

### General Description

- Trench Power MOSFET - AlphaSGT™ technology
- Low  $R_{DS(ON)}$
- Excellent Gate Charge x  $R_{DS(ON)}$  Product (FOM)
- RoHS and Halogen-Free Compliant

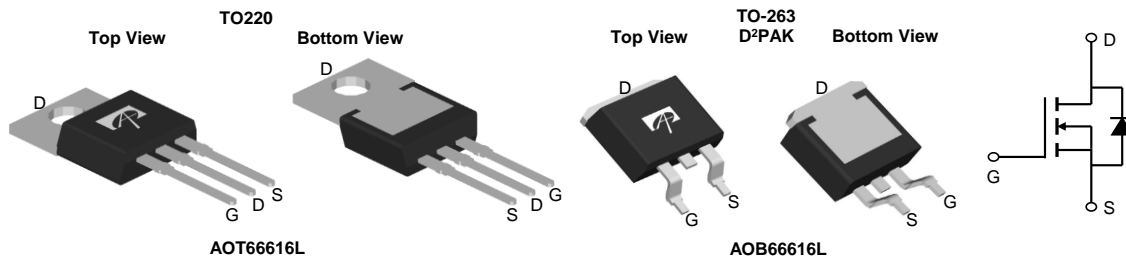
### Applications

- Synchronous Rectification in DC/DC and AC/DC Converters
- Industrial and Motor Drive applications

### Product Summary

$V_{DS}$	60V
$I_D$ (at $V_{GS}=10V$ )	140A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 3.2m $\Omega$
$R_{DS(ON)}$ (at $V_{GS}=6V$ )	< 4.6m $\Omega$

100% UIS Tested  
 100% Rg Tested



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOT66616L	TO-220	Tube	1000
AOB66616L	TO-263	Tape & Reel	800

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>G</sup>	$I_D$	$T_C=25^\circ\text{C}$	140
		$T_C=100^\circ\text{C}$	95
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	330	A
Continuous Drain Current	$I_{DSM}$	$T_A=25^\circ\text{C}$	38.5
		$T_A=70^\circ\text{C}$	30.5
Avalanche Current <sup>C</sup>	$I_{AS}$	35	A
Avalanche energy $L=0.3\text{mH}$ <sup>C</sup>	$E_{AS}$	184	mJ
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ\text{C}$	125
		$T_C=100^\circ\text{C}$	50
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A=25^\circ\text{C}$	8.3
		$T_A=70^\circ\text{C}$	5.3
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10\text{s}$	$R_{\theta JA}$	12	15	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A,D</sup> Steady-State		50	60	$^\circ\text{C/W}$
Maximum Junction-to-Case Steady-State	$R_{\theta JC}$	0.8	1.0	$^\circ\text{C/W}$

**Electrical Characteristics (T<sub>J</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> =250μA, V <sub>GS</sub> =0V	60			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.4	2.9	3.4	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A T <sub>J</sub> =125°C		2.5 4.0	3.2 5.1	mΩ
		V <sub>GS</sub> =6V, I <sub>D</sub> =20A		3.4	4.6	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A		100		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.7	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				135	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =30V, f=1MHz		2870		pF
C <sub>oss</sub>	Output Capacitance			940		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			38		pF
R <sub>g</sub>	Gate resistance	f=1MHz	0.6	1.25	1.9	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(10V)</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, I <sub>D</sub> =20A		42.5	60	nC
Q <sub>gs</sub>	Gate Source Charge			12		nC
Q <sub>gd</sub>	Gate Drain Charge			10		nC
Q <sub>oss</sub>	Output Charge	V <sub>GS</sub> =0V, V <sub>DS</sub> =30V		54		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, R <sub>L</sub> =1.5Ω, R <sub>GEN</sub> =3Ω		14.5		ns
t <sub>r</sub>	Turn-On Rise Time			15.5		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			33		ns
t <sub>f</sub>	Turn-Off Fall Time			12.5		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =20A, di/dt=500A/μs		26		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, di/dt=500A/μs		87		nC

A. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C. The Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> ≤ 10s and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150° C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Single pulse width limited by junction temperature T<sub>J(MAX)</sub>=150° C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

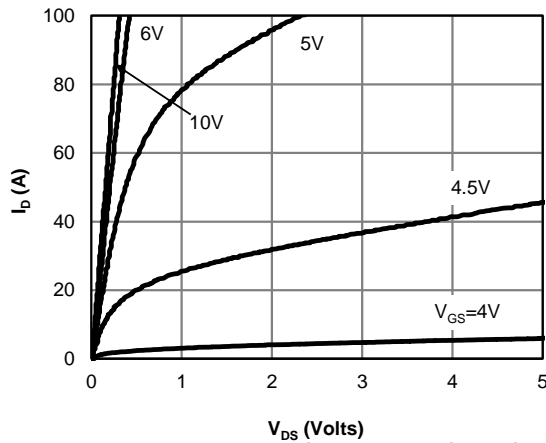
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150° C. The SOA curve provides a single pulse rating.

G. The maximum current rating is package limited.

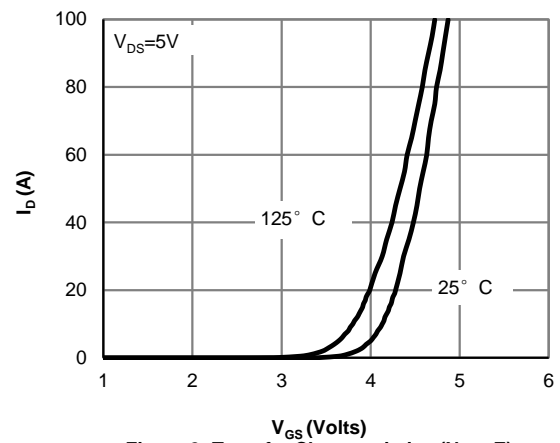
H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C.

APPLICATIONS OR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN,FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

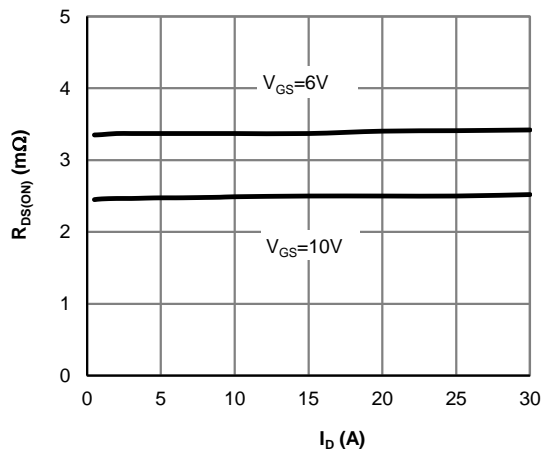
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



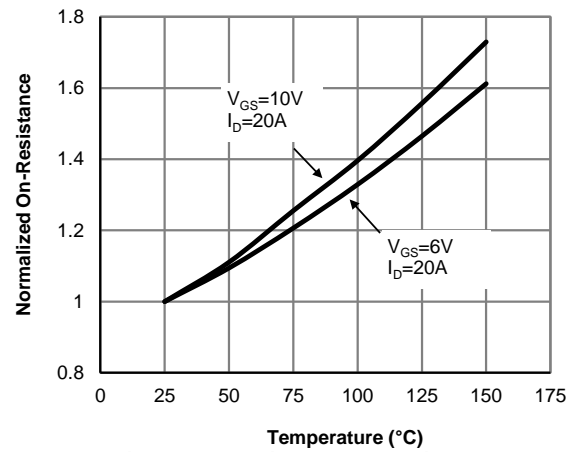
**Figure 1: On-Region Characteristics (Note E)**



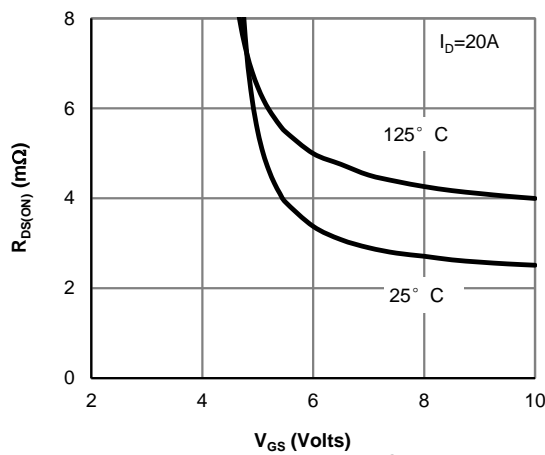
**Figure 2: Transfer Characteristics (Note E)**



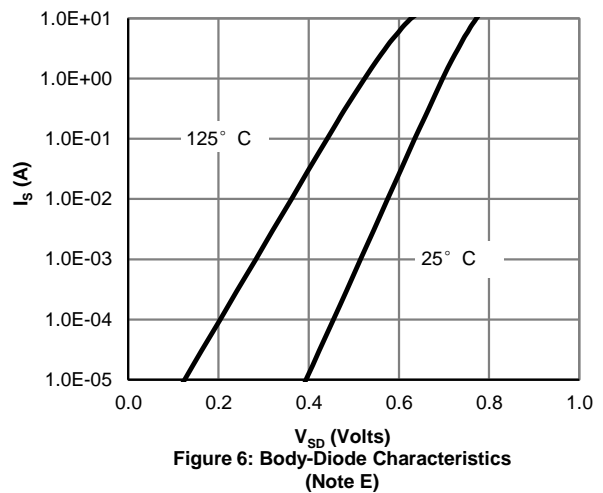
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



**Figure 4: On-Resistance vs. Junction Temperature (Note E)**

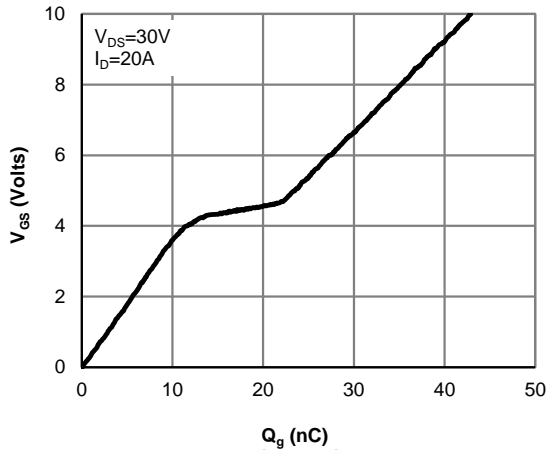


**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

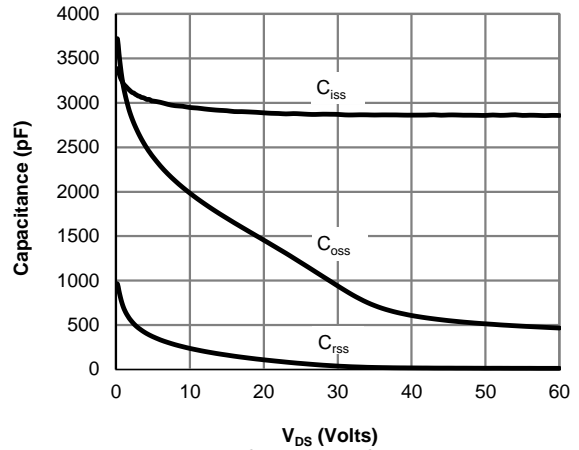


**Figure 6: Body-Diode Characteristics (Note E)**

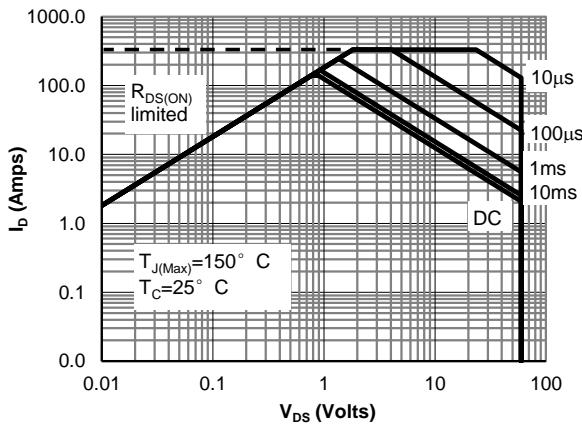
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



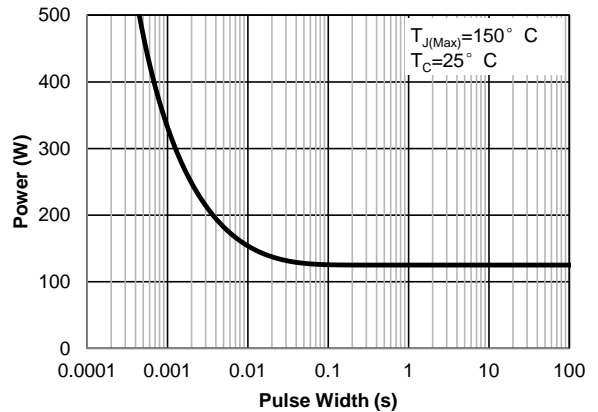
**Figure 7: Gate-Charge Characteristics**



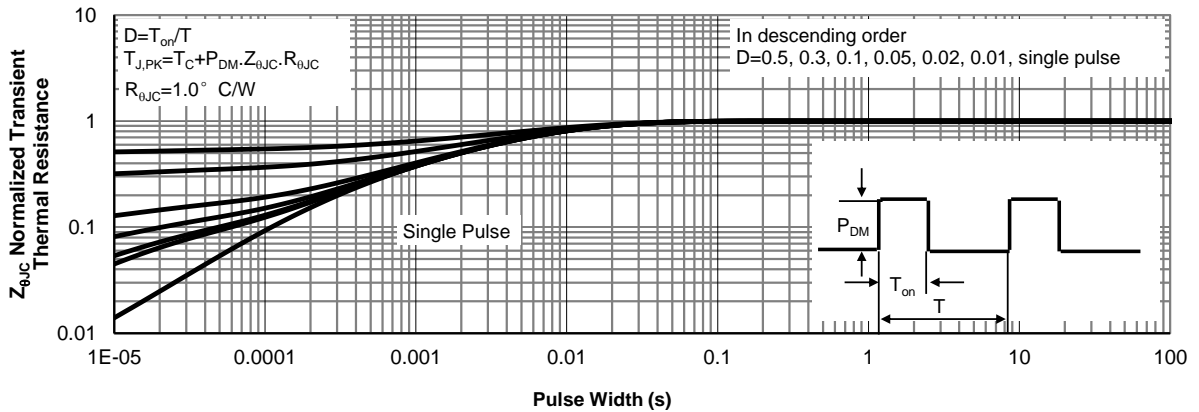
**Figure 8: Capacitance Characteristics**



**Figure 9: Maximum Forward Biased Safe Operating Area (Note F)**



**Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)**



**Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)**

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

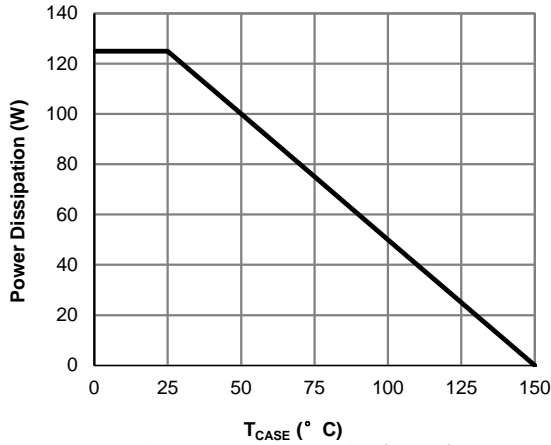


Figure 12: Power De-rating (Note F)

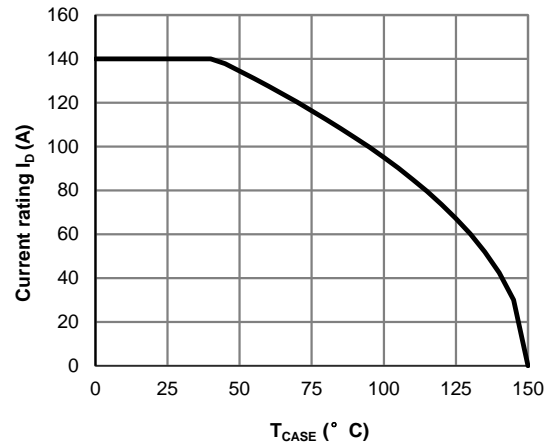


Figure 13: Current De-rating (Note F)

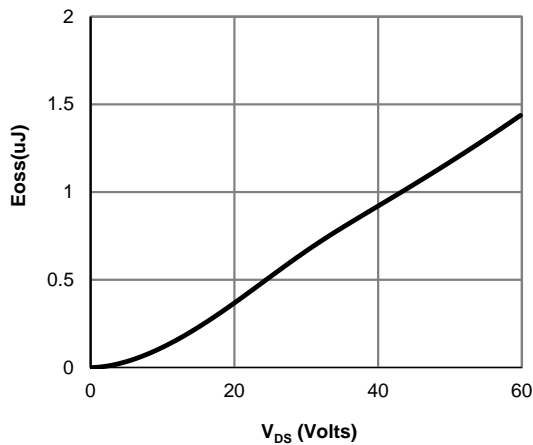


Figure 14: Coss stored Energy

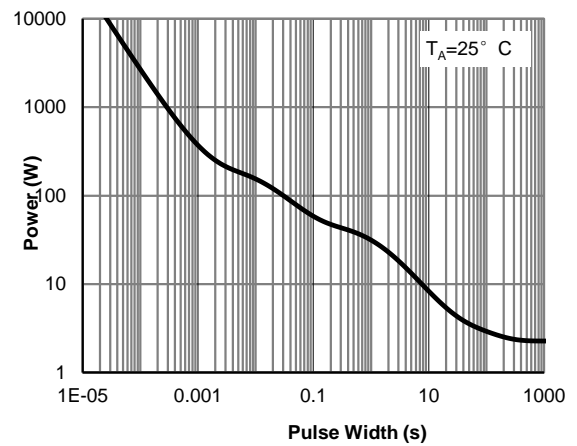


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

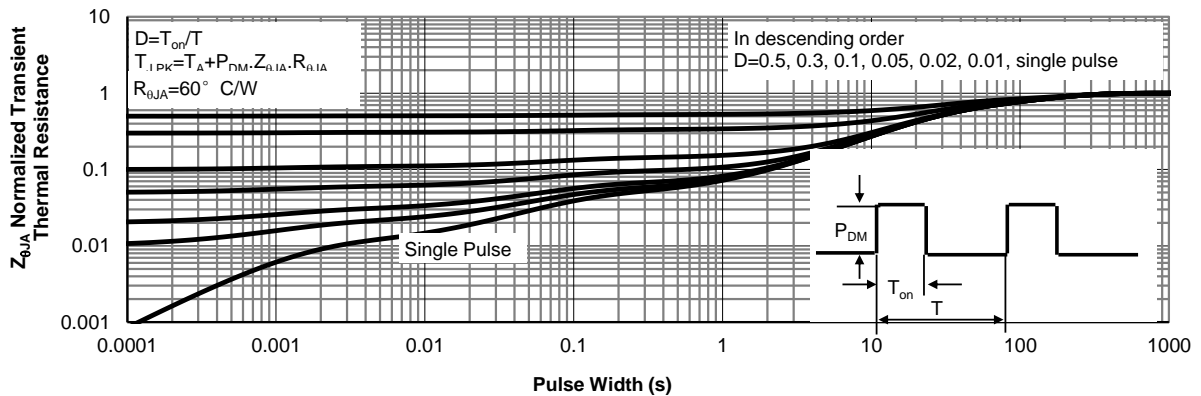


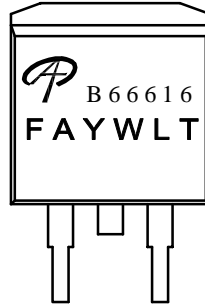
Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)





Document No.	PD-02974
Version	A
Title	AOB66616 Marking Description

TO263(D2PAK) PACKAGE MARKING DESCRIPTION



Green product

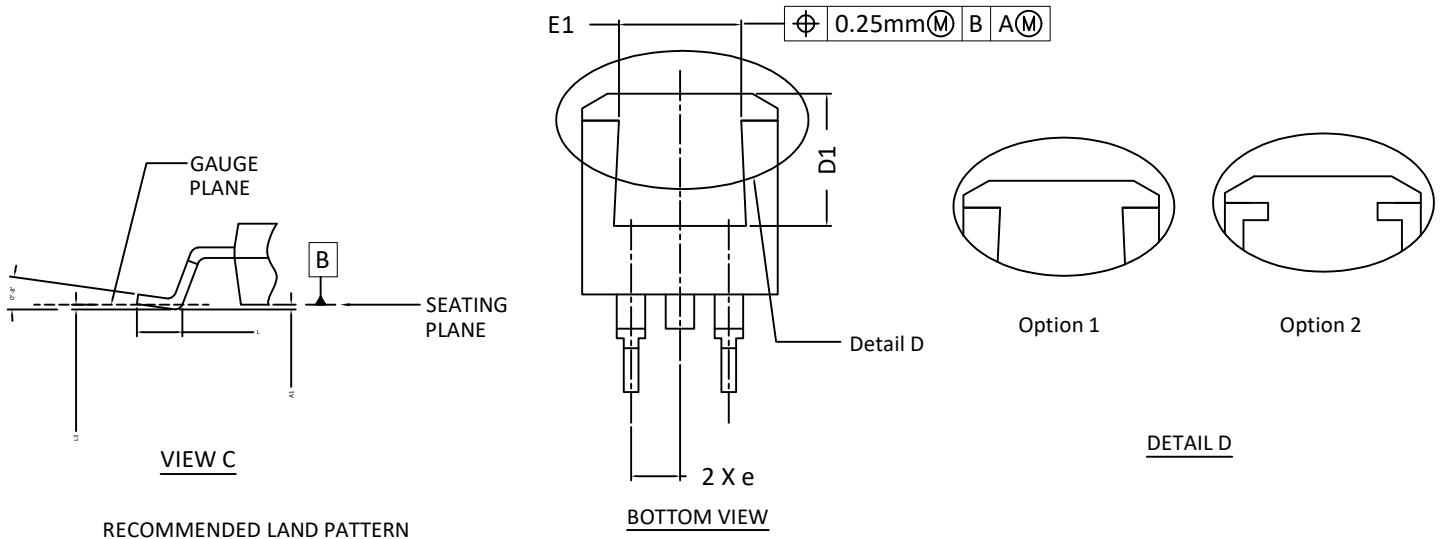
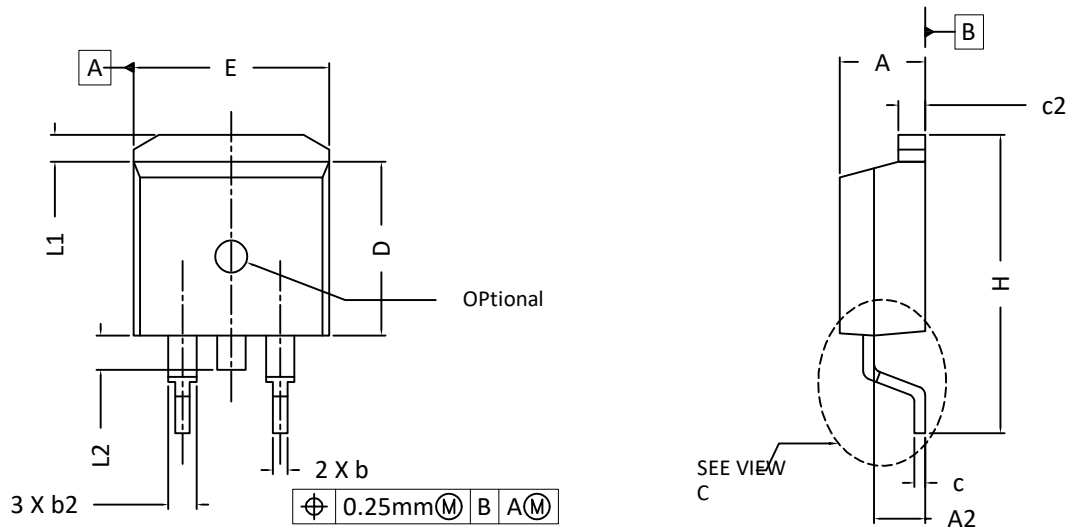
NOTE:

LOGO - AOS Logo  
B66616 - Part number code  
F - Fab code  
A - Assembly location code  
Y - Year code  
W - Week code  
L&T - Assembly lot code

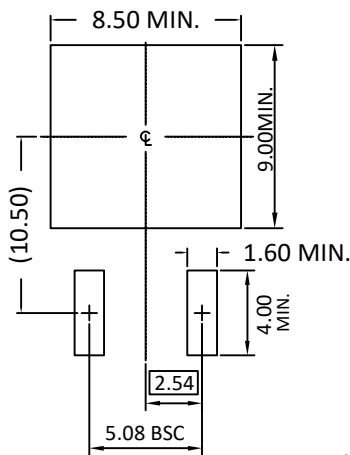
PART NO.	DESCRIPTION	CODE
AOB66616	Green product	B66616



TO263(D2PAK) PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.064	4.45	4.826	0.160	0.175	0.190
A1	0.00	---	0.254	0.000	---	0.010
A2	2.20	2.67	2.90	0.087	0.105	0.114
b	0.508	0.81	0.991	0.020	0.032	0.039
b2	1.143	1.27	1.778	0.045	0.050	0.070
c	0.381	0.50	0.737	0.015	0.020	0.029
c2	1.143	1.27	1.651	0.045	0.050	0.065
D	8.382	9.14	9.652	0.330	0.360	0.380
D1	6.858	8.00	8.37	0.270	0.315	0.330
e	2.54 BSC			0.100 BSC.		
E	9.652	10.03	10.668	0.380	0.395	0.420
E1	6.223	8.00	8.37	0.245	0.315	0.330
H	14.605	15.24	15.875	0.575	0.600	0.625
L	1.778	2.54	2.794	0.070	0.100	0.110
L1	1.02	1.27	1.676	0.040	0.050	0.066
L2	1.27	1.52	1.778	0.050	0.060	0.070
L3	0.25 BSC			0.010 BSC.		

NOTE:

- PACKAGE BODY SIDES EXCLUDE MOLD FLASH AND GATE BURRS. MOLD FLASH SHOULD BE LESS THAN 6 MILS.
- TOLERANCE 0.10 MILLIMETERS UNLESS OTHERWISE SPECIFIED.
- DIMENSION L IS MEASURED IN GAUGE LINE.
- CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
- REFER TO JEDEC TO-263 AB.





**ALPHA & OMEGA**  
SEMICONDUCTOR

# ***AOS Semiconductor Product Reliability Report***

**AOB66616L**, rev A

**Plastic Encapsulated Device**

**ALPHA & OMEGA Semiconductor, Inc**

**[www.aosmd.com](http://www.aosmd.com)**

Jul, 2018

This AOS product reliability report summarizes the qualification result for AOB66616L. Accelerated environmental tests are performed on a specific sample size, and then followed by electrical test at end point. Review of final electrical test result confirms that AOB66616L passes AOS quality and reliability requirements. The released product will be categorized by the process family and be routine monitored for continuously improving the product quality.

## I. Reliability Stress Test Summary and Results

Test Item	Test Condition	Time Point	Total Sample Size	Number of Failures	Reference Standard
HTGB	Temp = 150°C , Vgs=100% of Vgsmx	168 / 500 / 1000 hours	231 pcs	0	JESD22-A108
HTRB	Temp = 150°C , Vds=100% of Vdsmax	168 / 500 / 1000 hours	231 pcs	0	JESD22-A108
Precondition (Note A)	168hr 85°C / 85%RH + 3 cycle reflow@245°C (MSL 1)	-	4620 pcs	0	JESD22-A113
HAST	130°C , 85%RH, 33.3 psia, Vds = 80% of Vdsmax up to 42V	96 hours	693 pcs	0	JESD22-A110
H3TRB	85°C , 85%RH, Vds = 80% of Vdsmax	1000 hours	693 pcs	0	JESD22-A101
Autoclave	121°C , 29.7psia, RH=100%	96 hours	924 pcs	0	JESD22-A102
Temperature Cycle	-65°C to 150°C , air to air,	1000cycles	924 pcs	0	JESD22-A104
HTSL	Temp = 150°C	1000 hours	693 pcs	0	JESD22-A103
IOL	Δ Tj = 100°C	8572 cycles	693 pcs	0	MIL-STD-750 Method 1037

**Note:** The reliability data presents total of available generic data up to the published date.

Note A: MSL (Moisture Sensitivity Level) 1 based on J-STD-020

## II. Reliability Evaluation

**FIT rate (per billion): 7.63**

**MTTF = 14960 years**

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size. Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

**Failure Rate** =  $\text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 7.63$

**MTTF** =  $10^9 / \text{FIT} = 14960$  years

**Chi<sup>2</sup>** = Chi Squared Distribution, determined by the number of failures and confidence interval

**N** = Total Number of units from burn-in tests

**H** = Duration of burn-in testing

**Af** = Acceleration Factor from Test to Use Conditions (Ea = 0.7eV and Tuse = 55°C)

Acceleration Factor [**Af**] =  $\text{Exp} [Ea / k (1/Tj_u - 1/Tj_s)]$

**Acceleration Factor ratio list:**

	55 deg C	70 deg C	85 deg C	100 deg C	115 deg C	130 deg C	150 deg C
<b>Af</b>	<b>259</b>	<b>87</b>	<b>32</b>	<b>13</b>	<b>5.64</b>	<b>2.59</b>	<b>1</b>

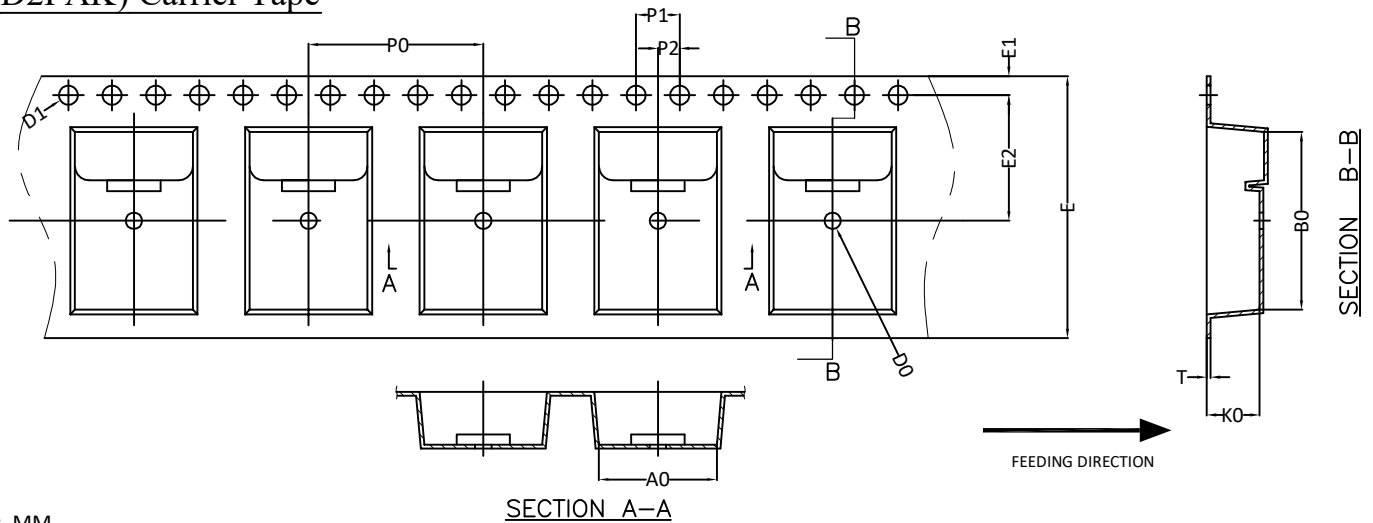
**Tj s** = Stressed junction temperature in degree (Kelvin), K = C+273.16

**Tj u** = The use junction temperature in degree (Kelvin), K = C+273.16

**k** = Boltzmann's constant,  $8.617164 \times 10^{-5} \text{eV} / \text{K}$



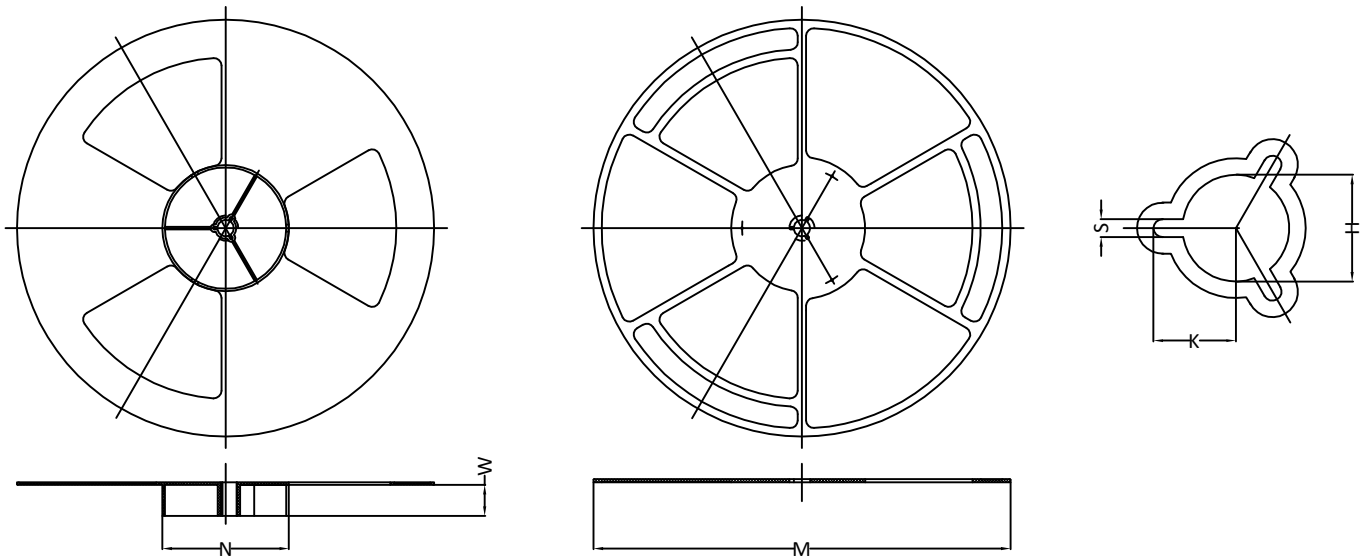
## TO263(D2PAK) Carrier Tape



UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
D2PAK (24 mm)	10.80 ±0.10	16.30 ±0.10	4.70 ±0.10	1.50 ±0.10	1.50 +0.1 -0	24.00 ±0.30	1.75 ±0.10	11.50 ±0.10	16.00 ±0.10	4.00 ±0.10	2.00 ±0.10	0.35 ±0.10

## TO263(D2PAK) Reel



UNIT: MM

TAPE SIZE	REEL SIZE	M	N	W	H	K	S
24 mm	Ø330	Ø330.00 +0.25 -4.00	Ø100.00 ±0.2	24.4 +2.0 -0.0	Ø13.00 +0.50 -0.20	10.5 ±0.25	2.2 ±0.25

## TO263(D2PAK) Tape

Leader / Trailer  
& Orientation

Unit Per Reel:  
800pcs

