



ELECTRONIC TUBE REFERENCE

12A8GT

Voltage Radio Detector Converter electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

HEPTODE

GT-envelope heptode oscillator-converter for superheterodyne receivers. Local oscillation and frequency conversion are integrated in one multi-grid structure, with heater characteristics suited to AC/DC series-string radios.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	8
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Heptode	
PLATE RESISTANCE	650000 Ω
TRANSCONDUCTANCE	0.0005 S
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM SCREEN VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	1 W
MAXIMUM SCREEN DISSIPATION	0.3 W
MAXIMUM CATHODE CURRENT	14 mA
<i>Pentagrid converter; oscillator subsection characteristics are preserved in parameters rather than treated as a separate physical section.</i>	

12A8GT — Pentagrid Converter

An indirectly heated pentagrid converter designed for superheterodyne receiver applications, featuring a low-current heater optimized for series-string AC-DC mains operation.

Overview

The **12A8GT** is a multi-electrode vacuum tube of the pentagrid converter type, designed primarily for frequency mixer and oscillator service in superheterodyne radio receivers. It features an indirectly heated, unipotential cathode and is housed in a compact glass envelope with an octal base.

The electrical characteristics of the 12A8GT are designed to match those of the 6.3-volt types [6A8](#), [6A8G](#), [6ABGT](#), and the single-ended [7B8](#), with the primary differences being its heater rating and specific interelectrode capacitances. The 12A8GT is specifically tailored for series-string heater arrangements in AC-DC receivers, where its low current draw significantly reduces overall power consumption and simplifies power supply design.

Physical Construction, Base, and Pinout

The 12A8GT is constructed in a **T-9 glass bulb** with a **small wafer 8-pin octal base** featuring a metal shell. The control grid (Grid #4) is terminated at a top cap to minimize input-to-output coupling and optimize RF performance.

Physical Dimensions

- **Maximum Overall Height:** 3-5/16 inches (approx. 84.1 mm)
- **Maximum Seated Height:** 2-3/4 inches (approx. 69.9 mm)
- **Maximum Bulb Diameter:** 1-3/16 inches (approx. 30.2 mm)
- **Maximum Base Diameter:** 1-5/16 inches (approx. 33.3 mm)
- **Top Cap Diameter:** 1/4 inch nominal

Pin Configuration

The tube utilizes an **8A** pinout arrangement, viewed from the bottom of the base:

Pin Number	Electrode Connection	Description
Pin 1	S	Shield / Metal Shell
Pin 2	H	Heater
Pin 3	P	Mixer Plate
Pin 4	Gs (G3 + G5)	Screen Grid
Pin 5	Go (G1)	Oscillator Grid

Pin Number	Electrode Connection	Description
Pin 6	Ga (<u>G2</u>)	Oscillator Anode
Pin 7	H	Heater
Pin 8	K	Cathode
Top Cap	G (G4)	Control Grid (RF Input)

Heater Characteristics and Series-String Application

The heater of the 12A8GT is designed for either AC or DC operation. By operating at a nominal current of **0.15 A**, the tube is highly efficient compared to older 0.3 A designs.

Heater Parameter	Value
Nominal Heater Voltage	12.5 to 12.6 V
Nominal Heater Current	0.15 A (150 mA)
Calculated Heater Power	1.875 to 1.89 W
Cathode Type	Coated, Unipotential

In AC-DC receivers, the 12A8GT's heater is connected in series with other 150 mA tubes. This configuration allows the series string to be powered directly from the mains supply through a small series resistor, eliminating the need for bulky, heat-generating line cords or plug-in dropping resistors. This design reduces the total heater power required for the entire receiver by approximately 50% compared to systems utilizing 0.3 A tubes.

Maximum Ratings

The following absolute maximum ratings must be observed to ensure reliable operation and prevent premature tube failure:

Parameter	Maximum Rating
Maximum Plate Voltage	300 V
Maximum Screen (Gs) Supply Voltage	300 V
Maximum Screen (Gs) Voltage	100 V
Maximum Oscillator Anode (Ga) Supply Voltage	300 V
Maximum Oscillator Anode (Ga) Voltage	200 V
Minimum External Control Grid (G) Bias Voltage	0 V

Parameter	Maximum Rating
Maximum Total Cathode Current	14 mA
Maximum Plate Dissipation	1.0 W
Maximum Screen Dissipation	0.3 W
Maximum Oscillator Anode (Ga) Dissipation	0.75 W

Typical Operating Conditions and Characteristics

The 12A8GT operates as a pentagrid converter where Grid #1 (Go) acts as the oscillator grid, Grid #2 (Ga) acts as the oscillator anode, Grid #4 (G) acts as the RF control grid, and Grids #3 and #5 (Gs) are tied together internally to act as the screen grid.

Converter Service Operating Points

Parameter	Low-Voltage Point	High-Voltage Point
Plate (P) Voltage	100 V	250 V
Screen (Gs) Voltage	50 V	100 V
Control Grid (G) Voltage	-1.5 V	-3.0 V
Oscillator Anode (Ga) Supply Voltage	—	250 V ¹
Oscillator Anode (Ga) Voltage	100 V	—
Oscillator Grid (Go) Resistor	50,000 Ω	50,000 Ω
Plate Current	1.1 to 1.2 mA	3.3 to 3.5 mA
Screen Current	1.3 to 1.5 mA	2.7 to 3.2 mA
Oscillator Anode Current	1.6 to 2.0 mA	4.0 mA
Oscillator Grid Current	0.25 mA	0.4 to 0.5 mA
Total Cathode Current (Calculated)	4.6 to 4.95 mA	10.4 to 11.2 mA ²
Plate Resistance (Approx.)	0.3 to 0.6 M Ω	0.36 M Ω

¹ Applied through a properly by-passed 20,000 Ω dropping resistor. ² The published typical total cathode current is 4.6 mA for the low-voltage point and 10.6 mA for the high-voltage point.

Conversion Transconductance and AGC Action

The conversion transconductance (S_C) of the 12A8GT is highly dependent on the control grid bias, enabling effective Automatic Gain Control (AGC/AVC) in receiver circuits:

- **At 100 V Plate Voltage:**
 - $S_C = 350$ to $360 \mu\text{mhos}$ at $E_g = -1.5 \text{ V}$
 - $S_C = 180 \mu\text{mhos}$ at $E_g = -3.0 \text{ V}$
 - $S_C = 50 \mu\text{mhos}$ at $E_g = -6.0 \text{ V}$
 - $S_C = 3 \mu\text{mhos}$ (Approx.) at $E_g = -20 \text{ V}$
 - Cut-off bias for $S_C = 2 \mu\text{mhos}$ is -20 V
- **At 250 V Plate Voltage:**
 - $S_C = 500$ to $550 \mu\text{mhos}$ at $E_g = -3.0 \text{ V}$
 - $S_C = 325 \mu\text{mhos}$ at $E_g = -6.0 \text{ V}$
 - $S_C = 100 \mu\text{mhos}$ at $E_g = -10 \text{ V}$
 - $S_C = 6 \mu\text{mhos}$ (Approx.) at $E_g = -35 \text{ V}$
 - Cut-off bias for $S_C = 2 \mu\text{mhos}$ is -45 V

Oscillator Section Characteristics (Non-Oscillating)

When the oscillator section of the 12A8GT is evaluated under static, non-oscillating conditions, it exhibits the following characteristics:

- **Transconductance:** Approximately $1150 \mu\text{mhos}$
- **Amplification Factor (μ):** 75
- **Oscillator Anode Current:** 4.0 mA

These values are measured under the following specific test conditions:

- Plate Voltage: 250 V
- Oscillator Anode Voltage: 100 V
- Screen Voltage: 55 V
- Control Grid Voltage: -2.0 V
- Oscillator Grid Voltage: -1.0 V

Interelectrode Capacitances

The interelectrode capacitances of the 12A8GT vary slightly depending on the shielding configuration.

Capacitances with External Shield Connected to Cathode

- **Control Grid (G) to Mixer Plate (P):** 0.26 pF (max)
- **Control Grid (G) to Oscillator Anode (Ga):** 0.19 pF (max)

- **Control Grid (G) to Oscillator Grid (Go):** 0.16 pF (max)
- **Oscillator Grid (Go) to Oscillator Anode (Ga):** 1.1 pF
- **RF Input (Control Grid to all other electrodes):** 9.5 pF
- **Oscillator Input (Go to all other electrodes except Ga):** 6.0 pF
- **Oscillator Output (Ga to all other electrodes except Go):** 4.6 pF
- **Mixer Output (Plate to all other electrodes):** 12 pF

Capacitances with Standard Shield Can

- **Grid #4 to Plate:** 0.20 pF
- **Grid #4 to Grid #2:** 0.19 pF
- **Grid #4 to Grid #1:** 0.15 pF
- **Grid #1 to Grid #2:** 1.0 pF
- **Grid #4 to all other electrodes:** 7.5 pF
- **Grid #2 to all other electrodes:** 5.0 pF
- **Plate to all other electrodes:** 7.5 pF
- **Grid #1 to all other electrodes:** 6.2 pF

Technical Summary

The **12A8GT** is a versatile, octal-based pentagrid converter designed for superheterodyne frequency conversion in space- and power-constrained AC-DC receivers. By combining the mixer and oscillator functions into a single envelope and utilizing a highly efficient **12.6 V, 150 mA** heater, it significantly reduces the component count and power dissipation of radio receivers. With a maximum plate rating of **300 V** and a conversion transconductance of up to **550 μ mhos**, the 12A8GT provides robust performance and excellent AGC characteristics, making it a staple of mid-20th-century series-string receiver designs.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1939 Arcturus

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

1939 ARCTURUS

Section 1 · Heptode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	250 V	—
Screen-grid voltage	100 V	—
Anode-grid voltage	250 V	—
Control-grid voltage	-3 V	—
Plate current	3.3 mA	—
Screen-grid current	3.2 mA	—
Anode-grid current	4 mA	—
Oscillator-grid current	0.5 mA	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Conversion conductance	500 μ S	—



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

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Oscillator Transconductance	1150 μ S	NotOscillating

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Oscillator Amplification Factor	75	NotOscillating

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ac –Dc Operated Superheterodyne Rece Ivers Using	150 mA	—
Max Imum Plate Voltage	300 V	—
Max Imum Screen (Gs) Supply Voltage	300 V	—
Max Imum Screen (Gs) Voltage	100 V	—
Minimum External Control Grid (G) Bias Voltage	0 V	—
Max Imum Oscillator Anode (Ga) Supply Voltage	300 V	—
Maximum Oscillator Anode (Ga) Voltage	200 V	—
Maximum Total Cathode Current	14 mA	—
Max Imum Plate Dissipation	1 W	—
Max Imum Screen Dissipation	0.3 W	—
Max Imum Oscillator Anode (Ga) Dissipation .	75 W	—
Oscillator Anode (Ga) Supply Voltage*	250 V	—
Oscillator Anode {Ga) Voltage	100 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Oscillator Grid (Go) To Oscillator Anode (Ga)	1.1 pF	—
Electrodes	12 pF	—