



AO3421E

30V P-Channel MOSFET

General Description

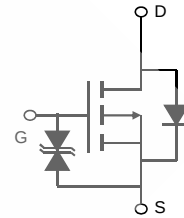
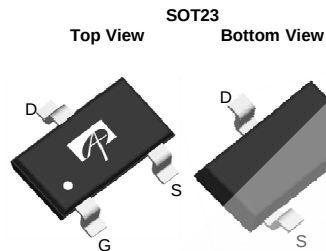
The AO3421E combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

Product Summary

V_{DS}	-30V
I_D (at $V_{GS}=-10V$)	-3A
$R_{DS(ON)}$ (at $V_{GS}=-10V$)	< 95m Ω
$R_{DS(ON)}$ (at $V_{GS}=-4.5V$)	< 160m Ω

Typical ESD protection

HBM Class 2



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	-3	A
		-2	
Pulsed Drain Current ^C	I_{DM}	-18	
Power Dissipation ^B	P_D	1.4	W
		0.9	
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	$R_{\theta JA}$	70	90	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A D}		100	125	$^\circ\text{C/W}$
Maximum Junction-to-Lead	$R_{\theta JL}$	63	80	$^\circ\text{C/W}$

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	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-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	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 16\text{V}$			± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-1.4	-2	-2.5	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$, $V_{DS}=-5\text{V}$	-18			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=-3\text{A}$ $T_J=125^\circ\text{C}$		78 112	95 135	$\text{m}\Omega$
		$V_{GS}=-4.5\text{V}$, $I_D=-2\text{A}$		120	160	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-3\text{A}$		6		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.8	-1	V
I_S	Maximum Body-Diode Continuous Current				-1.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-15\text{V}$, $f=1\text{MHz}$		215		pF
C_{oss}	Output Capacitance			46.5		pF
C_{rss}	Reverse Transfer Capacitance			27.5		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		9.5	19	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $I_D=-3\text{A}$		4.6	8	nC
$Q_g(4.5\text{V})$	Total Gate Charge			2.2	4	nC
Q_{gs}	Gate Source Charge			0.85		nC
Q_{gd}	Gate Drain Charge			1.2		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $R_L=5\Omega$, $R_{GEN}=3\Omega$		8		ns
t_r	Turn-On Rise Time			4		ns
$t_{D(off)}$	Turn-Off DelayTime			13.5		ns
t_f	Turn-Off Fall Time			4		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-3\text{A}$, $dI/dt=500\text{A}/\mu\text{s}$		9		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-3\text{A}$, $dI/dt=500\text{A}/\mu\text{s}$		16		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 given application depends on the user's specific board design.

B. The power dissipation P_D is based on $T_{J(MAX)}=150^\circ\text{C}$, using $\leq 10\text{s}$ junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_J=25^\circ\text{C}$.

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

E. The static characteristics in Figures 1 to 6 are obtained using $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}=150^\circ\text{C}$. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

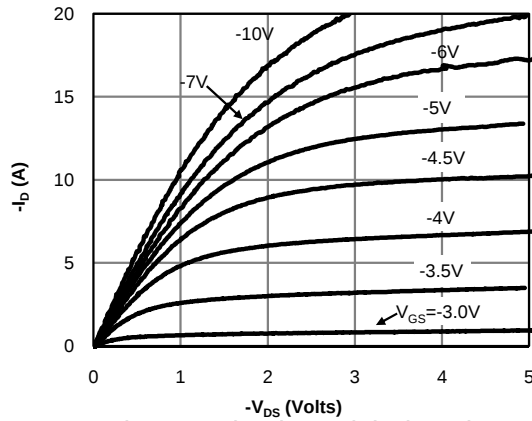


Fig 1: On-Region Characteristics (Note E)

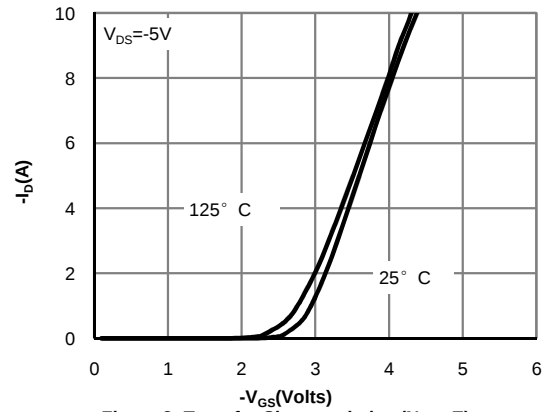


Figure 2: Transfer Characteristics (Note E)

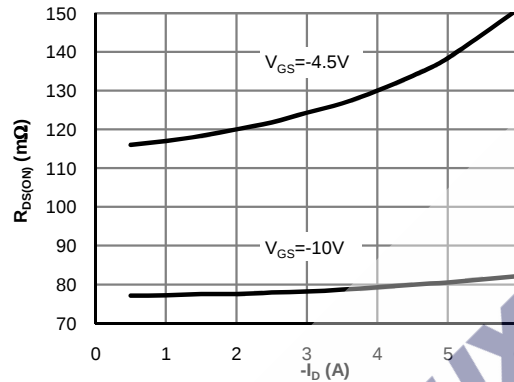


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

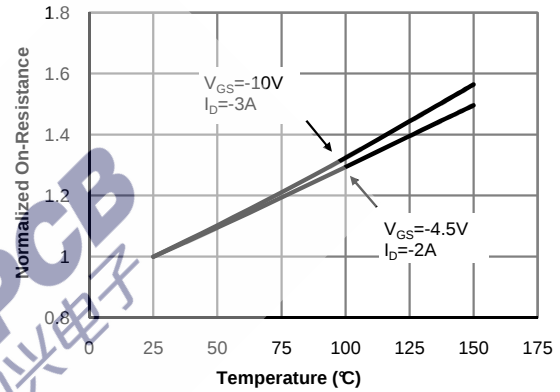


Figure 4: On-Resistance vs. Junction Temperature (Note E)

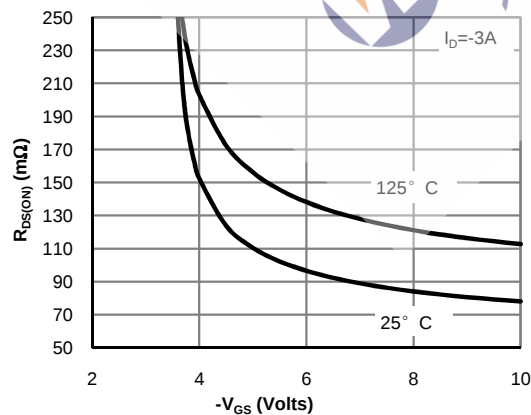


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

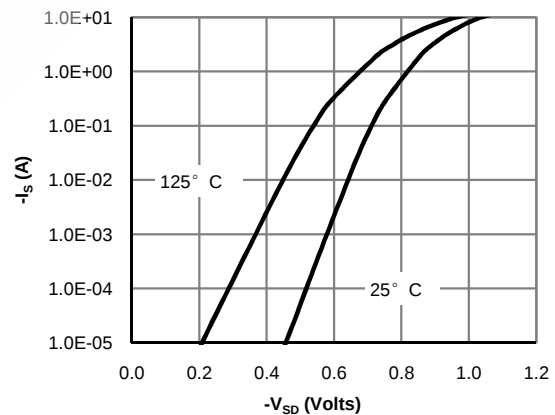


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

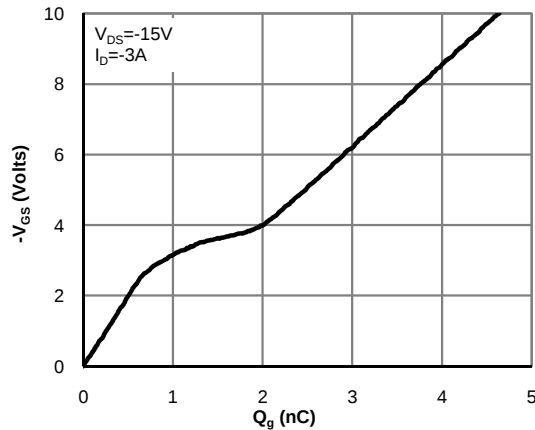


Figure 7: Gate-Charge Characteristics

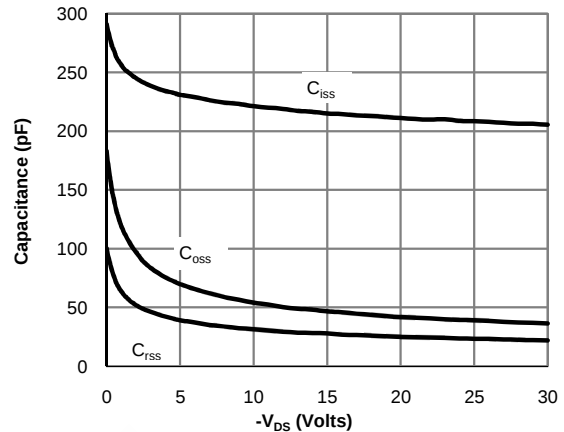


Figure 8: Capacitance Characteristics

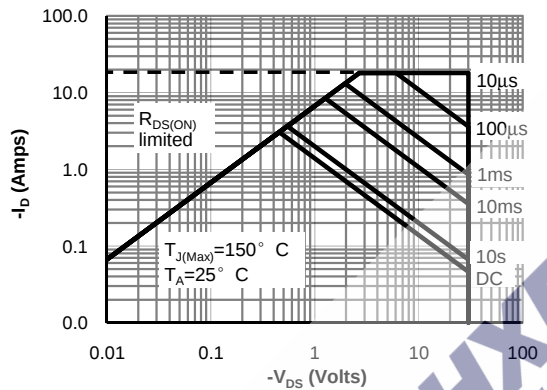


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

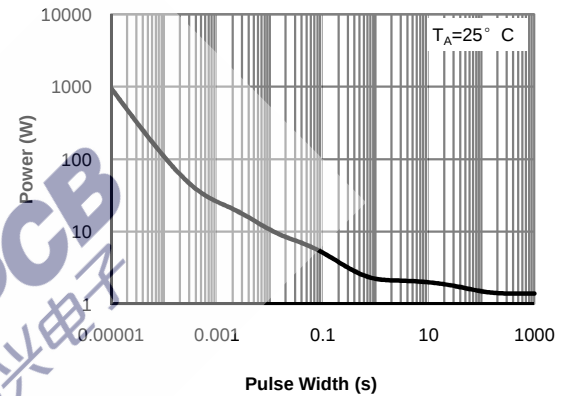


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

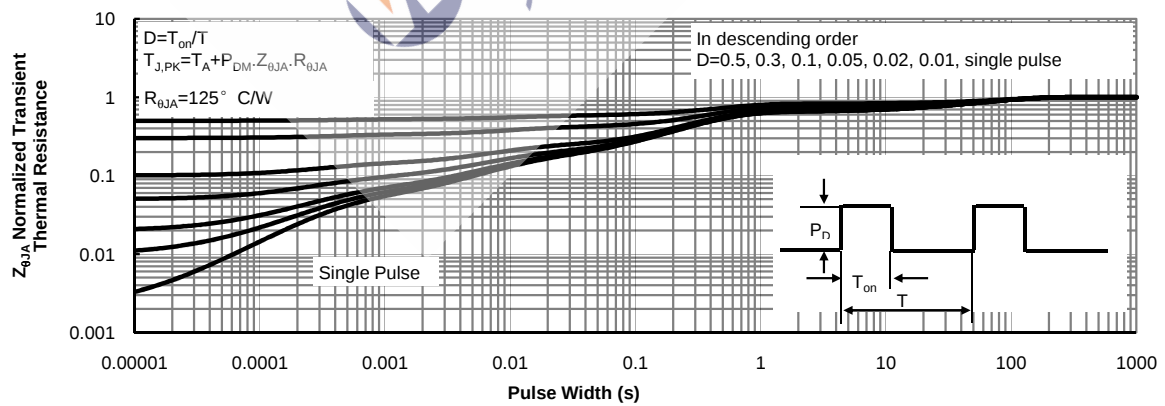
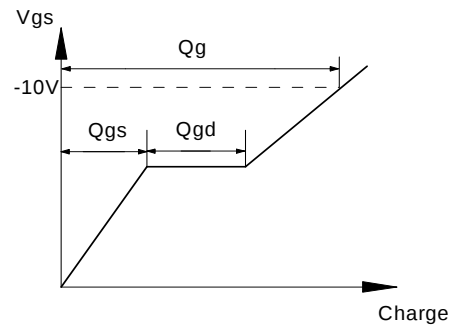
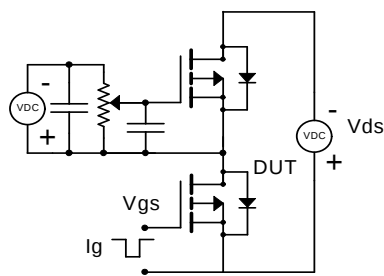
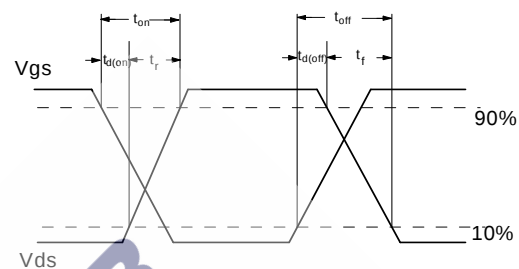
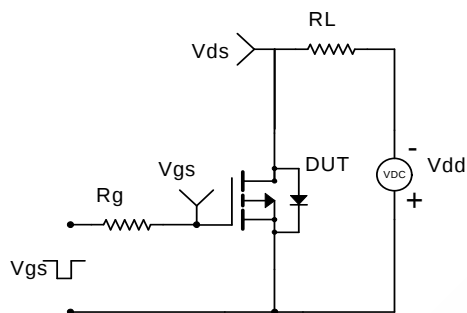


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

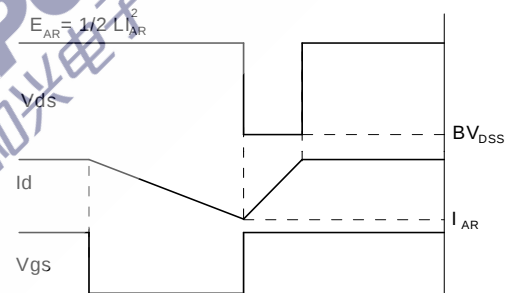
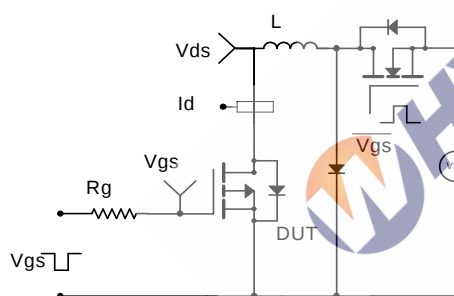
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

