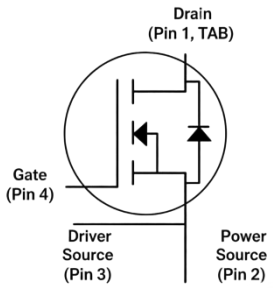
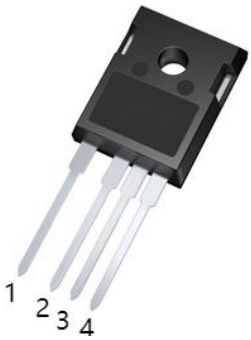
Silicon Carbide Power MOSFET

Parameter	Value	Unit
V_{DS}	1700	V
I_D	85	A
$R_{DS(ON)}$	40	mΩ
Q_G	248	nC





TO-247-4L

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Avalanche Ruggedness
- Easy to Parallel and Simple to Drive

Applications

- Motor Drive
- Solar Inverters
- High Voltage DC/DC Converters
- Switched-Mode Power Supply(SMPS)
- Pulsed Power Applications

Absolute Maximum Ratings (at T_J=25℃ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DS}	1700	V
Gate-source Voltage (Absolute maximum values)	V_{GS}	-10/+25	V
Gate-source Voltage (Recommended operational values)		-5/+20	
Drain Current (continuous;Tc=25°C) V_{GS}=20V	I_D	85	A
Drain Current (continuous;Tc=100°C) V_{GS}=20V		55	
Drain Current (pulsed)	I_{DM}	160	A
Power Dissipation (Tc=25°C, T_J=150°C)	P_D	520	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	°C
Thermal Resistance from Junction to Case	$R_{\theta JC}$	0.24	°C/W
Thermal Resistance From Junction to Ambient	$R_{\theta JA}$	30	

Electrical Characteristics

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Static characteristics (at T_C=25°C unless otherwise specified)						
Drain-Source Breakdown Voltage	B_{VDS}	V_{GS}=0V; I_D=100uA	1700	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1700V; V_{GS}=0V	-	2	100	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=20V; V_{DS}=0V	-	-	250	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS}; I_D=18mA; T_J=25°C	2.0	2.6	4.0	V
Static Drain-Source on Resistance	$R_{DS(on)}$	V_{GS}=20V; I_D=50A; T_J=25°C	-	40	60	mΩ
		V_{GS}=20V; I_D=50A; T_J=150°C	-	70	-	
Transconductance	G_{fs}	V_{GS}=20V; I_D=50A; T_J=25°C	-	16	-	S
		V_{GS}=20V; I_D=50A; T_J=150°C	-	19	-	
Dynamic characteristics (at T_C=25°C unless otherwise specified)						
Input Capacitance	C_{iss}	V_{DS}=1000V; f=1MHz; V_{GS}=0V T_j=25°C	-	4078	-	pF
Output Capacitance	C_{oss}		-	167	-	
Reverse Transfer Capacitance	C_{rss}		-	39	-	
C_{oss} Stored Energy	E_{oss}		-	203	-	uJ
Turn on Switching Energy	E_{on}	V_{DD}=1200V; V_{GS}=-5/20V; I_D=50A; $R_{g(ext)}$=2.5Ω; T_j=150°C	-	1.9	-	mJ
Turn off Switching Energy	E_{off}		-	0.3	-	
Total Gate Charge	Q_G	V_{DD}=1200V; V_{GS}=-5/20V; I_D=50A; T_j=25°C	-	248	-	nC
Gate-Source Charge	Q_{GS}		-	44	-	
Gate-Drain Charge	Q_{GD}		-	84	-	
Internal Gate Resistor	R_{Gint}	f=1MHz; V_{AC}=25mV	-	2.5	-	Ω
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=1200V; V_{GS}=-5/20V; I_D=50A; $R_{g(ext)}$=2.5Ω	-	21	-	ns
Rise Time	t_r		-	46	-	
Turn-off Delay Time	$t_{d(off)}$		-	50	-	
Fall Time	t_f		-	19	-	

Reverse SiC Diode Characteristics(at T_J=25℃ unless otherwise specified)

Parameter	Symbol	Conditions	Values			Units
			Min.	Typ.	Max.	
Diode Forward Voltage	V_{FSD}	V_{GS}=-5V; I_F=25A; T_J=25°C	-	6.1	-	V
Continuous Diode Forward Current	I_S	V_{GS}=-5V; T_C=25°C	-	-	75	A
Reverse Recovery Time	t_{RR}	V_R=1200V; V_{GS}=-5V; I_F=50A; di/dt=1400A/μs, T_j=150°C	-	126	-	ns
Reverse Recovery Charge	Q_{RR}		-	1360	-	nC
Peak Reverse Recovery Current	I_{RRM}		-	19	-	A

Typical Characteristics

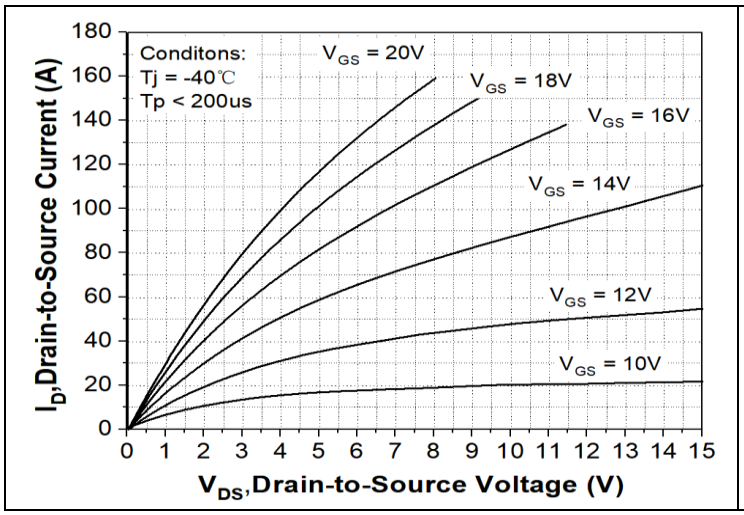


Figure 1. Output Characteristics T_J = -40 °C

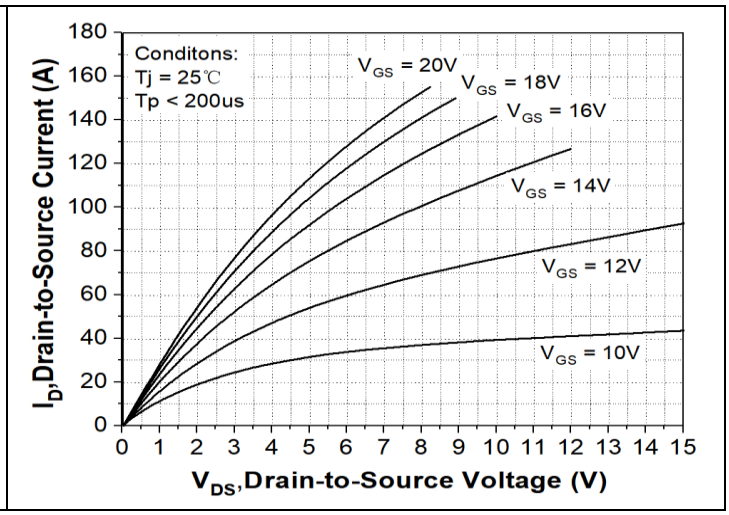


Figure 2. Output Characteristics T_J = 25 °C

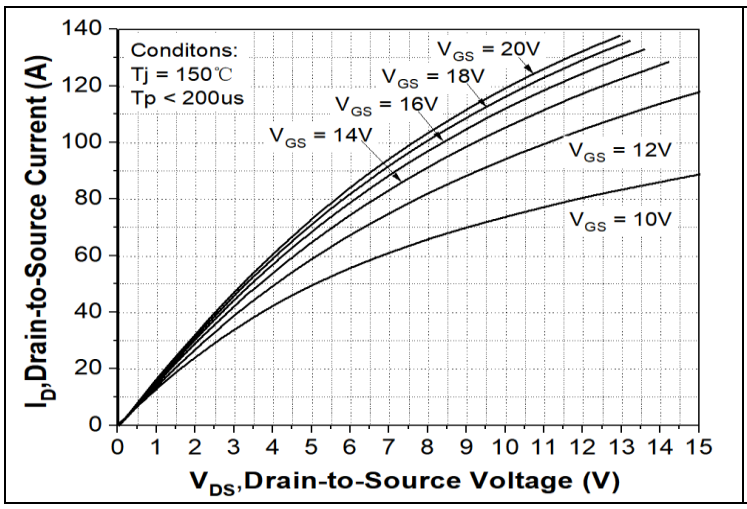


Figure 3. Output Characteristics T_J = 150°C

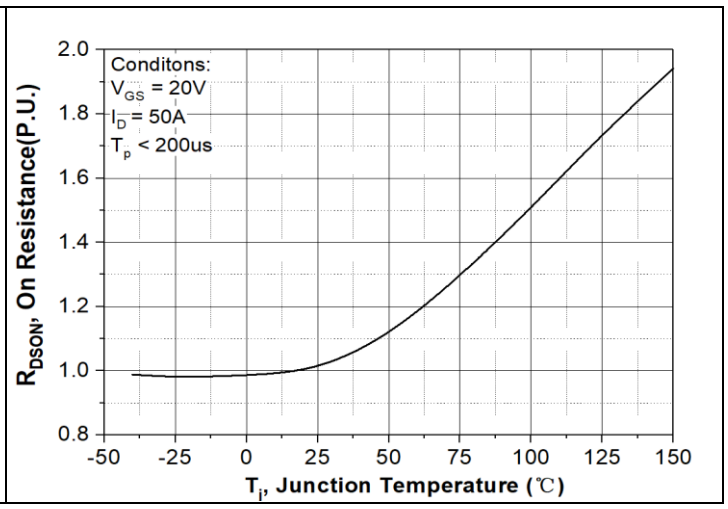


Figure 4. Normalized On-Resistance vs. Temperature

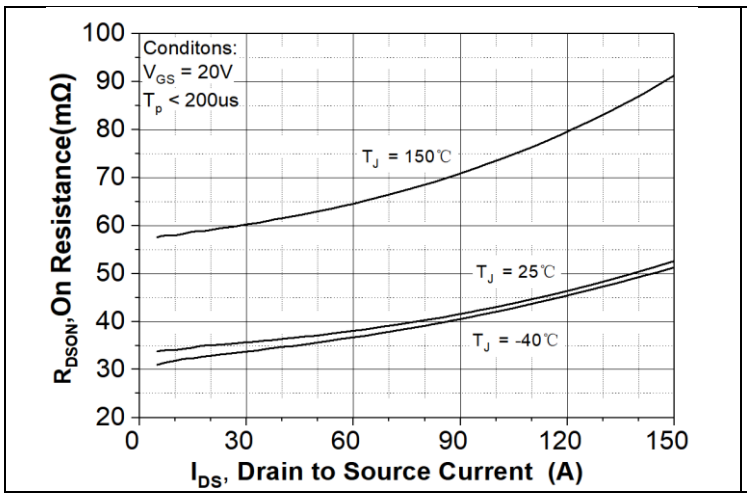


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

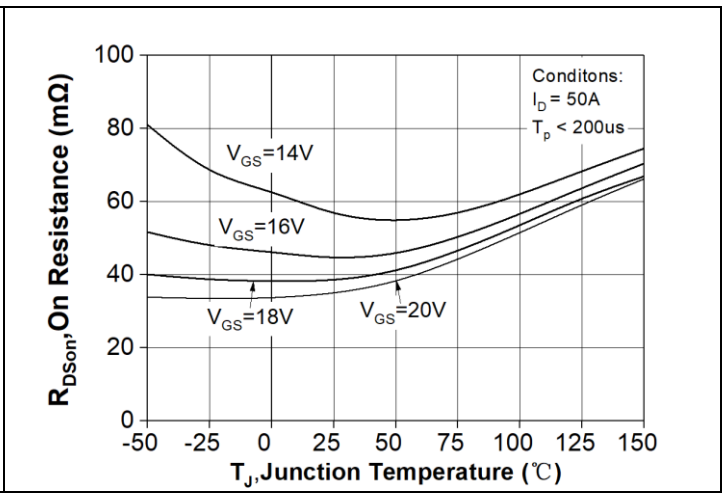


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

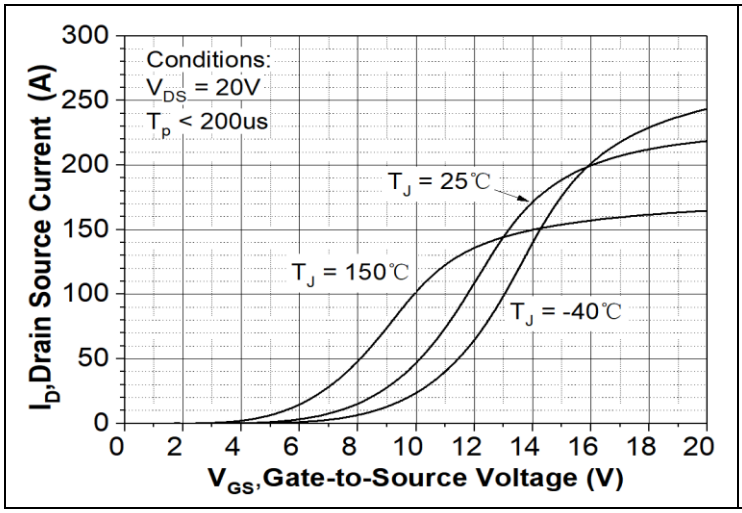


Figure 7. Transfer Characteristic for Various Junction Temperatures

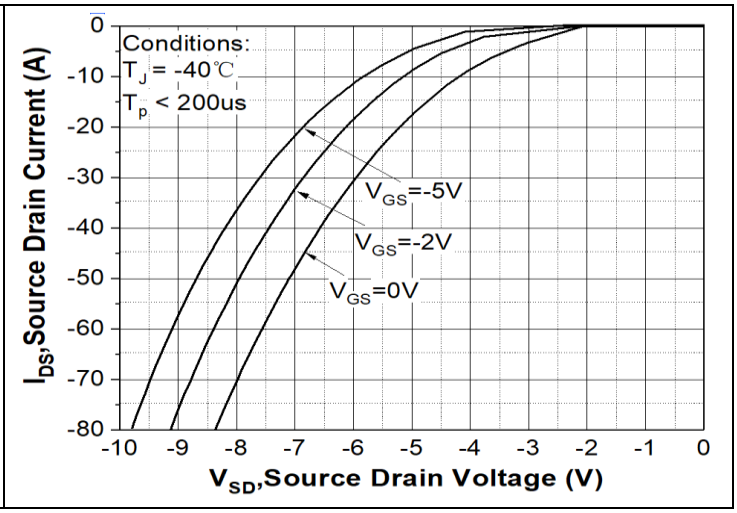


Figure 8. Body Diode Characteristic at T_J = -40 °C

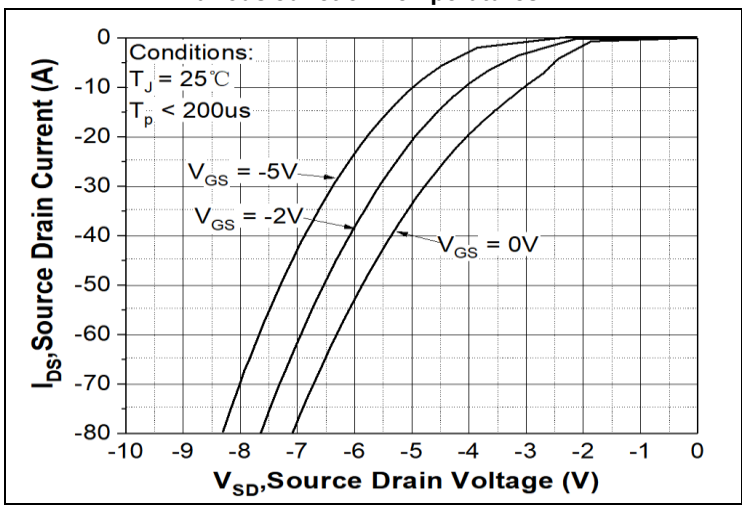


Figure 9. Body Diode Characteristic at T_J = 25 °C

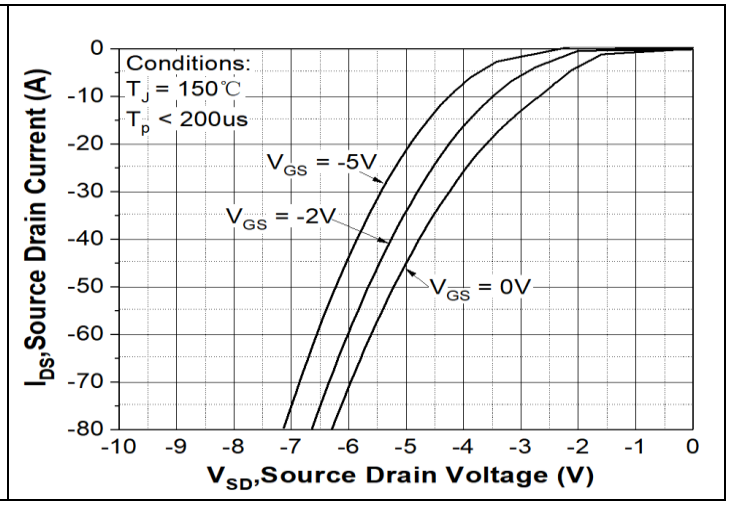


Figure 10. Body Diode Characteristic at T_J = 150 °C

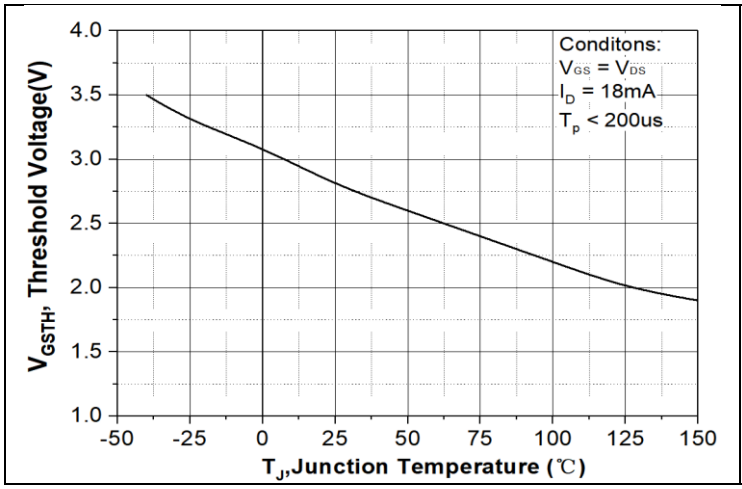


Figure 11. Threshold Voltage vs. Temperature

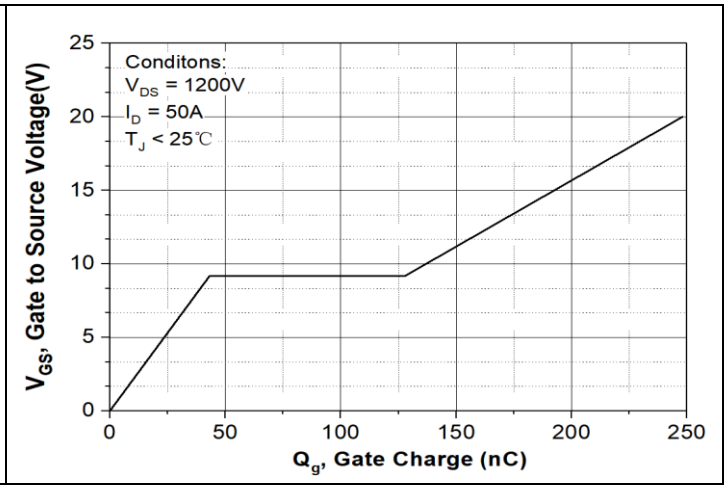


Figure 12. Gate Charge Characteristic

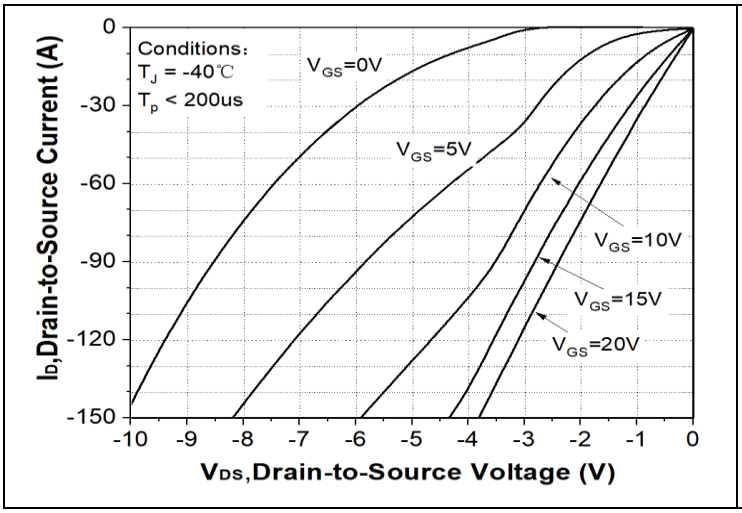


Figure 13. 3rd Quadrant Characteristic at T_J = -40 °C

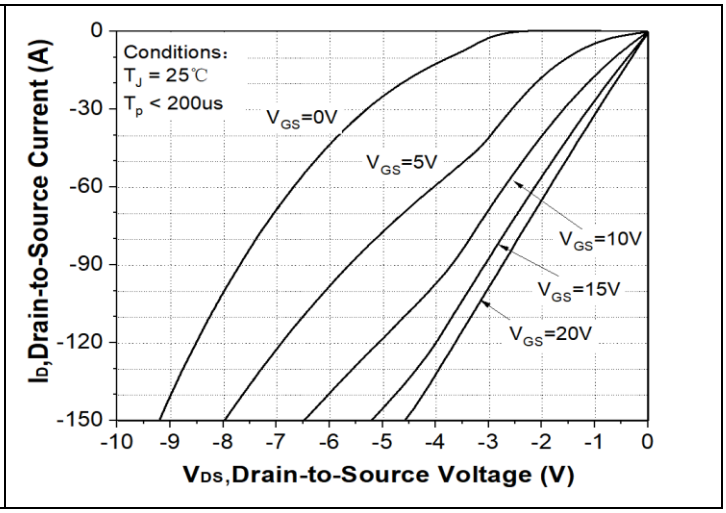


Figure 14. 3rd Quadrant Characteristic at T_J = 25 °C

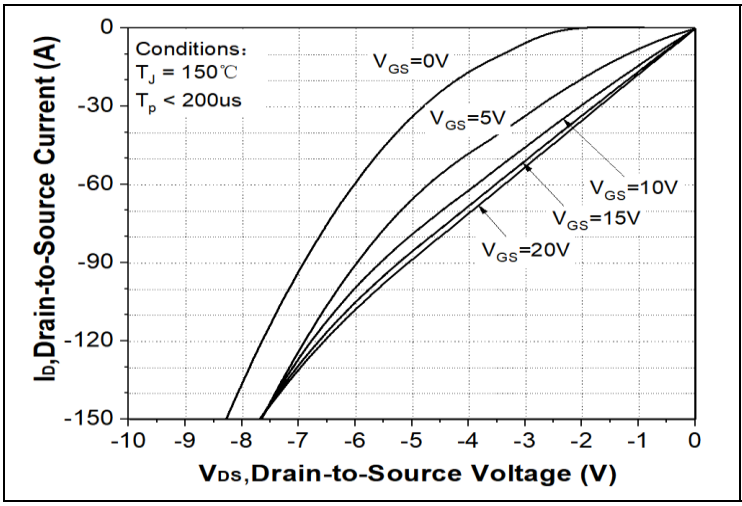


Figure 15. 3rd Quadrant Characteristic at T_J = 150°C

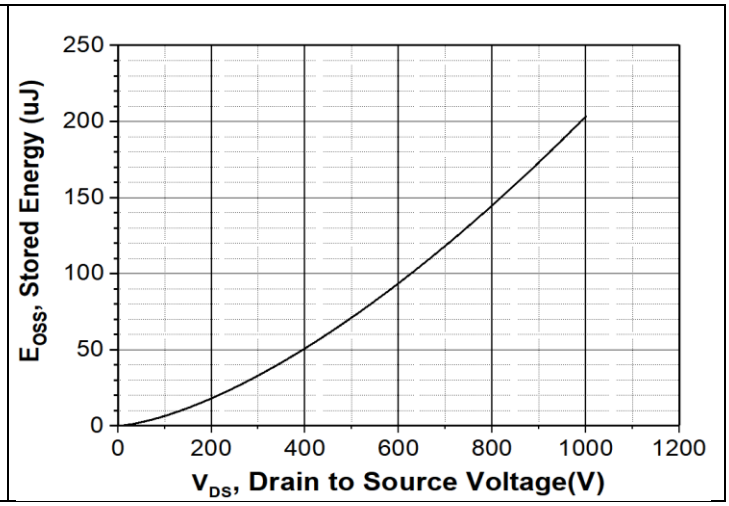


Figure 16. Output Capacitor Stored Energy

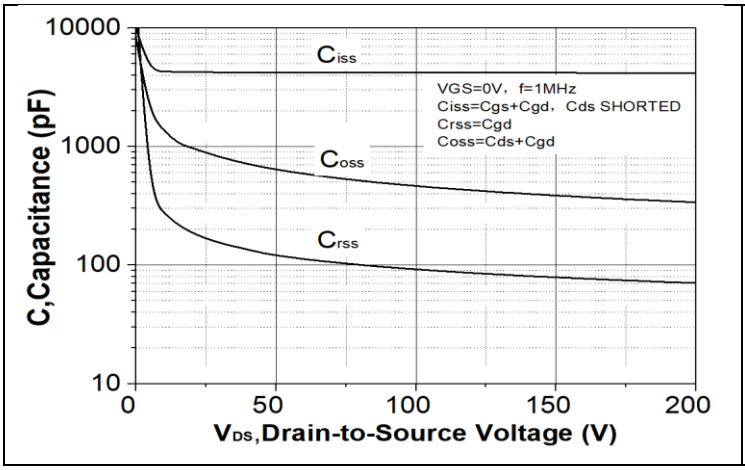


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

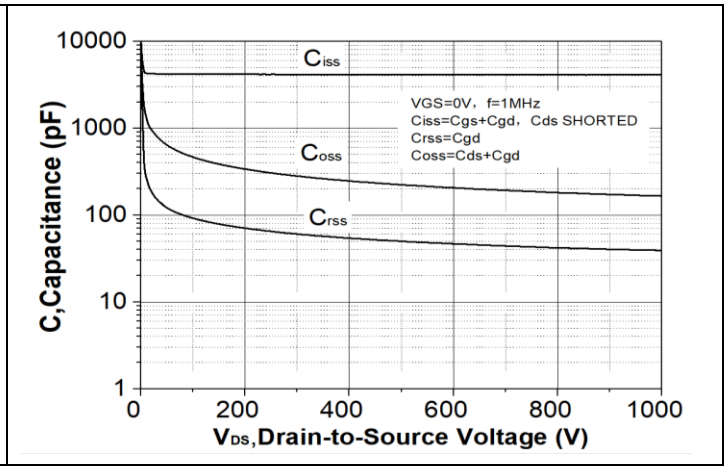


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

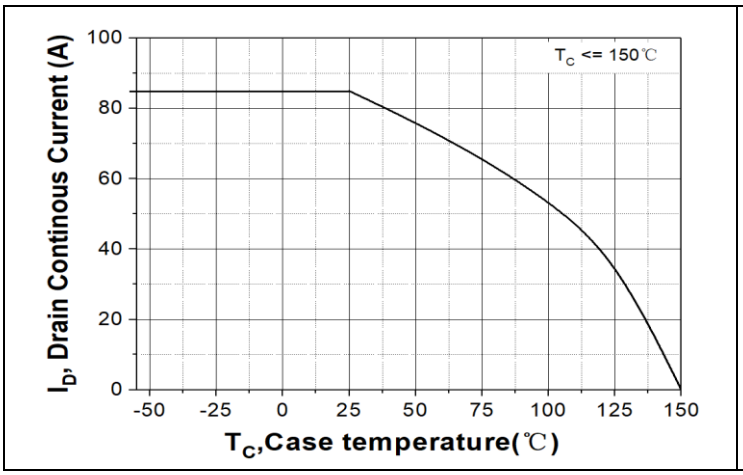


Figure 19. Continuous Drain Current Derating vs. Case Temperature

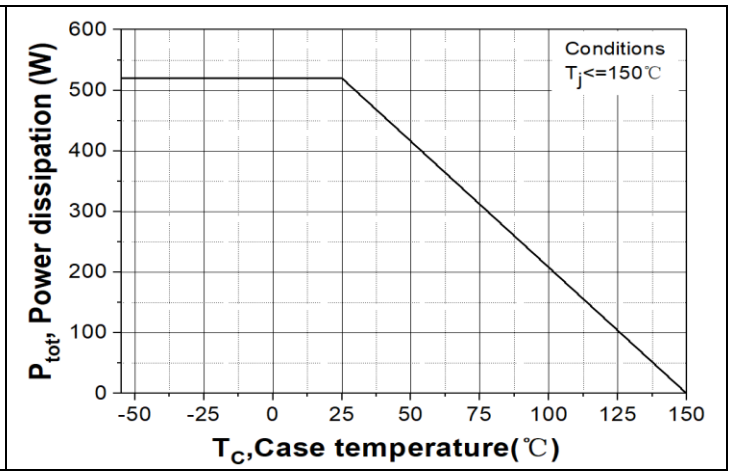


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

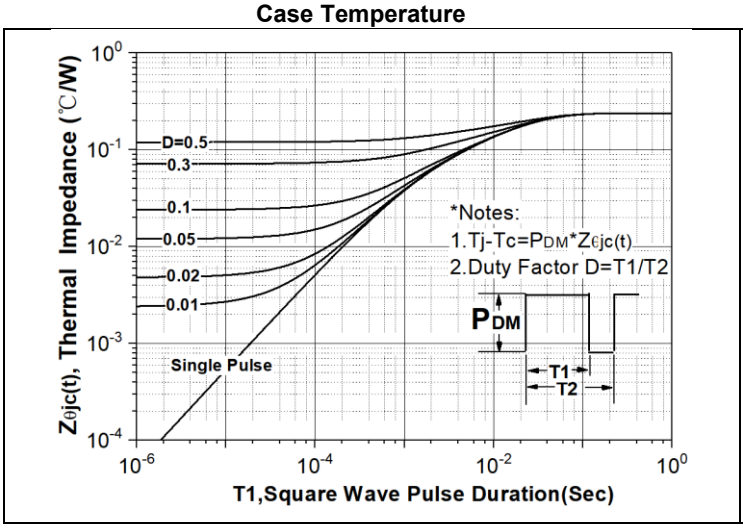


Figure 21. Transient Thermal Impedance (Junction - Case)

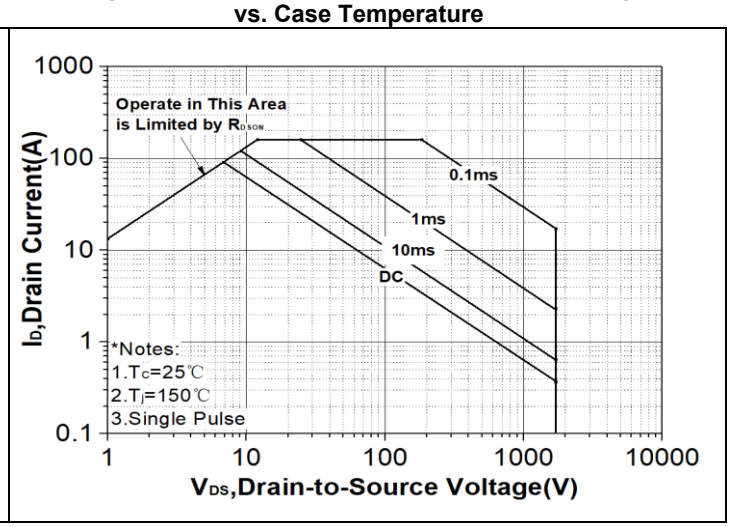


Figure 22. Safe Operating Area

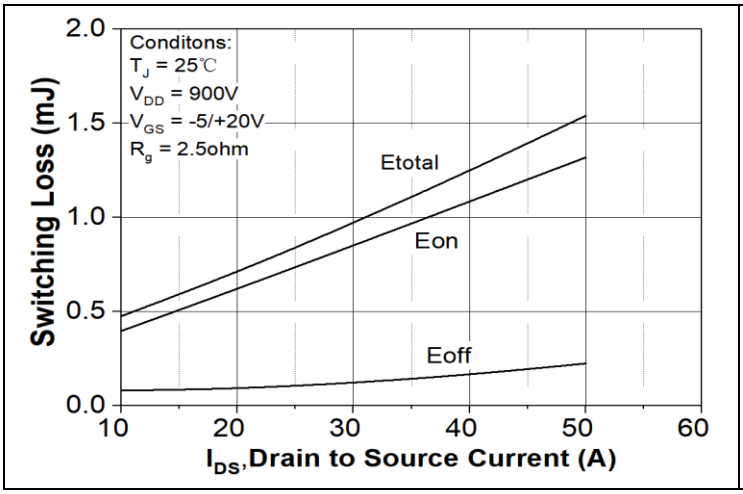


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 900V)

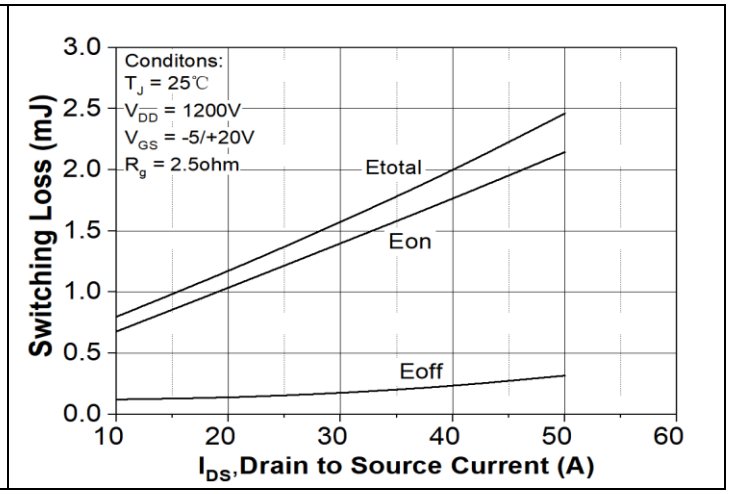


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 1200V)

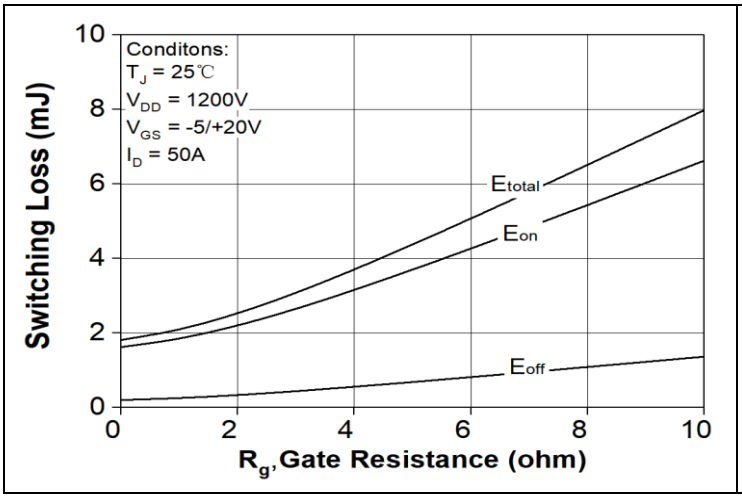


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

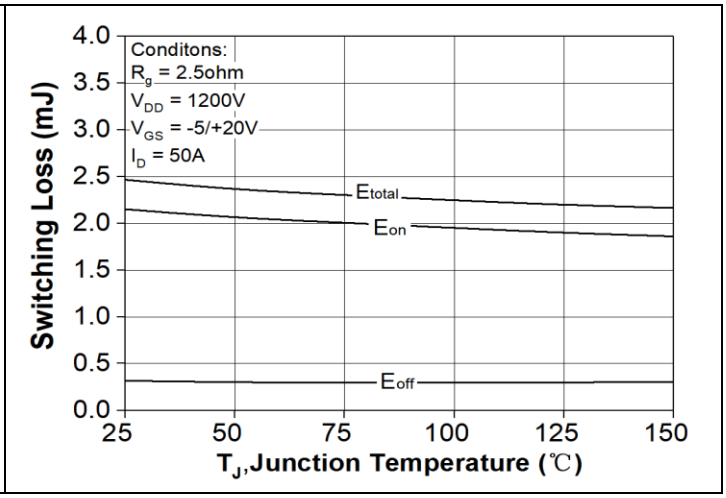


Figure 26. Clamped Inductive Switching Energy vs. Temperature

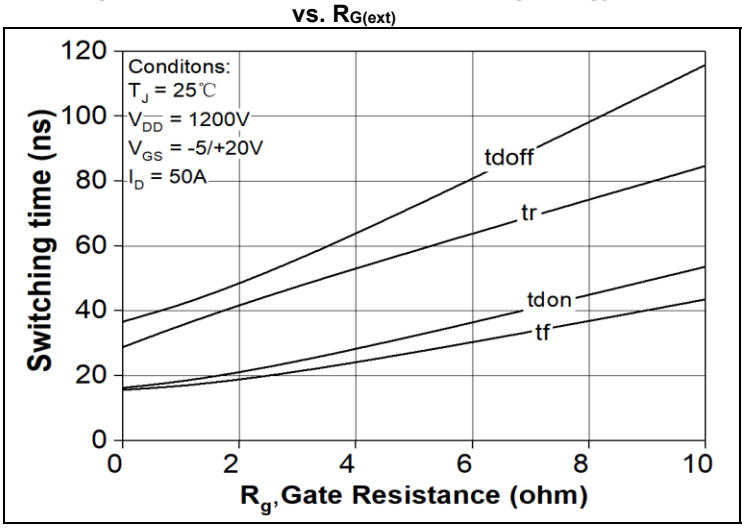


Figure 27. Switching Times vs. $R_{G(ext)}$

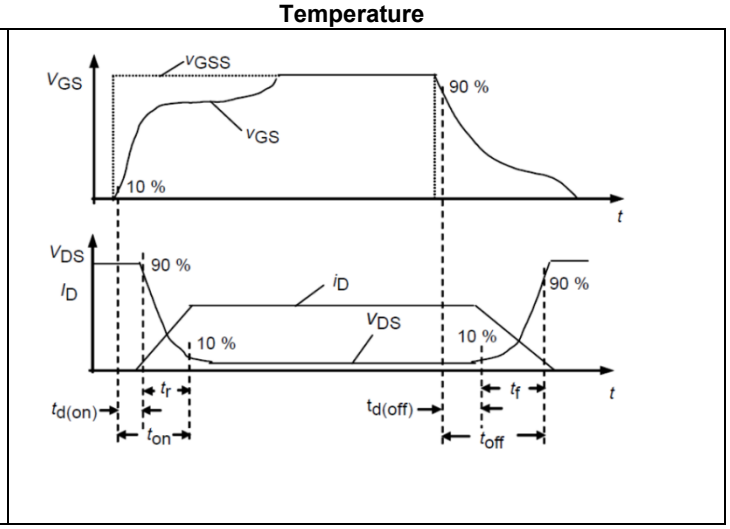
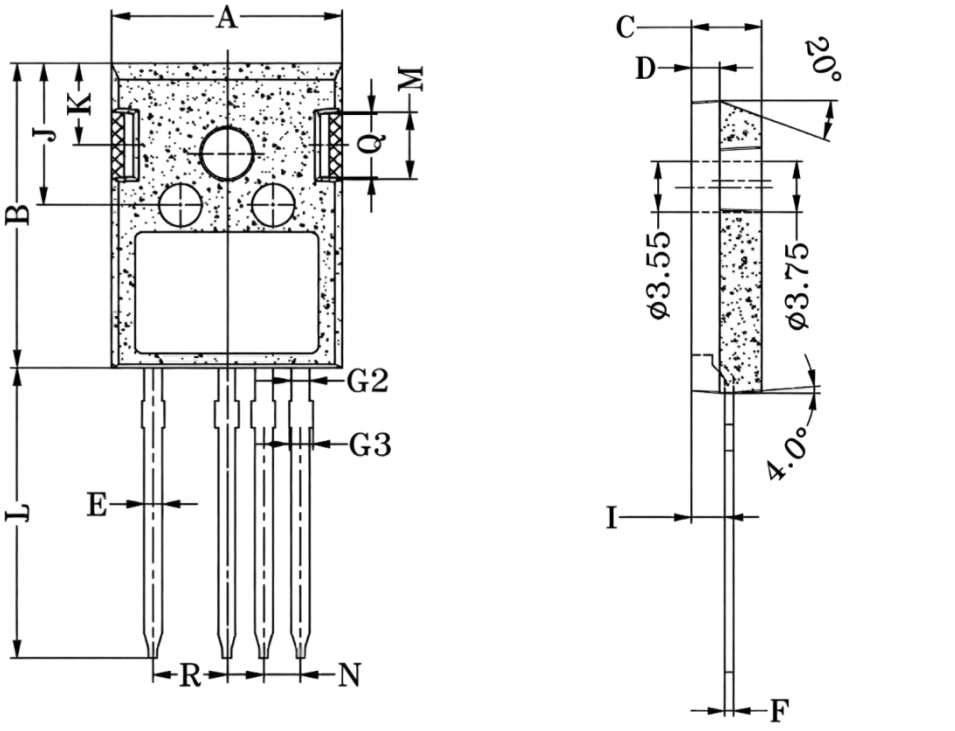
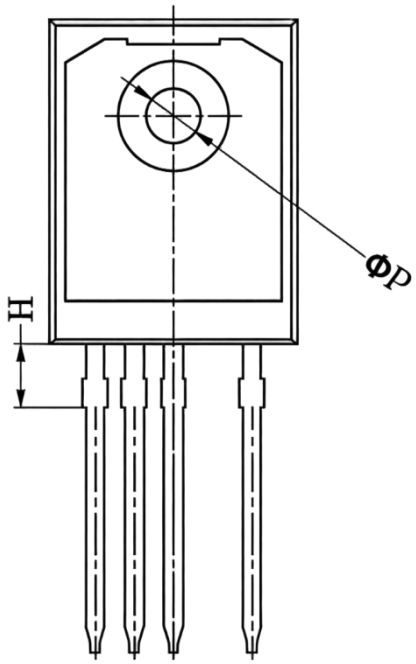


Figure 28. Switching Times Definition

Package Outlines(Unit:mm)

TO-247-4L





Symbol	Dimensions in Millimeter	
	MIN	MAX
A	15.80	16.00
B	20.90	21.10
C	4.90	5.10
D	1.90	2.10
E	1.10	1.30
F	0.50	0.70
G2	1.10	1.30
G3	1.18	1.38
H	4.18	4.38
I	2.30	2.50
J	9.65	9.85
K	5.54	5.74
L	19.80	20.20
M	4.50	4.70
N	2.34	2.74
ϕ P	3.40	3.60
Q	4.232	4.432
R	4.88	5.28

***Important Usage Information and Disclaimer**

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