

FAIRCHILD
SEMICONDUCTOR®

February 2007

UniFET™

FDP14N30 / FDPF14N30

300V N-Channel MOSFET

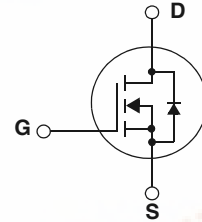
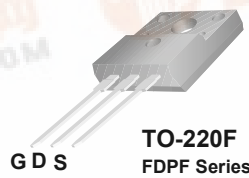
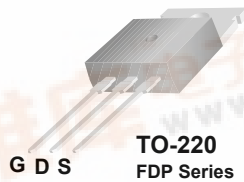
Features

- 14A, 300V, $R_{DS(on)} = 0.29\Omega @ V_{GS} = 10V$
- Low gate charge (typical 18 nC)
- Low C_{rss} (typical 17 pF)
- Fast switching
- 100% avalanche tested
- 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	FDP14N30	FDPF14N30	Unit
V_{DSS}	Drain-Source Voltage	300		V
I_D	Drain Current	- Continuous ($T_C = 25^\circ C$)	14	14 *
		- Continuous ($T_C = 100^\circ C$)	8.4	8.4 *
I_{DM}	Drain Current - Pulsed (Note 1)	56	56 *	A
V_{GSS}	Gate-Source voltage	± 30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	330		mJ
I_{AR}	Avalanche Current (Note 1)	14		A
E_{AR}	Repetitive Avalanche Energy (Note 1)	14		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
P_D	Power Dissipation ($T_C = 25^\circ C$) - Derate above $25^\circ C$	140	35	W
		1.12	0.28	
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		$^\circ C$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300		$^\circ C$

* Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FDP14N30	FDPF14N30	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.89	3.56	$^\circ C/W$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	$^\circ C/W$

FDP14N30 / FDPF14N30 300V N-Channel MOSFET



Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP14N30	FDP14N30	TO-220	-	-	50
FDPF14N30	FDPF14N30	TO-220F	-	-	50

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	300	--	--	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25°C	--	0.3	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 300V, V_{GS} = 0V$ $V_{DS} = 240V, T_C = 125^\circ C$	--	--	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	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10V, I_D = 7A$	--	0.24	0.29	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 40V, I_D = 7A$ (Note 4)	--	10.5	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	--	815	1060	pF
C_{oss}	Output Capacitance		--	150	195	pF
C_{rss}	Reverse Transfer Capacitance		--	17	25	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 150V, I_D = 14A$ $R_G = 25\Omega$	--	20	50	ns
t_r	Turn-On Rise Time		--	105	120	ns
$t_{d(off)}$	Turn-Off Delay Time		--	30	70	ns
t_f	Turn-Off Fall Time		(Note 4, 5)	--	75	160
Q_g	Total Gate Charge	$V_{DS} = 240V, I_D = 14A$ $V_{GS} = 10V$	--	18	25	nC
Q_{gs}	Gate-Source Charge		--	4.5	--	nC
Q_{gd}	Gate-Drain Charge		(Note 4, 5)	--	8	--
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	14	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	56	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 14A$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V, I_S = 14A$ $di_F/dt = 100A/\mu s$	--	235	--	ns
Q_{rr}	Reverse Recovery Charge		(Note 4)	--	1.6	--

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 2.8mH, $I_{AS} = 14A, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^\circ C$
3. $I_{SD} \leq 14A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ C$
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

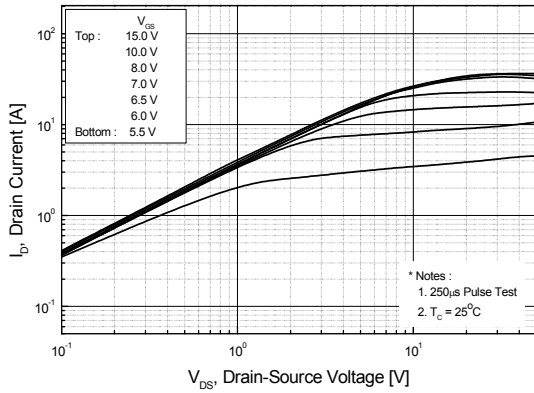


Figure 2. Transfer Characteristics

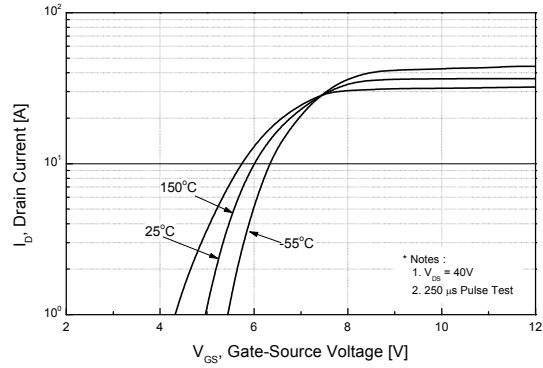


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

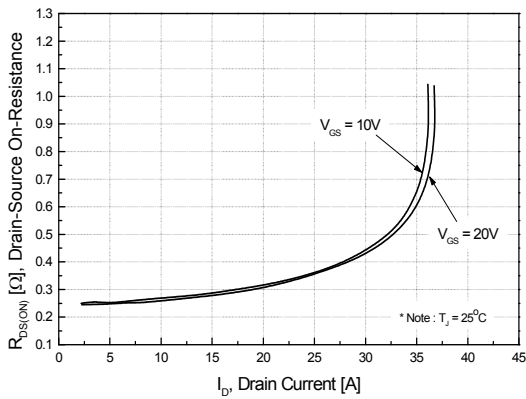


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

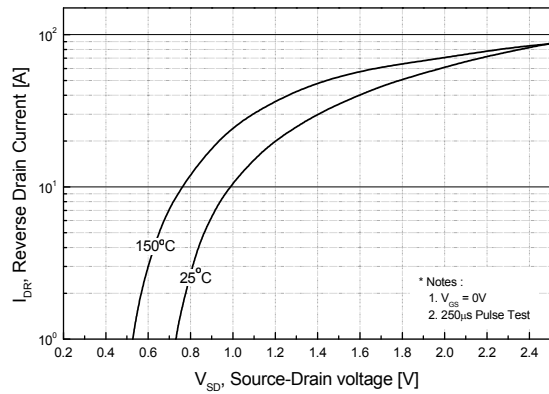


Figure 5. Capacitance Characteristics

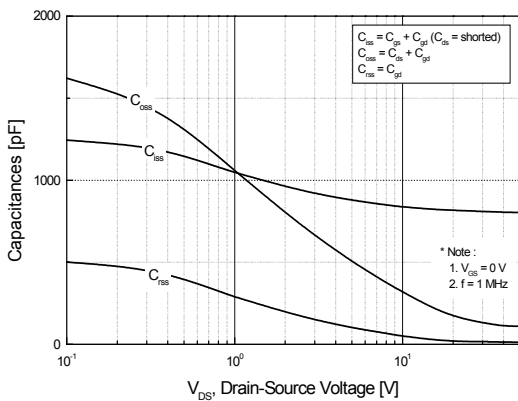
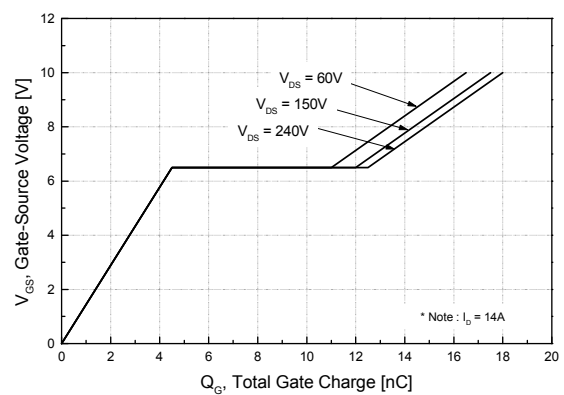


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

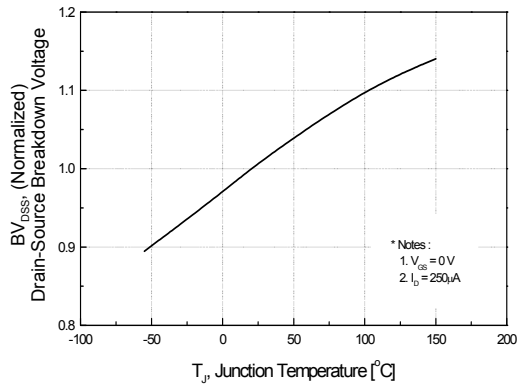


Figure 8. On-Resistance Variation vs. Temperature

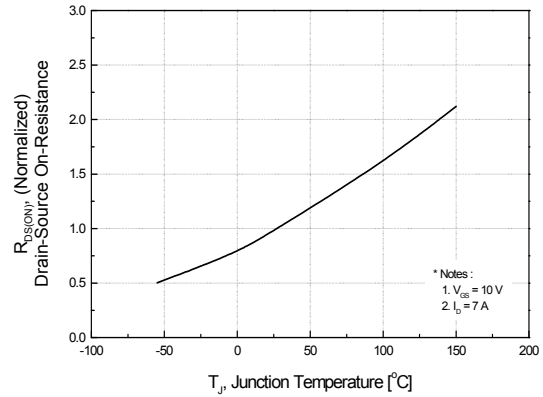


Figure 9-1. Maximum Safe Operating Area - FDP14N30

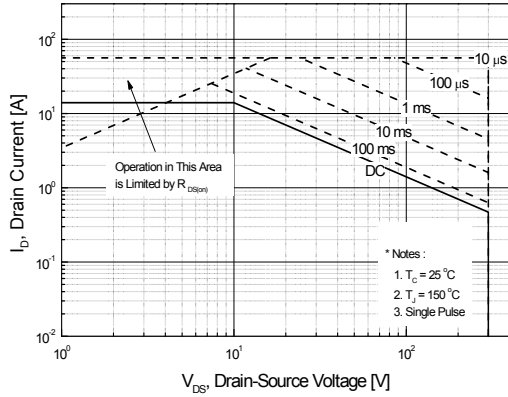


Figure 9-2. Maximum Safe Operating Area - FDPF14N30

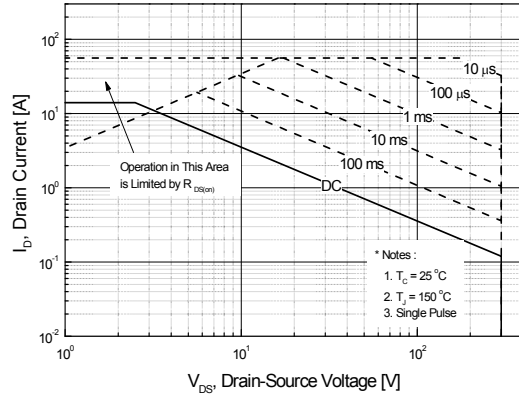
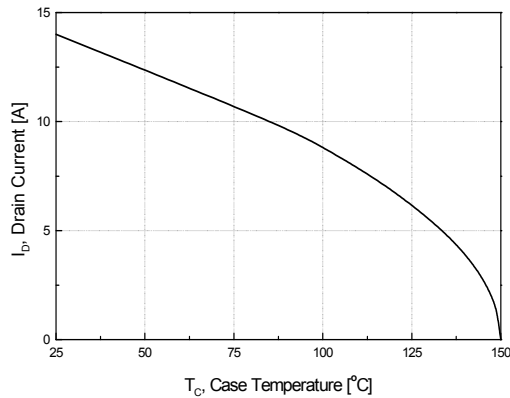


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics (Continued)

Figure 11-1. Transient Thermal Response Curve - FDP14N30

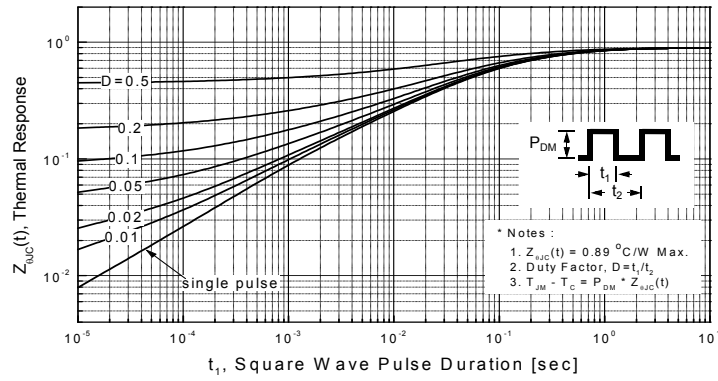
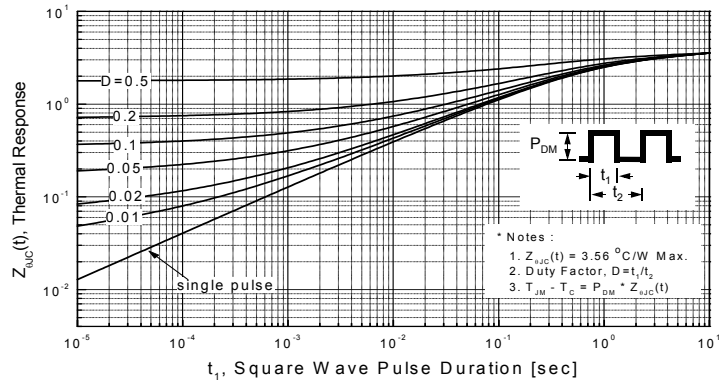
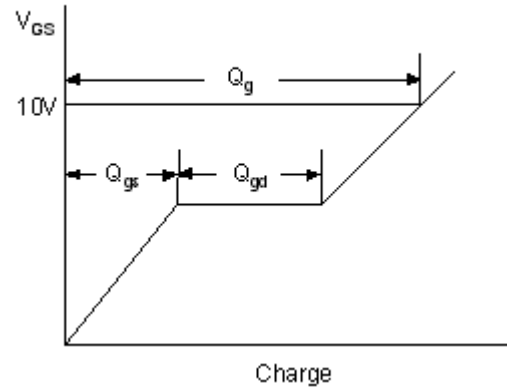
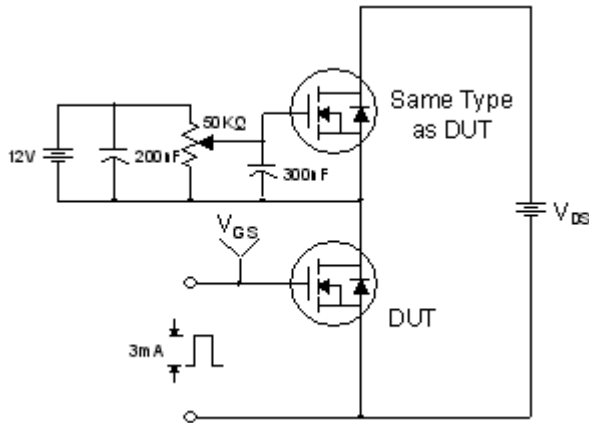


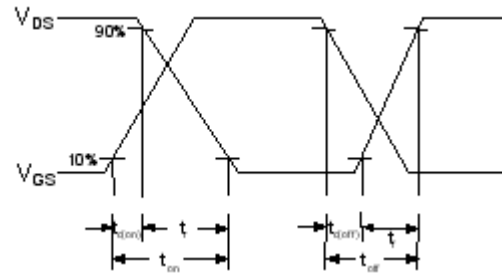
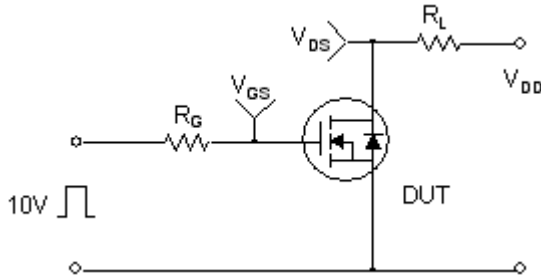
Figure 11-2. Transient Thermal Response Curve - FDPF14N30



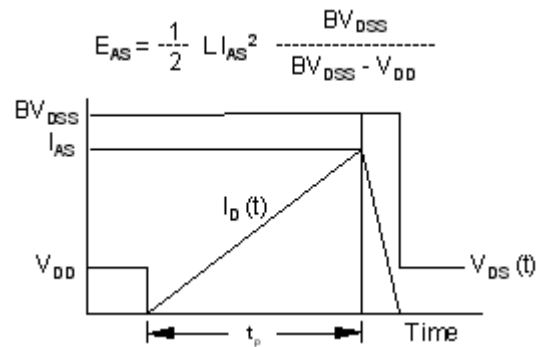
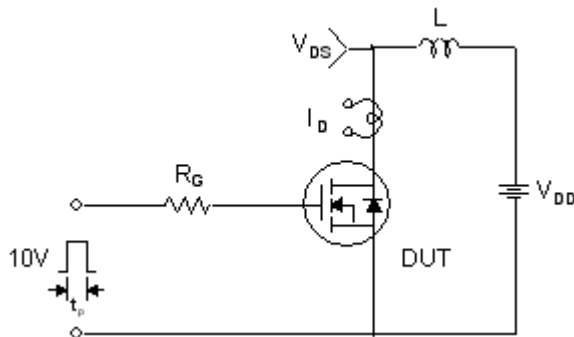
Gate Charge Test Circuit & Waveform



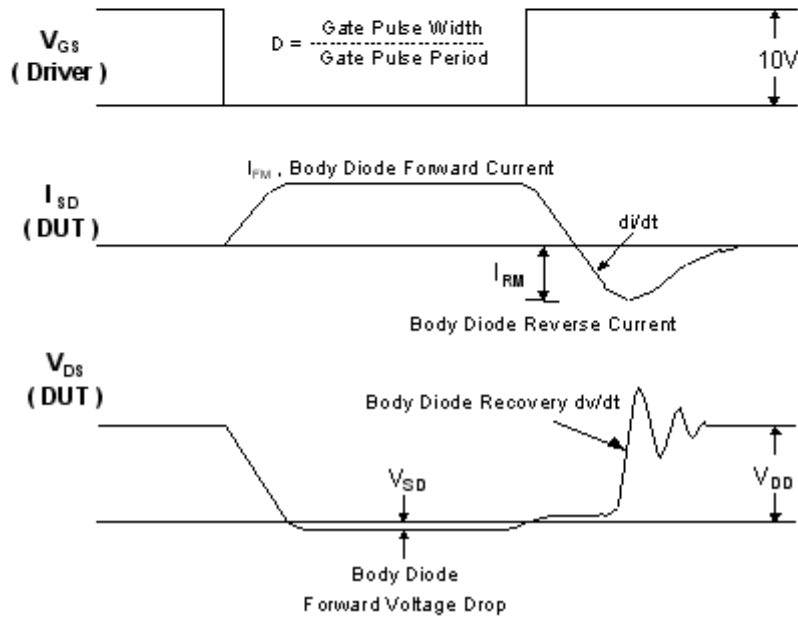
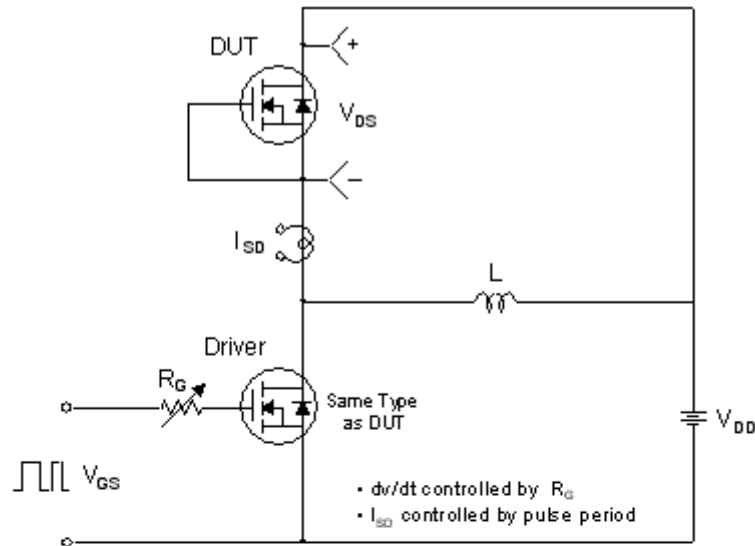
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

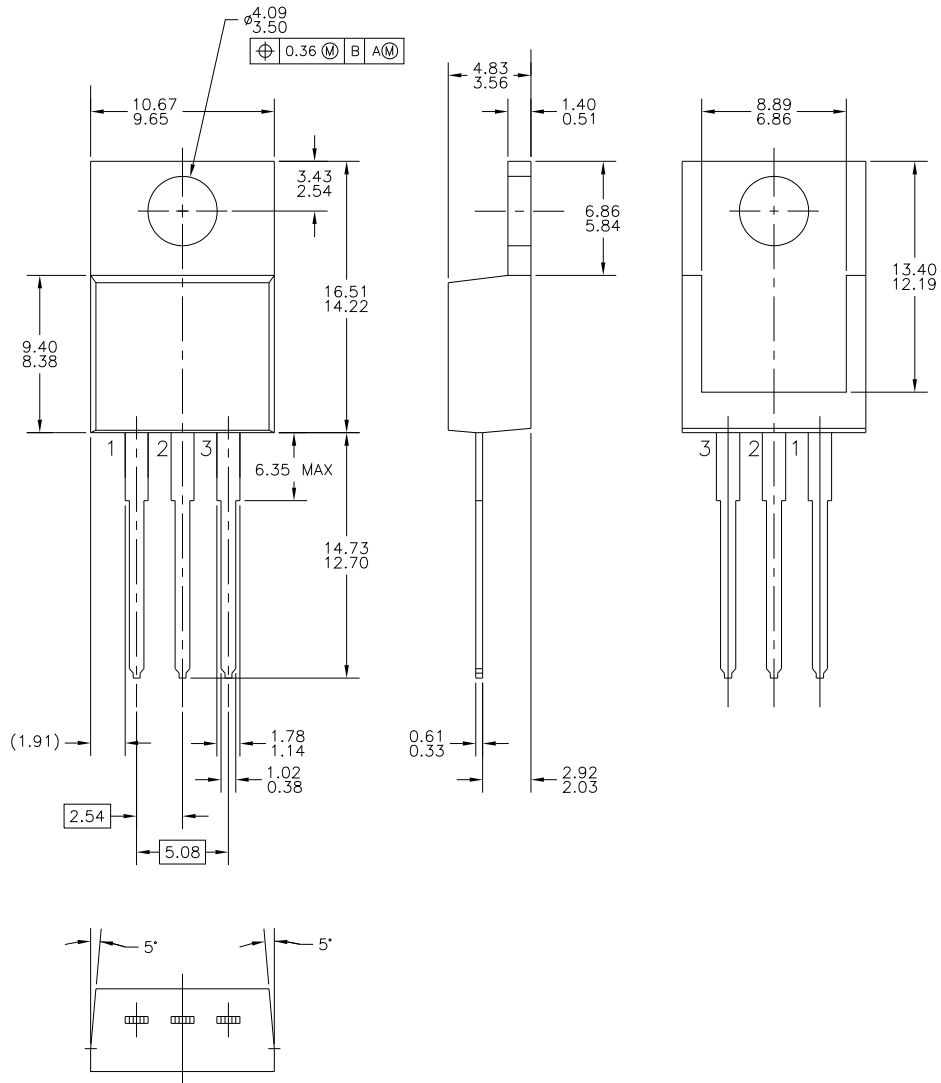


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

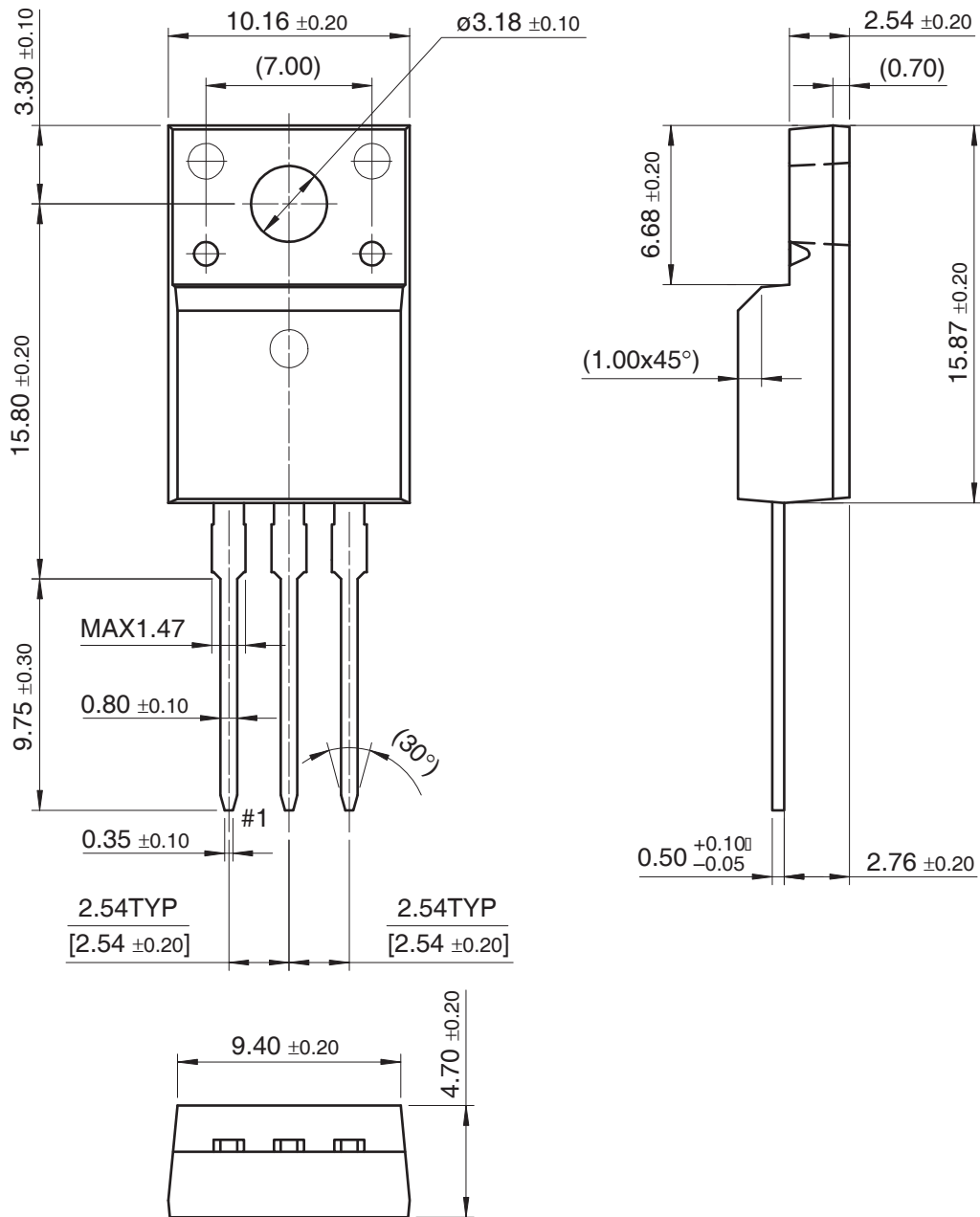
TO-220



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Mechanical Dimensions


TO-220F





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