MSC49N02X

40V 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.

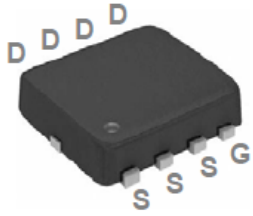
Features

- 40V,140A, RDS(ON) =2.2mΩ@VGS = 10V
- Improved dv/dt capability
- Fast switching
- Green Device Available
- RoHS compliant package

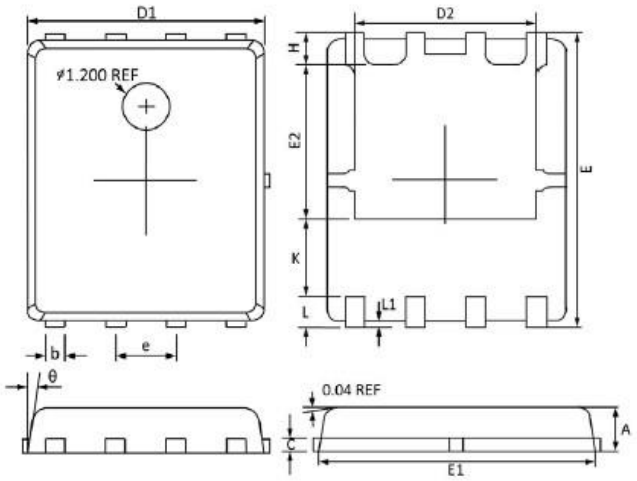
Applications

- PowerTools
- Load Switch
- LED applications
- Motor Drive Applications

PPAK5X6 Pin Configuration

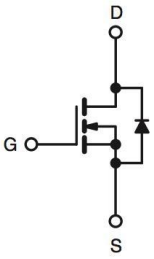


RoHS COMPLIANT



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
θ	12°	0°	12°	0°

Graphic symbol



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	±20	V
I_D	Drain Current - Continuous (T_C=25°C) (Chip Limitation)	140	A
	Drain Current - Continuous (T_C=100°C) (Chip Limitation)	88	A
I_{DM}	Drain Current - Pulsed[1]	560	A
EAS	Single Pulse Avalanche Energy[2]	360	mJ

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Absolute Maximum Ratings (T_A=25°C unless otherwise noted)			
Symbol	**Parameter**	**Value**	**Unit**
IAS	Single Pulse Avalanched Current[2]	85	A
P_D	Power Dissipation (T_C=25°C)	142	W
	Power Dissipation - Derate above 25°C	1.14	W/°C
T_J	Operating Junction Temperature Range	-55 to +150	°C
T_{STG}	Storage Temperature Range	-55 to +150	°C

Thermal Characteristics				
Symbol	**Parameter**	**Typ.**	**Max.**	**Units**
$R_{\Theta jA}$	Thermal Resistance Junction to ambient	--	62	°C/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	--	0.88	

Electrical Characteristics (TJ=25℃, 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 = 250uA	40			V
I_{GSS}	Gate-Source Leakage Current	V_{DS} = 0 V , V_{GS} = ±20 V			±100	nA
I_{DSS}	Drain-Source Leakage Current	V_{DS} = 40 V , V_{GS} = 0 V , T_J= 25°C V_{DS} = 32 V , V_{GS} = 0 V , T_J= 125°C			1 10	uA

On Characteristics						
Symbol	**Parameter**	**Test Conditions**	**Min**	**Typ.**	**Max.**	**Units**
$R_{DS(on)}$	Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 30 A V_{GS} = 4.5 V , I_D = 20 A		1.7 2.1	2.2 3	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D =-250μA	1.2	1.6	2.5	V
g_{fs}	Forward Tranconductance	V_{DS} = 10 V , I_S = 10 A		45		S

Dynamic and switching Characteristics						
Symbol	**Parameter**	**Test Conditions**	**Min**	**Typ.**	**Max.**	**Units**
Q_g	Total Gate Charge[3,4]	V_{DS} = 20 V , I_D = 10 A, V_{GS} = 4.5 V	--	70	140	nC
Q_{gs}	Gate-Source Charge[3,4]		--	15	32	nC
Q_{gd}	Gate-Drain Charge[3,4]		--	40	80	nC
C_{ISS}	Input Capacitance	V_{DS} = 25 V f = 1 MHz , V_{GS} = 0 V	--	8000	12000	pF
C_{OSS}	Output Capacitance		--	550	1000	pF
C_{RSS}	Reverse Transfer Capacitance		--	420	800	pF
Rg	Total Gate Charge	V_{DS} = 0 V , f = 1 MHz , V_{GS} = 0 V	--	1.2	2.4	Ω

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Dynamic and switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time[3,4]	I_D = 10 A , R_G = 10 Ω, V_{GS} = 10 V , V_{DD} = 20 V	--	24.6	48	ns
t_r	Rise Time[3,4]		--	62.8	120	ns
$t_{d(off)}$	Turn-Off Delay Time[3,4]		--	224	440	ns
tf	Fall Time[3,4]		--	162	320	ns

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 V , Force Current	--	--	140	A
I_{SM}	Pulsed Source Current		--	--	280	A
V_{SD}	Diode Forward Voltage	V_{GS} = 0 V , I_S = 1 A , TJ = 25°C	--	--	1	V
trr	Reverse Recovery Time	V_{GS} = 0 V , I_S = 1 A , di/dt=100A/μs , TJ=25°C	--	32	--	ns
Qrr	Reverse Recovery Charge		--	19	--	nC

Note :

1.Repetitive Rating : Pulsed width limited by maximum junction temperature.

2.VDD=25V,VGS=10V,L=1mH,IAS=8A.,RG=25Ω,Starting TJ=25℃.

3.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.

4.Essentially independent of operating temperature.

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■Characteristics Curve

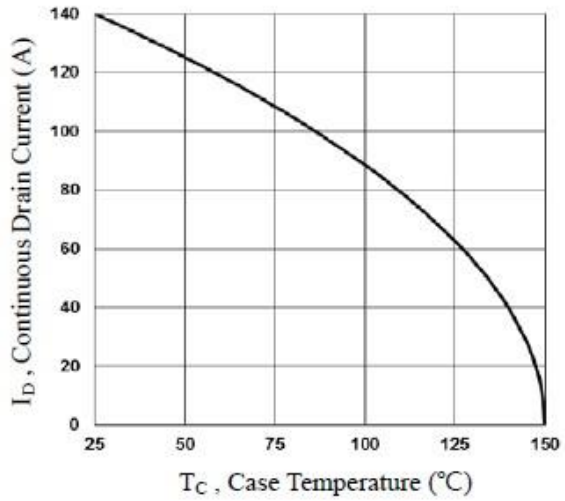

FIG.1-CONTINUOUS DRAIN CURRENT VS. TC

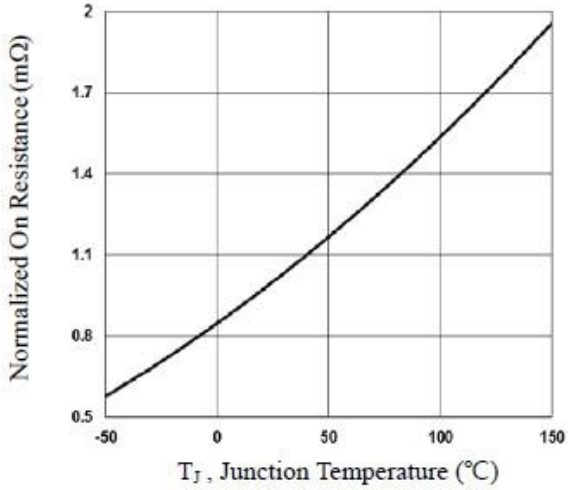

FIG.2-NORMALIZED RDSON VS. TJ

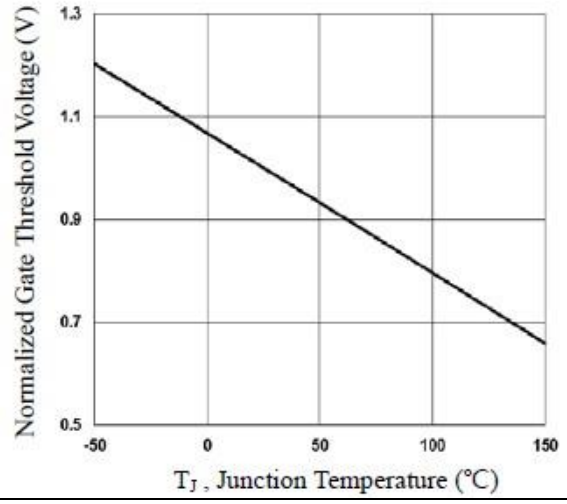

FIG.3-NORMALIZED VTH VS. TJ

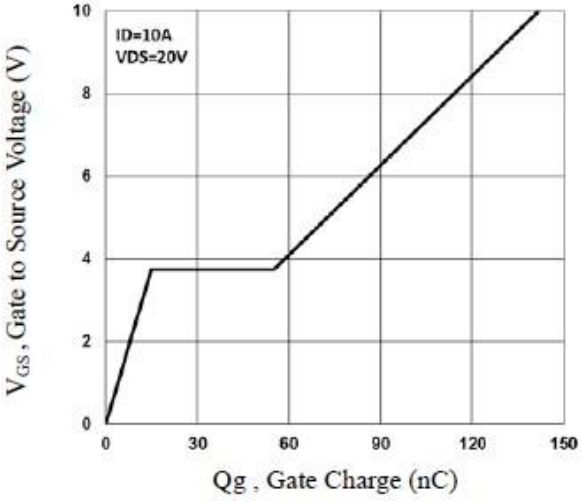

FIG.4-GATE CHARGE WAVEFORM

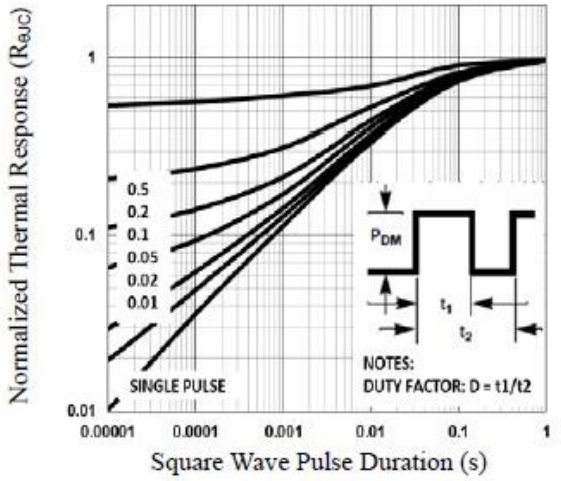

FIG.5-NORMALIZED TRANSIENT IMPEDANCE

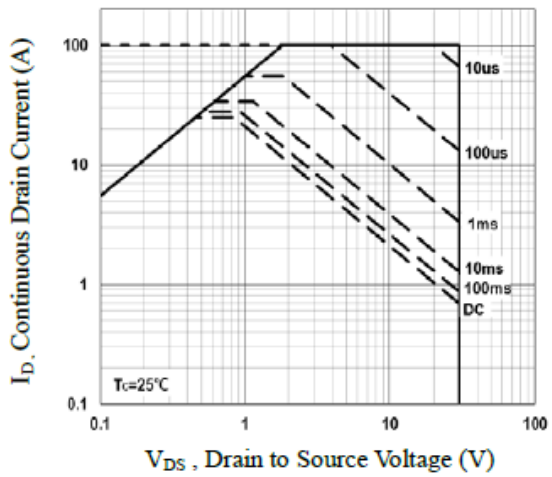

FIG.6-MAXIMUM SAFE OPERATION AREA

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■Characteristics Curve

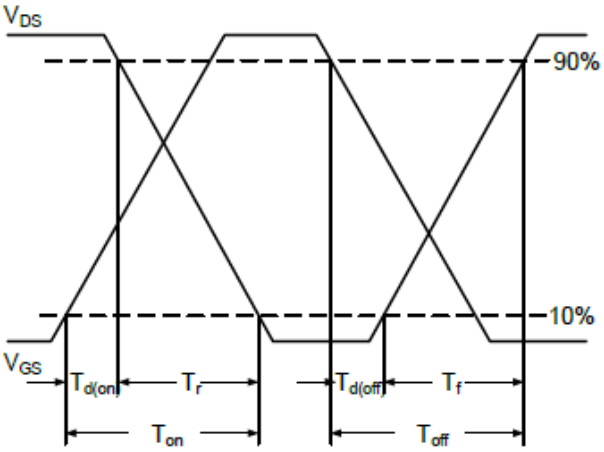

FIG.7-SWITCHING TIME WAVEFORM

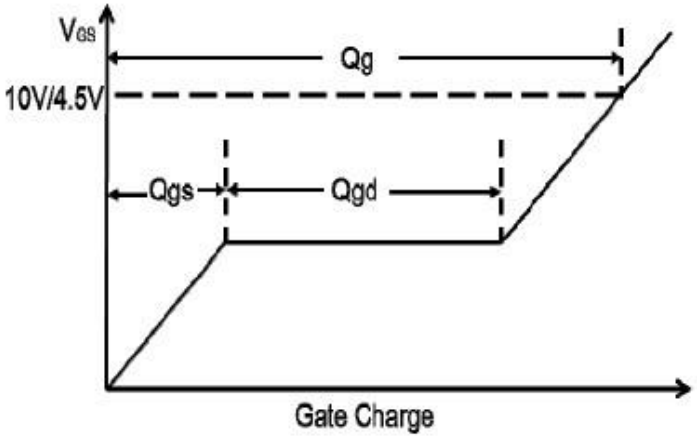

FIG.8-EAS WAVEFORM

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