

**TECHNICAL DATA
DATASHEET D0424 REV.-**

SILICON CARBIDE 1200 V / 25 mΩ POWER MOSFET DIE

Applications:

- Solar inverters • Switched-mode power supply • High voltage DC/DC converters
- Battery charges • Motor drives • 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 backside metal

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

Characteristics	Symbol	Conditions	Min.	Typ.	Max.	Units	Note
Drain - Source Voltage	V_{DSmax}	$V_{GS} = 0\text{ V}$, $I_D = 100\text{ }\mu\text{A}$			1200	V	
Gate - Source Voltage (dynamic)	V_{GSmax}	AC ($f > 1\text{ Hz}$)	-8		+22	V	
Gate - Source Voltage (static)	V_{GSop}	Static		-4 / +18		V	[1]
Continuous Drain Current	I_D	$V_{GS} = 18\text{ V}$, $T_C = 25\text{ }^\circ\text{C}$			77	A	
		$V_{GS} = 18\text{ V}$, $T_C = 100\text{ }^\circ\text{C}$			54		
Pulsed Drain Current	$I_{D(pulse)}$	Pulse width t_P limited by T_{Jmax}			200	A	
Operating Junction and Storage Temperature	T_J , T_{stg}				-55 to 175	$^\circ\text{C}$	
Maximum Processing Temperature	T_{Proc}	10 min. maximum			325	$^\circ\text{C}$	

[1] Recommended turn off gate voltage is -4 V. Recommended turn on gate voltage is 18 V. Do not use with $V_{GSon} < 12\text{ V}$.

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Electrical Characteristics (T_A = 25 °C, unless otherwise specified)

Characteristics	Symbol	Conditions	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 = 16.2 mA	2	2.5	4	V
		V _{DS} = V _{GS} , I _D = 16.2 mA, T _J = 175 °C		1.6		V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 1200 V, V _{GS} = 0 V		1	100	μA
Gate Source Leakage Current	I _{GSS}	V _{GS} = 18 V, V _{DS} = 0 V		10	250	nA
Drain Source On-State Resistance	R _{DS(on)}	V _{GS} = 18 V, I _D = 40.4 A		25	32	mΩ
		V _{GS} = 18 V, I _D = 40.4 A, T _J = 175 °C		36		mΩ
Transconductance	g _{fs}	V _{DS} = 20 V, I _{DS} = 48 A		28		S
		V _{DS} = 20 V, I _{DS} = 48 A, T _J = 175 °C		27		S
Input Capacitance	C _{ISS}	V _{GS} = 0 V		5251		pF
Output Capacitance	C _{OSS}	V _{DS} = 1000 V		228		
Reverse Transfer Capacitance	C _{RSS}	V _{AC} = 25 mV		28		
C _{OSS} Stored Energy	E _{OSS}	f = 1 MHz		134		
Internal Gate Resistance	R _{G(int)}	f = 1 MHz, AC = 25 mV		1.6		Ω
Gate to Source Charge	Q _{gs}	V _{DS} = 800 V, V _{GS} = -4 / 18 V I _D = 48 A Per IEC60747-8-4 pg 21		80		nC
Gate to Drain Charge	Q _{gd}			41		
Total Gate Charge	Q _g			175		

* Pulse width < 200 μs.

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Reverse Diode Characteristics (T_A = 25 °C, unless otherwise specified)

Characteristics	Symbol	Conditions	Typ.	Max.	Units
Diode Forward Voltage	V _{SD}	V _{GS} = -4 V, I _{SD} = 20.2 A	5.2		V
	V _{SD}	V _{GS} = -4 V, I _{SD} = 20.2 A, T _J = 175°C	4.5		V
Reverse Recovery Time	t _{rr}	V _{GS} = -4 V, I _{SD} = 48 A, T _J = 25 °C	18		ns
Reverse Recovery Charge	Q _{rr}	V _R = 800V	260		nC
Peak Reverse Recovery Current	I _{rm}	dif / dt = 2500 A / μs	21		A

Typical Performance

All the graphs are based on a die placed in a TO-247-4 package.

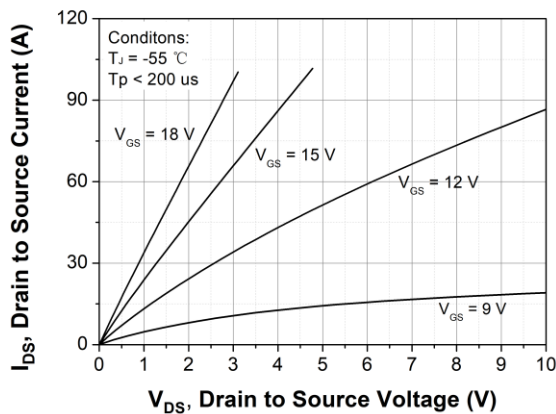


Figure 1. Output Characteristics T_J = -55 °C

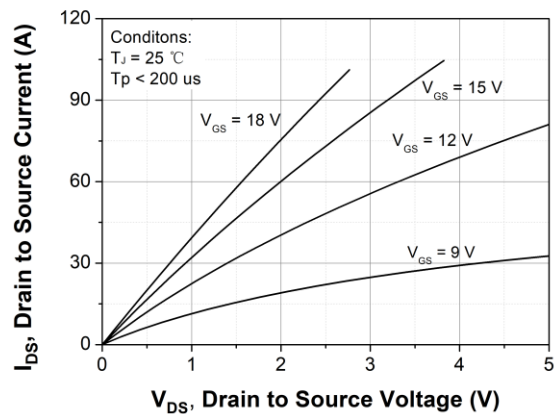


Figure 2. Output Characteristics T_J = 25 °C

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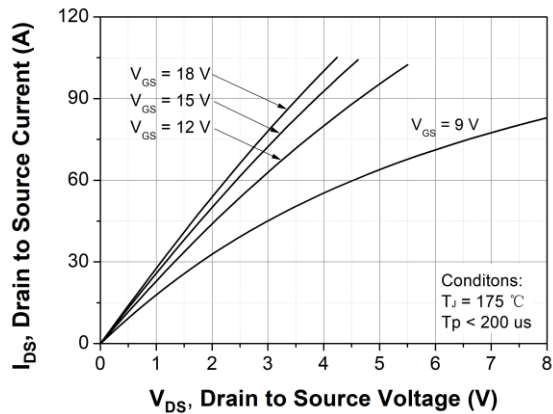


Figure 3. Output Characteristics $T_J = 175\text{ }^\circ\text{C}$

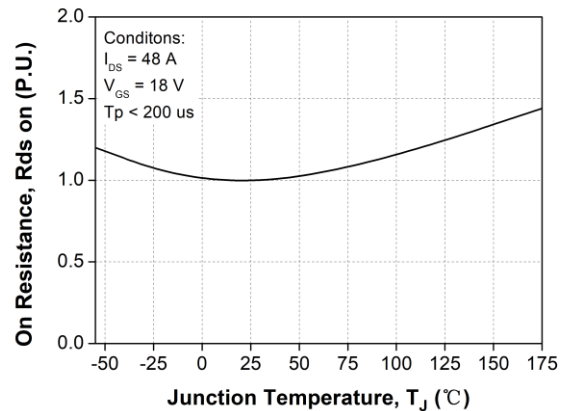


Figure 4. Normalized On-Resistance vs. Temperature

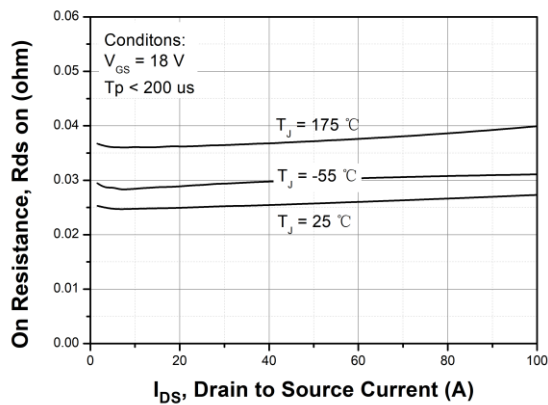


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

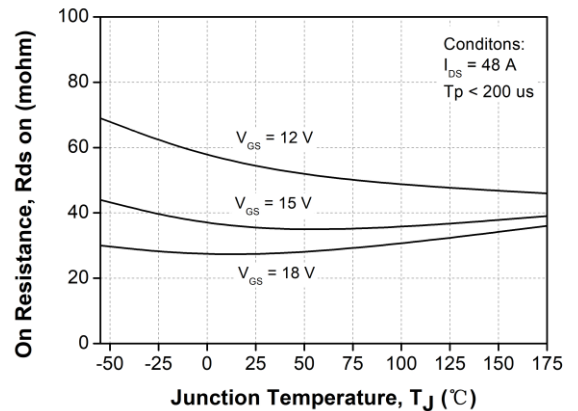


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

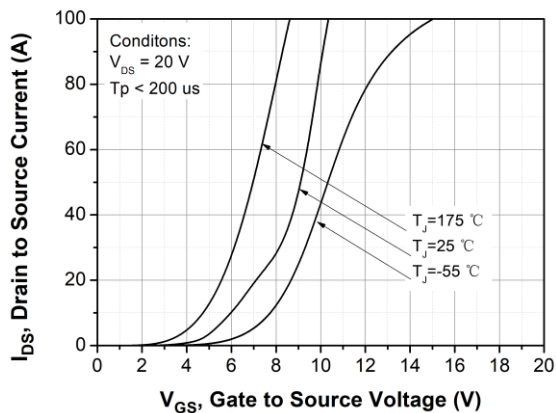


Figure 7. Transfer Characteristic for Various Junction Temperatures

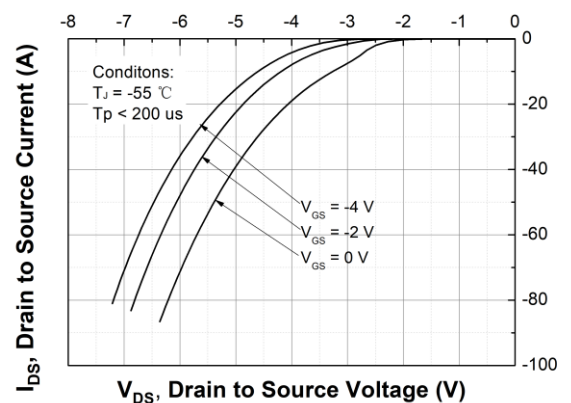


Figure 8. Body Diode Characteristic at $T_J = -55\text{ }^\circ\text{C}$

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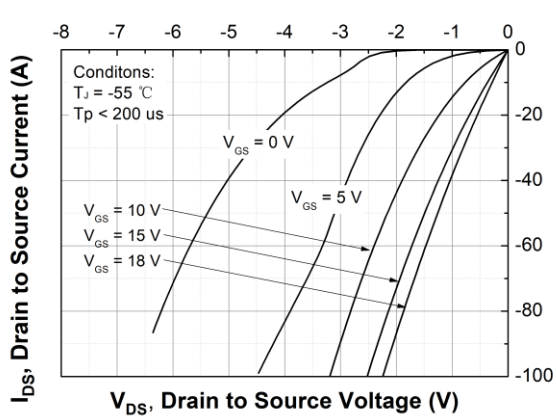


Figure 9. Body Diode Characteristic at $T_J = -55\text{ }^\circ\text{C}$

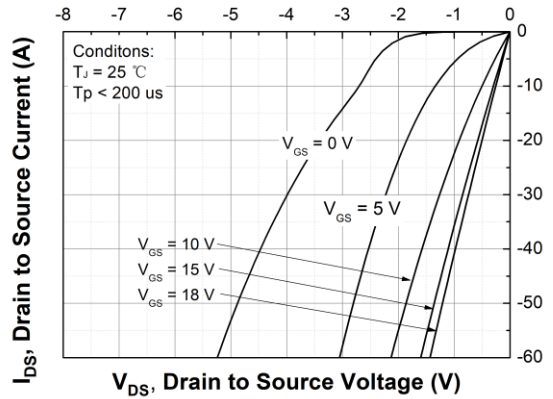


Figure 10. Body Diode Characteristic at $T_J = 175\text{ }^\circ\text{C}$

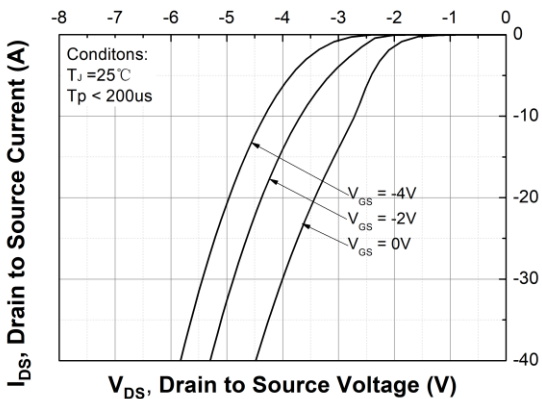


Figure 11. Threshold Voltage vs. Temperature

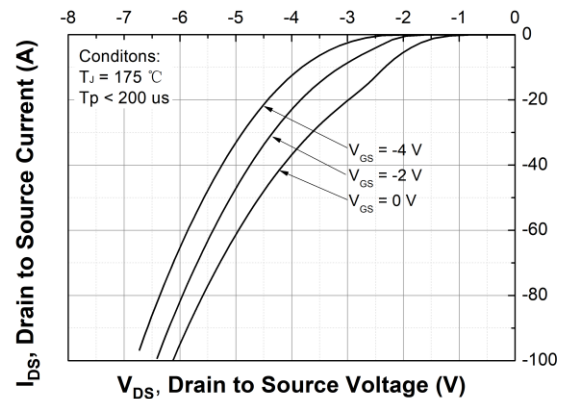


Figure 12. Gate Charge Characteristic

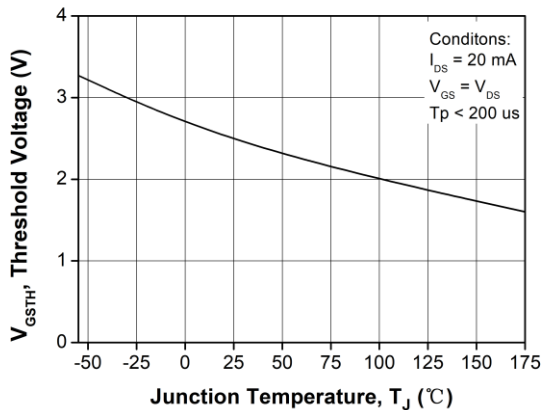


Figure 13. 3rd Quadrant Characteristic at $T_J = -55\text{ }^\circ\text{C}$

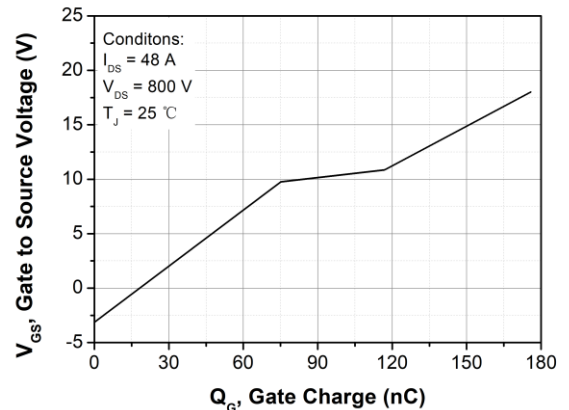


Figure 14. 3rd Quadrant Characteristic at $T_J = 25\text{ }^\circ\text{C}$

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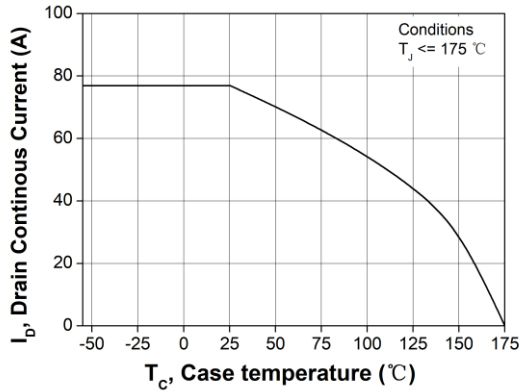


Figure 15. 3rd Quadrant Characteristic at $T_J = 175^\circ\text{C}$

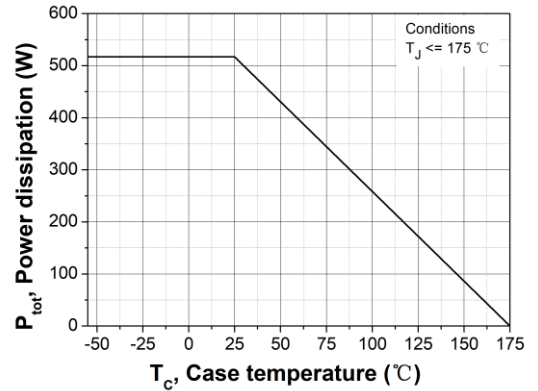


Figure 25. Output Capacitor Stored Energy

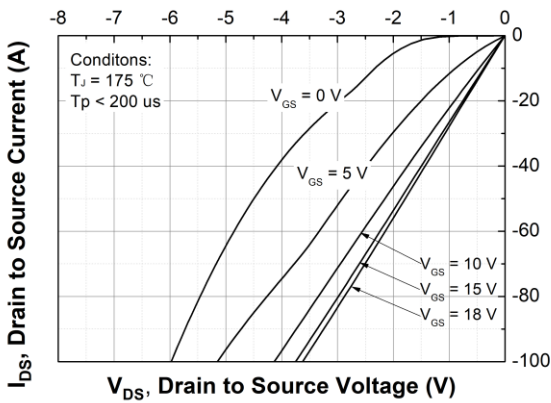


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200 V)

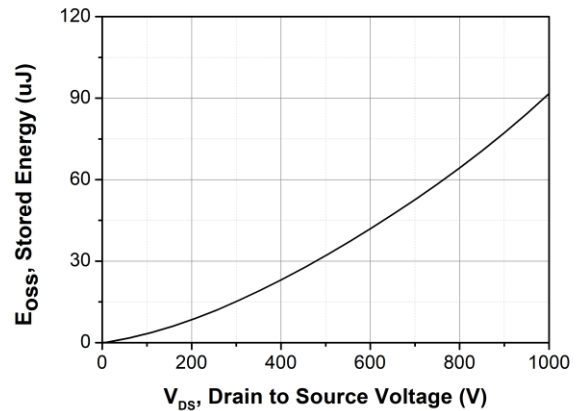


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000 V)

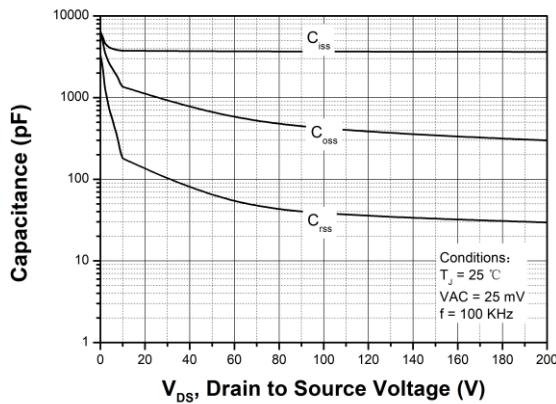


Figure 19. Continuous Drain Current Derating vs. Case Temperature

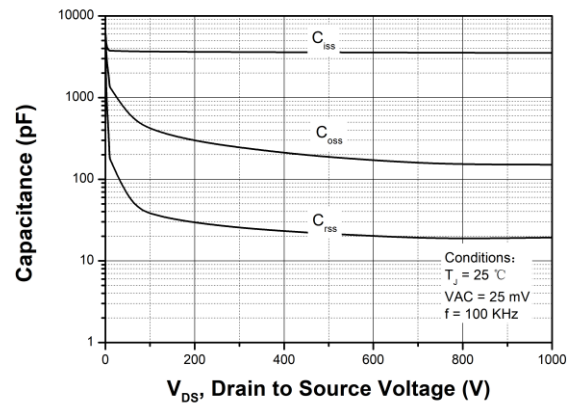


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

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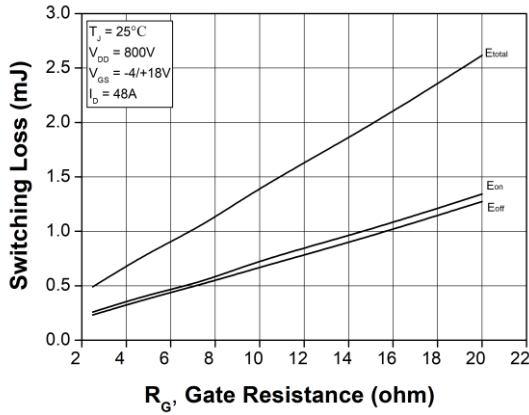


Figure 21. Transient Thermal Impedance (Junction - Case)

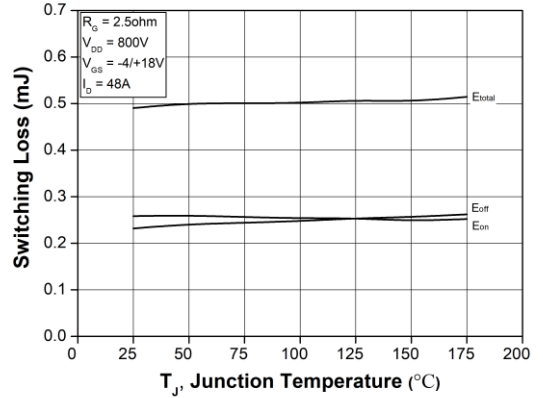


Figure 22. Safe Operating Area

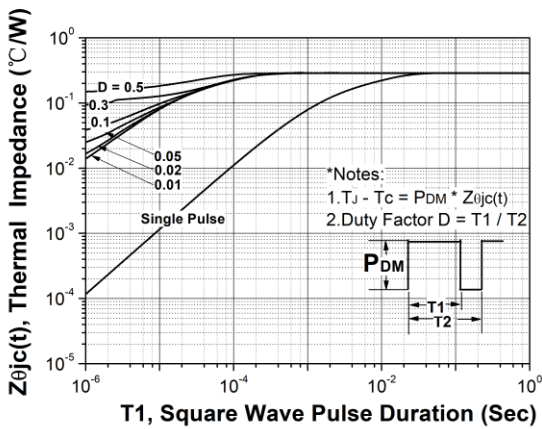


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 600V$)

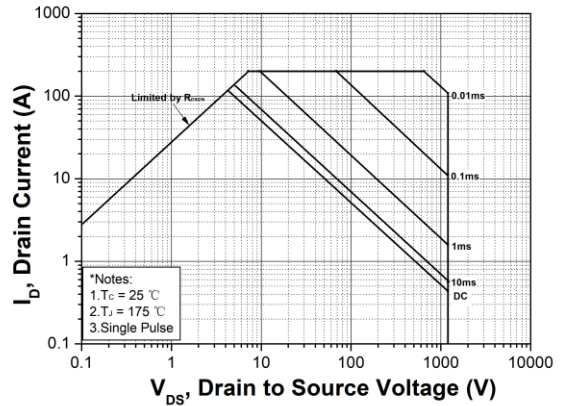


Figure 24. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 800V$)

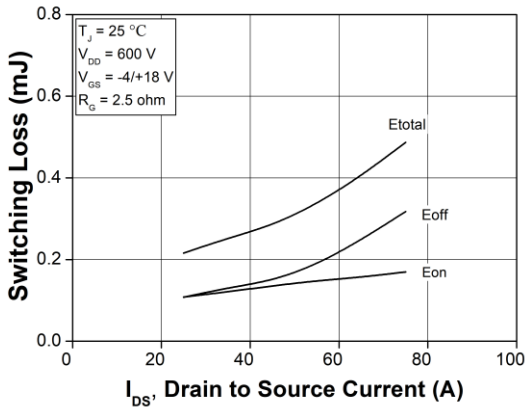


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

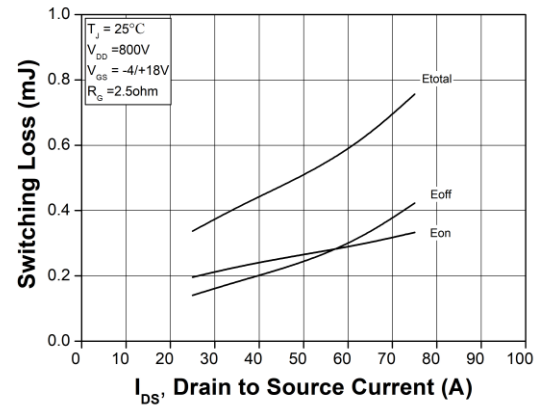


Figure 26. Clamped Inductive Switching Energy vs. Temperature

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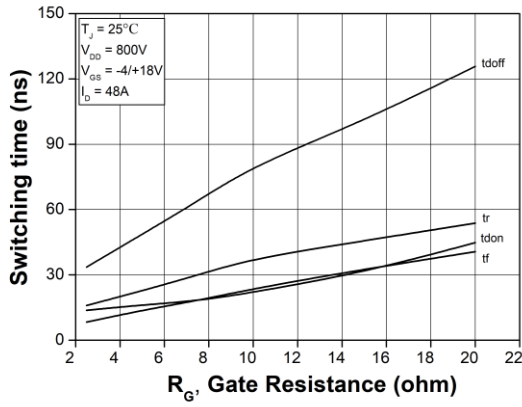


Figure 27. Switching Times vs. $R_{G(ext)}$

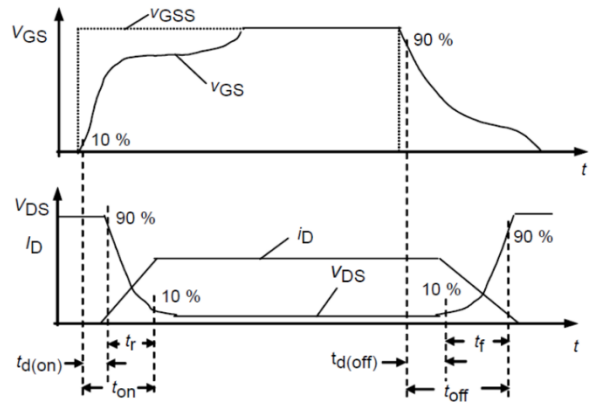
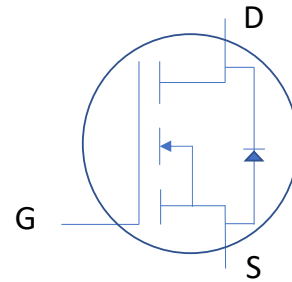


Figure 28. Switching Times Definition

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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 (L x W) Each		mm
Sense Pad Metal Dimensions (L x W)		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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