

November 2009

UniFET™

FDT3N40

400V N-Channel MOSFET

Features

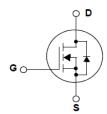
- 2A, 400V, $R_{DS(on)} = 3.4\Omega @V_{GS} = 10 \text{ V}$
- Low gate charge (typical 4.5 nC)
- Low C_{rss} (typical 3.7 pF)
- · Fast switching
- 100% avalanche tested
- · Improved dv/dt capability

Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficient switched mode power supplies and active power factor correction.





Absolute Maximum Ratings

Symbol	Parameter			FDT3N40	Unit
V _{DSS}	Drain-Source Volta	ge		400	V
I _D	Drain Current	- Continuous (T _C = 25°C) - Continuous (T _C = 100°C)		2.0 * 1.2 *	A A
I _{DM}	Drain Current	- Pulsed	(Note 1)	8.0 *	А
V _{GSS}	Gate-Source voltage			±30	V
E _{AS}	Single Pulsed Avala	anche Energy	(Note 2)	46	mJ
I _{AR}	Avalanche Current		(Note 1)	2	А
E _{AR}	Repetitive Avalanch	ne Energy	(Note 1)	0.2	mJ
dv/dt	Peak Diode Recove	ery dv/dt	(Note 3)	4.5	V/ns
P _D	Power Dissipation	(T _C = 25°C) - Derate above 25°C		2 0.02	W W/°C
T _{J,} T _{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T _L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds),	300	°C

^{*} Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	Тур	Max	Unit
$R_{\theta JA}^{\ \ *}$	Thermal Resistance, Case-to-Sink Typ.	-	60	°C/W

^{*} Surface Mounted on JESD51-3 Board, T<0.1sec.

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDT3N40	FDT3N40TF	SOT-223	330mm	12mm	4000

Electrical Characteristics $T_C = 25^{\circ}C$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Тур.	Max	Units	
Off Charac	Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	400			V	
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C		0.4		V/°C	
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 400V, V _{GS} = 0V V _{DS} = 320V, T _C = 125°C			1 10	μA μA	
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30V, V _{DS} = 0V			100	nA	
I _{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30V$, $V_{DS} = 0V$			-100	nA	
On Charac	On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	3.0		5.0	V	
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10V, I _D = 1A		2.8	3.4	Ω	
9 _{FS}	Forward Transconductance	$V_{DS} = 40V, I_D = 1A$ (Note 4)		2		S	
Dynamic C	haracteristics						
C _{iss}	Input Capacitance	$V_{DS} = 25V$, $V_{GS} = 0V$,		173	225	pF	
C _{oss}	Output Capacitance	f = 1.0MHz		30	40	pF	
C _{rss}	Reverse Transfer Capacitance			3.7	6	pF	
Switching	Characteristics						
t _{d(on)}	Turn-On Delay Time	, DD , D		10	30	ns	
t _r	Turn-On Rise Time	$R_G = 25\Omega$	1	30	70	ns	
t _{d(off)}	Turn-Off Delay Time			10	30	ns	
t _f	Turn-Off Fall Time	(Note 4, 5)		25	60	ns	
Q_g	Total Gate Charge	$V_{DS} = 320V, I_{D} = 2A$		4.5	6	nC	
Q _{gs}	Gate-Source Charge	$V_{GS} = 10V$		1.2		nC	
Q_{gd}	Gate-Drain Charge	(Note 4, 5)		2		nC	
Drain-Sour	ce Diode Characteristics and Maximun	n Ratings		•		•	
I _S	Maximum Continuous Drain-Source Diode Forward Current				2	Α	
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current				8	Α	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_{S} = 2A$			1.4	V	
t _{rr}	Reverse Recovery Time	$V_{GS} = 0V$, $I_S = 2A$		210		ns	
Q _{rr}	Reverse Recovery Charge	$dI_F/dt = 100A/\mu s $ (Note 4)		0.75		μС	

NOTES

- 1. Repetitive Rating: Pulse width limited by maximum junction temperature
- 2. L = 10mH, $\rm I_{AS}$ = 2A, $\rm V_{DD}$ = 50V, $\rm R_{G}$ = 25 Ω , Starting $\rm T_{J}$ = 25°C
- 3. $I_{SD} \le 2A$, di/dt $\le 200A/\mu s$, $V_{DD} \le BV_{DSS}$, Starting $T_J = 25^{\circ}C$
- 4. Pulse Test: Pulse width $\leq 300 \mu \text{s}, \, \text{Duty Cycle} \leq 2\%$
- ${\bf 5.} \ {\bf Essentially \ Independent \ of \ Operating \ Temperature \ Typical \ Characteristics}$

Typical Performance Characteristics

Figure 1. On-Region Characteristics

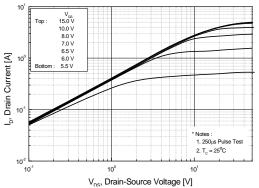


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage



Figure 2. Transfer Characteristics

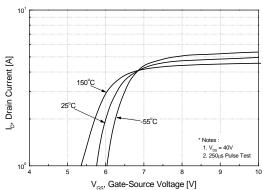


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

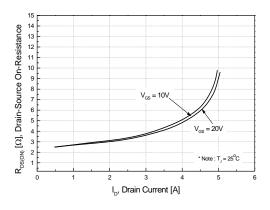
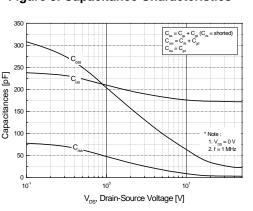
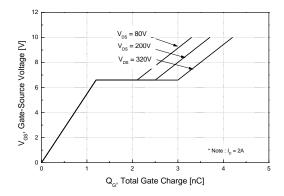


Figure 5. Capacitance Characteristics



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Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

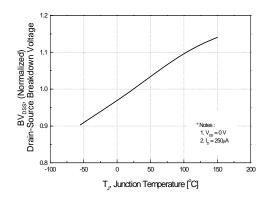


Figure 8. On-Resistance Variation vs. Temperature

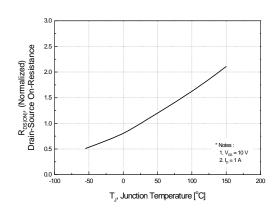


Figure 9. Maximum Safe Operating Area

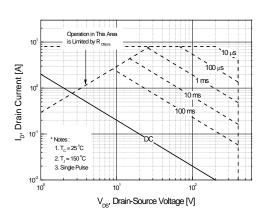


Figure 10. Maximum Drain Current vs. Case Temperature

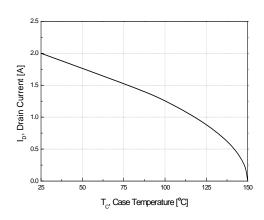
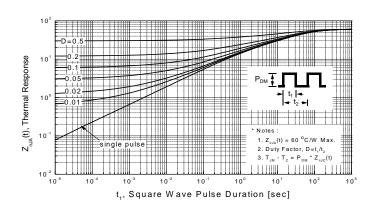
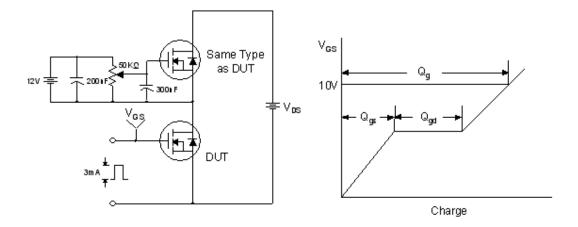


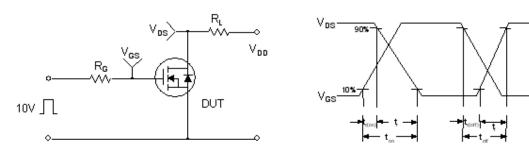
Figure 11. Transient Thermal Response Curve



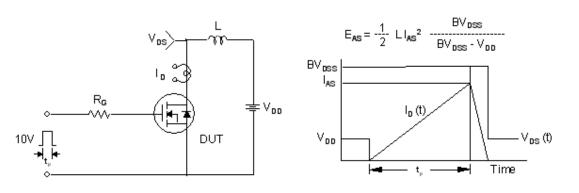
Gate Charge Test Circuit & Waveform

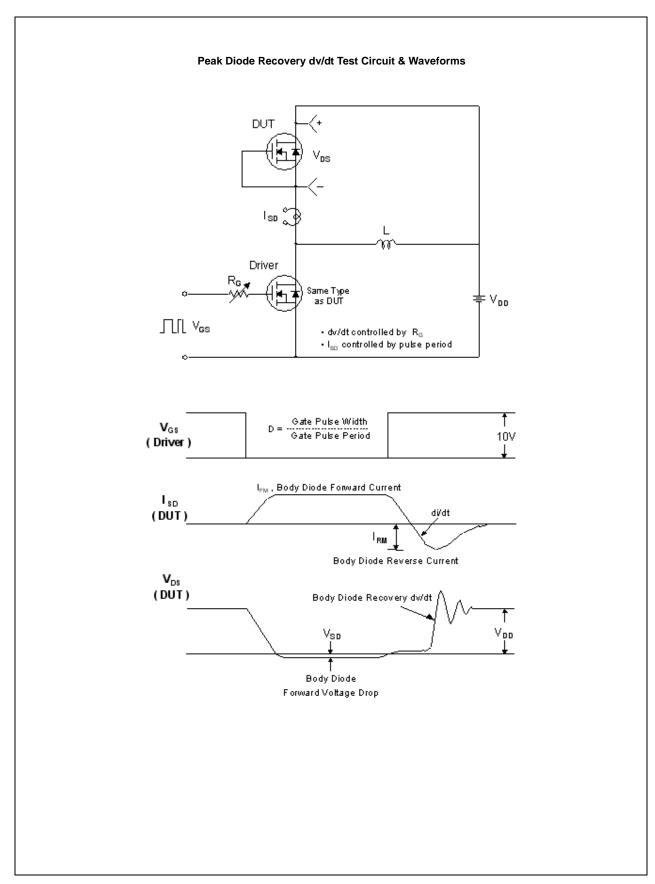


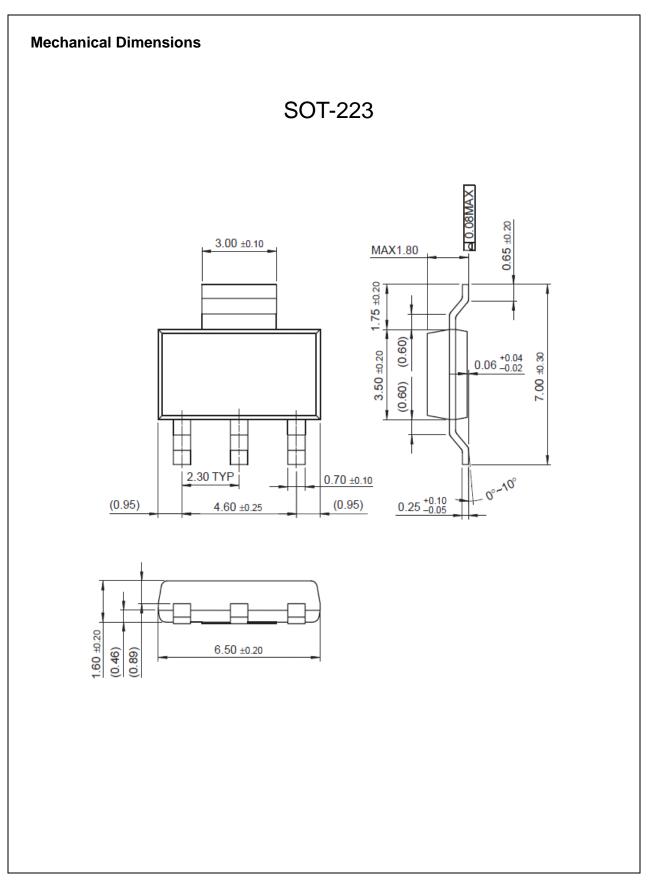
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms











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Definition of Terms					
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