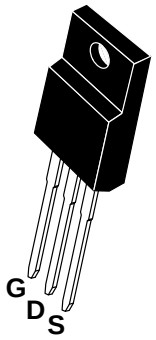
FIR20N60FG

Silicon N-Channel Power MOSFET

V_{DSS}	600	V
I_D	20	A
$P_D(T_C=25℃)$	250	W
$R_{DS(ON)}$	0.35	Ω

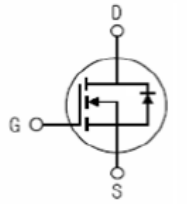
PIN Connection TO-220F



Features

- **Fast Switching**
- **Low ON Resistance(Rdson≤0. 45Ω)**
- **Low Gate Charge (Typical Data:70nC)**
- **Low Reverse transfer capacitances(Typical: 32pF)**
- **100% Single Pulse avalanche energy Test**

Inner Equivalent Principium Chart



Applications

Power switch circuit of adaptor and charger.

Marking Diagram

Y = Year
A = Assembly Location
WW = Work Week
FIR20N60F = Specific Device Code

Absolute（Tc= 25℃ unless otherwise specified）

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	600	V
I_D	Continuous Drain Current	20	A
	Continuous Drain Current T_C = 100 °C	13	A
I_{DM} [a1]	Pulsed Drain Current	80	A
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS} [a2]	Single Pulse Avalanche Energy	1000	mJ
E_{AR} [a1]	Avalanche Energy ,Repetitive	100	mJ
I_{AR} [a1]	Avalanche Current	14	A
dv/dt [a3]	Peak Diode Recovery dv/dt	4.5	V/ns
P_D	Power Dissipation	250	W
	Derating Factor above 25°C	2.0	W/℃
T_J， T_{stg}	Operating Junction and Storage Temperature Range	150，–55 to 150	℃
T_L	MaximumTemperature for Soldering	300	℃

Electrical Characteristics（Tc= 25℃ unless otherwise specified）

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	600	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	ID=250uA,Reference25℃	--	0.65	--	V/℃
I_{DSS}	Drain to Source Leakage Current	V_{DS} = 600V, V_{GS}= 0V, T_a = 25℃	--	--	10	μA
		V_{DS} =480V, V_{GS}= 0V, T_a = 125℃			200	
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{GS}= 30V	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{GS} =-30V	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	V_{GS}=10V,I_D=9.0A	--	0.35	0.45	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	2.0	--	4.0	V
Pulse width tp≤380μs, δ ≤2%						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
g_{fs}	Forward Transconductance	V_{DS}=15V, I_D =9.0A	--	15	--	S
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1.0MHz	--	2600		pF
C_{oss}	Output Capacitance		--	320		
C_{rss}	Reverse Transfer Capacitance		--	32		

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	I_D =18A V_{DD} = 300V R_G = 25Ω	--	60		ns
tr	Rise Time		--	200		
$t_{d(OFF)}$	Turn-Off Delay Time		--	150		
t_f	Fall Time		--	130		
Q_g	Total Gate Charge	I_D =18A V_{DD} =480V V_{GS} = 10V	--	70		nC
Q_{gs}	Gate to Source Charge		--	16	--	
Q_{gd}	Gate to Drain (“Miller”)Charge		--	32	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)		--	--	20	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	80	A
V_{SD}	Diode Forward Voltage	I_S=20A,V_{GS}=0V	--	--	1.5	V
trr	Reverse Recovery Time	I_S=20A,T_j = 25° C	--	400	--	ns
Qrr	Reverse Recovery Charge	dI_F/dt=100A/us, V_{GS}=0V	--	4.5	--	nC
Pulse width tp≤380μs, δ ≤2%						

Symbol	Parameter	Typ.	Units
$R_{\theta JC}$	Junction-to-Case	0.5	℃/W
$R_{\theta JA}$	Junction-to-Ambient	40	℃/W

[a1]: Repetitive rating; pulse width limited by maximum junction temperature
[a2]: L=10mH, I_D=18A, Start T_J=25℃
[a3]: I_{SD}=18A,di/dt ≤200A/us,V_{DD}≤$BV_{DSS,}$ Start T_J=25℃

Characteristic Curves

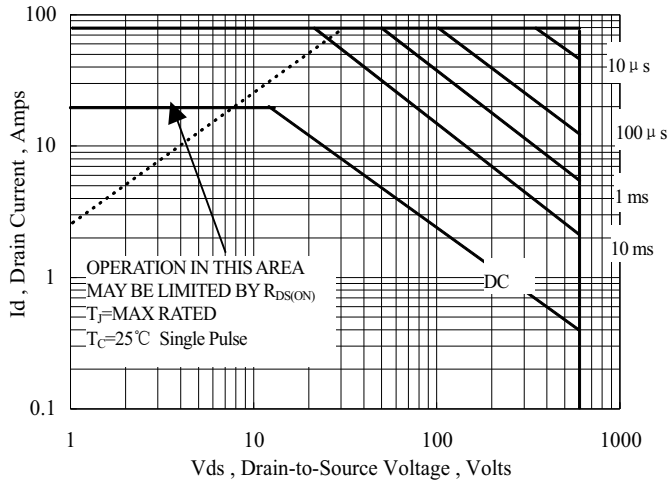


Figure 1 Maximun Forward Bias Safe Operating Area

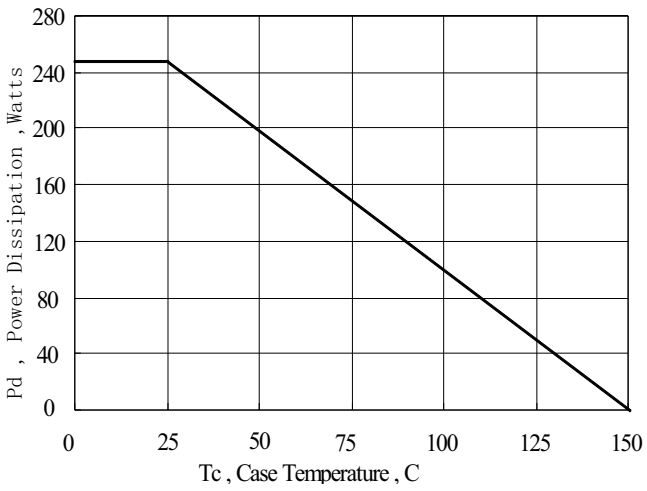


Figure 2 Maximun Power Dissipation vs Case Temperature

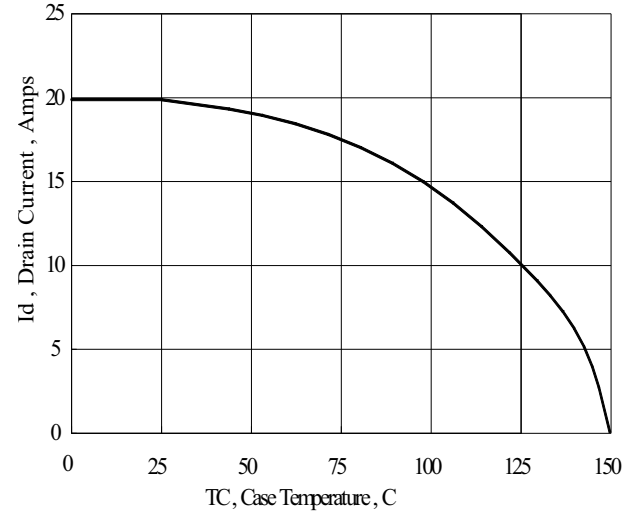


Figure 3 Maximum Continuous Drain Current vs Case Temperature

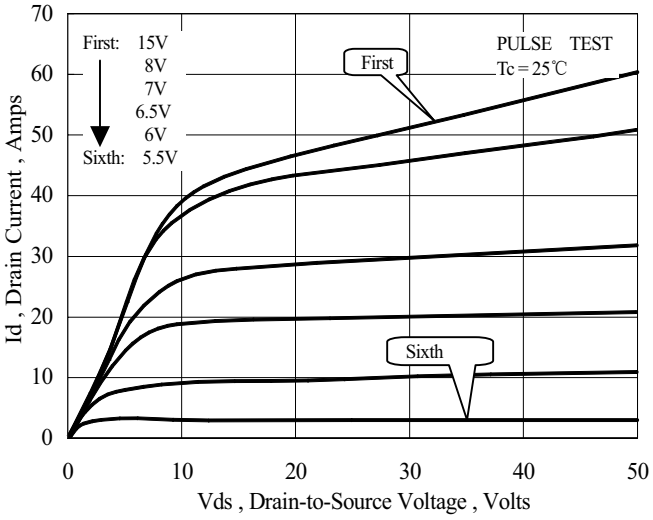


Figure 4 Typical Output Characteristics

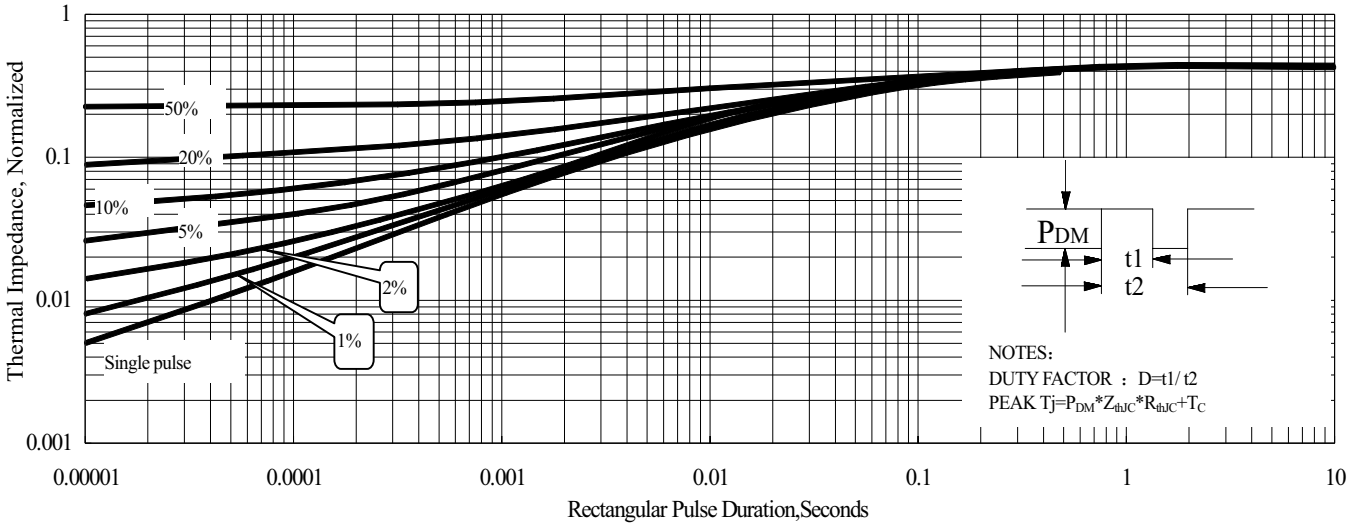


Figure 5 Maximum Effective Thermal Impendance , Junction to Case

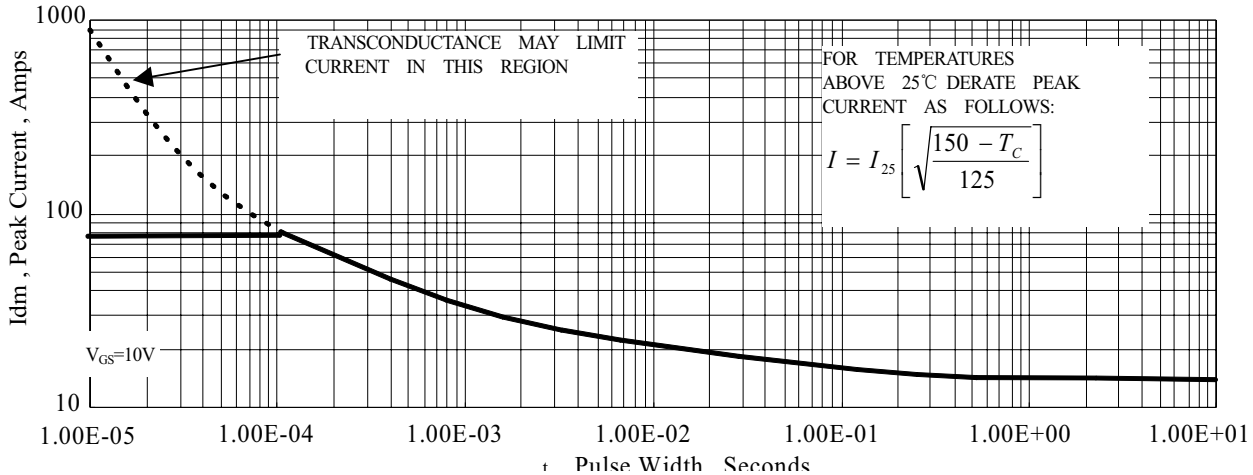


Figure 6 Maximun Peak Current Capability

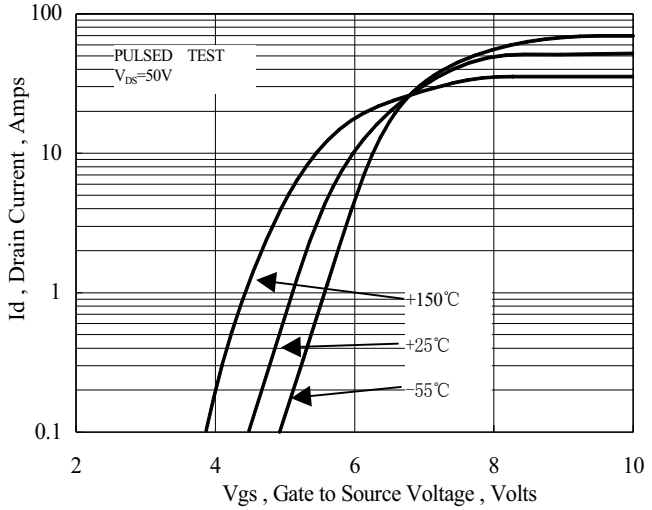


Figure 7 Typical Transfer Characteristics

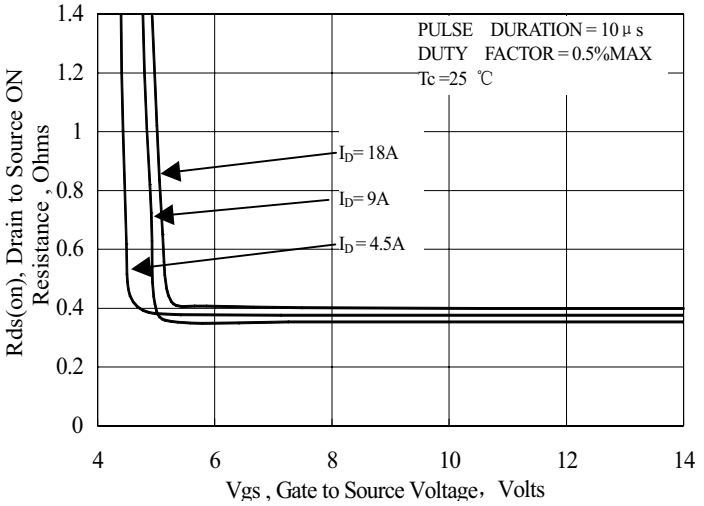


Figure 8 Typical Drain to Source ON Resistance vs Gate Voltage and Drain Current

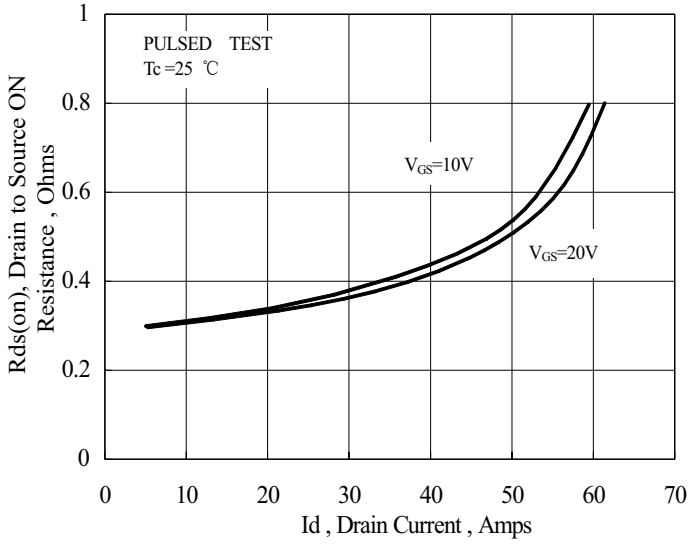


Figure 9 Typical Drain to Source ON Resistance vs Drain Current

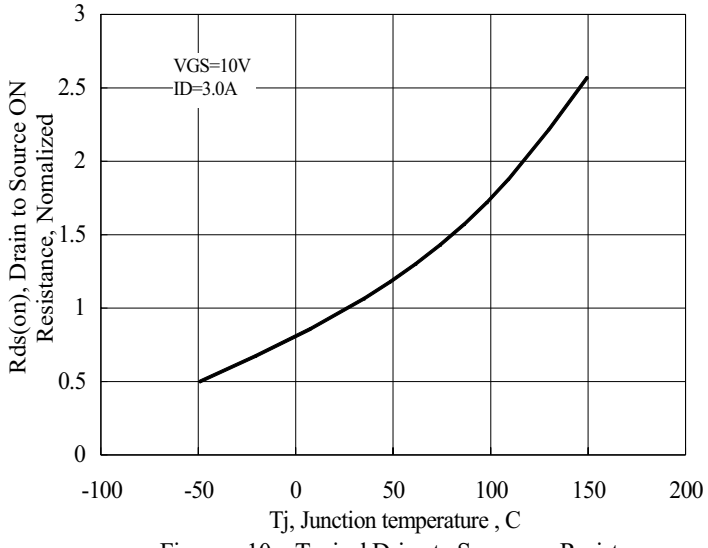


Figure 10 Typical Drian to Source on Resistance vs Junction Temperature

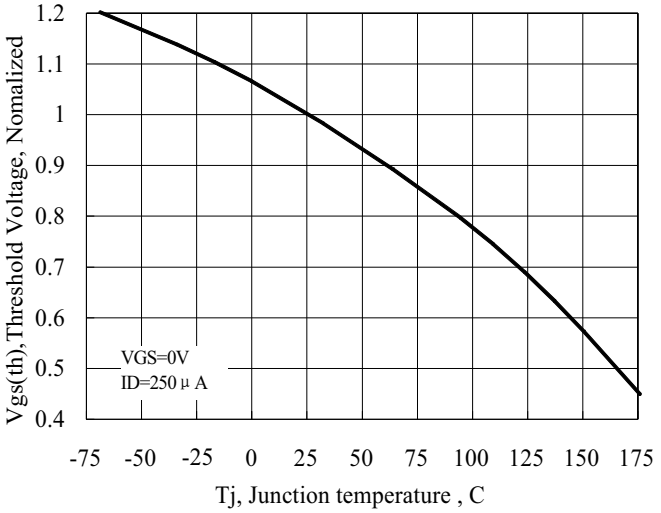


Figure 11 Typical Theshold Voltage vs Junction Temperature

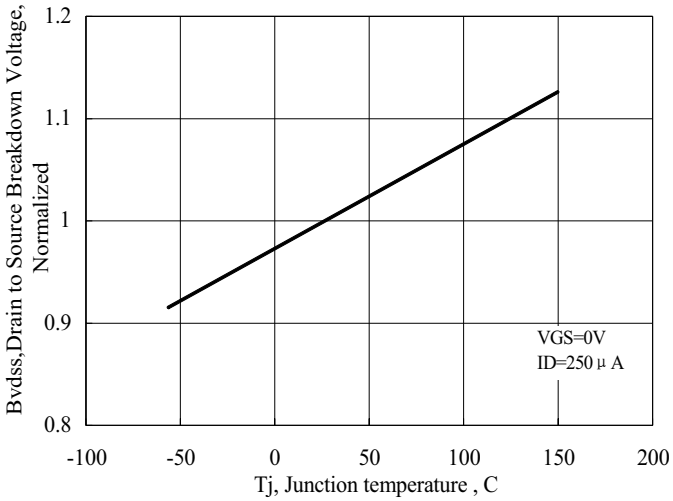


Figure 12 Typical Breakdown Voltage vs Junction Temperature

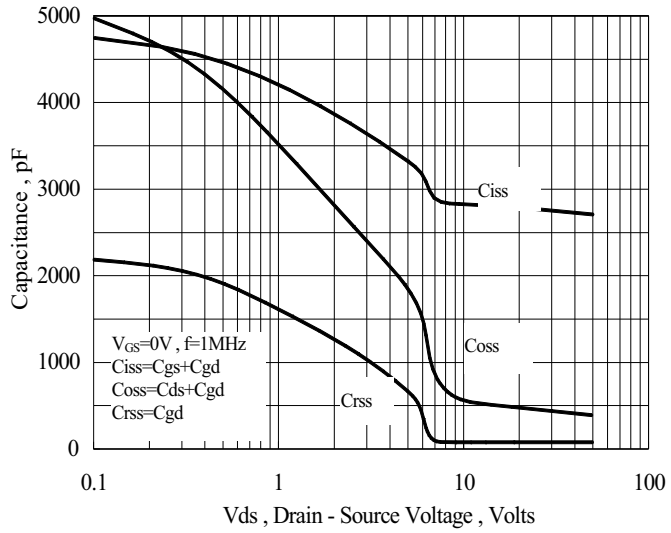


Figure 13 Typical Capacitance vs Drain to Source Voltage

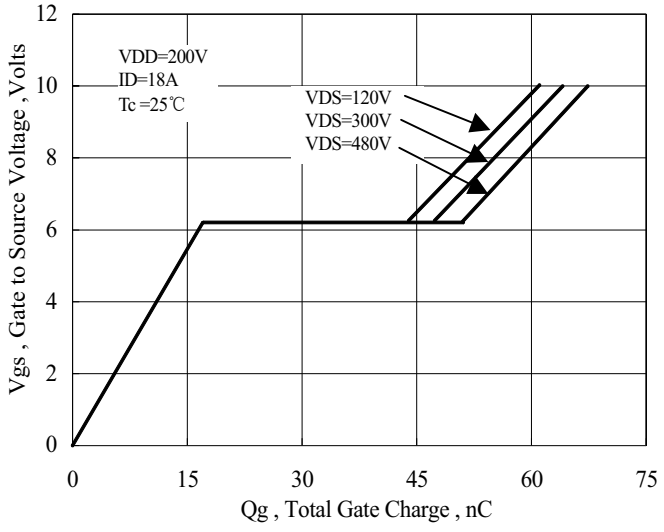


Figure 14 Typical Gate Charge vs Gate to Source Voltage

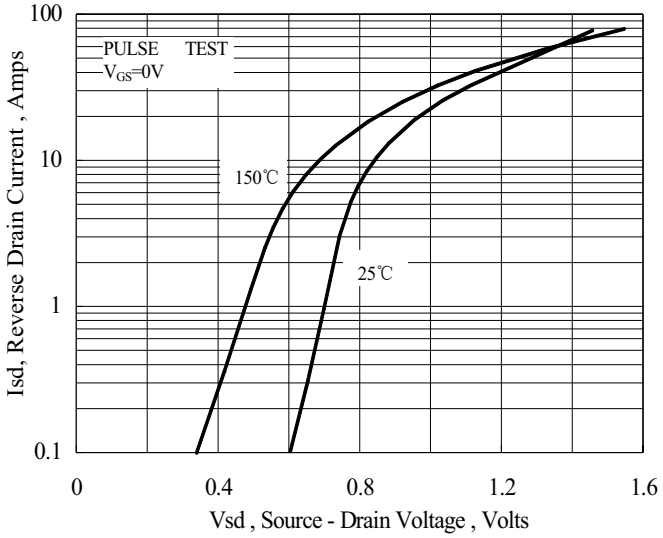


Figure 15 Typical Body Diode Transfer Characteristics

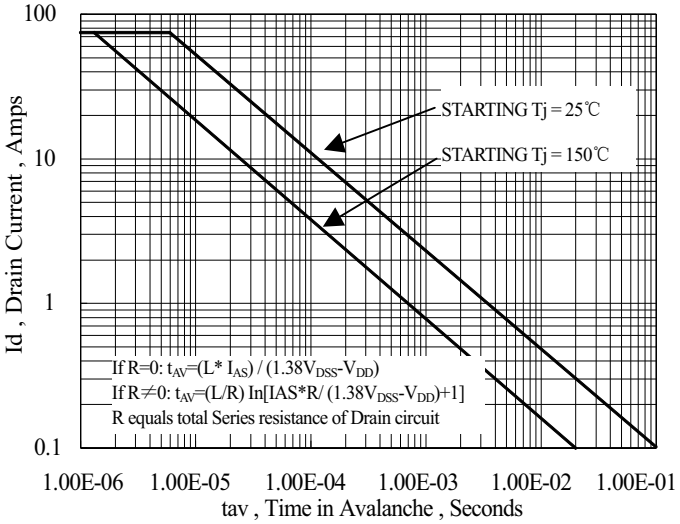
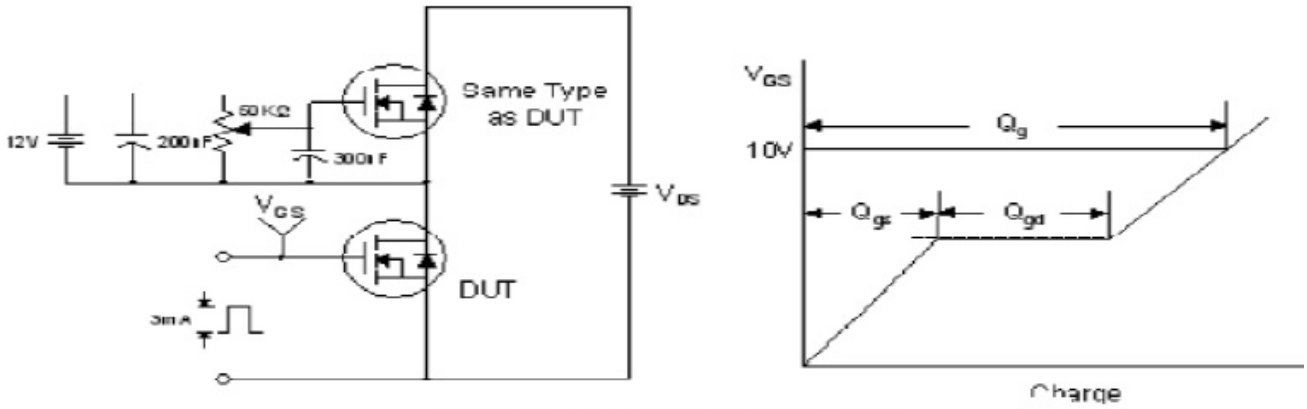
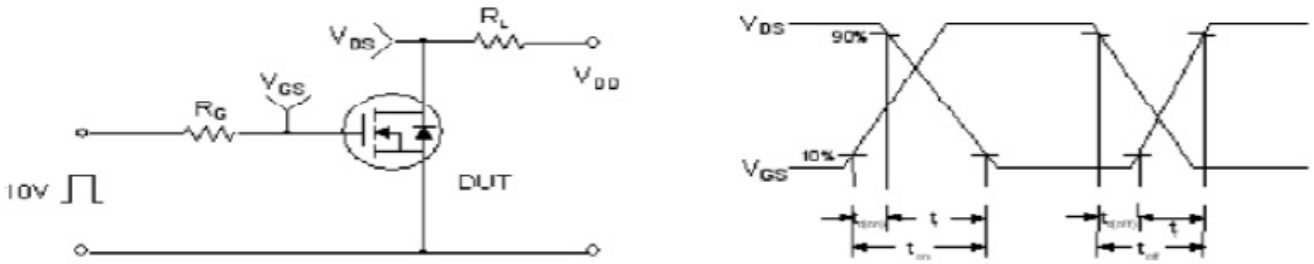


Figure 16 Unclamped Inductive Switching Capability

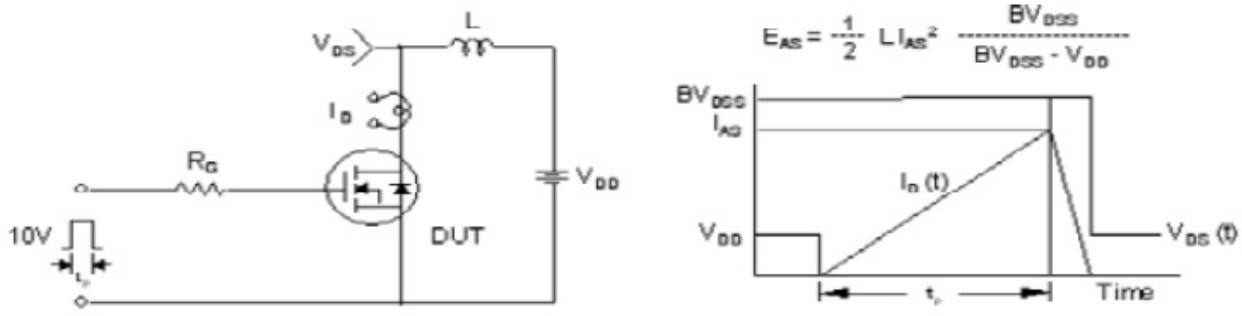
Test Circuitand Waveform



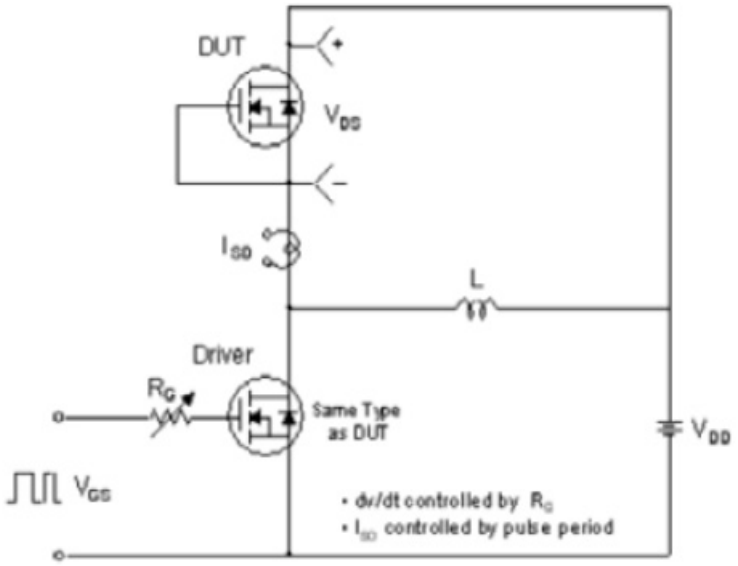
Gate Charge Test Circuit and Waveform

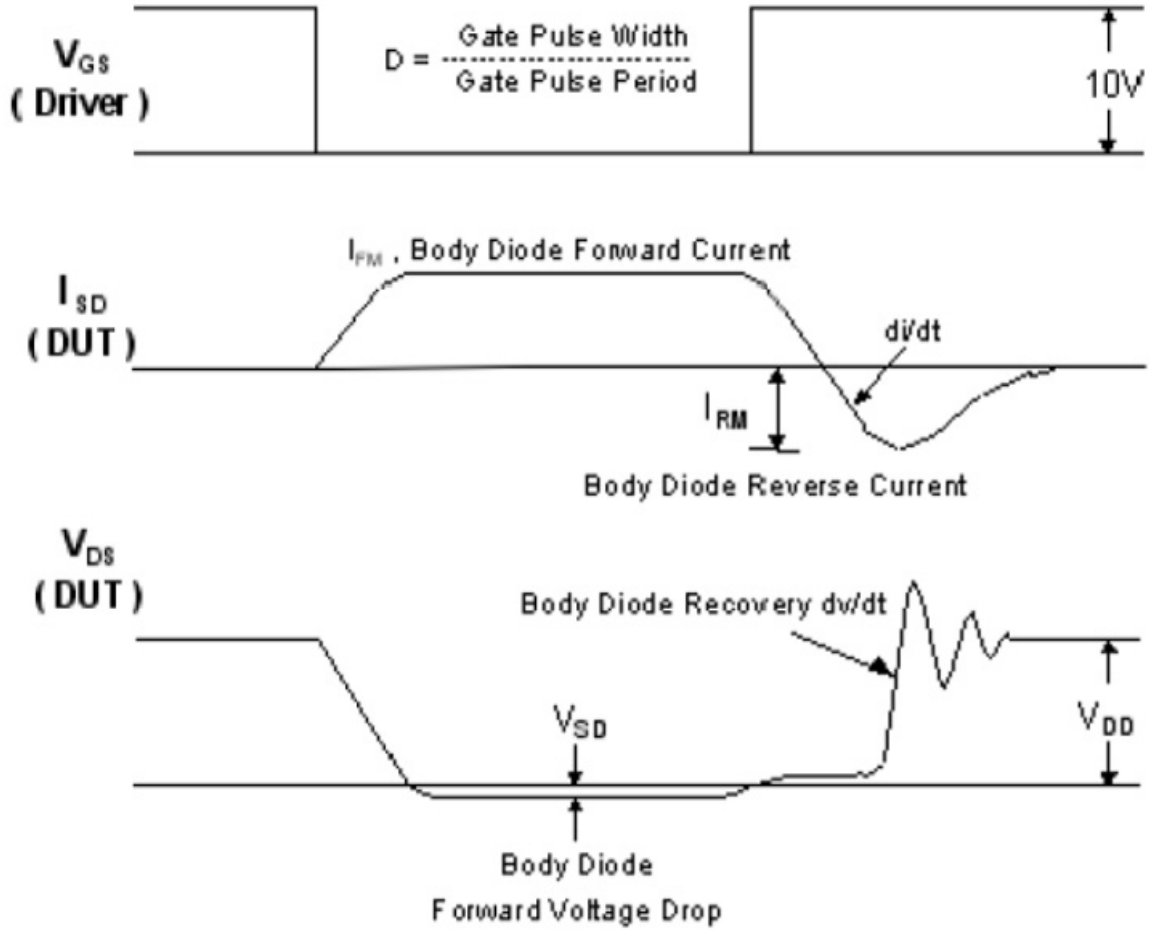


Resistive Switching Test Circuit and Waveform



Unclamped Inductive Switching Test Circuit and Waveform

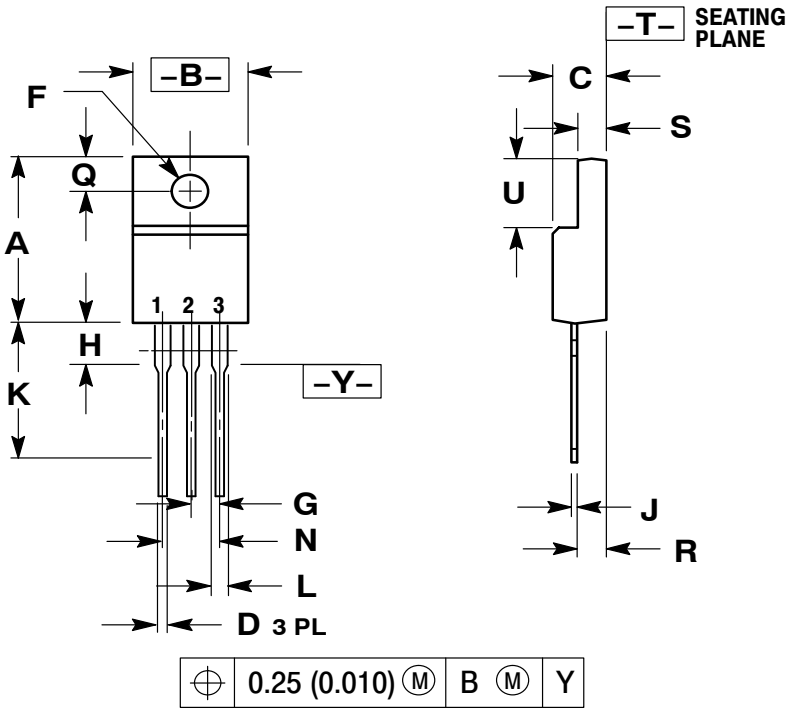




Diode Reverse Recovery Test Circuit and Waveform

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.

	INCHES		MILLIMETERS	
DIM	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