



## Markets

- Smart energy
- Cellular telephone infrastructure and handsets
- Wireless local area networks (WLAN)
- Automotive
- Remote meter reading for the Smart Grid
- Test and measurement
- Military communications
- Cable television (CATV)
- Point-to-point microwave radios
- Land mobile radio systems
- Wireless microwave access (WiMAX)
- Passive optical networks (PON)



## **PIN, Limiter, Schottky, Varactor Diodes**

Select diodes available from stock for prototype or high-volume production

Skyworks Solutions offers a select group of diodes from our diverse diode offering in stock and ready for immediate design into your demanding applications.

Select diodes include the most popular PIN, limiter, Schottky, and tuning varactor diodes, readily available to ship in 3k reels from stock. These devices provide excellent performance and even better value for applications including smart energy, multiswitches, wireless local area networks (WLAN), cellular telephone networks, cable television (CATV), automotive, test and measurement equipment, land mobile radio, and more.

### *PIN Diodes for Switch and Attenuator Applications*

Part Number	Features	Markets
<b>Switching PIN Diodes</b>		
SMP1345-040LF	High isolation, fast switching	WLAN, infrastructure, general
SMP1320-040LF	Fast switching, high isolation, low insertion loss	WLAN, infrastructure, general
SMP1352-079LF	Large signal	Infrastructure, general
SMP1302-085LF	High power (50 W) handling, shunt	Land mobile radio, LTE base station, and more
SMP1325-087LF	High Power (35 W) handling, series	Land mobile radio, LTE base station, and more
<b>Attenuator PIN Diodes</b>		
SMP1307-004LF	Low distortion / high IP3, dual	CATV, PON, base station, and more
SMP1307-027LF	Low distortion / high IP3, quad	CATV, PON, base station, and more

### *Limiter Diodes for Receiver Protection Applications*

Part Number	Features	Markets
SMP1330-005LF	Clean-up limiter, +30 dBm input power, +13 dBm flat leakage power, up to 2.5 GHz	Land mobile radio, military, infrastructure, and more
SMP1330-085LF	Low loss, high power, +30 dBm input power, +13 dBm flat leakage power, up to 4 GHz	Land mobile radio, military, infrastructure, and more
CLA4603-085LF	Medium power, low loss, +33 dBm input power, +13 dBm flat leakage power, up to 10 GHz	Land mobile radio, military, infrastructure, and more
CLA4606-085LF	Medium power, low loss, +35 dBm input power, +18 dBm flat leakage power, up to 10 GHz	Land mobile radio, military, infrastructure, and more
CLA4609-086LF	Course limiter, high power handling, +43 dBm input power, +41 dBm flat leakage power, up to 6 GHz	Land mobile radio, military, infrastructure, and more



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### Schottky Diodes for Detector and Mixer Applications

Part Number	Features	Markets
<b>Detector Diodes</b>		
SMS7621-060	Excellent sensitivity, low capacitance, 0201	WLAN, military, infrastructure, and more
SMS7621-040LF	Excellent sensitivity, low capacitance, 0402	WLAN, military, infrastructure, and more
SMS7621-005LF	Excellent sensitivity, low capacitance, series pair	Infrastructure, smart energy, infrastructure, and more
SMS7630-061	Best sensitivity, zero bias, 0201	WLAN, military, infrastructure, and more
SMS7630-040LF	Best sensitivity, zero bias, 0402	WLAN, military, infrastructure, and more
SMS3922-079LF	Medium barrier, high breakdown voltage	Infrastructure and more

### Tuning Varactor Diodes for VCO, Voltage Tuned Filters, and Phase Shifter Applications

Part Number	Features	Markets
<b>Hyperabrupt Diodes</b>		
SMV1234-040LF	Low capacitance (6.5 pF @ 1 V, 2 pF @ 6 V), low resistance (0.8 $\Omega$ )	Automotive, smart energy, WLAN, test and measurement, infrastructure, and more
SMV1232-040LF	High capacitance ratio at low reverse voltage: $C_{11}/C_{13} = 1.7$ typical	Automotive, smart energy, WLAN, test and measurement, infrastructure, and more
SMV1247-040LF	Low capacitance (7 pF @ 0.3 V, 0.7 pF @ 4.7 V), high Q (1500)	Automotive, smart energy, WLAN, test and measurement, infrastructure, and more
SMV1249-079LF	Medium capacitance (31 pF @ 0.3 V, 2.6 pF @ 4.7 V)	Automotive, smart energy, WLAN, test and measurement, infrastructure, and more
SMV1255-079LF	High capacitance (64 pF @ 0.3 V, 5.2 pF @ 4.7 V)	Automotive, smart energy, WLAN, test and measurement, infrastructure, and more
<b>Abrupt Diodes</b>		
SMV1405-040LF	Ultra high Q (3200)	Automotive, smart energy, WLAN, test and measurement, infrastructure, and more
SMV1413-079LF	Low resistance, high Q	Automotive, smart energy, WLAN, test and measurement, infrastructure, and more

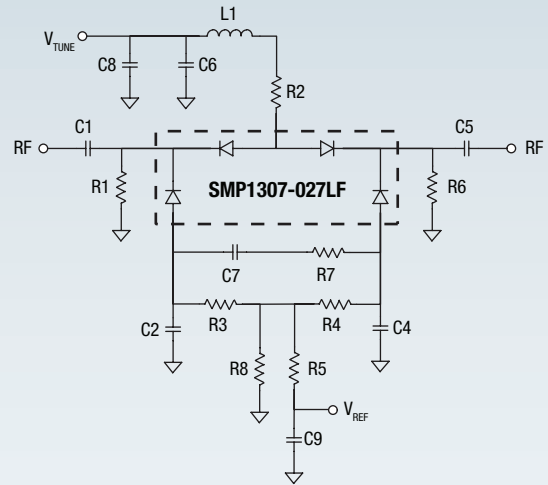
## PIN Diodes

### Features

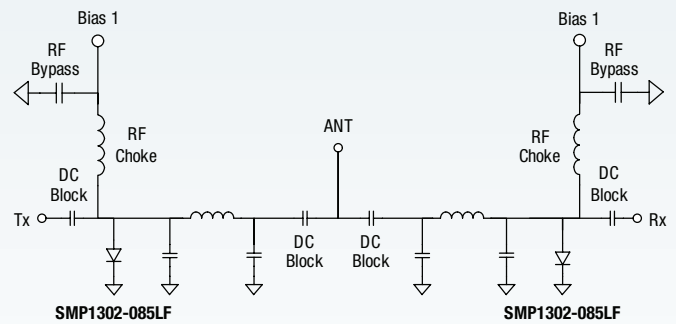
- Low capacitance for high isolation
- Low resistance
- Low distortion

Skyworks select PIN diodes are some of the most widely used PIN diodes in the world, for applications which range from RF switching in satellite television receiver low noise block converters (LNB) to automotive remote garage door openers to cable television automatic level controls.

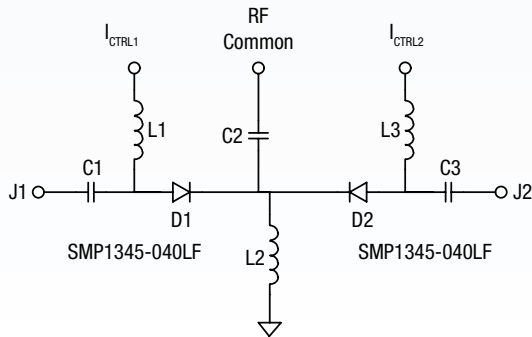
PIN diodes are three layer diodes, comprised of a heavily doped anode (the “P” layer) and a heavily doped cathode (the “N” layer) separated by a virtually undoped intrinsic layer (the “I” layer). Under forward bias, charge carriers from the P and the N layers are forced into the I layer, which reduces its RF impedance. When a reverse bias voltage is applied across the PIN diodes, all free charge carriers are removed from the I layer, thereby causing its RF impedance to increase. This variable RF impedance versus DC or low frequency bias signal allows the diode to be used in RF switching circuits, in which the PIN diode is either heavily forward-biased or reverse biased, or in RF attenuation circuits, in which case the PIN diode is utilized as a continuously-variable RF resistance by controlling the magnitude of the DC bias current through the diode.



Wide Bandwidth PIN Diode Variable Attenuator



High Power SPDT PIN Switch



Wide Bandwidth Single Pole Double Throw Switch

### PIN Diodes for Switch and Attenuator Applications

Part Number	Product Description	Key Features	Package (mm)
SMP1345-040LF	High isolation, fast switching PIN diode	Very low capacitance (0.14 pF), isolation 40 dB	0402 1.0 x 0.60 x 0.46
SMP1320-040LF	Fast switching / high isolation, low insertion loss PIN diode	Low capacitance, low series resistance, small footprint	0402 1.0 x 0.60 x 0.46
SMP1352-079LF	Large signal switching PIN diode	Low capacitance, SC-79	SC-79 1.6 x 0.8 x 0.6
SMP1302-085LF	High power shunt PIN diode	Power handling to 50 W CW	QFN 2 x 2 x 0.9
SMP1325-087LF	High power series PIN diode	Power handling to 34 W CW	QFN 2 x 2 x 0.9
SMP1307-004LF	Low distortion / high IP3 attenuator PIN diode	Low distortion common cathode configuration	SOT-23 2.37 x 2.92 x 1.0
SMP1307-027LF	Low distortion / high IP3 attenuator PIN diode	Low distortion, (4 diode) Pi configuration	SOT-5 2.8 x 2.9 x 1.8

## Receiver Protection Limiter Diodes

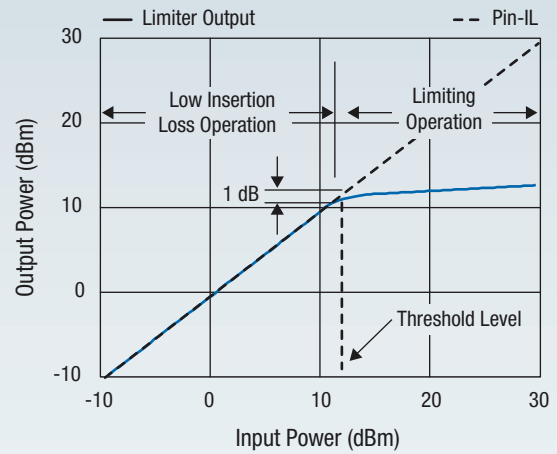
### Features

- High power, mid-range cleanup designs
- Tight control of basewidth

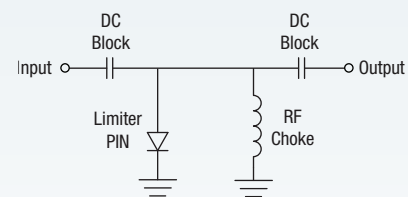
Skyworks' series of silicon limiter diode chips provides passive receiver protection over a wide range of frequencies from 100 MHz to beyond 30 GHz. These devices utilize Skyworks well established silicon technology for high resistivity and tightly controlled thin basewidth PIN limiter diodes. Limiter circuits employing these devices perform with strong limiting action and low loss.

The receiver protector function is performed by a specially processed PIN diode, known as a limiter diode. The PIN limiter diode can be described as an incident-power-controlled, variable resistor. In the case when no large input signal is present, the impedance of the limiter diode is at its maximum, thereby producing minimum insertion loss, typically less than 0.5 dB. The presence of a large input signal temporarily forces the impedance of the diode to a much lower value, producing an impedance mismatch which reflects the majority of the input signal power back towards its source.

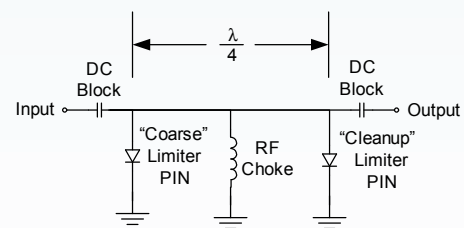
The input power level at which the limiter diode's impedance starts to decrease in response to a large input signal amplitude is primarily determined by the diode's I layer thickness. The diodes which "turn on" at the lowest signal levels have the thinnest I layers.



Output Power vs. Input Power for Single-Stage Limiter



Typical Single-Stage Limiter Circuit



Multistage Limiter Circuit

### Limiter Diodes for Receiver Protection

Part Number	Product Description	Key Features	Package (mm)
SMP1330-005LF	Clean-up limiter, high power handling	+30 dBm input power, +13 dBm flat leakage power, $\leq 2.5$ GHz	SOT-23 2.37 x 2.92 x 1.0
SMP1330-085LF	Low loss, high power, high power handling	+30 dBm input power, +13 dBm flat leakage power, $\leq 4$ GHz	QFN 2 x 2 x 0.9
CLA4603-085LF	Medium power, low loss, high power handling	+33 dBm input power, +13 dBm flat leakage power, $\leq 10$ GHz	QFN 2 x 2 x 0.9
CLA4606-085LF	Medium power, low loss, high power handling	+35 dBm input power, +18 dBm flat leakage power, $\leq 10$ GHz	QFN 2 x 2 x 0.9
CLA4609-086LF	Course limiter, high power handling	+43 dBm input power, +41 dBm flat leakage power, $\leq 6$ GHz	QFN 2 x 2 x 0.9

Skyworks Green™ products are compliant to all applicable materials legislation and are halogen-free. For additional information, refer to Skyworks Definition of Green™, document number SQ04-0074.

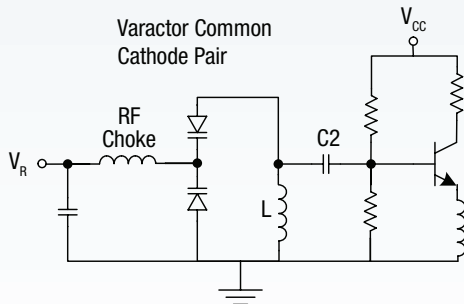
## Tuning Varactor Diodes

### Features

- Large available change in capacitance for wide bandwidth
- Low resistance for low loss

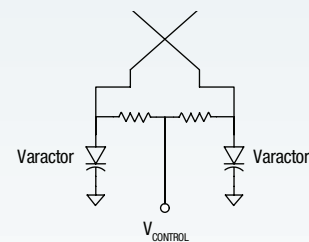
Skyworks series of select silicon tuning varactor diodes are used as the electrical tuning elements in voltage controlled oscillators (VCOs), voltage variable analog phase shifters and voltage tuned filters (VTFs). This family of diodes includes abrupt junction tuning varactors, useful for low loss, narrow band circuits, and hyperabrupt junction varactors, useful for wide bandwidth VCOs and VTFs and wide phase range variable phase shifters.

Tuning varactors are pn junction diodes. The depletion region that forms at the junction of the diode acts as a nearly-ideal insulator, which separates the highly-doped anode from the cathode layer, thus forming a parallel plate capacitor. The thickness of the depletion layer can be increased by applying a reverse bias voltage to the diode.

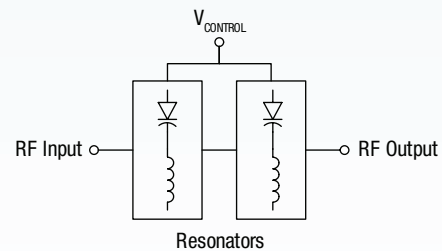


Typical Voltage Controlled Oscillator with a Common Cathode Pair of Tuning Varactors

The cathode layer's doping profile is very carefully designed to produce a tightly-controlled capacitance versus reverse bias voltage performance characteristic. The cathode layer of an abrupt junction diode has uniform dopant concentration throughout its thickness, which results in a low series resistance and moderately large change in capacitance versus bias voltage. By contrast, the doping concentration of cathode layer of hyperabrupt varactor diode is designed to change by several orders of magnitude, typically over the depth of a few microns. This non-constant dopant concentration versus depth of the hyperabrupt diode's cathode layer produces a much larger available change in capacitance versus reverse voltage, necessary for wide bandwidth or phase shift range applications.



Variable Phase Shifter



Voltage Tuned Filter

### Tuning Varactor Diodes for VCO, Voltage Tuned Filters, and Phase Shifter Applications

Part Number	Product Description	Key Feature	Package (mm)
SMV1234-040LF	Low capacitance tuning varactor diode	Low capacitance (6.3 pF @ 1 V, 2 pF @ 6 V), low resistance (0.8 Ω) hyperabrupt	0402 1.0 x 0.60 x 0.46
SMV1232-040LF	Wide band width tuning varactor diode	High capacitance ratio at low reverse voltage: CT1/CT3 = 1.7 typical	0402 1.0 x 0.60 x 0.46
SMV1247-040LF	Low capacitance and high Q tuning varactor diode	Low capacitance (7 pF @ 0.3 V, 0.7 pF @ 4.7 V), high Q (1500) hyperabrupt	0402 1.0 x 0.60 x 0.46
SMV1249-079LF	Medium capacitance and wide tuning range diode	Medium capacitance (31 pF @ 0.3 V, 2.6 pF @ 4.7 V) hyperabrupt	SC-79 1.6 x 0.8 x 0.6
SMV1255-079LF	High capacitance and wide tuning range diode	High capacitance (64 pF @ 0.3 V, 5.2 pF @ 4.7 V) hyperabrupt	SC-79 1.6 x 0.8 x 0.6
SMV1405-040LF	Ultra high Q (3200) varactor for filter and VCO	Highest VB: 1.84 pF @ 1 V, 0.63 pF @ 30 V	0402 1.0 x 0.60 x 0.46
SMV1413-079LF	Low resistance and high Q abrupt tuning diode	Low resistance (0.35 Ω), high Q (2400) and low capacitance (6.4 pF @ 1 V, 1.75 pF @ 30 V)	SC-79 1.6 x 0.8 x 0.6

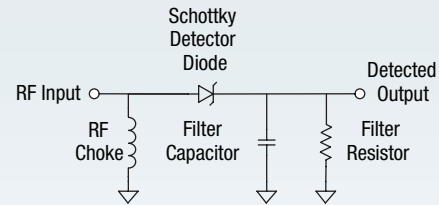
## Schottky Diodes

### Features

- Low capacitance for high frequency operation
- Excellent sensitivity
- High reverse breakdown voltage

Skyworks series of select silicon Schottky diodes are optimized for use as detector and mixer diodes at frequencies from below 10 MHz to higher than 20 GHz. This family of products includes medium, low and zero bias detector (ZBD) barrier height Schottky junctions with low junction capacitance and low series resistance.

Schottky junctions are formed by depositing specific metals on either n-type-doped silicon (low or medium barrier height) or on p-type-doped silicon (ZBD barrier height). The characteristics of the diode are determined by the type of metal deposited on the semiconductor material as well as the type of dopant in the semiconductor layer, among other parameters.



Single Schottky Diode Detector

### Schottky Diodes for Detector and Mixer Applications

Part Number	Product Description	Key Features	Package (mm)
SMS7621-060	Mixer applications up to 100 GHz and detector applications up to 40 GHz	Low barrier height, low inductance 0.15 nH, 0201 footprint	0201 0.60 x 0.30 x 0.27
SMS7621-040LF	Detector Schottky diode	Low barrier height and low capacitance	0402 1.0 x 0.60 x 0.46
SMS7621-005LF	Series pair detector Schottky diodes	Low barrier height and low capacitance	SOT-23 2.37 x 2.92 x 1.0
SMS7630-061	Detector applications up to 40 GHz	Lowest barrier height, low inductance 0.15 nH, 0201 footprint	0201 0.60 x 0.30 x 0.27
SMS7630-040LF	Zero biased detector Schottky diode	Lowest barrier height for best sensitivity	0402 1.0 x 0.60 x 0.46
SMS3922-079LF	Medium barrier detector Schottky diode	Medium barrier height with high breakdown voltage (>8 volts)	SC-79 1.6 x 0.8 x 0.6

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Through our Green Initiative,<sup>™</sup> we are committed to manufacturing products that comply with global government directives and industry requirements.

Skyworks is continuously innovating RF, analog and mixed-signal ICs. For the latest product introductions and information about Skyworks, visit our Web site at [www.skyworksinc.com](http://www.skyworksinc.com)

For additional information on our broad overall product portfolio, please contact your local sales office or email us at [sales@skyworksinc.com](mailto:sales@skyworksinc.com).

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