M2M-0030-120K

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

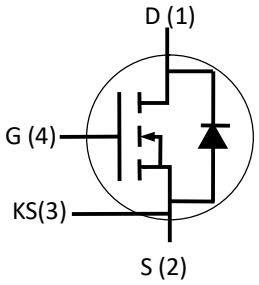
Benefits

- 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-0030-120K	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	-10/+22	V	Absolute maximum values	
V_{GSop}	Gate - Source Voltage	-6/+18	V	Recommended operational values	
I_D	Continuous Drain Current	76 68	A	V_{GS}=20V , T_C=25˚C V_{GS}=20V , T_C=100˚C	
I_{DM}	Pulse Drain Current	120	A	Pulse width limited by T_{jmax}	
P_D	Power Dissipation	375	W	T_C=25˚C, T_J=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	2.2	3.2	4.5	V	V_{GS}= V_{DS}, I_{DS}=11.5mA, T_C=25°C	
			2.2			V_{GS}= V_{DS}, I_{DS}=11.5mA, T_j=175°C	
I_{DSS}	Zero Gate Voltage Drain Current		5	50	μA	V_{DS}= 1200V, V_{GS}=0V	
I_{GSS}	Gate-Source Leakage Current			100	nA	V_{GS}=18V, V_{DS}= 0V	
$R_{DS(on)}$	Drain-Source on-state Resistance	20	30	40	mΩ	V_{GS}=18V, I_D=40A, T_C=25°C	
			48			V_{GS}=18V, I_D=40A, T_j=175°C	
g_{fs}	Transconductance		27		S	V_{DS} = 20 V, I_D = 40A, T_c = 25 °C	
			17		S	V_{DS} = 20 V, I_D = 40A, T_j=175°C	
Ciss	Input Capacitance		2940		pF	V_{GS}=0V, V_{DS}=800 V, f=100KHz V_{AC}=25 mV	
Coss	Output Capacitance		129				
Crss	Reverse Transfer Capacitance		15				
E_{ON}	Turn-On Switching Energy		1616		μJ	V_{DS}=800V, V_{GS}=-5/18V, I_D= 40A, $R_{G(ext)}$ = 2.5Ω, L= 99 μH	
E_{OFF}	Turn-Off Switching Energy		178				
$t_{d(on)}$	Turn-On Delay Time		14		ns	V_{DS}=800V, V_{GS}=-5/18 V I_D = 40A, $R_{G(ext)}$ = 2.5 Ω ,	
t_r	Rise Time		31				
$t_{d(off)}$	Turn-Off Delay Time		32				
t_f	Fall Time		12				
$R_{G(int)}$	Internal Gate Resistance		2.2		Ω	f=1 MHz, V_{AC}=25mV	
Q_{gs}	Gate to Source Charge		34		nC	V_{DS}=800V, V_{GS}=-5/18 V I_D = 40A	
Q_{gd}	Gate to Drain Charge		35				
Q_g	Total Gate Charge		138				

Reverse Diode Characteristics (T_c = 25°C unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.9		V	V_{GS} = -4V, I_{SD} = 20 A, T_J = 25 °C	
		4.4		V	V_{GS} =- 4V, I_{SD} = 20 A, T_J = 175 °C	
I_S	Continuous Diode Forward Current	68		A	T_C = 25°C	
t_{rr}	Reverse Recovery time	61		ns	V_{GS} = -4V, I_{SD} = 40 A, V_R= 800V, di/dt=1150A/μs;	
Q_{rr}	Reverse Recovery Charge	367		nC		
I_{rrm}	Peak Reverse Recovery Current	20		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.4	℃/W		
$R_{\theta JA}$	Thermal Resistance From Junction to Ambient	36			

Typical Performance

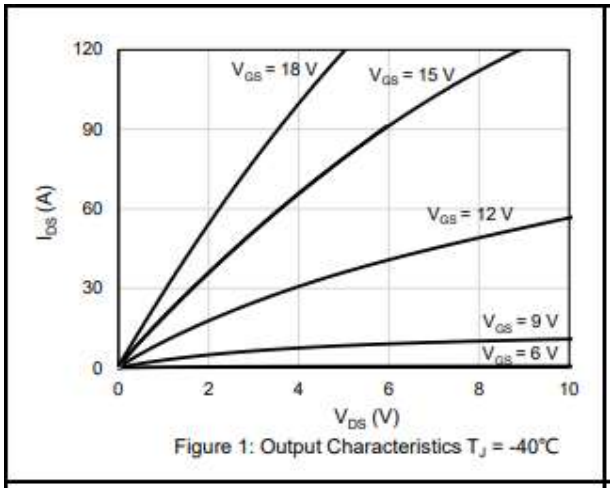


Figure 1: Output Characteristics T_J = -40℃

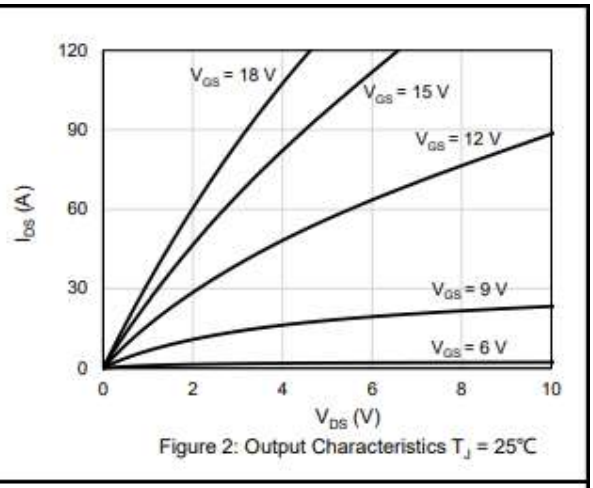


Figure 2: Output Characteristics T_J = 25℃

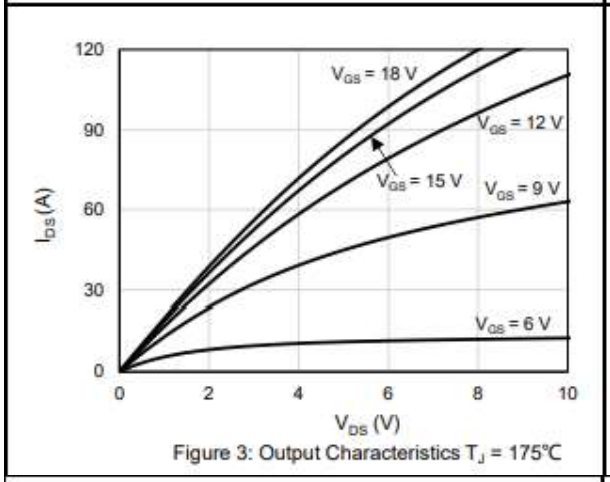


Figure 3: Output Characteristics T_J = 175℃

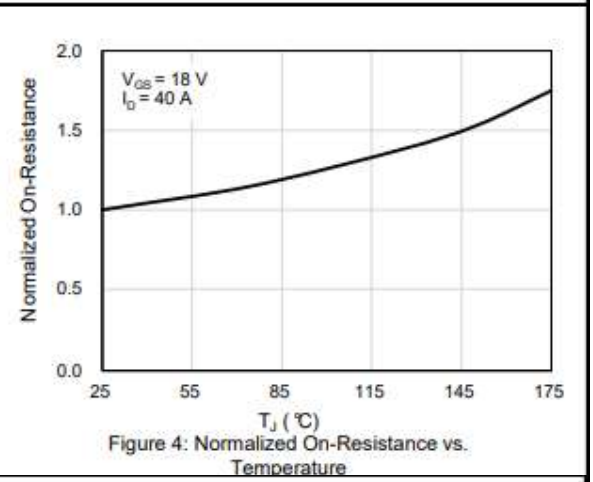


Figure 4: Normalized On-Resistance vs. Temperature

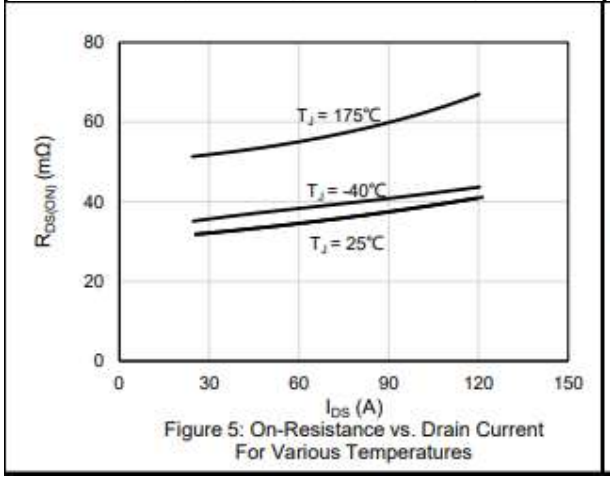


Figure 5: On-Resistance vs. Drain Current For Various Temperatures

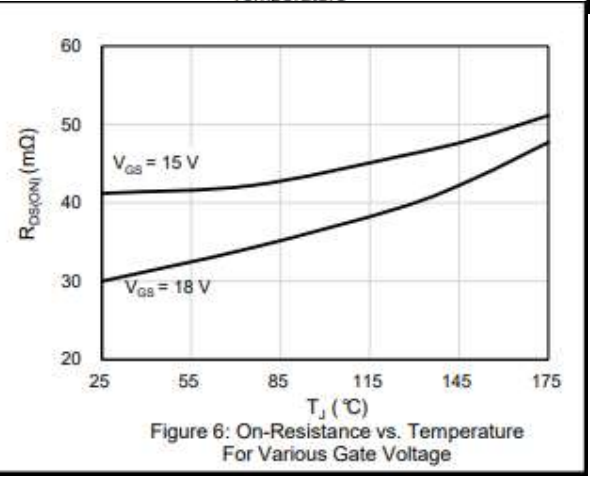


Figure 6: On-Resistance vs. Temperature For Various Gate Voltage

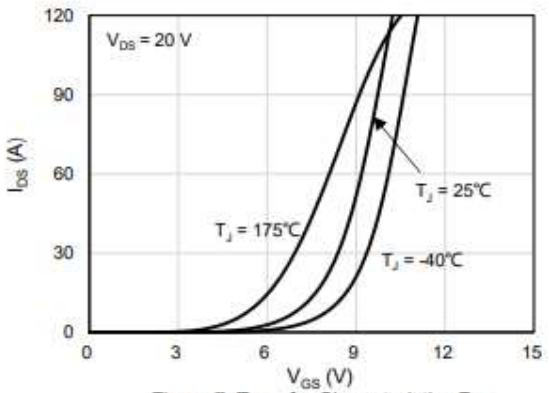


Figure 7: Transfer Characteristics For Various Junction Temparature

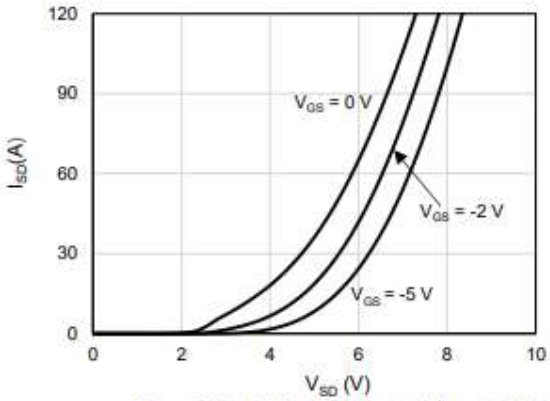


Figure 8: Body Diode Characteristics at -40℃

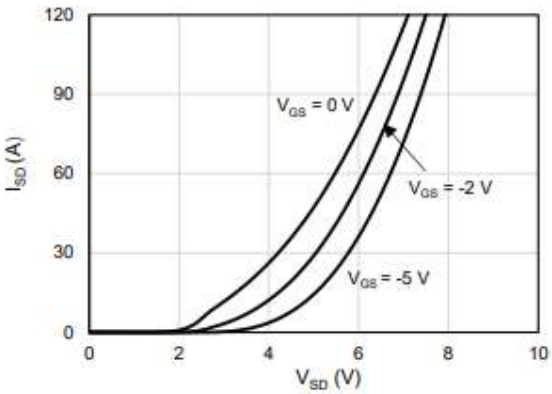


Figure 9: Body Diode Characteristics at 25℃

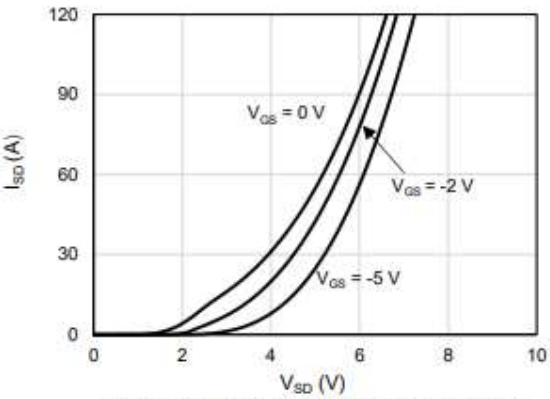


Figure 10: Body Diode Characteristics at 175℃

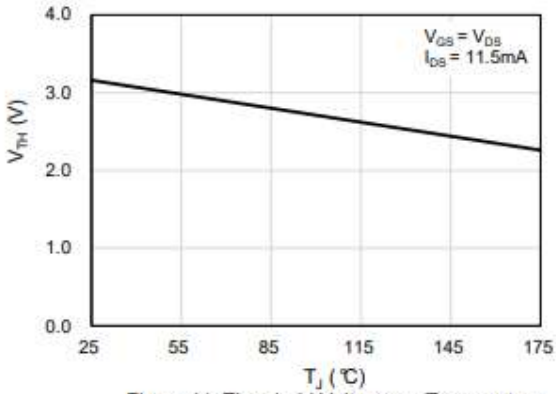


Figure 11: Threshold Voltage vs. Temperature

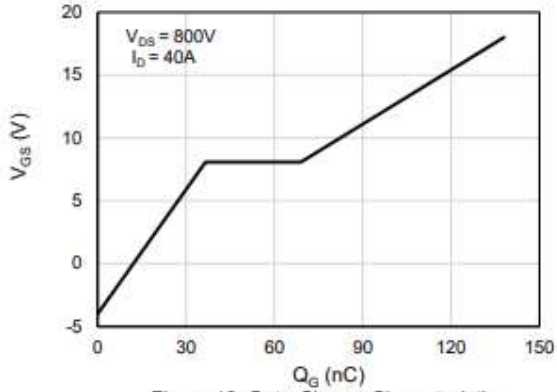


Figure 12: Gate-Charge Characteristics

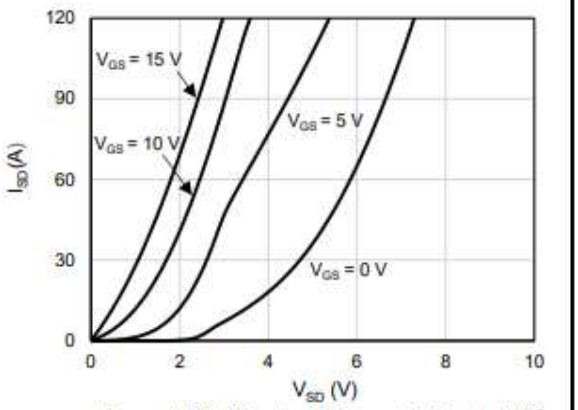


Figure 13: 3rd Quadrant Characteristics at -40℃

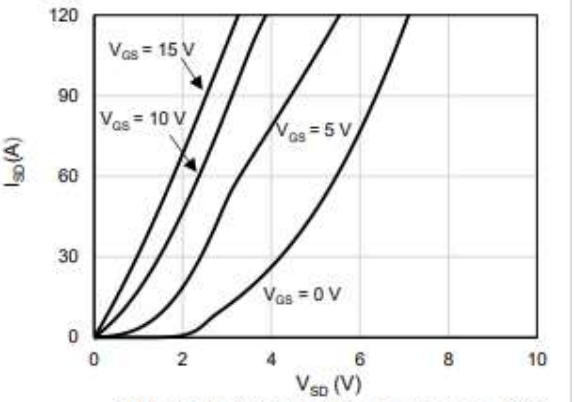


Figure 14: 3rd Quadrant Characteristics at 25℃

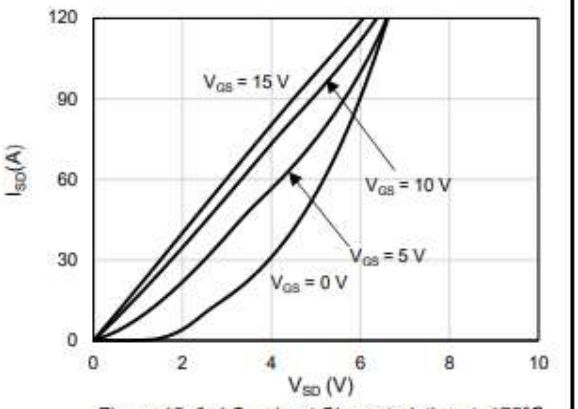


Figure 15: 3rd Quadrant Characteristics at 175℃

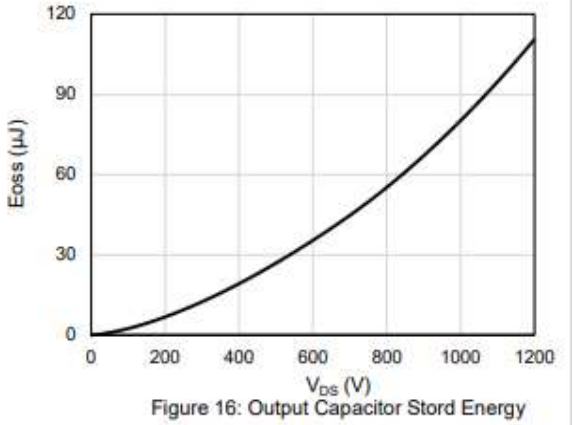


Figure 16: Output Capacitor Stord Energy

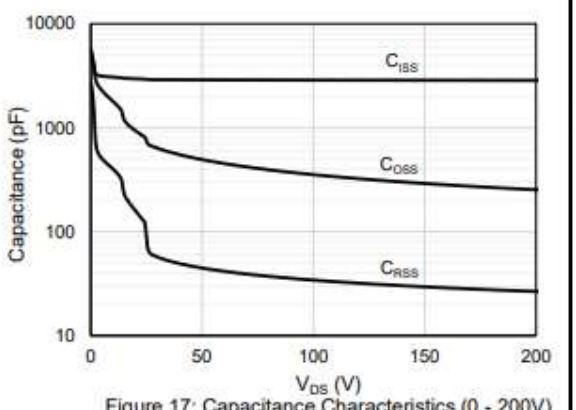


Figure 17: Capacitance Characteristics (0 - 200V)

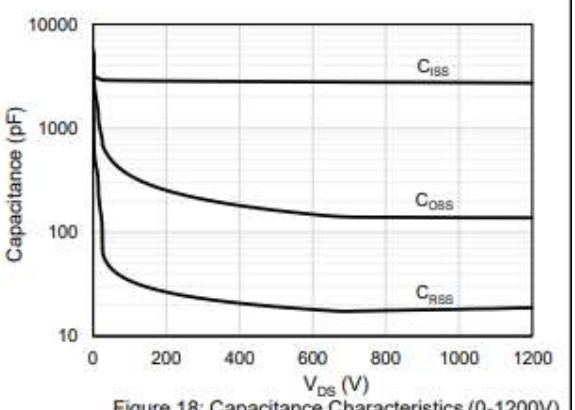


Figure 18: Capacitance Characteristics (0-1200V)

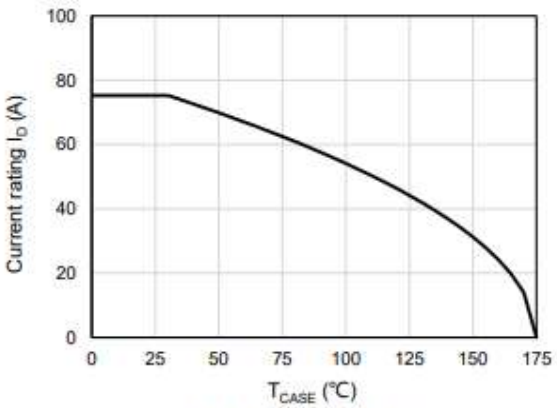


Figure 19: Current De-rating

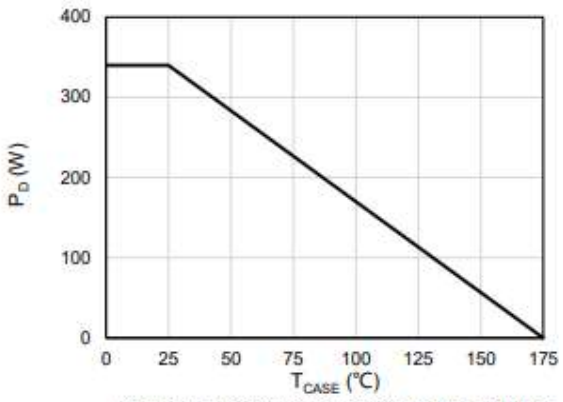


Figure 20: Maximum Power Disspation Derating vs CaseTemperature

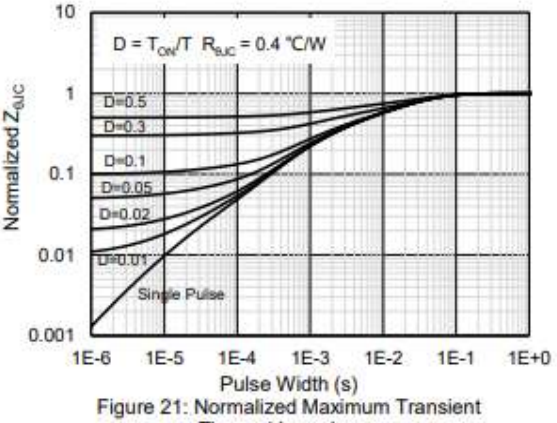


Figure 21: Normalized Maximum Transient Thermal Impedance

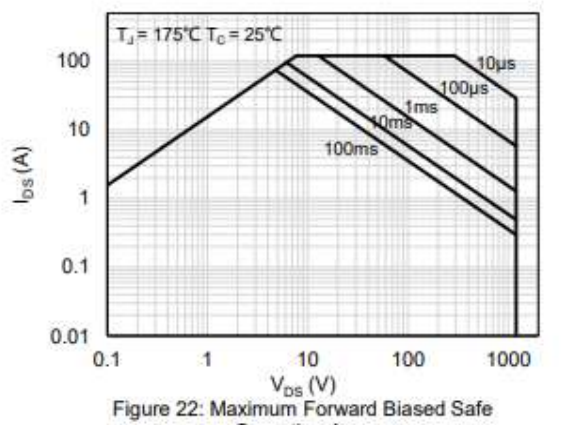


Figure 22: Maximum Forward Biased Safe Operating Area

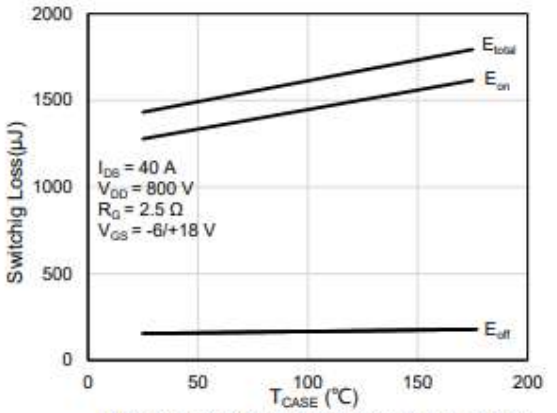
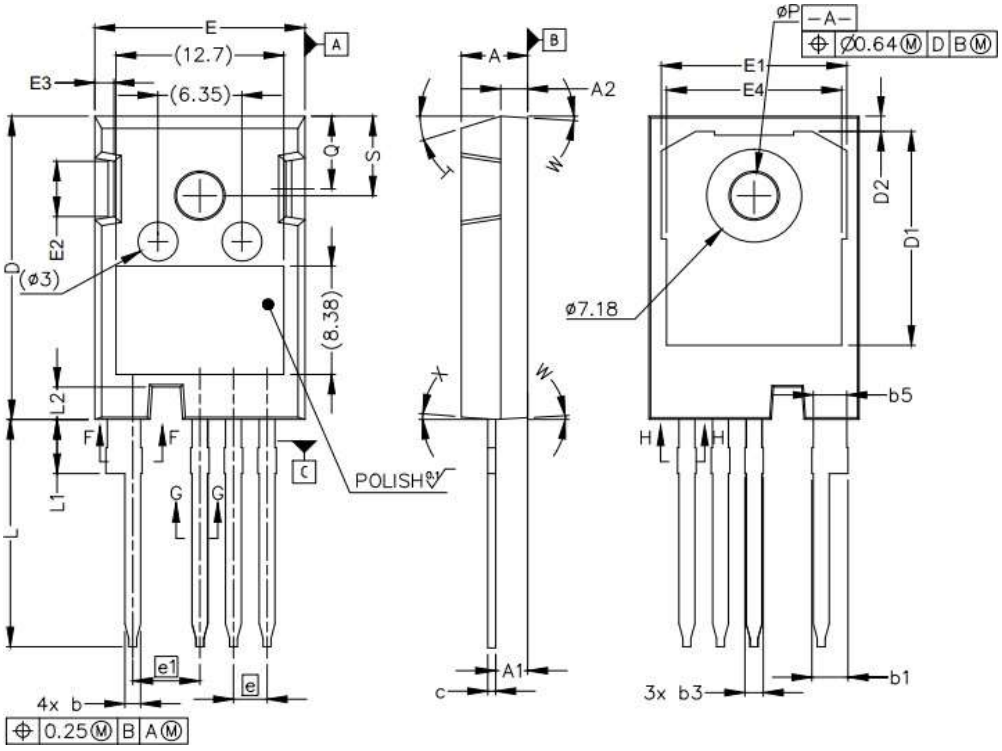
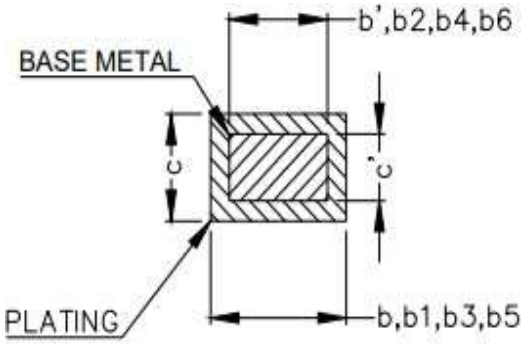


Figure 23: Clamped Inductive Switching Energy vs.Temperature

Package Outlines

TO-247-4L PKG Outlines





SECTION "F-F", "G-G" AND "H-H"
SCALE: NONE

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.	