

Ordering number : ENN7100

Monolithic Digital IC



# LB1931T

## Constant Current Solenoid Driver IC for Digital Cameras

### Overview

The LB1931T is a driver IC for solenoid coils that provide a constant current control function. The LB1931T features low-saturation output and a hold function, and is optimal for control of plunger shutters in digital cameras.

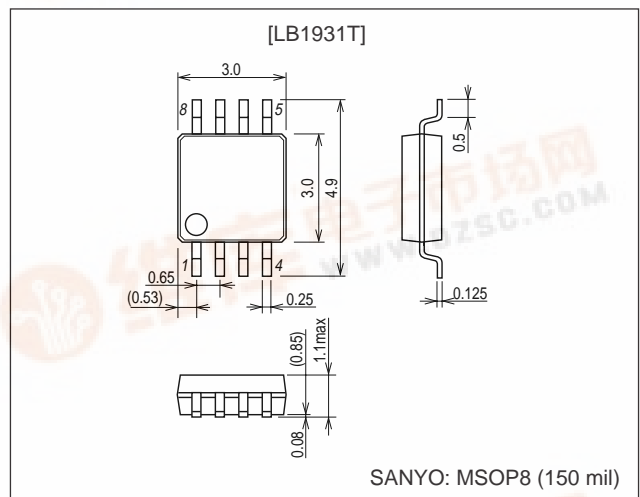
### Functions and Features

- Constant current control ( $I_O = 400 \text{ mA}$  when  $R_f = 0.5 \Omega$ )
- Ultraminiature package (MSOP8: 150 mil)
- Built-in thermal protection circuit
- Hold function
- Includes a rapid charge/rapid discharge circuit for stable shutter operation.
- Built-in reference voltage circuit (0.2 V typical)

### Package Dimensions

unit: mm

#### 3245A-MSOP8



### Specifications

#### Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC \text{ max}}$		-0.3 to +10.5	V
Output current	$I_O \text{ max}$		600	mA
Output applied voltage	$V_O \text{ max}$		-0.3 to $V_{CC} + 0.3$	V
Input applied voltage	$V_{IN}$	IN1	-0.3 to +10.5	V
Allowable power dissipation	$P_d \text{ max}$	Mounted on a specified board.*	400	mW
Operating temperature	$T_{opr}$		-20 to +75	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

Note\*: Mounted on a board (114.3 × 76.1 × 1.6 mm<sup>3</sup>: glass epoxy resin).

- Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.
- SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.



## LB1931T

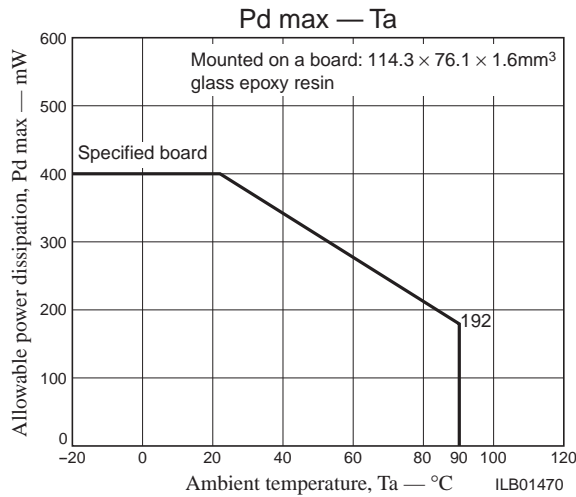
### Allowable Operating Range at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Function-guaranteed voltage range	VOPR		2.5 to 10	V
Constant-current set range	I <sub>OUT</sub>	Set with RFG-GND resistance	50 to 500	mA
Input low level voltage	V <sub>IL</sub>	IN1	-0.3 to +0.5	V
Input high level voltage	V <sub>IH</sub>	IN1	2.0 to 10	V

### Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 4 V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Standby Current dissipation	ISTB	V <sub>CC</sub> = 8.5 V	—	—	1.0	μA
[Constant-current H bridge drive circuit]						
Output saturation voltage	V <sub>OSat</sub>	I <sub>O</sub> = 400 mA	—	0.30	0.42	V
HLD terminal voltage	V <sub>HLD</sub>		197	208	218	mV
Output constant current	V <sub>OUT1</sub>	HLD = OPEN, R <sub>L</sub> = 3 Ω, R <sub>F</sub> = 0.5 Ω	375	400	425	mA
	V <sub>OUT2</sub>	HLD = GND, R <sub>L</sub> = 3 Ω, R <sub>F</sub> = 0.5 Ω	180	195	210	
Temperature dependence of output constant current (reference Ta = 25°C)	ΔI <sub>O</sub>	V <sub>CC</sub> = 4 V, R <sub>L</sub> = 3 Ω, R <sub>F</sub> = 0.5 Ω* (Ta = -10 to +60°C)	-2	—	+2	%
Operating current dissipation	I <sub>CC</sub>	V <sub>CC</sub> = 4 V, R <sub>L</sub> = 0 Ω (No load, full drive)	—	14	21	mA
Thermal protection operating temperature	T <sub>TSD</sub>	Design target values*	150	180	210	°C
[Control input circuit]						
Control pin maximum input current	I <sub>IH</sub>	V <sub>IH</sub> = 5.5 V, V <sub>CC</sub> = 5.5 V	—	80	100	μA
	I <sub>IL</sub>	V <sub>IL</sub> = GND	-1	—	0	

Note\*: These items are design target values and are not tested.



## LB1931T

### Truth Table

Input		Output	Mode
IN1	HLD	OUT	
L	*	OFF	Standby
H	open	H	Output ON
	L	H	Hold Output ON

Note\*: don't care.

### Difference between [Output ON] and [Hold Output ON]

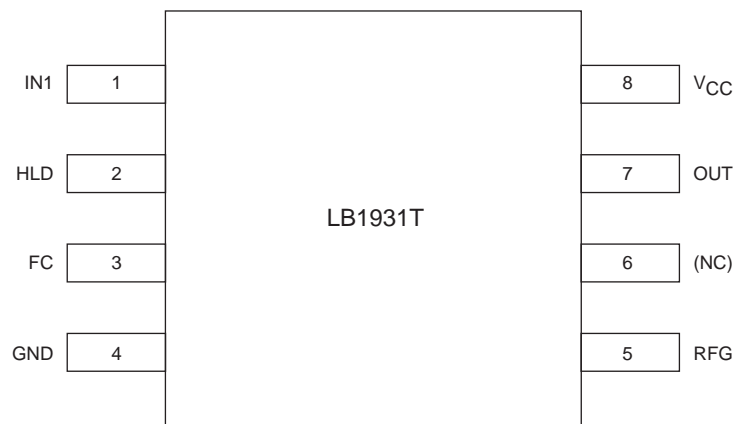
In the [Hold Output ON] mode, the output current value is 1/2 of the [Output ON] mode.

Theoretical equation of the output current value in each mode is shown below:

Output ON .....  $I_{OUT} [A] = 0.2 [V] / R_F [\Omega]$

Hold Output ON ....  $I_{OUT} [A] = 0.1 [V] / R_F [\Omega]$

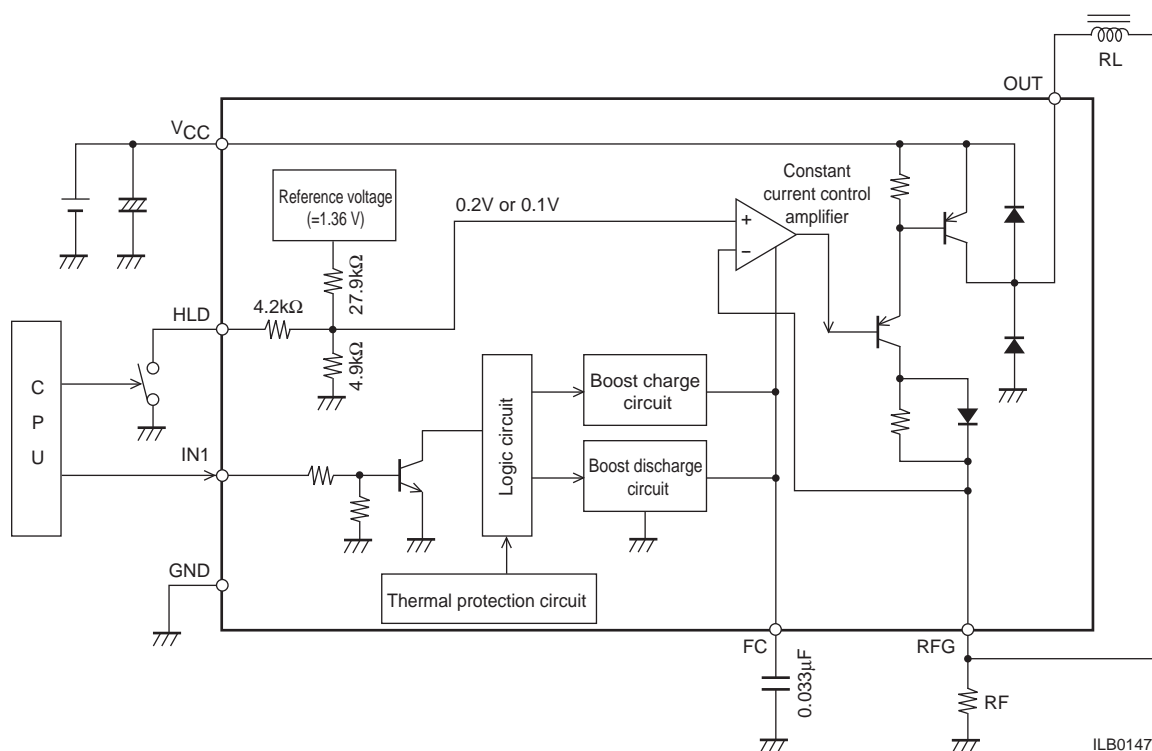
### Pin Assignment



Top view

ILB01485

## Block Diagram



## [Boost charge and discharge circuits]

In order to keep the output response time constant during mode transfer from the standby state to forward (reverse) rotation, this IC incorporates boost charge and discharge circuits for external capacitor connected to the FC pin.

The external capacitor connected to the FC pin is for output phase compensation (to suppress oscillation), for which 0.022 to 0.1  $\mu\text{F}$  is recommended. Note that increase in the capacitor value results in increase in the time necessary for the constant current control to rise.

- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.