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AO3413

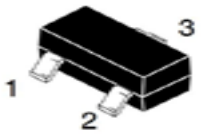
20V P-Channel MOSFET

General Description

The AO3413 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

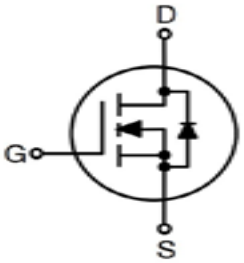
Features

V_{DS} = -20V
I_D = -3A (V_{GS} = -4.5V)
$R_{DS(ON)}$ < 80mΩ (V_{GS} =- 4.5V)
$R_{DS(ON)}$ < 100mΩ (V_{GS} = -2.5V)
$R_{DS(ON)}$ < 130mΩ (V_{GS} = -1.8V)



SOT-23

1 – Gate
2 – Source
3 – Drain



Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	-20	V
Gate-Source Voltage		V_{GS}	±8	V
Continuous Drain Current [A]	T_A=25℃	I_D	-3	A
	T_A=70℃		-2.4	
Pulsed Drain Current [B]		I_{DM}	-15	
Power Dissipation [A]	T_A=25℃	P_D	1.4	W
	T_A=70℃		0.9	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	70	90	℃/W
Maximum Junction-to-Ambient [A]	Steady-State		100	125	℃/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	63	80	℃/W

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Electrical Characteristics (T_J=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=-250μA, V_{GS}=0V	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-20V, V_{GS}=0V			-1	μA
		T_J=55℃			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±8V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250μA	-0.4	-0.65	-1	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-3A		56	80	mΩ
		T_J=125℃		80	115	
		V_{GS}=-2.5V, I_D=-2.6A		70	100	mΩ
		V_{GS}=-1.8V, I_D=-1A		85	130	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3A		12		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.7	-1	V
I_S	Maximum Body-Diode Continuous Current				-1.4	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		560	745	pF
C_{oss}	Output Capacitance			80		pF
C_{rss}	Reverse Transfer Capacitance			70		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		15	23	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-3A		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}=-4.5V, V_{DS}=-10V, R_L=3.3Ω, R_{GEN}=6Ω		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=-3A, dI/dt=100A/μs		37	49	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-3A, dI/dt=100A/μs		27		nC

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

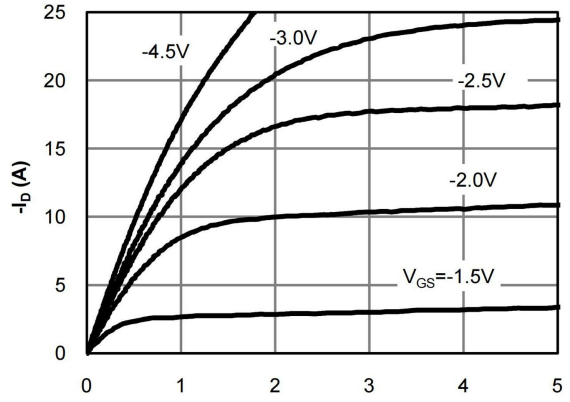


Figure 1: On-Region Characteristics

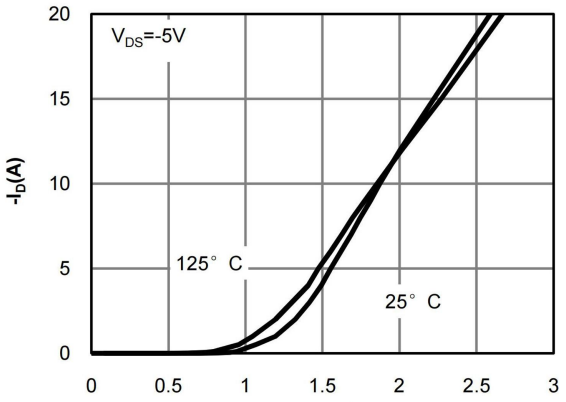


Figure 2: Transfer Characteristics

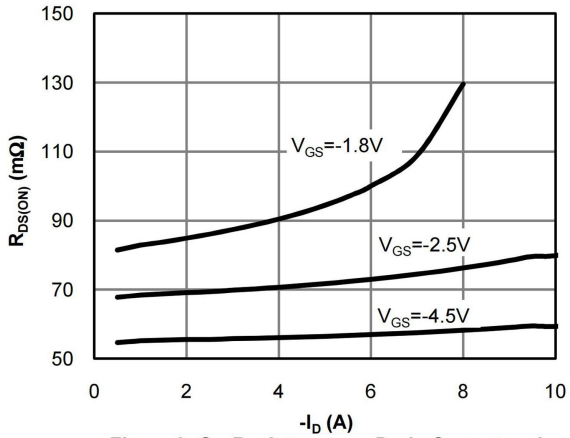


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

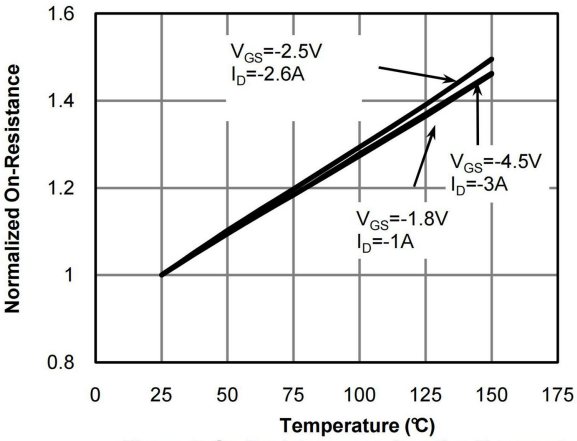


Figure 4: On-Resistance vs. Junction Temperature

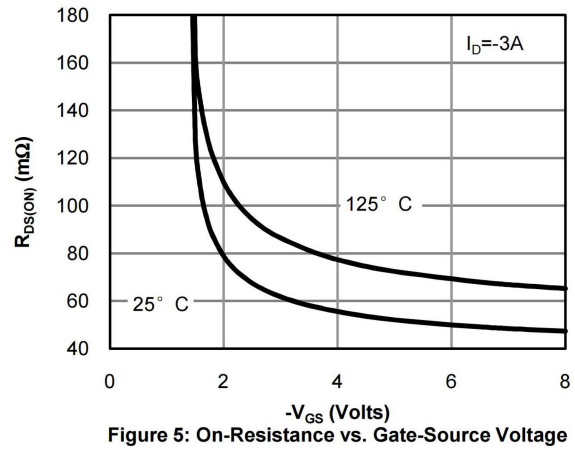


Figure 5: On-Resistance vs. Gate-Source Voltage

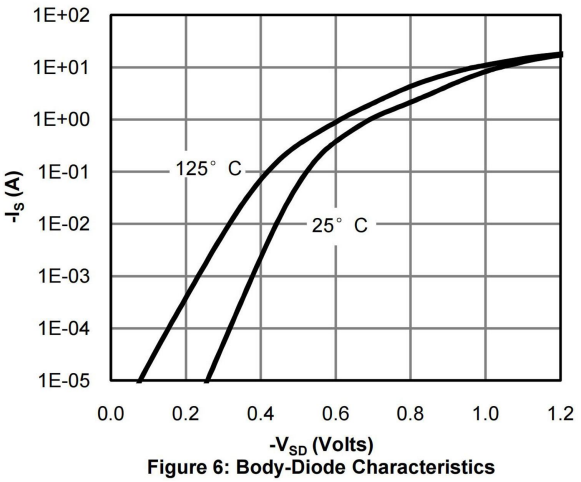


Figure 6: Body-Diode Characteristics

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

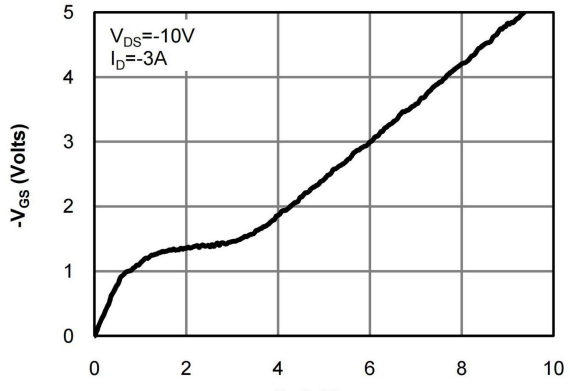


Figure 7: Gate-Charge Characteristics

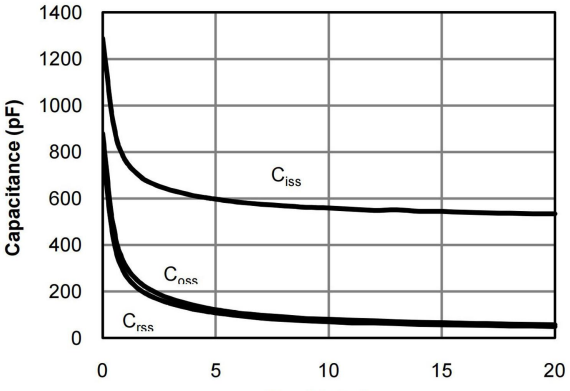


Figure 8: Capacitance Characteristics

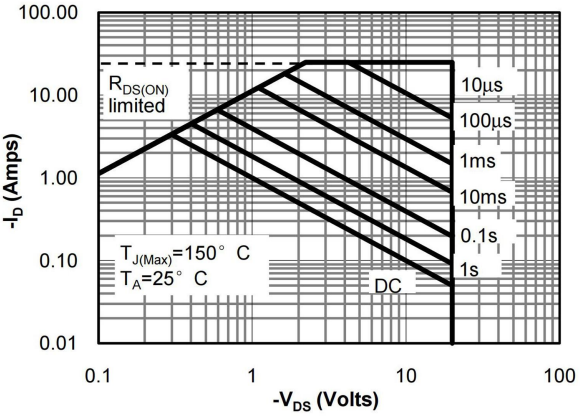


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

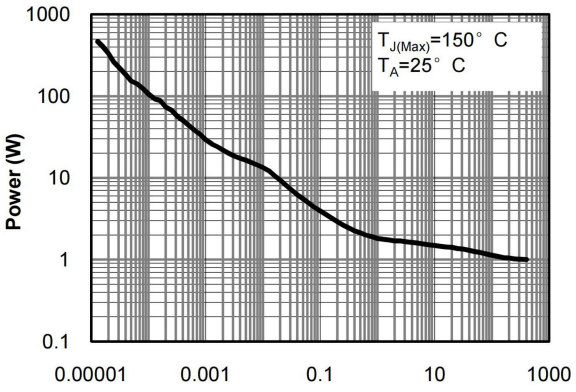


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

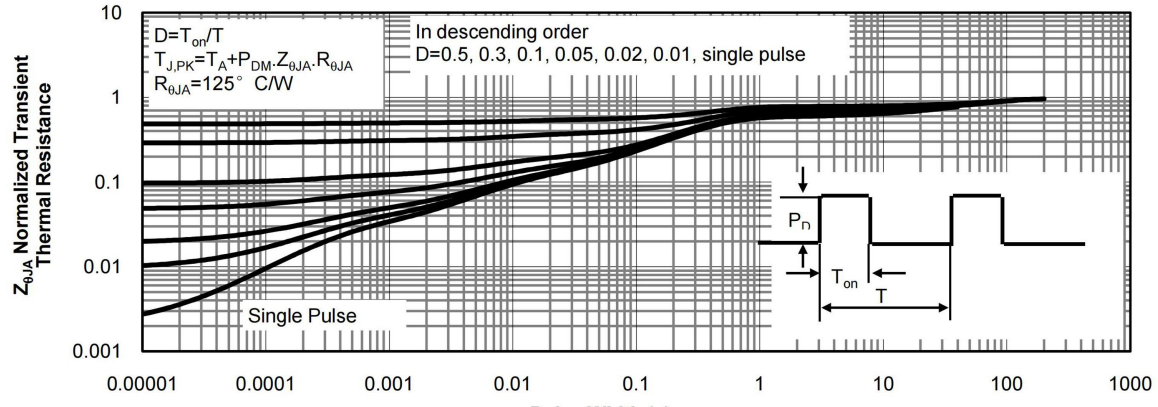


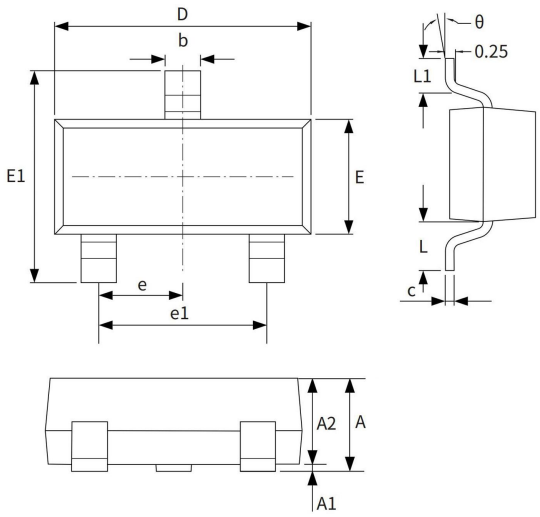
Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

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Ordering Information

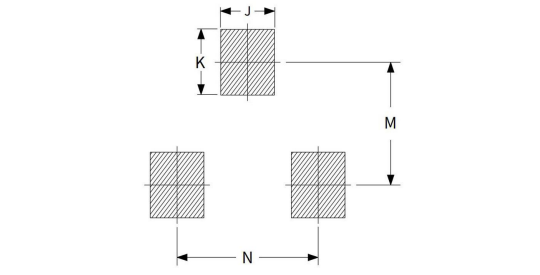
PACKAGE	PACKAGE CODE	UNIT WEIGHT(g)	REEL(pcs)	BOX(pcs)	CARTON(pcs)	DELIVERY MODE
SOT-23	R1	0.008	3000	30000	240000	7''

Package Outline Dimensions (SOT-23)



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.15	0.035	0.045
A1	-	0.10	-	0.004
A2	0.90	1.05	0.035	0.041
b	0.30	0.50	0.012	0.020
c	0.10	0.20	0.004	0.008
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
E1	2.25	2.55	0.089	0.100
e	0.950TYP		0.037TYP	
e1	1.80	2.00	0.071	0.079
L	0.550REF		0.022REF	
L1	0.30	0.50	0.012	0.020
θ	-	8°	-	8°

Suggested Pad Layout



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
J	0.75	0.85	0.030	0.033
K	0.85	0.95	0.033	0.037
M	1.95	2.05	0.077	0.081
N	1.85	1.95	0.073	0.077