

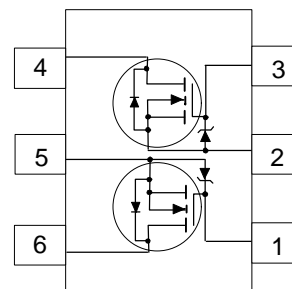
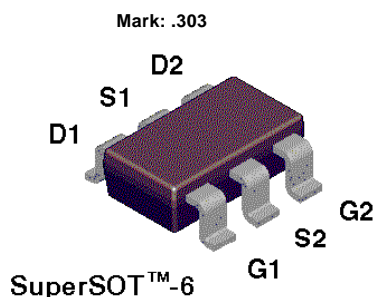
FDC6303N Digital FET, Dual N-Channel

General Description

These dual N-Channel logic level enhancement mode field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. This device has been designed especially for low voltage applications as a replacement for digital transistors in load switching applications. Since bias resistors are not required this one N-Channel FET can replace several digital transistors with different bias resistors like the IMHxA series.

Features

- 25 V, 0.68 A continuous, 2 A Peak.
 $R_{DS(ON)} = 0.6 \Omega @ V_{GS} = 2.7 V$
 $R_{DS(ON)} = 0.45 \Omega @ V_{GS} = 4.5 V.$
- Very low level gate drive requirements allowing direct operation in 3V circuits. $V_{GS(th)} < 1.5 V.$
- Gate-Source Zener for ESD ruggedness.
>6kV Human Body Model
- Replace multiple NPN digital transistors (IMHxA series) with one DMOS FET.



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

| Symbol | Parameter | FDC6303N | Units |
|----------------|---|------------|------------------|
| V_{DSS} | Drain-Source Voltage | 25 | V |
| V_{GSS} | Gate-Source Voltage | 8 | V |
| I_D | Drain Current - Continuous - Pulsed | 0.68 | A |
| | | 2 | |
| P_D | Maximum Power Dissipation (Note 1a) (Note 1b) | 0.9 | W |
| | | 0.7 | |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| ESD | Electrostatic Discharge Rating MIL-STD-883D Human Body Model (100pf / 1500 Ohm) | 6.0 | kV |

THERMAL CHARACTERISTICS

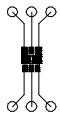
| | | | |
|-----------------|--|-----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 1a) | 140 | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case (Note 1) | 60 | $^\circ\text{C/W}$ |

DMOS Electrical Characteristics ($T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)

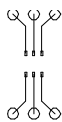
| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|--|---|------|------|------|----------------------------|
| OFF CHARACTERISTICS | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 25 | | | V |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | $I_D = 250\text{ }\mu\text{A}$, Referenced to $25\text{ }^\circ\text{C}$ | | 26 | | $\text{mV}/^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| | | $T_J = 55^\circ\text{C}$ | | | 10 | μA |
| I_{GSS} | Gate - Body Leakage Current | $V_{GS} = 8\text{ V}, V_{DS} = 0\text{ V}$ | | | 100 | nA |
| ON CHARACTERISTICS (Note 2) | | | | | | |
| $\Delta V_{GS(th)}/\Delta T_J$ | Gate Threshold Voltage Temp. Coefficient | $I_D = 250\text{ }\mu\text{A}$, Referenced to $25\text{ }^\circ\text{C}$ | | -2.6 | | $\text{mV}/^\circ\text{C}$ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 0.65 | 0.8 | 1.5 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = 4.5\text{ V}, I_D = 0.5\text{ A}$ | | 0.33 | 0.45 | Ω |
| | | $T_J = 125^\circ\text{C}$ | | 0.52 | 0.8 | |
| | | $V_{GS} = 2.7\text{ V}, I_D = 0.2\text{ A}$ | | 0.44 | 0.6 | |
| $I_{D(on)}$ | On-State Drain Current | $V_{GS} = 2.7\text{ V}, V_{DS} = 5\text{ V}$ | 0.5 | | | A |
| g_{FS} | Forward Transconductance | $V_{DS} = 5\text{ V}, I_D = 0.5\text{ A}$ | | 1.45 | | S |
| DYNAMIC CHARACTERISTICS | | | | | | |
| C_{iss} | Input Capacitance | $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$ | | 50 | | pF |
| C_{oss} | Output Capacitance | | | 28 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 9 | | pF |
| SWITCHING CHARACTERISTICS (Note 2) | | | | | | |
| $t_{D(on)}$ | Turn - On Delay Time | $V_{DD} = 6\text{ V}, I_D = 0.5\text{ A},$ $V_{GS} = 4.5\text{ V}, R_{GEN} = 50\text{ }\Omega$ | | 3 | 6 | ns |
| t_r | Turn - On Rise Time | | | 8.5 | 18 | ns |
| $t_{D(off)}$ | Turn - Off Delay Time | | | 17 | 30 | ns |
| t_f | Turn - Off Fall Time | | | 13 | 25 | ns |
| Q_g | Total Gate Charge | $V_{DS} = 5\text{ V}, I_D = 0.5\text{ A},$ $V_{GS} = 4.5\text{ V}$ | | 1.64 | 2.3 | nC |
| Q_{gs} | Gate-Source Charge | | | 0.38 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 0.45 | | nC |
| DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS | | | | | | |
| I_S | Maximum Continuous Source Current | | | | 0.3 | A |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 0.5\text{ A}$ (Note 2) | | 0.83 | 1.2 | V |

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 $R_{\theta CA}$ is determined by the user's board design. $R_{\theta JA}$ shown below for single device operation on FR-4 in still air.



a. $140^\circ\text{C}/\text{W}$ on a 0.125 in^2 pad of 2oz copper.



b. $180^\circ\text{C}/\text{W}$ on a 0.005 in^2 pad of 2oz copper.

- Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

Typical Electrical Characteristics

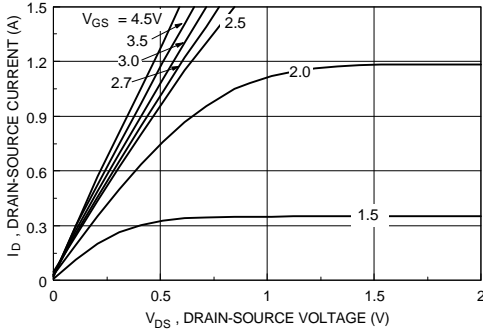


Figure 1. On-Region Characteristics.

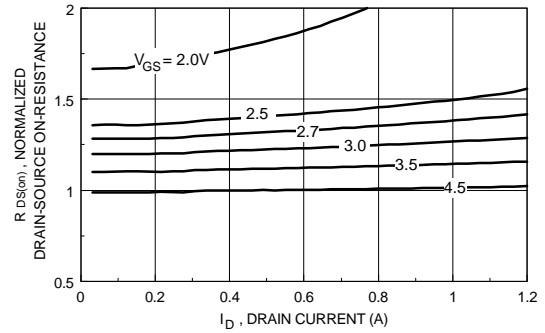


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

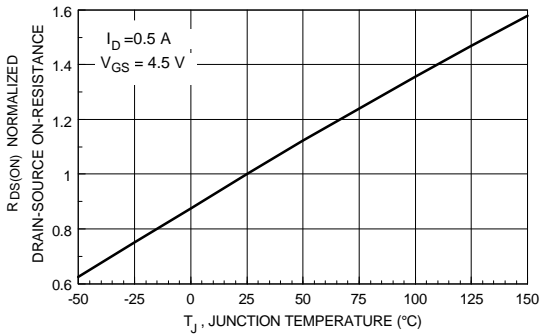


Figure 3. On-Resistance Variation with Temperature.

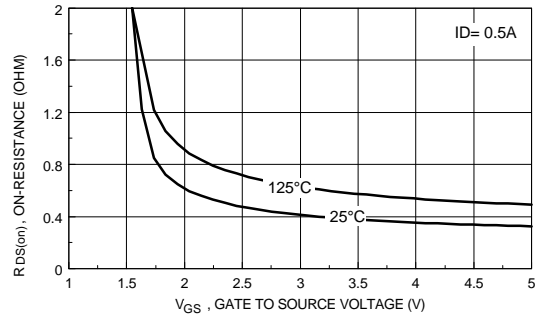


Figure 4. On Resistance Variation with Gate-To-Source Voltage.

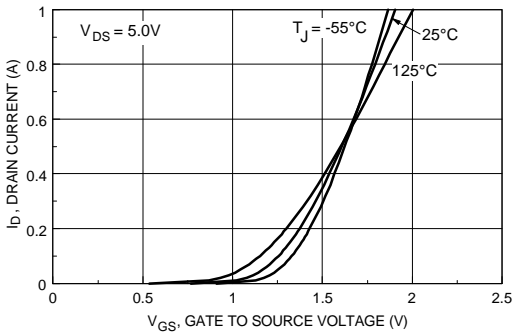


Figure 5. Transfer Characteristics.

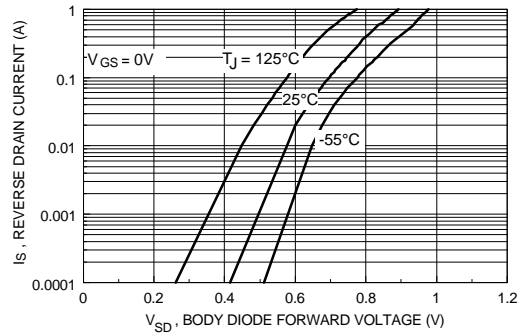


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical And Thermal Characteristics

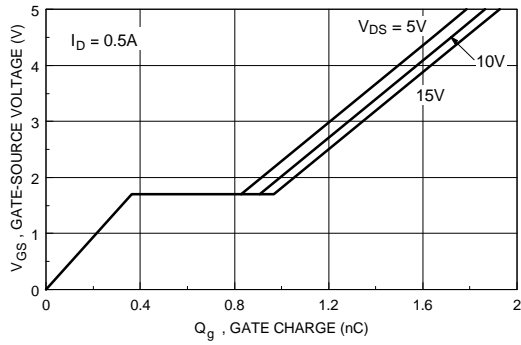


Figure 7. Gate Charge Characteristics.

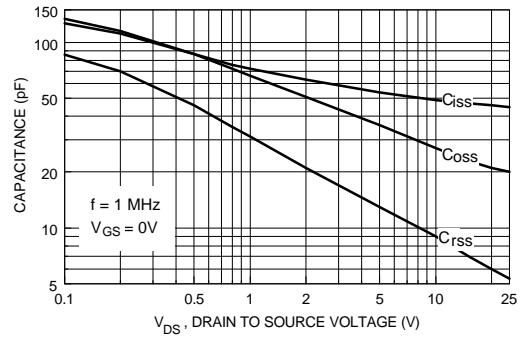


Figure 8. Capacitance Characteristics.

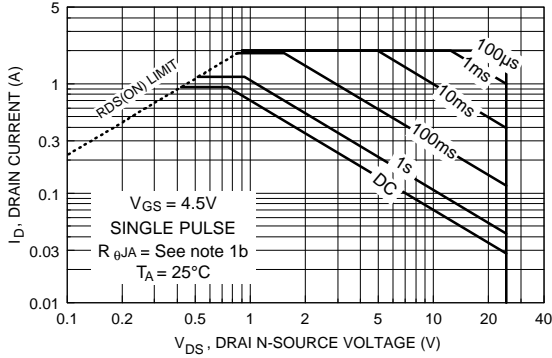


Figure 9. Maximum Safe Operating Area.

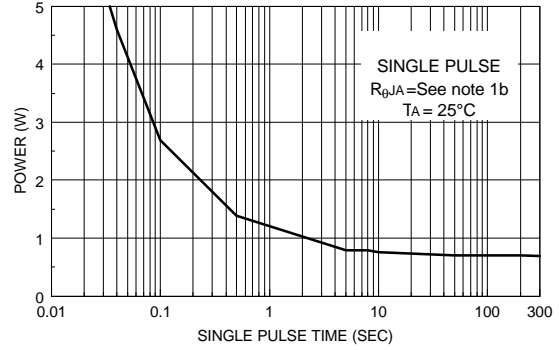


Figure 10. Single Pulse Maximum Power Dissipation.

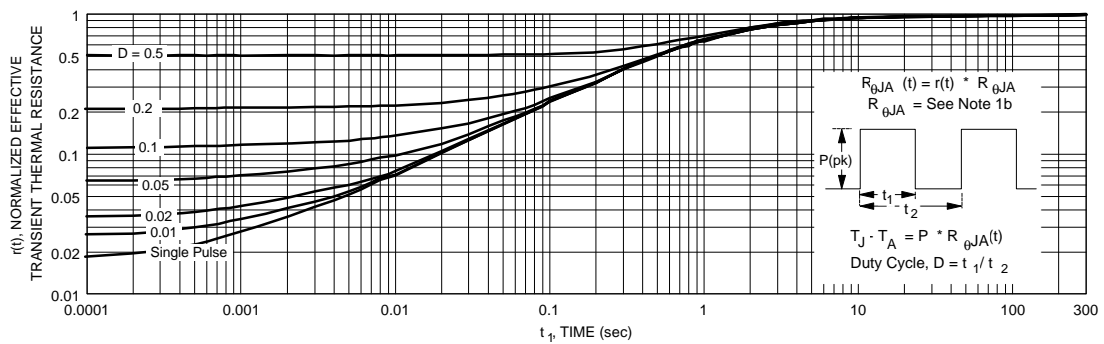


Figure 11. Transient Thermal Response Curve.

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

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