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June 2014

FQA170N06

N-Channel QFET® MOSFET

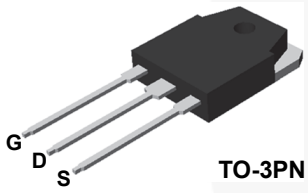
60 V, 170 A, 5.6 mΩ

Description

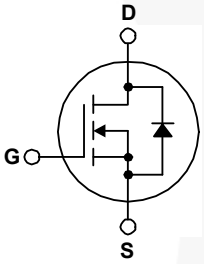
This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, DC motor control, and variable switching power applications.

Features

- 170 A, 60 V, $R_{DS(on)}$ = 5.6 mΩ (Max.) @ V_{GS} = 10 V, I_D = 85 A
- Low Gate Charge (Typ. 220 nC)
- Low Crss (Typ. 620 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



TO-3PN



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted.

Symbol	Parameter		FQA170N06	Unit
V_{DSS}	Drain-Source Voltage		60	V
I_D	Drain Current - Continuous (T_C = 25°C)		170	A
	- Continuous (T_C = 100°C)		120	A
I_{DM}	Drain Current - Pulsed	(Note 1)	680	A
V_{GSS}	Gate-Source Voltage		± 25	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	990	mJ
I_{AR}	Avalanche Current	(Note 1)	170	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	37.5	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	7.0	V/ns
P_D	Power Dissipation (T_C = 25°C)		375	W
	- Derate above 25°C		2.5	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C
T_L	Maximum lead temperature for soldering, 1/8" from case for 5 seconds.		300	°C

Thermal Characteristics

Symbol	Parameter	FQA170N06	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	°C/W

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Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQA170N06	FQA170N06	TO-3PN	Tube	N/A	N/A	30 units

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	60	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.053	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 48 V, T_C = 150°C	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 25 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -25 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 85 A	--	0.0045	0.0056	Ω
g_{FS}	Forward Transconductance	V_{DS} = 30 V, I_D = 85 A	--	85	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	7200	9350	pF
C_{oss}	Output Capacitance		--	3100	4000	pF
C_{rss}	Reverse Transfer Capacitance		--	620	810	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 30 V, I_D = 85 A, R_G = 25 Ω	--	85	180	ns
t_r	Turn-On Rise Time		--	700	1400	ns
$t_{d(off)}$	Turn-Off Delay Time		--	260	530	ns
t_f	Turn-Off Fall Time	(Note 4)	--	430	870	ns
Q_g	Total Gate Charge	V_{DS} = 48 V, I_D = 170 A, V_{GS} = 10 V	--	220	290	nC
Q_{gs}	Gate-Source Charge		--	50	--	nC
Q_{gd}	Gate-Drain Charge	(Note 4)	--	100	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current	(Note 5)	--	--	170	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	680	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 170 A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 170 A, dI_F / dt = 100 A/μs	--	100	--	ns
Q_{rr}	Reverse Recovery Charge		--	315	--	nC

Notes:
1. Repetitive rating : pulse-width limited by maximum junction temperature.
2. L = 40 μH, I_{AS} = 170 A, V_{DD} = 25 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 170 A, di/dt ≤ 300 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature.
5. Continuous drain current calculated by maximum Jjnction temperature : limited by package.

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Typical Characteristics

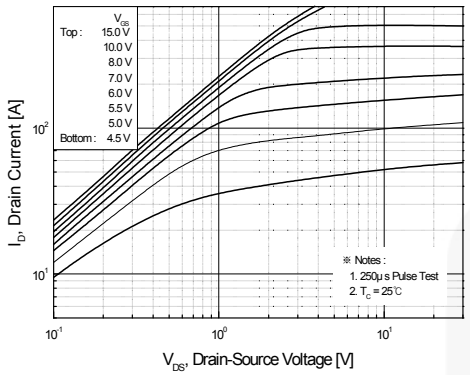


Figure 1. On-Region Characteristics.

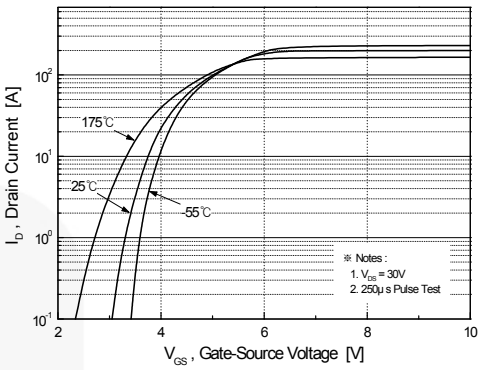


Figure 2. Transfer Characteristics.

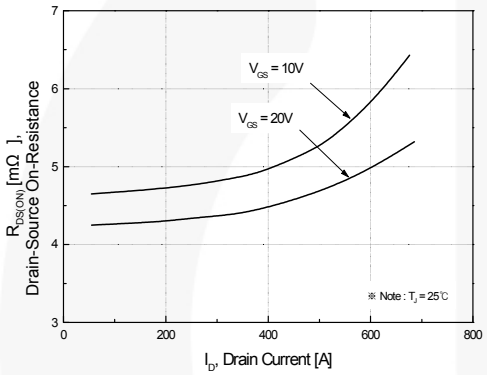


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage.

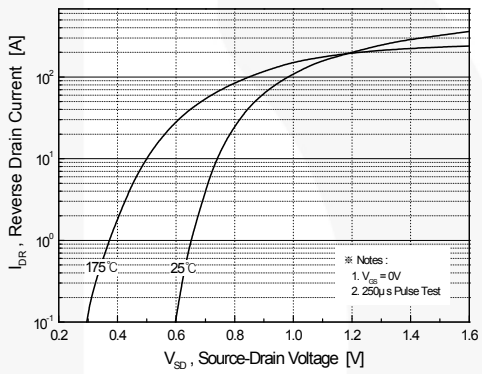


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature.

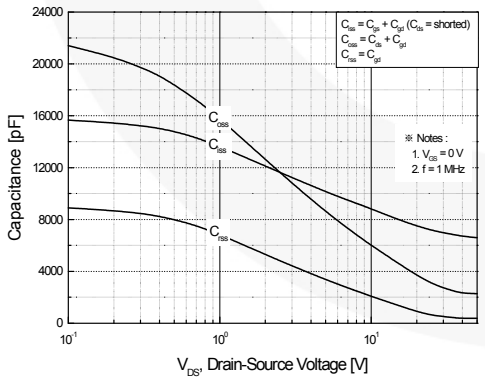


Figure 5. Capacitance Characteristics.

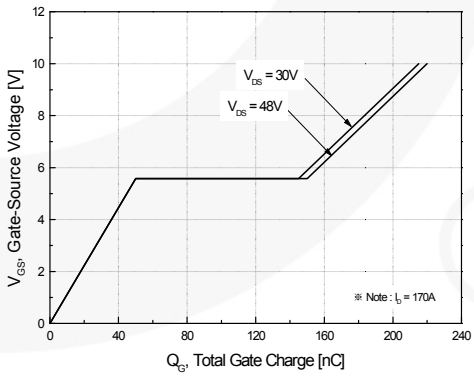


Figure 6. Gate -Charge Characteristics.

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Typical Characteristics (Continued)

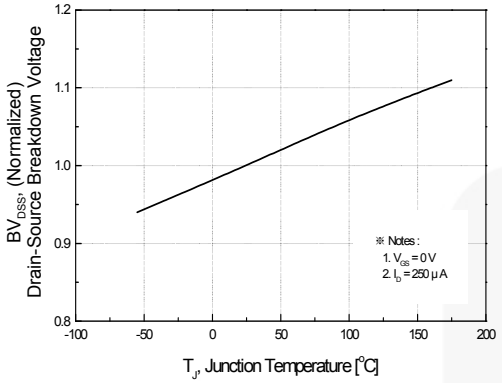


Figure 7. Breakdown Voltage Variation vs Temperature.

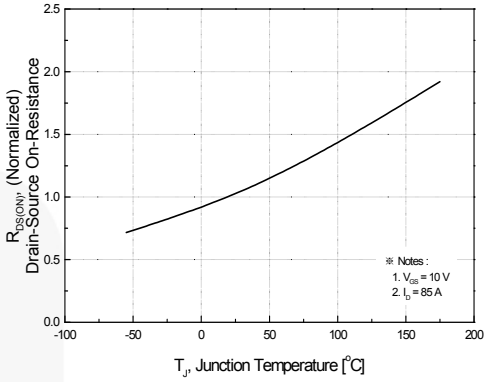


Figure 8. On-Resistance Variation vs Temperature.

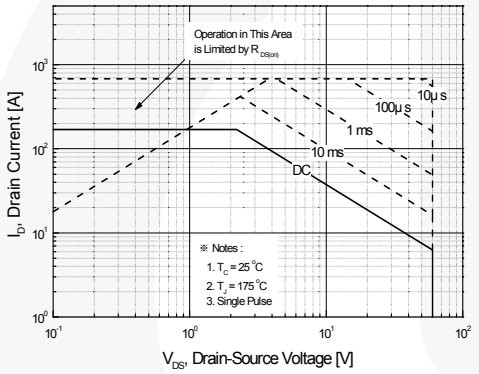


Figure 9. Maximum Safe Operating Area.

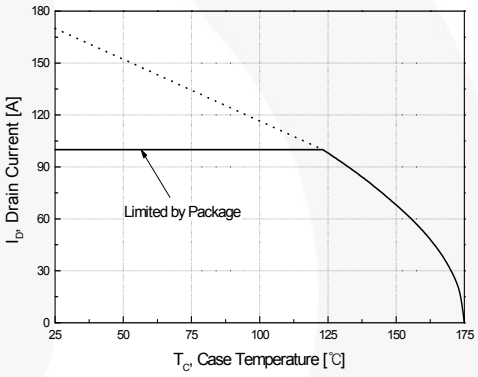


Figure 10. Maximum Drain Current vs Case Temperature.

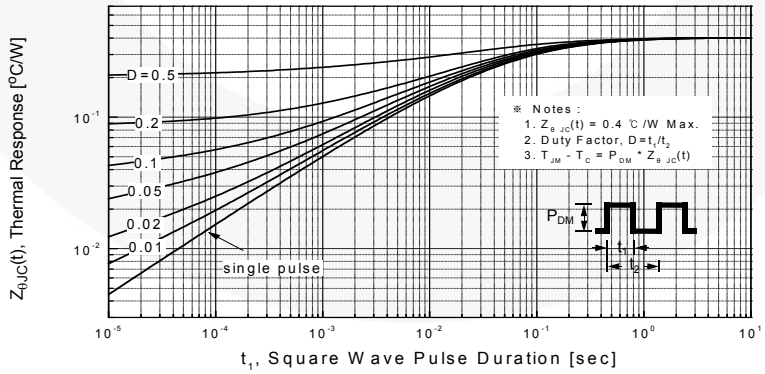


Figure 11. Transient Thermal Response Curve.

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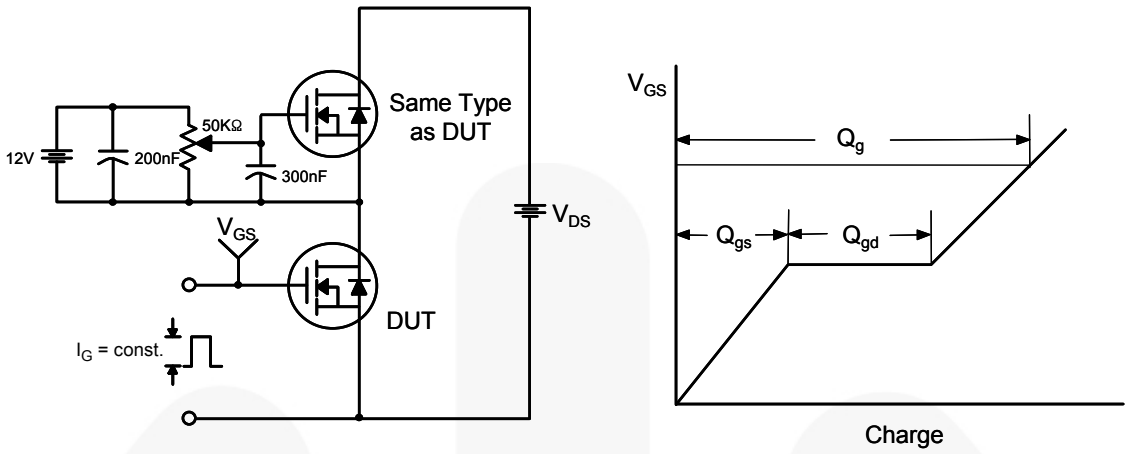


Figure 12. Gate Charge Test Circuit & Waveform

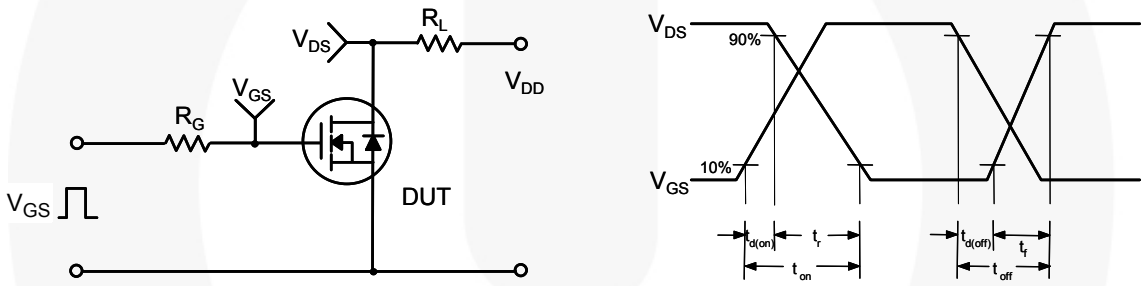


Figure 13. Resistive Switching Test Circuit & Waveforms

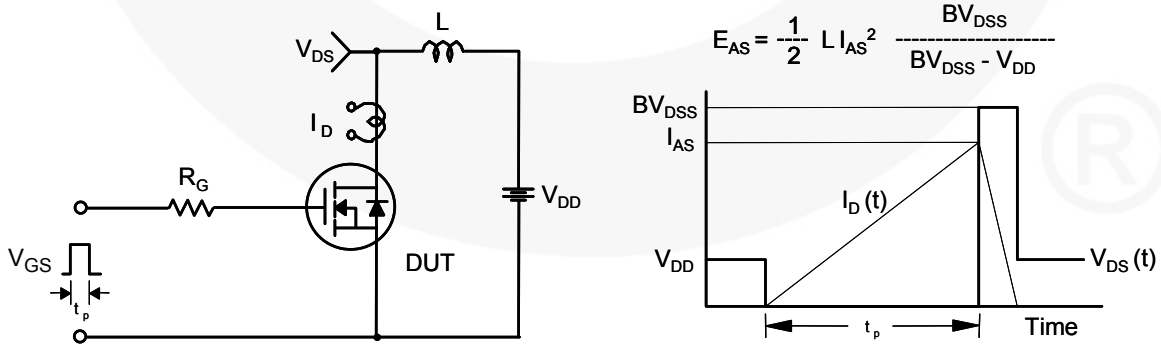


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

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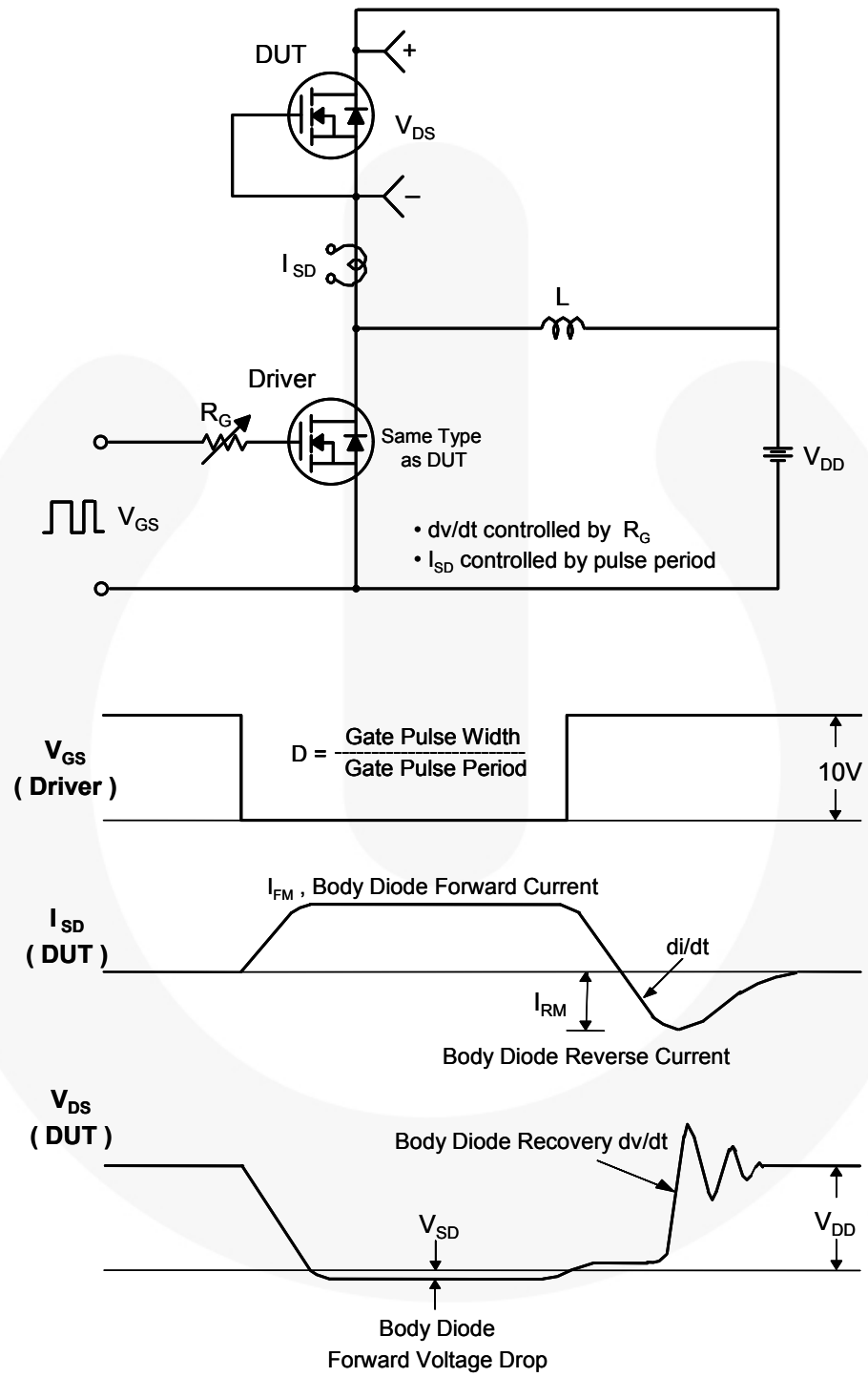


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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Mechanical Dimensions

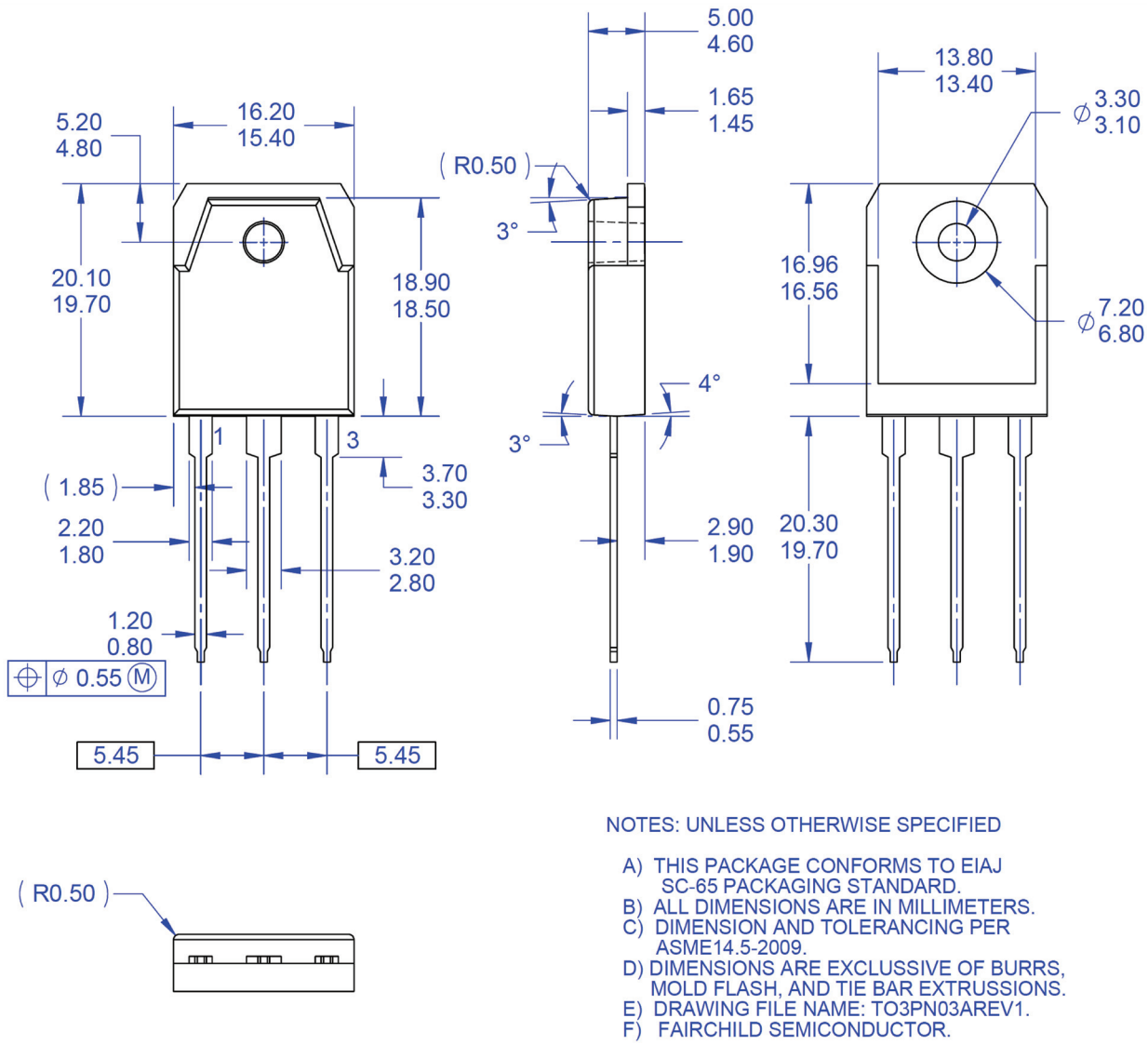


Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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