

FDP12N35 / FDPF12N35

350V N-Channel MOSFET

Features

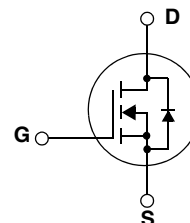
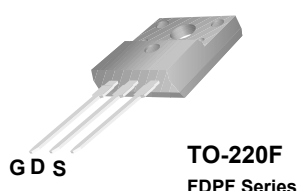
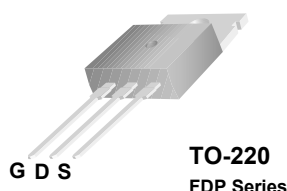
- 12A, 350V, $R_{DS(on)} = 0.38\Omega$ @ $V_{GS} = 10V$
- Low gate charge (typical 18 nC)
- Low C_{rss} (typical 15 pF)
- Fast switching
- Improved dv/dt capability



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 efficient switched mode power supplies and active power factor correction.



Absolute Maximum Ratings

Symbol	Parameter	FDP12N35	FDPF12N35	Unit
V_{DSS}	Drain-Source Voltage	350		V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	12	12*	A
		7.2	7.2*	A
I_{DM}	Drain Current - Pulsed (Note 1)	48	48*	A
V_{GSS}	Gate-Source voltage	± 30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	335		mJ
I_{AR}	Avalanche Current (Note 1)	12		A
E_{AR}	Repetitive Avalanche Energy (Note 1)	13.5		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	135	31.3	W
		1.09	0.25	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	FDP12N35	FDPF12N35	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.92	4.0	°C/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP12N35	FDP12N35	TO-220	-	-	50
FDPF12N35	FDPF12N35	TO-220F	-	-	50

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA, T _J = 25°C	350	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C	--	0.35	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 350V, V _{GS} = 0V V _{DS} = 280V, 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 = 6A	--	0.32	0.38	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40V, I _D = 6A (Note 4)	--	13	--	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	--	855	1110	pF
C _{oss}	Output Capacitance		--	135	175	pF
C _{rss}	Reverse Transfer Capacitance		--	15	25	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 175V, I _D = 12A R _G = 25Ω (Note 4, 5)	--	30	70	ns
t _r	Turn-On Rise Time		--	180	370	ns
t _{d(off)}	Turn-Off Delay Time		--	35	80	ns
t _f	Turn-Off Fall Time		--	60	130	ns
Q _g	Total Gate Charge	V _{DS} = 280V, I _D = 12A V _{GS} = 10V (Note 4, 5)	--	18	25	nC
Q _{gs}	Gate-Source Charge		--	5	--	nC
Q _{gd}	Gate-Drain Charge		--	8	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	12	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	48	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _S = 12A	--	--	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, I _S = 12A dI _F /dt = 100A/μs (Note 4)	--	270	--	ns
Q _{rr}	Reverse Recovery Charge		--	2.3	--	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 4\text{mH}$, $I_{AS} = 12A$, $V_{DD} = 50V$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 12A$, $di/dt \leq 200A/\mu s$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

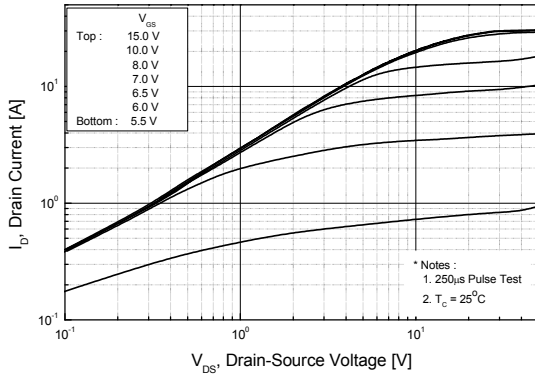


Figure 2. Transfer Characteristics

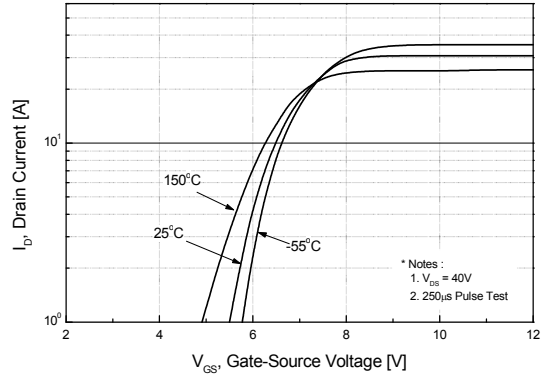


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

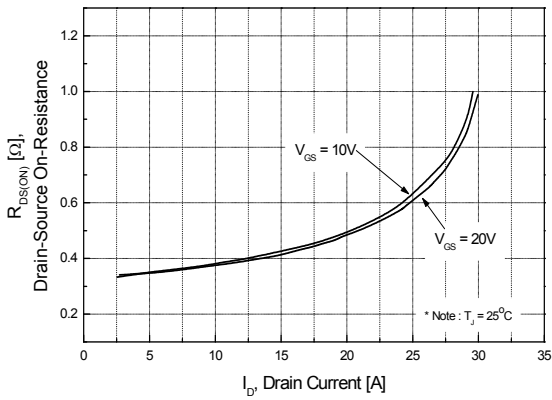


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

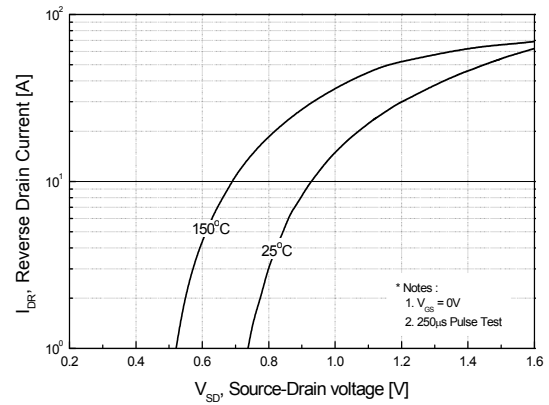


Figure 5. Capacitance Characteristics

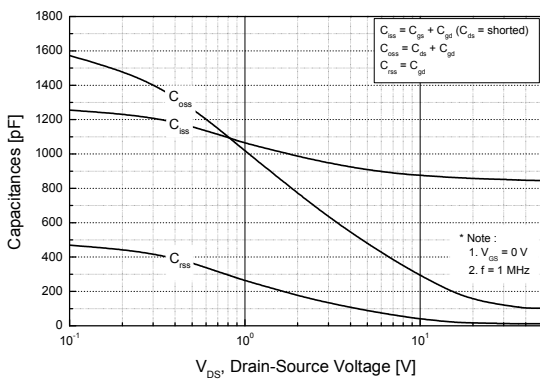
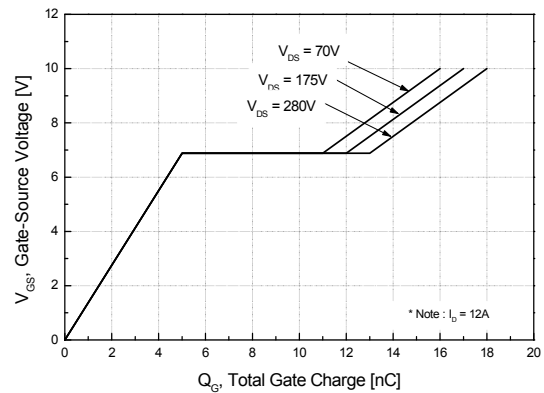


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

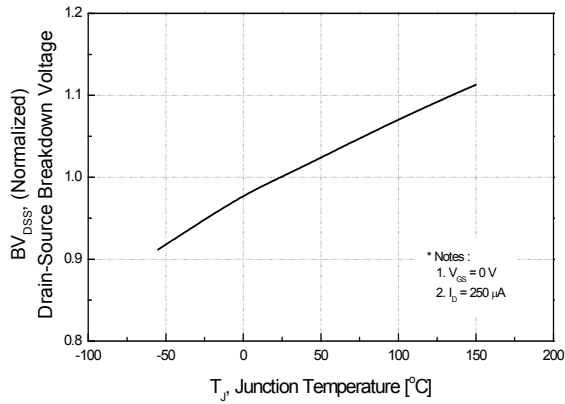


Figure 8. On-Resistance Variation vs. Temperature

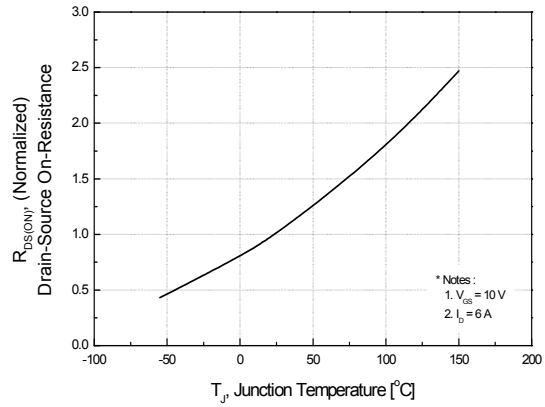


Figure 9-1. Maximum Safe Operating Area for FDP12N35

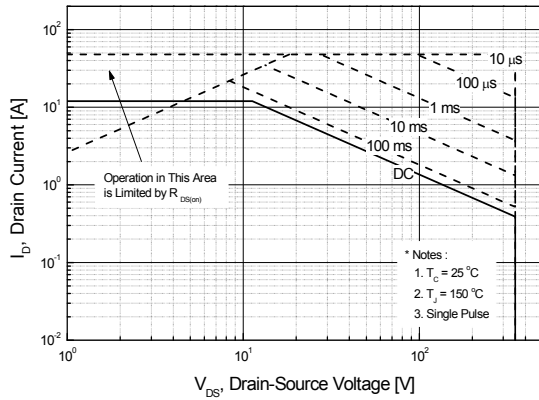


Figure 9-2. Maximum Safe Operating Area for FDPF12N35

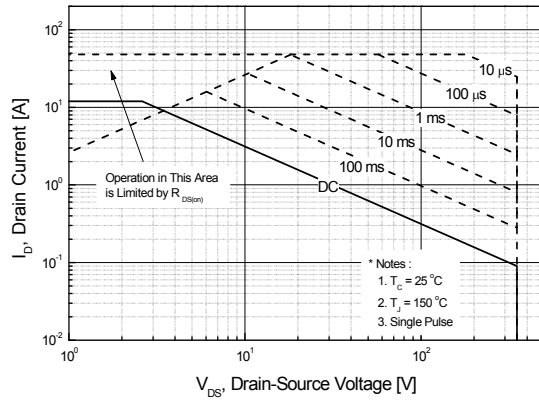
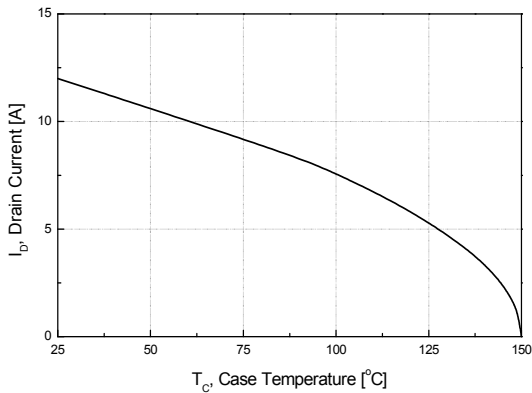


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics (Continued)

Figure 11-1. Transient Thermal Response Curve for FDP12N35

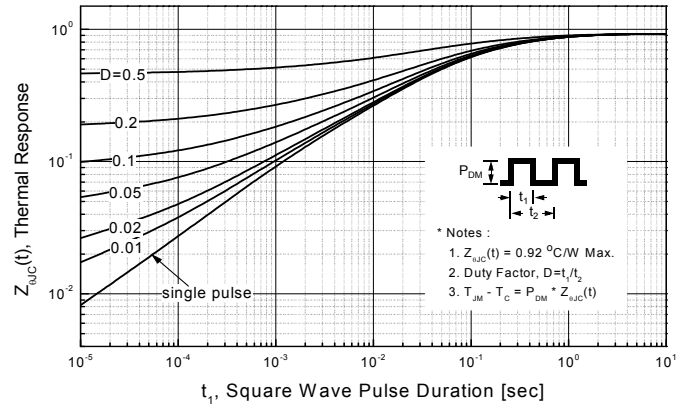
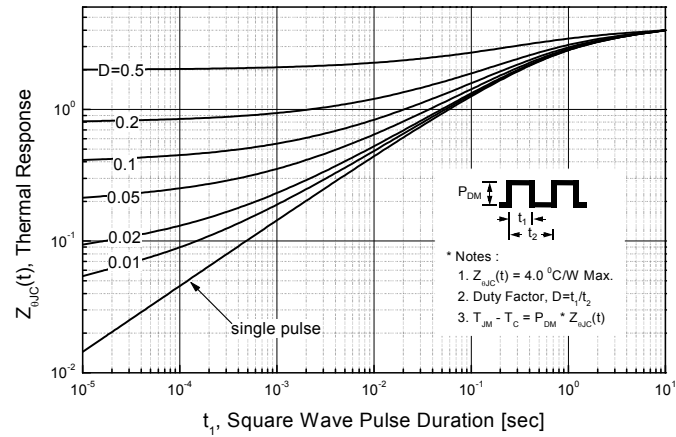
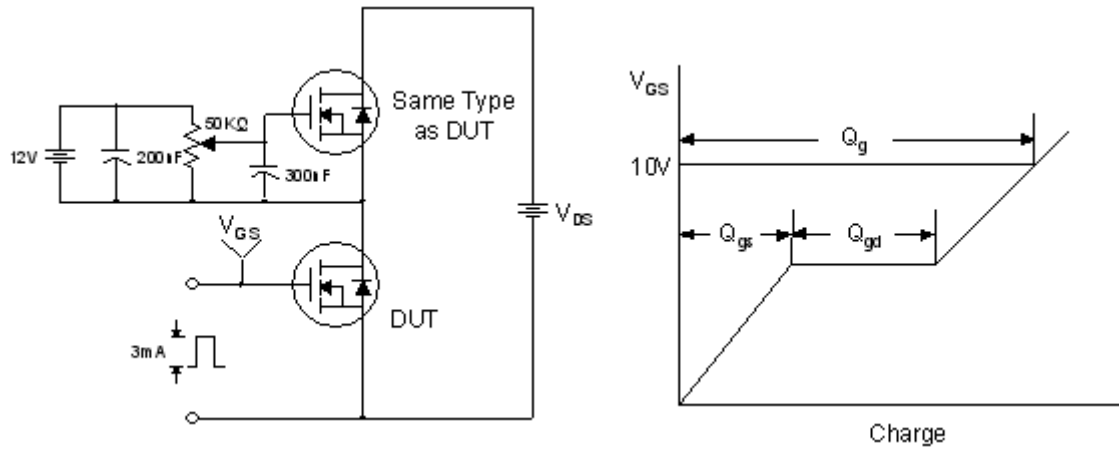


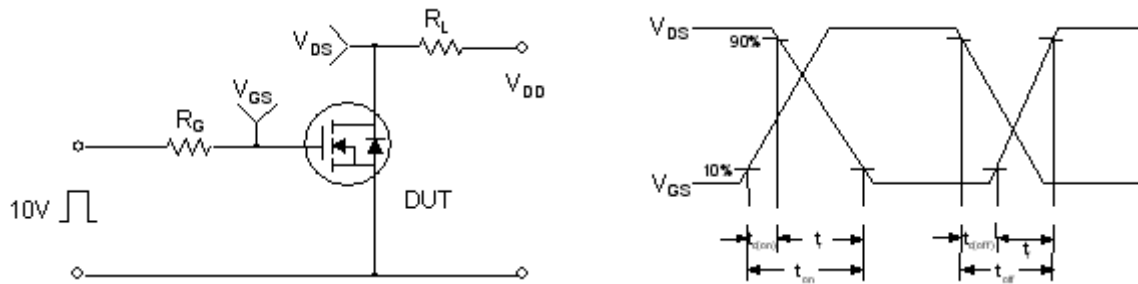
Figure 11-2. Transient Thermal Response Curve for FDPF12N35



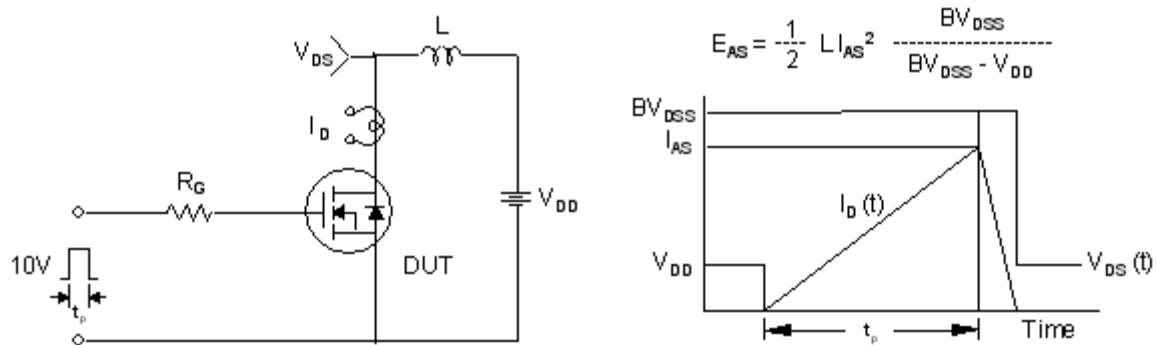
Gate Charge Test Circuit & Waveform



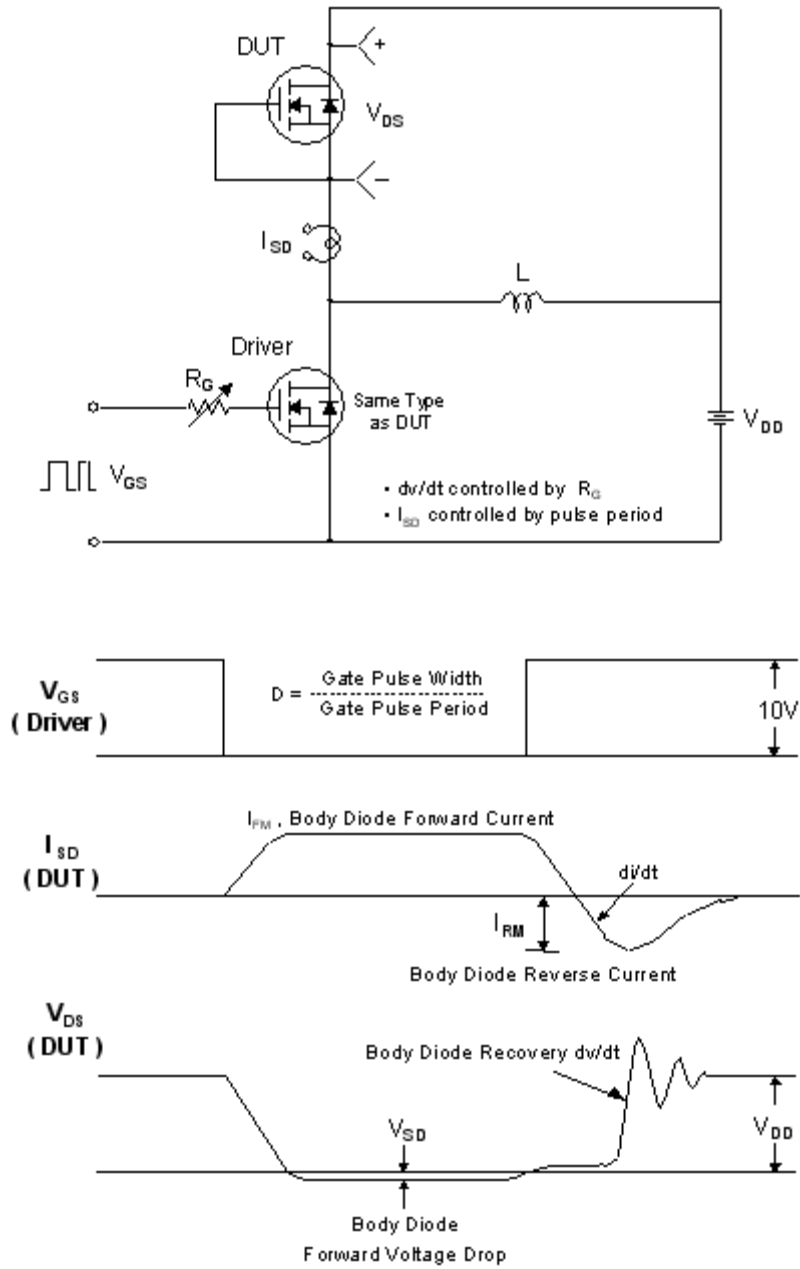
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

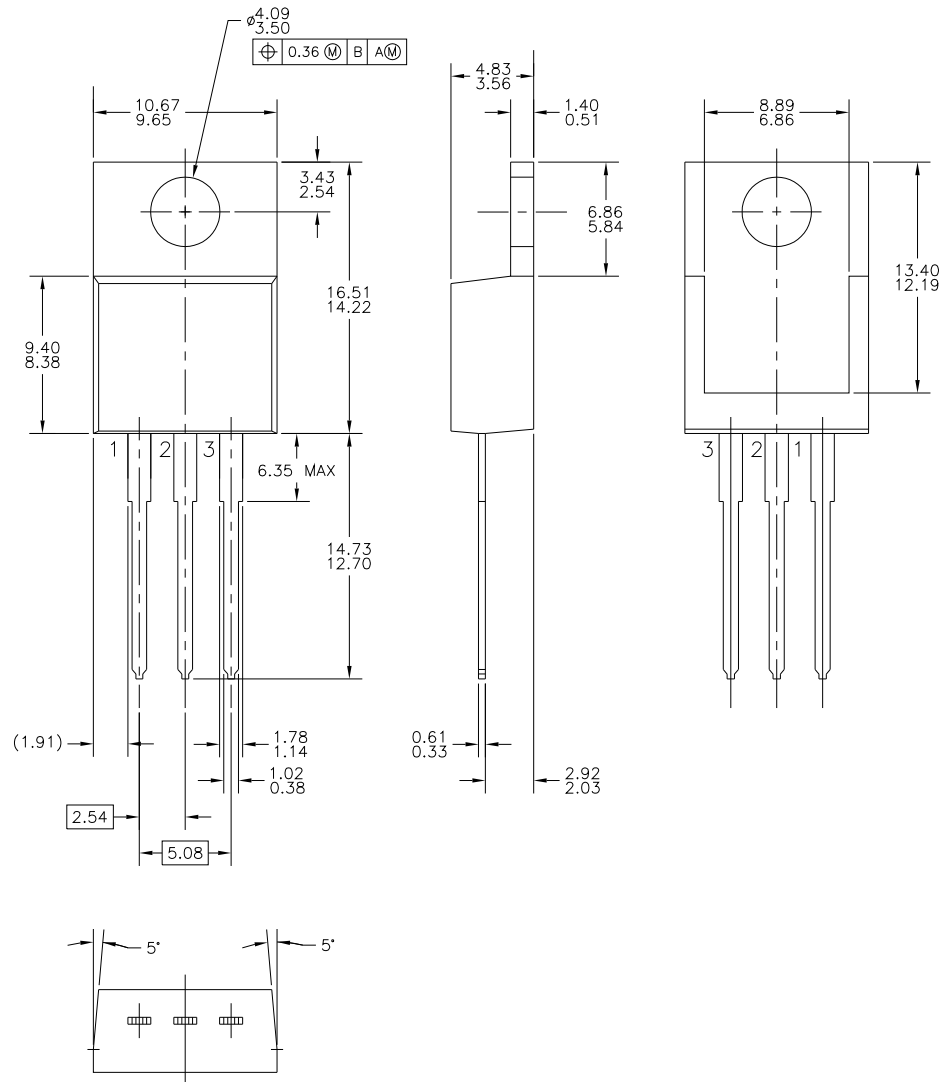


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

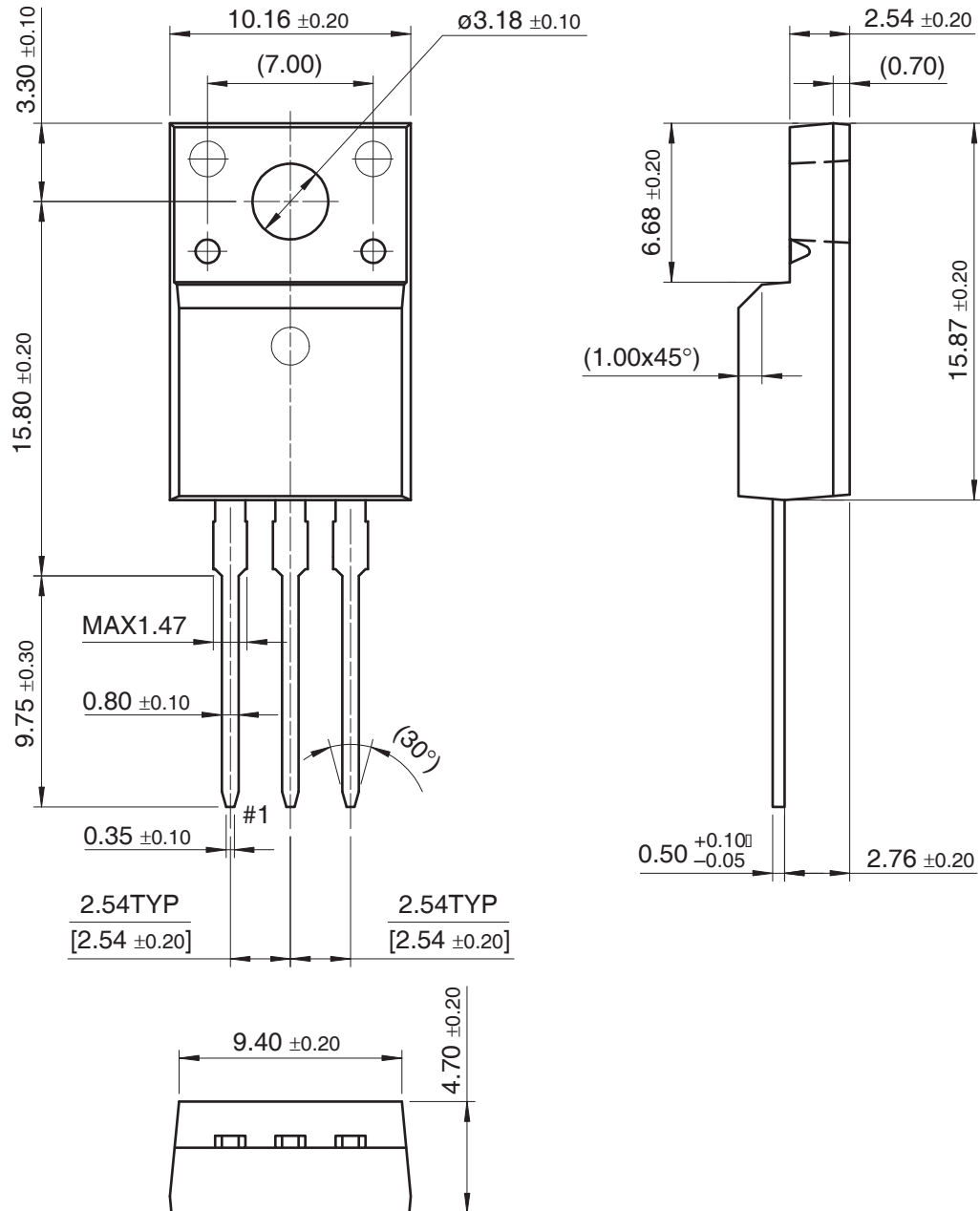
TO-220



Dimensions in Millimeters

Mechanical Dimensions (Continued)

TO-220F



Dimensions in Millimeters



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