Advanced N-Ch Power MOSFET

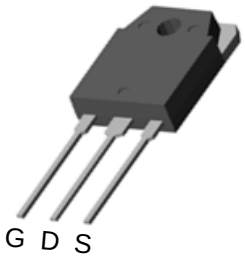
Description

The FIR20N50ANG 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.

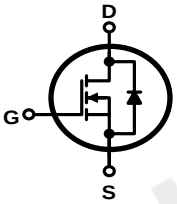
Features

- $R_{DS(ON)}$ = 0.24Ω@V_{GS} =10V
- Low gate charge (typical 70nC)
- Fast switching capability
- Avalanche energy specified
- Improved dv/dt capability

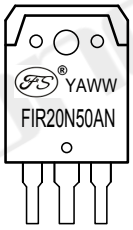
PIN Connection TO-3P



Schematic diagram



Marking Diagram



Y	= Year
A	= Assembly Location
WW	= Work Week
FIR20N50AN	= Specific Device Code

Absolute Maximum Ratings(T_c=25℃,unless otherwise specified)

Parameter		Symbol	Ratings	Units
Drain-Source Voltage		V_{DSS}	500	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Currenet Continuous	T_c=25℃	I_D	20.0	A
	T_c=100℃		12.5	A
Drain Current Pulsed (Note 1)		I_{DP}	80.0	A
Avalanche Energy	Repetitive (Note 1)	E_{AR}	23.5	mJ
	Single Pulse (Note 2)	E_{AS}	1050	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5	V/ns
Total Power Dissipation	T_c=25℃	P_D	235	W
	Derate above 25℃		1.90	W/℃
Junction Temperature		T_J	+150	℃
Storage Temperature		T_{STG}	-55~+150	℃

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Parameter	Symbol	Ratings		Units
Thermal Resistance Junction-Ambient	R_{thJA}	--	62.5	℃/W
Thermal Resistance, Case-to-Sink Typ.	R_{thCS}	0.24	--	
Thermal Resistance Junction-Case	R_{thJC}	--	0.53	

Electrical Characteristics (T_C=25°C unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Units
Off Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V,I_D=250μA	500	--	--	V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=500V,V_{GS}=0V	--	--	10	μA
			V_{DS}=400V,T_C=125℃	--	--	100	μA
Gate-Body Leakage Current	Forward	I_{GSS}	V_{GS}=30V,V_{DS}=0V	--	--	100	nA
	Reverse		V_{GS}=-30V,V_{DS}=0V	--	--	-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D=250μA	--	0.55	--	V/℃
On Characteristics							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.0	--	4.0	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V,I_D=10.0A	--	0.2	0.24	Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=25V,V_{GS}=0V, f=1MHz	--	4590	6000	pF
Output Capacitance		C_{OSS}		--	380	460	pF
Reverse Transfer Capacitance		C_{RSS}		--	60	80	pF
Switching Characteristics							
Turn-On Delay Time		$t_{D(ON)}$	V_{DD}=250V,I_D=20.0A, R_G=25Ω (Note 4, 5)	--	50	120	ns
Rise Time		t_R		--	150	310	ns
Turn-Off Delay Time		$t_{D(OFF)}$		--	380	770	ns
Fall Time		t_F		--	180	370	ns
Total Gate Charge		Q_G	V_{DS}=400V, I_D=20.0A, V_{GS}=10V (Note 4, 5)	--	130	170	nC
Gate-Source Charge		Q_{GS}		--	20	--	nC
Gate-Drain Charge		Q_{GD}		--	45	--	nC
Drain-Source Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V,I_{SD}=20.0A	--	--	1.4	V
Continuous Drain-Source Current		I_{SD}		--	--	20.0	A
Pulsed Drain-Source Current		I_{SM}		--	--	80.0	A
Reverse Recovery Time		t_{RR}	I_{SD}=20.0A, dI_{SD}/dt=100A/μs (Note 4)	--	480	--	ns
Reverse Recovery Charge		Q_{RR}		--	7.7	--	μC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=5.1mH, I_{AS}=20.0A, V_{DD}=50V, R_G=25Ω, Starting TJ=25°C
3. I_{SD}≤20.0A, di/dt≤200A/μs, V_{DD}≤BV_{DSS}, Starting TJ=25°C
4. Pulse Test : Pulse width≤300μs, Duty cycle≤2%
5. Essentially independent of operating temperature

Typical Characteristics

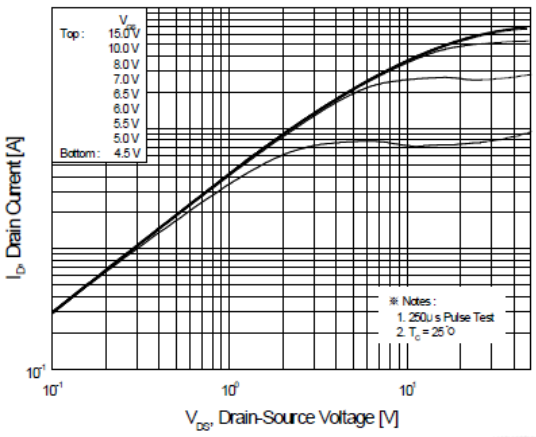


Figure 1. On-Region Characteristics

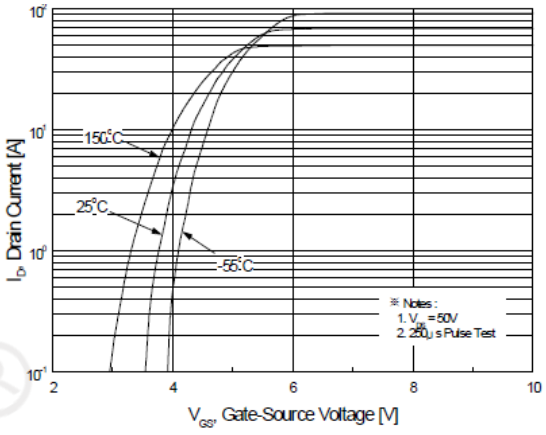


Figure 2. Transfer Characteristics

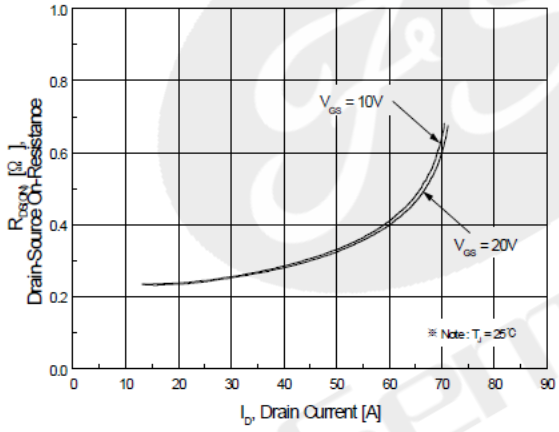


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

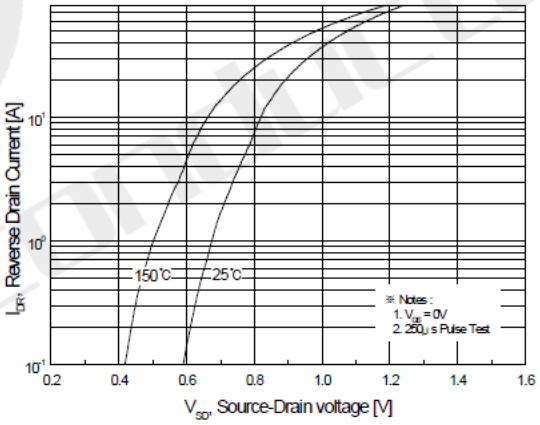


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

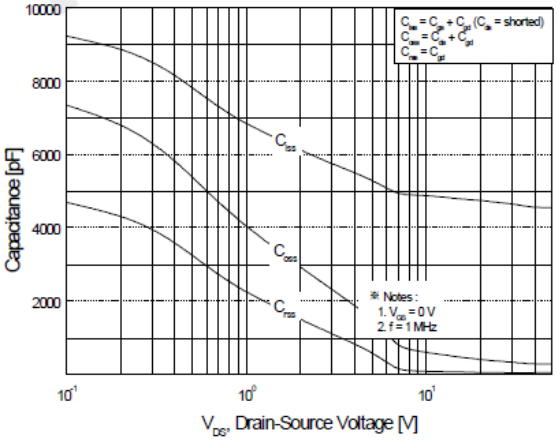


Figure 5. Capacitance Characteristics

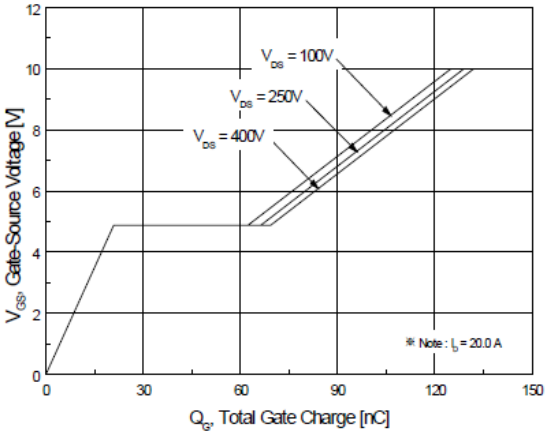


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

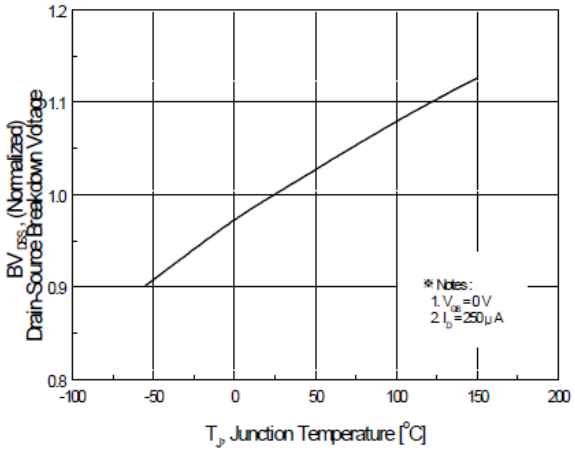


Figure 7. Breakdown Voltage Variation vs Temperature

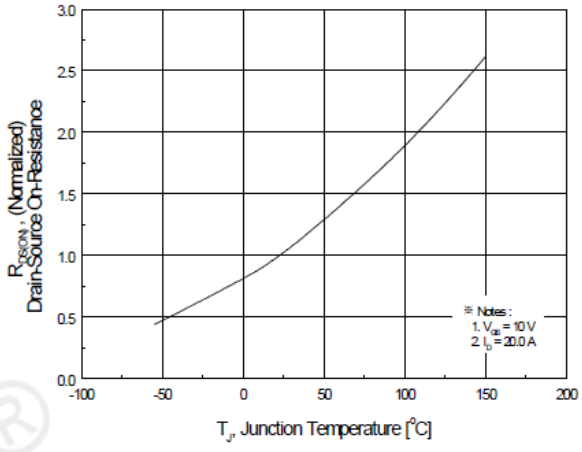


Figure 8. On-Resistance Variation vs Temperature

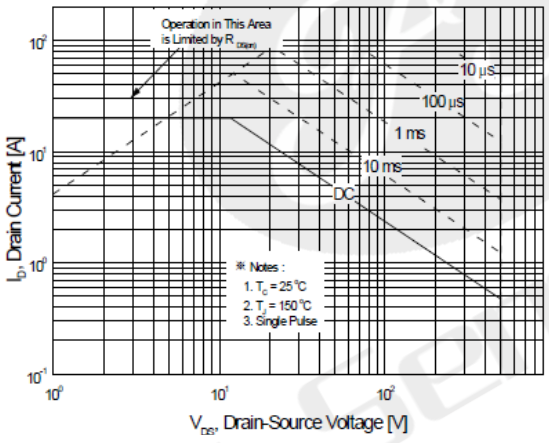


Figure 9. Maximum Safe Operating Area

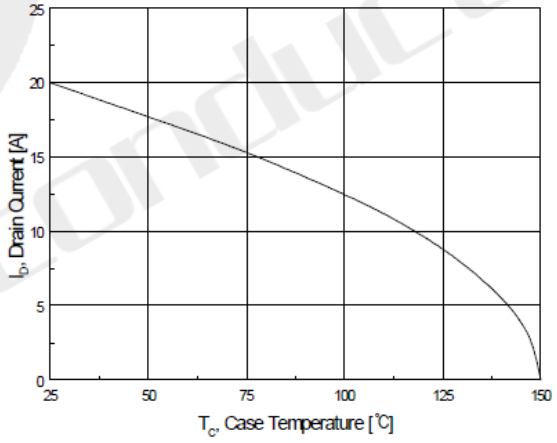


Figure 10. Maximum Drain Current vs Case Temperature

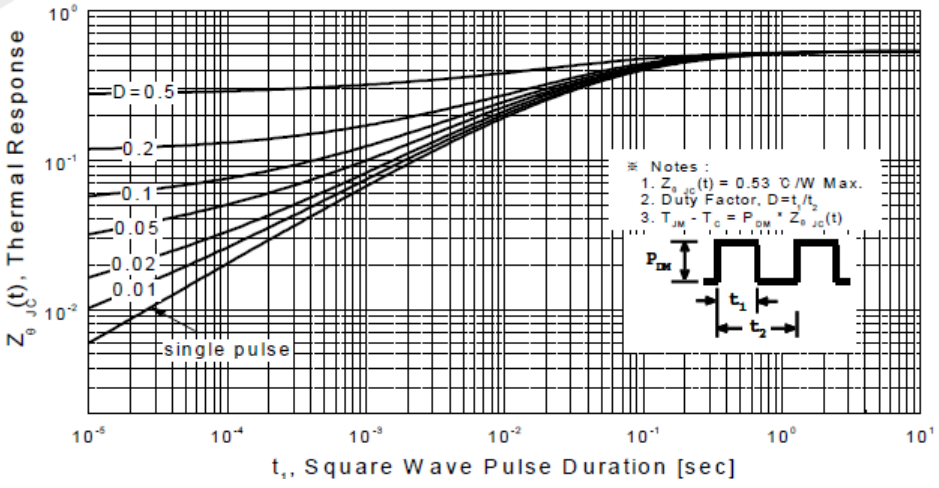
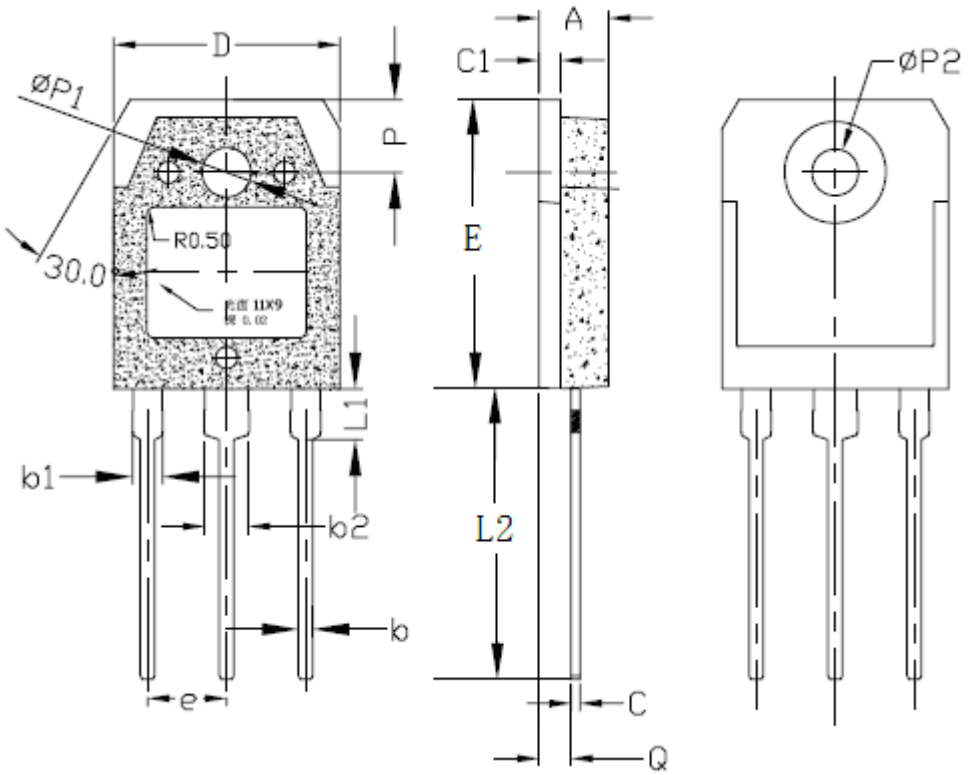


Figure 11. Transient Thermal Response Curve

Package Outline Dimensions

TO-3P



TO-3P Dimensions					
SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.181	0.197	4.60	5.00	
b	0.031	0.047	0.80	1.20	
b1	0.071	0.087	1.80	2.20	
b2	0.110	0.126	2.80	3.20	
c	0.022	0.030	0.55	0.75	
c1	0.057	0.065	1.45	1.65	
D	0.606	0.622	15.40	15.80	
E	0.776	0.791	19.70	20.10	
e	0.215 TYP		5.45 TYP		
L1	0.126MAX.		3.2 MAX.		
L2	0.780	0.795	19.80	20.20	
P	0.197	0.213	5.0	5.4	
ΦP1	0.130	0.138	3.30	3.50	
ΦP2	（0.126）		（3.20）		
Q	0.087	0.102	2.20	2.60	

Declaration

- FIRST reserves the right to change the specifications, the same specifications of products due to different packaging line mold, the size of the appearance will be slightly different, shipped in kind, without notice! Customers should obtain the latest version information before ordering, and verify whether the relevant information is complete and up-to-date.
- Any semiconductor product under certain conditions has the possibility of failure or failure,The buyer has the responsibility to comply with safety standards and take safety measures when using FIRST products for system design and manufacturing,To avoid To avoid potential failure risks, which may cause personal injury or property damage!
- Product promotion endless, our company will wholeheartedly provide customers with better products!

ATTACHMENT

Revision History

Date	REV	Description	Page
2018.01.01	1.0	Initial release	