

## DESCRIPTION

The SW7135L is a Front-End Module(FEM) with a fully-integrated Low-Noise Amplifier and Pre-Filter for BDS/GPS/GNSS. The SW7135L requires no external capacitor/inductor, reduces assembly complexity and the PCB area, enabling a cost-effective solution.

The SW7135L achieves low noise figure, high gain, excellent linearity and high Out-Of-Band rejection. All these features make SW7135L an excellent choice for GNSS FEM as it improves sensitivity with low noise figure and high gain, provide better immunity against out-of-band jammer signals with high linearity and jammer-rejection, meanwhile it reduces the overall cost of the GNSS receiver.

The SW7135L is available in a small lead-free, RoHS-Compliant, 1.5mm x 1.0mm x 0.5mm 6-pin LGA package.

## FEATURES

- **Low Noise Figure(including pre-filter): 1.6dB;**
- **Small signal gain: 17.5dB typical;**
- **Low current consumption: 3.9mA typical;**
- High Out-Of-Band jammer rejection at Cellular/PCS/WLAN bands;
- Fully-integrated module without any capacitor/inductor at input/output side;
- RF input/output internally matched to 50 ohm;
- Single Supply voltage: 1.5V to 3.6V;
- Operating frequencies: 1550~1615MHz;
- Slim LGA-6L package:1.5mm X 1.0mm X 0.5mm
- 3kV HBM ESD protection (including RFIN and RFOUT pin)

## APPLICATIONS

- Smart phones, Tablet PCs;
- Intelligent Bracelet wear products, Smart watch;
- Complete GNSS chipset modules with embedded WiFi/BT function at ISM band;

## PIN CONFIGURATION AND MARKING

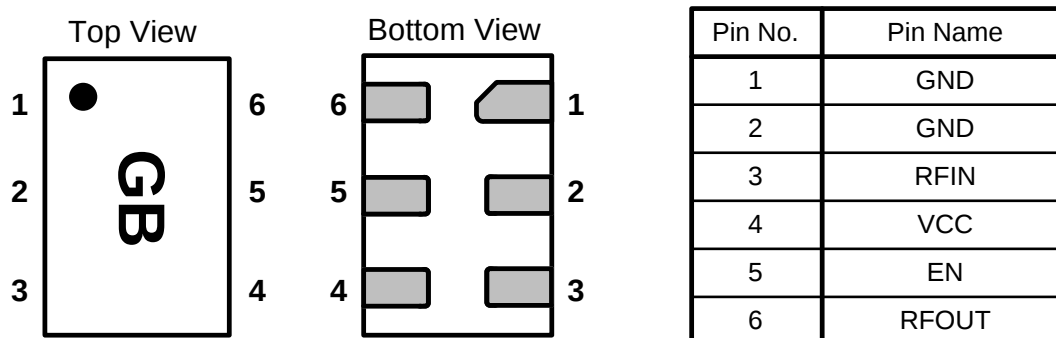


Figure 1. SW7135L Pin Configuration and Marking

## TYPICAL APPLICATION

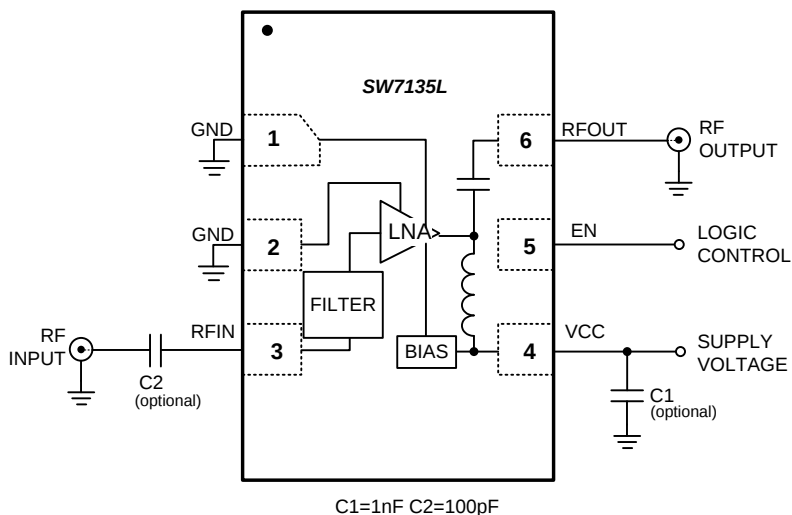


Figure 3. Application Schematic SW7135L

For a list of component see [Table 4](#)

## ORDER INFORMATION

Table 1. OrderInformation

| Part Number | Temperature  | Package                       | RoHS | Mark | SPQ                         |
|-------------|--------------|-------------------------------|------|------|-----------------------------|
| SW7135L     | -40°C ~ 85°C | 1.5mm x 1.0 mm x 0.5mm LGA-6L | Yes  | GB   | Tape and Reel 3000 pcs/Reel |

## ABSOLUTE MAXIMUM RATINGS <sup>1)</sup>

Table 2. Limiting Values

| Parameter                                     | Symbol           | Values                 |       |      | Unit     |
|-----------------------------------------------|------------------|------------------------|-------|------|----------|
|                                               |                  | Min.                   | Typ.  | Max. |          |
| Supply Voltage at pin VCC                     | V <sub>CC</sub>  | -0.3                   | -     | 5.0  | V        |
| Voltage at pin EN                             | V <sub>EN</sub>  | -0.3                   | -     | 5.0  | V        |
| Current into pin VCC                          | I <sub>CC</sub>  | -                      | -     | 30   | mA       |
| RF input power                                | P <sub>IN</sub>  | -                      | -     | 10   | dBm      |
| Package thermal resistance                    | θ <sub>JA</sub>  | -                      | 148.2 |      | °C/W     |
| Junction temperature                          | T <sub>J</sub>   | -                      | -     | 150  | °C       |
| Storage temperature range                     | T <sub>STG</sub> | -65                    | -     | 150  | °C       |
| Ambient temperature range                     | T <sub>amb</sub> | -40                    | -     | 85   | °C       |
| Solder temperature(10s)                       |                  | -                      | 260   | -    | °C       |
| ESD range                                     |                  |                        |       |      |          |
| HBM <sup>1)</sup>                             |                  | ±3000                  |       |      | V        |
| MM <sup>2)</sup>                              |                  | ±250                   |       |      | V        |
| Latch-up                                      |                  |                        |       |      |          |
| Standard : JEDEC STANDARD NO.78DNOVEMBER 2011 |                  | +IT: +400<br>-IT: -400 |       |      | mA<br>mA |

**Note 1:** HBM standard: MIL-STD-883H Method 3015.8.

**Note 2:** MM standard: JEDEC EIA/JESD22-A115.

## ELECTRICAL CHARACTERISTICS

( SW7135L EVB<sup>1)</sup>;  $V_{CC}=1.5$  to  $3.6V$ ,  $T_A=-40\sim+85^{\circ}C$ ,  $f=1550MHz$  to  $1615MHz$  and  $2400MHz$  to  $2500MHz$ ; Typical values are at  $V_{CC}=2.8V$  and  $T_{amb}=+25^{\circ}C$ ,  $f_1=1575.42MHz$ ,  $f_2=2400MHz$ , unless otherwise noted. )

**Table 3. Electrical Characteristics**

| PARAMETER                            |                                                             | CONDITIONS                                              | MIN  | TYP  | MAX  | UNITS   |
|--------------------------------------|-------------------------------------------------------------|---------------------------------------------------------|------|------|------|---------|
| <b>DC ELECTRICAL CHARACTERISTICS</b> |                                                             |                                                         |      |      |      |         |
| $V_{CC}$                             | Supply Voltage                                              |                                                         | 1.5  | 2.8  | 3.6  | V       |
| $I_{SD}$                             | Shut-Down Current                                           | EN=Low                                                  |      |      | 1.0  | $\mu A$ |
| $I_{CC}$                             | Supply Current                                              | EN=High                                                 |      | 3.9  |      | mA      |
| $V_{EN}$                             | Digital Input-Logic High                                    |                                                         | 0.80 |      |      | V       |
| $V_{EN}$                             | Digital Input-Logic Low                                     |                                                         |      |      | 0.45 | V       |
| <b>AC ELECTRICAL CHARACTERISTICS</b> |                                                             |                                                         |      |      |      |         |
| $G_p$                                | Power Gain <sup>1)</sup>                                    |                                                         |      | 17.5 |      | dB      |
| $RL_{in}$                            | Input Return Loss                                           |                                                         |      | 10.0 |      | dB      |
| ISL                                  | Reverse Isolation                                           |                                                         |      | 21.5 |      | dB      |
| $RL_{out}$                           | Output Return Loss                                          |                                                         |      | 14.2 |      | dB      |
| NF                                   | Noise Figure <sup>2)</sup>                                  | $Z_s=50\text{ ohm}$ ;<br>No jammer                      |      | 1.60 |      | dB      |
| Kf                                   | Stability factor                                            | $f=20MHz\sim10GHz$                                      | 1.0  |      |      |         |
| IP1dB                                | In-Band input<br>1dB-compression point                      | $f=1575.42MHz$ ;                                        |      | -6.0 |      | dBm     |
| IP1dB <sub>928MHz</sub>              | Out-Of-Band input<br>1dB-compression point                  | $f_{blocker}=928MHz$<br>$f=1575.42MHz$                  |      | +36  |      | dBm     |
| IP1dB <sub>1980MHz</sub>             | Out-Of-Band input<br>1dB-compression point                  | $f_{blocker}=1980MHz$<br>$f=1575.42MHz$                 |      | +28  |      | dBm     |
| IP1dB <sub>2400MHz</sub>             | Out-Of-Band input<br>1dB-compression point                  | $f_{blocker}=2400MHz$<br>$f=1575.42MHz$                 |      | +32  |      | dBm     |
| IIP3 <sub>oob</sub>                  | Out-of-band input 3 <sup>rd</sup> -order<br>intercept point | $f_1=1712.7MHz$ ;<br>$f_2=1850MHz$ ;<br>$P_{in}=-20dBm$ |      | TBD  |      | dBm     |
| ATT <sub>oob</sub>                   | Out-of-band Attenuation                                     | $F=824MHz\sim915MHz$                                    |      | +25  |      | dBc     |
| ATT <sub>oob</sub>                   | Out-of-band Attenuation                                     | $F=1880MHz\sim1980MHz$                                  |      | +20  |      | dBc     |
| ATT <sub>oob</sub>                   | Out-of-band Attenuation                                     | $F=2400MHz\sim2500MHz$                                  |      | +30  |      | dBc     |
| ATT <sub>oob</sub>                   | Out-of-band Attenuation                                     | $F=5000MHz\sim5200MHz$                                  |      | +30  |      | dBc     |
| $t_{on}$                             | Turn-on time <sup>3)</sup>                                  |                                                         |      | 2.0  |      | $\mu s$ |

|           |                             |  |     |         |
|-----------|-----------------------------|--|-----|---------|
| $t_{off}$ | Turn-off time <sup>4)</sup> |  | 2.0 | $\mu s$ |
|-----------|-----------------------------|--|-----|---------|

**Note1&2:** 0.08dB PCB losses are subtracted.

**Note3&4:** Within 10% of the final gain.

## TYPICAL PERFORMANCE CURVES OF S-PARAMETERS AT 25 °C

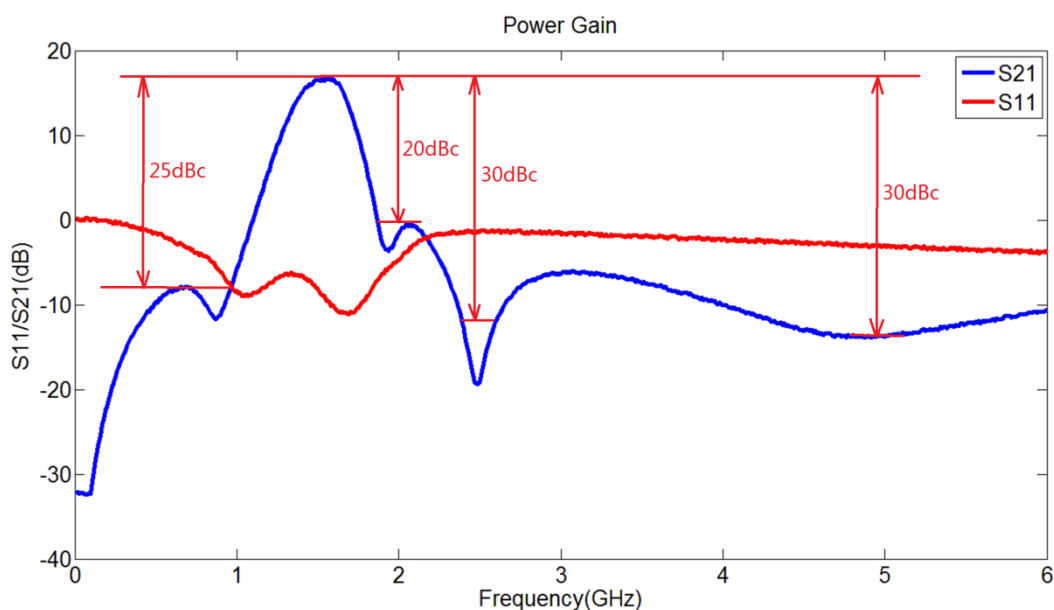


Figure 4. Typical S-parameter @Vdd=2.8V Idd=3.9mA

## APPLICATION INFORMATION

1. The SW7135L requires no external capacitor/inductor for input matching. Optional supply decoupling capacitor is 1nF. For schematics see [Figure 2](#).
2. The SW7135L should be placed close to the antenna. Use 50-ohm micro-strip lines to connect RF INPUT and RF OUTPUT. Bypass capacitor should be located close to the device. For long supply lines, it may be necessary to add more decoupling capacitors. Proper grounding of the GND pins is very important.

Table 4 lists the recommended capacitor types and values.

Table4: list of capacitor

| Part Number | Capacitance | Rated Voltage | Supplier | Size |
|-------------|-------------|---------------|----------|------|
| Units       | pF          | V             |          |      |
| GRM155      | 1000        | 50            | Murata   | 0402 |

## PACKAGE INFORMATION

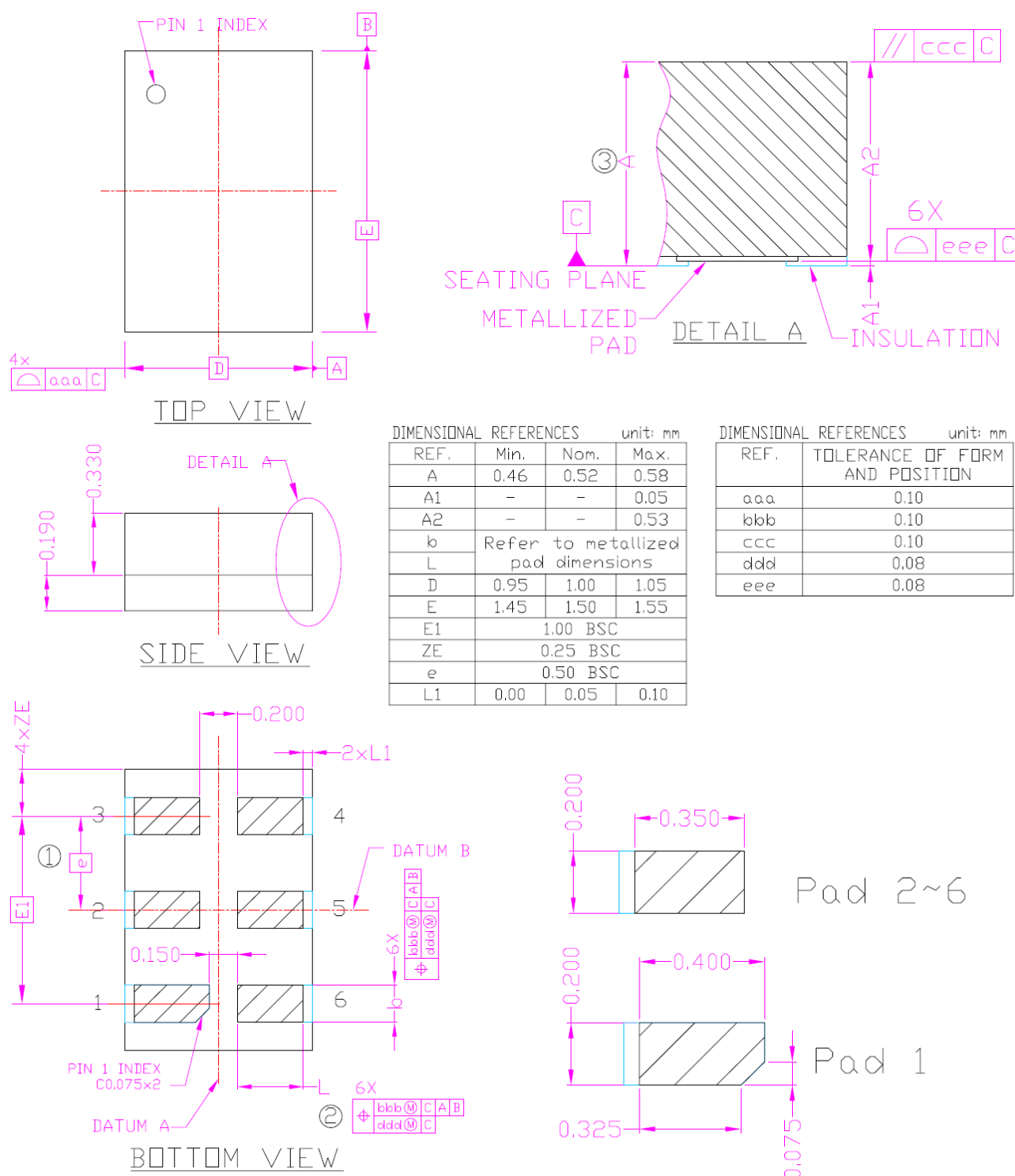
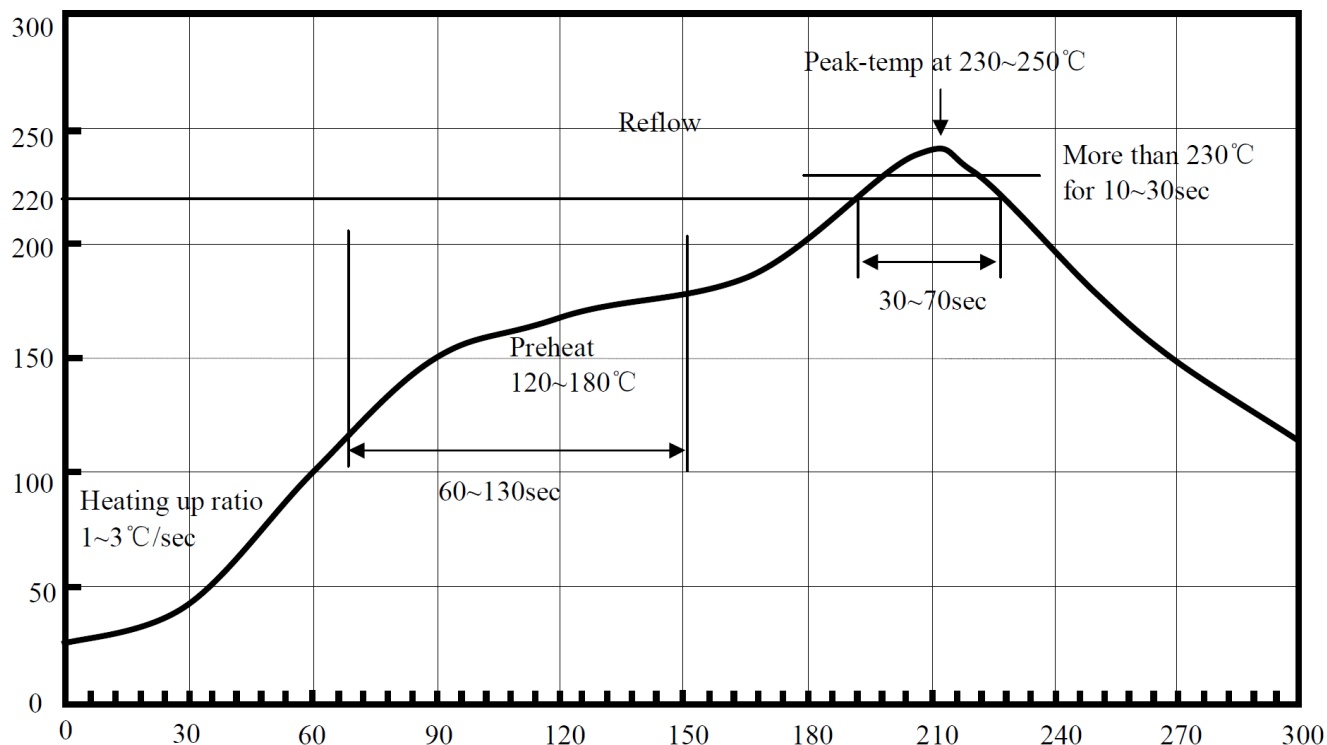


Figure 5. Package Outline

## RECOMMENDED SOLDER TEMPERATURE



Recommended Temperature Sn95.5Ag4.0Cu0.5

## ROHS COMPLIANT

The product does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE), and are therefore considered RoHS compliant.