March 2015

FDD8796/FDU8796
N-Channel PowerTrench® MOSFET
**25V, 35A, 5.7mΩ**

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. It has been optimized for low gate charge, low $r_{DS(on)}$ and fast switching speed.

Application

■ Vcore DC-DC for Desktop Computers and Servers

■ VRM for Intermediate Bus Architecture

Features

■ Max $r_{DS(on)}$ = 5.7mΩ at V_{GS} = 10V, I_D = 35A

■ Max $r_{DS(on)}$ = 8.0mΩ at V_{GS} = 4.5V, I_D = 35A

■ Low gate charge: $Q_{g(10)}$ = 37nC(Typ), V_{GS} = 10V

■ Low gate resistance

■ Avalanche rated and 100% tested

■ RoHS Compliant

D-PAK
(TO-252)

I-PAK
(TO-251AA)

Short Lead I-PAK
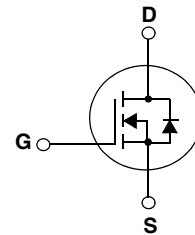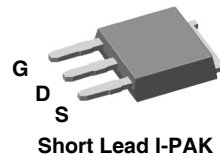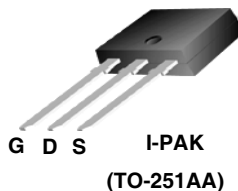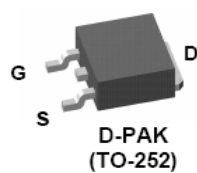
MOSFET Maximum Ratings T_C= 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DS}	Drain to Source Voltage		25	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current -Continuous (Package Limited)		35	A
	-Continuous (Die Limited)		98	
	-Pulsed	(Note 1)	305	
E_{AS}	Single Pulse Avalanche Energy	(Note 2)	91	mJ
P_D	Power Dissipation		88	W
T_J, T_{STG}	Operating and Storage Temperature		-55 to 175	°C

Thermal Characteristics

$R_{θJC}$	Thermal Resistance, Junction to Case TO_252, TO_251	1.7	°C/W
$R_{θJA}$	Thermal Resistance, Junction to Ambient TO_252, TO_251	100	°C/W
$R_{θJA}$	Thermal Resistance, Junction to Ambient TO-252,1in^2 copper pad area	52	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD8796	FDD8796	TO-252AA	13"	16mm	2500 units
FDU8796	FDU8796	TO-251AA	N/A (Tube)	N/A	75 units
FDU8796	FDU8796_F071	TO-251AA	N/A (Tube)	N/A	75 units

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
Off Characteristics							
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = 250µA, V_{GS} = 0V		25			V
$\frac{\Delta B_{VDSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250µA, referenced to 25°C			7		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 20V V_{GS} = 0V	T_J = 150°C			1 / 250	µA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V				±100	nA
On Characteristics							
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250µA		1.2	1.8	2.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250µA, referenced to 25°C			-6.7		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10V, I_D = 35A			4.5	5.7	mΩ
		V_{GS} = 4.5V, I_D = 35A			6.0	8.0	
		V_{DS} = 10V, I_D = 35A T_J = 175°C			6.9	9.5	
Dynamic Characteristics							
C_{iss}	Input Capacitance	V_{DS} = 13V, V_{GS} = 0V, f = 1MHz			1960	2610	pF
C_{oss}	Output Capacitance				455	605	pF
C_{rss}	Reverse Transfer Capacitance				315	475	pF
R_G	Gate Resistance	f = 1MHz			1.1		Ω
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	V_{DD} =13V, I_D = 35A V_{GS} = 10V, R_{GS} = 20Ω			10	20	ns
t_r	Rise Time				24	39	ns
$t_{d(off)}$	Turn-Off Delay Time				99	158	ns
t_f	Fall Time				57	91	ns
Q_g	Total Gate Charge	V_{GS} = 0 to10V	V_{DD} =13V, I_D = 35A, I_g = 1.0mA		37	52	nC
Q_g	Total Gate Charge	V_{GS} = 0 to 5V			19	27	nC
Q_{gs}	Gate to Source Gate Charge				6		nC
Q_{gd}	Gate to Drain Charge				6		nC
Drain-Source Diode Characteristics							
V_{SD}	Source to Drain Diode Voltage	V_{GS} = 0V, I_S = 35A			0.9	1.25	V
		V_{GS} = 0V, I_S = 15A			0.8	1.0	V
t_{rr}	Reverse Recovery Time	I_F = 35A, di/dt = 100A/µs			30	45	ns
Q_{rr}	Reverse Recovery Charge	I_F = 35A, di/dt = 100A/µs			23	35	nC

Notes:
1: Pulse time < 300µs, Duty cycle = 2%.
2: Starting T_J = 25°C, L = 0.3mH, I_{AS} = 24.7A, V_{DD} = 23V, V_{GS} = 10V.

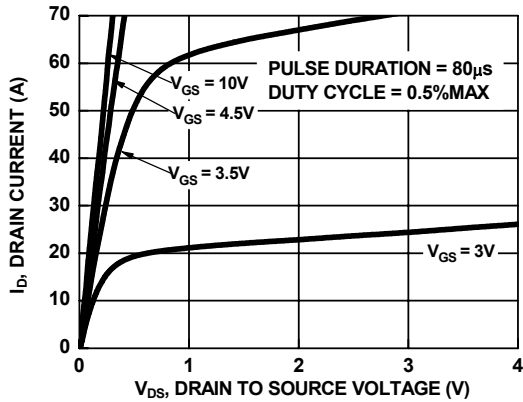**Typical Characteristics** $T_J = 25°C$ unless otherwise noted

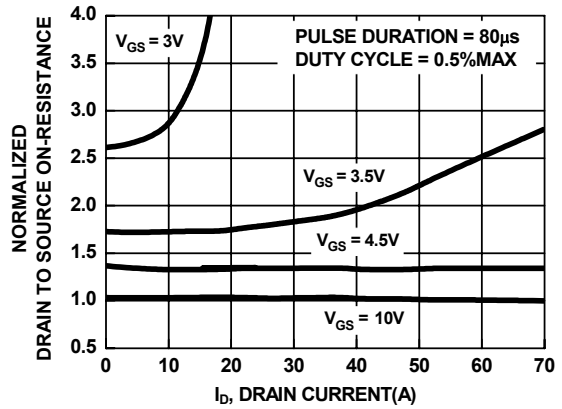**Figure 1. On Region Characteristics**

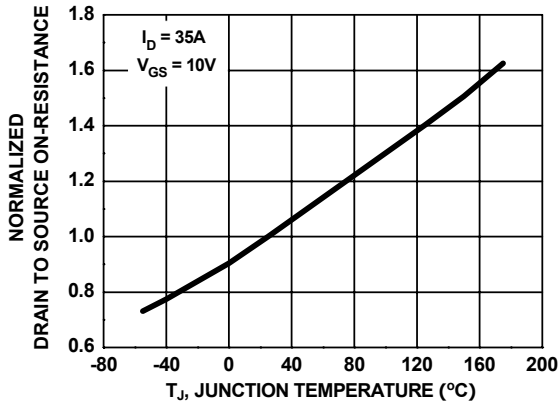**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**

Figure 3. Normalized On Resistance vs Junction Temperature
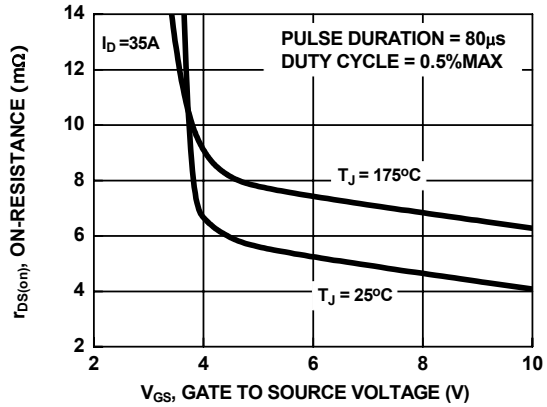

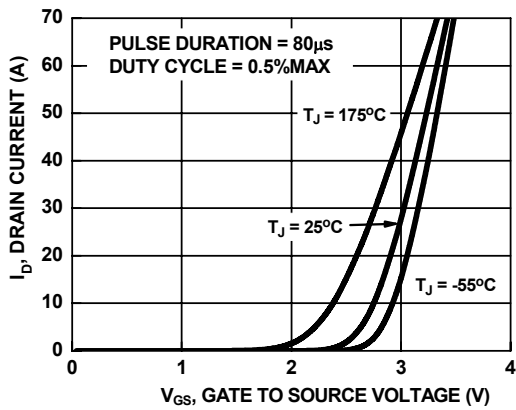**Figure 4. On-Resistance vs Gate to Source Voltage**
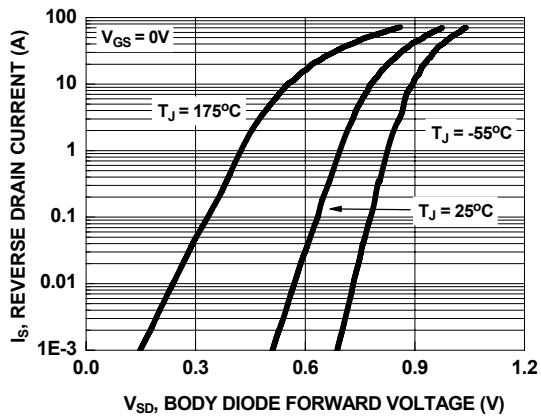

Figure 5. Transfer Characteristics

Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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Typical Characteristics $T_J = 25°C$ unless otherwise noted
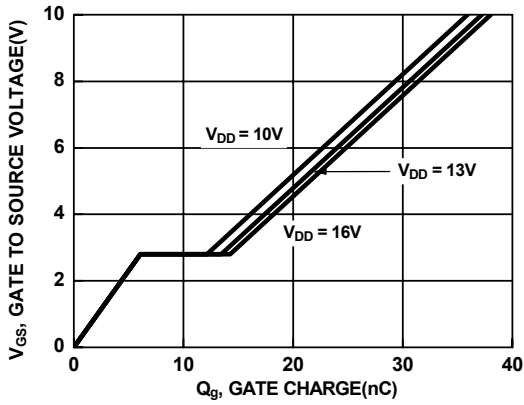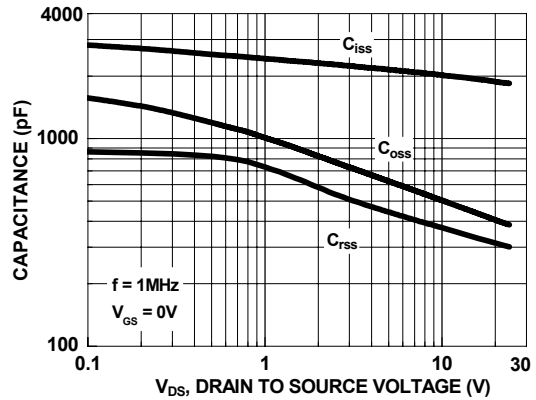

Figure 7. Gate Charge Characteristics

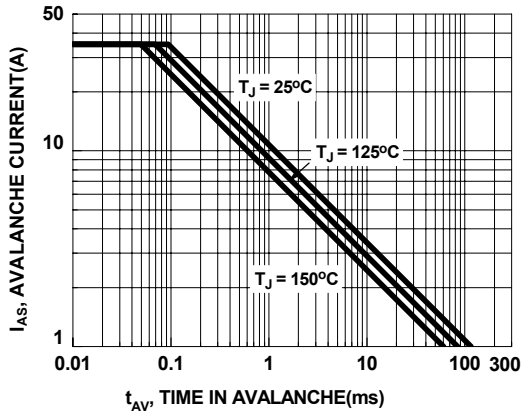Figure 8. Capacitance vs Drain to Source Voltage

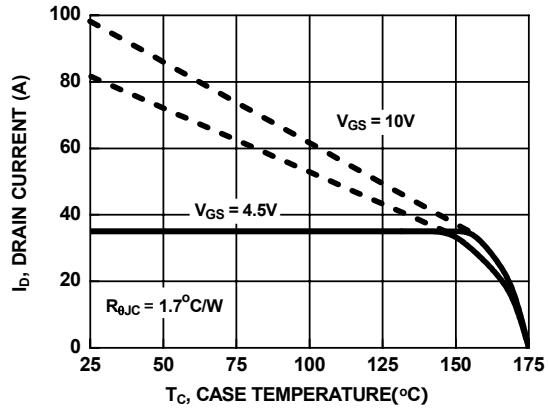Figure 9. Unclamped Inductive Switching Capability

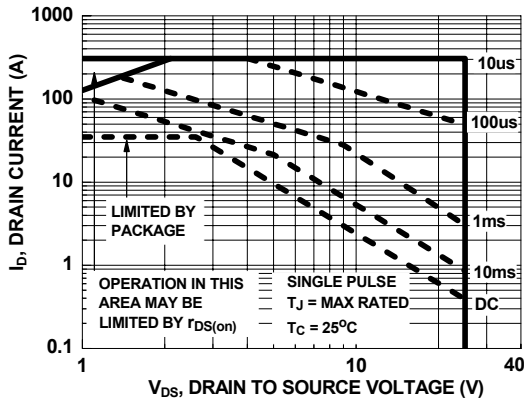Figure 10. Maximum Continuous Drain Current vs Case Temperature
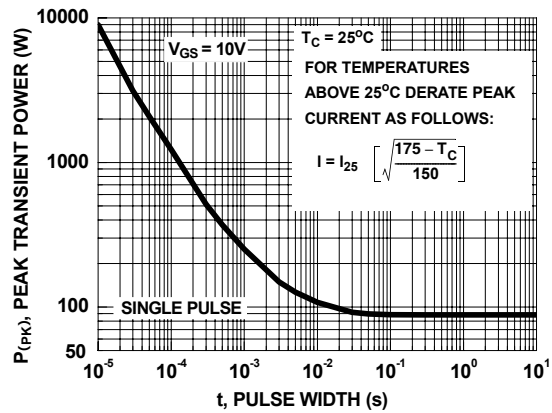

Figure 11. Forward Bias Safe Operating Area

Figure 12. Single Pulse Maximum Power Dissipation

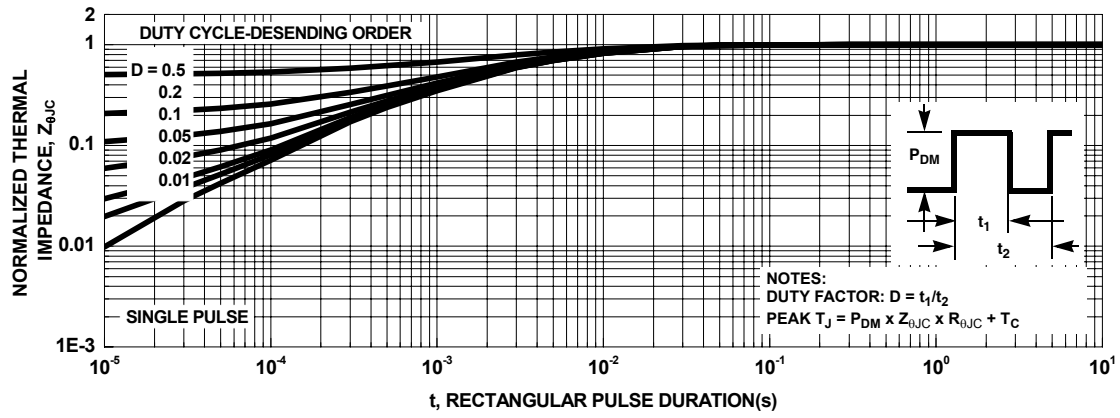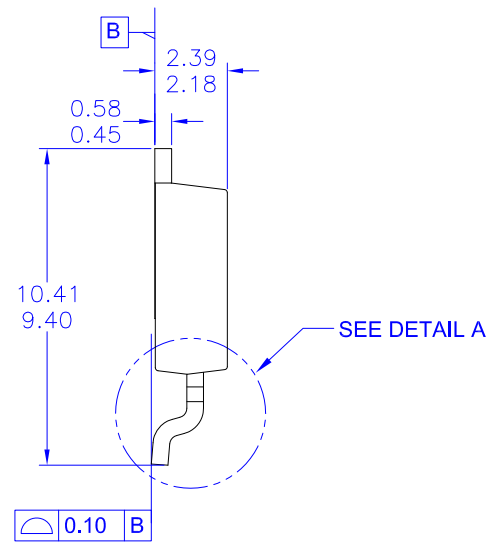**Typical Characteristics** T_J = 25°C unless otherwise noted

Figure 13. Transient Thermal Response Curve
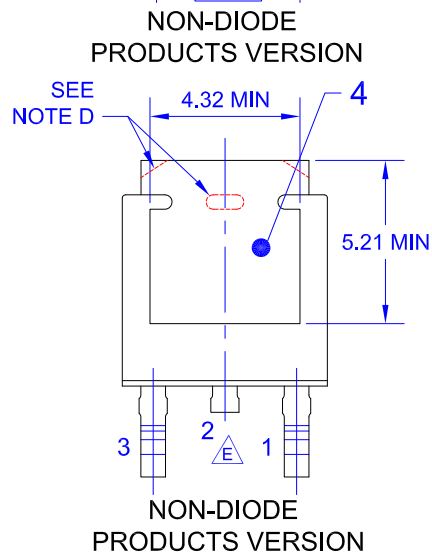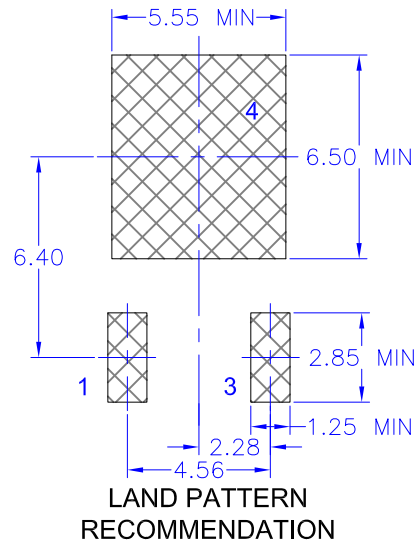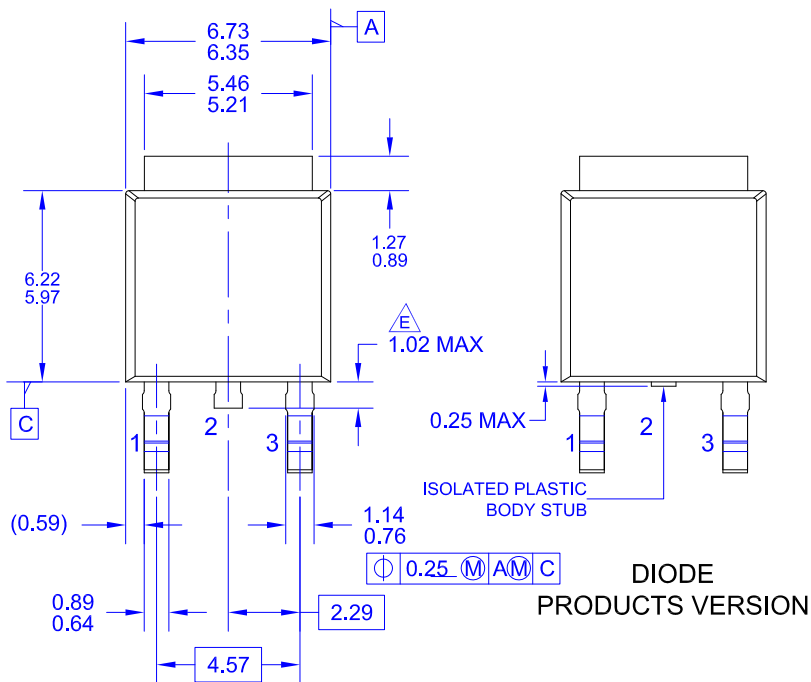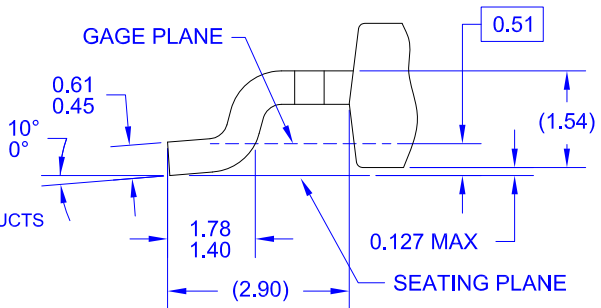
NOTES:
DUTY FACTOR: D = t_1/t_2
PEAK T_J = P_{DM} x $Z_{\theta JC}$ x $R_{\theta JC}$ + T_C

6.73
6.35

[A]

5.46
5.21

1.27
0.89

6.22
5.97

[C]

[E]
1.02 MAX

1   2   3

0.25 MAX

ISOLATED PLASTIC
BODY STUB

(0.59)

1.14
0.76

⌖ | 0.25 Ⓜ | AⓂ | C

DIODE
PRODUCTS VERSION

0.89
0.64

2.29

4.57

NON-DIODE
PRODUCTS VERSION

5.55 MIN

4

6.50 MIN

6.40

1   3

2.85 MIN

1.25 MIN

2.28

4.56

LAND PATTERN
RECOMMENDATION

SEE
NOTE D

4.32 MIN

4

5.21 MIN

3   2   1

[E]

NON-DIODE
PRODUCTS VERSION

3   2   1

DIODE
PRODUCTS VERSION

[B]

2.39
2.18

0.58
0.45

10.41
9.40

SEE DETAIL A

⌒ | 0.10 | B

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-2009.
D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED
   CORNERS OR EDGE PROTRUSION.
E) TRIMMED METAL CENTER LEAD IS PRESENT ON FOR NON-DIODE PRODUCTS
F) DIMENSIONS ARE EXCLUSIVE OF BURS,
   MOLD FLASH AND TIE BAR EXTRUSIONS.
G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD
   TO228P991X239-3N.
H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV11

GAGE PLANE

0.51

0.61
0.45

10°
0°

(1.54)

1.78
1.40

0.127 MAX

(2.90)

SEATING PLANE

DETAIL A
(ROTATED -90°)
SCALE: 12X

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Dual Cool™	MegaBuck™	Saving our world, 1mW/W/kW at a time™	TRUECURRENT®*
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	OPTOLOGIC®	Sync-Lock™	

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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.
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