FAIRCHILD SEMICONDUCTOR®

November 2013

FQPF9N25C / FQPF9N25CT

N-Channel QFET® MOSFET

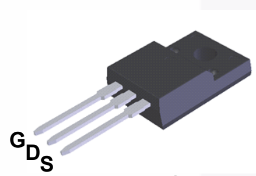
250 V, 8.8 A, 430 mΩ

Features

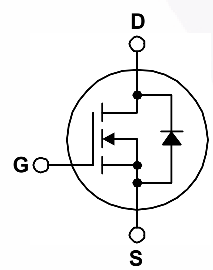
- 8.8 A, 250 V, $R_{DS(on)}$ = 430 mΩ (Max.) @ V_{GS} = 10 V, I_D = 4.4 A
- Low Gate Charge (Typ. 26.5 nC)
- Low Crss (Typ. 45.5 pF)
- 100% Avalanche Tested

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 high efficiency switching DC/DC converters, switch mode power supplies, DC-AC converters for uninterrupted power supplies and motor controls.



TO-220F



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

Symbol	Parameter		FQPF9N25C / FQPF9N25CT	Unit
V_{DSS}	Drain to Source Voltage		250	V
I_D	Drain Current	- Continuous (T_C = 25°C)	8.8 *	A
		- Continuous (T_C = 100°C)	5.6 *	A
I_{DM}	Drain Current	- Pulsed (Note 1)	35.2 *	A
V_{GSS}	Gate to Source Voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		285	mJ
I_{AR}	Avalanche Current (Note 1)		8.8	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		7.4	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		5.5	V/ns
P_D	Power Dissipation	(T_C = 25°C)	38	W
		- Derate Above 25°C	0.3	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

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FQPF9N25C / FQPF9N25CT	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.29	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQPF9N25C	FQPF9N25C	TO-220F	Tube	N/A	50 units
FQPF9N25CT	FQPF9N25CT	TO-220F	Tube	N/A	50 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
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.30	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 250 V, V_{GS} = 0 V	--	--	10	μA
		V_{DS} = 200 V, T_C = 125°C	--	--	100	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	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 4.4 A	--	0.35	0.43	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 4.4 A	--	7.0	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	545	710	pF
C_{oss}	Output Capacitance		--	115	150	pF
C_{rss}	Reverse Transfer Capacitance		--	45.5	60	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 125 V, I_D = 8.8 A, V_{GS} = 10 V , R_G = 25 Ω (Note 4)	--	15	40	ns
t_r	Turn-On Rise Time		--	85	180	ns
$t_{d(off)}$	Turn-Off Delay Time		--	90	190	ns
t_f	Turn-Off Fall Time		--	65	140	ns
Q_g	Total Gate Charge	V_{DS} = 200 V, I_D = 8.8 A, V_{GS} = 10 V (Note 4)	--	26.5	35	nC
Q_{gs}	Gate-Source Charge		--	3.5	--	nC
Q_{gd}	Gate-Drain Charge		--	13.5	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	8.8	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	35.2	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 8.8 A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 8.8 A, dI_F / dt = 100 A/μs	--	218	--	ns
Q_{rr}	Reverse Recovery Charge		--	1.58	--	μC

Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature.
2. L = 5.9 mH, I_{AS} = 8.8 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. $I_{SD} \leq$ 8.8 A, di/dt $\leq$ 300 A/μs, $V_{DD} \leq BV_{DSS,}$ starting T_J = 25°C.
4. Essentially independent of operating temperature.

Typical Characteristics

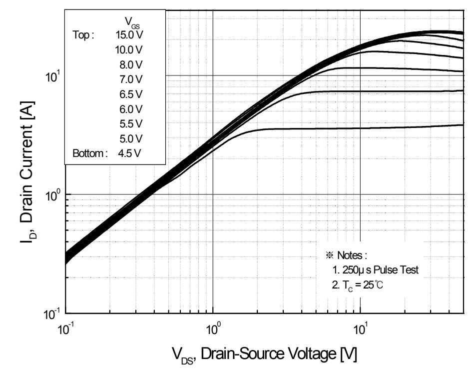


Figure 1. On-Region Characteristics

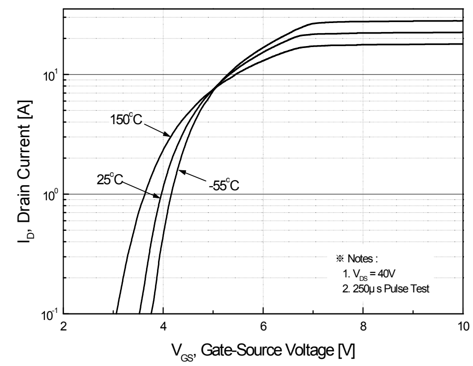


Figure 2. Transfer Characteristics

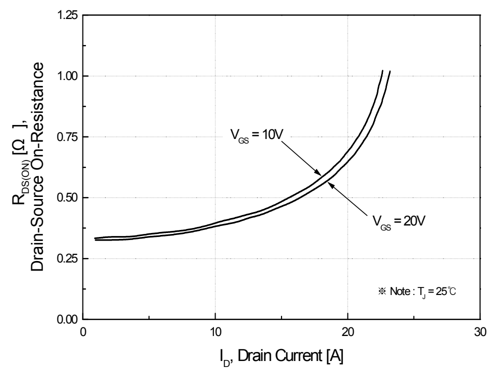


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

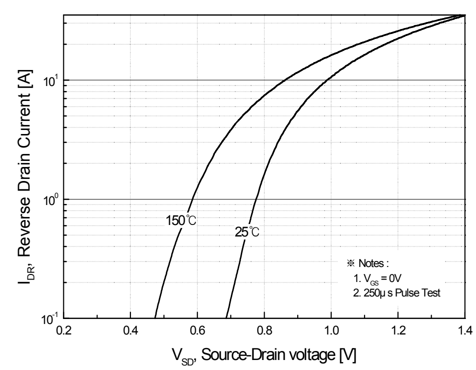


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

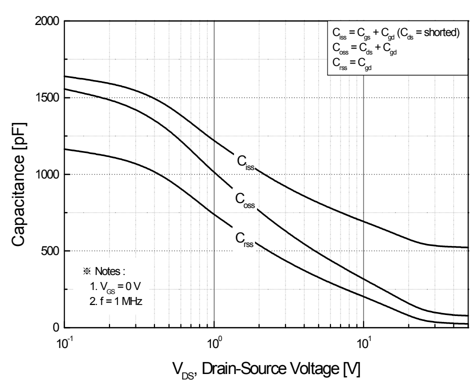


Figure 5. Capacitance Characteristics

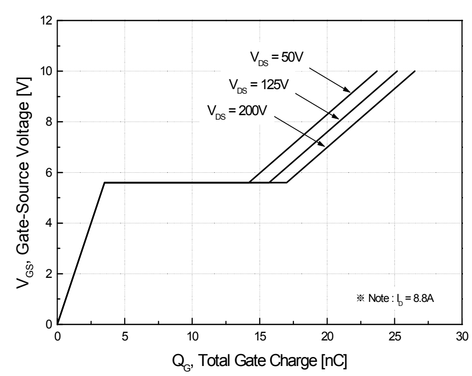


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

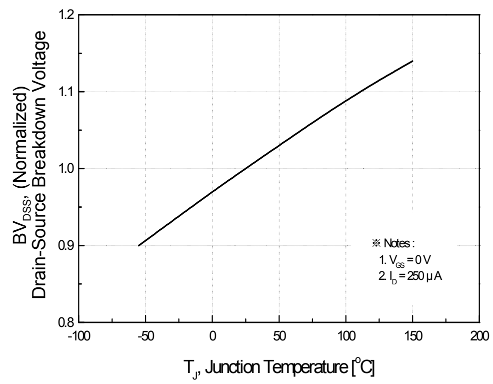


Figure 7. Breakdown Voltage Variation vs Temperature

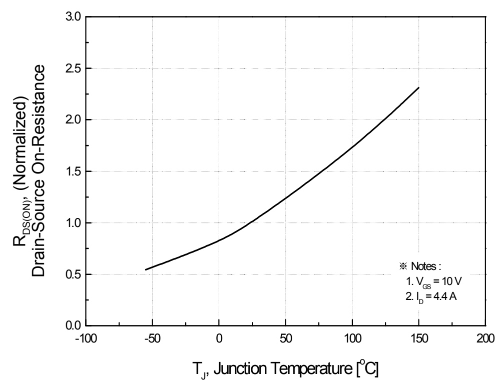


Figure 8. On-Resistance Variation vs Temperature

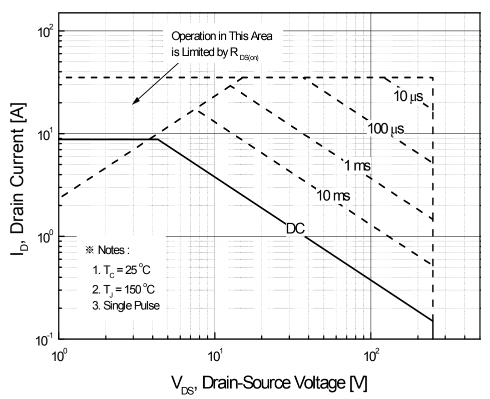


Figure 9. Maximum Safe Operating Area

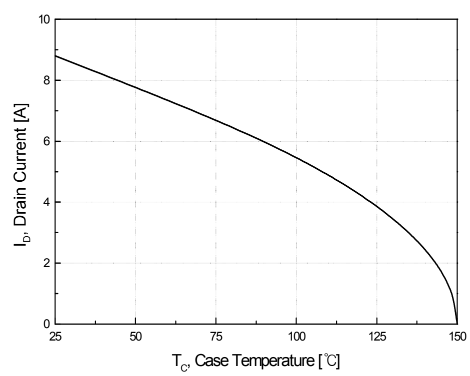


Figure 10. Maximum Drain Current vs Case Temperature

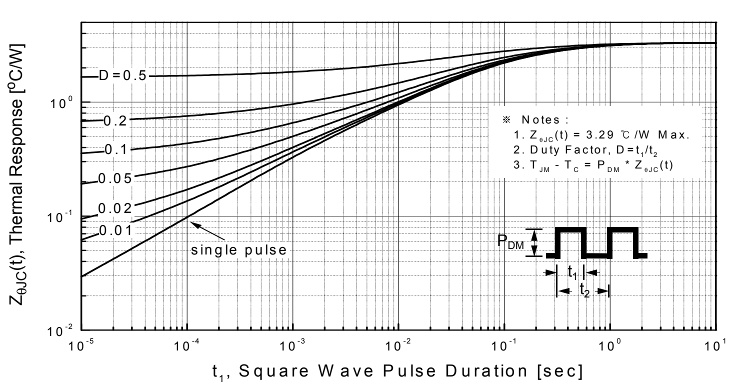


Figure 11. Transient Thermal Response Curve

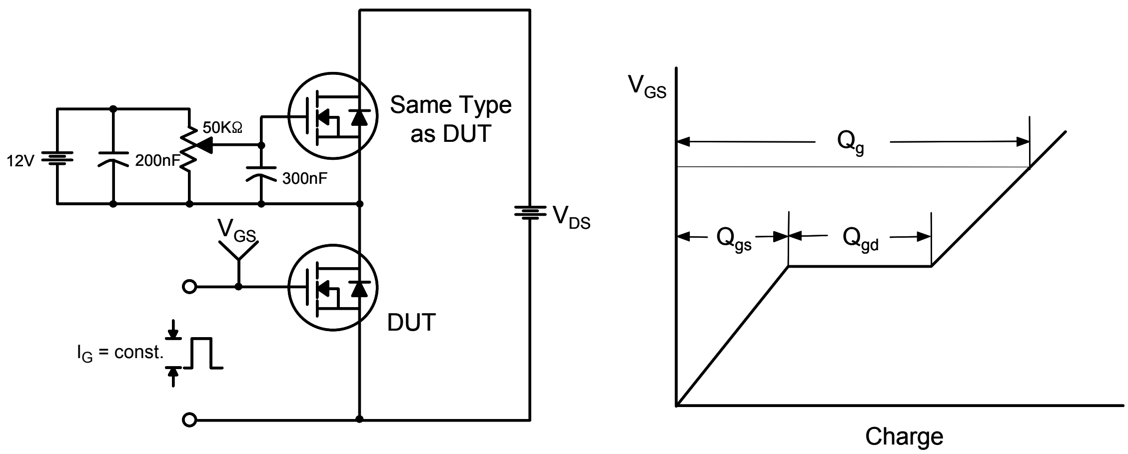


Figure 12. Gate Charge Test Circuit & Waveform

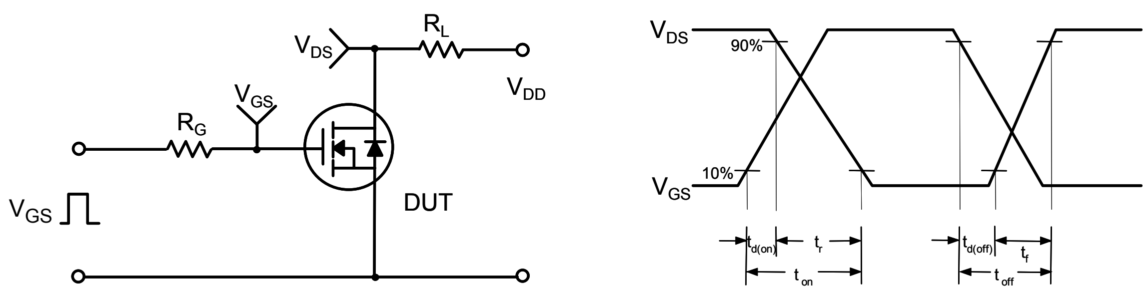


Figure 13. Resistive Switching Test Circuit & Waveforms

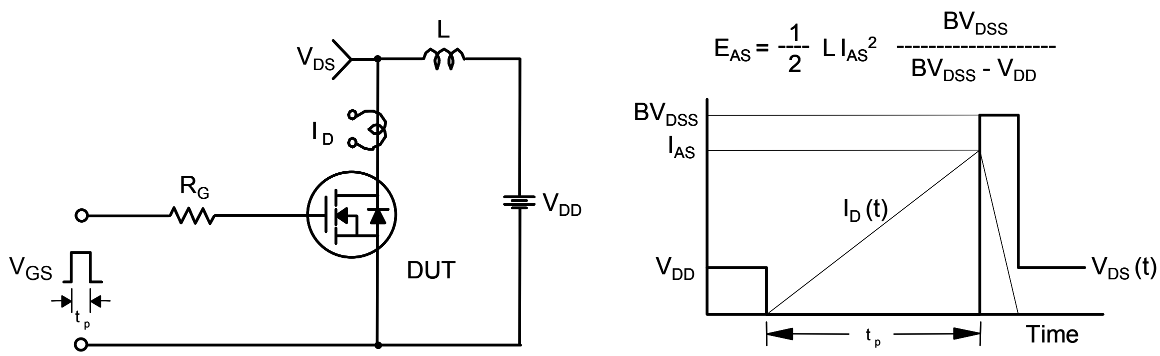


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

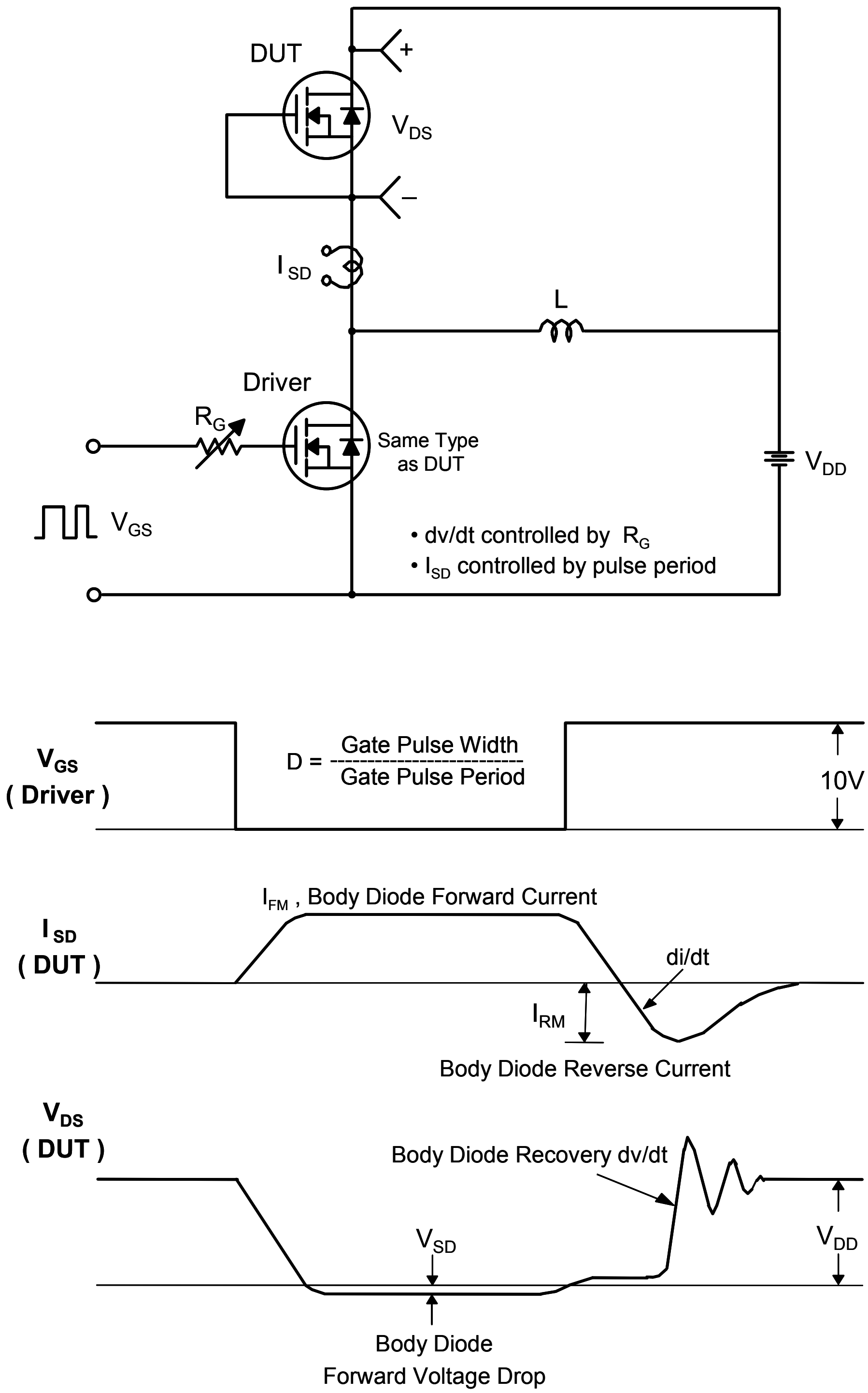


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

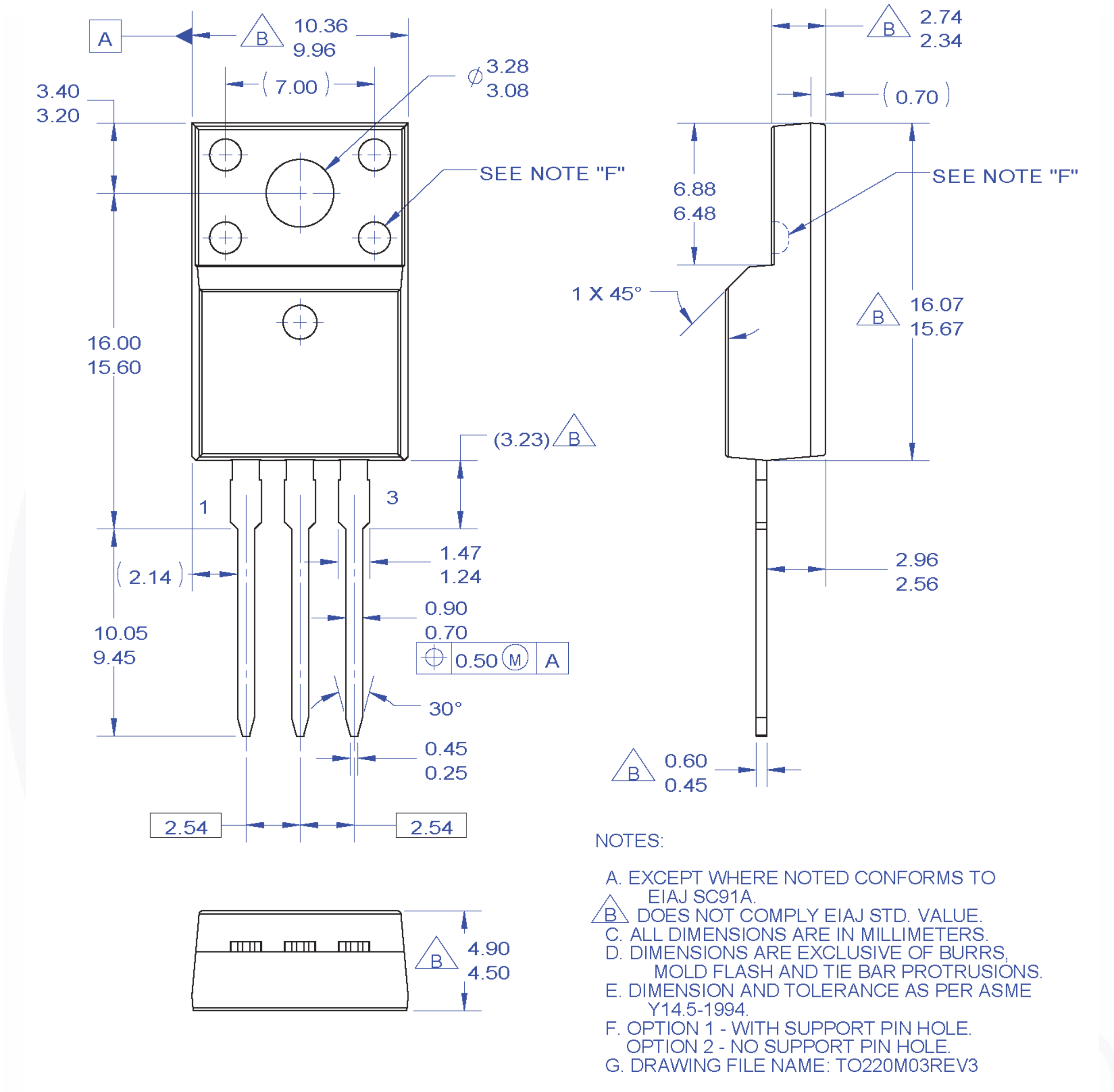


Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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