PMP09N50M

500V N-Channel MOSFETs

General Description

These N-Channel enhancement mode power field effect transistors are planar stripe, 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 switch mode power supply

BVDSS	RDSON	ID
500V	0.8Ω	9A

Features

- *Improved dv/dt capability*
- *Fast switching*
- *100% EAS Guaranteed*
- *Green Device Available*

TO220 Pin Configuration
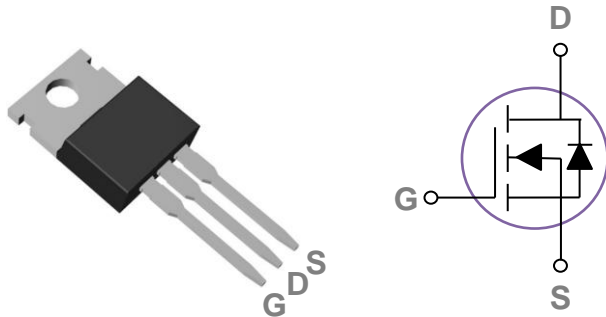
Applications

- *High efficient switched mode power supplies*
- *TV Power*
- *Adapter/charger*
- *Server Power*
- *PV Inverter / UPS*

Absolute Maximum Ratings Tc=25℃ unless otherwise noted

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	500	V
V_{GS}	Gate-Source Voltage	±30	V
I_D	Drain Current – Continuous (T_C=25℃)	9	A
	Drain Current – Continuous (T_C=100℃)	5.7	A
I_{DM}	Drain Current – Pulsed[1]	36	A
EAS	Single Pulse Avalanche Energy[2]	550	mJ
IAS	Single Pulse Avalanche Current[2]	10.5	A
P_D	Power Dissipation (T_C=25℃)	89	W
	Power Dissipation – Derate above 25℃	0.71	W/℃
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62	℃/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	1.4	℃/W

Electrical Characteristics (T$_J$=25 ℃, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV$_{DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$=0V , I$_D$=250uA	500	---	---	V
I$_{DSS}$	Drain-Source Leakage Current	V$_{DS}$=500V , V$_{GS}$=0V , T$_J$=25℃	---	---	1	uA
		V$_{DS}$=400V , V$_{GS}$=0V , T$_J$=100℃	---	---	10	uA
I$_{GSS}$	Gate-Source Leakage Current	V$_{GS}$=±30V , V$_{DS}$=0V	---	---	±100	nA

On Characteristics

| Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V , I$_D$=4A	---	0.65	0.8	Ω
V$_{GS(th)}$	Gate Threshold Voltage	V$_{GS}$=V$_{DS}$, I$_D$ =250uA	2	3	4	V
gfs	Forward Transconductance	V$_{DS}$=30V , I$_D$=2A	---	10	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q$_g$	Total Gate Charge[3,4]	V$_{DS}$=400V , V$_{GS}$=10V , I$_D$=4A	---	28	42	nC
Q$_{gs}$	Gate-Source Charge[3,4]		---	5.4	10	
Q$_{gd}$	Gate-Drain Charge[3,4]		---	10.2	15	
T$_{d(on)}$	Turn-On Delay Time[3,4]	V$_{DD}$=250V , V$_{GS}$=10V , R$_G$=25Ω I$_D$=4A	---	21	42	ns
T$_r$	Rise Time[3,4]		---	27	54	
T$_{d(off)}$	Turn-Off Delay Time[3,4]		---	54	108	
T$_f$	Fall Time[3,4]		---	20	40	
C$_{iss}$	Input Capacitance	V$_{DS}$=25V , V$_{GS}$=0V , F=1MHz	---	920	1800	pF
C$_{oss}$	Output Capacitance		---	103	200	
C$_{rss}$	Reverse Transfer Capacitance		---	15	30	
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, F=1MHz	---	2.4	4.8	Ω

Drain-Source Diode Characteristics and Maximum Ratings

| Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I$_S$	Continuous Source Current	V$_G$=V$_D$=0V , Force Current	---	---	9	A
I$_{SM}$	Pulsed Source Current		---	---	18	A
V$_{SD}$	Diode Forward Voltage	V$_{GS}$=0V , I$_S$=1A , T$_J$=25℃	---	---	1	V

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V$_{DD}$=50V,V$_{GS}$=10V,L=10mH,I$_{AS}$=10.5A.,R$_G$=25Ω,Starting T$_J$=25℃.
3. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
4. Essentially independent of operating temperature.
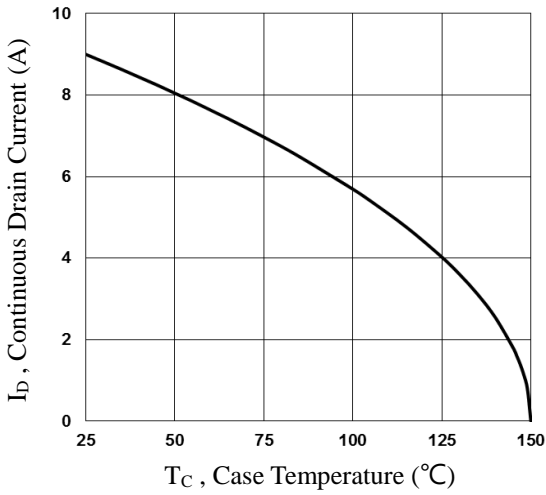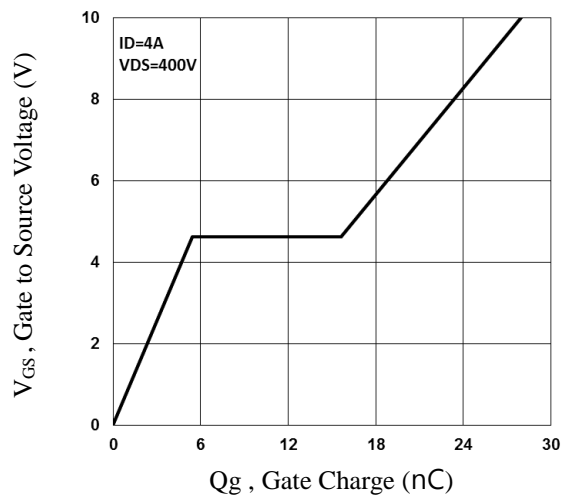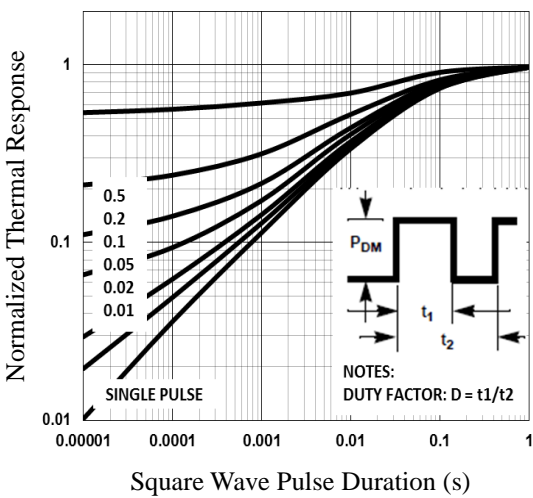
Fig.1   Continuous Drain Current vs. T$_C$
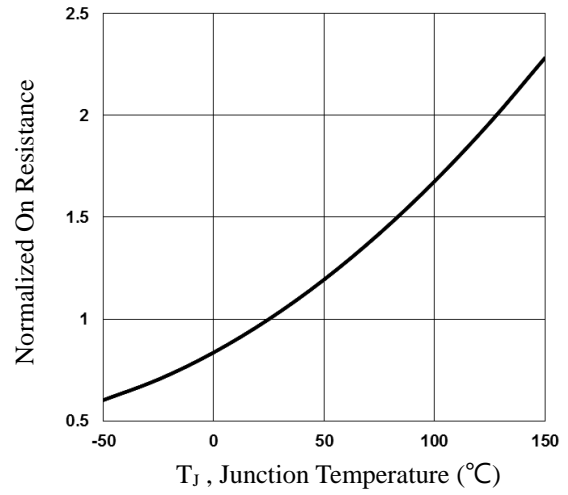
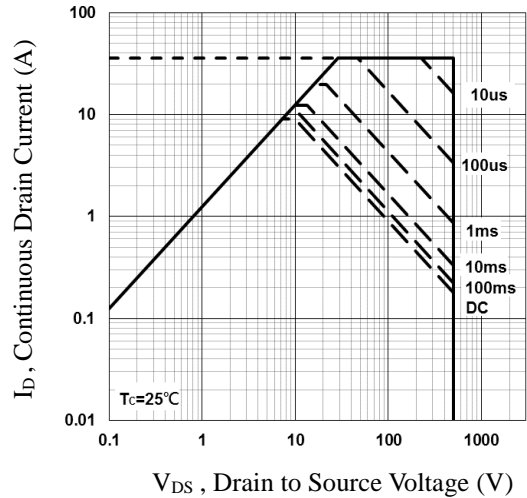**Fig.2   Normalized RDSON vs. T$_J$**
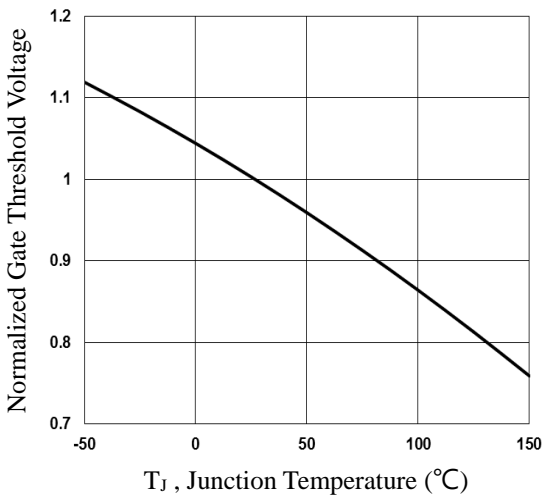
Fig.3   Normalized V$_{th}$ vs. T$_J$
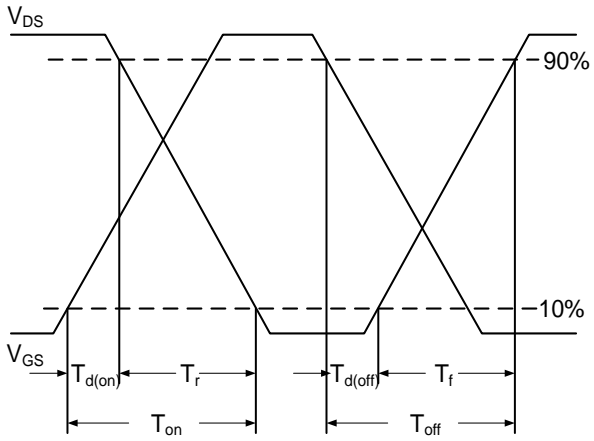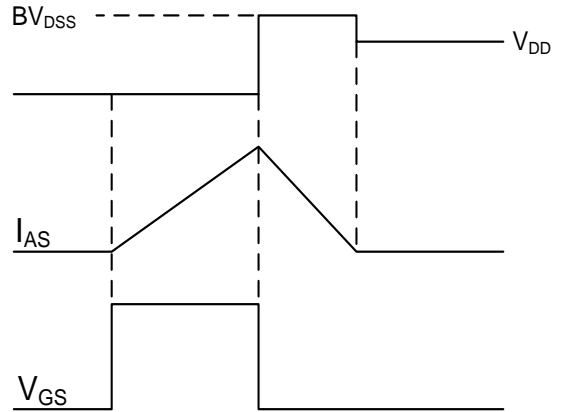

Fig.4   Gate Charge Waveform

Fig.5   Normalized Transient Impedance

Fig.6   Maximum Safe Operation Area

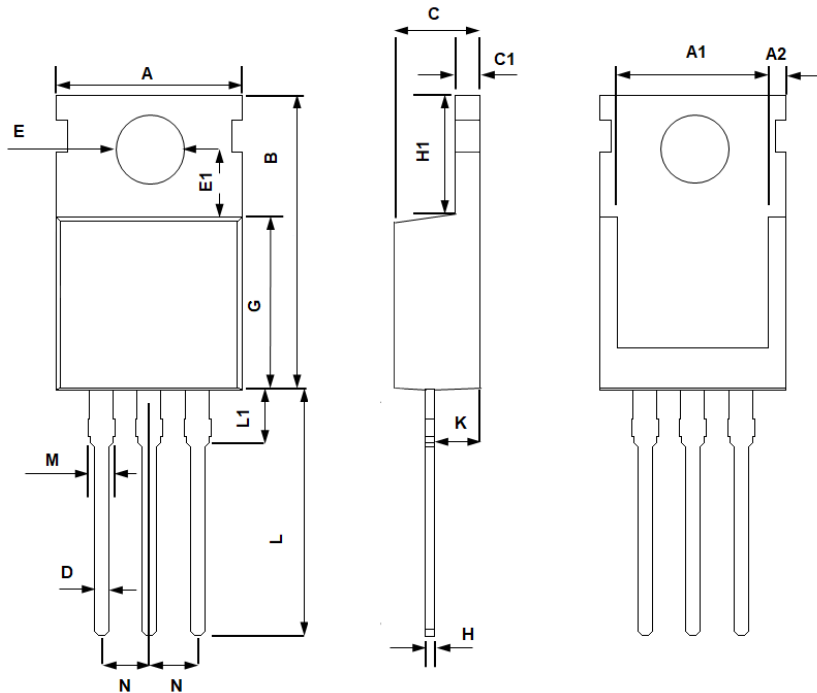**Fig.7   Switching Time Waveform**

Fig.8   EAS Waveform

TO220 PACKAGE INFORMATION

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	10.400	9.700	0.409	0.382
A1	8.900	7.400	0.350	0.291
A2	1.400	0.800	0.055	0.031
B	16.500	14.500	0.650	0.571
C	4.750	4.200	0.187	0.165
C1	1.500	1.100	0.059	0.043
D	1.000	0.600	0.039	0.024
E	4.000	3.300	0.157	0.130
E1	3.800	3.400	0.150	0.134
G	9.400	8.400	0.370	0.331
H	0.600	0.200	0.024	0.008
H1	6.850	6.200	0.270	0.244
K	2.850	2.100	0.112	0.083
L	14.000	12.500	0.551	0.492
L1	4.000	2.700	0.157	0.106
M	1.750	1.100	0.069	0.043
N	2.640	2.440	0.104	0.096