



November 2001

SSP45N20B/SSS45N20B

200V N-Channel MOSFET

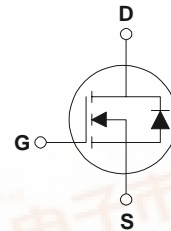
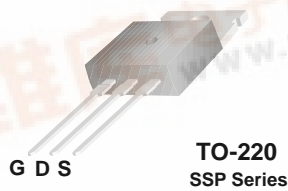
General Description

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 switching DC/DC converters, switch mode power supplies, DC-AC converters for uninterrupted power supply and motor control.

Features

- 35A, 200V, $R_{DS(on)} = 0.065\Omega @ V_{GS} = 10V$
- Low gate charge (typical 133 nC)
- Low C_{rss} (typical 120 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



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

Symbol	Parameter	SSP45N20B	SSS45N20B	Units
V_{DSS}	Drain-Source Voltage	200		V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	35	35 *	A
		22.2	22.2 *	A
I_{DM}	Drain Current - Pulsed (Note 1)	140	140 *	A
V_{GSS}	Gate-Source Voltage	± 30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	650		mJ
I_{AR}	Avalanche Current (Note 1)	35		A
E_{AR}	Repetitive Avalanche Energy (Note 1)	17.6		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°C	176	57	W
		1.41	0.45	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	SSP45N20B	SSS45N20B	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case Max.	0.71	2.2	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	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
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	200	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	--	0.2	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	μA
		$V_{DS} = 160\text{ V}, T_C = 125^\circ\text{C}$	--	--	100	μA
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	$V_{GS} = 10\text{ V}, I_D = 17.5\text{ A}$	--	0.052	0.065	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 17.5\text{ A}$ (Note 4)	--	36	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	3300	4300	pF
C_{oss}	Output Capacitance		--	460	600	pF
C_{rss}	Reverse Transfer Capacitance		--	120	155	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 100\text{ V}, I_D = 45\text{ A},$ $R_G = 25\ \Omega$ (Note 4, 5)	--	45	100	ns
t_r	Turn-On Rise Time		--	340	690	ns
$t_{d(off)}$	Turn-Off Delay Time		--	360	730	ns
t_f	Turn-Off Fall Time		--	270	550	ns
Q_g	Total Gate Charge	$V_{DS} = 160\text{ V}, I_D = 45\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 4, 5)	--	133	173	nC
Q_{gs}	Gate-Source Charge		--	19	--	nC
Q_{gd}	Gate-Drain Charge		--	67	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	35	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	140	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 35\text{ A}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 45\text{ A},$ $dI_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4)	--	245	--	ns
Q_{rr}	Reverse Recovery Charge		--	2.27	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 0.8\text{ mH}, I_{AS} = 35\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 45\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, 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

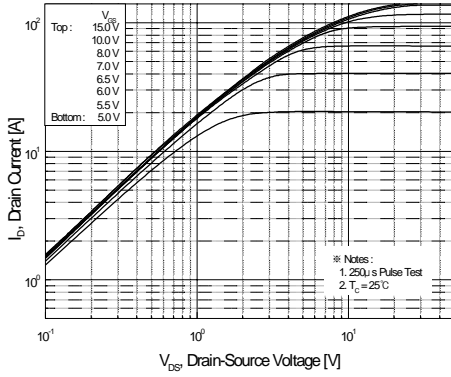


Figure 1. On-Region Characteristics

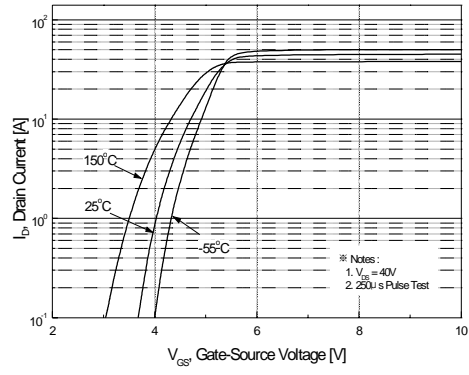


Figure 2. Transfer Characteristics

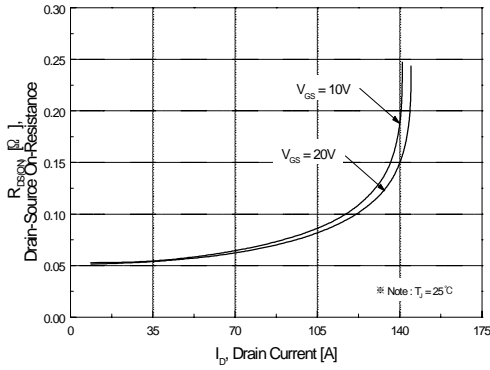


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

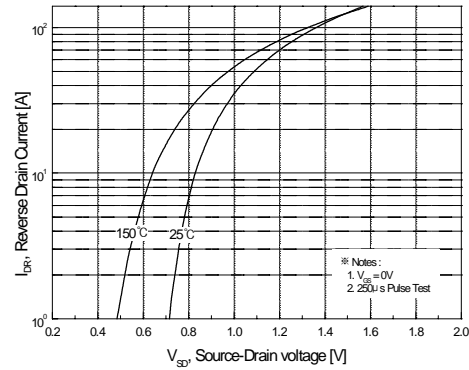


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

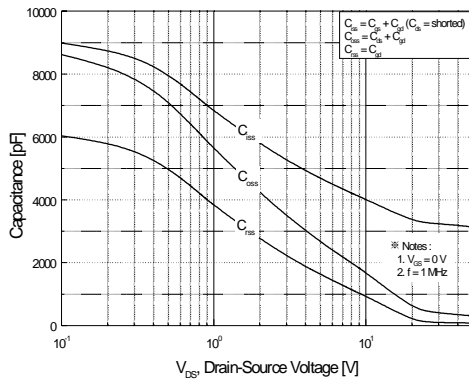


Figure 5. Capacitance Characteristics

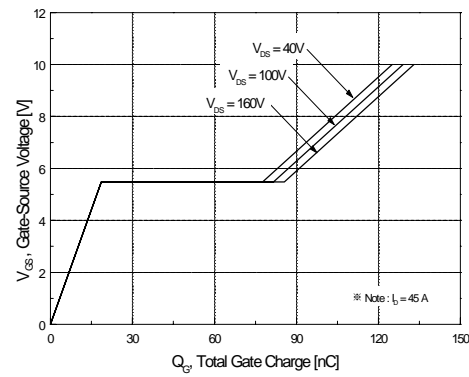


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

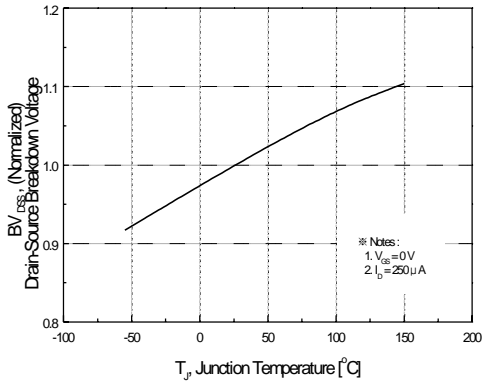


Figure 7. Breakdown Voltage Variation vs Temperature

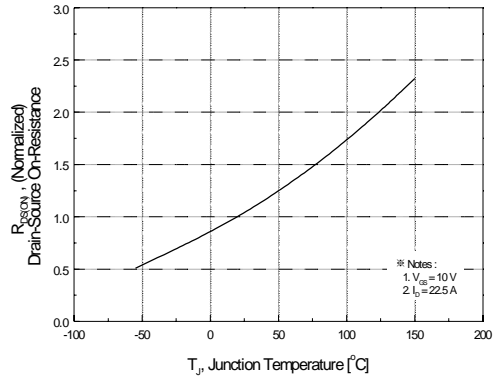


Figure 8. On-Resistance Variation vs Temperature

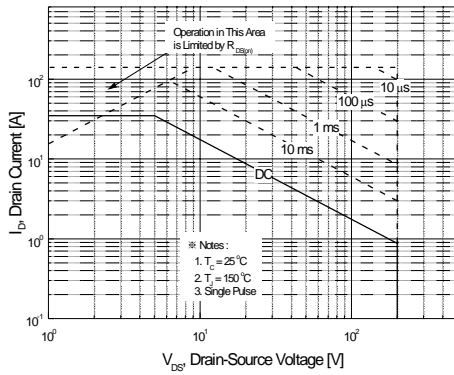


Figure 9-1. Maximum Safe Operating Area for SSP45N20B

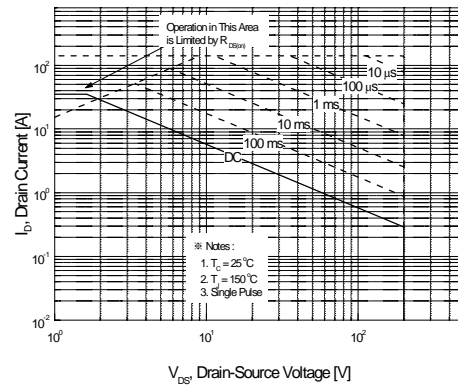


Figure 9-2. Maximum Safe Operating Area for SSS45N20B

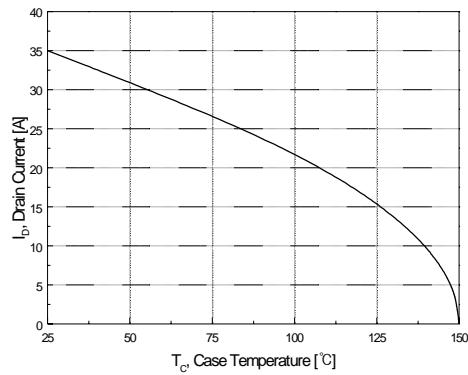


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

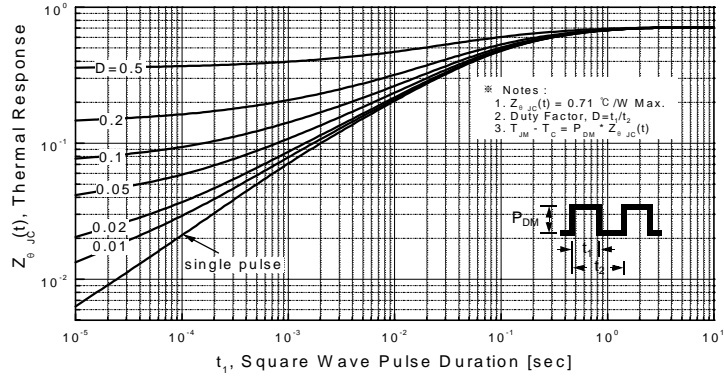


Figure 11-1. Transient Thermal Response Curve to SSP45N20B

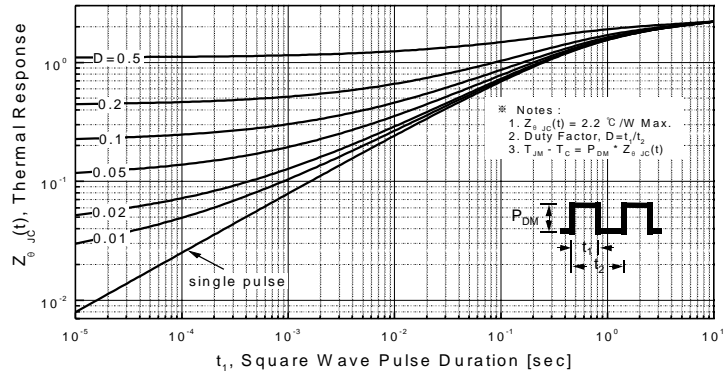
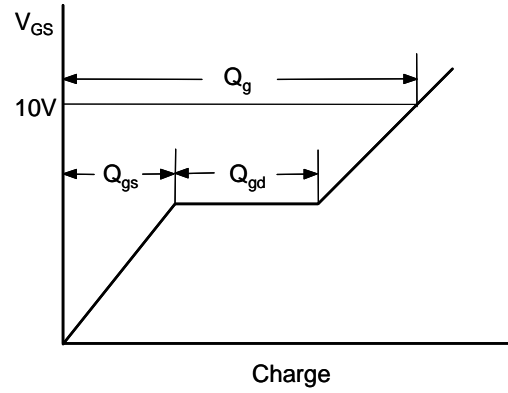
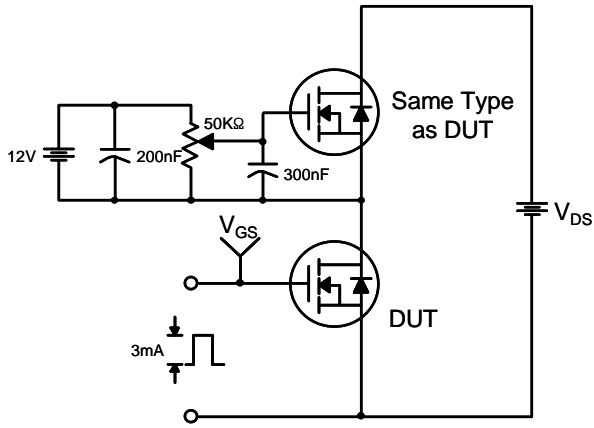
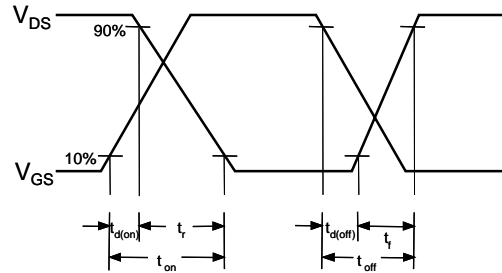
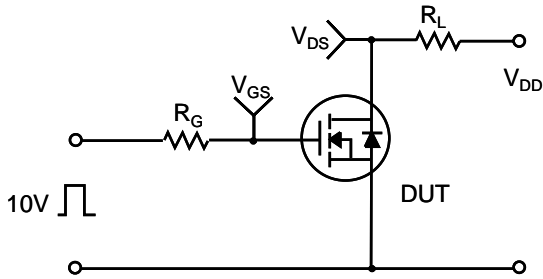


Figure 11-2. Transient Thermal Response Curve SSS45N20B

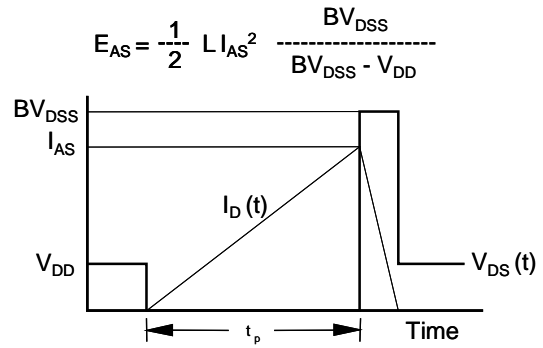
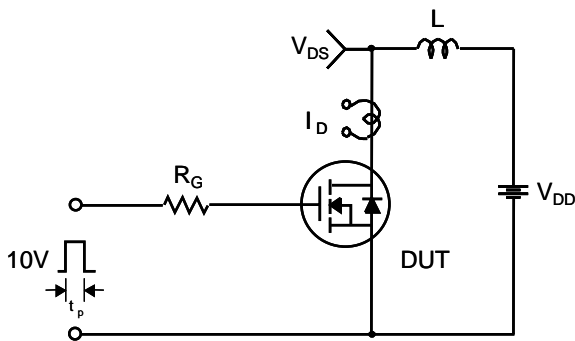
Gate Charge Test Circuit & Waveform



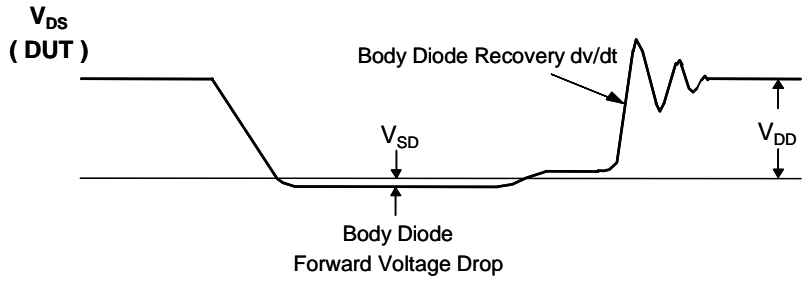
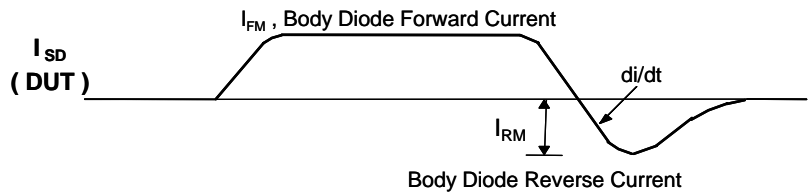
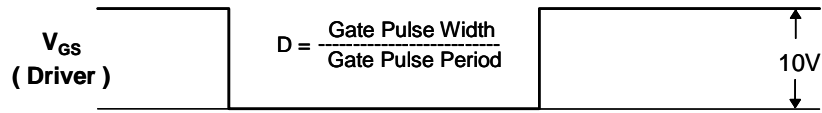
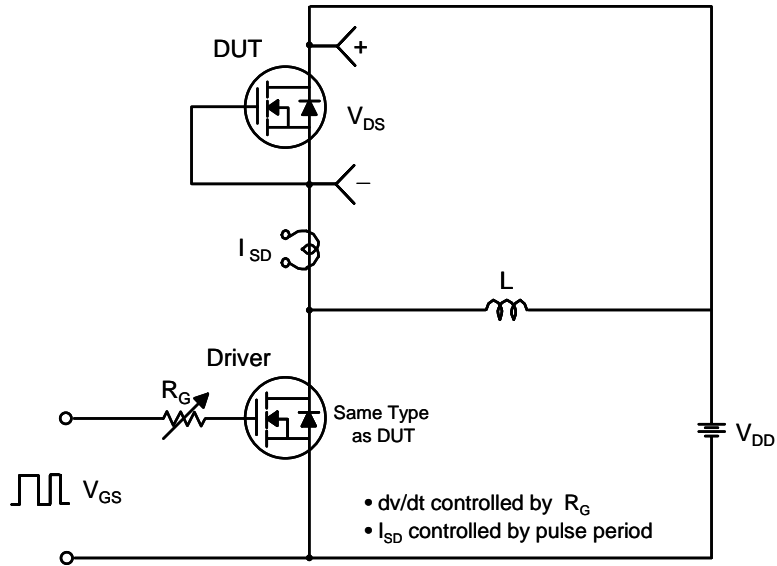
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

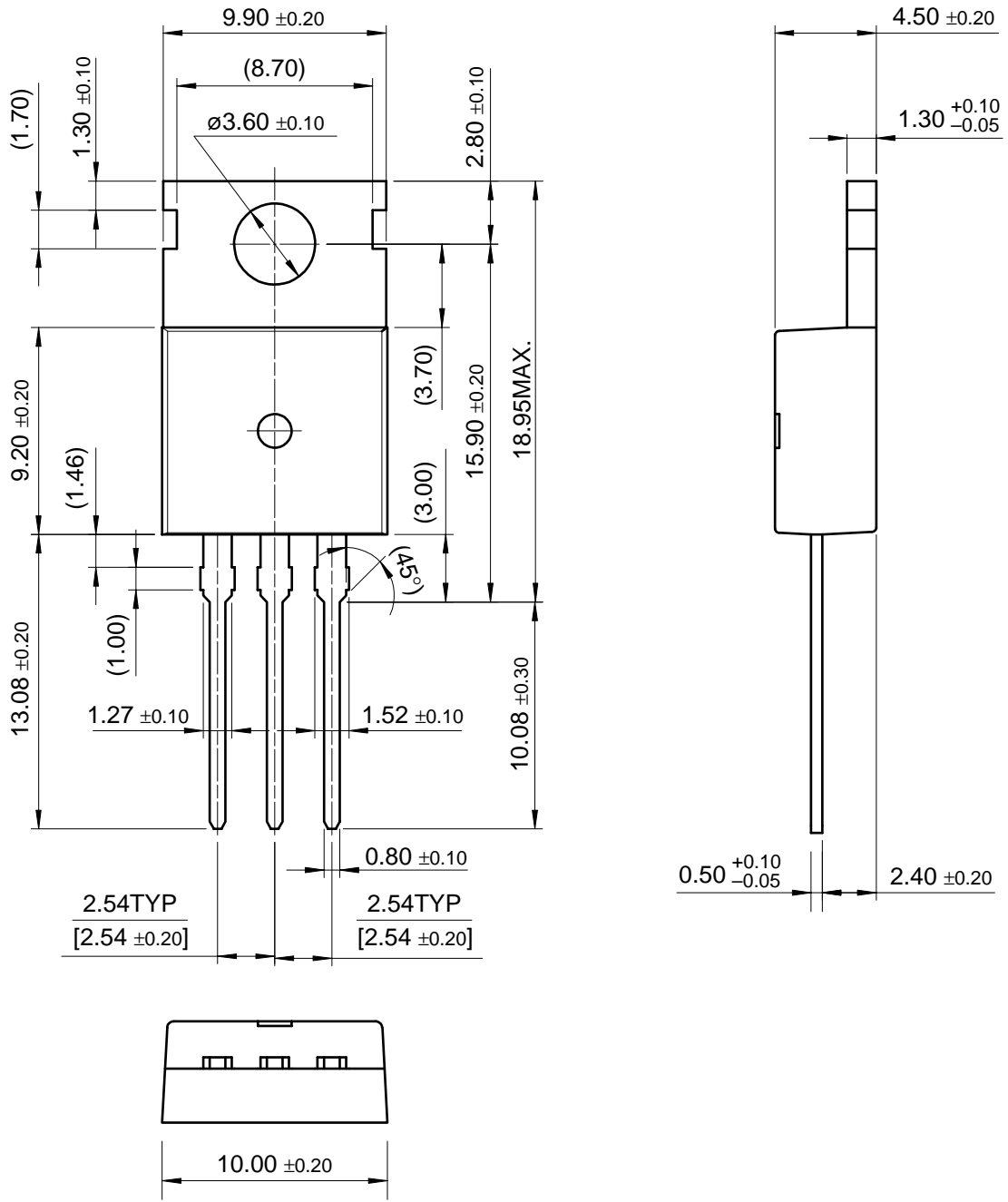


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimensions

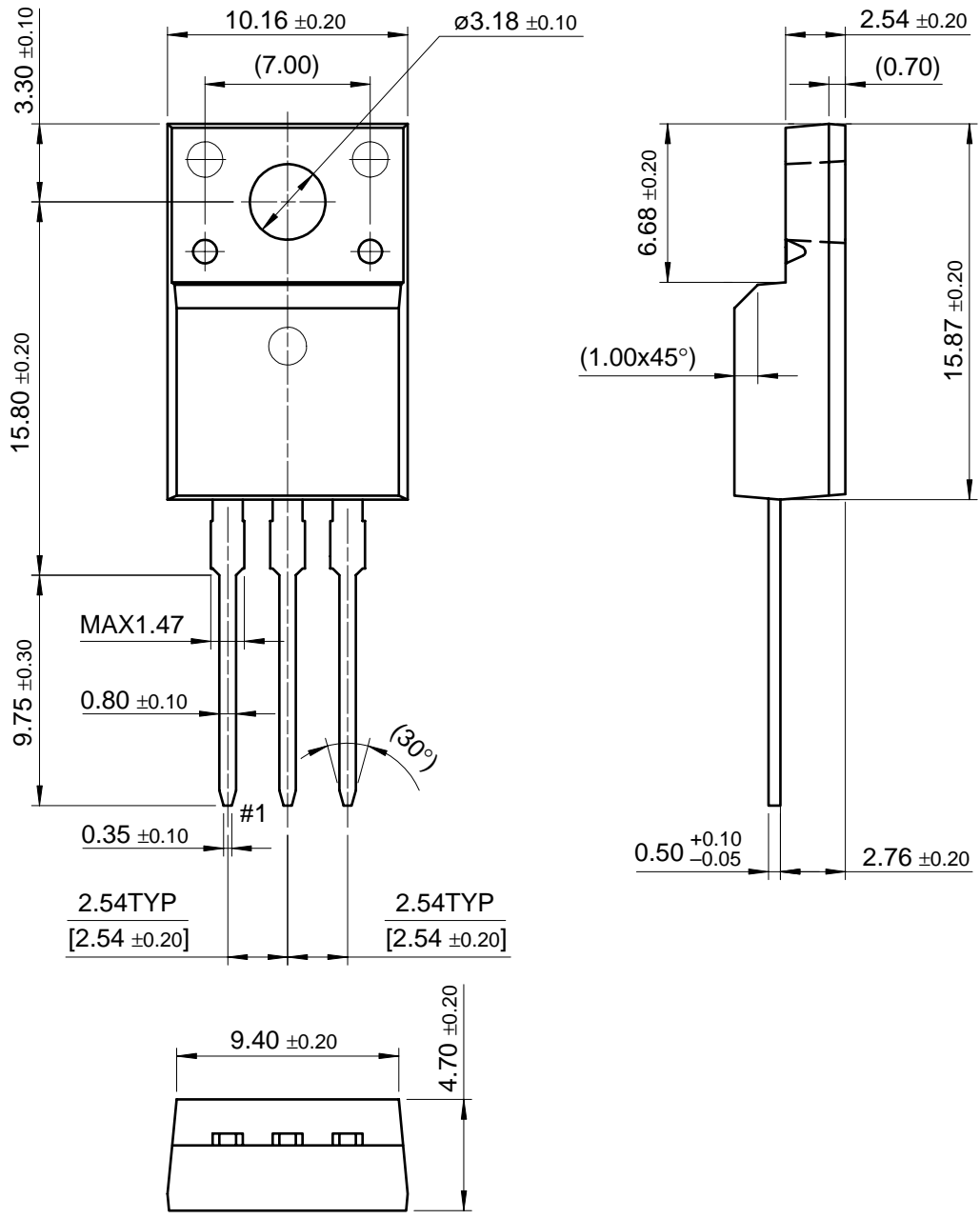
TO-220



Dimensions in Millimeters

Package Dimensions (Continued)

TO-220F



SSP45N20B/SSS45N20B

Dimensions in Millimeters

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