

**SANYO**

No.1410B

**LB1403N SERIES****5-Dot Red/Green LED Level Meter****Use**

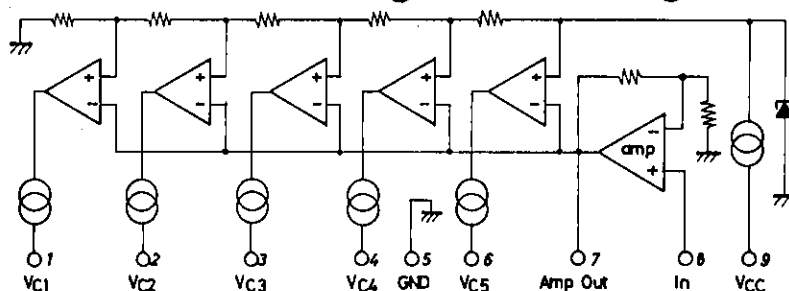
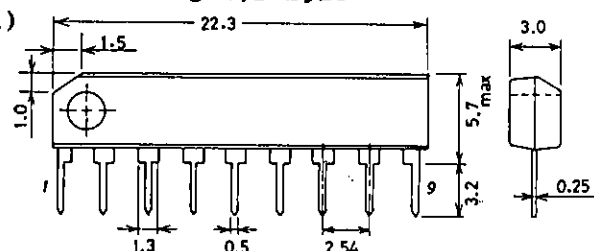
- . AC level meters such as VU meters.
- . DC level meters such as signal meters.

**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.
- . SEP-9 pin package and fewer externally connected components result in smaller space requirements on the circuit board.
- . Low noise at LED lighted mode

**LB1403N Series**

| Type No. | $V_{C3}$ lighting sensitivity | Comparator level                                                                                    | Constant LED current |
|----------|-------------------------------|-----------------------------------------------------------------------------------------------------|----------------------|
| LB1403N  | 85 mVrms typ                  | +6dB,+3dB,0dB,-5dB,-10dB                                                                            | 15 mA typ            |
| LB1413N  | 105 mVrms typ                 | 1.67V <sub>C3</sub> ,1.33V <sub>C3</sub> ,V <sub>C3</sub> ,0.67V <sub>C3</sub> ,0.33V <sub>C3</sub> | 15 mA typ            |
| LB1423N  | 85 mVrms typ                  | +6dB,+3dB,0dB,-5dB,-10dB                                                                            | 7 mA typ             |
| LB1433N  | 105 mVrms typ                 | 1.67V <sub>C3</sub> ,1.33V <sub>C3</sub> ,V <sub>C3</sub> ,0.67V <sub>C3</sub> ,0.33V <sub>C3</sub> | 7 mA typ             |
| LB1443N  | 85 mVrms typ                  | +6dB,+3dB,0dB,-6dB,-12dB                                                                            | 15 mA typ            |

**Equivalent Circuit Block Diagram and Pin Assignment****Package Dimensions**  
(unit: mm)**3017B-S9IC**

SANYO: SEP9

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7227KI/8225MW/2284KI, TS No. 1410-1/4

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

|                             |                     |             |    |
|-----------------------------|---------------------|-------------|----|
| Maximum Supply Voltage      | V <sub>CC</sub> max | 18          | V  |
| Allowable Power Dissipation | P <sub>d</sub> max  | 1100        | mW |
| Operating Temperature       | T <sub>opr</sub>    | -25 to +75  | °C |
| Storage Temperature         | T <sub>stg</sub>    | -55 to +125 | °C |

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

| Supply Voltage | V <sub>CC</sub> | min | typ | max | unit |
|----------------|-----------------|-----|-----|-----|------|
|                |                 | 3.5 | 6   | 16  | V    |

| <b>Electrical Characteristics</b> [LB1403N] at Ta=25°C, V <sub>CC</sub> =6V, f=1kHz |                                    |       |      |      |       |
|-------------------------------------------------------------------------------------|------------------------------------|-------|------|------|-------|
|                                                                                     |                                    | min   | typ  | max  | unit  |
| Current Dissipation                                                                 | 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    |

| <b>Electrical Characteristics</b> [LB1413N] at Ta=25°C, V <sub>CC</sub> =6V, f=1kHz |                                    |      |                 |      |       |
|-------------------------------------------------------------------------------------|------------------------------------|------|-----------------|------|-------|
|                                                                                     |                                    | min  | typ             | max  | unit  |
| Current Dissipation                                                                 | 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 | 0.33            | 0.40 | mVrms |
|                                                                                     |                                    | ·Vc3 | ·Vc3            | ·Vc3 |       |
| Comparator Level 2                                                                  | Vc2                                | 0.59 | 0.67            | 0.75 | mVrms |
|                                                                                     |                                    | ·Vc3 | ·Vc3            | ·Vc3 |       |
| Comparator Level 3                                                                  | Vc3 Point of adjustment            |      | V <sub>IN</sub> |      | mVrms |
| Comparator Level 4                                                                  | Vc4                                | 1.25 | 1.33            | 1.42 | mVrms |
|                                                                                     |                                    | ·Vc3 | ·Vc3            | ·Vc3 |       |
| Comparator Level 5                                                                  | Vc5                                | 1.48 | 1.67            | 1.87 | mVrms |
|                                                                                     |                                    | ·Vc3 | ·Vc3            | ·Vc3 |       |
| LED Constant Current                                                                | I <sub>LED</sub>                   | 11   | 15              | 18.5 | mA    |
| Input Bias Current                                                                  | I <sub>INO</sub>                   | -1.0 | -0.3            |      | μA    |

| <b>Electrical Characteristics</b> [LB1423N] at Ta=25°C, V <sub>CC</sub> =6V, f=1kHz |                                    |       |      |      |       |
|-------------------------------------------------------------------------------------|------------------------------------|-------|------|------|-------|
|                                                                                     |                                    | min   | typ  | max  | unit  |
| Current Dissipation                                                                 | 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    |

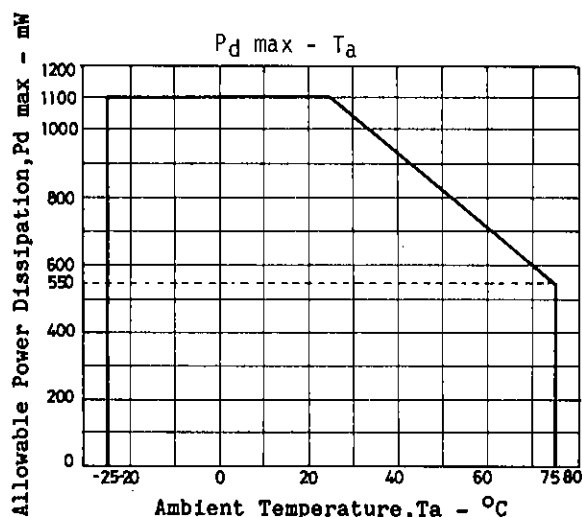
| <b>Electrical Characteristics</b> [LB1433N] at Ta=25°C, V <sub>CC</sub> =6V, f=1kHz |                                    |      |                 |      |       |
|-------------------------------------------------------------------------------------|------------------------------------|------|-----------------|------|-------|
|                                                                                     |                                    | min  | typ             | max  | unit  |
| Current Dissipation                                                                 | 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 | 0.33            | 0.40 | mVrms |
|                                                                                     |                                    | ·Vc3 | ·Vc3            | ·Vc3 |       |
| Comparator Level 2                                                                  | Vc2                                | 0.59 | 0.67            | 0.75 | mVrms |
|                                                                                     |                                    | ·Vc3 | ·Vc3            | ·Vc3 |       |
| Comparator Level 3                                                                  | Vc3 Point of adjustment            |      | V <sub>IN</sub> |      | mVrms |

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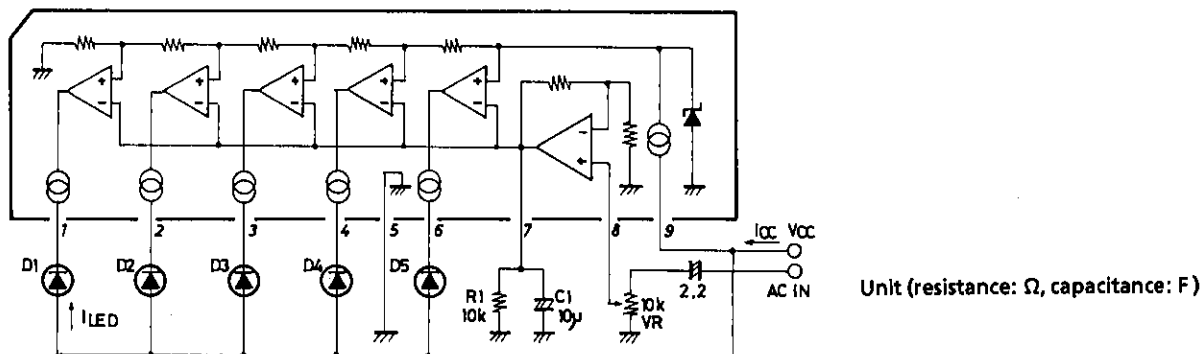
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|                      |           | min  | typ  | max  | unit    |
|----------------------|-----------|------|------|------|---------|
| Comparator Level 4   | Vc4       | 1.25 | 1.33 | 1.42 | mVrms   |
|                      | Vc3       | Vc3  | Vc3  | Vc3  |         |
| Comparator Level 5   | Vc5       | 1.48 | 1.67 | 1.87 | mVrms   |
|                      | Vc3       | Vc3  | Vc3  | Vc3  |         |
| LED Constant Current | $I_{LED}$ | 5    | 7    | 9.5  | mA      |
| Input Bias Current   | $I_{INO}$ | -1.0 | -0.3 |      | $\mu A$ |

| Electrical Characteristics[LB1443N] at $T_a=25^{\circ}C$ , $V_{CC}=6V$ , $f=1kHz$ |           |                     |  |  |  | min  | typ  | max  | unit    |
|-----------------------------------------------------------------------------------|-----------|---------------------|--|--|--|------|------|------|---------|
| Current Dissipation                                                               | $I_{CC}$  | $V_{IN}=0$          |  |  |  |      | 5    | 8    | mA      |
| Sensitivity                                                                       | $V_{IN}$  | Vc3 on-level        |  |  |  | 74   | 85   | 96   | mVrms   |
| Comparator Level 1                                                                | Vc1       |                     |  |  |  | -14  | -12  | -10  | dB      |
| Comparator Level 2                                                                | Vc2       |                     |  |  |  | -7   | -6   | -5   | 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                                                              | $I_{LED}$ |                     |  |  |  | 11   | 15   | 18.5 | mA      |
| Input Bias Current                                                                | $I_{INO}$ |                     |  |  |  | -1.0 | -0.3 |      | $\mu A$ |



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



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

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

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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.

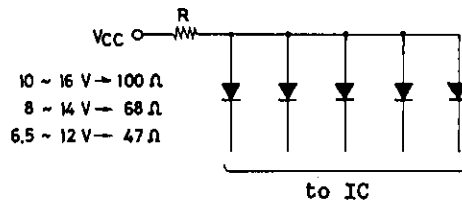
When lighting the five LEDs continuously for a prolonged length of time, make sure that  $V_{CC}$  does not exceed:

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

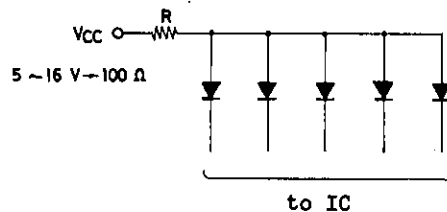
LB1423N, 1433N  $V_{CC}=14V$

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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