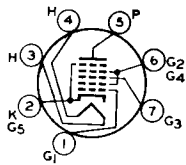


6CS6

PENTAGRID AMPLIFIER

3CS6, 4CS6, 12CS6



7CH

Miniature type used as a gated amplifier in color and black-and-white television receivers. In such service, it may be used as a combined sync separator and sync clipper. **Outlines section, 5C**; requires miniature 7-contact socket. Types 3CS6, 4CS6, and 12CS6 are identical with type 6CS6 except for heater ratings.

	3CS6	4CS6	6CS6	12CS6	
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	11	—	seconds
Heater-Cathode Voltage:					
Peak value	±200 max	±200 max	±200 max	±200 max	volts
Average value	100 max	100 max	100 max	100 max	volts
Direct Interelectrode Capacitances (Approx.)					
Grid No.1 to Plate				0.07 max	pF
Grid No.3 to Plate				0.36 max	pF
Grid No.1 to Grid No.3				0.22 max	pF
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, Grid No.4, and Grid No.5				5.5	pF
Grid No.3 to Cathode, Heater, Grid No.1, Grid No.2, Grid No.4, and Grid No.5				7	pF
Plate to Cathode, Heater, Grid No.1, Grid No.2, Grid No.3, Grid No.4, and Grid No.5				7.5	pF

Class A₁ Amplifier

CHARACTERISTICS

Plate Voltage	100	100	volts
Grids-No.2-and-No.4 Voltage	30	30	volts
Grid-No.3 Voltage	—1	0	volt
Grid-No.1 Voltage	0	—1	volt
Plate Resistance (Approx.)	0.7	1	megohm
Grid-No.3-to-Plate Transconductance	1500	—	μmhos
Grid-No.1-to-Plate Transconductance	—	1100	μmhos
Plate Current	0.8	1	mA
Grids-No.2-and-No.4 Current	5.5	1.3	mA
Grid-No.3 Voltage (Approx.) for plate current of 50 μA	—2.2	—	volts
Grid-No.1 Voltage (Approx.) for plate current of 50 μA	—	—2.5	volts

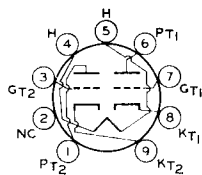
Gated Amplifier Service

MAXIMUM RATINGS (Design-Center Values)

Plate Voltage	300	volts
Grids-No.2-and-No.4 Supply Voltage	300	volts
Grids-No.2-and-No.4 Voltage	See curve page 300	
Cathode Current	14	mA
Plate Dissipation	1	watt
Grids-No.2-and-No.4 Input:		
For grids-No.2-and-No.4 voltages up to 150 volts	1	watt
For grids-No.2-and-No.4 voltages between 150 and 300 volts	See curve page 300	

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance	0.47	megohm
Grid-No.3-Circuit Resistance	2.2	megohms



9EF

6CS7

8CS7

MEDIUM-MU DUAL TRIODE

Miniature type used as combined vertical-deflection oscillator and vertical-deflection amplifier in television receivers. Unit No.1 is used as a conventional blocking oscillator in vertical-deflection circuits, and unit

No.2 as a vertical-deflection amplifier. **Outline section, 6E**; requires miniature 9-contact socket. Type 8CS7 is identical with type 6CS7 except for heater ratings.

	6CS7	8CS7	
Heater Voltage (ac/dc)	6.3	8.4	volts
Heater Current	0.6	0.45	ampere
Heater Warm-up Time (Average)	11	11	seconds
Heater-Cathode Voltage:			
Peak value	±200 max	±200 max	volts
Average value	100 max	100 max	volts
Direct Interelectrode Capacitances (Approx.):			
Grid to Plate	Unit No.1	Unit No.2	
Grid to Cathode and Heater	2.6	2.6	pF
Plate to Cathode and Heater	1.8	3	pF
Plate to Cathode and Heater	0.5	0.5	pF

Class A₁ Amplifier

CHARACTERISTICS	Unit No.1 Oscillator	Unit No.2 Amplifier	
Plate Voltage	250	250	volts
Grid Voltage	-8.5	-10.5	volts
Amplification Factor	17	15.5	
Plate Resistance (Approx.)	7700	3450	ohms
Transconductance	2200	4500	μmhos
Plate Current	10.5	19	mA
Plate Current for grid voltage of -16 volts	—	3	mA
Grid Voltage (Approx.) for plate current of 10 μA	-24	—	volts
Grid Voltage (Approx.) for plate current of 50 μA	—	-22	volts

Vertical-Deflection Oscillator and Amplifier

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

MAXIMUM RATINGS (Design-Center Values)	Unit No.1 Oscillator	Unit No.2 Amplifier	
DC Plate Voltage	500	500	volts
Peak Positive-Pulse Plate Voltage# (Absolute Maximum)	—	2200 ^Δ	volts
Peak Negative-Pulse Grid Voltage	400	250	volts
Peak Cathode Current	70	105	mA
Average Cathode Current	20	30	mA
Plate Dissipation	1.25	6.5	watts

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance

Unit No.1 Oscillator	2.2	2.2	megohms
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Pulse duration must not exceed 15% of a vertical scanning cycle (2.5 milliseconds).

^Δ Under no circumstances should this absolute value be exceeded.

6CT3

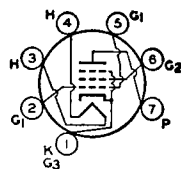
Refer to chart at end of section.

6CU5

12CU5/12C5,
17CU5/17C5

BEAM POWER TUBE

Miniature type used in the audio output stage of television receivers. Outlines section, 5D; requires miniature 7-contact socket. Types 12CU5/12C5, and 17CU5/17C5 are identical with type 6CU5 except for heater ratings.



7CV

	6CU5	12CU5/12C5	17CU5/ 17C5	
Heater Voltage (ac/dc)	6.3	12.6	16.8	volts
Heater Current	1.2	0.6	0.45	ampere
Heater Warm-up Time (Average)	—	11	11	seconds
Heater-Cathode Voltage:				
Peak value	±200 max	±200 max	±200 max	volts
Average value	100 max	100 max	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			13	pF
Plate to Cathode, Heater, Grid No.2, and Grid No.3			8.5	pF

Class A₁ Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	150	volts
Grid-No.2 (Screen-Grid) Voltage	130	volts
Grid-No.1 (Control-Grid) Voltage, Positive-bias value	0	volts
Plate Dissipation	7	watts
Grid-No.2 Input	1.4	watts
Bulb Temperature (At hottest point)	220	°C

TYPICAL OPERATION

Plate Voltage	120	volts
Grid-No.2 Voltage	110	volts
Grid-No.1 Voltage	-8	volts
Peak AF Grid-No.1 Voltage	8	volts
Zero-Signal Plate Current	49	mA
Maximum-Signal Plate Current	50	mA
Zero-Signal Grid-No.2 Current	4	mA
Maximum-Signal Grid-No.2 Current	8.5	mA
Plate Resistance (Approx.)	10000	ohms
Transconductance	7500	μmhos
Load Resistance	2500	ohms
Total Harmonic Distortion	10	per cent
Maximum-Signal Power Output	2.3	watts

MAXIMUM CIRCUIT VALUES

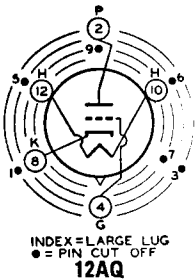
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1	megohm
For cathode-bias operation	0.5	megohm

For replacement use type 6BQ6GTB/6CU6.

6CU6

Refer to chart at end of section.

6CU8



6CW4

2CW4, 13CW4

HIGH-MU TRIODE

Nuvistor type used as a grounded-cathode, neutralized rf amplifier in vhf tuners of color and black-and-white television and FM receivers. Outlines section, 1; requires nuvistor socket. Types 2CW4 and 13CW4 are identical with type 6CW4 except for heater ratings.

	2CW4	6CW4	13CW4	
Heater Voltage (ac/dc)	2.1	6.3	13.5	volts
Heater Current	0.45	0.135	0.06	ampere
Heater Warm-up Time (Average)	8	—	—	seconds
Peak Heater-Cathode Voltage	±100 max	±100 max	±100 max	volts
Direct Interelectrode Capacitances (Approx.)				
Grid to Plate			0.92	pF
Grid to Cathode, Heater, and Shell			4.3	pF
Plate to Cathode, Heater, and Shell			1.8	pF
Plate to Cathode			0.18	pF
Heater to Cathode			1.6	pF

Class A₁ Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Supply Voltage	300°	volts
Plate Voltage	135	volts
Grid Voltage:		
Negative-bias value	55	volts
Peak positive value	0	volts
Cathode Current	15	mA
Plate Dissipation	1.5	watt

CHARACTERISTICS AND TYPICAL OPERATION

	Characteristics	Typical Operation	
Plate Supply Voltage	110	70	volts
Grid Supply Voltage	0	0	volts
Cathode-Bias Resistor	130	—	ohms
Grid Resistor	—	47000	ohms
Amplification Factor	65	68	
Plate Resistance (Approx.)	6600	5440	ohms
Transconductance	9800	12500	μ mhos
Plate Current	7	7.2	mA
Grid Voltage (Approx.) for plate current of 10 μ A ..	-4	—	volts

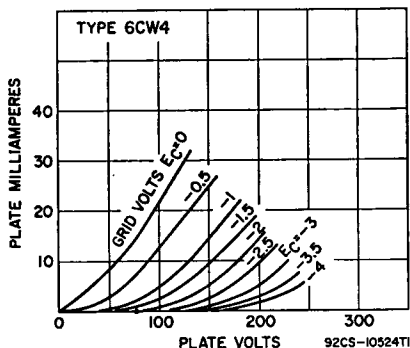
MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance:*

For fixed-bias operation	0.5	megohm
For cathode-bias operation	2.2	megohms

* A plate supply voltage of 300 volts may be used provided a sufficiently large resistor is used in the plate circuit to limit the plate dissipation to 1.5 watts under any condition of operation.

* For operation at metal-shell temperatures up to 135° C.



6CW5

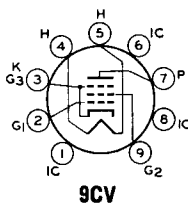
Refer to chart at end of section.

6CW5/ EL86

8CW5/XL86,
10CW5/LL86,
15CW5/PL84

POWER PENTODE

Miniature type used for vertical-deflection amplifier service in color and black-and-white television receivers. Outlines section, 6G; requires miniature 9-contact socket. Types 8CW5/XL86, 10CW5/LL86, and 15CW5/PL84 are identical with type 6CW5/EL86 except for heater ratings.



9CV

	6CW5/ EL86	8CW5/ XL86	10CW5/ LL86	15CW5/ PL84	
Heater Voltage (ac/dc)	6.3	8	10.6	15	volts
Heater Current	0.76	0.6	0.45	0.3	ampere
Heater Warm-up Time	—	—	11	—	seconds
Heater-Cathode Voltage:					
Peak value	± 330 max	± 330 max	± 330 max	± 330 max	volts
Average value	± 220 max	± 220 max	± 220 max	± 220 max	volts
Direct Interelectrode Capacitances:					
Grid No.1 to Plate				0.6	pF
Grid No.1 to Heater				0.25 max	pF
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3				13	pF
Plate to Cathode, Heater, Grid No.2, and Grid No.3				6.8	pF

Class A₁ or Class AB₁ Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	275	volts
Plate Supply Voltage	600	volts
Grid-No.2 Voltage	220	volts
Grid-No.2 (Screen-Grid) Supply Voltage	600	volts
Cathode Current	110	mA
Plate Dissipation	14	watts
Grid-No.2 Input	2.1	watts
Peak Grid-No.2 Input	7	watts

CHARACTERISTICS

Plate Voltage	170	volts
Grid-No.2 Voltage	170	volts
Grid-No.1 (Control-Grid) Voltage	-12.5	volts
Mu Factor (Grid No.2 to Grid No.1)	8	
Plate Resistance	26000	ohms
Transconductance	11000	umhos
Plate Current	70	mA
Grid-No.2 Current	3.5	mA

MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance	1	megohm
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Vertical-Deflection Amplifier

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

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	275	volts
Peak Positive-Pulse Plate Voltage#	2200	volts
Grid-No.2 Voltage	275	volts
Peak Negative-Pulse Grid-No.1 Voltage	250	volts
Peak Cathode Current	240	mA
Average Cathode Current	110	mA
Plate Dissipation	12	watts
Grid-No.2 Input	2.1	watts

MAXIMUM CIRCUIT VALUE

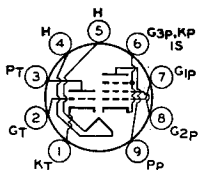
Grid-No.1-Circuit Resistance	2.2	megohms
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Pulse duration must not exceed 6% of a vertical scanning cycle (1.2 milliseconds).

**MEDIUM-MU TRIODE—
SHARP-CUTOFF PENTODE**

6CX8

8CX8



9DX

Miniature type used in television receiver applications. Pentode unit is used as video amplifier; triode unit is used in sound if-amplifier, sweep-oscillator, sync-separator, sync-amplifier, and sync-clipper circuits. Outlines section, 6E; requires miniature 9-contact socket. Type 8CX8 is identical with type 6CX8 except for heater ratings.

	6CX8	8CX8	
Heater Voltage (ac/dc)	6.3	8	volts
Heater Current	0.75	0.6	ampere
Heater Warm-up Time (Average)	—	11	volts
Heater-Cathode Voltage:			
Peak value	±200 max	±200 max	volts
Average value	100 max	100 max	volts
Direct Interelectrode Capacitances:			
Triode Unit:			
Grid to Plate		4.4	pF
Grid to Cathode and Heater		2.2	pF
Plate to Cathode and Heater		0.38	pF
Pentode Unit:			
Grid No.1 to Plate		0.06	pF
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield		9	pF
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield		4.4	pF
Triode Grid to Pentode Plate		0.018 max	pF
Pentode Grid No.1 to Triode Plate		0.005 max	pF
Pentode Plate to Triode Plate		0.17 max	pF

Class A₁ Amplifier

MAXIMUM RATINGS (Design-Maximum Values)	Triode Unit	Pentode Unit	
Plate Voltage	330	330	volts
Grid-No.2 (Screen-Grid) Voltage	—	330	volts
Grid-No.2 Voltage	—	See curve page 300	
Grid-No.1 (Control-Grid) Voltage, Positive-bias value	0	0	volts
Plate Dissipation	2	5	watts
Grid-No.2 Input:			
For grid-No.2 voltages up to 165 volts	—	1.1	watts
For grid-No. voltages between 165 and 330 volts	—	See curve page 300	

CHARACTERISTICS

Plate Supply Voltage	150	200	volts
Grid-No.2 Supply Voltage	—	125	volts
Cathode-Bias Resistor	150	68	ohms
Amplification Factor	40	—	
Plate Resistance (Approx.)	8700	70000	ohms
Transconductance	4600	10000	μ mhos
Plate Current	9.2	24	mA
Grid-No.2 Current	—	5.2	mA
Grid-No.1 (Voltage Approx.) for plate current of 100 μ A	-5	-8.5	volts

MAXIMUM CIRCUIT VALUES

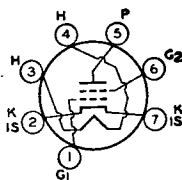
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	0.25	megohm
For cathode-bias operation	1	1	megohm

6CY5

2CY5, 3CY5

SHARP-CUTOFF TETRODE

Miniature type used as rf amplifier in vhf tuners of television receivers. Outlines section, 5C; requires miniature 7-contact socket. Types 2CY5 and 3CY5 are identical with type 6CY5 except for heater ratings.



7EW

	2CY5	3CY5	6CY5	
Heater Voltage (ac/dc)	2.4	2.9	6.3	volts
Heater Current	0.6	0.45	0.2	ampere
Heater Warm-up Time (Average)	11	11	—	seconds
Peak Heater-Cathode Voltage	± 100 max	± 100 max	± 100 max	volts
Direct Interelectrode Capacitances (Approx.) [*] :				
Grid-No.1 to Plate			0.03	pF
Grid-No.1 to Cathode, Heater, Grid No.2 and Internal Shield			4.5	pF
Plate to Cathode, Heater, Grid No.2, and Internal Shield			3	pF

* With external shield connected to cathode.

Class A₁ Amplifier

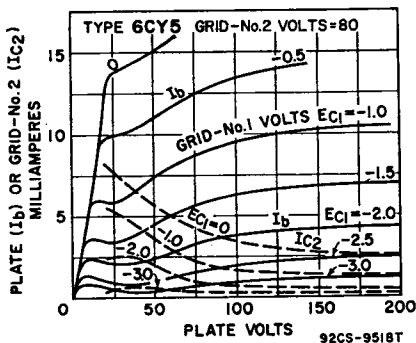
MAXIMUM RATINGS (Design-Maximum Values)		
Plate Voltage	180	volts
Grid-No.2 (Screen-Grid) Supply Voltage	180	volts
Grid-No.2 Voltage	See curve page 300	
Grid-No.1 (Control-Grid) Voltage, Positive-bias value	0	volts
Cathode Current	20	mA
Plate Dissipation	2	watts
Grid-No.2 Input:		
For grid-No.2 voltages up to 90 volts	0.5	watt
For grid-No.2 voltages between 90 and 180 volts	See curve page 300	

CHARACTERISTICS

Plate Voltage	125	volts
Grid-No.2 Voltage	80	volts
Grid-No.1 Voltage	-1	volt
Plate Resistance (Approx.)	0.1	megohm
Transconductance	8000	μ mhos
Plate Current	10	mA
Grid-No.2 Current	1.5	mA
Grid-No.1 Voltage (Approx.) for plate current of 20 μ A	-6	volts

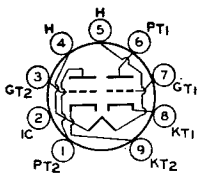
MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance	0.5	megohm
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DUAL TRIODE

6CY7



9LG

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 9-contact socket.

Heater Voltage (ac/dc)	6.3	volts
Heater Current	0.75	ampere
Heater-Cathode Voltage:		
Peak value	±200 max	volts
Average value	100 max	volts

Class A₁ Amplifier

CHARACTERISTICS	Unit No.1	Unit No.2	
Plate Supply Voltage	250	150	volts
Grid Voltage	-3	—	volts
Cathode-Bias Resistor	—	620	ohms
Amplification Factor	68	5	
Plate Resistance (Approx.)	52000	920	ohms
Transconductance	1300	5400	μmhos
Plate Current	1.2	30	mA
Plate Current for grid voltage of -30 volts	—	3.5	mA
Grid Voltage (Approx.) for plate current of 10 μA	-5.5	—	volts
Grid Voltage (Approx.) for plate current of 200 μA	—	-40	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	350	350	volts
Peak Positive-Pulse Plate Voltage#	—	1800	volts
Peak Negative-Pulse Grid Voltage	-400	-250	volts
Peak Cathode Current	—	120	mA
Average Cathode Current	—	35	mA
Plate Dissipation	1	5.5	watts

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance	2.2	2.2†	megohms
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Pulse duration must not exceed 15% of a vertical scanning cycle (2.5 milliseconds).

† For cathode-bias operation.