PENCIL TYPE U.H.F. MEDIUM-MU TRIODE for use in grounded grid service as anode pulsed oscillator up to 3300 Mc/s and altitudes up to 3 km (10 000 feet), or as class A amplifier, R.F. amplifier, R.F. oscillator or frequency doubler up to 1000 Mc/s and altitudes up to 30 km (100 000 feet)

HEATING: indirect by A.C. or D.C.

Heater voltage

under transmitting conditions	V_f =	6.0 V $^{+5\ \%}_{-10\ \%}$
under stand-by conditions	V_f =	6.3 V
Heater current	$I_f(V_f = 6.0\ V)$ =	0.28 A

CAPACITANCES

Anode to cathode	C_a <	0.07 pF
Grid to cathode	C_g =	2.5 pF
Anode to grid	C_{ag} =	1.75 pF

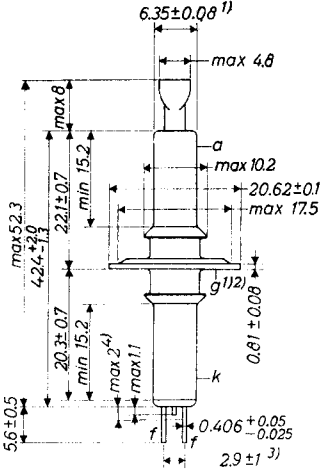
TYPICAL CHARACTERISTICS

Anode voltage	V_a =	200 V
Anode current	I_a =	25 mA
Mutual conductance	S =	6 mA/V
Amplification factor	μ =	27
Internal resistance	R_i =	4500 Ω

TEMPERATURE LIMITS

Anode seal temperature	= max. 175 °C

Dimensions in mm



Mounting position: arbitrary

INSTALLATION NOTES

Connections to the cathode cylinder, grid flange and anode cylinder should be made by flexible spring contacts only. The connectors must make firm, large-surface contact, yet must be sufficiently flexible so that no part of the tube is subjected to strain. Unless this recommendation is observed, the glass-to-metal seals may be damaged. The heater leads fit to the Cinch socket No. 54A1 1953. They should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater leads and damage the tube.

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1) Max. eccentricity of the axis of the anode terminal or grid terminal flange with respect to the axis of the cathode terminal is 0.204 mm.

2) The tilt of the grid terminal flange with respect to the rotational axis of the cathode terminal is determined by chucking the cathode terminal, rotating the tube and gauging the total travel distance of the grid terminal flange parallel to the axis at a point approximately 0.5 mm inward from its edge for one complete rotation. The total travel distance will not exceed 0.51 mm.

3) Distance at the terminal tips

4) Not tinned

Class A amplifier, without grid current

LIMITING VALUES (Absolute limits)

For altitudes up to 30 km (100 000 feet)

Anode voltage	V_a	= max.	330 V
Negative grid voltage	$-V_g$	= max.	100 V
Anode current	I_a	= max.	35 mA
Anode dissipation	W_a	= max.	7 W
Cathode to heater voltage	V_{kf}	= max.	90 V
	$-V_{kf}$	= max.	90 V

OPERATING CONDITIONS

Anode voltage	V_a	=	200 V
Anode current	I_a	=	25 mA
Cathode resistance	R_k	=	100 Ω

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2) The magnitude of any spike on the anode voltage pulse should not exceed a value of 2000 volts with respect to the cathode and its duration should not exceed 0.01 μsec measured at the peak value level.

3) In applications where the anode dissipation exceeds 2.5 watts it is important that a large area of contact be provided between the anode cylinder and the connector in order to provide adequate heat conduction.

4) The power output at the peak of a pulse is obtained from the average power output using the duty factor of the pulses. This procedure is necessary since the output power pulse duty factor may be less than the applied voltage pulse duty factor because of a delay in the start of R.F. output power.

5) The duty factor is the product of the pulse duration and the repetition frequency. For variable pulse durations and pulse repetition frequencies, the duty factor is defined as the ratio of time "on" to total elapsed time in any 5000 μsec interval.

Anode pulsed oscillator, class C

LIMITING VALUES (Absolute limits)

For altitudes up to 3 km (10 000 feet)

For a maximum "on" time of 5 µsec in any 5000 µsec interval [1]

Positive peak anode voltage	V_{ap}	= max.	1750 V [2]
Negative peak grid voltage	$-V_{gp}$	= max.	150 V
Peak anode current	I_{ap}	= max.	3 A
Peak rectified grid current	I_{gp}	= max.	1.3 A
Anode current	I_a	= max.	3 mA
Grid current	I_g	= max.	1.3 mA
Anode dissipation	W_a	= max.	6 W [3]
Pulse duration	T_{imp}	= max.	1.5 µsec
Grid circuit resistance	R_g	= max.	0.5 MΩ

OPERATING CONDITIONS with rectangular wave shape in grounded grid circuit at 3300 Mc/s

The heater should be allowed to warm up for at least 60 sec. before anode voltage is applied

Positive peak anode voltage	V_{ap}	=	1750 V [2]
Negative peak bias voltage	V_{gp}	=	-110 V
Grid resistance	R_g	=	100 Ω
Peak anode current	I_{ap}	=	3 A
Peak rectified grid current	I_{gp}	=	1.1 A
Anode current	I_a	=	3 mA
Grid current	I_g	=	1.1 mA
Peak output power	W_{op}	=	1200 W [4]
Pulse duration	T_{imp}	=	1 µsec
Pulse repetition frequency	f_{imp}	=	1000 c/sec
Duty factor	δ	=	0.001 [5]

[1] The "on" time is the sum of the durations of all the individual pulses which occur during any 5000 µsec interval. The pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 % of the peak value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

[2][3][4][5] See page 3.

Anode-modulated R.F. amplifier, class C telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

LIMITING VALUES (Absolute limits)

For altitudes up to 30 km (100 000 feet)

			C.C.S.	I.C.A.S.
Anode voltage	V_a	= max.	260	320 V
Negative grid voltage	$-V_g$	= max.	100	100 V
Anode current	I_a	= max.	33	33 mA
Grid current	I_g	= max.	15	15 mA
Anode input power	W_{ia}	= max.	8.5	10.5 W
Anode dissipation	W_a	= max.	5	5.5 W [1]
Grid circuit resistance	R_g	= max.	0.1	0.1 MΩ
Cathode to heater voltage	V_{kf}	= max.	90	90 V
	$-V_{kf}$	= max.	90	90 V

OPERATING CONDITIONS in grounded grid circuit at 500 Mc/s

			C.C.S.	I.C.A.S.
Anode voltage	V_a	=	250	300 V
Grid voltage	V_g	=	-36	-45 V [2]
Anode current	I_a	=	30	30 mA
Grid current	I_g	=	11	12 mA
Driver output power	W_{dr}	=	1.8	2.0 W
Output power	W_o	=	5.5	6.5 W

[1]) In applications where the anode dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the anode cylinder and the connector in order to provide adequate heat conduction

[2]) Obtained from grid resistor

R.F. power amplifier and oscillator, class C telegraphy

Key down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the peak of the audio frequency envelope does not exceed 115 % of the carrier conditions.

LIMITING VALUES (Absolute limits)

For altitudes up to 30 km (100 000 feet)

			C.C.S.	I.C.A.S.
Anode voltage	V_a	= max.	320	400 V
Negative grid voltage	$-V_g$	= max.	100	100 V
Anode current	I_a	= max.	35	40 mA
Grid current	I_g	= max.	15	15 mA
Anode input power	W_{i_a}	= max.	11	16 W
Anode dissipation	W_a	= max.	7	8 W [1]
Grid circuit resistance	R_g	= max.	0.1	0.1 MΩ
Cathode to heater voltage	V_{kf}	= max.	90	90 V
	$-V_{kf}$	= max.	90	90 V

OPERATING CONDITIONS as R.F. amplifier in grounded grid circuit at 500 Mc/s

			C.C.S.	I.C.A.S.
Anode voltage	V_a	=	300	350 V
Grid voltage	V_g	=	-47	-51 V [2]
Anode current	I_a	=	33	35 mA
Grid current	I_g	=	13	13 mA
Driver output power	W_{dr}	=	2.0	2.5 W
Output power	W_o	=	7.5	8.5 W

[1]) In applications where the anode dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the anode cylinder and the connector in order to provide adequate heat conduction.

[2]) Obtained from grid resistor.

R.F. power amplifier and oscillator, class C telegraphy (continued)

OPERATING CONDITIONS as R.F. amplifier in grounded grid circuit at 1000 Mc/s

			C.C.S.	I.C.A.S.	
Anode voltage	V_a	=	300	350	V
Grid voltage	V_g	=	-30	-33	V[2])
Anode current	I_a	=	33	33	mA
Grid current	I_g	=	12	13	mA
Driver output power	W_{dr}	=	1.9	2.4	W
Output power	W_o	=	5.5	6.5	W

OPERATING CONDITIONS as oscillator in grounded grid circuit at 500 Mc/s

			C.C.S.	I.C.A.S.	
Anode voltage	V_a	=	300	350	V
Grid voltage	V_g	=	-47	-51	V[2])
Anode current	I_a	=	33	35	mA
Grid current	I_g	=	13	13	mA
Output power	W_o	=	5	6	W

[1]) In applications where the anode dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the anode cylinder and the connector in order to provide adequate heat conduction.

[2]) Obtained from grid resistor

Frequency doubler

LIMITING VALUES (Absolute limits)

For altitudes up to 30 km (100 000 feet)

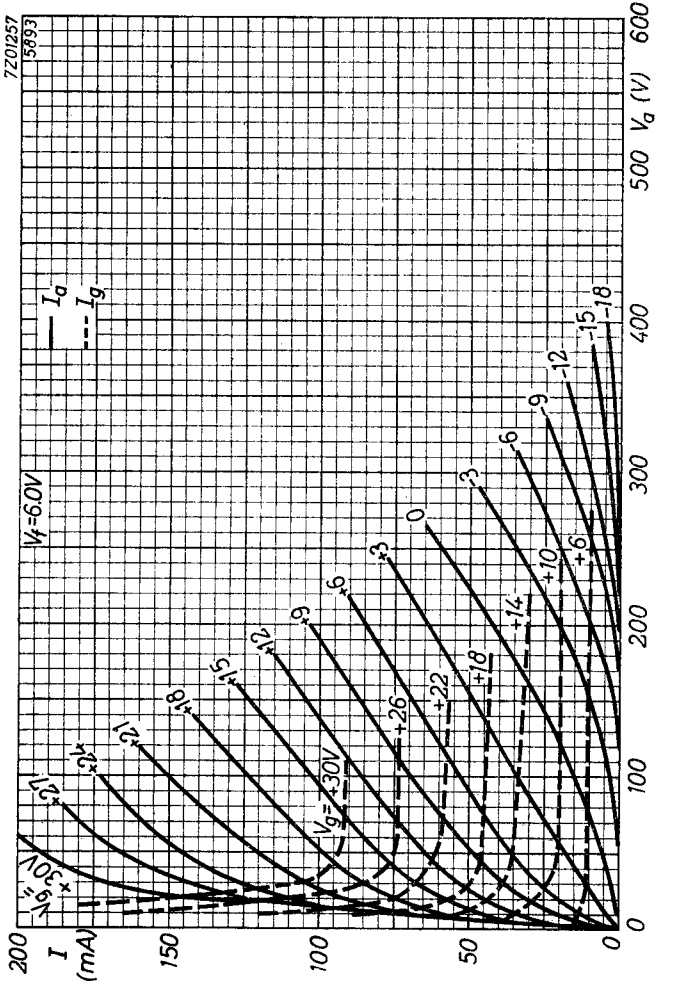
		C.C.S.	I.C.A.S.	
Anode voltage	V_a = max.	260	320	V
Negative grid voltage	$-V_g$ = max.	100	100	V
Anode current	I_a = max.	33	33	mA
Grid current	I_g = max.	12	12	mA
Anode input power	W_{ia} = max.	8.5	10.5	W
Anode dissipation	W_a = max.	6	7.5	W [1]
Grid circuit resistance	R_g = max.	0.1	0.1	MΩ
Cathode to heater voltage	V_{kf} = max.	90	90	V
	$-V_{kf}$ = max.	90	90	V

OPERATING CONDITIONS as frequency doubler to 1000 Mc/s in grounded grid circuit

		C.C.S.	I.C.A.S.	
Anode voltage	V_a =	250	300	V
Grid voltage	V_g =	-40	-50	V
Anode current	I_a =	33	33	mA
Grid current	I_g =	7	8	mA
Driver output power	W_{dr} =	3.2	3.5	W
Output power	W_o =	2.75	3.0	W

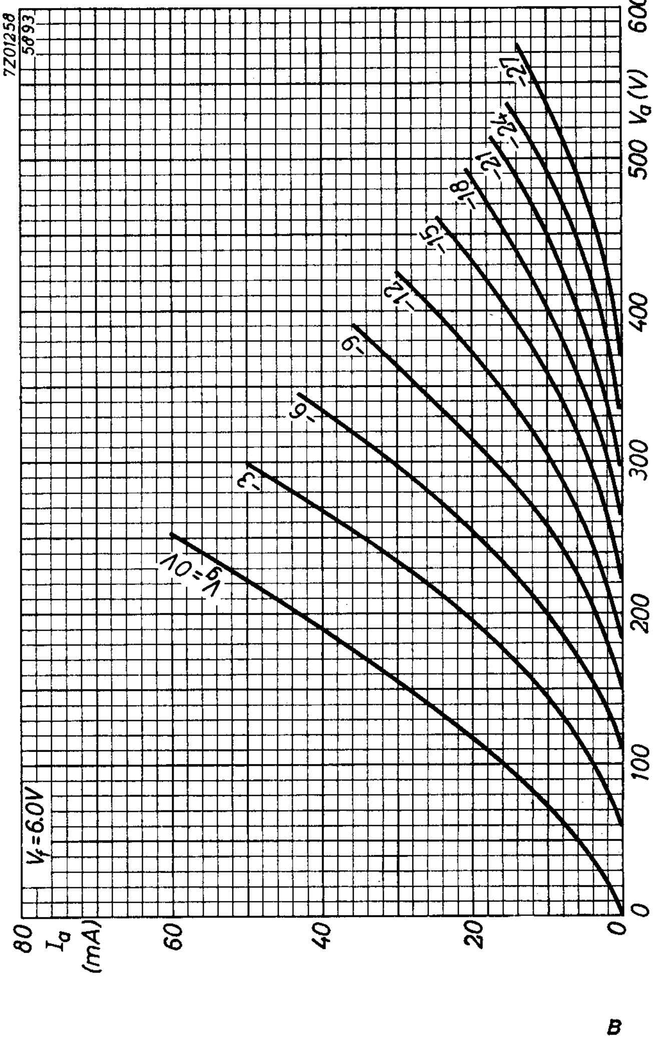
[1]) In applications where the anode dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the anode cylinder and the connector in order to provide adequate heat conduction

[2]) Obtained from grid resistor


7Z01257
5893
I_a
I_g
V_f=6.0V
V_g=-30V
V_a (V)
I (mA)
0
100
200
300
400
500
600
50
150
-27
-24
-21
-18
-15
-12
-9
-6
-3
0
+3
+6
+9
+12
+15
+18
+22
+26
+14
+10

5893

PHILIPS



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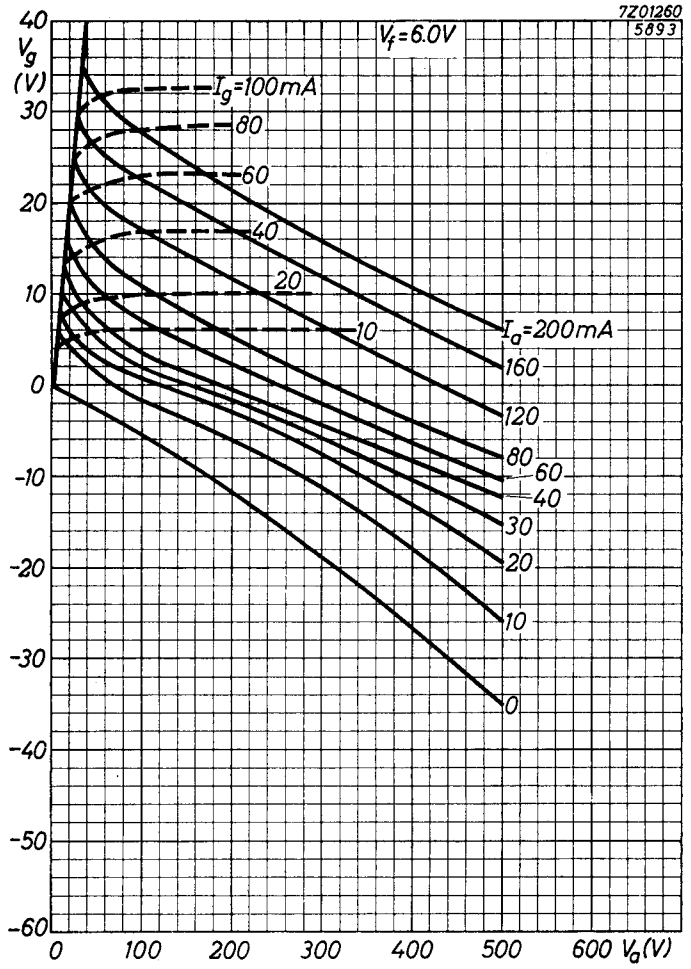
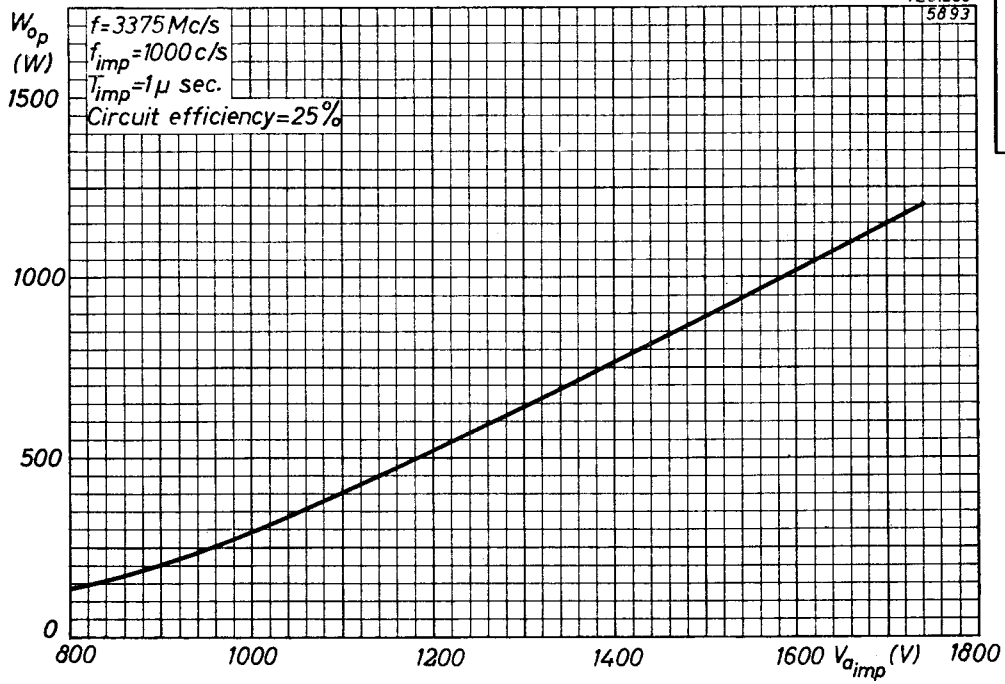

7Z01260
5893
V_f=6.0V
V_g (V)
40
30
20
10
0
-10
-20
-30
-40
-50
-60
I_g=100mA
80
60
40
20
10
I_a=200mA
160
120
80
60
40
30
20
10
0
0
100
200
300
400
500
600 V_a(V)


7Z01259
5893
W_{op} (W)
f=3375 Mc/s
f_{imp}=1000 c/s
T_{imp}=1 μ sec.
Circuit efficiency=25%
1500
1000
500
0
800
1000
1200
1400
1600
$V_{a_{imp}}$ (V)
1800

PHILIPS

Electronic Tube

HANDBOOK

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