FAIRCHILD SEMICONDUCTOR®

December 2013

FDPF3860T

N-Channel PowerTrench® MOSFET

100 V, 20 A, 38.2 mΩ

Features

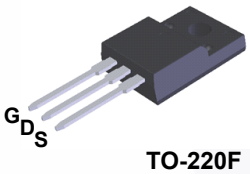
- $R_{DS(on)}$ = 29.1 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 5.9 A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

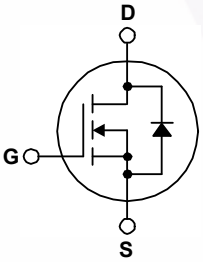
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Consumer Appliances
- LCD/LED/PDP TV
- Synchronous Rectification
- Uninterruptible Power Supply
- Micro Solar Inverter



TO-220F



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

Symbol	Parameter			FDPF3860T	Unit
V_{DSS}	Drain to Source Voltage			100	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Current	- Continuous (T_C = 25°C)		20	A
		- Continuous (T_C = 100°C)		12.7	
I_{DM}	Drain Current	- Pulsed	(Note 1)	80	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	278	mJ
I_{AR}	Avalanche Current		(Note 1)	20	A
E_{AR}	Repetitive Avalanche Energy		(Note 1)	3.4	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	15	V/ns
P_D	Power Dissipation	(T_C = 25°C)		33.8	W
		- Derate Above 25°C		0.27	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds			300	°C

Thermal Characteristics

Symbol	Parameter	FDPF3860T	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF3860T	FDPF3860T	TO-220F	Tube	N/A	N/A	50 units

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V, $T_J = 25^oC$	100	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25^oC	-	0.1	-	$V/^oC$
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 48 V, $T_C = 150^oC$	-	-	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, I_D = 250 μA	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 5.9 A	-	29.1	38.2	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 5.9 A	-	21	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	-	1350	1800	pF
C_{oss}	Output Capacitance		-	145	190	pF
C_{rss}	Reverse Transfer Capacitance		-	60	90	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 50 V, I_D = 5.9 A, V_{GS} = 10 V, R_G = 6 Ω (Note 4)	-	15	40	ns
t_r	Turn-On Rise Time		-	17	45	ns
$t_{d(off)}$	Turn-Off Delay Time		-	24	60	ns
t_f	Turn-Off Fall Time		-	7	25	ns
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 80 V, I_D = 5.9 A, V_{GS} = 10 V (Note 4)	-	23	35	nC
Q_{gs}	Gate to Source Gate Charge		-	7	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	8	-	nC
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	20	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	80	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 5.9 A	-	-	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 5.9 A, dI_F/dt = 100 A/μs	-	40	-	ns
Q_{rr}	Reverse Recovery Charge		-	56	-	nC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 16 mH, I_{AS} = 5.9 A, V_{DD} = 50 V, R_G = 25 Ω, starting $T_J = 25°C$.
3. $I_{SD} \le 5.9$ A, di/dt ≤ 200 A/μs, $V_{DD} \le BV_{DSS}$, starting $T_J = 25°C$.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

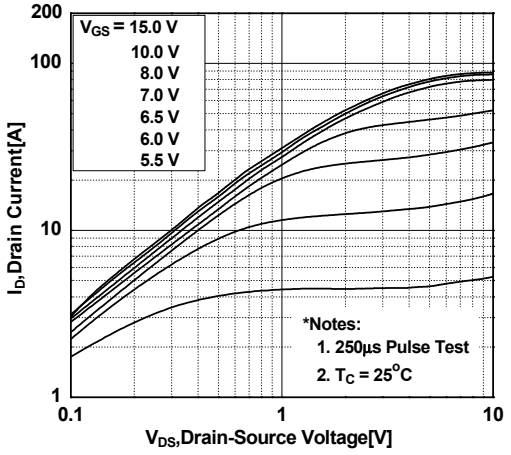


Figure 2. Transfer Characteristics

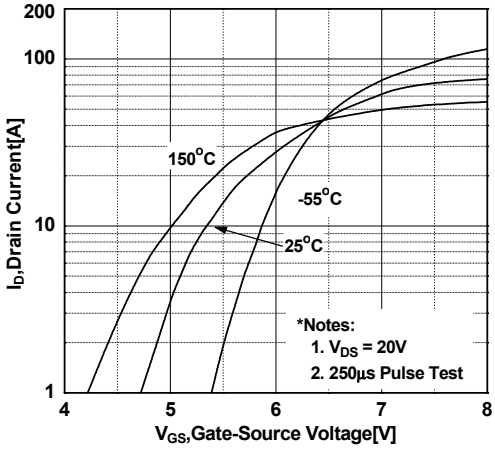


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

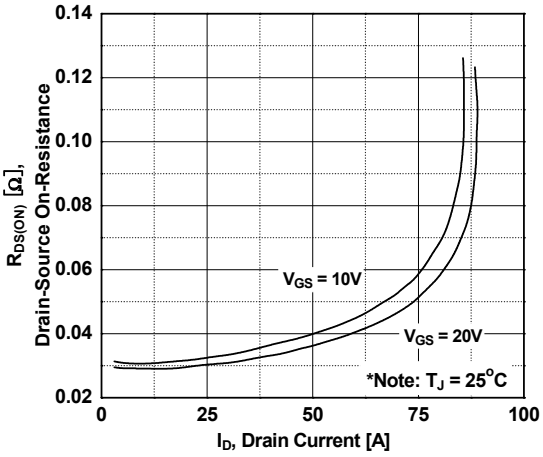


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

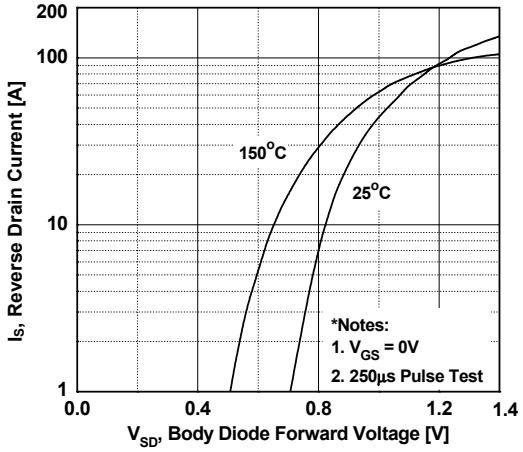


Figure 5. Capacitance Characteristics

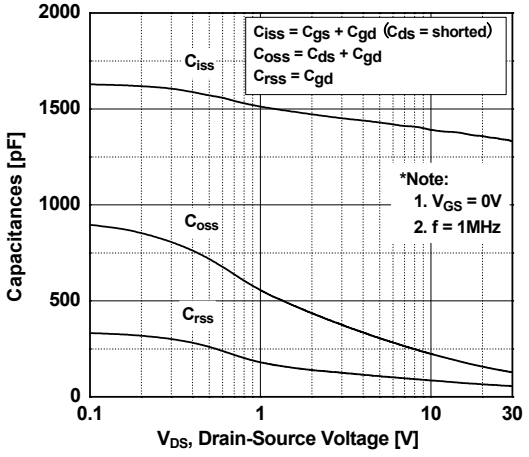
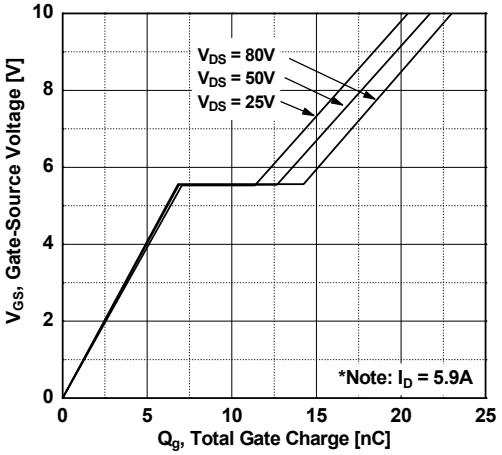


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

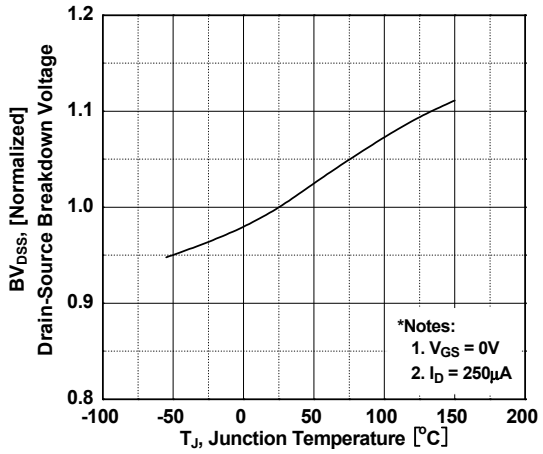


Figure 8. On-Resistance Variation vs. Temperature

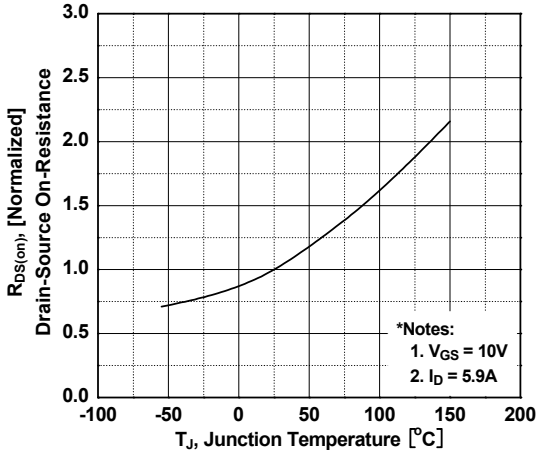


Figure 9. Maximum Safe Operating Area

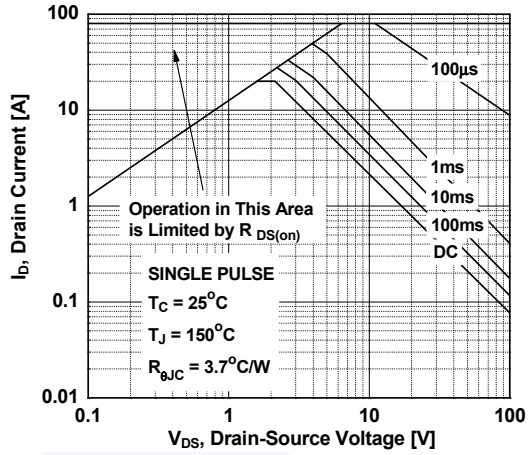


Figure 10. Maximum Drain Current vs. Case Temperature

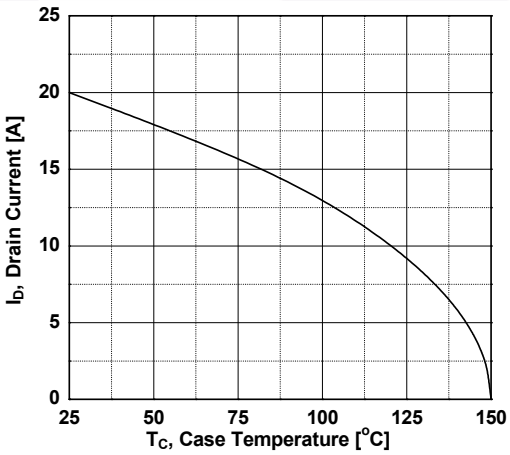
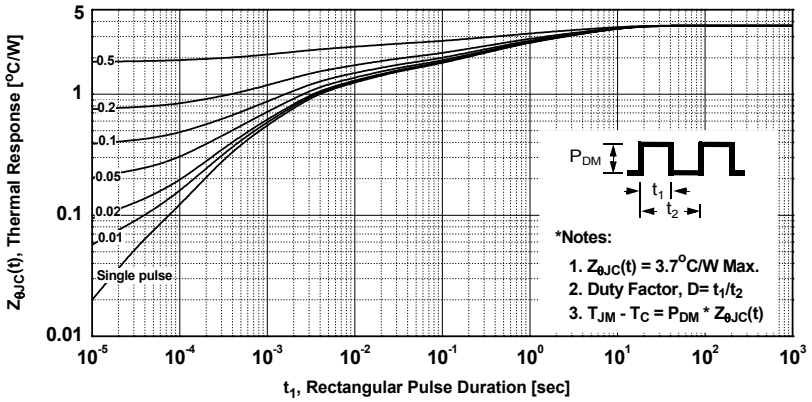


Figure 11. Transient Thermal Response Curve



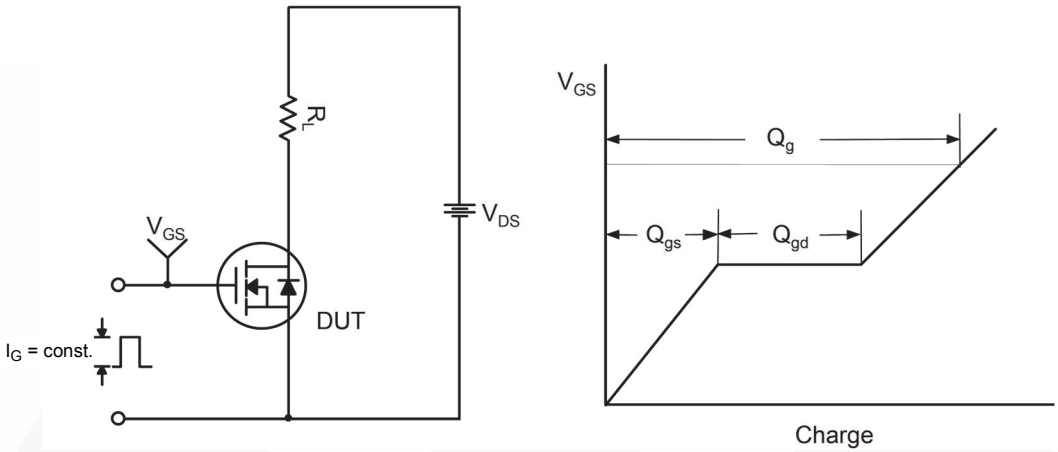


Figure 12. Gate Charge Test Circuit & Waveform

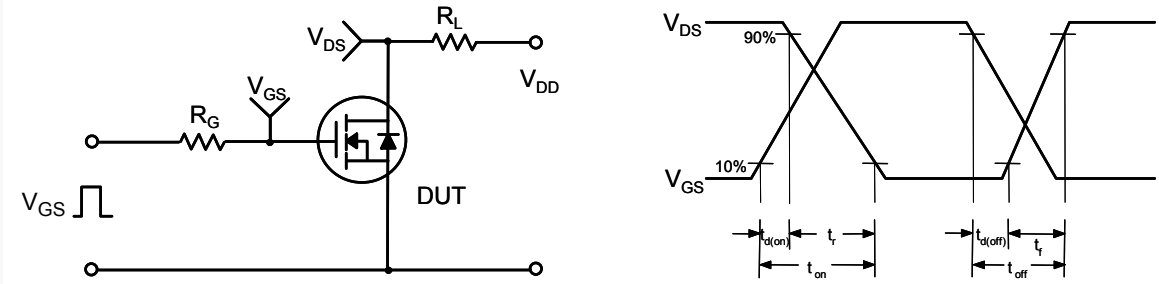


Figure 13. Resistive Switching Test Circuit & Waveforms

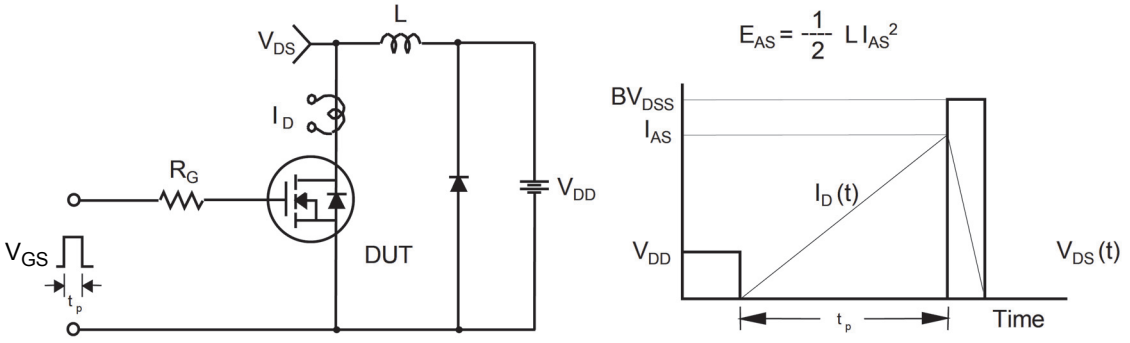


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

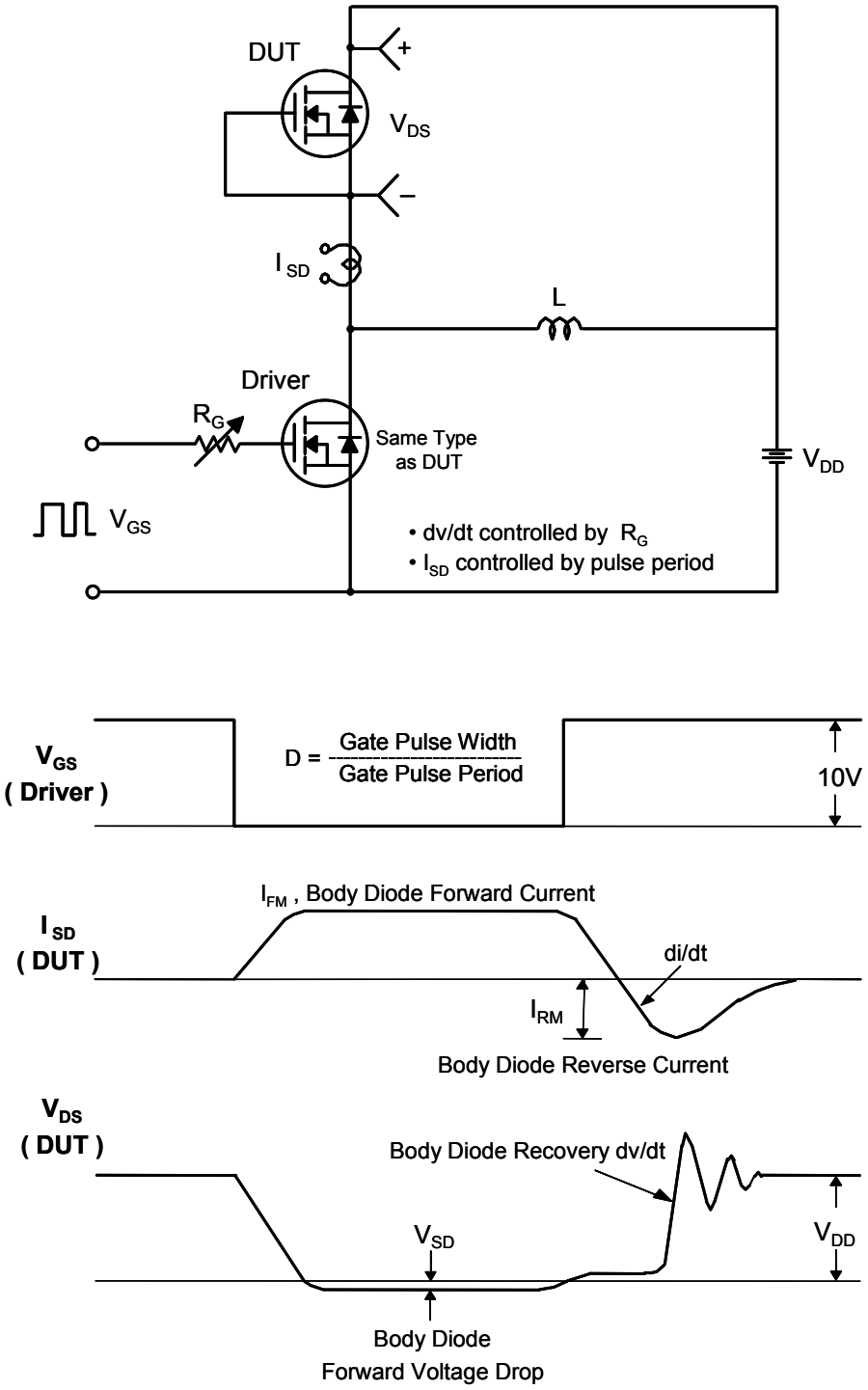


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

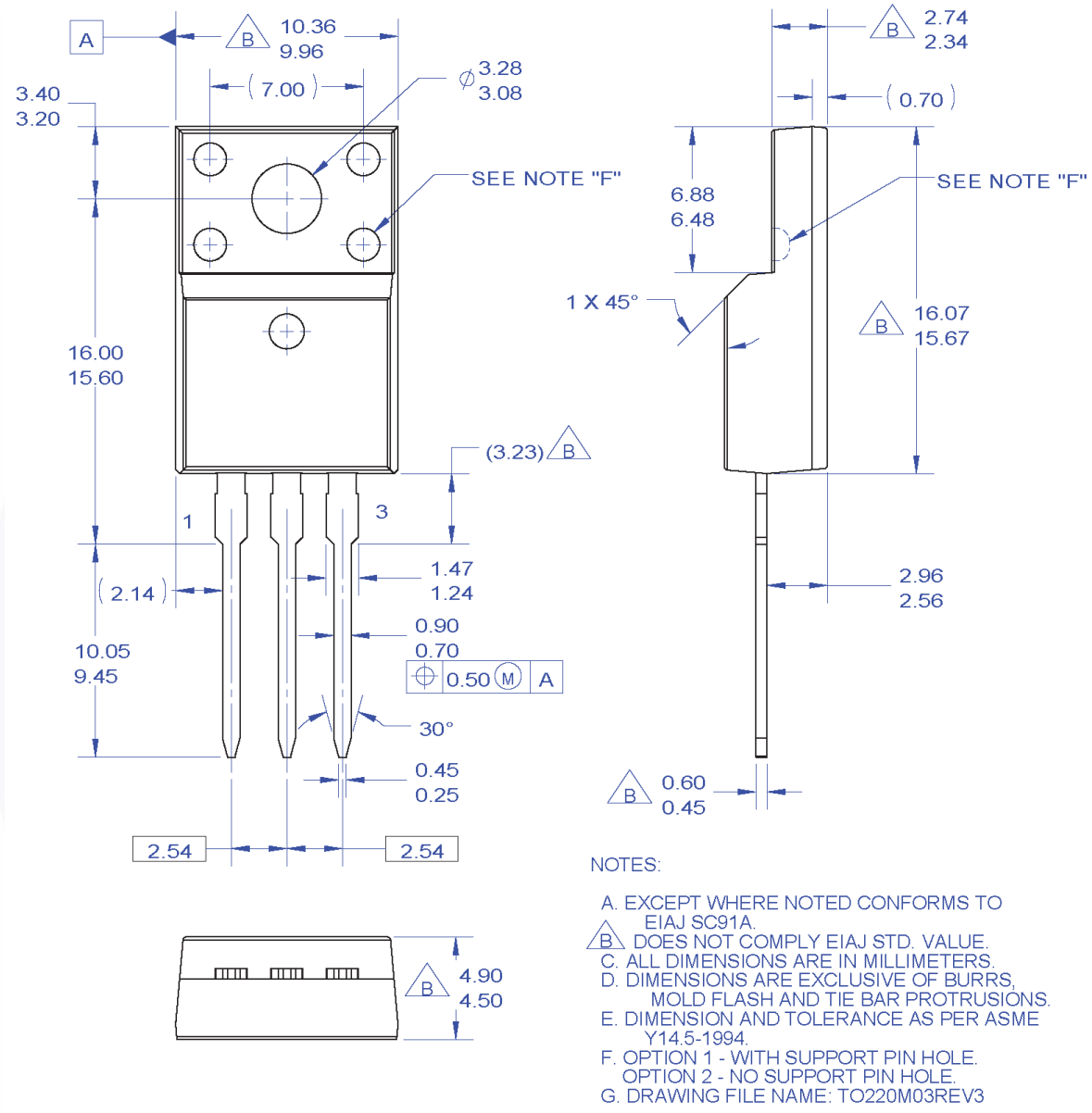


Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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