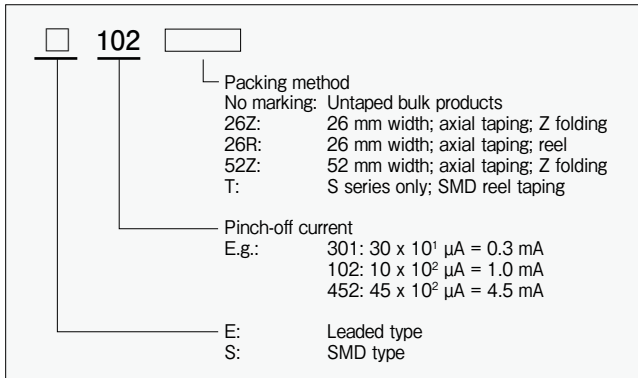


## Current regulating diode

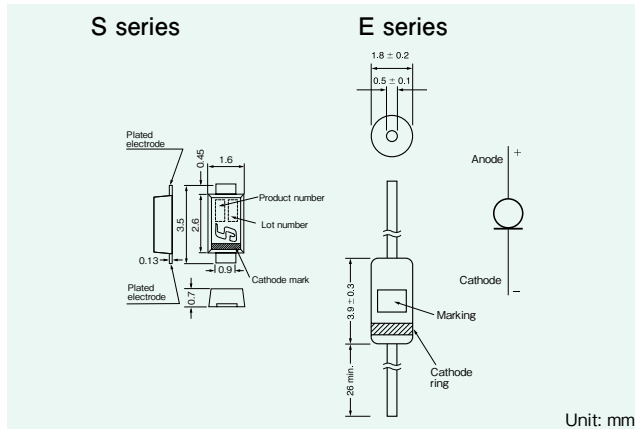
# CRD

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

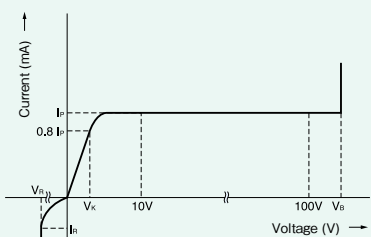
Product number	Voltage	Product number	Voltage
E-101 to E-562	100	S-101 to S-562	100
E-822	30	S-822T to S-223T	50
E-103			
E-123			
E-153	25		
E-183			

Product number		Pinch-off current (10 V) <sup>1</sup>		Limiting current <sup>1</sup>		Limiting current ratio $I_{100V}/I_p^1 I_{30V}/I_p$	Temperature coefficient (% / °C) <sup>2</sup>
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**

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

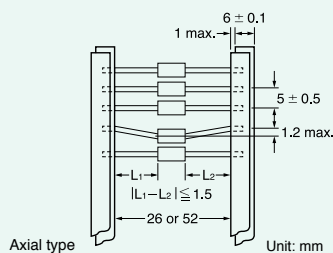
#### Voltage - current characteristics



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

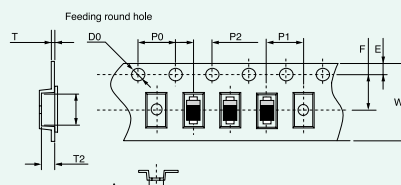
#### Taping options

SEMITEC offers both axial and SMD taping.



#### Minimum taping quantities

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



### Current - voltage characteristics with and without resistor (example)



### CRD for higher currents

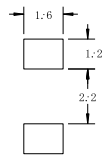
CRDs can be used in row to amplify permissible current.



### 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)



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

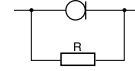
For currents of 1 mA or more resistors can be used together with CRDs to compensate for current decreases and fluctuations. The following values are typical for compensation resistors.

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	S-153	S-183	S-223
Recommended resistance value	1.1 MΩ	430 kΩ	300 kΩ	200 kΩ	130 kΩ	91 kΩ	62 kΩ	27 kΩ	18 kΩ	15 kΩ	12 kΩ	9 kΩ	5.6 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	E-153	E-183
Recommended resistance value	1 MΩ	390 kΩ	240 kΩ	120 kΩ	82 kΩ	56 kΩ	39 kΩ	20 kΩ	15 kΩ	11 kΩ	9.1 kΩ	7.5 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	

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