ELM7785-10F

C-band Internally Matched FET

FEATURES
- High Output Power: $P_{1dB}=40.5\,\text{dBm}(\text{typ.})$
- High Gain: $G_{1dB}=8.5\,\text{dB}(\text{typ.})$
- High P.A.E.: $\eta_{\text{add}}=37\%(\text{typ.})$
- Broad Band: 7.7 - 8.5 GHz
- Impedance Matched $Z_{\text{in}}/Z_{\text{out}} = 50\,\Omega$
- Hermetically Sealed Package

DESCRIPTION
The ELM7785-10F is a power GaAs FET that is internally matched for standard communication bands to provide optimum power and gain in a $50\,\Omega$ system.

SEDI's stringent Quality Assurance Program assures the highest reliability and consistent performance.

### ABSOLUTE MAXIMUM RATING

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-Source Voltage</td>
<td>$V_{DS}$</td>
<td>$15$</td>
<td>V</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>$V_{GS}$</td>
<td>$-5$</td>
<td>V</td>
</tr>
<tr>
<td>Total Power Dissipation</td>
<td>$P_T$</td>
<td>$42.8$</td>
<td>W</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>$T_{STG}$</td>
<td>$-65$ to $+175$</td>
<td>deg-C</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>$T_{CH}$</td>
<td>$+175$</td>
<td>deg-C</td>
</tr>
</tbody>
</table>

### RECOMMENDED OPERATING CONDITIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Condition</th>
<th>Recommend</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC input Voltage</td>
<td>$V_{DS}$</td>
<td>$&lt; 10$</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Forward Gate Current</td>
<td>$I_{GF}$</td>
<td>$R_{G}=51,\Omega$</td>
<td>$&lt; +27.0$</td>
<td>mA</td>
</tr>
<tr>
<td>Reverse Gate Current</td>
<td>$I_{GR}$</td>
<td>$R_{G}=51,\Omega$</td>
<td>$&lt; -5.8$</td>
<td>mA</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>$T_{STG}$</td>
<td>$-55$ to $+125$</td>
<td>deg-C</td>
<td></td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>$T_{CH}$</td>
<td>$+ 155$</td>
<td>deg-C</td>
<td></td>
</tr>
</tbody>
</table>

### RECOMMENDED OPERATING CONDITIONS (Case Temperature $T_c=25$ deg-C)

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain Current</td>
<td>$I_{DS}$</td>
<td>$V_{DS}=5,\text{V}, , V_{GS}=0,\text{V}$</td>
<td>$-4000$</td>
<td>$-5600$</td>
</tr>
<tr>
<td>Transconductance</td>
<td>$g_m$</td>
<td>$V_{DS}=5,\text{V}, , I_{DS}=2400,\text{mA}$</td>
<td>$-4000$</td>
<td>$-3.0$</td>
</tr>
<tr>
<td>Pinch-off Voltage</td>
<td>$V_P$</td>
<td>$V_{DS}=5,\text{V}, , I_{DS}=2400,\text{mA}$</td>
<td>$-0.5$</td>
<td>$-1.5$</td>
</tr>
<tr>
<td>Gate-Source Breakdown Voltage</td>
<td>$V_{GS0}$</td>
<td>$I_{DS}=240,\text{mA}$</td>
<td>$-5$</td>
<td>$-5$</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>$f$</td>
<td>$V_{DS}=10,\text{V}$</td>
<td>$7.7$</td>
<td>$8.5$</td>
</tr>
<tr>
<td>Output Power at 1dB G.C.P.</td>
<td>$P_{1\text{dB}}$</td>
<td>$V_{DS}(DC)=2600,\text{mA}$</td>
<td>$39.5$</td>
<td>$40.5$</td>
</tr>
<tr>
<td>Power Gain at 1dB G.C.P.</td>
<td>$G_{1\text{dB}}$</td>
<td>$Z_{s}=2\times50,\Omega$</td>
<td>$7.5$</td>
<td>$8.5$</td>
</tr>
<tr>
<td>Drain Current at 1dB G.C.P.</td>
<td>$I_{Dsr}$</td>
<td>$-2600$</td>
<td>$3000$</td>
<td>mA</td>
</tr>
<tr>
<td>Power Added Efficiency</td>
<td>$\eta_{\text{add}}$</td>
<td>$-37$</td>
<td>$-37$</td>
<td>$-37$</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>$G_d$</td>
<td>$-44$</td>
<td>$-46$</td>
<td>$-46$</td>
</tr>
<tr>
<td>3rd Order Inter Modulation Distortion</td>
<td>$I_{M3}$</td>
<td>$f=8.5,\text{GHz}, , df=10,\text{MHz}, , 2\text{-Tone Test}$</td>
<td>$-44$</td>
<td>$-46$</td>
</tr>
<tr>
<td>Thermal Resistance</td>
<td>$R_{\text{tch}}$</td>
<td>Channel to Case</td>
<td>$3.0$</td>
<td>$3.5$</td>
</tr>
<tr>
<td>Channel Temperature Rise</td>
<td>$d_{\text{tch}}$</td>
<td>$(V_{DS} \times I_{Dsr} - P_{\text{OUT}} + P_{(m)}) \times R_{\text{tch}}$</td>
<td>$-100$</td>
<td>$-100$</td>
</tr>
</tbody>
</table>

G.C.P. = Gain Compression Point
S.C.L. = Single Carrier Level
Note: RF-Test is measured with Vgs-Constant Circuit
ELM7785-10F
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Power Derating Curve

Output Power & P.A.E. v.s. Input Power
$V_{DS}=10V, I_{DS(DC)}=2.6A$

Output Power v.s. Frequency
$V_{DS}=10V, I_{DS(DC)}=2.6A$

IMD v.s. Output Power
$V_{DS}=10V, I_{DS(DC)}=2.6A$

Output Power (dBm) (S.C.L.)

$df=10MHz$

Edition 1.0
Mar. 2010
Output Power & P.A.E. v.s. Input Power by Drain Voltage

\[ I_{DS}(DC) = 2.6A @ 7.7GHz \]

Output Power & P.A.E. v.s. Input Power by Drain Voltage

\[ I_{DS}(DC) = 2.6A @ 8.1GHz \]

Output Power & P.A.E. v.s. Input Power by Drain Voltage

\[ I_{DS}(DC) = 2.6A @ 8.5GHz \]
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Output Power & P.A.E. v.s. Input Power by Quiescent Drain Current
$V_{DS(DC)}=10V@7.7GHz$

Output Power & P.A.E. v.s. Input Power by Quiescent Drain Current
$V_{DS(DC)}=10V@8.1GHz$

Output Power & P.A.E. v.s. Input Power by Quiescent Drain Current
$V_{DS(DC)}=10V@8.5GHz$

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ELM7785-10F
C-band Internally Matched FET

Output Power & P.A.E. v.s. Input Power by Temperature
\(V_{\text{DS(DC)}}=10\text{V}, \text{IDS(DC)}=2.6\text{A@7.7GHz}\)

Output Power & P.A.E. v.s. Input Power by Temperature
\(V_{\text{DS(DC)}}=10\text{V}, \text{IDS(DC)}=2.6\text{A@8.1GHz}\)

Output Power & P.A.E. v.s. Input Power by Temperature
\(V_{\text{DS(DC)}}=10\text{V}, \text{IDS(DC)}=2.6\text{A@8.5GHz}\)
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IMD v.s. Output Power by Drain Voltage
\[ I_{DS}(DC)=2.6\text{A}@7.7\text{GHz} \]

IMD v.s. Output Power by Drain Voltage
\[ I_{DS}(DC)=2.6\text{A}@8.1\text{GHz} \]

IMD v.s. Output Power by Drain Voltage
\[ I_{DS}(DC)=2.6\text{A}@8.5\text{GHz} \]
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IMD v.s. Output Power by Quiescent Drain Current
$V_{DS}(DC)=10V@7.7GHz$

IMD v.s. Output Power by Quiescent Drain Current
$V_{DS}(DC)=10V@8.1GHz$

IMD v.s. Output Power by Quiescent Drain Current
$V_{DS}(DC)=10V@8.5GHz$

Ids=2.2A  Ids=2.6A  Ids=3.0A
<table>
<thead>
<tr>
<th>FREQ. (GHz)</th>
<th>S11 mag</th>
<th>S11 angle</th>
<th>S21 mag</th>
<th>S21 angle</th>
<th>S12 mag</th>
<th>S12 angle</th>
<th>S22 mag</th>
<th>S22 angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5</td>
<td>0.513</td>
<td>66.6</td>
<td>2.946</td>
<td>-95.7</td>
<td>0.061</td>
<td>-120.5</td>
<td>0.282</td>
<td>150.9</td>
</tr>
<tr>
<td>7.6</td>
<td>0.487</td>
<td>57.8</td>
<td>2.914</td>
<td>-110.7</td>
<td>0.062</td>
<td>-133.4</td>
<td>0.343</td>
<td>136.5</td>
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<tr>
<td>7.7</td>
<td>0.458</td>
<td>51.8</td>
<td>2.880</td>
<td>-123.2</td>
<td>0.062</td>
<td>-144.5</td>
<td>0.391</td>
<td>126.4</td>
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<tr>
<td>7.8</td>
<td>0.420</td>
<td>47.1</td>
<td>2.852</td>
<td>-137.4</td>
<td>0.062</td>
<td>-157.6</td>
<td>0.435</td>
<td>116.9</td>
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<tr>
<td>7.9</td>
<td>0.374</td>
<td>44.0</td>
<td>2.832</td>
<td>-151.8</td>
<td>0.062</td>
<td>-170.7</td>
<td>0.467</td>
<td>108.3</td>
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<tr>
<td>8.0</td>
<td>0.330</td>
<td>44.1</td>
<td>2.825</td>
<td>-164.0</td>
<td>0.062</td>
<td>177.8</td>
<td>0.480</td>
<td>101.9</td>
</tr>
<tr>
<td>8.1</td>
<td>0.270</td>
<td>46.5</td>
<td>2.871</td>
<td>-178.5</td>
<td>0.064</td>
<td>164.3</td>
<td>0.486</td>
<td>94.2</td>
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<tr>
<td>8.2</td>
<td>0.221</td>
<td>63.5</td>
<td>2.916</td>
<td>165.1</td>
<td>0.064</td>
<td>146.5</td>
<td>0.461</td>
<td>84.2</td>
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<tr>
<td>8.3</td>
<td>0.226</td>
<td>83.5</td>
<td>2.933</td>
<td>149.7</td>
<td>0.061</td>
<td>133.2</td>
<td>0.408</td>
<td>74.3</td>
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<tr>
<td>8.4</td>
<td>0.307</td>
<td>103.6</td>
<td>2.866</td>
<td>130.6</td>
<td>0.064</td>
<td>114.5</td>
<td>0.293</td>
<td>64.2</td>
</tr>
<tr>
<td>8.5</td>
<td>0.443</td>
<td>105.0</td>
<td>2.686</td>
<td>111.4</td>
<td>0.062</td>
<td>91.8</td>
<td>0.173</td>
<td>61.3</td>
</tr>
<tr>
<td>8.6</td>
<td>0.544</td>
<td>101.0</td>
<td>2.492</td>
<td>95.6</td>
<td>0.058</td>
<td>73.7</td>
<td>0.076</td>
<td>76.7</td>
</tr>
<tr>
<td>8.7</td>
<td>0.644</td>
<td>93.9</td>
<td>2.229</td>
<td>78.2</td>
<td>0.053</td>
<td>54.7</td>
<td>0.081</td>
<td>166.2</td>
</tr>
</tbody>
</table>
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Package Out Line
Package Style: IK

PIN ASSIGNMENT
1: Gate
2: Source (Flange)
3: Drain
4: Source (Flange)
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CAUTION

Sumitomo Electric Device Innovations, Inc. products contain gallium arsenide (GaAs) which can be hazardous to the human body and the environment. For safety, observe the following procedures:

• Do not put these products into the mouth.

• Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.

• Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.

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