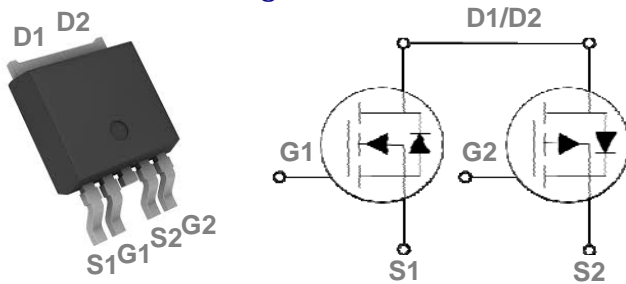# 40V N+P Dual Channel MOSFETs

PDD4701

General Description

These N+P dual 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	32mΩ	15A
-40V	40mΩ	-12A

Features

- *Fast switching*
- *Green Device Available*
- *Suit for 4.5V Gate Drive Applications*

TO252-4L Pin Configuration

Applications

- *DC Fan*
- *Motor Drive Applications*
- *Networking*
- *Half / Full Bridge Topology*

Absolute Maximum Ratings Tc=25℃ unless otherwise noted

Symbol	Parameter	Rating		Units
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D	Drain Current – Continuous (T_C=25℃)	15	-12	A
	Drain Current – Continuous (T_C=100℃)	9	-7	A
I_{DM}	Drain Current – Pulsed[1]	60	-48	A
P_D	Power Dissipation (T_C=25℃)	20		W
	Power Dissipation – Derate above 25℃	0.16		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
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	6	℃/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	---	62	℃/W

N-CH Electrical Characteristics (T$_J$=25 ℃, unless otherwise)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV$_{DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$=0V , I$_D$=250uA	40	---	---	V
ΔBV$_{DSS}$/ΔT$_J$	BV$_{DSS}$ Temperature Coefficient	Reference to 25℃ , I$_D$=1mA	---	0.04	---	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

R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V , I$_D$=6A	---	26	32	mΩ
		V$_{GS}$=4.5V , I$_D$=4A	---	36	42	mΩ
V$_{GS(th)}$	Gate Threshold Voltage	V$_{GS}$=V$_{DS}$, I$_D$ =250uA	1.2	1.6	2.5	V
ΔV$_{GS(th)}$	V$_{GS(th)}$ Temperature Coefficient		---	-3	---	mV/℃
gfs	Forward Transconductance	V$_{DS}$=10V , I$_D$=3A	---	6.5	---	S

Dynamic and switching Characteristics

Q$_g$	Total Gate Charge[2,3]	V$_{DS}$=20V , V$_{GS}$=4.5V , I$_D$=6A	---	5.2	10	nC
Q$_{gs}$	Gate-Source Charge[2,3]		---	1.2	2.4	
Q$_{gd}$	Gate-Drain Charge[2,3]		---	2.5	5	
T$_{d(on)}$	Turn-On Delay Time[2,3]	V$_{DD}$=20V , V$_{GS}$=4.5V , R$_G$=25Ω I$_D$=1A	---	3.2	6	ns
T$_r$	Rise Time[2,3]		---	8.6	16	
T$_{d(off)}$	Turn-Off Delay Time[2,3]		---	18	36	
T$_f$	Fall Time[2,3]		---	6	12	
C$_{iss}$	Input Capacitance	V$_{DS}$=15V , V$_{GS}$=0V , F=1MHz	---	420	800	pF
C$_{oss}$	Output Capacitance		---	65	120	
C$_{rss}$	Reverse Transfer Capacitance		---	40	80	

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	---	---	15	A
I$_{SM}$	Pulsed Source Current		---	---	30	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. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
3. Essentially independent of operating temperature.
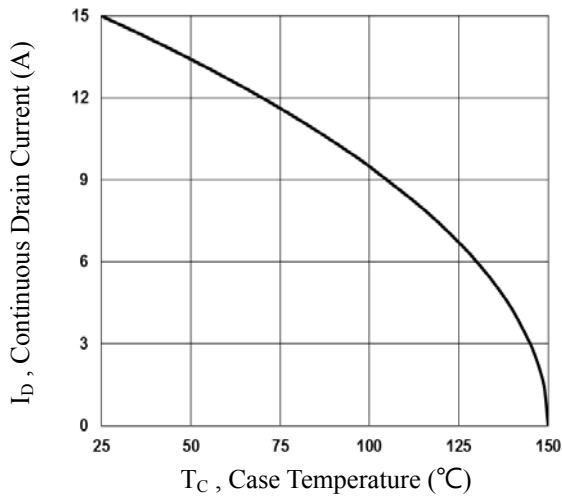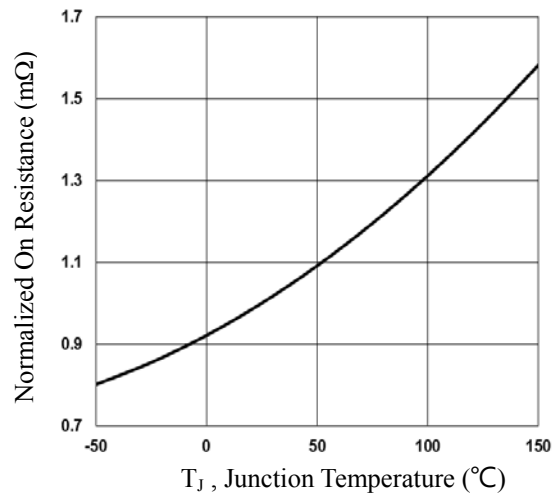
Fig.1   Continuous Drain Current vs. T_C
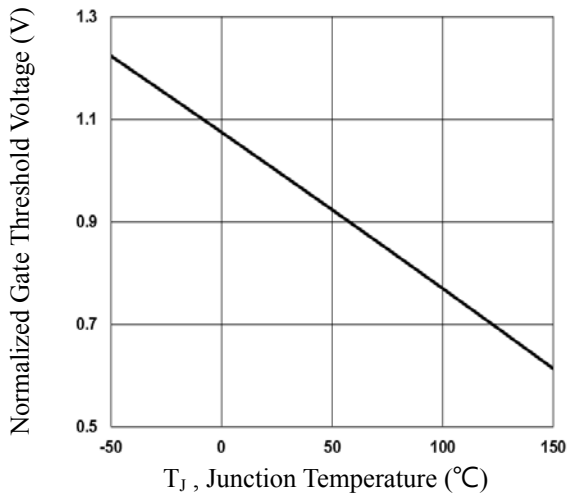

Fig.2   Normalized RDSON vs. T_J
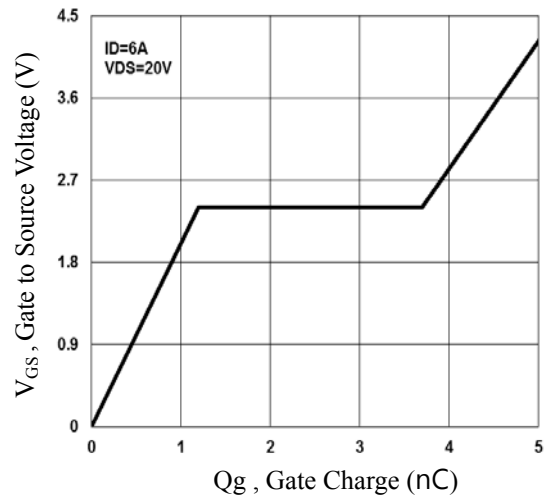

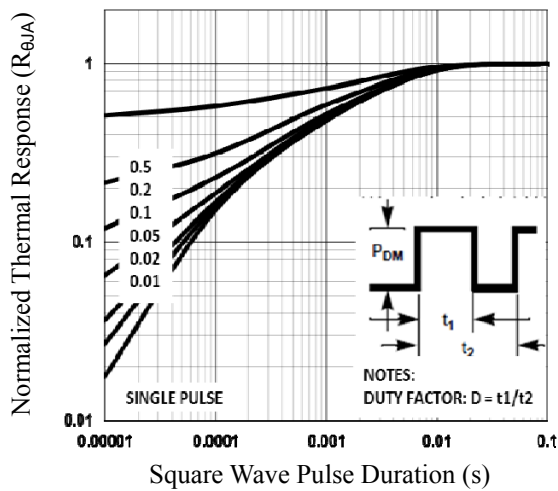Fig.3   Normalized V_{th} vs. T_J

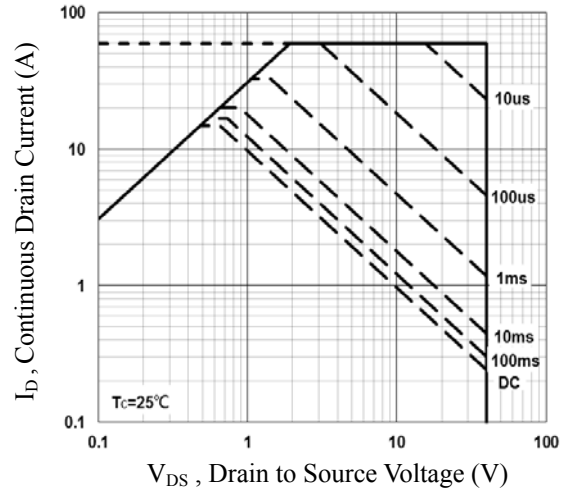Fig.4   Gate Charge Waveform

Fig.5   Normalized Transient Impedance

Fig.6   Maximum Safe Operation Area

P-CH Electrical Characteristics (T$_J$=25 ℃, unless otherwise

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV$_{DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$=0V , I$_D$=-250uA	-40	---	---	V
△BV$_{DSS}$/△T$_J$	BV$_{DSS}$ Temperature Coefficient	Reference to 25℃ , I$_D$=-1mA	---	-0.04	---	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$_{GS}$=±10V , 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	---	30	40	mΩ
		V$_{GS}$=-4.5V , I$_D$=-3A	---	42	52	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		---	3	---	mV/℃
gfs	Forward Transconductance	V$_{DS}$=-10V , I$_D$=-3A	---	9	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q$_g$	Total Gate Charge[2,3]	V$_{DS}$=-20V , V$_{GS}$=-4.5V , I$_D$=-5A	---	9	15	nC
Q$_{gs}$	Gate-Source Charge[2,3]		---	2.5	5	
Q$_{gd}$	Gate-Drain Charge[2,3]		---	3.2	7	
T$_{d(on)}$	Turn-On Delay Time[2,3]	V$_{DD}$=-20V , V$_{GS}$=-4.5V , R$_G$=25Ω I$_D$=-1A	---	20	40	ns
T$_r$	Rise Time[2,3]		---	12	24	
T$_{d(off)}$	Turn-Off Delay Time[2,3]		---	46	80	
T$_f$	Fall Time[2,3]		---	6	12	
C$_{iss}$	Input Capacitance	V$_{DS}$=-15V , V$_{GS}$=0V , F=1MHz	---	1050	1600	pF
C$_{oss}$	Output Capacitance		---	110	160	
C$_{rss}$	Reverse Transfer Capacitance		---	80	120	

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	---	---	-12	A
I$_{SM}$	Pulsed Source Current		---	---	-24	A
V$_{SD}$	Diode Forward Voltage	V$_{GS}$=0V , I$_S$=-1A , T$_J$=25℃	---	---	-1	V

Note :
4. Repetitive Rating : Pulsed width limited by maximum junction temperature.
5. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
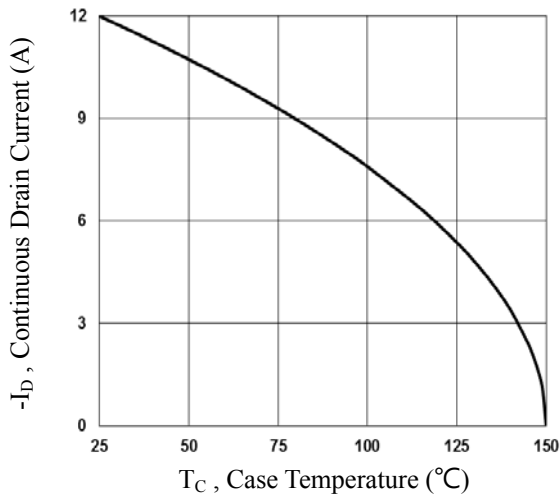6. Essentially independent of operating temperature.

Fig.7   Continuous Drain Current vs. T_C
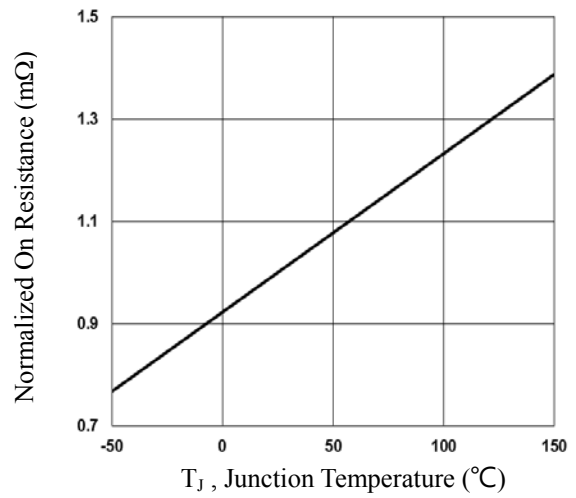

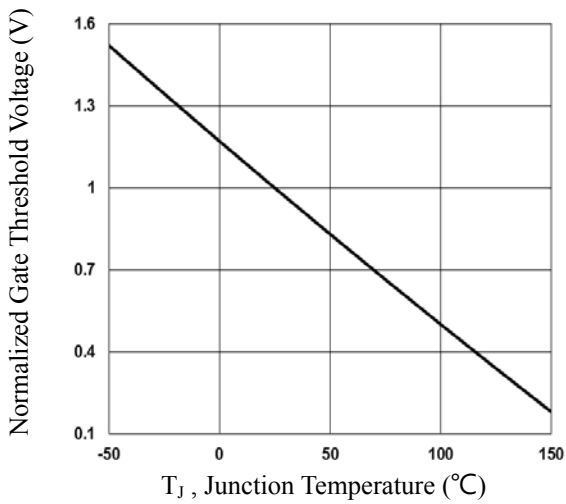Fig.8   Normalized RDSON vs. T_J

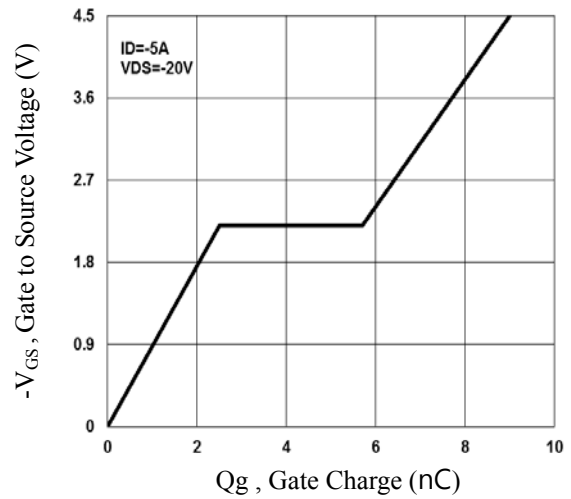Fig.9   Normalized V_{th} vs. T_J
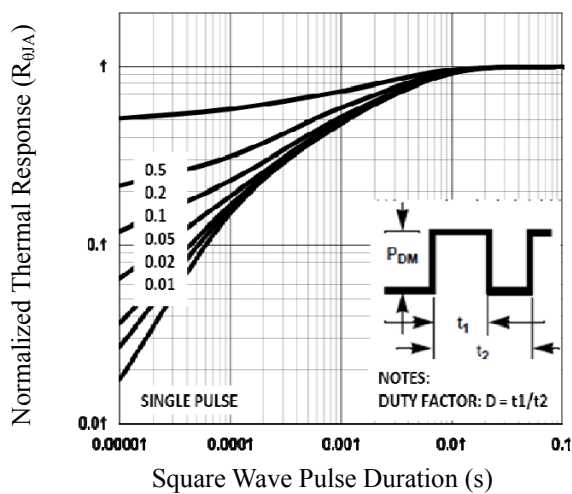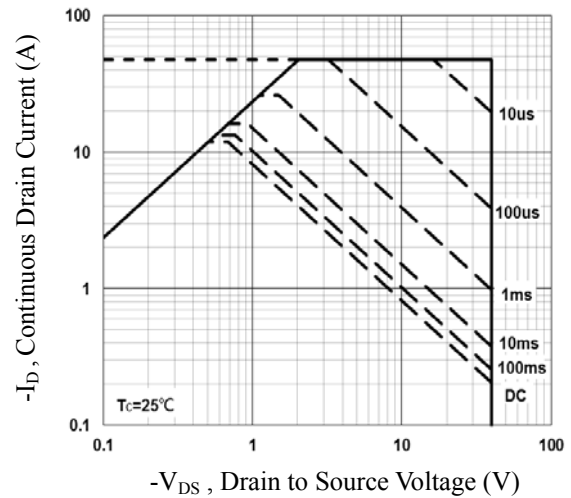

Fig.10   Gate Charge Waveform

Fig.11   Normalized Transient Impedance

Fig.12   Maximum Safe Operation Area