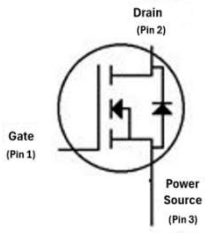
High Power SiC MOSFET Transistor

AMR075V120E2



Applications:

- **Solar Inverters**
- **Uninterrupted power supplies**
- **Switch mode power supplies**
- **Motor drives**

Features:

- **AEC-Q101 qualified**
- **High blocking voltage with low on-resistance**
- **High switching speed with low capacitance**
- **Very low switching losses**
- **Excellent avalanche ruggedness**
- **Very fast and robust intrinsic body diode with low reverse recovery**

Absolute Maximum Ratings (T_{amb}=25°C, unless specified otherwise)

Symbol	Parameter	Value	Unit
V_{DS}	DC Reverse Voltage	1200	V
V_{GSmax}	Gate-source voltage, max. transient voltage	-10/+25	
V_{GSmax}	Gate-source voltage, max. static voltage	-8/+22	
V_{GSop}	Gate-source voltage	-5/+18	
I_D	Continuous drain current (VGS = 18V)	26	A
	Continuous drain current (VGS = 18V), T_C = 100°C	18	
$I_{D(pulse)}$	Pulsed drain current	65	A
P_{tot}	Power dissipation	151	W
T_j	Operating junction temperature	-55 to 175	°C
T_{stg}	Storage temperature	-55 to 175	°C

Thermal and Mechanical Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal Resistance	-	0.83	-	°C/W
$R_{\theta JA}$	Junction-to-ambient thermal Resistance	-	-	40	°C/W

Static Electrical Characteristics (T_A =25°C, unless specified otherwise)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 100μA	1200	-	-	V
$V_{GS(th)}$	Gate-Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 2.5mA	1.8	2.9	4.2	
		V_{DS} = V_{GS}, I_D = 2.5mA, T_j = 175ºC	-	2.2	-	
I_{DSS}	Drain-Source Leakage current	V_{DS} = 1200V, V_{GS} = 0V	-	1	150	μA
I_{GSS}	Gate-Source leakage current	-10V < V_{GS} < 25V	-	1	100	nA
$R_{DS(on)}$	Drain-Source ON Resistance	V_{GS} = 15V, I_D = 18A	-	97	-	mΩ
		V_{GS} = 18V, I_D = 18A	-	75	98	
		V_{GS} = 18V, I_D = 18A, T_j = 175ºC	-	140	-	
g_{fs}	Transconductance	V_{DS} = 20V, I_D = 18A	-	11	-	S
		V_{DS} = 20V, I_D = 18A, T_j = 175ºC	-	10	-	
$R_{g(int)}$	Internal gate resistance	f = 1MHz, V_{AC} = 25mV	-	4.8	-	Ω

Dynamic Characteristics ($T_A = 25$ °C, unless specified otherwise)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 1000V, f = 100kHz, V_{AC} = 25mV	-	815	-	pF
C_{oss}	Output Capacitance		-	38	-	
C_{rss}	Reverse Transfer Capacitance		-	3	-	
E_{oss}	C_{oss} stored energy		-	22	-	μJ
Q_{gs}	Gate-Source Gate Charge	V_{DD} = 800V, V_{GS} = -5/+18V, I_D = 18A, I_{GS} = 1mA	-	12	-	nC
Q_{gd}	Gate-Drain Gate Charge		-	14	-	
Q_g	Total Gate Charge		-	40	-	

Switching Characteristics ($T_A = 25\ °C$, unless specified otherwise)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$T_{d(on)}$	Turn-on delay time	V_{DD} = 800V, V_{GS} = -5/+18V, I_D = 18A, $R_{G(ext)}$ = 2.4Ω, L = 110μH	-	27	-	ns
T_r	Rise time		-	12	-	
$T_{d(off)}$	Turn-off delay time		-	20	-	
T_f	Fall time		-	9	-	
E_{on}	Turn On Switching Energy		-	334	-	μJ
E_{off}	Turn Off Switching Energy		-	25	-	
$T_{d(on)}$	Turn-on delay time	V_{DD} = 800V, V_{GS} = -5/+18V, I_D = 18A, $R_{G(ext)}$ = 2.4Ω, L = 110μH, T_j = 175°C	-	27	-	ns
T_r	Rise time		-	17	-	
$T_{d(off)}$	Turn-off delay time		-	23	-	
T_f	Fall time		-	11	-	
E_{on}	Turn On Switching Energy		-	540	-	μJ
E_{off}	Turn Off Switching Energy		-	29	-	

Body Diode Characteristics ($T_A = 25\ °C$, unless specified otherwise)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_{SD}	Body Diode Forward Voltage	V_{GS} = -5V, I_{SD} = 18A	-	4.8	-	V
		V_{GS} = -5V, I_{SD} = 18A, T_j = 175°C	-	4.2	-	
I_S	Continuous diode forward current	V_{GS} = -5V, T_C = 25°C	-	-	26	A
$I_{S,\ pulse}$	Diode Pulse Current	V_{GS} = -5V, pulse width t_p limited by T_{jmax}		-	65	A
t_{rr}	Reverse recovery time	V_{GS} = -5V, I_{SD} = 18A, V_R = 800V, di_f/dt =3kA/μs	-	28	-	ns
Q_{rr}	Reverse recovery charge		-	0.13		μC
I_{rrm}	Peak reverse recovery current		-	9	-	A
t_{rr}	Reverse recovery time	V_{GS} = -5V, I_{SD} = 18A, V_R = 800V, T_j = 175°C , di_f/dt =3kA/μs	-	34	-	ns
Q_{rr}	Reverse recovery charge		-	0.40		μC
I_{rrm}	Peak reverse recovery current		-	19	-	A

Electrical Characteristic Diagrams

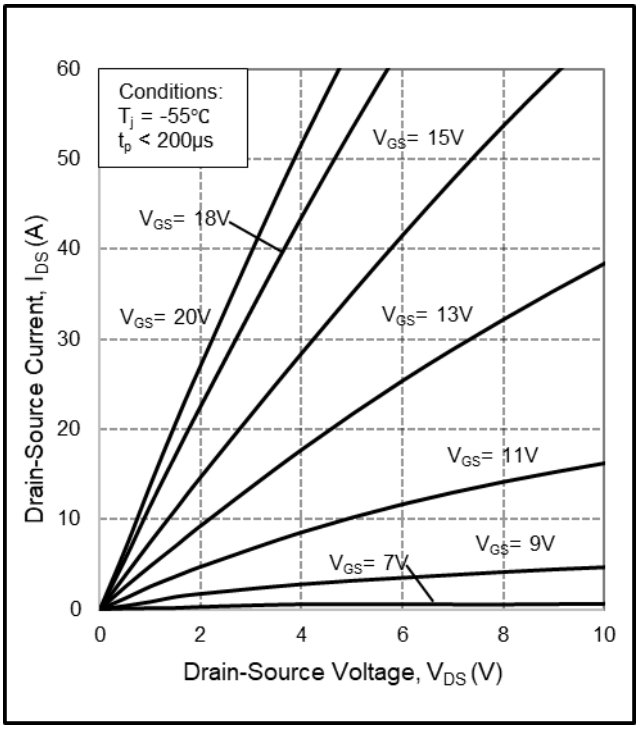


Figure 1. Output characteristics at T_j = -55℃

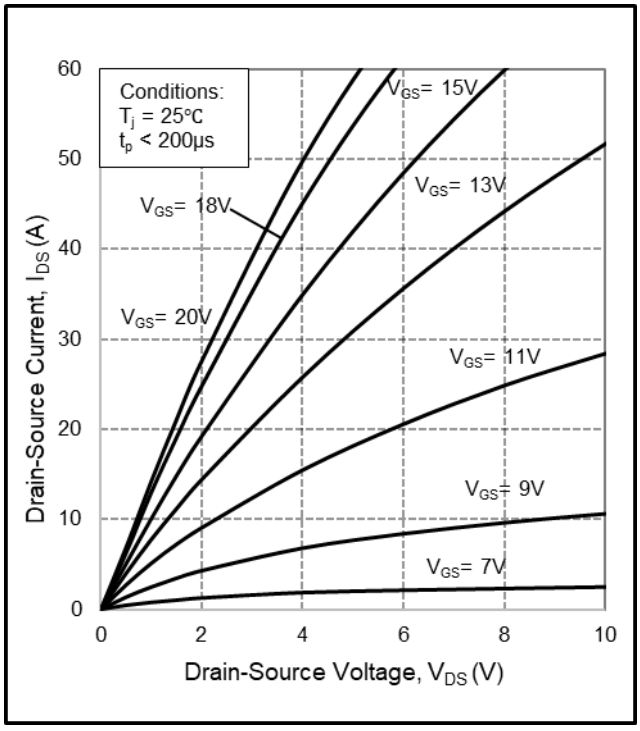


Figure 2. Output characteristics at T_j = 25℃

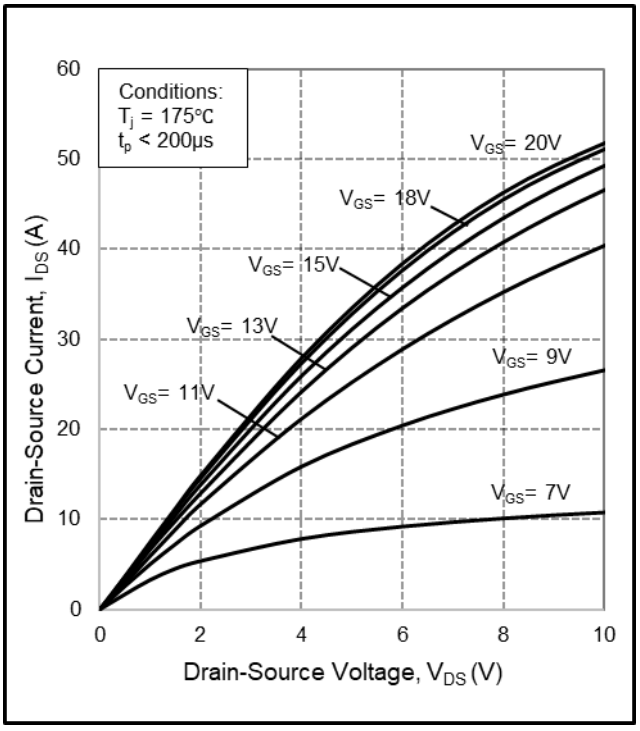


Figure 3. Output characteristics at T_j = 175℃

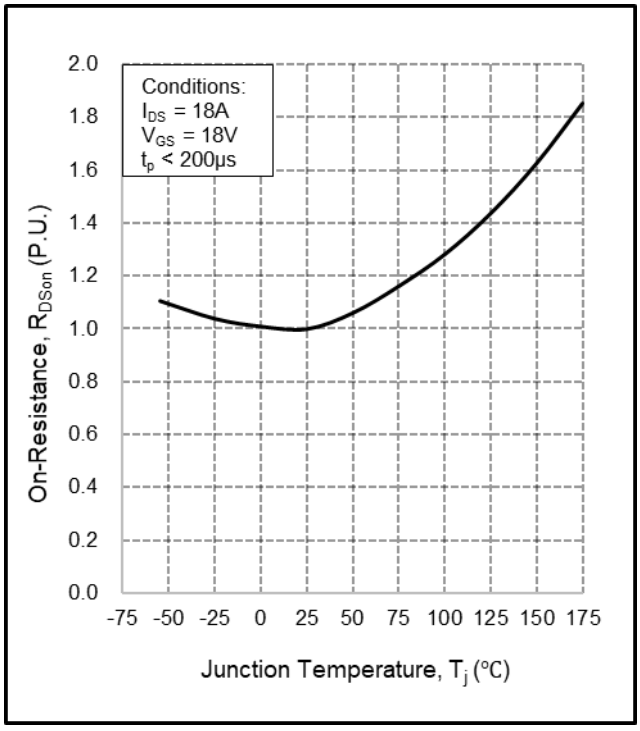


Figure 4. Normalized on-resistance vs. temperature

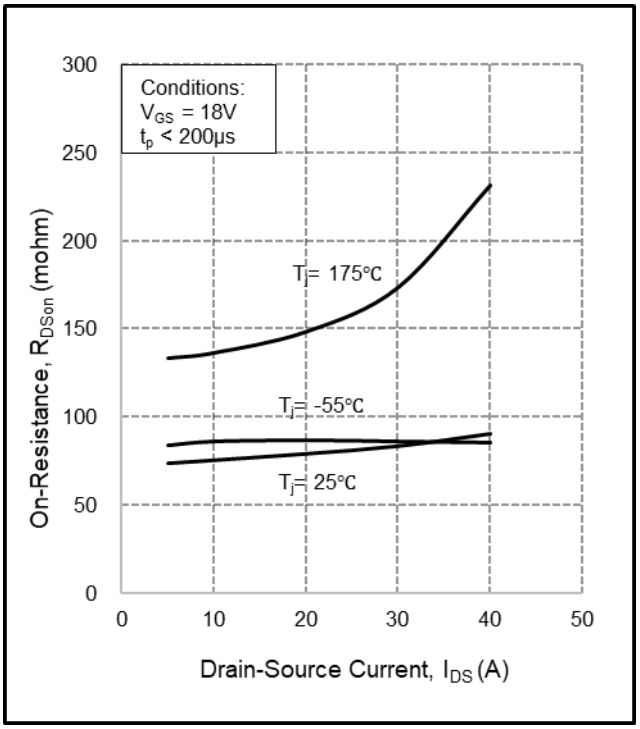


Figure 5. On-resistance vs. drain current
for various temperatures

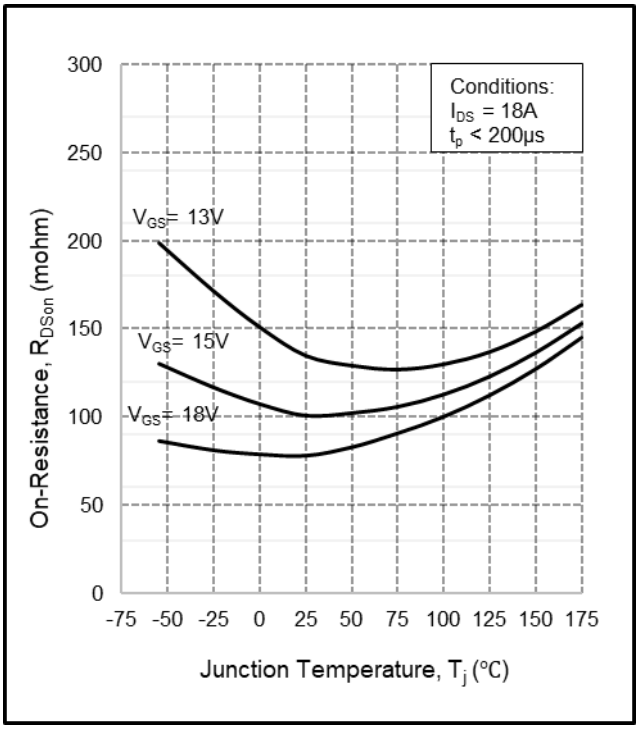


Figure 6. On-resistance vs. temperature
for various gate voltages

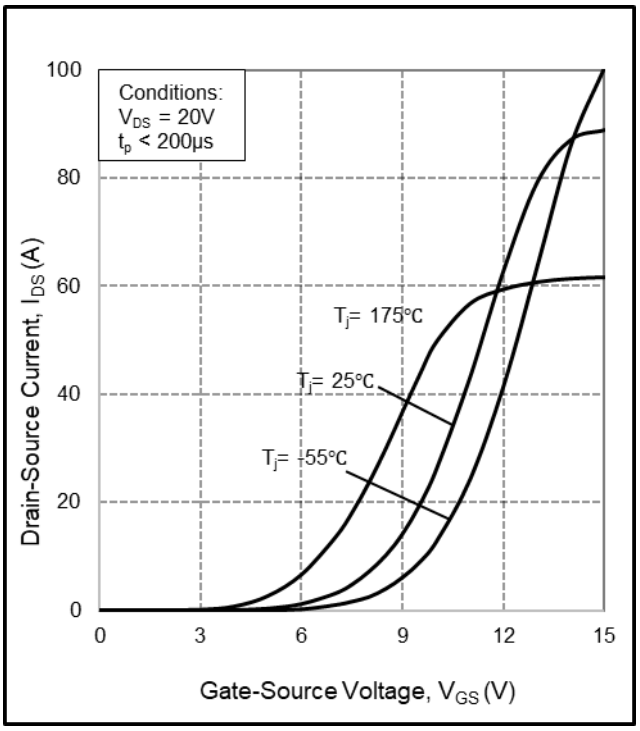


Figure 7. Transfer characteristic
for various junction temperatures

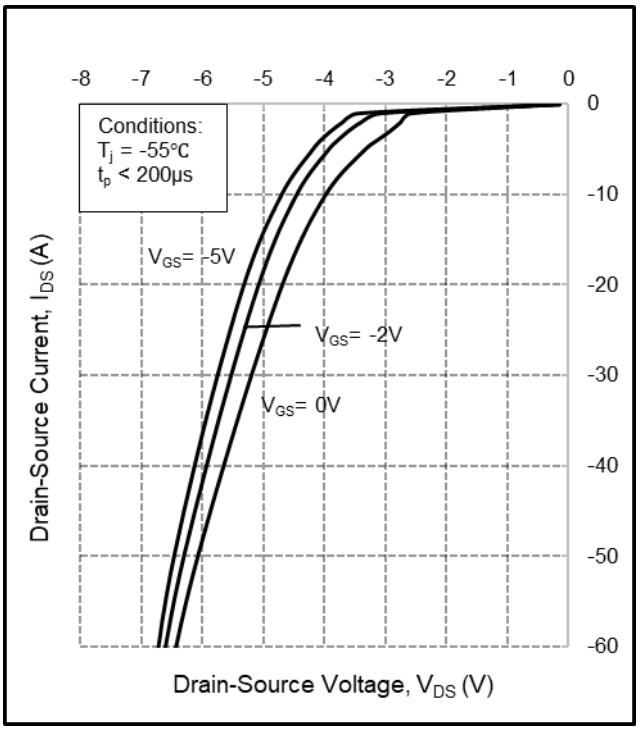


Figure 8. Body diode characteristic at T_j = -55°C

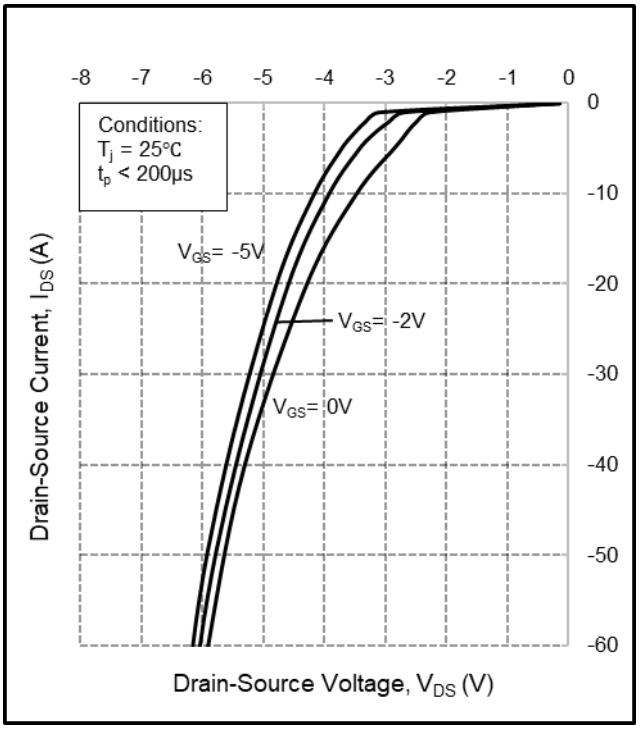


Figure 9. Body diode characteristic at T_j = 25℃

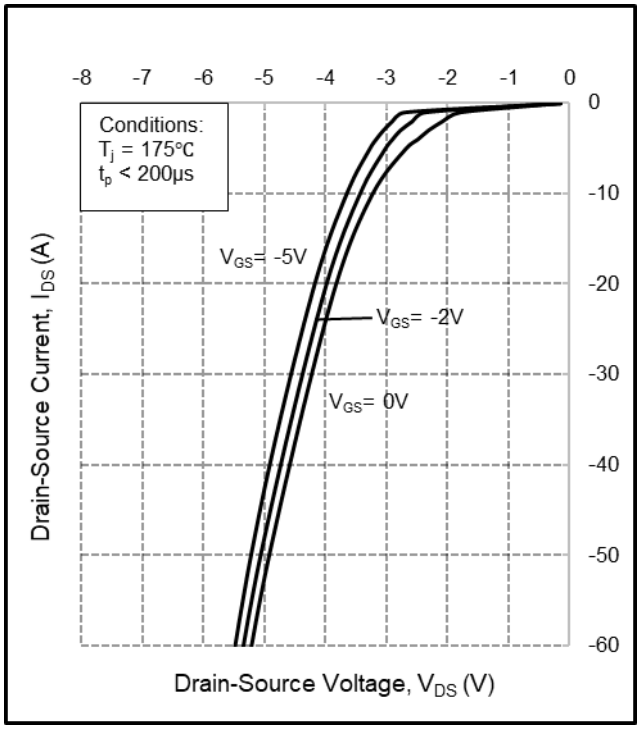


Figure 10. Body diode characteristic at T_j = 175℃

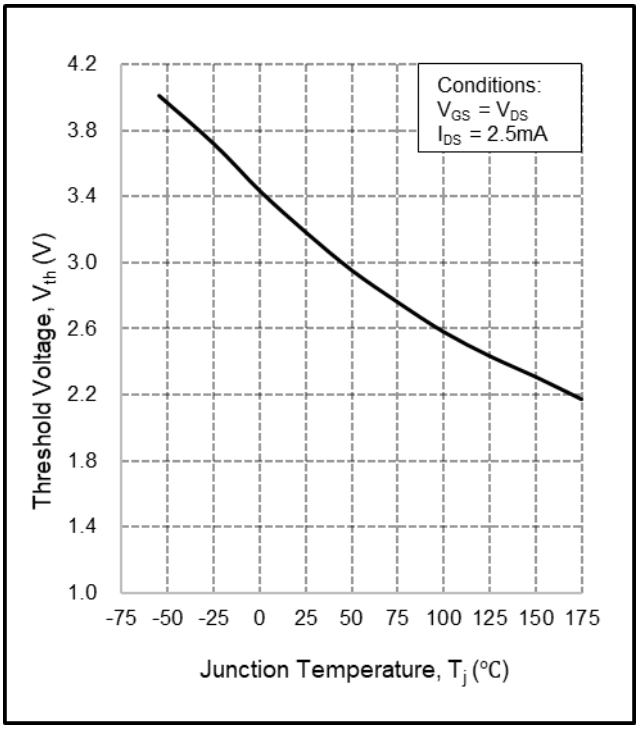


Figure 11. Threshold voltage vs. temperature

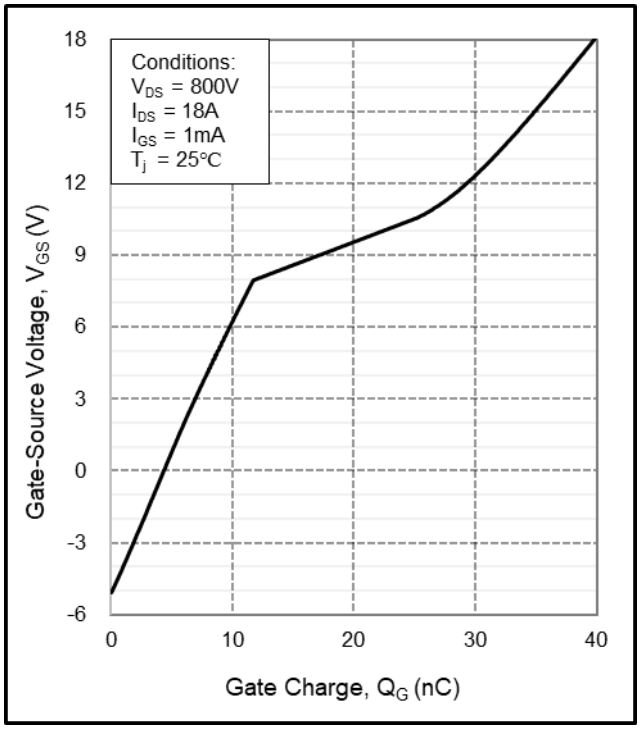


Figure 12. Gate charge characteristics

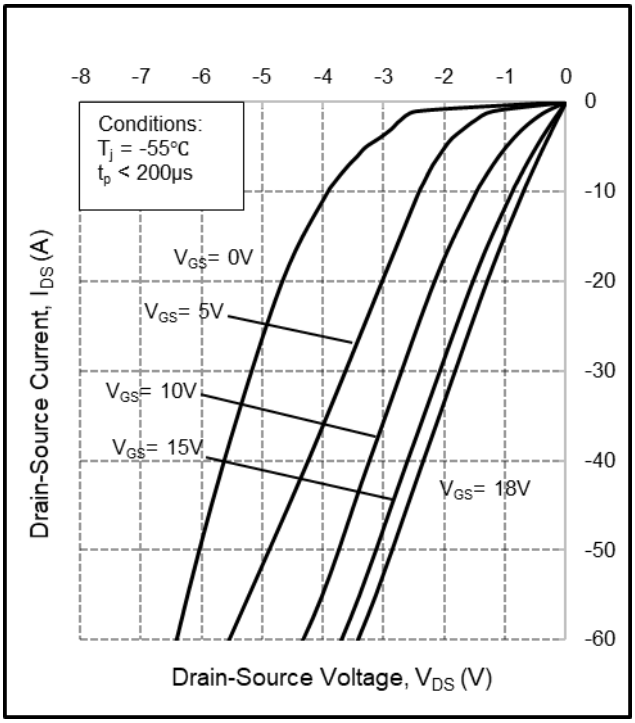


Figure 13. 3rd quadrant characteristic at T_j = -55℃

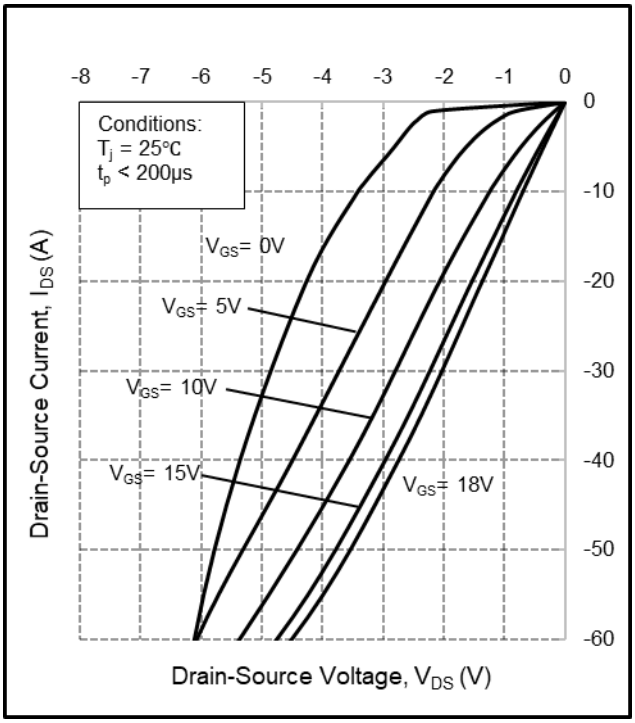


Figure 14. 3rd quadrant characteristic at T_j = 25℃

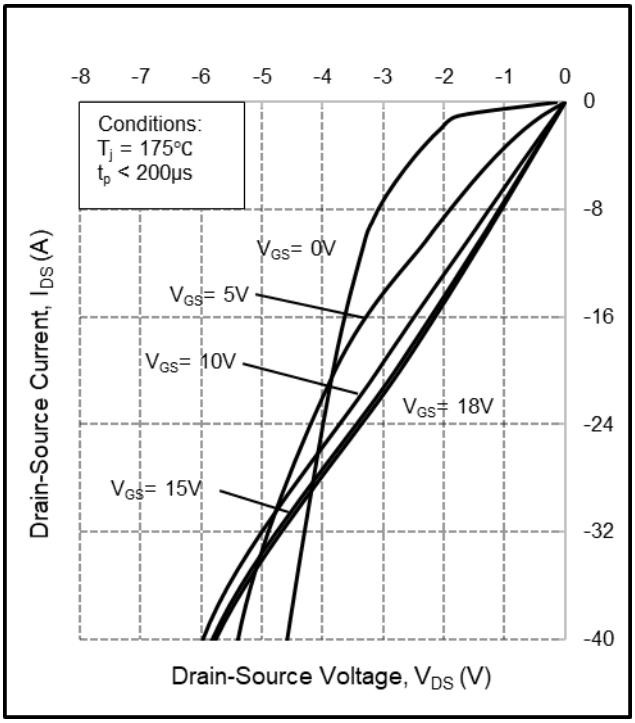


Figure 15. 3rd quadrant characteristic at T_j = 175℃

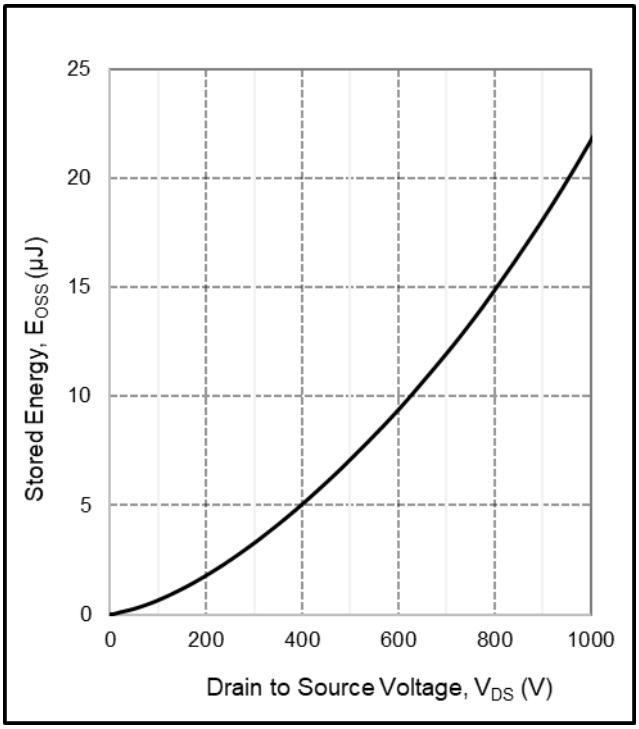


Figure 16. Output capacitor stored energy

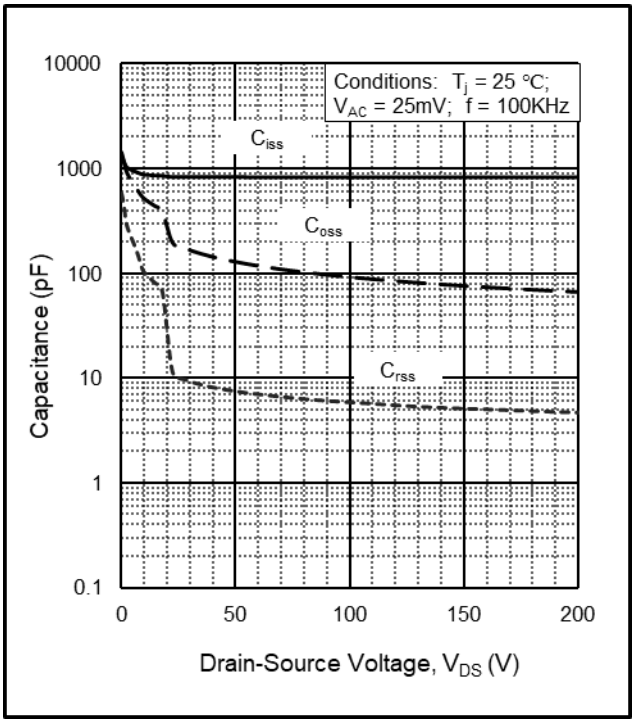


Figure 17. Capacitance vs. drain-source voltage (0 - 200V)

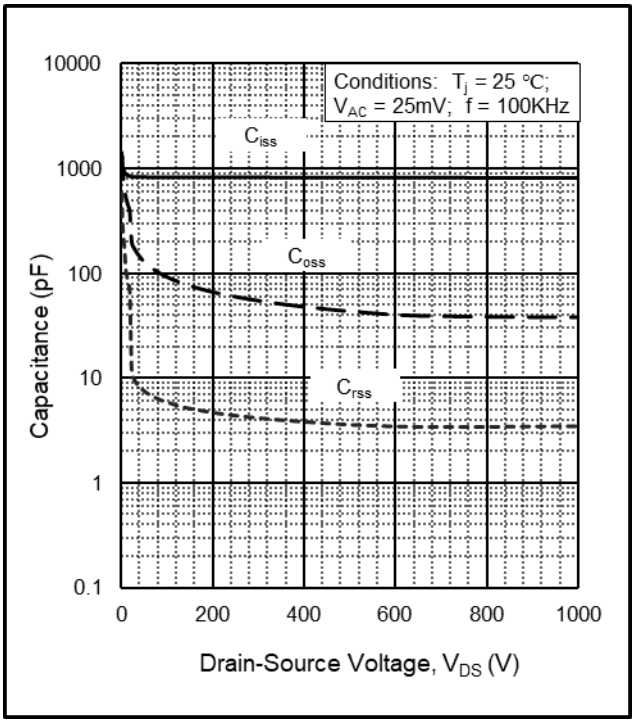


Figure 18. Capacitance vs. drain-source voltage (0 - 1000V)

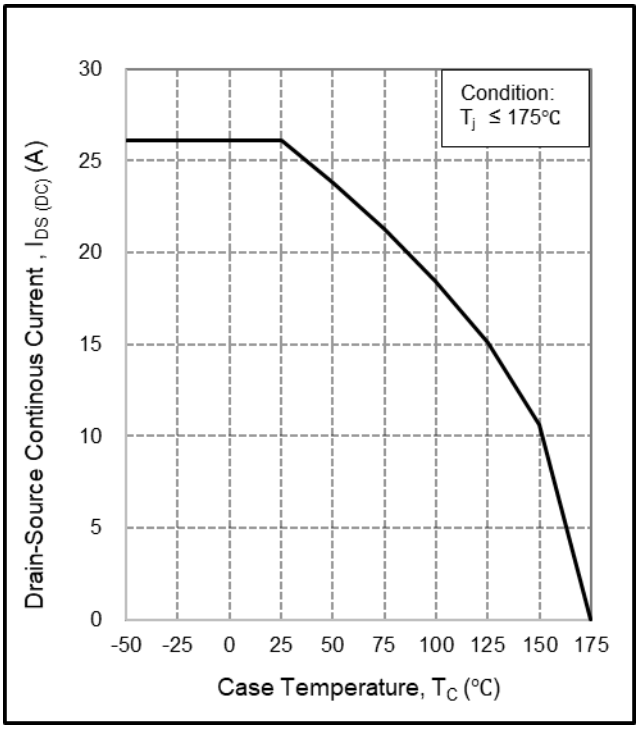


Figure 19. Continuous drain current derating vs. temperature

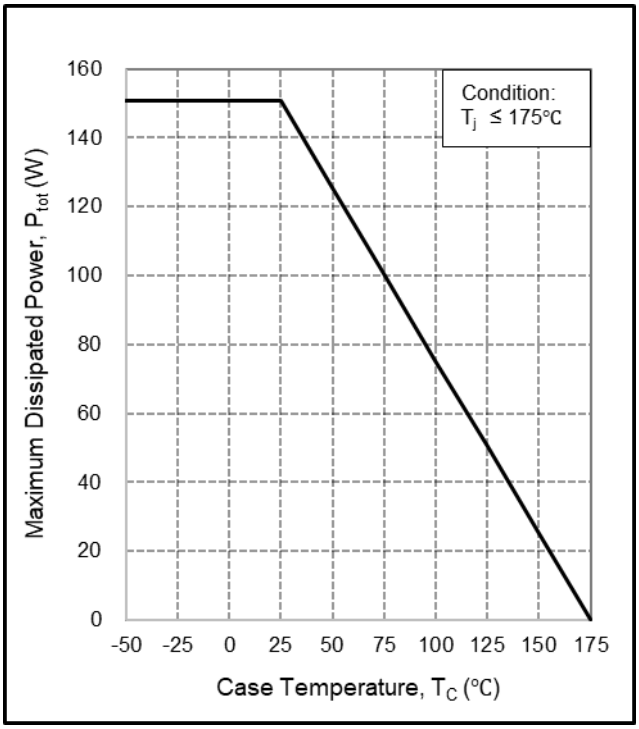


Figure 20. Maximum power dissipation derating vs. temperature

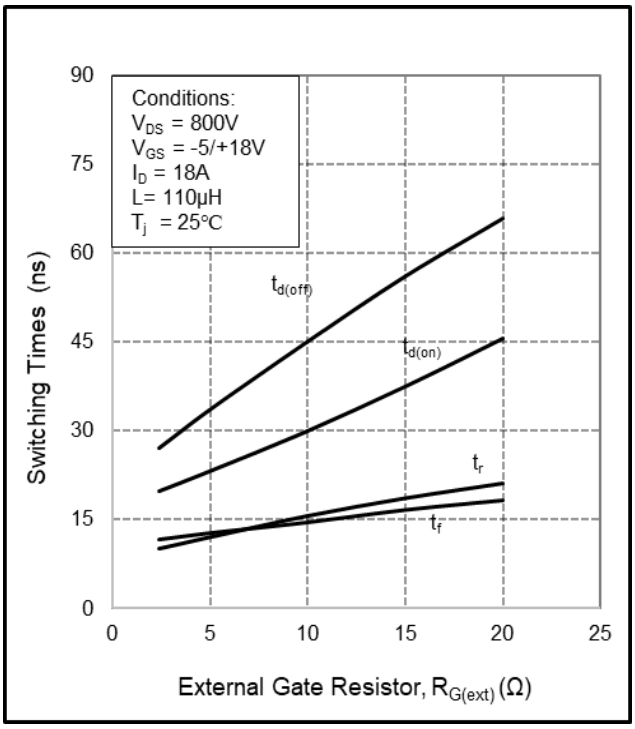


Figure 21. Switching Times vs. $R_{G(ext)}$

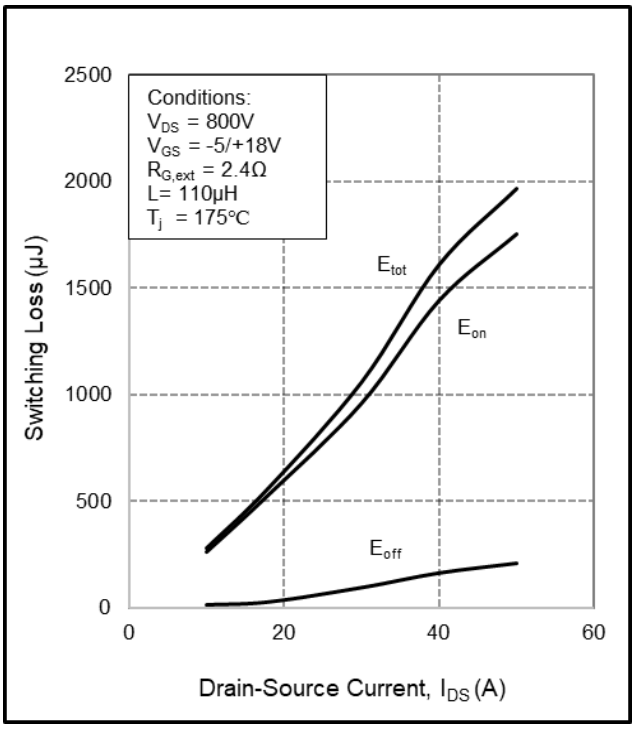


Figure 22. Clamped inductive Switching energy vs. drain current

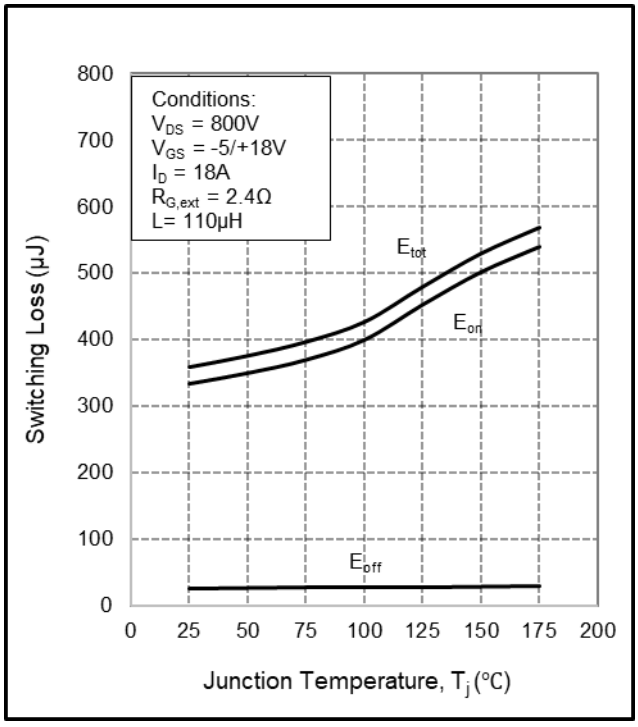


Figure 23. Clamped inductive Switching energy vs. temperature

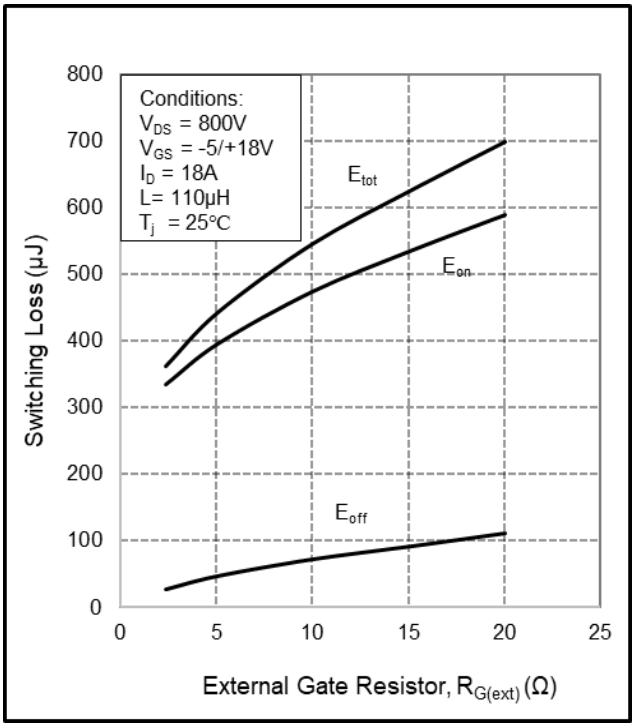


Figure 24. Clamped inductive Switching energy vs. $R_{G(ext)}$

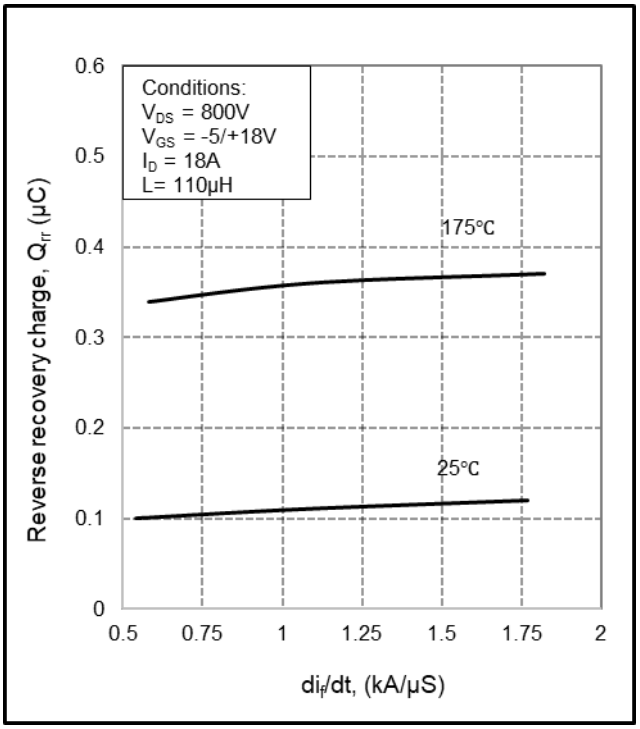


Figure 25. Reverse recovery charge vs. di_f/dt

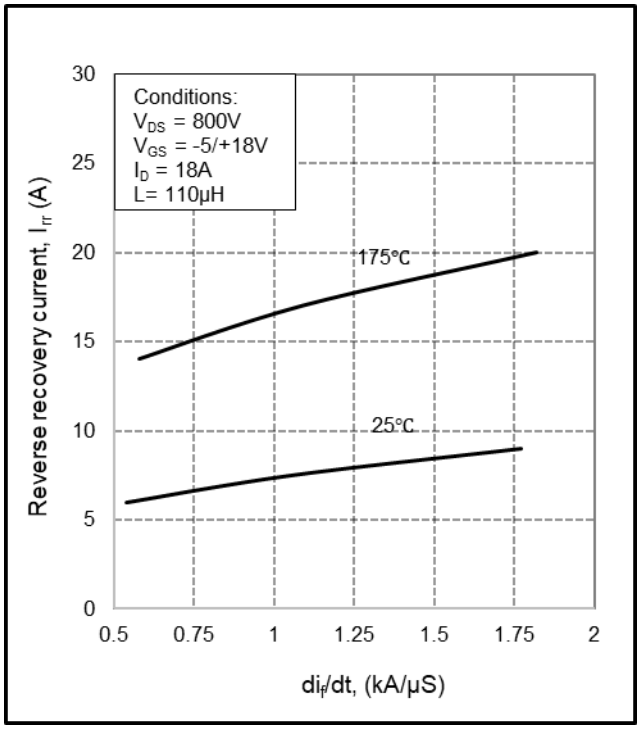


Figure 26. Reverse recovery current vs. di_f/dt

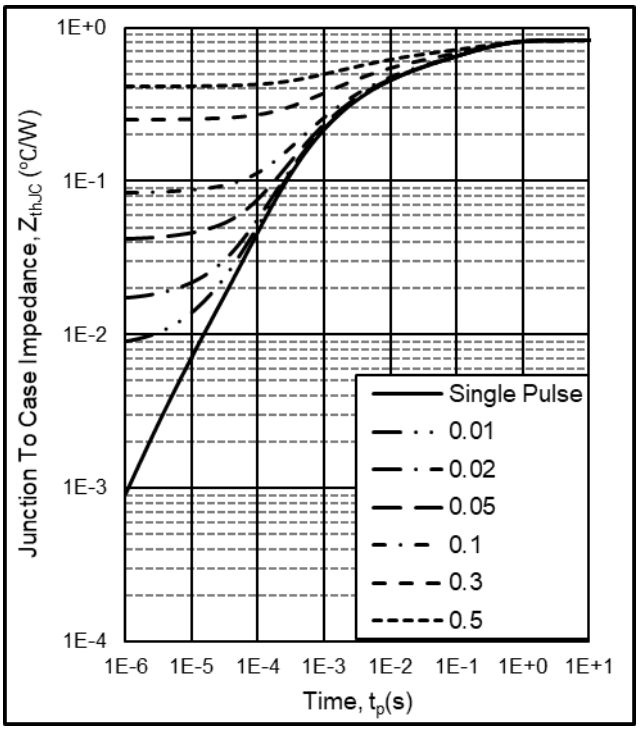


Figure 27. Transient thermal impedance (Junction - Case)

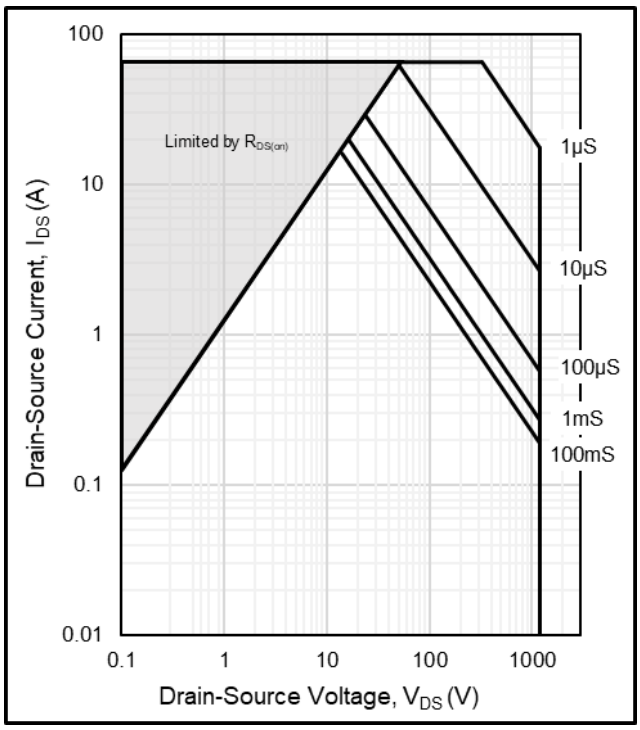


Figure 28. Safe Operating Area

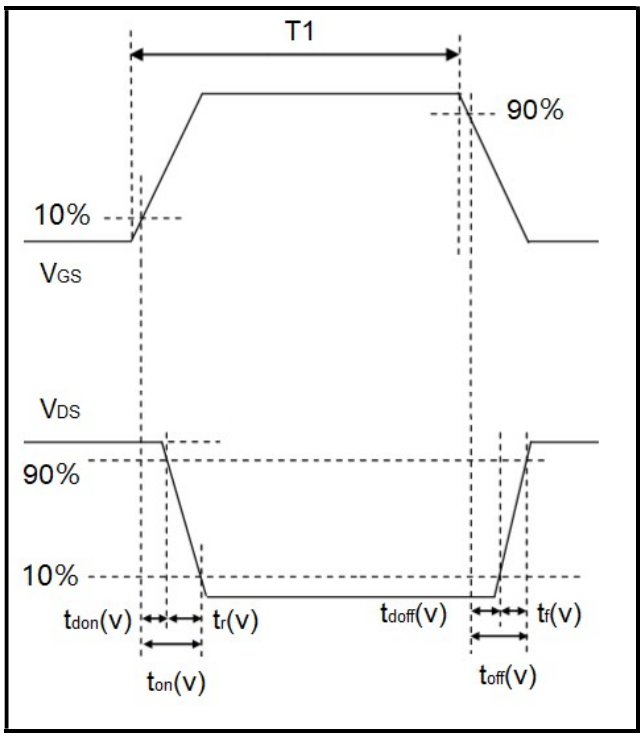


Figure 29. Switching times definition

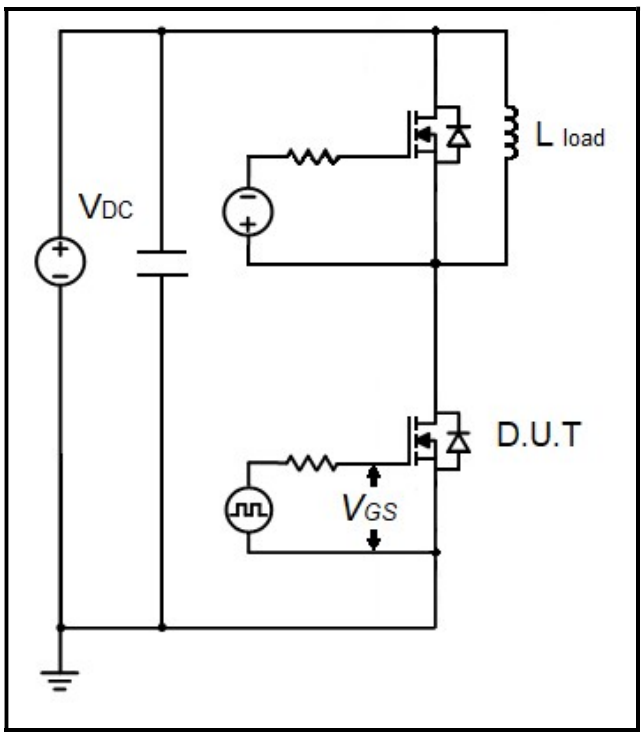
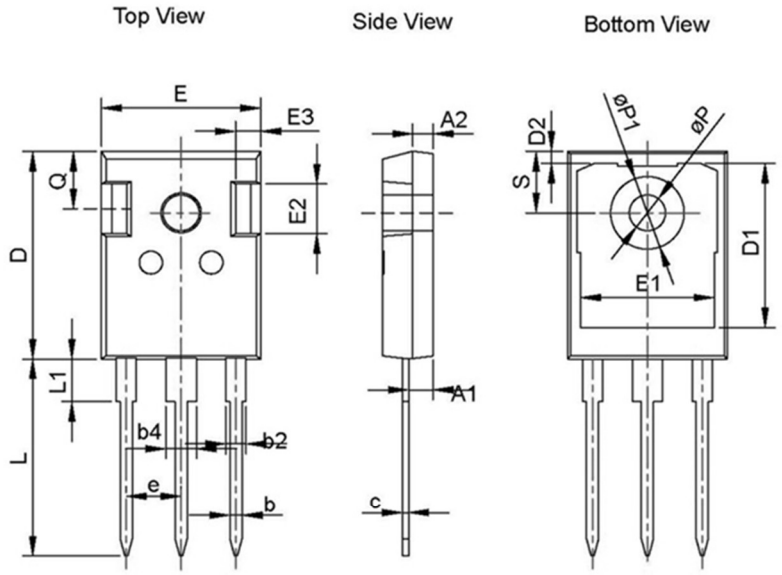
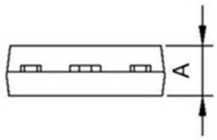


Figure 30. Clamped inductive switching waveform test circuit

Package Information:



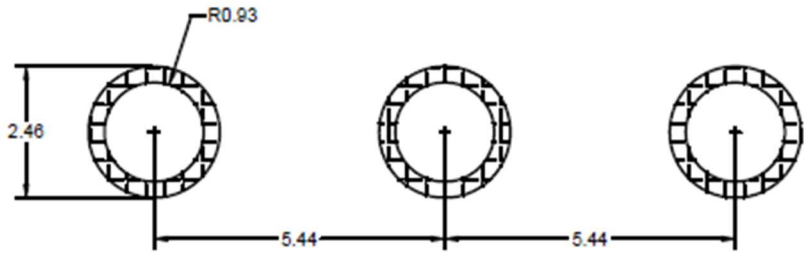
Front View



Dimension unit: [mm]			
Symbol	Min	Nom	Max
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.60	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
D2	1.00	1.20	1.35
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44 BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
øP	3.40	3.60	3.80
øP1	-	-	7.30
Q	5.40	5.80	6.20
S	6.20 BSC		

Recommended Solder Pad Layout

Note: All dimensions are in mm



TO-247-3L

Ordering Information

Part number	AMR075V120E2
Package	TO-247-3L
Unit quantity	300 EA
Packing type	Tube