FAIRCHILD
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March 2013

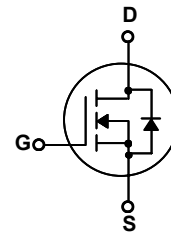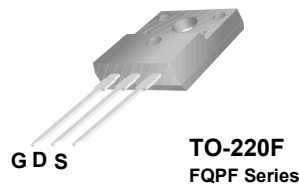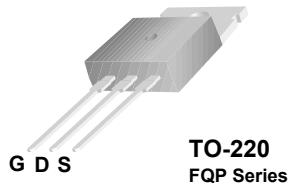# FQP8N80C / FQPF8N80C / FQPF8N80CYDTU

N-Channel QFET MOSFET

800 V, 8.0 A, 1.55 Ω

Description

This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor®'s proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

- 8.0 A, 800 V, $R_{DS(on)}$ = 1.55 Ω (Max) @V_{GS} = 10 V, I_D= 4.0 A

- Low Gate Charge (Typ. 35 nC)

- Low Crss (Typ. 13 pF)

- 100% Avalanche Tested

TO-220
FQP Series

G D S

TO-220F
FQPF Series

G D S

D

G

S

Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter			FQP8N80C	FQPF8N80C	Unit
V_{DSS}	Drain-Source Voltage			800		V
I_D	Drain Current	- Continuous (T_C = 25°C)		8	8 *	A
		- Continuous (T_C = 100°C)		5.1	5.1 *	A
I_{DM}	Drain Current	- Pulsed	(Note 1)	32	32 *	A
V_{GSS}	Gate-Source Voltage			± 30		V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)		850		mJ
I_{AR}	Avalanche Current	(Note 1)		8		A
E_{AR}	Repetitive Avalanche Energy	(Note 1)		17.8		mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)		4.5		V/ns
P_D	Power Dissipation (T_C = 25°C)			178	59	W
	- Derate above 25°C			1.43	0.48	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150		°C
T_L	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	Unit
$R_{θJC}$	Thermal Resistance, Junction-to-Case	0.7	2.1	°C/W
$R_{θJS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	°C/W
$R_{θJA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	°C/W

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Electrical Characteristics $T_C = 25°C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0$ V, $I_D = 250$ μA	800	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250$ μA, Referenced to 25°C	--	0.5	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 800$ V, $V_{GS} = 0$ V	--	--	10	μA
		$V_{DS} = 640$ V, $T_C = 125°C$	--	--	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30$ V, $V_{DS} = 0$ V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30$ V, $V_{DS} = 0$ V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250$ μA	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10$ V, $I_D = 4$ A	--	1.29	1.55	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 50$ V, $I_D = 4$ A (Note 4)	--	5.6	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25$ V, $V_{GS} = 0$ V, f = 1.0 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	$V_{DD} = 400$ V, $I_D = 8$ A, $R_G = 25$ Ω	--	40	90	ns
t_r	Turn-On Rise Time		--	110	230	ns
$t_{d(off)}$	Turn-Off Delay Time		--	65	140	ns
t_f	Turn-Off Fall Time	(Note 4, 5)	--	70	150	ns
Q_g	Total Gate Charge	$V_{DS} = 640$ V, $I_D = 8$ A, $V_{GS} = 10$ V	--	35	45	nC
Q_{gs}	Gate-Source Charge		--	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	$V_{GS} = 0$ V, $I_S = 8$ A	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0$ V, $I_S = 8$ A, $dI_F / dt = 100$ A/μs (Note 4)	--	690	--	ns
Q_{rr}	Reverse Recovery Charge		--	8.2	--	μC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 25mH, $I_{AS} = 8A$, $V_{DD} = 50V$, $R_G = 25$ Ω, Starting $T_J = 25°C$
3. $I_{SD} \leq 8A$, di/dt $\leq 200A/μs$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25°C$
4. Pulse Test : Pulse width $\leq 300μs$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature
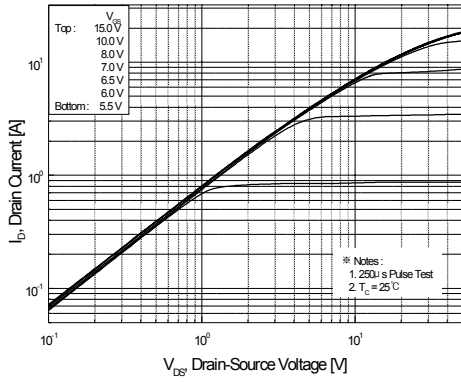
Typical Characteristics
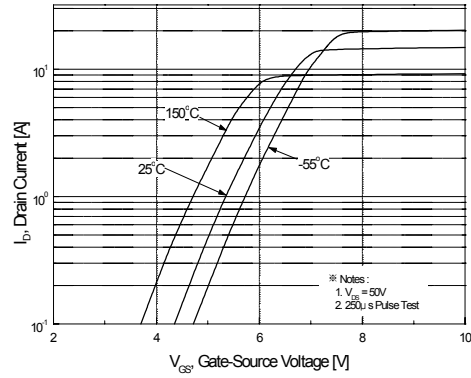

Figure 1. On-Region Characteristics

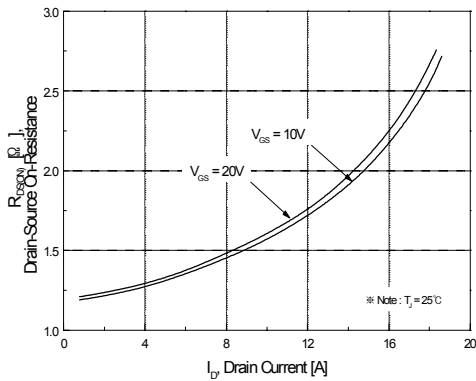Figure 2. Transfer Characteristics

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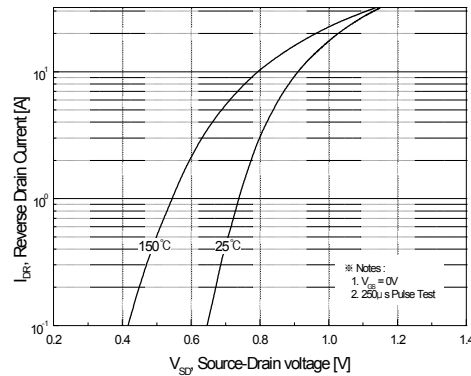Drain Current and Gate Voltage

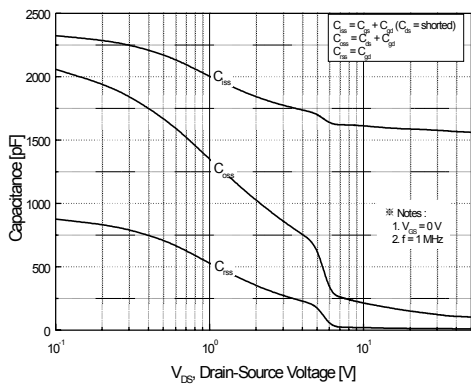Figure 4. Body Diode Forward Voltage
Variation with Source Current
and Temperature
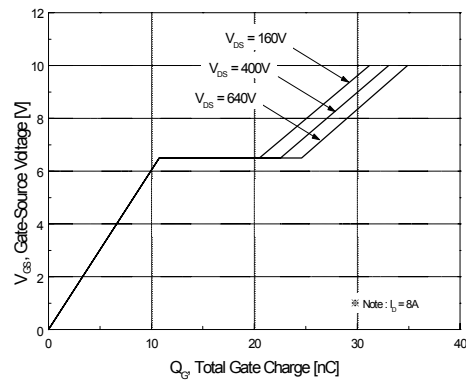

Figure 5. Capacitance Characteristics

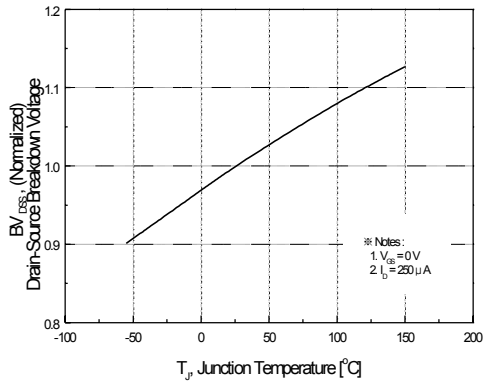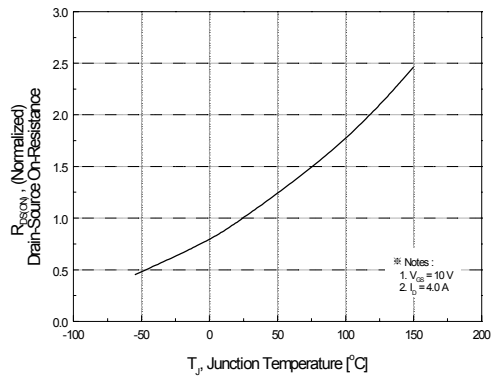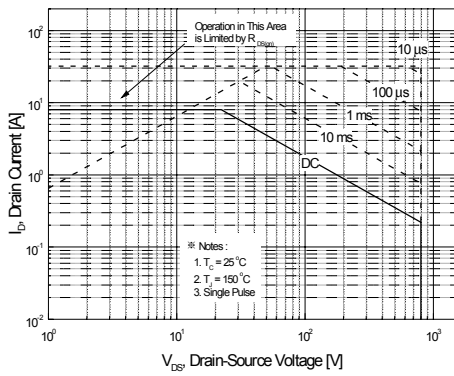Figure 6. Gate Charge Characteristics

FQP8N80C / FQPF8N80C / FQPF8N80CYDTU N-Channel MOSFETT

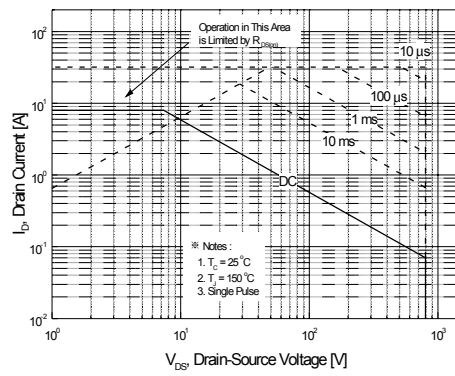## Typical Characteristics (Continued)

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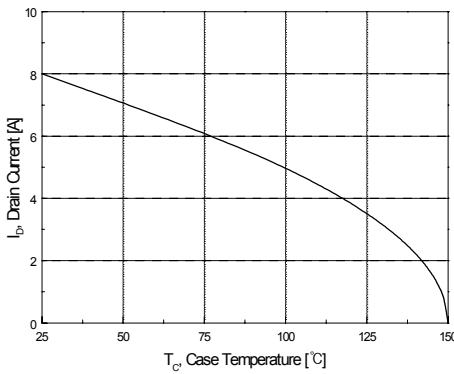vs Temperature**

**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
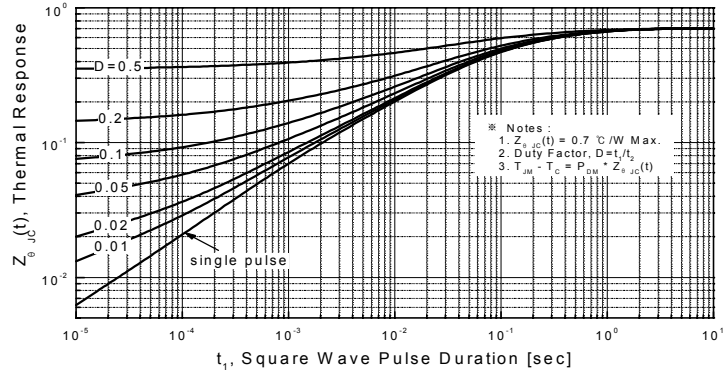vs Case Temperature**

Typical Characteristics (Continued)

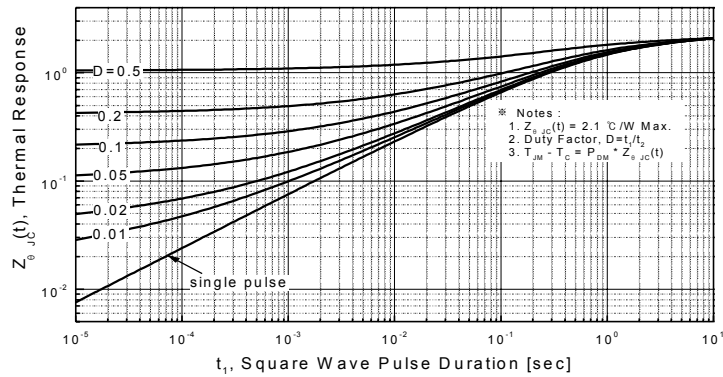**Figure 11-1. Transient Thermal Response Curve for FQP8N80C**
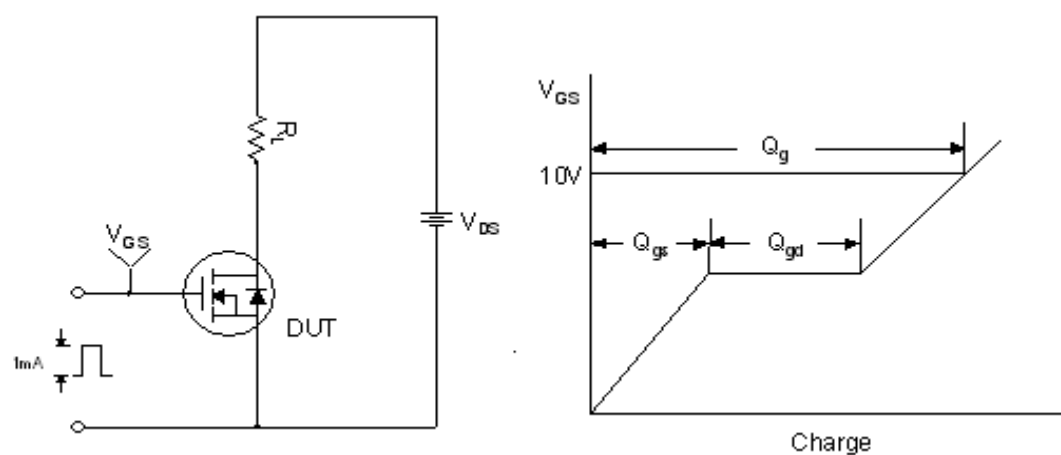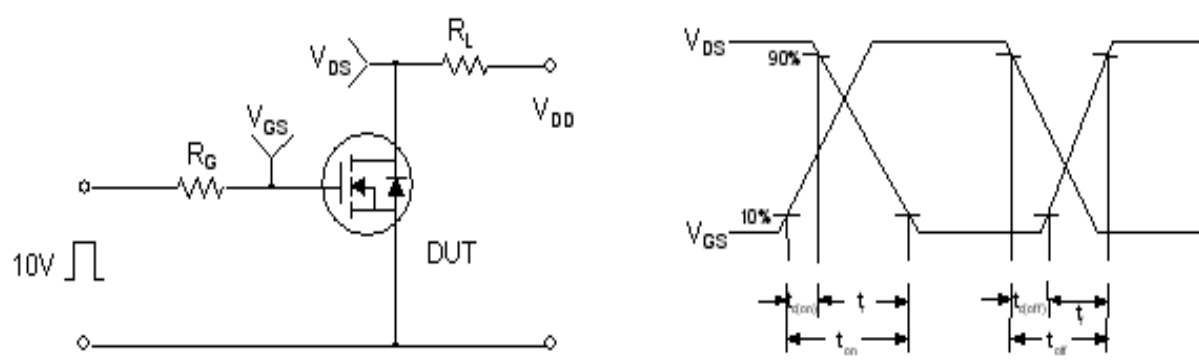

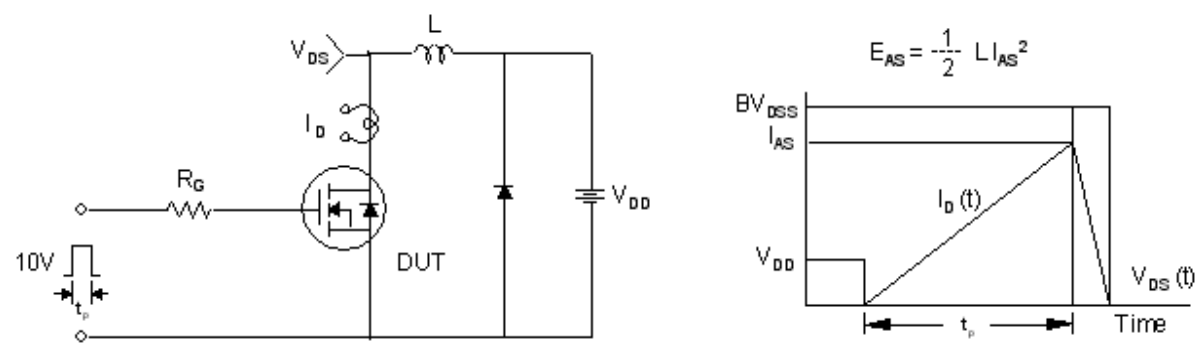**Figure 11-2. Transient Thermal Response Curve for FQPF8N80C**
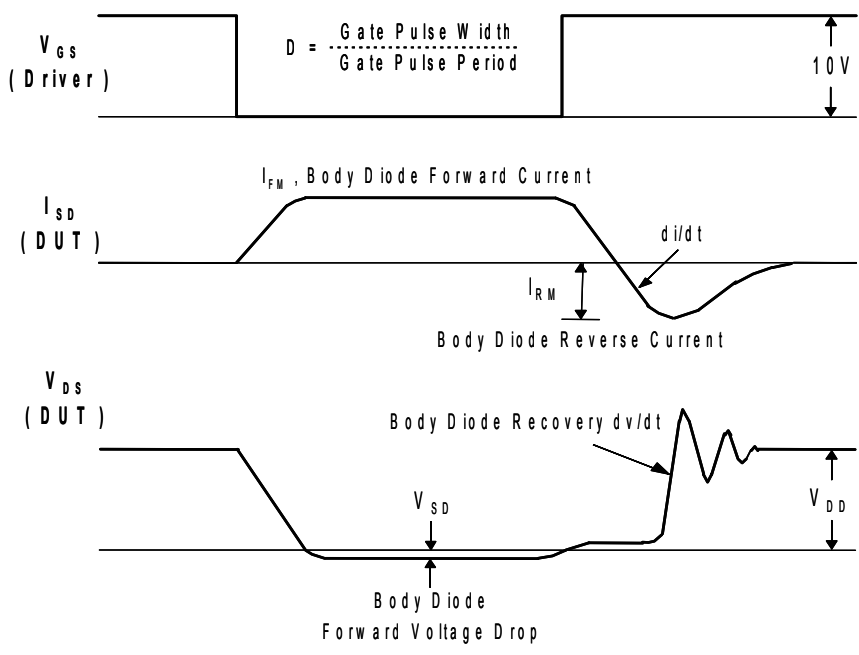
Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching Test Circuit & Waveforms

$$E_{AS} = \frac{1}{2} L I_{AS}^2$$

Peak Diode Recovery dv/dt Test Circuit & Waveforms

DUT

V_{DS}

+

-

I_{SD}

L

Driver

R_G

Same Type
as DUT

V_{GS}

V_{DD}

• dv/dt controlled by R_G
• I_{SD} controlled by pulse period

V_{GS}
(Driver)

$$D = \frac{Gate\ Pulse\ Width}{Gate\ Pulse\ Period}$$

10V

I_{SD}
(DUT)

I_{FM}, Body Diode Forward Current

di/dt

I_{RM}

Body Diode Reverse Current

V_{DS}
(DUT)

Body Diode Recovery dv/dt

V_{SD}

V_{DD}

Body Diode
Forward Voltage Drop

Peak Diode Recovery dv/dt Test Circuit & Waveforms

DUT

V_{DS}

I_{SD}

L

Driver

R_G

Same Type
as DUT

V_{GS}

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10V

I_{SD}
(DUT)

I_{FM}, Body Diode Forward Current

di/dt

I_{RM}

Body Diode Reverse Current

V_{DS}
(DUT)

Body Diode Recovery dv/dt

V_{SD}

V_{DD}

Body Diode
Forward Voltage Drop

Package Dimensions

TO-220

FQP8N80C / FQPF8N80C / FQPF8N80CYDTU N-Channel MOSFET

9.90 ±0.20
(8.70)
ø3.60 ±0.10
(1.70)
1.30 ±0.10
2.80 ±0.10
4.50 ±0.20
1.30 +0.10 −0.05
9.20 ±0.20
(1.46)
(3.70)
15.90 ±0.20
18.95MAX.
(3.00)
13.08 ±0.20
(1.00)
(45°)
10.08 ±0.30
1.27 ±0.10
1.52 ±0.10
0.80 ±0.10
2.54TYP [2.54 ±0.20]
2.54TYP [2.54 ±0.20]
0.50 +0.10 −0.05
2.40 ±0.20
10.00 ±0.20

Dimensions in Millimeters

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Package Dimensions (Continued)

TO-220F

10.16 ±0.20

(7.00)

ø3.18 ±0.10

3.30 ±0.10

15.80 ±0.20

9.75 ±0.30

MAX1.47

0.80 ±0.10

0.35 ±0.10

#1

(30°)

2.54TYP
[2.54 ±0.20]

2.54TYP
[2.54 ±0.20]

9.40 ±0.20

4.70 ±0.20

2.54 ±0.20

(0.70)

6.68 ±0.20

15.87 ±0.20

(1.00x45°)

0.50 $^{+0.10}_{-0.05}$

2.76 ±0.20

Dimensions in Millimeters

9

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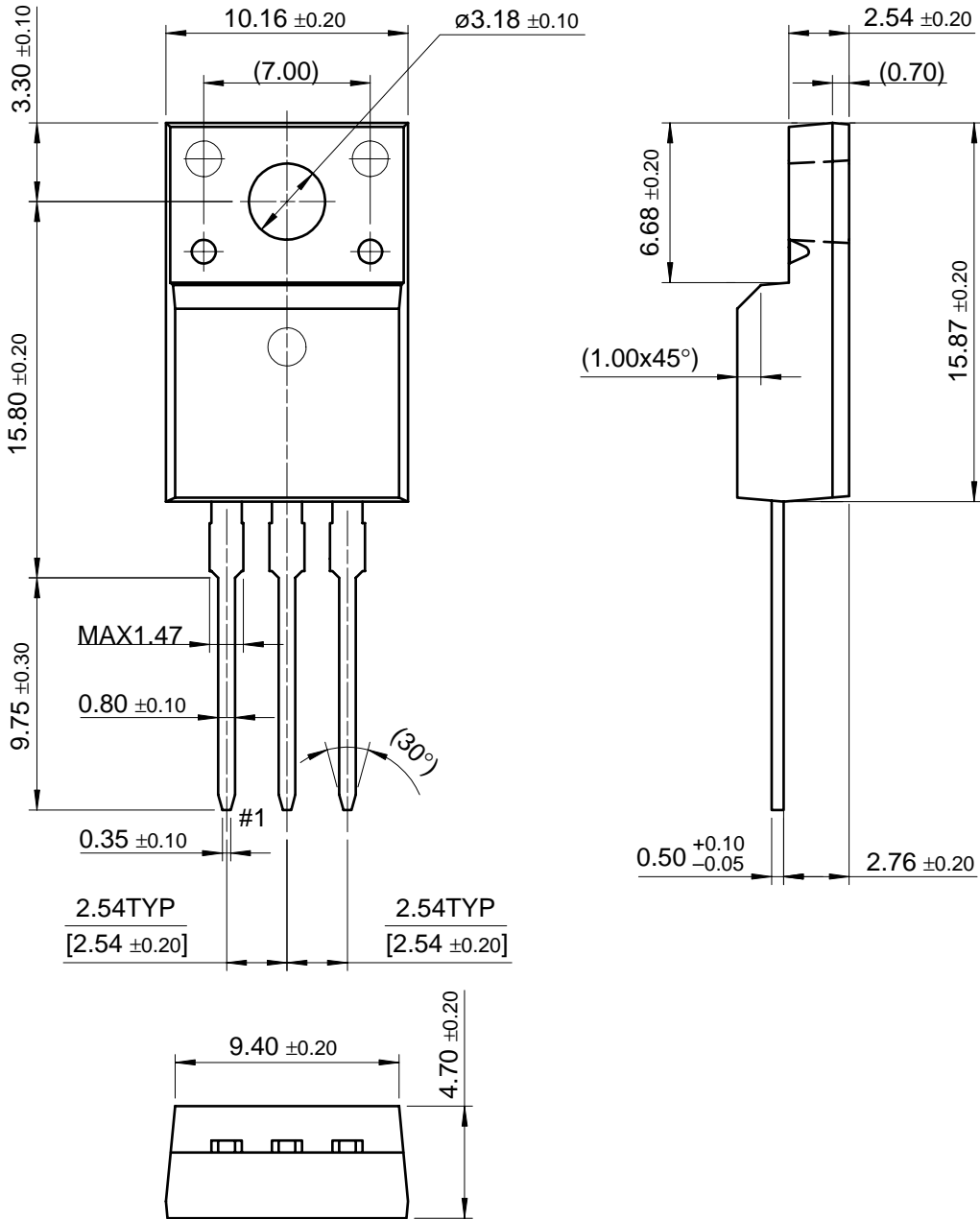
Mechanical Dimensions (Continued)

TO-220F (Y Forming)
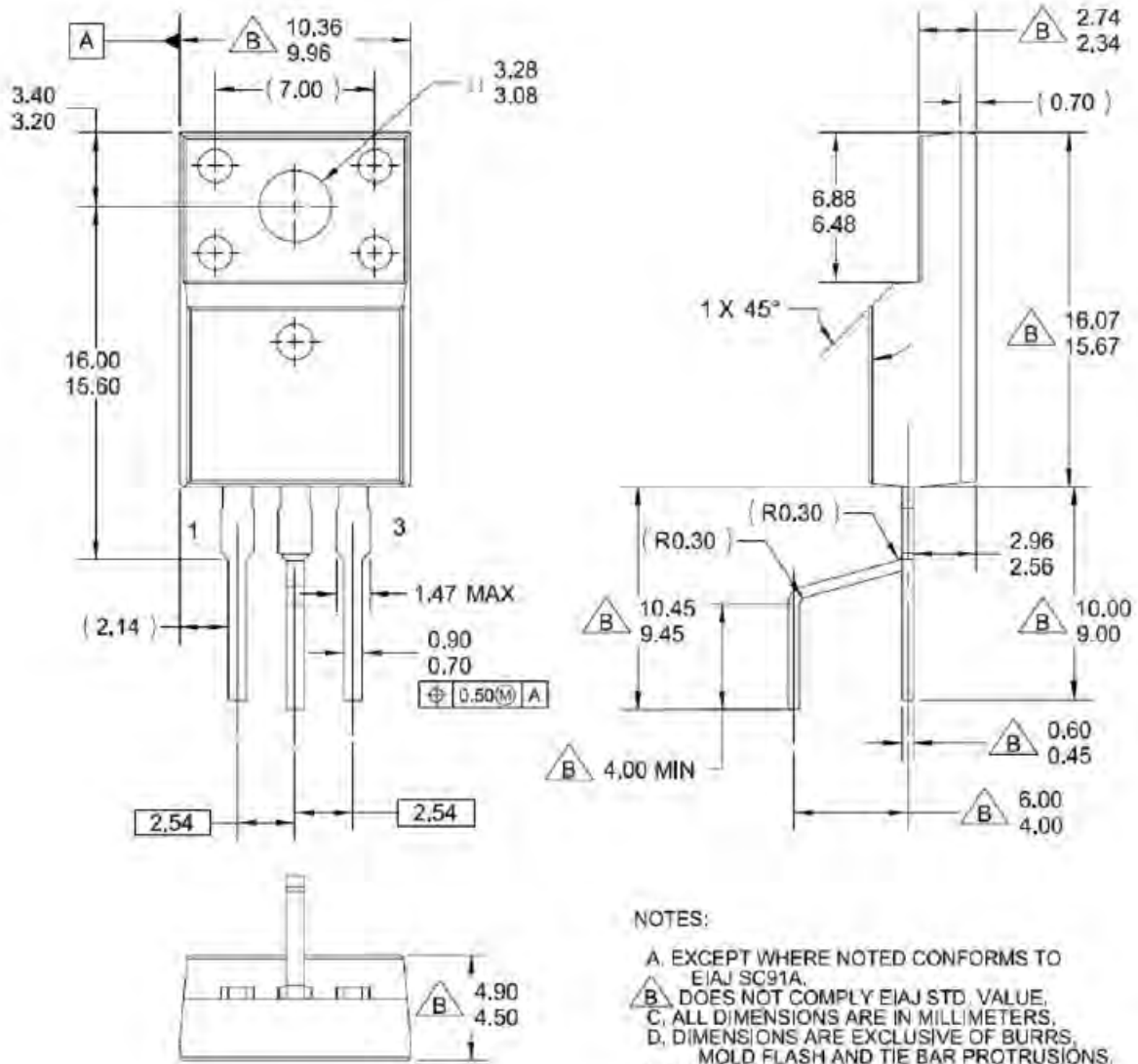
NOTES:

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D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
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F. DRAWING FILE NAME: TO220Q03REV1

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Dual Cool™	Marking Small Speakers Sound Louder	ng our world, 1mW/W/kW at a time™	TinyWire™
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ESBC™	MICROCOUPLER™	SMART START™	TRUECURRENT®*
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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.
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