晁元國際半導體股份有限公司
MaxPower SiC Semiconductor Co., Ltd.

V1.0

M2M-0017-120K

Silicon Carbide Power MOSFET

N-Channel Enhancement Mode

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

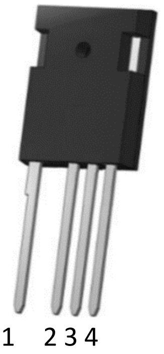
Benefits

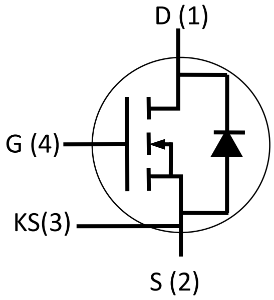
- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications

Package





Part Number	Package
M2M-0017-120K	**TO-247-4**

Maximum Ratings (T_c = 25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	1200	V	V_{GS}=0V, I_D=100μA	
V_{GSmax}	Gate - Source Voltage	-8/+25	V	Absolute maximum values	
V_{GSop}	Gate - Source Voltage	-5/+18	V	Recommended operational values	
I_D	Continuous Drain Current	97	A	V_{GS}=18V, T_{VJ}=25°C	
		85		V_{GS}=18V, T_{VJ}=100°C	
I_{DM}	Pulse Drain Current	200	A	Pulse width limited by T_{VJmax}	
P_D	Power Dissipation	600	W	T_C=25°C, T_{VJ}=150°C	
T_J, T_{stg}	Operating Junction and Storage Temperature	-55 to +175	°C		

Electrical Characteristics (T_c= 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200			V	V_{GS}=0V, I_D=100μA	
$V_{GS(th)}$	Gate Threshold Voltage	2.0	2.5	4.0	V	V_{GS}= V_{DS}, I_{DS}=25mA, T_{VJ}=25°C	
			1.8			V_{GS}= V_{DS}, I_{DS}=25mA, T_{VJ}=175°C	
I_{DSS}	Zero Gate Voltage Drain Current		8	100	μA	V_{DS}= 1200V, V_{GS}=0V	
I_{GSS}	Gate-Source Leakage Current		20	150	nA	V_{GS}=18V, V_{DS}= 0V	
$R_{DS(on)}$	Drain-Source on-state Resistance		17	23	mΩ	V_{GS}=18V, I_D=75A, T_{VJ}=25°C	
			29			V_{GS}=18V, I_D=75A, T_{VJ}=175°C	
g_{fs}	Transconductance		23		S	V_{DS} = 20 V, I_D = 75A, T_{VJ} = 25 °C	
			13		S	V_{DS} = 20 V, I_D = 75A, T_{VJ}=175°C	
Ciss	Input Capacitance		4150		pF	V_{GS}=0V, V_{DS}=800 V, f=100KHz V_{AC}=25 mV	
Coss	Output Capacitance		187				
Crss	Reverse Transfer Capacitance		27				
E_{ON}	Turn-On Switching Energy		4622		μJ	V_{DS}=800V, V_{GS}=-5/18V, I_D= 75A, $R_{G(ext)}$ = 10Ω, L= 99 μH	
E_{OFF}	Turn-Off Switching Energy		1354				
$t_{d(on)}$	Turn-On Delay Time		101		ns	V_{DS}=800V, V_{GS}=-5/18 V I_D = 75A, $R_{G(ext)}$ = 10 Ω ,	
t_r	Rise Time		55				
$t_{d(off)}$	Turn-Off Delay Time		129				
t_f	Fall Time		38				
$R_{G(int)}$	Internal Gate Resistance		1.0		Ω	f=1 MHz, V_{AC}=25mV	
Q_{gs}	Gate to Source Charge		67		nC	V_{DS}=800V, V_{GS}=-5/18 V I_D = 75A	
Q_{gd}	Gate to Drain Charge		148				
Q_g	Total Gate Charge		287				

Reverse Diode Characteristics (T_c= 25℃ unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.7		V	V_{GS} = -5V, I_{SD} = 35 A, T_{VJ} = 25 °C	
		3.6		V	V_{GS} =- 5V, I_{SD} = 35 A, T_{VJ} = 175 °C	
I_S	Continuous Diode Forward Current	97		A	T_{VJ} = 25°C	
t_{rr}	Reverse Recovery time	82		ns	V_{GS} = -5V, I_{SD} = 75 A, V_R= 800V, di/dt=1400A/μs; T_{VJ} = 175 °C	
Q_{rr}	Reverse Recovery Charge	1156		nC		
I_{rrm}	Peak Reverse Recovery Current	26		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.25	℃/W		
$R_{\theta JA}$	Thermal Resistance From Junction to Ambient	36			

Typical Performance

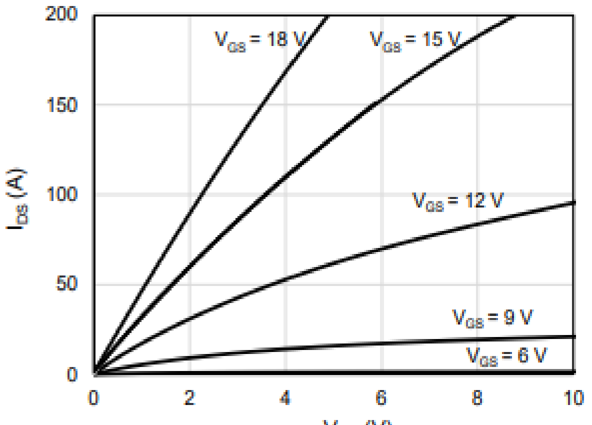


Figure 1: Output Characteristics T_J = -40℃

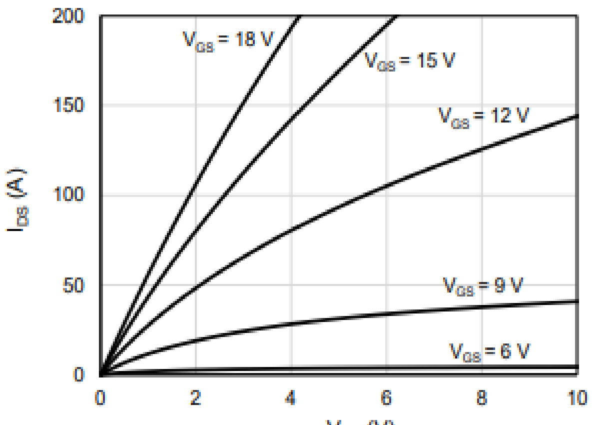


Figure 2: Output Characteristics T_J = 25℃

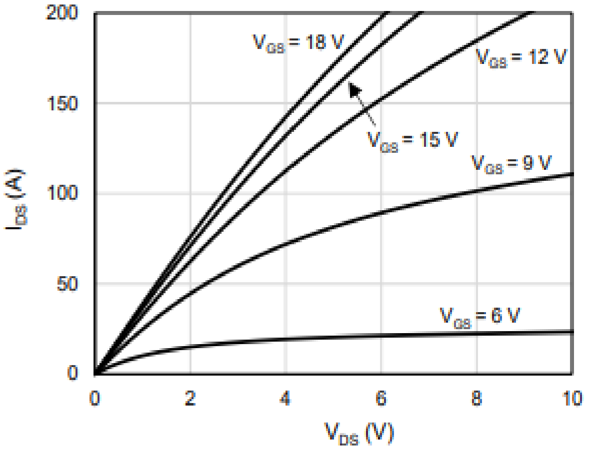


Figure 3: Output Characteristics T_J = 175℃

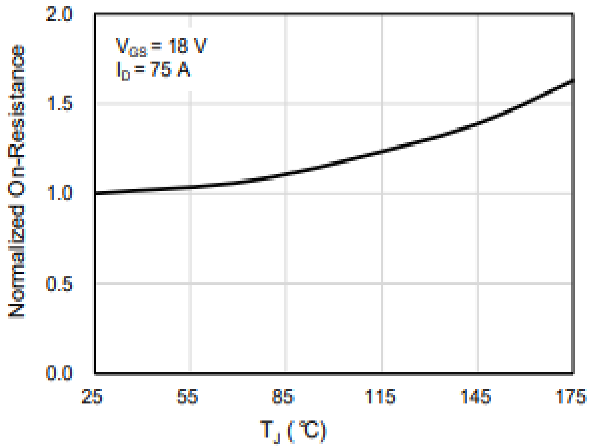


Figure 4: Normalized On-Resistance vs. Temperature

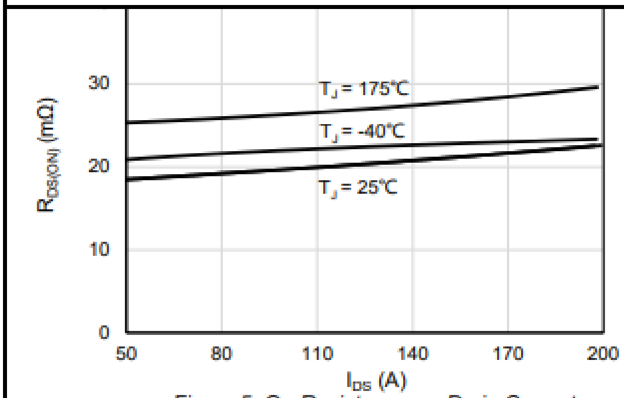


Figure 5: On-Resistance vs. Drain Current For Various Temperatures

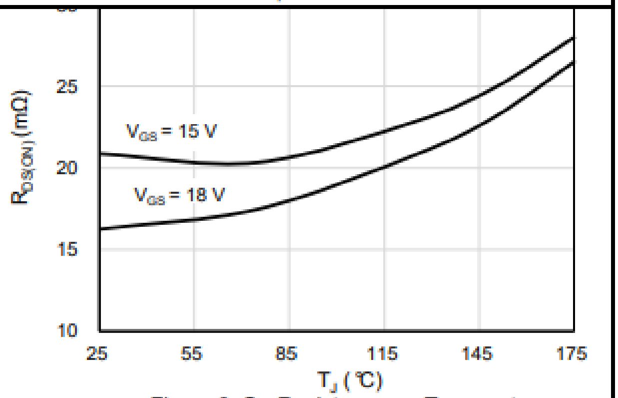


Figure 6: On-Resistance vs. Temperature For Various Gate Voltage

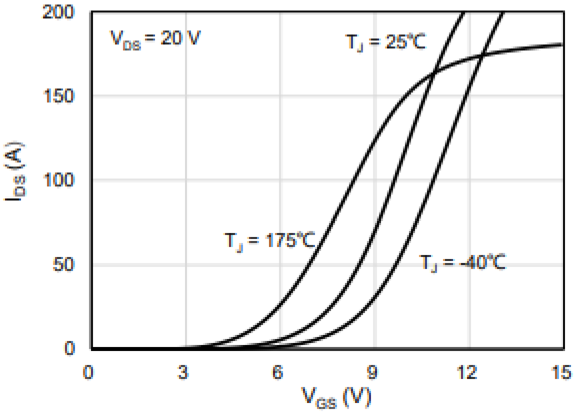


Figure 7: Transfer Characteristics For Various Junction Temparature

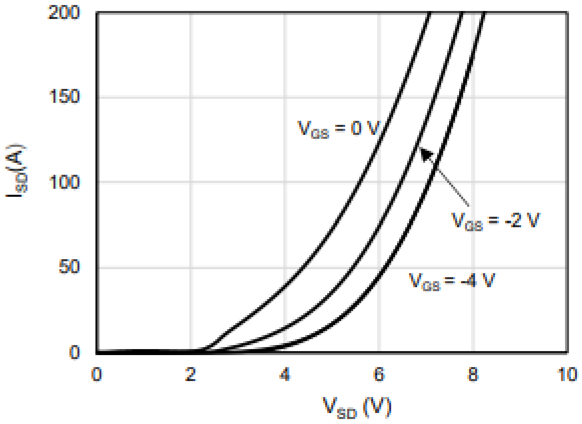


Figure 8: Body Diode Characteristics at -40℃

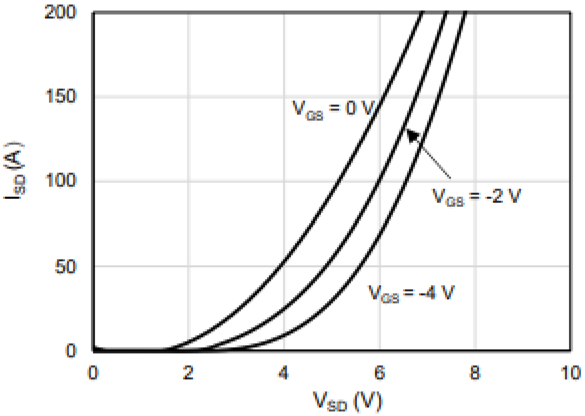


Figure 9: Body Diode Characteristics at 25℃

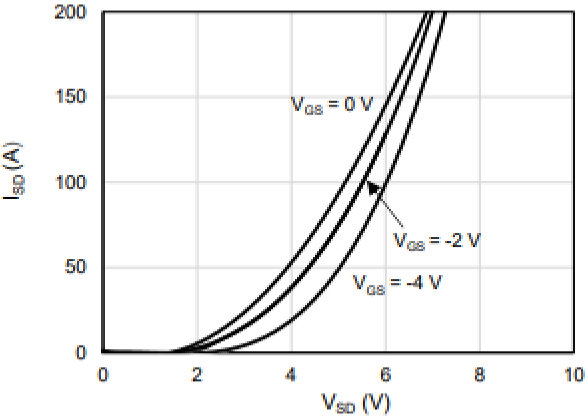


Figure 10: Body Diode Characteristics at 175℃

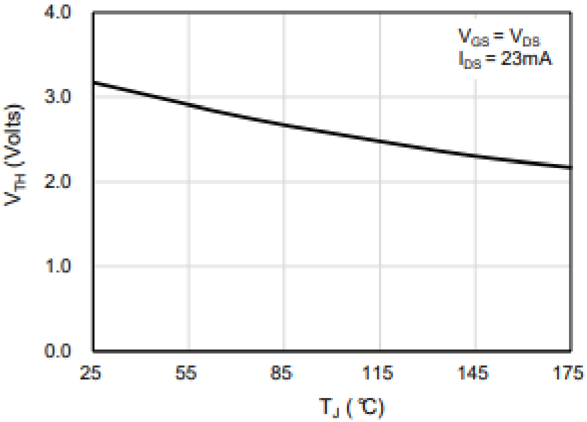


Figure 11: Threshold Voltage vs. Temperature

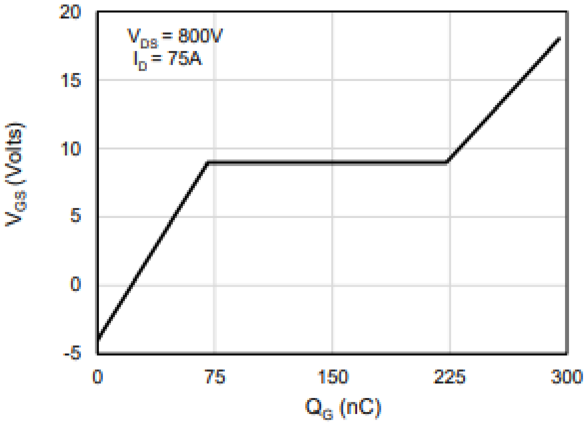


Figure 12: Gate-Charge Characteristics

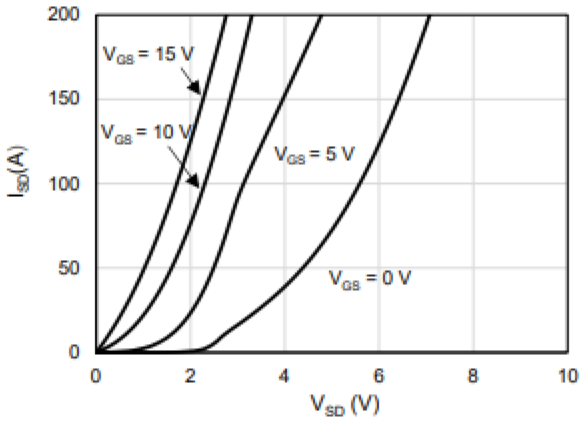


Figure 13: 3rd Quadrant Characteristics at -40℃

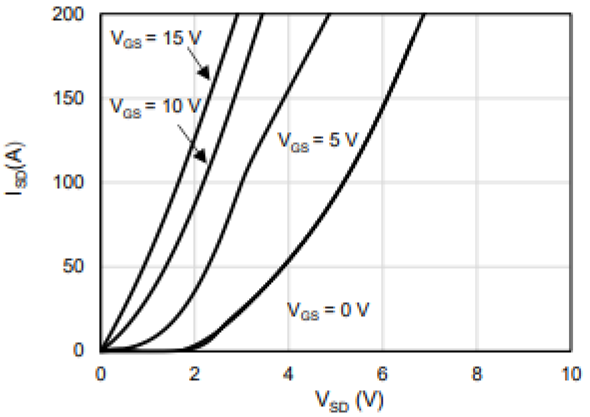


Figure 14: 3rd Quadrant Characteristics at 25℃

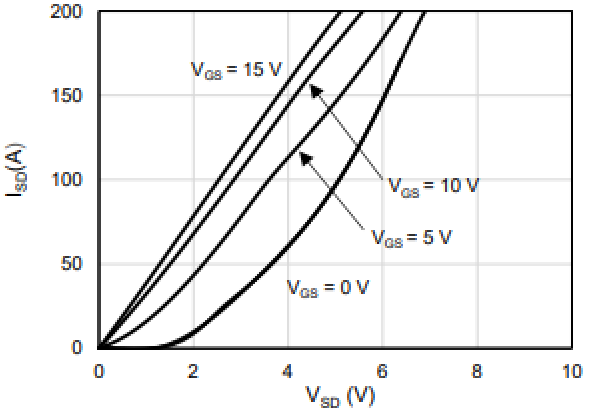


Figure 15: 3rd Quadrant Characteristics at 175℃

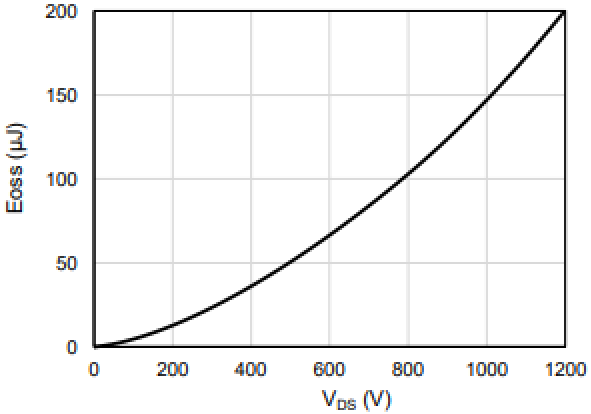


Figure 16: Output Capacitor Stord Energy

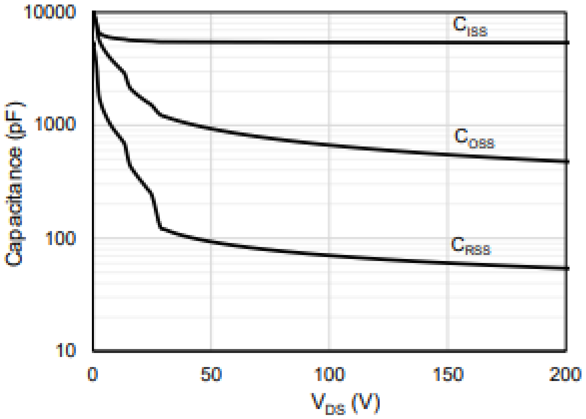


Figure 17: Capacitance Characteristics (0 - 200V)

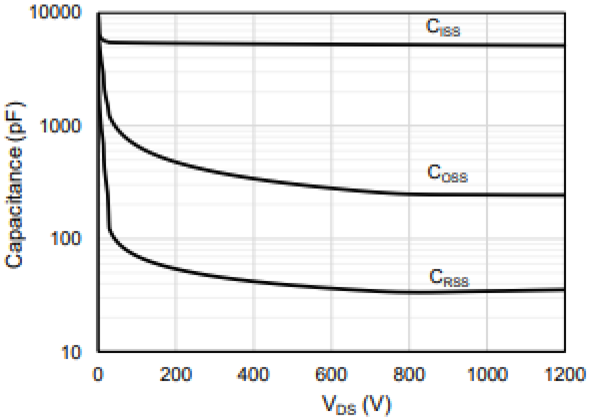


Figure 18: Capacitance Characteristics (0-1200V)

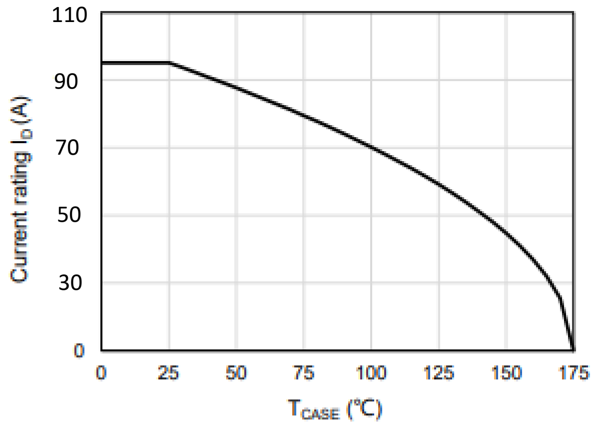


Figure 19: Current De-rating

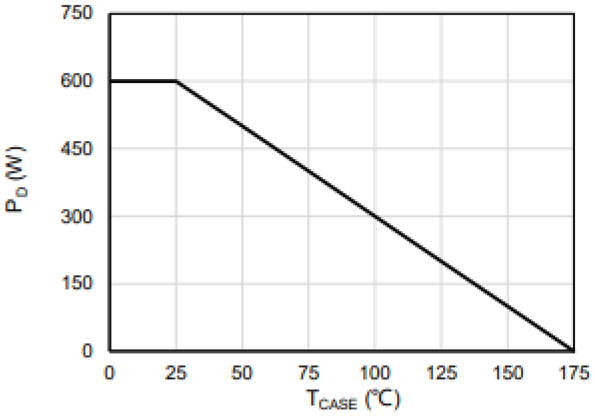


Figure 20: Maximum Power Disspation Derating vs CaseTemperature

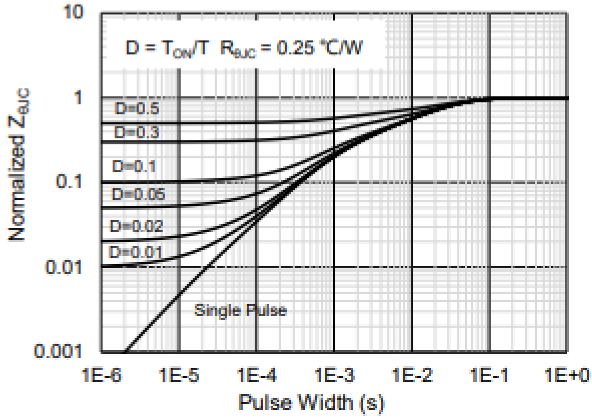


Figure 21: Normalized Maximum Transient Thermal Impedance

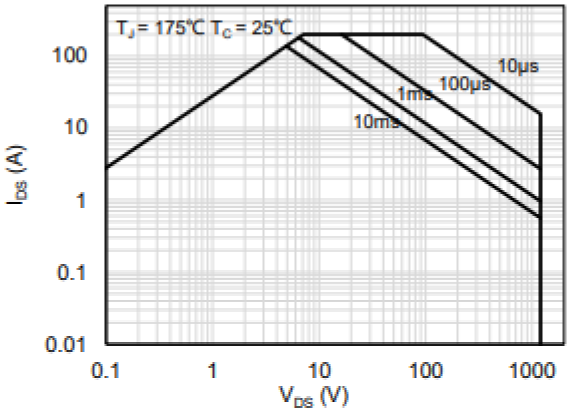


Figure 22: Maximum Forward Biased Safe Operating Area

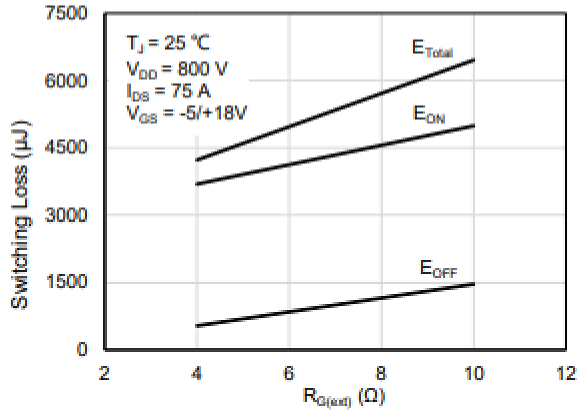


Figure 23: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

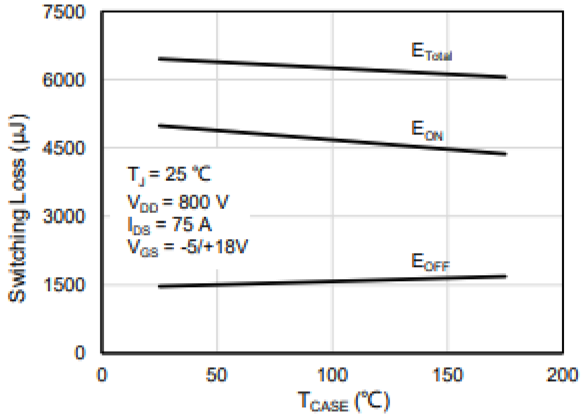
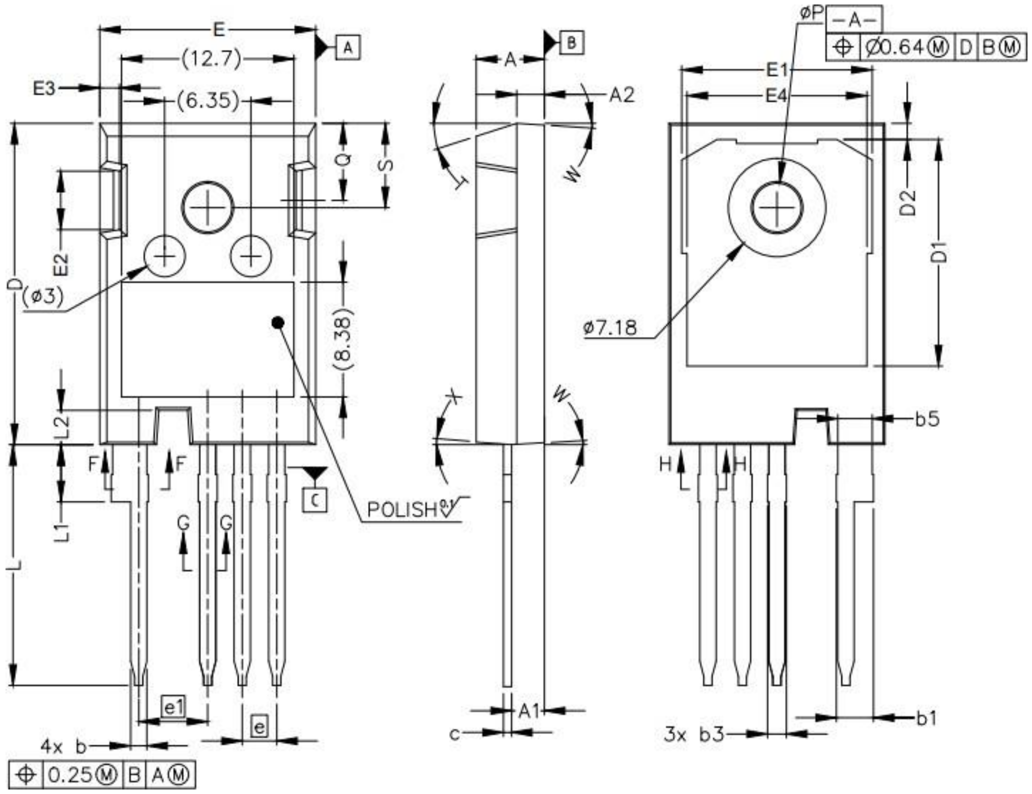
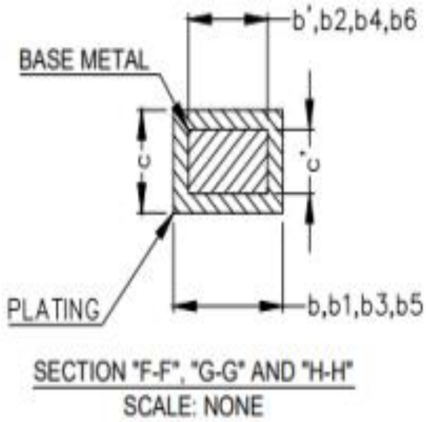


Figure 24: Clamped Inductive Switching Energy vs. Temperature

Package Outlines

TO-247-4L PKG Outlines





SYMBOL	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
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.	