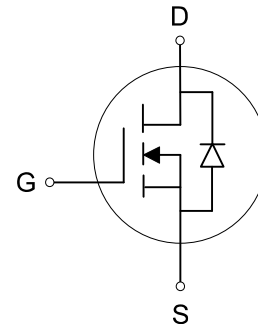


Feature

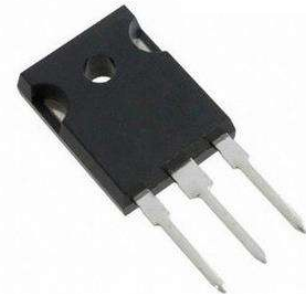
- 1200V,59A
 $R_{DS(ON)} < 54m\Omega @ V_{GS}=18V$ TYP=40 m Ω
- Low on-resistance
- Fast switching speed with low capacitances
- Fast intrinsic diode with low reverse recovery(Q_{RR})
- Halogen-free,RoHS compliant



TO-247-3L

Application

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



Package Marking and Ordering Information

Device Marking	Device	Device Package	Form	Quantity (PCS)
59C120W	AP59C120W	TO-247	Tube	450

ABSOLUTE MAXIMUM RATINGS ($T_a=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	1200	V
Gate-Source Voltage(dynamic)	V_{GS}	-10/+22	V
Gate-Source Voltage(static)	V_{GS}	-6/+18	V
Continuous Drain Current ($T_a = 25^{\circ}C$) ⁽¹⁾	I_D	59	A
Continuous Drain Current ($T_a = 100^{\circ}C$) ⁽¹⁾	I_D	45	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	100	A
Power Dissipation	P_D	300	W
Thermal Resistance from Junction to Case, Steady-State	$R_{\theta JC}$	0.5	$^{\circ}C/W$
Thermal Resistance from Junction to Ambient, Steady-State	$R_{\theta JA}$	40	$^{\circ}C/W$
Junction Temperature	T_J	175	$^{\circ}C$
Storage Temperature	T_{STG}	-55~ +175	$^{\circ}C$

MOSFET ELECTRICAL CHARACTERISTICS(T_a=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} = 0V, I _D =100μA	1200	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =1200V, V _{GS} = 0V	-	5	50	μA
Gate-body leakage current	I _{GSS}	V _{GS} =+18V, V _{DS} = 0V	-	-	100	nA
		V _{GS} =-6V, V _{DS} = 0V			-100	
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =9.5mA	2.2	3.2	4.5	V
		V _{DS} =V _{GS} , I _D =9.5mA, T _J =175°C	-	2.2	-	
Drain-source on-resistance	R _{DS(on)}	V _{GS} =18V, I _D =33A	-	40	54	mΩ
		V _{GS} =18V, I _D =33A, T _J =175°C	-	64	-	
Forward Transconductance	G _{FS}	V _{DS} =20V, I _D =33A	-	16	-	S
		V _{DS} =20V, I _D =33A, T _J =175°C	-	17	-	S
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} =800V, V _{GS} =0V, f =100KHz, V _{AC} =25mV	-	2360	-	pF
Output Capacitance	C _{oss}		-	108	-	
Reverse Transfer Capacitance	C _{rss}		-	13	-	
C _{oss} Stored Energy	E _{OSS}		-	43	-	
Gate Resistance	R _G	f=1MHZ, V _{AC} =25 mV	-	3.3	-	Ω
Total Gate Charge	Q _g	V _{DS} =800V, I _D =33A, V _{GS} =-5/+18V		128		nC
Gate-Source Charge	Q _{gs}			38		nC
Gate-Drain Charge	Q _{gd}			58		nC
Switching characteristics						
Turn-on delay time	t _{d(on)}	V _{DD} =800V, I _D =33A, V _{GS} =-5/+18V V, R _G =5Ω L=99μH	-	19	-	ns
Turn-on rise time	t _r		-	22	-	
Turn-off delay time	t _{d(off)}		-	33	-	
Turn-off fall time	t _f		-	22	-	
Turn-on Energy	E _{ON}	Diode: Body Diode at V _{GS} =-5V		1227		μJ
Turn-off Energy	E _{OFF}			160		μJ
Turn-on delay time	t _{d(on)}	V _{DD} =800V, I _D =33A, V _{GS} =-5/+18V V, R _G =20Ω L=99μH	-	30	-	ns
Turn-on rise time	t _r		-	45	-	
Turn-off delay time	t _{d(off)}		-	88	-	
Turn-off fall time	t _f		-	53	-	
Turn-on Energy	E _{ON}	Diode: Body Diode at V _{GS} =-5V	-	1970	-	μJ
Turn-off Energy	E _{OFF}		-	580	-	μJ

AP59C120W
Silicon Carbide Power Mosfet

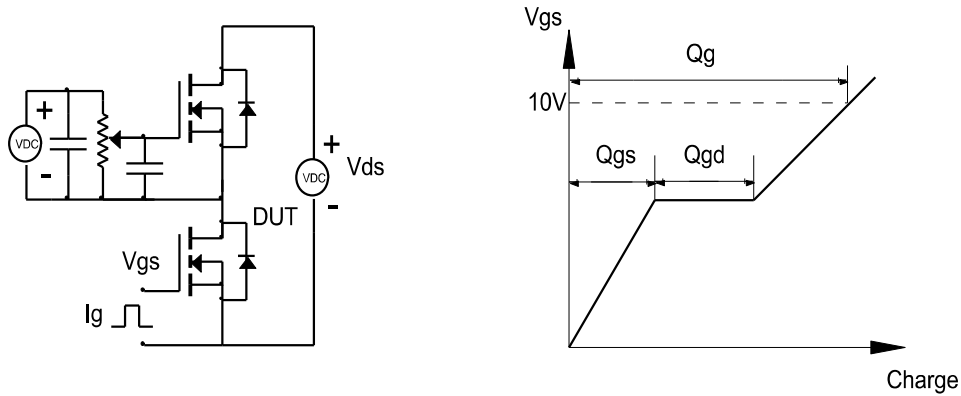
Source-Drain Diode characteristics						
Diode Forward voltage	V_{SD}	$V_{GS} = -4V, I_S = 20A$	-	4.5	-	V
		$V_{GS} = -4V, I_S = 20, T_J = 175^\circ C$	-	4	-	
Maximum Continuous Diode Forward current	I_S		-	59	-	A
Maximum Pulsed Diode Forward current	I_{SM}		-	100	-	A
Peak Reverse Recovery Current	I_{RM}	$V_{GS} = -4V, I_{SD} = 33A,$ $V_R = 800V, di/dt = 650A/\mu S$	-	7.5	-	A
Reverse Recovery Time	T_{RR}		-	22	-	nS
Reverse Recovery Charge	Q_{RR}		-	92	-	nC

Notes:

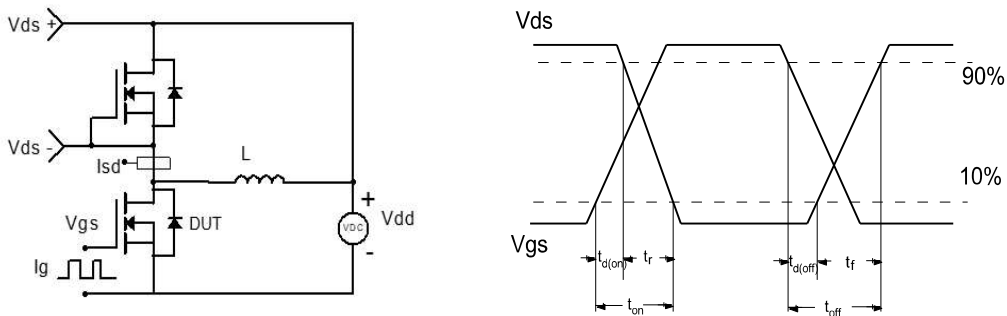
1. Repetitive Rating: pulse width limited by maximum junction temperature

Test Circuit and Waveform

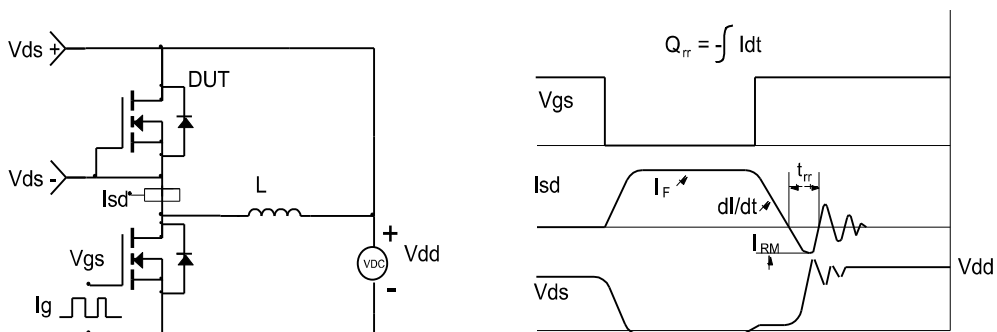
Gate Charge Test Circuit & Waveform



Clamped Inductive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Electrical Characteristics Diagrams

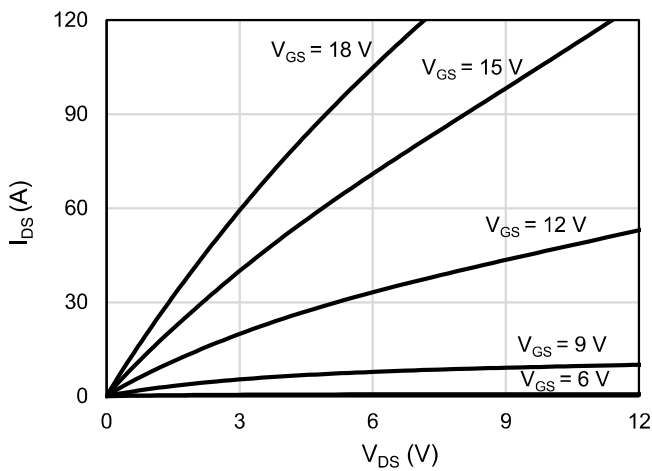


Figure 1: Output Characteristics $T_J = -40^\circ\text{C}$

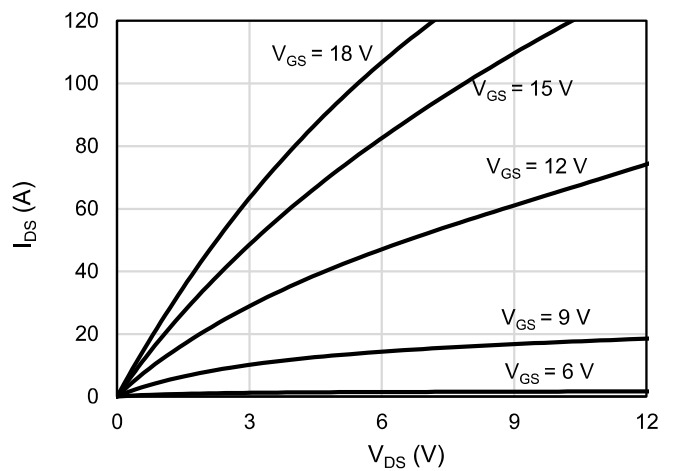


Figure 2: Output Characteristics $T_J = 25^\circ\text{C}$

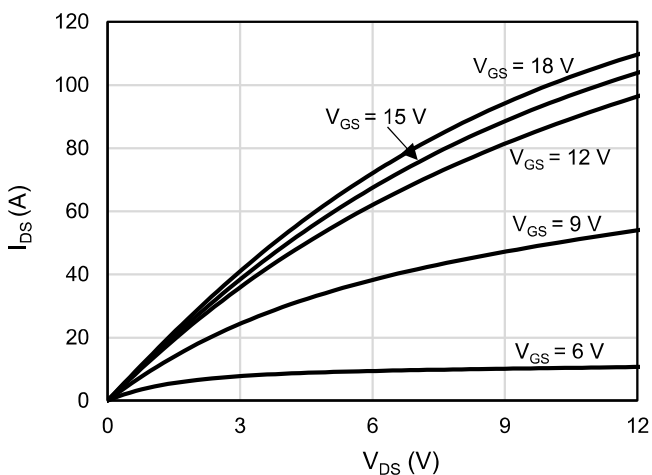


Figure 3: Output Characteristics $T_J = 175^\circ\text{C}$

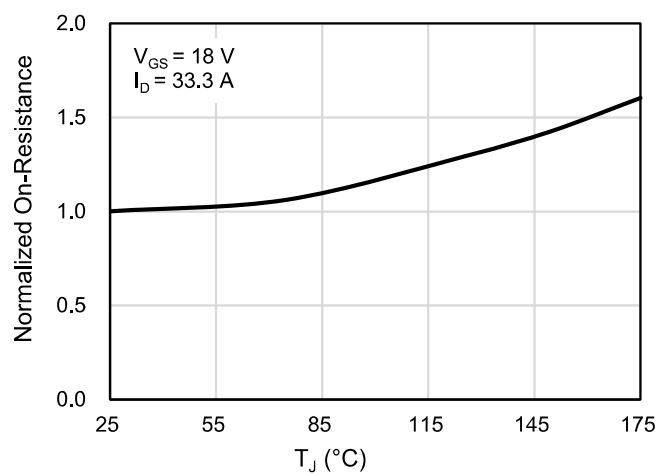


Figure 4: Normalized On-Resistance vs. Temperature

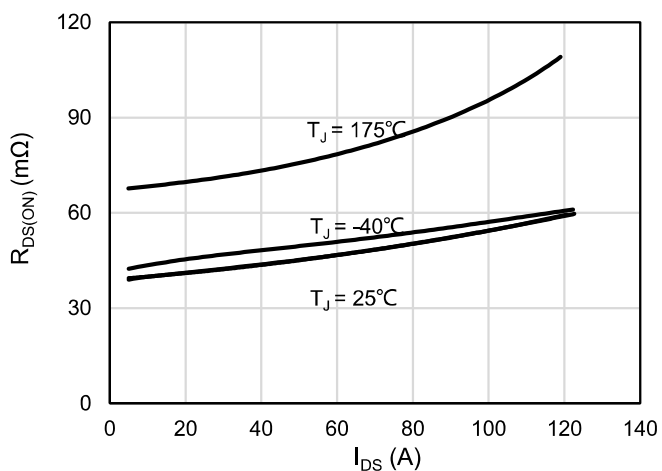


Figure 5: On-Resistance vs. Drain Current For Various Temperatures

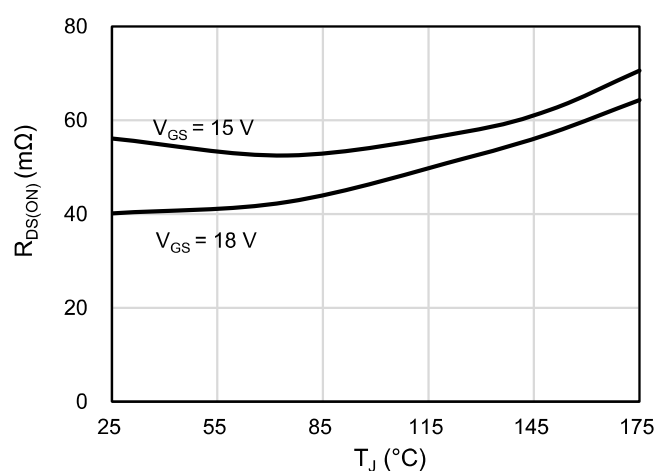


Figure 6: On-Resistance vs. Temperature For Various Gate Voltage

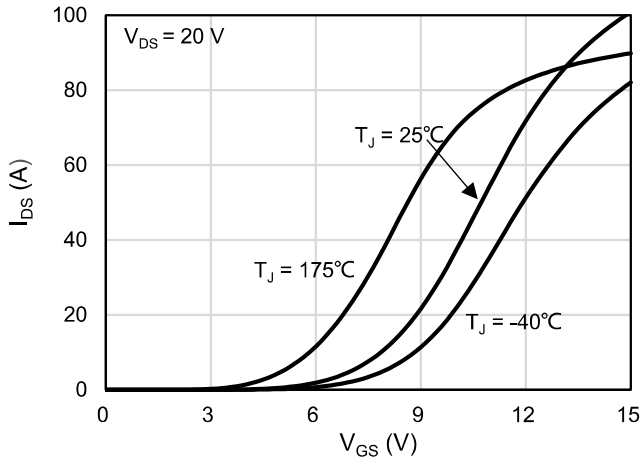


Figure 7: Transfer Characteristics For Various Junction Temperature

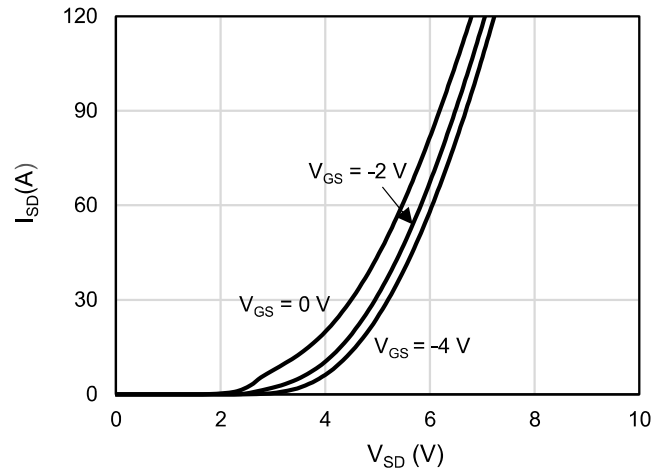


Figure 8: Body Diode Characteristics at -40°C

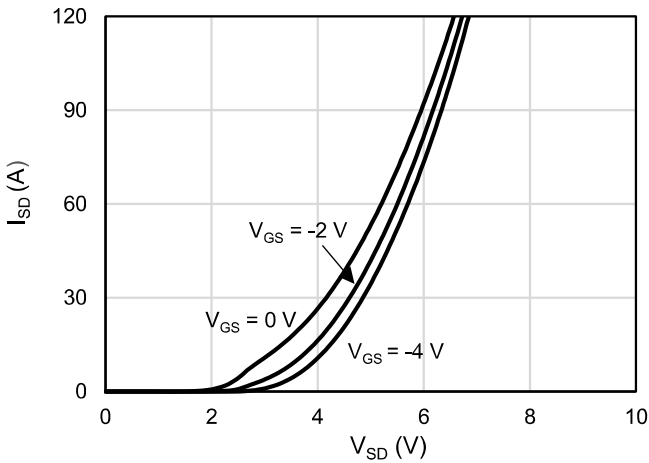


Figure 9: Body Diode Characteristics at 25°C

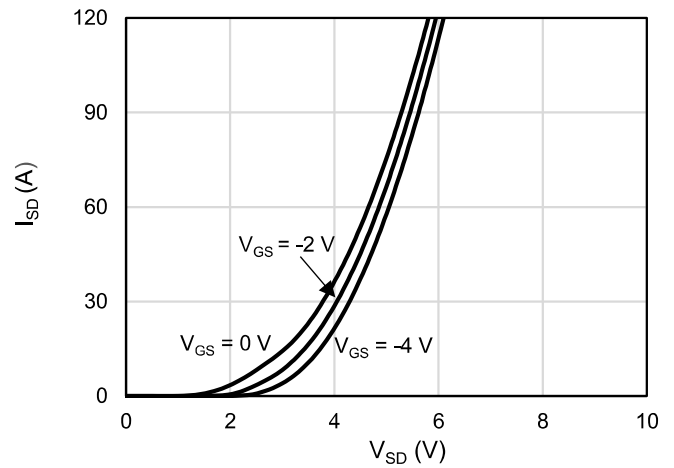


Figure 10: Body Diode Characteristics at 175°C

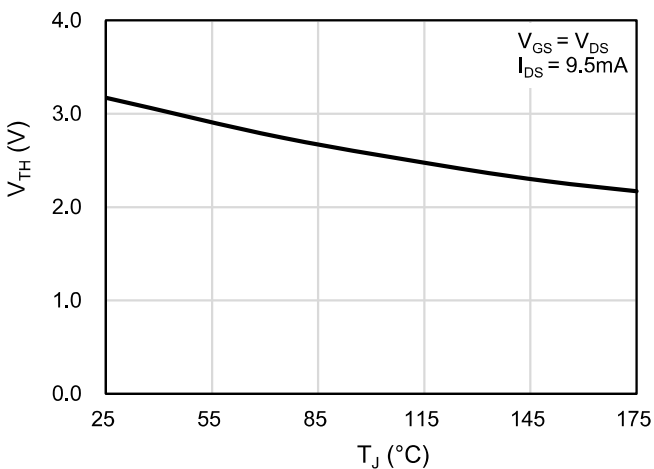


Figure 11: Threshold Voltage vs. Temperature

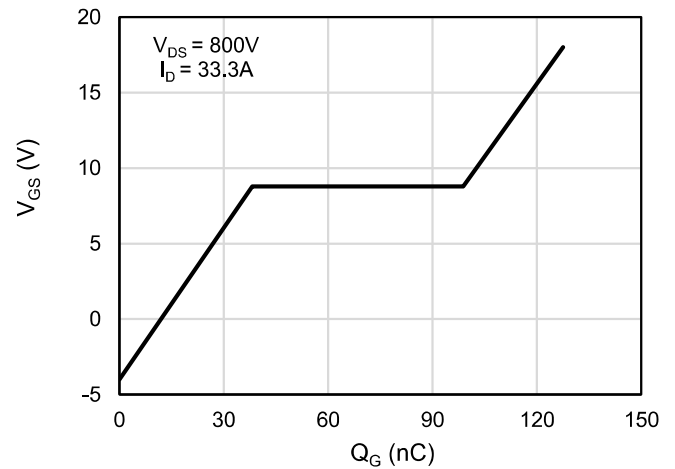


Figure 12: Gate-Charge Characteristics

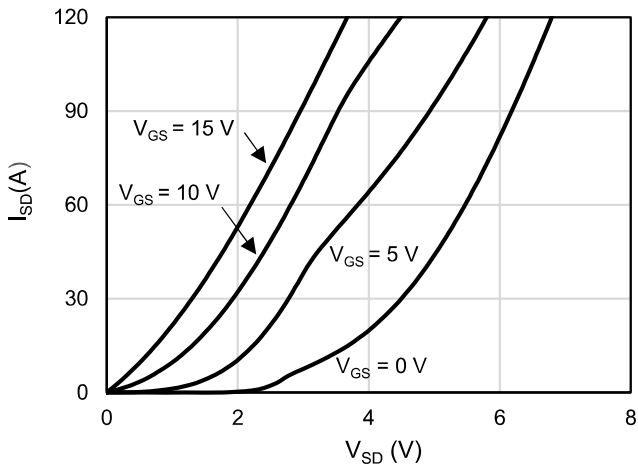


Figure 13: 3rd Quadrant Characteristics at -40°C

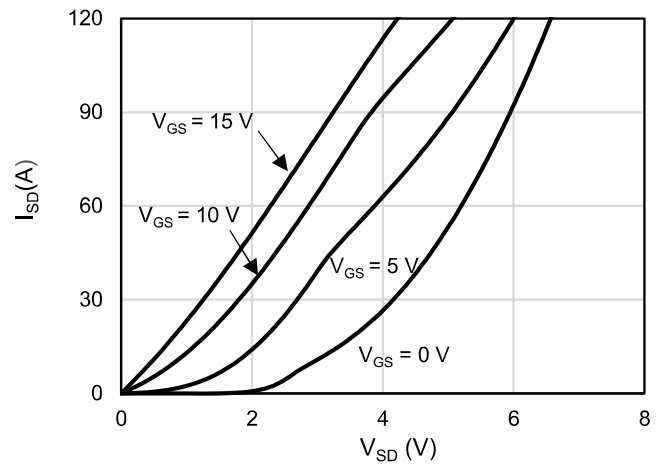


Figure 14: 3rd Quadrant Characteristics at 25°C

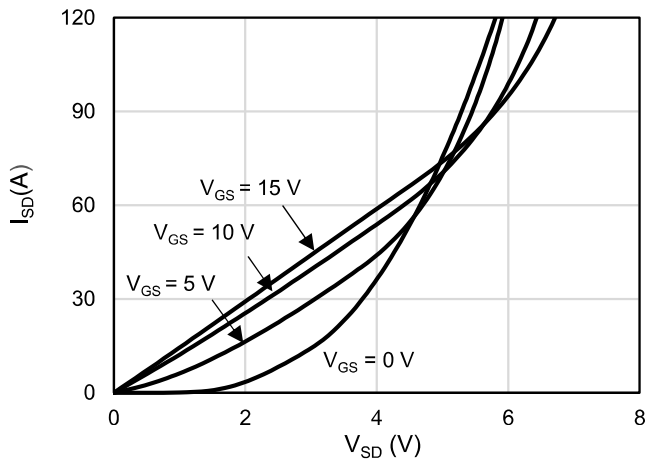


Figure 15: 3rd Quadrant Characteristics at 175°C

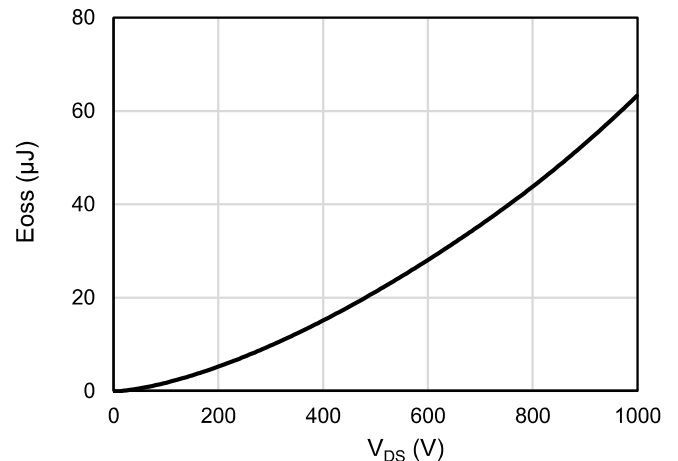


Figure 16: Output Capacitor Stord Energy

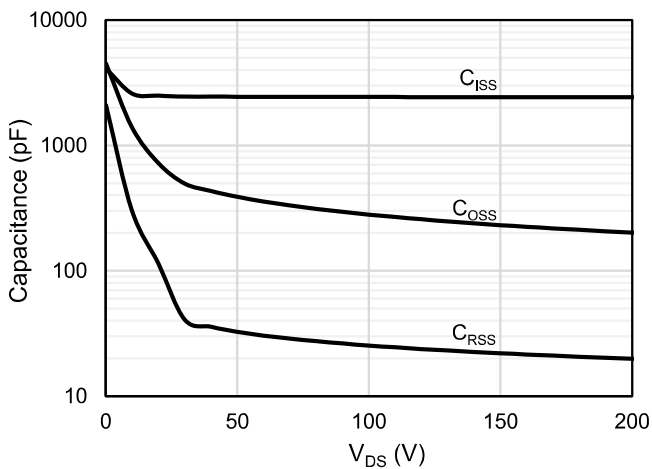


Figure 17: Capacitance Characteristics (0 - 200V)

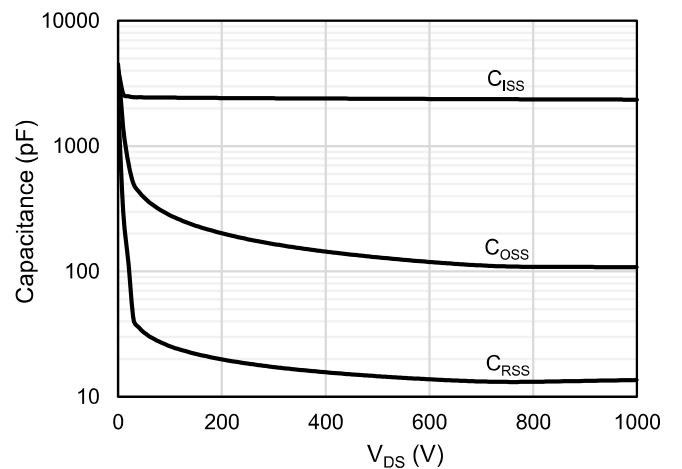


Figure 18: Capacitance Characteristics (0-1000V)

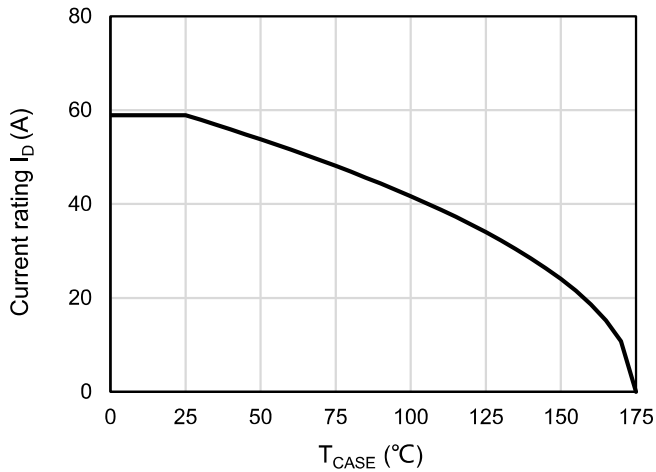


Figure 19: Current De-rating

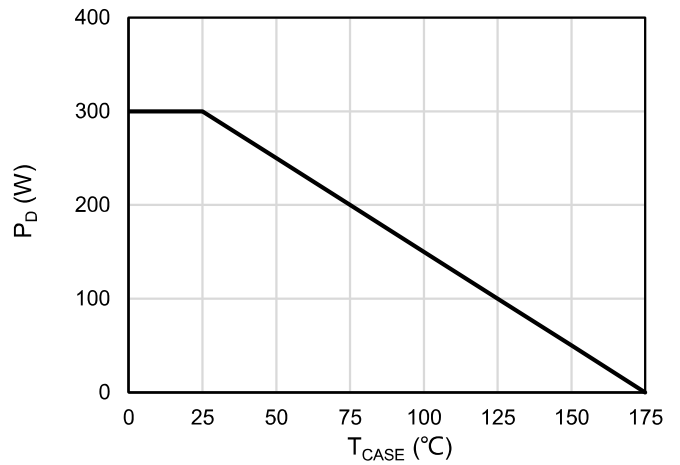


Figure 20: Maximum Power Dissipation Derating vs Case Temperature

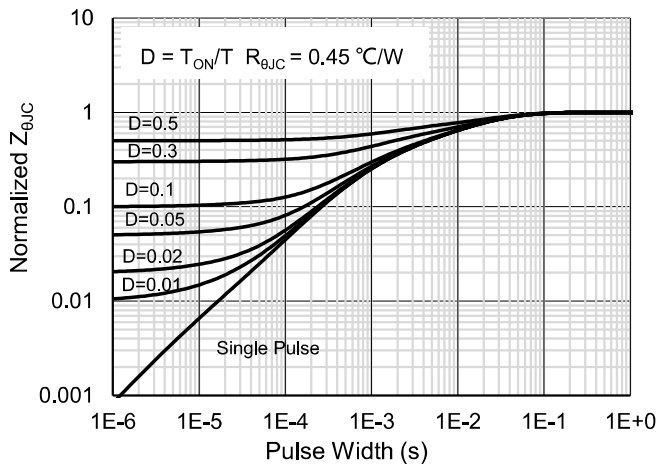


Figure 21: Normalized Maximum Transient Thermal Impedance

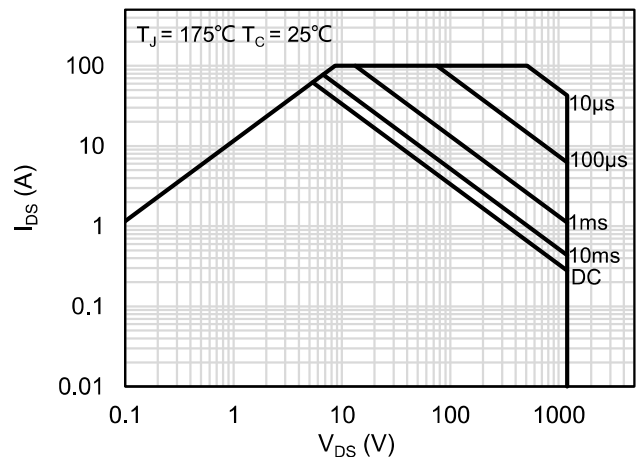


Figure 22: Maximum Forward Biased Safe Operating Area

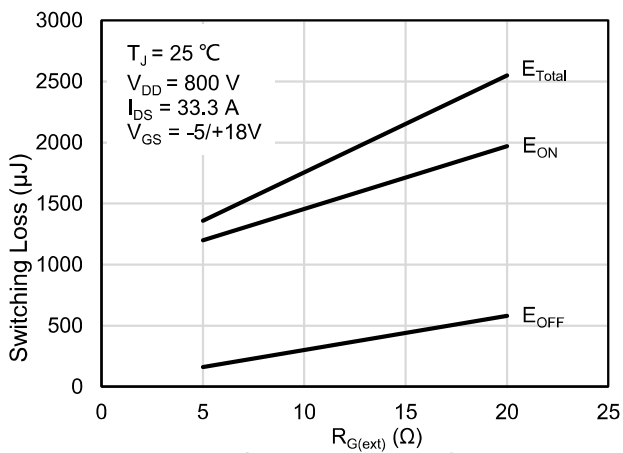


Figure 23: Clamped Inductive Switching Energy vs. $R_{G(EXT)}$

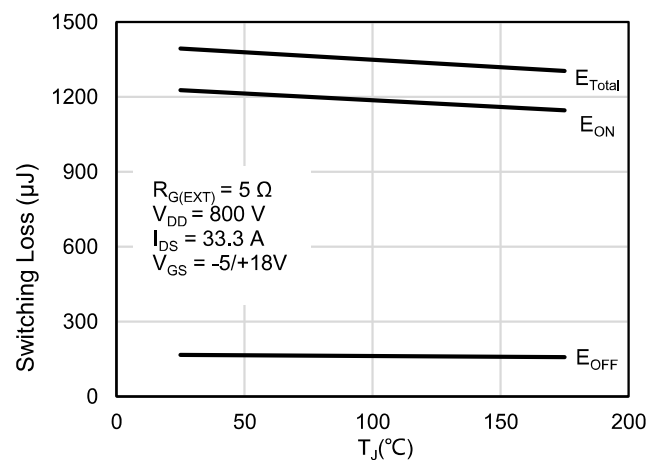


Figure 24: Clamped Inductive Switching Energy vs. T_J

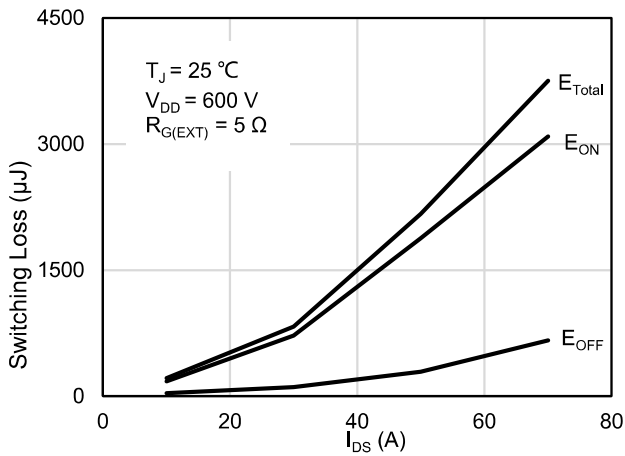


Figure 25: Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600 V)

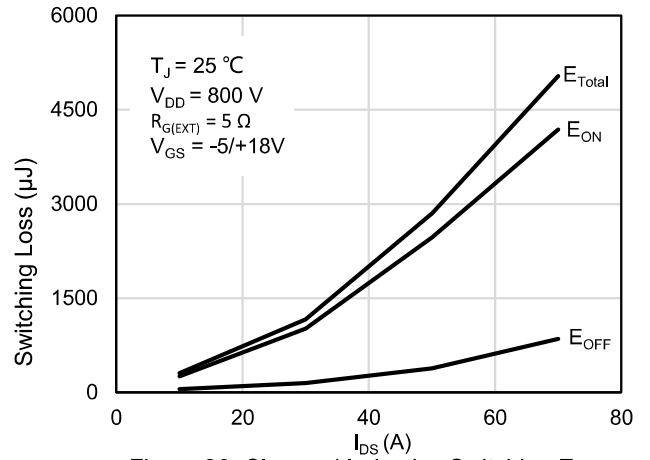
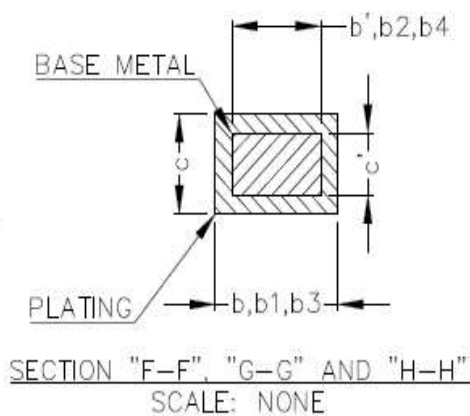
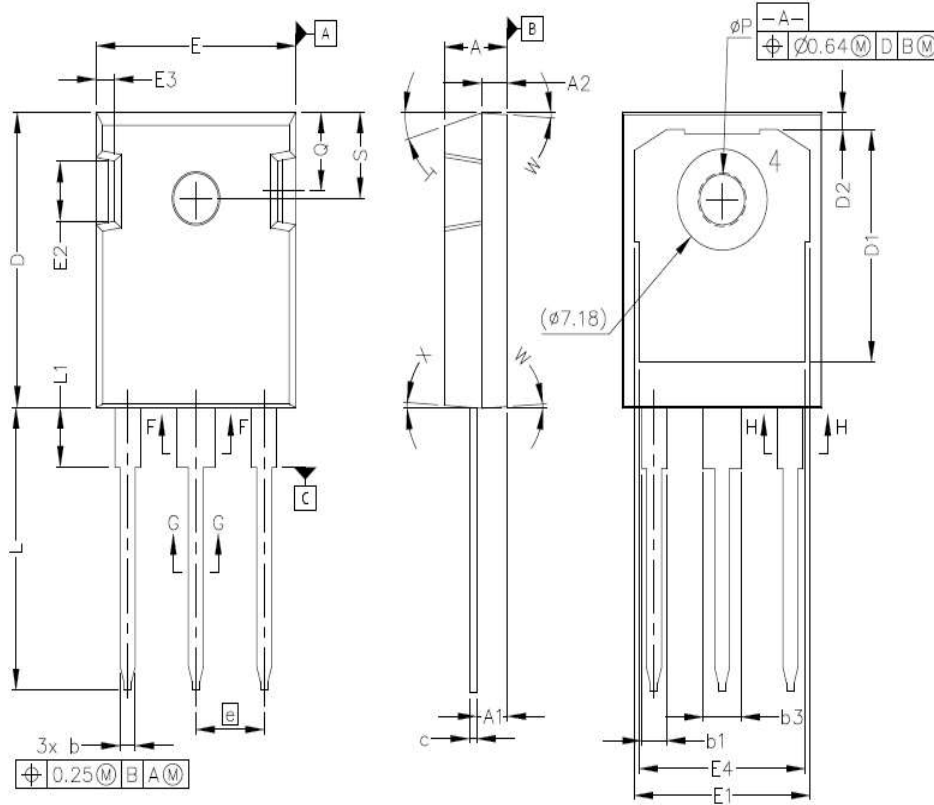


Figure 26: Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 800 V)

Package Outlines

TO-247-3L PKG Outlines



SYMBOL	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	1.91	2.41
b2	1.91	2.16
b3	2.87	3.38
b4	2.87	3.13
c'	0.55	0.65
c	0.55	0.68
D	20.80	21.10
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	5.44 BSC	
N	3	
L	19.81	20.32
L1	4.10	4.40
φP	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.	