60V N-Channel MOSFETs

PDP6960

General 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.

BVDSS	RDSON	ID
60V	6mΩ	100A

Features

- *60V,100A, RDS(ON) =6mΩ @VGS = 10V*
- *Improved dv/dt capability*
- *Fast switching*
- *100% EAS Guaranteed*
- *Green Device Available*

Applications

- *Motor Drive*
- *Power Tools*
- *LED Lighting*
- *Quick Charger*

TO220 Pin Configuration

Absolute Maximum Ratings Tc=25℃ unless otherwise noted

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	±20	V
I_D	Drain Current – Continuous (T_C=25℃)	100	A
	Drain Current – Continuous (T_C=100℃)	63.2	A
I_{DM}	Drain Current – Pulsed[1]	400	A
EAS	Single Pulse Avalanche Energy[2]	181	mJ
IAS	Single Pulse Avalanched Current[2]	60.1	A
P_D	Power Dissipation (T_C=25℃)	169	W
	Power Dissipation – Derate above 25℃	1.35	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
$R_{θJA}$	Thermal Resistance Junction to ambient	---	62	℃/W
$R_{θJC}$	Thermal Resistance Junction to Case	---	0.74	℃/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	60	---	---	V
△BV$_{DSS}$/△T$_J$	BV$_{DSS}$ Temperature Coefficient	Reference to 25℃ , I$_D$=1mA	---	0.036	---	V/℃
I$_{DSS}$	Drain-Source Leakage Current	V$_{DS}$=60V , V$_{GS}$=0V , T$_J$=25℃	---	---	1	uA
		V$_{DS}$=48V , V$_{GS}$=0V , T$_J$=125℃	---	---	10	uA
I$_{GSS}$	Gate-Source Leakage Current	V$_{GS}$=±20V , V$_{DS}$=0V	---	---	±100	nA

On Characteristics

R$_{DS(ON)}$	Static Drain-Source On-Resistance[3]	V$_{GS}$=10V , I$_D$=20A	---	5.1	6	mΩ
		V$_{GS}$=4.5V , I$_D$=10A	---	5.9	7.5	mΩ
V$_{GS(th)}$	Gate Threshold Voltage	V$_{GS}$=V$_{DS}$, I$_D$ =250uA	1.2	1.6	2.5	V
△V$_{GS(th)}$	V$_{GS(th)}$ Temperature Coefficient		---	-5.08	---	mV/℃
gfs	Forward Transconductance	V$_{DS}$=10V , I$_D$=3A	---	15	---	S

Dynamic and switching Characteristics

Q$_g$	Total Gate Charge[3 , 4]	V$_{DS}$=30V , V$_{GS}$=4.5V , I$_D$=10A	---	32.8	65	nC
Q$_{gs}$	Gate-Source Charge[3 , 4]		---	10.8	20	
Q$_{gd}$	Gate-Drain Charge[3 , 4]		---	11.6	22	
T$_{d(on)}$	Turn-On Delay Time[3 , 4]	V$_{DD}$=15V , V$_{GS}$=10V , R$_G$=3.3Ω I$_D$=1A	---	20	40	ns
T$_r$	Rise Time[3 , 4]		---	14.2	28	
T$_{d(off)}$	Turn-Off Delay Time[3 , 4]		---	61.2	122	
T$_f$	Fall Time[3 , 4]		---	16.8	34	
C$_{iss}$	Input Capacitance	V$_{DS}$=25V , V$_{GS}$=0V , F=1MHz	---	4740	7110	pF
C$_{oss}$	Output Capacitance		---	325	488	
C$_{rss}$	Reverse Transfer Capacitance		---	161	332	
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, F=1MHz	---	1.6	---	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	---	---	100	A
I$_{SM}$	Pulsed Source Current[3]		---	---	200	A
V$_{SD}$	Diode Forward Voltage[3]	V$_{GS}$=0V , I$_S$=1A , T$_J$=25℃	---	---	1	V
t$_{rr}$	Reverse Recovery Time	V$_{GS}$=0V , I$_S$=10A , di/dt=100A/μs	---	26	---	ns
Q$_{rr}$	Reverse Recovery Charge	T$_J$=25℃	---	56	---	nC

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V$_{DD}$=25V,V$_{GS}$=10V,L=0.1mH,I$_{AS}$=60.1A.,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.
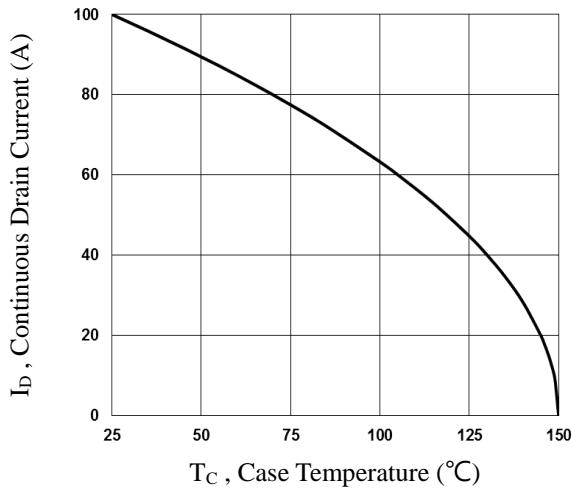
Fig.1 **Continuous Drain Current vs. T_C**
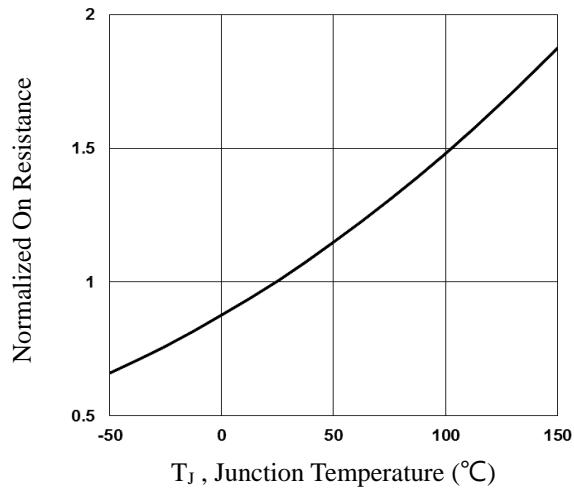
Fig.2 **Normalized RDSON vs. T_J**
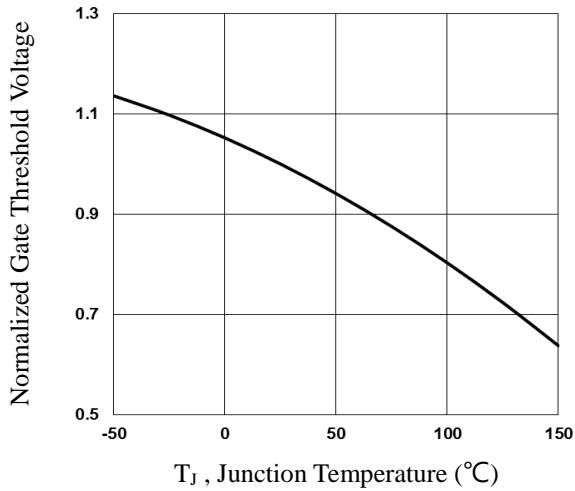
Fig.3 **Normalized V_{th} vs. T_J**
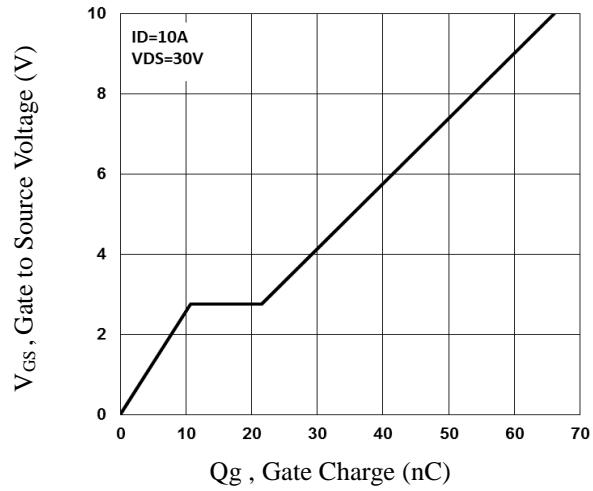
Fig.4 **Gate Charge Waveform**
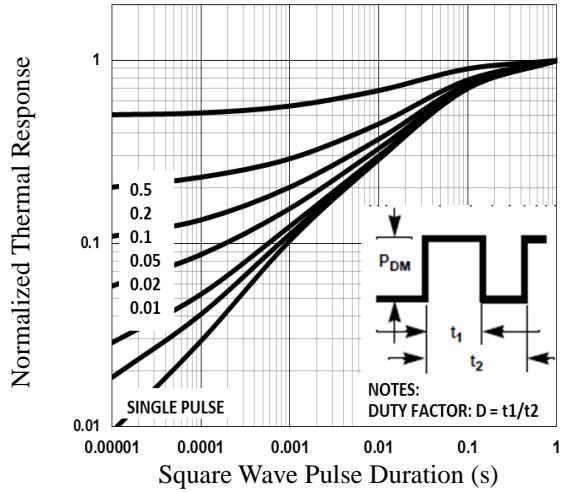
Fig.5 **Normalized Transient Response**
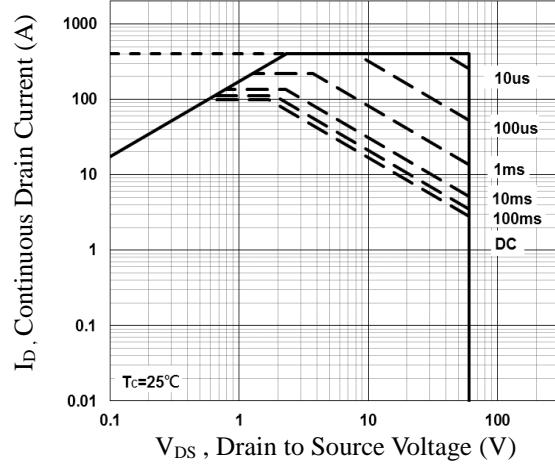
Fig.6 **Maximum Safe Operation Area**
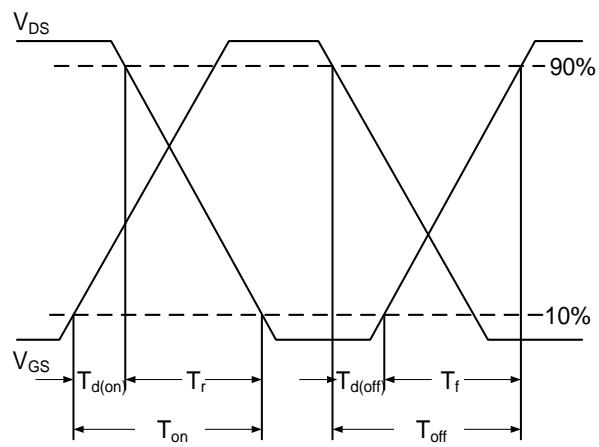
Fig.7   Switching Time Waveform
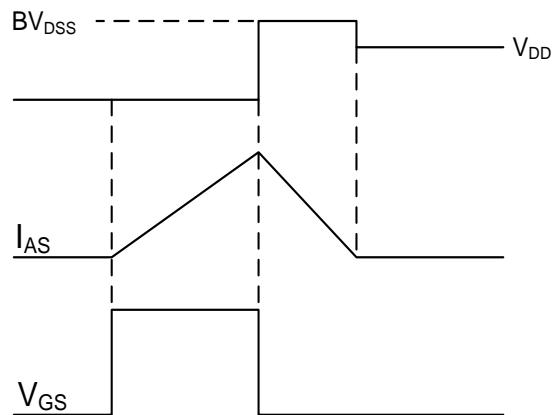
Fig.8   EAS Waveform

TO220 PACKAGE INFORMATION
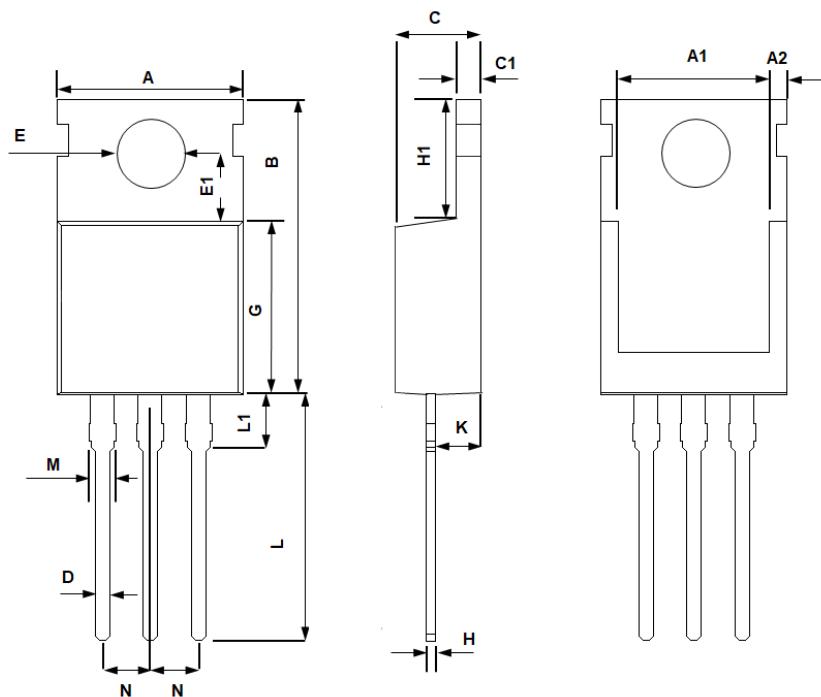
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	10.400	9.700	0.409	0.382
A1	8.900	7.400	0.350	0.291
A2	1.400	0.800	0.055	0.031
B	16.500	14.500	0.650	0.571
C	4.750	4.200	0.187	0.165
C1	1.500	1.100	0.059	0.043
D	1.000	0.600	0.039	0.024
E	4.000	3.300	0.157	0.130
E1	3.800	3.400	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