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FAIRCHILD SEMICONDUCTOR®

November 2008

FDPF680N10T

N-Channel PowerTrench® MOSFET

100V, 12A, 68mΩ

Features

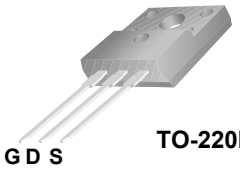
- $R_{DS(on)}$ = 54mΩ (Typ.)@ V_{GS} = 10V, I_D = 6A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Application

- DC to AC Converters / Synchronous Rectification

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.



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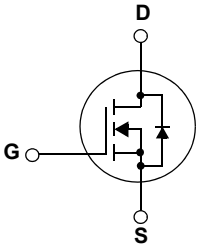

MOSFET Maximum Ratings T_C = 25°C unless otherwise noted*

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°C)	12	A
		-Continuous (T_C = 100°C)	7.6	
I_{DM}	Drain Current	- Pulsed (Note 1)	48	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	50.4	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	13.0	V/ns
P_D	Power Dissipation	(T_C = 25°C)	24	W
		- Derate above 25°C	0.19	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

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	5.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

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Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDPF680N10T	FDPF680N10T	TO-220F	-	-	50

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu A$, $V_{GS} = 0V$, $T_C = 25^oC$	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25^oC	-	0.1	-	$V/^oC$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 100V$, $V_{GS} = 0V$	-	-	1	μA
		$V_{DS} = 100V$, $V_{GS} = 0V$, $T_C = 150^oC$	-	-	500	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20V$, $V_{DS} = 0V$	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu A$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10V$, $I_D = 6A$	-	54	68	mΩ
g_{FS}	Forward Transconductance	$V_{DS} = 10V$, $I_D = 12A$ (Note 4)	-	26	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 50V$, $V_{GS} = 0V$, f = 1MHz	-	750	1000	pF
C_{oss}	Output Capacitance		-	60	80	pF
C_{rss}	Reverse Transfer Capacitance		-	25	40	pF
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 80V$, $I_D = 12A$, $V_{GS} = 10V$ (Note 4, 5)	-	13	17	nC
Q_{gs}	Gate to Source Gate Charge		-	4	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	4	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50V$, $I_D = 12A$, $V_{GS} = 10V$, $R_{GEN} = 10\Omega$ (Note 4, 5)	-	13	36	ns
t_r	Turn-On Rise Time		-	19	48	ns
$t_{d(off)}$	Turn-Off Delay Time		-	18	46	ns
t_f	Turn-Off Fall Time		-	6	22	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	12	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	48	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0V$, $I_{SD} = 12A$	-	-	1.3	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V$, $I_{SD} = 12A$, $dI_F/dt = 100A/\mu s$ (Note 4)	-	29	-	ns
Q_{rr}	Reverse Recovery Charge		-	35	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 0.7mH, $I_{AS} = 12A$, $V_{DD} = 50V$, $R_G = 25\Omega$, Starting $T_J = 25°C$
3. $I_{SD} \le 12A$, $di/dt \le 200A/\mu s$, $V_{DD} \le BV_{DSS}$, Starting $T_J = 25°C$
4. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

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Typical Performance Characteristics

Figure 1. On-Region Characteristics

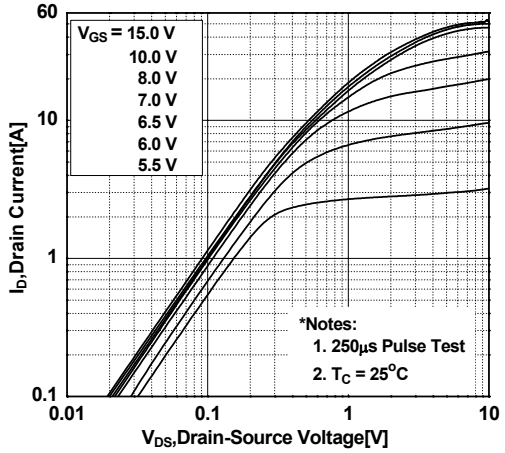


Figure 2. Transfer Characteristics

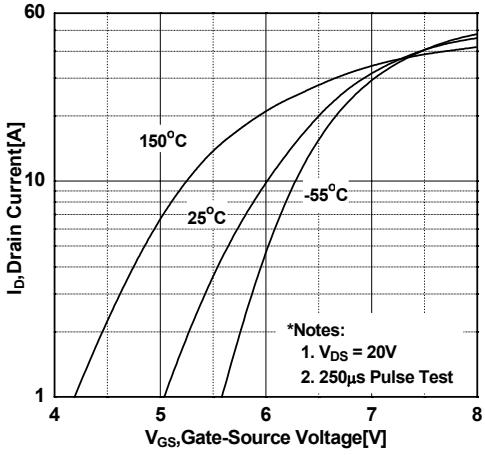


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

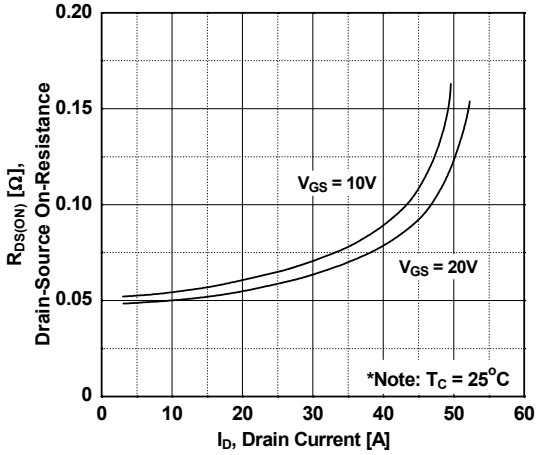


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

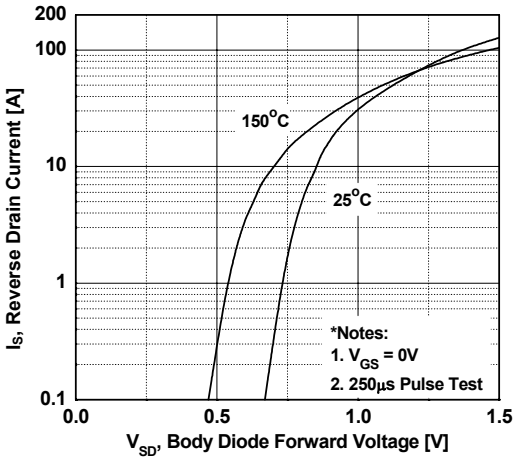


Figure 5. Capacitance Characteristics

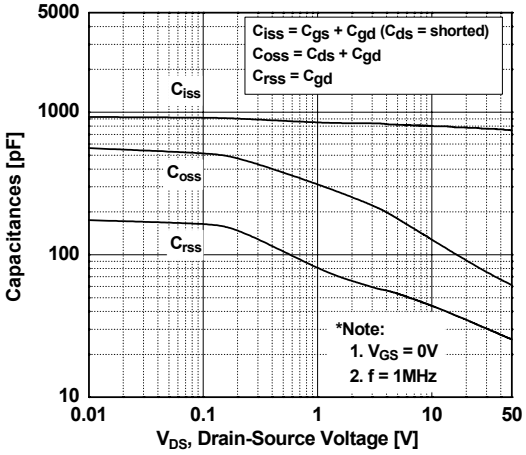
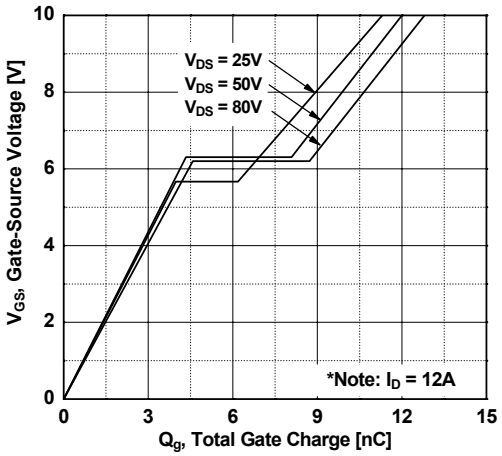


Figure 6. Gate Charge Characteristics



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Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

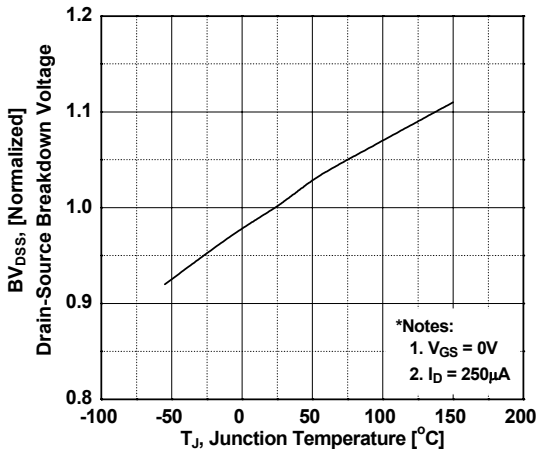


Figure 8. On-Resistance Variation vs. Temperature

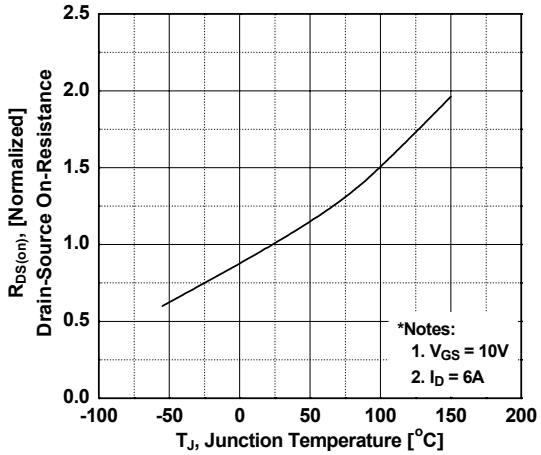


Figure 9. Maximum Safe Operating Area

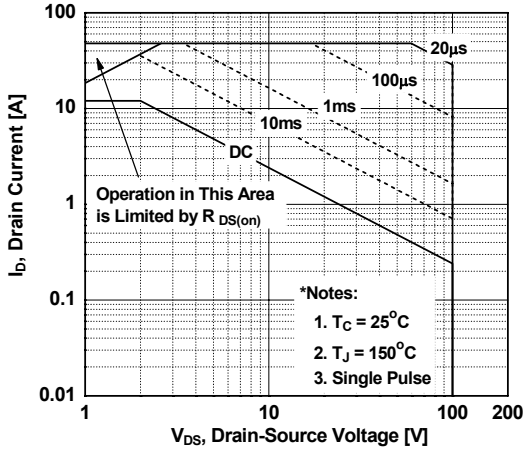


Figure 10. Maximum Drain Current vs. Case Temperature

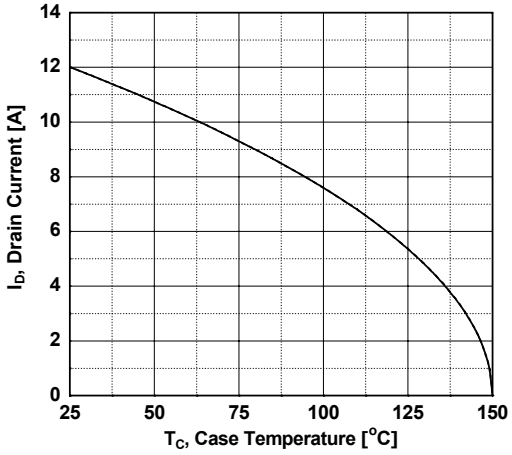
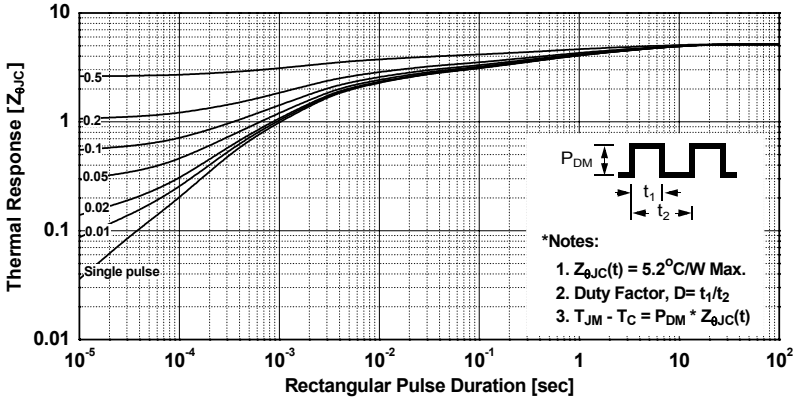


Figure 11. Transient Thermal Response Curve



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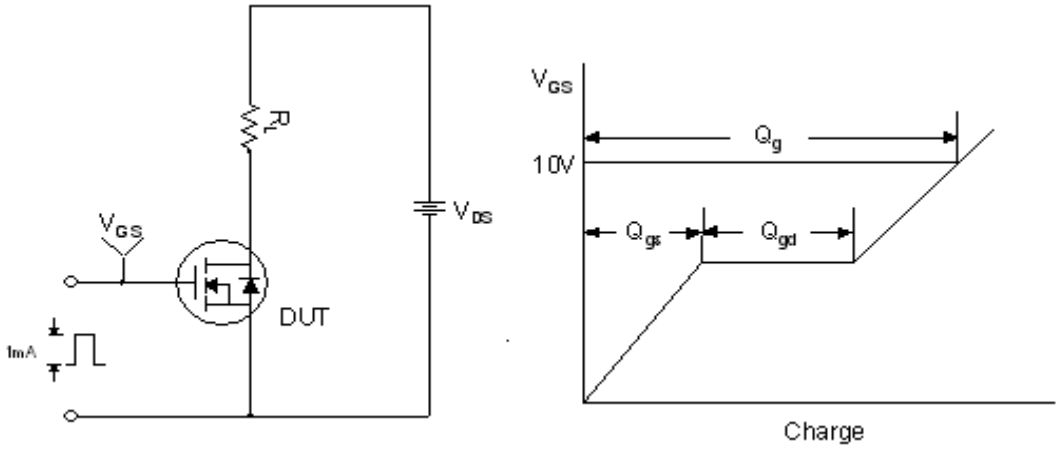
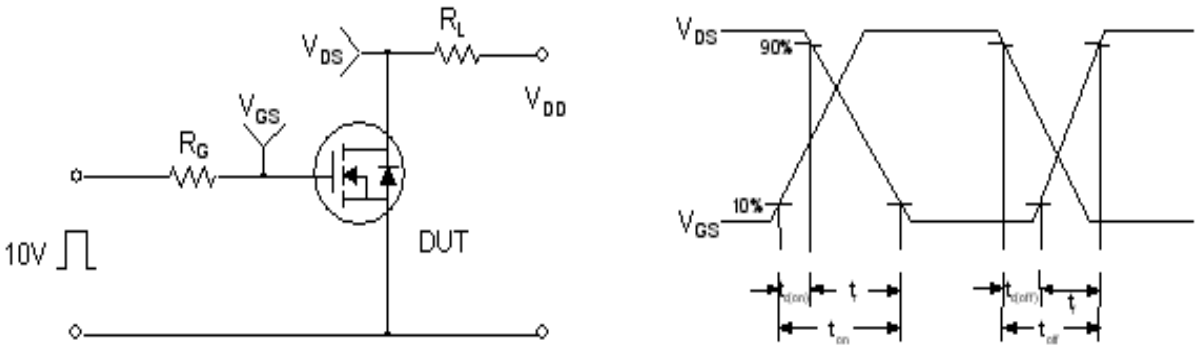
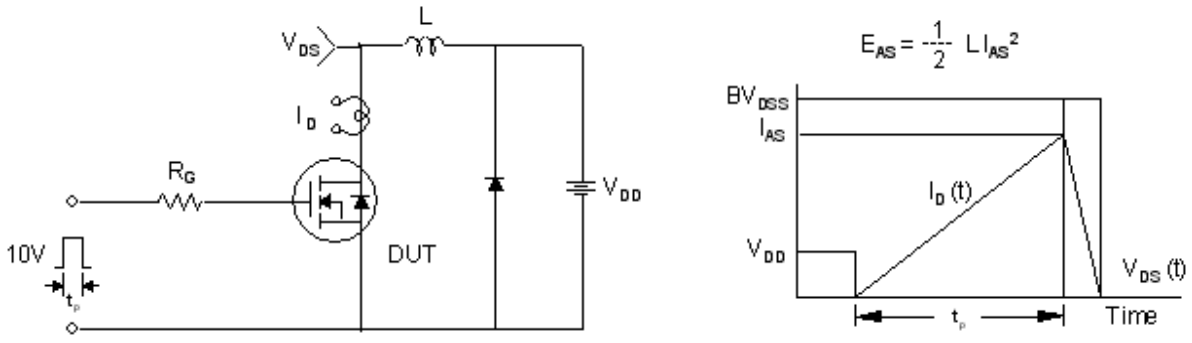
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



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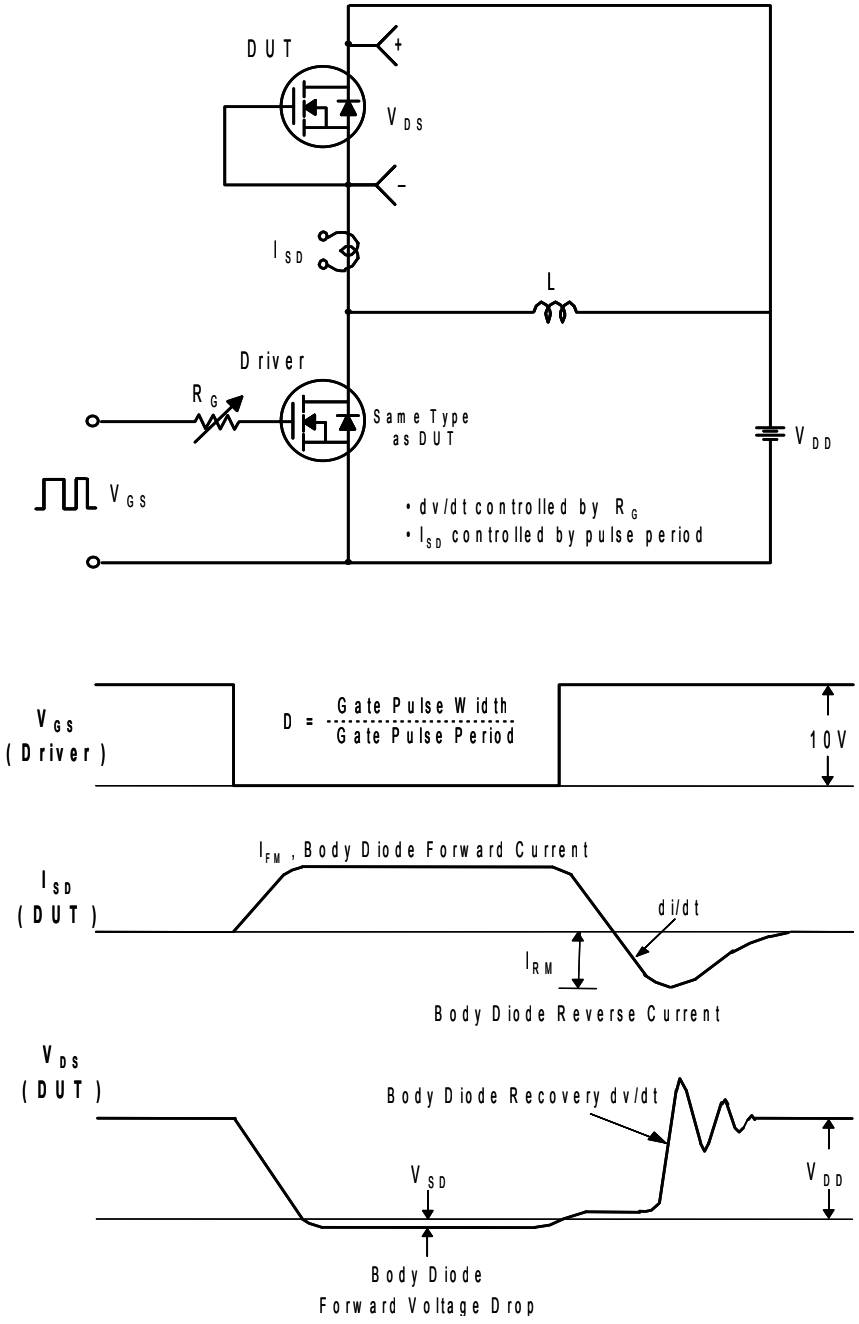
Peak Diode Recovery dv/dt Test Circuit & Waveforms



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Mechanical Dimensions

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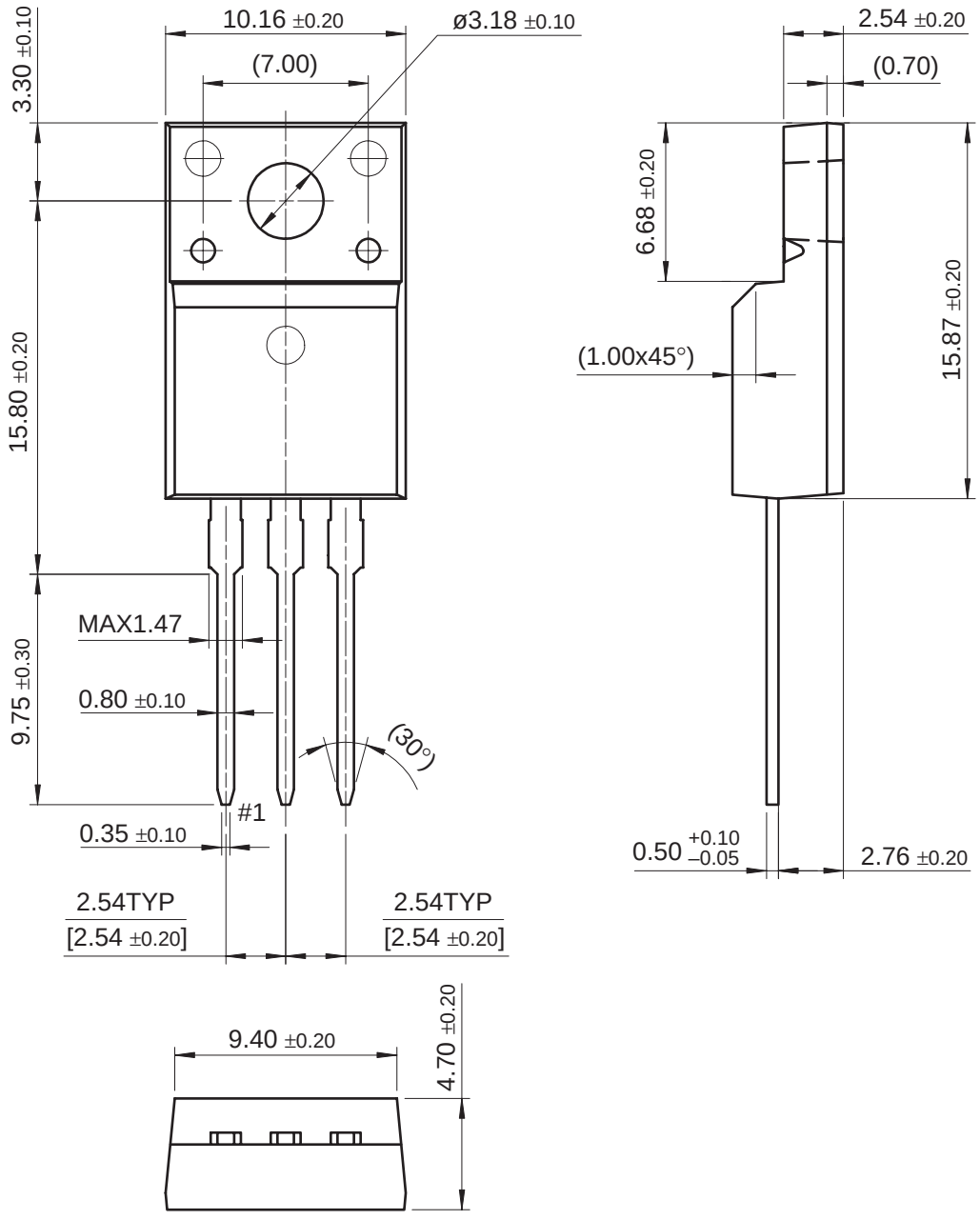

Dimensions in Millimeters

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