CAS100H12AM1

1200V, 100A Silicon Carbide Half-Bridge Module

Z-FET[TM] MOSFET and Z-Rec[TM] Diode

V_{DS}	1200 V
I_D (T_C= 100˚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˚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˚C	
		105		V_{GS} = 20V, T_C=100˚C	
$I_{D(pulse)}$	Pulsed Drain Current	400	A	Pulse width t_P = 1ms Limited by T_{jmax},T_C = 25˚C	
T_J	Junction Temperature	150	˚C		
T_C ,T_{STG}	Case and Storage Temperature Range	-55 to +125	˚C		
V_{isol}	Case Isolation Voltage	6000	V	AC, t=1min	
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˚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 = 100uA	
$V_{GS(th)}$	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 = 150ºC	
			2.4			$V_{DS} = V_{GS}$, I_D = 50mA, T_J = 150ºC	
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 = 150ºC	
I_{GSS}	Gate-Source Leakage Current			0.25	μA	V_{GS} = 20V, V_{DS} = 0V	
$R_{DS(on)}$	On State Resistance		16	20	mΩ	V_{GS} = 20V, I_D = 20A	Fig 4
			20	24		V_{GS} = 20V, I_D = 20A, T_J = 150ºC	
g_{fs}	Transconductance		31		S	V_{DS} = 20V, I_D = 100A	Fig 5
			32			V_{DS} = 20V, I_D = 100A, T_J = 150ºC	
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 (25ºC) (125ºC)		2.4 2.0		mJ	V_{DD} = 600V, V_{GS} = -5V/+20V I_D = 100A, R_G = 5Ω Inductive Load	Fig 10
E_{Off}	Turn-Off Switching Energy (25ºC) (125ºC)		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 = 150ºC	
Q_C	Total Capacitive Charge		1.6		μC	I_F = 100A, V_R = 600V di_F/dt = 2200A/μs, T_J = 25ºC	
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 Juction-to-Case for MOSFET		0.16	0.19	K /W		
R_{thJCD}	Thermal Resistance Juction-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

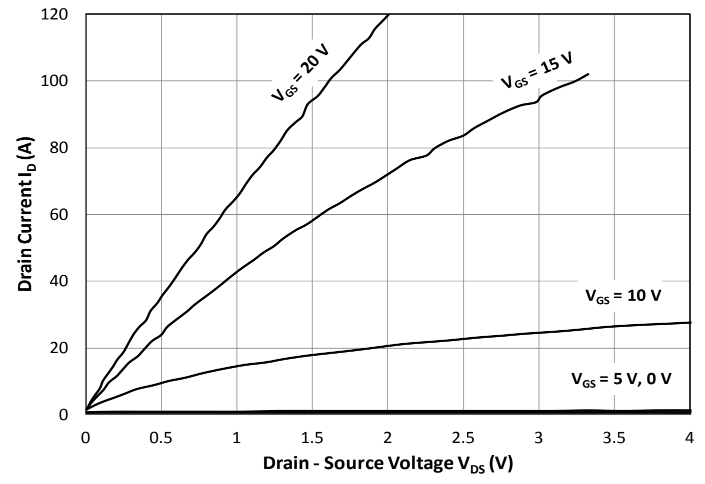


Figure 1. Typical Output Characteristics T_J = 25ºC

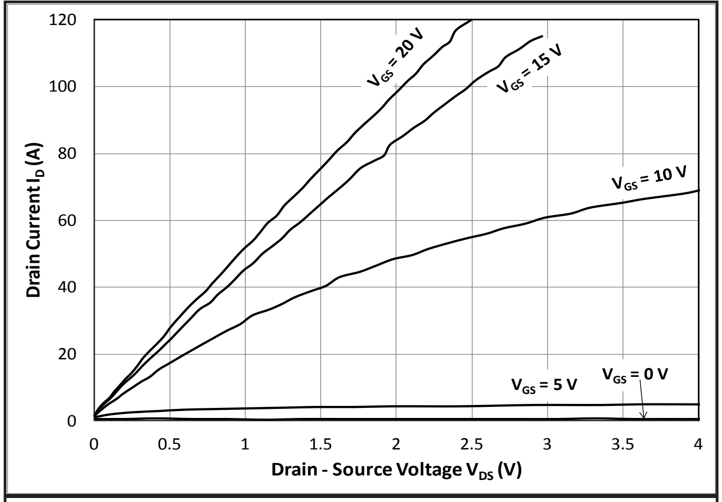


Figure 2. Typical Output Characteristics T_J = 150ºC

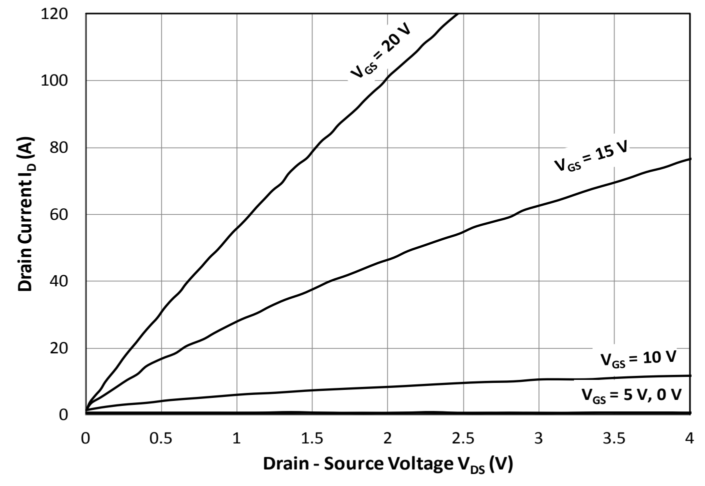


Figure 3. Typical Output Characteristics T_J = - 55ºC

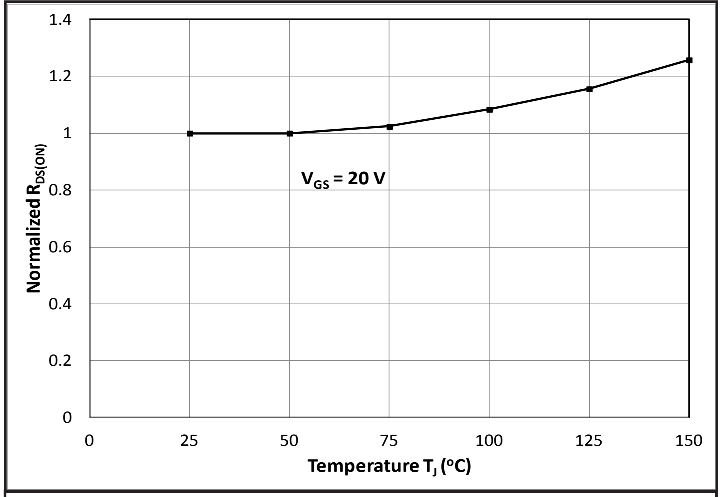


Figure 4. Normalized On-Resistance vs. Temperature

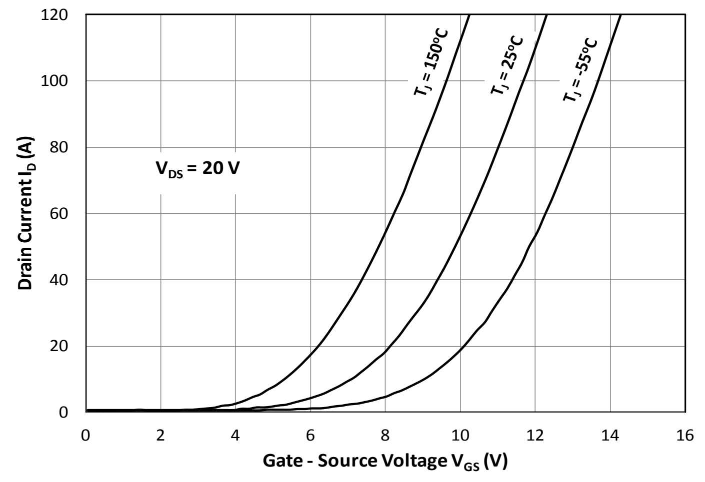


Figure 5. Typical Transfer Characteristics

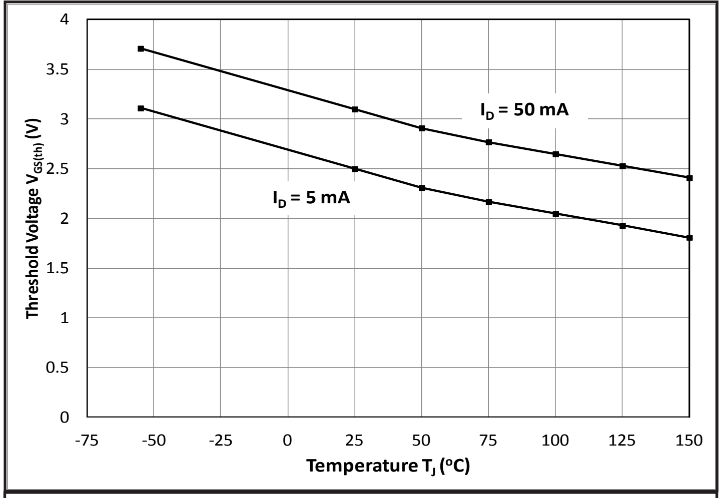


Fig 6. Typical Threshold Voltage vs. Temperature

Typical Performance

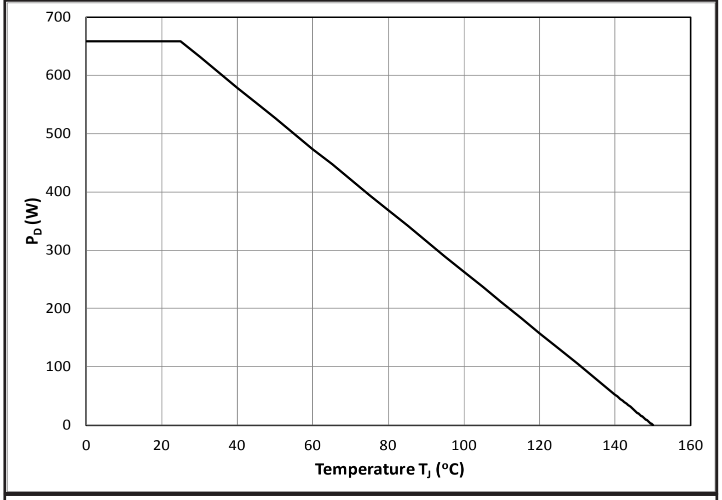


Figure 7. Power Dissipation Derating Curve

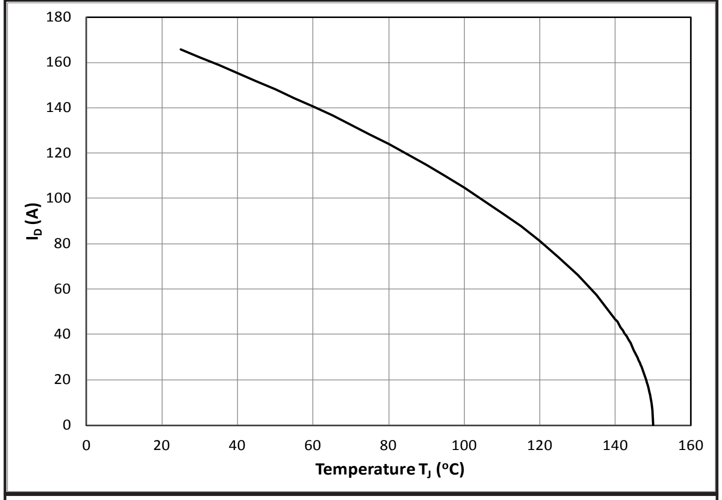


Figure 8. Continuous Current Derating Curve

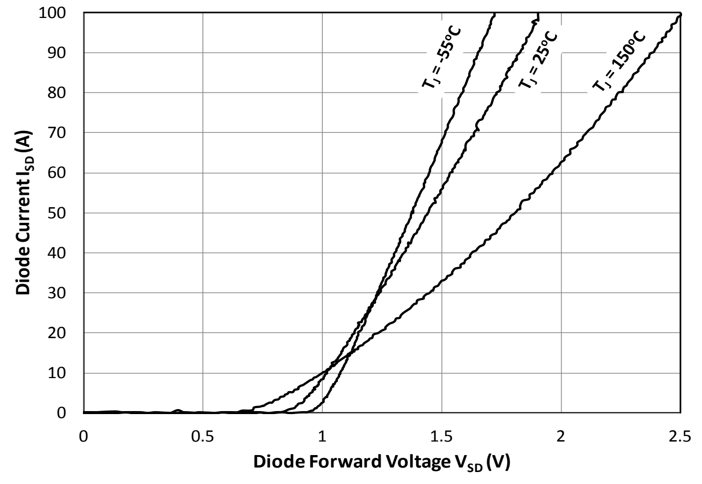


Figure 9. Typical Diode Turn-on

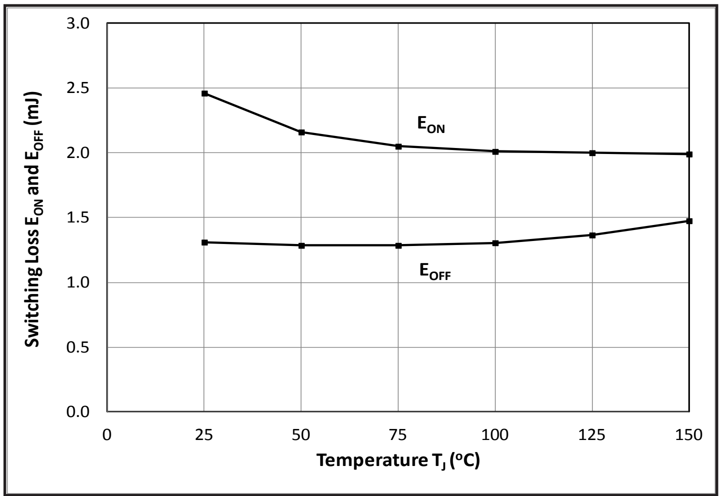
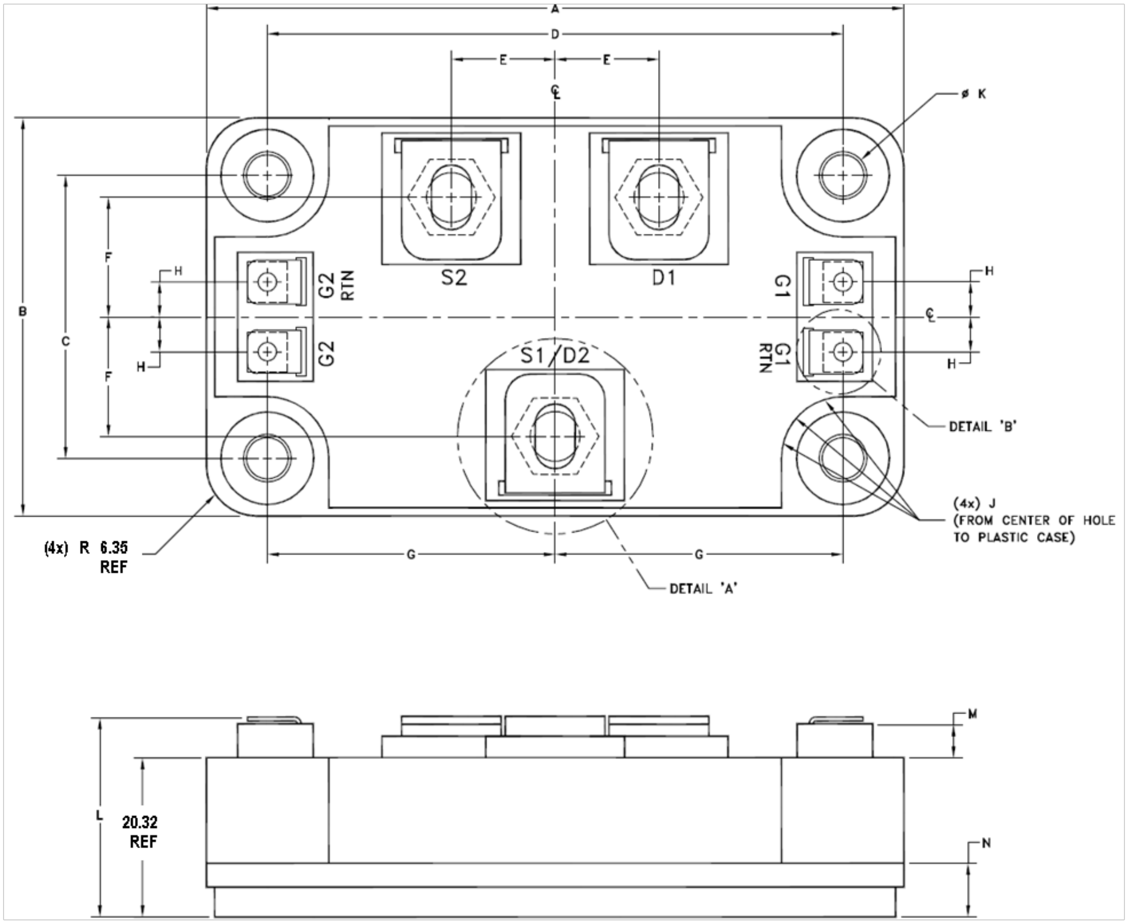
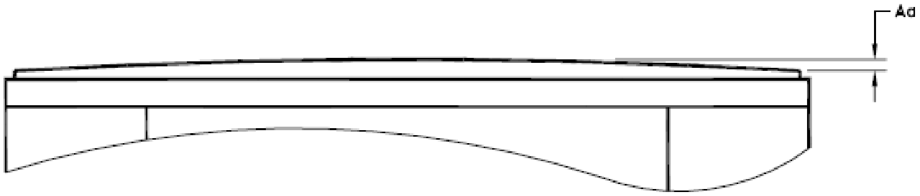


Figure 10. Inductive Switching Energy vs. Temperature

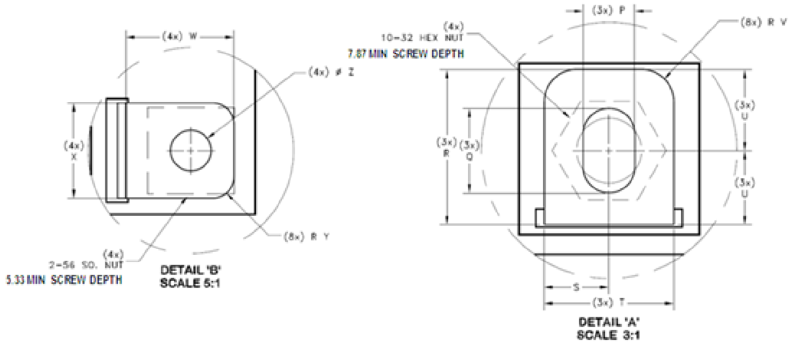
Package Dimensions (mm)





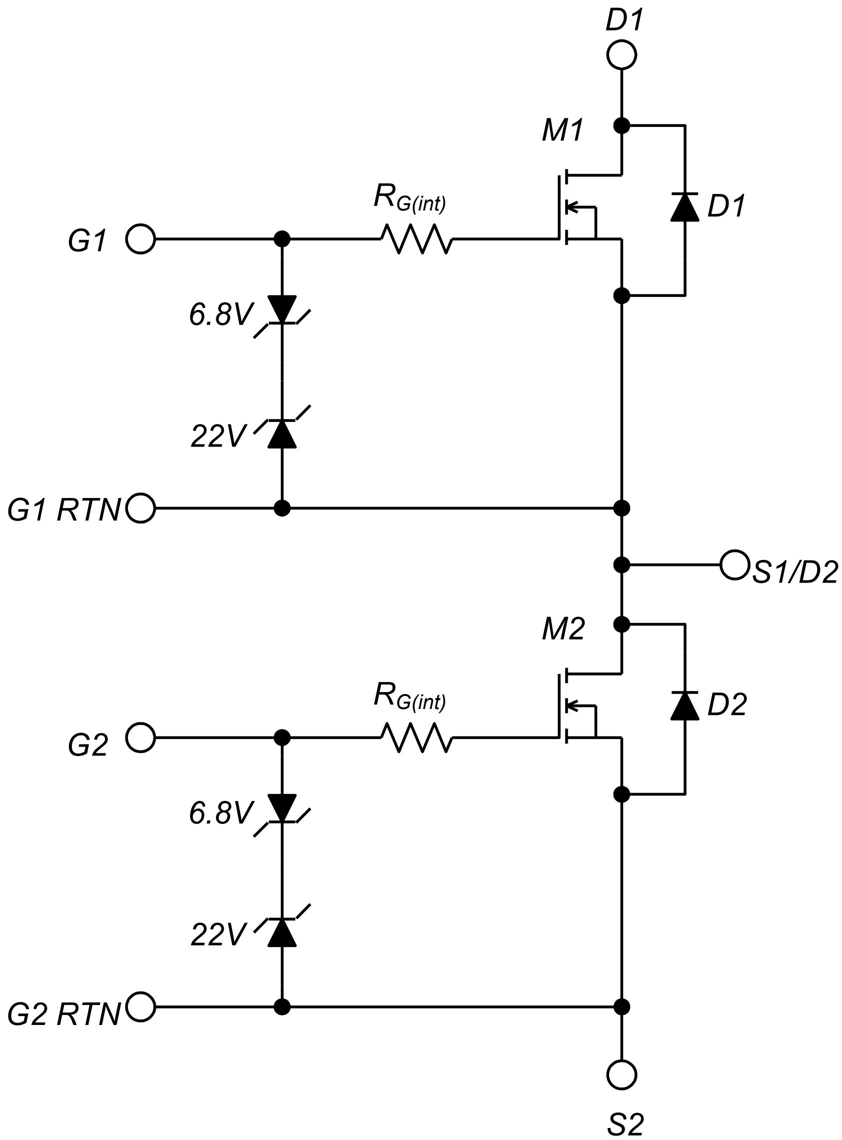
POWER MODULE (SIDE VIEW)
(EXAGGERATED DOME)
(NOT TO SCALE)

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



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