

# FQP8N60C/FQPF8N60C

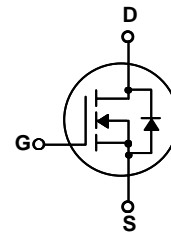
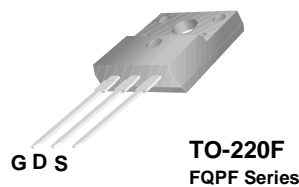
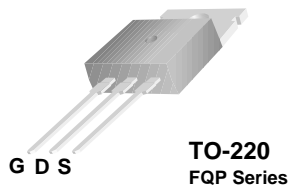
## 600V N-Channel MOSFET

### General Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.

### Features

- 7.5A, 600V,  $R_{DS(on)} = 1.2\Omega @ V_{GS} = 10V$
- Low gate charge ( typical 28 nC)
- Low Crss ( typical 12 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



### Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	FQP8N60C	FQPF8N60C	Units
V <sub>DSS</sub>	Drain-Source Voltage	600		V
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C) - Continuous (T <sub>C</sub> = 100°C)	7.5	7.5 *	A
		4.6	4.6 *	A
I <sub>DM</sub>	Drain Current - Pulsed (Note 1)	30	30 *	A
V <sub>GSS</sub>	Gate-Source Voltage	± 30		V
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)	230		mJ
I <sub>AR</sub>	Avalanche Current (Note 1)	7.5		A
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)	14.7		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> = 25°C) - Derate above 25°C	147	48	W
		1.18	0.38	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +150		°C
T <sub>L</sub>	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300		°C

\* Drain current limited by maximum junction temperature.

### Thermal Characteristics

Symbol	Parameter	FQP8N60C	FQPF8N60C	Units
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	0.85	2.6	°C/W
R <sub>θCS</sub>	Thermal Resistance, Case-to-Sink Typ.	0.5	--	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	62.5	62.5	°C/W

## Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	600	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.7	--	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	$\mu\text{A}$
		$V_{DS} = 480\text{ V}, T_C = 125^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 3.75\text{ A}$	--	1.0	1.2	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 3.75\text{ A}$ (Note 4)	--	8.7	--	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	965	1255	pF
$C_{oss}$	Output Capacitance		--	105	135	pF
$C_{rss}$	Reverse Transfer Capacitance		--	12	16	pF

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 300\text{ V}, I_D = 7.5\text{ A},$ $R_G = 25\ \Omega$	--	16.5	45	ns
$t_r$	Turn-On Rise Time		--	60.5	130	ns
$t_{d(off)}$	Turn-Off Delay Time		--	81	170	ns
$t_f$	Turn-Off Fall Time		(Note 4, 5)	--	64.5	140
$Q_g$	Total Gate Charge	$V_{DS} = 480\text{ V}, I_D = 7.5\text{ A},$ $V_{GS} = 10\text{ V}$	--	28	36	nC
$Q_{gs}$	Gate-Source Charge		--	4.5	--	nC
$Q_{gd}$	Gate-Drain Charge		(Note 4, 5)	--	12	--

### Drain-Source Diode Characteristics and Maximum Ratings

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	7.5	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	30	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 7.5\text{ A}$	--	--	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 7.5\text{ A},$	--	365	--	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4)	--	3.4	--	$\mu\text{C}$

#### Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 7.3\text{ mH}, I_{AS} = 7.5\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 7.5\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , 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

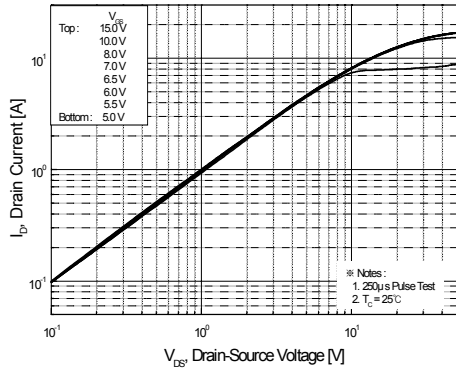


Figure 1. On-Region Characteristics

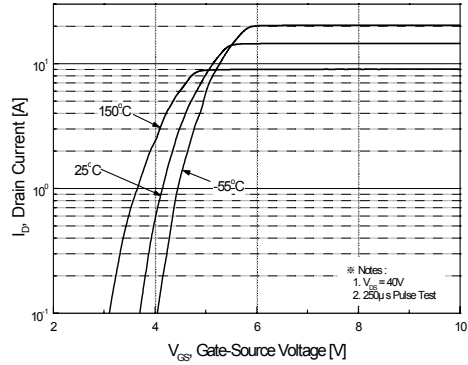


Figure 2. Transfer Characteristics

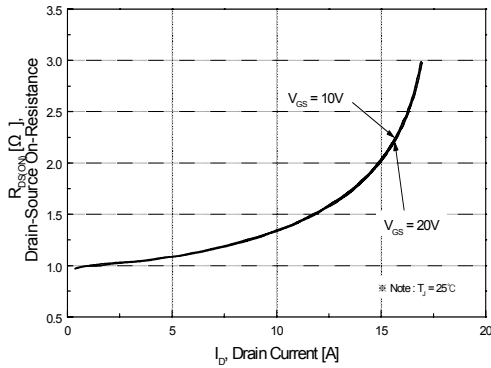


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

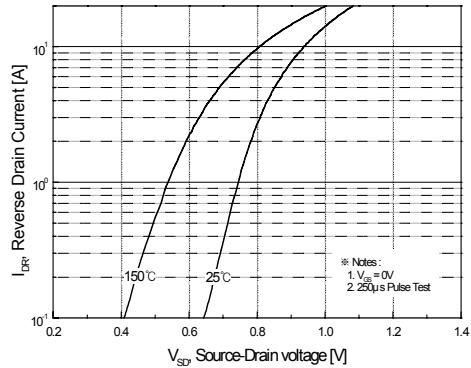


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

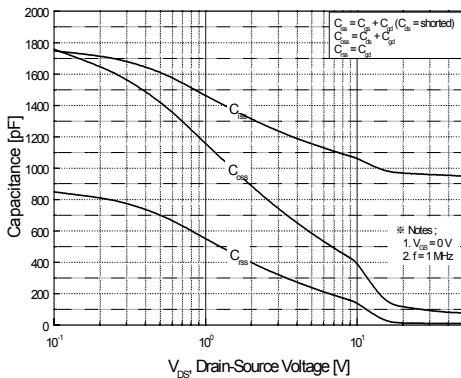


Figure 5. Capacitance Characteristics

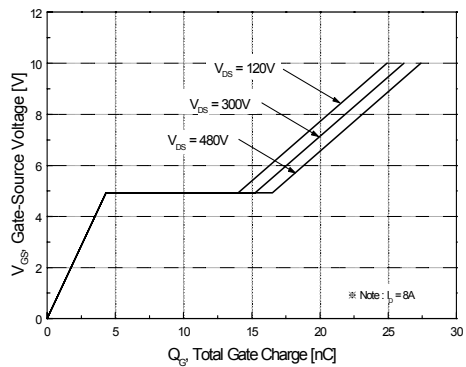
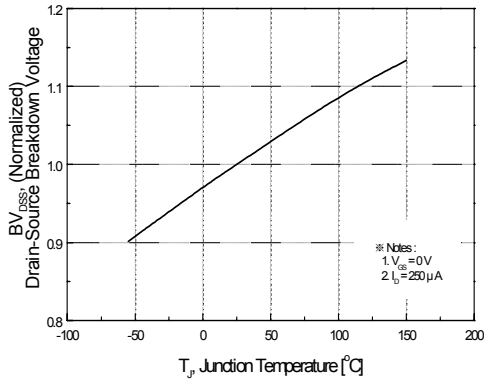
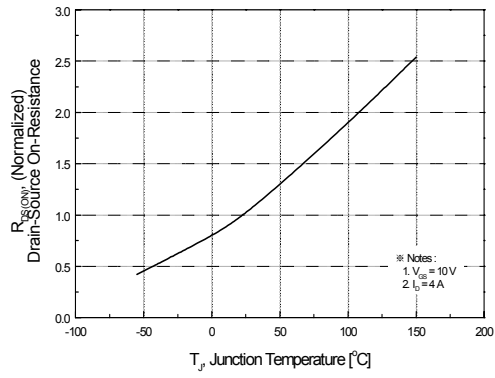


Figure 6. Gate Charge Characteristics

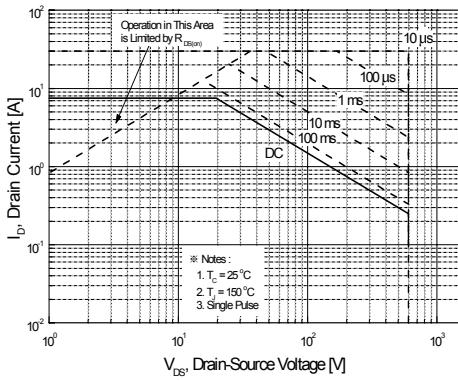
**Typical Characteristics** (Continued)



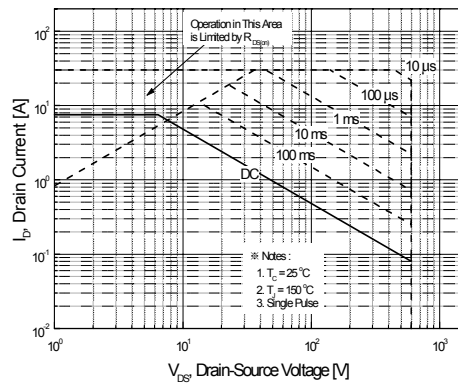
**Figure 7. Breakdown Voltage Variation vs Temperature**



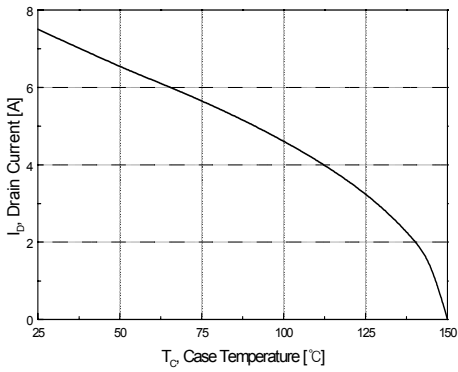
**Figure 8. On-Resistance Variation vs Temperature**



**Figure 9-1. Maximum Safe Operating Area for FQP8N60C**



**Figure 9-2. Maximum Safe Operating Area for FQPF8N60C**



**Figure 10. Maximum Drain Current vs Case Temperature**

Typical Characteristics (Continued)

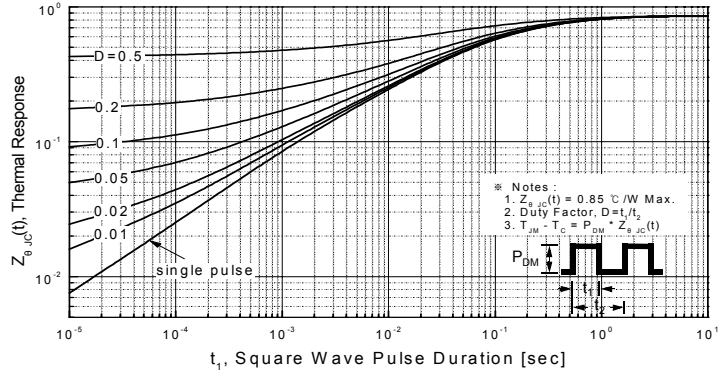


Figure 11-1. Transient Thermal Response Curve for FQP8N60C

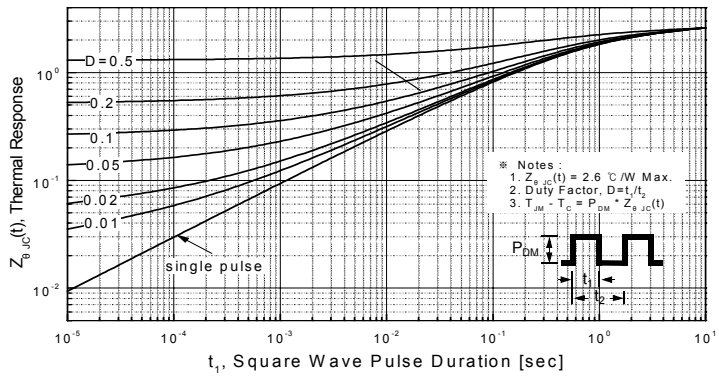
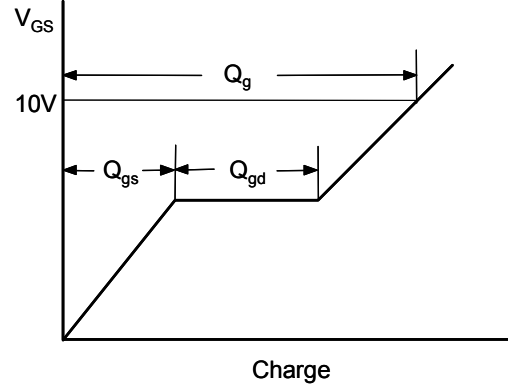
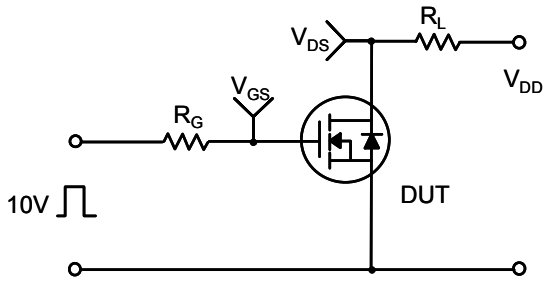


Figure 11-2. Transient Thermal Response Curve for FQPF8N60C

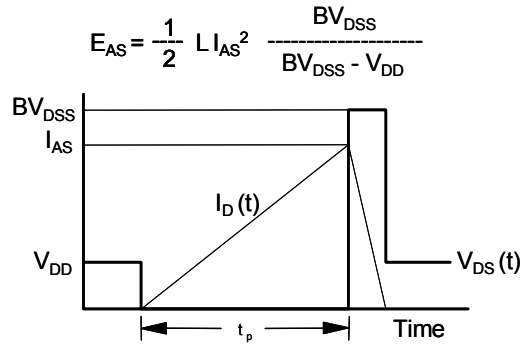
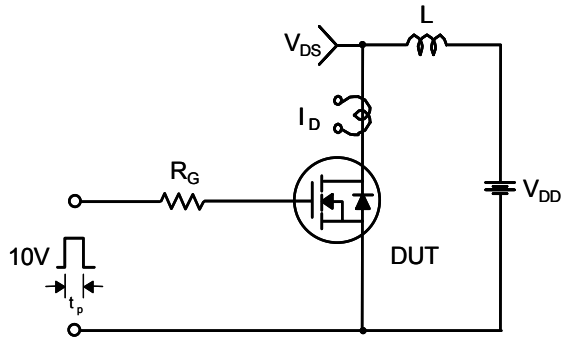
**Gate Charge Test Circuit & Waveform**



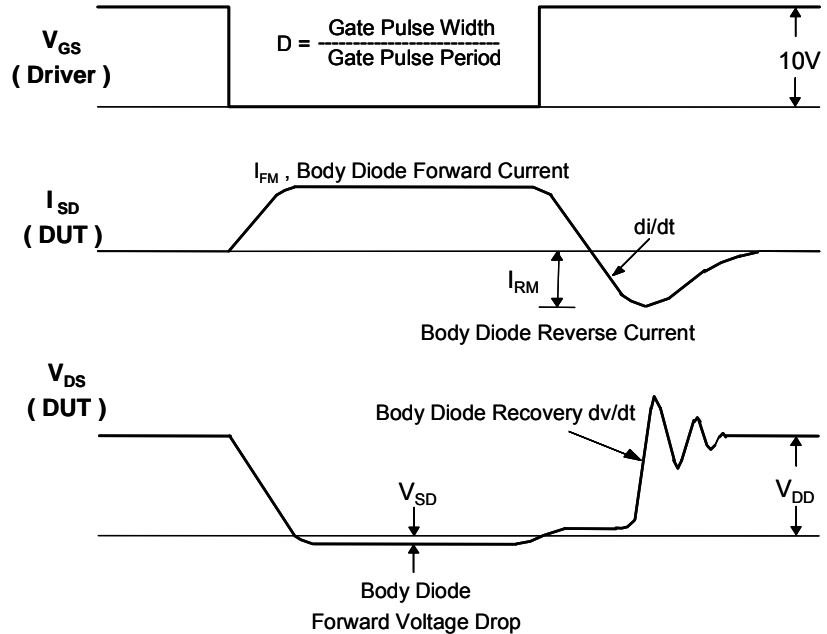
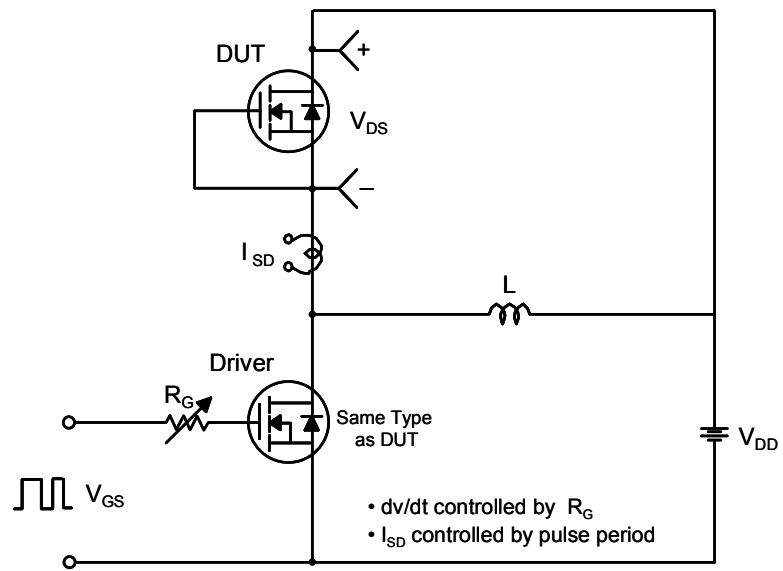
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**



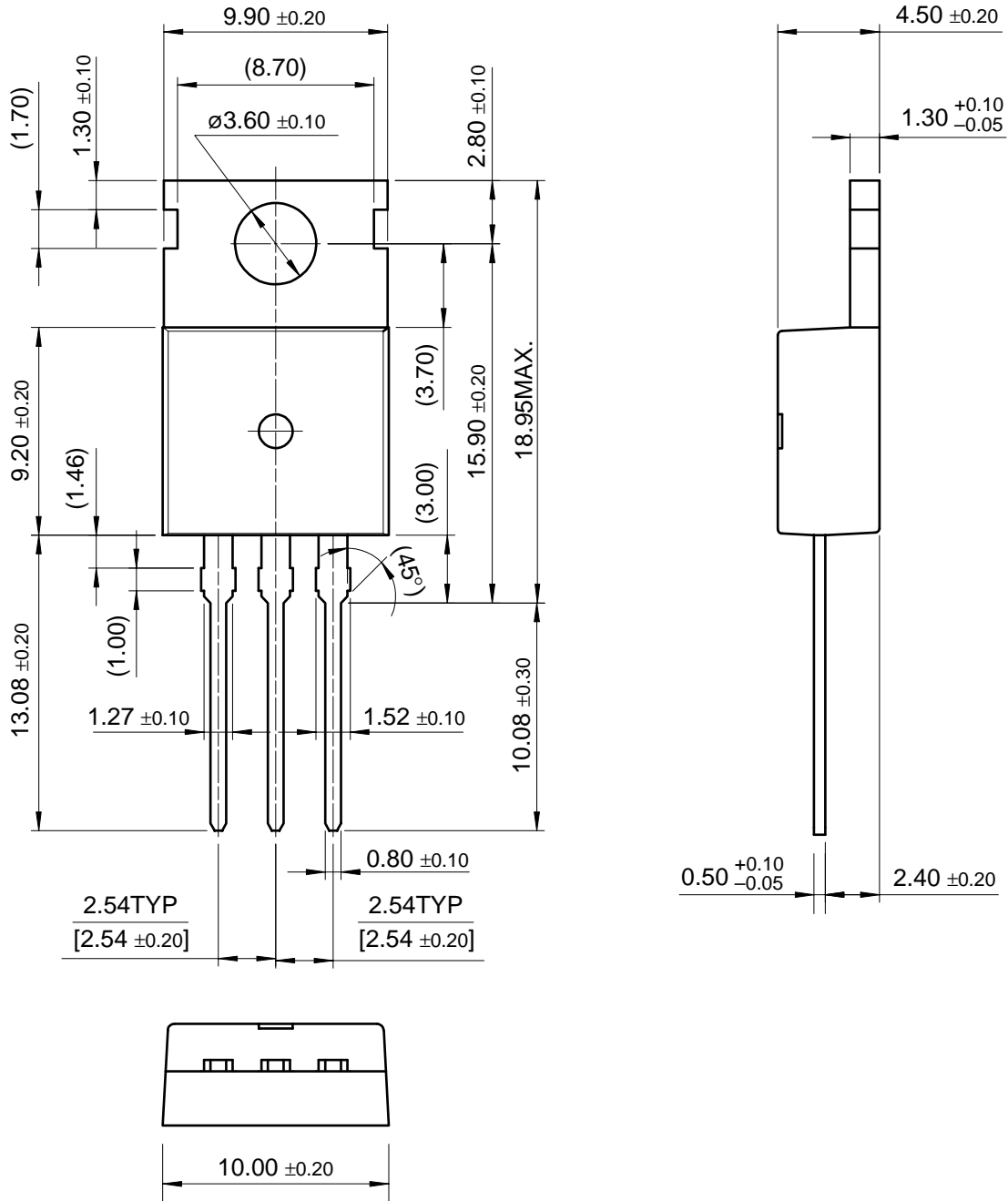
Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimensions

TO-220

FQP8N60C/FQPF8N60C

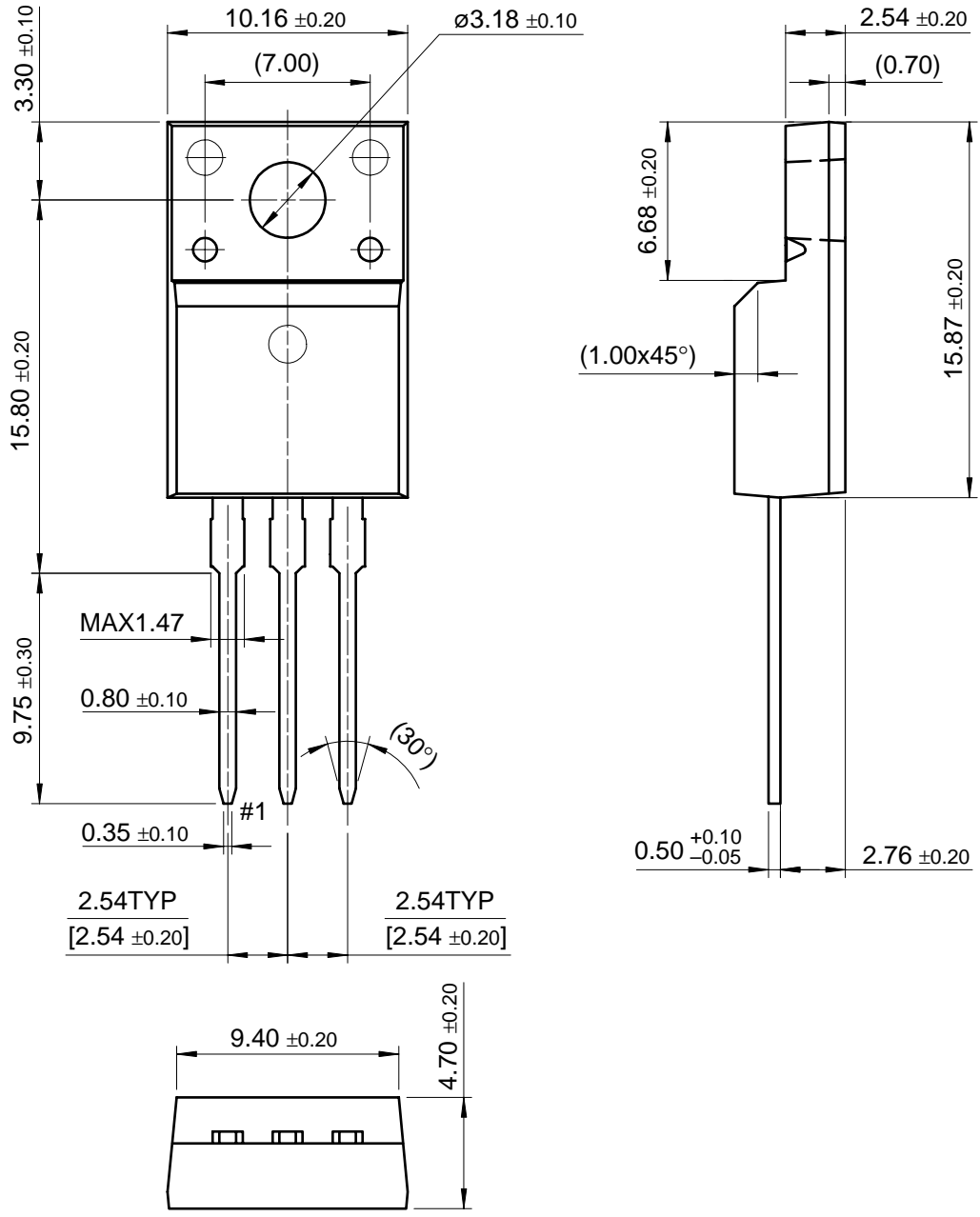


Dimensions in Millimeters



Package Dimensions (Continued)

# TO-220F



FQP8N60C/FQPF8N60C

Dimensions in Millimeters

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Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

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## FQPF8N60C

600V N-Channel Advance Q-FET C-Series

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- [Features](#)
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### General description

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Product	Product status	Pb-free Status	Pricing*	Package type	Leads	Packing method	Package Marking Convention**
							Line 1: \$Y (Fairchild logo)

FQPF8N60C	Full Production		\$1.12	<a href="#">TO-220F</a>	3	RAIL	&Z (Asm. Plant Code) &4 (4-Digit Date Code) Line 2: FQPF Line 3: 8N60C
FQPF8N60CT	Full Production		\$1.14	<a href="#">TO-220F</a>	3	RAIL	Line 1: \$Y (Fairchild logo) &Z (Asm. Plant Code) &E&3 (3-Digit Date Code) Line 2: FQPF Line 3: 8N60CT
FQPF8N60CYDTU	Full Production		\$1.26	<a href="#">TO-220F</a>	3	RAIL	Line 1: \$Y (Fairchild logo) &Z (Asm. Plant Code) &4 (4-Digit Date Code)

\* Fairchild 1,000 piece Budgetary Pricing

\*\* A sample button will appear if the part is available through Fairchild's on-line samples program. If there is no sample button, please contact a [Fairchild distributor](#) to obtain samples



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### Application notes

[AN-6014: AN-6014 Green Current Mode PWM Controller FAN7602 \(390 K\)](#)

Jul 27, 2007

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### Qualification Support

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