

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 $V_{DS(on)}$

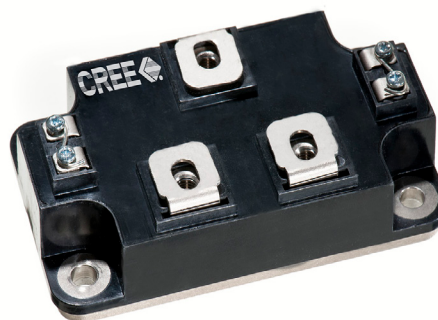
System Benefits

- 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	$V_{GS} = 20V, T_c = 25^\circ\text{C}$	
		105		$V_{GS} = 20V, T_c = 100^\circ\text{C}$	
$I_{D(pulse)}$	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	μA	$V_{DS} = 1200V, V_{GS} = 0V$	
			50	1250		$V_{DS} = 1200V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	
I_{GSS}	Gate-Source Leakage Current			0.25	μA	$V_{GS} = 20V, V_{DS} = 0V$	
$R_{DS(on)}$	On State Resistance		16	20	m Ω	$V_{GS} = 20V, I_D = 20A$	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°C) (125°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°C) (125°C)		1.3 1.4		mJ		
R_G	Internal Gate Resistance		1.25		Ω	$f = 1MHz, V_{AC} = 25mV$	
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		μC	$I_F = 100A, V_R = 600V$ $di_F/dt = 2200A/\mu s, T_J = 25^\circ\text{C}$	
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

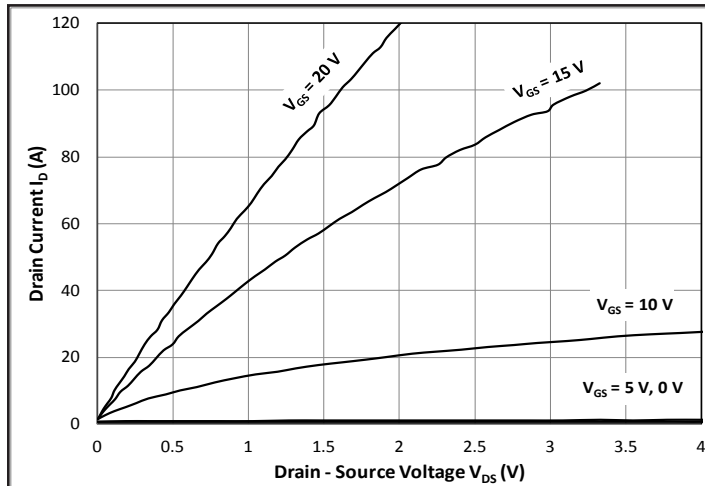


Figure 1. Typical Output Characteristics $T_j = 25^\circ\text{C}$

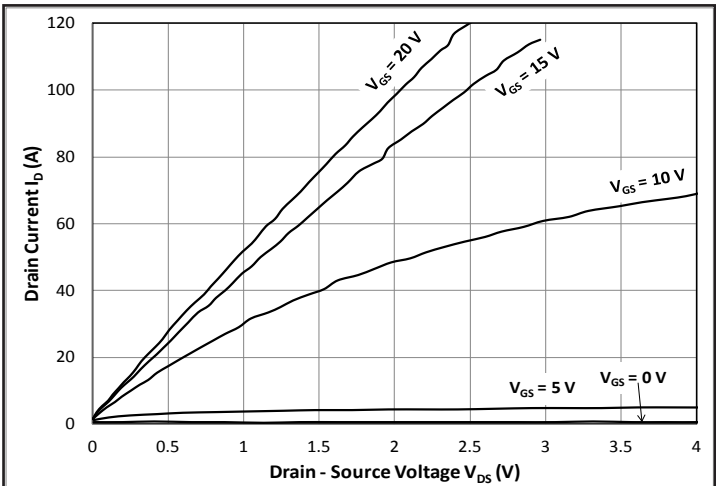


Figure 2. Typical Output Characteristics $T_j = 150^\circ\text{C}$

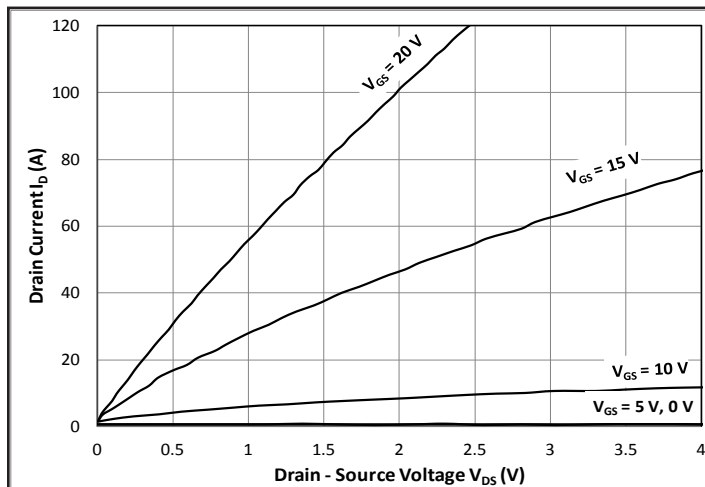


Figure 3. Typical Output Characteristics $T_j = -55^\circ\text{C}$

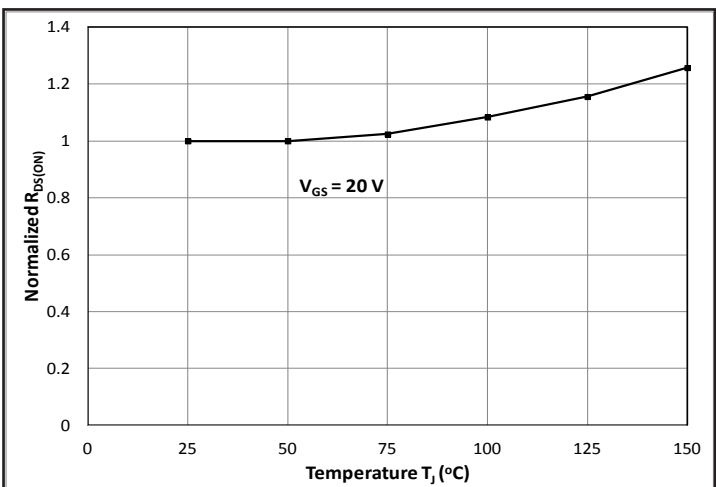


Figure 4. Normalized On-Resistance vs. Temperature

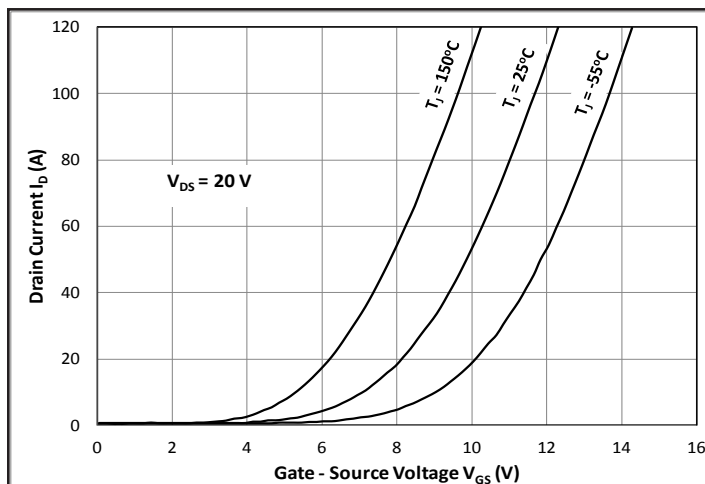


Figure 5. Typical Transfer Characteristics

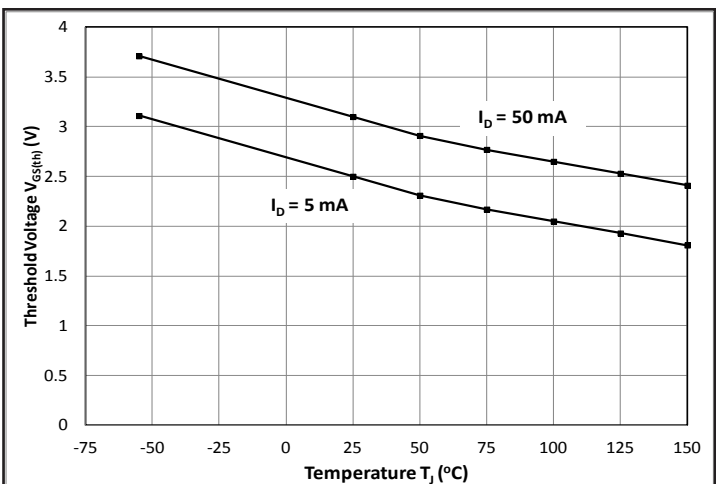


Fig 6. Typical Threshold Voltage vs. Temperature

Typical Performance

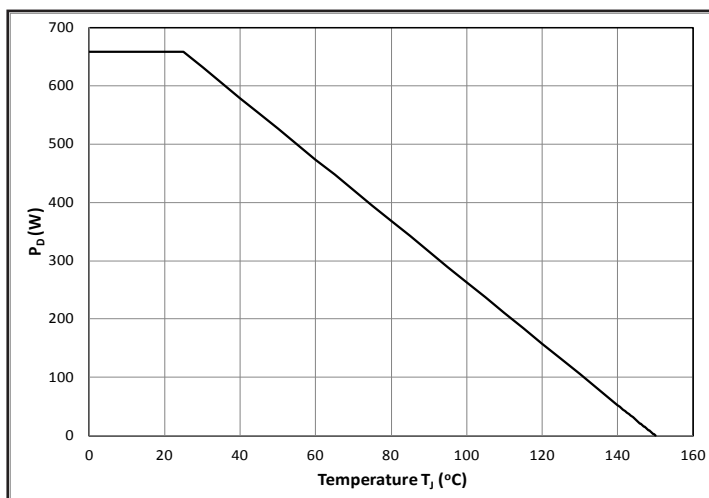


Figure 7. Power Dissipation Derating Curve

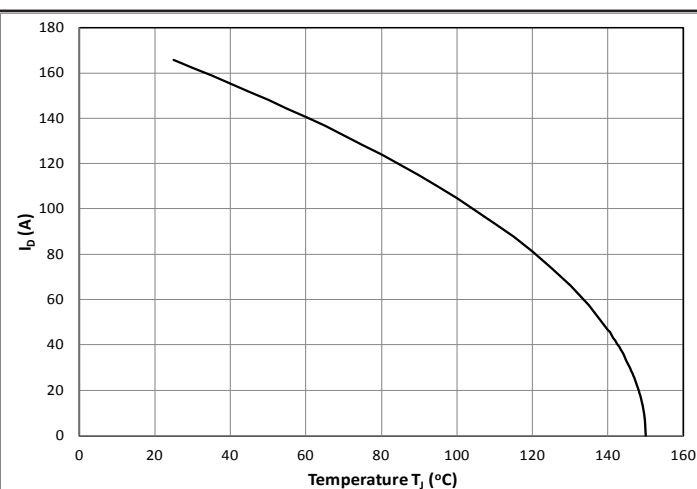


Figure 8. Continuous Current Derating Curve

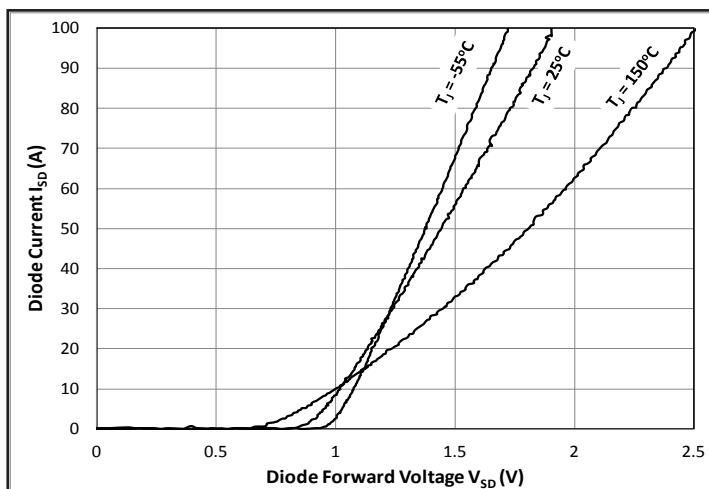


Figure 9. Typical Diode Turn-on

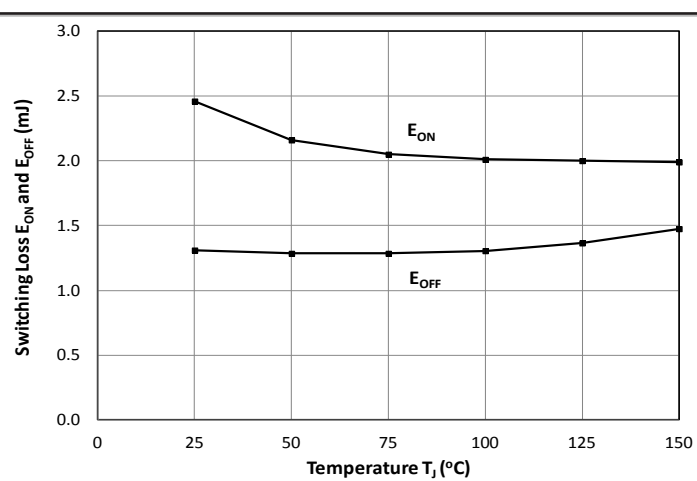
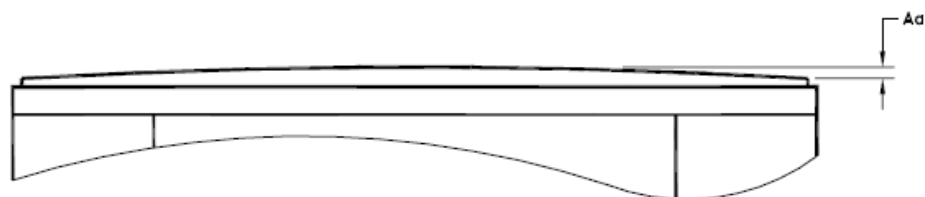
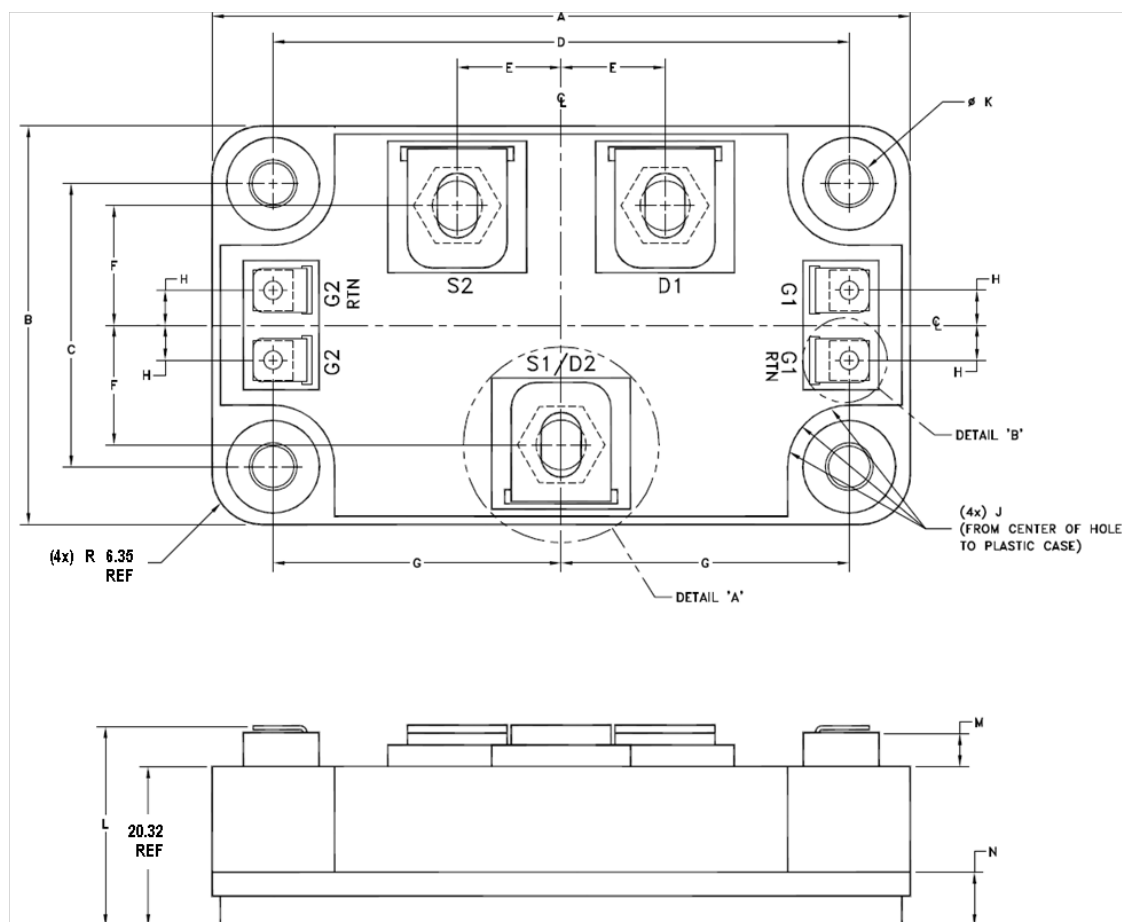


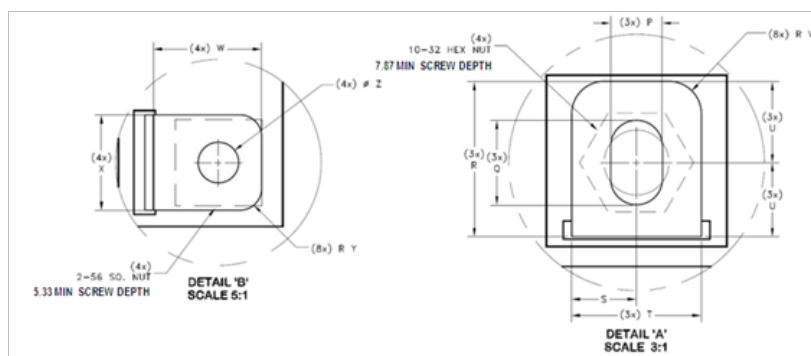
Figure 10. Inductive Switching Energy vs. Temperature

Package Dimensions (mm)



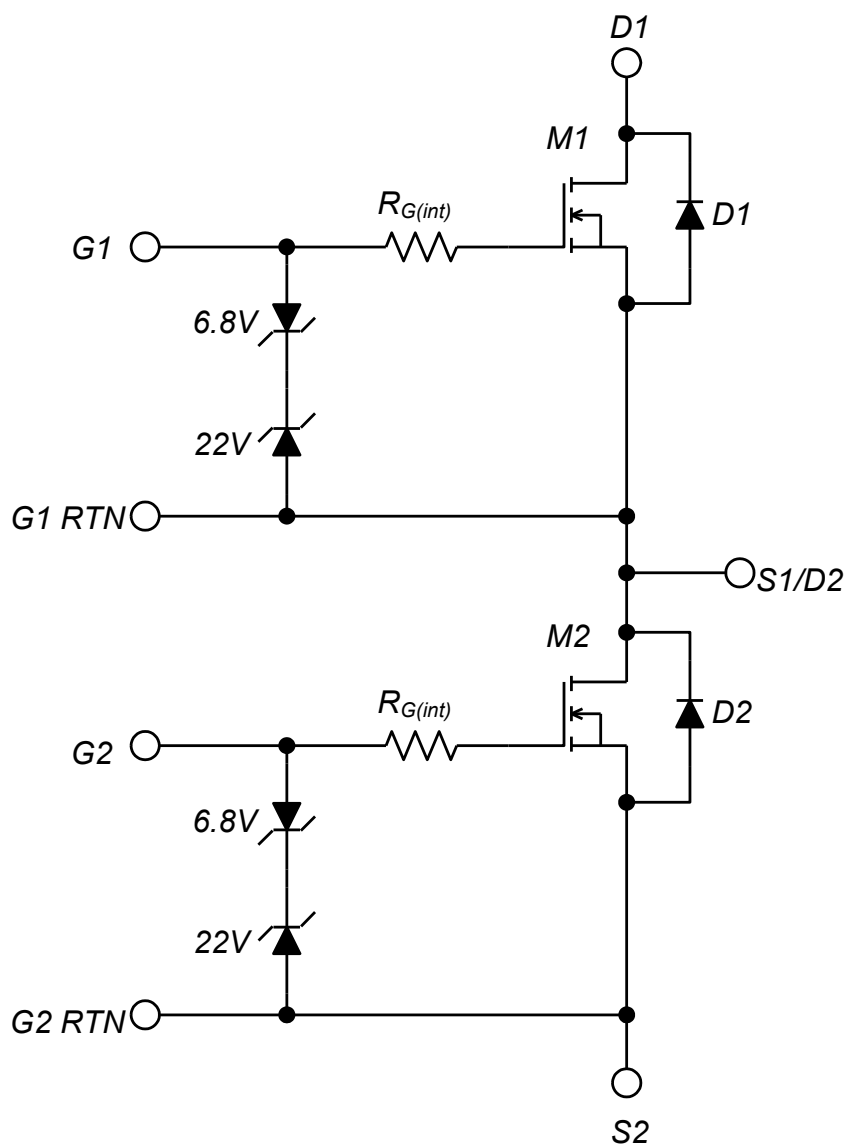
**POWER MODULE (SIDE VIEW)
(EXAGGERATED DOME)
(NOT TO SCALE)**

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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