



August 2012

FDT1600N10ALZ

N-Channel PowerTrench[®] MOSFET 100 V, 5.6 A, 160 mΩ

Features

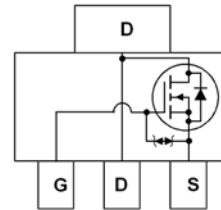
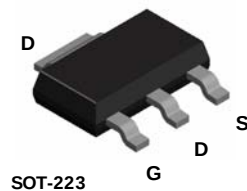
- $R_{DS(on)} = 121\text{ m}\Omega$ at $V_{GS} = 10\text{ V}$, $I_D = 2.8\text{ A}$
- $R_{DS(on)} = 156\text{ m}\Omega$ at $V_{GS} = 5\text{ V}$, $I_D = 1.8\text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Applications

- DC-DC converters
- Synchronous Rectification for Server/Telecom PSU
- Battery Charger
- AC Motor Drivers and Uninterruptible Power Supplies
- Off-line UPS



MOSFET Maximum Ratings $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	FDT1600N10ALZ	Units
V_{DSS}	Drain to Source Voltage	100	V
V_{GSS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	- Continuous ($T_C = 25\text{ }^\circ\text{C}$)	A
		- Continuous ($T_C = 100\text{ }^\circ\text{C}$)	
I_{DM}	Drain Current	- Pulsed (Note 2)	A
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	mJ
dv/dt	Peak Diode Recovery dv/dt	6.0	V/ns
P_D	Power Dissipation	($T_C = 25\text{ }^\circ\text{C}$) (Note 1a)	W
		- Derate above $25\text{ }^\circ\text{C}$ (Note 1b)	$^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	(Note 1)	12	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max	(Note 1a)	60	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
16010ALZ	FDT1600N10ALZ	SOT-223	13 "	12 mm	2500 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$	-	72	-	mV/ $^{\circ}\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 80\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	-	500	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$	-	-	± 10	μA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	1.4	-	2.8	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 2.8\text{ A}$	-	121	160	m Ω
		$V_{GS} = 5\text{ V}$, $I_D = 1.8\text{ A}$	-	156	375	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}$, $I_D = 5.6\text{ A}$	-	10.7	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 50 V, V _{GS} = 0 V, f = 1MHz		-	168	225	pF
C _{oss}	Output Capacitance			-	42	55	pF
C _{rss}	Reverse Transfer Capacitance			-	2	3	pF
C _{oss(er)}	Energy Related Output Capacitance	V _{DS} = 50 V, V _{GS} = 0 V		-	76	-	pF
Q _{g(tot)}	Total Gate Charge at 10V	V _{GS} = 10 V	V _{DD} = 50 V, I _D = 5.6 A	-	2.9	3.8	nC
Q _{g(tot)}	Total Gate Charge at 5V	V _{GS} = 5 V		-	1.6	-	nC
Q _{gs}	Gate to Source Gate Charge			-	0.7	-	nC
Q _{gd}	Gate to Drain "Miller" Charge			(Note 5)	-	0.64	-
ESR	Equivalent Series Resistance(G-S)	f = 1MHz		-	2.04	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}$, $I_D = 5.6\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 4.7\text{ }\Omega$	-	7.4	24.8	ns
t_r	Rise Time		-	2.5	15	ns
$t_{d(off)}$	Turn-Off Delay Time		-	13.5	37	ns
t_f	Turn-Off Fall Time	(Note 5)	-	2.4	14.8	ns

Drain-Source Diode Characteristics

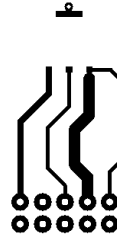
I _S	Maximum Continuous Drain to Source Diode Forward Current	-	-	5.6	A	
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	22.4	A	
V _{SD}	Source to Drain Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 5.6A	-	-	1.3	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 5.6A, V _{DD} = 50V,	-	34.1	46	ns
Q _{rr}	Reverse Recovery Charge	dI _P /dt = 100A/μs	-	32.7	20	nC

NOTES:

- $R_{\theta JA}$ 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) $60\text{ }^{\circ}\text{C/W}$ when mounted on a 1 in^2 pad of 2 oz copper



b) $118\text{ }^{\circ}\text{C/W}$ when mounted on a minimum pad of 2 oz copper

- Repetitive Rating: Pulse width limited by maximum junction temperature
- Starting $T_J = 25\text{ }^{\circ}\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 2.47\text{ A}$
- $I_{SD} \leq 5.6\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25\text{ }^{\circ}\text{C}$
- Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

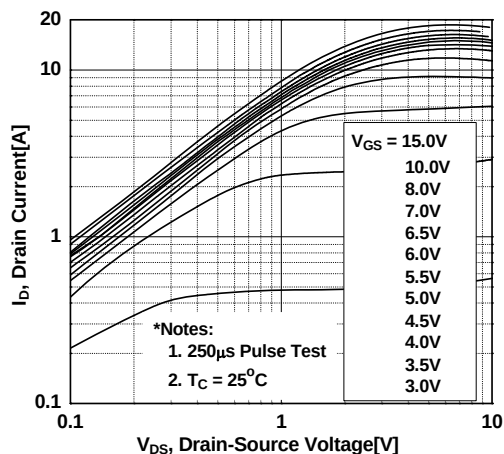


Figure 2. Transfer Characteristics

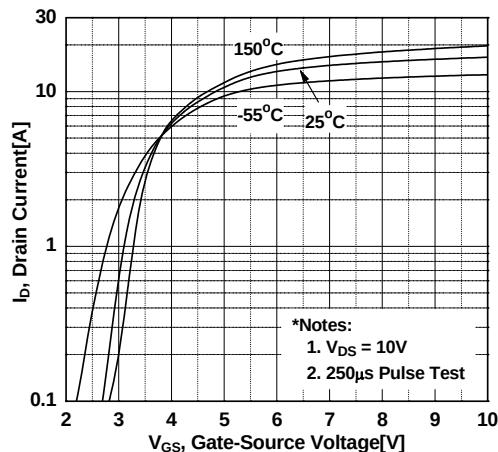


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

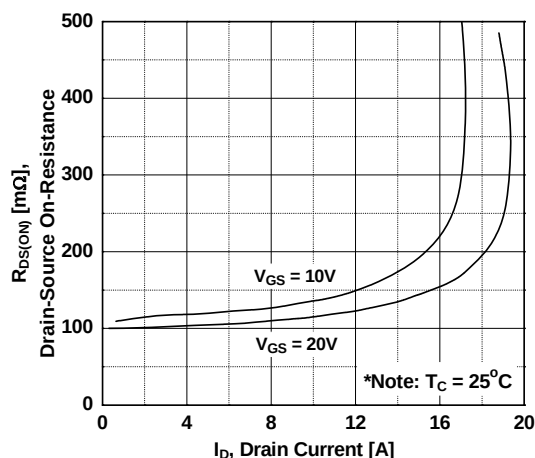


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

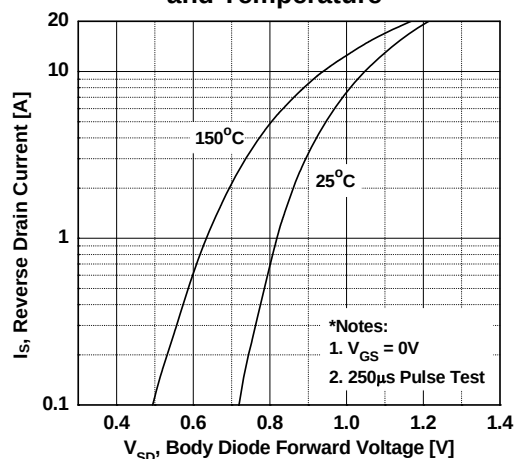


Figure 5. Capacitance Characteristics

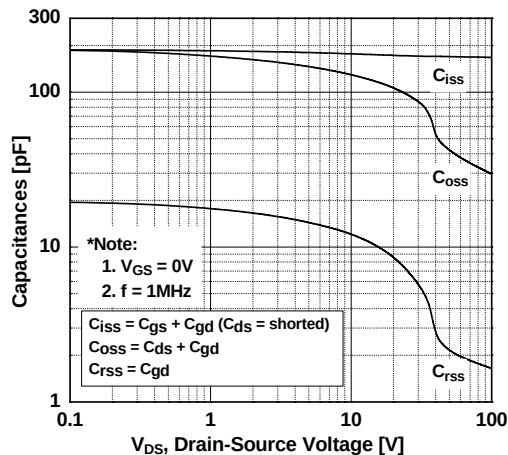
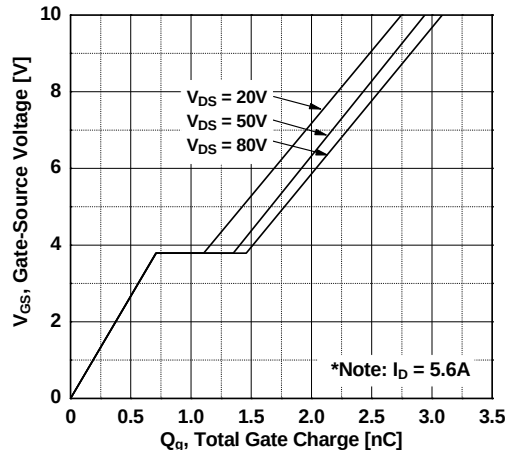


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

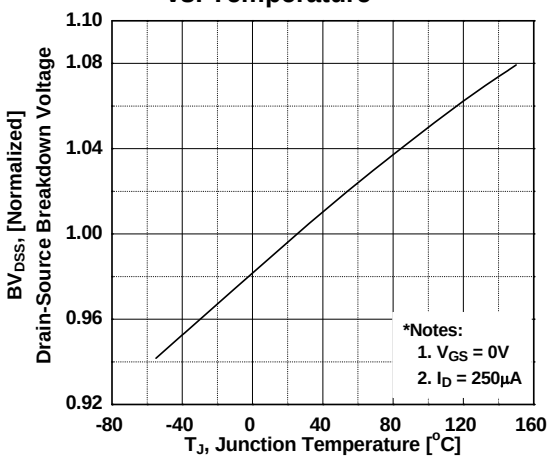


Figure 8. On-Resistance Variation vs. Temperature

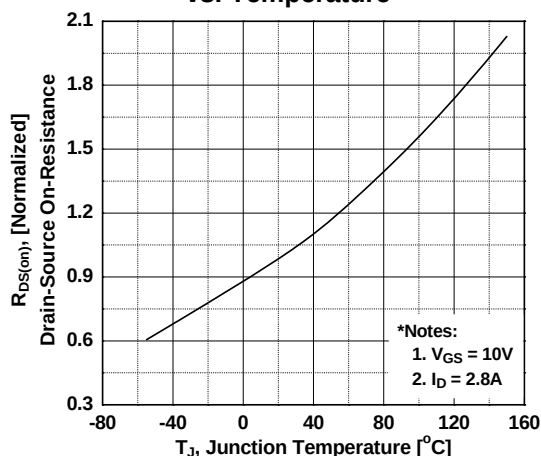


Figure 9. Maximum Safe Operating Area vs. Case Temperature

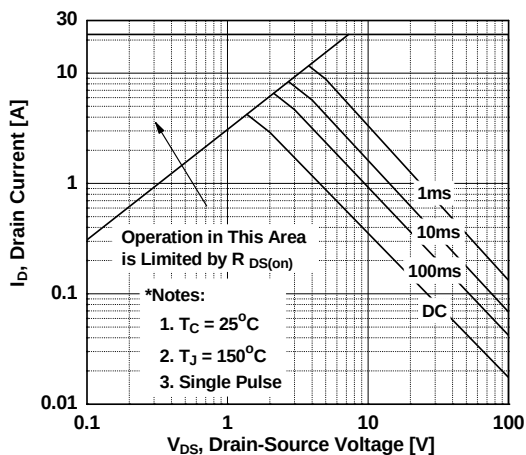


Figure 10. Maximum Drain Current

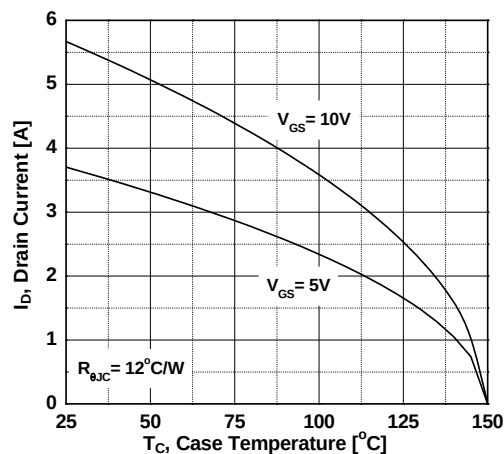


Figure 11. E_oss vs. Drain to Source Voltage

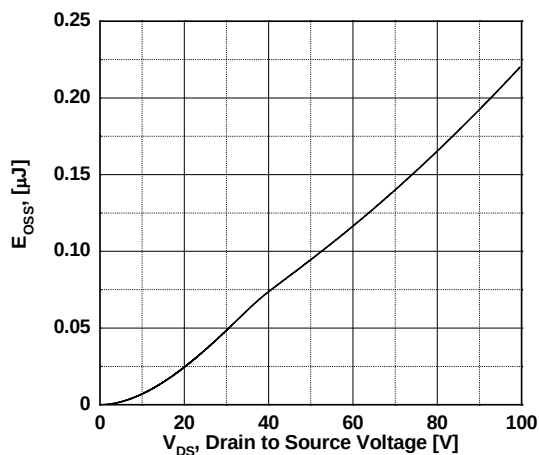
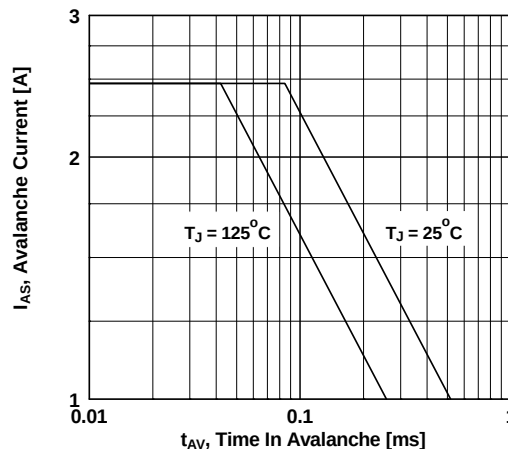
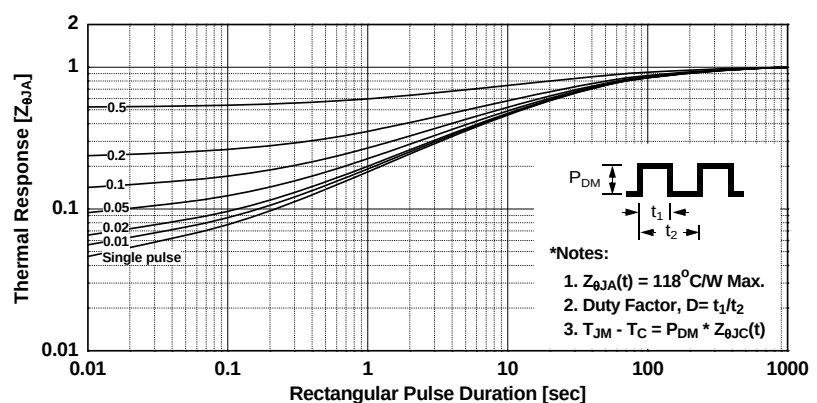


Figure 12. Unclamped Inductive Switching Capability

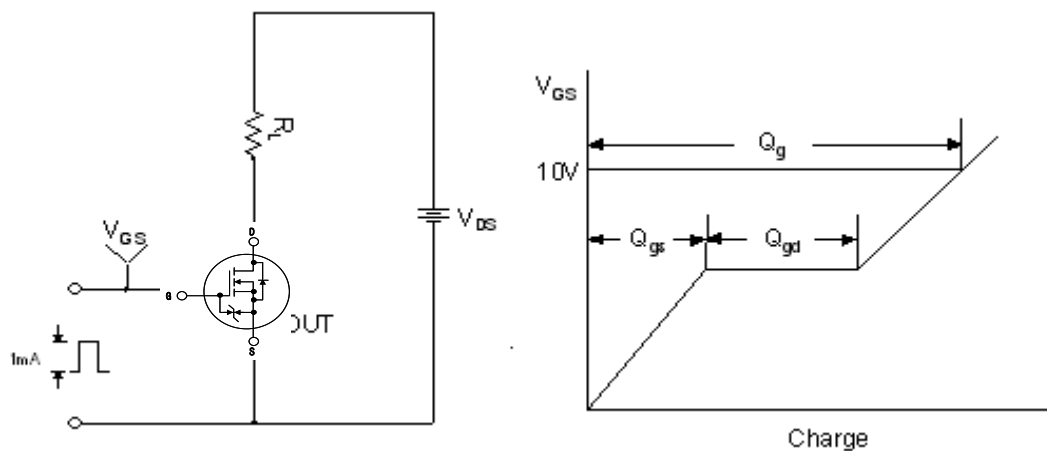


Typical Performance Characteristics (Continued)

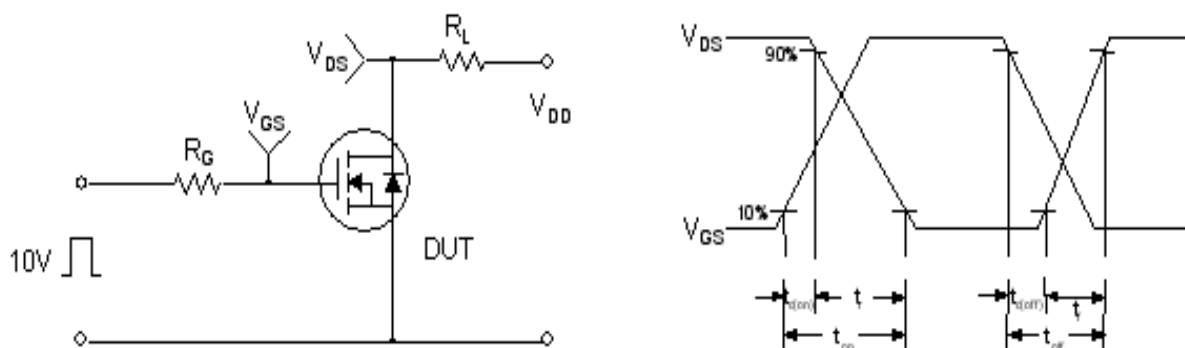
Figure 13. Transient Thermal Response Curve



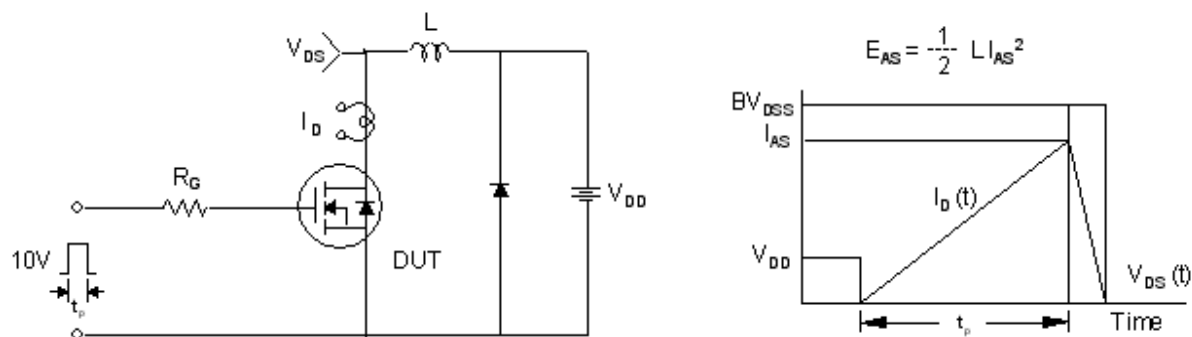
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms





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