

**PRELIMINARY DATA SHEET**

# SKY73063: 1700 – 2100 MHz High Linearity, Single Up/Downconversion Mixer


## Applications

- 2G/3G base station transceivers:
  - GSM/EDGE, CDMA, UMTS/WCDMA
- Wi-Fi (802.11)
- WiMAX (802.16)
- 3GPP Long-Term Evolution
- Wireless Local Loop
- High performance radio links
- Land mobile radio
- Private mobile radio

## Features

- Operating frequency range: 1700 to 2100 MHz
- IF frequency range: 100 to 200 MHz
- Insertion loss: 6.0 dB
- Input IP3: +33.5 dBm
- Noise Figure: 6.0 dB
- Integrated LO driver
- Integrated low loss RF balun
- On-chip SPDT LO switch (greater than 40 dB LO-to-LO isolation)
- Small, MCM (20-pin, 5 x 5 mm) Pb-free package (MSL3, 260 °C per JEDEC J-STD-020)

**NEW** Skyworks offers lead (Pb)-free RoHS (Restriction of Hazardous Substances) compliant packaging.

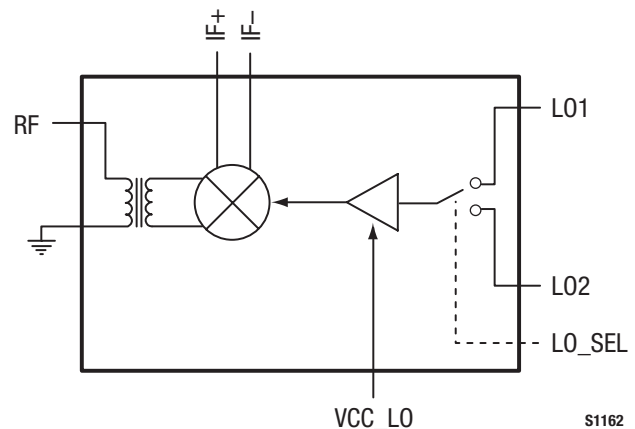


## Description

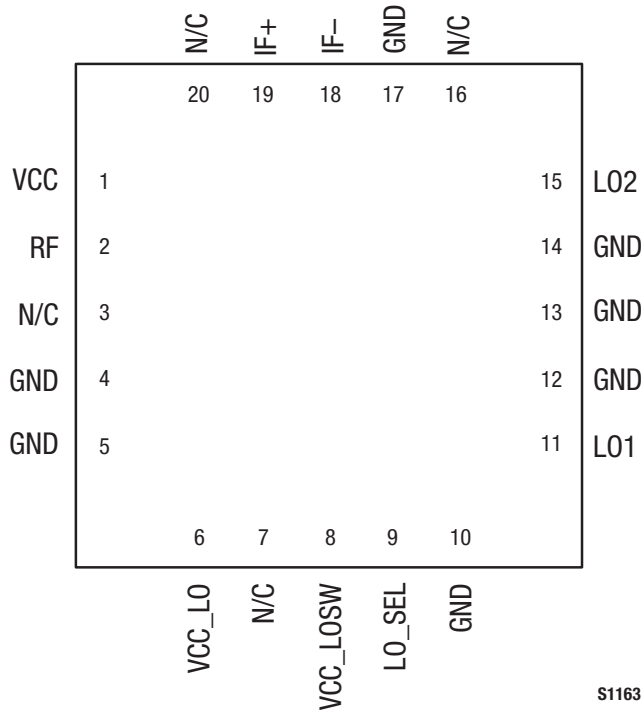
The SKY73063 is a fully integrated up/downconversion mixer that includes a Local Oscillator (LO) driver, an LO switch, and a high linearity mixer. A low loss RF balun has also been included to reduce design complications and lower system cost.

The SKY73063 features an input IP3 of +33.5 dBm and an insertion loss of 6.0 dB, making the device an ideal solution for high dynamic range systems such as 2G/3G base station receivers. The LO switch provides more than 40 dB of isolation between LO inputs and supports the switching time required for GSM/EDGE base stations.

The SKY73063 is manufactured using a robust silicon BiCMOS process and has been designed for optimum long-term reliability. The SKY73063 single up/downconversion mixer is provided in a compact, 20-pin 5 x 5 mm Multi-Chip Module (MCM). 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.



**Figure 1. SKY73063 Block Diagram**



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Figure 2. SKY73063 Pinout – 20-Pin MCM

Table 1. SKY73063 Signal Descriptions

Pin #	Name	Description	Pin #	Name	Description
1	VCC	DC supply, +5V	11	LO1	LO1 input
2	RF	RF input	12	GND	Ground
3	N/C	No connection	13	GND	Ground
4	GND	Ground	14	GND	Ground
5	GND	Ground	15	LO2	LO2 input
6	VCC_LO	LO DC supply, +5V	16	N/C	No connection
7	N/C	No connection	17	GND	Ground
8	VCC_LOSW	LO switch DC supply, +5V	18	IF-	Negative IF output
9	LO_SEL	LO select switch control	19	IF+	Positive IF output
10	GND	Ground	20	N/C	No connection

## Functional Description

The SKY73063 is a high linearity, single up/downconversion mixer, optimized for base station receiver applications. The device consists of a low loss RF balun and high linearity passive mixer.

An LO amplifier is also included that allow the SKY73063 to connect directly to the output of a Voltage Controlled Oscillator (VCO). This eliminates the extra gain stages needed by most discrete passive mixers. A Single Pole, Double Throw (SPDT) switch has been included to select between two different LO inputs (LO1 and LO2) for frequency hopping applications such as GSM.

## RF Balun and Passive Mixer

The RF balun provides a single ended input, which can easily be matched to 50  $\Omega$  using a simple external matching circuit. The balun offers very low loss, and excellent amplitude and phase balance.

The high linearity SKY73063 is a passive, double-balanced mixer that provides a very low conversion loss, and excellent 3<sup>rd</sup> Order Input Insertion Point (IIP3).

Additionally, the balanced nature of the mixer provides for high port-to-port isolation.

## LO Buffer and SPDT LO Switch

The LO buffer allows the input power of the SKY73063 to be in the range of  $\pm 6$  dBm. The LO section is optimized for high-side LO injection. However, each of the two LOs can be driven over a wide frequency range with some degradation in performance.

A high isolation SPDT switch allows the SKY73063 to be used for frequency hopping applications. This switch provides greater than 40 dB of LO1 to LO2 isolation:

LO_SEL Input	LO Path Selected
High	LO1 (pin 11) enabled
Low	LO2 (pin 15) enabled

For applications that do not require frequency hopping, LO\_SEL is fixed to one state and the appropriate LO input is used. An internal pull-down resistor enables the LO2 input.

## Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY73063 are provided in Table 2 and the recommended operating conditions in Table 3. Electrical characteristics for the SKY73063 are provided in Table 4.

**Table 2. SKY73063 Absolute Maximum Ratings**

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage, +5 V	VCC	4.5	5.5	V
Supply current	I <sub>CC</sub>		100	mA
RF input power	P <sub>RF</sub>		+20	dBm
IF input power	P <sub>IF</sub>		+20	dBm
LO input power	P <sub>LO</sub>		+20	dBm
Operating case temperature	T <sub>C</sub>	-40	+85	°C
Junction temperature	T <sub>J</sub>		+150	°C
Storage case temperature	T <sub>STG</sub>	-40	+125	°C

**Notes:** 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.

**Table 3. SKY73063 Recommended Operating Conditions**

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply voltage, +5 V	VCC	4.75	5.00	5.25	V
Supply current	I <sub>CC</sub>		70		mA
LO input power	P <sub>LO</sub>	-6	0	+6	dBm
LO select input: high low	LO_SEL <sub>H</sub> LO_SEL <sub>L</sub>	2.2		0.8	V V
Operating case temperature	T <sub>c</sub>	-40		+85	°C
RF frequency range	F <sub>RF</sub>	1700		2100	MHz
LO frequency range (Note 1)	F <sub>LO</sub>	1800		2300	MHz
IF frequency range	F <sub>IF</sub>	100		200	MHz

**Note 1:** The SKY73063 has been optimized for high-side LO injection. However, the LO can be used outside of the specified frequency range with degraded performance.

**Table 4. SKY73063 Electrical Specifications (1 of 2)**

**(Voltage Supply = +5 V, T<sub>c</sub> = +25 °C, LO = 0 dBm, RF Frequency = 1875 MHz, IF Frequency = 150 MHz, LO Frequency = 2025 MHz, Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Downconversion insertion loss	I <sub>LDOWN</sub>	RF input to IF output, F <sub>RF</sub> = 1875 MHz, P <sub>RF</sub> = -7 dBm		6.0		dB
Upconversion insertion loss	I <sub>LUP</sub>	IF input to RF output, F <sub>IF</sub> = 150 MHz, P <sub>IF</sub> = -7 dBm		5.9		dB
Noise Figure	NF			6.0		dB
Noise Figure with a blocker signal	NF <sub>BLK</sub>	Blocking signal input power = +8 dBm			25	dB
Upconversion third order input intercept point	IIP3 <sub>UP</sub>	IF input, F <sub>IF</sub> = 150 MHz and 150.8 MHz, P <sub>IF</sub> = -7 dBm/each tone		+33.5		dBm
Input 1 dB compression point	IP1 <sub>dB</sub>	Upconversion		+19		dBm
LO1-to-LO2 isolation				40		dB
LO leakage @ RF port				-30.5		dBm
LO_SEL input			-20	+150	+250	μA
LO switching time					0.5	μs
RF port return loss	Z <sub>RF</sub>	With external matching components	14			dB
LO port return loss	Z <sub>LO</sub>	With external matching components	14			dB
IF port return loss	Z <sub>IF</sub>	With external matching components	14			dB

**Evaluation Board Description**

The SKY73063 Evaluation Board is used to test the performance of the SKY73063 downconversion mixer. An assembly drawing for the Evaluation Board is shown in Figure 3 and the layer detail is provided in Figure 4.

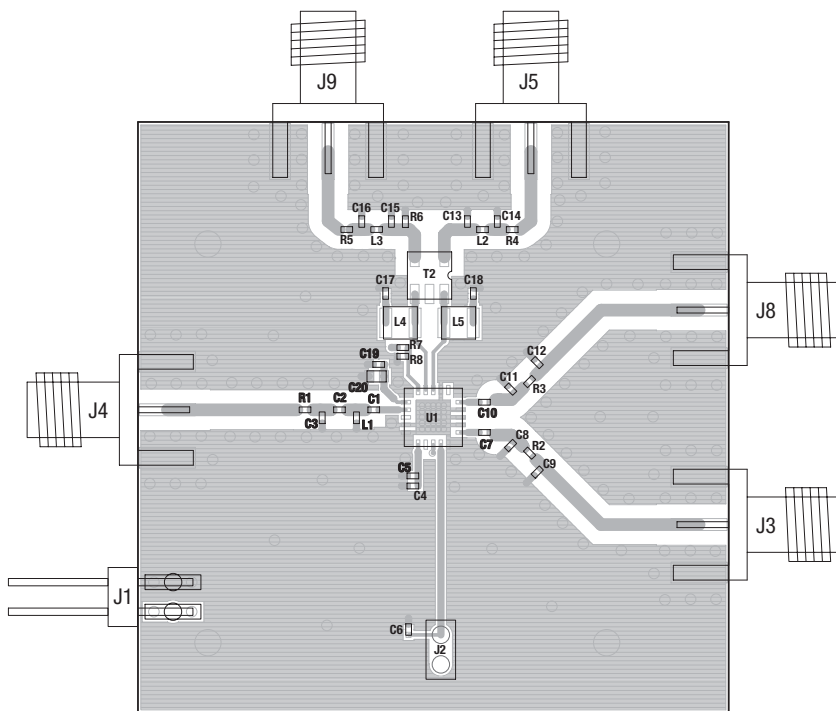
**Circuit Design Configurations**

The following design considerations are general in nature and must be followed regardless of final use or configuration:

1. Paths to ground should be made as short and as low impedance as possible.

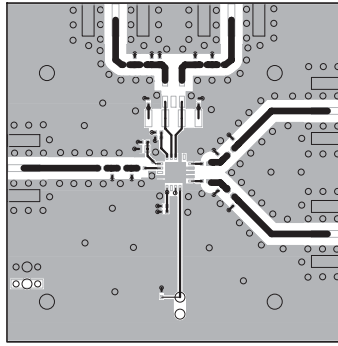
2. The ground pad of the SKY73063 provides critical electrical and thermal functionality. The connection to the ground pad should be designed to provide the best ground for the mixer. For more information on soldering the SKY73063, refer to the Package and Handling Information section of this Data Sheet.
3. Skyworks recommends including external bypass capacitors on the VCC voltage inputs of the device.

A schematic diagram for the SKY73063 Evaluation Board is shown in Figure 5.

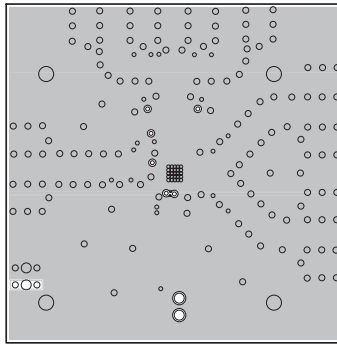


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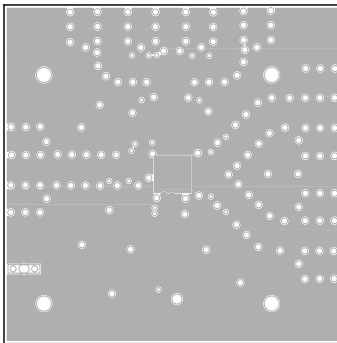
**Figure 3. SKY73063 Evaluation Board Assembly Diagram**



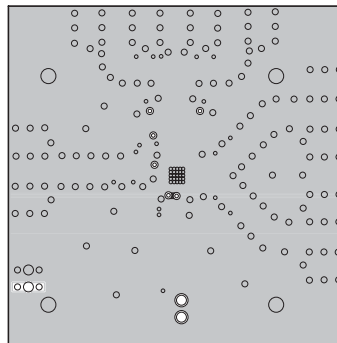
Layer 1: Top – Metal



Layer 2: Ground



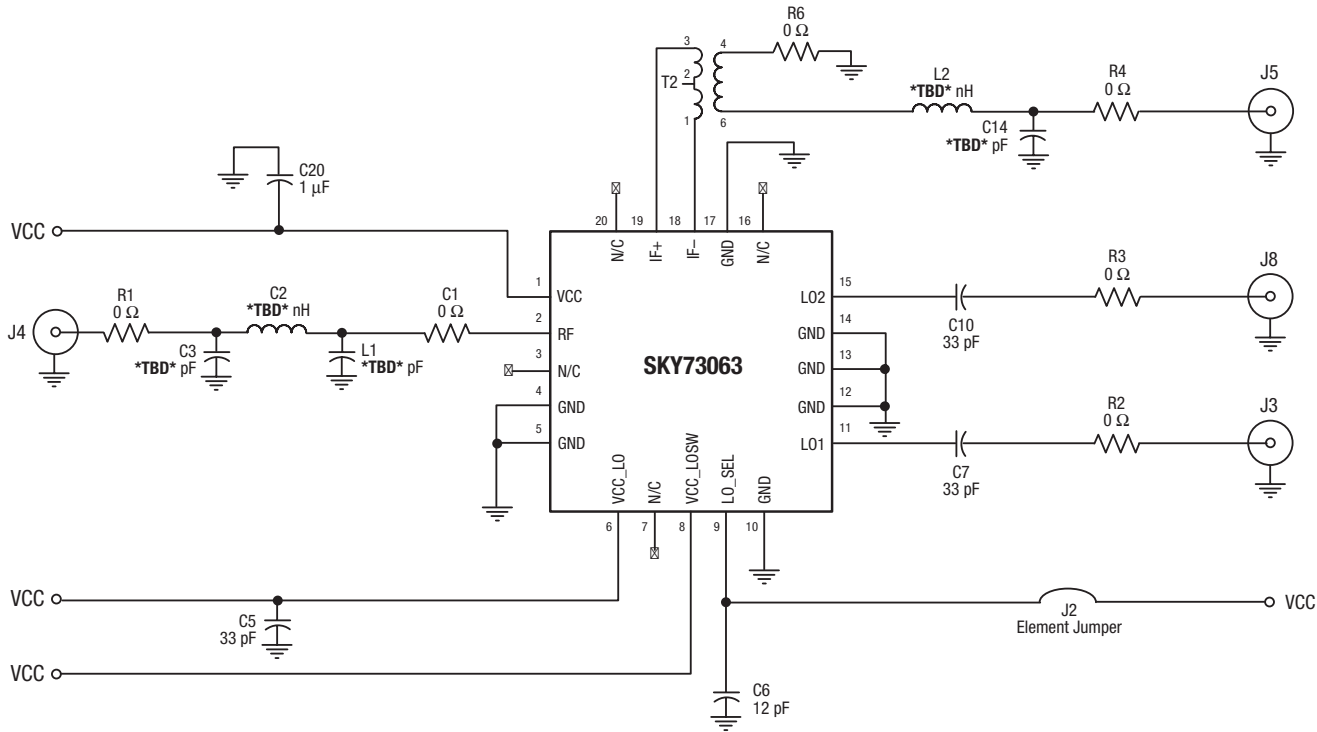
Layer 3: Power Plane



Layer 4: Solid Ground Plane

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**Figure 4. SKY73063 Evaluation Board Layer Detail**



Notes: Values for all components are subject to change for matching purposes.

Some component labels may be different than the corresponding component symbol shown here. Component values, however, are accurate as of the date of this Data Sheet.

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Figure 5. SKY73063 Evaluation Board Schematic

### Package Dimensions

Figure 6 shows the package dimensions for the 20-pin MCM, and Figure 7 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.

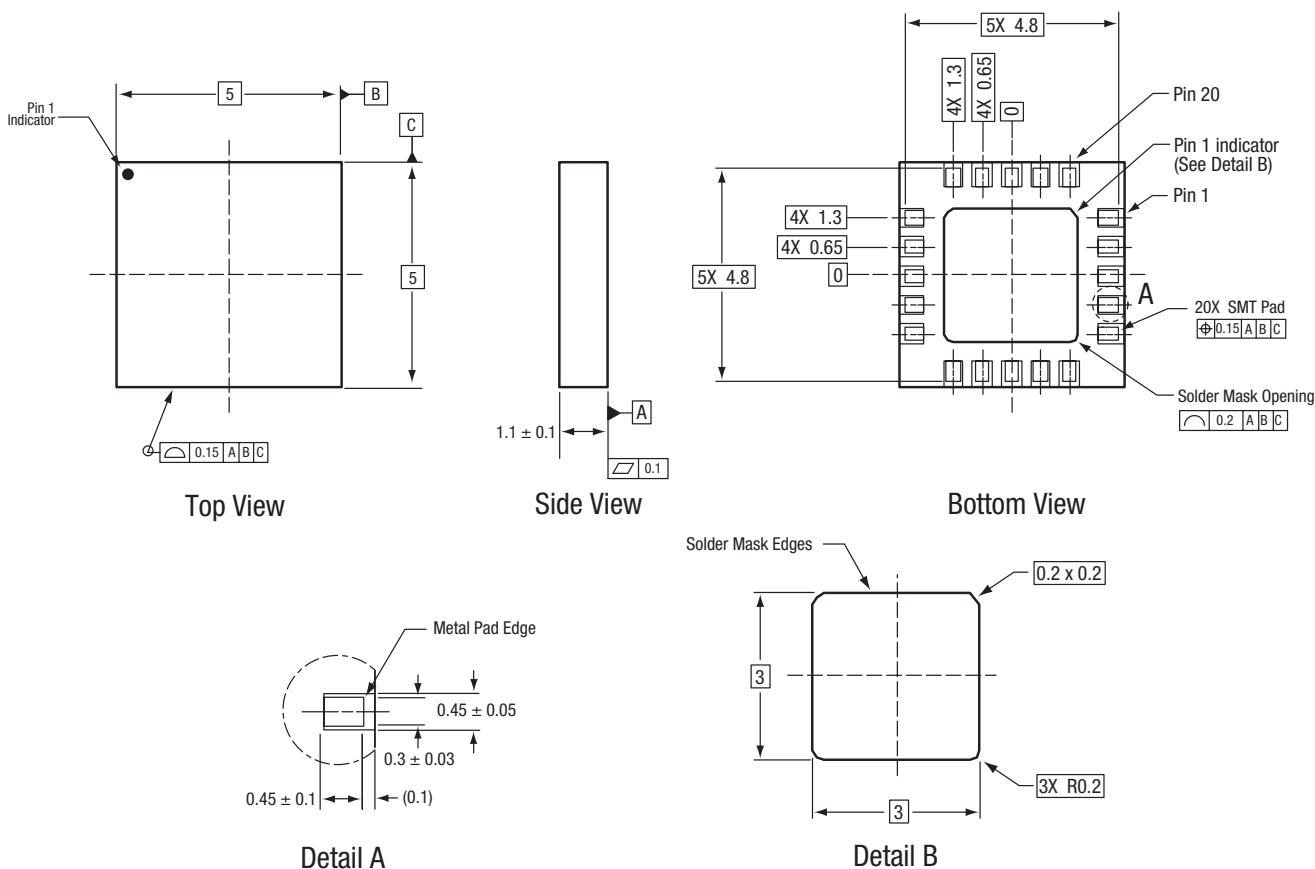
THE SKY73063 is rated to Moisture Sensitivity Level 3 (MSL3) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note,

*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. For packaging details, refer to the Skyworks Application Note, *Tape and Reel*, document number 101568.

### Electrostatic Discharge (ESD) Sensitivity

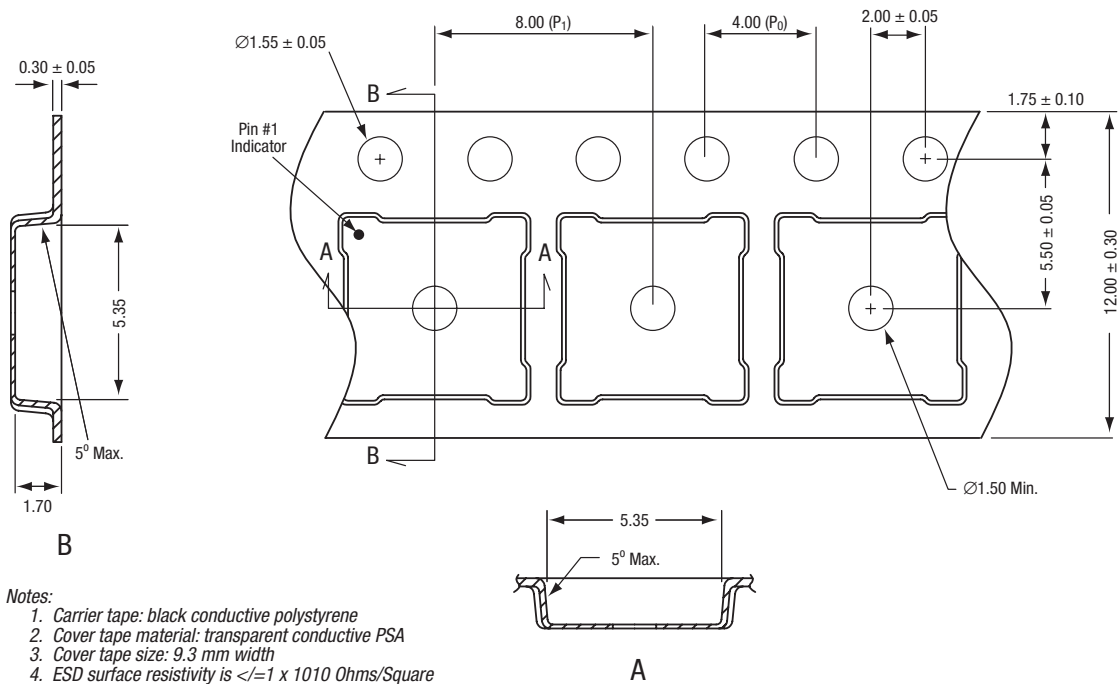
The SKY73063 is a static-sensitive electronic device. Do not operate or store near strong electrostatic fields. Take proper ESD precautions.



All measurements are in millimeters.  
Dimensioning and tolerancing according to ASME Y14.5M-1994.

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**Figure 6. SKY73063 20-Pin MCM Package Dimensions**



- Notes:
1. Carrier tape: black conductive polystyrene
  2. Cover tape material: transparent conductive PSA
  3. Cover tape size: 9.3 mm width
  4. ESD surface resistivity is  $\leq 1 \times 10^{10}$  Ohms/Square according to EIA, JEDIC TNR specification.
  5.  $P_0/P_1$  10 pitches cumulative tolerance on tape:  $\pm 0.20$  mm
  6. A and B measurement points are 0.30 mm from bottom pocket.
  7. All dimensions are in millimeters

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Figure 7. SKY73063 Tape and Reel Dimensions

## Ordering Information

Model Name	Manufacturing Part Number	Evaluation Kit Part Number
SKY73063 1700-2100 MHz Up/Downconversion Mixer	SKY73063 (Pb-free package)	*** TBD ***

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