

SANYO**LB1409****Level Meter Driver for 9 LEDs****Applications**

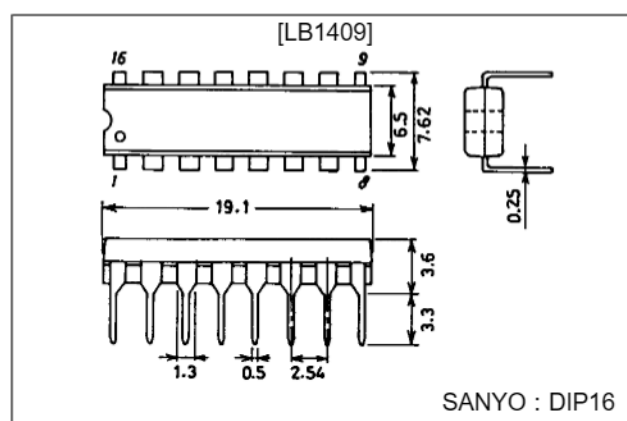
- AC level meters such as VU meters.
- DC level meters such as signal meters.

Functions

- Display
Nine red or green LEDs display the input level in the shape of a bar.
- Input amplifier
Wide application is available owing to built-in DC amplifier whose gain is variable with external resistors.
- Comparator level
Setting is made by steps of 3 dB as follows.
-18 dB, -15 dB, -12 dB, -9 dB, -6 dB, -3 dB, 0 dB, +3 dB, +6 dB
- Supply voltage
The recommended supply voltage range is so wide as 5.5 V to 16 V.
(If pin Vref 2 is used, 7 V to 16 V.)
- Reference voltage
Constant voltage output is available with external transistor owing to pin Vref 2 = 5 V.

Package Dimensions

unit : mm

3064-DIP16**Specifications****Comparator Level OUT Pin Voltage at Ta = 25°C, V_{CC} = 12 V, Vref 1 = 3 V**

Comparator level	Pin No.	min	typ	max	Unit
D1	7	0.11	0.18*	0.25	V
D2	8	0.20	0.27*	0.34	V
D3	9	0.30	0.38*	0.46	V
D4	10	0.45	0.53*	0.61	V
D5	11	0.66	0.75	0.84	V
D6	12	0.97	1.06	1.15	V
D7	13	1.40	1.50	1.60	V
D8	14	2.02	2.12	2.22	V
D9	15	2.90	3.00	3.10	V

*: No overlap occurs in each individual IC.

Absolute Maximum Ratings at Ta = 25°C

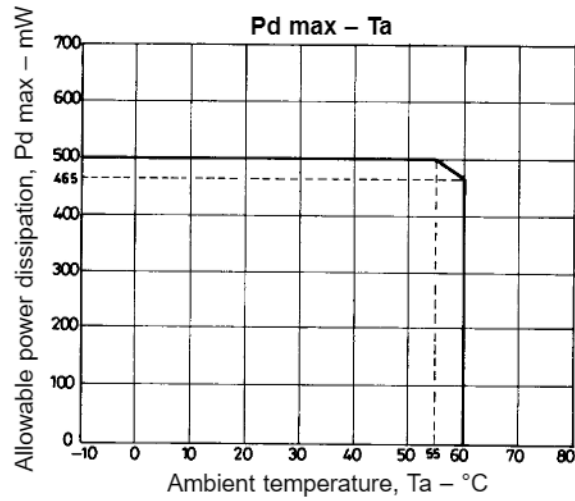
Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	Pin 1	-0.3 to +18	V
Input voltage	V_{IN}	Pin 3, 4	-0.3 to V_{CC}	V
D1 to D9 output voltage	V_{OUT} (D)	D1 to D9 off	-0.3 to +18	V
D1 to D9 output current	I_{OL} (D)	Pin 7 to 15, D1 to D9 on	+30	mA
First reference flow-out current	I_{ref} (1)	Pin 2	-1 to 0	mA
Second reference flow-out current	I_{ref} (2)	Pin 16	-6 to 0	mA
V_{OUT} supply voltage	V_{OUT}	Pin 5	-0.3 to +6	V
Allowable power dissipation	P_d max	Ta = 55°C	500	mW
Operating temperature	T_{opr}		-10 to +60	°C
Storage temperature	T_{stg}		-40 to +125	°C

Allowable Operating Ranges at Ta = 25°C

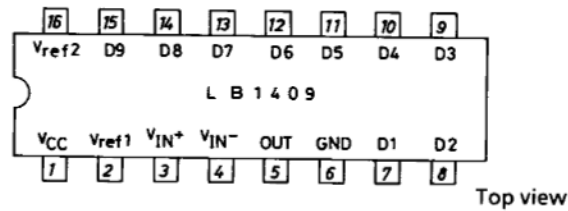
Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}	Pin 1, () : Using Vref 2	+5.5 to +16	V
			(+7 to +16)	V
Input voltage	V_{IN}^+ or V_{IN}^-	Pin 3 or Pin 4	-0.3 to V_{CC}	V
Output pin load resistance	R_L	Between pin 5 OUT and pin 6 GND.	15 k to 20 k	Ω

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

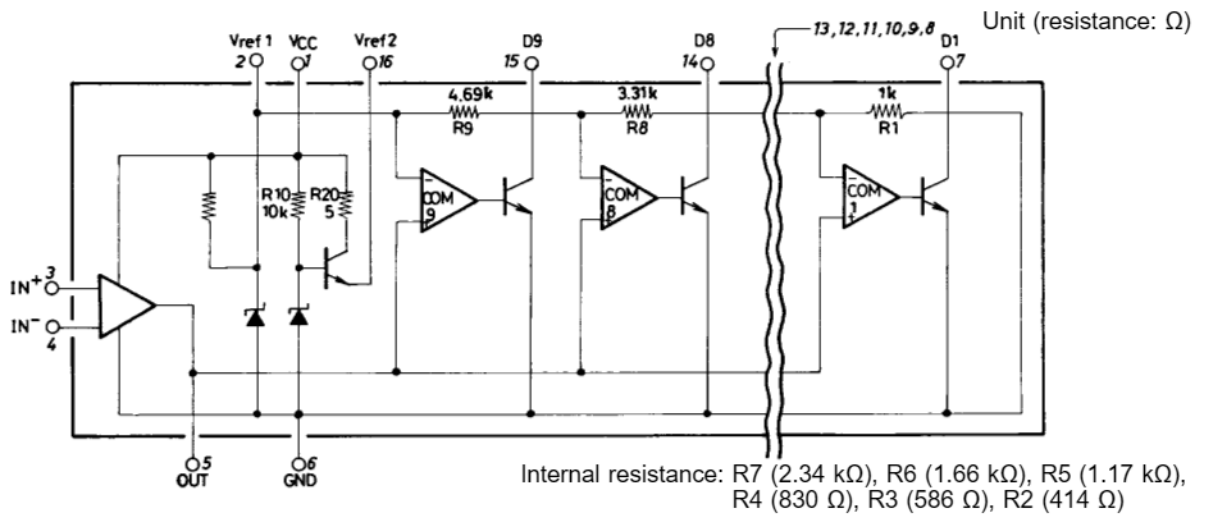
Parameter	Symbol	Conditions	min	typ	max	Unit
Input bias current (Amplifier)	I_{IN}^+ (A)	Pin 3, $V_{IN}^+ = 0$ V, $V_{IN}^- = 3$ V, GND = 0 V	-2		0	μ A
	I_{IN}^- (A)	Pin 4, $V_{IN}^+ = 3$ V, $V_{IN}^- = 0$ V, GND = 0 V	-2		0	μ A
Input bias current (Comparator) + Output leakage current	I_{IN}^+ (C)* I_{OL} (A)	Pin 5, $V_{IN}^+ = 0$ V, $V_{IN}^- = 3$ V, OUT = 0 V, GND = 0 V	-10		0	μ A
Offset voltage (1)	Voffset (1)	Pin 5, $V_{CC} = 6$ V, $V_{IN}^+ = V_{IN}^- = 0$ V, GND = -6 V, GAIN = 20 dB	-180		+180	mV
Offset voltage (2)	Voffset (2)	Pin 5, $V_{IN}^+ = V_{IN}^- = 0$ V, GND = 0 V, GAIN = 20 dB	0		+180	mV
First reference voltage	Vref (1)	Pin 2, Iref = 0 to 1 mA	2.6		3.0	V
Second reference voltage	Vref (2)	Pin 16, Iref = 0 to 6 mA	4.2	4.7	5.2	V
Current drain	I_{CC}	Pin 1, $V_{IN}^+ = 3$ V, $V_{IN}^- = 0$ V		10	20	mA
Amplifier gain	VG	Open loop	30			dB
Output flow-out current	I_{OH}	Pin 5, $V_{IN}^+ = 3$ V, $V_{IN}^- = 0$ V, $V_{OUT} = 0$ V			-10	mA
D pin output ON voltage	V_{OL} (D)	Pin 7 to 15, D1 to D9, $I_{OL} = 20$ mA, $V_{IN}^+ = 3$ V, $V_{IN}^- = 0$ V			1.2	V
D pin output leak current	I_{OH} (D)	Pin 7 to 15, D1 to D9, $V_{IN}^+ = 0$ V, $V_{IN}^- = 3$ V, V_{D1} to $D9 = 12$ V			10	μ A
Output voltage (Amplifier)	V_{OH}	Pin 5, $V_{CC} = 5.5$ V, $V_{IN}^+ = 3$ V, $V_{IN}^- = 0$ V, $R_L = 15$ k Ω	4			V
		Pin 5, $V_{CC} = 12$ V, $V_{IN}^+ = 3$ V, $V_{IN}^- = 0$ V, $R_L = 15$ k Ω	9.5			V



Pin Assignment



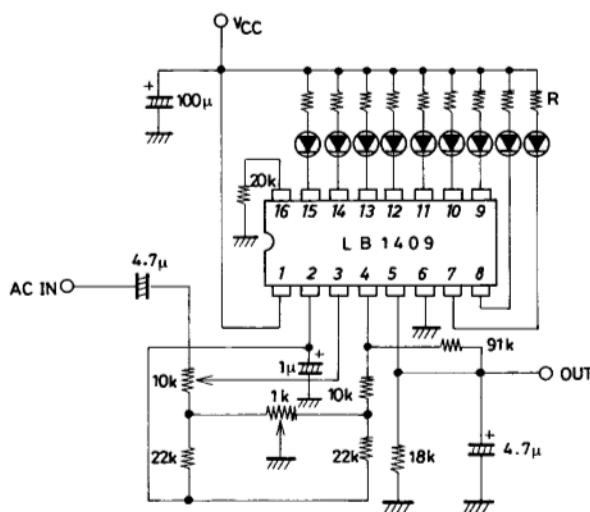
Equivalent Circuit



Sample Application Circuits

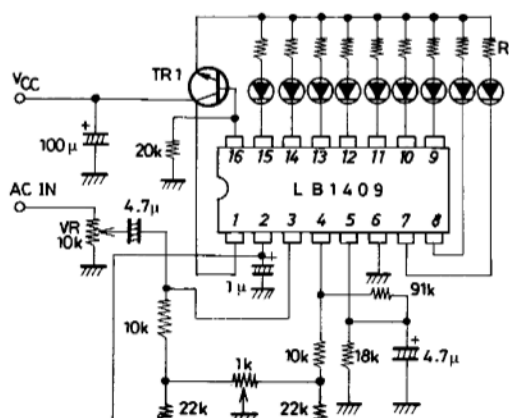
(All with offset adjustment)

• Circuit not using Vref 2



Unit (resistance: Ω, capacitance: F)

• Circuit using Vref 2



Unit (resistance: Ω, capacitance: F)

Adjusting procedures

1. Turn the center of 10 kΩ VR largely to 4.7 μF capacitor side.
2. Input AC signal of $50/\sqrt{2}$ mV from AC IN.
3. Adjust 1 kΩ VR so that the output at OUT becomes 500 mV DC.

Equation used in the calculation of R to be inserted in series with LED.

Gain : 20 dB

$$R(\text{red}) = (V_{CC} - 2.5) / 6 \text{ k}\Omega$$

$$R(\text{green}) = (V_{CC} - 2.8) / 18 \text{ k}\Omega$$

Adjusting procedures

- R to be inserted in series with LED is as follows irrespective of V_{CC} .

$$R(\text{red}) = 360 \Omega \text{ (Approx. 6 mA)}$$

$$R(\text{green}) = 100 \Omega \text{ (Approx. 18 mA)}$$

- TR1 should be chosen with P_C considered; and the following transistors are recommended.

Red LED drive 2SD400

Green LED drive 2SD325

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