



## LB1403N Series

## 5-Dot Red/Green LED Level Meter

## Use

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

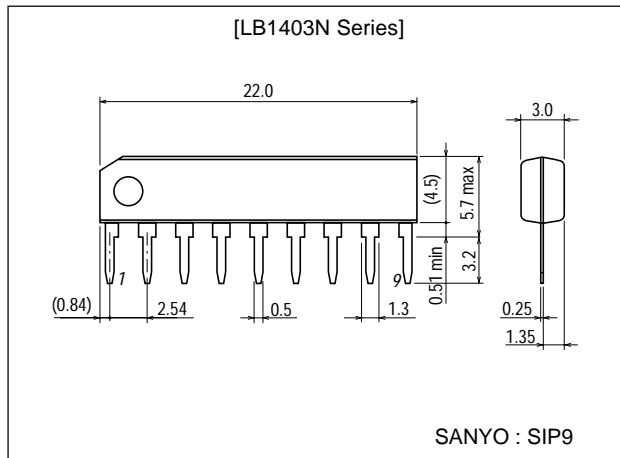
## Features and Functions

- Capable of generating a bar-display for input voltage with 5 LEDs.
- Operates from either AC or DC input voltage because of on-chip rectifier amplifier.
- Lighting levels remain stable to line regulation because of on-chip voltage reference.
- LEDs are driven by a constant current ; stable to line regulation.
- Power supply voltage range is wide (3.5 to 16V), for a wide range of applications.
- Five types of ICs constitute the series with various lighting levels of the LEDs and driving currents.
- SIP-9 pin package and fewer externally connected components result in smaller space requirements on the circuit board.
- Low noise at LED lighted mode.

## Package Dimensions

unit:mm

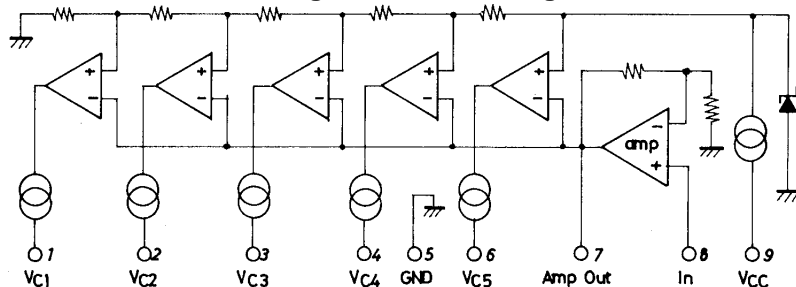
3017D-SIP9



## LB1403N Series

Type No.	VC3 lighting sensitivity	Comparator level	Constant LED current
LB1403N	85 mVrms typ	+6dB, +3dB 0dB, -5dB, -10dB	15 mA typ
LB1413N	105 mVrms typ	1.67Vc3, 1.33Vc3, Vc3, 0.67Vc3, 0.33Vc3	15 mA typ
LB1423N	85 mVrms typ	+6dB, +3dB, 0dB, -5dB, -10dB	7 mA typ
LB1433N	105 mVrms typ	1.67Vc3, 1.33Vc3, Vc3, 0.67Vc3, 0.33Vc3	7 mA typ
LB1443N	85 mVrms typ	+6dB, +3dB, 0dB, -6dB, -12dB	15 mA typ

### Equivalent Circuit Block Diagram and Pin Assignment



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**SANYO Electric Co.,Ltd. Semiconductor Company**

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

# LB1403N, 1413N, 1423N, 1433N, 1443N

## Specifications

### Absolute Maximum Ratings [LB1403N, 1413N, 1423N, 1433N, 1443N] at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		18	V
Allowable power dissipation	Pd max		1100	mW
Operating temperature	Topr		−25 to +75	°C
Storage temperature	Tstg		−55 to +125	°C

### Allowable Operating Ranges [LB1403N, 1413N, 1423N, 1433N, 1443N] at Ta = 25°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply voltage	V <sub>CC</sub>		3.5	6	16	V

### Electrical Characteristics [LB1403N] at Ta = 25°C, V<sub>CC</sub>=6V, f=1kHz

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	I <sub>CC</sub>	V <sub>IN</sub> =0		5	8	mA
Sensitivity	V <sub>IN</sub>	Vc3 on-level	74	85	96	mVrms
Comparator level 1	Vc1		−11.5	−10	−8.5	dB
Comparator level 2	Vc2		−6	−5	−4	dB
Comparator level 3	Vc3	Point of adjustment		0		dB
Comparator level 4	Vc4		2.5	3	3.5	dB
Comparator level 5	Vc5		5	6	7	dB
LED constant current	I <sub>LED</sub>		11	15	18.5	mA
Input bias current	I <sub>INO</sub>		−1.0	−0.3		μA

### Electrical Characteristics [LB1413N] at Ta = 25°C, V<sub>CC</sub>=6V, f=1kHz

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	I <sub>CC</sub>	V <sub>IN</sub> =0		5	8	mA
Sensitivity	V <sub>IN</sub>	Vc3 on-level	91	105	119	mVrms
Comparator level 1	Vc1		0.28 · Vc3	0.33 · Vc3	0.40 · Vc3	mVrms
Comparator level 2	Vc2		0.59 · Vc3	0.67 · Vc3	0.75 · Vc3	mVrms
Comparator level 3	Vc3	Point of adjustment		V <sub>IN</sub>		mVrms
Comparator level 4	Vc4		1.25 · Vc3	1.33 · Vc3	1.42 · Vc3	mVrms
Comparator level 5	Vc5		1.48 · Vc3	1.67 · Vc3	1.87 · Vc3	mVrms
LED constant current	I <sub>LED</sub>		11	15	18.5	mA
Input bias current	I <sub>INO</sub>		−1.0	−0.3		μA

### Electrical Characteristics [LB1423N] at Ta = 25°C, V<sub>CC</sub>=6V, f=1kHz

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	I <sub>CC</sub>	V <sub>IN</sub> =0		5	8	mA
Sensitivity	V <sub>IN</sub>	Vc3 on-level	74	85	96	mVrms
Comparator level 1	Vc1		−11.5	−10	−8.5	dB
Comparator level 2	Vc2		−6	−5	−4	dB
Comparator level 3	Vc3	Point of adjustment		0		dB
Comparator level 4	Vc4		2.5	3	3.5	dB
Comparator level 5	Vc5		5	6	7	dB
LED constant current	I <sub>LED</sub>		5	7	9.5	mA
Input bias current	I <sub>INO</sub>		−1.0	−0.3		μA

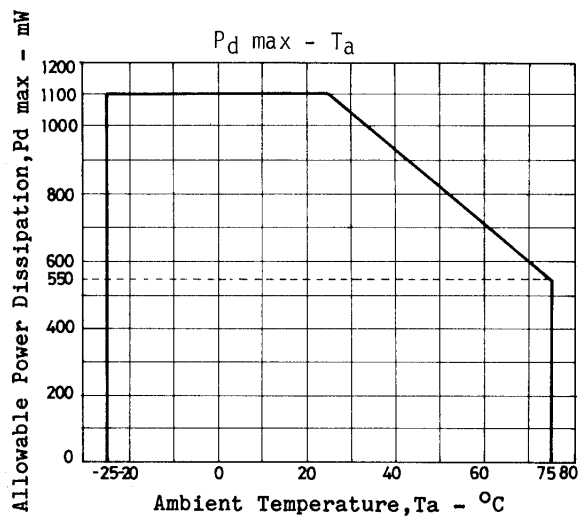
# LB1403N, 1413N, 1423N, 1433N, 1443N

## Electrical Characteristics [LB1433N] at $T_a = 25^\circ\text{C}$ , $V_{CC}=6\text{V}$ , $f=1\text{kHz}$

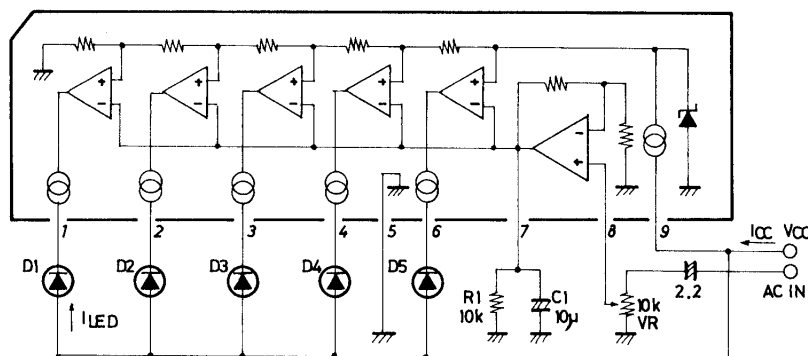
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	$I_{CC}$	$V_{IN}=0$		5	8	mA
Sensitivity	$V_{IN}$	$V_{C3}$ on-level	91	105	119	mVrms
Comparator level 1	$V_{C1}$		0.28 · $V_{C3}$	0.33 · $V_{C3}$	0.40 · $V_{C3}$	mVrms
Comparator level 2	$V_{C2}$		0.59 · $V_{C3}$	0.67 · $V_{C3}$	0.75 · $V_{C3}$	mVrms
Comparator level 3	$V_{C3}$	Point of adjustment		$V_{IN}$		mVrms
Comparator level 4	$V_{C4}$		1.25 · $V_{C3}$	1.33 · $V_{C3}$	1.42 · $V_{C3}$	mVrms
Comparator level 5	$V_{C5}$		1.48 · $V_{C3}$	1.67 · $V_{C3}$	1.87 · $V_{C3}$	mVrms
LED constant current	$I_{LED}$		5	7	9.5	mA
Input bias current	$I_{INO}$		-1.0	-0.3		$\mu\text{A}$

## Electrical Characteristics [LB1443N] at $T_a = 25^\circ\text{C}$ , $V_{CC}=6\text{V}$ , $f=1\text{kHz}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	$I_{CC}$	$V_{IN}=0$		5	8	mA
Sensitivity	$V_{IN}$	$V_{C3}$ on-level	74	85	96	mVrms
Comparator level 1	$V_{C1}$		-14	-12	-10	dB
Comparator level 2	$V_{C2}$		-7	-6	-5	dB
Comparator level 3	$V_{C3}$	Point of adjustment		0		dB
Comparator level 4	$V_{C4}$		2.5	3	3.5	dB
Comparator level 5	$V_{C5}$		5	6	7	dB
LED constant current	$I_{LED}$		11	15	18.5	mA
Input bias current	$I_{INO}$		-1.0	-0.3		$\mu\text{A}$



## Sample Application Circuit and Test Circuit (AC input VU meter)



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

\* Capacitor to be omitted when used as a DC-input signal meter.

## LB1403N, 1413N, 1423N, 1433N, 1443N

- $C_1, R_1$  time constant :

The response time can be varied by varying the  $C_1, R_1$  time constant (mainly the  $C_1$  value).

When the  $C_1, R_1$  time constant is larger :

..... The response time (attack time and release time) is made slower.

When the  $C_1, R_1$  time constant is smaller :

..... The response time (attack time and release time) is made faster.

- Considerations relative to  $P_d$  max of the package :

Due to the constant current  $I_{LED}$ , most of the power consumed by the circuits is consumed within the IC.

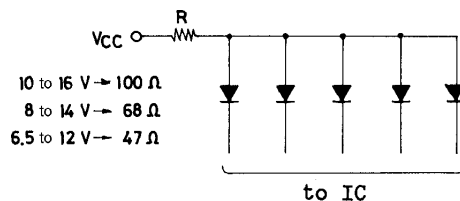
When lighting the five LEDs continuously for a prolonged length of time, make sure that  $V_{CC}$  does not exceed :

LB1403N, 1413N, 1443N  $V_{CC}=9V$

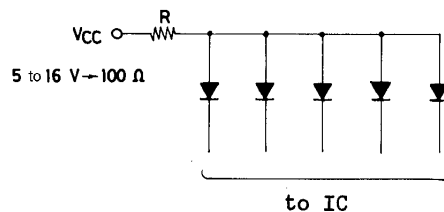
LB1423N, 1433N  $V_{CC}=14V$

When using a higher power supply voltage, insert a resistor in series with the LEDs to restrain the power consumed within the IC package.

For LB1403N, 1413N, 1443N :



For LB1423N, 1433N



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