

QORVO

SiC JFET Division

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Silicon Carbide (SiC) Diode - EliteSiC, TO-220-2L, 12 A, 650 V SiC Merged PiN-Schottky (MPS) Diode

Rev. B, January 2025

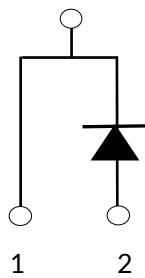
DATASHEET

UJ3D06512TS

CASE



CASE



Description

United Silicon Carbide, Inc. offers the 3rd generation of high performance SiC Merged-PiN-Schottky (MPS) diodes. With zero reverse recovery charge and 175°C maximum junction temperature, these diodes are ideally suited for high frequency and high efficiency power systems with minimum cooling requirements.

Features

- ◆ Maximum operating temperature of 175°C
- ◆ Easy paralleling
- ◆ Extremely fast switching not dependent on temperature
- ◆ No reverse or forward recovery
- ◆ Enhanced surge current capability, MPS structure
- ◆ Excellent thermal performance, Ag sintered
- ◆ 100% UIS tested
- ◆ AEC-Q101 qualified

Typical applications

- ◆ Power converters
- ◆ Industrial motor drives
- ◆ Switch mode power supplies
- ◆ Power factor correction modules

Part Number	Package	Marking
UJ3D06512TS	TO-220-2L	UJ3D06512TS



Maximum Ratings

Parameter	Symbol	Test Conditions	Value	Units
DC blocking voltage	V_R		650	V
Repetitive peak reverse voltage, $T_J=25^\circ\text{C}$	V_{RRM}		650	V
Surge peak reverse voltage	V_{RSM}		650	V
Maximum DC forward current	I_F	$T_C = 153^\circ\text{C}$	12	A
Non-repetitive forward surge current sine halfwave	I_{FSM}	$T_C = 25^\circ\text{C}, t_p = 10\text{ms}$	81	A
		$T_C = 110^\circ\text{C}, t_p = 10\text{ms}$	70	
Repetitive forward surge current sine halfwave, $D=0.1$	I_{FRM}	$T_C = 25^\circ\text{C}, t_p = 10\text{ms}$	53	A
		$T_C = 110^\circ\text{C}, t_p = 10\text{ms}$	32.5	
Non-repetitive peak forward current	$I_{F,max}$	$T_C = 25^\circ\text{C}, t_p = 10\mu\text{s}$	480	A
		$T_C = 110^\circ\text{C}, t_p = 10\mu\text{s}$	480	
i^2t value	$\int i^2 dt$	$T_C = 25^\circ\text{C}, t_p = 10\text{ms}$	32.8	A^2s
		$T_C = 110^\circ\text{C}, t_p = 10\text{ms}$	24.5	
Power dissipation	P_{tot}	$T_C = 25^\circ\text{C}$	187.5	W
		$T_C = 153^\circ\text{C}$	27.5	
Maximum junction temperature	$T_{J,max}$		175	$^\circ\text{C}$
Operating and storage temperature	T_J, T_{STG}		-55 to 175	$^\circ\text{C}$
Soldering temperatures, wavesoldering only allowed at leads	T_{sold}	1.6mm from case for 10s	260	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Thermal resistance, junction-to-case	$R_{\theta JC}$			0.6	0.8	$^\circ\text{C}/\text{W}$

Electrical Characteristics ($T_J = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Forward voltage	V_F	$I_F = 12\text{A}, T_J = 25^\circ\text{C}$	-	1.5	1.7	V
		$I_F = 12\text{A}, T_J = 150^\circ\text{C}$	-	1.8	2.1	
		$I_F = 12\text{A}, T_J = 175^\circ\text{C}$	-	1.9	2.25	
Reverse current	I_R	$V_R = 650\text{V}, T_J = 25^\circ\text{C}$	-	1.4	80	μA
		$V_R = 650\text{V}, T_J = 175^\circ\text{C}$	-	12		
Total capacitive charge ⁽¹⁾	Q_C	$V_R = 400\text{V}$		29		nC
Total capacitance	C	$V_R = 1\text{V}, f = 1\text{MHz}$		392		pF
		$V_R = 300\text{V}, f = 1\text{MHz}$		48		
		$V_R = 600\text{V}, f = 1\text{MHz}$		42		
Capacitance stored energy	E_C	$V_R = 400\text{V}$		4.4		μJ

(1) Q_C is independent on T_J , di_F/dt , and I_F as shown in the application note USCi_AN0011.

Typical Performance Diagrams

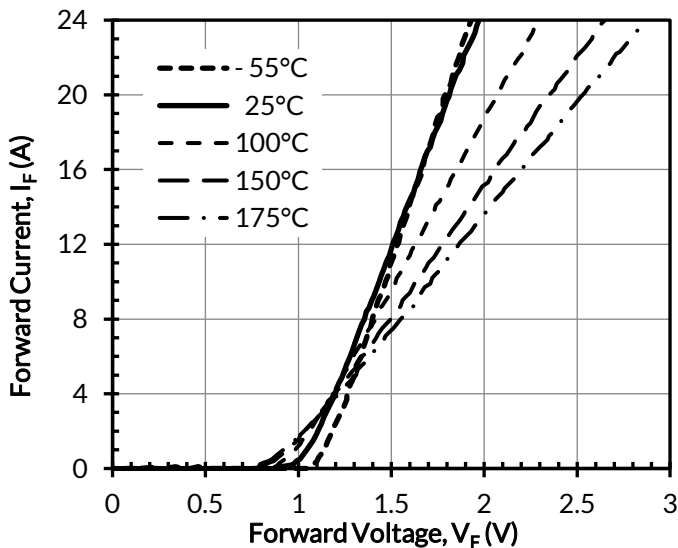


Figure 1. Typical forward characteristics

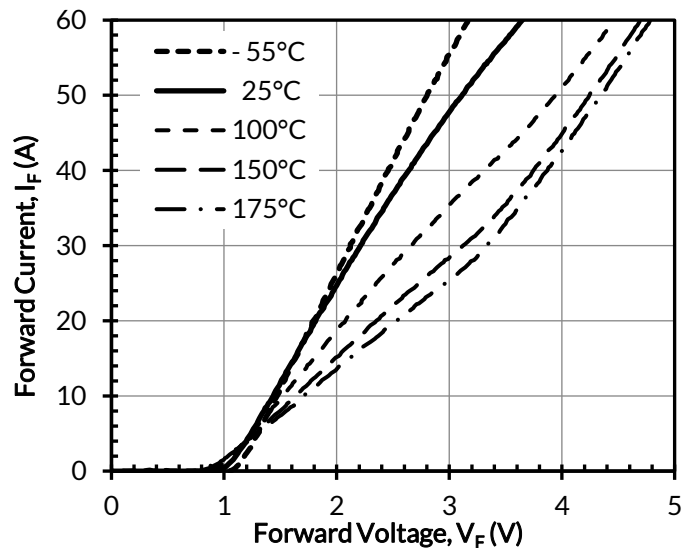


Figure 2. Typical forward characteristics in surge current

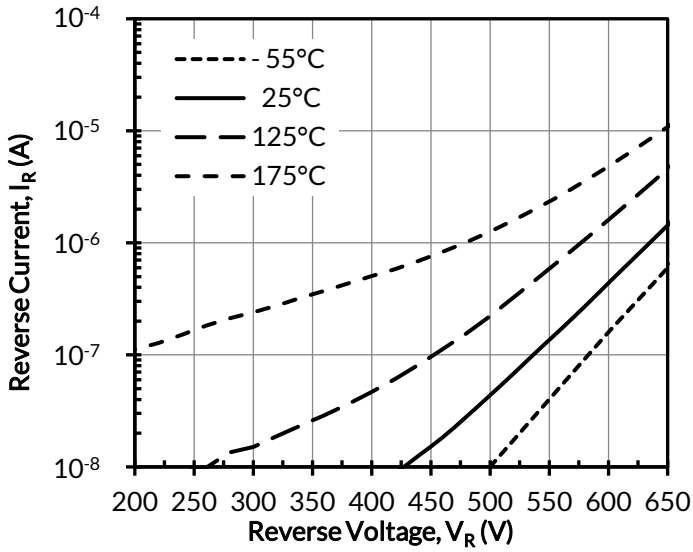


Figure 3. Typical reverse characteristics

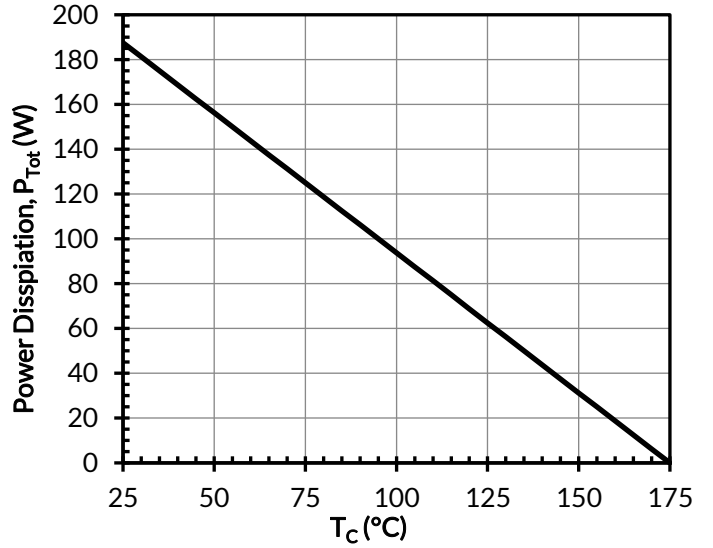


Figure 4. Power dissipation

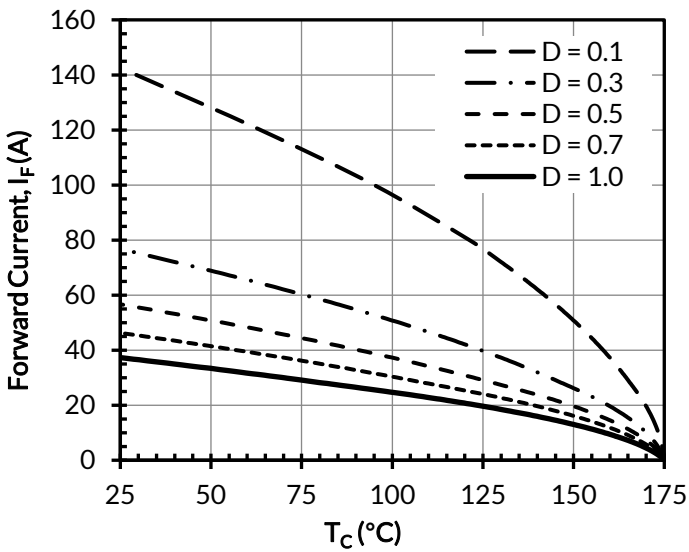


Figure 5. Diode forward current

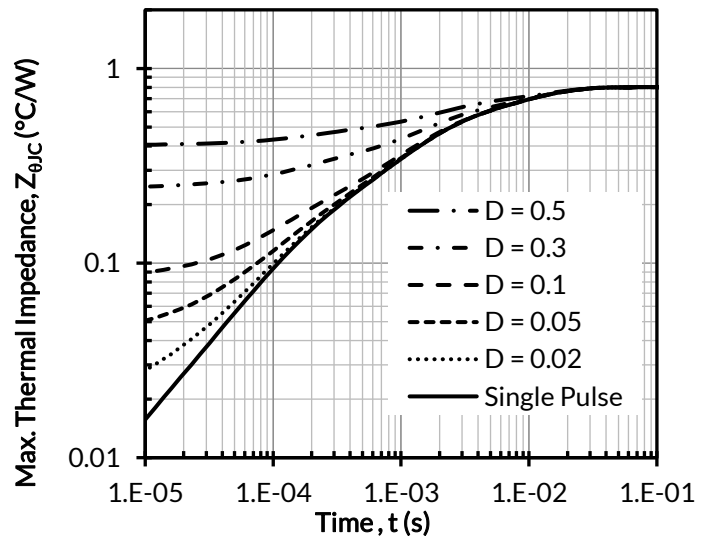


Figure 6. Maximum transient thermal impedance

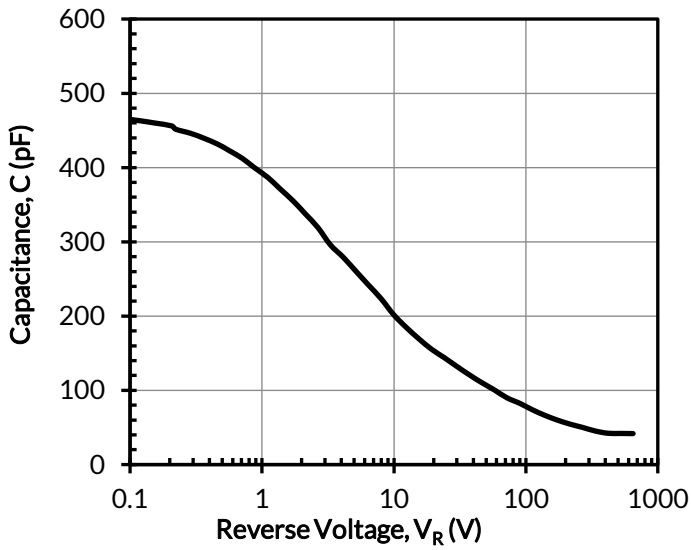


Figure 7. Capacitance vs. reverse voltage at 1MHz

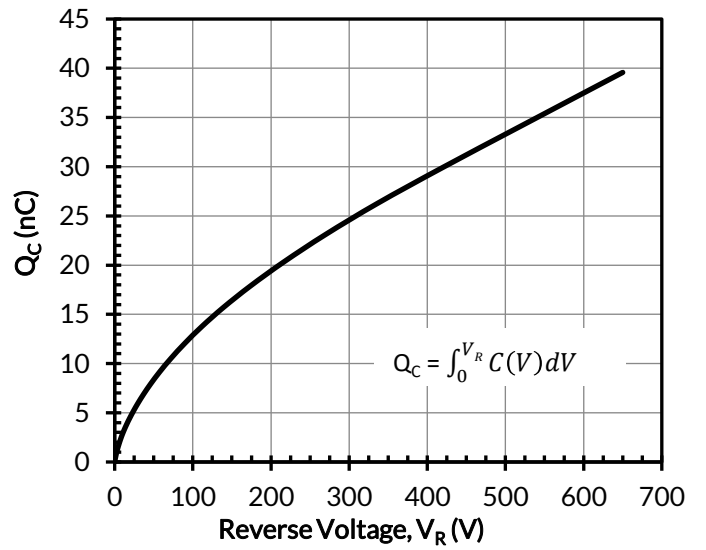


Figure 8. Typical capacitive charge vs. reverse voltage

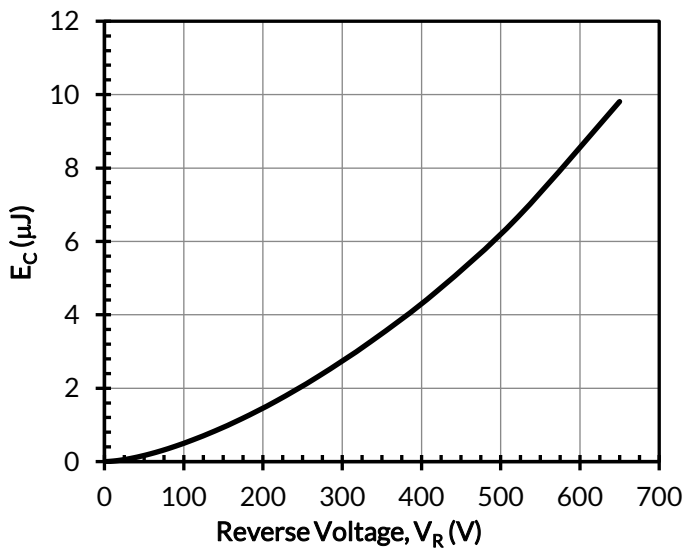


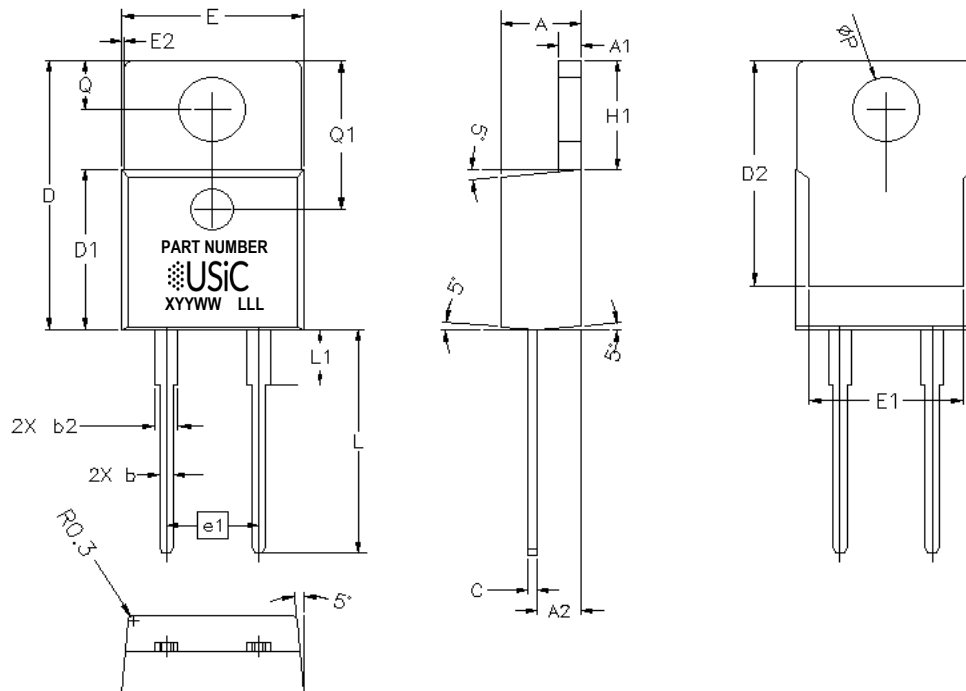
Figure 9. Typical capacitance stored energy vs. reverse voltage

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PACKAGE OUTLINE


DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.140	0.190	3.56	4.83
A1	0.020	0.055	0.51	1.40
A2	0.080	0.115	2.03	2.92
b	0.015	0.040	0.38	1.02
b2	0.040	0.070	1.02	1.78
C	0.014	0.030	0.36	0.76
D	0.560	0.650	14.22	16.51
D1	0.330	0.370	8.38	9.40
D2	0.480	0.517	12.19	13.13
E	0.380	0.420	9.65	10.67
e1	0.200 BSC		5.08 BSC	
E1	0.270	0.350	6.86	8.89
E2	-	0.030	-	0.76
L	0.495	0.580	12.57	14.73
L1	-	0.250	-	6.35
$\varnothing P$	0.139	0.161	3.53	4.09
H	0.230	0.270	5.84	6.86
Q	0.100	0.135	2.54	3.43
Q1	0.330	0.340	8.38	8.64

PART MARKING

PART NUMBER

XYYWW LLL

PART NUMBER = REFER TO
DS_PN DECODER FOR DETAILS

X = ASSEMBLY SITE

YY = YEAR

WW = WORK WEEK

LLL = LOT ID

PACKING TYPE

ANTI-STATIC TUBE

QUANTITY /TUBE : 50 UNITS

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