



**ALPHA & OMEGA**  
SEMICONDUCTOR

**AONS66520**

**150V N-Channel AlphaSGT™**

### General Description

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

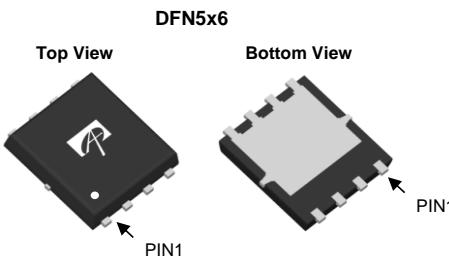
### Product Summary

$V_{DS}$	150V
$I_D$ (at $V_{GS}=10V$ )	100A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 9.5mΩ
$R_{DS(ON)}$ (at $V_{GS}=4.5V$ )	< 12mΩ

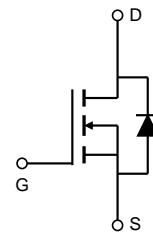
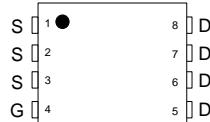
### Applications

- Adaptors SR MOSFET

100% UIS Tested  
100%  $R_g$  Tested



Top View



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AONS66520	DFN 5X6	Tape & Reel	3000

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	150	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	100	A
$T_C=100^\circ C$	$I_D$	64	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	400	
Continuous Drain Current	$I_{DSM}$	17	A
$T_A=70^\circ C$	$I_{DSM}$	13	
Avalanche Current <sup>C</sup>	$I_{AS}$	50	A
Avalanche energy $L=0.1mH$ <sup>C</sup>	$E_{AS}$	125	mJ
Diode reverse recovery $V_{DS}=0$ to $75V$ , $I_F \leq 10A$ , $T_j=25^\circ C$	$dv/dt$	30	V/ns
	$di/dt$	500	A/us
Power Dissipation <sup>B</sup>	$P_D$	215	W
$T_C=100^\circ C$	$P_D$	86	
Power Dissipation <sup>A</sup>	$P_{DSM}$	6.2	W
$T_A=70^\circ C$	$P_{DSM}$	4	
Junction and Storage Temperature Range	$T_J$ , $T_{STG}$	-55 to 150	°C

### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units	
Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10s$	$R_{\theta JA}$	15	20	°C/W	
Steady-State	$R_{\theta JA}$	40	50	°C/W	
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	0.43	0.58	°C/W

**Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	150			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=150\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm20\text{V}$			$\pm100$	nA
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.6	2.1	2.6	V
$R_{DS(\text{ON})}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=20\text{A}$ $T_J=125^\circ\text{C}$		7.9	9.5	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=20\text{A}$		14	17	$\text{m}\Omega$
				9.5	12	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=20\text{A}$		100		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.7	1	V
$I_S$	Maximum Body-Diode Continuous Current				100	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=75\text{V}, f=1\text{MHz}$		3200		pF
$C_{oss}$	Output Capacitance			380		pF
$C_{rss}$	Reverse Transfer Capacitance			4.5		pF
$R_g$	Gate resistance	$f=1\text{MHz}$	0.6	1.3	2	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=75\text{V}, I_D=20\text{A}$		44	65	nC
$Q_{gs}$	Gate Source Charge			10		nC
$Q_{gd}$	Gate Drain Charge			7		nC
$Q_{oss}$	Output Charge	$V_{GS}=0\text{V}, V_{DS}=75\text{V}$		130		nC
$t_{D(\text{on})}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=75\text{V}, R_L=3.75\Omega, R_{\text{GEN}}=3\Omega$		13		ns
$t_r$	Turn-On Rise Time			4.5		ns
$t_{D(\text{off})}$	Turn-Off Delay Time			40		ns
$t_f$	Turn-Off Fall Time			13		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=20\text{A}, \text{di}/\text{dt}=500\text{A}/\mu\text{s}$		66		ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=20\text{A}, \text{di}/\text{dt}=500\text{A}/\mu\text{s}$		570		nC

A. The value of  $R_{iJA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{DSM}$  is based on  $R_{iJA} \leq 10\text{s}$  and the maximum allowed junction temperature of  $150^\circ\text{C}$ . The value in any given application depends on the user's specific board design.

B. The power dissipation  $P_D$  is based on  $T_{J(\text{MAX})}=150^\circ\text{C}$ , 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  $T_{J(\text{MAX})}=150^\circ\text{C}$ .

D. The  $R_{iJA}$  is the sum of the thermal impedance from junction to case  $R_{iJC}$  and case to ambient.

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

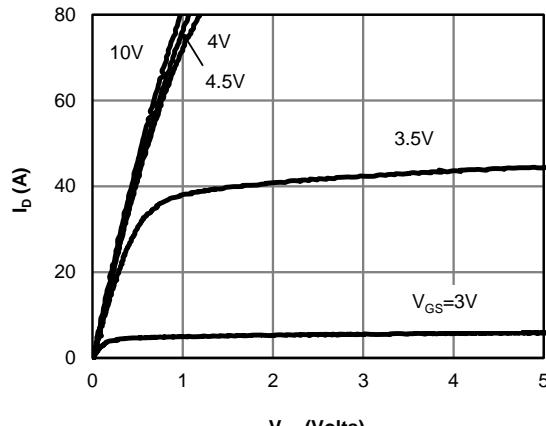
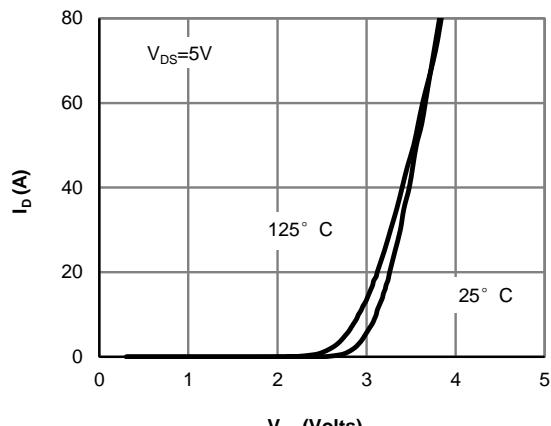
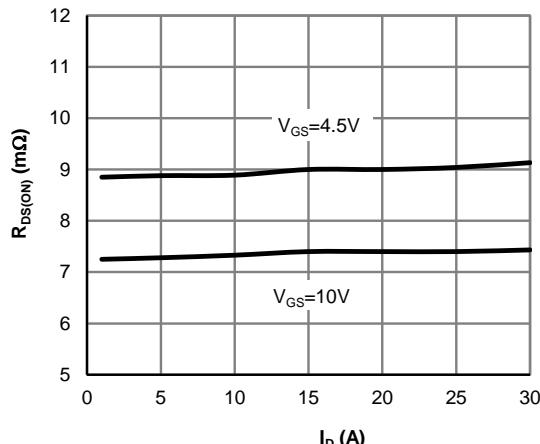
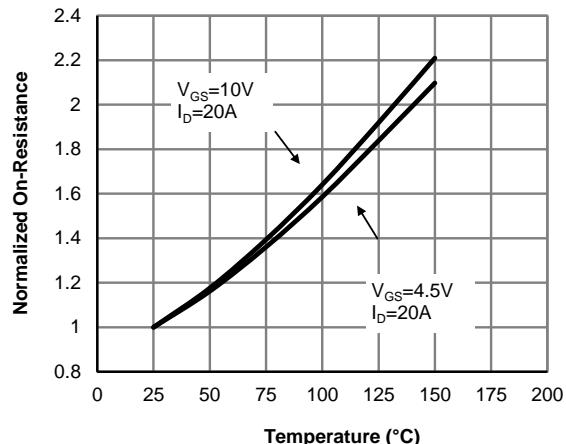
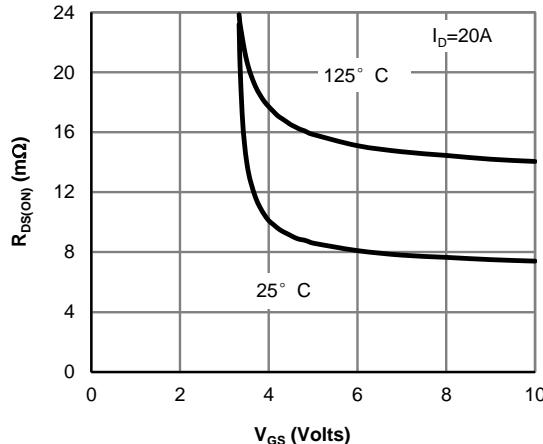
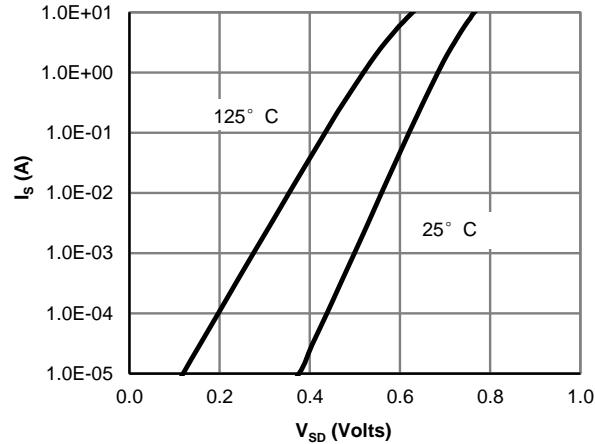
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(\text{MAX})}=150^\circ\text{C}$ . The SOA curve provides a single pulse rating.

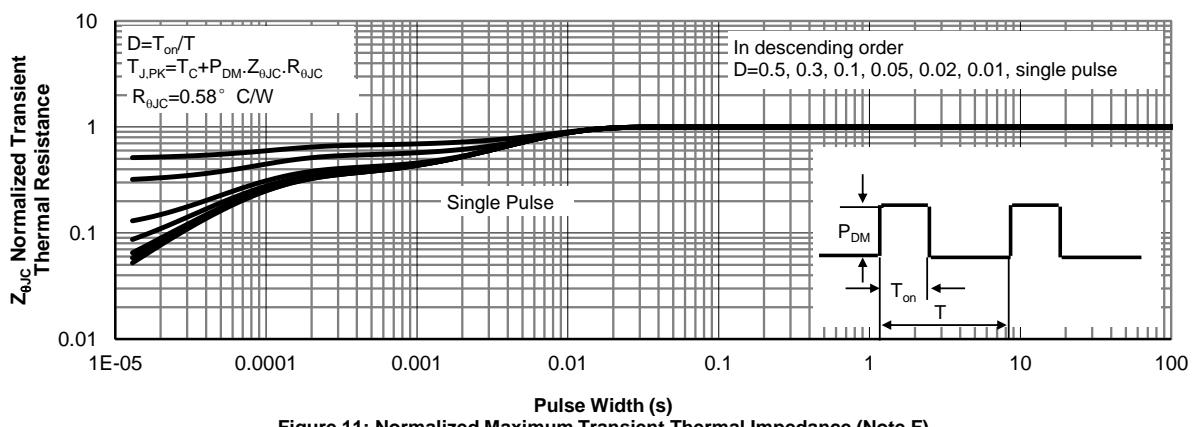
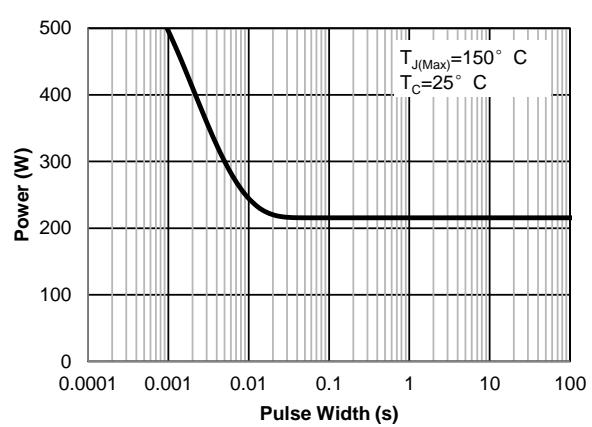
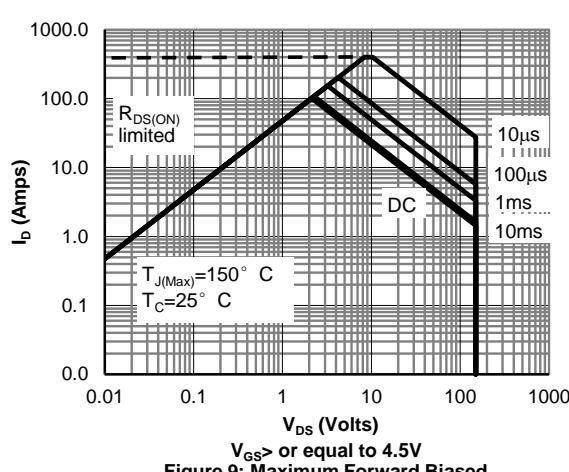
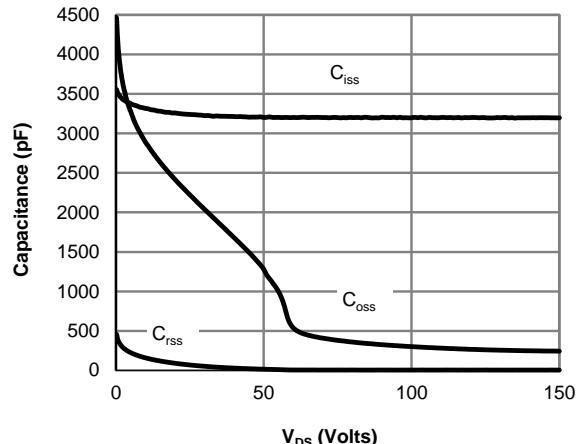
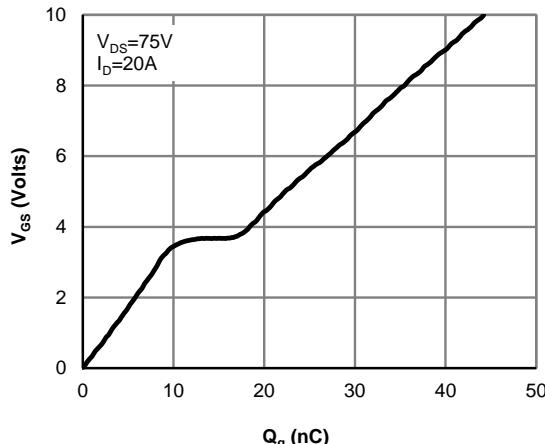
G. The maximum current rating is package limited.

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  $T_A=25^\circ\text{C}$ .

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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**


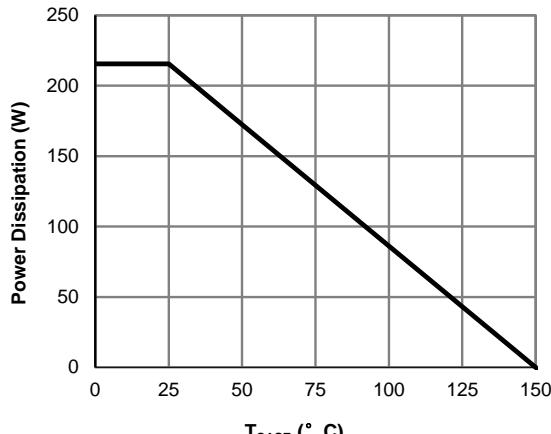
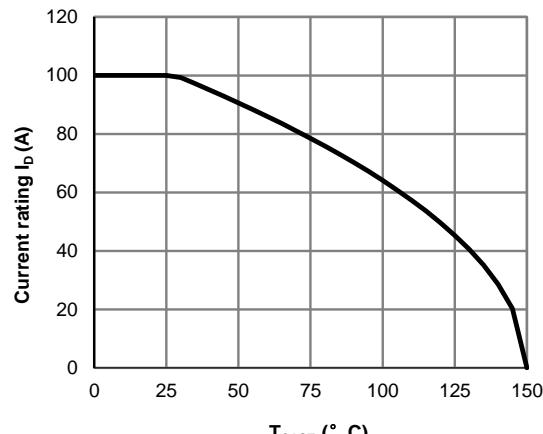
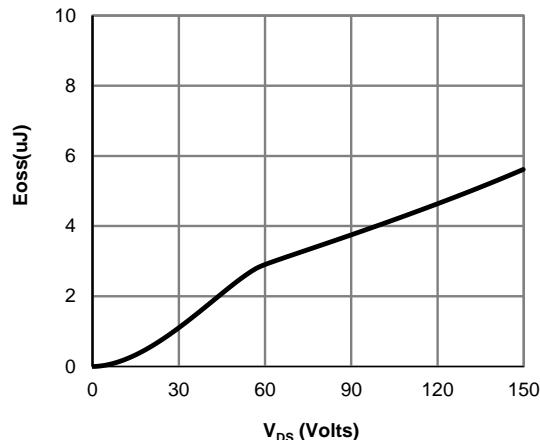
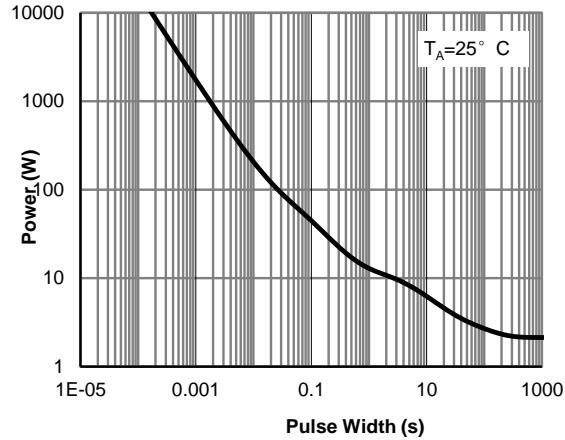
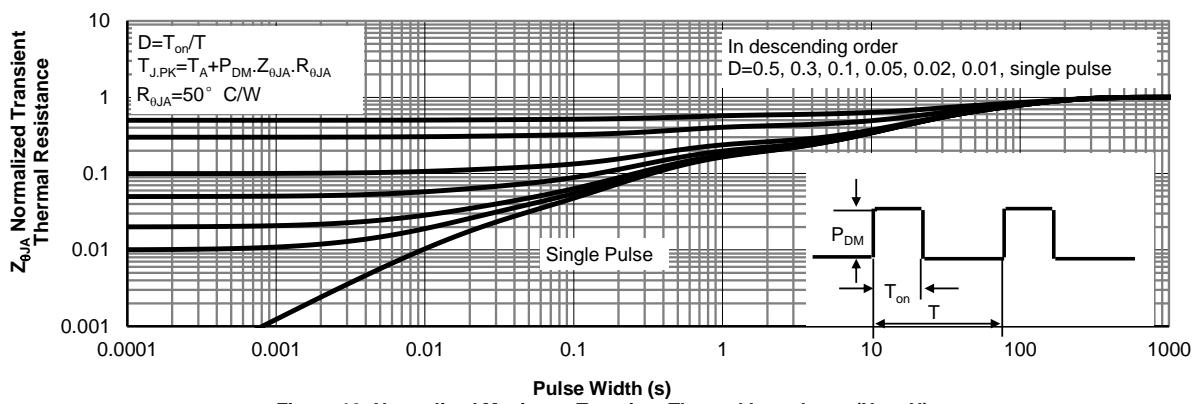
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

**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

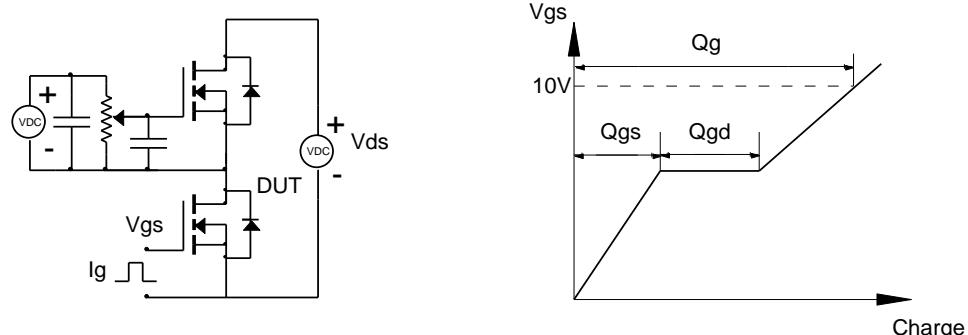


Figure B: Resistive Switching Test Circuit & Waveforms

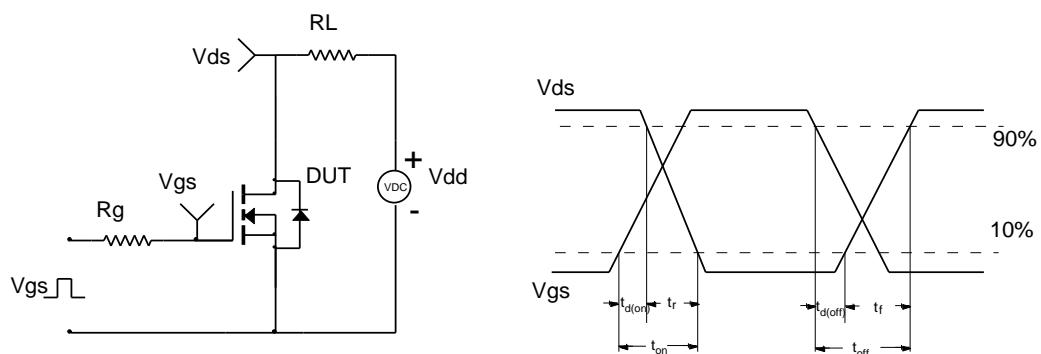


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

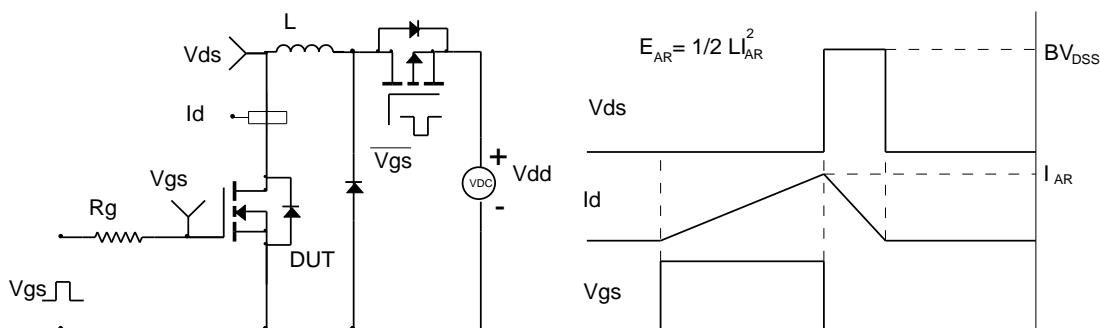
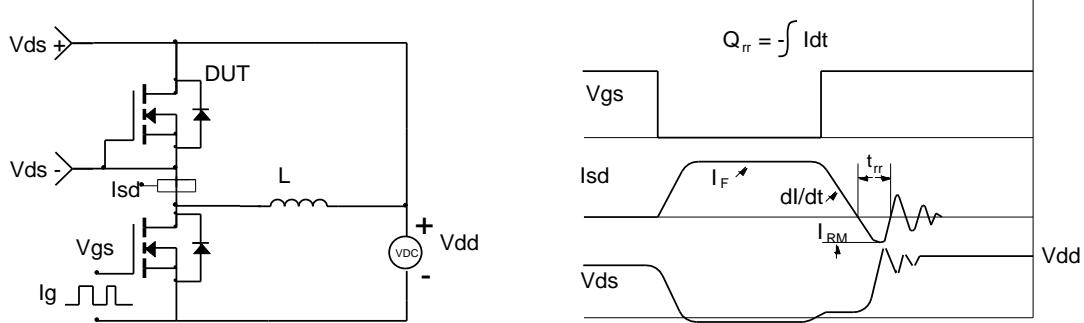


Figure D: Diode Recovery Test Circuit & Waveforms

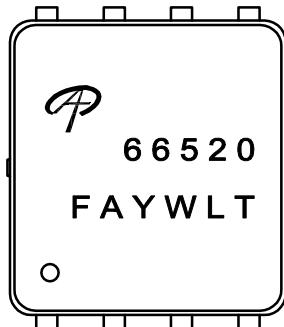




**ALPHA & OMEGA**  
**SEMICONDUCTOR**

Document No.	PD-03362
Version	A
Title	AONS66520 Marking Description

DFN5x6 PACKAGE MARKING DESCRIPTION



Green product

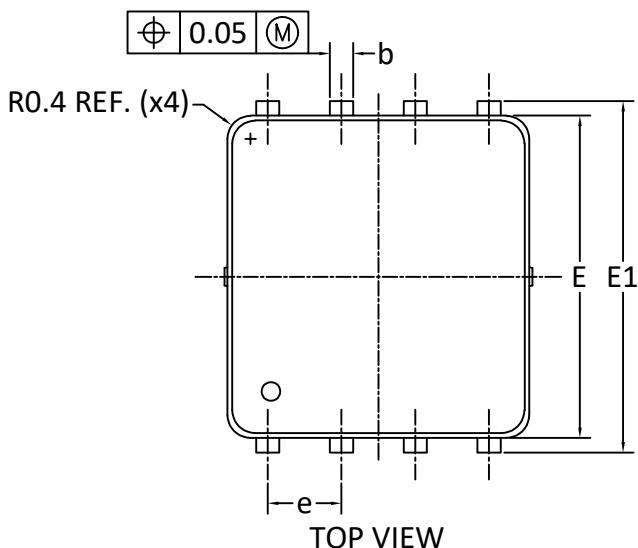
NOTE:

LOGO	- AOS Logo
66520	- Part number code
F	- Fab code
A	- Assembly location code
Y	- Year code
W	- Week code
L&T	- Assembly lot code

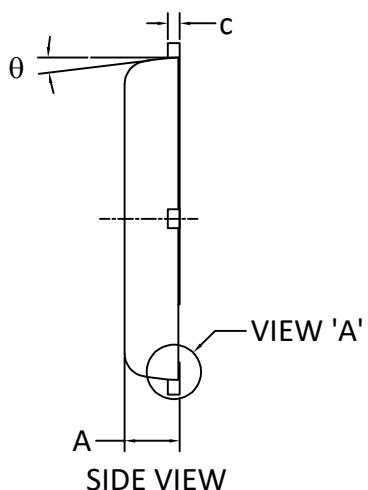
PART NO.	DESCRIPTION	CODE
AONS66520	Green product	66520



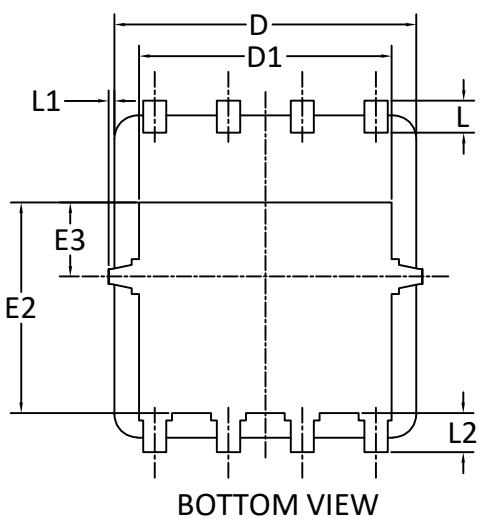
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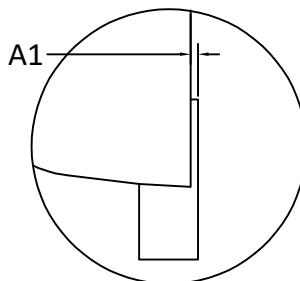
TOP VIEW



SIDE VIEW

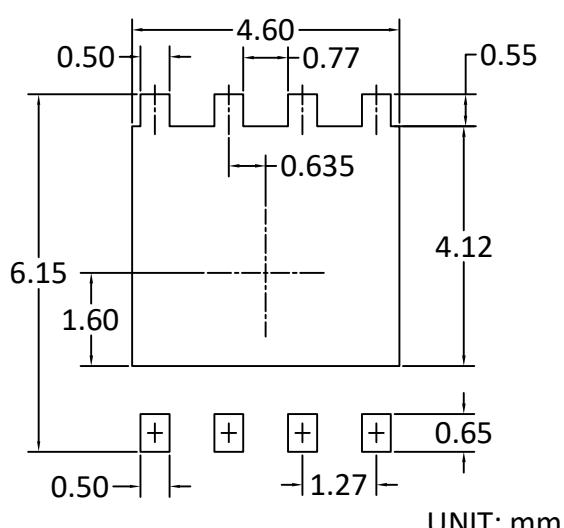


BOTTOM VIEW



VIEW 'A'  
(SCALE 5:1)

#### RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	0.95	1.00	0.033	0.037	0.039
A1	0.00	-	0.05	0.000	-	0.002
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.15	0.20	0.25	0.006	0.008	0.010
D	5.10	5.20	5.30	0.201	0.205	0.209
D1	4.25	4.35	4.45	0.167	0.171	0.175
E	5.45	5.55	5.65	0.215	0.219	0.222
E1	5.95	6.05	6.15	0.234	0.238	0.242
E2	3.525	3.625	3.725	0.139	0.143	0.147
E3	1.175	1.275	1.375	0.046	0.050	0.054
e	1.27 BSC			0.050 BSC		
L	0.45	0.55	0.65	0.018	0.022	0.026
L1	0.00	-	0.15	0.000	-	0.006
L2	0.68 REF			0.027 REF		
θ	0°	-	10°	0°	-	10°

#### 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.
3. THIS PACKAGE WAS QUALIFIED USING IR REFLOW PROCESS (JEDEC STANDARD). FOR USAGE  
IN OTHER SOLDERING PROCESSES, PLEASE CONTACT LOCAL AOS REPRESENTATIVES.



**ALPHA & OMEGA**  
SEMICONDUCTOR

## ***Alpha & Omega Semiconductor Product Reliability Report***

**AONS66520, rev A**

**Plastic Encapsulated Device**

**ALPHA & OMEGA Semiconductor, Inc**

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

Jun, 2020



This AOS product reliability report summarizes the qualification result for AONS66520. 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 AONS66520 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 Vgsmax	168 / 500 / 1000 hours	462 pcs	0	JESD22-A108
HTRB	Temp = 150°C , Vds=100% of Vdsmax	168 / 500 / 1000 hours	462 pcs	0	JESD22-A108
Precondition (Note A)	168hr 85°C / 85%RH + 3 cycle reflow @260°C (MSL 1)	-	3927 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
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 = 150°C	1000 hours	693 pcs	0	JESD22-A103
IOL	Δ Tj = 100°C	15000 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): 3.82**

**MTTF = 29919 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.

$$\text{Failure Rate} = \text{Chi}^2 \times 10^9 / [2(N)(H)(Af)] = 3.82$$

$$\text{MTTF} = 10^9 / \text{FIT} = 29919 \text{ years}$$

**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)

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

**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

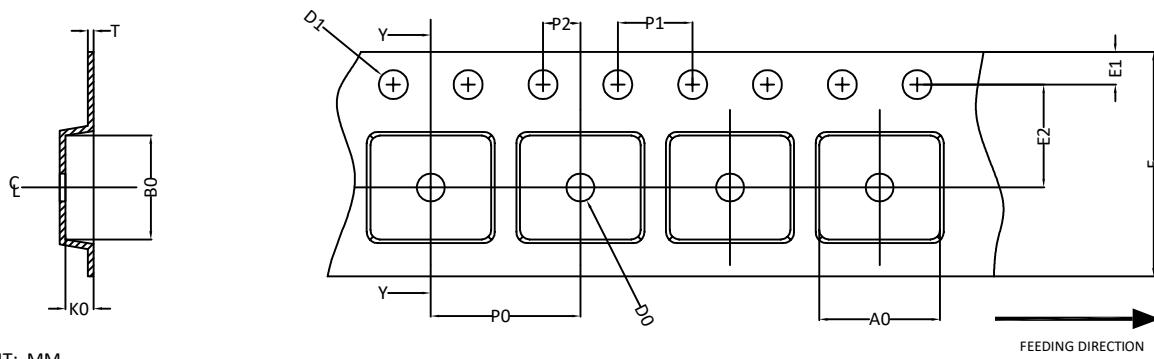
**T<sub>j</sub> s** = Stressed junction temperature in degree (Kelvin), K = C+273.16

**T<sub>j</sub> u** =The use junction temperature in degree (Kelvin), K = C+273.16

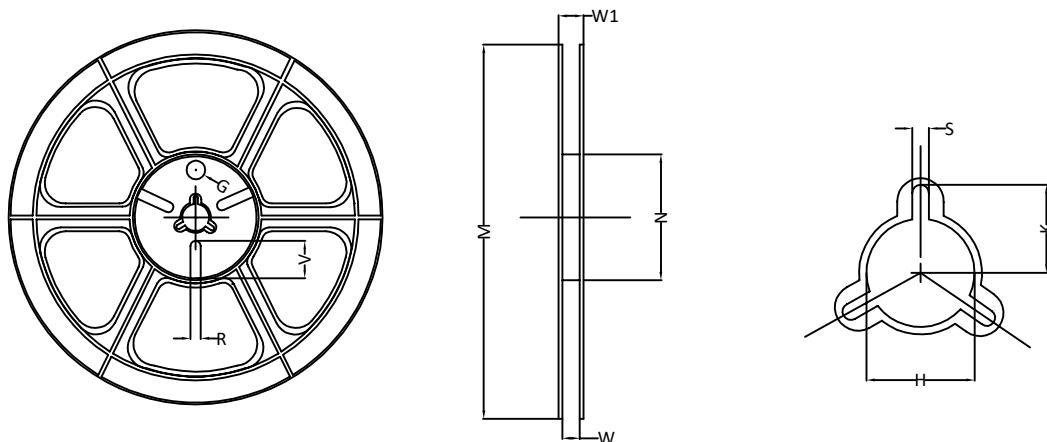
**k** = Boltzmann's constant, 8.617164 X 10<sup>-5</sup>eV / K



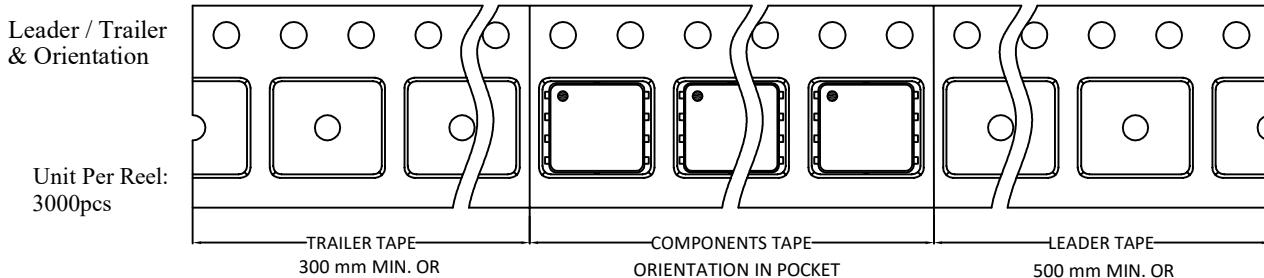
### DFN5x6 Carrier Tape



### DFN5x6 Reel



### DFN5x6 Punch Package Tape



### DFN5x6 Sawing Package (Except DFN5x6 7L EP1 TEP1 S/DFN5x6 2L EP3 TEP1 S/ DFN5x6 8L EP1 TEP1 S/DFN5x6 8L EP1 TEP2 S/DFN5x6 8L EP2 TEP1 S/ DFN5x6A 8L EP2 TEP1 S) Tape

