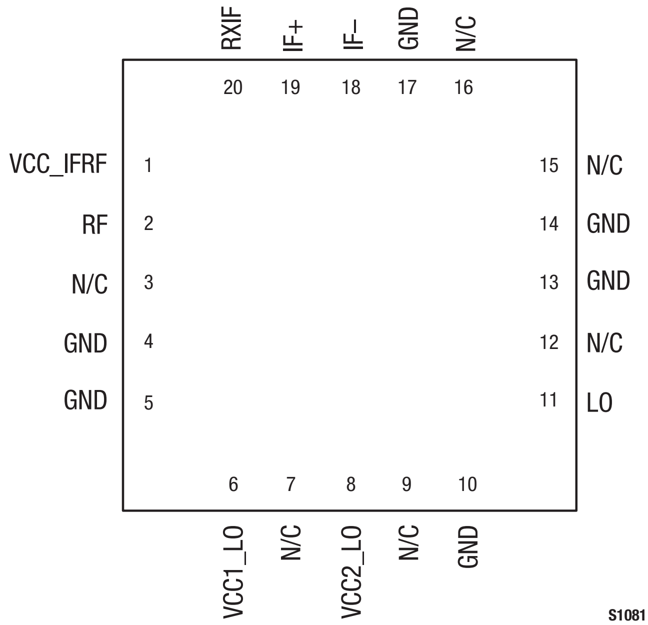



**Figure 2. SKY73070 Pinout – 20-Pin MCM**

**Table 1. SKY73070 Signal Descriptions**

| Pin # | Name | Description | Pin # | Name | Description |
|---|---|---|---|---|---|
| 1 | VCC_IFRF | IF and RF DC supply, +5V | 11 | LO | LO input |
| 2 | RF | RF input | 12 | N/C | No connection |
| 3 | N/C | No connection | 13 | GND | Ground |
| 4 | GND | Ground | 14 | GND | Ground |
| 5 | GND | Ground | 15 | N/C | No connection |
| 6 | VCC1_LO | DC supply for LO driver, +5V | 16 | N/C | No connection |
| 7 | N/C | No connection | 17 | GND | Ground |
| 8 | VCC2_LO | DC supply for LO buffer, +5V | 18 | IF– | Negative IF output |
| 9 | N/C | No connection | 19 | IF+ | Positive IF output |
| 10 | GND | Ground | 20 | RXIF | IF bias adjust |

## Functional Description

The SKY73070 is a high gain single mixer, optimized for base station receiver applications. The device consists of a low loss RF balun, high linearity passive mixer, and a low noise IF amplifier.

An LO amplifier is also included that allow the SKY73070 to connect directly to the output of a Voltage Controlled Oscillator (VCO). This eliminates the extra gain stages needed by most discrete passive mixers.

### RF Balun and Passive Mixer

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

The high linearity SKY73070 is a passive, double balanced mixer that provides a very low conversion loss, and excellent 3rd Order Input Insertion Point (IIP3).

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

### LO Buffer

An LO buffer allows the input power of the SKY73070 to be in the range of ±6 dBm. The LO section is optimized for high-side LO injection. However, the LO can be driven over a wide frequency range with only slight degradation in performance.

### IF Amplifier

The SKY73070 includes a high dynamic range IF amplifier that follows the passive mixer in the signal path. The outputs require a supply voltage connection using inductive chokes. These choke inductors should be high-Q and have the ability to handle 200 mA or greater.

A simple matching network allows the output ports to be matched to a balanced 200 Ω impedance. The IF amplifier is optimized for IF frequencies between 40 and 300 MHz. The IF amplifier can be operated outside of this range, but with a slight degradation in performance.

## Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY73070 are provided in Table 2 and the recommended operating conditions in Table 3. Electrical characteristics for the SKY73070 are provided in Table 4.

Typical performance characteristics for the SKY73070 are illustrated in Figures 3 through 18.

**Table 2. SKY73070 Absolute Maximum Ratings (Note 1)**

| Parameter | Symbol | Minimum | Maximum | Units |
|---|---|---|---|---|
| Supply voltage, +5 V | VCC | 4.5 | 5.5 | V |
| Supply current | $I_{CC}$ | | 240 | mA |
| RF input power | $P_{RF}$ | | +20.0 | dBm |
| LO input power | $P_{LO}$ | | +20.0 | dBm |
| Operating case temperature | $T_C$ | –40 | +85 | °C |
| Junction temperature (Note 2) | $T_J$ | | +150 | °C |
| Storage case temperature | $T_{STG}$ | –40 | +125 | °C |

**Note 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.

**Note 2**: Nominal thermal resistance (junction to center ground pad) is 5.1 °C/W.

**Table 3. SKY73070 Recommended Operating Conditions**

| Parameter | Symbol | Minimum | Typical | Maximum | Units |
|---|---|---|---|---|---|
| Supply voltage, +5 V | VCC | 4.75 | 5.00 | 5.25 | V |
| Supply current | $I_{CC}$ | | 210 | | mA |
| LO input power | $P_{LO}$ | –6.0 | 0 | +6.0 | dBm |
| Operating case temperature | $T_C$ | –40 | | +85 | °C |
| RF frequency range | $f_{RF}$ | 700 | | 1000 | MHz |
| LO frequency range (Note 1) | $F_{LO}$ | 900 | | 1250 | MHz |
| IF frequency range | $F_{IF}$ | 40 | | 300 | MHz |

**Note 1**: The SKY73070 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. SKY73070 Electrical Specifications**
**(VCC = +5 V, $T_A$ = +25 °C, LO = 0 dBm, RF Frequency = 900 MHz, IF Frequency = 200 MHz, LO Frequency = 1100 MHz, Unless Otherwise Noted)**

| Parameter | Symbol | Test Condition | Min | Typical | Max | Units |
|---|---|---|---|---|---|---|
| Conversion gain | G | $f_{RF}$ = 824 to 915 MHz, $T_A$ = 25 °C, $P_{LO}$ = –3 to +3 dBm | 8.2 | 9.5 | | dB |
| Gain variation over temperature | | $T_A$ = –40 to +85 °C | | ±0.6 | | dB |
| Noise Figure | NF | $T_A$ = 25 °C, $P_{LO}$ = –3 to +3 dBm, VCC = 4.75 to 5.25 V, IF = 200 MHz | | 8.3 | | dB |
| Noise Figure variation over temperature | | $T_A$ = –40 to +85 °C | | ±0.8 | | dB |
| Noise Figure with a blocker signal | $NF_{BLK}$ | Blocking signal input power = +8 dBm | | 18 | | dB |
| Third order input intercept point | IIP3 | $f_{RF}$ = 900 MHz and 900.8 MHz, $P_{RF}$ = –10 dBm/tone, VCC = 4.75 to 5.25 V | +24.7 | +27.0 | | dBm |
| Input IP3 variation over temperature | | $T_A$ = –40 to +85 °C | | ±0.3 | | dB |
| Third order output intercept point | OIP3 | $f_{RF}$ = 900 MHz and 900.8 MHz, $P_{RF}$ = –10 dBm/tone, VCC = 4.75 to 5.25 V | | +36.5 | | dBm |
| 2RF – 2LO | 2x2 | $P_{RF}$ = –10 dBm | | –68.5 | –63 | dBc |
| 3RF – 3LO | 3x3 | $P_{RF}$ = –10 dBm | | –80 | –70 | dBc |
| Input 1 dB compression point | IP1dB | | +11.0 | +13.3 | | dBm |
| Output 1 dB compression point | OP1dB | | | +22.8 | | dBm |
| RF to IF isolation | | | 30 | 48 | | dB |
| LO leakage:<br>@ RF port<br>@ IF port | | | | <br>–59<br>–34 | <br>–20<br>–23 | <br>dBm<br>dBm |
| RF port input return loss | $Z_{IN\_RF}$ | With external matching components | 14 | | | dB |
| LO port input return loss | $Z_{IN\_LO}$ | With external matching components | 14 | | | dB |
| IF port output return loss | $Z_{OUT\_IF}$ | With external matching components | 14 | | | dB |

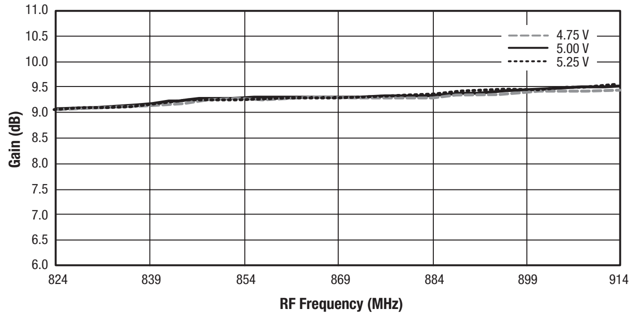



Figure 3. Gain vs Frequency and Supply Voltage

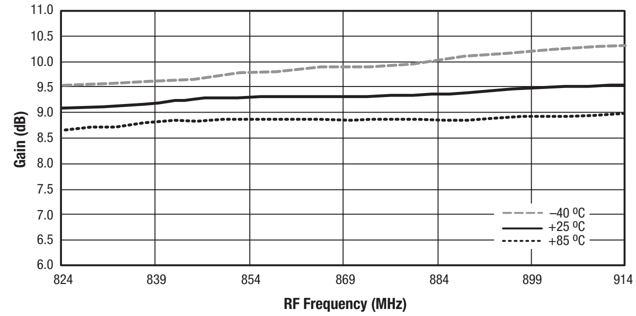



Figure 4. Gain vs Frequency and Temperature

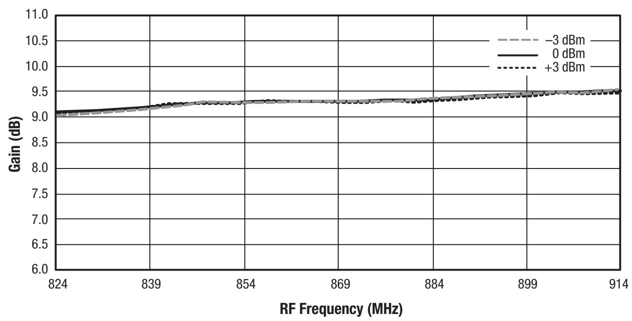



Figure 5. Gain vs Frequency and LO Power

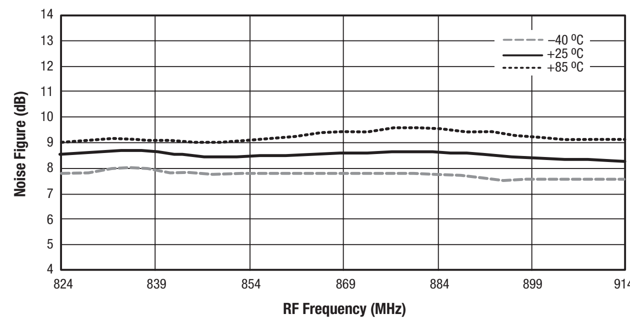



Figure 6. Noise Figure vs Frequency and Temperature

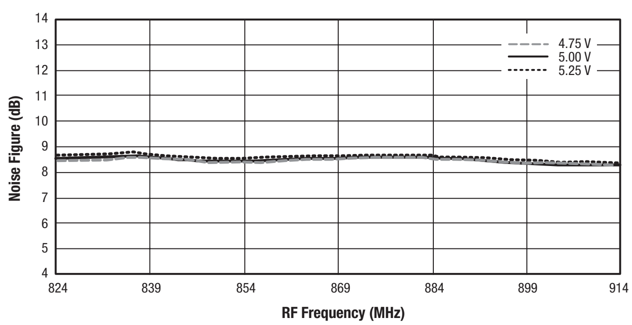



Figure 7. Noise Figure vs Frequency and Supply Voltage

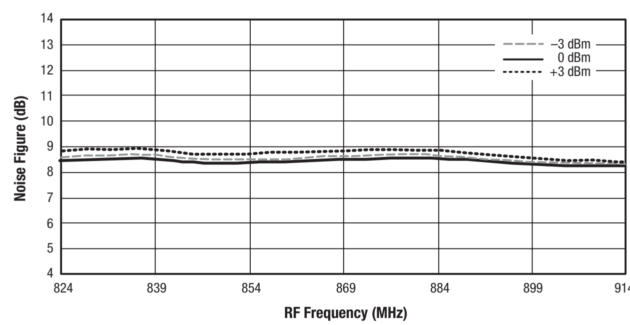



Figure 8. Noise Figure vs Frequency and LO Power

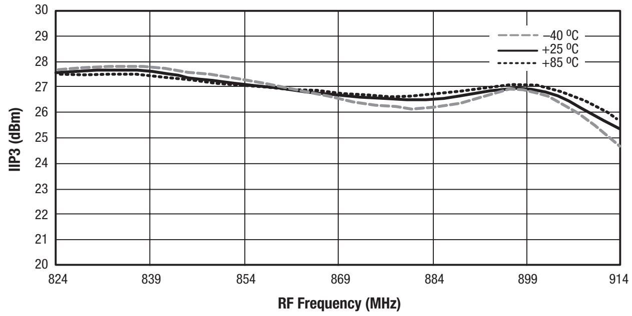



**Figure 9. IIP3 vs Frequency and Temperature**

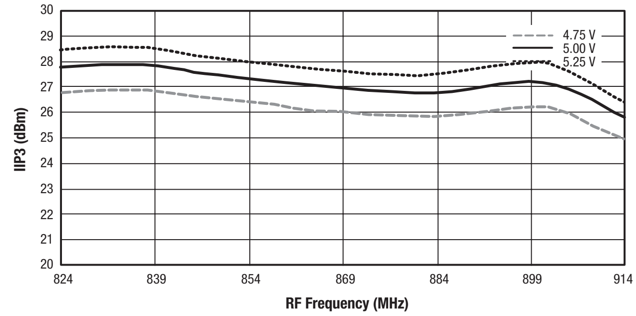



**Figure 10. IIP3 vs Frequency and Supply Voltage**

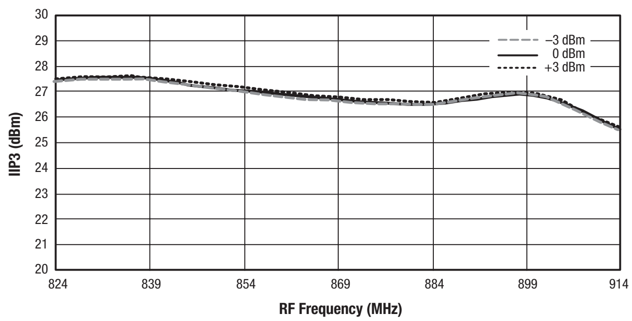



**Figure 11. IIP3 vs Frequency and LO Power**

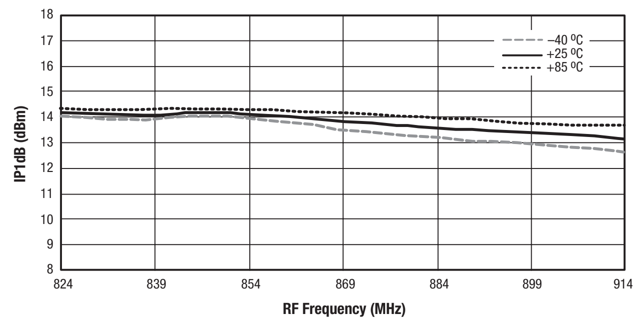



**Figure 12. IP1dB vs Frequency and Temperature**

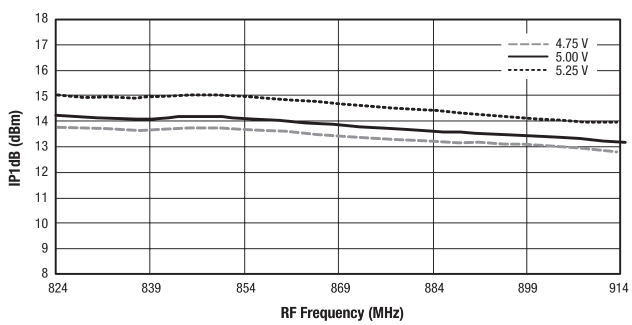



**Figure 13. IP1dB vs Frequency and Supply Voltage**

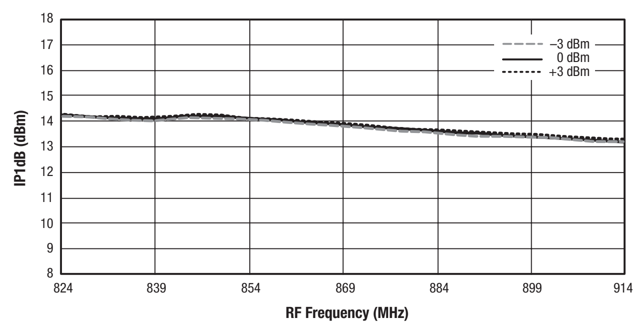



**Figure 14. IP1dB vs Frequency and LO Power**

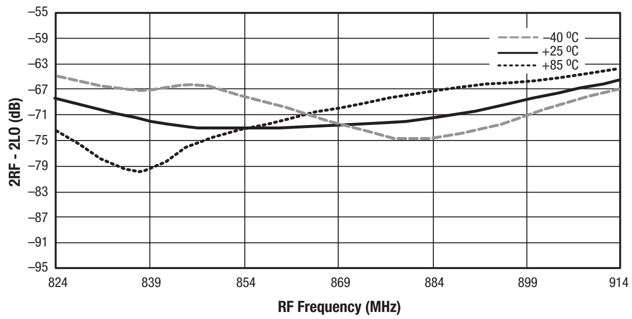



Figure 15. 2RF – 2LO vs Frequency and Temperature

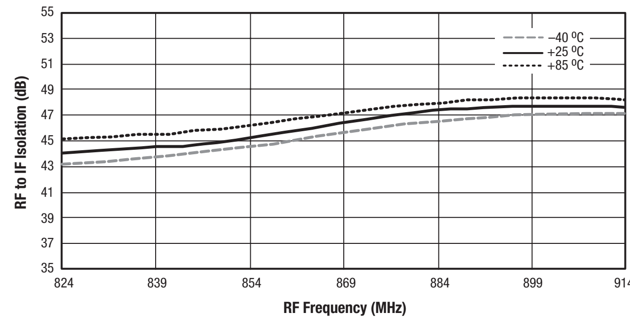



Figure 16. RF to IF Isolation vs Frequency and Temperature

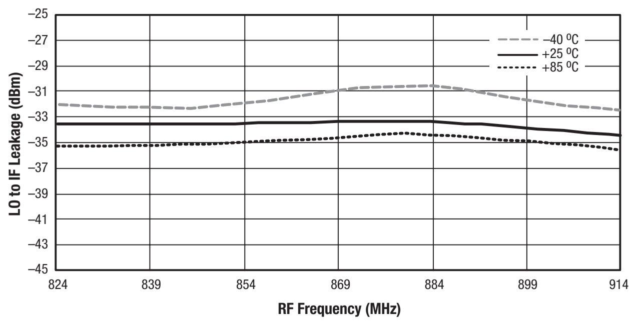



Figure 17. LO to IF Leakage vs Frequency and Temperature

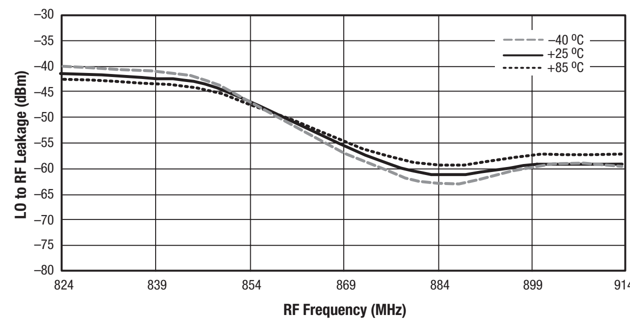



Figure 18. LO to RF Leakage vs Frequency and Temperature

## Evaluation Board Description

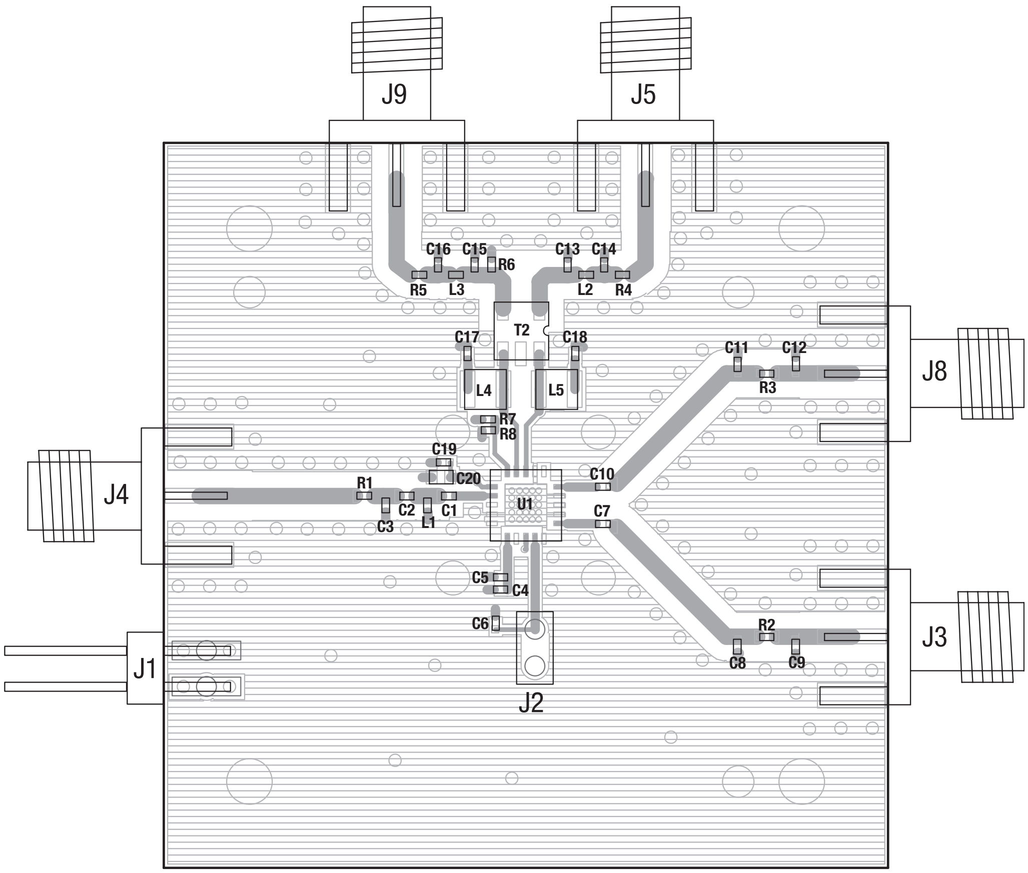
The SKY73070 Evaluation Board is used to test the performance of the SKY73070 downconversion mixer. An assembly drawing for the Evaluation Board is shown in Figure 19 and the layer detail is provided in Figure 20.

### 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 SKY73070 provides critical electrical and thermal functionality. This pad is the main thermal conduit for heat dissipation. Since the circuit board acts as the heat sink, it must shunt as much heat as possible from the device. Therefore, design the connection to the ground pad to dissipate the maximum heat produced by the circuit board. For more information on soldering the SKY73070, 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.
4. Components L5 and L4 (see Figure 21) are high-Q, low loss inductors. These inductors must be able to pass currents in excess of 200 mA DC.
5. Components R7 and R8 (see Figure 21) allow for external adjustment of the IF amplifier bias points. To reduce the IF amplifier bias current, connect pin 20 to ground through external resistor R8. To increase the IF amplifier bias current, connect pin 20 to VCC through external resistor R7. For operation as specified in Tables 3 and 4, these resistors are not required.

A schematic diagram for the SKY73070 Evaluation Board is shown in Figure 21.




Note: *This Evaluation Board is used for several different Skyworks devices. Components C4, C6, C8 through C13, C15 through C19, R3, R5, and L3 are not used for the device described by this Data Sheet.*

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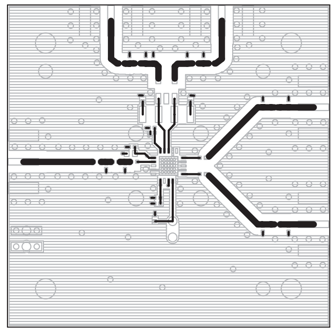
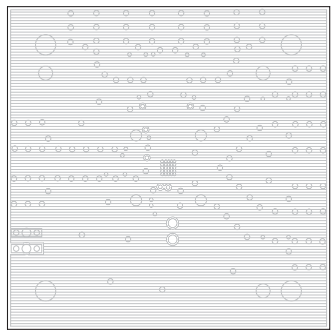
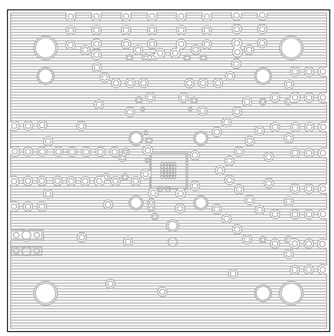
**Figure 19. SKY73070 Evaluation Board Assembly Diagram**



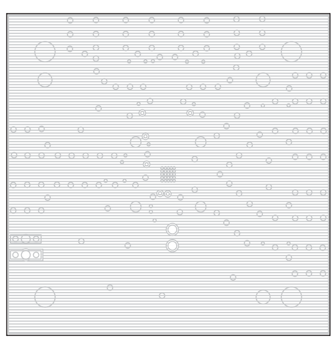
Layer 1: Top – Metal



Layer 2: Ground



Layer 3: Power Plane



Layer 4: Solid Ground Plane

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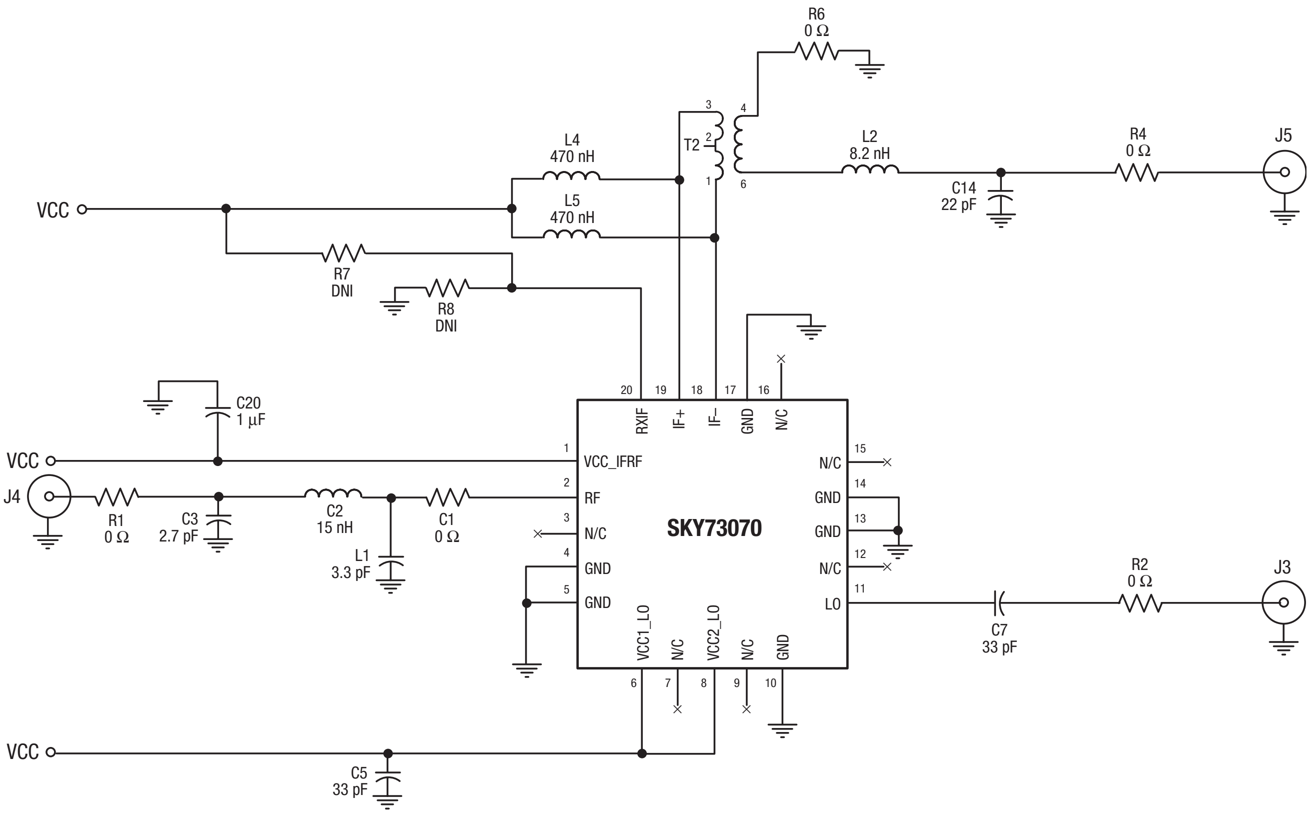
**Figure 20. SKY73070 Evaluation Board Layer Detail**




*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.*

**Figure 21. SKY73070 Evaluation Board Schematic**

## Package Dimensions

Figure 22 shows the package dimensions for the 20-pin MCM, and Figure 23 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 SKY73070 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 SKY73070 is a static-sensitive electronic device. Do not operate or store near strong electrostatic fields. Take proper ESD precautions.

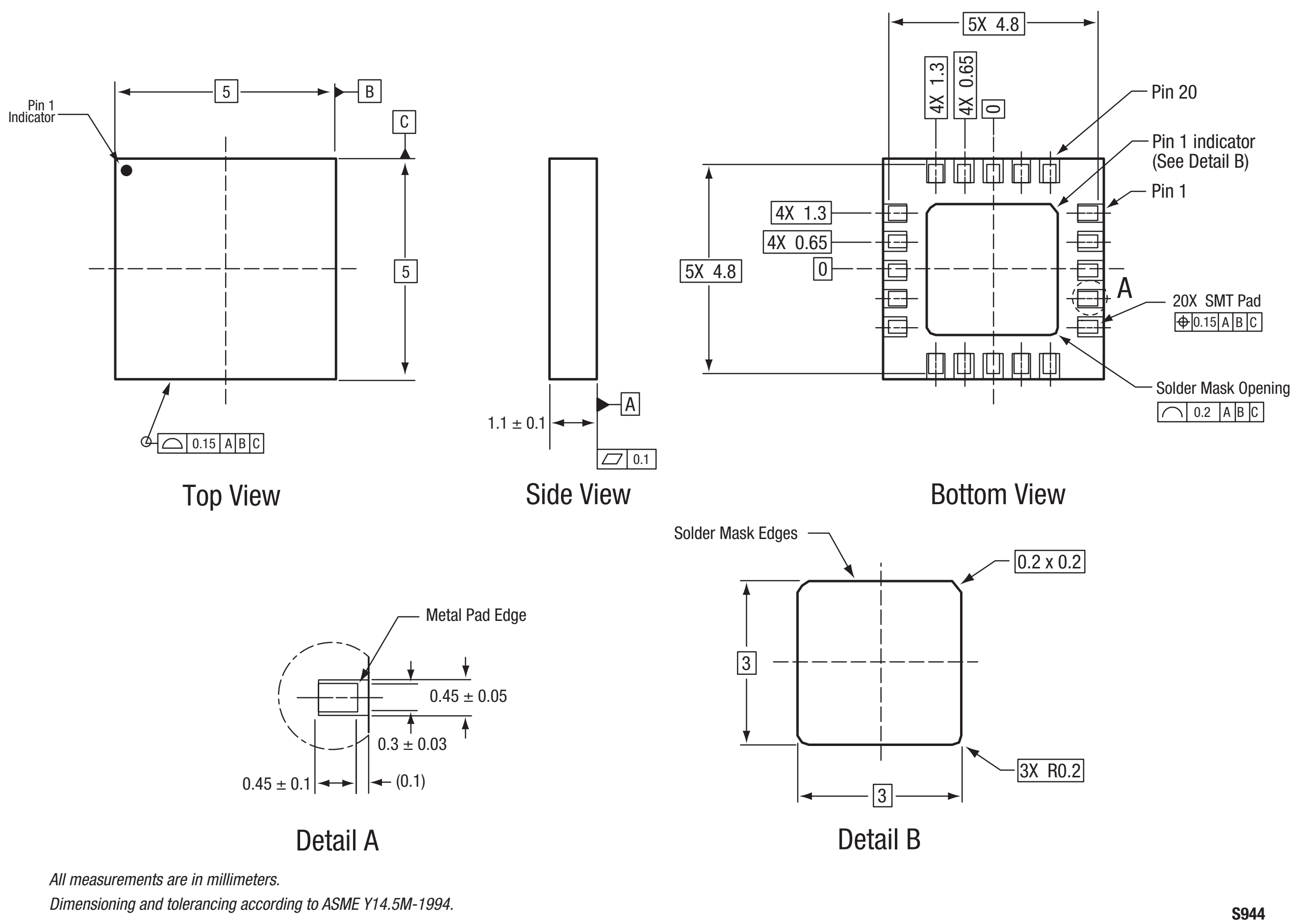
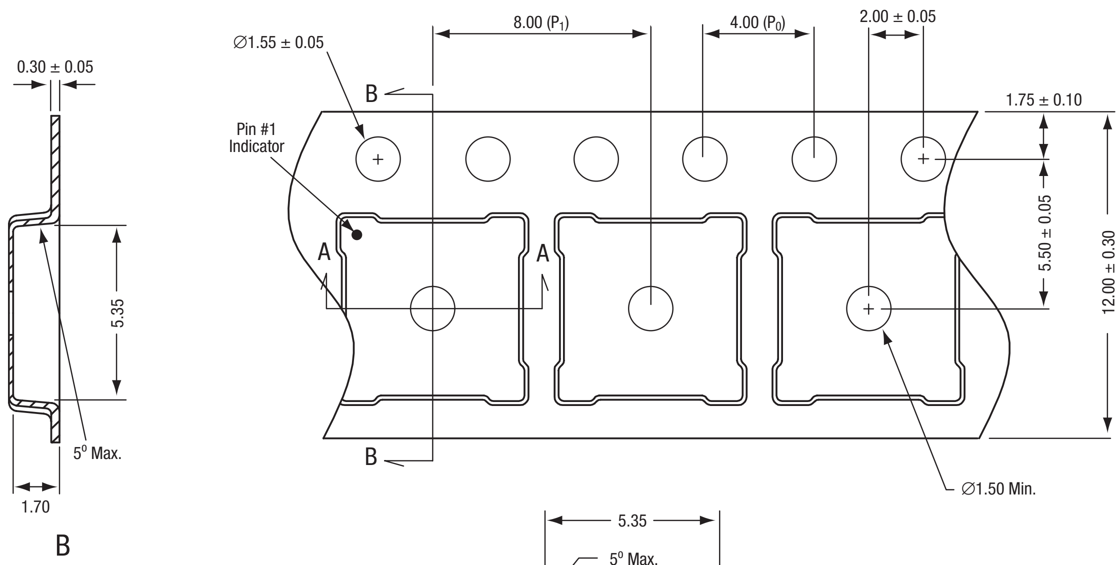
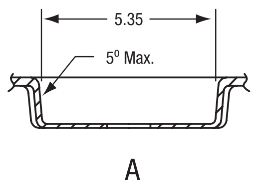



**Figure 22. SKY73070 20-Pin MCM Package Dimensions**




*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 </=1 x 1010 Ohms/Square according to EIA, JEDIC TNR specification.*
5. *$P_0$/$P_1$ 10 pitches cumulative tolerance on tape: ±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 23. SKY73070 Tape and Reel Dimensions**

## Ordering Information

| Model Name | Manufacturing Part Number | Evaluation Kit Part Number |
|---|---|---|
| SKY73070 700-1000 MHz Downconversion Mixer | SKY73070-11 (Pb-free package) | TW16-D660 |