

S.Q. TUBE

Special quality double triode designed for

Cascode circuits

H.F. or I.F. amplifiers

Mixer or phase inverter stages

Multivibrator and cathode follower in computers

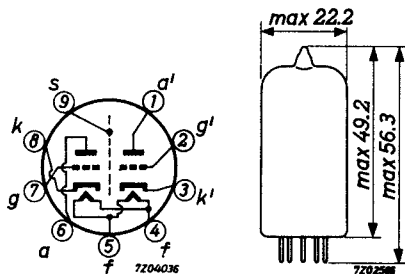
QUICK REFERENCE DATA

Life	10 000 hours	
Low interface resistance		
Mechanical quality	Shock and vibration resistant	
Base	Noval. Gold plated pins	
Heating	Indirect A.C. or D.C. ; parallel supply	
Heater voltage	V_f	6.3 V
Heater current	I_f	300 mA
Anode current	I_a	15 mA
Mutual conductance	S	12.5 mA/V
Equivalent noise resistance	R_{eq}	300 Ω
Noise factor ($f = 200$ MHz)	F	4.6 dB

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval



CHARACTERISTICS

Column I Nominal value or setting of the tube

II Range values for equipment design: Initial spread

III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	300	285 - 315		mA
Anode supply voltage	V_{ba}	100			V
Grid supply voltage	$+V_{bg}$	9			V
Cathode resistor	R_k	680			Ω
Anode current	I_a	15	14.2 - 15.8	min. 13.5	mA
Mutual conductance	S	12.5	10.5 - 15	min. 9	mA/V
Amplification factor	μ	33			
<u>Equivalent noise resistance</u>	R_{eq}	300			Ω
Frequency = 45 MHz					
<u>Noise figure</u>	F	4.6			dB
Frequency = 200 MHz					
In cascode circuit adapted to minimum noise					
<u>Input resistance</u>	r_g	3			k Ω
Frequency = 100 MHz					
<u>Start of grid current</u>	V_g	0.75			V_{RMS}
<u>Negative grid current</u>	$-I_g$		max. 0.1	max. 1	μA
Anode voltage	V_a	90			V
Anode current	I_a	15			mA
Anode supply voltage	V_{ba}	90			V
Cathode resistor	R_k	120			Ω
Anode current	I_a	12			mA
Mutual conductance	S	11.5			mA/V

CHARACTERISTICS (continued)

		I	II	III	
<u>Cut-off voltage</u>	$-V_g$	6.5	5 - 8.5		V
Anode voltage	V_a	150			V
Anode current	I_a	0.1			mA
<u>Difference in grid voltage</u> of two sections	$ V_g - V_g' $		max. 2	max. 2	V
Anode voltage	$V_a = V_a'$	150			V
Anode current	$I_a = I_a'$	0.1			mA
Anode supply voltage	V_{ba}	150			V
Negative grid voltage	$-V_g$	15			V
Anode current	I_a		max. 5		μA
<u>In circuit fig.1 "pag.7"</u>					
Anode supply voltage	V_{ba}	150			V
Anode current (not permitted continuously)	I_a	33	28 - 38		mA
Anode supply voltage	V_{ba}	60			V
Anode current	I_a		max. 9		mA
<u>Leakage current between cathode and heater</u>	I_{kf}		max. 6	max. 12	μA
Voltage between cathode and heater = 90 V, cath.neg. Voltage between cathode and heater = 120 V, cath.pos.					
<u>Insulation resistance between two electrodes</u>	R_{ins}		min.100	min. 20	M Ω
Voltage between electrodes = 200 V					
<u>Hum voltage</u>	V_g		max. 50		μV_{RMS}
Centre heater transformer earthed					
Grid resistor $R_g = 0.5 M\Omega$					

CAPACITANCES Both sections if applicable

		I	II	
Anode to cathode, heater and screen	$C_{a/kfs}$	1.75	1.55 - 1.95	pF
	$C_{a'/'k'fs}$	1.65	1.45 - 1.85	pF
Anode to cathode and heater	$C_{a/kf}$	0.5	0.4 - 0.6	pF
	$C_{a'/'k'f}$	0.4	0.3 - 0.5	pF
Grid to cathode, heater and screen	$C_{g/kfs}$	3.3	2.7 - 3.9	pF
Grid to cathode and heater	$C_{g/kf}$	3.3	2.7 - 3.9	pF
Anode to grid	C_{ag}	1.4	1.2 - 1.6	pF
Anode to cathode	C_{ak}	0.18	0.14 - 0.22	pF
Cathode to heater	C_{kf}	2.6		pF
	$C_{k'f}$	2.7		pF
Anode to screen	C_{as}	1.3	1.1 - 1.5	pF
Anode to grid, heater and screen	$C_{a/gfs}$	3.0	2.7 - 3.3	pF
	$C_{a'/'g'fs}$	2.9	2.6 - 3.2	pF
Cathode to grid, heater and screen	$C_{k/gfs}$	6.0	5.1 - 6.9	pF
Anode to anode other section	$C_{aa'}$		max. 0.045	pF
Grid to grid other section	$C_{gg'}$		max. 0.005	pF
Anode to grid other section	$C_{ag'}, C_{a'g}$		max. 0.005	pF
Grid to cathode other section	$C_{gk'}, C_{g'k}$		max. 0.005	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours under the following conditions:

Anode supply voltage	V_{ba}	100 V
Grid supply voltage	$+V_{bg}$	9 V
Cathode resistor	R_k	680 Ω
Grid resistor	R_g	47 $k\Omega$
Voltage between cathode and heater (cath.neg.)	V_{kf}	60 V
Anode current	I_a	15 mA

LIMITING VALUES Design centre rating system

Anode voltage	V_{a0}	max.	550 V
Anode voltage (Zero cathode current)	V_a	max.	400 V
Anode voltage	V_a	max.	220 V
Anode voltage (Max. anode dissipation 0.8 W)	V_a	max.	250 V
Anode dissipation	W_a	max.	1.5 W
Anode dissipation (Max. anode dissipation of section 1 plus section 2 = 2 W)	W_a	max.	1.8 W
Grid dissipation	W_g	max.	30 mW
Grid voltage	$-V_g$	max.	100 V
Grid peak voltage Max. pulse duration 200 μsec Max. duty factor 0.1	$-V_{gp}$	max.	200 V
Cathode current	I_k	max.	20 mA
Cathode peak current Max. pulse duration 200 μsec Max. duty factor 0.1	I_{kp}	max.	100 mA

LIMITING VALUES (continued)

Voltage between cathode and heater

Cathode positive	V_{kf}	max.	150 V
Cathode negative	V_{kf}	max.	100 V
Bulb temperature (Absolute max.)	t_{bulb}	max.	170 °C
Grid resistor (Anode current < 5 mA)	R_g	max.	1 MΩ

Heater voltage: The average heater voltage should be 6.3 V.

Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.

The tolerance of heater current (column II) should be taken into account.

OPERATING CHARACTERISTICSOutput tube class A

Anode voltage	V_a	220	V
Load resistance	$R_{a\sim}$	20	kΩ
Grid voltage	$-V_g$	6.5	V
Input voltage	V_i	0 1.5 4.5	V _{RMS}
Anode current	I_a	6.5 9.2	mA
Output power	W_o	0.05 0.5	W
Total distortion	d_{tot}	7	%

Output tube class B (two tubes)

Continuous single tone input signal

Anode voltage	V_a	200	V
Load resistance	$R_{aa\sim}$	22	kΩ
Grid voltage	$-V_g$	6	V
Input voltage	V_i	0 0.9 4.0	V _{RMS}
Anode current	I_a	2x5 2x9	mA
Output power	W_o	0.05 1.2	W
Total distortion	d_{tot}	3	%

OPERATING CHARACTERISTICS (continued)

Output tube class B (two tubes)

Speech and music input signal

Anode voltage	V_a	200	V
Load resistance	$R_{a-a\sim}$	10	$k\Omega$
Grid voltage	$-V_{g1}$	6	V
Input voltage	V_i	0 0.9 4.0	V_{RMS}
Anode current	I_a	2x5 2x13.5	mA
Output power	W_o	0.05 1.5	W
Total distortion	d_{tot}	4	%

Mixer

Anode supply voltage	V_{ba}	60 90 150	V
Anode resistor	R_a	0 1 3.9	$k\Omega$
Grid resistor	R_g	1 1 1	$M\Omega$
Oscillator voltage	V_{osc}	2 2.5 3	V_{RMS}
Anode current	I_a	4.7 7.7 11	mA
Conversion conductance	S_c	2.9 3.5 4.1	mA/V
Internal resistance	R_i	8.3 7 6.1	$k\Omega$

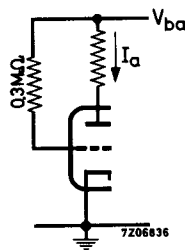
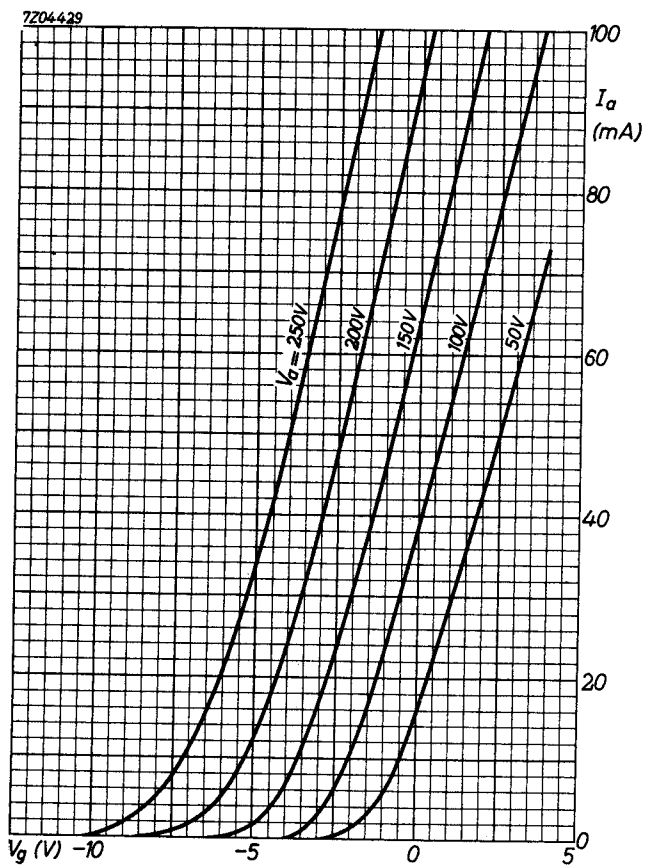
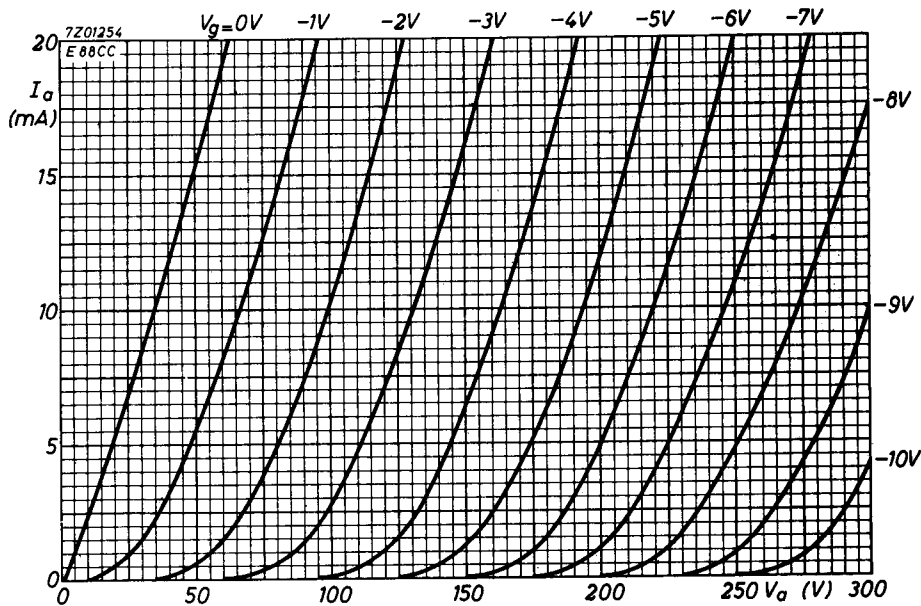
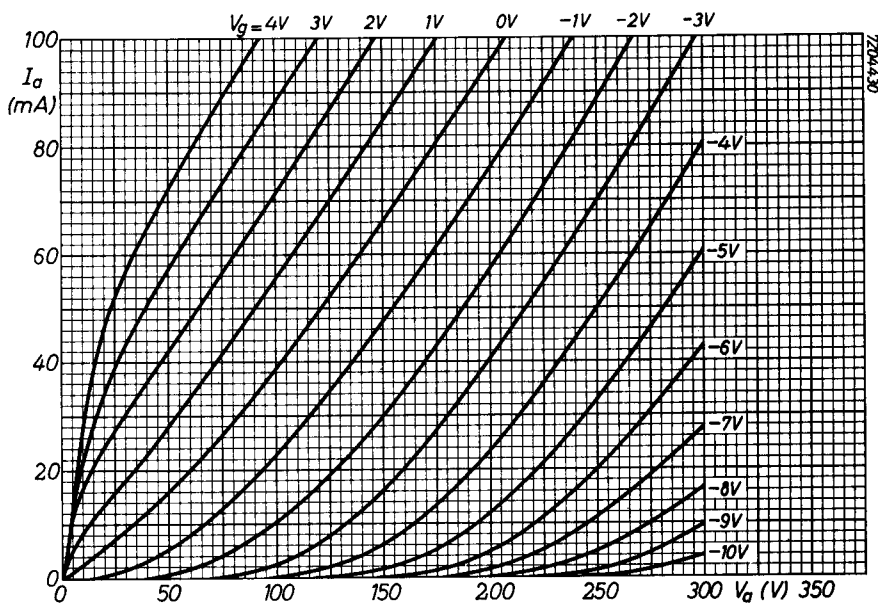
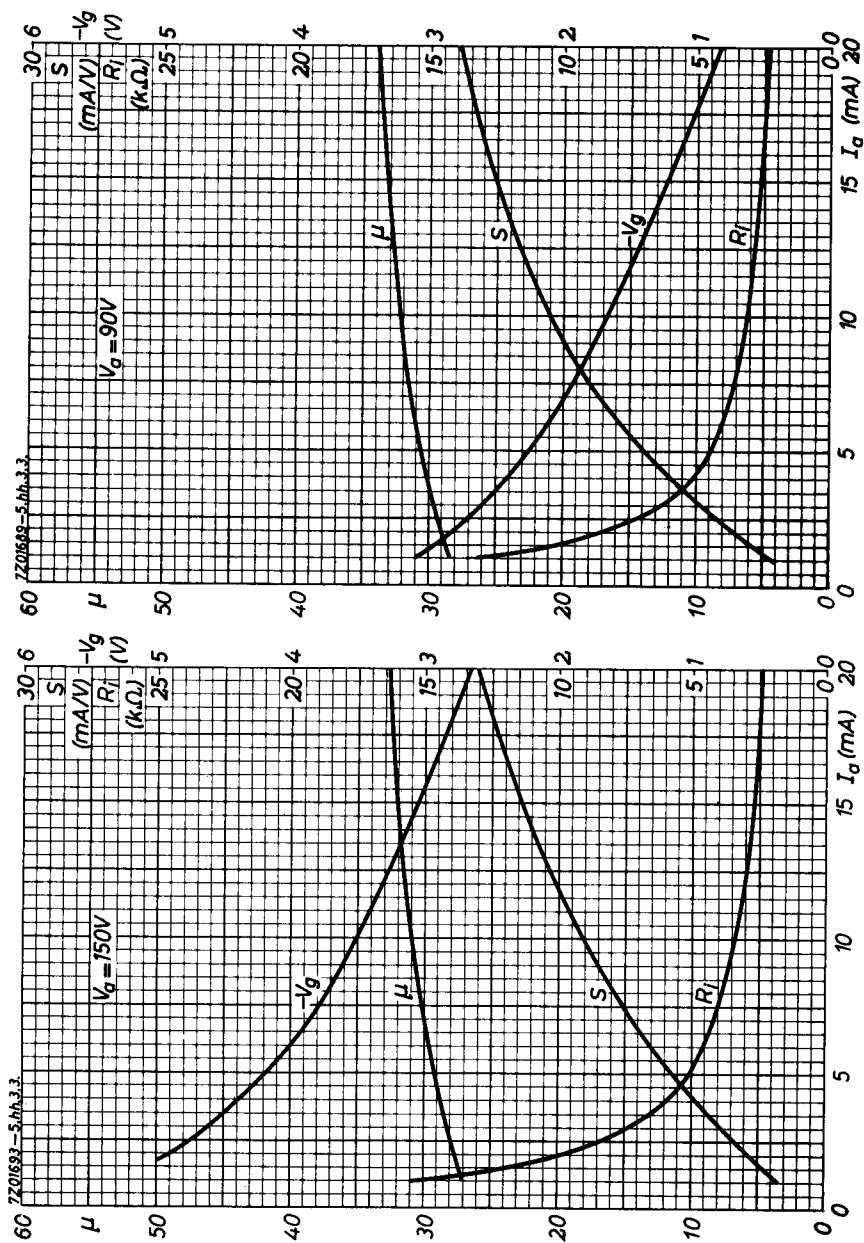
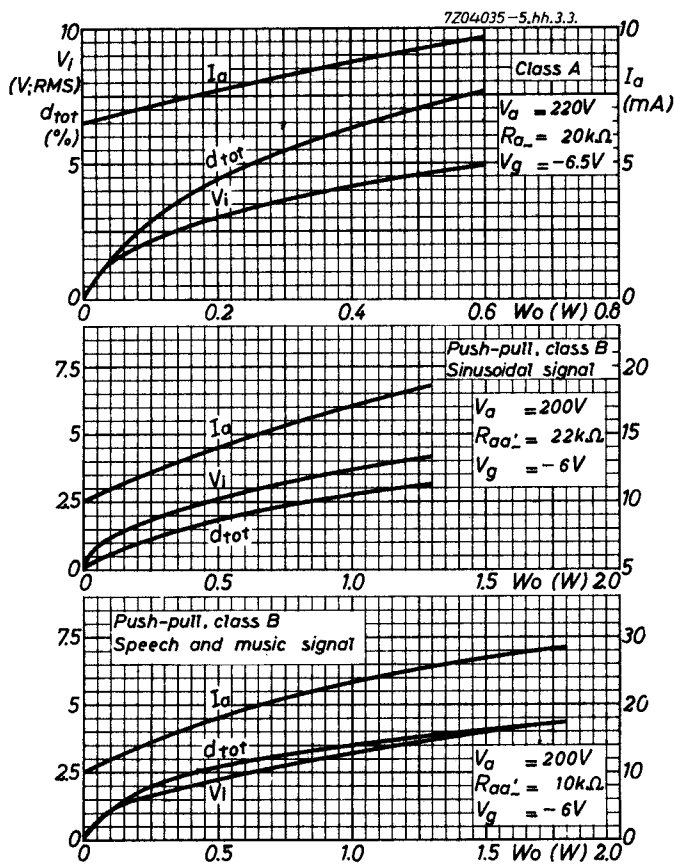


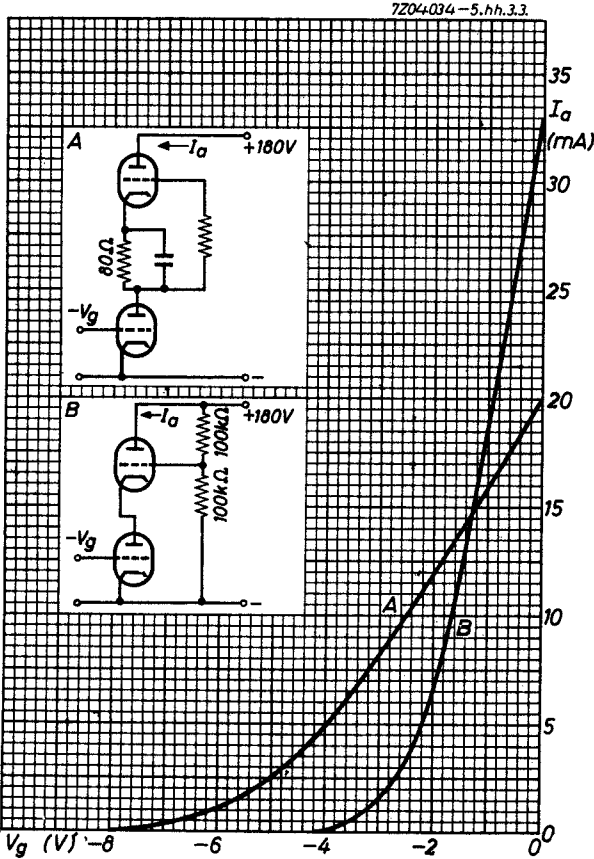
Fig.1











PHILIPS

Data handbook



**Electronic
components
and materials**

E88CC

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