

## MSD36N12

### N-Channel 30V MOSFETs

#### Description

These N-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

- 30V, 23A,  $R_{DS(ON)} = 30m\Omega @ V_{GS} = 4.5V$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available
- RoHS compliant package

#### Applications

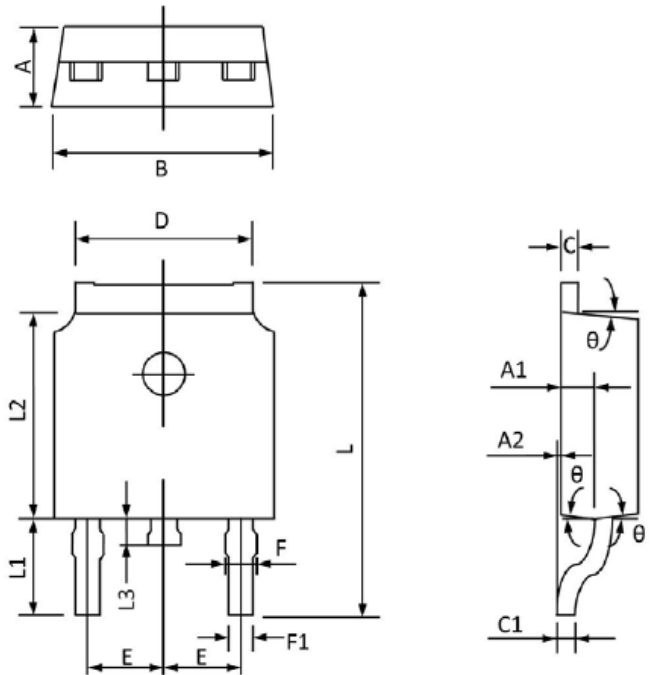
- Notebook
- Load Switch
- LED applications

Package type : TO-252

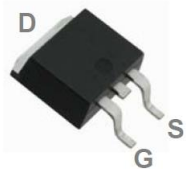
#### Packing & Order Information

R : 2,500/Reel

T : 80/Tube ; 4,000/Box

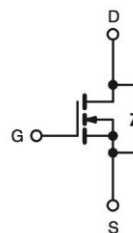


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.20	2.40	0.087	0.094
A1	0.91	1.11	0.036	0.044
A2	0.00	0.15	0.000	0.006
B	6.50	6.70	0.256	0.264
C	0.46	0.580	0.018	0.230
C1	0.46	0.580	0.018	0.030
D	5.10	5.46	0.201	0.215
E	2.186	2.386	0.086	0.094
F	0.74	0.94	0.029	0.037
F1	0.660	0.860	0.026	0.034
L	9.80	10.40	0.386	0.409
L1	2.9REF		0.114REF	
L2	6.00	6.20	0.236	0.244
L3	0.60	1.00	0.024	0.039
θ	3°	9°	3°	9°



**RoHS  
COMPLIANT**

Graphic symbol



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#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage	30	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current - Continuous ( $T_C=25^{\circ}\text{C}$ )	23	A
	Drain Current - Continuous ( $T_C=100^{\circ}\text{C}$ )	14.5	A
$I_{DM}$	Drain Current - Pulsed <sup>1</sup>	92	A
$P_D$	Power Dissipation ( $T_C=25^{\circ}\text{C}$ )	25	W
	Power Dissipation - Derate above $25^{\circ}\text{C}$	0.2	W/ $^{\circ}\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to +150	$^{\circ}\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to +150	$^{\circ}\text{C}$

##### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Thermal Resistance Junction to ambient	--	5	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	--	62	

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

##### Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = V_{GS}, I_D = 250\mu\text{A}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	$BV_{DSS}$ Temperature Coefficient	Reference to $25^{\circ}\text{C}$ , $I_D = 1\text{mA}$		0.06		V/ $^{\circ}\text{C}$
$I_{GSS}$	Gate-Source Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 12\text{V}$			$\pm 100$	nA
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}, T_J = 25^{\circ}\text{C}$ $V_{DS} = 24\text{V}, V_{GS} = 0\text{V}, T_J = 125^{\circ}\text{C}$			1 10	$\mu\text{A}$

##### On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$R_{DS(on)}$	Drain-Source On-Resistance	$V_{GS} = 4.5\text{V}, I_D = 8\text{A}$ $V_{GS} = 2.5\text{V}, I_D = 4\text{A}$		25 32	30 40	m $\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$	0.4	0.6	0.9	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$		-3		mV/ $^{\circ}\text{C}$
$g_{fs}$	Forward Transconductance	$V_{DS} = 10\text{V}, I_S = 3\text{A}$		7		S

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#### Dynamic and switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$Q_g$	Total Gate Charge <sup>2,3</sup>	$V_{DS} = 10\text{ V}$ , $I_D = 4\text{ A}$ , $V_{GS} = 4.5\text{ V}$	--	8.4	12	nC
$Q_{gs}$	Gate-Source Charge <sup>2,3</sup>		--	1	2	nC
$Q_{gd}$	Gate-Drain Charge <sup>2,3</sup>		--	2.2	4	nC
$t_{d(on)}$	Turn-On Delay Time <sup>2,3</sup>	$I_D = 1\text{ A}$ , $R_G = 25\ \Omega$ , $V_{GS} = 4.5\text{ V}$ , $V_{DD} = 10\text{ V}$	--	4.5	9	ns
$t_r$	Rise Time <sup>2,3</sup>		--	13	25	ns
$t_{d(off)}$	Turn-Off Delay Time <sup>2,3</sup>		--	27	51	ns
$t_f$	Fall Time <sup>2,3</sup>		--	8.3	16	ns
$C_{iss}$	Input Capacitance	$V_{DS} = 10\text{ V}$ $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	--	695	1000	pF
$C_{oss}$	Output Capacitance		--	45	65	pF
$C_{rss}$	Reverse Transfer Capacitance		--	36	50	pF
$R_g$	Total Gate Charge	$V_{DS} = 0\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	--	1.5	3	$\Omega$

#### 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	--	--	23	A
$I_{SM}$	Pulsed Source Current		--	--	46	A
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_s = 1\text{ A}$ , $T_J = 25^\circ\text{C}$	--	--	1	V

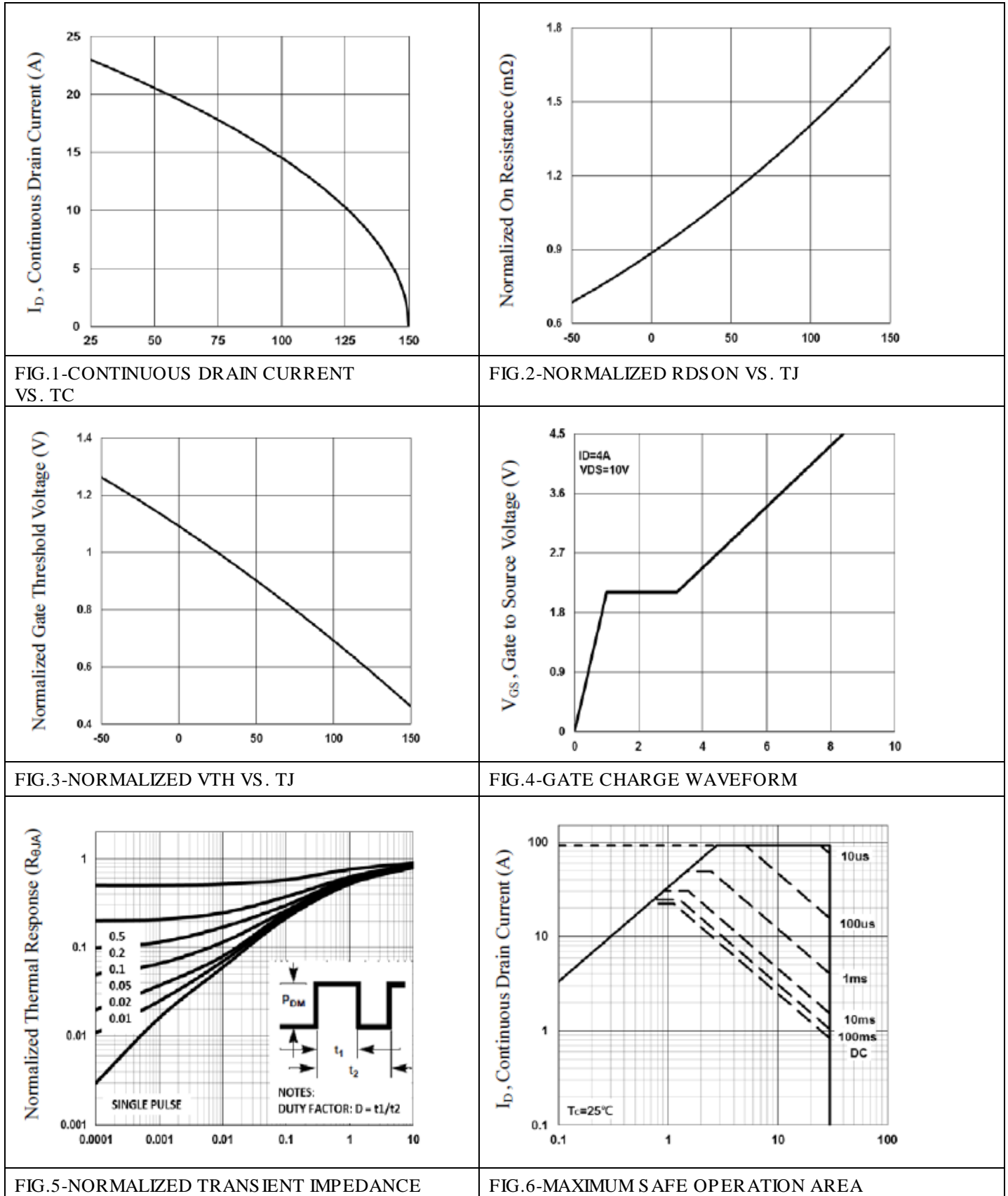
Note :

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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### N-Channel 30V MOSFETs

#### ■ Characteristics Curve



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■ Characteristics Curve

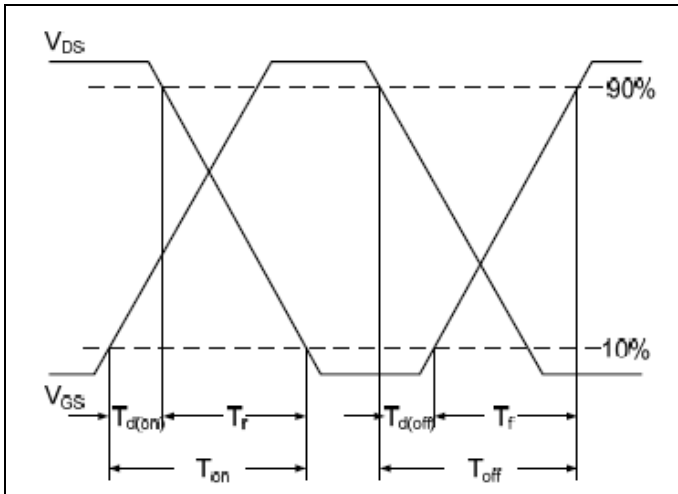


FIG.7-SWITCHING TIME WAVEFORM

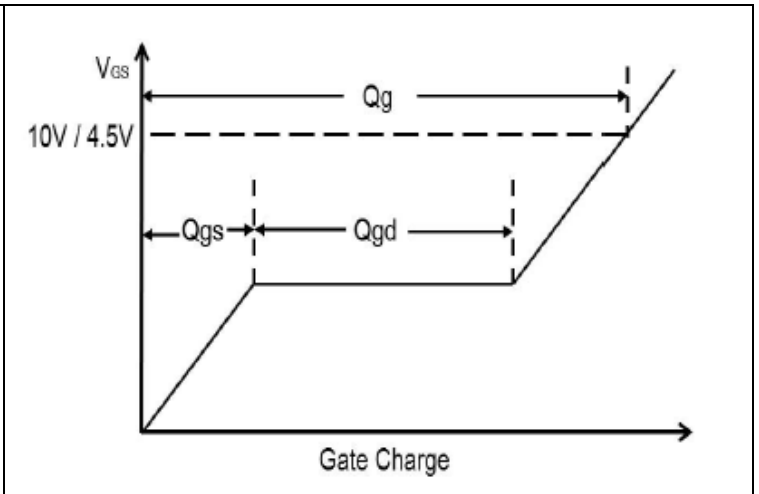


FIG.8-EAS WAVEFORM

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#### Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE

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