FAIRCHILD
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# FDC6304P
# Digital FET, Dual P-Channel

## General Description

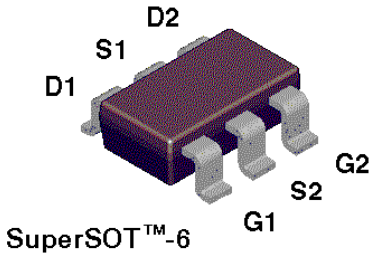
These P-Channel enhancement mode field effect transistor are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is tailored to minimize on-state resistance at low gate drive conditions. This device is designed especially for application in battery power applications such as notebook computers and cellular phones. This device has excellent on-state resistance even at gate drive voltages as low as 2.5 volts.

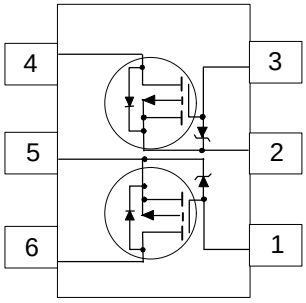
## Features

- -25 V, -0.46 A continuous, -1.0 A Peak.
  $R_{DS(ON)}$ = 1.5 Ω @ $V_{GS}$= -2.7 V
  $R_{DS(ON)}$ = 1.1 Ω @ $V_{GS}$ = -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.

SOT-23 | SuperSOT™-6 | SuperSOT™-8 | SO-8 | SOT-223 | SOIC-16

**Mark: .304**




## Absolute Maximum Ratings $T_A$ = 25°C unless other wise noted

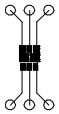
| Symbol | Parameter | | FDC6304P | Units |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | | -25 | V |
| $V_{GSS}$ | Gate-Source Voltage | | -8 | V |
| $I_D$ | Drain Current | - Continuous | -0.46 | A |
| | | - Pulsed | -1 | |
| $P_D$ | Maximum Power Dissipation | (Note 1a) | 0.9 | W |
| | | (Note 1b) | 0.7 | |
| $T_J$,$T_{STG}$ | Operating and Storage Temperature Range | | -55 to 150 | °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 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | (Note 1) | 60 | °C/W |

## Electrical Characteristics ($T_A$ = 25 °C unless otherwise noted )

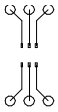
| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_D$ = -250 µA | -25 | | | V |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | $I_D$ = -250 µA, Referenced to 25 °C | | -22 | | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = -20 V, $V_{GS}$ = 0 V | | | -1 | µA |
| | | $T_J$ = 55°C | | | -10 | µA |
| $I_{GSS}$ | Gate - Body Leakage Current | $V_{GS}$ = -8 V, $V_{DS}$ = 0 V | | | -100 | nA |
| **ON CHARACTERISTICS** (Note 2) | | | | | | |
| $\Delta V_{GS(th)}/\Delta T_J$ | Gate Threshold Voltage Temp. Coefficient | $I_D$ = -250 µA, Referenced to 25 °C | | 2.1 | | mV/°C |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = -250 µA | -0.65 | -0.86 | -1.5 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$ = -2.7 V, $I_D$ = -0.25 A | | 1.22 | 1.5 | Ω |
| | | $V_{GS}$ = -4.5 V, $I_D$ = -0.5 A | | 0.87 | 1.1 | |
| | | $T_J$ =125°C | | 1.21 | 2 | |
| $I_{D(ON)}$ | On-State Drain Current | $V_{GS}$ = -2.7 V, $V_{DS}$ = -5 V | -0.5 | | | A |
| | | $V_{GS}$ = -4.5 V, $V_{DS}$ = -5 V | -1 | | | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = -5 V, $I_D$ = -0.5 A | | 0.8 | | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = -10 V, $V_{GS}$ = 0 V, f = 1.0 MHz | | 62 | | pF |
| $C_{oss}$ | Output Capacitance | | | 35 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 9.5 | | pF |
| **SWITCHING CHARACTERISTICS** (Note 2) | | | | | | |
| $t_{D(on)}$ | Turn - On Delay Time | $V_{DD}$ = -6 V, $I_D$ = -0.5 A, $V_{GS}$ = -4.5 V, $R_{GEN}$ = 50 Ω | | 7 | 20 | ns |
| $t_r$ | Turn - On Rise Time | | | 8 | 20 | ns |
| $t_{D(off)}$ | Turn - Off Delay Time | | | 55 | 110 | ns |
| $t_f$ | Turn - Off Fall Time | | | 35 | 70 | ns |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = -5 V, $I_D$ = - 0.25 A, $V_{GS}$ = -4.5 V | | 1.1 | 1.5 | nC |
| $Q_{gs}$ | Gate-Source Charge | | | 0.32 | | nC |
| $Q_{gd}$ | Gate-Drain Charge | | | 0.28 | | nC |
| **DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS** | | | | | | |
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | | | | -0.5 | A |
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = -0.5 A (Note 2) | | -0.88 | -1.2 | V |

Notes:

1. $R_{\theta JA}$ 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.



a. 140°C/W on a 0.125 in² pad of 2oz copper.



b. 180°C/W on a 0.005 in² of pad of 2oz copper.

2. Pulse Test: Pulse Width ≤ 300µs, Duty Cycle ≤ 2.0%.

## Typical Electrical Characteristics

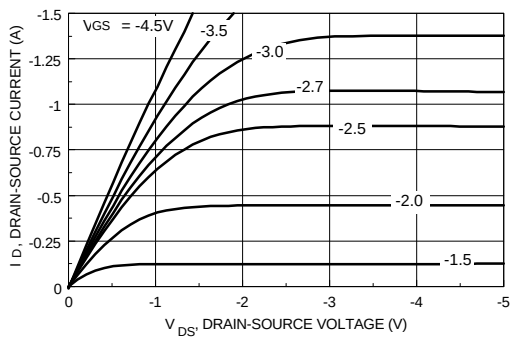



**Figure 1. On-Region Characteristics**.

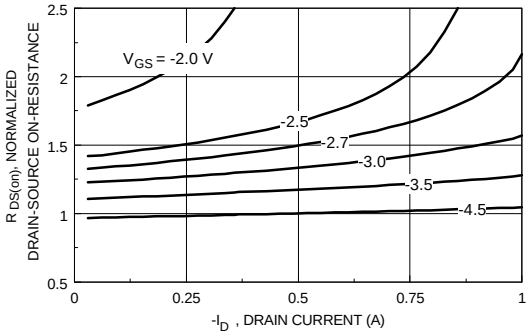



**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage**.

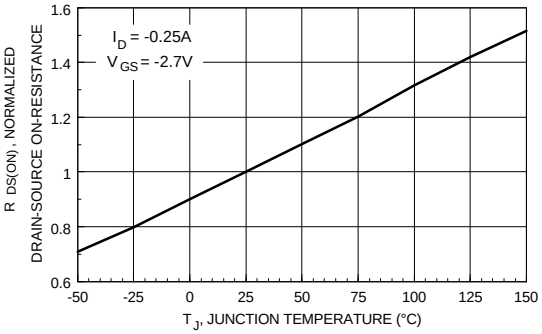



**Figure 3. On-Resistance Variation with Temperature**.

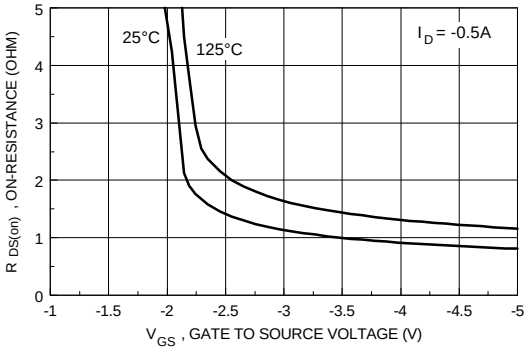



**Figure 4. On Resistance Variation with Gate-To- Source Voltage.**

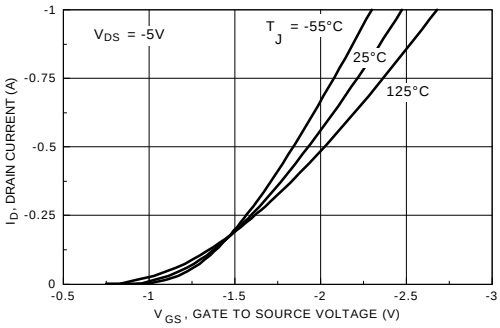



**Figure 5. Transfer Characteristics.**

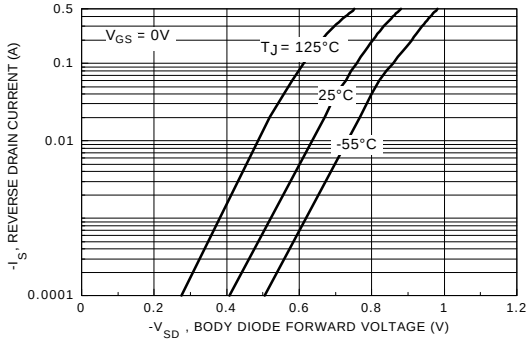



**Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.**

## Typical Electrical And Thermal Characteristics

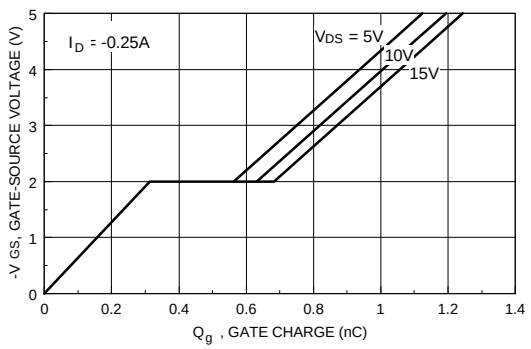



**Figure 7. Gate Charge Characteristics.**

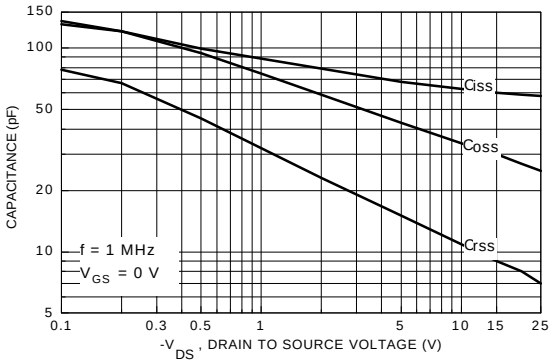



**Figure 8. Capacitance Characteristics**.

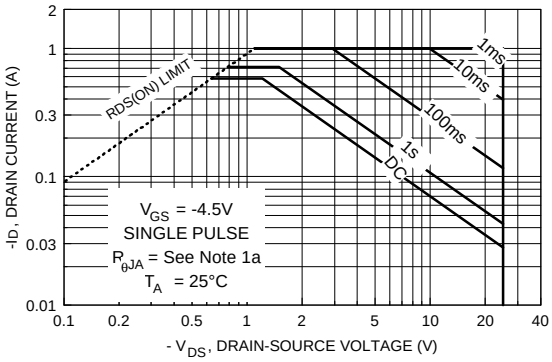



**Figure 9. Maximum Safe Operating Area.**

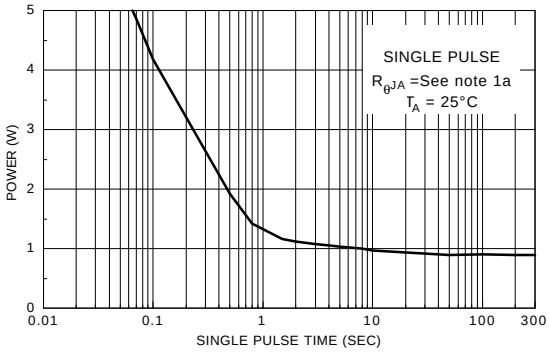



**Figure 10. Single Pulse Maximum Power Dissipation.**

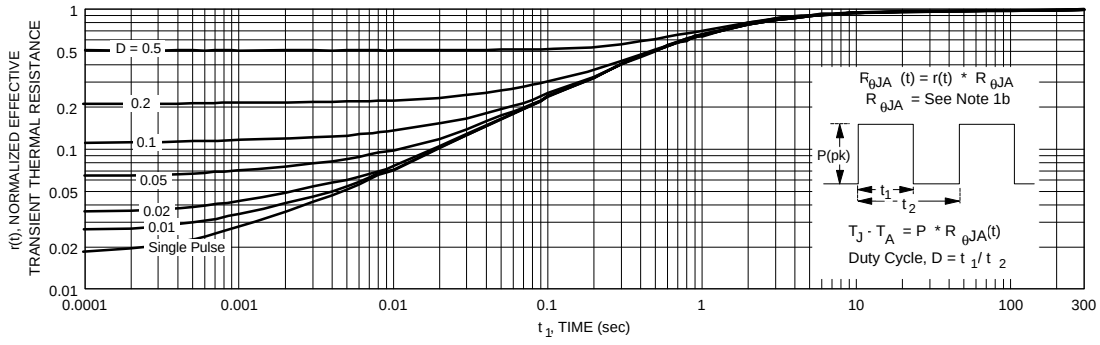



**Figure 11. Transient Thermal Response Curve.**

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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