

Features:

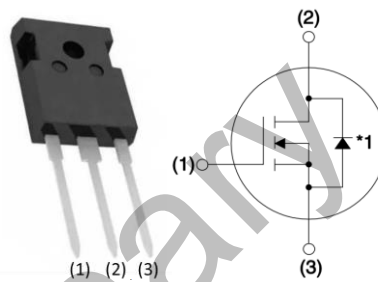
- High-speed switching performance
- low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{RR})
- Halogen-free, RoHS compliant ^(Note 1)

Applications:

- motor drive
- DC/DC converters
- Switched mode power supplies
- Solar inverters
- OBC

Key Performance Parameters:

Parameter	Value	Unit
V_{DS}	1200	V
$R_{DSON, TYP} @ V_{GS} = 18 V$	40	m Ω
I_D	57	A
P_D	300	W



- (1) Gate
- (2) Drain
- (3) Source

*1 Body Diode

Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AMPCW120R40CU	TO-247-3L	AMP120R40CU	Tube	450 per box

Notes:

1. Contact Marching Power sales for detail informations



Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{DS}	Drain-Source Voltage	1200	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) ^(Note 1)	57	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$) ^(Note 1)	41	A
I_{DM}	Drain Current - Pulsed ^(Note 2)	120	A
V_{GS}	Gate-Source Voltage (dynamic)	-10/+22	V
V_{GS}	Gate-Source Voltage (static)	-4/+18	V
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	300	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Steady-State	0.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Steady-State	40	$^\circ\text{C/W}$

Notes:

1. The max drain current limited by maximum junction temperature
2. Repetitive Rating: Pulse width limited by maximum junction temperature



Electrical Characteristics (T _J = 25°C unless otherwise noted)						
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
B _V DSS	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 100 μA	1200			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 1200 V, V _{GS} = 0 V		5	50	μA
I _{GSS}	Gate Leakage Current	V _{GS} = + 18 V, V _{DS} = 0 V			100	nA
		V _{GS} = - 4 V, V _{DS} = 0 V			100	nA
V _{GS(TH)}	Gate Threshold voltage	V _{DS} = V _{GS} , I _D = 9.5 mA	2.0	2.7	3.7	V
		V _{DS} = V _{GS} , I _D = 9.5 mA, T _J = 175 °C		1.9		V
R _{DS(ON)}	Drain-Source on-state resistance	V _{GS} = 18 V, I _D = 33.3 A	30	40	50	mΩ
		V _{GS} = 18 V, I _D = 33.3 A, T _J = 175 °C		69		mΩ
G _{FS}	Forward Transconductance	V _{DS} = 20 V, I _D = 33.3 A		TBD		S
		V _{DS} = 20 V, I _D = 33.3 A, T _J = 175 °C		TBD		S
Dynamic Characteristics						
C _{ISS}	Input Capacitance	V _{DS} = 800 V, V _{GS} = 0 V, F = 100 kHz, V _{AC} = 25 mV		2530		pF
C _{OSS}	Output Capacitance			152		pF
C _{RSS}	Reverse Transfer Capacitance			9		pF
E _{OSS}	C _{OSS} Stored Energy			TBD		μJ
R _G	Gate Resistance	F = 1 MHz, V _{AC} = 25 mV		0.8		Ω
Q _{GS}	Gate-Source Charge	V _{DS} = 800V, I _D = 33.3 A, V _{GS} = -4/+18 V		TBD		nC
Q _{GD}	Gate-Drain Charge			TBD		nC
Q _G	Total Gate Charge			TBD		nC



Switching Characteristics (Note3)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units	
$T_{D(ON)}$	Turn On Delay Time	$V_{DD} = 800\text{ V}$, $I_D = 33.3\text{ A}$, $V_{GS} = -4/+18\text{ V}$, $R_{G,EXT} = 5.1\ \Omega$ $L = 500\ \mu\text{H}$ Diode: Body Diode at $V_{GS} = -5\text{V}$ $T_J = 25\ \text{°C}$		72		ns	
T_R	Rise Time			32		ns	
$T_{D(OFF)}$	Turn Off Delay Time			55		ns	
T_F	Fall Time			39		ns	
E_{ON}	Turn On Energy				810		μJ
E_{OFF}	Turn Off Energy				580		μJ
$T_{D(ON)}$	Turn On Delay Time	$V_{DD} = 800\text{ V}$, $I_D = 33.3\text{ A}$, $V_{GS} = -4/+18\text{ V}$, $R_{G,EXT} = 5.1\ \Omega$ $L = 500\ \mu\text{H}$ Diode: Body Diode at $V_{GS} = -5\text{V}$ $T_J = 175\ \text{°C}$		73		ns	
T_R	Rise Time			31		ns	
$T_{D(OFF)}$	Turn Off Delay Time			60		ns	
T_F	Fall Time			42		ns	
E_{ON}	Turn On Energy				1161		μJ
E_{OFF}	Turn Off Energy				656		μJ

Note3: All switching characteristics reference TO-247-3L.

Drain-Source Diode Characteristics ($T_J = 25\ \text{°C}$ unless otherwise noted)

I_S	Maximum Continuous Drain-Source Diode Forward Current			63		A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current			100		A
V_{SD}	Diode Forward Voltage	$V_{GS} = -4\text{ V}$, $I_{SD} = 20\text{ A}$		3.8		V
		$V_{GS} = -4\text{ V}$, $I_{SD} = 20\text{ A}$, $T_J = 175\ \text{°C}$		3.4		V
I_{RM}	Peak Reverse Recovery Current	$V_{GS} = -4\text{ V}$, $I_{SD} = 33.3\text{ A}$, $V_R = 800\text{ V}$, $di/dt = 1400\text{ A}/\mu\text{s}$ $T_J = 25\ \text{°C}$		10		A
T_{RR}	Reverse Recovery Time			16		ns
Q_{RR}	Reverse Recovery Charge			100		nC
I_{RM}	Peak Reverse Recovery Current	$V_{GS} = -4\text{ V}$, $I_{SD} = 33.3\text{ A}$, $V_R = 800\text{ V}$, $di/dt = 1400\text{ A}/\mu\text{s}$ $T_J = 175\ \text{°C}$		24		A
T_{RR}	Reverse Recovery Time			41		ns
Q_{RR}	Reverse Recovery Charge			629		nC

Electrical Characteristics Diagrams (Note4)

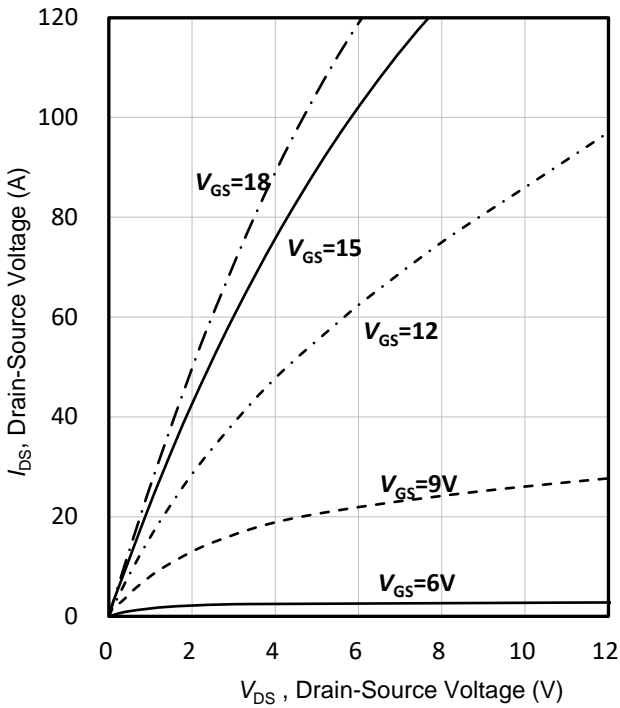


Figure 1. Output Characteristics ($T_{vj} = 25^{\circ}\text{C}$)

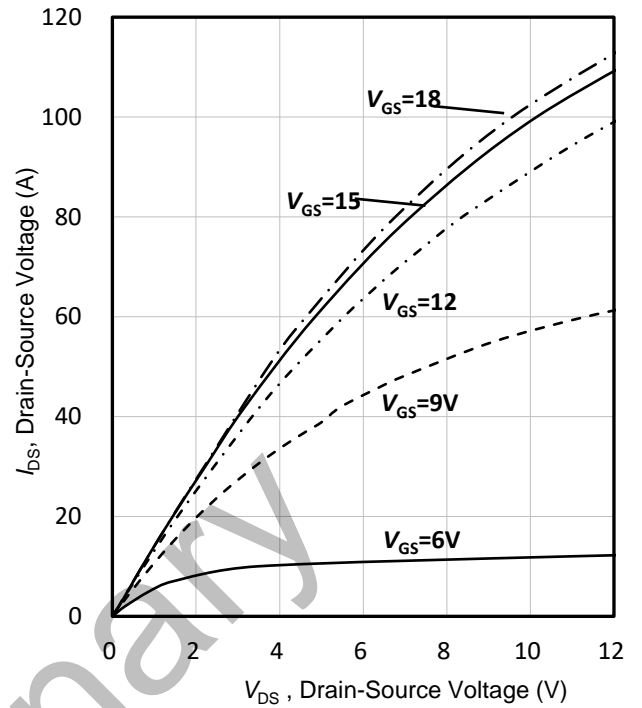


Figure 2. Output Characteristics ($T_{vj} = 175^{\circ}\text{C}$)

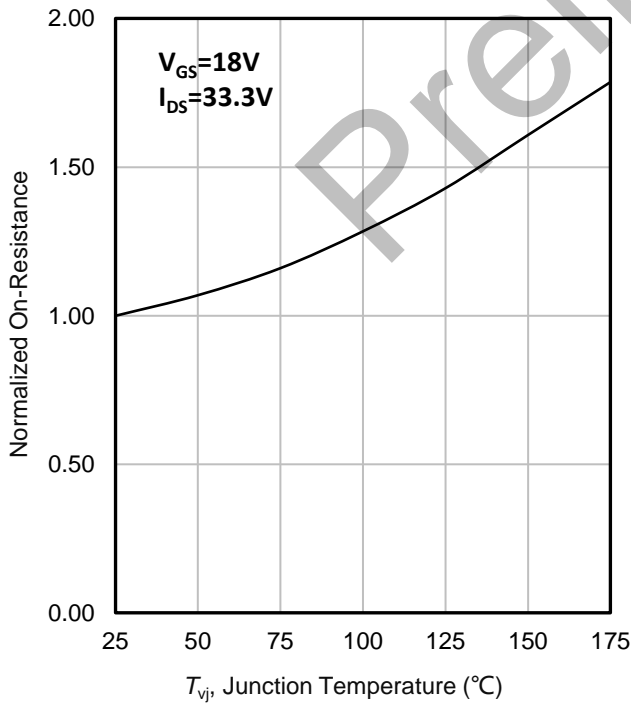


Figure 3. Normalized On-Resistance vs. Temperature

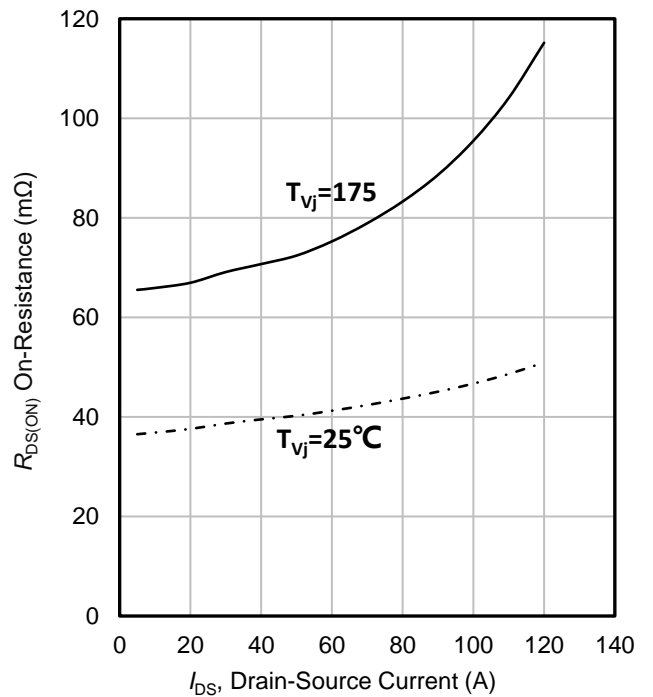


Figure 4. On-Resistance vs. Drain Current For Various Temperatures

Electrical Characteristics Diagrams (Note4)

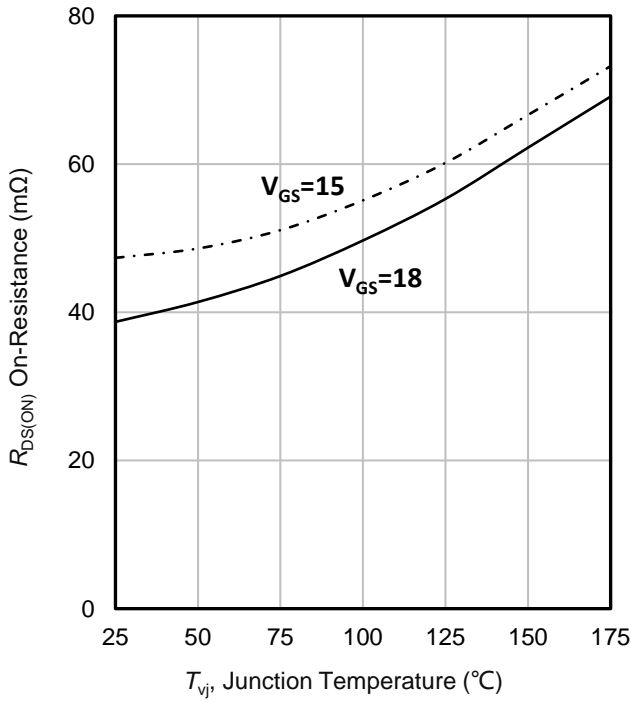


Figure 5. On-Resistance vs. Temperature For Various Gate Voltage

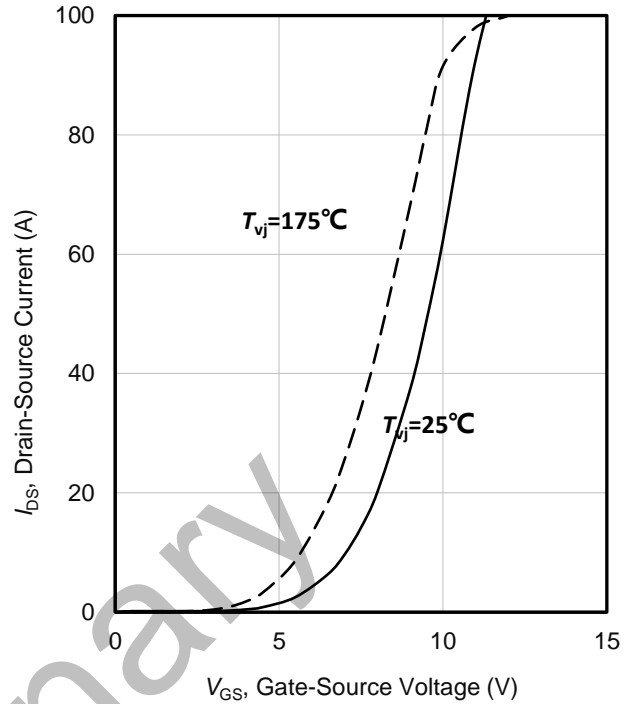


Figure 6. Transfer Characteristics For Various Junction Temperature

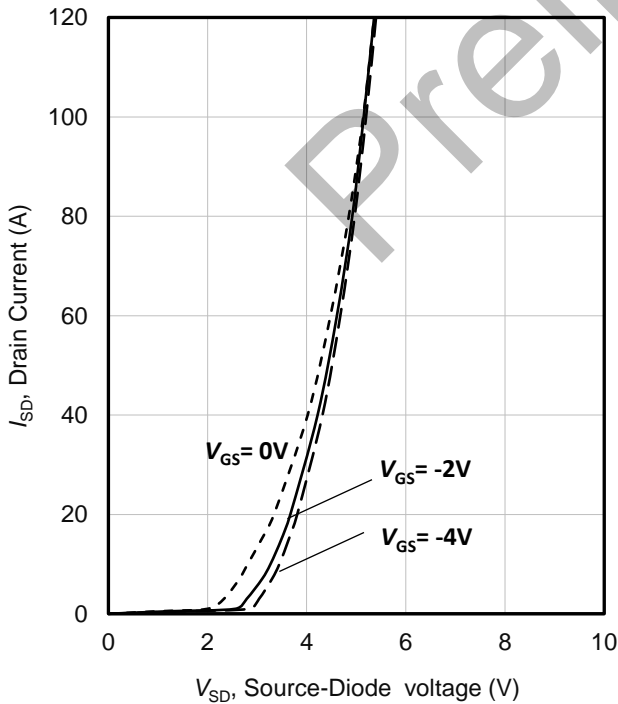


Figure 7. Body Diode Characteristics ($T_{vj} = 25^{\circ}\text{C}$)

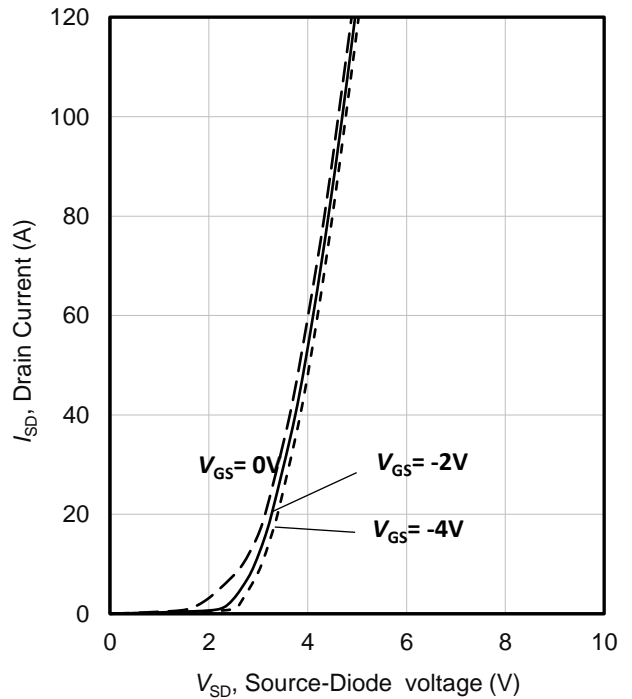


Figure 8. Body Diode Characteristics ($T_{vj} = 175^{\circ}\text{C}$)

Electrical Characteristics Diagrams (Note4)

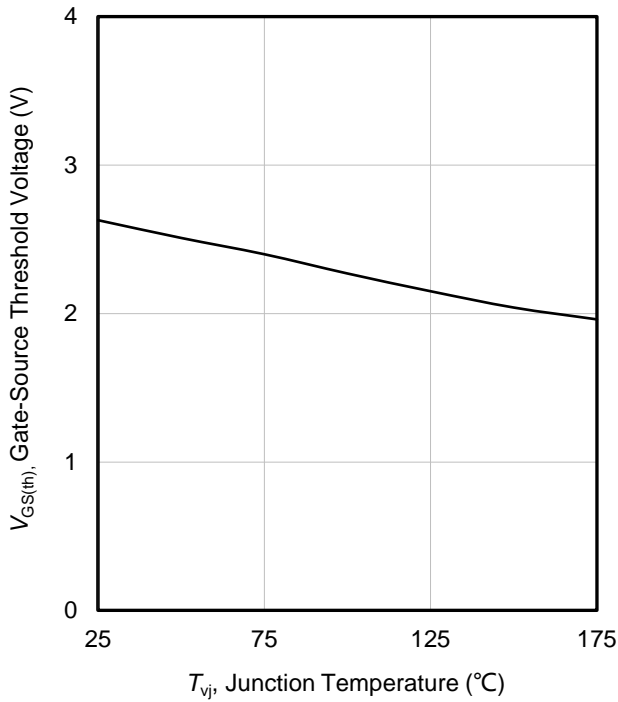


Figure 9. Threshold Voltage vs. Temperature

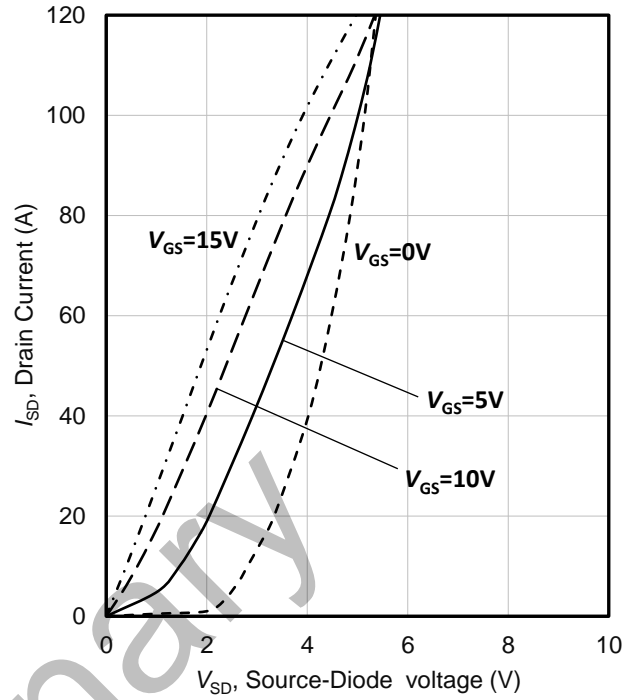


Figure 10. 3rd Quadrant Characteristics ($T_{vj} = -25^{\circ}\text{C}$)

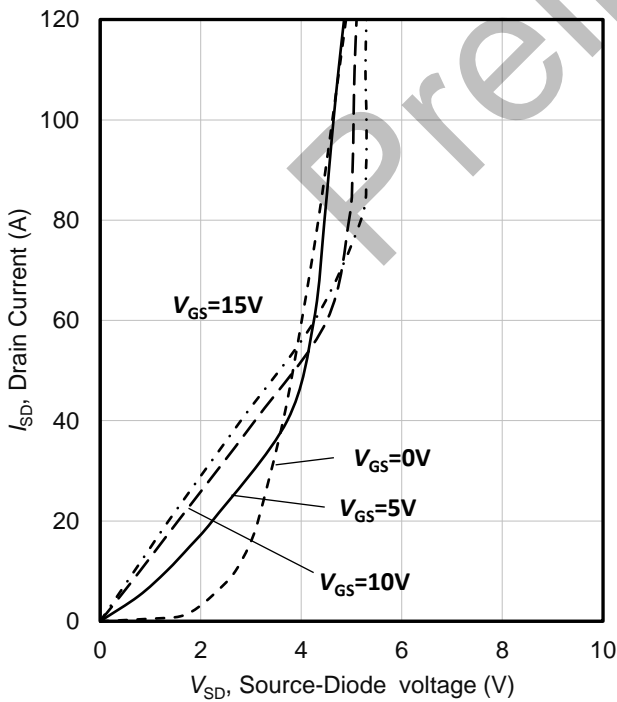


Figure 11. 3rd Quadrant Characteristics ($T_{vj} = 175^{\circ}\text{C}$)

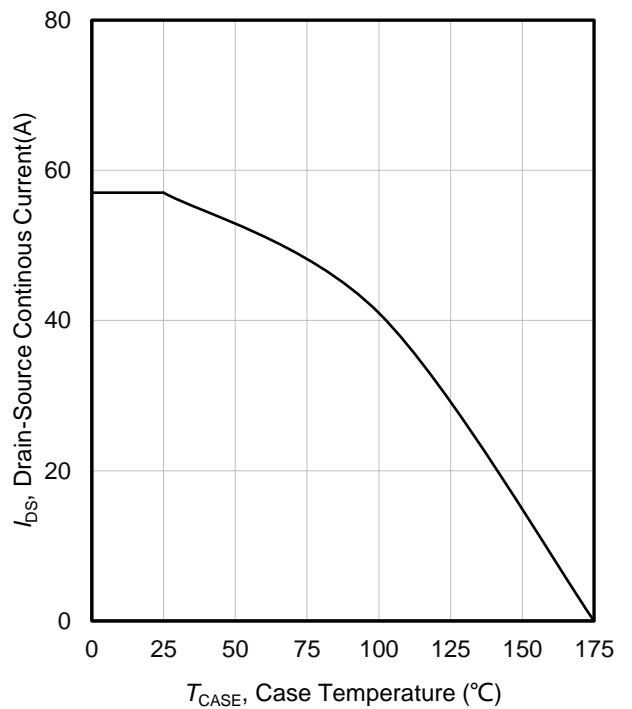


Figure 12. Current De-rating

Electrical Characteristics Diagrams (Note4)

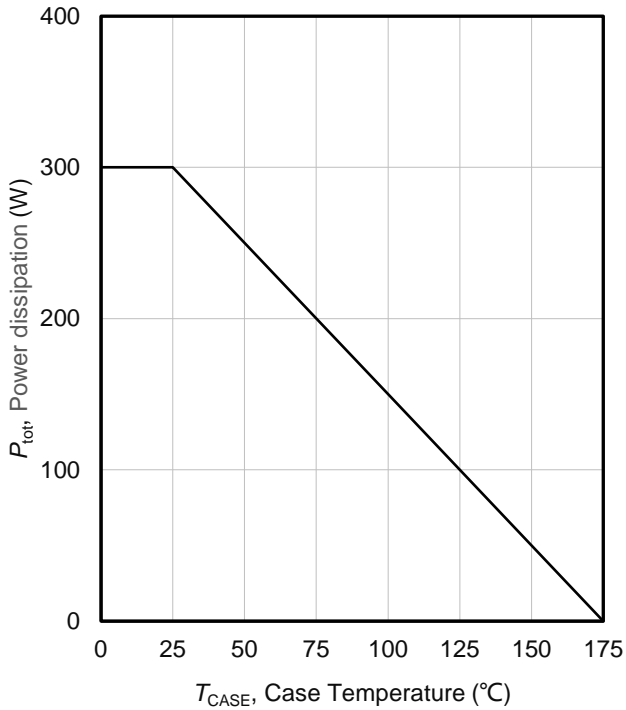


Figure 13. Maximum Power Dissipation Derating vs Case Temperature

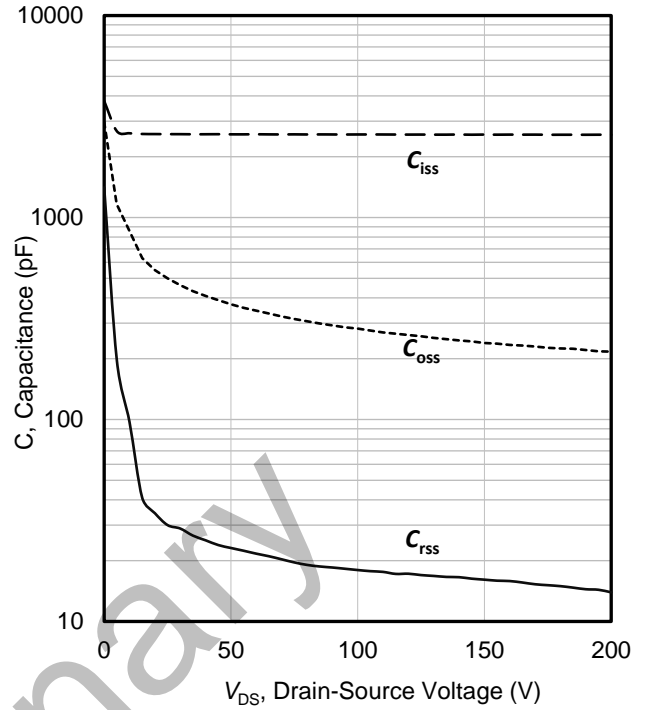


Figure 14. Capacitance Characteristics (0 - 200V)

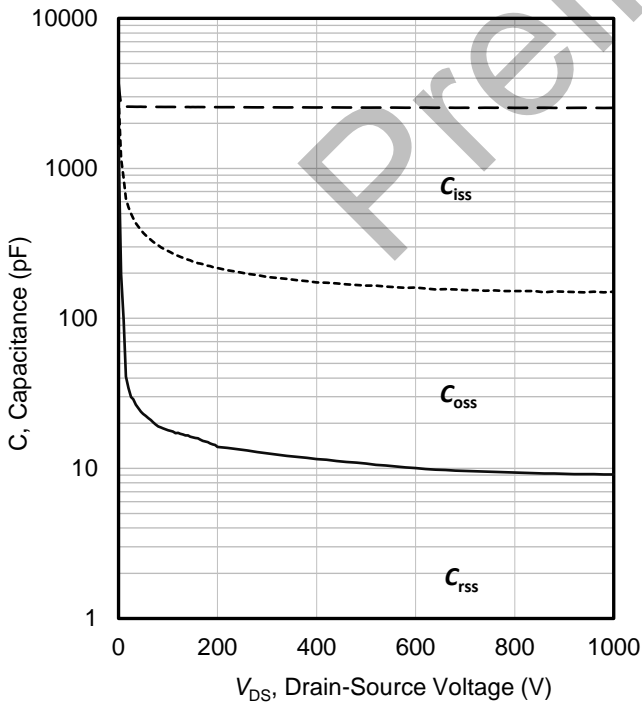


Figure 15. Capacitance Characteristics (0 - 1000V)

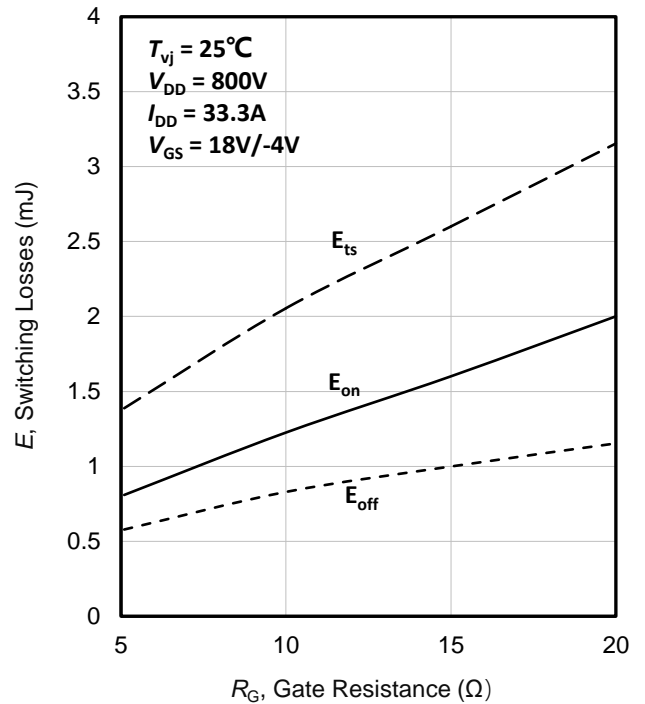


Figure 16. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

Electrical Characteristics Diagrams (Note4)

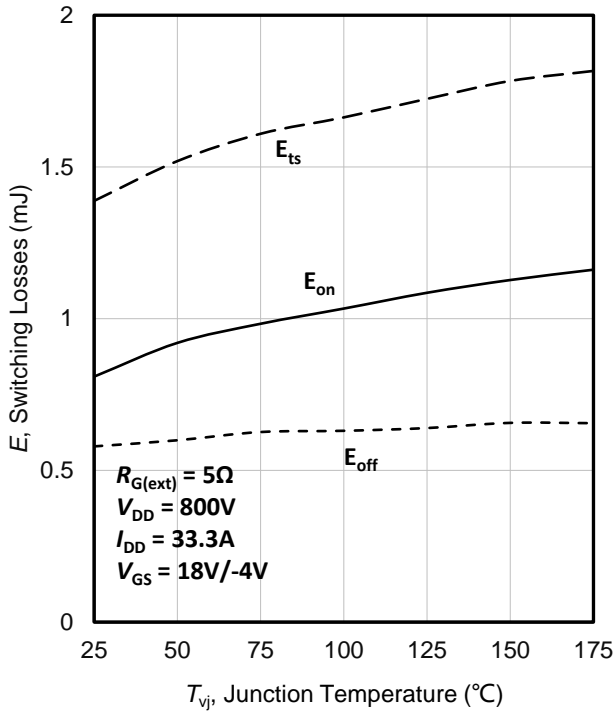


Figure 21. Clamped Inductive Switching Energy vs. Temperature

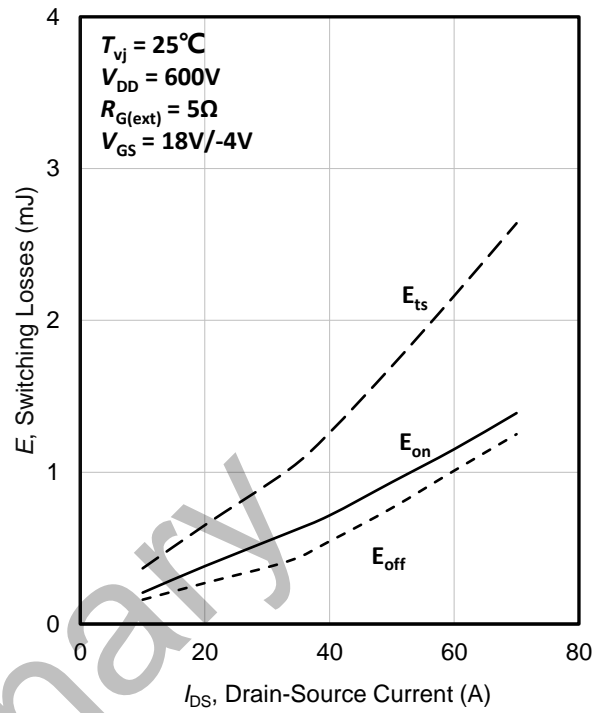


Figure 22. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 600 V$)

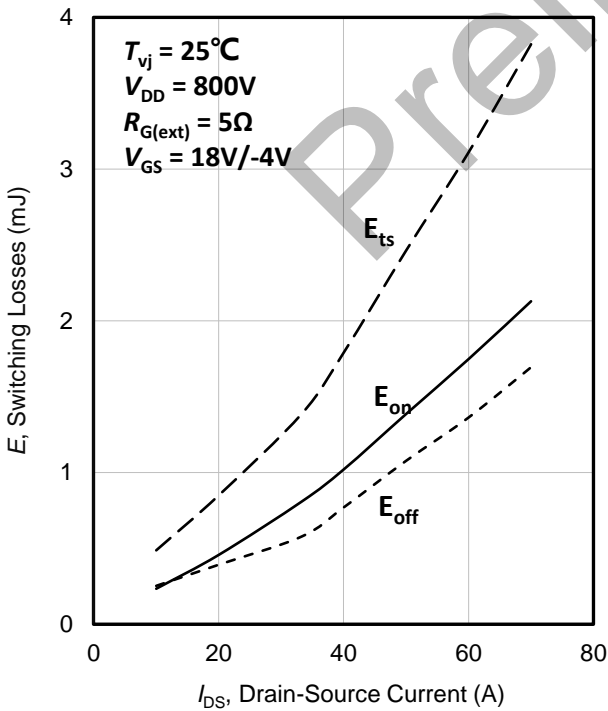
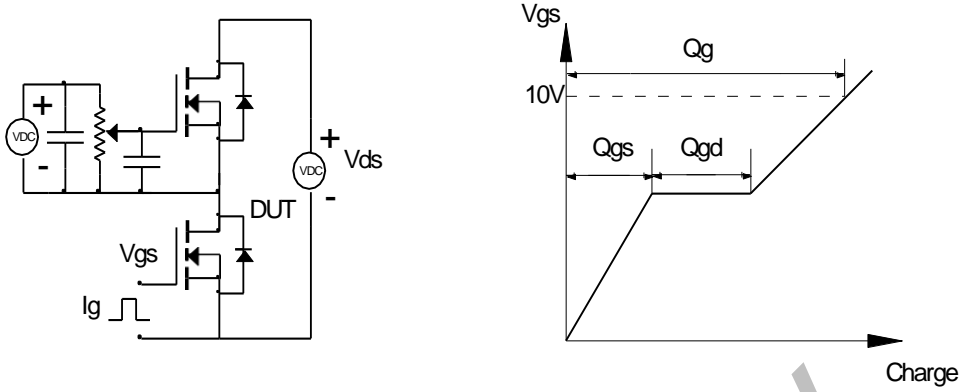


Figure 23. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 800 V$)

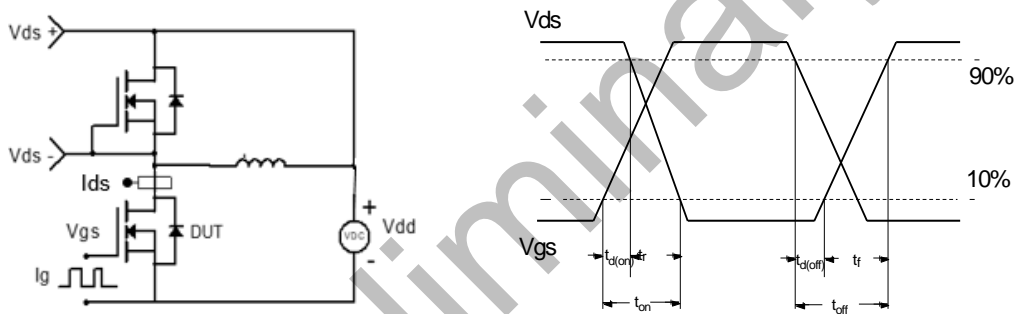
Note4: All figures reference TO 247-3L.

Test Circuit and Waveform

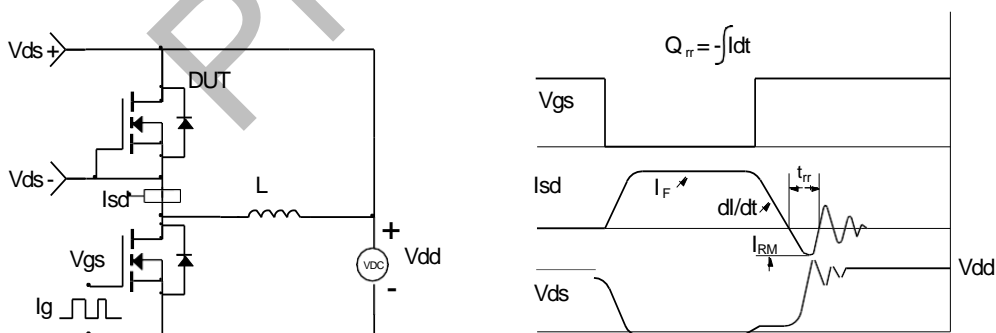
Gate Charge Test Circuit & Waveform



Clamped Inductive Switching Test Circuit & Waveforms

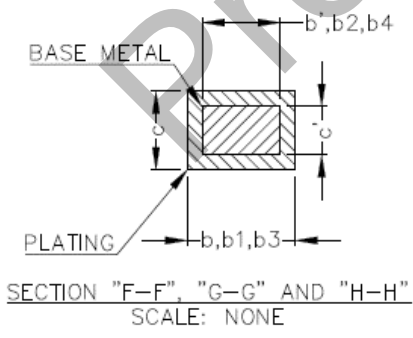
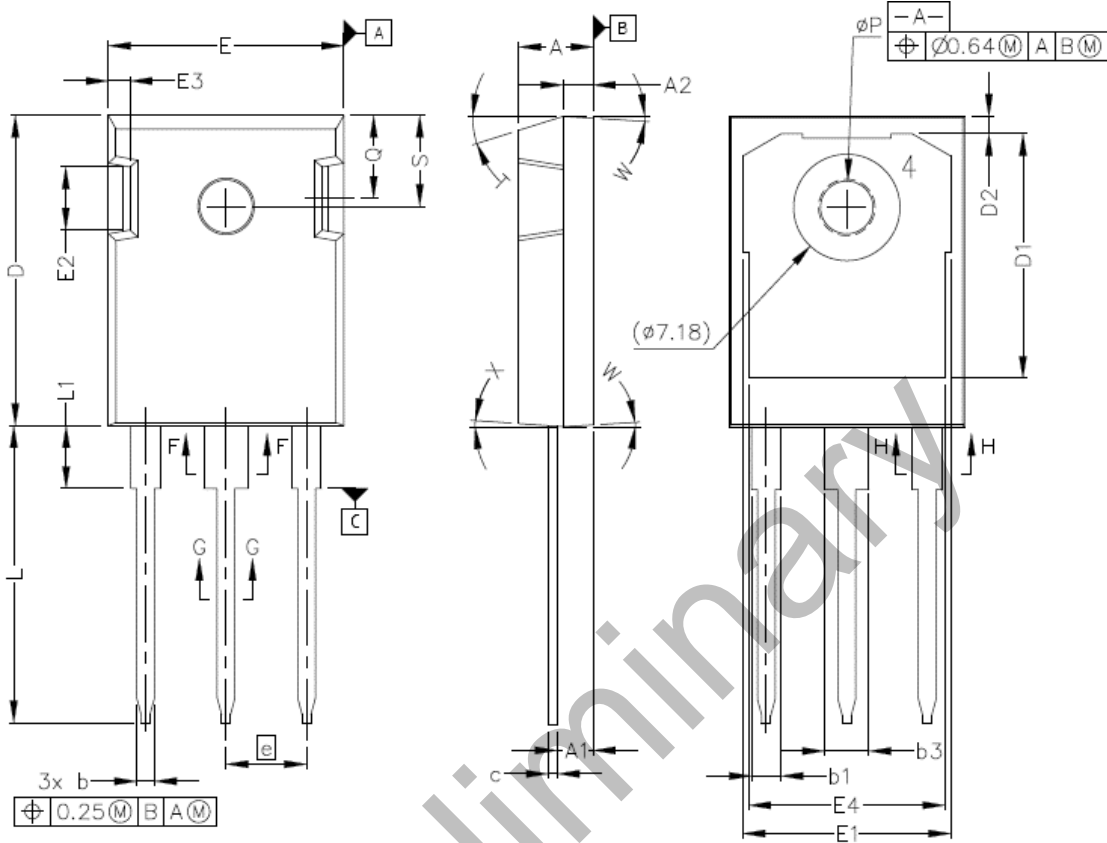


Diode Recovery Test Circuit & Waveforms



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.	

NOTE :
 1. ALL METAL SURFACES: TIN PLATED, EXCEPT AREA OF CUT
 2. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.
 3. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
 4. THIS DRAWING WILL MEET ALL DIMENSIONS REQUIREMENT OF JEDEC outtimes TO-247 AD.

- 1 - GATE
- 2 - DRAIN (COLLECTOR)
- 3 - SOURCE (EMITTER)
- 4 - DRAIN (COLLECTOR)



Revision History:

Revision	Date	Subjects (major changes since last revision)
1.0	2023-11-03	Initial Version

Preliminary

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