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June 2014

FQA55N25

N-Channel QFET[®] MOSFET

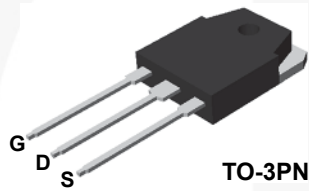
250 V, 55 A, 40 mΩ

Description

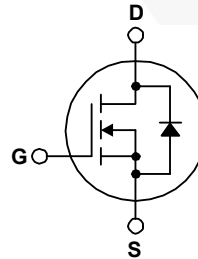
This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength.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

Features

- 55 A, 250 V, $R_{DS(on)} = 40 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 27.5 \text{ A}$
- Low Gate Charge (Typ. 140 nC)
- Low Crss (Typ. 125 pF)
- 100% Avalanche Tested



TO-3PN



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FQA55N25	Unit
V_{DSS}	Drain-Source Voltage	250	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	55	A
		34.8	A
I_{DM}	Drain Current - Pulsed (Note 1)	220	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	1000	mJ
I_{AR}	Avalanche Current (Note 1)	55	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	31	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	310	W
		2.5	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FQA55N25	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.4	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink, Typ.	0.24	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	$^\circ\text{C}/\text{W}$

FQA55N25 — N-Channel QFET[®] MOSFET

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQA55N25	FQA55N25	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
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Off Characteristics

BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	250	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C	--	0.22	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 250 V, V _{GS} = 0 V	--	--	1	μA
		V _{DS} = 200 V, T _C = 125°C	--	--	10	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 = 27.5 A	--	0.03	0.04	Ω
g _{FS}	Forward Transconductance	V _{DS} = 50 V, I _D = 27.5 A	--	46	--	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz	--	4800	6250	pF
C _{oss}	Output Capacitance		--	1000	1300	pF
C _{rss}	Reverse Transfer Capacitance		--	125	160	pF

Switching Characteristics

t _{d(on)}	Turn-On Delay Time	V _{DD} = 125 V, I _D = 55 A, R _G = 25 Ω (Note 4)	--	100	210	ns
t _r	Turn-On Rise Time		--	700	1400	ns
t _{d(off)}	Turn-Off Delay Time		--	200	410	ns
t _f	Turn-Off Fall Time		--	250	510	ns
Q _g	Total Gate Charge	V _{DS} = 200 V, I _D = 55 A, V _{GS} = 10 V (Note 4)	--	140	180	nC
Q _{gs}	Gate-Source Charge		--	33	--	nC
Q _{gd}	Gate-Drain Charge		--	77	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current	--	--	55	A	
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	220	A	
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 55 A	--	--	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 55 A,	--	240	--	ns
Q _{rr}	Reverse Recovery Charge	dI _F / dt = 100 A/μs	--	2.2	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 0.53 mH, I_{AS} = 55 A, V_{DD} = 50 V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 55 A, di/dt ≤ 300 A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially independent of operating temperature

Typical Characteristics

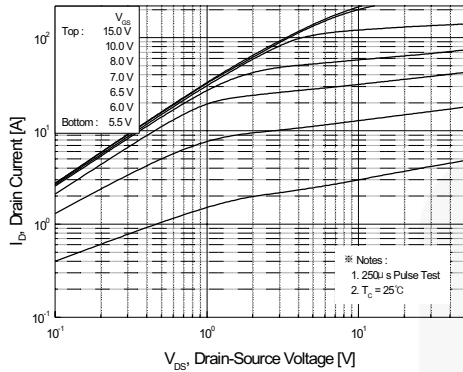


Figure 1. On-Region Characteristics

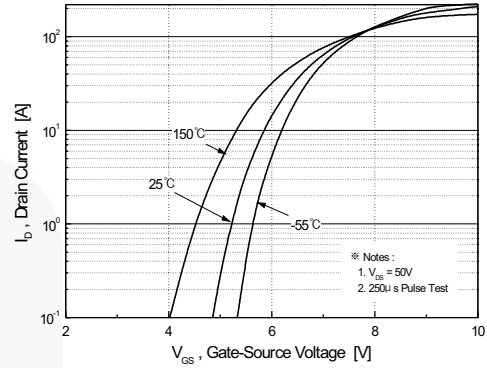


Figure 2. Transfer Characteristics

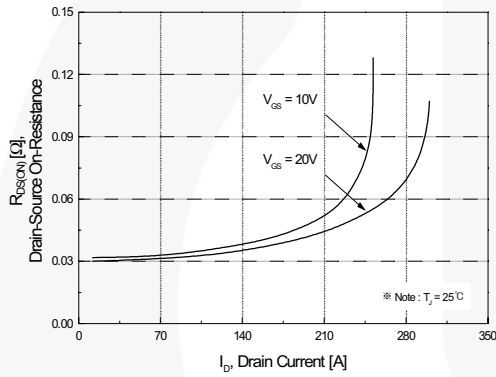


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

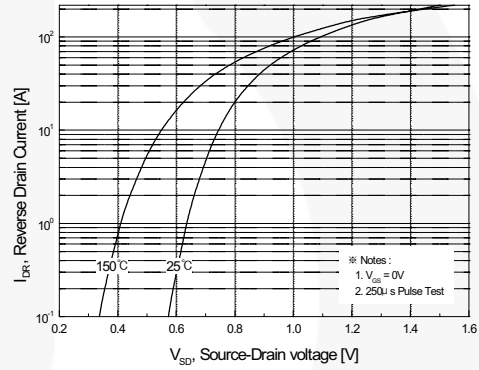


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

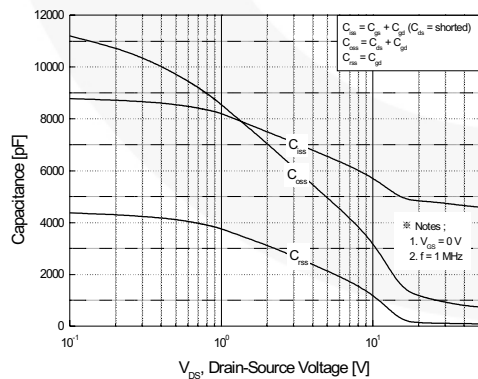


Figure 5. Capacitance Characteristics

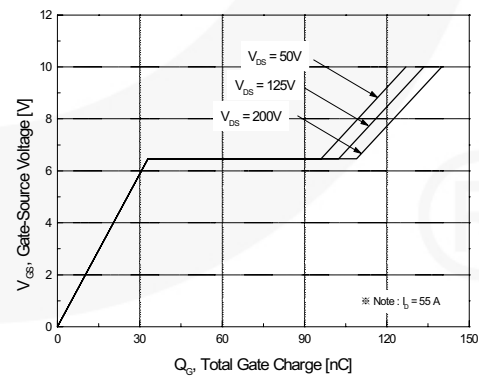


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

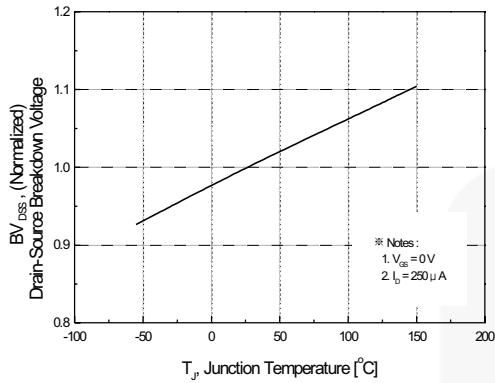


Figure 7. Breakdown Voltage Variation vs. Temperature

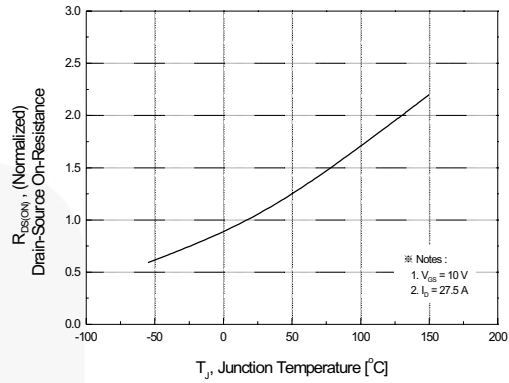


Figure 8. On-Resistance Variation vs. Temperature

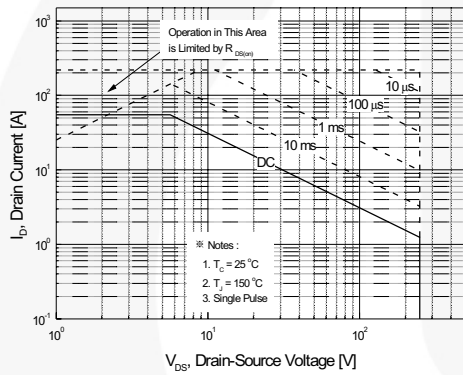


Figure 9. Maximum Safe Operating Area

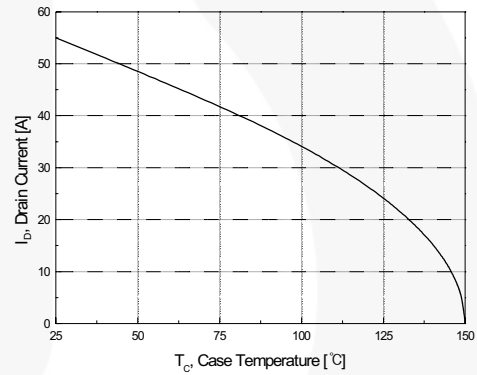


Figure 10. Maximum Drain Current vs. Case Temperature

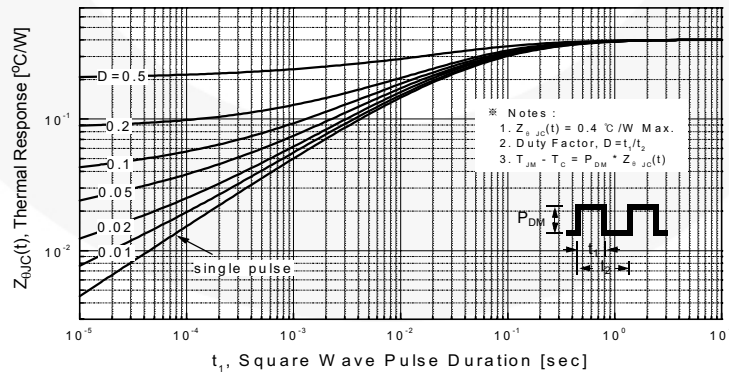


Figure 11. Transient Thermal Response Curve

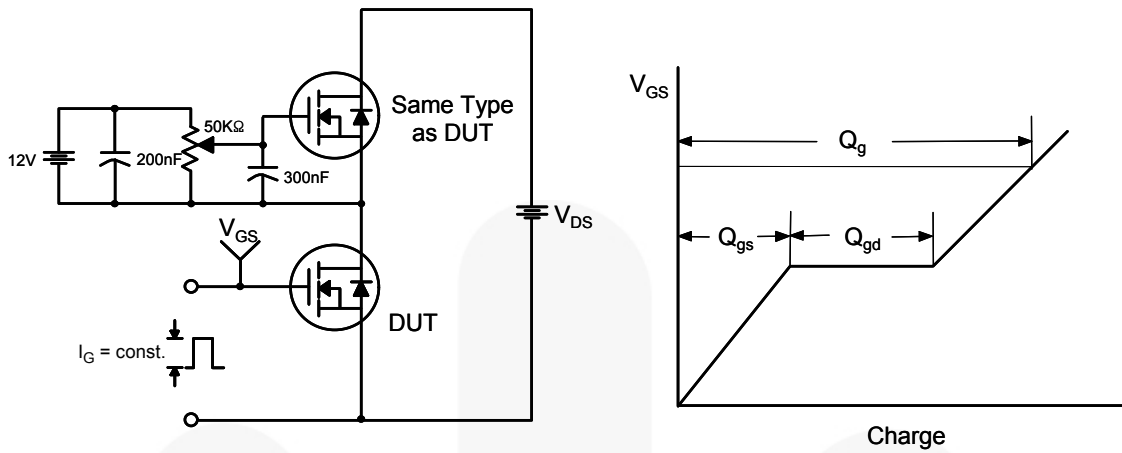


Figure 12. Gate Charge Test Circuit & Waveform

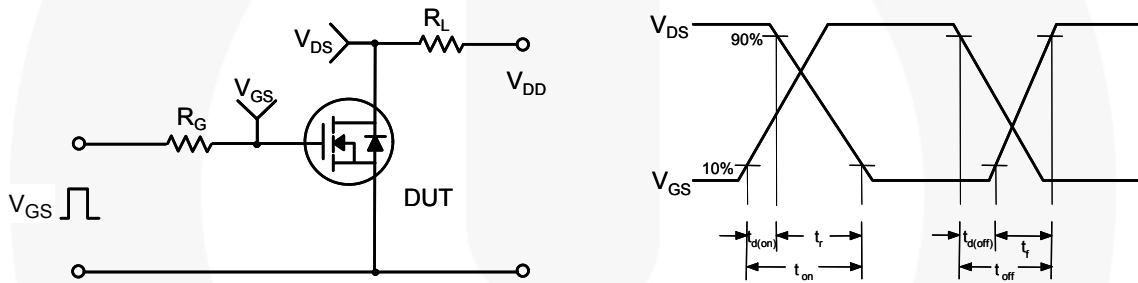


Figure 13. Resistive Switching Test Circuit & Waveforms

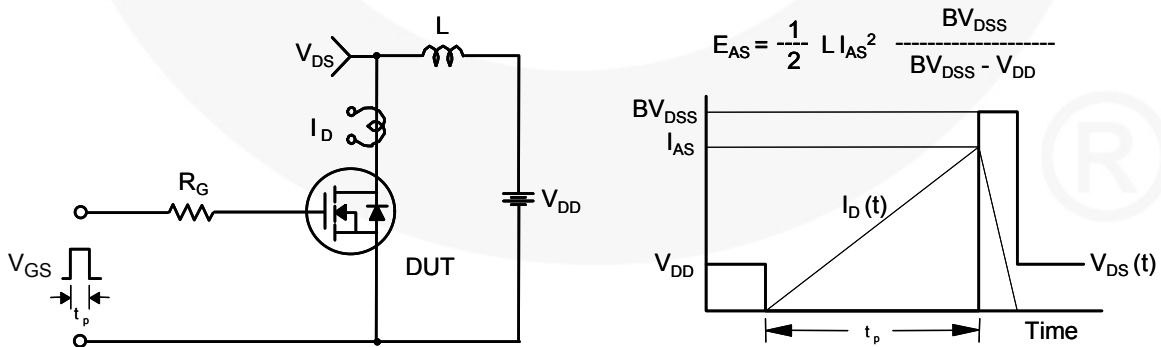


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

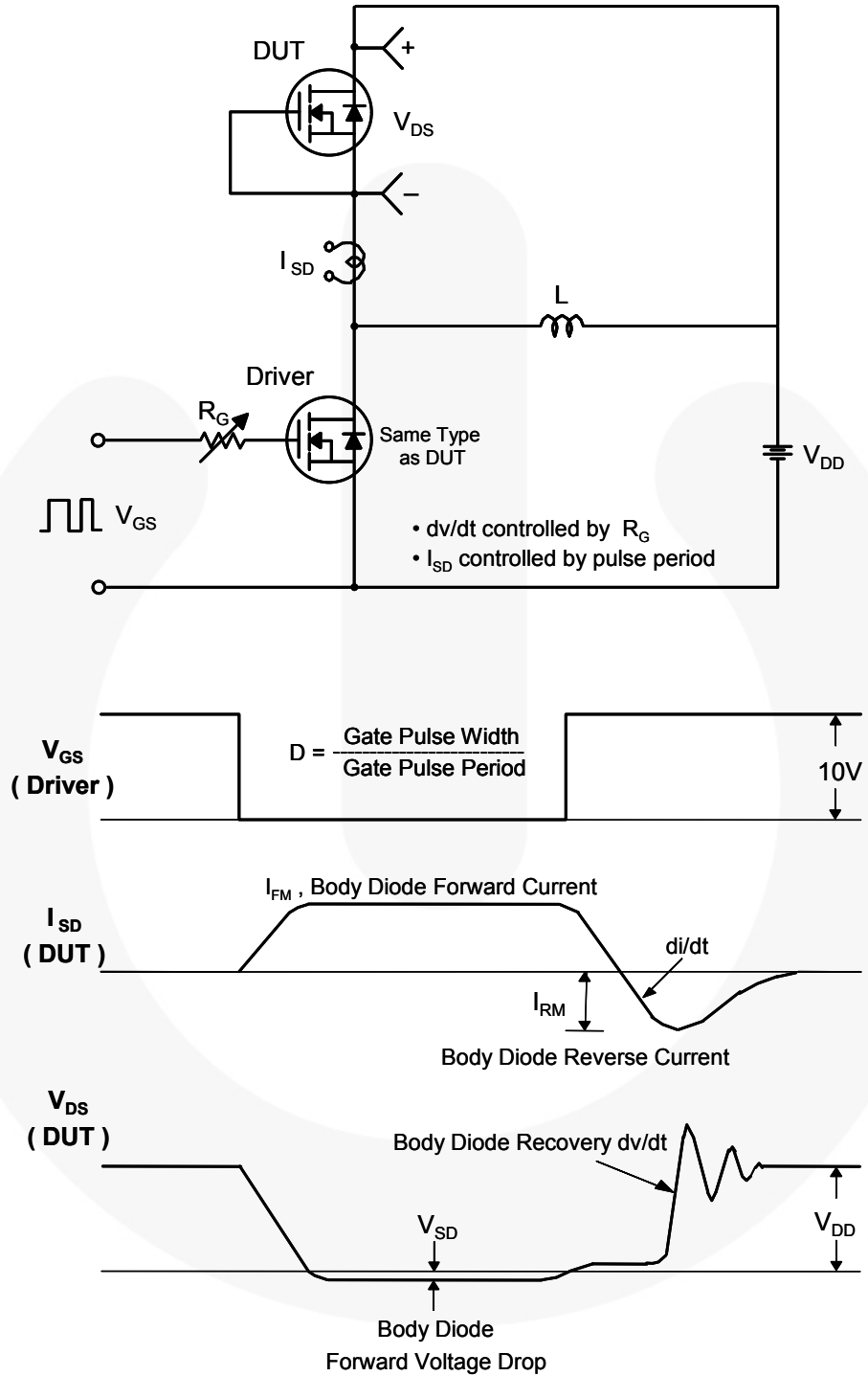


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

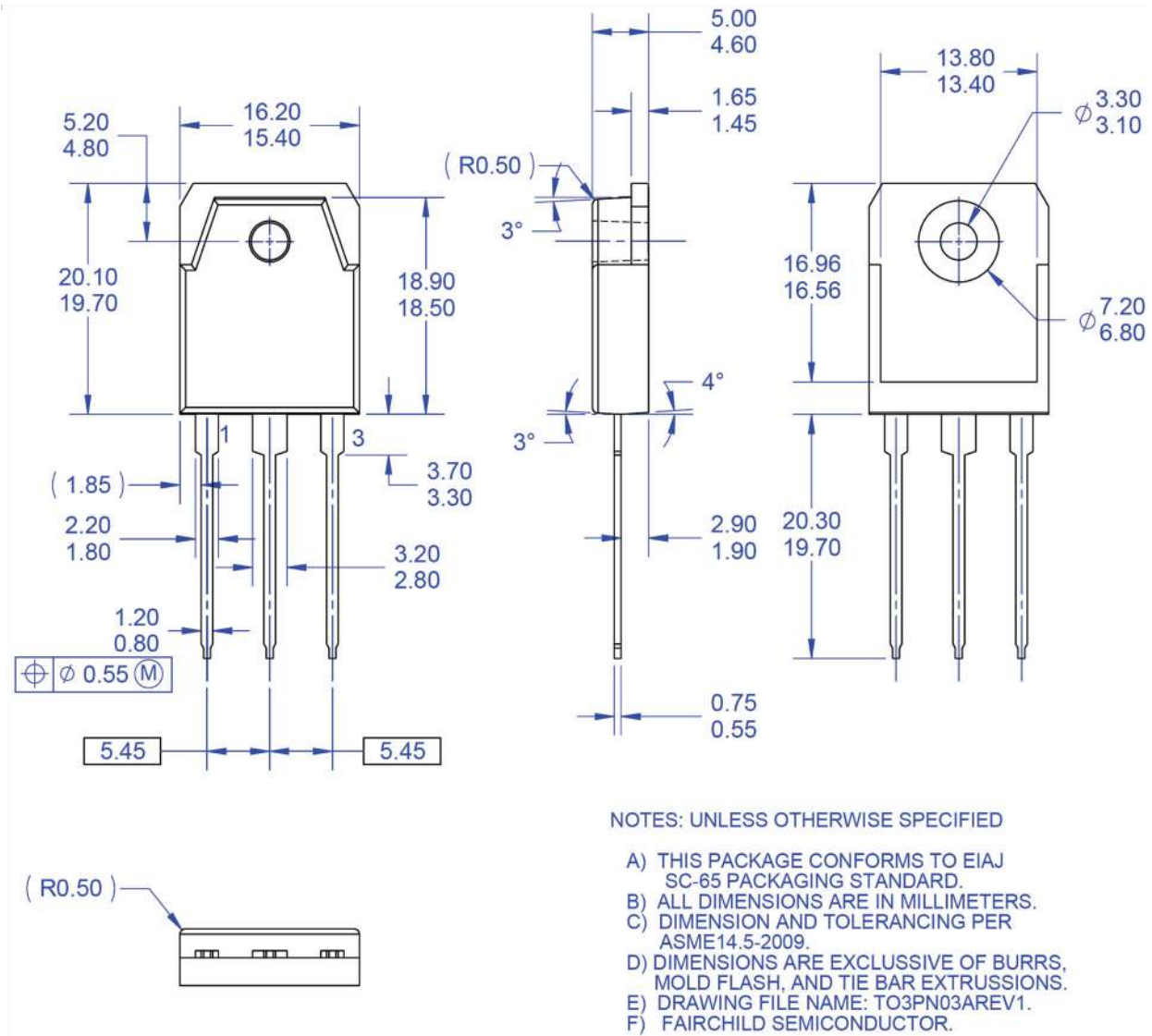


Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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