



ELECTRONIC TUBE REFERENCE

13SPA

Voltage - Pentode High Frequency (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Indirectly heated high-frequency pentode intended for HF amplification or detector service. Cossor documentation identifies it as a radio-frequency signal tube capable of both amplification and detection in receiving equipment.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	7
NOMINAL HEATER	13 V / 200 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Pentode	
TRANSCONDUCTANCE	0.0025 S
MAXIMUM PLATE VOLTAGE	200 V
MAXIMUM SCREEN VOLTAGE	100 V
Published ratings and characteristics promoted from approved datasheet.	

13SPA — Cossor High-Frequency Pentode

The **13SPA** (also designated as the Cossor 13 S.P.A.) is an indirectly heated high-frequency pentode designed for series-heater operation. It is primarily intended for use in AC/DC or DC mains radio receivers, serving as either a high-frequency amplifier or a highly sensitive detector.

Heater and Series-String Configuration

The 13SPA is equipped with an indirectly heated cathode. Its heater is designed to run in series with other valves in a series-string heater chain, which is typical for transformerless AC/DC or DC receivers.

Heater Parameter	Value
Nominal Heater Voltage	13 V (approx.)
Nominal Heater Current	0.2 A
Heating Method	Indirect

By operating at a constant current of 0.2 A, the 13SPA can be easily integrated into standard series-run heater circuits without requiring a mains transformer.

Electrical Characteristics and Ratings

The 13SPA is designed to operate with moderate voltages, providing stable performance in high-frequency stages. The maximum ratings and typical electrical characteristics are as follows:

Parameter	Value
Maximum Anode Voltage	200 V
Maximum Auxiliary Grid Voltage	100 V
Mutual Conductance (g_m)	2.5 mA/V

The mutual conductance of 2.5 mA/V is specified at the following operating point:

- **Anode Voltage (V_a):** 200 V
- **Auxiliary Grid Voltage (V_{ag}):** 100 V
- **Control Grid Voltage (V_g):** 0 V

Application and Stability Considerations

The 13SPA has general application in two main areas:

1. **High-Frequency Amplifier:** For RF or IF amplification stages.
2. **Detector:** As a detector of relatively high sensitivity.

Under normal operating conditions, the stage gain of the 13SPA is deliberately designed to be somewhat lower than that of a corresponding AC-only valve. This lower gain is intentionally introduced to ensure adequate stability in AC/DC and other receivers where perfect physical screening is difficult to achieve.

To maintain stable operation and prevent unwanted oscillations, the following design practices are recommended:

- **Screening:** Care should be taken to ensure the best possible physical screening of the stage.
- **Anode Decoupling:** An anode decoupling resistor is usually desirable to prevent high-frequency feedback through the common power supply lines.

Analysis of Characteristic Curves

The relationship between anode voltage, control grid bias, and anode current is illustrated by the valve's characteristic curves. When the auxiliary grid voltage (V_{ag}) is held constant at 100 V, the anode current (I_a) remains relatively constant across a wide range of anode voltages, demonstrating the high internal plate resistance characteristic of a pentode.

At a constant auxiliary grid voltage of 100 V, the anode current varies with control grid voltage (V_g) as follows:

- $V_g = 0$ V: The anode current is approximately 8.5 mA.
- $V_g = -1$ V: The anode current is approximately 6.2 mA.
- $V_g = -2$ V: The anode current is approximately 4.0 mA.
- $V_g = -3$ V: The anode current is approximately 2.2 mA.
- $V_g = -4$ V: The anode current is approximately 1.0 mA.
- $V_g = -5$ V: The anode current is approximately 0.4 mA.

These curves show that the anode current is largely independent of the anode voltage once the anode voltage exceeds approximately 25 to 50 V, which is typical of pentode behavior.

Technical Summary

The **13SPA** is an indirectly heated high-frequency pentode featuring a 13 V, 0.2 A heater designed for series-string operation in AC/DC or DC receivers. It operates with a maximum anode voltage of 200 V and a maximum auxiliary grid voltage of 100 V. At its typical operating point, it exhibits a mutual conductance of 2.5 mA/V. The valve is optimized for high-frequency amplification and sensitive detection, with its stage gain deliberately limited to ensure stability in circuits where perfect screening is difficult to maintain.

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