NXPSC10650X

Silicon Carbide Diode

6 January 2017 Product data sheet

1. General description

Silicon Carbide Schottky diode in a TO220F-2L 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
- Insulated package rated at 2500V RMS

3. Applications

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

4. Quick reference data

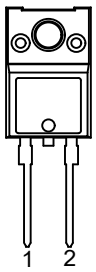
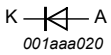
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{RRM}	repetitive peak reverse voltage			-	-	650	V
$I_{F(AV)}$	average forward current	δ = 0.5 ; $T_h \leq$ 25 °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							

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Q_r	recovered charge	I_F = 10 A; dI_F/dt = 500 A/µs; V_R = 400 V; T_j = 25 °C; Fig. 7		-	15	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 TO220F-2L	
2	A	anode		
mb	n.c.	mounting base; isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
NXPSC10650X	-	Plastic single-ended through-hole package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220F	TO220F-2L

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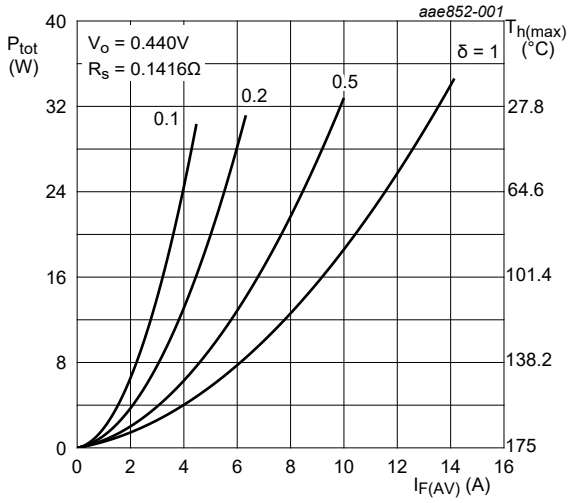
7. Limiting values

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	$\delta = 0.5$; $T_h \leq 25$ °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3; Fig. 4		-	10	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25$ µs; $T_h \leq 25$ °C; 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
T_{stg}	storage temperature			-55	175	°C
T_j	junction temperature			-	175	°C



$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$
$V_o = 0.440$ V; $R_s = 0.1416$ Ω

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

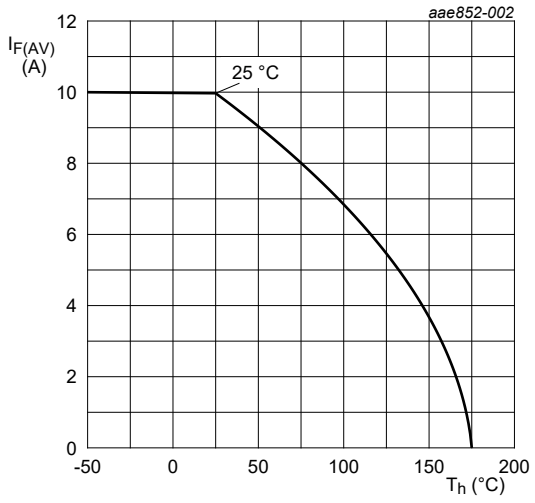


Fig. 2. Forward current as a function of heatsink temperature; maximum values

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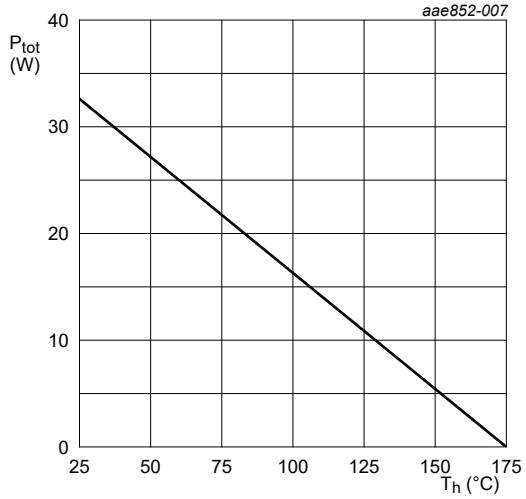

Fig. 3. Total power dissipation as a function of heatsink temperature

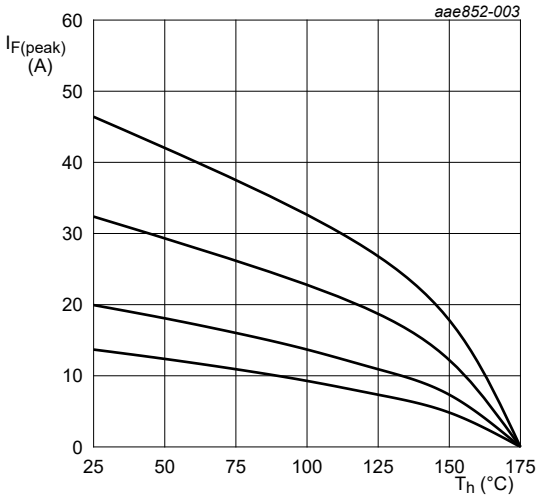

Fig. 4. Current derating as a function of heatsink temperature

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8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; Fig. 5		-	-	4.6	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	55	-	K/W

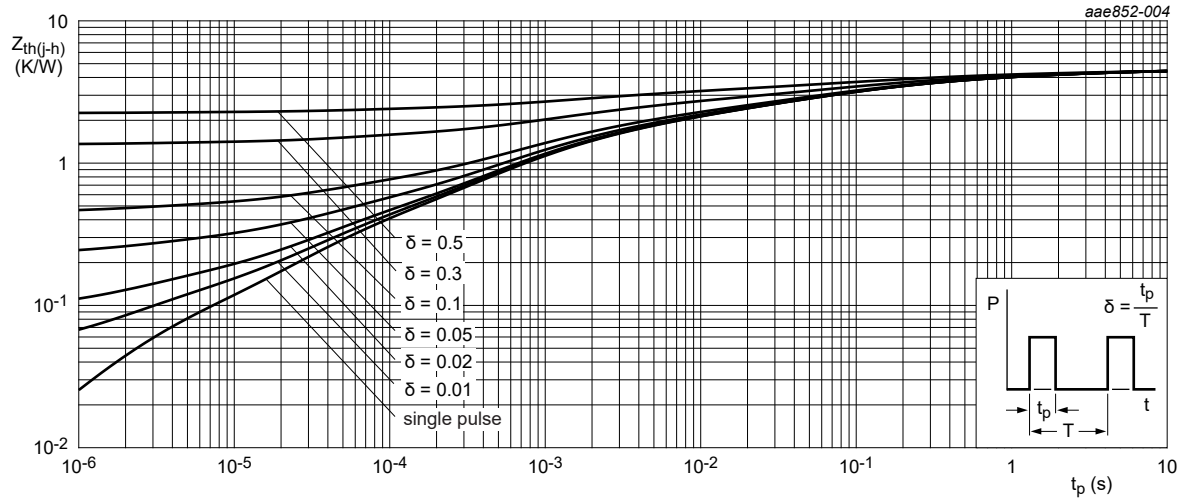

Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

9. Isolation characteristics

Table 6. Isolation characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free; 50 Hz ≤ f ≤ 60 Hz; T_h = 25 °C; RH = 65 %		-	-	2500	V

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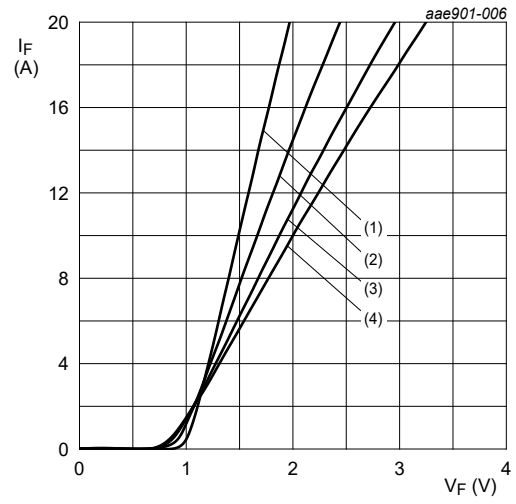
10. Characteristics

Table 7. 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		-	-	250	µA
		V_R = 650 V; T_j = 150 °C		-	-	800	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. 7		-	15	-	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	-	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

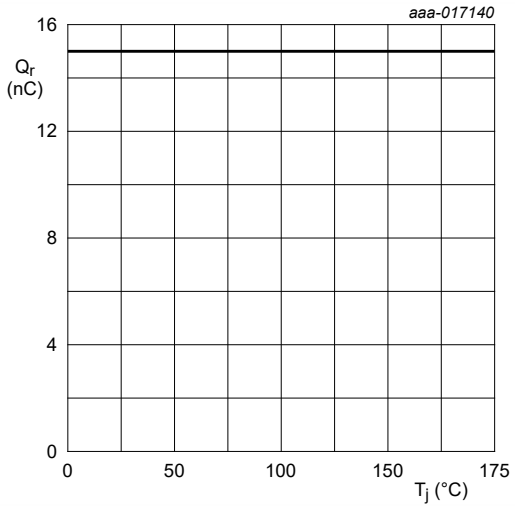


Fig. 7. Recovered charge as a function of junction temperature

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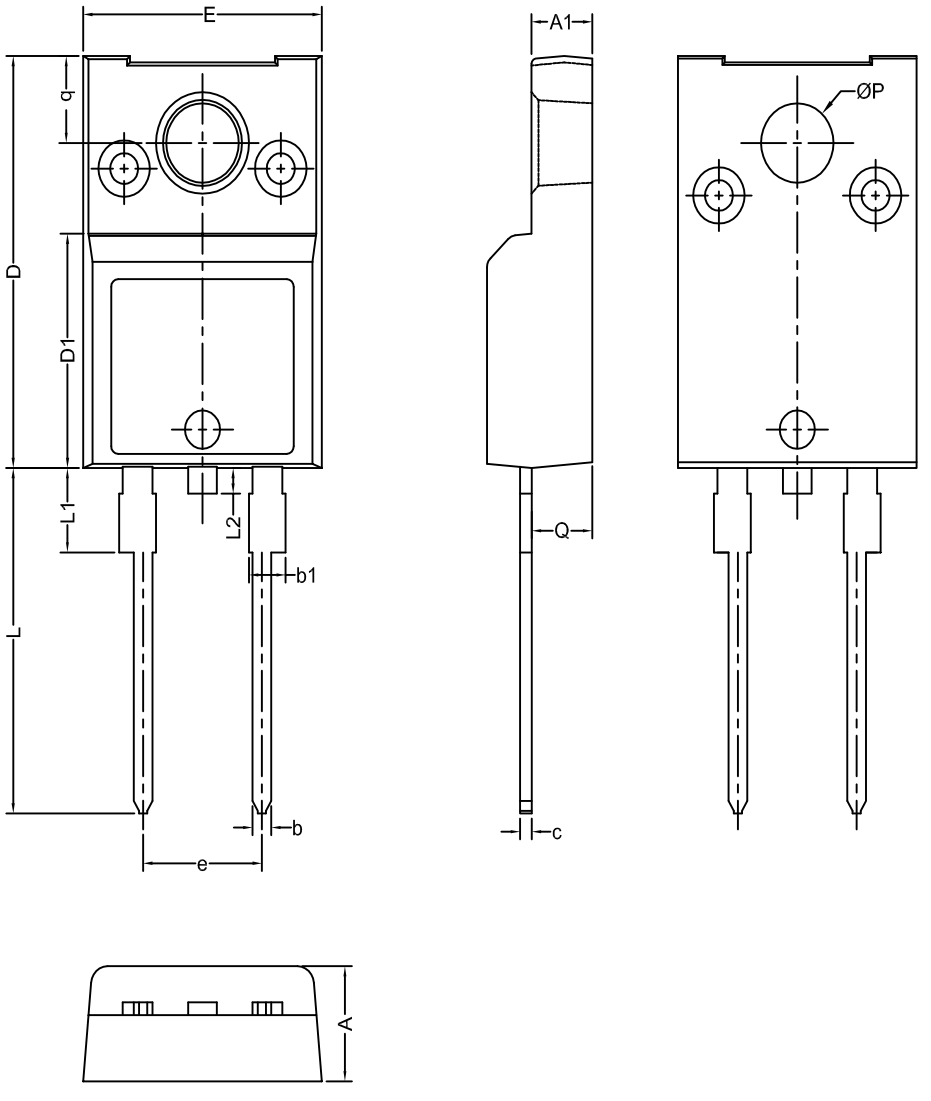
11. Package outline

Plastic single-ended through-hole package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220F TO220F-2L



Unit	A	A1	b	b1	c	D	D1	e	E	L	L1	L2	P	q	Q
min	4.35	2.40	0.76	1.22	0.46	15.95	9.00	5.08 (typ.)	10.05	13.15	3.15	0.50	2.95	3.40 (typ.)	2.30
max	4.65	2.80	0.89	1.60	0.59	16.25	9.30		10.35	13.85	3.45	1.00	3.25		2.80

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
TO220F−2L		-				

Fig. 8. Package outline TO220F-2L

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