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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 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, 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 Ta = 25°C

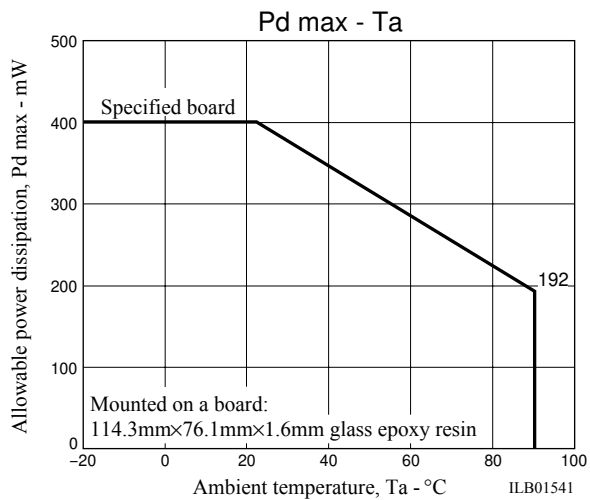
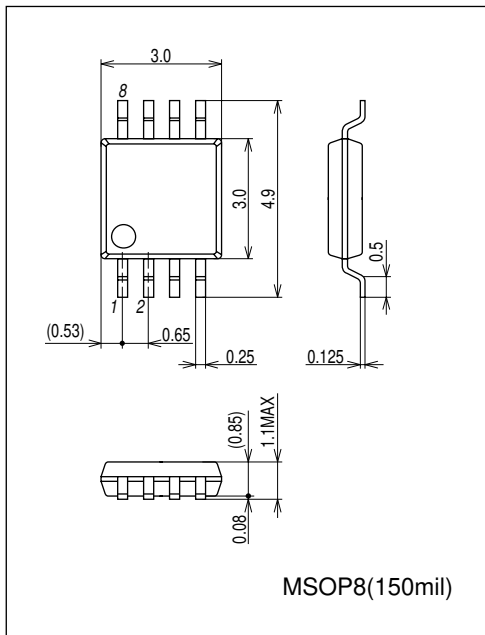
| Parameter   | Symbol               | Conditions   | Ratings |      |      | Unit |
|---|----------------------|--|---------|------|------|------|
|   |                      |  | min     | typ  | max  |      |
| Standby Current dissipation   | I <sub>STB</sub>     | V <sub>CC</sub> = 8.5V   |         |      | 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 Ta = 25°C) | ΔI <sub>O</sub>      | V <sub>CC</sub> = 4V, R <sub>L</sub> = 3Ω, R <sub>F</sub> = 0.5Ω * (Ta = -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

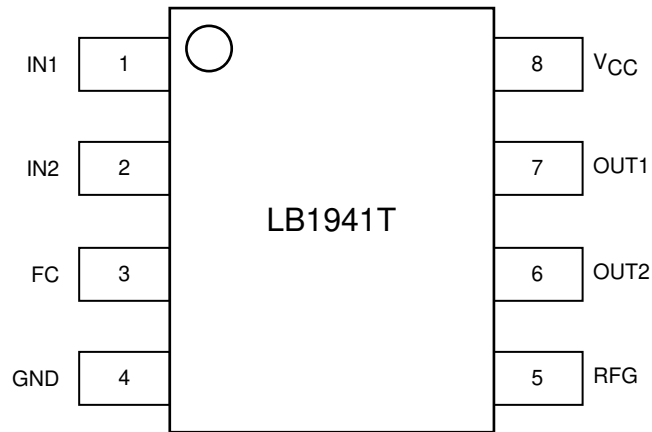
unit : mm (typ)

3245B



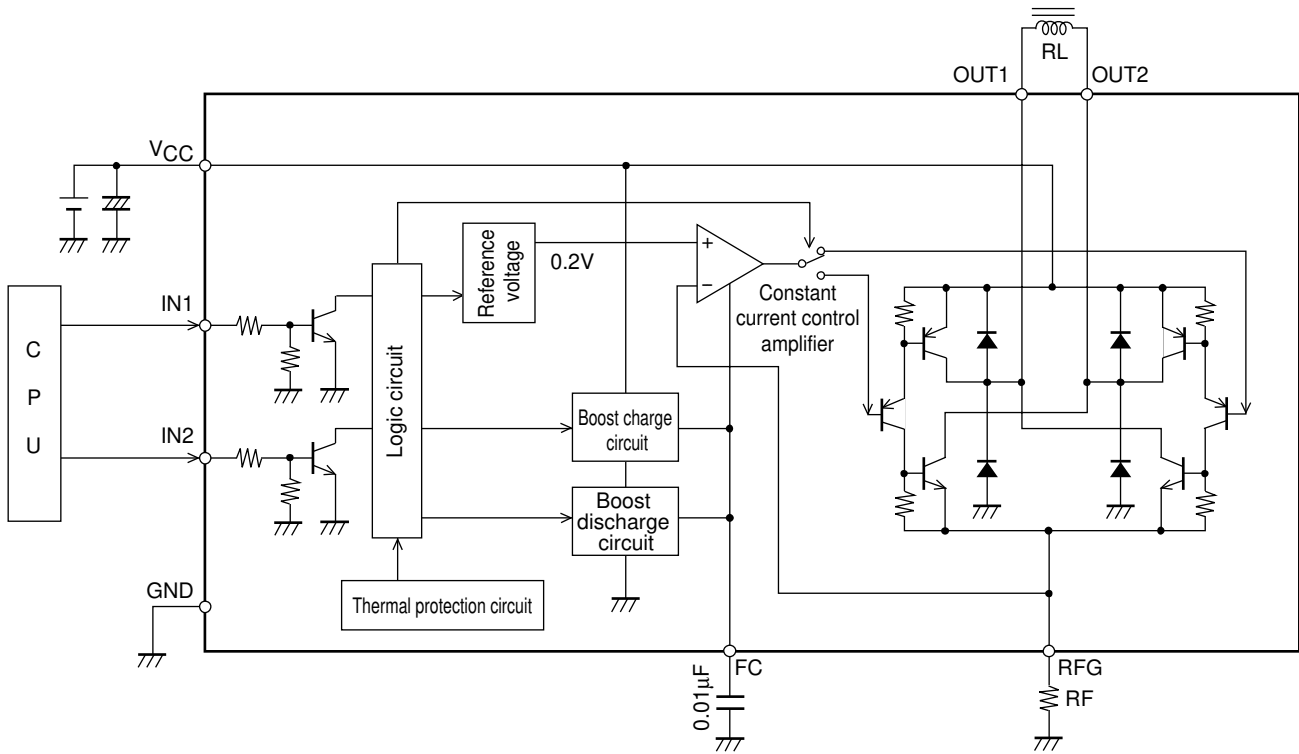
# LB1941T

## 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**

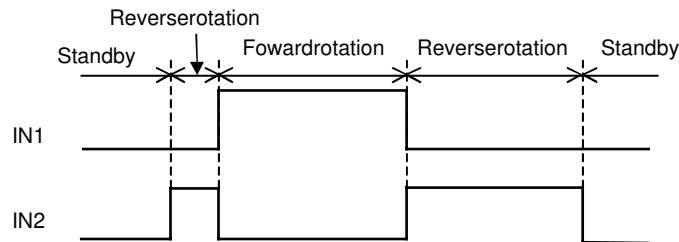
Standby states 1 and 2 in the above truth table differ as follows:

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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