

PRODUCT FEATURES

- Latest Generation SiC MOSFET with Low $R_{DS(on)}$
- Ideal for High Frequency Switching Applications
- Compatible with 18 V Gate Drive Voltage
- Real Kelvin Source Connection

APPLICATIONS

- Solar Inverters
- DC/DC Converters
- UPS
- Battery Chargers
- Motor Drives
- Induction Heating
- Switch Mode Power Supplies



MODULE CHARACTERISTICS ($T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{isol}	Isolation test voltage	RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ sec.}$	3000	V
		RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min.}$	2500	V
T_{stg}	Storage Temperature		-40~125	$^{\circ}\text{C}$
Torque	to heatsink	Recommended (M4)	0.7~1.1	Nm
	to terminal	Recommended (M4)	0.7~1.1	Nm
Weight			27	g

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MMN13J120U

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

Symbol	Parameter/Test Conditions		Values	Unit
V_{DS}	Drain-source Voltage	$V_{GS}=0\text{ V}, I_D=100\mu\text{A}$	1200	V
$V_{GS,max}$	Gate-source Voltage (Dynamic)	AC ($f > 1\text{ Hz}$)	-10/+23	V
$V_{GS,op}$	Gate-source Voltage (Static)	Static	-4/+18	V
I_D	Continuous Drain Current	$V_{GS}=15\text{V}, T_C=25^\circ\text{C}, T_{vj,max}=175^\circ\text{C}$	103	A
		$V_{GS}=18\text{V}, T_C=25^\circ\text{C}, T_{vj,max}=175^\circ\text{C}$	107	A
		$V_{GS}=18\text{V}, T_C=100^\circ\text{C}, T_{vj,max}=175^\circ\text{C}$	76	A
$I_{D,pulse}$	Pulsed Drain Current	tp limited by $T_{vj,max}$	200	A
P_D	Power Dissipation	$T_C=25^\circ\text{C}$, limited by $T_{vj,max}$	265	W
T_{vj}	Virtual Junction temperature		-40~175	$^\circ\text{C}$

Electrical Characteristic ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
$V_{BR(DSS)}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D=100\mu\text{A}$	1200			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=28\text{mA}, T_{vj}=25^\circ\text{C}$		2.8		V
		$V_{DS}=V_{GS}, I_D=28\text{mA}, T_{vj}=175^\circ\text{C}$		2.0		V
I_{DSS}	Reverse Bias Drain Current	$V_{DS}=1200\text{V}, V_{GS}=0\text{V}, T_{vj}=25^\circ\text{C}$		1.0	20	μA
I_{GSS}	Gate-source Leakage Current	$V_{DS}=0\text{V}, V_{GS}=23\text{V}, T_{vj}=25^\circ\text{C}$		10	100	nA
		$V_{DS}=0\text{V}, V_{GS}=-10\text{V}, T_{vj}=25^\circ\text{C}$	-100	-10		nA
$R_{DS(on)}$	Static Drain-source On-state Resistance	$I_D=100\text{A}, V_{GS}=15\text{V}, T_{vj}=25^\circ\text{C}$		16.3		m Ω
		$I_D=100\text{A}, V_{GS}=15\text{V}, T_{vj}=175^\circ\text{C}$		25.1		
		$I_D=100\text{A}, V_{GS}=18\text{V}, T_{vj}=25^\circ\text{C}$		13.4		m Ω
		$I_D=100\text{A}, V_{GS}=18\text{V}, T_{vj}=175^\circ\text{C}$		23.8		
g_{fs}	Transconductance	$V_{DS}=20\text{V}, I_D=100\text{A}, T_{vj}=25^\circ\text{C}$		94		S
		$V_{DS}=20\text{V}, I_D=100\text{A}, T_{vj}=175^\circ\text{C}$		84		
R_{gint}	Internal Gate Resistance	$V_{AC}=25\text{mV}, f = 1\text{MHz}$		6.2		Ω
C_{iss}	Input Capacitance	$V_{DS}=1000\text{V}, V_{GS}=0\text{V}, f = 100\text{kHz}$		6230		pF
C_{oss}	Output Capacitance			260		pF
C_{rSS}	Reverse Transfer Capacitance			10		pF
E_{oss}	Coss Stored Energy			270		μC

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Electrical Characteristic ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn on Delay Time		50		ns
t_r	Rise Time		40		
$t_{d(off)}$	Turn off Delay Time		106		
t_f	Fall Time		24		
E_{on}	Turn on Energy		2.11		mJ
E_{off}	Turn off Energy		1.07		
$t_{d(on)}$	Turn on Delay Time		50		ns
t_r	Rise Time		50		
$t_{d(off)}$	Turn off Delay Time		130		
t_f	Fall Time		29		
E_{on}	Turn on Energy		3.13		mJ
E_{off}	Turn off Energy		1.38		
Q_{GS}	Gate to Source Charge		86		nC
Q_{GD}	Gate to Drain Charge	$V_{DS}=800\text{V}, I_D=100\text{A}, V_{GS}=-4/18\text{V}$	88		nC
Q_G	Total Gate Charge		284		nC
R_{thJC}	Junction to Case Thermal Resistance			0.565	K/W

Body Diode

Electrical Characteristic ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Diode Forward Voltage	$I_{SD}=50\text{A}, V_{GS}=-4\text{V}, T_{vj}=25^\circ\text{C}$	4.5		V
		$I_{SD}=50\text{A}, V_{GS}=-4\text{V}, T_{vj}=175^\circ\text{C}$	4		
I_S	Continuous Diode Forward Current		108		A
t_{rr}	Reverse Recovery Time		37		ns
I_{RRM}	Max. Reverse Recovery Current	$V_{GS}=-4\text{V}, I_S=100\text{A}, V_R=800\text{V}$ $di_F/dt=-6900\text{A}/\mu\text{s}, T_{vj}=25^\circ\text{C}$	82.1		A
Q_{RR}	Reverse Recovery Charge		1.8		μC
t_{rr}	Reverse Recovery Time		65		ns
I_{RRM}	Max. Reverse Recovery Current	$V_{GS}=-4\text{V}, I_S=100\text{A}, V_R=800\text{V}$ $di_F/dt=-7200\text{A}/\mu\text{s}, T_{vj}=175^\circ\text{C}$	163		A
Q_{RR}	Reverse Recovery Charge		5.63		μC

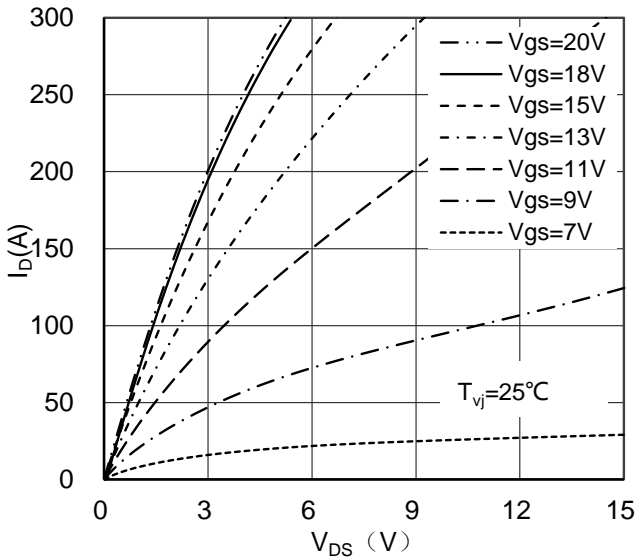


Figure 1. Typical Output Characteristics

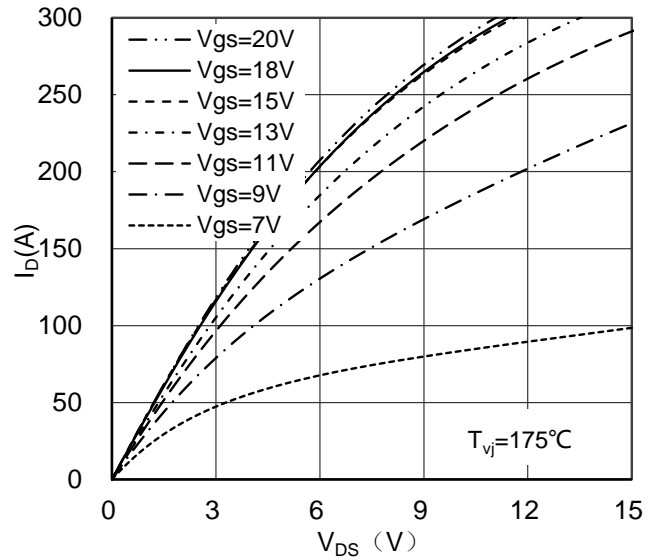


Figure 2. Typical Output Characteristics

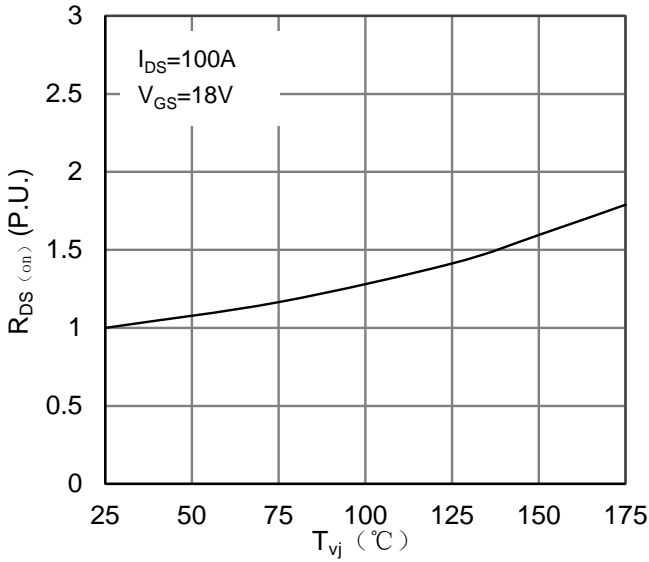


Figure 3. Typical Drain Source On-resistance

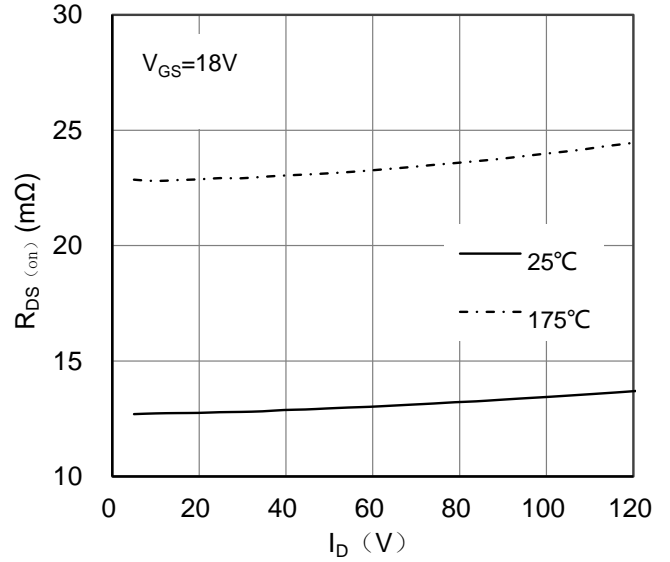


Figure 4. Typical Drain Source On-resistance

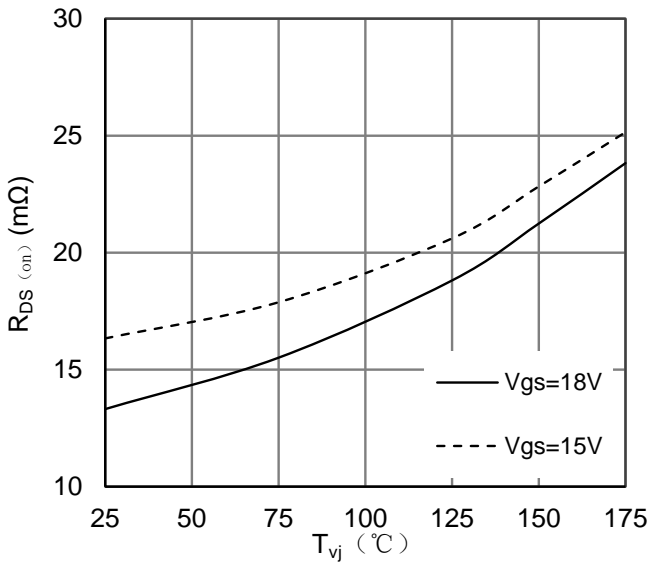


Figure 5. Typical Drain Source On-resistance

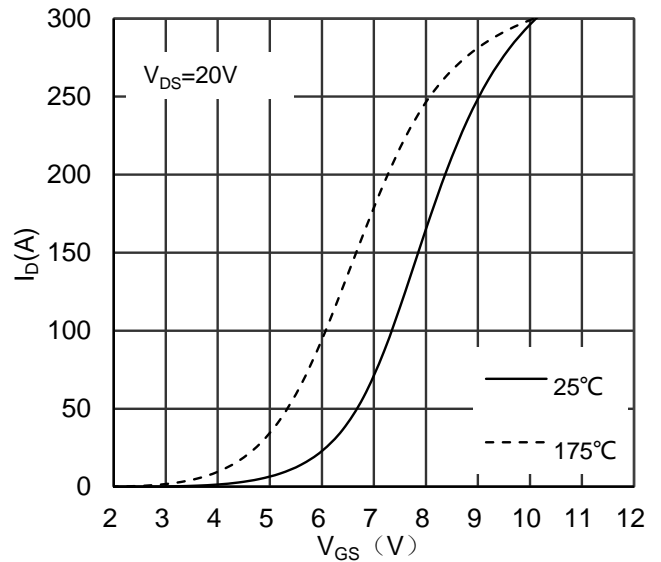


Figure 6. Typical Transfer Characteristics

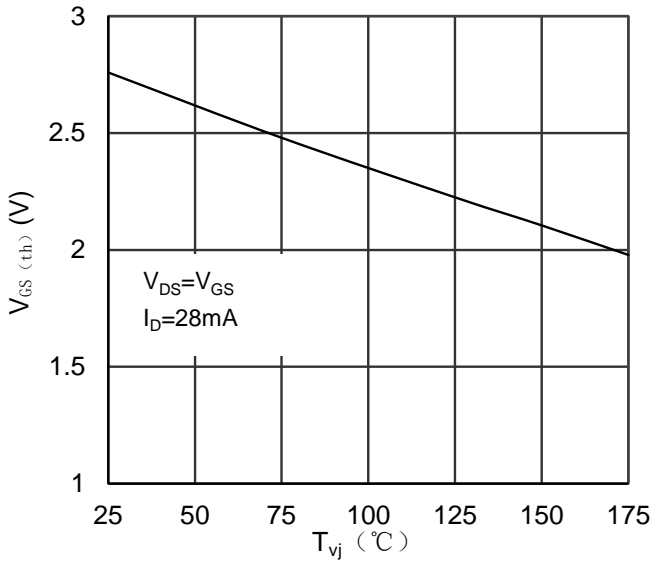


Figure 9. Typical Gate-source Threshold Voltage

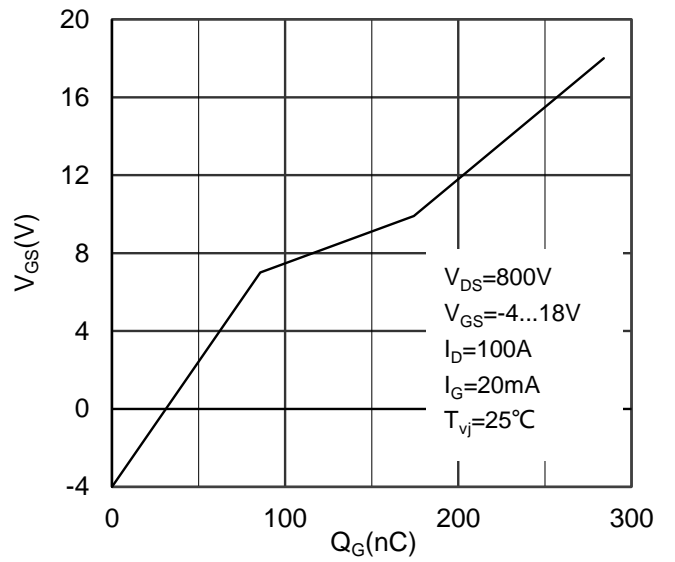


Figure 10. Typical Gate Charge

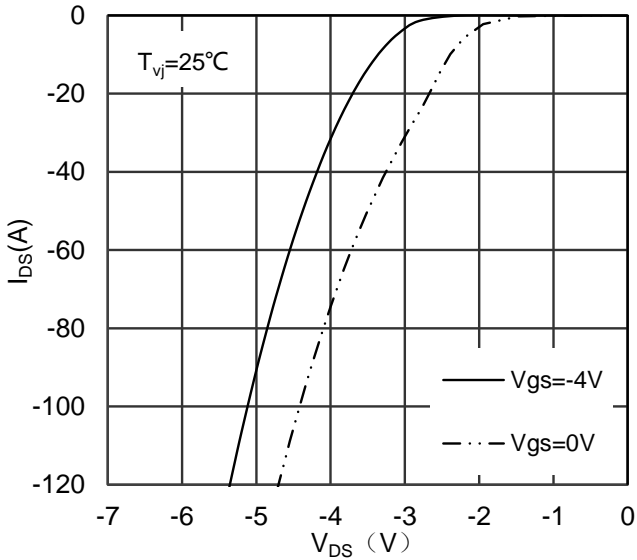


Figure 7. Typical Body Diode Forward Characteristics

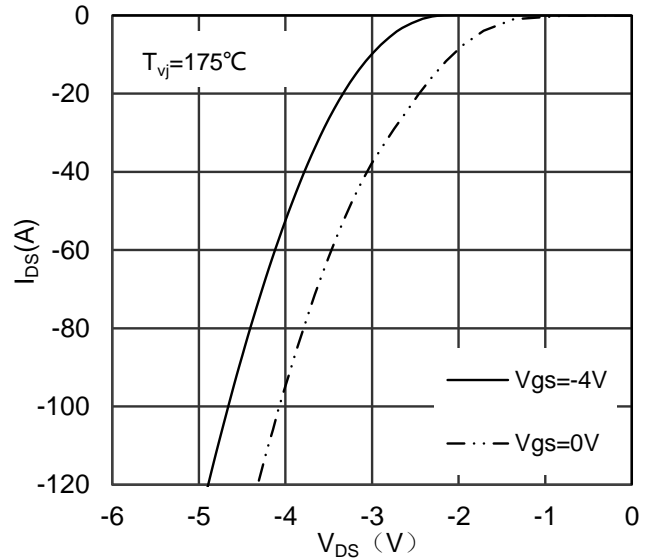


Figure 8. Typical Body Diode Forward Characteristics

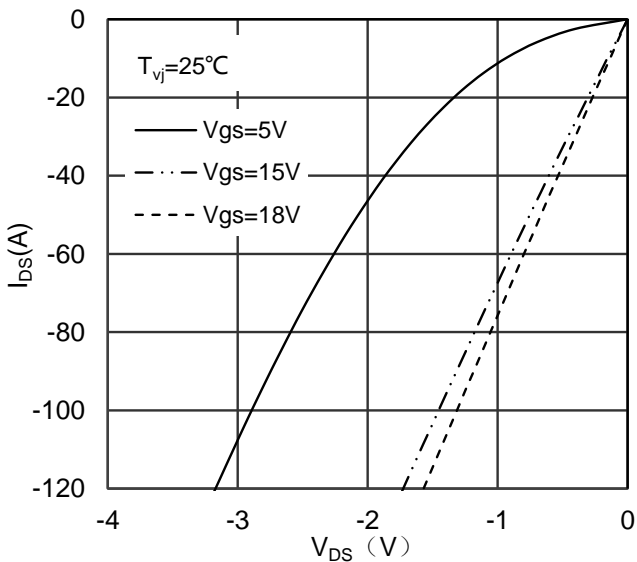


Figure 11. Typical Body Diode Forward Characteristics

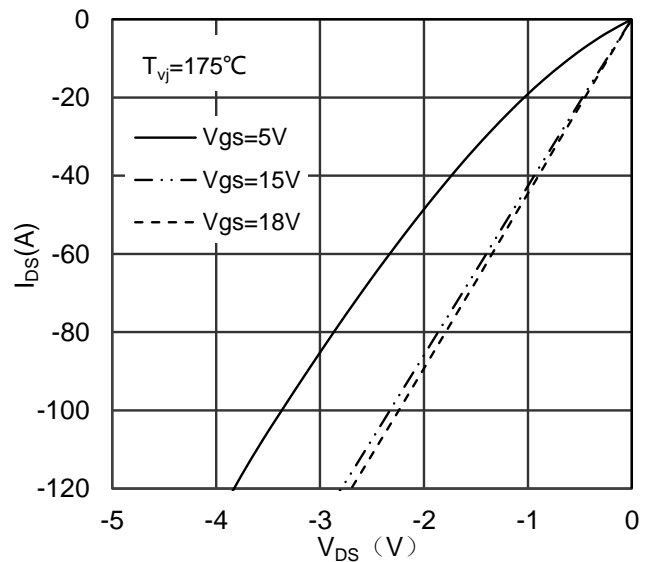


Figure 12. Typical Body Diode Forward Characteristics

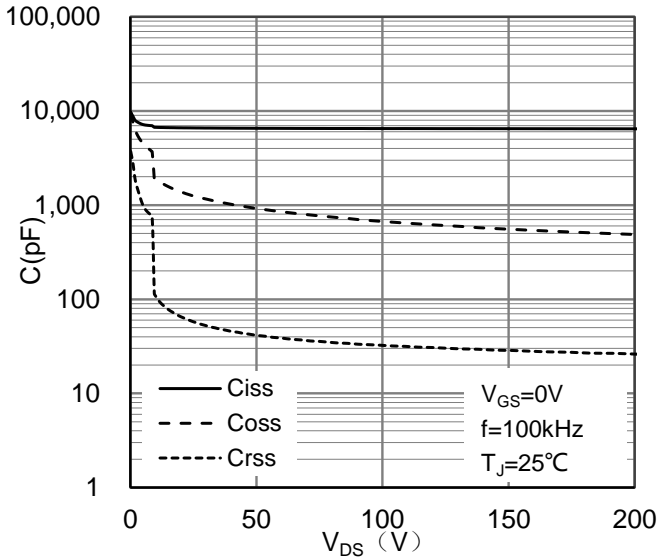


Figure 13. Typical Capacitance

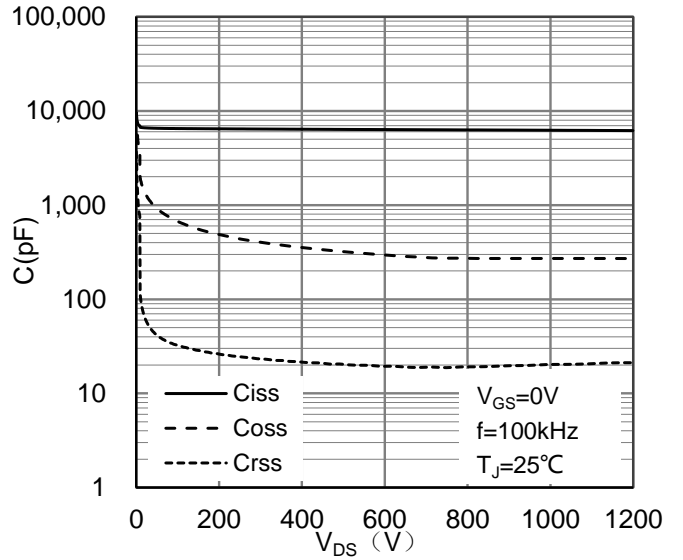


Figure 14. Typical Capacitance

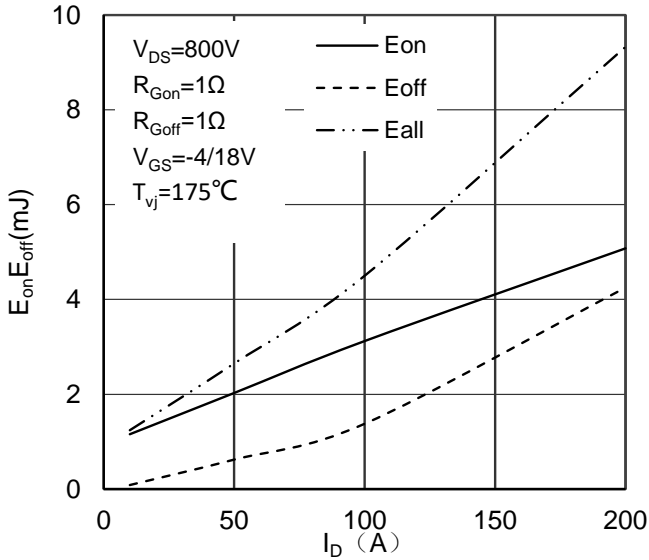


Figure 15. Typical Switching Energy

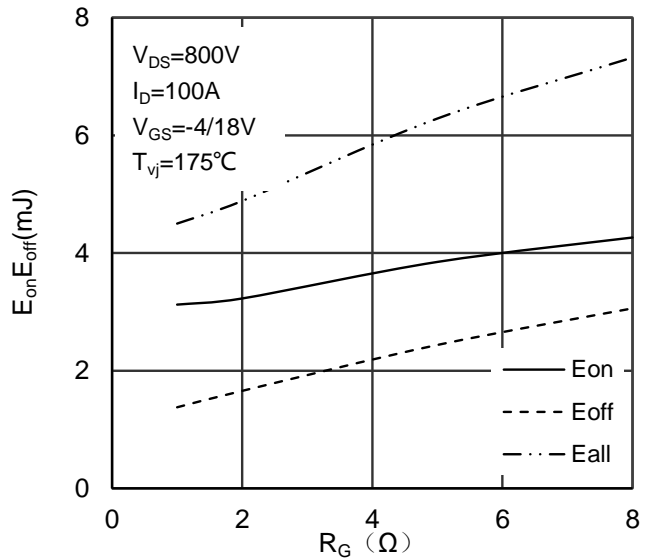


Figure 16. Typical Switching Energy

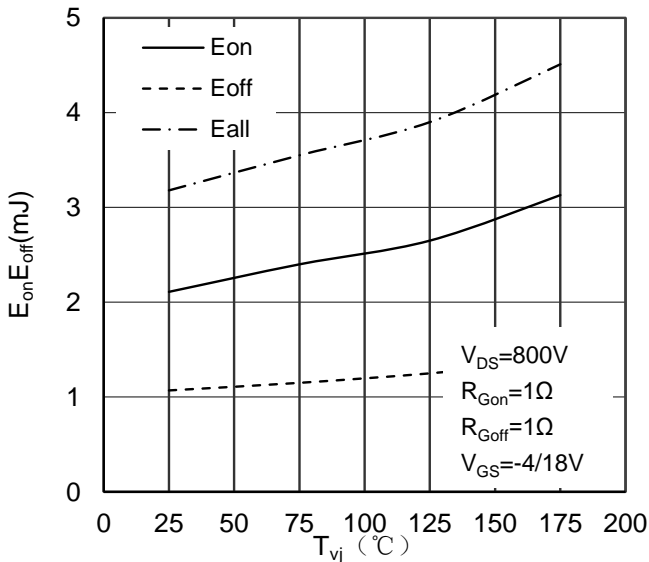


Figure 17. Typical Switching Energy

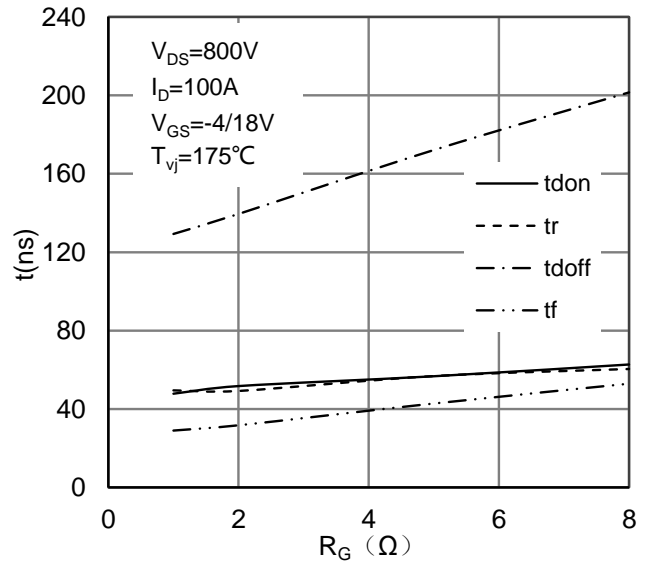


Figure 18. Typical Switching Times

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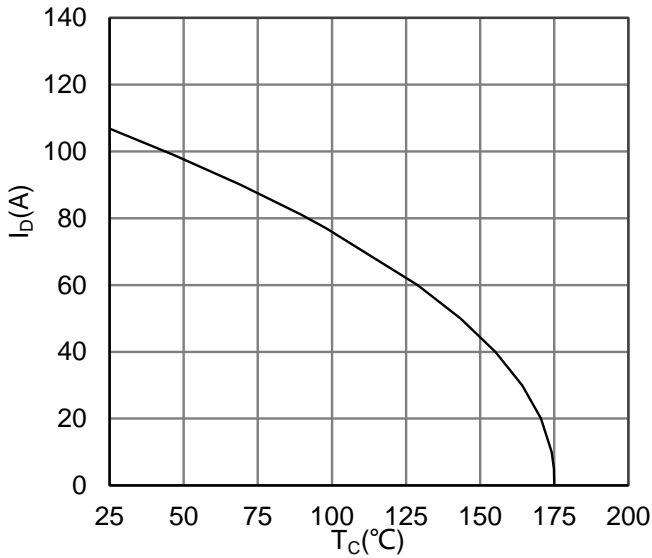


Figure 19. Continuous Drain Current vs Case Temperature

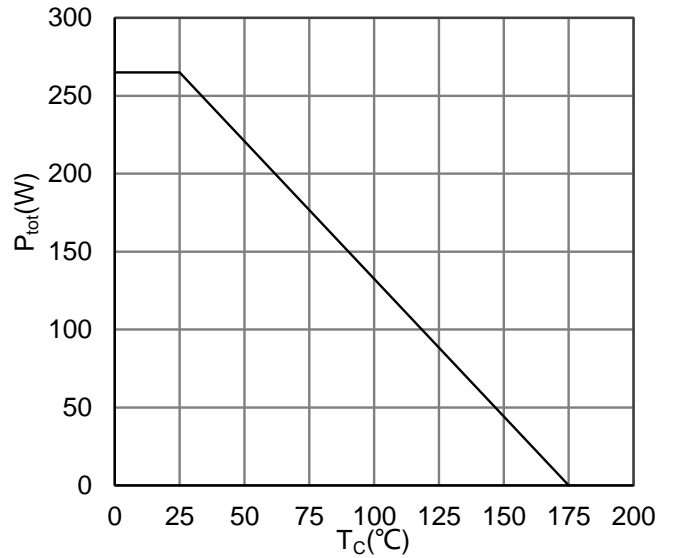


Figure 20. Power Dissipation vs Case Temperature

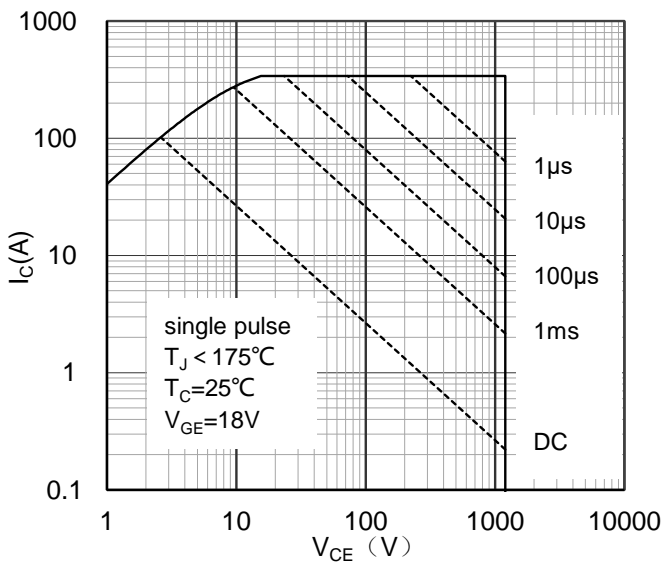


Figure 21. Forward Bias Safe Operating Area

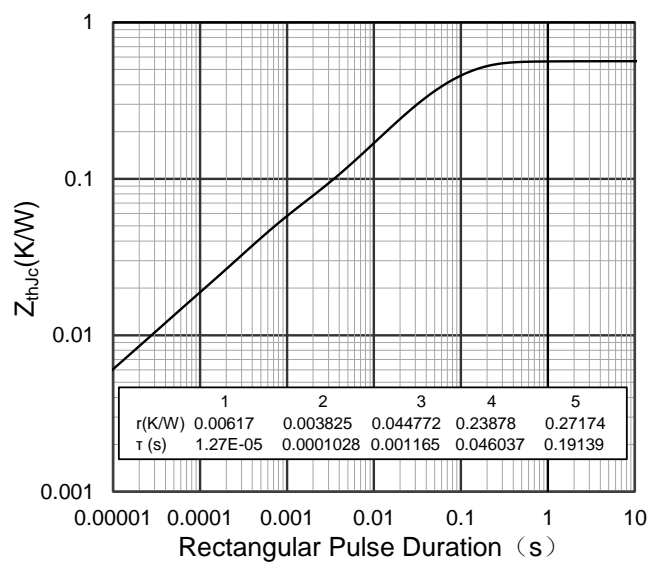


Figure 22. Transient Thermal Impedance

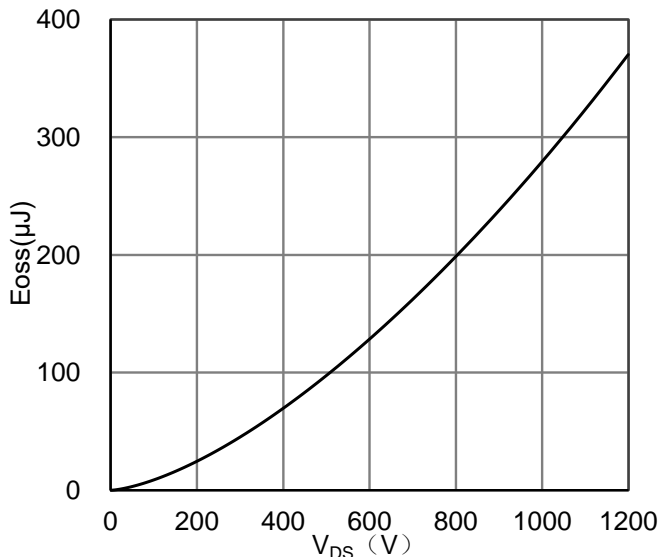


Figure 23. Output Capacitor Stored Energy

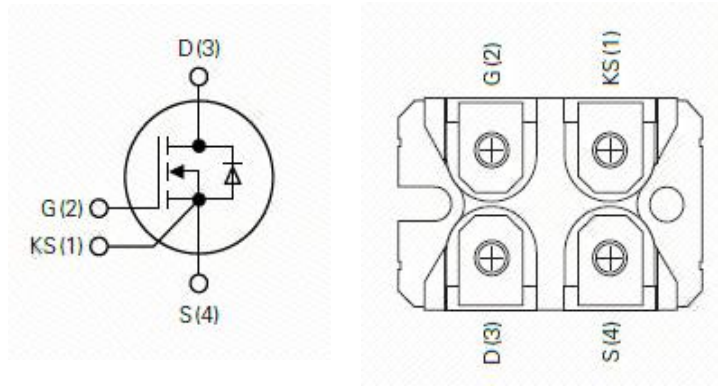
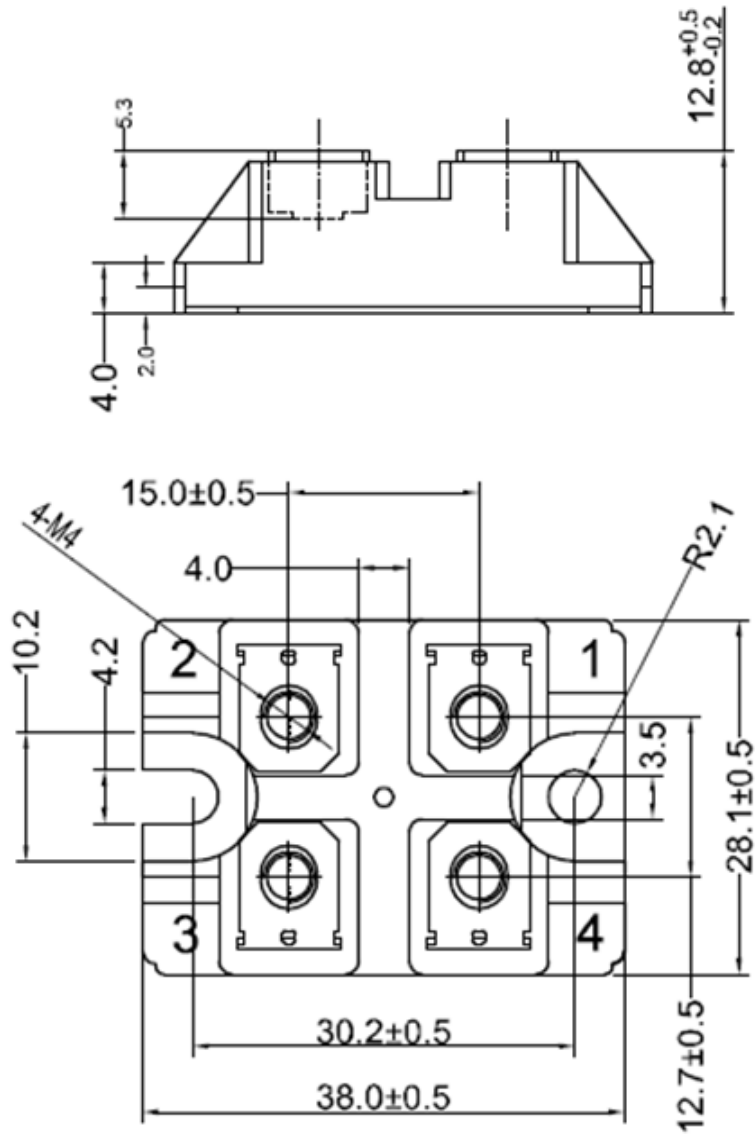


Figure 24. Circuit Diagram



Dimensions in (mm)

Figure 25. Package Outline