

# FDT86106LZ

## N-Channel PowerTrench® MOSFET 100 V, 3.2 A, 108 mΩ

### Features

- Max  $r_{DS(on)}$  = 108 mΩ at  $V_{GS} = 10$  V,  $I_D = 3.2$  A
- Max  $r_{DS(on)}$  = 153 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 2.7$  A
- High performance trench technology for extremely low  $r_{DS(on)}$
- High power and current handling capability in a widely used surface mount package
- HBM ESD protection level > 3 KV typical (Note 4)
- 100% UIL tested
- RoHS Compliant

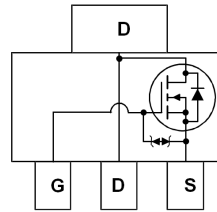
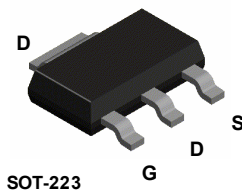


### General Description

This N-Channel logic Level MOSFETs are produced using Fairchild Semiconductor's advanced Power Trench® process that has been special tailored to minimize the on-state resistance and yet maintain superior switching performance. G-S zener has been added to enhance ESD voltage level.

### Application

- DC - DC Conversion



### MOSFET Maximum Ratings $T_C = 25$ °C unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	100	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current -Continuous	3.2	A
	-Pulsed	12	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	12	mJ
$P_D$	Power Dissipation $T_A = 25$ °C (Note 1a)	2.2	W
	Power Dissipation $T_A = 25$ °C (Note 1b)	1.0	
$T_J, T_{STG}$	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
86106LZ	FDT86106LZ	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 $25\text{ }^\circ\text{C}$		71		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}$			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 (Note 2)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.0	1.5	2.2	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 $25\text{ }^\circ\text{C}$		-5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 3.2\text{ A}$		80	108	m $\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 2.7\text{ A}$		100	153	
		$V_{GS} = 10\text{ V}, I_D = 3.2\text{ A}, T_J = 125\text{ }^\circ\text{C}$		140	189	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 3.2\text{ A}$		8		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		234	315	pF
$C_{oss}$	Output Capacitance			46	65	pF
$C_{rss}$	Reverse Transfer Capacitance			3.1	5	pF

### Switching Characteristics

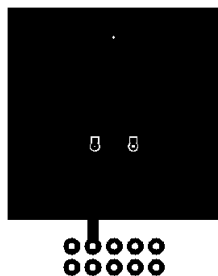
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}, I_D = 3.2\text{ A}, V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$		3.8	10	ns	
$t_r$	Rise Time			1.3	10	ns	
$t_{d(off)}$	Turn-Off Delay Time			10	20	ns	
$t_f$	Fall Time			1.5	10	ns	
$Q_g$	Total Gate Charge		$V_{GS} = 0\text{ V to } 10\text{ V}$		4.3	7	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0\text{ V to } 5\text{ V}$	$V_{DD} = 50\text{ V}, I_D = 3.2\text{ A}$		2.4	4	nC
$Q_{gs}$	Gate to Source Gate Charge				0.7		nC
$Q_{gd}$	Gate to Drain "Miller" Charge				0.9		nC

### Drain-Source Diode Characteristics

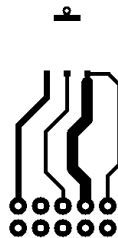
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 3.2\text{ A}$ (Note 2)		0.86	1.3	V
		$V_{GS} = 0\text{ V}, I_S = 1\text{ A}$ (Note 2)		0.77	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 3.2\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		31	49	ns
$Q_{rr}$	Reverse Recovery Charge			21	34	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  $R_{\theta JA}$  is determined by the user's board design.



a)  $55\text{ }^\circ\text{C/W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper



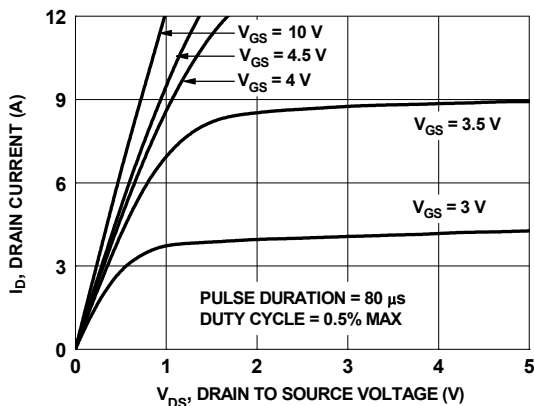
b)  $118\text{ }^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper

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

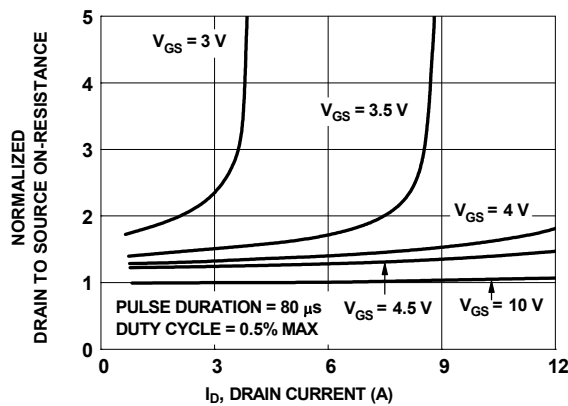
3. Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 1\text{ mH}$ ,  $I_{AS} = 5\text{ A}$ ,  $V_{DD} = 90\text{ V}$ ,  $V_{GS} = 10\text{ V}$ .

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

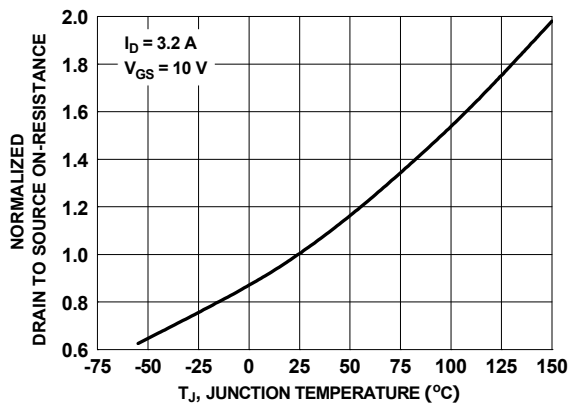
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



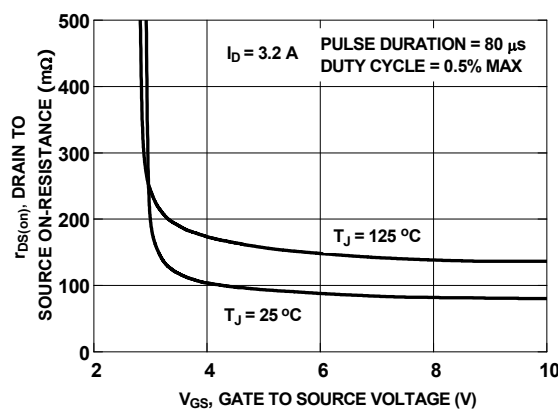
**Figure 1. On-Region Characteristics**



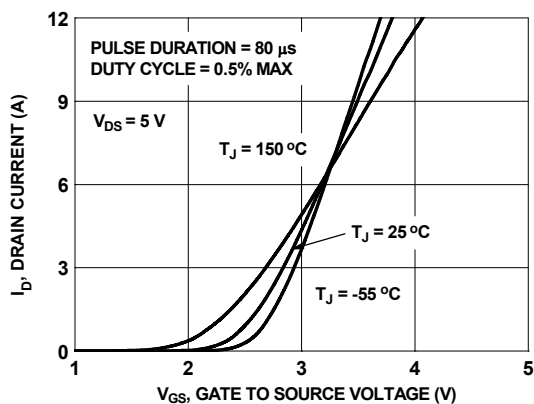
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



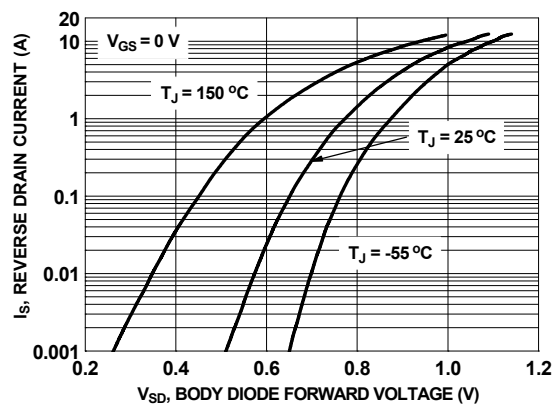
**Figure 3. Normalized On-Resistance vs Junction Temperature**



**Figure 4. On-Resistance vs Gate to Source Voltage**

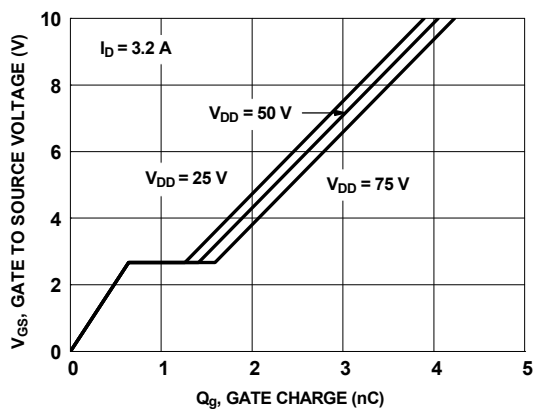


**Figure 5. Transfer Characteristics**

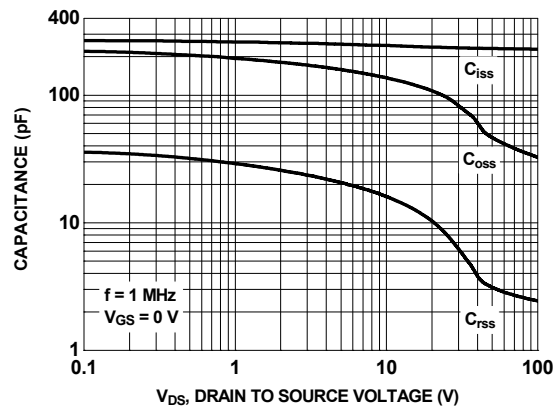


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

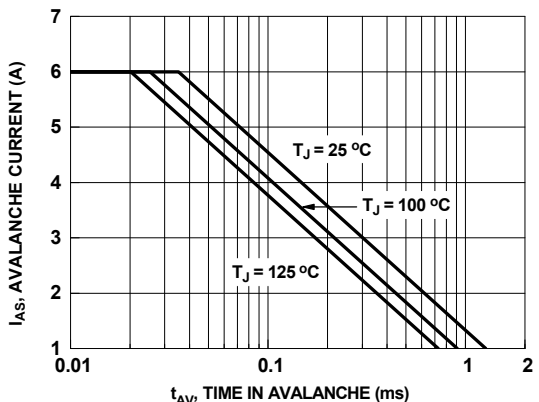
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



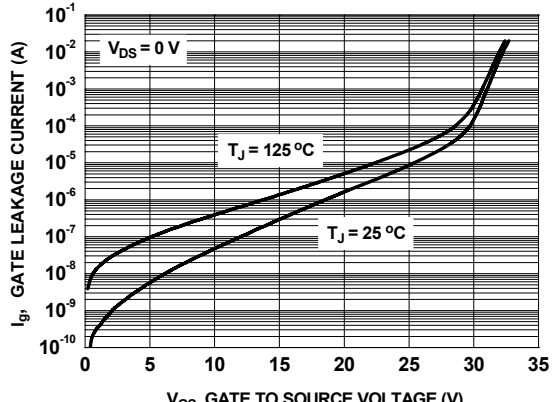
**Figure 7. Gate Charge Characteristics**



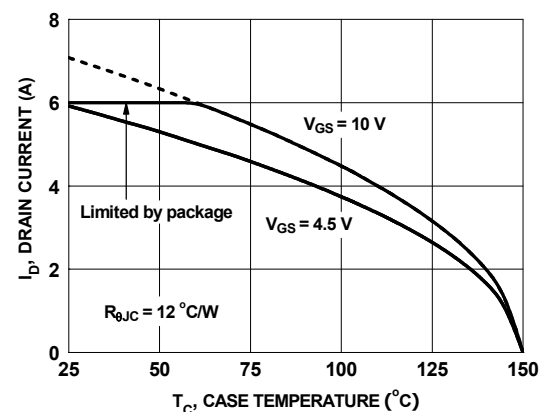
**Figure 8. Capacitance vs Drain to Source Voltage**



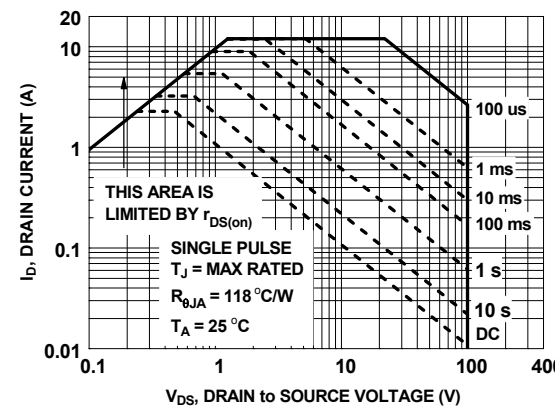
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Gate Leakage Current vs Gate to Source Voltage**

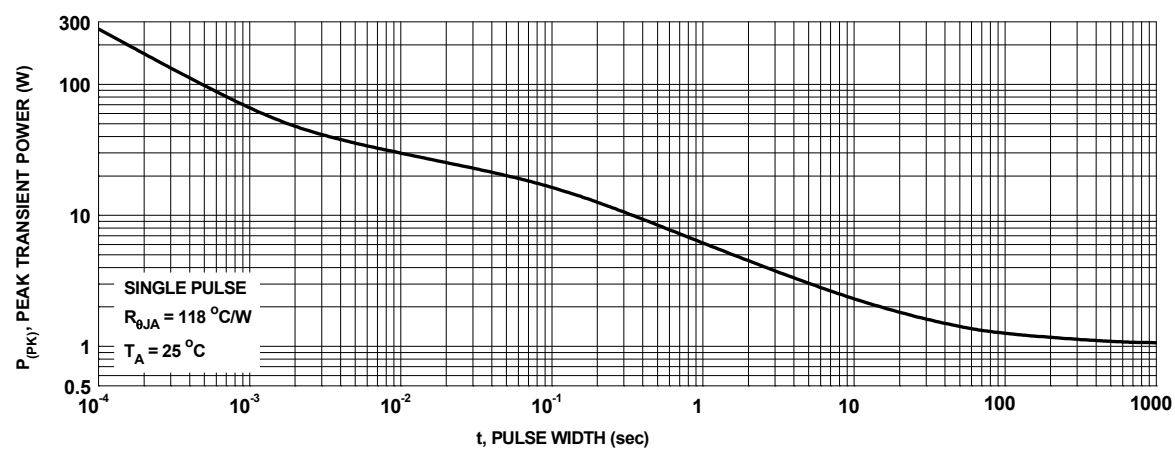


**Figure 11. Maximum Continuous Drain Current vs Case Temperature**

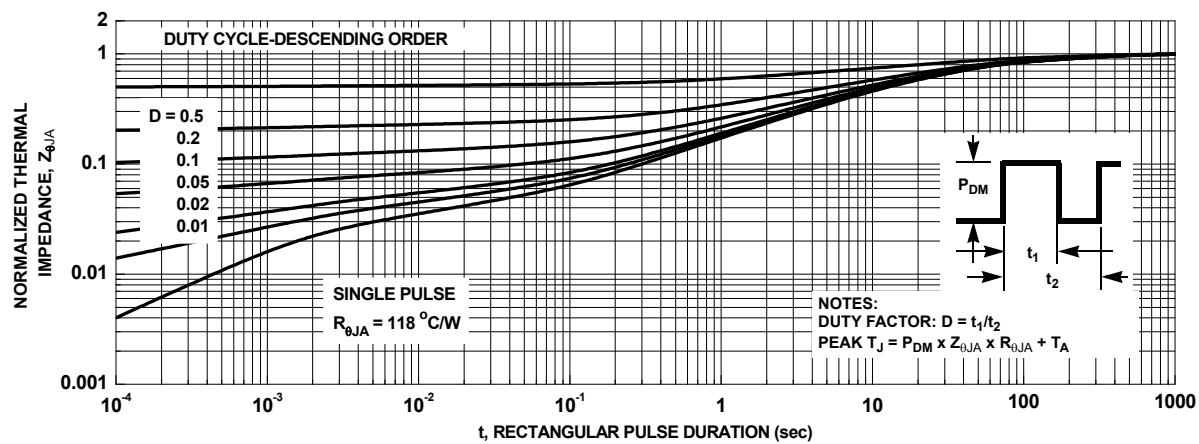


**Figure 12. Forward Bias Safe Operating Area**

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



**Figure 13. Single Pulse Maximum Power Dissipation**

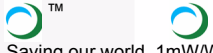





**Figure 14. Junction-to-Ambient Transient Thermal Response Curve**



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