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June 2014

FQA55N25

N-Channel QFET® MOSFET

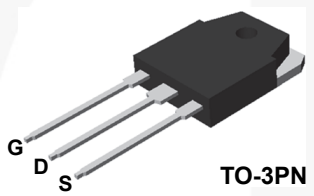
250 V, 55 A, 40 mΩ

Description

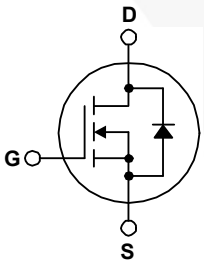
This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. 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 mΩ (Max.) @ V_{GS} = 10 V, I_D = 27.5 A
- Low Gate Charge (Typ. 140 nC)
- Low Crss (Typ. 125 pF)
- 100% Avalanche Tested



TO-3PN



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

Symbol	Parameter		FQA55N25	Unit
V_{DSS}	Drain-Source Voltage		250	V
I_D	Drain Current - Continuous (T_C = 25°C)		55	A
	- Continuous (T_C = 100°C)		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°C)		310	W
	- Derate above 25°C		2.5	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

Thermal Characteristics

Symbol	Parameter	FQA55N25	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

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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
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, dI_F / dt = 100 A/µs	--	240	--	ns
Q_{rr}	Reverse Recovery Charge		--	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

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Typical Characteristics

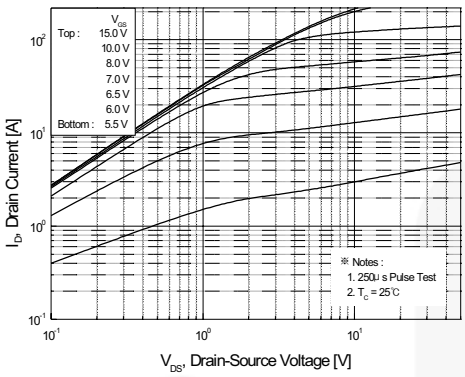

Figure 1. On-Region Characteristics

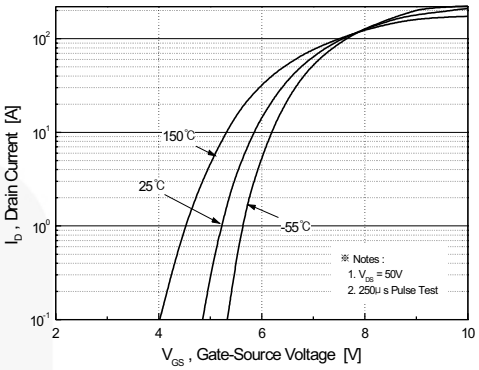

Figure 2. Transfer Characteristics

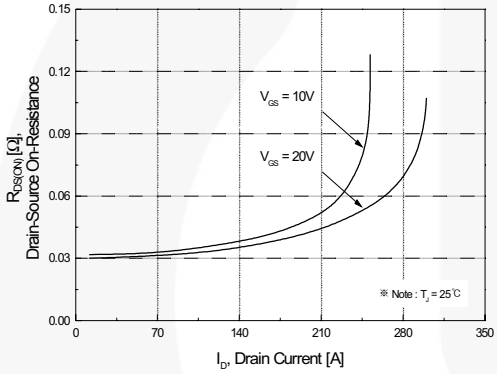

Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

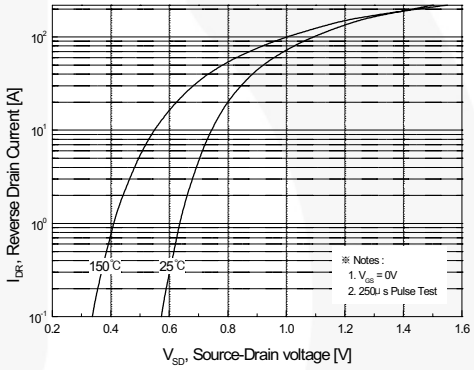

Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

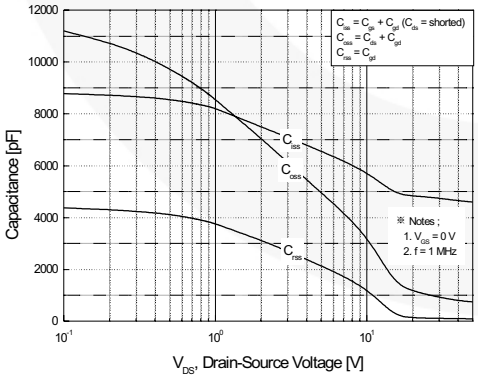

Figure 5. Capacitance Characteristics

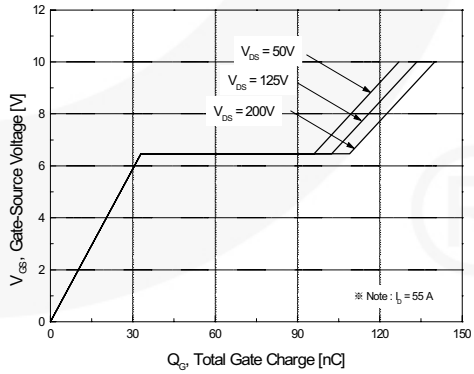

Figure 6. Gate Charge Characteristics

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Typical Characteristics (Continued)

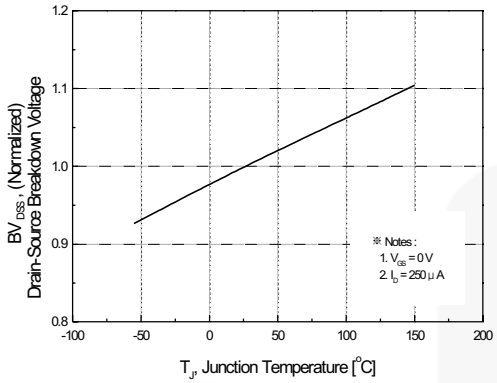

Figure 7. Breakdown Voltage Variation vs. Temperature

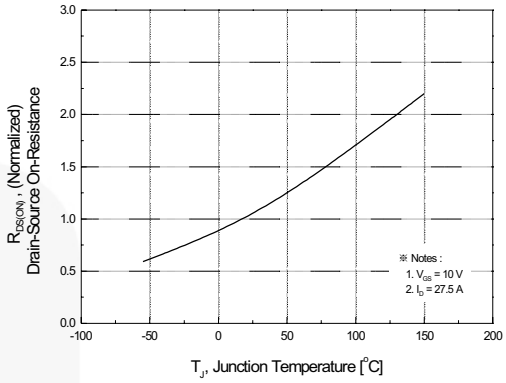

Figure 8. On-Resistance Variation vs. Temperature

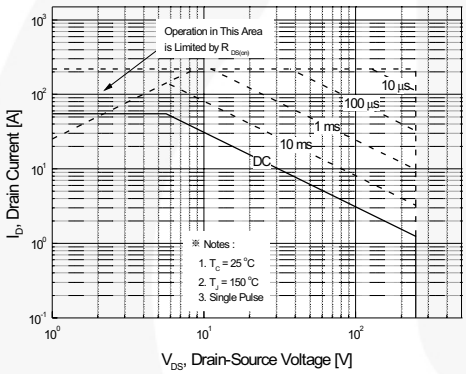

Figure 9. Maximum Safe Operating Area

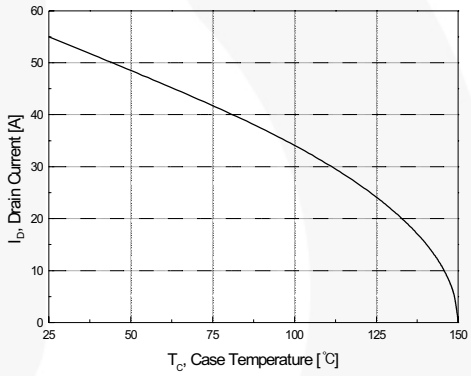

Figure 10. Maximum Drain Current vs. Case Temperature

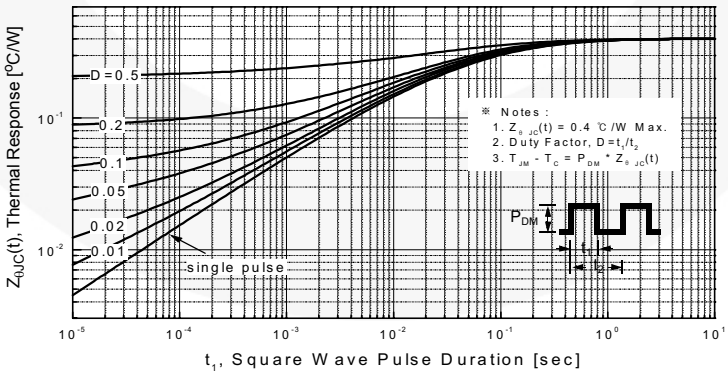

Figure 11. Transient Thermal Response Curve

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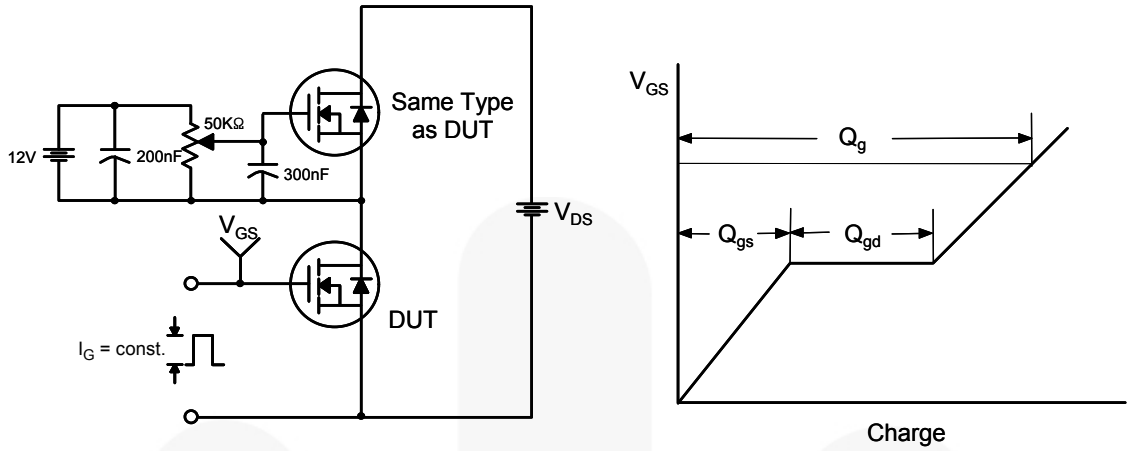

Figure 12. Gate Charge Test Circuit & Waveform

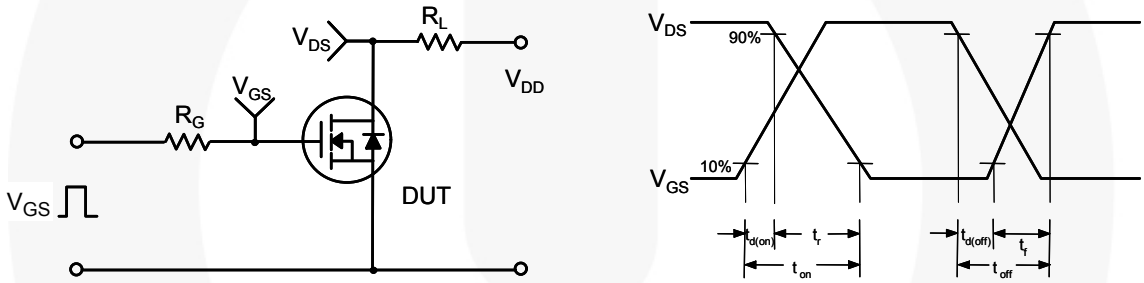

Figure 13. Resistive Switching Test Circuit & Waveforms

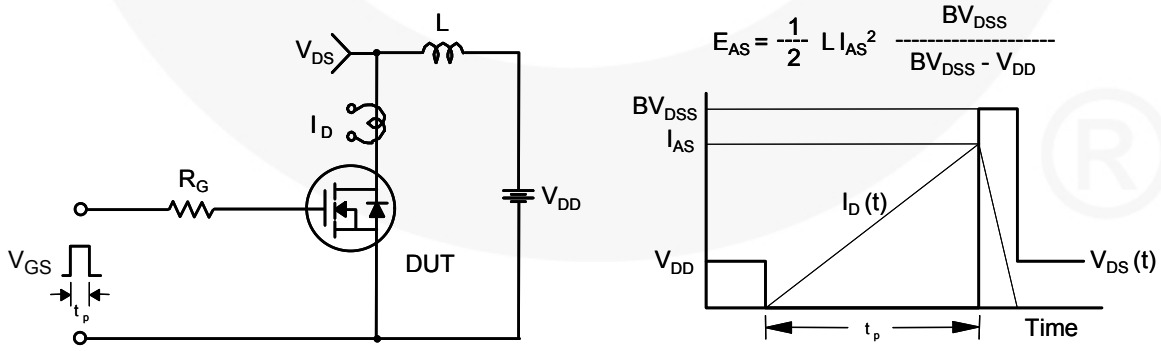

Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

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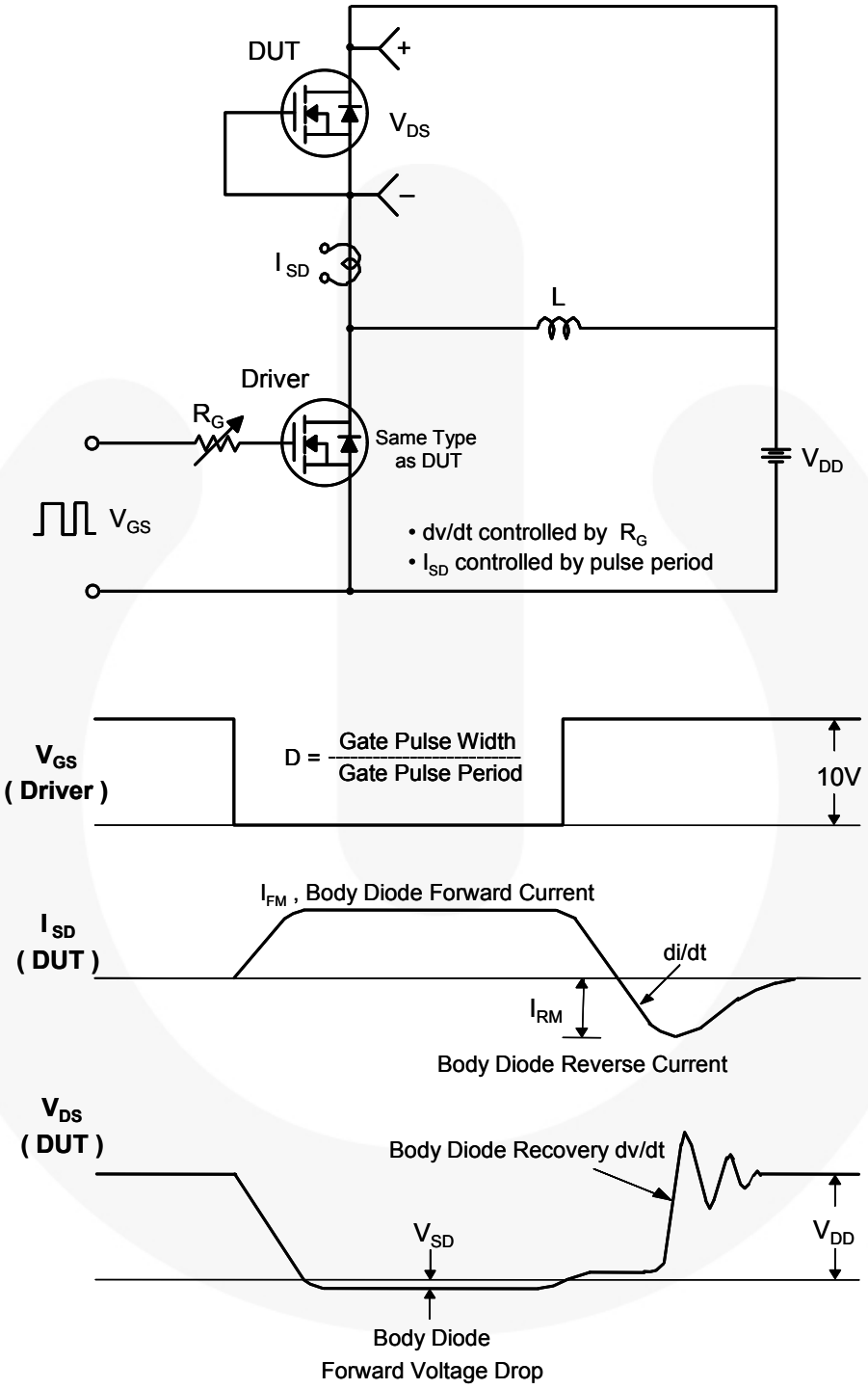

Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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Mechanical Dimensions

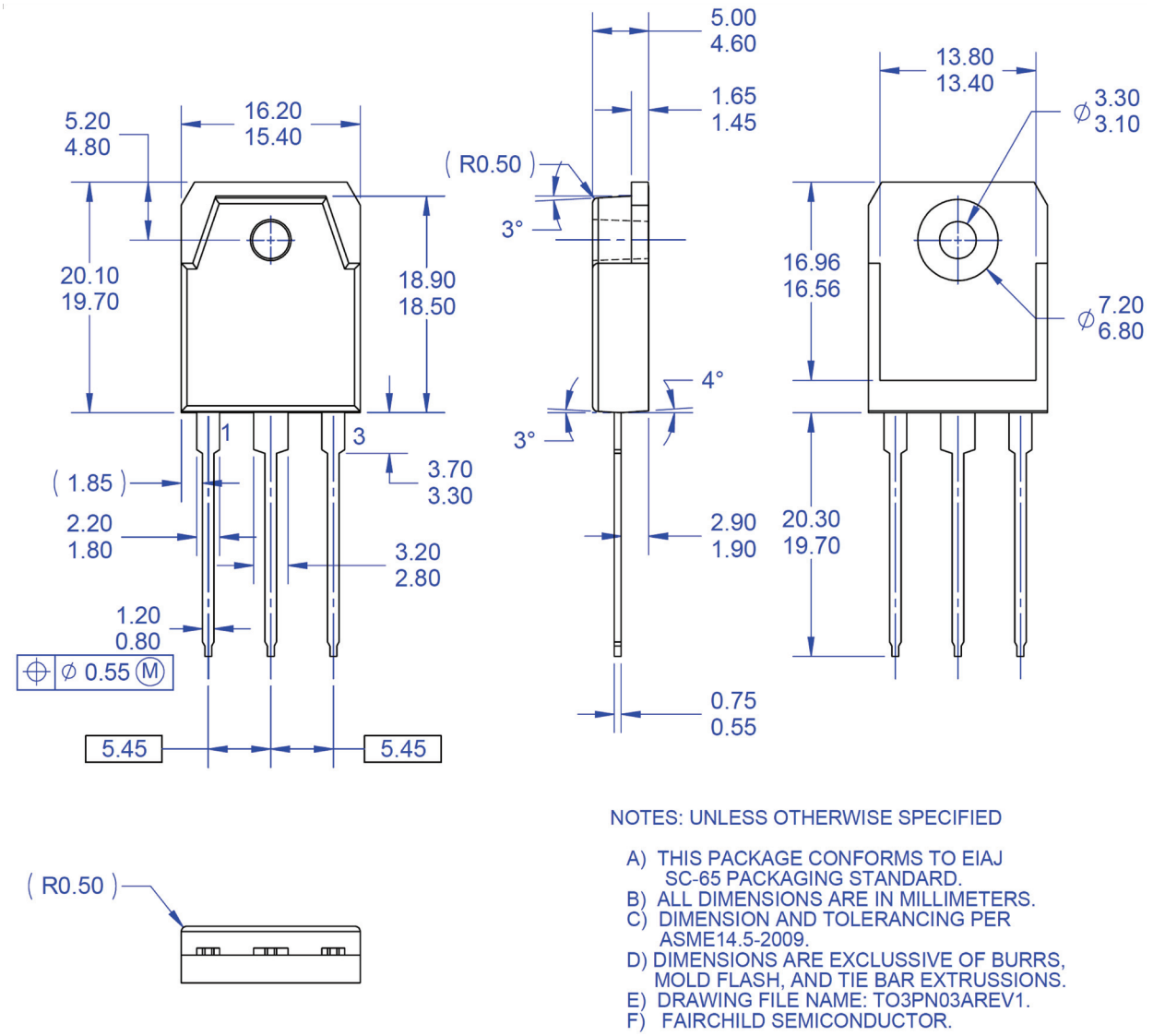

Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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