

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

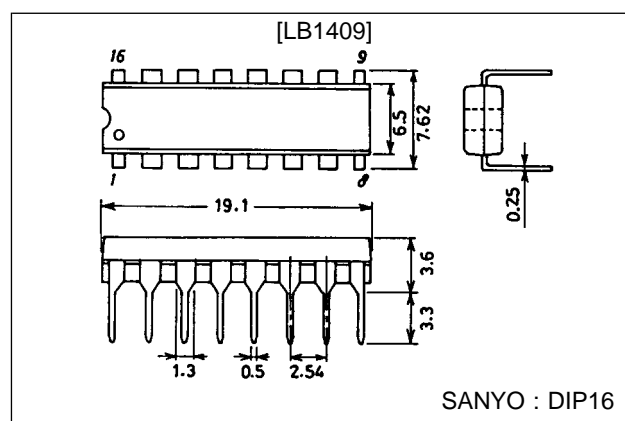
- AC level meters such as VU meters.
- DC level meters such as signal meters.

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.

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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

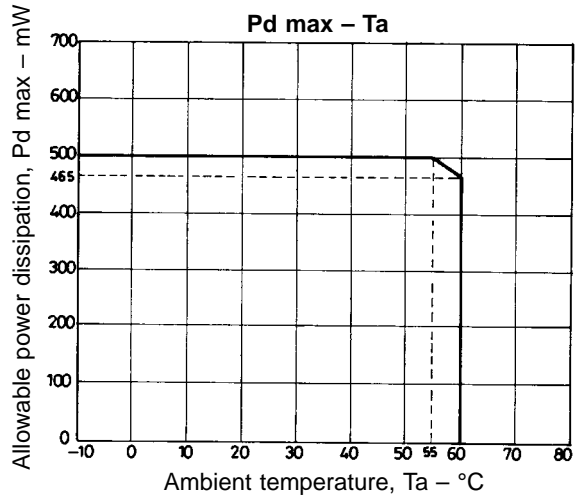
Allowable Operating Ranges at Ta = 25°C

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

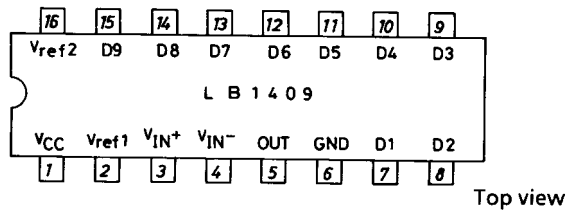
Electrical Characteristics at Ta = 25°C, V_{CC} = 12 V

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

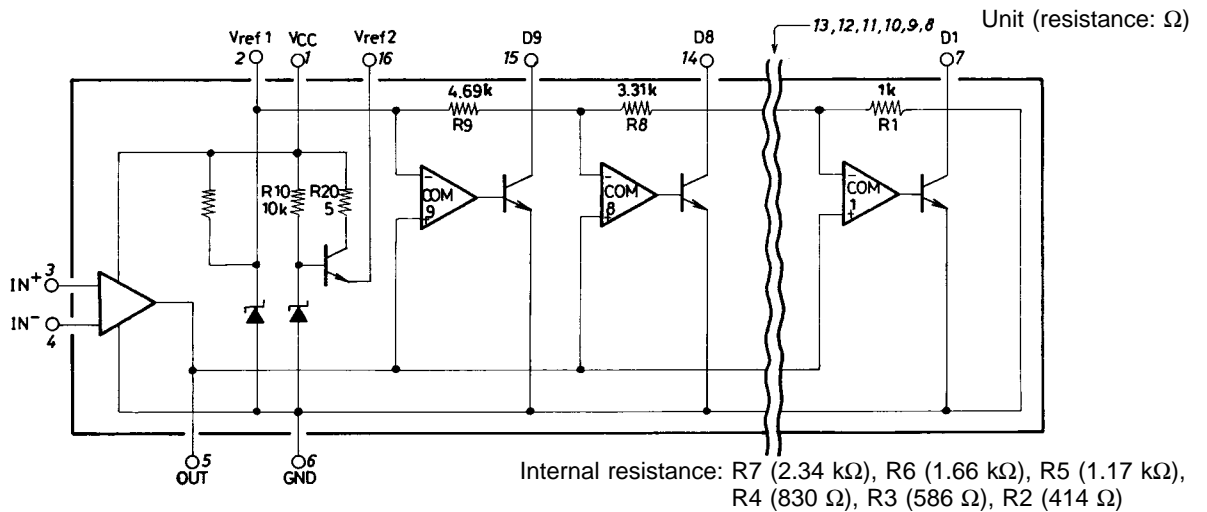
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Pin Assignment



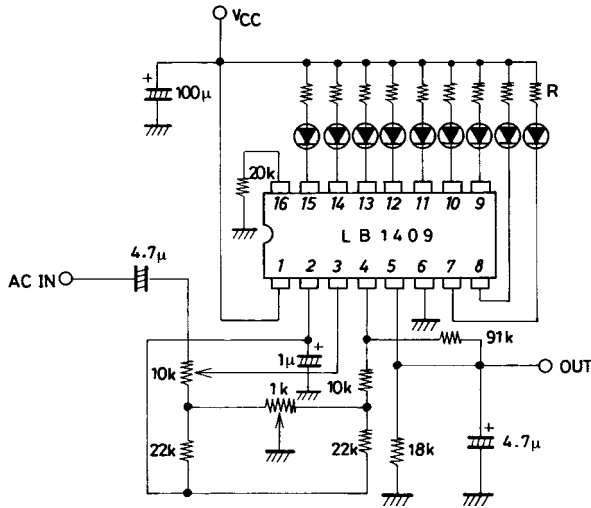
Equivalent Circuit



Sample Application Circuits

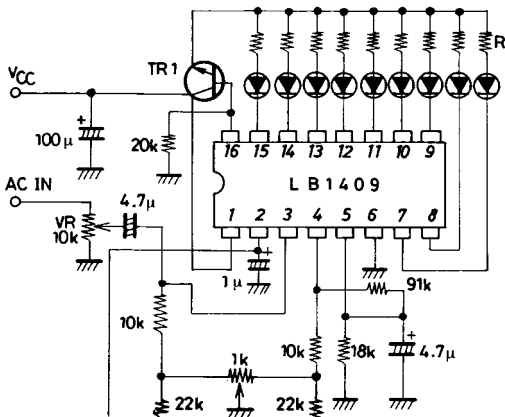
(All with offset adjustment)

• 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/√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}.
 $R (\text{red}) = 360 \Omega$ (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

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