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# FDC637BNZ

## N-Channel 2.5V Specified PowerTrench® MOSFET

20V, 6.2A, 24mΩ

### Features

- Max  $r_{DS(on)}$  = 24mΩ at  $V_{GS}$  = 4.5V,  $I_D$  = 6.2A
- Max  $r_{DS(on)}$  = 32mΩ at  $V_{GS}$  = 2.5V,  $I_D$  = 5.2A
- Fast switching speed
- Low gate charge (8nC typical)
- High performance trench technology for extremely low  $r_{DS(on)}$
- SuperSOT™-6 package: small footprint (72% smaller than standard SO-8; low profile (1mm thick)
- HBM ESD protection level > 2kV typical (Note 3)
- Manufactured using green packaging material
- Halide-Free
- RoHS Compliant



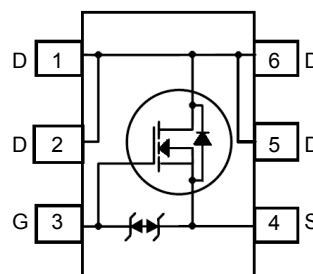
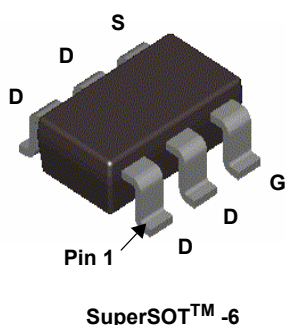
### General Description

This N-Channel 2.5V specified MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

These devices have been designed to offer exceptional power dissipation in a very small footprint compared with bigger SO-8 and TSSOP-8 packages.

### Applications

- DC - DC Conversion
- Load switch
- Battery Protection



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	20	V
$V_{GS}$	Gate to Source Voltage	±12	V
$I_D$	Drain Current -Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	6.2	A
	-Pulsed	20	
$P_D$	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	1.6	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1b)	0.8	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	78	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	156	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.637Z	FDC637BNZ	SSOT6	7"	8mm	3000 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		10		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 16\text{V}$ , $V_{GS} = 0\text{V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 12\text{V}$ , $V_{DS} = 0\text{V}$			$\pm 10$	$\mu\text{A}$

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	0.6	0.8	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-3		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 4.5\text{V}$ , $I_D = 6.2\text{A}$		21	24	m $\Omega$
		$V_{GS} = 2.5\text{V}$ , $I_D = 5.2\text{A}$		26	32	
		$V_{GS} = 4.5\text{V}$ , $I_D = 6.2\text{A}$ , $T_J = 125^\circ\text{C}$		30	41	
$g_{FS}$	Forward Transconductance	$V_{DD} = 5\text{V}$ , $I_D = 6.2\text{A}$		27		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 10\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$		670	895	pF
$C_{oss}$	Output Capacitance			160	215	pF
$C_{rss}$	Reverse Transfer Capacitance			115	175	pF
$R_g$	Gate Resistance	$f = 1\text{MHz}$		2.1		$\Omega$

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 10\text{V}$ , $I_D = 6.2\text{A}$ $V_{GS} = 4.5\text{V}$ , $R_{GEN} = 6\Omega$		8	16	ns
$t_r$	Rise Time			6	12	ns
$t_{d(off)}$	Turn-Off Delay Time			22	36	ns
$t_f$	Fall Time			6	12	ns
$Q_g$	Total Gate Charge	$V_{GS} = 4.5\text{V}$ , $V_{DD} = 10\text{V}$ , $I_D = 6.2\text{A}$		8	12	nC
$Q_{gs}$	Gate to Source Gate Charge			1.3		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			2.2		nC

**Drain-Source Diode Characteristics**

$I_S$	Maximum Continuous Drain-Source Diode Forward Current				1.3	A
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}$ , $I_S = 1.3\text{A}$ (Note 2)		0.7	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 6.2\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$		15	27	ns
$Q_{rr}$	Reverse Recovery Charge			5	10	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  $R_{\theta JA}$  is determined by the user's board design.



a.  $78^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b.  $156^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

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

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

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

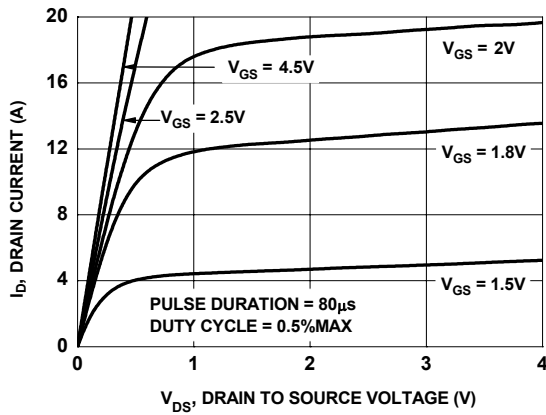


Figure 1. On-Region Characteristics

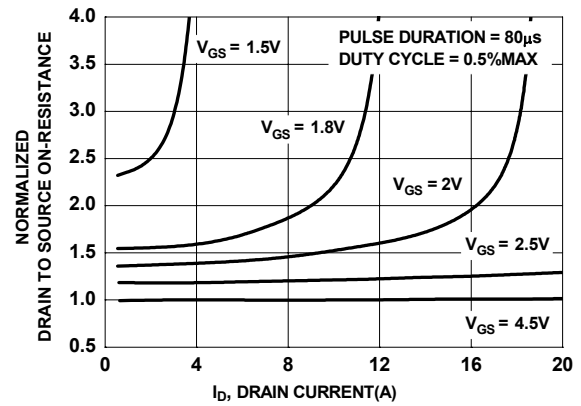


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

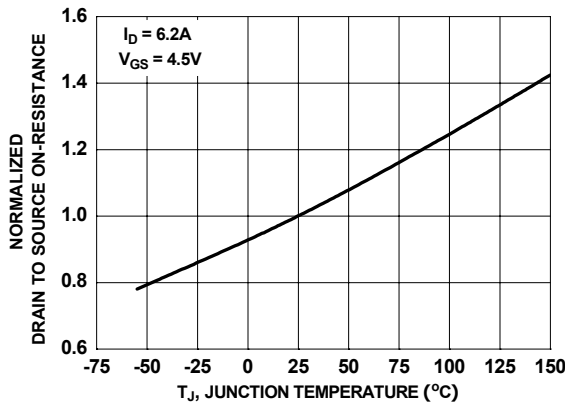


Figure 3. Normalized On-Resistance vs Junction Temperature

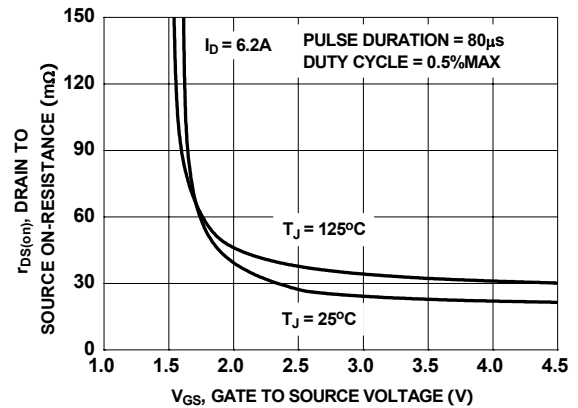


Figure 4. On-Resistance vs Gate to Source Voltage

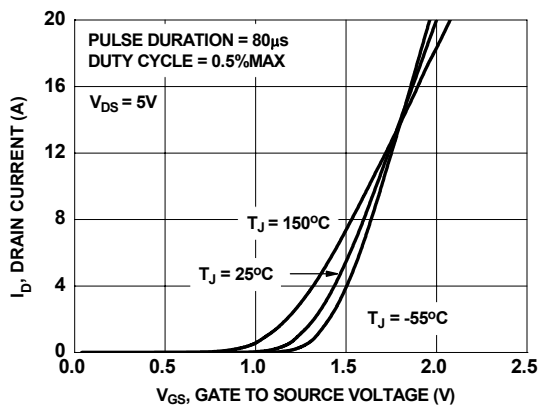


Figure 5. Transfer Characteristics

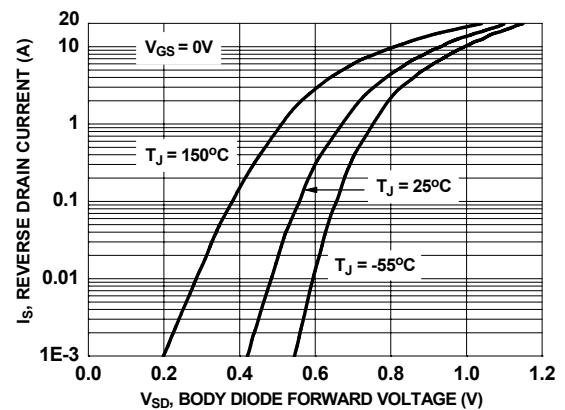


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

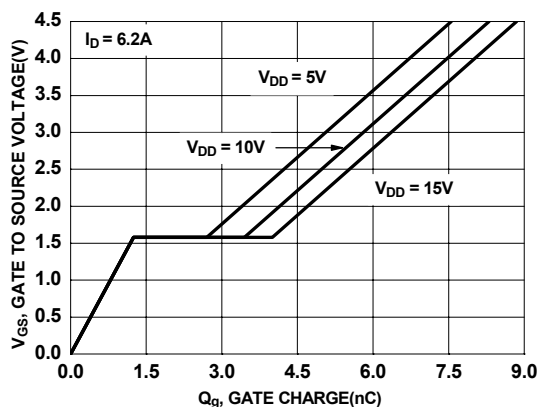


Figure 7. Gate Charge Characteristics

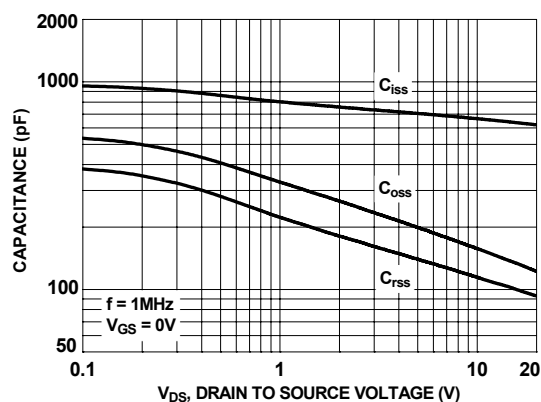


Figure 8. Capacitance vs Drain to Source Voltage

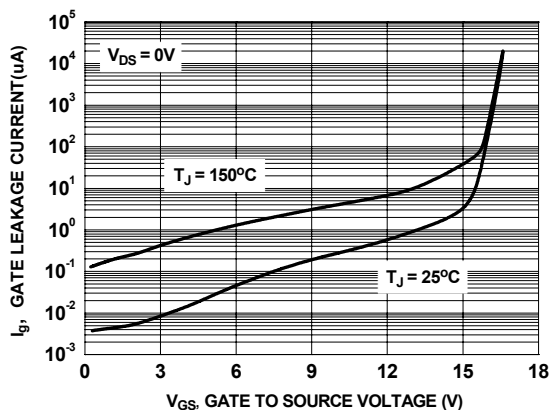


Figure 9. Gate Leakage Current vs Gate to Source Voltage

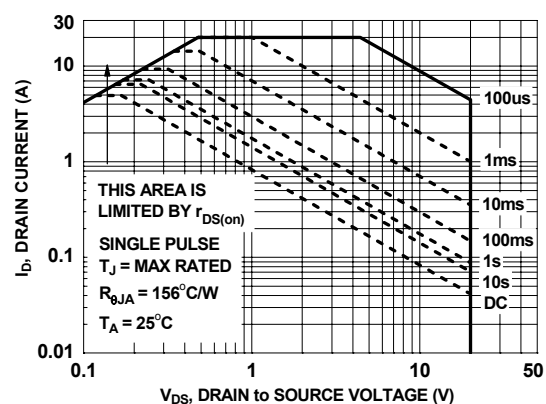


Figure 10. Forward Bias Safe Operating Area

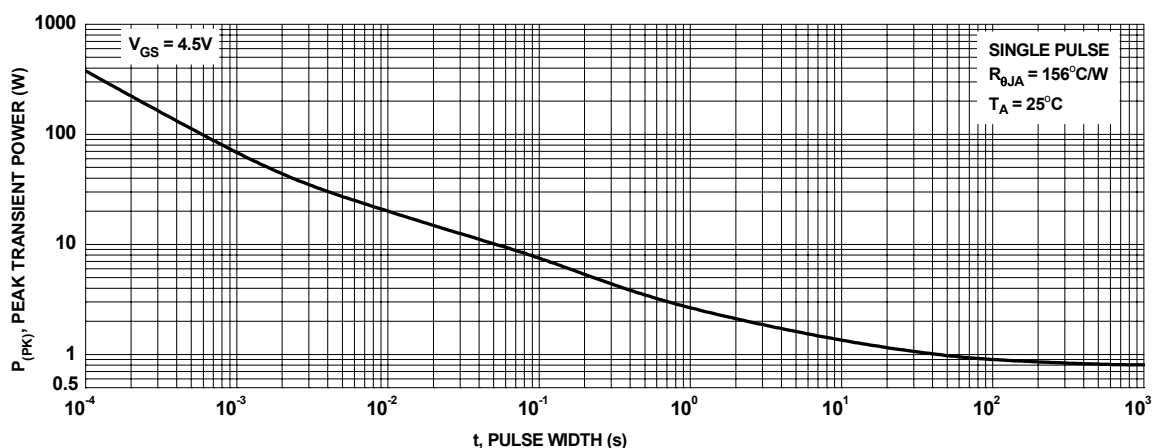
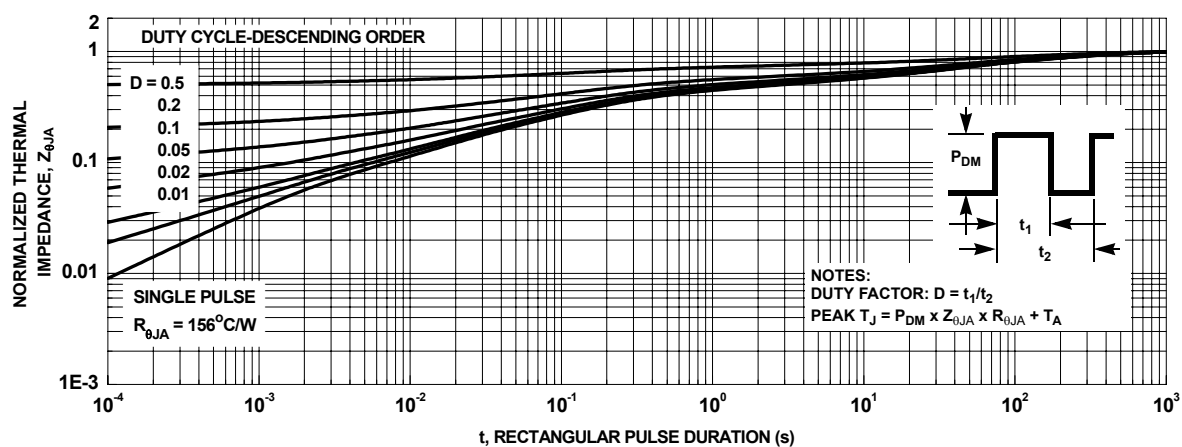


Figure 11. Single Pulse Maximum Power Dissipation


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





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