

DATA SHEET

SKY13374-397LF: 300 kHz to 6.0 GHz SPDT Switch

Applications

- Dual-band wireless LANs (802.11 a/b/g/n)
- Diversity antenna switching
- WCDMA handsets and data cards

Features

- Broadband frequency range: 300 kHz to 6.0 GHz
- Low insertion loss: 0.35 dB @ 1 GHz, 0.8 dB @ 6 GHz
- No external DC blocking capacitors required
- Positive low control voltage: 1.65 to 3.0 V (V_{CTRL}), 2.5 to 4.8 V (V_{BATT})
- Small, QFN (12-pin, 2 x 2 mm) package (MSL1, 260 °C per JEDEC J-STD-020)



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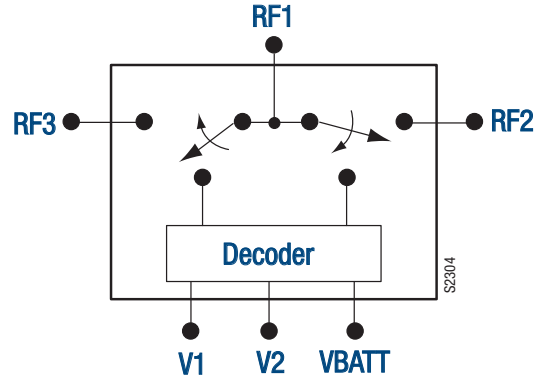


Figure 1. SKY13374-397LF Block Diagram

Description

The SKY13374-397LF is a CMOS silicon-on-insulator (SOI) single-pole, double-throw (SPDT) WCDMA band switch. The high-linearity performance and low insertion loss achieved by the device makes it an ideal choice for medium to high power WCDMA handset and data card applications.

The high 0.1 dB input compression point (IP0.1dB) and advance proprietary fabrication process enable exceptional WCDMA harmonic and adjacent channel power (ACP) performance. Excellent insertion loss and isolation is maintained over WCDMA bands 1 to 6 and 8 to 11.

The SKY13374-397LF SPDT switch is provided in a compact Quad Flat No-Lead (QFN) 2 x 2 mm package with 0.5 mm lead pitch for ease of manufacturing. 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.

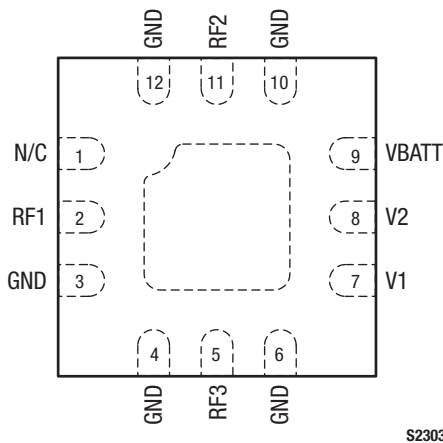


Figure 2. SKY13374-397LF Pinout (Top View)

Table 1. SKY13374-397LF Signal Descriptions (Note 1)

| Pin | Name | Description | Pin | Name | Description |
|-----|------|---------------|-----|-------|----------------------------------|
| 1 | N/C | No connection | 7 | V1 | DC control voltage. See Table 4. |
| 2 | RF1 | RF port 1 | 8 | V2 | DC control voltage. See Table 4. |
| 3 | GND | Ground | 9 | VBATT | DC power supply. |
| 4 | GND | Ground | 10 | GND | Ground |
| 5 | RF3 | RF port 3 | 11 | RF2 | RF port 2 |
| 6 | GND | Ground | 12 | GND | Ground |

Note 1: Exposed pad must be properly grounded using a low impedance path.

Functional Description

Switching is controlled by two control voltage inputs (V1 and V2). Depending on the logic voltage level applied to these pins, the RF1 pin is connected to one of two switched RF outputs (RF2 or RF3) using a low insertion loss path, while the path between the RF1 pin and the other RF path is in a high isolation state.

An internal negative voltage generator and decoder eliminate the need for external DC blocking capacitors on the RF ports. No external components are required for proper operation. DC decoupling capacitors may be added on the VBATT and control lines if necessary.

Shutdown mode is enabled by connecting both control pins (V1 and V2) to logic low. This mode reduces the overall current consumption of the device to 5 μ A typical.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY13374-397LF are provided in Table 2. Electrical specifications are provided in Table 3.

The state of the SKY13374-397LF is determined by the logic provided in Table 4.

Typical performance characteristics of the SKY13374-397LF are illustrated in Figures 3 through 5.

Table 2. SKY13374-397LF Absolute Maximum Ratings (Note 1)

| Parameter | Symbol | Minimum | Maximum | Units |
|-----------------------|-------------------|---------|---------|-------|
| Supply voltage | V _{BATT} | 2.5 | 4.8 | V |
| Control voltage | V _{CTL} | 1.65 | 3.00 | V |
| Input power | P _{IN} | | +39 | dBm |
| Storage temperature | T _{STG} | -40 | +125 | °C |
| Operating temperature | T _{OP} | -40 | +85 | °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. Exceeding any of the limits listed here may result in permanent damage to the device.

CAUTION: 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. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

Table 3. SKY13374-397LF Electrical Specifications (Note 1)

(VBATT = 2.5 to 4.8 V, V1/V2 = 0/1.65 to 3.0 V, TOP = +25 °C, PIN = 0 dBm, Characteristic Impedance [Z0] = 50 Ω, Unless Otherwise Noted)

| Parameter | Symbol | Test Condition | Min | Typical | Max | Units |
|---------------------------------------|--------------|--|------|---------|------|-------|
| RF Specifications | | | | | | |
| Insertion loss | IL | RF1 to RF2/RF3: | | | | |
| | | 300 kHz to 1.0 GHz | | 0.35 | 0.40 | dB |
| | | 1.0 to 2.2 GHz | | 0.45 | 0.55 | dB |
| | | 2.2 to 3.0 GHz | | 0.50 | 0.60 | dB |
| | | 4.9 to 6.0 GHz | | 0.8 | 1.00 | dB |
| Isolation | Iso | RF1 to RF2/RF3: | | | | |
| | | 300 kHz to 2.2 GHz | 30 | 34 | | dB |
| | | 2.2 to 3.0 GHz | 25 | 28 | | dB |
| | | 4.9 to 6.0 GHz | 18 | 22 | | dB |
| Shutdown isolation | ISO_SHUTDOWN | | | 16 | | dB |
| Return loss | IS111 | RF1 to RF2/RF3, 300 kHz to 6.0 GHz | | 17 | | dB |
| 0.1 dB input compression point | IPO.1dB | RF1 to RF2/RF3, 0.5 to 6.0 GHz | | +39 | | dBm |
| Third order input intercept point | IIP3 | 0.8 to 3.0 GHz, Δf = 1 MHz, PIN = +26 dBm/tone | | +68 | | dBm |
| Switching Speed Specifications | | | | | | |
| Switching speed @ 2.45 GHz | | 50% VCTL to 90% RF | | 1200 | | ns |
| | | 50% VCTL to 10% RF | | 1200 | | ns |
| | | 10% RF to 90% RF rise | | 200 | | ns |
| | | 90% RF to 10% RF fall | | 150 | | ns |
| Startup time | | Shutdown to any RF switch state | | 20 | | μs |
| DC Specifications | | | | | | |
| Control voltage: High Low | V1, V2 | | 1.65 | | 3.00 | V |
| | | | 0 | | 0.30 | V |
| Supply voltage | VBATT | | 2.5 | | 4.8 | V |
| Supply current | IBATT | VBATT = 3 V | | 40 | | μA |
| Control current | ICTL | V1/V2 = 1.8 V | | 2 | | μA |
| Shutdown mode supply current | IOFF | V1/V2 = 0 V, VBATT = 1.8 V | | 5 | | μA |

Note 1: Performance is guaranteed only under the conditions listed in this table.

Table 4. SKY13374-397LF Truth Table

| V1 | V2 | State |
|----|----|---------------|
| 0 | 0 | Shutdown mode |
| 1 | 0 | RF1 to RF2 |
| 0 | 1 | RF1 to RF3 |

Note: 1 = 1.65 to 3.0 V
0 = -0.1 to 0 V
Any state other than described in this table places the switch into an undefined state.

Typical Performance Characteristics

($V_{CTL} = 0\text{ V}$ and $+3.0\text{ V}$, $T_{OP} = +25\text{ }^{\circ}\text{C}$, $P_{IN} = 0\text{ dBm}$, Characteristic Impedance [Z_o] = $50\ \Omega$, Unless Otherwise Noted)

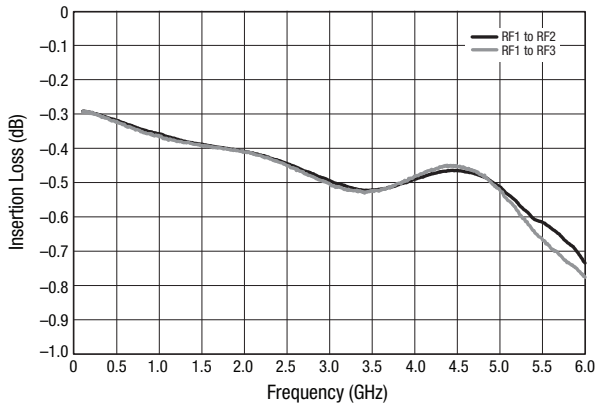


Figure 3. Typical Insertion Loss vs Frequency

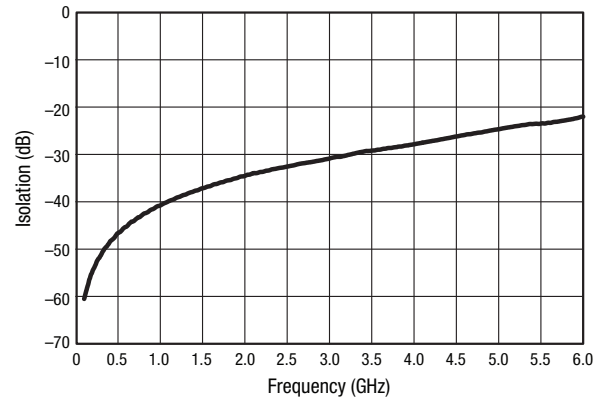


Figure 4. Typical Isolation vs Frequency (RF1 to RF2 Insertion Loss State)

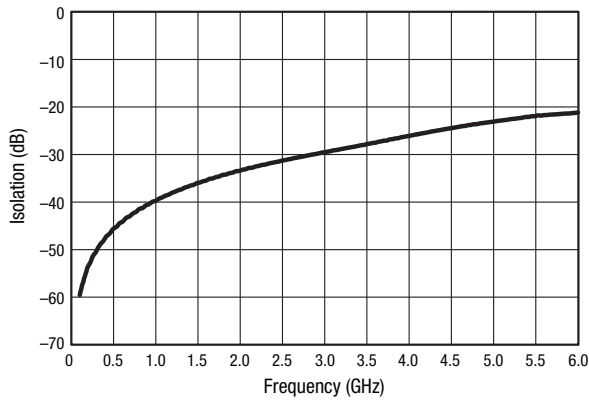


Figure 5. Typical Isolation vs Frequency (RF1 to RF3 Insertion Loss State)

Evaluation Board Description

The SKY13374-397LF Evaluation Board is used to test the performance of the SKY13374-397LF SPDT Switch.

An Evaluation Board schematic diagram is provided in Figure 6. An assembly drawing for the Evaluation Board is shown in Figure 7.

Package Dimensions

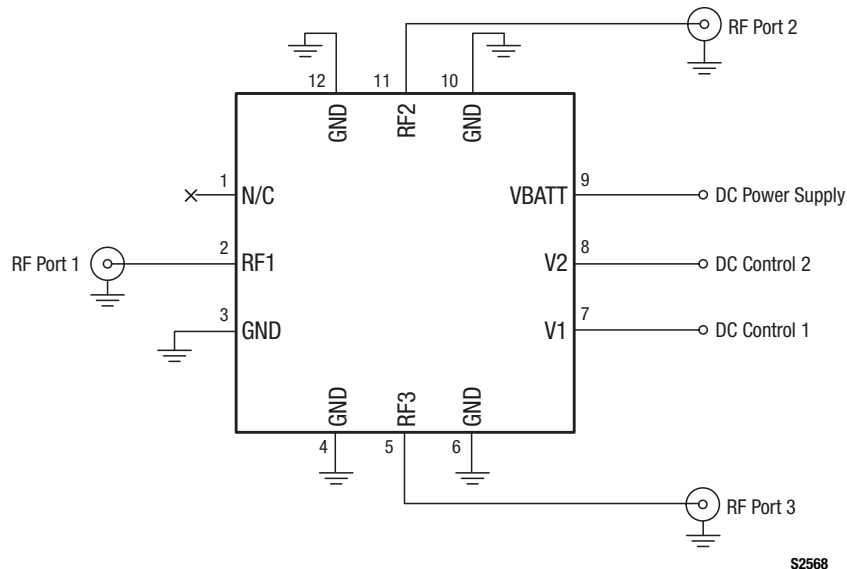
The PCB layout footprint for the SKY13374-397LF is provided in Figure 8. Typical part markings are shown in Figure 9. Package dimensions for the 12-pin QFN are shown in Figure 10, and tape and reel dimensions are provided in Figure 11.

Package and Handling Information

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.

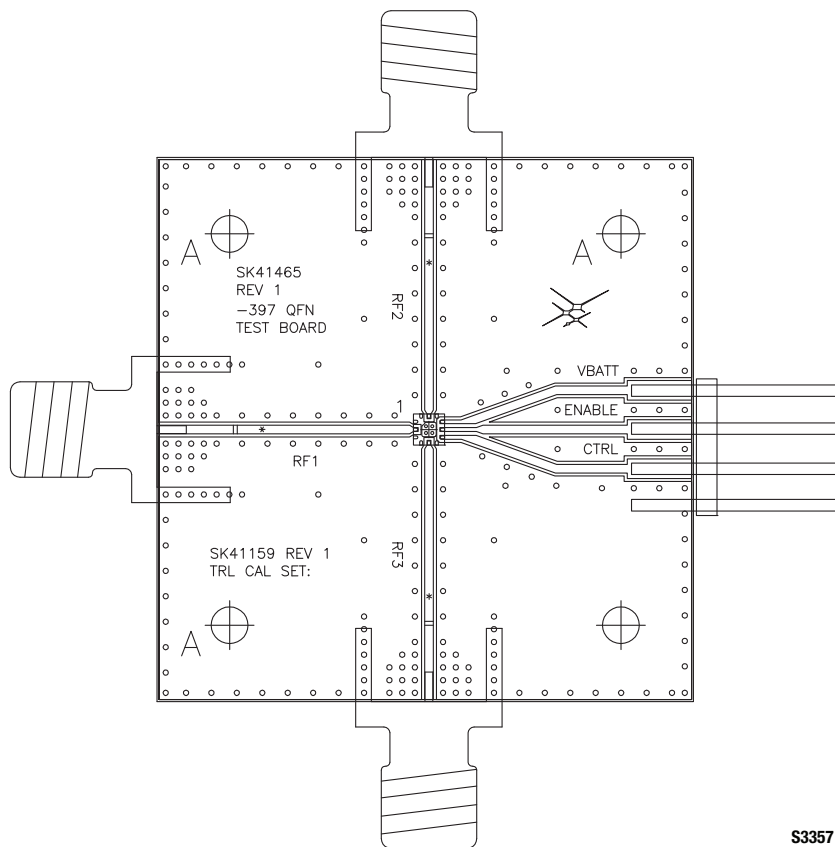
The SKY13374-397LF is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

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.



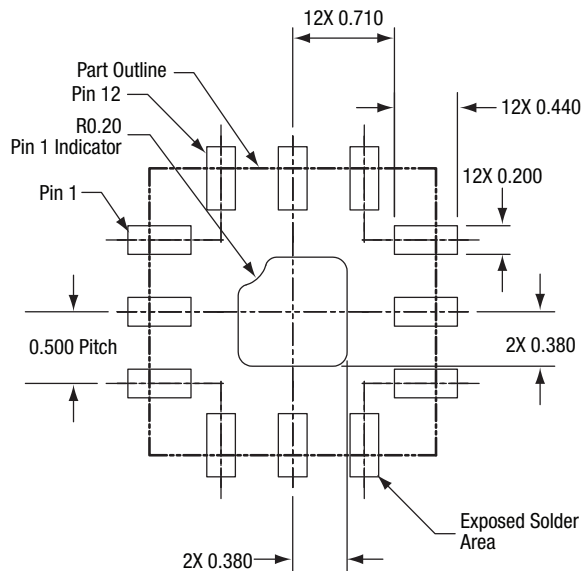
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Figure 6. SKY13374-397LF Evaluation Board Schematic



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Figure 7. SKY13374-397LF Evaluation Board Assembly Diagram



All measurements in millimeters

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Figure 8. SKY13374-397LF PCB Layout Footprint (Top View)

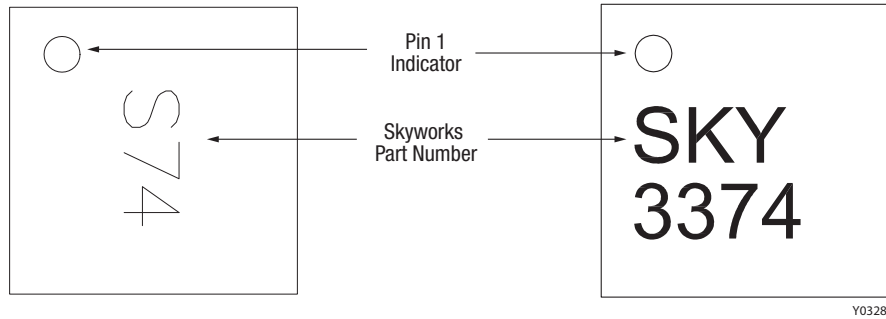
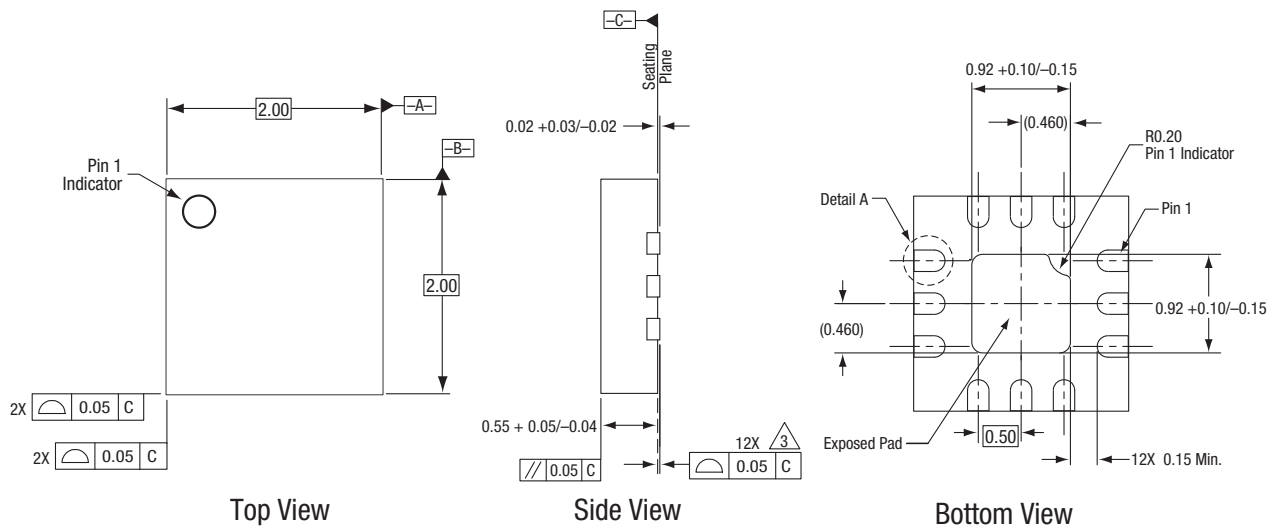


Figure 9. Typical Part Markings (Top View)



Notes:

1. All measurements are in millimeters.
2. Dimensions and tolerances according to ASME Y14.5M-1994.
3. Coplanarity applies to the terminals and all other bottom surface metallization.
4. Dimension applies to metallized terminal. If the terminal has a radius on its end, the width dimension should not be measured in that radius area.

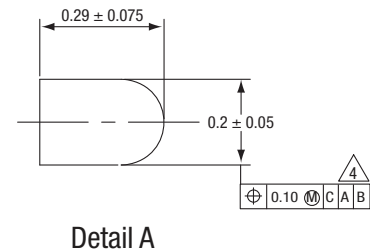
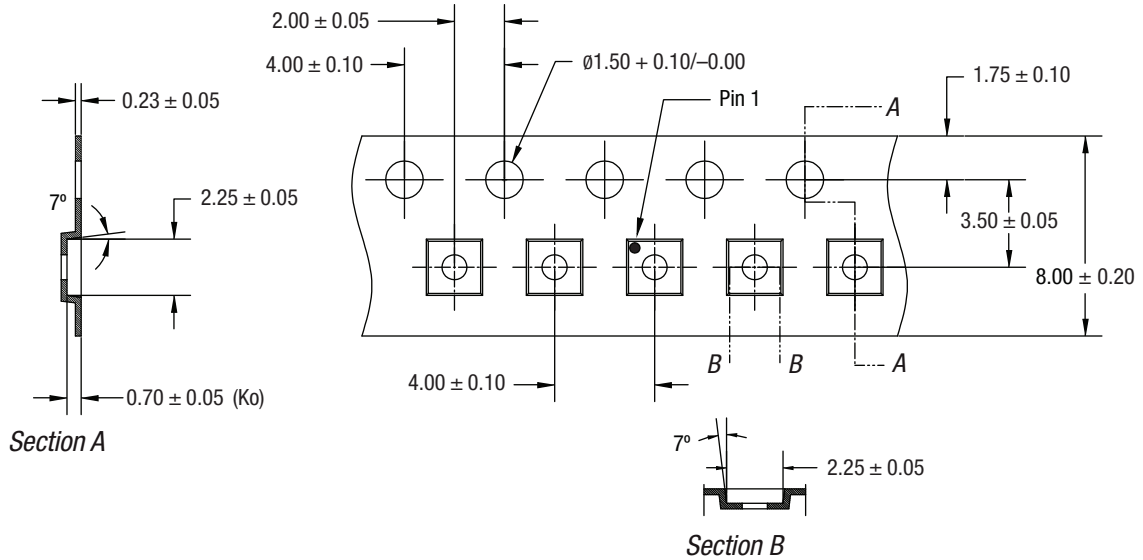


Figure 10. SKY13374-397LF Package Dimensions



Notes:

1. Carrier tape must meet all requirements of Skyworks GP01-D232 procurement spec for tape and reel shipping.
2. Carrier tape shall be black conductive polycarbonate bakeable material at 125 °C temperature.
3. Cover tape shall be transparent conductive with 5.40 mm width.
4. ESD-surface resistivity must meet all ESD requirements of Skyworks specified on GP01-D232.
5. All measurements are in millimeters.

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Figure 11. SKY13374-397LF Tape and Reel Dimensions

Ordering Information

| Model Name | Manufacturing Part Number | Evaluation Board Part Number |
|----------------------------|---------------------------|------------------------------|
| SKY13374-397LF SPDT Switch | SKY13374-397LF | SKY13374-397LF-EVB |

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