

# Integrated Load Switch

## FDC6331L



TSOT-23-6  
CASE 419BL

### Description

This device is particularly suited for compact power management in portable electronic equipment where 2.5 V to 8 V input and 2.8 A 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.

### Features

- 2.8 A, -8 V
  - $R_{DS(on)} = 55\text{ m}\Omega @ V_{GS} = -4.5\text{ V}$
  - $R_{DS(on)} = 70\text{ m}\Omega @ V_{GS} = -2.5\text{ V}$
  - $R_{DS(on)} = 100\text{ m}\Omega @ V_{GS} = -1.8\text{ V}$
- Control MOSFET (Q1) Includes Zener Protection for ESD Ruggedness (>6 kV Human Body Model)
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- This is a Pb-Free and Halide Free Device

### Applications

- Load Switch
- Power Management

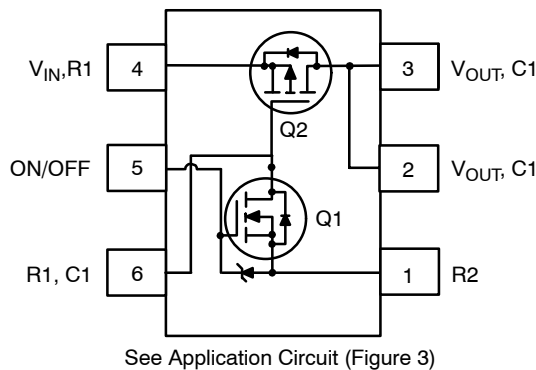


Figure 1.

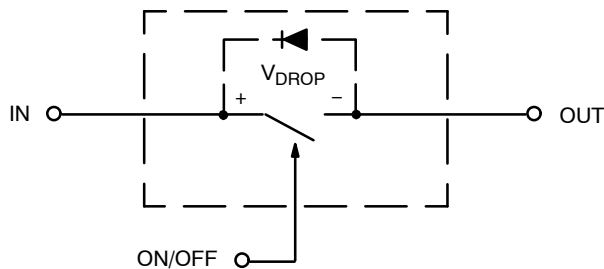
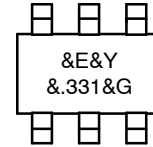


Figure 2. Equivalent Circuit

### MARKING DIAGRAM



- &E = Designates Space
- &Y = Binary Calendar Year Coding Scheme
- &. = Pin One Dot
- 331 = Specific Device Code
- &G = Date Code

### ORDERING INFORMATION

Device	Package	Shipping†
FDC6331L	TSOT-23-6 (Pb-Free)	3000 / 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.

# FDC6331L

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

Symbol	Parameter	Value	Unit
$V_{IN}$	Maximum Input Voltage	$\pm 8$	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
	Load Current – 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	$^\circ\text{C}$

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 1)	180	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	60	$^\circ\text{C}/\text{W}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

$BV_{IN}$	$V_{IN}$ Breakdown Voltage	$V_{ON/OFF} = 0\text{ V}, I_D = -250\ \mu\text{A}$	8	-	-	V
$I_{Load}$	Zero Gate Voltage Drain Current	$V_{IN} = 6.4\text{ V}, V_{ON/OFF} = 0\text{ V}$	-	-	-1	$\mu\text{A}$
$I_{FL}$	Leakage Current, Forward	$V_{ON/OFF} = 0\text{ V}, V_{IN} = 8\text{ V}$	-	-	-100	nA
$I_{RL}$	Leakage Current, Reverse	$V_{ON/OFF} = 0\text{ V}, V_{IN} = -8\text{ V}$	-	-	100	nA

### ON CHARACTERISTICS (Note 2)

$V_{ON/OFF(th)}$	Gate Threshold Voltage	$V_{IN} = V_{ON/OFF}, I_D = -250\ \mu\text{A}$	0.4	0.9	1.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance (Q2)	$V_{GS} = -4.5\text{ V}, I_D = -2.8\text{ A}$	-	34	55	m $\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -2.5\text{ A}$	-	45	70	
		$V_{GS} = -1.8\text{ V}, I_D = -2.0\text{ A}$	-	64	100	
$R_{DS(on)}$	Static Drain-Source On-Resistance (Q1)	$V_{GS} = 4.5\text{ V}, I_D = 0.4\text{ A}$	-	3.1	4	$\Omega$
		$V_{GS} = 2.7\text{ V}, I_D = 0.2\text{ A}$	-	3.8	5	

### DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

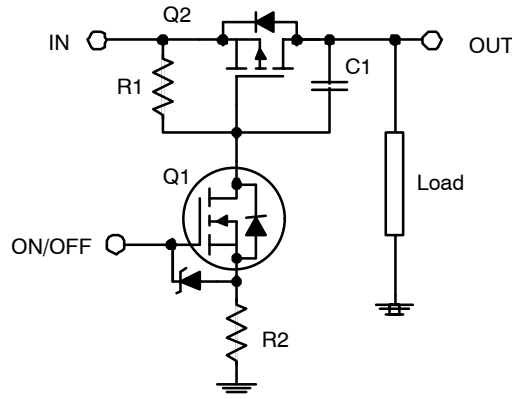
$I_S$	Maximum Continuous Drain-Source Diode Forward Current		-	-	-0.6	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{ON/OFF} = 0\text{ V}, I_S = -0.6\text{ A}$ (Note 2)	-	-	-1.2	V

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:

- $R_{\theta JA}$  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.
- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%.

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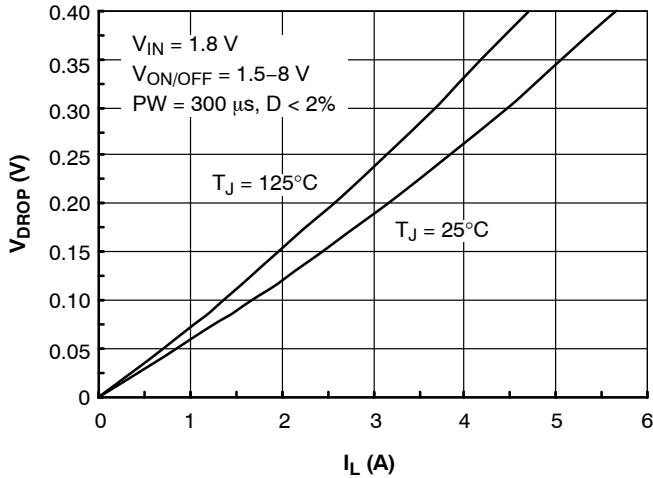


**Figure 3. FDC6331L Load Switch Application Circuit**

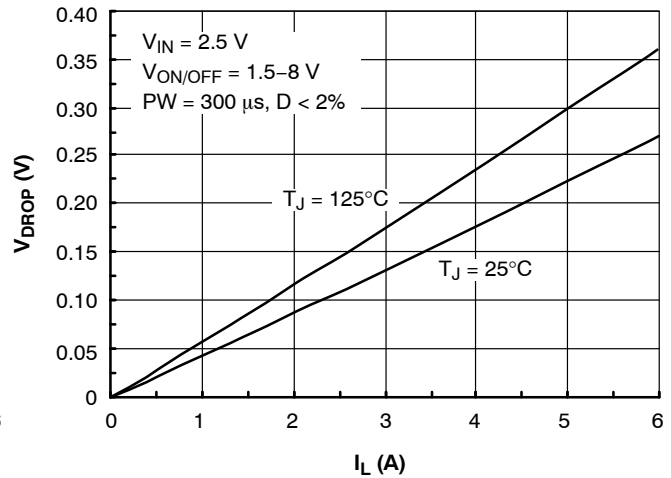
External Component Recommendation:

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

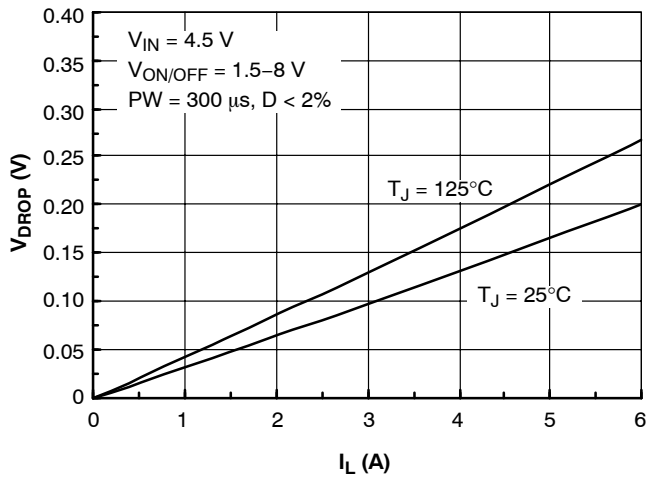
## TYPICAL CHARACTERISTICS



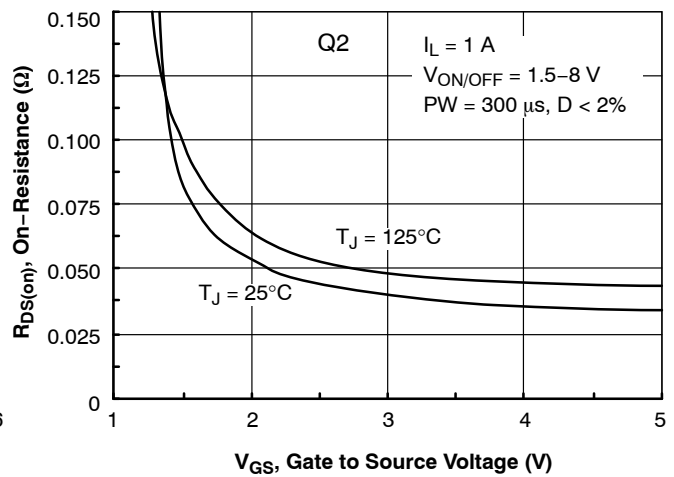
**Figure 4. Conduction Voltage Drop Variation with Load Current**



**Figure 5. Conduction Voltage Drop Variation with Load Current**



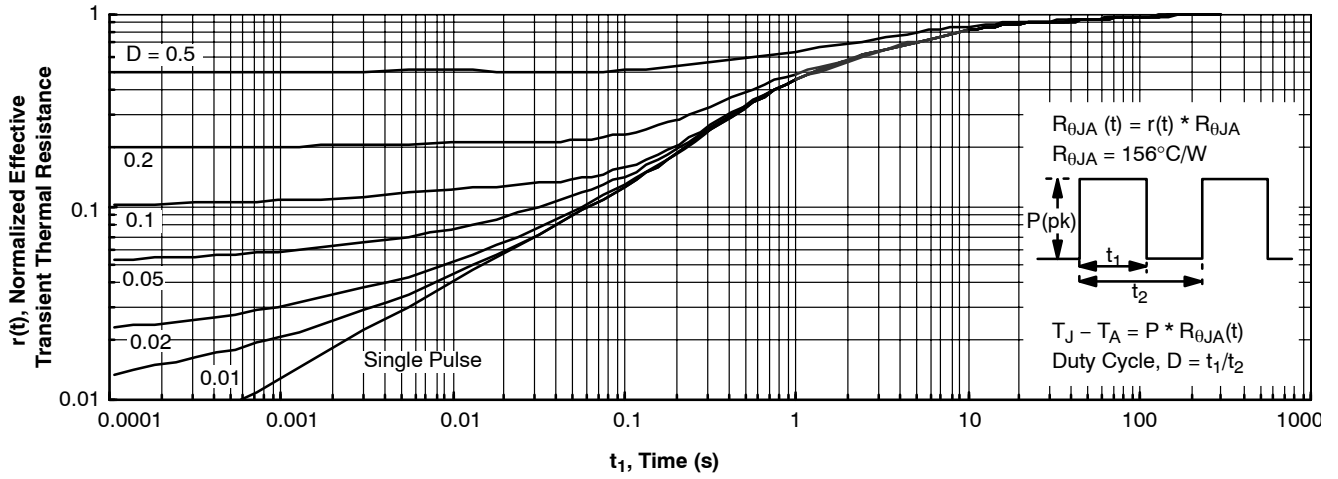
**Figure 6. Conduction Voltage Drop Variation with Load Current**



**Figure 7. On-Resistance Variation with Input Voltage**

# FDC6331L

## TYPICAL CHARACTERISTICS (continued)



**Figure 8. Transient Thermal Response Curve**

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

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

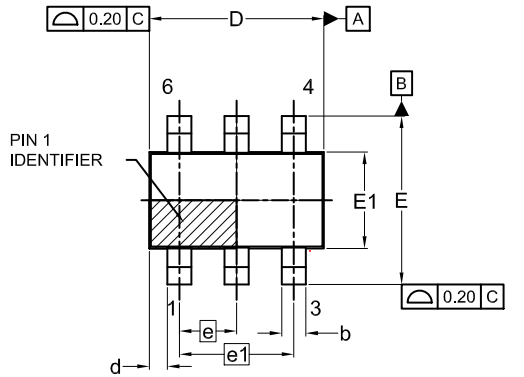
ON Semiconductor®



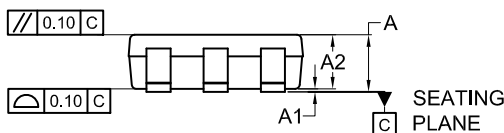
SCALE 2:1

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

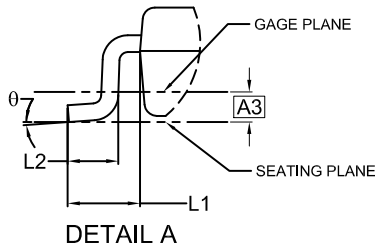
DATE 31 AUG 2020



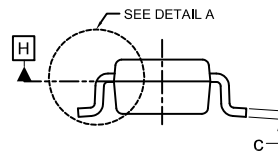
TOP VIEW



FRONT VIEW

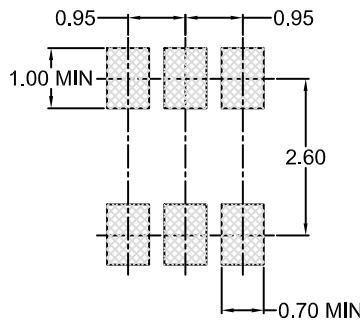


DETAIL A



SIDE VIEW

SYMM  
⌀



LAND PATTERN  
RECOMMENDATION

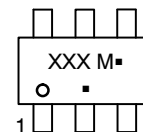
\*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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
⌀	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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