

MSC39N12

30V N-Channel 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.

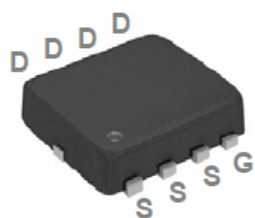
Features

- 30V, 25A, $R_{DS(ON)} = 18m\Omega$ @ $V_{GS} = 10V$
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available
- RoHS compliant package

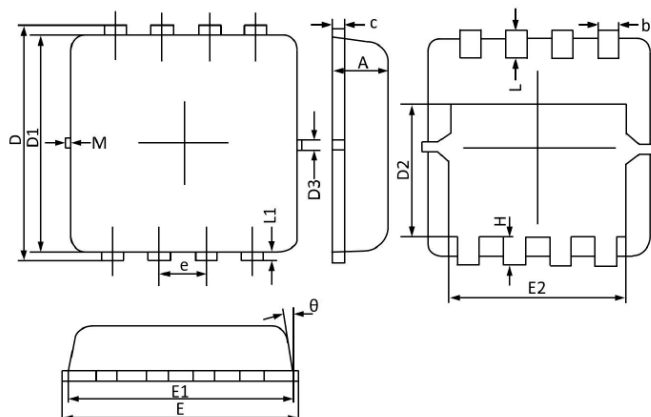
Applications

- MB / VGA / Vcore
- Load Switch
- Hand-Held Instrument

DFN 3X3 Package

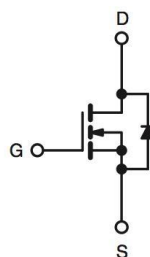


**RoHS
COMPLIANT**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.700	0.800	0.028	0.031
b	0.250	0.350	0.010	0.013
c	0.100	0.250	0.004	0.009
D	3.250	3.450	0.128	0.135
D1	3.000	3.200	0.119	0.125
D2	1.780	1.980	0.070	0.077
D3	0.130 REF		0.005 REF	
E	3.200	3.400	0.126	0.133
E1	3.000	3.200	0.119	0.125
E2	2.390	2.590	0.094	0.102
e	0.650 BSC		0.026 BSC	
H	0.300	0.500	0.011	0.019
L	0.300	0.500	0.011	0.019
L1	0.130 REF		0.005 REF	
theta	0°	12°	0°	12°
M	0.150 REF		0.006 REF	

Graphic symbol



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	± 20	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	25	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$)	16	A
I_{DM}	Drain Current - Pulsed ¹	100	A
EAS	Single Pulse Avalanche Energy ²	32	mJ
IAS	Single Pulse Avalanche Current ²	8	A

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

Symbol	Parameter	Value	Unit
P_D	Power Dissipation ($T_C=25^{\circ}\text{C}$)	21	W
	Power Dissipation - Derate above 25°C	0.17	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	--	62	$^{\circ}\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	--	6	

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
$\Delta BV_{DSS} / \Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D = 1\text{mA}$		0.04		V/ $^{\circ}\text{C}$
I_{GSS}	Gate-Source Leakage Current	$V_{DS} = 0\text{V}$, $V_{GS} = \pm 20\text{V}$			± 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	μA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$R_{DS(on)}$	Drain-Source On-Resistance	$V_{GS} = 10\text{V}$, $I_D = 12\text{A}$ $V_{GS} = 4.5\text{V}$, $I_D = 8\text{A}$		14 20	18 28	m Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = -250\mu\text{A}$	1.2	1.6	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient	$V_{DS} = V_{GS}$, $I_D = -250\mu\text{A}$		-4		mV/ $^{\circ}\text{C}$
g_{fs}	Forward Transconductance	$V_{DS} = 10\text{V}$, $I_S = 6\text{A}$		6.5		S

Dynamic and switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time ^{3,4}	$I_D = 1\text{A}$, $R_G = 6\Omega$, $V_{GS} = 10\text{V}$, $V_{DD} = 15\text{V}$	--	2.8	5	ns
t_r	Rise Time ^{3,4}		--	7.2	14	ns
$t_{d(off)}$	Turn-Off Delay Time ^{3,4}		--	15.8	30	ns
t_f	Fall Time ^{3,4}		--	4.6	9	ns

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Dynamic and switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
Q_g	Total Gate Charge ^{3,4}	$V_{DS} = 15\text{ V}$, $I_D = 6\text{ A}$, $V_{GS} = 4.5\text{ V}$	--	4.1	8	nC
Q_{gs}	Gate-Source Charge ^{3,4}		--	1	2	nC
Q_{gd}	Gate-Drain Charge ^{3,4}		--	2.1	4	nC
C_{ISS}	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	--	345	500	pF
C_{OSS}	Output Capacitance		--	55	80	pF
C_{RSS}	Reverse Transfer Capacitance		--	32	45	pF
R_g	Total Gate Charge	$V_{DS} = 0\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	--	3.2	6.4	Ω

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	--	--	25	A
I_{SM}	Pulsed Source Current		--	--	100	A
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 1\text{ A}$, $T_J = 25^\circ\text{C}$	--	--	1	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}$, $I_S = 1\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25^\circ\text{C}$	--	--	--	ns
Q_{rr}	Reverse Recovery Charge		--	--	--	nC

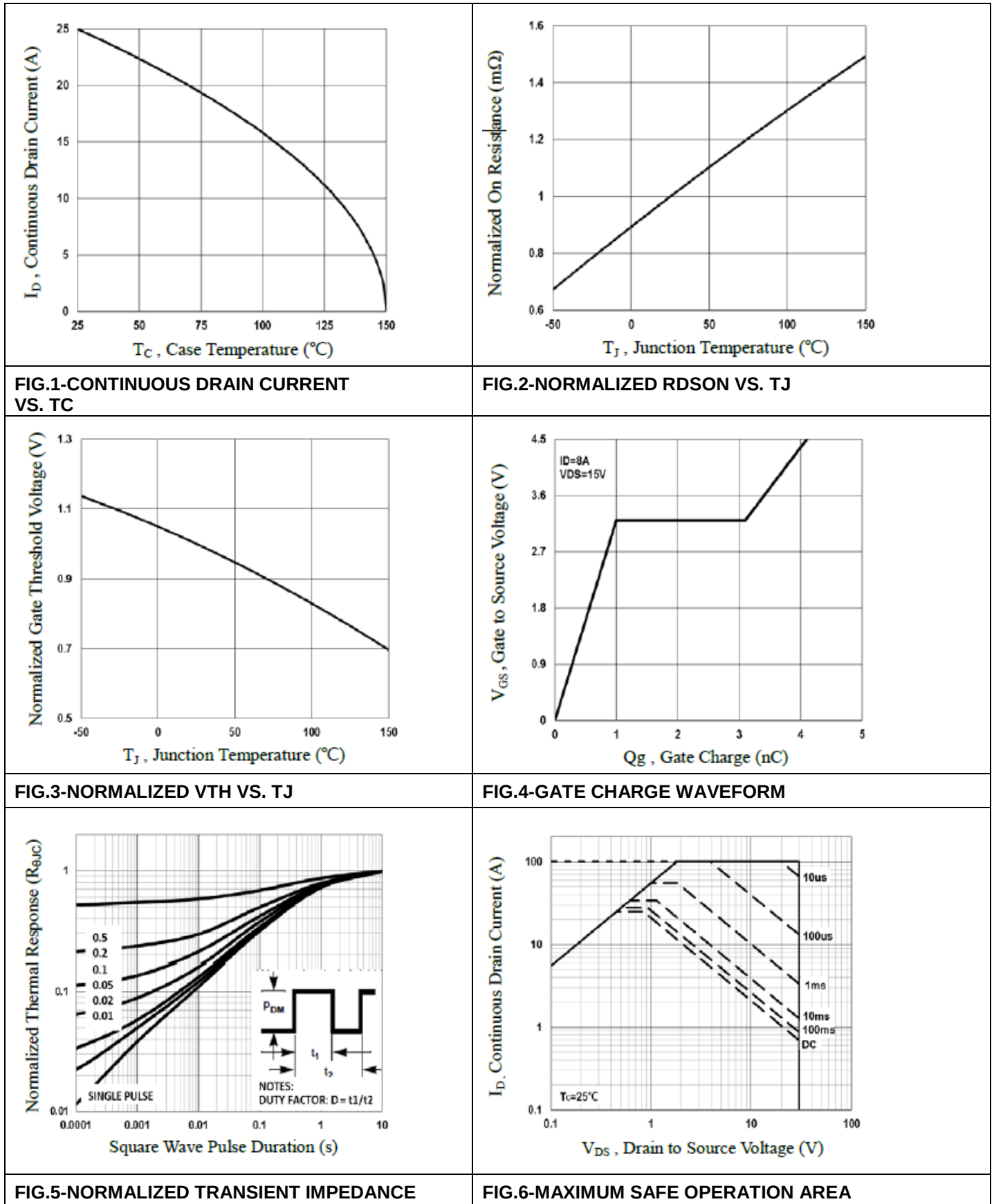
Note :

- 1.Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}=25\text{V}$, $V_{GS}=10\text{V}$, $L=1\text{mH}$, $I_{AS}=8\text{A}$, $R_G=25\ \Omega$, Starting $T_J=25^\circ\text{C}$.
- 3.The data tested by pulsed , pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
- 4.Essentially independent of operating temperature.

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■ Characteristics Curve



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■ Characteristics Curve

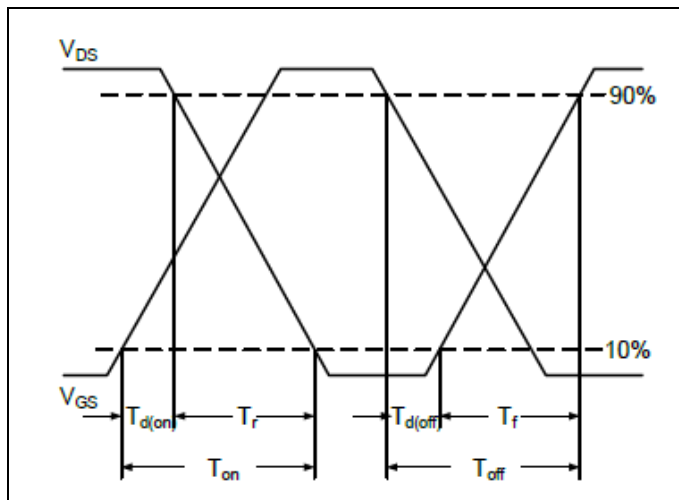


FIG.7-SWITCHING TIME WAVEFORM

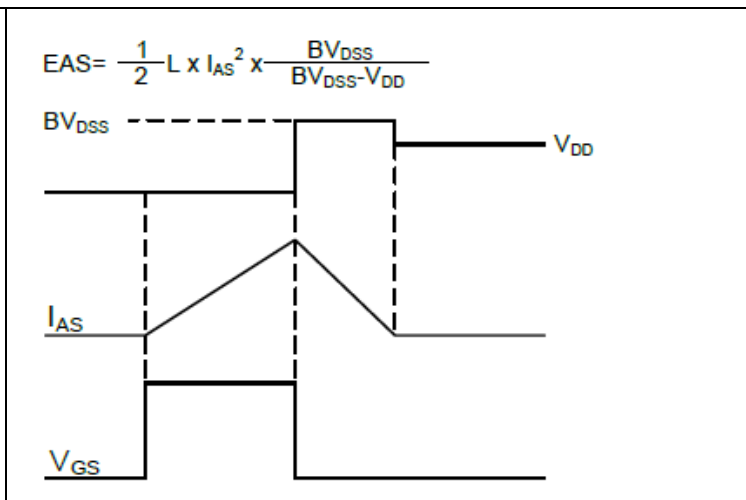


FIG.8-EAS WAVEFORM

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