

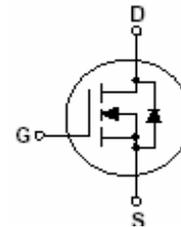
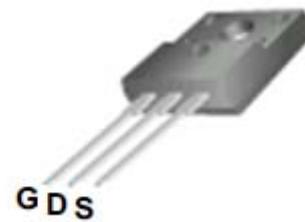


FQF13N50C

500V N-Channel MOSFET

Features

- Low Intrinsic Capacitances
- Excellent Switching Characteristics
- Extended Safe Operating Area
- Unrivalled Gate Charge : 56 nC (Typ.)
- BVDSS=500V, ID=13A
- Lower $R_{DS(on)}$: 0.48 Ω (Max) @VG=10V
- 100% Avalanche Tested



TO-220F

G-Gate,D-Drain,S-Source

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

Symbol	Parameter		Units
V_{DSS}	Drain-Source Voltage	500	V
I_D	Drain Current -continuous ($T_c=25^\circ\text{C}$)	13*	A
	-continuous ($T_c=100^\circ\text{C}$)	7.9*	A
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avanche Energy (Note1)	810	mJ
I_{AR}	Avalanche Current (Note2)	13	A
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	48	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	--	2.23	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	--	62.5	$^\circ\text{C}/\text{W}$

* Drain current limited by maximum junction temperature.

Electrical Characteristics Tc=25°C unless other wise noted						
Symbol	Parameter	Test Condition	Min.	Typ.	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	ID=250 μ A, VGS=0	500	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	ID=250 μ A, Reference to 25°C	--	0.48	--	V/°C
IDSS	Zero Gate Voltage Drain Current	Vds=500V, Vgs=0V	--	--	1	μ A
		Vds=400V, Tc=125°C			10	μ A
IGSSF	Gate-body leakage Current, Forward	Vgs=+30V, Vds=0V	--	--	100	nA
IGSSR	Gate-body leakage Current, Reverse	Vgs=-30V, Vds=0V	--	--	-100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	Id=250uA, Vds=Vgs	2	--	4	V
R _{DS(on)}	Static Drain-Source On-Resistance	Id=6.5A, Vgs=10V	--	--	0.48	Ω
Dynamic Characteristics						
Ciss	Input Capacitance	VDS=25V, VGS=0, f=1.0MHz	--	1800	2300	pF
Coss	Output Capacitance		--	245	320	pF
Crss	Reverse Transfer Capacitance		--	25	35	pF
Switching Characteristics						
Td(on)	Turn-On Delay Time	VDD=250V, ID=13A RG=25 Ω (Note 3,4)	--	40	90	nS
Tr	Turn-On Rise Time		--	140	290	nS
Td(off)	Turn-Off Delay Time		--	100	210	nS
Tf	Turn-Off Fall Time		--	85	180	nS
Qg	Total Gate Charge	VDS=400, VGS=10V, ID=13A (Note 3,4)	--	45	60	nC
Qgs	Gate-Source Charge		--	11	--	nC
Qgd	Gate-Drain Charge			22	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	13	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	29.2	A
V _{SD}	Drain-Source Diode Forward Voltage	Id=13A	--	--	1.5	V
trr	Reverse Recovery Time	I _S =13A, V _{GS} =0V	--	290	--	nS
Qrr	Reverse Recovery Charge	di _F /dt=100A/μ s (Note3)	--	2.6	--	μ C
*Notes	1, L=9.3mH, IAS=13A, VDD=50V, RG=25Ω, Starting T _J =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

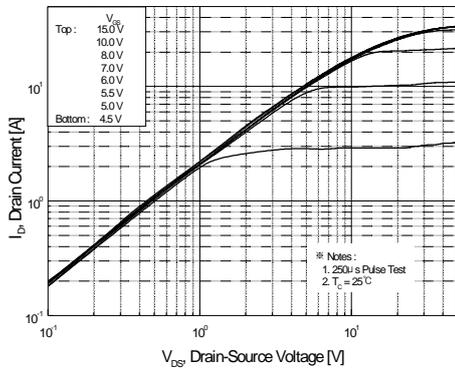


Figure 1. On-Region Characteristics

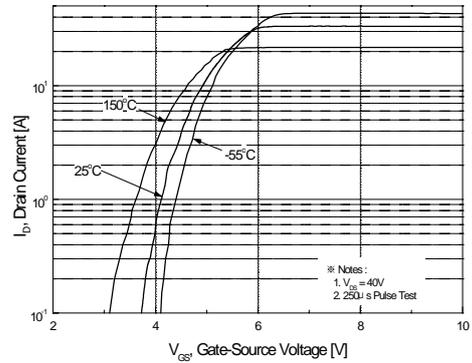


Figure 2. Transfer Characteristics

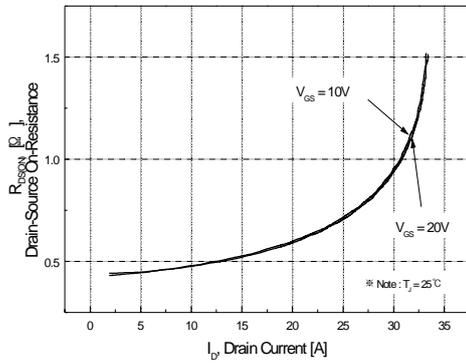


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

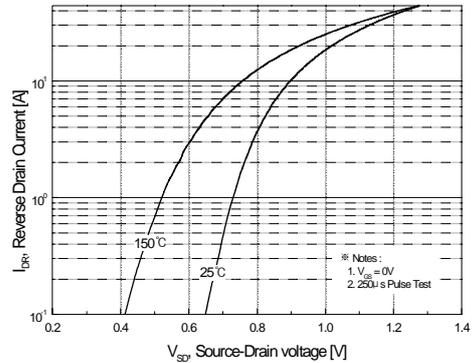


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

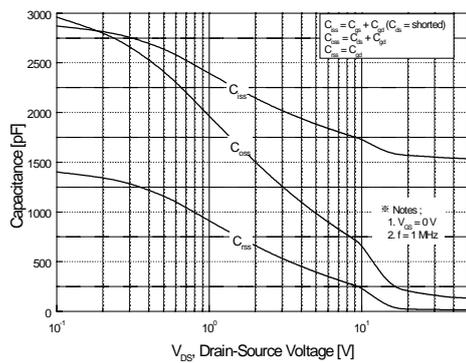


Figure 5. Capacitance Characteristics

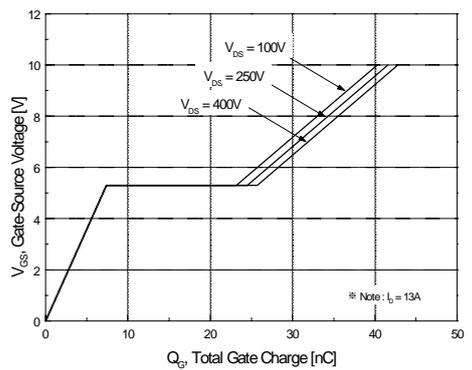


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

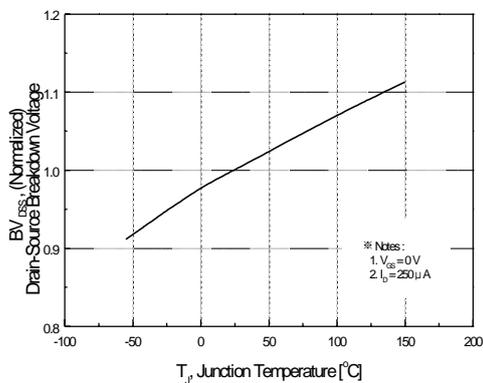


Figure 7. Breakdown Voltage Variation vs Temperature

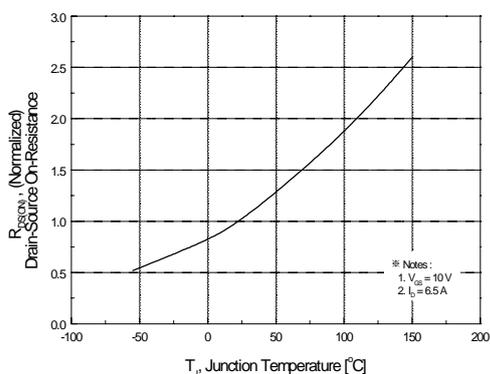


Figure 8. On-Resistance Variation vs Temperature

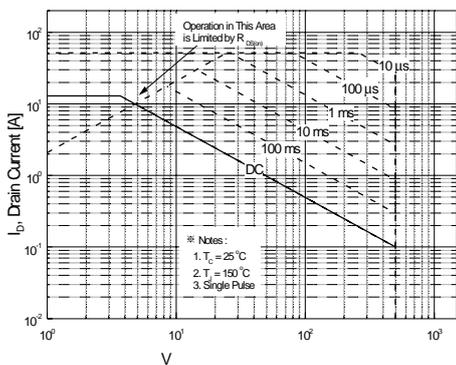


Figure 9-1. Maximum Safe Operating Area

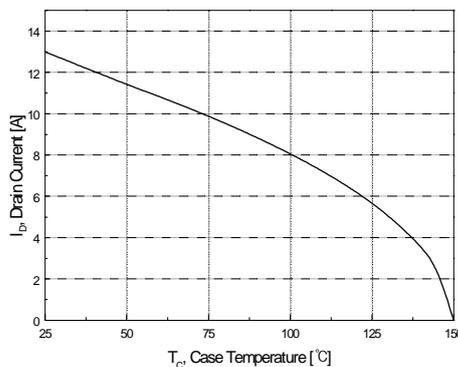


Figure 10. Maximum Drain Current vs Case Temperature

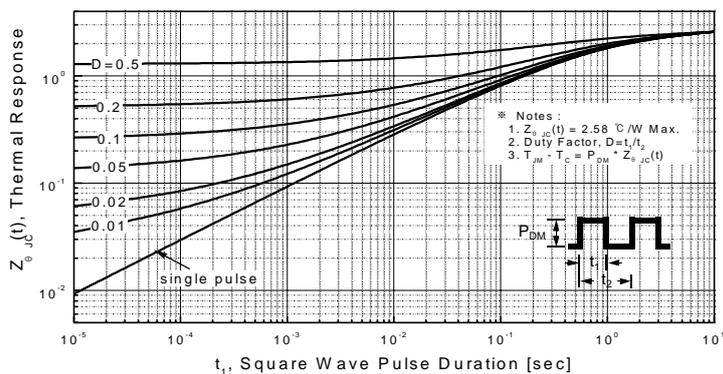
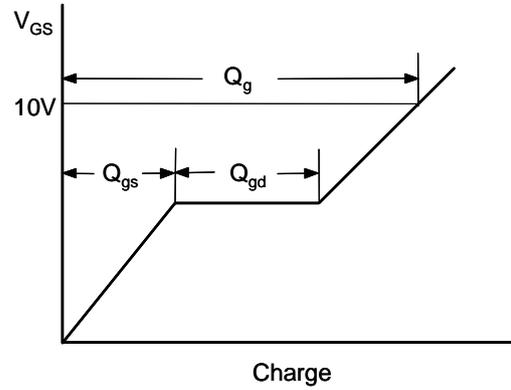
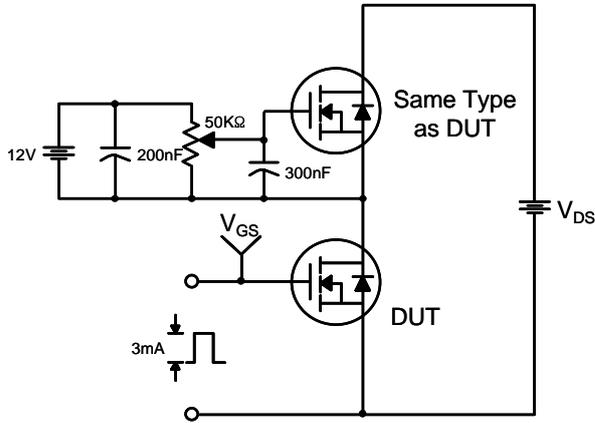
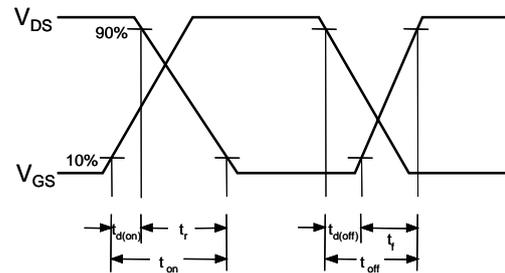
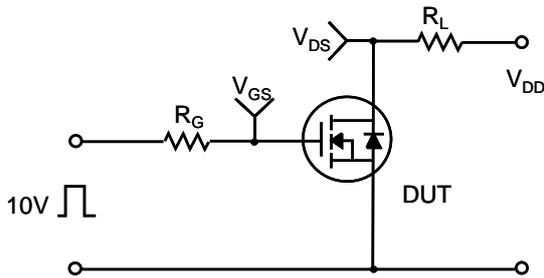


Figure 11-1. Transient Thermal Response Curve

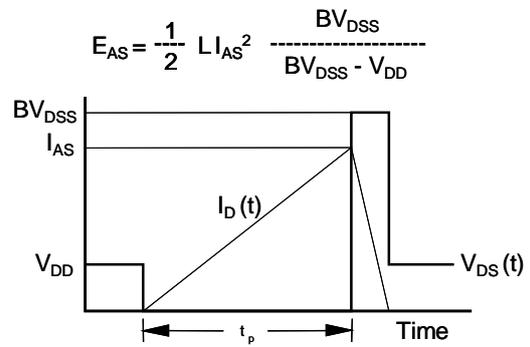
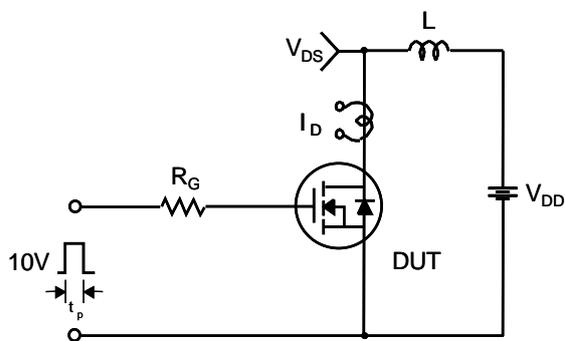
Gate Charge Test Circuit & Waveform



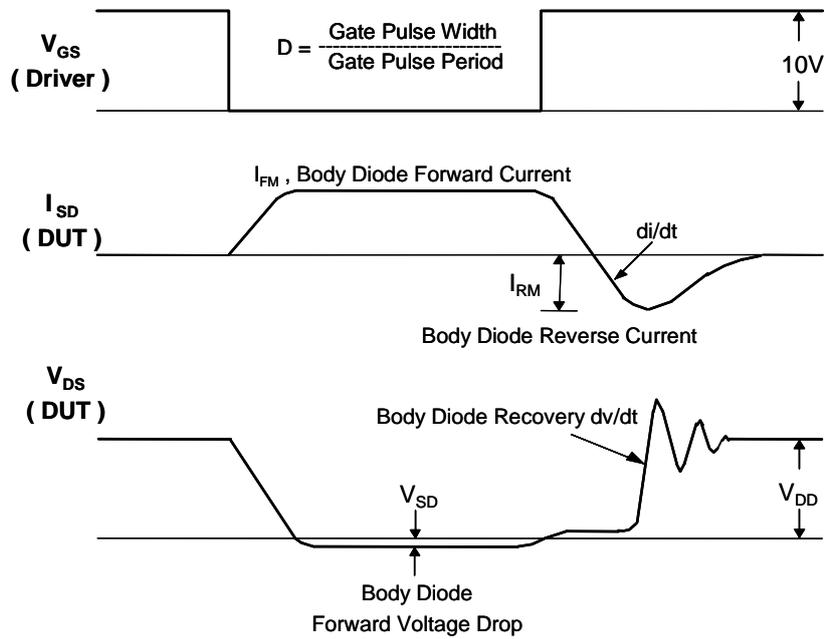
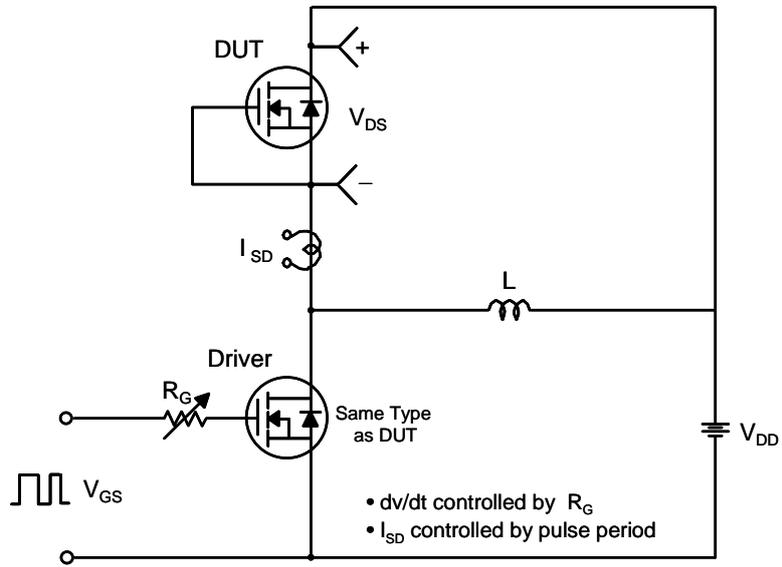
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

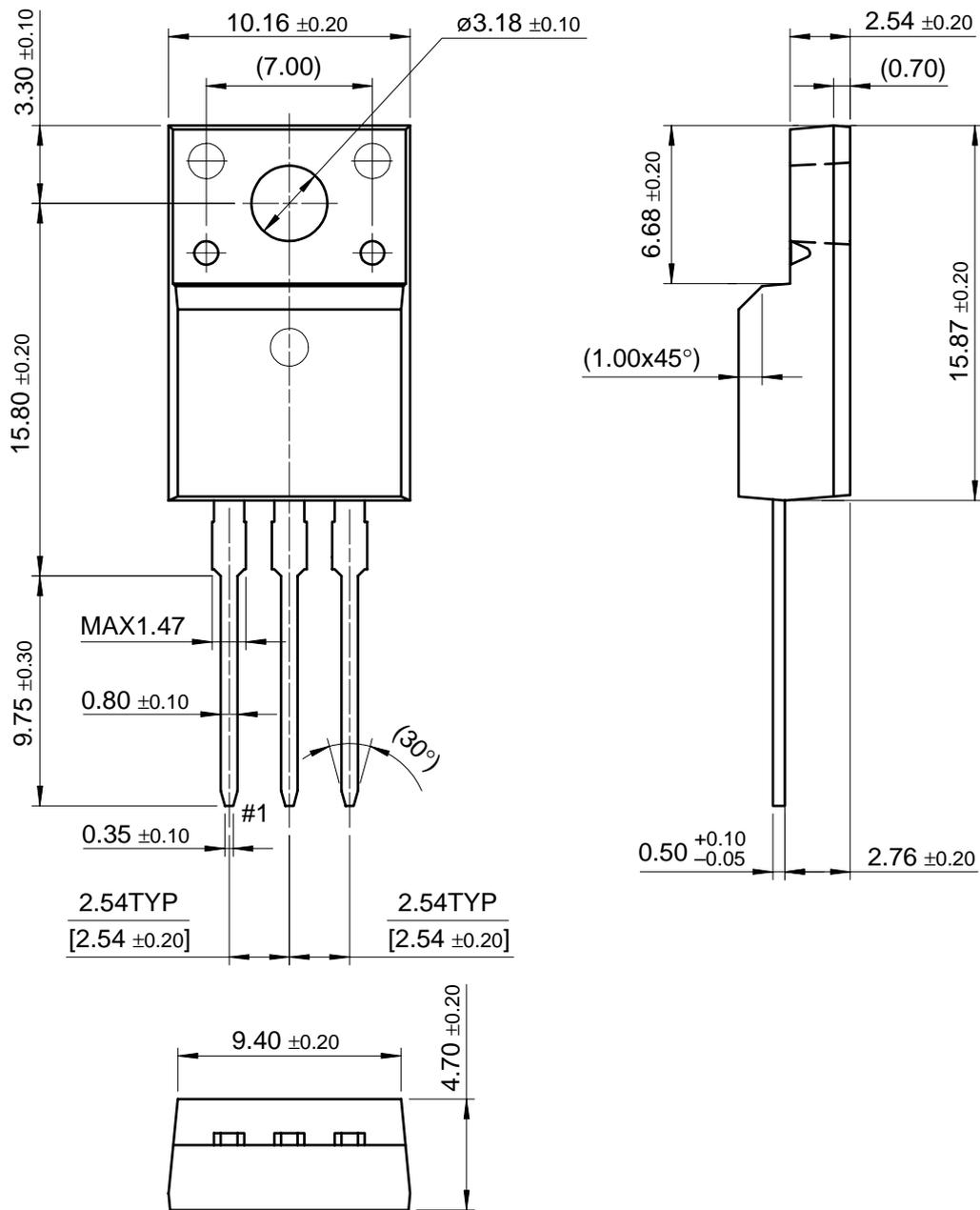


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimension

TO-220F



Dimensions in Millimeters