NXPSC10650B

Silicon Carbide Diode

29 January 2018 Product data sheet

1. General description

Silicon Carbide Schottky diode in a TO263 (D2PAK) plastic package, designed for high frequency switched-mode power supplies.

2. Features and benefits

- Highly stable switching performance
- High forward surge capability I_{FSM}
- Extremely fast reverse recovery time
- Superior in efficiency to Silicon Diode alternatives
- Reduced losses in associated MOSFET
- Reduced EMI
- Reduced cooling requirements
- RoHS compliant

3. Applications

- Power factor correction
- Telecom/Server SMPS
- UPS
- PV inverter
- PC Silverbox
- LED/OLED TV
- Motor Drives

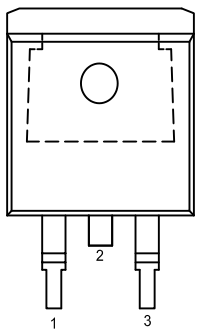
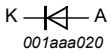
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{RRM}	repetitive peak reverse voltage			-	-	650	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $T_{mb} \leq$ 113 °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3; Fig. 4		-	-	10	A
T_j	junction temperature			-	-	175	°C
Static characteristics							
V_F	forward voltage	I_F = 10 A; T_j = 25 °C; Fig. 6		-	1.5	1.7	V
		I_F = 10 A; T_j = 150 °C; Fig. 6		-	1.8	2.1	V
Dynamic characteristics							
Q_r	recovered charge	I_F = 10 A; dI_F/dt = 500 A/µs; V_R = 400 V; T_j = 25 °C; Fig. 8; Fig. 9		-	15	22	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	n.c.	not connected	 D2PAK (TO263N)	
2	K	cathode[1]		
3	A	anode		
mb	K	mounting base; connected to cathode		

[1] It is not possible to connect to pin 2 of the TO263 package.

6. Ordering information

Table 3. Ordering information

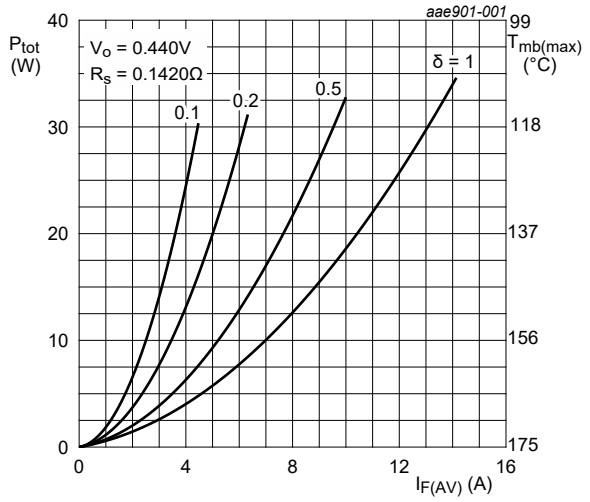
Type number	Package		
	Name	Description	Version
NXPSC10650B	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	TO263N

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{RRM}	repetitive peak reverse voltage			-	650	V
V_{RWM}	crest working reverse voltage			-	650	V
V_R	reverse voltage	DC		-	650	V
$I_{F(AV)}$	average forward current	δ = 0.5 ; $T_{mb} \leq$ 113 °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3; Fig. 4		-	10	A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; square-wave pulse		-	20	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse		-	50	A
		t_p = 10 µs; $T_{j(init)}$ = 25 °C; square-wave pulse		-	450	A
I^2t	I^2t for fusing	sine-wave pulse; $T_{j(init)}$ = 25°C; t_p = 10 ms		-	12.5	A^2s
T_{stg}	storage temperature			-55	175	°C
T_j	junction temperature			-	175	°C



$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$

Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

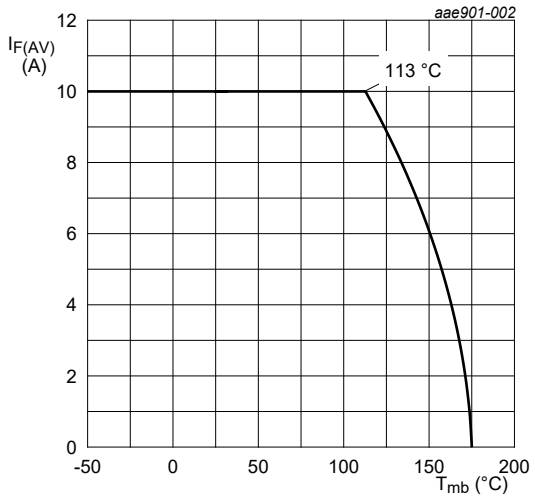


Fig. 2. Forward current as a function of mounting base temperature; maximum values

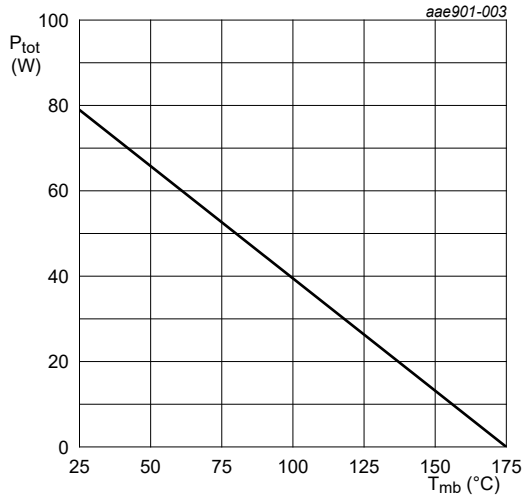


Fig. 3. Total power dissipation as a function of mounting base temperature

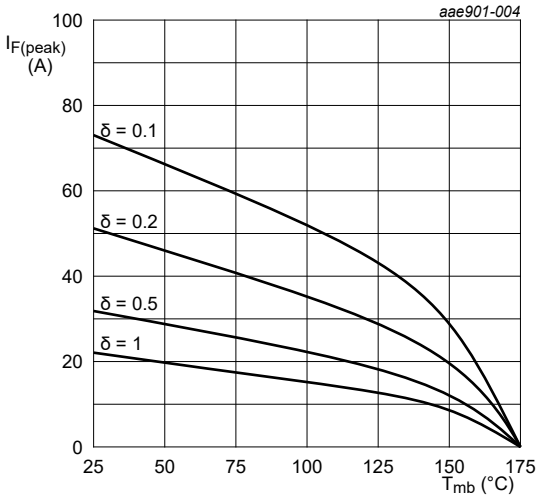


Fig. 4. Current derating as a function of mounting base temperature

8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j\text{-}mb)}$	thermal resistance from junction to mounting base	Fig. 5		-	-	1.9	K/W
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient free air	Device mounted on an FR4 Printed-Circuit Board (PCB)		-	50	-	K/W

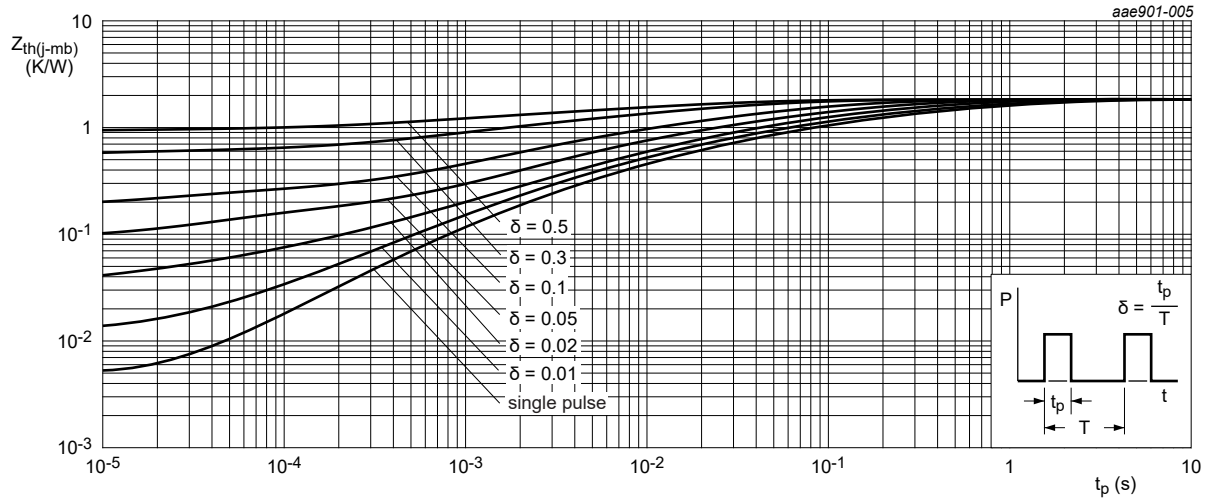
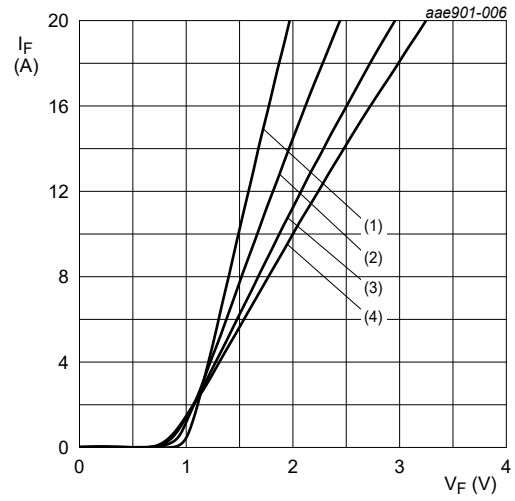


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	I_F = 10 A; T_j = 25 °C; Fig. 6		-	1.5	1.7	V
		I_F = 10 A; T_j = 150 °C; Fig. 6		-	1.8	2.1	V
I_R	reverse current	V_R = 650 V; T_j = 25 °C; Fig. 7		-	12	250	µA
		V_R = 650 V; T_j = 150 °C; Fig. 7		-	-	800	µA
		V_R = 600 V; T_j = 25 °C; Fig. 7		-	6	100	µA
		V_R = 600 V; T_j = 150 °C; Fig. 7		-	-	450	µA
Dynamic characteristics							
Q_r	recovered charge	I_F = 10 A; dI_F/dt = 500 A/µs; V_R = 400 V; T_j = 25 °C; Fig. 8; Fig. 9		-	15	22	nC
C_d	diode capacitance	f = 1 MHz; V_R = 1 V; T_j = 25 °C		-	300	-	pF
		f = 1 MHz; V_R = 300 V; T_j = 25 °C		-	34	-	pF
		f = 1 MHz; V_R = 600 V; T_j = 25 °C		-	28	40	pF



(1) T_j = 25 °C; typical values
(2) T_j = 100 °C; typical values
(3) T_j = 150 °C; typical values
(4) T_j = 175 °C; typical values

Fig. 6. Forward current as a function of forward voltage; typical values

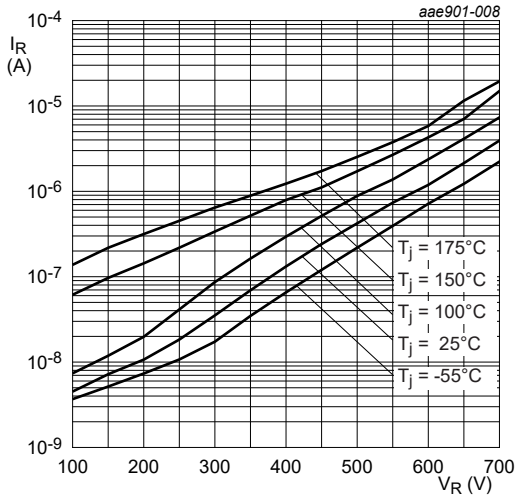


Fig. 7. Reverse current as a function of reverse voltage; typical values

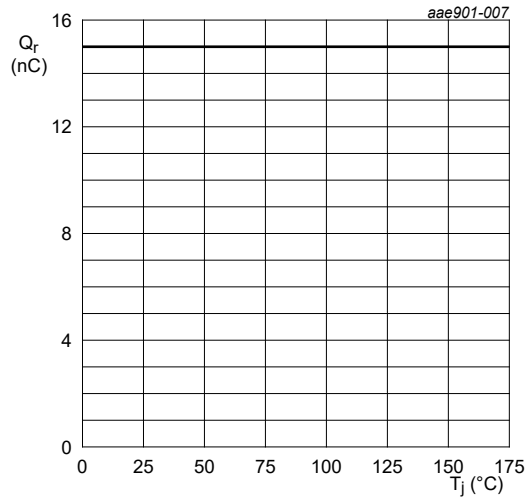


Fig. 8. Recovered charge as a function of junction temperature

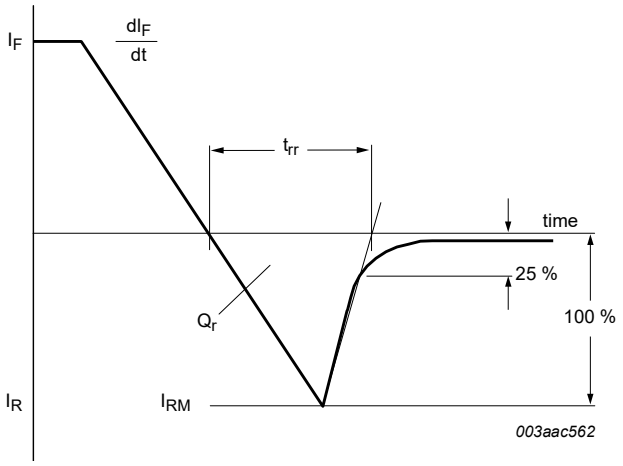
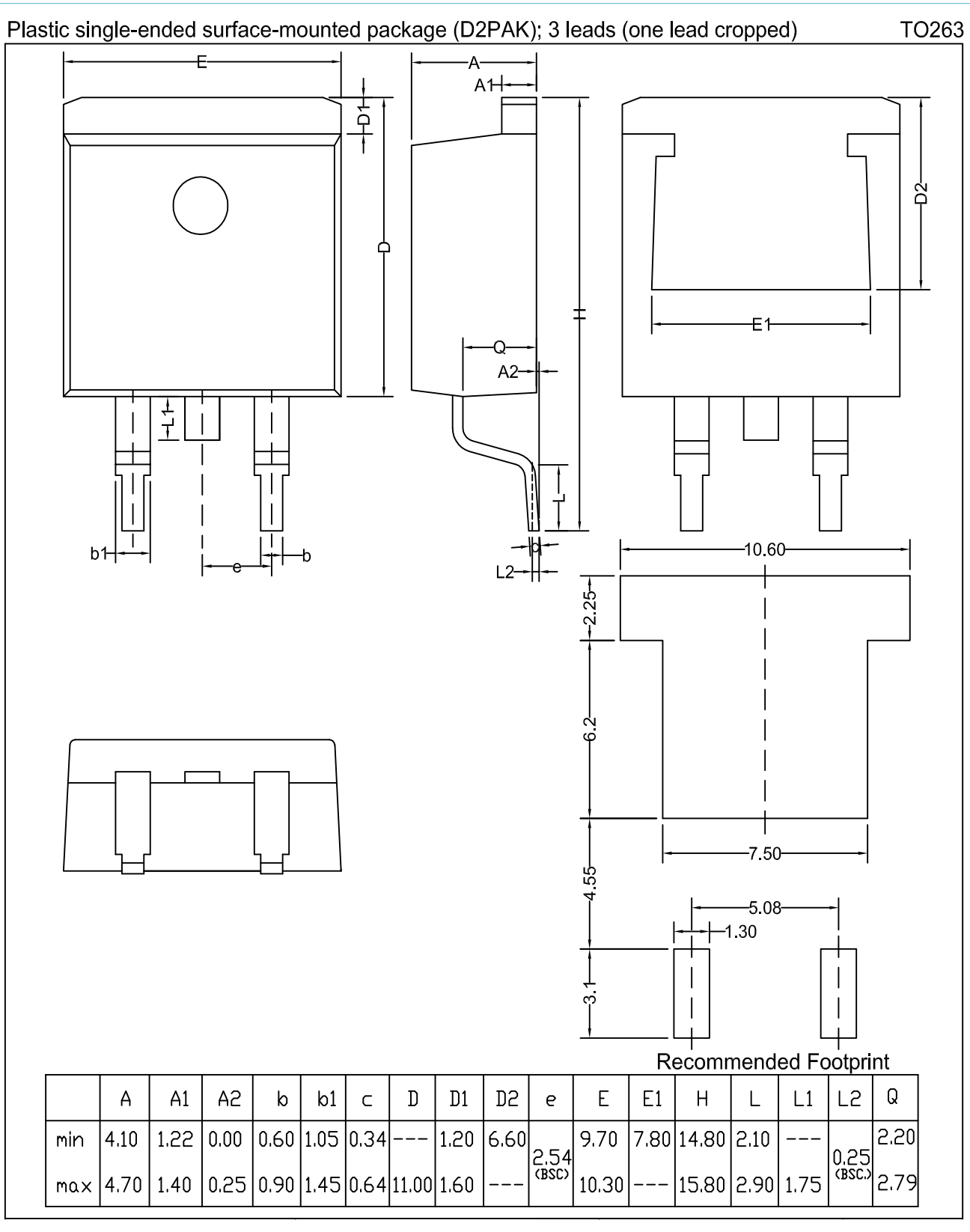


Fig. 9. Reverse recovery definitions; ramp recovery

10. Package outline



	A	A1	A2	b	b1	c	D	D1	D2	e	E	E1	H	L	L1	L2	Q
min	4.10	1.22	0.00	0.60	1.05	0.34	---	1.20	6.60	2.54 (BSC)	9.70	7.80	14.80	2.10	---	0.25 (BSC.)	2.20
max	4.70	1.40	0.25	0.90	1.45	0.64	11.00	1.60	---		10.30	---	15.80	2.90	1.75		2.79

Fig. 10. Package outline D2PAK (TO263N)

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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