1700V N-Channel Silicon Carbide Power MOSFET

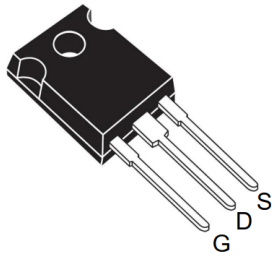
Features:

- Low on-resistance
- Fast switching speed with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{RR})
- Halogen-free，RoHS compliant

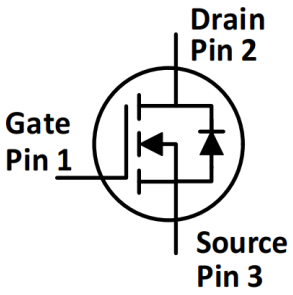
Applications:

- Motor drives
- DC/DC converters
- Switched mode power supplies
- Solar inverters

Package:



Top View



Part Number	Package
DTN055N170SC3	TO247-3

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

Symbol	Parameter	Value	Unit	Test Conditions
V_{DS}	Drain-Source voltage	1700	V	V_{GS}=0V, I_D=100μA
V_{GS}	Gate-Source voltage	-10 to 22	V	Recommended maximum
I_D	Drain current (continuous)	5.5	A	T_C=25°C
		4	A	T_C=100°C
I_{DM}	Drain current (pulsed)	11	A	Pulse width limited by SOA
P_{TOT}	Total power dissipation	100	W	T_C=25°C
T_{stg}	Storage temperature range	-55 to 175	°C	
T_J	Operating junction temperature	-55 to 175	°C	
T_L	Solder Temperature	260	°C	

Thermal Data

Symbol	Parameter	Value	Unit
$R_{\theta(J-C)}$	Thermal Resistance from Junction to Case	1.5	°C/W

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

Symbol	Parameter	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
I_{DSS}	Zero gate voltage drain current		5	50	μA	V_{DS}=1700V, V_{GS}=0V
I_{GSS}	Gate leakage current		1	±100	nA	V_{DS}=0V, V_{GS}=-10~22V
V_{TH}	Gate threshold voltage		3.2		V	V_{GS}=V_{DS}, I_D=0.7mA
			2			V_{GS}=V_{DS}, I_D=0.7mA @ T_C=175°C
R_{ON}	Static drain-source on-resistance		1000	1500	mΩ	V_{GS}=18V, I_D=2A @T_J=25°C
			2100		mΩ	V_{GS}=18V, I_D=2A @T_J=175°C
C_{iss}	Input capacitance		184		pF	V_{DS}=1000V, V_{GS}=0V, f=100kHz, V_{AC}=25mV
C_{oss}	Output capacitance		12		pF	
C_{rss}	Reverse transfer capacitance		3		pF	
E_{oss}	C_{oss} stored energy		7		μJ	
Q_g	Total gate charge		16.5		nC	V_{DS}=1200V, I_D=1A, V_{GS}=-6 to 18V
Q_{gs}	Gate-source charge		2.5		nC	
Q_{gd}	Gate-drain charge		12		nC	
R_g	Gate input resistance		8.7		Ω	f=1MHz
E_{ON}	Turn-on switching energy		45		μJ	V_{DS}=1200V, I_D=2A, V_{GS}=-6 to 18V, $R_{G(ext)}$=2.5Ω, L=1000μH
E_{OFF}	Turn-off switching energy		21		μJ	
$t_{d(on)}$	Turn-on delay time		5		ns	
t_r	Rise time		8			
$t_{d(off)}$	Turn-off delay time		6			
t_f	Fall time		41			

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

Symbol	Parameter	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
V_{SD}	Diode forward voltage		3.8		V	I_{SD}=1A, V_{GS}=-4V
			3.5		V	I_{SD}=1A, V_{GS}=-4V, T_J=175°C
t_{rr}	Reverse recovery time		15		ns	V_{GS}=-4V, I_{SD}=2 A, V_R=1200V, di/dt=2350A/us, T_J=175°C
Q_{rr}	Reverse recovery charge		68		nC	
I_{RRM}	Peak reverse recovery current		5		A	

Typical Performance (curves)

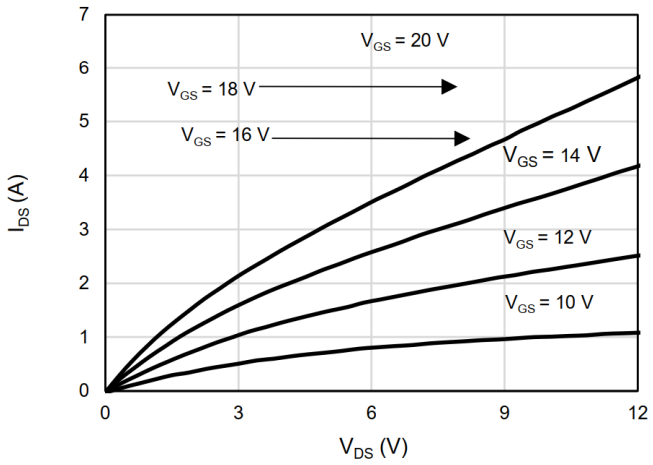


Figure 1: Output Characteristics T_J = -40°C

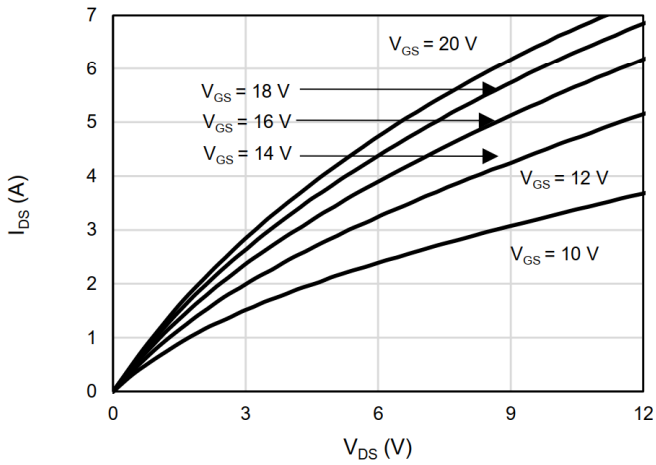


Figure 2: Output Characteristics T_J = 25°C

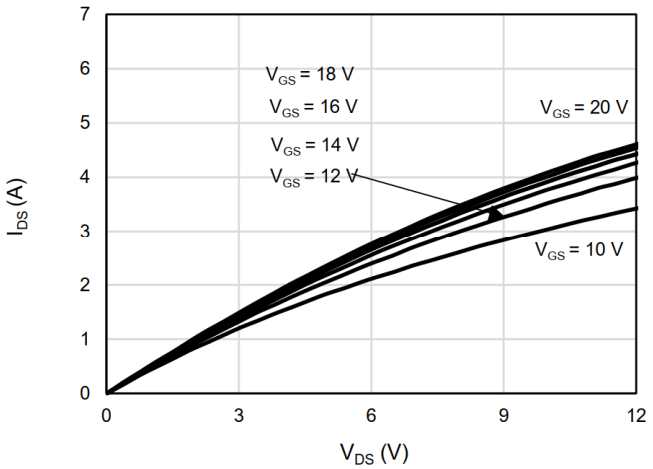


Figure 3: Output Characteristics T_J = 175°C

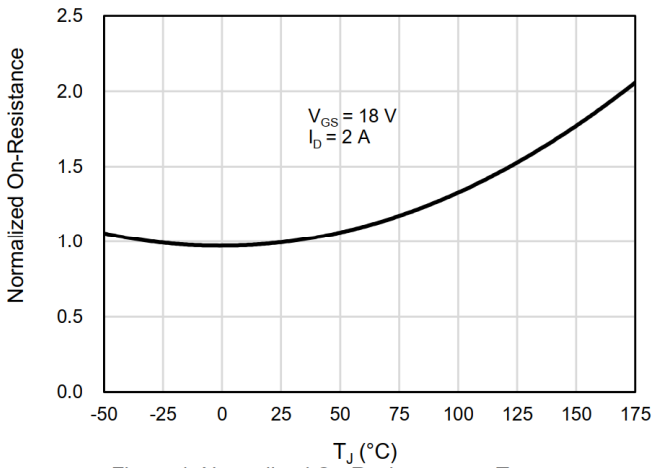


Figure 4: Normalized On-Resistance vs. Temperature

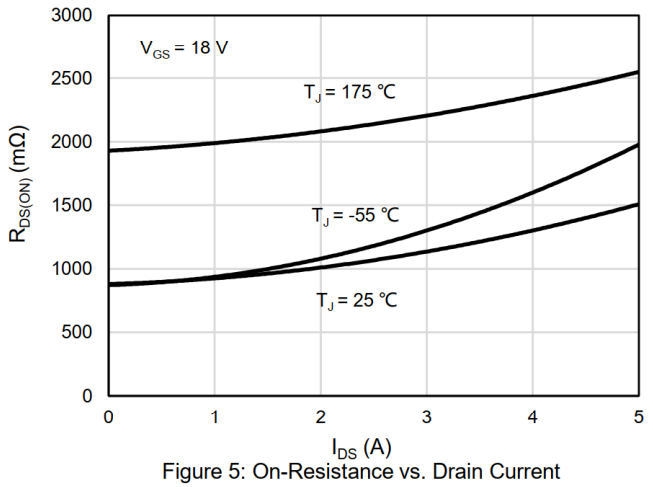


Figure 5: On-Resistance vs. Drain Current
For Various Temperatures

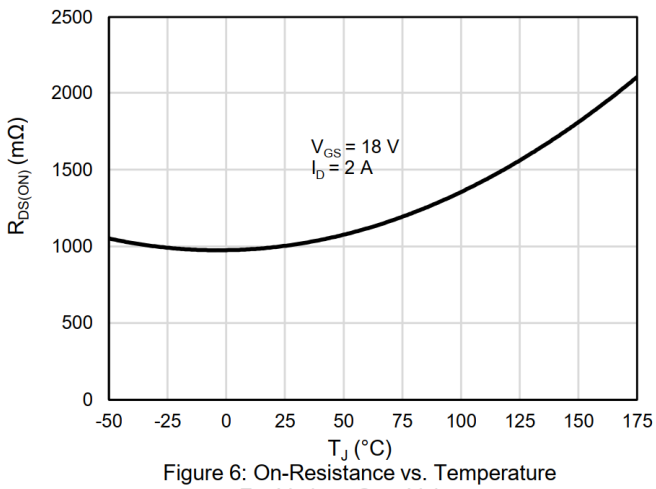


Figure 6: On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance (curves)

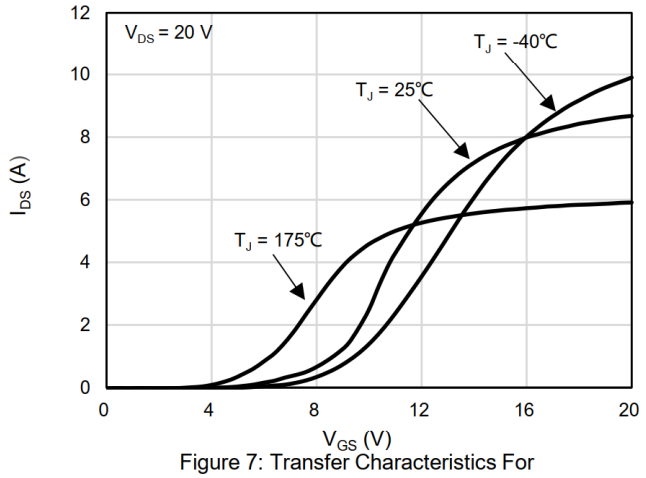


Figure 7: Transfer Characteristics For Various Junction Temparature

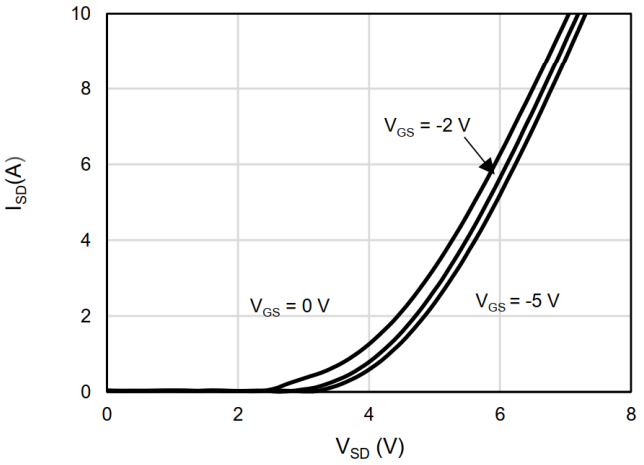


Figure 8: Body Diode Characteristics at -55℃

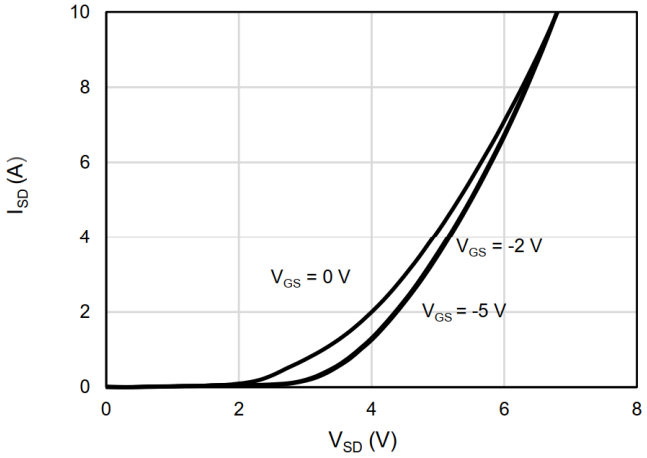


Figure 9: Body Diode Characteristics at 25℃

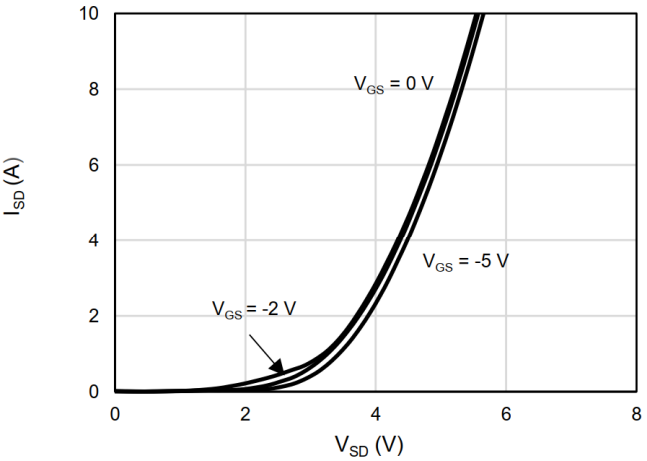


Figure 10: Body Diode Characteristics at 175℃

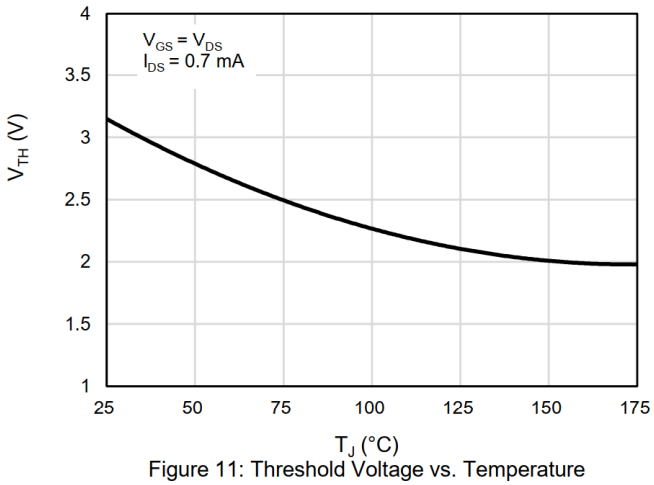


Figure 11: Threshold Voltage vs. Temperature

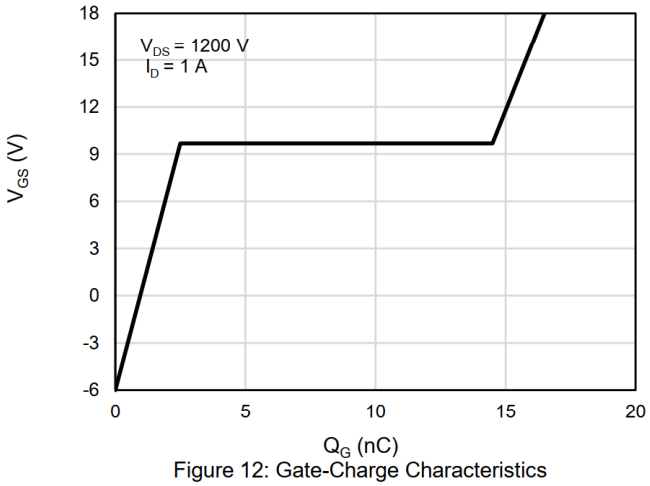


Figure 12: Gate-Charge Characteristics

Typical Performance (curves)

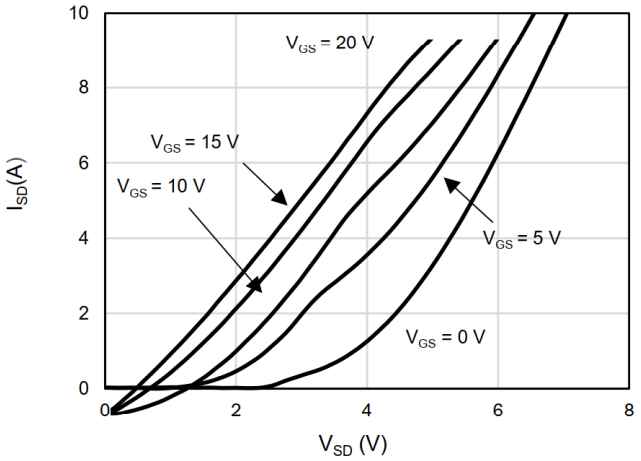


Figure 13: 3rd Quadrant Characteristics at -55℃

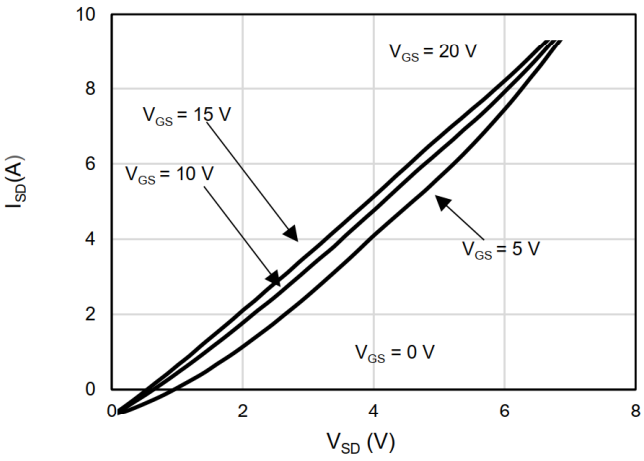


Figure 14: 3rd Quadrant Characteristics at 25℃

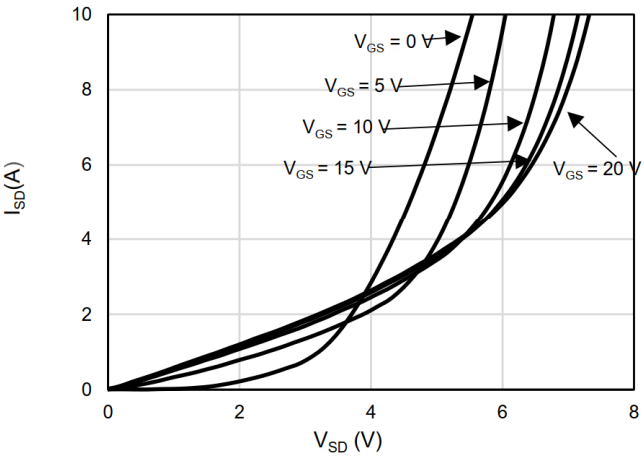


Figure 15: 3rd Quadrant Characteristics at 175℃

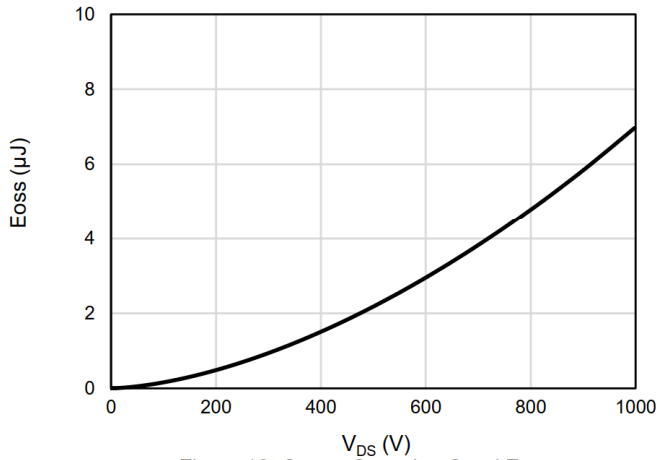


Figure 16: Output Capacitor Stord Energy

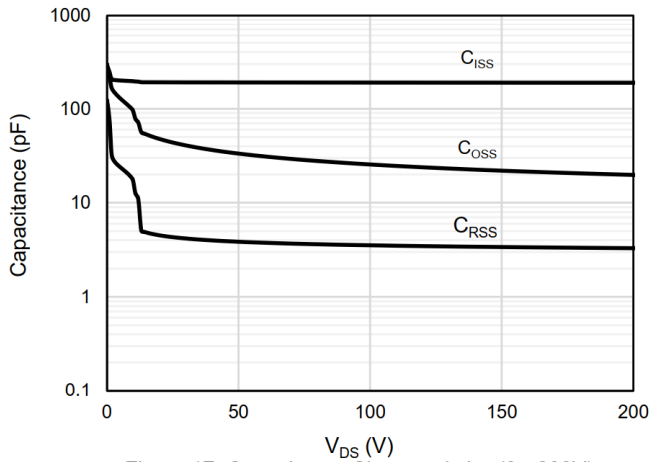


Figure 17: Capacitance Characteristics (0 - 200V)

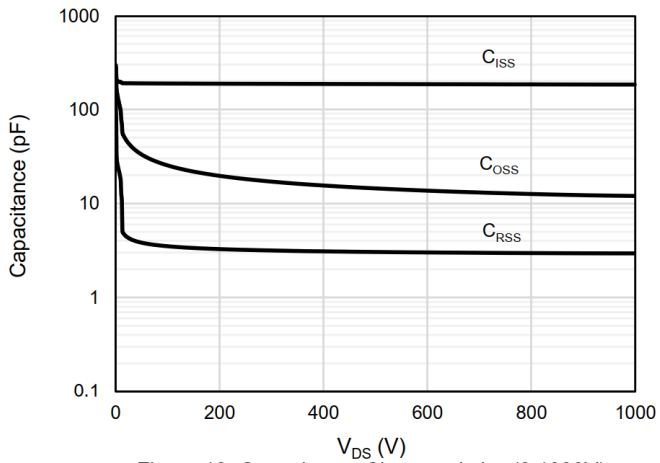


Figure 18: Capacitance Characteristics (0-1000V)

Typical Performance (curves)

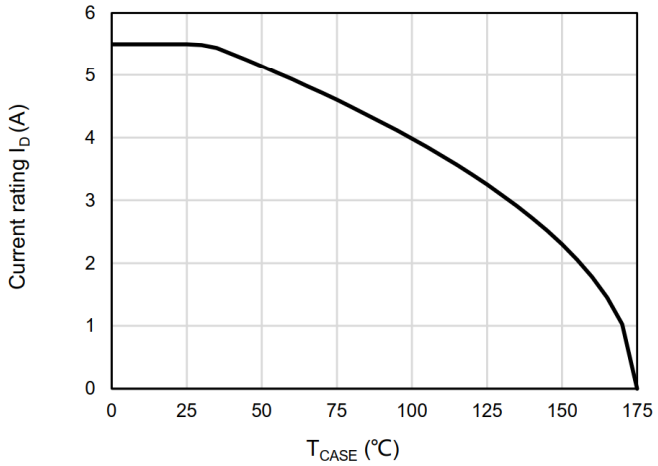


Figure 19: Current De-rating

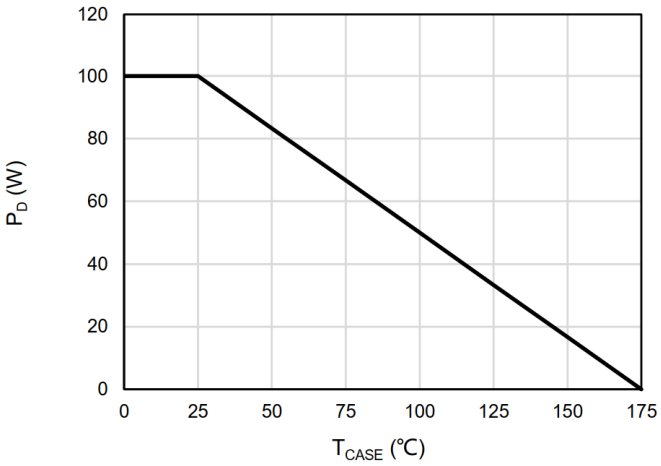


Figure 20: Maximum Power Disspation Derating vs CaseTemperature

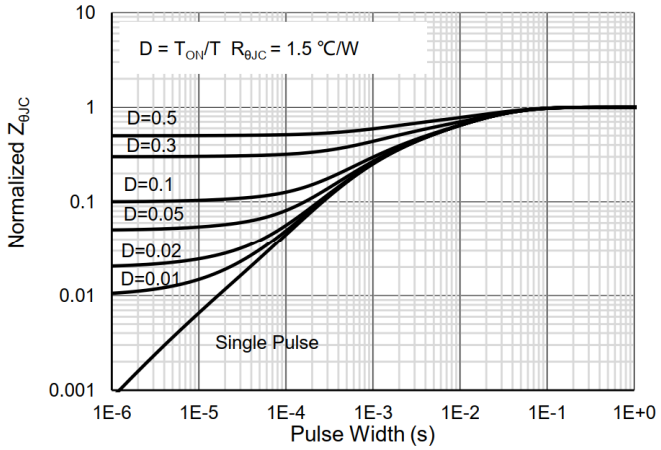


Figure 21: Normalized Maximum Transient Thermal Impedance

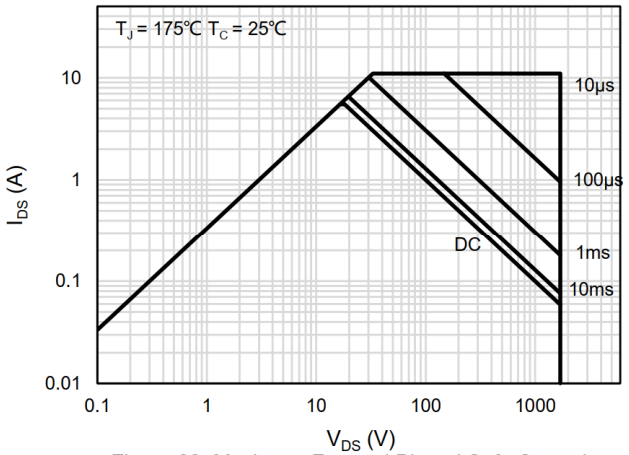


Figure 22: Maximum Forward Biased Safe Operating Area

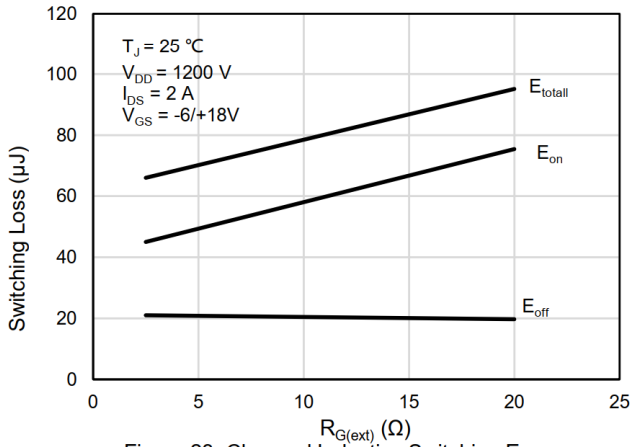


Figure 23: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

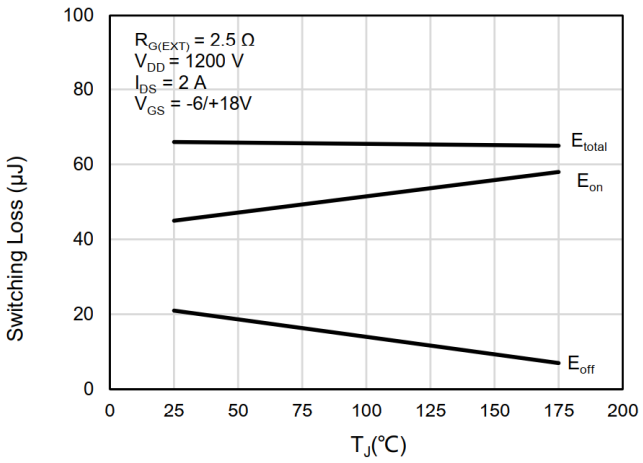


Figure 24: Clamped Inductive Switching Energy vs. T_J

Typical Performance (curves)

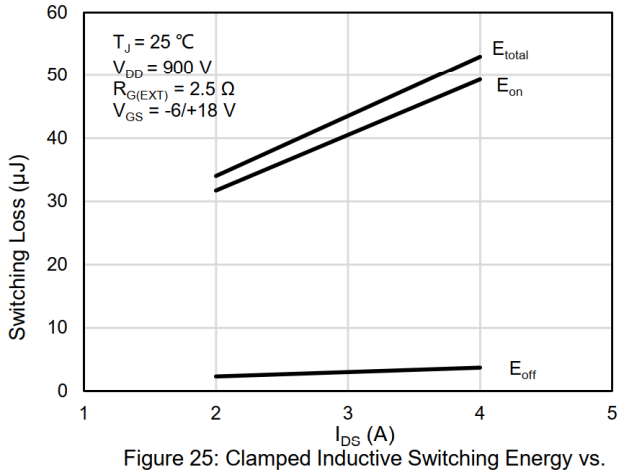


Figure 25: Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600 V)

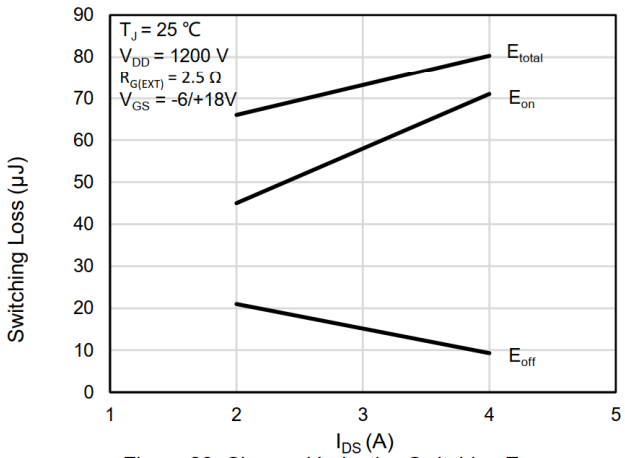


Figure 26: Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 1200 V)

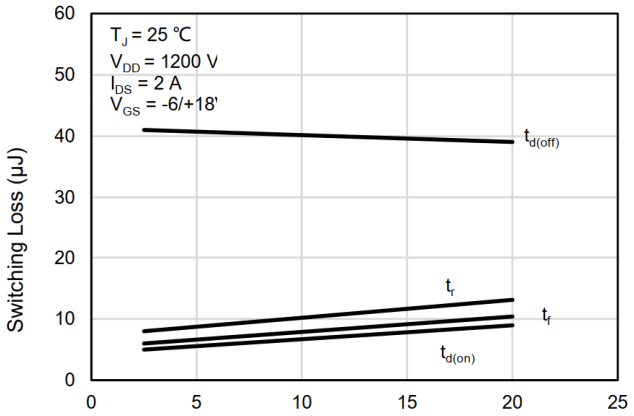
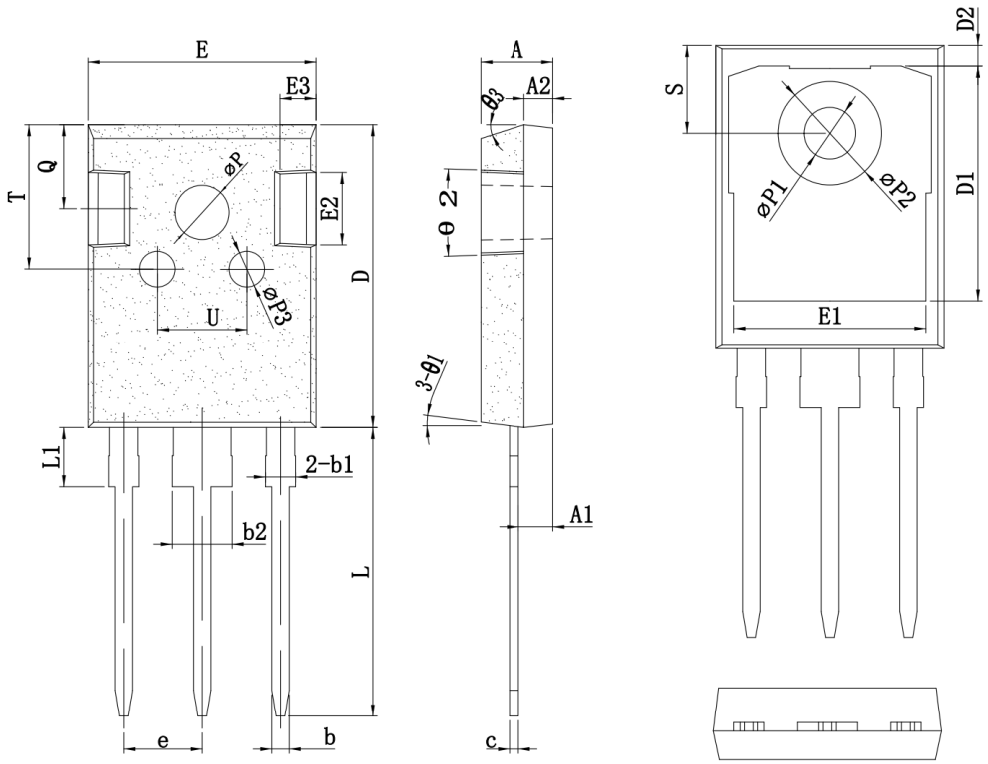


Figure 27: Switching Time vs. $R_{G(ext)}$

TO-247_3L PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	4.60	5.00	5.40	e	2.10	5.44	5.70
A1	2.10	2.41	2.70	L	19.00	19.98	21.00
A2	1.70	2.00	2.30	L1	-	-	4.50
b	1.00	1.20	1.40	ΦP	3.30	3.70	4.00
b1	1.80	2.10	2.40	ΦP1	3.25	3.55	3.85
b2	2.80	3.10	3.40	ΦP2	6.80	7.18	7.60
C	0.45	0.60	0.75	ΦP3	2.30	2.50	3.30
D	19.00	21.00	23.00	Q	5.50	5.80	6.30
D1	16.00	16.55	17.00	S	5.60	6.15	6.30
D2	0.95	1.20	1.45	T	9.50	10.00	10.50
E	15.70	15.80	16.50	U	6.00	-	8.00
E1	12.80	13.25	13.70	θ1	5°	7°	9°
E2	4.20	5.00	5.30	θ2	1°	3°	5°
E3	2.20	2.50	2.80	θ3	13°	15°	17°

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