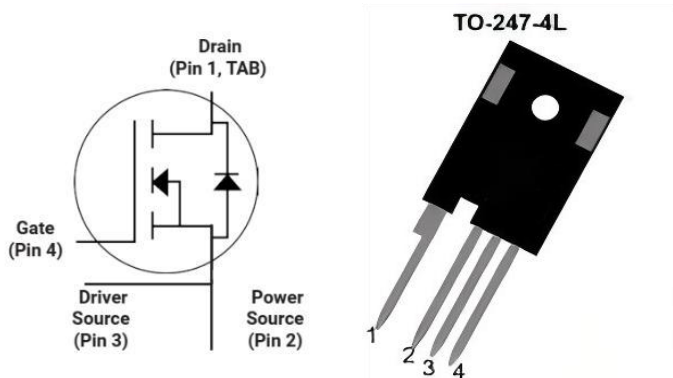


**SiC MOSFET N-channel 165A/1200V**

Parameter	Value	Unit
$BV_{DSS}$	1200	V
$R_{DS(ON),typ.(20V)}$	13	m $\Omega$
$V_{GS(TH)}$	2.5 ~ 3.5	V
$E_{on}$	9	mJ
$E_{off}$	2.1	mJ
$I_D$ (at $T_C=25^{\circ}C$ )	165	A



**FEATURES**

- High Speed Switching with Low Capacitance
- High Blocking Voltage with Low On-Resistance
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Reduced Cooling Requirements

**APPLICATIONS**

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Pulsed Power Applications

**MAXIMUM RATED VALUES** (at  $T_J = 25^{\circ}C$ , unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
$V_{DSmax}$	Drain-Source Voltage	1200	V	$V_{GS} = 0V, I_D = 1mA$
$V_{GSmax}$	Gate-Source Voltage	-10/+25	V	Absolute maximum values
$V_{GSop}$	Gate-Source Voltage	-5/+18	V	Recommended operational values
$I_D$	Continuous Drain Current	165	A	$V_{GS} = 18V, T_C = 25^{\circ}C$
		150		$V_{GS} = 18V, T_C = 60^{\circ}C$
$I_{D(pulse)}$	Pulsed Drain Current	300	A	Pulse width $t_p$ limited by $T_{Jmax}$
$P_D$	Power Dissipation	288	W	$T_C = 25^{\circ}C, T_J = 175^{\circ}C$
$T_J, T_{stg}$	Operating Junction and Storage Temperature	-40 to +175	$^{\circ}C$	
$T_L$	Solder Temperature	260	$^{\circ}C$	1.6mm (0.063") from case for 10s

**THERMAL CHARACTERISTICS**

Symbol	Parameter	Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case			0.27	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient			26.8	

**ELECTRICAL CHARACTERISTICS** (at  $T_J = 25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200	-	-	V	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$
$V_{GS(th)}$	Gate threshold Voltage	2.5	3.0	3.5	V	$V_{DS} = V_{GS}, I_D = 10\text{ mA}$
		-	2.5	-	V	$V_{DS} = V_{GS}, I_D = 10\text{ mA}, T_J = 175^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	-	-	50	$\mu\text{A}$	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$
$I_{GSS}$	Gate Source Leakage Current	-	-	200	nA	$V_{GS} = 18\text{ V}, V_{DS} = 0\text{ V}$
$R_{DS(on)}$	Drain-Source On-State Resistance	-	13	16	m $\Omega$	$V_{GS} = 18\text{ V}, I_D = 100\text{ A}$
		-	24	-		$V_{GS} = 18\text{ V}, I_D = 100\text{ A}, T_J = 175^\circ\text{C}$
$g_{fs}$	Transconductance	-	58	-	S	$V_{GS} = 20\text{ V}, I_D = 100\text{ A}$
		-	55	-		$V_{GS} = 20\text{ V}, I_D = 100\text{ A}, T_J = 175^\circ\text{C}$
$C_{iss}$	Input Capacitance	-	7500	-	pF	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}, f = 100\text{ kHz}$
$C_{oss}$	Output Capacitance	-	284	-		
$C_{rss}$	Reverse Capacitance	-	18	-		
$E_{oss}$	$C_{oss}$ Stored Energy	-	161	-	$\mu\text{J}$	
$E_{on}$	Turn on Switching Energy	-	9000	-	$\mu\text{J}$	$V_{DS} = 800\text{ V}, V_{GS} = -5/+15\text{ V}, I_D = 150\text{ A}, R_{g(ext)} = 5\Omega, T_J = 125^\circ\text{C}$
$E_{off}$	Turn off Switching Energy	-	2100	-		
$t_{don}$	Turn on delay time	-	31	-	ns	$V_{DS} = 800\text{ V}, V_{GS} = -5/+15\text{ V}, I_D = 150\text{ A}, R_{g(ext)} = 5\Omega, T_J = 125^\circ\text{C}$
$t_r$	Rise time	-	47	-		
$t_{doff}$	Turn off delay time	-	83	-		
$t_f$	Fall time	-	76	-		
$R_{gint}$	Internal Gate Resistance	-	2.5	-	$\Omega$	$V_{AC} = 25\text{ mV}, f = 1\text{ MHz}$
$Q_{gs}$	Gate to Source Charge	-	70	-	nC	$V_{DS} = 800\text{ V}, V_{GS} = -5/+18\text{ V}, I_D = 150\text{ A}$
$Q_{gd}$	Gate to Drain Charge	-	92	-		
$Q_g$	Total Gate Charge	-	260	-		

**SOURCE-DRAIN BODY DIODE CHARACTERISTICS**

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
$I_{SD}$	Continuous Source Current			132	A	$V_{GS} = -5\text{ V}, T_C = 25^\circ\text{C}$
$V_{SD}$	Diode Forward Voltage		4.9		V	$V_{GS} = -5\text{ V}, I_{SD} = 100\text{ A}$
			4.5			$V_{GS} = -5\text{ V}, I_{SD} = 100\text{ A}, T_J = 175^\circ\text{C}$
$t_{rr}$	Reverse Recovery Time		67		ns	$V_R = 800\text{ V}, V_{GS} = -5\text{ V}/+15\text{ V}, I_D = 150\text{ A}, di/dt = 2500\text{ A}/\mu\text{S}, T_J = 125^\circ\text{C}, R_G = 5\Omega$
$Q_{rr}$	Reverse Recovery Charge		1600		nC	
$I_{rrm}$	Peak Reverse Recovery Current		36		A	

### TYPICAL CHARACTERISTICS CURVES

Figure 1. Output Characteristics  $T_J = -40^\circ\text{C}$

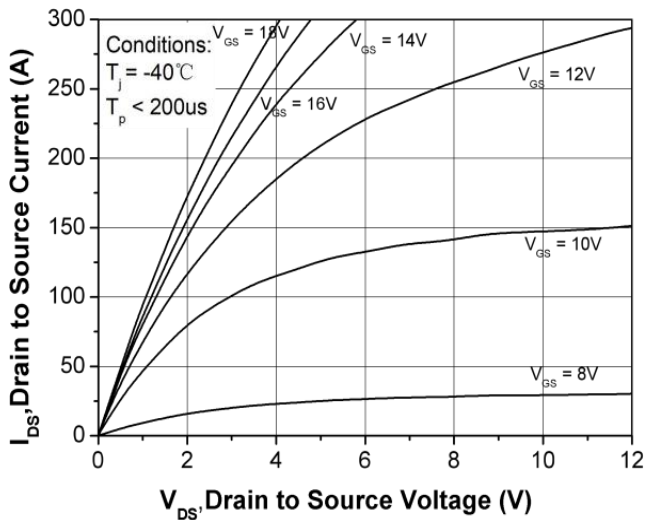


Figure 2. Output Characteristics  $T_J = 25^\circ\text{C}$

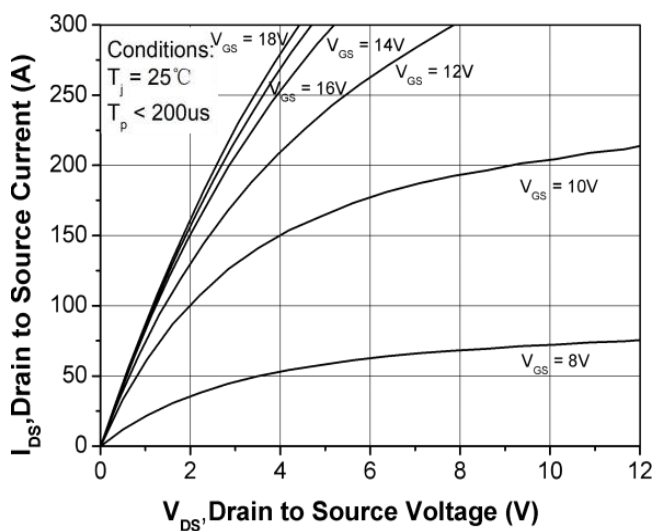


Figure 3. Output Characteristics  $T_J = 175^\circ\text{C}$

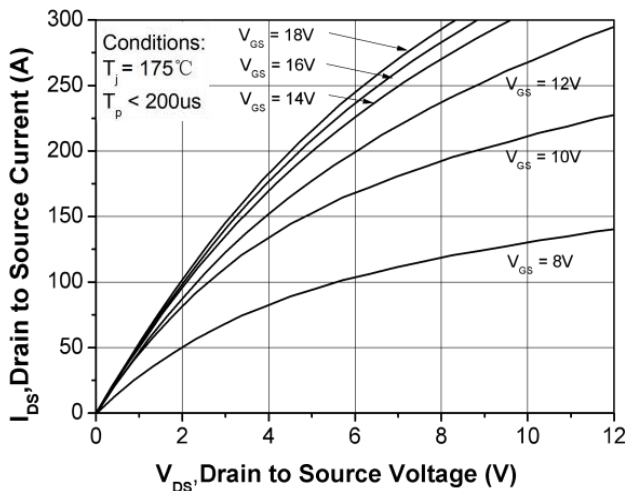


Figure 4. Normalized On-Resistance vs. Temperature

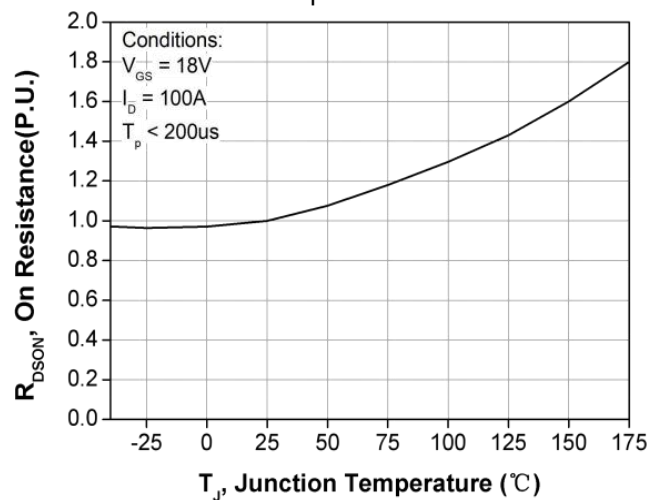


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

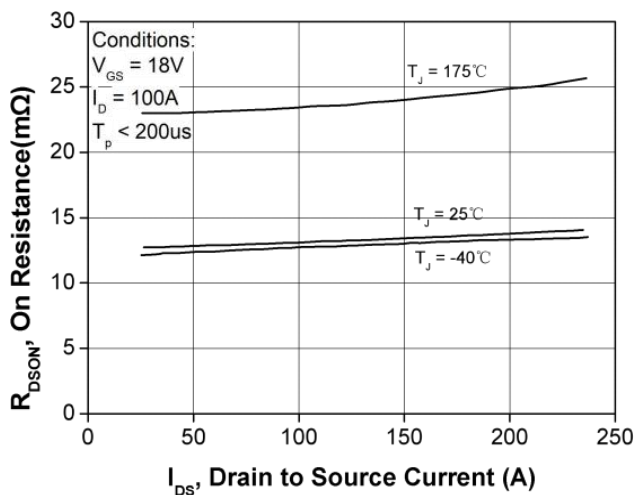


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

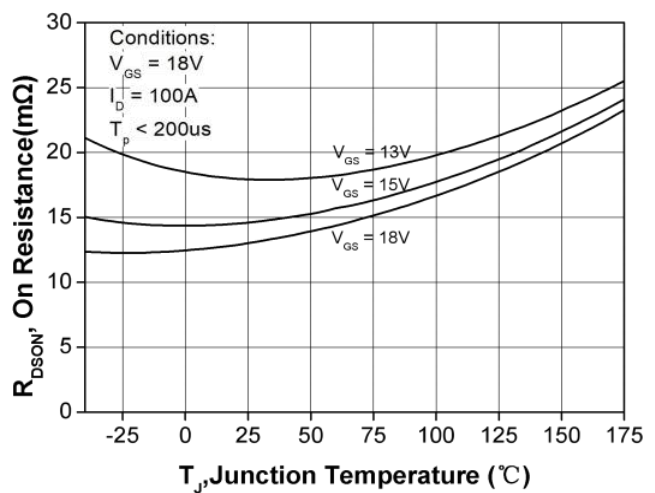


Figure 7. Transfer Characteristic for Various Junction Temperatures

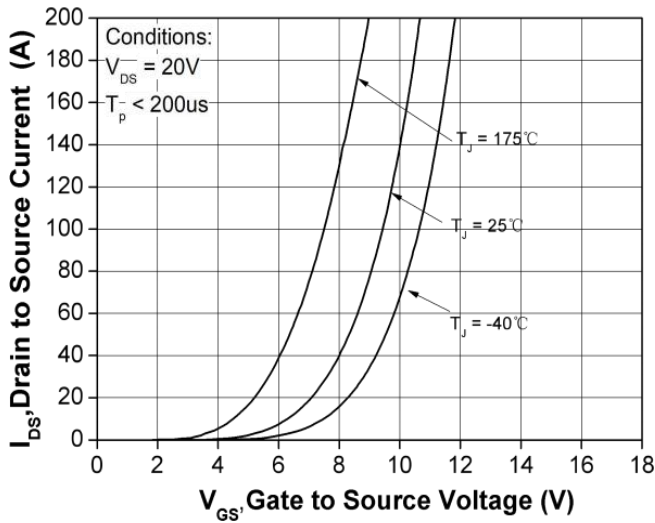


Figure 8. Body Diode Characteristic at  $T_J = -40^\circ\text{C}$

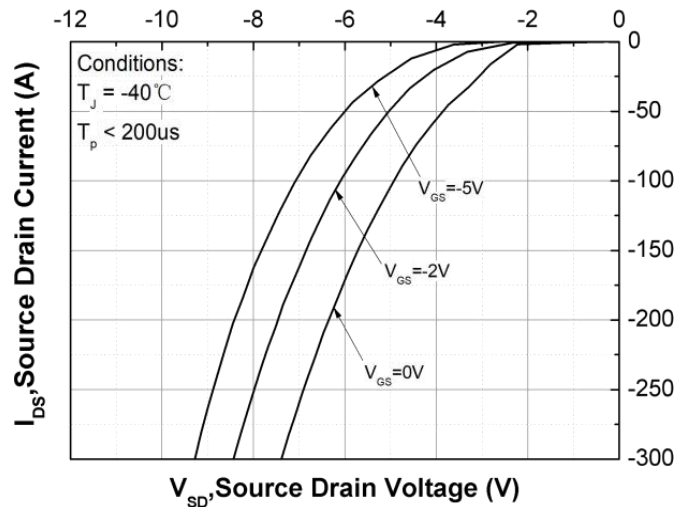


Figure 9. Body Diode Characteristic at  $T_J = 25^\circ\text{C}$

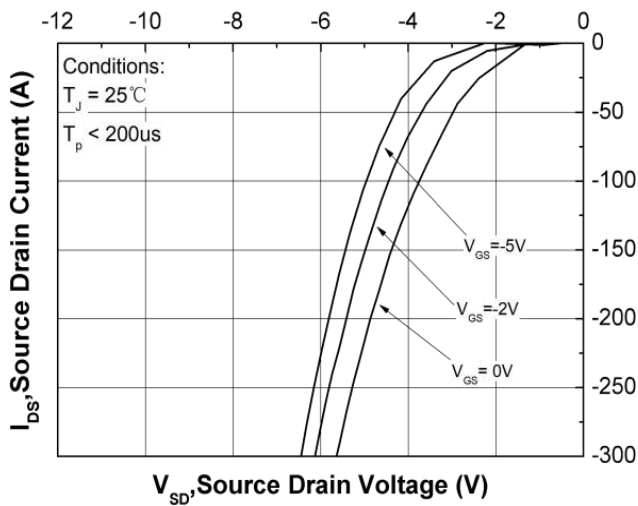


Figure 10. Body Diode Characteristic at  $T_J = 175^\circ\text{C}$

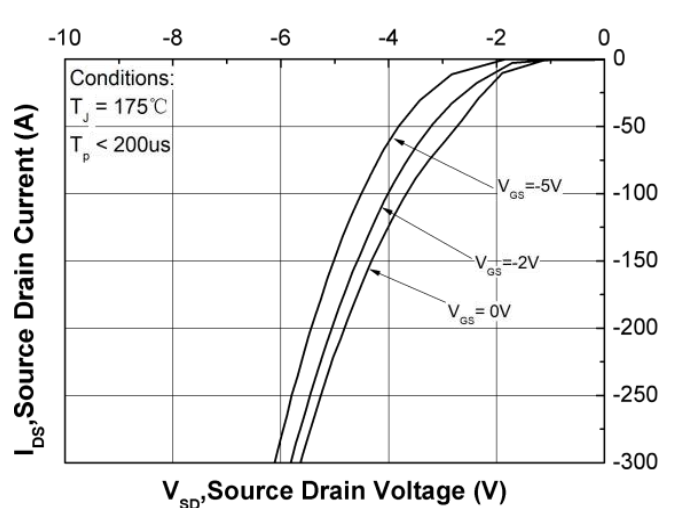


Figure 11. Threshold Voltage vs. Temperature

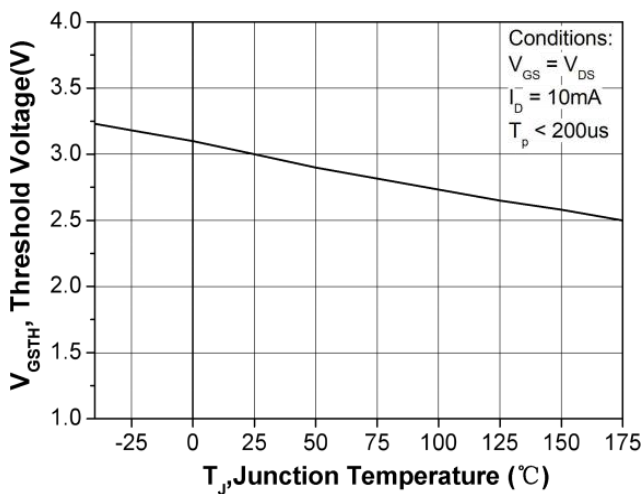


Figure 12. Gate Charge Characteristic

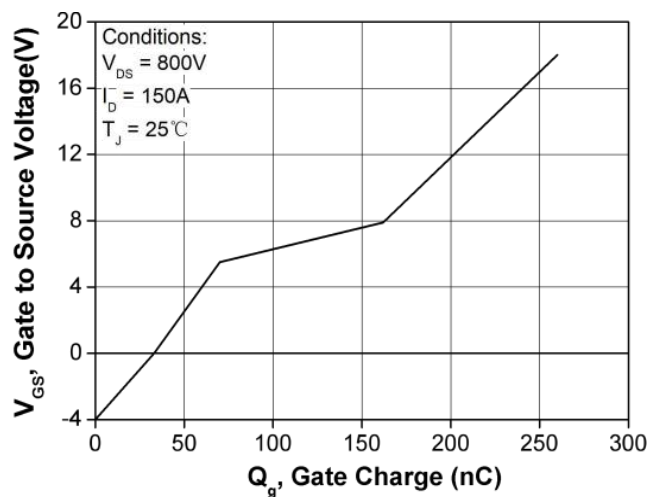


Figure 13. 3rd Quadrant Characteristic at  $T_J = -40^\circ\text{C}$

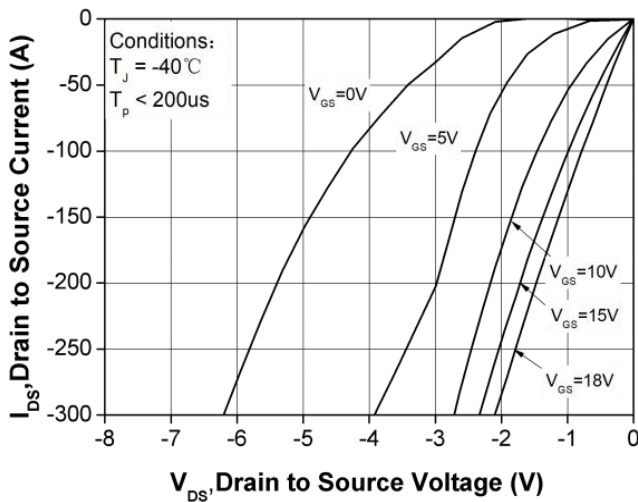


Figure 14. 3rd Quadrant Characteristic at  $T_J = 25^\circ\text{C}$

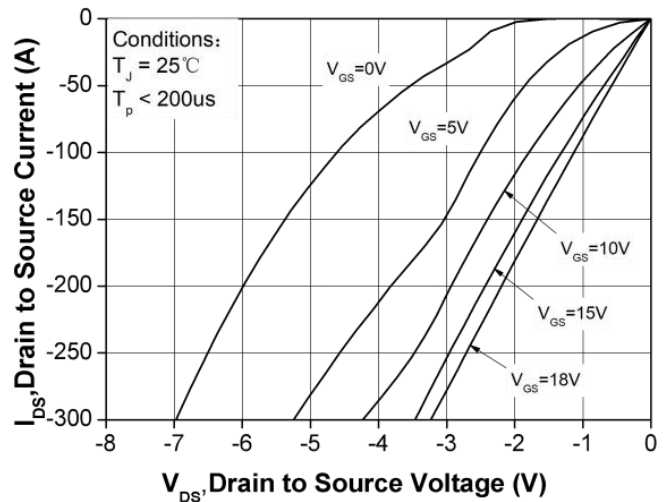


Figure 15. 3rd Quadrant Characteristic at  $T_J = 175^\circ\text{C}$

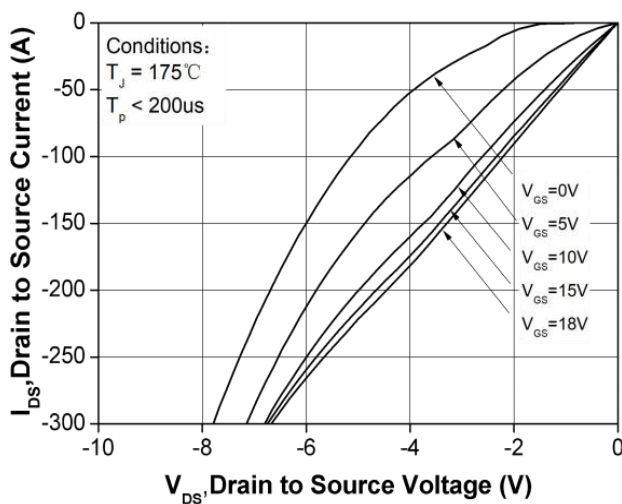


Figure 16. Output Capacitor Stored Energy

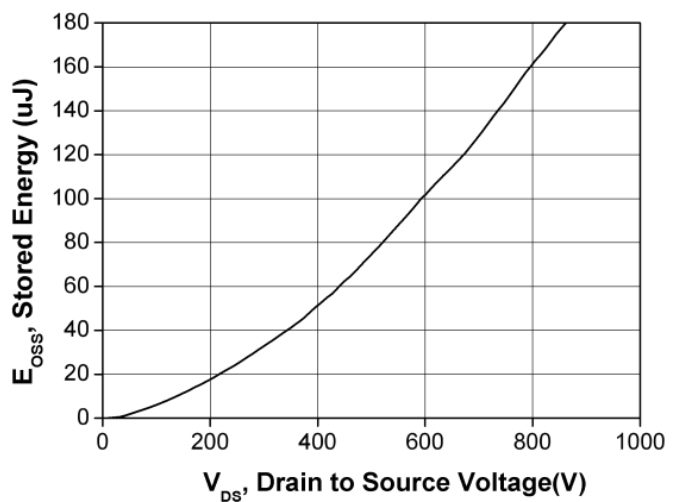


Figure 17. Capacitance vs. Drain-Source Voltage (0 - 200V)

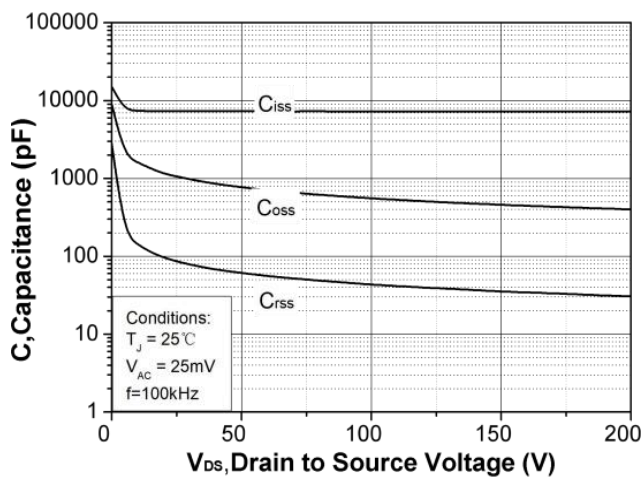


Figure 18. Capacitance vs. Drain-Source Voltage (0 - 800V)

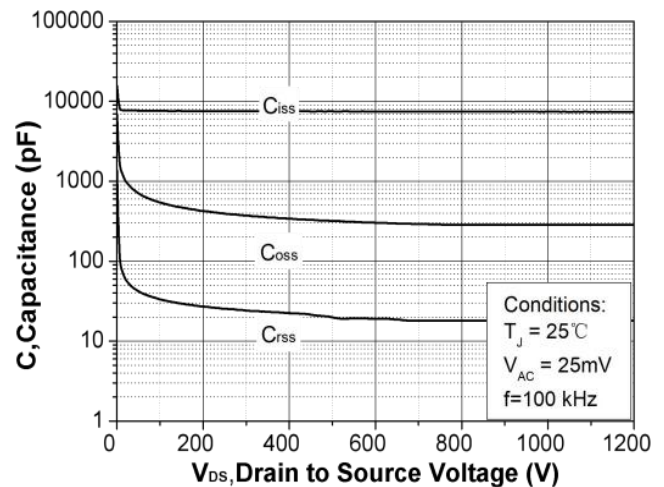




Figure 19. Continuous Drain Current Derating vs. Case Temperature

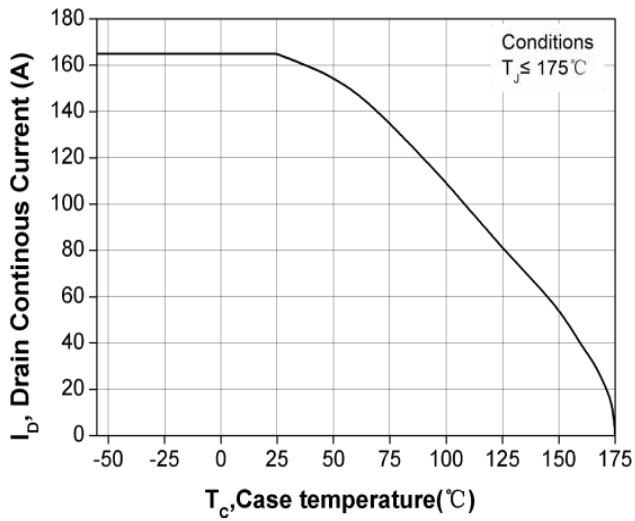


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

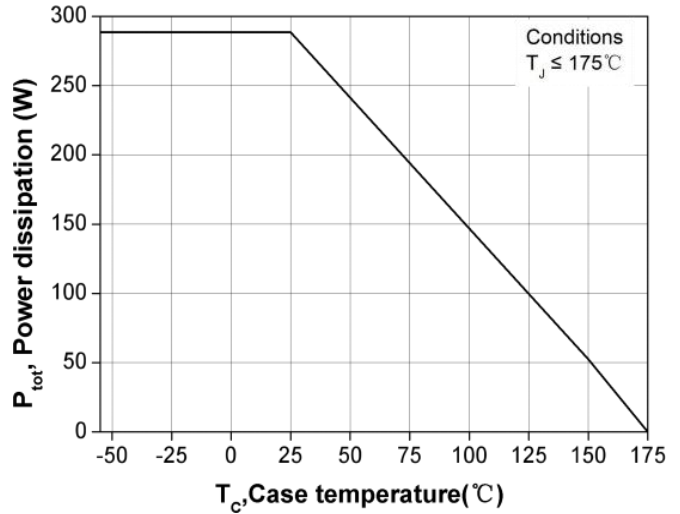


Figure 21. Transient Thermal Impedance (Junction - Case)

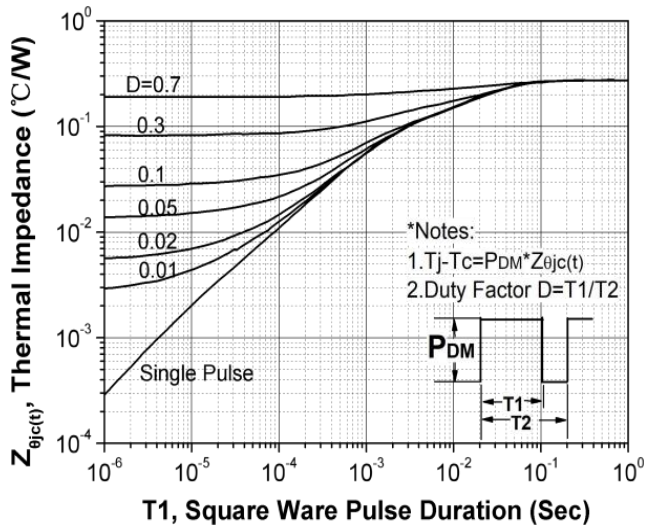


Figure 22. Safe Operating Area

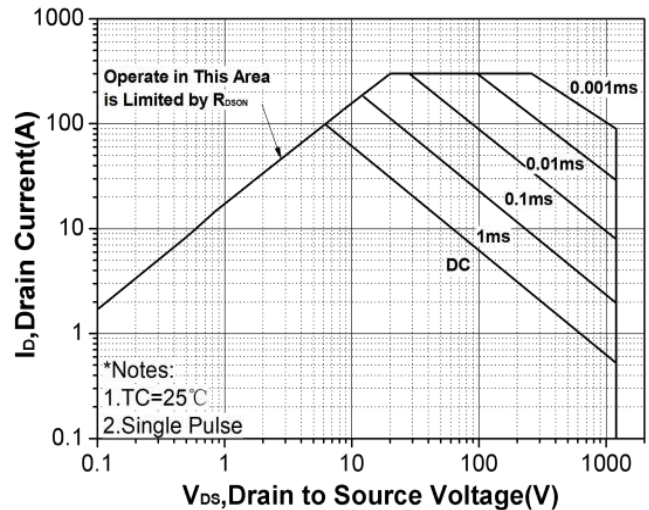


Figure 23. Clamped Inductive Switching Energy vs. Low Drain Current (VDD= 800V)

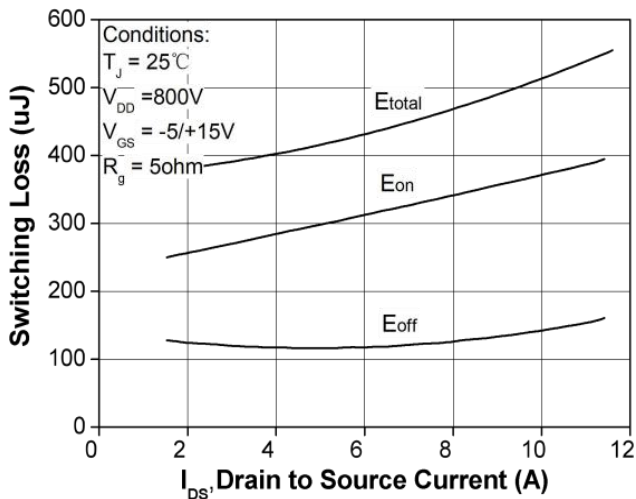


Figure 24. Clamped Inductive Switching Energy vs. High Drain Current (VDD= 800V)

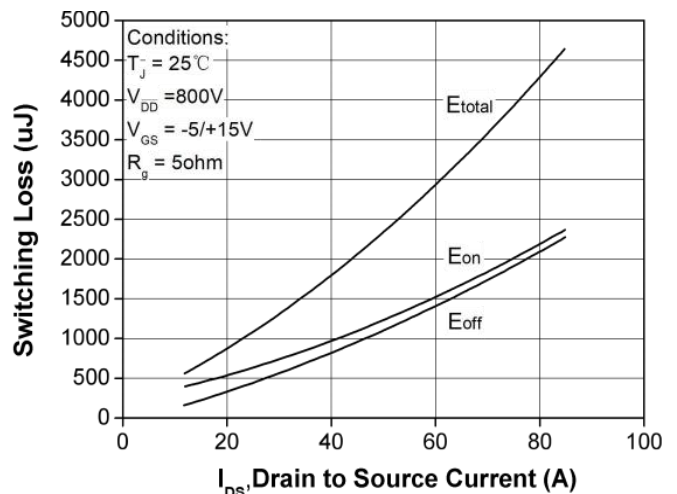


Figure 25. Clamped Inductive Switching Energy vs.  $R_g(\text{ext})$

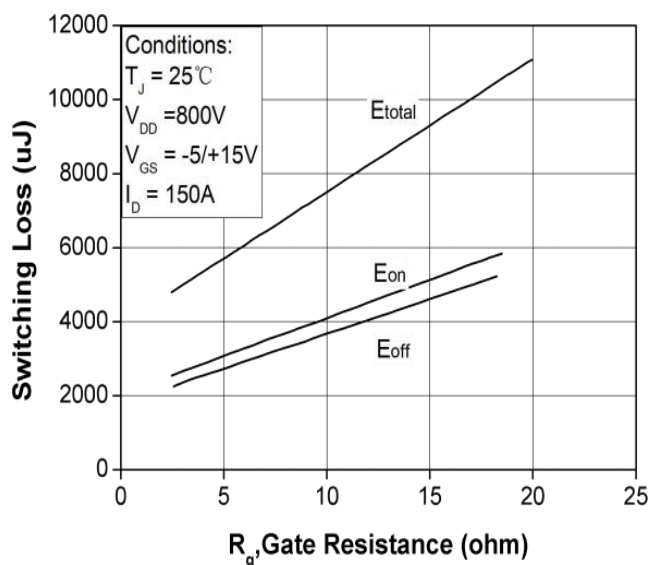


Figure 26. Clamped Inductive Switching Energy vs. Temperature

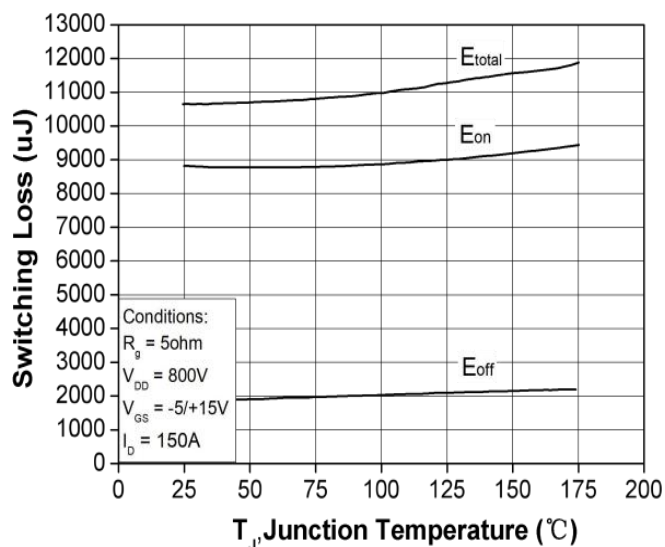


Figure 27. Switching Times vs.  $R_g(\text{ext})$

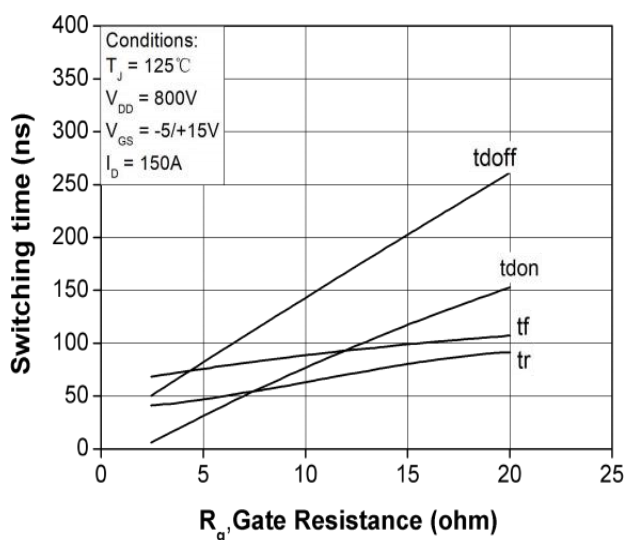
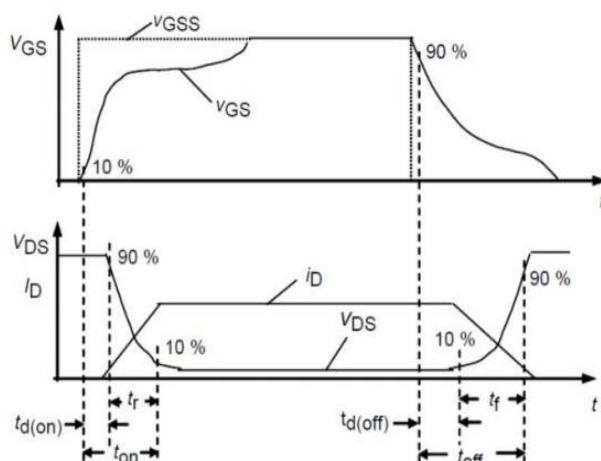
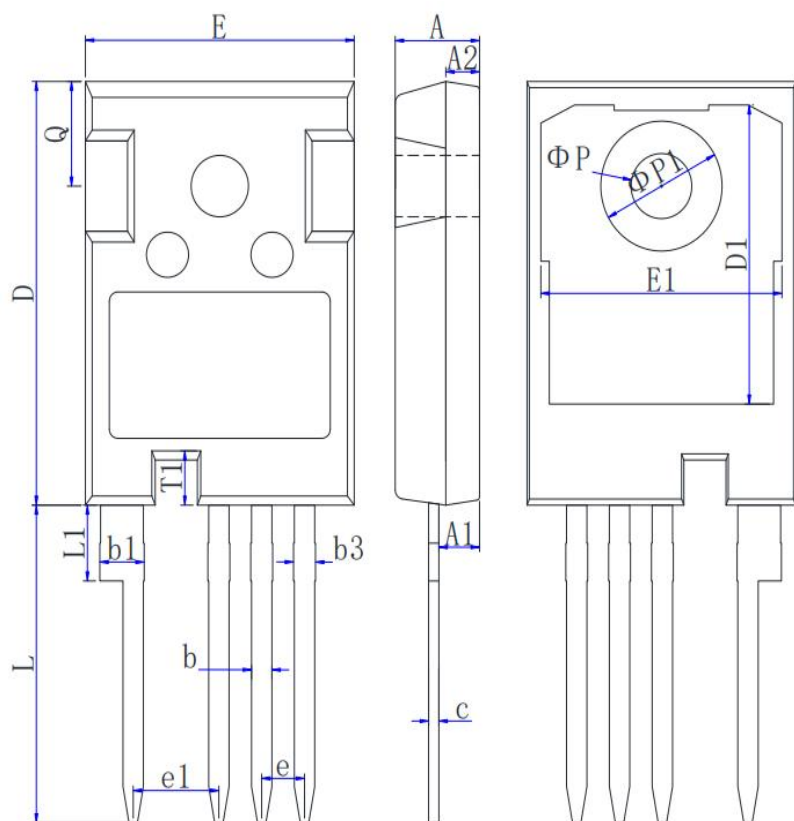


Figure 28. Switching Times Definition



### PACKAGE OUTLINES

TO-247-4L



SYMBOL	MM		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.80	2.00	2.20
b	1.06	1.21	1.36
b1	2.33	2.63	2.93
b3	1.07	1.30	1.60
c	0.51	0.61	0.75
D	23.30	23.45	23.60
D1	16.25	16.55	16.85
E	15.74	15.94	16.14
E1	13.72	14.02	14.32
T1	2.35	2.50	2.65
e	2.54BSC		
e1	5.08BSC		
Q	5.49	5.79	6.09
L	17.27	17.57	17.87
L1	3.99	4.19	4.39
ΦP	3.40	3.60	3.80
ΦP1	7.19REF		

### \*\*\*Important Usage Information and Disclaimer

The specifications of Zhuhai Hypersemi Co., Ltd. products are not guarantees of product characteristics. They reflect typical performance expected in standard applications, which may vary with specific uses. Users must conduct prior testing for their applications and make necessary adjustments.

Users are responsible for the safety of applications utilizing our products and must implement adequate safety measures to prevent physical injury, fire, or other risks in case of product failure. It is the user's duty to ensure that application designs comply with all applicable laws and standards. Our products must not be used in any applications where a product failure could reasonably result in personal injury, unless specifically authorized in a signed document by Zhuhai Hypersemi Co., Ltd.

No representations or warranties are made regarding the accuracy or completeness of this information, including any claims of non-infringement of third-party intellectual property rights. Zhuhai Hypersemi Co., Ltd. assumes no liability for any applications or uses of its products and does not grant any licenses to its intellectual property rights or those of others. We also make no claims regarding non-infringement of third-party intellectual property rights that may arise from applications.



Due to technical requirements, our products may contain hazardous substances. For details, please contact your nearest sales office. This document replaces all previous information and may be updated. We reserve the right to make changes.