

## MSC39N60X

### 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, 115A,  $R_{DS(ON)} = 2.4\text{m}\Omega @ V_{GS} = 10\text{V}$
- Improved  $dv/dt$  capability
- Fast switching

- 100% EAS Guaranteed
- RoHS compliant package

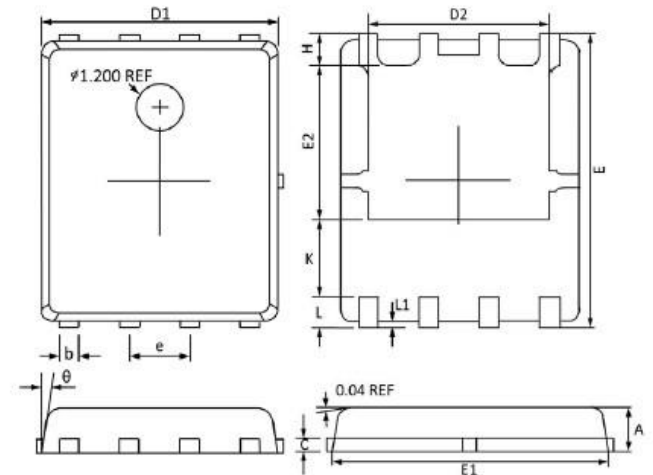
#### Applications

- MB / VGA / Vcore
- POL Applications
- SMPS 2nd SR

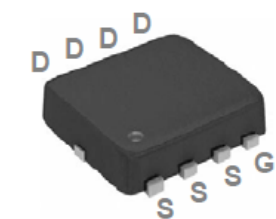
**Package type :** DFN5X6-8L

#### Packing & Order Information

3.000/Reel

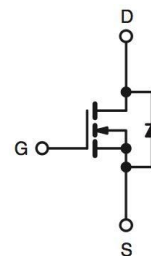


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	1.100	0.800	0.043	0.031
b	0.510	0.330	0.020	0.013
C	0.300	0.200	0.012	0.008
D1	5.100	4.800	0.201	0.189
D2	4.100	3.610	0.161	0.142
E	6.200	5.900	0.244	0.232
E1	5.900	5.700	0.232	0.224
E2	3.780	3.350	0.149	0.132
e	1.27BSC		0.05BSC	
H	0.700	0.410	0.028	0.016
K	1.500	1.100	0.059	0.043
L	0.710	0.510	0.028	0.020
L1	0.200	0.060	0.008	0.002
$\theta$	12°	0°	12°	0°



**RoHS  
COMPLIANT**

#### 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	$\pm 20$	V
$I_D$	Drain Current - Continuous ( $T_C=25^\circ\text{C}$ ) (Chip Limitation)	115	A
	Drain Current - Continuous ( $T_C=100^\circ\text{C}$ ) (Chip Limitation)	72	A
$I_{DM}$	Drain Current - Pulsed <sup>1</sup>	480	A
EAS	Single Pulse Avalanche Energy <sup>2</sup>	180	mJ

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

Symbol	Parameter	Value	Unit
I <sub>AS</sub>	Single Pulse Avalanche Current <sup>2</sup>	60	A
P <sub>D</sub>	Power Dissipation ( $T_C=25^\circ\text{C}$ )	135	W
	Power Dissipation - Derate above 25°C	1.08	W/°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to +150	°C
T <sub>STG</sub>	Storage Temperature Range	-55 to +150	°C

#### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
R <sub>θJA</sub>	Thermal Resistance Junction to ambient	--	62	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction to Case	--	0.92	

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

##### Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = V_{GS}, I_D = 250\mu\text{A}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	BVDSS Temperature Coefficient	Reference to 25°C, $I_D=1\text{mA}$		0.03		V/°C
I <sub>GSS</sub>	Gate-Source Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$			±100	nA
I <sub>DSS</sub>	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	uA

##### On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
R <sub>DS(on)</sub>	Drain-Source On-Resistance <sup>3</sup>	$V_{GS} = 10\text{V}, I_D = 30\text{A}$ $V_{GS} = 4.5\text{V}, I_D = 15\text{A}$		1.9 2.5	2.4 3.3	mΩ
V <sub>GS(th)</sub>	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 <sub>GS(th)</sub> Temperature Coefficient	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$		-5		mV/°C
g <sub>fs</sub>	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 2\text{A}$		16.5		S

##### Dynamic and switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
t <sub>d(on)</sub>	Turn-On Delay Time <sup>3,4</sup>	$I_D = 1\text{A}, R_G = 1\Omega,$ $V_{GS} = 10\text{V}, V_{DD} = 15\text{V}$	--	20	40	ns
t <sub>r</sub>	Rise Time <sup>3,4</sup>		--	32	60	ns
t <sub>d(off)</sub>	Turn-Off Delay Time <sup>3,4</sup>		--	75	130	ns
t <sub>f</sub>	Fall Time <sup>3,4</sup>		--	28	55	ns

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#### Dynamic and switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$Q_g$	Total Gate Charge <sup>3,4</sup>	$V_{DS} = 15\text{ V}$ , $I_D = 24\text{ A}$ , $V_{GS} = 4.5\text{ V}$	--	40	75	nC
$Q_{gs}$	Gate-Source Charge <sup>3,4</sup>		--	6	12	nC
$Q_{gd}$	Gate-Drain Charge <sup>3,4</sup>		--	19	35	nC
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	--	4800	8000	pF
$C_{oss}$	Output Capacitance		--	735	1300	pF
$C_{rss}$	Reverse Transfer Capacitance		--	420	800	pF
$R_g$	Total Gate Charge	$V_{DS} = 0\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	--	1.6	3.5	$\Omega$

#### 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	--	--	176	A
$I_{SM}$	Pulsed Source Current		--	--	352	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	$V_{DS} = 30\text{ V}$ , $I_s = 1\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $T_J = 25^\circ\text{C}$	--	49	85	ns
$Q_{rr}$	Reverse Recovery Charge		--	18	35	nC

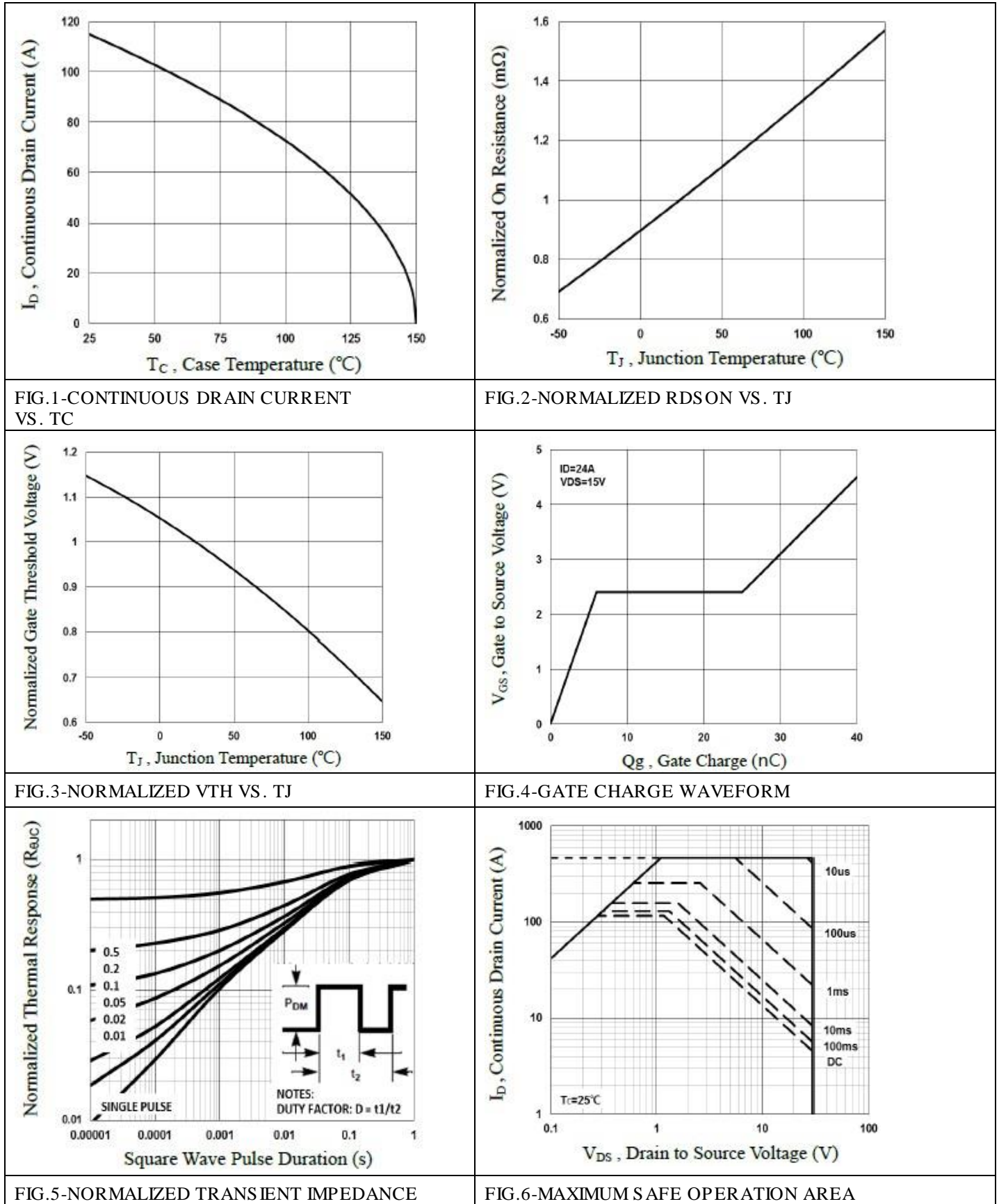
Note :

- 1.Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $V_{DD} = 25\text{ V}$ ,  $V_{GS} = 10\text{ V}$ ,  $L = 0.1\text{ mH}$ ,  $I_{AS} = 65\text{ A}$ ., 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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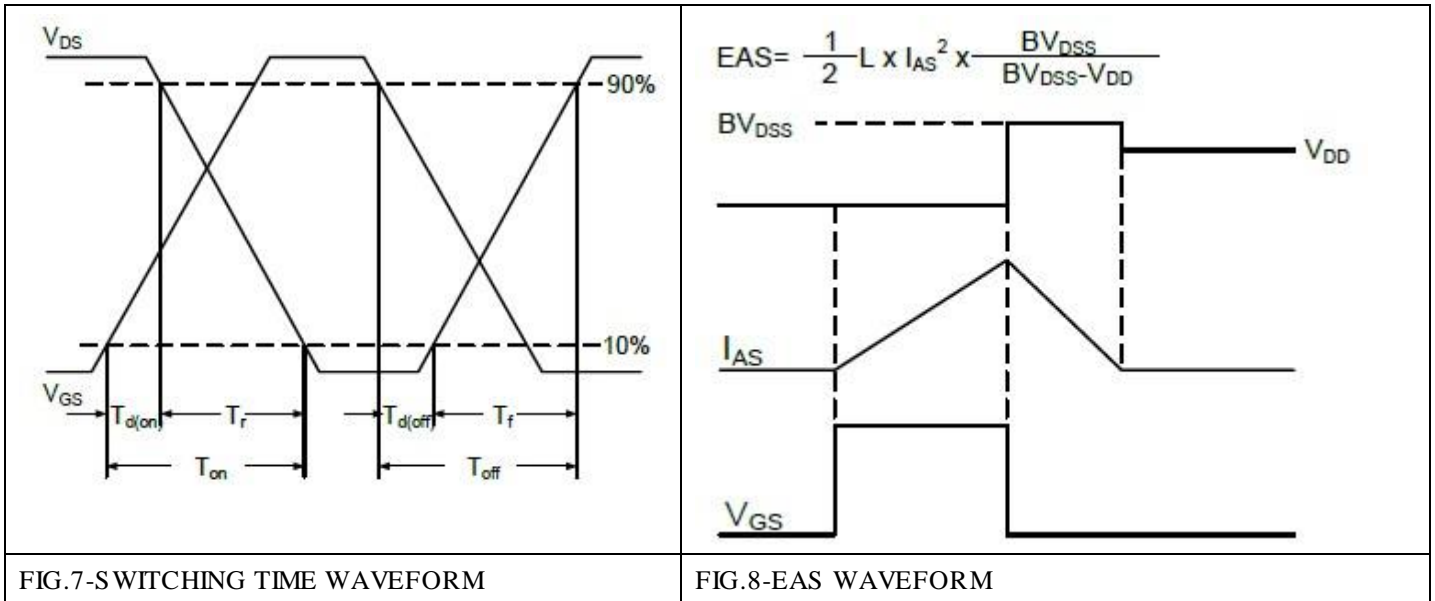
#### ■ Characteristics Curve



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■ Characteristics Curve



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#### Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE

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