FDD6676AS

30V N-Channel PowerTrench® SyncFET™

General Description

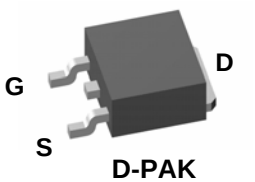
The FDD6676AS is designed to replace a single MOSFET and Schottky diode in synchronous DC:DC power supplies. This 30V MOSFET is designed to maximize power conversion efficiency, providing a low $R_{DS(ON)}$ and low gate charge. The FDD6676AS includes a patented combination of a MOSFET monolithically integrated with a Schottky diode using Fairchild's monolithic SyncFET technology.

Applications

- DC/DC converter
- Low side notebook

Features

- 90 A, 30 V $R_{DS(ON)}$ = 5.7 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 7.1 mΩ @ V_{GS} = 4.5 V
- Includes SyncFET schottky body diode
- Low gate charge (46nC typical)
- High performance trench technology for extremely low $R_{DS(ON)}$
- High power and current handling capability



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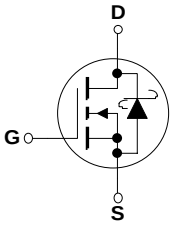

Absolute Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Drain Current – Continuous	(Note 3)	90	A
	– Pulsed	(Note 1a)	100	
P_D	Power Dissipation for Single Operation	(Note 1)	70	W
		(Note 1a)	3.1	
		(Note 1b)	1.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		–55 to +150	°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 1a)	40	°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
FDD6676AS	FDD6676AS	13''	12mm	2500 units
FDD6676AS	FDD6676AS_NL (Note 4)	13''	12mm	2500 units

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}	Drain-Source Avalanche Energy	Single Pulse, V_{DD} = 15 V, I_D = 16A		108	250	mJ
I_{AR}	Drain-Source Avalanche Current				16	A
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1 mA	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 10 mA, Referenced to 25°C		31		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			500	μA
		V_{DS} = 24 V, V_{GS} = 0 V, T_J=125°C		11		mA
I_{GSS}	Gate–Body Leakage	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 = 1 mA	1	1.5	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 10 mA, Referenced to 25°C		–3.6		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 16 A V_{GS} = 4.5 V, I_D = 15 A V_{GS} = 10 V, I_D = 16 A,T_J=125°C		4.7 5.8 6.7	5.7 7.1 8.4	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 16 A		61		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		2500		pF
C_{oss}	Output Capacitance			710		pF
C_{rss}	Reverse Transfer Capacitance			270		pF
R_G	Gate Resistance	V_{GS} = 0 V, f = 1.0 MHz		1.6		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		12	21	ns
t_r	Turn–On Rise Time			12	22	ns
$t_{d(off)}$	Turn–Off Delay Time			46	74	ns
t_f	Turn–Off Fall Time			28	44	ns
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15 V, I_D = 1 A, V_{GS} = 4.5 V, R_{GEN} = 6 Ω		20	32	ns
t_r	Turn–On Rise Time			24	38	ns
$t_{d(off)}$	Turn–Off Delay Time			35	56	ns
t_f	Turn–Off Fall Time			27	43	ns
$Q_{g(TOT)}$	Total Gate Charge, Vgs = 10V	V_{DS} = 15 V, I_D = 16 A		46	64	nC
Q_g	Total Gate Charge, Vgs = 5V			25	35	nC
Q_{gs}	Gate–Source Charge			7		nC
Q_{gd}	Gate–Drain Charge			9		nC

Electrical Characteristics (continued)

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				3.5	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 3.5 A (Note 2)		0.4	0.7	V
t_{RR}	Diode Reverse Recovery Time	dI_F/dt = 300A/us, I_F = 16A		25		ns
I_{RM}	Maximum Recovery Current			1.9		A
Q_{RR}	Diode Reverse Recovery Charge			24		nC

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 2 oz copper

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

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%

3. Maximum current is calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$

where P_D is maximum power dissipation at T_C = 25°C and $R_{DS(on)}$ is at $T_{J(max)}$ and V_{GS} = 10V. Package current limitation is 21A

4. FDD6676AS_NL is a lead free product. The FDD6676AS_NL marking will appear on the reel label.

Typical Characteristics

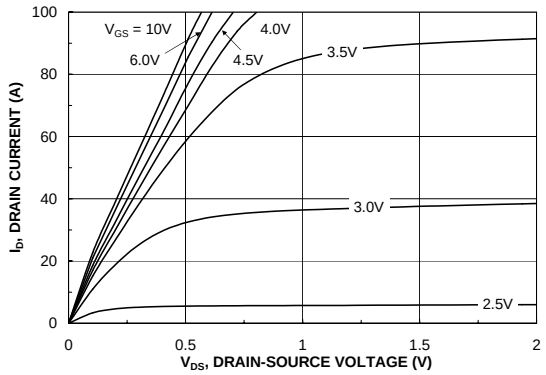

Figure 1. On-Region Characteristics

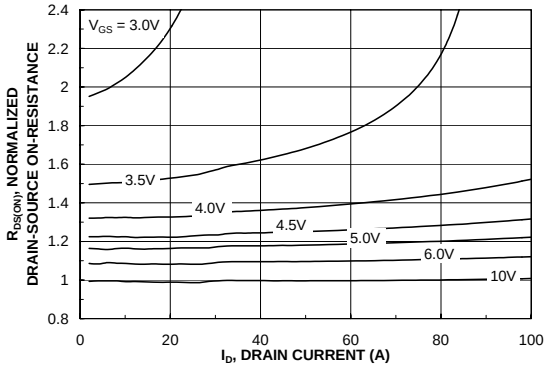

Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

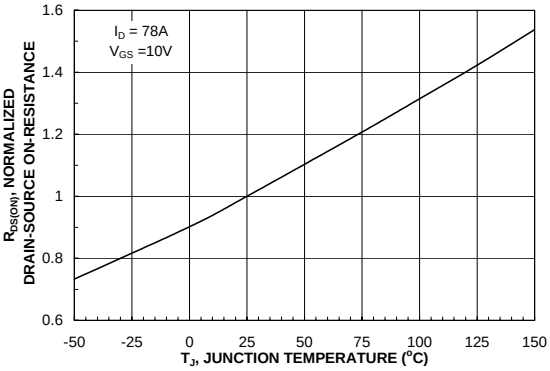

Figure 3. On-Resistance Variation with Temperature

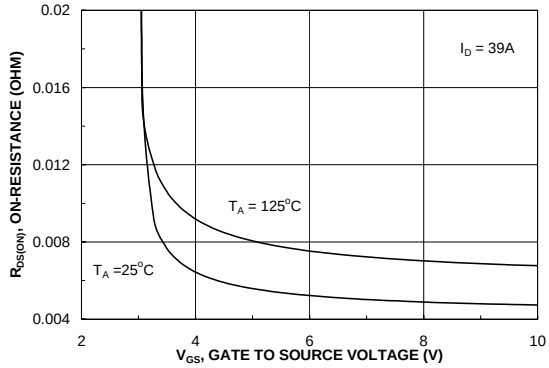

Figure 4. On-Resistance Variation with Gate-to-Source Voltage

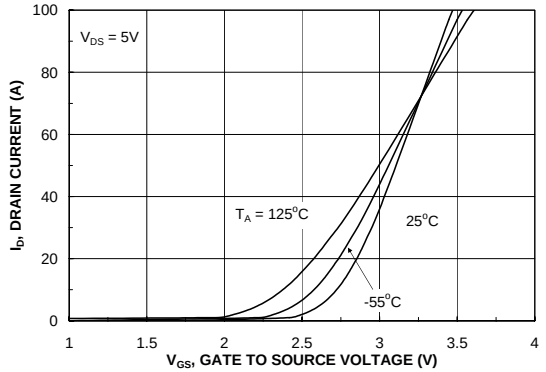

Figure 5. Transfer Characteristics

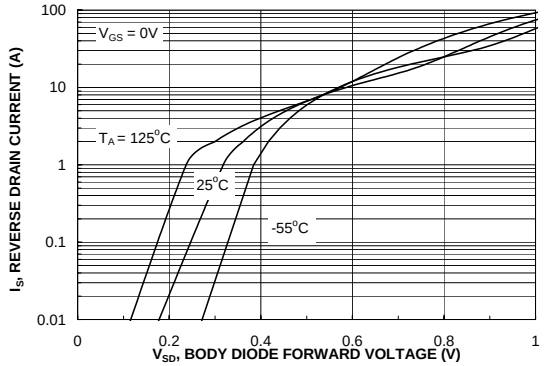

Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature