1200V N-Channel Silicon Carbide Power MOSFET

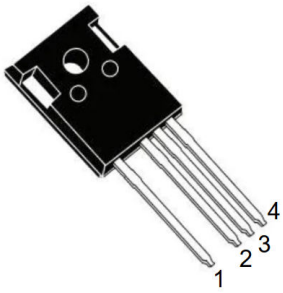
Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- High operating junction temperature capability
- Very fast and robust intrinsic body diode
- Kelvin gate input easing driver circuit design

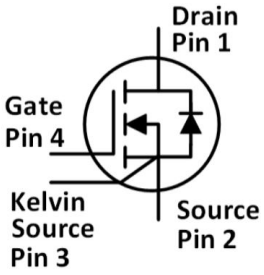
Applications

- Solar inverters
- Motor drivers
- High voltage DC/DC converters
- Switch mode power supplies

Package



Top View



Part Number	Package
DTN125N120SC4	TO247-4

Absolute Maximum Ratings (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DS}	Drain-Source voltage	1200	V	V_{GS}=0V, I_D=100μA	
V_{GSmax} (DC)	Maximum DC voltage	-6 to 18	V	Static (DC)	
V_{GSmax} (Spike)	Maximum spike voltage	-10 to 22	V	<1% duty cycle, and pulse width<200ns	
I_D	Drain current (continuous)	125	A	V_{GS}=20V, T_C=25°C	Fig. 21
		90	A	V_{GS}=20V, T_C=100°C	
I_{DM}	Drain current (pulsed)	200	A	Pulse width limited by SOA	Fig. 22
P_{TOT}	Total power dissipation	600	W	T_C=25°C	Fig. 20
T_{stg}	Storage temperature range	-55 to 175	°C		
T_J	Operating junction temperature	-55 to 175	°C		
T_L	Solder Temperature	260	°C	wave soldering only allowed at leads, 1.6mm from case for 10 s	

Thermal Data

Symbol	Parameter	Value	Unit	Note
$R_{\theta(J-C)}$	Thermal Resistance from Junction to Case	0.25	°C/W	Fig. 21

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

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
I_{DSS}	Zero gate voltage drain current		5	50	μA	V_{DS}=1200V, V_{GS}=0V	
I_{GSS}	Gate leakage current			±100	nA	V_{DS}=0V, V_{GS}=-6~18V	
V_{TH}	Gate threshold voltage	2.2	3.2	4.5	V	V_{GS}=V_{DS}, I_D=23mA	Fig. 11
			2.2			V_{GS}=V_{DS}, I_D=23mA @ T_C=175°C	
R_{ON}	Static drain-source on-resistance		16	23	mΩ	V_{GS}=18V, I_D=75A @T_J=25°C	Fig. 5, 6
			27		mΩ	V_{GS}=18V, I_D=75A @T_J=175°C	
C_{iss}	Input capacitance		5225		pF	V_{DS}=800V, V_{GS}=0V, f=100kHz, V_{AC}=25mV	Fig. 18
C_{oss}	Output capacitance		240		pF		
C_{rss}	Reverse transfer capacitance		29		pF		
E_{oss}	C_{oss} stored energy		102		μJ		Fig. 16
Q_g	Total gate charge		293		nC	V_{DS}=800V, I_D=75A, V_{GS}=-5 to 18V	Fig. 12
Q_{gs}	Gate-source charge		66		nC		
Q_{gd}	Gate-drain charge		155		nC		
R_g	Gate input resistance		1.7		Ω	f=1MHz	
E_{ON}	Turn-on switching energy		4980		μJ	V_{DS}=800V, I_D=75A, V_{GS}=-5 to 18V, $R_{G(ext)}$=10Ω, L=99μH	Fig. 23, 24
E_{OFF}	Turn-off switching energy		1466		μJ		
$t_{d(on)}$	Turn-on delay time		102		ns		
t_r	Rise time		55				
$t_{d(off)}$	Turn-off delay time		136				
t_f	Fall time		43				

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

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
I_S	Maximum continuous diode forward current		125		A	T_J=25°C	
V_{SD}	Diode forward voltage		5.2		V	I_{SD}=37.5A, V_{GS}=-4V	Fig. 10, 11, 12
			4.7		V	I_{SD}=37.5A, V_{GS}=-4V, T_J=175°C	
t_{rr}	Reverse recovery time		35		ns	V_{GS}=-4V, I_{SD}=75A, V_R=800V, di/dt=1400A/us	
Q_{rr}	Reverse recovery charge		498		nC		
I_{RRM}	Peak reverse recovery current		26.5		A		

Typical Performance(curves)

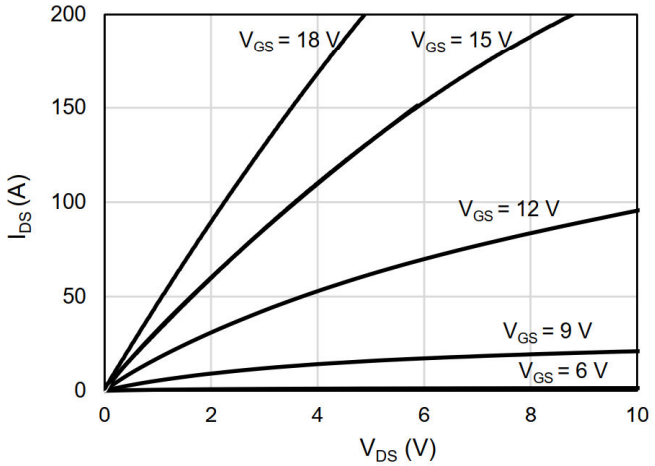


Figure 1: Output Characteristics T_J = -40℃

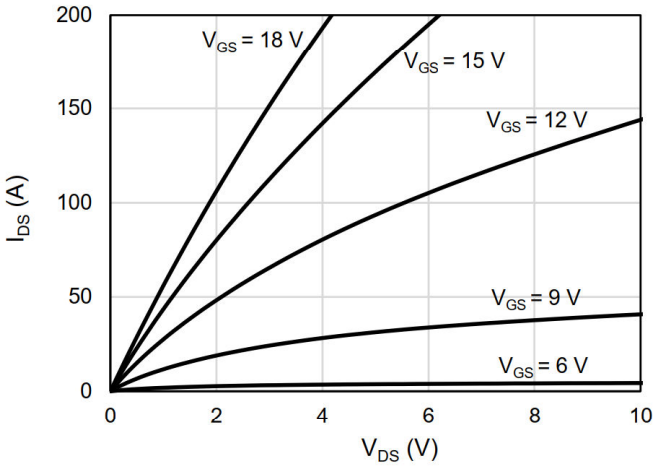


Figure 2: Output Characteristics T_J = 25℃

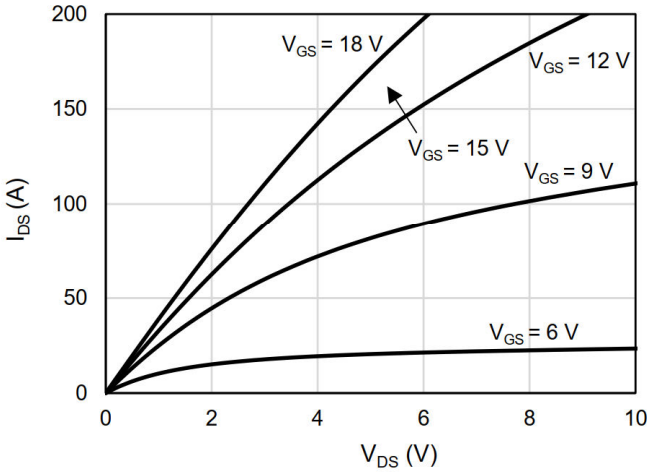


Figure 3: Output Characteristics T_J = 175℃

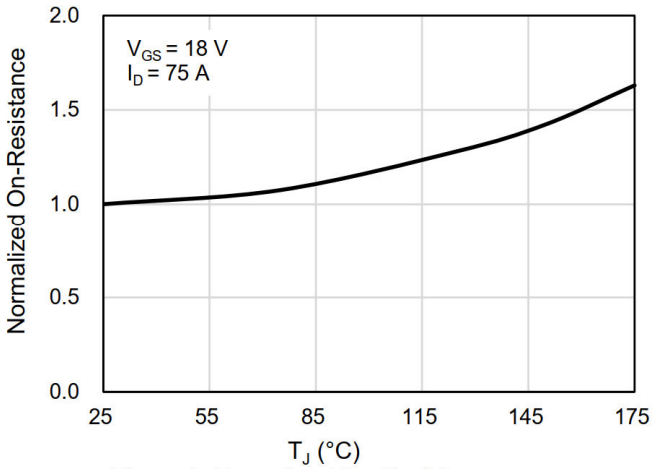


Figure 4: Normalized On-Resistance vs. Temperature

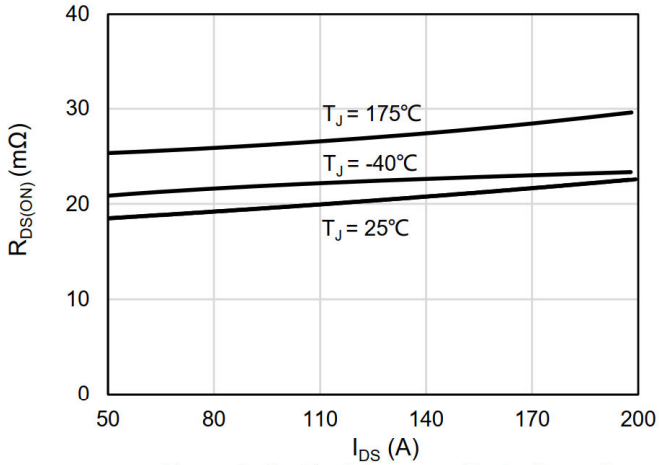


Figure 5: On-Resistance vs. Drain Current For Various Temperatures

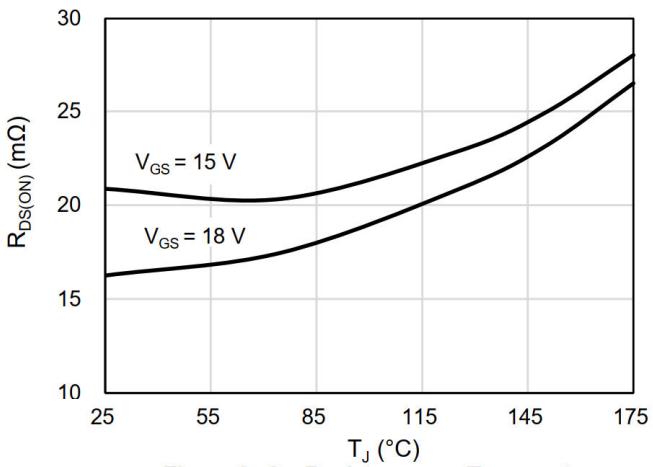


Figure 6: On-Resistance vs. Temperature For Various Gate Voltage

Typical Performance(curves)

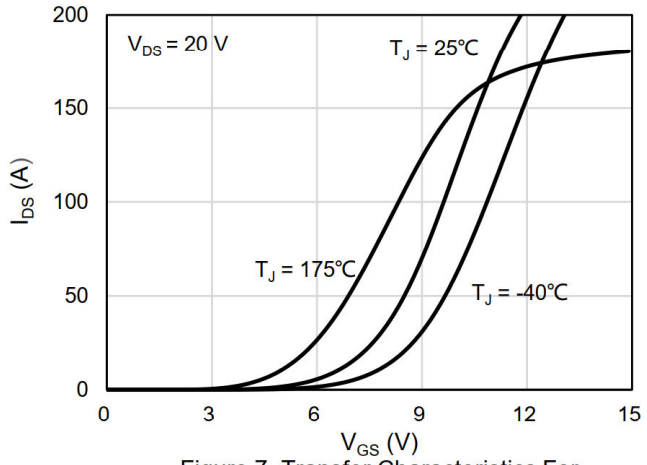


Figure 7: Transfer Characteristics For Various Junction Temparature

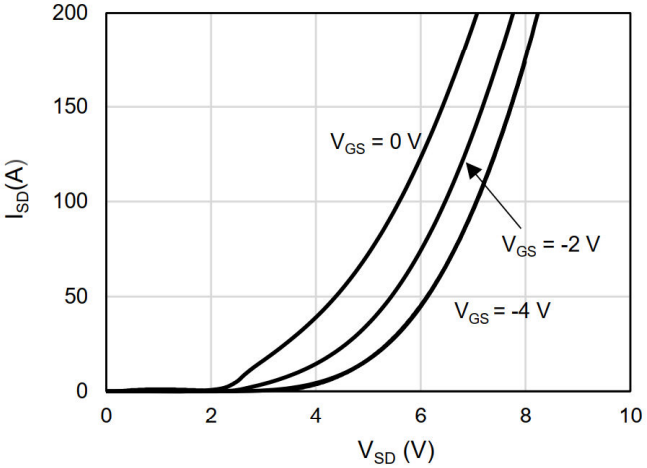


Figure 8: Body Diode Characteristics at -40℃

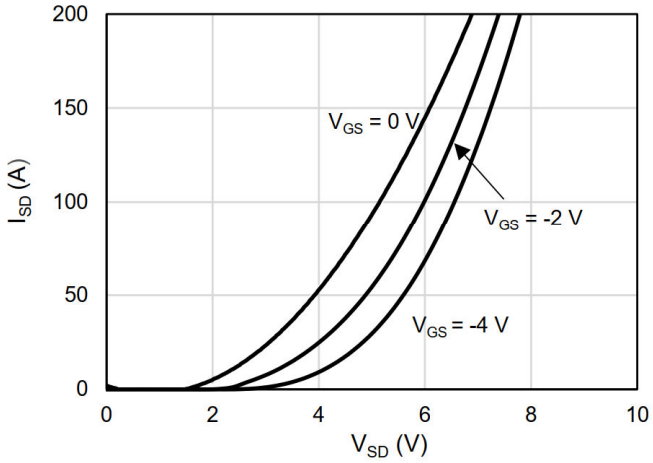


Figure 9: Body Diode Characteristics at 25℃

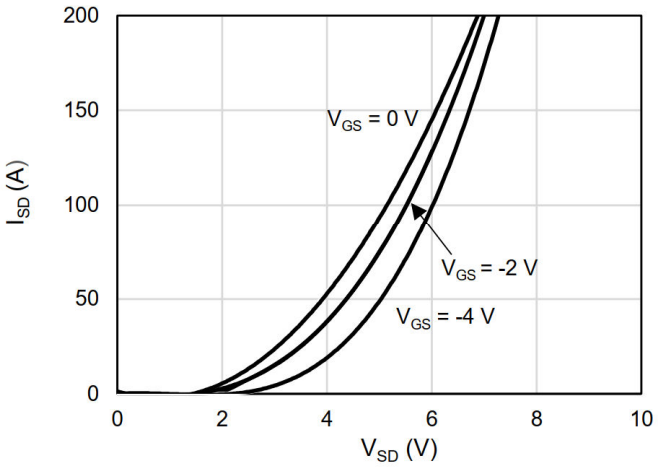


Figure 10: Body Diode Characteristics at 175℃

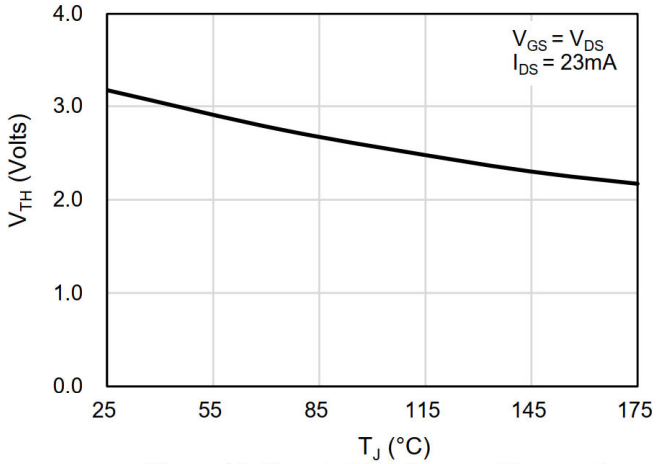


Figure 11: Threshold Voltage vs. Temperature

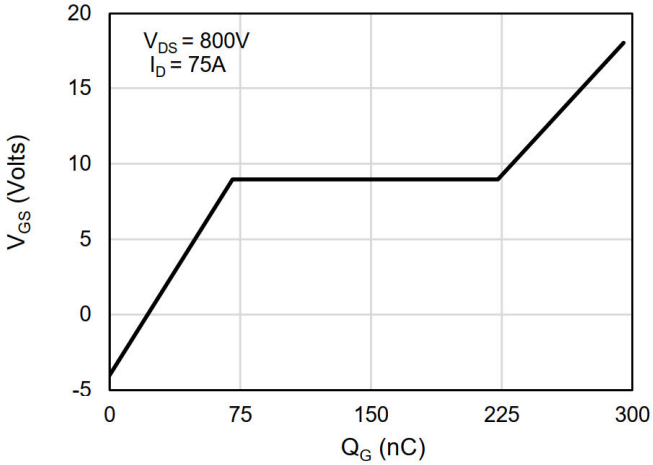


Figure 12: Gate-Charge Characteristics

Typical Performance(curves)

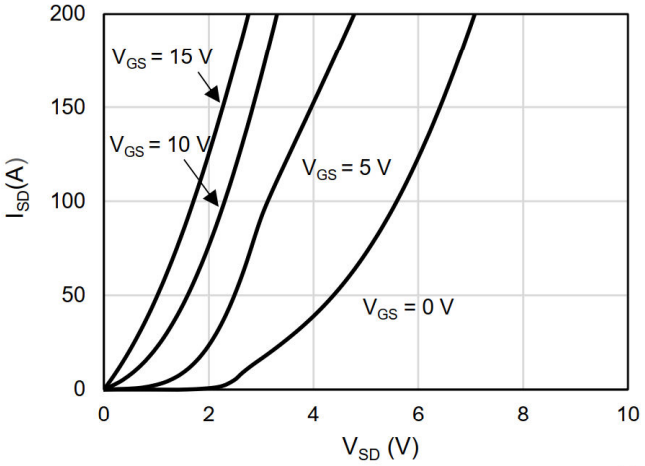


Figure 13: 3rd Quadrant Characteristics at -40℃

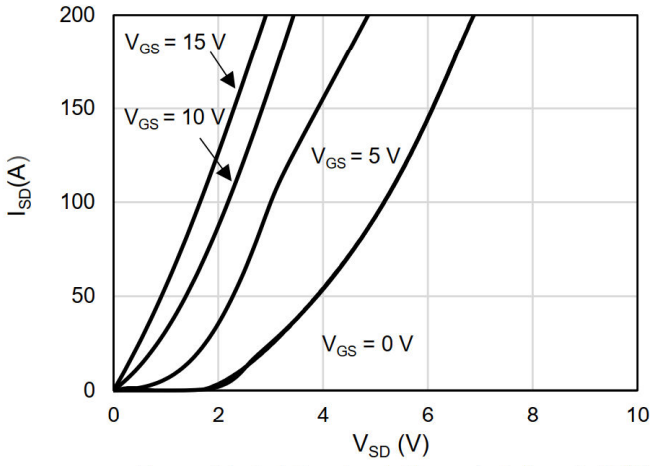


Figure 14: 3rd Quadrant Characteristics at 25℃

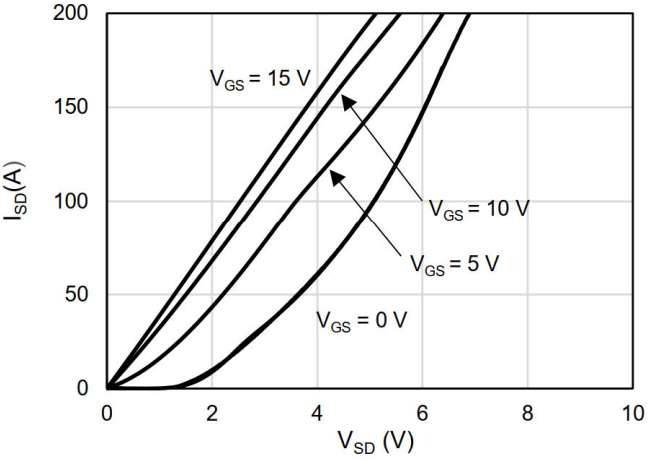


Figure 15: 3rd Quadrant Characteristics at 175℃

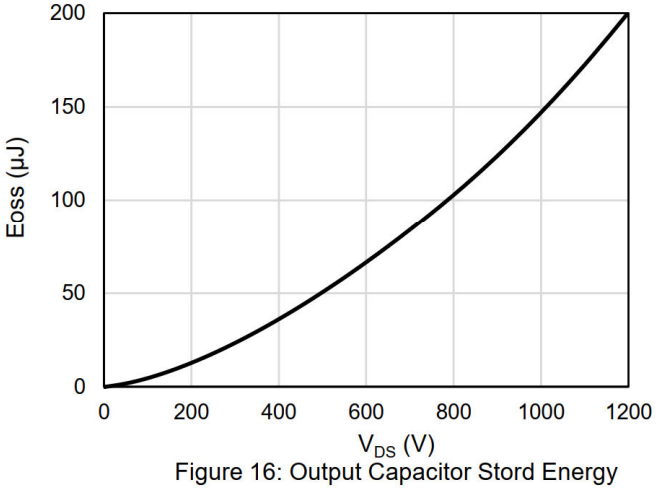


Figure 16: Output Capacitor Stord Energy

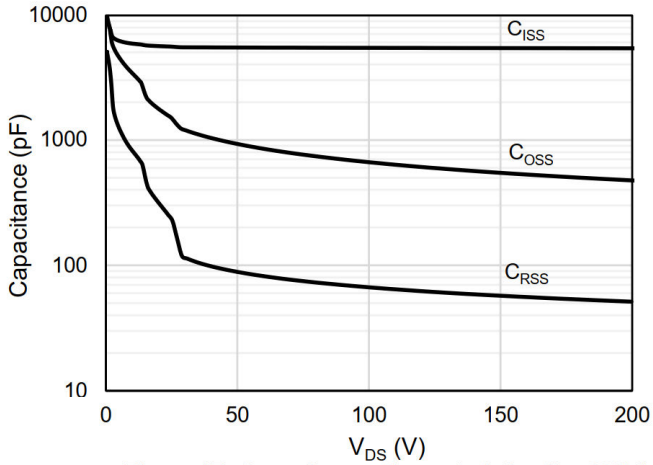


Figure 17: Capacitance Characteristics (0 - 200V)

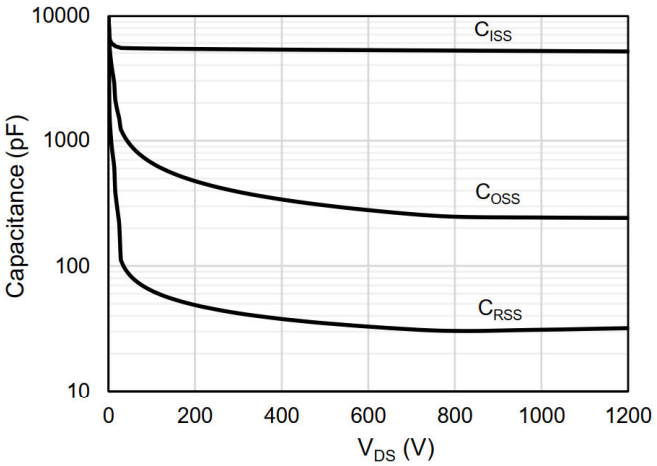


Figure 18: Capacitance Characteristics (0-1200V)

Typical Performance(curves)

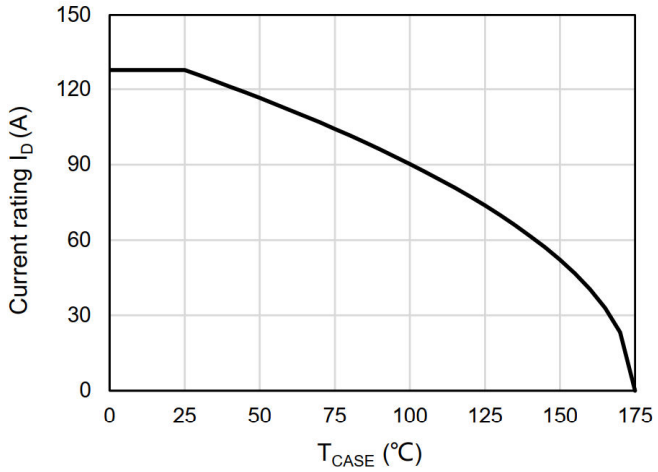


Figure 19: Current De-rating

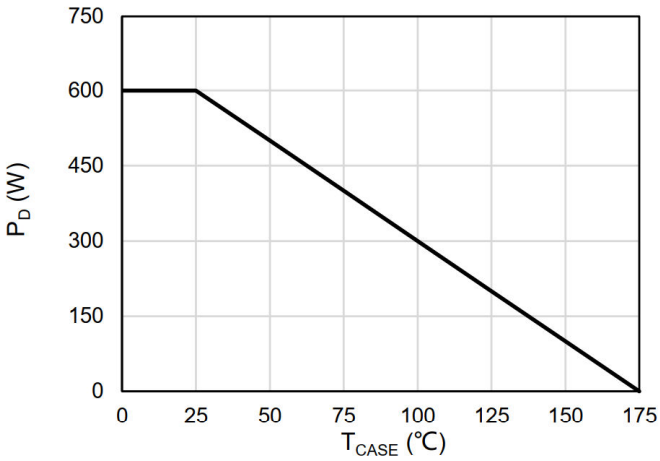


Figure 20: Maximum Power Disspation Derating vs CaseTemperature

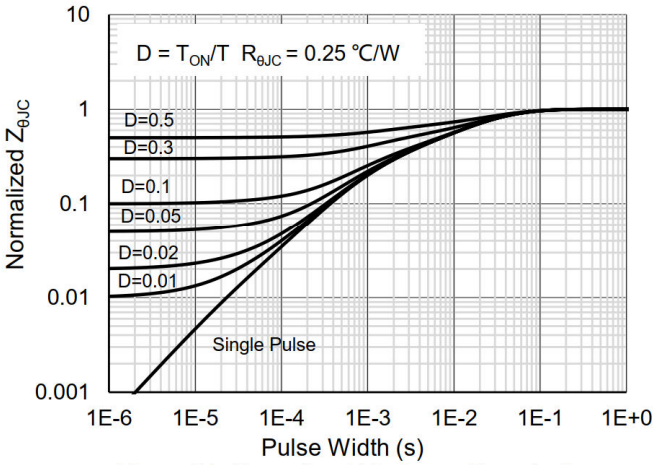


Figure 21: Normalized Maximum Transient Thermal Impedance

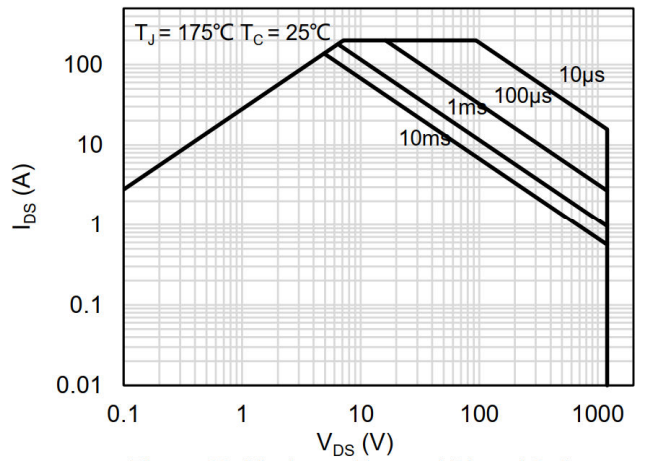


Figure 22: Maximum Forward Biased Safe Operating Area

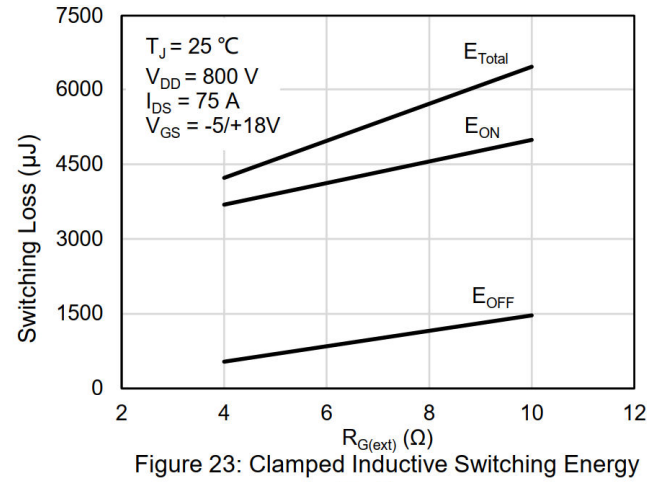


Figure 23: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

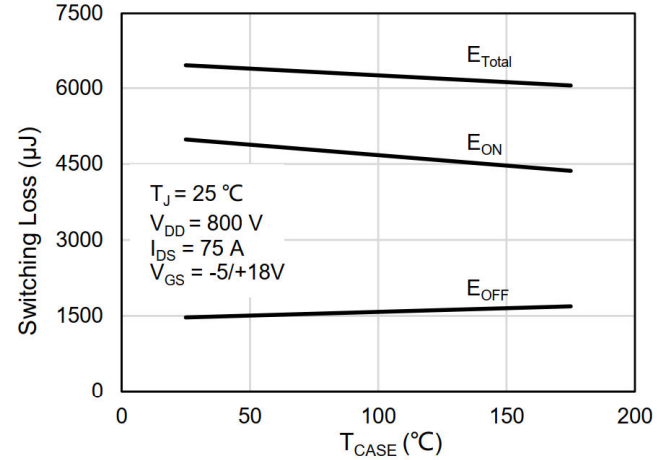
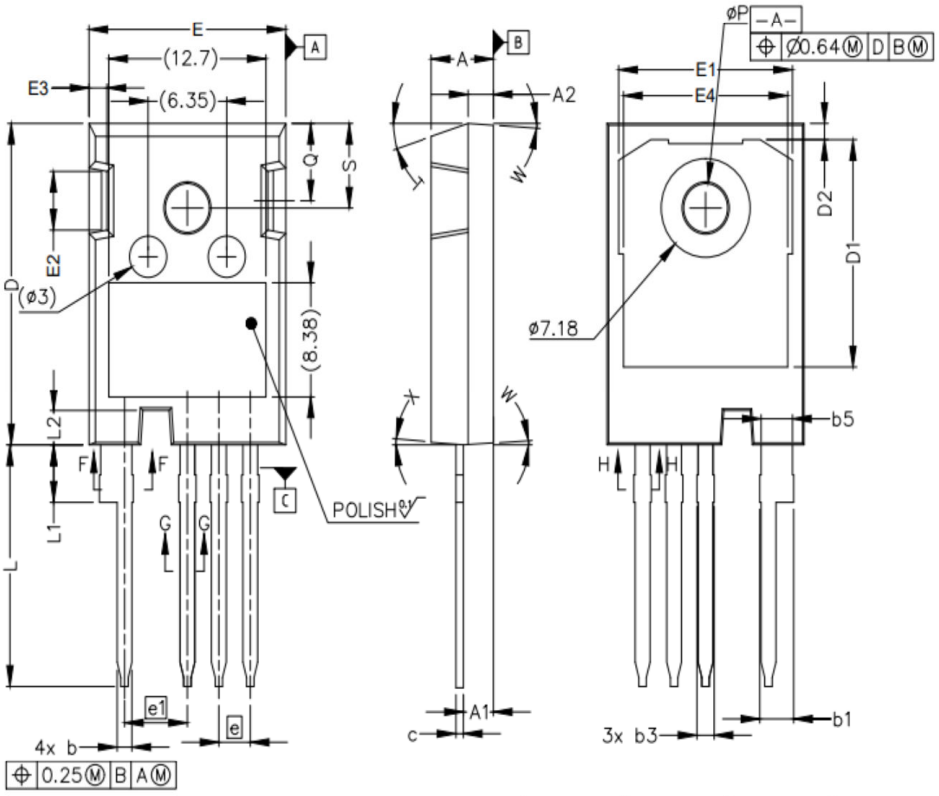
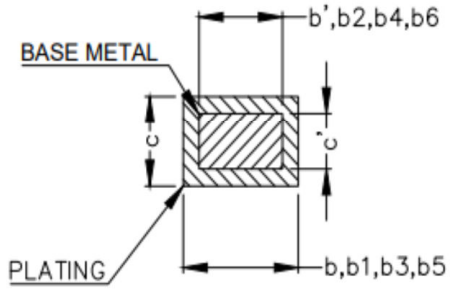


Figure 24: Clamped Inductive Switching Energy vs. Temperature

Package Dimensions

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.	

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