

DATA SHEET

SKY66013-11: 700 to 800 MHz, +19 dBm Linear Power Amplifier

Applications

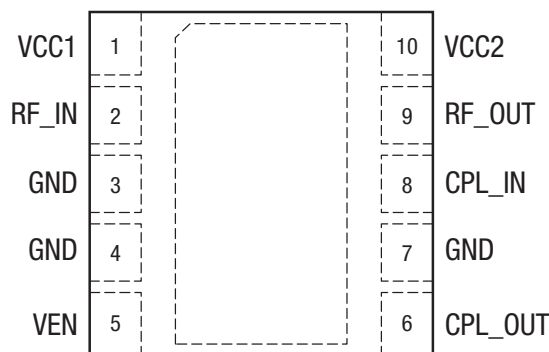
- Residential femtocells
- WCDMA, Bands 12, 13, 14, and 17
- Small cells

Features

- Small signal gain: 27.5 dB
- ACLR at P_{OUT} = +19 dBm: -51 dBc
- PA on/off control
- I/O impedance internally matched to 50 Ω
- Single DC supply: 3.3 V to 4.6 V
- Minimal number of external components required
- Small footprint MCM (10-pin, 3 x 3 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.



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Figure 2. SKY66013-11 Pinout (Top View)

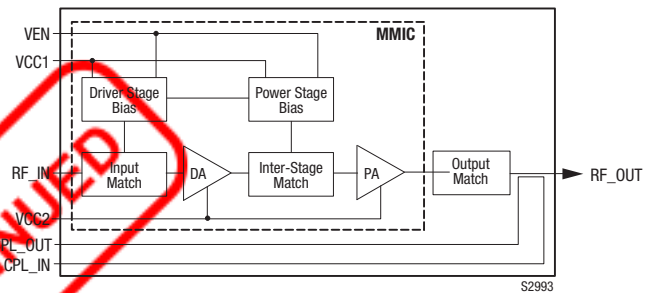


Figure 1. SKY66013-11 Linear PA Block Diagram

Description

The SKY66013-11 linear power amplifier (PA) is a fully matched surface-mount module developed for WCDMA applications operating from 700 to 800 MHz. The device meets the stringent spectral linearity requirements of WCDMA femtocell applications with high power-added efficiency. An integrated directional coupler eliminates the need for any external coupler.

The GaAs MMIC contains all active amplifier circuitry, which includes input and interstage matching circuits. An output match into a 50 Ω load, realized off-chip within the module package, optimizes efficiency and power performance.

The SKY66013-11 is manufactured with Skyworks InGaP GaAs HBT process, which provides for all positive voltage DC supply operation and maintains high efficiency and good linearity. The primary bias to the device can be supplied directly from any suitable power supply with an output of 4.2 V. Power down is achieved by setting the VEN pin to 0 V. No external supply side switch is needed since typical “off” leakage is a few microamps with full primary voltage supplied from the main power supply.

The SKY66013-11 is packaged in a 10-pin, 3 x 3 mm Multi-Chip Module (MCM), which allows for a highly manufacturable low-cost solution.

A functional block diagram of the SKY66013-11 is shown in Figure 1. The 10-pin MCM package and pinout are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.

Table 1. SKY66013-11 Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	VCC1	Input stage supply voltage	6	CPL_OUT	RF coupler output
2	RF_IN	RF input port	7	GND	Ground
3	GND	Ground	8	CPL_IN	RF coupler input
4	GND	Ground	9	RF_OUT	RF output port
5	VEN	Enable	10	VCC2	Output stage supply voltage

Technical Description

The SKY66013-11 PA contains all of the needed RF matching and DC biasing circuits. The device is a two-stage, HBT InGaP device optimized for high linearity and power efficiency. These features make the device suitable for wideband digital applications where PA linearity and power consumption are of critical importance (e.g., small cell and infrastructure applications).

The device is designed for standard WCDMA modulated signals. Under these stringent test conditions, the device exhibits excellent spectral purity and power efficiency.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY66013-11 are provided in Table 2. The recommended operating conditions are specified in Table 3 and electrical specifications are provided in Table 4.

Table 2. SKY66013-11 Absolute Maximum Ratings¹

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage (VCC1, VCC2)	VCC	0	+4.6	V
Total supply current	ICC		700	mA
Logic control input voltage (VEN)	VCTL	-0.5	3.1	V
Case operating temperature ²	Tc	-40	+85	°C
Storage temperature	TSTG	-55	+150	°C
Junction temperature	TJ		+150	°C
Thermal resistance	ΘJC		60	°C/W

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.

² Case operating temperature (Tc) refers to the temperature of the bottom ground pad.

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. SKY66013-11 Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units
Frequency range	f	729		768	MHz
Supply voltage (VCC1, VCC2) ¹	VCC	4.0	4.2	4.6	V
Logic control input voltage:					
Logic high	V _{IH}	1.35	1.80	3.10	V
Logic low	V _{IL}	0		0.5	V
PA enable current	I _{EN}			<1	mA
Case operating temperature	T _C	-20	+25	+85	°C

¹ Voltage levels measured at the pads of the package. The Evaluation Board supply voltage levels may be different. Refer to the Evaluation Board schematic diagram in Figure 3.

Table 4. SKY66013-11 Electrical Specifications¹

(VCC1 = VCC2 = +4.2 V, T_C = +25 °C, f = 746 MHz, Characteristic Impedance [Z₀] = 50 Ω, VEN = "1," Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Small signal gain	S ₂₁	CW, P _{IN} = -20 dBm	25.5	27.5		dB
Input return loss	S ₁₁	CW, P _{IN} = -20 dBm		-17		dB
Quiescent current	I _{CQ}	No RF		45	55	mA
Operating current	I _{CC}	CW, P _{OUT} = +19 dBm		110	120	mA
Power-down current	I _{PD}	V _{EN} = "0"		1	5	μA
Third order output intercept point	OIP3	Δf = 5 MHz	+36	+42		dBm
Adjacent channel leakage ratio	ACLR5	@5 MHz offset, WCDMA test model 1, with 64 DPCH, P _{OUT} = +19 dBm		-51	-45	dBc
Error vector magnitude	EVM	P _{OUT} = +19 dBm		2	3	%
Harmonic suppression	2f _o 3f _o	CW, P _{OUT} = +19 dBm		-43 -60	-38 -54	dBc dBc
Stability (non-harmonic spurious)	VSWR _{STABILITY}	VSWR = 6:1 @ P _{OUT} = +19 dBm		-63		dBc
Maximum ruggedness input power	P _{IN_RUG}	VSWR = 6:1		-7		dBm

¹ Performance is guaranteed only under the conditions listed in this table. Both pins 6 and 8 (CPL_OUT and CPL_IN, respectively) should be terminated with 50 Ω.

Evaluation Board Description

The SKY66013-11 Evaluation Board is used to test the performance of the SKY66013-11 PA. A schematic diagram of the Evaluation Board is shown in Figure 3.

An assembly drawing for the Evaluation Board is shown in Figure 4, and the layer detail is provided in Figure 5.

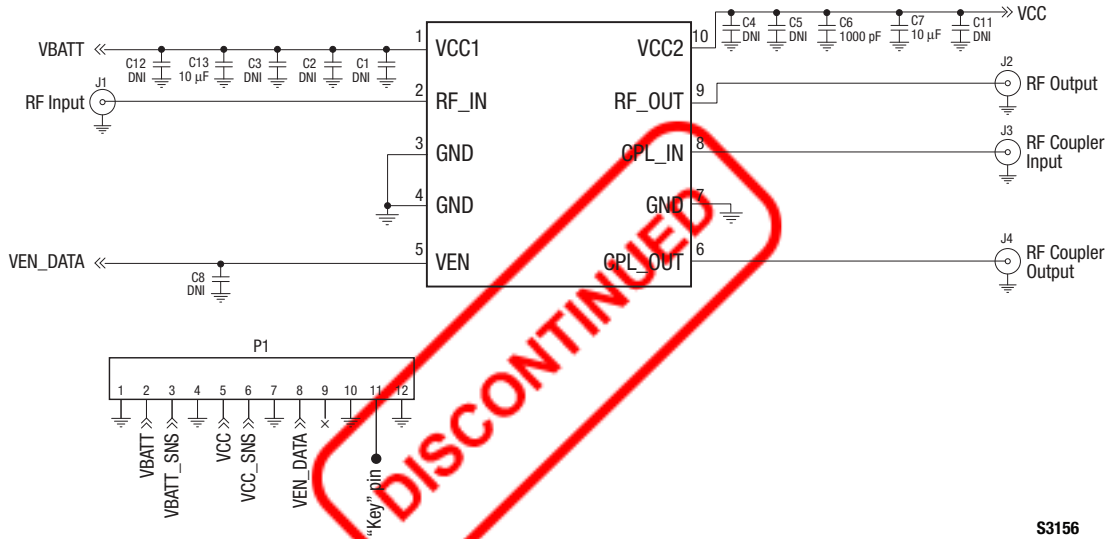


Figure 3. SKY66013-11 Evaluation Board Schematic

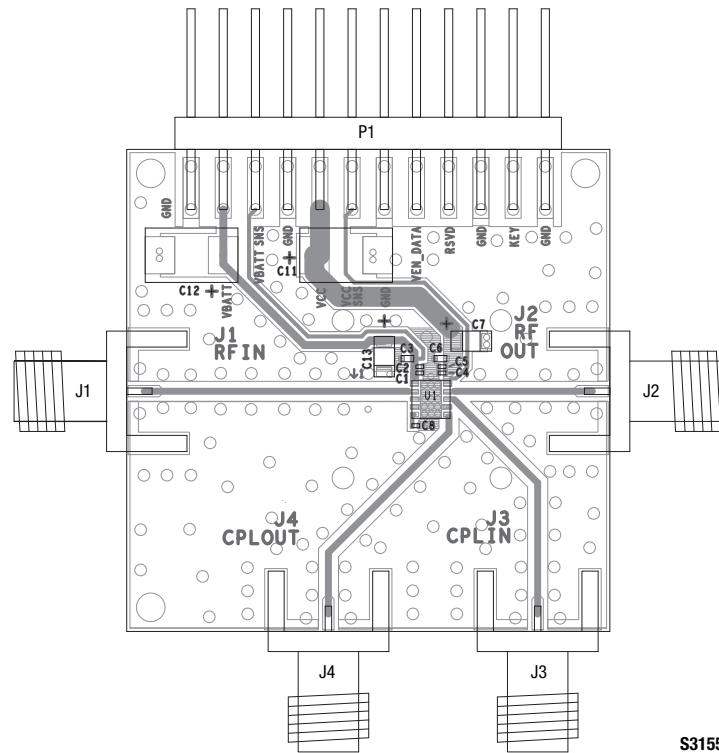
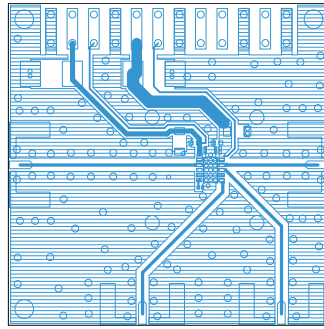


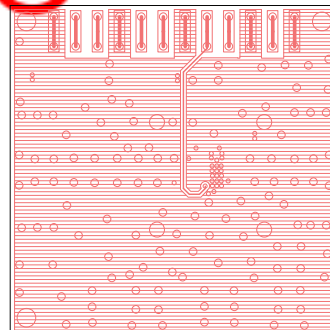
Figure 4. SKY66013-11 Evaluation Board Assembly Diagram



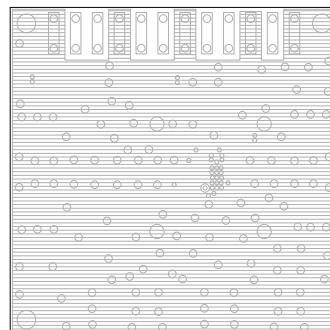
Layer 1: Top Metal



Layer 2: Ground



Layer 3: Ground



Layer 4: Bottom (Ground) Layer

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Figure 5. SKY66013-11 Evaluation Board Layer Detail

Package Dimensions

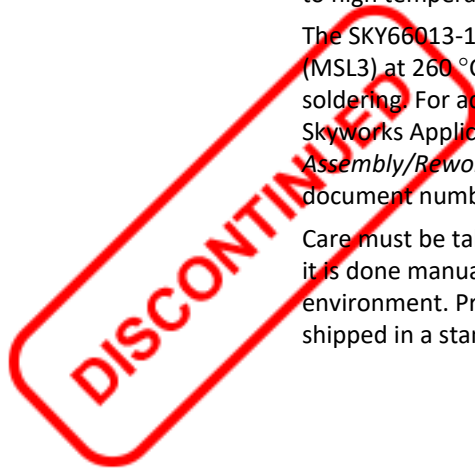
The PCB layout footprint for the SKY66013-11 is provided in Figure 6. Typical part markings are shown in Figure 7. Figure 8 shows the package dimensions, and Figure 9 provides the tape and reel dimensions.

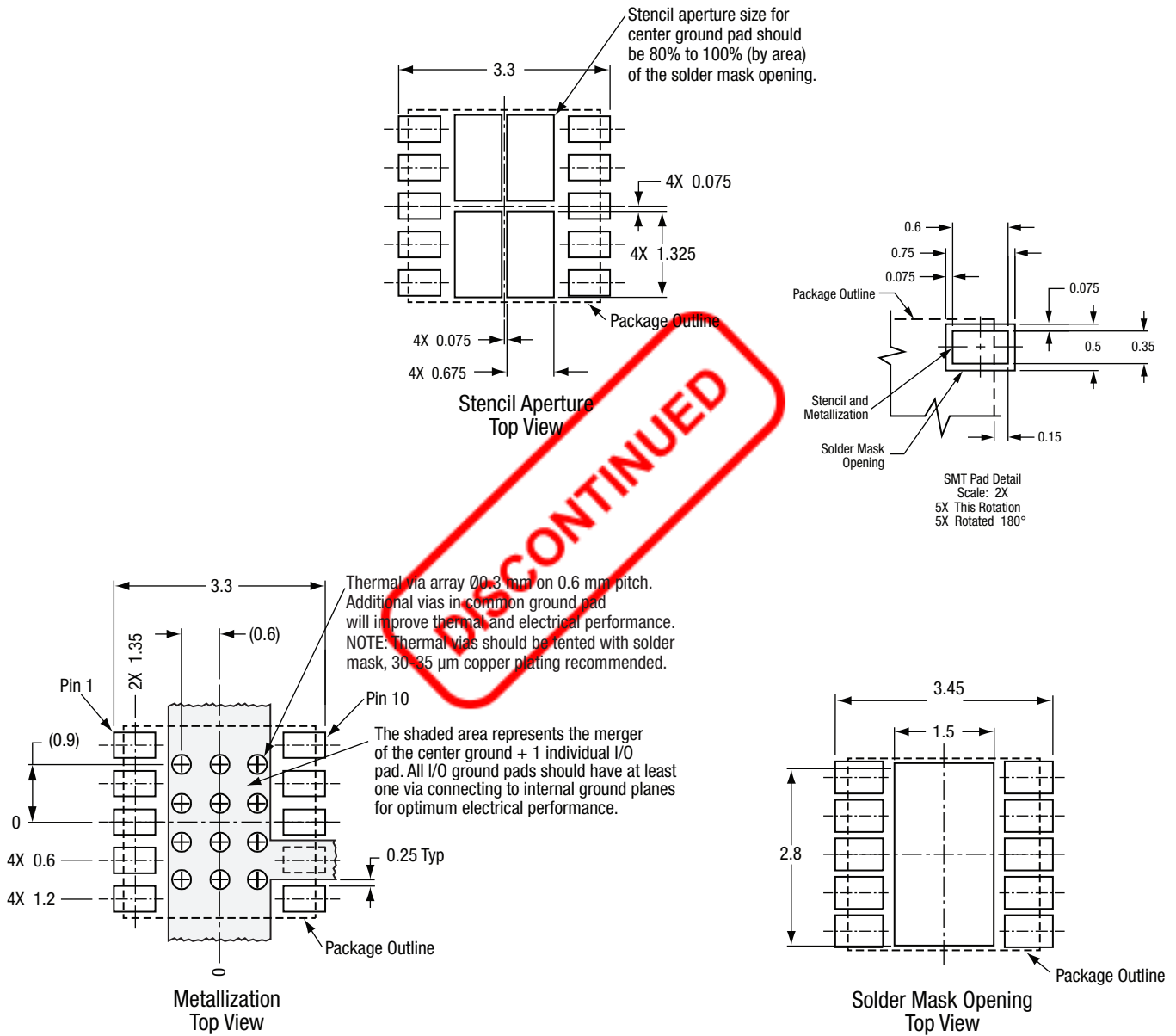
Package and Handling Information

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 SKY66013-11 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 and 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.





All dimensions are in millimeters

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Figure 6. PCB Layout Footprint for the SKY66013-11

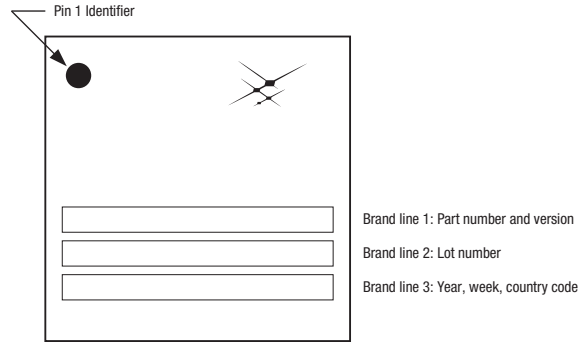
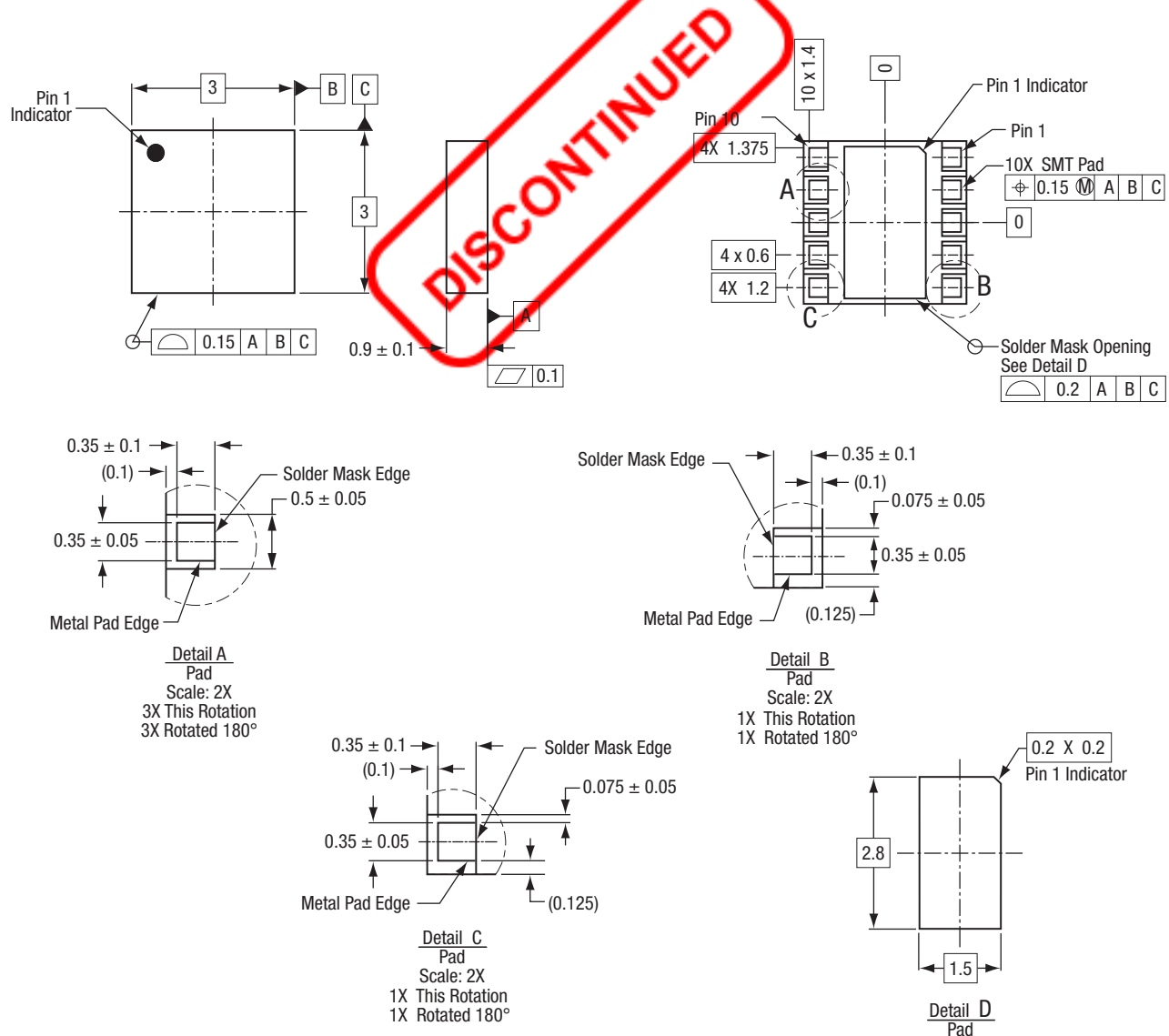


Figure 7. Typical Part Markings
(Top View)



Dimensioning and Tolerancing in accordance with ASME Y14.5M-1994
All dimensions are in millimeters.

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Figure 8. SKY66013-11 Package Dimensions

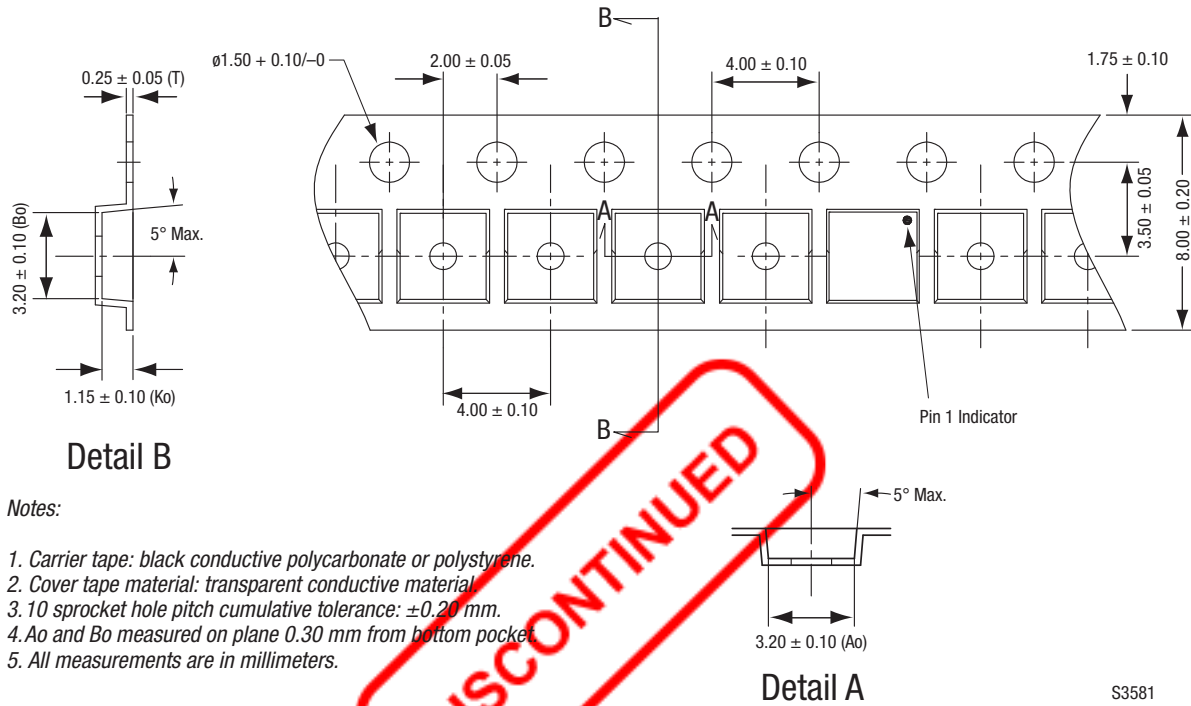


Figure 9. SKY66013-11 Tape and Reel Dimensions

Ordering Information

Product Description	Product Part Number	Evaluation Board Part Number
SKY66013-11: 700 to 800 MHz, +19 dBm Linear PA	SKY66013-11	SKY66013-11-EVB



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