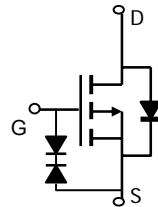
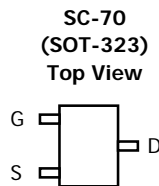



**AO7413**
**P-Channel Enhancement Mode Field Effect Transistor**
**General Description**

The AO7413 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge, and operation with gate voltages as low as 1.8V, in the small SOT323 footprint. It can be used for a wide variety of applications, including load switching, low current inverters and low current DC-DC converters. It is ESD protected to 2KV HBM. Standard Product AO7413 is Pb-free (meets ROHS & Sony 259 specifications). AO7413L is a Green Product ordering option. AO7413 and AO7413L are electrically identical.

**Features**

$V_{DS} (V) = -20V$   
 $I_D = -1.4A (V_{GS} = -10V)$   
 $R_{DS(ON)} < 113m\Omega (V_{GS} = -10V)$   
 $R_{DS(ON)} < 135m\Omega (V_{GS} = -4.5V)$   
 $R_{DS(ON)} < 180m\Omega (V_{GS} = -2.5V)$


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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	-1.4
		$T_A=70^\circ C$	-1.2
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	-3	A
Power Dissipation <sup>A</sup>	$P_D$	$T_A=25^\circ C$	0.35
		$T_A=70^\circ C$	0.22
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ C$

**Thermal Characteristics**

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	$t \leq 10s$	300	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	350	$^\circ C/W$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	280	320	$^\circ C/W$

Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
B <sub>V</sub> DSS	Drain-Source Breakdown Voltage	I <sub>D</sub> =-250μA, V <sub>GS</sub> =0V	-20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V			-0.5	μA
		T <sub>J</sub> =55°C			-2.5	
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±10V			±1	μA
		V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V			±10	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =-250μA	-0.7	-0.9	-1.4	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-5V	-15			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-1.4A		94	113	mΩ
		T <sub>J</sub> =125°C		130	160	
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-1.3A		111	135	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-1.1A		150	180	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-1.4A		5		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =-1A, V <sub>GS</sub> =0V		-0.84	-0.95	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				0.6	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-10V, f=1MHz		512	620	pF
C <sub>oss</sub>	Output Capacitance			77		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			62		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		9.2	13	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V, I <sub>D</sub> =-1.4A		4.9	6	nC
Q <sub>gs</sub>	Gate Source Charge			3.5		nC
Q <sub>gd</sub>	Gate Drain Charge			3.7		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V, R <sub>L</sub> =7.1Ω, R <sub>GEN</sub> =3Ω		11	13	ns
t <sub>r</sub>	Turn-On Rise Time			8	10	ns
t <sub>D(off)</sub>	Turn-Off DelayTime			34	41	ns
t <sub>f</sub>	Turn-Off Fall Time			12	15	ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =-1.4A, dI/dt=100A/μs		12.9	16	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =-1.4A, dI/dt=100A/μs		3.9	5	nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

D: The static characteristics in Figures 1 to 6,12,14 are obtained using 80μs pulses, duty cycle 0.5% max.

E: 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<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

Rev3: August 2005

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. 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 IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

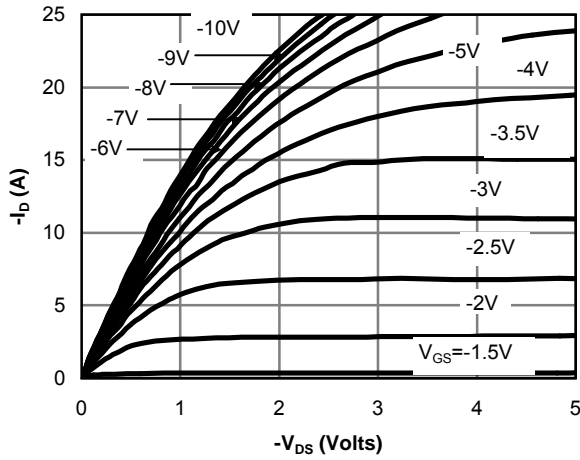


Fig 1: On-Region Characteristics

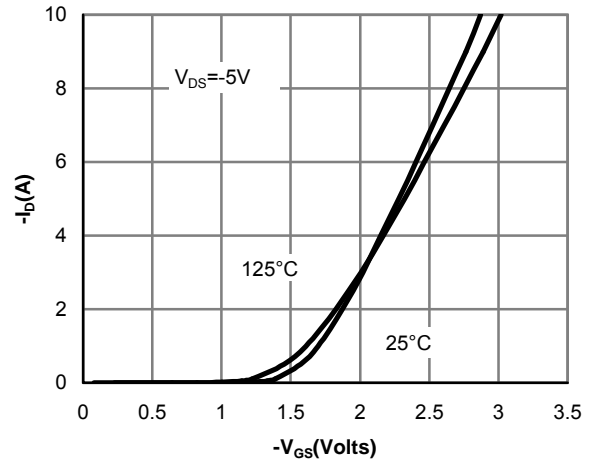


Figure 2: Transfer Characteristics

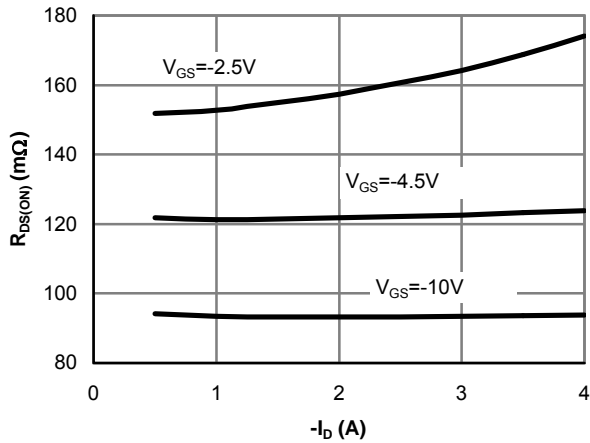


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

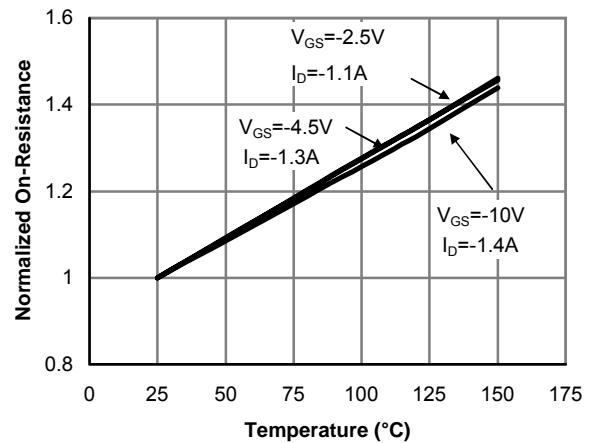


Figure 4: On-Resistance vs. Junction Temperature

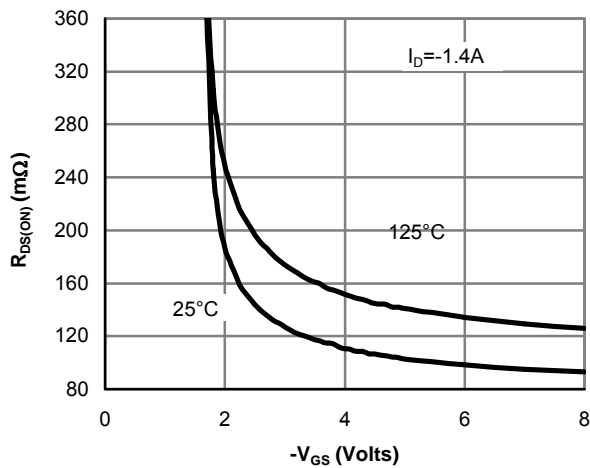


Figure 5: On-Resistance vs. Gate-Source Voltage

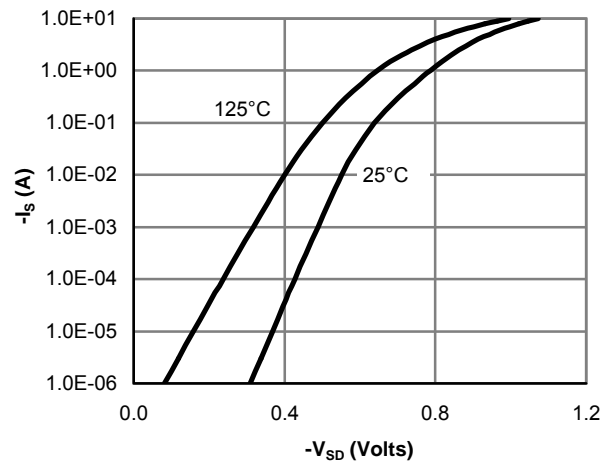


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

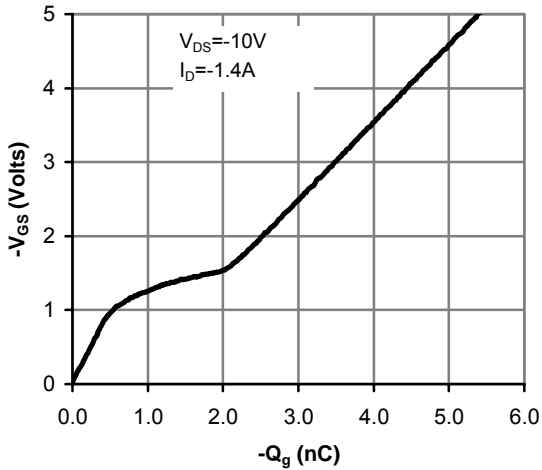


Figure 7: Gate-Charge Characteristics

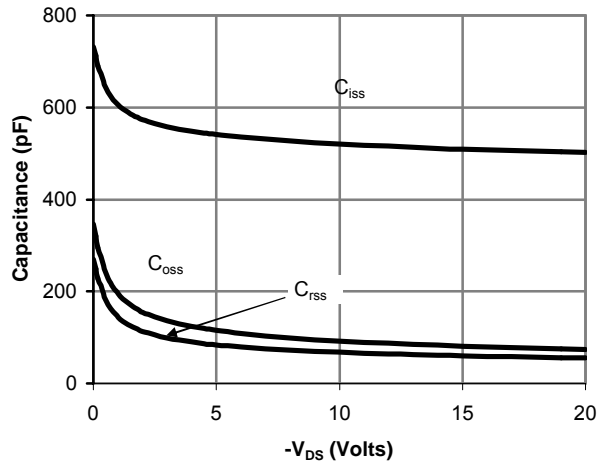


Figure 8: Capacitance Characteristics

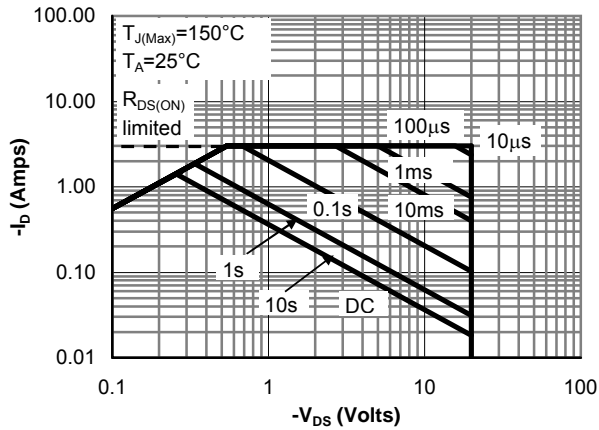


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

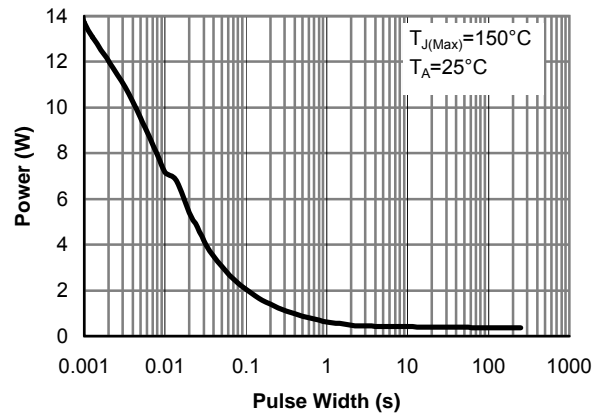


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

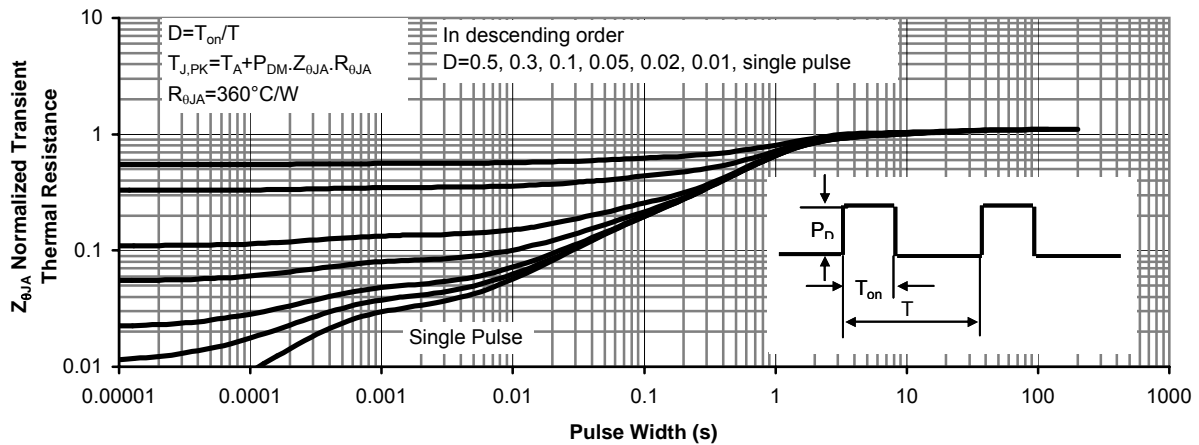


Figure 11: Normalized Maximum Transient Thermal Impedance