Integrated Load Switch

FDC6331L

TSOT−23−6
CASE 419BL

Description

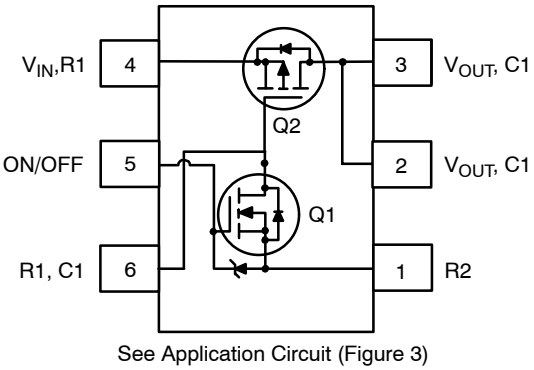
This device is particularly suited for compact power management in portable electronic equipment where 2.5 V to 8 V input and 2.8 A output current capability are needed. This load switch integrates a small N−Channel power MOSFET (Q1) that drives a large P−Channel power MOSFET (Q2) in one tiny SUPERSOT™−6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

Features

- −2.8 A, −8 V
  - $R_{DS(on)}$ = 55 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 (>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



See Application Circuit (Figure 3)

Figure 1.

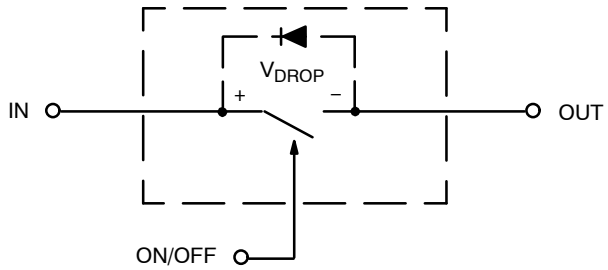
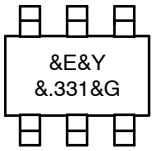


Figure 2. Equivalent Circuit

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.

ABSOLUTE MAXIMUM RATINGS T_A = 25°C unless otherwise noted

Symbol	Parameter	Value	Unit
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
	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	°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°C unless otherwise noted

Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient (Note 1)	180	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case (Note 1)	60	°C/W

ELECTRICAL CHARACTERISTICS T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{IN}	V_{IN} 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 = −2.8 A	−	34	55	mΩ
		V_{GS} = −2.5 V, I_D = −2.5 A	−	45	70	
		V_{GS} = −1.8 V, I_D = −2.0 A	−	64	100	
$R_{DS(on)}$	Static Drain−Source On−Resistance (Q1)	V_{GS} = 4.5 V, I_D = 0.4 A	−	3.1	4	Ω
		V_{GS} = 2.7 V, I_D = 0.2 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 V, I_S = −0.6 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:
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 < 300 μs, Duty Cycle < 2.0%.

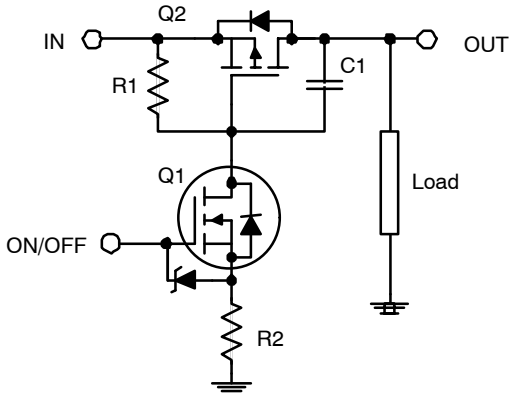


Figure 3. FDC6331L Load Switch Application Circuit

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

TYPICAL CHARACTERISTICS

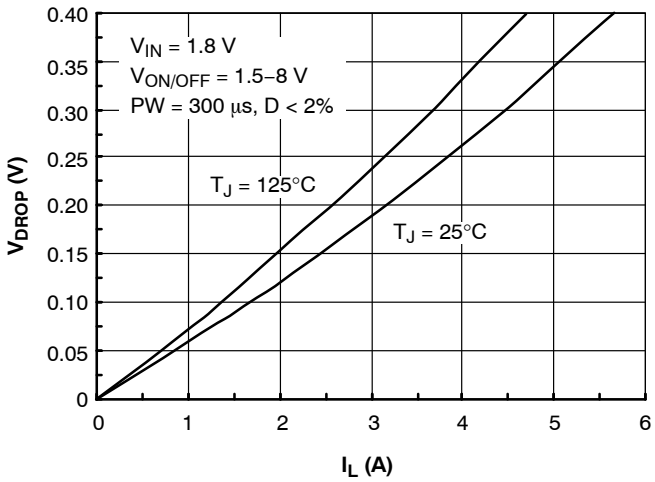


Figure 4. Conduction Voltage Drop Variation with Load Current

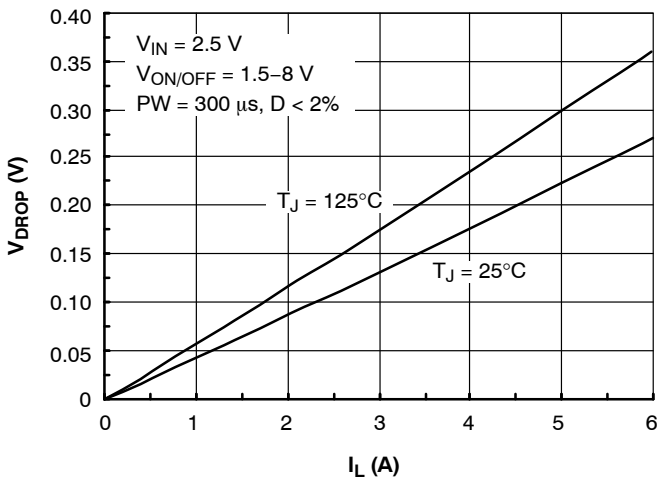


Figure 5. Conduction Voltage Drop Variation with Load Current

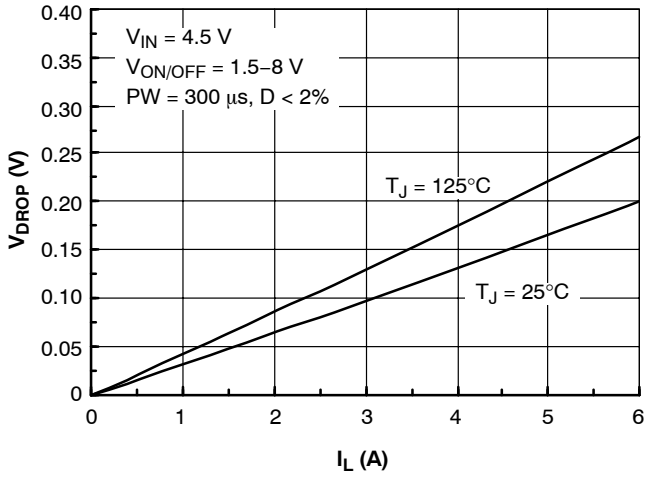


Figure 6. Conduction Voltage Drop Variation with Load Current

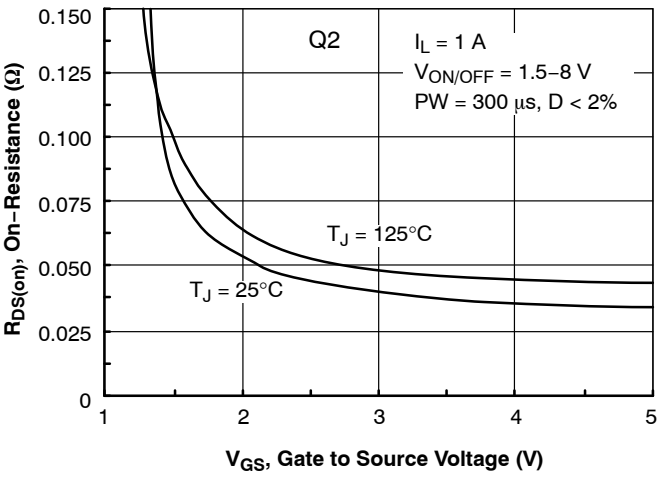


Figure 7. On−Resistance Variation with Input Voltage

TYPICAL CHARACTERISTICS (continued)

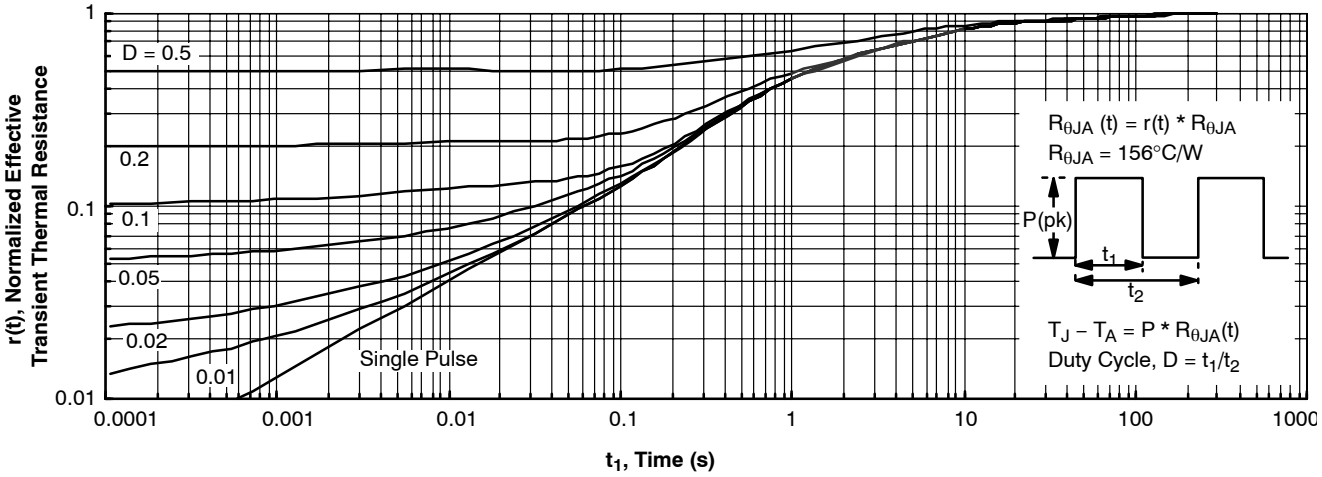


Figure 8. Transient Thermal Response Curve

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

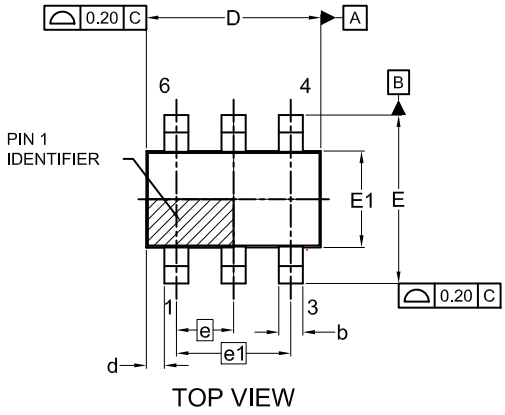
ON Semiconductor®

1

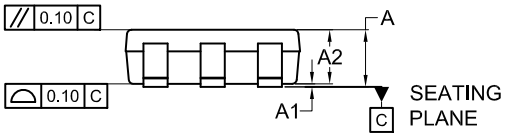
SCALE 2:1

TSOT23 6−Lead
CASE 419BL
ISSUE A

DATE 31 AUG 2020

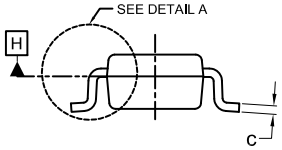


TOP VIEW

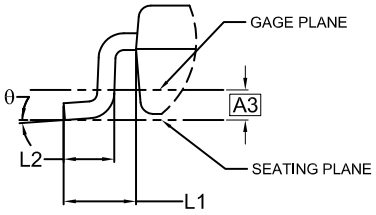


FRONT VIEW

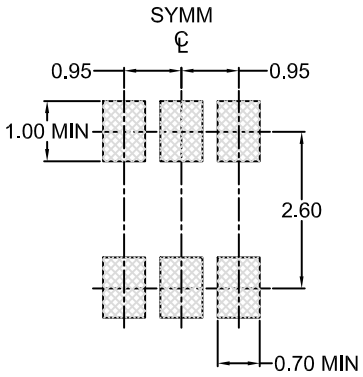
NOTE 4



SIDE VIEW



DETAIL A



LAND PATTERN
RECOMMENDATION

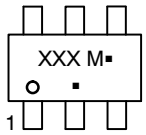
*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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
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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DESCRIPTION:	**TSOT23 6−Lead**	**PAGE 1 OF 1**