

## Features

- Proprietary  $\alpha$ SiC MOSFET technology
- Low loss, with low  $R_{DS, ON}$
- Fast switching with low  $R_G$  and low capacitance
- Optimized gate drive voltage ( $V_{GS} = 15V$ )
- Low reverse recovery diode ( $Q_{rr}$ )
- AEC-Q101 Automotive Qualified

## Product Summary

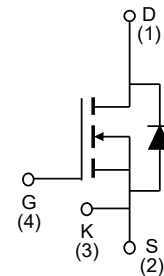
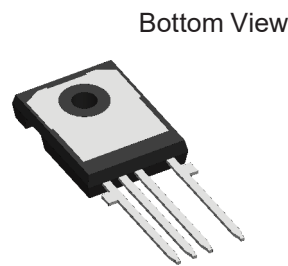
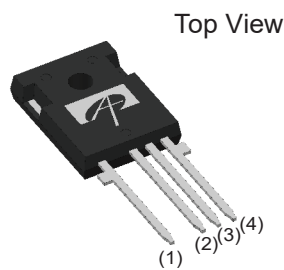
$V_{DS} @ T_{J, max}$	1200V
$I_{DM}$	120A
$R_{DS(ON), typ}$	33 m $\Omega$
$Q_{rr}$	226 nC
$E_{OSS} @ 800V$	63 $\mu$ J
100% UIS Tested	

## Applications

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



## Pin Configuration



Ordering Part Number	Package Type	Form	Shipping Quantity
AOM033V120X2Q	TO-247-4L	Tube	30/Tube

## Absolute Maximum Ratings

( $T_A = 25^\circ C$ , unless otherwise noted)

Symbol	Parameter	AOM033V120X2Q	Units
$V_{DS}$	Drain-Source Voltage	1200	V
$V_{GS, MAX}$	Gate-Source Voltage	Maximum	-8/+18
$V_{GS, OP, TRANS}$		Max Transient <sup>(A)</sup>	-8/+20
$V_{GS, OP}$		Recommended Operating <sup>(B)</sup>	-5/+15
$I_D$	Continuous Drain Current	$T_C = 25^\circ C$	68
		$T_C = 100^\circ C$	48
$I_{DM}$	Pulsed Drain Current <sup>(C)</sup>	120	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>(D)</sup>	1000	mJ
$P_D$	Power Dissipation <sup>(C)</sup>	300	W
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to 175	$^\circ C$
$T_L$	Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	300	$^\circ C$

## Thermal Characteristics

Symbol	Parameter	AOM033V120X2Q	Units
R <sub>θJA</sub>	Maximum Junction-to-Ambient <sup>(E,F)</sup>	40	°C/W
R <sub>θJC</sub>	Maximum Junction-to-Case <sup>(G)</sup>	0.5	°C/W

## Electrical Characteristics

(T<sub>A</sub> = 25°C, unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
<b>STATIC PARAMETERS</b>							
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C	1200			V	
		I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C		1200			
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 1200V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C			100	μA	
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>DS</sub> = 0V, V <sub>GS</sub> = +15/-5V			±100	nA	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 17.5 mA		2.8		V	
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 15V, I <sub>D</sub> = 20A	T <sub>J</sub> = 25°C	33	43	mΩ	
			T <sub>J</sub> = 150°C	45			
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 20V, I <sub>D</sub> = 20A		15	-	S	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> = 17.5A, V <sub>GS</sub> = -5V		4	5	V	
<b>DYNAMIC</b>							
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 800V, f = 1 MHz		2908		pF	
C <sub>oss</sub>	Output Capacitance			128		pF	
C <sub>rss</sub>	Reverse Transfer Capacitance			9.9		pF	
E <sub>oss</sub>	Coss Stored Energy			63		μJ	
R <sub>G</sub>	Gate Resistance	f = 1 MHz		1.7		Ω	
<b>SWITCHING</b>							
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> = -5/+15V, V <sub>DS</sub> = 800V, I <sub>D</sub> = 20A, I <sub>GS</sub> = 50 mA		104		nC	
Q <sub>gs</sub>	Gate Source Charge			37		nC	
Q <sub>gd</sub>	Gate Drain Charge			32		nC	
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> = -5V/+15V, V <sub>DS</sub> = 800V, I <sub>D</sub> = 40A, R <sub>G</sub> = 2Ω L = 60 μH		13.3		ns	
t <sub>r</sub>	Turn-On Rise Time			15.4		ns	
t <sub>d(off)</sub>	Turn-Off Delay Time			15.3		ns	
t <sub>f</sub>	Turn-Off Fall Time			5.1		ns	
E <sub>on</sub>	Turn-On Energy				297		μJ
E <sub>off</sub>	Turn-Off Energy	FWD: AOM033V120X2Q		40		μJ	
E <sub>tot</sub>	Total Switching Energy			337		μJ	
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> = 20A, dI/dt = 1500A/us, V <sub>GS</sub> = -5V V <sub>DS</sub> = 800V		48		ns	
I <sub>rm</sub>	Peak Reverse Recovery Current				13		A
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge				226		nC

### Notes:

- t<sub>pulse</sub> < 1 μs, f > 1Hz
- Device can be operated at V<sub>GS</sub> = 0/15V. Actual operating VGS will depend on application specifics such as parasitic inductance and dV/dt but should not exceed maximum ratings.
- The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub> = 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.
- L = 5mH, I<sub>AS</sub> = 20A, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C.
- The value of R<sub>θJA</sub> is measured with the device in a still air environment with T<sub>A</sub> = 25°C.
- The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> and case to ambient.
- The value of R<sub>θJC</sub> is measured with the device mounted to a large heat-sink, assuming a maximum junction temperature of T<sub>J(MAX)</sub> = 175°C.
- The static characteristics in Figures 1 to 8 are obtained using < 300ms pulses, duty cycle 0.5% max.
- These curves are based on R<sub>θJC</sub> which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub> = 175°C. The SOA curve provides a single pulse rating.

## Typical Electrical and Thermal Characteristics

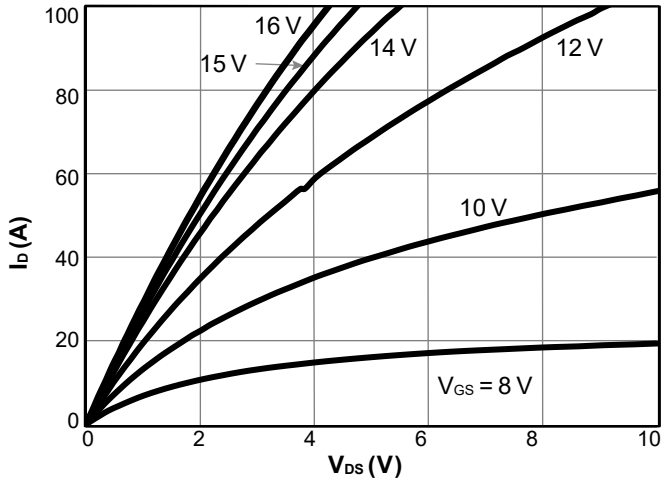


Figure 1. On-Region Characteristics  $T_J = 25^\circ\text{C}$

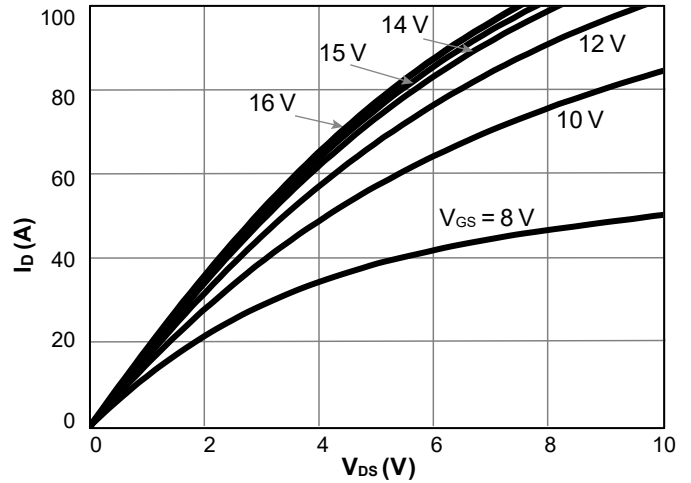


Figure 2. On-Region Characteristics  $T_J = 175^\circ\text{C}$

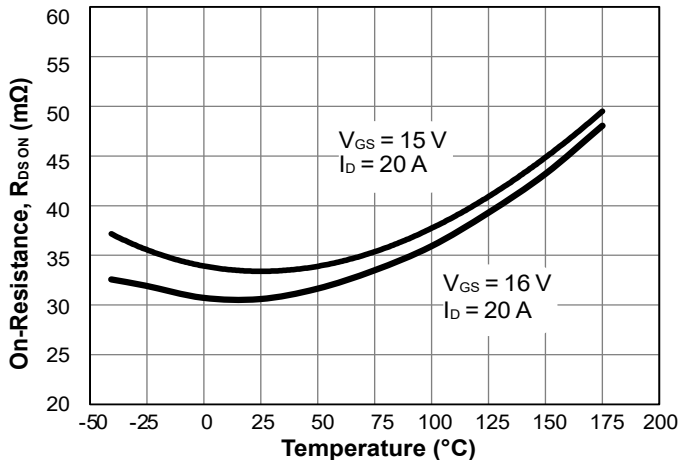


Figure 3. On-Resistance vs. Junction Temperature

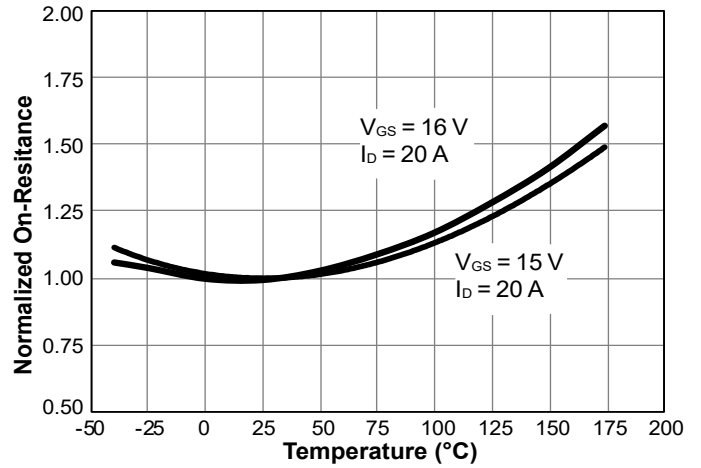


Figure 4. Normalized On-Resistance vs. Junction Temperature

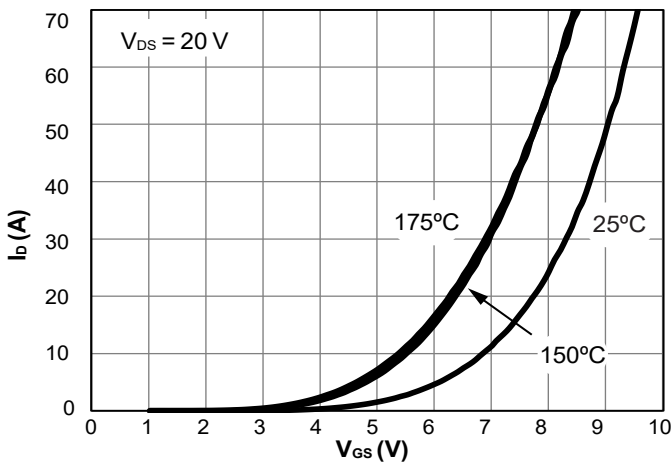


Figure 5. Transfer Characteristics

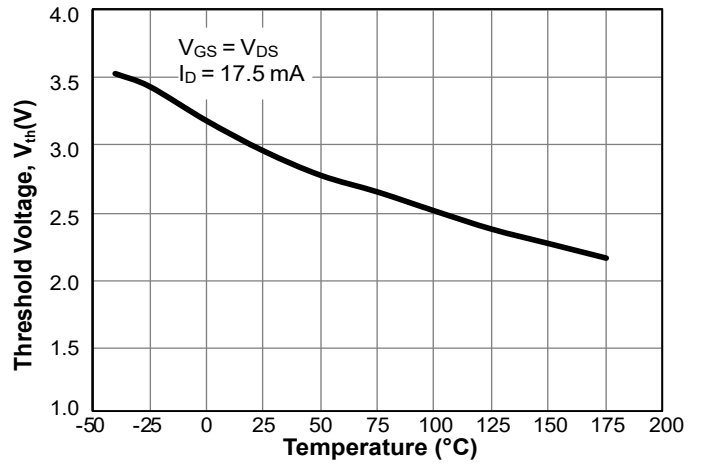


Figure 6. Threshold Voltage vs. Junction Temperature

Typical Electrical and Thermal Characteristics (Continued)

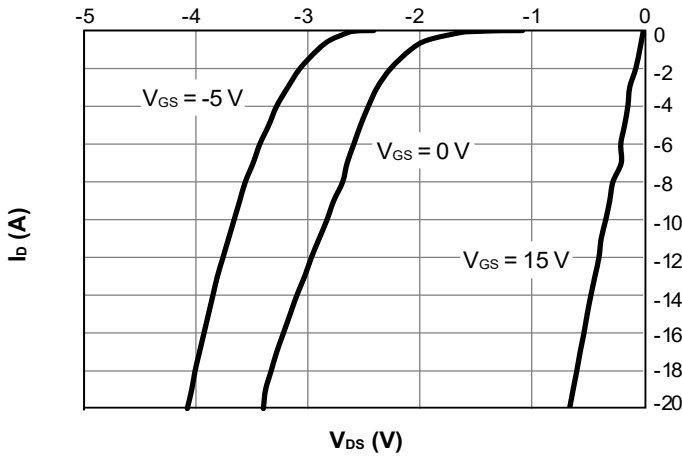


Figure 7. Body-Diode Characteristics at 25°C

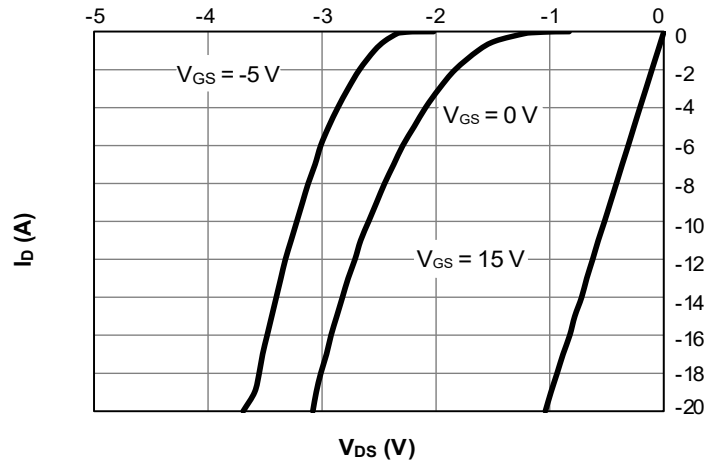


Figure 8. Body-Diode Characteristics at 175°C

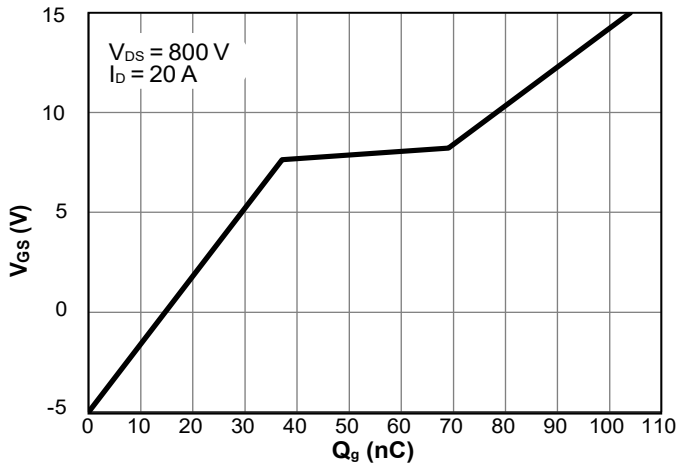


Figure 9. Gate-Charge Characteristics

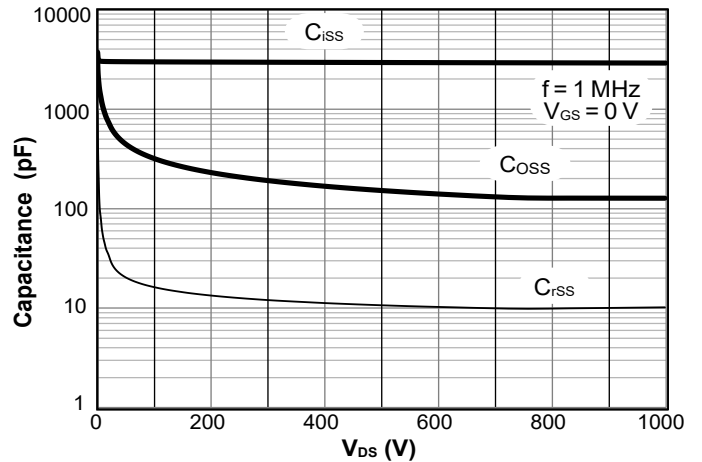


Figure 10. Capacitance Characteristics

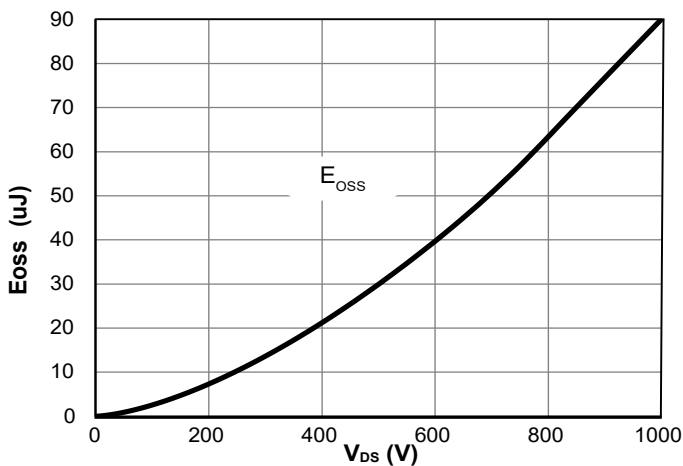


Figure 11. C<sub>oss</sub> Stored Energy

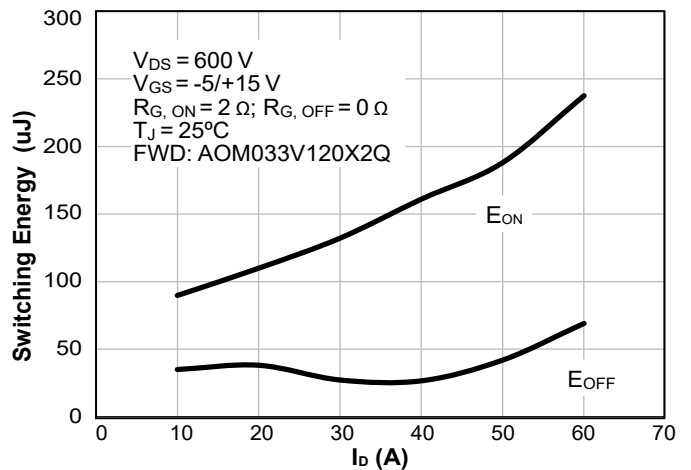


Figure 12. Switching Energy vs. Drain Current

Typical Electrical and Thermal Characteristics (Continued)

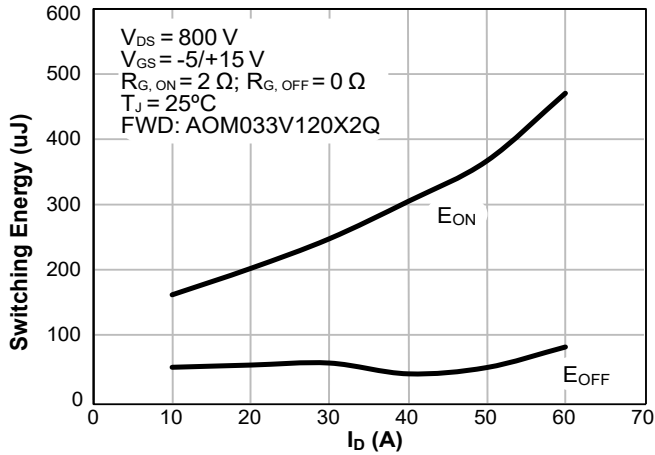


Figure 13. Switching Energy vs. Drain Current

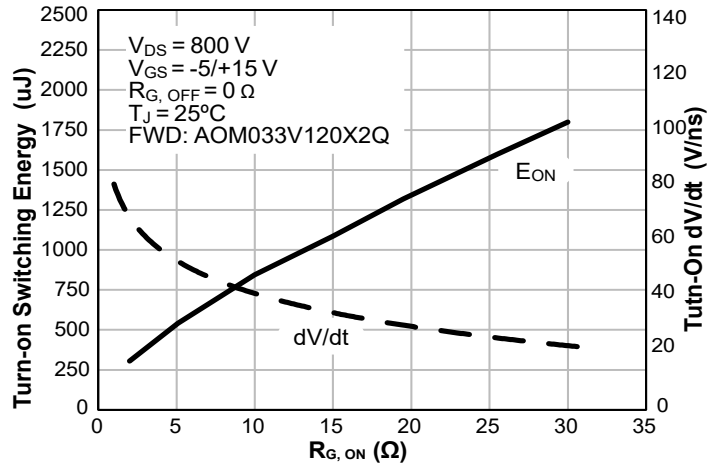


Figure 14. Turn-On Energy and dV/dt vs. External Gate Resistance

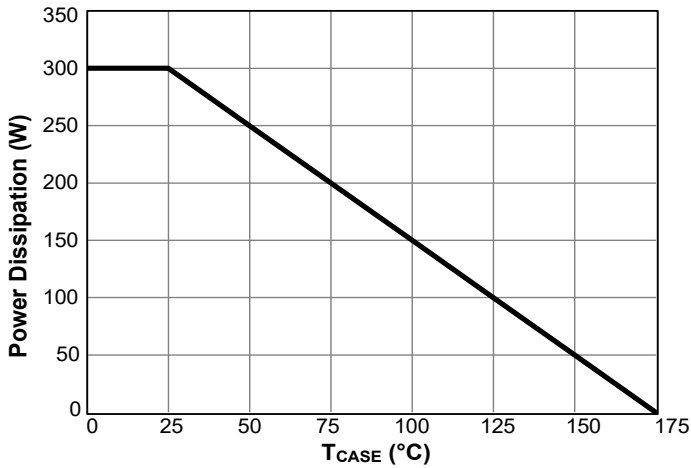


Figure 15. Power Derating vs. Case Temperature (Note I)

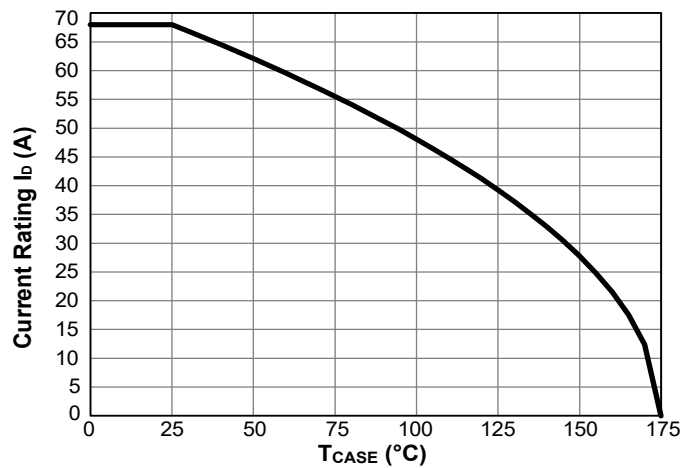


Figure 16. Current Derating vs. Case Temperature (Note I)

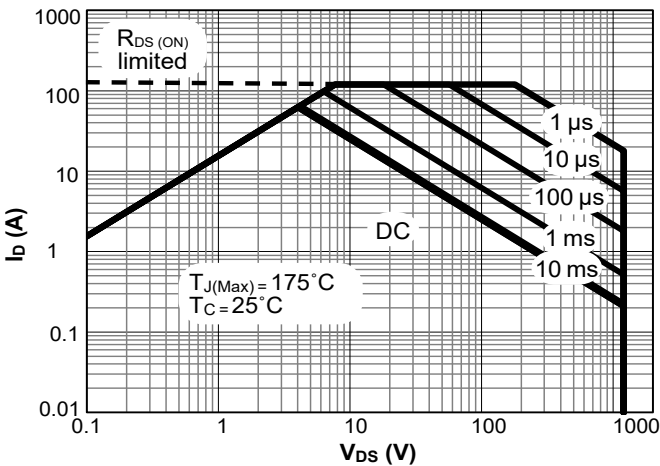


Figure 17. Maximum Forward Biased Safe Operating (Note I)

Typical Electrical and Thermal Characteristics (Continued)

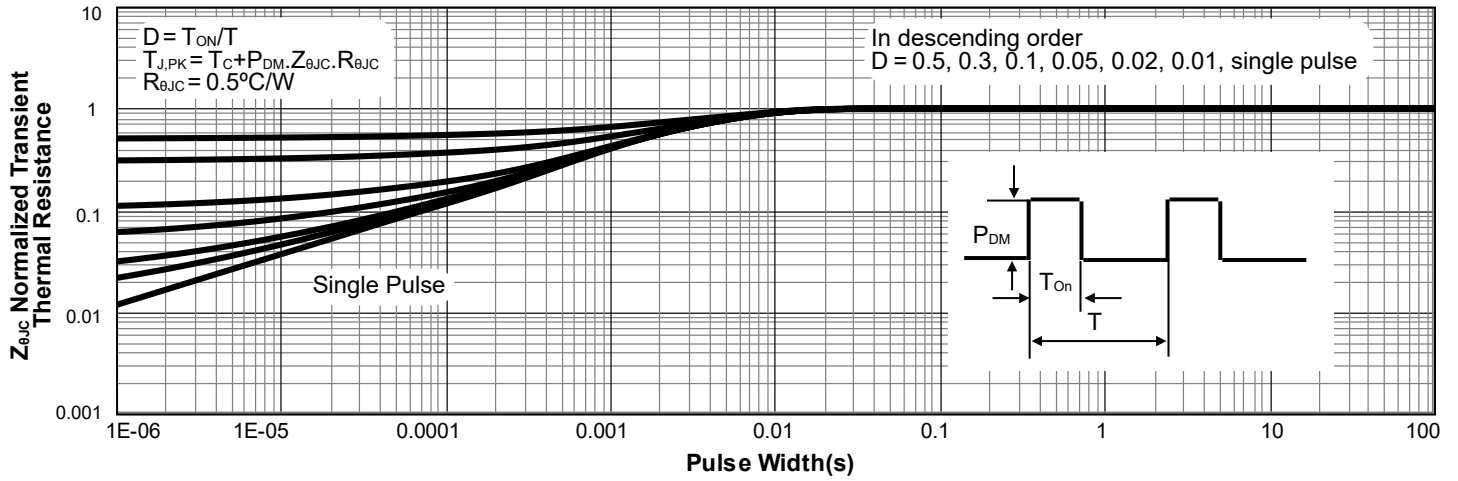


Figure 18. Normalized Maximum Transient Thermal Impedance for AOM033V120X2Q (Note I)

## Test Circuits and Waveforms

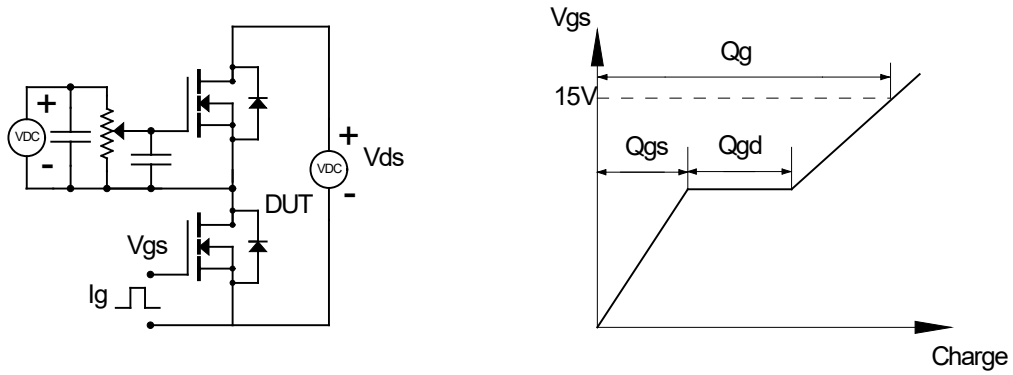


Figure 19. Gate Charge Test Circuits and Waveforms

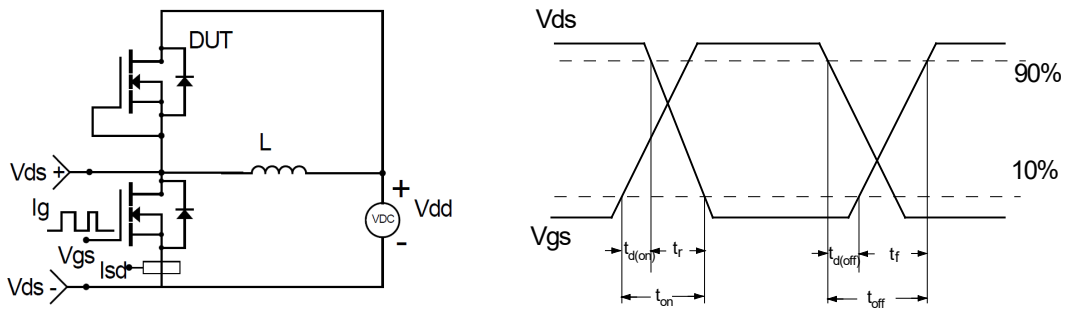


Figure 20. Inductive Switching Test Circuit and Waveforms

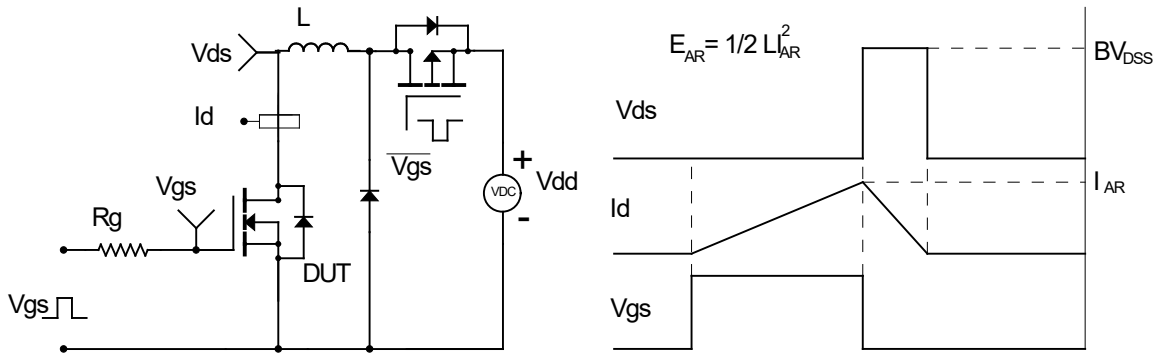


Figure 21. Unclamped Inductive Switching (UIS) Test Circuit and Waveforms

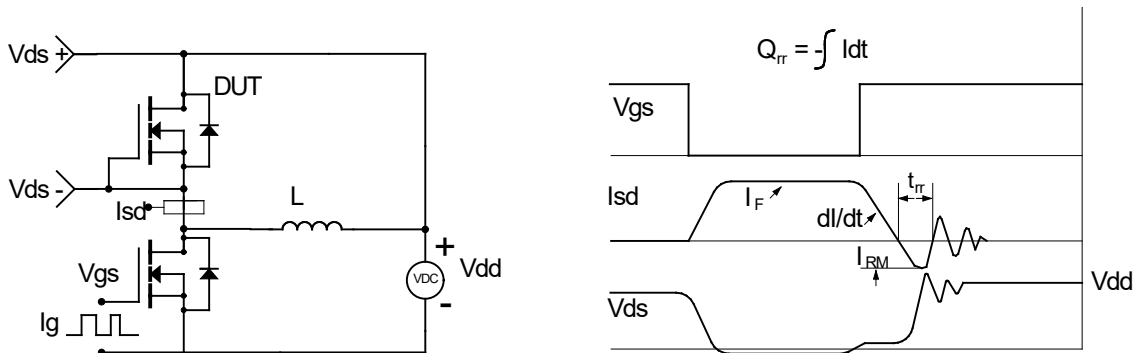
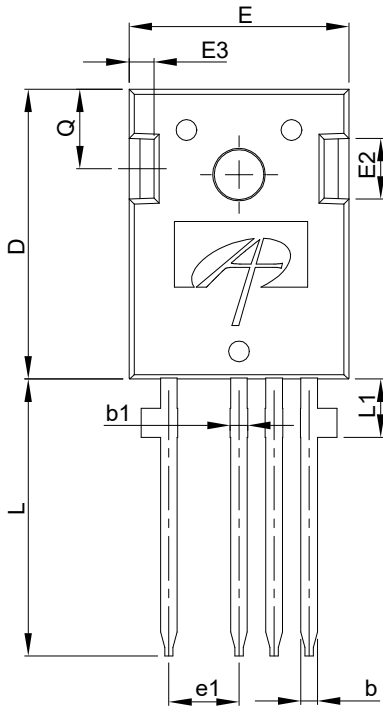
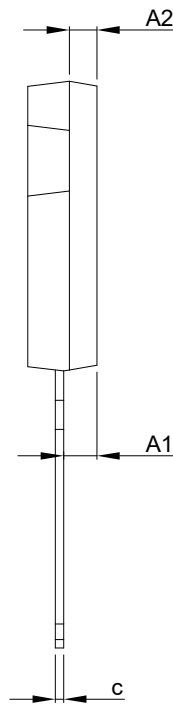


Figure 22. Diode Recovery Test Circuits and Waveforms

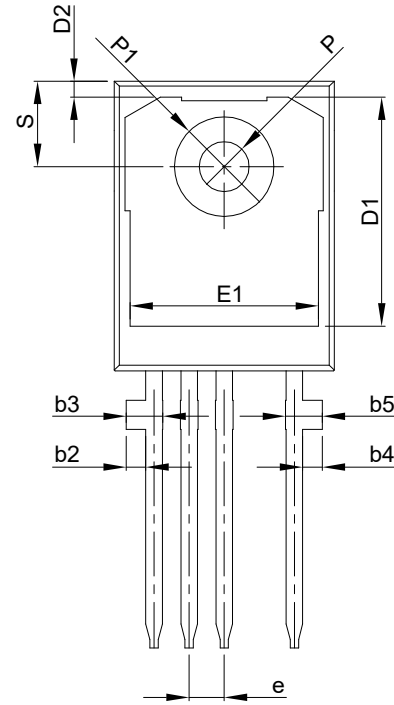
**Package Dimensions, TO-247-4L**



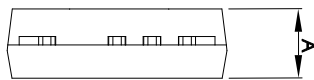
**TOP VIEW**



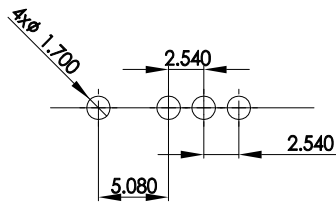
**SIDE VIEW**



**BOTTOM VIEW**



**SIDE VIEW**



**RECOMMENDED THROUGH HOLES FOR LAND PATTERN**

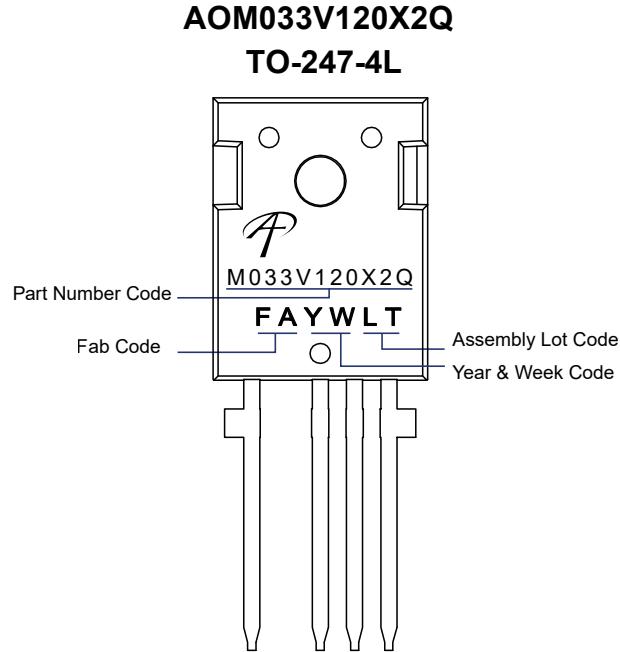
**NOTE:**

1. CONTROLLED DIMENSIONS ARE IN MILLIMETERS.
2. THIS IS AN ENGINEERING DRAFT FOR REVIEW. AOS CONFIDENTIAL.

SYMBOLS	DIM. IN MM			DIM. IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	4.90	5.00	5.10	0.193	0.197	0.201
A1	2.32	2.42	2.52	0.091	0.095	0.099
A2	1.90	2.00	2.10	0.075	0.079	0.083
b	1.17	1.22	1.27	0.046	0.048	0.050
b1	1.20	1.30	1.40	0.047	0.051	0.055
b2	1.31	1.41	1.51	0.052	0.056	0.059
b3	2.45	2.65	2.85	0.096	0.104	0.112
b4	1.31	1.41	1.51	0.052	0.056	0.059
b5	2.45	2.65	2.85	0.096	0.104	0.112
c	0.57	0.62	0.67	0.022	0.024	0.026
D	20.80	20.95	21.10	0.819	0.825	0.831
D1	16.25	16.55	16.85	0.640	0.652	0.663
D2	1.00	1.15	1.30	0.039	0.045	0.051
E	15.77	15.92	16.07	0.621	0.627	0.632
E1	13.43	13.63	13.83	0.529	0.536	0.544
E2	4.29	4.39	4.49	0.169	0.173	0.177
E3	1.70	1.80	1.90	0.067	0.071	0.075
e	2.54BSC			0.1000BSC		
e1	5.08BSC			0.2000BSC		
N	4			4		
L	19.82	20.02	20.22	0.780	0.788	0.796
L1	4.01	4.21	4.41	0.158	0.166	0.174
P	3.50	3.60	3.70	0.138	0.142	0.146
P1	7.00	7.20	7.40	0.276	0.283	0.291
Q	5.65	5.75	5.85	0.222	0.226	0.230
S	6.07	6.17	6.27	0.239	0.243	0.247



## Part Marking



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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.