

# 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  $Q_g$  and  $Q_{gd}$  compared to competing trench technologies
- Fast switching speed
- 100% UIL Tested
- RoHS Compliant

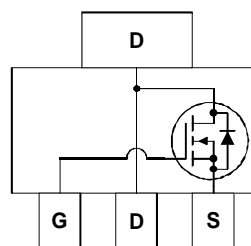
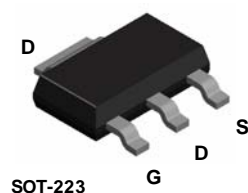


### General Description

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



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

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

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	12	$^\circ\text{C/W}$
$R_{\theta JA}$	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

**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	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^{\circ}\text{C}$		100		mV/ $^{\circ}\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 120\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 10$	$\mu\text{A}$

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	2	3.5	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^{\circ}\text{C}$		-8		mV/ $^{\circ}\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 1.2\text{ A}$		695	845	m $\Omega$
		$V_{GS} = 6\text{ V}$ , $I_D = 1.0\text{ A}$		912	1280	
		$V_{GS} = 10\text{ V}$ , $I_D = 1.2\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$		1298	1367	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{ V}$ , $I_D = 1.2\text{ A}$		0.3		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 75\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		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		$\Omega$

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\text{ V}$ , $I_D = 1.2\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		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	$V_{GS} = 0\text{ V to }10\text{ V}$	$V_{DD} = 75\text{ V}$ , $I_D = 1.2\text{ A}$	1.2	2.0	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }6\text{ V}$		0.8	1.0	
$Q_{gs}$	Gate to Source Charge			0.4		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			0.3		nC

**Drain-Source Diode Characteristics**

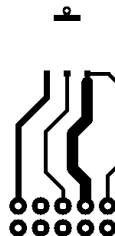
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 1.2\text{ A}$ (Note 2)		0.9	1.3	V
		$V_{GS} = 0\text{ V}$ , $I_S = 1.0\text{ A}$ (Note 2)		0.8	1.3	
$t_{rr}$	Reverse Recovery Time	$I_F = 1.2\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		47	75	ns
$Q_{rr}$	Reverse Recovery Charge			24	38	nC

**NOTES:**

1.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> 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  $^{\circ}\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



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

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0 %.

3. Starting  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $L = 3\text{ mH}$ ,  $I_{AS} = 1\text{ A}$ ,  $V_{DD} = 150\text{ V}$ ,  $V_{GS} = 10\text{ V}$ .

4. The diode connected between gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

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

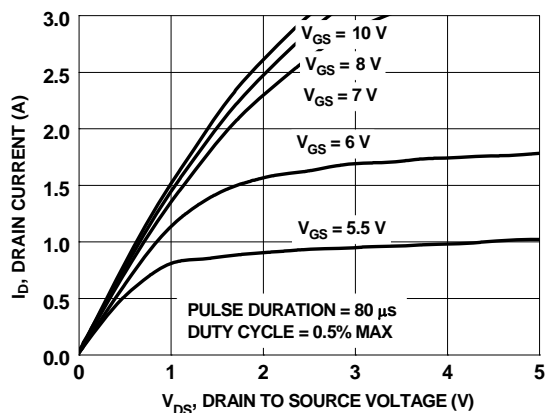


Figure 1. On-Region Characteristics

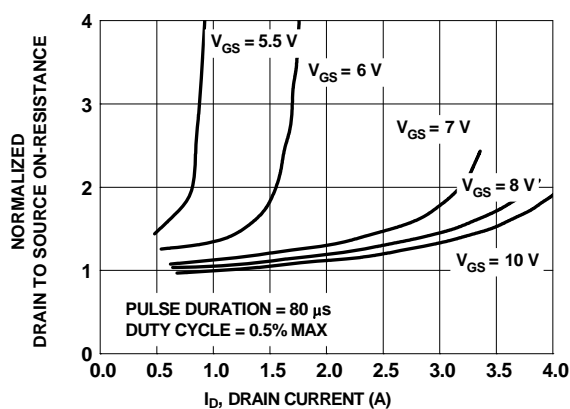


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

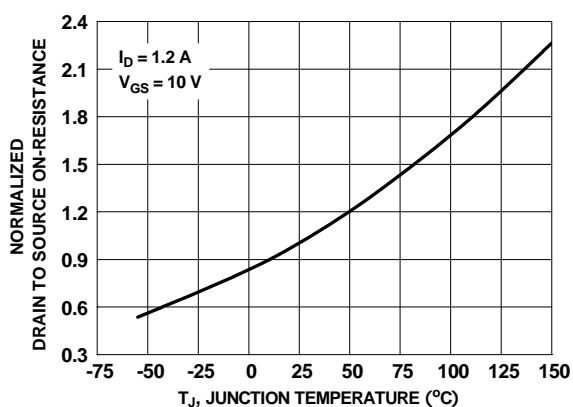


Figure 3. Normalized On-Resistance vs Junction Temperature

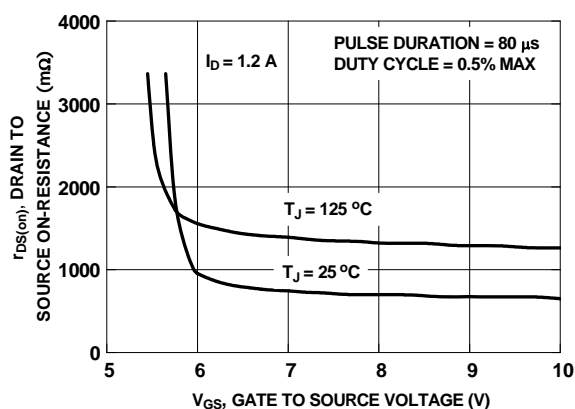


Figure 4. On-Resistance vs Gate to Source Voltage

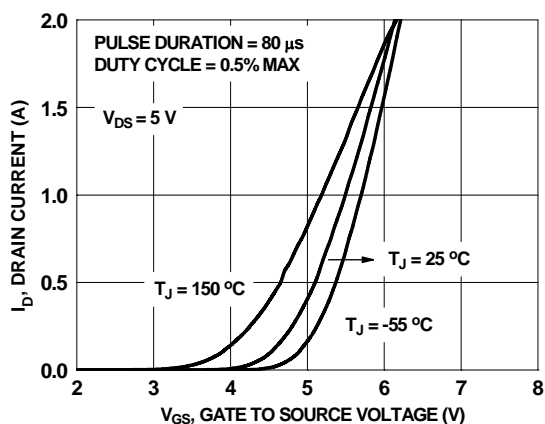


Figure 5. Transfer Characteristics

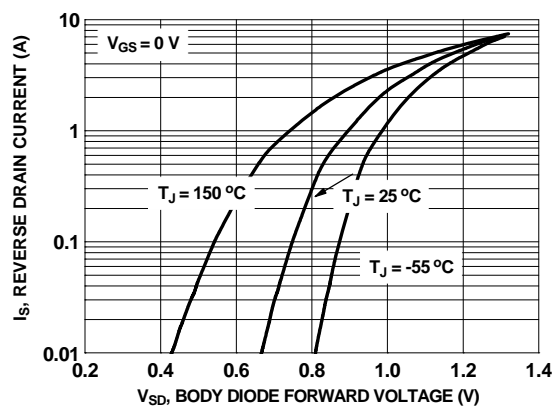


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

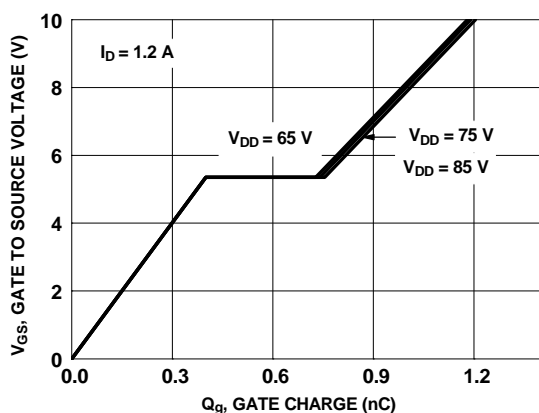


Figure 7. Gate Charge Characteristics

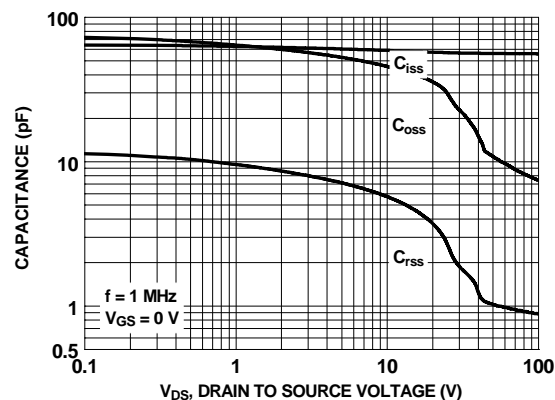


Figure 8. Capacitance vs Drain to Source Voltage

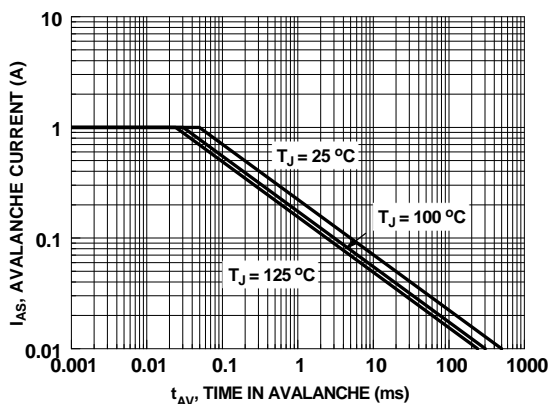


Figure 9. Unclamped Inductive Switching Capability

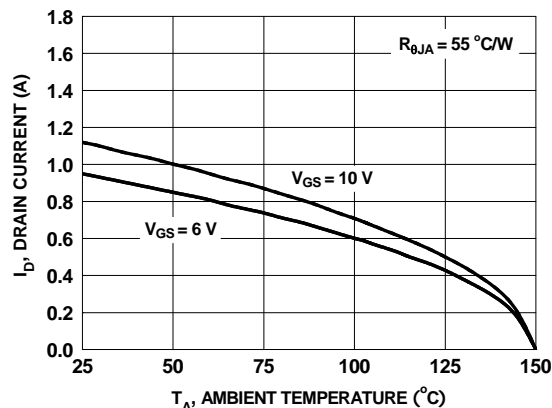


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

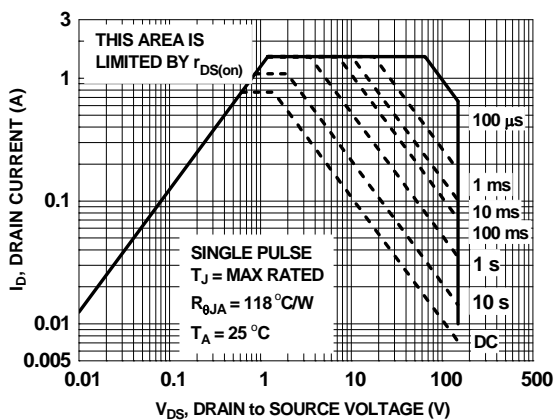


Figure 11. Forward Bias Safe Operating Area

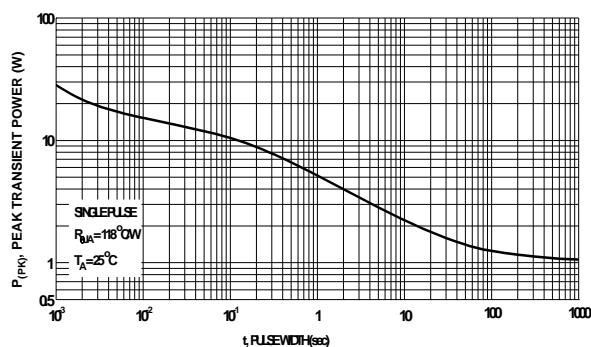
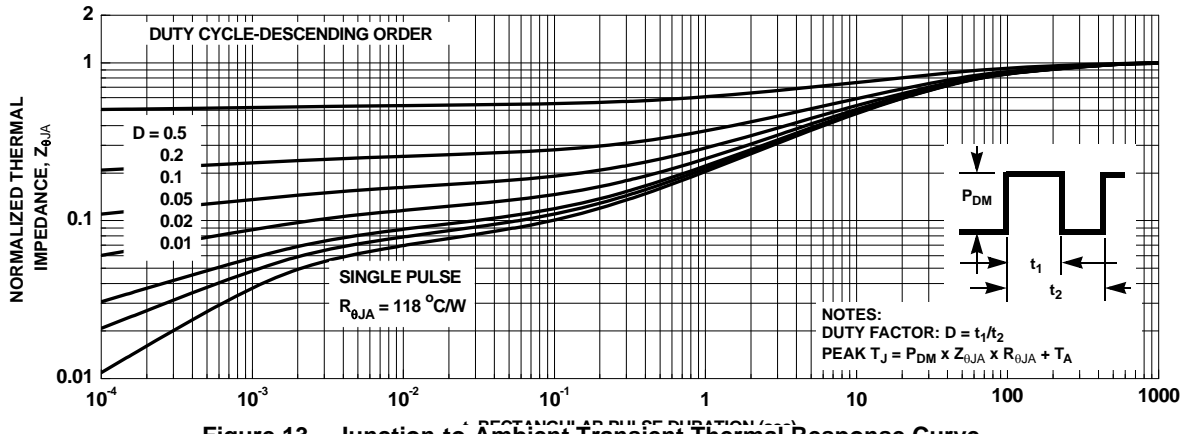
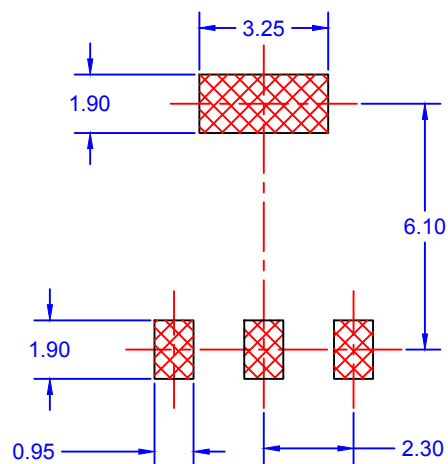


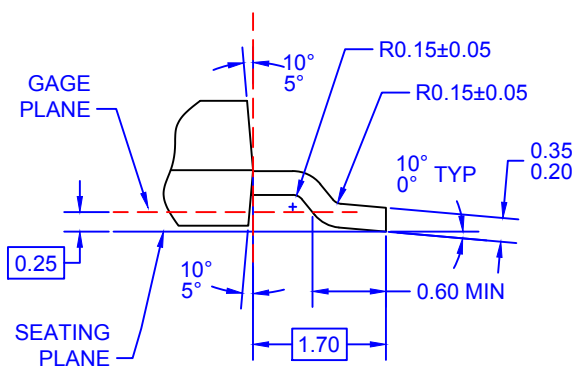
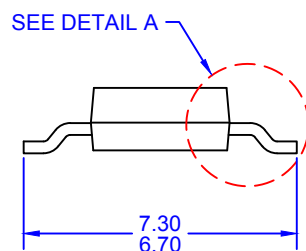
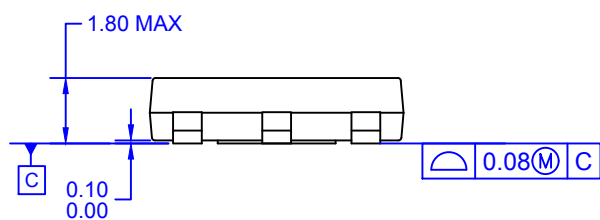
Figure 12. Single Pulse Maximum Power Dissipation

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





## LAND PATTERN RECOMMENDATION



**DETAIL A**  
**SCALE: 2:1**

- 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





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## PRODUCT STATUS DEFINITIONS

### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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