

**DATA SHEET**

# SPD1101-111, SPD1102-111, SPD1103-111: Sampling Phase Detectors

## Features

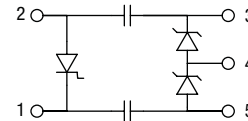
- For phase locked VCOs to 22 GHz
- Reference frequencies below 50 MHz
- New surface mount package design
- Small footprint (90 x 110 mils)
- Automated chip on board construction
- Available on tape and reel
- Available lead (Pb)-free, RoHS-compliant, and Green

## Description

Skyworks family of sampling phase detectors, SPD1101-111, SPD1102-111 and SPD1103-111, consists of a step recovery diode (SRD), a series pair of Schottky mixer diodes and a pair of coupling capacitors. These chip on board components are manufactured using automated pick-and-place techniques to provide uniformly performing, surface mountable, small footprint devices with excellent high-frequency performance.

Sampling phase detectors are typically used in systems which lock the output signal of a high-frequency voltage controlled oscillator (VCO) to a lower frequency, stable reference oscillator output signal. The reference oscillator signal is applied to the SRD, which produces outputs at the harmonics of the reference oscillator frequency. This comb of harmonics is coupled to the Schottky series pair, which comprises a singly balanced mixer, via the on-board coupling capacitors. The high-frequency signal from the VCO is applied to the center node of the Schottky diode pair. The high-frequency VCO signal is mixed with the harmonics of the low-frequency, stable reference oscillator signal in the Schottky diode pair. The desired output signal, which is typically the different frequency signal that is produced by the VCO signal and the harmonic of the reference oscillator signal nearest to it in frequency, is present at pin 4 of the sampling phase detector, along with the other mixer products produced by the other harmonics of the reference oscillator signal and the VCO signal, all of which are higher in frequency than the desired output signal. The desired output signal is selected by an external low pass filter, and can be utilized to lock the frequency and the phase of the VCO signal to the stable reference oscillator signal.

## Schematic Diagram



## Absolute Maximum Ratings

| Characteristic        | Value             |
|-----------------------|-------------------|
| Incident power        | 27 dBm            |
| Operating temperature | -65 °C to +150 °C |
| Storage temperature   | -65 °C to +175 °C |
| ESD human body model  | Class 1B          |

Performance is guaranteed only under the conditions listed in the specifications table and is not guaranteed under the full range(s) described by the Absolute Maximum specifications. Exceeding any of the absolute maximum/minimum specifications may result in permanent damage to the device and will void the warranty.

**CAUTION:** Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) 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 must be employed at all times.

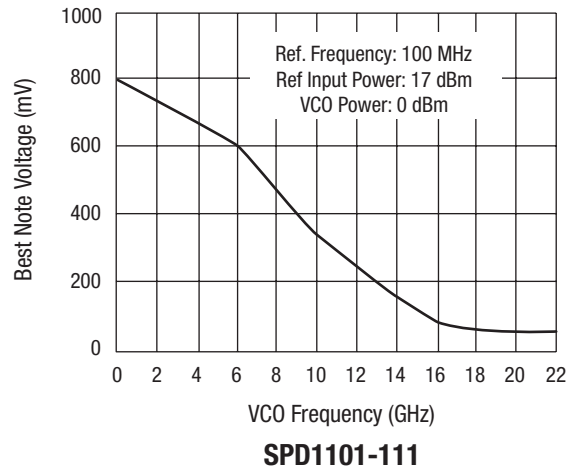
**NEW** Skyworks Green products are lead (Pb)-free, RoHS (Restriction of Hazardous Substances)-compliant, conform to the EIA/EICTA/JEITA Joint Industry Guide (JIG) Level A guidelines, and are free from antimony trioxide and brominated flame retardants.



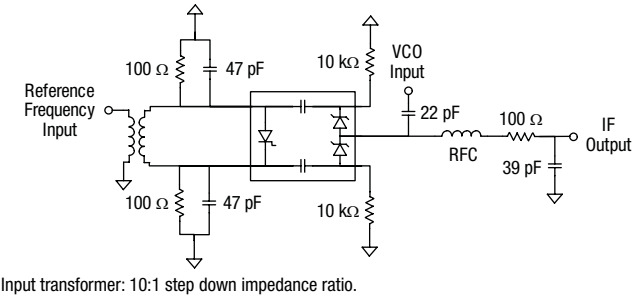
Electrical Characteristics at 25 °C

| Part Number | Microwave Signal Drive Level (dBm) | Schottky Diode |                            |                           |                           | Capacitor           | Step Recovery Diode       |                     |         |
|-------------|------------------------------------|----------------|----------------------------|---------------------------|---------------------------|---------------------|---------------------------|---------------------|---------|
|             |                                    | Barrier        | V <sub>F</sub> @ 1 mA (mV) | C <sub>J</sub> @ 0 V (pF) | R <sub>T</sub> @ 5 mA (Ω) | C <sub>C</sub> (pF) | C <sub>J</sub> @ 6 V (pF) | T <sub>L</sub> (ns) | TT (ps) |
|             | Typ.                               |                |                            | Max.                      | Max.                      | Typ.                | Max.                      | Typ.                | Typ.    |
| SPD1101-111 | -3 to 0                            | Low            | 270–350                    | 0.1                       | 24                        | 0.5                 | 0.25                      | 10                  | 70      |
| SPD1102-111 | 0 to 3                             | Medium         | 370–550                    | 0.1                       | 24                        | 0.5                 | 0.25                      | 10                  | 70      |
| SPD1103-111 | 0 to 13                            | High           | 600–700                    | 0.1                       | 24                        | 0.5                 | 0.25                      | 10                  | 70      |

Typical Performance



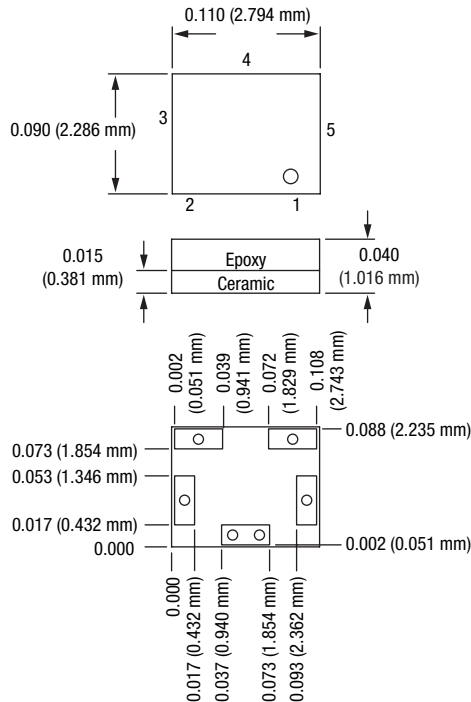
Suggested Circuit



Recommended Solder Reflow Profiles

Refer to the [“Recommended Solder Reflow Profile”](#) Application Note.

-111 Package Outline



Tape and Reel Information

Refer to the [“Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation”](#) Application Note.

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