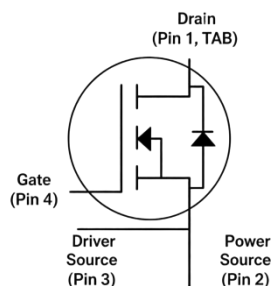


Silicon Carbide Power MOSFET

Parameter	Value	Unit
V_{DS}	1700	V
I_D	85	A
$R_{DS(ON)}$	40	m Ω
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 $T_J=25^{\circ}\text{C}$ 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; $T_c=25^{\circ}\text{C}$) $V_{GS}=20\text{V}$	I_D	85	A
Drain Current (continuous; $T_c=100^{\circ}\text{C}$) $V_{GS}=20\text{V}$		55	
Drain Current (pulsed)	I_{DM}	160	A
Power Dissipation ($T_c=25^{\circ}\text{C}$, $T_J=150^{\circ}\text{C}$)	P_D	520	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^{\circ}\text{C}$
Thermal Resistance from Junction to Case	$R_{\theta JC}$	0.24	$^{\circ}\text{C/W}$
Thermal Resistance From Junction to Ambient	$R_{\theta JA}$	30	

Electrical Characteristics (at $T_C=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Static characteristics						
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						
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 $T_C=25^{\circ}\text{C}$ unless otherwise specified)

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

Typical Characteristics

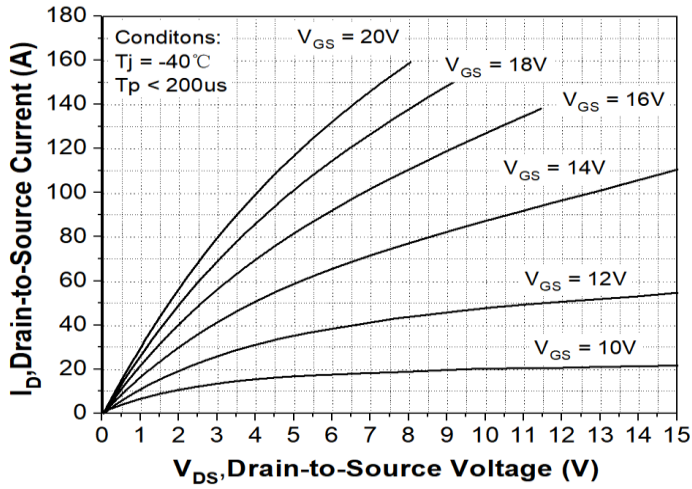


Figure 1. Output Characteristics $T_J = -40^\circ\text{C}$

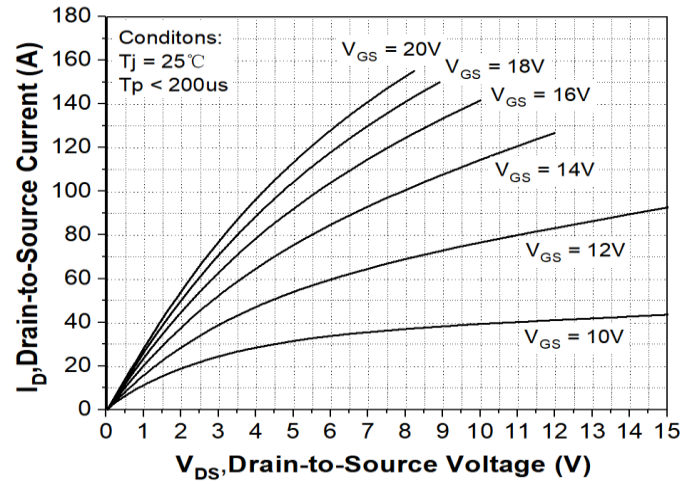


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

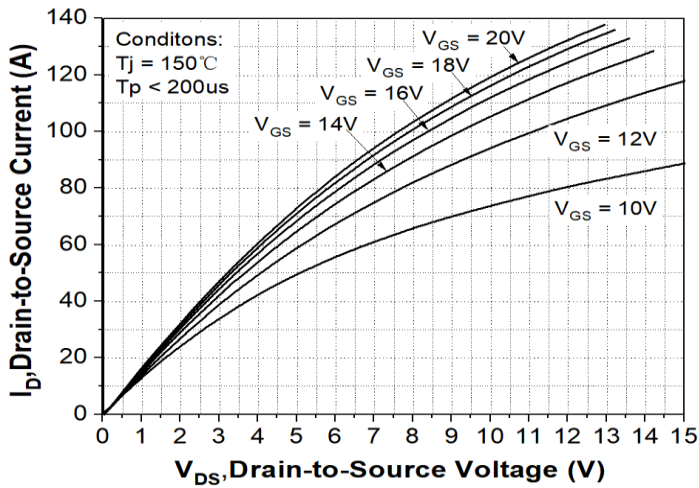


Figure 3. Output Characteristics $T_J = 150^\circ\text{C}$

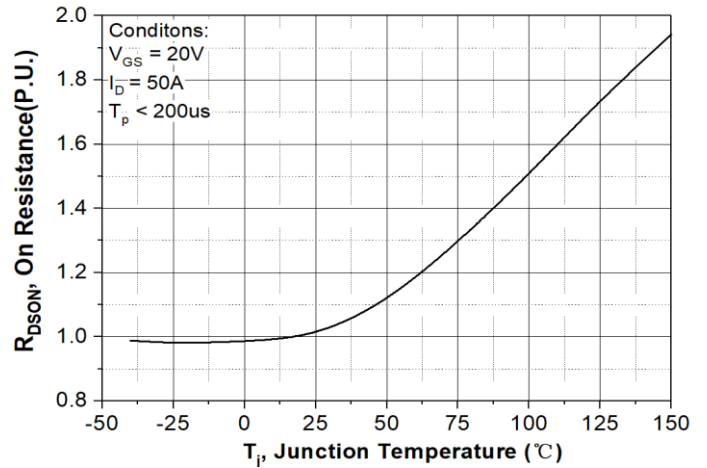


Figure 4. Normalized On-Resistance vs. Temperature

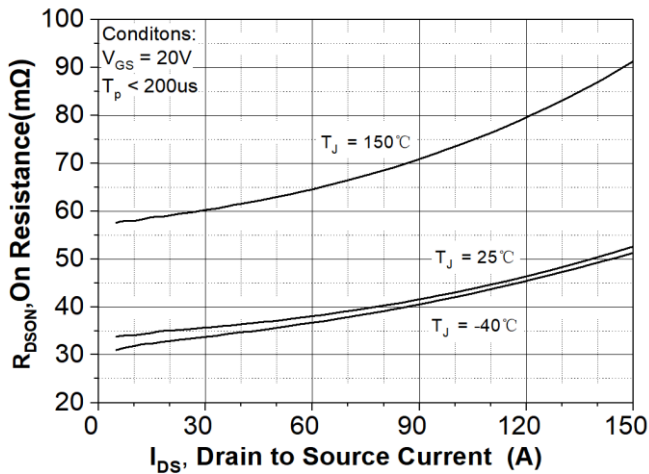


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

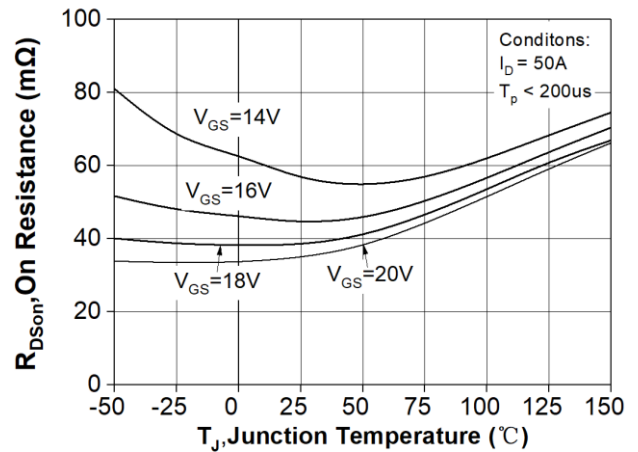


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

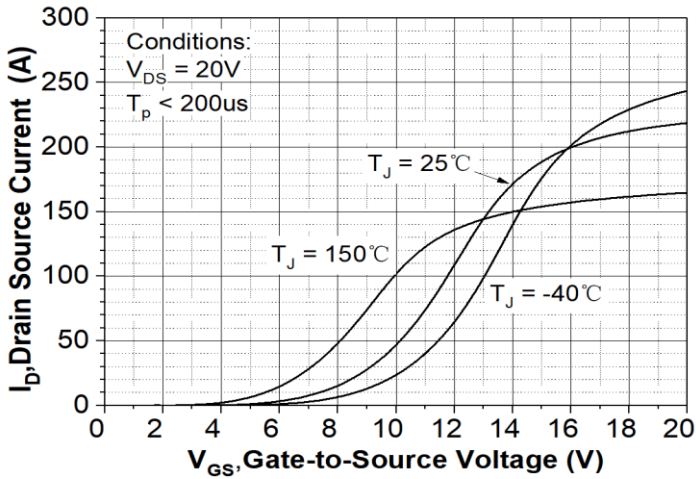


Figure 7. Transfer Characteristic for Various Junction Temperatures

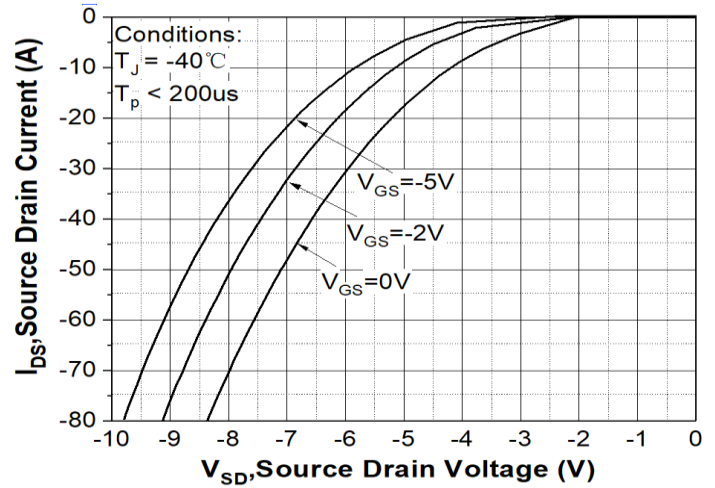


Figure 8. Body Diode Characteristic at $T_J = -40^\circ C$

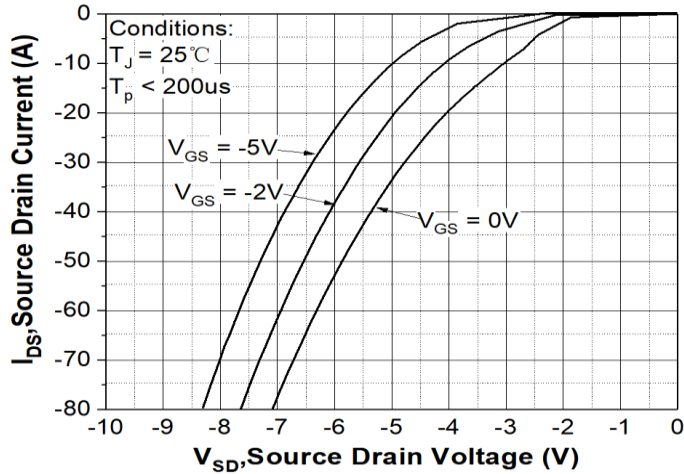


Figure 9. Body Diode Characteristic at $T_J = 25^\circ C$

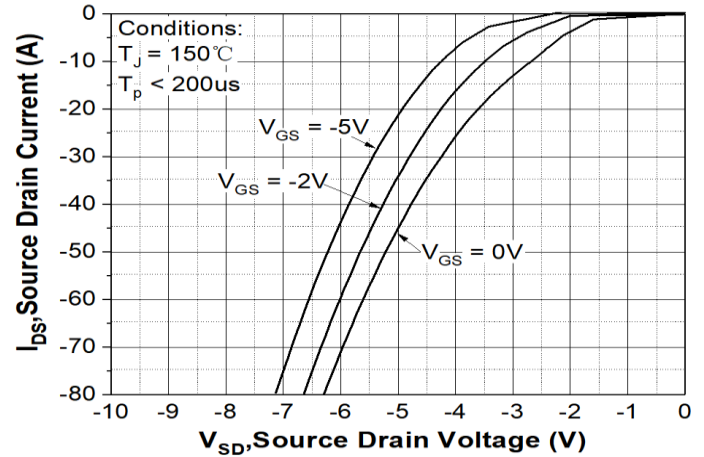


Figure 10. Body Diode Characteristic at $T_J = 150^\circ C$

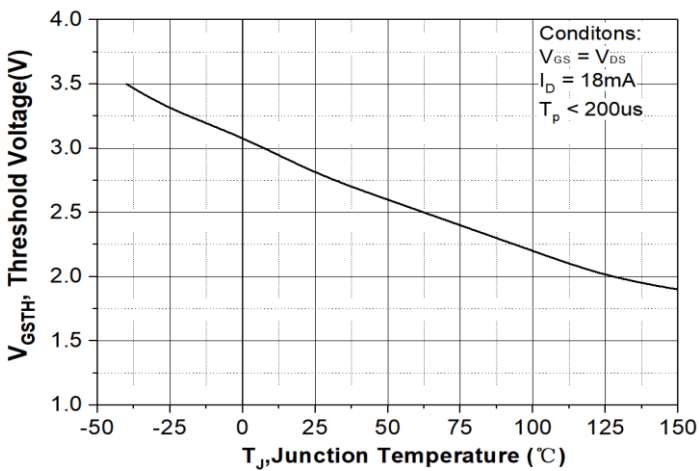


Figure 11. Threshold Voltage vs. Temperature

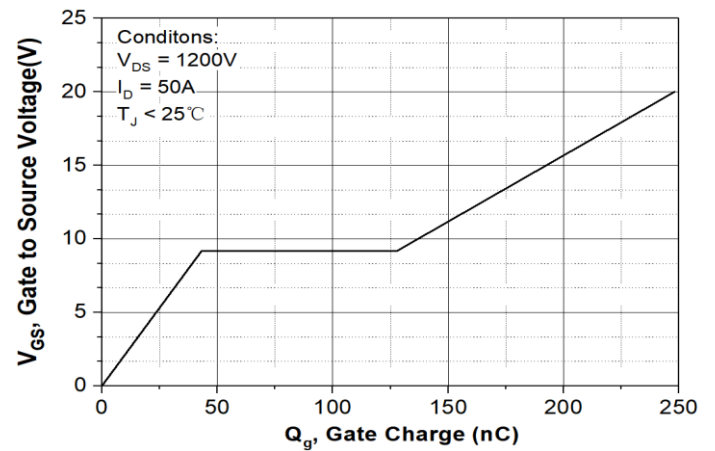


Figure 12. Gate Charge Characteristic

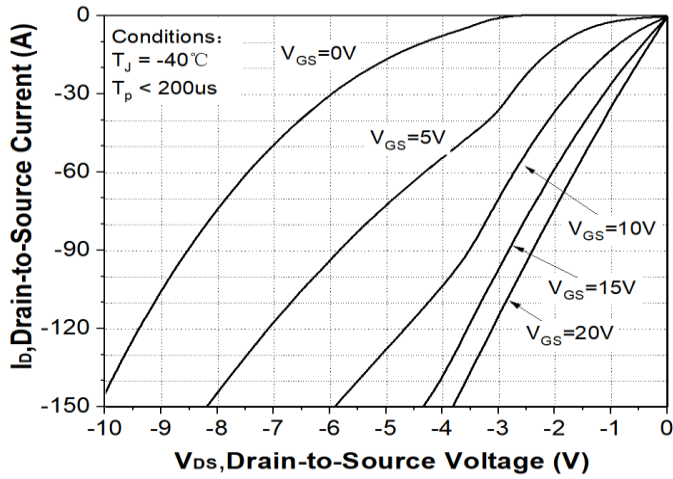


Figure 13. 3rd Quadrant Characteristic at $T_J = -40\text{ }^{\circ}\text{C}$

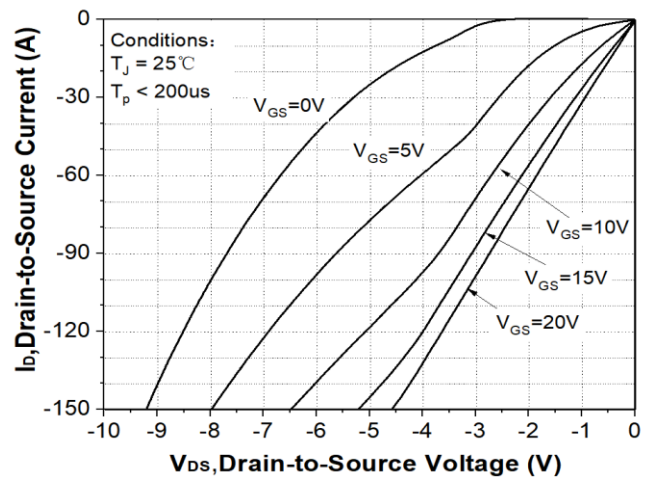


Figure 14. 3rd Quadrant Characteristic at $T_J = 25\text{ }^{\circ}\text{C}$

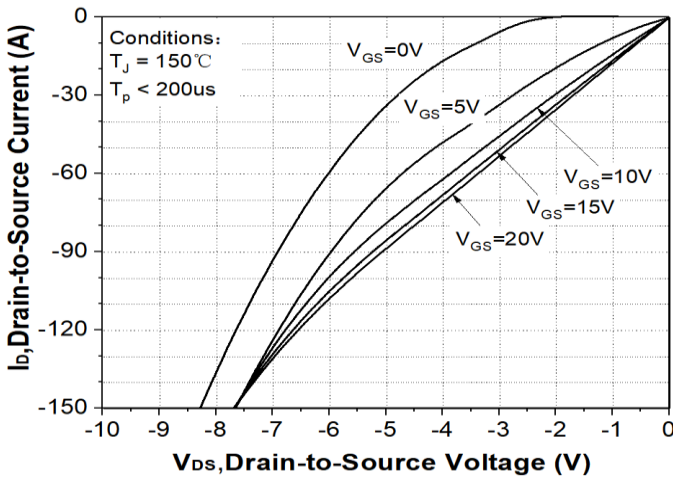


Figure 15. 3rd Quadrant Characteristic at $T_J = 150\text{ }^{\circ}\text{C}$

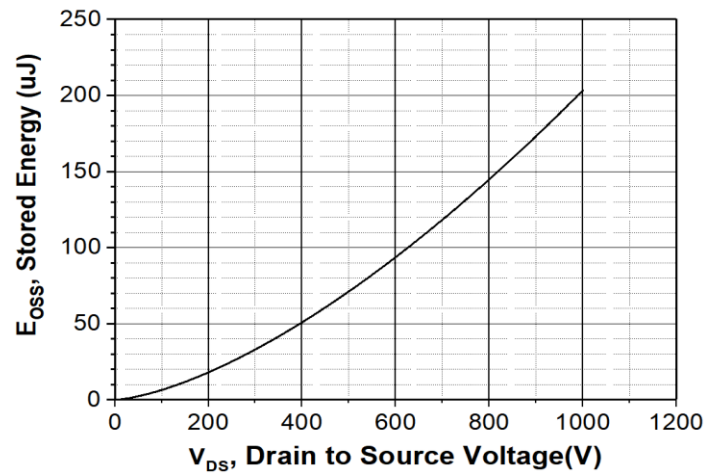


Figure 16. Output Capacitor Stored Energy

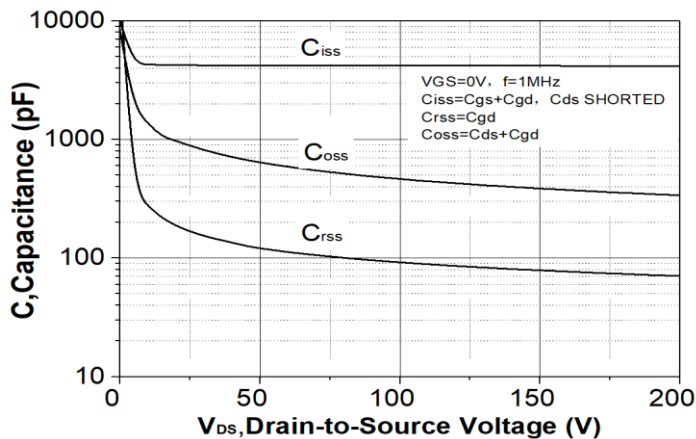


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

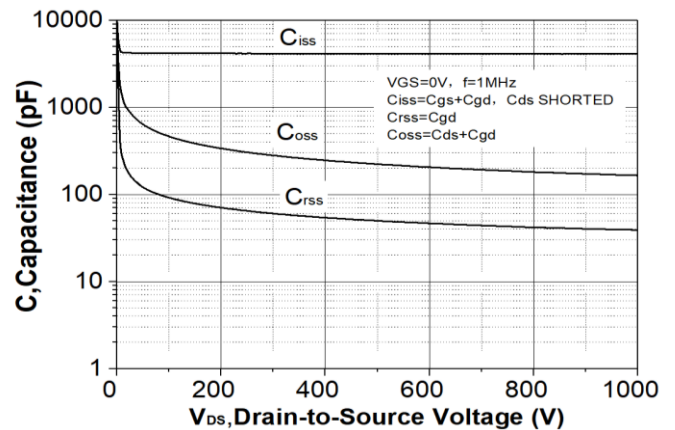


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

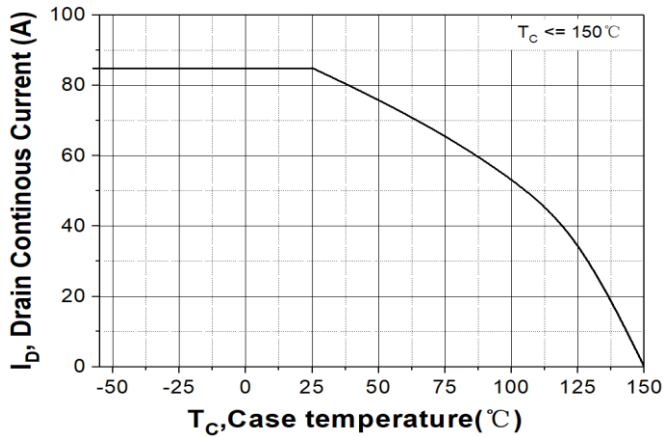


Figure 19. Continuous Drain Current Derating vs. Case Temperature

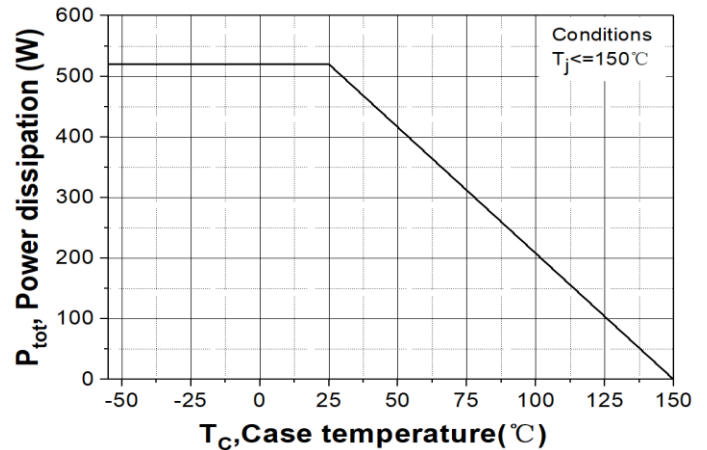


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

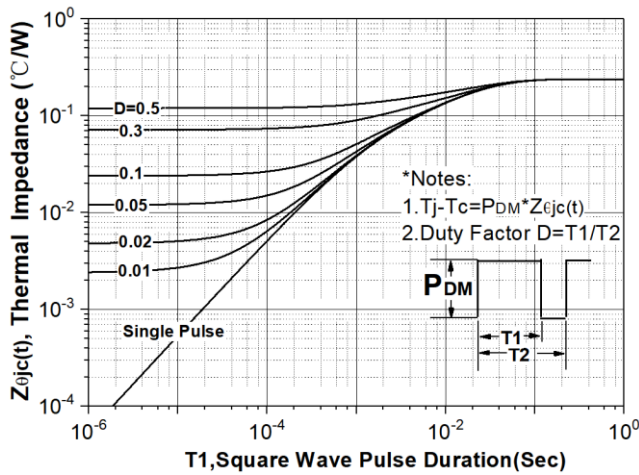


Figure 21. Transient Thermal Impedance (Junction - Case)

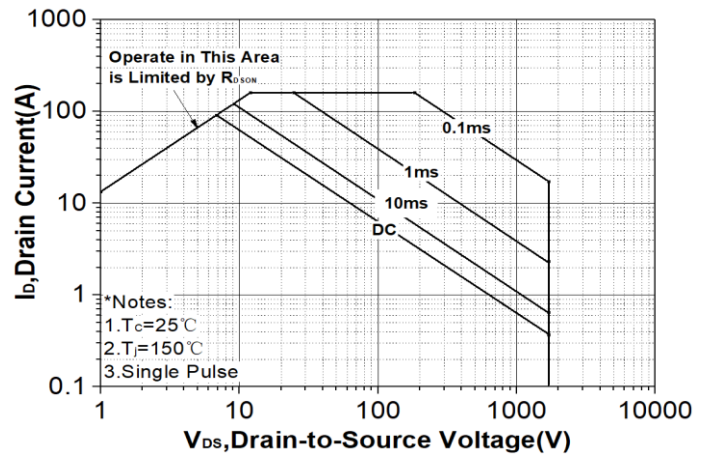


Figure 22. Safe Operating Area

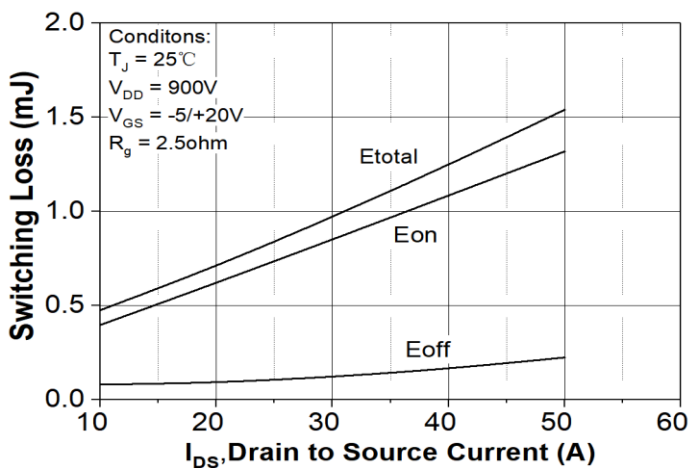


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 900\text{V}$)

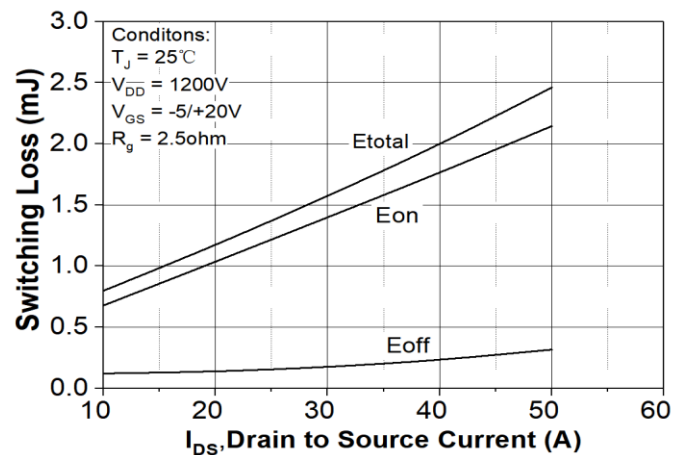


Figure 24. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 1200\text{V}$)

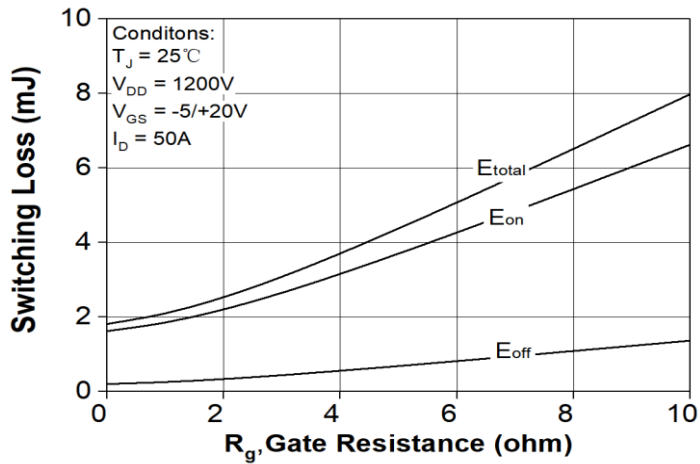


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(\text{ext})}$

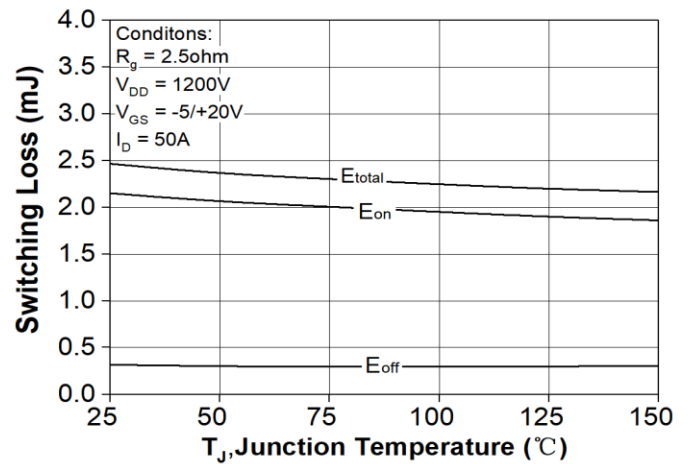


Figure 26. Clamped Inductive Switching Energy vs. Temperature

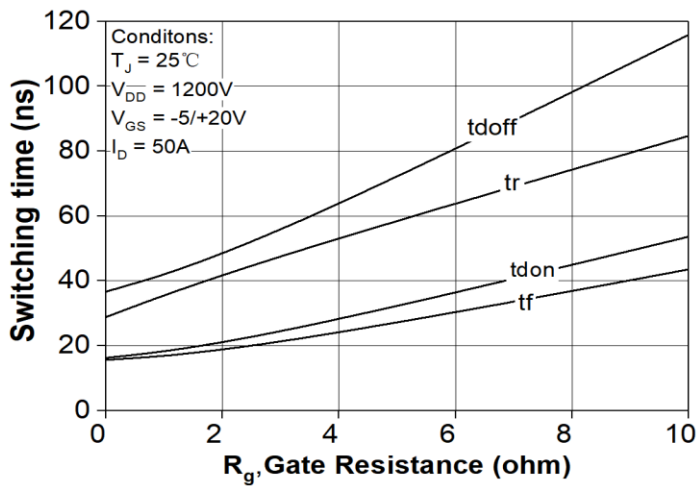


Figure 27. Switching Times vs. $R_{G(\text{ext})}$

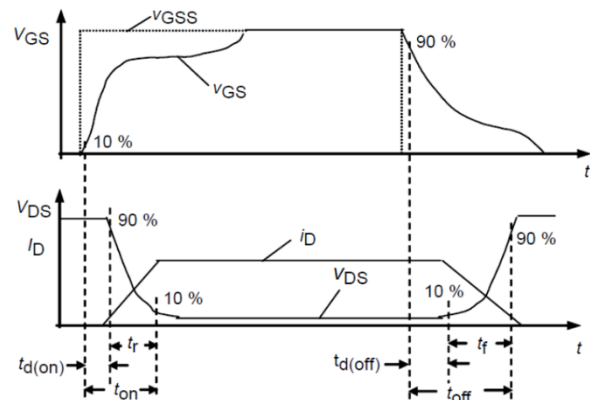
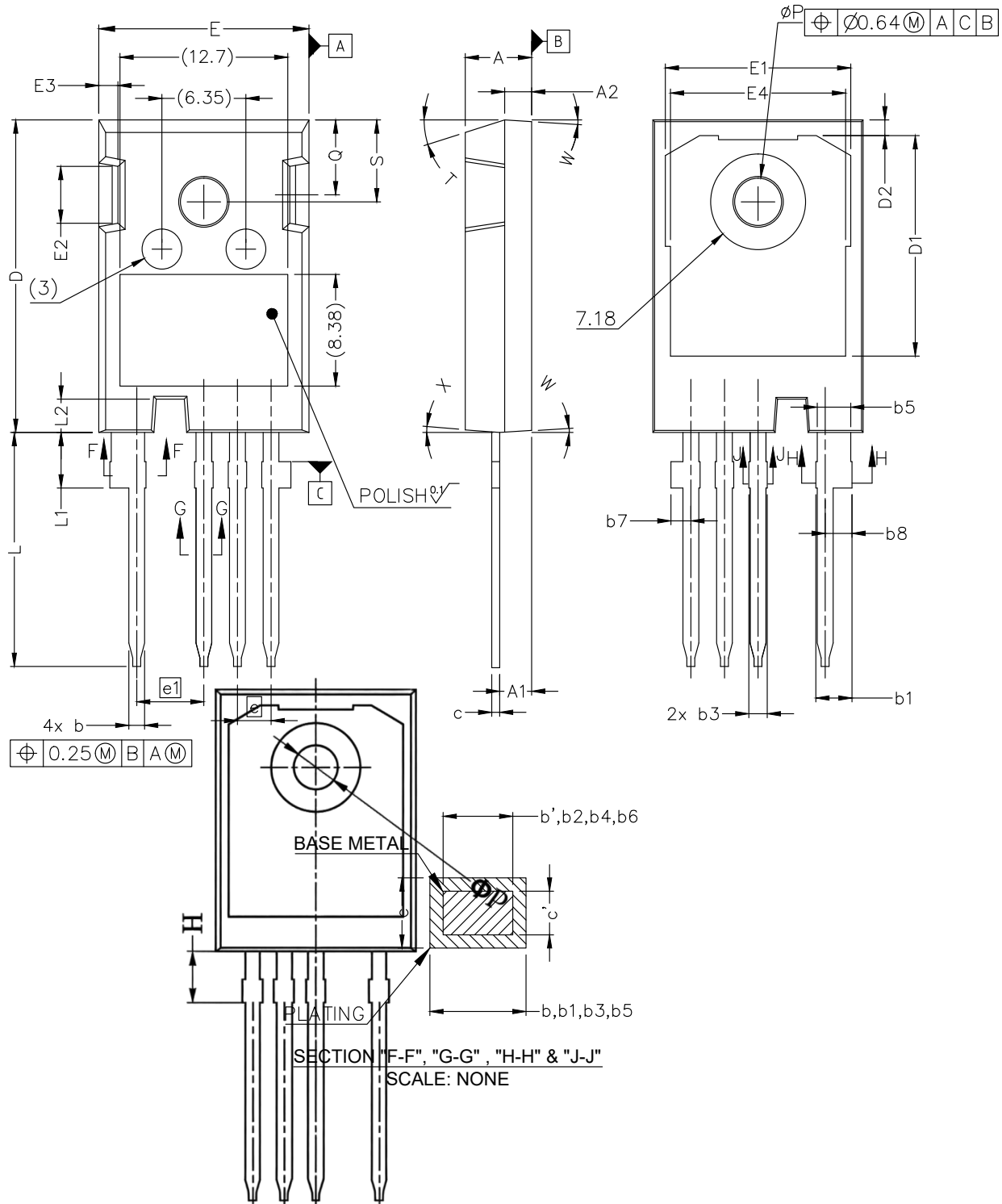


Figure 28. Switching Times Definition

Package Outline (Unit:mm)

TO-247-4L



SYM	MILLIMETERS	
	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
b7	1.30	1.70
b8	1.80	2.20

c'	0.55	0.65
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
N*	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
øP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5 ° REF.	
X	4° REF.	

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