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WS3A004065E

Silicon Carbide Schottky Diode

V_{RRM}	=	650	V
I_F (T_C≤135℃)	=	6	A
Q_C	=	9	nC

Features

- Zero Reverse Recovery Current
- Zero Forward Recovery Voltage
- Positive Temperature Coefficient on V_F
- Temperature-independent Switching
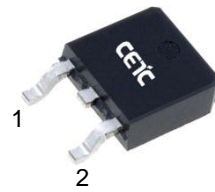- 175°C Operating Junction Temperature

Benefits

- Replace Bipolar with Unipolar Device
- Reduction of Heat Sink Size
- Parallel Devices Without Thermal Runaway
- Essentially No Switching Losses

Applications

- Switch Mode Power Supplies
- Power Factor Correction
- Motor drive, PV Inverter, Wind Power Station

Package

TO-252

RoHS

Part Number	Package	Marking
WS3A004065E	TO-252	WS3A004065E

Maximum Ratings

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{RRM}	Repetitive Peak Reverse Voltage	650	V	T_C = 25℃	
V_{RSM}	Surge Peak Reverse Voltage	650	V	T_C = 25℃	
V_R	DC Blocking Voltage	650	V	T_C = 25℃	
I_F	Forward Current	13 6 4	A	T_C ≤ 25℃ T_C ≤ 135℃ T_C ≤ 155℃	
I_{FSM}	Non-Repetitive Forward Surge Current	40	A	T_C = 25℃, t_p = 8.3ms, Half Sine Wave	
P_{tot}	Power Dissipation	51	W	T_C = 25℃	Fig.3
T_C	Maximum Case Temperature	155	℃		
T_J,T_{STG}	Operating Junction and Storage Temperature	-55 to 175	℃		

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Electrical Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_F	Forward Voltage	1.4	1.65	V	$I_F = 4A$, $T_J = 25°C$	Fig.1
		1.7	2.3		$I_F = 4A$, $T_J = 175°C$	
I_R	Reverse Current	1	10	μA	$V_R = 650V$, $T_J = 25°C$	Fig.2
		5	100		$V_R = 650V$, $T_J = 175°C$	
C	Total Capacitance	230		pF	$V_R = 0V$, $T_J = 25°C$, f = 1MHz	Fig.5
		24	/		$V_R = 200V$, $T_J = 25°C$, f = 1MHz	
		20			$V_R = 400V$, $T_J = 25°C$, f = 1MHz	
Q_C	Total Capacitive Charge	9	/	nC	$V_R = 650V$, $I_F = 4A$ di/dt = 200A/μs, $T_J = 25°C$	Fig.4

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Note
$R_{θJC}$	Thermal Resistance from Junction to Case	2.9	°C/W	Fig.6
$R_{θJA}$	Thermal Resistance from Junction to Ambient	80	°C/W	
T_{sold}	Soldering Temperature	260	°C	

Typical Performance
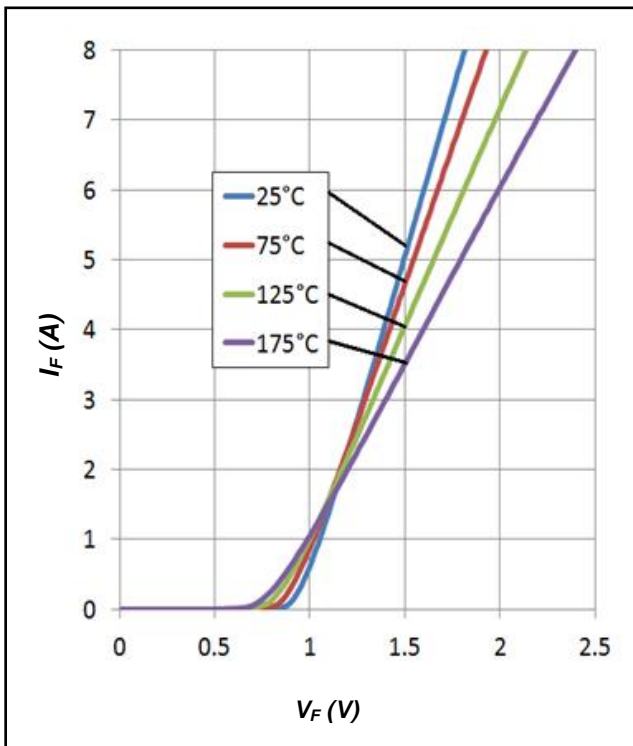
Figure 1. Forward Characteristics

Figure 2. Reverse Characteristics

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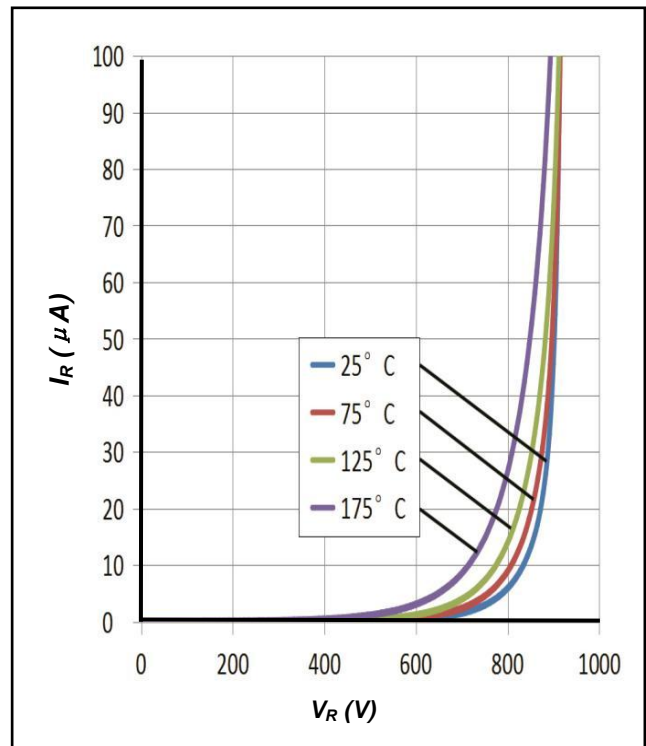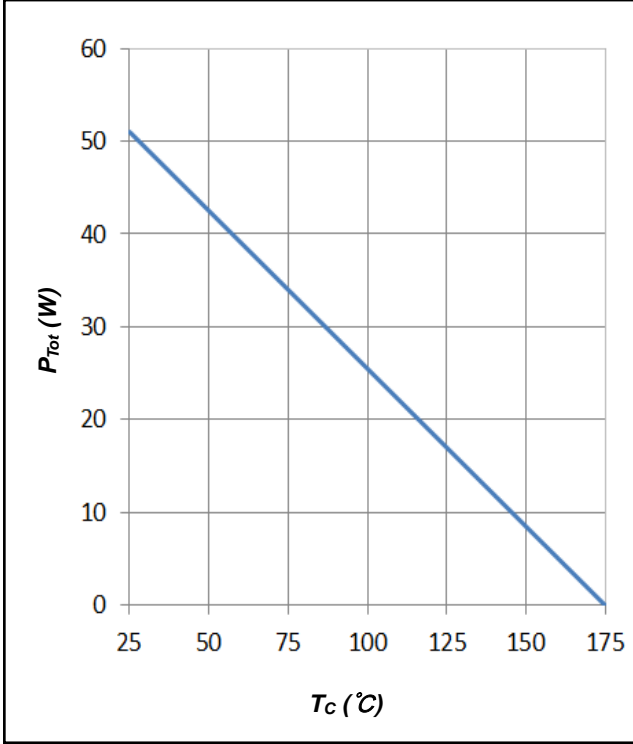## Typical Performance
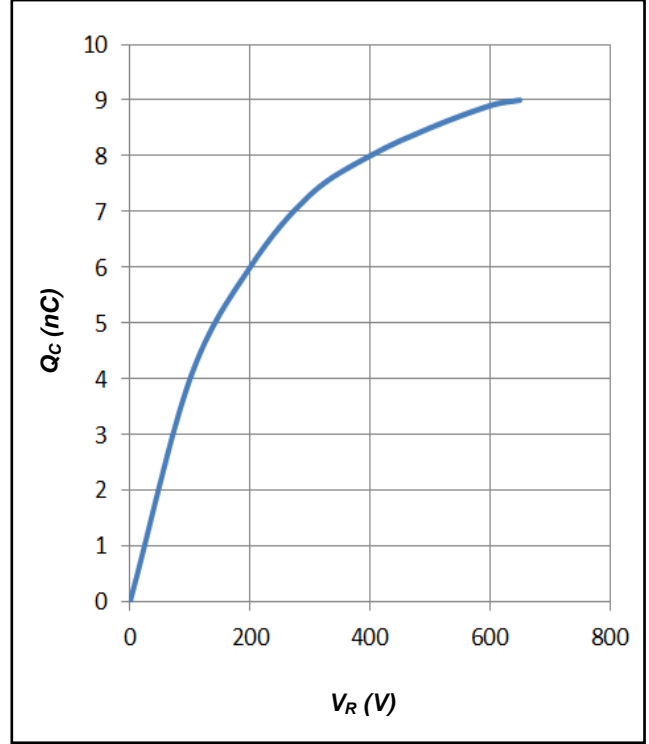

Figure 3. Power Derating

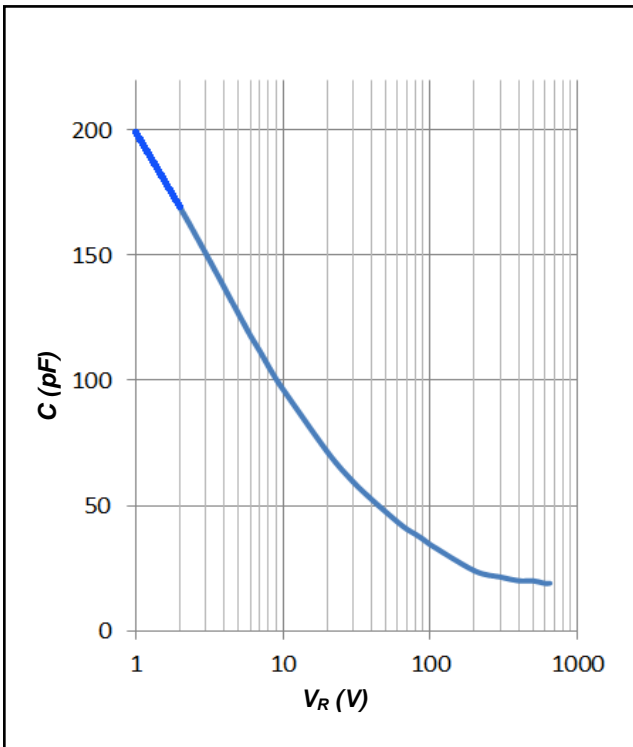Figure 4. Total Capacitive Charge vs. Reverse Voltage
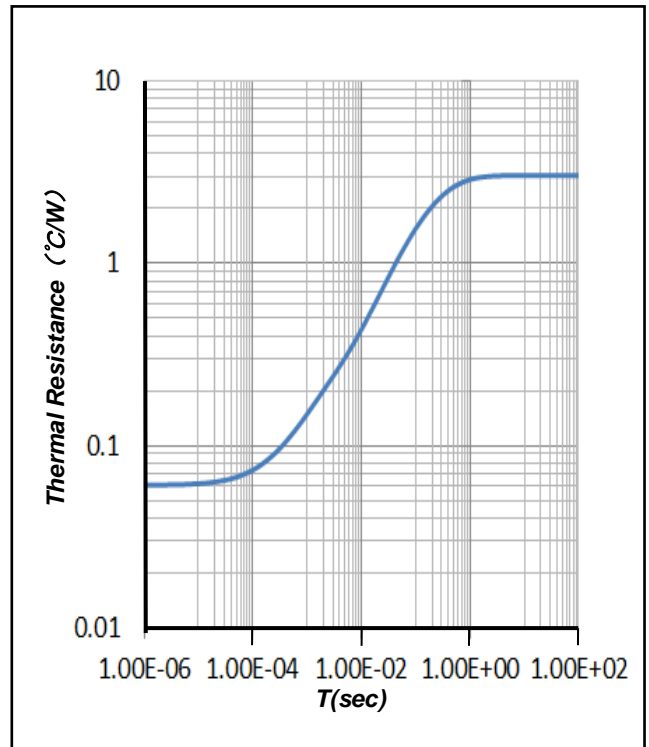
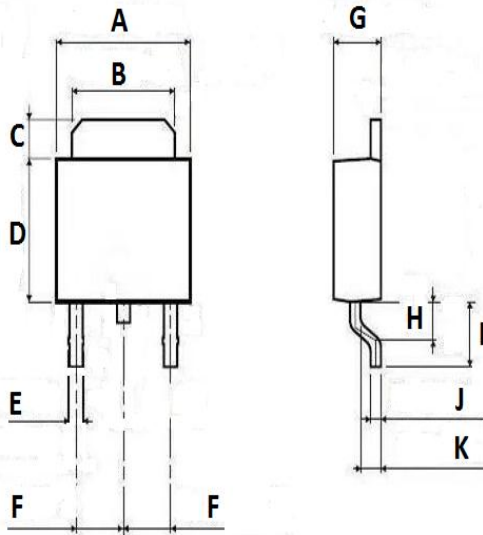

Figure 5. Total Capacitance vs. Reverse Voltage

Figure 6. Transient Thermal Impedance

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Package Dimensions

Package TO-252
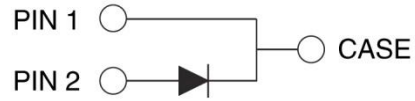
Symbol	Min. (mm)	Typ. (mm)	Max. (mm)
A	6.3	6.5	6.7
B	5.2	5.3	5.4
C	1.15	1.25	1.35
D	5.7	5.9	6.1
E	0.65	0.7	0.75
F	2.1	2.3	2.5
G	2.2	2.3	2.4
H	1.45	1.5	1.55
I	2.9	3.0	3.1
J	0.45	0.5	0.55
K	0.9	1	1.1

Simplified Diode Model

Equivalent IV Curve for Model

$I_F = f(V_F)$

V_t
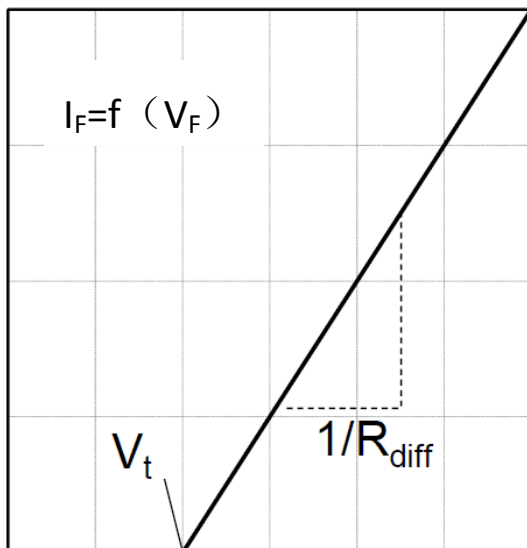
$1/R_{diff}$

Mathematical Equation

$$V_F = V_t + I_F \times R_{diff}$$

$V_t = -0.0011 \times T_j + 0.99$ [V]

$R_{diff} = 1.83 \times 10^{-6} \times T_j^2 + 2.52 \times 10^{-4} \times T_j + 0.099$ [Ω]

Note:

   T_j = Diode Junction Temperature In Degrees Celsius,

   valid from 25°C to 175°C

   I_F = Forward Current

   Less than 8A

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