

MSKSEMI 美森科

SEMICONDUCTOR



ESD



TVS



TSS



MOV



GDT



PLED

2N7002BK-MS

Product specification

Features

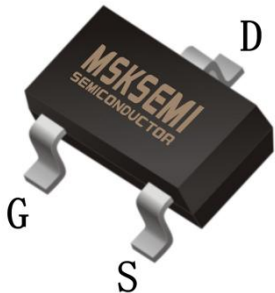
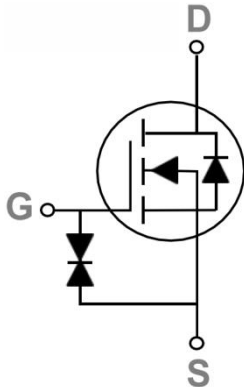
- 60V, 0.3A, $R_{DS(ON)} = 2.2\Omega @ V_{GS}=10V$
- Improved dv/dt capability
- Fast switching
- Green Device Available
- G-S ESD Protection Diode Embedded
- ESD protected up to 2KV

Application

- Motor Drive
- Power Tools
- LED Lighting

BVDSS	RDSON	ID
60V	2.2Ω	0.3A

Reference News

PACKAGE OUTLINE	Pin Configuration	Marking
 SOT-23		

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain- Source Voltage	60	V
V_{GS}	Gate- Source Voltage	±20	V
I_D	Drain Current – Continuous ($T_C=25^\circ C$)	0.3	A
	Drain Current – Continuous ($T_C=100^\circ C$)	0.1	A
I_{DM}	Drain Current – Pulsed ¹	0.8	A
P_D	Power Dissipation ($T_C=25^\circ C$)	0.35	W
	Power Dissipation – Derate above 25°C	0.003	W/°C
T_{STG}	Storage Temperature Range	-50 to 150	°C
T_J	Operating Junction Temperature Range	-50 to 150	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	357	°C/W

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

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain- Source Breakdown Voltage	$V_{GS}=0V$, $I_D=250\mu A$	60	---	---	V
I_{DSS}	Drain- Source Leakage Current	$V_{DS}=60V$, $V_{GS}=0V$, $T_J=25^{\circ}\text{C}$	---	---	1	μA
		$V_{DS}=48V$, $V_{GS}=0V$, $T_J=125^{\circ}\text{C}$	---	---	10	μA
I_{GSS}	Gate- Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 10	μA

On Characteristics

$R_{DS(ON)}$	Static Drain- Source On- Resistance	$V_{GS}=10V$, $I_D=0.3A$	---	2.2	2.8	Ω
		$V_{GS}=4.5V$, $I_D=0.2A$	---	2.4	3.0	Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1	1.6	2.5	V
g_{fs}	Forward Transconductance	$V_{DS}=10V$, $I_D=0.3A$	---	0.5	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{2, 3}	$V_{DS}=30V$, $V_{GS}=10V$, $I_D=1A$	---	3.7	5.6	nC
Q_{gs}	Gate-Source Charge ^{2, 3}		---	0.9	1.4	
Q_{gd}	Gate-Drain Charge ^{2, 3}		---	0.4	0.6	
$T_{d(on)}$	Turn-On Delay Time ^{2, 3}	$V_{DD}=30V$, $V_{GS}=10V$, $R_G=6\Omega$ $I_D=0.2A$	---	3	6	ns
T_r	Rise Time ^{2, 3}		---	5	10	
$T_{d(off)}$	Turn-Off Delay Time ^{2, 3}		---	14	27	
T_f	Fall Time ^{2, 3}		---	9	17	
C_{iss}	Input Capacitance	$V_{DS}=30V$, $V_{GS}=0V$, $F=1\text{MHz}$	---	25.5	38	pF
C_{oss}	Output Capacitance		---	17	26	
C_{rss}	Reverse Transfer Capacitance		---	7.8	12	

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	$V_G=V_D=0V$, Force Current	---	---	0.3	A
I_{SM}	Pulsed Source Current		---	---	1.2	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V$, $I_S=1A$, $T_J=25^{\circ}\text{C}$	---	---	1	V
t_{rr}	Reverse Recovery Time	$V_{GS}=50V$, $I_S=1A$, $dI/dt=100A/\mu s$ $T_J=25^{\circ}\text{C}$	---	3.4	---	ns
Q_{rr}	Reverse Recovery Charge		---	0.7	---	nC

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.

ELECTRICAL CHARACTERISTICS CURVE

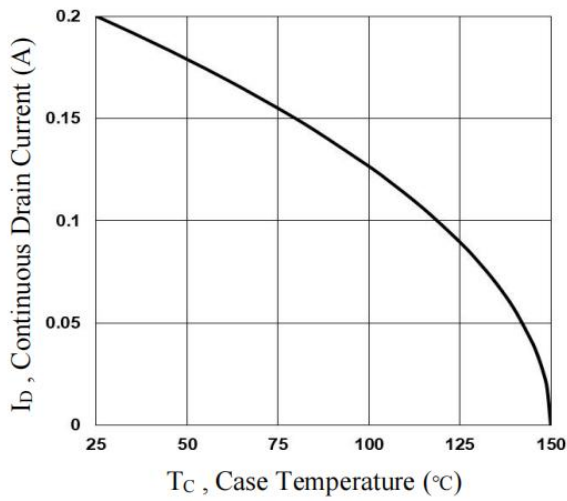


Fig.1 Continuous Drain Current vs. T_C

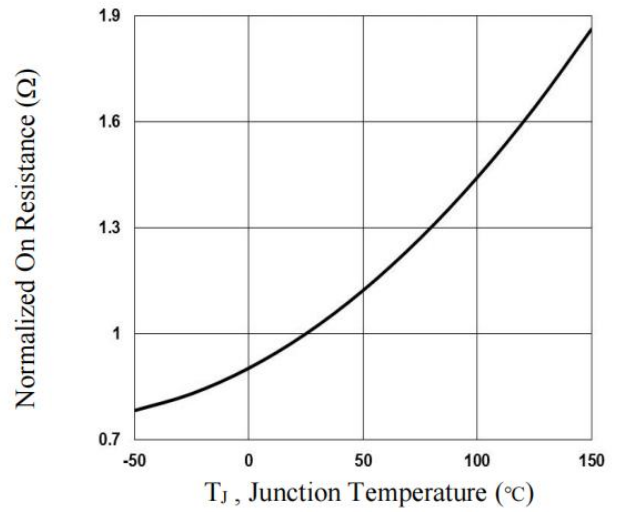


Fig.2 Normalized $R_{DS(on)}$ vs. T_J

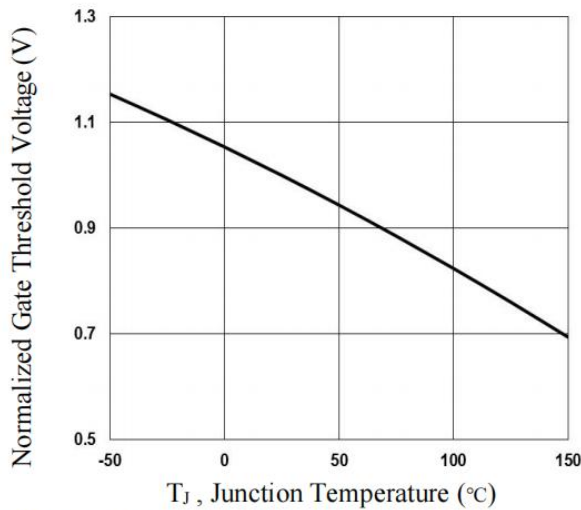


Fig.3 Normalized V_{th} vs. T_J

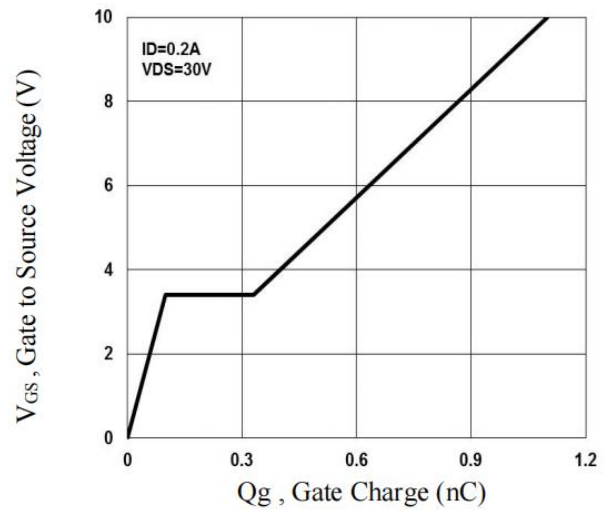


Fig.4 Gate Charge Waveform

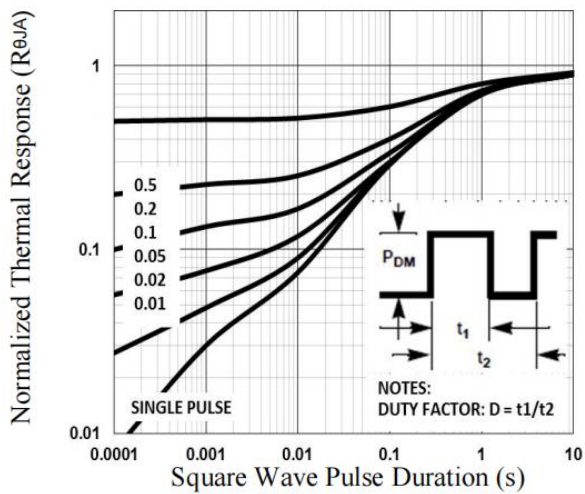


Fig.5 Normalized Transient Impedance

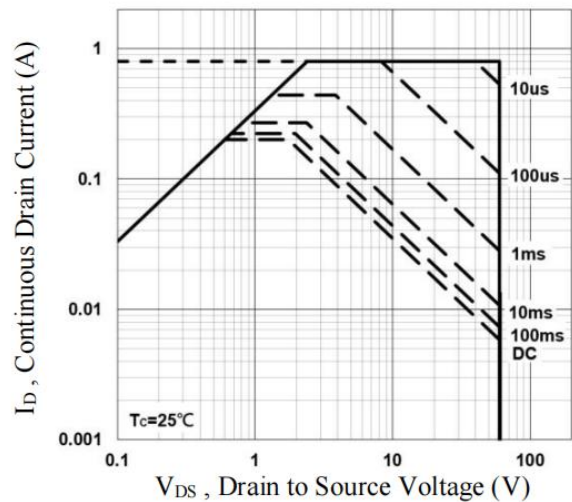
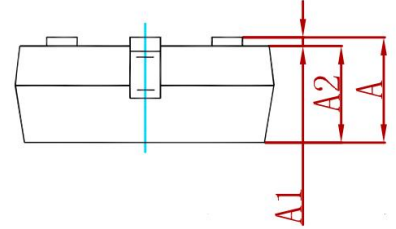
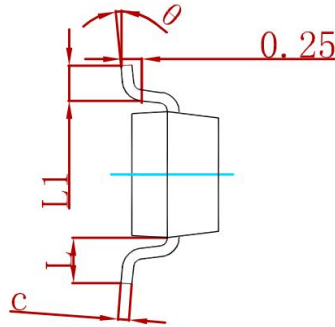
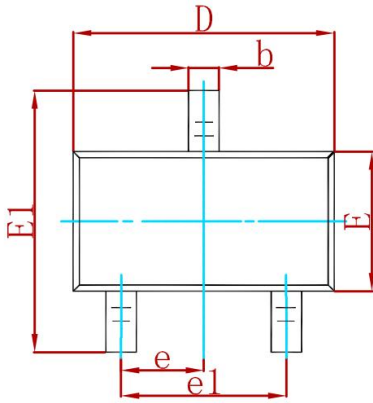


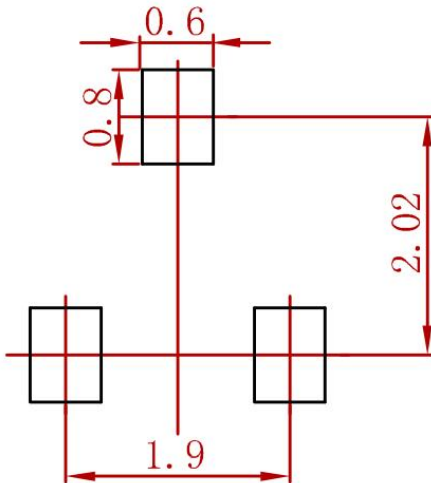
Fig.6 Maximum Safe Operation Area

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: ± 0.05 mm.
3. The pad layout is for reference purposes only.

REEL SPECIFICATION

P/N	PKG	QTY
2N7002BK-MS	SOT-23	3000

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