



**ALPHA & OMEGA**  
SEMICONDUCTOR

**AONH36334**

**30V Dual Asymmetric N-Channel MOSFET**

### General Description

- Latest Trench Power MOSFET technology
- Very Low RDS(on) at 4.5V<sub>GS</sub>
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

### Product Summary

	<u>Q1</u>	<u>Q2</u>
$V_{DS}$	30V	30V
$I_D$ (at $V_{GS}=10V$ )	16A	18A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	<10.2mΩ	<7.7mΩ
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$ )	<15.8mΩ	<11.6mΩ

100% UIS Tested

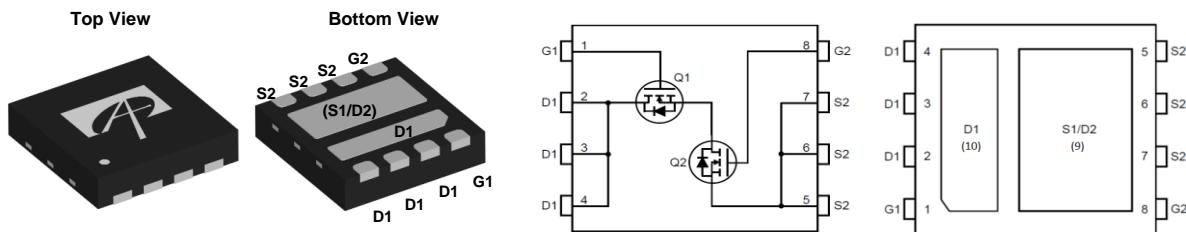
100%  $R_g$  Tested



### Application

- DC/DC Converters in Computing, Servers, and POL
- Isolated DC/DC Converters in Telecom and Industrial

### Power DFN3x3A



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

Parameter	Symbol	Max Q1	Max Q2	Units	
Drain-Source Voltage	$V_{DS}$	30		V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 20$	V	
Continuous Drain Current <sup>G</sup>	$I_D$	16	18	A	
		12	14		
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	64	72		
Continuous Drain Current	$I_{DSM}$	13	15	A	
		7.8	9		
Avalanche Current <sup>C</sup>	$I_{AS}$	32	32	A	
Avalanche Energy L=0.01mH <sup>C</sup>	$E_{AS}$	5	5	mJ	
$V_{DS}$ Spike	100ns	$V_{SPIKE}$	36	V	
Power Dissipation <sup>B</sup>	$P_D$	23	25	W	
		9	10		
Power Dissipation <sup>A</sup>	$P_{DSM}$	2.5	2.5	W	
		0.9	0.9		
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150			

### Thermal Characteristics

Parameter	Symbol	Typ Q1	Max Q1	Typ Q2	Max Q2	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{JA}$	40	50	40	50	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A,D</sup>		70	90	70	90	$^\circ C/W$
Maximum Junction-to-Case	$R_{JC}$	4.5	5.4	4.2	5	$^\circ C/W$

**Q1 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	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS} = \pm 20\text{V}$			100	nA
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.2	1.8	2.2	V
$R_{DS(\text{ON})}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=13\text{A}$		8.3	10.2	$\text{m}\Omega$
		$T_J=125^\circ\text{C}$		11.2	13.7	
		$V_{GS}=4.5\text{V}, I_D=10\text{A}$		12.4	15.8	
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=13\text{A}$		50		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 <sup>G</sup>				16	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		485		pF
$C_{oss}$	Output Capacitance			235		pF
$C_{rss}$	Reverse Transfer Capacitance			32		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	0.9	1.8	2.7	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=13\text{A}$		8	12	nC
$Q_g(4.5\text{V})$	Total Gate Charge			3.9	8.0	nC
$Q_{gs}$	Gate Source Charge			1.1		nC
$Q_{gd}$	Gate Drain Charge			2.1		nC
$t_{D(\text{on})}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=1.2\Omega, R_{\text{GEN}}=3\Omega$		3.5		ns
$t_r$	Turn-On Rise Time			2.8		ns
$t_{D(\text{off})}$	Turn-Off Delay Time			16.3		ns
$t_f$	Turn-Off Fall Time			3		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=13\text{A}, dI/dt=500\text{A}/\mu\text{s}$		9.9		ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=13\text{A}, dI/dt=500\text{A}/\mu\text{s}$		12.9		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  $R_{iJA}$   $t \leq 10\text{s}$  value 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. Repetitive rating, pulse width limited by junction temperature  $T_{J(\text{MAX})}=150^\circ\text{ C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{ C}$ .

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.

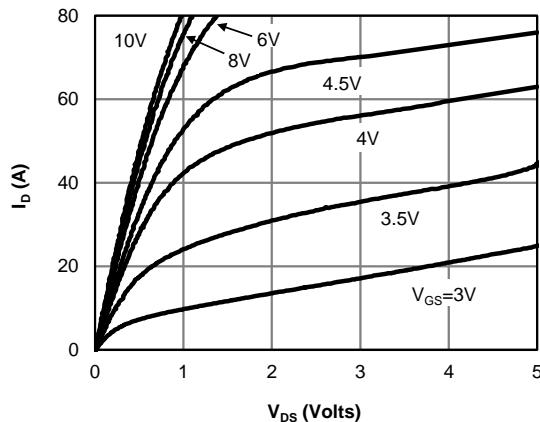
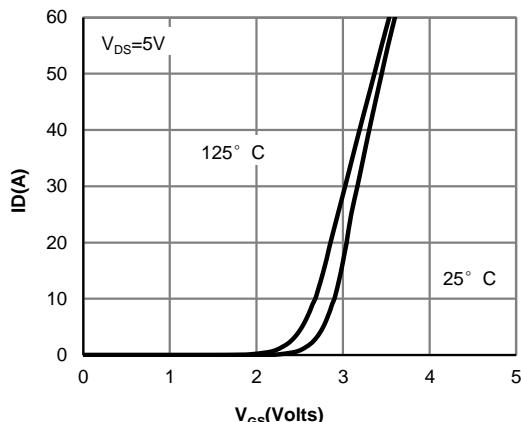
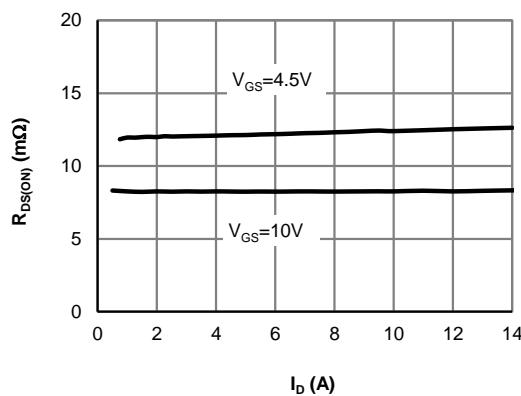
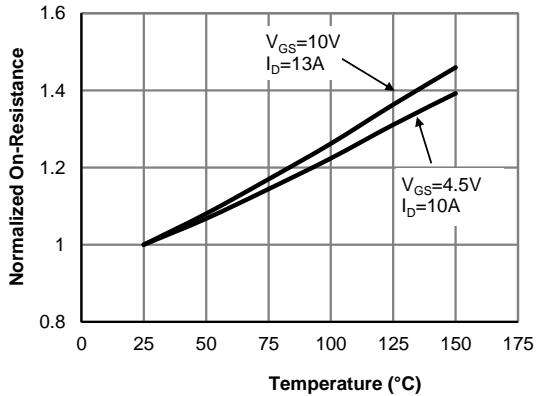
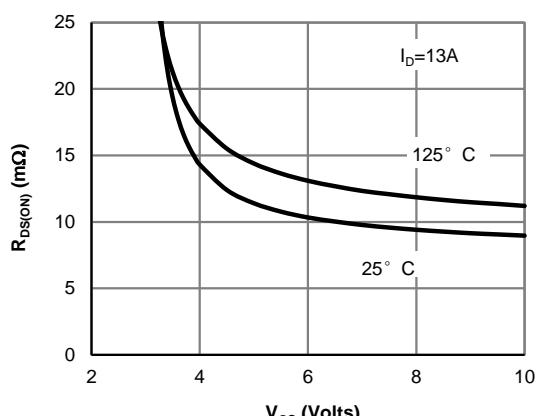
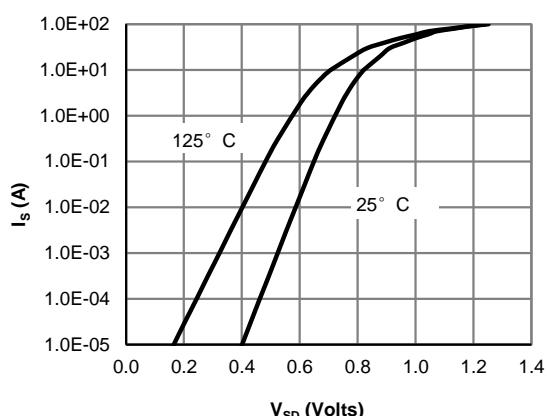
G. The maximum current rating is limited by package.

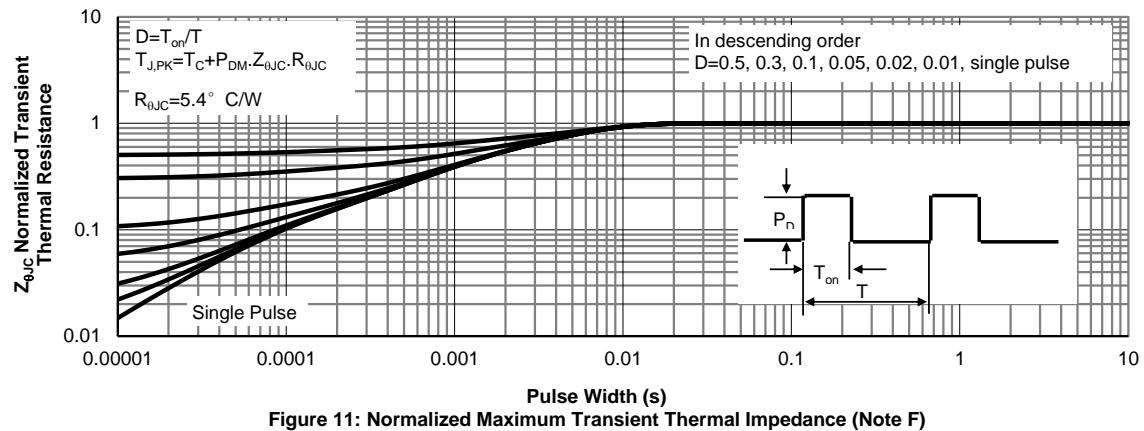
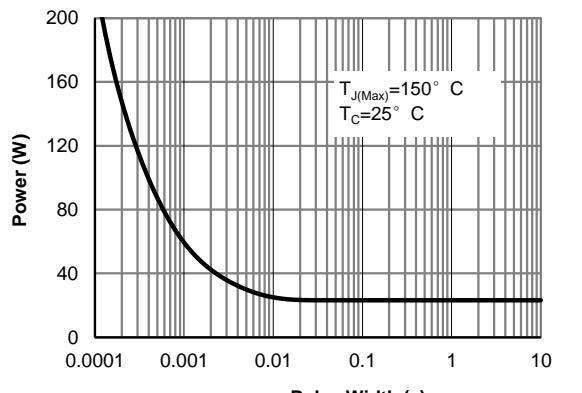
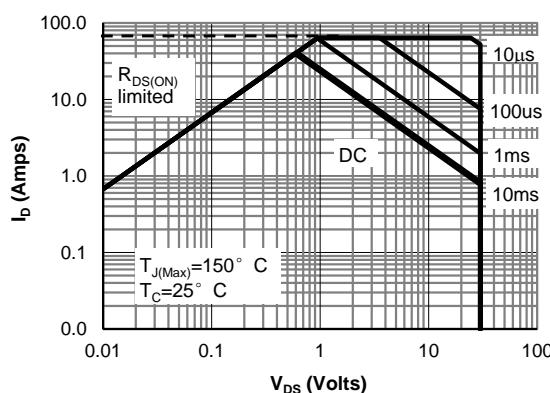
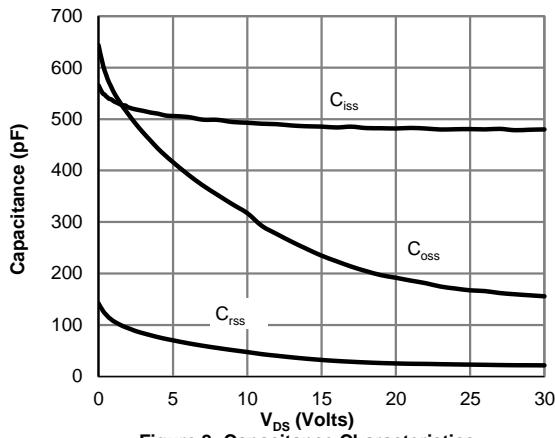
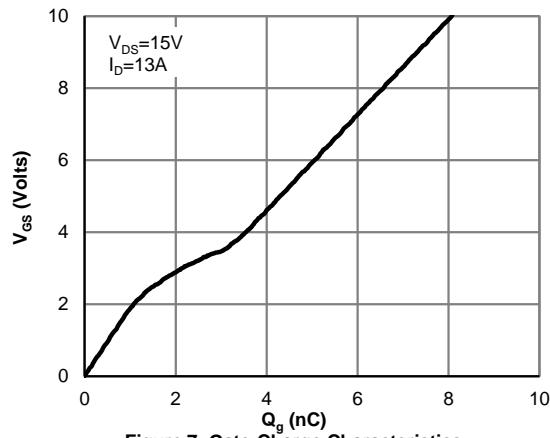
H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $TA=25^\circ\text{ C}$ .

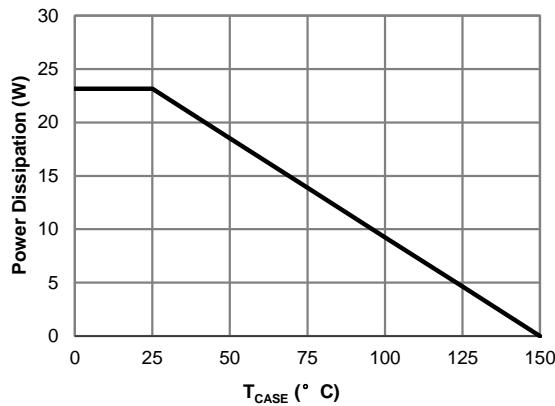
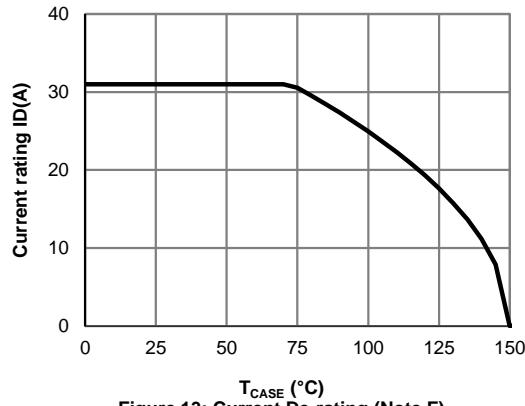
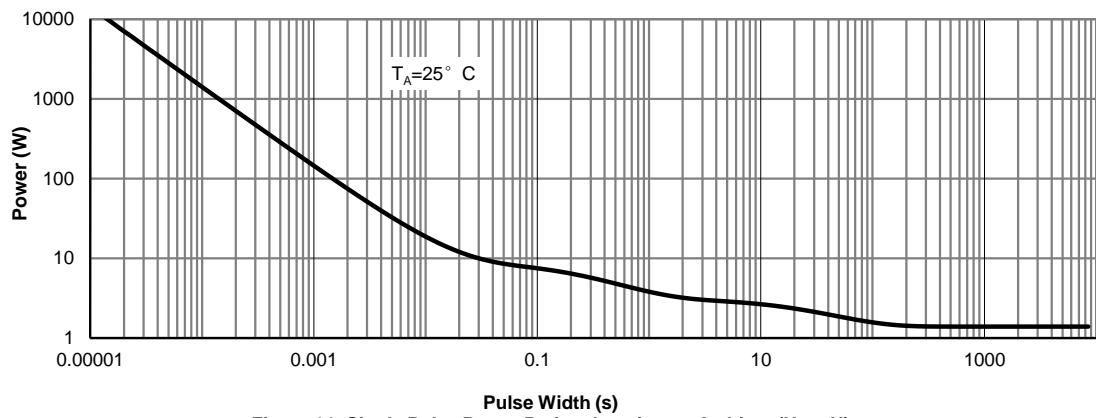
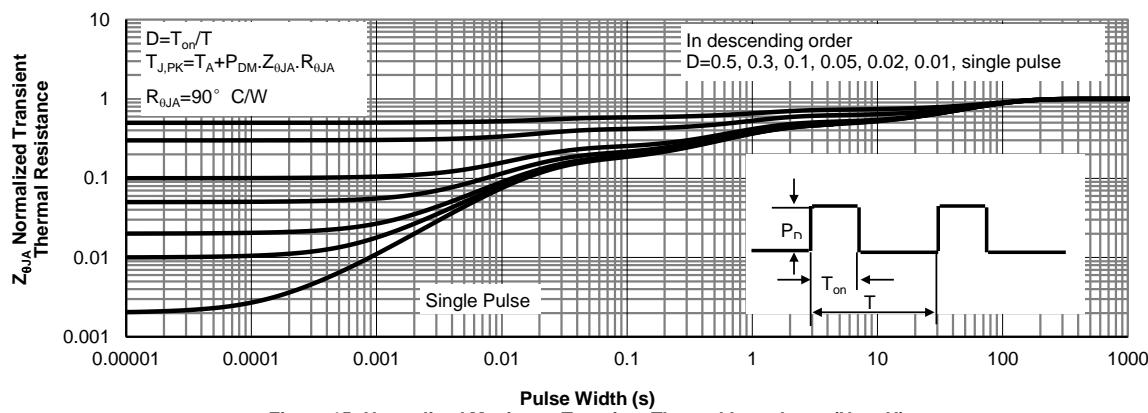
APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO MAKE CHANGES TO PRODUCT SPECIFICATIONS WITHOUT NOTICE. IT IS THE RESPONSIBILITY OF THE CUSTOMER TO EVALUATE SUITABILITY OF THE PRODUCT FOR THEIR INTENDED APPLICATION. CUSTOMER SHALL COMPLY WITH APPLICABLE LEGAL REQUIREMENTS, INCLUDING ALL APPLICABLE EXPORT CONTROL RULES, REGULATIONS AND LIMITATIONS.

AOS' products are provided subject to AOS' terms and conditions of sale which are set forth at:

[http://www.aosmd.com/terms\\_and\\_conditions\\_of\\_sale](http://www.aosmd.com/terms_and_conditions_of_sale)

**Q1-CHANNEL: 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)**

**Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**


**Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

**Figure 12: Power De-rating (Note F)**

**Figure 13: Current De-rating (Note F)**

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

**Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)**

**Q2 Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	30			V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS} = \pm 20\text{V}$			100	nA
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.2	1.8	2.2	V
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=15\text{A}$		6.3	7.7	$\text{m}\Omega$
		$T_J=125^\circ\text{C}$		8.4	10.3	
		$V_{GS}=4.5\text{V}, I_D=10\text{A}$		9.1	11.6	
$g_{\text{FS}}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=15\text{A}$		100		S
$V_{\text{SD}}$	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.7	1	V
$I_S$	Maximum Body-Diode Continuous Current <sup>G</sup>				18	A
<b>DYNAMIC PARAMETERS</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		807		pF
$C_{\text{oss}}$	Output Capacitance			314		pF
$C_{\text{rss}}$	Reverse Transfer Capacitance			40		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	0.6	1.3	2	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=15\text{A}$		12.9	18	nC
$Q_g(4.5\text{V})$	Total Gate Charge			6	10	nC
$Q_{\text{gs}}$	Gate Source Charge			2.1		nC
$Q_{\text{gd}}$	Gate Drain Charge			3		nC
$t_{\text{D(on)}}$	Turn-On DelayTime	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=1\Omega, R_{\text{GEN}}=3\Omega$		4.8		ns
$t_r$	Turn-On Rise Time			3.3		ns
$t_{\text{D(off)}}$	Turn-Off DelayTime			18.8		ns
$t_f$	Turn-Off Fall Time			3.3		ns
$t_{\text{rr}}$	Body Diode Reverse Recovery Time	$I_F=15\text{A}, dI/dt=500\text{A}/\mu\text{s}$		11.3		ns
$Q_{\text{rr}}$	Body Diode Reverse Recovery Charge	$I_F=15\text{A}, dI/dt=500\text{A}/\mu\text{s}$		15		nC

A. The value of  $R_{\text{QJA}}$  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  $P_{\text{DSM}}$  is based on  $R_{\text{QJA}}$   $t \leq 10\text{s}$  value 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. Repetitive rating, pulse width limited by junction temperature  $T_{J(\text{MAX})}=150^\circ\text{C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{C}$ .

D. The  $R_{\text{QJA}}$  is the sum of the thermal impedance from junction to case  $R_{\text{QJC}}$  and case to ambient.

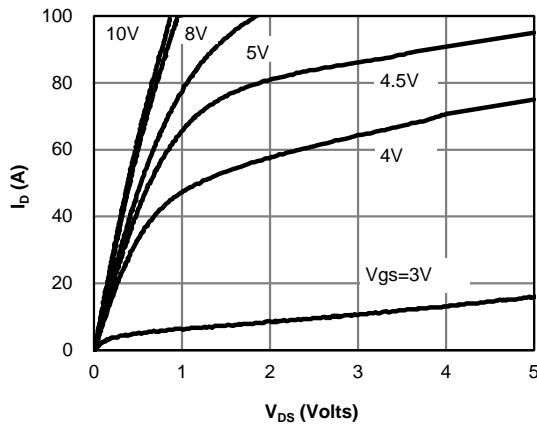
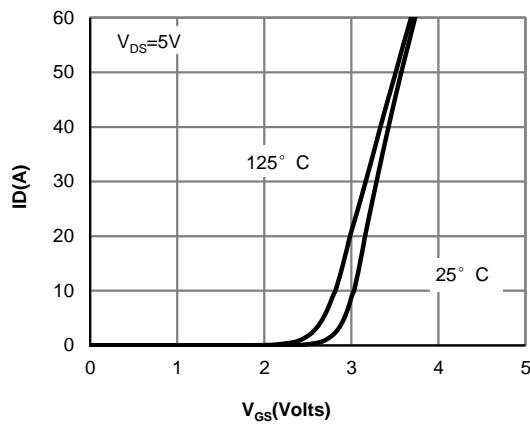
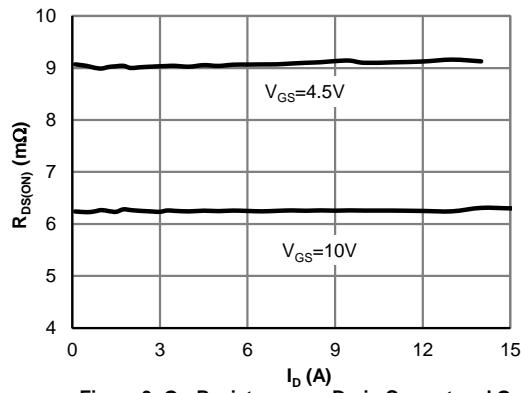
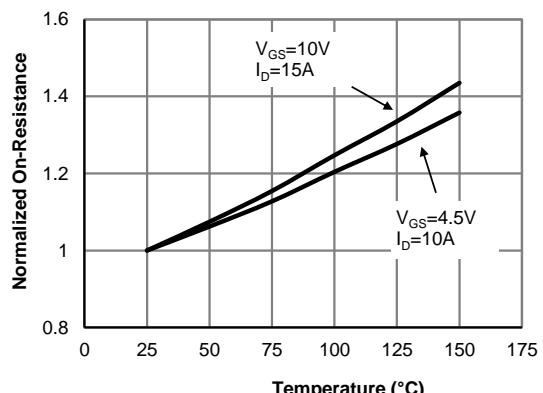
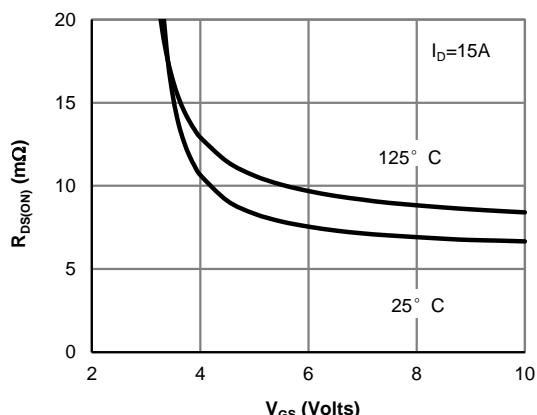
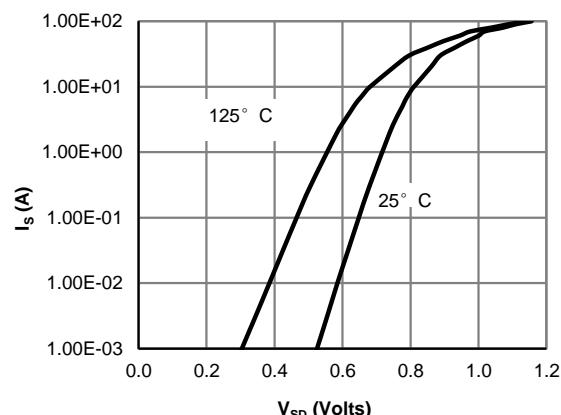
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

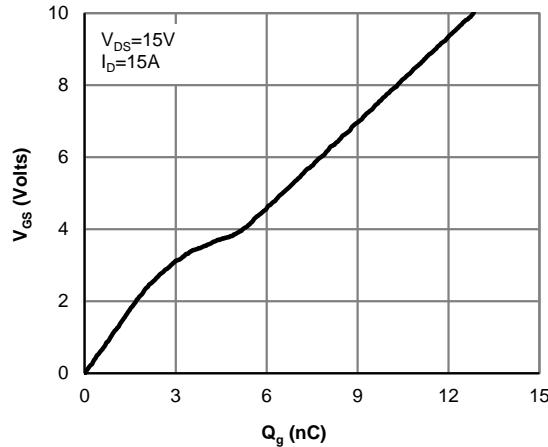
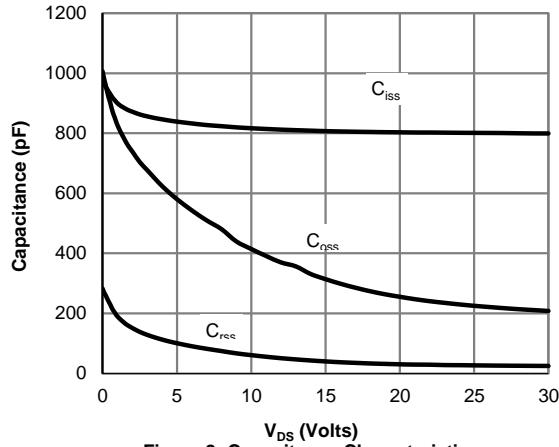
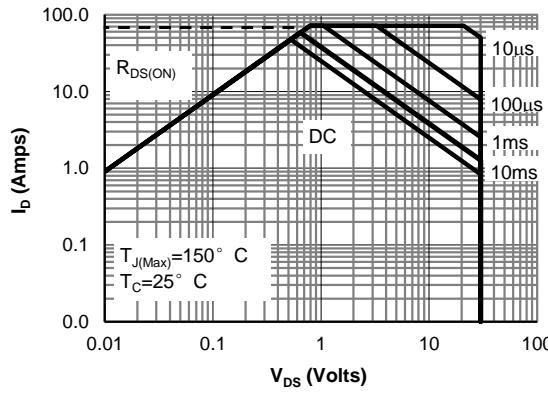
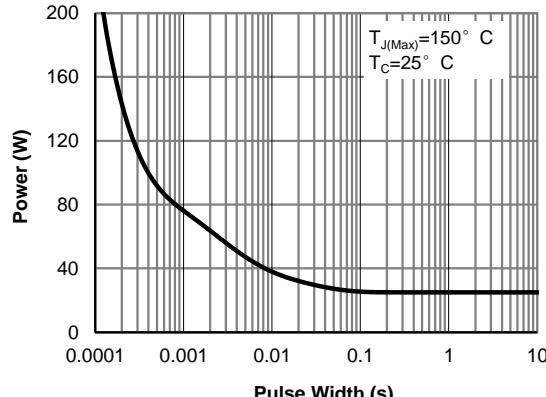
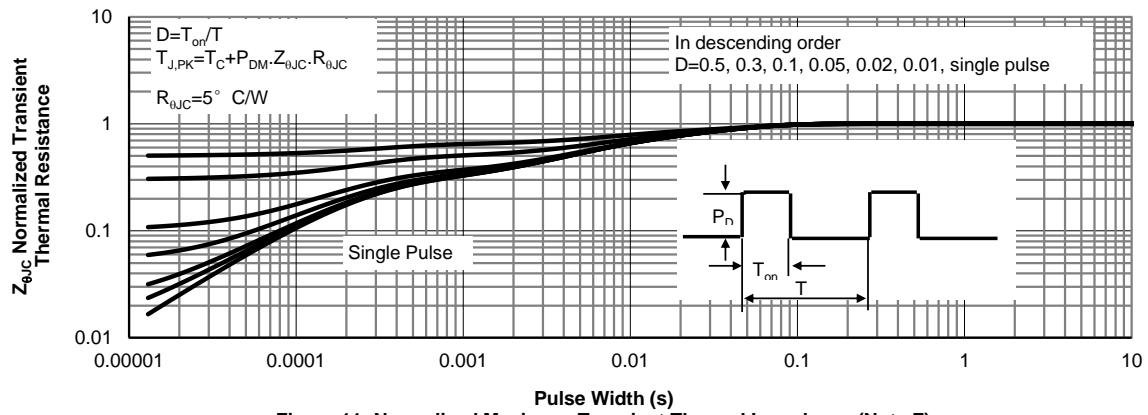
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(\text{MAX})}=150^\circ\text{C}$ . The SOA curve provides a single pulse rating.

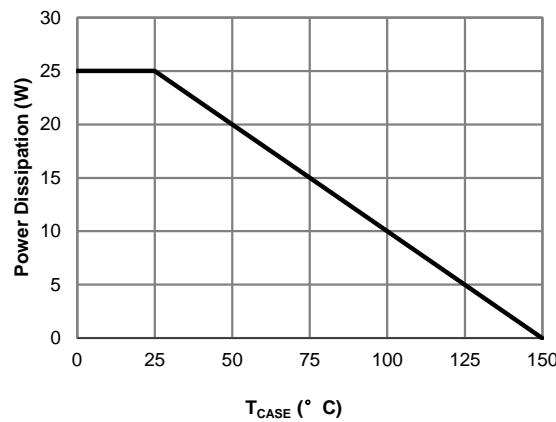
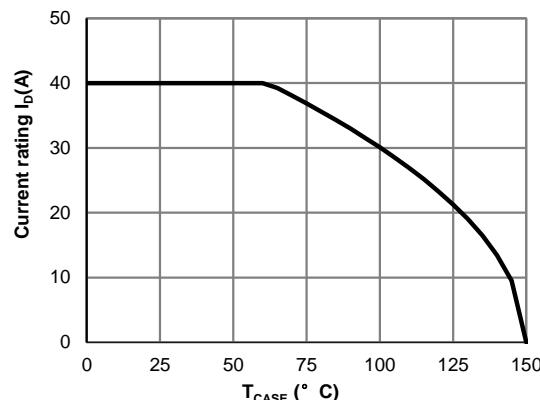
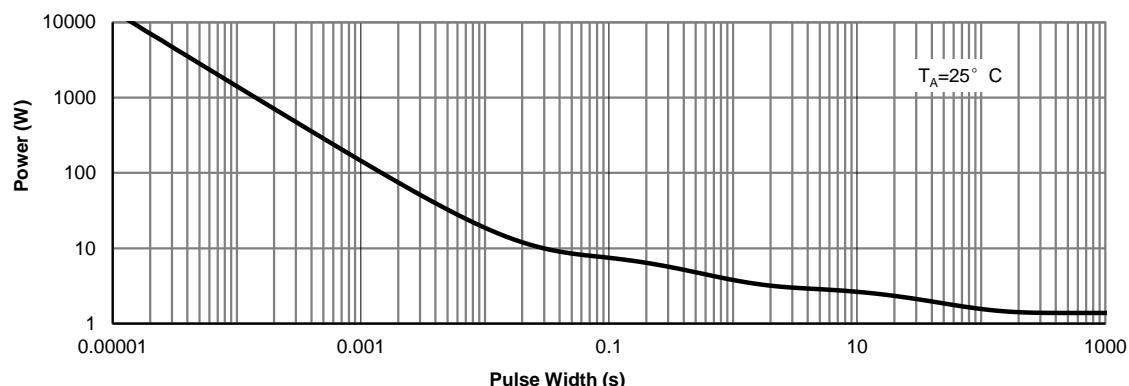
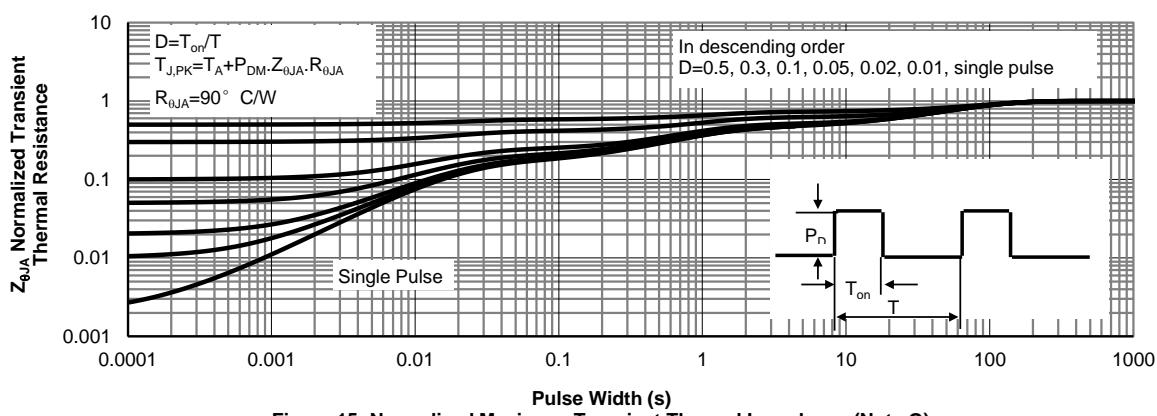
G. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ .

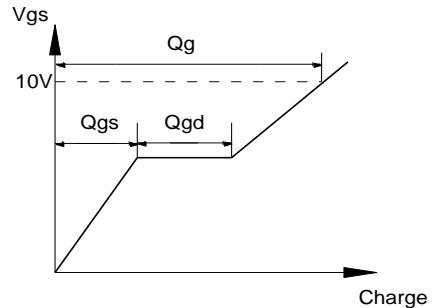
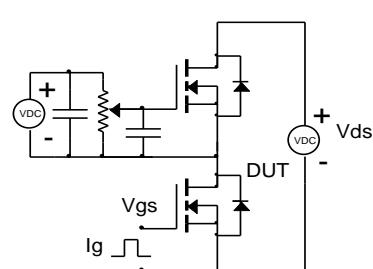
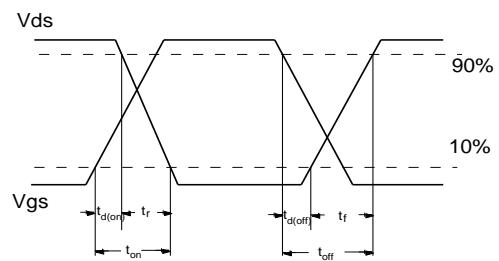
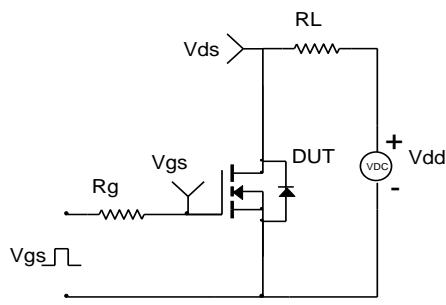
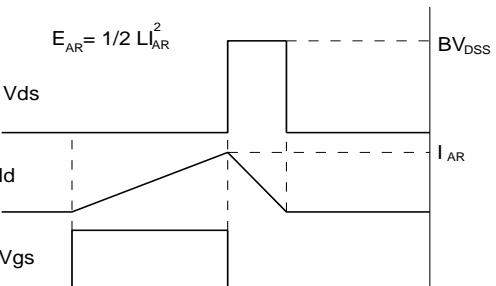
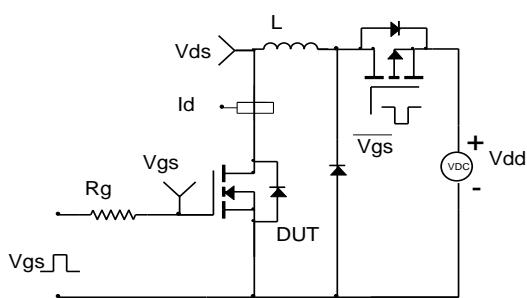
APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO MAKE CHANGES TO PRODUCT SPECIFICATIONS WITHOUT NOTICE. IT IS THE RESPONSIBILITY OF THE CUSTOMER TO EVALUATE SUITABILITY OF THE PRODUCT FOR THEIR INTENDED APPLICATION. CUSTOMER SHALL COMPLY WITH APPLICABLE LEGAL REQUIREMENTS, INCLUDING ALL APPLICABLE EXPORT CONTROL RULES, REGULATIONS AND LIMITATIONS.

AOS' products are provided subject to AOS' terms and conditions of sale which are set forth at:  
[http://www.aosmd.com/terms\\_and\\_conditions\\_of\\_sale](http://www.aosmd.com/terms_and_conditions_of_sale)

**Q2-CHANNEL: 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)**

**Q2-CHANNEL: 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)**

**Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

**Figure 12: Power De-rating (Note F)**

**Figure 13: Current De-rating (Note F)**

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

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

**Gate Charge Test Circuit & Waveform**

**Resistive Switching Test Circuit & Waveforms**

**Unclamped Inductive Switching (UIS) Test Circuit & Waveforms**

**Diode Recovery Test Circuit & Waveforms**
