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FAIRCHILD

May 2014

FQA90N15

N-Channel QFET® MOSFET

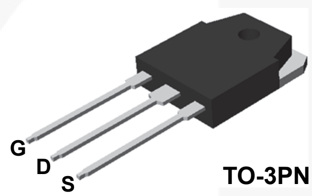
150 V, 90 A, 18 mΩ

Features

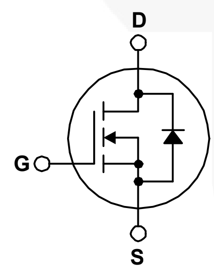
- $R_{DS(on)}$ = 18 mΩ (Max.) @ V_{GS} = 10 V, I_D = 45 A
- Low Gate Charge (Typ. 220 nC)
- Low Crss (Typ. 200 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Memperature Rating

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 low voltage applications such as audio amplifier, high efficiency switching for DC/DC converters, and DC motor control, uninterrupted power supply.



TO-3PN



Absolute Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter	FQA90N15	Unit
V_{DSS}	Drain-Source Voltage	150	V
I_D	Drain Current - Continuous (T_C = 25°C) - Continuous (T_C = 100°C)	90 63.5	A A
I_{DM}	Drain Current - Pulsed (Note 1)	360	A
V_{GSS}	Gate-Source voltage	±25	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1400	mJ
I_{AR}	Avalanche Current (Note 1)	90	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	37.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	6.0	V/ns
P_D	Power Dissipation (T_C = 25°C) - Derate Above 25°C	375 2.5	W W/°C
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	°C

Thermal Characteristics

Symbol	Parameter	FQA90N15	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.4	°C/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink, Typ.	0.24	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	°C/W

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQA90N15	FQA90N15	TO-3PN	Tube	N/A	N/A	30 units

Electrical Characteristics T_C = 25°C unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	150	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	--	0.15	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 150V, V_{GS} = 0V V_{DS} = 120V, T_C = 150°C	-- --	-- --	1 10	μA μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 25V, V_{DS} = 0V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -25V, V_{DS} = 0V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 45A	--	0.014	0.018	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40V, I_D = 45A	--	68	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	--	6700	8700	pF
C_{oss}	Output Capacitance		--	1400	1800	pF
C_{rss}	Reverse Transfer Capacitance		--	200	260	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 75V, I_D = 90A R_G = 25Ω (Note 4)	--	105	220	ns
t_r	Turn-On Rise Time		--	760	1500	ns
$t_{d(off)}$	Turn-Off Delay Time		--	470	950	ns
t_f	Turn-Off Fall Time		--	410	830	ns
Q_g	Total Gate Charge	V_{DS} = 120V, I_D = 90A V_{GS} = 10V (Note 4)	--	220	285	nC
Q_{gs}	Gate-Source Charge		--	43	--	nC
Q_{gd}	Gate-Drain Charge		--	110	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	90	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	360	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 90A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_S = 90A dI_F/dt =100A/μs	--	175	--	ns
Q_{rr}	Reverse Recovery Charge		--	0.97	--	μC

NOTES:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 0.29 mH, I_{AS} = 90 A, V_{DD} = 25 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 90 A, di/dt ≤ 300 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

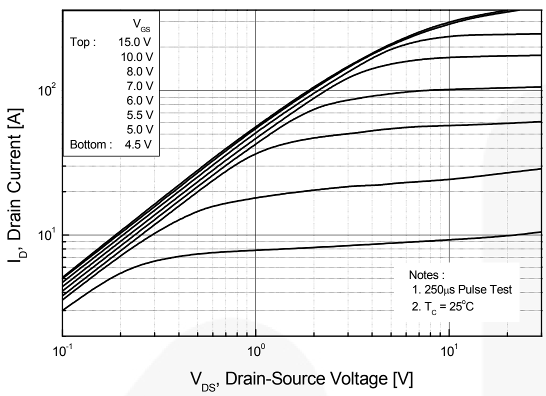


Figure 2. Transfer Characteristics

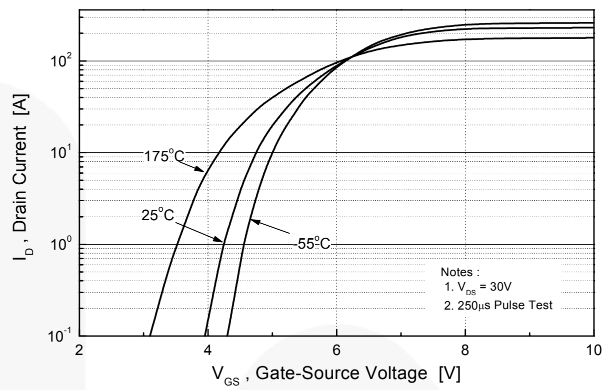


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

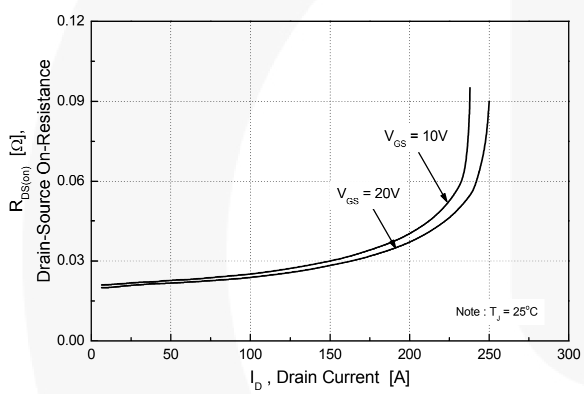


Figure 4. Body Diode Forward Voltage Variation vs. Source Current

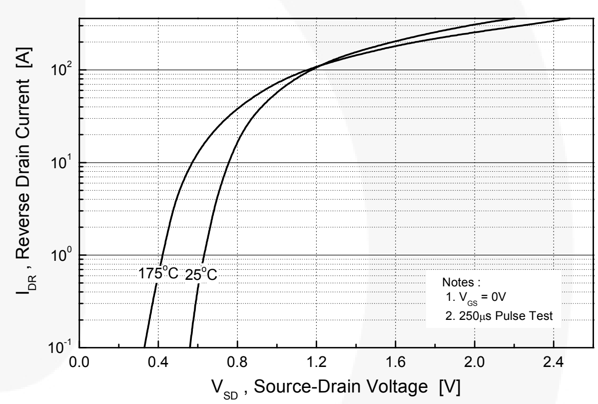


Figure 5. Capacitance Characteristics

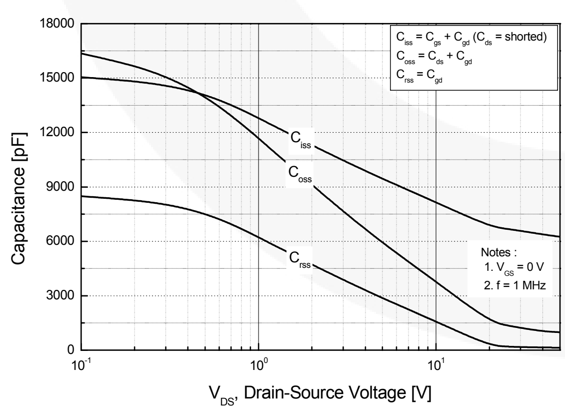
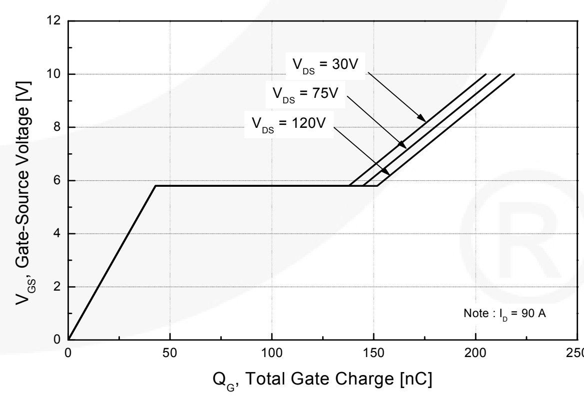


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

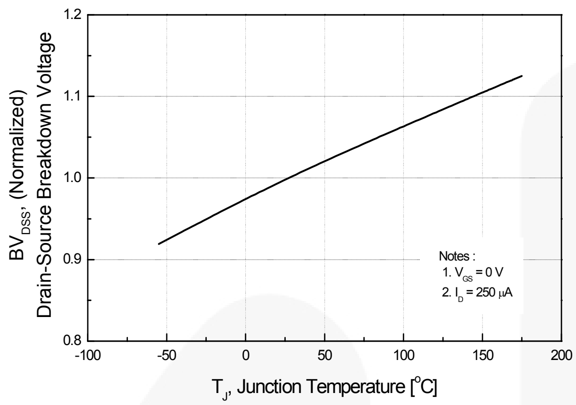


Figure 8. On-Resistance Variation vs. Temperature

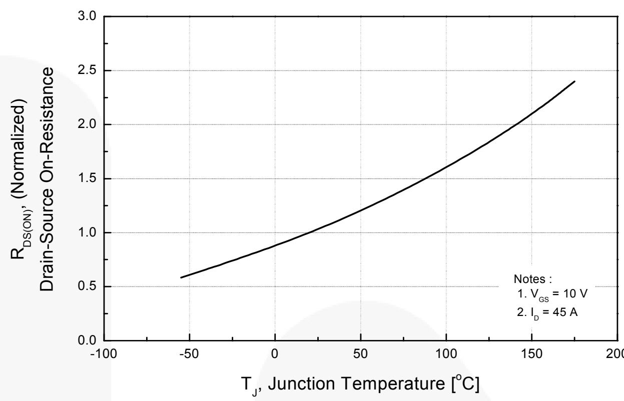


Figure 9. Maximum Safe Operating Area

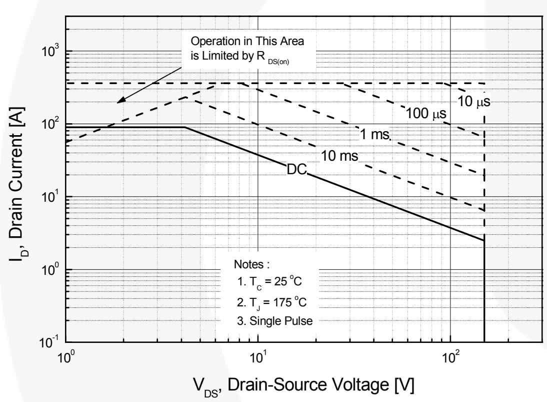


Figure 10. Maximum Drain Current vs. Case Temperature

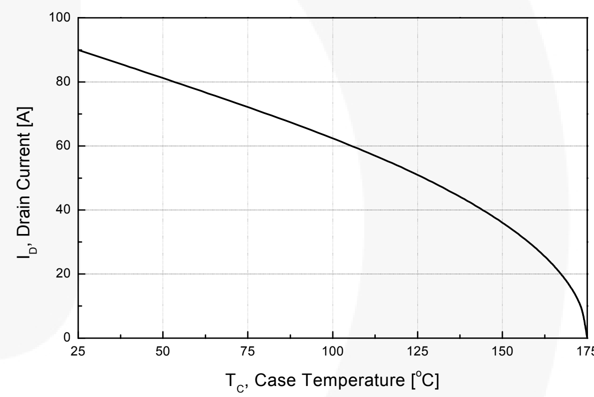
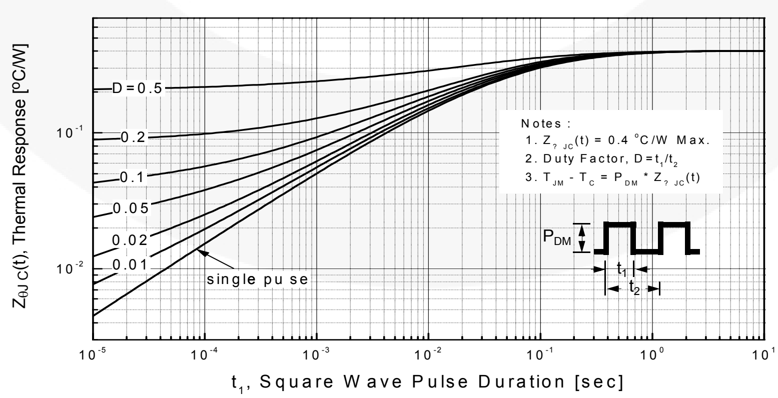


Figure 11. Transient Thermal Response Curve



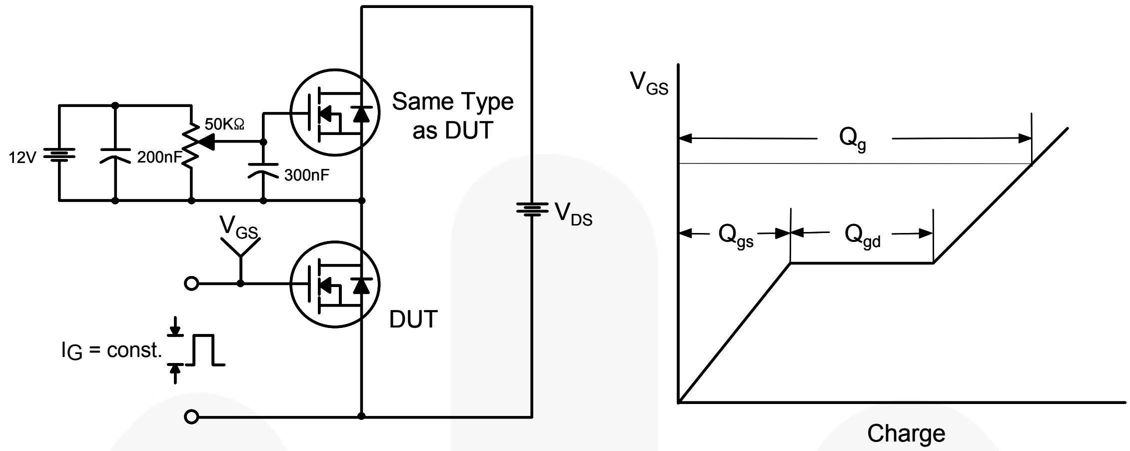


Figure 12. Gate Charge Test Circuit & Waveform

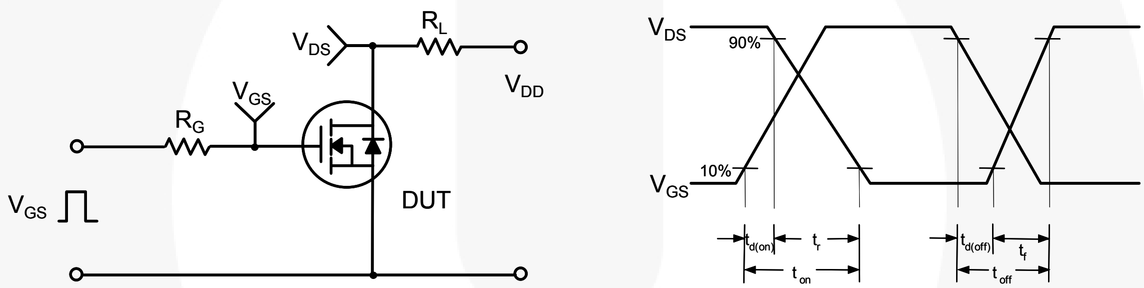


Figure 13. Resistive Switching Test Circuit & Waveforms

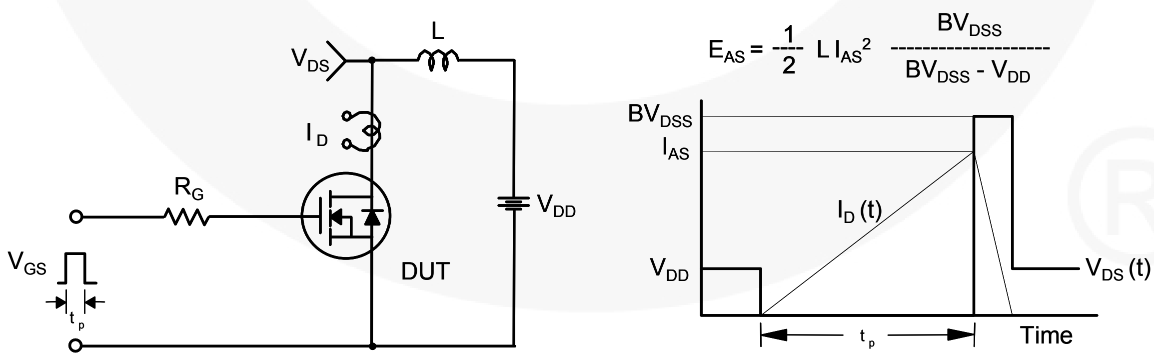


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

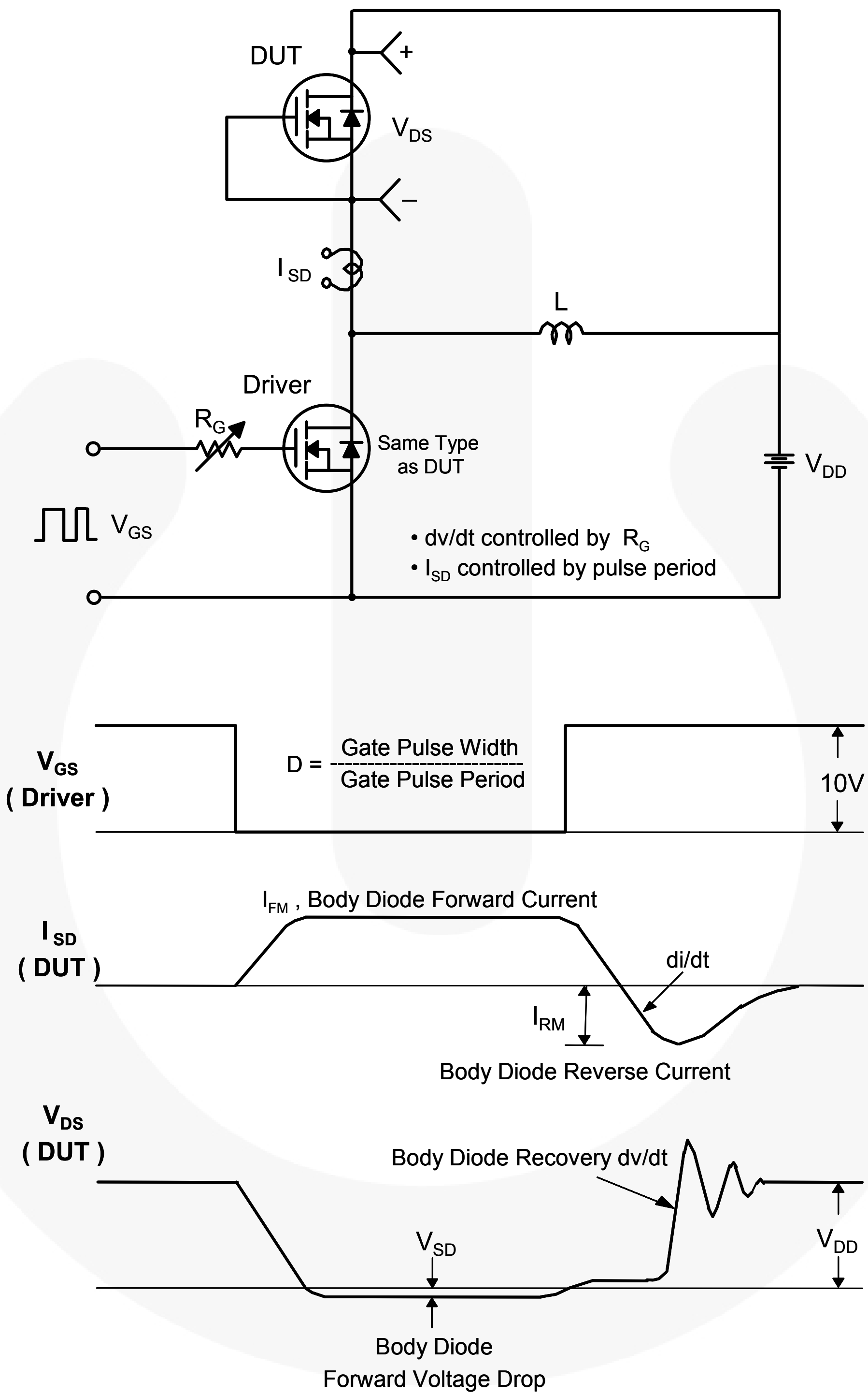


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

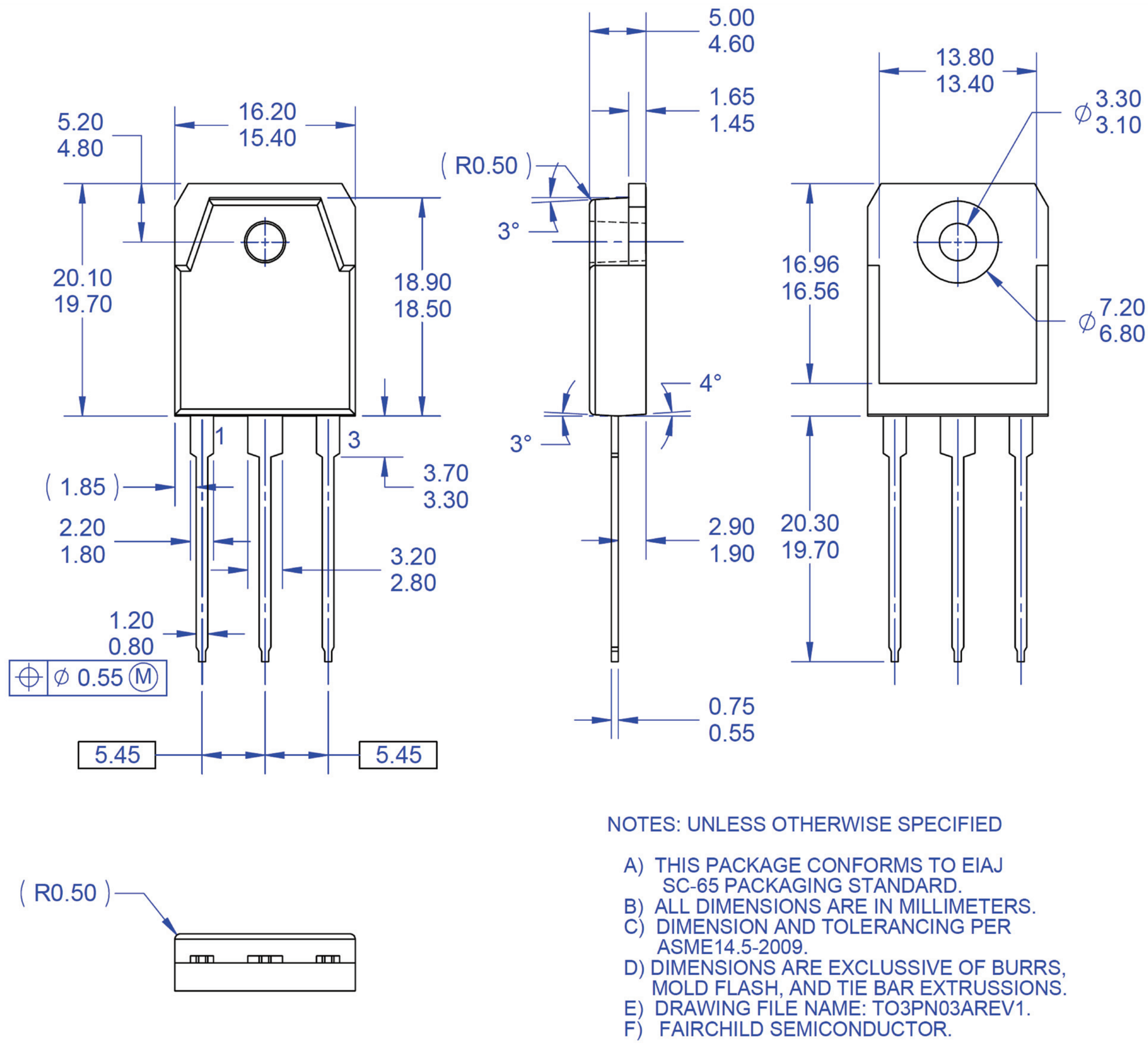


Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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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.
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Rev. I68

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