TUNG-SOL

HEPTODE

12SA7

MT8

METAL SHELL

BOTTOM VIEW

SMALL WAFER

8 PIN OCTAL BASE

12SA7GT

T-9

GLASS BULB

BOTTOM VIEW

INTERMEDIATE SHELL

8 PIN OCTAL BASE

COATED UNIPOTENTIAL CATHODE

HEATER

12.6 VOLTS 150 MA.

AC OR DC

ANY MOUNTING POSITION

THE 12SA7 AND 12SA7GT ARE PENTAGRID CONVERTERS DESIGNED TO MINIMIZE FREQUENCY DRIFT. THEY ARE INTENDED FOR SERVICE AS COMBINED OSCILLATORS AND MIXERS IN AC, STORAGE BATTERY, AND AC/DC OPERATED SUPERHETERODYNES.

DIRECT INTERELECTRODE CAPACITANCES

<table>
<thead>
<tr>
<th>12SA7</th>
<th>12SA7GT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.5A</td>
<td>11B</td>
</tr>
<tr>
<td>7A</td>
<td>8B</td>
</tr>
<tr>
<td>12A</td>
<td>11B</td>
</tr>
<tr>
<td>0.13A</td>
<td>0.5B</td>
</tr>
<tr>
<td>0.15A</td>
<td>0.4B</td>
</tr>
<tr>
<td>0.06A</td>
<td>0.2B</td>
</tr>
<tr>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>14.0</td>
<td></td>
</tr>
</tbody>
</table>

A WITH SHELL CONNECTED TO CATHODE.

B WITH EXTERNAL SHIELD CONNECTED TO CATHODE.
CONTINUED FROM PRECEDING PAGE

RATINGS
INTERPRETED ACCORDING TO RMA STANDARD NS-220

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Heater Voltage</td>
<td>12.6</td>
</tr>
<tr>
<td>Maximum Heater-Cathode Voltage</td>
<td>90</td>
</tr>
<tr>
<td>Maximum Plate Voltage</td>
<td>300</td>
</tr>
<tr>
<td>Maximum Grids #2 &amp; #4 Voltage</td>
<td>100</td>
</tr>
<tr>
<td>Maximum Grids #2 &amp; #4 Supply Voltage</td>
<td>300</td>
</tr>
<tr>
<td>Minimum Grid #3 Voltage</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Plate Dissipation</td>
<td>1.0</td>
</tr>
<tr>
<td>Maximum Grids #2 &amp; #4 Dissipation</td>
<td>1.0</td>
</tr>
<tr>
<td>Maximum Cathode Current</td>
<td>14 MA</td>
</tr>
</tbody>
</table>

C FOR SELF-EXCITED OSCILLATOR.

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

CONVERTER SERVICE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Self Excitation</th>
<th>Separate Excitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage</td>
<td>12.6</td>
<td>12.6</td>
</tr>
<tr>
<td>Heater Current</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Plate Voltage</td>
<td>100</td>
<td>250</td>
</tr>
<tr>
<td>Grids #2 &amp; #4 Voltage</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Grid #3 Voltage</td>
<td>0</td>
<td>-2</td>
</tr>
<tr>
<td>Grid #1 Resistor</td>
<td>20 000</td>
<td>20 000</td>
</tr>
<tr>
<td>Plate Current</td>
<td>3.3</td>
<td>3.5</td>
</tr>
<tr>
<td>Grids #2 &amp; #4 Current</td>
<td>8.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Grid #1 Current</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Cathode Current</td>
<td>12.3</td>
<td>12.5</td>
</tr>
<tr>
<td>Plate Resistance (Approx.)</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Conversion Transconductance:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WITH E9 = -2 VOLTS</td>
<td>425</td>
<td>425</td>
</tr>
<tr>
<td>WITH E9 = -6 VOLTS</td>
<td></td>
<td>450</td>
</tr>
<tr>
<td>WITH E9 = -10 VOLTS</td>
<td></td>
<td>310</td>
</tr>
<tr>
<td>WITH E9 = -35 VOLTS (Approx.)</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>WITH E9 = -35 VOLTS (Approx.)</td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>Oscillator Transconductance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

D: Hartley Oscillator circuit with a feedback of approximately 2 volts peak in the cathode circuit. Values are approximate.

SIMILAR TYPE REFERENCE: Ratings and Characteristics somewhat similar to 1407.
CONVERSION TRANSCONDUCTANCE ($g_c$) - MICROMOSHS

$E_k = 0.8$ Volts RMS

1.4 = 2 Volts Peak

$P = 7\%$

2.0

$P = 10\%$

3.0

$P = 20\%$

5.0

12SA7 SELF-EXCITATION

$E_f = 12.6$ Volts

$E_b = 250$ Volts

$E_{C2}$ & $E_{C4} = 100$ Volts

$E_{C3}$ = −1 Volt

$R_{g1} = 20,000$ Ohms

$E_g$ = Oscillator Voltage between Cathode and Grid.

$E_k$ to $E_g + E_g$ where

$E_k$ = Voltage across Oscillator-coil Section between Cathode and Ground.

$P$ = Percentage Ratio of $E_k$ for values percent $P$

$g_c$ for values of $E_k$

$g_c$ for values percent $P$

$C_d$ = By-Pass Cond.

$C_g$ = 50 μf

$C_p$ = Padding Cond.

$C_t$ = Tuning Cond.

$N_k$ = Total Turns in Osc. Coil

$N_k$ = Turns in Cathode Section of Oscillator Coil.

$R_g = 20,000$ Ohms

GRID 1 (OSCILLATOR-GGRID) MILLIAMPERES ($I_{C1}$)
12SA7

$E_f = 12.6\ \text{Volts}$  
$E_b = 250\ \text{Volts}$  
$E_{C2} \& E_{C4} = 100\ \text{Volts}$  
$R_{gt} = 20,000\ \Omega$  

Oscillator Voltage Adjusted to give Grid #1 Current of 0.5 MA.
**12SA7, 12SA7GT**

**Recommended Min.**

\[ I_{C4} = 0.18 \text{ mA} \]

**12SA7**

**SEPARATE EXCITATION**

\[
\begin{align*}
E_f &= 12.6 \text{ Volts} \\
E_b &= 250 \text{ Volts} \\
E_{C2} \& E_{C4} &= 100 \text{ Volts} \\
E_{C3} &= -2 \text{ Volts} \\
R_{G4} &= 20000 \text{ Ohms} \\
q_c &= \text{Grid \& Current Varied by Adjustment of Oscillator Voltage}
\end{align*}
\]

**12SA7**

**SELF-EXCITATION**

\[
\begin{align*}
E_f &= 12.6 \text{ Volts} \\
E_b &= 250 \text{ Volts} \\
E_{C2} \& E_{C4} &= 100 \text{ Volts} \\
E_{C3} &= 0 \text{ Volts} \\
R_{G4} &= 20000 \text{ Ohms} \\
I_{C4} &= 0.5 \text{ mA}
\end{align*}
\]

**Conversion Gain**

\[
\text{Conversion Gain} = \frac{\text{IF Output Volts}}{\text{RF Input Volts}}
\]

**PLATE**

1883
SEPT. 2 1947

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