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FDC637AN

Single N-Channel, 2.5V Specified PowerTrench™ MOSFET

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 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.

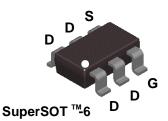
Applications

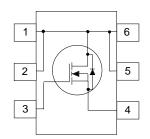
- DC/DC converter
- Load switch
- Battery Protection

Features

• 6.2 A, 20 V.
$$R_{DS(on)} = 0.024~\Omega~$$
 @ $V_{GS} = 4.5~V$ $R_{DS(on)} = 0.032~\Omega~$ @ $V_{GS} = 2.5~V$

- Fast switching speed.
- Low gate charge (10.5nC typical).
- $\bullet \;\;$ High performance trench technology for extremely low $R_{_{DS(ON)}}.$
- SuperSOTTM-6 package: small footprint (72% smaller than standard SO-8); low profile (1mm thick).





Absolute Maximum Ratings T_A = 25°C unless otherwise noted

| Symbol | Parameter | | FDC637AN | Units |
|-----------------------------------|--|-----------|-------------|-------|
| V _{DSS} | Drain-Source Voltage | | 20 | V |
| V_{GSS} | Gate-Source Voltage | | ±8 | V |
| I _D | Drain Current - Continuous | (Note 1a) | 6.2 | Α |
| | Drain Current - Pulsed | | 20 | 1 |
| P _D | Power Dissipation for Single Operation | (Note 1a) | 1.6 | W |
| | | (Note 1b) | 0.8 | 1 |
| T _J , T _{stg} | Operating and Storage Junction Temperature Range | | -55 to +150 | °C |

Thermal Characteristics

| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | (Note 1a) | 78 | °C/W |
|-----------------|---|-----------|----|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | (Note 1) | 30 | °C/W |

Package Outlines and Ordering Information

| Device Marking | Device | Reel Size | Tape Width | Quantity | |
|----------------|---------------|-----------|------------|------------|--|
| .637 | .637 FDC637AN | | 8mm | 3000 units | |

| Symbol | Parameter | Test Conditions | Min | Тур | Max | Units |
|---|--|--|-----|-------------------------|-------------------------|-------|
| Off Char | acteristics | | 1 | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$ | 20 | | | V |
| <u>ΔBV_{DSS}</u> ΔT _J | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu A$, Referenced to $25^{\circ}C$ | | 14 | | mV/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 16 \text{ V}, V_{GS} = 0 \text{ V}$ | | | 1 | μΑ |
| I _{GSSF} | Gate-Body Leakage Current, Forward | $V_{GS} = 8 \text{ V}, V_{DS} = 0 \text{ V}$ | | | 100 | nA |
| I _{GSSR} | Gate-Body Leakage Current, Reverse | $V_{GS} = -8 \text{ V}, V_{DS} = 0 \text{ V}$ | | | -100 | nA |
| On Char | acteristics (Note 2) | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$ | 0.4 | 0.82 | 1.5 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | I _D =250μA,Referenced to 125°C | | -3 | | mV/°C |
| R _{DS(on)} | Static Drain-Source On-Resistance | $V_{GS} = 4.5 \text{ V}, I_D = 6.2 \text{ A}$ $V_{GS} = 4.5 \text{ V}, I_D = 6.2 \text{ A}, T_J = 125^{\circ}\text{C}$ $V_{GS} = 2.5 \text{ V}, I_D = 5.2 \text{ A}$ | | 0.019 0.028 0.025 | 0.024 0.041 0.032 | Ω |
| I _{D(on)} | On-State Drain Current | V _{GS} = 4.5 V, V _{DS} = 5 V | 10 | | | Α |
| g _{FS} | Forward Transconductance | $V_{DS} = 5 \text{ V}, I_D = 6.2 \text{ A}$ | | 7.4 | | S |
| Dynamic | Characteristics | | | | | |
| C _{iss} | Input Capacitance | $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V},$ | | 1125 | | pF |
| C _{oss} | Output Capacitance | f = 1.0 MHz | | 290 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 145 | | pF |
| Switchin | ng Characteristics (Note 2) | | | | | |
| t _{d(on)} | Turn-On Delay Time | $V_{DD} = 10 \text{ V}, I_D = 1 \text{ A},$ | | 9 | 18 | ns |
| t _r | Turn-On Rise Time | $V_{GS} = 4.5 \text{ V}, R_{GEN} = 6 \Omega$ | | 13 | 24 | ns |
| t _{d(off)} | Turn-Off Delay Time | | | 26 | 42 | ns |
| t _f | Turn-Off Fall Time | | | 11 | 20 | ns |
| Q _g | Total Gate Charge | $V_{DS} = 5 \text{ V}, I_D = 6.2 \text{ A},$ | | 10.5 | 16 | nC |
| Q _{gs} | Gate-Source Charge | $V_{GS} = 4.5 \text{ V}$ | | 1.5 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 2.2 | | nC |
| Drain-Sc | ource Diode Characteristics a | and Maximum Ratings | • | • | | |
| I _S | Maximum Continuous Drain-Source Di | | Ï | ĺ | 1.3 | Α |
| V _{SD} | Drain-Source Diode Forward Voltage | V _{GS} = 0 V, I _S = 1.3 A (Note 2) | | 0.7 | 1.2 | V |

Notes:

- 1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient 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) 78° C/W when mounted on a 1.0 in $\!^2$ pad of 2 oz. copper.
 - b) 156° C/W when mounted on a minimum pad of 2 oz.copper.
- 2. Pulse Test: Pulse Width $\leq 300~\mu s,~Duty~Cycle \leq 2.0\%$

Typical Characteristics

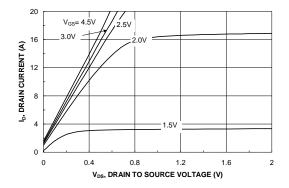


Figure 1. On-Region Characteristics.

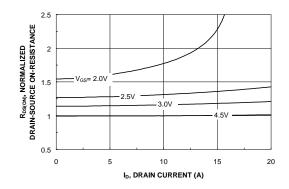


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

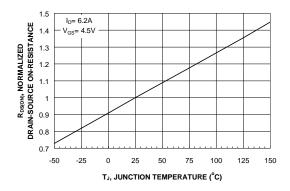


Figure 3. On-Resistance Variation with Temperature.

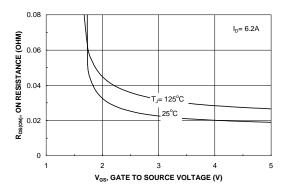


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

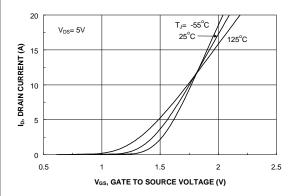


Figure 5. Transfer Characteristics.

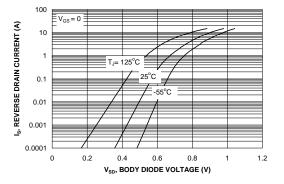
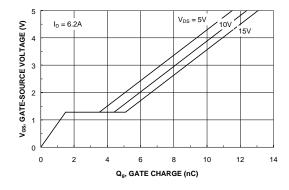


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics (continued)



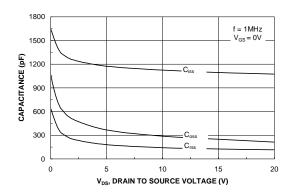
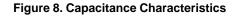
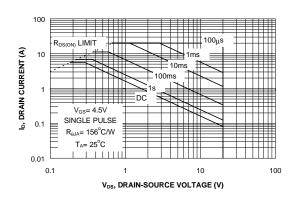


Figure 7. Gate-Charge Characteristics





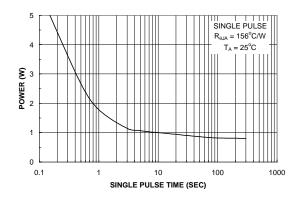


Figure 9. Maximum Safe Operating Area

Figure 10. Single Pulse Maximum Power Dissipation

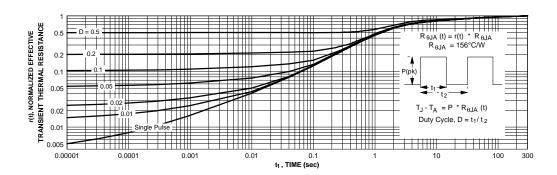


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b. Transient themal response will change depending on the circuit board design.

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