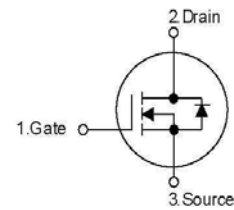
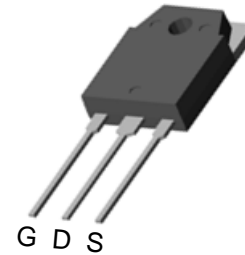


## PIN Connection TO-3P



## Marking Diagram



- Y = Year
- A = Assembly Location
- WW = Work Week
- FIR12N80AN = Specific Device Code

## Description

The FIR12N80ANG N-Channel enhancement mode silicon gate power MOSFET is designed for high voltage, high speed power switching applications such as high efficiency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology

## Features

- $R_{DS(ON)} = 0.90\Omega @ V_{GS} = 10V$
- Low gate charge ( typical 52nC)
- Fast switching capability
- Avalanche energy specified
- Improved dv/dt capability

## Absolute Maximum Ratings ( $T_c = 25^\circ C$ , unless otherwise specified)

Parameter	Symbol	Ratings	Units	
		TO-3P		
Drain-Source Voltage	$V_{DSS}$	800	V	
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	V	
Drain Current Continuous	$I_D$	$T_c = 25^\circ C$	12.0	A
		$T_c = 100^\circ C$	7.4	A
Drain Current Pulsed (Note 1)	$I_{DP}$	48.0	A	
Avalanche Energy	$E_{AS}$	Repetitive (Note 1)	23.1	mJ
		Single Pulse (Note 2)	865	mJ
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.5	V/ns	
Total Power Dissipation	$P_D$	$T_c = 25^\circ C$	231	W
		Derate above $25^\circ C$	1.85	W/ $^\circ C$
Junction Temperature	$T_J$	+150	$^\circ C$	
Storage Temperature	$T_{STG}$	-55~+150	$^\circ C$	

\* Drain current limited by maximum junction temperature.

## Thermal Characteristics

Parameter	Symbol	Ratings	Units
		TO-3P	
Thermal Resistance Junction-Ambient	$R_{thJA}$	62.5	°C/W
Thermal Resistance, Case-to-Sink Typ.	$R_{thCS}$	0.5	
Thermal Resistance Junction-Case	$R_{thJC}$	0.54	

## Electrical Characteristics (T<sub>J</sub>=25°C, unless Otherwise specified.)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	800	--	--	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=800V, V_{GS}=0V$	--	--	1	μA
		$V_{DS}=640V, T_C=125^\circ C$	--	--	10	μA
Gate-Body Leakage Current	$I_{GSS}$	Forward $V_{GS}=30V, V_{DS}=0V$	--	--	100	nA
		Reverse $V_{GS}=-30V, V_{DS}=0V$	--	--	-100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$	--	0.7	--	V/°C
<b>On Characteristics</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3.0	--	5.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=6.0A$	--	0.65	0.90	Ω
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$	--	1850	--	pF
Output Capacitance	$C_{OSS}$		--	180	--	pF
Reverse Transfer Capacitance	$C_{RSS}$		--	20	--	pF
<b>Switching Characteristics</b>						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=400V, I_D=12.0A, R_G=25\Omega$ (Note 4, 5)	--	30	--	ns
Rise Time	$t_R$		--	90	--	ns
Turn-Off Delay Time	$t_{D(OFF)}$		--	140	--	ns
Fall Time	$t_F$		--	90	--	ns
Total Gate Charge	$Q_G$	$V_{DS}=640V, I_D=12.0A, V_{GS}=10V$ (Note 4, 5)	--	52	--	nC
Gate-Source Charge	$Q_{GS}$		--	8.5	--	nC
Gate-Drain Charge	$Q_{GD}$		--	20	--	nC
<b>Drain-Source Diode Characteristics</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_{SD}=12.0A$	--	--	1.4	V
Continuous Drain-Source Current	$I_{SD}$		--	--	12.0	A
Pulsed Drain-Source Current	$I_{SM}$		--	--	48.0	A
Reverse Recovery Time	$t_{RR}$	$I_{SD}=12.0A, di_{SD}/dt=100A/\mu s$ (Note 4)	--	430	--	ns
Reverse Recovery Charge	$Q_{RR}$		--	5.0	--	μC

### Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=11.0mH, I<sub>AS</sub>=12.0A, V<sub>DD</sub>=50V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C
3. I<sub>SD</sub> ≤ 12.0A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub>=25°C
4. Pulse Test : Pulse width ≤ 300 μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

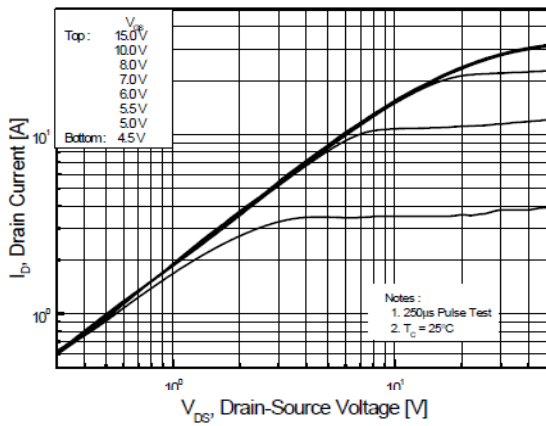


Figure 1. On-Region Characteristics

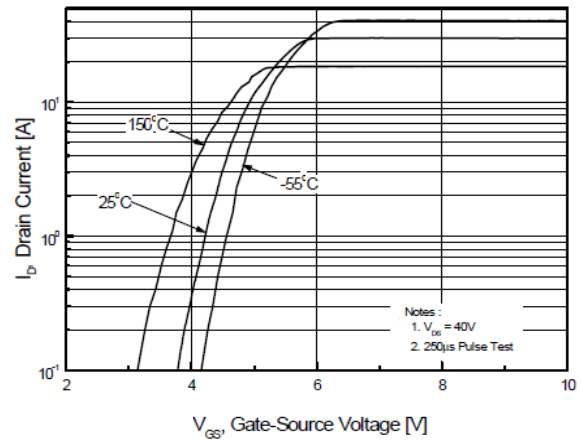


Figure 2. Transfer Characteristics

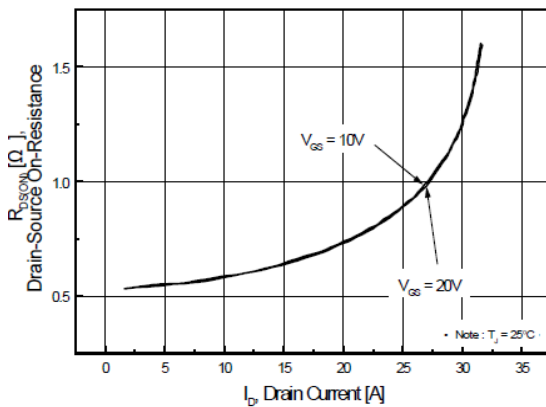


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

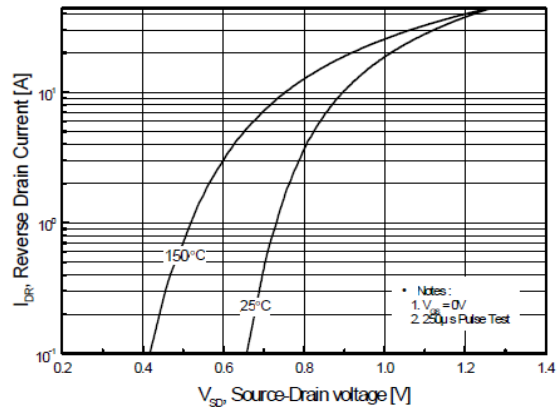


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

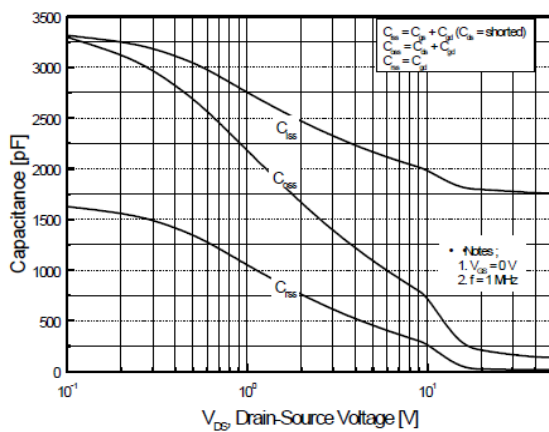


Figure 5. Capacitance Characteristics

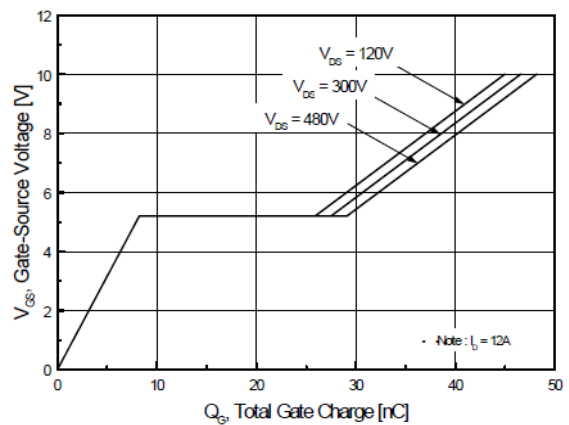


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

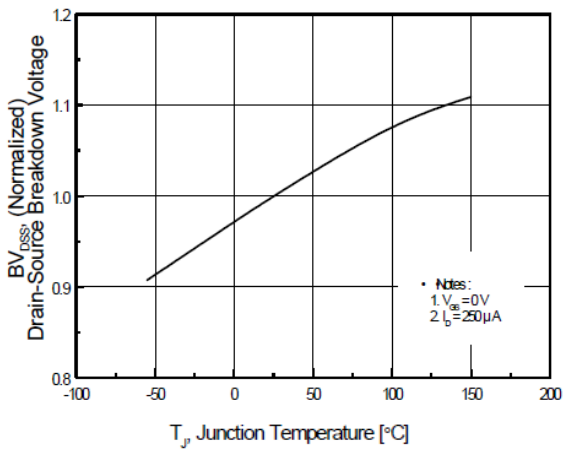


Figure 7. Breakdown Voltage Variation vs Temperature

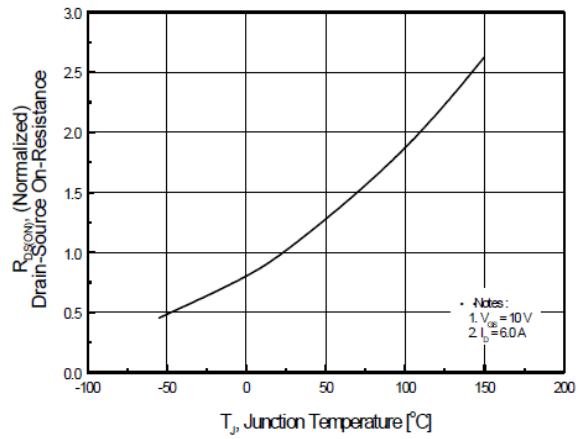


Figure 8. On-Resistance Variation vs Temperature

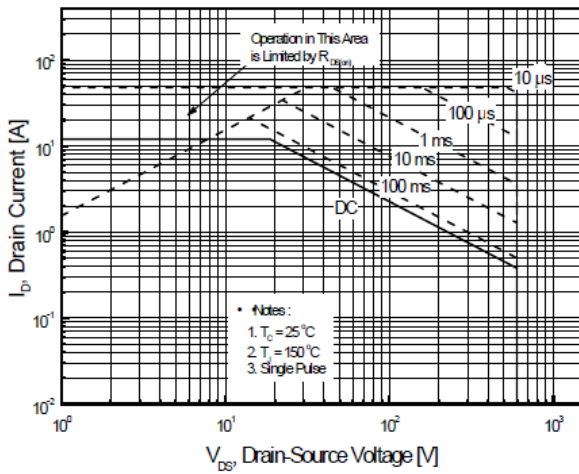


Figure 9-1. Maximum Safe Operating Area for TO-3P

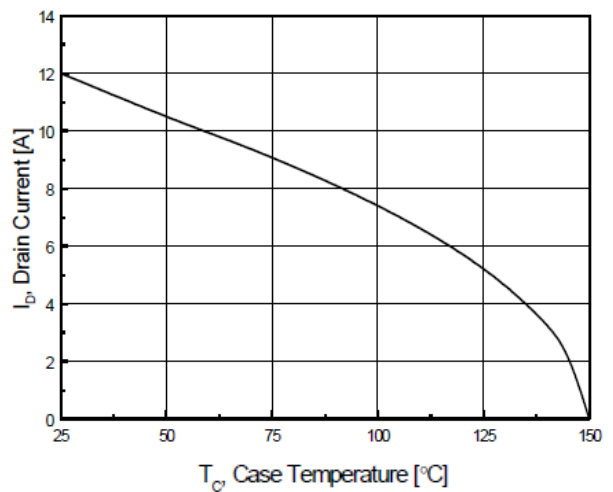


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

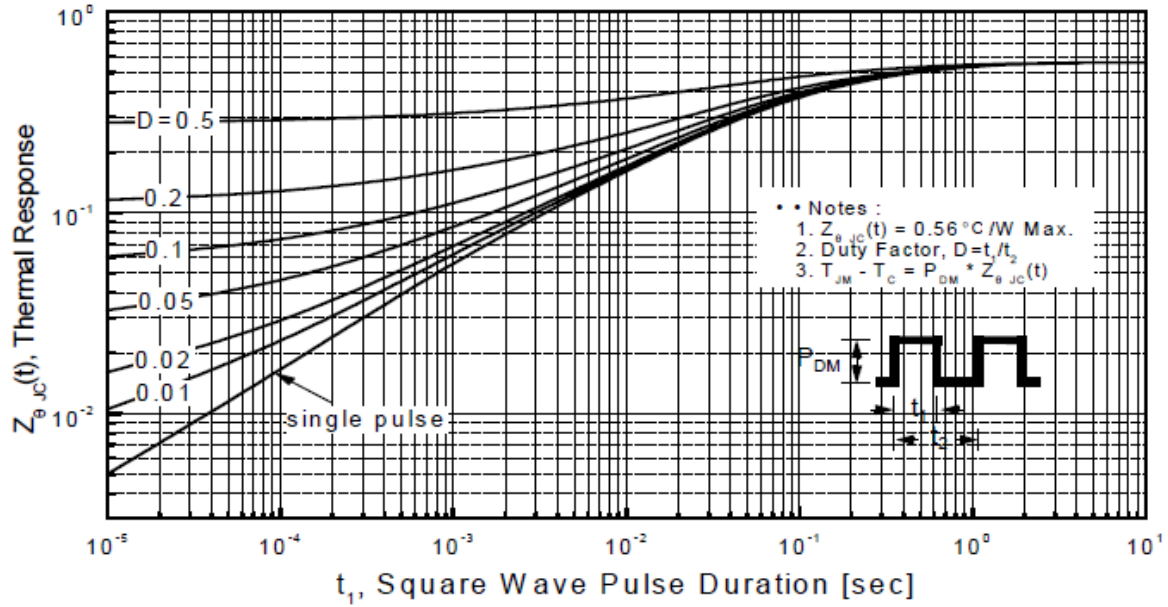
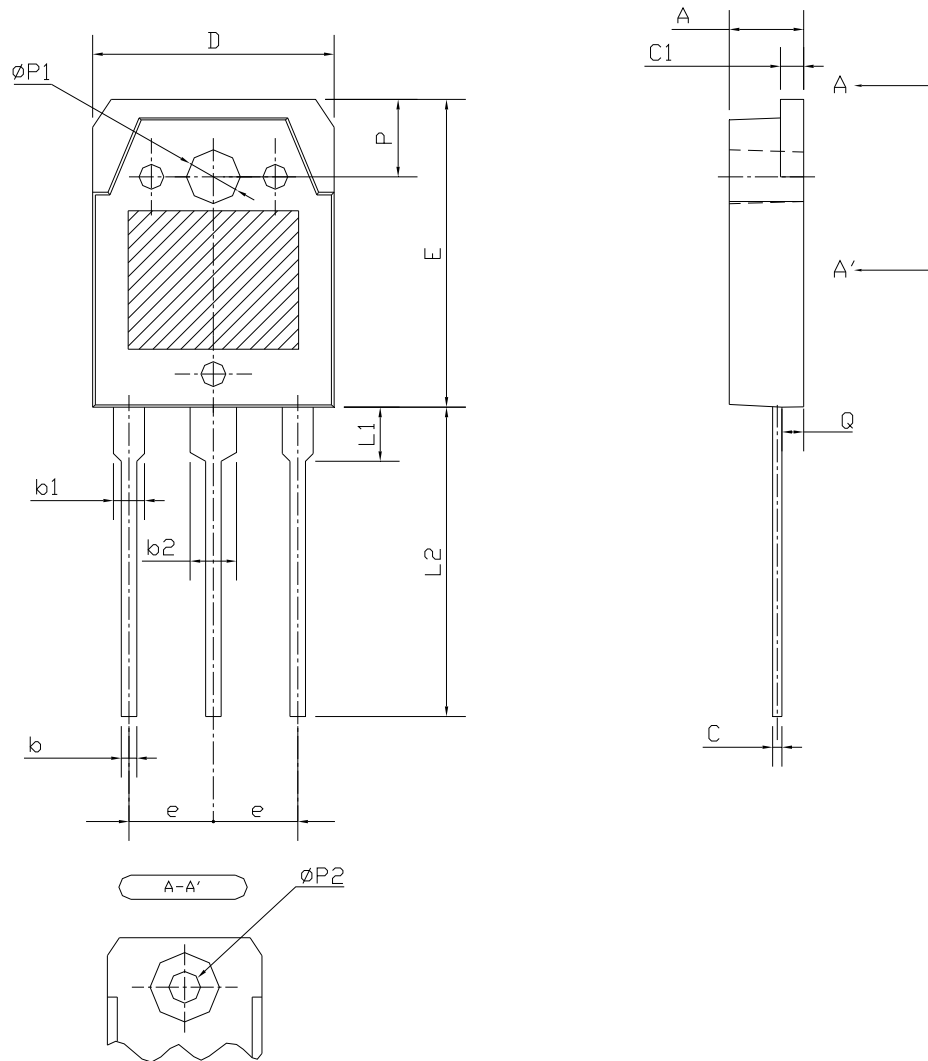


Figure 11-1. Transient Thermal Response Curve for TO-3P

**Package Outline Dimensions**


SYMBOL	MIN	NOM	MAX
A	4.60	4.80	5.00
b	0.80	1.00	1.20
b1	1.80	2.00	2.20
b2	2.80	3.00	3.20
C	0.55	0.60	0.75
C1	1.45	1.50	1.65
D	15.40	15.60	15.80
E	19.70	19.90	20.10
e	5.15	5.45	5.75
L1	3.30	3.50	3.70
L2	19.80	20.00	20.20
P	4.80	5.00	5.20
$\phi P1$	3.30	3.40	3.50
$\phi P2$	(3.20)		
Q	1.20	1.40	1.60