



March 2008

FDPF3860T

N-Channel PowerTrench[®] MOSFET

100V, 20A, 38.2mΩ

Description

- $R_{DS(on)} = 38.2m\Omega$ (MAX) @ $V_{GS} = 10V, I_D = 5.9A$
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low $R_{DS(on)}$
- High power and current handling capability
- RoHS compliant

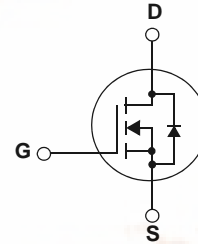
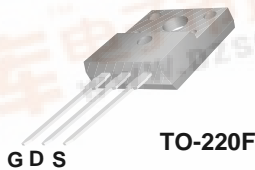


General Description

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

Application

- DC to AC converters / Synchronous Rectification



MOSFET Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	100	V
V_{GSS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ C$)	20
		- Continuous ($T_C = 100^\circ C$)	12.7
I_{DM}	Drain Current	- Pulsed (Note 1)	80
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	278
I_{AR}	Avalanche Current	(Note 1)	20
E_{AR}	Repetitive Avalanche Energy	(Note 1)	3.4
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	15
P_D	Power Dissipation	($T_C = 25^\circ C$)	33.8
		- Derate above $25^\circ C$	0.27
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	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.7	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

FDPF3860T N-Channel PowerTrench[®] MOSFET



Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDPF3860T	FDPF3860T	TO-220F	-	-	50

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, Referenced to 25°C	-	0.1	-	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 48\text{V}, T_C = 150^\circ\text{C}$	-	-	1 500	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 5.9\text{A}$	-	29.1	38.2	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 5.9\text{A}$ (Note 4)	-	21	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	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	$V_{DD} = 50\text{V}, I_D = 5.9\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$	-	15	40	ns	
t_r	Turn-On Rise Time		-	17	45	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4, 5)	-	24	60	ns
t_f	Turn-Off Fall Time		(Note 4, 5)	-	7	25	ns
$Q_{g(tot)}$	Total Gate Charge at 10V		(Note 4, 5)	-	23	35	nC
Q_{gs}	Gate to Source Gate Charge	$V_{DS} = 80\text{V}, I_D = 5.9\text{A}$ $V_{GS} = 10\text{V}$	-	7	-	nC	
Q_{gd}	Gate to Drain "Miller" Charge		(Note 4, 5)	-	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	$V_{GS} = 0\text{V}, I_{SD} = 5.9\text{A}$	-	-	1.3	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 5.9\text{A}$ $di_F/dt = 100\text{A}/\mu\text{s}$	-	40	-	ns
Q_{rr}	Reverse Recovery Charge		(Note 4)	-	56	-

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 16\text{mH}, I_{AS} = 5.9\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 5.9\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

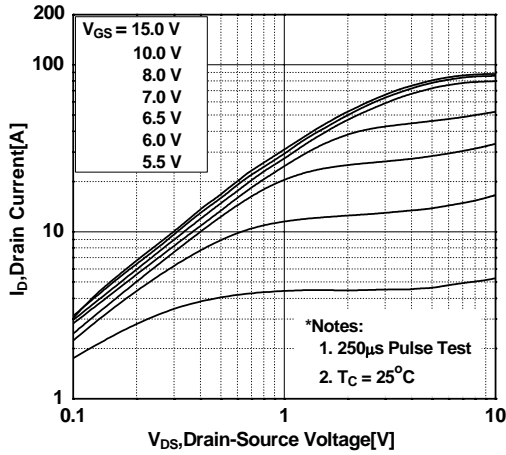


Figure 2. Transfer Characteristics

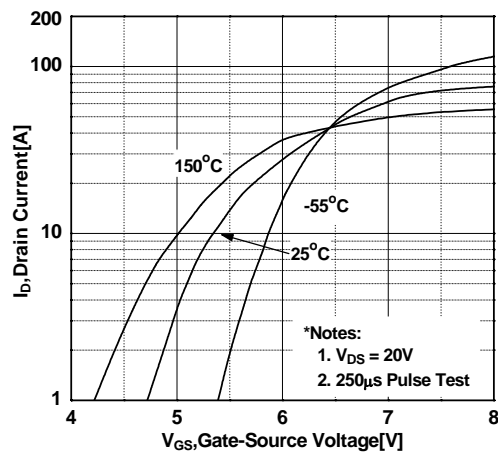


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

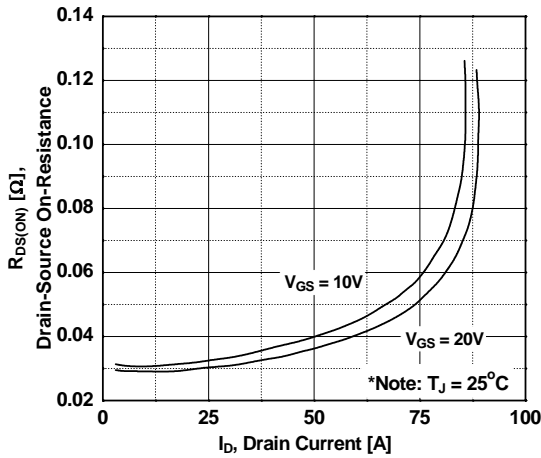


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

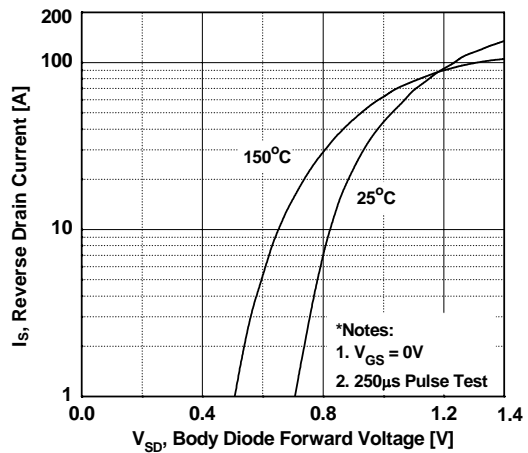


Figure 5. Capacitance Characteristics

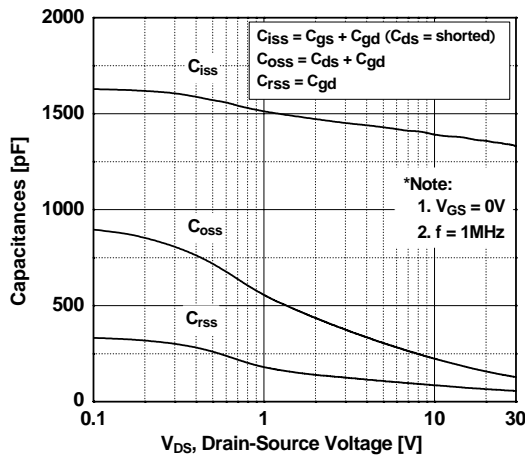
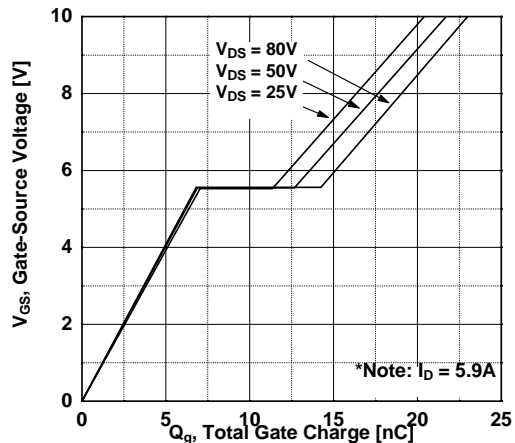


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

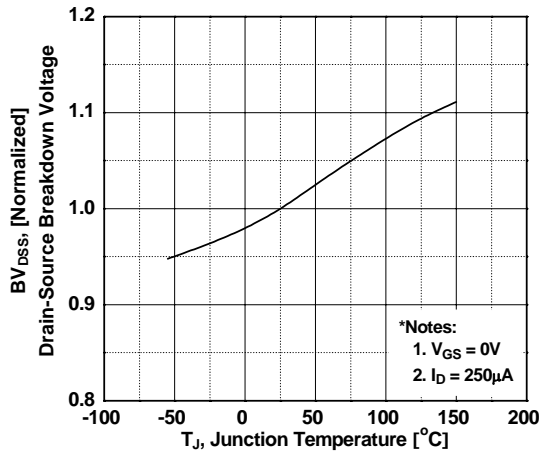


Figure 8. On-Resistance Variation vs. Temperature

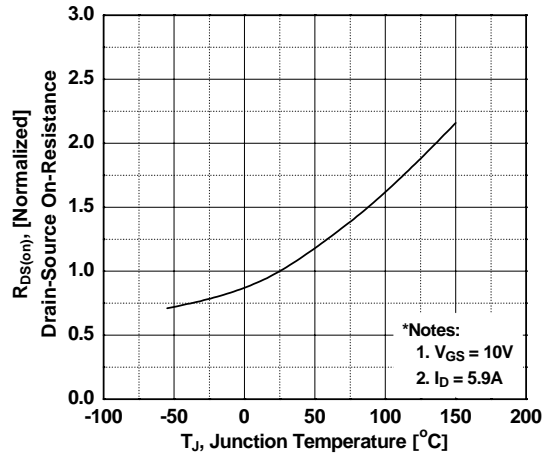


Figure 9. Maximum Safe Operating Area

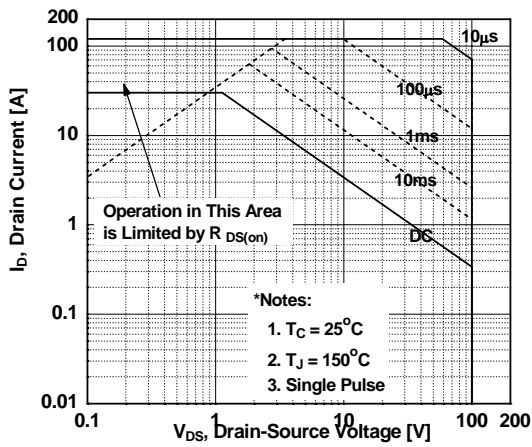


Figure 10. Maximum Drain Current vs. Case Temperature

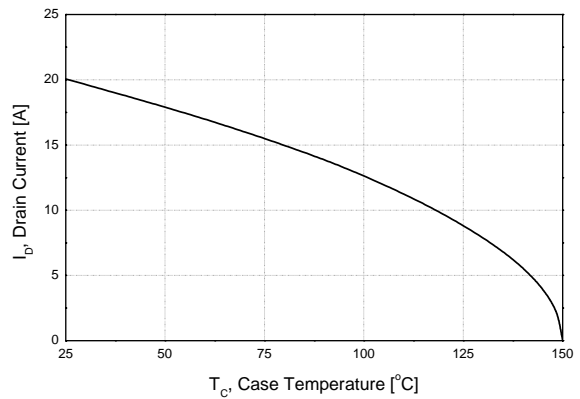
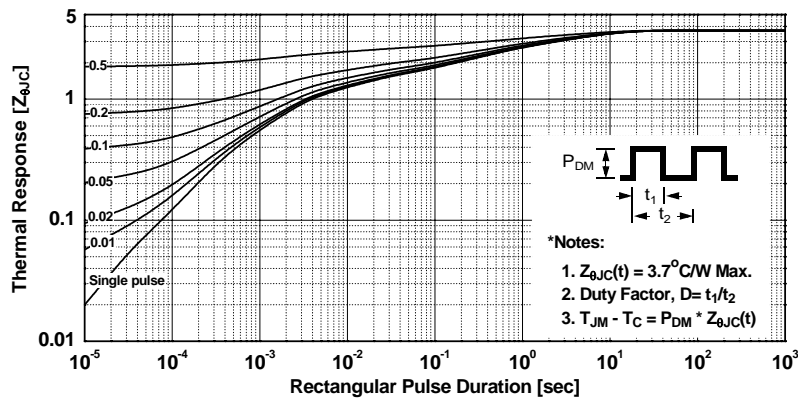
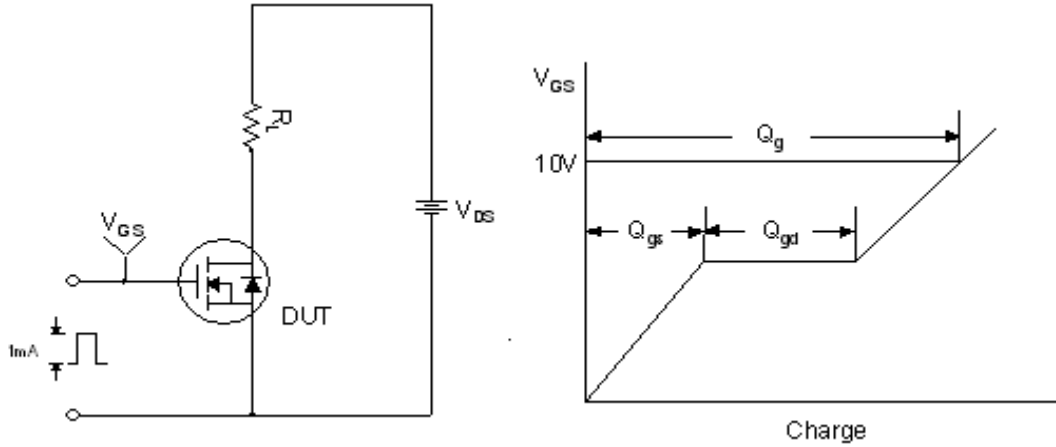


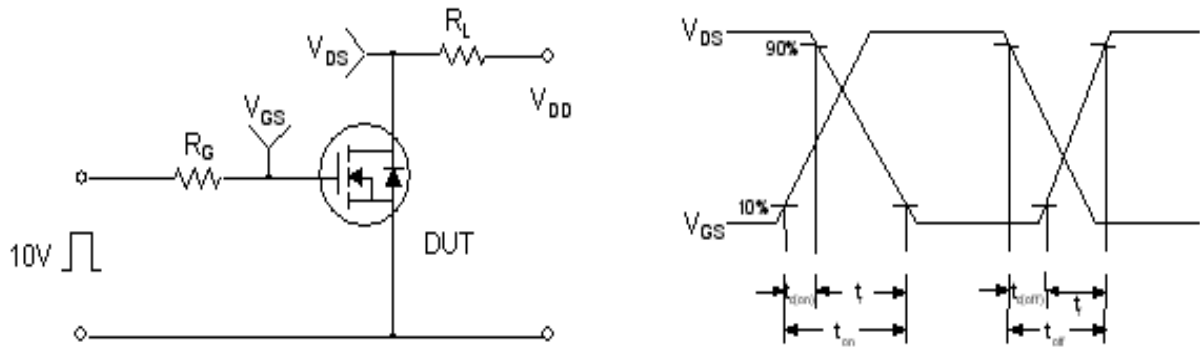
Figure 11. Transient Thermal Response Curve



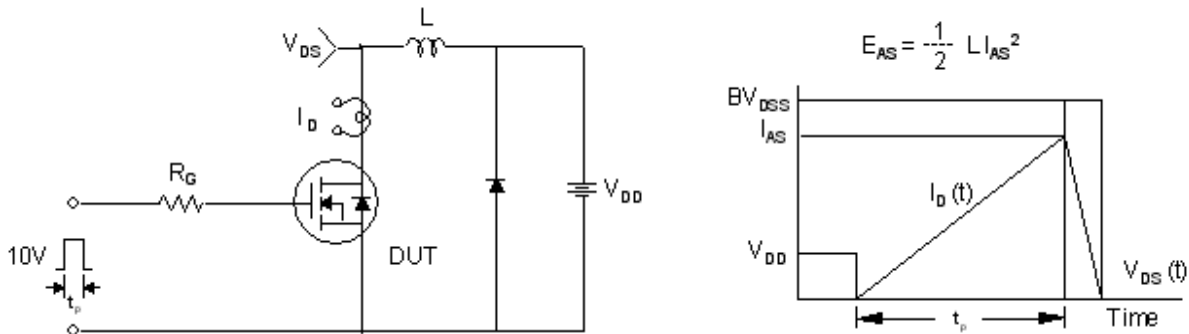
Gate Charge Test Circuit & Waveform



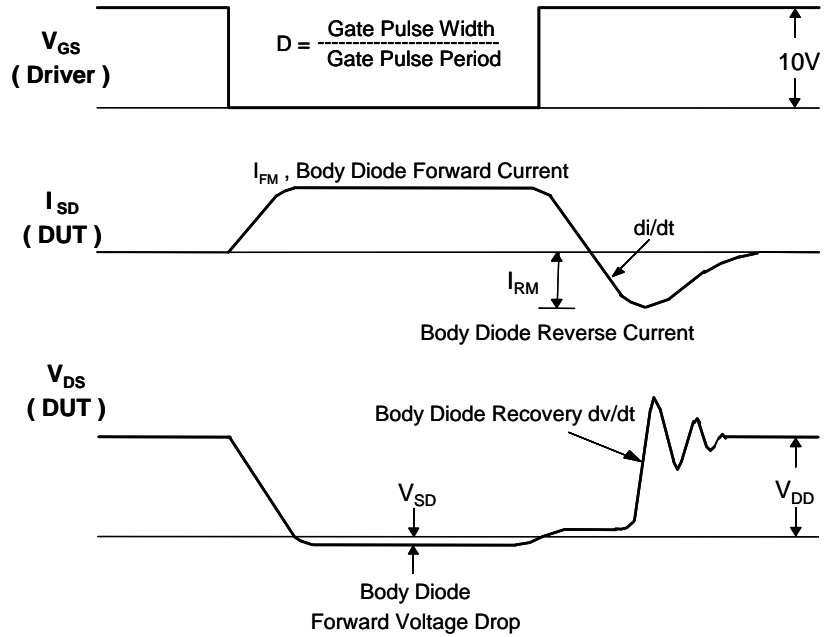
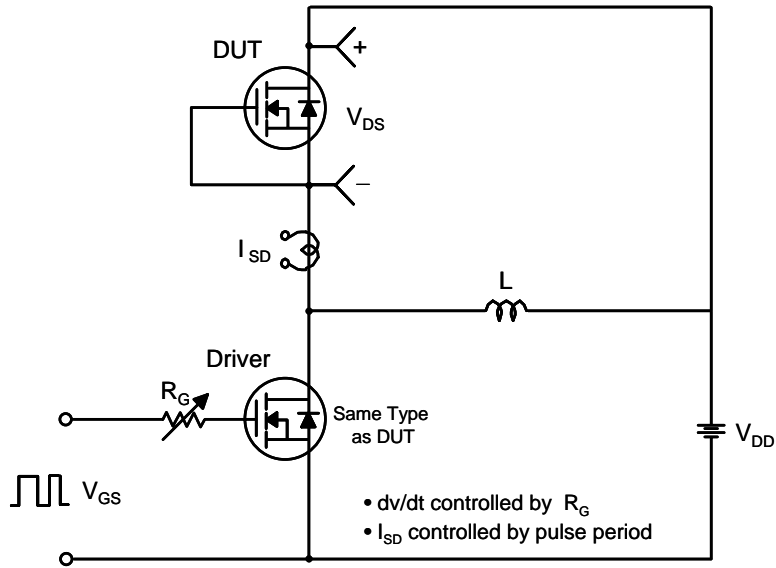
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

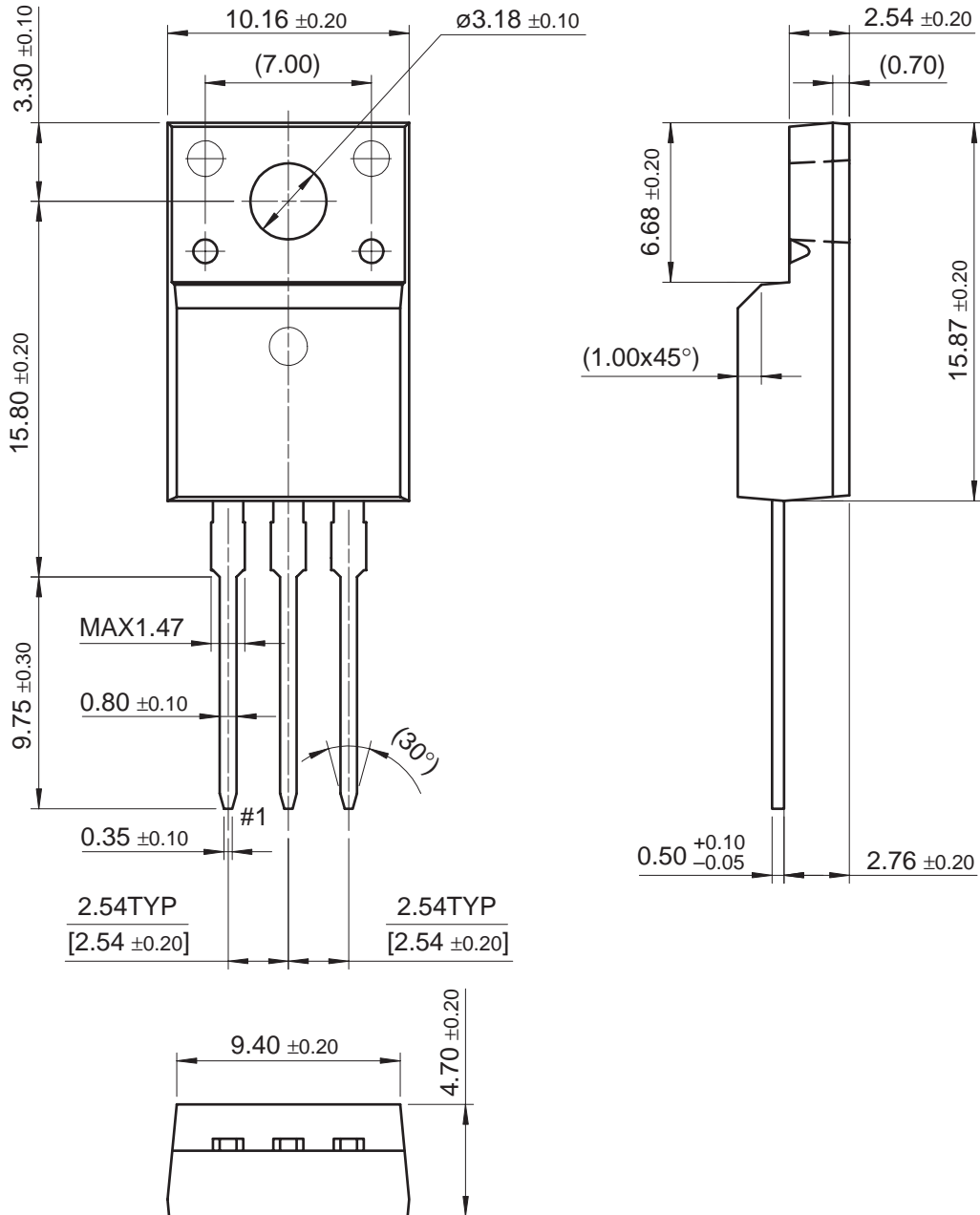


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimensions

TO-220F





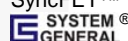


Dimensions in Millimeters



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