Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

DATA SHEET

SKY16601-555LF: Integrated Single-Stage PIN Diode Limiter Module 0.50 to 6.0 GHz

Applications

- Cellular infrastructure
- WLAN, WiMAX
- Receiver LNA protection
- Test instruments

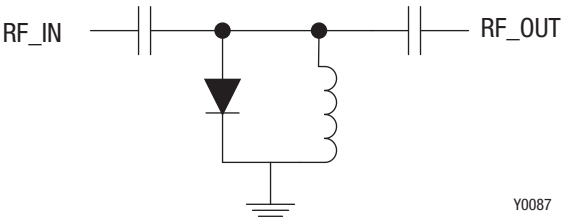


Figure 1. SKY16601-555LF Block Diagram

Features

- Optimized for 0.50 to 6.0 GHz operation
- Low insertion loss
- Low distortion
- Integrated PIN limiter, RF choke inductor, and DC blocks
- MLP (2-pin, 2.5 x 2.5 mm) Pb-free package, (MSL1, 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.

Description

The SKY16601-555LF is a fully integrated PIN diode low-threshold limiter module in a surface-mount package. It is designed for use as a passive receiver protector in wireless or other RF systems for frequencies up to 6 GHz. It features low-insertion loss and low distortion in a single MLP package.

The SKY16601-555LF module is comprised of a PIN limiter diode, an RF choke inductor, and 2 DC blocking caps at the RF ports in a 2-lead MLP package. The small package design reduces printed circuit board area.

The module can operate over the temperature range of –40 ˚C to +85 ˚C.

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.

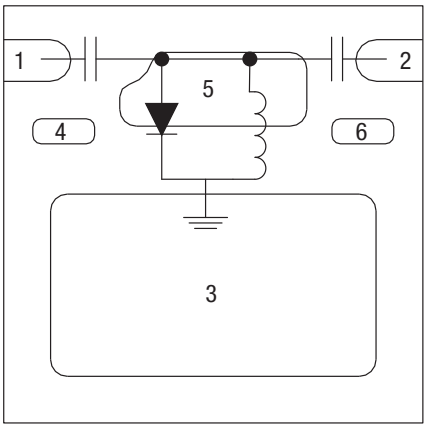


Figure 2. SKY16601-555LF Pinout, 2-Pin MLP (Top View)

Table 1. SKY16601-555LF Signal Descriptions

Pin	Name	Description
1	RF_IN	RF Input, AC coupled
2	RF_OUT	RF Output, AC coupled
3	GND	Must be connected to chassis ground
4	PAD	Exposed pad **(must be isolated from ground)**
5	PAD	Exposed pad **(must be isolated from ground)**
6	PAD	Exposed pad **(must be isolated from ground)**

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY16601-555LF are provided in Table 2. Electrical specifications for the limiter module are provided in Table 3, and RF electrical specifications for the 2.6 GHz limiter module are provided in Table 4.

Table 2. SKY16601-555LF Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Minimum	Maximum	Unit
Reverse voltage	V_R		45	V
Forward current @ 25 °C	I_F		1.5	A
RF input power (CW) at T_{CASE} = 85 °C	P_{IN}		23	W
RF input power (1 μs pulse, 10% duty cycle) at T_{CASE} = 85 °C	P_{IN}		230	W
CW power dissipation at T_{CASE} = 85 °C	P_{DIS}		1	W
Storage temperature	T_{STG}	–65	+150	°C
Operating temperature	T_{OP}	–40	+85	°C
Electrostatic discharge:	ESD			
Charged Device Model (CDM), Class 4			1000	V
Human Body Model (HBM), Class1A			250	V
Machine Model (MM), Class A			150	V

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 these devices are designed to be as robust as possible, Electrostatic Discharge (ESD) can damage them. These devices 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 employed at all times.*

Table 3. SKY16601-555LF Electrical Specifications (T_A = 25°C, Unless Otherwise Noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Units
Breakdown voltage	VB	IR = 10 µA	20		45	V
Reverse current	IR	VR = 16 V			1	µA
Capacitance	CT	f = 1 MHz, VR = 6 V		0.33	0.40	pF
Series resistance	RS	f = 500 MHz, IF = 10 mA		1.7	2.0	Ω
Series inductance	LS			0.3		nH
Carrier lifetime	TL	IF = 10 mA		10		ns
I region width	W			1.5		µm

Table 4. SKY16601-555LF RF Electrical Specifications (T_{OP} = 25°C, Z_O = 50 Ω, as Measured in the Skyworks Evaluation Board)

Parameter	Symbol	Condition	Frequency	Min.	Typ.	Max.	Units
Insertion loss	I_L	P_{IN}= 0 dBm	2.5 GHz		0.1	0.5	dB
Return loss	R_L	P_{IN}= 0 dBm	2.5 GHz		27.5		dB
Threshold level	T_L	P1dB	2.5 GHz	10	11	12	dBm
Saturated CW input power	P_{IN} CW		2.5 GHz		29		dBm
Input third order intercept	IIP3	P_{IN} = –10 dBm/tone, spacing = 10 MHz	2.5 GHz		32		dBm
Recovery time (Note 1)	T_R		2.5 GHz		5		ns
Thermal resistance	Θ_{JC}	Junction-to-case			88		°C/W
Flat leakage power (Note 2)	F_L	P_{IN} = +20 dBm			13		dBm

Note 1: Recovery time represents the transition time from the high-loss to low-loss state following the removal of high-power input. RF pulse modulation: 1 µs pulse width and 0.1% duty factor.

Note 2: Flat leakage power is defined as the power level after the limiter has fully turned on and the output pulse reaches a constant level.

Theory of Operation

A limiter prevents overload by allowing RF signals that are below a certain threshold to pass through, but larger signals exceeding the threshold are increasingly attenuated. The SKY16601-555LF is a single-stage limiter module, comprised of a shunt-connected PIN diode that biases itself in the presence of large signals. The PIN diode performs the dual functions of rectifying the incoming RF signal and then using the rectified current to bias itself to a low effective series resistance. An inductor completes the loop for the bias current flow while presenting a high impedance path to RF. The SKY16601-555LF includes input/output DC blocking capacitors needed for most applications.

Typical Performance Characteristics (T_{OP}=25°C, Characteristic Impedance = 50 Ω)

Typical performance characteristics are illustrated in Figures 3 and 4. Figures 5 and 6 show the power derating curves for the limiter module. In Figure 5, the temperature is referenced to the bottom of the MLP package. The power derating curve with the temperature referenced to the bottom of the printed circuit board is shown in Figure 6.

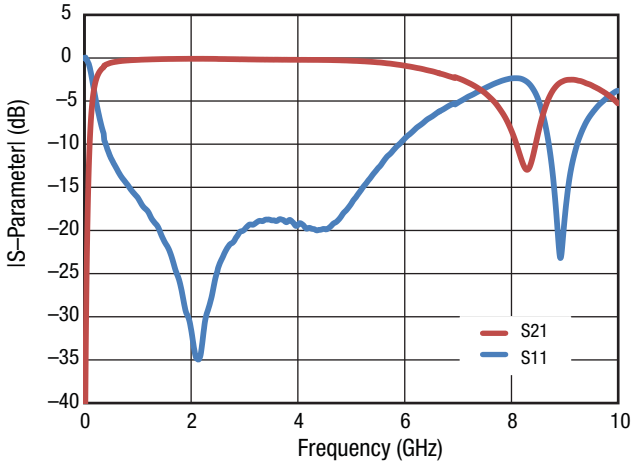


Figure 3. Small Signal Performance

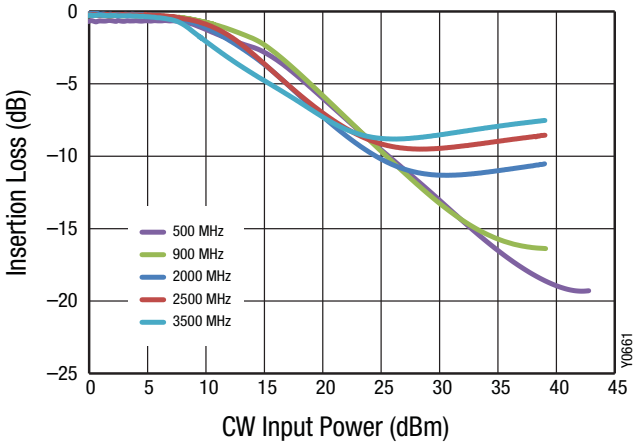


Figure 4. Insertion Loss vs CW Input Power vs Frequency

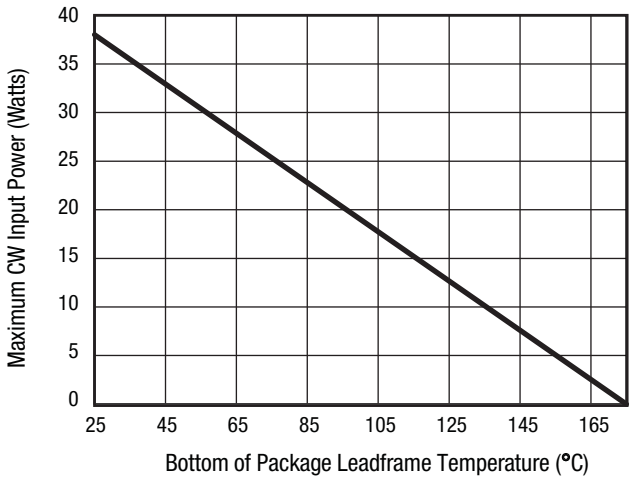


Figure 5. Power De-rating Curve (Insertion Loss = 0.2 dB) vs Temperature on Bottom of Package Leadframe

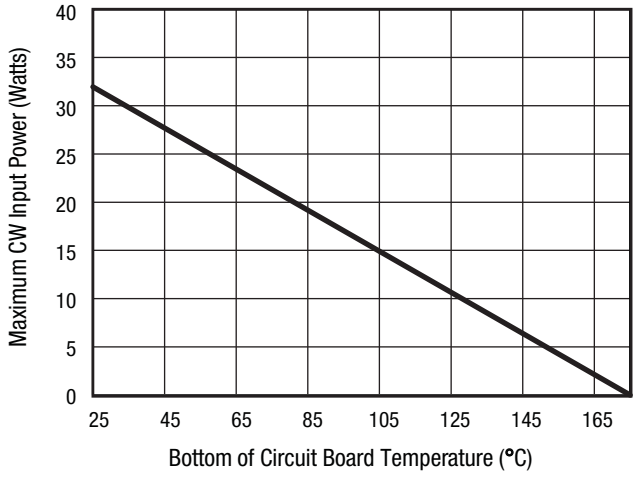


Figure 6. Power De-rating Curve (Insertion Loss =0.2 dB) vs Temperature on Bottom of EVB Circuit Board

Evaluation Board Description

The SKY16601-555LF evaluation board is used to test the performance of the limiter module. An assembly drawing for the evaluation board is shown in Figure 7. The evaluation board layer detail is provided in Figure 8.

Package Dimensions

The PCB layout footprint for the SKY16601-555LF is shown in Figure 9. Typical case markings are noted in Figure 10. Package dimensions for the 2 pin MLP are shown in Figure 11, and tape and reel dimensions are provided in Figure 12.

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 SKY16601-555LF 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.

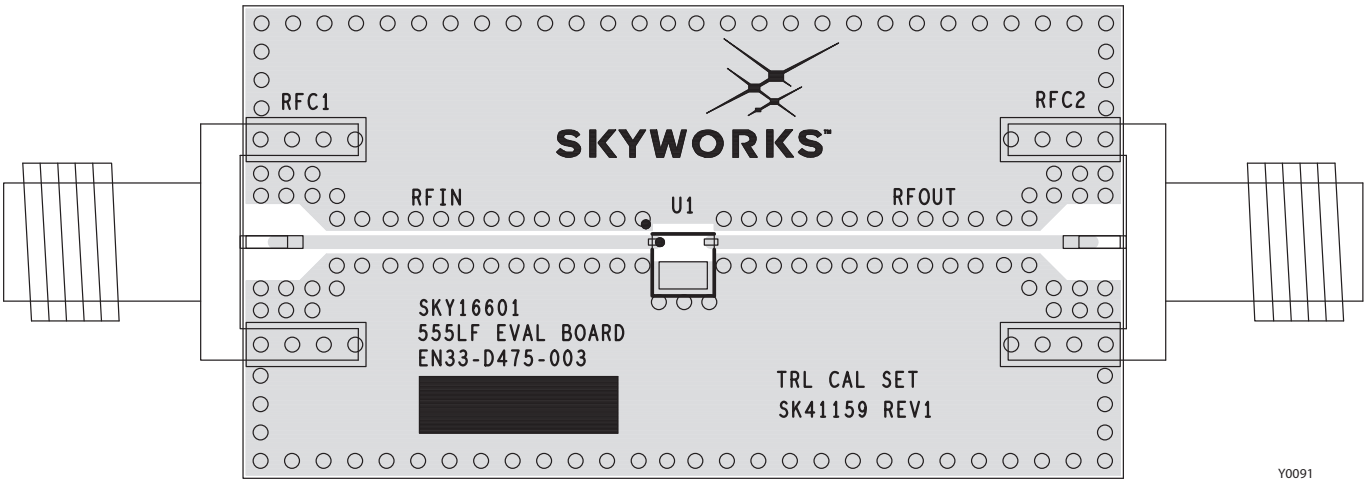


Figure 7. SKY16601-555LF Evaluation Board Assembly Diagram

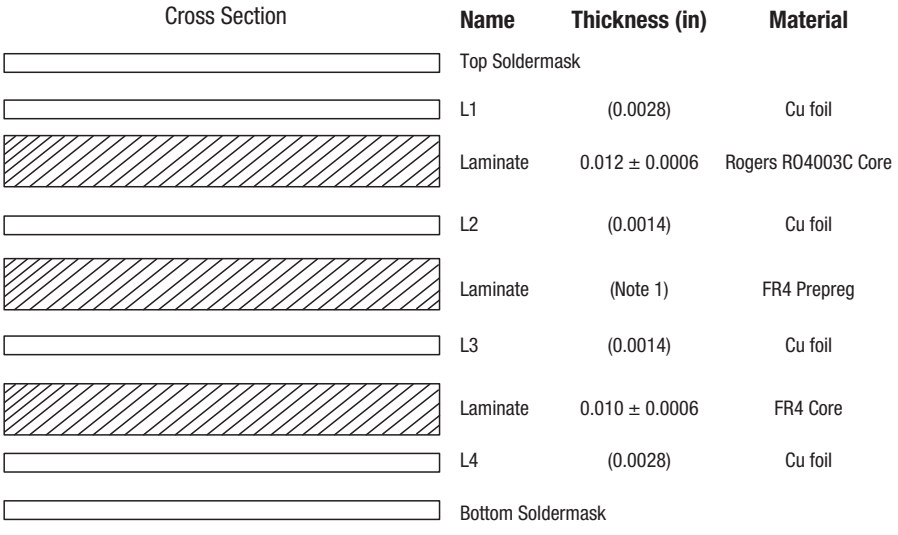


Figure 8. Board Layer Detail Physical Characteristics

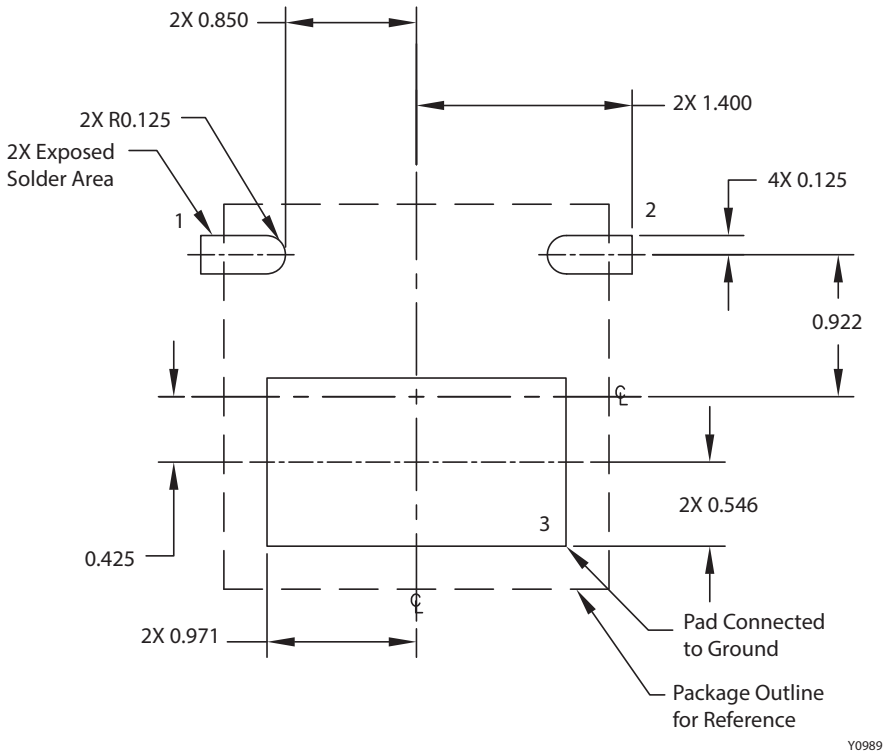


Figure 9. SKY16601-555LF PCB Layout Footprint

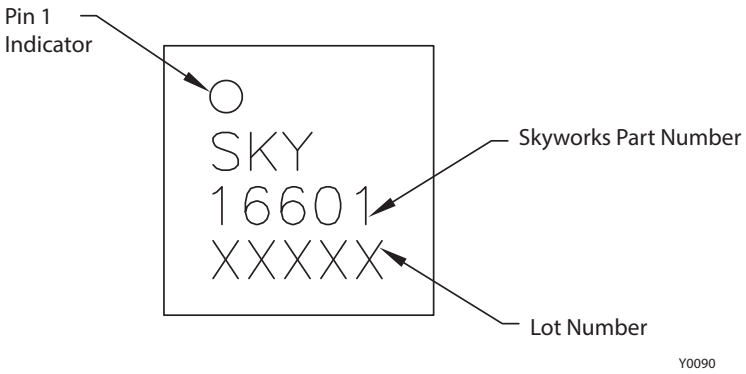
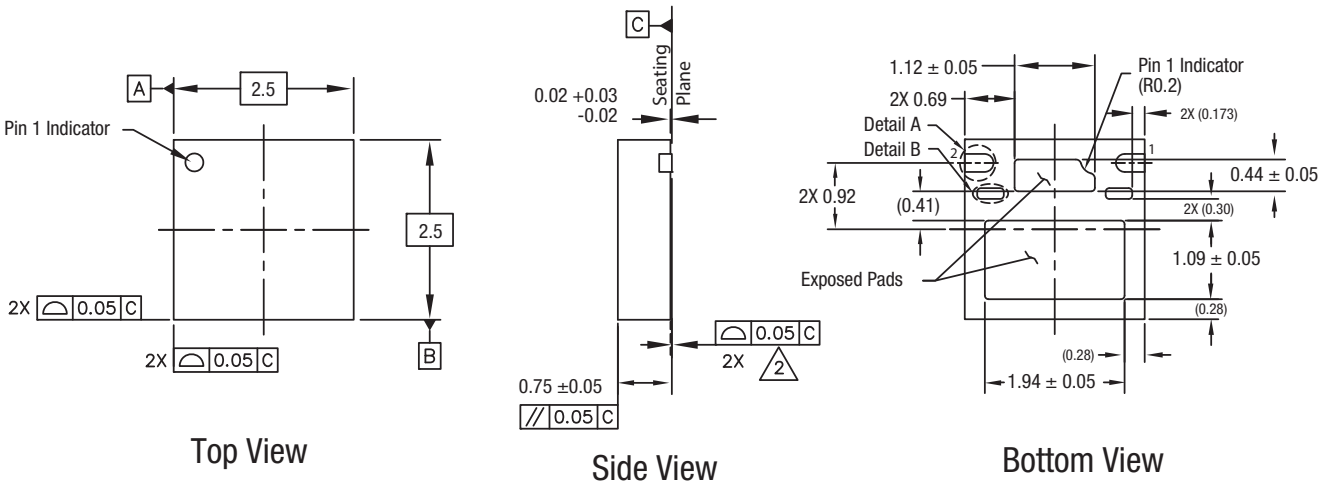


Figure 10. SKY16601-555LF Typical Case Markings

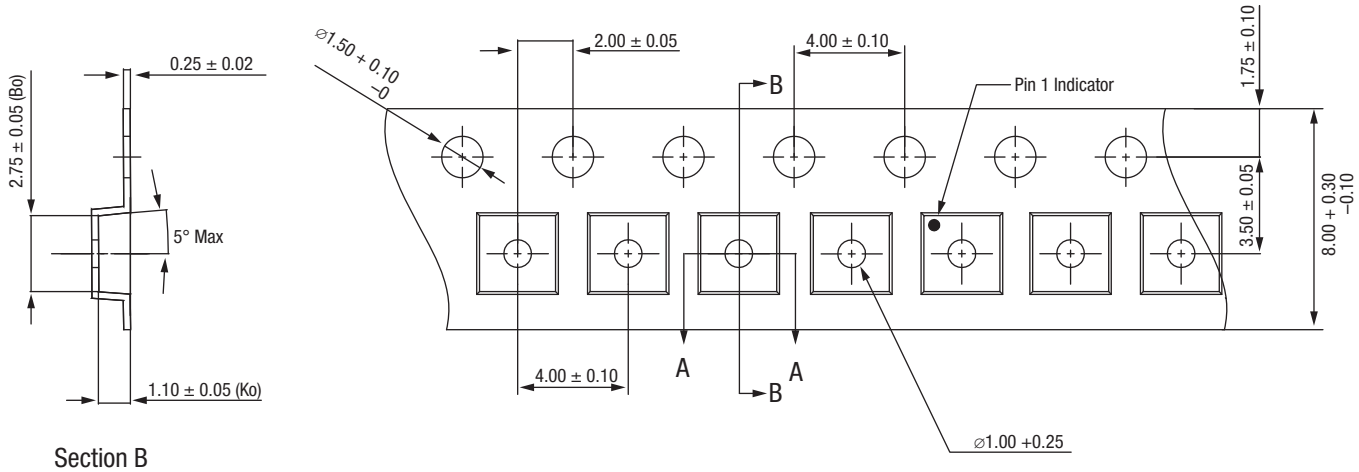


Notes:

All measurements are in millimeters.
Dimensioning and tolerancing according to ASME Y14.5M-1994.
Coplanarity applies to the exposed heat sink ground pad as well as the terminals.
Dimension applies to metalized terminal. If the terminal has a radius on its end, the dimension should not be measured in that area.
Plating requirement per source control drawing (SCD) 2504.

Y0093

Figure 11. SKY16601-555LF 2-PIN MLP Package Dimensions



Notes:

1. *Carrier tape: black conductive polycarbonate or polystyrene.*
2. *Cover tape material: transparent conductive.*
3. *ESD-surface resistivity shall be ≤ 1 x 10^{10} Ω/square per EIA, JEDEC TNR Specification.*
4. *10-sprocket hole pitch cumulative tolerance: ±0.20 mm.*
5. *Ao and Bo measurement point to be 0.30 mm from bottom pocket.*
6. *All dimensions are in millimeters.*

Figure 12. SKY16601-555LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKY16601-555LF: Low Threshold PIN Diode Limiter Module	SKY16601-555LF	SKY16601-555LF-EVB