

# MSKSEMI 美森科

SEMICONDUCTOR



ESD



TVS



TSS



MOV



GDT



PLED

## SI2309CDS-T1-GE3-MS

Product specification

## Features

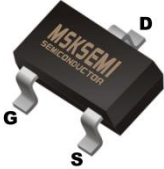
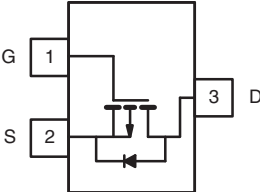

- -60V,-1.8A,  $R_{DS(ON)} = 200m\Omega @ V_{GS} = -10V$
- Improved dv/dt capability
- Fast switching
- Green Device Available

## Applications

- Motor Drive
- Power Tools
- LED Lighting

BVDSS	RDSON	ID
-60V	200mΩ	-1.8A

## Reference News

PACKAGE OUTLINE	PIN Configuration	Marking
 <p>SOT-23</p>		

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

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current – Continuous ( $T_A=25^\circ\text{C}$ )	-1.8	A
	Drain Current – Continuous ( $T_A=70^\circ\text{C}$ )	-1.5	A
$I_{DM}$	Drain Current – Pulsed <sup>1</sup>	-8	A
$P_D$	Power Dissipation ( $T_A=25^\circ\text{C}$ )	1.56	W
	Power Dissipation – Derate above $25^\circ\text{C}$	0.012	W/ $^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

## Thermal Characteristics

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

## 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	-60	---	---	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C , I <sub>D</sub> =-1mA	---	-0.05	---	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-60V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-48V , 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> = ±20V , V <sub>DS</sub> =0V	---	---	±100	nA

### On Characteristics

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V , I <sub>D</sub> =-1.8A	---	200	300	mΩ
		V <sub>GS</sub> =-4.5V , I <sub>D</sub> =-1.5A	---	300	400	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-1.0	-1.7	-2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	5	---	mV/°C
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V , I <sub>D</sub> =-2A	---	3.5	---	S

### Dynamic and switching Characteristics

Q <sub>g</sub>	Total Gate Charge <sup>2, 3</sup>	V <sub>DS</sub> =-30V , V <sub>GS</sub> =-10V , I <sub>D</sub> =-2A	---	8.2	---	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>2, 3</sup>		---	1.8	---	
Q <sub>gd</sub>	Gate-Drain Charge <sup>2, 3</sup>		---	1.5	---	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>2, 3</sup>	V <sub>DD</sub> =-30V , V <sub>GS</sub> =-10V , R <sub>G</sub> =6Ω I <sub>D</sub> =-1A	---	5.2	---	ns
T <sub>r</sub>	Rise Time <sup>2, 3</sup>		---	19	---	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>2, 3</sup>		---	35	---	
T <sub>f</sub>	Fall Time <sup>2, 3</sup>		---	10.6	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-30V , V <sub>GS</sub> =0V , F=1MHz	---	425	---	pF
C <sub>oss</sub>	Output Capacitance		---	35	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	20	---	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	---	17	---	Ω

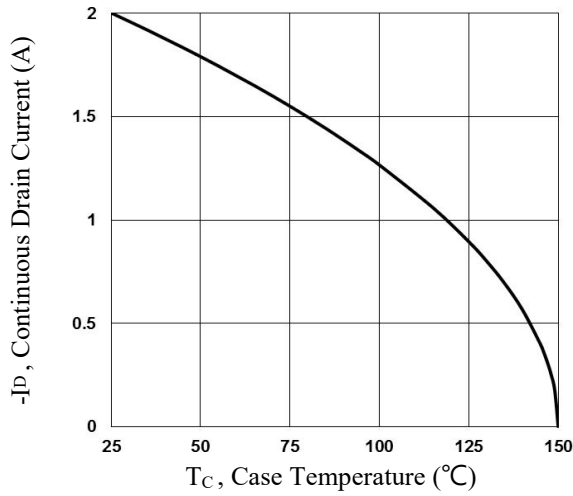
### Drain-Source Diode Characteristics and Maximum Ratings

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	---	---	-1.8	A
I <sub>SM</sub>	Pulsed Source Current		---	---	-3.6	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

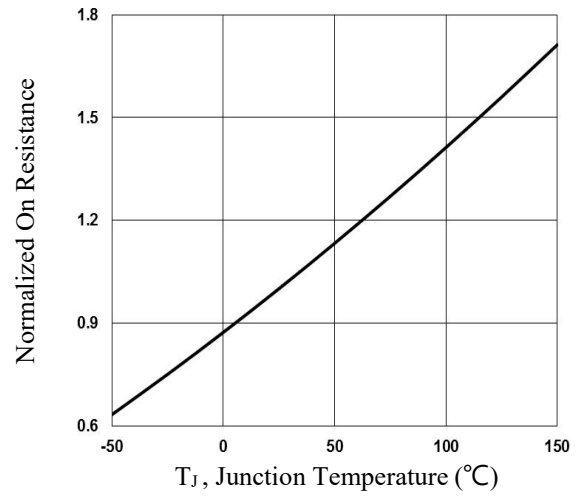
#### Note :

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.

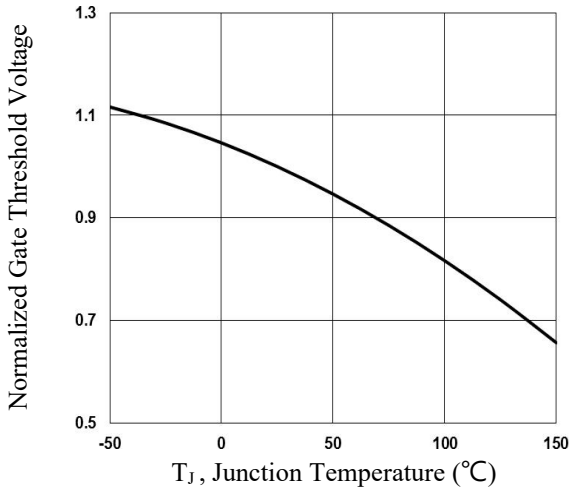
Electrical Characteristics ( $T_c=25^\circ\text{C}$  unless otherwise noted)



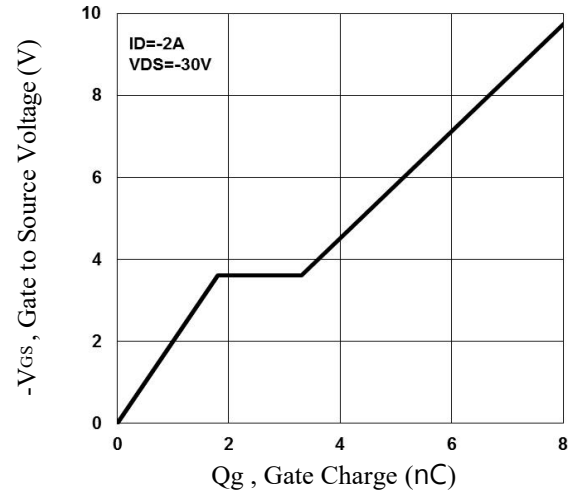
**Fig.1 Continuous Drain Current vs.  $T_c$**



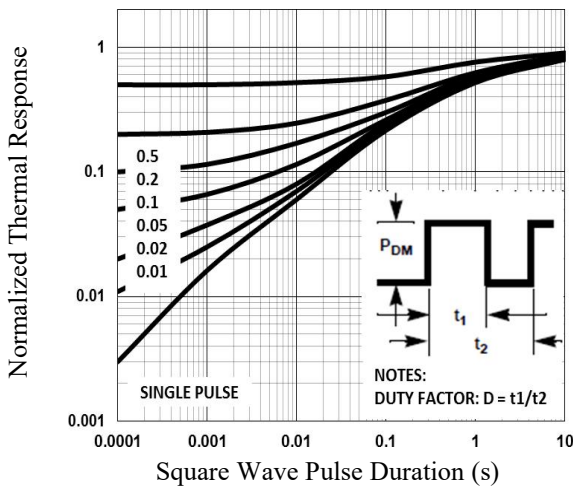
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$**



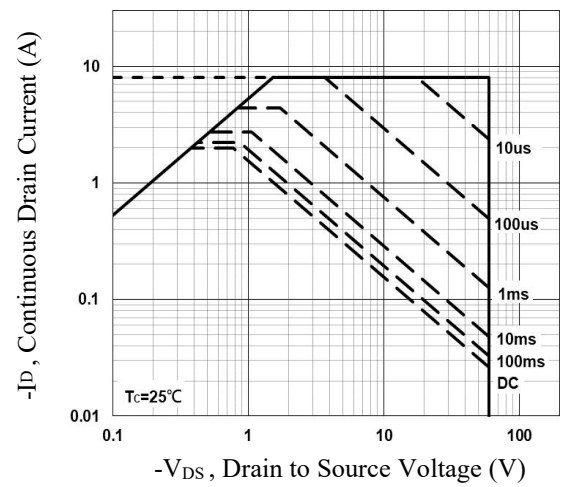
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



**Fig.4 Gate Charge Waveform**

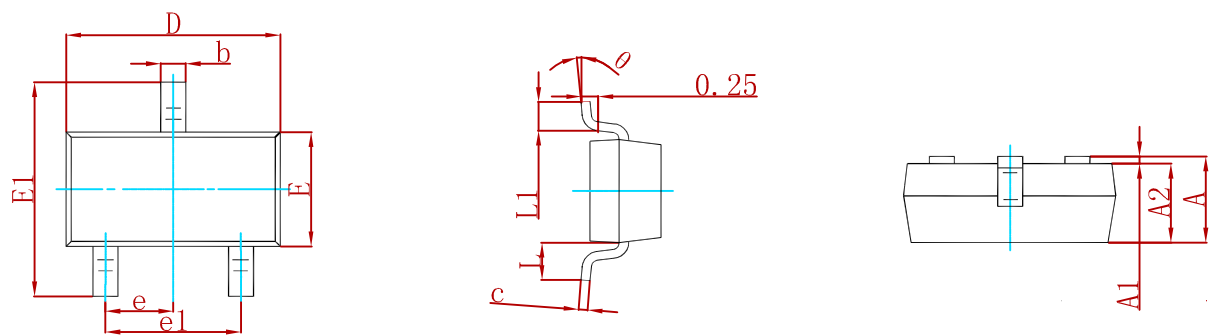


**Fig.5 Normalized Transient Impedance**



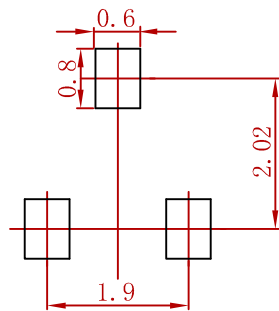
**Fig.6 Maximum Safe Operation Area**

**PACKAGE MECHANICAL DATA**



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°

**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
SI2309CDS-T1-GE3-MS	SOT-23	3000

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