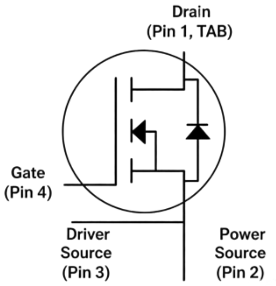
Silicon Carbide Power MOSFET

Parameter	Value	Unit
V_{DS}	3300	V
I_D	45	A
$R_{DS(ON)}$	70	mΩ
Q_G	290	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
- Battery Chargers
- High Voltage DC/DC Converters
- Switched-Mode Power Supply(SMPS)

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

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DS}	3300	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	45	A
Drain Current (continuous;Tc=100°C) V_{GS}=20V		29	
Drain Current (pulsed)	I_{DM}	90	A
Power Dissipation (Tc=25°C, T_J=175°C)	P_D	600	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	°C
Thermal Resistance from Junction to Case	$R_{\theta JC}$	0.25	°C/W
Thermal Resistance From Junction to Ambient	$R_{\theta JA}$	28	

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=1mA	3300	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=3300V; V_{GS}=0V	-	-	200	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=10mA; T_J=25°C	2.0	3.4	4.5	V
Static Drain-Source on Resistance	$R_{DS(on)}$	V_{GS}=20V; I_D=20A; T_J=25°C	-	70	-	mΩ
		V_{GS}=20V; I_D=20A; T_J=175°C	-	189	-	
Transconductance	G_{fs}	V_{GS}=10V; I_D=20A; T_J=25°C	-	7.1	-	S
		V_{GS}=10V; I_D=20A; T_J=175°C	-	08	-	
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	-	5199	-	pF
Output Capacitance	C_{oss}		-	100	-	
Reverse Transfer Capacitance	C_{rss}		-	16	-	
Coss Stored Energy	E_{oss}		-	66	-	uJ
Turn on Switching Energy	E_{on}	V_{DD}=1200V; V_{GS}=-5/20V; I_D=20A; $R_{g(ext)}$=3Ω	-	826	-	uJ
Turn off Switching Energy	E_{off}		-	209	-	
Total Gate Charge	Q_G	V_{DD}=1000V; V_{GS}=-5/20V; I_D=20A; T_j=25°C	-	290	-	nC
Gate-Source Charge	Q_{GS}		-	56	-	
Gate-Drain Charge	Q_{GD}		-	57	-	
Internal Gate Resistor	R_{Gint}	f=1MHz; V_{AC}=25mV	-	0.85	-	Ω
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=1200V; V_{GS}=-5/20V; I_D=20A; $R_{g(ext)}$=3Ω	-	39	-	ns
Rise Time	t_r		-	26	-	
Turn-off Delay Time	$t_{d(off)}$		-	55	-	
Fall Time	t_f		-	22	-	

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=20A; T_J=25°C	-	6.5	-	V
Continuous Diode Forward Current	I_S	T_C=25°C	-	45	-	A
Reverse Recovery Time	t_{RR}	V_R=1200V; V_{GS}=-5V; I_F=20A; di/dt=500A/μs;T_J=25°C	-	30	-	ns
Reverse Recovery Charge	Q_{RR}		-	150	-	nC
Peak Reverse Recovery Current	I_{RRM}		-	8.9	-	A

Typical Characteristics

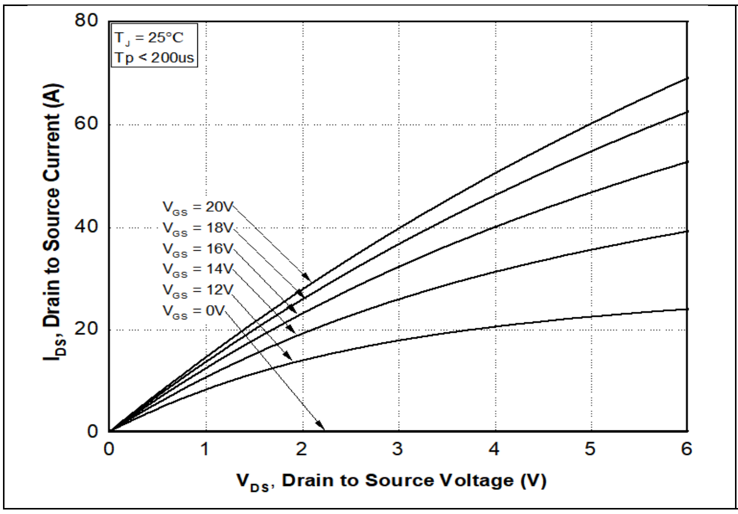


Figure 1. Output Characteristics T_J = 25°C

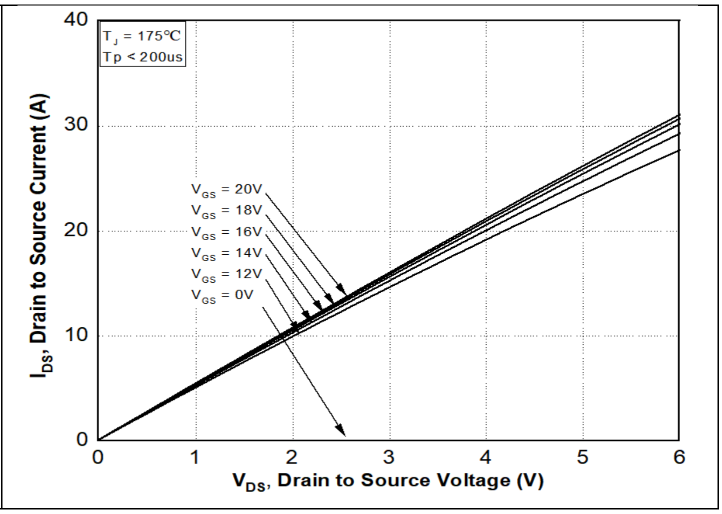


Figure 2. Output Characteristics T_J = 175 °C

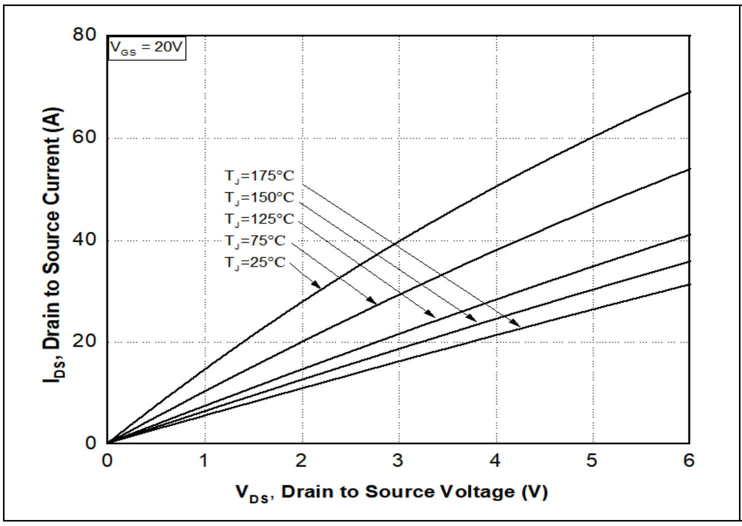


Figure 3. Output Characteristics (V_{GS} =20V)

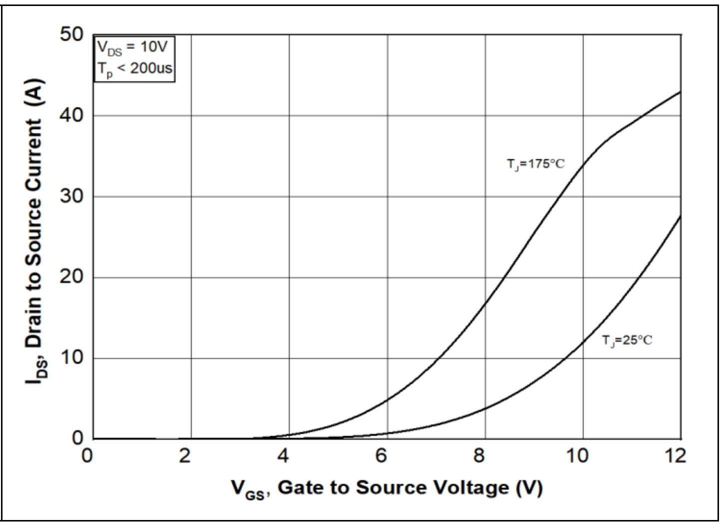


Figure 4. Transfer Characteristics

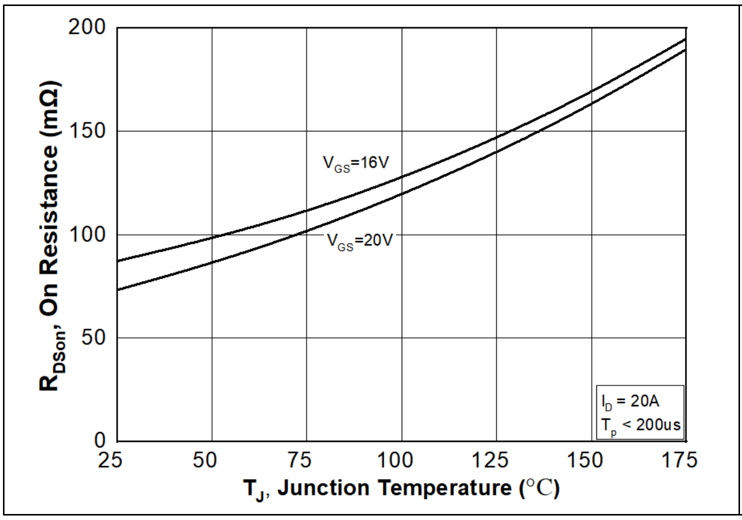


Figure 5. On-Resistance vs. Temperature

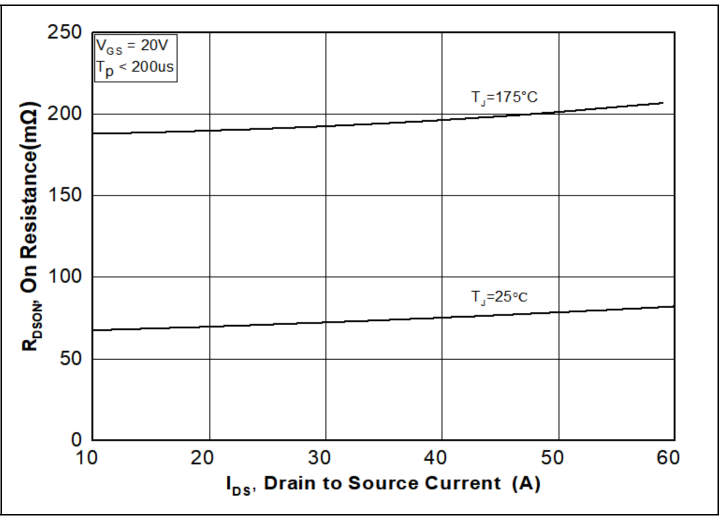


Figure 6. On-State Resistance vs. Drain Current

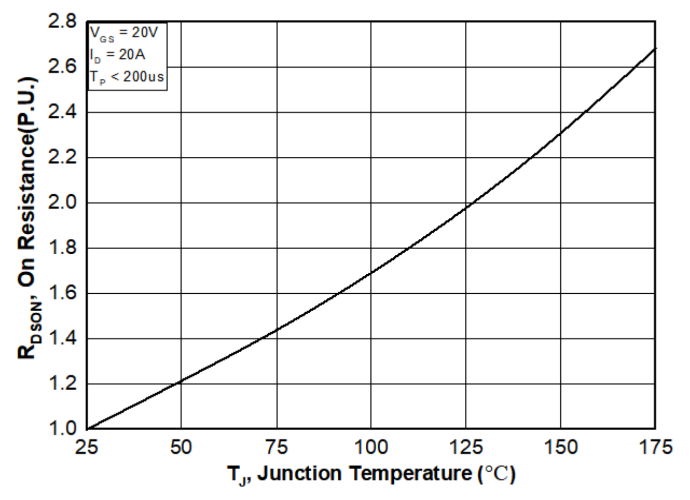


Figure 7. Normalized On-State Resistance vs. Temperature

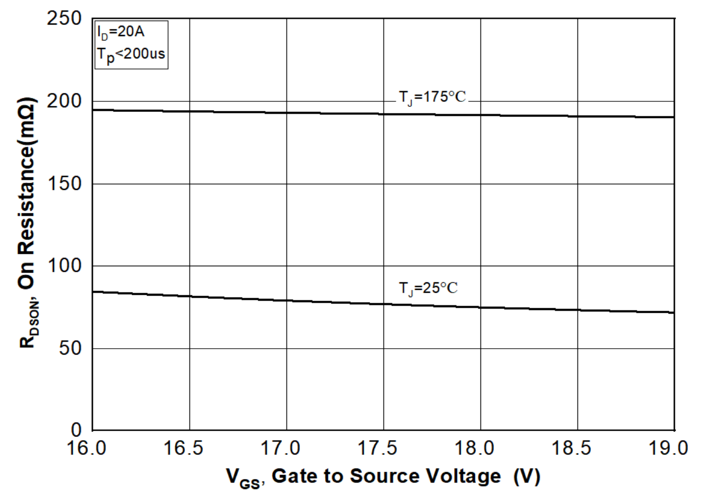


Figure 8. On-State Resistance vs. Gate Voltage

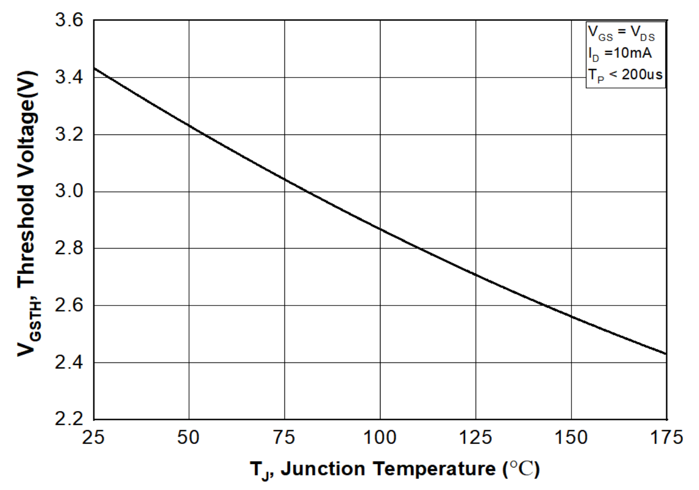


Figure 9. Threshold Voltage Characteristics

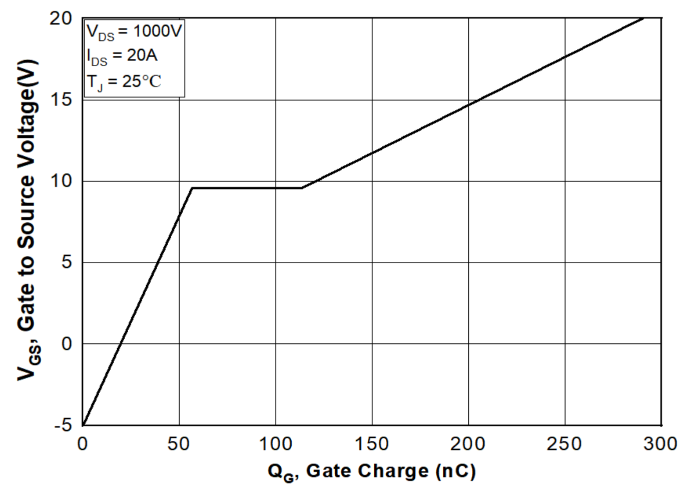


Figure 10. Gate Charge Characteristics

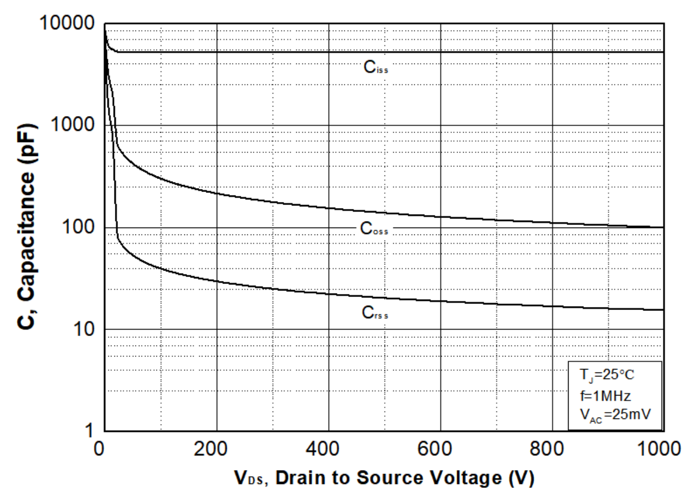


Figure 11. Capacitance vs. Drain-Source Voltage

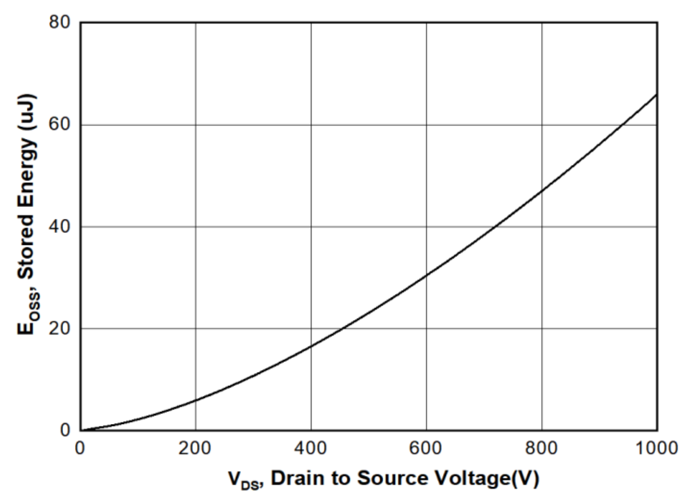


Figure 12. Output Capacitor Stored Energy

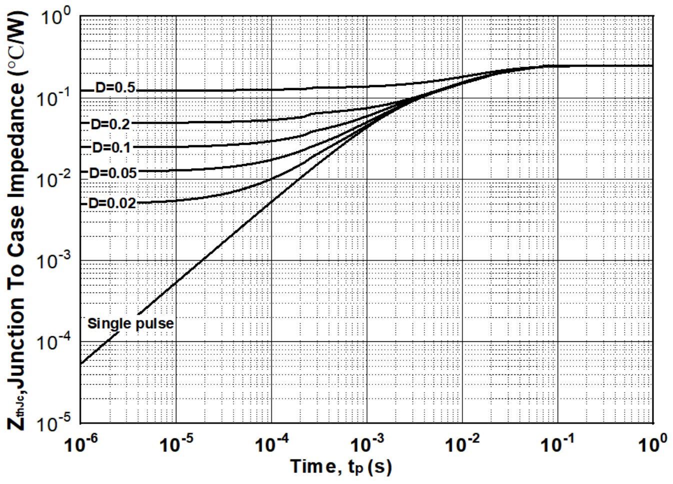


Figure 13. Transient Thermal Impedance (Junction - Case)

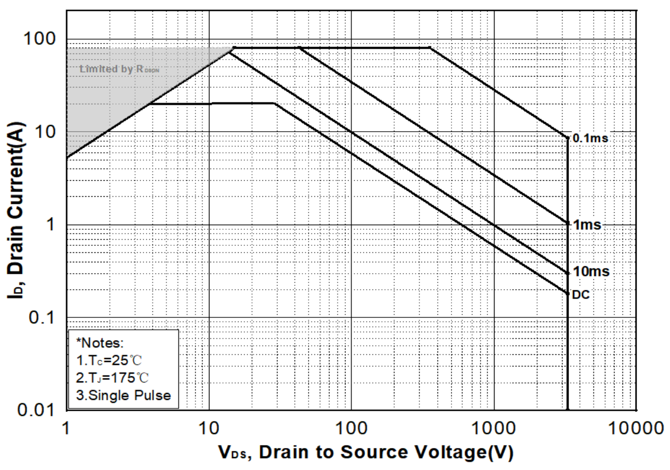


Figure 14. Safe Operating Area(T_c = 25°C)

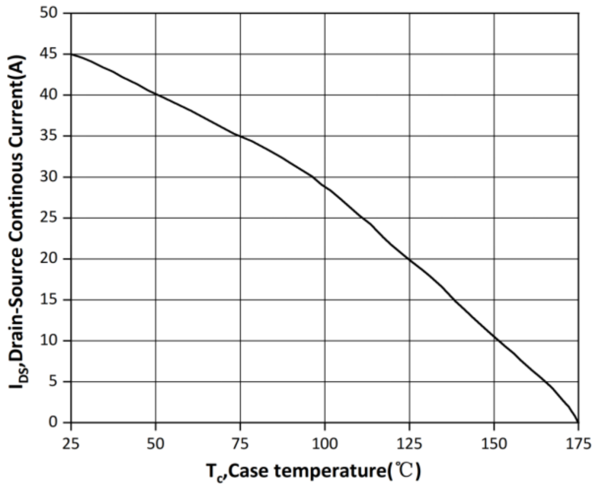


Figure 15. Current De-rating Curve

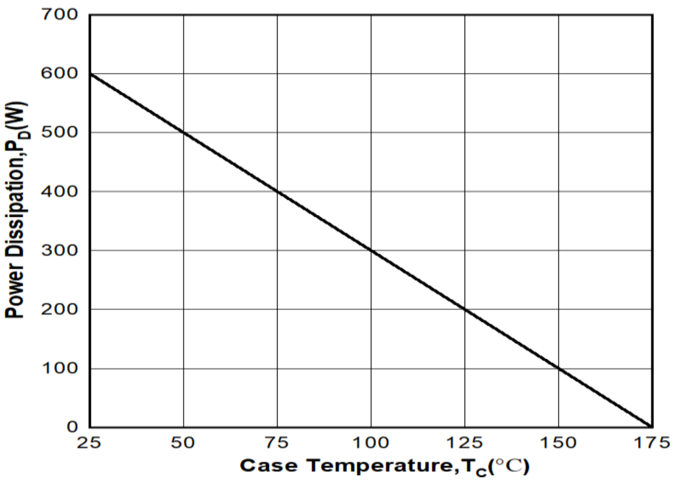


Figure 16. Power De-rating Curve

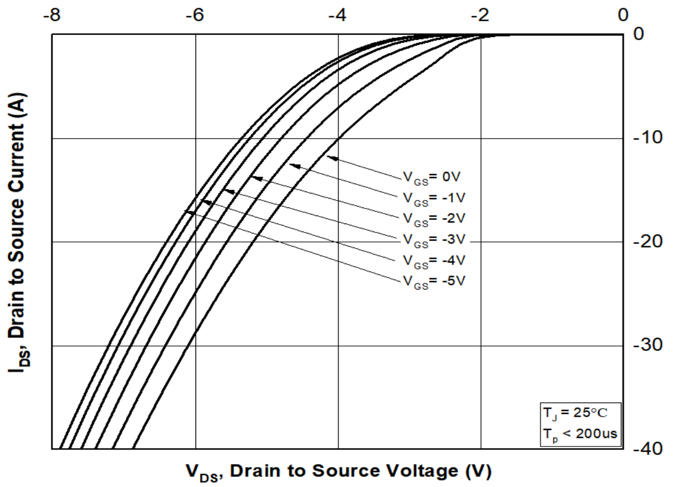


Figure 17. Body Diode Characteristics at T_J = 25 °C

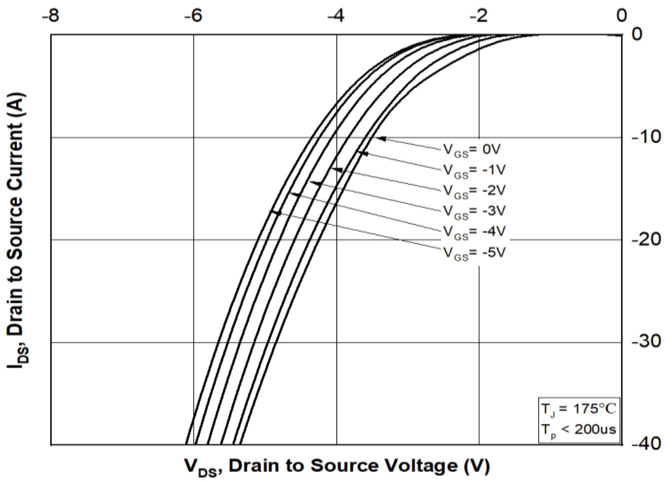
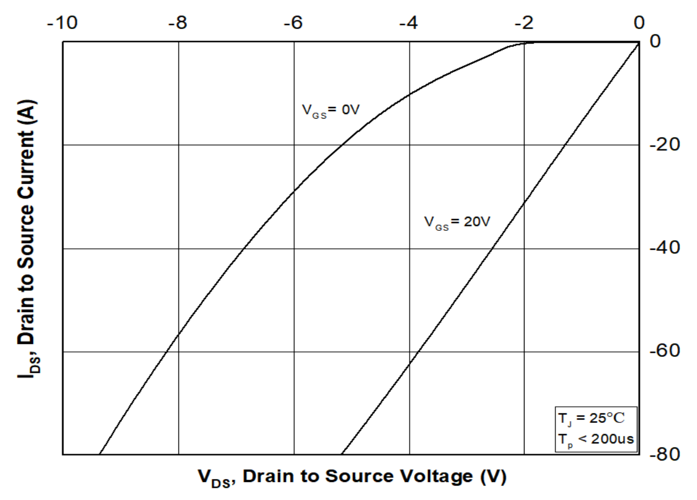


Figure 18. Body Diode Characteristics at T_J = 175 °C



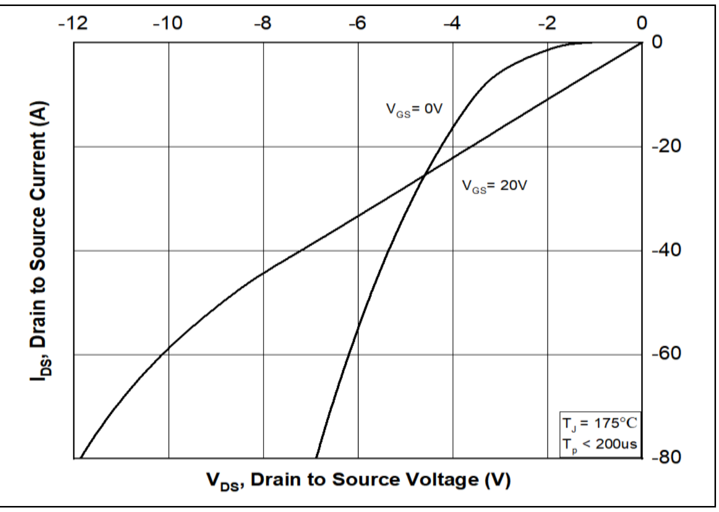
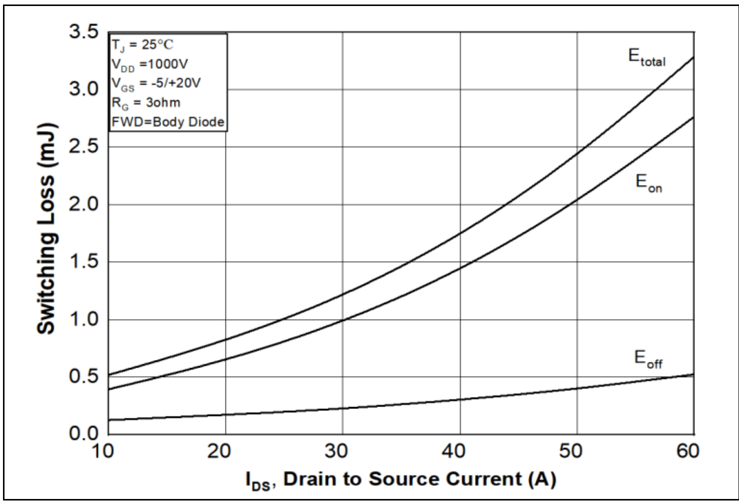


Figure 19. 3rd Quadrant Characteristics at T_J = 25 °C

Figure 20. 3rd Quadrant Characteristics at T_J = 175 °C



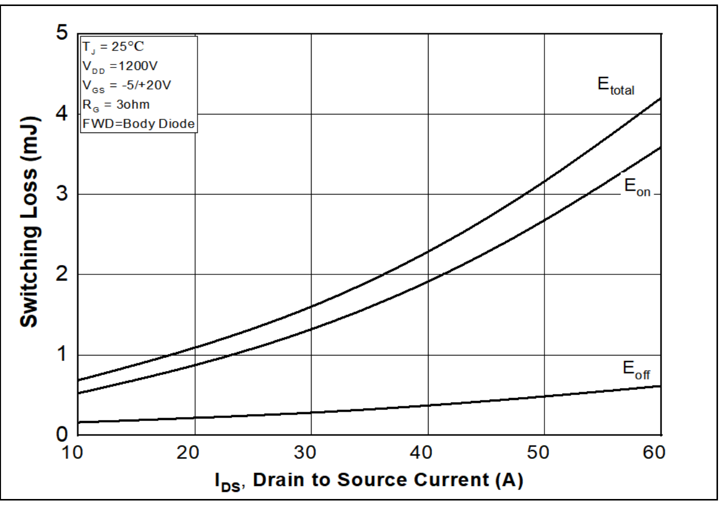
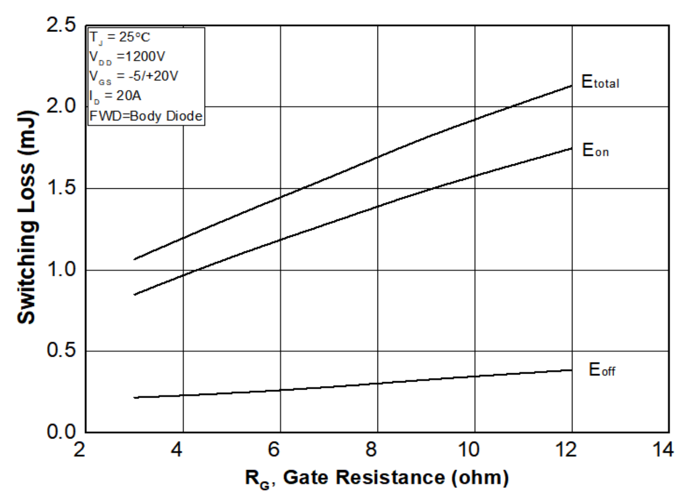


Figure 21. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 1000V)

Figure 22. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 1200V)



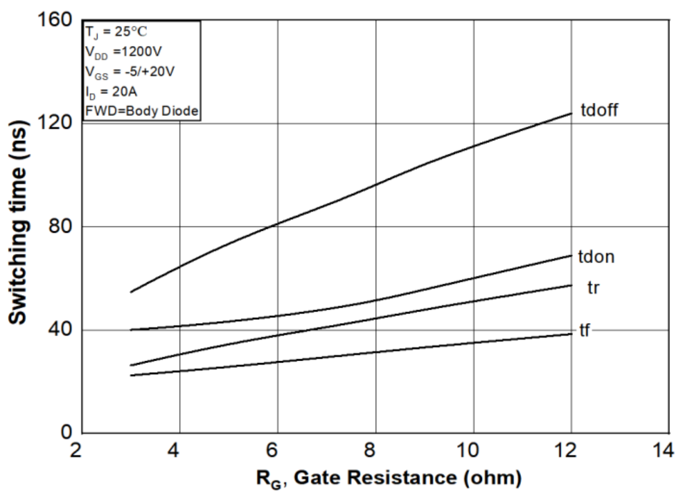
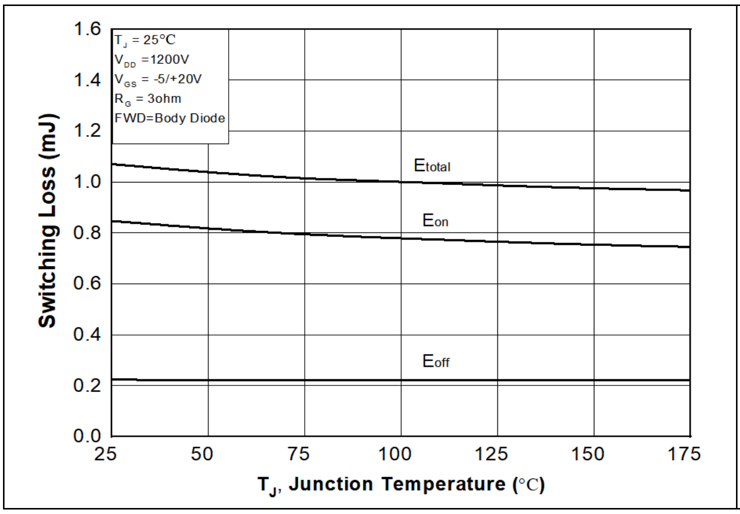


Figure 23.Clamped Inductive Switching Energy vs. $R_{G(ext)}$

Figure 24. Switching Times vs. $R_{G(ext)}$



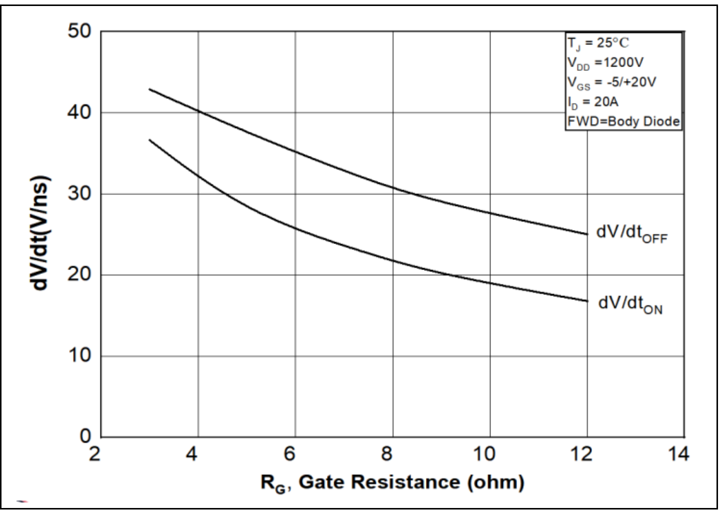
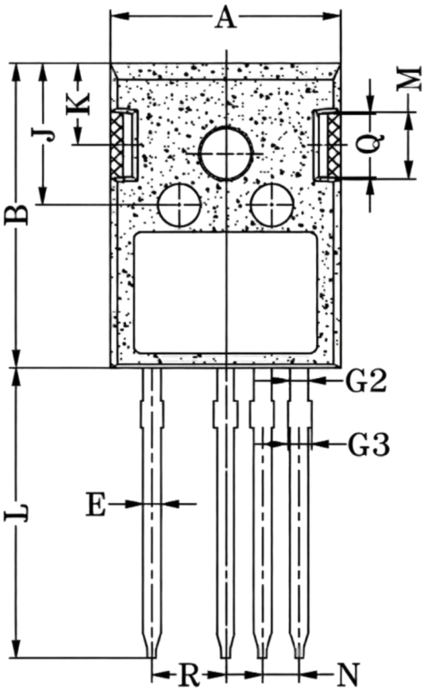


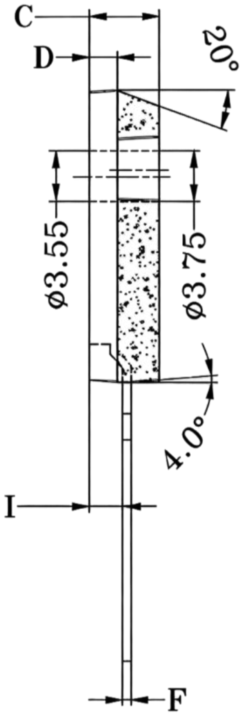
Figure 25. Clamped Inductive Switching Energy vs. Temperature

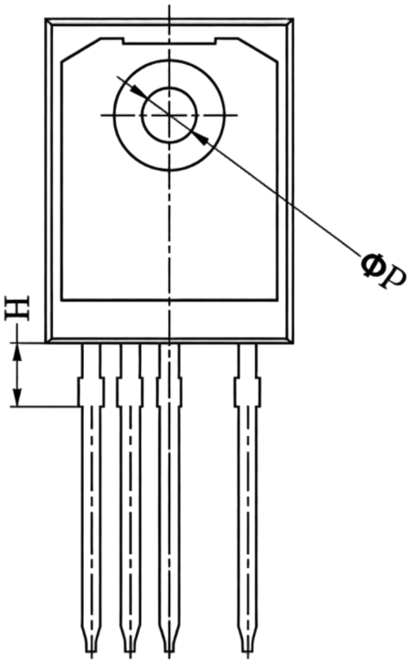
Figure 26.dv/dt v/s $R_{G(ext)}$

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

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