ELM7785-7PS

C-Band Internally Matched FET

- Features
  - High Output Power: P1dB=39.0 dBm (Typ.)
  - High Gain: G1dB=9.5dB (Typ.)
  - High Power Added Efficiency: PAE=33% (Typ.)
  - Broad Band: Frequency=7.7 to 8.5GHz
  - Internally Matched
  - Plastic Package for SMT applications

- Description
  The ELM7785-7PS is a power GaAs FET that is internally matched for standard communication bands to provide optimum power and gain.

### ABSOLUTE MAXIMUM RATING (Case Temperature Tc=25 deg.C)

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-Source Voltage</td>
<td>VDS</td>
<td>15</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>VGS</td>
<td>-5</td>
</tr>
<tr>
<td>Total Power Dissipation</td>
<td>PT</td>
<td>50</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>Tsto</td>
<td>-40 to +125</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>Tch</td>
<td>175</td>
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</table>

### RECOMMENDED OPERATING CONDITION

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Condition</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-Source Voltage</td>
<td>VDS</td>
<td>Rg=100ohm</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Forward Gate Current</td>
<td>IGf</td>
<td>Rg=100ohm</td>
<td>&lt;+16</td>
</tr>
<tr>
<td>Reverse Gate Current</td>
<td>IGr</td>
<td>Rg=100ohm</td>
<td>&gt;-2.2</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>Tch</td>
<td></td>
<td>155</td>
</tr>
</tbody>
</table>

### ELECTRICAL CHARACTERISTICS (Case Temperature Tc=25 deg.C)

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Condition</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturated Drain Current</td>
<td>I_DSS</td>
<td>VDS=5V, VGS=0V</td>
<td>-5.0</td>
</tr>
<tr>
<td>Trans Conductance</td>
<td>gm</td>
<td>VDS=5V, IDS=2200mA</td>
<td>-0.5</td>
</tr>
<tr>
<td>Pinch-off Voltage</td>
<td>Vp</td>
<td>VDS=5V, IDS=170mA</td>
<td>-0.5</td>
</tr>
<tr>
<td>Gate-Source Breakdown Voltage</td>
<td>V_GSO</td>
<td>IGS=-170uA</td>
<td>-5.0</td>
</tr>
<tr>
<td>Output Power at 1dB G.C.P.</td>
<td>P_G1DB</td>
<td>VDS=10V</td>
<td>38.0</td>
</tr>
<tr>
<td>Power Gain at 1dB G.C.P.</td>
<td>G_D1GB</td>
<td>VDS=10V</td>
<td>8.0</td>
</tr>
<tr>
<td>Drain Current</td>
<td>I_DSR</td>
<td>Ids(DC)=2200mA (typ.)</td>
<td>-2.2</td>
</tr>
<tr>
<td>Power Added Efficiency</td>
<td>PAE</td>
<td>f=7.7 to 8.5 GHz</td>
<td>-33.0</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>ΔG</td>
<td></td>
<td>-1.2</td>
</tr>
<tr>
<td>3rd Order Inter Modulation Distortion</td>
<td>IM3</td>
<td>f=8.5GHz, Δf=10MHz, 2-tone Test</td>
<td>-40.0</td>
</tr>
<tr>
<td>Thermal Resistance</td>
<td>Rth</td>
<td>Channel to Case</td>
<td>2.5</td>
</tr>
<tr>
<td>Channel Temperature Rise</td>
<td>ΔTch</td>
<td>(V_DS x I_DSR - Pout + Pin) x R_TH</td>
<td>-80.0</td>
</tr>
</tbody>
</table>

G.C.P.: Gain Compression Point, S.C.L.: Single Carrier Level

### CASE STYLE

- 12C

### RoHS Compliance

- YES

### ESD

- Class 3A

### MSL

- 2

Note: Based on ANSI/ESDA/JEDEC JS-001-2012 (C=100pF, R=1.5kohm)
Ordering Information

<table>
<thead>
<tr>
<th>Model Type</th>
<th>MOQ</th>
<th>MOU</th>
<th>Packing Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELM7785-7PS</td>
<td>15pcs</td>
<td>No Limitation</td>
<td>50pcs-max./Tray, 1Tray-max./Packing</td>
</tr>
<tr>
<td>ELM7785-7PST</td>
<td>500pcs</td>
<td>500pcs</td>
<td>24mm width Tape (500pcs/Reel)</td>
</tr>
</tbody>
</table>

* MOQ stands for Minimum Order Quantity.
* MOU stands for Minimum Order Unit size.

Note
- This device will not be delivered with test data but tested pass/fail 100% against DC and RF specifications.
- NO liquid cleaning process is suitable for this device. (including de-ionized water or solvent)
RF Characteristics

- **Power Derating Curve**
  - Total Power Dissipation vs. Case Temperature

- **Input Power vs. Output Power and Power Added Efficiency**
  - Frequency: 7.7 GHz, 8.1 GHz, 8.5 GHz
  - Case Temperature: 0°C to 200°C

- **Output Power vs. Frequency**
  - Frequency: 7.5 GHz to 8.7 GHz

- **IMD vs. Output Power**
  - Frequency: 19 GHz to 33 GHz

- **Output Power vs. Frequency S.C.L.**
  - Frequency: 7.7 GHz, 8.1 GHz, 8.5 GHz

**Specifications**

- **ELM7785-7PS**
  - C-Band Internally Matched FET
  - Edition 1.3
  - Jun. 2020
RF Characteristics

Input Power vs. Output Power, Power Added Efficiency by Drain Voltage
IDS(DC)=2200mA @7.7GHz

- Input Power [dBm] vs. Output Power [dBm]
- Power Added Efficiency [%]
- Drain Voltage: 8 V, 9 V, 10 V

Input Power vs. Output Power, Power Added Efficiency by Drain Voltage
IDS(DC)=2200mA @8.1GHz

- Input Power [dBm] vs. Output Power [dBm]
- Power Added Efficiency [%]
- Drain Voltage: 8 V, 9 V, 10 V

Input Power vs. Output Power, Power Added Efficiency by Drain Voltage
IDS(DC)=2200mA @8.5GHz

- Input Power [dBm] vs. Output Power [dBm]
- Power Added Efficiency [%]
- Drain Voltage: 8 V, 9 V, 10 V
RF Characteristics

Input Power vs. Output Power, Power Added Efficiency by Quiescent Drain Current
VDS=10V @7.7GHz

Input Power vs. Output Power, Power Added Efficiency by Quiescent Drain Current
VDS=10V @8.1GHz

Input Power vs. Output Power, Power Added Efficiency by Quiescent Drain Current
VDS=10V @8.5GHz

- 1400 mA
- 1800 mA
- 2200 mA
RF Characteristics

Input Power vs. Output Power, Power Added Efficiency by Case Temperature
VDS=10V IDS(DC)=2200mA @7.7GHz

Input Power vs. Output Power, Power Added Efficiency by Case Temperature
VDS=10V IDS(DC)=2200mA @8.1GHz

Input Power vs. Output Power, Power Added Efficiency by Case Temperature
VDS=10V IDS(DC)=2200mA @8.5GHz
• **RF Characteristics**

**IMD Performance vs. Output Power by Drain Voltage**

IDS(DC)=2200mA @7.7GHz

![Graph for IMD Performance vs. Output Power by Drain Voltage (7.7GHz)](image)

**IMD Performance vs. Output Power by Drain Voltage**

IDS(DC)=2200mA @8.1GHz

![Graph for IMD Performance vs. Output Power by Drain Voltage (8.1GHz)](image)

**IMD Performance vs. Output Power by Drain Voltage**

IDS(DC)=2200mA @8.5GHz

![Graph for IMD Performance vs. Output Power by Drain Voltage (8.5GHz)](image)
**RF Characteristics**

IMD Performance vs. Output Power by Quiescent Drain Current

VDS=10V @7.7GHz

![IMD Performance vs. Output Power by Quiescent Drain Current VDS=10V @7.7GHz](image1)

VDS=10V @8.1GHz

![IMD Performance vs. Output Power by Quiescent Drain Current VDS=10V @8.1GHz](image2)

VDS=10V @8.5GHz

![IMD Performance vs. Output Power by Quiescent Drain Current VDS=10V @8.5GHz](image3)
RF Characteristics

IMD Performance vs. Output Power by Case Temperature
VDS=10V IDS(DC)=2200mA @7.7GHz

IMD Performance vs. Output Power by Case Temperature
VDS=10V IDS(DC)=2200mA @8.1GHz

IMD Performance vs. Output Power by Case Temperature
VDS=10V IDS(DC)=2200mA @8.5GHz
### S-Parameter

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>S11 MAG</th>
<th>S11 ANG</th>
<th>S12 MAG</th>
<th>S12 ANG</th>
<th>S21 MAG</th>
<th>S21 ANG</th>
<th>S22 MAG</th>
<th>S22 ANG</th>
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<tbody>
<tr>
<td>7500</td>
<td>0.573</td>
<td>113.6</td>
<td>3.050</td>
<td>-105.1</td>
<td>0.017</td>
<td>-115.5</td>
<td>0.436</td>
<td>136.4</td>
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<tr>
<td>7600</td>
<td>0.505</td>
<td>102.5</td>
<td>3.163</td>
<td>-118.5</td>
<td>0.016</td>
<td>-121.7</td>
<td>0.412</td>
<td>124.2</td>
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<tr>
<td>7700</td>
<td>0.437</td>
<td>87.2</td>
<td>3.328</td>
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<td>0.018</td>
<td>-125.5</td>
<td>0.393</td>
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<td>7800</td>
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<td>3.480</td>
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<td>-137.2</td>
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<td>7900</td>
<td>0.324</td>
<td>36.7</td>
<td>3.612</td>
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<td>0.025</td>
<td>-156.3</td>
<td>0.332</td>
<td>79.7</td>
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<tr>
<td>8000</td>
<td>0.306</td>
<td>4.5</td>
<td>3.634</td>
<td>177.7</td>
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<td>-175.4</td>
<td>0.289</td>
<td>60.7</td>
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<tr>
<td>8100</td>
<td>0.316</td>
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<td>3.585</td>
<td>160.2</td>
<td>0.029</td>
<td>164.8</td>
<td>0.243</td>
<td>38.5</td>
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<tr>
<td>8200</td>
<td>0.335</td>
<td>-51.4</td>
<td>3.492</td>
<td>143.6</td>
<td>0.029</td>
<td>144.9</td>
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<td>8300</td>
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<td>8400</td>
<td>0.346</td>
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<td>8700</td>
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<td>2.616</td>
<td>65.9</td>
<td>0.025</td>
<td>62.3</td>
<td>0.185</td>
<td>-109.1</td>
</tr>
</tbody>
</table>
● Package Outline

Case Style: I2C

1. Gate
2. Source
3. Drain
4. Source

Tolerance: ±0.15
Unit: mm
- PCB Pads and Solder-Resist Pattern

Notes:
1. Laminate: Rogers Corporation RO4003, Thickness t=0.508mm, Cu Foil 18um. Finish to copper foil: Ni 0.1um min. / Au 0.1um (Both side).
2. : Resist
# Package Marking

Lot Number : 1st: Year Code  
2nd: Month Code

### Year Code

<table>
<thead>
<tr>
<th>Code</th>
<th>Y</th>
<th>Z</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
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</table>

### Month Code

<table>
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<tr>
<th>Code</th>
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<th>M</th>
<th>N</th>
<th>P</th>
<th>R</th>
<th>S</th>
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<th>U</th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
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<tr>
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<td>2</td>
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<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

### Marking

- **PKG**: I2C (ex. I2C PKG)
- **Type Number**: ELM****-***  
  SGK****-***  
- **Part Number**: 5964-7PS  
  5872-20A

- **Factory code**
- **Type code**
- **10 thousand code**
- **Year / Month Code**
- **Serial number**
JEDEC Tray Dimension
(Part No: ELM7785-7PS)
Tape/Reel Configuration
(Part No: ELM7785-7PST)

Tape/Reel Configuration
(Part No: ELM7785-7PST)

User Direction Unreeling

Embossed Carrier

Quantity: 500pcs/tape
Tape Material: Conductive PS

(unit in mm)
Mounting Instructions for Package for Lead-free solder

Mounting Condition
For soldering, Lead-free solder (Sn-3.0Ag-0.5Cu)*1 or equivalent shall be used.
1. The example solder is a tin-rich alloy with 3.0% silver and 0.5% copper, often called Sn 96 for its approximate Tin content.
2. A rosin type flux with chlorine content of 0.2% or less shall be used. The rosin flux with low halogen content is recommended. When soldering, use the following time/temperature profile with any of the methods listed for acceptable solder joints.
3. Make sure the devices have been properly prepared with flux prior soldering.

* Reflow soldering method (Infrared reflow / Heat circulation reflow / Hot plate reflow);
Limit solder to 3 reflow cycles because resin is used in the modules manufacturing process. Excessive reflow will effect the resin resulting in a potential failure or latent defect. The recommended reflow temperature profile is shown below. The temperature of the reflow profile must be measured at the device lead.

Reflow temperature profile and condition:

2. Preheating: 150 to 200 deg.C, 60 to 180 seconds.

* Measurement point: Device Heat-sink (Source Pin).

1. The above-recommended conditions were confirmed using the manufacturer’s equipment and materials. However, when soldering these products, the soldering condition should be verified by customer using their own particular equipment and materials.

Cleaning
Avoid washing of the device after soldering by reflow method due to the risk of liquid absorption by the resin used in this part.
Humidity Lifetime for ELMxxxx-7PST

The following graph shows the effect of moisture on lifetime (moisture resistance) for the ELMxxxx-7PST. Each graph indicates the MTTF and failure rate prediction (Confidential Level = 90%) which calculated from the results of highly accelerated temperature and humidity stress test (HAST).

Representative of device type: ELM7179-7PST
Subject of device type: ELMxxxx-7PST

Field environmental conditions for operation

If the ELMxxxx-7PST is installed in a non-hermetic environment, please refer to the following recommendations and notes for design with, and assembly and use of our products.

Note 1. When drain current cuts off, it should be cut off by drain bias, and not cut off by gate bias only. The humidity lifetime becomes shorter in case of the gate-only cut off operation due to electric field strength interacting with humidity.

Note 2. ELMxxxx-7PST should be used under the environment conditions of no dew condensation. These plots do not apply in the case of liquid absorbed into the resin, whether applied to the part in assembly or as condensate in the application.
For Safety, Observe the Following Procedures Environmental Management

- Do not put this product 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.
- Respect all applicable laws of the country when discarding this product.
  This product must be disposed in accordance with methods specified by applicable hazardous waste procedures.

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