

FDP51N25 / FDPF51N25 / FDPF51N25YDTU

N-Channel UniFET™ MOSFET

250 V, 51 A, 60 mΩ

Features

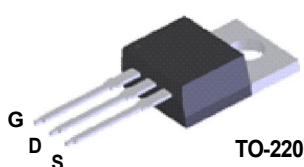
- $R_{DS(on)} = 60 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 25.5 \text{ A}$
- Low Gate Charge (Typ. 55 nC)
- Low C_{rss} (Typ. 63 pF)

Applications

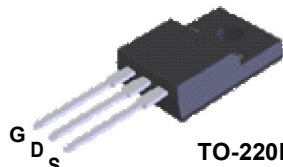
- PDP TV
- Lighting
- Uninterruptible Power Supply
- AC-DC Power Supply

Description

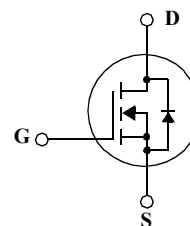
UniFET™ MOSFET is Fairchild Semiconductor®'s high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power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



TO-220



TO-220F



Absolute Maximum Ratings

Symbol	Parameter	FDP51N25	FDPF51N25 / FDPF51N25YDTU	Unit
V_{DSS}	Drain-Source Voltage	250		V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	51	A
		- Continuous ($T_C = 100^\circ\text{C}$)	30	A
I_{DM}	Drain Current	- Pulsed (Note 1)	204	A
V_{GSS}	Gate-Source voltage	± 30		V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	1111	mJ
I_{AR}	Avalanche Current	(Note 1)	51	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	32	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5	V/ns
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	320	W
		- Derate above 25°C	3.7	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300		$^\circ\text{C}$

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FDP51N25	FDPF51N25 / FDPF51N25YDTU	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.39	3.3	$^\circ\text{C/W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink, Typ.	0.5	--	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	62.5	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP51N25	FDP51N25	TO-220	-	-	50
FDPF51N25	FDPF51N25	TO-220F	-	-	50
FDPF51N25	FDPF51N25YDTU	TO-220F	-	-	50

Electrical Characteristics T_C = 25°C 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	250	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C	--	0.25	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 250V, V _{GS} = 0V V _{DS} = 200V, 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 = 25.5A	--	0.048	0.060	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40V, I _D = 25.5A	--	43	--	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	--	2620	3410	pF
C _{oss}	Output Capacitance		--	530	690	pF
C _{rss}	Reverse Transfer Capacitance		--	63	90	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 125V, I _D = 51A R _G = 25Ω (Note 4)	--	62	135	ns
t _r	Turn-On Rise Time		--	465	940	ns
t _{d(off)}	Turn-Off Delay Time		--	98	205	ns
t _f	Turn-Off Fall Time		--	130	270	ns
Q _g	Total Gate Charge	V _{DS} = 200V, I _D = 51A V _{GS} = 10V (Note 4)	--	55	70	nC
Q _{gs}	Gate-Source Charge		--	16	--	nC
Q _{gd}	Gate-Drain Charge		--	27	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	51	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	204	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _S = 51A	--	--	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, I _S = 51A	--	178	--	ns
Q _{rr}	Reverse Recovery Charge	dI _F /dt = 100A/μs	--	4.0	--	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 0.68mH, I_{AS} = 51A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 51A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

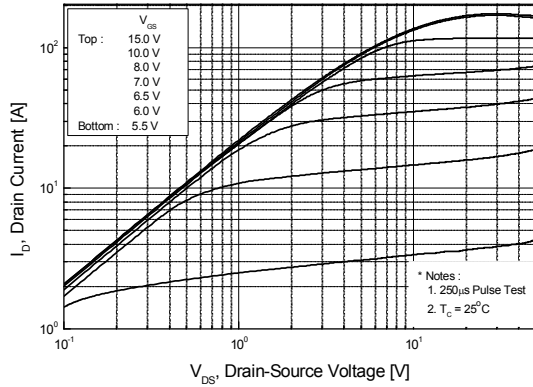


Figure 2. Transfer Characteristics

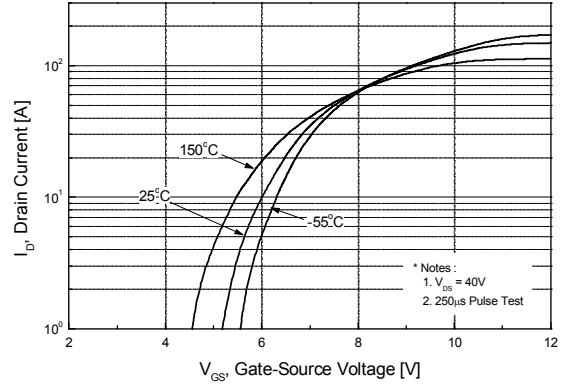


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

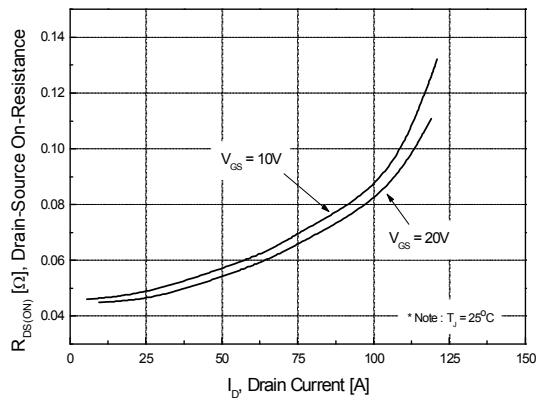


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

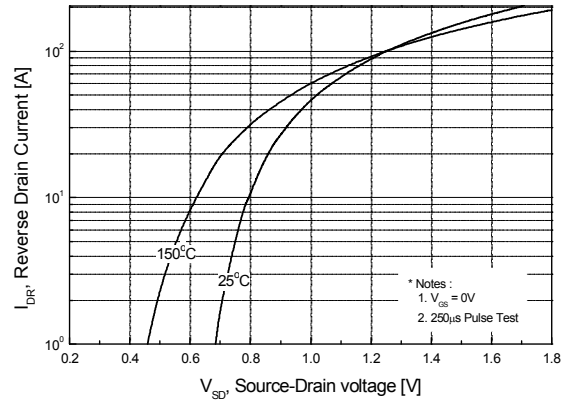


Figure 5. Capacitance Characteristics

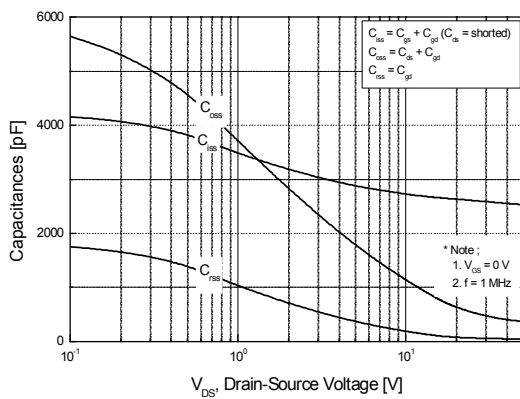
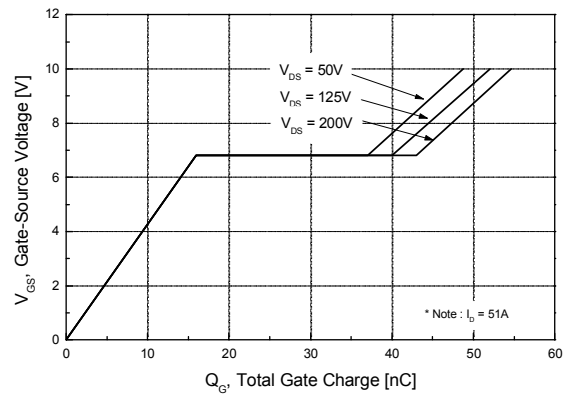


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

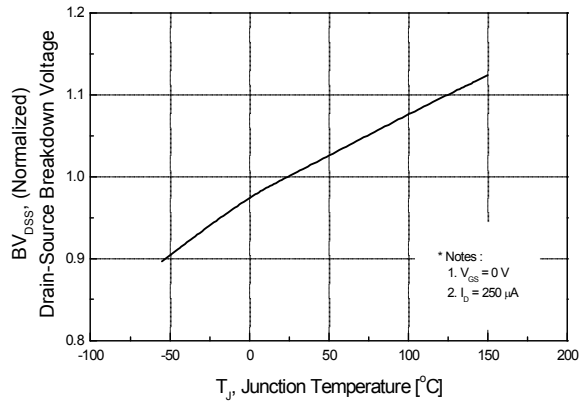


Figure 8. On-Resistance Variation vs. Temperature

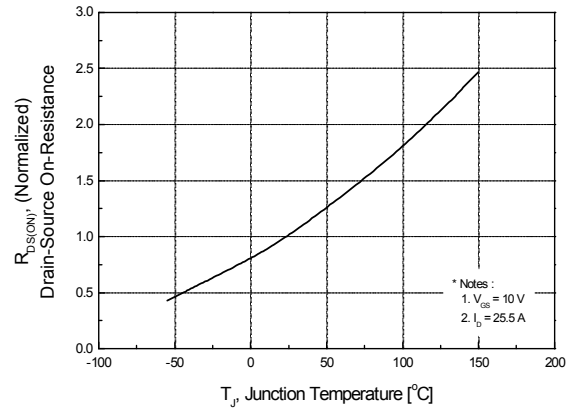


Figure 9-1. Maximum Safe Operating Area for FDP51N25

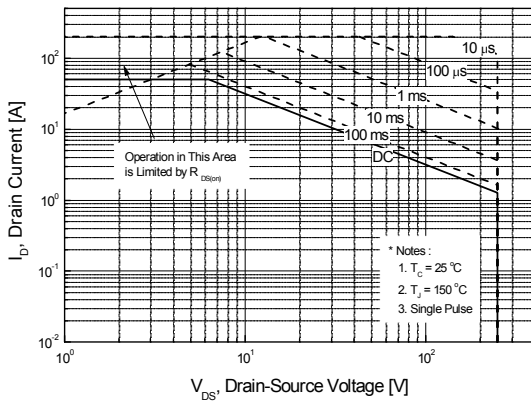


Figure 9-2. Maximum Safe Operating Area for FDPF51N25 / FDPF51N25YDTU

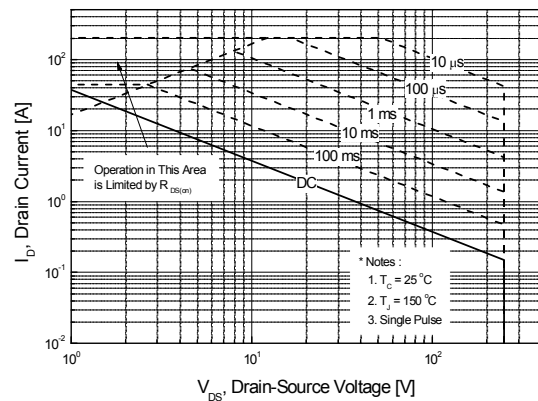
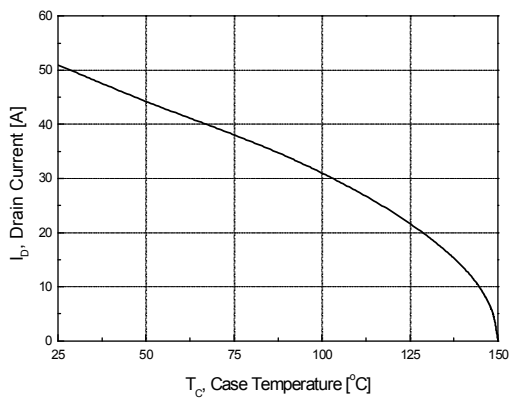


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics (Continued)

Figure 11-1. Transient Thermal Response Curve for FDP51N25

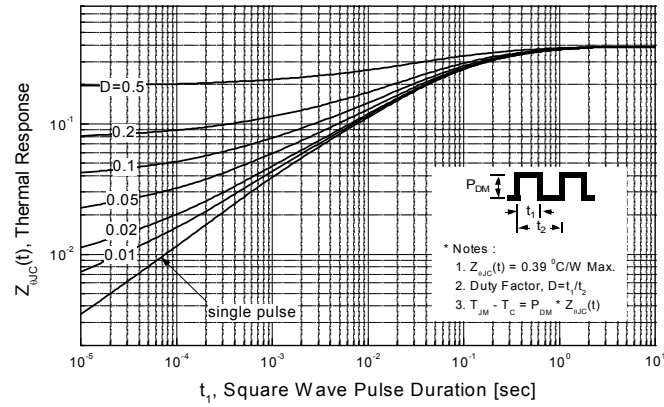
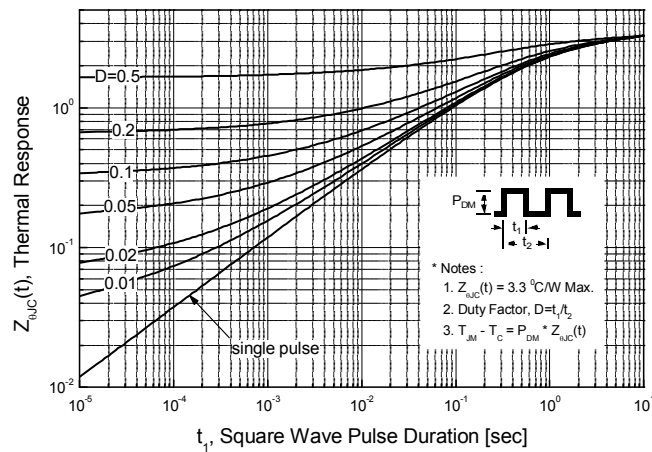
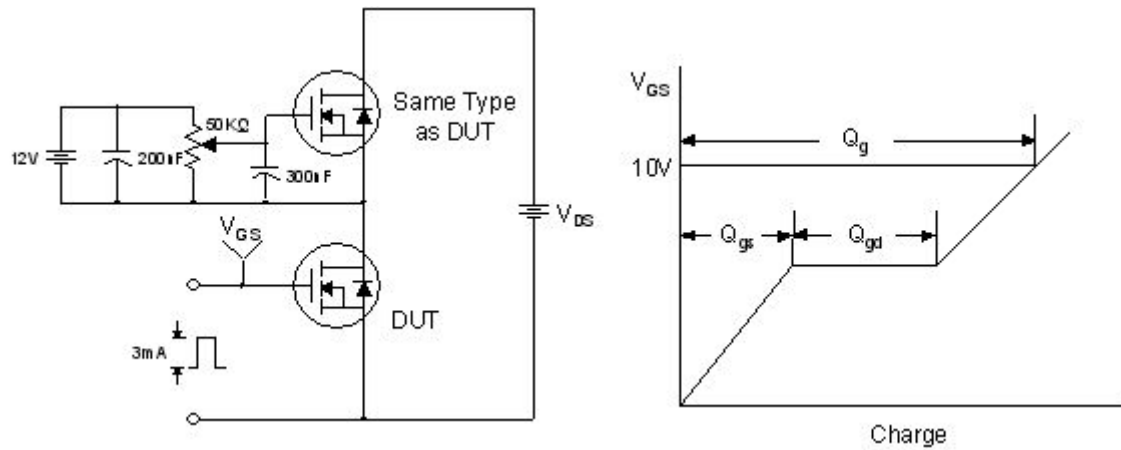


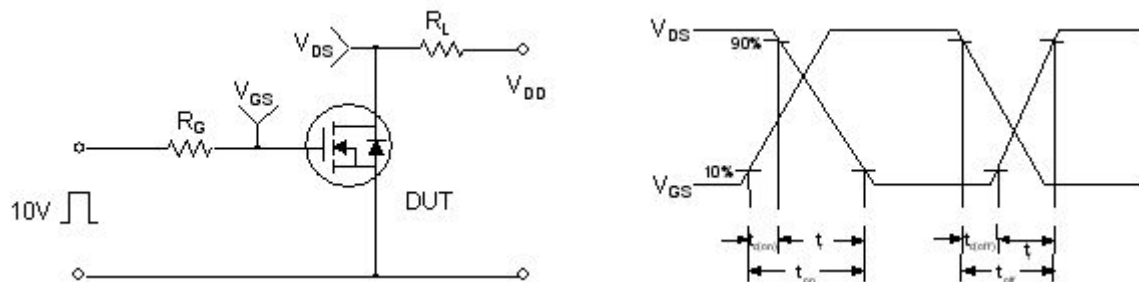
Figure 11-2. Transient Thermal Response Curve for FDPF51N25 / FDPF51N25YDTU



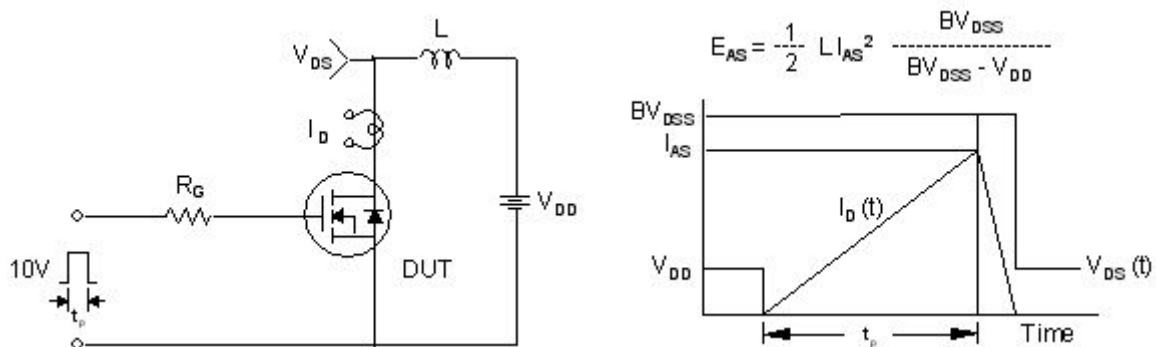
Gate Charge Test Circuit & Waveform



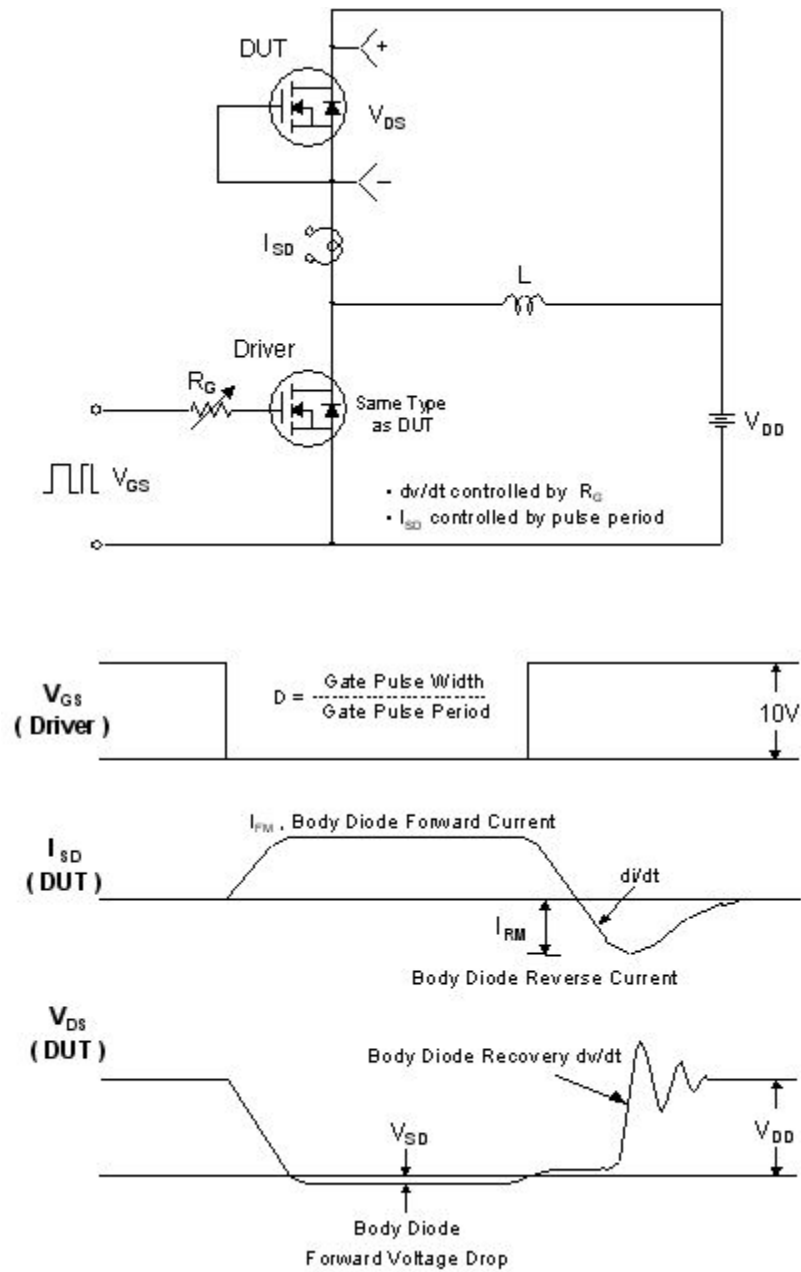
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

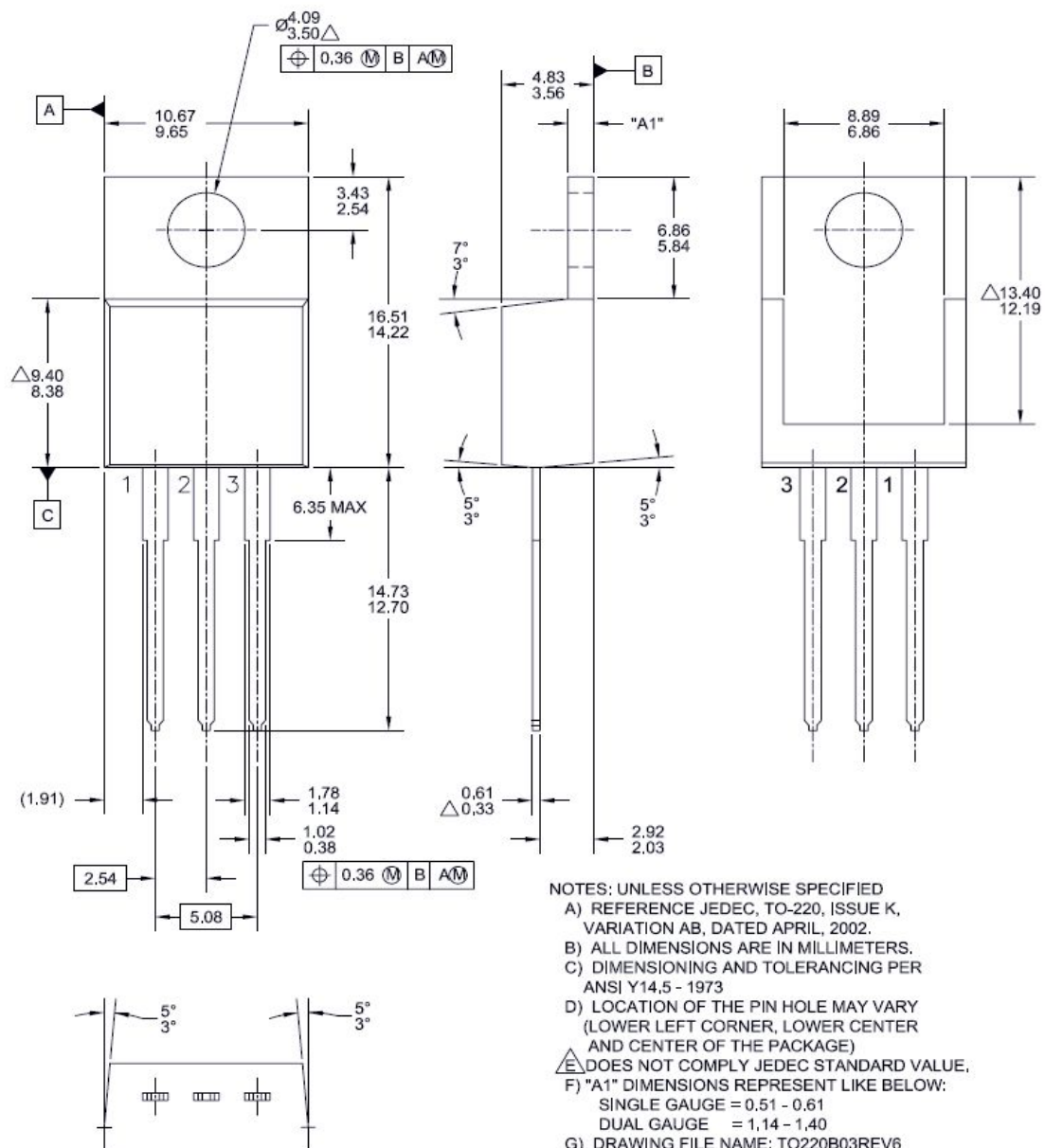


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

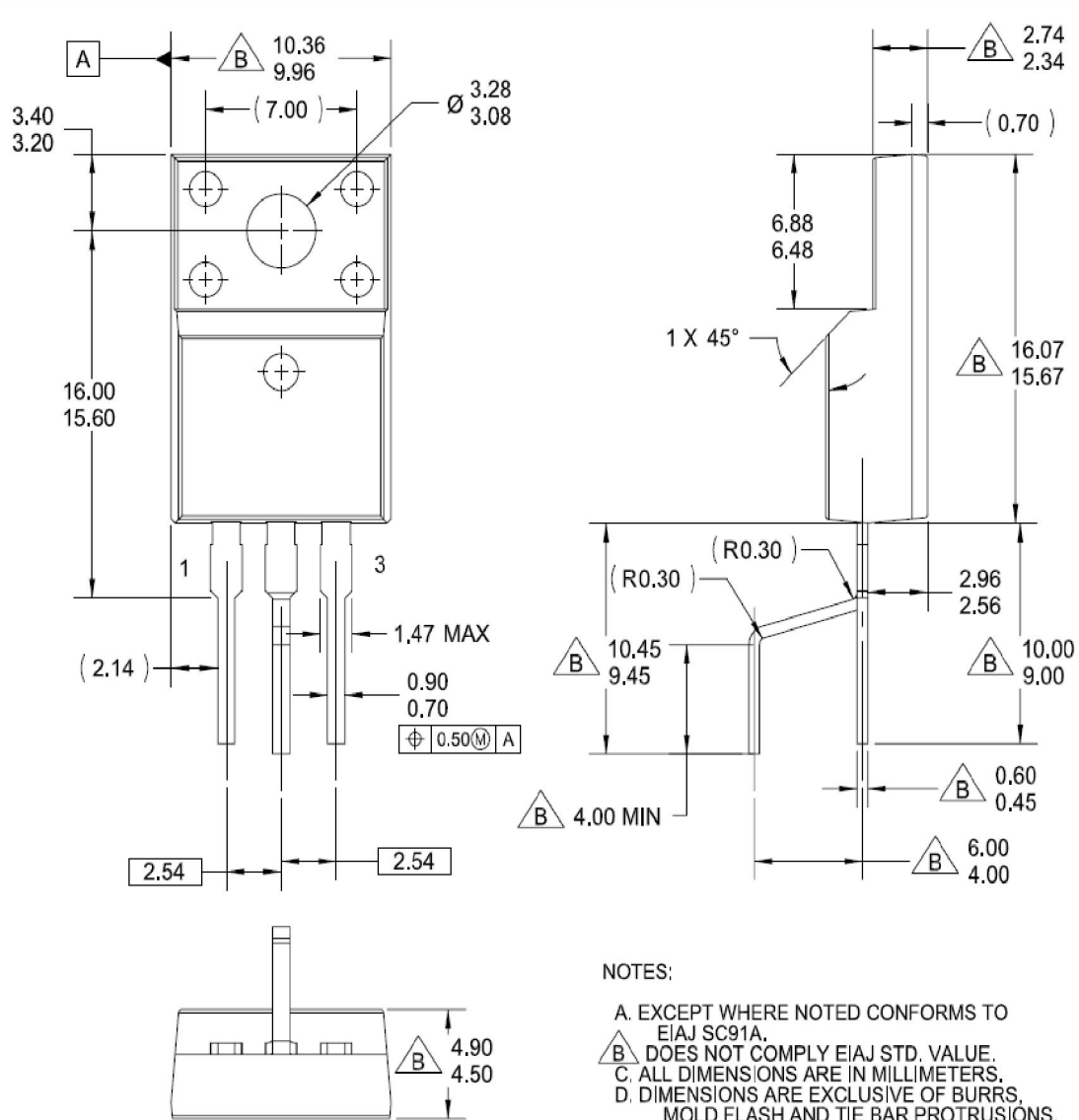
TO-220B03



Dimensions in Millimeters

Mechanical Dimensions (Continued)

TO-220Q03



NOTES:

- A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A.
- B. DOES NOT COMPLY EIAJ STD. VALUE.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
- F. DRAWING FILE NAME: TO220Q03REV1

Dimensions 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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