FAIRCHILD
SEMICONDUCTOR®

November 2001

IRF830B/IRFS830B

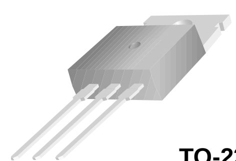
500V N-Channel MOSFET

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, power factor correction and electronic lamp ballasts based on half bridge.

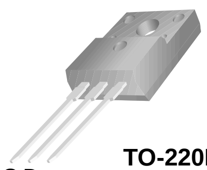
Features

- 4.5A, 500V, $R_{DS(on)}$ = 1.5Ω @V_{GS} = 10 V
- Low gate charge (typical 27 nC)
- Low Crss (typical 17 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



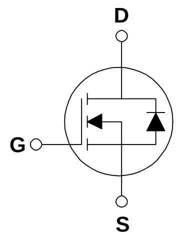
G D S

TO-220
IRF Series



G D S

TO-220F
IRFS Series



Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter			IRF830B	IRFS830	Units
V_{DSS}	Drain-Source Voltage			500		V
I_D	Drain Current	- Continuous (T_C = 25°C)		4.5	4.5 *	A
		- Continuous (T_C = 100°C)		2.9	2.9 *	A
I_{DM}	Drain Current	- Pulsed	(Note 1)	18	18 *	A
V_{GSS}	Gate-Source Voltage			± 30		V
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	270		mJ
I_{AR}	Avalanche Current		(Note 1)	4.5		A
E_{AR}	Repetitive Avalanche Energy		(Note 1)	7.3		mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	5.5		V/ns
P_D	Power Dissipation (T_C = 25°C)			73	38	W
		- Derate above 25°C		0.58	0.3	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150		°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds			300		°C

* Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	IRF830B	IRFS830B	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case Max.	1.71	3.31	°C/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient Max.	62.5	62.5	°C/W

Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	500	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C	--	0.54	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 500 V, V_{GS} = 0 V	--	--	10	µA
		V_{DS} = 400 V, T_C = 125°C	--	--	100	µA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 2.25 A	--	1.16	1.5	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 2.25 A (Note 4)	--	4.2	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	800	1050	pF
C_{oss}	Output Capacitance		--	76	100	pF
C_{rss}	Reverse Transfer Capacitance		--	17	22	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 250 V, I_D = 4.5 A, R_G = 25 Ω (Note 4, 5)	--	15	40	ns
t_r	Turn-On Rise Time		--	40	90	ns
$t_{d(off)}$	Turn-Off Delay Time		--	85	180	ns
t_f	Turn-Off Fall Time		--	45	100	ns
Q_g	Total Gate Charge	V_{DS} = 400 V, I_D = 4.5 A, V_{GS} = 10 V (Note 4, 5)	--	27	35	nC
Q_{gs}	Gate-Source Charge		--	4.0	--	nC
Q_{gd}	Gate-Drain Charge		--	12	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	4.5	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	18	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 4.5 A	--	--	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 4.5 A, dI_F / dt = 100 A/µs (Note 4)	--	305	--	ns
Q_{rr}	Reverse Recovery Charge		--	2.6	--	µC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 24mH, I_{AS} = 4.5A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
3. $I_{SD} \leq$ 4.5A, di/dt $\leq$ 300A/µs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C
4. Pulse Test : Pulse width $\leq$ 300µs, Duty cycle $\leq$ 2%
5. Essentially independent of operating temperature

Typical Characteristics

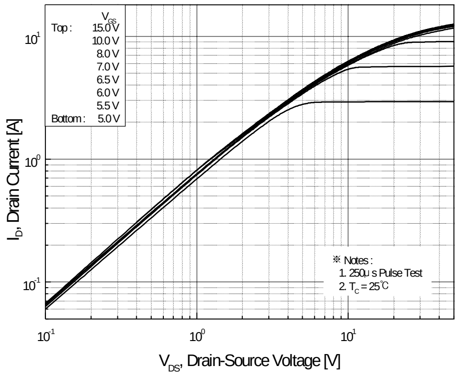


Figure 1. On-Region Characteristics

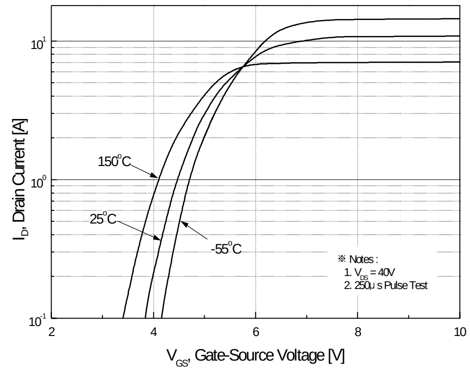


Figure 2. Transfer Characteristics

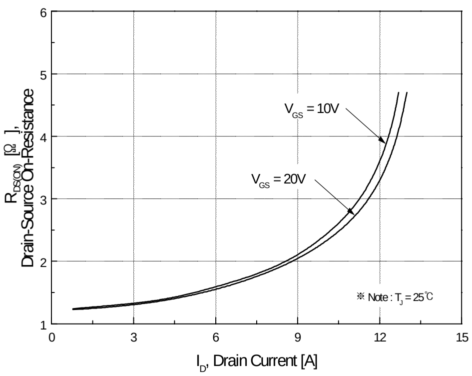


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

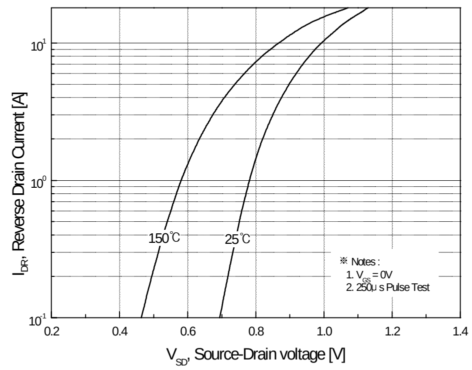


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

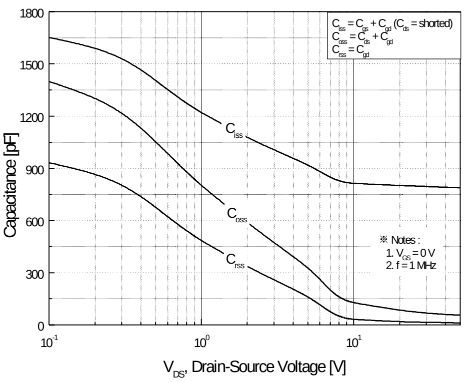


Figure 5. Capacitance Characteristics

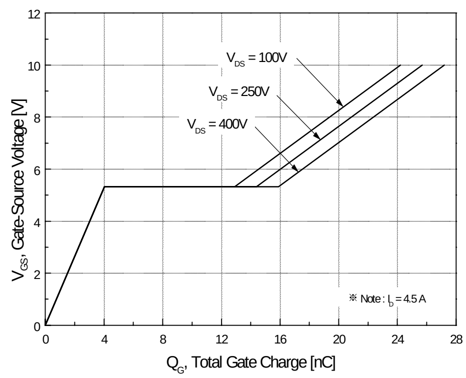


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

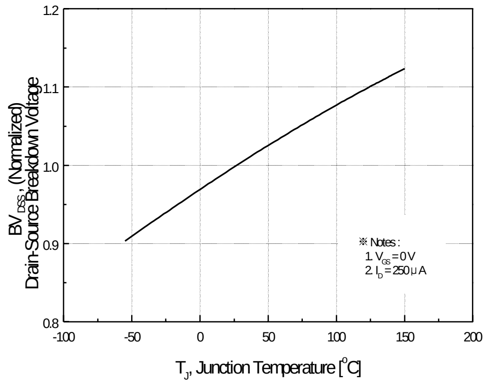


Figure 7. Breakdown Voltage Variation vs Temperature

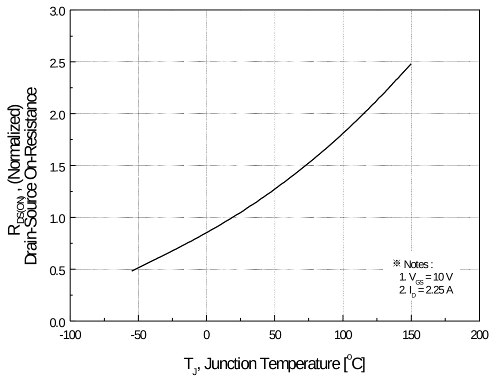


Figure 8. On-Resistance Variation

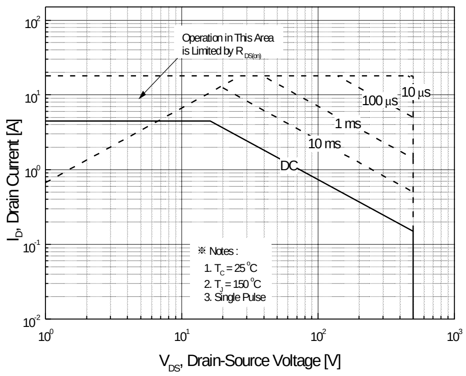


Figure 9-1. Maximum Safe Operating Area for IRF830B

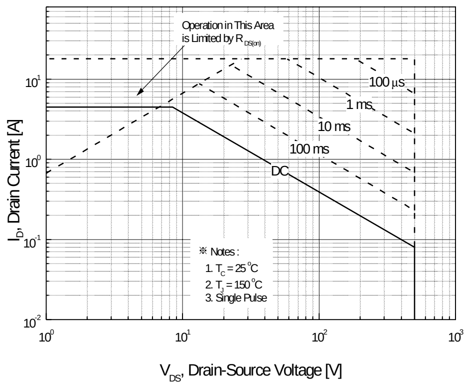


Figure 9-2. Maximum Safe Operating Area for IRFS830B

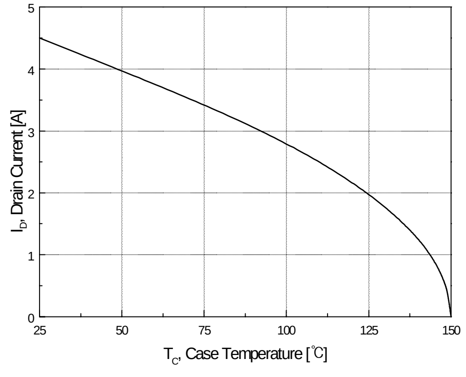


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

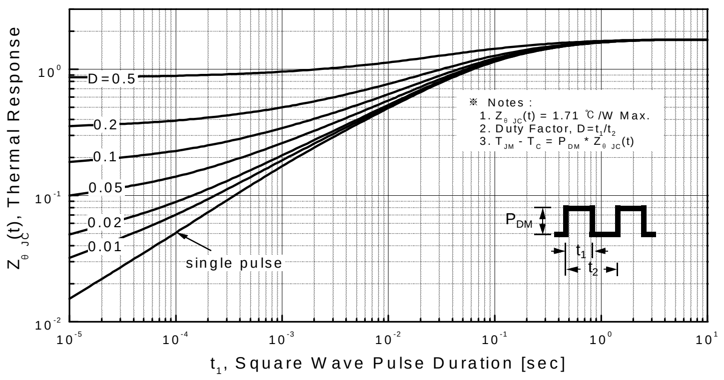


Figure 11-1. Transient Thermal Response Curve for IRF830B

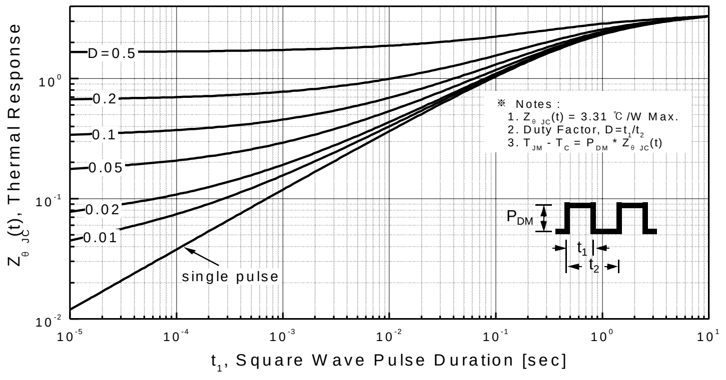
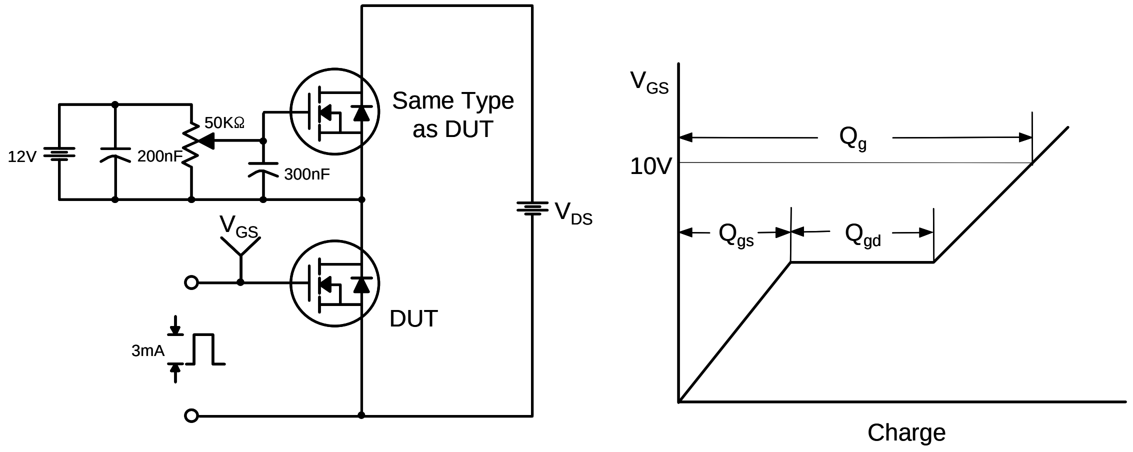
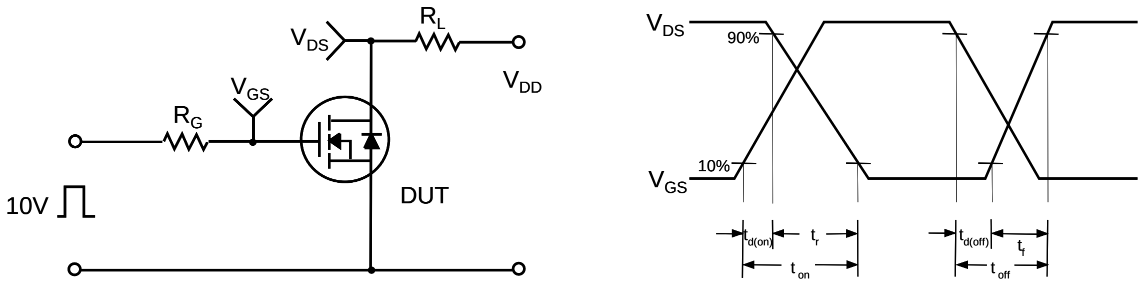


Figure 11-2. Transient Thermal Response Curve for IRFS830B

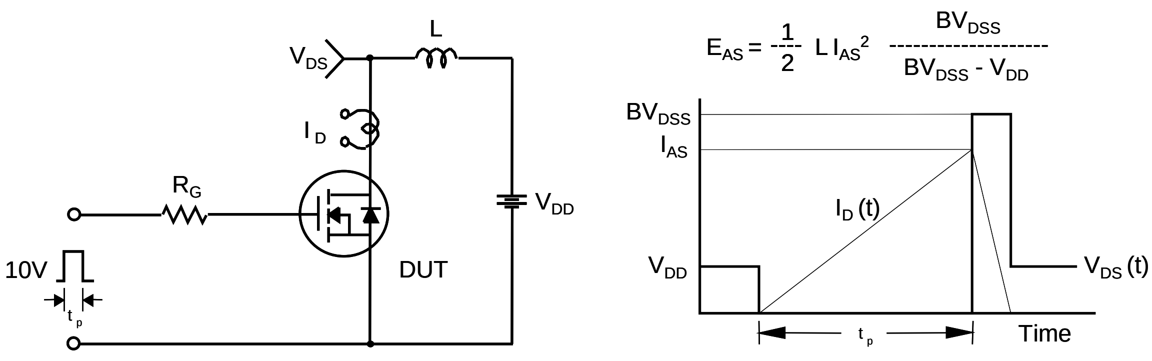
Gate Charge Test Circuit & Waveform



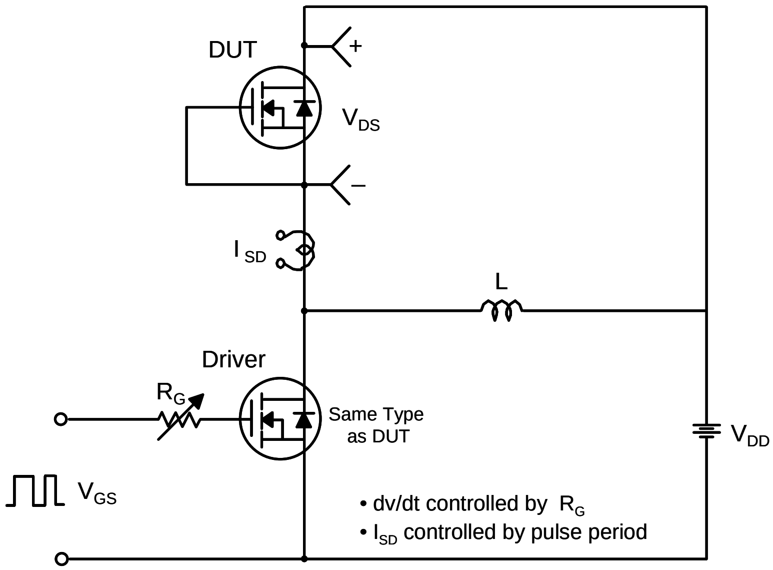
Resistive Switching Test Circuit & Waveforms

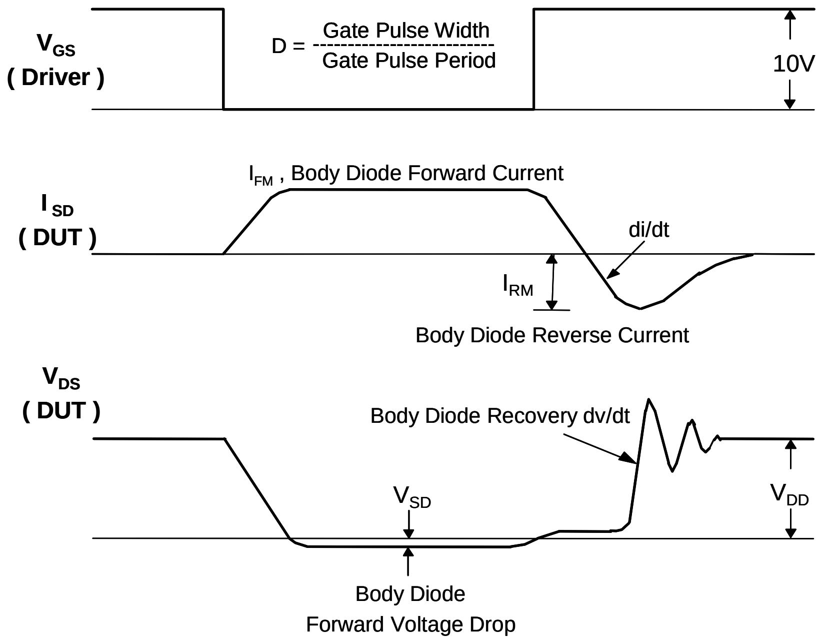


Unclamped Inductive Switching Test Circuit & Waveforms

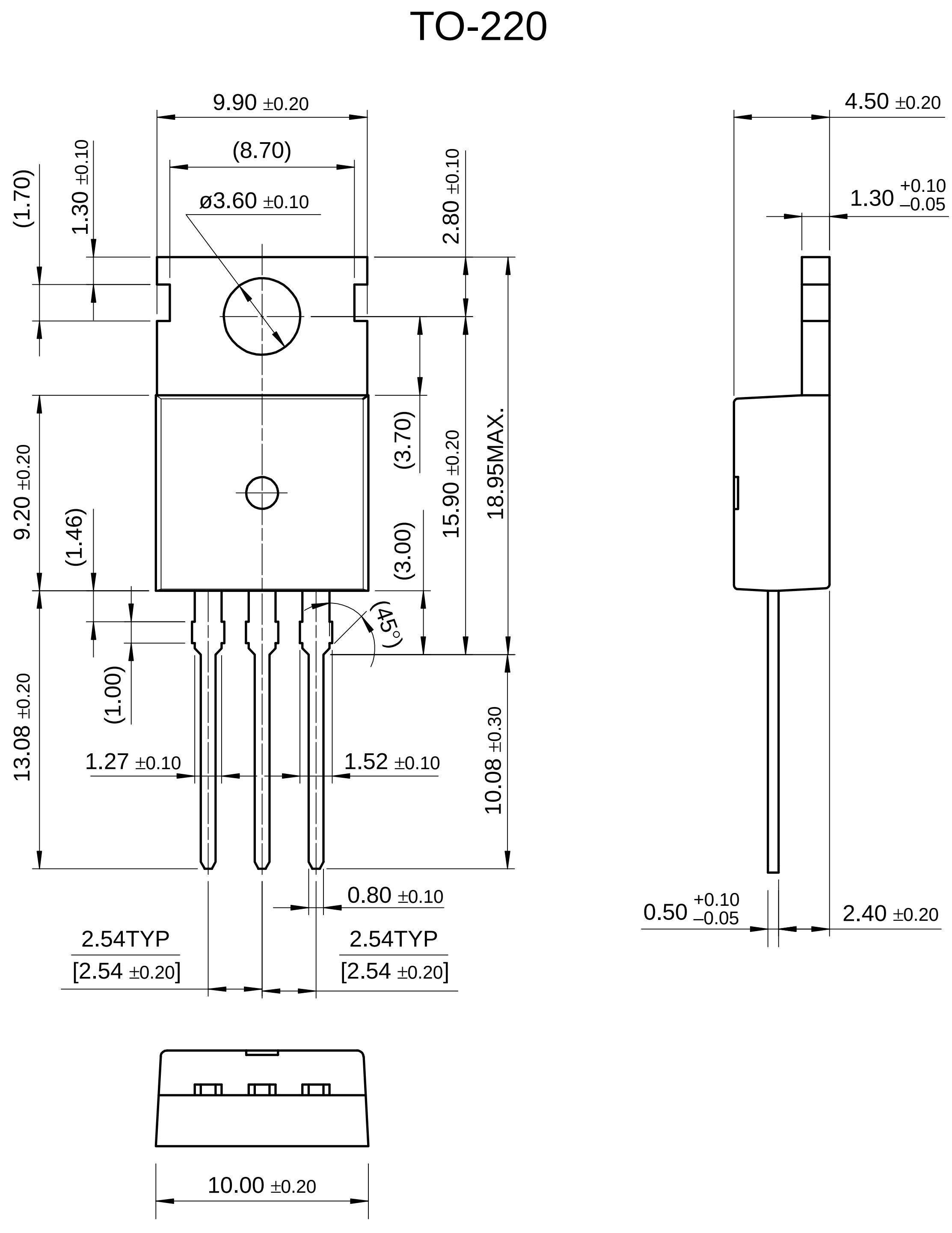


Peak Diode Recovery dv/dt Test Circuit & Waveforms





Package Dimensions



Dimensions in Millimeters

Package Dimensions (Continued)

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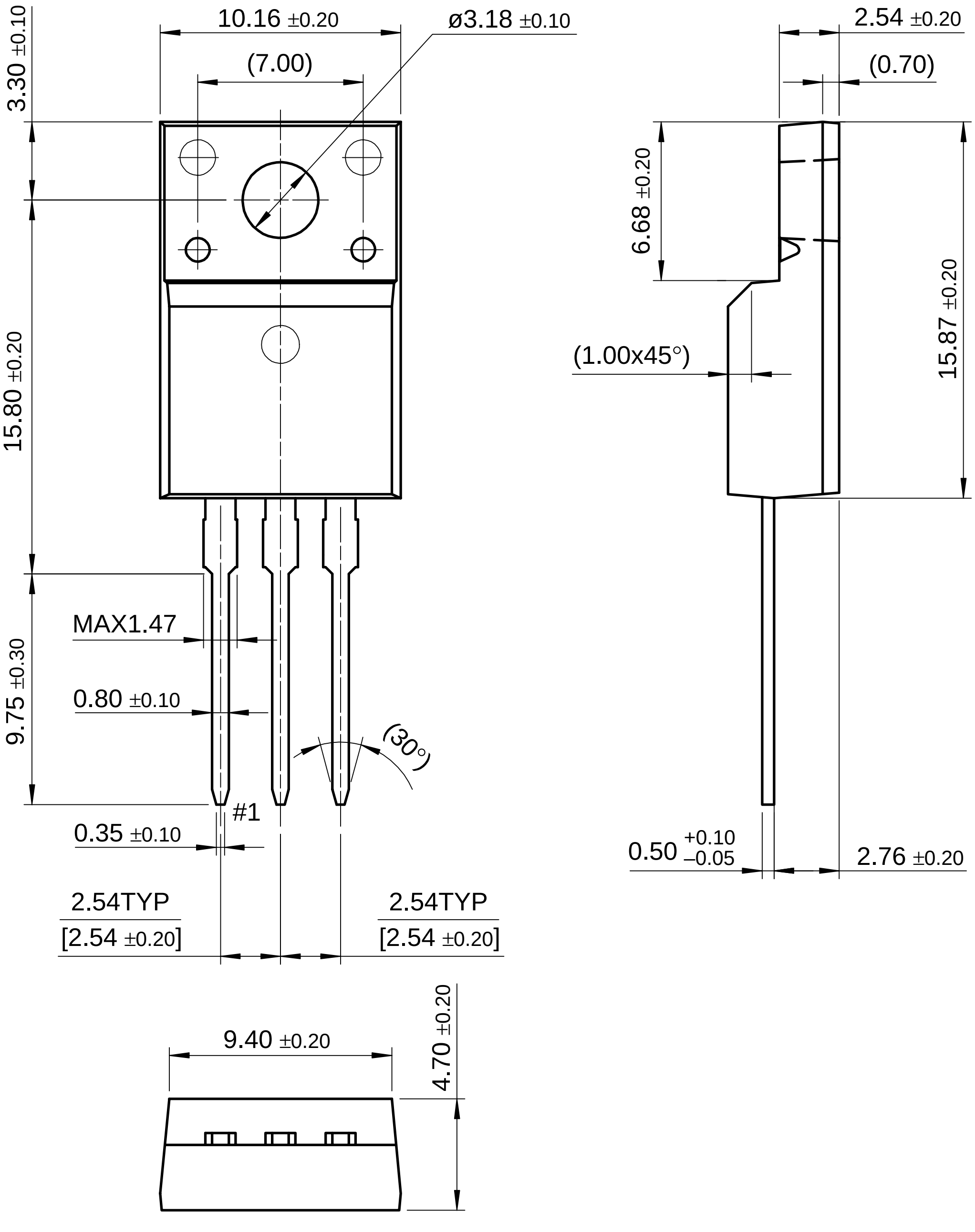

Dimensions in Millimeters

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
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Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

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IRFS830B
500V N-Channel B-FET / Substitute of IRFS830 & IRFS830A

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General description

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Product status/pricing/packaging

Product	Product status	Pricing*	Package type	Leads	Packing method

IRFS830B	Full Production	$0.66	TO-220F	3	RAIL
IRFS830BT	Full Production	$0.66	TO-220F	3	RAIL

* 1,000 piece Budgetary Pricing

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Application notes

AN-4121: AN-4121 Design of Power Factor Correction Circuit Using FAN7527B (124 K) Jul 19, 2002

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