SILICON CARBIDE 1200 V / 160 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 °C, unless otherwise specified)

Characteristics	Symbol	Conditions	Min.	Typ.	Max.	Units	Note
Drain - Source Voltage	V_{DSmax}	V_{GS} = 0 V, I_D = 100 µA			1200	V	
Gate - Source Voltage (dynamic)	V_{GSmax}	AC (f > 1 Hz)	-10		+25	V	
Gate - Source Voltage (static)	V_{GSop}	Static		-5 / +20		V	[1]
Continuous Drain Current	I_D	V_{GS} = 20 V, T_C = 25 ˚C V_{GS} = 20 V, T_C = 100 ˚C			17 12	A	
Pulsed Drain Current	$I_{D(pulse)}$	Pulse width t_P limited by T_{jmax}			40	A	
Operating Junction and Storage Temperature	T_J , T_{stg}				-55 to 175	˚C	
Maximum Processing Temperature	T_{Proc}	10 min. maximum			325	˚C	

[1] Recommended turn off gate voltage is -5 V. Recommended turn on gate voltage is 20 V. Do not use with V_{GSON} < 15 V.

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 = 2.5 mA	2	2.8	4	V
		V_{DS} = V_{GS}, I_D = 2.5 mA, T_J = 175 °C		1.9		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} = 20 V, V_{DS} = 0 V		10	250	nA
Drain Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 20 V, I_D = 10 A		175	196	mΩ
		V_{GS} = 20 V, I_D = 10 A, T_J = 175 °C		300		mΩ
Transconductance	gfs	V_{DS} = 20 V, I_{DS} = 10 A		3.3		S
		V_{DS} = 20 V, I_{DS} = 10 A, T_J = 175 °C		3.4		S
Input Capacitance	C_{ISS}	V_{GS} = 0 V		513		pF
Output Capacitance	C_{OSS}	V_{DS} = 1000 V		35		
Reverse Transfer Capacitance	C_{RSS}	V_{AC} = 25 mV		2		
C_{OSS} Stored Energy	E_{OSS}	f = 1 MHz		20		µJ
Internal Gate Resistance	$R_{G(int)}$	f = 1 MHz, AC = 25 mV		6		Ω
Gate to Source Charge	Q_{gs}	V_{DS} = 800 V, V_{GS} = -5 / 20 V		7		nC
Gate to Drain Charge	Q_{gd}	I_D = 10 A		8		
Total Gate Charge	Q_g	Per IEC60747-8-4 pg 21		26		

* Pulse width < 200 µs.

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

Characteristics	Symbol	Conditions	Typ.	Max.	Units
Diode Forward Voltage	V_{SD}	V_{GS} = -5 V, I_{SD} = 5 A	3.7		V
	V_{SD}	V_{GS} = -5 V, I_{SD} = 5 A, T_J = 175°C	2.5		V
Reverse Recovery Time	t_{rr}	V_{GS} = -5 V, I_{SD} = 10 A, T_J = 25 °C	6		ns
Reverse Recovery Charge	Q_{rr}	V_R = 800V	40		nC
Peak Reverse Recovery Current	I_{mm}	dif / dt = 2533 A / µs	11		A

Typical Performance

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

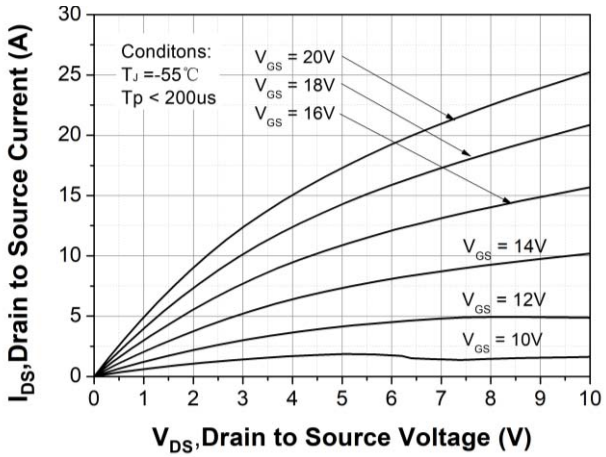


Figure 1. Output Characteristics T_J = -55 °C

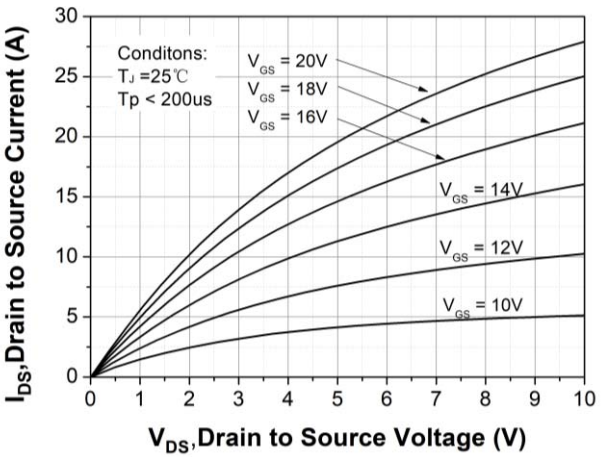


Figure 2. Output Characteristics T_J = 25 °C

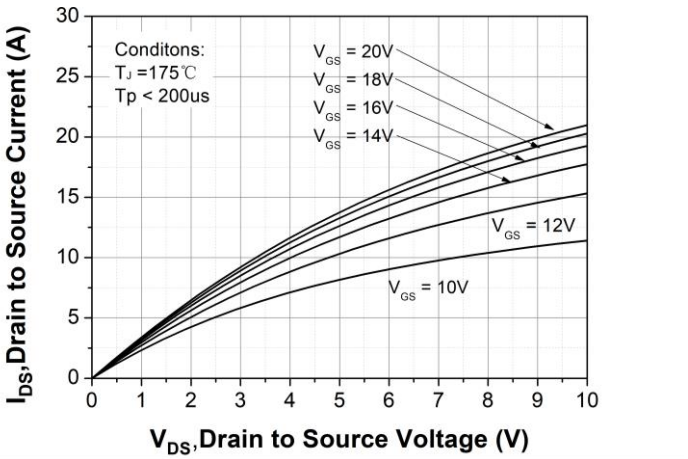


Figure 3. Output Characteristics T_J = 175 ºC

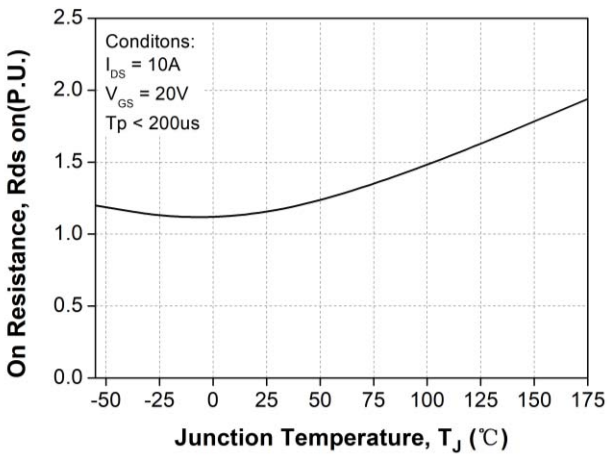


Figure 4. Normalized On-Resistance vs. Temperature

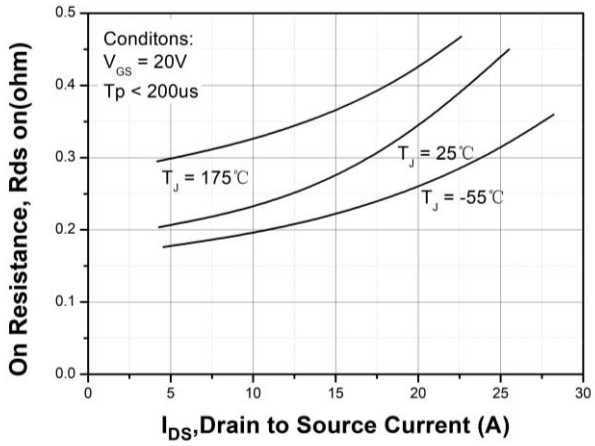


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

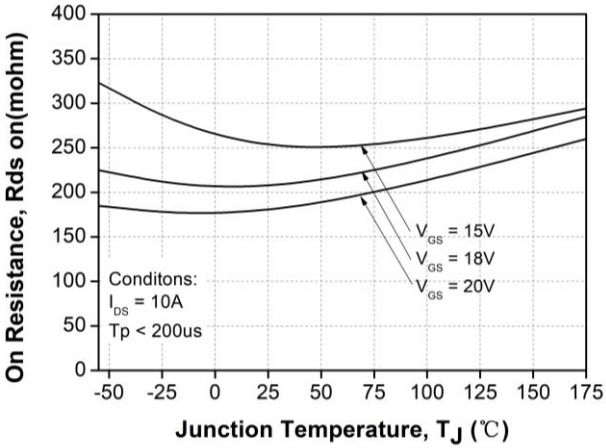


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

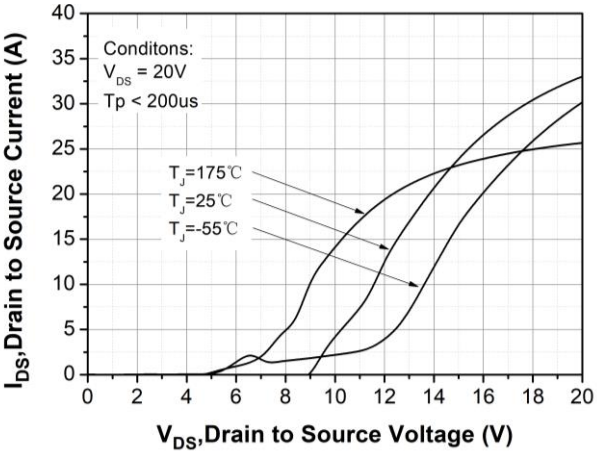


Figure 7. Transfer Characteristic for Various Junction Temperatures

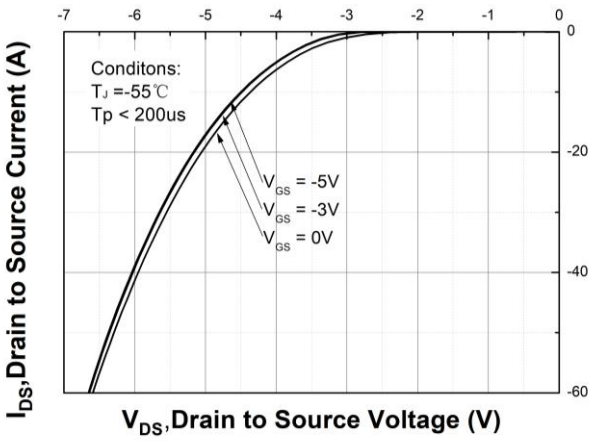


Figure 8. Body Diode Characteristic at T_J = -55 ºC

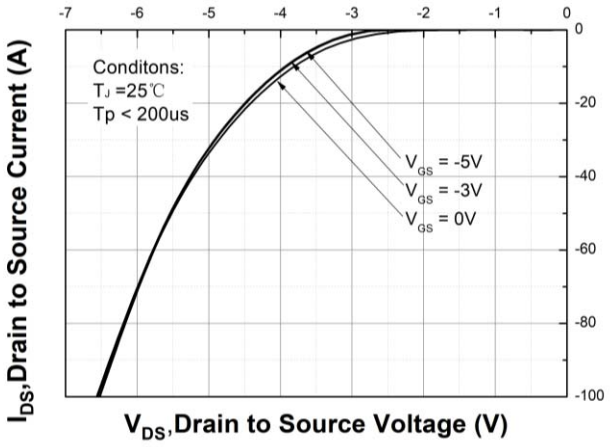


Figure 9. Body Diode Characteristic at T_J = 25 °C

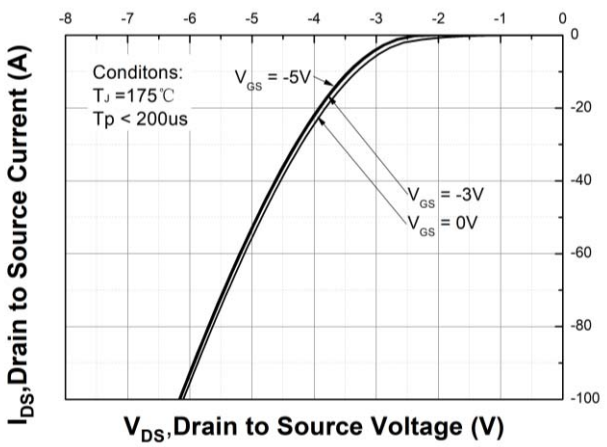


Figure 10. Body Diode Characteristic at T_J = 175 °C

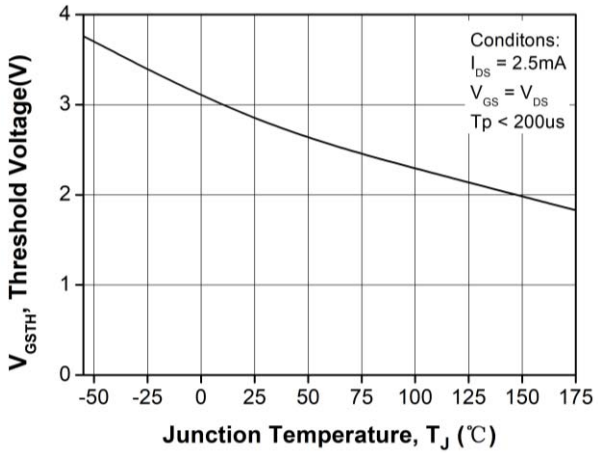


Figure 11. Threshold Voltage vs. Temperature

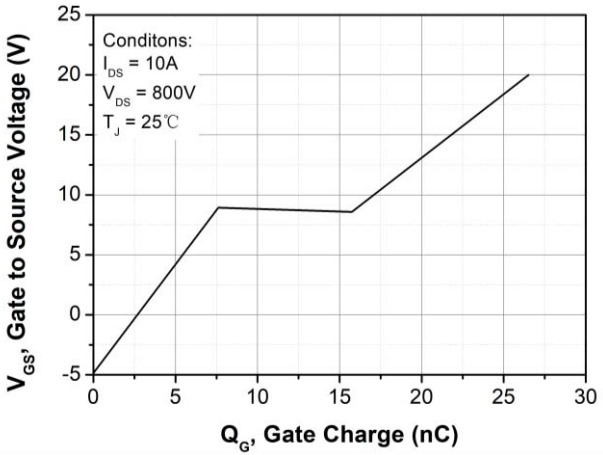


Figure 12. Gate Charge Characteristic

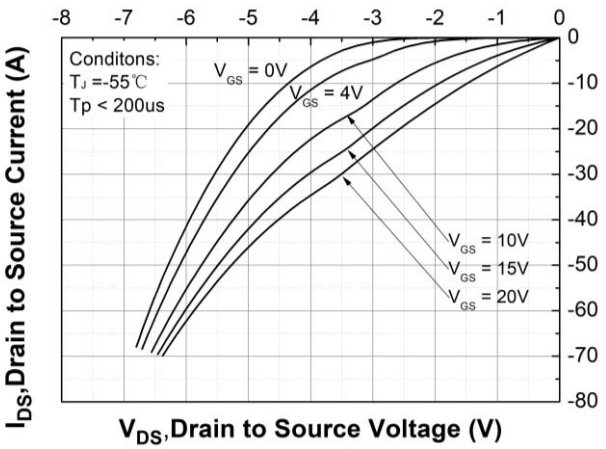


Figure 13. 3rd Quadrant Characteristic at T_J = -55 °C

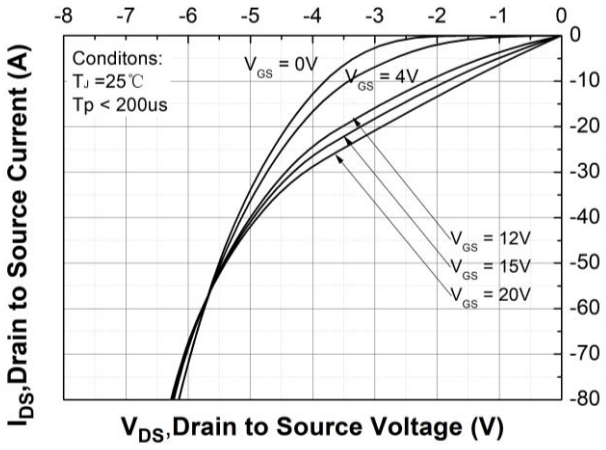


Figure 14. 3rd Quadrant Characteristic at T_J = 25 °C

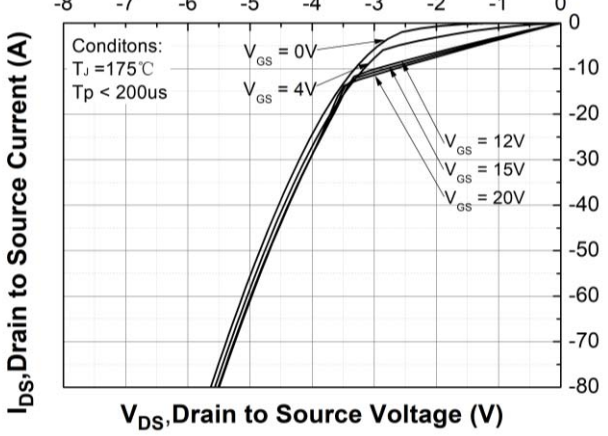


Figure 15. 3rd Quadrant Characteristic at T_J = 175 °C

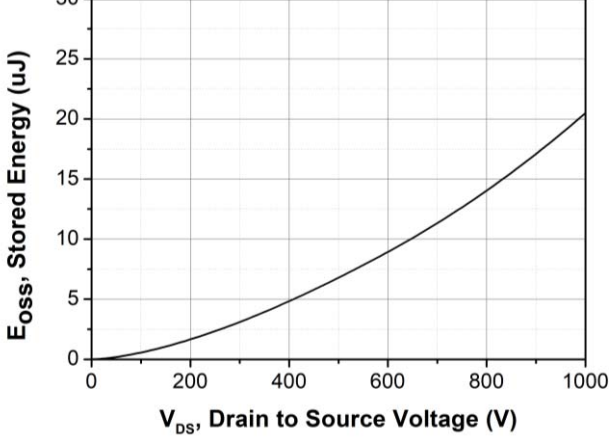


Figure 16. Output Capacitor Stored Energy

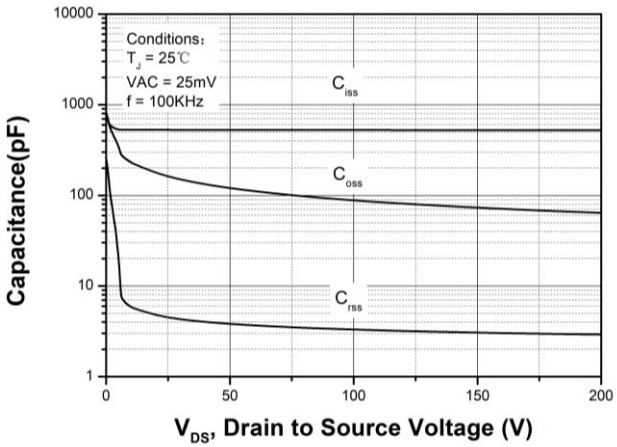


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200 V)

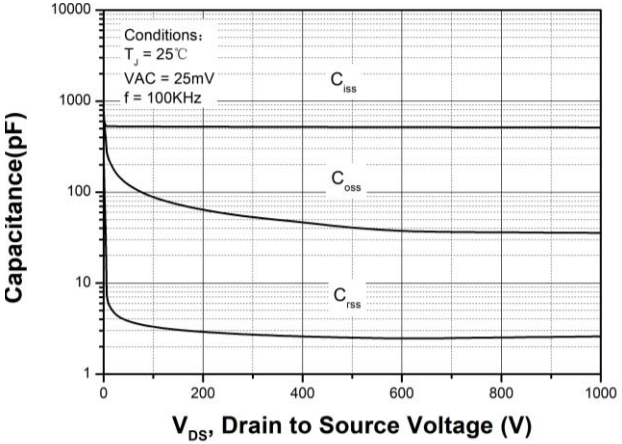


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000 V)

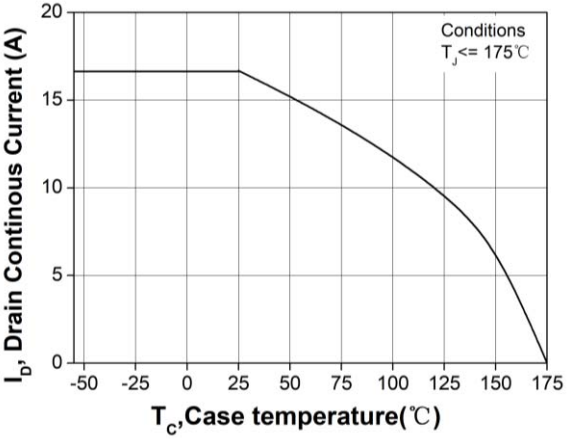


Figure 19. Continuous Drain Current Derating vs. Case Temperature

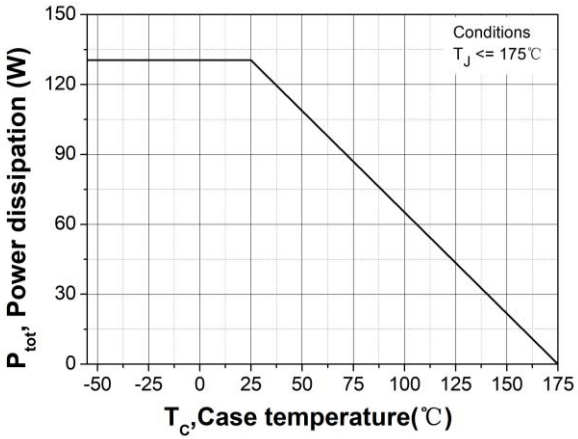


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

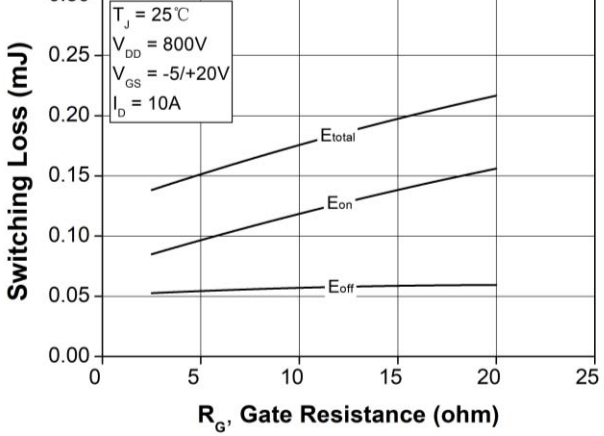


Figure 21. Transient Thermal Impedance (Junction - Case)

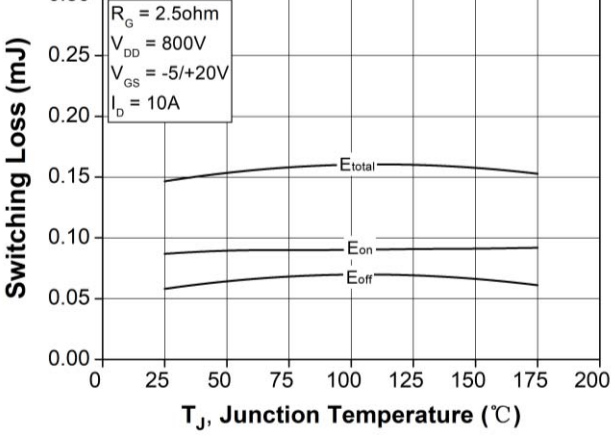


Figure 22. Safe Operating Area

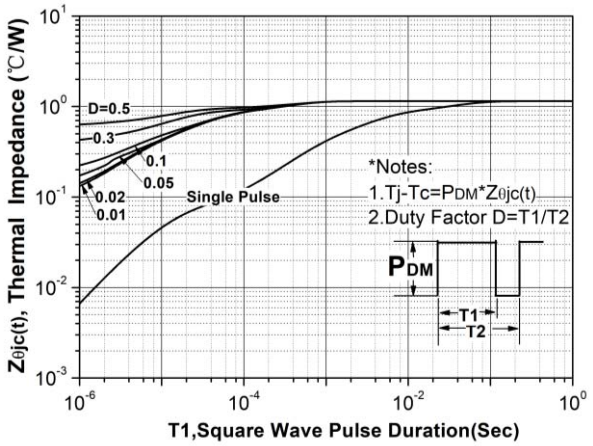


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600V)

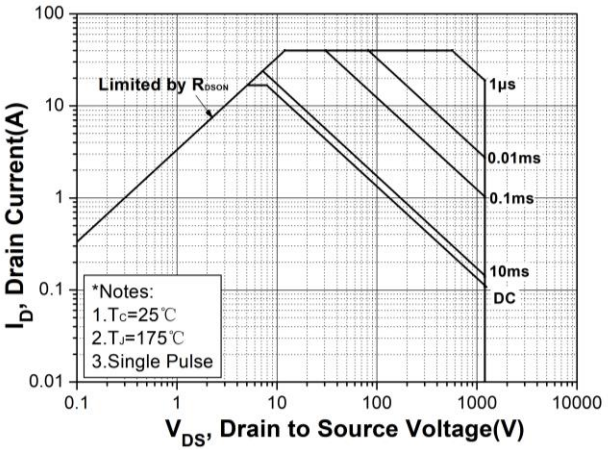


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 800V)

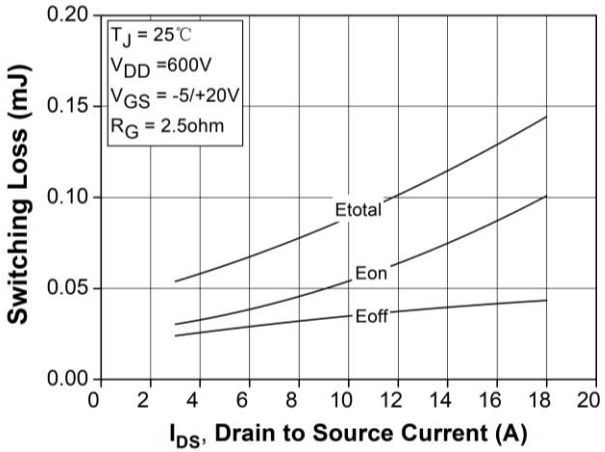


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

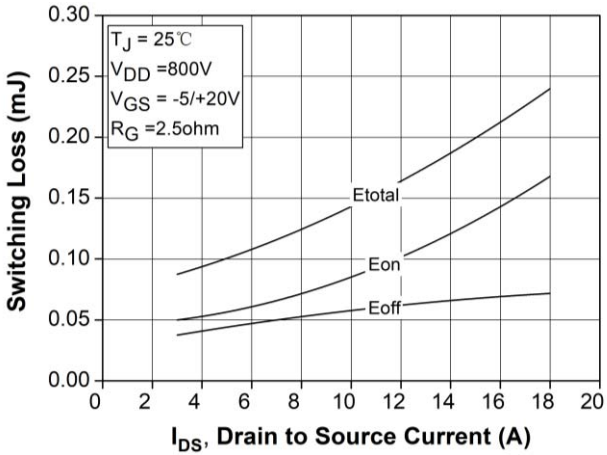


Figure 26. Clamped Inductive Switching Energy vs. Temperature

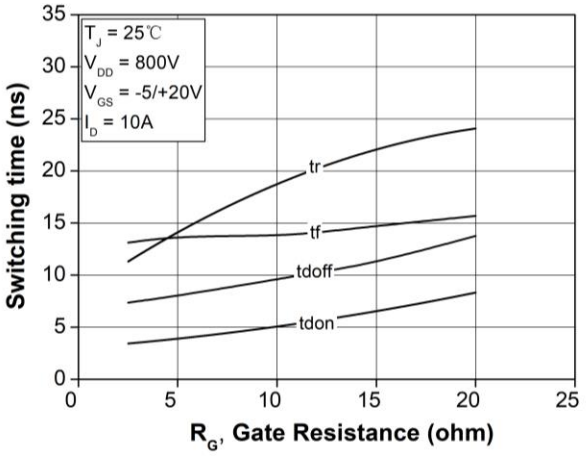


Figure 27. Switching Times vs. $R_{G(ext)}$

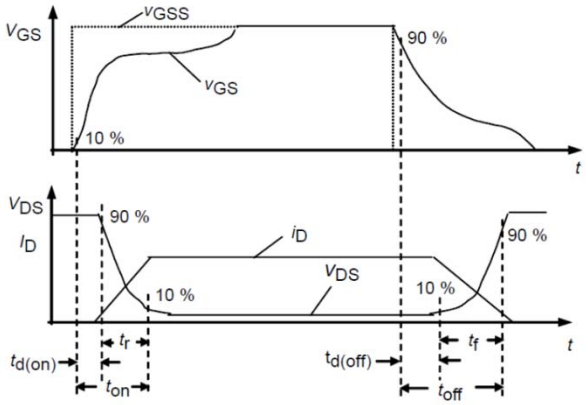
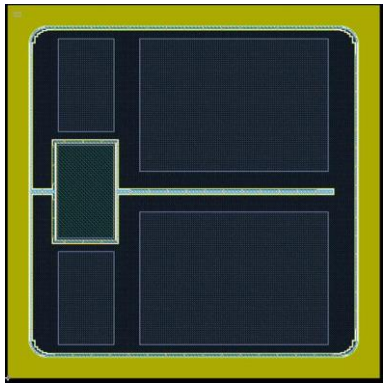
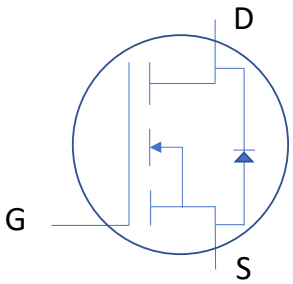


Figure 28. Switching Times Definition

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