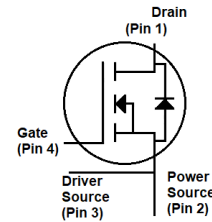




High Power SiC MOSFET Transistor

AAR030V120H2



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 ($T_{amb}=25^{\circ}\text{C}$, 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 ($V_{GS} = 18\text{V}$)	57	A
	Continuous drain current ($V_{GS} = 18\text{V}$, $T_C = 100^{\circ}\text{C}$)	41	
$I_{D(pulse)}$	Pulsed drain current	143	A
P_{tot}	Power dissipation	278	W
T_j	Operating junction temperature	-55 to 175	$^{\circ}\text{C}$
T_{stg}	Storage temperature	-55 to 175	$^{\circ}\text{C}$

Thermal and Mechanical Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal Resistance	-	0.45	-	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Junction-to-ambient thermal Resistance	-	-	40	$^{\circ}\text{C/W}$

Static Electrical Characteristics ($T_A = 25^\circ\text{C}$, unless specified otherwise)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
BV_{DSS}	Drain-Source breakdown voltage	$V_{GS} = 0V, I_D = 100\mu A$	1200	-	-	V
$V_{GS(th)}$	Gate-Source threshold voltage	$V_{DS} = V_{GS}, I_D = 10mA$	1.8	3.2	4.2	
		$V_{DS} = V_{GS}, I_D = 10mA, T_J = 175^\circ\text{C}$	-	2.4	-	
I_{DSS}	Drain-Source leakage current	$V_{DS} = 1200V, V_{GS} = 0V$	-	1	150	μA
I_{GSS}	Gate-Source leakage current	$V_{GS} = 18V, V_{DS} = 0V$	-	1	250	nA
$R_{DS(on)}$	Drain-Source ON Resistance	$V_{GS} = 15V, I_D = 40A$	-	37	-	m Ω
		$V_{GS} = 18V, I_D = 40A$	-	30	42	
		$V_{GS} = 18V, I_D = 40A, T_J = 175^\circ\text{C}$	-	53	-	
g_{fs}	Transconductance	$V_{DS} = 20V, I_D = 40A$	-	24	-	S
		$V_{DS} = 20V, I_D = 40A, T_J = 175^\circ\text{C}$	-	20	-	
$R_{g(int)}$	Internal gate resistance	$f = 1MHz, V_{AC} = 25mV$	-	3.6	-	Ω

Dynamic Characteristics ($T_A = 25^\circ\text{C}$, unless specified otherwise)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 1000V, f = 100kHz, V_{AC} = 25mV$	-	2090	-	pF
C_{oss}	Output Capacitance		-	86	-	
C_{rss}	Reverse Transfer Capacitance		-	5	-	
E_{oss}	C_{oss} stored energy		-	50	-	μJ
Q_{gs}	Gate-Source Gate Charge	$V_{DD} = 800V, V_{GS} = -5/+18V, I_D = 40A, I_{GS} = 1mA$	-	30	-	nC
Q_{gd}	Gate-Drain Gate Charge		-	27	-	
Q_g	Total Gate Charge		-	91	-	

Switching Characteristics ($T_A = 25^\circ\text{C}$, unless specified otherwise)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$T_{d(on)}$	Turn-on delay time	$V_{DD} = 800V$, $V_{GS} = -5/+18V$, $I_D = 40A$, $R_{G(ext)} = 2.4\Omega$, $L = 110\mu H$	-	12	-	ns
T_r	Rise time		-	17	-	
$T_{d(off)}$	Turn-off delay time		-	30	-	
T_f	Fall time		-	7	-	
E_{on}	Turn On switching energy	$V_{DD} = 800V$, $V_{GS} = -5/+18V$, $I_D = 40A$, $R_{G(ext)} = 2.4\Omega$, $L = 110\mu H$, $T_j = 175^\circ\text{C}$	-	353	-	μJ
E_{off}	Turn Off switching energy		-	35	-	
$T_{d(on)}$	Turn-on delay time		-	11	-	ns
T_r	Rise time		-	21	-	
$T_{d(off)}$	Turn-off delay time		-	37	-	
T_f	Fall time		-	8	-	
E_{on}	Turn on switching energy		-	504	-	μJ
E_{off}	Turn off switching energy		-	40	-	

Body Diode Characteristics ($T_A = 25^\circ\text{C}$, unless specified otherwise)

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_{SD}	Body diode forward voltage	$V_{GS} = -5V$, $I_{SD} = 40A$	-	4.6	-	V
		$V_{GS} = -5V$, $I_{SD} = 40A$, $T_j = 175^\circ\text{C}$	-	4.0	-	
I_S	Continuous diode forward current	$T_C = 25^\circ\text{C}$	-	-	57	A
$I_{S, pulse}$	Diode Pulse Current	$V_{GS} = -5V$, pulse width t_p limited by T_{jmax}		-	143	A
t_{rr}	Reverse recovery time	$V_{GS} = -5V$, $I_{SD} = 40A$, $V_R = 800V$, $di_f/dt = 3.08kA/\mu s$	-	13	-	ns
Q_{rr}	Reverse recovery charge		-	0.28		μC
I_{rrm}	Peak reverse recovery current		-	36	-	A
t_{rr}	Reverse recovery time	$V_{GS} = -5V$, $I_{SD} = 40A$, $V_R = 800V$, $T_j = 175^\circ\text{C}$, $di_f/dt = 3.19kA/\mu s$	-	23	-	ns
Q_{rr}	Reverse recovery charge		-	0.84		μC
I_{rrm}	Peak reverse recovery current		-	60	-	A

Electrical Characteristic Diagrams

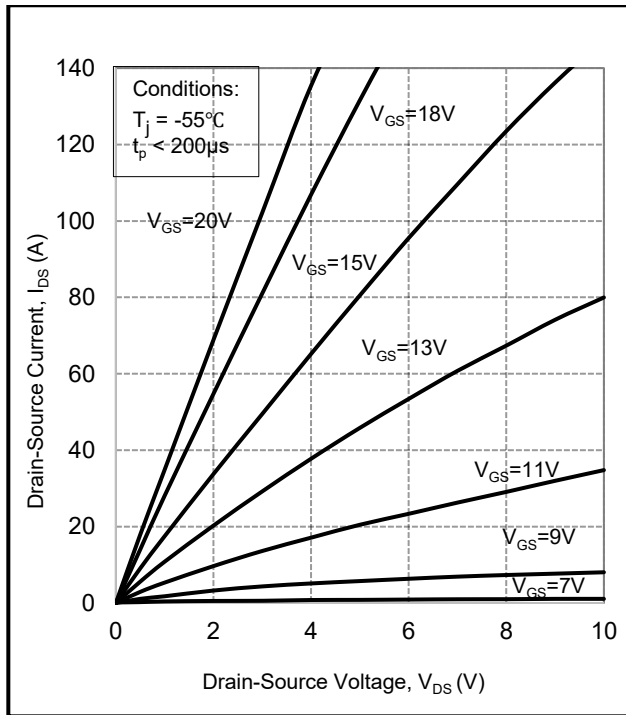
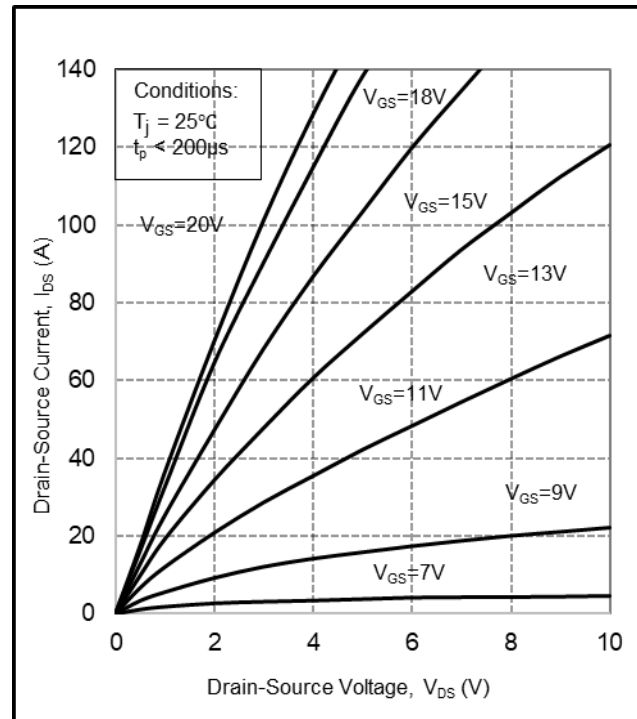
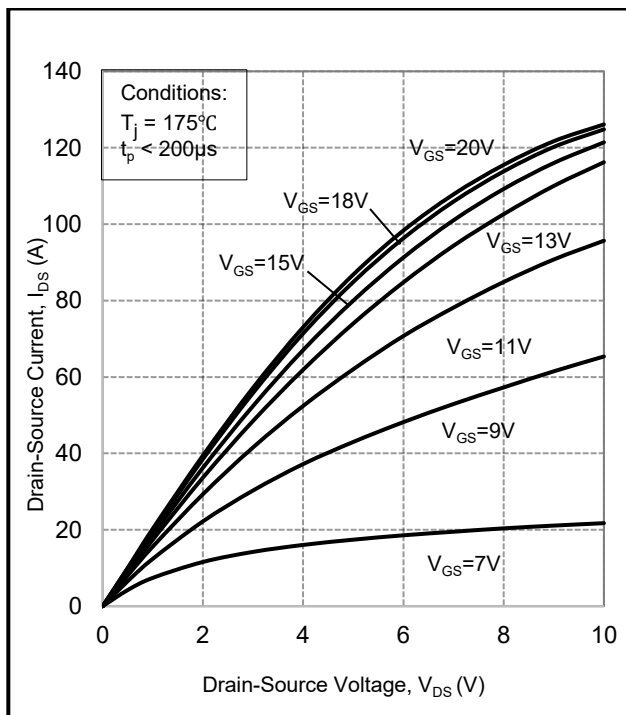
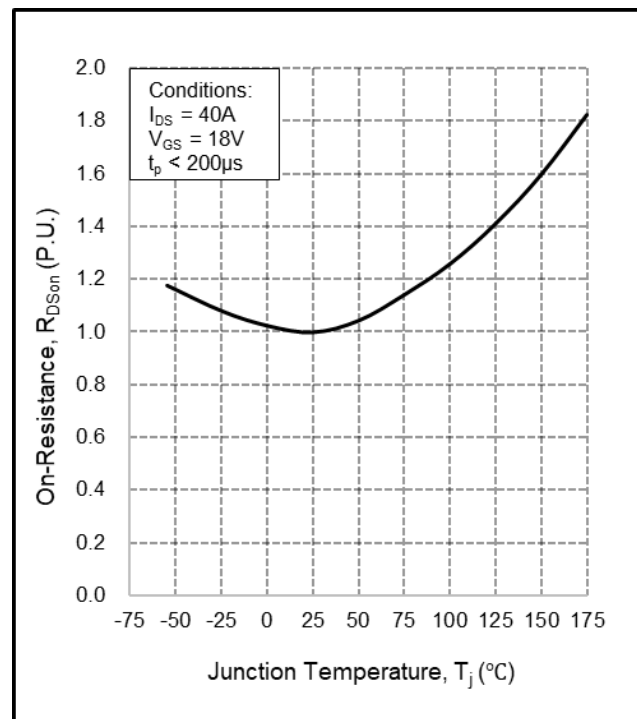
Figure 1. Output characteristics at $T_j = -55^\circ\text{C}$ Figure 2. Output characteristics at $T_j = 25^\circ\text{C}$ Figure 3. Output characteristics at $T_j = 175^\circ\text{C}$ 

Figure 4. Normalized on-resistance vs. temperature

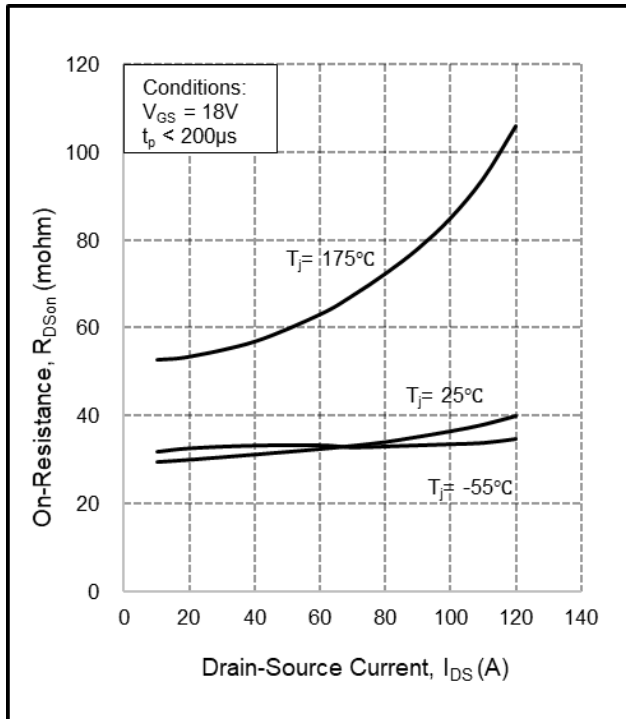


Figure 5. On-resistance vs. drain current for various temperatures

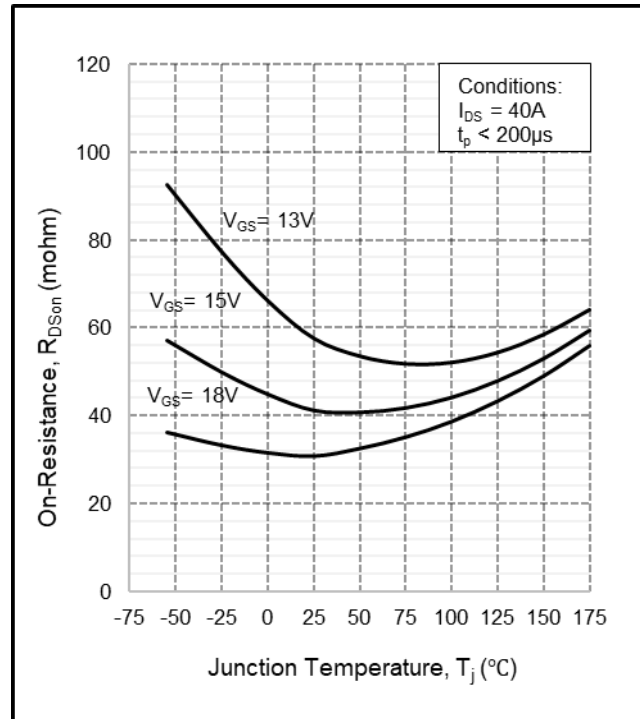


Figure 6. On-resistance vs. temperature for various gate voltages

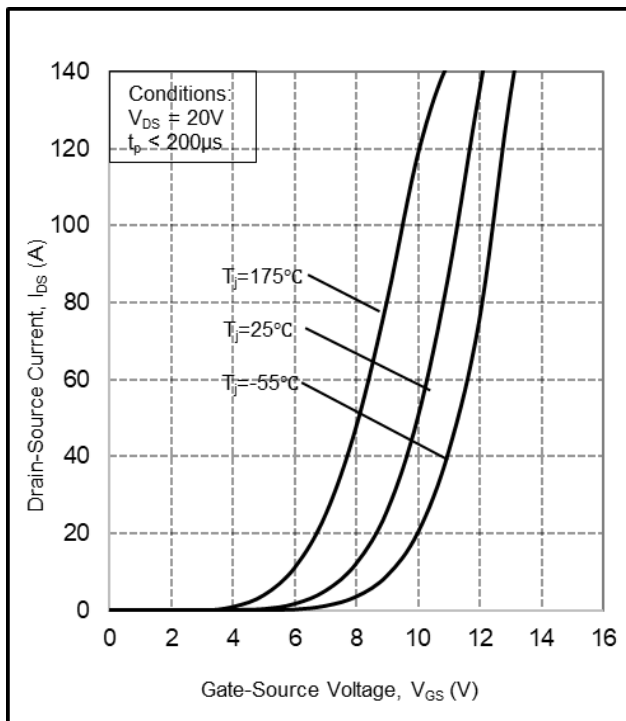


Figure 7. Transfer characteristic for various junction temperatures

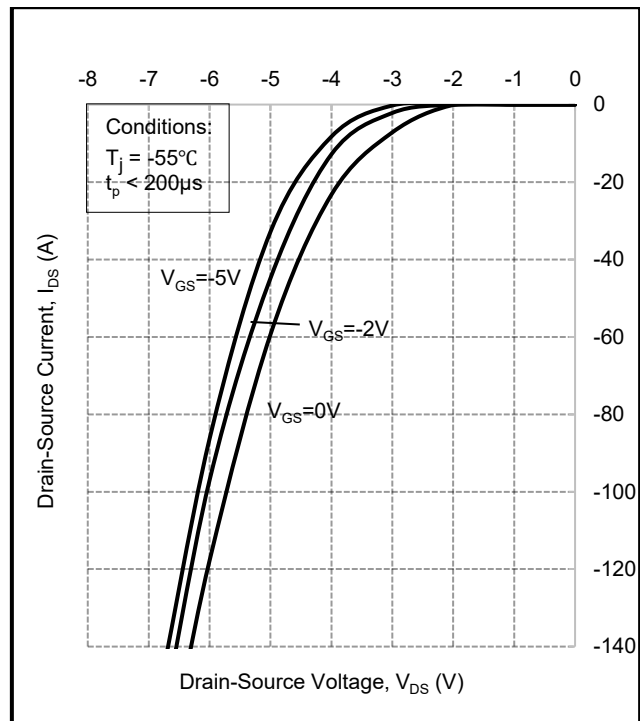


Figure 8. Body diode characteristic at $T_J = -55^\circ\text{C}$

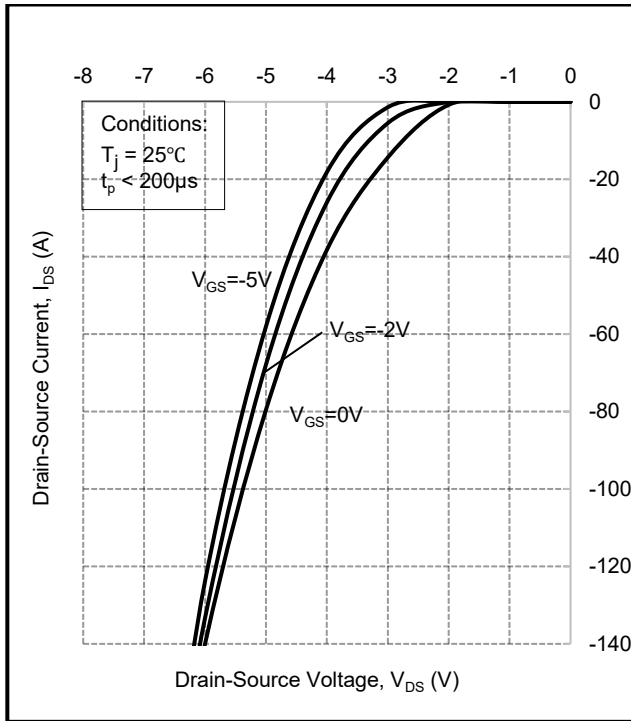
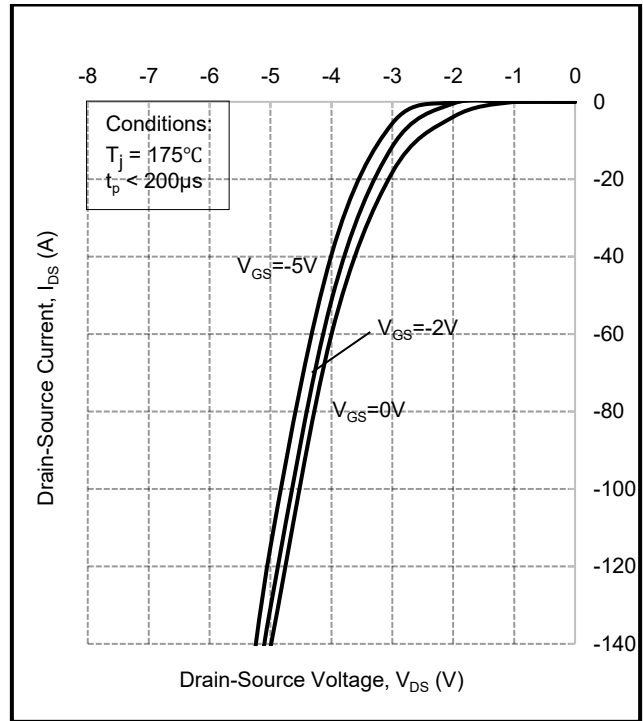
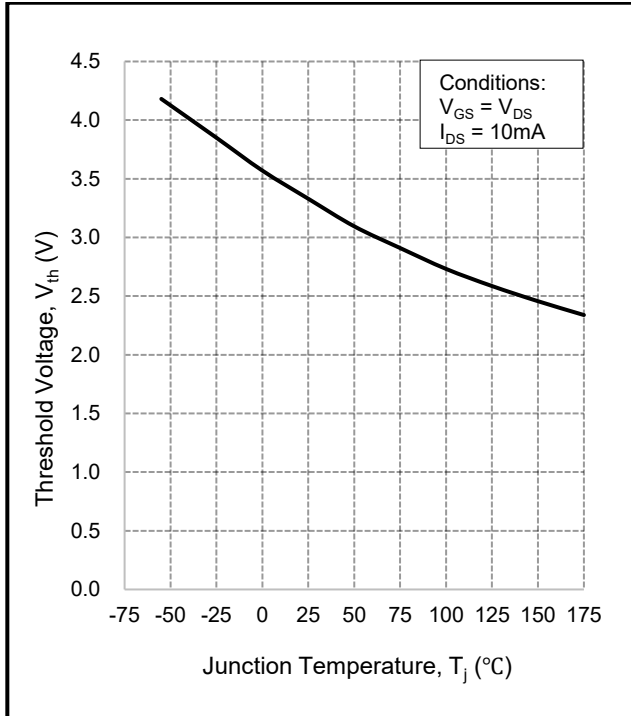
Figure 9. Body diode characteristic at $T_j = 25^\circ\text{C}$ Figure 10. Body diode characteristic at $T_j = 175^\circ\text{C}$ 

Figure 11. Threshold voltage vs. temperature

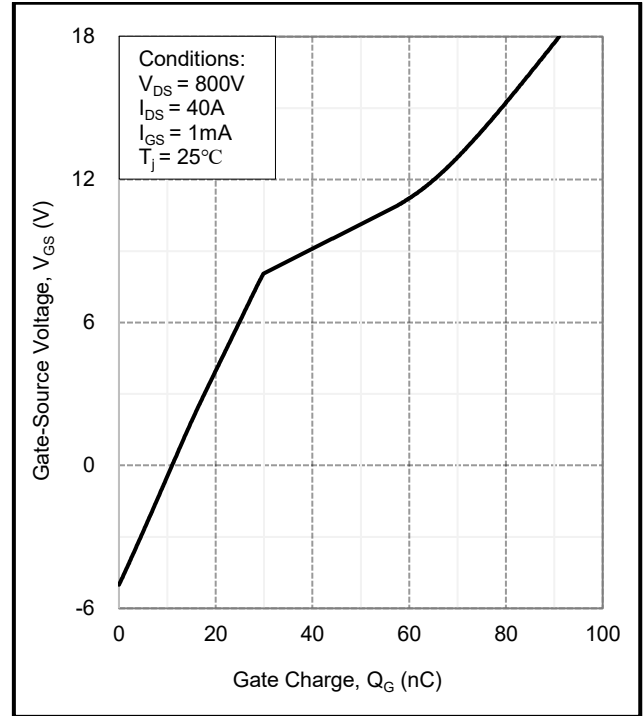


Figure 12. Gate charge characteristics

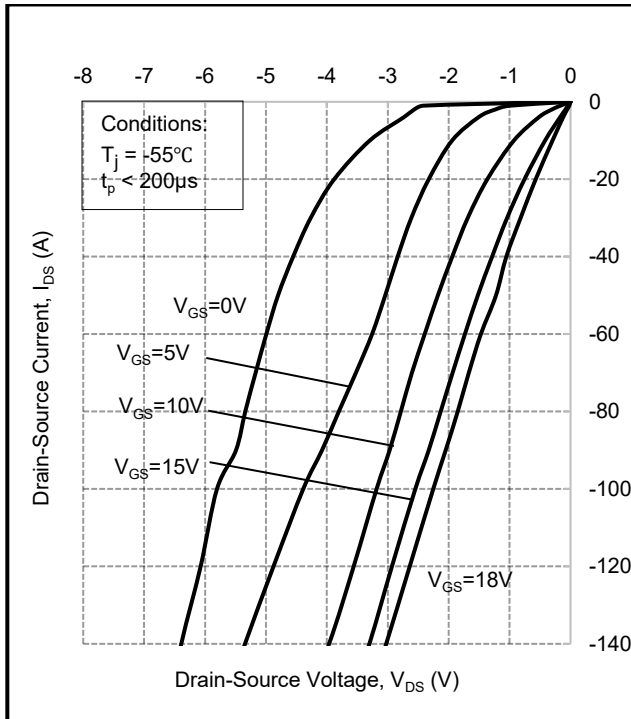


Figure 13. 3rd quadrant characteristic
at $T_j = -55^\circ\text{C}$

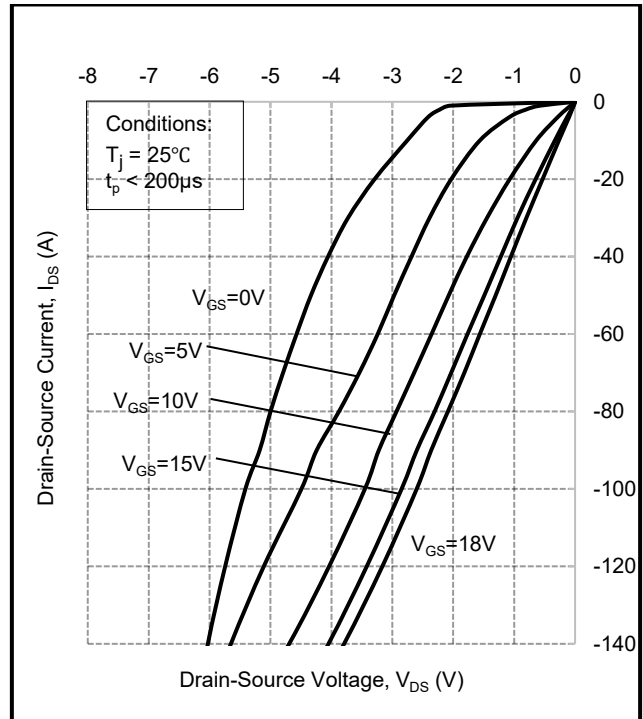


Figure 14. 3rd quadrant characteristic
at $T_j = 25^\circ\text{C}$

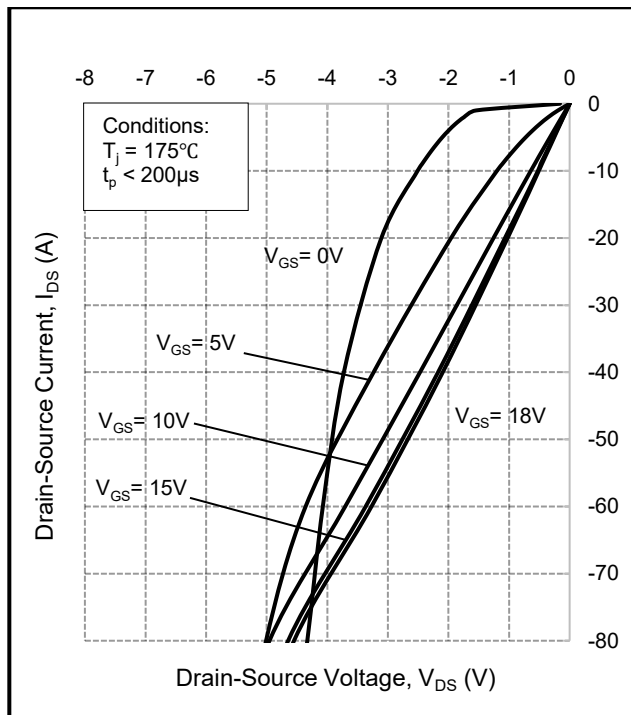


Figure 15. 3rd quadrant characteristic
at $T_j = 175^\circ\text{C}$

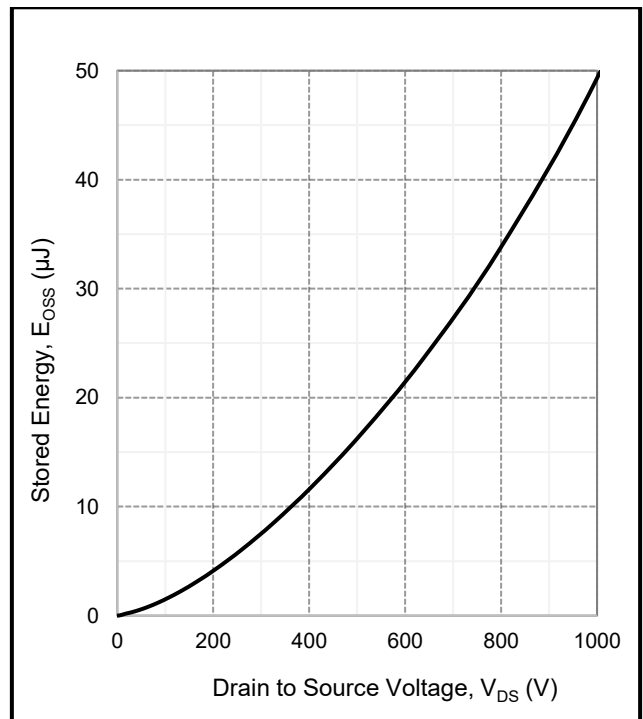


Figure 16. Output capacitor stored energy

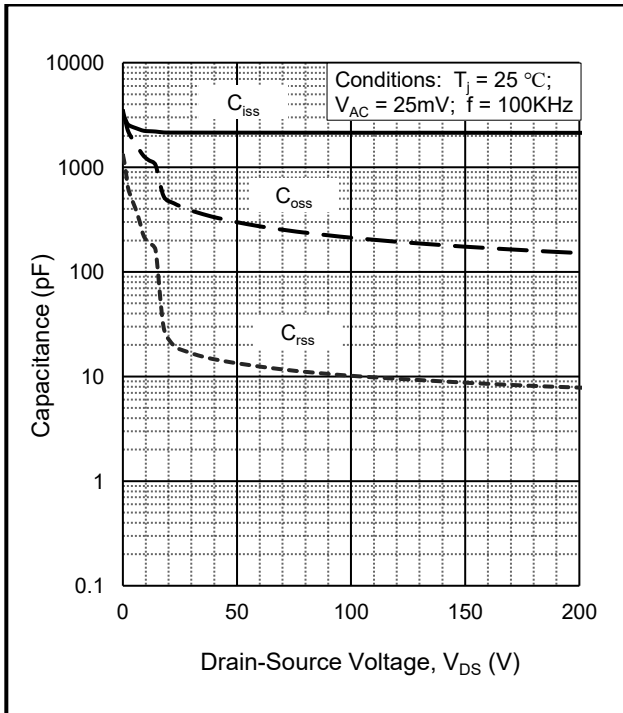


Figure 17. Capacitance vs. drain-source voltage (0 - 200V)

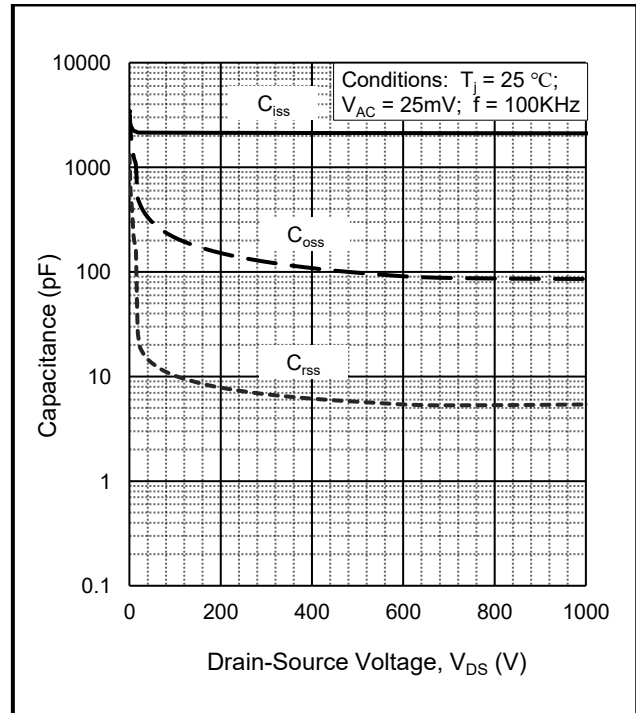


Figure 18. Capacitance vs. drain-source voltage (0 - 1000V)

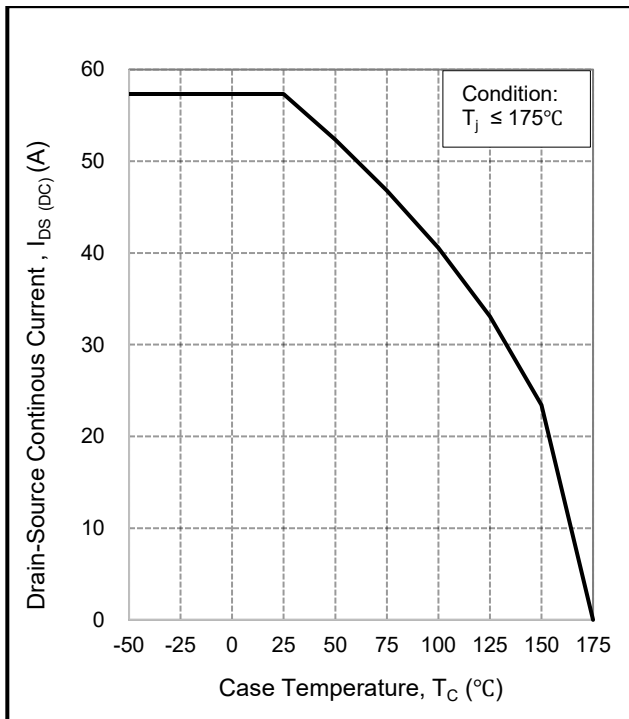


Figure 19. Continuous drain current derating vs. temperature

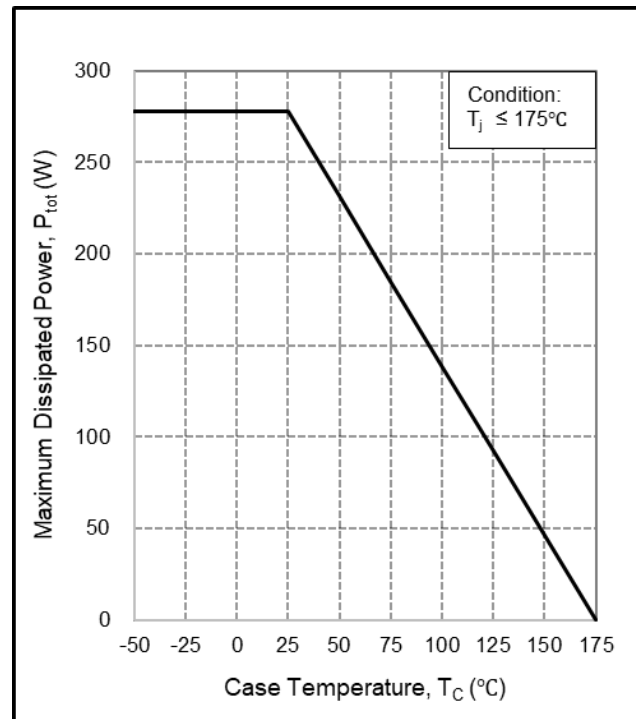


Figure 20. Maximum power dissipation derating vs. temperature

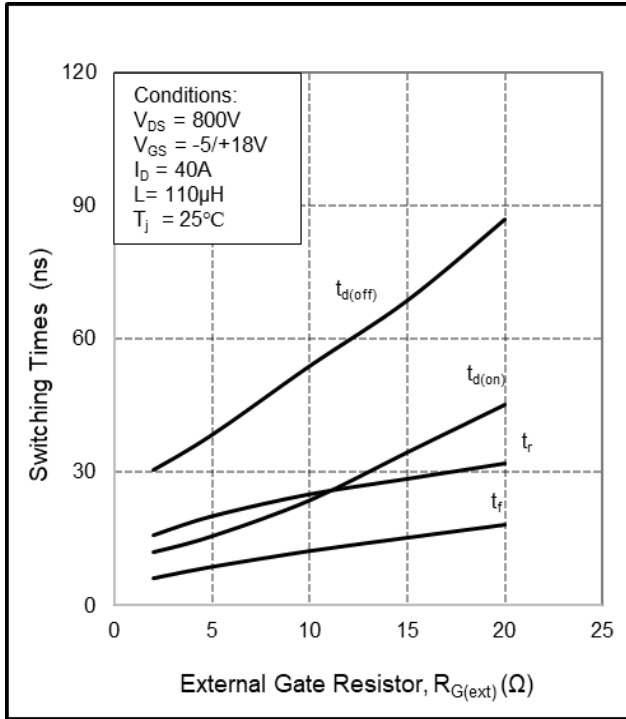
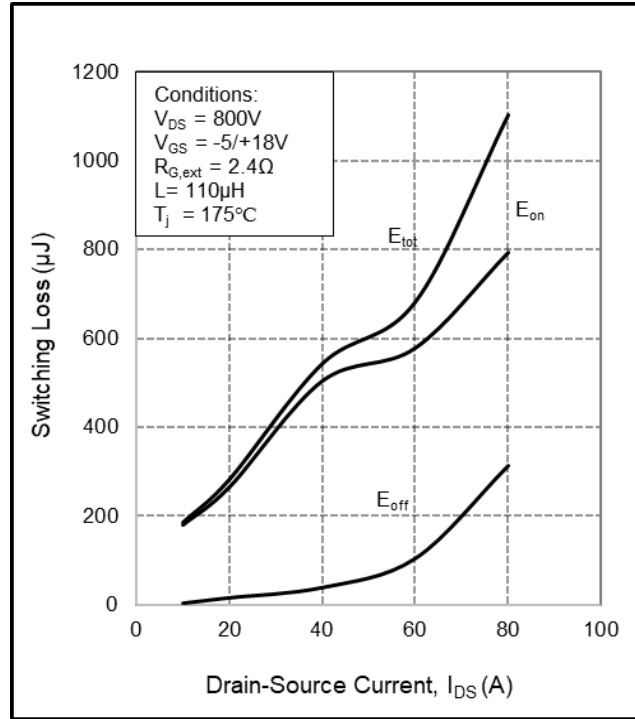
Figure 21. Switching Times vs. $R_{G(ext)}$ 

Figure 22. Clamped inductive Switching energy vs. drain current

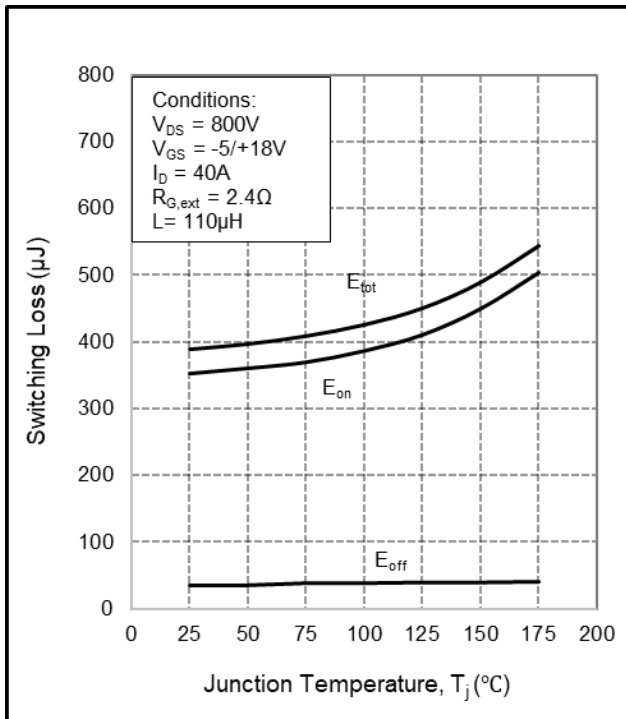
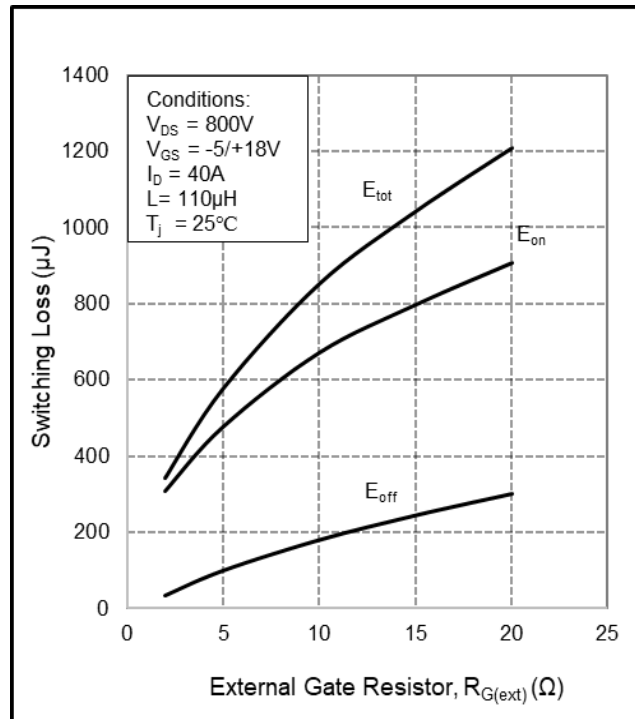


Figure 23. Clamped inductive Switching energy vs. temperature

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

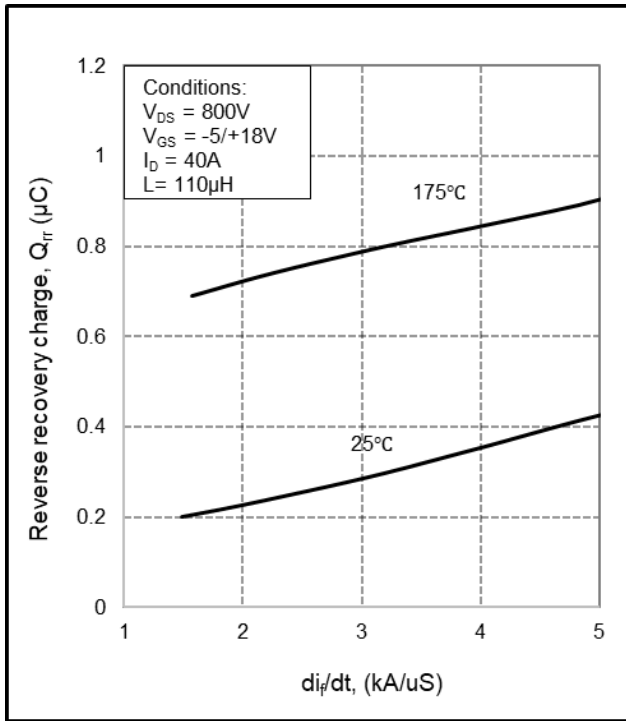
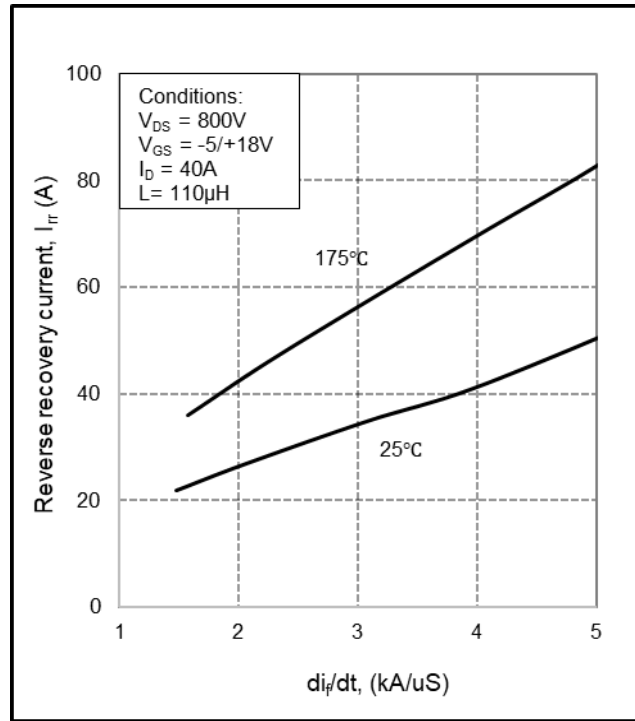
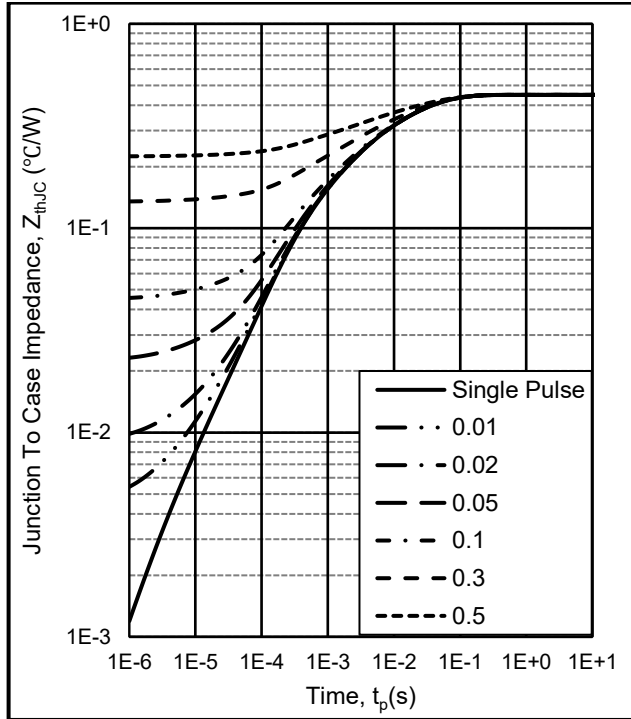
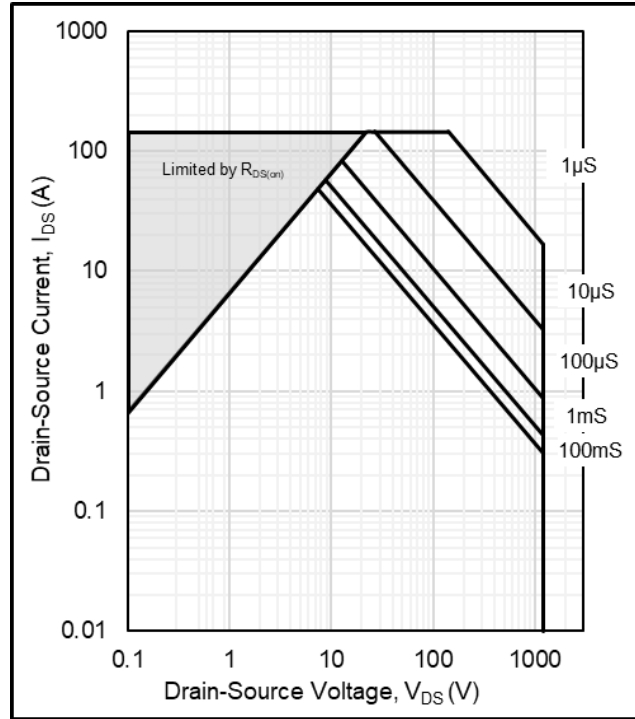
Figure 25. Reverse recovery charge vs. di/dt Figure 26. Reverse recovery current vs. di/dt Figure 27. Transient thermal impedance
(Junction - Case)

Figure 28. Safe Operating Area

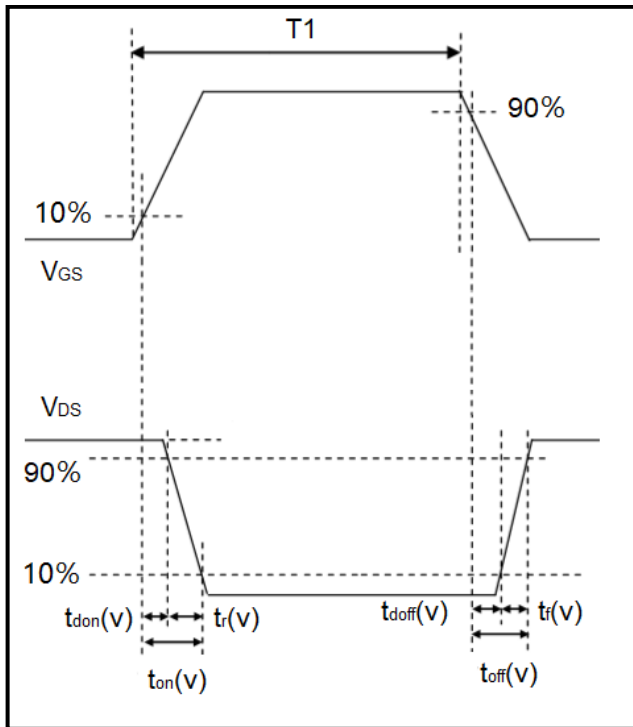


Figure 29. Switching times definition

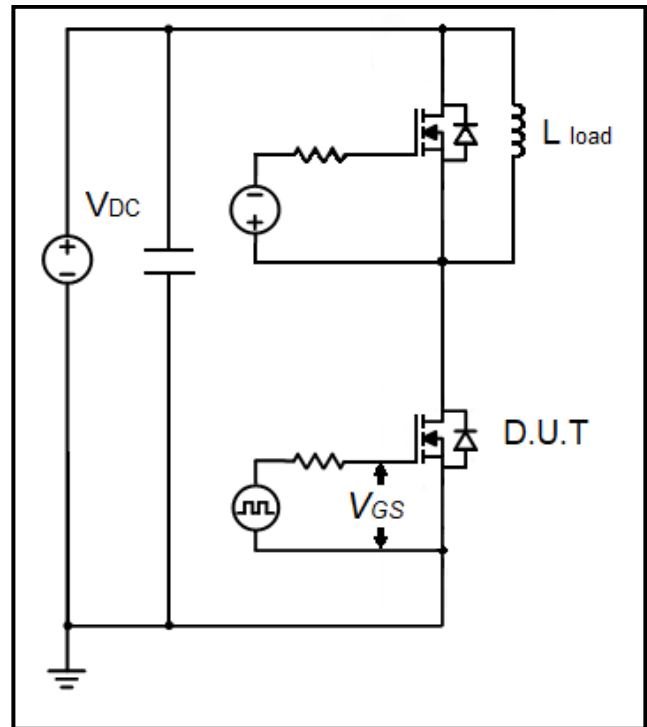
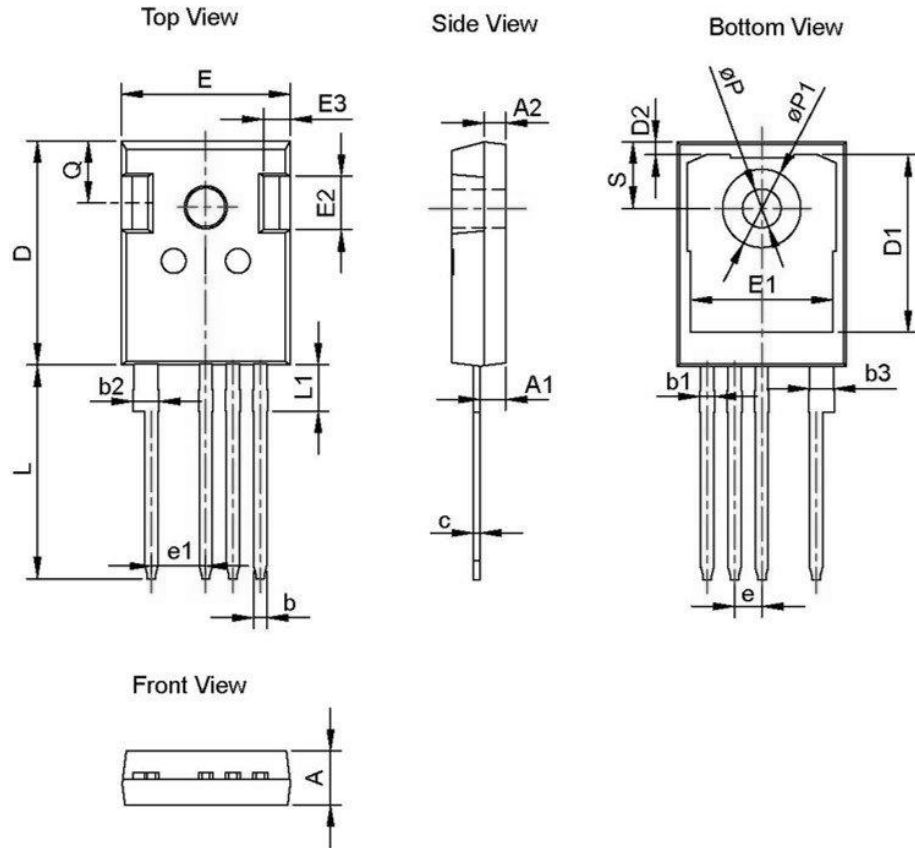


Figure 30. Clamped inductive switching waveform test circuit

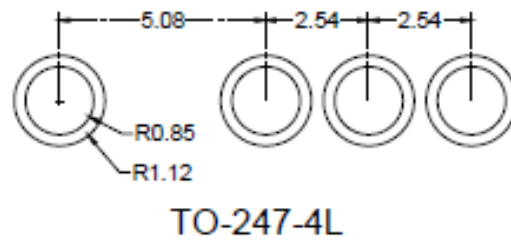
Package Information:

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
b1	1.11	1.37	1.57
b2	2.24	2.40	2.60
b3	2.11	2.21	2.36
c	0.51	0.60	0.75
D	20.70	20.90	21.30
D1	15.92	16.22	16.52
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	2.54 BSC		
e1	5.08 BSC		

Dimension unit: [mm]			
Symbol	Min	Nom	Max
L	19.62	19.92	20.22
L1	-	-	4.30
ϕP	3.40	3.60	3.80
$\phi P1$	-	-	7.30
Q	5.40	5.80	6.20
S	6.20 BSC		

Recommended Solder Pad Layout

Note: All dimensions are in mm



Ordering Information

Part number	AAR030V120H2
Package	TO-247-4L
Unit quantity	300 EA
Packing type	Tube