

# MSKSEMI 美森科

SEMICONDUCTOR



ESD



TVS



TSS



MOV



GDT



PLED

## **FDN338P**

**Product specification**

## Description

These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

BVDSS	RDSON	ID
-20V	85mΩ	-2.0A

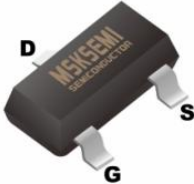
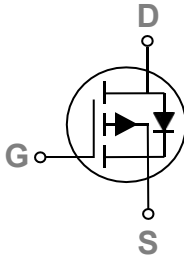

## Features

- -20V, -2.0A,  $R_{DS(ON)} = 85\text{m}\Omega @ V_{GS} = -4.5\text{V}$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available

## Applications

- Notebook
- Load Switch
- Hand-Held Instruments

## Reference News

PACKAGE OUTLINE	P-Channel MOSFET	Marking
 <p>SOT-23</p>		

## Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ 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 ( $T_C = 25^\circ\text{C}$ )	-2.0	A
	Drain Current – Continuous ( $T_C = 100^\circ\text{C}$ )	-1.6	A
$I_{DM}$	Drain Current – Pulsed <sup>1</sup>	-5.0	A
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	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	$^\circ\text{C}/\text{W}$

**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	-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	---	---	±100	nA

**On Characteristics**

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-4.5V , I <sub>D</sub> =-2.0A	---	85	110	mΩ
		V <sub>GS</sub> =-2.5V , I <sub>D</sub> =-1A	---	110	150	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-0.3	-0.8	-1.3	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	3	---	mV/°C

**Dynamic and switching Characteristics**

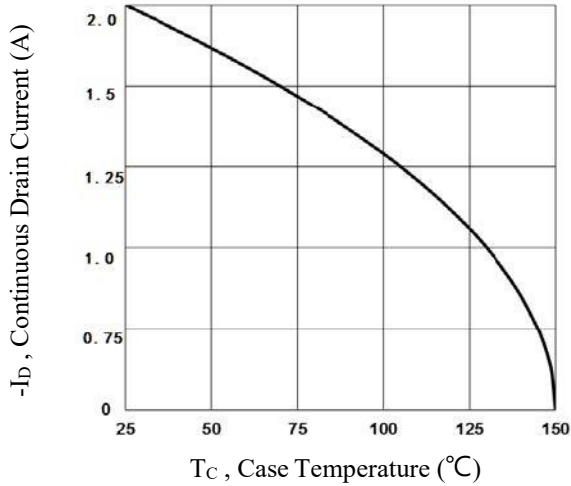
Q <sub>g</sub>	Total Gate Charge <sup>2 , 3</sup>	V <sub>DS</sub> =-10V , V <sub>GS</sub> =-4.5V , I <sub>D</sub> =-1A	---	3.0	---	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>2 , 3</sup>		---	0.5	---	
Q <sub>gd</sub>	Gate-Drain Charge <sup>2 , 3</sup>		---	0.8	---	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>2 , 3</sup>	V <sub>DD</sub> =-10V , V <sub>GS</sub> =-4.5V , R <sub>G</sub> =3Ω I <sub>D</sub> =-1A	---	10	---	nS
T <sub>r</sub>	Rise Time <sup>2 , 3</sup>		---	5.5	---	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>2 , 3</sup>		---	20	---	
T <sub>f</sub>	Fall Time <sup>2 , 3</sup>		---	6.5	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-10V , V <sub>GS</sub> =0V , F= 1MHz	---	180	---	pF
C <sub>oss</sub>	Output Capacitance		---	35	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	25	---	

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

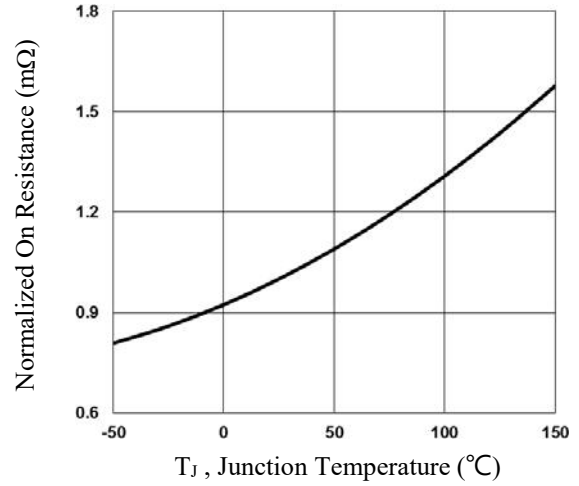
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V , Force Current	---	---	-2.0	A
I <sub>SM</sub>	Pulsed Source Current		---	---	-4.0	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V , I <sub>S</sub> =-1A , T <sub>J</sub> =25°C	---	---	-1.2	V

**Note :**

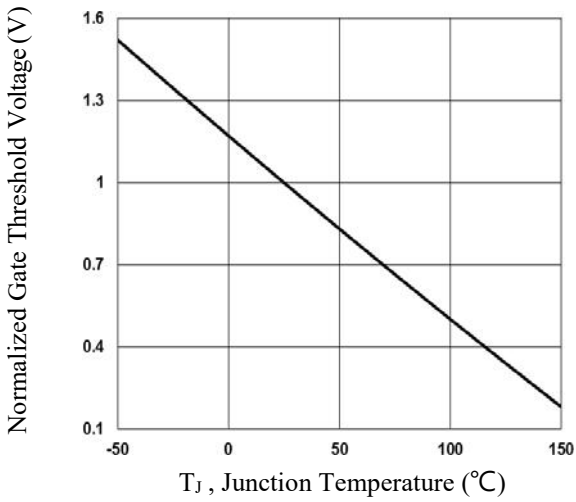
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
3. Essentially independent of operating temperature.



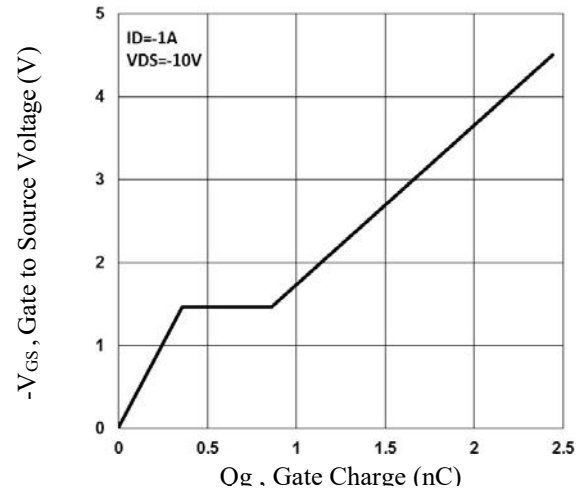
**Fig.1 Continuous Drain Current vs.  $T_c$**



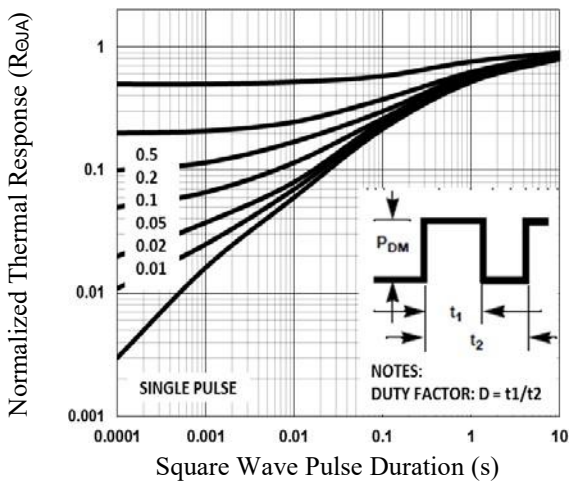
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_j$**



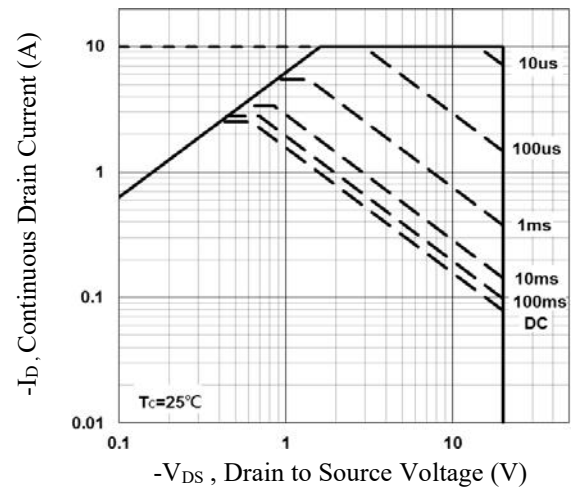
**Fig.3 Normalized  $V_{th}$  vs.  $T_j$**



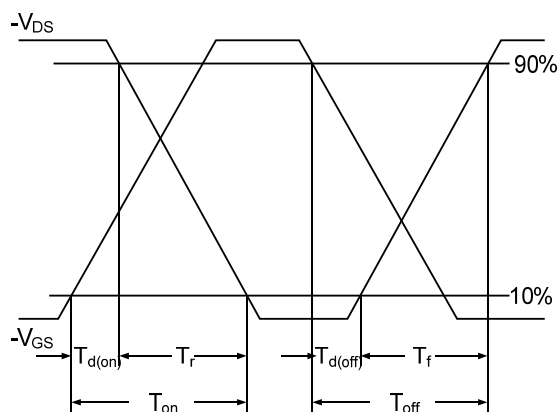
**Fig.4 Gate Charge Waveform**



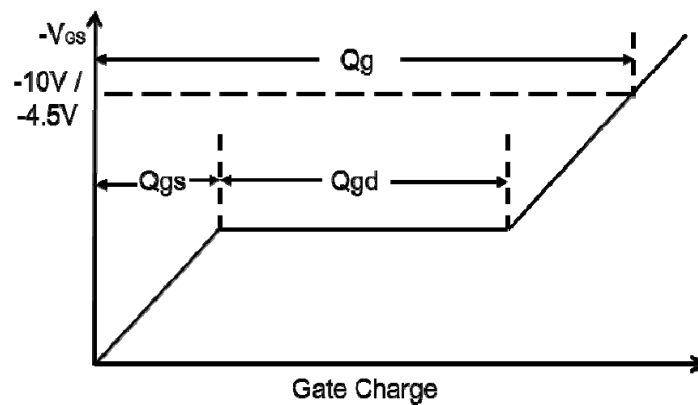
**Fig.5 Normalized Transient Impedance**



**Fig.6 Maximum Safe Operation Area**

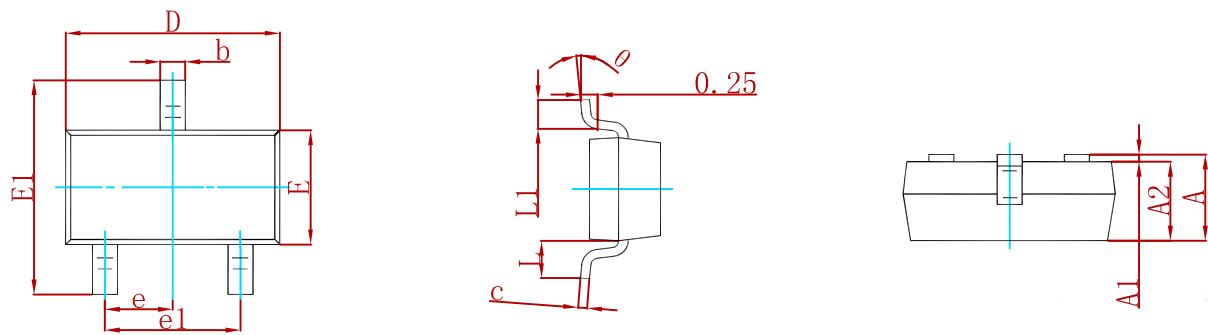


**Fig.7 Switching Time Waveform**



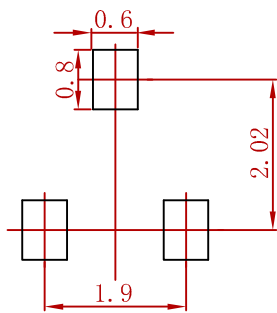
**Fig.8 Gate Charge Waveform**

PACKAGE MECHANICAL DATA



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	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.

REELSPECIFICATION

P/N	PKG	QTY
FDN338P	SOT-23	3000

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