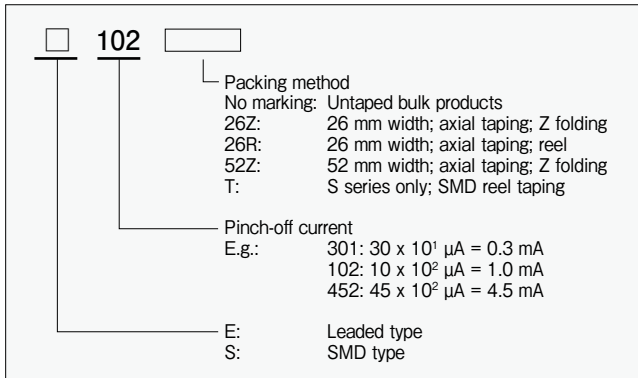


Current regulating diode

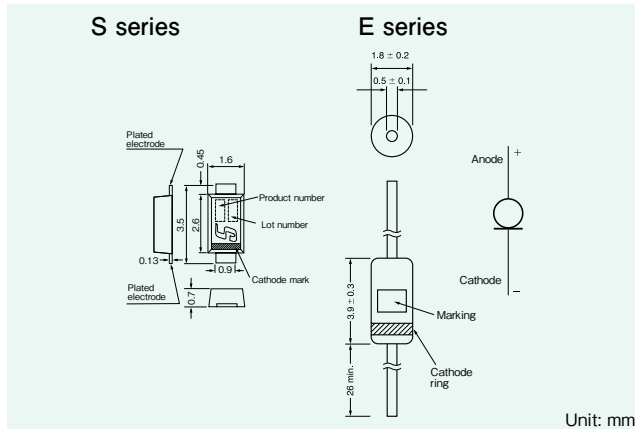
CRD

Current regulating diodes (CRD hereunder) are diodes that maintain a constant current flow despite voltage fluctuations. CRDs supply constant current over a wide range of voltage from less than 1V to 100V. Constant current is supplied regardless of fluctuations in voltage applied, load resistance changes and ripple voltage. Creating a constant current circuit generally involves multiple components, but with SEMITEC CRDs only one part is required to accomplish the same function.

Product number explanation



Dimensions



Applications

- Constant current source for LED brightness stabilization
- LED street lights, LED fluorescent lamps, LED light bulbs, LED downlights
- Constant voltage circuit for supplying constant current to Zener diodes
- Constant current source for proximity sensors and other sensors
- Battery charge / discharge circuits
- Electrolytic capacitor aging equipment

- Constant current test equipment for various semiconductor devices
- Telecommunications line interface
- Earth leakage circuit breakers
- Current source for piezoelectric actuators
- Stabilized power supply circuits

Specifications

General

| | E series | S series |
|-----------------------------|------------------------|------------------------|
| Rated power | 300 mW | 500 mW |
| Rated voltage (pulse wave) | 100 V (E-101 to E-562) | 100 V (S-101 to S-562) |
| Allowable reverse current | 50 mA | |
| Junction temperature | 150 °C | |
| Operating temperature range | - 30 to 150 °C | - 40 to 150 °C |

Recommended maximum voltage

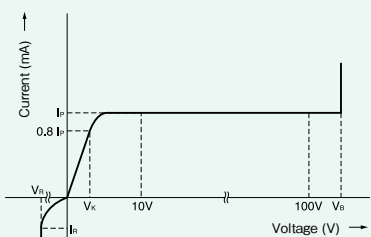
| Product number | Voltage | Product number | Voltage |
|----------------|---------|------------------|---------|
| E-101 to E-562 | 100 | S-101 to S-562 | 100 |
| E-822 | 30 | S-822T to S-223T | 50 |
| E-103 | | | |
| E-123 | | | |
| E-153 | 25 | | |
| E-183 | | | |

| Product number | | Pinch-off current (10 V) ¹ | | Limiting current ¹ | | Limiting current ratio $I_{100V}/I_p^1 I_{30V}/I_p$ | Temperature coefficient (% / °C) ² |
|----------------|--------|---------------------------------------|-------------|-------------------------------|-----------------|---|---|
| SMD | Leaded | I_p (mA) typical | Min - max | V_k (V) | I_k (mA) | | |
| S-101T | E-101 | 0.10 | 0.05 - 0.21 | 0.5 | 0.8 $I_{pmin.}$ | 1.1 max | + 2.10 to + 0.10 |
| S-301T | E-301 | 0.30 | 0.20 - 0.4 | 0.8 | | | - 0.40 to - 0.20 |
| S-501T | E-501 | 0.50 | 0.40 - 0.6 | 1.1 | | | + 0.15 to - 0.25 |
| S-701T | E-701 | 0.70 | 0.60 - 0.9 | 1.4 | | | 0.00 to - 0.32 |
| S-102T | E-102 | 1.00 | 0.88 - 1.3 | 1.7 | | | - 0.10 to - 0.37 |
| S-152T | E-152 | 1.50 | 1.28 - 1.7 | 2.0 | | | - 0.13 to - 0.40 |
| S-202T | E-202 | 2.00 | 1.68 - 2.3 | 2.3 | | | - 0.15 to - 0.42 |
| S-272T | E-272 | 2.70 | 2.28 - 3.1 | 2.7 | | | - 0.18 to - 0.45 |
| S-352T | E-352 | 3.50 | 3.00 - 4.1 | 3.2 | | | - 0.20 to - 0.47 |
| S-452T | E-452 | 4.50 | 3.90 - 5.1 | 3.7 | | | - 0.22 to - 0.50 |
| S-562T | E-562 | 5.60 | 5.00 - 6.5 | 4.5 | | | - 0.25 to - 0.53 |
| S-822T | E-822 | 8.20 | 6.56 - 9.8 | 3.1 | | | - 0.25 to - 0.45 |
| S-103T | E-103 | 10.0 | 8.00 - 12.4 | 3.5 | | | - 0.25 to - 0.45 |
| S-123T | E-123 | 12.0 | 9.60 - 14.4 | 3.8 | | | - 0.25 to - 0.45 |
| S-153T | E-153 | 15.0 | 12.0 - 18.0 | 4.3 | | | - 0.25 to - 0.45 |
| S-183T | E-183 | 18.0 | 16.0 - 20.0 | 4.6 | | | - 0.25 to - 0.45 |
| S-223T | | 22.5 | 20.0 - 25.0 | 5.3 | | | - 0.25 to - 0.45 |

New

¹: Pinch-off current and limiting current are measured by pulse wave at 25 °C environment temperature
²: Temperature coefficient is calculated from measurements at 25 and 50 °C.

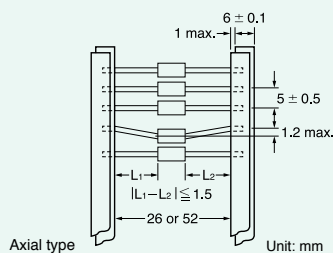
Voltage - current characteristics



I_p : Pinch-off current at 10 V
 V_k : Voltage which produces 0.8 I_p or greater current
 V_B : Breakdown voltage
 I_R : Permitted reverse current

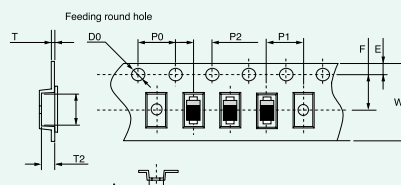
Taping options

SEMITEC offers both axial and SMD taping.



Minimum taping quantities

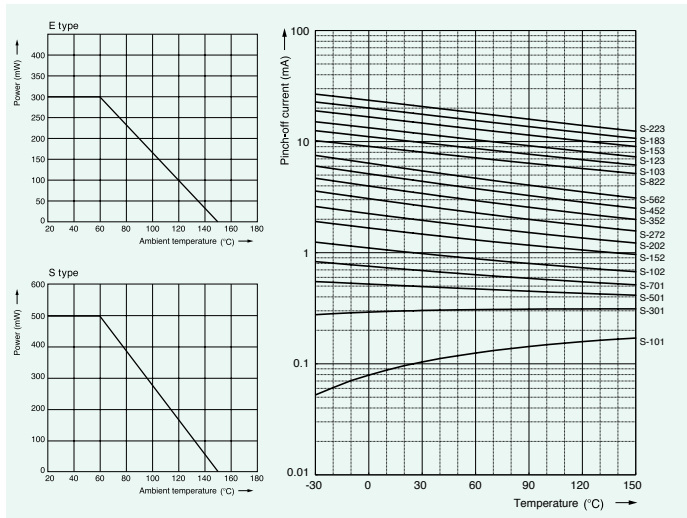
Axial type Reel: 5000 pcs
 Box: 2500 pcs
 SMD type Reel: 3000 pcs
 Box: 1500 pcs



| A | B | W | F | E | P0 | P1 | P2 | D0 | T | T2 |
|-------|--------|-------|--------|--------|-------|-------|--------|---------|--------|-------|
| 1.8 | 3.74 | 8.0 | 3.50 | 1.75 | 4.0 | 4.0 | 2.00 | φ1.5 | 0.2 | 0.9 |
| ± 0.1 | ± 0.10 | ± 0.1 | ± 0.05 | ± 0.10 | ± 0.1 | ± 0.1 | ± 0.05 | +0.1/-1 | ± 0.05 | ± 0.1 |

SMD element is set with the cathode side on the side with holes.

Influence of environment temperature on power and pinch-off current rating

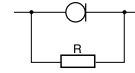


How to compensate current reduction due to heat up of the CRD

For currents of 1 mA or more resistors can be used together with CRDs to compensate for current decreases and fluctuations. The following values are typical for compensation resistors.

| Rated power: 500 mW | | | | | | | | | | |
|------------------------------|--------|--------|--------|--------|--------|-------|-------|-------|-------|-------|
| Product number | S-102 | S-152 | S-202 | S-272 | S-352 | S-452 | S-562 | S-822 | S-103 | S-123 |
| Recommended resistance value | 1.1 MΩ | 430 kΩ | 300 kΩ | 200 kΩ | 130 kΩ | 91 kΩ | 62 kΩ | 27 kΩ | 18 kΩ | 15 kΩ |

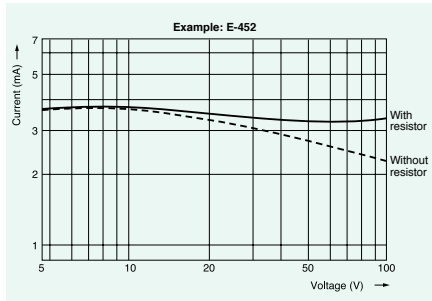
| Rated power: 300 mW | | | | | | | | | | |
|------------------------------|-------|--------|--------|--------|-------|-------|-------|-------|-------|-------|
| Product number | E-102 | E-152 | E-202 | E-272 | E-352 | E-452 | E-562 | E-822 | E-103 | E-123 |
| Recommended resistance value | 1 MΩ | 390 kΩ | 240 kΩ | 120 kΩ | 82 kΩ | 56 kΩ | 39 kΩ | 20 kΩ | 15 kΩ | 11 kΩ |



Reliability data

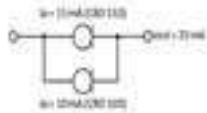
| Item | Test conditions | Criteria |
|---|--|------------------------|
| Resistance to soldering heat | 10 s at 260 °C (wave soldering) | $\Delta I_p \pm 5\%$ |
| Solderability | 3 s at 245 °C Flux material: Rosin 25%, propanol 75% | More than 90% soldered |
| Dry heat | 1000 hours at 150 °C | $\Delta I_p \pm 5\%$ |
| Damp heat (CRD S) | 1000 hours at 85 °C and 85% humidity | |
| Damp heat (CRD E) | 1000 hours at 70 °C and 90% humidity | |
| Temperature cycle / thermal shock (CRD S) | 10 cycles as below: 1. - 55 °C for 15 minutes 2. Room temperature for 15 minutes 3. 150 °C for 15 minutes 4. Room temperature for 15 minutes | |
| Temperature cycle / thermal shock (CRD E) | 5 cycles as below: 1. - 25 °C for 30 minutes 2. Room temperature for 15 minutes 3. 150 °C for 30 minutes 4. Room temperature for 15 minutes | |

Current - voltage characteristics with and without resistor (example)



CRD for higher currents

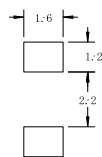
CRDs can be used in row to amplify permissible current.



CRD for higher voltages

Using CRDs in row with Zener diodes allows the use of stable currents at higher voltage values.

Recommended mounting pad dimensions (S series only)



Dynamic characteristics (voltage - current)

