

# MSKSEMI

SEMICONDUCTOR



ESD



TVS



TSS



MOV

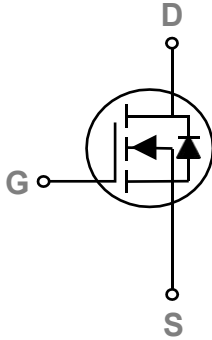
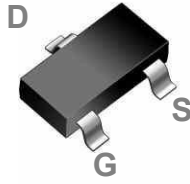


GDT



PLED

Product data sheet



BVDSS	RDSON	ID
60V	1.7Ω	200mA

**Features**

- 60V, 200mA,  $R_{DS(ON)} = 1.7\Omega @ V_{GS} = 10V$
- Fast switching
- Green Device Available

**Applications**

- Notebook
- Smartphone
- Battery Protection
- Hand-held Instruments

**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 ( $T_A=25^\circ\text{C}$ )	200	mA
	Drain Current – Continuous ( $T_A=70^\circ\text{C}$ )	160	mA
$I_{DM}$	Drain Current – Pulsed <sup>1</sup>	800	mA
$P_D$	Power Dissipation ( $T_A=25^\circ\text{C}$ )	156	mW
	Power Dissipation – Derate above $25^\circ\text{C}$	1.25	mW/ $^\circ\text{C}$
$T_{STG}$	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	---	800	$^\circ\text{C}/\text{W}$

**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
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =60V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C	---	---	10	nA
		V <sub>DS</sub> =48V , V <sub>GS</sub> =0V , T <sub>J</sub> =125°C	---	---	100	nA
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> =0.15A	---	1.6	3	Ω
		V <sub>GS</sub> =4.5V , I <sub>D</sub> =0.1A	---	1.7	4	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.0	2	3.0	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V , I <sub>D</sub> =0.1A	---	0.3	---	S

**Dynamic and switching Characteristics**

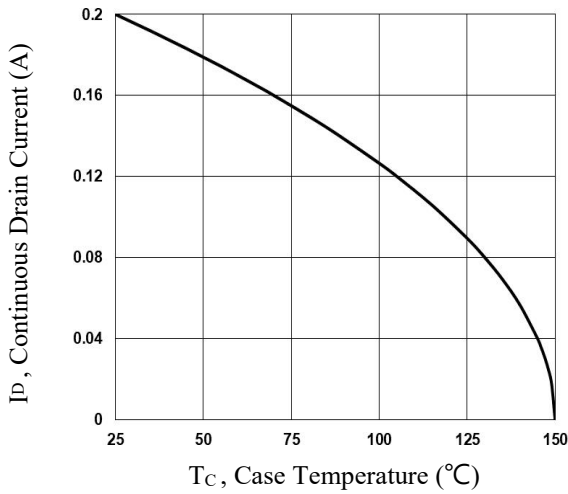
Q <sub>g</sub>	Total Gate Charge <sup>2, 3</sup>	V <sub>DS</sub> =30V , V <sub>GS</sub> =10V , I <sub>D</sub> =0.1A	---	2	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>2, 3</sup>		---	0.9	
Q <sub>gd</sub>	Gate-Drain Charge <sup>2, 3</sup>		---	0.4	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>2, 3</sup>	V <sub>DD</sub> =30V , V <sub>GS</sub> =10V , R <sub>G</sub> =6Ω I <sub>D</sub> =0.1A	---	3	ns
T <sub>r</sub>	Rise Time <sup>2, 3</sup>		---	5	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>2, 3</sup>		---	14	
T <sub>f</sub>	Fall Time <sup>2, 3</sup>		---	9	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =30V , V <sub>GS</sub> =0V , F=1MHz	---	25	pF
C <sub>oss</sub>	Output Capacitance		---	15	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	6.8	

**Drain-Source Diode Characteristics and Maximum Ratings**

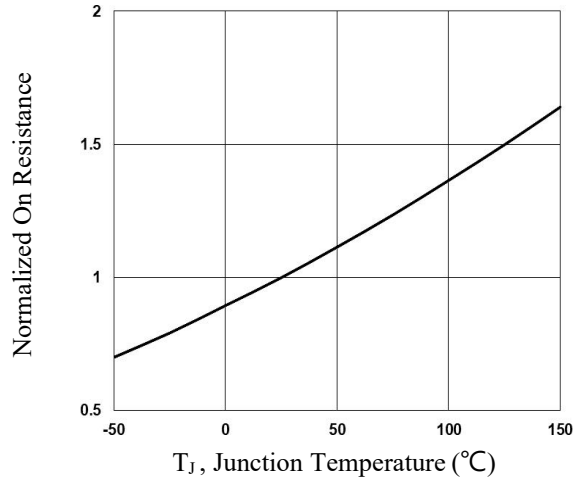
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V , Force Current	---	---	200	mA
I <sub>SM</sub>	Pulsed Source Current		---	---	400	mA
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V , I <sub>S</sub> =0.1A , T <sub>J</sub> =25°C	---	---	1	V
T <sub>rr</sub>	Reverse Recovery Time	V <sub>R</sub> =50V , I <sub>S</sub> =0.1A ,		18		ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI/dt=100A/μs , T <sub>J</sub> =25°C		6		nC

Note :

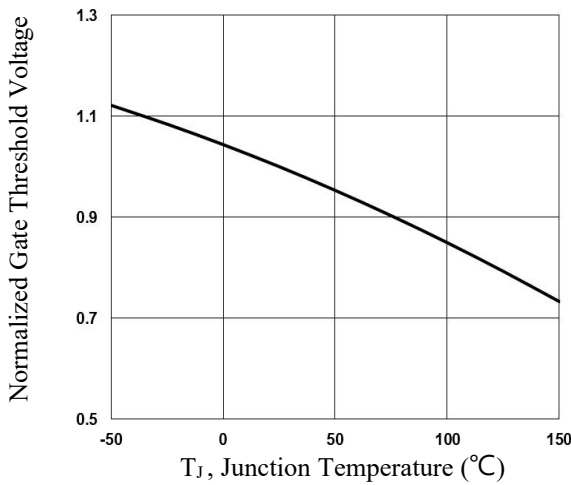
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
3. Essentially independent of operating temperature.



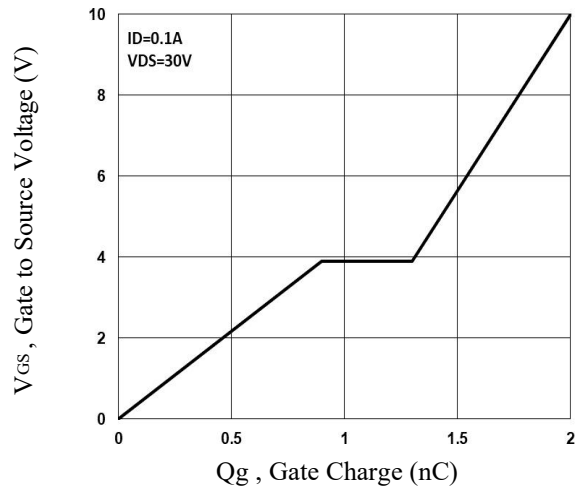
**Fig.1 Continuous Drain Current vs.  $T_C$**



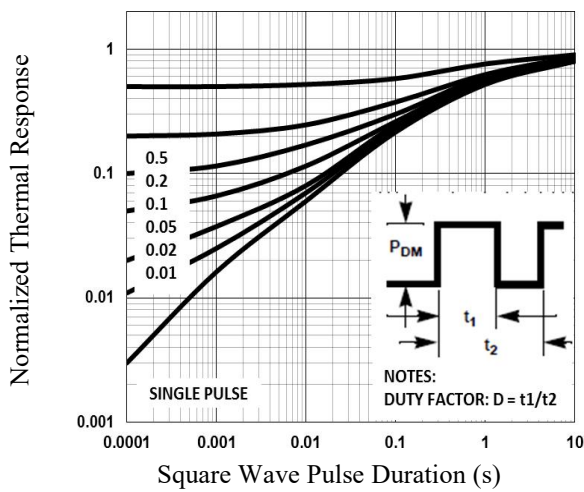
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$**



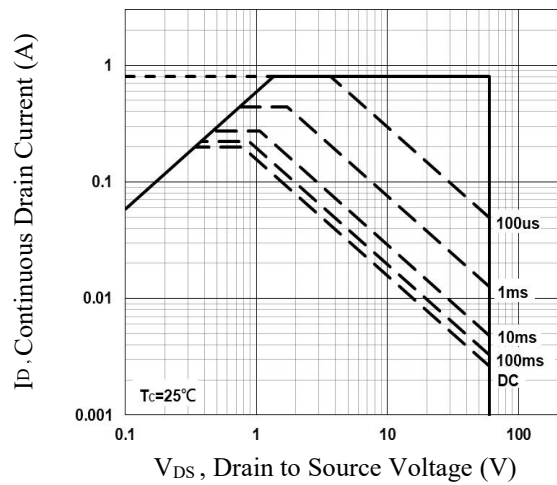
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



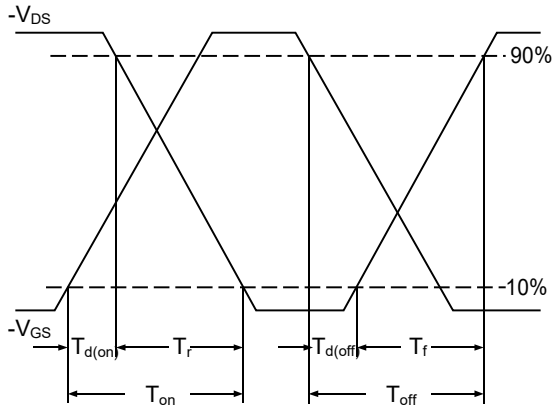
**Fig.4 Gate Charge Waveform**



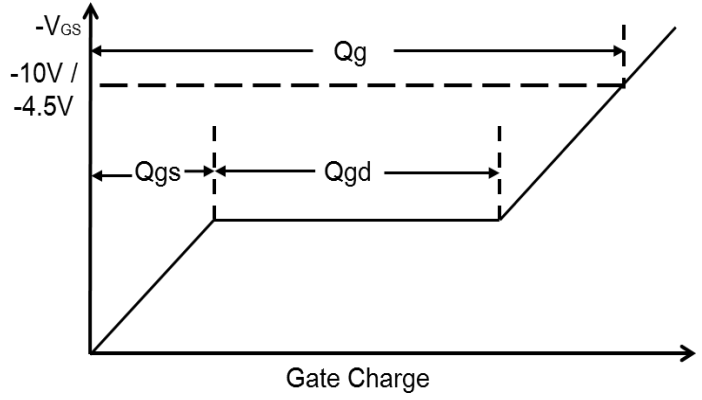
**Fig.5 Normalized Transient Response**



**Fig.6 Maximum Safe Operation Area**

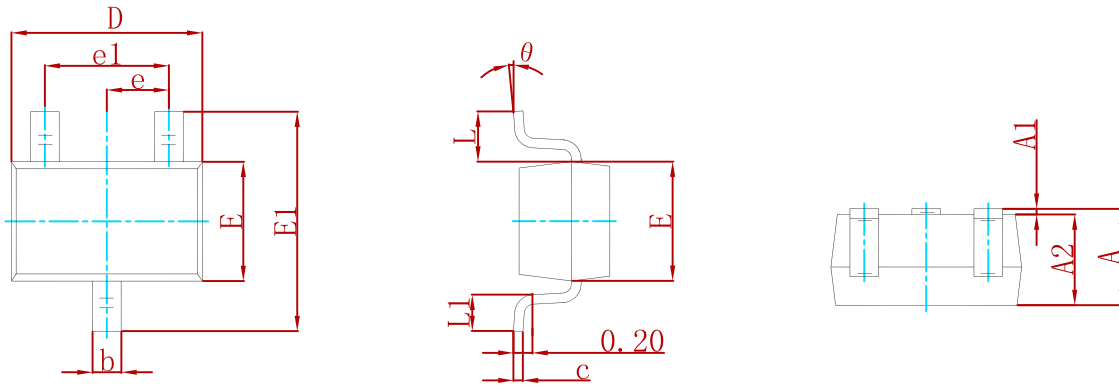


**Fig.7 Switching Time Waveform**



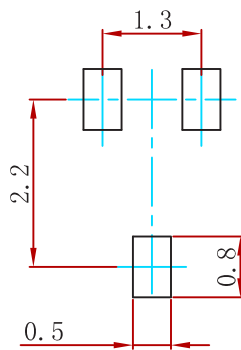
**Fig.8 Gate Charge Waveform**

**PACKAGE MECHANICAL DATA**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.200	0.400	0.008	0.016
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 TYP		0.026 TYP	
e1	1.200	1.400	0.047	0.055
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
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
2N7002W	SOT-323	3000

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