



ALPHA & OMEGA
SEMICONDUCTOR



AO7417

P-Channel Enhancement Mode Field Effect Transistor

General Description

The AO7417/L uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.5V, in the small SOT363 footprint. This device is suitable for use in buck convertor.

AO7417 and AO7417L are electrically identical.

-RoHS Compliant

-AO7417L is Halogen Free

Features

V_{DS} (V) = -20V

I_D = -2 A (V_{GS} = -4.5V)

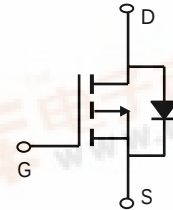
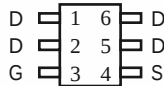
$R_{DS(ON)}$ < 80m Ω (V_{GS} = -4.5V)

$R_{DS(ON)}$ < 100m Ω (V_{GS} = -2.5V)

$R_{DS(ON)}$ < 125m Ω (V_{GS} = -1.8V)

$R_{DS(ON)}$ < 150m Ω (V_{GS} = -1.5V)

SC-70-6
(SOT-363)
Top View



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

Parameter	Symbol	10 Sec	Steady State	Units
Drain-Source Voltage	V_{DS}	-20		V
Gate-Source Voltage	V_{GS}	± 8		V
Continuous Drain Current ^A	I_D	-2	-1.9	A
$T_A=25^\circ\text{C}$				
$T_A=70^\circ\text{C}$		-1.7	-1.6	
Pulsed Drain Current ^B	I_{DM}	-20		
Power Dissipation ^A	P_D	0.63	0.57	W
$T_A=25^\circ\text{C}$				
$T_A=70^\circ\text{C}$		0.4	0.36	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150		$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A $t \leq 10\text{s}$	$R_{\theta JA}$	160	200	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A Steady-State		180	220	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C Steady-State	$R_{\theta JL}$	130	160	$^\circ\text{C/W}$



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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-20\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.5	-0.65	-1	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-20			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$, $I_D=-2\text{A}$ $T_J=125^{\circ}\text{C}$		65 90	80 110	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}$, $I_D=-1.8\text{A}$		80	100	$\text{m}\Omega$
		$V_{GS}=-1.8\text{V}$, $I_D=-1.5\text{A}$		100	125	$\text{m}\Omega$
		$V_{GS}=-1.5\text{V}$, $I_D=-0.5\text{A}$		115	150	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-2\text{A}$		10		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				-1	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-10\text{V}$, $f=1\text{MHz}$		560	745	pF
C_{oss}	Output Capacitance			80		pF
C_{rss}	Reverse Transfer Capacitance			70		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		15	23	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $I_D=-2\text{A}$		8.5	11	nC
Q_{gs}	Gate Source Charge			1.2		nC
Q_{gd}	Gate Drain Charge			2.1		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $R_L=5\Omega$, $R_{GEN}=6\Omega$		7.2		ns
t_r	Turn-On Rise Time			36		ns
$t_{D(off)}$	Turn-Off DelayTime			53		ns
t_f	Turn-Off Fall Time			56		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-2\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		37	49	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-2\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		27		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 $T_A=25^{\circ}\text{C}$. The value in any a given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

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

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

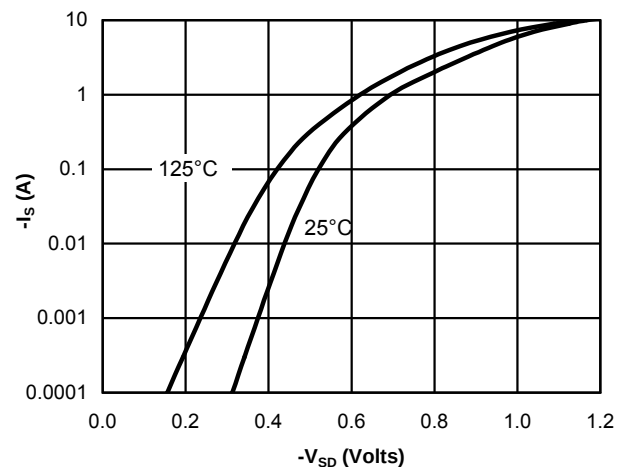
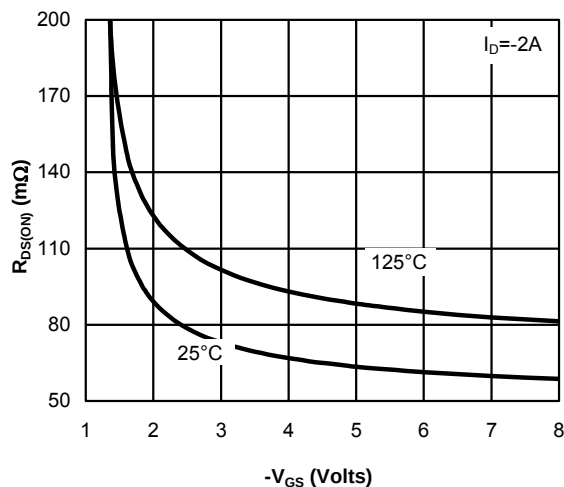
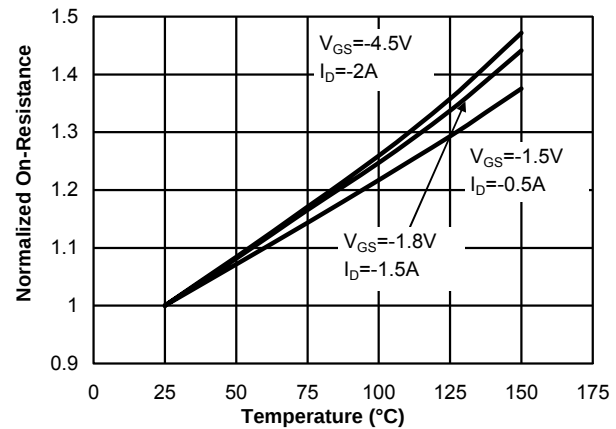
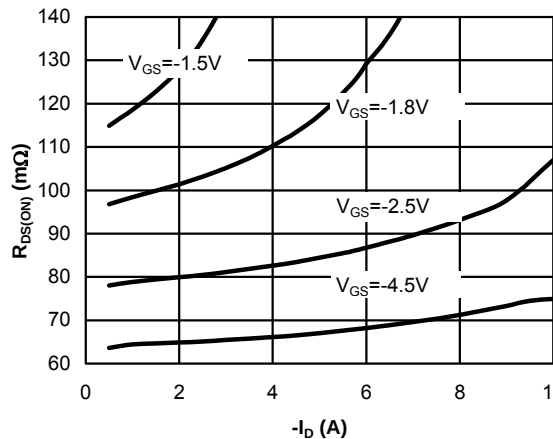
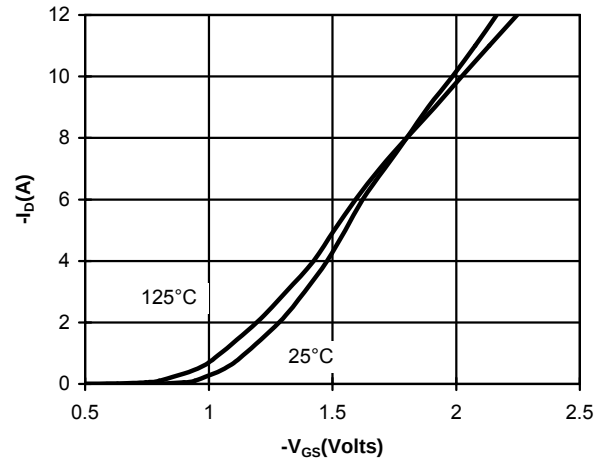
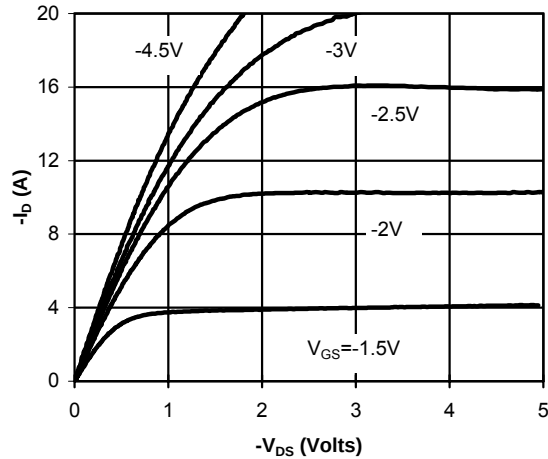
D: The static characteristics in Figures 1 to 6 are obtained using 300 μs pulse width, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Rev0: May 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



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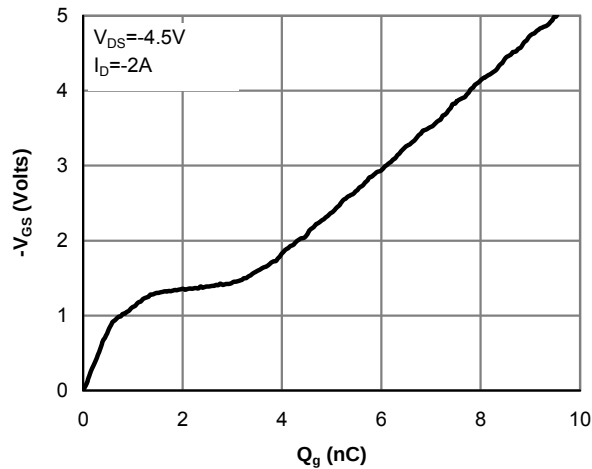


Figure 7: Gate-Charge Characteristics

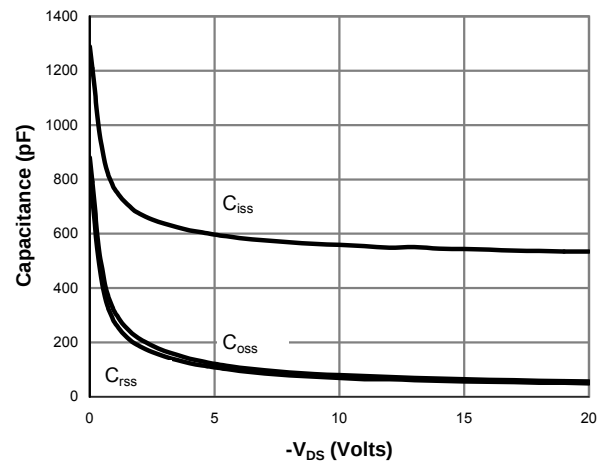


Figure 8: Capacitance Characteristics

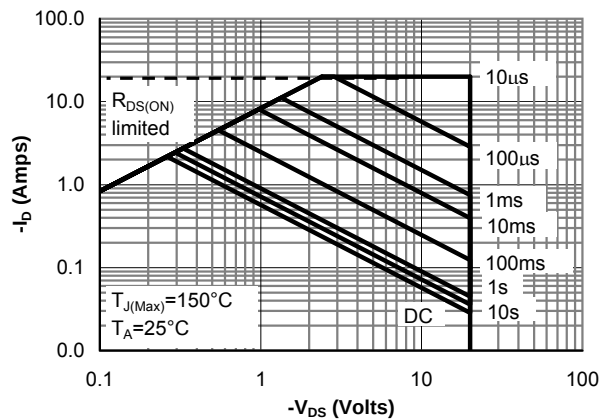


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

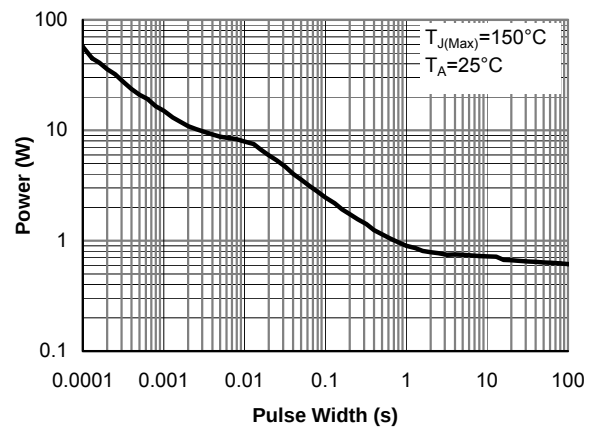


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

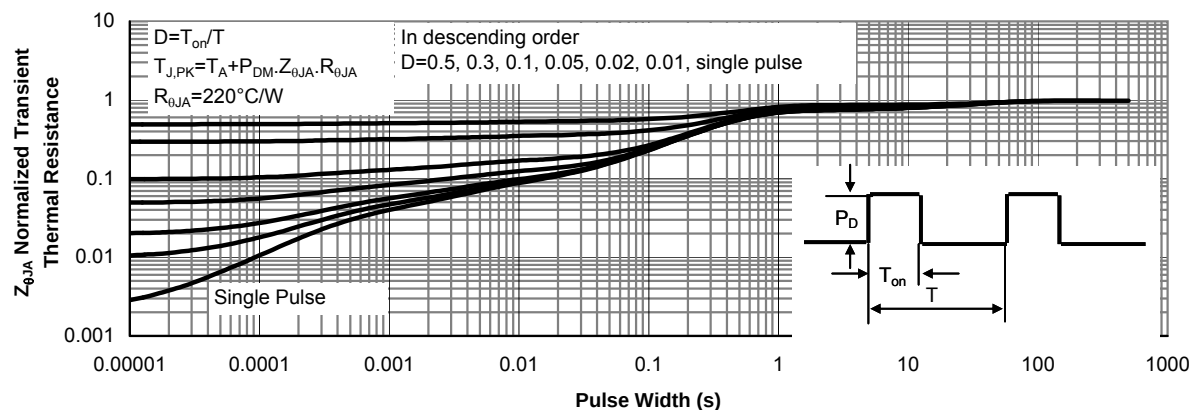


Figure 11: Normalized Maximum Transient Thermal Impedance