



General Description

- Trench Power MOSFET - AlphaSGT™ technology
- Extremely Low $R_{DS(ON)}$
- Optimized switching performance
- 175°C operating temperature
- RoHS and Halogen-Free Compliant

Applications

- Telecom DC-DC
- Industrial power
- Load switch

Product Summary

V_{DS}	150V
I_D (at $V_{GS}=10V$)	120A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 5.4mΩ
$R_{DS(ON)}$ (at $V_{GS}=6V$)	< 6mΩ

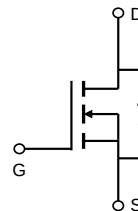
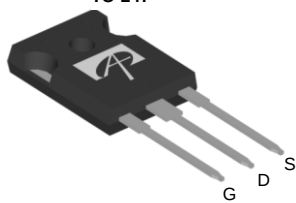
100% UIS Tested
100% Rg Tested

Max Tj=175°C



Top View

TO-247



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOK66518	TO-247	Tube	240

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	150	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current ^G	I_D	120	A
$T_C=25^\circ\text{C}$		120	
$T_C=100^\circ\text{C}$			
Pulsed Drain Current ^C	I_{DM}	480	
Continuous Drain Current	I_{DSM}	38	A
$T_A=25^\circ\text{C}$		32	
$T_A=70^\circ\text{C}$			
Avalanche Current ^C	I_{AS}	70	A
Avalanche energy $L=0.3\text{mH}$ ^C	E_{AS}	735	mJ
Power Dissipation ^B	P_D	500	W
$T_C=25^\circ\text{C}$		250	
$T_C=100^\circ\text{C}$			
Power Dissipation ^A	P_{DSM}	18	W
$T_A=25^\circ\text{C}$		13	
$T_A=70^\circ\text{C}$			
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	$R_{\theta JA}$	5	8	°C/W
$t \leq 10\text{s}$				
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JC}$	30	40	°C/W
Steady-State				
Maximum Junction-to-Case	$R_{\theta JC}$	0.22	0.30	°C/W
Steady-State				

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	150			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =150V, 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	2.7	3.2	3.7	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =20A T _J =125°C		4.5 7.8	5.4 9.5	mΩ
		V _{GS} =8V, I _D =20A		4.8	6.0	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		50		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.7	1	V
I _S	Maximum Body-Diode Continuous Current ^G				120	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =75V, f=1MHz		6460		pF
C _{oss}	Output Capacitance			820		pF
C _{rss}	Reverse Transfer Capacitance			5		pF
R _g	Gate resistance	f=1MHz	1.1	2.3	3.5	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =75V, I _D =20A		80	115	nC
Q _{gs}	Gate Source Charge			32		nC
Q _{gd}	Gate Drain Charge			15		nC
Q _{oss}	Output Charge	V _{GS} =0V, V _{DS} =75V		273		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =75V, R _L =2.5Ω, R _{GEN} =3Ω		27		ns
t _r	Turn-On Rise Time			20		ns
t _{D(off)}	Turn-Off DelayTime			49		ns
t _f	Turn-Off Fall Time			28		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, di/dt=500A/μs		86		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, di/dt=500A/μs		920		nC

- A. The value of R_{θJA} is measured 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.
- 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 in a still air environment with T_A=25° C.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

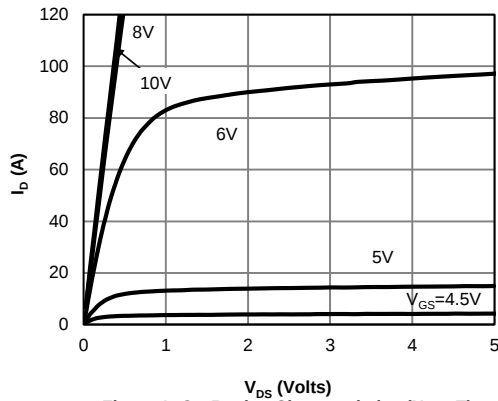


Figure 1: On-Region Characteristics (Note E)

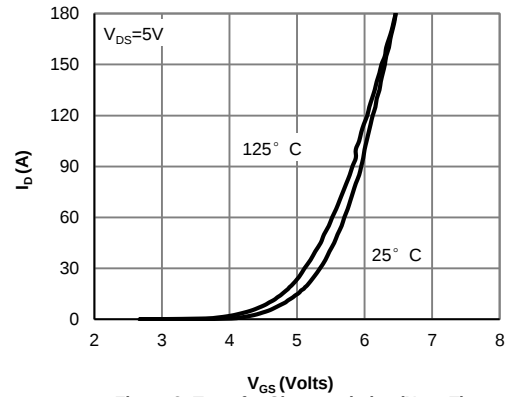


Figure 2: Transfer Characteristics (Note E)

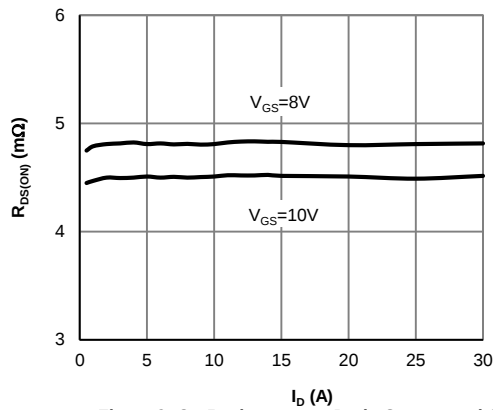


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

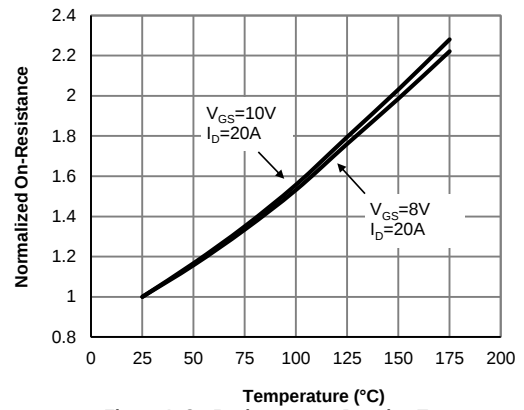


Figure 4: On-Resistance vs. Junction Temperature (Note E)

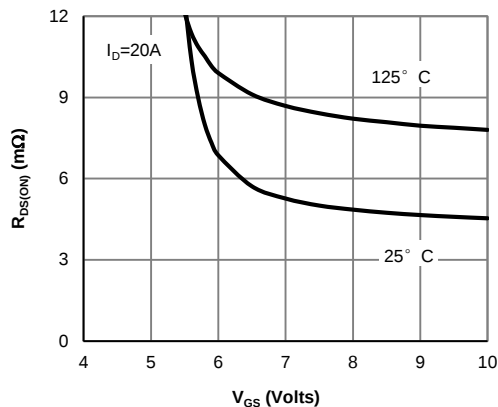


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

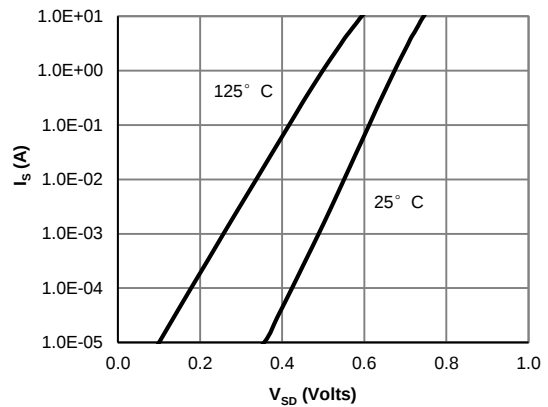
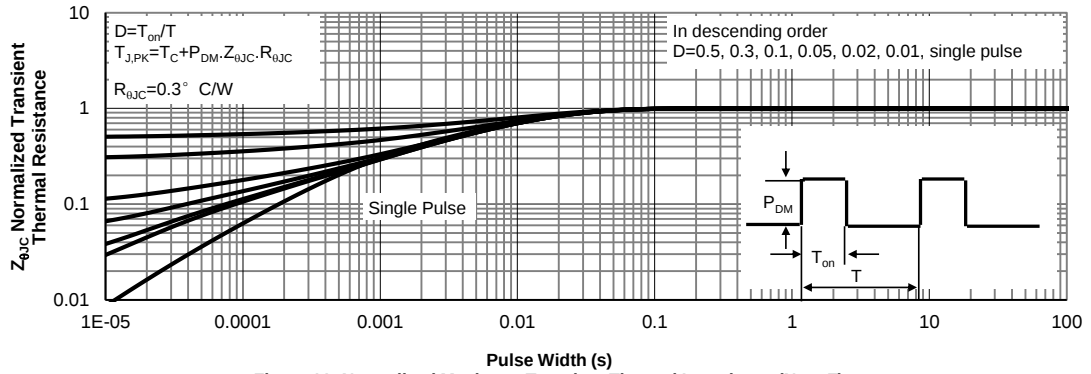
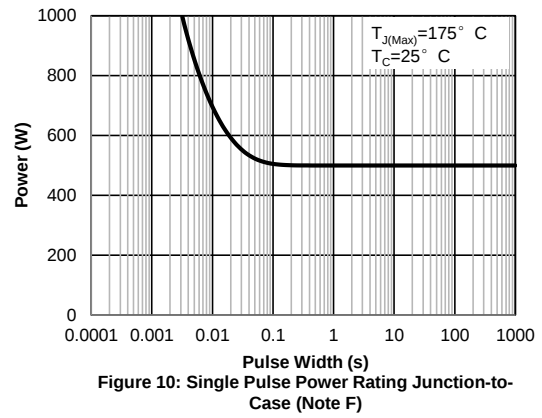
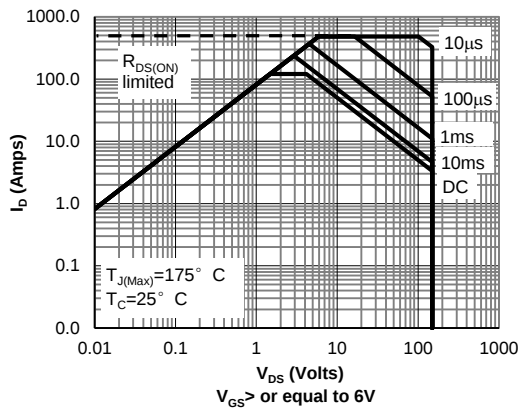
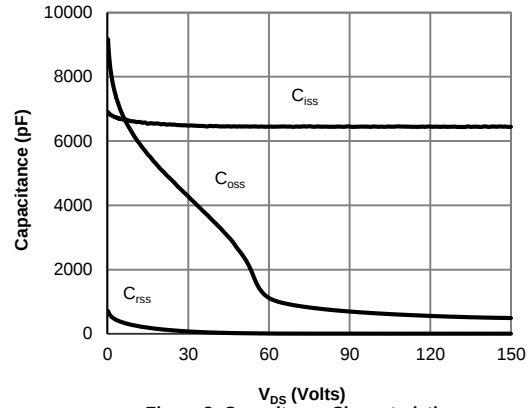
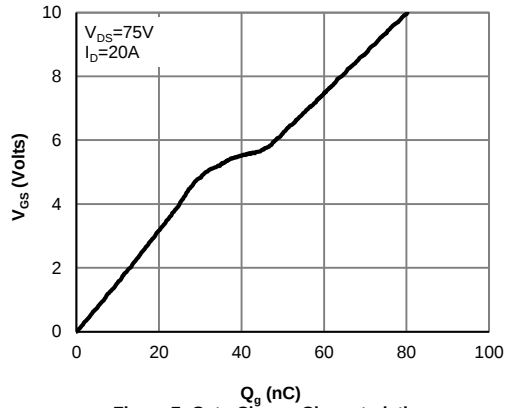


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

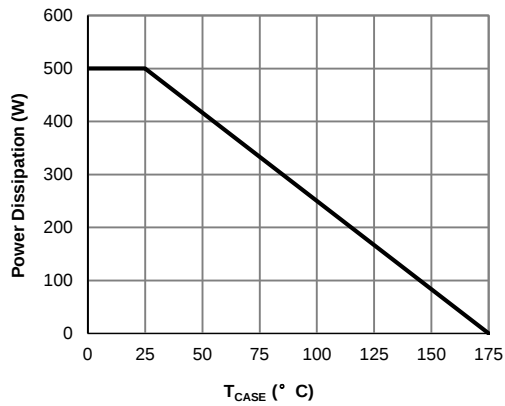


Figure 12: Power De-rating (Note F)

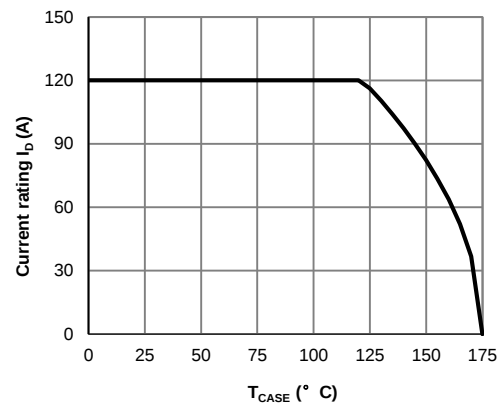


Figure 13: Current De-rating (Note F)

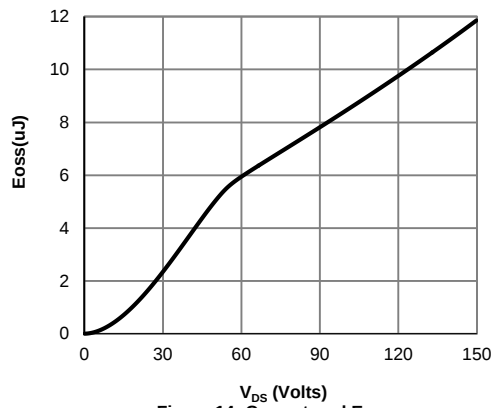


Figure 14: Coss stored Energy

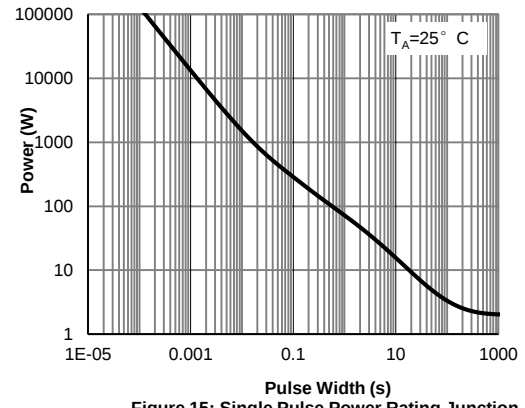


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

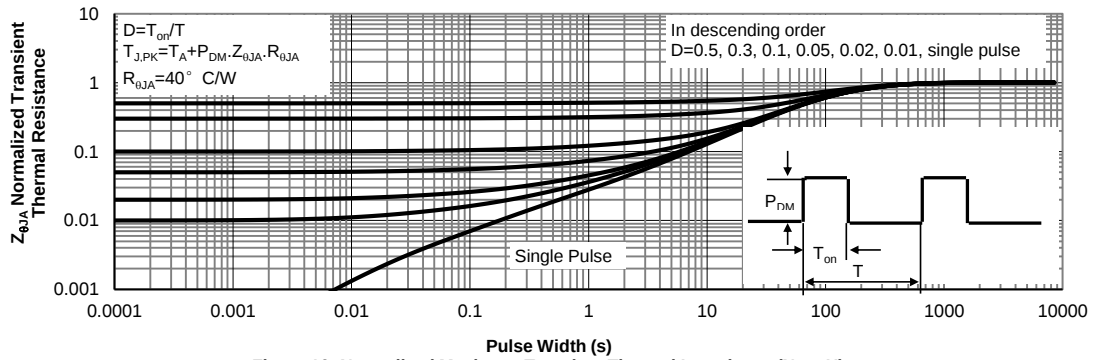


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

Figure A: Gate Charge Test Circuit & Waveforms

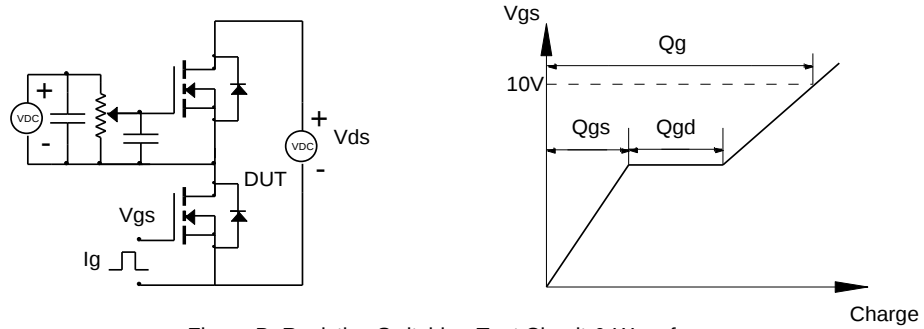


Figure B: Resistive Switching Test Circuit & Waveforms

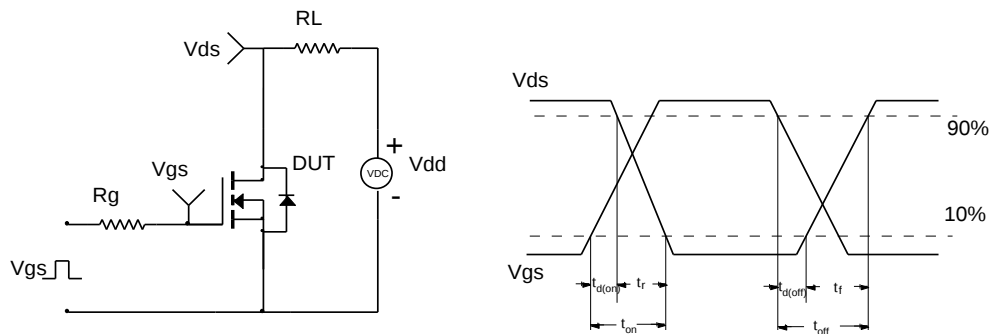


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

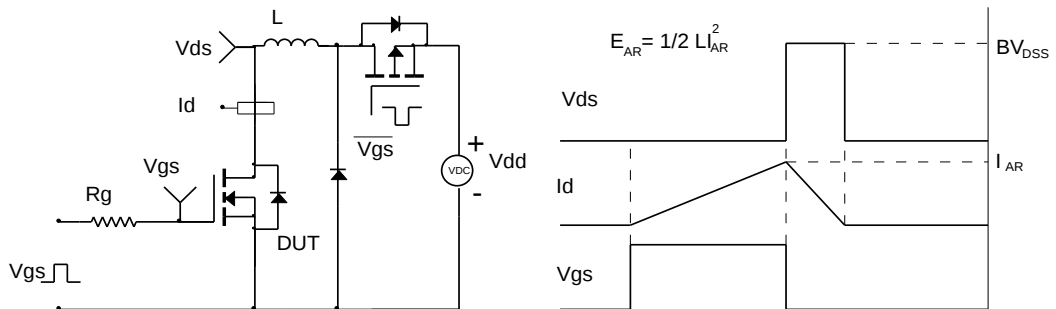
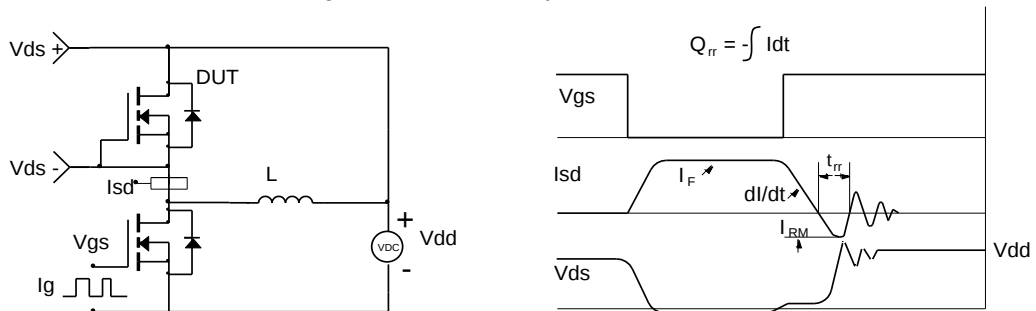
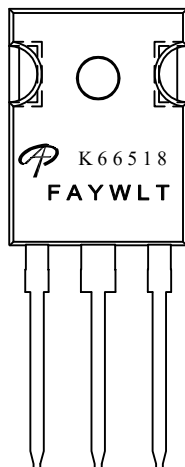


Figure D: Diode Recovery Test Circuit & Waveforms



TO247 PACKAGE MARKING DESCRIPTION



Standard product

NOTE:

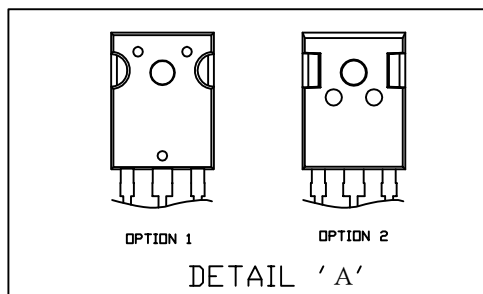
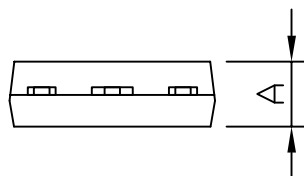
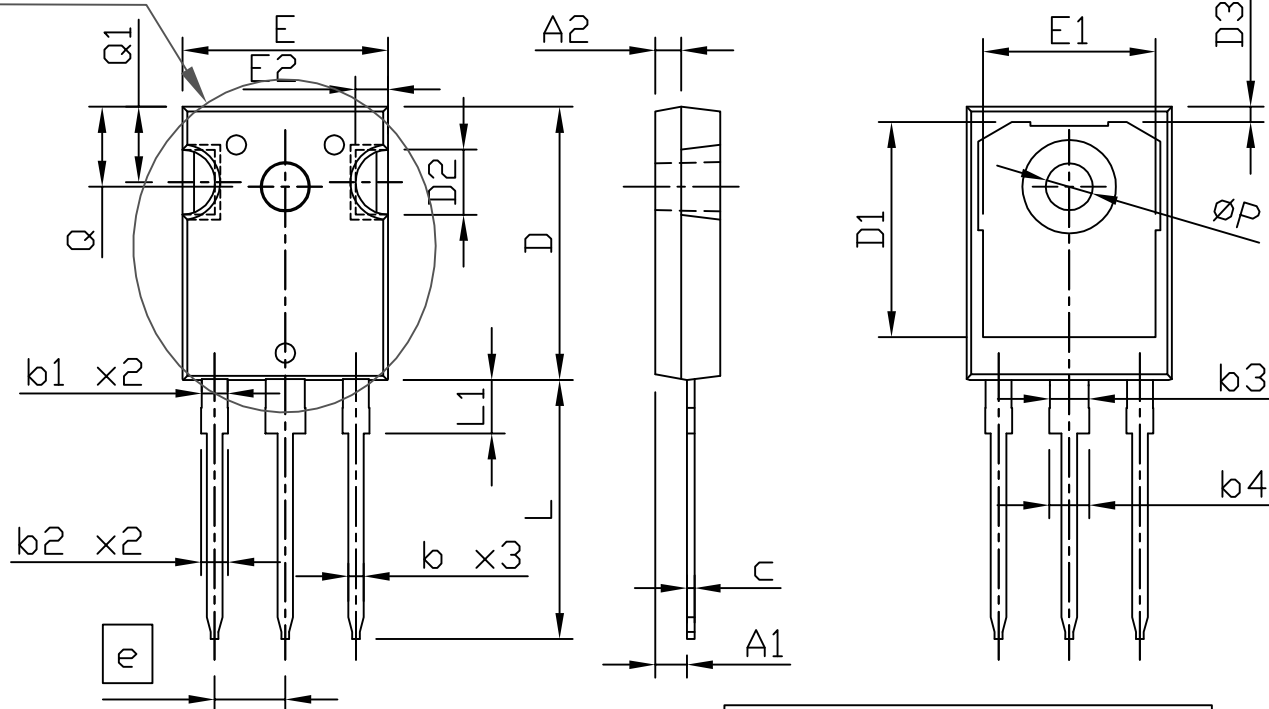
LOGO	- AOS Logo
K66518	- Part number code
F	- Fab code
A	- Assembly location code
Y	- Year code
W	- Week code
L&T	- Assembly lot code

PART NO.	DESCRIPTION	CODE
AOK66518	Standard product	K66518

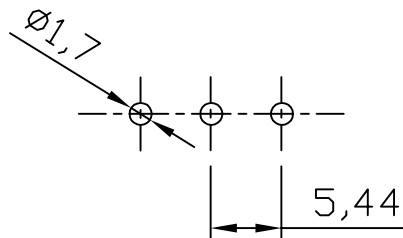


TO247 PACKAGE OUTLINE

DETAIL 'A'



RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.90	5.00	5.10	0.193	0.197	0.201
A1	2.31	2.42	2.52	0.091	0.095	0.099
A2	1.90	2.00	2.10	0.075	0.079	0.083
b	1.16	1.22	1.27	0.046	0.048	0.050
b1	1.96	2.02	2.07	0.078	0.080	0.081
b2	2.00	2.10	2.20	0.079	0.083	0.087
b3	2.96	3.02	3.07	0.117	0.119	0.121
b4	3.00	3.10	3.20	0.118	0.122	0.126
c	0.59	0.62	0.66	0.023	0.024	0.026
D	20.90	21.00	21.10	0.823	0.827	0.831
D1	16.25	16.55	16.85	0.640	0.652	0.663
D2	5.00 TYP			0.197 TYP		
D3	1.05	1.20	1.35	0.041	0.047	0.053
e	5.44 BSC			0.214 BSC		
E	15.70	15.80	15.90	0.618	0.622	0.626
E1	13.06	13.26	13.50	0.514	0.522	0.530
E2	2.50 TYP			0.098 TYP		
L	19.72	19.92	20.12	0.776	0.784	0.792
L1	---	---	4.30	---	---	0.169
Q	6.15 BSC			0.242 BSC		
Q1	5.60	5.80	6.00	0.220	0.228	0.236
ϕP	3.55	3.60	3.70	0.140	0.142	0.146

NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
2. CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.



Alpha & Omega Semiconductor Product Reliability Report

AOK66518, rev A

Plastic Encapsulated Device

ALPHA & OMEGA Semiconductor, Inc

www.aosmd.com

This AOS product reliability report summarizes the qualification result for AOK66518. 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 AOK66518 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	462 pcs	0	JESD22-A108
HTRB	Temp = 175°C , Vds=100% of Vdsmax	168 / 500 / 1000 hours	462 pcs	0	JESD22-A108
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,	1000 cycles	924 pcs	0	JESD22-A104
HTSL	Temp = 175°C	1000 hours	693 pcs	0	JESD22-A103
IOL	$\Delta T_j = 100^\circ\text{C}$	6000 cycles	693 pcs	0	MIL-STD-750 Method 1037
Resistance to Solder Heat	Temp = 270°C	15 seconds	30 pcs	0	JESD22-B106

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

II. Reliability Evaluation

FIT rate (per billion): 1.31

MTTF = 83740 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 = $\text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 1.31$

MTTF = $10^9 / \text{FIT} = 87340$ 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]** = $\text{Exp} [E_a / k (1/T_j u - 1/T_j s)]$

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

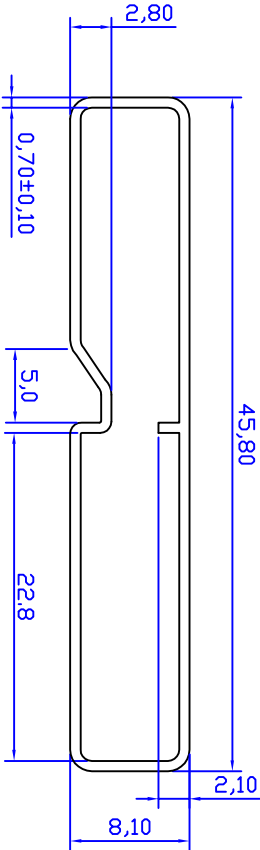
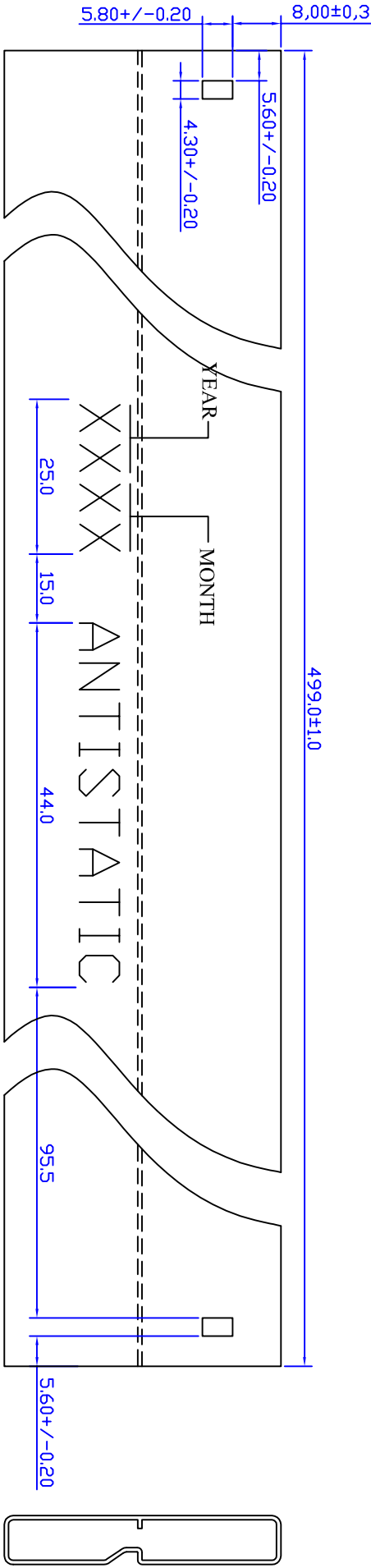
Tj s = Stressed junction temperature in degree (Kelvin), $K = C + 273.16$

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

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



REV.	DATE	DESCRIPTION	DWG.
A		NEW ISSUE	



SCALE 2:1

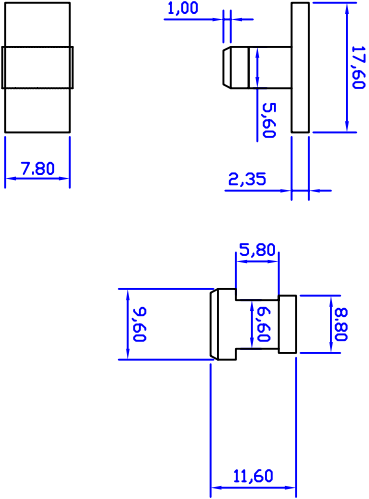
(NOTE)

1. TUBE
 - MATERIAL :TRANS RIGID P.V.C
 - ANTISATIC TREATED
 - COLOR : CLEAR
2. ALL DIMENSION : MILLIMETER UNLESS OTHERWISE SPECIFIED
 3. ALL UNSPECIFICATED SPECIFICATIONS FOLLOW TUBE GENERAL SPEC.
 - UNSPECIFICATED TOLERANCE ±0.20

4. ENTIRE TUBE MUST MEET ANTISATIC TEST CRITERIA PER MIL-STD-81705B AND ASTM-D257

5. PACKING Q'TY :

PKG	Q'TY(PCS)
TO247	30



PLUG FOR TO247 TUBE

TITLE			
TO247 TUBE DRAWING			
DRAWN BY	SIGNATURE	UNIT	PAGE
APPROVED BY	SIGNATURE	MM	1 OF 1
SCALE	PROJECTION	DRAWING NUMBER	VENDOR CODE
N.T.S.		TR-00091	REV. A