TECHNICAL DATA
DATA SHEET D0326 REV.-

SILICON CARBIDE 1200V 140A 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°C unless otherwise specified:

Characteristics	Symbol	Condition	Max.	Units
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
Continuous Drain Current	I_D	V_{GS} =20 V, T_C = 25˚C V_{GS} =20 V, T_C = 100˚C	140 100	A
Pulsed Drain Current	$I_{D(pulse)}$	Pulse width t_P limited by T_{jmax}	314	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) When using MOSFET body diode V_{GSmax} = -10V/+25V

(2) Assumes a $R_{\theta JC}$ < 0.35 K/W

TECHNICAL DATA
DATA SHEET D0326 REV.-

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} = 0V, I_D = 100uA	1200			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 23mA	1.8	2.3	3.6	V
		V_{DS} = V_{GS}, I_D = 23mA, T_J = 175 °C		1.5		V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 1200V, V_{GS} = 0V		2	50	uA
Gate Source Leakage Current	I_{GSS}	V_{GS} = 20V, V_{DS} = 0V		10	250	nA
Drain Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 20V, I_D = 75A	11.2	16	22.3	mΩ
		V_{GS} = 20V, I_D = 75A, T_J = 175 °C		29		mΩ
Transconductance	gfs	V_{DS}= 20 V, I_D= 75 A		45		S
		V_{DS}= 20 V, I_D= 75 A, T_J = 175 °C		40		S
Input Capacitance	C_{lSS}	V_{GS} = 0V, V_{DS} = 1000V V_{AC} = 25mV f = 200kHz		6680		pF
Output Capacitance	C_{OSS}			361		
Reverse Transfer Capacitance	C_{RSS}			32		
C_{OSS} Stored Energy	E_{OSS}			204		uJ
Internal Gate Resistance	$R_{G(int)}$	f = 1MHz, VAC = 25 mV, D-S short		2.0		Ω
Gate to Source Charge	Q_{gs}	V_{DS} = 800V, V_{GS} = -5/20V I_D = 75A		78		nC
Gate to Drain Charge	Q_{gd}			73		
Total Gate Charge	Q_g			224		

Reverse Diode Characteristics:

Characteristics	Symbol	Condition	Typ.	Max.	Units
Diode Forward Voltage	V_{SD}	V_{GS}= -5V, I_{SD}= 37.5A	3.4		V
	V_{SD}	V_{GS}= -5V, I_{SD}= 37.5A, T_J= 175°C	3.0		V
Continuous Diode Forward Current	I_S	V_{GS}= -5V, T_C= 25℃		157	A
Reverse Recovery Time	t_{rr}	V_{GS}= -5V, I_{SD}= 75A, T_J= 175°C V_R= 800V dif/dt= 4000A/μs	37		ns
Reverse Recovery Charge	Q_{rr}		1.2		μ C
Peak Reverse Recovery Current	I_{mm}		53		A

TECHNICAL DATA
DATA SHEET D0326 REV.-

Typical Performance:

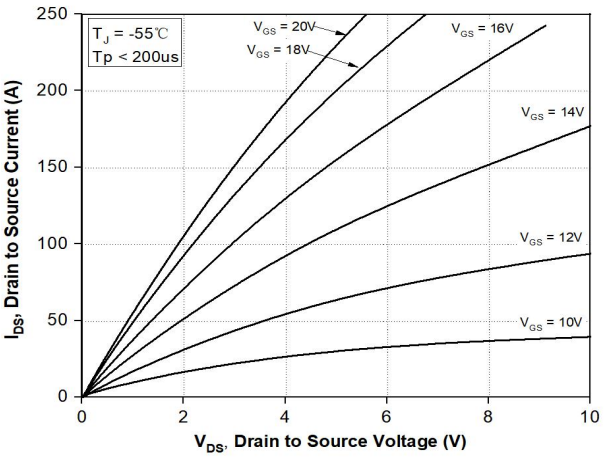


Figure 1. Output Characteristics T_J = -55 °C

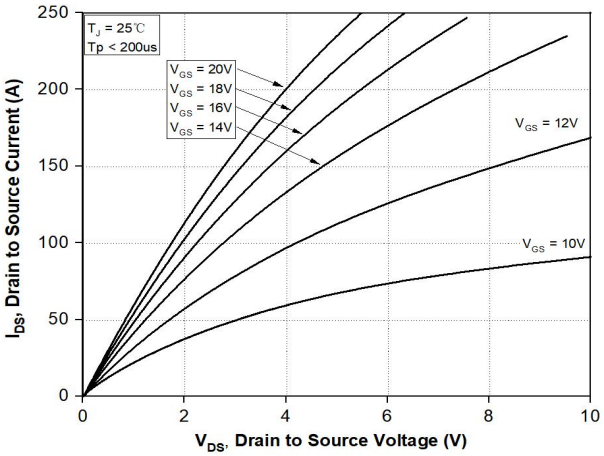


Figure 2. Output Characteristics T_J = 25 °C

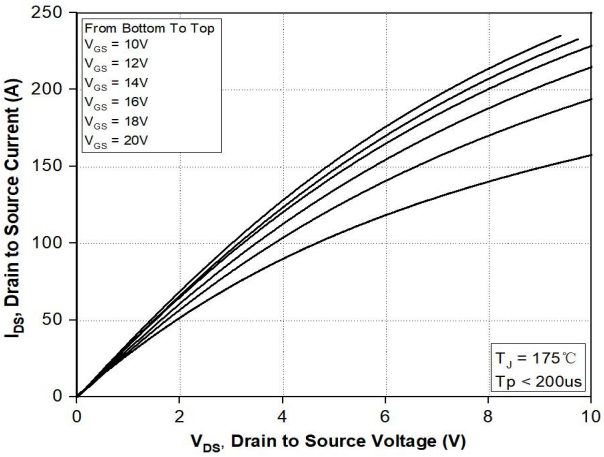


Figure 3. Output Characteristics T_J = 175°C

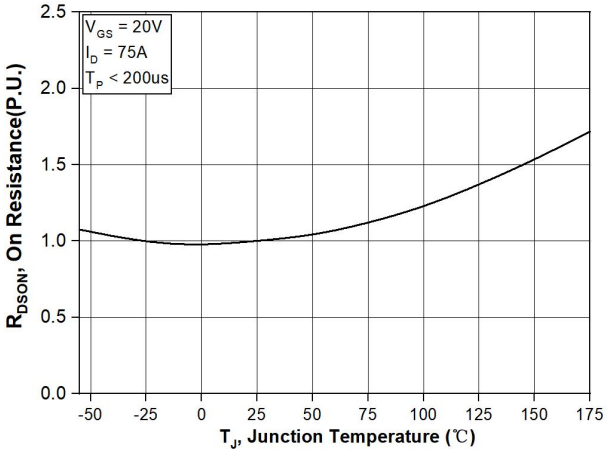


Figure 4. Normalized On-Resistance vs. Temperature

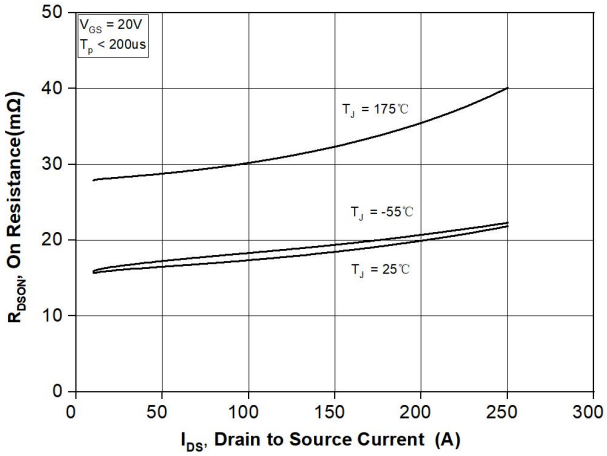


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

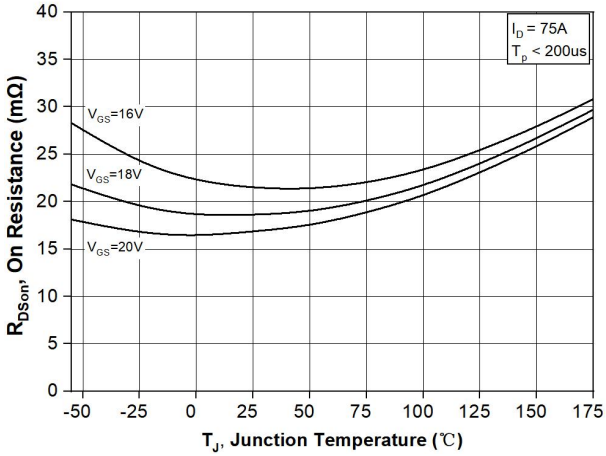


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

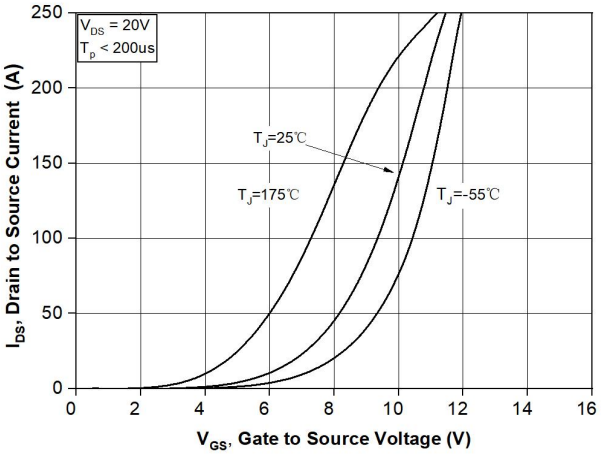


Figure 7. Transfer Characteristic for Various Junction Temperatures

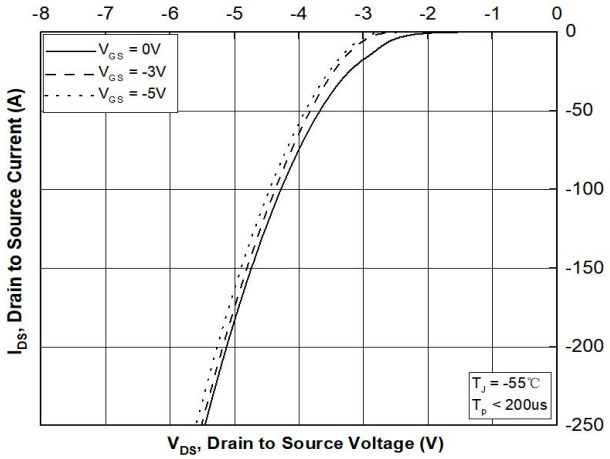


Figure 8. Body Diode Characteristic at T_J = -55 °C

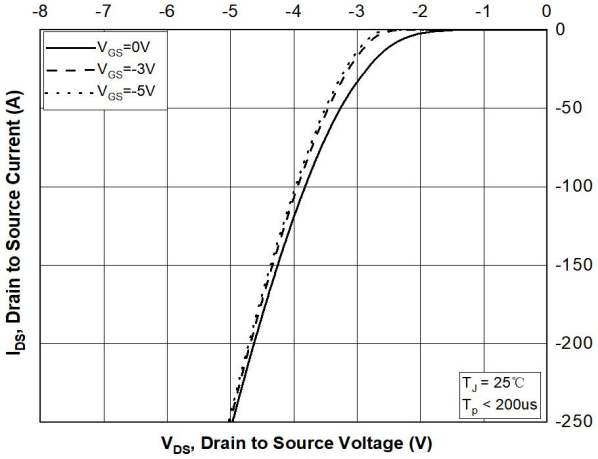


Figure 9. Body Diode Characteristic at T_J = 25 °C

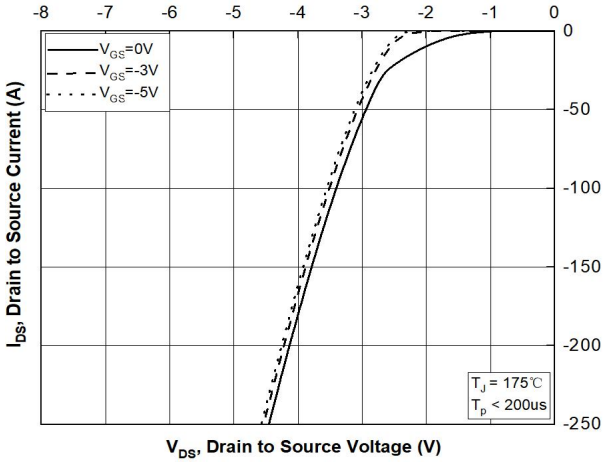


Figure 10. Body Diode Characteristic at T_J = 175 °C

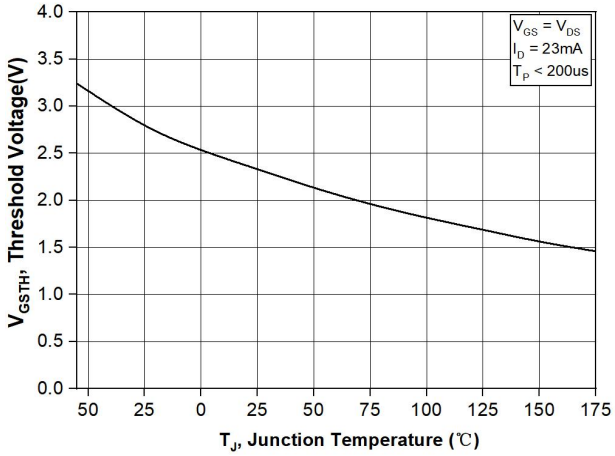


Figure 11. Threshold Voltage vs. Temperature

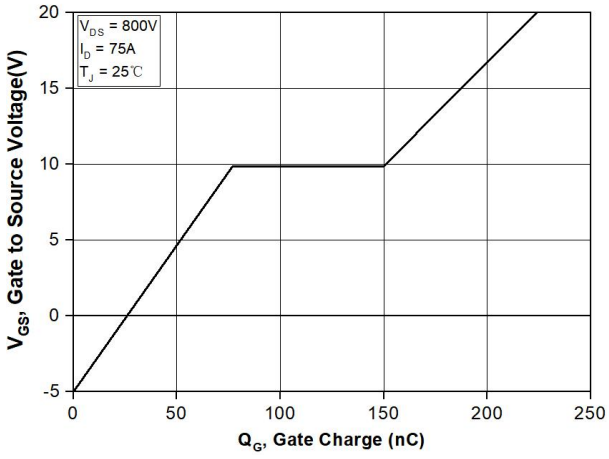


Figure 12. Gate Charge Characteristic

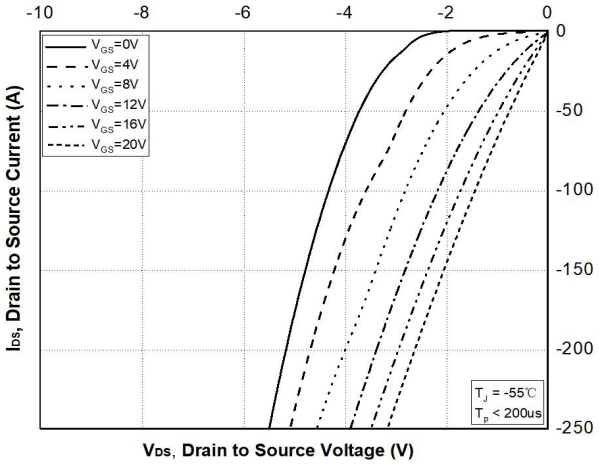


Figure 13. 3rd Quadrant Characteristic at T_J = -55 °C

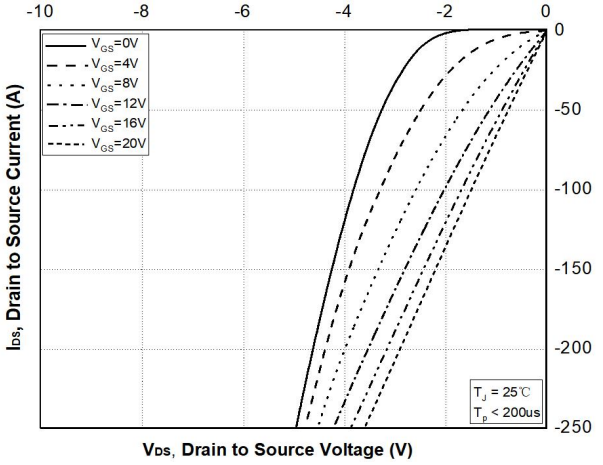


Figure 14. 3rd Quadrant Characteristic at T_J = 25 °C

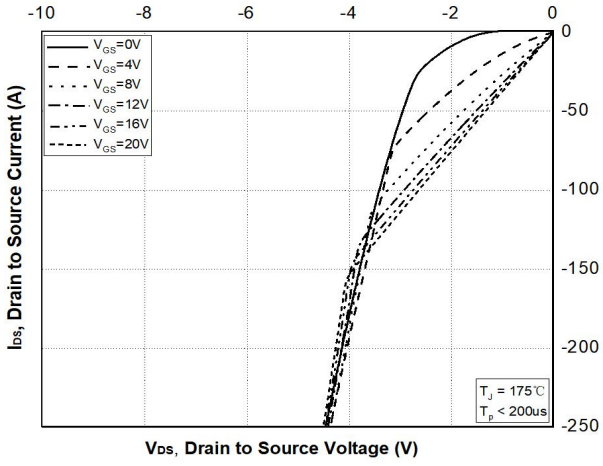


Figure 15. 3rd Quadrant Characteristic at T_J = 175°C

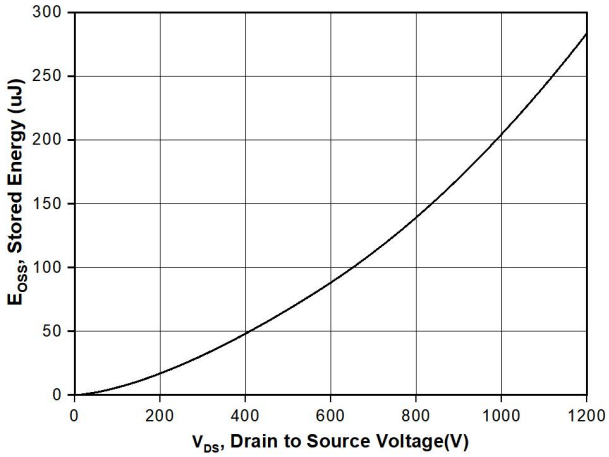


Figure 16. Output Capacitor Stored Energy

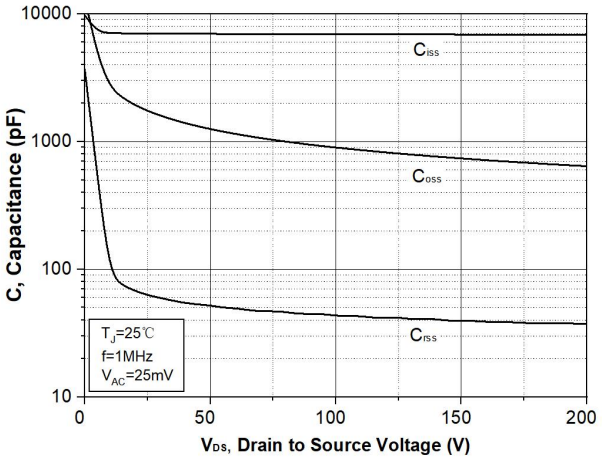


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

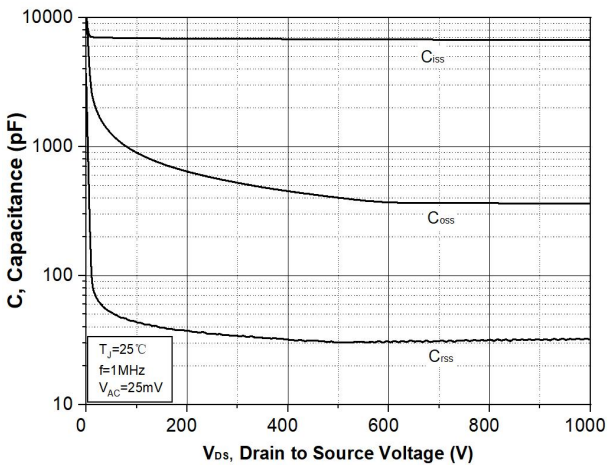


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

TECHNICAL DATA
DATA SHEET D0326 REV.-

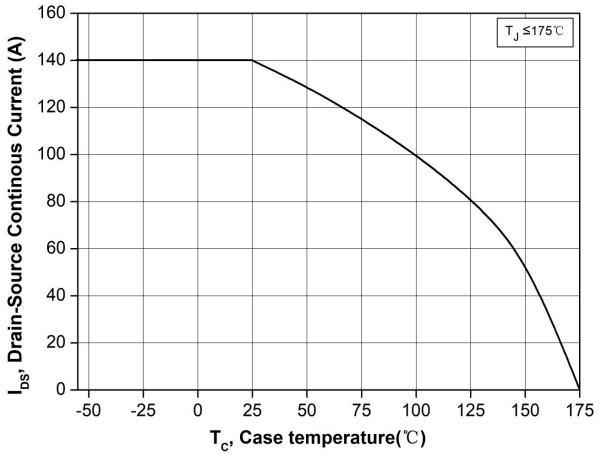


Figure 19. Continuous Drain Current Derating vs. Case Temperature

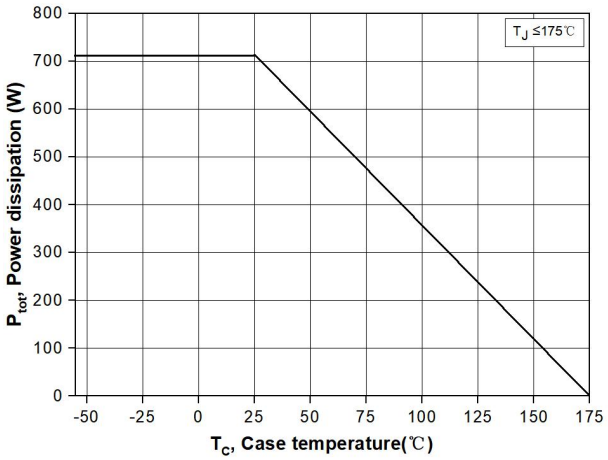


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

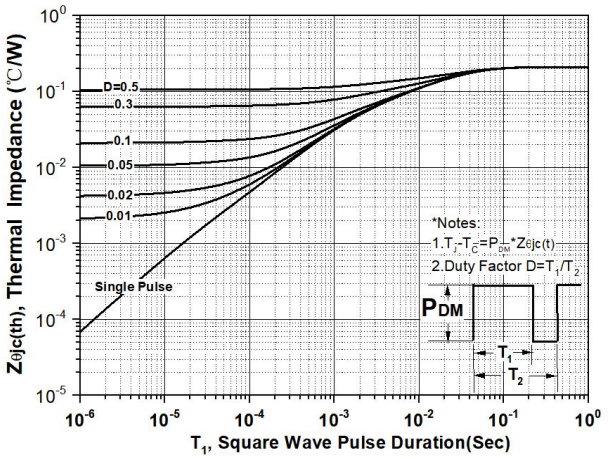


Figure 21. Transient Thermal Impedance (Junction - Case)

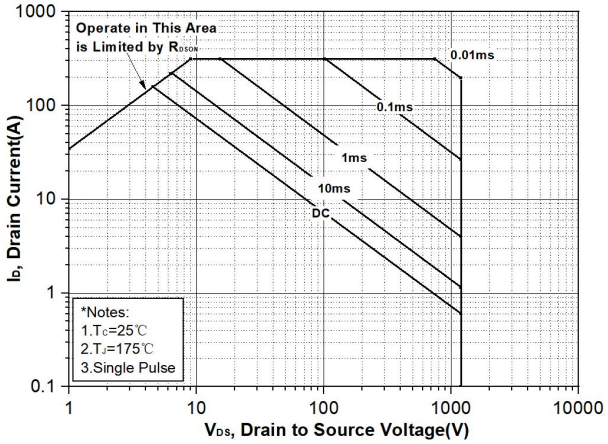


Figure 22. Safe Operating Area

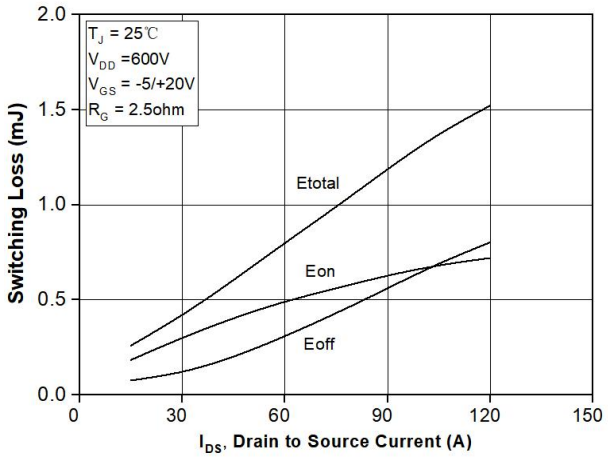


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600V)

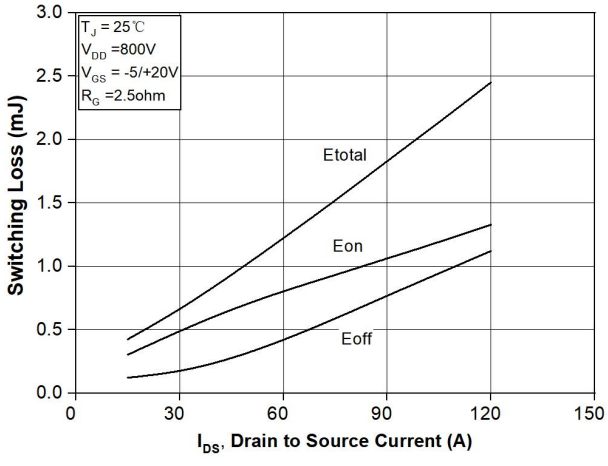


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 800V)

TECHNICAL DATA
DATA SHEET D0326 REV.-

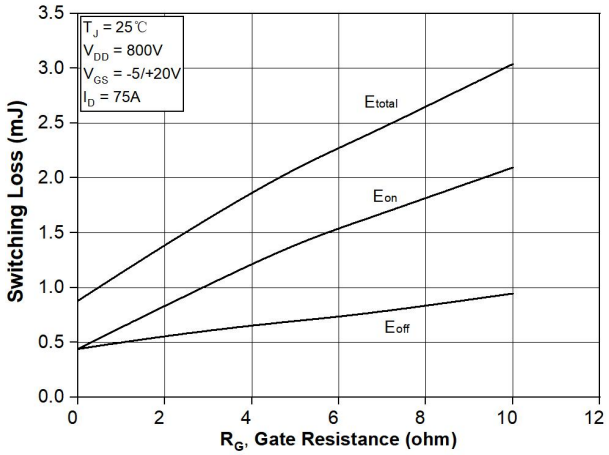


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

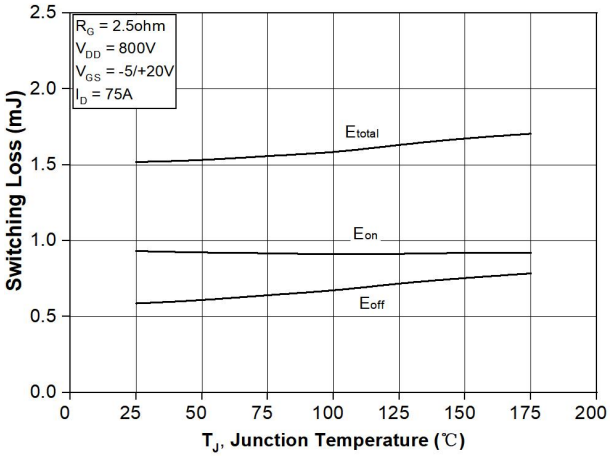


Figure 26. Clamped Inductive Switching Energy vs. Temperature

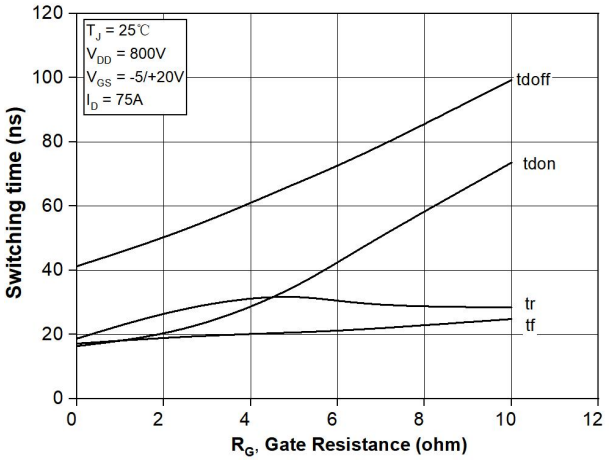


Figure 27. Switching Times vs. $R_{G(ext)}$

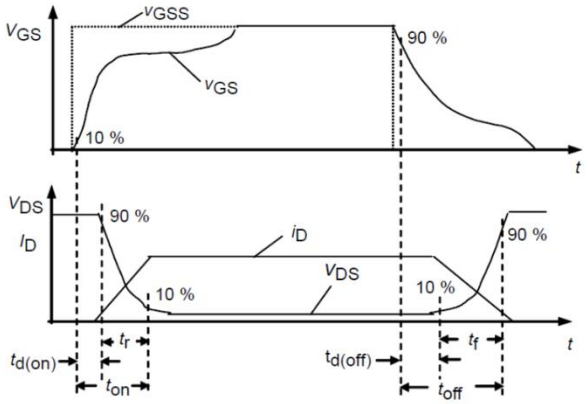
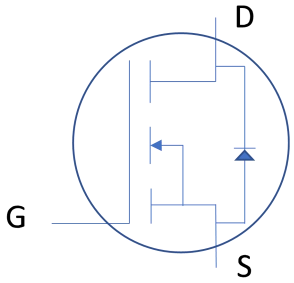


Figure 28. Switching Times Definition

TECHNICAL DATA
DATA SHEET D0326 REV.-

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

TECHNICAL DATA
DATA SHEET D0326 REV.-

DISCLAIMER:
1- The information given herein, including the specifications and dimensions, is subject to change without prior notice to improve product characteristics. Before ordering, purchasers are advised to contact the SMC Diode Solutions sales department for the latest version of the datasheet(s).
2- In cases where extremely high reliability is required (such as use in nuclear power control, aerospace and aviation, traffic equipment, medical equipment , and safety equipment) , safety should be ensured by using semiconductor devices that feature assured safety or by means of users' fail-safe precautions or other arrangement .
3- In no event shall SMC Diode Solutions be liable for any damages that may result from an accident or any other cause during operation of the user's units according to the datasheet(s). SMC Diode Solution assumes no responsibility for any intellectual property claims or any other problems that may result from applications of information, products or circuits described in the datasheets.
4- In no event shall SMC Diode Solutions be liable for any failure in a semiconductor device or any secondary damage resulting from use at a value exceeding the absolute maximum rating.
5- No license is granted by the datasheet(s) under any patents or other rights of any third party or SMC Diode Solutions.
6- The datasheet(s) may not be reproduced or duplicated, in any form, in whole or part, without the expressed written permission of SMC Diode Solutions.
7- The products (technologies) described in the datasheet(s) are not to be provided to any party whose purpose in their application will hinder maintenance of international peace and safety nor are they to be applied to that purpose by their direct purchasers or any third party. When exporting these products (technologies), the necessary procedures are to be taken in accordance with related laws and regulations..