

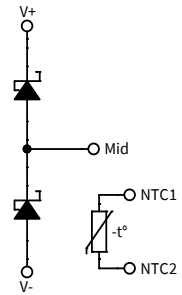
CAR600M12HN6, CAR600M12HN6T

1200 V, 600 A, Silicon Carbide, Half-Bridge Rectifier

V_R	1200 V
I_F	600 A

Technical Features

- Ultra-Low Loss, High Frequency Operation
- Low Forward Voltage (V_F) Drop with Positive Temperature Coefficient
- Zero Reverse Recovery Current
- Zero Forward Recovery Voltage
- Temperature-Independent Switching Behavior



Typical Applications

- Railway, Traction, and Motor Drives
- EV Chargers
- High-Efficiency Converters/Inverters
- Renewable Energy
- Smart-Grid/Grid-Tied Distributed Generation

System Benefits

- Enables Compact, Lightweight Systems
- Increased System Efficiency, due to Low Switching & Conduction Losses of SiC
- Reduced Thermal Requirements and System Cost

Key Parameters (Verified by Design)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions	Note
Maximum Reverse Voltage	V_{R-Max}			1200	V		
Continuous Forward Current	I_F		908		A	$T_C = 25\text{ }^{\circ}\text{C}$, $T_{VJ} \leq 175\text{ }^{\circ}\text{C}$	
			642			$T_C = 90\text{ }^{\circ}\text{C}$, $T_{VJ} \leq 175\text{ }^{\circ}\text{C}$	
Maximum Pulsed Forward Current	$I_F \text{ (Pulsed)}$			1200		t_{Pmax} Limited by T_{VJmVax} $T_C = 25\text{ }^{\circ}\text{C}$	
Maximum Virtual Junction Temperature	T_{VJ}	-40		175	$^{\circ}\text{C}$		

Diode Characteristics (Per Position) ($T_{VJ} = 25^{\circ}\text{C}$ Unless Otherwise Specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions	Note
Diode Forward Voltage	V_F		1.5		V	$I_F = 600\text{ A}$	
			2.0			$I_F = 600\text{ A}, T_{VJ} = 175^{\circ}\text{C}$	
Reverse Current	I_R		0.16		mA	$V_R = 1200\text{ V}, T_{VJ} = 25^{\circ}\text{C}$	
			0.90			$V_R = 1200\text{ V}, T_{VJ} = 175^{\circ}\text{C}$	
Total Capacitive Charge	Q_C		3.5		mC	$V_R = 800\text{ V}$	Note 1
Total Capacitance	C		45.3		nF	$V_R = 0\text{ V}, f = 100\text{ kHz}$	
			3.2			$V_R = 400\text{ V}, f = 100\text{ kHz}$	
			2.5			$V_R = 800\text{ V}, f = 100\text{ kHz}$	
Thermal Resistance, Junction to Case	R_{TH-JC}		0.063			Per position	

Note (1): SiC Schottky diodes are majority carrier devices, so there is no reverse recovery charge.



Module Physical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Package Resistance, M1 (High-Side)	R ₁₋₂		106.5		μΩ	T _c = 125 °C, Note 2
Package Resistance, M2 (Low-Side)	R ₂₋₃		126.3			T _c = 125 °C, Note 2
Stray Inductance	L _{Stray}		4.9		nH	Between DC- and DC+, f = 10 MHz
Case Temperature	T _c	-40		125	°C	
Mounting Torque	M _s	3.0	4.5	5.0	N-m	Baseplate, CAR600M12HN6, M6 Bolts
		4.5		6.0		Baseplate, CAR600M12HN6T, M6 Bolts
		0.9	1.1	1.3		Power Terminals, M4 x 0.7 Bolts
Weight	W		167		g	
Case Isolation Voltage	V _{isol}	4			kV	AC, 50 Hz, 1 minute
Comparative Tracking Index	CTI	600				
Clearance Distance		9.85			mm	Terminal to Terminal
		12.70				Terminal to Heatsink
Creepage Distance		12.57				Terminal to Terminal
		15.30				Terminal to Heatsink

Note (2): Total Effective Resistance (Per Switch Position) = Diode forward/reverse resistance + Switch Position Package Resistance

NTC Characteristics (T_{NTC} = 25 °C Unless Otherwise Specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Resistance at 25 °C	R ₂₅		4700		Ω	
Tolerance of R ₂₅			±1		%	
Beta Value for 25 °C to 85 °C	B _{25/85}		3435		K	
Beta Value for 0 °C to 100 °C	B _{0/100}		3399		K	
Tolerance of B _{25/85}			±1		%	
Maximum Power Dissipation	P _{Max}		50		mW	

Steinhart & Hart Coefficients for NTC Resistance & NTC Temperature Computation (T in K)

$\ln\left(\frac{R}{R_{25}}\right) = A + \frac{B}{T} + \frac{C}{T^2} + \frac{D}{T^3}$				$\frac{1}{T} = A_1 + B_1 \ln\left(\frac{R}{R_{25}}\right) + C_1 \ln^2\left(\frac{R}{R_{25}}\right) + D_1 \ln^3\left(\frac{R}{R_{25}}\right)$			
A	B	C	D	A ₁	B ₁	C ₁	D ₁
-1.289E+01	4.245E+03	-8.749E+04	-9.588E+06	3.354E-03	3.001E-04	5.085E-06	2.188E-07

Typical Performance

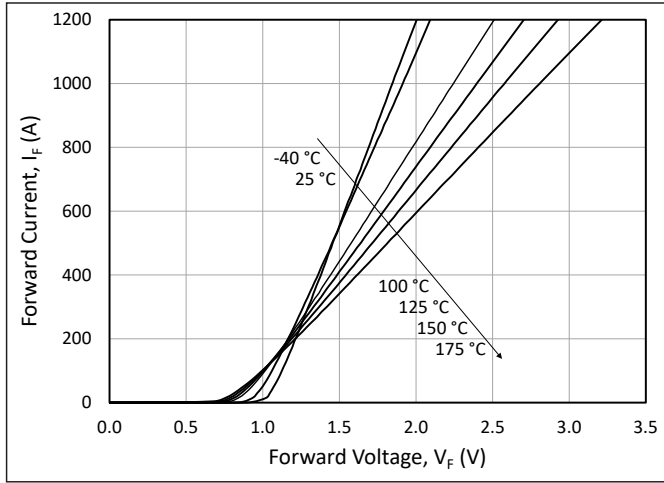


Figure 1. Typical Forward Characteristics

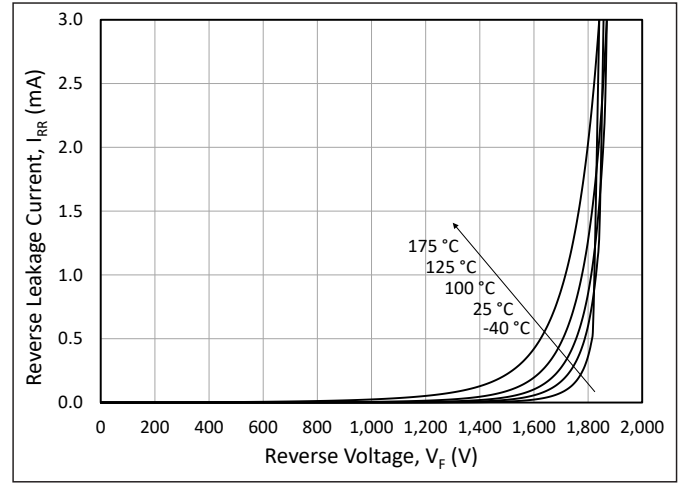


Figure 2. Typical Reverse Characteristics

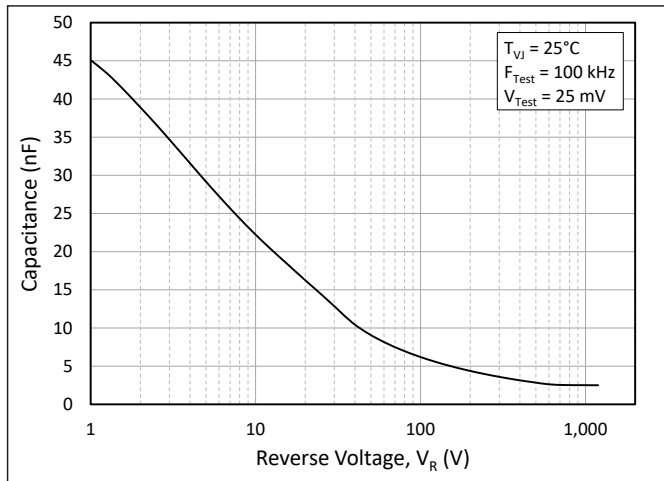


Figure 3. Typical Capacitance vs. Reverse Voltage

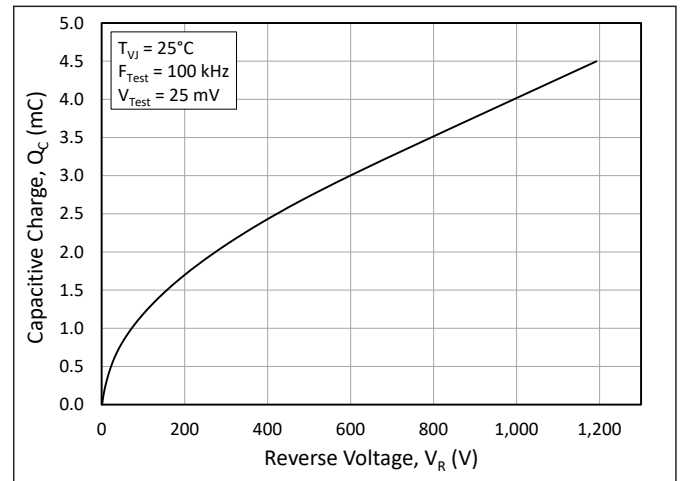


Figure 4. Typical Capacitive Charge vs. Reverse Voltage

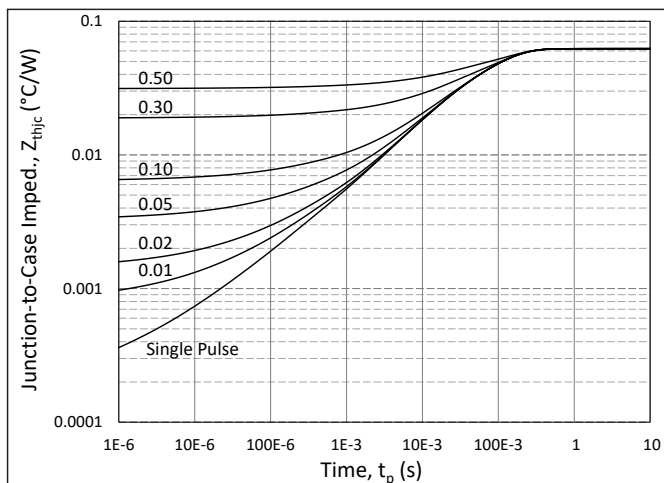


Figure 5. Diode Junction to Case Transient Thermal Impedance, Z_{thJC} (°C/W)

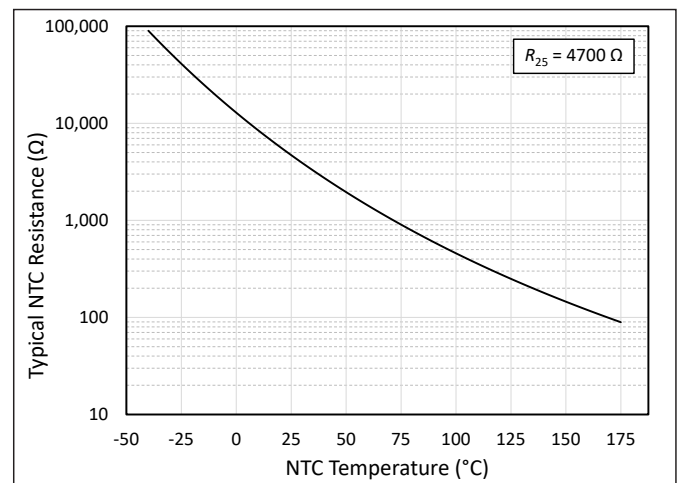
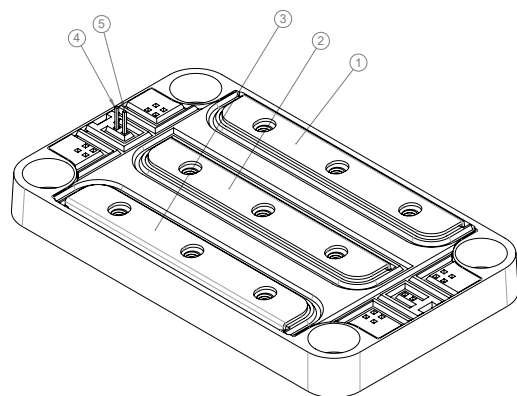


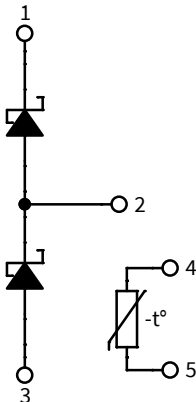
Figure 6. NTC Resistance vs. NTC Temperature



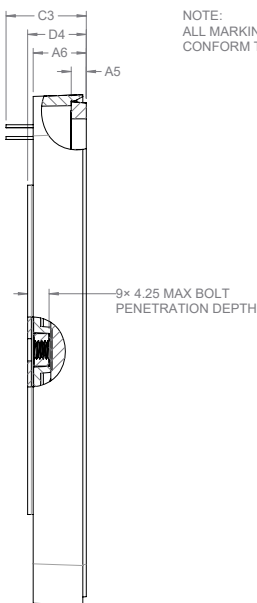
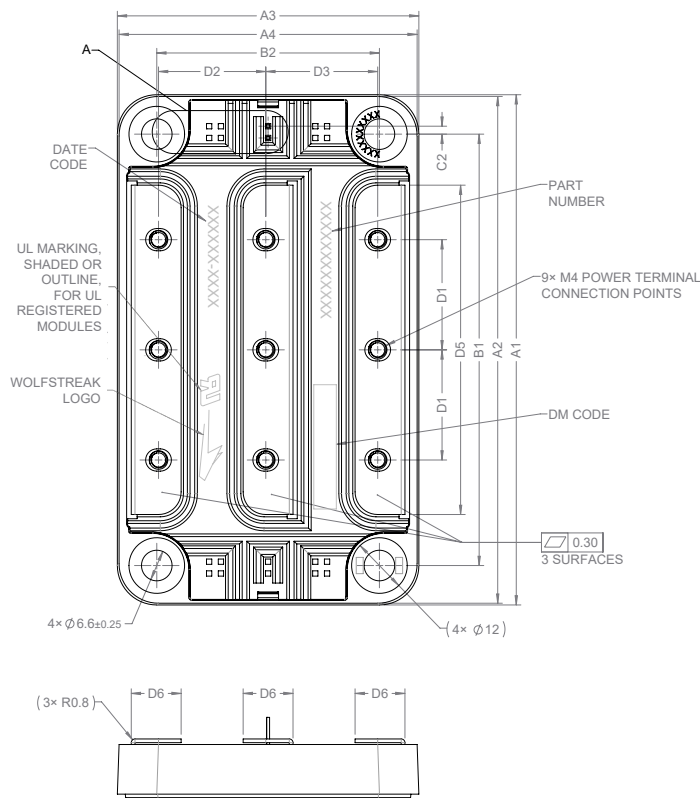
Schematic and Pin Out



PIN OUT SCHEME	
PIN	LABEL
①	V+
②	Mid
③	V-
④	NTC1
⑤	NTC2

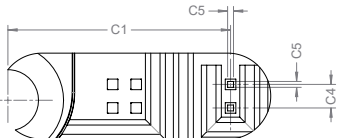


Package Dimensions (mm)



NOTE:
ALL MARKINGS SHALL
CONFORM TO PRC-00786.

DIMENSION TABLE		
SYMBOL	DIMENSION	TOLERANCE
A1	110	±0.60
A2	109.25	±0.60
A3	65	±0.60
A4	64.25	±0.60
A5	3.25	±0.40
A6	11.45	±0.60
B1	93	±0.30
B2	48	±0.30
C1	24	±0.40
C2	1.71	±0.40
C3	17.84	±0.75
C4	2.54	±0.30
C5	0.64	±0.30
D1	23.75	±0.50
D2	23.13	±0.50
D3	24.13	±0.50
D4	12.65	±0.50
D5	71	±0.30
D6	10.75	±0.50



DETAIL A
SCALE: 4:1

Note (3): To improve product traceability, Wolfstreak products include Data Matrix Content barcodes in the form of ZZZZZZZZZZ-DDDDDD-XXXX-NNNNNNNNNN, where -Z, -D, -X/-N represent product number, date code, and module serial number, respectively. For instance, CAR600M12HN6-FA2036-0042-6706546042 is a CAR600M12HN6 produced in 2020 week 36 with a unique serial number..

Note (4): CAR600M12HN6 has been certified by UL as an “Electrically Isolated Semiconductor Devices – Component” in accordance with UL 1557. Only power modules that bear the UL marking shown in the Package Dimension figure above should be considered as being covered under the UL Component Recognition Program.



Product Ordering Code

Part Number	Description
CAR600M12HN6	Without Pre-Applied Phase Change Thermal Interface Material
CAR600M12HN6T	With Pre-Applied Phase Change Thermal Interface Material

Supporting Links & Tools

Evaluation Tools & Support

- [SpeedFit 2.0 Design Simulator™](#)
- [Technical Support Forum](#)
- [LTspice and PLECS Models](#)

Application Notes

- [PRD-04814: Design Options for Wolfspeed® Silicon Carbide MOSFET Gate Bias Power Supplies](#)
- [PRD-06379: Environmental Considerations for Power Electronics Systems](#)
- [PRD-08333: Wolfspeed Module CIL Evaluation Kits User Guide](#)
- [PRD-07933: Wolfspeed Power Module Thermal Interface Material Application User Guide](#)
- [PRD-08376: Thermal Characterization Methods and Applications](#)
- [PRD-07845: Power Module Baseplate Capacitance and Electromagnetic Compatibility](#)
- [PRD-08710: Measuring Stray Inductance in Power Electronics Systems](#)
- [PRD-08911: Considerations for Current Balancing in Paralleled SiC Power Modules](#)
- [PRD-09035: Power Module RC Thermal Models User Guide](#)
- [PRD-07913: Wolfspeed Power Module SPICE Models User Guide](#)
- [PRD-09002: Wolfspeed H Module Mounting Guide](#)



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