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# LB1941T

## Monolithic Linear IC For Digital Cameras Constant Current Forward/Reverse Driver IC

### Overview

The LB1941T is a single-channel forward/reverse driver IC that provides a constant current control function. Its low-saturation output makes it appropriate for voice coil motor control, and it is optimal for use as the shutter driver IC in digital cameras.

### Functions

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

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC}$ max		-0.3 to +10.5	V
Output current	$I_O$ max		600	mA
Output applied voltage	$V_O$ max		-0.3 to $V_{CC}+0.3$	V
Input applied voltage	$V_{IN}$ max	IN1, IN2	-0.3 to +10.5	V
Allowable power dissipation	$P_d$ 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: 114.3mm×76.1mm×1.6mm, glass epoxy resin.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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## Allowable Operating Range at $T_a = 25^\circ\text{C}$

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, IN2	-0.3 to +0.5	V
Input high level voltage	V <sub>IH</sub>	IN1, IN2	2.0 to 10	V

## Electrical Characteristics at $T_a = 25^\circ\text{C}$

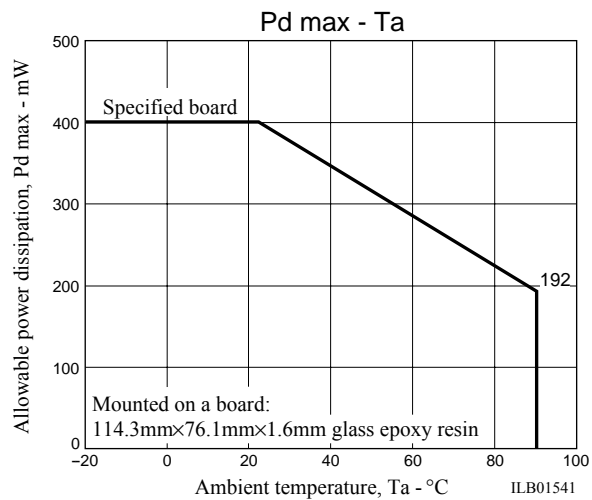
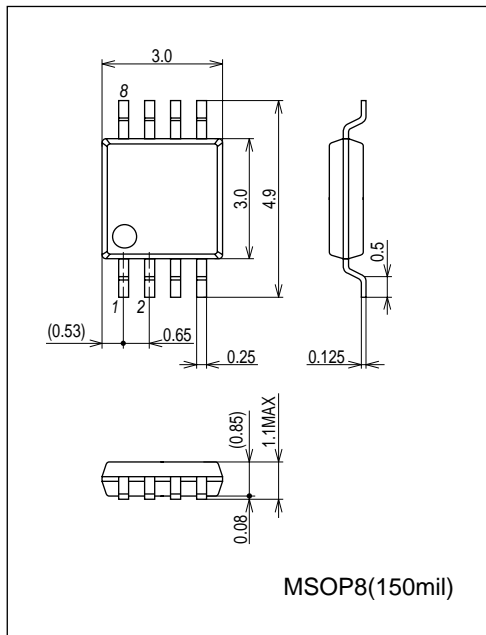
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Standby Current dissipation	I <sub>STB</sub>	V <sub>CC</sub> = 8.5V			1.0	μA
<b>Constant-current H bridge drive circuit</b>						
Output saturation voltage	V <sub>O(sat)1</sub>	V <sub>CC</sub> = 3V, I <sub>O</sub> = 200mA (Upper + Lower side)		0.20	0.35	V
	V <sub>O(sat)2</sub>	V <sub>CC</sub> = 4V, I <sub>O</sub> = 400mA (Upper + Lower side)		0.50	0.70	V
Output constant current	I <sub>OUT</sub>	V <sub>CC</sub> = 4V, R <sub>L</sub> = 3Ω, R <sub>F</sub> = 0.5Ω	375	400	424	mA
Temperature dependence of output constant current (reference $T_a = 25^\circ\text{C}$ )	ΔI <sub>O</sub>	V <sub>CC</sub> = 4V, R <sub>L</sub> = 3Ω, R <sub>F</sub> = 0.5Ω * (T <sub>a</sub> = -10 to +60°C)	-2		+2	%
Operating current dissipation	I <sub>CC</sub>	V <sub>CC</sub> = 4V, R <sub>L</sub> = 0Ω, (No load, full drive)		14	21	mA
Thermal protection operating temperature	TSD	Design target value *	150	180	210	°C
<b>Control input circuit</b>						
Control pin maximum input current	I <sub>IH</sub>	V <sub>IH</sub> = 5.5V, V <sub>CC</sub> = 5.5V		80	100	μA
	I <sub>IL</sub>	V <sub>IL</sub> = GND	-1		0	μA

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

## Package Dimensions

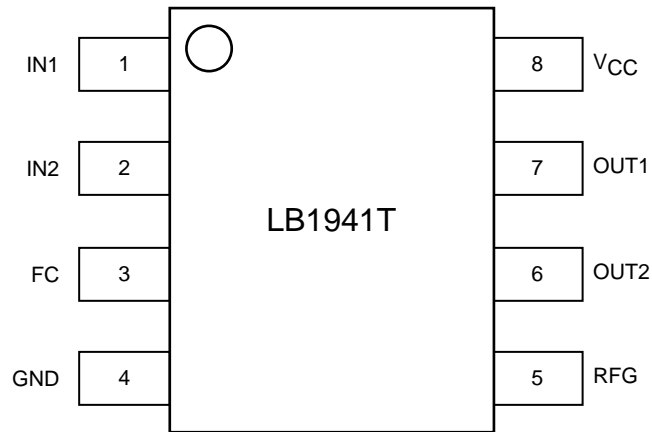
unit : mm (typ)

3245B



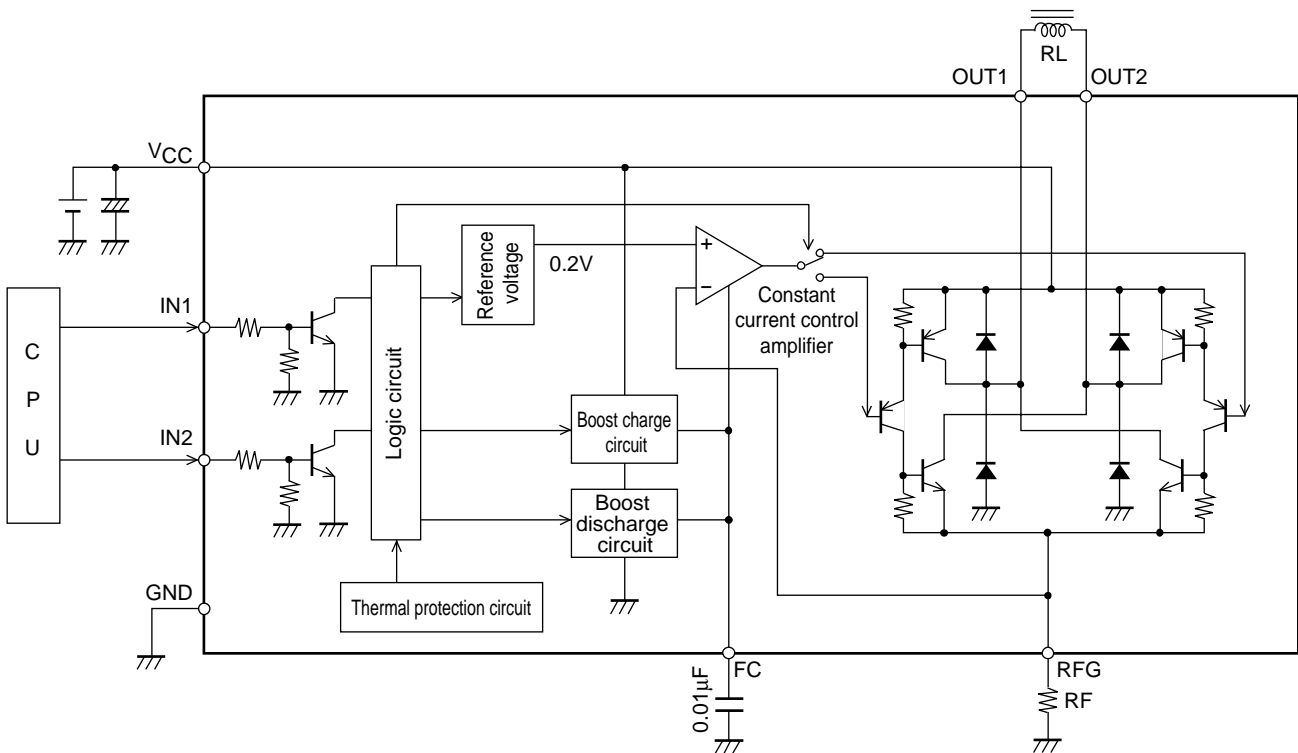
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## Pin Assignment



Top view

## Block Diagram



ILB01540

### 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 0.01 to 0.1 $\mu$ F is recommended. Note that increase in the capacitor value results in increase in the time necessary for the constant current control to rise.

**Truth Table**

Input		Output		Mode
IN1	IN2	OUT1	OUT2	
L	L	OFF	OFF	Standby 1*
H	L	H	L	Forward rotation
L	H	L	H	Reverse rotation
H	H	OFF	OFF	Standby 2*

**Cautions for use**

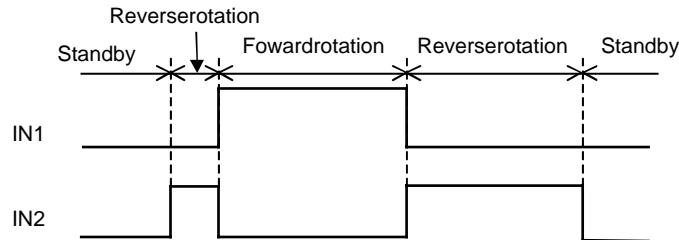
Standby states 1 and 2 in the above truth table differ as follows:

Standby state 1 .....All circuits in IC are not operating and the current dissipation is almost zero.

Standby state 2 .....The constant-current control amplifier output in IC is in the full drive condition. Both OUT1 and OUT2 are OFF. The current dissipation is a few mA.

During mode transfer from the standby state 1 to forward (reverse) rotation, the current rises from the output current zero condition to the required constant current value. On the other hand, during mode transfer from the standby state 2 to forward (reverse) rotation, full drive is applied once to the output, then the current lowers to the required current value.

Therefore, select the standby 1 state when putting IC in the standby state. A typical drive sequence is shown in the figure below.



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