

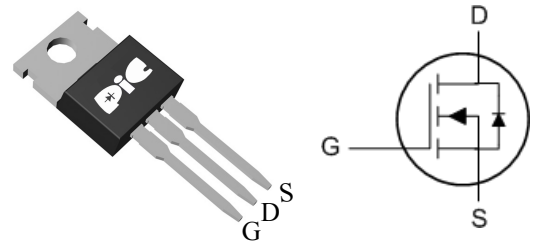
## ➤ General Description

This PAN00TG04G N-Channel enhancement mode power field effect transistor is the high density trench technology and this advanced technology can provide excellent  $R_{ds(On)}$  performance and efficiency for power switching and load switching application., this device also comply with the RoHS and Green Product requirement with full function reliability approved.

## ➤ Feature

- Super Low Gate Charge
- 100% EAS Guaranteed
- Green Device Available
- Excellent  $CdV/dt$  effect decline
- Advanced high cell density Trench technology
- TO-220 package design

## ➤ TO-220



## ➤ Application

- SMPS Power Supplier.
- Charger Adapter
- Power Tools
- LED Lighting

## ➤ Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current, $V_{GS} @ 10V^1$	$I_D @ T_C=25^\circ C$	18	A
Continuous Drain Current, $V_{GS} @ 10V^1$	$I_D @ T_C=100^\circ C$	12	A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	40	A
Single Pulse Avalanche Energy <sup>3</sup>	EAS	6.1	mJ
Avalanche Current	$I_{AS}$	11	A
Total Power Dissipation <sup>3</sup>	$P_D @ T_C=25^\circ C$	59	W
Storage Temperature Range	$T_{STG}$	-55 to 150	$^\circ C$
Operating Junction Temperature Range	$T_J$	-55 to 150	$^\circ C$
Thermal Resistance Junction-ambient <sup>1</sup>	$R_{\theta JA}$	62	$^\circ C/W$
Thermal Resistance Junction-Case <sup>1</sup>	$R_{\theta JC}$	2.1	$^\circ C/W$

## ➤ Electrical Characteristics (T<sub>J</sub> =25°C Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V , I <sub>D</sub> =250uA	100	---	---	V
Static Drain-Source On-Resistance <sup>2</sup>	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V , I <sub>D</sub> =10A	---	---	112	mΩ
		V <sub>GS</sub> =4.5V , I <sub>D</sub> =8A	---	---	120	mΩ
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.0	---	2.5	V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =80V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =80V , V <sub>GS</sub> =0V , T <sub>J</sub> =55°C	---	---	5	
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V , V <sub>DS</sub> =0V	---	---	±100	nA
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> =5V , I <sub>D</sub> =10A	---	13	---	S
Gate Resistance	R <sub>g</sub>	V <sub>DS</sub> =0V , V <sub>GS</sub> =0V , f=1MHz	---	2	---	Ω
Total Gate Charge (10V)	Q <sub>g</sub>	V <sub>DS</sub> =80V , V <sub>GS</sub> =10V , I <sub>D</sub> =10A	---	26.2	---	nC
Gate-Source Charge	Q <sub>gs</sub>		---	4.6	---	
Gate-Drain Charge	Q <sub>gd</sub>		---	5.1	---	
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>DD</sub> =50V , V <sub>GS</sub> =10V , R <sub>G</sub> =3.3Ω I <sub>D</sub> =10A	---	4.2	---	ns
Rise Time	T <sub>r</sub>		---	8.2	---	
Turn-Off Delay Time	T <sub>d(off)</sub>		---	35.6	---	
Fall Time	T <sub>f</sub>		---	9.6	---	
Input Capacitance	C <sub>iSS</sub>	V <sub>DS</sub> =15V , V <sub>GS</sub> =0V , f=1MHz	---	1535	---	pF
Output Capacitance	C <sub>oss</sub>		---	60	---	
Reverse Transfer Capacitance	C <sub>rSS</sub>		---	37	---	

## ➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current <sup>1,5</sup>	I <sub>S</sub>	V <sub>G</sub> =V <sub>D</sub> =0V , Force Current	---	---	10	A
Diode Forward Voltage <sup>2</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V , I <sub>S</sub> =1A , T <sub>J</sub> =25°C	---	---	1.2	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =10A , dI/dt=100A/μs , T <sub>J</sub> =25°C	---	37	---	nS
Reverse Recovery Charge	Q <sub>rr</sub>		---	27.3	---	nC

Note :

- 1.Pulse width limited by maximum junction temperature.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The EAS data shows Max. rating . The test condition is V<sub>DD</sub>=25V,V<sub>GS</sub>=10V,L=0.1mH,I<sub>AS</sub>=11A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> in real applications , should be limited by total power dissipation.

## ➤ Typical Characteristics

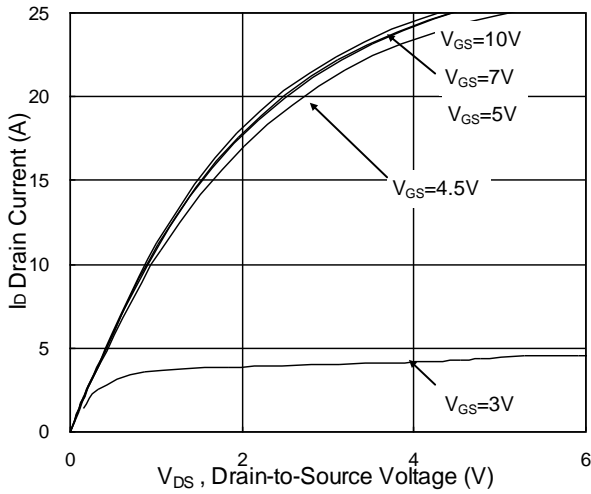


Fig.1 Typical Output Characteristics

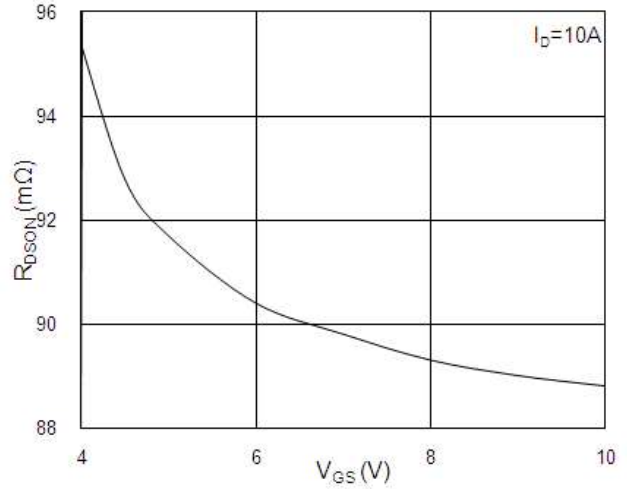


Fig.2 On-Resistance vs G-S Voltage

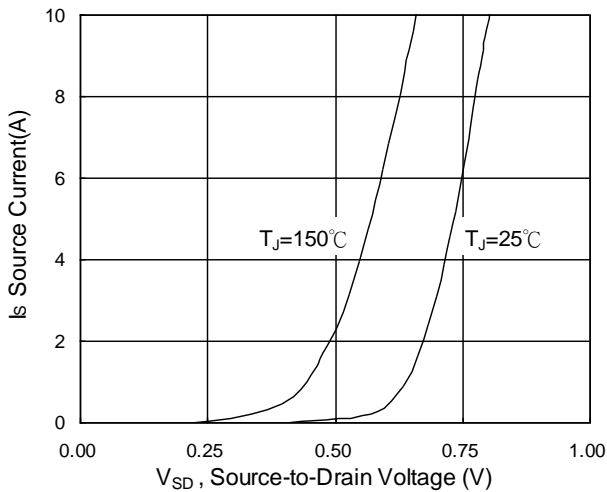


Fig.3 Source Drain Forward Characteristics

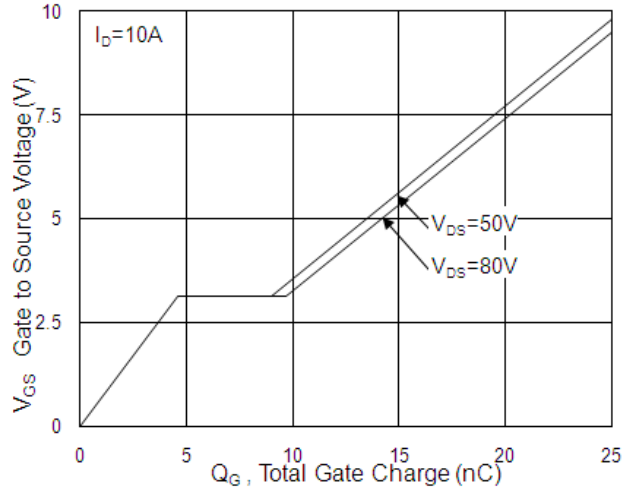


Fig.4 Gate-Charge Characteristics

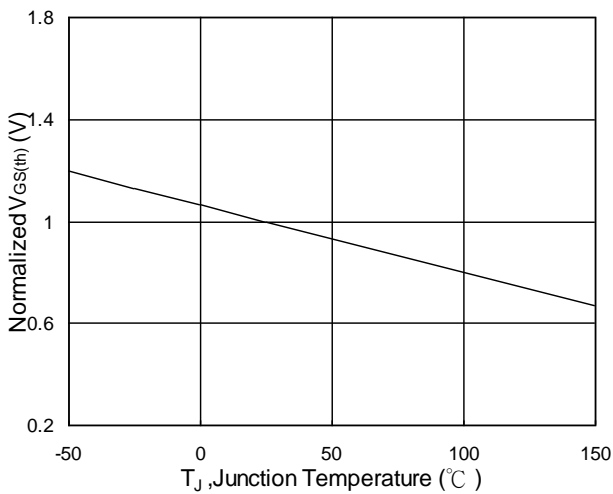


Fig.5 Normalized  $V_{GS(th)}$  vs  $T_J$

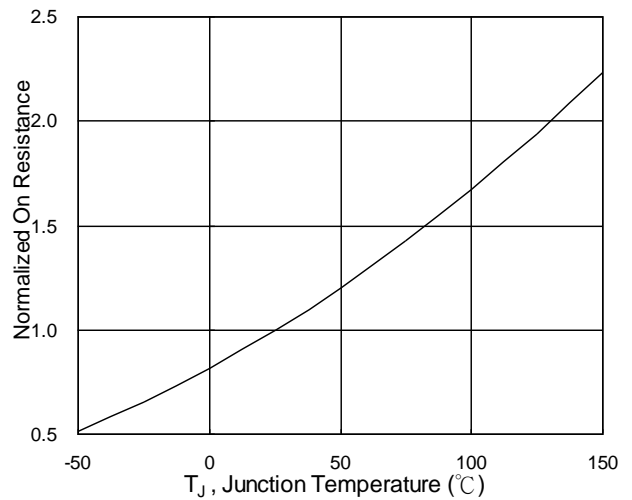


Fig.6 Normalized  $R_{DS(ON)}$  vs  $T_J$

N-Ch 100V Fast Switching MOSFET  
 $V_{DS}=100V$ ,  $I_D=18A$ ,  $R_{DS(ON)}=112m\Omega$

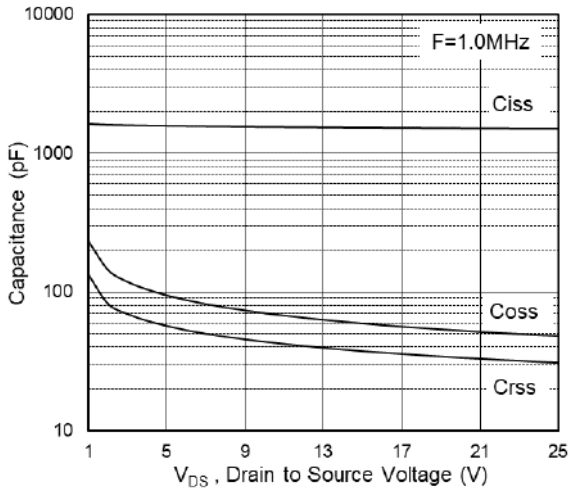


Fig.7 Capacitance

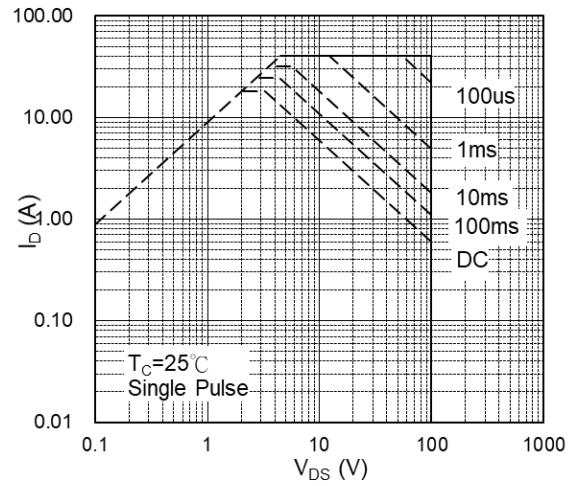


Fig.8 Safe Operating Area

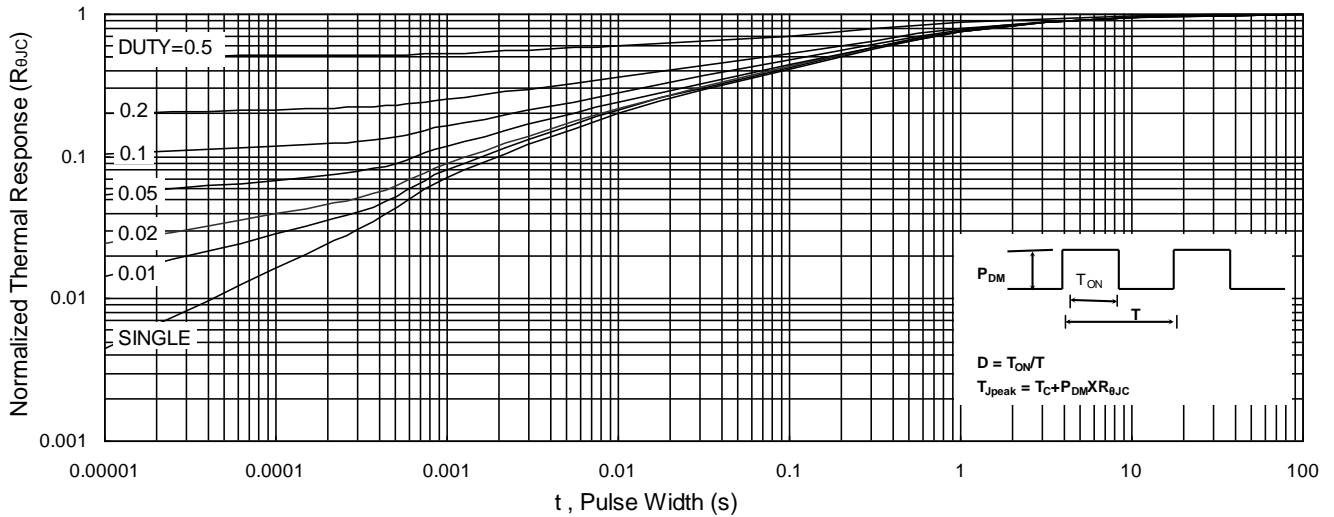


Fig.9 Normalized Maximum Transient Thermal Impedance

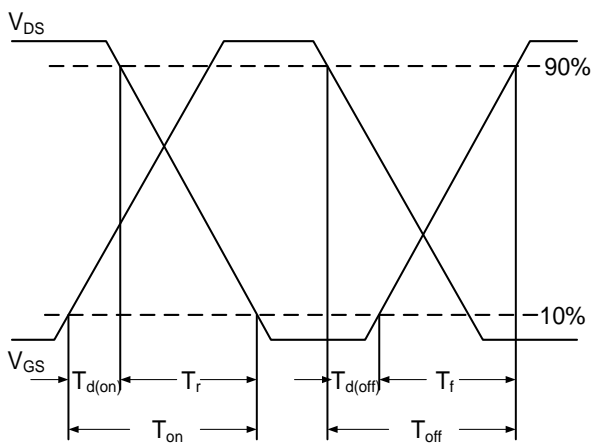


Fig.10 Switching Time Waveform

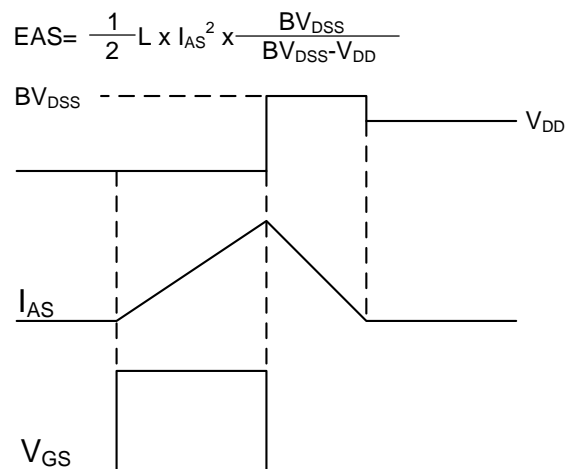


Fig.11 Unclamped Inductive Switching Waveform

## ➤ Recommend IR Reflow Soldering Thermal Profile

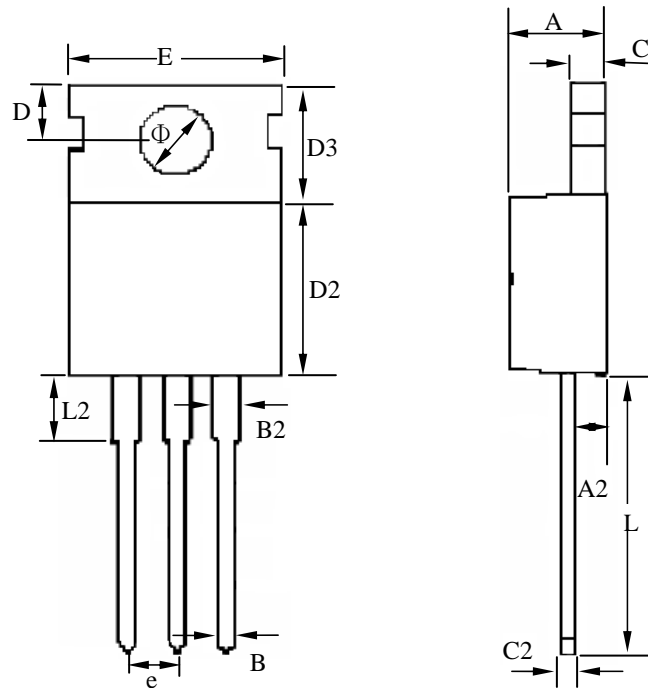


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	150°C
Temperature Max. (T <sub>smax</sub> )	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds
Average Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.
Liquidous Temperature (T <sub>L</sub> )	217°C
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60 – 150 seconds
Peak Temperature	260°C +0°C / -5°C
Time (t <sub>P</sub> ) within 5°C of actual Peak Temperature	30 seconds
Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.

## ➤ Ordering Information

Part Number	Description	Quantity
PAN00TG04G	TO-220	50 pcs/tube

### ➤ Package Information ( TO-220 )



SYMBOLS	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.25	--	4.80	0.167	--	0.189
A2	2.20	--	2.92	0.087	--	0.115
B	0.70	--	0.91	0.028	--	0.036
B2	1.15	--	1.77	0.045	--	0.070
C	1.20	--	1.40	0.047	--	0.055
C2	0.45	--	0.61	0.018	--	0.024
D	2.54	--	3.00	0.100	--	0.118
D2	8.39	--	9.47	0.330	--	0.373
D3	6.30	--	6.70	0.248	--	0.264
E	9.70	--	10.36	0.382	--	0.408
L	12.75	--	14.40	0.502	--	0.567
L2	2.45	--	4.05	0.096	--	0.159
Φ	3.50	--	3.80	0.138	--	0.150
e	--	2.54	--	--	0.100	--

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