

M2M-0017-120D

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

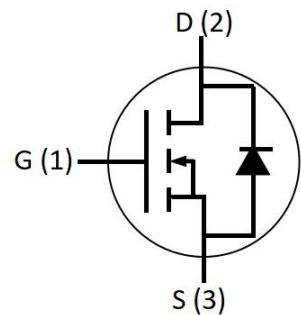
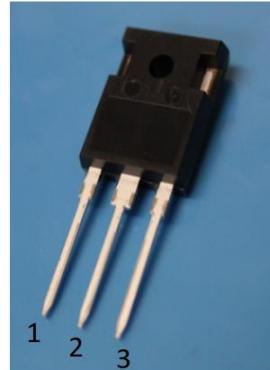
Benefits

- 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-0017-120D	TO-247-3

Maximum Ratings ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
$V_{DS\max}$	Drain - Source Voltage	1200	V	$V_{GS}=0\text{V}$, $I_D=100\mu\text{A}$	
$V_{GS\max}$	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 85	A	$V_{GS}=18\text{V}$, $T_{VJ}=25^\circ\text{C}$ $V_{GS}=18\text{V}$, $T_{VJ}=100^\circ\text{C}$	
I_{DM}	Pulse Drain Current	200	A	Pulse width limited by $T_{VJ\max}$	
P_D	Power Dissipation	600	W	$T_c=25^\circ\text{C}$, $T_{VJ}=150^\circ\text{C}$	
T_J , T_{stg}	Operating Junction and Storage Temperature	-55 to +175	°C		

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

V1.0

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

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

Reverse Diode Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified)

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

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

V1.0

Thermal Characteristics

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

Typical Performance

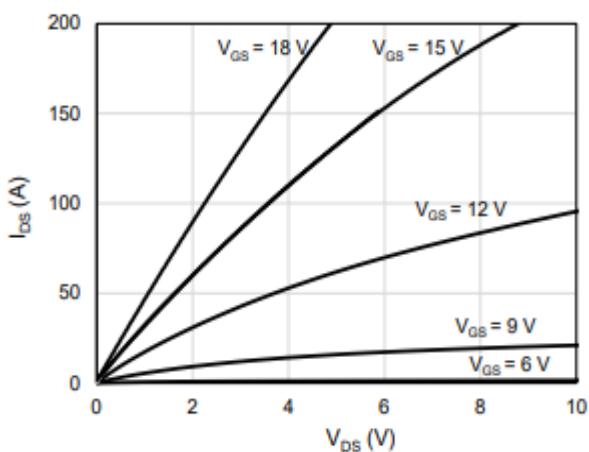


Figure 1: Output Characteristics $T_J = -40^\circ\text{C}$

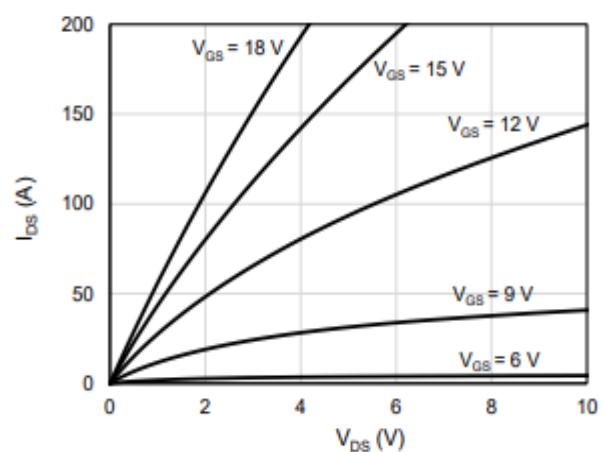


Figure 2: Output Characteristics $T_J = 25^\circ\text{C}$

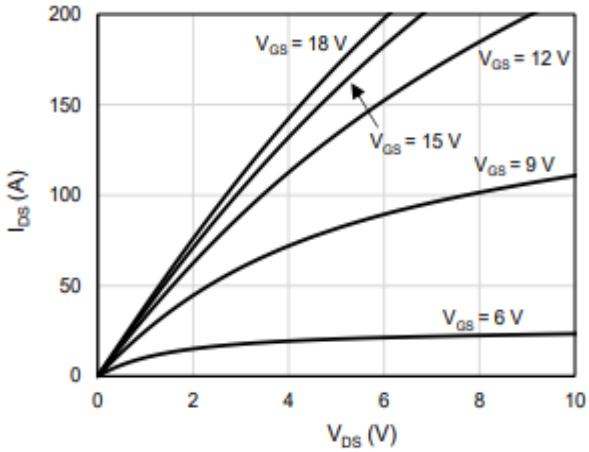


Figure 3: Output Characteristics $T_J = 175^\circ\text{C}$

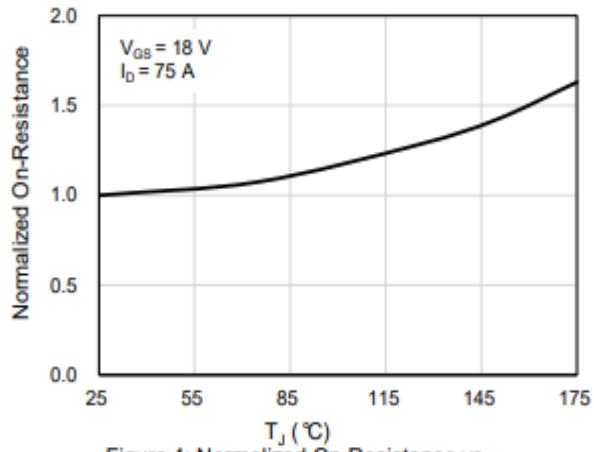


Figure 4: Normalized On-Resistance vs. Temperature

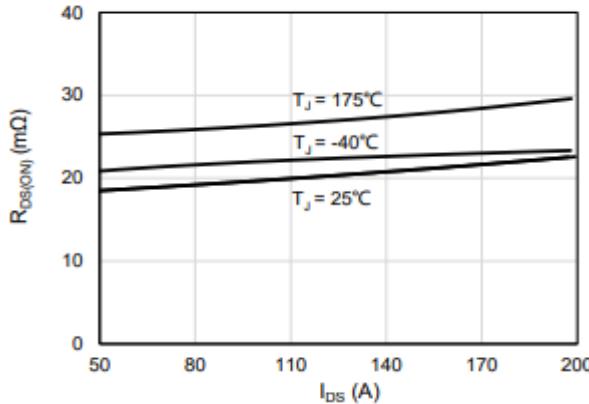


Figure 5: On-Resistance vs. Drain Current For Various Temperatures

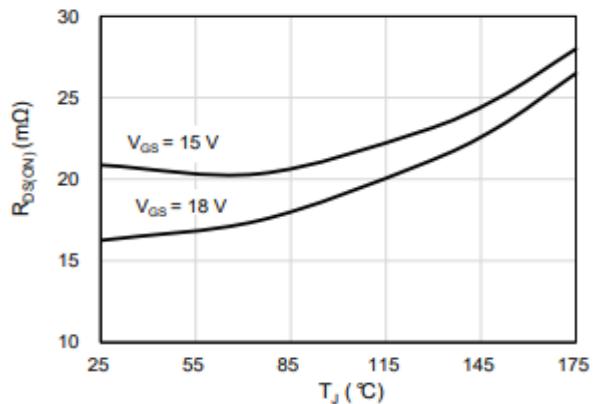


Figure 6: On-Resistance vs. Temperature For Various Gate Voltage

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

V1.0

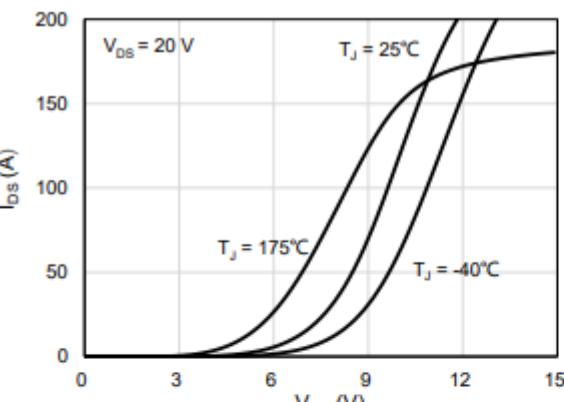


Figure 7: Transfer Characteristics For Various Junction Temperature

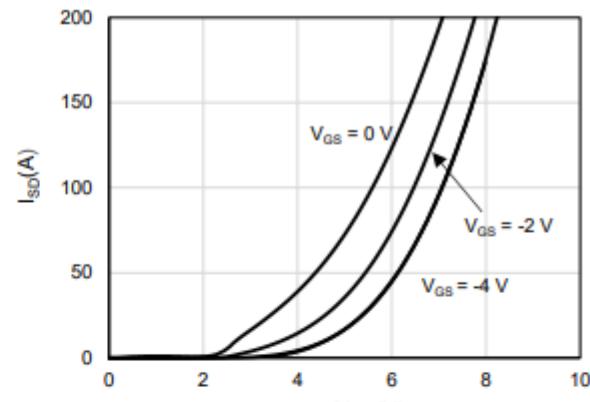


Figure 8: Body Diode Characteristics at -40°C

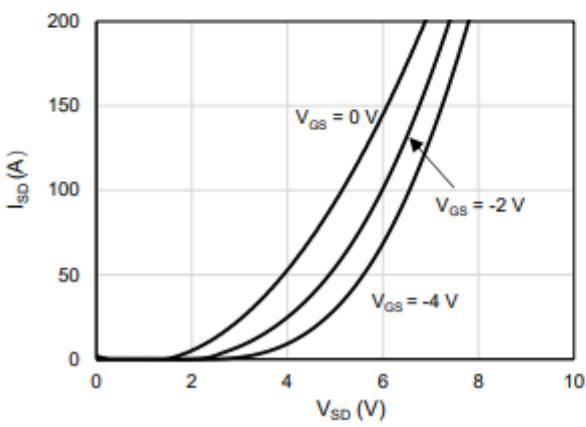


Figure 9: Body Diode Characteristics at 25°C

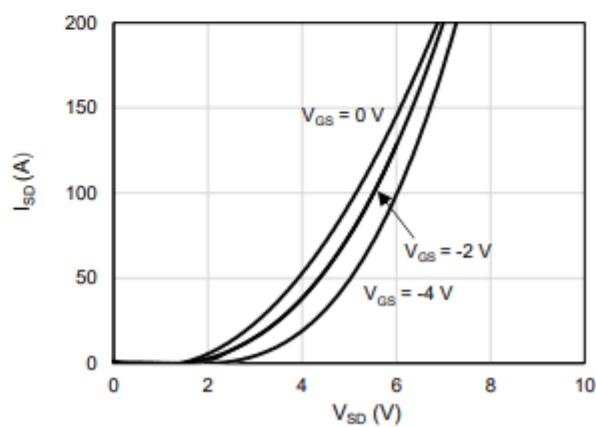


Figure 10: Body Diode Characteristics at 175°C

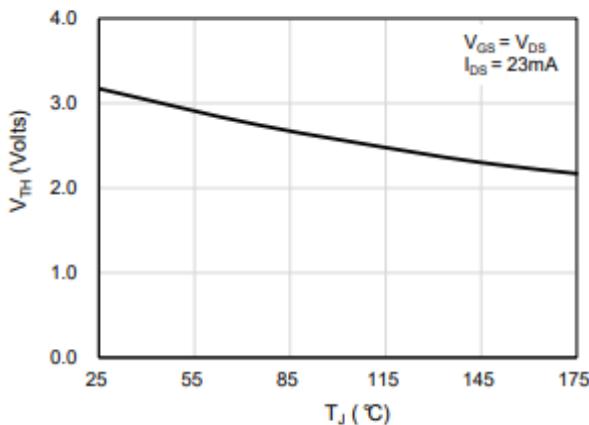


Figure 11: Threshold Voltage vs. Temperature

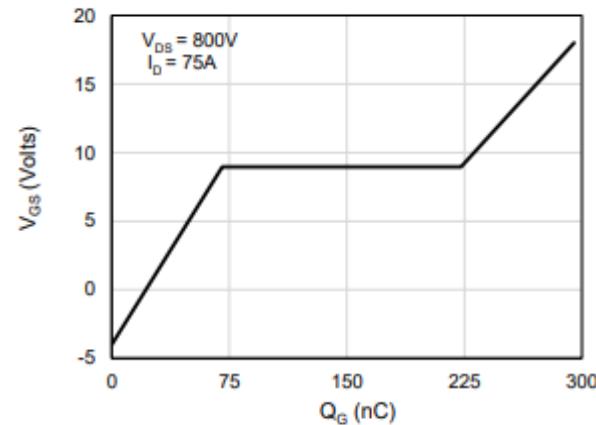


Figure 12: Gate-Charge Characteristics

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

V1.0

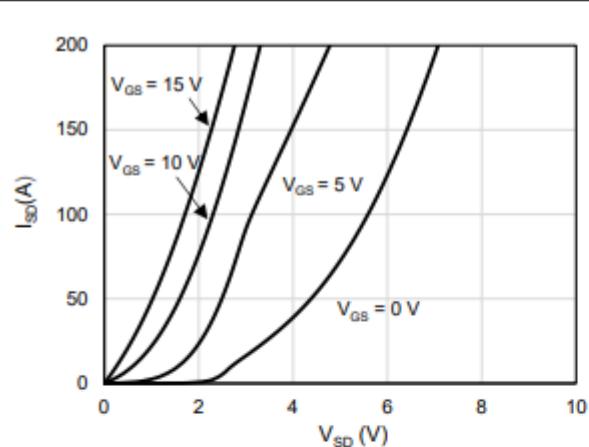


Figure 13: 3rd Quadrant Characteristics at -40°C

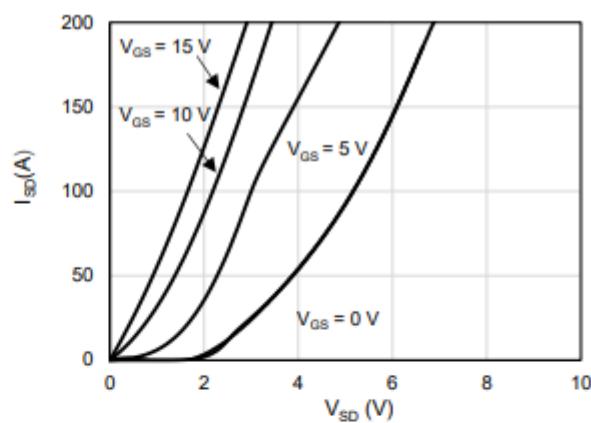


Figure 14: 3rd Quadrant Characteristics at 25°C

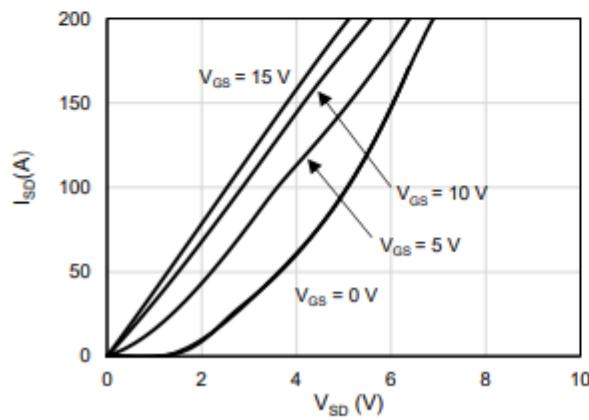


Figure 15: 3rd Quadrant Characteristics at 175°C

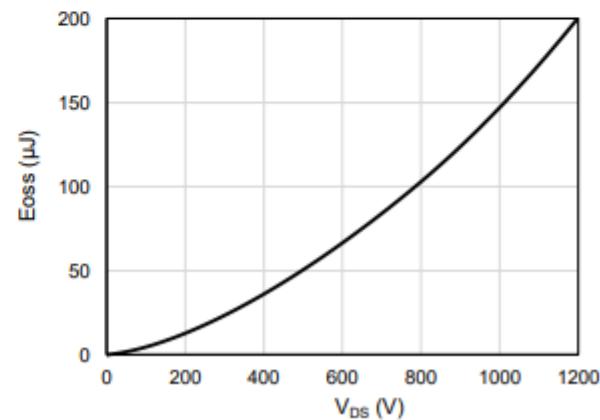


Figure 16: Output Capacitor Stored Energy

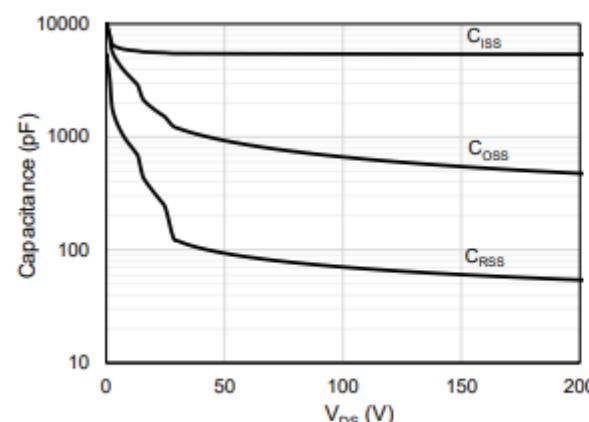


Figure 17: Capacitance Characteristics (0 - 200V)

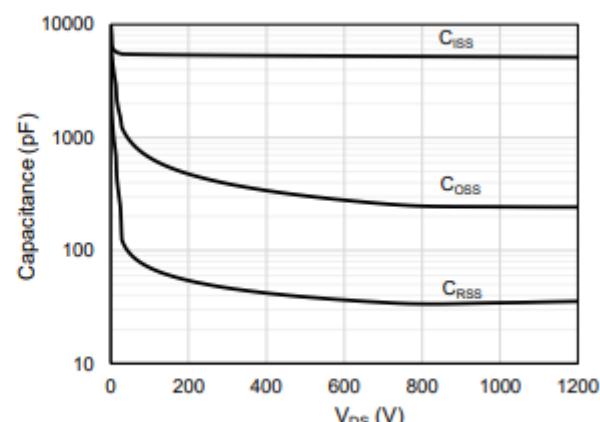


Figure 18: Capacitance Characteristics (0-1200V)

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

V1.0

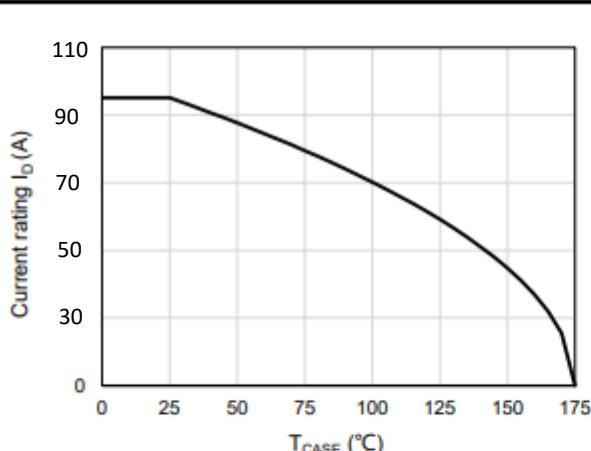


Figure 19: Current De-rating

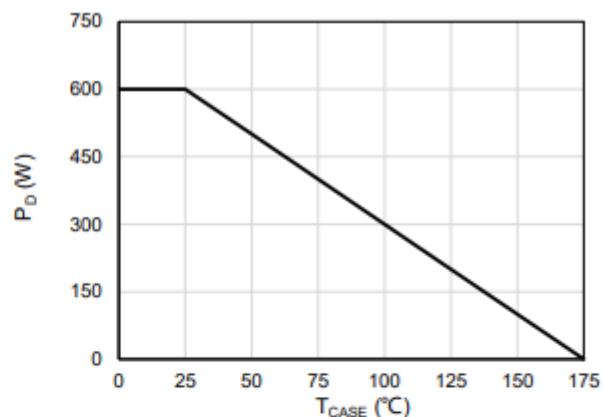


Figure 20: Maximum Power Dissipation Derating
vs CaseTemperature

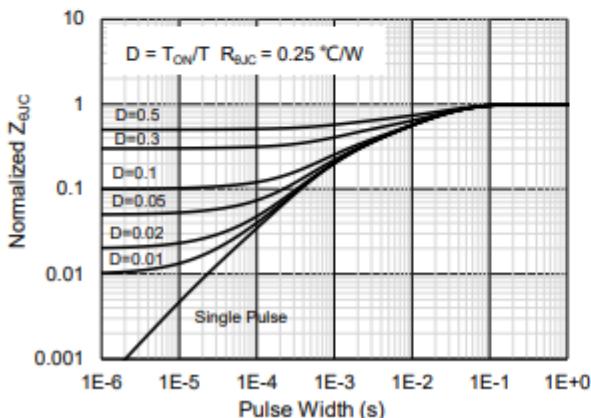


Figure 21: Normalized Maximum Transient Thermal Impedance

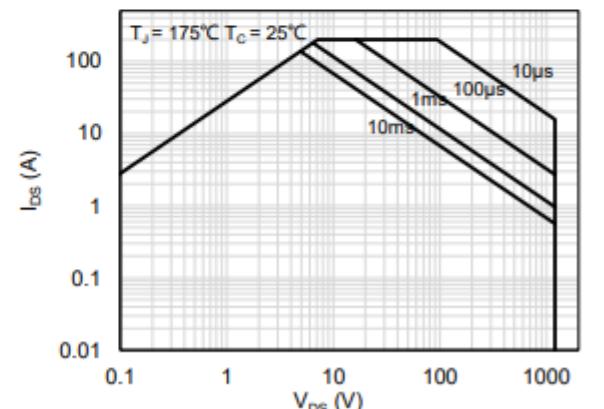


Figure 22: Maximum Forward Biased Safe Operating Area

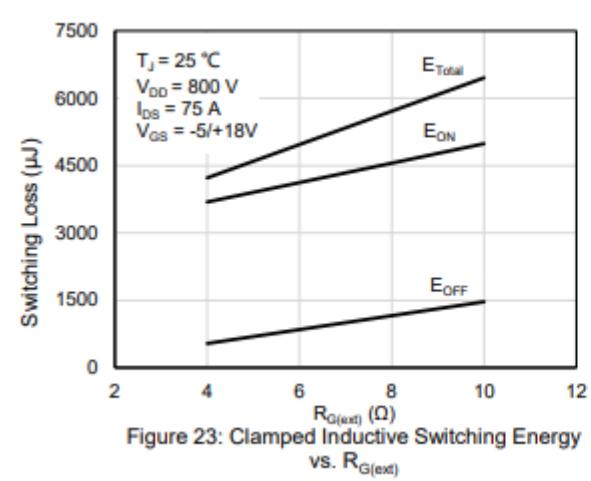


Figure 23: Clamped Inductive Switching Energy
vs. R_{G(ext)}

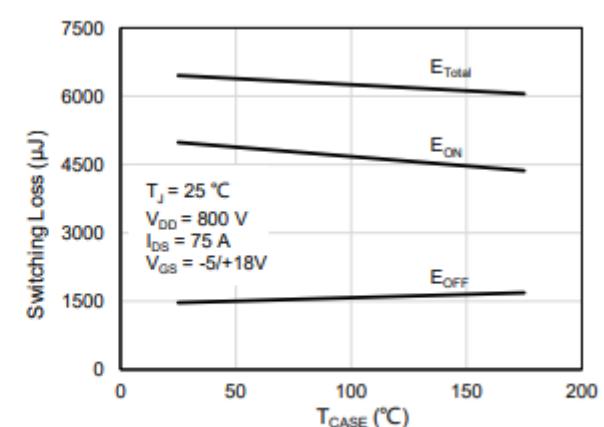


Figure 24: Clamped Inductive Switching Energy
vs. Temperature

Package Outlines

TO-247-3L PKG Outlines

