April 2013

FQB19N20L / FQI19N20L

N-Channel QFET® MOSFET

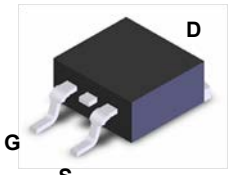
200 V, 21 A, 140 mΩ

Description

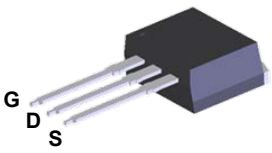
This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor®'s proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

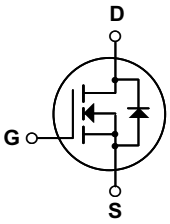
- 21 A, 200 V, $R_{DS(on)}$ = 140 mΩ (Max.) @ V_{GS} = 10 V, I_D = 10.5 A
- Low Gate Charge (Typ. 27 nC)
- Low Crss (Typ. 30 pF)
- 100% Avalanche Tested
- Low level gate drive requirement allowing direct operation from logic drivers



D^2-PAK



I^2-PAK



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter		FQB19N20L / FQI19N20L	Unit
V_{DSS}	Drain-Source Voltage		200	V
I_D	Drain Current - Continuous (T_C = 25°C)		21	A
	- Continuous (T_C = 100°C)		13.3	A
I_{DM}	Drain Current - Pulsed	(Note 1)	84	A
V_{GSS}	Gate-Source Voltage		± 20	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	250	mJ
I_{AR}	Avalanche Current	(Note 1)	21	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	14	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	5.5	V/ns
P_D	Power Dissipation (T_A = 25°C) *		3.13	W
	Power Dissipation (T_C = 25°C)		140	W
	- Derate above 25°C		1.12	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

Thermal Characteristics

Symbol	Parameter	FQB19N20L / FQI19N20L	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.89	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient *	40	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	°C/W

* When mounted on the minimum pad size recommended (PCB Mount)

Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	200	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.16	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 200 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 160 V, T_C = 125°C	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 20 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -20 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	1.0	--	2.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 10.5 A V_{GS} = 5 V, I_D = 10.5 A (Note 4)	--	0.11 0.12	0.14 0.15	Ω
g_{FS}	Forward Transconductance	V_{DS} = 30 V, I_D = 10.5 A	--	18.5	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	1700	2200	pF
C_{oss}	Output Capacitance		--	220	290	pF
C_{rss}	Reverse Transfer Capacitance		--	30	40	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 100 V, I_D = 21 A, R_G = 25 Ω (Note 4, 5)	--	35	80	ns
t_r	Turn-On Rise Time		--	300	610	ns
$t_{d(off)}$	Turn-Off Delay Time		--	130	270	ns
t_f	Turn-Off Fall Time		--	180	370	ns
Q_g	Total Gate Charge	V_{DS} = 160 V, I_D = 21 A, V_{GS} = 5 V (Note 4, 5)	--	27	35	nC
Q_{gs}	Gate-Source Charge		--	5.8	--	nC
Q_{gd}	Gate-Drain Charge		--	11.2	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	21	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	84	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 21 A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 21 A, (Note 4) dI_F / dt = 100 A/μs	--	140	--	ns
Q_{rr}	Reverse Recovery Charge		--	0.66	--	μC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 0.85mH, I_{AS} = 21A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
3. $I_{SD} \leq$ 21A, 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

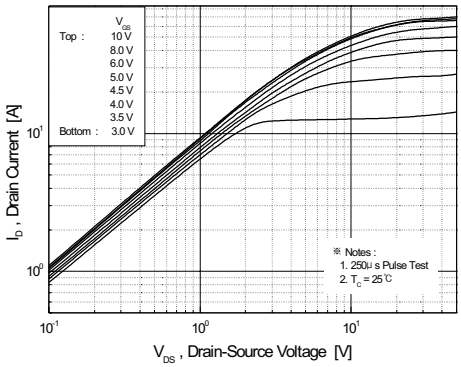


Figure 1. On-Region Characteristics

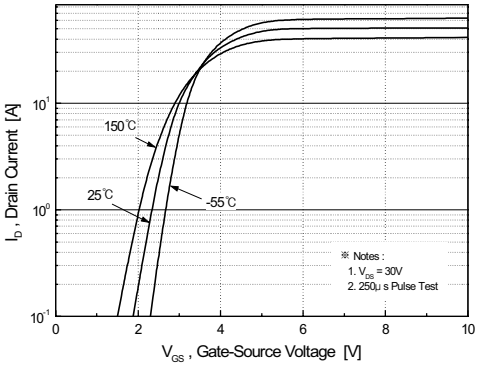


Figure 2. Transfer Characteristics

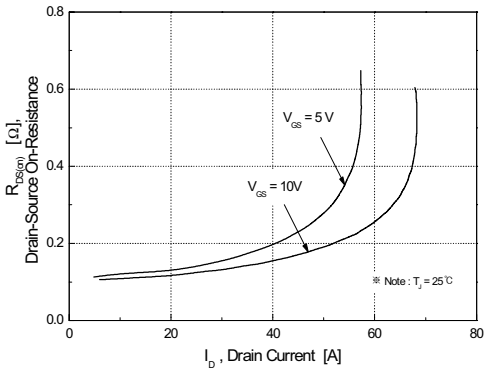


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

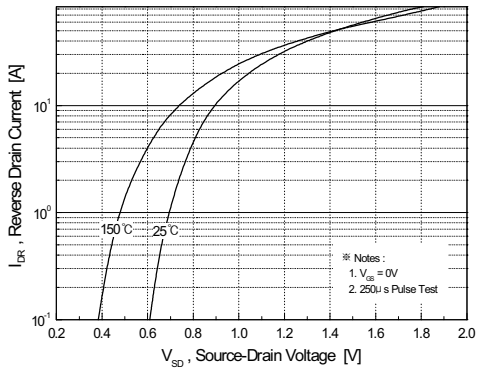


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

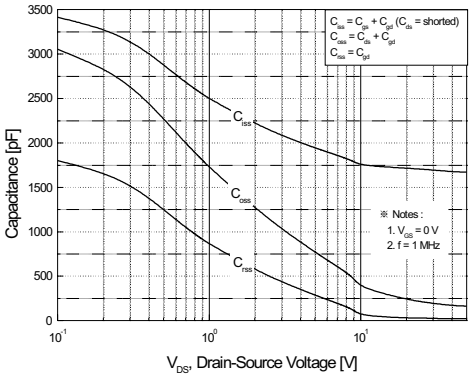


Figure 5. Capacitance Characteristics

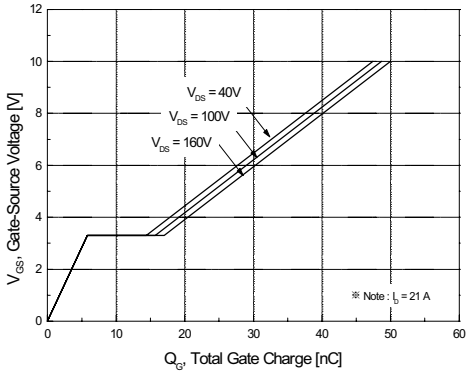


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

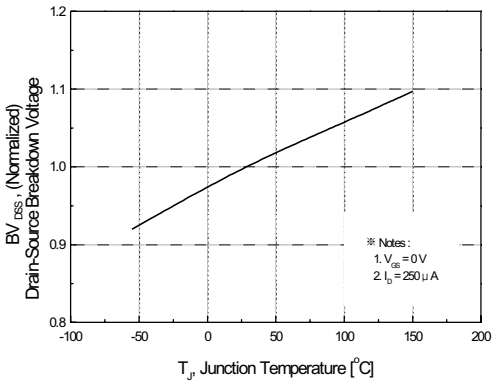


Figure 7. Breakdown Voltage Variation vs. Temperature

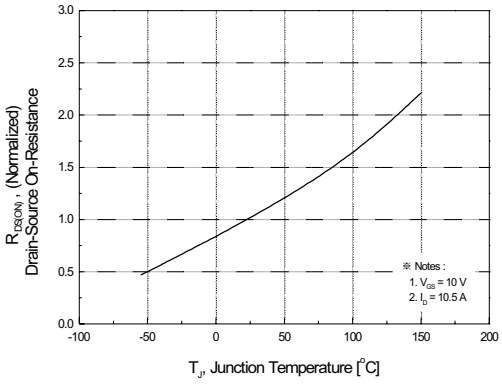


Figure 8. On-Resistance Variation vs. Temperature

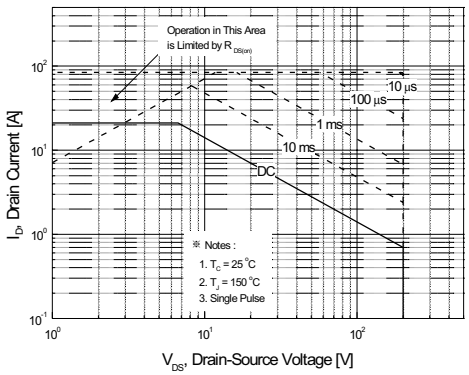


Figure 9. Maximum Safe Operating Area

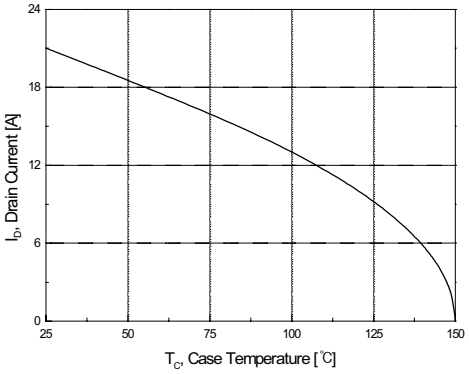


Figure 10. Maximum Drain Current vs. Case Temperature

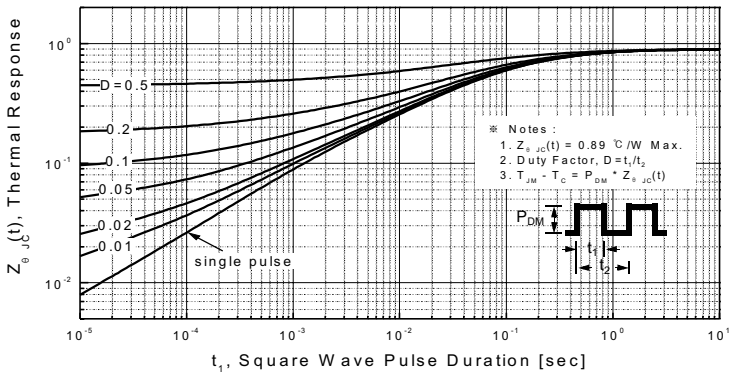
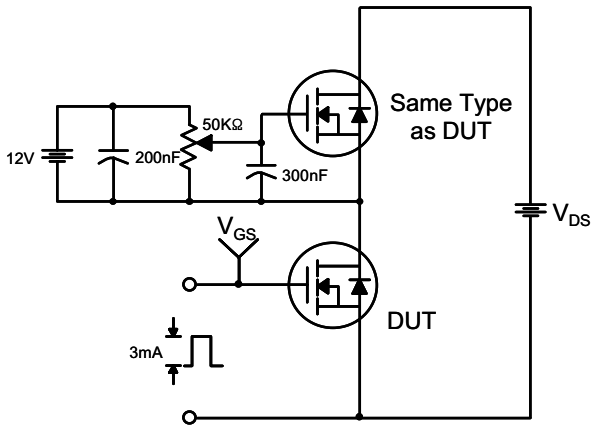
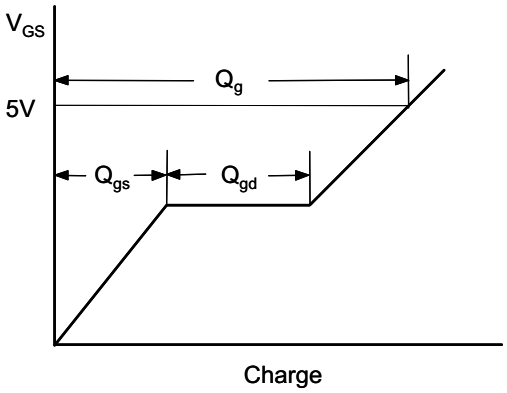


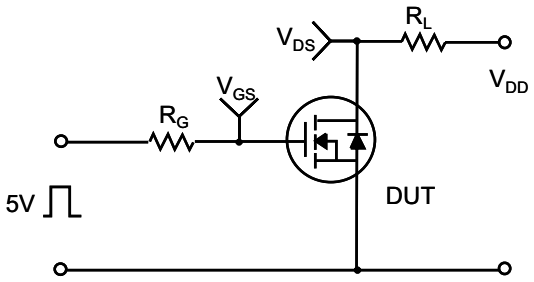
Figure 11. Transient Thermal Response Curve

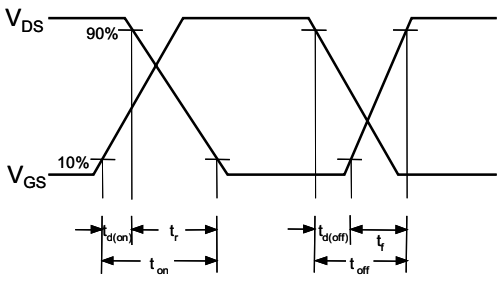
Gate Charge Test Circuit & Waveform



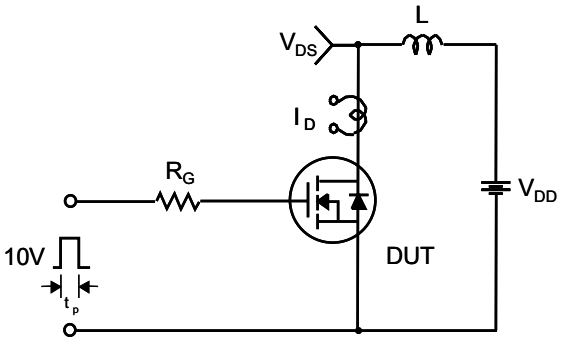


Resistive Switching Test Circuit & Waveforms

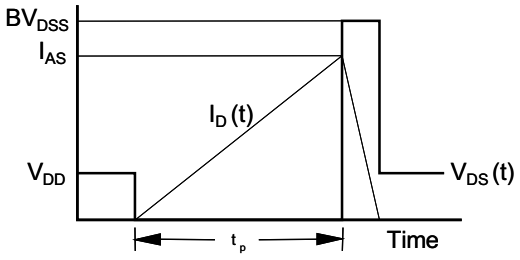




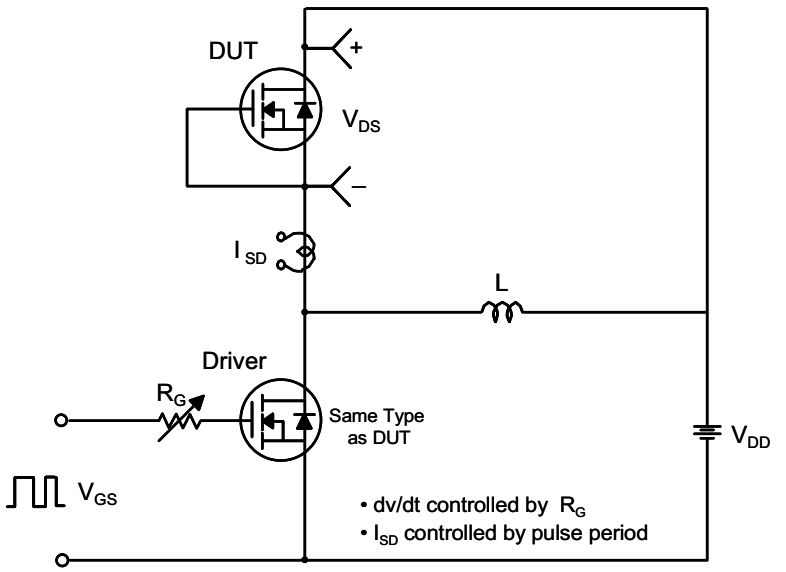
Unclamped Inductive Switching Test Circuit & Waveforms

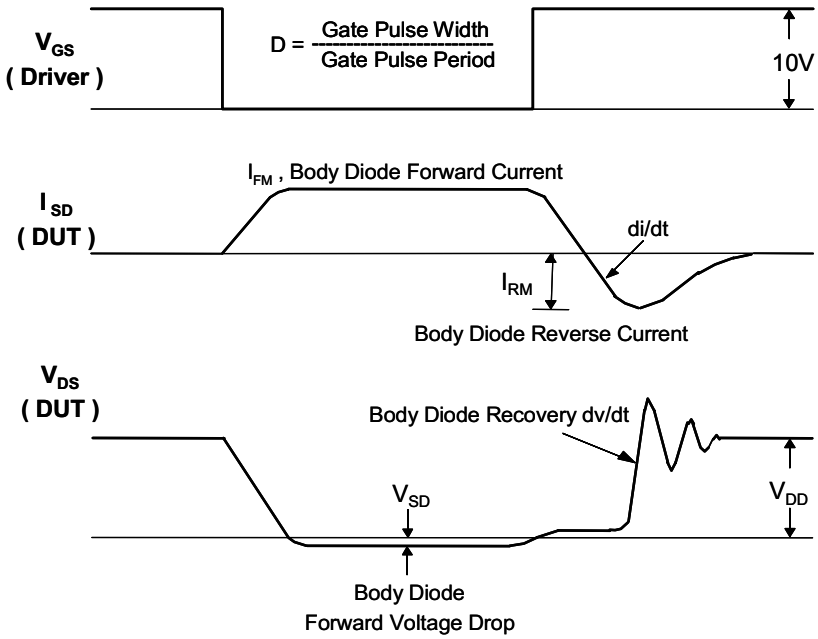


$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



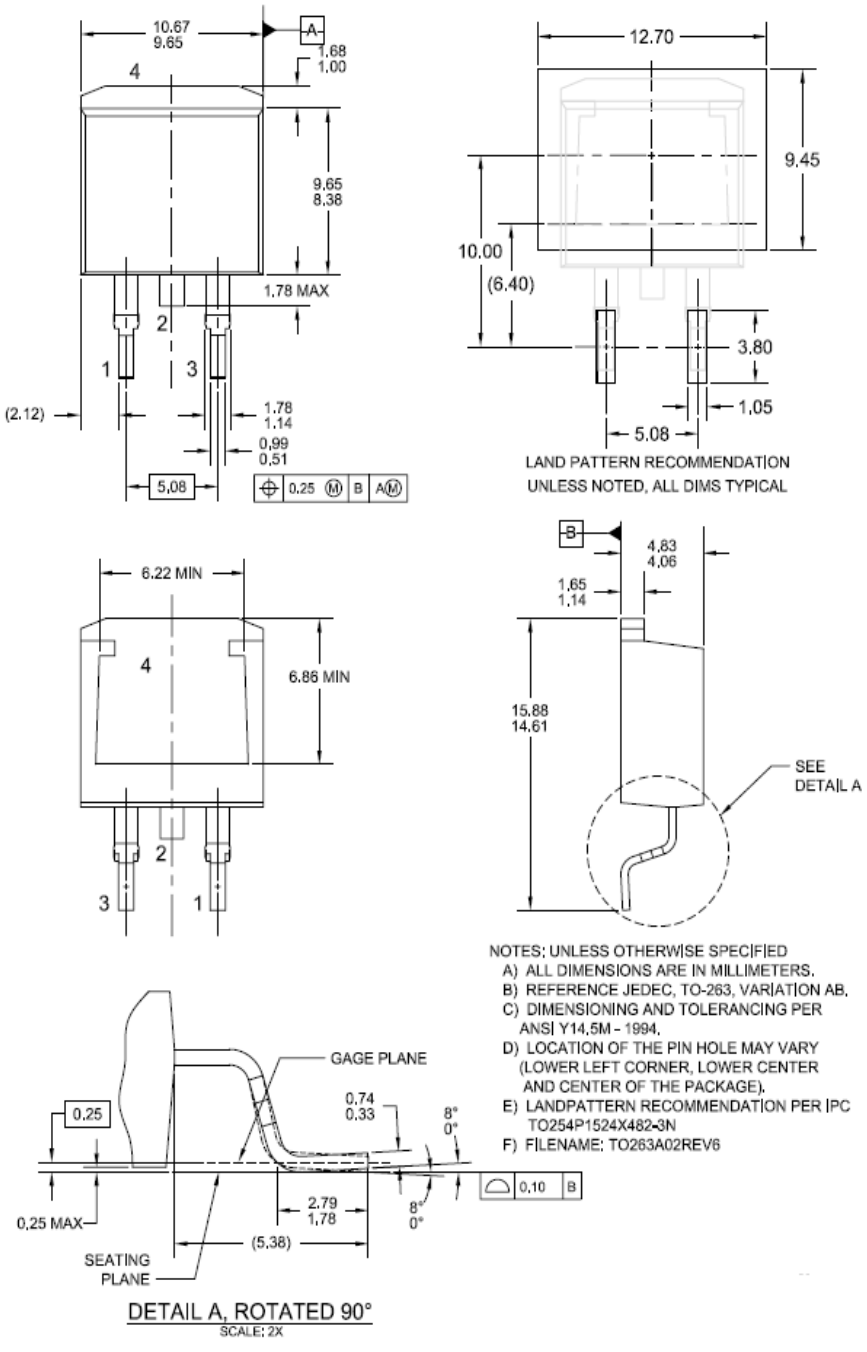
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

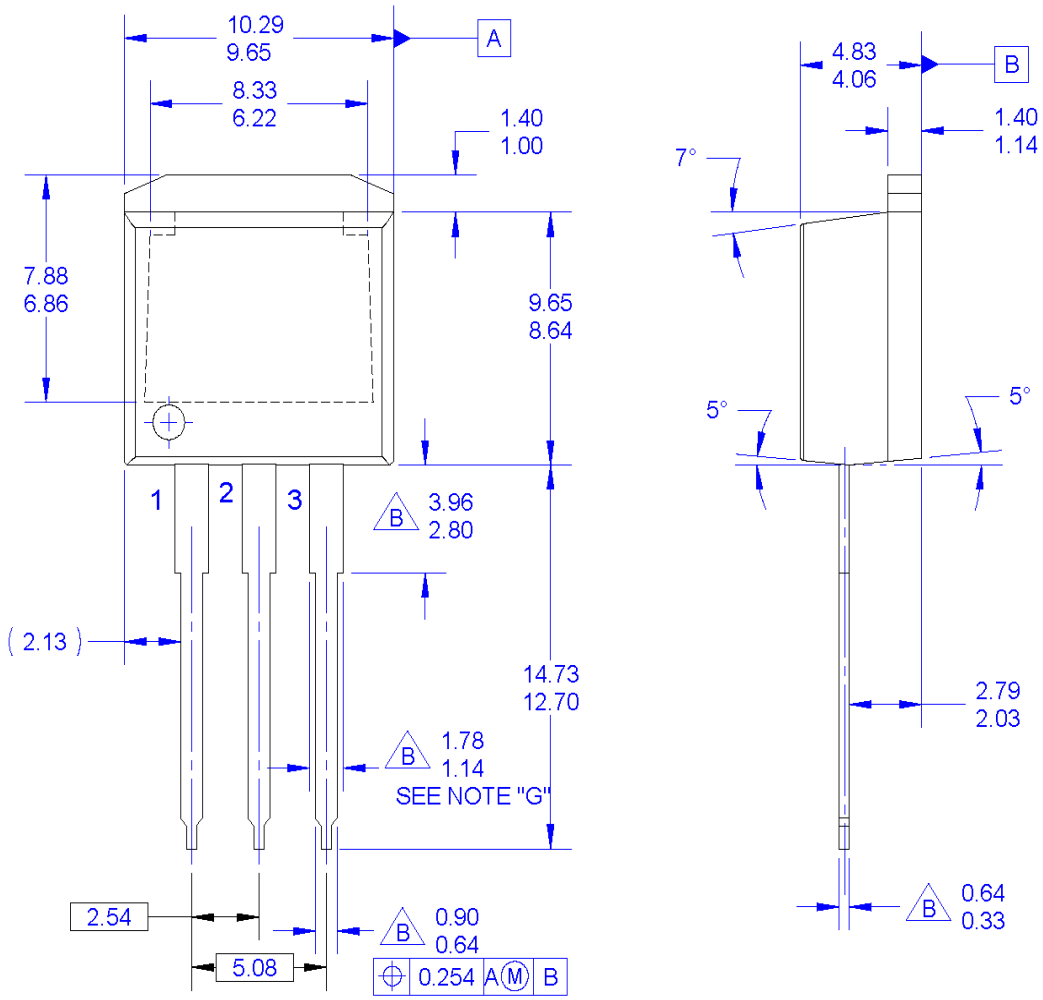
D^2PAK



Dimensions in Millimeters

Mechanical Dimensions

I² PAK



NOTES:

A. EXCEPT WHERE NOTED CONFORMS TO TO262 JEDEC VARIATION AA.
B. DOES NOT COMPLY JEDEC STD. VALUE.
C. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
E. DIMENSION AND TOLERANCE AS PER ANSI Y14.5-1994.
F. LOCATION OF PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF PACKAGE)
G. MAXIMUM WIDTH FOR F102 DEVICE = 1.35 MAX.
H. DRAWING FILE NAME: TO262A03REV5

Dimensions in Millimeters

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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I64