



General Description

- AlphaSGT™ N-Channel Power MOSFET
- Excellent gate charge x R_{DS(ON)} product (FOM)
- PB-free lead plating, RoHS compliant

Applications

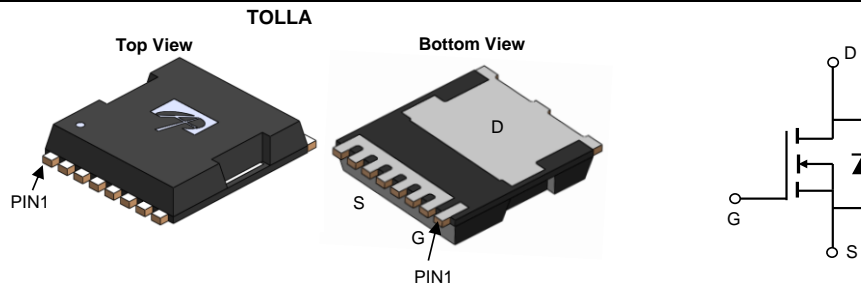
- BLDC Motor Drive
- Battery Management
- Load Switch

Product Summary

V _{DS}	80V
I _D (at V _{GS} =10V)	420A
R _{DS(ON)} (at V _{GS} =10V)	< 1.25mΩ
R _{DS(ON)} (at V _{GS} =8V)	< 1.45mΩ

100% UIS Tested
100% Rg Tested

Max T_j=175°C



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOTL66810	TOLLA	Tape & Reel	2000

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V _{DS}	80	V
Gate-Source Voltage	V _{GS}	±20	V
Continuous Drain Current	I _D	T _C =25°C	420
		T _C =100°C	300
Pulsed Drain Current ^C (≤100μS)	I _{DM}	1700	A
Continuous Drain Current	I _{DSM}	T _A =25°C	65
		T _A =70°C	55
Avalanche Current ^C	I _{AS}	80	A
Avalanche energy L=0.3mH ^C	E _{AS}	960	mJ
Power Dissipation ^B	P _D	T _C =25°C	425
		T _C =100°C	210
Power Dissipation ^A	P _{DSM}	T _A =25°C	10
		T _A =70°C	7
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	R _{θJA}	t ≤ 10s	10	°C/W
Maximum Junction-to-Ambient ^{A,D}		Steady-State	35	45
Maximum Junction-to-Case	R _{θJC}	0.25	0.35	°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	80			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =80V, V _{GS} =0V T _J =55°C			1 5	μA
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	2.4	3	3.6	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =20A T _J =125°C		1.0 1.5	1.25 1.90	mΩ
		V _{GS} =8V, I _D =20A		1.1	1.45	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		81		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.7	1	V
I _S	Maximum Body-Diode Continuous Current				200	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =40V, f=1MHz		13000		pF
C _{oss}	Output Capacitance			3300		pF
C _{rss}	Reverse Transfer Capacitance			95		pF
R _g	Gate resistance	f=1MHz	1	2	3	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =40V, I _D =20A		175	245	nC
Q _{gs}	Gate Source Charge			50		nC
Q _{gd}	Gate Drain Charge			35		nC
Q _{oss}	Output Charge	V _{GS} =0V, V _{DS} =40V		238		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =40V, R _L =2.0Ω, R _{GEN} =3Ω		35		ns
t _r	Turn-On Rise Time			25		ns
t _{D(off)}	Turn-Off DelayTime			113		ns
t _f	Turn-Off Fall Time			39		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, di/dt=500A/μs		52		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, di/dt=500A/μs		340		nC

A. The value of R_{θJA} is measured with the device mounted on 1in² 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_{θJA} ≤ 10s and the maximum allowed junction temperature of 175° 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_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} 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. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

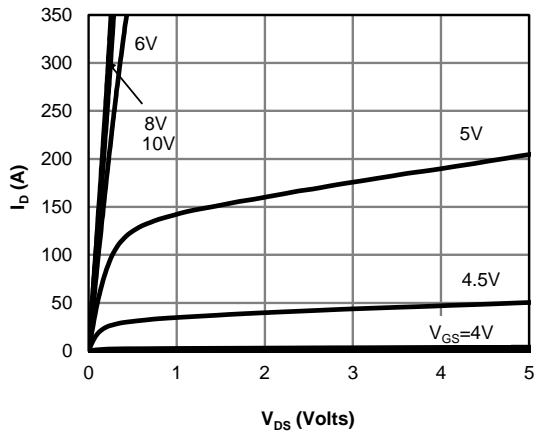


Figure 1: On-Region Characteristics (Note E)

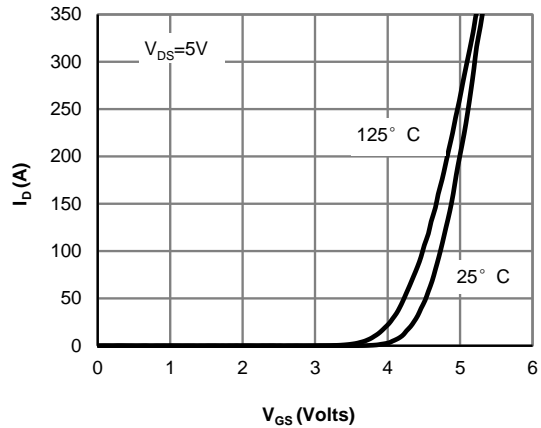


Figure 2: Transfer Characteristics (Note E)

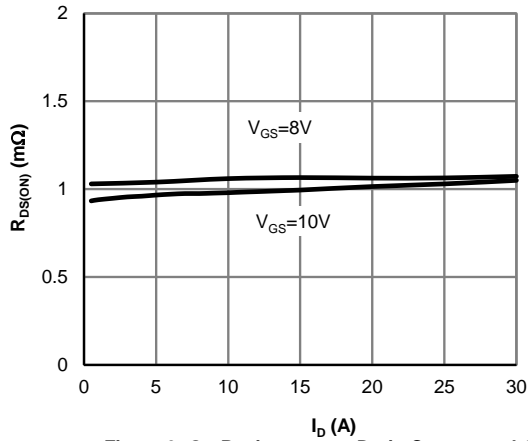


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

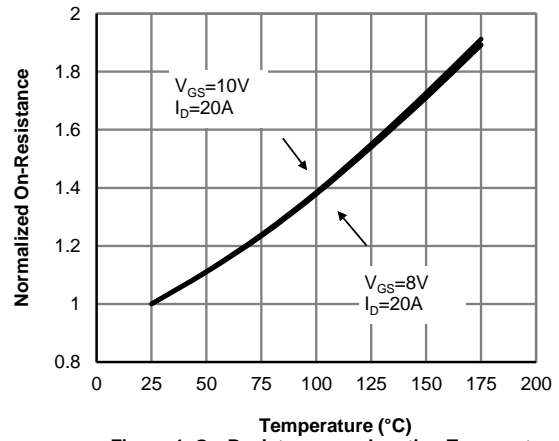


Figure 4: On-Resistance vs. Junction Temperature (Note E)

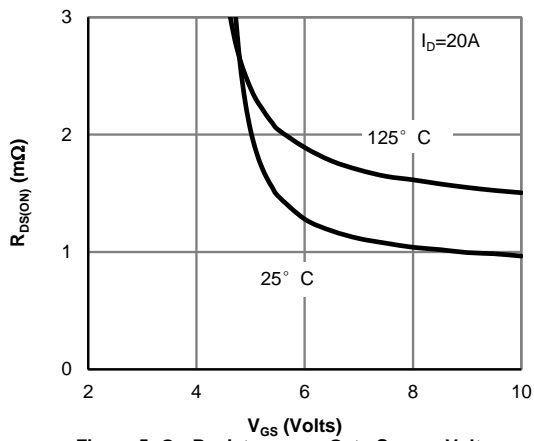


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

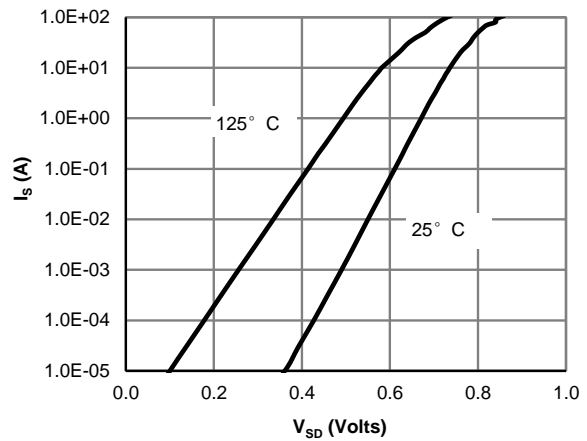


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

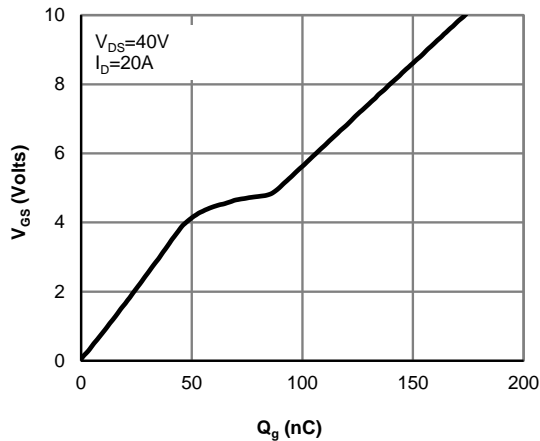


Figure 7: Gate-Charge Characteristics

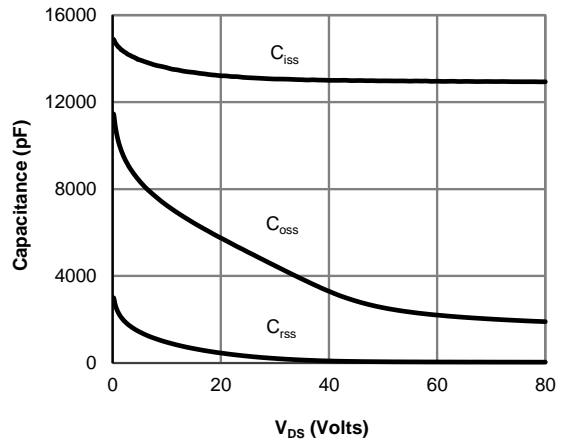


Figure 8: Capacitance Characteristics

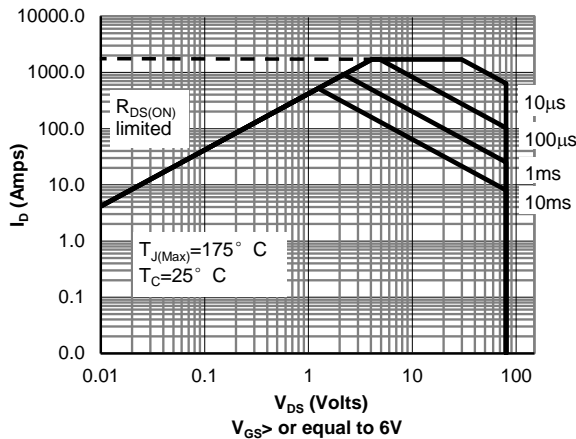


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

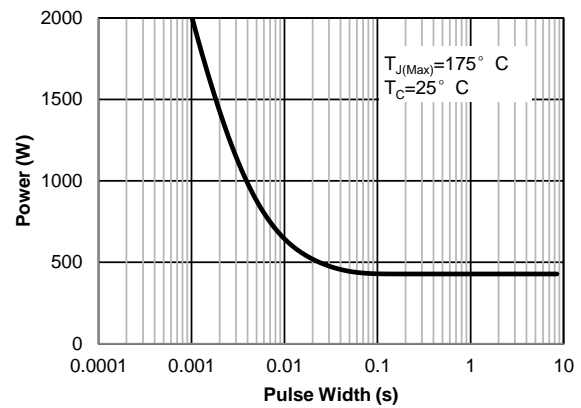


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

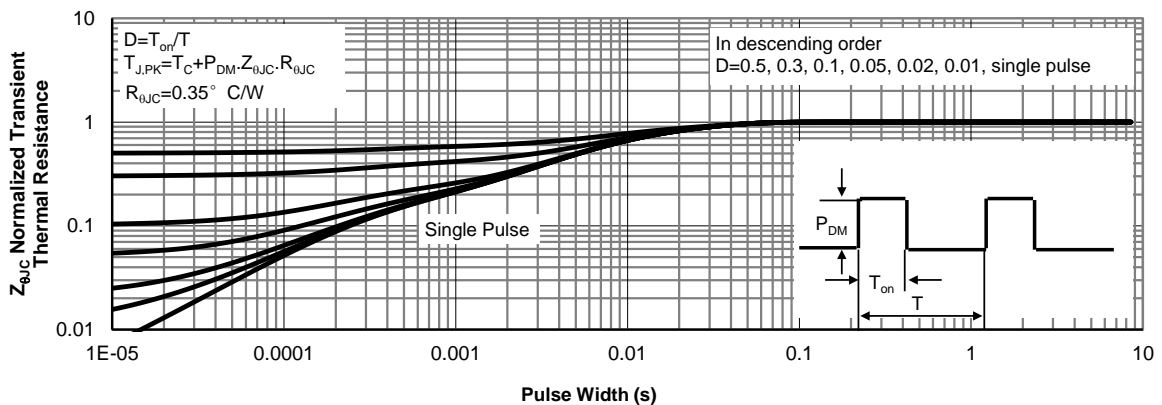


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

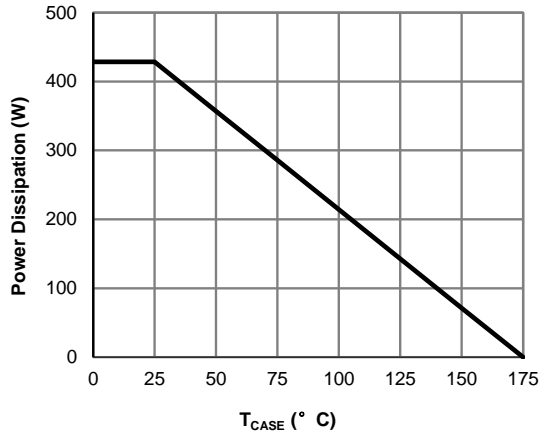


Figure 12: Power De-rating (Note F)

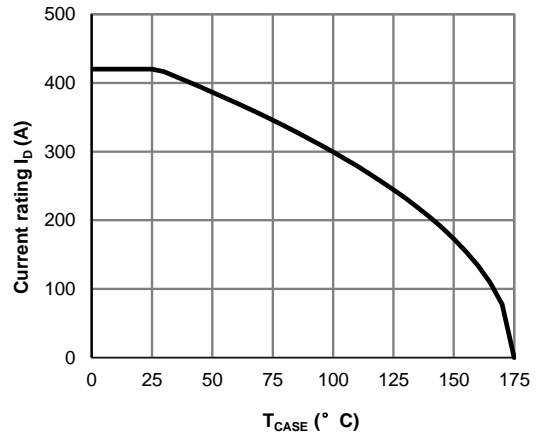


Figure 13: Current De-rating (Note F)

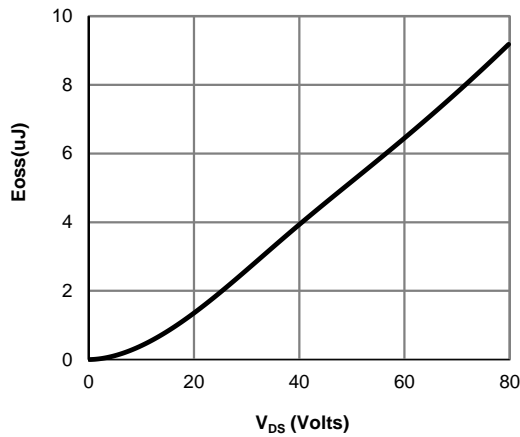


Figure 14: Coss stored Energy

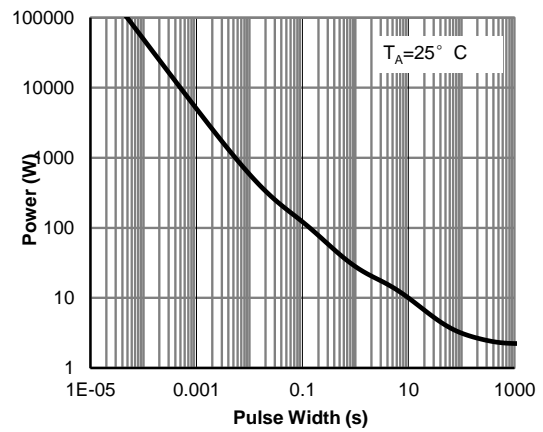


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

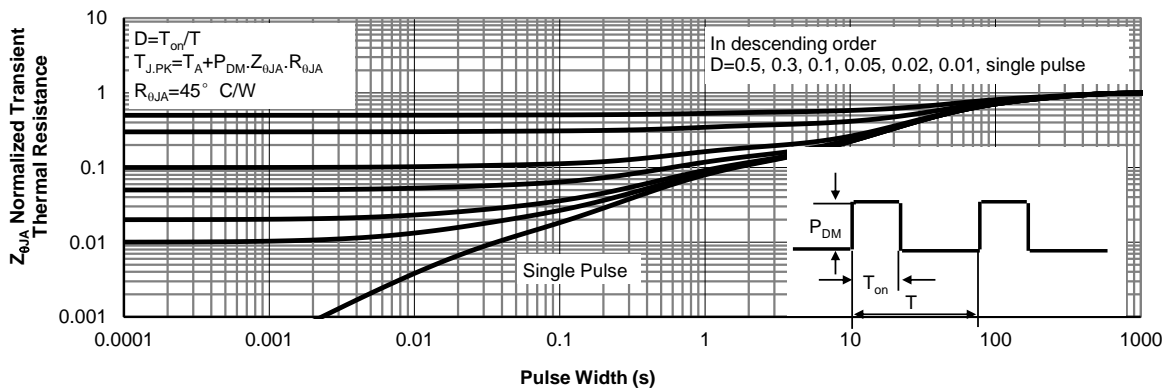


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

Figure A: Gate Charge Test Circuit & Waveforms

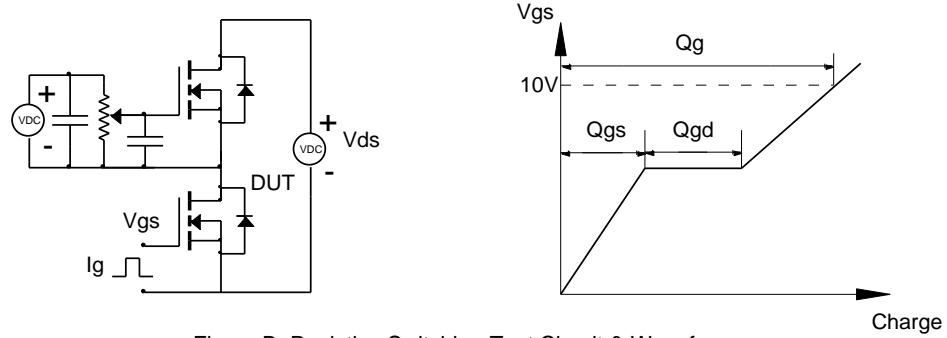


Figure B: Resistive Switching Test Circuit & Waveforms

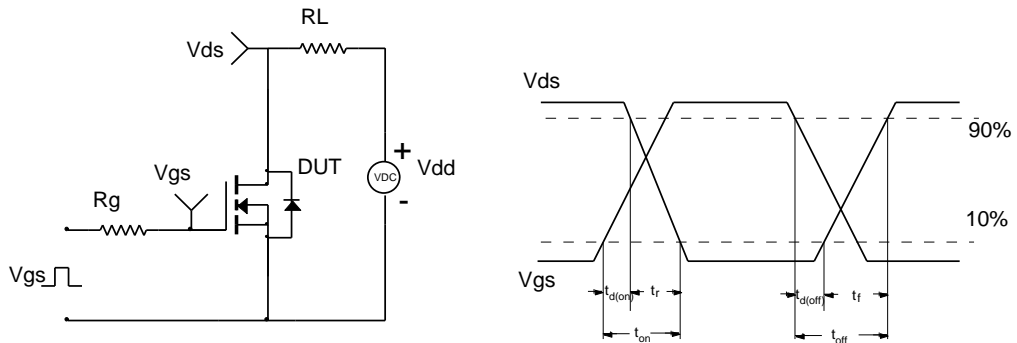


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

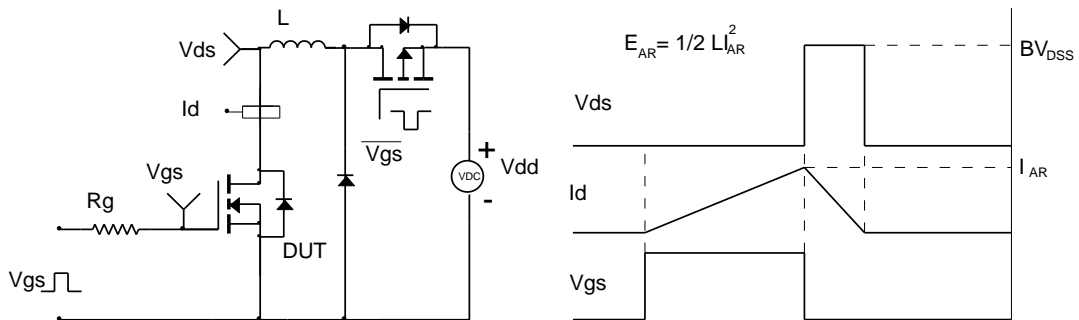
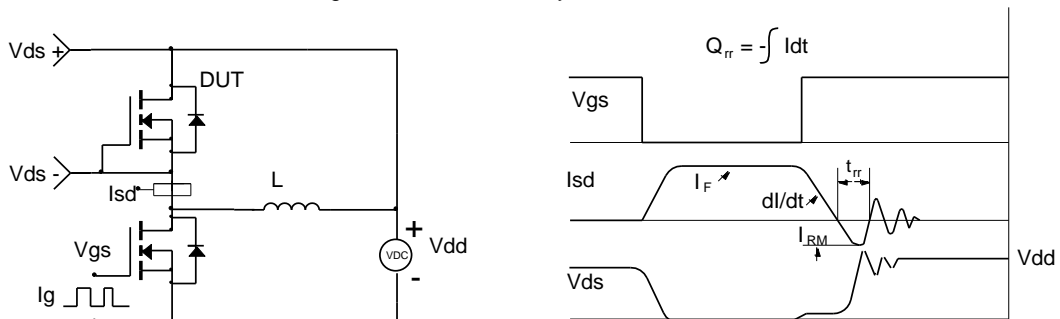


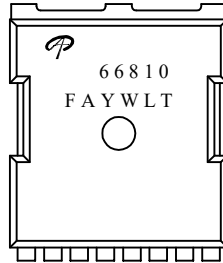
Figure D: Diode Recovery Test Circuit & Waveforms





Document No.	PD-03738
Version	C
Title	AOTL66810 Marking Description

TOLLA PACKAGE MARKING DESCRIPTION



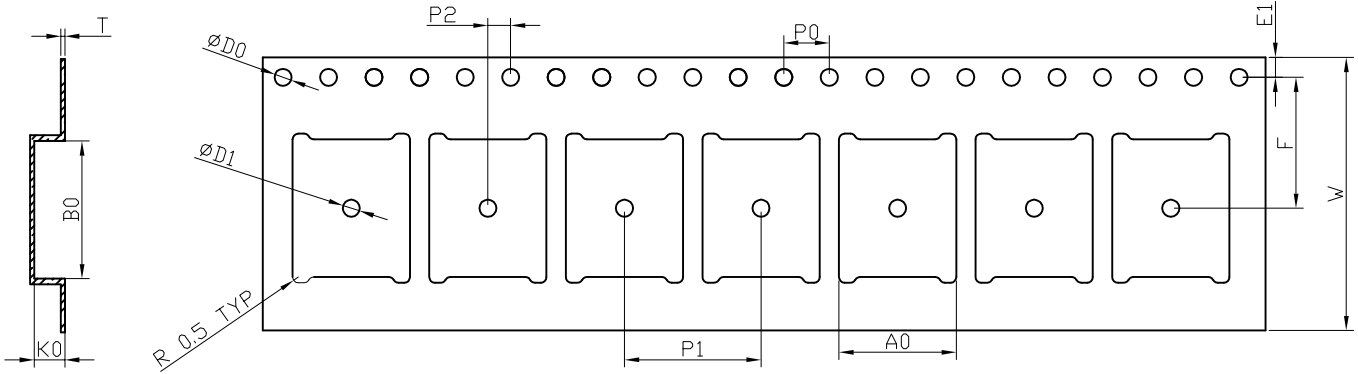
Green product

NOTE:	
LOGO	- AOS Logo
66810	- 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
AOTL66810	Green product	66810



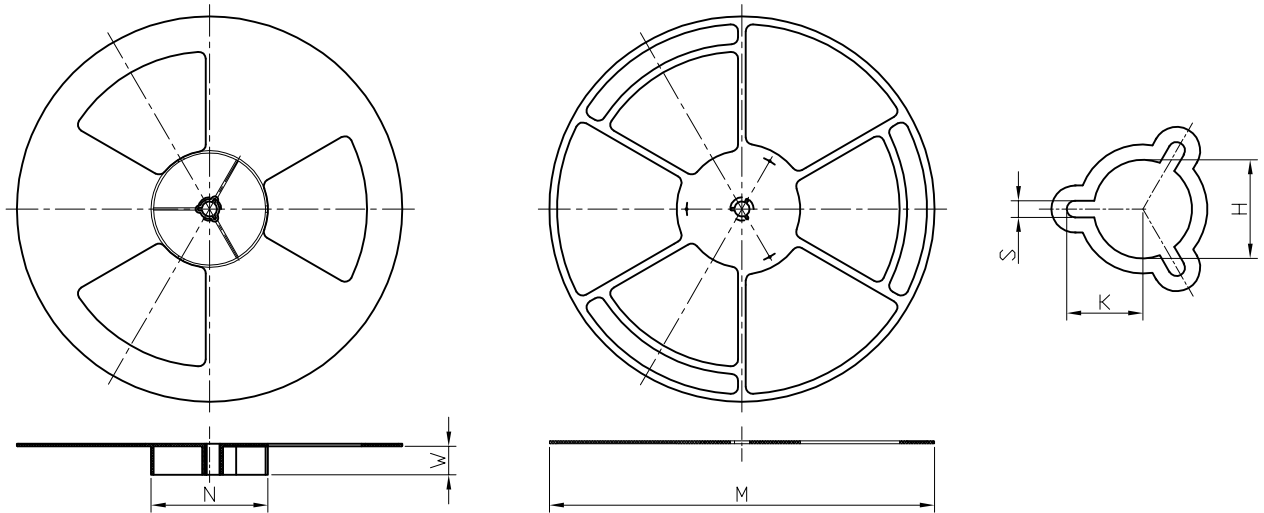
TOLL Carrier Tape



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



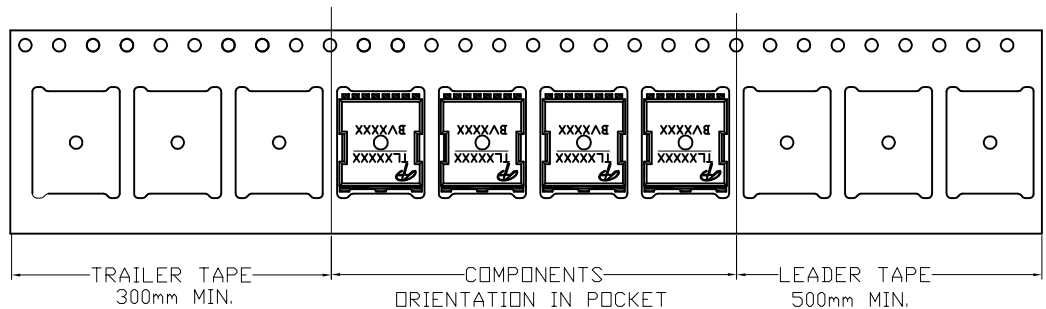
UNIT: MM

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





Alpha & Omega Semiconductor Product Reliability Report

AOTL66810, rev A

Plastic Encapsulated Device

ALPHA & OMEGA Semiconductor, Inc

www.aosmd.com

This AOS product reliability report summarizes the qualification result for AOTL66810. 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 AOTL66810 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 Vdsmx	168 / 500 / 1000 hours	231 pcs	0	JESD22-A108
Precondition (Note A)	168hr 85°C / 85%RH + 3 cycle reflow @260°C (MSL 1)	-	1386 pcs	0	JESD22-A113
HAST	130°C , 85%RH, 33.3 psia, Vds = 80% of Vdsmx up to 42V	96 hours	231 pcs	0	JESD22-A110
H3TRB	85°C , 85%RH, Vds = 80% of Vdsmx	1000 hours	231 pcs	0	JESD22-A101
Autoclave	121°C , 29.7psia, RH=100%	96 hours	231 pcs	0	JESD22-A102
Temperature Cycle	-65°C to 150°C , air to air,	1000 cycles	231 pcs	0	JESD22-A104
HTSL	Temp = 150°C	1000 hours	231 pcs	0	JESD22-A103
IOL	Δ Tj = 100°C	15000 cycles	231 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

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**] = $\text{Exp} [Ea / k (1/Tj u - 1/Tj s)]$

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
Af	259	87	32	13	5.64	2.59	1

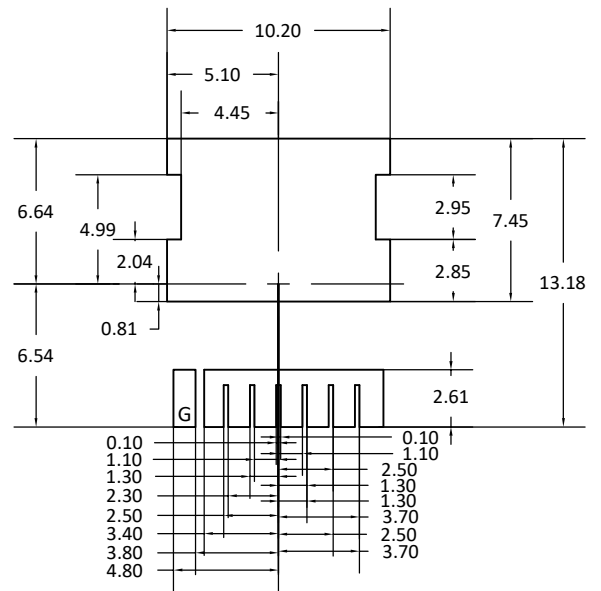
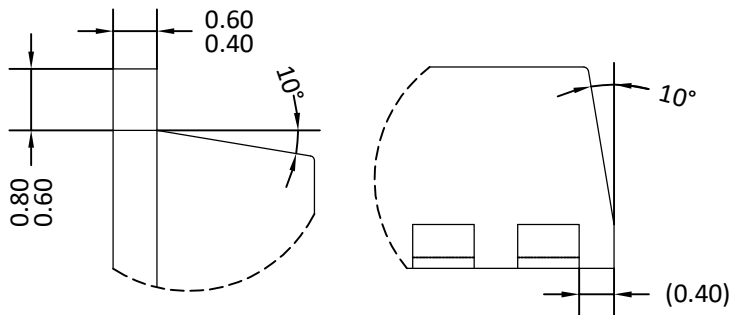
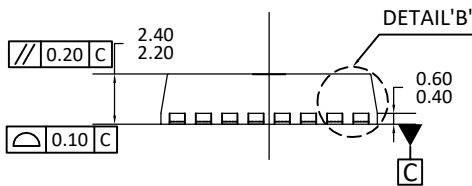
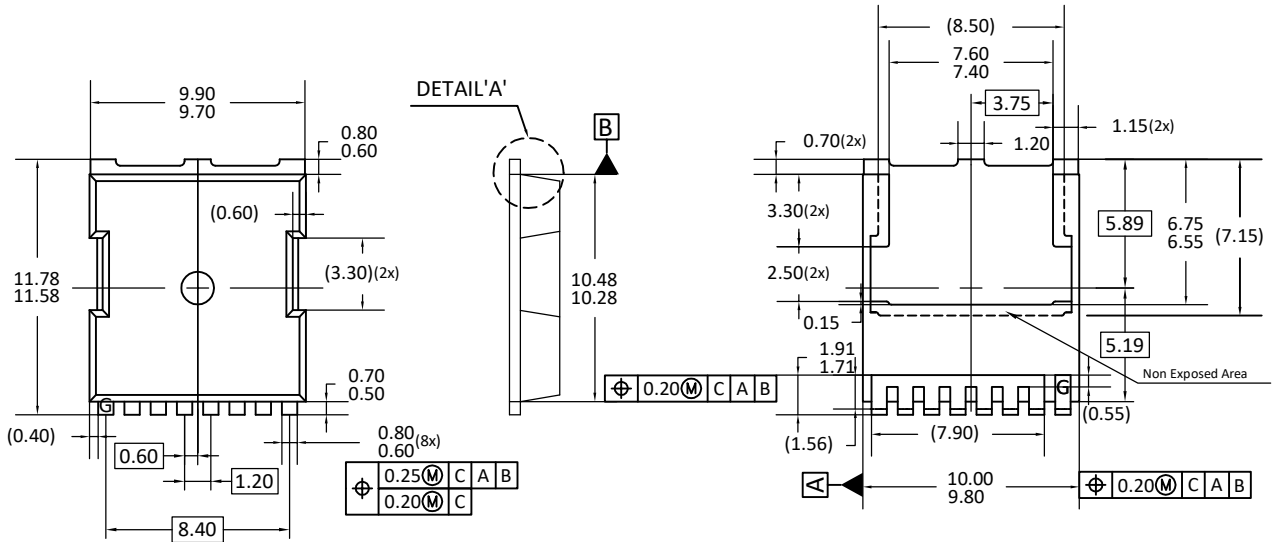
Tj s = Stressed junction temperature in degree (Kelvin), K = C+273.16

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

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



TOLLA PACKAGE OUTLINE



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.

LAND PATTERN RECOMMENDATIONS