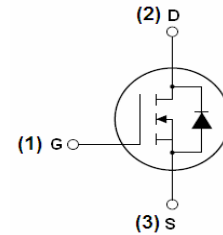
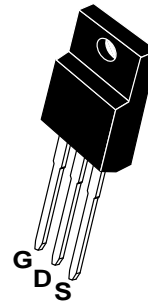




**Features**

- Low Intrinsic Capacitances
- Excellent Switching Characteristics
- Extended Safe Operating Area
- Unrivalled Gate Charge : 31 nC (Typ.)
- BVDSS=60V, ID=50A
- Lower  $R_{DS(on)}$  : 0.022  $\Omega$  (Max) @VG=10V
- 100% Avalanche Tested



**Marking Diagram**



- Y = Year
- A = Assembly Location
- WW = Work Week
- FIR50N06AF = Specific Device Code

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

Symbol	Parameter	FIR50N06AFG	Units
$V_{DSS}$	Drain-Source Voltage	60	V
$I_D$	Drain Current -continuous ( $T_c=25^\circ\text{C}$ )	50	A
	-continuous ( $T_c=100^\circ\text{C}$ )	35.4	A
$V_{GS}$	Gate-Source Voltage	$\pm 25$	V
$E_{AS}$	Single Plused Avanche Energy (Note1)	490	mJ
$I_{AR}$	Avalanche Current (Note2)	50	A
$P_D$	Power Dissipation ( $T_c=25^\circ\text{C}$ )	80	W
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 ~ +150	$^\circ\text{C}$
TL	Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	--	1.24	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case to Sink	0.5	--	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	--	62.5	$^\circ\text{C}/\text{W}$



Electrical Characteristics Tc=25°C unless other wise noted						
Symbol	Parameter	Test Condition	Min.	Typ.	Max	Units
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	ID=250 μ A, VGS=0	60	--	--	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> =250 μ A, Reference to 25°C	--	0.06	--	V/°C
IDSS	Zero Gate Voltage Drain Current	Vds=60V, Vgs=0V	--	--	1	μ A
		Vds=48V, Tc=125 °C			10	μ A
IGSSF	Gate-body leakage Current, Forward	Vgs=+25V, Vds=0V	--	--	100	nA
IGSSR	Gate-body leakage Current, Reverse	Vgs=-25V, Vds=0V	--	--	-100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	I <sub>D</sub> =250μA, Vds=Vgs	2	--	4	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	I <sub>D</sub> =25A, Vgs=10V	--	--	0.022	Ω
<b>Dynamic Characteristics</b>						
Ciss	Input Capacitance	VDS=25V, VGS=0, f=1.0MHz	--	1180	1540	pF
Coss	Output Capacitance		--	440	580	pF
Crss	Reverse Transfer Capacitance		--	65	90	pF
<b>Switching Characteristics</b>						
Td(on)	Turn-On Delay Time	VDD=250V, ID=25A RG=25 Ω (Note 3,4)	--	15	40	nS
Tr	Turn-On Rise Time		--	105	220	nS
Td(off)	Turn-Off Delay Time		--	60	130	nS
Tf	Turn-Off Fall Time		--	65	140	nS
Qg	Total Gate Charge	VDS=400, VGS=10V, ID=25A (Note 3,4)	--	31	41	nC
Qgs	Gate-Source Charge		--	8	--	nC
Qgd	Gate-Drain Charge			13	--	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		--	--	50	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		--	--	200	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	I <sub>D</sub> =25A	--	--	1.5	V
trr	Reverse Recovery Time	I <sub>S</sub> =25A, V <sub>GS</sub> =0V	--	52	--	nS
Qrr	Reverse Recovery Charge	di <sub>F</sub> /dt=100A/ μ s (Note3)	--	75	--	μ C
*Notes	1, L=9.3mH, IAS=50A, VDD=50V, RG=25Ω, Starting T <sub>J</sub> =25°C 2, Repetitive Rating : Pulse width limited by maximum junction temperature 3, Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2% 4, Essentially Independent of Operating Temperature					

# Typical Characteristics

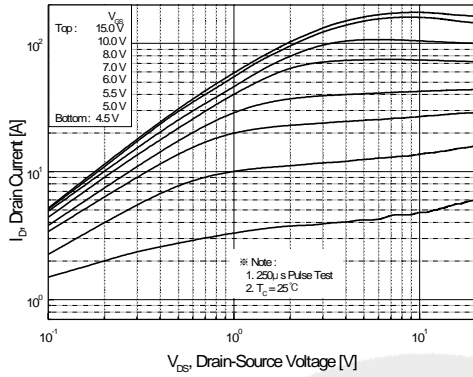


Figure 1. On-Region Characteristics

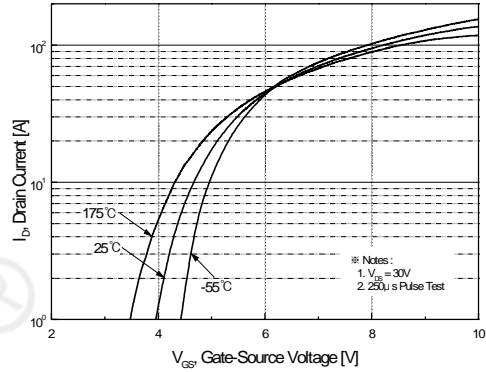


Figure 2. Transfer Characteristics

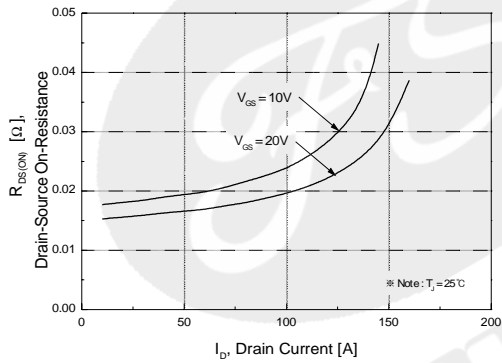


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

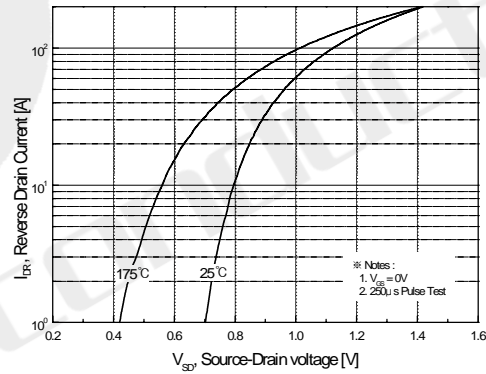


Figure 4. Body Diode Forward Current Variation vs. Source Current and Temperature

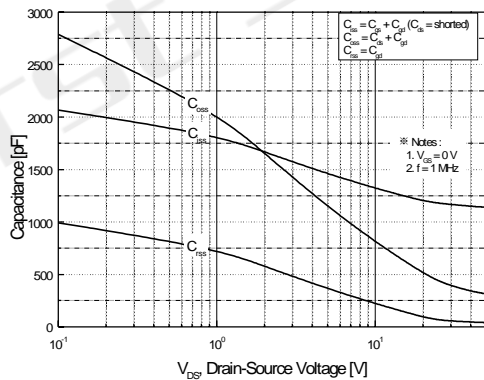


Figure 5. Capacitance Characteristics

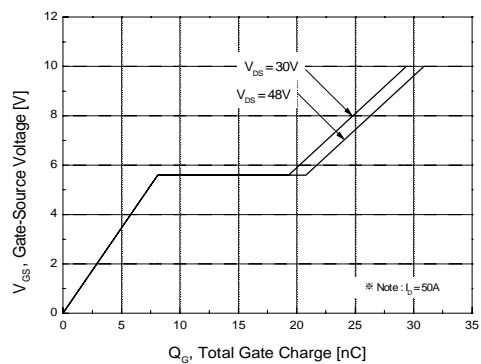


Figure 6. Gate Charge Characteristics

### Typical Characteristics (Continued)

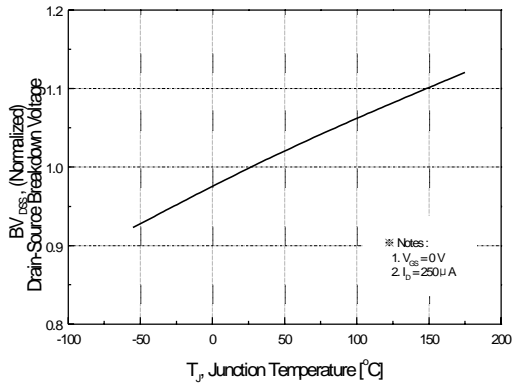


Figure 7. Breakdown Voltage Variation vs. Temperature

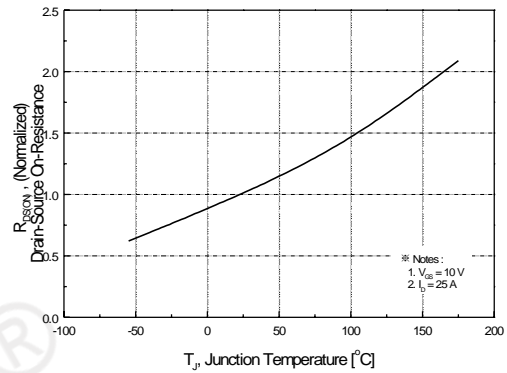


Figure 8. On-Resistance Variation vs. Temperature

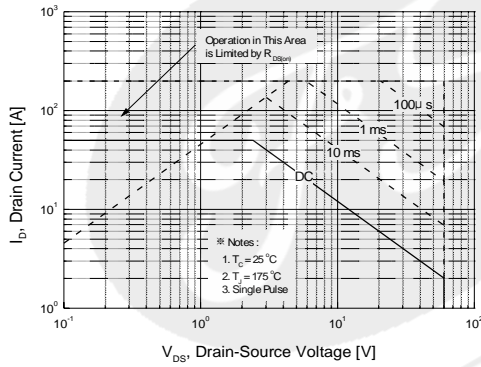


Figure 9. Maximum Safe Operating Area

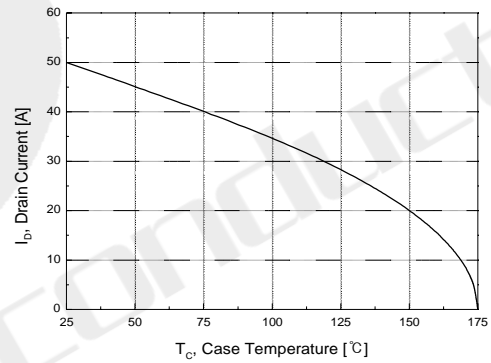


Figure 10. Maximum Drain Current vs. Case Temperature

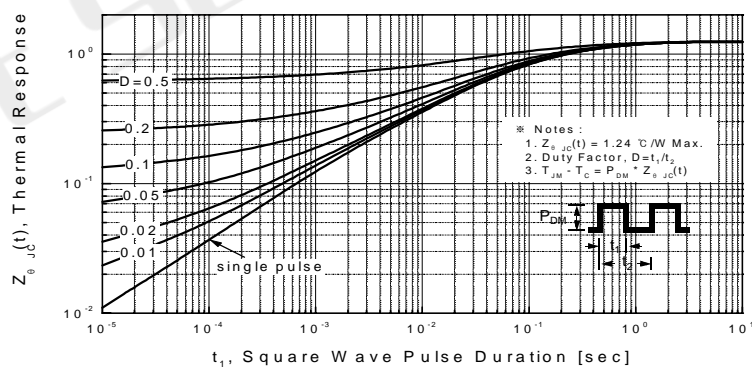
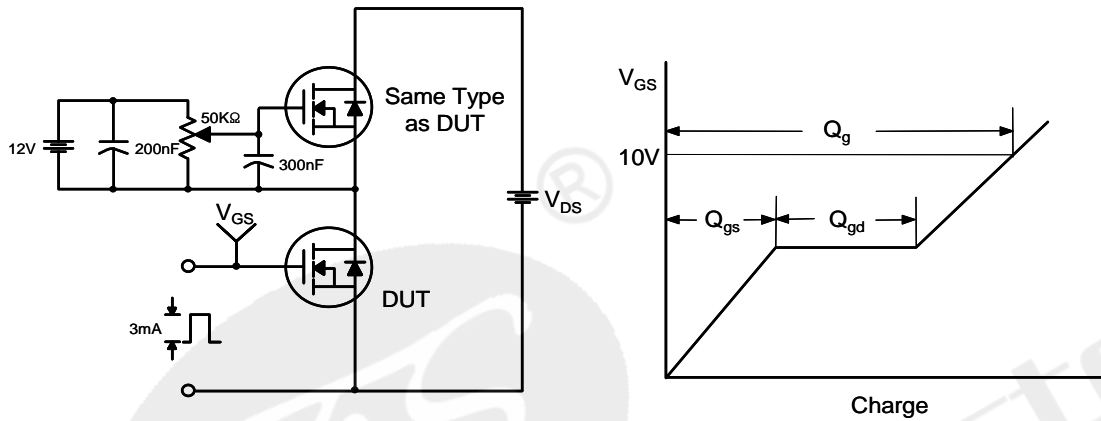
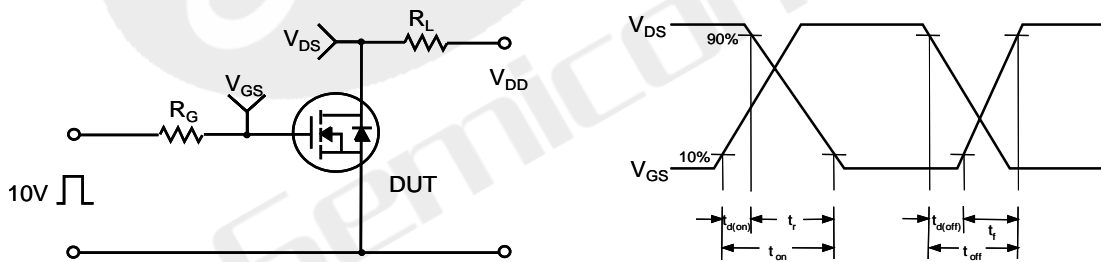


Figure 11. Transient Thermal Response Curve

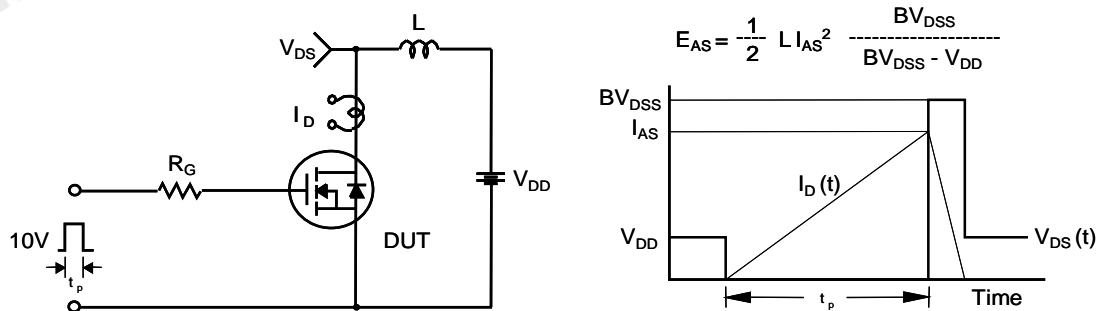
Gate Charge Test Circuit & Waveform



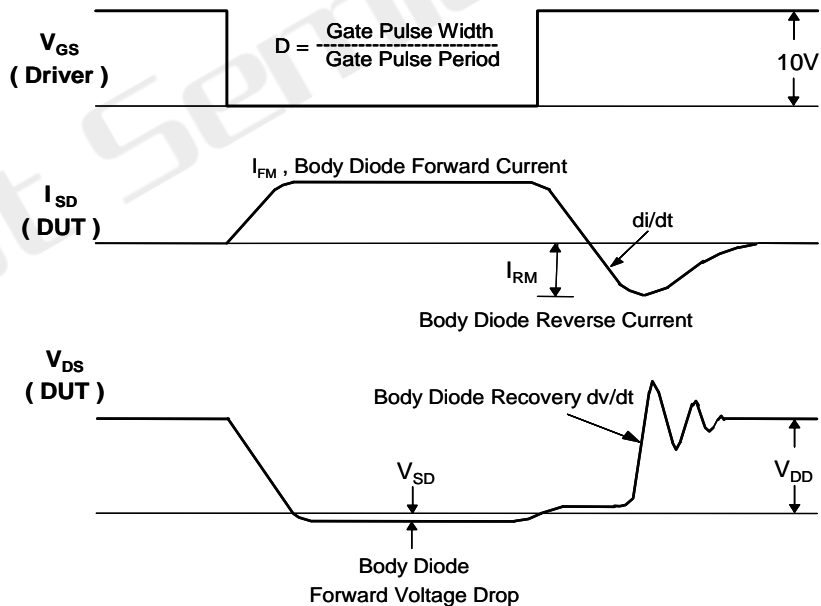
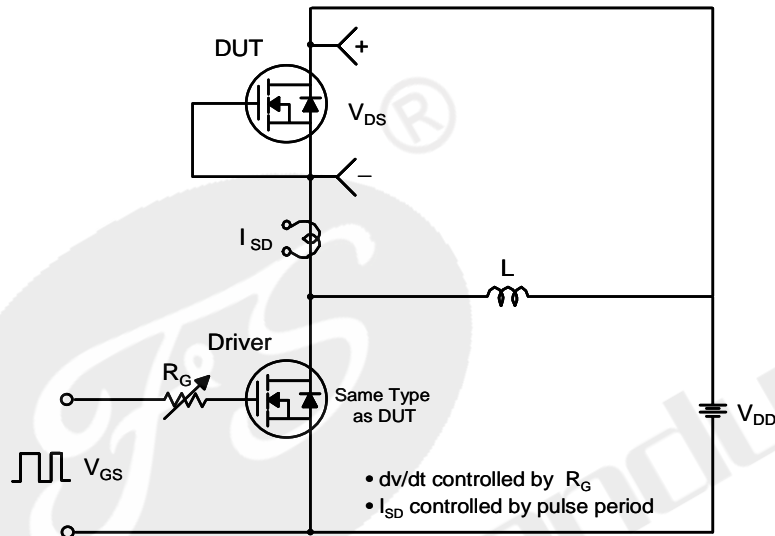
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

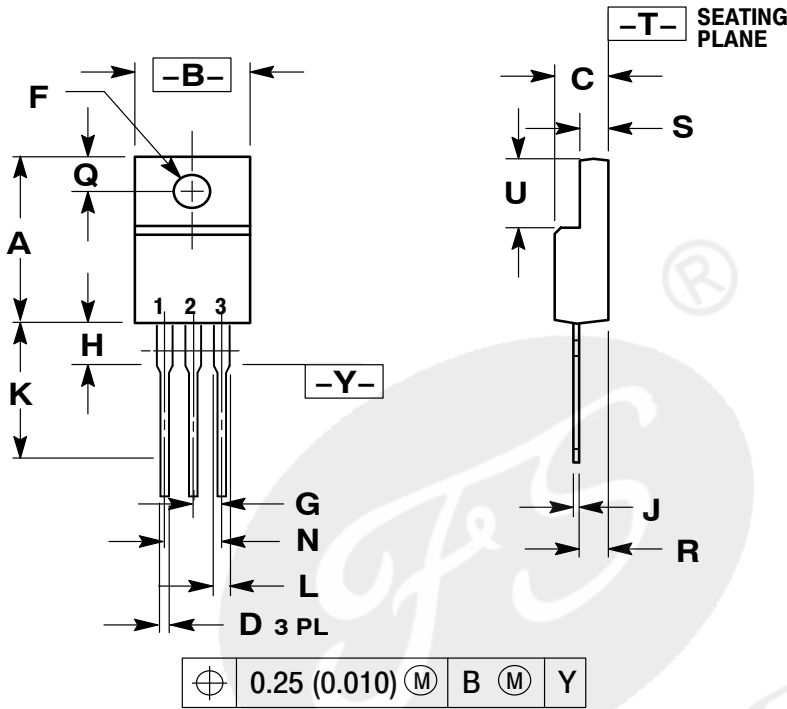


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimensions

TO-220F



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. 221D-01 THRU 221D-02 OBSOLETE, NEW STANDARD 221D-03.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.617	0.635	15.67	16.12
B	0.392	0.419	9.96	10.63
C	0.177	0.193	4.50	4.90
D	0.024	0.039	0.60	1.00
F	0.116	0.129	2.95	3.28
G	0.100 BSC		2.54 BSC	
H	0.118	0.135	3.00	3.43
J	0.018	0.025	0.45	0.63
K	0.503	0.541	12.78	13.73
L	0.048	0.058	1.23	1.47
N	0.200 BSC		5.08 BSC	
Q	0.122	0.138	3.10	3.50
R	0.099	0.117	2.51	2.96
S	0.092	0.113	2.34	2.87
U	0.239	0.271	6.06	6.88

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	