DESCRIPTION

The SW7135 is a Front-End Module(FEM) with a fully-integrated Low- Noise Amplifier and Pre-Filter for BDS/GPS/ GNSS. The SW7135 requires no external capacitor/inductor, reduces assembly complexity and the PCB area, enabling a cost-effective solution.

The SW7135 achieves low noise figure, high gain, excellent linearity and high Out-Of-Band rejection. All these features make SW7135 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 SW7135 is available in a small lead-free, RoHS-Compliant, 1.5mm x 1.0mm x 0.75mm 6-pin LGA package。

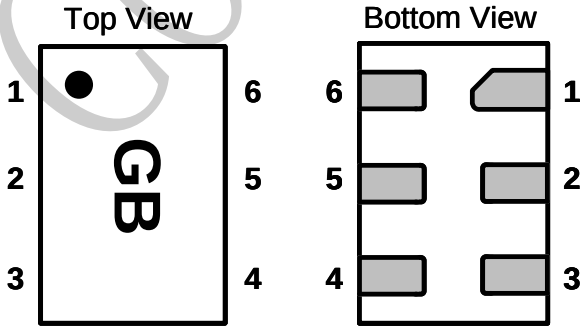
FEATURES

- **Low Noise Figure(NF): 1.6dB typical;**
- **Small signal gain: 17.5dB typical;**
- **Low current consumption: 3.9mA;**
- 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:1.5mmX1.0mmX 0.75mm
- 3kV HBM ESD protection (including RFIN and RFOUT pin)

APPLICATIONS

- Smart phones, feature phones, tablet PCs,
- Personal Navigation Devices,
- Digital Still Cameras, Digital Video Cameras;
- Complete GPS chipset modules;
- Theft protection (laptop, ATM);
- Smart watch and other mobile devices

PIN CONFIGURATION AND MARKING



Pin No.	Pin Name
1	GND
2	GND
3	RFIN
4	VCC
5	EN
6	RFOUT

Figure 2. SW7135 Pin Configuration and Marking

TYPICAL APPLICATION

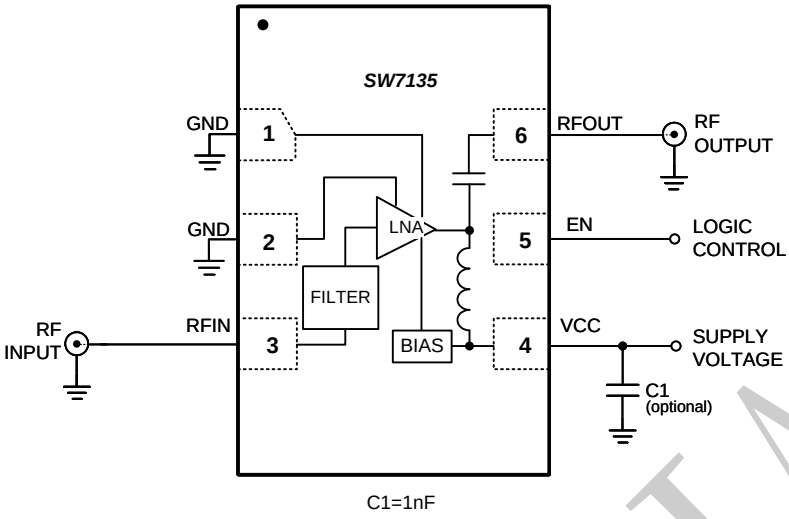


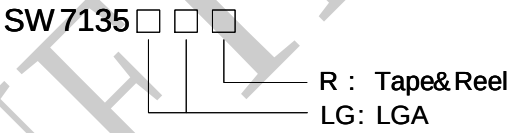
Figure 3. Application Schematic SW7135

For a list of components see *Table 4*

ORDER INFORMATION

Table 1. Order Information

Part Number	Temperature	Package	RoHS	Mark	SPQ
SW7135L	-40℃~85℃	1.5mm x 1.0 mm x 0.75mm LGA-6L	Yes	GB	Tape and Reel 3000 pcs/Reel



ABSOLUTE MAXIMUM RATINGS [1)]

Table 2. Limiting Values

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Supply Voltage at pin VCC	V_{CC}	-0.3	-	5.0	V
Voltage at pin EN[2)]	V_{EN}	-0.3	-	5.0	V
Current into pin VCC	I_{CC}	-	-	30	mA
RF input power[3)]	P_{IN}	-	-	10	dBm
Package thermal resistance	θ_{JA}	-	148.2		℃/W
Junction temperature	T_J	-	-	150	℃
Storage temperature range	T_{STG}	-65	-	150	℃
Ambient temperature range	T_{amb}	-40	-	85	℃
Solder temperature(10s)		-	260	-	℃
ESD range					
HBM[4)]		±3000			V
MM[5)]		±250			V
Latch-up					
Standard：JEDEC STANDARD NO.78DNOVEMBER 2011		+IT: +400 -IT: -400			mA mA

Note1*: Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.*

Note2: *Warning: due to internal ESD diode protection, the applied DC voltage should not exceed 5.0V in order to avoid excess current.*

Note3: *The RF input and RF output are AC coupled through internal DC blocking capacitor.*

Note4*: HBM standard:MIL-STD-883H Method 3015.8.*

Note5*:MM standard: JEDEC EIA/JESD22-A115.*

ELECTRICAL CHARACTERISTICS

(SW7135 EVB[1)]; V_{CC}=1.5 to 3.6V, T_A=-40~+85℃, f=1550MHz to 1615MHz; Typical values are at V_{CC}=2.8V and T_{amb}=+25℃, f=1575.42MHz, unless otherwise noted.)

Table 3. Electrical Characteristics

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
DC ELECTRICAL CHARACTERISTICS						
V_{CC}	Supply Voltage		1.5	2.8	3.6	V
I_{SD}	Shut-Down Current	EN=Low			1.0	μA
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
AC ELECTRICAL CHARACTERISTICS						
Gp	Power Gain			17.5		dB
RL_{in}	Input Return Loss			15.0		dB
ISL	Reverse Isolation			21.5		dB
RL_{out}	Output Return Loss			14.2		dB
NF	Noise Figure[2)]	Zs=50 ohm; No jammer		1.60		dB
Kf	Stability factor	f=20MHz...10GHz	1.0			
IP1dB	In-Band input 1dB-compression point	f=1575.42MHz;		-6.0		dBm
$IP1dB_{928MHz}$	Out-Of-Band input 1dB-compression point	$f_{blocker}$=928MHz; f=1575.42MHz;		+36		dBm
$IP1dB_{1980MHz}$	Out-Of-Band input 1dB-compression point	$f_{blocker}$=1980MHz; f=1575.42MHz;		+28		dBm
$IP1dB_{2400MHz}$	Out-Of-Band input 1dB-compression point	$f_{blocker}$=2400MHz; f=1575.42MHz;		+32		dBm

$IIP3_{oob}$	Out-of-band input 3rd-order intercept point	f1= 1712.7MHz;
		f2=1850MHz;
		Pin=-20dBm;
				TBD		dBm

t_{on}	Turn-on time[3)]			2.0		μs
t_{off}	Turn-off time[3)]			2.0		μs
FREQUENCY RESPONSE CHARACTERISTICS						
PG ripple	Power Gain ripple	f=1575.42MHz+-0.1MHz;		0.1		dBc
ATT	Attenuation	f=DC~1300MHz	35	45		dBc
ATT	Attenuation	f=1700MHz~2300MHz	30	35		dBc
ATT	Attenuation	f=2300~6000MHz	35	41		dBc

***Note1**: input matched to 50 ohms using a high quality-factor 9.1nH inductor.*

***Note2**: 0.08dB PCB losses are subtracted.*

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

TYPICAL PERFORMANCE CURVES AT 25 °C

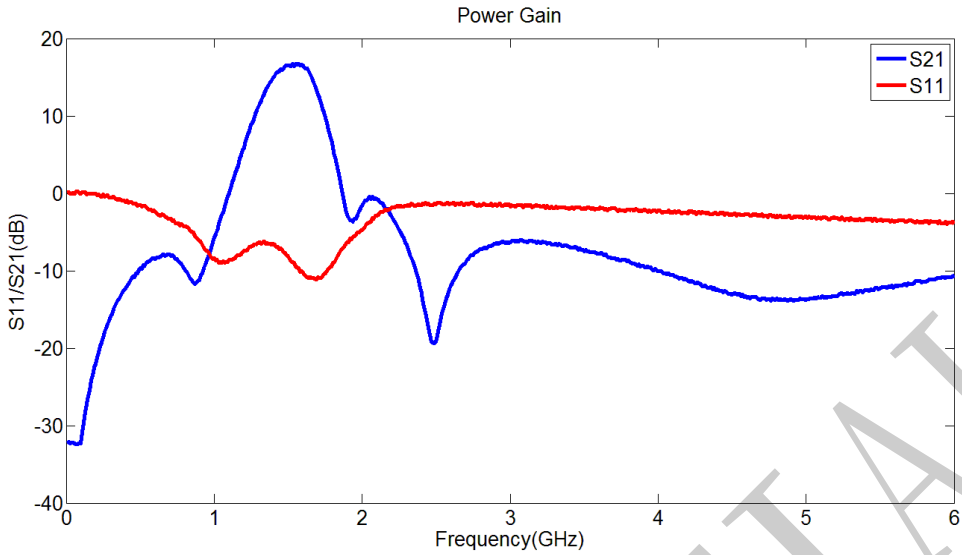


Figure 4. Typical S-parameter @Vdd=2.8V Idd=3.9mA

APPLICATION INFORMATION

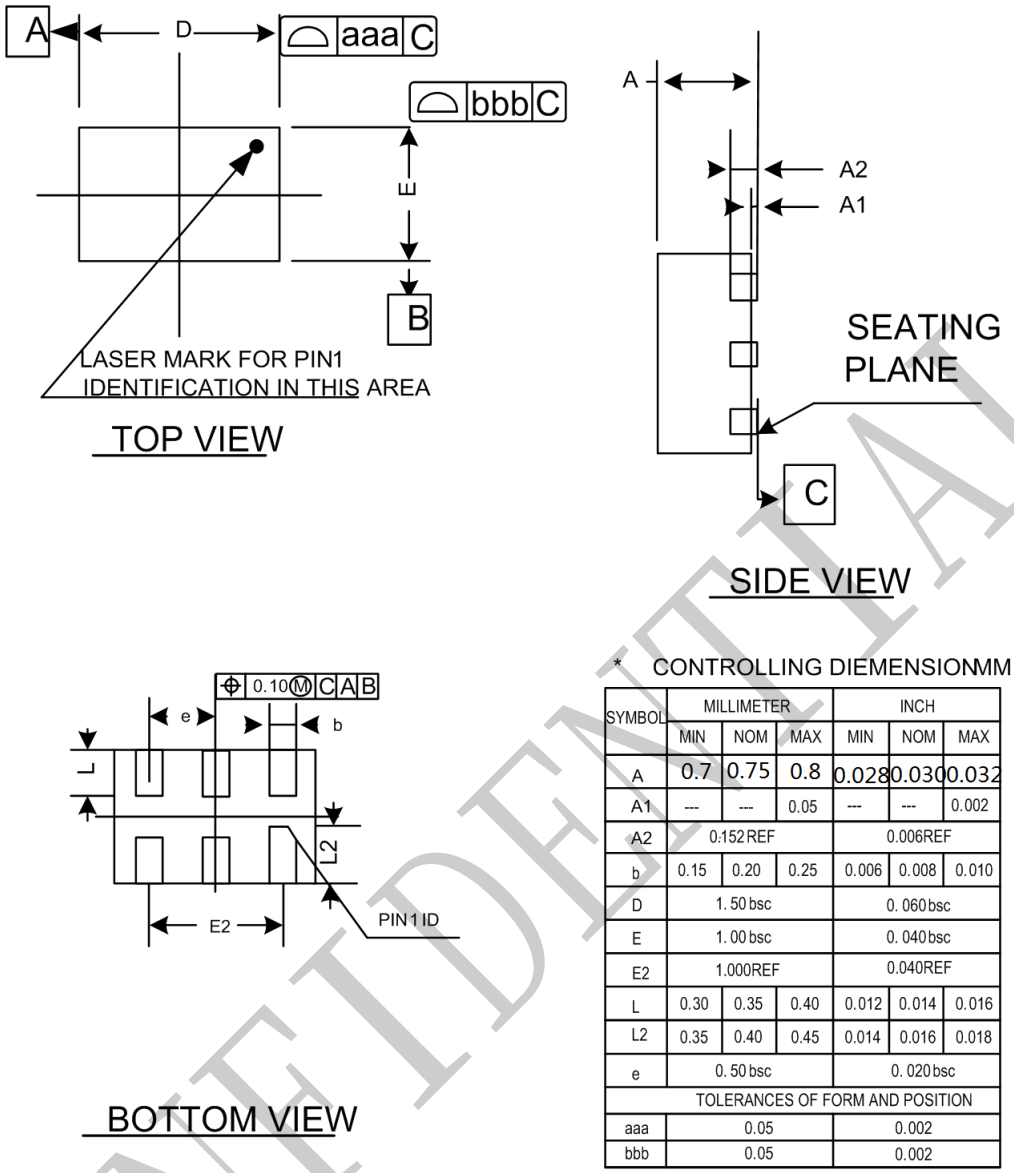
1. The SW7135 requires no external capacitor/inductor for input matching. Optional supply decoupling capacitor is 1nF. For schematics see *Figure 2.*
2. The SW7135 should be placed close to the GPS antenna. Use 50-ohm micro-strip lines to connect RF INPUT and RF OUTPUT. Bypass capacitor should be located 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
GRM155	100	50	Murata	0402

PACKAGE INFORMATION

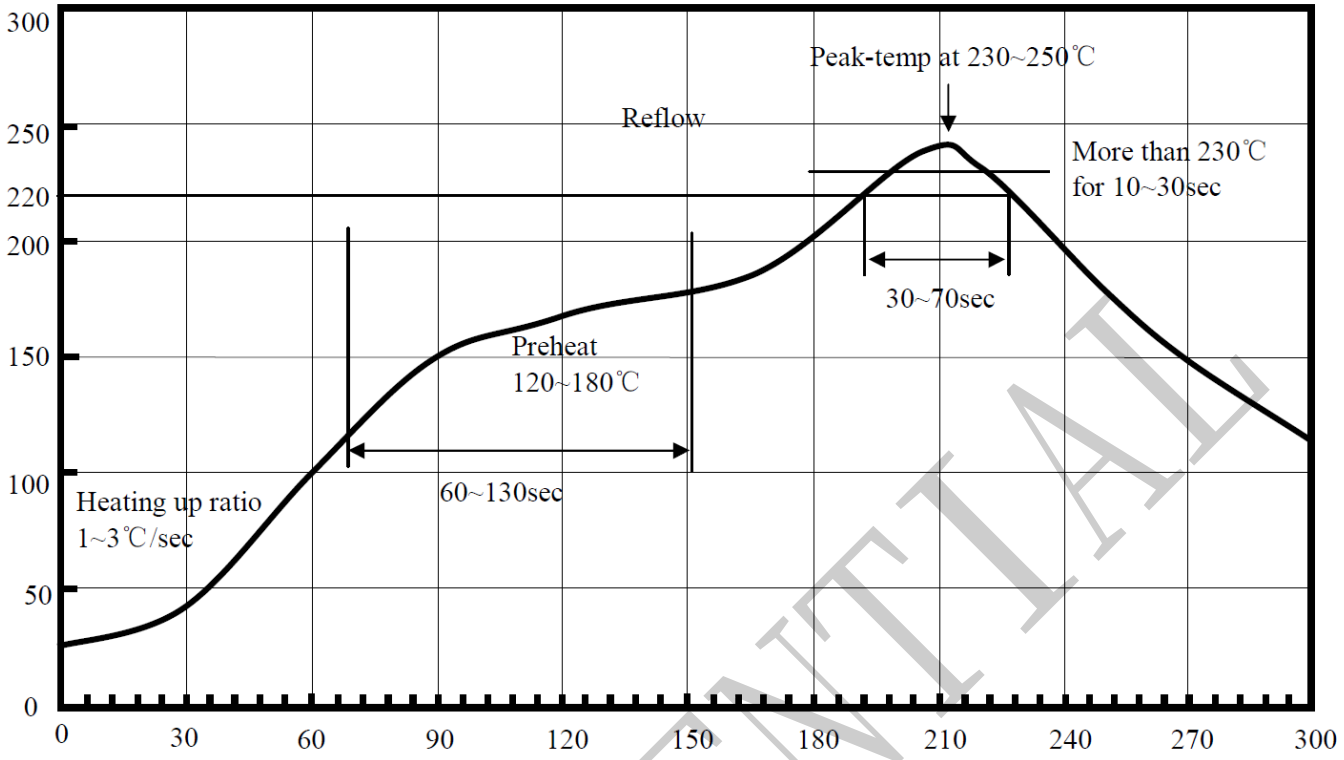


* CONTROLLING DIEMENSIONMM

SYMBOL	MILLIMETER			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.7	0.75	0.8	0.028	0.030	0.032
A1	---	---	0.05	---	---	0.002
A2	0.152 REF			0.006REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	1.50 bsc			0.060 bsc		
E	1.00 bsc			0.040 bsc		
E2	1.000REF			0.040REF		
L	0.30	0.35	0.40	0.012	0.014	0.016
L2	0.35	0.40	0.45	0.014	0.016	0.018
e	0.50 bsc			0.020 bsc		
TOLERANCES OF FORM AND POSITION						
aaa	0.05			0.002		
bbb	0.05			0.002		

Figure 5. Package Outline

RECOMMENDED SOLDER TEMPERATURE



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.