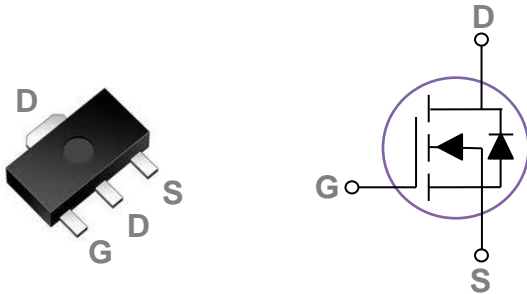# 60V N-Channel MOSFETs

PDK6912

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	75mΩ	5A

Features

- *60V,5A, RDS(ON) =75mΩ@VGS = 10V*
- *Improved dv/dt capability*
- *Fast switching*
- *100% EAS Guaranteed*
- *Green Device Available*

SOT89 Pin Configuration

Applications

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

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℃)	5	A
	Drain Current – Continuous (T_C=100℃)	3.2	A
I_{DM}	Drain Current – Pulsed[1]	20	A
EAS	Single Pulse Avalanche Energy[2]	25	mJ
IAS	Single Pulse Avalanche Current[2]	7	A
P_D	Power Dissipation (T_C=25℃)	1.79	W
	Power Dissipation – Derate above 25℃	0.014	W/℃
T_{STG}	Storage Temperature Range	-50 to 150	℃
T_J	Operating Junction Temperature Range	-50 to 150	℃

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	70	℃/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	30	℃/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	---	0.05	---	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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V , I$_D$=5A	---	60	75	mΩ
		V$_{GS}$=4.5V , I$_D$=3A	---	70	90	mΩ
V$_{GS(th)}$	Gate Threshold Voltage	V$_{GS}$=V$_{DS}$, I$_D$ =250uA	1.2	1.8	2.5	V
△V$_{GS(th)}$	V$_{GS(th)}$ Temperature Coefficient		---	-5	---	mV/℃
gfs	Forward Transconductance	V$_{DS}$=10V , I$_D$=3A	---	7	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q$_g$	Total Gate Charge[2,3]	V$_{DS}$=48V , V$_{GS}$=10V , I$_D$=5A	---	9.3	14	nC
Q$_{gs}$	Gate-Source Charge[2,3]		---	2.1	4	
Q$_{gd}$	Gate-Drain Charge[2,3]		---	1.8	4	
T$_{d(on)}$	Turn-On Delay Time[2,3]	V$_{DD}$=30V , V$_{GS}$=10V , R$_G$=3.3Ω I$_D$=1A	---	2.9	6	ns
T$_r$	Rise Time[2,3]		---	9.5	18	
T$_{d(off)}$	Turn-Off Delay Time[2,3]		---	18.4	35	
T$_f$	Fall Time[2,3]		---	5.3	10	
C$_{iss}$	Input Capacitance	V$_{DS}$=15V , V$_{GS}$=0V , F=1MHz	---	500	725	pF
C$_{oss}$	Output Capacitance		---	45	65	
C$_{rss}$	Reverse Transfer Capacitance		---	16	30	
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, F=1MHz	---	2	4	Ω

Drain-Source Diode Characteristics and Maximum Ratings

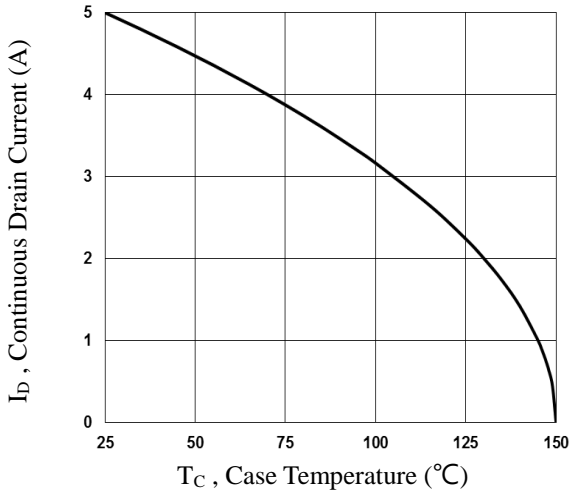| Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I$_S$	Continuous Source Current	V$_G$=V$_D$=0V , Force Current	---	---	5	A
I$_{SM}$	Pulsed Source Current		---	---	20	A
V$_{SD}$	Diode Forward Voltage	V$_{GS}$=0V , I$_S$=1A , T$_J$=25℃	---	---	1	V
t$_{rr}$	Reverse Recovery Time[2]	V$_{GS}$=30V,I$_S$=1A , dI/dt=100A/μs	---	23.2	---	ns
Q$_{rr}$	Reverse Recovery Charge[2]	T$_J$=25℃	---	14.3	---	nC

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V$_{DD}$=25V,V$_{GS}$=10V,L=1mH,I$_{AS}$=7A.,R$_G$=25Ω, Starting T$_J$=25℃
3. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
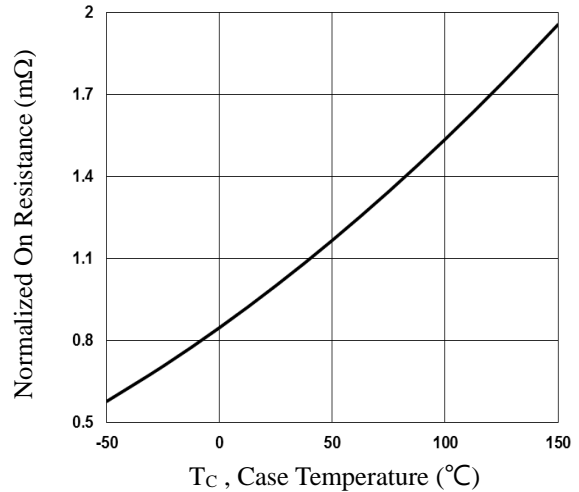4. Essentially independent of operating temperature.
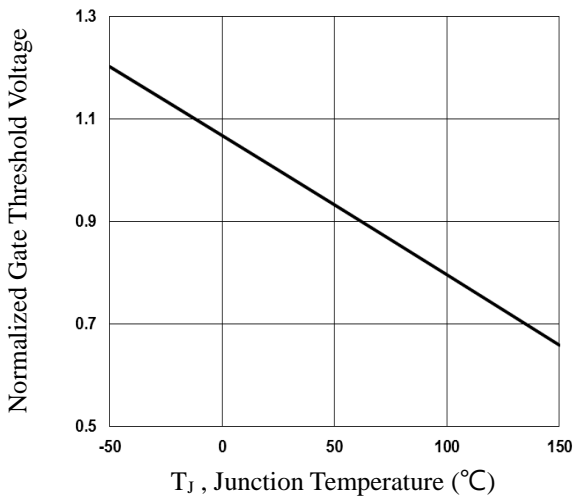
Fig.1   Typical Output Characteristics
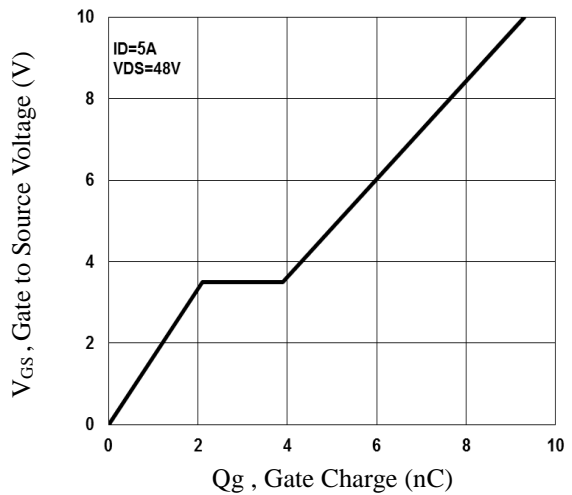

Fig.2   RDSON vs. Gate Voltage

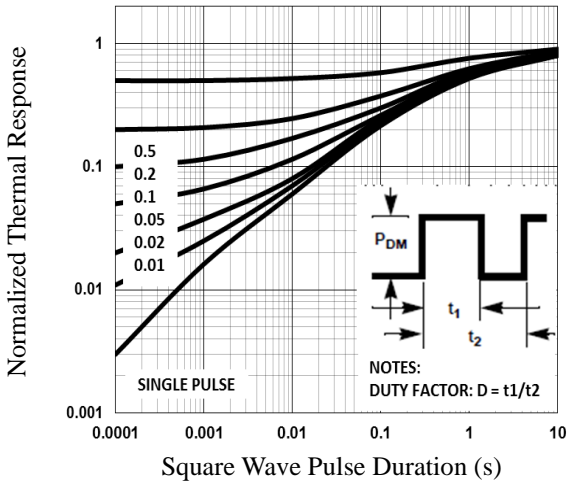**Fig.3   Continuous Drain Current vs. T$_C$**

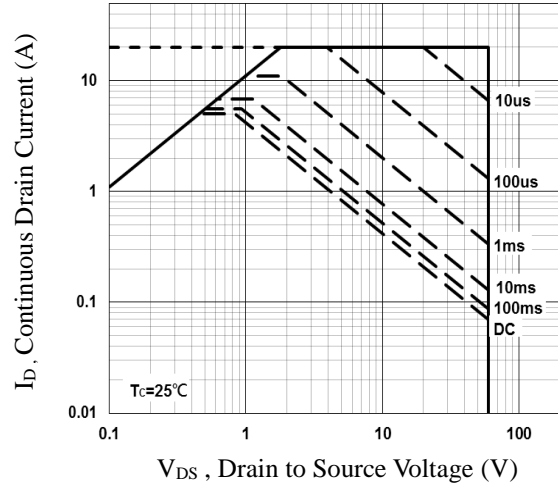**Fig.4   Normalized RDSON vs. T$_J$**
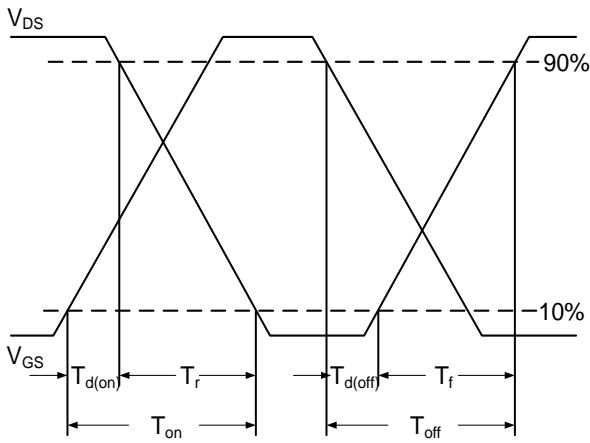

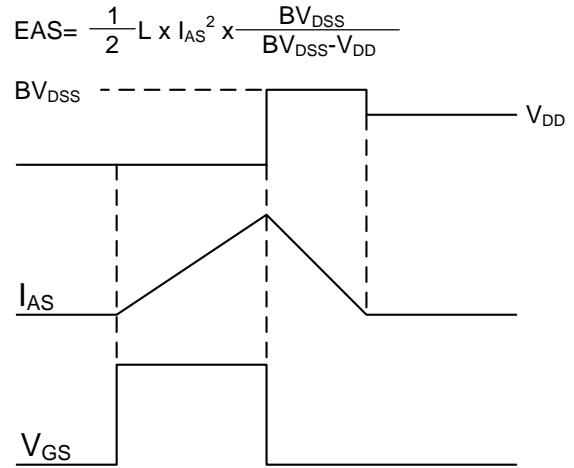**Fig.5   Normalized V$_{th}$ vs. T$_J$**

Fig.6   Gate Charge Waveform

Fig.7   Normalized Transient Response
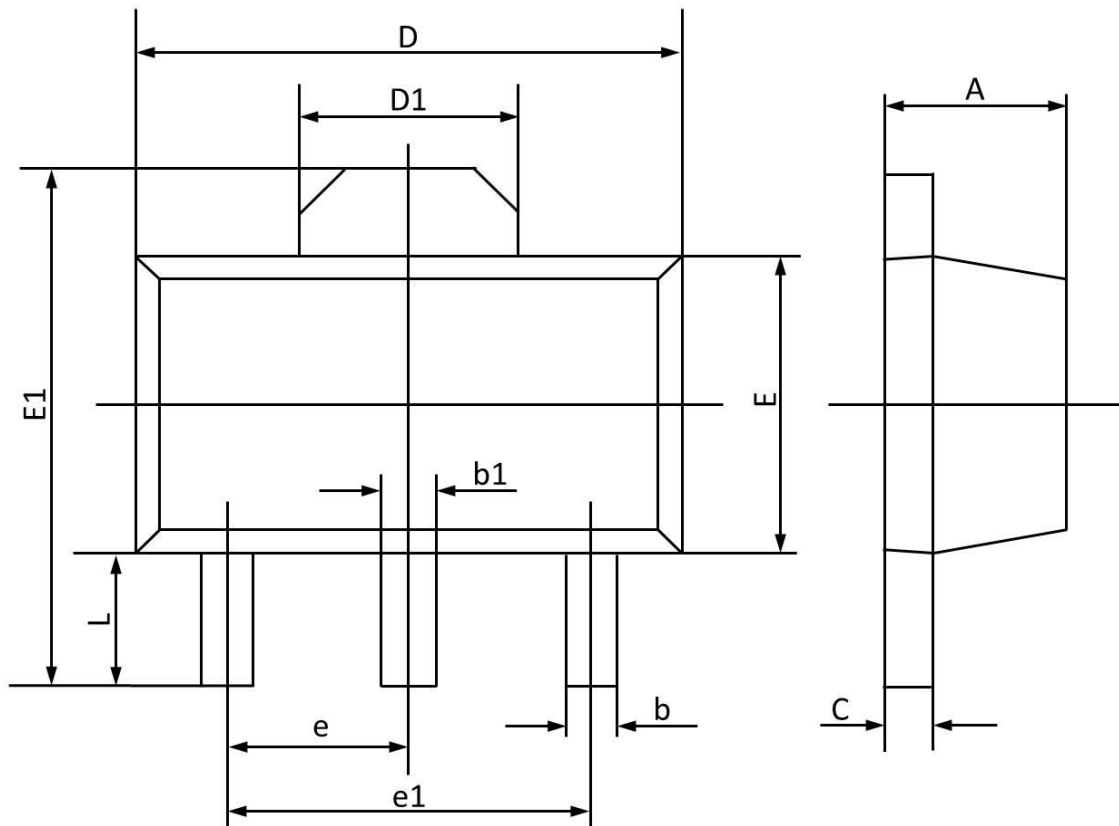

Fig.8   Maximum Safe Operation Area

Fig.9   Switching Time Waveform

$$EAS= \frac{1}{2}L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$

Fig.10   EAS Waveform

SOT89 PACKAGE INFORMATION

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047

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