

# CAS100H12AM1

## 1200V, 100A Silicon Carbide Half-Bridge Module

### Z-FET™ MOSFET and Z-Rec™ Diode

$V_{DS}$	1200 V
$I_D (T_c = 100^\circ\text{C})$	100 A
$R_{DS(on)}$	16 mΩ

#### Features

- Ultra Low Loss
- High Ruggedness
- High-Frequency Operation
- Zero Reverse Recovery Current from Diode
- Zero Turn-off Tail Current from MOSFET
- Positive Temperature Coefficient on  $V_F$  and  $V_{DS(on)}$

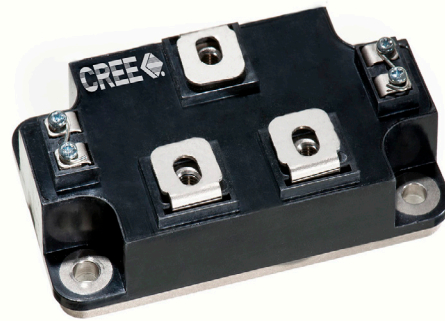
#### System Benefits

- Enables compact and lightweight systems
- High efficiency operation
- Mitigate over-voltage protection
- Ease of transistor gate control
- Reduces thermal requirements

#### Applications

- High Power Converters
- Motor Drives
- Solar Inverters
- UPS and SMPS
- Induction Heating

#### Package



Part Number	Package	Marking
CAS100H12AM1	Half-Bridge Module	CAS100H12AM1

#### Maximum Ratings ( $T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Notes
$V_{DS}$	Drain - Source Voltage	1200	V		
$V_{GS}$	Gate - Source Voltage	-5/+20	V		
$I_D$	Continuous Drain Current	165	A	$V_{GS} = 20\text{V}, T_c = 25^\circ\text{C}$	
		105		$V_{GS} = 20\text{V}, T_c = 100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	400	A	Pulse width $t_p = 1\text{ms}$ Limited by $T_{jmax}, T_c = 25^\circ\text{C}$	
$T_j$	Junction Temperature	150	$^\circ\text{C}$		
$T_c, T_{STG}$	Case and Storage Temperature Range	-55 to +125	$^\circ\text{C}$		
$V_{isol}$	Case Isolation Voltage	6000	V	AC, $t = 1\text{min}$	
$L_{Stray}$	Stray Inductance	<15	nH	Measured along maximum path from pad to Lug	
M	Mounting Torque	2.94	Nm		
G	Weight	200	g		
	Clearance Distance	12.2	mm	Terminal to terminal	
	Creepage Distance	17.3	mm	Terminal to terminal	
		20.2	mm	Terminal to base plate	



## Electrical Characteristics ( $T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain - Source Breakdown voltage	1200			V	$V_{GS} = 0V, I_D = 100\mu A$	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.5		V	$V_{DS} = V_{GS}, I_D = 5mA$	Fig 6
		2.6	3.1			$V_{DS} = V_{GS}, I_D = 50mA$	
			1.8			$V_{DS} = V_{GS}, I_D = 5mA, T_J = 150^\circ\text{C}$	
			2.4			$V_{DS} = V_{GS}, I_D = 50mA, T_J = 150^\circ\text{C}$	
$I_{DSS}$	Zero Gate Voltage Drain Current		5	500	$\mu A$	$V_{DS} = 1200V, V_{GS} = 0V$	
			50	1250		$V_{DS} = 1200V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	
$I_{GSS}$	Gate-Source Leakage Current			0.25	$\mu A$	$V_{GS} = 20V, V_{DS} = 0V$	
$R_{DS(on)}$	On State Resistance		16	20	$m\Omega$	$V_{GS} = 20V, I_D = 20A$	Fig 4
			20	24		$V_{GS} = 20V, I_D = 20A, T_J = 150^\circ\text{C}$	
$g_{fs}$	Transconductance		31		S	$V_{DS} = 20V, I_D = 100A$	Fig 5
			32			$V_{DS} = 20V, I_D = 100A, T_J = 150^\circ\text{C}$	
$C_{iss}$	Input Capacitance		9500		$pF$	$V_{DS} = 800V, V_{GS} = 0V$ $f = 1MHz, V_{AC} = 25mV$	
$C_{oss}$	Output Capacitance		600				
$C_{rss}$	Reverse Transfer Capacitance		65				
$E_{ON}$	Turn-On Switching Energy	( $25^\circ\text{C}$ ) ( $125^\circ\text{C}$ )	2.4 2.0		mJ	$V_{DD} = 600V, V_{GS} = -5V/+20V$ $I_D = 100A, R_G = 5\Omega$ Inductive Load	Fig 10
$E_{off}$	Turn-Off Switching Energy	( $25^\circ\text{C}$ ) ( $125^\circ\text{C}$ )	1.3 1.4				
$R_G$	Internal Gate Resistance		1.25		$\Omega$	$f = 1MHz, V_{AC} = 25mV$	
$Q_G$	Gate Charge		490		nC	$V_{DD} = 600V, I_D = 100A$	

### Free-Wheeling SiC Schottky Diode Characteristics

$V_{SD}$	Diode Forward Voltage		1.8	2.2	V	$I_F = 100A$	Fig 9
			2.5			$I_F = 100A, T_J = 150^\circ\text{C}$	
$Q_C$	Total Capacitive Charge		1.6		$\mu C$	$I_F = 100A, V_R = 600V$ $di_F/dt = 2200A/\mu S, T_J = 25^\circ\text{C}$	
$t_{RR}$	Reverse Recovery Time		47		ns		
$E_{RR}$	Reverse Recovery Energy		0.5		mJ		
C	Total Capacitance		5000		$pF$	$V_R = 0V, f = 1MHz$	
			400			$V_R = 200V, f = 1MHz$	
			300			$V_R = 400V, f = 1MHz$	

### Thermal Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$R_{thJCM}$	Thermal Resistance Junction-to-Case for MOSFET		0.16	0.19	K / W		
$R_{thJCD}$	Thermal Resistance Junction-to-Case for Diode		0.35	0.37			

**Module Application Note:** The SiC MOSFET module switches at speeds beyond what is customarily associated with IGBT based modules. Therefore, special precautions are required to realize the best performance. The interconnection between the gate driver and module housing needs to be as short as possible. This will afford the best switching time and avoid the potential for device oscillation. Also, great care is required to insure minimum inductance between the module and link capacitors to avoid excessive  $V_{DS}$  overshoots.

# Typical Performance

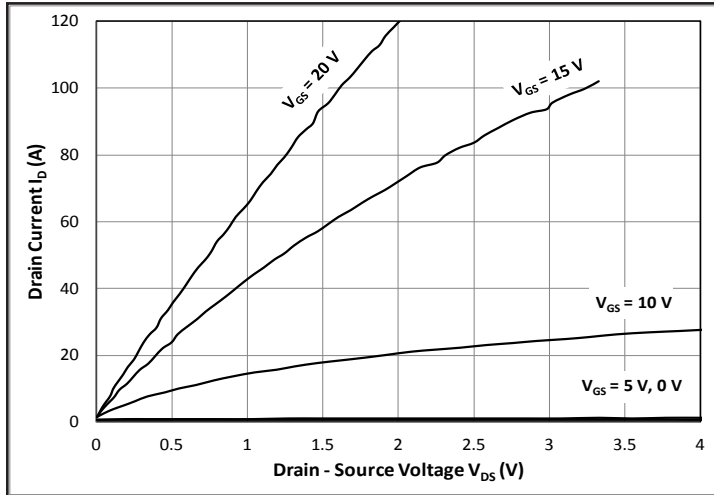


Figure 1. Typical Output Characteristics  $T_j = 25^\circ\text{C}$

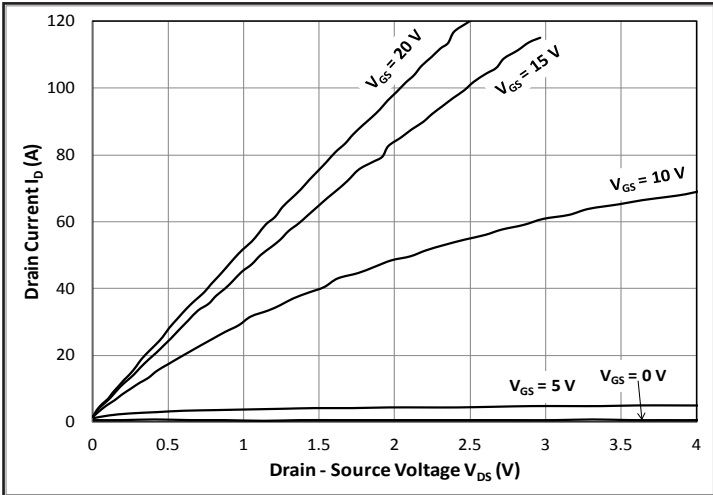


Figure 2. Typical Output Characteristics  $T_j = 150^\circ\text{C}$

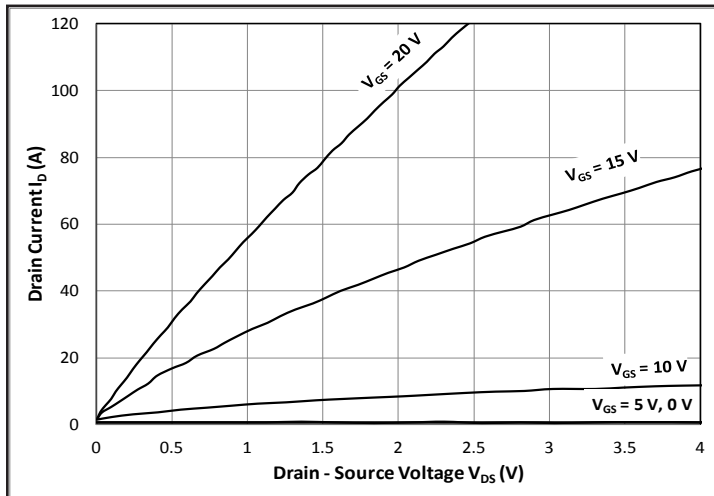


Figure 3. Typical Output Characteristics  $T_j = -55^\circ\text{C}$

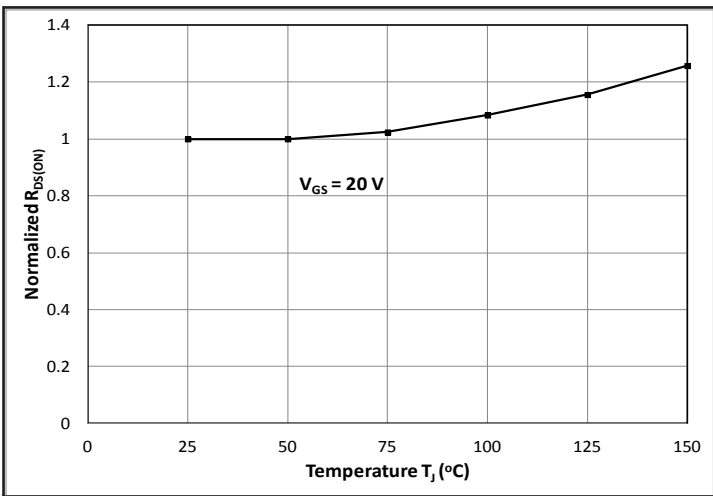


Figure 4. Normalized On-Resistance vs. Temperature

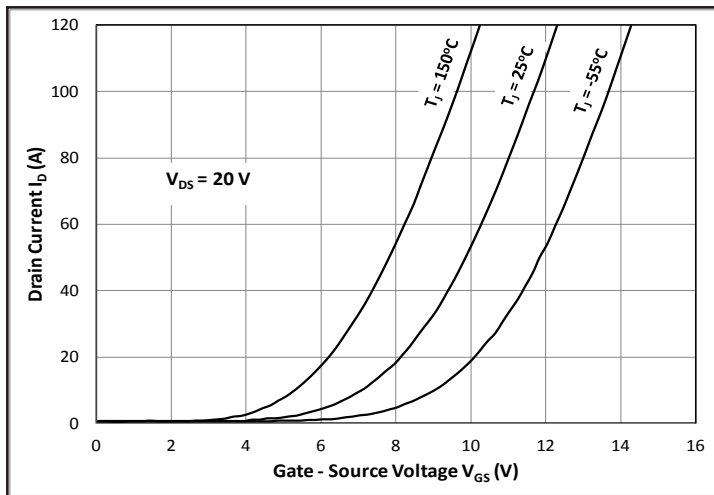


Figure 5. Typical Transfer Characteristics

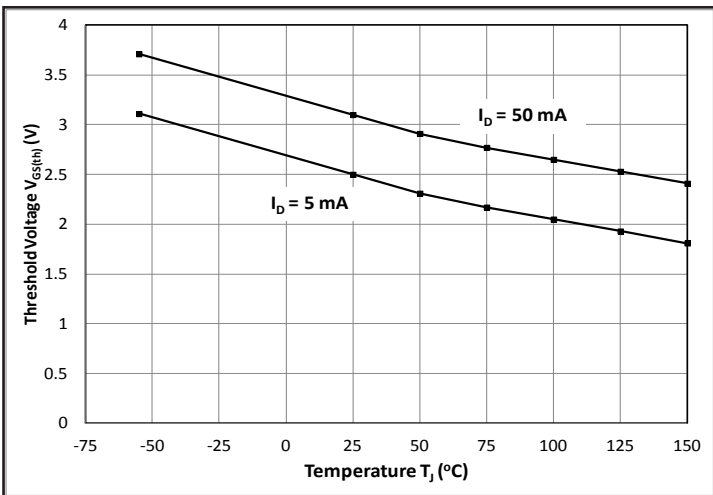


Fig 6. Typical Threshold Voltage vs. Temperature

## Typical Performance

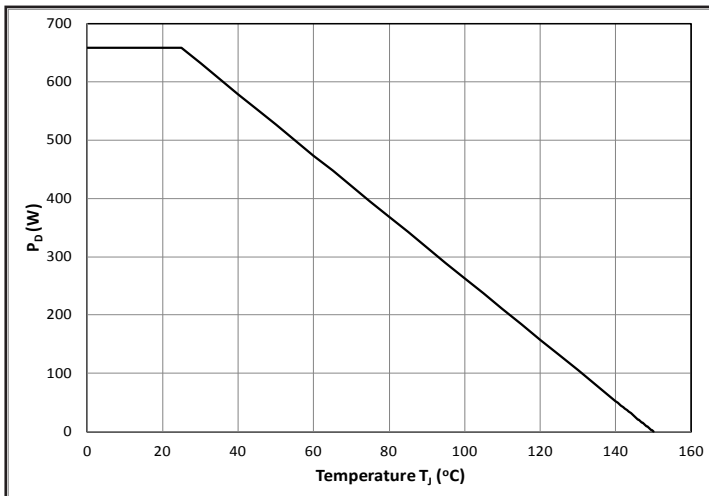


Figure 7. Power Dissipation Derating Curve

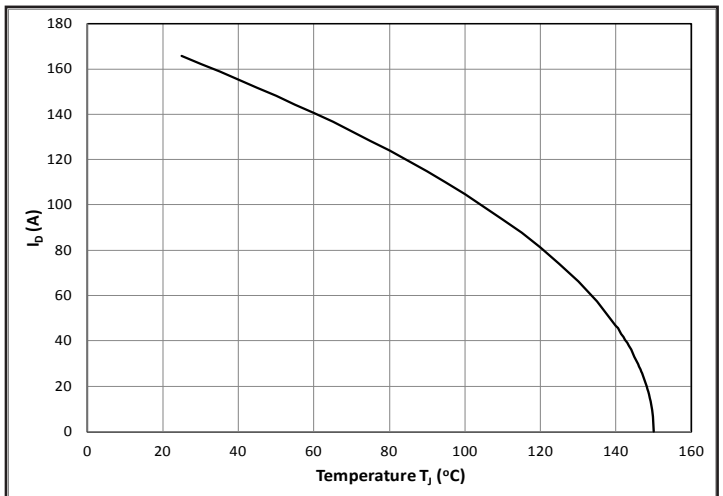


Figure 8. Continuous Current Derating Curve

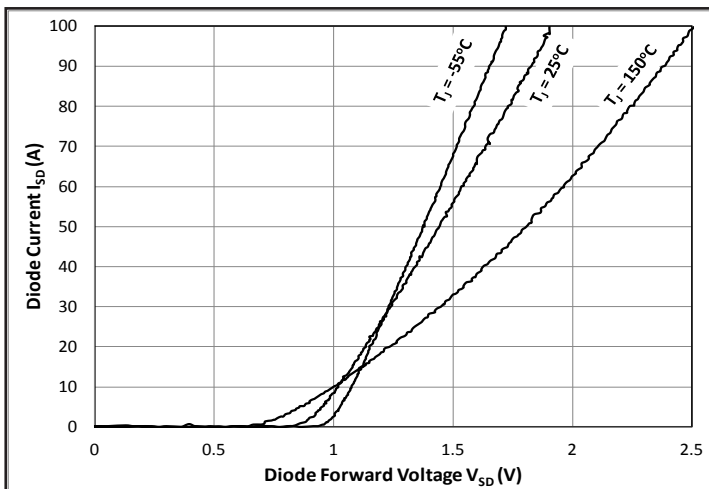


Figure 9. Typical Diode Turn-on

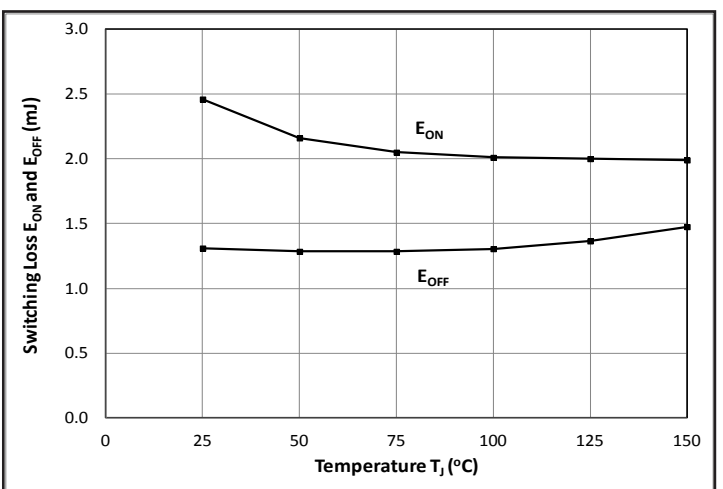
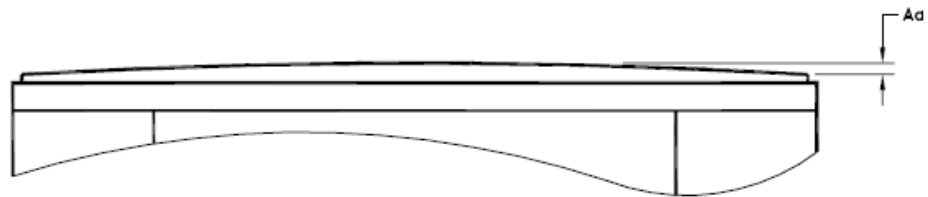
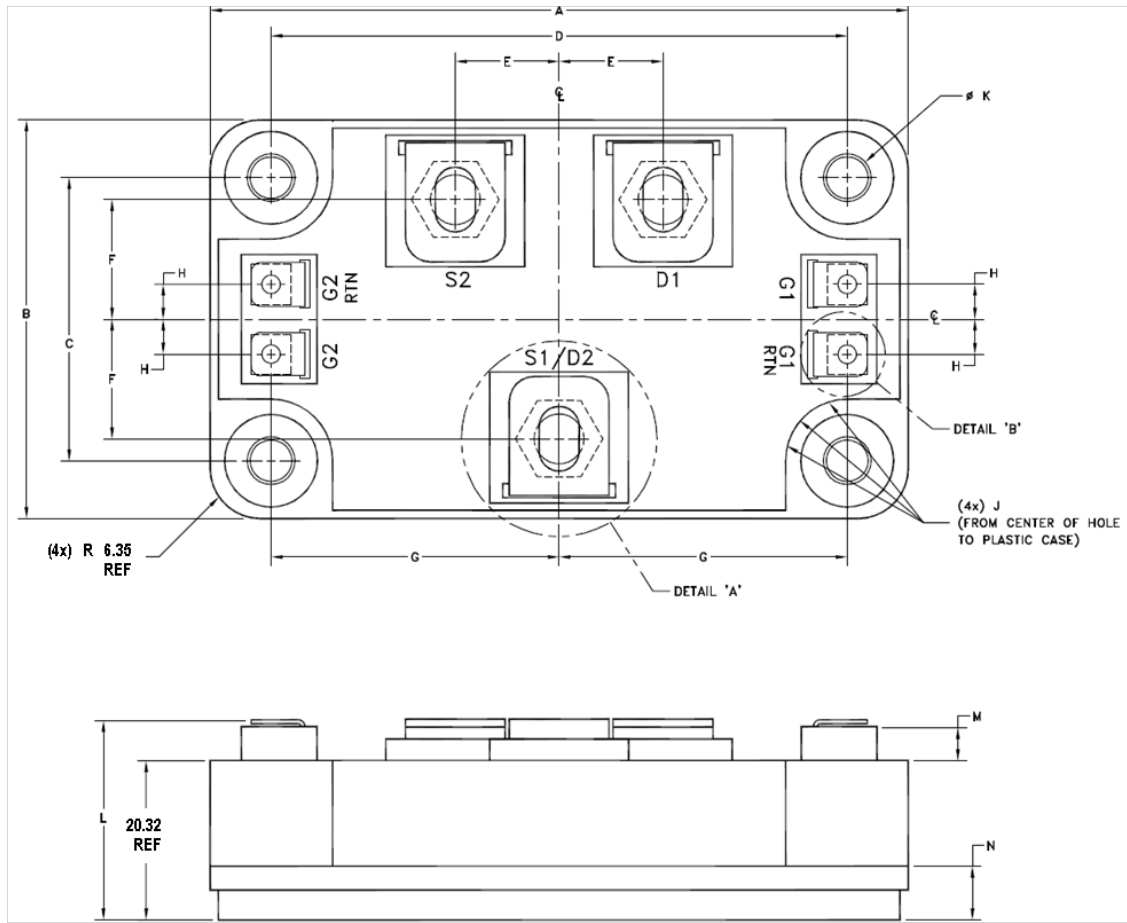


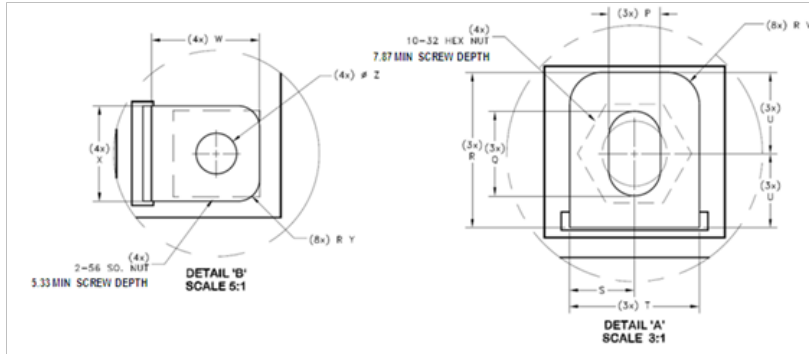
Figure 10. Inductive Switching Energy vs. Temperature

**Package Dimensions (mm)**



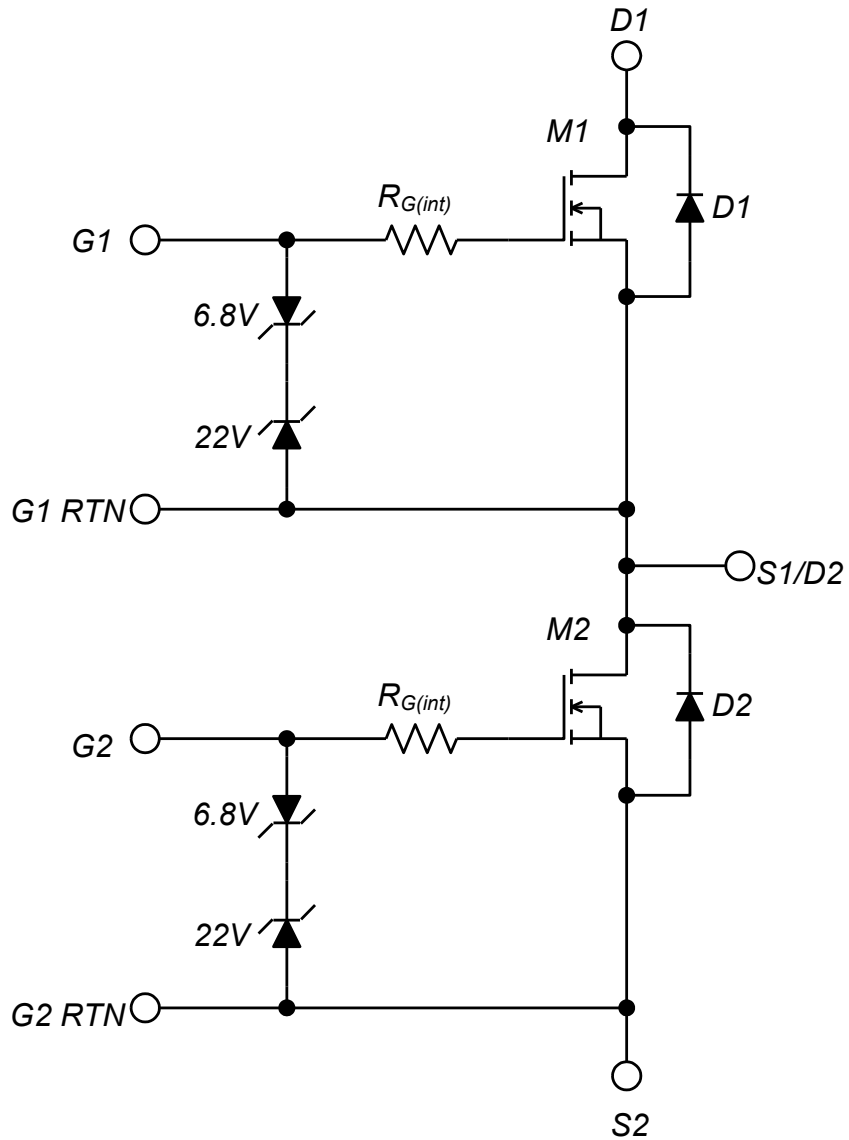
**POWER MODULE (SIDE VIEW)  
(EXAGGERATED DOME)  
(NOT TO SCALE)**

## Package Dimensions (mm)



REF	MIN (mm)	MAX (mm)
A	88.14	89.15
B	50.04	51.05
C	35.81	36.32
D	73.15	73.66
E	12.60	13.87
F	14.61	15.88
G	36.07	37.34
H	3.810	5.080
J	6.096	_____
K	5.283	5.715
L	25.02	25.78
M	2.286	_____
N	6.477	7.239
P	4.953	5.842
Q	7.874	8.636
R	12.70	17.78
S	5.080	7.620
T	12.70	13.97
U	_____	10.16
V	2.540	_____
W	_____	6.350
X	_____	5.588
Y	1.270	_____
Z	2.286	2.794
Aa	0.000	0.178

# Circuit Diagram



This product has not been designed or tested for use in, and is not intended for use in, applications implanted into the human body nor in applications in which failure of the product could lead to death, personal injury or property damage, including but not limited to equipment used in the operation of nuclear facilities, life-support machines, cardiac defibrillators or similar emergency medical equipment, aircraft navigation or communication or control systems, air traffic control systems, or weapons systems.

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