

Class A₁ Amplifier

MAXIMUM RATINGS (Design-Center Values)

Plate Voltage	250	volts
Grid Voltage, Negative-bias value	50	volts
Cathode Current	20	mA
Plate Dissipation	2.2	watts

CHARACTERISTICS

Plate Voltage	200	volts
Grid Voltage	-1.2	volts
Amplification Factor	80	
Plate Resistance (Approx.)	8000	ohms
Transconductance	10500	μ mhos
Plate Current	10	mA
Grid Voltage (Approx.) for transconductance of 500 μ mhos	-3.8	volts
Grid Voltage (Approx.) for transconductance of 100 μ mhos	-5.6	volts

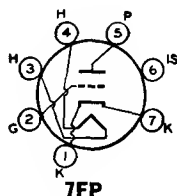
MAXIMUM CIRCUIT VALUE

Grid-Circuit Resistance	1	megohm
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6ES5

HIGH-MU TRIODE

Miniature type used as grounded-cathode rf amplifier in vhf television receivers. Outlines section, 5C; requires miniature 7-contact socket.



7FP

Heater Voltage (ac/dc)	6.3	volts	
Heater Current	0.2	ampere	
Peak Heater-Cathode Voltage	±100 max	volts	
Direct Interelectrode Capacitances:	Unshielded	Shielded	
Grid to Plate	0.5 max	0.5 max	pF
Grid to Cathode, Heater, and Internal Shield	3.2	3.2	pF
Plate to Cathode, Heater, and Internal Shield	3.2	4	pF

Class A₁ Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	250	volts
Grid Voltage, Positive-bias value	0	volts
Cathode Current	22	mA
Plate Dissipation	2.2	watts

CHARACTERISTICS

Plate Voltage	200	volts
Grid Voltage	-1	volt
Amplification Factor	75	
Plate Resistance (Approx.)	8000	ohms
Transconductance	9000	μ mhos
Plate Current	10	mA
Grid Voltage (Approx.) for plate current of 100 μ A	-6	volts

MAXIMUM CIRCUIT VALUE

Grid-Circuit Resistance	1	megohm
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6ES8

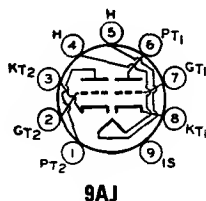
Refer to chart at end of section.

6ES8/
ECC189

4ES8/XCC189

VARIABLE-MU TWIN TRIODE

Miniature type used as cascode-type amplifier in tuners of television receivers. Outlines section, 6B; requires miniature 9-contact socket. Type 4ES8/XCC189 is identical with type 6ES8/ECC189 except for heater ratings.



9AJ

	4ES8/ XCC189	6ES8/ECC189	
Heater Voltage (ac/dc)	4	6.3	volts
Heater Current	0.6	0.365	ampere
Heater Warm-up Time (Average)	11	—	seconds

Direct Interelectrode Capacitances:

	Unshielded	Shielded*	
Grid to Plate (Each Unit)	1.9	1.9	pF
Plate to Cathode (Each Unit)	0.18	0.17	pF
Heater to Cathode (Each Unit)	3	3a	pF
Plate of Unit No.2 to Plate of Unit No.1	0.04 max	0.015 max	pF
Plate of Unit No.2 to Grid of Unit No.1	0.003 max	0.003 max	pF
Grid of Unit No.1 to Cathode of Unit No.2	0.002 max	0.002 max	pF

* With external shield connected to cathode of unit under test except as noted.

Δ With external shield connected to ground.

Class A₁ Amplifier (Each Unit)

CHARACTERISTICS

Plate Voltage	90	90	90	volts
Grid Voltage	—1.2	—5	—9	volts
Plate Resistance (Approx.)	2500	—	—	ohms
Transconductance	12500	625	125	μmhos
Plate Current	15	—	—	mA

Cascode-Type Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Supply Voltage with plate current of 0 mA	550	volts
Plate Voltage (Each unit)	130	volts
Grid Voltage, Negative-bias value (Each unit)	50	volts
Cathode Current (Each unit)	22	mA
Plate Dissipation (Each unit)	1.8	watts
Heater-Cathode Voltage:		
Unit No.1:°		
RMS voltage between cathode and heater	50	volts
Unit No.2:°		
RMS voltage between cathode and heater*	50	volts
DC voltage between cathode and heater*	130	volts

TYPICAL OPERATION in a cascode-type circuit†

Supply Voltage	180	volts
Plate Current	15	mA
Transconductance	12500	μmhos
Noise Figure*	6.5	dB
Grid Voltage (Approx.) for transconductance of 125 μmhos	—9	volts
Input Voltage for cross-modulation factor of 0.01 and transconductance of 125 μmhos	500	mV

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance (Each unit)	1	megohm
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° Grounded-cathode input unit—pins 6, 7, and 8.

‡ Grounded-grid output unit—pins 1, 2, and 3.

* Cathode positive with respect to heater.

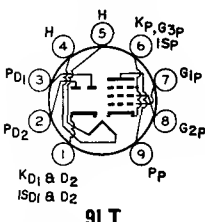
† With grid of output unit connected to a voltage divider.

* Measured with tube operating in a television tuner.

TWIN DIODE—
SHARP-CUTOFF PENTODE

6ET7
8ET7

Miniature type used in television receiver applications. The pentode unit is used as a video amplifier and the diodes are used as a horizontal phase inverter. Outlines section, 6E; requires miniature 9-contact socket. Type 8ET7 is identical with type 6ET7 except for heater ratings.



Heater Voltage (ac/dc)	6.3	8	volts
Heater Current	0.75	0.6	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

Pentode Unit as Class A₁ Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	330	volts
Grid-No.2 (Screen-Grid) Supply Voltage	330	volts
Grid-No.2 Voltage		

See curve page 98