HestiaPower

P1M120HB007P66

Full Silicon Carbide Half-Bridge Power Module
N-CHANNEL ENHANCEMENT MODE

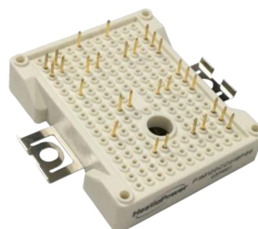
Product Summary

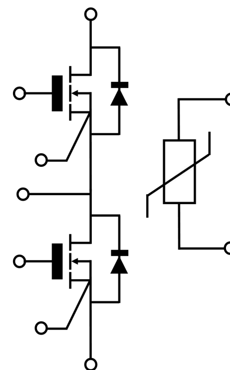
V_{DS}	1200V
$I_{D(@25°C)}$	325A
$R_{DS(on)}$	7mΩ

Features

- Low On-Resistance and High Current Density
- Low Capacitance for High Frequency Operation
- Ease of Temperature Sensing by Embedded NTC
- Positive Temperature Coefficient Device
- RoHS Compliant and Halogen Free
- AlN-AMB Insulator

Product Overview





Benefits

- Higher System Efficiency
- Increase Parallel Device Convenience
- Temperature Independent Switching Behavior
- Allow High Frequency Operation
- Realize Compact and Lightweight Systems

Description

P1M120HB007P66 1200V, 7mΩ SiC power module is a full SiC half-bridge power module that implementing N-channel e-mode SiC MOSFETs. Exploiting the outstanding wide bandgap material properties, this module shows better current density and switching behavior (tail-current-free & temperature independent dynamic performance) compared to conventional Si IGBT modules.

Applications

- Induction Heating
- DC/DC Converter
- Motion/Servo Control
- UPS and SMPS
- Solar/Wind Renewable Energy

Absolute Maximum Ratings (T_c = 25°C unless otherwise specified)

SiC MOSFET

Parameter	Symbol	Test Conditions	Value	Unit
Drain – Source Voltage	$V_{DS, max}$	V_{GS}=0V, I_D=500μA	1200	V
Continuous Drain Current	I_D	V_{GS}=20V, T_C=25°C	325*	A
		V_{GS}=20V, T_C=75°C	270*	
Pulse Drain Current	$I_{D, pulse}$	t_{PW}=200μs	680*	
Power Dissipation	P_D	T_C=25°C	1764*	W
Recommend Gate Source Voltage	$V_{GS, op}$	Static, recommended DC operating values	-5 to 20	V
Maximum Gate Source Voltage	$V_{GS, max}$	Transient operating limit (AC f > 1Hz, duty cycle < 1%)	-10 to 25	

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SiC MOSFET Electrical Characteristics (T_c = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=500uA	1200			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=10V, I_D=180mA		3.0		V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V		<5	450	μA
		V_{DS}=1200V, V_{GS}=0V T_j=175°C		100	1500	
Gate-Source Leakage Current	I_{GSS}	V_{GS}=20V, V_{DS}=0V			1	uA
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS}=20V, I_D=180A		7	9	mΩ
		V_{GS}=20V, I_D=180A, T_j=175°C		12		
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=800V f =1MHz, V_{AC}=25mV		20*		nF
Output Capacitance	C_{oss}			1.0*		
Reverse Transfer Capacitance	C_{rss}			0.17*		
Effective Output Capacitance, Energy Related	$C_{o(er)}$	V_{GS}=0V, V_{DS}=0 to 800V		1.35*		
Effective Output Capacitance, Time Related	$C_{o(tr)}$	I_D=const., V_{GS}=0V, V_{DS}=0 to 800V		1.90*		
Turn On Delay Time	$t_{d(on)}$	V_{DS}=800V, V_{GS}=-4/20V, I_D=180A, R_L=4.4Ω, $R_{G(ext)}$= 0.3 Ω		40*		ns
Rise Time	t_r			39*		
Turn Off Delay Time	$t_{d(off)}$			35*		
Fall Time	t_f			24*		
C_{oss} Stored Energy	E_{oss}	V_{GS}=0V, V_{DS}=800V f =1MHz, V_{AC}=25mV		423*		μJ
Turn-on Switching Energy	E_{on}	V_{DS}=800V, V_{GS}=0/20V, I_D=180A, $R_{G(ext)}$= 0.3 Ω		4293*		
Turn-off Switching Energy	E_{off}			918*		
Internal Gate Resistance	$R_{G(int.)}$	f =1MHz, V_{AC}=25mV		0.13*		Ω
Gate to Source Charge	Q_{GS}	V_{DS}=800V, V_{GS}=-5/+20V, I_D=180A		261*		nC
Gate to Drain Charge	Q_{GD}			576*		
Total Gate Charge	Q_G			1161*		
Gate plateau voltage	V_{pl}			7*		V

Built-in SiC Diode Electrical Characteristics (T_c = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Typ.	Unit
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_{SD}=150A	4.7	V
Continuous Diode Forward Current	I_S	V_{GS}=0V, T_C=25°C	300*	A
Reverse Recovery Time	t_{rr}	V_{GS}=0V, I_{SD}=180A, V_{DS}=400V, di/dt=300A/μs	513*	ns
Reverse Recovery Charge	Q_{rr}		981*	nC
Peak Reverse Recovery Current	I_{rrm}		31.5*	A

* By estimation.

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Thermal Characteristics (T_c = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Value	Unit
Max Junction Temperature	T_{Jmax}		175	°C
Operating Temperature	T_{Jop}		-55~175	
Storage Temperature	T_{stg}		-55~175	
Thermal Resistance, Junction to Case	$R_{th_(j-c)}$	JESD51-14	0.085	°C/W

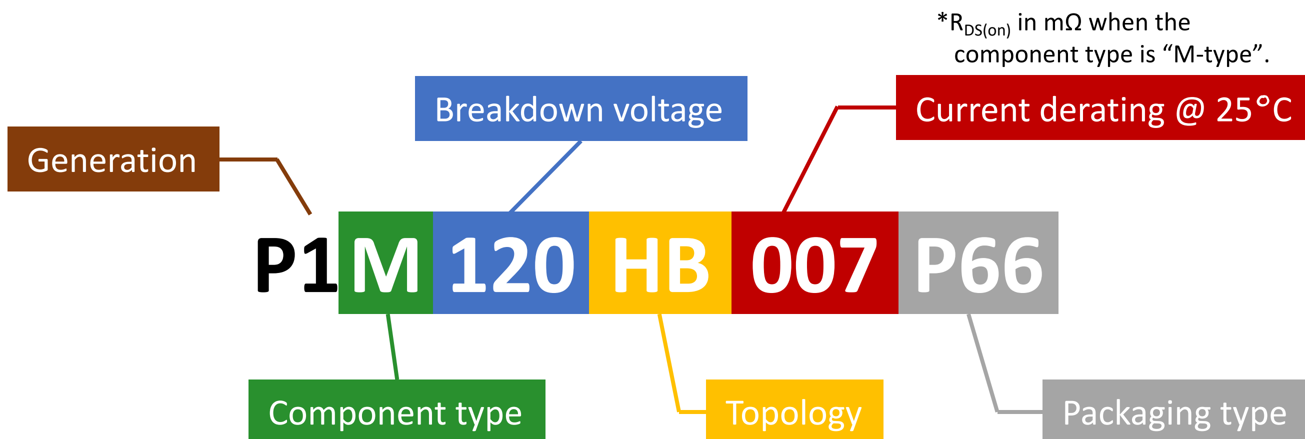
NTC Characteristics

Parameter	Symbol	Test Conditions	Value	Unit
Resistance	R_{25}	T_C =25°C	5	kΩ
B-value	B_{25_150}	$R_2= R_{25} \exp [B_{25_150}(1/T_2 -1/(298.15K))]$	3380	K

Mechanical Characteristics

Parameter	Symbol	Test Conditions	Value	Unit
Isolation Breakdown Voltage	V_{iso}	AC, 50Hz (R.M.S), t=1minute	3000	V
Comparative Tracking Index	CTI		>200	-
Mounting Torque	τ_{tc}	Recommended (M6 screw)	3~5	Nm
Weight	W		25	g

Naming Rule



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Typical Device Performance

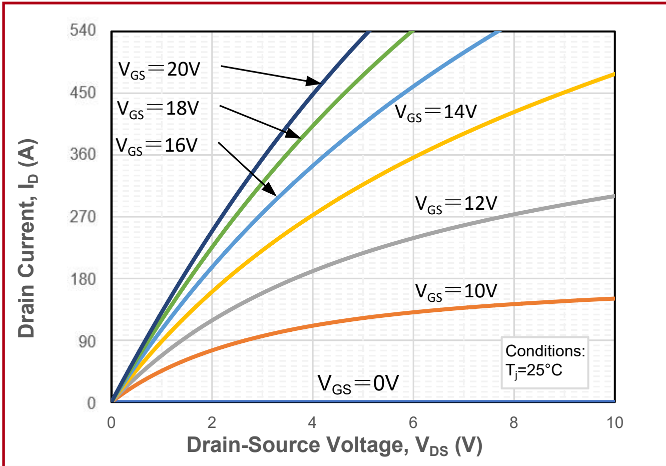

Fig.1 Forward Output Characteristics at T_j=25°C

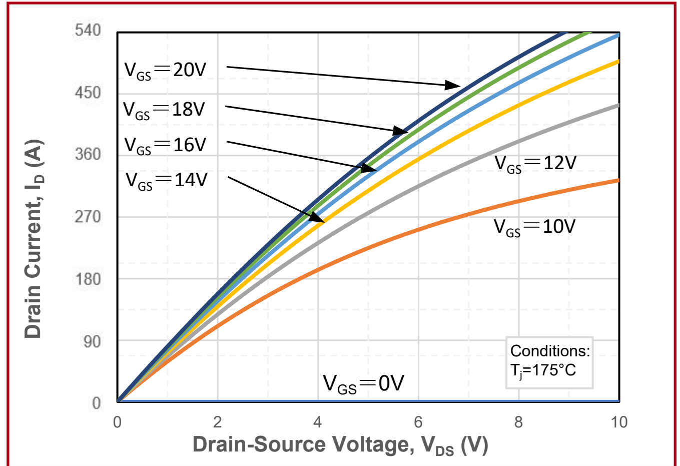

Fig.2 Forward Output Characteristics at T_j=175°C

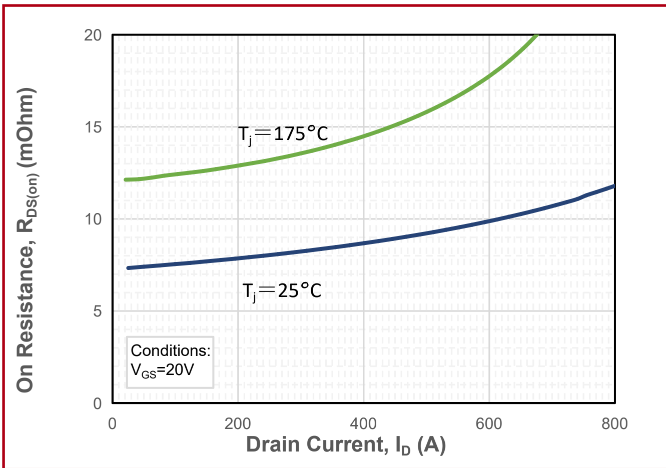

Fig.3 On-Resistance vs. Drain Current for Various T_j

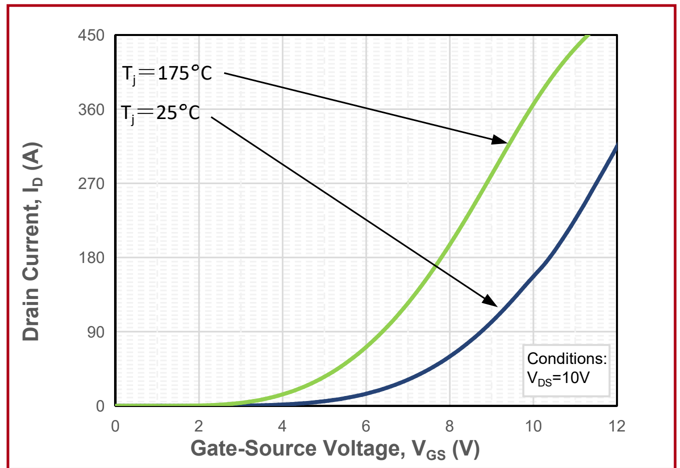

Fig.4 Transfer Characteristics for Various T_j

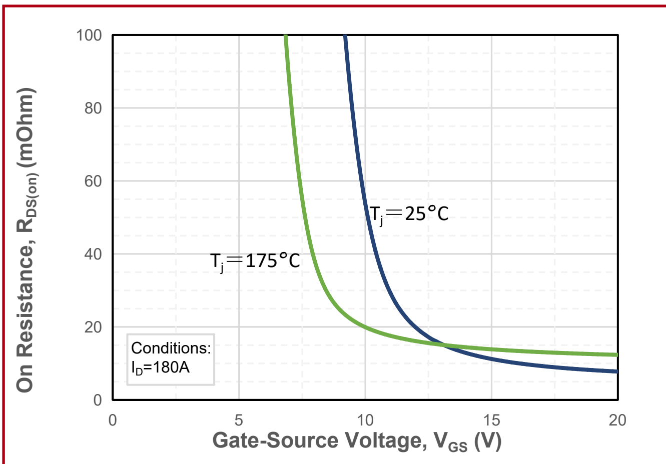

Fig.5 On-Resistance vs. Gate Voltage for Various T_j

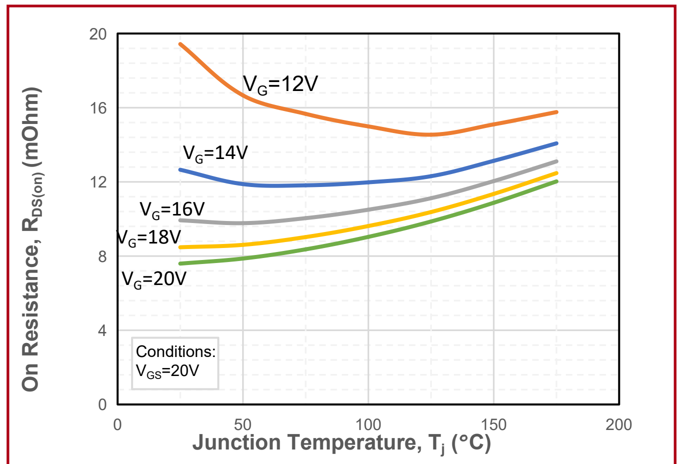

Fig.6 On-Resistance vs. Temperature for Various Gate Voltage

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Typical Device Performance

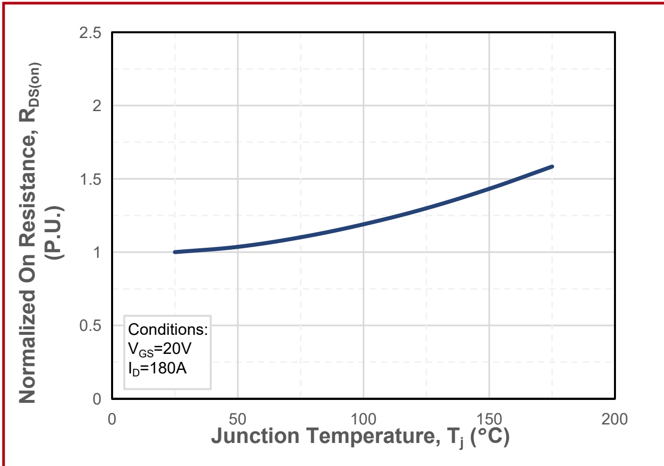

Fig.7 Normalized On-Resistance vs. Temperature

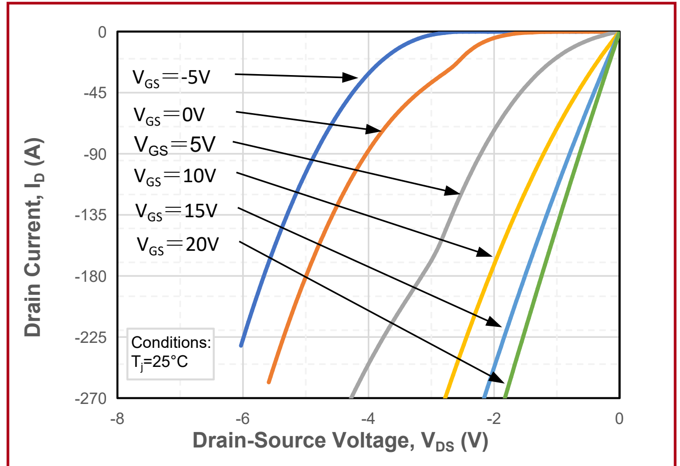

Fig.8 Reverse Output Characteristics at T_j = 25°C

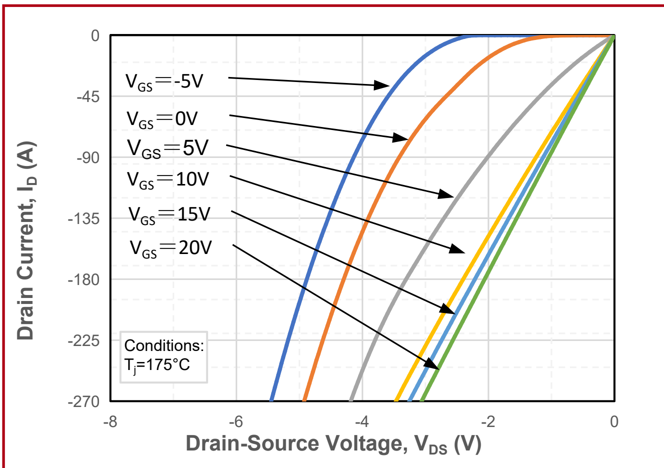

Fig.9 Reverse Output Characteristics at T_j = 175°C

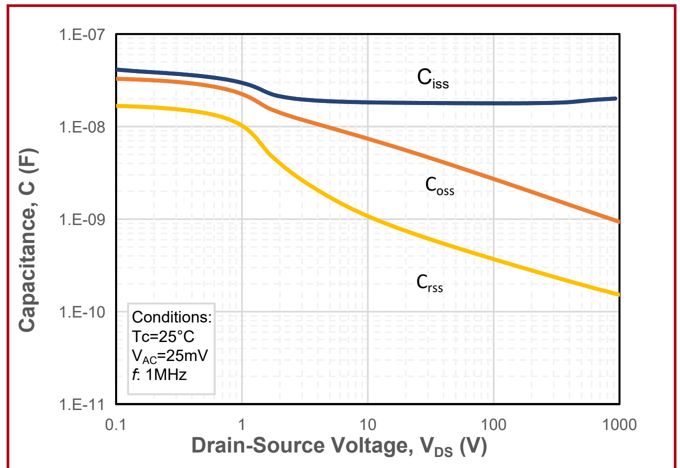

Fig.10 Capacitances vs. Drain to Source Voltage

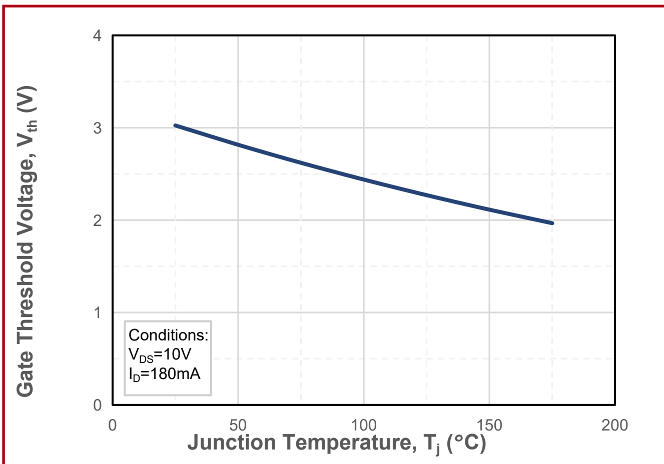

Fig.11 Threshold Voltage vs. Temperature

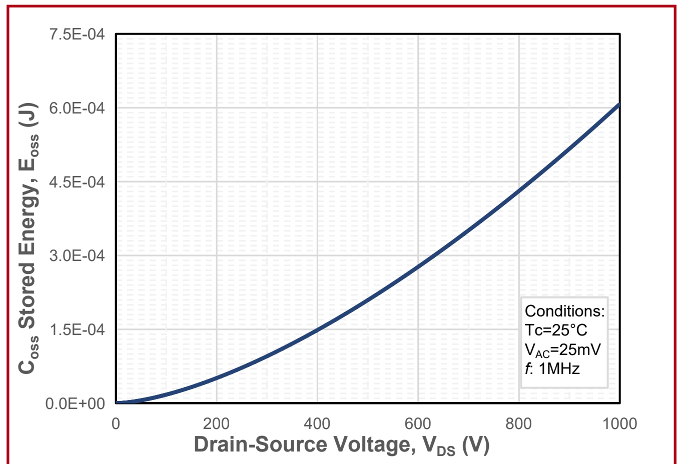

Fig.12 Output Capacitor Stored Energy

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Typical Device Performance

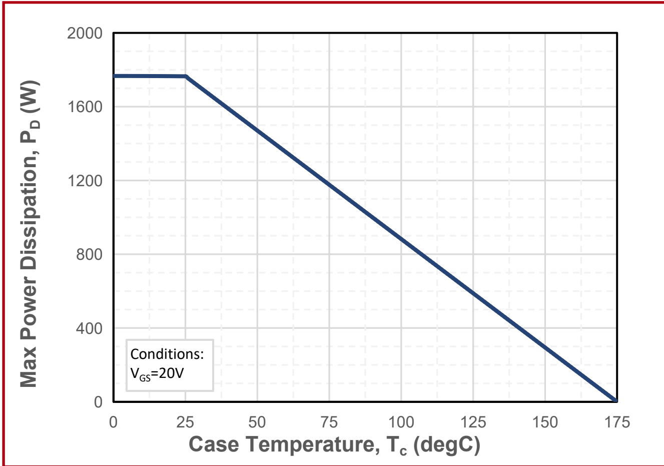

Fig.13 Maximum Power Dissipation Derating vs. Case Temperature

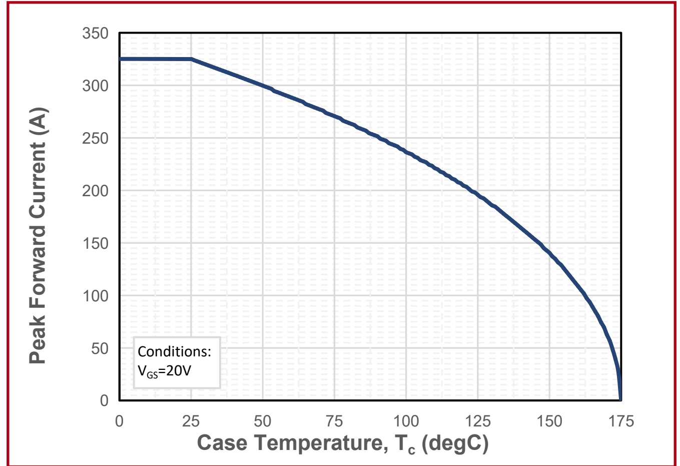

Fig.14 Drain Current Derating vs. Case Temperature

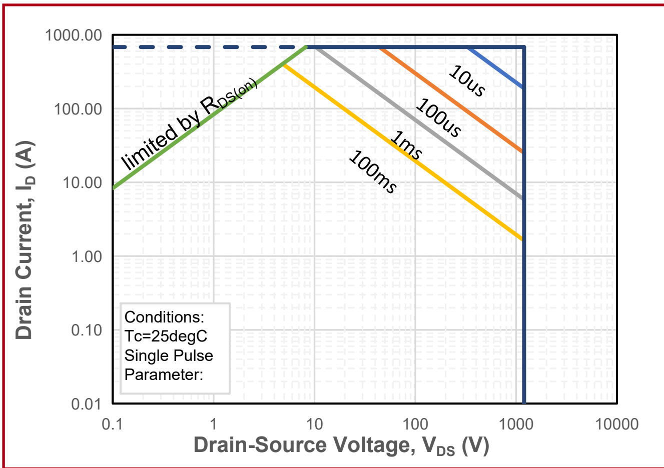

Fig.15 Safe Operating Area

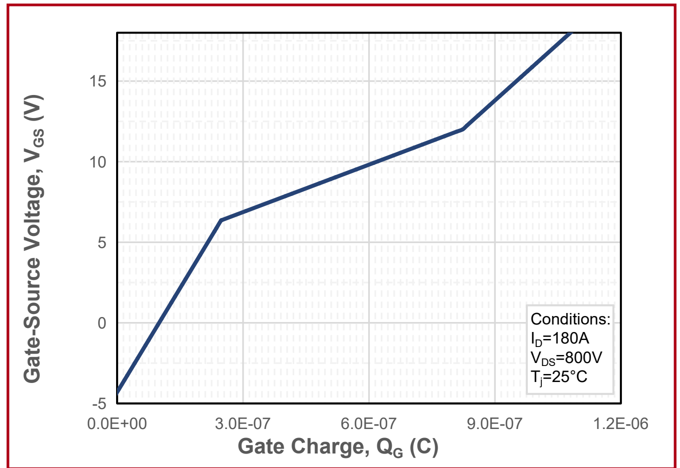

Fig.16 Gate Charge Characteristics

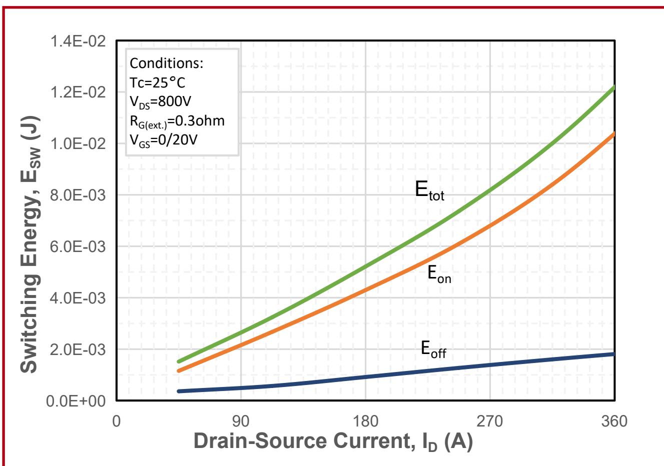

Fig.17 Clamped Inductive Switching Energy vs. Drain Current

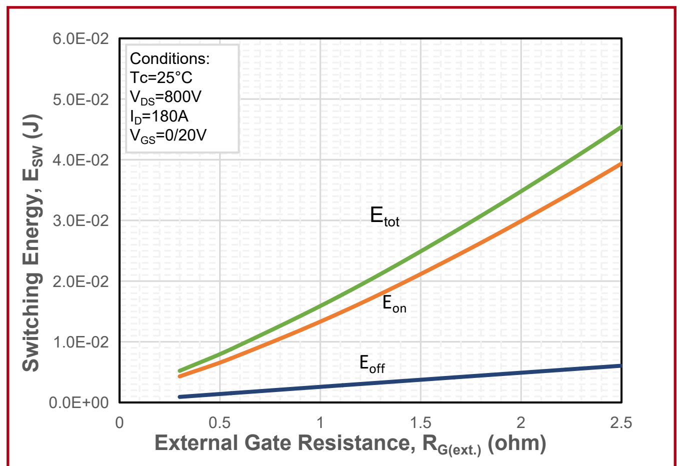

Fig.18 Clamped Inductive Switching Energy vs. External Gate Resistor ($R_{G(ext.)}$)

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Typical Device Performance

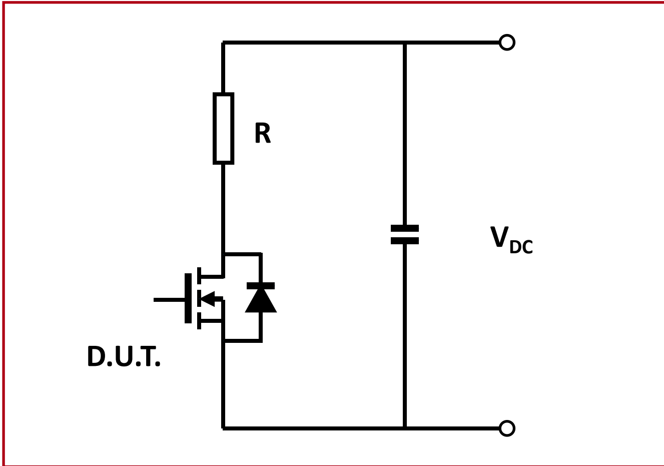

Fig.19 Schematic of Resistive Switching

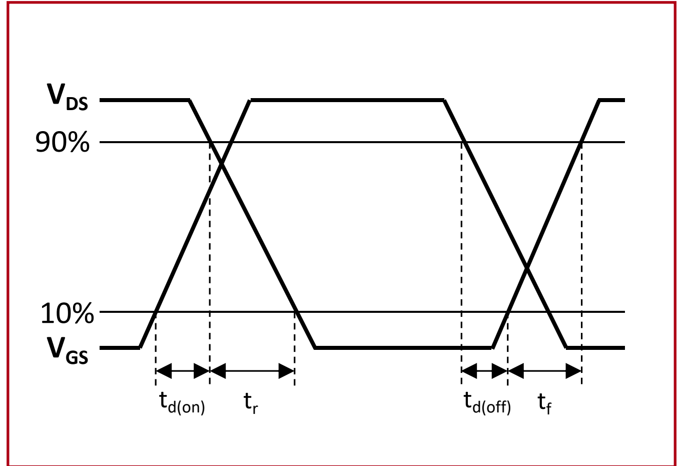

Fig.20 Switching Times Definition

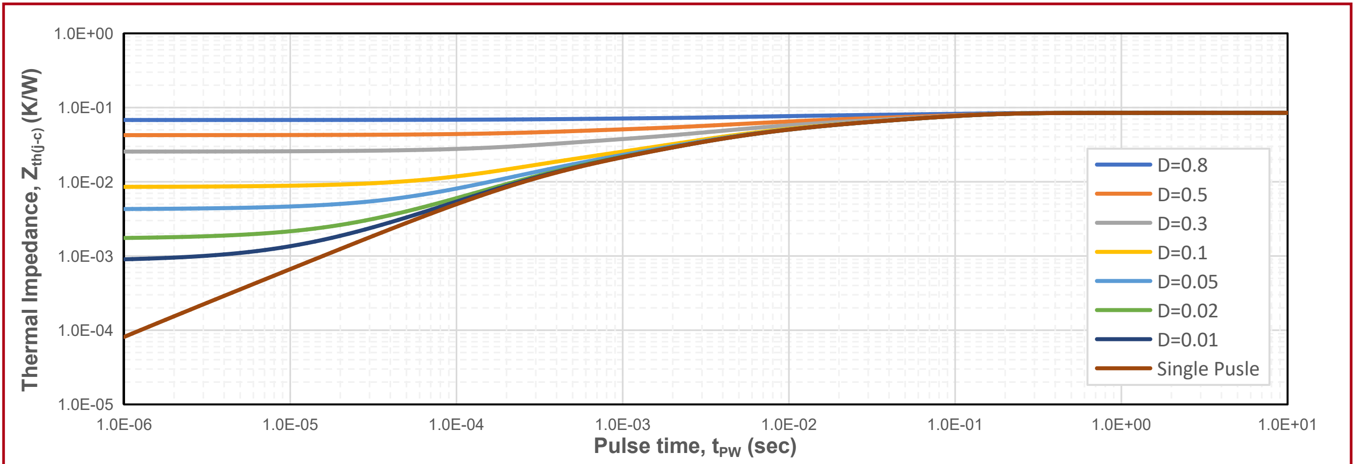

Fig.21 Transient Junction to Case Thermal Impedance

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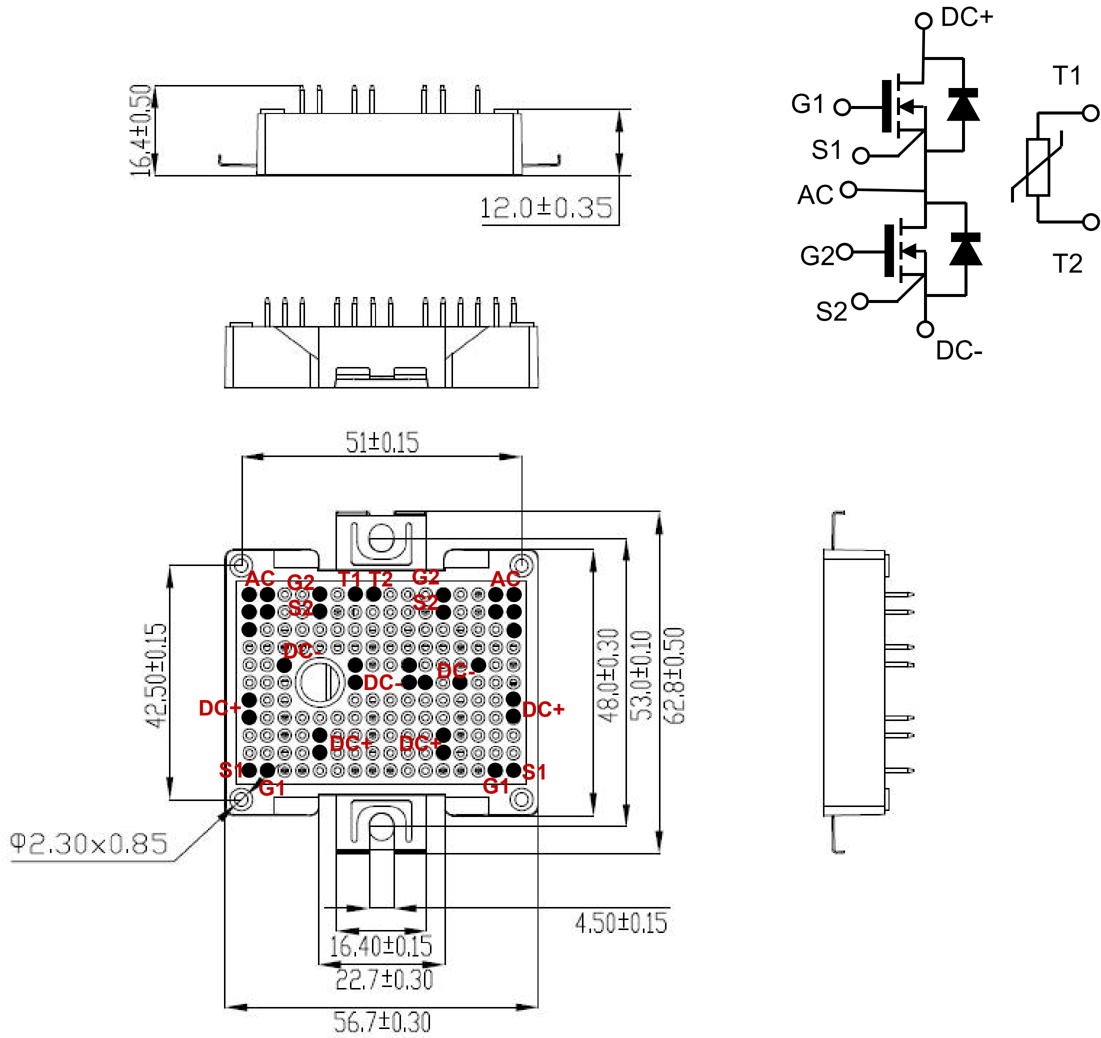
Package Dimensions



Notes

- The information provided herein is subject to change without notice.
- For other information that does not show on this datasheet, please contact us for inquiry.

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