FAIRCHILD

SEMICONDUCTOR ™

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FDD3670

## 100V N-Channel PowerTrench⊕ MOSFET

General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable $R_{DS(ON)}$ specifications.

The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.

Features

- 34 A, 100 V. $R_{DS(ON)}$ = 32 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 35 mΩ @ V_{GS} = 6 V

- Low gate charge (57 nC typical)

- Fast switching speed

- High performance trench technology for extremely low $R_{DS(ON)}$

- High power and current handling capability

TO-252
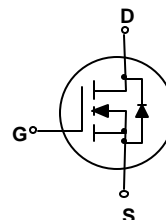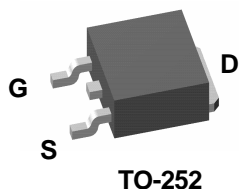
Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		100	V
V_{GSS}	Gate-Source Voltage		$\pm$20	V
I_D	Drain Current – Continuous	(Note 1)	34	A
	Drain Current – Pulsed		100	
P_D	Maximum Power Dissipation @ T_C = 25°C	(Note 1)	83	W
	@ T_A = 25°C	(Note 1a)	3.8	
	@ T_A = 25°C	(Note 1b)	1.6	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		−55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	1.8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	96	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDD3670	FDD3670	13"	16mm	2500 units

FDD3670 Rev C(W)

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain-Source Avalanche Ratings (Note 2)						
W_{DSS}	Single Pulse Drain-Source Avalanche Energy	V_{DD} = 50 V, I_D = 7.3 A			360	mJ
I_{AR}	Maximum Drain-Source Avalanche Current				7.3	A
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	100			V
$\dfrac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		92		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V			10	µA
I_{GSSF}	Gate–Body Leakage, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	V_{GS} = –20 V, V_{DS} = 0 V			–100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	2	2.5	4	V
$\dfrac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		–7.2		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 7.3 A V_{GS} = 10 V, I_D = 7.3 A, T_J = 125°C V_{GS} = 6 V, I_D = 7.0 A		22 39 24	32 56 35	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	25			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 7.3 A	15	31		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1.0 MHz		2490		pF
C_{oss}	Output Capacitance			265		pF
C_{rss}	Reverse Transfer Capacitance			80		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 50 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		16	26	ns
t_r	Turn–On Rise Time			10	18	ns
$t_{d(off)}$	Turn–Off Delay Time			56	84	ns
t_f	Turn–Off Fall Time			25	40	ns
Q_g	Total Gate Charge	V_{DS} = 50 V, I_D = 7.3 A, V_{GS} = 10 V		57	80	nC
Q_{gs}	Gate–Source Charge			11		nC
Q_{gd}	Gate–Drain Charge			15		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				2.7	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.7 A (Note 2)		0.72	1.2	V

Notes:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

a) $R_{\theta JA}$= 40°C/W when mounted on a 1in^2 pad of 2oz copper.

b) $R_{\theta JA}$= 96°C/W on a minimum mounting pad.

Scale 1 : 1 on letter size paper

Pulse Test: Pulse Width < 300µs, Duty Cycle < 2.0%
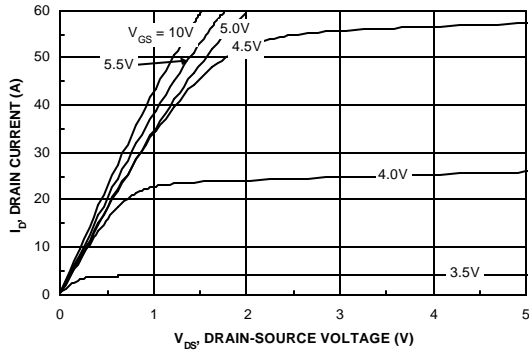
Typical Characteristics

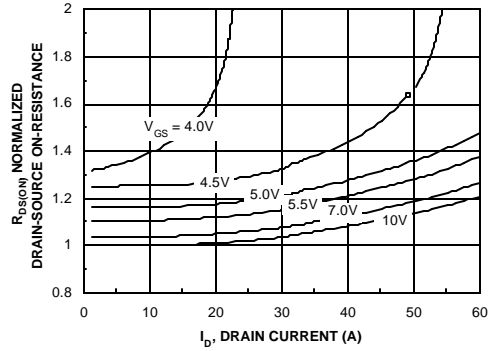**Figure 1. On-Region Characteristics.**

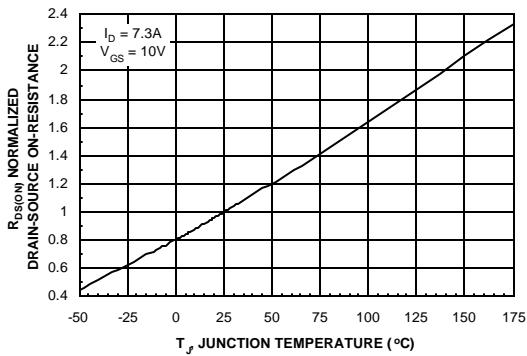**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.**

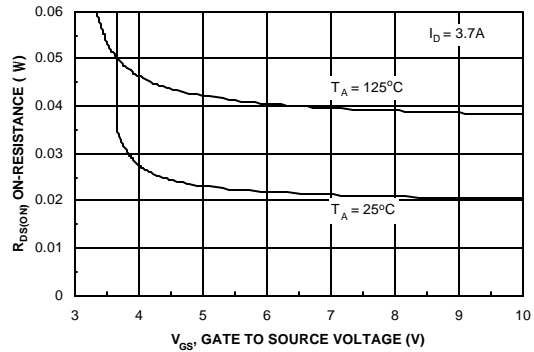**Figure 3. On-Resistance Variation with Temperature.**

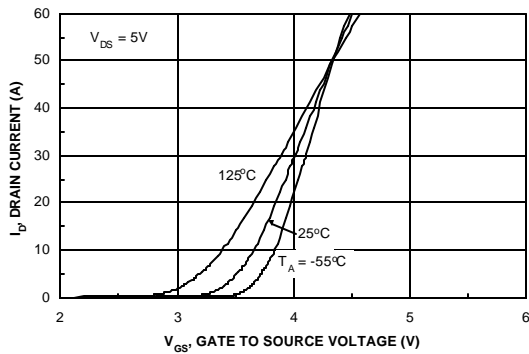**Figure 4. On-Resistance Variation with Gate-to-Source Voltage.**

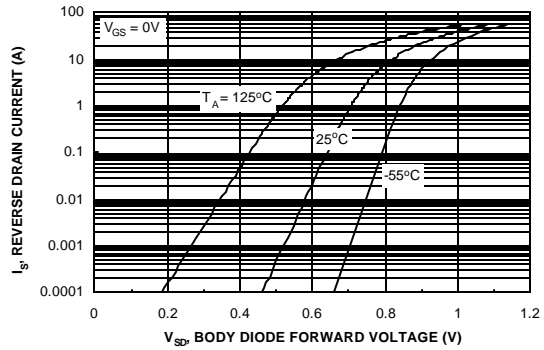**Figure 5. Transfer Characteristics.**

Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.
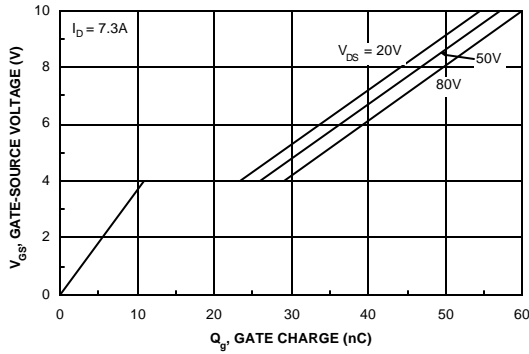
Typical Characteristics
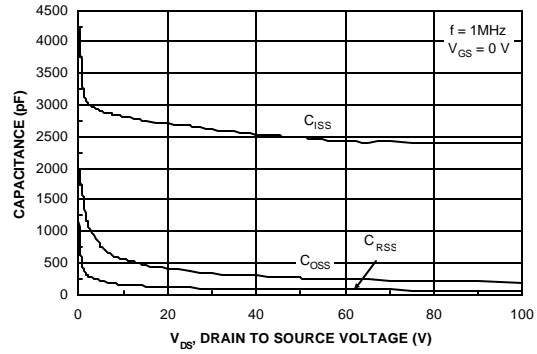

Figure 7. Gate Charge Characteristics.

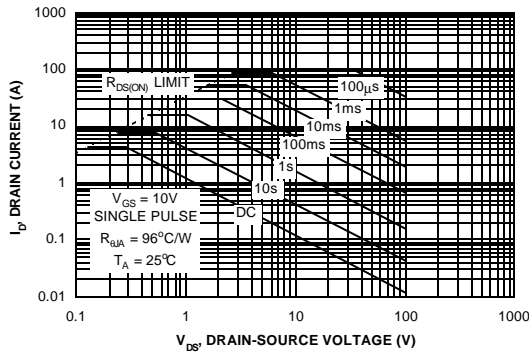**Figure 8. Capacitance Characteristics.**

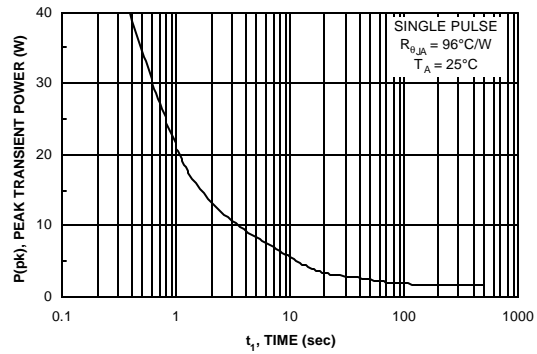**Figure 9. Maximum Safe Operating Area.**

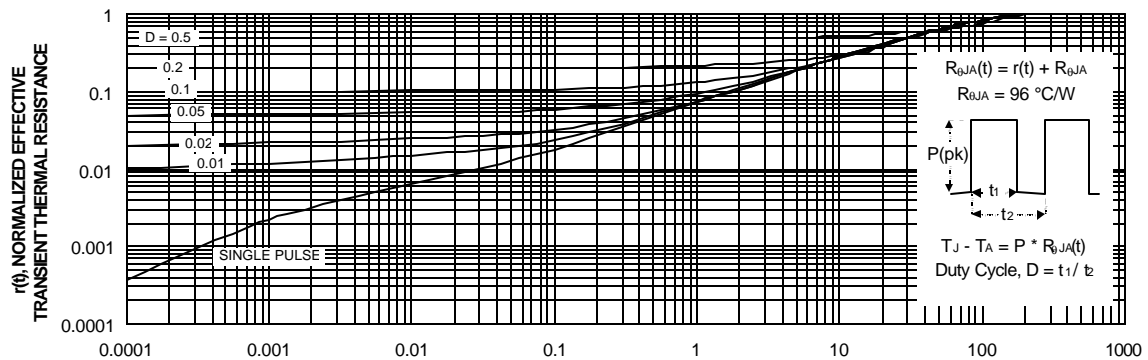**Figure 10. Single Pulse Maximum Power Dissipation.**

Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.

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