FAIRCHILD SEMICONDUCTOR®

August 2012

FDT1600N10ALZ

N-Channel PowerTrench® MOSFET

100 V, 5.6 A, 160 mΩ

Features

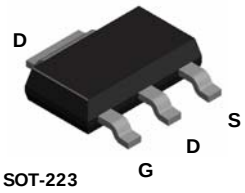
- $R_{DS(on)}$ = 121 mΩ at V_{GS} = 10 V, I_D = 2.8 A
- $R_{DS(on)}$ = 156 mΩ at V_{GS} = 5 V, I_D = 1.8 A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

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 Drovers and Uninterruptible Power Supplies
- Off-line UPS



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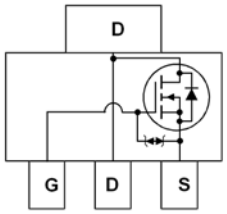


MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

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 °C)		5.6	A
		- Continuous (T_C = 100 °C)		3.5	
I_{DM}	Drain Current	- Pulsed	(Note 2)	22.4	A
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	9.2	mJ
dv/dt	Peak Diode Recovery dv/dt			6.0	V/ns
P_D	Power Dissipation	(T_C = 25 °C)	(Note 1a)	10.42	W
		- Derate above 25 °C	(Note 1b)	0.083	°C
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds			300	°C

Thermal Characteristics

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

Package Marking and Ordering Information

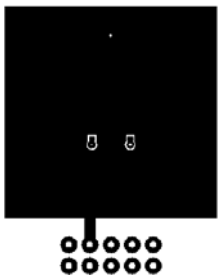
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
16010ALZ	FDT1600N10ALZ	SOT-223	13 "	12 mm	2500 units

Electrical Characteristics T_J = 25 °C unless otherwise noted

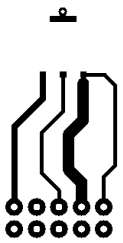
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C	-	72	-	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 80 V, T_J = 125 °C	-	-	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	-	-	±10	μA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1.4	-	2.8	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 2.8 A	-	121	160	mΩ
		V_{GS} = 5 V, I_D = 1.8 A	-	156	375	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 5.6 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; V_{DD} = 50 V, I_D = 5.6 A	-	1.6	-	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 50 V, I_D = 5.6 A (Note 5)	-	0.7	-	nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 50 V, I_D = 5.6 A (Note 5)	-	0.64	-	nC
ESR	Equivalent Series Resistance(G-S)	f = 1MHz	-	2.04	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 50 V, I_D = 5.6 A, V_{GS} = 10 V, R_{GEN} = 4.7 Ω (Note 5)	-	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		-	2.4	14.8	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continous 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, dI_F/dt = 100A/μs	-	34.1	46	ns
Q_{rr}	Reverse Recovery Charge		-	32.7	20	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) 60 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b) 118 °C/W when mounted on a minimum pad of 2 oz copper

2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. Starting T_J = 25 °C, L = 3 mH, I_{AS} = 2.47 A
4. I_{SD} ≤ 5.6A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

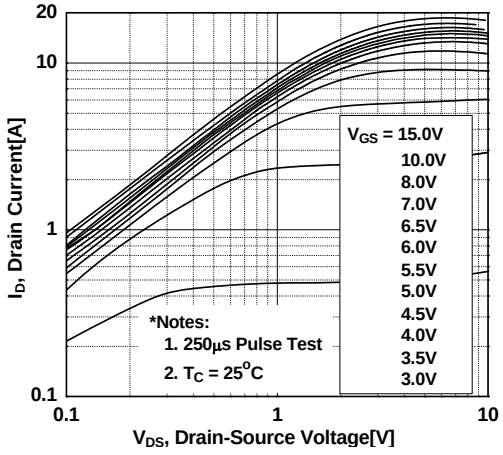


Figure 2. Transfer Characteristics

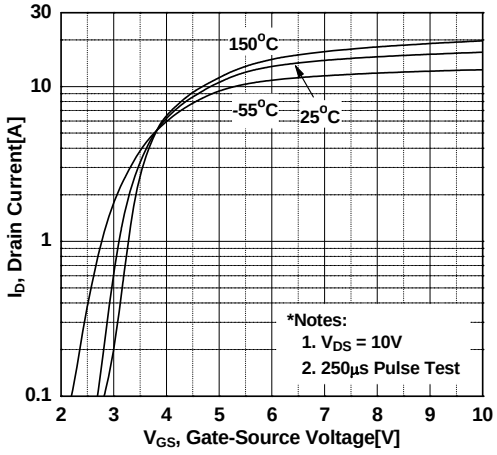


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

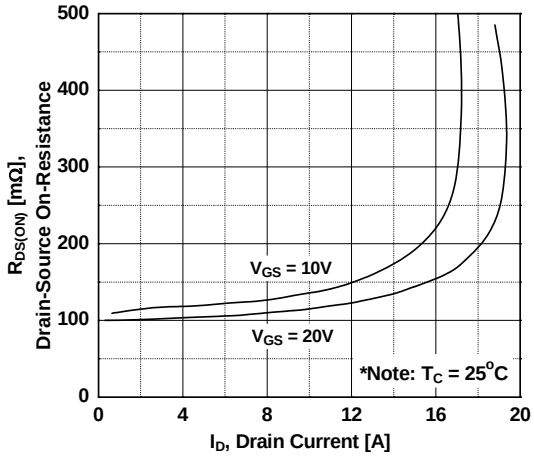


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

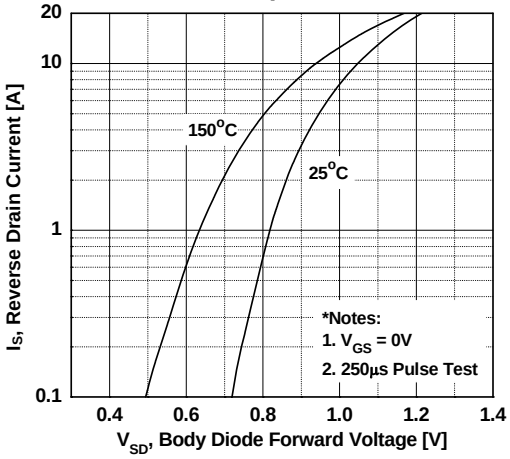


Figure 5. Capacitance Characteristics

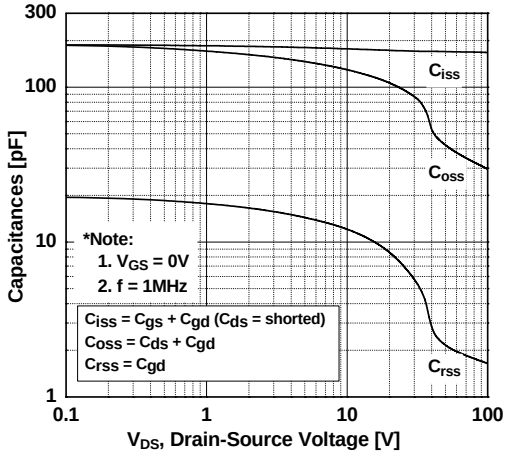
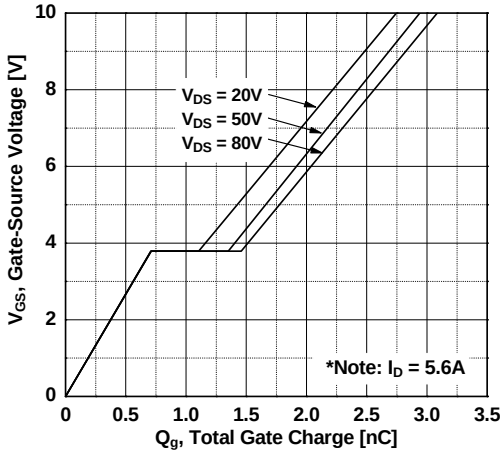


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

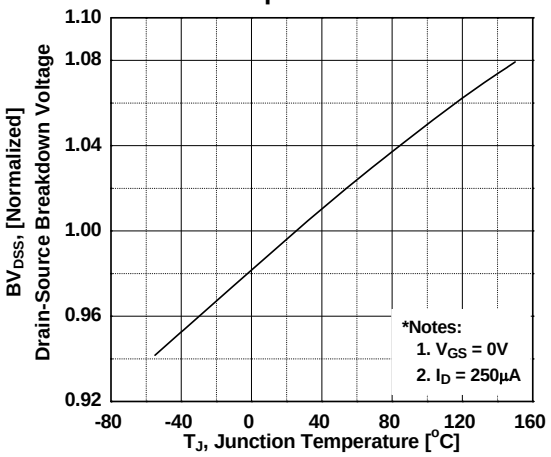


Figure 8. On-Resistance Variation vs. Temperature

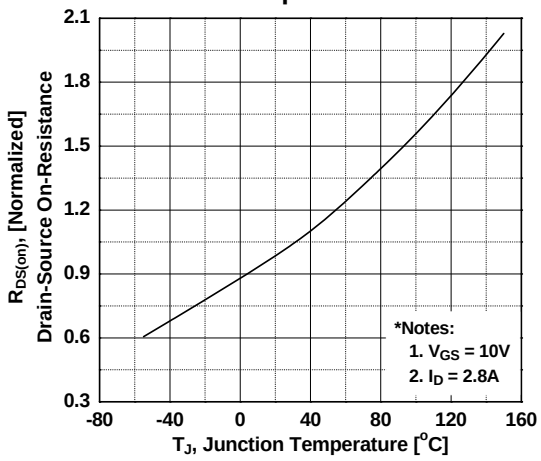


Figure 9. Maximum Safe Operating Area vs. Case Temperature

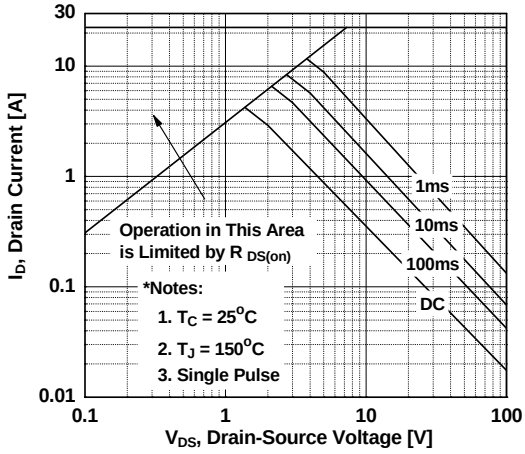


Figure 10. Maximum Drain Current

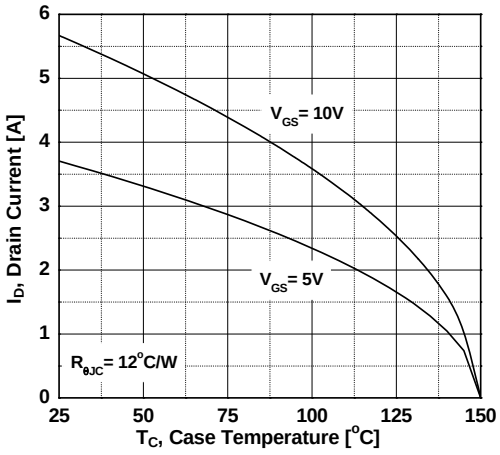


Figure 11. Eoss vs. Drain to Source Voltage

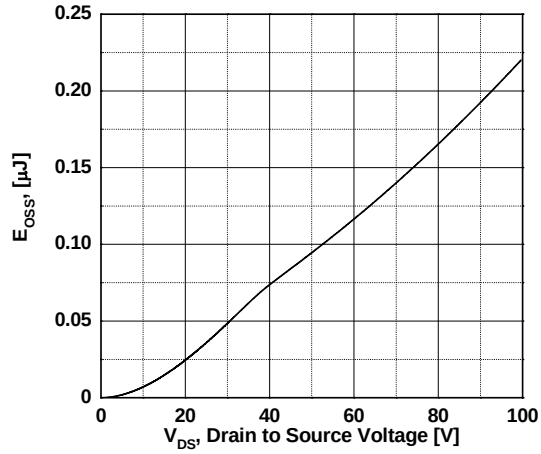
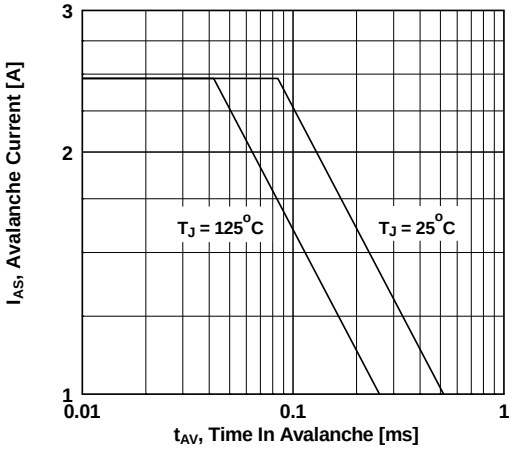
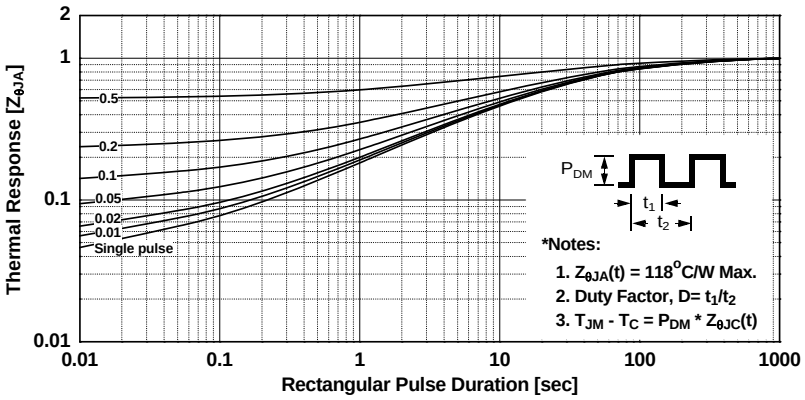


Figure 12. Unclamped Inductive Switching Capability

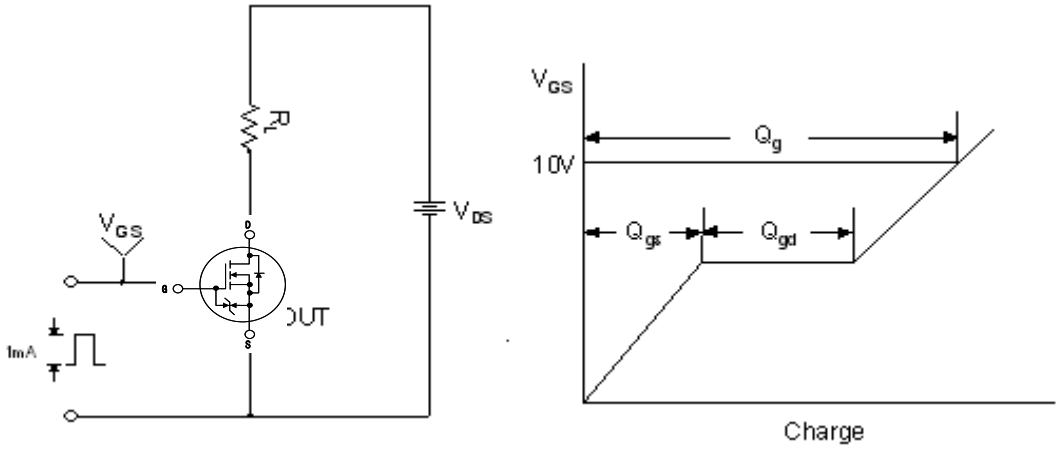


Typical Performance Characteristics (Continued)

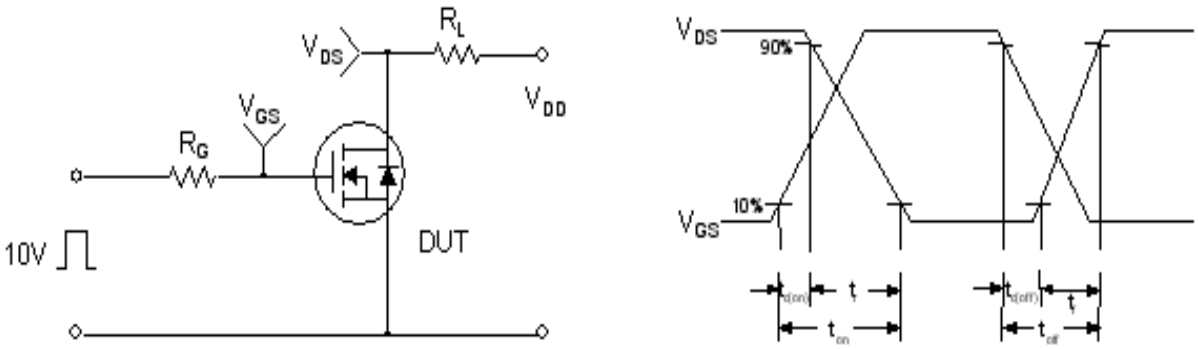
Figure 13. Transient Thermal Response Curve



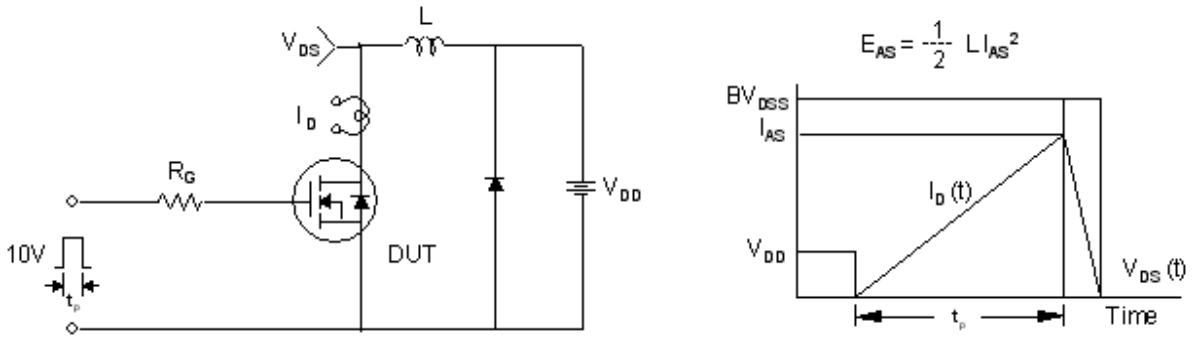
Gate Charge Test Circuit & Waveform



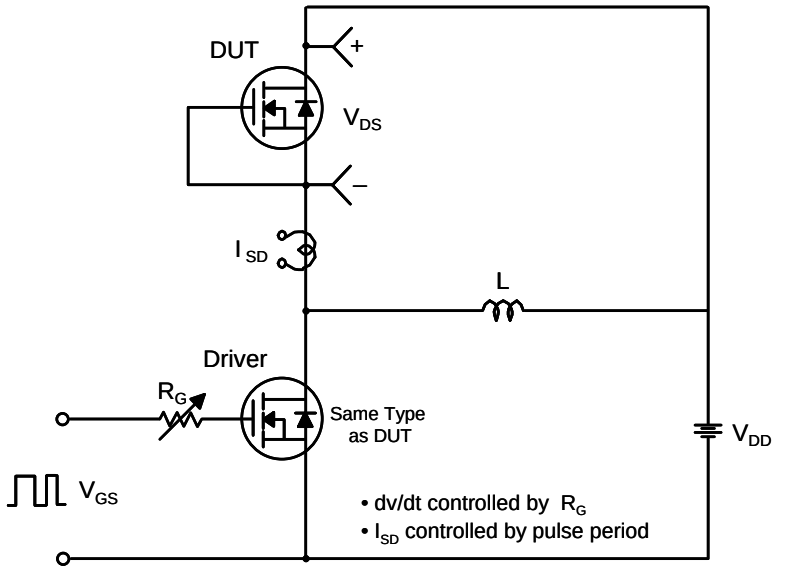
Resistive Switching Test Circuit & Waveforms

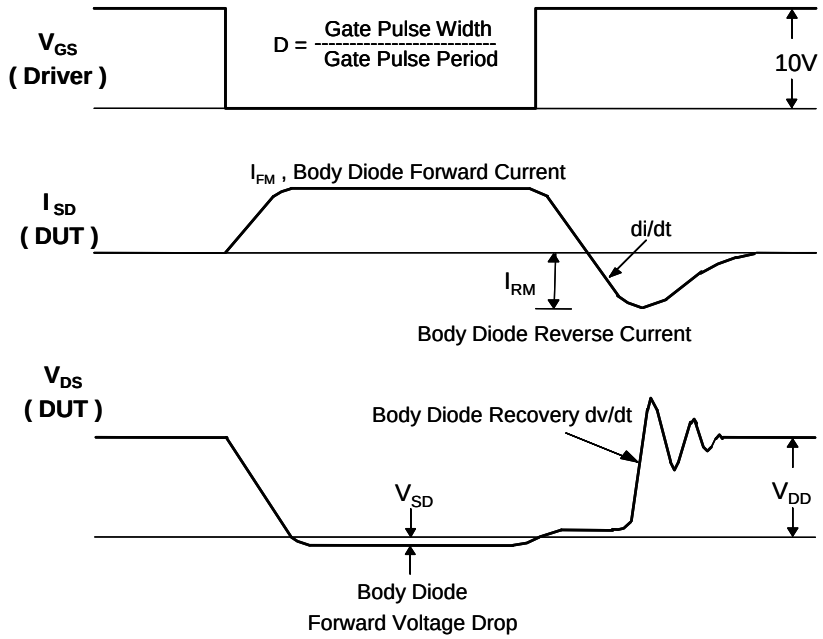


Unclamped Inductive Switching Test Circuit & Waveforms



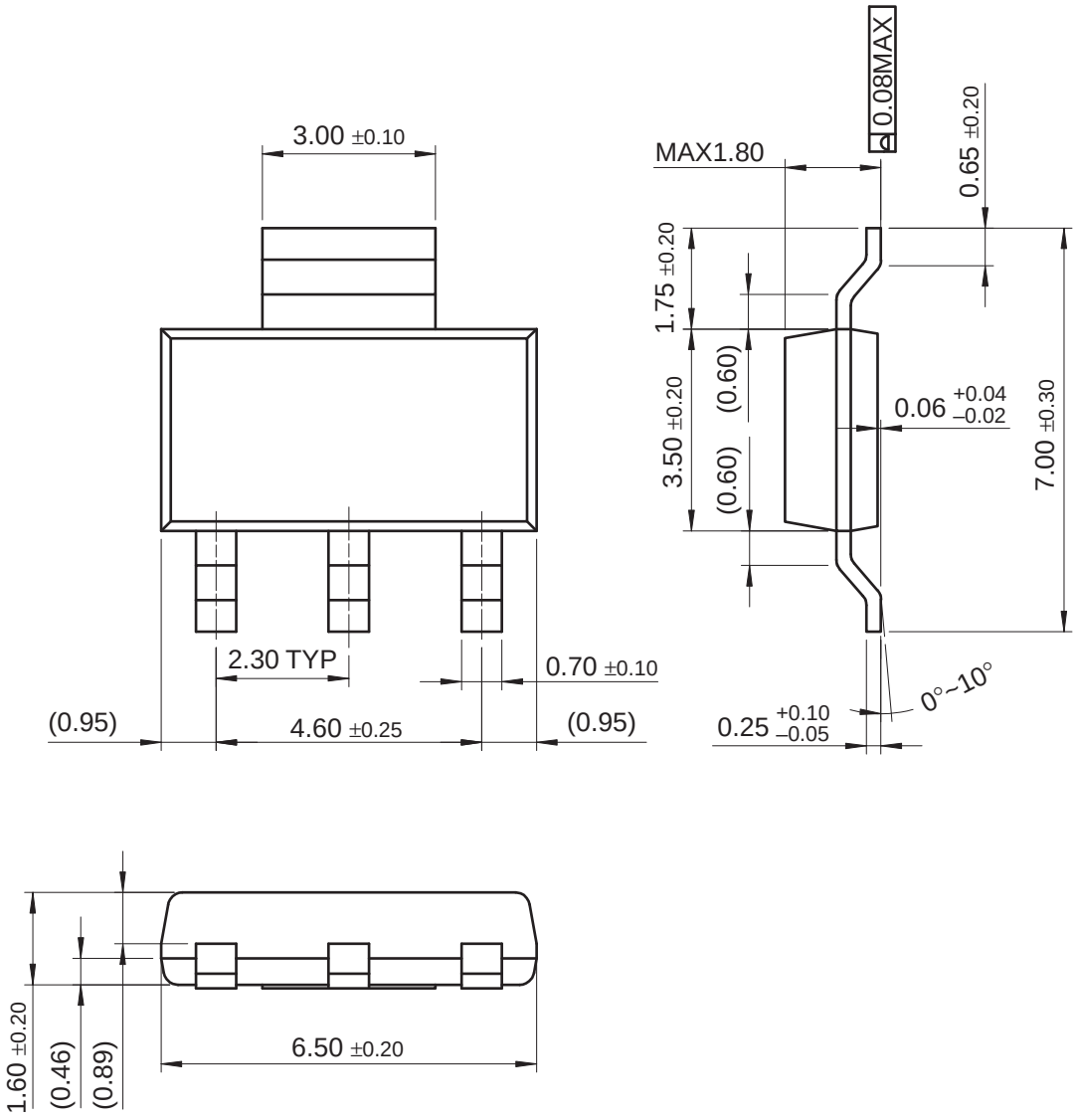
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

SOT-223



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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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