Monolithic Digital IC

# LB1412

## Level Meter Driver for 12 LEDs

## Functions and Features

· Bar-shaped display of input level by means of 12 LEDs
· High-order 5 dots with peak hold
· Built-in oscillator for peak hold reset. Requires 1 pce. each of external C, R. Uses either oscillator at the time of stereo operation. Capable of also resetting manually.
· Capable of constant-current driving low-order 7 dots (green LED). Constant-current value variable with an external resistor
· Lower current drain available by connecting green LEDs in series
· Built-in input amplifier
· Requires no other light-up level adjustment than adjustment for 0 dB. D1 error: within ±3 dB of 20 dB
· Supply voltage range : 10 to 16 V

## Package Dimensions

unit : mm

### 3010A-DIP22



[LB1412]

SANYO : DIP22
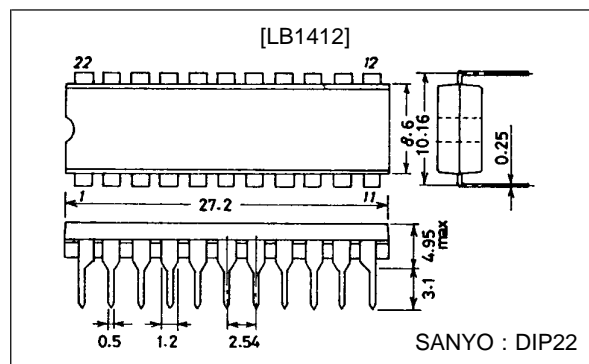
## Specifications

### Absolute Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Pin No. | Conditions | Ratings | Unit |
|---|---|---|---|---|---|
| Maximum supply voltage | $V_{CC}$ max | 15 | | −0.3 to +18 | V |
| Output current | $I_{OL}$ | 1 to 5 | D8 to D12, output on | 30 | mA |
| Allowable power dissipation | Pd max | | Ta = 60°C | 650 | mW |
| Operating temperature | Topr | | | −30 to +75 | °C |
| Storage temperature | Tstg | | | −40 to +125 | °C |

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

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | | 10 to 16 | V |

## SANYO Electric Co.,Ltd. Semiconductor Bussiness Headquarters
### TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

## Electrical Characteristics at Ta = 25°C, $V_{CC}$ = 12 V

| Parameter | | Symbols | Pin No. | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|---|---|
| Input bias current | Amp (1) | $I_{BIN1}$ | 7 | | −3 | −0.2 | 0 | μA |
| Output saturation voltage | Amp (1) | $V_{OH01}$ | 8 | Pins 8, 9 short | 10.5 | 11.2 | 11.6 | V |
| | Amp (1) | $V_{OL01}$ | 8 | Pins 8, 9 short | 1.0 | 1.5 | 2.0 | V |
| Voltage gain | Amp (1) | $V_{GA1}$ | | | 30 | 100 | | dB |
| Input resistance | Amp (2) | $R_{IN2}$ | 9 | | 8 | 12 | 16 | kΩ |
| Load resistance | Amp (2) | $R_{02}$ | 10 | | 35 | 50 | 65 | kΩ |
| Output current | Amp (2) | $I_{OL02}$ | 10 | | 3 | 6 | 12 | mA |
| Voltage gain | Amp (2) | $V_{GA2}$ | | | 1.8 | 2.0 | 2.2 | times |
| Output current | | $I_{OL}$ | 19, 22 | D1, D5 : 3 kΩ across $V_Z$ and $I_{LED}$ | 13 | 17 | 20 | mA |
| Output saturation voltage | | $V_{sat}$ | 17, 18, 19, 21, 22 | D2 to D4, D6 to D7 : Output Transistor on across $V_Z$ and $I_{LED}$ | | 1.0 | 1.3 | V |
| | | $V_{sat}$ | 1 to 5 | D8 to D12 : $I_{OLD1\ to\ D5}$ = 30 mA | | 1.5 | 2.0 | V |
| Output leak current | | $I_{off}$ | 19, 22 | D1, D5 : output transistor off | 0 | | 30 | μA |
| | | $I_{off}$ | 1 to 15 | D8 to D12 : output transistor off | 0 | | 30 | μA |
| Comparator level | D8 | $V_{THD8}$ | 1 | D8 : Voltage to turn on D8 by applying DC voltage across $V_Z$ and $I_{NZ}$ | −0.625 | −0.55 | −0.465 | V |
| | D1 | $G_{D1}$ | 16 | D8 light-up level : 0 dB | −23 | −20 | −17 | dB |
| | D2 | $G_{D2}$ | 17 | D8 light-up level : 0 dB | −17 | −15 | −13 | dB |
| | D3 | $G_{D3}$ | 18 | D8 light-up level : 0 dB | −12 | −10 | −8 | dB |
| | D4 | $G_{D4}$ | 19 | D8 light-up level : 0 dB | −8 | −7 | −6 | dB |
| | D5 | $G_{D5}$ | 20 | D8 light-up level : 0 dB | −6 | −5 | −4 | dB |
| | D6 | $G_{D6}$ | 21 | D8 light-up level : 0 dB | −4 | −3 | −2 | dB |
| | D7 | $G_{D7}$ | 22 | D8 light-up level : 0 dB | −1.5 | −1 | −0.5 | dB |
| | D9 | $G_{D9}$ | 2 | D8 light-up level : 0 dB | 0.5 | 1 | 1.5 | dB |
| | D10 | $G_{D10}$ | 3 | D8 light-up level : 0 dB | 2 | 3 | 4 | dB |
| | D11 | $G_{D11}$ | 4 | D8 light-up level : 0 dB | 4 | 5 | 6 | dB |
| | D12 | $G_{D12}$ | 5 | D8 light-up level : 0 dB | 7 | 8 | 9 | dB |
| Reference voltage | | $V_Z$ | 12 | 3 kΩ across $V_Z$ and $I_{LED}$ | 5.6 | 6.3 | 6.8 | V |
| R pin flow-out current | | $I_{OLR}$ | 11 | $V_R$ = 0 V, OSC pin: open | −0.6 | −0.3 | −0.1 | mA |
| R pin voltage | | $V_R$ | 11 | OSC pin: open | 0.4 | 0.7 | 0.9 | V |
| Oscillation frequency | | $f_{OSC}$ | 13 | 1 MΩ, 2.2 μF across $V_{CC}$ and $V_Z$ | 1.5 | 2 | 2.5 | s |
| Current drain | | $I_{CC}$ | 15 | 3 kΩ across $V_Z$ and $I_{LED}$, all D outputs off | | 9 | 15 | mA |

**Pd max – Ta**



Allowable power dissipation, Pd max – mW vs Ambient temperature, Ta – °C
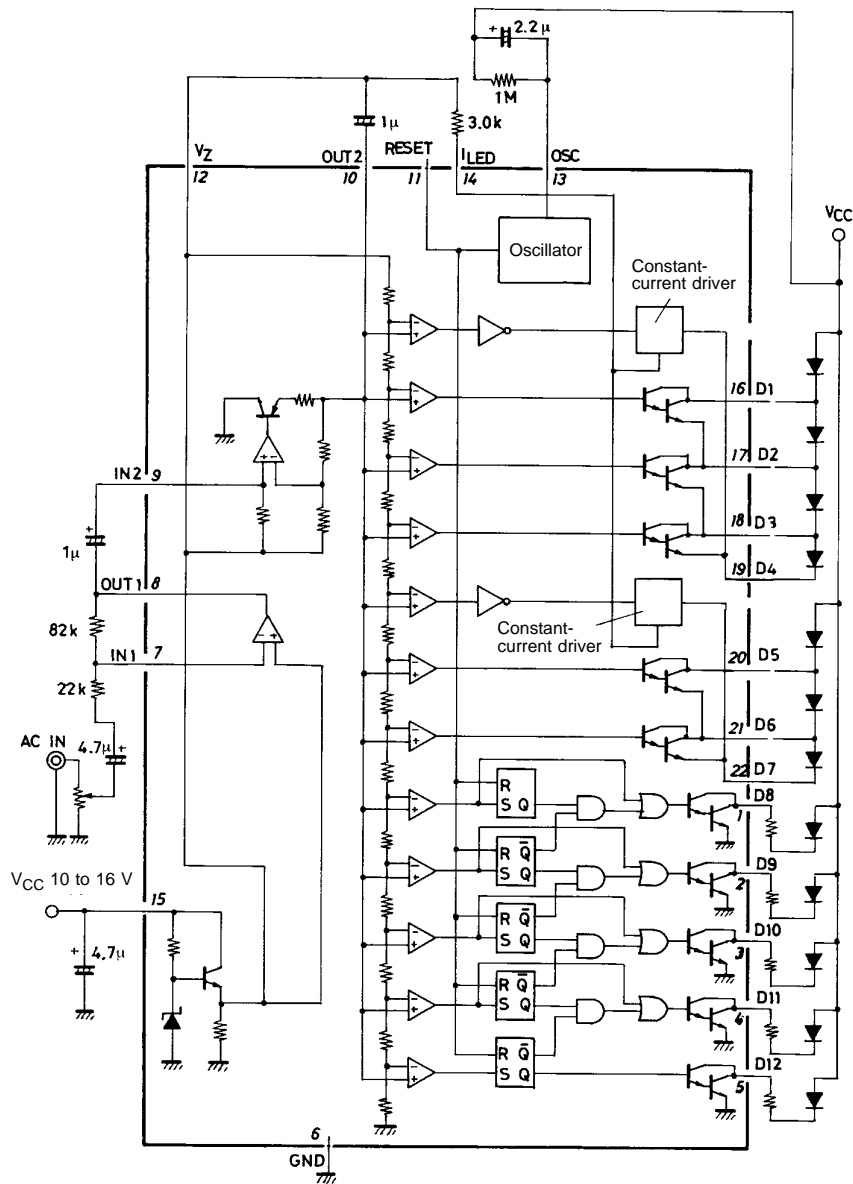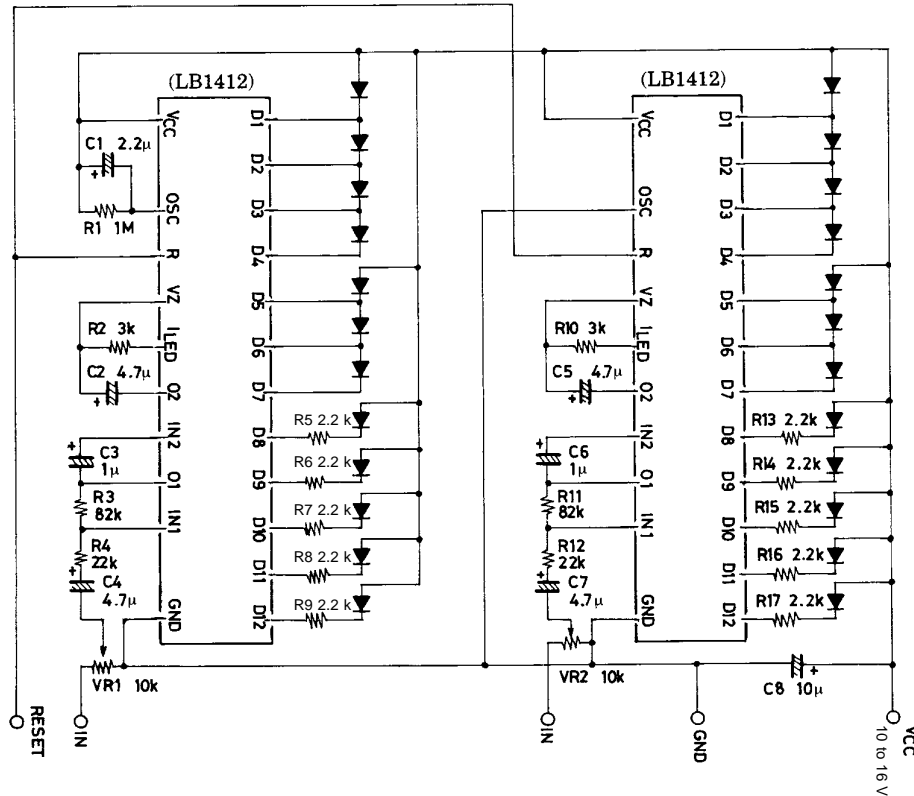
## Pin Assignment



Top view
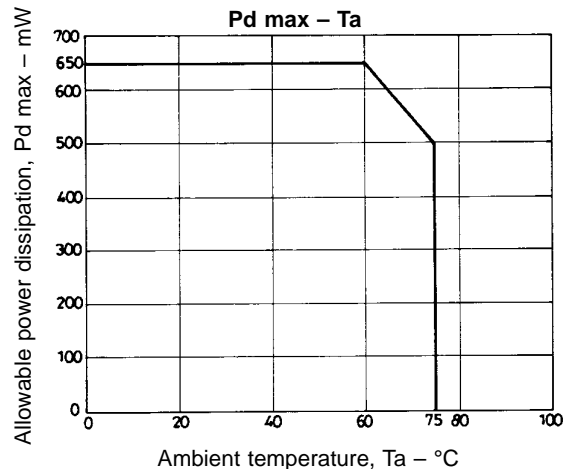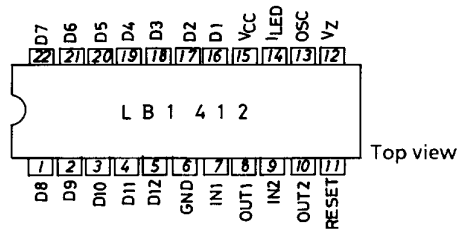
## Equivalent Circuit Block Diagram



Unit (resistance: $\Omega$, capacitance: F)

## Sample Application Circuit



Note : Input signal of approximately 110 mVrms causes D8 (0 dB display) to light.

Unit (resistance: Ω, capacitance: F)

### For sample application circuit:

1. The LB1412 consists of the following blocks.
   - Input amp 1 : Amplification of input signal, variable with external constants
   - Input amp 2 : Amplification of signal (fixed, double), detection of signal
   - Reference voltage : Reference voltage of comparator, constant-current drive of LED
   - Comparator : Comparison of input voltage
   - LED driver : LED drive, D1 to D7 : Constant-current drive
   - Peak hold circuit : Hold of highest-order point of high-order 5 points (D8 to D12)
   - Oscillator for peak hold reset : Peak hold circuit reset

2. Description of constants of each block

   2-1  R3, R4 (R11, R12)

   The gain of amp 1 depends on R3, R4. Gain of amp 1 = R3/R4 times. The gain of amp 1 must not exceed 4 times (12 dB).

   R3 + R4 ≒ 100 kΩ (C4 = 4.7 μF)

   2-2  C2, C3 (C5, C6)

   C3 is for coupling amp 1 with amp 2 and its value is 1 μF. C2 is for controlling the time to turn off LED.

   2-3  R2 (R10)

   The current of LEDs connected to D1 to D7 depends on R2. The current is stabilized to be approximately 17 mA at R2 = 3 kΩ and approximately 11 mA at R2 = 4.7 kΩ.

   2-4  R5 to R9 (R13 to R17)

   The current of LEDs connected to D8 to D12 depends on these resistors. D8 to D12 pins are collectors of Darlington transistors.

$$I_{D8 \text{ to } D12} = \frac{V_{CC} - V_{sat \, D8 \text{ to } D12} - V_{FLED}}{R5 \text{ to } 9} \fallingdotseq \frac{V_{CC} - 3.5 \text{ V}}{R5 \text{ to } 9}$$

   $I_{D8 \text{ to } D12}$ is approximately 4 mA at R5 to 9 = 2.2 kΩ.
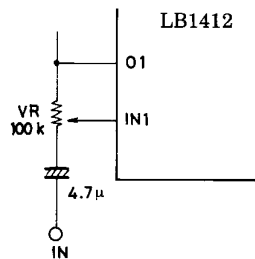
2-5 Reset pin (Pin 11)

When the reset pin is open, peak hold of D8 to D12 occurs. When the reset pin is connected to GND, reset occurs. Connecting the reset pin to GND causes no peak hold.

2-6 C1, R1

The oscillation cycle of oscillator depends on the product of C1 and R1. The oscillation cycle at C1 = 2.2 μF, R1 = 1 MΩ is approximately 2 seconds. However, if an electrolytic capacitor is used for C1, the actual capacitance differs from the marked value.

2-7 Reduction in number of parts

R3, R4, VR1 are substituted by one VR.

Unit (resistance: Ω, capacitance: F)

This catalog provides information as of May, 1996. Specifications and information herein are subject to change without notice.