

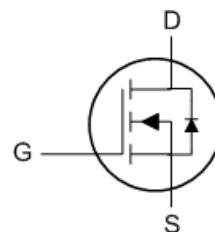
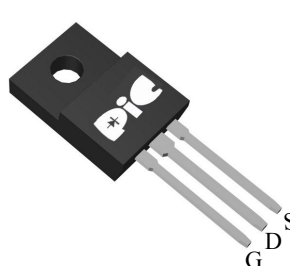
➤ General Description

This PAN00SF94GF 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 C_{dv}/dt effect decline
- Advanced high cell density Trench technology

➤ TO220F



➤ 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}	± 20	V
Continuous Drain Current ¹	$I_D @ T_C=25^\circ C$	36	A
Continuous Drain Current ¹	$I_D @ T_C=100^\circ C$	25	A
Pulsed Drain Current ²	I_{DM}	120	A
Single Pulse Avalanche Energy ³	EAS	33	mJ
Avalanche Current	I_{AS}	15	A
Total Power Dissipation ⁴	$P_D @ T_C=25^\circ C$	56.5	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 ¹	$R_{\theta JA}$	60	$^\circ C/W$
Thermal Resistance Junction-Case ¹	$R_{\theta JC}$	4.5	$^\circ C/W$

➤ Electrical Characteristics ($T_J=25^\circ C$ Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V$, $I_D=250\mu A$	100	---	---	V
Static Drain-Source On-Resistance ²	$R_{DS(ON)}$	$V_{GS}=10V$, $I_D=20A$	---	8.5	12	$m\Omega$
Static Drain-Source On-Resistance ²		$V_{GS}=4.5V$, $I_D=15A$	---	12	15	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.2	---	2.4	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=80V$, $V_{GS}=0V$, $T_J=25^\circ C$	---	---	1	μA
		$V_{DS}=80V$, $V_{GS}=0V$, $T_J=55^\circ C$	---	---	5	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
Total Gate Charge (10V)	Q_g	$V_{DS}=50V$, $V_{GS}=10V$, $I_D=20A$	---	43	---	nC
Total Gate Charge (4.5V)	Q_g		---	18.5	---	
Gate-Source Charge	Q_{gs}		---	8.5	---	
Gate-Drain Charge	Q_{gd}		---	10.3	---	
Turn-On Delay Time	$T_d(on)$	$V_{DD}=50V$, $V_{GS}=10V$, $R_G=3.3\Omega$ $I_D=20A$	---	10	---	ns
Rise Time	T_r		---	7	---	
Turn-Off Delay Time	$T_d(off)$		---	50	---	
Fall Time	T_f		---	11	---	
Input Capacitance	C_{iss}	$V_{DS}=50V$, $V_{GS}=0V$, $f=1MHz$	---	3150	---	pF
Output Capacitance	C_{oss}		---	695	---	
Reverse Transfer Capacitance	C_{rss}		---	25	---	

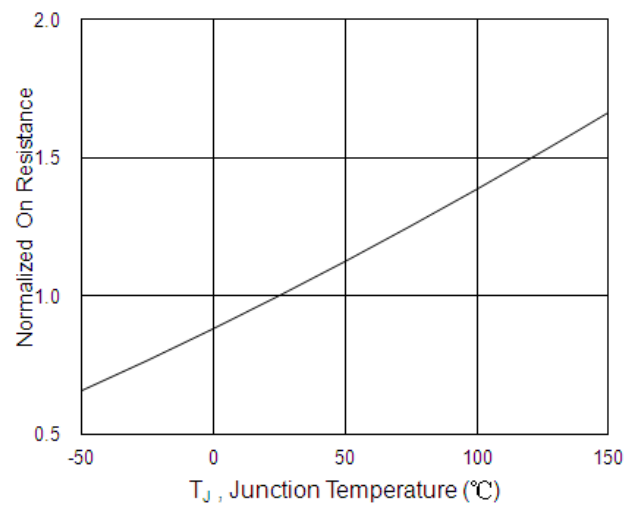
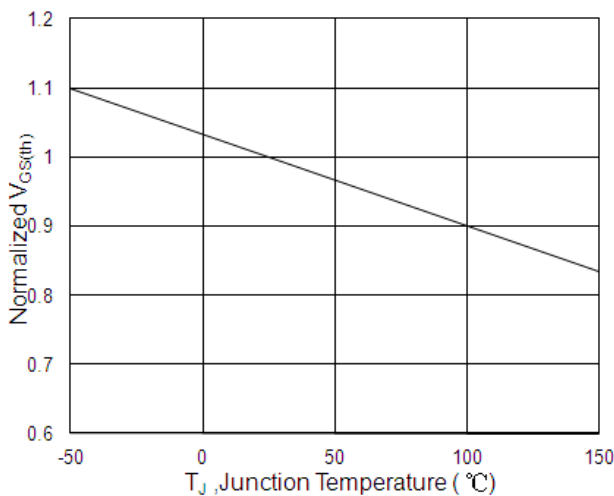
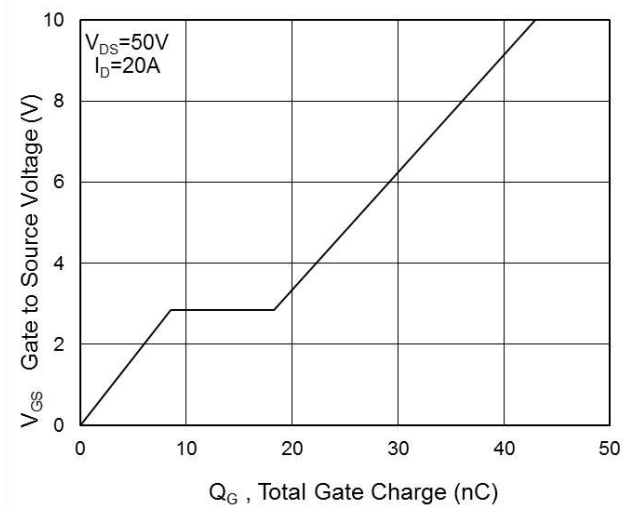
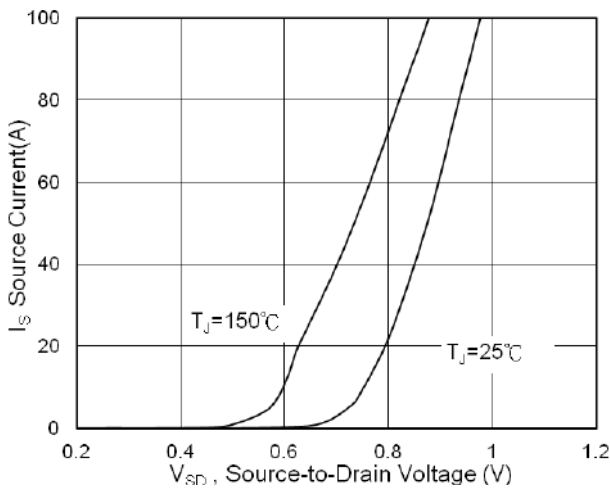
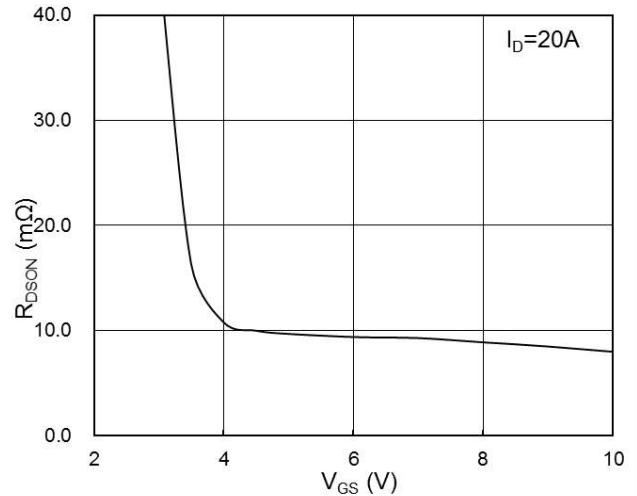
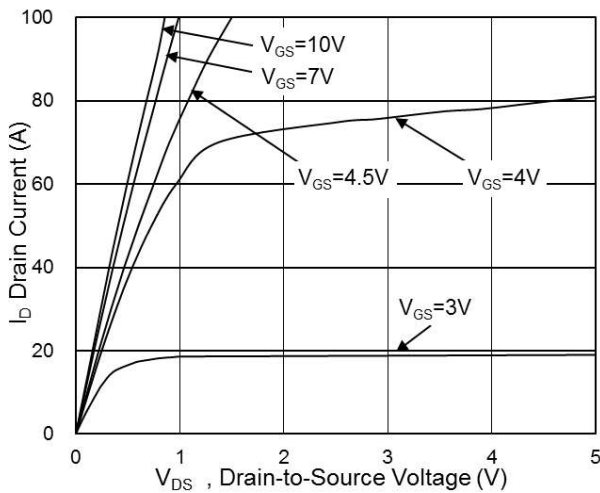
➤ Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Continuous Source Current ^{1,5}	I_S	$V_G=V_D=0V$, Force Current	---	---	36	A
Diode Forward Voltage ²	V_{SD}	$V_{GS}=0V$, $I_S=1A$, $T_J=25^\circ C$	---	---	1.2	V
Reverse Recovery Time	t_{rr}	$I_F=20A$, $di/dt=100A/\mu s$, $T_J=25^\circ C$	---	45	---	nS
Reverse Recovery Charge	Q_{rr}		---	165	---	nC

Note :

1. Pulse width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. The EAS data shows Max. rating. The test condition is $V_{DD}=25V$, $V_{GS}=10V$, $L=0.3mH$, $I_{AS}=15A$
4. Ensure that the channel temperature does not exceed $150^\circ C$.
5. The data is theoretically the same as I_D and IDM , in real applications, should be limited by total power dissipation.

➤ Typical Characteristics



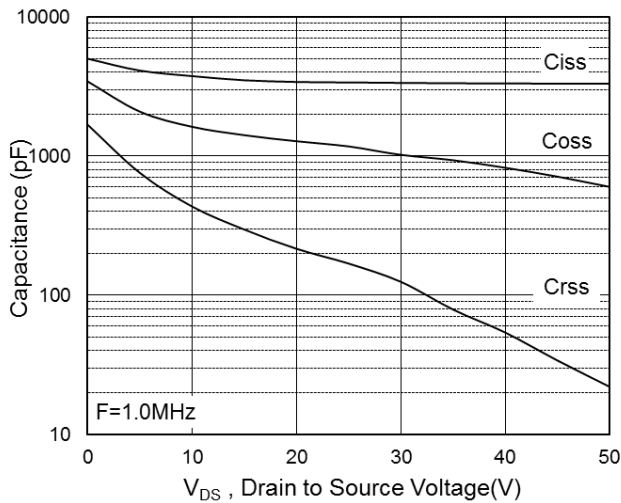


Fig.7 Capacitance

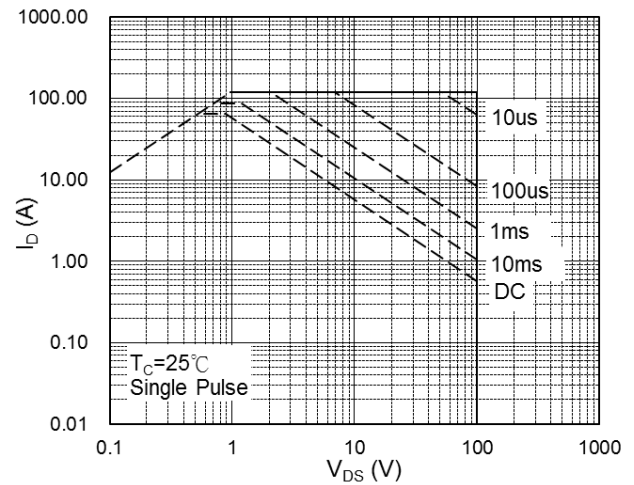


Fig.8 Safe Operating Area

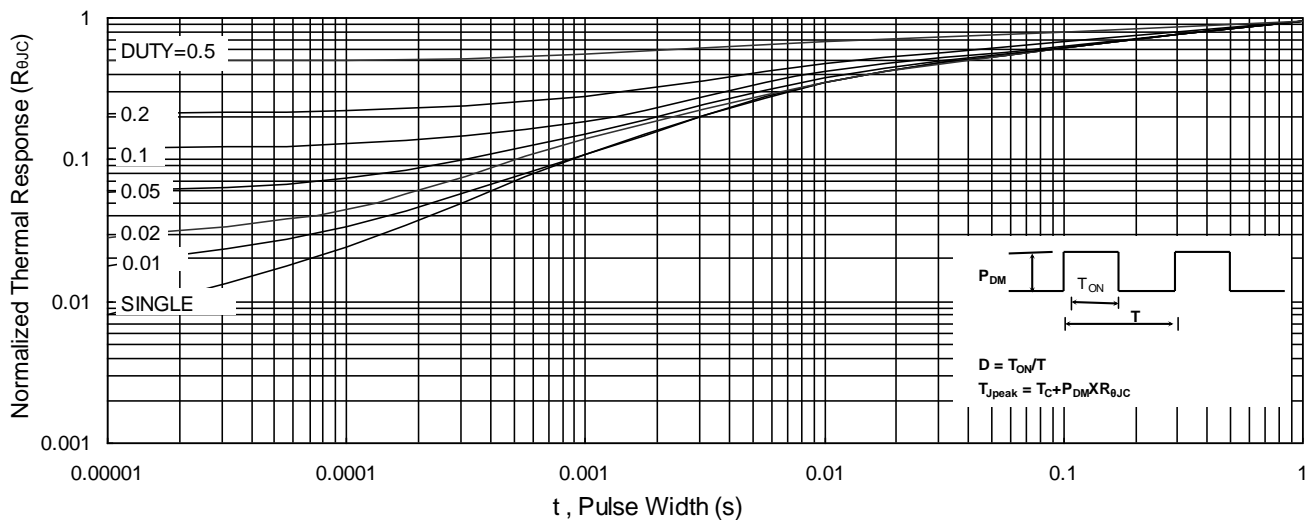


Fig.9 Normalized Maximum Transient Thermal Impedance

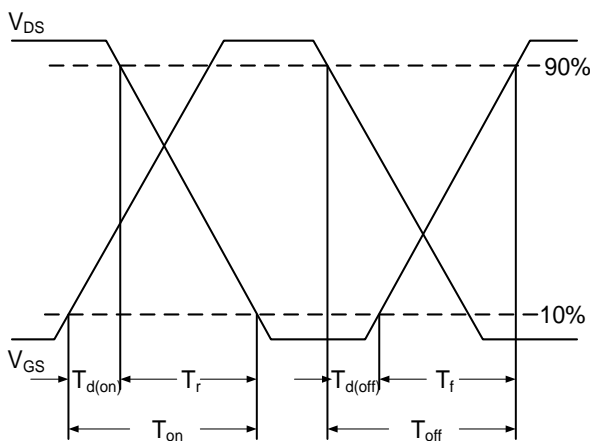


Fig.10 Switching Time Waveform

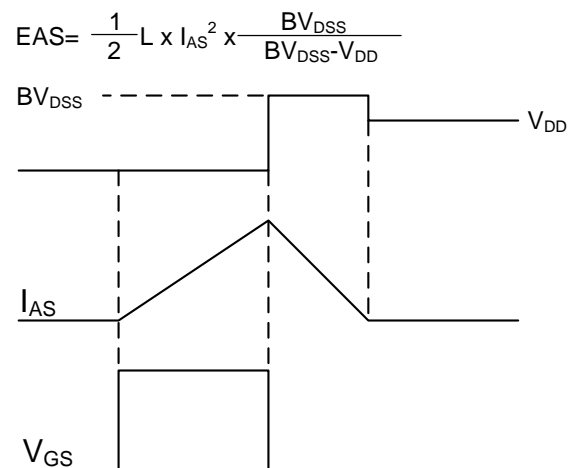
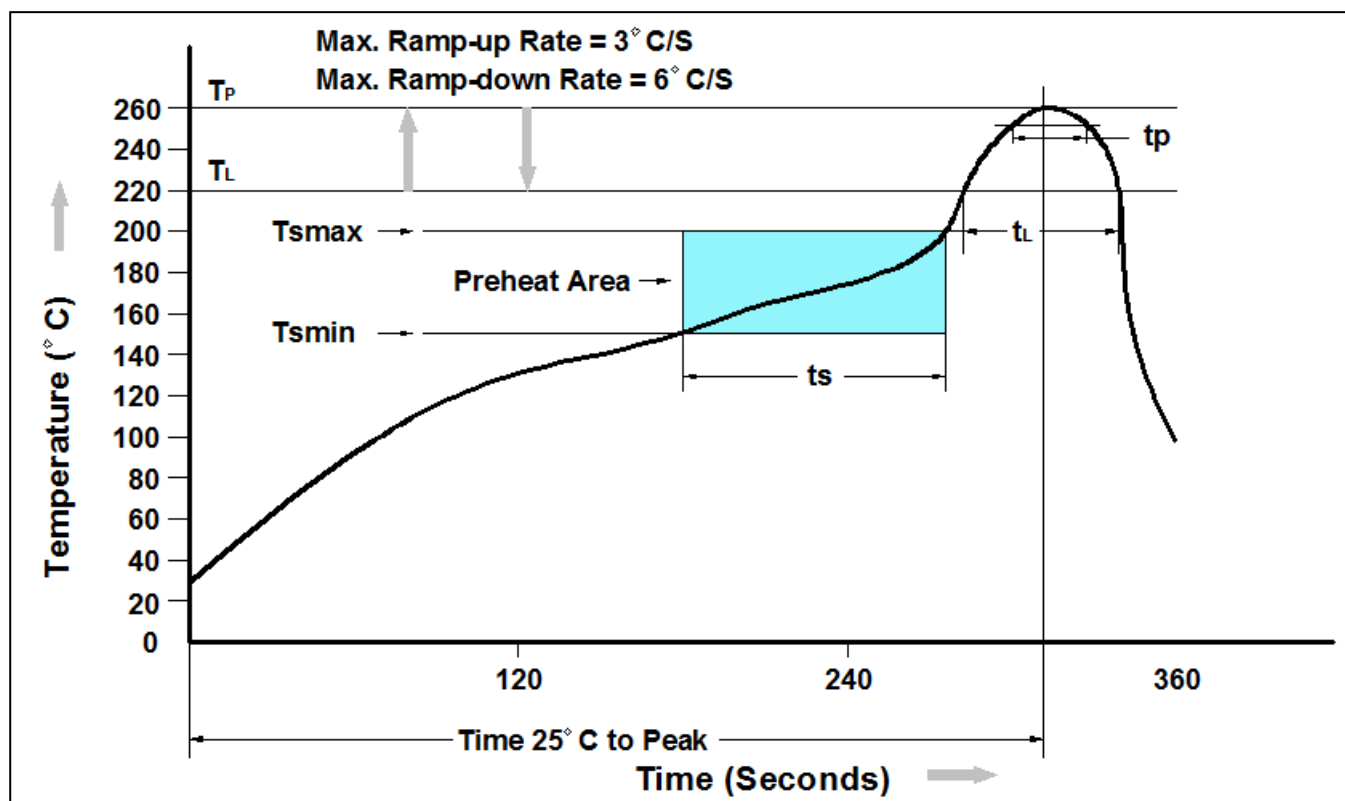


Fig.11 Unclamped Inductive Switching Waveform

➤ Recommend IR Reflow Soldering Thermal Profile

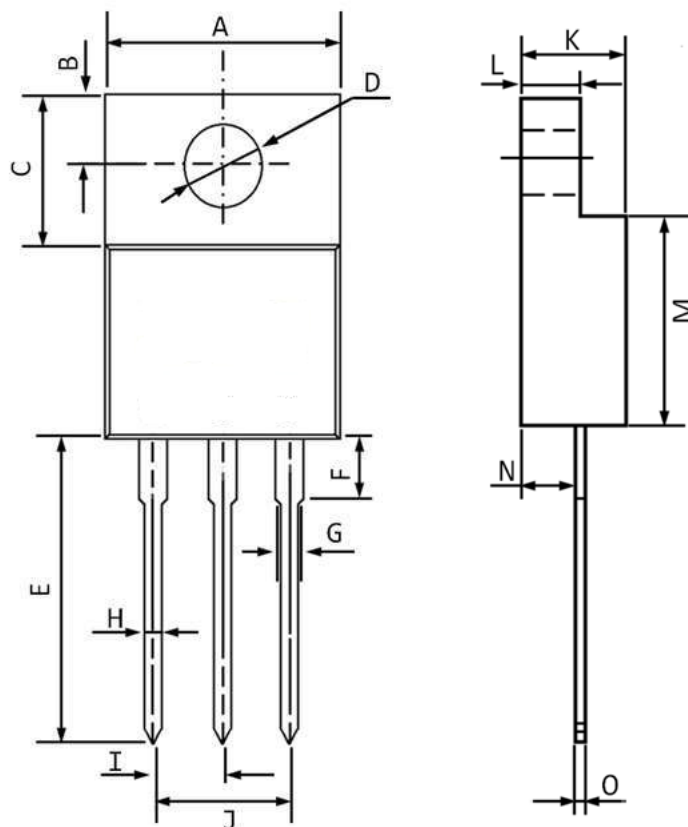


Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T_{Smin})	150°C
Temperature Max. (T_{Smax})	200°C
Time (t_S) from (T_{Smin} to T_{Smax})	60-120 seconds
Average Ramp-up Rate (t_L to t_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60 – 150 seconds
Peak Temperature	260°C +0°C / -5°C
Time (t_P) within 5°C of actual Peak Temperature	30 seconds
Ramp-down Rate (T_P to T_L)	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.

➤ Ordering Information

Part Number	Description	Quantity
PAN00SF94GF	TO-220F / 50 pcs/tube	1000 pcs

➤ Package Information (TO-220F)



SYMBOLS	MILLIMETERS		INCHES	
	Min.	Max.	Min.	Max.
A	—	10.50	—	0.414
B	2.60	3.00	0.102	0.118
C	6.70	7.10	0.264	0.280
D	2.90	3.50	0.114	0.138
E	13.10	13.90	0.516	0.548
F	—	4.00	—	0.158
G	1.11	1.45	0.044	0.057
H	0.40	0.80	0.016	0.032
I	2.40	2.80	0.095	0.110
J	5.00	5.40	0.197	0.213
K	4.30	4.70	0.169	0.185
L	2.90	3.30	0.114	0.130
M	8.20	9.00	0.323	0.355
N	2.50	2.90	0.099	0.114
O	0.40	0.80	0.016	0.032

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