

## MS23P19Z

### P-Channel 20V MOSFETs

#### 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.

#### Features

- -20V, -250mA,  $R_{DS(ON)} = 650m\Omega @ V_{GS} = -4.5V$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available
- Suit for -1.5V Gate Drive Applications
- RoHS compliant package

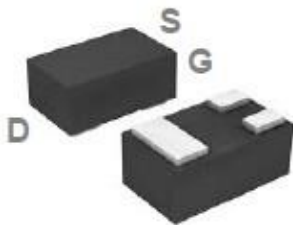
#### Application

- Notebook
- Load Switch
- Battery Protection
- Hand-held Instruments

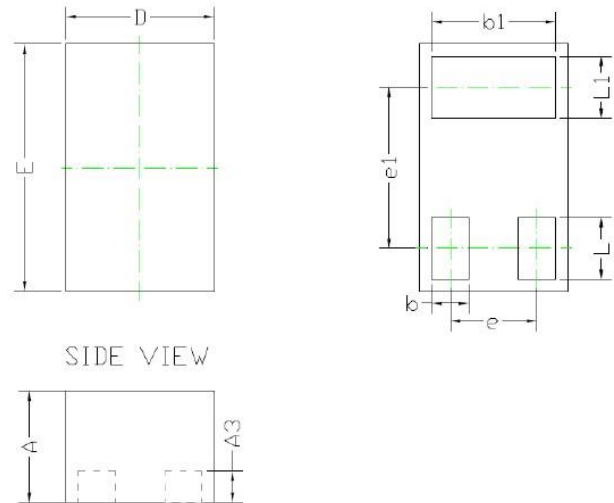
**Package type :** SOT-883

#### Packing & Order Information

3,000/Reel

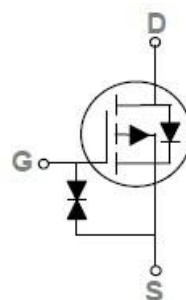


**RoHS  
COMPLIANT**



SYMBOL	COMMON		
	DIMENSIONS MILLIMETER		
	MIN	NOM.	MAX
A	0.40	0.45	0.50
A3	0.127 BSC		
D	0.55	0.60	0.65
E	0.95	1.00	1.05
e	0.35 BSC		
e1	0.65 BSC		
b	0.13	0.15	0.18
b1	0.45	0.50	0.55
L	0.20	0.25	0.30
L1	0.20	0.25	0.30

#### Graphic symbol



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#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-Source Voltage	-20	V
V <sub>GS</sub>	Gate-Source Voltage	±8	V
I <sub>D</sub>	Drain Current -Continuous (TC=25°C)	-250	mA
	Drain Current -Continuous (TC=100°C)	-160	mA
I <sub>DM</sub>	Drain Current Pulsed <sup>1</sup>	-1.0	A
P <sub>D</sub>	Power Dissipation (TC=25°C)	155	mW
	Power Dissipation - Derate above 25°C	1.25	mW/°C
T <sub>J</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>STG</sub>	Operating Junction Temperature Range	-55 to 150	°C

##### Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
R <sub>θJA</sub>	Thermal Resistance Junction to ambient		800	°C/W

##### Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)

##### On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
V <sub>GS</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	-0.3	-0.7	-1.0	V
	V <sub>GS(th)</sub> Temperature Coefficient			3		mV/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -0.2 A		500	650	mΩ
		V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -0.15 A		700	900	
		V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -0.1 A		1100	1400	
		V <sub>GS</sub> = -1.5 V, I <sub>D</sub> = -0.1 A		1700	2300	

##### Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250μA	-20	--	--	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	I <sub>D</sub> = -1mA, Referenced to 25°C	--	-0.01	--	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C	--	--	-1 -10	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> = ±8 V, V <sub>DS</sub> = 0 V	--	--	±20	uA

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Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$Q_g$	Total Gate Charge <sup>2,3</sup>	$V_{DS} = -10\text{ V}, I_D = -0.2\text{ A},$ $V_{GS} = -4.5\text{ V}$	--	1	2	nC
$Q_{gs}$	Gate-Source Charge <sup>2,3</sup>		--	0.28	0.5	nC
$Q_{gd}$	Gate-Drain Charge <sup>2,3</sup>		--	0.18	0.4	nC
$T_{d(on)}$	Turn-On Time <sup>2,3</sup>	$V_{DD} = -10\text{ V}, I_D = -0.2\text{ A},$ $R_G = 10\ \Omega, V_{GS} = -4.5\text{ V}$	--	8	16	ns
$T_r$	Turn-On Time <sup>2,3</sup>		--	5.2	10	ns
$T_{d(off)}$	Turn-Off Delay Time <sup>2,3</sup>		--	30	60	ns
$T_f$	Turn-Off Fall Time <sup>2,3</sup>		--	18	36	ns
$C_{ISS}$	Input Capacitance	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $F = 1.0\text{ MHz}$	--	40	78	pF
$C_{OSS}$	Output Capacitance		--	15	30	pF
$C_{RSS}$	Reverse Transfer Capacitance		--	6.5	13	pF

Drain-Source Diode Characteristics and Maximum Ratings						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$I_S$	Continuous Source Current	$V_G = V_D = 0\text{ V},$ Force Current	--	--	-0.25	A
$I_{SM}$	Pulsed Source Current		--	--	-0.5	
$V_{SD}$	Diode Forward Voltage	$I_S = -0.2\text{ A}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$	--	--	-1	V

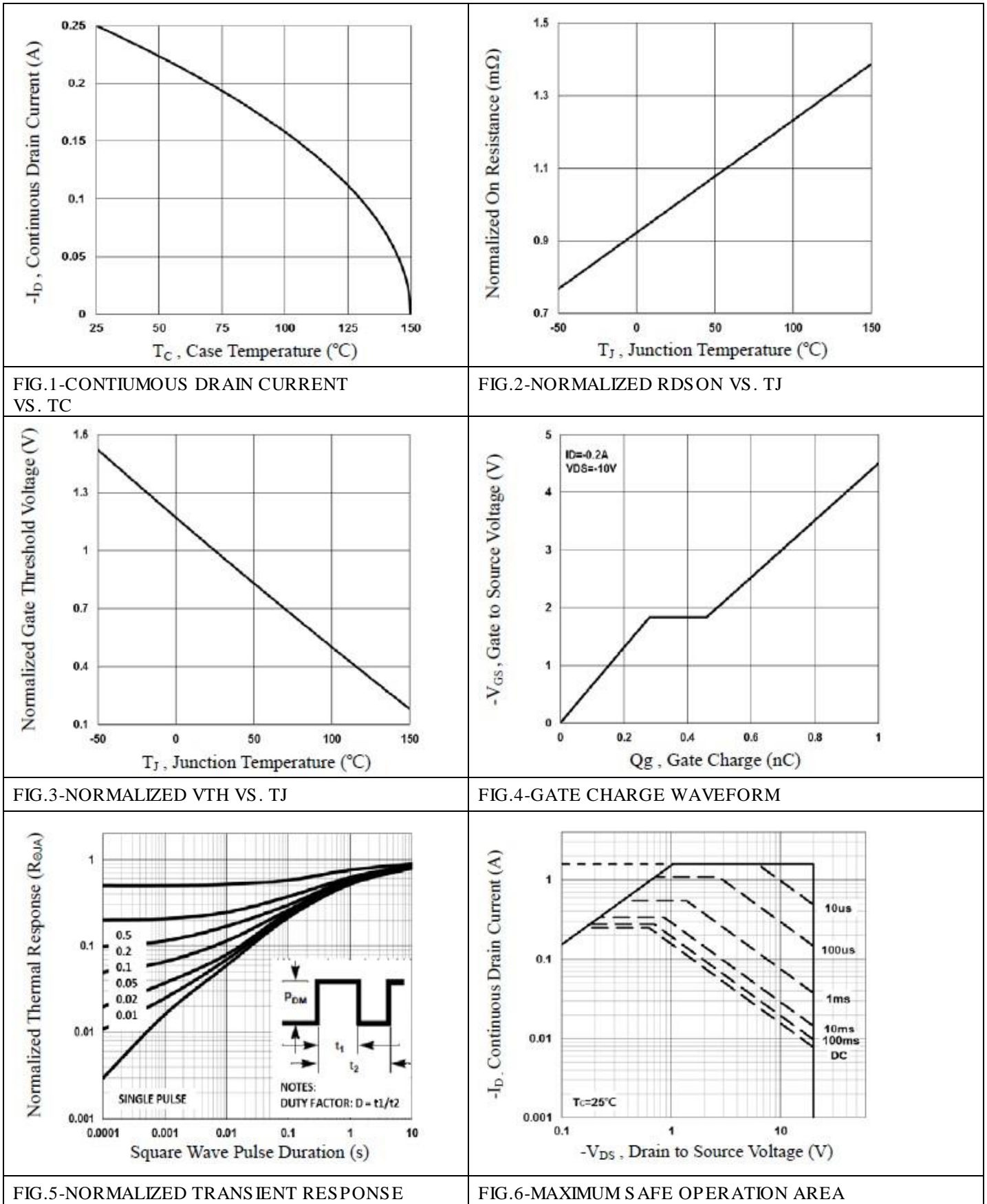
Notes ;

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

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### P-Channel 20V MOSFETs

#### ■ Characteristics Curve



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### ■ Characteristics Curve

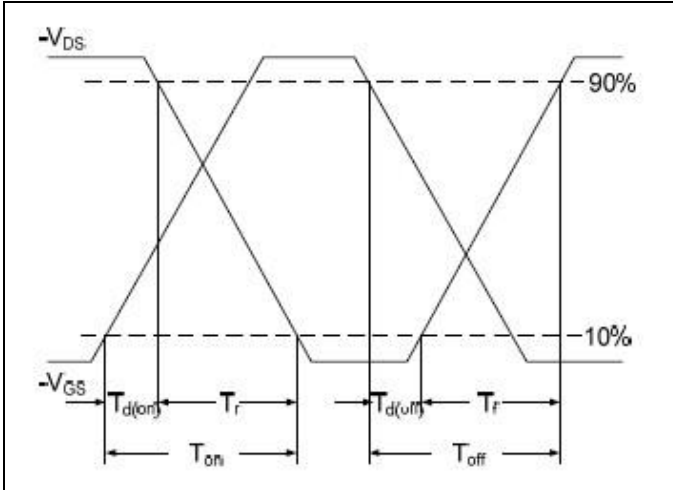


FIG.7-SWITCHING TIME WAVEFORM

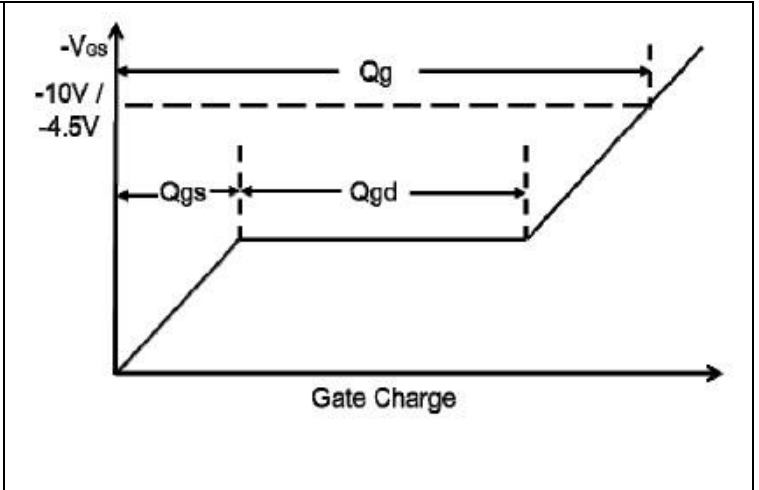


FIG.8-GATE CHARGE WAVEFORM

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#### Disclaimer

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