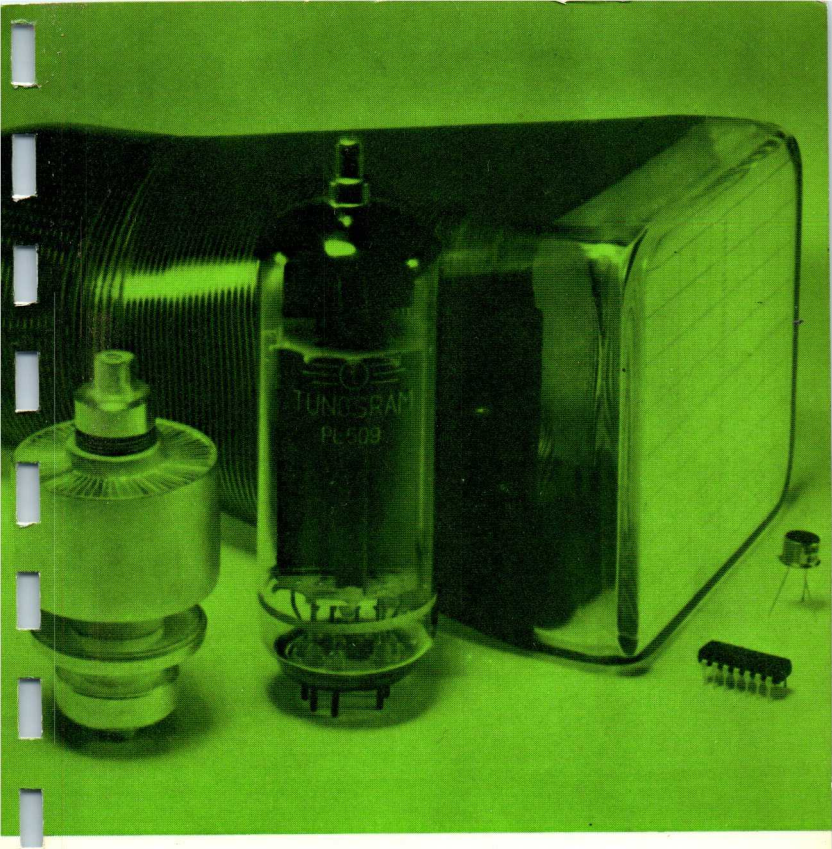

P. J. Durham

TUNGSRAM

ELECTRON TUBES SEMICONDUCTORS '76

Type	Page	Type	Page	Type	Page	Type	Page
AA 112	V-2	BA 244	V-3	BYX42/300T	V-16	EBF 80	I-5
AA 113	V-2	BAY 41	V-3	BYX42/400T	V-16	EBF 89	I-5
AA 116	V-2	BAY 42	V-3				
AA 117	V-2	BAY 43	V-3	D. 7-113	II-3	EC 86	I-6
AA 118	V-2	BAY 93	V-3	D. 7-113 F	II-3	EC 88	I-6
AA 119	V-2			D. 7-115	II-4	EC 92	I-6
AA 132	V-2	BB 105A	V-4	D. 7-115 F	II-4		
AA 135	V-2	BB 105B	V-4	D. 7-116	II-5	ECC 40	I-6
AA 136	V-2	BB 105G	V-4	D. 7-116 F	II-5	ECC 81	I-7
AA 137	V-2			DG 7-123	II-6	ECC 82	I-7
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		BC 177	V-8	DG 7-131	II-10	ECF 80	I-8
AC 125	V-5	BC 178	V-8	DG 7-132	II-11	ECF 82	I-9
AC 125(z)	V-5	BC 179	V-8	D. 7-176	II-12	ECH 42	I-9
AC 125F(z)	V-5	BC 237	V-8	D. 7-178	II-13	ECH 81	I-10
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AC 128	V-5	BC 308	V-8	D 13-21 ..	II-17	ECL 80	I-12
AC 128K	V-5	BC 309	V-8	D 13-26 ..	II-18	ECL 82	I-12
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AC 176	V-5	BCY 58	V-8	D. 13-111	II-20	ECL 86	I-13
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AC 187	V-5	BCY 78	V-8	D. 13-116	II-22		
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		BF 173	V-10	D. 13-136	II-25	EF 80	I-15
AD 161	V-7	BF 177	V-10	D. 13-154	II-26	EF 85	I-15
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ASZ 15	V-7			DY 86	I-2		
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ASZ 17	V-7	BFY 34	V-10	DY 802	I-2	EY 87	I-18
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I.

TUNGSRAM

RADIO AND TV RECEIVING TUBES

KEY TO SYMBOLS OF RECEIVING TUBES

1. INDICES

max	maximum value
min	minimum value
s	peak value

2. SYMBOLS DENOTING VOLTAGES

U_a	anode voltage
U_{a0}	cold-cathode anode voltage, the DC-voltage allowed between anode and cathode of the unheated tube and/or the tube operation under anode current cutoff condition ($I_a = 0$ mA)
U_{arc}	arc voltage
$\triangle U_{arc}$	arc voltage difference in the control range
U_b	supply voltage
U_f	heater voltage
U_{fk}	maximum voltage between cathode and heater if cathode is negative
U_{-fk}	maximum voltage between cathode and heater if cathode is positive
$U_{g2\ldots4}$	D.C. voltage between grids No. 2...4 and cathode
U_{ign}	ignition voltage
U_l	voltage on fluorescent screen
U_{tr}	transformer voltage (secondary)

3. SYMBOLS DENOTING CURRENTS

I_a	anode current; at voltage regulators: arc current
$I_{a\,s}$	peak anode current
I_f	heater current
$I_{g2\ldots4}$	direct current to grids No. 2...4
I_k	cathode current
I_l	current to fluorescent screen

4. SYMBOLS DENOTING POWERS

N_a	anode dissipation
$N_{g2\ldots4}$	dissipation of grids No. 2...4
N_o	output power ($k < 10\%$)

5. SYMBOLS DENOTING CAPACITANCES

C_{ag1}	capacitance, anode to grid
C_{boost}	capacitance of booster diode
C_{filt}	maximum capacitance of smoothing filter
C_i	input capacitance, i.e. capacitance between grid No. 1 and all other electrodes except anode
C_o	output capacitance, i.e. capacitance between anode and all other electrodes except grid No. 1

6. SYMBOLS DENOTING RESISTANCES

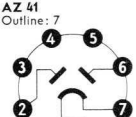
R_a	external resistance in an anode lead
R_d	protecting resistance of rectifier tube
R_{eq}	equivalent noise resistance
R_{fk}	external resistance between cathode and heater
$R_{g1\ldots4}$	external resistor in the circuit of grid No. 1...4
R_k	cathode resistance
r_i	internal resistance

7. SYMBOLS DENOTING VARIOUS QUANTITIES

d	direct-heated cathode
i	indirect-heated cathode
S	mutual conductance
S_c	conversion conductance
T_b	bulb temperature
μ	amplification factor
μ_{g2g1}	amplification factor of grid No. 2 with respect to grid No.1

The base connections given in the catalogue are represented in bottom-view.
It is not permitted to connect anything to the pin even if it is free according to the drawing because an inner connection may be on the free pin.

AZ 41
Outline: 7



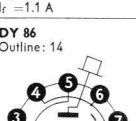
U_f = 4 V
I_f = 1.1 A

FULL-WAVE RECTIFIER

Typical Operation

U_{tr}	= 2 × 300	2 × 400	2 × 500 V_{eff}
I_a	= 70	65	60 mA
C_{filt}	= 50	50	50 μF
$R_{d\,min}$	= 2 × 100	2 × 150	2 × 200 Ω

DY 86
Outline: 14



U_f = 1.4 V
I_f = 0.55 A

HIGH VOLTAGE RECTIFIER for TV receivers

Rectification of line flyback pulses

Maximum Ratings		Typical Operation	
$-U_{a\,s}$[1]	= 22 kV	U_a =	18 kV
I_a	= 0.8 mA	I_a =	0.15 mA
$I_{a\,s}$	= 40 mA	Capacitance	
C_{filt}	= 2 nF	C_o =	1.8 pF

[1] maximum pulse duration 22% of one cycle, not exceeding 18 μs

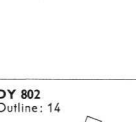
DY 87

HIGH VOLTAGE RECTIFIER for TV receivers

Electrical data identical with DY 86.

The envelope is coated with a water repellent layer to preclude flash-overs even at high ambient humidity.

DY 802
Outline: 14



U_f = 1.4 V
I_f = 0.6 A

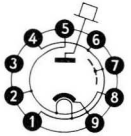
HIGH VOLTAGE RECTIFIER for TV receivers

Rectification of line flyback pulses

Maximum Ratings		Typical Operation	
$-U_{a\,s}$[1]	= 25 kV	U_a =	20 kV
I_a[2]	= 0.5 mA	I_a =	200 μA
$I_{a\,s}$	= 50 mA	Capacitance	
C_{filt}	= 3 nF	C_o =	1 pF

[1] maximum pulse duration 22% of one cycle, not exceeding 18 μs
[2] in circuits with constant load; during short periods as in operation of TV circuits I_a = max. 0.8 mA

DY 806
Outline: 14



U_f = 1.4 V
I_f = 0.55 A

HIGH VOLTAGE RECTIFIER for TV receivers

Rectification of line flyback pulses

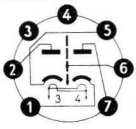
Maximum Ratings		Typical Operation	
$-U_{as}$[1]	= 22 kV	U_a	= 18 kV
I_a	= 0.8 mA	I_a	= 0.15 mA
I_{as}	= 40 mA	Capacitance	
C_{filt}	= 2 nF	C_o	= 1.8 pF

[1] maximum pulse duration 22% of one cycle, not exceeding 18 µs

DY 807

HIGH VOLTAGE RECTIFIER for TV receivers
Electrical data identical with DY 806.
The envelope is coated with a water-repellent layer to preclude flash-overs even at high humidity.

EAA 91
Outline: 1



U_f = 6.3 V
I_f = 300 mA
$U_{fk\,s}$ = 150 V
$U_{fk\,s}$[1] = 330 V

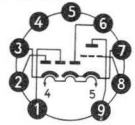
TWIN DIODE for AM, FM demodulators and ratio detectors

Maximum Ratings per Section		Typical Operation per Section	
$-U_{ak}$	= 420 V	U_{tr}	= 150 V_{eff}
I_a	= 9 mA	I_a	= 9 mA
I_{ks}	= 54 mA	Capacitance	
R_{fk}	= 20 kΩ	C_o	= 3.2 pF

[1] DC component max. 200 V

EABC 80

Outline: 11



U_f = 6.3 V
I_f = 480 mA
U_{fk} = 150 V

TRIPLE DIODE-TRIODE intended for AM and FM signal detection and AF amplifiers

Maximum Ratings

Triode

U_a = 300 V
N_a = 1 W
I_k = 5 mA
R_{g-k} = 3 MΩ
R_g[1] = 22 MΩ
R_{fk} = 20 kΩ

Diodes

$-U_{dI\,s}$ = 350 V
$-U_{dII\,s}$ = 350 V
$-U_{dIII\,s}$ = 350 V
$I_{dI\,s}$ = 6 mA
$I_{dII\,s}$ = 75 mA
$I_{dIII\,s}$ = 75 mA
I_{dI} = 1 mA
I_{dII} = 10 mA
I_{dIII} = 10 mA

Typical Operation

Triode

U_a = 200 V
$-U_g$ = 2.3 V
I_a = 1 A
S = 1.4 mA/V
r_i = 50 kΩ
μ = 70

Diodes

I_{dI} = 2 mA
U_{dI} = 10 V
I_{dII} = 25 mA
U_{dII} = 5 V
I_{dIII} = 25 mA
U_{dIII} = 5 V

Capacitances of Triode

C_i = 1.9 pF
C_o = 1.4 pF
C_{ag} = 2 pF

[1] grid current bias

EAF 42

Outline: 4

U_f = 6.3 V
I_f = 200 mA
U_{fk} = 50 V

DIODE-PENTODE for RF, IF or AF amplifiers

Maximum Ratings

Pentode

$U_{a\,0}$ = 550 V
N_a = 2 W
$N_{g\,2}$ = 0.3 W
$U_{g\,2}$ = 550 V
I_k = 10 mA
R_{gI} = 3 MΩ
R_{g3} = 3MΩ

Diode

$-U_{f\,k}$ = 350 V
$I_{f\,k}$ = 5 mA
I_a = 0.8 mA

Typical Operation

Pentode in RF or IF amplifiers

U_a = 250 V
I_a = 5 mA
U_{g3} = 0 V
U_{g2} = 85 V
I_{g2} = 1.5 mA
R_{g2} = 110 kΩ
$-U_{gI}$ = 2 V
R_k = 0.31 kΩ
S = 2 mA/V
r_i = 1.4 MΩ
$\mu_{g2/gI}$ = 16

Capacitances

Pentode

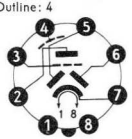
C_i = 4 pF
C_o = 6.5 pF
C_{ag} = 2 mpF

Diode

C_D = 3.8 pF

EBC 41

Outline: 4



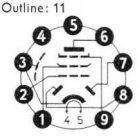
U_f = 6.3 V
I_f = 230 mA
U_{fk} = 100 V

TWIN DIODE-TRIODE FOR AF amplifiers

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Triode	
U_{a0}	= 550 V	U_a	= 250 V	C_i	= 2.7 pF
N_a	= 0.5 W	$-U_g$	= 3 V	C_o	= 1.7 pF
I_k	= 5 mA	I_a	= 1 mA	C_{ag1}	= 1.5 pF
R_g	= 3 MΩ	S	= 1.2 mA/V	Diode	
Diodes		μ	= 70	C_{d1}	= 0.8 pF
$-U_{as}$	= 350 V	r_i	= 58 kΩ	C_{d2}	= 0.7 pF
I_{as}	= 5 mA				
I_a	= 0.8 mA				

EBF 80

Outline: 11



U_f = 6.3 V
I_f = 300 mA
U_{fk} = 100 V

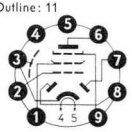
TWIN DIODE-PENTODE WITH VARIABLE TRANSCONDUCTANCE for RF, IF or AF amplifiers

Maximum Ratings		Typical Operation		Capacitances	
Pentode		Pentode		Pentode	
U_{a0}	= 550 V	U_a	= 250 V	C_i	= 4.2 pF
N_a	= 1.5 W	I_a	= 5 mA	C_o	= 4.9 pF
N_{g2}	= 0.3 W	U_{g2}	= 85 V	C_{ag1}	= 4 mpF
U_{g2}	= 300 V	I_{g2}	= 1.75 mA	Diode	
I_k	= 10 mA	R_{g2}	= 95 kΩ	C_o	= 2.2 pF
R_{g1}[1]	= 3 MΩ	$-U_{g1}$	= 2 V		
Diodes		R_k	= 300 Ω		
$-U_{as}$	= 350 V	S	= 2.2 mA/V		
I_{as}	= 5 mA	r_i	= 1.4 MΩ		
I_a	= 0.8 mA	μ_{g2g1}	= 18		

[1] automatic bias

EBF 89

Outline: 11



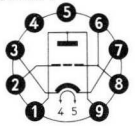
U_f = 6.3 V
I_f = 300 mA
U_{fk} = 100 V

TWIN DIODE-PENTODE WITH VARIABLE TRANSCONDUCTANCE for RF, IF or AF amplifiers

Maximum Ratings		Typical Operation		Capacitances	
Pentode		Pentode		Pentode	
U_{a0}	= 550 V	U_a	= 250 V	C_i	= 5 pF
N_a	= 2.25 W	I_a	= 9 mA	C_o	= 5.2 pF
U_{g2}	= 300 V	U_{g3}	= 0 V	C_{ag1}	= 3.5 mpF
N_{g2}	= 0.45 V	U_{g2}	= 100 V		
I_k	= 16.5 mA	I_{g2}	= 2.7 mA	Diodes	
R_{g1}	= 3 MΩ	$-U_{g1}$	= 2 V	C_o	= 2.5 pF
Diodes		S	= 3.8 mA/V		
$-U_{as}$	= 200 V	r_i	= 1 MΩ		
I_{as}	= 5 mA	μ_{g2g1}	= 20		
I_a	= 0.8 mA				

EC 86

Outline: 9



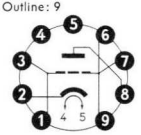
U_f = 6.3 V
I_f = 175 mA
U_{fk} = 50 V
U_{-fk} = 100 V

TRIODE for use as UHF amplifier and self-oscillating mixer for bands IV and V

Maximum Ratings		Typical Operations		Capacitances	
$U_{a\,o}$	= 550 V	U_a	= 175 V	C_i	= 3.6 pF
U_a	= 220 V	I_a	= 12 mA	C_o	= 2.3 pF
N_a	= 2.2 W	$-U_g$	= 1.5 V	C_{ag}	= 2.2 pF
I_k	= 20 mA	S	= 14 mA/V		
$-U_g$	= 50 V	μ	= 68		
R_g	= 1 MΩ	R_{eq}	= 230 Ω		

EC 88

Outline: 9



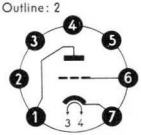
U_f = 6.3 V
I_f = 165 mA
U_{fk} = 100 V

TRIODE for use as UHF amplifier for bands IV and V

Maximum Ratings		Typical Operations		Capacitance	
$U_{a\,o}$	= 550 V	U_a	= 160 V	C_{ag}	= 1.7 pF
U_a	= 175 V	I_a	= 12.5 mA		
N_a	= 2 W	$-U_g$	= 1.3 V		
I_k	= 13 mA	S	= 13.5 mA/V		
$-U_g$	= 50 V	μ	= 65		
R_g	= 1 MΩ	R_{eq}	= 240 Ω		
		R_k	= 100 Ω		

EC 92

Outline: 2



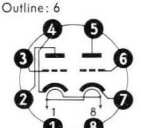
U_f = 6.3 V
I_f = 150 mA
U_{fk} = 100 V

TRIODE for use as oscillator, mixer or amplifier in FM and TV receivers

Maximum Ratings		Typical Operation		Capacitances	
$U_{a\,o}$	= 550 V	U_a	= 250 V	C_i	= 2.8 pF
U_a	= 300 V	I_a	= 10 mA	C_o	= 0.55 pF
N_a	= 2.5 W	$-U_g$	= 2 V	C_{ag}	= 1.8 pF
I_k	= 15 mA	S	= 5.5 mA/V		
$-U_g$	= 50 V	r_i	= 11 kΩ		
R_g	= 1 MΩ	μ	= 60		

ECC 40

Outline: 6



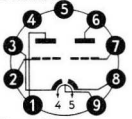
U_f = 6.3 V
I_f = 300 mA
U_{fk} = 90 V

TWIN TRIODE for use as AF amplifier, phase inverter or output tube

Maximum Ratings per Section		Typical Operation per Section		Capacitances	
U_{a0}	= 550 V	U_a	= 250 V	C_i	= 2.8 pF
U_a	= 300 V	I_a	= 6 mA	C_o	= 1.1 pF
N_a	= 1.5 W	$-U_g$	= 5.6 V	C_{ag}	= 2.7 pF
N_g	= 0.1 W	S	= 2.9 mA/V		
R_g	= 1 MΩ	μ	= 32		
I_k	= 10 mA	r_i	= 11 kΩ		

ECC 81

Outline: 9



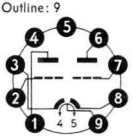
U_f = 6.3 V
I_f = 300 mA or
U_f = 12.6 V
I_f = 150 mA
U_{fk} = 90 V

TWIN TRIODE for use as oscillator, mixer or amplifier in TV receivers

Maximum Ratings per Section		Typical Operation per Section		Capacitances	
U_{a0}	= 550 V	U_a	= 250 V	C_i	= 2.5 pF
U_a	= 300 V	I_a	= 10 mA	C_o	= 0.4 pF
N_a	= 2.5 W	$-U_g$	= 2 V	C_{ag}	= 1.7 pF
I_k	= 15 mA	S	= 5.5 mA/V		
$-U_g$	= 50 V	r_i	= 11 kΩ		
R_g	= 1 MΩ	μ	= 60		

ECC 82

Outline: 9



U_f = 6.3 V
I_f = 300 mA or
U_f = 12.6 V
I_f = 150 mA
U_{fk} = 180 V

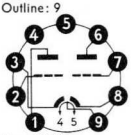
TWIN TRIODE for use as AF amplifier

Maximum Ratings per Section		Typical Operation per Section		Capacitances	
U_{a0}	= 550 V	U_a	= 250 V	C_i	= 1.8 pF
U_a	= 300 V	I_a	= 10.5 mA	C_{oI}	= 0.5 pF
N_a	= 2.75 W	$-U_g$	= 8.5 V	C_{oII}	= 0.37 pF
I_k	= 20 mA	S	= 2.2 mA/V	C_{ag}	= 1.6 pF
$-U_g$	= 100 V	r_i	= 7.7 kΩ		
R_g[1]	= 1 MΩ	μ	= 17		

[1] automatic bias

ECC 83

Outline: 9



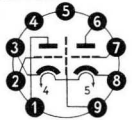
U_f = 6.3 V
I_f = 300 mA or
U_f = 12.6 V
I_f = 150 mA
U_{fk} = 180 V

TWIN TRIODE for use as AF amplifier

Maximum Ratings per Section		Typical Operation per Section		Capacitances	
U_{a0}	= 550 V	U_a	= 250 V	C_i	= 1.7 pF
U_a	= 300 V	I_a	= 1.2 mA	C_{oI}	= 0.46 pF
N_a	= 1 W	$-U_g$	= 2 V	C_{oII}	= 0.34 pF
I_k	= 8 mA	S	= 1.6 mA/V	C_{ag}	= 1.7 pF
$-U_g$	= 50 V	r_i	= 62.5 kΩ		
R_g	= 2 MΩ	μ	= 100		

ECC 85

Outline: 9



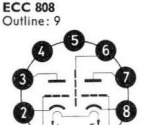
U_f = 6.3 V
I_f = 435 mA
U_{fk} = 90 V

TWIN TRIODE for use as RF amplifier and self-oscillating mixer

Maximum Ratings per Section		Typical Operation per Section		Capacitances	
U_{a0}	= 550 V	U_a	= 250 V	C_i	= 3 pF
U_a	= 300 V	I_a	= 10 mA	C_o	= 1.2 pF
N_a	= 2.5 W	$-U_g$	= 2.2 V	C_{ag}	= 1.5 pF
I_k	= 15 mA	S	= 6 mA/V		
$-U_g$	= 100 V	r_i	= 9.4 kΩ		
R_g	= 1 MΩ	μ	= 57		

ECC 808

Outline: 9



U_f = 6.3 V
I_f = 340 mA
U_{fk} = 100 V
$\cdot U_{fk}$ = 100 V

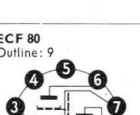
TWIN TRIODE for use as low noise, low hum pre-amplifier

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_a = 300 V	U_a = 250 V	C_i = 2.2 pF
N_a = 0.5 W	I_a = 1.2 mA	C_o = 1.5 pF
I_k = 4 mA	$-U_g$ = 1.9 V	C_{ag} = 1.5 pF
R_g[1] = 1 MΩ	S = 1.6 mA/V	
R_g[2] = 22 MΩ	μ = 100	

[1] fixed grid bias
[2] grid current bias

ECF 80

Outline: 9



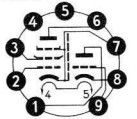
U_f = 6.3 V
I_f = 430 mA
U_{kf} = 100 V
U_{-fk} = 100 V

TRIODE-PENTODE with separate cathodes for use as frequency changer in TV receivers

Maximum Ratings	Typical Operation	Capacitances
Triode	Triode	Triode
U_a = 250 V	U_a = 100 V	C_i = 2.5 pF
N_a = 1.5 W	I_a = 14 mA	C_o = 1.8 pF
I_k = 14 mA	$-U_g$ = 2 V	C_{ag} = 1.5 pF
R_g = 0.5 MΩ	S = 5 mA/V	Pentode
Pentode	μ = 20	C_i = 5.2 pF
U_a = 250 V	Pentode	C_o = 3.4 pF
U_{g2} = 175 V	U_a = 170 V	C_{ag1} < 25 mpF
N_a = 1.7 W	U_{g2} = 170 V	
N_{g2} = 0.75 W	$-U_{g1}$ = 2 V	
I_k = 14 mA	I_a = 10 mA	
R_{g1} = 1 MΩ	I_{g2} = 2.8 mA	
	S = 6.2 mA/V	
	μ_{g2g1} = 47	
	r_i = 0.4 MΩ	

ECF 82

Outline: 9



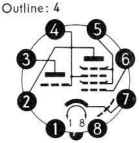
U_f = 6.3 V
I_f = 430 mA
U_{fk} = 90 V

TRIODE-PENTODE with separate cathodes for use as frequency changer in TV receivers

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Triode	
U_a	= 300 V	U_a	= 150 V	C_i	= 2.5 pF
N_a	= 1.5 W	I_a	= 11 mA	C_o	= 0.4 pF
I_k	= 20 mA	$-U_g$	= 2 V	C_{ag}	= 1.8 mpF
R_g	= 1 MΩ	S	= 5.8 mA/V	Pentode	
Pentode		μ	= 35	C_i	= 5.2 pF
U_a	= 300 V	Pentode		C_o	= 2.6 pF
U_{g2}	= 300 V	U_a	= 170 V	C_{ag1}	< 15 mpF
N_a	= 2 W	I_a	= 10 mA		
N_{g2}	= 0.5 W	U_{g2}	= 110 V		
I_k	= 20 mA	I_{g2}	= 3.3 mA		
R_{g1}	= 1 MΩ	S	= 5.5 mA/V		
		r_i	= 400 kΩ		
		μ_{g2g1}	= 32		

ECH 42

Outline: 4



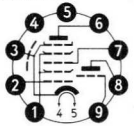
U_f = 6.3 V
I_f = 230 mA
U_{fk} = 100 V

TRIODE-HEXODE for use as frequency changer and phase inverter

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Triode	
U_a	= 175 V	U_a	= 100 V	C_i	= 5.5 pF
N_a	= 0.8 W	U_g	= 0 V	C_o	= 2.3 pF
I_k	= 6 mA	I_a	= 10 mA	C_{ag}	= 1.2 pF
R_g	= 3 MΩ	S	= 2.8 mA/V	Hexode	
Hexode		μ	= 22	C_i	= 4.1 pF
U_a	= 300 V	Hexode as frequency changer		C_o	= 9.2 pF
N_a	= 1.5 W	U_a	= 250 V	C_{ag1}	< 0.1 pF
I_k	= 10 mA	$-U_{g1}$	= 2 V		
U_{g2+4}	= 125 V	U_{g2+4}	= 85 V		
N_{g2+4}	= 0.3 W	I_a	= 3 mA		
R_{g1}	= 3 MΩ	I_{g2+4}	= 3 mA		
R_{g3}	= 3 MΩ	S_c	= 750 μA/V		
		R_i	= 1 MΩ		
		$R_1 = R_2$	= 2 kΩ		
		R_k	= 180 Ω		

ECH 81

Outline: 11



U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

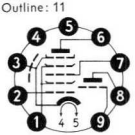
TRIODE-HEPTODE; heptode section for use as mixer, RF or IF amplifier, triode section for use as oscillator in AM or FM receivers

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Triode	
U_a	= 250 V	U_a	= 100 V	C_i	= 3.3 pF
N_a	= 0.8 W	U_g	= 0 V	C_o	= 2.7 pF
I_k	= 6.5 mA	I_a	= 13.5 mA	C_{ag}	= 1 pF
R_g	= 3 MΩ	S	= 3.7 mA/V		
		μ	= 22	Heptode	
Heptode				C_i	= 4.8 pF
U_a	= 300 V	Heptode		C_o	= 7.9 pF
N_a	= 2 W	U_a	= 160 V	C_{ag1}	< 8 mpF
U_{g2+4}	= 125 V	U_{g3}	= 0 V		
N_{g2+4}	= 0.8 W	U_{g2+4}	= 100 V		
I_k	= 18 mA	I_{g1}	= 0.5 μA		
R_{g1}	= 3 MΩ	$-U_{g1}$	= 0.5 V		
R_{g3}[1]	= 3 MΩ	I_a	= 11 mA		
		I_{g2+4}	= 7 mA		
		S	= 4.5 mA/V		
		μ_{g2g1}	= 25		

[1] in case No. 3 is directly connected to grid triode

ECH 83

Outline: 11



U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

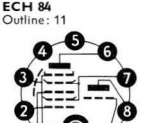
TRIODE-HEPTODE for use as mixer in car radio sets and as synchronizing separator in TV receivers

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Triode	
U_a	= 250 V	U_a	= 6.3 V	C_i	= 3.3 pF
N_a	= 0.8 W	I_a	= 0.3 mA	C_o	= 2.7 pF
I_k	= 6.5 mA	S	= 0.8 mA/V	C_{ag}	< 1 pF
R_g[1]	= 3 MΩ	μ	= 14.6		
		R_g[1]	= 47 kΩ	Heptode	
Heptode				C_i	= 4.8 pF
U_a	= 50 V	Heptode as mixer[2]		C_o	= 7.9 pF
U_{g2+4}	= 50 V	U_a	= 6.3 V	C_{ag1}	= 12 mpF
I_k	= 5 mA	U_{g2+4}	= 6.3 V		
R_{g1}[1]	= 3 MΩ	I_a	= 50 μA		
R_{g3}	= 50 kΩ	I_{g2+4}	= 80 μA		
		S_c	= 80 μA/V		
		r_i	= 1.3 MΩ		
		U_{osc}	= 1.1 V_{eff}		
		R_{g1}[1]	= 1 MΩ		
		R_{g3}	= 47 kΩ		
		I_{g3}	= 7 μA		

[1] grid current bias

ECH 84

Outline: 11



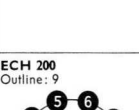
U_f = 6.3 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE-HEPTODE for use as pulse separator, noise inverter and synchronizing amplifier

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Triode	
U_a	= 250 V	U_a	= 50 V	C_i	= 3 pF
N_a	= 1.3 W	U_g	= 0 V	C_{ag}	= 1.1 pF
$-U_{g\,s}$	= 200 V	I_a	= 3 mA	Heptode	
I_k	= 10 mA	S	= 3.7 mA/V	C_{ag1}	< 9 mpF
R_g	= 3 MΩ	μ	= 50		
Heptode		Heptode			
U_a	= 250 V	U_a	= 135 V		
N_a	= 1.7 W	U_{g3}	= 0 V		
U_{g2+4}	= 250 V	U_{g2+4}	= 14 V		
N_{g2+4}	= 0.8 W	I_a	= 1.7 mA		
I_k	= 12.5 mA	I_{g2+4}	= 0.9 mA		
$-U_{g1\,s}$	= 150 V	S	= 2.2 mA/V		
R_{g1}	= 3 MΩ				
$-U_{g3\,s}$	= 150 V				
R_{g3}	= 3 MΩ				

ECH 200

Outline: 9



U_f = 6.3 V
I_f = 435 mA
U_{fk} = 100 V

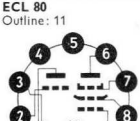
TRIODE-HEPTODE; triode section for use as pulse amplifier and heptode section for use as noisegated synchronizing separator

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Triode	
U_a	= 250 V	U_a	= 100 V	C_i	= 3.3 pF
N_a	= 1.5 W	I_a	= 9 mA	C_o	= 1.7 pF
I_k	= 20 mA	$-U_g$	= 1 V	C_{ag}	= 1.8 pF
R_g	= 3 MΩ	S	= 8.8 mA/V	Heptode	
$-U_{g\,s}$	= 200 V	μ	= 50	C_i	= 4.4 pF
Heptode		Heptode		C_o	= 5.4 pF
U_a	= 100 V	U_a	= 14 V	C_{ag1}	< 100 mpF
U_{g2+4}	= 50 V	U_{g2+4}	= 14 V		
N_a	= 0.5 W	U_{g3}	= 0 V		
N_{g2+4}	= 0.5 W	U_{g1}	= 1.5 V		
I_k	= 8 mA	I_{g2+4}	= 1.3 mA		
R_{g1}	= 3 MΩ				
R_{g3}[1]	= 3 MΩ				
$-U_{g1\,s}$	= 100 V				
$-U_{g3\,s}$	= 150 V				

[1] automatic bias

ECL 80

Outline: 11



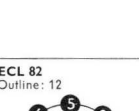
U_f = 6.3 V
I_f = 0.3 A
U_{fk} = 150 V

TRIODE-OUTPUT PENTODE: triode for use as AF preamplifier and oscillator; pentode for use as synchronizing pulse separator, frame output tube and AF power amplifier

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Triode	
U_a	= 200 V	U_a	= 100 V	C_i	= 2.1 pF
N_a	= 1 W	U_g	= 0 V	C_o	= 0.8 pF
I_k	= 8 mA	I_a	= 8 mA	C_{ag}	= 0.9 pF
R_g	= 1 MΩ	S	= 1.9 mA/V	Pentode	
Pentode		μ	= 20	C_i	= 4.3 pF
U_a	= 400 V	Pentode as AF power amplifier, class A		C_o	= 4.8 pF
N_a	= 3.5 W	U_a	= 170 V	C_{ag1}	= 2 pF
N_{g2}	= 1.2 W	I_a	= 15 mA		
I_k	= 25 mA	U_{g3}	= 0 V		
R_{g1}	= 1 MΩ	U_{g2}	= 170 V		
		$-U_{g1}$	= 6.7 V		
		I_{g2}	= 2.8 mA		
		S	= 3.2 mA/V		
		μ_{g2g1}	= 14		

ECL 82

Outline: 12



U_f = 6.3 V
I_f = 780 mA
U_{fk} = 150 V

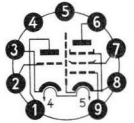
TRIODE-OUTPUT PENTODE: triode for use as frame oscillator and AF amplifier, pentode for use as frame output tube and AF power amplifier

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Triode	
U_a	= 300 V	U_a	= 100 V	C_i	= 3 pF
N_a	= 1 W	U_g	= 0 V	C_o	= 4.3 pF
I_k	= 15 mA	I_a	= 3.5 mA	C_{ag}	= 4.4 pF
R_g[1]	= 3 MΩ	S	= 2.2 mA/V	Pentode	
Pentode		μ	= 70	C_i	= 9.3 pF
U_a	= 300 V	Pentode		C_o	= 8 pF
N_a	= 5 W	U_a	= 170 V	C_{ag1}	< 0.3 pF
U_{g2}	= 300 V	U_{g2}	= 170 V		
N_{g2}	= 2 W	$-U_{g1}$	= 11.5 V		
I_k	= 50 mA	I_a	= 41 mA		
R_{g1}[1]	= 2 MΩ	I_{g2}	= 9 mA		
		S	= 7.5 mA/V		
		r_i	= 16 kΩ		
		μ_{g2g1}	= 9.5		

[1] automatic bias

ECL 85

Outline: 12



U_f = 6.3 V
I_f = 860 mA
U_{fk} = 100 V

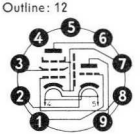
TRIODE-OUTPUT PENTODE with separate cathodes; triode for use as frame oscillator or pulse amplifier, pentode for use as frame output tube

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Pentode	
U_a	= 300 V	U_a	= 100 V	C_{ag1}	= 0.6 pF
N_a	= 0.5 W	I_a	= 10 mA		
I_k	= 15 mA	U_g	= 0 V		
R_g[1]	= 3.3 MΩ	S	= 7 mA/V		
Pentode		μ	= 63		
U_a	= 300 V	r_i	= 9 kΩ		
U_{g2}	= 250 V	Pentode			
N_a	= 7 W	U_a	= 50 V		
N_{g2}	= 1.5 W	U_{g2}	= 170 V		
I_k	= 75 mA	$-U_{g1}$	= 1 V		
R_{g1}[1]	= 2.2 MΩ	I_{a1}	= 200 mA		
		$I_{g2\,s}$	= 35 mA		

[1] automatic bias

ECL 86

Outline: 12



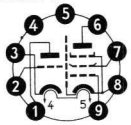
U_f = 6.3 V
I_f = 700 mA
U_{fk} = 100 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode for use as AF amplifier, pentode for use as AF amplifier

Maximum Ratings		Typical Operation		Capacitances	
Triode		Triode		Triode	
U_a	= 300 V	U_a	= 250 V	C_i	= 2.3 pF
N_a	= 0.5 W	$-U_g$	= 1.9 V	C_o	= 2.3 pF
I_k	= 4 mA	I_a	= 1.2 mA	C_{ag1}	= 1.4 pF
R_g	= 1 MΩ	S	= 1.6 mA/V	Pentode	
Pentode		μ	= 100	C_i	= 10 pF
U_a	= 300 V	Pentode		C_{ag1}	= 0.4 pF
U_{g2}	= 300 V	U_a	= 250 V		
N_a	= 9 W	U_{g2}	= 250 V		
N_{g2}	= 1.8 W	$-U_{g1}$	= 7 V		
I_k	= 55 mA	I_a	= 36 mA		
R_{g1}	= 0.5 MΩ	I_{g2}	= 6 mA		
		S	= 10 mA/V		
		μ_{g2g1}	= 21		
		r_i	= 48 kΩ		

ECL 805

Outline: 12



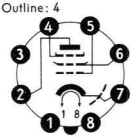
U_f = 6.3 V
I_f = 860 mA
U_{fk} = 200 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode for use as oscillator or preamplifier, pentode for use as power stage for vertical deflection

Maximum Ratings	Typical Operation	Capacitances
Triode	Triode	Pentode
U_a = 300 V	U_a = 100 V	C_{ag1} < 1 pF
N_a = 0.5 W	$-U_g$ = 0.85 V	
I_k = 15 mA	I_a = 5 mA	
R_g = 1 MΩ	S = 5.5 mA/V	
	μ = 60	
Pentode	Pentode	
U_a = 300 V	U_a = 65 V	
N_a = 8 W	U_{g2} = 210 V	
U_{g2} = 250 V	$-U_{g1}$ = 1 V	
N_{g2} = 1.5 W	I_{a+} = 285 mA	
I_k = 75 mA	I_{g2+} = 45 mA	
R_{g1} = 1 MΩ		

EF 40

Outline: 4



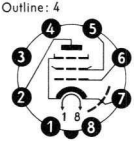
U_f = 6.3 V
I_f = 200 mA
U_{fk} = 50 V

PENTODE for use as AF amplifier

Maximum Ratings	Typical Operation	Capacitance
U_a = 300 V	U_a = 250 V	C_i = 4.5 pF
N_a = 1 W	U_{g3} = 0 V	C_o = 5.2 pF
U_{g2} = 200 V	U_{g2} = 140 V	C_{ag1} < 40 mpF
N_{g2} = 0.2 W	$-U_{g1}$ = 2 V	
I_k = 6 mA	I_a = 3 mA	
R_{g1} = 3 MΩ	I_{g2} = 0.55 mA	
	S = 1.85 mA/V	
	r_i = 2.5 MΩ	
	μ_{g2g1} = 38	

EF 41

Outline: 4



U_f = 6.3 V
I_f = 200 mA
U_{fk} = 50 V

PENTODE with variable transconductance for use as RF and IF amplifier

Maximum Ratings	Typical Operation	Capacitances
U_a = 300 V	U_a = 250 V	C_i = 5 pF
N_a = 2 W	I_a = 6 mA	C_o = 5.7 pF
U_{g2} [1] = 300 V	I_{g2} = 1.7 mA	C_{ag1} < 3 mpF
N_{g2} = 0.3 W	S = 2.2 mA/V	
I_k = 10 mA	r_i = 1.1 MΩ	
R_{g1} = 3 MΩ	μ_{g2g1} = 18	
R_{g2} = 90 kΩ		
R_k = 325 Ω		

[1] in case I_a < 3 mA

EF 42
Outline: 4

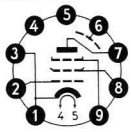
U_f = 6.3 V
I_f = 330 mA
U_{fk} = 50 V

PENTODE for use as wide-band amplifier

Maximum Ratings		Typical Operation		Capacitances	
U_a	= 300 V	U_a	= 250 V	C_i	= 9 pF
N_a	= 3.5 W	U_{g1}	= 2 V	C_o	= 4.3 pF
U_{g2}	= 300 V	U_{g3}	= 0 V	C_{ag1}	< 6 mpF
N_{g2}	= 0.7 W	U_{g2}	= 250 V		
I_k	= 25 mA	I_a	= 10 mA		
R_{g1} [1]	= 1 MΩ	I_{g2}	= 2.4 mA		
		S	= 9 mA/V		
		r_i	= 0.5 MΩ		
		μ_{g2g1}	= 83		

[1] automatic bias

EF 80
Outline: 11

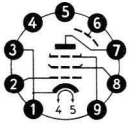


U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

PENTODE for use as RF, IF and video amplifying tubes or as mixing tube in TV receivers

Maximum Ratings		Typical Operation		Capacitances	
U_a	= 300 V	U_a	= 250 V	C_i	= 7.5 pF
N_a	= 2.5 W	U_{g3}	= 0 V	C_o	= 3.3 pF
U_{g2}	= 300 V	U_{g2}	= 250 V	C_{ag1}	< 7 mpF
N_{g2}	= 0.7 W	$-U_{g1}$	= 3.5 V		
I_k	= 15 mA	I_a	= 10 mA		
R_{g1}	= 1 MΩ	I_{g2}	= 2.8 mA		
		S	= 6.8 mA/V		
		r_i	= 0.65 MΩ		
		μ_{g2g1}	= 50		

EF 85
Outline: 11

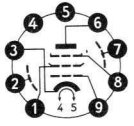


U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

PENTODE with variable transconductance for use as RF or IF amplifier

Maximum Ratings		Typical Operation		Capacitances	
U_a	= 250 V	U_a	= 250 V	C_i	= 7.2 pF
N_a	= 2.5 W	U_{g3}	= 0 V	C_o	= 3.2 pF
U_{g2}	= 250 V	$-U_{g1}$	= 2 V	C_{ag1}	< 7 mpF
N_{g2}	= 0.65 W	U_{g2}	= 100 V		
R_{g1}	= 3 MΩ	I_a	= 10 mA		
I_k	= 15 mA	I_{g2}	= 2.5 mA		
		R_{g2}	= 60 kΩ		
		S	= 6 mA/V		
		r_i	= 0.6 MΩ		
		μ_{g2g1}	= 26		

EF 86
Outline: 9

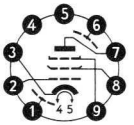


U_f = 6.3 V
I_f = 200 mA
U_{fk} = 150 V

PENTODE for use as AF amplifier

Maximum Ratings		Typical Operation		Capacitances	
U_a	= 300 V	U_a	= 250 V	C_i	= 4 pF
N_a	= 1 W	U_{g3}	= 0 V	C_o	= 5.5 pF
U_{g2}	= 200 V	U_{g2}	= 140 V	C_{ag1}	< 50 mpF
N_{g2}	= 0.2 W	$-U_{g1}$	= 2.2 V		
R_{g1}	= 3 MΩ	I_a	= 3 mA		
I_k	= 6 mA	I_{g2}	= 0.6 mA		
		S	= 2.2 mA/V		
		μ_{g2g1}	= 38		
		r_i	= 2.5 MΩ		

EF 89
Outline: 10

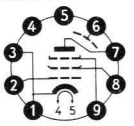


U_f = 6.3 V
I_f = 200 mA
U_{fk} = 100 V

PENTODE with variable transconductances for use as RF or IF amplifier

Maximum Ratings		Typical Operation		Capacitances	
U_a	= 300 V	U_a	= 250 V	C_i	= 5.5 pF
N_a	= 2.25 W	U_{g2}	= 85 V	C_o	= 5.1 pF
U_{g2}	= 300 V	U_{g3}	= 0 V	C_{ag1}	< 2.5 mpF
N_{g2}	= 0.45 W	I_a	= 9 mA		
I_k	= 16.5 mA	$-U_{g1}$	= 1.2 V		
		I_{g2}	= 3.2 mA		
		S	= 4 mA/V		
		r_i	= 0.75 MΩ		
		μ_{g2g1}	= 21		

EF 183
Outline: 10



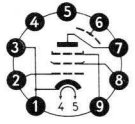
U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

PENTODE with variable transconductance for use as IF amplifier in TV receivers

Maximum Ratings		Typical Operation		Capacitances	
U_a	250 V	U_a	= 200 V	C_i	= 9.5 pF
N_a	= 2.5 W	U_{g3}	= 0 V	C_o	= 3 pF
U_{g2}	= 250 V	U_{g2}	= 90 V	C_{ag1}	< 5 mpF
$-U_{g1\,s}$	= 50 V	$-U_{g1}$	= 2 V		
N_{g2}	= 0.65 W	I_a	= 12 mA		
I_k	= 20 mA	I_{g2}	= 4.5 mA		
		S	= 12.5 mA/V		
		r_i	= 500 kΩ		

EF 184

Outline: 10



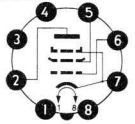
U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

PENTODE for use as IF amplifier in TV receivers

Maximum Ratings		Typical Operation		Capacitances	
U_a	= 250 V	U_a	= 200 V	C_i	= 10 pF
N_a	= 2.5 W	U_{g3}	= 0 V	C_o	= 3 pF
U_{g2}	= 250 V	U_{g2}	= 200 V	C_{ag1}	< 5.5 mpF
$-U_{g1\,s}$	= 50 V	$-U_{g1}$	= 2.5 V		
N_{g2}	= 0.9 W	I_a	= 10 mA		
I_k	= 25 mA	I_{g2}	= 4.1 mA		
		S	= 15 mA		
		r_i	= 380 kΩ		
		R_{g2}	= 7.5 kΩ		

EL 41

Outline: 7



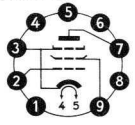
U_f = 6.3 V
I_f = 710 mA
U_{fk} = 50 V

PENTODE for use as AF power amplifier

Maximum Ratings		Typical Operation		Capacitances	
U_a	= 300 V	U_a	= 250 V	C_i	= 10 pF
U_{g2}	= 300 V	U_{g2}	= 250 V	C_o	= 7.8 pF
N_a	= 9 W	$-U_{g1}$	= 7 V	C_{ag1}	< 1 pF
N_{g2}	= 1.4 W	I_a	= 36 mA		
I_k	= 55 mA	I_{g2}	= 5.2 mA		
R_{g1}	= 1 MΩ	S	= 10 mA/V		
		μ_{g2g1}	= 22		
		r_i	= 40 kΩ		
		N_o	= 3.9 W		

EL 84

Outline: 12



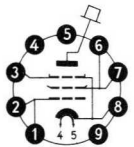
U_f = 6.3 V
I_f = 760 mA
U_{fk} = 100 V

PENTODE for use as AF power amplifier

Maximum Ratings		Typical Operation		Capacitances	
U_a	= 300 V	U_a	= 250 V	C_i	= 11 pF
N_a	= 12 W	U_{g2}	= 250 V	C_o	= 6 pF
U_{g2}	= 300 V	$-U_{g1}$	= 7.3 V	C_{ag1}	< 500 mpF
N_{g2}	= 2 W	I_a	= 48 mA		
$-U_{g1}$	= 100 V	I_{g2}	= 5.5 mA		
I_k	= 65 mA	N_o	= 6 W		
R_{g1} [1]	= 1 MΩ	S	= 11.3 mA/V		
		μ_{g2g1}	= 19		
		r_i	= 38 kΩ		

[1] automatic bias

EL 504
Outline: 18



U_f = 6.3 V
I_f = 1380 mA
U_{fk} = 220 V

PENTODE for use as line output tube in TV receivers

Maximum Ratings		Typical Operation[1]		Capacitance
U_a	= 250 V	U_a	= 50 V	C_{ag1} = 1.75 pF
$U_{a\,s}$[2]	= 7 kV	U_{g2}	= 200 V	
U_{g2}	= 250 V	$-U_{g1}$	= 10 V	
I_k	= 250 mA	$I_{a\,s}$	= 420 mA	
R_{g1}[3]	= 0.5 MΩ	$I_{g2\,s}$	= 37 mA	
		N_a	= 16 W	
		N_{g2}	= 4 W	

[1] measured under pulse conditions
[2] Max. pulse duration is 22% of a cycle and max. 18 µs
[3] should not exceed 2.2 MΩ for line output application

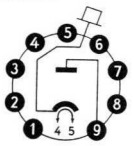
EY 86
U_f = 6.3 V
I_f = 90 mA

HIGH VOLTAGE RECTIFIER for TV receivers
Further data identical with DY 86.

EY 87
U_f = 6.3 V
I_f = 90 mA

HIGH VOLTAGE RECTIFIER for TV receivers
Further data identical with DY 87.

EY 88
Outline: 15



U_f = 6.3 V
I_f = 1550 mA

BOOSTER DIODE for use as line time-base circuits of transformerless TV receivers

Maximum Ratings		Capacitance
U_a	= 250 V	C_a = 8.9 pF
N_a	= 5 W	
I_a	= 220 mA	
$I_{a\,s}$	= 550 mA	
$U_{a\,s}$[2]	= 6000 V	
$U_{fk\,s}$[1]	= 6600 V	

[1] max. pulse duration is 22% of a cycle and max. 18 µs
[2] cathode positive with respect to anode

EY 500A
$U_f = 6.3$ V
$I_f = 90$ mA

BOOSTER DIODE for line time-base circuits of colour TV receivers
Further data identical with PY 500 A.

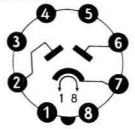
EY 806
$U_f = 6.3$ V
$I_f = 90$ mA

HIGH VOLTAGE RECTIFIER for TV receivers
Further data identical with DY 806.

EY 807
$U_f = 6.3$ V
$I_f = 90$ mA

HIGH VOLTAGE RECTIFIER for TV receivers
Further data identical with DY 807.

EZ 40
Outline: 6



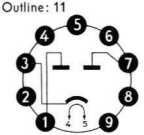
$U_f = 6.3$ V
$I_f = 600$ mA
$U_{fk} = 300$ V

FULL-WAVE RECTIFIER

Typical Operation

U_{tr}	$= 2 \times 250$	2×275	2×300	2×350 V_{eff}
I_a	$=$ 90	90	90	90 mA
C_{filt}	$=$ 50	50	50	50 μF
R_d	$= 2 \times 125$	2×175	2×215	2×300 Ω

EZ 80
Outline: 11



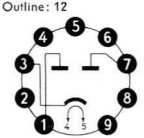
$U_f = 6.3$ V
$I_f = 600$ mA
$U_{fk} = 300$ V

FULL-WAVE RECTIFIER

Typical Operation

U_{tr}	$= 2 \times 250$	2×275	2×300	2×350 V_{eff}
I_a	$=$ 90	90	90	90 mA
C_{filt}	$=$ 50	50	50	50 μF
R_d	$= 2 \times 125$	2×175	2×215	2×300 Ω

EZ 81
Outline: 12



$U_f = 6.3$ V
$I_f = 600$ mA
$U_{fk} = 300$ V

FULL-WAVE RECTIFIER

Typical Operation

U_{tr}	$= 2 \times 250$	2×350	2×450 V_{eff}
I_a	$=$ 160	150	100 mA
C_{filt}	$=$ 50	50	50 μF
R_d	$= 2 \times 150$	2×230	2×310 Ω

PABC 80
U_f = 9.5 V
I_f = 300 mA
U_{fk} = 150 V

AF TRIODE WITH 3 DIODES for FM and AM signal detections and AF signal amplifications

Further data identical with EABC 80.

PC 86
U_f = 3.8 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE for use as UHF amplifier and selfoscillating mixer for bands IV and V

Further data identical with EC 86.

PC 88
U_f = 4 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE for use as UHF amplifier for bands IV and V

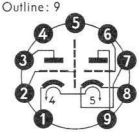
Further data identical with EC 88.

PC 92
U_f = 3.1 V
I_f = 300 mA
U_{fk} = 250 V

TRIODE for use as RF amplifier, selfoscillating mixer and video amplifying tube of TV receivers

Further data identical with EC 92.

PCC 84
Outline: 9

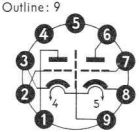


U_f = 7.2 V
I_f = 300 mA
U_{fk} = 90 V

TWIN TRIODE for use in cascode pre-stages in TV receivers

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_a = 180 V	U_a = 90 V	C_i = 2.3 pF
N_a = 2 W	$-U_g$ = 1.5 V	C_o = 0.45 pF
I_k = 22 mA	I_a = 12 mA	C_{agt} = 1150 mpF
$-U_g$ = 50 V	S = 6 mA/V	
	μ = 24	

PCC 88
Outline: 9



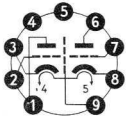
U_f = 7 V
I_f = 300 mA
U_{fk} = 80 V

TWIN-TRIODE for use as cascode amplifier in TV receivers

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_a = 130 V	U_a = 90 V	C_i = 3.3 pF
N_a = 1.8 W	$-U_g$ = 1.3 V	C_o = 1.8 pF
I_k = 25 mA	I_a = 15 mA	C_{agt} = 1.4 pF
$-U_g$ = 50 V	S = 12.5 mA/V	
R_g = 1 MΩ	μ = 33	

PCC 189

Outline: 9



U_f = 7.2 V
I_f = 300 mA
U_{fk} = 80 V

TWIN-TRIODE with variable transconductance for use as VHF cascode amplifier in TV receivers

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_a = 130 V	U_a = 90 V	C_i = 3.5 pF
N_a = 1.8 W	$-U_g$ = 1.4 V	C_i = 1.7 pF
$-U_g$ = 50 V	I_a = 15 mA	C_{ag1} = 1.9 pF
R_g[1] = 1 MΩ	S = 12.5 mA/V	
I_k = 22 mA	r_i = 2.5 kΩ	

[1] for unit a—g—k; for unit a'—g'—k': Rg = 0.5 MΩ

PCF 80

U_f = 9 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE-PENTODE with separate cathodes for use as frequency changer in TV receivers

Further data identical with ECF 80.

PCF 82

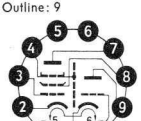
U_f = 9 V
I_f = 300 mA
U_{fk} = 90 V

TRIODE-PENTODE with separate cathodes for use as mixer in TV receivers

Further data identical with ECF 82.

PCF 200

Outline: 9

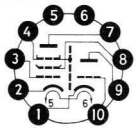


U_f = 8 V
I_f = 300 mA
U_{fk} = 150 V

TRIODE-PENTODE for use in TV receivers, triode section as limiter, noise detector, AGC amplifier, synchronizing separator and pulse amplifier; pentode section as sound IF amplifier and video IF amplifier

Maximum Ratings	Typical Operation	Capacitances
Pentode	Pentode	Triode
U_a = 250 V	U_a = 160 V	C_i = 2.1 pF
N_a = 2.1 W	U_{g3} = 0 V	C_o = 2.9 pF
I_k = 20 mA	U_{g2} = 135 V	C_{ag} = 2.2 pF
U_{g2} = 250 V	$-U_{g1}$ = 1.7 V	
N_{g2} = 0.75 W	I_a = 13 mA	Pentode
R_{g1} = 1 MΩ	I_{g2} = 5.3 mA	C_i = 6 pF
U_{fk} = 150 V	S = 14 mA/V	C_o = 3.3 pF
	μ_{g2g1} = 53	C_{ag1} = 5.6 mpF
Triode	Triode	
U_a = 250 V	U_a = 170 V	
N_a = 1.5 W	$-U_g$ = 1 V	
I_k = 18 mA	I_a = 8.5 mA	
R_g = 1 MΩ	S = 5.2 mA	
U_{fk} = 150 V	μ = 57	
U_{fk} = 200 V		

PCF 201
Outline: 9



U_f = 8 V
I_f = 300 mA
U_{fk} = 150 V

TRIODE-PENTODE for use in TV receivers; triode section as line blocking oscillator, part of multivibrator, synchronizing separator, pulse amplifier of AGC delay diode; pentode section with remote cut-off as video IF amplifier

Maximum Ratings

Pentode

U_a = 250 V
N_a = 2.1 W
U_{g2} = 250 V
N_{g2} = 0.7 W
R_{g1} = 1 MΩ
I_k = 20 mA

Triode

U_a = 250 V
N_a = 1.5 W
R_g = 1 MΩ
I_k = 18 mA

Typical Operation

Pentode

U_a = 160 V
U_{g3} = 0 V
U_{g2} = 110 V
$-U_{g1}$ = 1.4 V
I_a = 13 mA
I_{g2} = 5.3 mA
S = 12.6 mA/V
μ_{g2g1} = 45

Triode

U_a = 100 V
$-U_g$ = 2 V
I_a = 14 mA
S = 4.8 mA/V
μ = 17.5

Capacitance

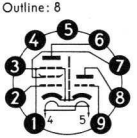
Triode

C_i = 2.1 pF
C_o = 3 pF
C_{ag} = 2 pF

Pentode

C_i = 6 pF
C_o = 3.3 pF
C_{ag1} = 5.6 mpF

PCF 801
Outline: 8



U_f = 8.5 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE-PENTODE; high transconductance triode section as oscillator, pentode section for use as frequency changer in VHF TV tuners

Maximum Ratings

Pentode

U_a = 250 V
N_a = 2 W
U_{g2} = 250 V
$-U_{g1}$ = 50 V
R_{g1} = 1 MΩ
I_k = 18 mA

Triode

U_a = 125 V
N_a = 1.5 W
$-U_g$ = 50 V
R_g = 0.5 MΩ
I_k = 20 mA

Typical Operation

Pentode

U_a = 170 V
U_{g2} = 120 V
$-U_{g1}$ = 1.4 V
I_a = 10 mA
I_{g2} = 3 mA
S = 11 mA/V
r_i = 350 kΩ
μ_{g2g1} = 55

Triode

U_a = 100 V
$-U_g$ = 3 V
I_a = 15 mA
S = 9 mA/V
μ = 20

Capacitances

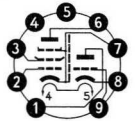
Triode

C_i = 3.3 pF
C_o = 1.7 pF
C_{ag} = 1.8 pF

Pentode

C_i = 6.2 pF
C_o = 3.5 pF
C_{ag1} = 9 mpF

PCF 802
Outline: 8



U_f = 9 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE-PENTODE; triode section for use as reactance tube, pentode section for use as sine wave oscillator or pulse shaper in TV receivers

Maximum Ratings

Pentode

U_a = 250 V
N_a = 1.2 W
U_{g2} = 250 V
N_{g2} = 0.8 W
R_{g1} = 0.56 MΩ
I_k = 15 mA

Triode

U_a = 250 V
N_a = 1.4 W
R_g = 3 MΩ
I_k = 10 mA

Typical Operation

Pentode

U_a = 100 V
U_{g2} = 100 V
$-U_{g1}$ = 1 V
I_a = 6 mA
I_{g2} = 1.7 mA
S = 5.5 mA/V
r_i = 400 kΩ
μ_{g2g1} = 47

Triode

U_a = 200 V
$-U_g$ = 2 V
I_a = 3.5 mA
S = 3.5 mA/V
r_i = 20 kΩ
μ = 70

Capacitances

Triode

C_i = 2.4 pF
C_{ag} = 1.5 pF

Pentode

C_i = 5.4 pF
C_{ag1} = 60 mpF

PCH 200
U_f = 9.2 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE-HEPTODE; triode section for use as pulse amplifier and heptode section for use as noisegated synchronizing separator

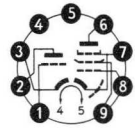
Further data identical with ECH 200.

PCL 82
U_f = 16 V
I_f = 300 mA
U_{fk} = 200 V

TRIODE-OUTPUT PENTODE; triode section for use as frame oscillator and AF amplifier, pentode section for use as frame output tube and AF amplifier

Further data identical with ECL 82.

PCL 84
Outline: 11



U_f = 15 V
I_f =300 mA
U_{fk} =150 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode section for use in circuits for gated AGC, synchronizing separation, synchronizing amplification and noise suppression, pentode section for use as video output tube.

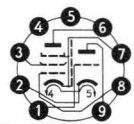
Maximum Ratings	Typical Operation	Capacitances
Triode	Triode	Triode
U_a =250 V	U_a =200 V	C_i = 4 pF
N_a = 1 W	$-U_g$ = 1.7 V	C_o =2.5 pF
I_k = 12 mA	I_a = 3 mA	C_{ag} =2.7 pF
R_g = 1 MΩ	S = 4 mA/V	Pentode
Pentode	μ = 65	C_i = 9 pF
U_a =250 V	Pentode	C_o =4.5 pF
U_{g2} =250 V	U_a =170 V	C_{ag1} < 100 mpF
N_a = 4 W	U_{g2} =170 V	
N_{g2} = 1.7 W	$-U_{g1}$ = 2.1 V	
I_k = 40 mA	I_a = 18 mA	
R_{g1} = 1 MΩ	I_{g2} = 3 mA	
	S = 11 mA/V	
	μ_{g2g1} = 36	
	r_i =100 kΩ	

PCL 85
U_f = 18 V
I_f =300 mA
U_{fk} =200 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode section for use as frame oscillator or pulse amplifier, pentode section for use as frame output tube

Further data identical with ECL 85.

PCL 86

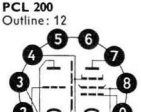


U_f =14.5 V
I_f = 300 mA
U_{fk} = 100 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode section for use as AF amplifier, pentode section for use as AF amplifier

Further data identical with ECL 86.

PCL 200
Outline: 12



U_f =15.5 V
I_f = 300 mA
U_{fk} = 200 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode section for use in circuits for gated AGC, pentode section for use in video output stage

Maximum Ratings

Triode

U_a =250 V
N_a = 1.7 W
I_k = 15 mA
R_g = 0.5 MΩ

Pentode

U_a =250 V
N_a = 6 W
U_{g2} =250 V
N_{g2} = 2.5 W
I_k = 85 mA
R_{g1} = 0.5 MΩ

Typical Operation

Pentode

U_a =150 V
U_{g2} =220 V
$-U_{g1}$ = 2.1 V
I_a = 40 mA
I_{g2} = 8 mA
S = 28 mA/V
r_i = 22 kΩ

Triode

U_a =200 V
$-U_g$ = 1.5 V
I_a = 8.5 mA
S = 5.2 mA/V
μ = 55

Capacitances

Triode

C_i = 3 pF
C_o = 4.4 pF
C_{ag} = 2.5 pF

Pentode

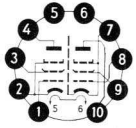
C_i =14.5 pF
C_o = 6 pF
C_{ag1} = 70 mpF

PCL 805
U_f = 18 V
I_f =300 mA
U_{fk} =200 V

TRIODE-OUTPUT PENTODE with separate cathodes; triode section for use as oscillator and pre-amplifier, pentode section for use as power stage for vertical deflection

Further data identical with ECL 805.

PFL 200
Outline: 12

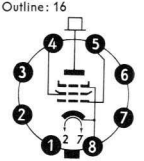


U_f = 17 V
I_f = 300 mA
U_{fk} = 200 V

DOUBLE PENTODE for use as video output tube, synchronizing separator, AGC amplifier or IF sound amplifier

Maximum Ratings	Typical Operation	Capacitances
L section	L section	L section
U_a = 250 V	U_a = 170 V	C_i = 13 pF
N_a = 5.1 W	U_{g2} = 170 V	C_o = 7 pF
U_{g2} = 250 V	$-U_{g1}$ = 2.7 V	C_{ag1} = 100 mpF
N_{g2} = 2.5 W	I_a = 30 mA	F section
R_{g1} = 1 MΩ	I_{g2} = 7 mA	C_i = 10 pF
I_k = 60 mA	S = 22 mA/V	C_o = 10.5 pF
F section	r_i = 33 kΩ	C_{ag1} = 140 mpF
U_a = 250 V	μ_{g2g1} = 38	
N_a = 1.5 W	F section	
U_{g2} = 250 V	U_a = 150 V	
N_{g2} = 0.5 W	U_{g2} = 150 V	
R_{g1} = 1 MΩ	$-U_{g1}$ = 2.1 V	
I_k = 15 mA	I_a = 10 mA	
	I_{g2} = 3 mA	
	S = 8.5 mA/V	
	r_i = 150 kΩ	
	μ_{g2g1} = 38	

PL 36
Outline: 16



U_f = 25 V
I_f = 300 mA
U_{fk} = 250 V

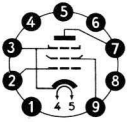
PENTODE for use as line output tube in TV receivers

Maximum Ratings	Typical Operation	Capacitances
U_a = 250 V	U_a = 100 V	C_i = 17.5 pF
$U_{a\,s}$[1] = 7 kV	U_{g2} = 100 V	C_o = 8 pF
U_{g2} = 250 V	$-U_{g1}$ = 8.2 V	C_{ag1} = 1.15 pF
I_k = 200 mA	I_a = 100 mA	
R_{g1} = 0.5 MΩ	I_{g2} = 7 mA	
N_a = 12 W	S = 14 mA/V	
N_{g2}[2] = 4 W	μ_{g2g1} = 5.6	
	r_i = 5 kΩ	

[1] max. pulse duration is 22% of a cycle, max. 18 µs
[2] if N_a = 8 W, N_{g2} = max. 5 W

PL 82

Outline: 12



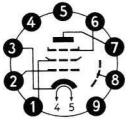
U_f = 16.5 V
I_f = 300 mA
U_{fk} = 200 V

PENTODE for use as frame output tube in TV receivers and as AF power amplifier

Maximum Ratings	Typical Operation	Capacitances
U_a = 250 V	U_a = 170 V	C_i = 11 pF
U_{g2} = 250 V	U_{g2} = 170 V	C_o = 5.9 pF
N_a = 9 W	$-U_{g1}$ = 10.4 V	C_{ag1} = 1 pF
N_{g2} = 2.5 W	I_a = 53 mA	
I_k = 75 mA	I_{g2} = 10 mA	
R_{g1} = 0.4 MΩ	S = 10.2 mA/V	
	r_i = 20 kΩ	
	μ_{g2g1} = 10	

PL 83

Outline: 12



U_f = 15 V
I_f = 300 mA
U_{fk} = 150 V

PENTODE for use as video output tube

Maximum Ratings	Typical Operation	Capacitances
U_a = 250 V	U_a = 170 V	C_i = 10.8 pF
U_{g2} = 250 V	U_{g3} = 0 V	C_o = 6.6 pF
N_a = 9 W	U_{g2} = 170 V	C_{ag1} < 100 mpF
N_{g2} = 2 W	$-U_{g1}$ = 2.3 V	
I_k = 70 mA	I_a = 36 mA	
R_{g1} = 0.5 MΩ	I_{g2} = 5 mA	
	S = 10.5 mA/V	
	μ_{g2g1} = 24	
	r_i = 0.1 MΩ	

PL 84

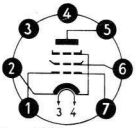
U_f = 15 V
I_f = 300 mA
U_{fk} = 200 V

PENTODE for use as frame output tube in TV receivers and as AF power amplifier

Further data identical with EL 84

PL 95

Outline: 3



U_f = 4.5 V
I_f = 300 mA
U_{fk} = 100 V

PENTODE for use as AF power amplifier

Maximum Ratings	Typical Operation	Capacitances
U_{a0} = 550 V	U_a = 250 V	C_i = 5.3 pF
U_a = 300 V	U_{g2} = 250 V	C_o = 3.5 pF
U_{g2} = 300 V	$-U_{g1}$ = 9 V	C_{ag1} < 400 mpF
N_a = 6 W	I_a = 24 mA	
N_{g2} = 1.25 W	I_{g2} = 4.5 mA	
I_k = 35 mA	S = 5 mA/V	
R_{g1} = 2 MΩ	μ_{g2g1} = 17	
	R_i = 80 kΩ	

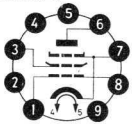
PL 500

BEAM PENTODE for use as line output tube in TV receivers
All data are identical with PL 504.

PL 504
U_f = 27 V
I_f = 300 mA
U_{fk} = 220 V

BEAM PENTODE for use as line output tube in TV receivers
Further data identical with EL 504.

PL 508
Outline: 17



U_f = 17 V
I_f = 300 mA
U_{fk} = 220 V

PENTODE for use as frame output amplifier in colour TV receivers

Maximum Ratings		Typical Operation		Capacitances	
U_a	= 400 V	U_a	= 190 V	C	= 18 pF
$U_{a\,s}$[1]	= 2.5 kV	U_{g2}	= 190 V	C_o	= 10 pF
U_{g2}	= 275 V	$-U_{g1}$	= 17 V	C_{ag1}	= 1.4 pF
N_a	= 12 W	I_a	= 60 mA		
N_{g2}	= 3 W	I_{g2}	= 4.5 mA		
I_k	= 100 mA	S	= 9 mA/V		
R_{g1}	= 1 MΩ	μ_{g2g1}	= 8		

[1] max. pulse duration is 5% of a cycle and max. 1 ms

PL 509
Outline: 21

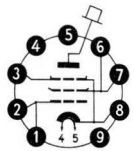
U_f = 40 V
I_f = 300 mA
U_{fk} = 250 V

PENTODE for colour TV line deflection circuits

Maximum Ratings		Typical Operation[2]			Capacitances	
$U_{a\,o}$	= 700 V	U_a	= 160	50 V	C_{ag1}	= 2.5 pF
$U_{a\,s}$[1]	= 7000 V	U_{g3}	= 0	0 V		
U_{g3}	= 50 V	U_{g2}	= 160	175 V		
U_{g2}	= 275 V	U_{g1}	= 0	10 V		
N_a	= 30 W	I_a	= 1.4	0.8 A		
N_{g2}	= 7 W	I_{g2}	= 45	70 mA		
I_k	= 500 mA					
$I_{k\,s}$	= 1.2 A					
R_{g1}	= 0.5 MΩ					

[1] max. pulse duration is 22% of a cycle and max. 18 µs
[2] measured under pulse conditions

PL 519
Outline: 21



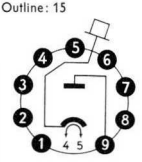
U_f = 40 V
I_f = 300 mA
U_{fk} = 250 V

PENTODE for colour TV line deflection circuits

Maximum Ratings		Typical Operation[2]		Capacitance
$U_{a\,o}$	= 700 V	U_a	= 160 50 V	C_{ag1} = 2.5 pF
$U_{a\,s}$[1]	= 7000 V	U_{g3}	= 0 0 V	
U_{g3}	= 50 V	U_{g2}	= 160 175 V	
U_{g2}	= 275 V	U_{g1}	= 0 10 V	
N_{g2}	= 7 W	I_a	= 1.4 0.8 A	
N_a	= 35 W	I_{g2}	= 45 70 mA	
I_k	= 500 mA			
$I_{k\,s}$	= 1.4 A			
R_{g1}	= 0.5 Ω			

[1] max. pulse duration is 22% of a cycle and max. 18 µs
[2] measured under pulse conditions

PY 81
Outline: 15



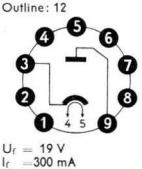
U_f = 17 V
I_f = 300 mA
U_{fk}[1] = 5 kV

BOOSTER DIODE for use in line time-base circuits of transformerless TV receivers

Maximum Ratings		Capacitance
U_b	= 250 V	C_o = 6.4 pF
N_a	= 3.5 W	
I_a	= 150 mA	
$I_{a\,s}$	= 450 mA	
$U_{a\,s}$[1,2]	= 5 kV	
R_s	= 80 Ω	

[1] max. pulse duration is 22% of a cycle and max. 18 µs
[2] cathode positive with respect to anode

PY 82
Outline: 12



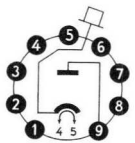
U_f = 19 V
I_f = 300 mA
U_{fk} = 550 V

HALF-WAVE RECTIFIER

Typical Operation

U_{tr}	= 250	220	127 V_{eff}
U_o	= 195	195	127 V
I_o	= 180	180	180 mA
R_t	= 125	65	0 Ω
C_{filt}	= 60	60	60 µF

PY 83
Outline: 13



U_f = 20 V
I_f = 300 mA
$U_{fk\,s}$[1] = 5 kV

BOOSTER DIODE for TV receivers

Maximum Ratings

$-U_{a\,s}$[1,2] = 5 kV
I_a = 175 mA
$I_{a\,s}$ = 500 mA
N_a = 3.5 W

Capacitance

C_o = 9.2 pF

[1] max. pulse duration is 22% of a cycle and max. 18 µs
[2] cathode positive with respect to anode

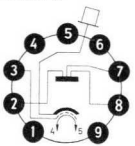
PY 88
U_f = 30 V
I_f = 300 mA
$U_{fk\,s}$[1] = 6.6 kV

BOOSTER DIODE for use as line time-base circuits of transformerless TV receivers

Further data identical with EY 88.

[1] max. pulse duration is 22% of a cycle and max. 18 µs

PY 500 A
Outline: 19



U_f = 42 V
I_f = 300 mA
$U_{fk\,s}$[1] = 6.3 kV

BOOSTER DIODE for time-base circuits of colour TV receivers

Maximum Ratings

N_a = 11 W
I_a = 440 mA
$I_{a\,s}$ = 1 A
$U_{a\,s}$[1,2] = 5.6 kV

Capacitance

C_o = 13.5 pF

[1] max. pulse duration is 22% of a cycle and max. 18 µs
[2] cathode positive with respect to anode

UABC 80
U_f = 28.5 V
I_f = 100 mA
U_{fk} = 150 V

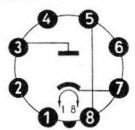
TRIPLE DIODE-TRIODE for AM and FM signal detection and AF signal amplification

Further data identical with EABC 80.

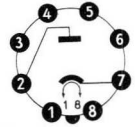
UAF 42
U_f = 12.6 V
I_f = 100 mA
U_{fk} = 150 V

DIODE-PENTODE for use as RF, IF or AF amplifier

Further data identical with EAF 42.

UBC 41 U_f = 14 V I_f =100 mA U_{fk}=100 V	TWIN DIODE WITH TRIODE for AF amplifiers Further data identical with EBC 41.
UBF 80 U_f = 17 V I_f =100 mA U_{fk}=100 V	TWIN DIODE AND TRIODE WITH VARIABLE TRANSCONDUCTANCE for RF, IF or AF amplifiers Further data identical with EBF 80.
UCH 42 U_f = 14 V I_f =100 mA U_{fk}=150 V	TRIODE-HEXODE for use as frequency changer and phase inverter Further data identical with ECH 42.
UCH 81 U_f = 19 V I_f =100 mA U_{fk}=100 V	TRIODE-HEPTODE; heptode section for use as mixer, RF or IF amplifier, triode section for use as oscillator in AM or FM receivers. Further data identical with ECH 81.
UF 41 U_f =12.6 V I_f = 100 mA U_{fk}= 150 V	PENTODE for use as RF or IF amplifier Further data identical with EF 41.
UL 41 U_f = 45 V I_f =100 mA U_{fk}=150 V	PENTODE for use as AF power amplifier Further data identical with EL 41.
UY 1N Outline: 20  U_f = 50 V I_f =100 mA U_{fk}=500 V	HALF-WAVE RECTIFIER Typical Operation U_a =250 V_{eff} I_a =140 mA R_d >175 Ω C_{filt} = 60 μF

UY 41
Outline: 5



U_f = 31 V
I_f =100 mA
U_{fk} =300 V

HALF-WAVE RECTIFIER

Typical Operation

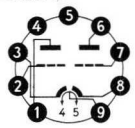
U_a =220 V_{eff}
I_a = 80 mA
R_d >160 Ω
C_{filt} = 50 µF

UY 82
U_f = 55 V
I_f =100 mA
U_{fk} =550 V

HALF-WAVE RECTIFIER

Further data identical with PY 82.

E80CC
Outline: 12

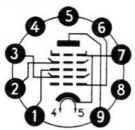


U_f = 6.3 V
I_f = 600 mA
or
U_f =12.6 V
I_f =300 mA
U_{fk} = 120 V

TWIN TRIODE with separate cathodes, for use in professional and commercial equipments

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_{a0} =600 V	U_a =250 V	C_i = 2.4 pF
U_a =300 V	I_a = 6 mA	C_o =0.45 pF
N_a = 2 W	S = 5.5 mA/V	C_{ag} = 3.1 pF
I_k = 12 mA	µ = 30	
$-U_g$ =200 V		
R_g = 1 MΩ		

E81H
Outline: 11



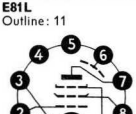
U_f = 6.3 V
I_f =300 mA
U_{fk} =120 V

HEPTODE with two linear control grids

Maximum Ratings	Typical Operation	Capacitances
U_{a0} =500 V	U_a =150 V	C_i =5.3 pF
U_a =250 V	U_{g2} = 75 V	C_o =6.7 pF
U_{g20} =500 V	U_{g4} = 75 V	C_{ag1} <0.1 pF
U_{g2} =125 V	U_{g1} = 0 V	
U_{g40} =500 V	I_a = 7 mA	
U_{g4} =250 V	I_{g2} = 6.6 mA	
N_a = 1.2 W		
N_{g2} = 0.8 W		
N_{g4} = 0.4 W		
I_k = 20 mA		

E81L

Outline: 11



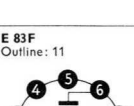
U_f = 6.3 V
I_f = 375 mA
U_{fk} = 120 V

OUTPUT PENTODE for use in telecommunication equipments

Maximum Ratings	Typical Operation	Capacitance
U_{a0} = 550 V	U_a = 210 V	C_{ag1} < 0.02 pF
U_a = 210 V	U_{g3} = 0 V	
N_a = 4.5 W	U_{g2} = 210 V	
U_{g2} = 210 V	I_a = 20 mA	
N_{g2} = 1.2 W	I_{g2} = 5.3 mA	
I_k = 30 mA	S = 11 mA/V	
	r_i = 0.4 MΩ	

E 83F

Outline: 11



U_f = 6.3 V
I_f = 300 mA
U_{fk} = 100 V

WIDE-BAND PENTODE for use in telecommunication equipments

Maximum Ratings	Typical Operation	Capacitance
U_{a0} = 550 V	U_a = 210 V	C_{ag1} < 15 mpF
U_a = 210 V	U_{g3} = 0 V	
N_a = 2.1 W	U_{g2} = 120 V	
U_{g2} = 210 V	I_a = 10 mA	
N_{g2} = 350 mW	I_{g2} = 2.1 mA	
I_k = 16 mA	S = 9 mA/V	
	r_i = 0.5 MΩ	

E 88CC

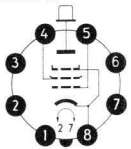
Outline: 9

U_f = 6.3 V
I_f = 300 mA
U_{fk} = 150 V

TWIN TRIODE for use in cascode circuits, HF or IF amplifiers, mixer or phase inverter stages, multivibrators and in cathode followers

Maximum Ratings per Section	Typical Operation per Section	Capacitances
U_{a0} = 550 V	U_a = 100 V	C_i = 3 pF
U_a = 220 V	I_a = 15 mA	C_o = 0.8 pF
N_a = 1.5 W	S = 12.5 mA/V	C_{ag} = 1.4 pF
$-U_g$ = 200 V	μ = 33	
I_k = 20 mA	R_{cg} = 300 Ω	

E 130L
Outline: 22

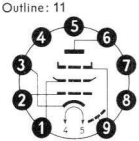


U_f = 6.3 V
I_f = 1.7 A
U_{fk} = 100 V

OUTPUT PENTODE for use as wide band amplifier, cathode follower, series regulator tube for stabilised d.c. supply

Maximum Ratings		Typical Operation		Capacitances	
U_{a0}	= 2 000 V	U_a	= 250 V	C_i	= 35 pF
U_a	= 900 V	U_{g2}	= 150 V	C_o	= 17 pF
N_a	= 27.5 W	$-U_{g1}$	= 15.5 V	C_{ag1}	= 2 pF
U_{g20}	= 550 V	I_a	= 100 mA		
U_{g2}	= 250 V	S	= 27.5 mA/V		
N_{g2}	= 5 W	μ_{g2g1}	= 6.5		
I_k	= 300 mA	r_i	= 10 kΩ		

18042
Outline: 11

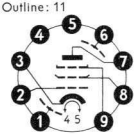


U_f = 18 V
I_f = 100 mA
U_{fk} = 100 V

WIDE-BAND PENTODE for use in telecommunication equipments

Maximum Ratings		Typical Operation		Capacitances	
U_{a0}	= 550 V	U_a	= 210 V	C_i	= 8.0 pF
U_a	= 210 V	U_{g3}	= 0 V	C_o	= 3.5 pF
N_a	= 2.1 W	U_{g2}	= 120 V	C_{ag1}	< 150 mpF
U_{g20}	= 550 V	I_a	= 10 mA		
U	= 210 V	S	= 9 mA/V		
N_{g2}	= 0.35 W	r_i	= 0.5 MΩ		
I_k	= 16 mA	μ_{g2g1}	= 34		

18046
Outline: 11



U_f = 20 V
I_f = 135 mA
U_{fk} = 120 V

OUTPUT PENTODE for use in telecommunication equipments

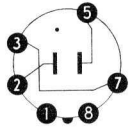
Maximum Ratings		Typical Operation		Capacitances	
U_{a0}	= 550 V	U_a	= 210 V	C_i	= 11.5 pF
U_a	= 210 V	U_{g3}	= 0 V	C_o	= 6.5 pF
N_a	= 4.5 W	U_{g2}	= 210 V	C_{ag1}	= 20 mpF
U_{g20}	= 550 V	I_a	= 20 mA		
U_{g2}	= 210 V	I_{g2}	= 5.3 mA		
N_{g2}	= 1.2 W	S	= 11 mA/V		
I_k	= 30 mA	μ_{g2g1}	= 36		

VOLTAGE REGULATORS

Type	Anode voltage drop			DC anode current			Typical Operation					Outline
	$U_{arc\ min}$ V	U_{arc} V	$U_{arc\ max}$ V	$I_{a\ min}$ mA	I_a mA	$I_{a\ max}$ mA	$U_{sign\ max}$ V	$\Delta U_{arc\ max}$ V	r_i Ω	I_{as} mA	T_b °C	
OA 3	68	75	85	5	20	40	105	6.5	100	100[1]	—55...+90	20
OC 3	103	108	116	5	20	40	135	4.5	100	100[1]	—55...+90	20
OD 3	142	153	165	5	20	40	185	5.5	100	100[1]	—55...+90	20
85A2T/OG 3	83	85	87	1	5.5	10	125	4	250		—55...+90	2
108C1/OB 2	106	108	111	5	17.5	30	138	3.5	100	75[2]	—55...+90	3
150C2/OA 2	144	150	164	5	17.5	30	190	4.5	100	75[2]	—55...+90	3

[1] Averaged over a starting period not exceeding 10 s. This starting period must be followed by a steady-state operating condition of at least 20 minutes, otherwise tube performance will be impaired

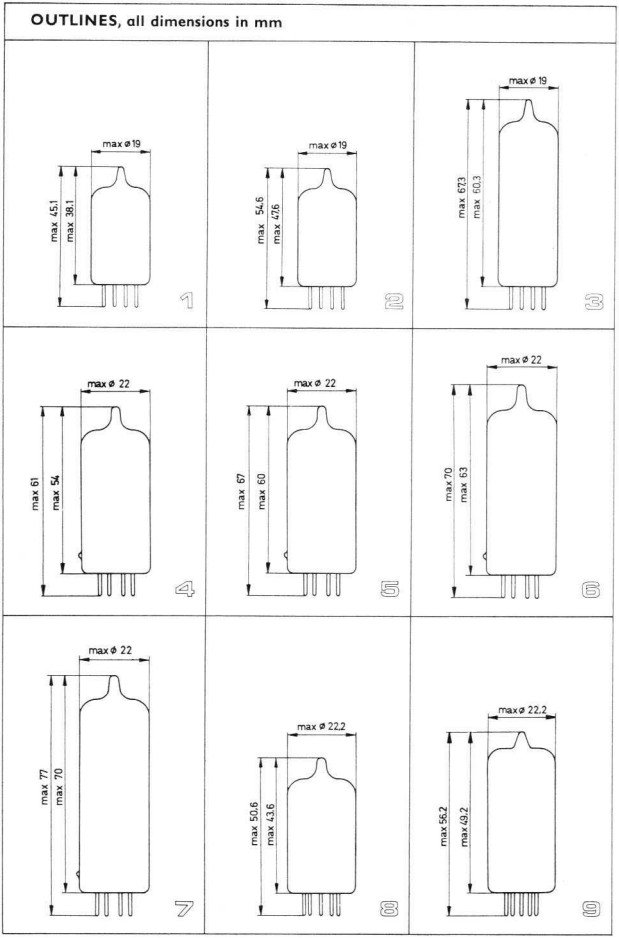
[2] duration not to exceed 10 s; such short overloads may be repeated only once or twice in 8 hours

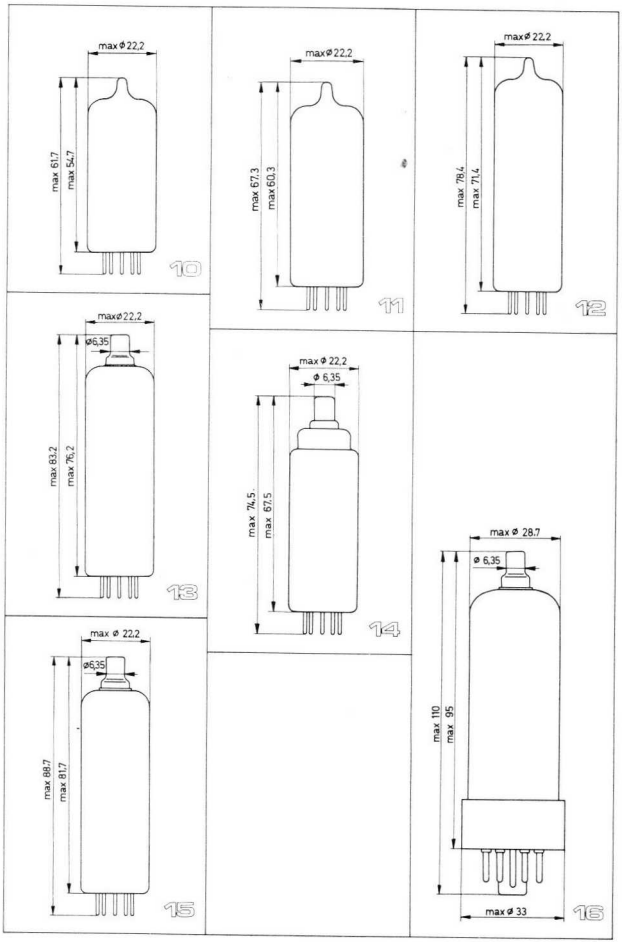


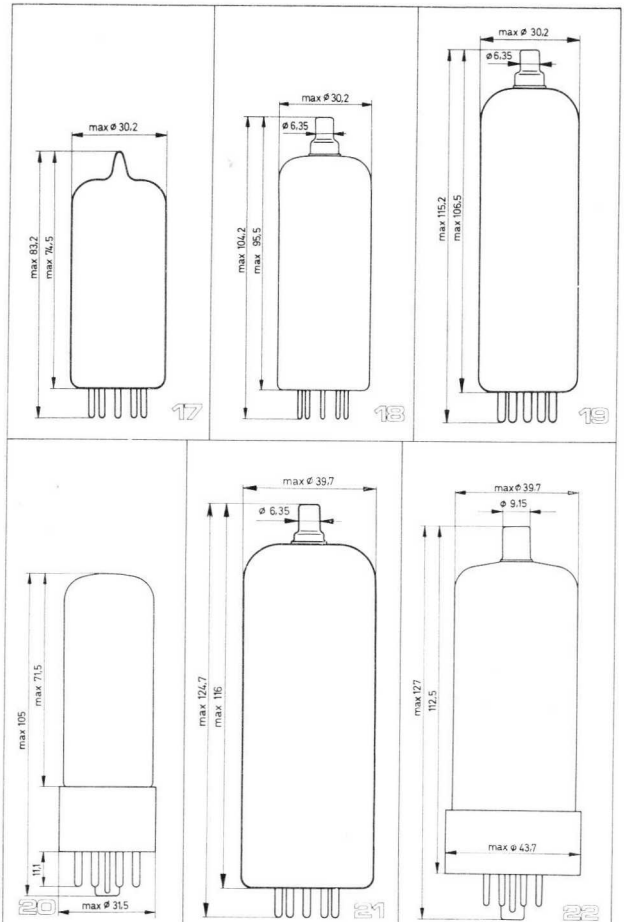
OA 3
OC 3
OD 3

85 A2T/OG 3
108 C1/OB 2
150 C2/OA 2

OUTLINES, all dimensions in mm




max Φ 22,2
max 61,7
max 54,7
10
max Φ 22,2
max 67,3
max 60,3
11
max Φ 22,2
max 79,4
max 71,4
12
max Φ 22,2
Φ6,35
max 83,2
max 76,2
13
max Φ 22,2
Φ 6,35
max 74,5
max 67,5
14
max Φ 22,2
Φ6,35
max 88,7
max 81,7
15
max Φ 28,7
Φ 6,35
max 110
max 95
max Φ 33
16


max ø 30.2
max 83.2
max 76.5
17
max ø 30.2
ø 6.35
max 104.2
max 95.5
18
max ø 30.2
ø 6.35
max 115.2
max 106.5
19
max 105
max 71.5
111
max ø 31.5
20
max ø 39.7
ø 6.35
max 124.7
max 116
21
max ø 39.7
ø 9.15
max 127
112.5
max ø 43.7
22

INTERCHANGEABILITY LIST

In the following list the TUNGSRAM equivalents to other makes are indicated. Type designations without brackets are direct equivalents, while those in brackets are near equivalents only.

Type	TUNGSRAM Type
AA 61	ECC 40
B 152	ECC 81
B 309	ECC 81
B 319	(PCC 84)
B 329	ECC 82
B 339	ECC 83
B 719	ECC 85
BF 61	EL 41
CV 283	EAA 91
CV 455	ECC 81
CV 491	ECC 82
CV 492	ECC 83
CV 1375	EF 85
CV 1376	EF 80
CV 1535	EZ 80
CV 1977	UL 41
CV 2128	ECH 81
CV 2901	EF 86
CV 2966	EY 86
CV 2975	EL 84
CV 3882	EBC 41
CV 3883	EAF 42
CV 3884	ECC 40
CV 3885	EF 40
CV 3887	EF 42
CV 3888	ECH 42
CV 3889	EL 41
CV 3891	EZ 40
CV 3892	AZ 41
CV 5072	EZ 81
CV 5156	EF 89
CV 5192	PCC 84
D 2M9	EAA 91
D 121	(UAF 42)
D 152	EAA 91
DH 150	EBC 41
DH 718	EBC 41
DH 719	EABC 80
E 2163	ECC 82
E 2164	ECC 83
E 2175	ECC 81
E 2385	(EY 86)
EBF 171	(EBF 80)
EBF 175	(EBF 89)
ECH 113	ECH 42
ECH 171	(ECH 81)
EF 174	(EF 80)
EF 175	(EF 85)
EF 804	(EF 86)
EL 171	(EL 84)
LN 152	ECL 80
LN 309	(PCL 82)
LN 329	(PCL 82)
LZ 319	(PCF 80)
LZ 329	PCF 80)
N 142	UL 41
N 150	EL 41
N 154	PL 82
N 308	(PL 36)
N 329	PL 82
N 369	PCL 82
N 709	EL 84
OA 2	150C2
OA 3	VR 75
OB 2	108C1
OC 3	VR 105
OD 3	VR 150
OG 3	85A2T
R 19	(DY 86)
U 26	EY 86
U 49	EY 86
U 119	UY 85
U 142	UY 41
U 150	EZ 40
U 153	PY 81
U 154	PY 82
U 192	PY 82
U 319	(PY 82)
U 381	UY 85
U 404	(UY 41)
U 709	EZ 81
UCH 171	(UCH 81)
UU 12	EZ 81
V 41	AZ 41
V 61	EZ 40
W 142	UF 41
W 719	EF 85
W 729	(EF 85)
WD 142	UAF 42
WD 150	EAF 42
WD 709	EBF 80
X 119	UCH 81
X 142	UCH 42
X 143	ECH 21
X 150	ECH 42
X 719	ECH 81
Z 150	EF 42
Z 152	EF 80
Z 329	(EF 80)
Z 719	EF 80
Z 729	EF 86
ZD 152	EBF 80
1BG2	DY 51
1BQ2	DY 802
1H2	DY 86
1S2	DY 86
1S2A	DY 87
1X2A	(DY 86)
1X2B	(DY 86)
4CM4	PC 86
4DL4	PC 88
4HA5	PC 900
6AB4	EC 92
6AB8	ECL 80
6AD8	(EBF 89)
6AJ8	ECH 81
6AK8	EABC 80
6AL3	EY 88
6AN7	(ECH 81)
6AQ8	ECC 85
6BH5	(EF 89)
6BK8	(EF 86)
6BM8	ECL 82
6BQ5	EL 84
6BT4	EZ 40
6BW4	EZ 81
6BW7	(EF 80)
6BX6	EF 80
6BY7	EF 85
6C10	ECH 42
6C12	ECH 81
6CA4	EZ 81
6CJ5	EF 41
6CK5	EL 41
6CM4	EC 86
6CT7	EAF 42
6CU7	ECH 42
6CV7	EBC 41
6DA6	EF 89
6DC8	EBF 89
6DL4	EC 88
6DS8	ECH 83
6DT8	(ECC 85)
6EC7	(EF 89)
6EH7	EF 183
6EJ7	EF 184
6EL7	EF 80
6F18	(EF 89)
6F19	EF 85
6F20	(EF 85)
6F23	(EF 80)
6F24	(EF 184)
6F25	(EF 183)
6F29	EF 183
6F30	EF 184
6F40	EF 86
6FD12	EBF 89
6FG6	EM 84
6GB5A	EL 504
6GK6	(EL 84)
6GW8	ECL 86
6KX8	ECC 808
6JX8	ECH 84
6L12	ECC 85
6L13	ECC 88
6LD3	EBC 41
6LD12	EABC 80
6M5	(EL 84)
6N8	EBF 80
6N8K	(EBF 89)
6P15	EL 84

Type	TUNGSRAM Type
6PD12	EBF 89
6S2	EY 86
6S2A	EY 87
6S8	EY 86
6T8	(EABC 80)
6V4	EZ 80
7AN7	PCC 84
7DE7	(EF 80)
7DJ8	PCC 88
7ES8	PCC 189
7FC7	(PCC 189)
8D8	(EF 86)
8GJ7	PCF 801
8U9	PCF 201
9A8	PCF 80
9AK8	PABC 80
9D7	(EF 85)
9JW8	PCF 802
9U8	PCF 82
9V9	PCH 200
10C14	UCH 81
12AC5	UF 41
12AT7	ECC 81
12AU7	ECC 82
12AX7	ECC 83

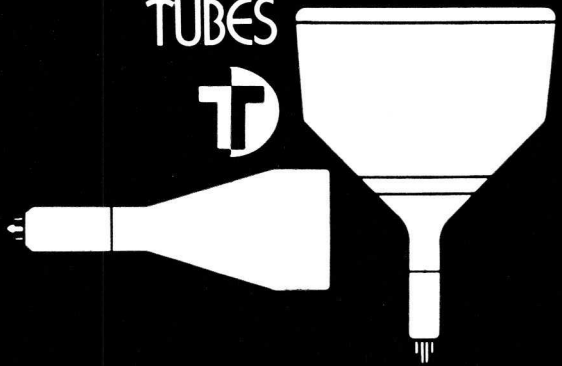
Type	TUNGSRAM Type
12S7	UAF 42
14GW8	PCL 86
14K7	UCH 42
14Y7	(UCH 81)
15CW5	PL 84
15DQ8	PCL 84
16A5	PL 82
16A8	PCL 82
16Y9	PFL 200
17C8	UBF 80
17KW6	PL 508
17V9	PFL 200
17Z3	PY 81
17Z3A	PY 83
18GV8	PCL 85
19AJ8	UCH 81
19D8	UCH 81
19SU	PY 82
19Y3	PY 82
25E5	PL 36
28GB5	PL 500
	PL 504
30AE3	PY 88
30C1	PCF 80
30F5	(EF 80)

Type	TUNGSRAM Type
30F27	(EF 184)
30L1	PCC 84
30P4	(PL 36)
30P16	PL 82
30PL1	(PCL 82)
30PL13	(PCL 82)
31A3	UY 41
38A3	UY 85
40KG6	PL 509
45A5	UL 41
62DDT	EBC 41
62TH	ECH 42
64SPT	EF 80
66KU	EZ 40
67PT	EL 41
121VP	UF 41
141TH	UCH 42
163Pen	PL 82
311SU	UY 41
451PT	UL 41
3885	EF 40
3887	EF 42
5879	(EF 86)
6267	EF 86
7025	(ECC 83)

II.

TUNGSRAM

OSCILLOSCOPE AND MONITOR TUBES



TYPE DESIGNATION SYSTEM

symbol		old	new
first letter	before the group of numbers	D: electrostatic deflection and focus	D: single trace oscilloscope tube M: monitor tube
second letter		B, G, H, L, N, P or W: cf. screen designation system	—
third letter		M: multiple trace tube	—
number preceding hyphen		screen diameter or screen diagonal in cm	
number following hyphen		serial number indicating a particular design or development	
final letters		F: flat faceplate	BE, GH, GJ, GL, GM, GR, LD or cf. screen designation system

For eliminating the parallax the oscilloscope- and monitor tubes can be provided with internal graticules. These tubes are available on special order. The type designation of tubes with not illuminable graticules must be completed with /01, /03, /05, etc., while those with illuminable graticules with /02, /04, /06, etc. and those with illuminable graticules and provided with fittings for illumination with /02S, /04S, /06S, etc.

SCREEN DESIGNATION SYSTEM

Code			Screen colour		Persistence
new	old	EIA	fluorescence	phosphorescence	
BE	B	P11	blue	blue	medium short
GH	H	P31	green	green	medium short
GJ	G	P1	yellowish green	yellowish green	medium
GL	N	P2	yellowish green	yellowish green	medium short
GM	P	P7	bluish white	yellowish green	long
GR	—	P39	yellowish green	yellowish green	long
LD	L	P33	orange	orange	very long
W	W	P4	white	white	medium

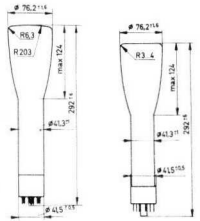
Persistence is defined as the period of time during which brightness diminishes to 1/10 of its initial value.

Persistence	JEDEC description
less than 1 μs	very short
1 μs ... 10 μs	short
10 μs ... 1 ms	medium short
1 ms...100 ms	medium
100 ms... 1 s	long
over 1 s	very long

A	side connection according to JEDEC J1-22
$a_1 \ldots a_4$	anode 1...4
b	metal rimband
B	side connection according to JEDEC J1-21
D_1 and D_2	horizontal deflection plates
D_3 and D_4	vertical deflection plates
d_{12}	horizontal deflection factor
d_{34}	vertical deflection factor
f	heater
$g_1 \ldots g_4$	grid 1...4
I_f	heater current
i.c.	internal connection; base connection should not be used as tie point for components
k	cathode
m	external conductive coating
t_h	heating time
U_a	anode voltage
$U_{a1} \ldots U_{a4}$	voltage of anode 1...4
U_f	heater voltage
$U_{g1} \ldots U_{g4}$	DC voltage between grid 1...4 and cathode
$-U_{g1\ cut\ off}$	negative grid bias for the visual extinction of undeflected focused spot (at oscilloscope tubes) and for raster (at monitor tubes)
U_k	voltage between grid 1 and cathode at cathode control

All voltages refer to cathode unless otherwise stated.

In double-trace oscilloscope tubes the equivalent electrodes are distinguished by subscripts a and b.



with spherical faceplate (D. 7-113) and flat faceplate (D. 7-113 F) respectively, for medium operating voltages

Application

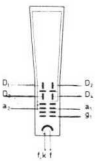
in small size portable oscilloscopes for medical and industrial purposes

Screen Types

DB 7-113	DB 7-113 F
DG 7-113	DG 7-113 F
DN 7-113	DN 7-113 F
DP 7-113	DP 7-113 F

System Structure

Arrangement of Electrodes:



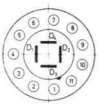
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — g_1
3 — K
4 — a_2
5 — D_3
6 — D_4
7 — a_1
8 — D_2
9 — D_1
10 — i. c.
11 — f

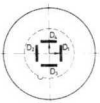


Base

Medium-Shell Magnal, 11-pin, JETEC No. B11-66

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 70 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

U_{a2} = 2.5 kV
U_{a1} = 1 kV

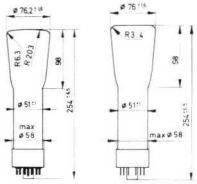
Typical Operation

U_{a2}	=	2 kV
U_{a1}	=	320...600 V
$-U_{a1\ cut\ off}$	=	45...90 V
d_{12}	=	39.4...53.5 V/cm
d_{34}	=	30...41 V/cm

Accessories

Socket: VST 5
Metallic Shield: ART 1

with spherical faceplate (D. 7-115) and flat faceplate (D. 7-115 F) respectively, for medium operating voltages



Application

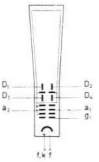
in small size portable oscilloscopes for medical and industrial purposes

Screen Types

DB 7-115	DB 7-115 F
DG 7-115	DG 7-115 F
DN 7-115	DN 7-115 F

System Structure

Arrangement of Electrodes:



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_2
10 — D_2
11 — D_1
12 — i. c.
14 — f

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Deflection

(viewed from screen end)

Minimum Useful Screen Diameter 70 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

U_{a2} = 2.2 kV
U_{a1} = 1.1 kV

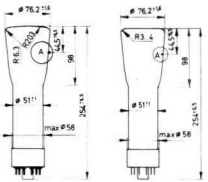
Typical Operation

U_{a2}	=	2 kV
U_{a1}	=	320...720 V
$-U_{g1\ cut\ off}$	=	30...90 V
d_{12}	=	75 V/cm
d_{34}	=	59 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 6

with spherical faceplate (D. 7-116) and flat faceplate (D. 7-116 F) respectively, post-deflection accelerator for medium operating voltages



Application

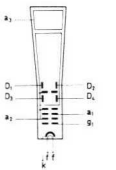
in small size portable oscilloscopes for medical and industrial purposes, extremely suitable for small oscillosynchroscopes

Screen Types

DB 7-116	DB 7-116 F
DG 7-116	DG 7-116 F
DN 7-116	DN 7-116 F
DP 7-116	DP 7-116 F

System Structure

Arrangement of Electrodes:



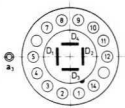
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_2
10 — D_2
11 — D_1
12 — i. c.
14 — f
A — a_3

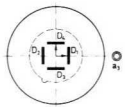


Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 70 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

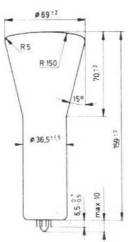
U_{a3} = 4 kV
U_{a2} = 2 kV
U_{a1} = 1 kV

Typical Operation

U_{a3}	=	4 kV
U_{a2}	=	2 kV
U_{a1}	=	400 . . . 690 V
$-U_{g1\ cut\ off}$	=	30 . . . 90 V
d_{12}	=	67 . . . 91 V/cm
d_{34}	=	49 . . . 67 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 5
Post-Deflection Accelerator Terminal: VST 2



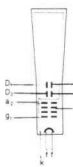
for asymmetrical operation with short overall length for low operating voltages

Application

low anode voltage indicator tube for asymmetrical operation

System Structure

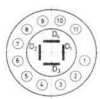
Arrangement of Electrodes:



Base Connections

(bottom view)

1 — f
2 — f
3 — g_1
4 — k
5 — a_1
6 — D_3
7 — D_4
8 — a_2
9 — D_2
10 — D_1
11 — i. c.



Deflection

(viewed from screen end)

Deflection Method: electrostatic. D_{12} asymmetrical (D_2 must be connected to a_2), D_{34} symmetrical

Focusing Method: electrostatic

Base

Small-Button Unidecar, 11-pin, JETEC No. E11-22

Minimum Useful Screen Diameter

60 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

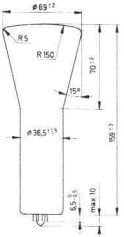
U_{a2} = 1 kV
U_{a1} = 0.4 kV

Accessories

Socket: VST 8
Metallic Shield: ART-K411

Typical Operation

U_{a2}	=	0.8 kV
U_{a1}	=	0...180 V
$-U_{g1\ cut\ off}$	=	80...160 V
d_{12}	=	36...44 V/cm
d_{34}	=	24...30 V/cm



for symmetrical operation with short overall length for low operating voltages

Application

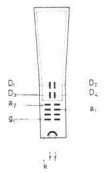
low anode voltage indicator tube for symmetrical operation

Screen Types

DG 7-124
DN 7-124

System Structure

Arrangement of Electrodes:



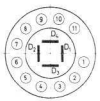
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — f
3 — g_1
4 — k
5 — a_1
6 — D_3
7 — D_4
8 — a_2
9 — D_2
10 — D_1
11 — i. c.

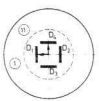


Base

Small-Button Unidecar, 11-pin, JETEC No. E11-22

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 63 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a2} = 1 kV
U_{a1} = 0.4 kV

Accessories

Socket: VST 8
Metallic Shield: ART-K411

Typical Operation

U_{a2} = 0.8 kV
U_{a1} = 0...180 V
$-U_{g1\ cut\ off}$ = 80...160 V
d_{12} = 36...44 V/cm
d_{34} = 24...30 V/cm

with cathode of low filament input power, reduced warm-up time, flat faceplate and short overall length for low operating voltages

Application

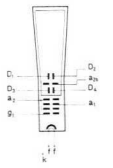
in small size portable transistorized oscilloscopes and other equipment of low operating voltage

Screen Types

DG 7-125
DP 7-125

System Structure

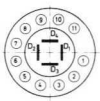
Arrangement of Electrodes:



Base Connections

(bottom view)

1 — f
2 — f
3 — g_1
4 — k
5 — a_1
6 — D_3
7 — D_4
8 — a_{2a}
9 — D_2
10 — D_1
11 — a_{2b}



Deflection

(viewed from screen end)

Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

Small-Button Unidecar, 11-pin, JETEC No. E11-22

Minimum Useful Screen Diameter 65 mm

Heating

U_f = 6.3 V
I_f = 95 mA

Typical Operation

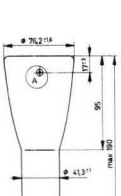
U_{g2a}	=	0.8 kV
U_{a1}	=	0 . . . 180 V
$-U_{g1\ cut\ off}$	=	30 . . . 60 V
d_{12}	=	36 . . . 44 V/cm
d_{34}	=	24 . . . 30 V/cm

Maximum Ratings

U_{g2a} = 1.6 kV
U_{a1} = 0.4 kV

Accessories

Socket: VST 8
Metallic Shield: ART-K591



with spiral post-deflection accelerator, for medium operating voltages

Application

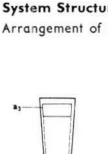
in small oscilloscopes of high brightness and for other equipment; with W-screen as monitor tube in small size display devices

Screen Types

DB 7-126
DG 7-126
DN 7-126
DP 7-126
DW 7-126

System Structure

Arrangement of Electrodes:



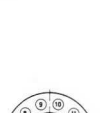
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — f
3 — g_1
4 — k
5 — a_1
6 — D_3
7 — D_4
8 — a_2
9 — D_2
10 — D_1
11 — i. c.
A — a_3

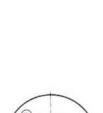


Base

Small-Button Unidecar, 11-pin, JETEC No. E11-22

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 68 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

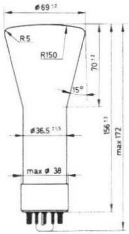
U_{a3} = 4 kV
U_{a2} = 1 kV
U_{a1} = 0.4 kV

Typical Operation

U_{a3}	=	4 kV
U_{a2}	=	1 kV
U_{a1}	=	0...250 V
$-U_{g1\ cut\ off}$	=	80...180 V
d_{12}	=	55...62.5 V/cm
d_{34}	=	37.5...46 V/cm

Accessories

Socket: VST 8
Metallic Shield: ART-K501
Post-Deflection Accelerator Terminal: VST 2



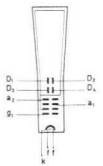
for asymmetrical operation with low operating voltages

Application

low anode voltage indicator tube for asymmetrical operation in direction D_{12}

System Structure

Arrangement of Electrodes:



Deflection Method: electrostatic, D_{12} asymmetrical (D_1 must be connected to a_2), D_{34} symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — g_1
3 — k
4 — a_2
6 — D_3
7 — D_4
8 — a_1
9 — D_1
10 — D_2
12 — f

Base

Small-Shell Duodecal, 12-pin, JETEC No. B12-43

Typical Operation

U_{a_2}	=	0.5 kV
U_{a_1}	=	0...120 V
$-U_{g1\ cut\ off}$	=	50...100 V
d_{12}	=	33.3...41.5 V/cm
d_{34}	=	18.8...23.2 V/cm

Deflection

(viewed from screen end)

Minimum Useful Screen Diameter 63 mm

Heating

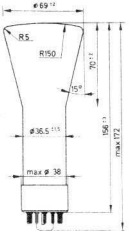
U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a2} = 0.8 kV
U_{a1} = 0.2 kV

Accessories

Socket: VST 10
Metallic Shield: ART-K461



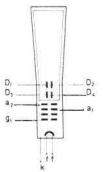
for symmetrical operation with low operating voltages

Application

low anode voltage indicator tube for symmetrical operation

System Structure

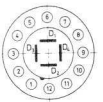
Arrangement of Electrodes:



Base Connections

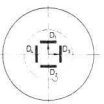
(bottom view)

1 — f
2 — g_1
3 — k
4 — a_1
5 — D_3
7 — D_4
8 — a_2
9 — D_1
10 — D_2
12 — f



Deflection

(viewed from screen end)



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

Small-Shell Duodecal, 12-pin, JETEC No. B12-43

Minimum Useful Screen Diameter 63 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Typical Operation

U_{a2}	=	0.5 kV
U_{a1}	=	0...120 V
$-U_{g1\ cut\ off}$	=	50...100 V
d_{12}	=	33.3...41.5 V/cm
d_{34}	=	18.8...23.2 V/cm

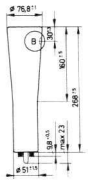
Maximum Ratings

U_{a2} = 0.8 kV
U_{a1} = 0.2 kV

Accessories

Socket: VST 10
Metallic Shield: ART-K461

of high deflection sensitivity, with flat faceplate and mesh post-deflection accelerator, for medium operating voltages



Application

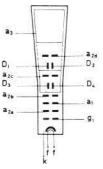
in small size transistorized broad-band oscilloscopes

Screen Types

DB 7-176
DG 7-176
DH 7-176
DN 7-176
DP 7-176

System Structure

Arrangement of Electrodes:



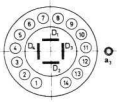
Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2c}
6 — D_4
7 — D_3
8 — a_{2b}
9 — D_2
10 — D_1
11 — i. c.
12 — a_{2a}
13 — a_{2d}
14 — f
B — a_3

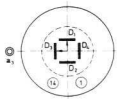


Base

special, 14-pin

Deflection

(viewed from screen end)



Minimum Useful Deflection

in direction D_{12}: 65 mm
in direction D_{34}: 50 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a3} = 8 kV
U_{a2a} = 1.2 kV
U_{a1} = 1 kV

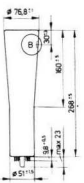
Typical Operation

U_{a3} = 3 kV
U_{a2a} = 0.5 kV
U_{a1} = 20...200 V
$-U_{g1\ cut\ off}$ = 25...75 V
d_{12} = 7.3...10 V/cm
d_{34} = 4.25...5.85 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART 4
Post-Deflection Accelerator Terminal: VST-K005

of high deflection sensitivity, with flat faceplate and spiral post-deflection accelerator, for medium operating voltages



Application

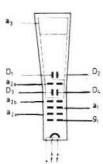
in small size transistorized broad-band oscilloscopes

Screen Types

DB 7-178
DH 7-178
DN 7-178
DP 7-178

System Structure

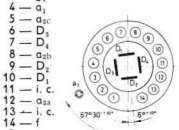
Arrangement of Electrodes:



Base Connections

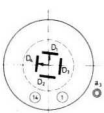
(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2c}
6 — D_3
7 — D_4
8 — a_{2b}
9 — D_2
10 — D_1
11 — i. c.
12 — a_{2a}
13 — i. c.
14 — f
B — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 14-pin

Minimum Useful Deflection at $U_{a3}/U_{a2b} = 4$

in direction D_{12}: 60 mm
in direction D_{34}: 45 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Typical Operation

U_{a3}	=	4 kV
U_{a2a}	=	1 kV
U_{a1}	=	35...165 V
$-U_{g1\ cut\ off}$	=	30...60 V
d_{12}	=	31...40 V/cm
d_{34}	=	10.5...13.7 V/cm

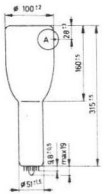
Maximum Ratings

U_{a3} = 5 kV
U_{a2a} = 1.6 kV
U_{a1} = 1 kV

Accessories

Socket: VST 7
Metallic Shield: ART 4
Post-Deflection Accelerator Terminal: VST-K005

of high deflection sensitivity, with flat faceplate and spiral post-deflection accelerator for medium operating voltages



Application

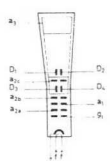
in medium size universal oscilloscopes

Screen Types

D 10-12 BE
D 10-12 GH
D 10-12 GL
D 10-12 GM

System Structure

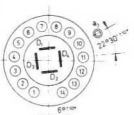
Arrangement of Electrodes:



Base Connections

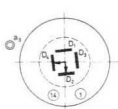
(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2c}
6 — D_3
7 — D_4
8 — a_{2b}
9 — D_2
10 — D_1
11 — i. c.
12 — a_{2a}
13 — i. c.
14 — f
A — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 14-pin

Minimum Useful Deflection

in D_{12} direction: 85 mm
in D_{34} direction: 60 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a3} = 5 kV
U_{a2a} = 2.2 kV
U_{a1} = 1.5 kV

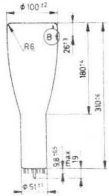
Typical Operation

U_{a3}	=	4 kV
U_{a2a}	=	1 kV
U_{a1}	=	50 . . . 200 V
$-U_{g1\ cut\ off}$	=	25 . . . 67 V
d_{12}	=	24 . . . 31 V/cm
d_{34}	=	8.6 . . . 11 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K451
Post-Deflection Accelerator Terminal: VST 2

of high deflection sensitivity, with metal backed flat faceplate and mesh post-deflection accelerator, for medium operating voltages



Application

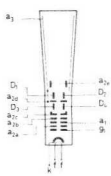
in small size transistorized broad-band oscilloscopes

Screen Types

DB 10-111
DH 10-111
DN 10-111
DP 10-111

System Structure

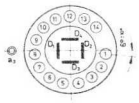
Arrangement of Electrodes:



Base Connections

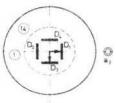
(bottom view)

1 — f
2 — a_{2c}
3 — g_1
4 — D_2
5 — a_{23}
6 — D_4
7 — k
8 — a_1
9 — a_{2b}
10 — D_1
11 — a_{2d}
12 — D_3
13 — a_{2c}
14 — f
B — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 14-pin

Minimum Useful Deflection

in direction D_{12}: 80 mm
in direction D_{34}: 60 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

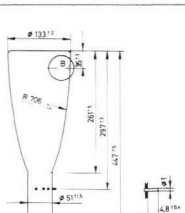
U_{a3} = 8 kV
U_{a2a} = 2.2 kV
U_{a1} = 1 kV

Typical Operation

U_{a3}	=	6 kV
U_{a2a}	=	1 kV
U_{a1}	=	100...300 V
$-U_{g1\ cut\ off}$	=	40...80 V
d_{12}	=	12.5 V/cm
d_{34}	=	4 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K531
Post-Deflection Accelerator Terminal: VST-K005



of high deflection sensitivity, with metal-backed flat faceplate, spiral post-deflection accelerator and small capacitance deflection plates with side contacts, for high operating voltages

Application

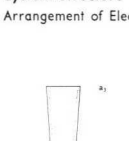
in broad-band oscilloscopes of high cut-off frequency

Screen Types

D 13-19 BE
D 13-19 GH
D 13-19 GL
D 13-19 GM

System Structure

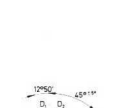
Arrangement of Electrodes:



Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — i. c.
8 — a_{2a}
9 — a_{2b}
10 — i. c.
11 — a_{2c}
12 — i. c.
14 — f
B — a_3



Deflection

(viewed from screen end)

Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a3} = 12 kV
U_{a2a} = 2.2 kV
U_{a1} = 1.5 kV

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Typical Operation

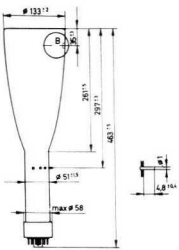
U_{a3}	=	10 kV
U_{a2a}	=	1.67 kV
U_{a1}	=	320 . . . 500 V
$-U_{g1\ cut\ off}$	=	53 . . . 82 V
d_{12}	=	27 . . . 32 V/cm
d_{34}	=	9.5 . . . 12.4 V/cm

Minimum Useful Deflection at U_{a3}/U_{a2b} = 6

in direction D_{12}: 100 mm
in direction D_{34}: 60 mm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART-K002
Post-Deflection Accelerator Terminal: VST-K005
Side Contacts: VST 9 (5 pcs.)



of high deflection sensitivity, with metal-backed flat faceplate, spiral post-deflection accelerator and small capacitance deflection plates with side contacts, for high operating voltages

Application

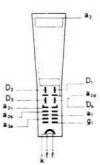
in broad-band oscilloscopes of high cut-off frequency

Screen Types

D 13-21 BE
D 13-21 GH
D 13-21 GL

System Structure

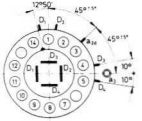
Arrangement of Electrodes:



Base Connections

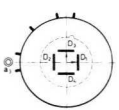
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — i. c.
8 — a_{2a}
9 — a_{2b}
10 — i. c.
11 — a_{2c}
12 — i. c.
14 — f
B — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Minimum Useful Deflection at $U_{a3}/U_{a2b}=6$

in direction D_{12}: 100 mm
in direction D_{34}: 40 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

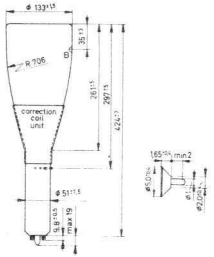
U_{a3} = 1.2 kV
U_{a2a} = 2.1 kV
U_{a1} = 1.5 kV

Typical Operation

U_{a3}	=	10 kV
U_{a2a}	=	1.67 kV
U_{a1}	=	200 . . . 500 kV
$-U_{g1\ cut\ off}$	=	50 . . . 80 kV
d_{12}	=	27 . . . 33.5 V/cm
d_{34}	=	5.7 . . . 7.2 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART-K002
Post-Deflection Accelerator Terminal: VST-K005
Side Contacts: VST 9 (5 pcs.)



of high deflection sensitivity, with metal-backed flat faceplate, mesh post-deflection accelerator, small capacitance deflection plates with side contacts and correction coils, for high operating voltages

Application

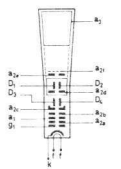
in transistorized broad-band devices

Screen Types

D 13-26 BE
D 13-26 GH
D 13-26 GL
D 13-26 GM

System Structure

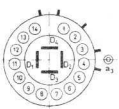
Arrangement of Electrodes:



Base Connections

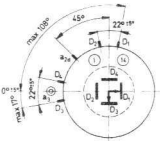
(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2e}
6 — a_{2f}
7 — a_{2c}
8 — a_{2b}
9 — a_{2a}
10 — i. c.
11 — i. c.
12 — i. c.
13 — i. c.
14 — i. c.
B — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 14-pin

Minimum Useful Screen Diameter 114 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

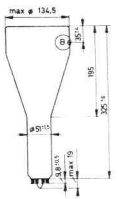
U_{a3} = 16.5 kV
U_{a2a} = 2.5 kV
U_{a1} = 2.5 kV

Typical Operation

U_{a3} = 15 kV
U_{a2a} = 1.5 kV
U_{a1} = 375 . . . 625 V
$-U_{g1\ cut\ off}$ = 40 . . . 90 V
d_{12} = 8 . . . 11 V/cm
d_{34} = 2.3 . . . . 3.5 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K001
Post-Deflection Accelerator Terminal: VST-K005
Side Contacts: VST 9 (5 pcs.)



of high deflection sensitivity, with flat faceplate, spiral post-deflection accelerator and ray extinction, for medium operating voltages

Application

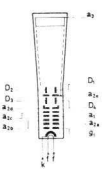
in universal oscilloscopes and medical instruments

Screen Types

D 13-27 GH
D 13-27 GL
D 13-27 GM

System Structure

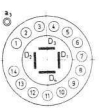
Arrangement of Electrodes:



Base Connections

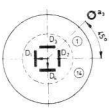
(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2c}
6 — D_2
7 — D_4
8 — a_{2c}
9 — D_1
10 — D_3
11 — a_{2b}
12 — a_{2a}
13 — a_{2d}
14 — f
B — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 14-pin

Minimum Useful Deflection

in direction D_{12}: 100 mm
in direction D_{34}: 80 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

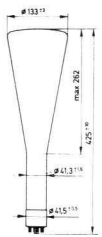
U_{a3} = 5 kV
U_{a2a} = 1.7 kV
U_{a1} = 1.2 kV

Typical Operation

U_{a3}	=	5 kV
U_{a2a}	=	1.5 kV
U_{a1}	=	−200 . . . 380 V
$-U_{a1\ cut\ off}$	=	38 . . . 135 V
d_{12}	=	21 . . . 27 V/cm
d_{34}	=	9.8 . . . 12.2 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K521
Post-Deflection Accelerator Terminal: VST-K005



for medium operating voltages

Application

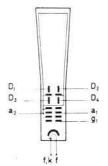
in low frequency oscilloscopes and industrial instruments

Screen Types

DB 13-111
DG 13-111
DN 13-111

System Structure

Arrangement of Electrodes:



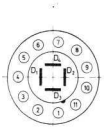
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — i. c.
3 — D_1
4 — a_1
5 — i. c.
6 — D_4
7 — a_2
8 — D_2
9 — D_3
10 — g_1
11 — f, k



Base

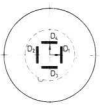
Medium-Shell Magnal, 11-pin, JETEC No. B11-66

Typical Operation

U_{a2}	=	2 kV
U_{a1}	=	320...620 V
$-U_{g1\ cut\ off}$	=	30...70 V
d_{12}	=	27.5...38.5 V/cm
d_{34}	=	25...35 V/cm

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 114 mm

Heating

U_f = 6.3 V
I_f = 600 mA

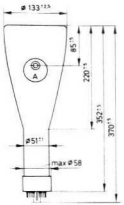
Maximum Ratings

U_{a2} = 2.2 kV
U_{a1} = 1.1 kV

Accessories

Socket: VST 5
Metallic Shield: ART-K006

with flat faceplate and post-deflection accelerator, for medium operating voltages



Application

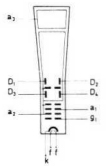
in low-frequency oscilloscopes and industrial instruments

Screen Types

DB 13-114
DG 13-114
DN 13-114
DP 13-114

System Structure

Arrangement of Electrodes:

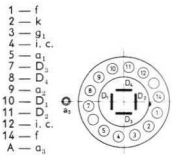


Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base Connections

(bottom view)

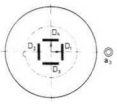


Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Deflection

(viewed from screen end)



Minimum Useful Deflection

in direction D_{12}: 102 mm
in direction D_{34}: 102 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

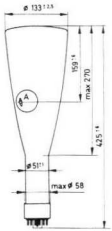
U_{a3} = 6 kV
U_{a2} = 3 kV
U_{a1} = 1.5 kV

Typical Operation

U_{a3}	=	4 kV
U_{a2}	=	2 kV
U_{a1}	=	360 . . . 620 V
$-U_{g1\ cut\ off}$	=	48 . . . 82 V
d_{12}	=	30 . . . 37 V/cm
d_{34}	=	24 . . . 30 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 7
Post-Deflection Accelerator Terminal: VST 2



with post-deflection accelerator, for medium operating voltages

Application

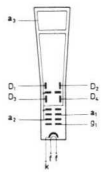
for displaying high-speed non-recurring phenomena, e.g. for surge voltage tests

Screen Types

DB 13-116
DG 13-116
DN 13-116
DP 13-116

System Structure

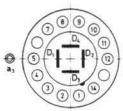
Arrangement of Electrodes:



Base Connections

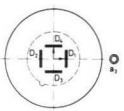
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_2
10 — D_2
11 — D_1
12 — i. c.
14 — f
A — a_3



Deflection

(viewed from screen end)



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Minimum Useful Screen Diameter 114 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

U_{a3} = 4.4 kV
U_{a2} = 2.2 kV
U_{a1} = 1 kV

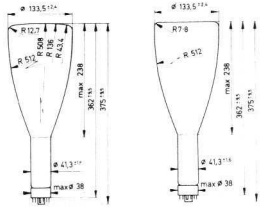
Typical Operation

U_{a3}	=	4 kV
U_{a2}	=	2 kV
U_{a1}	=	370...690 V
$-U_{g1\ cut\ off}$	=	30...90 V
d_{12}	=	30.5...42 V/cm
d_{34}	=	26...35.5 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 3Z
Post-Deflection Accelerator Terminal: VST 2

with spherical (D. 13-132) and flat faceplate (D. 13-132 F) respectively, for medium operating voltages



Application

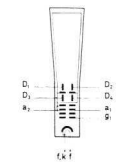
for service oscilloscopes and display purposes

Screen Types

DB 13-132	DB 13-132 F
DG 13-132	DG 13-132 F
DN 13-132	DN 13-132 F
DP 13-132	DP 13-132 F

System Structure

Arrangement of Electrodes:



Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — g_2
3 — k
4 — a_2
5 — i. c.
6 — D_3
7 — D_4
8 — a_1
9 — D_2
10 — D_1
11 — i. c.
12 — f

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Deflection

(viewed from screen end)

Minimum Useful Screen Diameter 114 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

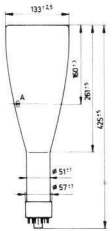
U_{a2} = 2.75 kV
U_{a1} = 1.1 kV

Typical Operation

U_{a2}	= 2 kV
U_{a1}	= 340 . . . 640 V
$-U_{g1\ cut\ off}$	= 30 . . . 90 V
d_{12}	= 22 . . . 30.5 V/cm
d_{34}	= 18 . . . 24.5 V/cm

Accessories

Socket: VST 10
Metallic Shield: ART K471



of high deflection sensitivity, with flat faceplate and post-deflection accelerator, for medium operating voltages

Application

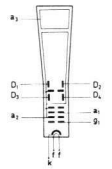
in oscilloscopes for observing high-speed non-recurring phenomena

Screen Types

DB 13-134
DG 13-134
DN 13-134
DP 13-134

System Structure

Arrangement of Electrodes:



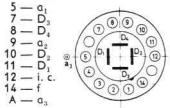
Deflection Method: electrostatic, symmetrical

Focusing Method: electrostatic

Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — D_3
8 — D_4
9 — a_2
10 — D_2
11 — D_1
12 — i. c.
14 — f
A — a_3

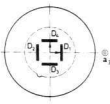


Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Deflection

(viewed from screen end)



Minimum Useful Deflection

in direction D_{12}: 102 mm
in direction D_{34}: 102 mm

Heating

U_f = 6.3 V
I_f = 600 mA

Maximum Ratings

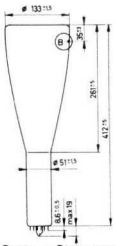
U_{a3} = 6 kV
U_{a2} = 2.6 kV
U_{a1} = 1 kV

Typical Operation

U_{a3}	=	4 kV
U_{a2}	=	2 kV
U_{a1}	=	400...700 V
$-U_{g1\ cut\ off}$	=	45...75 V
d_{12}	=	21...26 V/cm
d_{34}	=	16...20 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 3Z
Post-Deflection Accelerator Terminal: VST 2



of high deflection sensitivity, with metal-backed flat faceplate and spiral post-deflection accelerator, for medium operating voltages

Application

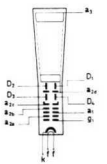
in oscilloscopes of medium bandwidth, as well as for medical and industrial instruments

Screen Types

DH 13-136
DN 13-136
DP 13-136

System Structure

Arrangement of Electrodes:



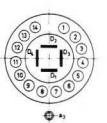
Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base Connections

(bottom view)

1 — f
2 — k
3 — g_3
4 — g_1
5 — a_{2d}
6 — D_4
7 — D_3
8 — a_{2b}
9 — D_1
10 — D_2
11 — i. e.
12 — a_{2a}
13 — a_{2c}
14 — f
B — a_3

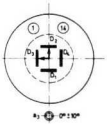


Base

special, 14-pin

Deflection

(viewed from screen end)



Minimum Useful Deflection at $U_{a3}/U_{a2} = 2$

in direction D_{12}: 100 mm
in direction D_{34}: 100 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

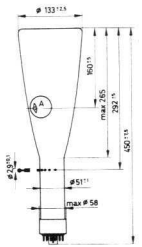
U_{a3} = 12 kV
U_{a2a} = 2.5 kV
U_{a1} = 1.5 kV

Typical Operation

U_{a3}	=	10 kV
U_{a2a}	=	1.67 kV
U_{a1}	=	320...500 V
$-U_{g1\ cut\ off}$	=	50...80 V
d_{12}	=	27...33 V/cm
d_{34}	=	9.5...12.4 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K005
Post-Deflection Accelerator Terminal: VST-K005



of high deflection sensitivity, with flat faceplate, post-deflection and small capacitance deflection plates with side contacts, for medium operating voltages

Application

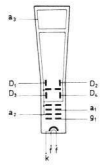
in broad-band oscilloscopes

Screen Types

DB 13-154
DG 13-154
DN 13-154
DP 13-154

System Structure

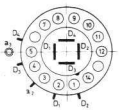
Arrangement of Electrodes:



Base Connections

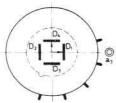
(bottom view)

1 — f
2 — k
3 — g_1
4 — i. c.
5 — a_1
7 — i. c.
8 — i. c.
9 — i. c.
10 — i. c.
11 — i. c.
12 — i. c.
14 — f
A — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Minimum Useful Deflection

in direction D_{12} : 105 mm
in direction D_{34} : 65 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

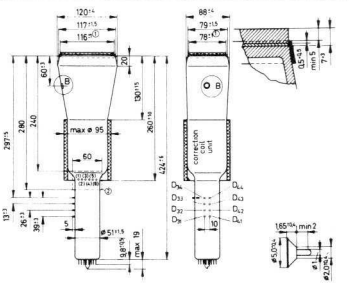
U_{a3} = 8 kV
U_{a2} = 4 kV
U_{a1} = 2 kV

Typical Operation

U_{a3} = 4 kV
U_{a2} = 2 kV
U_{a1} = 360...700 V
$-U_{g1\ cut\ off}$ = 30...90 V
without post-deflection accelerator
d_{12} = 17...23 V/cm
d_{34} = 7...14 V/cm
with post-deflection accelerator
d_{12} = 24...28.5 V/cm
d_{34} = 10...16 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 3
Post-Deflection Accelerator Terminal: VST 2
Side Contacts: VST 1 (5 pcs.)



of high deflection sensitivity, with illuminable internal graticules, rectangular, metal-backed flat faceplate, mesh postdeflection accelerator and small capacitance deflection plates with side contacts. It is provided with in four parts divided vertical deflection plates and correction coils for centralizing and vertical adjustment. The tube is for high operating voltages.

Application

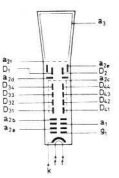
in transistorized devices up to 250 MHz bandwidth

Screen Types

D 13-450 GH/01
D 13-450 GL/01

System Structure

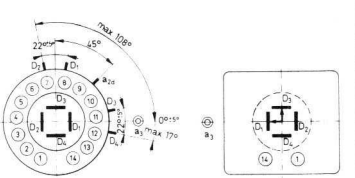
Arrangement of Electrodes:



Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2c}
6 — a_{2f}
7 — a_{2c}
8 — a_{2b}
9 — a_{2a}
10 — i. c.
11 — i. c.
12 — i. c.
13 — i. c.
14 — f
B — a_3



Deflection

(viewed from screen end)

Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 14-pin

Minimum Useful Deflection

in direction $D_{1,2}$: 100 mm
in direction $D_{3,4}$: 60 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

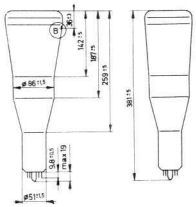
U_{a3} = 16.5 kV
U_{a2a} = 1.8 kV
U_{a1} = 2.4 kV

Typical Operation

U_{a3}	=	15 kV
U_{a2a}	=	1.5 kV
U_{a1}	=	400 . . . 550 V
$-U_{g1\ cut\ off}$	=	40 . . . 100 V
d_{12}	=	9.9 (max 11) V/cm
d_{34}	=	3 (max 3.3) V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K551
Post-Deflection Accelerator Terminal: VST-K005
Side Contacts: VST 9 (11 pcs.)



of high deflection sensitivity, with rectangular flat faceplate, spiral post-deflection accelerator and ray extinction, for medium operating voltages

Application

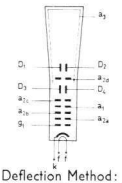
in small size portable oscilloscopes

Screen Types

D 14-180 GH/T
D 14-180 GM/T

System Structure

Arrangement of Electrodes:



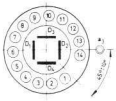
Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base Connections

(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2d}
6 — D_4
7 — D_3
8 — a_{2a}
9 — D_1
10 — D_2
11 — a_{2b}
12 — a_{2c}
14 — f
B — a_3

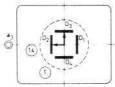


Base

special, 14-pin

Deflection

(viewed from screen end)



Minimum Useful Deflection

in direction D_{12}: 100 mm
in direction D_{34}: 80 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a4} = 7 kV
U_{a2a} = 1.75 kV
U_{a1} = 1 kV

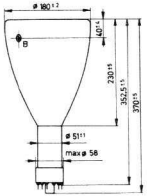
Typical Operation

U_{a3} = 6 kV
U_{a2a} = 1.5 kV
U_{a1} = 260 . . . 600 V
$-U_{x1\ cut\ off}$ = 50 . . . 90 V
d_{12} = 21.2 . . . 25.5 V/cm
d_{34} = 10 . . . 13.1 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K611Z
Post-Deflection Accelerator Terminal: VST-K005

with flat faceplate and spiral post-deflection accelerator, for medium operating voltages



Application

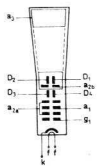
in large screen oscilloscopes

Screen Types

DB 18-114
DG 18-114
DH 18-114
DN 18-114
DP 18-114

System Structure

Arrangement of Electrodes:

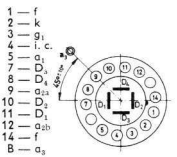


Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base Connections

(bottom view)

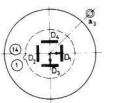


Base

Medium-Shell Diheptal, 12-pin, JETEC No. B12-37

Deflection

(viewed from screen end)



Minimum Useful Deflection

in direction D_{12}: 150 mm
in direction D_{34}: 150 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a3} = 6 kV
U_{a2a} = 3 kV
U_{a1} = 1.5 kV

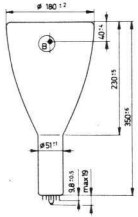
Typical Operation

U_{a3} = 4 kV
U_{a2a} = 2 kV
U_{a1} = 200...600 V
$-U_{g1\ cut\ off}$ = 45...95 V
d_{12} = 31.5...37.5 V/cm
d_{34} = 26.5...31.5 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART-K541Z
Post-Deflection Accelerator Terminal: VST-K005

with flat faceplate and spiral post-deflection accelerator, for medium operating voltages



Application

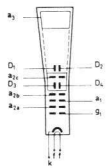
in large screen oscilloscopes

Screen Types

DB 18-116
DG 18-116
DH 18-116
DN 18-116
DP 18-116

System Structure

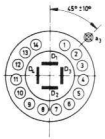
Arrangement of Electrodes:



Base Connections

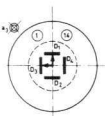
(bottom view)

1 — f
2 — k
3 — g_1
4 — a_1
5 — a_{2c}
6 — D_3
7 — D_4
8 — a_{2b}
9 — D_2
10 — D_1
11 — i. c.
12 — a_{2a}
13 — i. c.
14 — f
B — a_3



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 14-pin

Minimum Useful Deflection at $U_{a3}/U_{a2} = 2$

in direction D_{12}: 150 mm
in direction D_{34}: 150 mm

Heating

U_f = 6.3 V
I_f = 300 mA

Maximum Ratings

U_{a3} = 6 kV
U_{a2} = 3 kV
U_{a1} = 1.5 kV

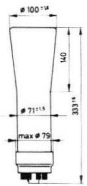
Typical Operation

U_{a3}	=	4 kV
U_{a2}	=	2 kV
U_{a1}	=	200 . . . 600 V
$-U_{g1\ cut\ off}$	=	45 . . . 95 V
d_{12}	=	31.5 . . . 37.5 V/cm
d_{34}	=	26.5 . . . 31.5 V/cm

Accessories

Socket: VST 7
Metallic Shield: ART-K541
Post-Deflection Accelerator Terminal: VST-K005

with flat faceplate, for medium operating voltages



Application

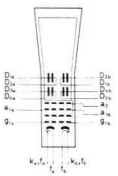
in small size double trace oscilloscopes for industrial and medical purposes

Screen Types

DBM 10-111
DGM 10-111
DNM 10-111

System Structure

Arrangement of Electrodes:



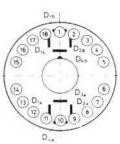
Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base Connections

(bottom view)

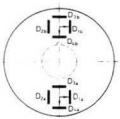
1 — a_2
2 — D_{1b}
3 — D_{2b}
4 — D_{4b}
5 — D_{3b}
6 — D_{3a}
7 — D_{2a}
8 — D_{4a}
9 — D_{1a}
10 — i. c.
11 — a_{1a}
12 — f_a, k_a
13 — g_{4a}
14 — f_a
15 — f_b, k_b
16 — g_{1b}
17 — f_b
18 — a_{1b}



Base
special, 18-pin

Deflection

(viewed from screen end)



Minimum Useful Screen Diameter 80 mm

Heating

U_f = 6.3 V
I_f = 2 × 300 mA

Maximum Ratings

(each system)

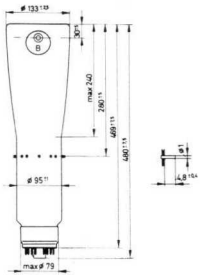
U_{a2} = 2.5 kV
U_{a1} = 1.1 kV

Typical Operation (each system)

U_{a2} = 2 kV
U_{a1} = 340 . . . 640 V
$-U_{g1\ cut\ off}$ = 30 . . . 90 V
d_{12} = 41 V/cm
d_{34} = 40 V/cm

Accessories

Socket: VST 3
Metallic Shield: ART-K004



of high deflection sensitivity, with flat faceplate, spiral post-deflection accelerator and small capacitance deflection plates with side contacts, for medium operating voltages

Application

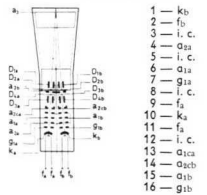
in broad-band oscilloscopes for observing high-speed non-recurring phenomena

Screen Types

DBM 13-136
DGM 13-136
DNM 13-136
DPM 13-136

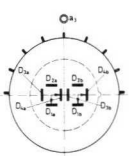
System Structure and Base Connections (bottom view)

Arrangement of Electrodes:



Deflection

(viewed from screen end)



Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base

special, 18-pin

Minimum Useful Deflection at U_{a3} = 4 kV and U_{a2} = 2 kV

in direction D_{12}: 110 mm
in direction D_{34}: 70 mm

Heating

U_f = 6.3 V
I_f = 2 × 300 mA

Maximum Ratings

(each system)

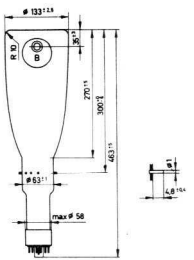
U_{a3} =	8 kV
U_{a2} =	4 kV
U_{a1} =	2 kV

Typical Operation (each system)

U_{a3}	=	4 kV
U_{a2}	=	2 kV
U_{a1}	=	360...700 V
$-U_{g1\ cut\ off}$	=	30...90 V
d_{12}	=	24...28.5 V/cm
d_{34}	=	10...16 V/cm

Accessories

Socket: VST 3
Metallic Shield: ART 9
Post-Deflection Accelerator Terminal: VST-K005
Side Contacts: VST 9 (9 pcs.)



of high deflection sensitivity, with metal-backed screen, spiral post-deflection accelerator, side terminal deflection p'ates and common horizontal deflection of the two traces, for high operating voltages

Application

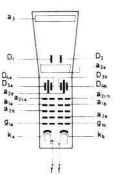
in broad-band oscilloscopes for observing non-recurring phenomena

Screen Types

DBM 13-140
DGM 13-140
DNM 13-140
DPM 13-140

System Structure

Arrangement of Electrodes:



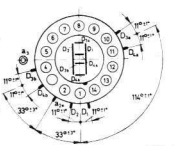
Deflection Method:
electrostatic, symmetrical

Focusing Method:
electrostatic

Base Connections

(bottom view)

1 — f
2 — k_b
3 — i. c.
4 — g_{1b}
5 — a_{1b}
6 — a_{2b}
7 — a_{2cb}
8 — a_{2a}
9 — a_{2d}
10 — a_{1a}
11 — g_{1a}
12 — k_a
13 — a_{2ca}
14 — f
B — a_3

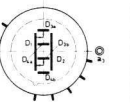


Base

Medium Shell Diheptal, 14-pin, JETEC No. B14-38

Deflection

(viewed from screen end)



Minimum Useful Deflection (each system) at $U_{a3}/U_{a2} = 2$

in direction D_{12}: 100 mm
in direction D_{34}: 40 mm
the common useful display area: 100 mm × 20 mm

Heating

U_f = 6.3 V
I_f = 1.2 A

Maximum Ratings

(each system)

U_{a3} = 12 kV
U_{a2a} = 2.1 kV
U_{a1} = 1.5 kV

Typical Operation (each system)

U_{a3}	=	10 kV
U_{a2a}	=	1.67 kV
U_{a1}	=	180...570 V
$-U_{g1\ cut\ off}$	=	50...80 V
d_{12}	=	27...33.5 V/cm
d_{34}	=	5.35...7.2 V/cm

Accessories

Socket: VST 4 or VST 6
Metallic Shield: ART 8
Post-Deflection Accelerator Terminal: VST-K005
Side Contacts: VST 9 (7 pcs.)

with electrostatic focusing, 90° magnetic deflection, small neck diameter, low filament input power and metal-backed grey glass faceplate, no ion-trap, for use without safety plate, suitable for push-through technique (with internal graticules if requested)

Application

with W-screen: in monitor-television sets, with GH-, GL-, GM-, GR- or LD-screen: in industrial display units

Screen Types

K 36-20 GH
K 36-20 GL
K 36-20 GM
K 36-20 GR
K 36-20 LD
K 36-20 W

Minimum Useful Display Area: 210 mm × 270 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 90°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...10 Oe

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity contact: JEDEC No. J1-22

Heating

U_f = 11 V
I_f = 68 mA

Maximum Ratings

U_a = 16 kV
U_{g2} = 350 V
U_{g4} = 500 V

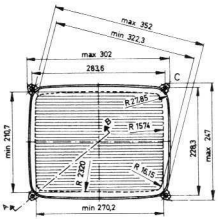
Typical Operation

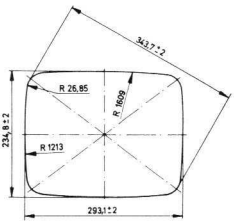
at grid control

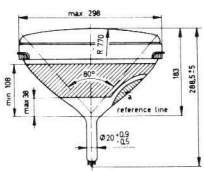
U_a	=	14 kV
U_{g2}	=	350 V
U_{g4}	=	0...350 V
$-U_{g1\ cut\ off}$	=	47...92 V

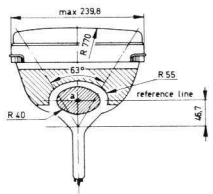
at cathode control

U_a	=	14 kV
U_{g2}	=	200...350 V
U_{g4}	=	0...350 V
U_k	=	approx. 48 V



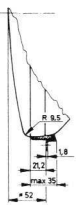


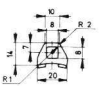


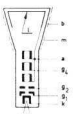


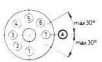
Section A-B

Detail C









1 — g_1
2 — k
3 — f
4 — f
5 — g_1
6 — g_2
7 — g_4

with electrostatic focusing, 90° magnetic deflection, small neck diameter, low filament input power and metal-backed flat faceplate, no ion-trap (with internal graticules if requested)

Application

with W-screen: in monitor-television sets and in video telephones; with GH-, GL-, GM-, GR- or LD-screen: in industrial display units

Screen Types

K 2001 GH
K 2001 GL
K 2001 GM
K 2001 GR
K 2001 LD
K 2001 W

Minimum Useful Display Area: 130 mm × 150 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 90°
Focusing Method: electrostatic
Beam Centring: magnetic

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity contact: JEDEC No. J1-22

Heating

U_f = 11 V
I_f = 68 mA

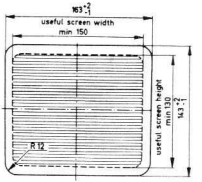
Maximum Ratings

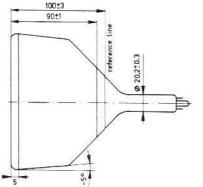
U_a = 15 kV
U_{g2} = 450 V
U_{g4} = 450 V

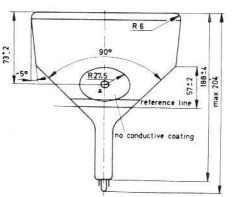
Typical Operation

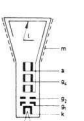
at cathode control

U_a = 14 kV
U_{g2} = 200 . . . 350 V
U_{g4} = 0 . . . 400 V
$U_{k\ cut\ off}$ = 30 . . . 70 V









1 — g_1
2 — k
3 — f
4 — f
5 — i.c.
6 — g_2
7 — g_4

with electrostatic focusing, 55° magnetic deflection, small neck diameter, low filament input power, metal-backed faceplate, no ion-trap (with internal graticules if requested)

Application

with W-screen: in monitor-television sets and as camera-monitor-tube; with GH-, GL-, GM-, GR- or LD-screen: in industrial display units

Screen Types

M 12-100 GH
M 12-100 GL
M 12-100 GM
M 12-100 GR
M 12-100 LD
M 12-100 W

Minimum Useful Display Area: 70 mm × 90 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 55°
Focusing Method: electrostatic
Beam Centring: magnetic

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity contact: JEDEC No. J1-30

Heating

U_f = 11 V
I_f = 68 mA

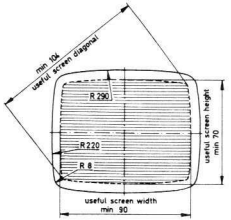
Maximum Ratings

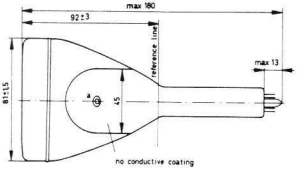
U_a = 10 kV
U_{g2} = 450 V
U_{g4} = 1.1 kV

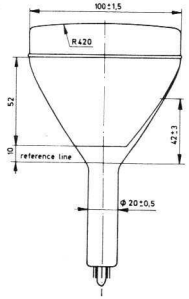
Typical Operation

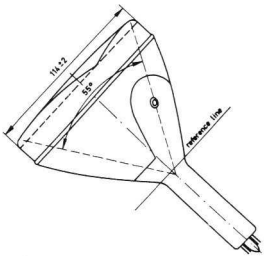
at grid control

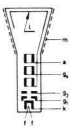
U_a	=	8 kV
U_{g2}	=	300 V
U_{g4}	=	—50 . . . 300 V
$-U_{g1\ cut\ off}$	=	25 . . . 50 V



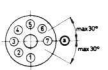








1 — g_1
2 — k
3 — f
4 — f
5 — g_1
6 — g_2
7 — g_4



with electrostatic focusing, 75° magnetic deflection, small neck diameter, low filament input power and metal-backed flat faceplate, no ion-trap (with internal graticules if requested)

Application

with W-screen: in monitor-television sets and as camera-monitor-tube; with GH-, GL-, GM-, GR- or LD-screen: in industrial display units

Screen Types

M 17-11 GH
M 17-11 GL
M 17-11 GM
M 17-11 GR
M 17-11 LD
M 17-11 W

Minimum Useful Display Area: 95 mm × 125 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 75°
Focusing Method: electrostatic
Beam Centring: magnetic

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity contact: JEDEC No. J1-22

Heating

U_f = 11 V
I_f = 68 mA

Maximum Ratings

U_a = 14 kV
U_{g2} = 350 V
U_{g4} = 500 V

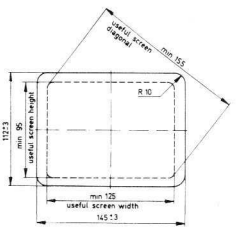
Typical Operation

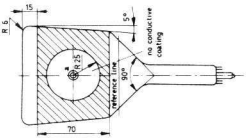
at grid control

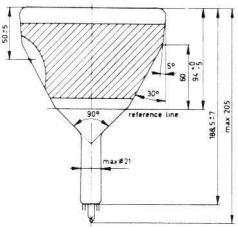
U_a	=	13 kV
U_{g2}	=	350 V
U_{g4}	=	50 . . . 400 V
$-U_{g1\ cut\ off}$	=	46 . . . . 91 V

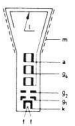
at cathode control

U_a	=	13 kV
U_{g2}	=	200 . . . 350 V
U_{g4}	=	50 . . . 400 V
U_k	=	approx. 47 V









1 — g_1
2 — K
3 — f
4 — f
5 — g_1
6 — g_2
7 — g_4

with electrostatic focusing, 90° magnetic deflection, small neck diameter, low filament input power, metal-backed grey glass faceplate and rimband reinforced envelope integral mounting leaks[1], suitable for push-through technique (with internal graticules if requested)

Application

with W-screen: in monitor-television sets; with GH-, GL-, GM-, GR- or LD-screen: in industrial display devices

Screen Types

M 23-100 GH
M 23-100 GL
M 23-100 GM
M 23-100 GR
M 23-100 LD
M 23-100 W

Minimum Useful Display Area: 140 mm × 183 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 90°
Focusing Method: electrostatic
Beam Centring: magnetic

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity contact: JEDEC No. J1-21

Heating

U_f = 11 V
I_f = 68 mA

Maximum Ratings

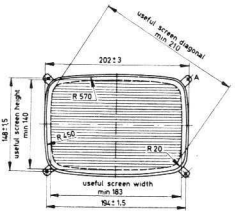
U_a = 12 kV
U_{g2} = 125 V
U_{g4} = 1.1 kV

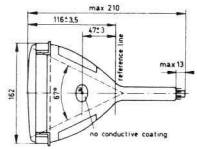
Typical Operation

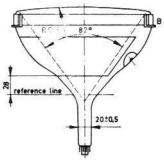
at grid control

U_a	=	9 kV
U_{g2}	=	100 V
U_{g4}	=	−50 . . . 300 V
$-U_{g1\ cut\ off}$	=	32 . . . . 50 V

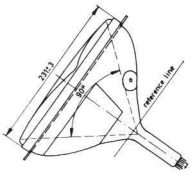
[1] The tube can be applied without safety plate and can be fixed at the metal rimband.



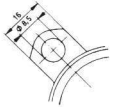


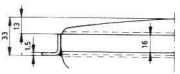


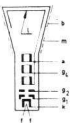
Detail A



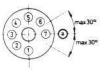
Detail B







1 — g_1
2 — k
3 — f
4 — f
5 — g_1
6 — g_2
7 — g_4



with electrostatic focusing, 90° magnetic deflection, small neck diameter, low filament input power and metal-backed grey glass faceplate, no ion-trap, for use without safety plate, suitable for push-through technique (with internal graticules if requested)

Application

with W-screen: in monitor-television sets; with GH-, GL-, GM-, GR- or LD-screen: in industrial display units

Screen Types

M 28-12 GH
M 28-12 GL
M 28-12 GM
M 28-12 GR
M 28-12 LD
M 28-12 W

Minimum Useful Display Area: 171 mm × 228 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 90°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0 . . . 10 Oe

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity contact: JEDEC No. J1-22

Heating

U_f = 11 V
I_f = 68 mA

Maximum Ratings

U_a = 14 kV
U_{g2} = 350 V
U_{g4} = 500 V

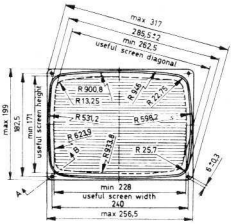
Typical Operation

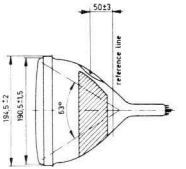
at grid control

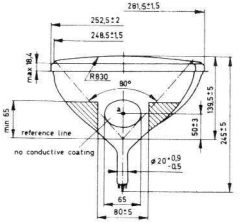
U_a	=	13 kV
U_{g2}	=	350 V
U_{g4}	=	50 . . . 400 V
$-U_{g1\ cut\ off}$	=	46 . . . 91 V

at cathode control

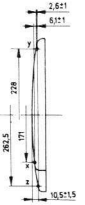
U_a	=	13 kV
U_{g2}	=	200 . . . 350 V
U_{g4}	=	50 . . . 400 V
U_k	=	approx. 47 V



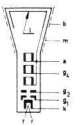




Spherical faceplate



Section A-B



1 — g_1
2 — k
3 — f
4 — f
5 — g_1
6 — g_2
7 — g_4

with electrostatic focusing, 110° magnetic deflection, metal-backed grey glass faceplate and rimband reinforced envelope integral mounting leaks[1] suitable for push-through technique (with internal graticules if requested)

Application

with W-screen: in monitor-television sets; with GH-, GL-, GM-, GR- or LD-screen: in industrial display units

Screen Types

M 31-120 GH
M 31-120 GL
M 31-120 GM
M 31-120 GR
M 31-120 LD
M 31-120 W

Minimum Useful Display Area: 195 mm × 257 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 110°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...10 Oe

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity contact: JEDEC No. J1-22

Heating

U_f = 11 V
I_f = 68 mA

Maximum Ratings

U_a = 12 kV
U_{g2} = 350 V
U_{g4} = 500 V

Typical Operation

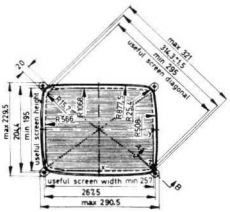
at grid control

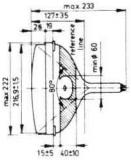
U_a = 11 kV
U_{g2} = 250 V
U_{g4} = 0...350 V
$-U_{g1}$ = 35...69 V

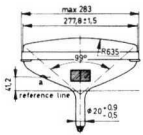
at cathode control

U_a = 11 kV
U_{g2} = 250 V
U_{g4} = 0...350 V
U_k = 32...58 V

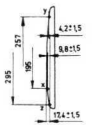
[1] The tube can be applied without safety plate and can be fixed at the metal rimband.



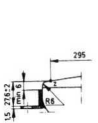


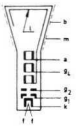


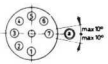
Spherical faceplate



Section A-B







with electrostatic focusing, 110° magnetic deflection and metal-backed grey glass faceplate (with internal graticules if requested)

Application

with W-screen: in monitor-television sets; with LD-, GH-, GL-, GM- or GR-screen: in industrial display units

Screen Types

M 38-120 GH
M 38-120 GL
M 38-120 GM
M 38-120 GR
M 38-120 LD
M 38-120 W

Minimum Useful Display Area: 226 mm × 291 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 110°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...10 Oe

Base: neoeightar (JEDEC No. B7-208)

Cavity contact: JEDEC No. J1-22

Heating

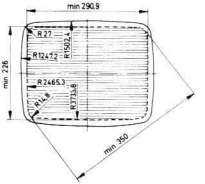
U_f = 6.3 V
I_f = 300 mA

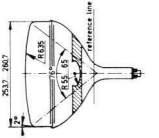
Maximum Ratings

U_a = 18 kV
U_{g2} = 550 V
U_{g4} = 1 kV

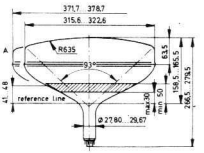
Typical Operation

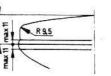
U_a	=	16 kV
U_{g2}	=	400 V
U_{g4}	=	0...400 V
$-U_{g1\ cut\ off}$	=	40...85 V
resolution	=	min 625 rows

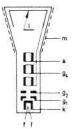




Detail A







1 — f
2 — g_1
3 — g_2
4 — g_4
6 — g_3
7 — K
8 — f

with electrostatic focusing, 110° magnetic deflection and metal-backed grey glass faceplate, for use without safety plate (with internal graticules if requested)

Application

with W-screen: in monitor-television sets, with GH-, GL-, GM-, GR- or LD-screen: in industrial display units

Screen Types

M 47-12 GH
M 47-12 GL
M 47-12 GM
M 47-12 GR
M 47-12 LD
M 47-12 W

Minimum Useful Display Area: 305 mm × 348 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 110°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0 . . . 6.5 Oe

Base: neoeightar (JEDEC No. B7-208)

Cavity contact: JEDEC No. J1-22

Heating

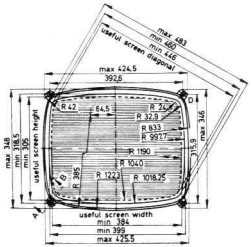
U_f = 6.3 V
I_f = 300 mA

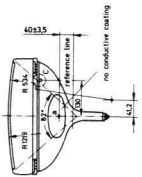
Maximum Ratings

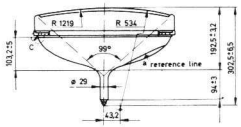
U_a = 18 kV
U_{g2} = 550 V
U_{g4} = 1 kV

Typical Operation

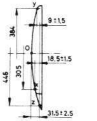
U_a = 18 kV
U_{g2} = 500 V
U_{g4} = 0 . . . 400 V
$-U_{g1\ cut\ off}$ = 50 . . . 93 V



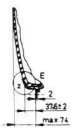




Spherical faceplate

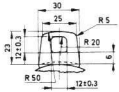


Section A-B

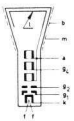


Detail C

Detail D



Detail E



1 — f
2 — g1
3 — g2
4 — g3
5 — k
6 — a
7 — m
8 — f

with electrostatic focusing, 110° magnetic deflection and metal-backed grey glass faceplate, no ion-trap, for use without safety plate (with internal graticules if requested)

Application

with W-screen: in monitor-television sets, with GH-, GL-, GM-, GR- or LD-screen: in industrial display units

Screen Types

M 59-33 GH
M 59-33 GL
M 59-33 GM
M 59-33 GR
M 59-33 LD
M 59-33 W

Minimum Useful Display Area: 385 mm × 489 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 110°
Focusing Method: electrostatic
Beam Centring: magnetic
magnetic field intensity perpendicular to tube axis: 0...10 Oe

Base: neoeightar (JEDEC No. B7-208)

Cavity contact: JEDEC No. J1-22

Heating

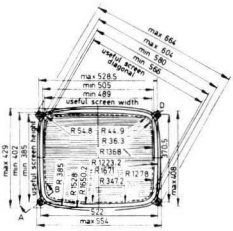
U_f = 6.3 V
I_f = 300 mA

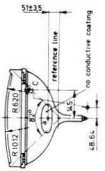
Maximum Ratings

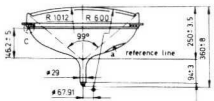
U_a = 18 kV
U_{g2} = 550 V
U_{g4} = 1 kV

Typical Operation

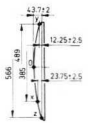
U_a	=	18 kV
U_{g2}	=	500 V
U_{g4}	=	0...400 V
$-U_{g1\ cut\ off}$	=	50...93 V







Spherical faceplate

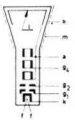


Section A-B

Detail C

Detail D

Detail E



1 — f
2 — g_1
3 — g_2
4 — g_4
5 — g_3
6 — K
7 — K
8 — f

with electrostatic focusing, 70° magnetic deflection, small neck diameter, low filament input power and metal-backed faceplate, no ion-trap (with internal graticules if requested)

Application

with B4-screen: in monitor-television sets and as camera-monitor-tube; with B2-, B7-, B31- or B39-screen: in industrial display units

Screen Types

140 MB2/T (equal to GL)
140 MB4/T (equal to W)
140 MB7/T (equal to GM)
140 MB31/T (equal to GH)
140 MB39/T (equal to GR)

Minimum Useful Display Area: 85 mm × 110 mm

System Structure

Deflection Method: magnetic
Deflection Angle: 70°
Focusing Method: electrostatic

Base: miniature, with exhaust connection (JEDEC No. E7-91)

Cavity contact: JEDEC No. J1-22

Heating

U_f = 11 V
I_f = 68 mA

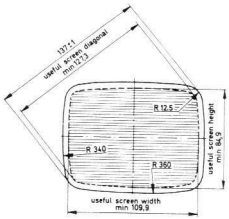
Maximum Ratings

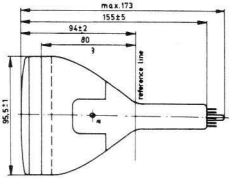
U_a = 10 kV
U_{g2} = 450 V
U_{g4} = 1.1 kV

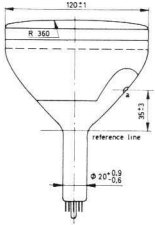
Typical Operation

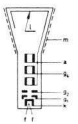
at grid control

U_a	=	8 kV
U_{g2}	=	300 V
U_{g4}	=	0...300 V
$-U_{g1\ cut\ off}$	=	15...40 V

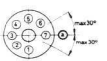




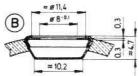




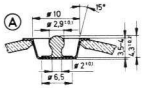
1 — g_1
2 — k
3 — f
4 — f
5 — g_1
6 — g_2
7 — g_1



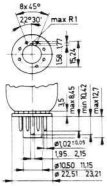
BASES AND CAVITY CONTACTS



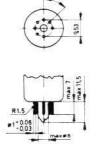
JEDEC No. J1-21



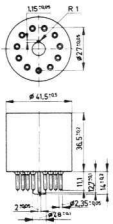
JEDEC No. J1-22



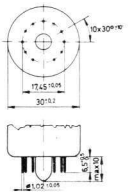
Small-Button Neoeightar, 7-pin
JEDEC No. B7-208



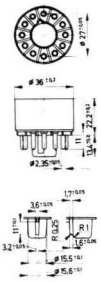
Miniature, 7-pin, with exhaust connection
JEDEC No. E7-91



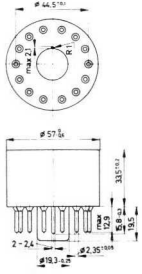
Medium-Shell Magnal, 11-pin
JETEC No. B11-66



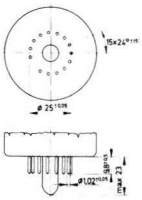
Small-Button Unidecar, 11-pin
JETEC No. E11-22



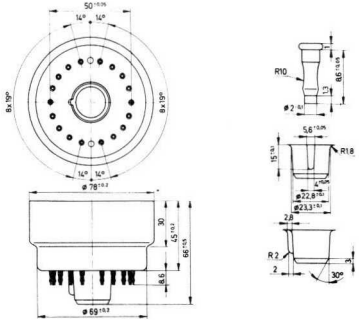
Small-Shell Duodecal,
12-pin
JETEC No. B12-43



Medium-Shell Diheptal
14-pin: JETEC No. B14-38
12-pin (without pins 6 and
13): JETEC No. B12-37



14-pin Special Base



18-pin Special Base

INTERCHANGEABILITY LIST

The oscilloscope and monitor tubes of this interchangeability list are not identical, but owing to their similarity they are interchangeable in almost every circuit.

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
B7S4	DH 7-178	D 18-140 GJ[2]	DG 18-114	DN 13-58[2]	D 13-21 GL
B7S4N	DN 7-178	D 18-140 GH[2]	DP 18-114	DN 13-78[2]	D 13-21 GL
B10S21[1]	DGM 10-111	D 18-141 GH[2]	DH 18-116	DN 13-79	D 13-21 GL
B10S21B[1]	DBM 10-111	D 18-141 GJ[2]	DG 18-116	DP 7-14[3]	DP 7-116 F
B10S21N[1]	DNM 10-111	D 18-141 GH[2]	DP 18-116	DP 7-78	DP 7-178
B13S5[1]	DG 13-154	DB 7-14[3]	DB 7-116 F	DP 13-2	DP 13-116
B13S5B[1]	DB 13-154	DB 7-78	DB 7-178	DP 13-14	DP 13-114
B13S5DN[1]	DP 13-154	DB 13-2	DB 13-116	DP 13-32	DP 13-132
B13S5N[1]	DN 13-154	DB 13-14	DB 13-114	DP 13-34	DP 13-134
B13S6[2]	DG 13-114	DB 13-32	DB 13-132	DP 13-54	DP 13-154
B13S6DN[2]	DP 13-114	DB 13-34	DB 13-134	DP 18-14[2]	DP 18-114
B13S6N[2]	DN 13-114	DB 13-54	DB 13-154	F8074P1	DGM 13-140
B13S8[1]	DG 13-160	DB 13-58[2]	D 13-21 BE	F8074P2	DNM 13-140
B13S8A[1]	DN 13-160	DB 13-78[2]	D 13-21 BE	F8074P11	DBM 13-140
B13S25[1]	DGM 13-116	DB 13-79	D 13-21 BE	M 17-11 LF	M 17-11 LD
B13S25DN[1]	DPM 13-136	DG 7-14[3]	DG 7-116 F	M 17-18 W	M 17-11 W
B13S25N[1]	DNM 13-136	DG 7-31	DG 7-131	M 28-10 GL[2]	M 28-12 GL
B13S52	DG 13-154	DG 7-32	DG 7-132	M 28-12 GL[2]	M 28-12 GL
B13S52DN	DP 13-153	DG 13-2	DG 13-116	M 28-10 GM	M 28-12 GM
B13S52N	DN 13-154	DG 13-14	DG 13-114	M 28-12 GM[2]	M 28-12 GM
D 10-12 BE	D 10-12 BE	DG 13-32	DG 13-132	M 47-12 GM	M 47-12 GM
D 10-12 GH	D 10-12 GH	DG 13-34	DG 13-134	M 47-12 LF	M 47-12 LD
D 10-12 GL	D 10-12 GL	DG 13-54	DG 13-154	M 47-25 . .[1]	M 47-12 . .
D 10-12 GM	D 10-12 GM	DG 13-58[2]	D 13-21 GH	M 59-25 . .[1]	M 59-33 . .
D 13-21 BE	D 13-21 BE	DG 18-14 A[2]	DG 18-114	M 59-33 GM	M 59-33 GM
D 13-21 BG	D 13-21 BE	DG 18-14[3]	DH 18-114	M 59-33 GR	M 59-33 GR
D 13-21 GH	D 13-21 GH	DH 7-78	DH 7-178	M 59-33 LF	M 59-33 LD
D 13-21 GL	D 13-21 GL	DH 13-78[2]	D 13-21 GH	T 54P2[2]	D 13-21 GL
D 13-21 GM	D 13-21 GM	DH 13-79	D 13-21 GH	T 54P11[2]	D 13-21 BE
D 13-21 GP	D 13-21 GL	DN 7-14[3]	DN 7-116 F	T 54P31[2]	D 13-21 GH
D 13-26 GH	D 13-26 GH	DN 7-78	DN 7-178	T 543P2	D 13-21 GL
D 13-26 GP	D 13-26 GL	DN 13-2	DN 13-116	T 543P11	D 13-21 BE
D 13-27 GH	D 13-27 GH	DN 13-14	DN 13-114	T 543P31	D 13-21 GH
D 13-450 GH/01	D 13-450 GH/01	DN 13-32	DN 13-132	T 5511P1	DGM 13-140
D 14-180 GH[4]	D 14-180 GH/T	DN 13-34	DN 13-134	T 5511P2	DNM 13-140
D 18-140 GH[2]	DH 18-114	DN 13-54	DN 13-154	T 5511P7	DPM 13-140

[1], [2], [3] and [4]
see next page

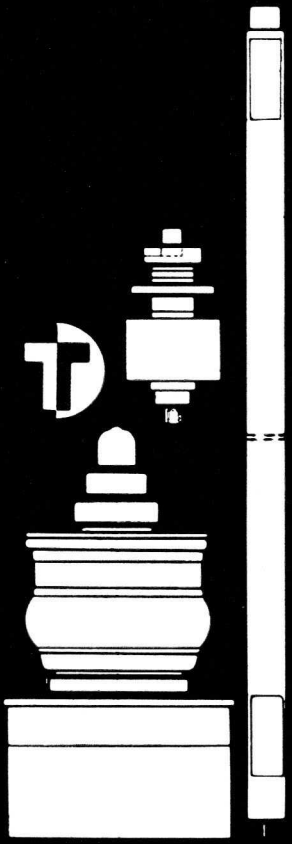
type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
T 5511P11	DBM 13-140	3KP11	DB 7-113	5ELP2	D 13-21 GL
3AMP1A	DG 7-132	3KP11-F	DB 7-113 F	5ELP11	D 13-21 BE
3BKP2	DN 7-178	5ADP1	DG 13-134	5ELP31	D 13-21 GH
3BKP7	DP 7-178	5ADP1A	DG 13-134	5UP1	DG 13-132
3BKP11	DB 7-178	5ADP2	DN 13-134	5UP1-F	DG 13-132 F
3BKP31	DH 7-178	5ADP2A	DN 13-134	5UP2	DN 13-132
3BLP31[4]	DH 7-176	5ADP7	DP 13-134	5UP2-F	DN 13-132 F
3BP1-A	DG 7-115	5ADP7A	DP 13-134	5UP7	DP 13-132
3BP2-A	DN 7-115	5ADP11	DB 13-134	5UP7-F	DP 13-132 F
3BP11-A	DB 7-115	5ADP11A	DB 13-134	5UP11	DB 13-132
3JP1	DG 7-116	5ADP31	DH 13-134	5UP11-F	DB 13-132 F
3JP1-F	DG 7-116 F	5BPH2[2]	D 13-21 GL	5YP1	DG 13-154
3JP2	DN 7-116	5BPH11[2]	D 13-21 BE	5YP2	DN 13-154
3JP2-F	DN 7-116 F	5BPH31[2]	D 13-21 GH	5YP7	DP 13-154
3JP7	DP 7-116	5BP1-A	DG 13-111	5YP11	DB 13-154
3JP7-F	DP 7-116 F	5BP2-A	DN 13-111	8L029I	DG 7-115
3JP11	DB 7-116	5BP11-A	DB 13-111	8L039V	DP 7-116
3JP11-F	DB 7-116 F	5CP1-A	DG 13-116	13L036V	DP 13-116
3KP1	DG 7-113	5CP2-A	DN 13-116	13L037A	DB 13-116
3KP1-F	DG 7-113 F	5CP7-A	DP 13-116	13L037I	DG 13-116
3KP2	DN 7-113	5DQP2	D 13-21 GL	31B82	D 13-21 GH
3KP2-F	DN 7-113 F	5DQP31	D 13-21 GH	140 MB.	140 MB./T

[1] type with similar data
[2] type with identical data
[3] also for asymmetrical deflection
[4] different base

III.

TUNGSRAM

TRANSMITTING TUBES RECTIFIERS AND MICROWAVE TUBES



Explanation of Symbols

f	frequency
Δf	frequency range
G_N	power amplification factor
I_a	anode current
$I_{a\,s}$	peak anode current
I_c	collector current
I_e	emission current
I_f	heater current
I_g or I_{g1}	grid No. 1 current
I_{g2}	grid No. 2 current
I_h	helix current
I_k	cathode current
I_{Res}	resonator current
F	noise figure
N_a	anode dissipation
N_i	input power
N_o	output power
$N_{o\,sat}$	saturated output power
S	mutual conductance
S_m	reflector modulation sensitivity
U_a	anode voltage
$-U_{a\,s}$	peak inverse anode voltage
U_c	collector voltage
U_f	heater voltage
$-U_g$ or U_{g1}	grid No. 1 voltage
U_{g2}	grid No. 2 voltage
U_h	helix voltage
U_{Res}	resonator voltage
μ	amplification factor
μ_{g2g1}	grid No. 2 amplification factor

Explanation of Abbreviations

Cathode

do	directly-heated oxide-coated
id	indirectly-heated dispenser type
io	indirectly-heated oxide-coated
pt	directly-heated pure tungsten
tt	directly-heated thoriated tungsten

Construction

mco	metal-ceramic construction, outer cavity
mgo	metal-glass construction, outer cavity
mmi	all-metal construction, mechanically-tuned integral cavity

Cooling

f	forced-air
n	natural
v	vapour
w	water

Filling

Hg	mercury
Xe	xenon

Magnet

p	permanent
pp	periodical permanent
s	solenoid

Typical operating conditions

af/B-2	class B, af power amplifier stage, two tubes in push-pull
rf/C/o	class C oscillator for industrial and medical applications, unfiltered d.c. anode voltage from a three-phase rectifier
rf/C/tg	class C, telegraphy, rf power amplifier
rf/C/tph	class C, telephony, anode-modulated power amplifier
tv/B	class B, television service, negative modulation, positive synchronization

TRANSMITTING TRIODES OF NATURAL COOLING

type	cathode	HEATING		TYPICAL CHARACTERISTICS			MAXIMUM RATINGS			TYPICAL OPERATION							
		U_f	I_f	S	μ	I_c	f	U_a	N_a	operation	f	U_a	$-U_g$	I_a	I_g	N_i	N_o
		V	A	mA/V		A	MHz	kV	W		MHz	kV	V	mA	mA	W	W
OQQ 55/1500	tt	7.5	3	2.2	20	0.75	60	1.5	55	af/B-2	—	1.5	65	220	16	2.6	220
										rf/C/tg	15	1.5	140	135	18	5.5	150
OQQ 151/3000	tt	10.5	4	3	18	1.3	60	2.5	150	af/B-2	—	2.5	112	270	17.4	3	430
										rf/C/tg	30	2.5	170	220	25	8	400
OQQ 501/3000	pt	23	16	4	36	1.8	60	3	500	af/B-2	—	3	60	900	120	40	2000
										rf/C/tg	20	3	150	500	100	50	1000
OT 100	tt	10	3.25	5	20	1.2	100	1.5	75	af/B-2	—	1.5	88	280	16	2.8	286
										rf/C/tg	40	1.5	165	160	15	4	180
OT 400	tt	10	10	10	35	3.5	75	3	300	af/B-2	—	3	70	744	110	20	1650
										rf/C/tg	30	3	200	415	55	20	1000
3S012T	tt	10	4.5	4.5	33	1.2	50	2.25	125	af/B-2	—	2	50	420	64	10	590
										rf/C/tg	30	2	160	250	40	12	375
3S035T-1	tt	5	15	9	30	2.4	150	4	350	af/B-2	—	4	130	660	170	40	1960
										rf/C/tg	100	4	290	340	75	30	1050

TRANSMITTING TETRODES OF NATURAL COOLING

type	cathode	HEATING		TYPICAL CHARACTERISTICS			MAXIMUM RATINGS			TYPICAL OPERATION										
		U_f	I_f	S	$\mu_{g_2g_1}$	I_c	f	U_a	N_a	operation	f	U_a	U_{g_2}	$-U_{g_1}$	I_a	I_{g_2}	I_{g_1}	N_i	N_o
		V	A	mA/V		A	MHz	kV	W		MHz	kV	V	V	mA	mA	mA	W	W
4S040T-1	tt	5	15	4.5	5	2.4	120	4	400	af/B-2	—	4	400	70	560	76	12	1.2	1600
										rf/C/tg	50	4	400	165	325	58	12	3	1000

TRANSMITTING PENTODES OF NATURAL COOLING

type	cathode	HEATING		TYPICAL CHARACTERISTICS			MAXIMUM RATINGS			TYPICAL OPERATION										
		U_f	I_f	S	$\mu_{g_2g_1}$	I_c	f	U_a	N_a	operation	f	U_a	U_{g_2}	$-U_{g_1}$	I_a	I_{g_2}	I_{g_1}	N_i	N_o
		V	A	mA/V		A	MHz	kV	W		MHz	kV	V	V	mA	mA	mA	W	W
OS 51	io	12.6	1.35	6	6.7	—	60	1	45	af/B-2	—	1	250	34	268	56	1.6	0.60	194
										rf/C/tg	60	1	250	120	177	28	5	0.65	132
OS 70/1750	tt	10	3.25	2.7	6.2	1.2	75	1.25	70	af/B-2	—	1.7	750	120	248	43	0	0	300
										rf/C/tg	30	1.25	400	95	160	35	12	2.1	150
OS 125/2000	tt	10	5	4.5	10.5	1.5	60	2	125	rf/C/tg	30	2	500	90	160	45	12	2	210
5S004	io	12.6	0.655	4	5.28	—	67	1	40	af/B-2	—	1	250	70	194	16	0	0	115
5S004-1										rf/C/tg	25	1	250	100	130	10	2	0.5	90
5S045T	tt	12	8.5	5.5	3.5	3.5	60	3	450	rf/C/tg	10	3	500	300	465	200	20	9	950
5S045T-1																			

TRANSMITTING TRIODES OF FORCED AIR, VAPOUR OR WATER COOLING

type	cooling	cathode	HEATING		TYPICAL CHARACTERISTICS			MAXIMUM RATINGS			TYPICAL OPERATION								
			U_f	I_f	S	μ	I_c	f	U_a	N_a	operation	f	U_a	$-U_g$	I_a	I_g	N_i	N_o
			V	A	mA/V		A	MHz	kV	kW		MHz	kV	V	A	mA	W	kW
3L030K	f	tt	3.4	19	10	32	3	900	2.5	0.3	rf/C/tph	175	2	200	0.335	120	30	0.505
											rf/C/tg	175	2.5	200	0.260	100	25	0.475
3L050K	f	tt	3.4	19	14	70	3	625	2.5	0.5	rf/C/tg	400	2.5	70	0.380	160	70	0.670
3L1T	f	tt	5	50	13	25	7	200	4	2	af/B-2	—	4	130	1.4	350	96	4
											rf/C/tph	100	3	300	0.5	140	70	1.2
											rf/C/tg	100	4	300	0.6	150	70	1.9
3L2T	f	tt	12.6	29	12	30	10	220	6	3	af/B-2	—	4.7	200	2.8	280	195	8.8
											rf/C/tph	30	4.7	400	0.96	280	170	3.7
3V2T	w										rf/C/tg	30	6	550	1.25	290	1225	' 7
3L3T	f	tt	5.5	120	25	8	20	—	4	5	af/B-2	—	4	665	7.2	1000	1190	20
3V3T	w																	
3L4Z	f	pt	2 × 22	2 × 38	7	22	8	30	12	4	af/B-2	—	10	400	2.4	120	80	16
											rf/C/tph	5	10	800	1	440	530	7.7
3L4Z-1	f		22	76							rf/C/tg	5	12	700	1.21	280	300	10.5

type	cooling	cathode	HEATING		TYPICAL CHARACTERISTICS			MAXIMUM RATINGS			TYPICAL OPERATION							
			U_f	I_f	S	μ	I_c	f	U_a	N_a	operation	f	U_a	$-U_g$	I_a	I_g	N_i	N_o
			V	A	mA/V		A	MHz	kV	kW		MHz	kV	V	A	mA	W	kW
3L5T	f	tt	12.6	28	10	22	11	50	9	5	af/B-2	—	9	410	3.34	468	374	20
											rf/C/tph	30	6.5	1040	1.23	240	356	6
3V5T	w										rf/C/tg	30	8	1360	1.74	330	646	10.4
3L5T-U1	f	tt	5	82	38	60	12	220	2.8	5	tv/B	220	2.8	40	2.8	400	580	5
3G6T	v	tt	5	140	25	40	20	100	10	10	af/B-2	—	10	250	6	600	680	32
3L6T	f									8	rf/C/tph	30	8	382	2.25	320	232	13
3V6T	w									10	rf/C/tg	30	10	467	2.8	400	320	20
3L10T-U1	f	tt	10	75	62	62	30	220	4	10	tv/B	220	4	70	4.8	1100	1300	12
3V10T-U1	w																	
3V10T-U2	w																	
3G10T-2	v	tt	10	125	55	6	50	—	4	10	af/B-2	—	4	600	15	1400	1050	40
3V10T-2	w																	
3G12T	v	tt	8.5	110	30	50	28	30	14	12	af/B-2	—	14	280	6.4	1500	810	65
											rf/C/tph	30	12	810	2.7	470	520	24
3V12T	w										rf/C/tg	30	14	1060	4.3	1120	1660	48
3L20T	f	tt	14.5	47	12	30	22	30	12	20	af/B-2	—	12	400	6	800	830	48
											rf/C/tph	15	12	1550	4.46	310	677	20
3V20T	w										rf/C/tg	15	12	1900	3.3	526	1530	30
3V20T-1	w	tt	10	140	23	40	45	30	12	20	af/B-2	—	12	300	10	2000	1530	80
											rf/C/tph	15	12	1200	3.6	800	1370	32.4
											rf/C/tg	15	12	1450	6.7	1450	3160	60

type	cooling	cathode	HEATING		TYPICAL CHARACTERISTICS			MAXIMUM RATINGS			TYPICAL OPERATION							
			U_f	I_f	S	μ	I_c	f	U_a	N_a	operation	f	U_a	$-U_g$	I_a	I_g	N_i	N_o
			V	A	mA/V		A	MHz	kV	kW		MHz	kV	V	A	mA	W	kW
3L20Z-21	f	pt	21	64	5	12	7.5	5	17.5	20	af/B-2	—	15	1250	4.8	400	620	48
3V20Z-21	w										rf/C/tph	5	12	3000	1	130	500	9
											rf/C/tg	5	17.5	4150	1.6	200	1000	21
3L20Z-31	f	pt	22.5	71	10	23	12	22	17.5	20	af/B-2	—	17.5	700	6	560	1600	70
3V20Z-31	w										rf/C/tph	5	14	2120	1.72	240	675	18
											rf/C/tg	5	17.5	2400	2	240	740	26.75
3L25T	f	tt	10	320	50	40	80	30	15	25	af/B-2	—	12	260	10.3	850	360	72.5
3V25T	w				56	42				50	rf/C/tph	30	12	820	6	1000	1200	55
											rf/C/tg	15	15	1250	6.67	1000	1680	75
3V50Z-1	w	pt	20	400	8	55	50	5	18	50	rf/C/o	5	18	1430	8	360	730	108
3V80Z-1	w	pt	26.5	248	20	36	45	22	17.5	80	af/B-2	—	14	150	13	1000	2000	100
											rf/C/tph	2	12	600	5	500	500	40
											rf/C/tg	2	17.5	600	9.6	500	950	100
3G125T	v	tt	2×9.6	2×290	85	34	175	27	14	125	rf/C/tg	27	14	765	17.5	3100	4000	200
3V705Z	w	pt	2×22	2×38	7	22	8	30	12	7.5	af/B-2	—	10	385	3.6	260	180	24
3V705Z-1			22	76							rf/C/tph	20	8	700	1	350	500	6.2
											rf/C/tg	5	12	700	1.7	350	385	15

TRANSMITTING TETRODES OF FORCED AIR, VAPOUR OR WATER COOLING

type	cooling	cathode	HEATING		TYPICAL CHARACTERISTICS			MAXIMUM RATINGS			TYPICAL OPERATION								
			U_f	I_f	S	μ_{g2g1}	I_c	f	U_a	N_a	operation	f	U_a	U_{g2}	$-U_{g1}$	I_a	I_{g2}	I_{g1}	N_i	N_o
			V	A	mA/V		A	MHz	kV	kW		MHz	kV	kV	V	A	mA	mA	W	kW
4G3T-U1	v	tt	5	64	22	5.2	10	230	4	4	tv/B	230	4	0.6	115	1.5	40	60	550	5.5
4L3T-U1	f																			
4V3T-U1	w																			
4V3T-U2	w																			
4G10T	v	tt	8.5	110	20	10	28	30	10	8	af/B-2	—	10	1.5	150	2.2	1000	200	40	13.2
4L10T	f									10	rf/C/tph	30	8	1.5	400	1.2	500	100	50	6.5
4V10T	w									10										
4G11T	v									12	rf/C/tg	30	10	1.5	400	1.2	500	100	50	8.2

RECTIFIERS

type	filling	cathode	HEATING		MAXIMUM RATINGS		
			U_f	I_f	$-U_{a\,s}$	I_a	$I_{a\,s}$
			V	A	kV	A	A
4Q025	Hg	do	2.5	4.8	10	0.25	1
4Q025-1							
4Q025-2							
4Q025-3							
4X025	Xe	do	2.5	5	10	0.25	1
5Q105	Hg	do	5	7	13	1.5	6
9Q205	Hg	do	5	12	21	2.5	10
9Q205-1							
RG 250/3000	Hg	do	2.5	4.8	10	0.25	1
RG 250/5000-1							
RG 1000/3000	Hg	do	5	6.5	10	1.25	5
RG 1000/3000-1							
RG 1000/3000-2							

THYRATRONS

type	filling	cathode	HEATING		MAXIMUM RATINGS		
			U_f	I_f	$-U_{a\,s}$	I_a	$I_{a\,s}$
			V	A	kV	A	A
4QR8	Hg	do	2.5	22	14	6	24
8QR45	Hg	io	5	40	20	45	200
12QR205	Hg	do	5	14	27	2.5	10
15QR40 15QR40-1 15QR40-2	Hg	do	5	15	15	12.5	40
GRG 200/3000	Hg	do	2.5	4.8	7.5	0.25	1
GRG 250/3000	Hg	do					

SENDITRON AND THYRATRON

type	filling	cathode	HEATING		MAXIMUM RATINGS		
			U_f	I_f	$-U_{a\,s}$	I_a	$I_{a\,s}$
			V	A	kV	A	A
600QS3	Hg	—	—	—	1.2	3	50
600XR8	Xe	do	2.5	22	1.2	8	25

TRAVELLING WAVE TUBES

type	cooling	magnet	cathode	HEATING		TYPICAL CHARACTERISTICS								
				U_f	I_f	Δf	U_h	U_c	I_h	I_c	G_N	N_O	$N_{O\,sat}$	F
				V	A	GHz	kV	kV	mA	mA	dB	W	W	dB
MH 03	f	p	io	6.3	1.2	3.4...3.9	1.5...2.1	1.1...1.5	2	65	33	5	10	—
MH 10[1]	n	pp	io	6.3	0.4	5.6...6.2	2.6...2.9	1.6	2.2	43	34	10	18	30
MH 11[2]	n	pp	io	6.3	0.4	3.4...4.2	2.15...2.65	1.75	2	60	37	16	25	27
MH 12[3]	n	pp	io	6.3	0.4	5.6...6.5	2.6...2.9	1.75	2	43	34	10	18	30
MH 41	n	s	io	2.5	0.7	2.6...3.2	0.325...0.375	0.45	0.004	0.5	20	—	0.002	7
MH 43	n	s	io	2.7	0.7	0.75...0.95	0.18...0.24	0.375	0.005	0.23	20	—	0.0018	7

[1] for this type magnetic mount MF 10 is available
[2] for this type magnetic mount MF 11 is available
[3] for this type magnetic mount MF 12 is available

REFLEX KLYSTRONS

type	cooling	construction	cathode	HEATING		TYPICAL CHARACTERISTICS				
				U_f	I_f	Δf	U_{Res}	I_{Res}	S_m	N_o
				V	A	GHz	V	mA	MHz/V	mW
MR 01/A	n	mgo	io	6.3	0.64	3.3...4.9	900	20	0.3	80
MR 01/B						3.8...7.5	1000			10
MR 01/C						7...10.5	1200			10
MR 01/D_1						4.9...7.05	1000			80
MR 01/D_2						5.6...8.2	1000			60
MR 02	n	mmi	id	6.3	0.92	3.37...3.55	450	40	0.5	250
MR 02/M						3.4 $\pm$ 0.005			2	50
MR 03	n	mmi	id	6.3	0.92	3.63...3.92	450	40	0.5...2	250
MR 06	n	mgo	io	6.3	0.7	1...4	250	28.5	0.4	100
MR 53	n	mco	io	6.3	0.6	6.8...7.5	350	40	1	80

REPLACEMENT GUIDE

Owing to the similarity of their data the transmitting tubes, rectifiers and microwave tubes of the replacement guide are interchangeable in almost every case.

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
AX 6768	15QR40	DQ 61	9Q205	QY 4-250	4S040T-1
AX-9901	3S035T-1	DX 2	4X025	RD 50YA	3V50Z-2
AX-9909	OS 51	G 7.5/0.6 ds	4Q025-2	RD 200B	OQQ 151/3000
AX4-250	4S040T-1	G 10/1 d	4Q025-3	RD 3005	3S035T-1
B143	OT 400	G 10/1 dV	4X025	RE 400P	4S040T-1
B1135	3S035T-1	G 10/4 d	RG 1000/3000-1	RK 5721	MR 01/A
BT 69	15QR40	G 20/5 d	9Q205-1		MR 01/C
BY 1144	3G125T	GL 5830	15QR40		MR 01/D_1
C200	OQQ 151/3000	GRI 10000/025/1	4Q025-4		MR 01/D_2
C1112	4S040T-1	Gle 13000/1.5/6	5Q105	RK 6236	MR 01/B
CV 2116	MR 06	Gle 20000/2.5/10	9Q205-1	RK 6390	MR 01/D_1
D177	OS 70/1750	GRI-0.25/1.5	4Q025-1		MR 01/D_2
DCG 4/1000 ED	4Q025	GU 50	5S004	RL 65A	OS 70/1750
DCG 4/1000 G	4Q025-1	GU 80	5S045T-1	RS 329 G	OQQ 501/3000
DCG 5/5000 EG	5Q105	HF 201	OQQ 151/3000	RS 384	5S045T-1
DCG 5/5000 GB	RG 1000/3000	P 120-1	OS 70/1750	RS 686	4S040T-1
DCG 7/100	15QR40	PB 1/150	OS 70/1750	RS 1002	4S040T-1
DCG 9/20	9Q205	PB 3/800	5S045T	RS 1011L	3L10T-U1
DCG 12/30	12QR205	PC 2/500	OS 125/2000	RS 1011W	3V10T-U2
DCX 4/1000	4X025	PE 1/100	OS 51	RS 1012L	4L3T-U1
DQ 2	4Q025-1	PY 3-450	5S045T	RS 1012V	4G3T-U1
DQ 2a	4Q025	Q 400-1	4S040T-1	RS 1026	3S035T-1
DQ 4a	5Q105	QB 3.5/750	4S040T	RS 1071L	3L5T-U1

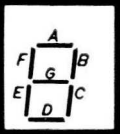
type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
RSQ 15/40 i	15QR40	TX 2/6	600XR8	5557	GRG 250/3000
S 15/5 d	12QR205	TY 1-50	OQQ 55/1500	5721	MR 01/A
S 15/40 i	15QR40	TY 3-250	3S035T-1		MR 01/B
SRL 351	3L1T	TY 4-350	OT 400		MR 01/C
SRL 353	3L6T	UA 3A	9Q205		MR 01/D_1
SRS 301	OQQ 501/3000	VRV 352	3G10T-2		MR 01/D_2
SRS 360	3S035T-1	VRW 352	3V10T-2	5762-7C24	3L2T
SRS 456	4S040T-1	XG 15-10	15QR40	5867	3S035T-1
SRS 502	5S045T-1	YL 1181	4L3T-U1	5870	12QR205
SRS 552	5S004	YL 1182	4G3T-U1	6083	OS 51
SRS 552N	5S004-1	3 B/504A	OQQ 55/1500	6155-4D21	4S016T
SRW 353	3V6T	3 C/150A	OQQ 151/3000	6156-5D22	4S040T
Ste 2000/6/80	600XR8	3I 200A	3L20Z-21	8005	OT 100
Ste 2500/05/2	GRG 250/3000	3I 221E	3L20Z-31		
Ste 15000/15/45	15QR40	3Q 200A	3V20Z-21		
T 50-2	OT 100	3Q 221E	3V20Z-31		
T 100-1	OQQ 151/3000	3T 50	OQQ 55/1500		
T 150-1	3S012T	3T 200A	OQQ 151/3000		
T 300-1	OT 400	5 B/700A	OS 70/1750		
T 329T	OQQ 501/3000	5T 125	OS 125/2000		
T 350-1	3S035T-1	803	OS 125/2000		
TAL 12/10	3L4Z	810	3S012T		
TAW 12/10	3V705Z	828	OS 70/1750		
TB 1/60 A	OQQ 55/1500	833-A	OT 400		
TB 3/750	3S035T-1	834-BV11	OQQ 55/1500		
TBL 2/300	3L030K	866	RG 250/3000		
TBL 2/500	3L050K		RG 250/3000-1		
TG 2	GRG 250/3000		4Q025		
TQ 61	12QR205	866A	4Q025-1		
TQ 71	15QR40	872	5Q105		
TQ 91	8QR45	872A	RG 1000/3000-1		
TR 12/15	15QR40	4030 C	3V80Z-1		

IV.

TUNGSRAM

INCANDESCENT FILAMENT DIGITAL AND LEVEL DISPLAY DEVICES

GLOW DISCHARGE TUBES



GLOW DISCHARGE INDICATOR TUBES

Type	Supply voltage, V_{rms}	Operating current, mA	Current limiting resistance, kΩ
ZM 11	220	max 2	110
ZM 12	220	max 2	110
ZM 13	220	max 2.2	36
ZM 14	220	max 2.2	18/36/22
ZM 11 	**ZM 12** 	**ZM 13** 	**ZM 14** 

TYPES AND CHARACTERS OF DIGITAL DISPLAY DEVICES

Type		Character
Standing Formation	Slanting Formation	
TM 80	TM 84	plus and minus sign
TM 81	TM 85	plus and minus sign and the numeral 1
TM 82	TM 86	numerals 0 through 9, some letters
TM 83	—	decimal point at left side, numerals 0 through 9, some letters
—	TM 87	decimal point at right side, numerals 0 through 9, some letters
TM 218	—	numerals 0 through 19, some letters

TYPES AND CHARACTERS OF LEVEL DISPLAY DEVICES

Type	Character
TM 210	0...10 parallel lines
TM 211	0...10 parallel lines of increasing length, the shortest line being nearest to the base

GENERAL SPECIFICATIONS

Viewing angle 110°; segment luminance 3,000 footlamberts; switching-on response time 60 ms; switching-off response time 90 ms; ambient temperature —20... +70 °C; operating position optional.

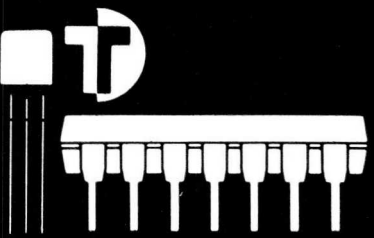
ELECTRICAL DATA

Direct voltage operation
Segment voltage 5 (3.5...5.5) $V_{=}$; segment current 30 mA; switching peak segment current 180 mA; segment cold resistance 28 ohms.

Pulse operation
Peak segment voltage max 16 V; peak segment current max 90 mA.

V.

TUNGSRAM
SEMICONDUCTORS



explanation of symbols

A	anode
A	gate input
B	base
B	gate input
C	collector
C	gate input
C	capacitance
$\mathbf{C_D}$	diode capacitance
$\mathbf{C_{12e}}$	feedback capacitance
CK	clock input at flip-flops
CR	clear input at flip-flops
D	gate input
E	emitter
f	frequency
$\mathbf{f_T}$	gain-bandwidth product
F	noise figure
G	gate
$\mathbf{G_p}$	power gain
GND	ground
$\mathbf{h_{21e}}$	small-signal forward current transfer ratio
$\mathbf{h_{21E}}$	D.C. forward current transfer ratio
$\mathbf{I_C}$	collector current
$\mathbf{I_F}$	forward current
$\mathbf{I_{FAV}}$	average forward current
$\mathbf{I_{FM}}$	peak forward current
$\mathbf{I_{FRM}}$	repetitive peak forward current
$\mathbf{I_{FSM}}$	non-repetitive peak forward current
$\mathbf{I_{GT}}$	trigger current
$\mathbf{I_H}$	holding current
$\mathbf{I_R}$	reverse current
$\mathbf{I_{TAV}}$	average on-state current at thyristors
$\mathbf{I_{TSM}}$	non-repetitive on-state peak current at thyristors
$\mathbf{I_0}$	rectified current
$\mathbf{I_Z}$	Z-current
$\mathbf{I_1}$	recommended operating current
J	input at flip-flops
K	cathode
K	input at flip-flops
LAG	lag output at operational amplifiers
LEAD	lead output at operational amplifiers
N	npn-type transistor
NC	no internal connection
P	pnp-type transistor
$\mathbf{P_{tot}}$	total power dissipation
PR	preset input at flip-flops
Q	output at flip-flops
$\mathbf{r_F}$	differential forward resistance
$\mathbf{r_S}$	series loss resistance
$\mathbf{r_{Zj}}$	differential inner resistance at Z-diodes
R	resistance
$\mathbf{R_L}$	load resistance
$\mathbf{R_S}$	series resistance
$\mathbf{R_{thja}}$	thermal resistance junction to ambient
$\mathbf{R_{thjc}}$	thermal resistance junction to case
$\mathbf{T_{amb}}$	ambient temperature
$\mathbf{T_{case}}$	case temperature
$\mathbf{T_j}$	junction temperature
$\mathbf{t_{on}}$	turn-on time
$\mathbf{t_{off}}$	turn-off time
$\mathbf{t_{rr}}$	reverse recovery time
$\mathbf{t_q}$	turn-off time at thyristors
$\mathbf{U_{CBO}}$	collector-base voltage (with emitter open-circuited)
$\mathbf{U_{CC}}$	supply voltage
$\mathbf{U_{CE}}$	collector-emitter voltage
$\mathbf{U_{CEO}}$	collector-emitter voltage (with base open-circuited)
$\mathbf{U_{CES}}$	collector-emitter voltage (emitter and base short-circuited)
$\mathbf{U_{CE\ sat}}$	collector-emitter saturation voltage
$\mathbf{U_D}$	off-state voltage at thyristors
$\mathbf{U_{DRM}}$	repetitive peak off-state voltage at thyristors
$\mathbf{U_{EBO}}$	emitter-base voltage (with collector open-circuited)
$\mathbf{U_F}$	forward voltage
$\mathbf{U_{GT}}$	trigger voltage
$\mathbf{U_I}$	input voltage
$\mathbf{U_O}$	output voltage
$\mathbf{U_R}$	reverse voltage
$\mathbf{U_{RM}}$	reverse peak voltage
$\mathbf{U_{RRM}}$	repetitive reverse peak voltage
$\mathbf{U_{RSM}}$	non-repetitive reverse peak voltage
$\mathbf{U_{RWM}}$	crest working reverse voltage
$\mathbf{U_Z}$	Z-voltage
$\mathbf{U_{12}}$	stabilized voltage at integrated voltage stabilizers
Y	gate output
α_{UZ}	temperature coefficient of Z-voltage
$\Delta\mathbf{G_p}$	control range of power gain

DIODES

germanium diodes

type	outline	technique	MAXIMUM RATINGS (T_{amb} = 25 °C)				TYPICAL CHARACTERISTICS (T_j = 25 °C)				notes
			U_R V	U_{RM} V	I_R at U_{RM} mA	I_{FM} mA	U_F max. V	at I_F mA	I_R max. µA	at U_R V	
AA 112[1]	1	point-contact diodes	15	20	24	45	1.5	10	40	10	for use in low-resistance demodulator circuits
AA 113[1]	1		60	65	10	50	1.6	10	500	60	for use in high-resistance demodulator circuits
AA 116[1]	1		20	30	24	45	1.5	10	140	10	for use in low-resistance demodulator circuits
AA 117	1		90	115	15	150	1.2[4]	10	280	100	for general purposes
AA 118[1]	1		90	115	15	150	1.05[4]	10	250	100	for use in phase discriminator circuits
AA 119[1]	1		30	45	10	100	1.5[4]	10	350	45	for use in high-resistance rectifier circuits
AA 132	1		100	110	15	150	1.8	10	120	60	for general purposes
AA 137	1		30	40	12	25	1.5	10	50	10	for use in AGC circuits
AAZ 10[2]	1		25	30	20	30	1	6	400	25	for use in switching circuits
OA 1154Q[3]	1		50	55	20	75	1	4	100	40	for use in ring modulator circuits
OA 1161[3]	1		130	140	6	75	1	2,5	200	100	for general purposes
AA 135	1	gold-bonded diodes	20	30	150	500	0.35[4]	10	30	20	for general purposes
AA 136	1		50	60	150	500	0.35[4]	10	30	50	for general purposes
AA 139	1		20	20	200	400	0.5	10	100	20	for use in switching circuits
OA 1180	1		20	30	120	400	0.75	100	20	10	for use in switching circuits
OA 1182	1		80	100	50	500	0.85	100	20	60	for use in switching circuits
OA 1182D	1		50[4]	60	50	500	0.85	100	30	50	for use in switching circuits

[1] *Also available in matched pairs.*
[2] *Also available in matched quads type 4-AAZ 10 for use in ring modulator circuits.*
[3] *Not recommended for new designs.*
[4] *Mean value*

DIODES

silicon diodes

type	outline	technique	MAXIMUM RATINGS (T_{amb} = 25 °C)				TYPICAL CHARACTERISTICS (T_j = 25 °C)									notes
			U_R V	U_{RM} V	I_F (I_R) mA	I_{FM} mA	U_F max. V	at I_F mA	I_R max. nA	at U_R V	C_D pF	at U_R V	t_{rr} ns	at I_F mA	and I_R mA	
BA 243	2	epitaxial planar	20		100		1	100	100	15	≤2	15				bandswitching diode for use in v.h.f.-band, r_F = max. 1 Ω
BA 244	2		20		100		1	100	100	15	≤2	15				bandswitching diode for use in u.h.f.-band, r_F = max. 0.5 Ω
BAY 41	2	epitaxial planar	40	40	225	600	1	200	50	20	≤5	0	≤15	200	200	for use in switching circuits
BAY 42	2		60	60	225	600	1	200	50	30	≤5	0	≤15	200	200	
BAY 43	2		80	80	225	600	1	200	50	40	≤5	0	≤15	200	200	
BAY 93	2		20	25	(75)	225	1	10	100	10	≤5	0	≤15	10	10	
1N 4148 (1N 914)	2	epitaxial planar	75	100	(150)	450	1	10	5000	75	≤4	0	≤4[1]	10		for use in fast switching (logic) circuits
1N 4149 (1N 916)	2		75	100	(150)	450	1	10	5000	75	≤2	0	≤4[1]	10		
1N 4151 (BAY 95)	2		50	75	(150)	450	1	50	50	50	≤2	0	≤4	10	10	
1N 4154 (BAY 94)	2		25	35	(150)	450	1	30	100	25	≤4	0	≤4	10	10	
1N 4446 (1N 914A)	2		75	100	(150)	450	1	20	5000	75	≤4	0	≤4[1]	10		
1N 4447 (1N 916A)	2		75	100	(150)	450	1	20	5000	75	≤2	0	≤4[1]	10		
1N 4448 (1N 914B)	2		75	100	(150)	450	1	100	5000	75	≤4	0	≤4[1]	10		
1N 4449 (1N 916B)	2		75	100	(150)	450	1	30	5000	75	≤2	0	≤4[1]	10		

[1] U_R = 6 V, R_L = 100 Ω

DIODES

variable capacitance diodes

type	outline	technique	MAX. RATINGS (T_{amb} = 25 °C)	TYPICAL CHARACTERISTICS ((T_j = 25 °C)						notes
			U_{RM} V	C_D pF	at U_R V	C_D (U_R = 3 V) / C_D (U_R = 25 V)	R_S Ω	at C_D pF	and f MHz	
BB 105A	3	epitaxial planar	30	2.3...2.8	25	4...5	<0.8	9	470	for use in u.h.f.-band to 790 MHz
BB 105B	3		30	2...2.3	25	4.5...6	<0.8	9	470	for use in u.h.f.-band to 860 MHz
BB 105G	3		30	1.8...2.8	25	4...6	<1.2	9	470	for use in v.h.f.-band

TRANSISTORS

germanium low- and medium-power alloy transistors[1]

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)					notes
			U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C A	T_j °C	P_{tot} mW	R_{thjc} (R_{thja}) °C/mW	f_T MHz	h_{21E} (h_{21e}) at	I_C mA	$U_{CE\,sat}$ max. at V	I_C A	
AC 125	P	10	32	12	10	0.2	90	163[4]	(0.4)	1.7	75...175	50			F = 4 (max. 10) dB
AC 126	P	10	32	12	10	0.2	90	163[4]	(0.4)	2.3	125...350	50			
AC 125(z)[2]	P	10	32	12	12	0.25	75	125[4]	(0.4)	1.5	50...250	50			F = 4 (max. 10) dB
AC 125F(z)[2]	P	10	32	12	12	0.25	75	125[4]	(0.4)	1.5	50...250	50			F = 3 (max. 5) dB
AC 125K(z)[2]	P	10	40	12	12	0.25	75	125[4]	(0.4)	1.5	50...250	50	0.25	0.1	t_{on} = 0.6 µs, t_{off} = 1 µs
AC 125U(z)[2]	P	10	60	12	12	0.25	75	125[4]	(0.4)	1.5	50...250	50	0.25	0.1	
AC 128[3]	P	11	32	16	10	1	90	1000[5]	0.05	1.5	50...250	300	0.6	1	complementary
AC 176	N	11	32	18	10	1	90	1000[5]	0.05	3	50...250	300	0.6	1	pair
AC 128K[3]	P	12	32	16	10	1	90	1000[5]	0.055	1.5	50...250	300	0.6	1	complementary
AC 176K	N	12	32	18	10	1	90	1000[5]	0.055	3	50...250	300	0.6	1	pair
AC 128(z)[2]	P	11	32	16	10	1	75	1000[5]	0.05	1.5	50...250	300	0.6	1	t_{on} = 1 µs, t_{off} = 2.5 µs
AC 187	N	11	25	15	10	1	90	1000[5]	0.05	3	100...500	300	0.6	1	complementary
AC 188	P	11	25	15	10	1	90	1000[5]	0.05	1.5	100...500	300	0.6	1	pair
AC 187K	N	12	25	15	10	1	90	1000[5]	0.055	3	100...500	300	0.6	1	complementary
AC 188K	P	12	25	15	10	1	90	1000[5]	0.055	1.5	100...500	300	0.6	1	pair

[1] *At the current and voltage data the polarities are not indicated, they must be applied according to the sense.*
[2] *Also available in group h_{21E}.*
[3] *Also available in matched pairs.*
[4] T_{amb} = 25 °C
[5] T_{case} = 25 °C

AC 125 U(z)

V	VI
50...100	75...150

AC 125(z)...AC 125K(z), AC 128(z)

V	VI	VII
50...100	75...150	125...250

TRANSISTORS

germanium mesa transistors[1]

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)						notes
			U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C mA	T_j °C	P_{tot}[2] mW	R_{thja} °C/mW	f_T MHz	G_p dB typ.	and min.	F dB typ.	at max.	f MHz	
AF 106	P	13	25	18	0.3	10	90	60	0.75	220	17.5	14	5.5	7.5	200	for use in v.h.f.-band to 260 MHz
AF 139	P	13	20	15	0.3	10	90	60	0.75	550	11	9	7	8.2	800	for use in u.h.f.-band to 860 MHz
AF 200	P	14	25		0.3	10	90	145	0.45		29				35	for use in i.f. amplifier stages of tv-receivers $\triangle G_p$ = 60 dB at f = 35 MHz
AF 201	P	14	25		0.3	10	90	145	0.45		30	28			35	for use in i.f. amplifier stages of tv-receivers
AF 239	P	13	20	15	0.3	10	90	60	0.75	700	14.5	11.5	5	6	800	for use in u.h.f. preamplifier stages to 900 MHz
AF 239S	P	13	20	15	0.3	10	90	60	0.75	780	15	12.5		5	800	for use in diode tuners to 900 MHz

[1] *At the current and voltage data the polarities are not indicated, they must be applied according to the sense.*
[2] T_{amb} = 25 °C

TRANSISTORS

germanium alloy power transistors[1]

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)					notes
			U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C A	T_j °C	P_{tot}[3] W	R_{thjc} °C/W	f_T MHz	h_{21E} at	I_C A	$U_{CE\ sat}$ max. V	at I_C A	
AD 161	N	15	32	20	10	2	90	4	4.5	3	50...350	0.5	0.8	1	complementary pair
AD 162[2]	P	15	32	20	10	2	90	6	4.5	1.5	50...350	0.5	0.6	1	
ASZ 15	P	16	100	60	40	8	90	22.5	2	0.2	15...30	6	0.4	10	t_{on} = max. 27 µs, t_{off} = max. 30 µs at I_C = 1 A
ASZ 16	P	16	60	32	20	8	90	22.5	2	0.25	35...80	6	0.4	10	
ASZ 17	P	16	60	32	20	8	90	22.5	2	0.22	20...45	6	0.4	10	
ASZ 18	P	16	100	32	40	8	90	22.5	2	0.22	20...65	6	0.4	10	
ASZ 1015	P	16	80	60	40	6	90	22.5	2	0.2	15...30	6	1	6	t_{on} = 20 µs, t_{off} = 55 µs at I_C = 1 A
ASZ 1016	P	16	60	32	20	6	90	22.5	2	0.25	35...80	6	1	6	
ASZ 1017	P	16	60	32	20	6	90	22.5	2	0.22	20...45	6	1	6	
ASZ 1018	P	16	80	32	40	6	90	22.5	2	0.22	20...65	6	1	6	
OC 26[2, 3]	P	16	40	20	10	3.5	90	22.5	2	0.16	20...55	1	0.8	3	

[1] *At the current and voltage data the polarities are not indicated, they must be applied according to the sense.*
[2] *Also available in matched pairs.*
[3] *Not recommended for new designs.*
[4] T_{case} = 25 °C

TRANSISTORS

silicon low-power epitaxial planar transistors for general purposes[1]

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j=25 °C)					notes
			U_{CBO} (U_{CES}) V	U_{CEO} V	U_{EBO} V	I_C mA	T_j °C	P_{tot} mW	R_{thjc} (R_{thja}) C/mW	f_T MHz	h_{21e} at	I_C mA	U_{CEsat} max. V at	I_C mA	
BC 107	N	17	(50)	45	6	100	175	300[2]	(0.5)	250	125...500	2	0.2	10	F=2 (max. 10) dB
BC 108	N	17	(30)	20	5	100	175	300[2]	(0.5)	250	125...900	2	0.2	10	F=2 (max. 10) dB
BC 109	N	17	(30)	20	5	50	175	300[2]	(0.5)	300	240...900	2	0.2	10	F=max. 4 dB
BC 177	P	17	(50)	45	5	100	175	300[2]	(0.5)	130	75...500	2	0.2	10	F=max. 10 dB
BC 178	P	17	(30)	25	5	100	175	300[2]	(0.5)	130	75...900	2	0.2	10	F=max. 10 dB
BC 179	P	17	(25)	20	5	50	175	300[2]	(0.5)	130	125...900	2	0.2	10	F=max. 4 dB
BC 237	N	18	(50)	45	6	100	150	300[2]	(0.42)	250	125...500	2	0.2	10	F=2 (max. 10) dB
BC 238	N	18	(30)	20	5	100	150	300[2]	(0.42)	250	125...900	2	0.2	10	F=2 (max. 10) dB
BC 239	N	18	(30)	20	5	50	150	300[2]	(0.42)	300	240...900	2	0.2	10	F=max. 4 dB
BC 307	P	18	(50)	45	5	100	150	300[2]	(0.42)	130	75...500	2	0.2	10	F=max. 10 dB
BC 308	P	18	(30)	25	5	100	150	300[2]	(0.42)	130	75...500	2	0.2	10	F=max. 10 dB
BC 309	P	18	(25)	20	5	50	150	300[2]	(0.42)	130	125...500	2	0.2	10	F=max. 4 dB
BCY 58	N	17	(32)	32	7	200	200	1000[3]	0.15	250	125...700	2	0.35	10	t_{on}=85 ns, t_{off}=480 ns at I_C=10 mA
BCY 59	N	17	(45)	45	7	200	200	1000[3]	0.15	250	125...700	2	0.35	10	
BCY 78	P	17	(32)	32	5	200	200	1000[3]	0.15	180	125...700	2	0.25	10	
BCY 79	P	17	(45)	45	5	200	200	1000[3]	0.15	180	125...500	2	0.25	10	

[1] *At the current and voltage data the polarities are not indicated, they must be applied according to the sense.*
[2] T_{amb} = *25 °C*
[3] T_{case} = *25 °C*

The types indicated on the previous page are also available in groups according to their D.C. forward current transfer ratio h_{21E} measured at operating point $U_{CE}=5$ V, $I_C=2$ mA, in compliance with the tables below.

Character of group h_{21E}:	**VI**	**A**	**B**	**C**
h_{21E}	70...140	120...220	180...460	380...800
npn-types		BC 107, BC 237 BC 108, BC 238	BC 107, BC 237 BC 108, BC 238 BC 109, BC 239	BC 108, BC 238 BC 109, BC 239
pnp-types	BC 177, BC 307 BC 178, BC 308	BC 177, BC 307 BC 178, BC 308 BC 179, BC 309	BC 177, BC 307 BC 178, BC 308 BC 179, BC 309	BC 178 BC 179

Character of group h_{21E}:	**VII**	**VIII**	**IX**	**X**
h_{21E}	120...220	180...310	250...460	380...630
npn-types pnp-types	BCY 58, BCY 59 BCY 78, BCY 79	BCY 58, BCY 59 BCY 78, BCY 79	BCY 58, BCY 59 BCY 78, BCY 79	BCY 58, BCY 59 BCY 78

TRANSISTORS

silicon low- and medium-power epitaxial planar transistors for use in amplifiers and switching circuits[1]

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)					notes
			U_{CBO} (U_{CES}) V	U_{CEO} V	U_{EBO} V	I_C mA	T_j °C	P_{tot} W	R_{thjc} (R_{thja}) °C/mW	f_T MHz	h_{21E} at	I_C mA	$U_{CE\,sat}$ max. at V	I_C mA	
BF 167	N	19	40	30	4	25	175	0.13[2]	(1.00)	350	>26	4			G_p = 42 dB at f = 35 MHz
BF 173	N	19	40	25	4	25	175	0.23[2]	(0.65)	550	>38	7			G_p = 42.5 dB at f = 35 MHz
BF 177	N	20	(100)		5	40	175	2.9[3]	0.045	120	>20	15			
BF 178	N	20	(185)		5	50	175	2.9[3]	0.045	120	>20	30			
BF 179A	N	20	(185)		5	50	175	2.9[3]	0.045	120	>20	20			C_{12e} = 1.3 (max. 3.5) pF
BF 179B	N	20	(220)		5	50	175	2.9[3]	0.045	120	>20	20			
BF 179C	N	20	(250)		5	50	175	2.9[3]	0.045	120	>20	20			
BF 184	N	19	30	20	5	30	175	0.145[2]	(0.9)	300	75...750	1			C_{12e} = 0.65 (max. 0.9) pF
BF 185	N	19	30	20	5	30	175	0.145[2]	(0.9)	220	34...140	1			
BF 224	N	22	45	30	4	50	150	0.25[2]	(0.5)	450	>30	7			C_{12e} = 0.3 pF
BF 225	N	22	50	40	4	50	150	0.25[2]	(0.5)	700	75 (>30)	4			C_{12e} = 0.28 pF
BFY 33	N	21	50	24	7	500	200	2.6[3]	0.06	100	>40	150	1.5	150	
BFY 34 / 2N 1613	N	21	75	30	7	500	200	2.6[3]	0.06	100	40...120	150	1.5	150	
BFY 46 / 2N 1711	N	21	75	30	7	500	200	2.6[3]	0.06	120	100...300	150	1.5	150	

[1] *At the current and voltage data the polarities are not indicated, they must be applied according to the sense.*
[2] T_{amb} = 25 °C
[3] T_{case} = 25 °C

TRANSISTORS

silicon epitaxial planar transistors for use in amplifiers and switching circuits[1]

type	structure	outline	MAXIMUM RATINGS							TYPICAL CHARACTERISTICS (T_j = 25 °C)						notes
			U_{CBO} V	U_{CEO} V	U_{EBO} V	I_C A	T_j °C	P_{tot} W	R_{thjc} ($R_{thj(a)}$) °C/W	f_T MHz	h_{21E}	at I_C mA	$U_{CE\,sat}$ max. V	at I_C mA		
2N 2218	N	20	60	30	5	0.8	200	3[2]	58	>250	40...120	150	0.4	150		
2N 2218A	N	20	75	40	6	0.8	200	3[2]	58	>250	40...120	150	0.3	150		
2N 2219	N	20	60	30	5	0.8	200	3[2]	58	>250	100...300	150	0.4	150		
2N 2219A	N	20	75	40	6	0.8	200	3[2]	58	>250	100...300	150	0.3	150	$t_{on} \leq 26$ ns,	
2N 2221	N	17	60	30	5	0.8	175	1.8[2]	84	>250	40...120	150	0.4	150	$t_{off} \leq 70$ ns	
2N 2221A	N	17	75	40	6	0.8	175	1.8[2]	84	>250	40...120	150	0.3	150	at I_C = 150 mA	
2N 2222	N	17	60	30	5	0.8	175	1.8[2]	84	>250	100...300	150	0.4	150		
2N 2222A	N	17	75	40	6	0.8	175	1.8[2]	84	>250	100...300	150	0.3	150		
2N 2368 (BSX 19)	N	17	40	15	4.5	0.2	200	0.36[3]	(480)	>400	20...60	10	0.25	10	$t_{on} \leq 12$ ns, $t_{off} \leq 15$ ns at I_C = 10 mA	
2N 2369 (BSX 20)	N	17	40	15	4.5	0.2	200	0.36[3]	(480)	>500	40...120	10	0.25	10	$t_{on} \leq 12$ ns, $t_{off} \leq 18$ ns	
2N 2369A	N	17	40	15	4.5	0.2	200	0.36[3]	(480)	>500	40...120	10	0.2	10	at I_C = 10 mA	
2N 2894	P	17	12	12	4	0.2	200	0.36[3]	(480)	400	40...150	30	0.5	100	$t_{on} \leq 60$ ns, $t_{off} \leq 90$ ns at I_C = 30 mA	
2N 2904	P	20	60	40	5	0.6	200	3[2]	58	>200	40...120	150	0.4	150		
2N 2904A	P	20	60	60	5	0.6	200	3[2]	58	>200	40...120	150	0.4	150		
2N 2905	P	20	60	40	5	0.6	200	3[2]	58	>200	100...300	150	0.4	150		
2N 2905A	P	20	60	60	5	0.6	200	3[2]	58	>200	100...300	150	0.4	150	$t_{on} \leq$ 45 ns,	
2N 2906	P	17	60	40	5	0.6	200	1.8[2]	97	>200	40...120	150	0.4	150	$t_{off} \leq 100$ ns	
2N 2906A	P	17	60	60	5	0.6	200	1.8[2]	97	>200	40...120	150	0.4	150	at I_C = 150 mA	
2N 2907	P	17	60	40	5	0.6	200	1.8[2]	97	>200	100...300	150	0.4	150		
2N 2907A	P	17	60	60	5	0.6	200	1.8[2]	97	>200	100...300	150	0.4	150		

[1] *At the current and voltage data the polarities are not indicated, they must be applied according to the sense.*
[2] T_{case} = 25 °C
[3] T_{amb} = 25 °C

Z-DIODES

silicon planar Z-diodes

Stabilized voltages of types ZL and ZG correspond to the international series E24 with a tolerance of ±5% as well as E12 with a tolerance of ±10%, respectively.

type	outline	MAXIMUM RATINGS[1]			TYPICAL CHARACTERISTICS (T_j = 25 °C)					
		I_Z[2] mA	I_Z[3] mA	P_{tot}[3,4] mW	U_Z at I_Z = 5 mA V	r_{Zj} at I_Z = 5 mA Ω	r_{Zj} at I_Z = 1 mA Ω	α_{UZ} at I_Z = 5 mA 10^{-4}/°C	U_F at I_F = 100 mA V	U_R at I_R = 0,1 µA V
ZF 2,7	2	160	135	430	2.5...2.9	75 (<83)	<500	—9...—4	<1	
ZF 3	2	140	117	430	2.8...3.2	80 (<90)	<500	—9...—3	<1	
ZF 3,3	2	130	109	430	3.1...3.5	80 (<90)	<500	—8...—3	<1	
ZF 3,6	2	120	101	430	3.4...3.8	80 (<90)	<500	—8...—3	<1	
ZF 3,9	2	110	92	430	3.7...4.1	80 (<90)	<500	—7...—3	<1	
ZF 4,3	2	100	85	430	4.0...4.6	80 (<90)	<500	—6...—1	<1	
ZF 4,7	2	90	76	430	4.4...5.0	70 (<78)	<500	—5...+2	<1	
ZF 5,1	2	80	67	430	4.8...5.4	30 (<60)	<480	—3...+4	<1	>0.8
ZF 5,6	2	70	59	430	5.2...6.0	10 (<40)	<400	—2...+6	<1	>1
ZF 6,2	2	64	54	430	5.8...6.6	4.8 (<10)	<200	—1...+7	<1	>2
ZF 6,8	2	58	49	430	6.4...7.2	4.5 (<8)	<150	+2...+7	<1	>3
ZF 7,5	2	53	44	430	7.0...7.9	4 (<7)	<50	+3...+7	<1	>5
ZF 8,2	2	47	40	430	7.7...8.7	4.5 (<7)	<50	+4...+7	<1	>6
ZF 9,1	2	43	36	430	8.5...9.6	4.8 (<10)	<50	+5...+8	<1	>7
ZF 10	2	40	33	430	9.4...10.6	5.2 (<15)	<70	+5...+8	<1	>7.5
ZF 11	2	36	30	430	10.4...11.6	6 (<20)	<70	+5...+9	<1	>8.5
ZF 12	2	32	28	430	11.4...12.7	7 (<20)	<90	+6...+9	<1	>9
ZF 13	2	29	25	430	12.4...14.1	9 (<25)	<110	+7...+9	<1	>10

ZF 15	2	27	23	430	13.8...15.6	11 (<30)	<110	+7...+9	<1	>11
ZF 16	2	24	20	430	15.3...17.1	13 (<40)	<170	+8...+9.5	<1	>12
ZF 18	2	21	18	430	16.8...19.1	18 (<50)	<170	+8...+9.5	<1	>14
ZF 20	2	20	17	430	18.8...21.2	20 (<50)	<220	+8...+10	<1	>15
ZF 22	2	18	16	430	20.8...23.3	25 (<55)	<220	+8...+10	<1	>17
ZF 24	2	16	13	430	22.8...25.6	28 (<80)	<220	+8...+10	<1	>18
ZF 27	2	14	12	430	25.1...28.9	30 (<80)	<250	+8...+10	<1	>20
ZF 30	2	13	10	430	28.0...32.0	35 (<80)	<250	+8...+10	<1	>22.5
ZF 33	2	12	9	430	31.0...35.0	40 (<80)	<250	+8...+10	<1	>25
ZG 2,7	2	160	135	430	2.4...3.1	75 (<83)	<500	−9...−4	<1	
ZG 3,3	2	130	109	430	2.9...3.7	80 (<90)	<500	−8...−3	<1	
ZG 3,9	2	110	92	430	3.5...4.3	80 (<90)	<500	−7...−3	<1	
ZG 4,7	2	90	76	430	4.1...5.2	70 (<78)	<500	−5...+2	<1	
ZG 5,6	2	70	59	430	5.0...6.3	10 (<40)	<400	−2...+6	<1	>1
ZG 6,8	2	58	49	430	6.1...7.5	4.5 (<8)	<150	+2...+7	<1	>3
ZG 8,2	2	47	40	430	7.3...9.2	4.5 (<7)	<50	+4...+7	<1	>6
ZG 10	2	40	33	430	8.8...11.0	5.2 (<15)	<70	+5...+8	<1	>7.5
ZG 12	2	32	28	430	10.7...13.4	7 (<20)	<90	+6...+9	<1	>9
ZG 15	2	27	23	430	13.0...16.5	11 (<30)	<110	+7...+9	<1	>11
ZG 18	2	21	18	430	16.0...20.0	18 (<50)	<170	+8...+9.5	<1	>14
ZG 22	2	18	16	430	19.6...24.4	25 (<55)	<220	+8...+10	<1	>17
ZG 27	2	14	12	430	24.1...30.0	30 (<80)	<250	+8...+10	<1	>20
ZG 33	2	12	9	430	29.6...36.5	40 (<80)	<250	+8...+10	<1	>25

[1] *Valid provided that connection leads are kept at the specified ambient temperature at a distance of 8 mm from the case.*
[2] $T_{amb} = 25$ °C
[3] $T_{amb} = 45$ °C
[4] $P_{tot} = 500$ mW at $T_{amb} = 25$ °C

Z-DIODES

Silicon large power Z-diodes

Stabilized voltages of types ZF and ZX correspond to the international series E12 with a tolerance of ±10% as well as E24 with a tolerance of ±5%, respectively.

type	outline	MAXIMUM RATINGS				TYPICAL CHARACTERISTICS (T_j = 25 °C)				
		I_Z[1,2] mA	I_Z[1,3] mA	P_{tot}[1,4] W	T_j °C	U_Z V	and r_{Zj} Ω	and α_{UZ} 10^{-4}/°C	at I_Z mA	U_R at I_R = 1 µA V
ZL 3,9	4	2100	280	1.3	150	3.5...4.3	3.8 (<7)	−7...+2	100	
ZL 4,7	4	1500	210	1.3	150	4.1...5.2	3.8 (<7)	−7...+4	100	
ZL 5,6	4	1350	180	1.3	150	5.0...6.2	1 (<2)	−3...+5	100	>1.5
ZL 6,8	4	1150	150	1.3	150	6.0...7.5	1 (<2)	0...+7	100	>2
ZL 8,2	4	980	130	1.3	150	7.3...9.2	1 (<2)	+3...+8	100	>3.5
ZL 10	4	800	105	1.3	150	8.8...11.0	2 (<4)	+5...+9	50	>5
ZL 12	4	620	86	1.3	150	10.7...13.4	4 (<7)	+5...+10	50	>7
ZL 15	4	500	71	1.3	150	13.0...16.5	5 (<10)	+5...+10	50	>10
ZL 18	4	430	60	1.3	150	16.0...20.0	6 (<15)	+6...+11	25	>10
ZL 22	4	375	50	1.3	150	19.6...24.4	6 (<15)	+6...+11	25	>12
ZL 27	4	320	40	1.3	150	24.1...30.0	7 (<15)	+6...+11	25	>14
ZL 33	4	260	33	1.3	150	29.6...36.5	8 (<15)	+6...+11	25	>17
ZX 3,9	4	2100	280	1.3	150	3.7...4.1	3.8 (<7)	−7...+2	100	
ZX 4,3	4	1750	240	1.3	150	4.0...4.6	3.8 (<7)	−7...+3	100	
ZX 4,7	4	1500	210	1.3	150	4.4...5.0	3.8 (<7)	−7...+4	100	
ZX 5,1	4	1430	190	1.3	150	4.8...5.4	2 (<5)	−6...+5	100	
ZX 5,6	4	1350	180	1.3	150	5.2...6.0	1 (<2)	−3...+5	100	>1.5
ZX 6,2	4	1250	160	1.3	150	5.8...6.6	1 (<2)	−1...+6	100	>1.5

ZX 6,8	4	1150	150	1.3	150	6.4...7.2	1	(<2)	0...+7	100	>2
ZX 7,5	4	1060	140	1.3	150	7.0...7.9	1	(<2)	0...+7	100	>2
ZX 8,2	4	980	130	1.3	150	7.7...8.7	1	(<2)	+3...+8	100	>3.5
ZX 9,1	4	890	117	1.3	150	8.5...9.6	2	(<4)	+3...+8	50	>3.5
ZX 10	4	800	105	1.3	150	9.4...10.6	2	(<4)	+5...+9	50	>5
ZX 11	4	710	95	1.3	150	10.4...11.6	4	(<7)	+5...+10	50	>5
ZX 12	4	620	86	1.3	150	11.4...12.7	4	(<7)	+5...+10	50	>7
ZX 13	4	560	78	1.3	150	12.4...14.1	5	(<10)	+5...+10	50	>7
ZX 15	4	500	71	1.3	150	13.8...15.8	5	(<10)	+5...+10	50	>10
ZX 16	4	465	65	1.3	150	15.3...17.1	6	(<15)	+6...+11	25	>10
ZX 18	4	430	60	1.3	150	16.8...19.1	6	(<15)	+6...+11	25	>10
ZX 20	4	400	55	1.3	150	18.8...21.2	6	(<15)	+6...+11	25	>10
ZX 22	4	375	50	1.3	150	20.8...23.3	6	(<15)	+6...+11	25	>12
ZX 24	4	345	45	1.3	150	22.8...25.6	7	(<15)	+6...+11	25	>12
ZX 27	4	320	40	1.3	150	25.1...28.9	7	(<15)	+6...+11	25	>14
ZX 30	4	290	36	1.3	150	28.0...32.0	8	(<15)	+6...+11	25	>14
ZX 33	4	260	33	1.3	150	31.0...35.0	8	(<15)	+6...+11	25	>17

[1] $T_{amb} = 45\ °C$

[2] *The diode should be mounted on 2 mm Al. heatsink of 12.5 × 12.5 cm².*

[3] *Without heatsink*

[4] $P_{tot} = 10.5\ W$ *in case the diode is mounted on 2 mm Al. heatsink of 12.5 × 12.5 cm².*

RECTIFIERS

silicon rectifiers

type	outline	technique	MAXIMUM RATINGS (T_{amb} = 25 °C)						TYPICAL CHARACTERISTICS (T_j = 25 °C)		
			U_{RRM} (U_{RSM}) V	U_{RWM} V	I_{FAV} A	I_{FRM} A	I_{FSM} A	T_j °C	U_F max. V	at I_F A	I_R max. at U_{RRM} (U_{RWM}) µA
BY 133	5	diffusion	1300	850	1	10	50	150	1.3	2	5
BY 134	5		600	400	1	10	50	150	1.3	2	5
BY 135	5		150	100	1	10	50	150	1.3	2	5
BYX 42/100T	6	diffusion	(120)	100	10[1]	40	80	155	1.1	10	(60)
BYX 42/200T	6		(240)	200	10[1]	40	80	155	1.1	10	(60)
BYX 42/300T	6		(360)	300	10[1]	40	80	155	1.1	10	(60)
BYX 42/400T	6		(480)	400	10[1]	40	80	155	1.1	10	(60)

[1] *Applied in half wave rectifier circuits in case R_{thh} = 30 °C/W is not exceeded. Applied up to T_{amb} = 85 °C in case the rectifier is mounted on 2 mm Al. heatsink of 12.5 × 12.5 cm².*

THYRISTORS

silicon thyristors

type	outline	structure	MAXIMUM RATINGS (T_{amb} = 25 °C)				TYPICAL CHARACTERISTICS (T_j = 25 °C)					
			U_{DRM} V	U_{RRM} V	I_{TAV} A	I_{TSM} A	I_H mA	t_q µs	I_{GT} mA at	U_D V	U_{GT} V at	U_D V
T0,8N/50T	7	pnpn	50	50	1	15	17	40	10	6	3	6
T0,8N/100T	7		100	100	1	15	17	40	10	6	3	6
T0,8N/200T	7		200	200	1	15	17	40	10	6	3	6
T0,8N/300T	7		300	300	1	15	17	40	10	6	3	6
T0,8N/400T	7		400	400	1	15	17	40	10	6	3	6
T3N/50T	8	pnpn	50	50	3[1]	40	20	40	15	6	3	6
T3N/100T	8		100	100	3[1]	40	20	40	15	6	3	6
T3N/200T	8		200	200	3[1]	40	20	40	15	6	3	6
T3N/300T	8		300	300	3[1]	40	20	40	15	6	3	6
T3N/400T	8		400	400	3[1]	40	20	40	15	6	3	6
T15N/50T	9	pnpn	50	50	15[1]	120	50	40	40	10	3	10
T15N/100T	9		100	100	15[1]	120	50	40	40	10	3	10
T15N/200T	9		200	200	15[1]	120	50	40	40	10	3	10
T15N/300T	9		300	300	15[1]	120	50	40	40	10	3	10
T15N/400T	9		400	400	15[1]	120	50	40	40	10	3	10

[1] *With adequate cooling*

ANALOG INTEGRATED CIRCUITS

Type TA 72702 operational amplifier

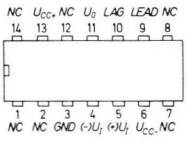
The TA 72702 circuit is a wideband differential amplifier using planar technique on silicon substrate. It is designed for operational amplifier in analog circuits as well as for feedback amplification in precision instrument techniques and electronics up to 30 MHz. Provisions are incorporated within the circuit whereby external components may be used to compensate the amplifier for stable operation under various feedback or load conditions. The circuit is available in dual-in-line plastic package with 14 leads (outline 24).

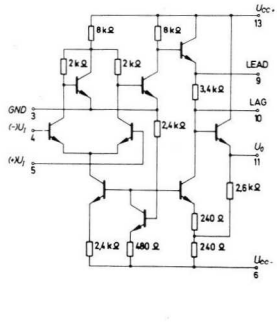
Maximum ratings

Supply voltage U_{CC+}	14	V
Supply voltage U_{CC-}	7	V
Differential input voltage	5	V
Input voltage	—6 . . . +1.5	V
Power dissipation	300	mW
Ambient temperature	0 . . . 70	°C

Typical characteristics

Input offset voltage	5 ($\leq$10)	mV
Input offset current	0.5 ($\leq$5)	µA
Input bias current	4 ($\leq$15)	µA
Input resistance	25 ($\geq$6)	kΩ
Temperature coefficient of input offset voltage	5	µV/°C
Input voltage range		
— positive swing ($+U_I$)	1 ($\geq$0.5)	V
— negative swing ($-U_I$)	—5 ($\leq$—4)	V
Common-mode rejection ratio	80 ($\geq$65)	dB
Large-signal differential voltage amplification	2,600 ($\geq$1,000)	
Maximum peak-to-peak output voltage swing (U_O)	10.6 ($\geq$10)	V
Output resistance	200 ($\leq$600)	Ω
Power dissipation	90 ($\leq$125)	mW





TUNGSRAM

ANALOG INTEGRATED CIRCUITS

Type TAA 550 voltage stabilizer

The TAA 550 circuit is an integrated voltage stabilizer with low temperature coefficient and low differential input resistance, using planar technique on silicon substrate. It is primarily intended to provide a supply voltage which is independent of variations in mains supply or temperature, for variable capacitance diodes in radio and television tuners or it can be used as a reference element for general purposes. The circuit is incorporated in case TO-18 (outline 23) and available according to its stabilized voltage U_{12} in groups A, B or C as follows:

U_{12} = 30...32 V — TAA 550A;
U_{12} = 32...34 V — TAA 550B;
U_{12} = 34...36 V — TAA 550C.

Maximum ratings

Operating current (at T_{case} = 70 °C)	15	mA
Operating temperature	—20...+150	°C
Storage temperature	—20...+150	°C

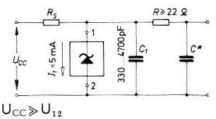
Thermal resistance

junction to case	150	°C/W
junction to ambient	500	°C/W

Typical characteristics at T_{amb} = 25 °C

Recommended operating current (I_1)	5 (≥2)	mA
Stabilized voltage at operating current of 5 mA	30...36	V
Differential internal resistance	10 (≤25)	Ω
Temperature coefficient of the stabilized voltage	—3.1...+1.55	mV/°C

Recommended circuit



$U_{CC} \gg U_{12}$

C*: to be connected if decoupling for low frequency noise is necessary. In practice values up to 10 μF are used.

TUNGSRAM

DIGITAL INTEGRATED CIRCUITS

Series TL 7400...7472 consist of standard digital integrated circuits using monolithic techniques and operating in TTL (transistor-transistor-logic) circuit system incorporated in dual-in-line plastic packages with 14 leads (outline 24).

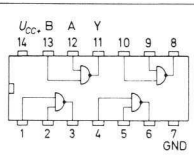
Maximum ratings

Supply voltage	max. 7 V
Input voltage	max. 5.5 V
Operating temperature	0...+70 °C
Storage temperature	—65...+150 °C

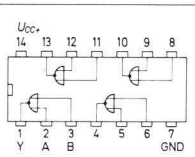
Typical characteristics

Supply voltage	4.75...5.25 V
Propagation delay time	
each gate	13 ns
at flip-flop	30 ns
Power dissipation	
each gate	10 mW
at flip-flop	60 mW
D.C. noise susceptibility	1 V

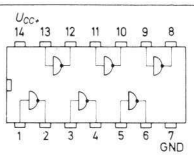
Type	Application (functions)
TL 7400	Quad 2-input NAND gates
TL 7402	Quad 2-input NOR gates
TL 7406	Hex inverter buffers/drivers
TL 7410	Triple 3-input NAND gates
TL 7440	Dual 4-input NAND buffers
TL 7460	Dual 4-input expander
TL 7472	J-K-master-slave flip-flops



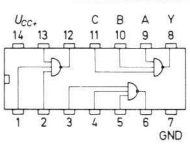
TL 7400



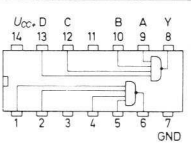
TL 7402



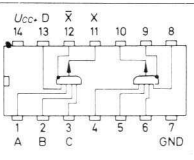
TL 7406



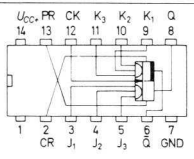
TL 7410



TL 7440



TL 7460



TL 7472

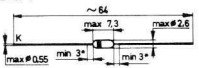
TUNGSRAM

OUTLINES

Type

AA 112 AA 137
AA 113 AA 139
AA 116 AAZ 10
AA 117 OA 1154Q
AA 118 OA 1161
AA 119 OA 1180
AA 132 OA 1182
AA 135 OA 1182D
AA 136

DO-7

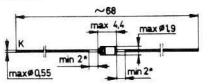


* Not to be soldered

1

Type	Marking on the cathode side
BA 243	green
BA 244	violet
BAY 41	black
BAY 42	white
BAY 43	yellow
BAY 93	blue
ZF 2,7...ZF 33	
ZG 2,7...ZG 33	
1N 4148 (1N 914)	
1N 4149 (1N 916)	
1N 4151 (BAY 95)	white-green
1N 4154 (BAY 94)	white-yellow
1N 4446 (1N 914A)	
1N 4447 (1N 916A)	
1N 4448 (1N 914B)	
1N 4449 (1N 916B)	

DO-35

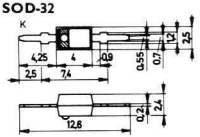


* Not to be soldered

2

Type	Marking on the cathode side
BB 105A	white dot
BB 105B	red dot
BB 105G	green dot

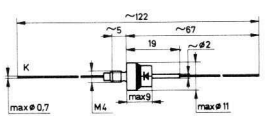
SOD-32



3

Type

ZL 3,9...ZL 33
ZX 3,9...ZX 33

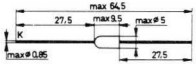


4

Type

BY 133
BY 134
BY 135

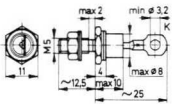
DO-13



5

Type

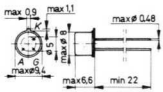
BYX 42/100T
BYX 42/200T
BYX 42/300T
BYX 42/400T



6

Type

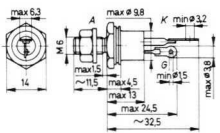
T0,8N/50T
T0,8N/100T
T0,8N/200T
T0,8N/300T
T0,8N/400T



7

Type

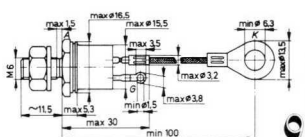
T3N/50T
T3N/100T
T3N/200T
T3N/300T
T3N/400T



8

Type

T15N/50T
T15N/100T
T15N/200T
T15N/300T
T15N/400T

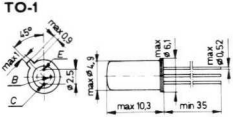


9

Type

AC 125
AC 125(z)
AC 125F(z)
AC 125K(z)
AC 125U(z)
AC 126

TO-1

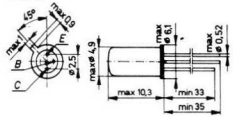


10

Type

AC 128
AC 128(z)
AC 176
AC 187
AC 188

TO-1

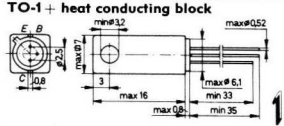


11

Type

AC 128K
AC 176K
AC 187K
AC 188K

TO-1 + heat conducting block

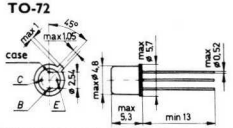


12

Type

AF 106
AF 139
AF 239
AF 239S

TO-72

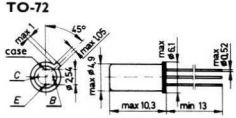


13

Type

AF 200
AF 201

TO-72

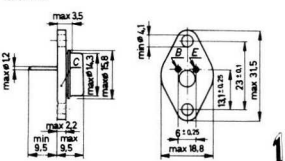


14

Type

AD 161
AD 162

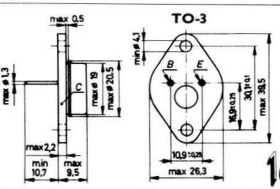
SOT-9



15

Type

ASZ 15
ASZ 16
ASZ 17
ASZ 18
ASZ 1015
ASZ 1016
ASZ 1017
ASZ 1018
OC 26

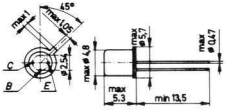


16

Type

BC 107 2N 2221 2N 2907
BC 108 2N 2221A 2N 2907A
BC 109 2N 2222
BC 177 2N 2222A
BC 178 2N 2368 (BSX 19)
BC 179 2N 2369 (BSX 20)
BCY 58 2N 2369A
BCY 59 2N 2894
BCY 78 2N 2906
BCY 79 2N 2906A

TO-18

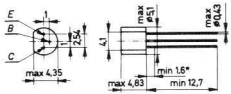


17

Type

BC 237
BC 238
BC 239
BC 307
BC 308
BC 309

TO-92



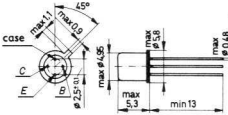
* Not to be soldered

18

Type

BF 167
BF 173
BF 184
BF 185

TO-72

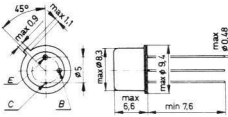


19

Type

BF 177 2N 2904
BF 178 2N 2904A
BF 179A 2N 2905
BF 179B 2N 2905A
BF 179C
2N 2218
2N 2218A
2N 2219
2N 2219A

TO-39

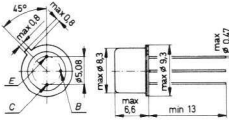


20

Type

BFY 33
BFY 34
BFY 46
2N 1613
2N 1711

TO-5

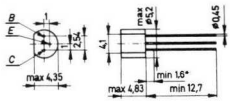


21

Type

BF 224
BF 225

TO-92

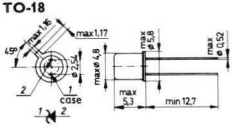


22

Type

TAA 550

TO-18

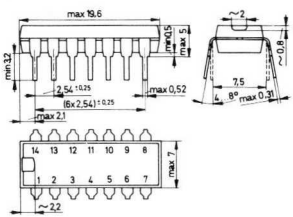


23

Type

TA 72702
TL 7400
TL 7402
TL 7406
TL 7410
TL 7440
TL 7460
TL 7472

TO-116

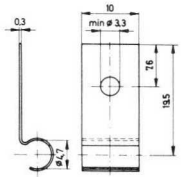


24

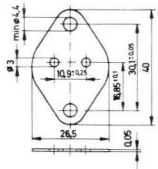
TUNGSRAM

ACCESSORIES

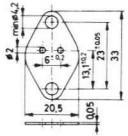
designation	accessory	for types		
HL-M613/A	heat sink	AC 125 AC 125(z) AC 125F(z) AC 125K(z) AC 125U(z) AC 126	AC 128 AC 128(z) AC 176 AC 187 AC 188	
CL-M024/C	insulating washer	ASZ 15 ASZ 16 ASZ 17 ASZ 18	ASZ 1015 ASZ 1016 ASZ 1017 ASZ 1018	OC 26
CL-M031/A	insulating washer	AD 161 AD 162		
VA-M168/B	insulating bush	AD 161 AD 162 ASZ 15 ASZ 16	ASZ 17 ASZ 18 ASZ 1015 ASZ 1016	ASZ 1017 ASZ 1018 OC 26



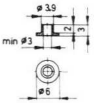
HL-M613/A



CL-M024/C



CL-M031/A



VA-M168/B

REPLACEMENT GUIDE

The following list includes the TUNGSRAM equivalents to other makes. The comparisons are carried out on the basis of their typical applications. Certain minor differences may occur in the characteristics or constructions of the compared types. In such cases it is necessary to examine the conditions of application at all times on the basis of the detailed catalogue data.

Transistors

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
AC 107	AC 125F(z)	AC 180K	AC 128K	AF 106A	AF 106
AC 116	AC 128K	AC 180KL	AC 128K	AF 121	AF 200
AC 117	AC 128K	AC 181	AC 176		AF 201
	AC 188K	AC 181K	AC 176K	AF 178	AF 106
AC 121	AC 125	AC 181KL	AC 176K	AF 181	AF 200
AC 122	AC 125	AC 182	AC 125		AF 201
	AC 126		AC 126	AF 185	AF 200
AC 122/30	AC 125(z)	AC 184	AC 128		AF 201
AC 123	AC 128K	AC 185	AC 176	AF 251	AF 239S
AC 124	AC 128K	AC 186	AC 176	AF 252	AF 239
AC 127	AC 176		AC 187	AF 253	AF 139
AC 130	AC 176	AC 191	AC 125	AF 256	AF 106
AC 131	AC 125		AC 126	AF 257	AF 106
AC 132	AC 125	AC 192	AC 125	AF 264	AF 106
AC 134	AC 126		AC 126	AFY 12	AF 106
AC 135	AC 125	AC 194	AC 176	AFY 41	AF 239
AC 136	AC 128	ACY 16	AC 128(z)	AFZ 12	AF 106
AC 137	AC 126	ACY 23	AC 125(z)	ASY 12	AC 128(z)
AC 138	AC 128	ACY 24	AC 125U(z)	ASY 14	AC 125U(z)
AC 139	AC 128	ACY 32	AC 125F(z)	ASY 26	BCY 78
AC 141	AC 176	ACY 33	AC 128(z)	ASY 27	BCY 78
AC 141B	AC 176	ACY 38	AC 125F(z)	ASY 31	BCY 78
AC 141K	AC 176K	AD 105	ASZ 1015	ASY 32	BCY 78
AC 142	AC 128	AD 130	ASZ 1017	ASY 48	AC 125U(z)
AC 142K	AC 128K	AD 131	ASZ 1016	ASY 70	AC 125K(z)
AC 150	AC 125	AD 132	ASZ 1015	ASY 76	AC 125K(z)
	AC 126	AD 138	ASZ 16	ASY 77	AC 125U(z)
AC 151	AC 125	AD 138/50	ASZ 15	ASY 80	AC 125K(z)
AC 151r	AC 125F(z)	AD 139	AD 162	ASY 81	AC 125U(z)
AC 152	AC 125	AD 142	ASZ 1018	ASY 90	AC 125K(z)
AC 153	AC 128	AD 143	ASZ 16	ASY 91	AC 125(z)
AC 153K	AC 128K	AD 145	ASZ 16	AZY 11	BCY 78
AC 160	AC 125F(z)	AD 148	AD 162	ASZ 12	BCY 78
AC 161	AC 125F(z)	AD 149	ASZ 1017	AUY 18	ASZ 16
AC 162	AC 125	AD 150	ASZ 1017	AUY 19	ASZ 16
AC 163	AC 126	AD 152	AD 162	AUY 20	ASZ 18
AC 170	AC 125	AD 153	ASZ 1017	AUY 21	ASZ 16
AC 171	AC 126		AD 162	AUY 21A	ASZ 17
AC 172	AC 176	AD 163	ASZ 15	AUY 22	ASZ 15
AC 173	AC 125	AD 164	AD 162	AUY 22A	ASZ 15
AC 174	AC 125	AD 165	AD 161	AUY 28	ASZ 15
AC 175	AC 176K	AD 169	AD 162	AUY 30	ASZ 15
	AC 187K	AD 262	ASZ 1017	AUY 31	ASZ 16
AC 178	AC 128K	AD 263	ASZ 1017	AUY 32	ASZ 15
AC 179	AC 176K	ADY 27	ASZ 17	AUY 33	ASZ 16
	AC 187K	ADY 28	ASZ 15	AUY 34	ASZ 15
AC 180	AC 128	AF 102	AF 106	AUY 37	ASZ 18

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
BC 113	BC 238	BC 331	BC 237	BF 186	BF 178
	BC 238B	BC 332	BC 238	BF 189	BF 184
BC 114	BC 239	BC 337	BC 237	BF 194	BF 184
BC 115	BC 237A	BC 338	BC 238	BF 195	BF 185
BC 116	BC 308	BC 382	BC 237	BF 196	BF 167
BC 116A	BC 308A	BC 383	BC 238	BF 197	BF 173
BC 118	BC 238	BC 384	BC 239	BF 198	BF 167
BC 125	BC 237	BC 413	BC 239	BF 199	BF 173
BC 129	BC 107	BC 414	BC 239	BF 223	BF 173
BC 130	BC 108	BC 415	BC 308	BF 232	BF 173
BC 131	BC 109		BC 309	BF 233	BF 184
BC 135	BC 107	BC 416	BC 309	BF 234	BF 184
BC 147	BC 237	BC 477	BC 177	BF 235	BF 185
BC 148	BC 238	BC 478	BC 178	BF 240	BF 167
BC 149	BC 239	BC 479	BC 179	BF 241	BF 185
BC 153	BC 308	BC 512	BC 307	BF 251	BF 167
BC 154	BC 309	BC 513	BC 308	BF 254	BF 184
BC 157	BC 307	BC 514	BC 309	BF 255	BF 185
BC 158	BC 308	BC 582	BC 237	BF 257	BF 178
BC 159	BC 309	BC 583	BC 238	BF 258	BF 179C
BC 167	BC 237	BC 584	BC 239	BF 261	BF 167
BC 168	BC 238	BCW 90A	2N 2221	BF 271	BF 173
BC 169	BC 239	BCW 90B	2N 2222	BF 288	BF 167
BC 170	BC 238	BCW 91A	2N 2221A	BF 310	BF 173
BC 171	BC 237	BCW 91B	2N 2222A	BF 336	BF 178
BC 172	BC 238	BCW 92A	2N 2906	BF 337	BF 179C
BC 173	BC 239	BCW 92B	2N 2907	BFR 18	2N 2221
BC 204	BC 307	BCW 93A	2N 2906A	BFR 19	2N 2218
BC 205	BC 308	BCW 93B	2N 2907A	BFR 20	2N 2219
BC 206	BC 309	BCY 33	BCY 78	BFR 21	2N 2218A
BC 207	BC 237	BCY 34	BCY 78	BFX 74	2N 2904
BC 208	BC 238	BCY 50	BCY 58	BFX 74A	2N 2904A
BC 209	BC 239	BCY 51	BCY 58	BFY 19	BCY 58
BC 230	BC 239	BCY 56	BCY 59	BFY 37	BCY 58
BC 250	BC 308	BCY 57	BCY 58	BFY 39	BCY 59
BC 251	BC 307	BCY 66	BCY 59	BFY 56	2N 2218
BC 252	BC 308	BCY 69	BCY 58	BFY 56A	2N 2218A
BC 253	BC 309	BF 114	BF 177	BFY 67	BFY 34
BC 255	BC 309	BF 115	BF 184		2N 1613
BC 256	BC 307	BF 117	BF 177	BFY 68	BFY 46
BC 257	BC 307	BF 123	BF 173		2N 1711
BC 258	BC 308	BF 127	BF 167	BFY 76	BCY 59
BC 259	BC 309	BF 137	BF 178	BSW 19	BCY 78
BC 260	BC 178	BF 140	BF 178		BCY 79
BC 261	BC 177	BF 153	BF 184	BSW 21	BCY 78
BC 262	BC 178	BF 154	BF 167	BSW 21A	2N 2907
BC 263	BC 179	BF 157	BF 179	BSW 22	BCY 78
BC 267	BC 107	BF 158	BF 173	BSW 22A	2N 2907
BC 268	BC 108	BF 159	BF 173	BSW 42	BCY 58
BC 269	BC 109	BF 160	BF 184	BSW 42A	BCY 59
BC 270	BC 108	BF 163	BF 167	BSW 43	BCY 58
BC 271	BC 108A	BF 164	BF 167	BSW 43A	2N 2222A
BC 291	BCY 79	BF 165	BF 185	BSW 44	BCY 78
BC 292	BCY 79	BF 174	BF 179	BSW 44A	BCY 79
BC 327	BC 307	BF 175	BF 167	BSW 45	BCY 78
BC 328	BC 308	BF 176	BF 173	BSW 45A	BCY 79

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
BSW 58	2N 2368	OC 71	AC 125	2N 930	BCY 59
BSW 59	2N 2369	OC 72	AC 125	2N 1273	AC 125(z)
BSW 72	2N 2906	OC 74	AC 128	2N 1274	AC 125(z)
BSW 73	2N 2907	OC 75	AC 125	2N 1371	AC 125K(z)
BSW 74	2N 2906A	OC 76	AC 125K(z)	2N 1372	AC 125K(z)
BSW 75	2N 2907A	OC 77	AC 125U(z)	2N 1373	AC 125(z)
BSW 82	2N 2221	OC 79	AC 128	2N 1374	AC 125K(z)
BSW 83	2N 2222	OC 83	AC 128	2N 1375	AC 125(z)
BSW 84	2N 2221A	OC 200	BC 178	2N 1376	AC 125K(z)
BSW 85	2N 2222A	OC 201	BC 178	2N 1377	AC 125(z)
BSX 19	2N 2368	OC 303	AC 125	2N 1924	AC 125U(z)
BSX 20	2N 2369	OC 304	AC 125	2N 1925	AC 125U(z)
BSX 24	BCY 58	OC 305	AC 126	2N 1926	AC 125U(z)
BSX 51	BCY 58	OC 306	AC 125F(z)	2N 2411	BC 178A
BSX 51A	BCY 59	OC 307	AC 125K(z)	2N 2412	BC 178A
BSX 52	BCY 58	OC 308	AC 125K(z)	2N 2586	BC 107A
BSX 52A	BCY 59	OC 309	AC 125U(z)	2N 2604	BCY 79
BSX 66	BCY 58	OC 469	BCY 78	2N 2605	BCY 79
BSX 67	BCY 58	OC 470	BCY 78	2N 2694	BC 108A
BSX 72	2N 2218	OC 602	AC 125	2N 2712	BC 238A
BSX 75	2N 2221	OC 603	AC 125	2N 2944	BCY 78
BSY 11	BCY 59	OC 604	AC 125	2N 2945	BCY 78
BSY 44	BFY 34	SFT 223	AC 125(z)	2N 2946	BCY 79
	2N 1613	SFT 228	BCY 78	2N 3391	BCY 58
BSY 45	BFY 34	SFT 229	BCY 78	2N 3392	BCY 58
	2N 1613	SFT 243	AC 125U(z)	2N 3393	BCY 58
BSY 53	BFY 34	SFT 253	AC 128(z)	2N 3394	BCY 58
	2N 1613	SFT 288	BCY 78	2N 3395	BCY 58
BSY 54	BFY 46	SFT 321	AC 125	2N 3396	BCY 58
	2N 1711	SFT 322	AC 125	2N 3397	BCY 58
BSY 71	BFY 46	SFT 323	AC 125	2N 3398	BCY 58
	2N 1711	SFT 335	AC 125	2N 3403	BCY 58
BSY 72	BCY 58	SFT 351	AC 125	2N 3414	BCY 58
BSY 73	BCY 58	SFT 352	AC 125	2N 3415	BCY 58
BSY 74	BCY 58	SFT 353	AC 126	2N 3416	BCY 59
BSY 75	BCY 59	TI 3021	ASZ 15	2N 3417	BCY 59
BSY 76	BCY 59	TI 3027	ASZ 1016	2N 3672	BCY 79
BSY 80	BCY 58	TI 3028	ASZ 1015	2N 3702	BC 308
BSY 95A	BCY 58	TI 3031	ASZ 15	2N 3703	BC 307
CTP 1111	ASZ 1015	TIS 37	BC 308	2N 3704	BC 237
	ASZ 1018	TIS 38	BC 308	2N 3705	BC 237
OC 16	ASZ 1017	TF 78/30	AD 162	2N 3706	BC 238
OC 22	ASZ 1017	2N 257	ASZ 1016	2N 3707	BC 237A
OC 23	ASZ 1017		ASZ 1017	2N 3708	BC 237A
OC 24	ASZ 1017	2N 268	ASZ 1015	2N 3709	BC 237A
OC 27	ASZ 1017		ASZ 1018	2N 3710	BC 237A
OC 28	ASZ 1015	2N 404	BCY 78	2N 3711	BC 237B
OC 29	ASZ 1016	2N 524	AC 128	2N 3855	BC 238A
OC 30	AD 162	2N 525	AC 128	2N 3856	BC 238B
OC 35	ASZ 1017	2N 526	AC 128	2N 3903	BC 237A
OC 36	ASZ 1018	2N 527	AC 128	2N 3904	BC 237A
OC 42	AC 125	2N 717	BCY 58	2N 3964	BC 177B
OC 44	BC 178	2N 718	BCY 58	2N 4060	BC 308A
OC 45	BC 178	2N 721	BCY 78	2N 4061	BC 308A
OC 47	BCY 78	2N 722	BCY 78	2N 4062	BC 308B
OC 70	AC 125	2N 929	BCY 59	2N 4286	BCY 58

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
2N 4289	BCY 79	2SB 44(g)	AC 125(z)	2SB 426	ASZ 1017
2N 4402	BC 307A	2SB 47(g)	AC 125F(z)	2SB 439	AC 125
2N 4403	BC 307A	2SB 54	AC 125		AC 126
2N 4424	BCY 59		AC 126	2SB 459	AC 125
2N 4951	2N 2221	2SB 54(g)	AC 125(z)	2SB 460	AC 125
2N 4952	2N 2221	2SB 55(g)	AC 125U(z)	2SB 461	AC 128
2N 4953	2N 2222	2SB 56	AC 125	2SB 463	AD 162
2N 4954	2N 2222	2SB 66(H)	AC 125(z)	2SB 471	ASZ 1016
2N 5086	BC 307A	2SB 67(H)	AC 125U(z)		ASZ 1017
2N 5087	BC 307B	2SB 67A(H)	AC 125U(z)	2SB 472	ASZ 1015
2N 5088	BC 237B	2SB 73(H)	AC 125F(z)	2SB 496	AC 125
2N 5089	BC 239	2SB 75	AC 125	2SC 70	BF 177
2N 5172	BC 237A	2SB 75(H)	AC 125(z)	2SC 154C	BF 179
2N 5209	BC 237A	2SB 75A(H)	AC 125K(z)	2SC 281	BC 108A
2N 5210	BC 237B	2SB 77	AC 125	2SC 283	BC 107
2N 5219	BC 239B		AC 126	2SC 368	BC 109
2N 5223	BC 239B	2SB 77A	AC 126	2SC 369	BC 109
2N 5354	BC 237A	2SB 77(H)	AC 125(z)	2SC 370	BCY 59
2N 5355	BC 237A	2SB 77A(H)	AC 125K(z)	2SC 371	BF 184
2N 5356	BC 237B	2SB 89(H)	AC 125(z)	2SC 374	BC 238
2N 5367	BCY 79	2SB 91(g)	AC 125(z)	2SC 395A	2N 2369
2N 5539	BC 178A	2SB 122	ASZ 1015	2SC 454	BF 184
2SA 12	BC 178		ASZ 1018	2SC 458	BC 107
2SA 15	BC 178	2SB 122(g)	ASZ 18	2SC 458LG	BC 109
2SA 16	BC 178	2SB 123	ASZ 1016	2SC 460	BF 184
2SA 49	BC 178		ASZ 1017	2SC 461	BF 185
2SA 50(g)	BCY 78	2SB 149	ASZ 1016	2SC 464	BF 173
2SA 52	BC 178		ASZ 1017	2SC 479(H)	2N 2218
2SA 53	BC 178	2SB 156A	AC 125	2SC 482	BFY 33
2SA 73	BC 178	2SB 189	AC 128	2SC 500	BF 177
2SA 95(g)	2N 2894	2SB 189(g)	AC 128(z)	2SC 501	2N 2218
2SA 208(H)	BCY 78	2SB 200	AC 128	2SC 512	BFY 46
2SA 209(H)	BCY 78	2SB 200(g)	AC 128(z)		2N 1711
2SA 210(H)	BCY 78	2SB 201	AC 128	2SC 535	BF 185
2SA 217(H)	BCY 78	2SB 201(g)	AC 128(z)	2SC 548(H)	BCY 78
2SA 229	AF 139	2SB 337	ASZ 1016		BCY 79
2SA 230	AF 139	2SB 338(H)	ASZ 16	2SC 649	BC 108
2SA 239	AF 106		ASZ 17	2SC 650	BC 109
2SA 240	AF 106	2SB 339(H)	ASZ 16	2SC 682	BF 167
2SA 282(g)	BCY 78		ASZ 17	2SC 689(H)	2N 2369
2SA 283(g)	BCY 78	2SB 340(H)	ASZ 15	2SC 708A(H)	BFY 34
2SA 284(g)	BCY 78	2SB 340(H)	ASZ 18		2N 1613
2SA 372	AF 200	2SB 341(H)	ASZ 15	2SC 732	BC 179
	AF 201		ASZ 18	2SC 733	BC 108
2SA 400	BC 108	2SB 364	AC 126	2SC 733BL	BC 109
2SA 495	BC 178	2SB 367	AD 162	2SC 733GR	BC 108B
2SA 499	BC 177	2SB 368	AD 162	2SC 735	BC 107
2SA 500	BC 178	2SB 370	AC 125		BC 108
2SA 503	2N 2904	2SB 370A	AC 125	2SC 856	BC 108A
2SA 548	BC 177	2SB 415	AC 128		BF 177
2SA 567	BC 177	2SB 415(g)	AC 128(z)	2SC 907A(H)	BF 178
2SB 25(g)	ASZ 16	2SB 424	ASZ 1015	2SC 979	BCY 59
2SB 26	ASZ 1017		ASZ 1018	2SD 77	BCY 59
2SB 26(g)	ASZ 16	2SB 425	ASZ 1016	2SD 96	AC 176
2SB 40(g)	AC 125K(z)		ASZ 1017	2SD 170	AC 176
2SB 44	AC 126	2SB 426	ASZ 1016	2SD 170A	AC 176

Diodes, Z-diodes, rectifiers and thyristors

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
AA 111	AA 119	BAY 71	1N 4151	BZX 55/C5V6	ZF 5,6
AA 114	AA 116		(BAY 95)	...BZX 55/C33	...ZF 33
AA 121	AA 116	BAY 99	BAY 41	BZX 55/D5V6	ZG 5,6
AA 123	AA 116	BB 121	BB 105A	...BZX 55/D33	...ZG 33
AA 130	AA 119	BB 122	BB 105G	BZX 61/C6V8	ZF 6,8
AA 131	AA 119	BB 141	BB 105A	...BZX 61/C33	...ZF 33
AA 133	AA 132		BB 105B	BZX 70/C10	ZF 10
AA 134	AA 113	BB 142	BB 105G	...BZX 70/C33	...ZF 33
AA 135	OA 1180	BStB 0106	T0,8N/100T	BZX 71/C5V1	ZF 5,1
AA 136	OA 1182D	BStB 0113	T0,8N/200T	...BZX 71/C24	...ZF 24
AA 137	AA 119	BStB 0126	T0,8N/400T	BZX 83/C2V7	ZF 2,7
AA 138	AA 116	BStB 0206	T3N/100T	...BZX 83/C33	...ZF 33
AA 140	AA 119	BStB 0213	T3N/200T	BZY 85/C4V7	ZF 4,7
AA 142	AA 119	BStB 0226	T3N/400T	...BZY 85/C24	...ZF 24
AAY 12	OA 1182	BStC 0313	T15N/200T	BZY 85/D4V7	ZG 4,7
AAY 14	OA 1182	BStC 0326	T15N/400T	...BZY 85/D22	...ZG 22
AAY 21	AA 116	BStD 0313	T15N/200T	BZY 88/C3V3	ZF 3,3
AAY 27	AAZ 10	BStD 0326	T15N/400T	...BZY 88/C33	...ZF 33
AAY 43	4-AAZ 10	BTY 79/100R	T15N/100T	BZY 96/C4V7..	ZX 4,7...
BA 128	BAY 43	BTY 79/200R	T15N/200T	ESN 100	BY 135
BA 136	BA 243	BTY 79/400R	T15N/400T	FS 19	OA 1180
BA 141	BB 105A	BTY 87/100R	T15N/100T	FS 36	AAZ 10
BA 142	BB 105G	BTY 87/200R	T15N/200T	IS 1941	BY 135
BA 152	BA 243	BTY 87/400R	T15N/400T	N 20	1N 4148
BA 174	1N 4154	BY 100	BY 133	OA 70	AA 116
	(BAY 94)	BY 102	BY 135	OA 72	AA 119
BA 175	1N 4151	BY 103	BY 133	OA 73	AA 116
	(BAY 95)	BY 112	BY 135	OA 79	AA 119
BA 177	BA 243	BY 113	BY 133	OA 81	AA 117
BA 178	BA 243	BY 114	BY 135	OA 85	AA 118
BA 182	BA 243	BY 116	BY 133	OA 86	AA 117
BA 282	BA 243	BY 126	BY 135	OA 90	AA 116
BA 283	BA 244	BY 127	BY 133	OA 91	AA 117
BAU 54—70	1N 4151	BY 138	BY 133	OA 95	AA 118
	(BAY 95)	BY 152	BY 133	OA 150	AA 117
BAV 10	1N 4151	BY 177	BY 133	OA 154	AAZ 10
	(BAY 95)	BY 178	BY 133	OA 154Q	4-AAZ 10
BAV 54—30	1N 4154	BY 242	BY 133	OA 160	AA 116
	(BAY 94)	BY 250	BY 133	OA 161	AA 118
BAW 62	1N 4151	BYX 36/150	BY 134	OA 172	AA 119
	(BAY 95)	BYX 36/300	BY 134	OA 180	OA 1180
BAW 75	1N 4154	BYX 36/600	BY 134	OA 182	OA 1182
	(BAY 94)	BYX 38/300	BYX 42/300T	OA 182B	OA 1182D
BAW 76	1N 4151	BYX 38/300	BYX 42/300T	OY 1011	BY 134
	(BAY 95)	BYX 48/300	BYX 42/300T	OY 1021	BY 133
BAX 20	BAY 93	BYY 31	BY 134	SFD 83	1N 4154
BAX 21	BAY 42	BYY 32	BY 134		(BAY 94)
BAX 22	BAY 43	BYY 33	BY 133		
BAY 31	BAY 93	BYY 34	BY 133	SFD 104	AA 116
BAY 60	1N 4154	BYY 59	BY 134	SFD 105	AAZ 10
	(BAY 94)	BYY 60	BY 133	SFD 106	AA 116
BAY 63	1N 4151	BZX 46/C2V7	ZF 2,7	SFD 107	AA 119
	(BAY 95)	...BZX 46/C33	...ZF 33.	SFD 108	AA 117
BAY 68	BAY 41	BZX 55/C2V7	ZF 2,7	SFD 108A	OA 1182
BAY 69	BAY 42	...BZX 55/C33	...ZF 33	SFD 110	AA 119

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
SFD 110	AAZ 10	1N 127A	AA 117	1N 3193	BY 134
SFD 111	2-AA 116	1N 198	AA 117	1N 3194	BY 134
SFD 112	AA 119	1N 277	OA 1182	1N 3195	BY 133
SFD 115	4-AAZ 10	1N 440B	BY 135	1N 3600	1N 4151
SFD 183	1N 4151	1N 441B	BY 134		(BAY 95)
	(BAY 95)	1N 442B	BY 134	1N 3602	1N 4151
SFR 105	BYX 42/200T	1N 443B	BY 134		(BAY 95)
SFR 164	BY 133	1N 444B	BY 133	1N 3604	1N 4151
SSiB 0110	BY 134	1N 445B	BY 133		(BAY 95)
SSiB 0120	BY 134	1N 536	BY 135	1N 3605	1N 4154
SSiB 0140	BY 133	1N 537	BY 135		(BAY 94)
SSiB 0610	BY 134	1N 538	BY 134	1N 3606	1N 4151
SSiB 0620	BY 134	1N 539	BY 134		(BAY 95)
SSiB 0640	BY 133	1N 540	BY 134	1N 4009	1N 4154
SSiC 1320	BYX 42/300T	1N 541	AA 119		(BAY 94)
TIC 60	T0,8N/50T	1N 542	2-AA 119	1N 4364	BY 135
TIC 61	T0,8N/50T	1N 614	BY 133	1N 4365	BY 134
TIC 62	T0,8N/100T	1N 746...	ZF 3,3...	1N 4366	BY 134
TIC 63	T0,8N/200T	...1N 759	...ZF 11	1N 4367	BY 134
TIC 64	T0,8N/200T	1N 914	1N 4148	1N 4368	BY 133
TIC 106A	T3N/100T	1N 914A	1N 4446	1N 4369	BY 133
TIC 106B	T3N/200T	1N 914B	1N 4448	1N 4383	BY 134
TIC 106C	T3N/300T	1N 916	1N 4149	1N 4384	BY 134
TIC 106D	T3N/400T	1N 916A	1N 4447	1N 4385	BY 133
TIC 106F	T3N/50T	1N 9163	1N 4449	1S 10—400	BYX 42/400T
TIC 106Y	T3N/50T	1N 956...	ZF 3,3...	1S 32	AA 113
TIC 126A	T15N/100T	...1N 976	...ZF 22	1S 33	AA 117
TIC 126B	T15N/200T	1N 1100	BY 135	1S 34	AA 119
TIC 126C	T15N/300T	1N 1101	BY 134	1S 34A	AA 117
TIC 126D	T15N/400T	1N 1102	BY 134	1S 38A	AA 118
TIC 126F	T15N/50T	1N 1103	BY 134	1S 73	OA 1180
T0,8N0,6A00	T0,8N/50T	1N 1104	BY 133	1S 82	OA 1180
T0,8N1A00	T0,8N/100T	1N 1105	BY 133	1S 83	OA 1180
T0,8N2A00	T0,8N/200T	1N 1487	BY 135	1S 100	BY 135
T0,8N3A00	T0,8N/300T	1N 1488	BY 134	1S 101	BY 134
T0,8N4A00	T0,8N/400T	1N 1489	BY 134	1S 103	BY 134
T0,8N100	T0,8N/100T	1N 1490	BY 134	1S 105	BY 133
T0,8N200	T0,8N/200T	1N 1491	BY 133	1S 107	BY 134
T0,8N300	T0,8N/300T	1N 1492	BY 133	1S 134...	ZF 5,1...
T0,8N400	T0,8N/400T	1N 1581	BYX 42/100T	...1S 143	...ZF 15
T3N0,6000	T3N/50T	1N 1582	BYX 42/100T	1S 1515	1N 4151
T3N1000	T3N/100T	1N 1583	BYX 42/200T		(BAY 95)
T3N2000	T3N/200T	1N 1584	BYX 42/300T	1S 1516	1N 4151
T3N3000	T3N/300T	1N 1585	BYX 42/400T		(BAY 95)
T3N4000	T3N/400T	1N 1692	BY 135	1S 1553	BAY 43
T3N 100	T3N/100T	1N 1693	BY 134	1S 1554	BAY 42
T3N 200	T3N/200T	1N 1694	BY 134	1S 1555	BAY 41
T3N 300	T3N/300T	1N 1695	BY 134	1S 1652	BYX 42/200T
T3N 400	T3N/400T	1N 1696	BY 133	1S 1653	BYX 42/300T
1N 48	AA 117	1N 1697	BY 133	1S 1942	BY 134
1N 60	AA 116	1N 3063	1N 4151	1S 1943	BY 134
1N 63	AA 117		(BAY 95)	1S 1944	BY 133
1N 64	AA 116	1N 3064	1N 4151	1S 2030...	ZF 3...
1N 65	AA 117		(BAY 95)	...1S 2330	...ZF 33
1N 87A	AA 116	1N 3067	1N 4154	1S 2074(H)	BAY 42
	AA 119		(BAY 94)	1S 6006A...	ZX 6,8...

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
2N 1595	T0,8N/50T	2N 5060	T0,8N/50T	12GC 11	BYX 42/400T
2N 1596	T0,8N/100T	2N 5061	T0,8N/50T	15P1	OA 1182
2N 1597	T0,8N/200T	2N 5062	T0,8N/100T	19P1	OA 1180
2N 1598	T0,8N/300T	2N 5063	T0,8N/200T	62R2	BYX 42/200T
2N 1599	T0,8N/400T	2N 5064	T0,8N/200T		BYX 42/400T

Integrated circuits

type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type	type to be replaced	TUNGSRAM-type
FJH 121	TL 7410	MIC 7472	TL 7472	T 7440	TL 7440
FJH 131	TL 7400	SF.C 400E	TL 7400	T 7460	TL 7460
FJH 221	TL 7402	SF.C 402E	TL 7402	T 7472	TL 7472
FLH 101	TL 7400	SF.C 406E	TL 7406	TAA 940	TAA 550
FLH 111	TL 7410	SF.C 410E	TL 7410	TBA 271	TAA 550
FLH 141	TL 7440	SF.C 440E	TL 7440	TL 7400E	TL 7400
FLH 191	TL 7402	SF.C 460E	TL 7460	TL 7402N	TL 7402
FLJ 111	TL 7472	SF.C 472E	TL 7472	TL 7406N	TL 7406
FLY 101	TL 7460	SN 7400N	TL 7400	TL 7410N	TL 7410
HD 2501	TL 7440	SN 7402N	TL 7402	TL 7440N	TL 7440
HD 2502	TL 7460	SN 7406N	TL 7406	TL 7460N	TL 7460
HD 2503	TL 7400	SN 7410N	TL 7410	TL 7472N	TL 7472
HD 2507	TL 7410	SN 7440N	TL 7440	TTμL 9001	TL 7472
HD 2511	TL 7402	SN 7460N	TL 7460	TTμL 9002	TL 7400
MIC 7400	TL 7400	SN 7472N	TL 7472	TTμL 9003	TL 7410
MIC 7402	TL 7402	SN 72702N	TL 72702	TTμL 9006	TL 7460
MIC 7406	TL 7406	T 7400	TL 7400	TTμL 9009	TL 7440
MIC 7410	TL 7410	T 7402	TL 7402	ZTK 33	TAA 550
MIC 7440	TL 7440	T 7406	TL 7406	μA 702	TL 72702
MIC 7460	TL 7460	T 7410	TL 7410		

Replacement list of semiconductor types not included in the existing TUNGSRAM Delivery Programme or types not recommended for new designs.

obsolete type	type recommended for replacement	obsolete type	type recommended for replacement	obsolete type	type recommended for replacement
Transistors		OC 26	ASZ 1017	BAY 44	BY 135
AC 107	AC 125F(z)	OC 1016	ASZ 1017		(1N 4148)
AC 125F	AC 125F(z)	OC 44K(z)	BCY 78	BAY 45	BY 134
AC 127	AC 176	OC 1044	BC 178	BAY 46	BY 134
AC 132	AC 125	OC 1045	BC 178	GEN 51	BYX 42/100T
AF 109R	AF 139	OC 1070	AC 125	GEN 52	BYX 42/100T
AFY 12	AF 106	OC 1071	AC 125	GEN 53	BYX 42/100T
AD 149	ASZ 1017	OC 1072	AC 125	GEN 54	BYX 42/200T
AD 150	ASZ 1017	OC 1074	AC 128	GEN 55	BYX 42/200T
AD 1202	ASZ 1017	OC 1075	AC 125	OA 1150	AA 117
AD 1203	ASZ 1017	OC 1076	AC 125K(z)	OA 1154	AAZ 10
BC 147	BC 237	OC 1077	AC 125U(z)	OA 1154Q	4-AAZ 10
BC 148	BC 238	OC 1079	AC 128	OA 1160	AA 116
BC 149	BC 239	**Diodes and rectifiers**		OA 1161	AA 118
BC 182	BC 237			OA 1172	AA 119
BC 183	BC 238	AY 101T	BY 135	SiEK 1F	BY 135
BC 184	BC 239	AY 102T	BY 135	SiEK 2F	BY 134
BC 212	BC 307	AY 103T	BY 134	SiEK 3F	BY 134
BC 213	BC 308	AY 104T	BY 134	SiEK 4F	BY 134
BC 214	BC 309	AY 105T	BY 134	SiEK 5F	BY 133
BF 194	BF 184	AY 106T	BY 134	SiEK 6F	BY 133
BF 195	BF 185	AY 107T	BY 134	SiEK 7F	BY 133