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FAIRCHILD SEMICONDUCTOR®

December 2013

IRLS640A

N-Channel Logic Level A-FET

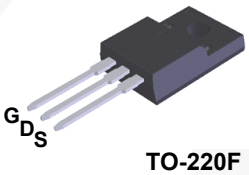
200 V, 9.8 A, 180 mΩ

Description

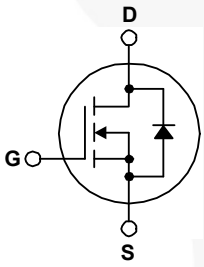
These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar, DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche 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 supply and motor control.

Features

- 9.8 A, 200 V, $R_{DS(on)}$ = 180 mΩ @ V_{GS} = 5 V
- Low Gate Charge (Typ. 40 nC)
- Low Crss (Typ. 95 pF)
- Fast Switching
- 100% Avalanche Tested
- Improved dv/dt Capability
- Logic-Level Gate Drive



TO-220F



Absolute Maximum Ratings

Symbol	Characteristic	Value	Units
V_{DSS}	Drain-to-Source Voltage	200	V
I_D	Continuous Drain Current (T_C=25℃)	9.8	A
	Continuous Drain Current (T_C=100℃)	6.2	
I_{DM}	Drain Current-Pulsed ①	63	A
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulsed Avalanche Energy ②	64	mJ
I_{AR}	Avalanche Current ①	18	A
E_{AR}	Repetitive Avalanche Energy ①	4.0	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5	V/ns
P_D	Total Power Dissipation (T_C=25℃)	40	W
	Linear Derating Factor	0.32	W/℃
T_J , T_{STG}	Operating Junction and Storage Temperature Range	- 55 to +150	℃
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8 " from case for 5-seconds	300	

Thermal Resistance

Symbol	Characteristic	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	--	3.13	°C/W
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
IRLS640A	IRLS640A	TO-220F	Tube	N/A	N/A	50 units

Electrical Characteristics (T_C=25℃ unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
BV_{DSS}	Drain-Source Breakdown Voltage	200	--	--	V	V_{GS}=0V,I_D=250μA
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.17	--	V/℃	I_D=250μA ***See Fig 7***
$V_{GS(th)}$	Gate Threshold Voltage	1.0	--	2.0	V	V_{DS}=V_{GS}, I_D=250μA
I_{GSS}	Gate-Source Leakage , Forward	--	--	100	nA	V_{GS}=20V
	Gate-Source Leakage , Reverse	--	--	-100		V_{GS}=-20V
I_{DSS}	Drain-to-Source Leakage Current	--	--	10	μA	V_{DS}=200V
		--	--	100		V_{DS}=160V,T_C=125℃
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	0.18	Ω	V_{GS}=5V,I_D=4.9A ④
g_{fs}	Forward Transconductance	--	13.3	--	S	V_{DS}=40V,I_D=4.9A ④
C_{iss}	Input Capacitance	--	1310	1705	pF	V_{GS}=0V,V_{DS}=25V,f =1MHz ***See Fig 5***
C_{oss}	Output Capacitance	--	200	250		
C_{rss}	Reverse Transfer Capacitance	--	95	120		
$t_{d(on)}$	Turn-On Delay Time	--	11	30	ns	V_{DD}=100V,I_D=18A, R_G=4.6Ω ***See Fig 13*** ④ ⑤
t_r	Rise Time	--	8	25		
$t_{d(off)}$	Turn-Off Delay Time	--	46	100		
t_f	Fall Time	--	15	40		
Q_g	Total Gate Charge	--	40	56	nC	V_{DS}=160V,V_{GS}=5V, I_D=18A ***See Fig 6 & Fig 12*** ④ ⑤
Q_{gs}	Gate-Source Charge	--	6.8	--		
Q_{gd}	Gate-Drain("Miller") Charge	--	18.6	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	18	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	63		
V_{SD}	Diode Forward Voltage ④	--	--	1.5	V	T_J=25℃,I_S=9.8A,V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	224	--	ns	T_J=25℃,I_F=18A
Q_{rr}	Reverse Recovery Charge	--	1.55	--	μC	di_F/dt=100A/μs ④

Notes ;

① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature

② L=1mH, I_{AS}=9.8A, V_{DD}=50V, R_G=27Ω, Starting T_J=25℃

③ I_{SD}≤18A, di/dt≤260A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25℃

④ Pulse Test : Pulse Width = 250μs, Duty Cycle ≤ 2%

⑤ Essentially Independent of Operating Temperature

Typical Characteristics

Fig 1. Output Characteristics

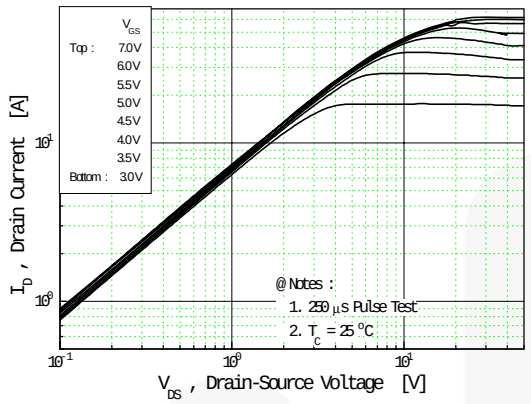


Fig 2. Transfer Characteristics

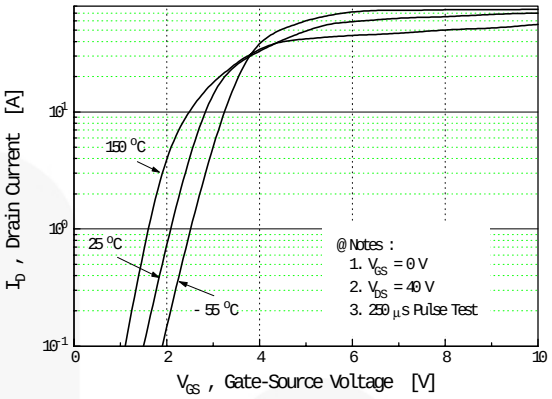


Fig 3. On-Resistance vs. Drain Current

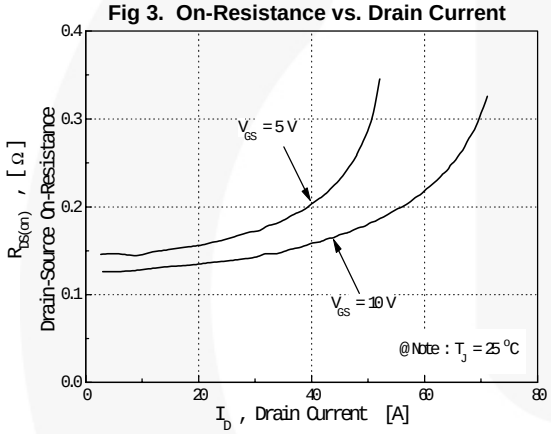


Fig 4. Source-Drain Diode Forward Voltage

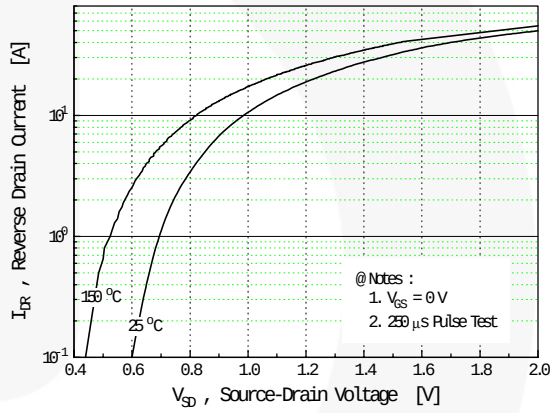


Fig 5. Capacitance vs. Drain-Source Voltage

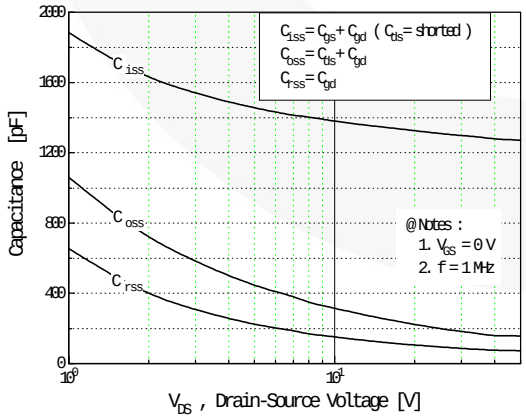
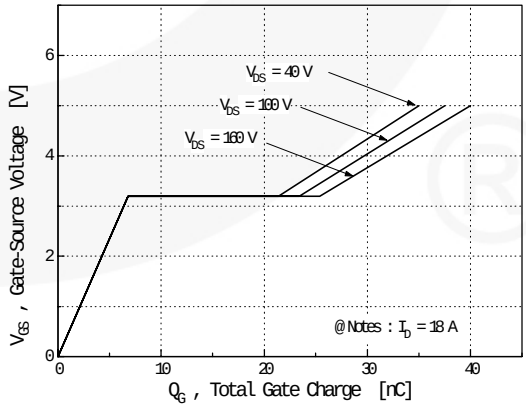


Fig 6. Gate Charge vs. Gate-Source Voltage



Typical Characteristics (continued)

Fig 7. Breakdown Voltage vs. Temperature

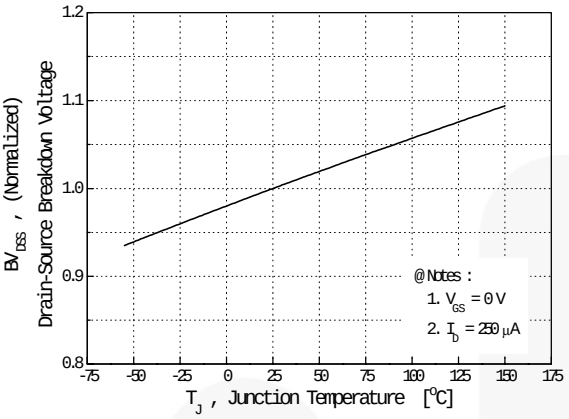


Fig 8. On-Resistance vs. Temperature

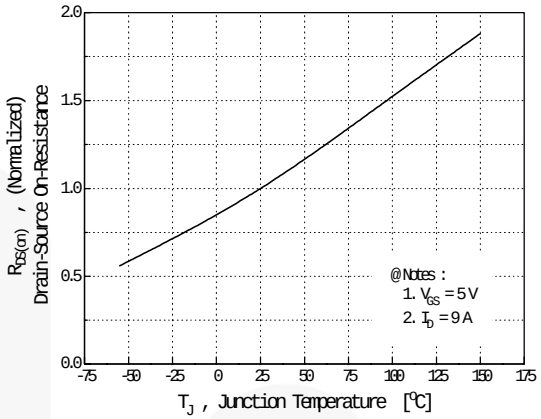


Fig 9. Max. Safe Operating Area

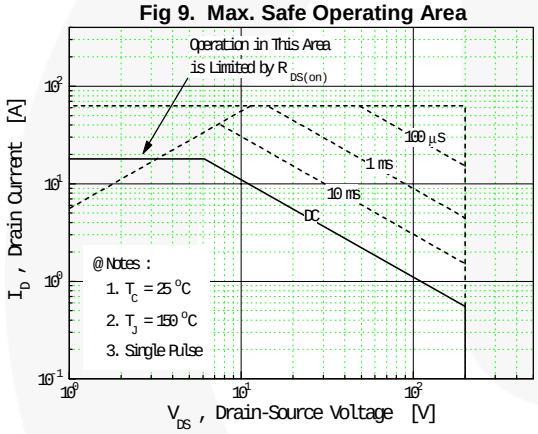


Fig 10. Max. Drain Current vs. Case Temperature

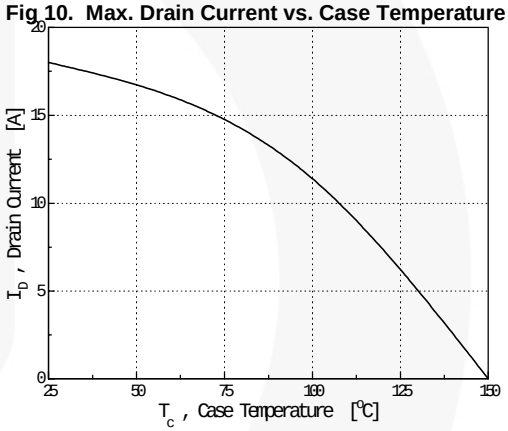
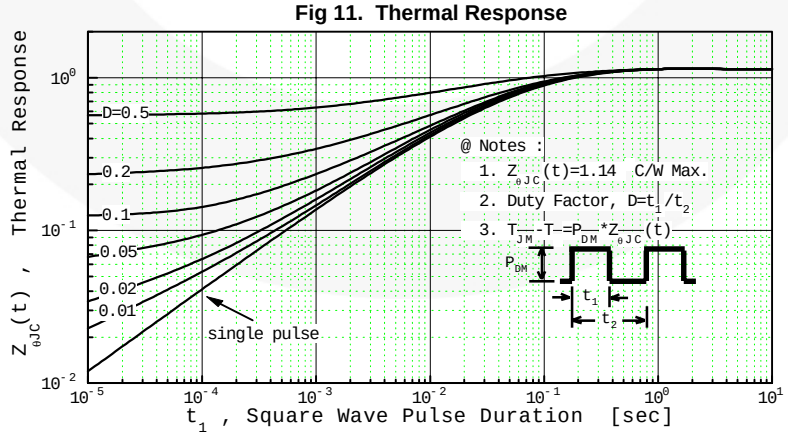


Fig 11. Thermal Response



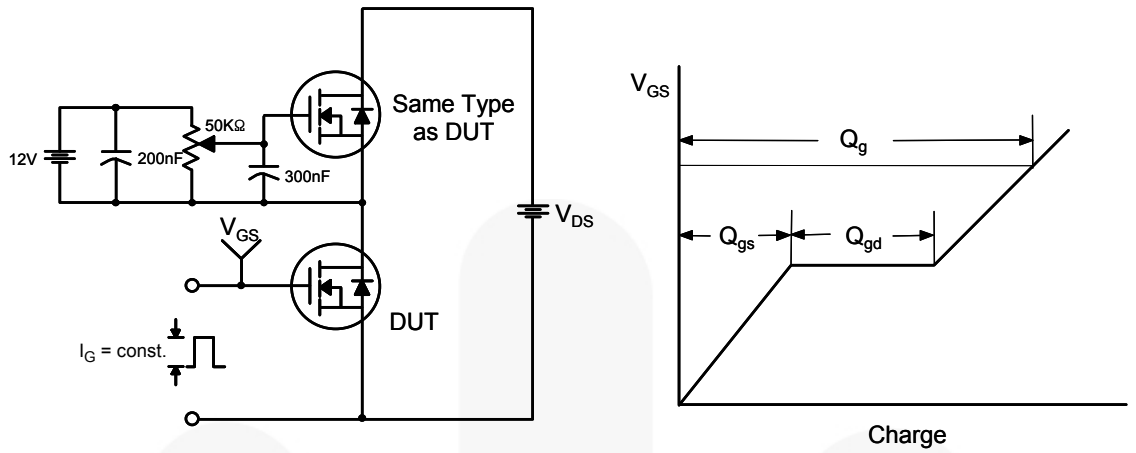


Figure 12. Gate Charge Test Circuit & Waveform

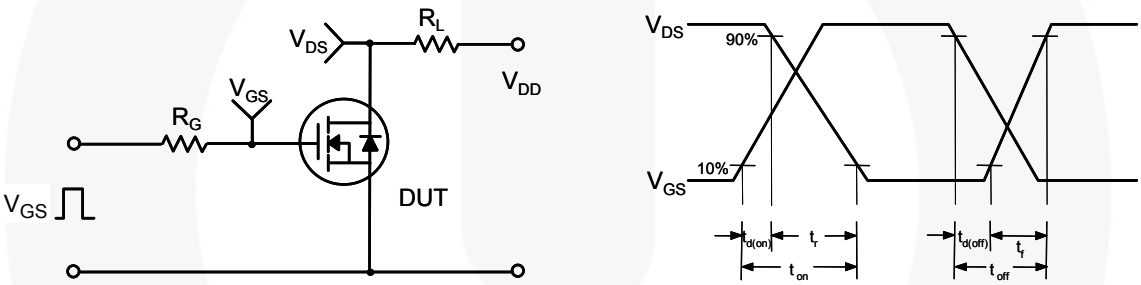


Figure 13. Resistive Switching Test Circuit & Waveforms

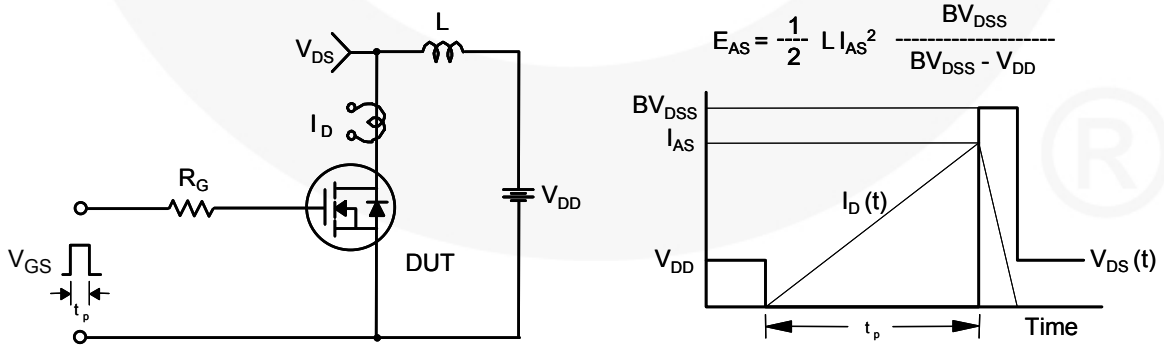


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

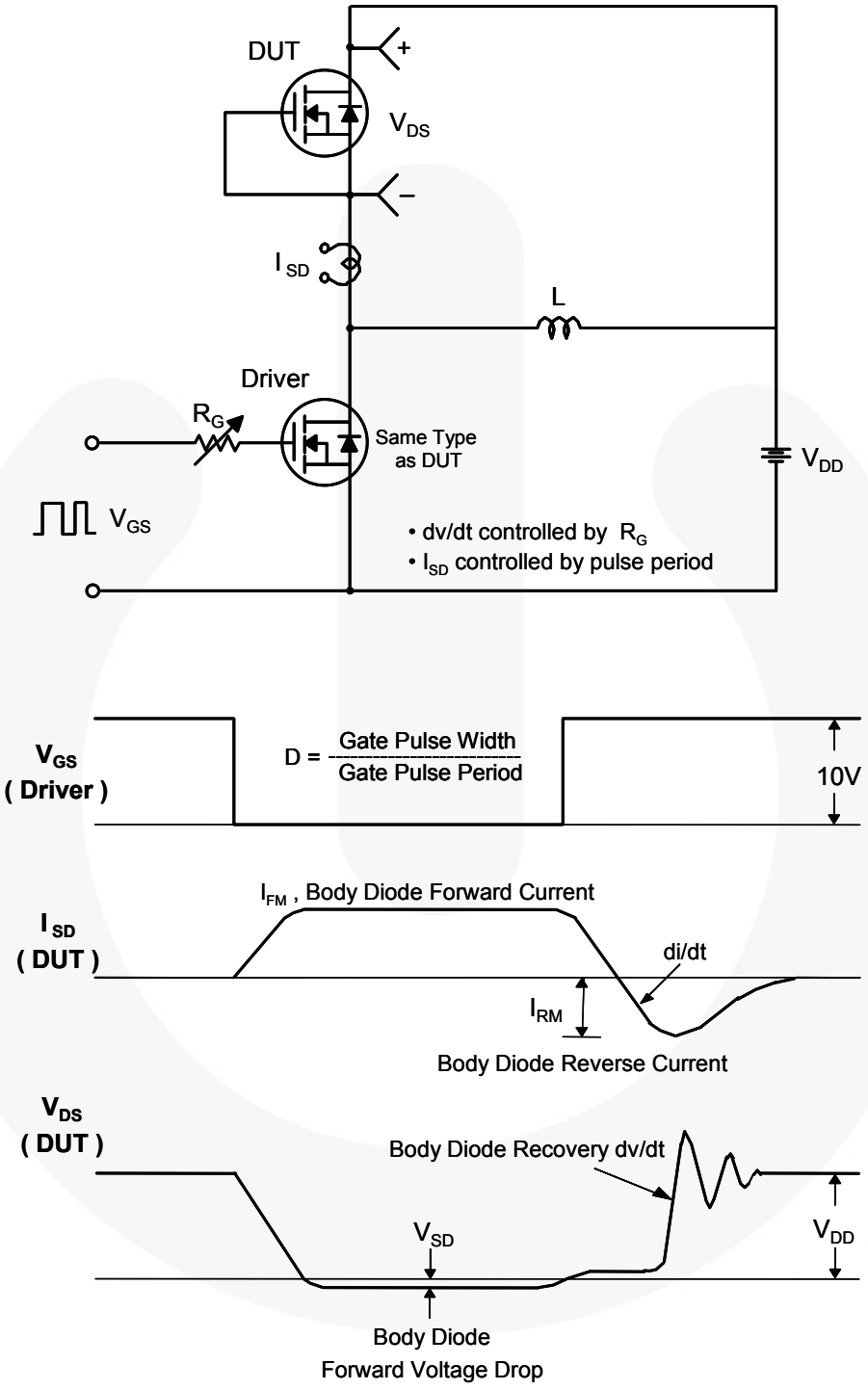


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

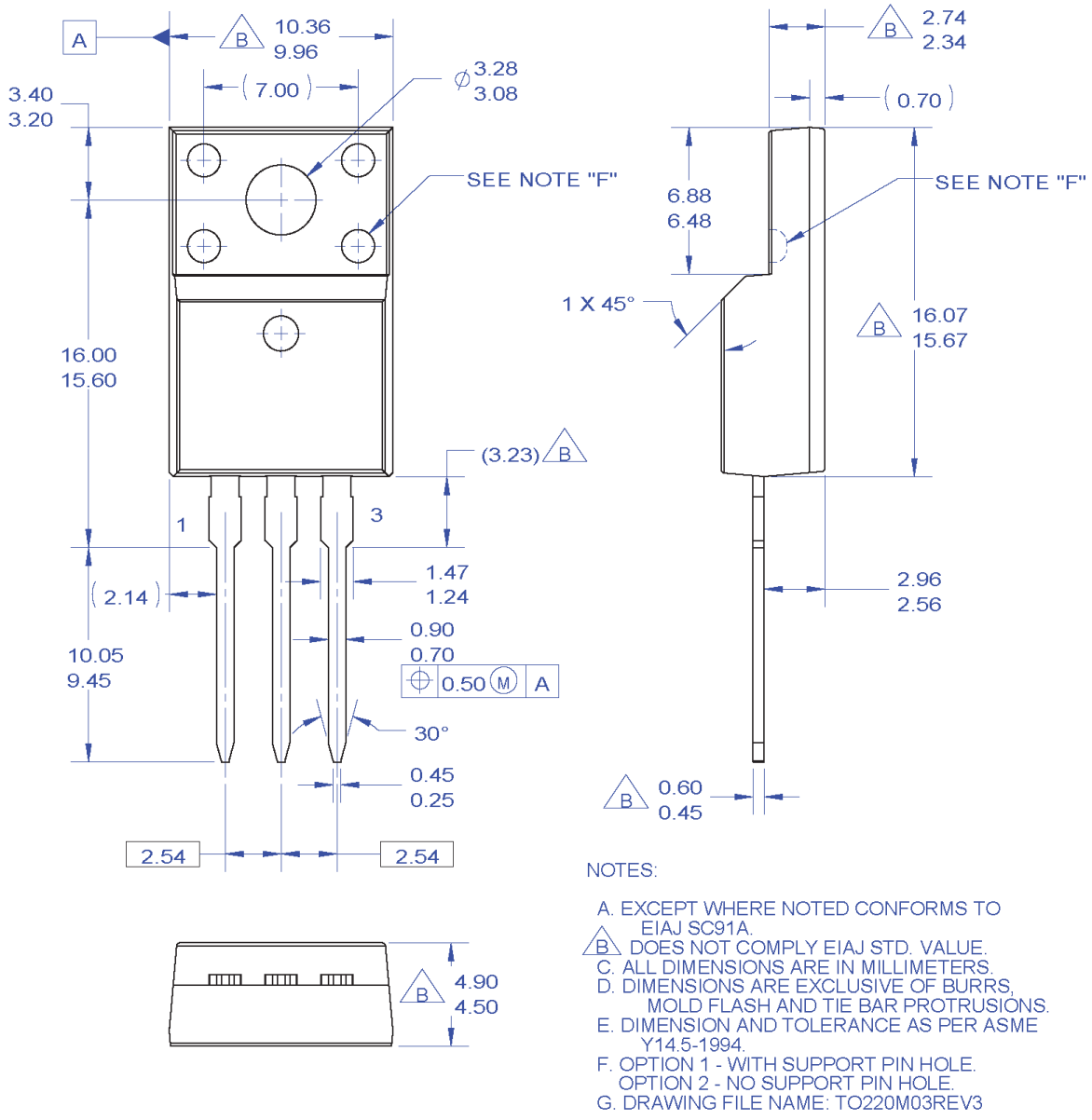


Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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