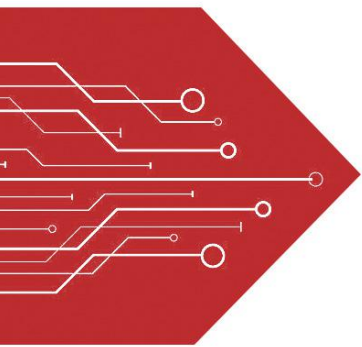


# MSKSEMI

SEMICONDUCTOR



ESD



TVS



TSS



MOV



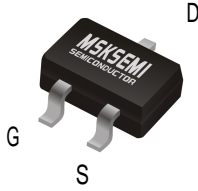
GDT



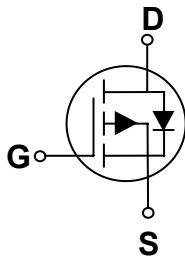
PLED

Product data sheet

[www.msksemi.com](http://www.msksemi.com)



SOT-23-3L



**Features**

- -20 V, -4.5A,  $R_{DS(ON)}=40m\Omega@V_{GS}=-4.5V$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available

**Applications**

- Notebook
- Load Switch
- Hand-Held Instruments

BVDSS	R <sub>DS(ON)</sub>	I <sub>D</sub>
-20V	40mΩ	-4.5A

**Absolute Maximum Ratings** T<sub>c</sub>=25°C unless otherwise noted

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	-20	V
V <sub>GS</sub>	Gate-Source Voltage	±12	V
I <sub>D</sub>	Drain Current – Continuous (T <sub>c</sub> =25°C)	-4.5	A
	Drain Current – Continuous (T <sub>c</sub> =100°C)	-2.7	A
I <sub>DM</sub>	Drain Current – Pulsed <sup>1</sup>	-18	A
P <sub>D</sub>	Power Dissipation (T <sub>c</sub> =25°C)	1.5	W
	Power Dissipation – Derate above 25°C	0.012	W/ °C
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction to ambient	---	80	°C/ W

**Off Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	$BV_{DSS}$ Temperature Coefficient	Reference to 25°C, $I_D=-1mA$	---	-0.02	---	V/°C
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-20V, V_{GS}=0V, T_J=25°C$	---	---	-1	$\mu A$
		$V_{DS}=-16V, V_{GS}=0V, T_J=125°C$	---	---	-10	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 12V, V_{DS}=0V$	---	---	$\pm 100$	nA

**On Characteristics**

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5V, I_D=-3A$	---	40	52	mΩ
		$V_{GS}=-2.5V, I_D=-2A$	---	47	65	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-0.3	-0.65	-1.0	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	2	---	mV/°C
$g_{fs}$	Forward Transconductance	$V_{DS}=-10V, I_S=-3A$	---	7	---	S

**Dynamic and switching Characteristics**

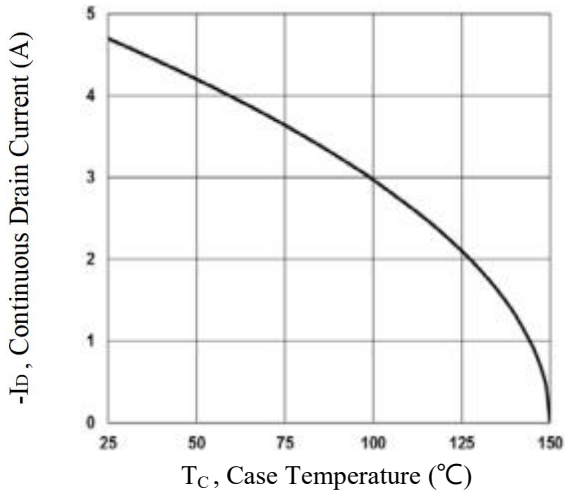
$Q_g$	Total Gate Charge <sup>2,3</sup>	$V_{DS}=-10V, V_{GS}=-4.5V, I_D=-3A$	---	9.6	---	nC
$Q_{gs}$	Gate-Source Charge <sup>2,3</sup>		---	1.6	---	
$Q_{gd}$	Gate-Drain Charge <sup>2,3</sup>		---	2	---	
$T_{d(on)}$	Turn-On Delay Time <sup>2,3</sup>	$V_{DD}=-10V, V_{GS}=-4.5V, R_G=25\Omega$ $I_D=-1A$	---	6	---	nS
$T_r$	Rise Time <sup>2,3</sup>		---	21.6	---	
$T_{d(off)}$	Turn-Off Delay Time <sup>2,3</sup>		---	51	---	
$T_f$	Fall Time <sup>2,3</sup>		---	13.8	---	
$C_{iss}$	Input Capacitance	$V_{DS}=-10V, V_{GS}=0V, F=1MHz$	---	850	---	pF
$C_{oss}$	Output Capacitance		---	70	---	
$C_{rss}$	Reverse Transfer Capacitance		---	55	---	

**Drain Source Diode Characteristics and Maximum Ratings**

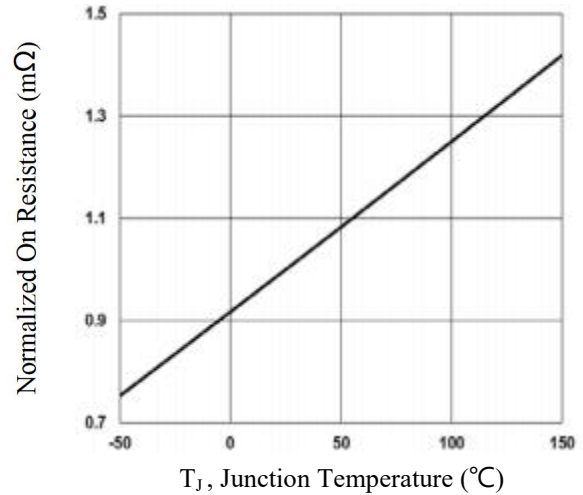
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current	$V_G=V_D=0V, \text{Force Current}$	---	---	-4.5	A
$I_{SM}$	Pulsed Source Current		---	---	-9.0	A
$V_{SD}$	Diode Forward Voltage	$V_{GS}=0V, I_S=-1A, T_J=25°C$	---	---	-1.2	V

Note :

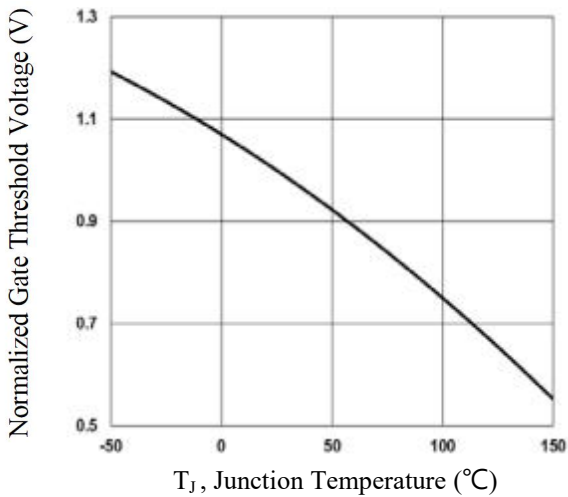
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
3. Essentially independent of operating temperature.



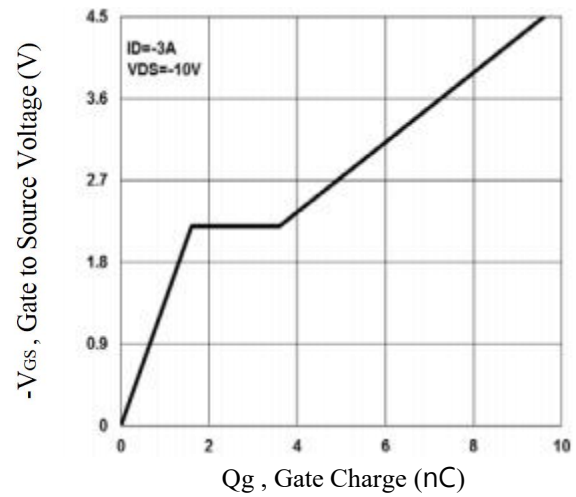
**Fig. 1 Continuous Drain Current vs.  $T_c$**



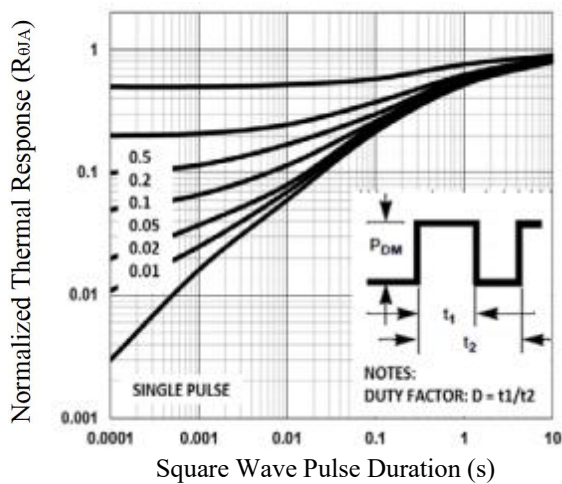
**Fig. 2 Normalized  $R_{DS(on)}$  vs.  $T_j$**



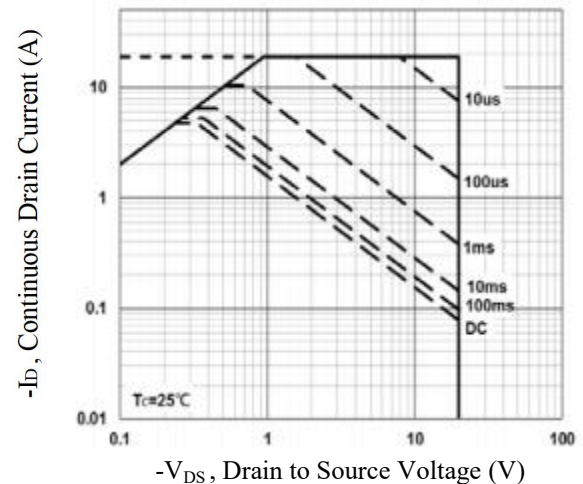
**Fig. 3 Normalized  $V_{th}$  vs.  $T_j$**



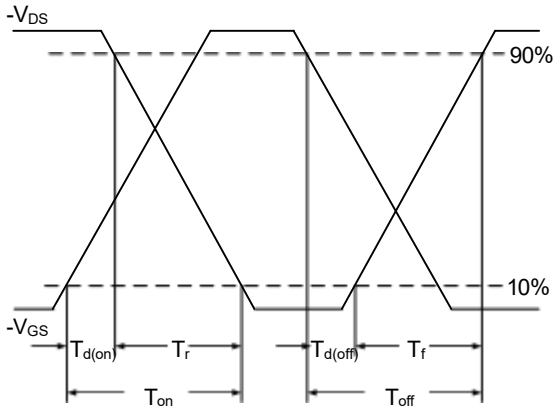
**Fig. 4 Gate Charge Waveform**



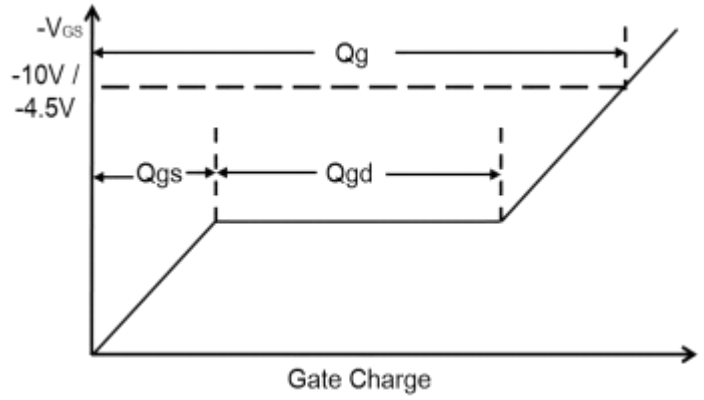
**Fig. 5 Normalized Transient Impedance**



**Fig. 6 Maximum Safe Operation Area**

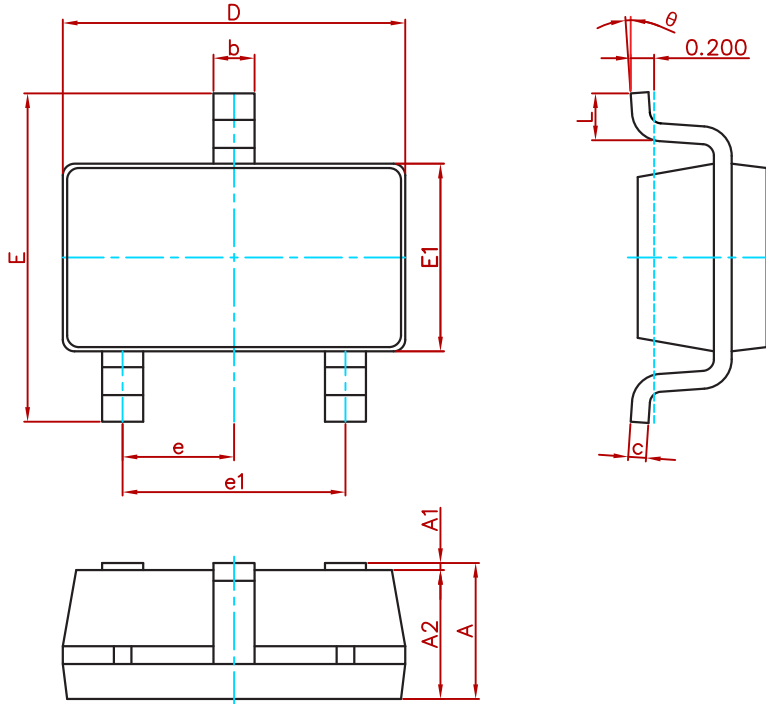


**Fig. 7 Switching Time Waveform**



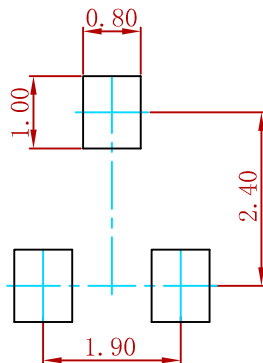
**Fig. 8 Gate Charge Waveform**

**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°

**Suggested Pad Layout**



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

**REEL SPECIFICATION**

P/N	PKG	QTY
AO3415A	SOT-23-3L	3000

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