

# FQP8N80C/FQPF8N80C/FQPF8N80CYDTU

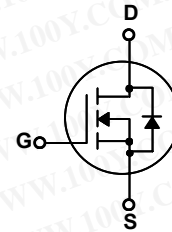
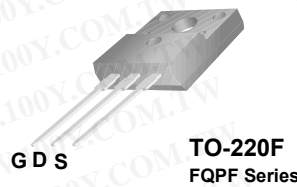
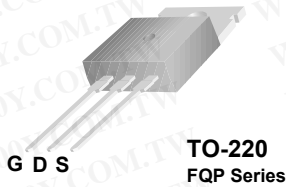
## 800V N-Channel MOSFET

### 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 switch mode power supplies.

### Features

- 8A, 800V,  $R_{DS(on)} = 1.55\Omega @ V_{GS} = 10V$
- Low gate charge ( typical 35 nC)
- Low  $C_{rss}$  ( typical 13 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS Compliant



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

Symbol	Parameter	FQP8N80C	FQPF8N80C	Units
V <sub>DSS</sub>	Drain-Source Voltage	800		V
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C) - Continuous (T <sub>C</sub> = 100°C)	8	8 *	A
		5.1	5.1 *	A
I <sub>DM</sub>	Drain Current - Pulsed (Note 1)	32	32 *	A
V <sub>GSS</sub>	Gate-Source Voltage	± 30		V
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)	850		mJ
I <sub>AR</sub>	Avalanche Current (Note 1)	8		A
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)	17.8		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	178	59	W
		1.43	0.48	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	FQP8N80C	FQPF8N80C	Units
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	0.7	2.1	°C/W
R <sub>θJS</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	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	800	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.5	--	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	$\mu\text{A}$
		$V_{DS} = 640\text{ V}, T_C = 125^\circ\text{C}$	--	--	100	$\mu\text{A}$
$I_{GSSF}$	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	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 4\text{ A}$	--	1.29	1.55	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 50\text{ V}, I_D = 4\text{ A}$ (Note 4)	--	5.6	--	S

## Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	1580	2050	pF
$C_{oss}$	Output Capacitance		--	135	175	pF
$C_{rss}$	Reverse Transfer Capacitance		--	13	17	pF

## Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 400\text{ V}, I_D = 8\text{ A},$ $R_G = 25\ \Omega$	--	40	90	ns	
$t_r$	Turn-On Rise Time		--	110	230	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4, 5)	--	65	140	ns
$t_f$	Turn-Off Fall Time		(Note 4, 5)	--	70	150	ns
$Q_g$	Total Gate Charge	$V_{DS} = 640\text{ V}, I_D = 8\text{ A},$ $V_{GS} = 10\text{ V}$	--	35	45	nC	
$Q_{gs}$	Gate-Source Charge		(Note 4, 5)	--	10	--	nC
$Q_{gd}$	Gate-Drain Charge		(Note 4, 5)	--	14	--	nC

## Drain-Source Diode Characteristics and Maximum Ratings

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	8	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	32	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 8\text{ A}$	--	--	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 8\text{ A},$	--	690	--	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4)	--	8.2	--	$\mu\text{C}$

### Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 25\text{mH}, I_{AS} = 8\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 8\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , 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

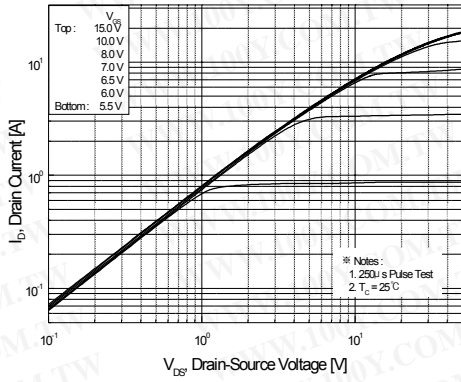


Figure 1. On-Region Characteristics

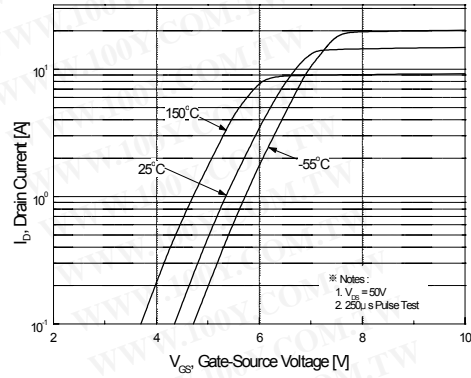


Figure 2. Transfer Characteristics

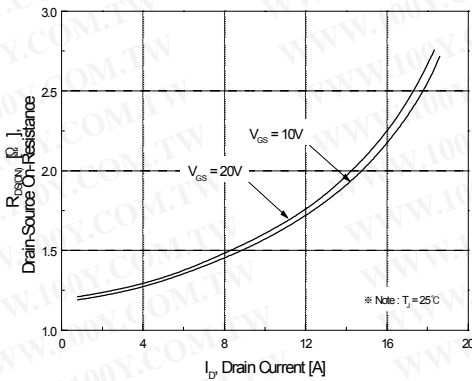


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

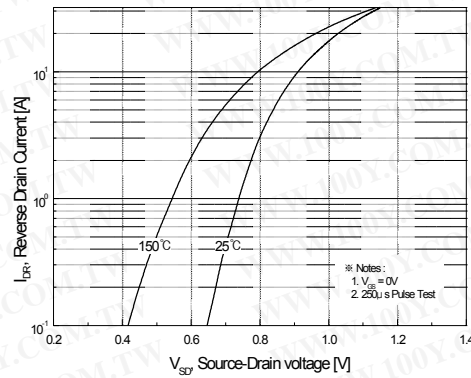


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

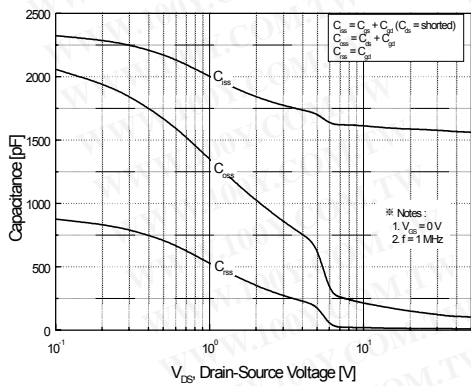


Figure 5. Capacitance Characteristics

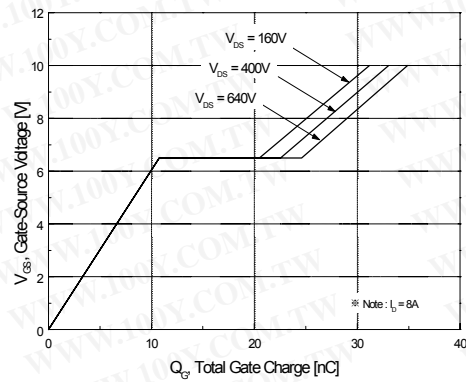
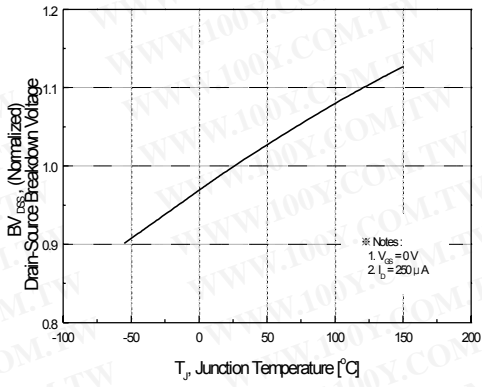
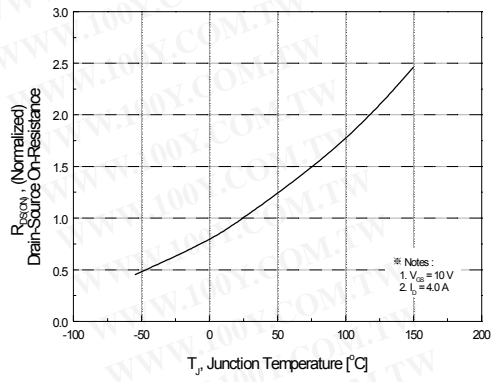


Figure 6. Gate Charge Characteristics

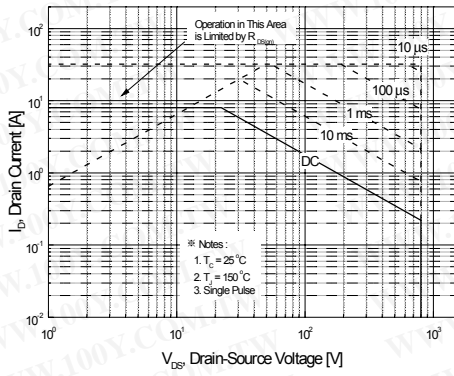
**Typical Characteristics** (Continued)



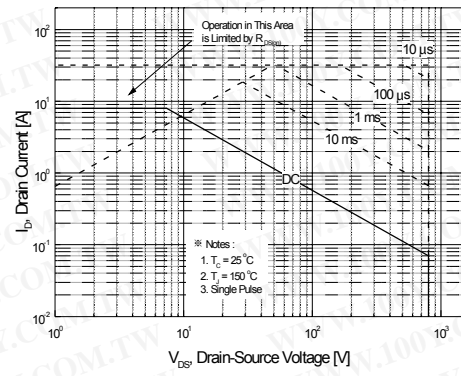
**Figure 7. Breakdown Voltage Variation vs Temperature**



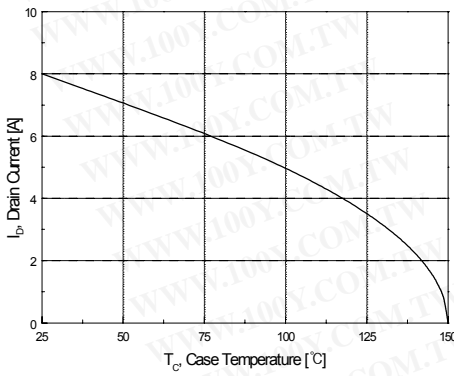
**Figure 8. On-Resistance Variation vs Temperature**



**Figure 9-1. Maximum Safe Operating Area for FQP8N80C**

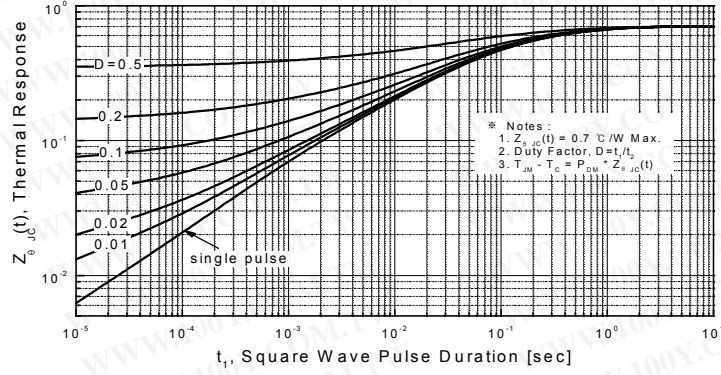


**Figure 9-2. Maximum Safe Operating Area for FQPF8N80C**

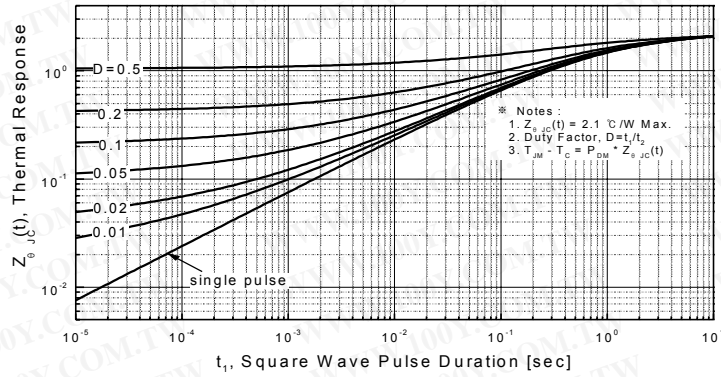


**Figure 10. Maximum Drain Current vs Case Temperature**

**Typical Characteristics** (Continued)

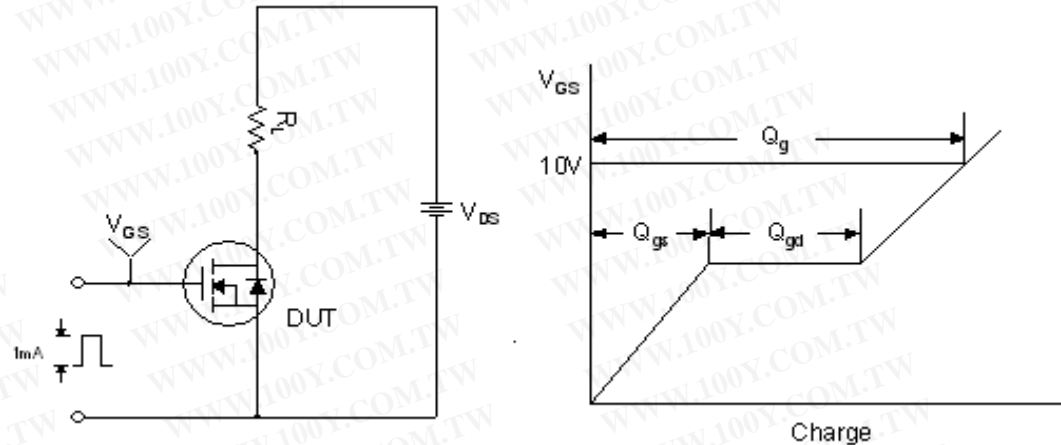


**Figure 11-1. Transient Thermal Response Curve for FQP8N80C**

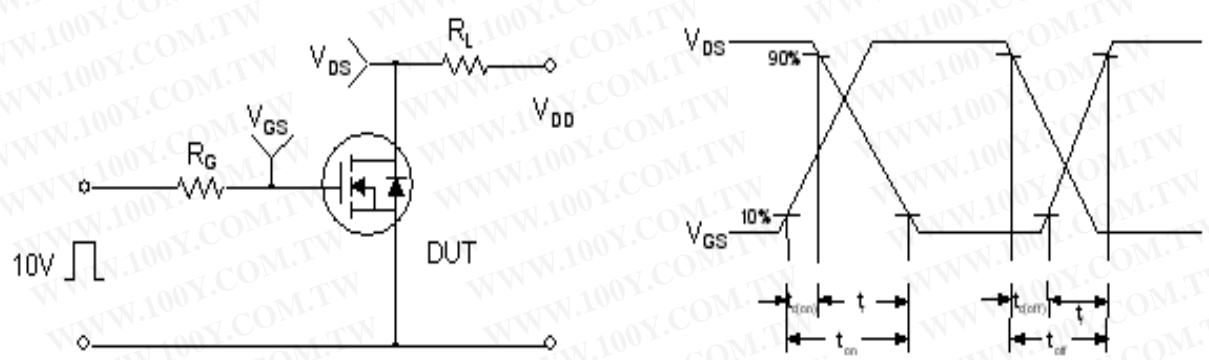


**Figure 11-2. Transient Thermal Response Curve for FQPF8N80C**

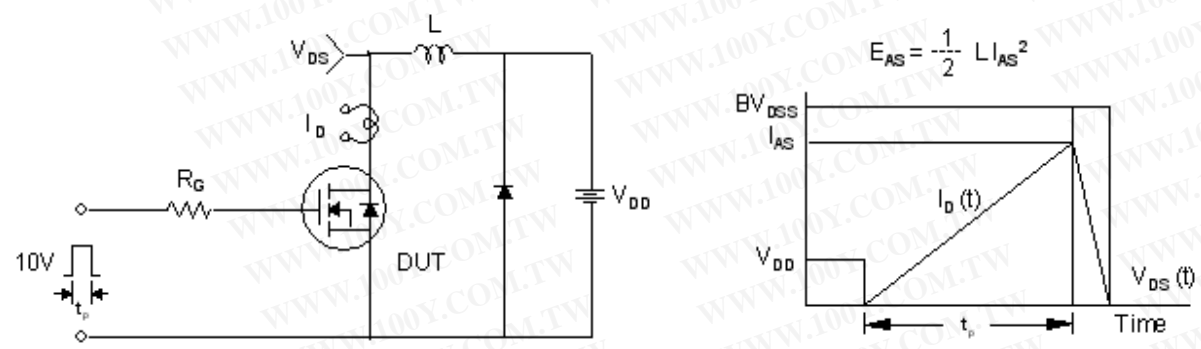
**Gate Charge Test Circuit & Waveform**



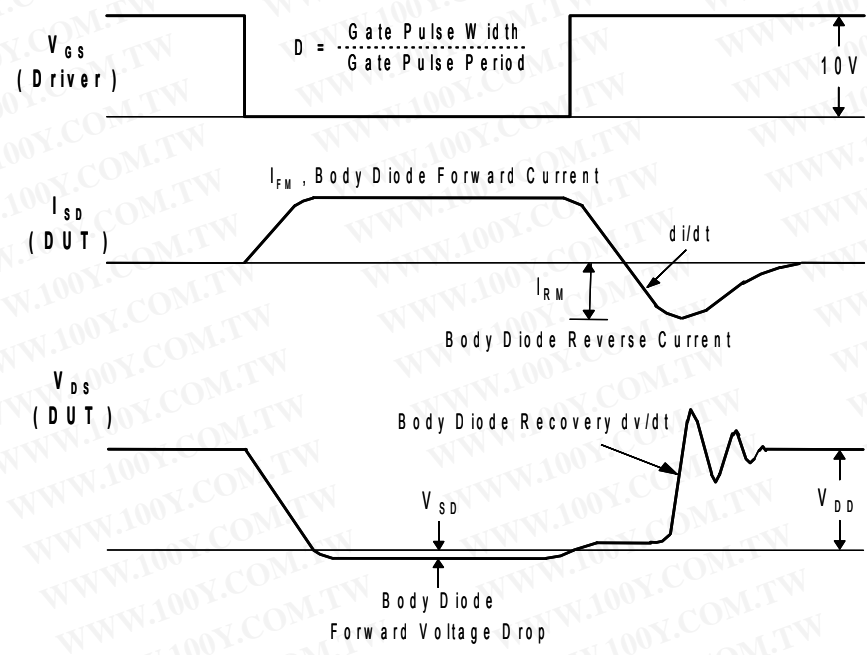
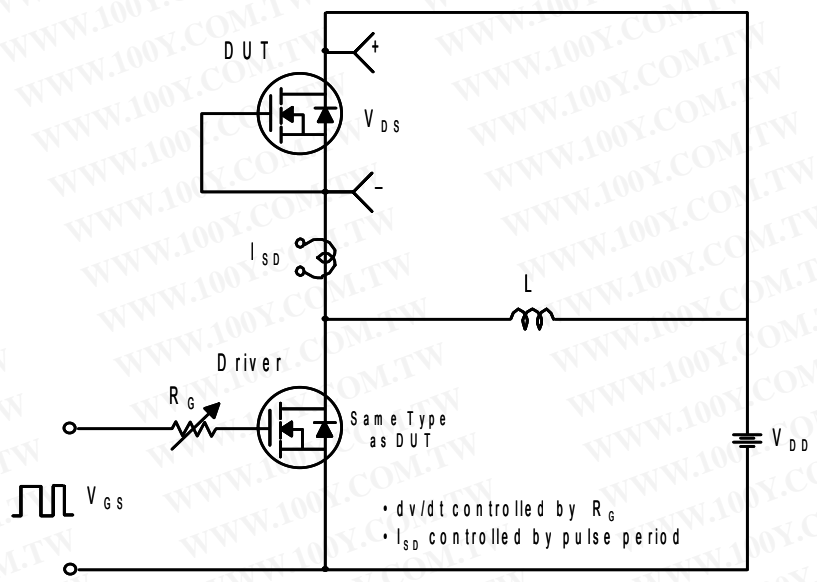
**Resistive Switching Test Circuit & Waveforms**



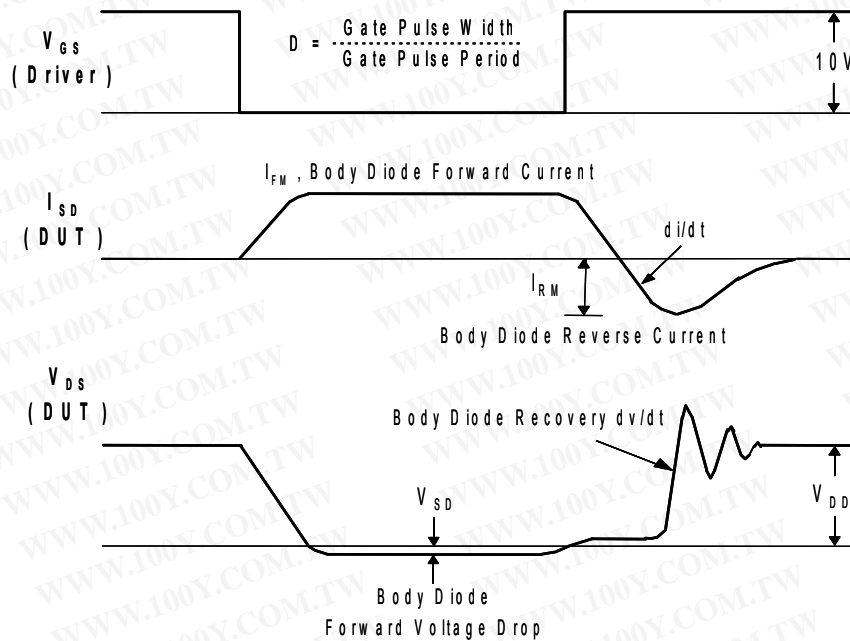
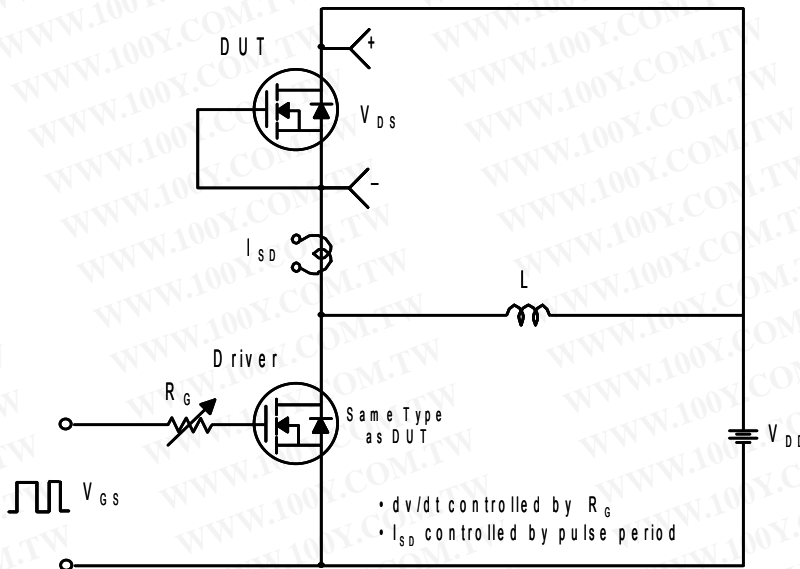
**Unclamped Inductive Switching Test Circuit & Waveforms**



Peak Diode Recovery dv/dt Test Circuit & Waveforms



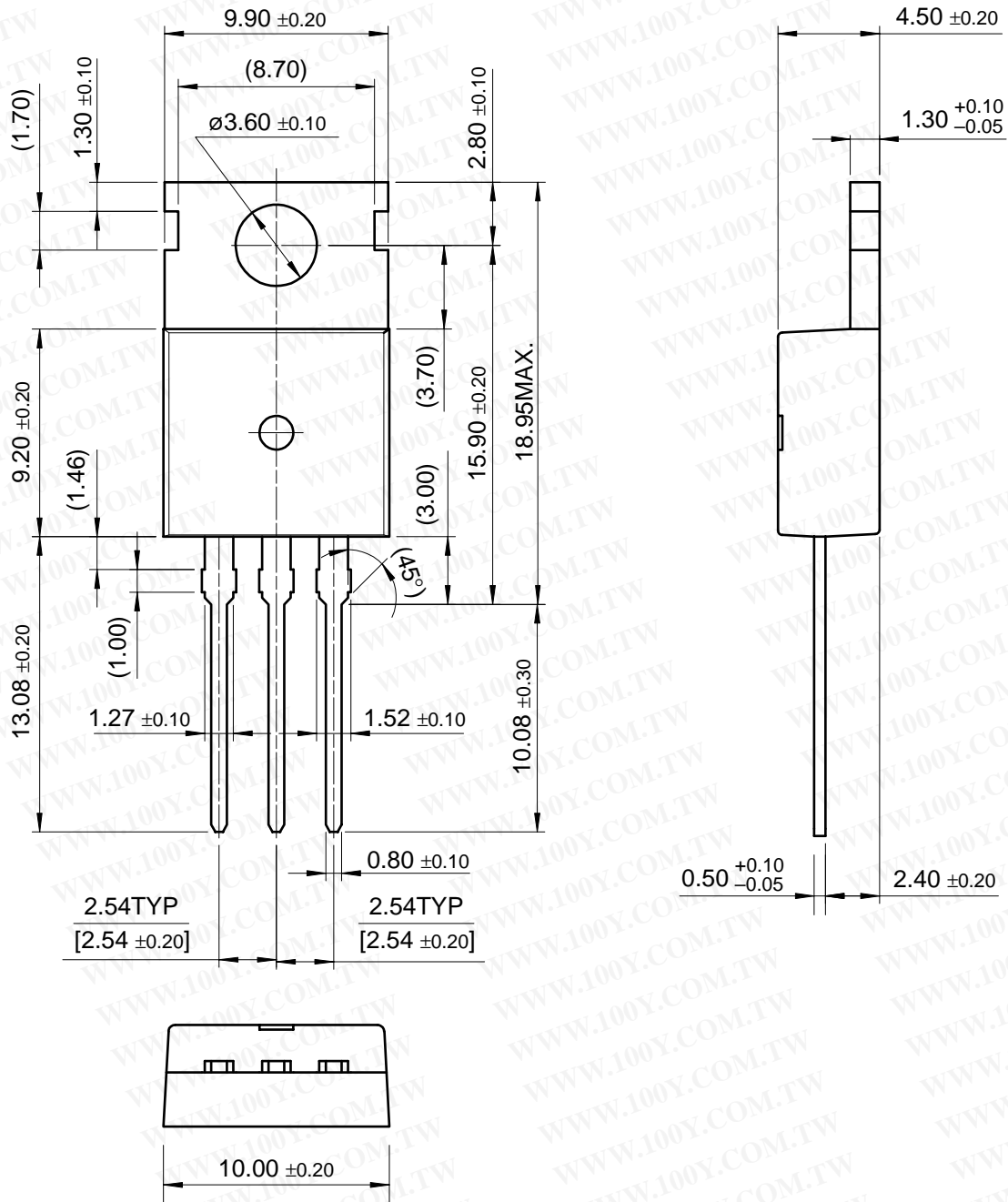
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Package Dimensions

TO-220

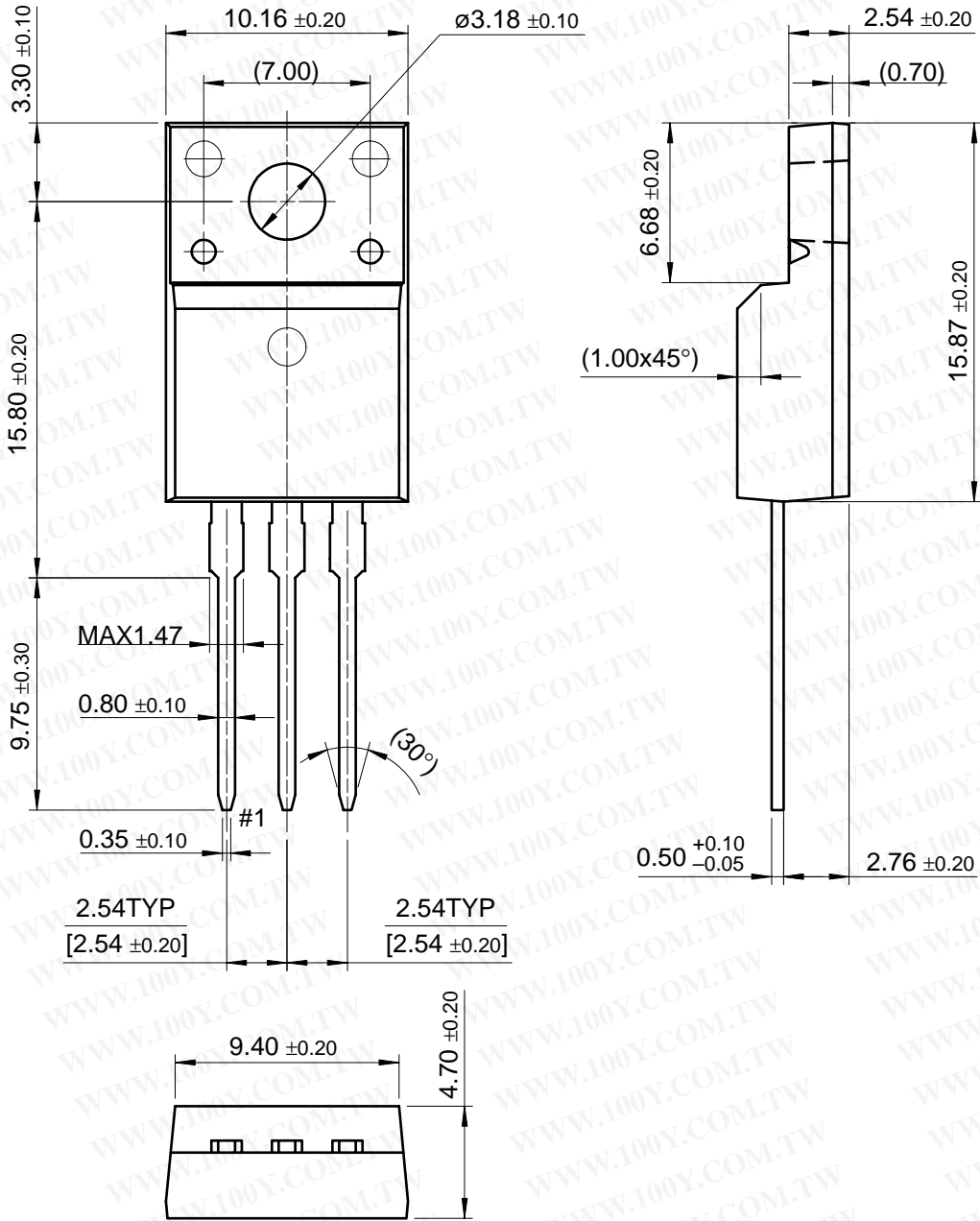


FQP8N80C/FQPF8N80C/FQPF8N80CYDTU 800V N-Channel MOSFET

Dimensions in Millimeters

Package Dimensions (Continued)

TO-220F

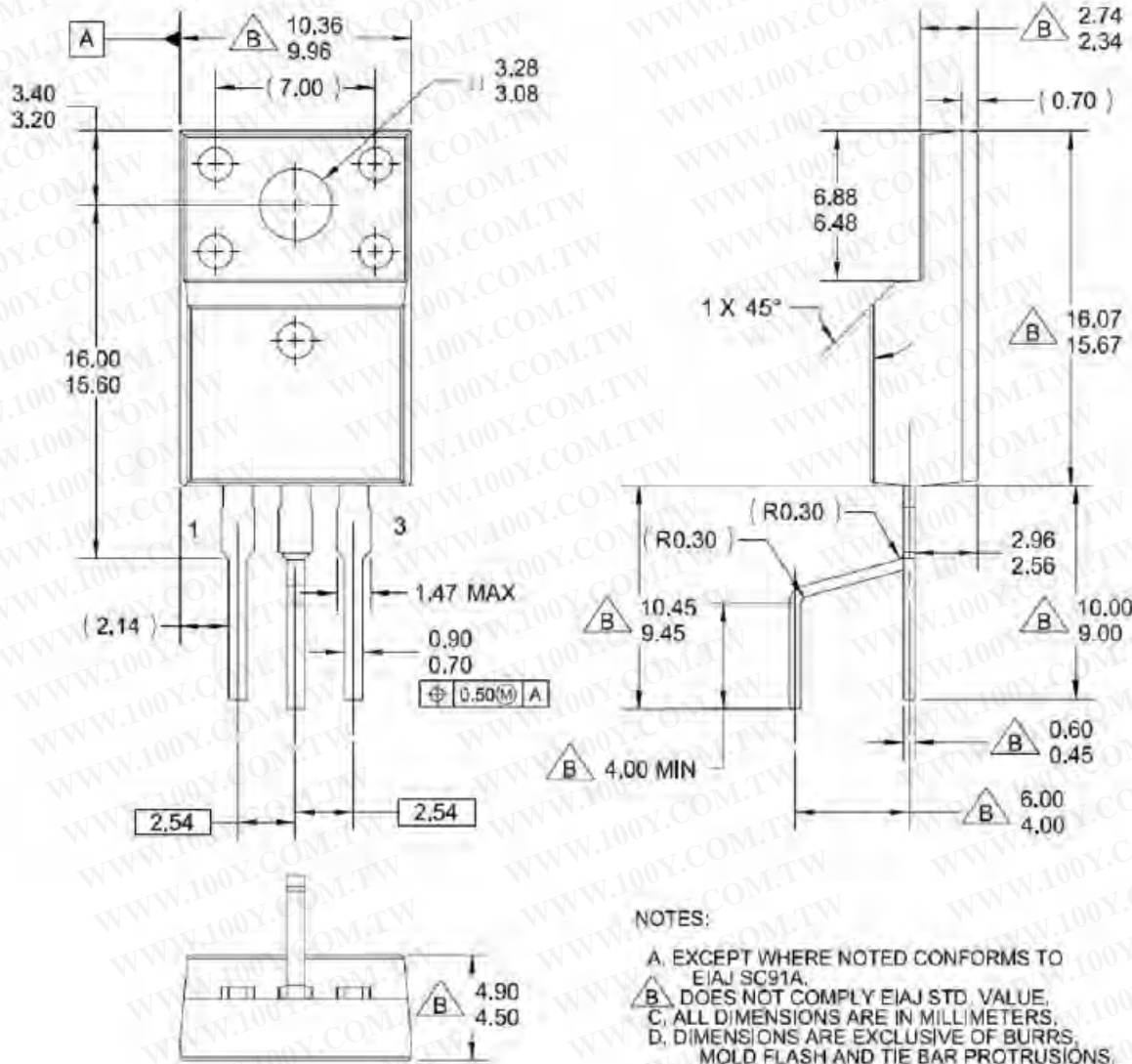


Dimensions in Millimeters

FQP8N80C/FQPF8N80C/FQPF8N80CYDTU 800V N-Channel MOSFET

**Mechanical Dimensions** (Continued)

**TO-220F (Y Forming)**


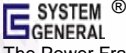


**NOTES:**

- A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A.
- B. DOES NOT COMPLY EIAJ STD. VALUE.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
- F. DRAWING FILE NAME: TQ220Q03REV1

**TRADEMARKS**

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- |   |                        |   |   |
|---|------------------------|---|---|
| Build it Now™   | FRFET®                 | Programmable Active Droop™  | <br>the power franchise<br>TinyBoost™<br>TinyBuck™<br>TinyLogic®<br>TINYOPTO™<br>TinyPower™<br>TinyPWM™<br>TinyWire™<br>μSerDes™ |
| CorePLUS™   | Global Power Resource™ | QFET®   |   |
| CorePOWER™  | Green FPS™             | QST™  |   |
| CROSSVOLT™  | Green FPST™ e-Series™  | Quiet Series™   |   |
| CTL™  | GTO™                   | RapidConfigure™   |   |
| Current Transfer Logic™   | IntelliMAX™            |  Saving our world, 1mW /W /kW at a time™ |   |
| EcoSPARK®   | ISOPLANAR™             | SmartMax™   |   |
| EfficientMax™   | MegaBuck™              | SMART START™  |   |
| EZSWITCH™ *   | MICROCOUPLER™          | SPM®  |   |
|  ™ | MicroFET™              | STEALTH™  |   |
|  ® | MicroPak™              | SuperFET™   |   |
| Fairchild®  | MillerDrive™           | SuperSOT™-3   | <br>SerDes®<br>UHC®<br>Ultra FRFET™<br>UniFET™<br>VCX™<br>VisualMax™<br>XS™  |
| Fairchild Semiconductor®  | MotionMax™             | SuperSOT™-6   |   |
| FACT Quiet Series™  | Motion-SPM™            | SuperSOT™-8   |   |
| FACT®   | OPTOLOGIC®             | SupreMOST™  |   |
| FAST®   | OPTOPLANAR®            | SyncFET™  |   |
| FastvCore™  |                        |  SYSTEM GENERAL®                         |   |
| FlashWriter® *  | PDP SPM™               | The Power Franchise®  |   |
| FPS™  | Power-SPM™             |   |   |
| F-PFS™  | PowerTrench®           |   |   |
|   | PowerXS™               |   |   |

\* EZSWITCH™ and FlashWriter® are trademarks of System General Corporation, used under license by Fairchild Semiconductor.

**DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
- A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**ANTI-COUNTERFEITING POLICY**

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufactures of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed application, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address and warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

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