

### Description

The AO3416A uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

$V_{DS} = 20V$   $I_D = 6A$

$R_{DS(ON)} < 17m\Omega$  @  $V_{GS}=4.5V$

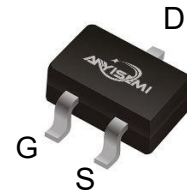
ESD=2500V HBM

### Application

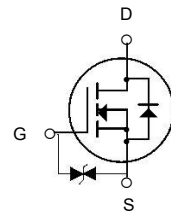
Battery protection

Load switch

Uninterruptible power supply



SOT-23



N-Channel MOSFET

### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AO3416A	SOT-23	3416	3000

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

Symbol	Parameter	Limit	Unit
$V_{DS}$	Drain-Source Voltage	20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current-Continuous	6	A
$I_{DM}$	Drain Current-Pulsed (Note 1)	30	A
$P_D$	Maximum Power Dissipation	1.4	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 150	$^{\circ}C$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 2)	89	$^{\circ}C/W$

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	20		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±10V, V <sub>DS</sub> =0V	-	-	±10	μA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.45	0.7	1.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A	-	14	17	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =5.5A	-	18	23	mΩ
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =5A	-	28	40	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =6.5A	8	-	-	S
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, F=1.0MHz	-	660	-	PF
Output Capacitance	C <sub>OSS</sub>		-	160	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	87	-	PF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =10V, R <sub>L</sub> =1.5Ω V <sub>GS</sub> =5V, R <sub>GEN</sub> =3Ω	-	0.5		nS
Turn-on Rise Time	t <sub>r</sub>		-	1		nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	12		nS
Turn-Off Fall Time	t <sub>f</sub>		-	4		nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =6.5A, V <sub>GS</sub> =4.5V	-	8		nC
Gate-Source Charge	Q <sub>gs</sub>		-	2.5	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	3	-	nC
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =6.5A	-	-	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	6.0	A

**Notes:**

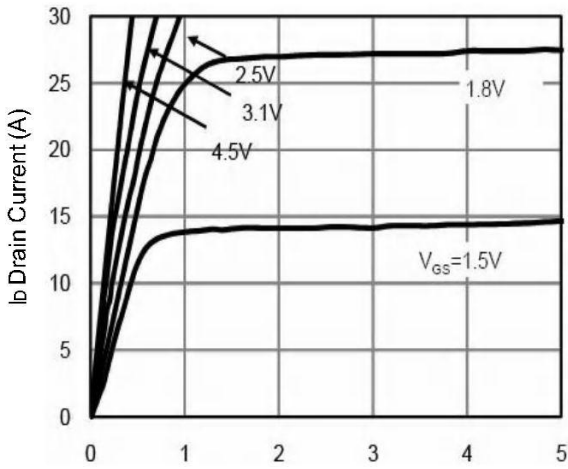
Repetitive Rating: Pulse width limited by maximum junction temperature.

Surface Mounted on FR4 Board, t ≤ 10 sec.

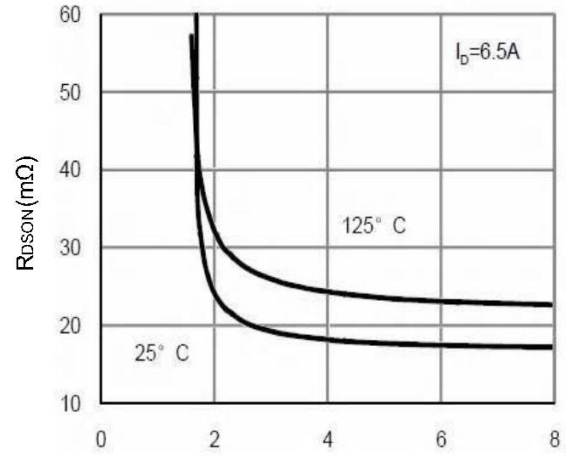
Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

Guaranteed by design, not subject to production

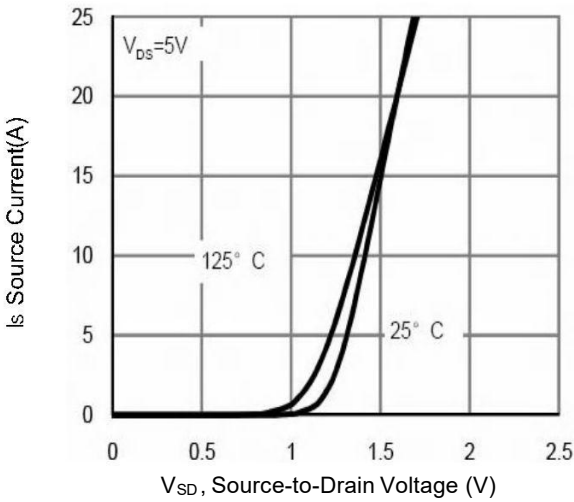
**Typical Characteristics**



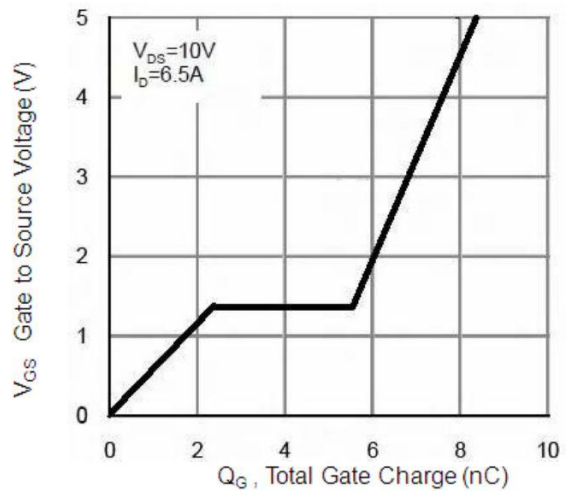
**Fig.1 Typical Output Characteristics**



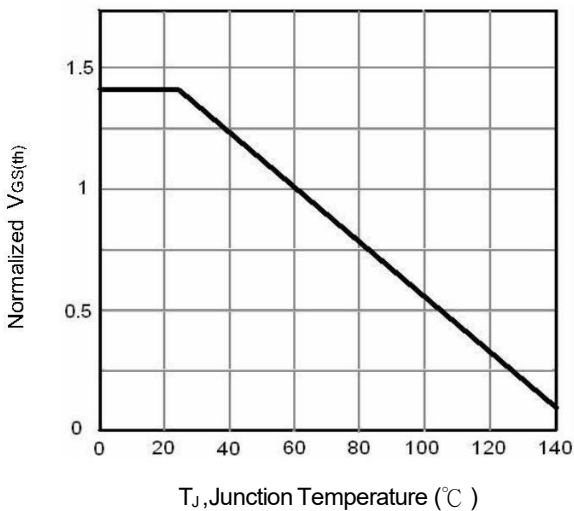
**Fig.2 On-Resistance vs. Gate-Source**



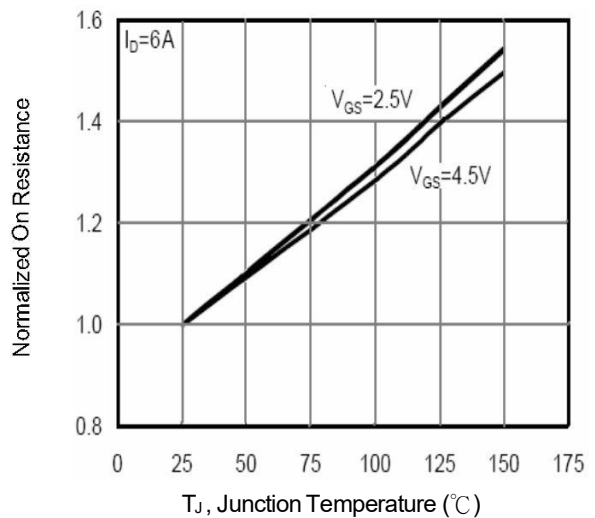
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**



**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**

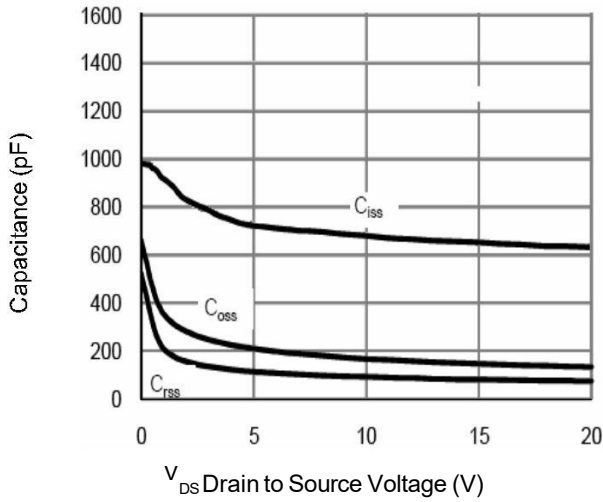


Fig.7 Capacitance

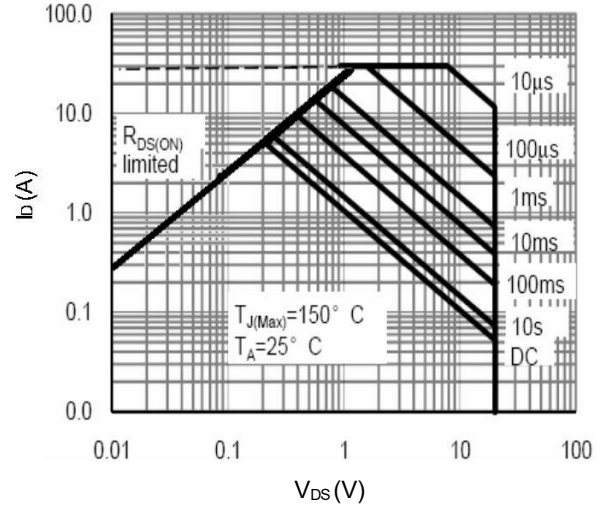


Fig.8 Safe Operating Area

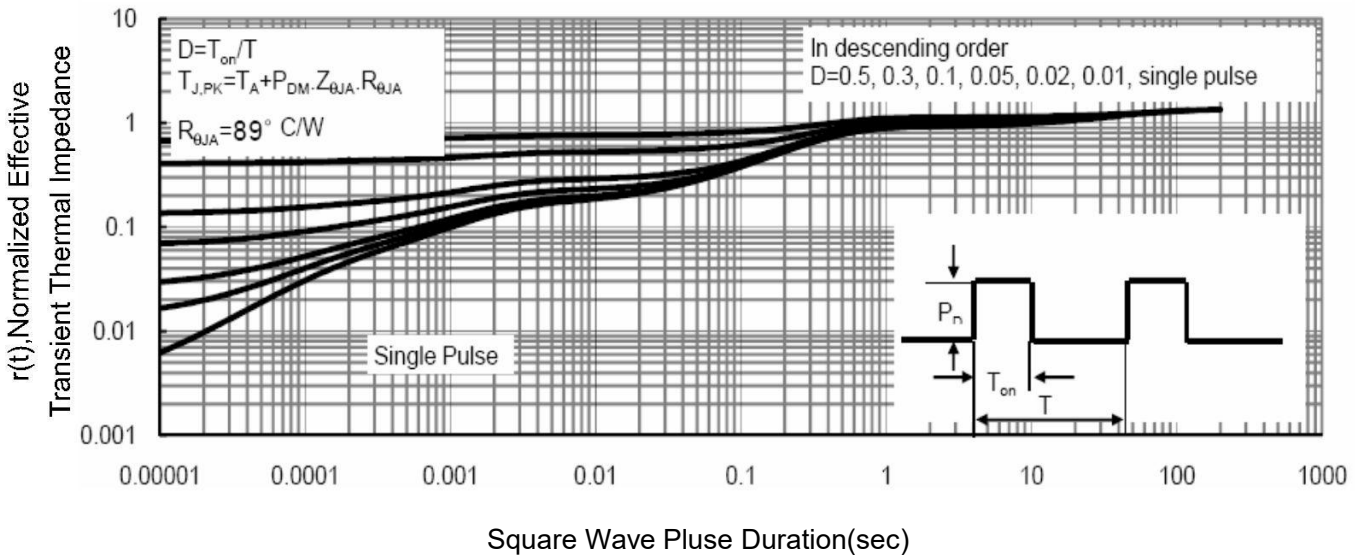


Fig.9 Normalized Maximum Transient Thermal Impedance

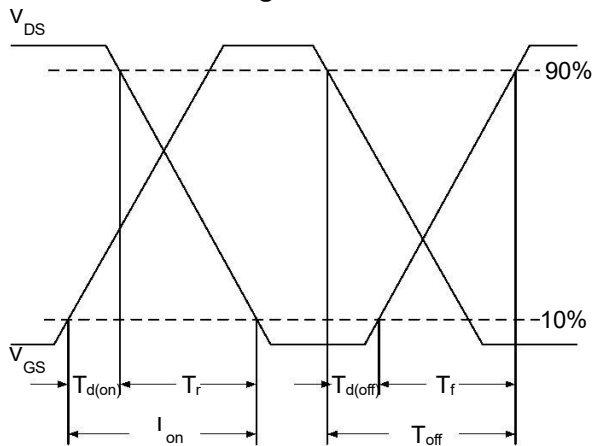


Fig.10 Switching Time Waveform

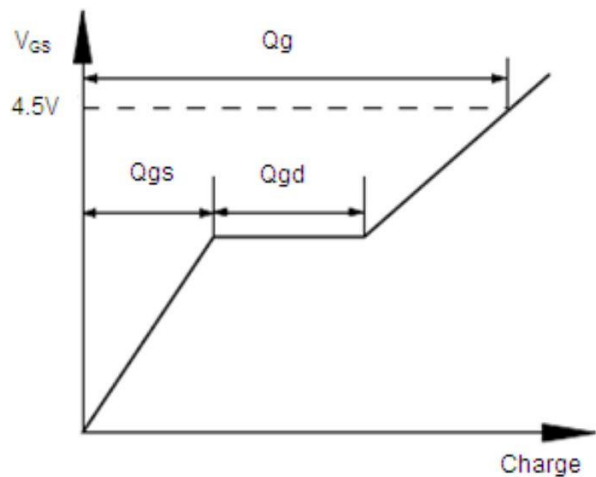
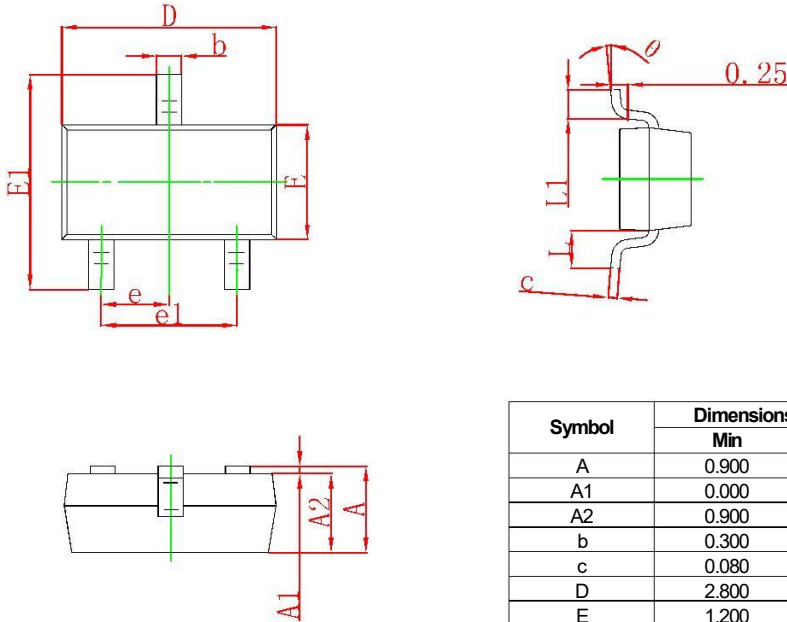


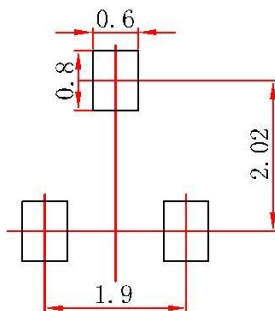
Fig.11 Gate Charge Waveform

**SOT-23 Package Outline Dimensions**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

**SOT-23 Suggested Pad Layout**



Note:  
 1. Controlling dimension: in millimeters.  
 2. General tolerance:  $\pm 0.05\text{mm}$ .  
 3. The pad layout is for reference purposes only.

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