DATA SHEET

SKY65720-11: Shielded Low-Noise Amplifier Front-End Module with GPS/GNSS/BDS Pre-Filter

Applications

- GPS/GNSS/BDS radio receivers
- Global Navigation Satellite Systems (GLONASS)
- Fitness/activity trackers
- Smartphones
- Laptop PCs and tablets

Features

- Innovative proprietary shielded technology
- Wideband pre-filter
- Small signal gain: 16 dB typical
- Excellent out-of-band rejection
- Low noise figure: 1.5 dB typical
- Low current consumption
- Input/output impedance internally matched to 50 Ω
- Single DC supply: 1.8 V
- Minimal number of external components required
- Small, MCM (9-pin, 1.6 x 1.6 x 0.8 mm) package (MSL3, 260 °C per JEDEC J-STD-020)

Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.

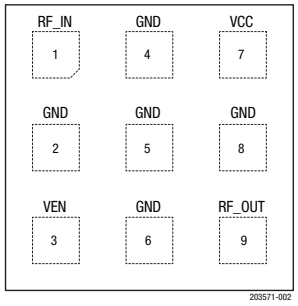


Figure 2. SKY65720-11 Pinout (Top View)

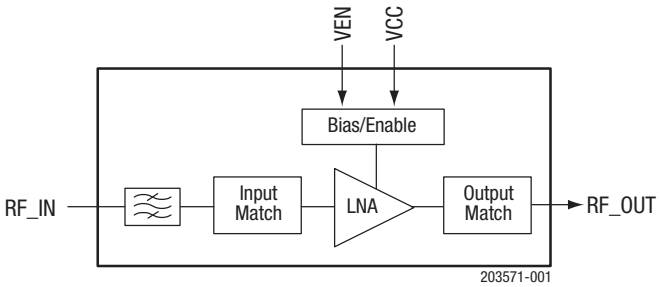


Figure 1. SKY65720-11 Block Diagram

Description

The SKY65720-11 is a shielded front-end module (FEM) with an integrated low noise amplifier (LNA) and pre-filter designed for Global Positioning System/Global Navigation Satellite System/Beidou Navigation Satellite System (GPS/GNSS/BDS) receiver applications. The device provides high linearity, excellent gain, a high 1 dB input compression point (IP1dB), and a superior noise figure (NF).

The pre-filter provides the low in-band insertion loss and integrated notch filtering for excellent rejections of the cellular, PCS, and WLAN frequency bands. The SKY65720-11 uses surface-mount technology (SMT) in a 1.6 x 1.6 x 0.8 mm Multi-Chip Module (MCM) package, which allows for a highly manufacturable and low-cost solution.

A functional block diagram is shown in Figure 1. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.

Table 1. SKY65720-11 Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	RF_IN	RF input	6	GND	Ground
2	GND	Ground	7	VCC	Supply voltage
3	VEN	LNA enable	8	GND	Ground
4	GND	Ground	9	RF_OUT	RF output
5	GND	Ground			

Technical Description

LNA Enable

The VEN signal (pin 3) enables or disables the LNA. A logic high signal powers on the LNA and a logic low signal powers off the device. An external series resistor can be used on this pin to adjust the LNA bias current.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY65720-11 are provided in Table 2. The recommended operating conditions are specified in Table 3, and electrical specifications are provided in Table 4.

Table 2. SKY65720-11 Absolute Maximum Ratings[1]

Parameter	Symbol	Minimum	Maximum	Units
RF input power	P_{IN}		+10	dBm
Supply voltage	V_{CC}	0	3.1	V
Storage temperature	T_{STG}	–55	+150	°C
Junction temperature	T_J		+150	°C
Electrostatic discharge:	ESD			
Human Body Model (HBM), Class 1A			250	V

[1] Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

ESD HANDLING: *Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.*

Table 3. Recommended Operating Conditions

Parameter	Symbol	Minimum	Typical	Maximum	Units
Frequency range	f	1559	1575	1606	MHz
Supply voltage	V_{CC}		1.8		V
LNA enable:					
Enable (high)	LNA_{ENABLE}	V_{CC} – 0.3		V_{CC}	V
Disable (low)	$LNA_{DISABLE}$		0	0.3	V
Case operating temperature	T_C	–40	+25	+85	°C

Table 4. SKY65720-11 Electrical Specifications[1]
(V_{CC} = 1.8 V, V_{EN} = 1.8 V, f = 1575 MHz, Tc = +25°C, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Small signal gain	|S21|	P_{IN} = -30 dBm		16		dB
Noise figure	NF			1.5		dB
In-band third order input intercept point	IIP3			–7		dBm
1 dB input compression point (in-band)	IP1dB			–15		dBm
Reverse isolation	|S12|	P_{IN} = -30 dBm		33		dB
Input return loss	|S11|	P_{IN} = -30 dBm		8		dB
Output return loss	|S22|	P_{IN} = -30 dBm		15		dB
Supply current	Icc	No RF		3.8		mA
Shutdown current	Ileak	No RF, V_{EN} = 0 V		0.1	1	uA
Out-of-band rejection	OOB	P_{IN} = 0 dBm (in-band referred):				
		@ 777 to 798 MHz		60		dBc
		@ 806 to 928 MHz		55		dBc
		@ 1710 to 1980 MHz		45		dBc
		@ 2400 to 2500 MHz		65		dBc
		@ 5160 to 5560 MHz		80		dBc

[1] Performance is guaranteed only under the conditions listed in this table.

Evaluation Board

An Evaluation Board is used to test the performance of the SKY65720-11 device. A schematic of the Evaluation Board is provided in Figure 3. An assembly diagram of the Evaluation Board is shown in Figure 4.

Package Dimensions

The PCB layout footprint for the SKY65720-11 is provided in Figure 5. The typical part marking is shown in Figure 6. Package dimensions are shown in Figure 7, and tape and reel dimensions are provided in Figure 8.

Package and Handling Information

Since the device package is sensitive to moisture absorption, it is baked and vacuum packed before shipping. Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SKY65720-11 is rated to Moisture Sensitivity Level 3 (MSL3) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *PCB Design & SMT Assembly/Rework Guidelines for MCM-L Packages*, document number 101752.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

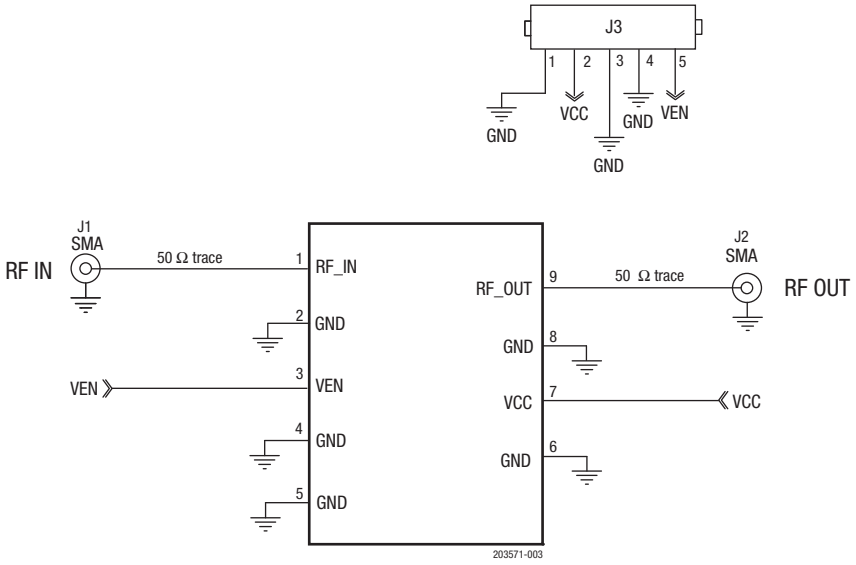


Figure 3. SKY65720-11 Evaluation Board Schematic

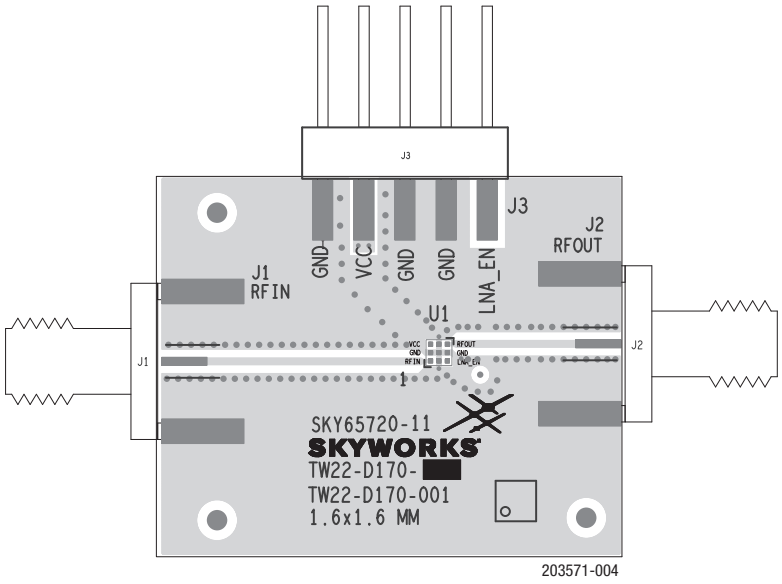
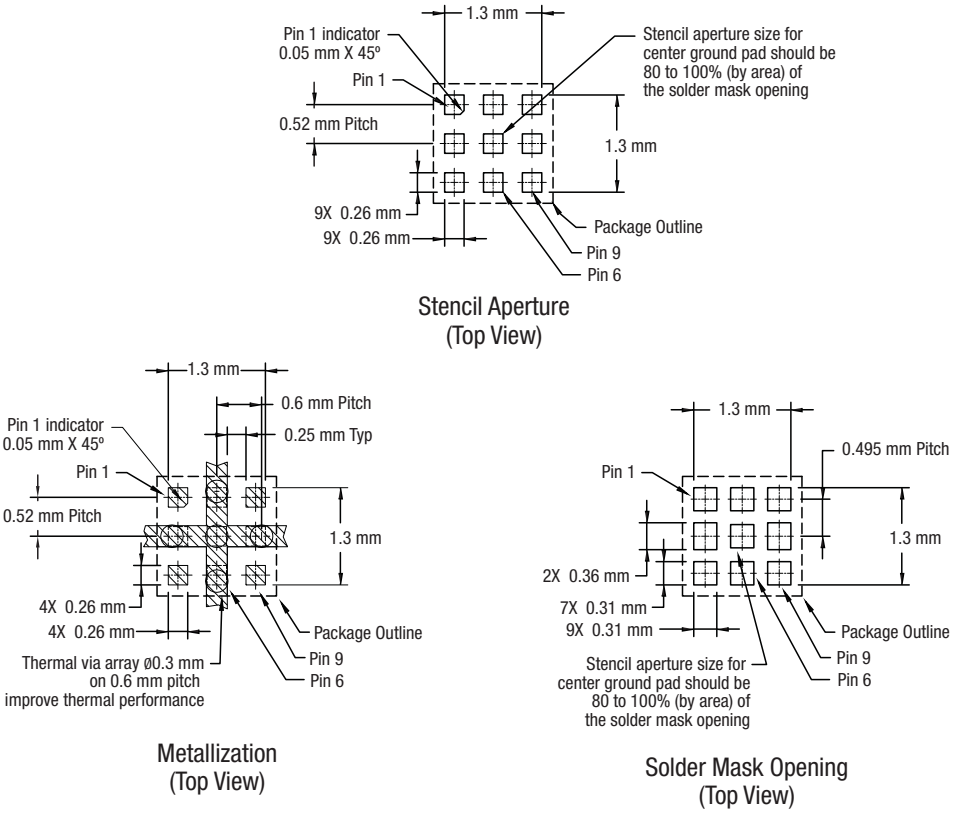


Figure 4. SKY65720-11 Evaluation Board Assembly Diagram



Notes:

1. *All measurements are in millimeters.*
2. *Thermal vias should be resin filled and capped in accordance with IPC-4761 type VII vias. Recommended Cu thickness is 30 to 35 µm.*

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Figure 5. SKY65720-11 PCB Layout Footprint

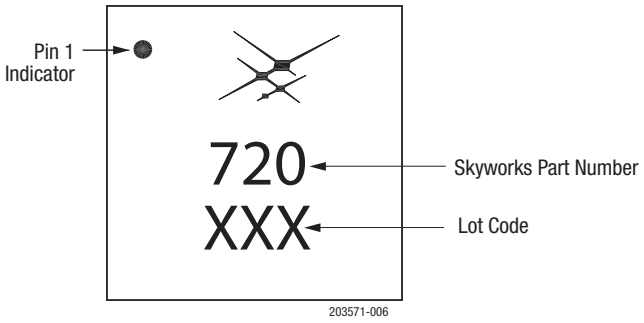
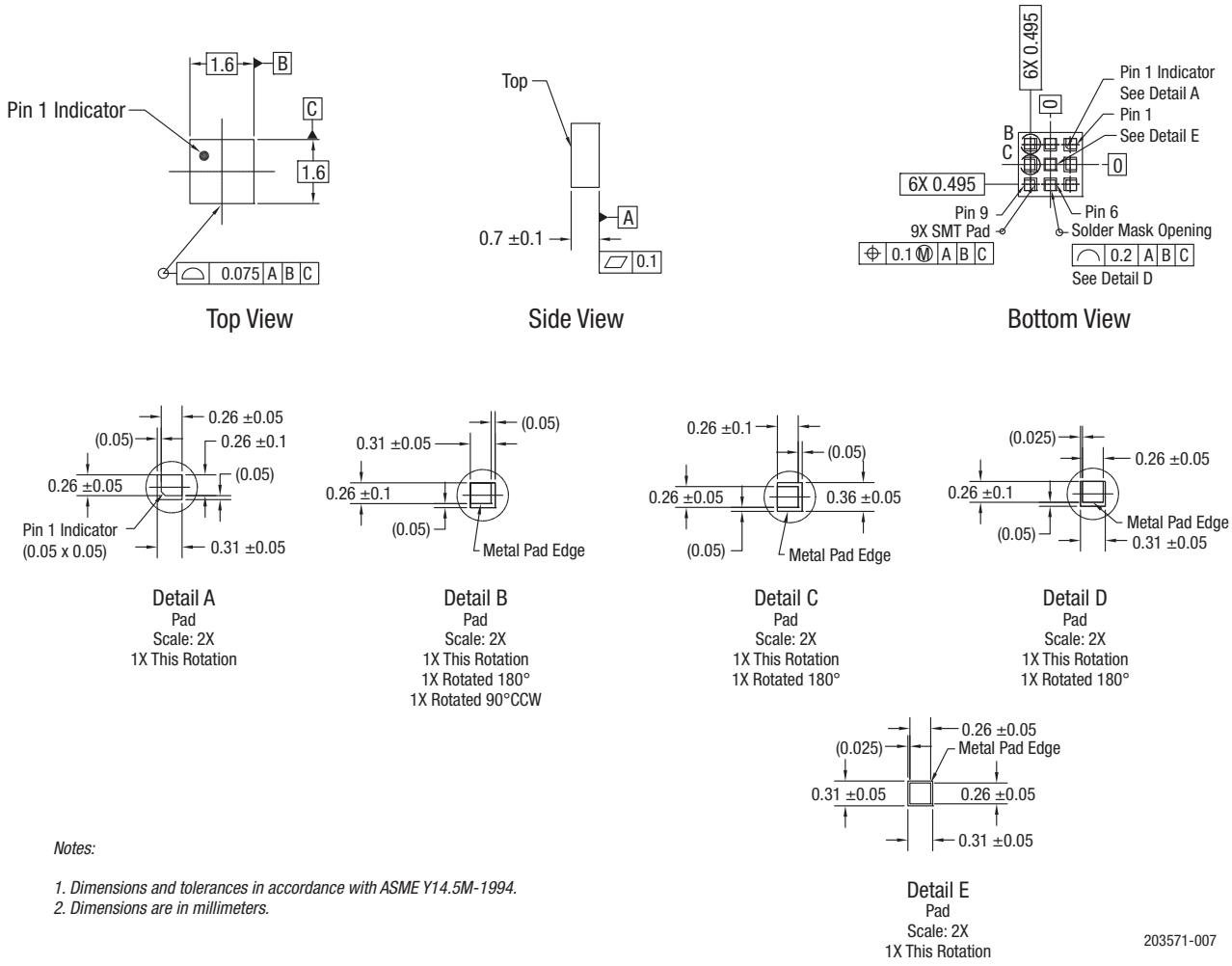


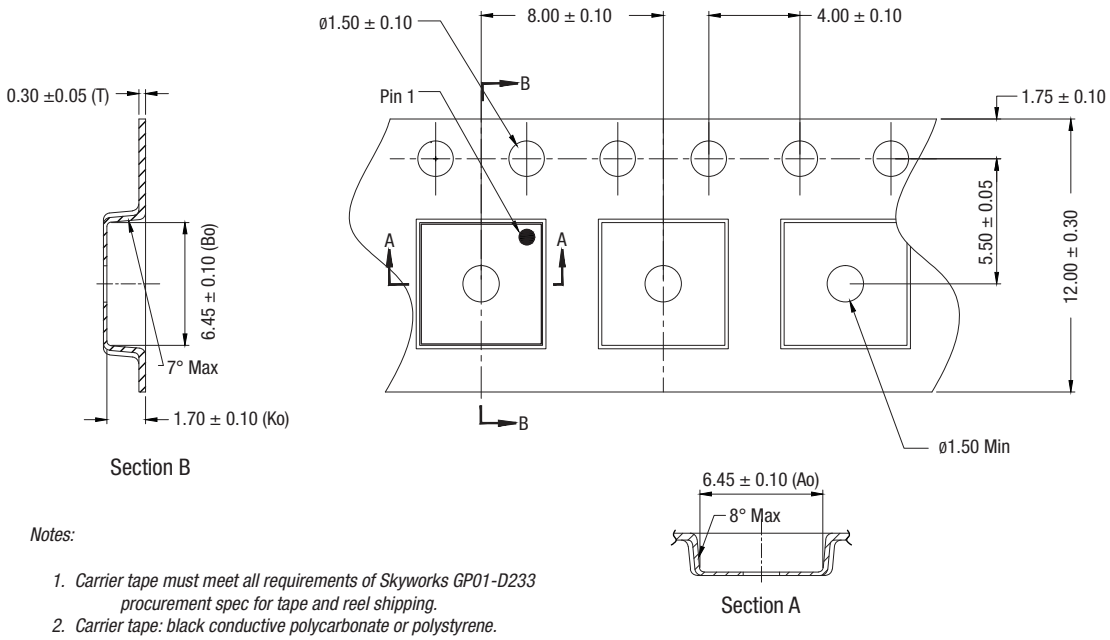
Figure 6. SKY65720-11 Typical Part Marking



Notes:

1. Dimensions and tolerances in accordance with ASME Y14.5M-1994.
2. Dimensions are in millimeters.

Figure 7. SKY65720-11 Package Dimensions



Notes:

1. *Carrier tape must meet all requirements of Skyworks GP01-D233 procurement spec for tape and reel shipping.*
2. *Carrier tape: black conductive polycarbonate or polystyrene.*
3. *Cover tape material: transparent antistatic polyester film.*
4. *ESD-surface resistivity shall be ≤ 1 x 10^6 Ω/square per EIA, JEDEC TNR Specification.*
5. *All dimensions are in millimeters.*

Figure 8. SKY65720-11 Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKY65720-11: Shielded Low-Noise Amplifier FEM with GPS/GLONASS/BDS Filter	SKY65720-11	SKY65720-11-EVB