

# SSP2N60B/SSS2N60B

## 600V N-Channel MOSFET

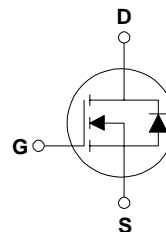
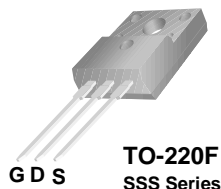
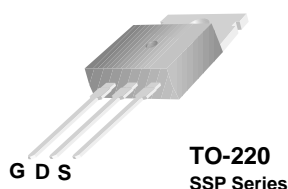
### General Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar, 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 efficiency switch mode power supplies.

### Features

- 2.0A, 600V,  $R_{DS(on)} = 5.0\Omega @ V_{GS} = 10V$
  - Low gate charge ( typical 12.5 nC)
  - Low  $C_{rss}$  ( typical 7.6 pF)
  - Fast switching
  - 100% avalanche tested
  - Improved dv/dt capability
- Typical Characteristics



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	SSP2N60B	SSS2N60B	Units
$V_{DSS}$	Drain-Source Voltage	600		V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) - Continuous ( $T_C = 100^\circ\text{C}$ )	2.0	2.0 *	A
		1.3	1.3 *	A
$I_{DM}$	Drain Current - Pulsed (Note 1)	6.0	6.0 *	A
$V_{GSS}$	Gate-Source Voltage	$\pm 30$		V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	120		mJ
$I_{AR}$	Avalanche Current (Note 1)	2.0		A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	5.4		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5		V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ ) - Derate above $25^\circ\text{C}$	54	23	W
		0.43	0.18	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 purposes, 1/8" from case for 5 seconds	300		$^\circ\text{C}$

\* Drain current limited by maximum junction temperature.

### Thermal Characteristics

Symbol	Parameter	SSP2N60B	SSS2N60B	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case Max.	2.32	5.5	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient Max.	62.5	62.5	$^\circ\text{C}/\text{W}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	600	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.65	--	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	$\mu\text{A}$
		$V_{DS} = 480\text{ V}, T_C = 125^\circ\text{C}$	--	--	100	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

**On Characteristics**

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 1.0\text{ A}$	--	3.8	5.0	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 1.0\text{ A}$ (Note 4)	--	2.05	--	S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	380	490	pF
$C_{oss}$	Output Capacitance		--	35	46	pF
$C_{riss}$	Reverse Transfer Capacitance		--	7.6	9.9	pF

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 300\text{ V}, I_D = 2.0\text{ A},$ $R_G = 25\ \Omega$	--	16	40	ns	
$t_r$	Turn-On Rise Time		--	50	110	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4, 5)	--	40	90	ns
$t_f$	Turn-Off Fall Time		(Note 4, 5)	--	40	90	ns
$Q_g$	Total Gate Charge	$V_{DS} = 480\text{ V}, I_D = 2.0\text{ A},$ $V_{GS} = 10\text{ V}$	--	12.5	17	nC	
$Q_{gs}$	Gate-Source Charge		(Note 4, 5)	--	2.2	--	nC
$Q_{gd}$	Gate-Drain Charge		(Note 4, 5)	--	5.4	--	nC

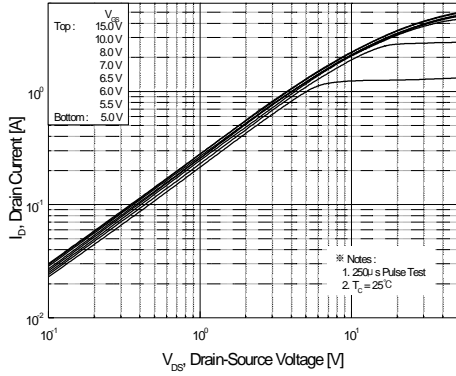
**Drain-Source Diode Characteristics and Maximum Ratings**

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	2.0	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	6.0	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2.0\text{ A}$	--	--	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 2.0\text{ A},$	--	250	--	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4)	--	1.31	--	$\mu\text{C}$

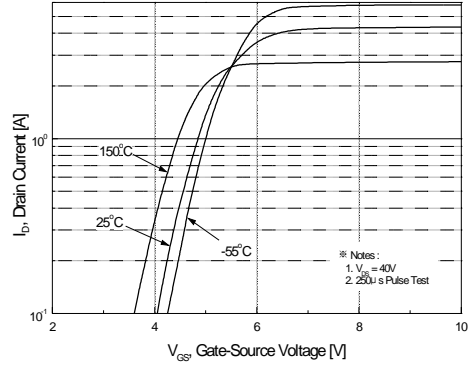
**Notes:**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 55\text{ mH}, I_{AS} = 2.0\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 2.0\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , 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

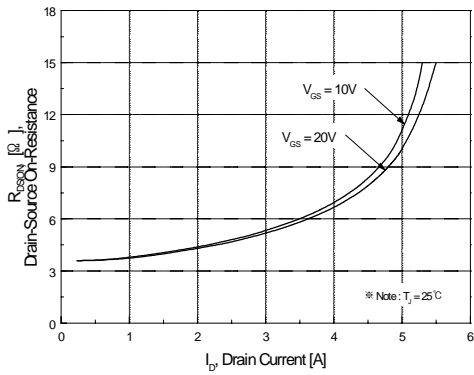
## Typical Characteristics



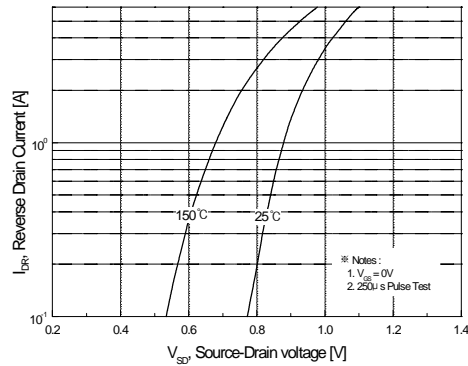
**Figure 1. On-Region Characteristics**



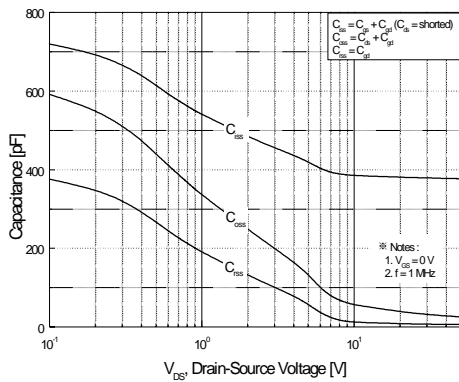
**Figure 2. Transfer Characteristics**



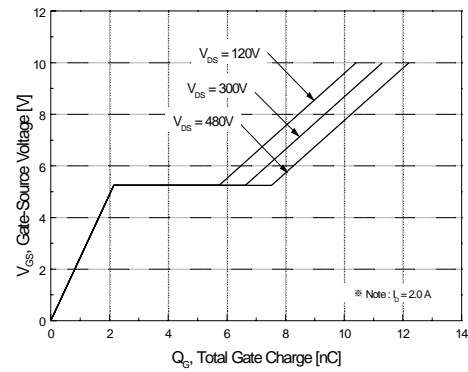
**Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage**



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



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**

Typical Characteristics (Continued)

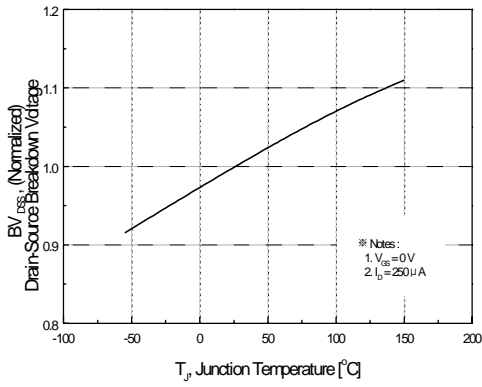


Figure 7. Breakdown Voltage Variation vs Temperature

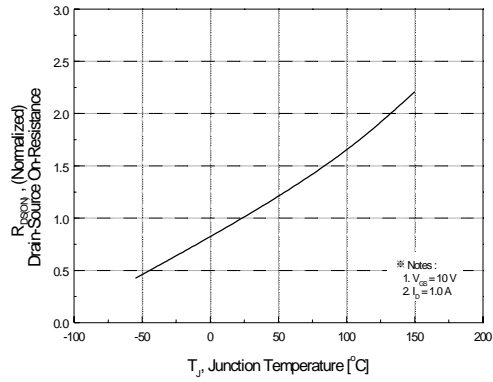


Figure 8. On-Resistance Variation vs Temperature

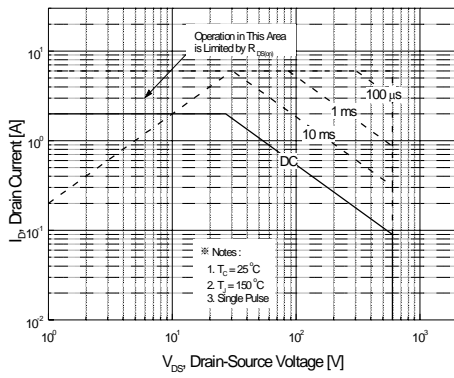


Figure 9-1. Maximum Safe Operating Area for SSP2N60B

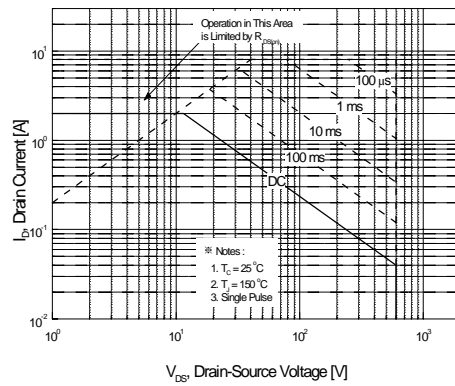


Figure 9-2. Maximum Safe Operating Area for SSS2N60B

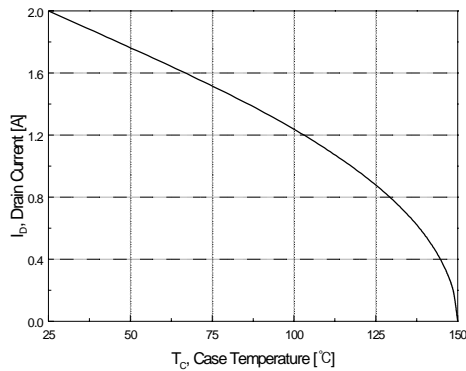


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

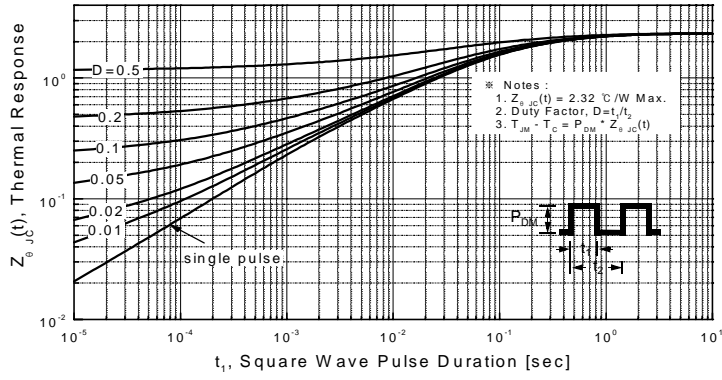


Figure 11-1. Transient Thermal Response Curve for SSP2N60B

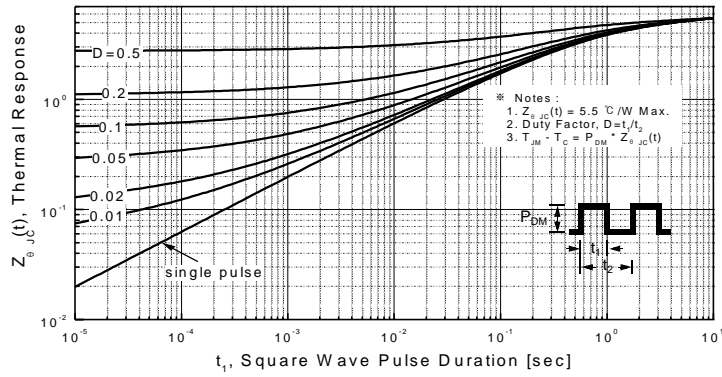
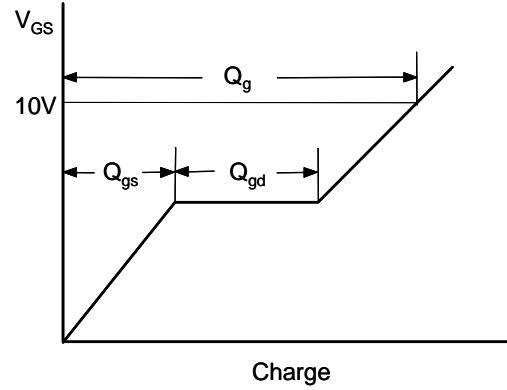
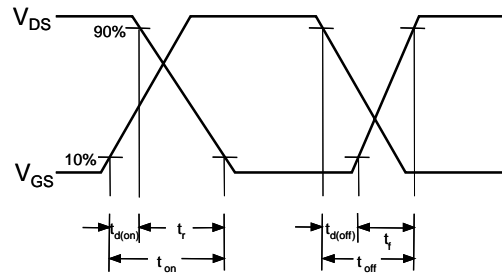
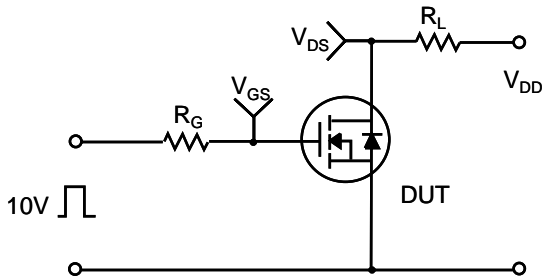


Figure 11-2. Transient Thermal Response Curve for SSS2N60B

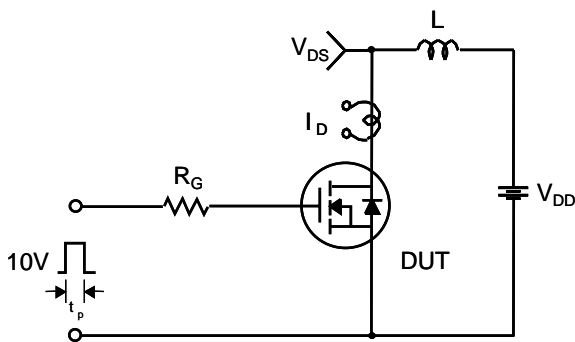
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

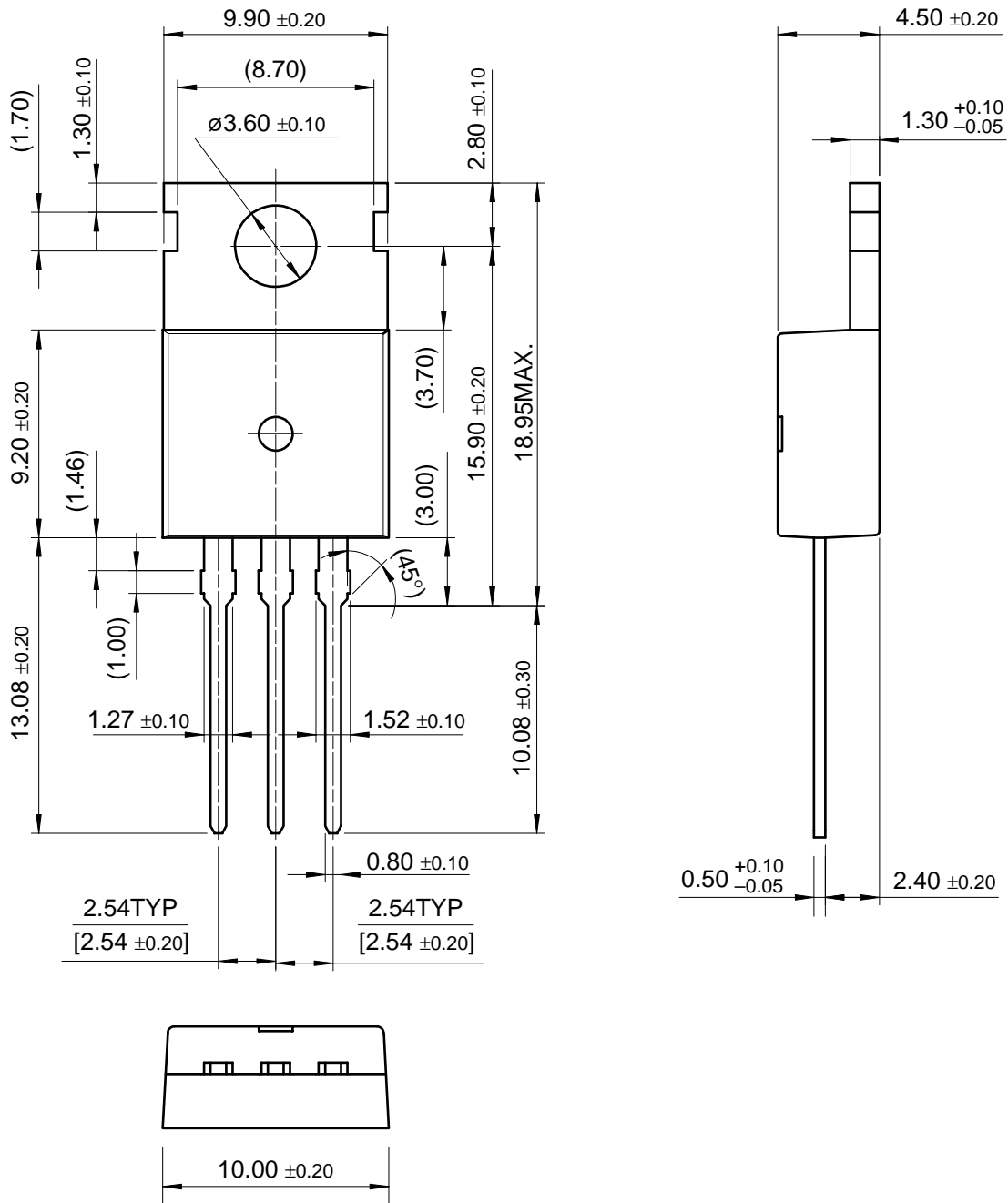




Package Dimensions

TO-220

SSP2N60B/SSS2N60B

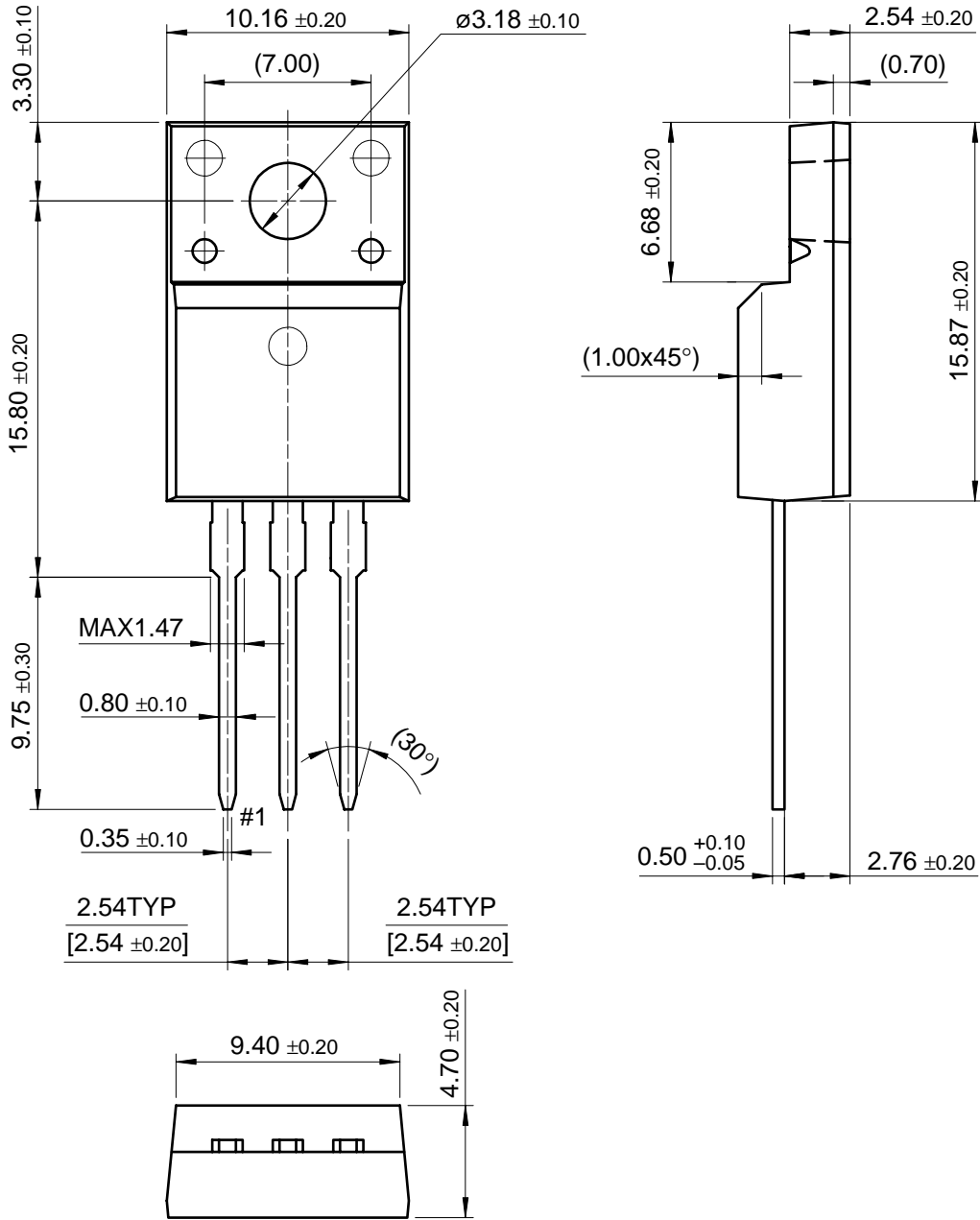


Dimensions in Millimeters



Package Dimensions (Continued)

TO-220F



SSP2N60B/SSS2N60B

Dimensions in Millimeters

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