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FAIRCHILD SEMICONDUCTOR®

October 2013

FDP55N06 / FDPF55N06

N-Channel UniFET™ MOSFET

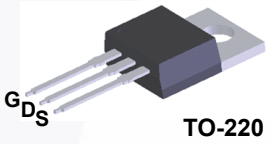
60 V, 55 A, 22 mΩ

Features

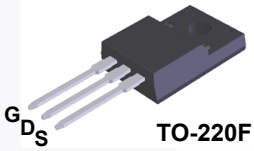
- $R_{DS(on)}$ = 22 mΩ @V_{GS} = 10 V, I_D = 27.5 A
- Low Gate Charge (Typ. 30 nC)
- Low Crss (Typ. 60 pF)
- 100% Avalanche Tested

Description

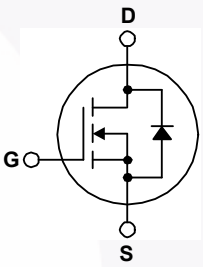
UniFET™ MOSFET is Fairchild Semiconductor's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power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



TO-220



TO-220F



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter		FDP55N06	FDPF55N06	Unit
V_{DSS}	Drain-Source Voltage		60		V
I_D	Drain Current - Continuous (T_C = 25°C)		55	55 *	A
	- Continuous (T_C = 100°C)		34.8	34.8 *	A
I_{DM}	Drain Current - Pulsed	(Note 1)	220	220 *	A
V_{GSS}	Gate-Source Voltage		± 25		V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	480		mJ
I_{AR}	Avalanche Current	(Note 1)	55		A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	11.4		mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5		V/ns
P_D	Power Dissipation (T_C = 25°C)		114	48	W
	- Derate above 25°C		0.9	0.4	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

* Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FDP55N06	FDPF55N06	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	1.1	2.58	°C/W
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink, Typ.	0.5	--	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max,	62.5	62.5	°C/W

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Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP55N06	FDP55N06	TO-220	Tube	N/A	50 units
FDPF55N06	FDPF55N06	TO-220F	Tube	N/A	50 units

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	60	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.05	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 48 V, T_C = 150°C	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 20 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -20 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 = 27.5 A	--	0.018	0.022	Ω
g_{FS}	Forward Transconductance	V_{DS} = 25 V, I_D = 27.5 A	--	33	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	1160	1510	pF
C_{oss}	Output Capacitance		--	375	490	pF
C_{rss}	Reverse Transfer Capacitance		--	60	90	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 30 V, I_D = 55 A, R_G = 25 Ω (Note 4)	--	30	65	ns
t_r	Turn-On Rise Time		--	130	265	ns
$t_{d(off)}$	Turn-Off Delay Time		--	70	150	ns
t_f	Turn-Off Fall Time		--	95	195	ns
Q_g	Total Gate Charge	V_{DS} = 48 V, I_D = 55A, V_{GS} = 10 V (Note 4)	--	30	37	nC
Q_{gs}	Gate-Source Charge		--	6.5	--	nC
Q_{gd}	Gate-Drain Charge		--	7.5	--	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	--	--	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 55 A, dI_F / dt = 100 A/μs	--	40	--	ns
Q_{rr}	Reverse Recovery Charge		--	55	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 5.6mH, I_{AS} = 55A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 55A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially independent of operating temperature

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Typical Performance Characteristics

Figure 1. On-Region Characteristics

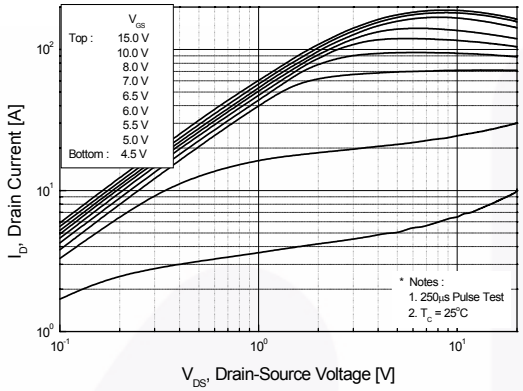


Figure 2. Transfer Characteristics

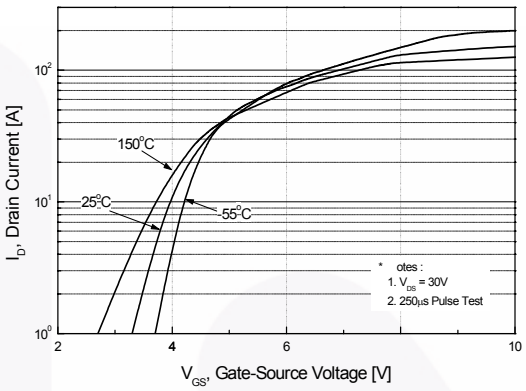


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

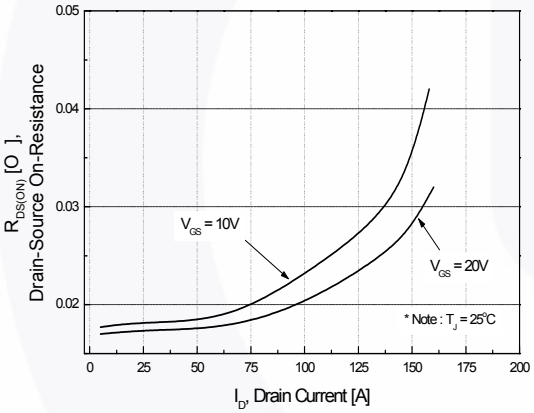


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

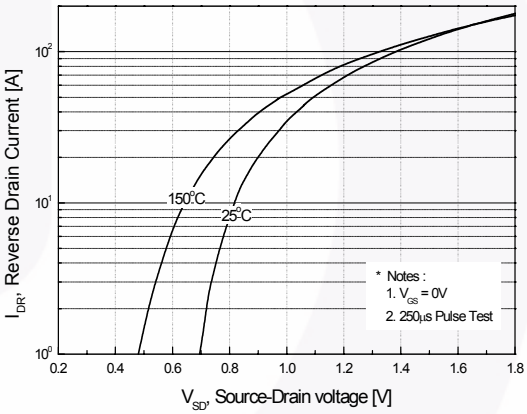


Figure 5. Capacitance Characteristics

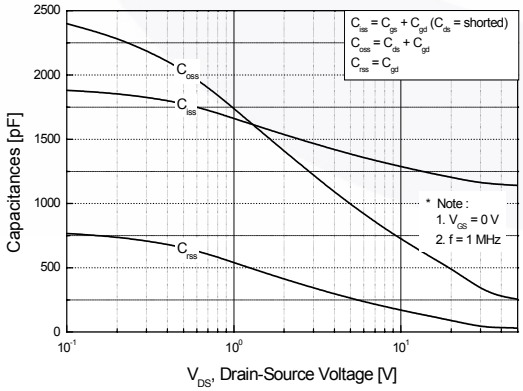
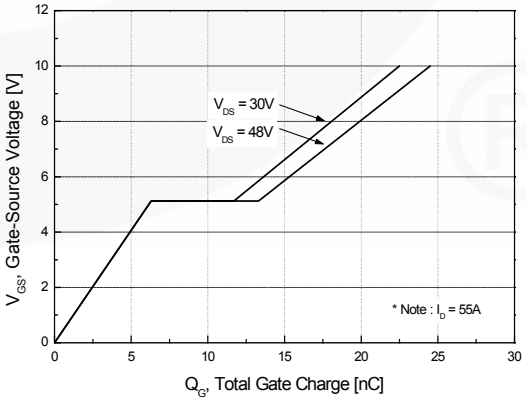


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

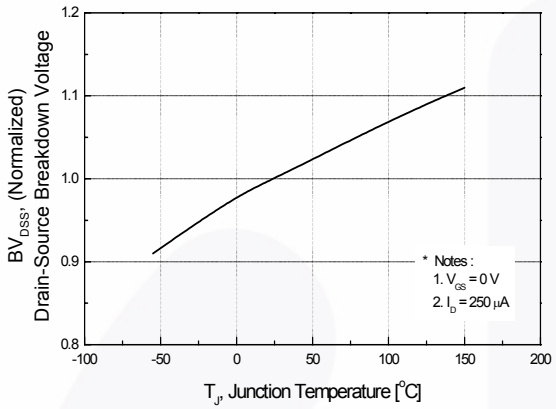


Figure 8. On-Resistance Variation vs. Temperature

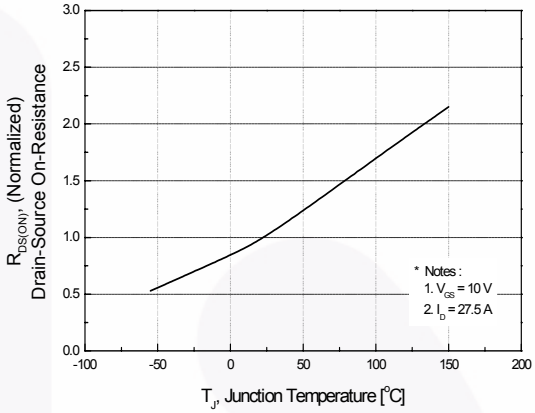


Figure 9-1. Maximum Safe Operating Area for FDP55N06

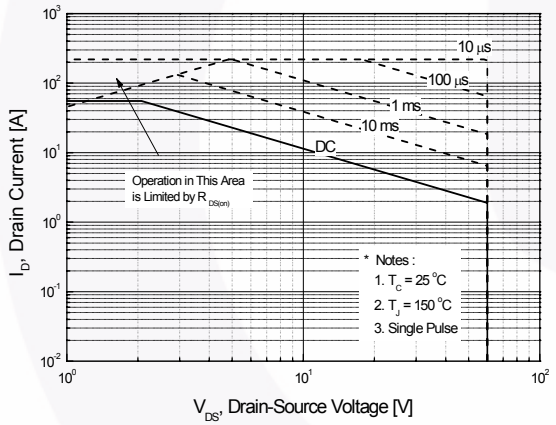


Figure 9-2. Maximum Safe Operating Area for FDPF55N06

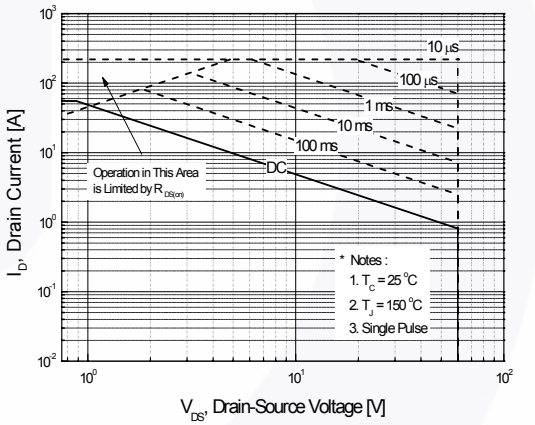
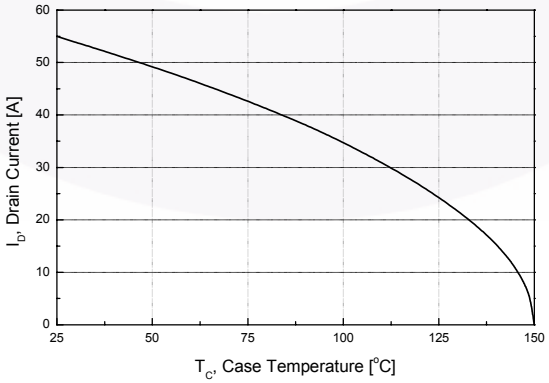


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics (Continued)

Figure 11-1. Transient Thermal Response Curve for FDP55N06

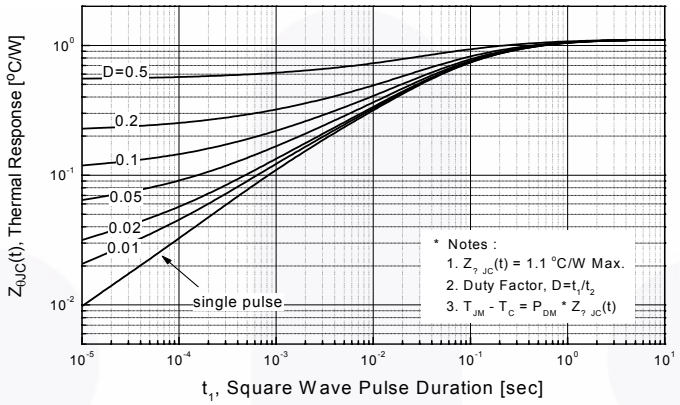


Figure 11-2. Transient Thermal Response Curve for FDPF55N06

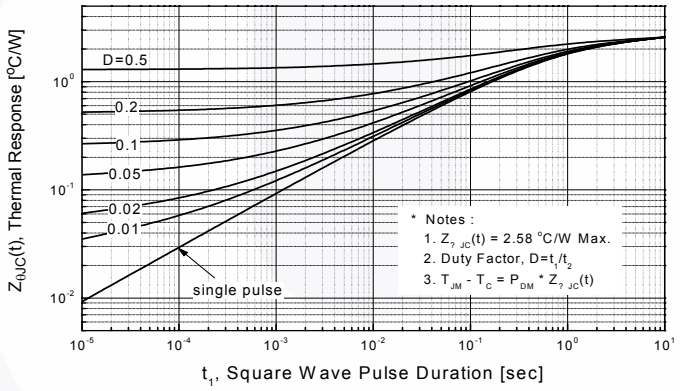


Figure 12. Gate Charge Test Circuit & Waveform

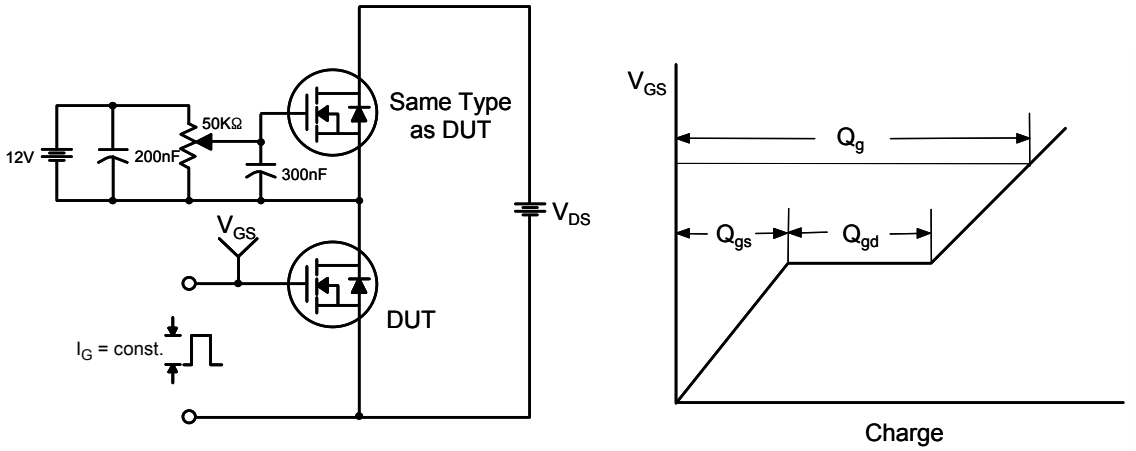


Figure 13. Resistive Switching Test Circuit & Waveforms

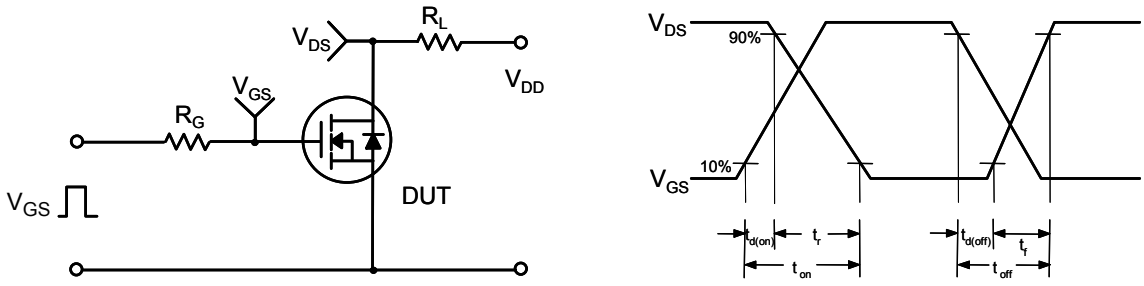


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

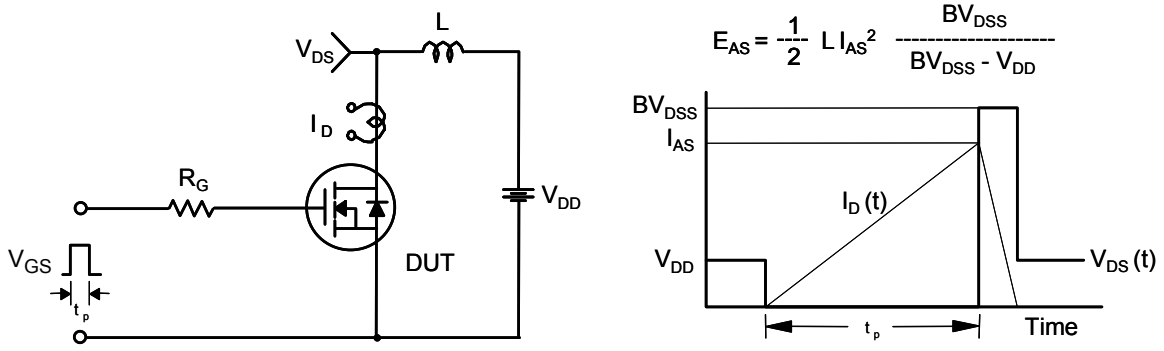
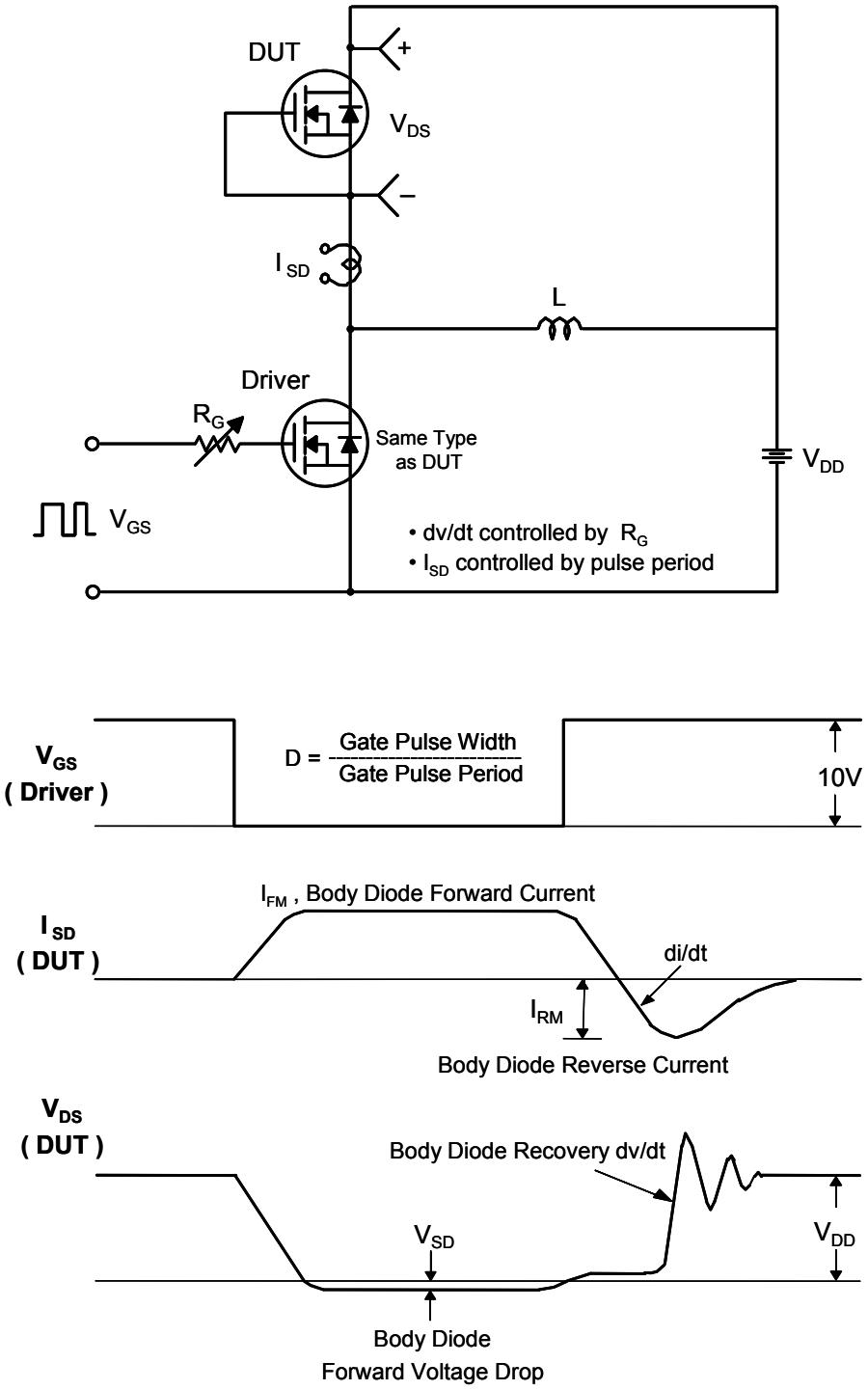


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

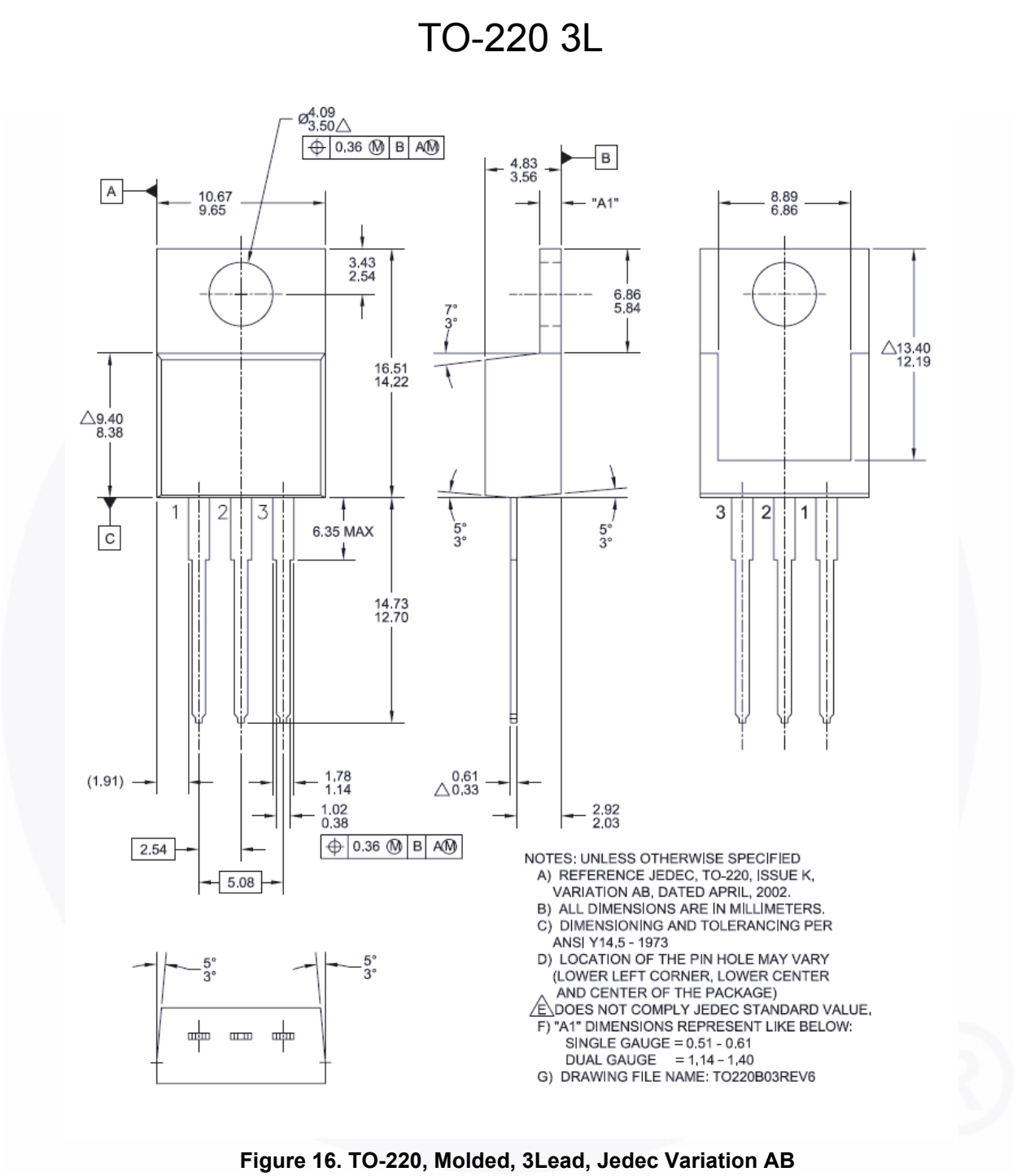


Figure 16. TO-220, Molded, 3Lead, Jedec Variation AB

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Dimension in Millimeters

Mechanical Dimensions

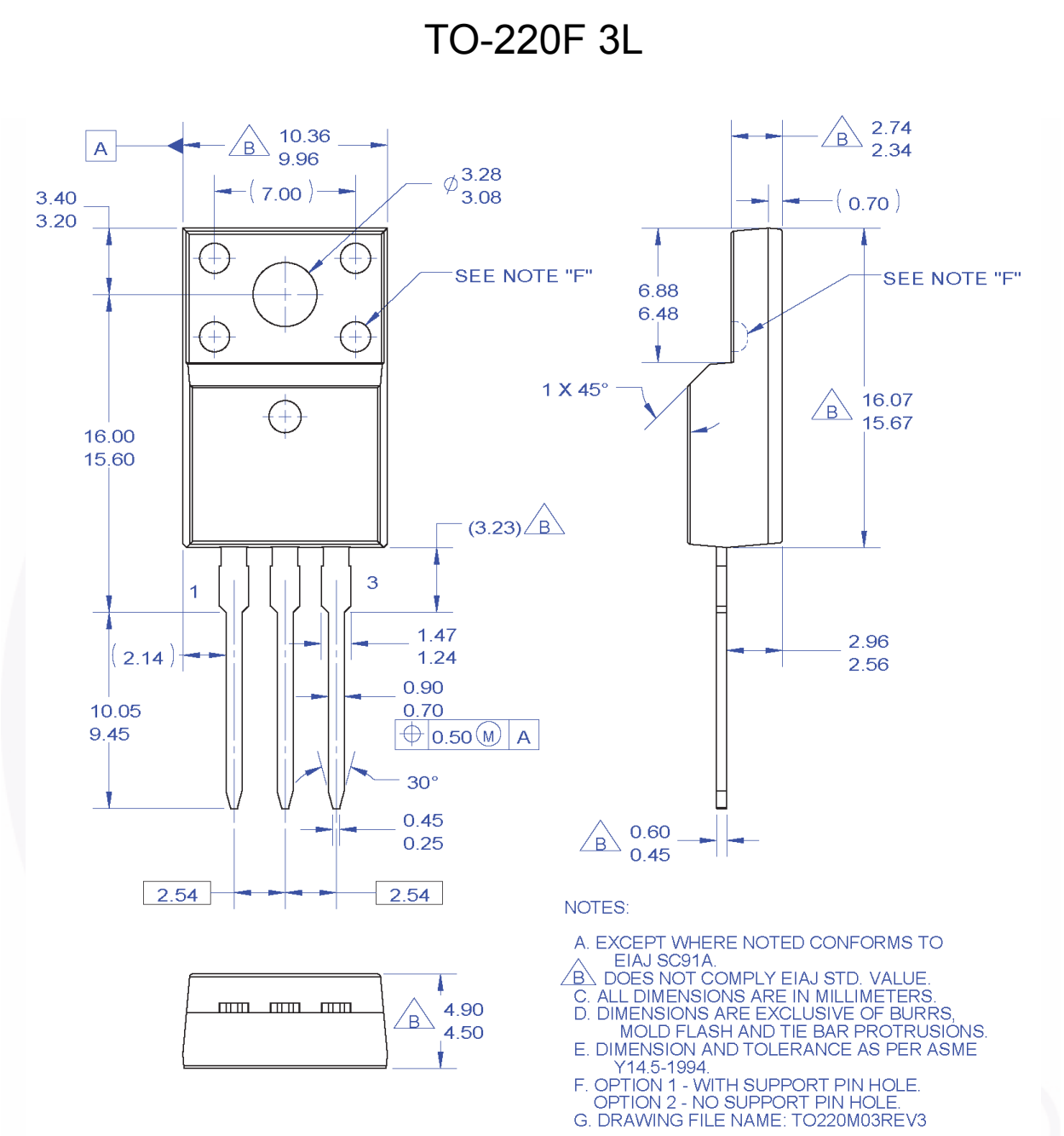


Figure 17. TO220, Molded, 3LD, Full Pack, EIAJ SC91, Straight Lead

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Dimension in Millimeters

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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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