Monolithic Digital IC

No.1410B

B1403N 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

SANYO

- . 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 <sub>C3</sub> 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



SANYO Electric Co., Ltd. Semiconductor Business Headquarters TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

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

Absolute Maximum Rating Maximum Supply Voltag		3N,1413N,1423N,1433N,1 <sup>1</sup> V <sub>CC</sub> max			it V						
Allowable Power Dissi		Pd max	110		w						
Operating Temperature	-	Topr	-25 to +7	-	C C						
Storage Temperature		Tstg	-55 to $+12$	-	с 'с						
protage temperature		TACK	-55 60 +12		C I						
<b>Allowable Operating Conditions</b> [LB1403N,1413N,1423N,1433N,1443N] at Ta=25 <sup>o</sup> C min typ max unit											
Supply Voltage		V <sub>CC</sub>	3.5	6	16	V					
2-PP23 1020080		*CC	ر.ر	Ū	10	¥					
<b>Electrical Characteristics</b> [LB1403N] at Ta=25°C, V <sub>CC</sub> =6V, f=1kHz min typ max unit											
Current Dissipation	ICC	V <sub>IN</sub> =0	· · · · · · · · · · · · · · · · · · ·	5	8	mA					
Sensitivity	VIN	Vc3 on-level	74	85	96	mVrms					
Comparator Level 1	Ve1		-11.5	-10	-8.5	dB					
Comparator Level 2	Vc2		-6	-5	-4	dB					
Comparator Level 3	Ve3	Point of adjustment	· ·	õ	•	dB					
Comparator Level 4	Ve4		2.5	3	3.5	dB					
Comparator Level 5	Vc5		5	5	7	dB					
LED Constant Current			11	15	18.5	mA					
Input Bias Current	I <sub>LED</sub>		-1.0	-0.3	10.5	μА					
input bits our one	IINO		-1.0	-0+3		μя					
Electrical Characterist	ics[LB1	413N] at $Ta=25^{\circ}C_{1}V_{2}=6V$	7 f-1kHz min	typ	max	unit					
Current Dissipation	I <sub>CC</sub>	V <sub>IN</sub> =0	iji – ikinz min	5	8	mA					
Sensitivity		Vc3 on-level	91	105	119						
Comparator Level 1	V <sub>IN</sub> Vel		0.28	0.33	0.40	mVrms					
	101		•Ve3	•Ve3	•Ve3	шчгшs					
Comparator Level 2	Vc2		0.59	0.67	0.75	mTromo					
comparator never 2	102		•Ve3			mVrms					
Comparator Level 3	Vc3	Point of adjustment	• 463	·Vc3	•Vc3						
Comparator Level 4	Ve3 Ve4	forme of adjustment	1 05	VIN	4 10	mVrms					
comparator. Tevet 4	¥04		1.25	1.33	1.42	mVrms					
Comparator Level 5	VoF		• Vc3	-	•Ve3						
comparator rever )	Ve5		1.48		1.87	mVrms					
LED Constant Current	т		•Ve3	-	•Vc3	8					
Input Bias Current	$I_{LED}$		11	15	18.5	mA					
Input Blas current	IINO		-1.0	-0.3		µ۸					
Electrical Characterist		10011 of To-050 11 _61	7 E-11-17- min	<b>A</b>							
Current Dissipation	TCOLLDI	$\frac{423N}{2}$ at 12=25 C, $\frac{1000}{100}$	,1= KHZ MIN	typ	max	unit					
Sensitivity	<sup>I</sup> CC	V <sub>IN</sub> =0 Vc3 on-level	rz h	5	8	mA					
Comparator Level 1	V <sub>IN</sub> Vc1	AC2 OU-TEAST	74	85	96	mVrms					
Comparator Level 2	Ve1 Ve2		-11.5 -6	-10	-8.5	dB					
Comparator Level 3	Vc2 Vc3	Point of adjustment	-0	-5	-4	dB					
Comparator Level 4	Ve4	forme of adjustment	0 F	0	<b>2</b> E	dB					
Comparator Level 5	Ve4 Ve5		2.5	3	3.5	dB					
LED Constant Current			5 5	6	7	dB					
	ILED			7	9.5	mA					
Input Bias Current	IINO		-1.0	-0.3		ДЦ					
Electrical Characterist	100 T D1	LISAN] at Tamore To an and	f=11/2a min	<b>*</b>		1 . m J L					
Current Dissipation			r,∎ ikuz mil	typ	max 8	unit					
Sensitivity		V <sub>IN</sub> =0 Vc3 on-level	04	5 105		mA mVrom z					
Comparator Level 1	V <sub>IN</sub> Vc1	100 011-TEAGT	91	105	119	mVrms					
COMPAUGOOL TEAGT 1	¥0 I		0.28	0.33	0.40	mVrms					
Comparator Level 2	Ve2		• Ve3	•Ve3	•Vc3	milme					
Combar MAAL TOAGT E	106		0.59	0.67	0.75	mVrms					
Comparator Level 3	Ve3	Point of adjustment	•Vc3	·Vc3	•Vc3	-					
comparator react 2	402	TOTHE OF AUJUSTMENT		VIN		mVrms					
			Conti	nued c	n next	page.					

Continued on next page.

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

Continued from preced:	Lng pag	e.				
min					max	unit
Comparator Level 4	Ve4		1.25	1.33	1.42	mVrms
			•Vc3	•Ve3	•Vc3	
Comparator Level 5	Vc5		1.48	1.67	1.87	mVrms
			•Ve3	·Ve3	·Vc3	
LED Constant Current	ILED		5	7	9.5	mA
Input Bias Current	IINO		-1.0	-0.3		µ۹
<b>Electrical Characterist</b>	f=1kHz min	typ	max	unit		
Current Dissipation	ICC	V <sub>TN</sub> =0		5	8	mA
Sensitivity	VIN	Vc3 on-level	74	85	96	mVrms
Comparator Level 1	või		-14	-12	-10	dB
Comparator Level 2	Vc2		-7	-6	-5	dB
Comparator Level 3	Vc3	Point of adjustment		0		dB
Comparator Level 4	Ve4		2.5	3	3.5	dB
Comparator Level 5	Vc5		5	6	7	dB
LED Constant Current	$_{\downarrow \text{LED}}^{\text{I}}$		11	15	18.5	mA
Input Bias Current	INO		-1.0	-0.3		Αىر



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.

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

Continued on next page.

Continued from preceding page.

When the C<sub>1</sub>, R<sub>1</sub> 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 Pd 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  $V_{\rm CC}$  does not exceed:

LB1403N, 1413N, 1443N V<sub>CC</sub>=9V

LB1423N, 1433N V<sub>CC</sub>=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:







