ALPHA & OMEGA SEMICONDUCTOR
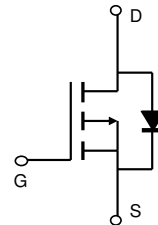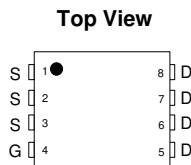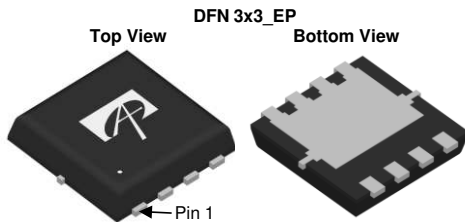
AON7401
30V P-Channel MOSFET

General Description

The AON7401 uses advanced trench technology to provide excellent $R_{DS(ON)}$, and ultra-low low gate charge with a 25V gate rating. This device is suitable for use as a load switch or in PWM applications.

Product Summary

V_{DS}	-30V
I_D (at V_{GS}=-10V)	-35A
$R_{DS(ON)}$ (at V_{GS}=-10V)	< 14mΩ
$R_{DS(ON)}$ (at V_{GS}=-6V)	< 17mΩ

100% UIS Tested
100% R_g Tested

Green Product

DFN 3x3_EP
Top View   Bottom View

Pin 1

Top View

S	1 ●	8	D
S	2	7	D
S	3	6	D
G	4	5	D

D
G
S

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	-30	V
Gate-Source Voltage		V_{GS}	±25	V
Continuous Drain Current	T_C=25°C	I_D	-35	A
	T_C=100°C		-23	
Pulsed Drain Current [C]		I_{DM}	-80	
Continuous Drain Current	T_A=25°C	I_{DSM}	-12	A
	T_A=70°C		-9.7	
Power Dissipation [B]	T_C=25°C	P_D	29	W
	T_C=100°C		12	
Power Dissipation [A]	T_A=25°C	P_{DSM}	3.1	W
	T_A=70°C		2	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	30	40	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		60	75	°C/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	3.5	4.2	°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		-30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-30V, V_{GS}=0V				-1	µA
			T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±25V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA		-1.7	-2.2	-3	V
$I_{D(ON)}$	On state drain current	V_{GS}=-10V, V_{DS}=-5V		-80			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-9A			11	14	mΩ
			T_J=125°C		16	19	
		V_{GS}=-6V, I_D=-7A			12.9	17	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-9A			27		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V			-0.7	-1	V
I_S	Maximum Body-Diode Continuous Current					-25	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz			2060	2600	pF
C_{oss}	Output Capacitance				370		pF
C_{rss}	Reverse Transfer Capacitance				295		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz			2.4	3.6	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=-10V, V_{DS}=-15V, I_D=-9A			30	39	nC
Q_{gs}	Gate Source Charge				4.6		nC
Q_{gd}	Gate Drain Charge				10		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=1.6Ω, R_{GEN}=3Ω			11		ns
t_r	Turn-On Rise Time				9.4		ns
$t_{D(off)}$	Turn-Off DelayTime				24		ns
t_f	Turn-Off Fall Time				12		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-9A, dI/dt=500A/µs			14	18	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-9A, dI/dt=500A/µs			35		nC

A. The value of $R_{\theta JA}$ 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 $R_{\theta JA}$ t ⩽ 10s value 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 150° C may be used if the PCB allows it.

B. The power dissipation P_D is based on $T_{J(MAX)}$=150° 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 $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initial T_J =25° 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 impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150° 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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SEMICONDUCTOR
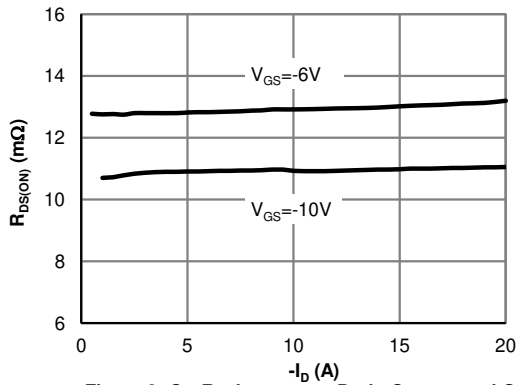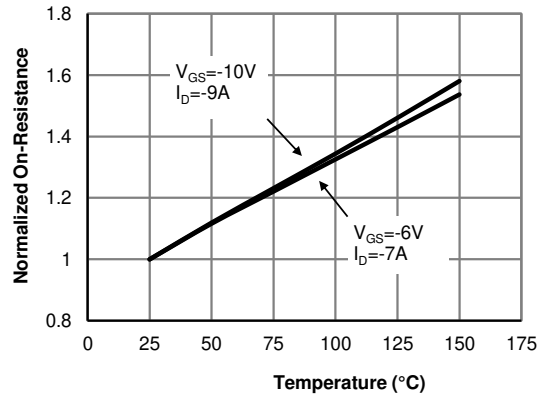
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
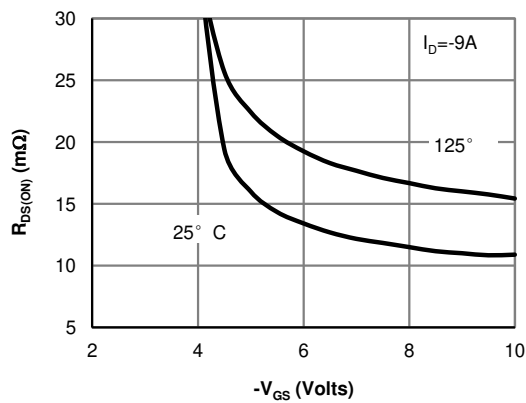
Fig 1: On-Region Characteristics (Note E)
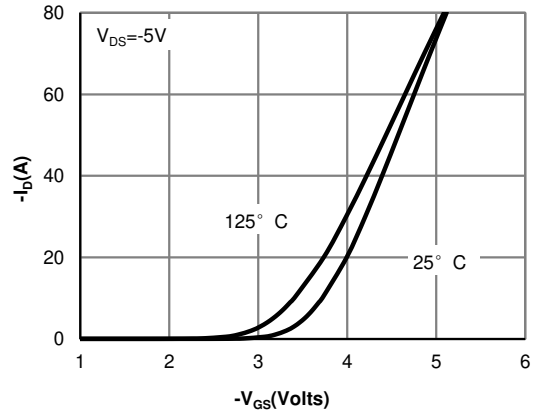
Figure 2: Transfer Characteristics (Note E)
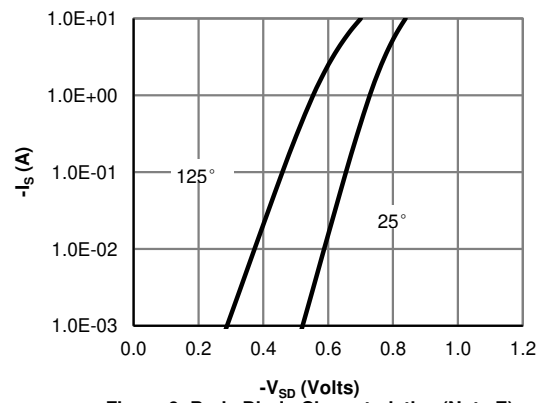
Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

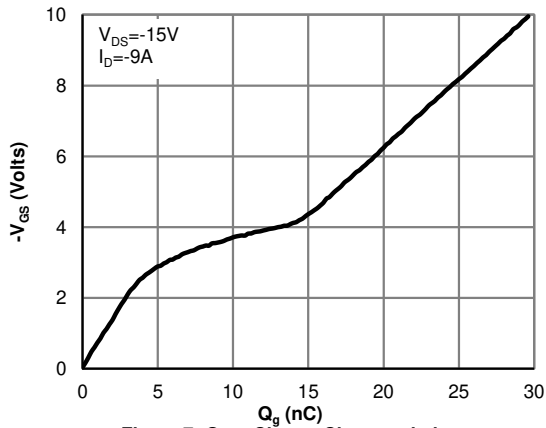Figure 4: On-Resistance vs. Junction Temperature (Note E)
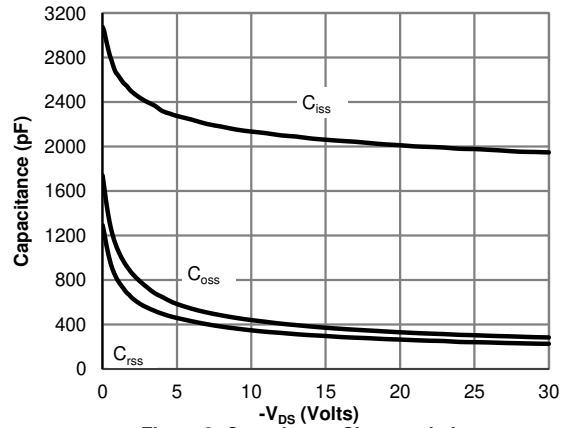
Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)
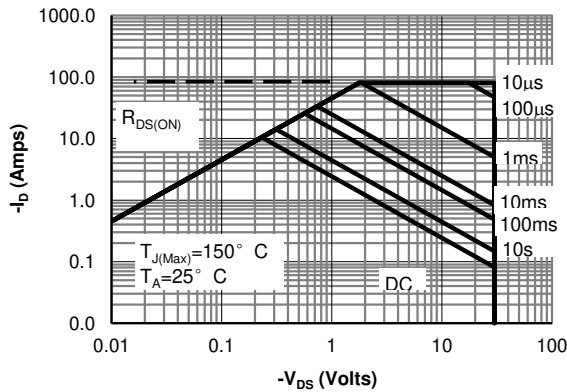
Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
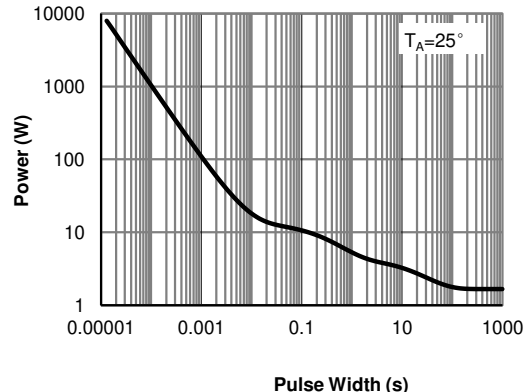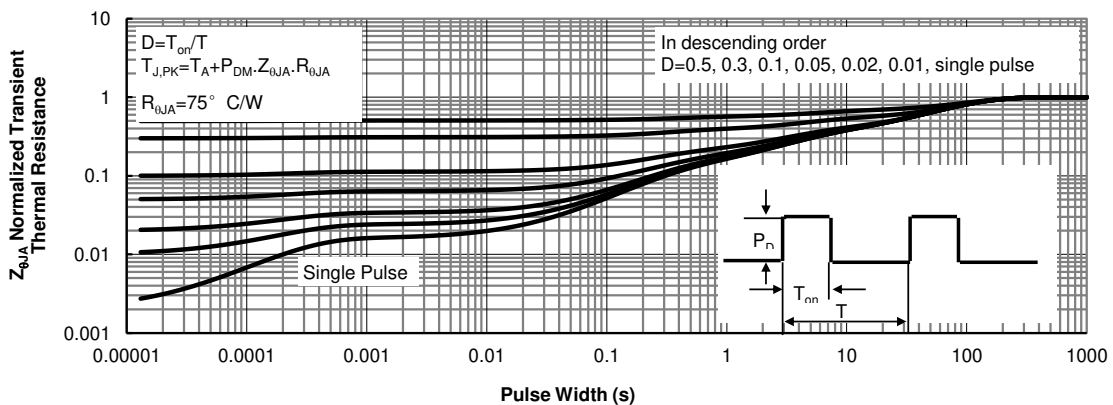

Figure 7: Gate-Charge Characteristics

Figure 8: Capacitance Characteristics

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

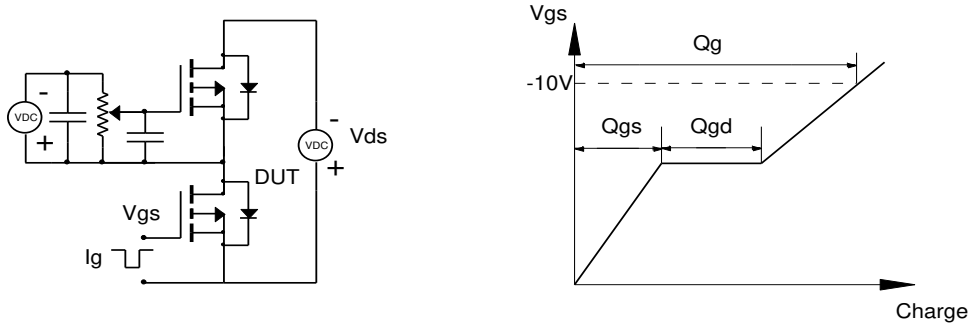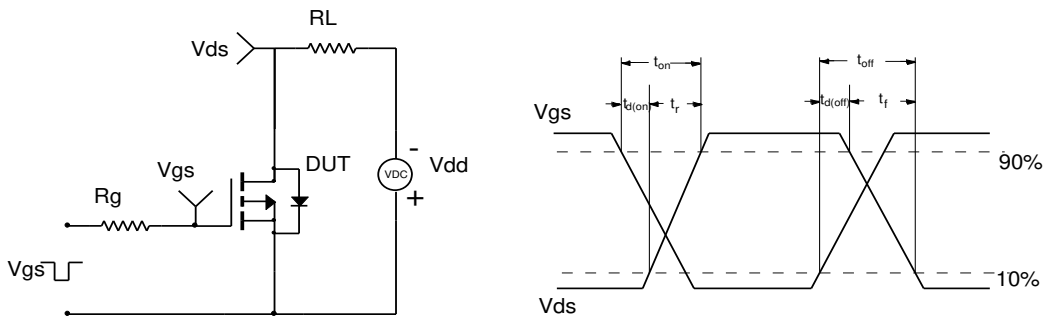Figure 10: Single Pulse Power Rating Junction-to-
Ambient (Note F)

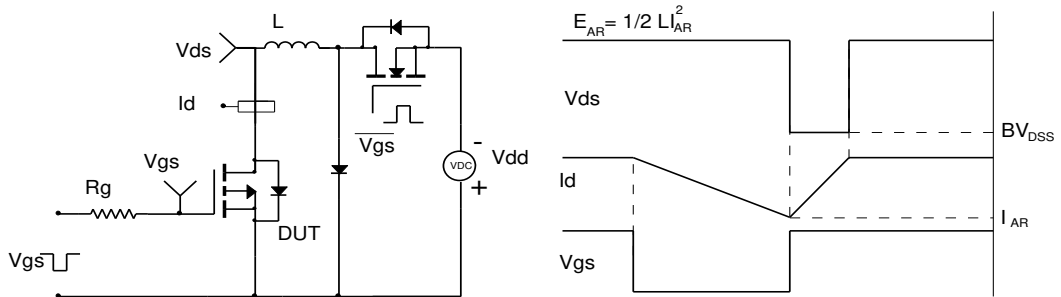Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Gate Charge Test Circuit & Waveform

VDC

Vds
-
+

VDC
- Vds
+

DUT

Vgs

Ig

Vgs

-10V

Qg

Qgs   Qgd

Charge

Resistive Switching Test Circuit & Waveforms

RL

Vds

Vgs

Rg

DUT

VDC
- Vdd
+

Vgs

t_{on}

t_{off}

$t_{d(on)}$ t_r

$t_{d(off)}$ t_f

Vgs

Vds

90%

10%

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

L

Vds

Id

Vgs

Rg

DUT

$\overline{Vgs}$

VDC
- Vdd
+

Vgs

$E_{AR} = 1/2\, LI_{AR}^2$

Vds

Id

Vgs

BV_{DSS}

I_{AR}

Diode Recovery Test Circuit & Waveforms

Vds +

Vds -

Isd

DUT

L

Vgs

Ig

VDC
+ Vdd
-

$Q_{rr} = -\int Idt$

Vgs

-Isd

-Vds

$-I_F$

t_{rr}

dI/dt

$-I_{RM}$

Vdd