



ELECTRONIC TUBE REFERENCE

12GA6

Voltage - Pentode or Tetrode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
HEPTODE

Low-voltage heptode oscillator-converter for 12 V automobile radios. It combines mixer and local-oscillator functions while operating directly from the vehicle supply without conventional high-voltage B-plus.

GENERAL CHARACTERISTICS

BASE DESIGNATION	7CH	BASE PINS	7
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

7CH - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – G1	A	G1 – Control Grid	CONNECTED
PIN2 – G5	A	G5 – Fifth Grid	CONNECTED
PIN2 – K	A	K – Cathode	CONNECTED
PIN3 – H	–	H – Heater	CONNECTED
PIN4 – H	–	H – Heater	CONNECTED
PIN5 – P	A	P – Plate (Anode)	CONNECTED
PIN6 – G2	A	G2 – Screen Grid	CONNECTED
PIN6 – G4	A	G4 – Fourth Grid	CONNECTED
PIN7 – G3	A	G3 – Suppressor Grid	CONNECTED

SECTION RATINGS

SECTION1 Heptode	
PLATE RESISTANCE	1000000 Ω
TRANSCONDUCTANCE	0.00014 S
AMPLIFICATION FACTOR	2
MAXIMUM PLATE VOLTAGE	16 V
MAXIMUM SCREEN VOLTAGE	16 V
<i>Low-voltage heptode converter; promoted gm is conversion transconductance.</i>	

12GA6 — Miniature Heptode Pentagrid Converter

The **12GA6** is a miniature heptode vacuum tube designed primarily to perform the combined functions of mixer and oscillator (pentagrid converter) in automobile radio receivers. It is specifically engineered to operate with its plate and screen voltages supplied directly from a 12-volt storage battery, eliminating the need for a high-voltage power supply.

Construction, Heater, and Pinout

The 12GA6 is constructed in a T-5 1/2 glass envelope with a miniature button 7-pin base (EIA 7CH / E7-1). It features a coated unipotential cathode and can be mounted in any position.

Heater Characteristics

The heater is designed to operate from either an AC or DC supply, typically sourced from an automobile electrical system.

Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	0.15 A
Heater Voltage Range (Automobile Service)	10.0 V to 15.9 V

Under automobile service conditions, the heater voltage must not fall below 10.0 volts or exceed 15.9 volts. Operation near these extreme limits results in a sacrifice in performance at low voltages and a reduction in life expectancy at high voltages. Improved supply-voltage regulation significantly increases equipment reliability.

Terminal Connections and Pinout

The 12GA6 uses a 7-pin miniature base with the following pin assignments (viewed from the bottom):

Pin Number	Connection
Pin 1	Grid Number 1 (Oscillator Grid)
Pin 2	Cathode and Grid Number 5 (Suppressor Grid)
Pin 3	Heater
Pin 4	Heater
Pin 5	Plate
Pin 6	Grid Numbers 2 and 4 (Screen Grid)
Pin 7	Grid Number 3 (Signal Grid)

Maximum Ratings

The ratings of the 12GA6 are established under the Design-Maximum System. These are limiting values of operating and environmental conditions that should not be exceeded under the worst probable conditions in a bogey tube.

Rating	Value
Maximum Plate Voltage	16 V
Maximum Screen Voltage (Grids #2 & #4)	16 V
Maximum Positive DC Grid #3 Voltage	0 V
Maximum Negative DC Grid #3 Voltage	16 V
Maximum Heater-Cathode Voltage (Heater Positive)	16 V
Maximum Heater-Cathode Voltage (Heater Negative)	16 V
Maximum Grid #3 Circuit Resistance	10 MΩ

Electrical Characteristics and Typical Operation

The 12GA6 is optimized for low-voltage operation, typically running directly from a nominal 12.6 V supply.

Converter Service

In typical converter service, the tube operates with the following parameters:

Parameter	Value
Plate Voltage	12.6 V
Screen Voltage	12.6 V
Grid #3 Supply Voltage	0 V
Grid #3 Resistor (Bypassed)	2.2 M Ω
Grid #1 Voltage (RMS, approximate)	1.6 V
Grid #1 Resistor	33,000 Ω
Plate Resistance (approximate)	1.0 M Ω
Conversion Transconductance	140 μ mhos
Plate Current	0.30 mA
Screen Current	0.80 mA
Grid #1 Current	0.060 mA
Grid #3 Voltage for $G_c = 5 \mu$ mhos (approximate)	-3 V
Grid #3 Voltage for $G_c = 20 \mu$ mhos (approximate)	-2.5 V

Oscillator Characteristics (Not Oscillating)

When evaluated for its oscillator section characteristics under non-oscillating conditions, with the screen (Grids #2 and #4) connected to the plate, the triode-connected characteristics are as follows:

Parameter	Value
Plate Voltage	12.6 V
Screen Voltage (Connected to Plate)	12.6 V
Grid #3 Voltage	0 V
Amplification Factor (between Grid #1 and Grids #2 & #4 connected to Plate)	9.0
Transconductance (between Grid #1 and Grids #2 & #4 connected to Plate)	2400 μ mhos
Cathode Current	3.6 mA
Grid #1 Voltage for Plate Current (I_b) = 10 μ A (approximate)	-3.3 V

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12GA6 are specified both with and without an external shield. When a shield is used, it is an EIA 316 shield connected to Pin 2 (Cathode and Grid Number 5).

Capacitance Parameter	With Shield	Without Shield	Unit
Grid #3 to All	8.0	8.0	μF
Plate to All	13	8.0	μF
Grid #1 to All	5.0	5.0	μF
Cathode to All except Grid #1	20	15	μF
Grid #3 to Plate (Maximum)	0.25	0.3	μF
Grid #1 to Grid #3 (Maximum)	0.15	0.15	μF
Grid #1 to Plate (Maximum)	0.05	0.1	μF
Grid #1 to Cathode	2.5	2.5	μF

Technical Summary

The **12GA6** is a specialized miniature heptode designed for low-voltage pentagrid converter applications in automotive receivers. Operating directly from a 12-volt storage battery, it eliminates the need for high-voltage power generation. With a 12.6 V, 0.15 A heater, a maximum plate and screen rating of 16 V, and a conversion transconductance of 140 μmhos , the 12GA6 provides a compact, efficient solution for combined mixer and oscillator functions in mobile environments.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Tung Sol

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1961 TUNG SOL

Section 1 · Heptode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	—
Heater current	150 mA	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Conversion transconductance	140 μ S	Converter
Oscillator transconductance	2400 μ S	NotOscillating

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	0.1 pF	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1966 Tung Sol Electronic Tubes 3 of 4

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1966 TUNG SOL ELECTRONIC TUBES 3 OF 4

Section 1 · Heptode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	12.6 V	Converter
Screen voltage	12.6 V	Converter

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid #3 resistor	2.2 megohm	Converter
Grid #1 voltage RMS	7.6 V	Converter
Grid #1 resistor	33000 ohm	Converter
Plate current	0.3 mA	Converter
Screen current	0.8 mA	Converter
Oscillator cathode current	3.6 mA	Oscillator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	1000000 ohm	Converter
Conversion transconductance	740 uS	Converter
Oscillator amplification factor	9	Oscillator
Oscillator transconductance	2400 uS	Oscillator

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid #3 to all capacitance	8 pF	—
Plate to all capacitance	8 pF	—
Grid #1 to all capacitance	5 pF	—
Grid #3-to-plate capacitance	0.3 pF	—

TUBE TINKER

An independent reference for electronic tubes, vacuum tubes, and their source documents.

[Catalog](#) [Tube types](#) [Full books](#) [Blog](#) [Feedback & corrections](#)

© 2026 Tube Tinker