

TECHNICAL DATA
DATA SHEET D0240 REV. B

SILICON CARBIDE 1200V 104A POWER MOSFET DIE

Applications:

- Solar inverters • Switch Mode Power Supplies • High voltage DC/DC converters
- Battery charges • Mode drive • Pulsed power application

Features:

- High blocking voltage with low on-resistance
- High Speed Switching with low capacitances
- Easy to parallel and simple to drive
- Avalanche ruggedness
- Resistant to latch-up
- Silver back metal

Maximum Ratings@ $T_A=25^\circ\text{C}$ unless otherwise specified:

Characteristics	Symbol	Condition	Max.	Units
Drain - Source Voltage	V_{DSmax}	$V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$	1200	V
Gate - Source Voltage (dynamic)	V_{GSmax}	AC ($f > 1\text{ Hz}$)	-10/+25	V
Gate - Source Voltage (static)	V_{GSop}	Static	-5/+20	V
Continuous Drain Current	I_D	$V_{GS} = 20\text{ V}, T_C = 25^\circ\text{C}$	104	A
Pulsed Drain Current	$I_{D(pulse)}$	Pulse width t_p limited by T_{jmax}	300	A
Operating Junction and Storage	T_J, T_{stg}		-55 to +175	$^\circ\text{C}$
Maximum Processing Temperature	T_{Proc}	10 min. maximum	325	$^\circ\text{C}$

- (1) When using MOSFET body diode $V_{GSmax} = -5\text{V}/+25\text{V}$
- (2) MOSFET can also safely operate at $V_{GS} = 0/+20\text{ V}$
- (3) Assumes a $R_{\theta JC} < 0.35\text{ K/W}$

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Electrical Characteristics@T_A=25°C unless otherwise specified:

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 100 μA	1200			V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 15mA	1.8	2.3	4	V
		V _{DS} = V _{GS} , I _D = 15mA, T _J = 175 °C		1.4		
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 1200 V, V _{GS} = 0 V		2	100	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} = 20 V, V _{DS} = 0 V			250	nA
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 20 V, I _D = 50 A		25	34	mΩ
		V _{GS} = 20 V, I _D = 50 A, T _J = 175 °C		32		
Transconductance	g _{fs}	V _{DS} = 20 V, I _{DS} = 50 A		21		S
		V _{DS} = 20 V, I _{DS} = 50 A, T _J = 175 °C		23		
Input Capacitance	C _{iss}	V _{GS} = 0 V		4054		pF
Output Capacitance	C _{oss}	V _{DS} = 1000V f = 1 MHz		246		
Reverse Transfer Capacitance	C _{riss}	V _{AC} = 25 mV		17		
C _{oss} Stored Energy	E _{oss}			129		
Internal Gate Resistance	R _{G(int)}	f = 1 MHz, V _{AC} = 25 mV, ESR of C _{iss}		2.2		Ω
Gate to Source Charge	Q _{gs}	V _{DS} = 800 V, V _{GS} = -5/20 V		33		nC
Gate to Drain Charge	Q _{gd}	I _D = 50 A		67		
Total Gate Charge	Q _g	Per IEC60747-8-4 pg 83		165		

Reverse Diode Characteristics:

Characteristics	Symbol	Condition	Typ.	Max.	Units
Diode Forward Voltage	V _{SD}	V _{GS} = - 5 V, I _{SD} = 25 A	3.5		V
		V _{GS} = - 5 V, I _{SD} = 25 A, T _J = 175 °C	3.1		V
Continuous Diode Forward Current	I _S	T _C = 25 °C		130	
Reverse Recovery Time	t _{rr}	V _{GS} = - 5 V, I _{SD} = 50 A, T _J = 25 °C	33		ns
Reverse Recovery Charge	Q _{rr}		384		nC
Peak Reverse Recovery Current	I _{rrm}		VR = 800 V, dif/dt = 1790 A/μs	22	

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Typical Performance:

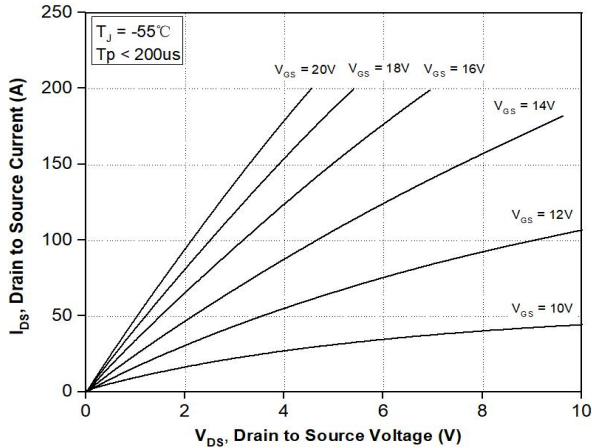


Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$

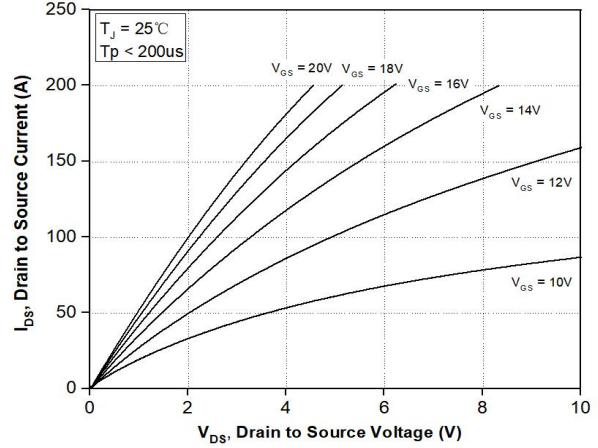


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

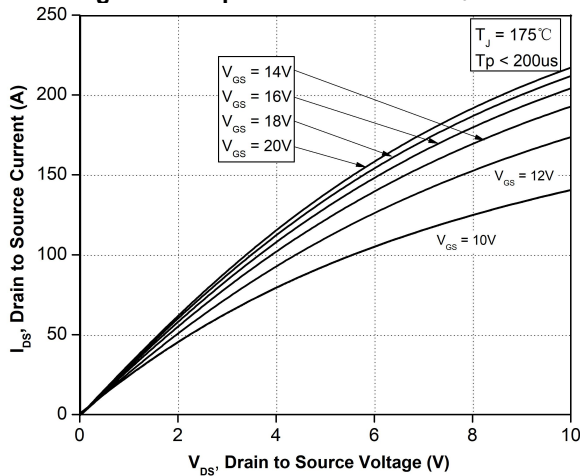


Figure 3. Output Characteristics $T_J = 175^\circ\text{C}$

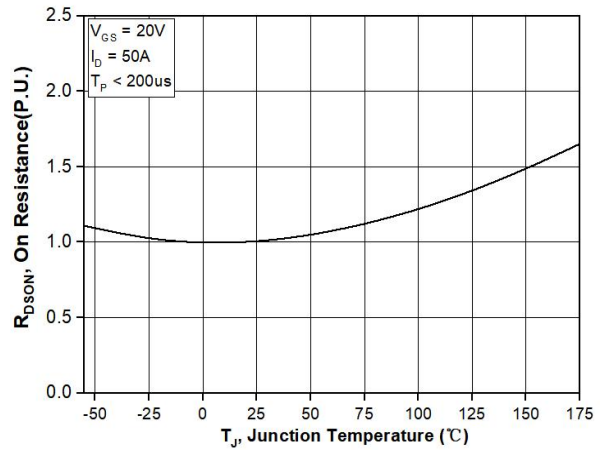


Figure 4. Normalized On-Resistance vs. Temperature

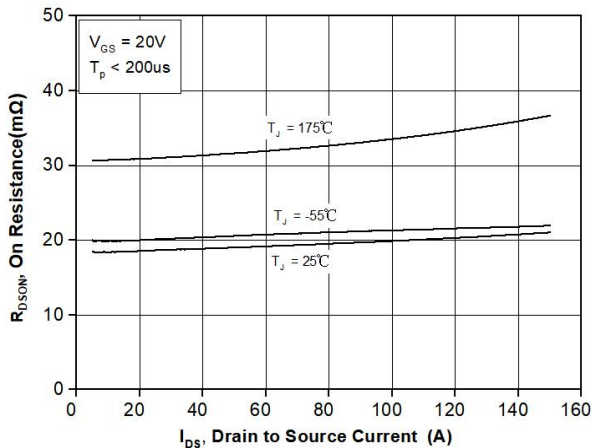


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

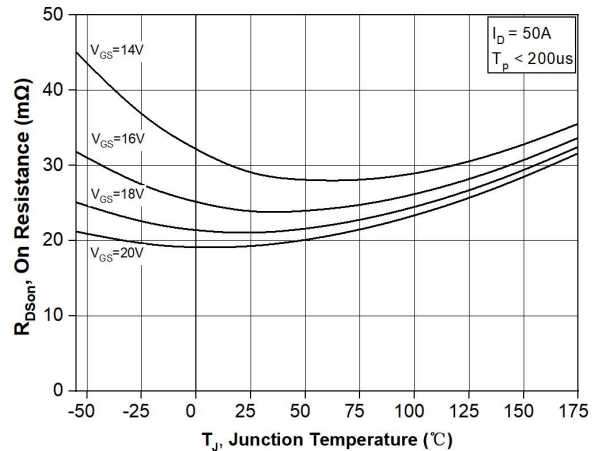


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

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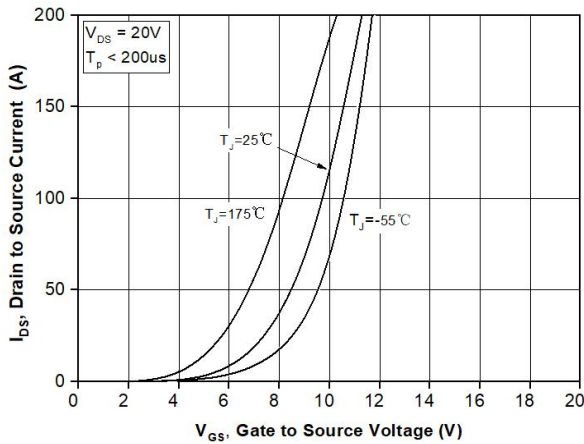


Figure 7. Transfer Characteristic for Various Junction Temperatures

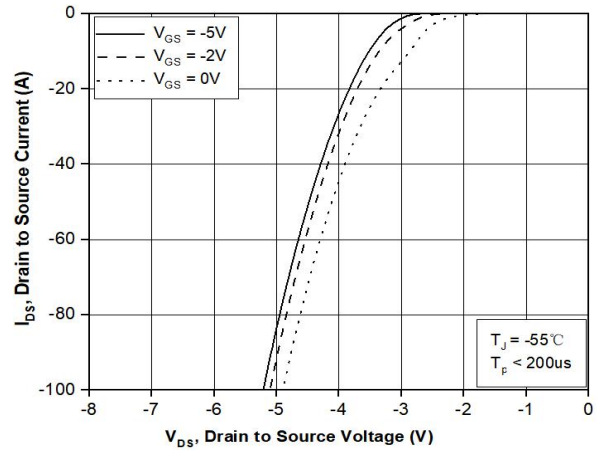


Figure 8. Body Diode Characteristic at $T_J = -55^\circ\text{C}$

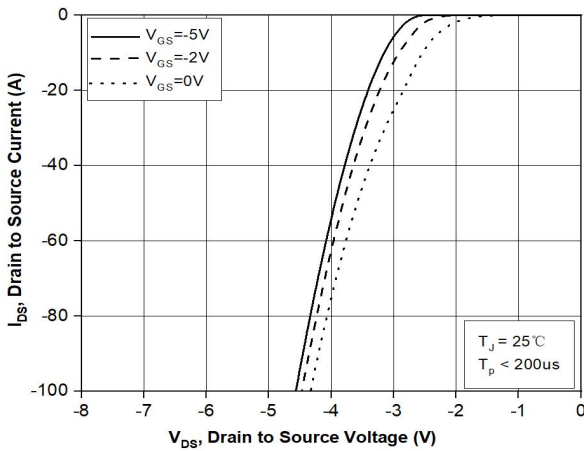


Figure 9. Body Diode Characteristic at $T_J = 25^\circ\text{C}$

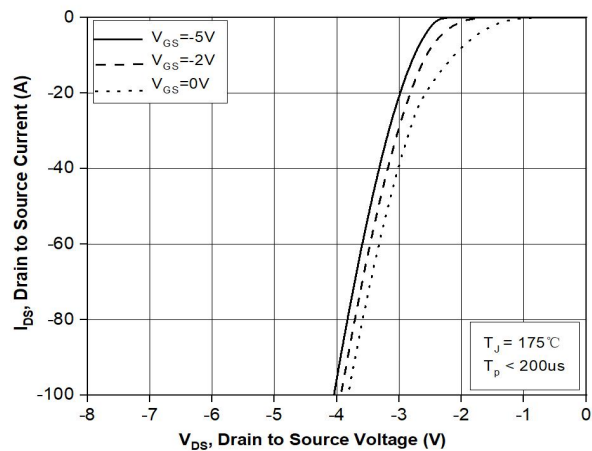


Figure 10. Body Diode Characteristic at $T_J = 175^\circ\text{C}$

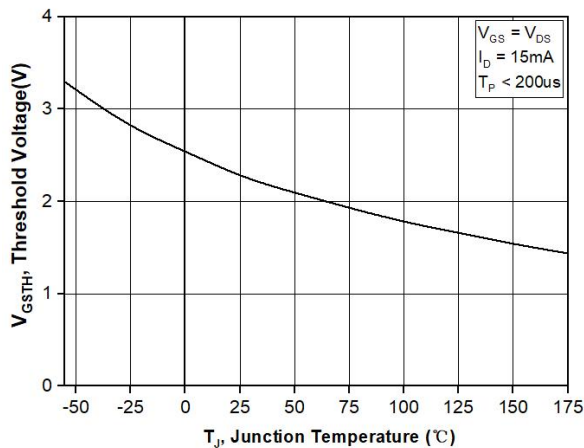


Figure 11. Threshold Voltage vs. Temperature

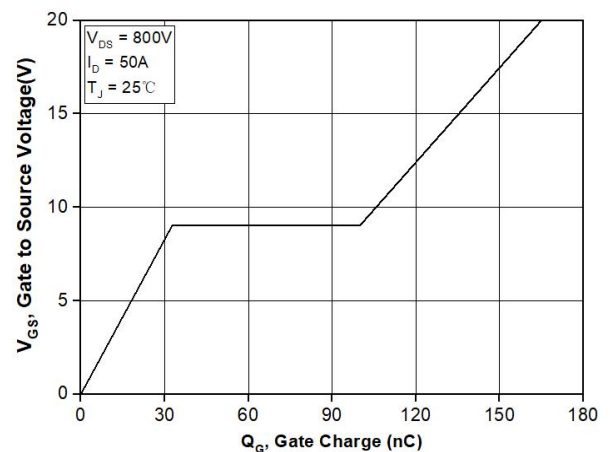


Figure 12. Gate Charge Characteristic

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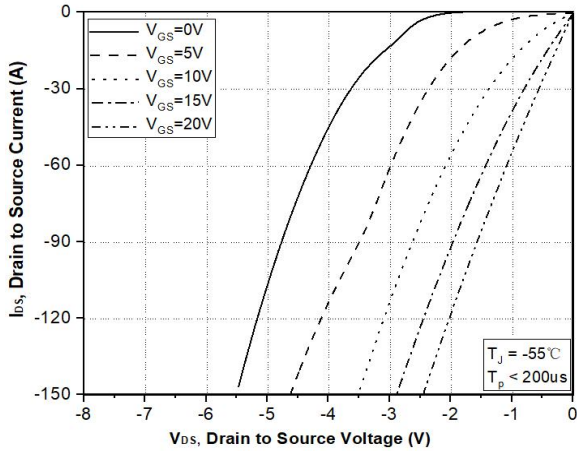


Figure 13. 3rd Quadrant Characteristic at $T_J = -55\text{ }^\circ\text{C}$

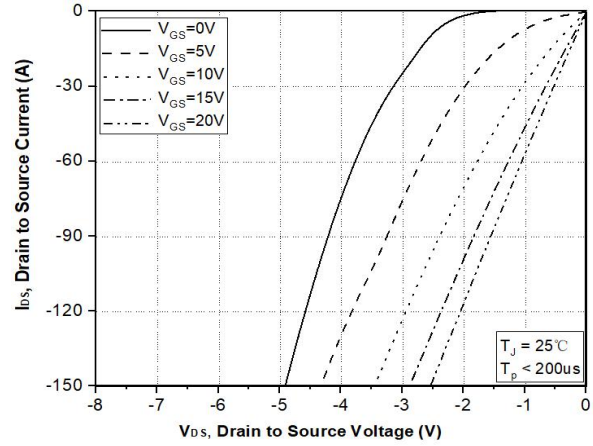


Figure 14. 3rd Quadrant Characteristic at $T_J = 25\text{ }^\circ\text{C}$

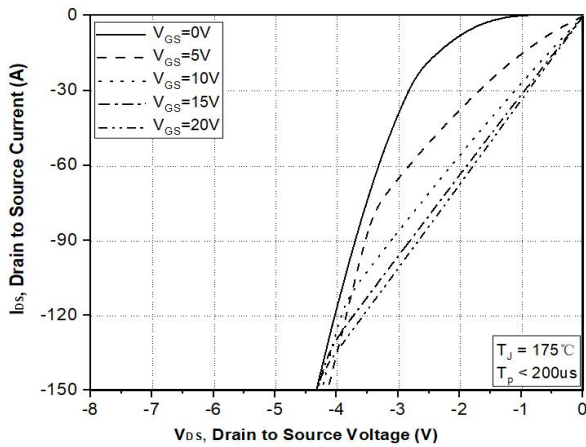


Figure 15. 3rd Quadrant Characteristic at $T_J = 175\text{ }^\circ\text{C}$

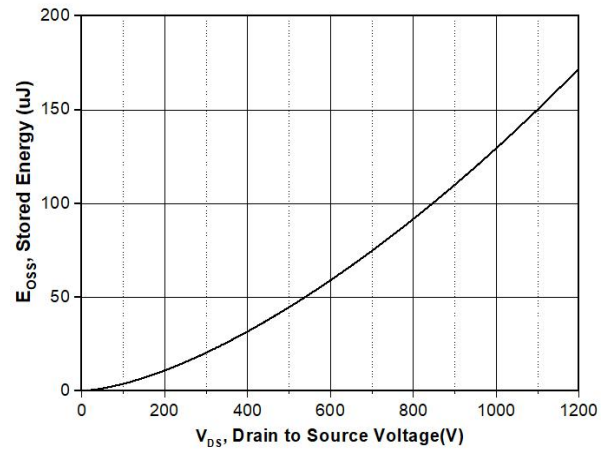


Figure 16. Output Capacitor Stored Energy

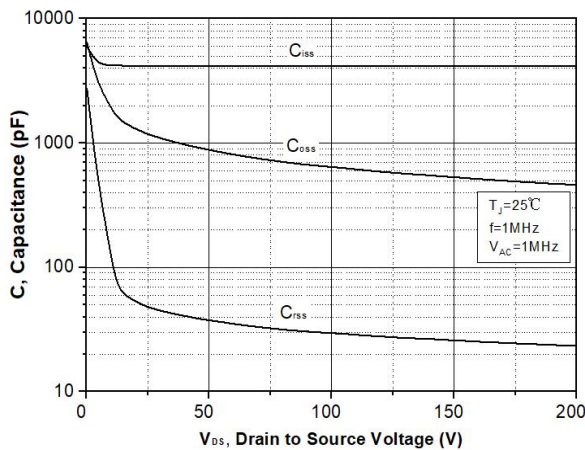


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

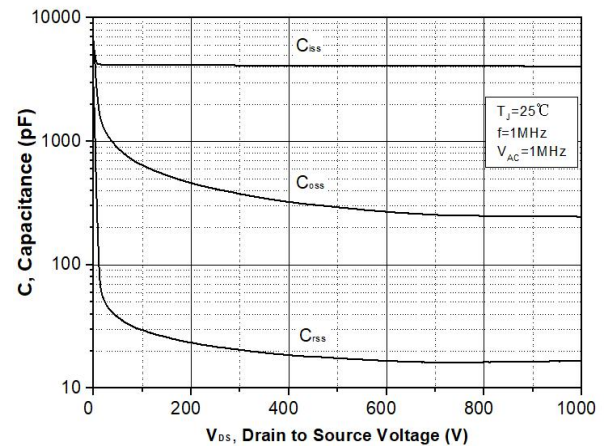


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

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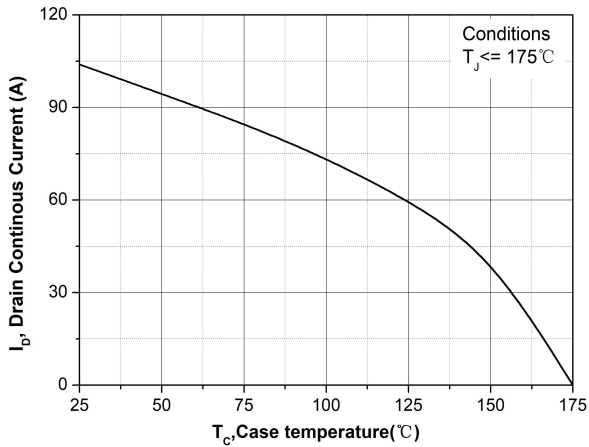


Figure 19. Continuous Drain Current Derating vs. Case Temperature

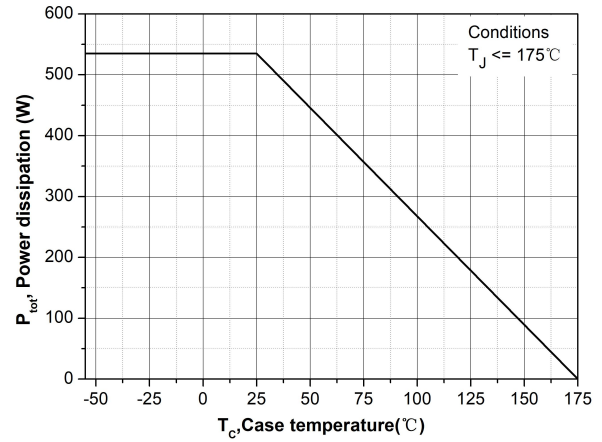


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

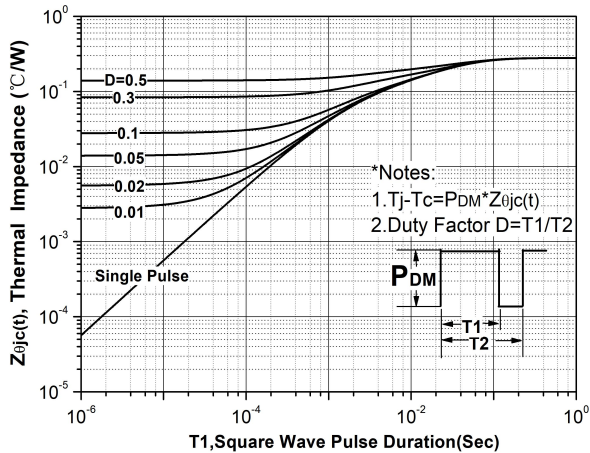


Figure 21. Transient Thermal Impedance (Junction - Case)

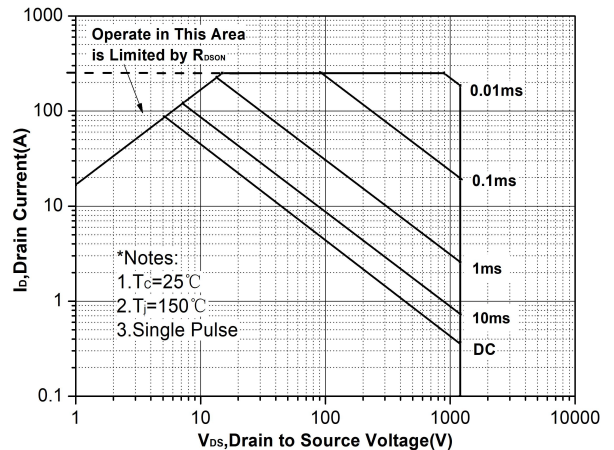


Figure 22. Safe Operating Area

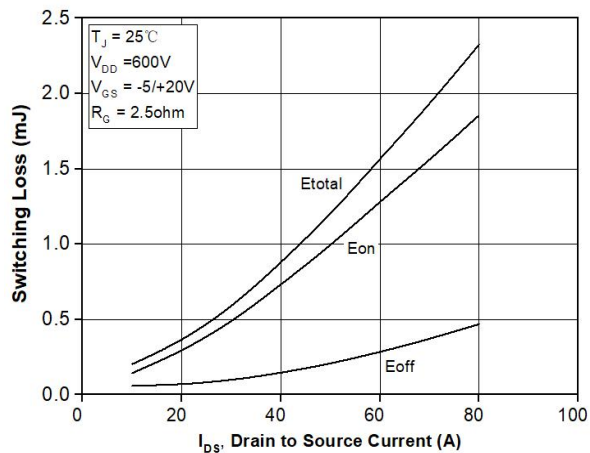


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 600V$)

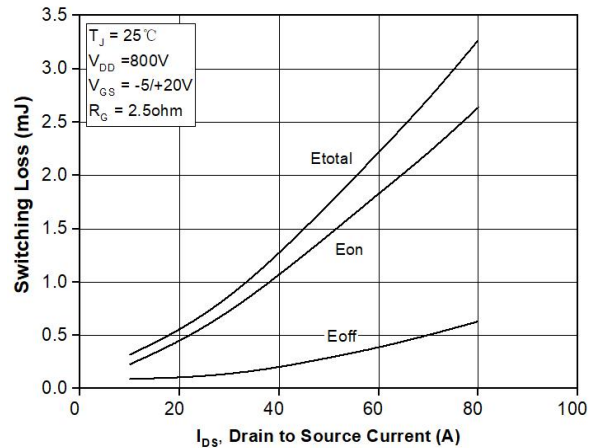


Figure 24. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 800V$)

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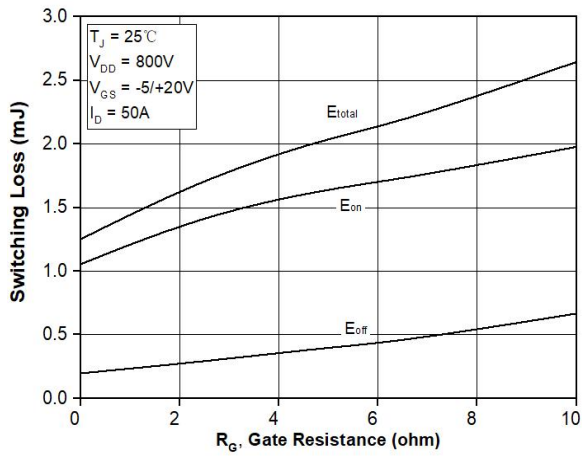


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

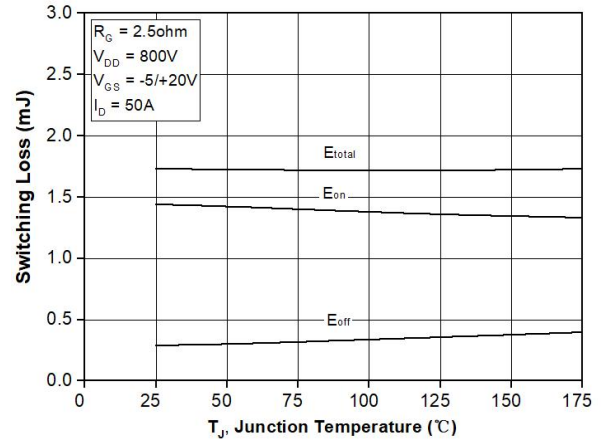


Figure 26. Clamped Inductive Switching Energy vs. Temperature

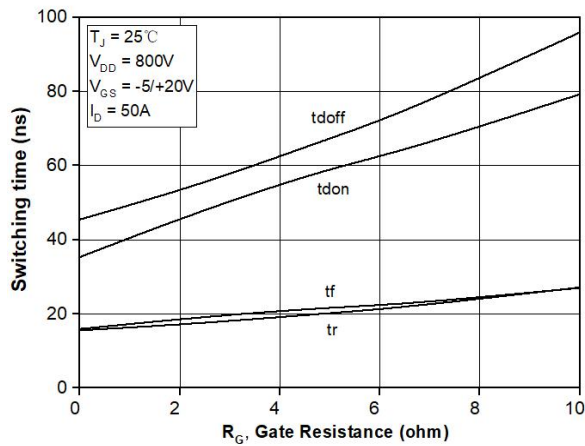


Figure 27. Switching Times vs. $R_{G(ext)}$

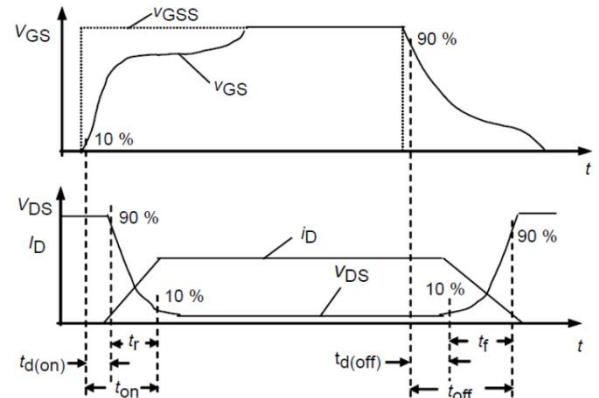
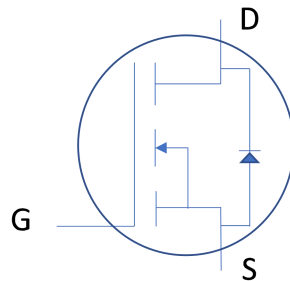


Figure 28. Switching Times Definition

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Mechanical Dimensions



Parameter	Typical Value	Unit
Die Dimensions (L x W)	Please contact your sales representative to get the detailed information about die layout and dimensions.	mm
Exposed Source Pad Metal Dimensions (LxW) Each		mm
Sense Pad Metal Dimensions (LxW)		mm
Gate Pad Dimensions (L x W)		mm
Top Side Source metallization (Al)		µm
Top Side Gate metallization (Al)		µm
Bottom Drain metallization (Ni/Ag)		µm

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