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FAIRCHILD
SEMICONDUCTOR®

FQD7N30

N-Channel QFET® MOSFET

300 V, 5.5 A, 700 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

- 5.5 A, 300 V, $R_{DS(on)}$ = 700 mΩ (Max.) @ V_{GS} = 10 V, I_D = 2.75 A
- Low Gate Charge (Typ. 13 nC)
- Low Crss (Typ. 12 pF)
- 100% Avalanche Tested

D-PAK
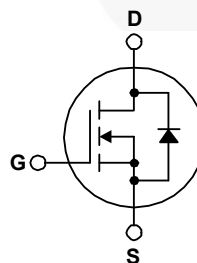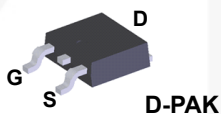
Absolute Maximum Ratings
T_C = 25°C unless otherwise noted.

Symbol	Parameter			FQD7N30TM	Unit
V_{DSS}	Drain-Source Voltage			300	V
I_D	Drain Current	- Continuous (T_C = 25°C)		5.5	A
		- Continuous (T_C = 100°C)		3.48	A
I_{DM}	Drain Current	- Pulsed	(Note 1)	22	A
V_{GSS}	Gate-Source Voltage			± 30	V
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	380	mJ
I_{AR}	Avalanche Current		(Note 1)	5.5	A
E_{AR}	Repetitive Avalanche Energy		(Note 1)	5.0	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	4.5	V/ns
P_D	Power Dissipation (T_A = 25°C) *			2.5	W
	Power Dissipation (T_C = 25°C)			50	W
	- Derate above 25°C			0.4	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds.			300	°C

Thermal Characteristics

Symbol	Parameter	FQD7N30TM	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.	110	°C/W
	Thermal Resistance, Junction to Ambient (*1 in² Pad of 2-oz Copper), Max.	50	

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Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQD7N30TM	FQD7N30	DPAK	Tape and Reel	330 mm	16 mm	2500 units

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	300	--	--	V
$\Delta BV_{DSS} / \Delta T$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.3	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 300 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 240 V, T_C = 125°C	--	--	10	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	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 2.75 A	--	0.53	0.7	Ω
g_{FS}	Forward Transconductance	V_{DS} = 50 V, I_D = 2.75 A	--	4.0	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	470	610	pF
C_{oss}	Output Capacitance		--	100	130	pF
C_{rss}	Reverse Transfer Capacitance		--	12	16	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 150 V, I_D = 7.0 A, R_G = 25 Ω	--	13	35	ns
t_r	Turn-On Rise Time		--	75	160	ns
$t_{d(off)}$	Turn-Off Delay Time		--	25	60	ns
t_f	Turn-Off Fall Time	(Note 4)	--	35	80	ns
Q_g	Total Gate Charge	V_{DS} = 240 V, I_D = 7.0 A, V_{GS} = 10 V	--	13	17	nC
Q_{gs}	Gate-Source Charge		--	3.4	--	nC
Q_{gd}	Gate-Drain Charge	(Note 4)	--	6.4	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	5.5	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	22	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 5.5 A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 7.0 A, dI_F / dt = 100 A/μs	--	150	--	ns
Q_{rr}	Reverse Recovery Charge		--	0.74	--	μC

Notes:
1. Repetitive rating : pulse-width limited by maximum junction temperature.
2. L = 21 mH, I_{AS} = 5.5 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 7.0 A, di/dt ≤ 200 A/μs , V_{DD} ≤ $BV_{DSS,}$ starting T_J = 25°C.
4. Essentially independent of operating temperature.
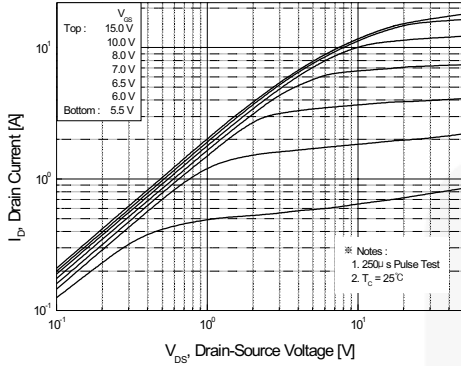
Typical Characteristics

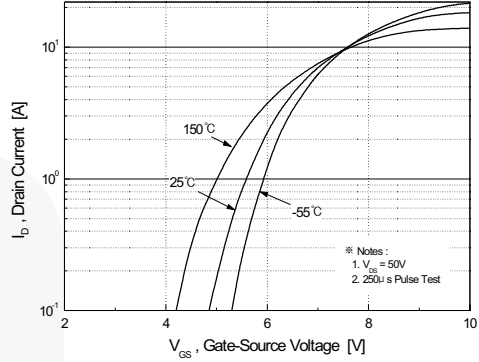**Figure 1. On-Region Characteristics**
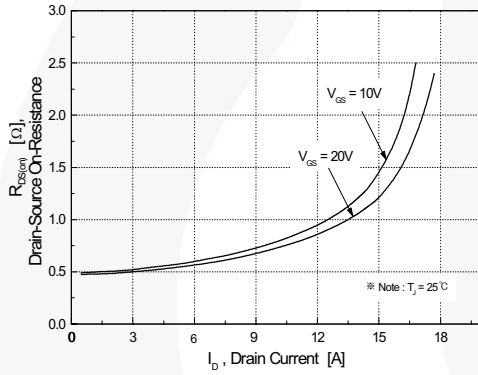
Figure 2. Transfer Characteristics

Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage
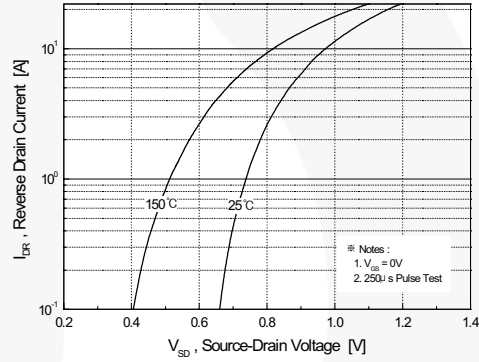
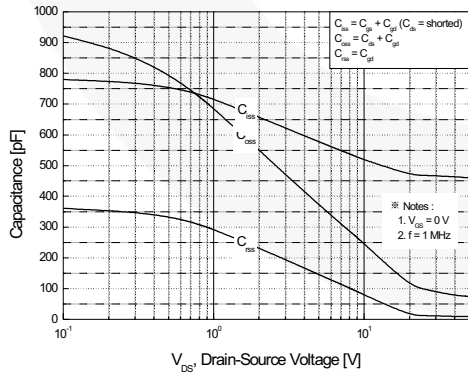**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**
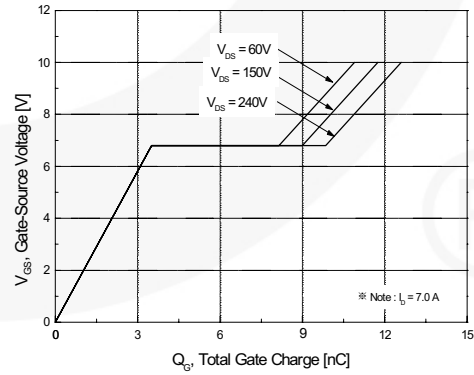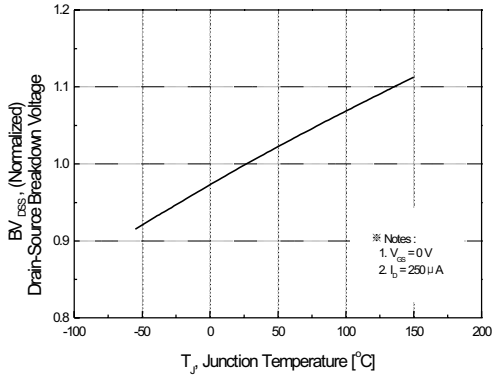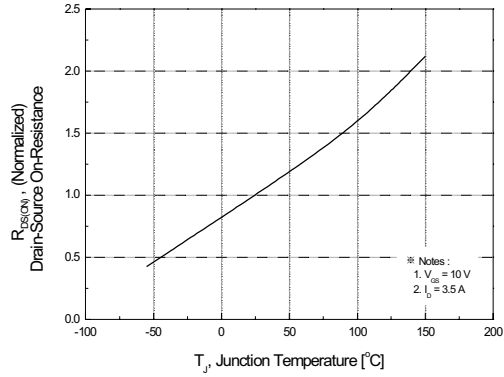
Figure 5. Capacitance Characteristics
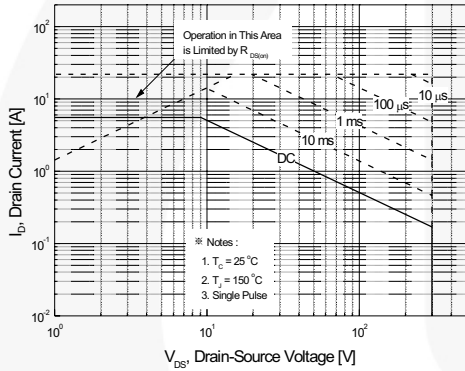
Figure 6. Gate Charge Characteristics
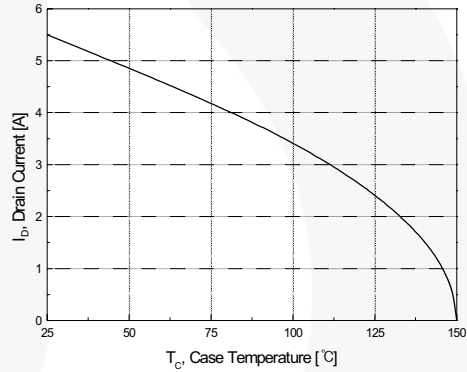
3

Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

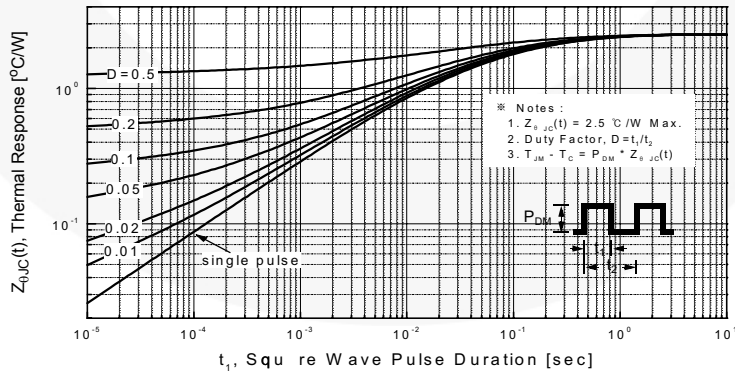Figure 8. On-Resistance Variation vs. Temperature

Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

Figure 11. Transient Thermal Response Curve

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Figure 12. Gate Charge Test Circuit & Waveform

Figure 13. Resistive Switching Test Circuit & Waveforms

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

Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

DUT

V_{DS}

I_{SD}

L

Driver

R_G

Same Type
as DUT

V_{DD}

V_{GS}

• dv/dt controlled by R_G
• I_{SD} controlled by pulse period

V_{GS}
(Driver)

$$D = \frac{\text{Gate Pulse Width}}{\text{Gate Pulse Period}}$$

10V

I_{SD}
(DUT)

I_{FM} , Body Diode Forward Current

di/dt

I_{RM}

Body Diode Reverse Current

V_{DS}
(DUT)

Body Diode Recovery dv/dt

V_{SD}

V_{DD}

Body Diode
Forward Voltage Drop
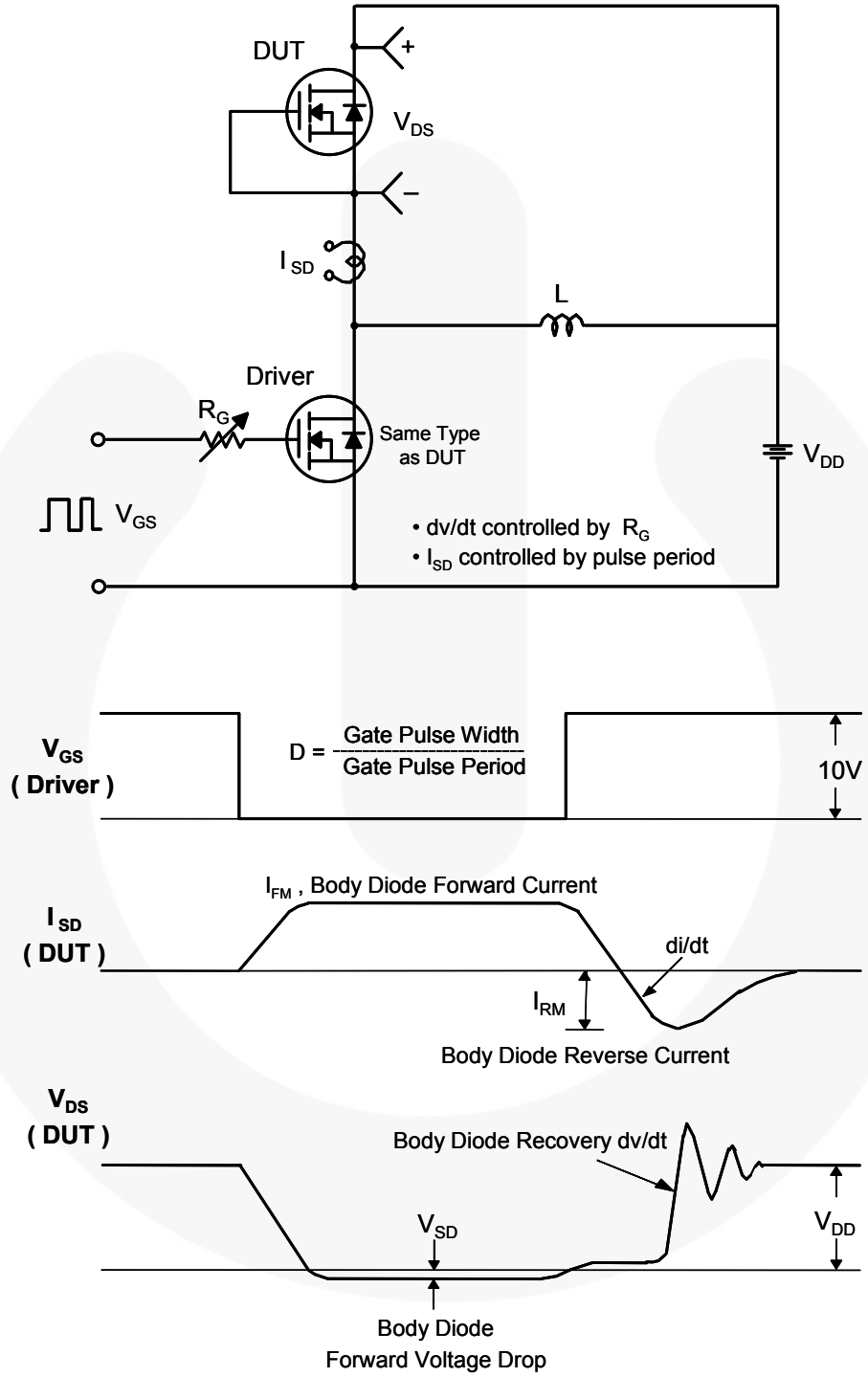
Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

NOTES: UNLESS OTHERWISE SPECIFIED
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 EXCLUSIVE OF BURSS, MOLD FLASH AND TIE BAR EXTRUSIONS.
G) LAND PATTERN RECOMENDATION IS BASED ON IPC7351A STD TO220P1003X238-3N.
H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV8

LAND PATTERN RECOMMENDATION

DETAIL A
(ROTATED -90°)
SCALE: 12X

Figure 16. TO252 (D-PAK), Molded, 3-Lead, Option AA&AB

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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
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. I66

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