NXPSC04650D

Silicon Carbide Diode

5 July 2018 Product data sheet

1. General description

Silicon Carbide Schottky diode designed for high frequency switched mode power supplies in a TO252 (DPAK) plastic package.

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

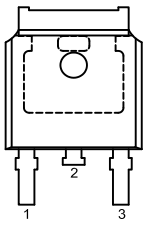
4. Quick reference data

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	$\delta = 0.5$; $T_{mb} \leq 136$ °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3; Fig. 4		-	-	4	A
Static characteristics							
V_F	forward voltage	$I_F = 4$ A; $T_j = 25$ °C; Fig. 6		-	1.5	1.7	V
		$I_F = 4$ A; $T_j = 150$ °C		-	1.8	2.1	V

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	n.c.	not connected	 DPAK (TO252NS)	
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 TO252 package.

6. Ordering information

Table 3. Ordering information

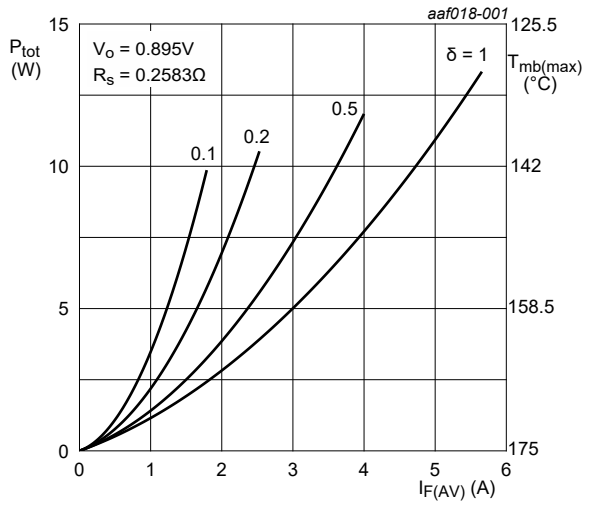
Type number	Package		
	Name	Description	Version
NXPSC04650D	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	TO252NS

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} ≤ 136 °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3; Fig. 4		-	4	A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; square-wave pulse		-	8	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse		-	24	A
		t_p = 10 µs; $T_{j(init)}$ = 25 °C; square-wave pulse		-	235	A
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

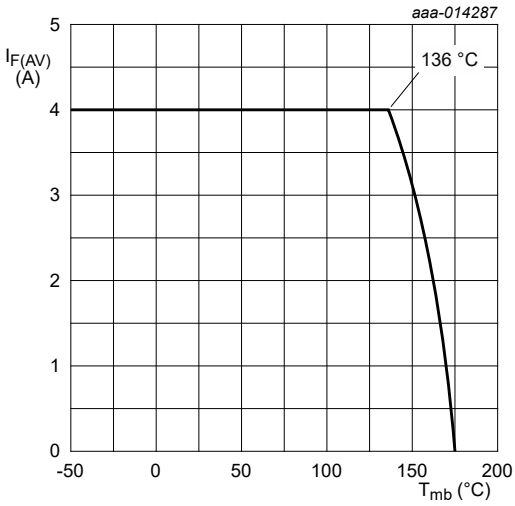


Fig. 2. Forward current as a function of mounting base temperature; maximum values

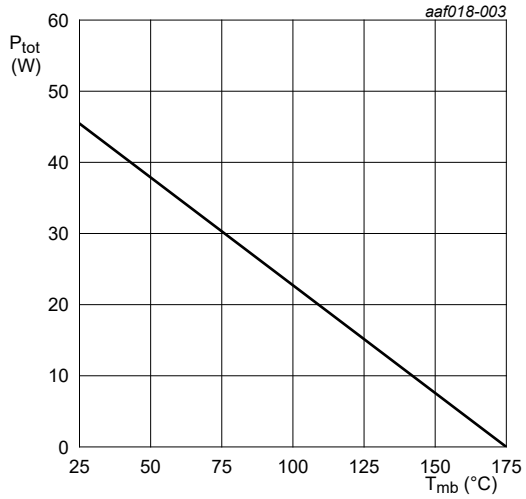


Fig. 3. Total power dissipation as a function of mounting base temperature

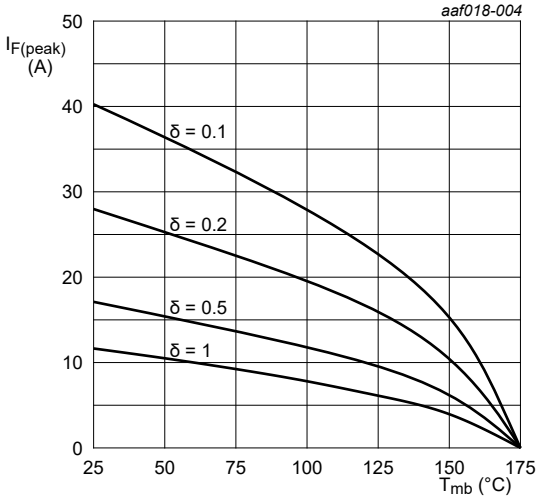


Fig. 4. Current derating as a function of mounting base temperature

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		-	-	3.3	K/W
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient free air	Device mounted on an FR4 Printed-Circuit Board		-	50	-	K/W

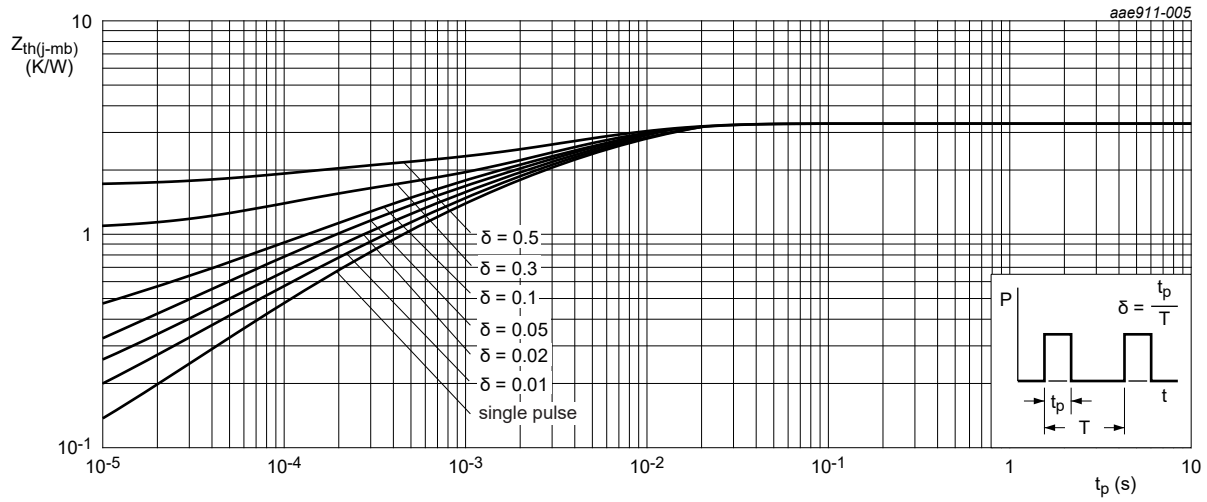
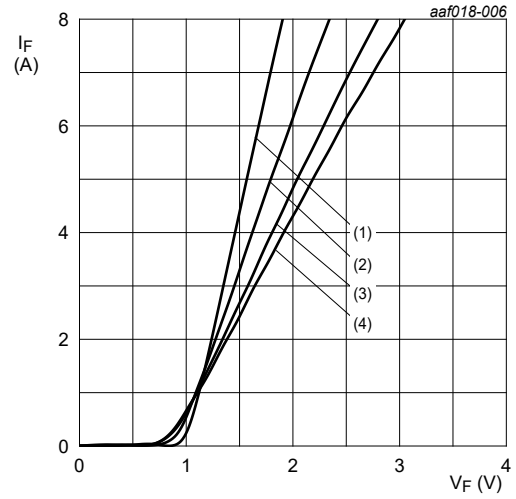


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	I_F = 4 A; T_j = 25 °C; Fig. 6		-	1.5	1.7	V
		I_F = 4 A; T_j = 150 °C		-	1.8	2.1	V
I_R	reverse current	V_R = 650 V; T_j = 25 °C; Fig. 7		-	-	170	µA
		V_R = 650 V; T_j = 150 °C; Fig. 7		-	-	550	µA
Dynamic characteristics							
Q_r	recovered charge	I_F = 4 A; dI_F/dt = 500 A/µs; V_R = 400 V; T_j = 25 °C; Fig. 8		-	7	-	nC
C_d	diode capacitance	f = 1 MHz; V_R = 1 V; T_j = 25 °C		-	130	-	pF
		f = 1 MHz; V_R = 300 V; T_j = 25 °C		-	16	-	pF
		f = 1 MHz; V_R = 600 V; T_j = 25 °C		-	13	-	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

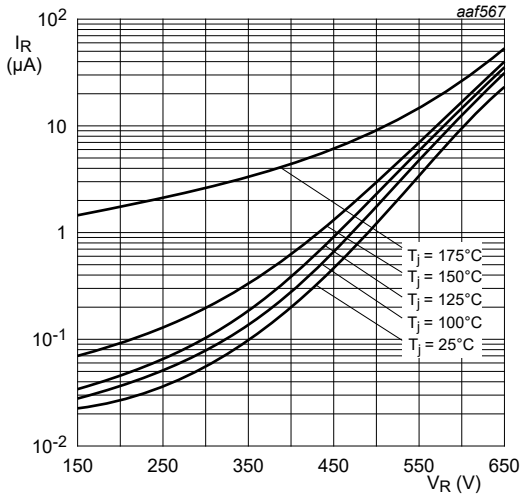


Fig. 7. Reverse leakage current as a function of reverse voltage; typical value

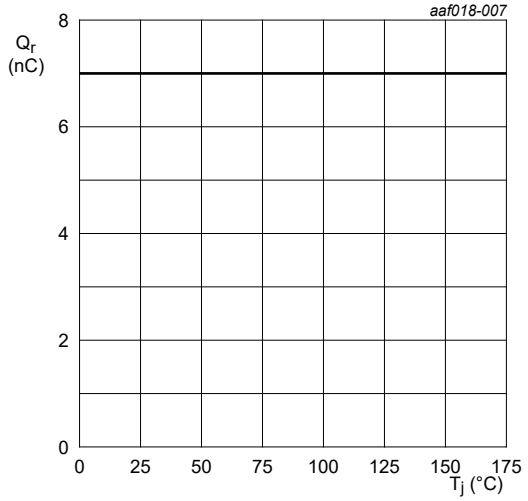
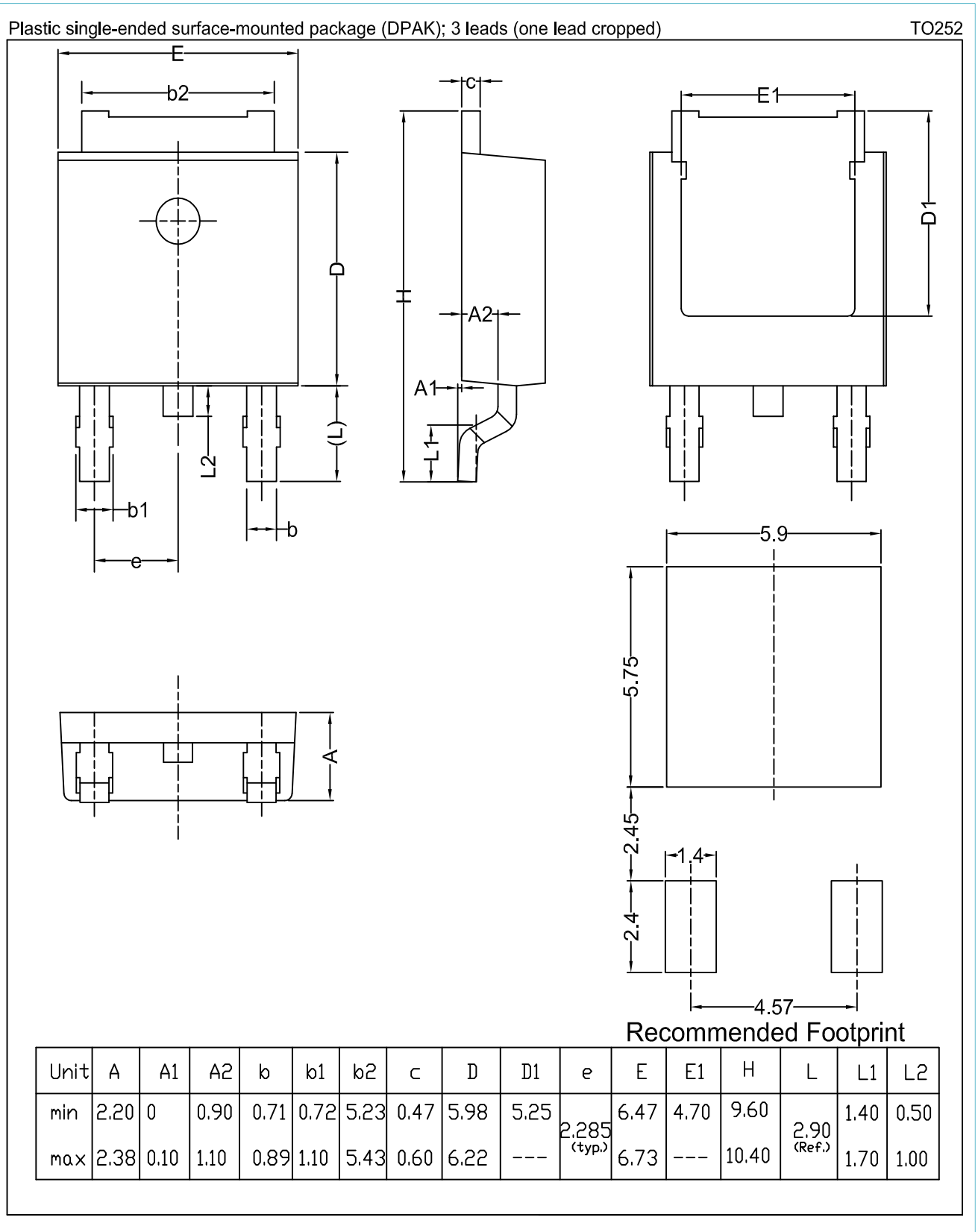


Fig. 8. Recovered charge as a function of junction temperature

10. Package outline



Unit	A	A1	A2	b	b1	b2	c	D	D1	e	E	E1	H	L	L1	L2
min	2.20	0	0.90	0.71	0.72	5.23	0.47	5.98	5.25	2.285 (typ.)	6.47	4.70	9.60	2.90 (Ref.)	1.40	0.50
max	2.38	0.10	1.10	0.89	1.10	5.43	0.60	6.22	---		6.73	---	10.40		1.70	1.00

Fig. 9. Package outline DPAK (TO252NS)

11. Legal information

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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