

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

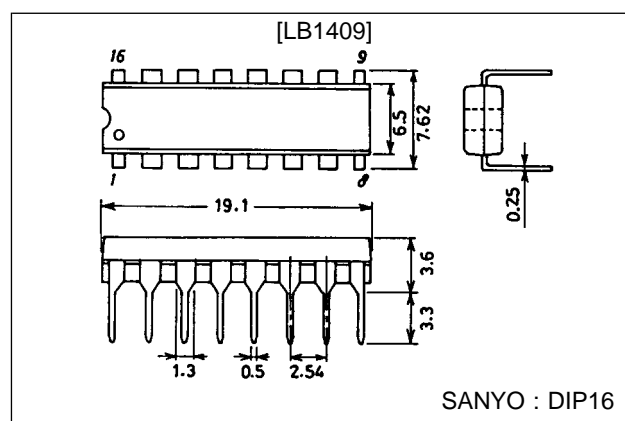
- AC level meters such as VU meters.
- DC level meters such as signal meters.

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.

LB1409

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	Pd max	Ta = 55°C	500	mW
Operating temperature	T _{opr}		-10 to +60	°C
Storage temperature	T _{stg}		-40 to +125	°C

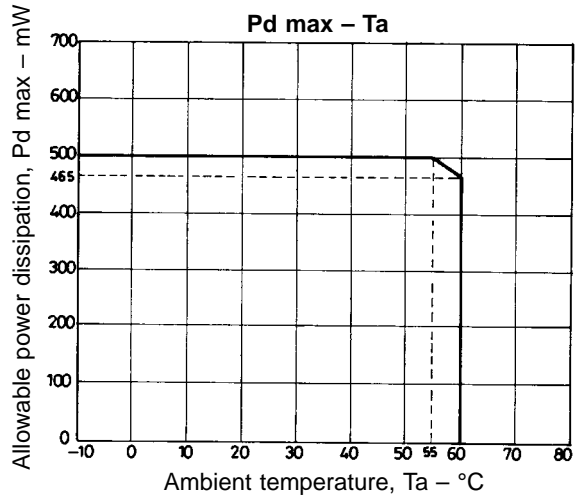
Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V _{CC}	Pin 1, (): Using V _{ref} 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

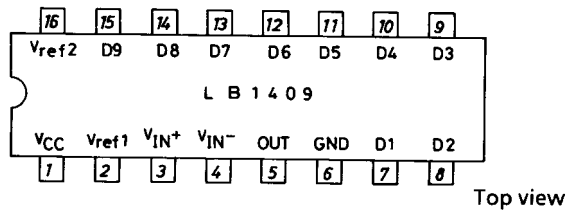
Electrical Characteristics at Ta = 25°C, V_{CC} = 12 V

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	μA
	I _{IN} ⁻ (A)	Pin 4, V _{IN} ⁺ = 3 V, V _{IN} ⁻ = 0 V, GND = 0 V	-2		0	μA
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	μA
Offset voltage (1)	V _{offset} (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)	V _{offset} (2)	Pin 5, V _{IN} ⁺ = V _{IN} ⁻ = 0 V, GND = 0 V, GAIN = 20 dB	0		+180	mV
First reference voltage	V _{ref} (1)	Pin 2, I _{ref} = 0 to 1 mA	2.6		3.0	V
Second reference voltage	V _{ref} (2)	Pin 16, I _{ref} = 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	V _G	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	μA
Output voltage (Amplifier)	V _{OH}	Pin 5, V _{CC} = 5.5 V, V _{IN} ⁺ = 3 V, V _{IN} ⁻ = 0 V, R _L = 15 kΩ	4			V
		Pin 5, V _{CC} = 12 V, V _{IN} ⁺ = 3 V, V _{IN} ⁻ = 0 V, R _L = 15 kΩ	9.5			V

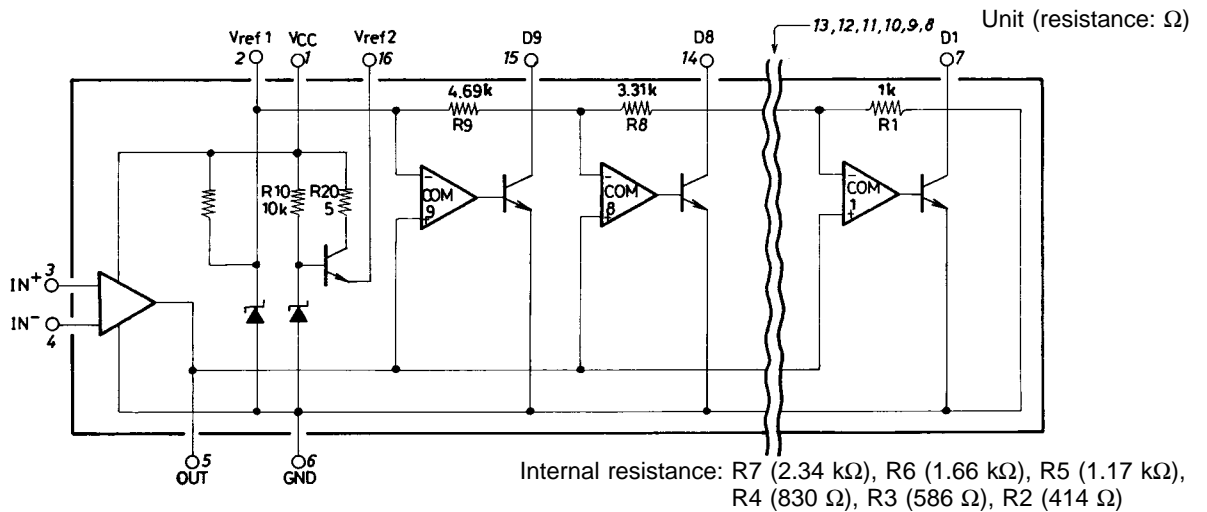
LB1409



Pin Assignment



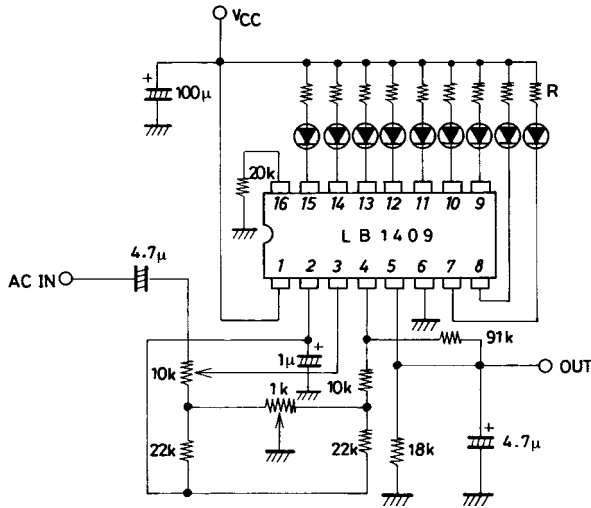
Equivalent Circuit



Sample Application Circuits

(All with offset adjustment)

• Circuit not 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.

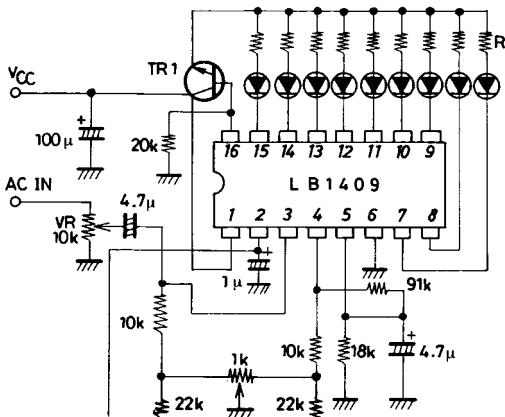
Equation used in the calculation of R to be inserted in series with LED.

Gain : 20 dB

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

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

• Circuit using Vref 2



Unit (resistance: Ω, capacitance: F)

Adjusting procedures

- R to be inserted in series with LED is as follows irrespective of V_{CC} .
 $R (\text{red}) = 360 \Omega$ (Approx. 6 mA)
 $R (\text{green}) = 100 \Omega$ (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

■ No products described or contained herein are intended for use in surgical implants, life-support systems, aerospace equipment, nuclear power control systems, vehicles, disaster/crime-prevention equipment and the like, the failure of which may directly or indirectly cause injury, death or property loss.

■ Anyone purchasing any products described or contained herein for an above-mentioned use shall:

- ① Accept full responsibility and indemnify and defend SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors and all their officers and employees, jointly and severally, against any and all claims and litigation and all damages, cost and expenses associated with such use:
- ② Not impose any responsibility for any fault or negligence which may be cited in any such claim or litigation on SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors or any of their officers and employees jointly or severally.

■ Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

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