ALPHA & OMEGA SEMICONDUCTOR

AOBB1000V170X2Q

1700V αSiC Silicon Carbide Power MOSFET

Features

- Proprietary αSiC MOSFET technology
- Low loss, with low $R_{DS,\ ON}$
- Fast switching with low R_G and low capacitance
- Optimized gate drive voltage (V_{GS} = 18V)
- Low reverse recovery diode (Qrr)
- AEC-Q101 Automotive Qualified

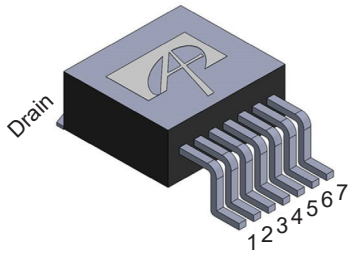
Product Summary

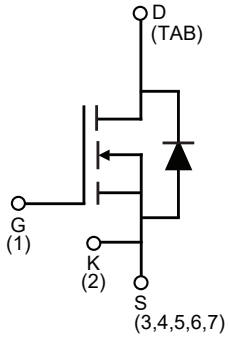
V_{DS} @ $T_{J,\ max}$	1700V
I_{DM}	5A
$R_{DS(ON),\ typ}$	1000mΩ
Q_{rr}	28nC
E_{OSS} @ 1000V	10µJ
100% UIS Tested	

Applications

- xEV Charger
- Electric Vehicle Supply Equipment (EVSE)
- Motor Drives
- Automotive Inverters

Pin Configuration





Ordering Part Number	Package Type	Form	Shipping Quantity
AOBB1000V170X2Q	TO-263-7L	Tape and Reel	800/Reel

Absolute Maximum Ratings

(T_A = 25°C, unless otherwise noted)

Symbol	Parameter		AOBB1000V170X2Q	Units
V_{DS}	Drain-Source Voltage		1700	V
$V_{GS,\ MAX}$	Gate-Source Voltage	Maximum	-8/+18	V
$V_{GS,OP,TRANS}$		Max Transient [A]	-8/+22	
$V_{GS,OP}$		Recommended Operating [B]	-5/+18	
I_D	Continuous Drain Current	T_C = 25°C	3.5	A
		T_C = 100°C	2.4	
I_{DM}	Pulsed Drain Current [C]		5	
I_{SD}	Continuous Body Diode Forward Current (V_{GS}=-5V)		5.5	
E_{AS}	Single Pulsed Avalanche Energy [D]		15.6	mJ
P_D	Power Dissipation [C]		37	W
T_J, T_{STG}	Junction and Storage Temperature Range		-55 to 175	°C
T_L	Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds		245	°C

Thermal Characteristics

Symbol	Parameter	AOBB1000V170X2Q		Units
		Typ	Max	
$R_{\theta JA}$	Maximum Junction-to-Ambient (E,F)		40	°C/W
$R_{\theta JC}$	Maximum Junction-to-Case (G)	3.3	4.0	°C/W

Electrical Characteristics

(T_A = 25°C, unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250µA, V_{GS}=0V, T_J=25°C		1700			V
		I_D=250µA, V_{GS}=0V, T_J=150°C		1700			
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1700V, V_{GS}=0V, T_J=25°C				100	µA
I_{GSS}	Gate-Body Leakage Current	V_{DS}=0V, V_{GS}=+18/-5V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=0.7mA			3.9		V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=18V, I_D=0.7A	T_J=25°C		1000	1400	mΩ
			T_J=150°C		1750		
g_{FS}	Forward Transconductance	V_{DS}=20V, I_D=0.7A			0.65	-	S
V_{SD}	Diode Forward Voltage	I_S=0.7A, V_{GS}=-5V			4	5	V
DYNAMIC							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=1000V, f=100KHz			129		pF
C_{oss}	Output Capacitance				17		pF
C_{rss}	Reverse Transfer Capacitance				4		pF
E_{oss}	Coss Stored Energy				10		µJ
R_G	Gate Resistance	f=1MHz			138		Ω
SWITCHING							
Q_g	Total Gate Charge	V_{GS}=-5/+18V, V_{DS}=1000V, I_D=0.7A, I_{GS}=50mA			11		nC
Q_{gs}	Gate Source Charge				2		nC
Q_{gd}	Gate Drain Charge				8		nC
$t_{d(on)}$	Turn-On Delay Time	V_{GS}=-5V/+18V, V_{DS}=1000V, I_D=2A, R_G=2Ω, L=300µH, FWD: AOBB1000V170X2Q			18		ns
t_r	Turn-On Rise Time				18		ns
$t_{d(off)}$	Turn-Off Delay Time				26		ns
t_f	Turn-Off Fall Time				22		ns
E_{on}	Turn-On Energy				75		µJ
E_{off}	Turn-Off Energy				10		µJ
E_{tot}	Total Switching Energy				85		µJ
t_{rr}	Body Diode Reverse Recovery Time	I_F=2A, dI/dt=2500A/µs, V_{GS}=-5V, V_{DS}=1000V			33		ns
I_{rm}	Peak Reverse Recovery Current				1.4		A
Q_{rr}	Body Diode Reverse Recovery Charge				28		nC

Notes:

A. t_{ON}< 1% *(Duty Cycle)/(Frequency), t<25hrs over lifetime.

B. Device can be operated at V_{GS}=0/18V. Actual operating V_{GS} will depend on application specifics such as parasitic inductance and dV/dt but should not exceed maximum ratings.

C. The power dissipation P_D is based on $T_{J(MAX)}$=175°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

D. L=5mH, I_{AS}=2.5A, R_G=25Ω, Starting T_J=25°C.

E. The value of $R_{\theta JA}$ is measured with the device in a still air environment with T_A =25°C.

F. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

G. The value of $R_{\theta JC}$ is measured with the device mounted to a large heat-sink, assuming a maximum junction temperature of $T_{J(MAX)}$=175°C.

H. The static characteristics in Figures 1 to 8 are obtained using <300ms pulses, duty cycle 0.5% max.

I. These curves are based on $R_{\theta JC}$ which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=175°C. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

T_A = 25 °C, unless otherwise specified.

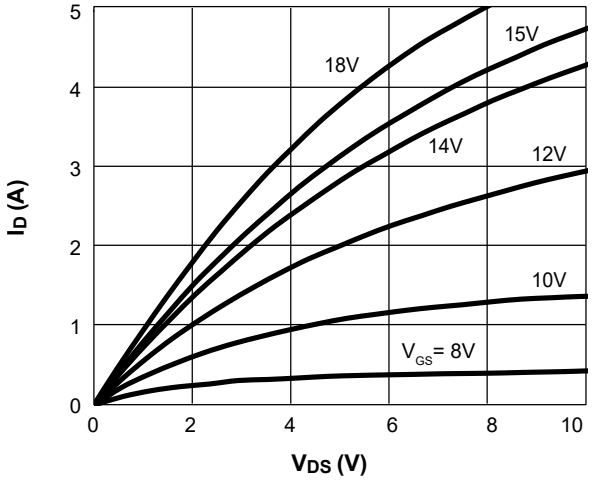


Figure 1. On-region Characteristics T_J = 25°C

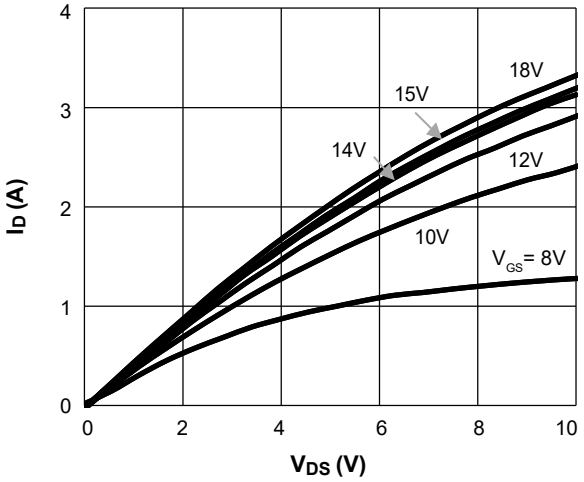


Figure 2. On-region Characteristics T_J = 175°C

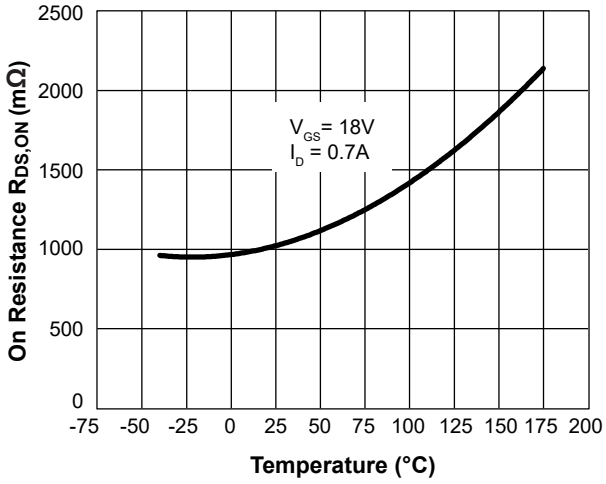


Figure 3. On-resistance vs. Junction Temperature

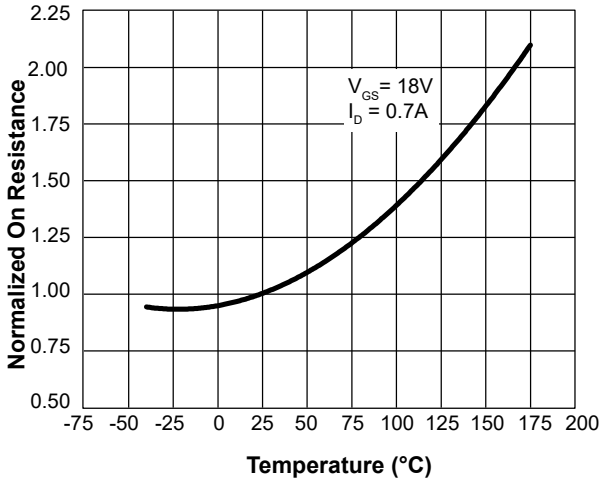


Figure 4. Normalized On-resistance vs. Junction Temperature

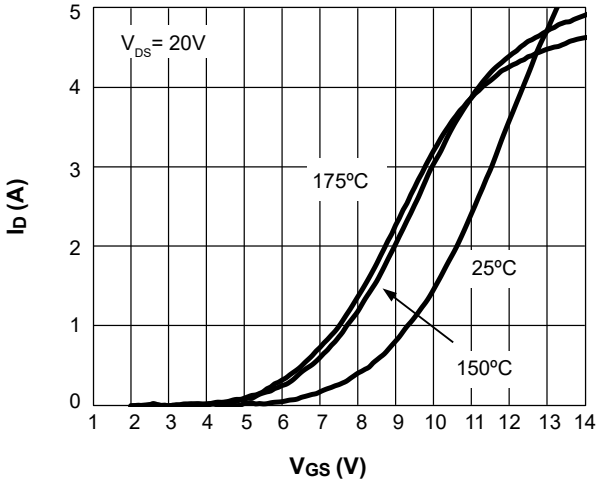


Figure 5. Transfer Characteristics

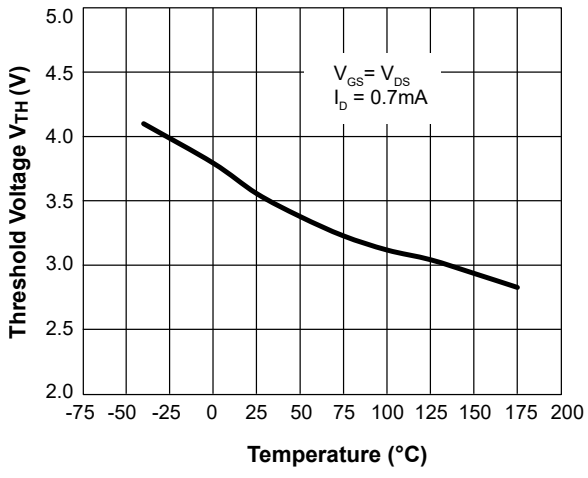


Figure 6. Threshold Voltage vs. Junction Temperature

Typical Electrical and Thermal Characteristics *(Continued)*

T_A = 25 °C, unless otherwise specified.

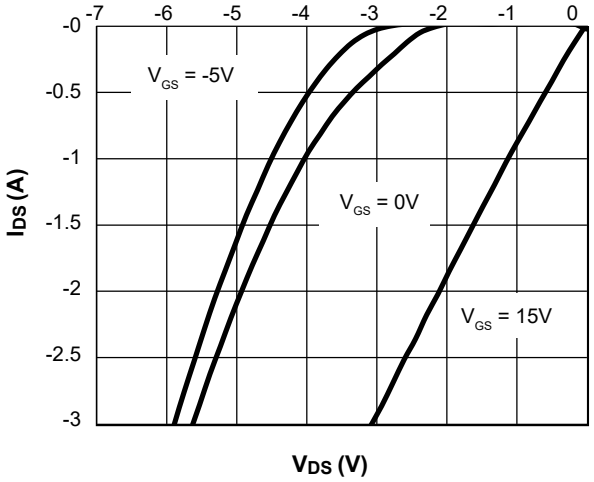


Figure 7. Body-diode Characteristics at 25°C

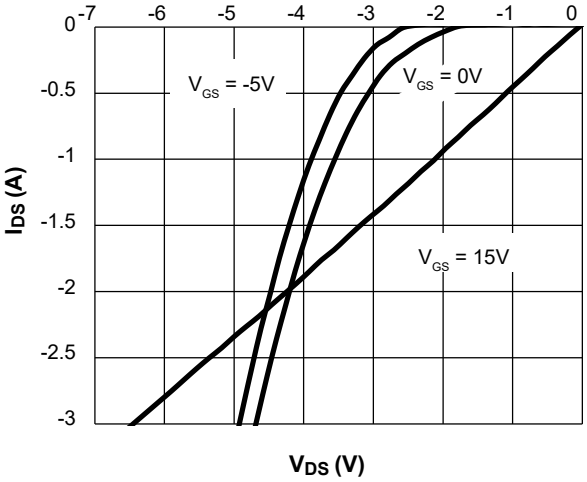


Figure 8. Body-diode Characteristics at 175°C

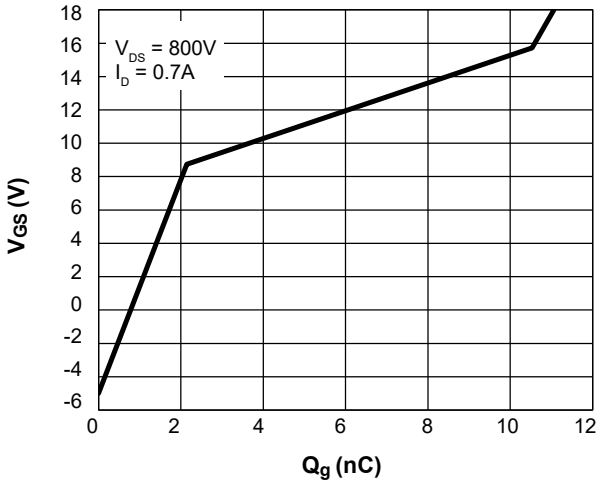


Figure 9. Gate-charge Characteristics

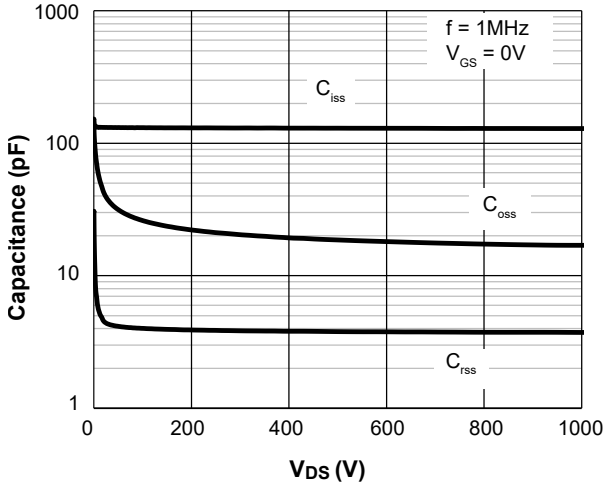


Figure 10. Capacitance Characteristics

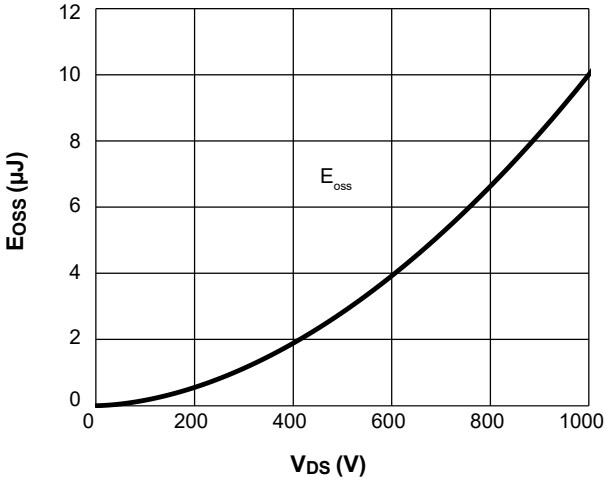


Figure 11. Coss Stored Energy

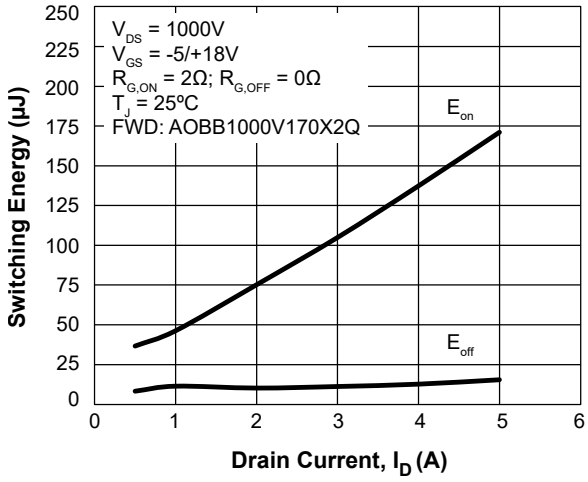


Figure 12. Switching Energy vs. Drain Current

Typical Electrical and Thermal Characteristics *(Continued)*

T_A = 25 °C, unless otherwise specified.

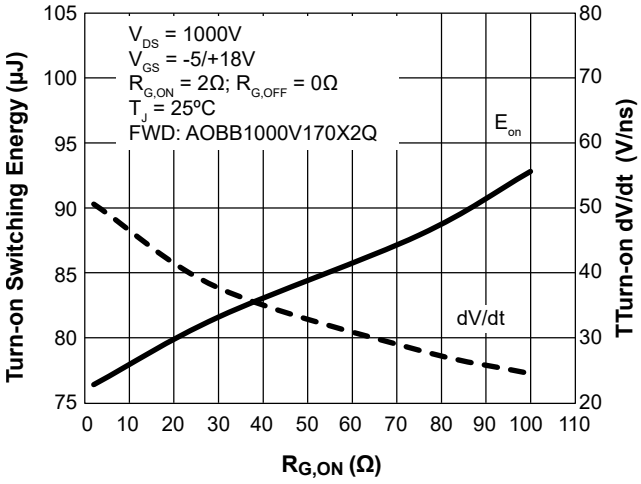


Figure 13. Turn-On Energy and dV/dt vs. External Gate Resistance

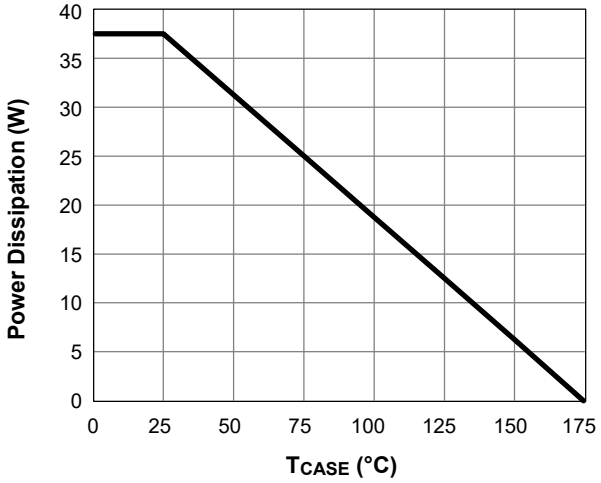


Figure 14. Power De-rating (Note I)

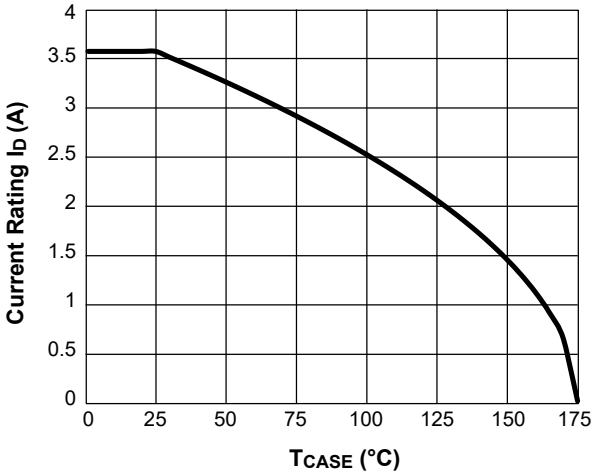


Figure 15. Current De-rating (Note I)

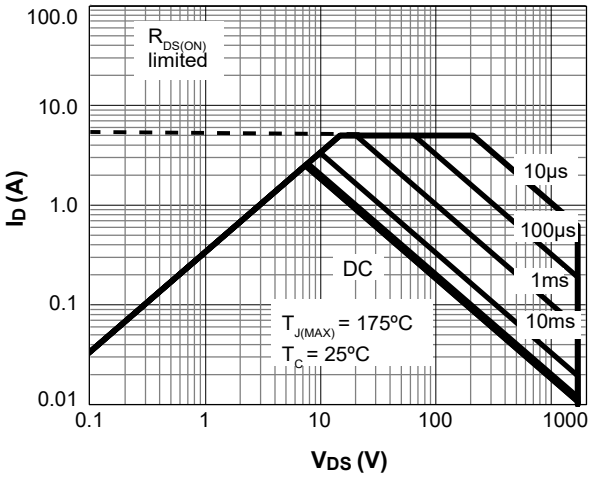


Figure 16. Maximum Forward Biased Safe Operating Area for AOBB1000V170X2Q (Note I)

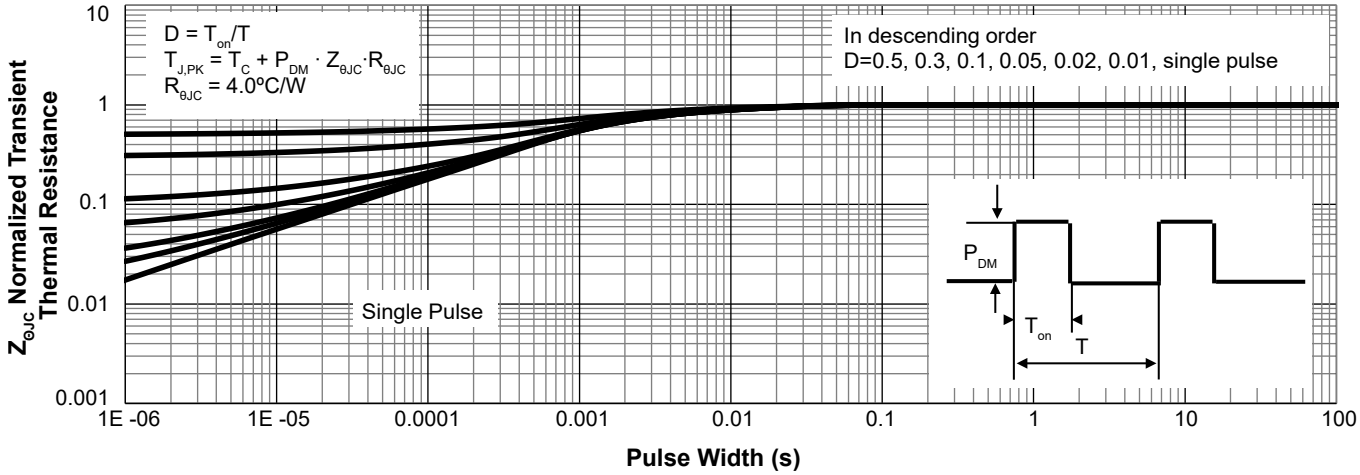


Figure 17. Normalized Maximum Transient Thermal Impedance for AOBB1000V170X2Q (Note I)

Test Circuits and Waveforms

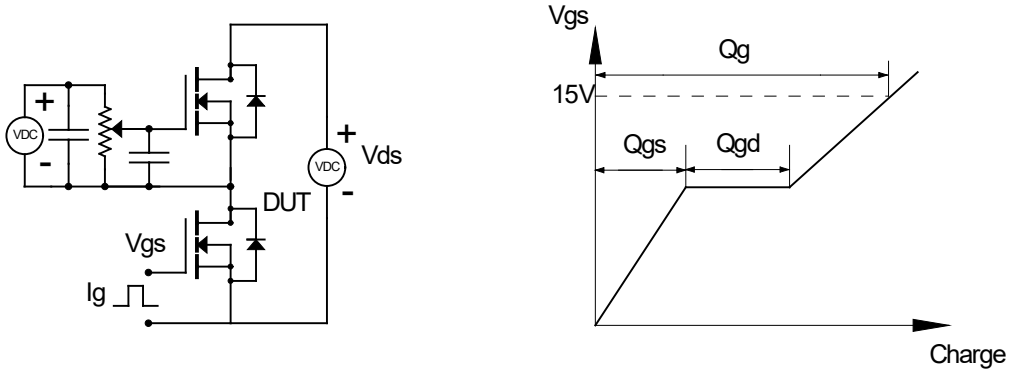


Figure 18. Gate Charge Test Circuits and Waveforms

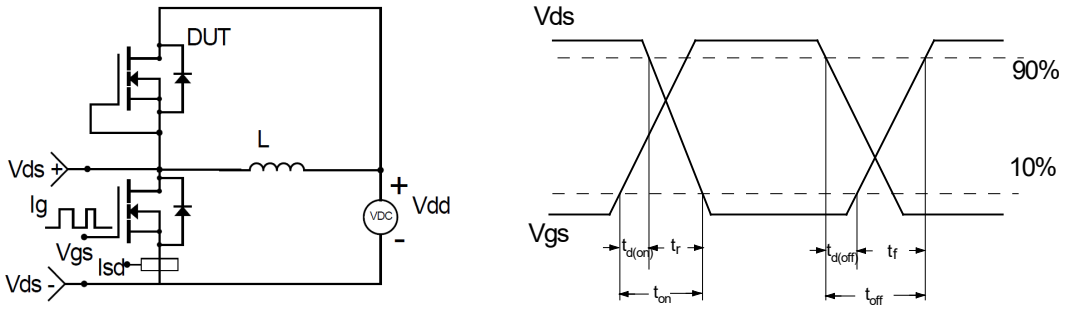


Figure 19. Inductive Switching Test Circuit and Waveforms

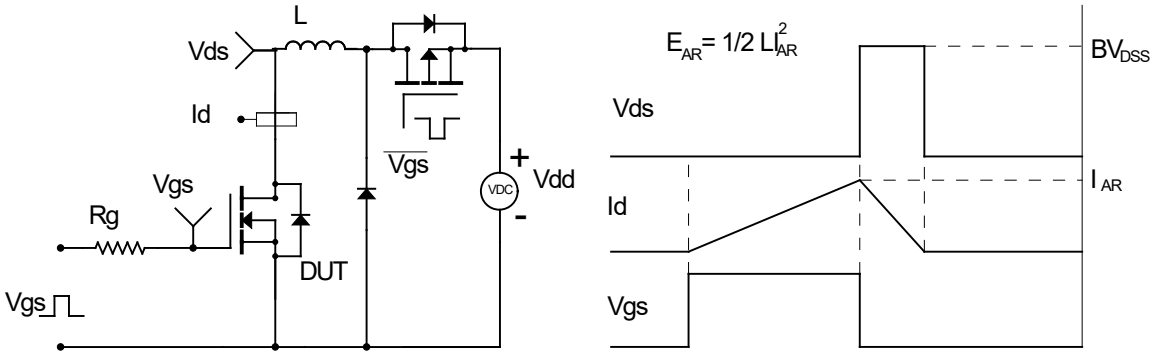


Figure 20. Unclamped Inductive Switching (UIS) Test Circuit and Waveforms

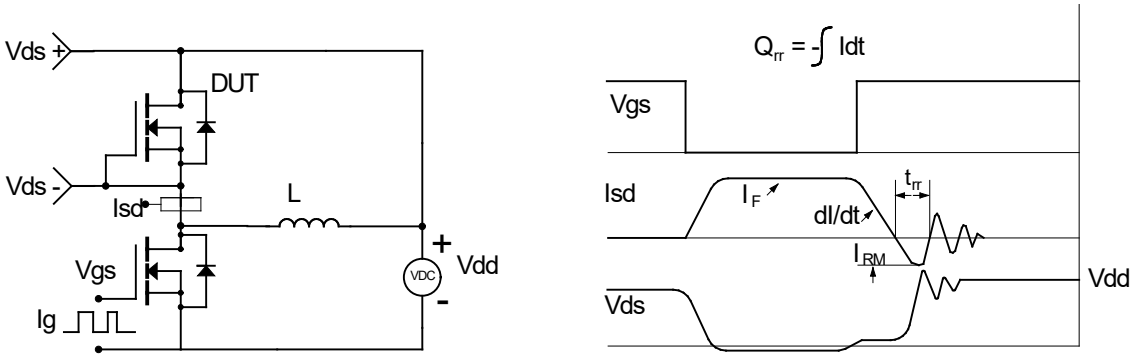
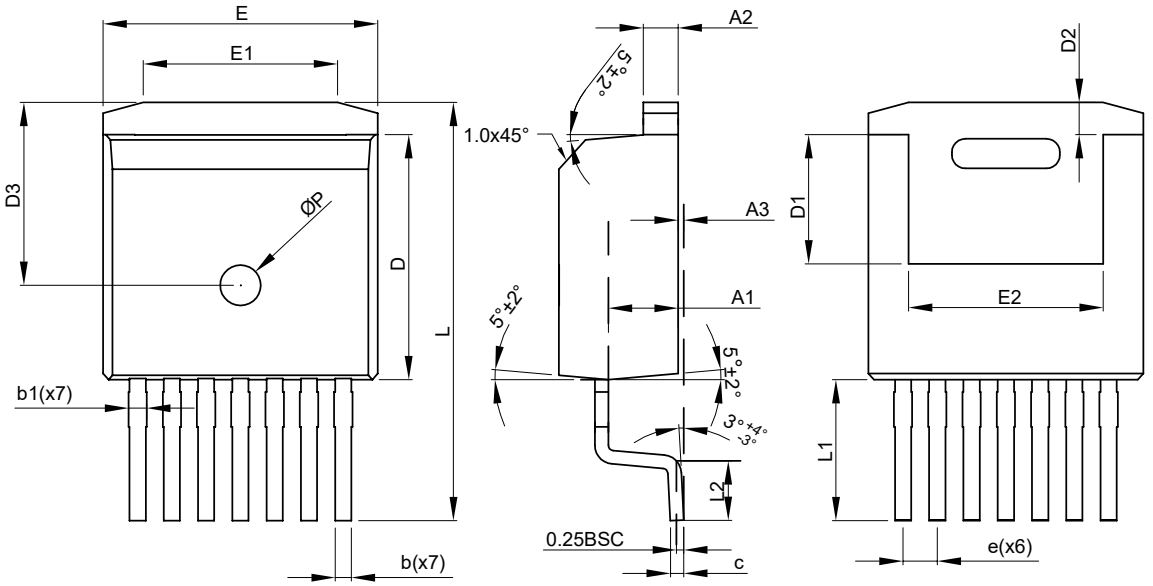
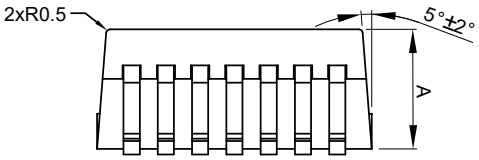


Figure 21. Diode Recovery Test Circuits and Waveforms

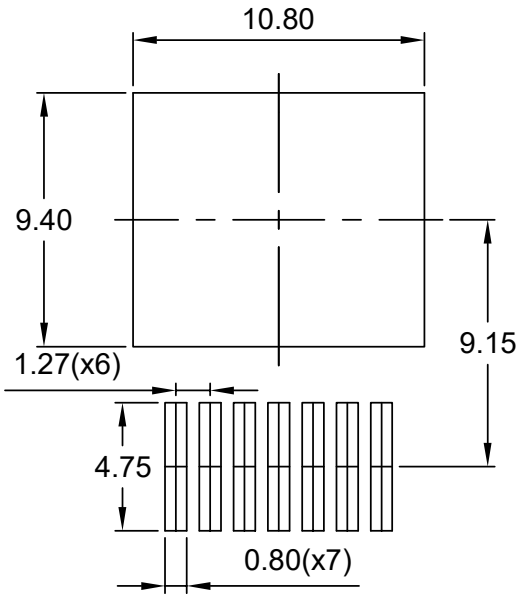
Package Dimensions, TO-263-7L



TOP VIEW SIDE VIEW BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN

SYMBOLS	DIM. IN MM			DIM. IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	4.30	4.43	4.56	0.169	0.174	0.180
A1	2.45	2.60	2.75	0.096	0.102	0.108
A2	1.20	1.30	1.40	0.047	0.051	0.055
A3	0.00	0.13	0.25	0.000	0.005	0.010
b	0.50	0.60	0.70	0.020	0.024	0.028
b1	0.60	0.70	0.90	0.024	0.028	0.035
c	0.45	0.50	0.60	0.018	0.020	0.024
D	8.93	9.08	9.23	0.352	0.357	0.363
D1	4.65	4.80	4.95	0.183	0.189	0.195
D2	0.98	1.20	1.42	0.039	0.047	0.056
D3	6.48	6.78	7.08	0.255	0.267	0.279
E	10.08	10.18	10.28	0.397	0.401	0.405
E1	6.50	7.00	7.50	0.256	0.276	0.295
E2	6.92	7.22	7.52	0.272	0.284	0.296
e	1.27BSC			0.05BSC		
L	15.00	15.50	16.00	0.591	0.610	0.630
L1	4.82	5.22	5.62	0.190	0.206	0.221
L2	1.90	2.20	2.50	0.075	0.087	0.098
P	1.40	1.50	1.60	0.055	0.059	0.063

NOTES:

1. CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
2. DOTTED OUTLINE IS GUIDELINE TO BE COMPATIBLE WITH
INDUSTRY COMMON LAYOUT BUT NOT RECOMMENDED BY AOS.

Part Marking

AOBB1000V170X2Q
TO-263-7L