40V P-Channel MOSFETs

PDD4959
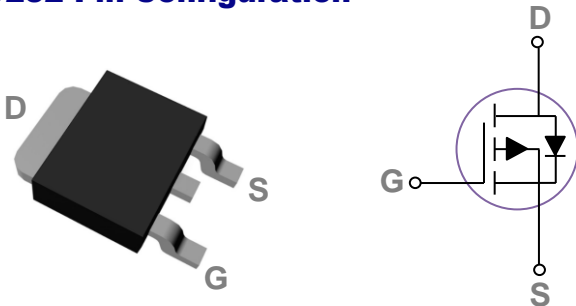
General Description

These P-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
-40V	5.8mΩ	-90A

Features

- *-40V,-90A, RDS(ON) =5.8mΩ@VGS = -10V*
- *Fast switching*
- *Green Device Available*
- *Suit for -4.5V Gate Drive Applications*

Applications

- *Notebook*
- *Load Switch*
- *Battery Protection*
- *Hand-held Instruments*

TO252 Pin Configuration

Absolute Maximum Ratings Tc=25℃ unless otherwise noted

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-40	V
V_{GS}	Gate-Source Voltage	±20	V
I_D	Drain Current – Continuous (T_C=25℃)	-90	A
	Drain Current – Continuous (T_C=100℃)	-57	A
I_{DM}	Drain Current – Pulsed[1]	-360	A
EAS	Single Pulse Avalanche Energy[2]	174	mJ
IAS	Single Pulse Avalanche Current[2]	-59	A
P_D	Power Dissipation (T_C=25℃)	101	W
	Power Dissipation – Derate above 25℃	0.81	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	---	1.23	℃/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	-40	---	---	V
I$_{DSS}$	Drain-Source Leakage Current	V_{DS}=-40V , V_{GS}=0V , T_J=25℃	---	---	-1	uA
		V_{DS}=-32V , 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=-25A	---	4.7	5.8	mΩ
		V_{GS}=-4.5V , I_D=-15A	---	6.4	8.3	mΩ
V$_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D=-250uA	-1.2	-1.6	-2.5	V
gfs	Forward Transconductance	V_{DS}=-10V , I_D=-3A	---	15	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q$_g$	Total Gate Charge[3,4]	V_{DS}=-20V , V_{GS}=-10V , I_D=-45A	---	115	160	nC
Q$_{gs}$	Gate-Source Charge[3,4]		---	16	25	
Q$_{gd}$	Gate-Drain Charge[3,4]		---	25	40	
T$_{d(on)}$	Turn-On Delay Time[3,4]	V_{DD}=-20V , V_{GS}=-10V , R_G=6Ω I_D=-45A	---	41.6	82	ns
T$_r$	Rise Time[3,4]		---	12.7	26	
T$_{d(off)}$	Turn-Off Delay Time[3,4]		---	308	600	
T$_f$	Fall Time[3,4]		---	70	140	
C$_{iss}$	Input Capacitance	V_{DS}=-20V , V_{GS}=0V , F=1MHz	---	6100	9100	pF
C$_{oss}$	Output Capacitance		---	600	900	
C$_{rss}$	Reverse Transfer Capacitance		---	540	810	
R$_g$	Gate resistance	V_{GS}=0V, V_{DS}=0V, F=1MHz	---	4.2	---	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	---	---	-90	A
I$_{SM}$	Pulsed Source Current		---	---	-180	A
V$_{SD}$	Diode Forward Voltage	V_{GS}=0V , I_S=-1A , T_J=25℃	---	---	-1	V
t$_{rr}$	Reverse Recovery Time	V_R=30V, I_S=10A	---	60	---	ns
Q$_{rr}$	Reverse Recovery Charge	di/dt=100A/μs , T_J=25℃	---	55	---	nC

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V_{DD}=-25V,V_{GS}=-10V,L=0.1mH,I_{AS}=-59A.,R_G=25Ω,Starting T_J=25℃
3. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
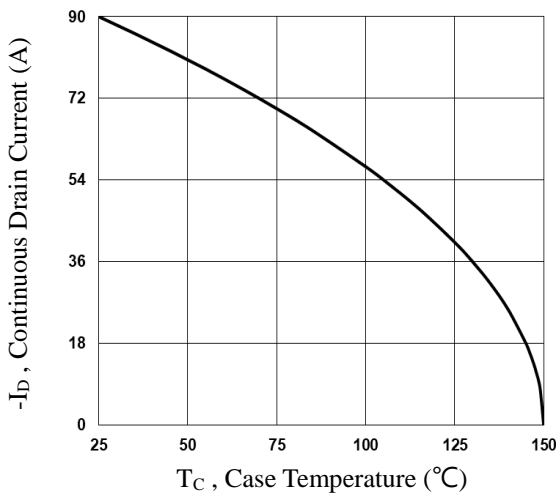4. Essentially independent of operating temperature.
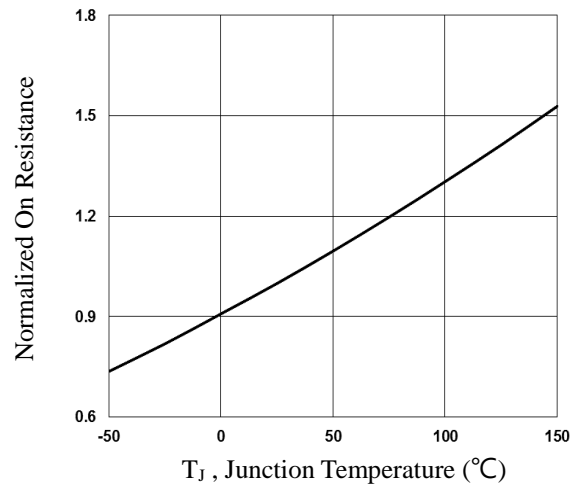
Fig.1   Continuous Drain Current vs. T_C

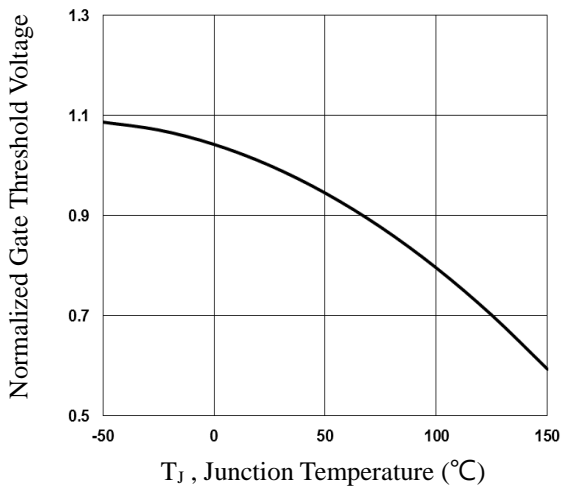Fig.2   Normalized RDSON vs. T_J
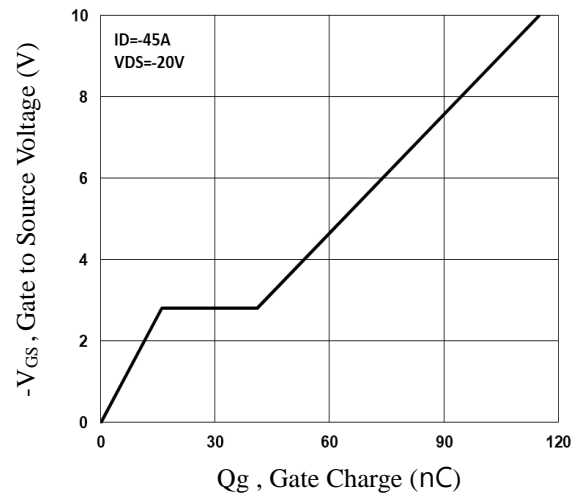

Fig.3   Normalized V_{th} vs. T_J
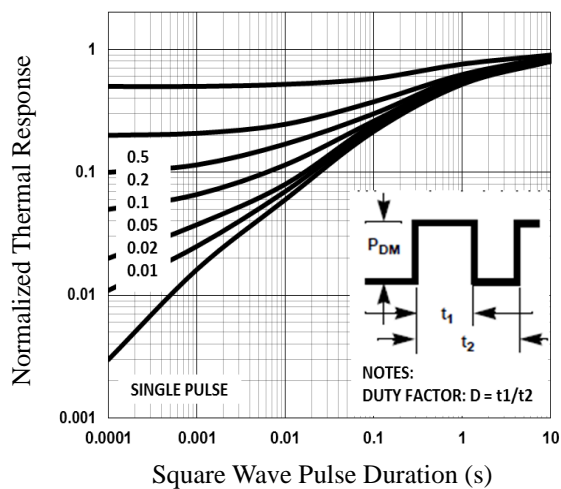

Fig.4   Gate Charge Waveform
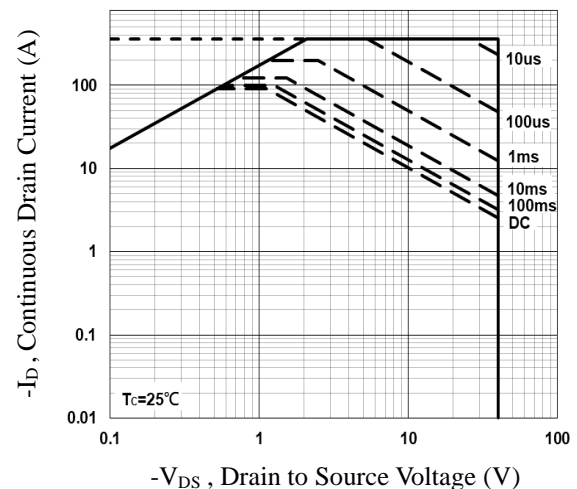

Fig.5   Normalized Transient Impedance

Fig.6   Maximum Safe Operation Area

Fig.7   Switching Time Waveform

Gate Charge

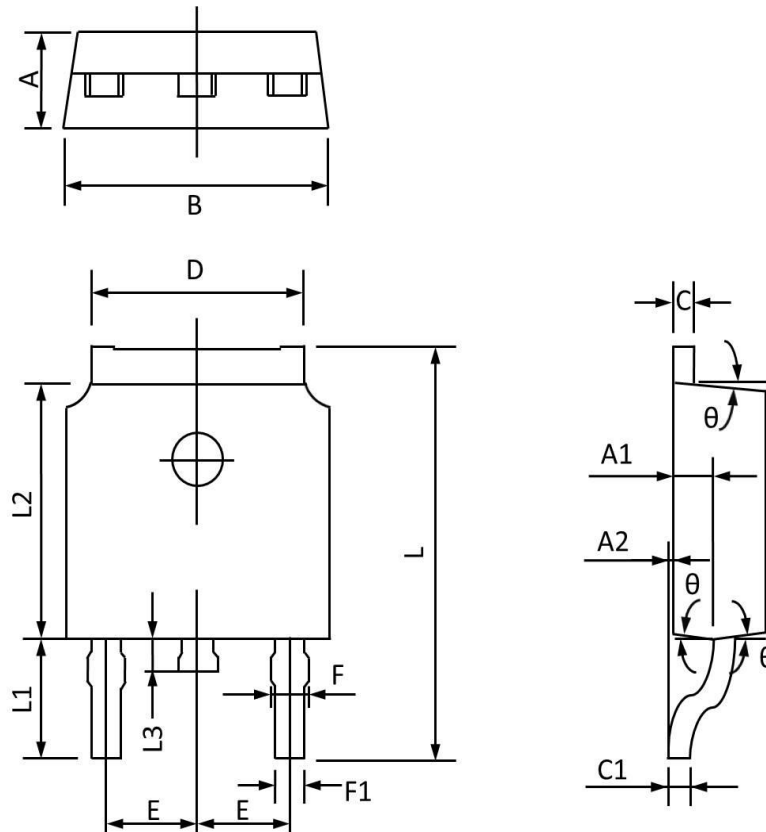**Fig.8   Gate Charge Waveform**

TO252 PACKAGE INFORMATION

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	2.450	2.150	0.096	0.085
A1	1.200	0.910	0.047	0.036
A2	0.150	0.000	0.006	0.000
B	6.800	6.300	0.268	0.248
C	0.580	0.350	0.023	0.014
C1	0.550	0.380	0.022	0.015
D	5.500	5.100	0.217	0.201
E	2.390	2.000	0.094	0.079
F	0.940	0.600	0.037	0.024
F1	0.860	0.500	0.034	0.020
L	10.400	9.400	0.409	0.370
L1	3.000	2.400	0.118	0.094
L2	6.200	5.300	0.244	0.209
L3	1.200	0.600	0.047	0.024
θ	9°	3°	9°	3°