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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD SEMICONDUCTOR®

April 2013

FQD7P06

P-Channel QFET® MOSFET

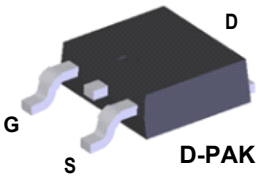
- 60 V, - 5.4 A, 450 mΩ

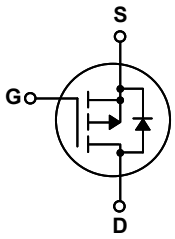
Description

This P-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, audio amplifier, DC motor control, and variable switching power applications.

Features

- - 5.4 A, - 60 V, $R_{DS(on)}$ = 450 mΩ (Max.) @ V_{GS} = - 10 V, I_D = - 2.7 A
- Low Gate Charge (Typ. 6.3 nC)
- Low Crss (Typ. 25 pF)
- 100% Avalanche Tested





Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter			FQD7P06	Unit
V_{DSS}	Drain-Source Voltage			-60	V
I_D	Drain Current	- Continuous (T_C = 25°C)		-5.4	A
		- Continuous (T_C = 100°C)		-3.42	A
I_{DM}	Drain Current	- Pulsed	(Note 1)	-21.6	A
V_{GSS}	Gate-Source Voltage			± 25	V
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	90	mJ
I_{AR}	Avalanche Current		(Note 1)	-5.4	A
E_{AR}	Repetitive Avalanche Energy		(Note 1)	2.8	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	-7.0	V/ns
P_D	Power Dissipation (T_A = 25°C) *			2.5	W
	Power Dissipation (T_C = 25°C)			28	W
	- Derate above 25°C			0.22	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	FQD7P06	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	4.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient *	50	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	110	°C/W

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

Elerical 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	-60	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = -250 μA, Referenced to 25°C	--	-0.07	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -60 V, V_{GS} = 0 V	--	--	-1	μA
		V_{DS} = -48 V, T_C = 125°C	--	--	-10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = -25 V, V_{DS} = 0 V	--	--	-100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = 25 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 = -2.7 A	--	0.36	0.451	Ω
g_{FS}	Forward Transconductance	V_{DS} = -30 V, I_D = -2.7 A	--	3.8	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -25 V, V_{GS} = 0 V, f = 1.0 MHz	--	225	295	pF
C_{oss}	Output Capacitance		--	110	145	pF
C_{rss}	Reverse Transfer Capacitance		--	25	32	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -30 V, I_D = -3.5 A, R_G = 25 Ω	--	7	25	ns
t_r	Turn-On Rise Time		--	50	110	ns
$t_{d(off)}$	Turn-Off Delay Time		--	7.5	25	ns
t_f	Turn-Off Fall Time	(Note 4)	--	25	60	ns
Q_g	Total Gate Charge	V_{DS} = -48 V, I_D = -7.0 A, V_{GS} = -10 V	--	6.3	8.2	nC
Q_{gs}	Gate-Source Charge		--	1.6	--	nC
Q_{gd}	Gate-Drain Charge	(Note 4)	--	3.1	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	-5.4	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	-21.6	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = -5.4 A	--	--	-4.0	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = -7.0 A, dI_F / dt = 100 A/μs	--	77	--	ns
Q_{rr}	Reverse Recovery Charge		--	0.23	--	μC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 3.6mH, I_{AS} = -5.4A, V_{DD} = -25V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ -7.0A, di/dt ≤ 300A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially independent of operating temperature

Typical Characteristics

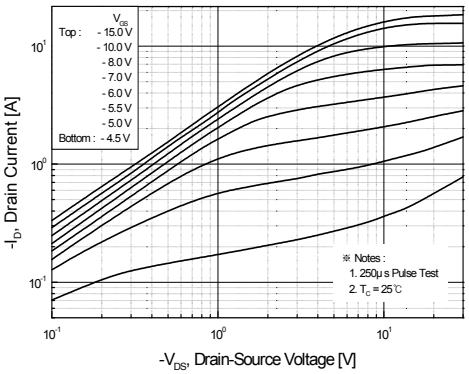


Figure 1. On-Region Characteristics

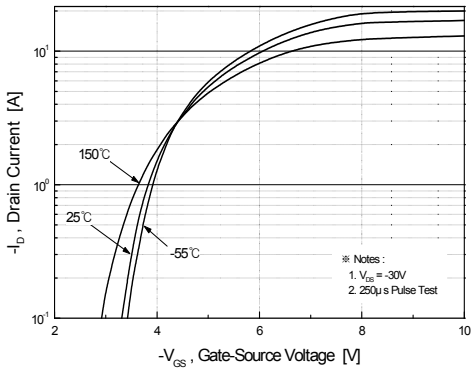


Figure 2. Transfer Characteristics

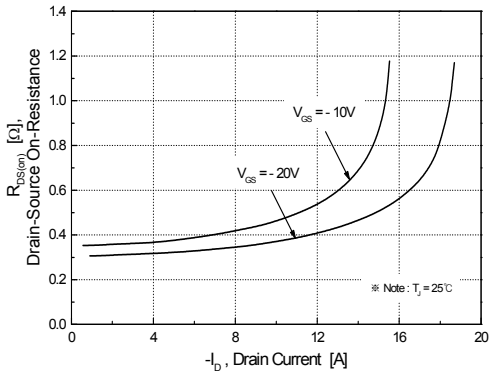


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

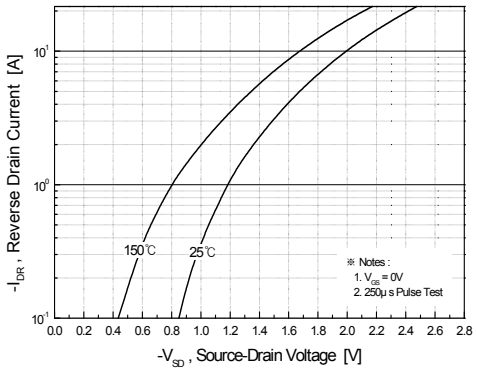


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

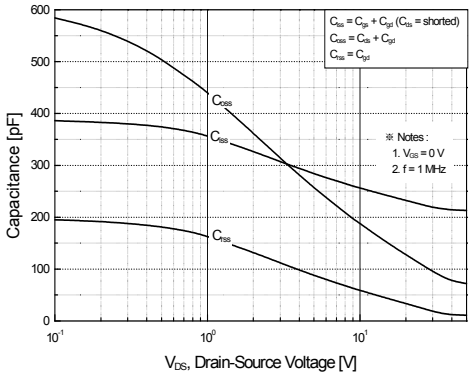


Figure 5. Capacitance Characteristics

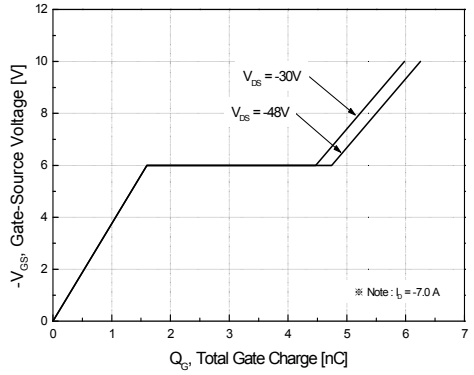


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

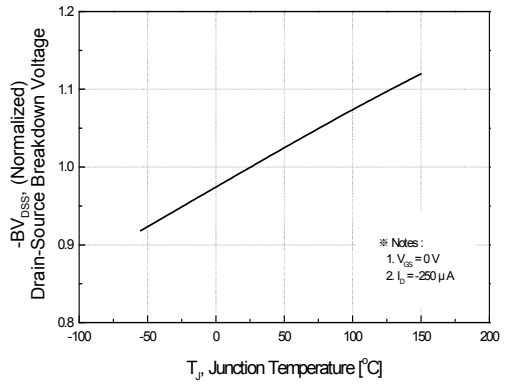


Figure 7. Breakdown Voltage Variation vs. Temperature

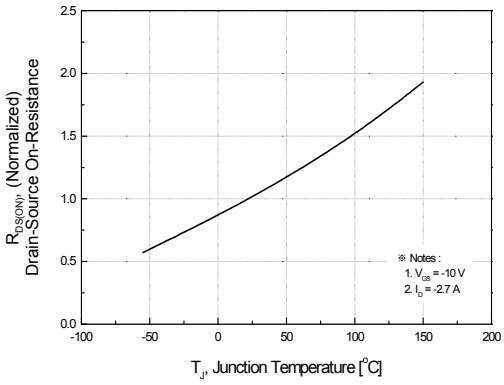


Figure 8. On-Resistance Variation vs. Temperature

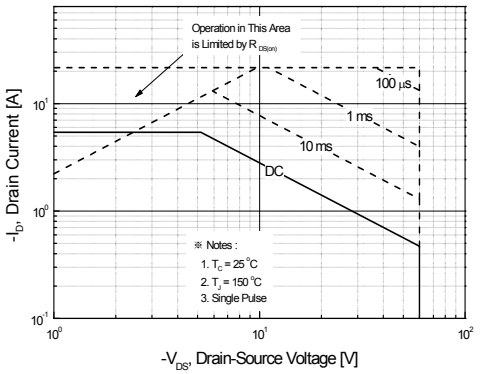


Figure 9. Maximum Safe Operating Area

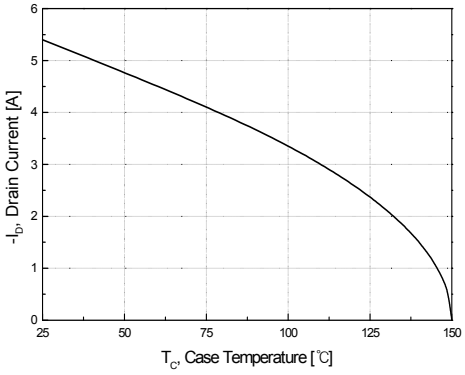


Figure 10. Maximum Drain Current vs. Case Temperature

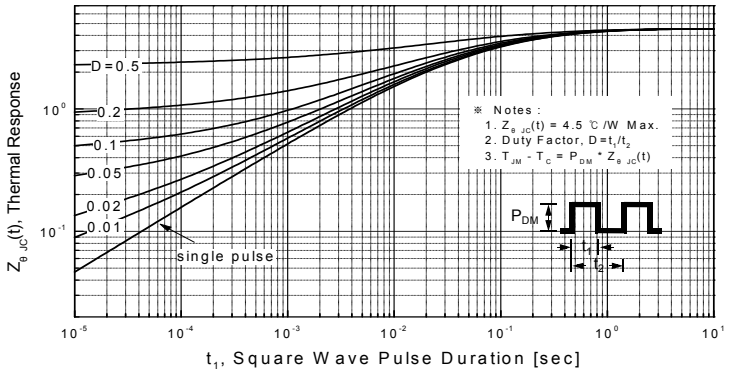
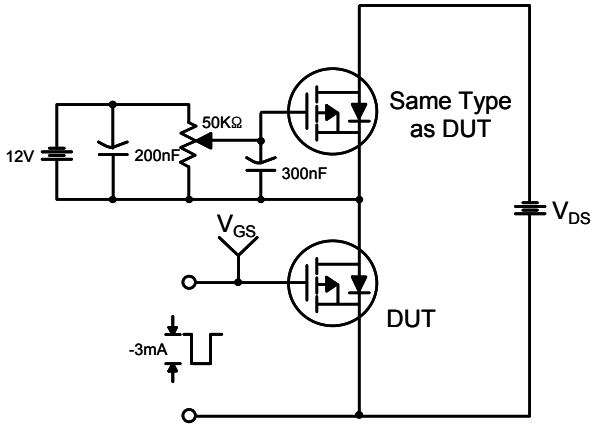
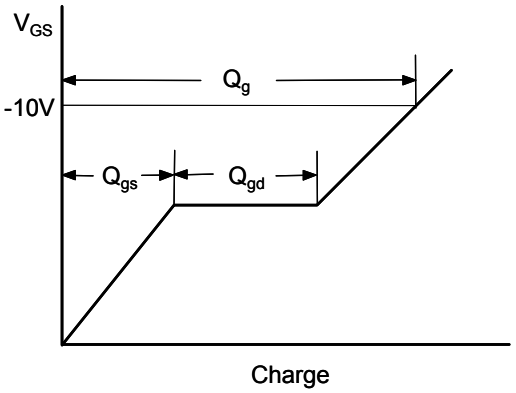


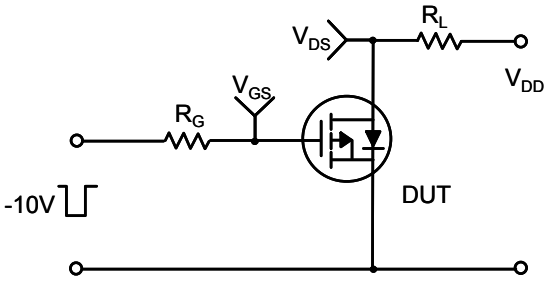
Figure 11. Transient Thermal Response Curve

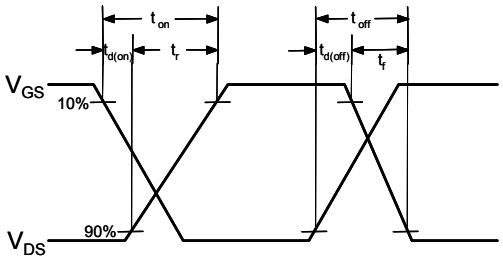
Gate Charge Test Circuit & Waveform



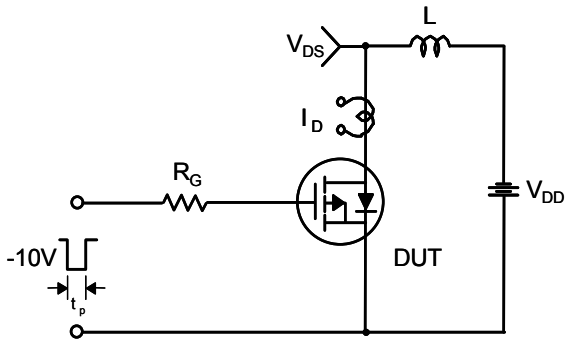


Resistive Switching Test Circuit & Waveforms

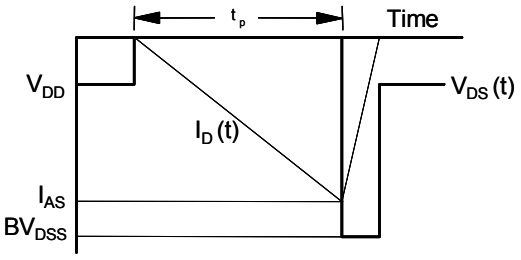




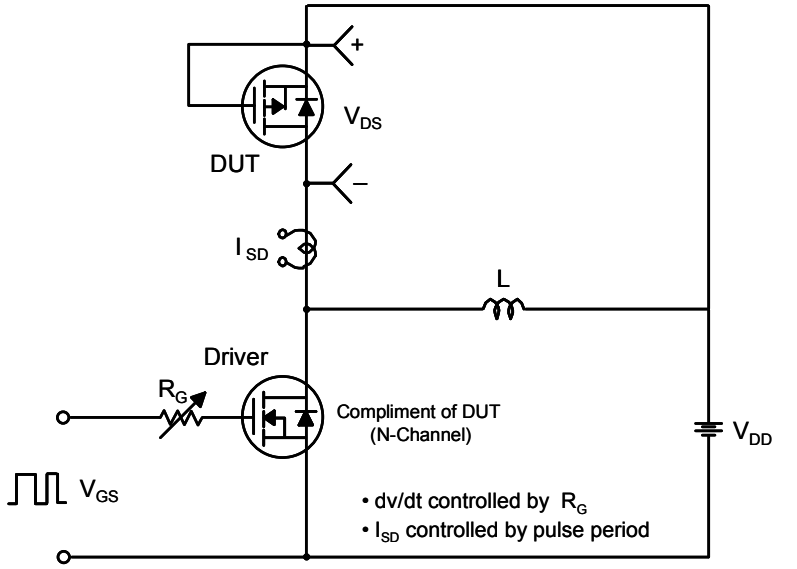
Unclamped Inductive Switching Test Circuit & Waveforms

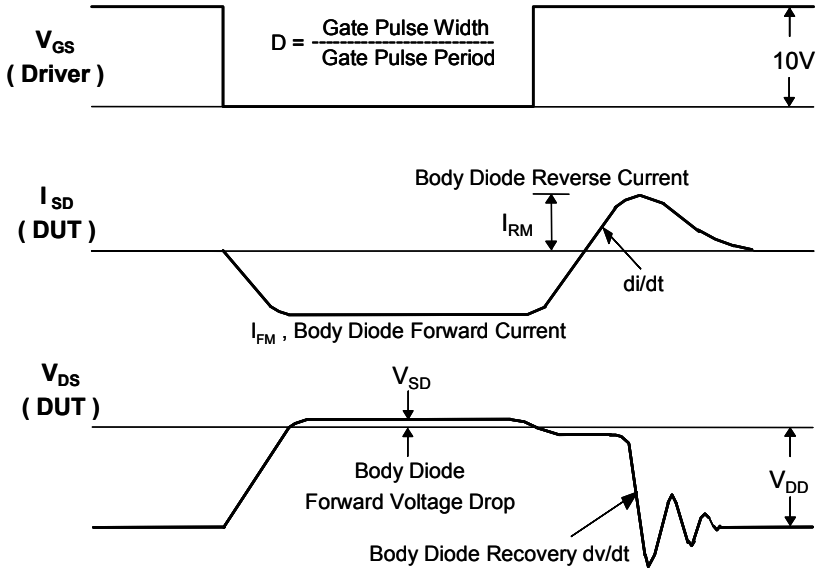


$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



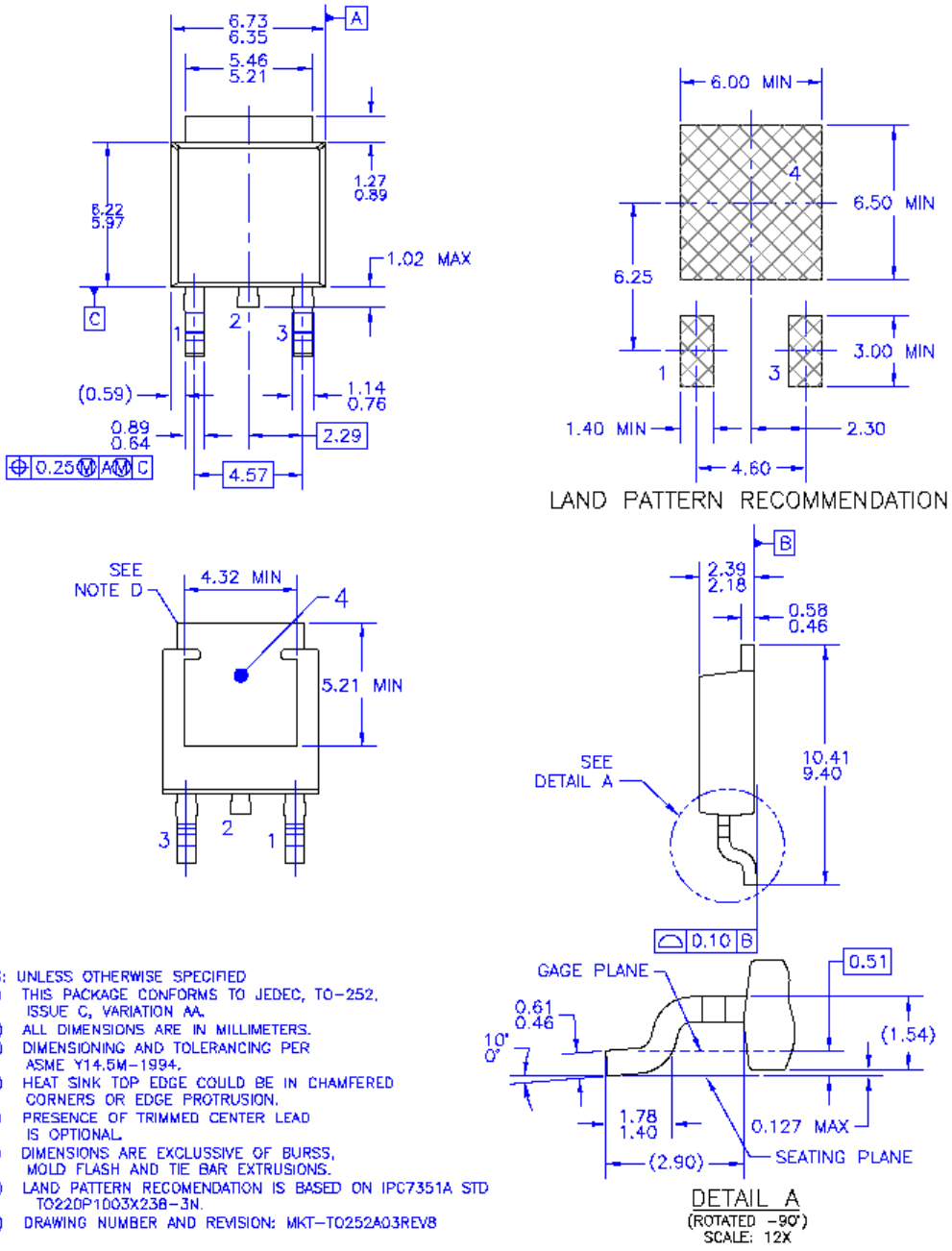
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Package Dimensions

DPAK



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A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.
E) PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.
F) DIMENSIONS ARE EXCLUSSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
G) LAND PATTERN RECOMENDATION IS BASED ON IPC7351A STD TO220P1003X238-3N.
H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV8

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Datasheet Identification	Product Status	Definition
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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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

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