

# MSKSEMI 美森科

SEMICONDUCTOR



ESD



TVS



TSS



MOV



GDT



PLED

## AO3413

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Product specification

## Features

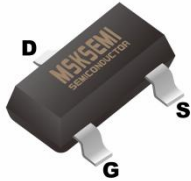
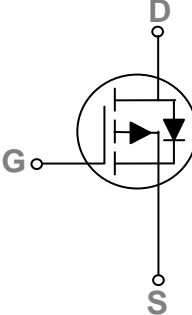

- -20V, -3A,  $R_{DS(ON)} = 60m\Omega @ V_{GS} = -4.5V$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available

## Applications

- Notebook
- Load Switch
- Battery Protection
- Hand-held Instruments

BVDSS	RDSON	ID
-20V	60mΩ	-3A

## Reference News

PACKAGE OUTLINE	PIN Configuration	Marking
 SOT-23-3L		

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

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current - Continuous ( $T_c=25^{\circ}C$ )	-3.0	A
	Drain Current - Continuous ( $T_c=100^{\circ}C$ )	-2.0	A
$I_{DM}$	Drain Current - Pulsed <sup>1</sup>	-12	A
$P_D$	Power Dissipation ( $T_c=25^{\circ}C$ )	1.56	W
	Power Dissipation - Derate above $25^{\circ}C$	0.012	W/ $^{\circ}C$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^{\circ}C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^{\circ}C$

## Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	80	$^{\circ}C/W$

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

### Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V , I <sub>D</sub> =-250uA	-20	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C , I <sub>D</sub> =-1mA	---	-0.01	---	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-20V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-16V , V <sub>GS</sub> =0V , T <sub>J</sub> =125°C	---	---	-10	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> = ±12V , V <sub>DS</sub> =0V	---	---	±10	uA

### On Characteristics

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-4.5V , I <sub>D</sub> =-3A	---	60	80	mΩ
		V <sub>GS</sub> =-2.5V , I <sub>D</sub> =-2A	---	80	120	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-0.3	-0.65	-1.1	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	3	---	mV/°C
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V , I <sub>S</sub> =-1A	---	2.2	---	S

### Dynamic and switching Characteristics

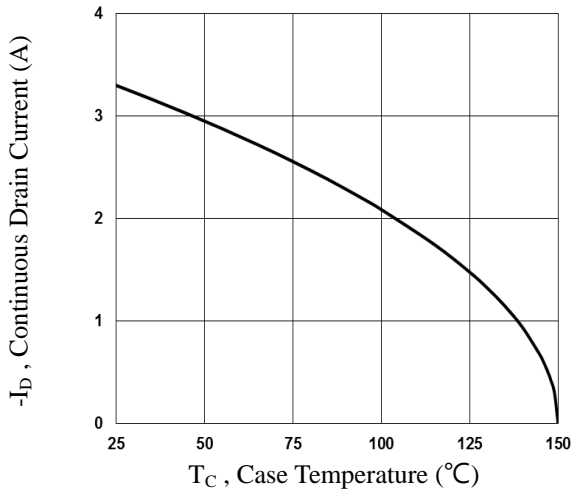
Q <sub>g</sub>	Total Gate Charge <sup>2, 3</sup>	V <sub>DS</sub> =-10V , V <sub>GS</sub> =-4.5V , I <sub>D</sub> =-3A	---	4.8	---	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>2, 3</sup>		---	0.5	---	
Q <sub>gd</sub>	Gate-Drain Charge <sup>2, 3</sup>		---	1.9	---	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>2, 3</sup>	V <sub>DD</sub> =-10V , V <sub>GS</sub> =-4.5V , R <sub>G</sub> =25Ω I <sub>D</sub> =-1A	---	3.5	---	nS
T <sub>r</sub>	Rise Time <sup>2, 3</sup>		---	12.6	---	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>2, 3</sup>		---	32.6	---	
T <sub>f</sub>	Fall Time <sup>2, 3</sup>		---	8.4	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-10V , V <sub>GS</sub> =0V , F=1MHz	---	550	---	pF
C <sub>oss</sub>	Output Capacitance		---	65	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	55	---	

### Drain-Source Diode Characteristics and Maximum Ratings

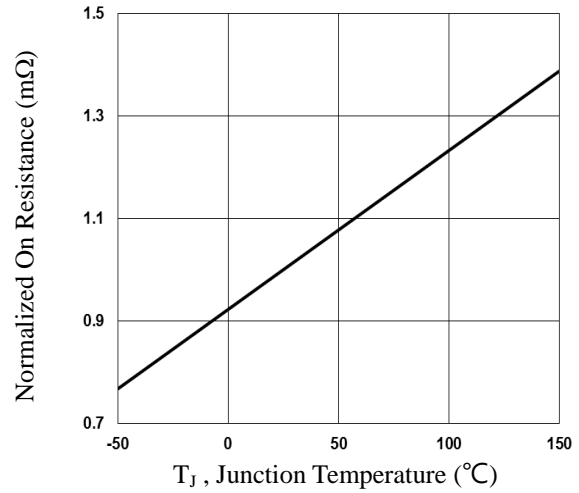
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V , Force Current	---	---	-3.0	A
I <sub>SM</sub>	Pulsed Source Current		---	---	-13	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V , I <sub>S</sub> =-1A , T <sub>J</sub> =25°C	---	---	-1.2	V

Note :

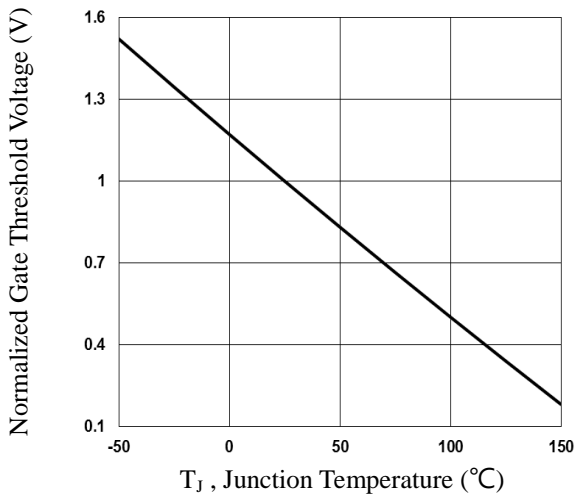
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
3. Essentially independent of operating temperature.



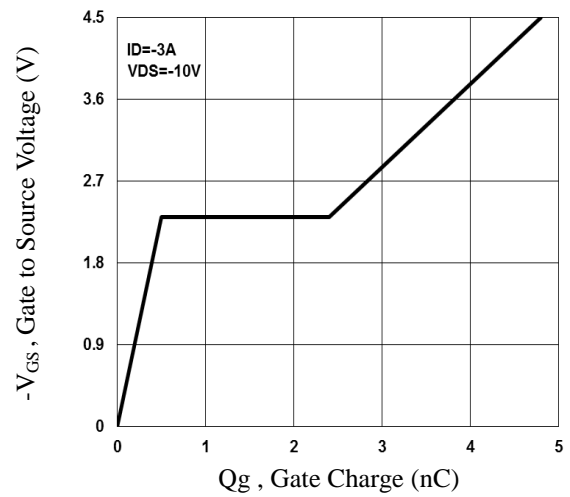
**Fig.1 Continuous Drain Current vs.  $T_c$**



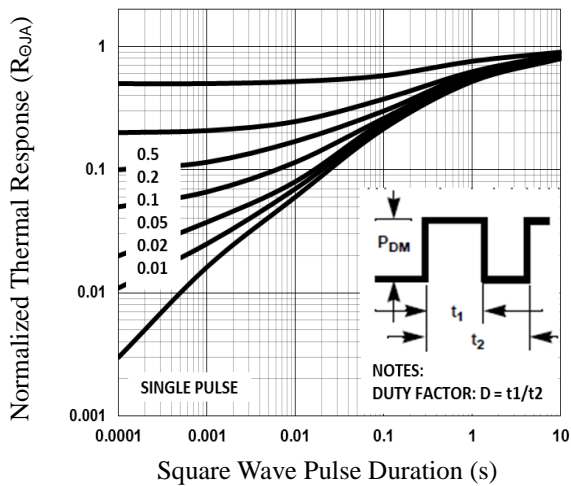
**Fig.2 Normalized RDSON vs.  $T_J$**



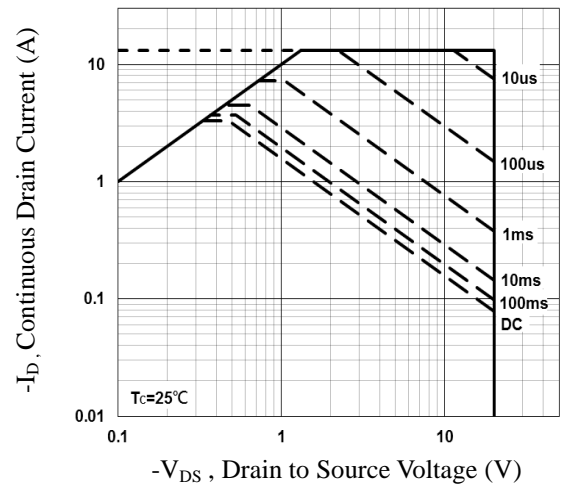
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



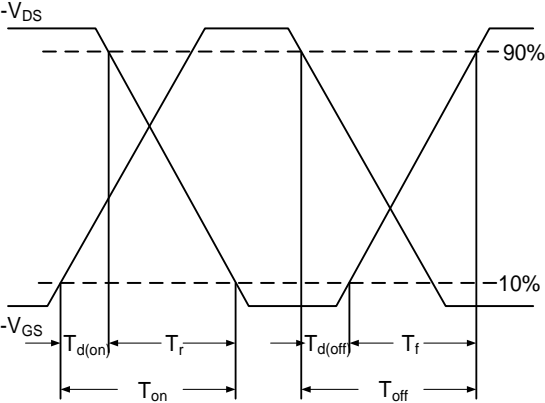
**Fig.4 Gate Charge Waveform**



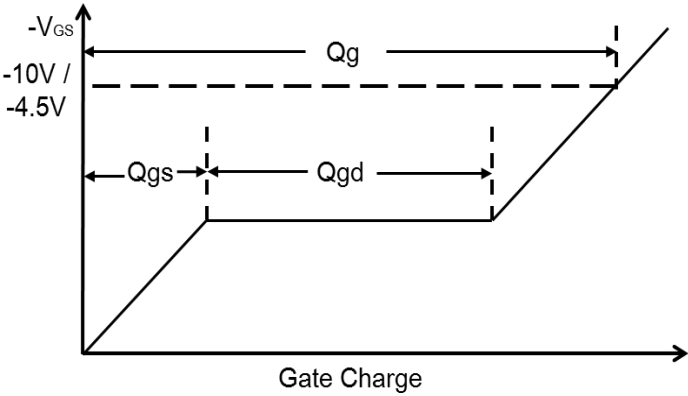
**Fig.5 Normalized Transient Response**



**Fig.6 Maximum Safe Operation Area**

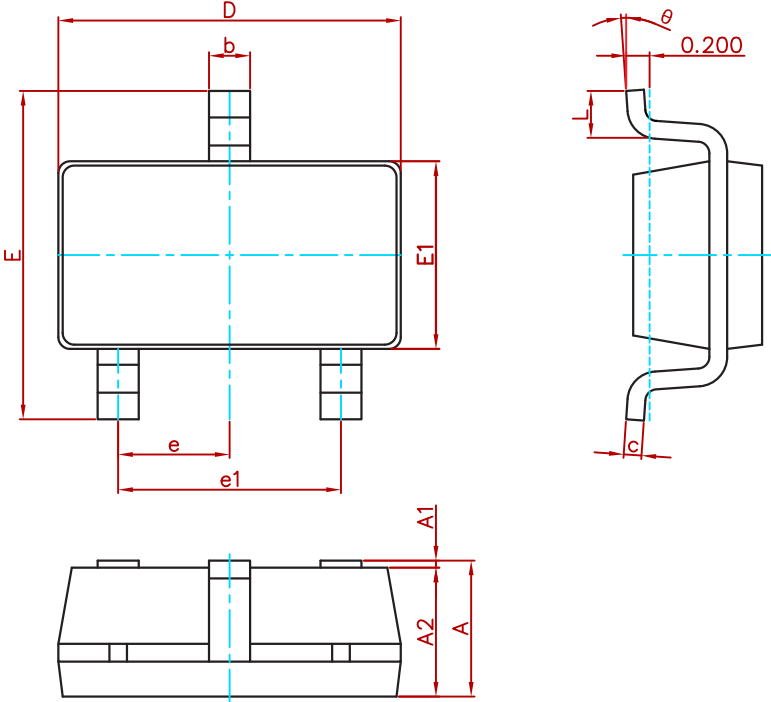


**Fig.7 Switching Time Waveform**



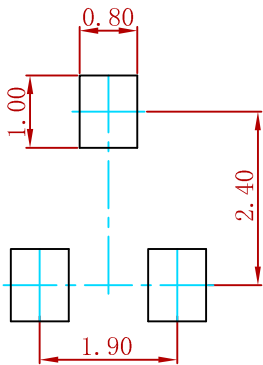
**Fig.8 Gate Charge Waveform**

PACKAGE MECHANICAL DATA



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Suuggested Pad Layout



Note:  
1.Controlling dimension:in millimeters.  
2.General tolerance:± 0.05mm.  
3.The pad layout is for reference purposes only.

REELSPECIFICATION

P/N	PKG	QTY
AO3413	SOT-23-3L	3000

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