Ordering number : ENA0610

SANYO Semiconductors
DATA SHEET

# LB1941GP

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

## Overview

The LB1941GP 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

- High-performance dual operational amplifier
- Constant current control ($I_O$ = 400 mA when Rf = 0.5Ω)
- Built-in thermal protection circuit
- Includes a rapid charge/rapid discharge circuit for stable shutter operation.
- Built-in reference voltage circuit (0.2 V typical)
- Ultraminiature package (VCT16 (2.6mm × 2.6mm)

## Specifications

### Maximum Ratings at Ta = 25°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 | Pd max | Mounted on a specified board.* | 0.7 | W |
| Operating temperature | Topr | | -20 to +75 | °C |
| Storage temperature | Tstg | | -55 to +150 | °C |

Note*: Mounted on a board: 50×40×10.8 mm3: glass epoxy four-layer.

### 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 | $I_{OUT}$ | Set with RFG-GND resistance | 50 to 500 | mA |
| Input low level voltage | $V_{IL}$ | IN1, IN2 | -0.3 to +0.5 | V |
| Input high level voltage | $V_{IH}$ | IN1, IN2 | 2.0 to 10 | V |




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## Electrical Characteristics at Ta = 25°C

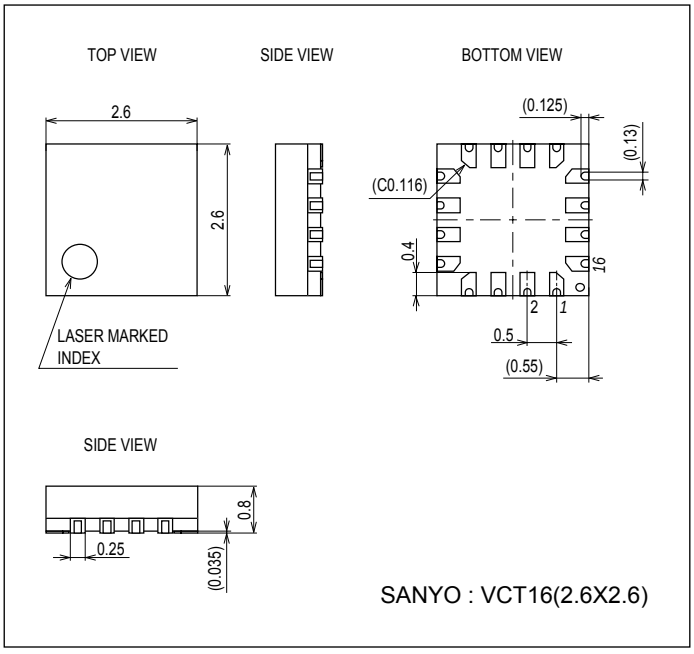
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Standby Current dissipation | $I_{STB}$ | $V_{CC}$ = 10V | | | 1.0 | mV |
| **Constant-current H bridge drive circuit** | | | | | | |
| Output saturation voltage 1 | $V_{OUT}11$ | $V_{CC}$ = 3V, $I_O$ = 200mA (Lower side) | | 0.08 | 0.15 | μA |
| | $V_{OUT}12$ | $V_{CC}$ = 3V, $I_O$ = 200mA (Upper side) | | 0.12 | 0.23 | V |
| | $V_{OUT}1$ | $V_{CC}$ = 3V, $I_O$ = 200mA (Upper + Lower side) | | 0.20 | 0.35 | V |
| Output saturation voltage 2 * | $V_{OUT}21$ | $V_{CC}$ = 4V, $I_O$ = 500mA (Lower side) | | 0.25 | 0.38 | V |
| | $V_{OUT}22$ | $V_{CC}$ = 4V, $I_O$ = 500mA (Upper side) | | 0.35 | 0.52 | V |
| | $V_{OUT}2$ | $V_{CC}$ = 4V, $I_O$ = 500mA (Upper + Lower side) | | 0.60 | 0.90 | V |
| Output constant current 1 | $I_{OUT}1$ | $V_{CC}$ = 4V, $R_L$ = 3Ω, RF = 1Ω | 190 | 200 | 210 | mA |
| Output constant current 2 * | $I_{OUT}2$ | $V_{CC}$ = 4V, $R_L$ = 3Ω, RF = 0.5Ω | 375 | 400 | 424 | mA |
| Temperature dependence of output constant current (reference Ta = 25°C) | $\Delta I_O$ | $V_{CC}$ = 4V, $R_L$ = 3Ω, RF = 0.5Ω * (Ta = –10 to +60°C) | -2 | | +2 | % |
| Operating current dissipation | $I_{CC}$ | $V_{CC}$ = 4V, $R_L$ = 0Ω, (No load, full drive) | | 14 | 21 | mA |
| Thermal protection operating temperature | TSD | * | 150 | 180 | 210 | °C |
| **Control input circuit** | | | | | | |
| Control pin maximum input current | $I_{IH}1$ | $V_{IH}$ = 5.5V, $V_{CC}$ = 5.5V | | 80 | 100 | μA |
| | $I_{IH}2$ | $V_{IH}$ = 10V, $V_{CC}$ = 10V | | 145 | 200 | μA |
| | $I_{IL}$ | $V_{IL}$ = GND | -1 | | 0 | μA |

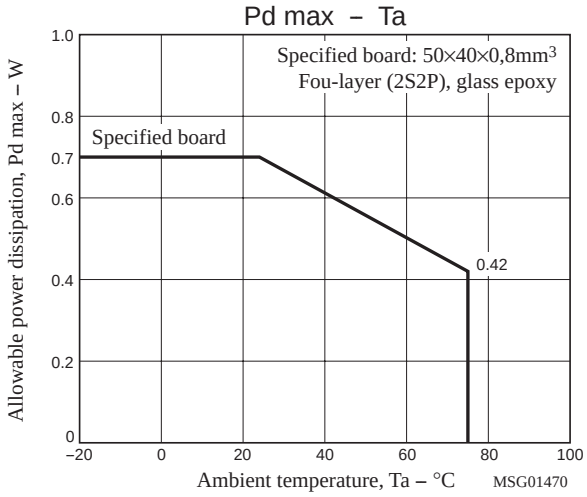
Note*: Design guarantee: Characteristics shown here are design targets and measurement with independent unit is not made before shipment.

## Package Dimensions

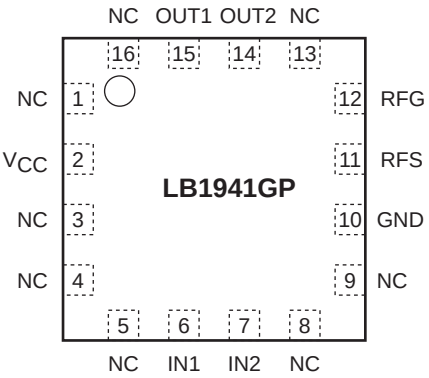
unit : mm (typ)

3318



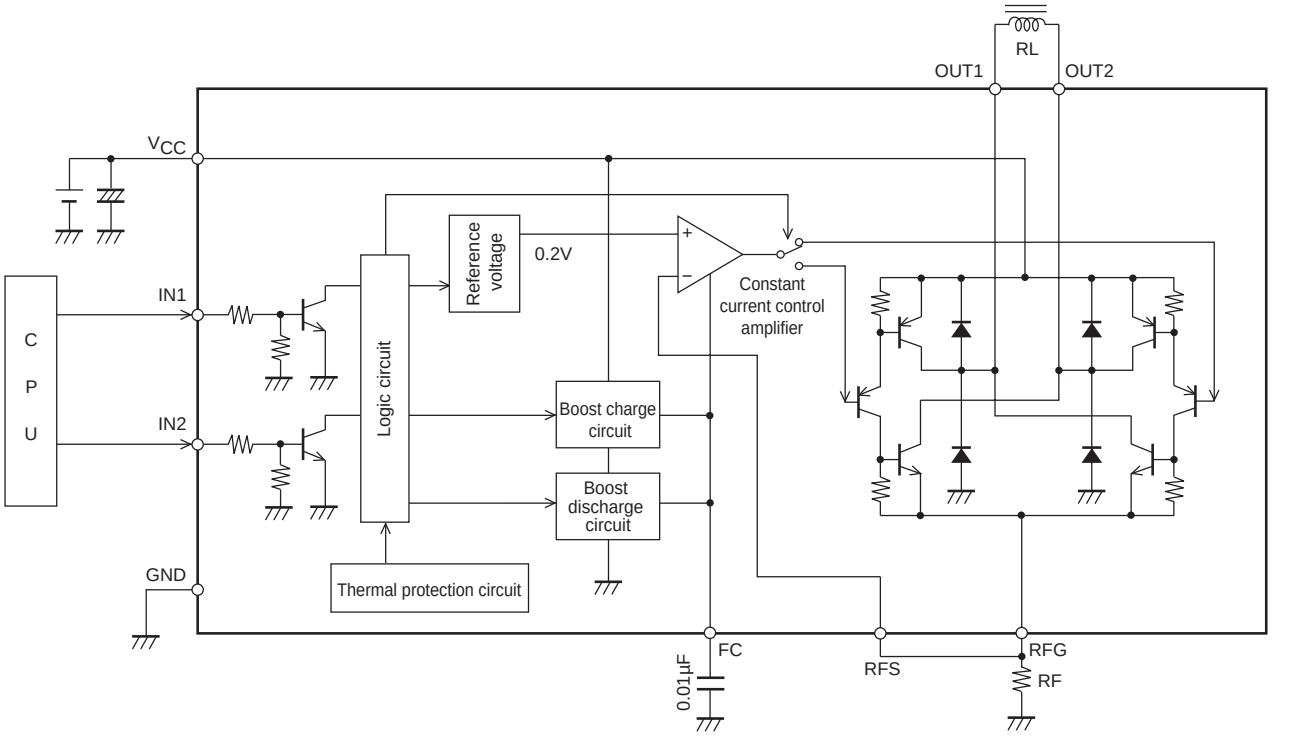



## Pin Assignment




Top view

## Block Diagram

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## 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

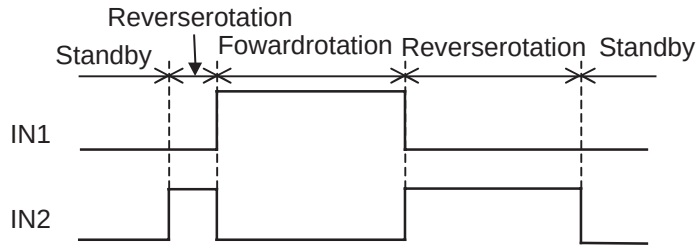
Standby states 1 and 2 in the above truth table differ as follows:

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.




### 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 0.1μF is recommended. Note that increase in the capacitor value results in increase in the time necessary for the constant current control to rise.