

**Electrical Characteristics** $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Off Characteristics**

$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.06	--	V/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	$\mu\text{A}$
		$V_{DS} = 48\text{ V}, T_C = 150^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 25\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -25\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

**On Characteristics**

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 4.7\text{ A}$	--	0.105	0.135	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 25\text{ V}, I_D = 4.7\text{ A}$ (Note 4)	--	4.8	--	S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	240	310	pF
$C_{oss}$	Output Capacitance		--	90	120	pF
$C_{rss}$	Reverse Transfer Capacitance		--	15	20	pF

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\text{ V}, I_D = 6.5\text{ A},$ $R_G = 25\text{ }\Omega$	--	5	20	ns
$t_r$	Turn-On Rise Time		--	25	60	ns
$t_{d(off)}$	Turn-Off Delay Time		--	8	25	ns
$t_f$	Turn-Off Fall Time	(Note 4, 5)	--	15	40	ns
$Q_g$	Total Gate Charge	$V_{DS} = 48\text{ V}, I_D = 13\text{ A},$ $V_{GS} = 10\text{ V}$	--	5.8	7.5	nC
$Q_{gs}$	Gate-Source Charge		--	2.0	--	nC
$Q_{gd}$	Gate-Drain Charge		--	2.5	--	nC

**Drain-Source Diode Characteristics and Maximum Ratings**

I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		--	--	9.4	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		--	--	37.6	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 9.4 A	--	--	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 13 A,	--	39	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI <sub>F</sub> / dt = 100 A/μs (Note 4)	--	40	--	nC

**Notes:**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 1.12\text{ mH}, I_{AS} = 9.4\text{ A}, V_{DD} = 25\text{ V}, R_G = 25\text{ }\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 13\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$
5. Essentially independent of operating temperature

## Typical Characteristics

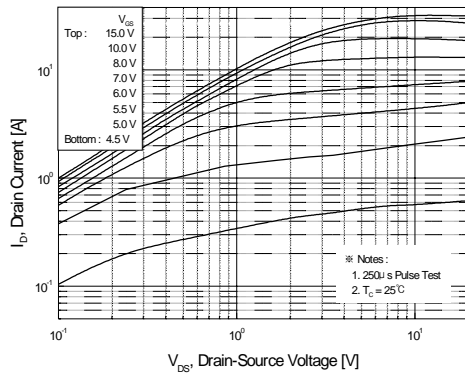


Figure 1. On-Region Characteristics

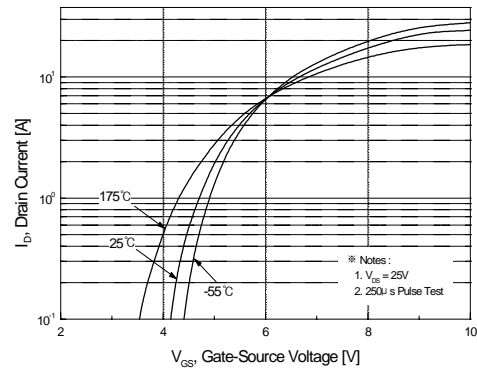


Figure 2. Transfer Characteristics

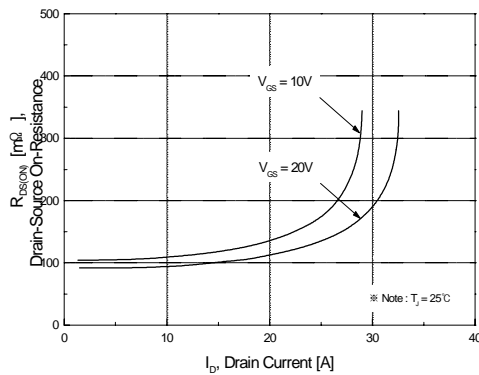


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

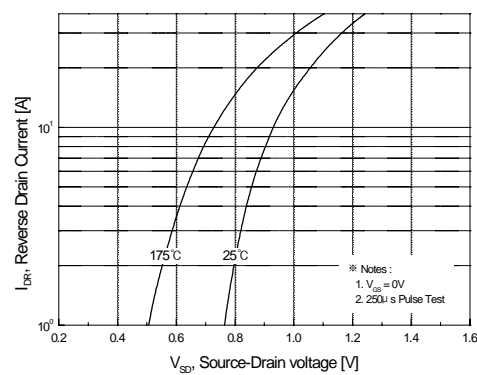


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

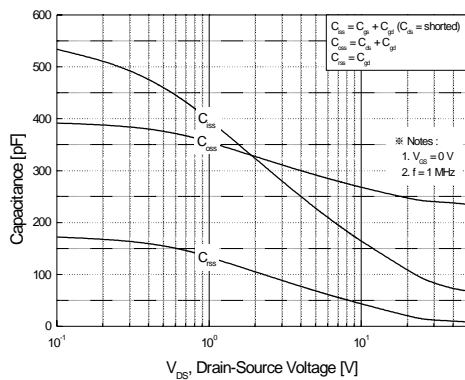


Figure 5. Capacitance Characteristics

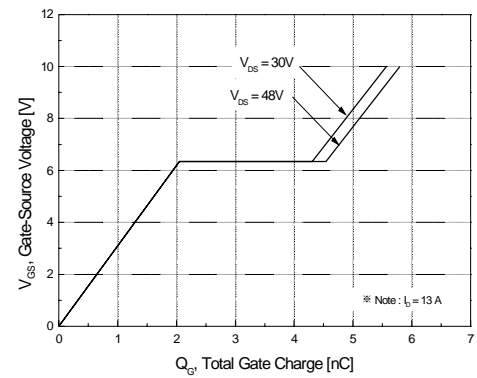


Figure 6. Gate Charge Characteristics

# Typical Characteristics (Continued)

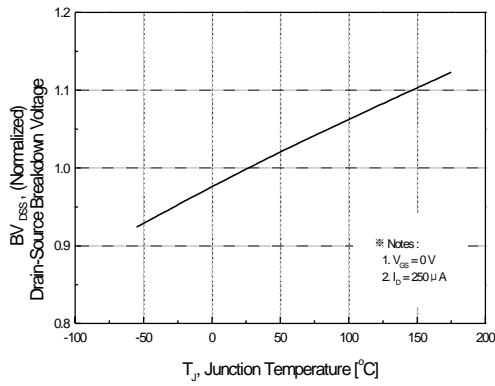


Figure 7. Breakdown Voltage Variation vs. Temperature

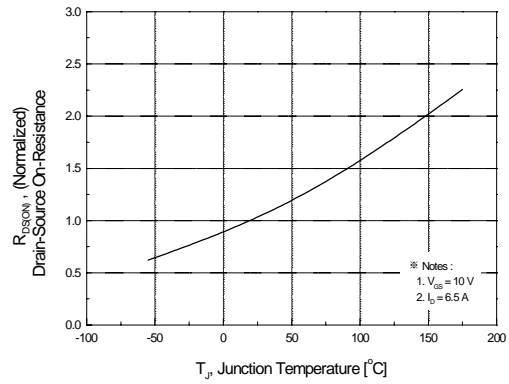


Figure 8. On-Resistance Variation vs. Temperature

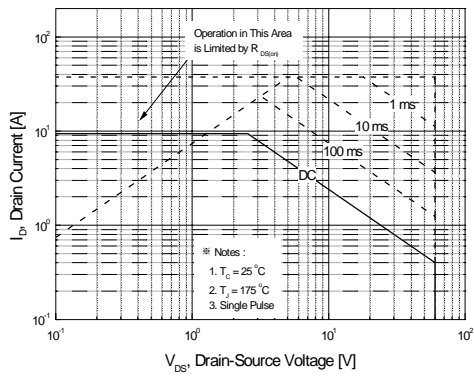


Figure 9. Maximum Safe Operating Area

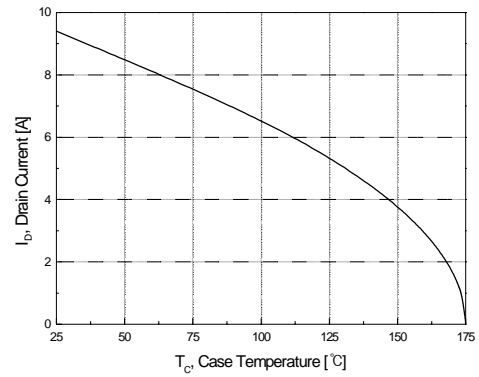


Figure 10. Maximum Drain Current vs. Case Temperature

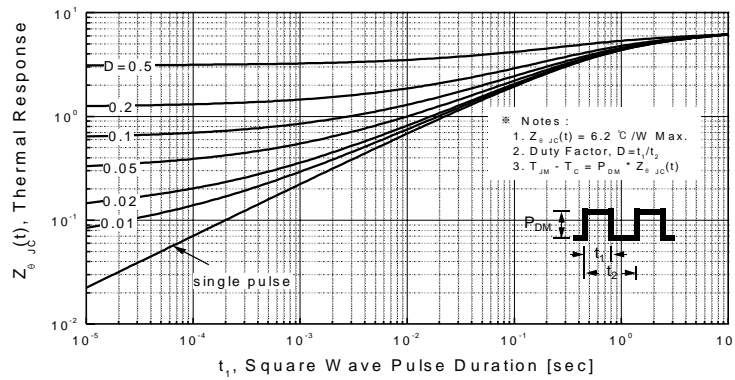
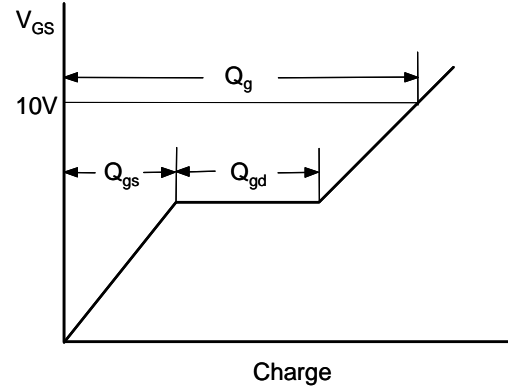
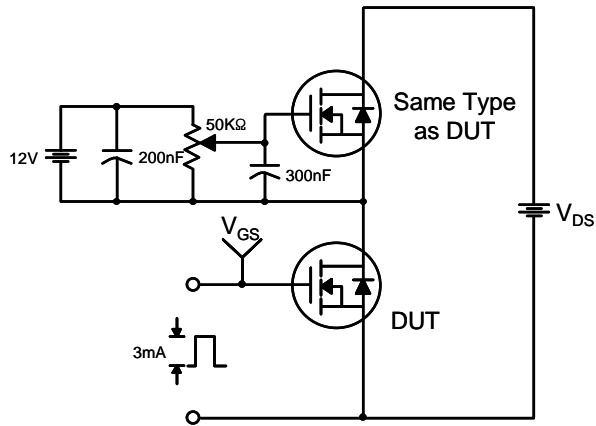
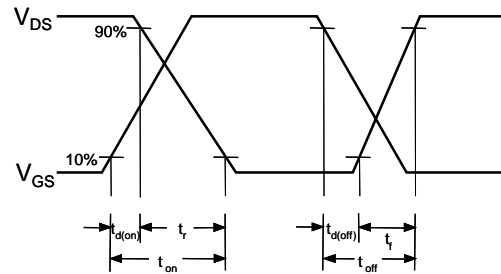
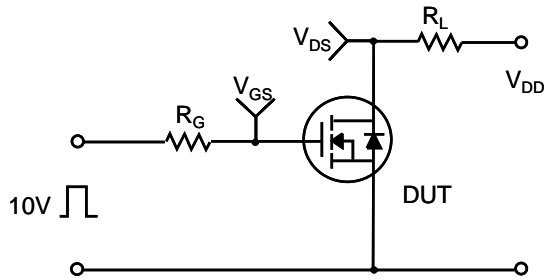


Figure 11. Transient Thermal Response Curve

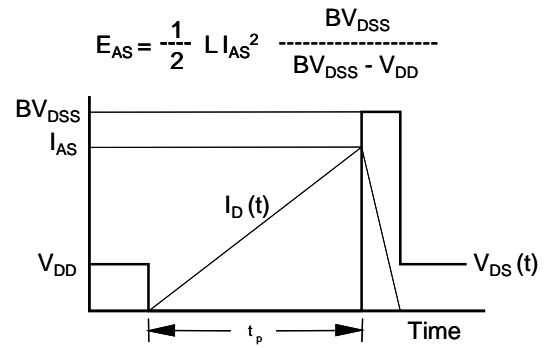
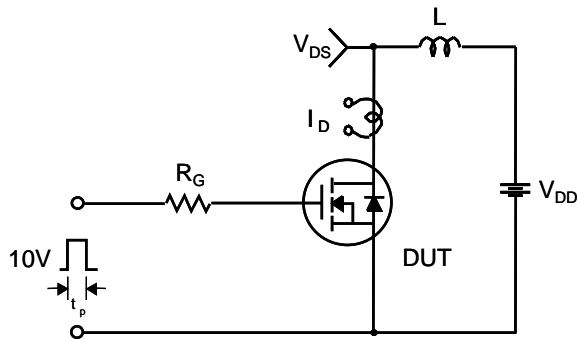
### Gate Charge Test Circuit & Waveform



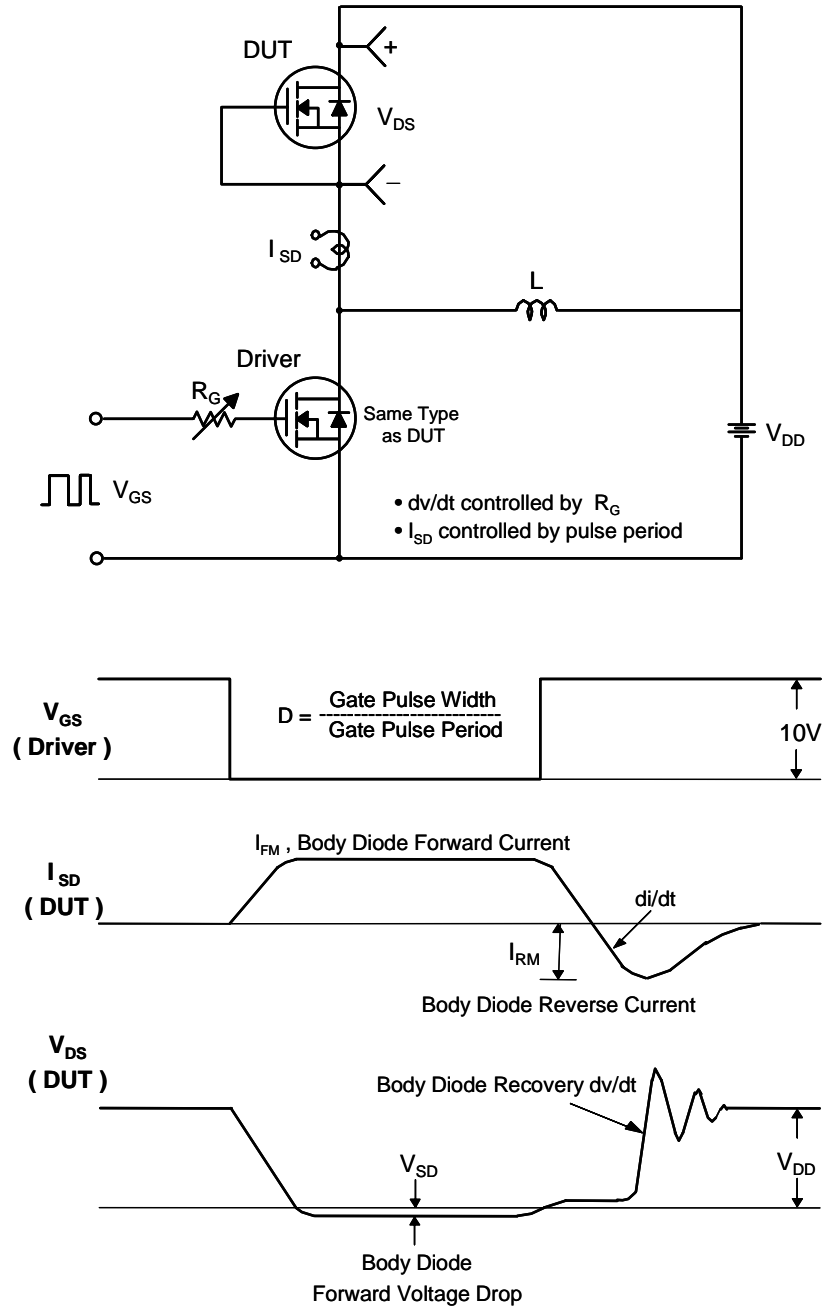
### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching Test Circuit & Waveforms



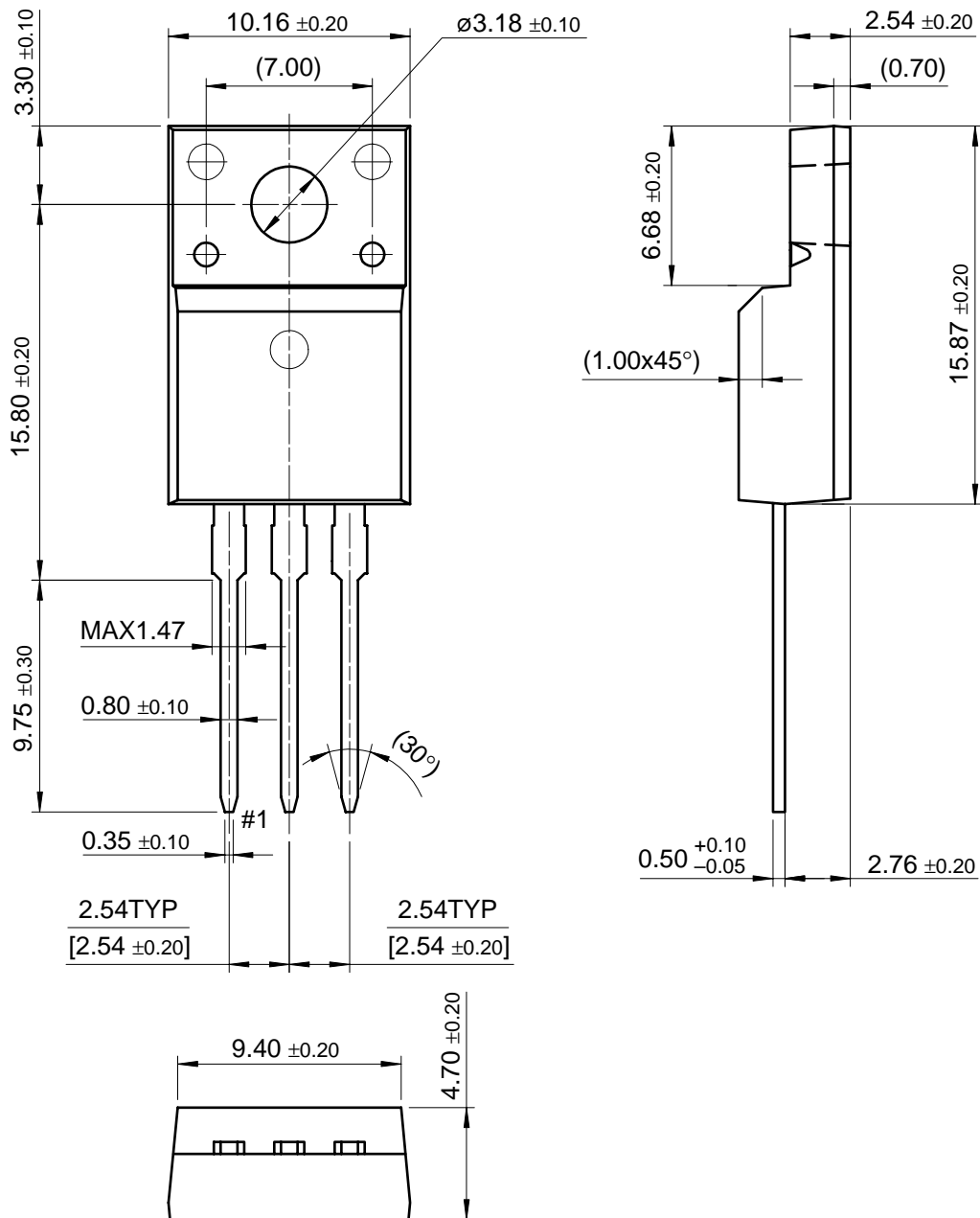
# Peak Diode Recovery dv/dt Test Circuit & Waveforms



# Package Dimensions

## TO-220F

FQPF13N06



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