

## WS3A006065F

### Silicon Carbide Schottky Diode

$V_{RRM}$	=	650	V
$I_F (T_C \leq 135^\circ\text{C})$	=	6	A
$Q_C$	=	18	nC

#### Features

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

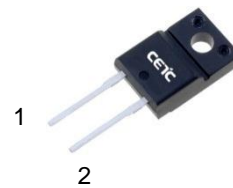
#### Benefits

- 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-220FM



Part Number	Package	Marking
WS3A006065F	TO-220FM	WS3A006065F

#### Maximum Ratings

Symbol	Parameter	Value	Unit	Test Conditions	Note
$V_{RRM}$	Repetitive Peak Reverse Voltage	650	V	$T_C = 25^\circ\text{C}$	
$V_{RSM}$	Surge Peak Reverse Voltage	650	V	$T_C = 25^\circ\text{C}$	
$V_R$	DC Blocking Voltage	650	V	$T_C = 25^\circ\text{C}$	
$I_F$	Forward Current	13 6	A	$T_C \leq 25^\circ\text{C}$ $T_C \leq 135^\circ\text{C}$	
$I_{FSM}$	Non-Repetitive Forward Surge Current	54	A	$T_C = 25^\circ\text{C}$ , $t_p = 8.3\text{ms}$ , Half Sine Wave	
$P_{tot}$	Power Dissipation	41	W	$T_C = 25^\circ\text{C}$	Fig.3
$T_J, T_{STG}$	Operating Junction and Storage Temperature	-55 to 175	$^\circ\text{C}$		
	TO-220 Mounting Torque	1	Nm	M3 Screw	

## Electrical Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$V_F$	Forward Voltage	1.4 1.75	1.65 2.3	V	$I_F = 6A, T_J = 25^\circ C$ $I_F = 6A, T_J = 175^\circ C$	Fig.1
$I_R$	Reverse Current	1 5	20 100	$\mu A$	$V_R = 650V, T_J = 25^\circ C$ $V_R = 650V, T_J = 175^\circ C$	Fig.2
C	Total Capacitance	300 34 30	/	pF	$V_R = 0V, T_J = 25^\circ C, f = 1MHz$ $V_R = 200V, T_J = 25^\circ C, f = 1MHz$ $V_R = 400V, T_J = 25^\circ C, f = 1MHz$	Fig.5
$Q_C$	Total Capacitive Charge	18	/	nC	$V_R = 650V, I_F = 6A$ $di/dt = 200A/\mu s, T_J = 25^\circ C$	Fig.4

## Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	3.6	$^\circ C/W$	Fig.6
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	80	$^\circ C/W$	
$T_{sold}$	Soldering Temperature	260	$^\circ C$	

## Typical Performance

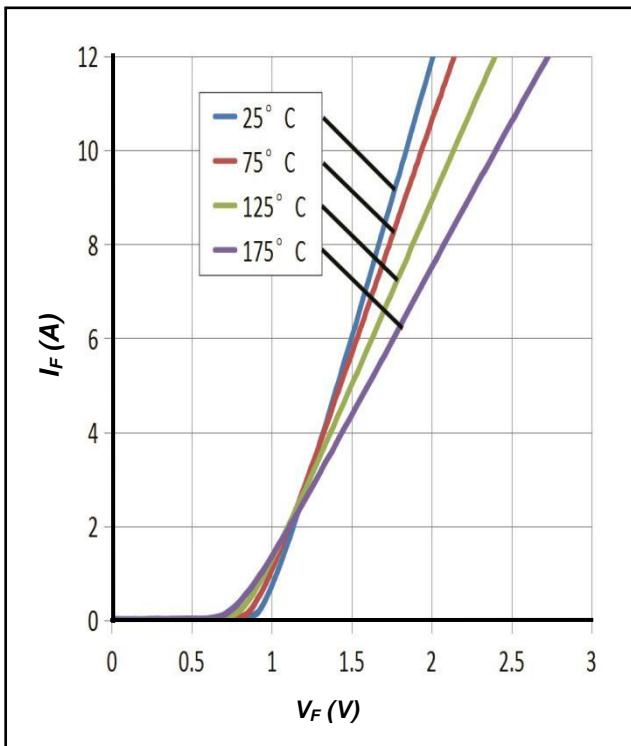


Figure 1. Forward Characteristics

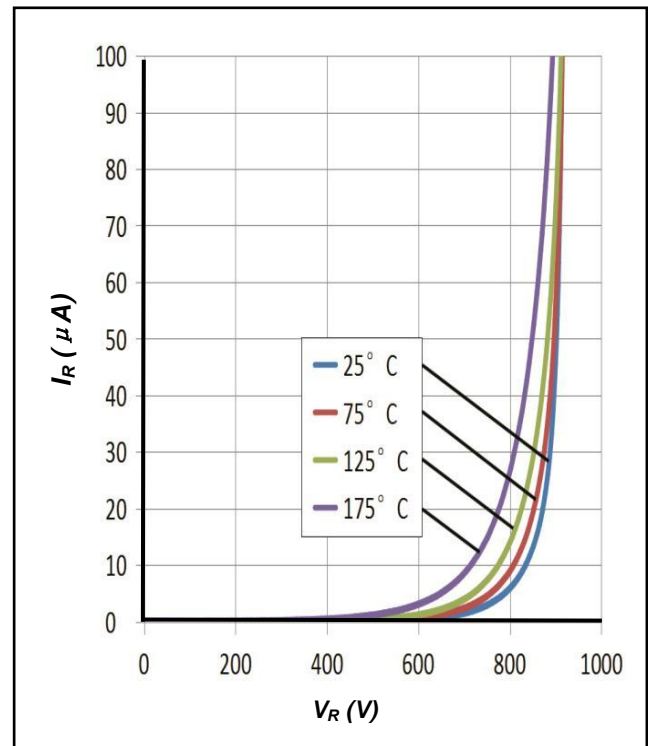


Figure 2. Reverse Characteristics

Typical Performance

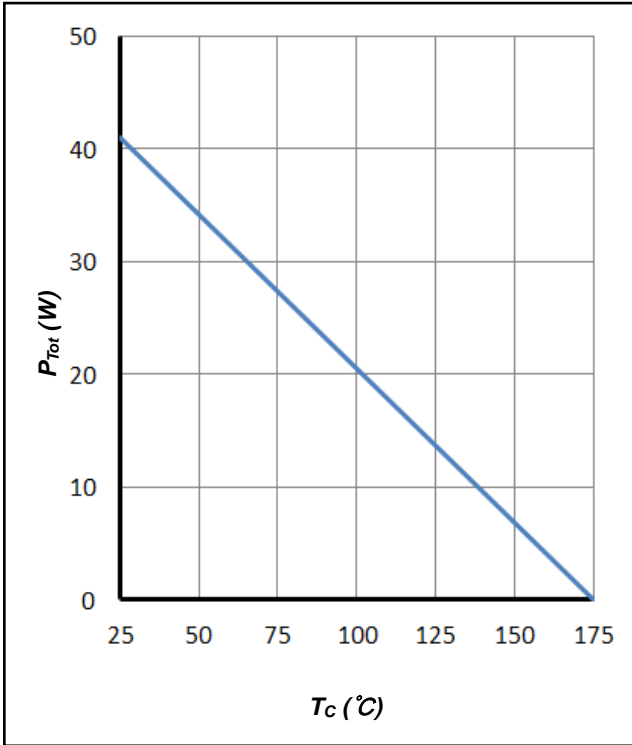


Figure 3. Power Derating

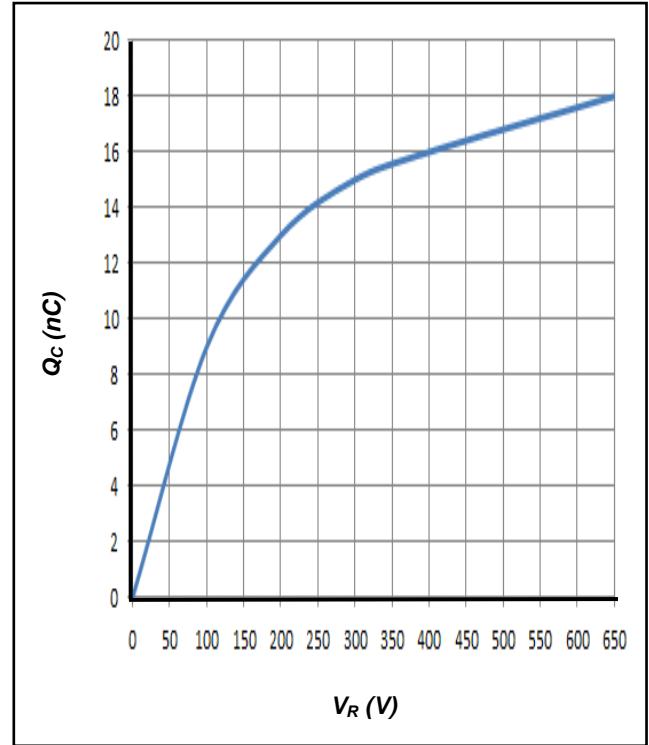


Figure 4. Total Capacitive Charge vs. Reverse Voltage

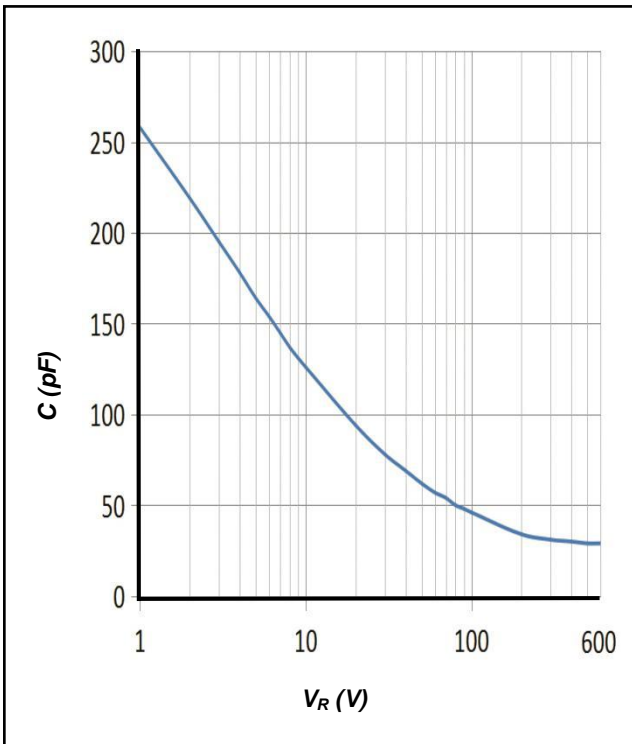


Figure 5. Total Capacitance vs. Reverse Voltage

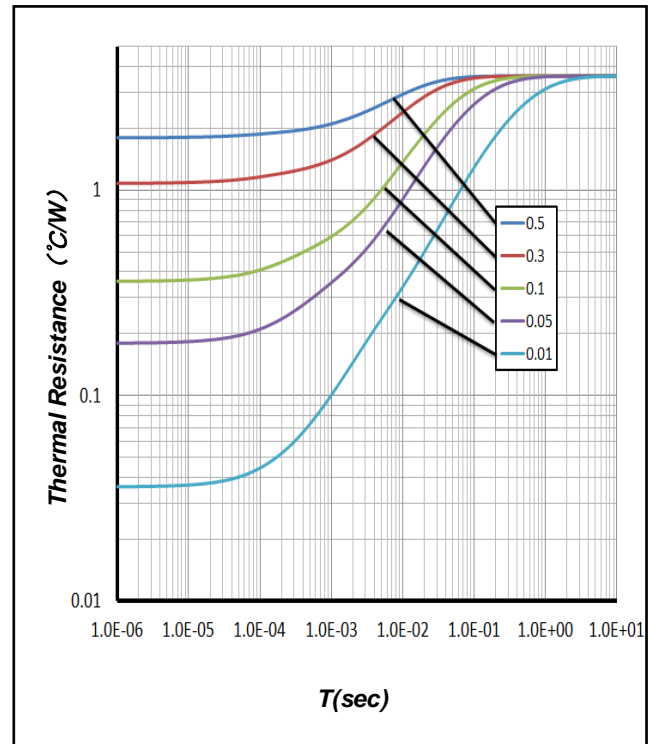
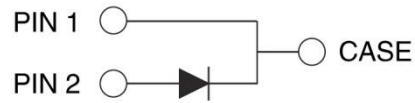
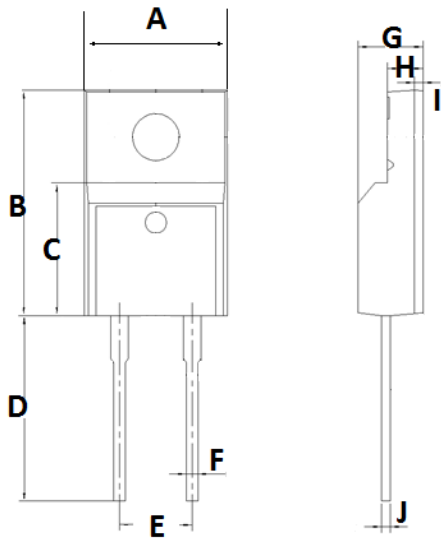


Figure 6. Transient Thermal Impedance

## Package Dimensions

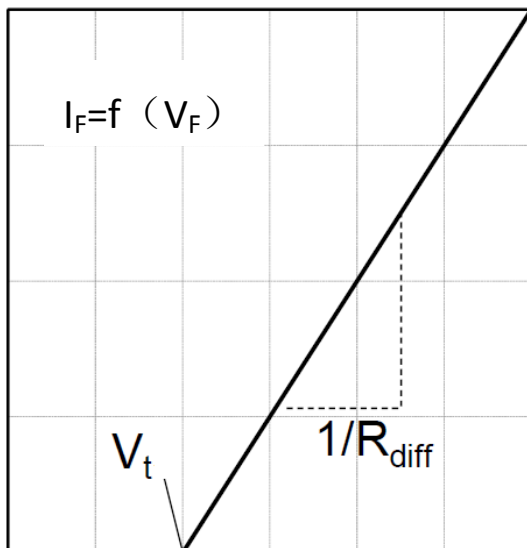
Package TO-220FM



Symbol	Min. (mm)	Typ. (mm)	Max. (mm)
A	9.90	10.10	10.30
B	15.80	16.00	16.20
C	9.10	9.30	9.50
D	12.90	13.20	13.50
E	4.70	5.00	5.30
F	0.60	0.80	1.00
G	4.55	4.75	4.95
H	2.40	2.60	2.80
I	0.40	0.60	0.80
J	0.42	0.50	0.58

## Simplified Diode Model

### Equivalent IV Curve for Model



### Mathematical Equation

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

$$V_t = -0.0017 \times T_j + 1.03 \text{ [V]}$$

$$R_{diff} = 2 \times 10^{-6} \times T_j^2 + 2 \times 10^{-4} \times T_j + 0.08 \text{ [\Omega]}$$

Note:

$T_j$  = Diode Junction Temperature In Degrees Celsius,  
valid from 25°C to 175°C

$I_F$  = Forward Current

Less than 12A



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