ALPHA & OMEGA SEMICONDUCTOR

AOTL66912

100V N-Channel AlphaSGT™

General Description

- Trench Power MOSFET - AlphaSGT™ technology
- Combination of low $R_{DS(ON)}$ and wide safe operating area (SOA)
- Higher in-rush current enabled for faster start-up and shorter down time
- RoHS and Halogen-Free Compliant

Applications

- Telecom hotswap
- Load switch
- Solar
- Battery management

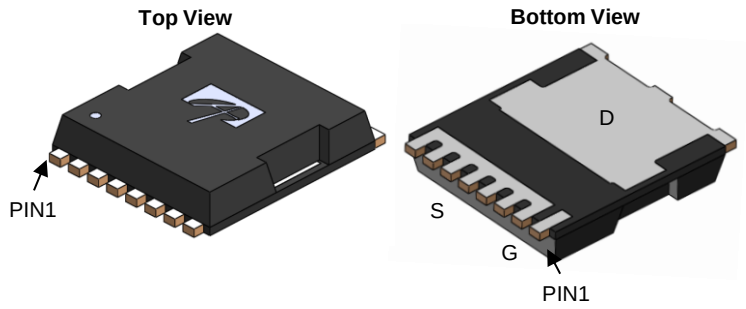
Product Summary

V_{DS}	100V
I_D (at V_{GS}=10V)	380A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 1.7mΩ
$R_{DS(ON)}$ (at V_{GS}=6V)	< 2.5mΩ

100% UIS Tested
100% Rg Tested

Green Product

TOLLA



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOTL66912	TOLLA	Tape & Reel	2000

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	100	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C=25°C	I_D	380	A
	T_C=100°C		269	
Pulsed Drain Current [C] (≤100μS)		I_{DM}	1520	
Continuous Drain Current	T_A=25°C	I_{DSM}	49	A
	T_A=70°C		39	
Avalanche Current [C]		I_{AS}	90	A
Avalanche energy	L=0.1mH [C]	E_{AS}	405	mJ
Power Dissipation [B]	T_C=25°C	P_D	500	W
	T_C=100°C		250	
Power Dissipation [A]	T_A=25°C	P_{DSM}	8.3	W
	T_A=70°C		5.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	10	15	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		35	45	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	0.2	0.3	°C/W

Electrical Characteristics (T_J=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	100			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=100V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=$V_{GS,}$ I_D=250µA	2.5	3.0	3.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A		1.4	1.7	mΩ
		T_J=125°C		2.25	2.75	
		V_{GS}=6V, I_D=20A		2.0	2.5	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		70		S
V_{SD}	Diode Forward Voltage	I_S=1A, V_{GS}=0V		0.67	1	V
I_S	Maximum Body-Diode Continuous Current				330	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=50V, f=1MHz		12500		pF
C_{oss}	Output Capacitance			3190		pF
C_{rss}	Reverse Transfer Capacitance			55		pF
R_g	Gate resistance	f=1MHz	0.8	1.75	2.7	Ω
SWITCHING PARAMETERS						
$Q_{g(10V)}$	Total Gate Charge	V_{GS}=10V, V_{DS}=50V, I_D=20A		155	220	nC
Q_{gs}	Gate Source Charge			48		nC
Q_{gd}	Gate Drain Charge			31		nC
Q_{oss}	Output Charge	V_{GS}=0V, V_{DS}=50V		269		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=50V, R_L=2.5Ω, R_{GEN}=3Ω		36		ns
t_r	Turn-On Rise Time			25		ns
$t_{D(off)}$	Turn-Off DelayTime			90		ns
t_f	Turn-Off Fall Time			40		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, di/dt=500A/µs		55		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, di/dt=500A/µs		335		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ t≤ 10s and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175° C may be used if the PCB allows it.
B. 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.
C. Single pulse width limited by junction temperature $T_{J(MAX)}$=175° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ 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 $T_{J(MAX)}$=175° C. The SOA curve provides a single pulse rating.
G. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

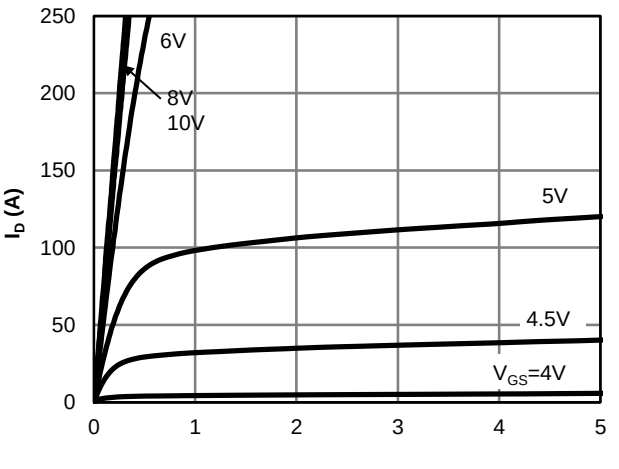


Figure 1: On-Region Characteristics (Note E)

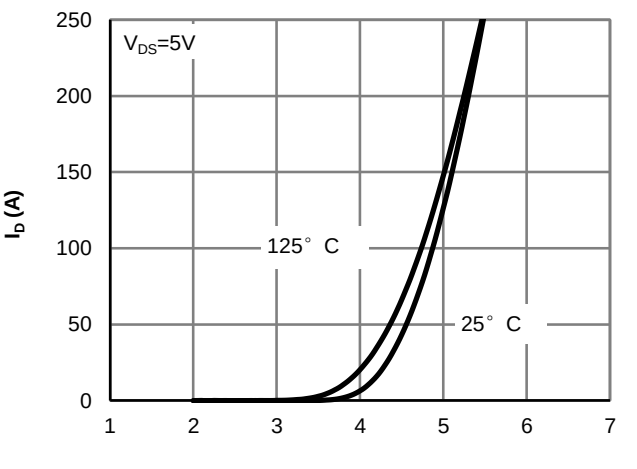


Figure 2: Transfer Characteristics (Note E)

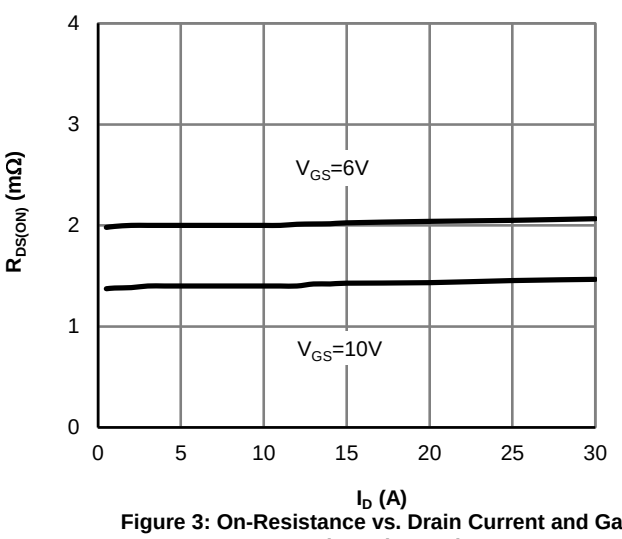


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

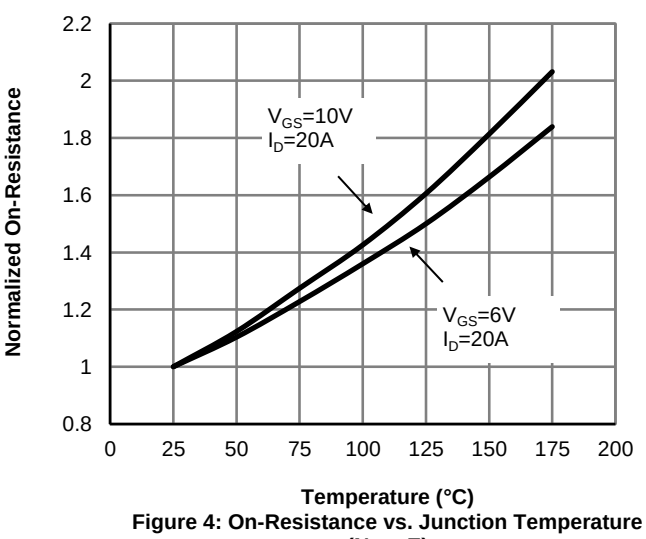


Figure 4: On-Resistance vs. Junction Temperature (Note E)

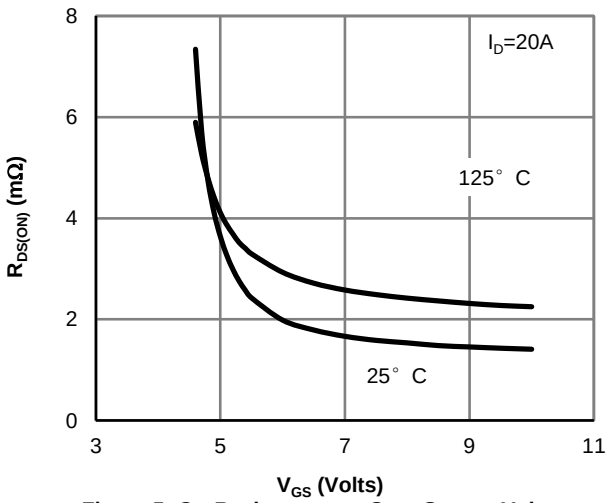


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

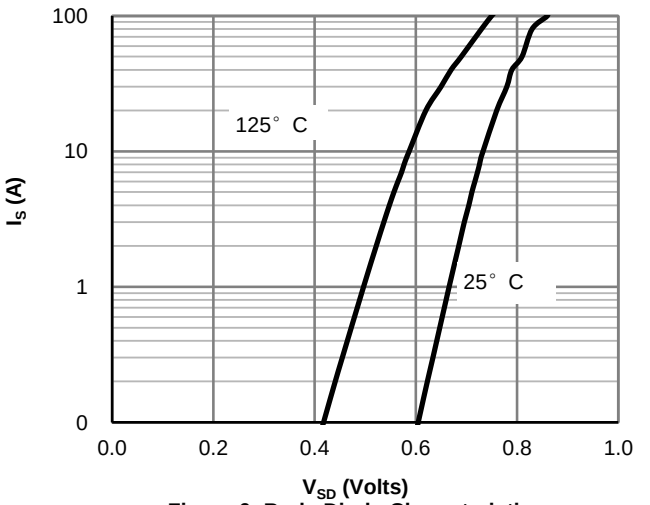


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

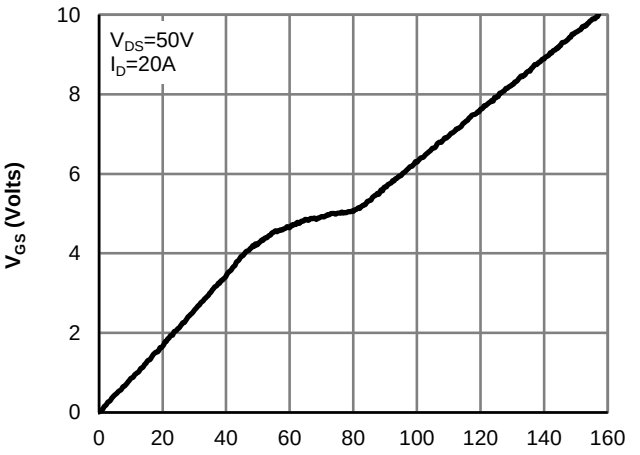


Figure 7: Gate-Charge Characteristics

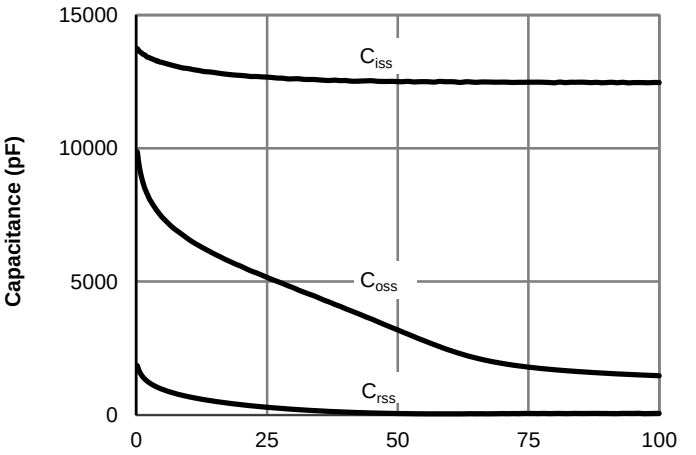


Figure 8: Capacitance Characteristics

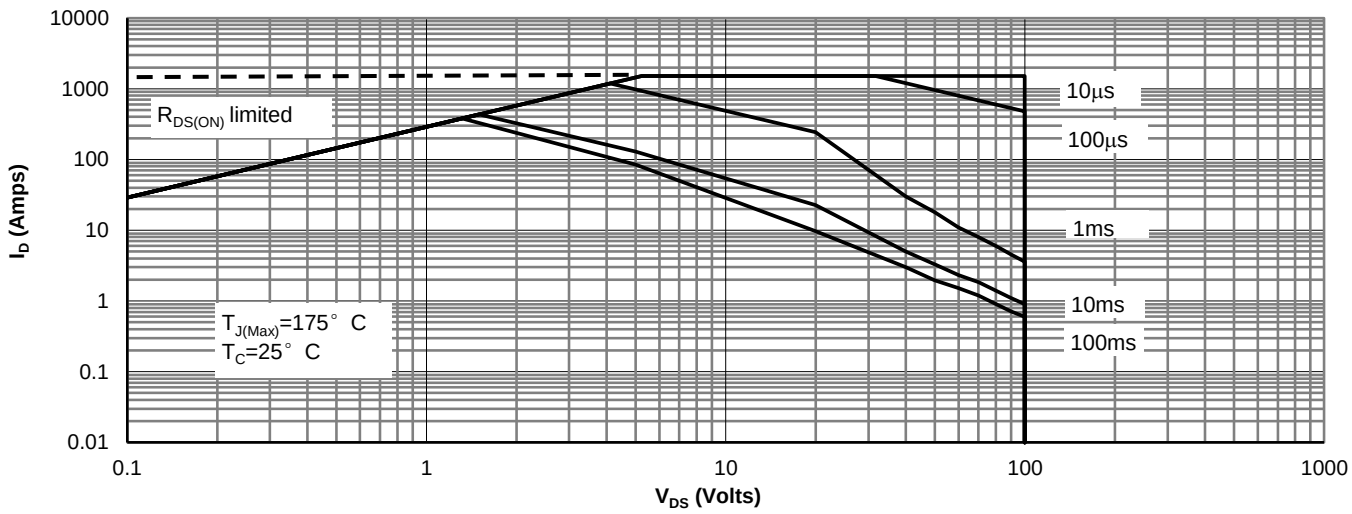


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

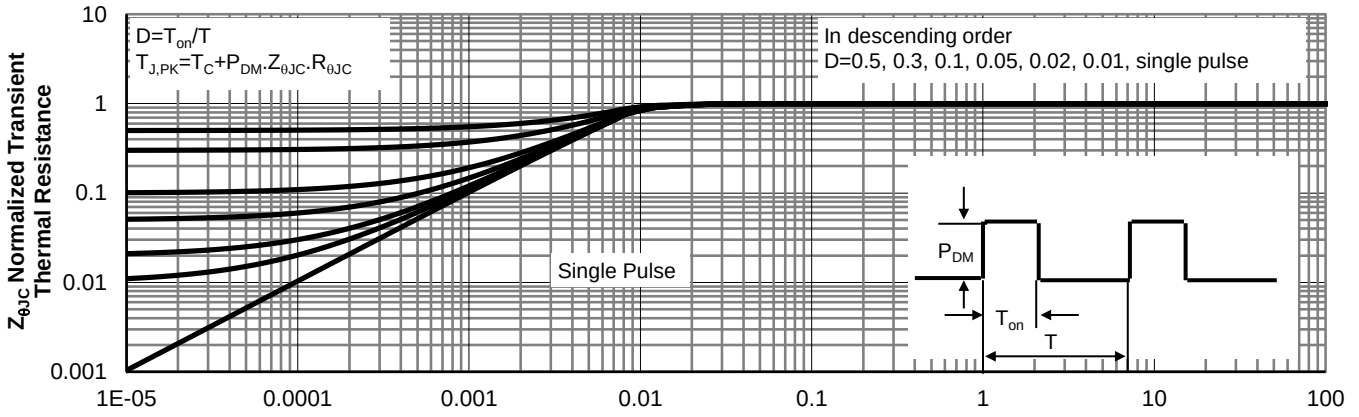


Figure 10: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

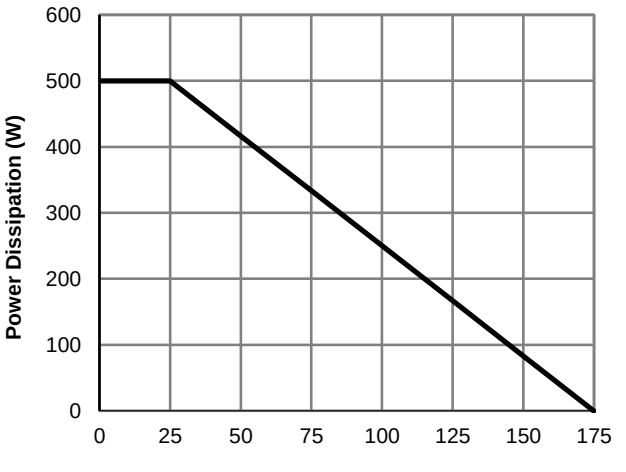


Figure 11: Power De-rating (Note F)

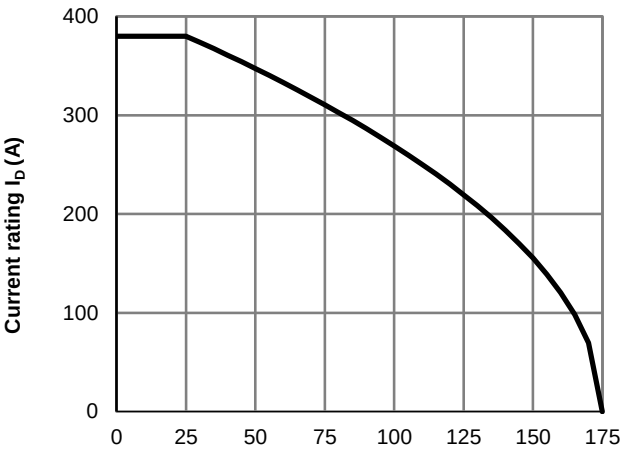


Figure 12: Current De-rating (Note F)

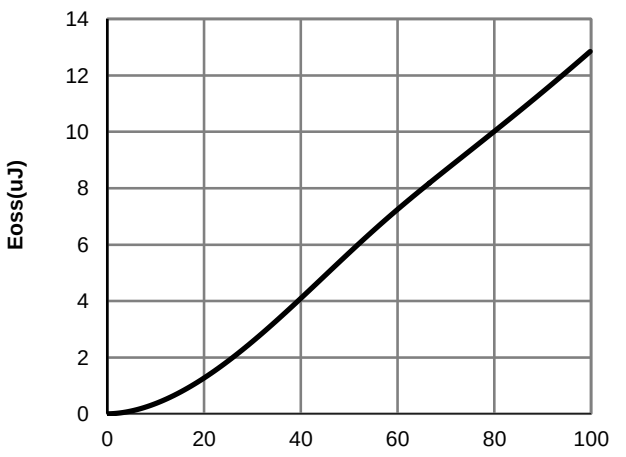


Figure 13: Coss stored Energy

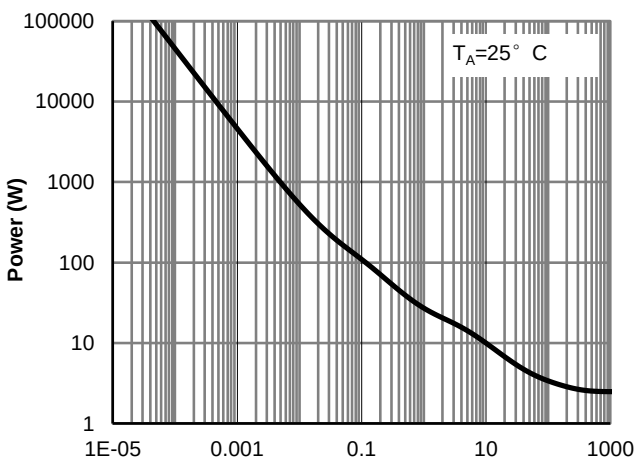


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

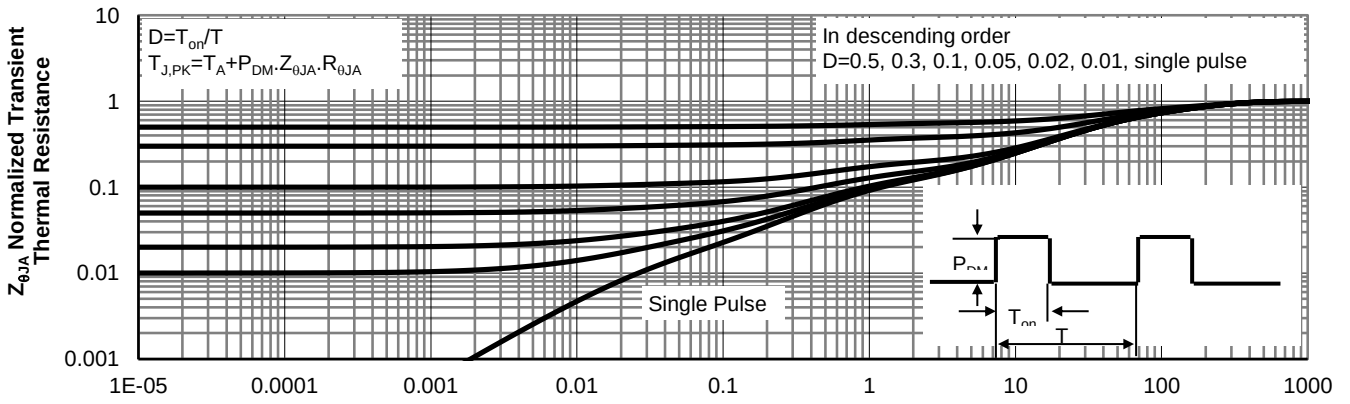


Figure 15: Normalized Maximum Transient Thermal Impedance (Note G)

Figure A: Gate Charge Test Circuit & Waveforms

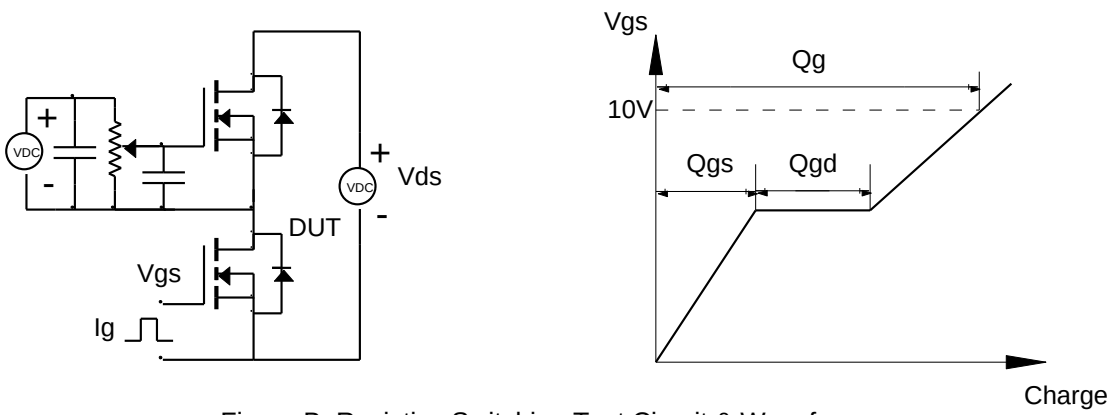


Figure B: Resistive Switching Test Circuit & Waveforms

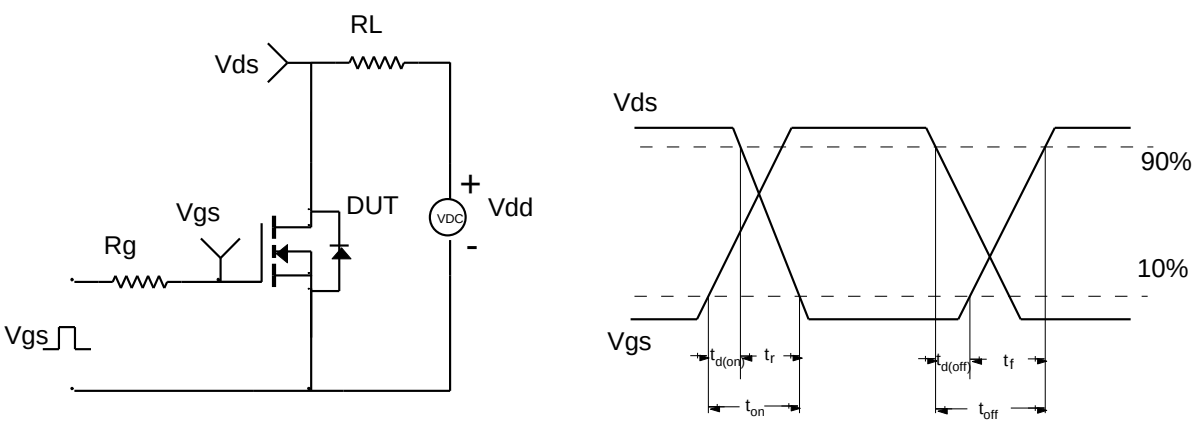


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

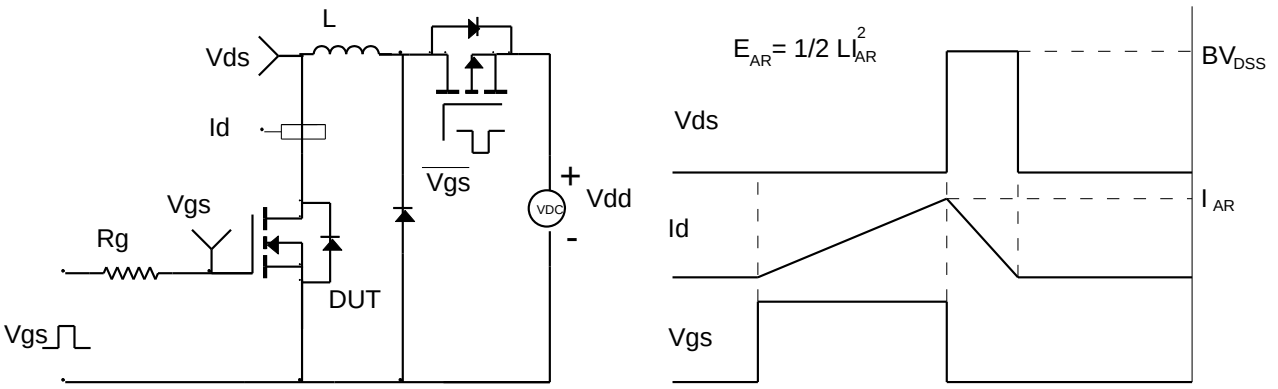
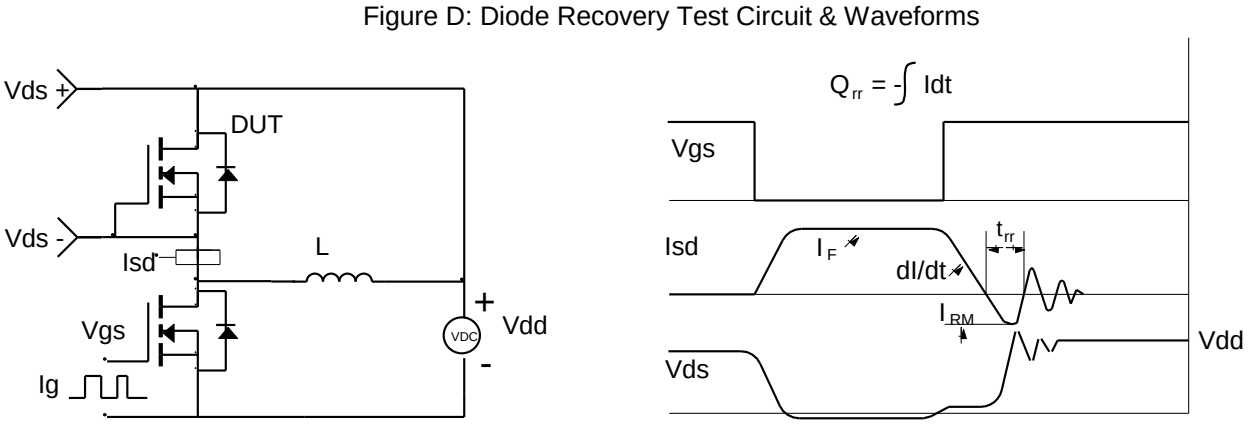


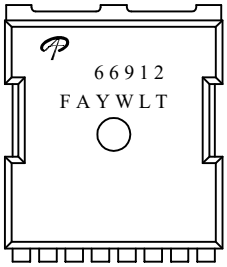
Figure D: Diode Recovery Test Circuit & Waveforms



ALPHA & OMEGA SEMICONDUCTOR

Document No.	PD-03151
Version	B
Title	AOTL66912 Marking Description

TOLLA PACKAGE MARKING DESCRIPTION



Green product

NOTE:

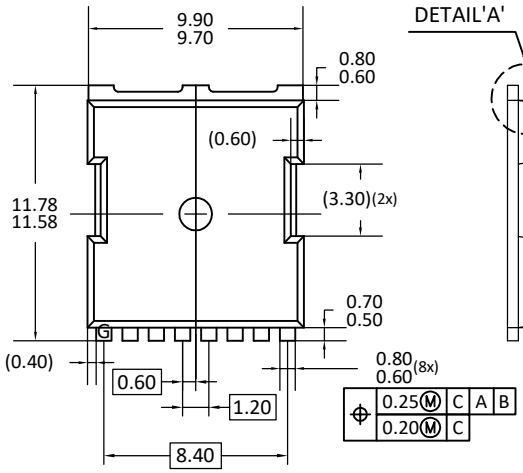
LOGO	- AOS Logo
66912	- Part number code
F	- Fab code
A	- Assembly location code
Y	- Year code
W	- Week code
L&T	- Assembly lot code

PART NO.	DESCRIPTION	CODE
AOTL66912	Green product	66912

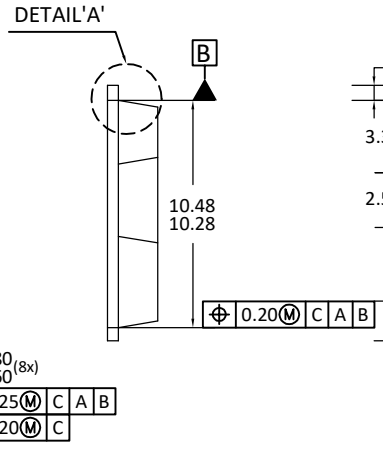
ALPHA & OMEGA SEMICONDUCTOR

Document No.	PO-00272
Version	D

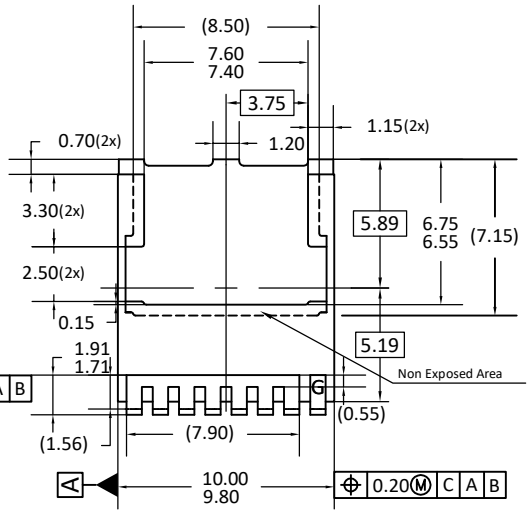
TOLLA PACKAGE OUTLINE



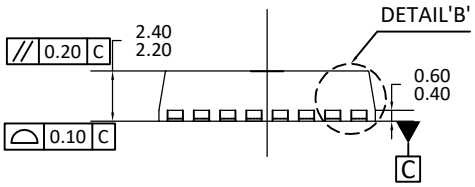
TOP VIEW



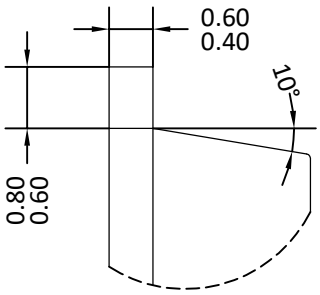
SIDE VIEW



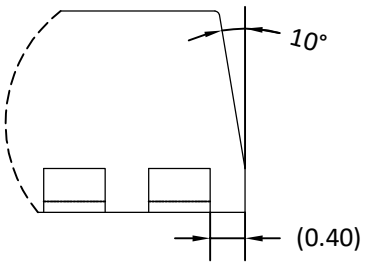
BOTTOM VIEW



SIDE VIEW



DETAIL 'A'



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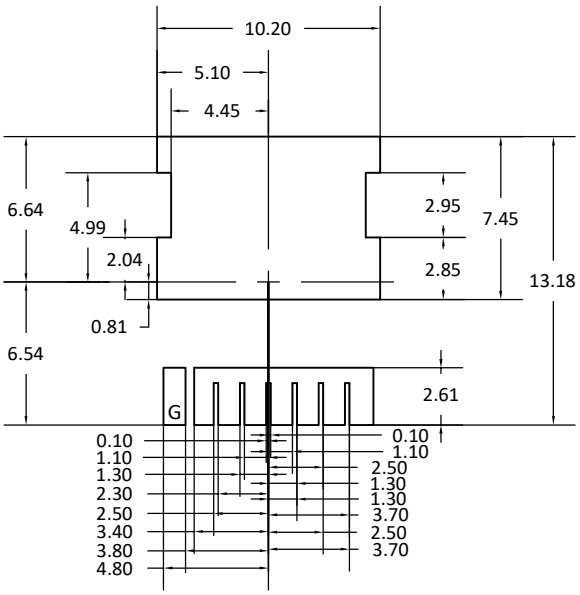


LAND PATTERN RECOMMENDATIONS

UNIT: mm

NOTE:
A) PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS. MOLD FLASH SHOULD BE LESS THAN 6 MIL.
B) TOLERANCE 0.100 MILLIMETERS UNLESS OTHERWISE SPECIFIED.
C) CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
D) ( ) IS REFERENCE.
E) THIS PACKAGE WAS QUALIFIED USING IR REFLOW PROCESS (JEDEC STANDARD). FOR USAGE IN OTHER SOLDERING PROCESSES, PLEASE CONTACT LOCAL AOS REPRESENTATIVES.

AOS Semiconductor
Product Reliability Report

AOTL66912, rev A

Plastic Encapsulated Device

ALPHA & OMEGA Semiconductor, Inc

www.aosmd.com

Feb, 2018

This AOS product reliability report summarizes the qualification result for AOTL66912. 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 AOTL66912 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 = 175°C , Vgs=100% of Vgsmax**	**168 / 500 / 1000 hours**	**231 pcs**	**0**	**JESD22-A108**
HTRB	**Temp = 175°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@260°C (MSL 1)**	**-**	**693 pcs**	**0**	**JESD22-A113**
HAST	**130°C , 85%RH, 33.3 psia, Vds = 80% of Vdsmax up to 42V**	**96 hours**	**231 pcs**	**0**	**JESD22-A110**
Autoclave	**121°C , 29.7psia, RH=100%**	**96 hours**	**231 pcs**	**0**	**JESD22-A102**
Temperature Cycle	**-55°C to 150°C , air to air,**	**1000cycles**	**231 pcs**	**0**	**JESD22-A104**

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): 2.61
MTTF = 43670 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 = $Chi^2 \times 10^9$ **/ [**2 (N) (H) (Af)**] =** 2.61
MTTF = 10^9 / FIT = 43670 years

Chi² = 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**] = **Exp** [Ea / **k** (1/Tj u – 1/Tj s)]

Acceleration Factor ratio list:

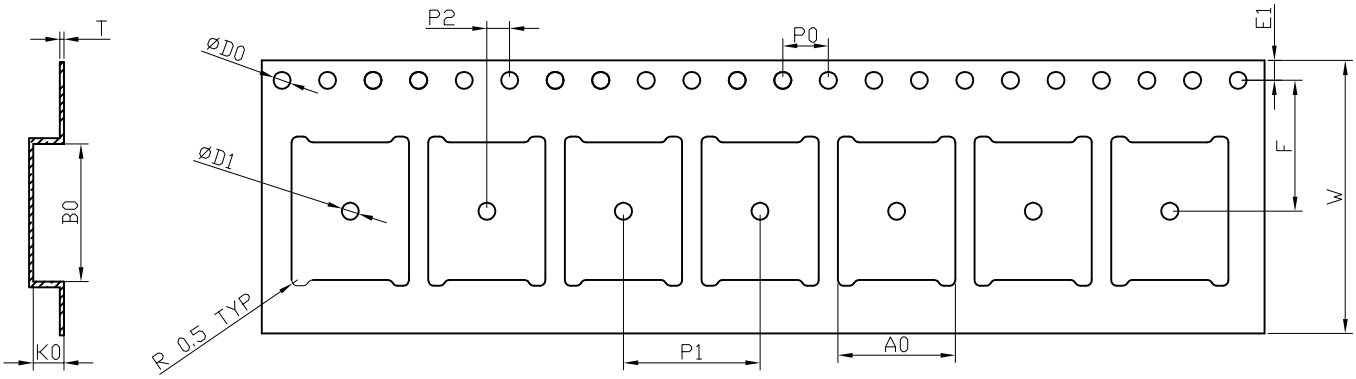
	55 deg C	70 deg C	85 deg C	100 deg C	125 deg C	150 deg C	175 deg C
Af	**758**	**256**	**95**	**38**	**9.7**	**2.9**	**1**

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 X 10^{-5}eV / K

ALPHA & OMEGA SEMICONDUCTOR

TOLL Tape and Reel Data

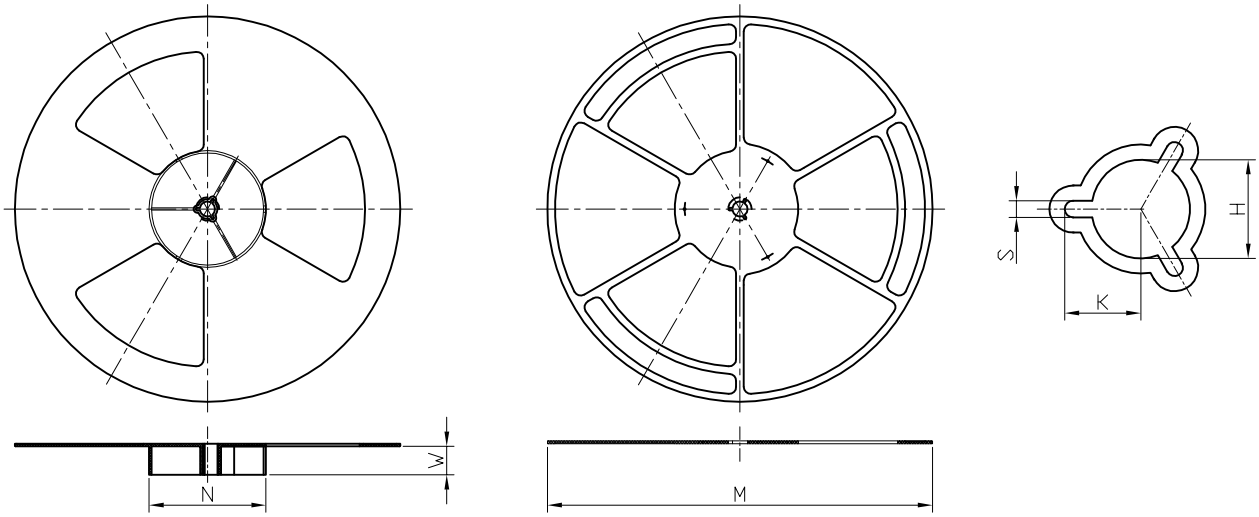
TOLL Carrier Tape



UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	W	E1	F	P0	P1	P2	T
TOLL (24 MM)	10.30 ±0.10	12.10 ±0.10	2.60 ±0.10	1.50 +0.10	1.50 MIN.	24.00 ±0.30	1.75 ±0.10	11.50 ±0.10	4.00 ±0.10	12.00 ±0.10	2.00 ±0.10	0.35 ±0.04

TOLL Reel

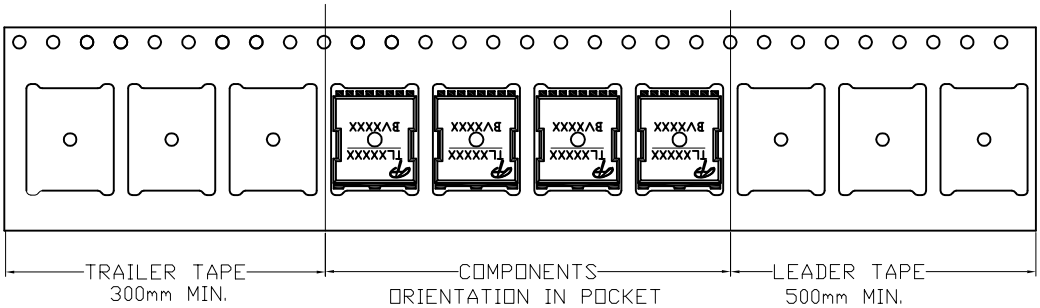


UNIT: MM

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

TOLL Tape

Leader / Trailer & Orientation



Unit Per Reel:
2000pcs