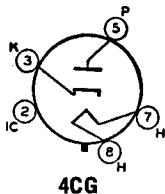


## HALF-WAVE VACUUM RECTIFIER

## 6DE4/6CQ4

17DE4, 22DE4



Glass octal type used as damper tube in horizontal-deflection circuits of television receivers. Outlines section, 13G; requires octal socket. Socket terminals 1, 2, 4, and 6 should not be used as tie points. This tube, like other power-handling tubes, should be adequately ventilated. Types 17DE4 and 22DE4 are identical with type 6DE4/6CQ4 except for heater ratings.

	6DE4/6CQ4	17DE4	22DE4	
Heater Voltage (ac/dc)	6.3	17	22.4	volts
Heater Current	1.6	0.6	0.45	amperes
Heater Warm-up Time (Average)	—	11	11	seconds
Direct Interelectrode Capacitances (Approx.):				
Plate to Cathode and Heater			8.5	pF
Cathode to Plate and Heater			11.5	pF
Heater to Cathode			4	pF

### Damper Service

For operation in a 525-line, 30-frame system

#### MAXIMUM RATINGS (Design-Maximum Values)

Peak Inverse Plate Voltage#		5500	volts
Peak Plate Current		1100	mA
Average Plate Current		180	mA
Plate Dissipation		6.5	watts
Heater-Cathode Voltage:			
Peak value	+300	-5500	volts
Average value	+100	-900	volts

#### CHARACTERISTIC Instantaneous Value

Tube Voltage Drop for plate current of 350 mA		34	volts
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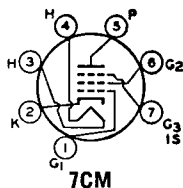
# Pulse duration must not exceed 15% of a horizontal scanning cycle (10 microseconds).

## 6DE6

4DE6

## SHARP-CUTOFF PENTODE

Miniature type used in the gain-controlled picture fix stages of television receivers utilizing an intermediate frequency in the order of 40 MHz and as an rf amplifier in vhf television tuners. Outlines section, 5C; requires miniature 7-contact socket. Type 4DE6 is identical with type 6DE6 except for heater ratings.



	4DE6	6DE6	
Heater Voltage (ac/dc)	4.2	6.3	volts
Heater Current	0.45	0.3	ampere
Heater Warm-up Time (Average)	11	—	seconds
Heater-Cathode Voltage:			
Peak value	±200 max	±200 max	volts
Average value	100 max	100 max	volts
Direct Interelectrode Capacitances:			
Grid No.1 to Plate	Unshielded	Shielded <sup>▲</sup>	
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	0.025 max	0.015 max	pF
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	6.5	6.5	pF
	2	3	pF

▲ With external shield connected to cathode.

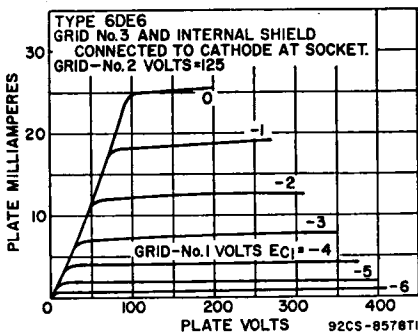
### Class A<sub>1</sub> Amplifier

#### MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	330	volts
Grid-No.3 (Suppressor-Grid) Voltage, Positive value	0	volts
Grid-No.2 (Screen-Grid) Supply Voltage	330	volts
Grid-No.2 Voltage	See curve page 300	volts
Grid-No.1 (Control-Grid) Voltage, Positive-bias value	0	volts
Plate Dissipation	2.3	watts

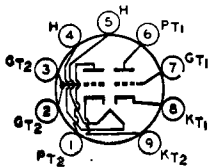
Grid-No.2 Input:

For grid-No.2 voltages up to 165 volts .....	0.55	watt
For grid-No.2 voltages between 165 and 330 volts .....	See curve page 300	



CHARACTERISTICS

Plate Supply Voltage .....	125	volts
Grid No.3 .....	Connected to cathode at socket	
Grid-No.2 Supply Voltage .....	125	volts
Cathode-Bias Resistor .....	56	ohms
Plate Resistance (Approx.) .....	0.25	megohm
Transconductance .....	8000	$\mu$ mhos
Transconductance for grid-No.1 volts of -5.5 and cathode resistor of 0 ohms .....	700	$\mu$ mhos
Plate Current .....	15.5	mA
Grid-No.2 Current .....	4.2	mA
Grid-No.1 Voltage (Approx.) for plate current of 20 $\mu$ A .....	-9	volts



9HF

ature 9-contact socket. For curve of average plate characteristics, Unit No.2, refer to type 6DR7. Types 10DE7 and 13DE7 are identical with type 6DE7 except for heater ratings.

DUAL TRIODE

6DE7

10DE7, 13DE7

Miniature type used as combined vertical oscillator and vertical-deflection amplifier in television receivers. Unit No.1 is used as a blocking oscillator in vertical-deflection circuits, and unit No.2 is used as a vertical-deflection amplifier. Outlines section, 6E; requires miniature

Heater Voltage (ac/dc) .....	6DE7	10DE7	13DE7	
Heater Current .....	6.3	9.7	13	volts
Heater Warm-up Time (Average) .....	0.9	0.6	0.45	ampere
Heater-Cathode Voltage:		11	11	seconds
Peak value .....	$\pm 200$ max	$\pm 200$ max	$\pm 200$ max	volts
Average value .....	100 max	100 max	100 max	volts
Direct Interelectrode Capacitances (Approx.):	Unit No.1		Unit No.2	
Grid to Plate .....	4		8.5	pF
Grid to Cathode and Heater .....	2.2		5.5	pF
Plate to Cathode and Heater .....	0.52		1	pF

Class A<sub>1</sub> Amplifier

CHARACTERISTICS

Plate Voltage .....	Unit No.1	Unit No.2	
Grid Voltage .....	250	150	volts
Amplification Factor .....	-11	-17.5	volts
Plate Resistance (Approx.) .....	17.5	6	
Transconductance .....	8750	925	ohms
Plate Current .....	2000	6500	$\mu$ mhos
Plate Current for grid voltage of -24 volts .....	5.5	35	mA
Grid Voltage (Approx.) for plate current of 10 $\mu$ A .....	-20	-	mA
Grid Voltage (Approx.) for plate current of 50 $\mu$ A .....	-	-44	volts

## Vertical-Deflection Oscillator and Amplifier

For operation in a 525-line, 30-frame system

## MAXIMUM RATINGS (Design-Maximum Values)

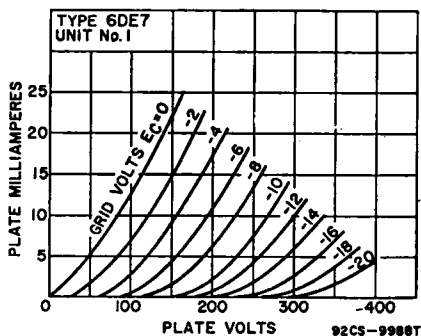
	Unit No.1 Oscillator	Unit No.2 Amplifier	
DC Plate Voltage	330	275	volts
Peak Positive-Pulse Plate Voltage#	—	1500	volts
Peak Negative-Pulse Grid Voltage	400	250	volts
Peak Cathode Current	77	175	mA
Average Cathode Current	22	50	mA
Plate Dissipation	1.5	7	watts

## MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance:

For grid-resistor bias or cathode-bias operation 2.2 2.2 megohms

# Pulse duration must not exceed 15% of a vertical scanning cycle (2.5 milliseconds).

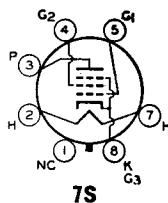


## 6DG6GT

## BEAM POWER TUBE

Glass octal type used as output tube in audio-amplifier applications Outlines section, 13D; requires octal socket. This type may be supplied with pin 1 omitted.

Heater Voltage (ac/dc)	6.3	volts
Heater Current	1.2	amperes
Heater-Cathode Voltage:		
Peak value	±200 max	volts
Average value	100 max	volts
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to Plate	0.6	pF
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	15	pF
Plate to Cathode, Heater, Grid No.2, and Grid No.3	10	pF

Class A<sub>1</sub> Audio-Frequency Power Amplifier

## MAXIMUM RATINGS (Design-Center Values)

Plate Voltage	200	volts
Grid-No.2 (Screen-Grid) Voltage	125	volts
Plate Dissipation	10	watts
Grid-No.2 Input	1.25	watts

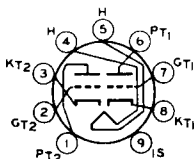
## TYPICAL OPERATION

Plate Supply Voltage	110	200	volts
Grid-No.2 Supply Voltage	110	125	volts
Grid-No.1 (Control-Grid) Supply Voltage	—7.5	—	volts
Peak AF Grid-No.1 Voltage	7.5	8.5	volts
Cathode-Bias Resistor	—	180	ohms
Zero-Signal Plate Current	49	46	mA
Maximum-Signal Plate Current	50	47	mA
Zero-Signal Grid-No.2 Current	4	2.2	mA
Maximum-Signal Grid-No.2 Current	10	8.5	mA

Plate Resistance (Approx.) .....	13000	28000	ohms
Transconductance .....	8000	8000	μmhos
Load Resistance .....	2000	4000	ohms
Total Harmonic Distortion .....	10	10	per cent
Maximum-Signal Power Output .....	2.1	3.8	watts

**MAXIMUM CIRCUIT VALUES**

Grid-No.1-Circuit Resistance:			
For fixed-bias operation .....		0.1	megohm
For cathode-bias operation .....		0.5	megohm



9AJ

**MEDIUM-MU TWIN TRIODE**

**6DJ8/  
ECC88**  
INDUSTRIAL  
TYPE

Miniature type used as a cascode amplifier in vhf color and black-and-white television tuners. Outlines section, 6B; requires miniature 9-contact socket.

Heater Voltage (ac/dc) .....		6.3	volts
Heater Current .....		0.365	ampere
Heater-Cathode Voltage:			
Peak value .....	Unit No. 1	Unit No. 2	volts
Average value .....	50	—130	volts
Direct Interelectrode Capacitances:			
Grid to Plate .....	1.4	1.4	pF
Grid to Cathode, Heater, and Internal Shield .....	3.3	—	pF
Cathode to Grid, Heater, and Internal Shield .....	—	6.0	pF
Plate to Cathode, Heater, and Internal Shield .....	1.8	—	pF
Plate to Grid, Heater, and Internal Shield .....	—	2.8	pF
Plate to Cathode .....	—	1.8	pF
Heater to Cathode .....	—	2.7	pF
Grid to Heater .....		0.13	pF
Plate of Unit No. 1 to Plate of Unit No. 2 .....		0.045	pF
Grid of Unit No. 2 to Plate of Unit No. 1 .....		0.005	pF

**Class A<sub>1</sub> Amplifier (Each Unit)**

**MAXIMUM RATINGS (Design-Center Values)**

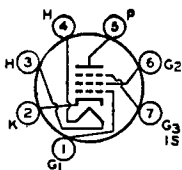
Plate Supply Voltage .....	130	volts
Cathode Current .....	25	mA
Plate Dissipation .....	1.8	watts
Negative Grid Voltage .....	50	volts
Plate Supply Voltage (cold condition) .....	550	volts

**CHARACTERISTICS**

Plate Voltage .....	90	volts
Grid Voltage .....	—1.3	volts
Amplification Factor .....	33	
Transconductance .....	12250	μmhos
Plate Current .....	15	mA
Equivalent Noise Resistance .....	300	ohms

**MAXIMUM CIRCUIT VALUES**

Grid-Circuit Resistance .....	1.0	megohm
Heater to Cathode Circuit Resistance .....	0.02	megohm



7CM

**SHARP-CUTOFF PENTODE**

3DK6, 4DK6, 12DK6

**6DK6**

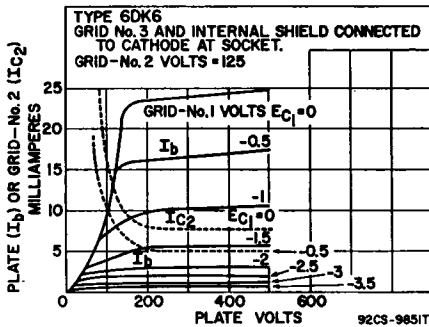
Miniature type used as if-amplifier tube in color and black-and-white television receivers. Outlines section, 5C; requires miniature 7-contact socket. Types 3DK6, 4DK6, and 12DK6 are identical with type 6DK6 except for heater ratings.

	<b>3DK6</b>	<b>4DK6</b>	<b>6DK6</b>	<b>12DK6</b>	
Heater Voltage (ac/dc) .....	3.15	4.2	6.3	12.6	volts
Heater Current .....	0.6	0.45	0.3	0.15	ampere
Heater Warm-up Time (Average) .....	11	11	—	—	seconds
Heater-Cathode Voltage:					
Peak value .....	{ +200 max	±200 max	±200 max	±200 max	volts
Average value .....	{ -300 max	100 max	100 max	100 max	volts
100 max					
Direct Interelectrode Capacitances:					
Grid No.1 to Plate .....					0.025 max pF
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3 and Internal Shield .....					6.3 pF
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield .....					1.9 pF

**Class A<sub>1</sub> Amplifier**

**MAXIMUM RATINGS (Design-Maximum Values)**

Plate Voltage .....	330	volts
Grid-No.3 (Suppressor-Grid) Voltage, Positive value .....	0	volts
Grid-No.2 (Screen-Grid) Supply Voltage .....	330	volts
Grid-No.2 Voltage .....	See curve page 300	
Grid-No.1 (Control-Grid) Voltage, Positive-bias value .....	0	volts
Plate Dissipation .....	2.3	watts
Grid-No.2 Input:		
For grid-No.2 voltages up to 165 volts .....	0.55	watt
For grid-No.2 voltages between 165 and 330 volts .....	See curve page 300	



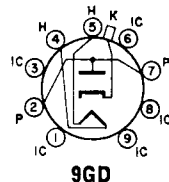
**CHARACTERISTICS**

Plate Supply Voltage .....	125	volts
Grid No.3 .....	Connected to cathode at socket	
Grid-No.2 Supply Voltage .....	125	volts
Cathode-Bias Resistor .....	56	ohms
Plate Resistance (Approx.) .....	0.35	megohm
Transconductance .....	9800	$\mu$ mhos
Plate Current .....	12	mA
Grid-No.2 Current .....	3.8	mA
Grid-No.1 Voltage (Approx.) for plate current of 20 $\mu$ A .....	-6.5	volts

**6DL3**  
25DL3

**HALF-WAVE  
VACUUM RECTIFIER**

Novar type used as a damper tube in television receivers. Outlines section, 40B; requires novar 9-contact socket. Socket terminals 1, 3, 6, 8, and 9 should not be used as tie points. Type 25DL3 is identical with type 6DL3 except for heater ratings.



	<b>6DL3</b>	<b>25DL3</b>	
Heater Voltage (ac/dc) .....	6.3	25.2	volts
Heater Current .....	2.3	0.45	ampere
Heater Warm-up Time (average) .....	—	11	seconds
Direct Interelectrode Capacitances:			
Cathode to Plate and Heater .....		17	pF
Plate to Cathode and Heater .....		13	pF
Heater to Cathode .....		4.4	pF

**Damper Service**

For operation in a 525-line, 30-frame system

Peak Inverse Plate Voltage# .....	6500		volts
Peak Plate Current .....	1800		mA
Average Plate Current .....	400		mA
Plate Dissipation .....	11		watts
Bulb Temperature (At hottest point) .....	220		°C
Heater-Cathode Voltage:			
Peak value .....	+300	—6500	volts
Average value .....	+100	—900	volts

**CHARACTERISTIC, Instantaneous Value**

Tube Voltage Drop for plate current of 800 mA .....	25	volts
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# Pulse duration must not exceed 15% of a horizontal scanning cycle.

Refer to chart at end of section.

**6DL4/EC88**

Refer to chart at end of section.

**6DL5  
6DL5/EL95**

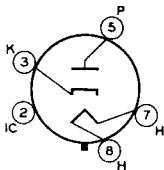
Refer to chart at end of section.

For replacement use type 6DM4A/6DA4.

**6DM4  
6DM4A**

**6DM4A/  
6DA4  
17DM4A**

**HALF-WAVE  
VACUUM RECTIFIER**



**4CG**

Glass octal type used as damper tube in horizontal-deflection circuits of television receivers. Outlines section, 13G; requires octal socket. Socket terminals 1, 2, 4, and 6 should not be used as tie points. This tube, like other power-handling tubes, should be adequately ventilated. Type 17DM4A is identical with type 6DM4A/6DA4 except for heater ratings.

	<b>6DM4A/6DA4</b>	<b>17DM4A</b>	
Heater Voltage (ac/dc) .....	6.3	16.8	volts
Heater Current .....	1.2	0.45	amperes
Heater Warm-up Time (Average) .....	—	11	seconds

**Damper Service**

For operation in a 525-line, 30-frame system

**MAXIMUM RATINGS (Design-Maximum Values)**

Peak Inverse Plate Voltage# .....	5000		volts
Peak Plate Current .....	1200		mA
Average Plate Current .....	200		mA
Plate Dissipation .....	6.5		watts
Heater-Cathode Voltage:			
Peak value .....	+300	—5000	volts
Average value .....	+100	—900	volts

# Pulse duration must not exceed 15% of a horizontal scanning cycle (10 microseconds).