1200V N-Channel Silicon Carbide Power MOSFET

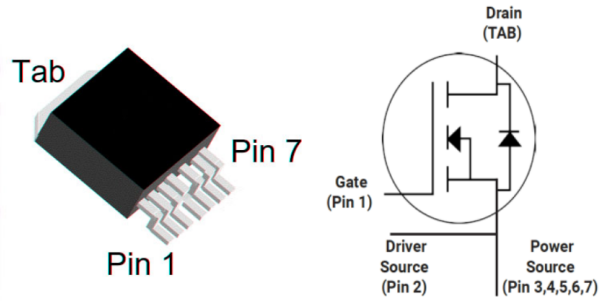
Features:

- High blocking voltage with low $R_{DS(ON)}$
- Fast switching speed with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{RR})
- Halogen-free，RoHS compliant (Note 1)

Applications:

- PFC
- EV battery charges
- High voltage DC/DC converters
- Booster converters
- Solar inverters

Package:



Part Number	Package
DTK30N120SC7	TO-263-7L

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

Symbol	Parameter	Value	Unit	Test Conditions
V_{DS}	Drain-Source voltage	1200	V	V_{GS}= 0V, I_D=100μA
V_{GS}	Gate-Source voltage	-6 to 18	V	static
V_{GS}	Gate-Source voltage	-10 to 22	V	dynamic
I_D	Drain current (continuous)	30	A	T_C=25°C
		22	A	T_C=100°C
I_{DM}	Drain current (pulsed)	80	A	
P_{TOT}	Total power dissipation	150	W	T_C=25°C
T_{stg}	Storage temperature range	-55 to 175	°C	
T_J	Operating junction temperature	-55 to 175	°C	

Thermal Data

Symbol	Parameter	Value	Unit
$R_{\theta(J-C)}$	Thermal Resistance from Junction to Case	1.0	°C/W
$R_{\theta(J-A)}$	Thermal Resistance from Junction to Case	40	°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}=1200V, V_{GS}=0V
I_{GSS}	Gate leakage current		1	±100	nA	V_{DS}=0V, V_{GS}=-6~18V
V_{TH}	Gate threshold voltage		3.2	4.5	V	V_{GS}=V_{DS}, I_D=5mA
			2.2		V	V_{GS}=V_{DS}, I_D=5mA @ T_C=175°C
R_{ON}	Static drain-source on-resistance		80	95	mΩ	V_{GS}=18V, I_D=20A @T_J=25°C
			128		mΩ	V_{GS}=18V, I_D=20A @T_J=175°C
C_{iss}	Input capacitance		1295		pF	V_{DS}=800V, V_{GS}=0V, f=100kHz, V_{AC}=25mV
C_{oss}	Output capacitance		65		pF	
C_{rss}	Reverse transfer capacitance		8		pF	
E_{oss}	C_{oss} stored energy		26		μJ	
Q_g	Total gate charge		67		nC	V_{DS}=800V, I_D=20A, V_{GS}=-5 to 18V
Q_{gs}	Gate-source charge		15		nC	
Q_{gd}	Gate-drain charge		46		nC	
R_g	Gate input resistance		5.4		Ω	f=1MHz, V_{AC}=25mV
G_{FS}	Forward Transconductance		11		S	V_{DS} = 20 V, I_D = 20 A
			9.5		S	V_{DS} = 20 V, I_D = 20 A, T_J = 175 °C

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

Switching Characteristics						
Symbol	**Parameter**	**Test Conditions**	**Min**	**Typ**	**Max**	**Units**
$T_{D(ON)}$	Turn On Delay Time	V_{DD} = 800 V , I_D = 20 A, V_{GS} = -5/+18 V, $R_{G,EXT}$ = 5 Ω L = 99 µH Diode：Body Diode at V_{GS} = -5V T_J = 25 °C		3		ns
T_R	Rise Time			5		ns
$T_{D(OFF)}$	Turn Off Delay Time			22		ns
T_F	Fall Time			17		ns
E_{ON}	Turn On Energy			464		µJ
E_{OFF}	Turn Off Energy			37		µJ
$T_{D(ON)}$	Turn On Delay Time	V_{DD} = 800 V , I_D = 20 A, V_{GS} = -5/+18 V, $R_{G,EXT}$ = 5 Ω L = 99 µH Diode：Body Diode at V_{GS} = -5V T_J = 175 °C		3		ns
T_R	Rise Time			6		ns
$T_{D(OFF)}$	Turn Off Delay Time			24		ns
T_F	Fall Time			15		ns
E_{ON}	Turn On Energy			423		µJ
E_{OFF}	Turn Off Energy			35		µJ
Drain-Source Diode Characteristics (T_J = 25 °C unless otherwise noted)						
I_S	Maximum Continuous Drain-Source Diode Forward Current				30	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current				80	A
V_{SD}	Diode Forward Voltage	V_{GS} = -4 V , I_{SD} = 20 A		5		V
		V_{GS} = -4 V , I_{SD} = 20 A, T_J = 175 °C		3.4		V
I_{RM}	Peak Reverse Recovery Current	V_{GS} = -4 V , I_{SD} = 20 A, V_R = 800 V, di/dt = 460 A/µS		3.1		A
T_{RR}	Reverse Recovery Time			21		ns
Q_{RR}	Reverse Recovery Charge			32		nC

Typical Performance (curves)

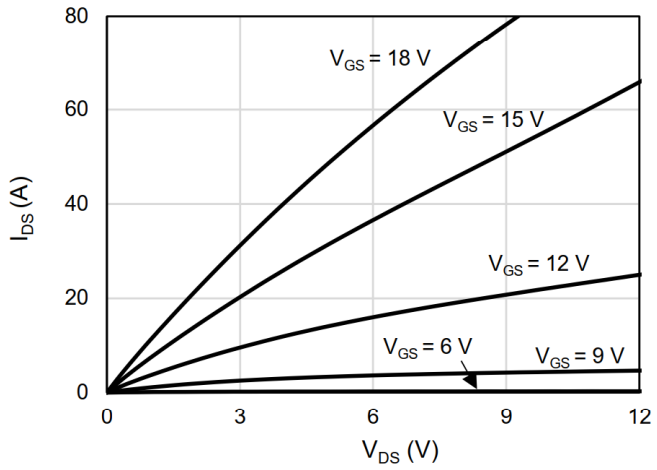


Figure 1: Output Characteristics T_J = -40℃

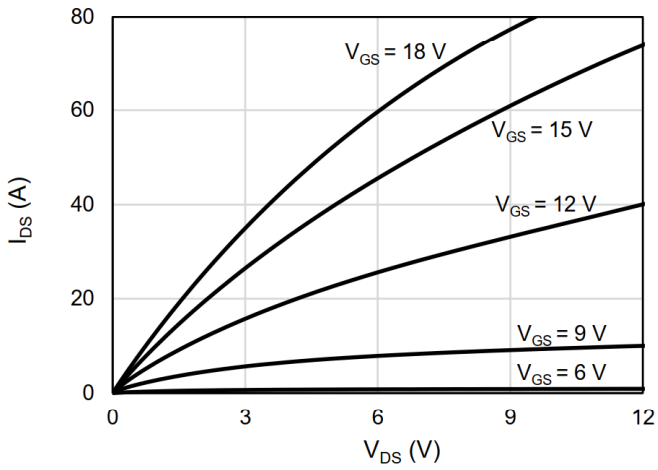


Figure 2: Output Characteristics T_J = 25℃

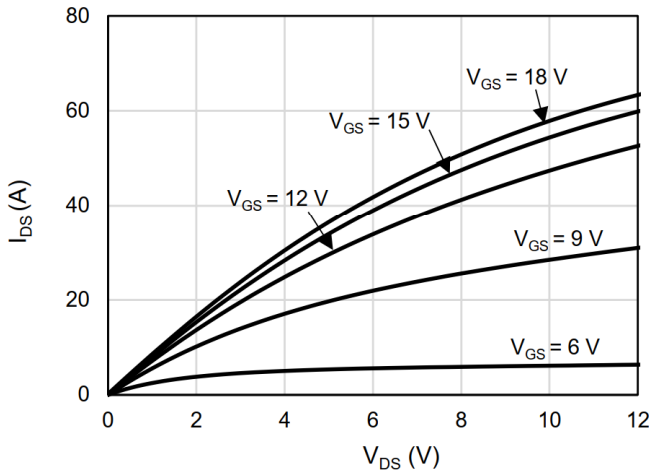


Figure 3: Output Characteristics T_J = 175℃

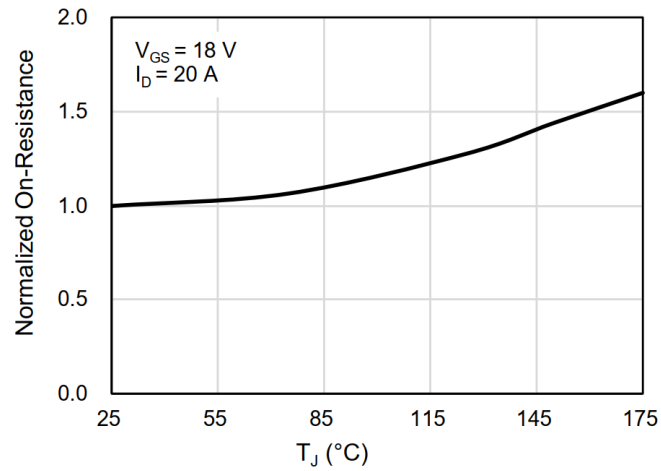


Figure 4: Normalized On-Resistance vs. Temperature

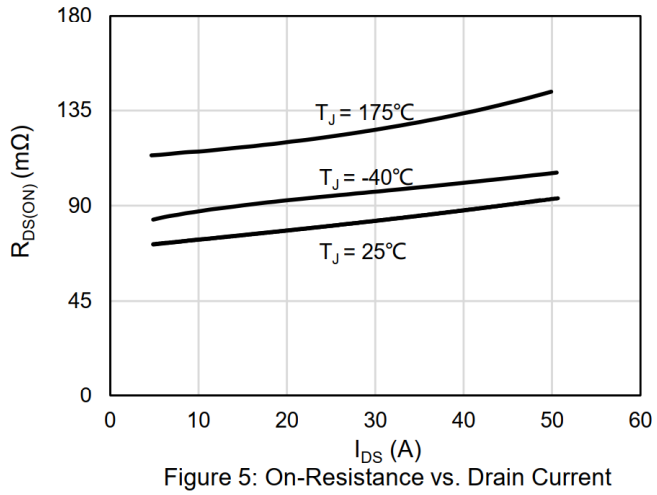


Figure 5: On-Resistance vs. Drain Current For Various Temperatures

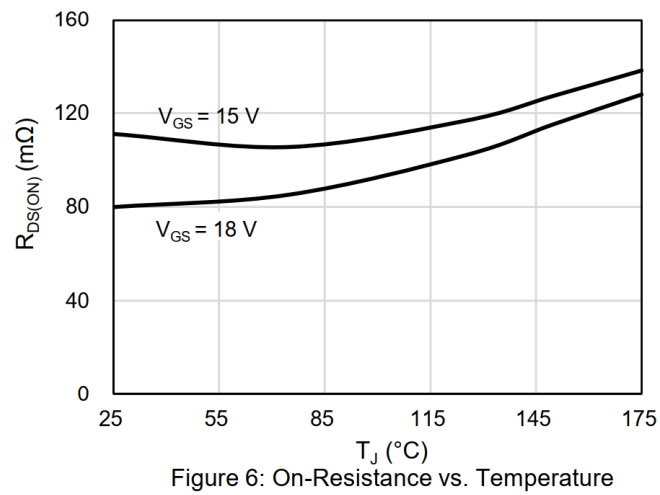


Figure 6: On-Resistance vs. Temperature For Various Gate Voltage

Typical Performance (curves)

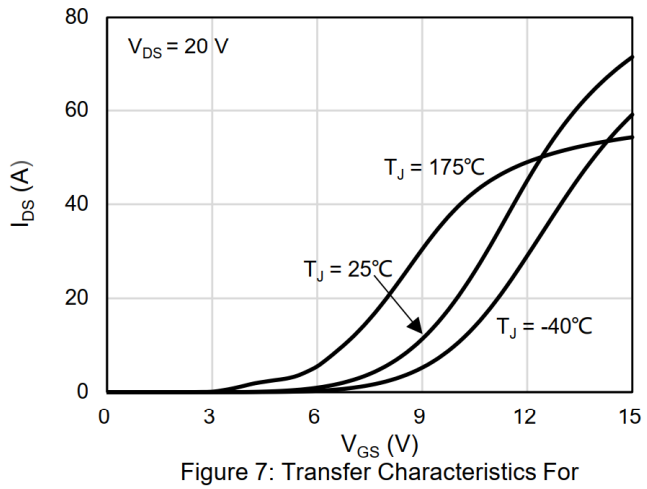


Figure 7: Transfer Characteristics For Various Junction Temparature

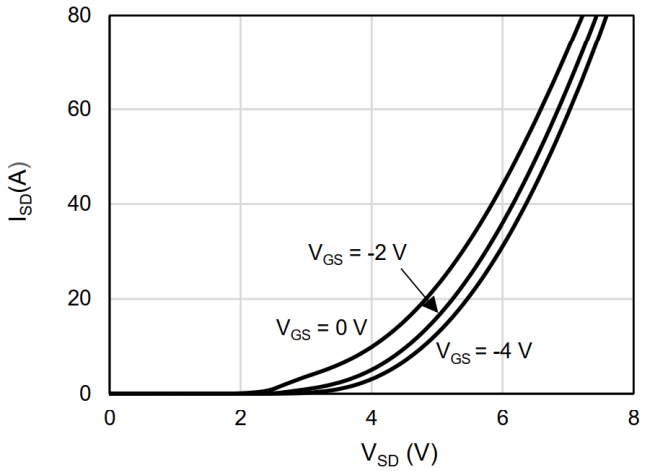


Figure 8: Body Diode Characteristics at -40°C

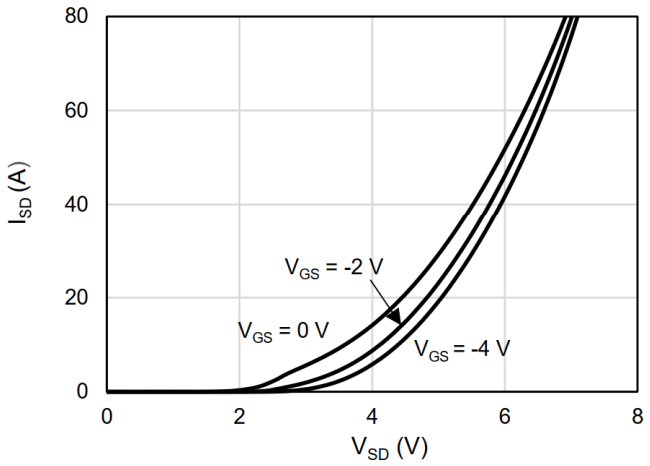


Figure 9: Body Diode Characteristics at 25°C

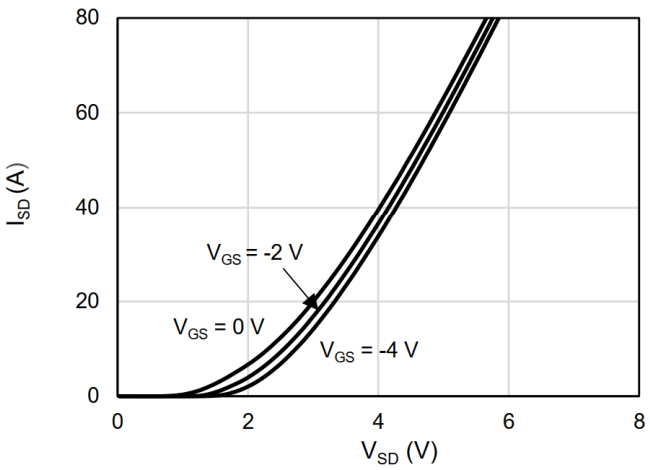


Figure 10: Body Diode Characteristics at 175°C

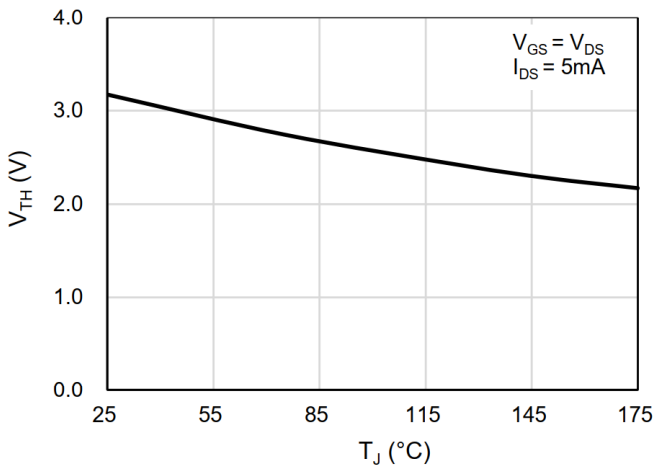


Figure 11: Threshold Voltage vs. Temperature

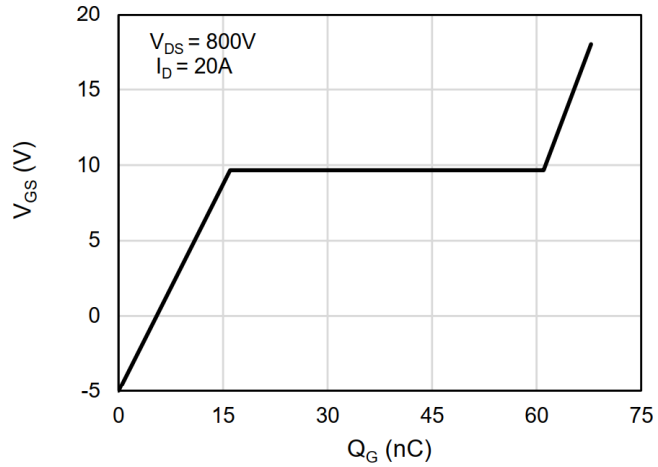


Figure 12: Gate-Charge Characteristics

Typical Performance (curves)

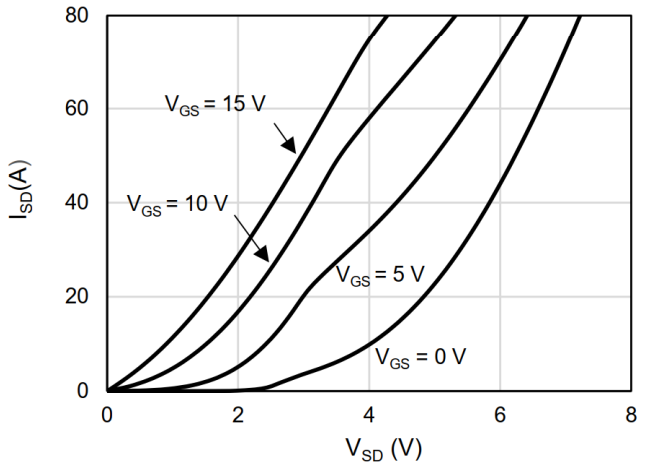


Figure 13: 3rd Quadrant Characteristics at -40℃

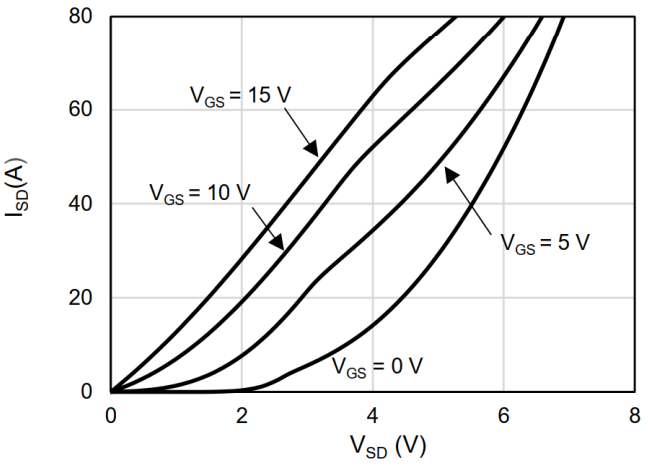


Figure 14: 3rd Quadrant Characteristics at 25℃

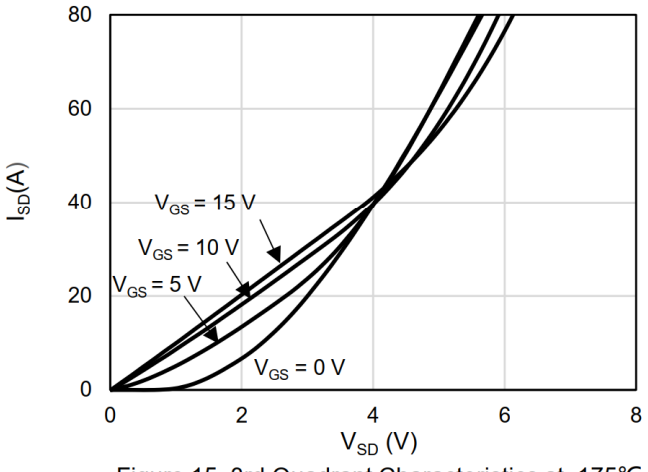


Figure 15: 3rd Quadrant Characteristics at 175℃

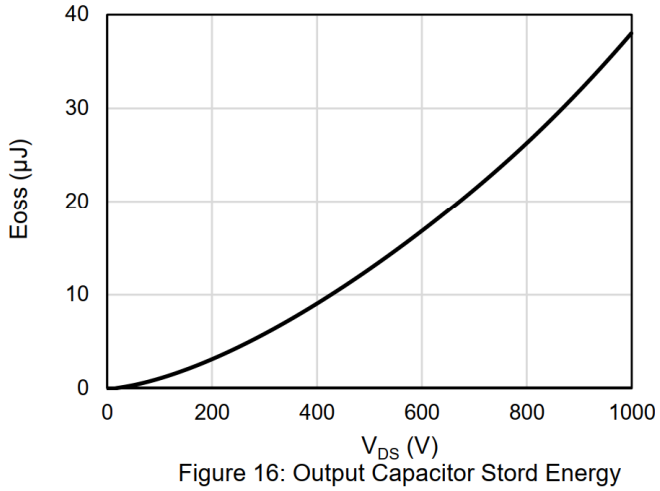


Figure 16: Output Capacitor Stord Energy

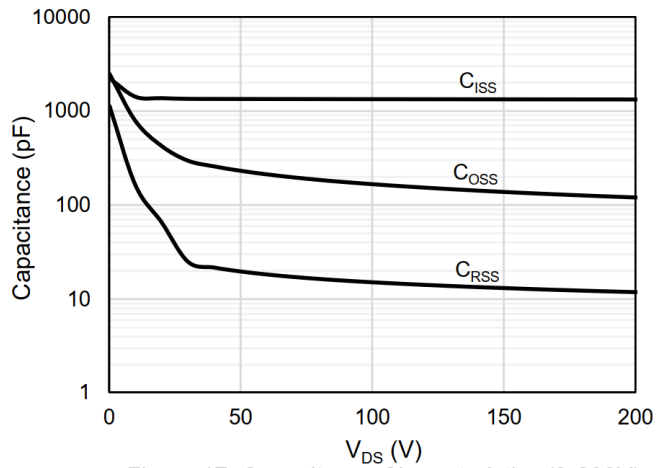


Figure 17: Capacitance Characteristics (0-200V)

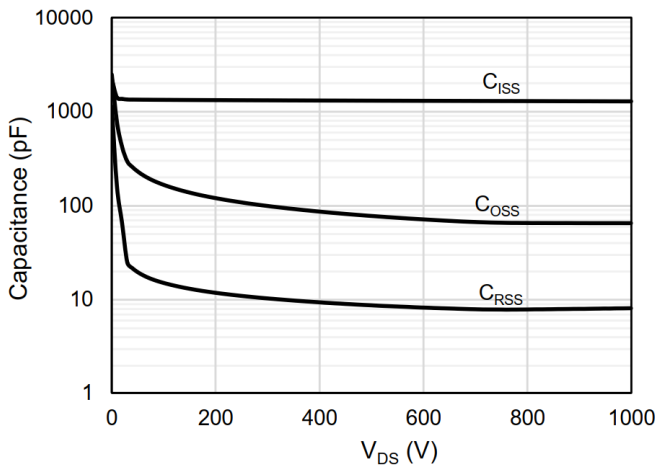


Figure 18: Capacitance Characteristics (0-1200V)

Typical Performance (curves)

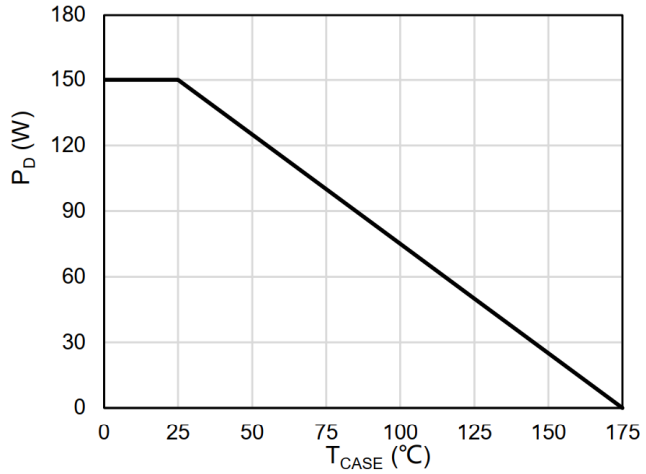


Figure 19: Maximum Power Disspation Derating vs CaseTemperature

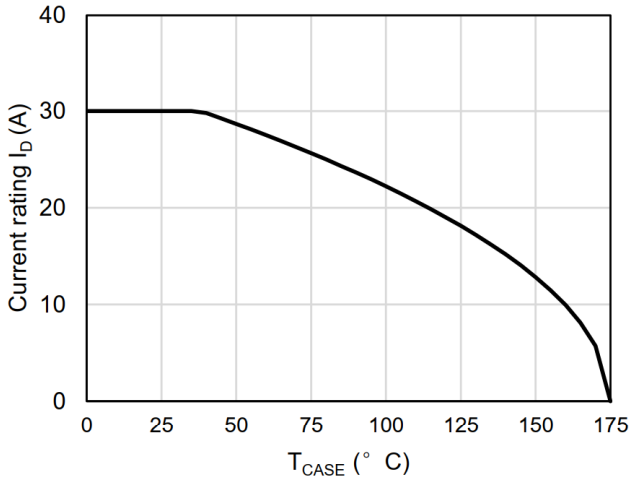


Figure 20: Current De-rating

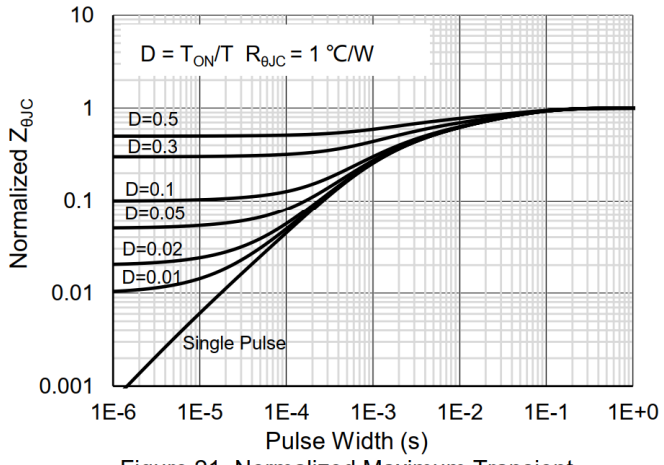


Figure 21: Normalized Maximum Transient Thermal Impedance

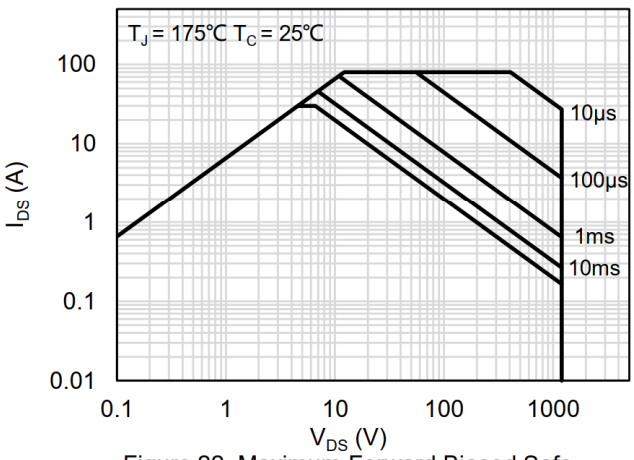


Figure 22: Maximum Forward Biased Safe Operating Area

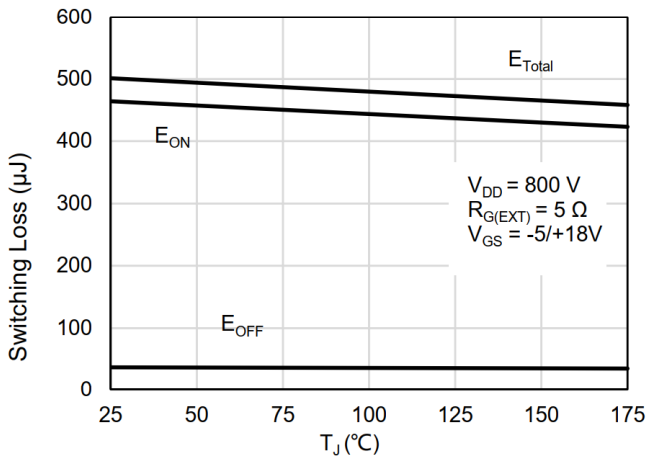


Figure 23: Clamped Inductive Switching Energy vs. T_J

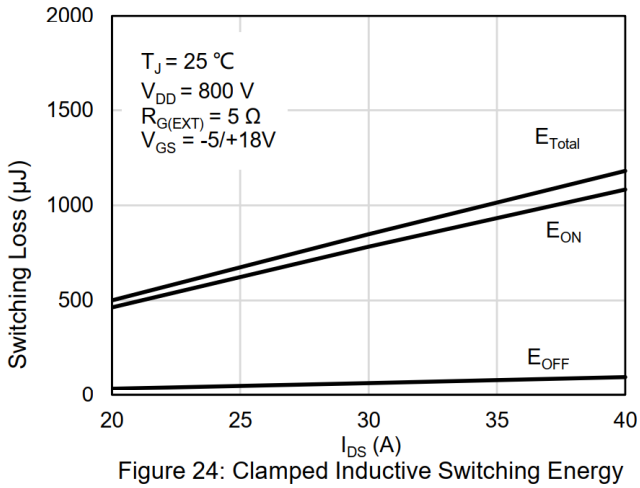


Figure 24: Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600 V)

Typical Performance (curves)

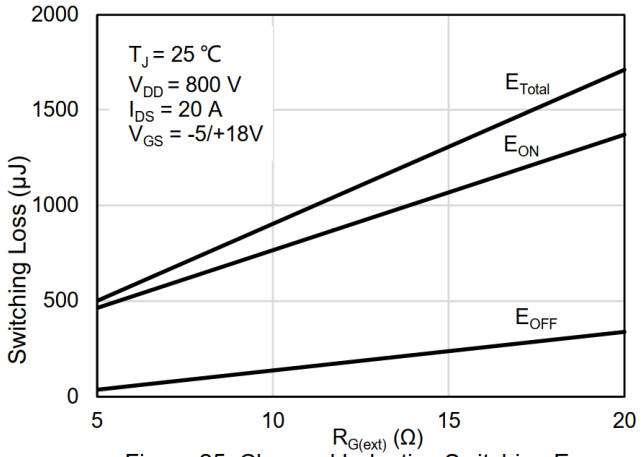


Figure 25: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

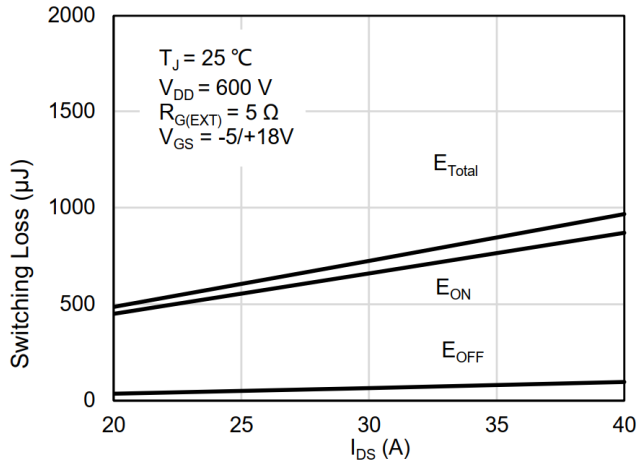


Figure 26: Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600 V)

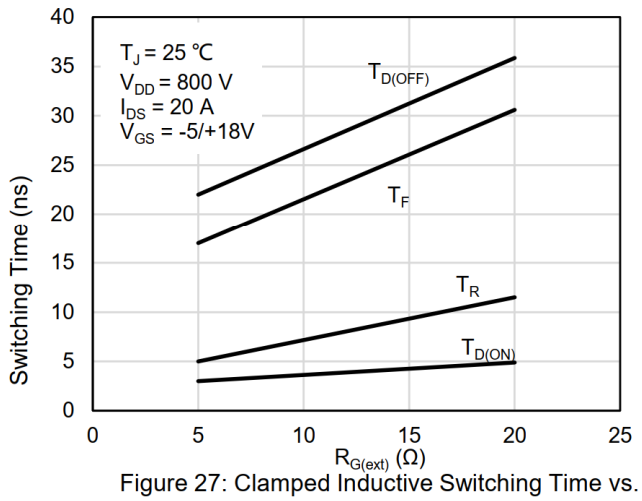


Figure 27: Clamped Inductive Switching Time vs. $R_{G(ext)}$

Note4: All figures reference TO247-4L.

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