Half-Bridge Module with Sic MOSFET & SBD

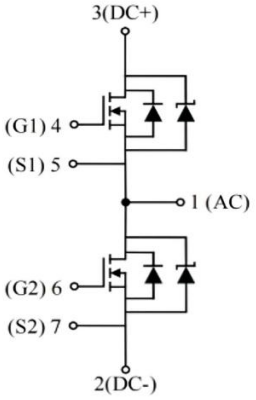
Parameter	Value	Unit
V_{DS}	1200	V
I_D	80	A
$R_{DS(ON)}$	13	mΩ
Q_G	246	nC



Package Type：34mm

Features：

- Ultra-Low Loss
- Low Inductive Design
- Zero Reverse Recovery
- Standard 34mm Package
- High Frequency Operation
- SiC MOSFET with Antiparallel SBD



Applications：

- High Power Converters
- Motor Drives
- UPS Systems

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

Symbol	Parameter	Value	Unit	Test Conditions
V_{DSmax}	Drain-Source Voltage	1200	V	
V_{GSmax}	Gate-Source Voltage	-10/+22	V	Absolute Maximum Values
V_{GSsop}	Gate-Source Voltage	-4/+18	V	Recommended Operational Values
I_D	DC Continuous Drain Current (MOSFET)	113	A	V_{GS}=18V,T_C=25℃,T_J≤175℃
		80		V_{GS}=18V,T_C=90°℃,T_J≤175℃
$I_{F(SBD)}$	DC Source-Drain Current (Schottky Diode)	80	A	V_{GS}=-4V,T_C=90°℃,T_J≤175℃
$I_{D_MOS(pulse)}$	Pulsed Drain Current	160	A	Pulse Width t,Limited by T_{Jmax}
P_D	Power Dissipation	348	W	T_C=25℃,T_J≤175℃

Electrical Characteristics (T_C=25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{DSS}	Drain Source Blocking Voltage	V_{GS}=0V,I_D=100μA	1200			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=27mA	2.0	2.9	4.0	V
		V_{DS}=V_{GS}, I_{DS}=27mA,T_J=150℃		2.2		V
		V_{DS}=V_{GS}, I_{DS}=27mA,T_J=175℃		2.1		V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1200V,V_{GS}=0V		1	50	μA
I_{GSS+}	Gate-Source Leakage Current	V_{GS}=+18V,V_{DS}=0V		1	200	nA
I_{GSS-}	Gate-Source Leakage Current	V_{GS}=-4V,V_{DS}=0V	-200	-1		nA
$R_{DS(on)}$	On State Resistance	V_{GS}=18V,I_{DS}=80A,T_J=25℃		13	17	mΩ
		V_{GS}=18V,I_{DS}=80A,T_J=150℃		24		
		V_{GS}=18V,I_{DS}=80A,T_J=175℃		27		
g_{fs}	Transconductance	V_{DS}=20V,I_{DS}=80A		68		S
		V_{DS}=20V,I_{DS}=80A,T_J=175℃		60		
Q_{GS}	Gate-Source Charge	V_{DD}=800V,V_{GS}=-4V/+18V, I_D=80A		48		nC
Q_{GD}	Gate-Drain Charge			156		
Q_G	Total Gate Charge			246		
C_{iss}	Input Capacitance	V_{GS}=0V,V_{DS}=800V, f=100kHz,V_{AC}=25mV		5.26		nF
C_{oss}	Output Capacitance			251		pF
C_{rss}	Reverse Transfer Capacitance			23.6		pF
$R_{G(int)}$	Internal Gate Resistance	V_{GS}=0V,f=100kHz		10		Ω

(continued)SiC MOSFET Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
E_{on}	Tum-On Energy T_J=25℃ T_J=125℃ T_J=150℃ T_J=175℃		 2.56 2.22 2.18 2.20		mJ	V_{DD}=800V,V_{GS}=-4V/+18V I_D=80A, $R_{G(on)}$=10.0Ω Load=100μH
E_{off}	Tum-Off Energy T_J=25℃ T_J=125℃ T_J=150℃ T_J=175℃		 0.78 1.33 1.38 1.43		mJ	V_{DD}=800V,V_{GS}=-4V/+18V I_D=80A,$R_{G(on)}$=3.9Ω Load=100μH
$t_{d(on)}$	Tum-on delay time T_J=25℃ T_J=125℃ T_J=150℃ T_J=175℃		 53 53 53 51		ns	V_{DD}=800V,V_{GS}=-4V/+18V I_D=80A, $R_{G(on)}$=10.0Ω Load=100μH

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
t_r	Rise Time T_J=25℃ T_J=125℃ T_J=150℃ T_J=175℃		 22 21 21 21		ns	V_{DD}=800V,V_{GS}=-4V/+18V I_D=80A, $R_{G(on)}$=10.0Ω Load=100μH
$t_{d(of)}$	Turn-off delay time T_J=25℃ T_J=125℃ T_J=150℃ T_J=175℃		 118 138 144 149		ns	V_{DD}=800V,V_{GS}=-4V/+18V I_D=80A,$R_{G(on)}$=3.9Ω Load=100μH
t_f	Fall Time T_J=25℃ T_J=125℃ T_J=150℃ T_J=175℃		 34 42 44 44		ns	V_{DD}=800V,V_{GS}=-4V/+18V I_D=80A,$R_{G(on)}$=3.9Ω Load=100μH

Diode electrical characteristics (T_C=25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{DC}	DC Blocking Voltage	1200			V	T_J=25℃
V_{RRM}	Repetitive Peak Reverse Voltage	1200			V	T_J=25℃
V_{RSM}	Surge Peak Reverse Voltage	1200			V	T_J=25℃
$I_{F(SBD)}$	Continuous DC Forward Current		80		A	T_C=90℃,T_J≤175℃
I_{FRM}	Repetitive Peak Forward Current		160		A	Pulse Width tp Limited by T_{Jmax}
I_{FSM}	Surge Non-repetitive Forward Current		450		A	T_J=25℃,tp=10ms,Half Sine Pulse
V_F	Diode Forward Voltage (Schottky Diode)		1.5		V	I_F=80A,T_J=25℃,V_{GS}=-4V
			2.2			I_F=80A,T_J=150°℃,V_{GS}=-4V
			2.4			I_F=80A,T_J=175℃,V_{GS}=-4V
I_R	Reverse Current		1		μA	V_R=1200V,T_J=25℃
			11			V_R=1200V,T_J=175℃
C	TotalCapacitive		2980		pF	V_R=1V,f=100kHz
			248		pF	V_R=400V,f=100kHz
			190		pF	V_R=800V,f=100kHz
Q_C	Total Capacitive Charge		260		nC	V_R=800V
T_{RR}	Reverse Recovery Time T_J=25℃ T_J=125℃ T_J=150℃ T_J=175℃		 22 21 22 22		ns	V_{DD}=800V,V_{GS}=-4V/+18V I_D=80A,$R_{G(on)}$=10.0Ω, $R_{G(off)}$=3.9Ω Load=100μH
Q_{RR}	Reverse Recovery Charge T_J=25℃ T_J=125℃ T_J=150℃ T_J=175℃		 0.58 0.60 0.61 0.61		μC	

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
I_{RRM}	Peak Reverse Recovery Current T_J=25℃ T_J=125℃ T_J=150℃ T_J=175℃		 44 45 45 46		A	V_{DD}=800V,V_{GS}=-4V/+18V I_D=80A,$R_{G(on)}$=10.0Ω, $R_{G(off)}$=3.9Ω Load=100μH
E_{RR}	Reverse Recovery Energy T_J=25℃ T_J=125℃ T_J=150℃ T_J=175℃		 0.35 0.35 0.36 0.36		mJ	

Thermal characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{thjc\ MOS}$	Juction-to-Case Thermal Resistance for MOSFET	Per SiC MOSFET	--	--	0.364	K/W
$R_{thjc\ SBD}$	Juction-to-Case Thermal Resistance for Schottky Diode	Per SiC Schottky Diode	--	--	0.334	K/W

Module Physical Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions
	Material of Module Baseplate	Cu		
	Internal Isolation	AMB		
L_{stray}	Stray Inductance	26	nH	Measured Between Terminals Input and Output
$R_{CC+HE\ LS}$	Lead Resistance,Low-Side	1.50	mΩ	T_C=25℃,I_D=80A,Terminal-Die
R_{CC+E_HS}	Lead Resistance,High-Side	1.08	mΩ	T_C=25℃,I_D=80A,Terminal-Die
V_{isol}	Isolation Test Voltage	3.0	kV	RMS,f=50Hz,t=1min
T_{stg}	Storage Temperature	-40 to 125	℃	
da	Clearance	9.5	mm	Terminal to Terminal
		17.0	mm	Terminal to Heatsink
ds	Creepage	20.0	mm	Terminal to Terminal
		17.0	mm	Terminal to Heatsink
M_S	Mounting Torque of Screws	2.5~6.0	N·m	Baseplate To Heatsink,Screw M5
M_T	Mounting Torque of Screws	3.5~6.0	N·m	To Terminals,Screw M5
G	Weight	170	g	
CTI	Comparative Tracking Index	>200		

Typical Characteristics

Figure 1. Output Characteristics T_J=175℃

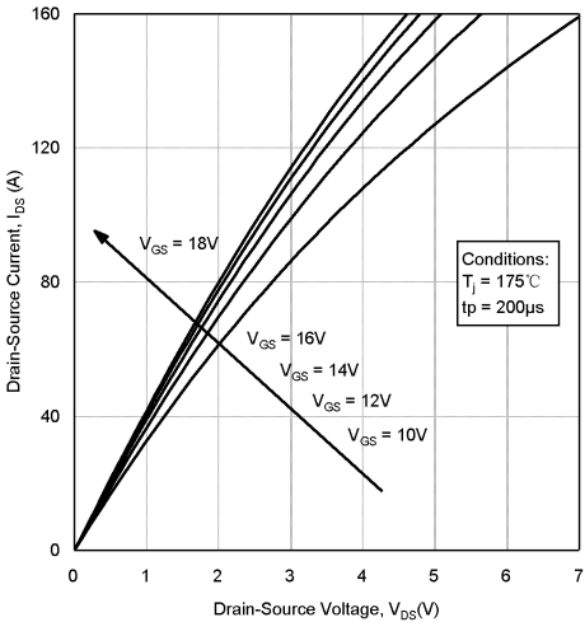


Figure 2. Output Characteristics vs. Temperature

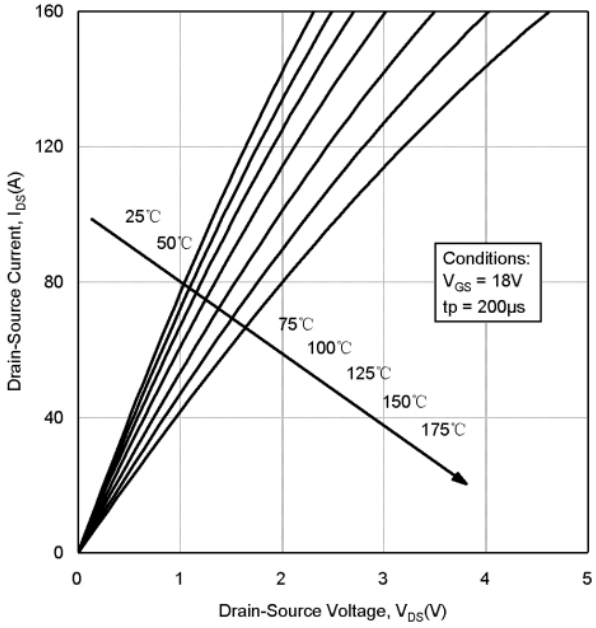


Figure 3. Transfer Characteristics

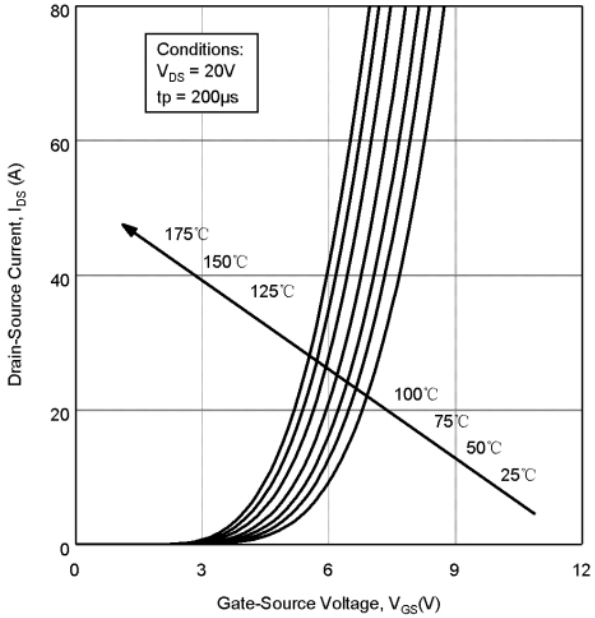


Figure 4. Normalized On-Resistance vs. Junction Temperature

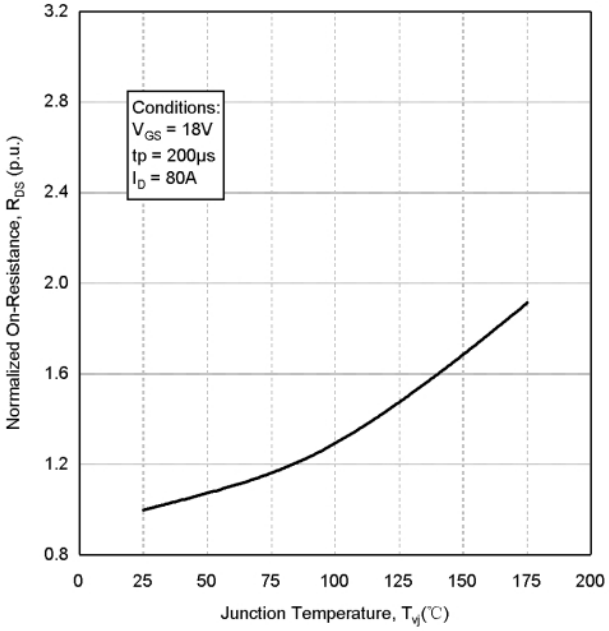


Figure 5. Gate Charge Characteristics

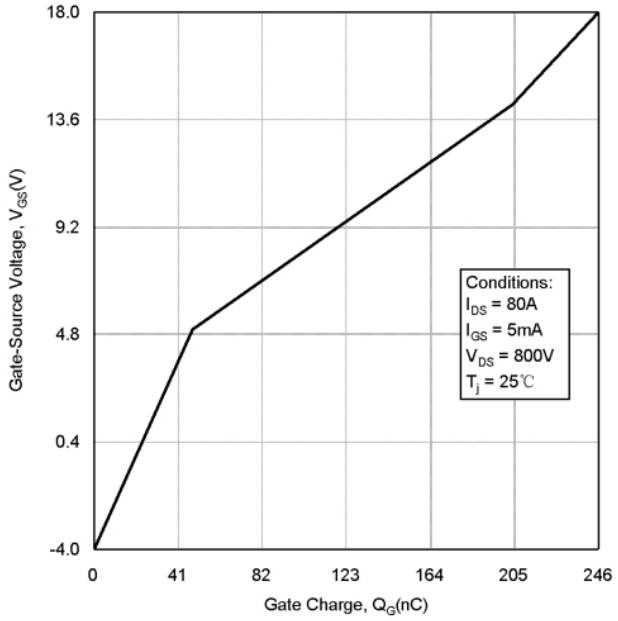


Figure 6. Threshold Voltage Temperature Junction

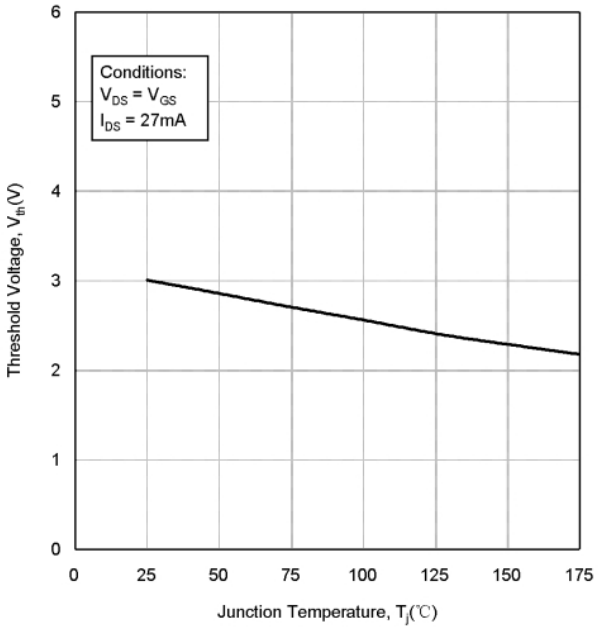


Figure 7. Capacitance vs Drain-Source Voltage（0-800V）

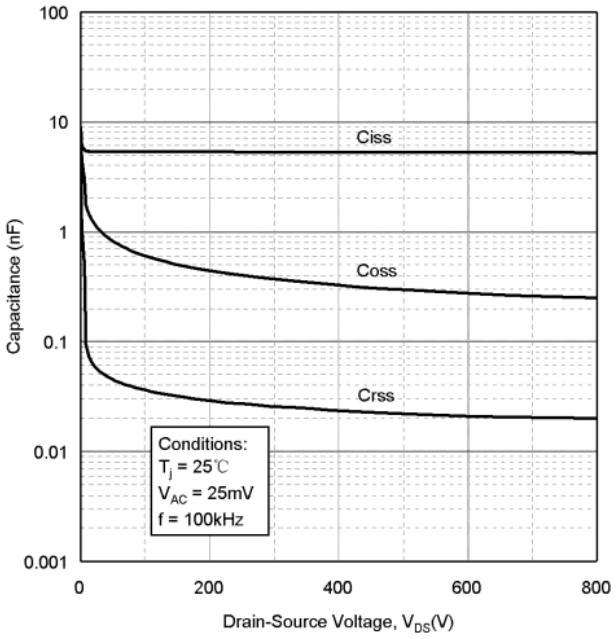


Figure 8. Source Drain Output Characteristics

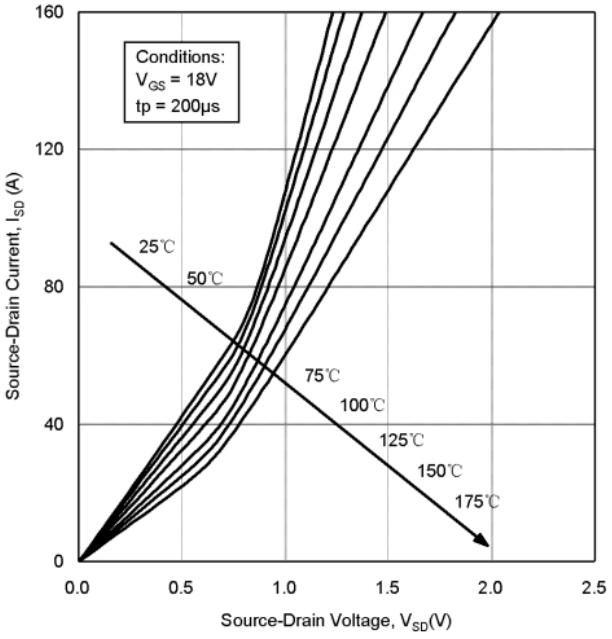


Figure 9. 3rd Quadrant Characteristic vs. Junction Temperature at V_{GS}=-4V (Diode)

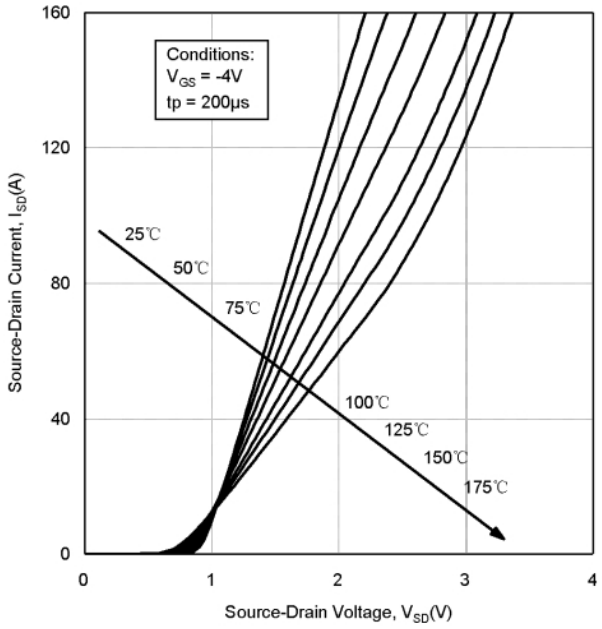


Figure 10. Temperature MOSFET Switching Energy vs. Junction

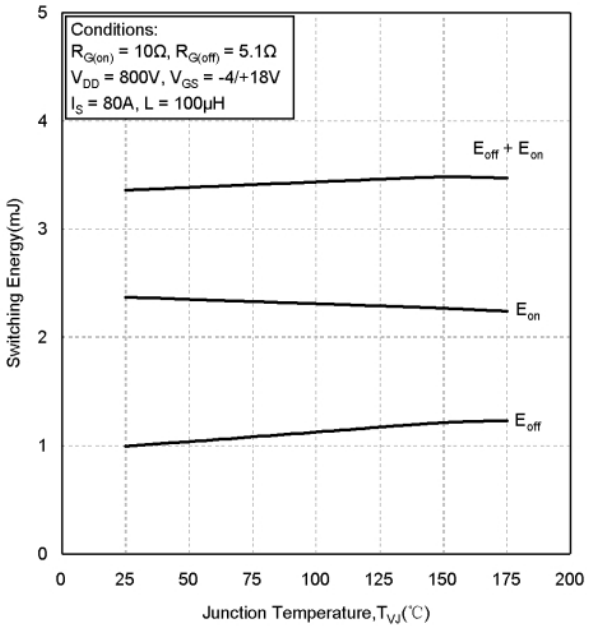


Figure 11. Inductive Switching Energy vs. Drain Current (T_J=150℃,T_J=175℃)

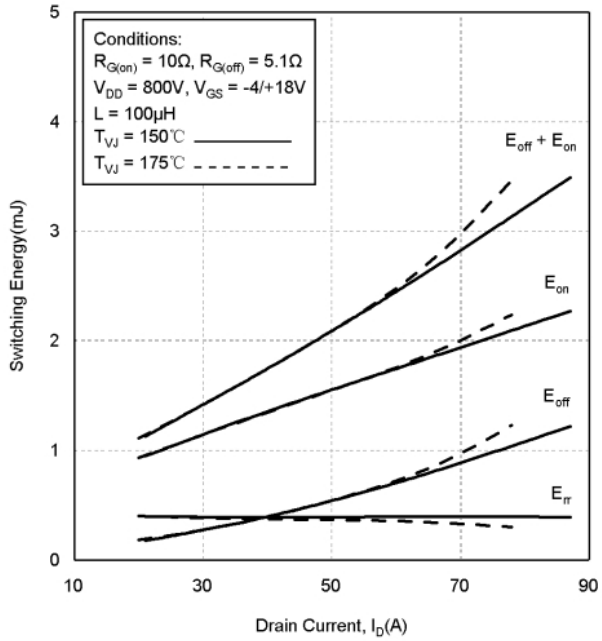


Figure 12. Inductive Switching Energy Vs. RG(ext) (T_J=150℃,T_J=175℃)

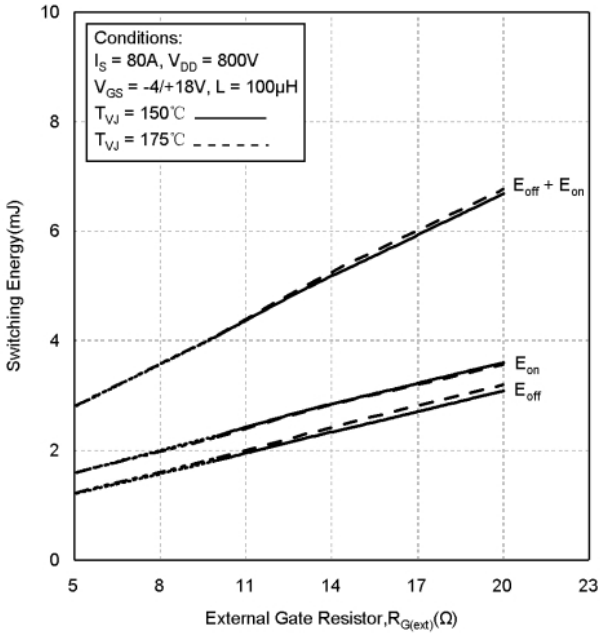


Figure 13. Reverse Recovery Energy Vs. Junction Temperature

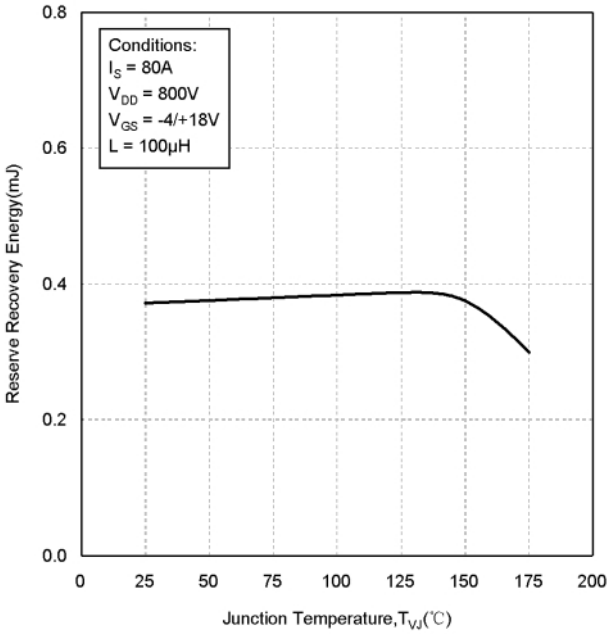


Figure 14. Reverse Recovery Energy vs. External Gate Resistance

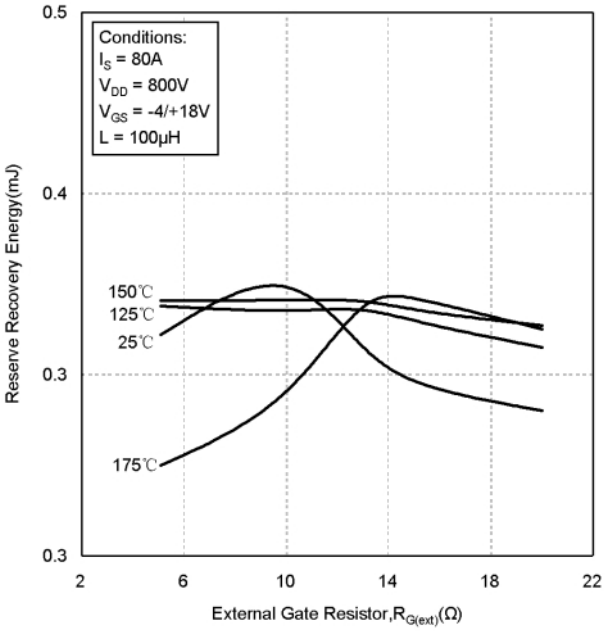


Figure 15. MOSFET Junction to Case Transient Thermal Impedance, Zthjc (K/W)

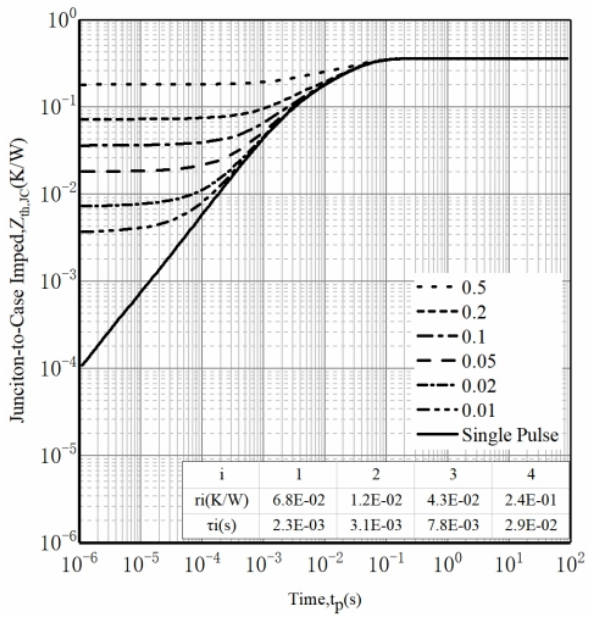


Figure 16. Example of acceptable V_{GS} waveform

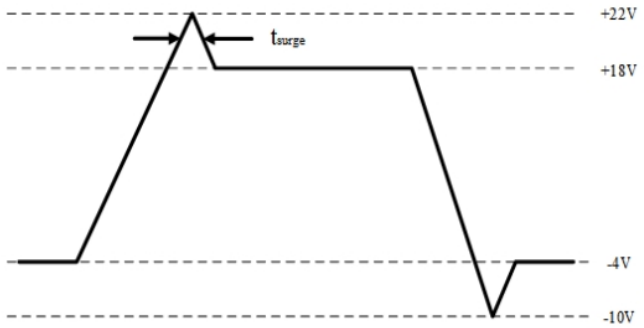


Figure 17. Wavelength for Switching Test

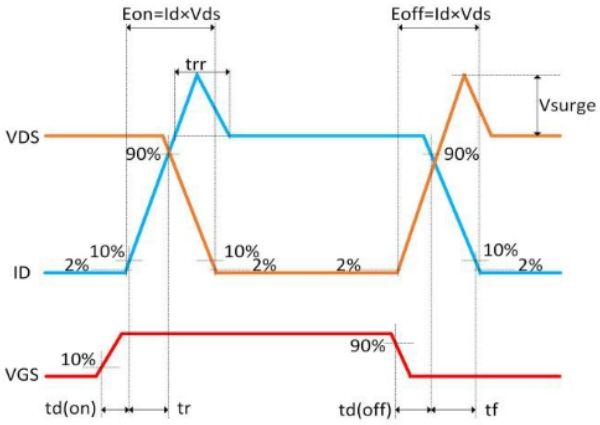
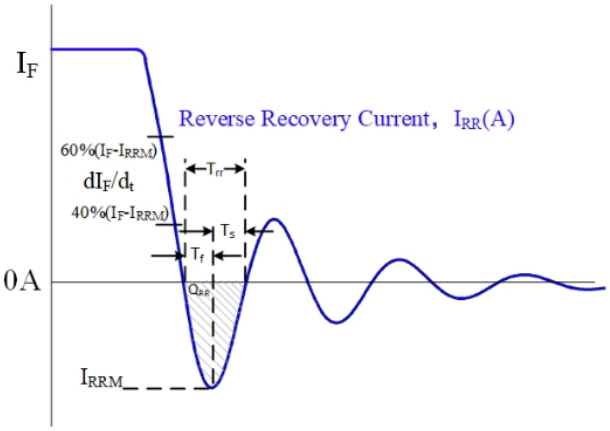
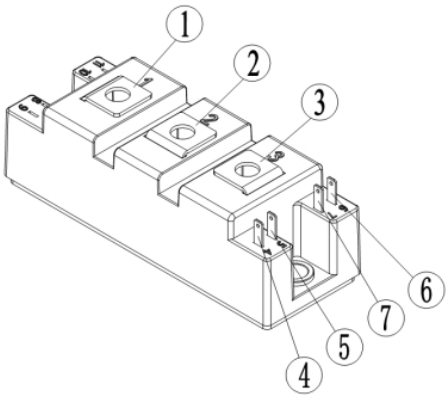
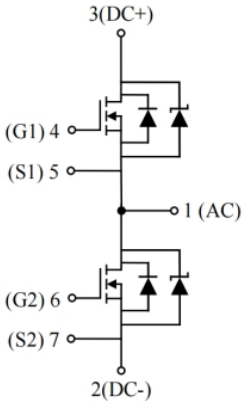


Figure 18. Reverse Recovery Definitions

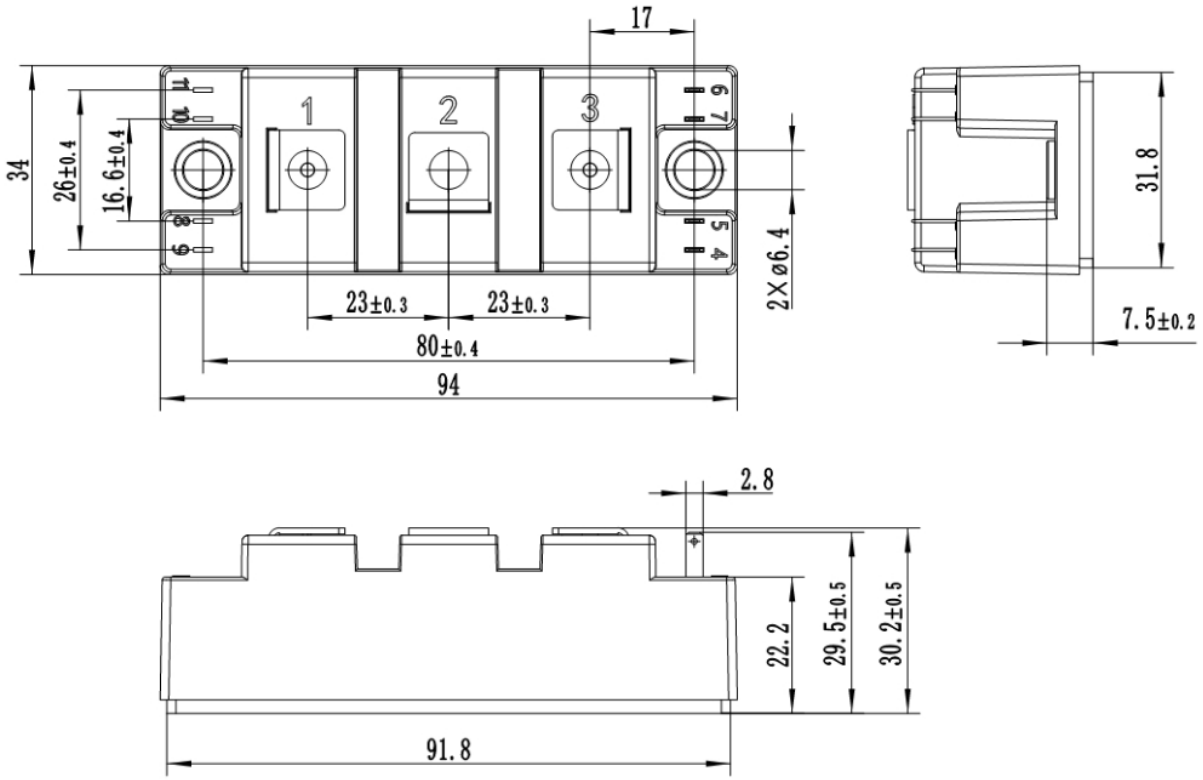


Circuit Diagram





Package Outlines(Unit: mm):



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