1200V N-Channel Silicon Carbide Power MOSFET

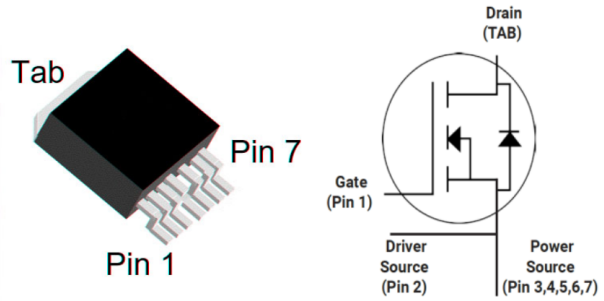
Features:

- Low on-resistance
- Fast switching speed with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{RR})
- Halogen-free，RoHS compliant (Note 1)

Applications:

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

Package:



Part Number	Package
DTK54N120SC7	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)	54	A	T_C=25°C
		38	A	T_C=100°C
I_{DM}	Drain current (pulsed)	100	A	
P_{TOT}	Total power dissipation	250	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	0.6	°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		V	V_{GS}=V_{DS}, I_D=9.5mA
			2.2		V	V_{GS}=V_{DS}, I_D=9.5mA @ T_C=175°C
R_{ON}	Static drain-source on-resistance		40	54	mΩ	V_{GS}=18V, I_D=33.3A @T_J=25°C
			64		mΩ	V_{GS}=18V, I_D=33.3A @T_J=175°C
C_{iss}	Input capacitance		2360		pF	V_{DS}=800V, V_{GS}=0V, f=100kHz, V_{AC}=25mV
C_{oss}	Output capacitance		108		pF	
C_{rss}	Reverse transfer capacitance		13		pF	
E_{oss}	C_{oss} stored energy		43		μJ	
Q_g	Total gate charge		126		nC	V_{DS}=800V, I_D=33.3A, V_{GS}=-5 to 18V
Q_{gs}	Gate-source charge		33		nC	
Q_{gd}	Gate-drain charge		66		nC	
R_g	Gate input resistance		3.3		Ω	f=1MHz, V_{AC}=25mV
G_{FS}	Forward Transconductance		16		S	V_{DS} = 20 V, I_D = 33.3 A
			17		S	V_{DS} = 20 V, I_D = 33.3 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 = 33.3 A, V_{GS} = -5/+18 V, $R_{G,EXT}$ = 5 Ω L = 99 μH Diode: Body Diode at V_{GS} = -5V		13		ns
T_R	Rise Time			11		ns
$T_{D(OFF)}$	Turn Off Delay Time			42		ns
T_F	Fall Time			22		ns
E_{ON}	Turn On Energy			928		μJ
E_{OFF}	Turn Off Energy			131		μJ
$T_{D(ON)}$	Turn On Delay Time	V_{DD} = 800 V , I_D = 33.3 A, V_{GS} = -5/+18 V, $R_{G,EXT}$ = 20 Ω L = 99 μH Diode: Body Diode at V_{GS} = -5V		18		ns
T_R	Rise Time			22		ns
$T_{D(OFF)}$	Turn Off Delay Time			69		ns
T_F	Fall Time			48		ns
E_{ON}	Turn On Energy			1222		μJ
E_{OFF}	Turn Off Energy			437		μJ
Drain-Source Diode Characteristics (T_J = 25 °C unless otherwise noted)						
I_S	Maximum Continuous Drain-Source Diode Forward Current				54	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current				100	A
V_{SD}	Diode Forward Voltage	V_{GS} = -4 V , I_{SD} = 20 A		4.5		V
		V_{GS} = -4 V , I_{SD} = 20 A, T_J = 175 °C		4		V
I_{RM}	Peak Reverse Recovery Current	V_{GS} = -4 V , I_{SD} = 33.3 A, V_R = 800 V, di/dt = 650 A/μS		9.3		A
T_{RR}	Reverse Recovery Time			22		ns
Q_{RR}	Reverse Recovery Charge			108		nC

Typical Performance (curves)

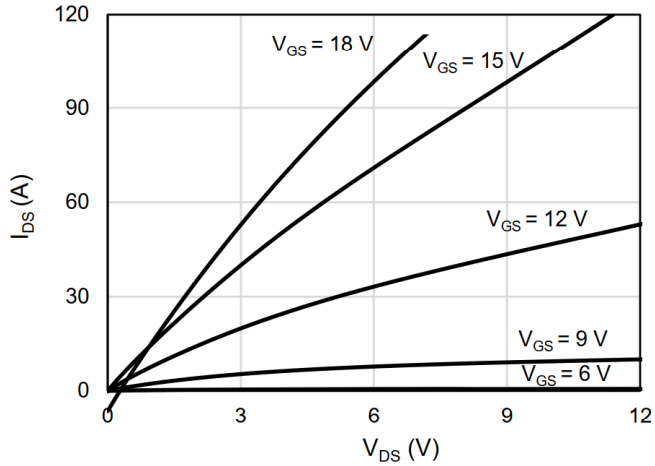


Figure 1: Output Characteristics T_J = -40℃

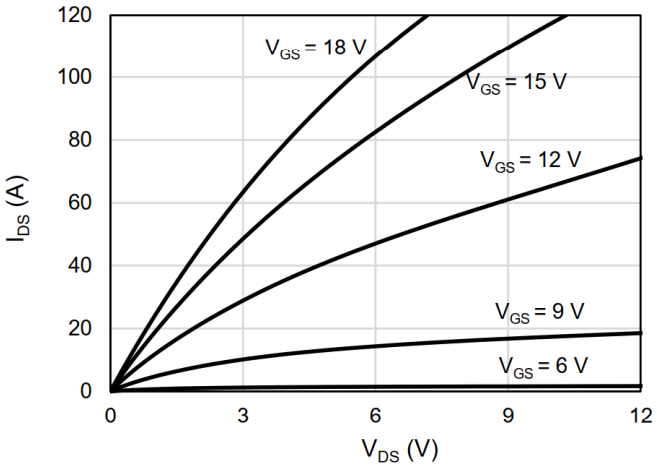


Figure 2: Output Characteristics T_J = 25℃

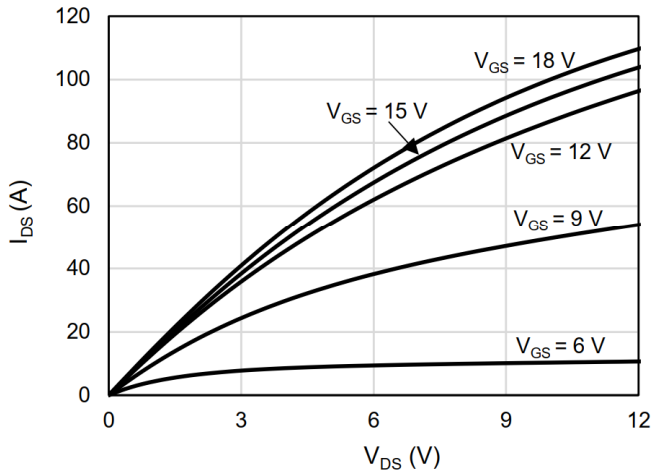


Figure 3: Output Characteristics T_J = 175℃

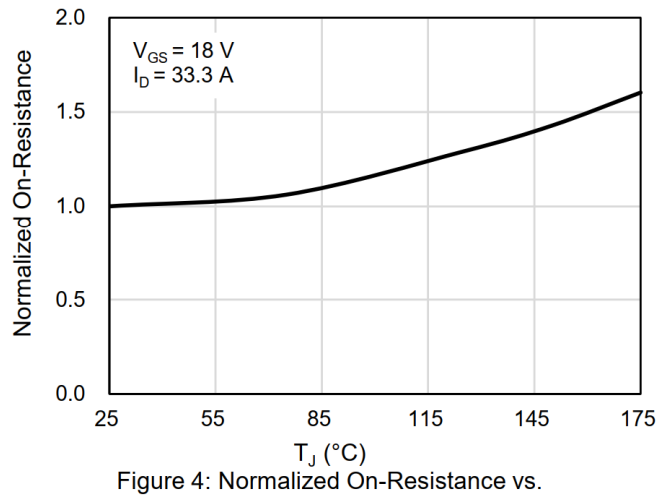


Figure 4: Normalized On-Resistance vs. Temperature

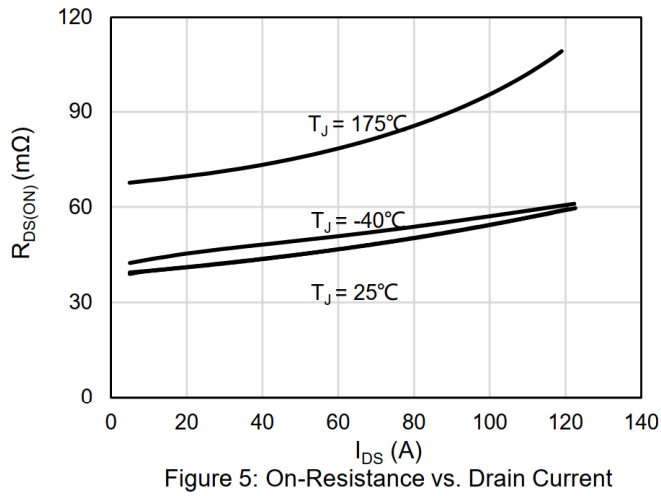


Figure 5: On-Resistance vs. Drain Current For Various Temperatures

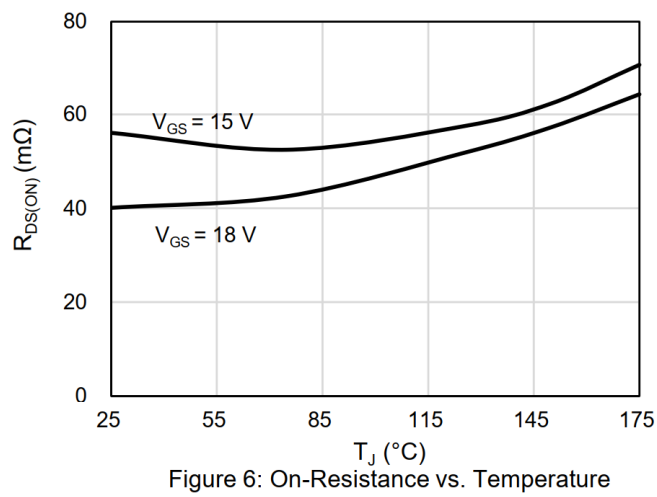


Figure 6: On-Resistance vs. Temperature For Various Gate Voltage

Typical Performance (curves)

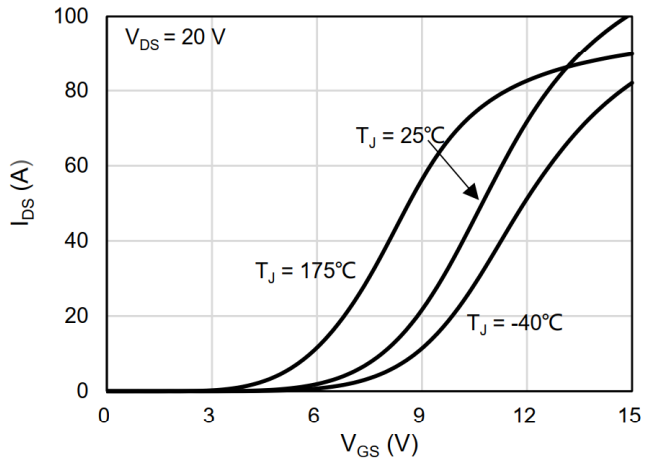


Figure 7: Transfer Characteristics For Various Junction Temparature

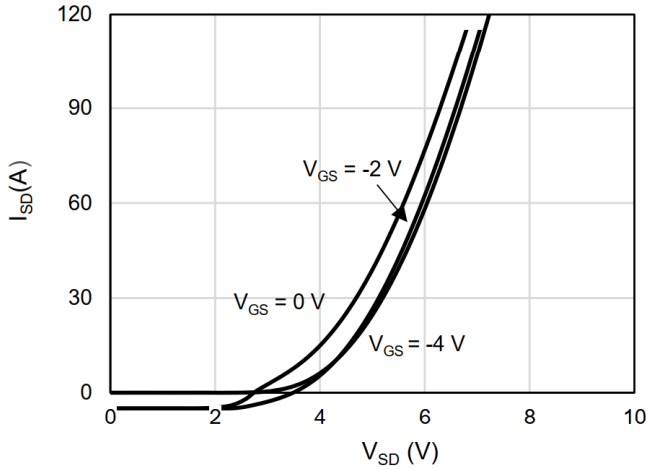


Figure 8: Body Diode Characteristics at -40℃

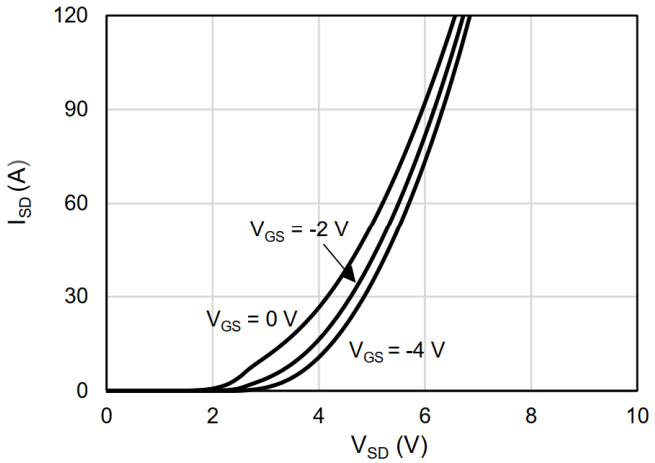


Figure 9: Body Diode Characteristics at 25℃

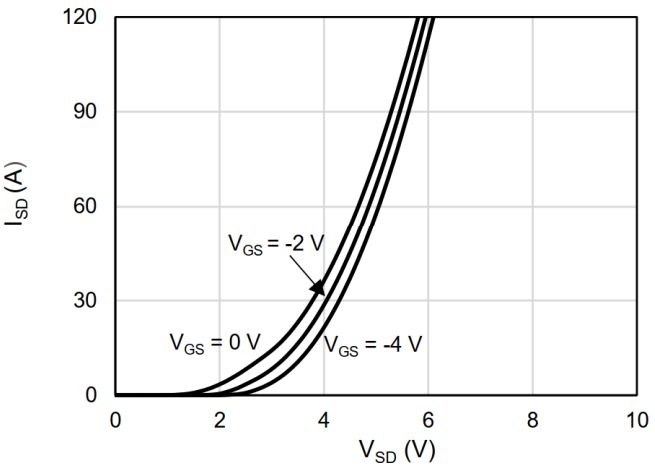


Figure 10: Body Diode Characteristics at 175℃

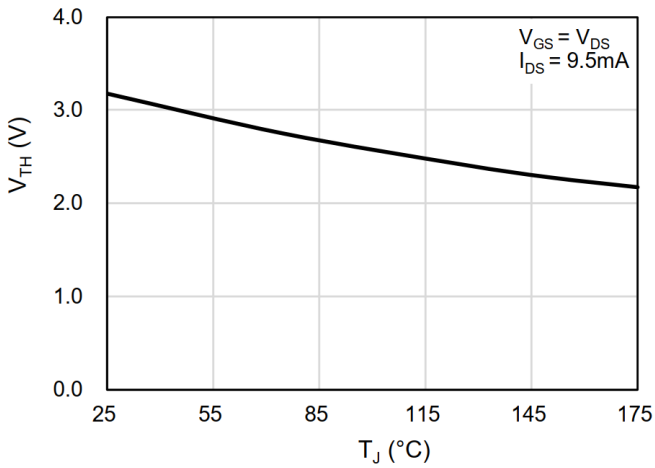


Figure 11: Threshold Voltage vs. Temperature

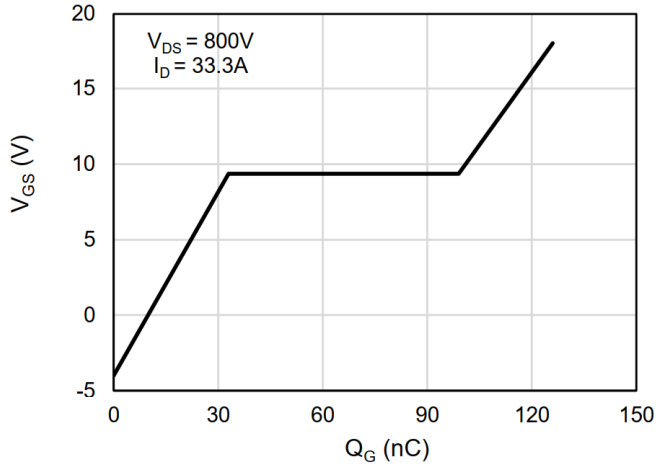


Figure 12: Gate-Charge Characteristics

Typical Performance (curves)

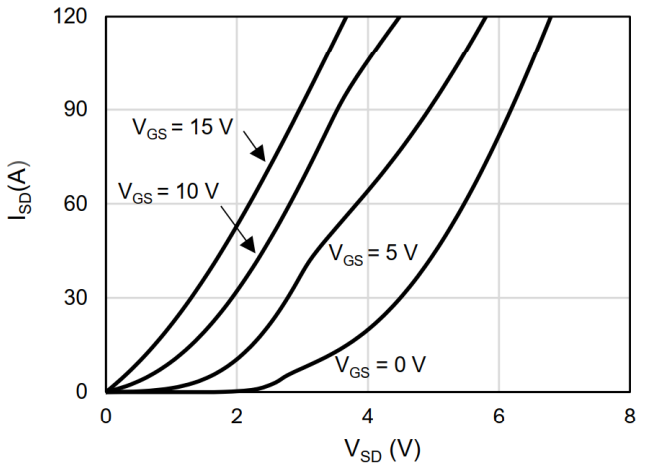


Figure 13: 3rd Quadrant Characteristics at -40℃

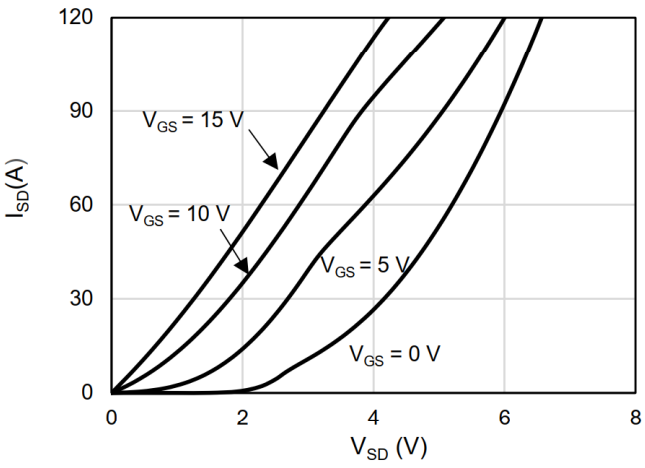


Figure 14: 3rd Quadrant Characteristics at 25℃

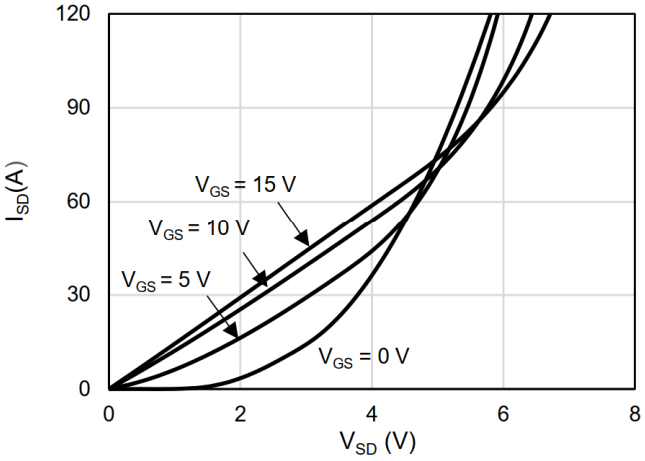


Figure 15: 3rd Quadrant Characteristics at 175℃

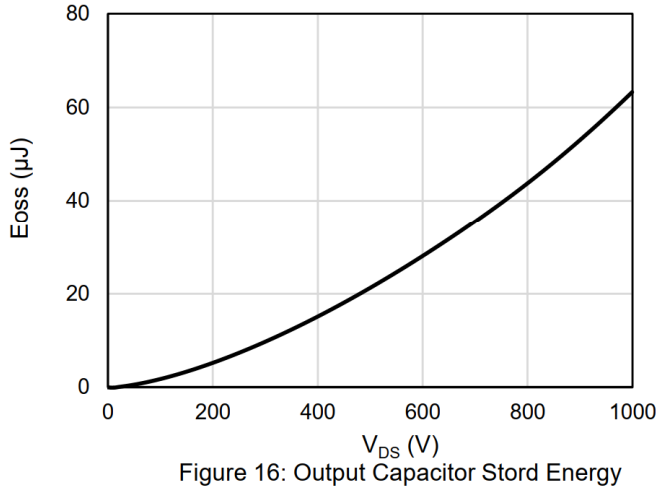


Figure 16: Output Capacitor Stord Energy

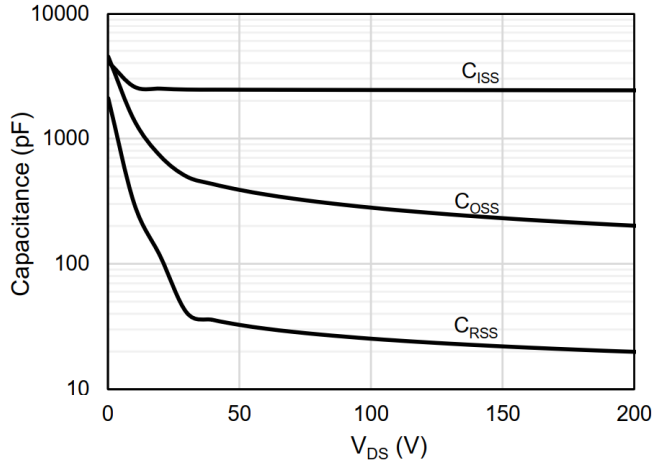


Figure 17: Capacitance Characteristics (0 - 200V)

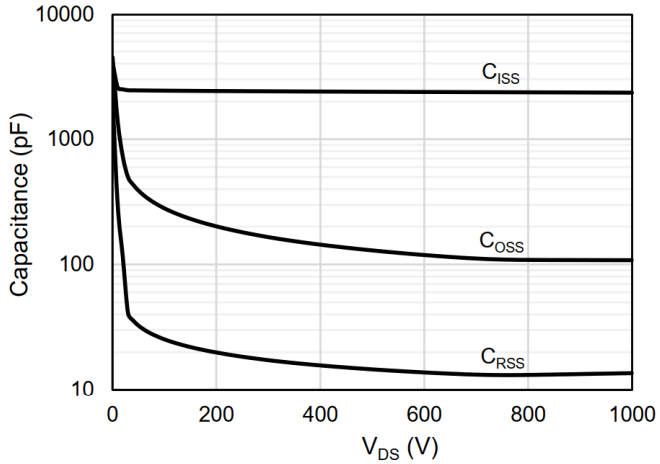


Figure 18: Capacitance Characteristics (0-1000V)

Typical Performance (curves)

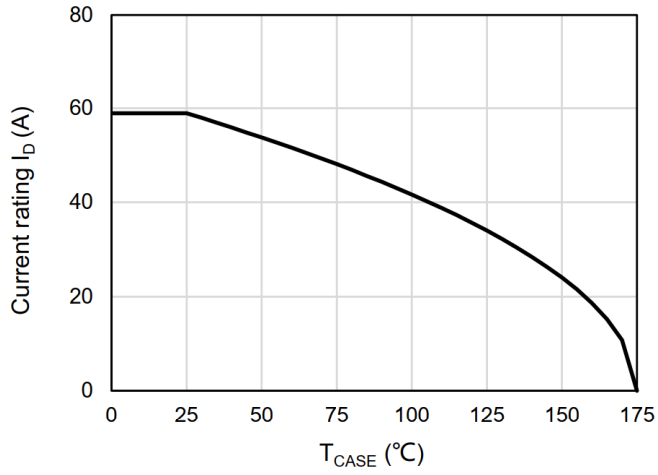


Figure 19: Current De-rating

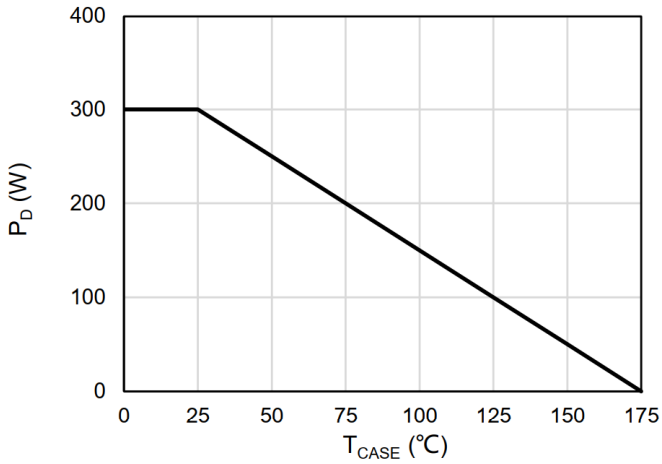


Figure 20: Maximum Power Disspation Derating vs CaseTemperature

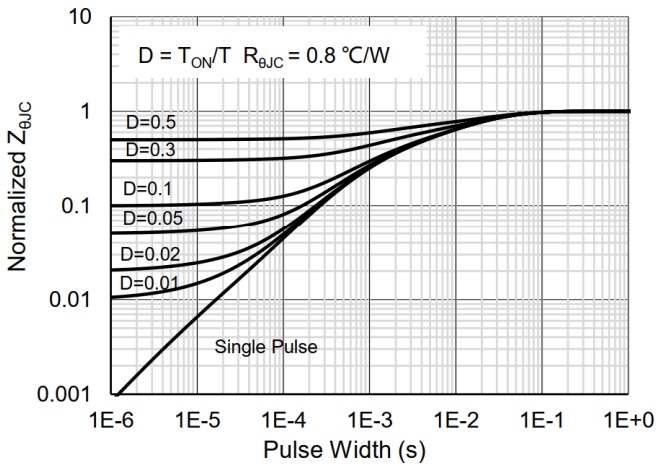


Figure 21: Normalized Maximum Transient Thermal Impedance

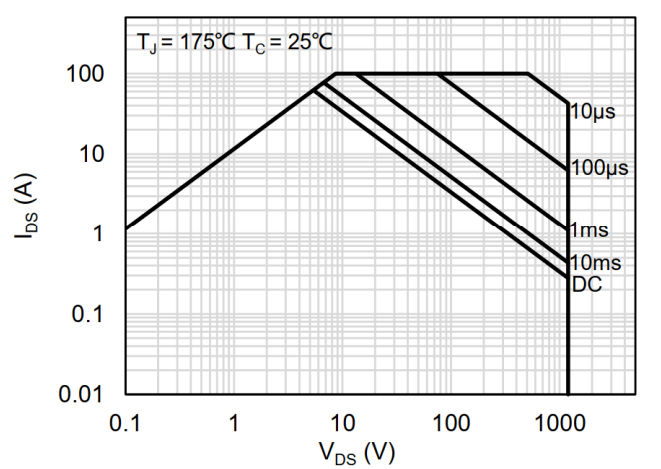


Figure 22: Maximum Forward Biased Safe Operating Area

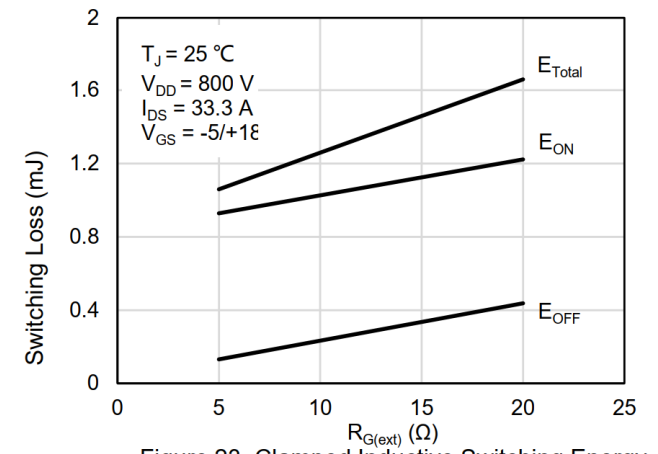


Figure 23: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

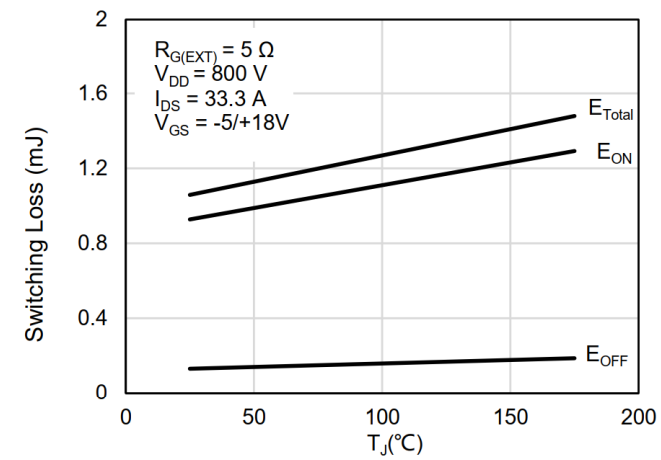


Figure 24: Clamped Inductive Switching Energy vs. T_J

Typical Performance (curves)

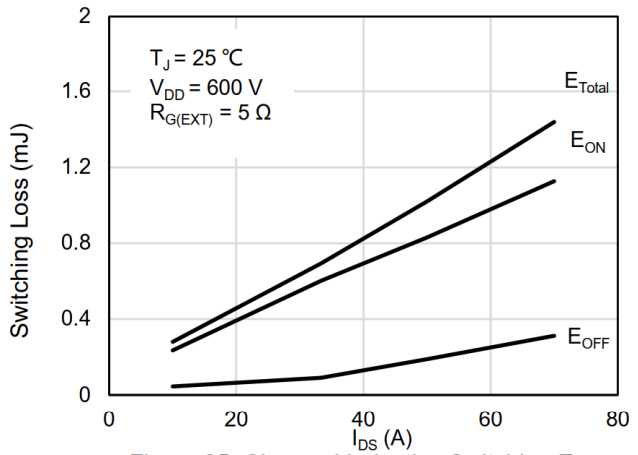


Figure 25: Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600 V)

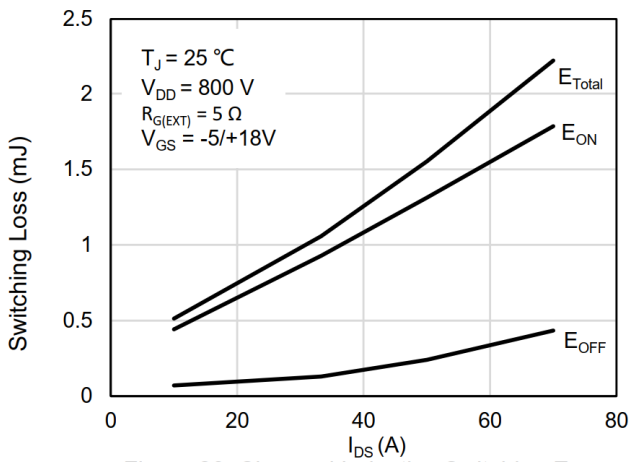


Figure 26: Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 800 V)

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