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FAIRCHILD SEMICONDUCTOR®

August 2011

FDT86256

N-Channel PowerTrench® MOSFET
150 V, 1.2 A, 845 mΩ

Features

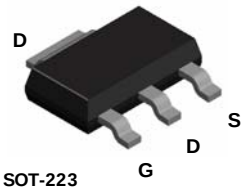
- Max $r_{DS(on)}$ = 845 mΩ at V_{GS} = 10 V, I_D = 1.2 A
- Max $r_{DS(on)}$ = 1280 mΩ at V_{GS} = 6.0 V, I_D = 1.0 A
- Very low Qg and Qgd compared to competing trench technologies
- Fast switching speed
- 100% UIL Tested
- RoHS Compliant

General Description

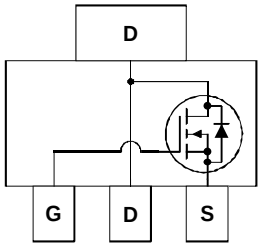
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been especially tailored to minimize the on-state resistance and switching loss. G-S zener has been added to enhance ESD voltage level.

Applications

- DC-DC conversion
- Inverter
- Synchronous Rectifier



SOT-223



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			150	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous (Package limited)	T_C = 25 °C		3	A
	-Continuous (Silicon limited)	T_C = 25 °C		2.5	
	-Continuous	T_A = 25 °C	(Note 1a)	1.2	
	-Pulsed			2	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	1	mJ
P_D	Power Dissipation	T_C = 25 °C		10	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	12	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	55	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
86256	FDT86256	SOT-223	13 ”	12 mm	2500 units

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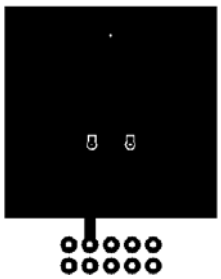
Electrical Characteristics T_J = 25 °C unless otherwise noted

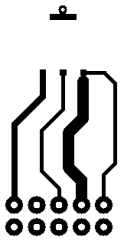
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		100		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V			±10	μA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2	3.5	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-8		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 1.2 A		695	845	mΩ
		V_{GS} = 6 V, I_D = 1.0 A		912	1280	
		V_{GS} = 10 V, I_D = 1.2 A, T_J = 125 °C		1298	1367	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 1.2 A		0.3		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 75 V, V_{GS} = 0 V, f = 1MHz		55	73	pF
C_{oss}	Output Capacitance			8	11	pF
C_{rss}	Reverse Transfer Capacitance			1	1.4	pF
R_g	Gate Resistance			1.3		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 75 V, I_D = 1.2 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		2.7	10	ns
t_r	Rise Time			1.7	10	ns
$t_{d(off)}$	Turn-Off Delay Time			4.8	10	ns
t_f	Fall Time			2.6	10	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 75 V, I_D = 1.2 A		1.2	2.0	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 6 V; V_{DD} = 75 V, I_D = 1.2 A		0.8	1.0	
Q_{gs}	Gate to Source Charge	V_{DD} = 75 V, I_D = 1.2 A		0.4		nC
Q_{gd}	Gate to Drain “Miller” Charge			0.3		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 1.2 A (Note 2)		0.9	1.3	V
		V_{GS} = 0 V, I_S = 1.0 A (Note 2)		0.8	1.3	
t_{rr}	Reverse Recovery Time	I_F = 1.2 A, di/dt = 100 A/μs		47	75	ns
Q_{rr}	Reverse Recovery Charge			24	38	nC

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 55 °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. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0 %.
3. Starting T_J = 25 °C, L = 3 mH, I_{AS} = 1 A, V_{DD} = 150 V, V_{GS} = 10 V.
4. The diode connected between gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics T_J = 25 °C unless otherwise noted

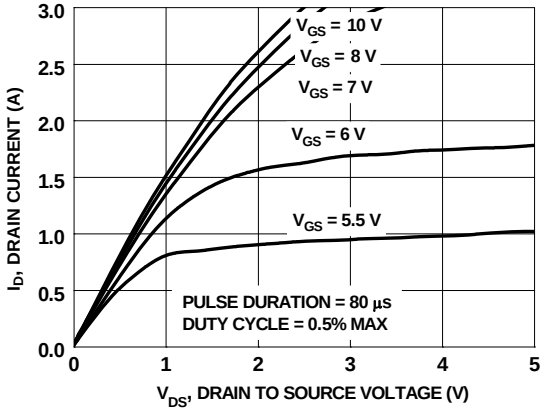


Figure 1. On-Region Characteristics

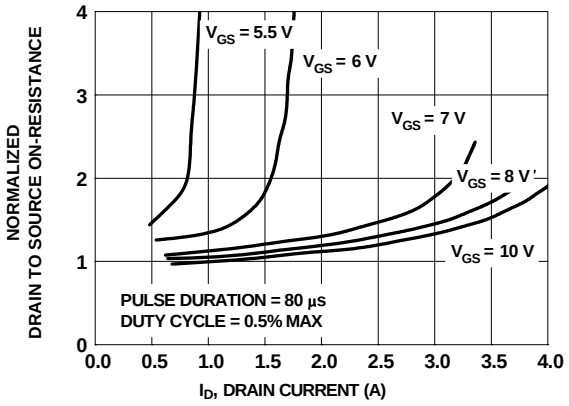


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

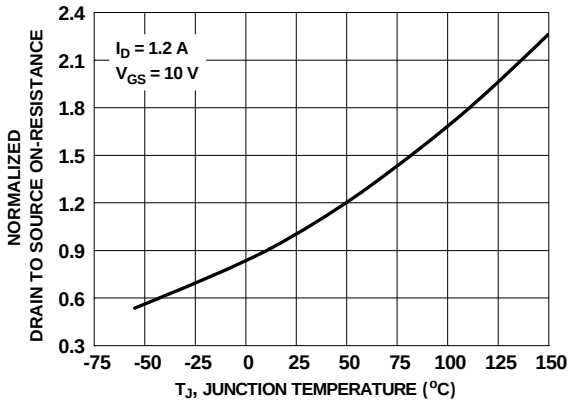


Figure 3. Normalized On-Resistance vs Junction Temperature

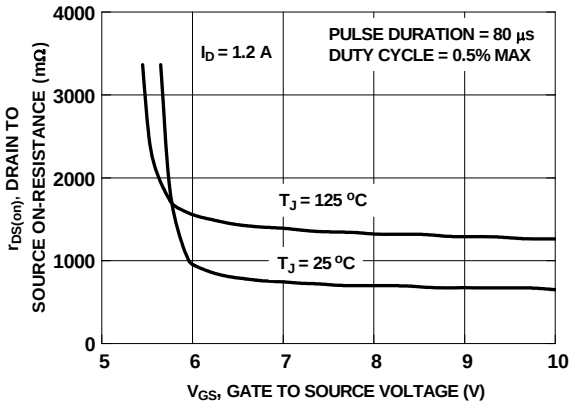


Figure 4. On-Resistance vs Gate to Source Voltage

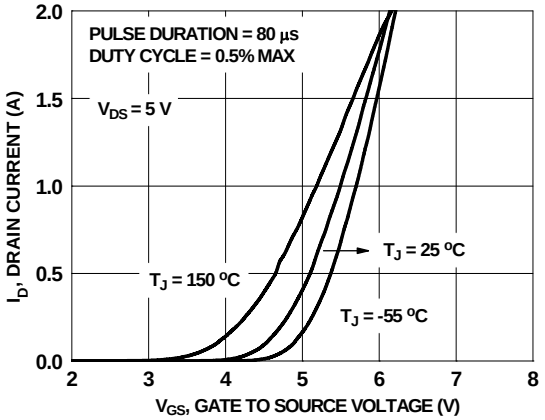


Figure 5. Transfer Characteristics

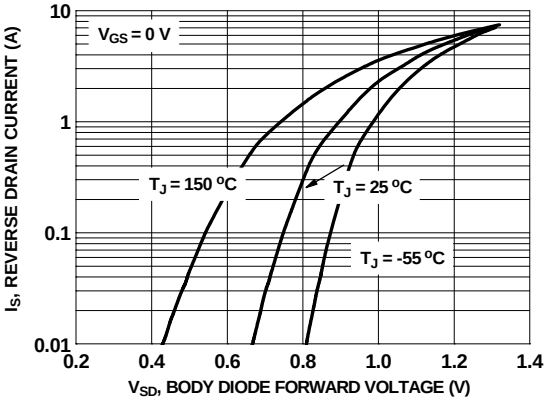


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

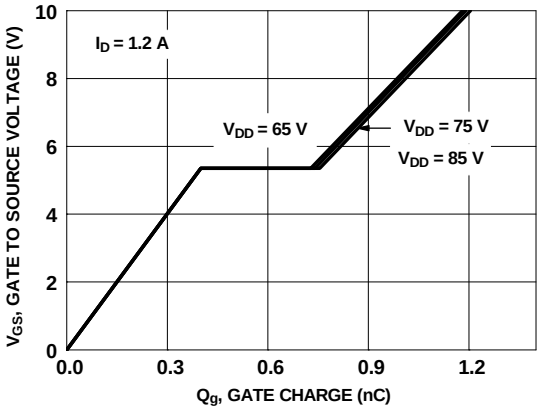


Figure 7. Gate Charge Characteristics

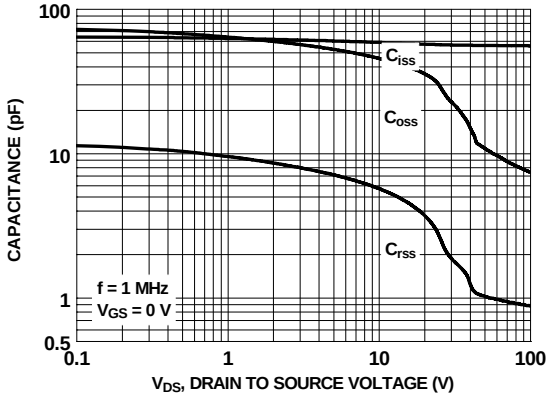


Figure 8. Capacitance vs Drain to Source Voltage

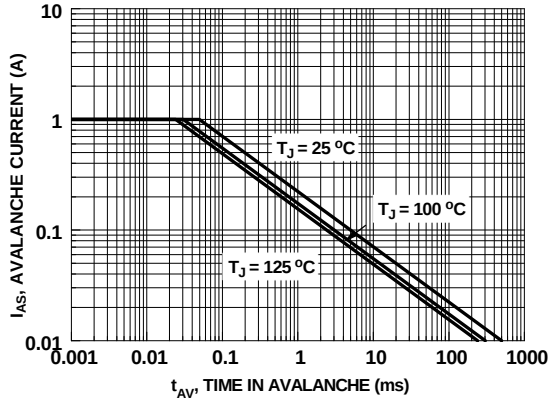


Figure 9. Unclamped Inductive Switching Capability

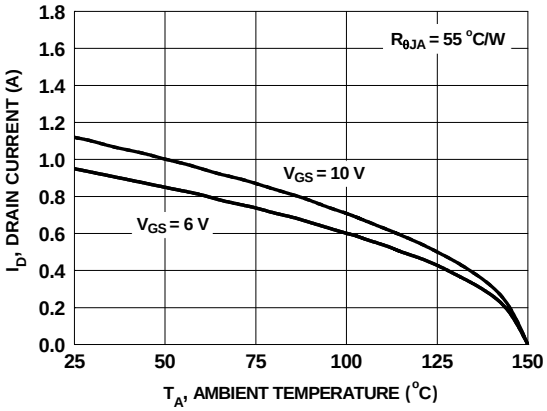


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

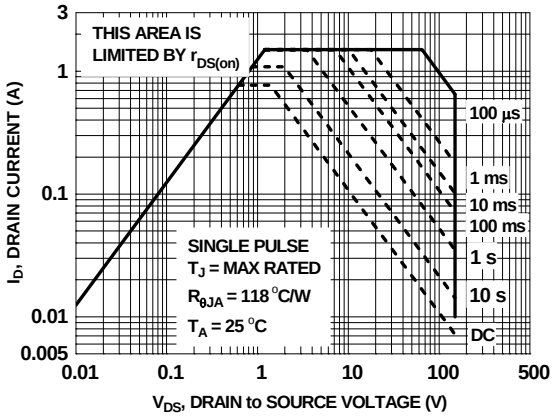


Figure 11. Forward Bias Safe Operating Area

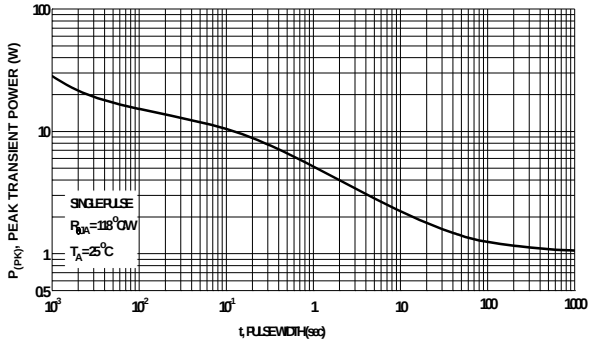


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

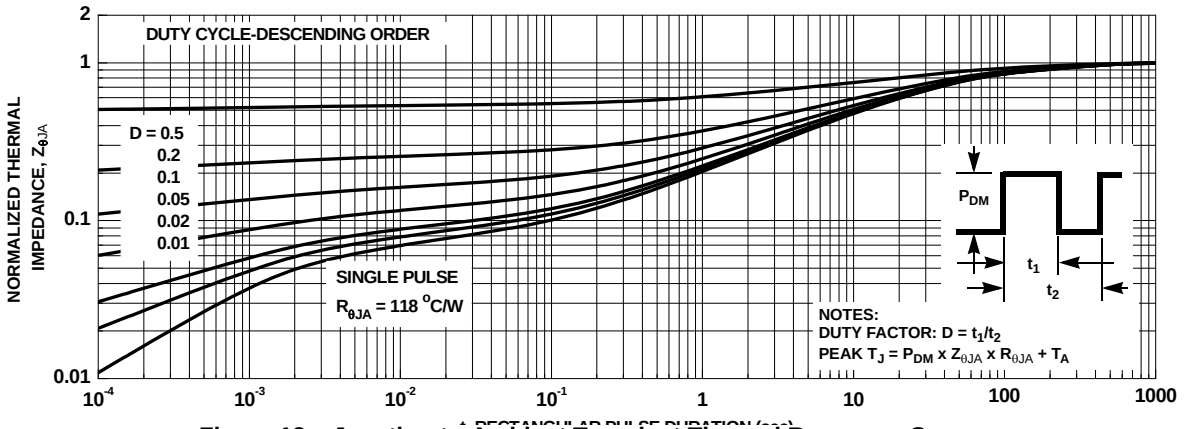
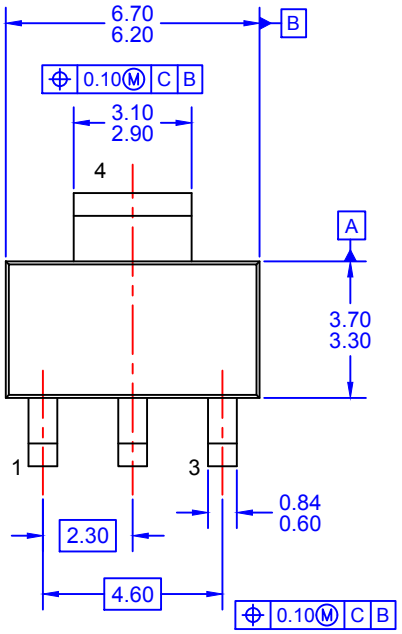
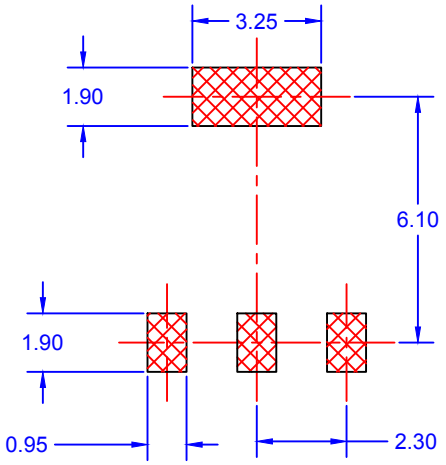
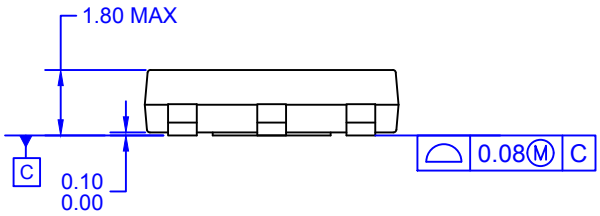


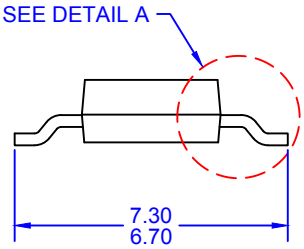
Figure 13. Junction-to-Ambient Transient Thermal Response Curve



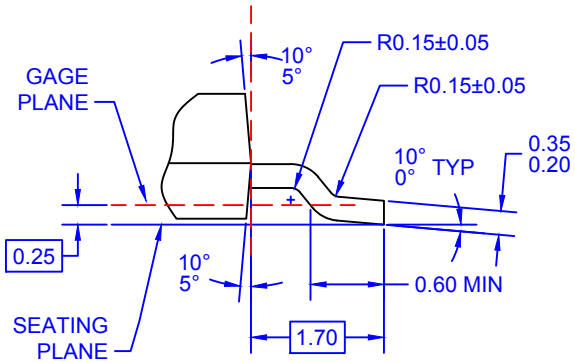


LAND PATTERN RECOMMENDATION





NOTES: UNLESS OTHERWISE SPECIFIED
A) DRAWING BASED ON JEDEC REGISTRATION TO-261C, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
E) LANDPATTERN NAME: SOT230P700X180-4BN
F) DRAWING FILENAME: MKT-MA04AREV3



DETAIL A
SCALE: 2:1

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