

30VN+P Dual Channel MOSFETs

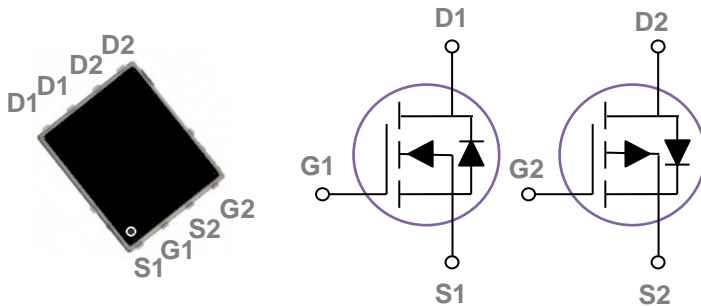
RC3701T

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	R _{DS(on)}	I _D
30V	13mΩ	23A
-30V	28mΩ	-15A

PPAK5x6 Dual Pin Configuration



Features

- Fast switching
- Green Device Available
- Suit for 4.5V Gate Drive Applications
- 100% EAS Guaranteed

Applications

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

Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Rating		Units
V _{DS}	Drain-Source Voltage	30	-30	V
V _{GS}	Gate-Source Voltage	±20	±20	V
I _D	Drain Current – Continuous ($T_c=25^\circ\text{C}$)	23	-15	A
	Drain Current – Continuous ($T_c=100^\circ\text{C}$)	15	-10	A
I _{DM}	Drain Current – Pulsed ¹	90	-60	A
EAS	Single Pulse Avalanche Energy ^{2,6}	39	39	mJ
IAS	Single Pulse Avalanche Current ²	28	28	A
P _D	Power Dissipation ($T_c=25^\circ\text{C}$)	17		W
	Power Dissipation – Derate above 25°C	0.14		W/°C
T _{STG}	Storage Temperature Range	-55 to 150		°C
T _J	Operating Junction Temperature Range	-55 to 150		°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R _{θJA}	Thermal Resistance Junction to ambient	---	62.5	°C/W
R _{θJC}	Thermal Resistance Junction to Case	---	7.2	°C/W

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N-CH Electrical Characteristics (T_J=25 °C, unless otherwise)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	30	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.04	---	V/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =30V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =24V, V _{GS} =0V, T _J =125°C	---	---	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 =10A	---	10	12	mΩ
		V _{GS} =4.5V, I _D =5A	---	13	18	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.2	1.5	2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-4	---	mV/°C
g _{fs}	Forward Transconductance	V _{DS} =5V, I _D =5A	---	6.4	---	S

Dynamic and switching Characteristics

Q _g	Total Gate Charge ^{3,4}	V _{DS} =15V, V _{GS} =4.5V, I _D =5A	---	7.4	12	nC
Q _{gs}	Gate-Source Charge ^{3,4}		---	2.3	5	
Q _{gd}	Gate-Drain Charge ^{3,4}		---	3	6	
T _{d(on)}	Turn-On Delay Time ^{3,4}	V _{DD} =15V, V _{GS} =10V, R _G =6Ω I _D =1A	---	3.8	7	ns
T _r	Rise Time ^{3,4}		---	10	19	
T _{d(off)}	Turn-Off Delay Time ^{3,4}		---	22	42	
T _f	Fall Time ^{3,4}		---	6.6	13	
C _{iss}	Input Capacitance	V _{DS} =25V, V _{GS} =0V, F=1MHz	---	620	900	pF
C _{oss}	Output Capacitance		---	85	125	
C _{rss}	Reverse Transfer Capacitance		---	60	90	
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	---	2.8	5.6	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	---	---	23	A
I _{SM}	Pulsed Source Current		---	---	47	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=28A., R_G=25Ω, Starting T_J=25°C.
3. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.

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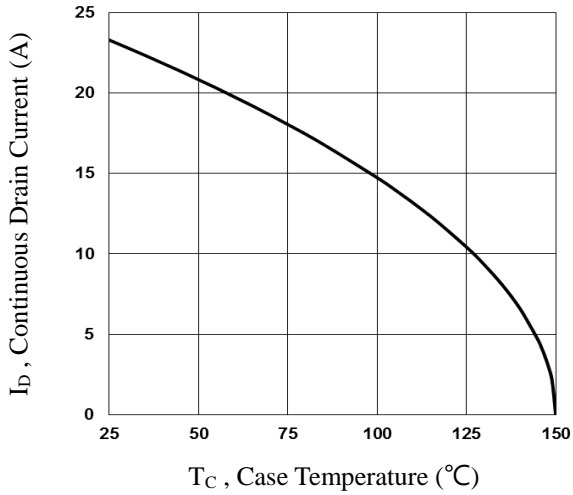


Fig.1 Continuous Drain Current vs. T_c

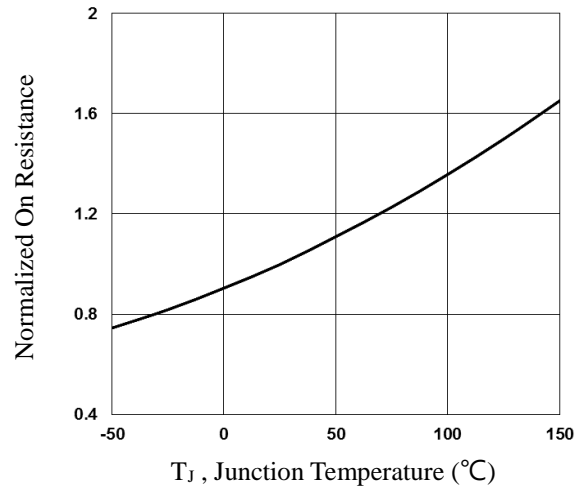


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

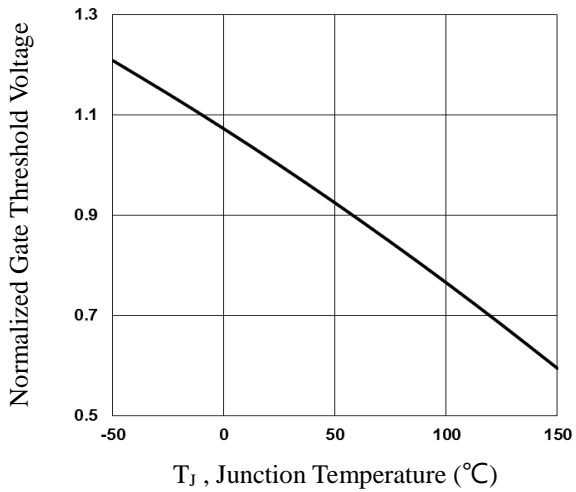


Fig.3 Normalized V_{th} vs. T_j

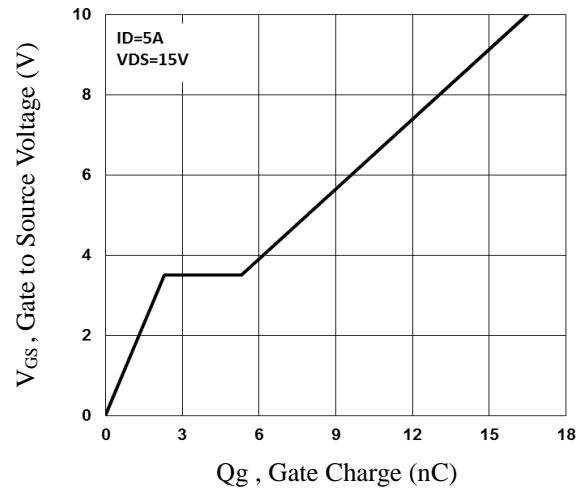


Fig.4 Gate Charge Waveform

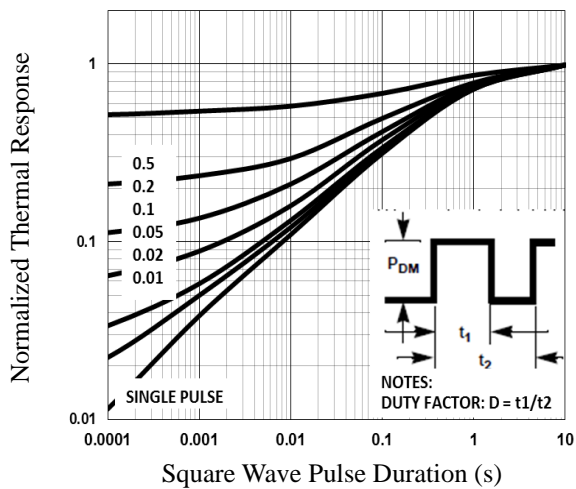


Fig.5 Normalized Transient Response

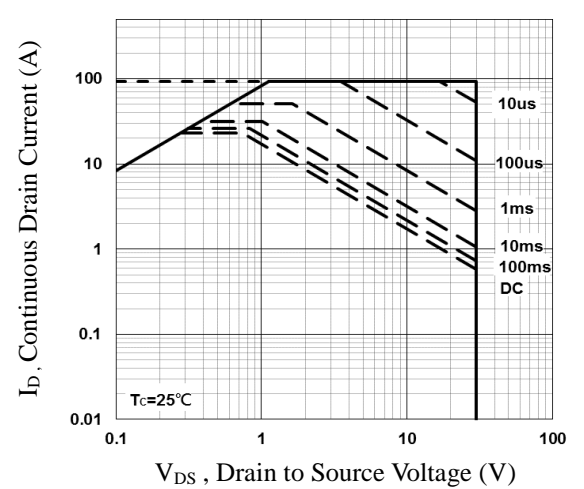


Fig.6 Maximum Safe Operation Area

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P-CH Electrical Characteristics (T_J=25 °C, unless otherwise

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-30	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.03	---	V/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-30V, V _{GS} =0V, T _J =25°C	---	---	-1	uA
		V _{DS} =-24V, V _{GS} =0V, T _J =125°C	---	---	-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 =-7A	---	25	29	mΩ
		V _{GS} =-4.5V, I _D =-4A	---	35	46	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		---	4	---	mV/°C
g _{fs}	Forward Transconductance	V _{DS} =-10V, I _D =-3A	---	5.4	---	S

Dynamic and switching Characteristics

Q _g	Total Gate Charge ^{7,8}	V _{DS} =-15V, V _{GS} =-4.5V, I _D =-5A	---	8	15	nC
Q _{gs}	Gate-Source Charge ^{7,8}		---	3.3	6	
Q _{gd}	Gate-Drain Charge ^{7,8}		---	2.3	5	
T _{d(on)}	Turn-On Delay Time ^{7,8}	V _{DD} =-15V, V _{GS} =-10V, R _G =6Ω I _D =-1A	---	4.6	9	ns
T _r	Rise Time ^{7,8}		---	14	26	
T _{d(off)}	Turn-Off Delay Time ^{7,8}		---	34	58	
T _f	Fall Time ^{7,8}		---	18	35	
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, F=1MHz	---	757	1280	pF
C _{oss}	Output Capacitance		---	122	210	
C _{rss}	Reverse Transfer Capacitance		---	88	175	

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°C	---	---	-1	V

Note :

5. Repetitive Rating : Pulsed width limited by maximum junction temperature.
6. V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-28A., R_G=25Ω, Starting T_J=25°C
7. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
8. Essentially independent of operating temperature.

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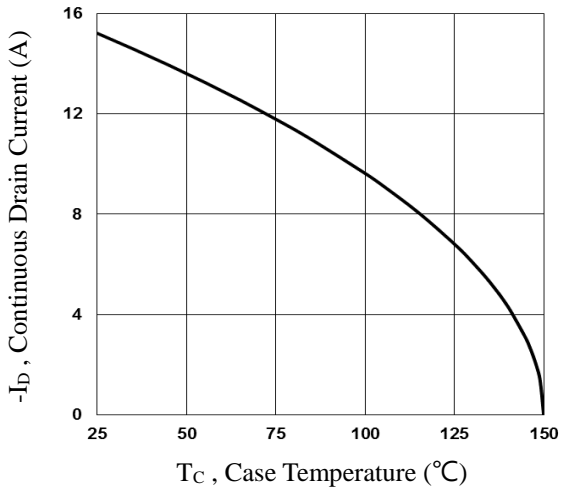


Fig.7 Continuous Drain Current vs. T_c

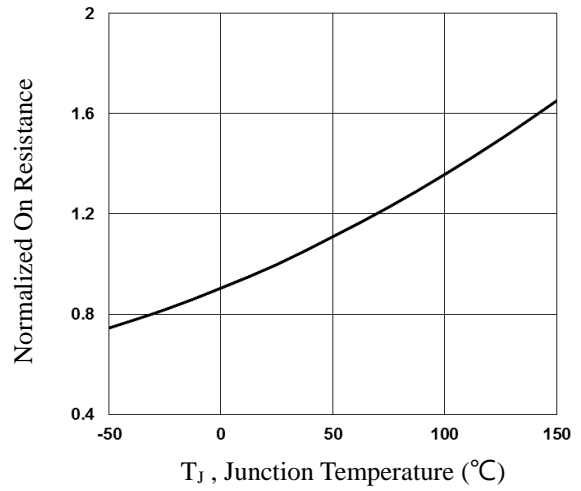


Fig.8 Normalized $R_{DS(on)}$ vs. T_j

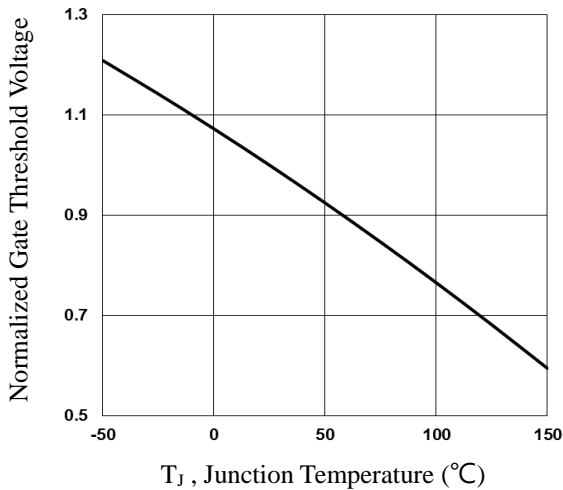


Fig.9 Normalized V_{th} vs. T_j

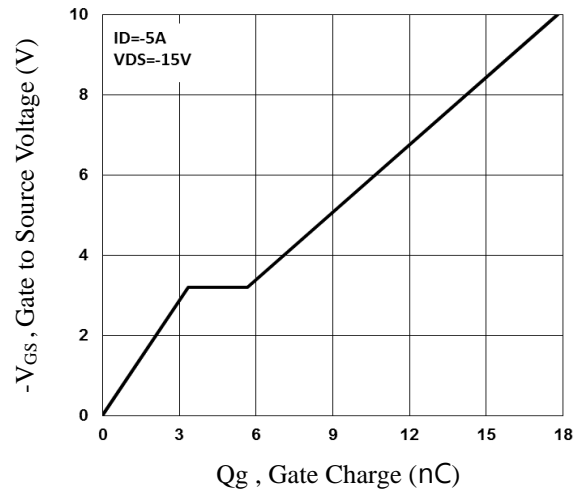


Fig.10 Gate Charge Waveform

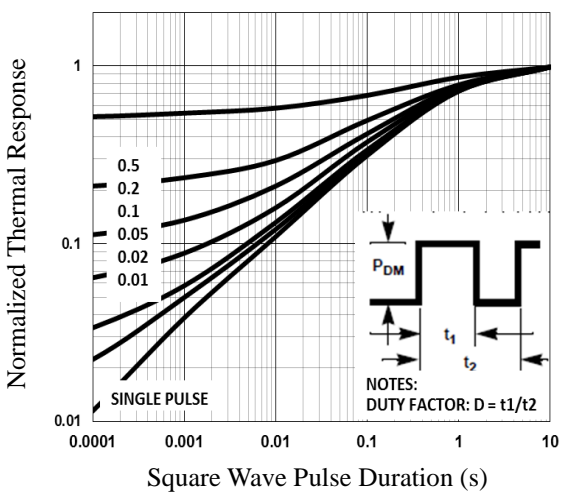


Fig.11 Normalized Transient Impedance

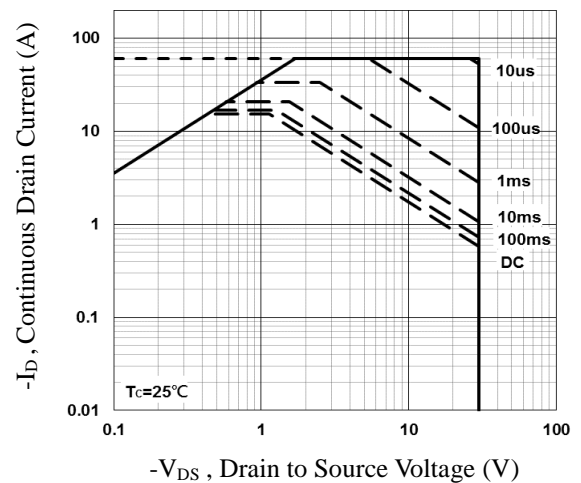


Fig.12 Maximum Safe Operation Area