Integrated Load Switch

FDC6330L

TSOT−23−6
CASE 419BL

Description

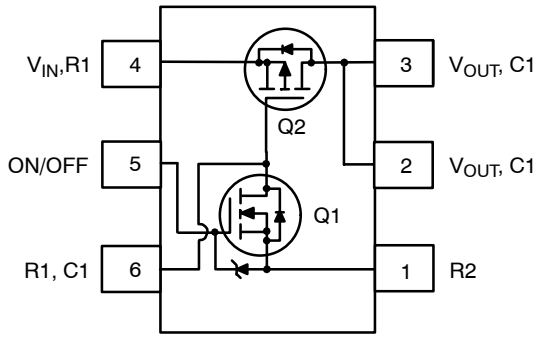
This device is particularly suited for compact power management in portable electronic equipment where 3 V to 20 V input and 2.3 A output current capability are needed. This load switch integrates a small N−Channel power MOSFET (Q1) which drives a large P−Channel power MOSFET (Q2) in one tiny SUPERSOT™−6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

Features

- V_{DROP} = 0.20 V @ V_{IN} = 12 V, I_L = 2.5 A, $R_{(on)}$ = 0.08 Ω
- V_{DROP} = 0.20 V @ V_{IN} = 5 V, I_L = 1.6 A, $R_{(on)}$ = 0.125 Ω
- 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.

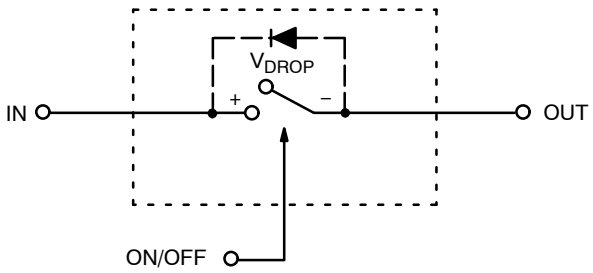
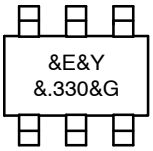


Figure 2. Equivalent Circuit

MARKING DIAGRAM



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

ORDERING INFORMATION

Device	Package	Shipping†
FDC6330L	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}	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	°C
ESD	Electrostatic Discharge Rating MIL−STD−883D Human Body Model (100 pF / 1500 Ω)	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°C unless otherwise noted

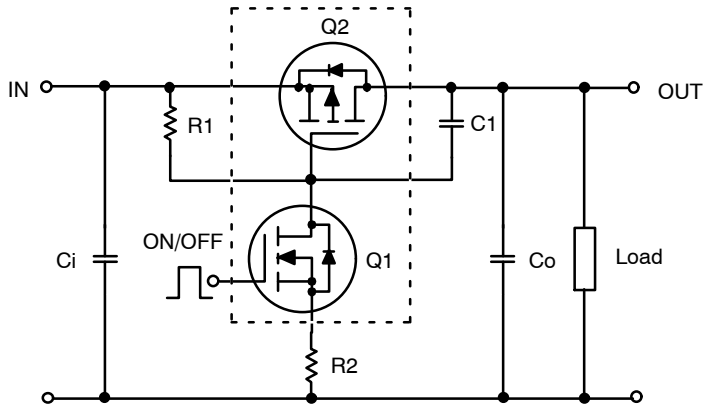
Symbol	Parameter	Value	Unit
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient (Note 2)	180	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case (Note 2)	60	°C/W

ELECTRICAL CHARACTERISTICS T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
I_{FL}	Leakage Current	V_{IN} = 20 V, $V_{ON/OFF}$ = 0 V	–	–	1	μA
ON CHARACTERISTICS (Note 3)						
V_{DROP}	Conduction Voltage	V_{IN} = 12 V, $V_{ON/OFF}$ = 3.3 V, I_L = 2.5 A	–	–	0.2	V
		V_{IN} = 5 V, $V_{ON/OFF}$ = 3.3 V, I_L = 1.6 A	–	–	0.2	
$R_{DS(on)}$	Q_2 – Static On−Resistance	V_{GS} = −12 V, I_D = −2.3 A	–	0.054	0.08	Ω
		V_{GS} = −5 V, I_D = −1.9 A	–	0.081	0.125	
I_L	Load Current	V_{DROP} = 0.2 V, V_{IN} = 12 V, $V_{ON/OFF}$ = 3.3 V	2.5	–	–	A
		V_{DROP} = 0.2 V, V_{IN} = 5 V, $V_{ON/OFF}$ = 3.3 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 Q2 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 ≤ 300 μs, Duty Cycle ≤ 2.0%.



External Component Recommendation:

For applications where Co ≤ 1 μF.
For slew rate control, select R2 in the range of 1k – 4.7 kΩ.
For additional in−rush current control, C1 ≤ 1000 pF can be added.
Select R1 so that the R1/R2 ratio ranges from 10−100.
R1 is required to turn Q2 off.

Figure 3. FDC6330L Load Switch Application

TYPICAL CHARACTERISTICS

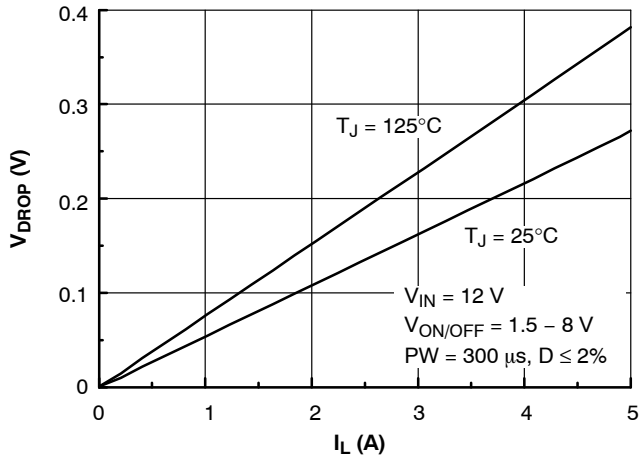


Figure 4. Conduction Voltage Drop Variation with Load Current

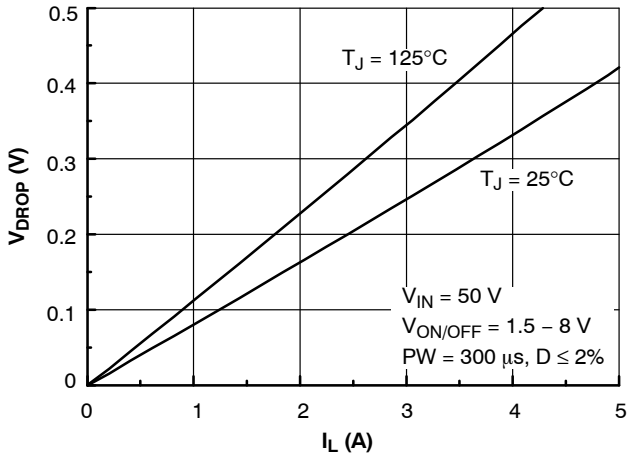


Figure 5. Conduction Voltage Drop Variation with Load Current

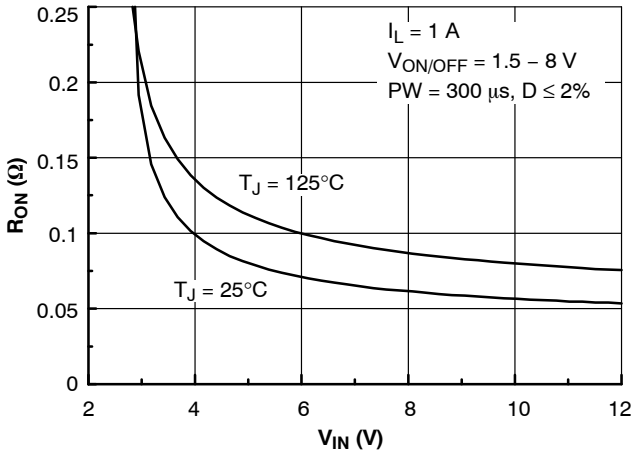


Figure 6. On−Resistance Variation with Input Voltage

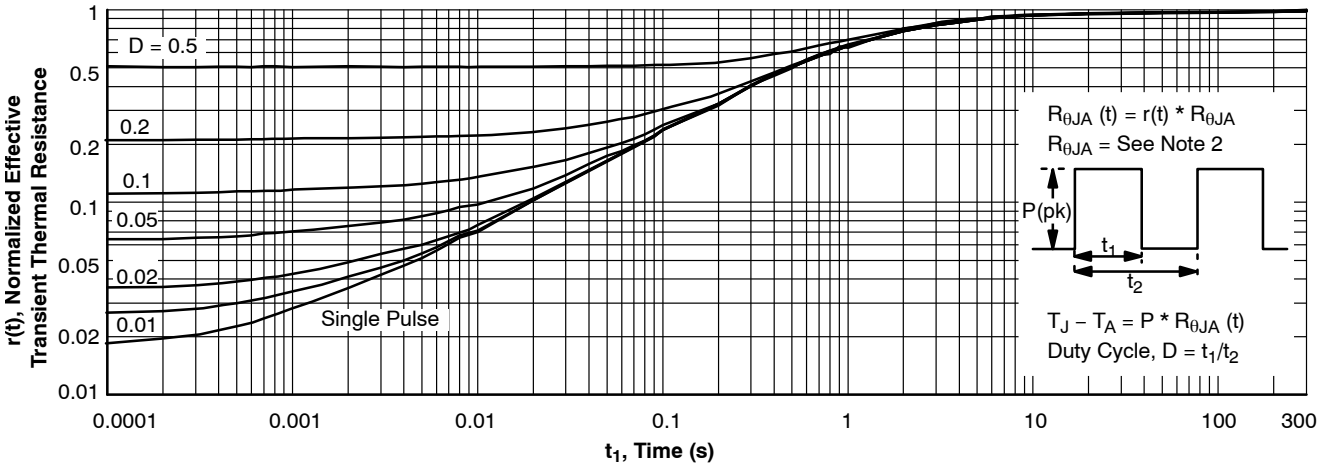


Figure 7. Transient Thermal Response Curve

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

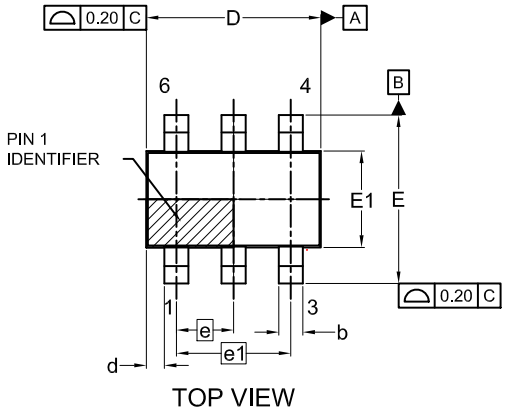
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

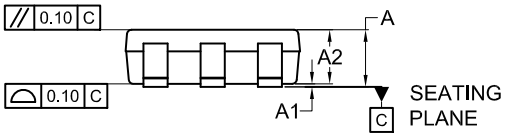
TSOT23 6−Lead
CASE 419BL
ISSUE A

DATE 31 AUG 2020

1
SCALE 2:1

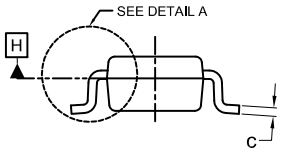


TOP VIEW

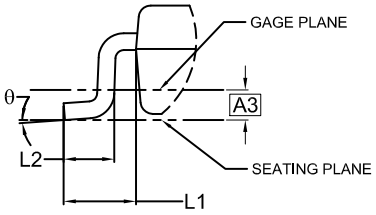


FRONT VIEW

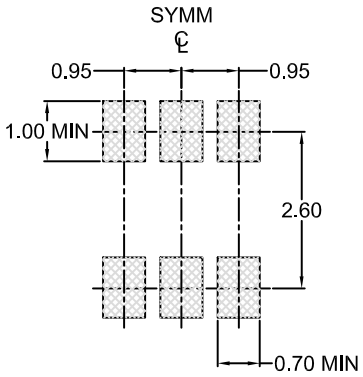
NOTE 4



SIDE VIEW



DETAIL A



LAND PATTERN
RECOMMENDATION

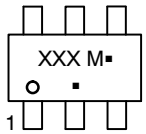
*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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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