

# Integrated Load Switch

## FDC6330L

### Description

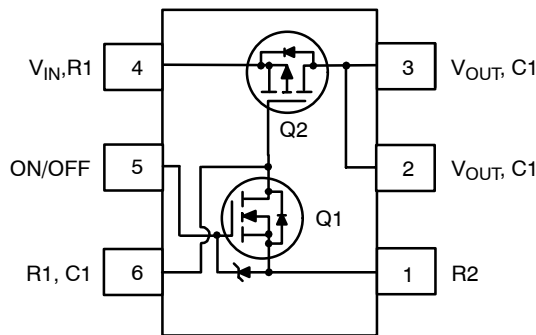
This device is particularly suited for compact power management in portable electronic equipment where 3 V to 20 V input and 2.3 A output current capability are needed. This load switch integrates a small N-Channel power MOSFET (Q1) which drives a large P-Channel power MOSFET (Q2) in one tiny SUPERSOT™-6 package.

### Features

- $V_{DROP} = 0.20\text{ V}$  @  $V_{IN} = 12\text{ V}$ ,  $I_L = 2.5\text{ A}$ ,  $R_{(on)} = 0.08\ \Omega$
- $V_{DROP} = 0.20\text{ V}$  @  $V_{IN} = 5\text{ V}$ ,  $I_L = 1.6\text{ A}$ ,  $R_{(on)} = 0.125\ \Omega$
- Control MOSFET (Q1) Includes Zener Protection for ESD Ruggedness (> 6 kV Human Body Model)
- High Performance POWERTRENCH® Technology for Extremely Low On-Resistance
- SUPERSOT-6 Package Design Using Copper Lead Frame for Superior Thermal and Electrical Capabilities
- This is a Pb-Free and Halide Free Device

### Application

- Power Management
- Load Actuation



See Application Circuit (Figure 2)

Figure 1.

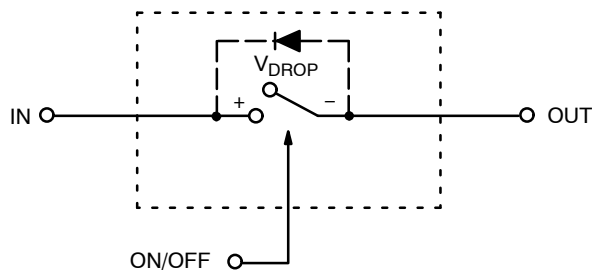
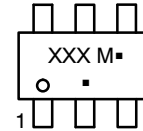


Figure 2. Equivalent Circuit



TSOT-23-6  
CASE 419BL

### MARKING DIAGRAM



XXX = Specific Device Code

M = Date Code

■ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device   | Package                | Shipping†             |
|----------|------------------------|-----------------------|
| FDC6330L | TSOT-23-6<br>(Pb-Free) | 3000 /<br>Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# FDC6330L

## ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol         | Parameter                                                                              | Value      | Unit             |
|----------------|----------------------------------------------------------------------------------------|------------|------------------|
| $V_{IN}$       | Input Voltage Range (Note 1)                                                           | 3 – 20     | V                |
| $V_{ON/OFF}$   | On/Off Voltage Range                                                                   | 1.5 – 8    | V                |
| $I_D$          | Load Current – Continuous (Note 2)                                                     | 2.3        | A                |
|                | Load Current – Pulsed                                                                  | 10         |                  |
| $P_D$          | Maximum Power Dissipation (Note 1)                                                     | 0.7        | W                |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                                                | –55 to 150 | $^\circ\text{C}$ |
| ESD            | Electrostatic Discharge Rating MIL–STD–883D Human Body Model (100 pF / 1500 $\Omega$ ) | 6          | kV               |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol          | Parameter                                        | Value | Unit               |
|-----------------|--------------------------------------------------|-------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 2) | 180   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case (Note 2)    | 60    | $^\circ\text{C/W}$ |

## ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|--------|-----------|-----------------|-----|-----|-----|------|
|--------|-----------|-----------------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|          |                 |                                                 |   |   |   |               |
|----------|-----------------|-------------------------------------------------|---|---|---|---------------|
| $I_{FL}$ | Leakage Current | $V_{IN} = 20\text{ V}, V_{ON/OFF} = 0\text{ V}$ | – | – | 1 | $\mu\text{A}$ |
|----------|-----------------|-------------------------------------------------|---|---|---|---------------|

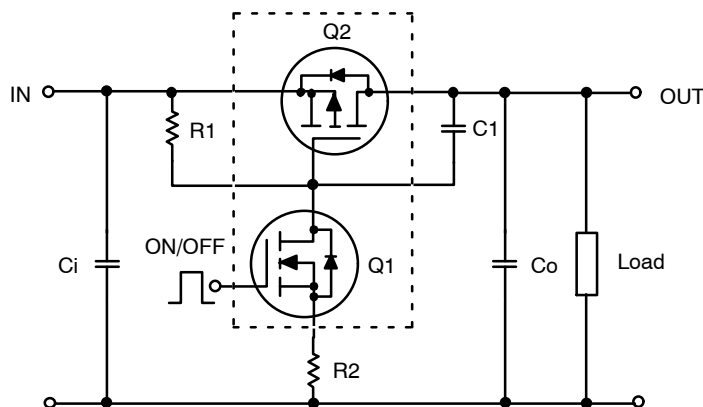
### ON CHARACTERISTICS (Note 3)

|              |                              |                                                                            |     |       |       |          |
|--------------|------------------------------|----------------------------------------------------------------------------|-----|-------|-------|----------|
| $V_{DROP}$   | Conduction Voltage           | $V_{IN} = 12\text{ V}, V_{ON/OFF} = 3.3\text{ V}, I_L = 2.5\text{ A}$      | –   | –     | 0.2   | V        |
|              |                              | $V_{IN} = 5\text{ V}, V_{ON/OFF} = 3.3\text{ V}, I_L = 1.6\text{ A}$       | –   | –     | 0.2   |          |
| $R_{DS(on)}$ | $Q_2$ – Static On-Resistance | $V_{GS} = -12\text{ V}, I_D = -2.3\text{ A}$                               | –   | 0.054 | 0.08  | $\Omega$ |
|              |                              | $V_{GS} = -5\text{ V}, I_D = -1.9\text{ A}$                                | –   | 0.081 | 0.125 |          |
| $I_L$        | Load Current                 | $V_{DROP} = 0.2\text{ V}, V_{IN} = 12\text{ V}, V_{ON/OFF} = 3.3\text{ V}$ | 2.5 | –     | –     | A        |
|              |                              | $V_{DROP} = 0.2\text{ V}, V_{IN} = 5\text{ V}, V_{ON/OFF} = 3.3\text{ V}$  | 1.6 | –     | –     |          |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### NOTES:

1. Range of  $V_{in}$  can be up to 30 V, but  $R_1$  and  $R_2$  must be scaled such that  $V_{GS}$  of  $Q_2$  does not exceed 20 V.
2.  $R_{\theta JA}$  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.
3. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .



### External Component Recommendation:

For applications where  $C_o \leq 1\text{ }\mu\text{F}$ .  
 For slew rate control, select  $R_2$  in the range of 1k – 4.7 k $\Omega$ .  
 For additional in-rush current control,  $C_1 \leq 1000\text{ pF}$  can be added.  
 Select  $R_1$  so that the  $R_1/R_2$  ratio ranges from 10–100.  
 $R_1$  is required to turn  $Q_2$  off.

Figure 3. FDC6330L Load Switch Application

TYPICAL CHARACTERISTICS

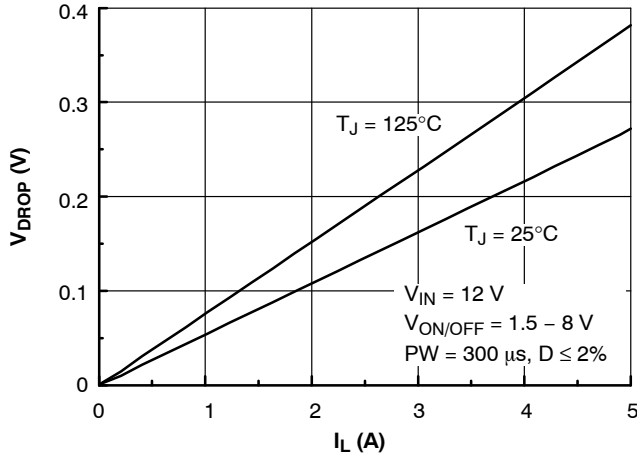


Figure 4. Conduction Voltage Drop Variation with Load Current

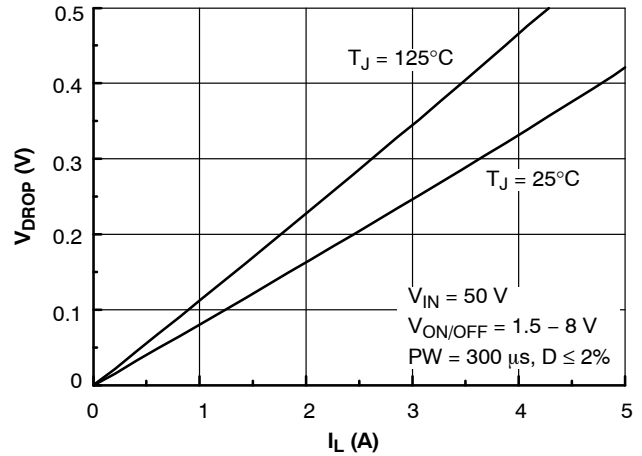


Figure 5. Conduction Voltage Drop Variation with Load Current

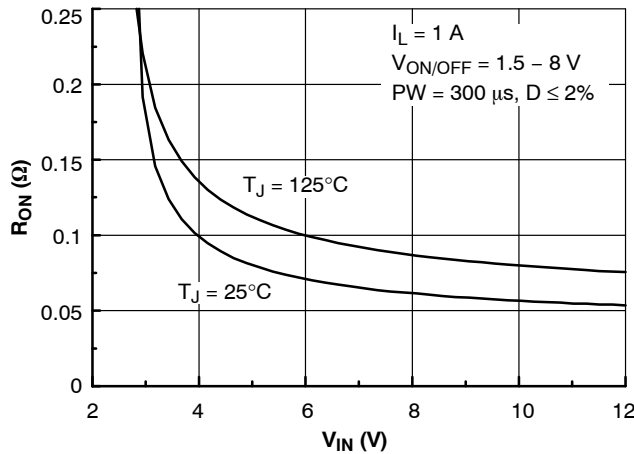


Figure 6. On-Resistance Variation with Input Voltage

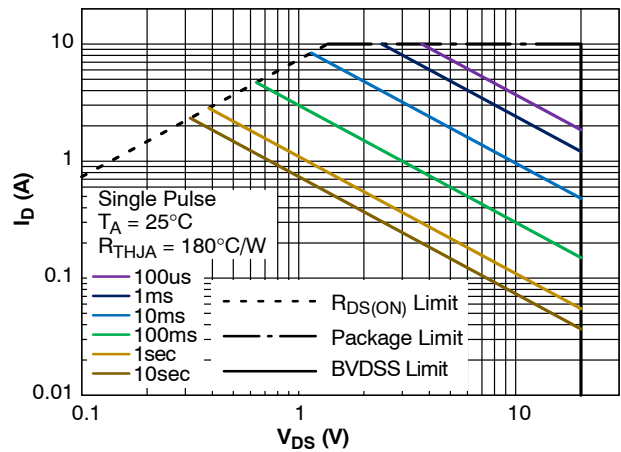


Figure 7. Safe Operating Area

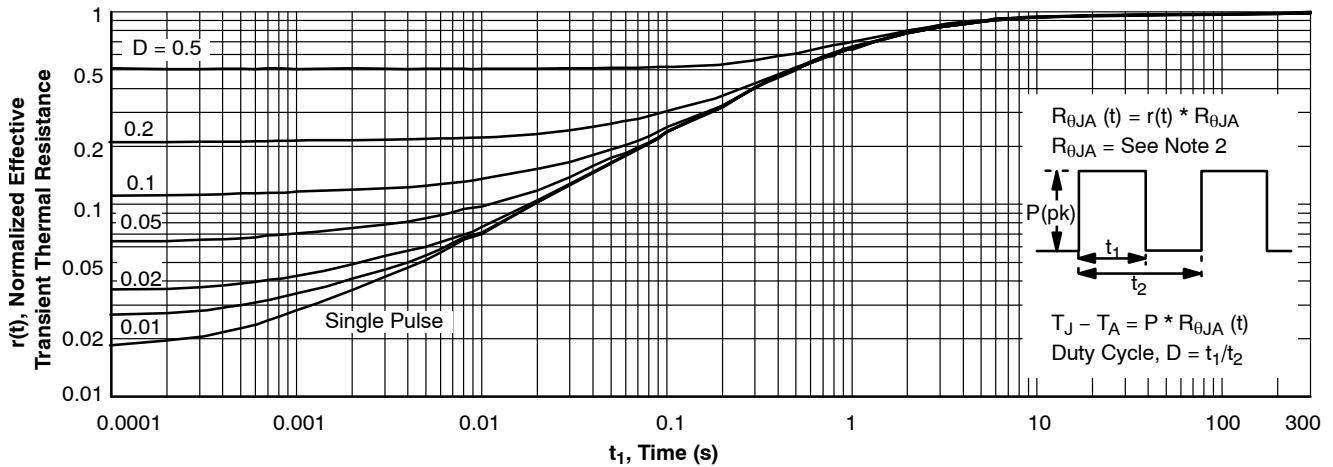


Figure 8. Transient Thermal Response Curve

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

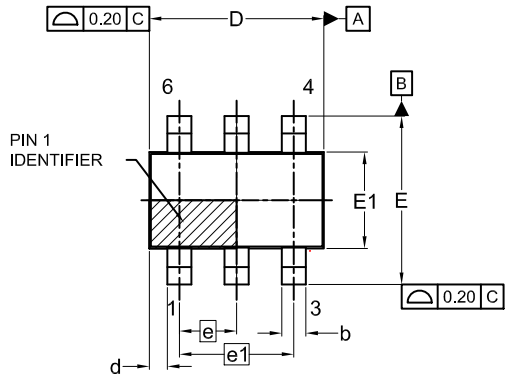
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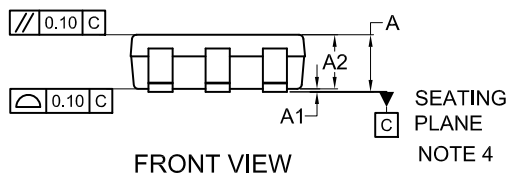
SCALE 2:1

**TSOT23 6-Lead**  
**CASE 419BL**  
**ISSUE A**

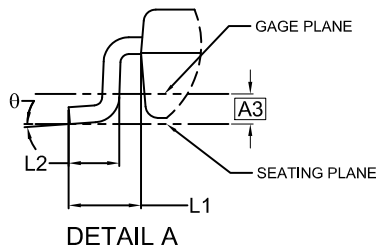
DATE 31 AUG 2020



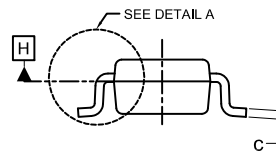
TOP VIEW



FRONT VIEW

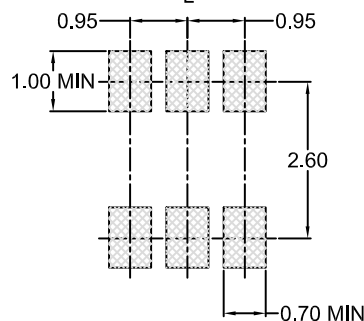


DETAIL A



SIDE VIEW

SYMM

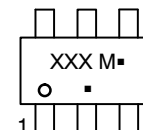

LAND PATTERN  
RECOMMENDATION

\*FOR ADDITIONAL INFORMATION ON OUR  
Pb-FREE STRATEGY AND SOLDERING DETAILS,  
PLEASE DOWNLOAD THE ON SEMICONDUCTOR  
SOLDERING AND MOUNTING TECHNIQUES  
REFERENCE MANUAL, SOLDERM/D.

## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.25MM PER END. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
4. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.90        | 1.00 | 1.10 |
| A1  | 0.00        | 0.05 | 0.10 |
| A2  | 0.70        | 0.85 | 1.00 |
| A3  | 0.25 BSC    |      |      |
| b   | 0.25        | 0.38 | 0.50 |
| c   | 0.10        | 0.18 | 0.26 |
| D   | 2.80        | 2.95 | 3.10 |
| d   | 0.30 REF    |      |      |
| E   | 2.50        | 2.75 | 3.00 |
| E1  | 1.30        | 1.50 | 1.70 |
| e   | 0.95 BSC    |      |      |
| e1  | 1.90 BSC    |      |      |
| L1  | 0.60 REF    |      |      |
| L2  | 0.20        | 0.40 | 0.60 |
| Θ   | 0°          | —    | 10°  |

**GENERIC  
MARKING DIAGRAM\***


XXX = Specific Device Code

M = Date Code

▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

|                         |                      |                                                                                                                                                                                  |
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