



ELECTRONIC TUBE REFERENCE

12ED5

Power - Beam Single (NOT sweep) (under 10W) electronic tube

CONSOLIDATED TECHNICAL
DATA

1 SECTION
CONSTRUCTION
BEAMPOWER

Miniature beam-power pentode designed specifically for audio-output amplifier service, providing a compact power stage for low-voltage consumer equipment.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	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

SECTION RATINGS

SECTION1 Beam Power	
PLATE RESISTANCE	300000 Ω
TRANSCONDUCTANCE	0.006 S
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM SCREEN VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	2 W
MAXIMUM SCREEN DISSIPATION	1.5 W
<i>Promoted from published ratings/characteristics tables; additional operating points and capacitances retained in TUBE_SECTION_PARAMETER.</i>	

12ED5 — Beam Power Pentode

The **12ED5** is a miniature beam power pentode designed primarily for service as an audio output amplifier. Housed in a 7-pin miniature glass envelope, this tube features a coated unipotential cathode

and a heater with controlled thermal characteristics. The controlled heater warm-up cycle is specifically designed to minimize heater voltage surges when the tube is operated in series-string arrangements with other similarly controlled television or audio receiving tubes. The 12ED5 can be operated in any mounting position.

Physical Specifications and Basing Configuration

The 12ED5 utilizes a standard T-5 1/2 glass bulb and a 7-pin miniature base. Its physical dimensions conform to the following maximum limits:

- **Maximum overall length:** 2 3/8 inches
- **Maximum seated height:** 2 1/8 inches
- **Maximum diameter:** 3/4 inch

The bottom-view basing diagram provides the following pin connections:

- **Pin 1:** Grid Number 1 (Control Grid, G1)
- **Pin 2:** Cathode (K) and Grid Number 3 (Beam Plates, G3)
- **Pin 3:** Heater (H)
- **Pin 4:** Heater (H)
- **Pin 5:** Grid Number 1 (Control Grid, G1)
- **Pin 6:** Grid Number 2 (Screen Grid, G2)
- **Pin 7:** Plate (P)

Grid Number 1 is internally connected to both Pin 1 and Pin 5, which can facilitate circuit layout and heat dissipation. Grid Number 3 (the beam-forming plates) is internally tied to the cathode at Pin 2.

Heater Characteristics and Controlled Warm-Up

The heater of the 12ED5 is designed for operation from either an AC or DC supply. It has a nominal voltage rating of 12.6 V and draws a nominal current of 0.45 A.

Heater Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	0.45 A
Calculated Heater Power	5.67 W
Heater Supply Type	AC or DC
Approximate Warm-Up Time	11.0 seconds

The thermal characteristics of the heater are tightly controlled. The approximate heater warm-up time of 11.0 seconds is defined by a specific test condition: it is the time required for the voltage across the heater to reach 80% of its rated voltage (10.08 V) after applying four times the rated heater voltage (50.4

V) to a circuit consisting of the tube heater in series with an external resistance equal to three times the nominal heater operating resistance.

Under nominal operating conditions, the hot heater resistance is calculated as:

$$R_{\text{hot}} = \frac{12.6 \text{ V}}{0.45 \text{ A}} = 28 \, \Omega$$

Using this value, the test series resistance is calculated as:

$$R_{\text{series}} = 3 \times 28 \, \Omega = 84 \, \Omega$$

This controlled warm-up characteristic ensures that when the tube is used in series-string heater circuits, voltage surges across individual heaters during the initial turn-on phase are minimized.

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12ED5, measured without an external shield, are as follows:

Capacitance Parameter	Value
Grid Number 1 to Plate	0.26 μF
Input: G1 to (H + K + <u>G2</u> + G3)	14 μF
Output: P to (H + K + <u>G2</u> + G3)	8.5 μF

These capacitance values reflect the typical shielding properties of the beam power pentode structure, where the low grid-to-plate capacitance helps prevent unwanted feedback and instability in high-gain audio stages.

Design-Maximum Ratings

The ratings for the 12ED5 are established under the Design-Maximum System. Design-maximum ratings are limiting values of operating and environmental conditions applicable to a nominal electron device of this type. They should not be exceeded under the worst probable operating conditions, taking into account supply-voltage variations, component tolerances, equipment control adjustments, load variations, signal variations, and environmental conditions.

Rating Parameter	Design-Maximum Limit
Maximum Plate Voltage	150 V
Maximum Grid Number 2 (Screen Grid) Voltage	150 V
Maximum Plate Dissipation	6.25 W
Maximum Grid Number 2 Dissipation	1.5 W
Maximum Grid Number 1 Circuit Resistance (Fixed Bias)	0.1 M Ω

Rating Parameter	Design-Maximum Limit
Maximum Grid Number 1 Circuit Resistance (Cathode Bias)	0.5 MΩ
Max Heater-Cathode Voltage (Heater Negative to Cathode, DC)	200 V
Max Heater-Cathode Voltage (Heater Negative to Cathode, Total DC + Peak)	300 V
Max Heater-Cathode Voltage (Heater Positive to Cathode, DC)	100 V
Max Heater-Cathode Voltage (Heater Positive to Cathode, Total DC + Peak)	200 V

The maximum plate and screen grid voltages are both limited to 150 V, making this tube highly suitable for low-voltage or transformerless equipment designs. The maximum plate dissipation is rated at 6.25 W, while the screen grid can safely dissipate up to 1.5 W. The grid circuit resistance limits must be strictly observed to prevent thermal runaway: fixed-bias operation is restricted to a maximum of 0.1 MΩ, whereas self-bias (cathode bias) operation allows up to 0.5 MΩ.

Typical Operating Conditions and Class A1 Amplifier Characteristics

The 12ED5 is characterized for Class A1 audio power amplifier service. The typical operating parameters are documented at two distinct plate and screen voltage levels (110 V and 125 V), utilizing a load resistance of 4,500 Ω in both cases.

Parameter	Operating Point A	Operating Point B	Unit
Heater Voltage	12.6	12.6	V
Heater Current	0.45	0.45	A
Plate Voltage	110	125	V
Grid Number 2 Voltage	110	125	V
Grid Number 1 Voltage	-4.0	-4.5	V
Peak AF Grid Number 1 Voltage	4.0	4.5	V
Zero-Signal Plate Current	32	37	mA

Parameter	Operating Point A	Operating Point B	Unit
Maximum-Signal Plate Current	31	36	mA
Zero-Signal Grid Number 2 Current	4.0	7.0	mA
Maximum-Signal Grid Number 2 Current	8.0	11	mA
Transconductance	8,100	8,500	μmhos
Plate Resistance (Approximate)	14,000	14,000	Ω
Load Resistance	4,500	4,500	Ω
Maximum-Signal Power Output	1.1	1.5	W
Total Harmonic Distortion (Approximate)	5	5	%

An interesting characteristic of the 12ED5 is that the plate current decreases slightly under full-signal conditions. At 110 V, the plate current drops from 32 mA (zero-signal) to 31 mA (maximum-signal). At 125 V, it drops from 37 mA to 36 mA. Conversely, the screen grid (Grid Number 2) current increases significantly under full-signal conditions, doubling from 4.0 mA to 8.0 mA at the 110 V operating point, and increasing from 7.0 mA to 11 mA at the 125 V operating point.

With a 125 V supply, the tube delivers a maximum-signal power output of 1.5 W into a 4,500 Ω load with approximately 5% total harmonic distortion. At the lower supply voltage of 110 V, the power output is 1.1 W with the same distortion level. The high transconductance of 8,100 to 8,500 μmhos allows the tube to be driven to full output with a relatively small peak audio-frequency grid signal (4.0 V to 4.5 V peak).

Technical Summary

The **12ED5** is a compact, high-transconductance **7-pin miniature beam power pentode** designed for **Class A1 audio output amplification**. It features a **12.6 V, 0.45 A heater** with controlled warm-up characteristics (approximately 11.0 seconds) to prevent voltage surges in series-string heater circuits.

Operating at moderate plate and screen voltages up to **150 V**, the 12ED5 is capable of delivering **1.1 to 1.5 W of audio power** into a **4,500 Ω load** with **5% total harmonic distortion**. Its high transconductance (up to **8,500 μmhos**) and low drive voltage requirements make it an efficient and effective output stage for compact audio systems and television receivers. The tube's design-maximum ratings, including a **6.25 W plate dissipation** limit and robust heater-cathode voltage ratings, ensure reliable operation within its intended low-voltage application envelope.



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 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	150 mA	Nominal
Plate voltage	150 V	Typical operating conditions
Screen voltage	150 V	Typical operating conditions
Plate current	3237 mA	Typical operating conditions



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1966 Tung Sol Electronic Tubes 2 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 1 · Beam Power

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HEATER VOLTAGE	12.6 V	HEATER VOLTAGE 12.6 VOLTS
HEATER WARM--~UP TIME (APPROX.)*	11 s	HEATER WARM--~UP TIME (APPROX.)* 11.0 SECONDS
HEATER VOLTAGE	12.6 V	HEATER VOLTAGE 12.6 12.6 VOLTS
HEATER CURRENT 0.~{	5 A	HEATER CURRENT 0.~{ 5 0,4jF AMP.
PLATE VOLTAGE	11 V	PLATE VOLTAGE 110 LZjF VOLTS
GRID #	2 V	GRID #2 VOLTAGE ,110 12,5 VOLTS

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
GRID #1 VOLTAGE –	4 V	GRID #1 VOLTAGE —4.Q —4.jr VOLTS
PEAK AF GRID #	1 V	PEAK AF GRID #1 VOLTAGE 4.0 4.5 VOLTS
PLATE RESISTANCE (APPROX.J Z4 000	14 Ω	PLATE RESISTANCE (APPROX.J Z4 000 14 000 OHMS

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAXIMUM PLATE VOLTAGE	15 V	MAXIMUM PLATE VOLTAGE 150 VOLTS
MAXIMUM GRID #	2 V	MAXIMUM GRID #2 VOLTAGE 150 VOLTS
MAXIMUM PLATE DISSIPATION	6.25 mA	MAXIMUM PLATE DISSIPATION 6.25 WATTS
MAXIMUM GRID #	2 mA	MAXIMUM GRID #2 DISSIPATION 1.5 WATTS
MAXIMUM GRID #	1 mA	MAXIMUM GRID #1 CIRCUIT RESISTANCE:
FIXED BIAS 0	1 M Ω	FIXED BIAS 0.1 MEGOHM
CATHODE BIAS 0	5 M Ω	CATHODE BIAS 0.5 MEGOHM
ZERO—SIGNAL PLATE CURRENT	32 mA	ZERO—SIGNAL PLATE CURRENT 32 3] MA.
MAXIMUM—SIGNAL PLATE CURRENT	3 mA	MAXIMUM—SIGNAL PLATE CURRENT 3L 36 MA.
ZERO—SIGNAL GRID #	2 mA	ZERO—SIGNAL GRID #2 CURRENT 4.0].0 MA.
MAXIMUM—SIGNAL GRID #	2 mA	MAXIMUM—SIGNAL GRID #2 CURRENT \$,~ 11 MA.
LOAD RESISTANCE	4 Ω	LOAD RESISTANCE 4 500 4 500 OHMS
MAXIMUM—SIGNAL POWER OUTPUT	1.1 mA	MAXIMUM—SIGNAL POWER OUTPUT 1.1 Z.5 WATTS

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