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FAIRCHILD SEMICONDUCTOR

April 2007

# FDC6331L

## Integrated Load Switch

### General Description

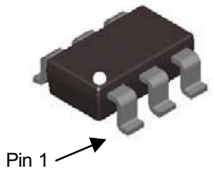
This device is particularly suited for compact power management in portable electronic equipment where 2.5V to 8V input and 2.8A output current capability are needed. This load switch integrates a small N-Channel power MOSFET (Q1) that drives a large P-Channel power MOSFET (Q2) in one tiny SuperSOT™-6 package.

### Applications

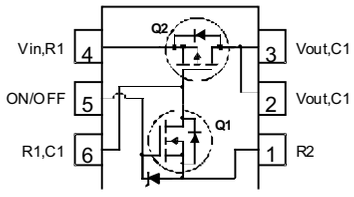
- Load switch
- Power management

### Features

- –2.8 A, –8 V. $R_{DS(ON)}$ = 55 mΩ @ $V_{GS}$ = –4.5 V
  $R_{DS(ON)}$ = 70 mΩ @ $V_{GS}$ = –2.5 V
  $R_{DS(ON)}$ = 100 mΩ @ $V_{GS}$ = –1.8 V
- Control MOSFET (Q1) includes Zener protection for ESD ruggedness (>6KV Human body model)
- High performance trench technology for extremely low $R_{DS(ON)}$

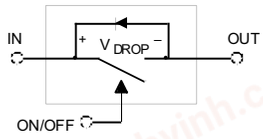



SuperSOT™-6




See Application Circuit

Equivalent Circuit




## Absolute Maximum Ratings

$T_A$=25°C unless otherwise noted

| Symbol | Parameter | | Ratings | Units |
|---|---|---|---|---|
| $V_{IN}$ | Maximum Input Voltage | | ± 8 | V |
| $V_{ON/OFF}$ | High level ON/OFF voltage range | | –0.5 to 8 | V |
| $I_{Load}$ | Load Current – Continuous | (Note 1) | 2.8 | A |
| | – Pulsed | | 9 | |
| $P_D$ | Maximum Power Dissipation | (Note 1) | 0.7 | W |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | | –55 to +150 | °C |

## Thermal Characteristics

| | | | | |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | (Note 1) | 180 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | (Note 1) | 60 | °C/W |

## Package Marking and Ordering Information

| Device Marking | Device | Reel Size | Tape width | Quantity |
|---|---|---|---|---|
| .331 | FDC6331L | 7” | 8mm | 3000 units |

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## Electrical Characteristics

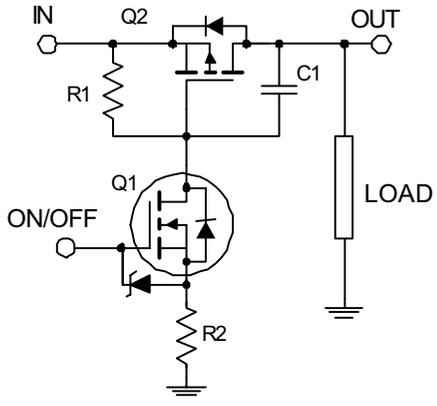
$T_A$ = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{IN}$ | Vin Breakdown Voltage | $V_{ON/OFF}$ = 0 V, $I_D$ = –250 µA | 8 | | | V |
| $I_{Load}$ | Zero Gate Voltage Drain Current | $V_{IN}$ = 6.4 V, $V_{ON/OFF}$ = 0 V | | | –1 | µA |
| $I_{FL}$ | Leakage Current, Forward | $V_{ON/OFF}$ = 0 V, $V_{IN}$ = 8 V | | | –100 | nA |
| $I_{RL}$ | Leakage Current, Reverse | $V_{ON/OFF}$ = 0 V, $V_{IN}$ = –8 V | | | 100 | nA |
| **On Characteristics** (Note 2) | | | | | | |
| $V_{ON/OFF\ (th)}$ | Gate Threshold Voltage | $V_{IN}$ = $V_{ON/OFF}$, $I_D$ = –250 µA | 0.4 | 0.9 | 1.5 | V |
| $R_{DS(on)}$ | Static Drain–Source On–Resistance (Q2) | $V_{GS}$ = –4.5 V, $I_D$ = –2.8A<br>$V_{GS}$ = –2.5 V, $I_D$ = –2.5 A<br>$V_{GS}$ = –1.8 V, $I_D$ = –2.0 A | | 34<br>45<br>64 | 55<br>70<br>100 | mΩ |
| $R_{DS(on)}$ | Static Drain–Source On–Resistance (Q1) | $V_{GS}$ = 4.5 V, $I_D$ = 0.4A<br>$V_{GS}$ = 2.7 V, $I_D$ = 0.2 A | | 3.1<br>3.8 | 4<br>5 | Ω |
| **Drain–Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain–Source Diode Forward Current | | | | –0.6 | A |
| $V_{SD}$ | Drain–Source Diode Forward Voltage | $V_{ON/OFF}$ = 0 V, $I_S$ = –0.6 A (Note 2) | | | –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 $R_{\theta JA}$ is determined by the user's board design.

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

### FDC6331L Load Switch Application Circuit




External Component Recommendation:
For additional in-rush current control, R2 and C1 can be added. For more information, see application note AN1030.

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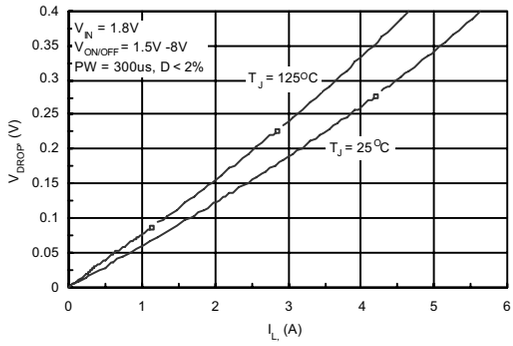



**Figure 1. Conduction Voltage Drop Variation with Load Current.**

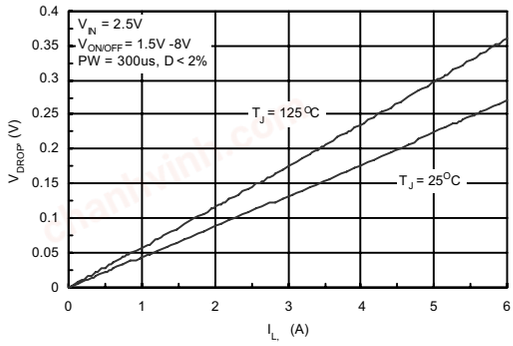



**Figure 2. Conduction Voltage Drop Variation with Load Current.**

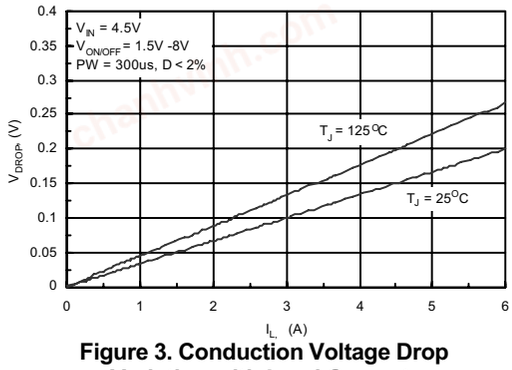



**Figure 3. Conduction Voltage Drop Variation with Load Current.**

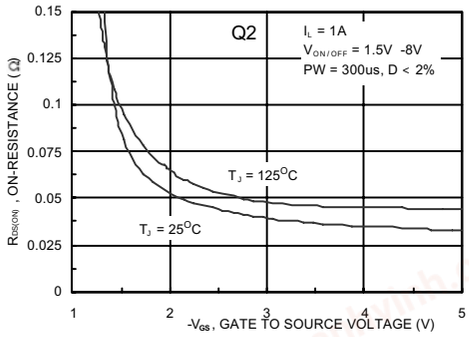



**Figure 4. On-Resistance Variation With Input Voltage**

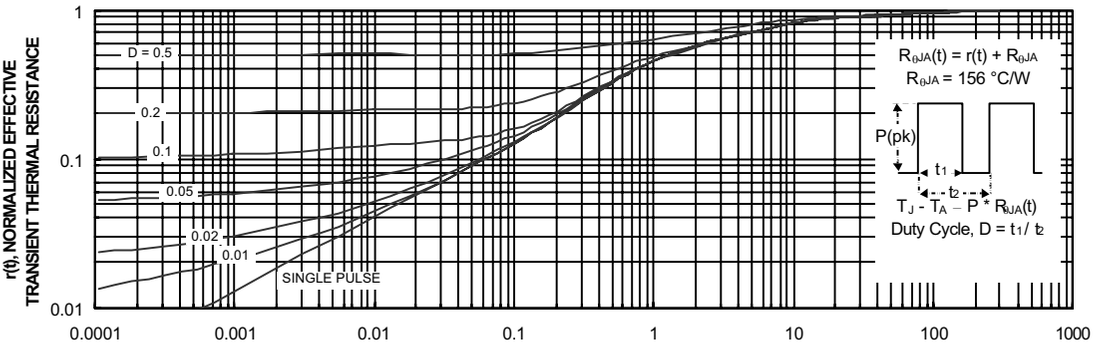



**Figure 5. Transient Thermal Response Curve.**

Thermal characterization performed on the conditions described in Note 2.
Transient thermal response will change depends on the circuit board design.

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