

WS3A040120K

Silicon Carbide Schottky Diode

V_{RRM}	=	1200	V
$I_F (T_C \leq 135^\circ C)$	=	48	A**
Q_C	=	102	nC**

Features

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

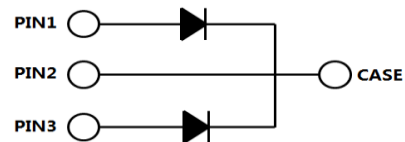
Benefits

- 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
WS3A040120K	TO-247-3	WS3A040120K

Maximum Ratings

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V	$T_C = 25^\circ C$	
V_{RSM}	Surge Peak Reverse Voltage	1200	V	$T_C = 25^\circ C$	
V_R	DC Blocking Voltage	1200	V	$T_C = 25^\circ C$	
I_F	Forward Current (Per leg/Device)	52/104 24/48 20/40	A	$T_C \leq 25^\circ C$ $T_C \leq 135^\circ C$ $T_C \leq 146^\circ C$	
I_{FSM}	Non-Repetitive Forward Surge Current	180*	A	$T_C = 25^\circ C, t_p = 8.3ms, \text{Half Sine Wave}$	
P_{tot}	Power Dissipation (Per leg/Device)	230/ 460	W	$T_C = 25^\circ C$	Fig.3
T_C	Maximum Case Temperature	146	$^\circ C$		
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to 175	$^\circ C$		
	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	$I_F = 20A, T_J = 25^\circ C$ $I_F = 20A, T_J = 175^\circ C$	Fig.1
I_R	Reverse Current	5 30	20 200	μA	$V_R = 1200V, T_J = 25^\circ C$ $V_R = 1200V, T_J = 175^\circ C$	Fig.2
C	Total Capacitance	1280 95 77	/	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	51	/	nC	$V_R = 800V, I_F = 20A$ $di/dt = 200A/\mu s, T_J = 25^\circ C$	Fig.4

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.65* 0.33**	$^\circ C/W$	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)

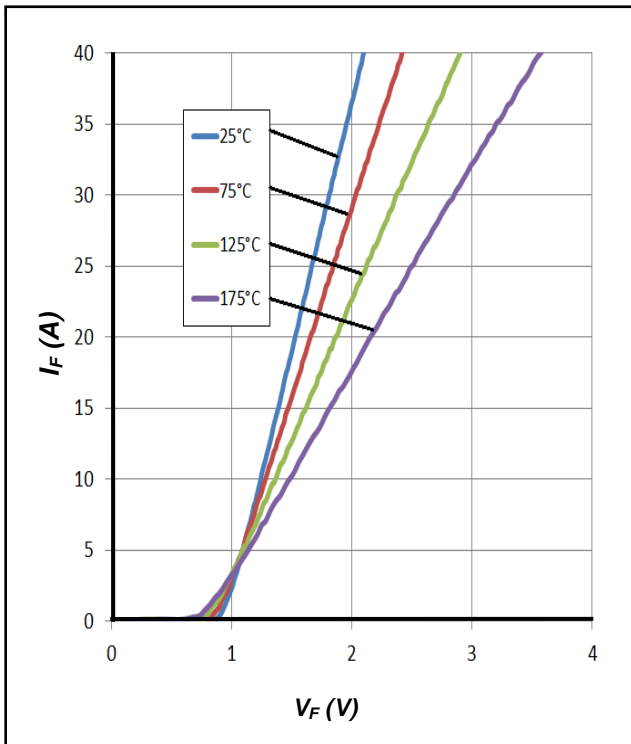


Figure 1. Forward Characteristics

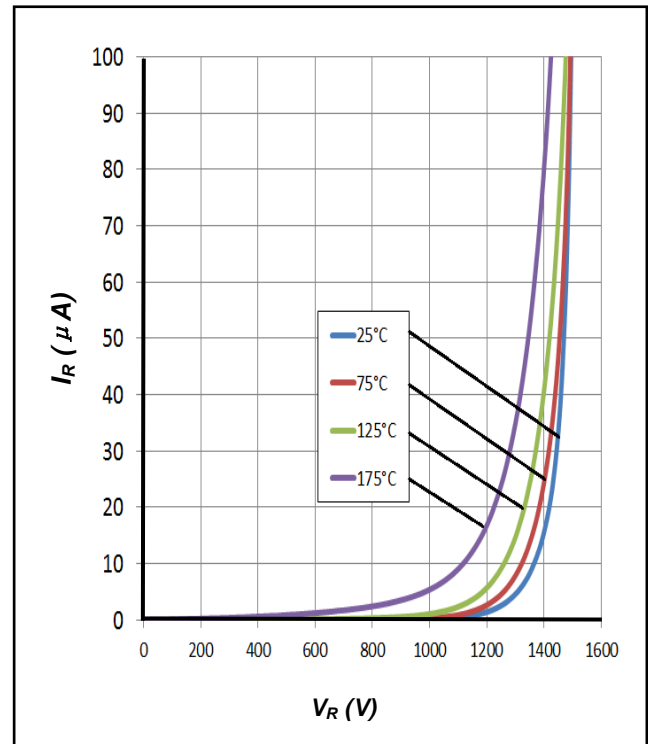


Figure 2. Reverse Characteristics

Typical Performance (Per Leg)

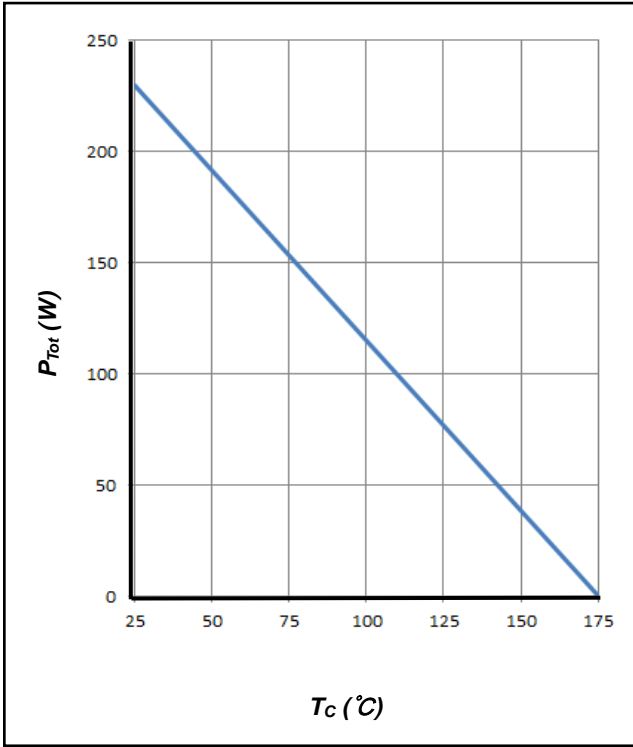


Figure 3. Power Derating

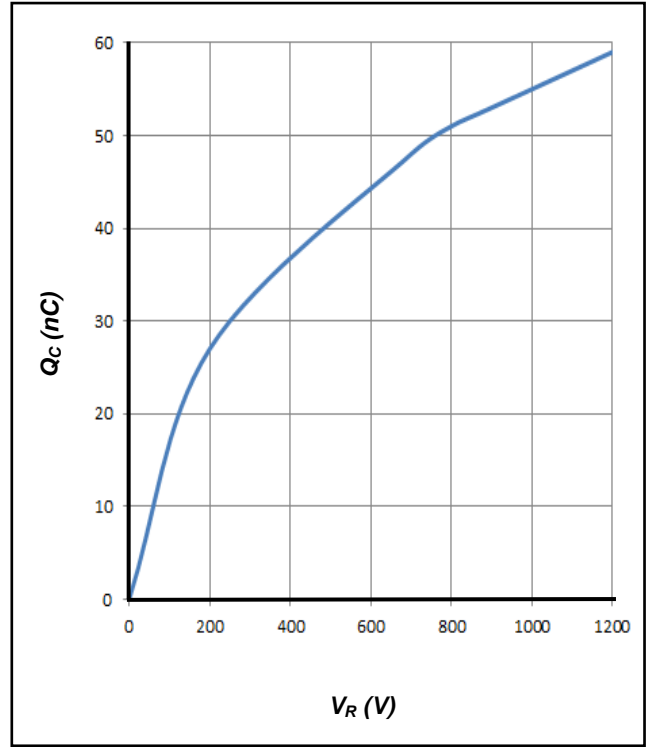


Figure 4. Total Capacitive Charge vs. Reverse Voltage

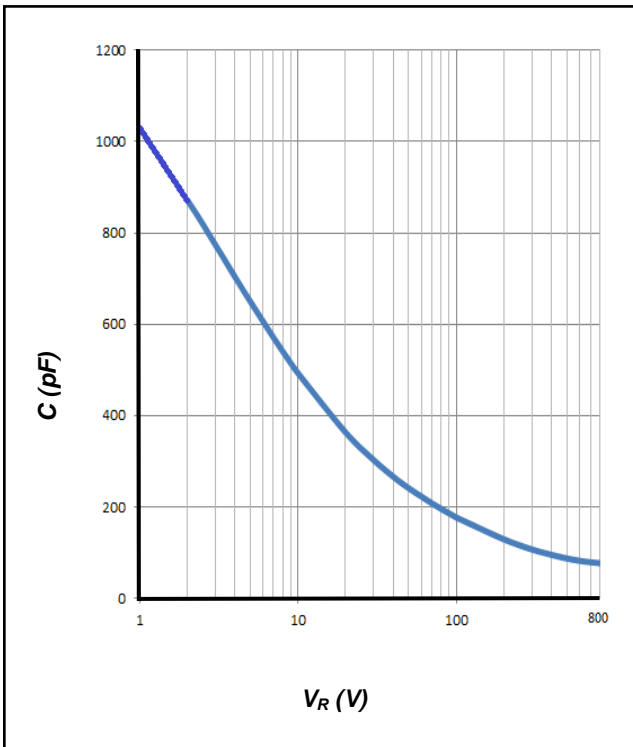


Figure 5. Total Capacitance vs. Reverse Voltage

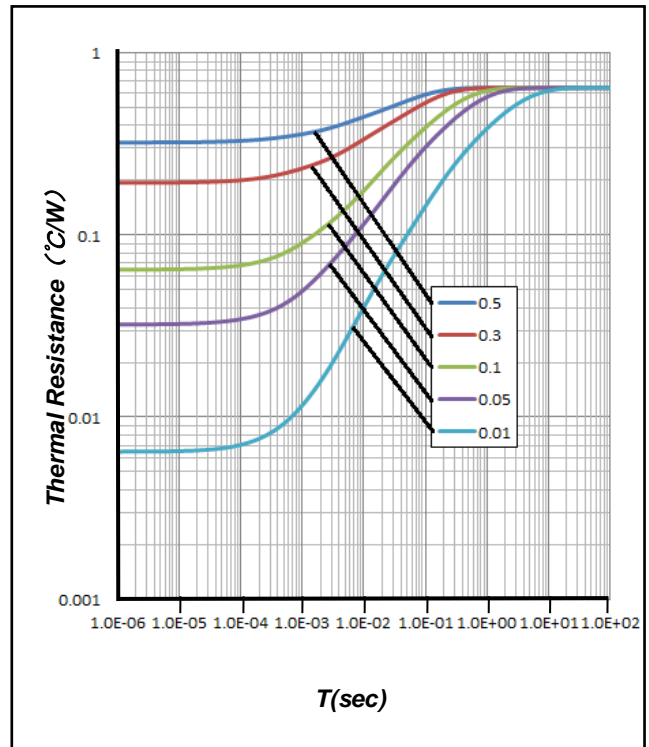
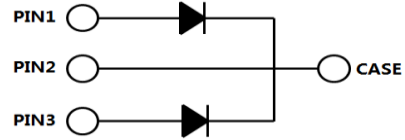
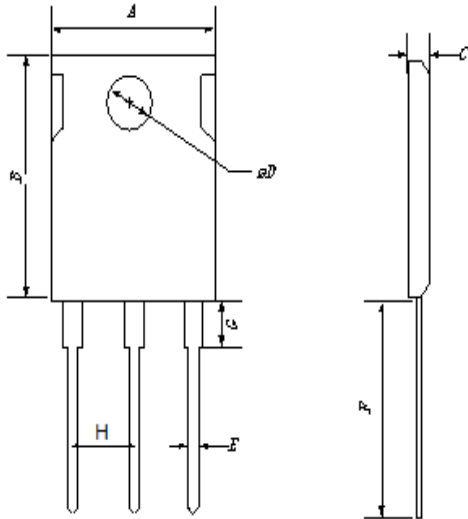


Figure 6. Transient Thermal Impedance

Package Dimensions

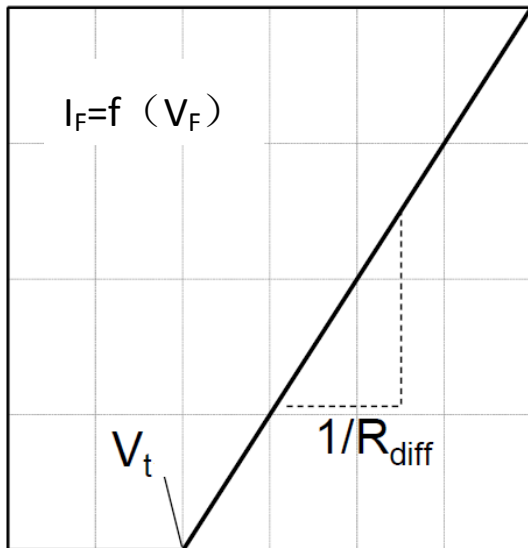
Package TO-247-3



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(Per Leg)

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

$$V_t = -0.0012 \times T_j + 0.987 \text{ [V]}$$

$$R_{diff} = 9 \times 10^{-7} \times T_j^2 + 9 \times 10^{-5} \times T_j + 0.0257 \text{ [\Omega]}$$

Note:

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

I_F = Forward Current

Less than 40A



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