Monolithic Digital IC



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.

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



- Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.
- SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges,or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

SANYO Electric Co., Ltd. Semiconductor Company TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Package Dimensions

unit:mm



Specifications

Absolute Maximum Ratings [LB1403N, 1413N, 1423N, 1433N, 1443N] at $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V _{CC} 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 $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions		Unit			
i alameter	Gymbol	Conditions	min	typ	max		
Supply voltage	VCC		3.5	6	16	V	

Electrical Characteristics [LB1403N] at Ta = 25°C, V_{CC}=6V, f=1kHz

Parameter	Symbol	Symbol Conditions		Unit		
	Symbol		min	typ	max	Unit
Current drain	ICC	V _{IN} =0		5	8	mA
Sensitivity	VIN	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	ILED		11	15	18.5	mA
Input bias current	INO		-1.0	-0.3		μA

Electrical Characteristics [LB1413N] at Ta = 25°C, V_{CC}=6V, f=1kHz

Parameter	Symbol	Conditions		Unit		
Falameter	Symbol	Conditions	min	typ	max	
Current drain	ICC	V _{IN} =0		5	8	mA
Sensitivity	VIN	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		VIN		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	ILED		11	15	18.5	mA
Input bias current	INO		-1.0	-0.3		μA

Electrical Characteristics [LB1423N] at Ta = 25° C, V_{CC}=6V, f=1kHz

Parameter	Symbol	I Conditions		Unit		
	Symbol		min	typ	max	
Current drain	ICC	V _{IN} =0		5	8	mA
Sensitivity	VIN	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	ILED		5	7	9.5	mA
Input bias current	IINO		-1.0	-0.3		μA

Electrical Characteristics [LB1433N] at Ta = 25°C, V_{CC}=6V, f=1kHz

Parameter	Symbol	Conditions		Unit		
Faranielei	Symbol	Conditions	min	typ	max	
Current drain	ICC	V _{IN} =0		5	8	mA
Sensitivity	VIN	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		VIN		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	ILED		5	7	9.5	mA
Input bias current	IINO		-1.0	-0.3		μΑ

Electrical Characteristics [LB1443N] at Ta = 25° C, V_{CC}=6V, f=1kHz

Parameter	Symbol Conditions -	Conditions		Unit		
		min	typ	max	Unit	
Current drain	ICC	V _{IN} =0		5	8	mA
Sensitivity	VIN	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	ILED		11	15	18.5	mA
Input bias current	I _{INO}		-1.0	-0.3		μA



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



Unit (resistance: Ω , capacitance: F)

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

$\cdot C_1, R_1$ 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.

 \cdot Considerations relative to Pd max of the package :

Due to the constant current ILED, 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



- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products(including technical data,services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- 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 February, 2001. Specifications and information herein are subject to change without notice.