

## Applications

- Receiver protection

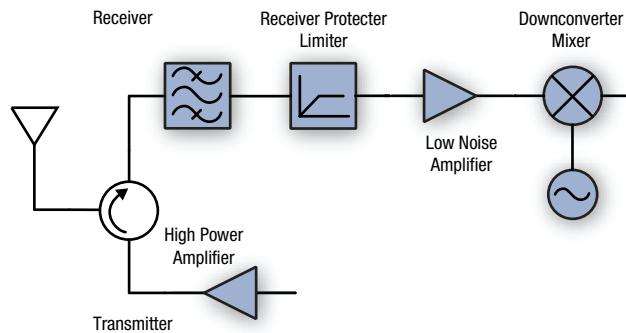
## Features

- High power, mid-range and clean-up designs
- Low insertion loss (0.1 dB at 10 GHz)
- Power handling to 66 dBm
- Tight control of basewidth

## Limiter Diodes

Skyworks broad product portfolio includes limiter diodes as packaged and bondable silicon chips, in addition to ceramic hermetic packaged and plastic surface mount packaged devices for receiver protection applications.

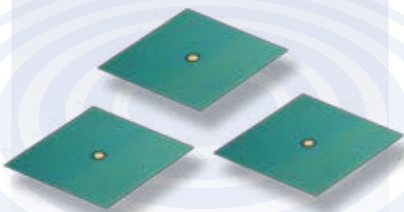
Skyworks CLA series of silicon limiter diode chips provides passive receiver protection over a wide range of frequencies from 100 MHz to beyond 30 GHz. These devices utilize Skyworks well established silicon technology for high resistivity and tightly controlled thin base width PIN limiter diodes. Limiter circuits employing these devices will perform with strong limiting action and low loss. The CLA series consists of eight individual chip designs of different intrinsic region basewidths and capacitances designed to accommodate multistage limiter applications. The mesa constructed, thin basewidth, low capacitance CLA4601-000, CLA4602-000, CLA4604-000 and CLA4605-000 are designed for low-level and cleanup applications. The CLA4603-000, and CLA4606-000 through CLA4608-000 are planar designs designated for high-power and mid-range applications.



Simplified Radar Transceiver with a Receiver Protector Limiter



Skyworks Green™ products are RoHS (Restriction of Hazardous Substances)-compliant, conform to the EIA/EICTA/JEITA Joint Industry Guide (JIG) Level A guidelines, are halogen free according to IEC-61249-2-21, and contain <1,000 ppm antimony trioxide in polymeric materials.

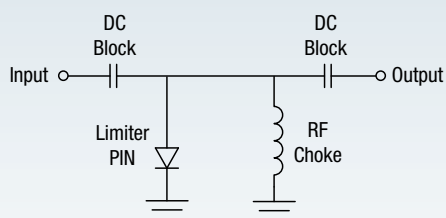


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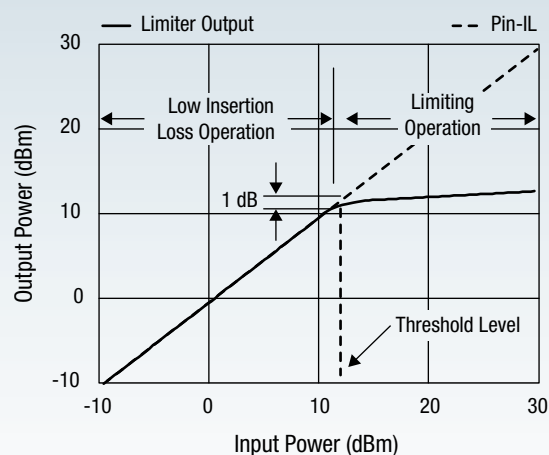
Select products and sample/designer kits available for purchase online.

[www.skyworksinc.com](http://www.skyworksinc.com)





A Single-Stage Limiter



Output Power vs. Input Power for a Single-Stage Limiter

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.

## Electrical Specifications at 25 °C

| Part Number | Breakdown Voltage (V) | I Region (μm) | C <sub>j</sub> @ 0 V (pF) | C <sub>j</sub> @ 6 V (pF) | R <sub>s</sub> @ 10 mA (Ω) | T <sub>L</sub> @ 10 mA (ns) | Thermal Impedance (θ) |                   | Top Contact Diam. (mils/mm) | Outline Drawing |
|-------------|-----------------------|---------------|---------------------------|---------------------------|----------------------------|-----------------------------|-----------------------|-------------------|-----------------------------|-----------------|
|             | Min. – Max.           | Nominal       | Typ.                      | Max.                      | Max.                       | Typ.                        | Average (°C/W)        | 1 μs Pulse (°C/W) | Typ.                        |                 |
| CLA4601-000 | 15–30                 | 1             | 0.12                      | 0.1                       | 2.5                        | 5                           | 120                   | 15                | 1.2/0.03                    | 150-806         |
| CLA4602-000 | 15–30                 | 1             | 0.2                       | 0.15                      | 2                          | 5                           | 80                    | 10                | 1.5/0.038                   | 150-806         |
| CLA4603-000 | 20–45                 | 1.5           | 0.2                       | 0.15                      | 2                          | 5                           | 100                   | 10                | 1.5/0.038                   | 149-815         |
| CLA4604-000 | 30–60                 | 2             | 0.12                      | 0.1                       | 2.5                        | 7                           | 100                   | 10                | 1.5/0.038                   | 150-806         |
| CLA4605-000 | 30–60                 | 2             | 0.2                       | 0.15                      | 2                          | 7                           | 70                    | 7                 | 2.5/0.064                   | 150-813         |
| CLA4606-000 | 45–75                 | 2.5           | 0.2                       | 0.15                      | 2                          | 10                          | 80                    | 7                 | 2.5/0.064                   | 149-815         |
| CLA4607-000 | 120–180               | 7             | 0.2                       | 0.15 @ 50 V               | 2                          | 50                          | 40                    | 1.2               | 3/0.076                     | 149-815         |
| CLA4608-000 | 120–180               | 7             | 0.8                       | 0.5 @ 50 V                | 1.2                        | 100                         | 15                    | 0.3               | 5/0.127                     | 149-815         |

Capacitance, C<sub>j</sub>, specified at 1 MHz.

Resistance, R<sub>s</sub>, measured at 500 MHz.

CW thermal resistance for infinite heat sink.

Pulse thermal resistance for single 1 μs pulse.

## Typical Performance at 25 °C

| Part Number | Insertion Loss @ -10 dBm (dB) | Input Power for 1 dB Loss (dBm) | Maximum Pulsed Input Power (dBm) | Output at Max. Pulsed Input (dBm) | Maximum CW Input Power (W) | Recovery Time (ns) |
|-------------|-------------------------------|---------------------------------|----------------------------------|-----------------------------------|----------------------------|--------------------|
| CLA4601-000 | 0.1                           | 7                               | 47                               | 21                                | 2                          | 5                  |
| CLA4602-000 | 0.1                           | 7                               | 50                               | 24                                | 3                          | 5                  |
| CLA4603-000 | 0.1                           | 10                              | 50                               | 22                                | 2                          | 10                 |
| CLA4604-000 | 0.1                           | 12                              | 47                               | 24                                | 3                          | 10                 |
| CLA4605-000 | 0.1                           | 12                              | 50                               | 27                                | 4                          | 10                 |
| CLA4606-000 | 0.1                           | 15                              | 53                               | 27                                | 3                          | 20                 |
| CLA4607-000 | 0.1                           | 20                              | 60                               | 39                                | 6                          | 50                 |
| CLA4608-000 | 0.2                           | 20                              | 66                               | 44                                | 15                         | 100                |

Insertion loss for CLA4601-000 through CLA4607-000 at 10 GHz; insertion loss for CLA4608-000 at 5 GHz.

Limiter power results at 1 GHz for shunt connected, single limiter diode and DC return in 50 Ω line.

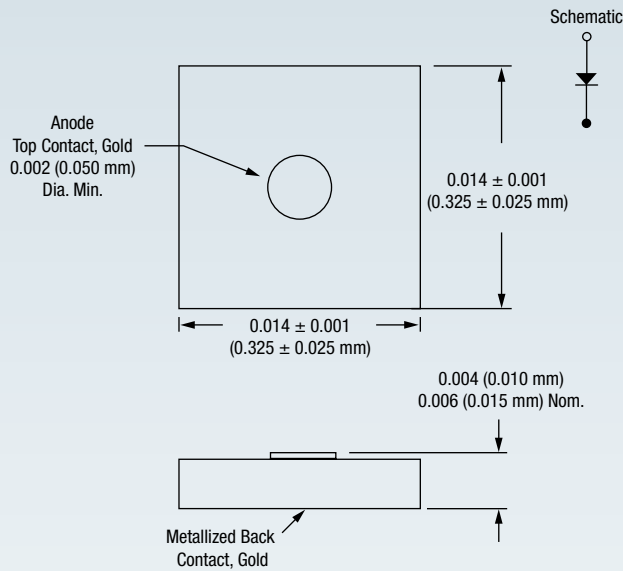
Maximum pulsed power for 1 μs pulse and 0.1% duty factor with chip at 25 °C heat sink. Derate linearly to 0 W at 175 °C.

Maximum CW input power at 25 °C heat sink. Derate linearly to 0 W at 175 °C.

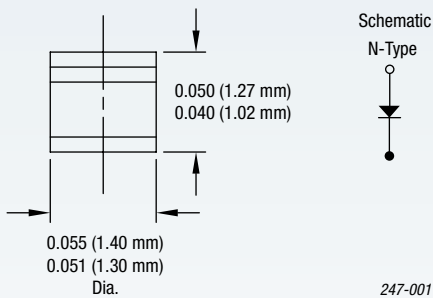
Recovery time to insertion loss from limiting state.

## Outline Drawngs

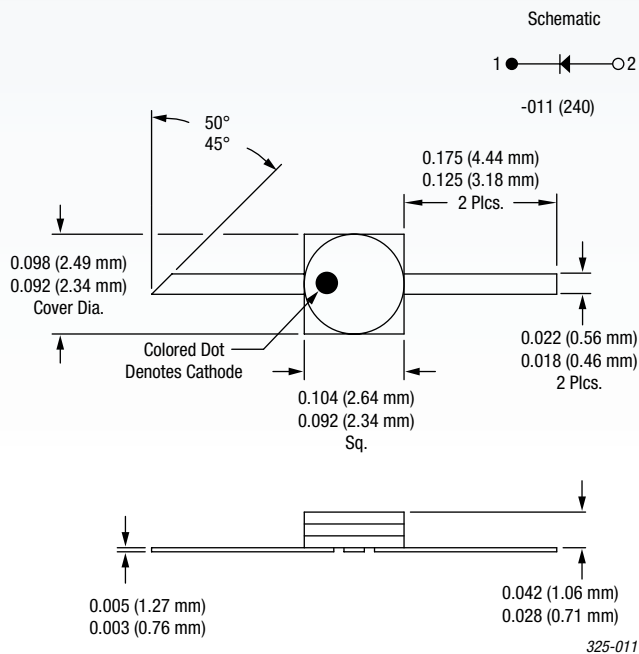
### 149-815



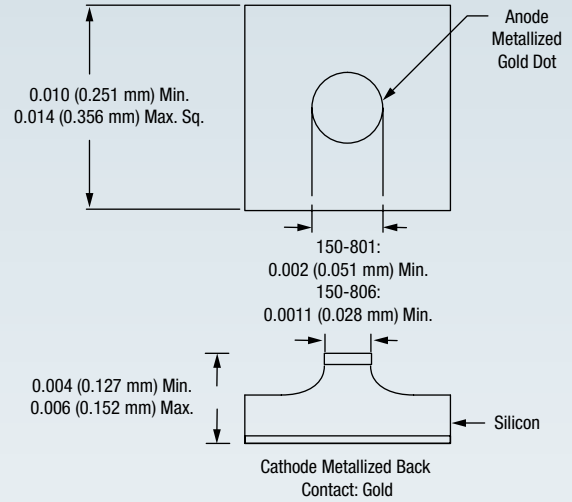
### -203



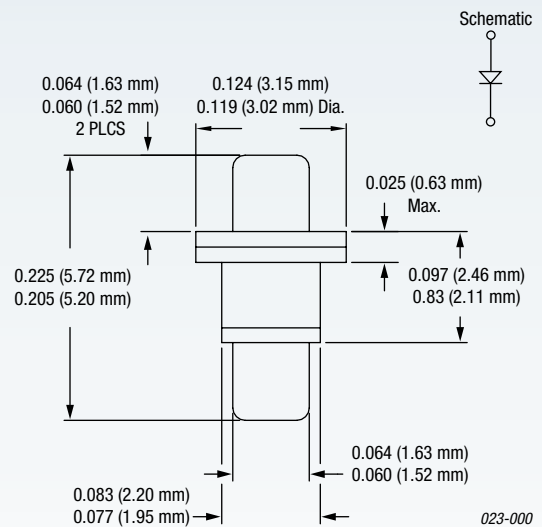
### -240



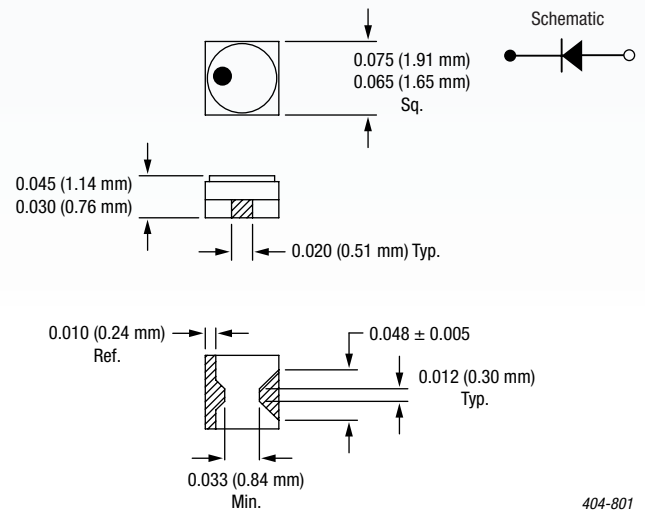
### 150 Series



### -210



### -219



## Application Note

For additional information, please refer to the ***"Diode Chips, Beam-Lead Diodes, Capacitors: Bonding Methods and Packaging"*** Application Note.



Through our Green Initiative™, 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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