



## WS3A010120K

### Silicon Carbide Schottky Diode

$V_{RRM}$	=	1200	V
$I_F (T_C \leq 135^\circ\text{C})$	=	18	A**
$Q_C$	=	37	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



Part Number	Package	Marking
WS3A010120K	TO-247-3	WS3A010120K

#### Maximum Ratings

Symbol	Parameter	Value	Unit	Test Conditions	Note
$V_{RRM}$	Repetitive Peak Reverse Voltage	1200	V	$T_C = 25^\circ\text{C}$	
$V_{RSM}$	Surge Peak Reverse Voltage	1200	V	$T_C = 25^\circ\text{C}$	
$V_R$	DC Blocking Voltage	1200	V	$T_C = 25^\circ\text{C}$	
$I_F$	Forward Current (Per leg/Device)	18/36 9/18 5/10	A	$T_C \leq 25^\circ\text{C}$ $T_C \leq 135^\circ\text{C}$ $T_C \leq 159^\circ\text{C}$	
$I_{FSM}$	Non-Repetitive Forward Surge Current	50*	A	$T_C = 25^\circ\text{C}$ , $t_p = 8.3\text{ms}$ , Half Sine Wave	
$P_{tot}$	Power Dissipation (Per leg/Device)	125/ 250	W	$T_C = 25^\circ\text{C}$	Fig.3
$T_C$	Maximum Case Temperature	159	$^\circ\text{C}$		
$T_J, T_{STG}$	Operating Junction and Storage Temperature	-55 to 175	$^\circ\text{C}$		
	TO-247 Mounting Torque	1	Nm	M3 Screw	

\*Per Leg, \*\*Per Device

## Electrical Characteristics (Per Leg)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$V_F$	Forward Voltage	1.55 2.2	1.8 2.5	V	$I_F = 5A, T_J = 25^\circ C$ $I_F = 5A, T_J = 175^\circ C$	Fig.1
$I_R$	Reverse Current	2 10	20 200	$\mu A$	$V_R = 1200V, T_J = 25^\circ C$ $V_R = 1200V, T_J = 175^\circ C$	Fig.2
C	Total Capacitance	340 32.5 25	/	pF	$V_R = 0V, T_J = 25^\circ C, f = 1MHz$ $V_R = 400V, T_J = 25^\circ C, f = 1MHz$ $V_R = 800V, T_J = 25^\circ C, f = 1MHz$	Fig.5
$Q_C$	Total Capacitive Charge	18.5	/	nC	$V_R = 800V, I_F = 5A$ $di/dt = 200A/\mu s, T_J = 25^\circ C$	Fig.4

## Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	1.2* 0.6**	$^\circ C/W$	Fig.6
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	80	$^\circ C/W$	
$T_{sold}$	Soldering Temperature	260	$^\circ C$	

\*Per Leg, \*\*Per Device

## Typical Performance (Per Leg)

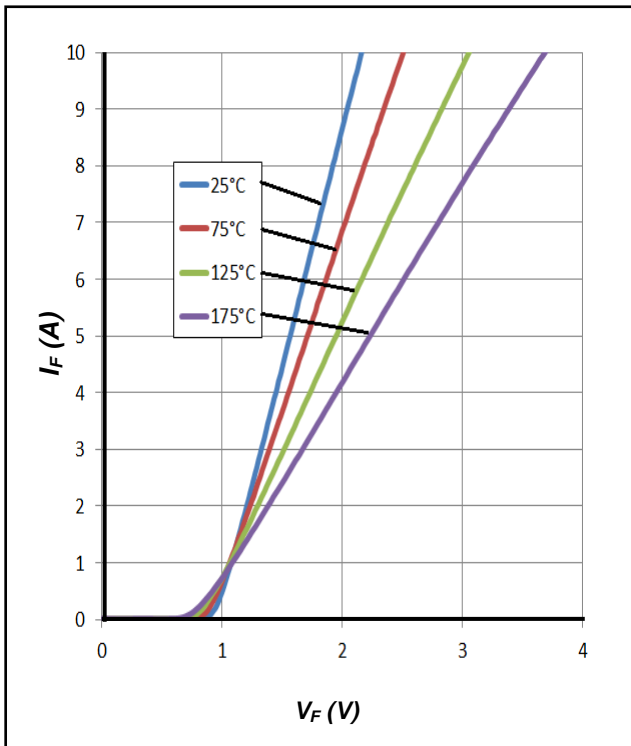


Figure 1. Forward Characteristics

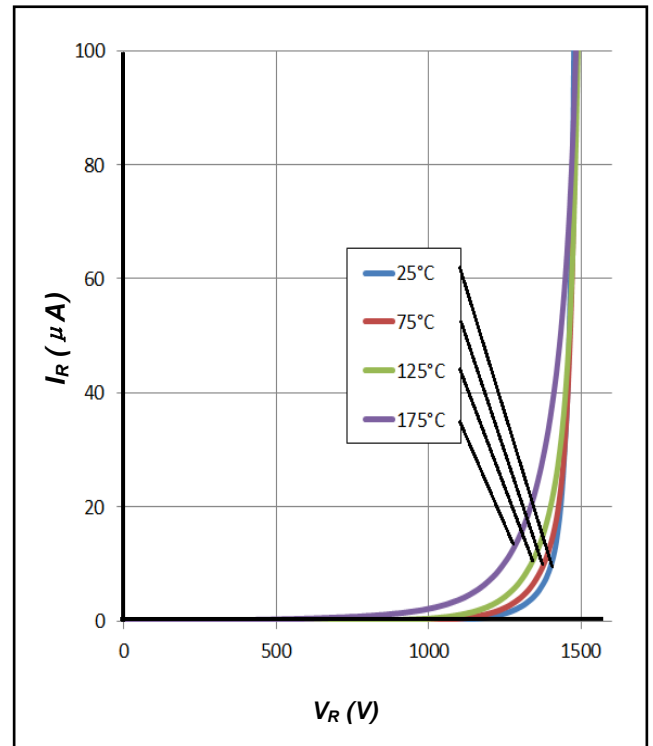


Figure 2. Reverse Characteristics

Typical Performance (Per Leg)

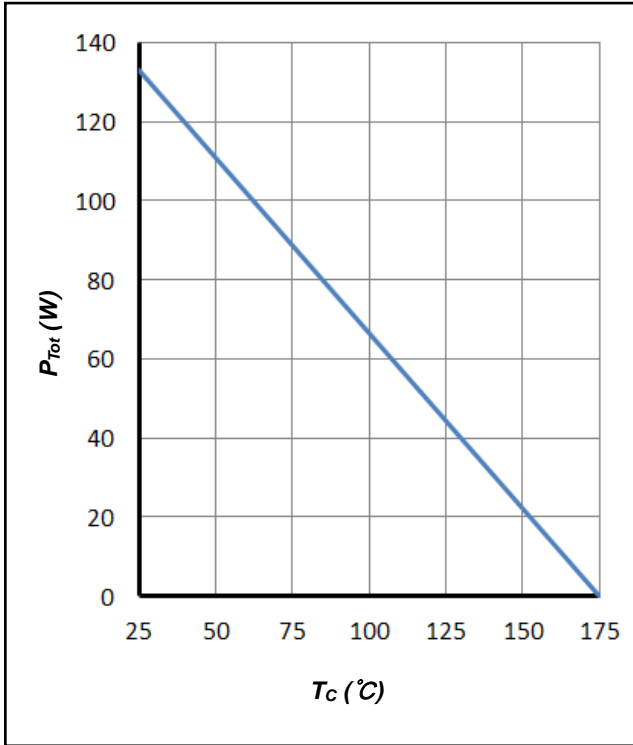


Figure 3. Power Derating

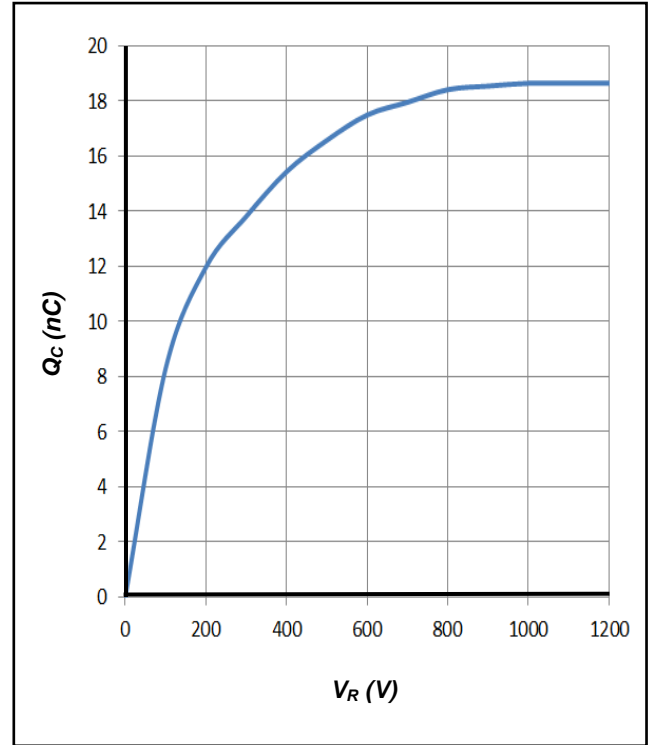


Figure 4. Total Capacitive Charge vs. Reverse Voltage

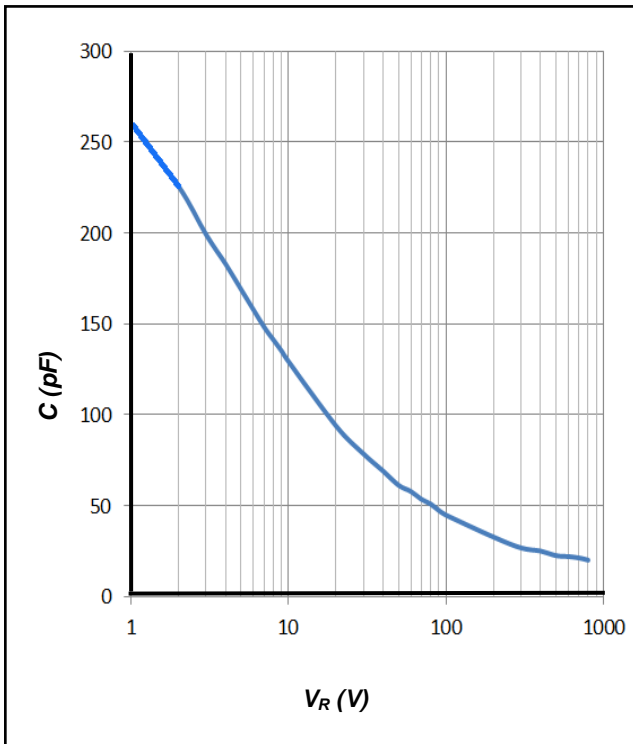


Figure 5. Total Capacitance vs. Reverse Voltage

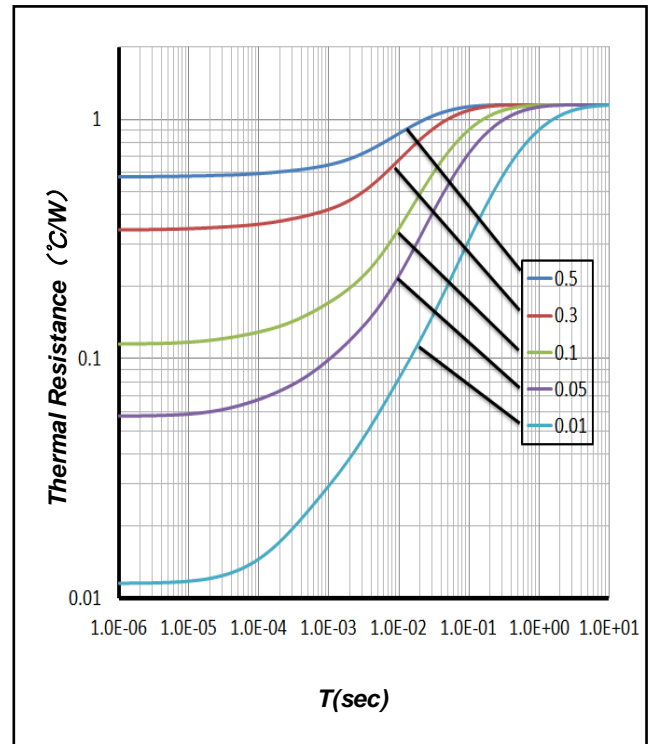
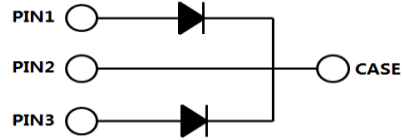
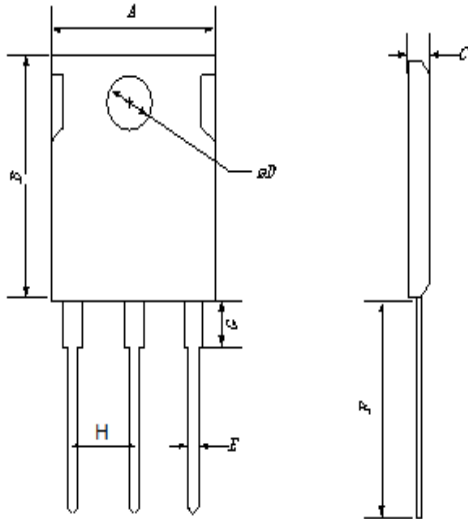


Figure 6. Transient Thermal Impedance

## Package Dimensions

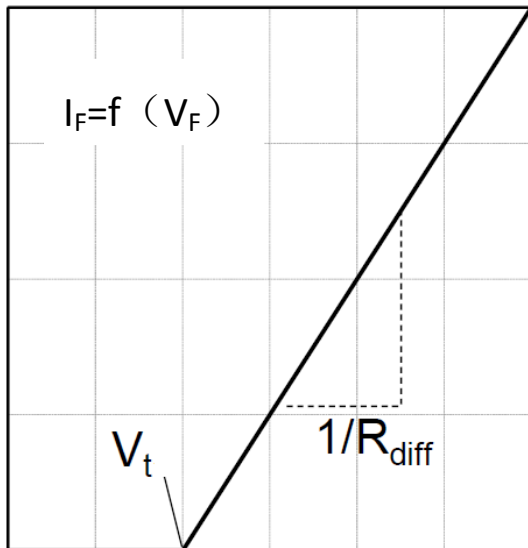
Package TO-247-3



Symbol	Min. (mm)	Typ. (mm)	Max. (mm)
A	14.18	15.75	17.33
B	18.45	20.5	22.55
C	4.50	5.00	5.50
D	3.15	3.50	3.85
E	1.08	1.20	1.32
F	18.27	20.30	22.33
G	4.21	4.68	5.15
H	4.91	5.46	6.01

## Simplified Diode Model (Per Leg)

Equivalent IV Curve for Model



Mathematical Equation

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

$$V_t = -0.0012 \times T_j + 0.995 \text{ [V]}$$

$$R_{diff} = 2.84 \times 10^{-6} \times T_j^2 + 5.76 \times 10^{-4} \times T_j + 0.11 \text{ [\Omega]}$$

Note:

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

$I_F$  = Forward Current

Less than 10A



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