June 2014

FDA20N50_F109

N-Channel UniFET™ MOSFET

500 V, 20 A, 230 mΩ

Features

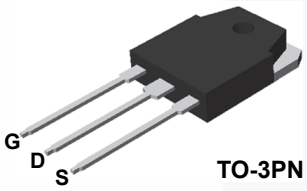
- $R_{DS(on)}$ = 230 mΩ (Max.) @ V_{GS} = 10 V, I_D = 10 A
- Low Gate Charge (Typ. 45.6 nC)
- Low C_{rss} (Typ. 27 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability

Applications

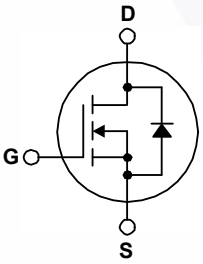
- PDP TV
- Uninterruptible Power Supply
- AC-DC Power Supply

Description

UniFET™ MOSFET is Fairchild Semiconductor's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.



TO-3PN



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

Symbol	Parameter		FDA20N50_F109	Unit
V_{DSS}	Drain-Source Voltage		500	V
I_D	Drain Current	- Continuous (T_C = 25°C) - Continuous (T_C = 100°C)	22 13.2	A A
I_{DM}	Drain Current	- Pulsed (Note 1)	88	A
V_{GSS}	Gate-Source voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	1110	mJ
I_{AR}	Avalanche Current	(Note 1)	22	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	28.0	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	20	V/ns
P_D	Power Dissipation	(T_C = 25°C) - Derate above 25°C	280 2.3	W W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FDA20N50_F109	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.44	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDA20N50	FDA20N50_F109	TO-3PN	Tube	N/A	30 units

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA, T_J = 25°C	500	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	--	0.50	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 500V, V_{GS} = 0V V_{DS} = 400V, T_C = 125°C	-- --	-- --	1 10	μA μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30V, V_{DS} = 0V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30V, V_{DS} = 0V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 11A	--	0.20	0.23	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40V, I_D = 11A	--	24.6	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	--	2400	3120	pF
C_{oss}	Output Capacitance		--	355	465	pF
C_{rss}	Reverse Transfer Capacitance		--	27	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 250V, I_D = 20A R_G = 25Ω (Note 4)	--	95	200	ns
t_r	Turn-On Rise Time		--	375	760	ns
$t_{d(off)}$	Turn-Off Delay Time		--	100	210	ns
t_f	Turn-Off Fall Time		--	105	220	ns
Q_g	Total Gate Charge	V_{DS} = 400V, I_D = 20A V_{GS} = 10V (Note 4)	--	45.6	59.5	nC
Q_{gs}	Gate-Source Charge		--	14.8	--	nC
Q_{gd}	Gate-Drain Charge		--	21.6	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	20	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	80	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 22A	--	--	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_S = 20A dI_F/dt =100A/μs	--	507	--	ns
Q_{rr}	Reverse Recovery Charge		--	7.20	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 4.1mH, I_{AS} = 22A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 22A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Characteristics

Figure 1. On-Region Characteristics

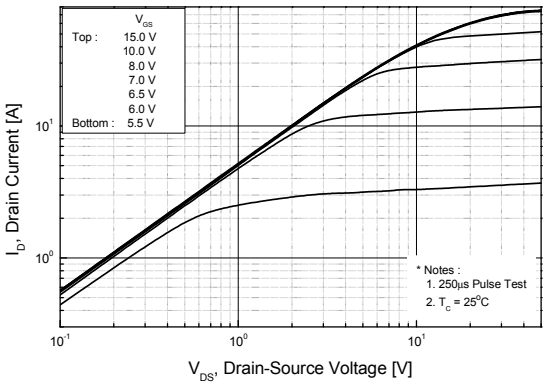


Figure 2. Transfer Characteristics

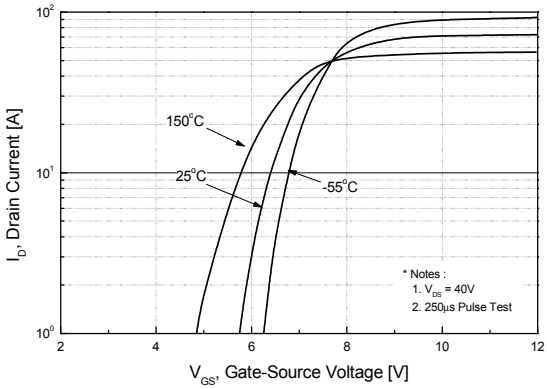


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

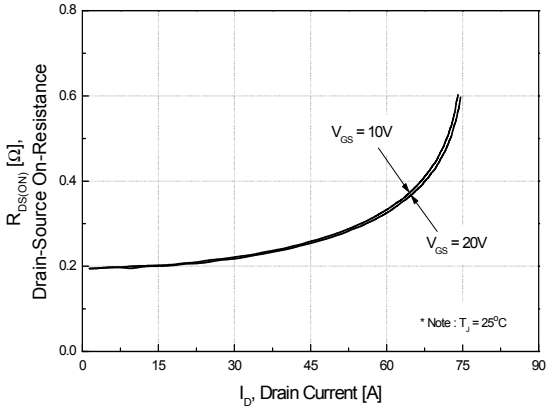


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

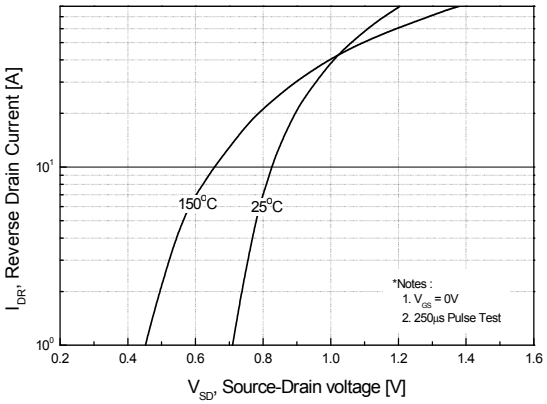


Figure 5. Capacitance Characteristics

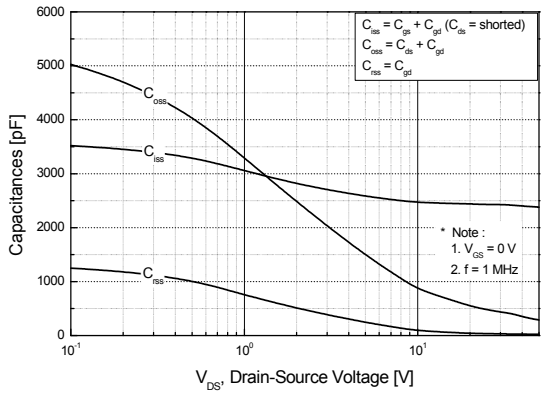
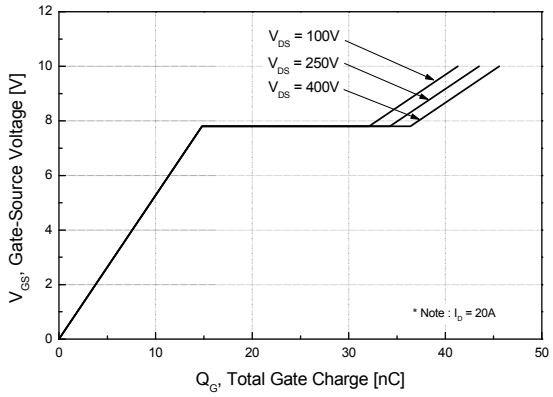


Figure 6. Gate Charge Characteristics



Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

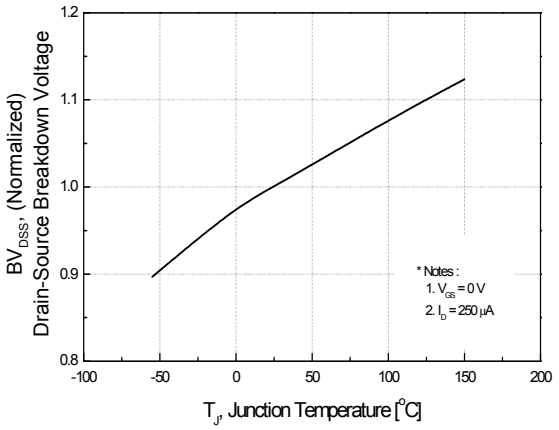


Figure 8. On-Resistance Variation vs. Temperature

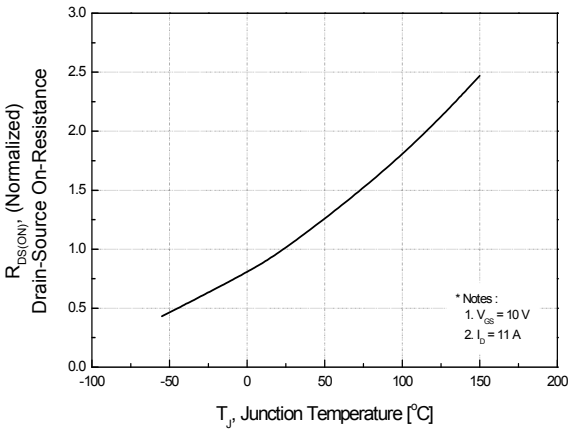


Figure 9. Safe Operating Area

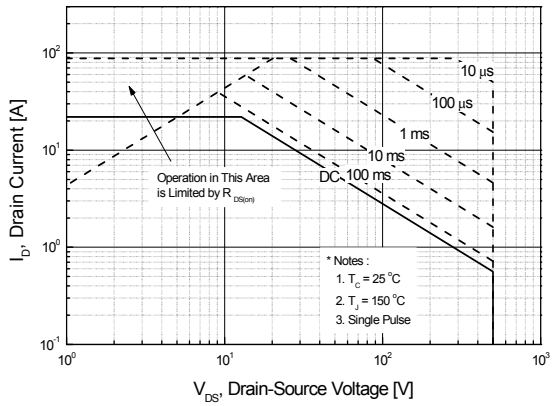


Figure 10. Maximum Drain Current vs. Case Temperature

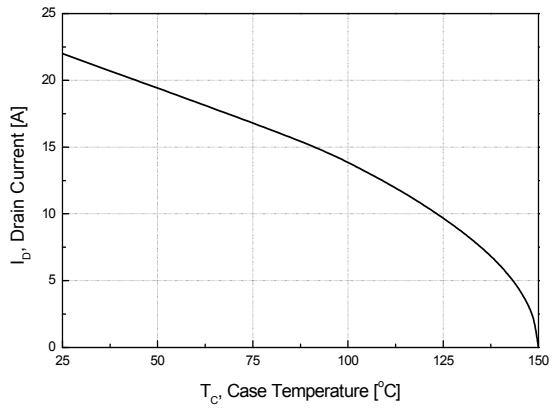


Figure 11. Transient Thermal Response Curve

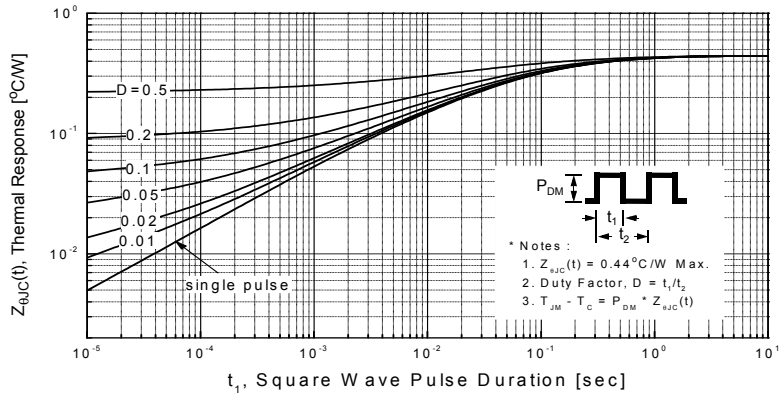


Figure 12. Gate Charge Test Circuit & Waveform

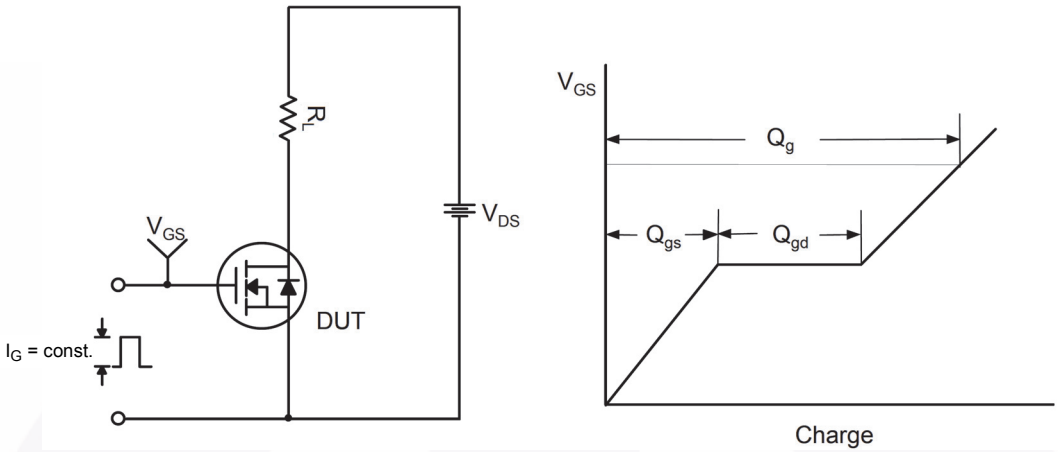


Figure 13. Resistive Switching Test Circuit & Waveforms

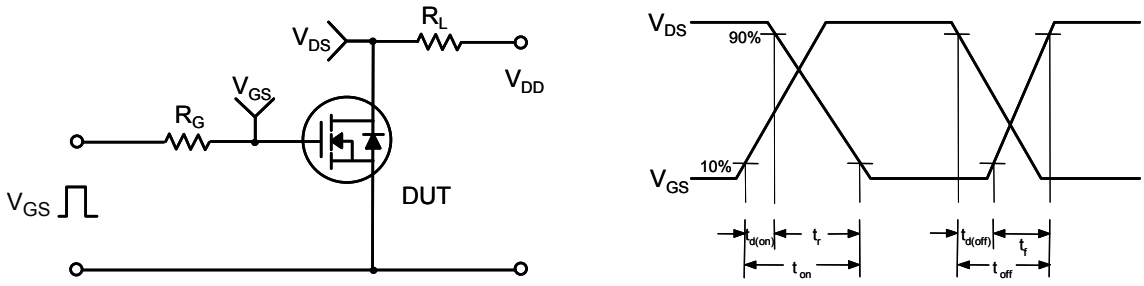


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

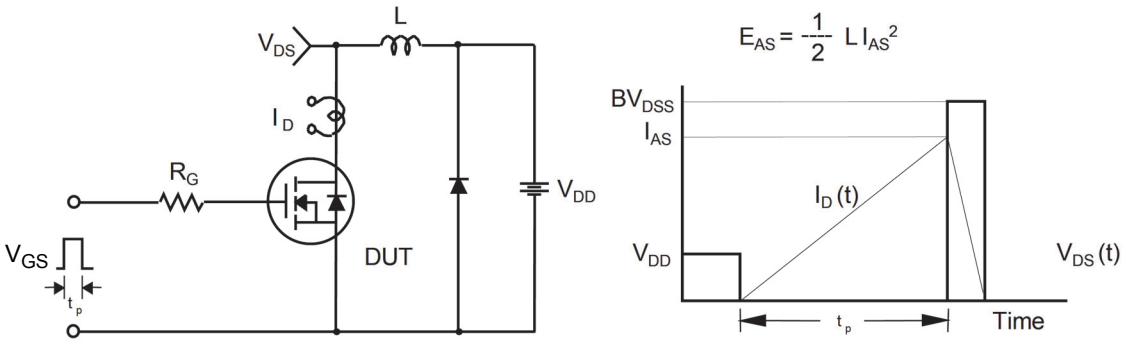
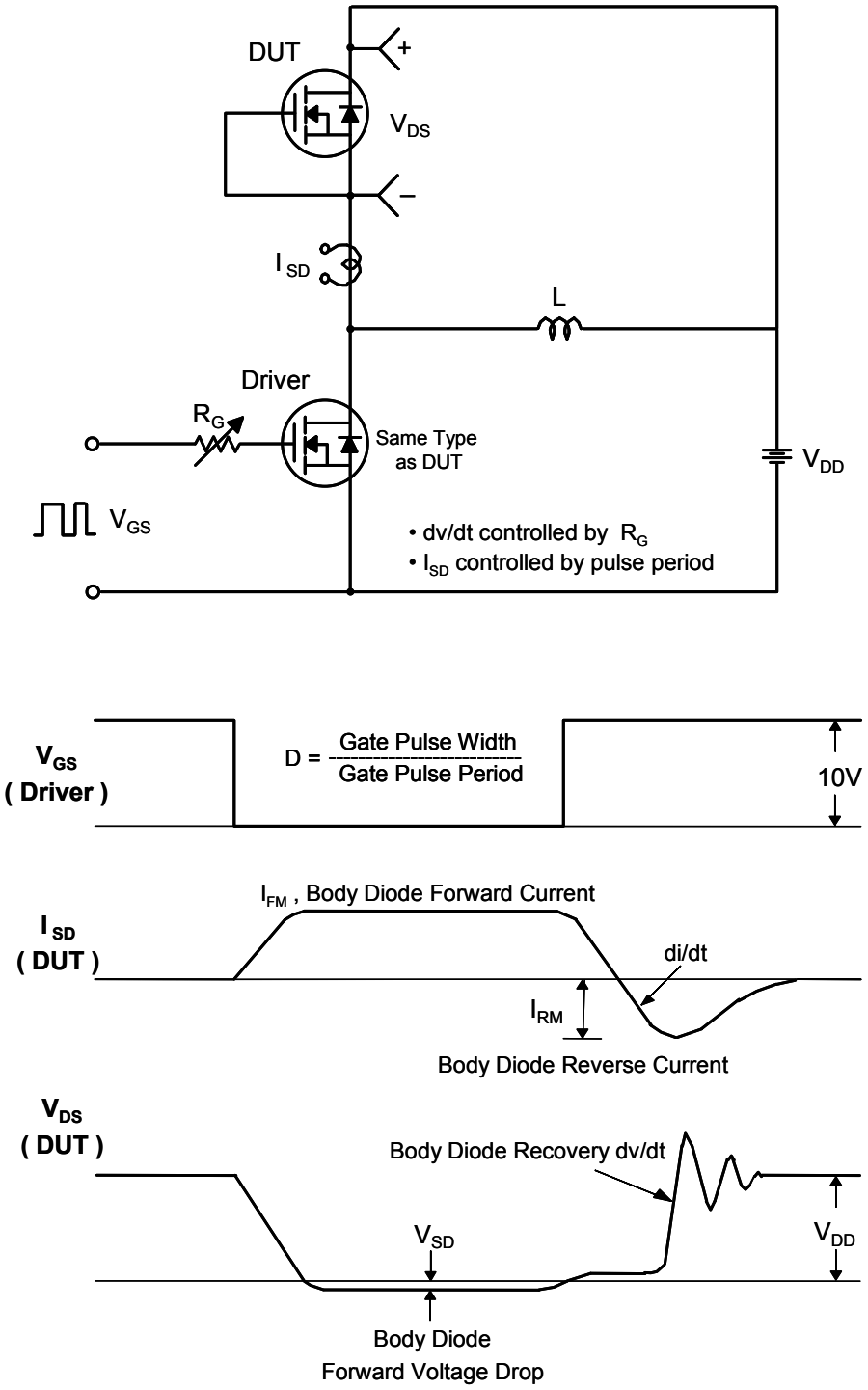


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

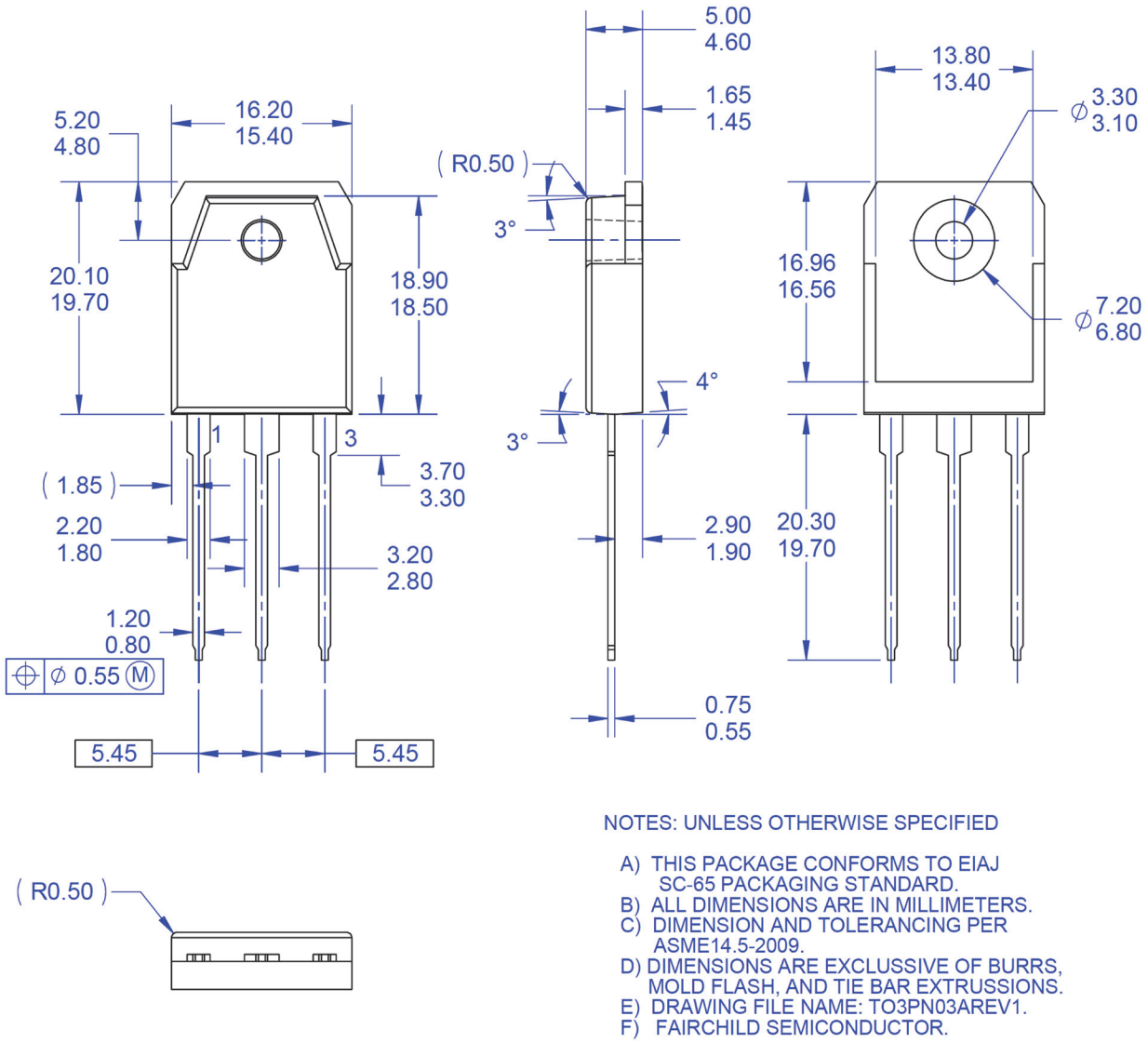


Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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