

# IR2431/IR2432/IR2433 12-Dot LED Display Driver

## Description

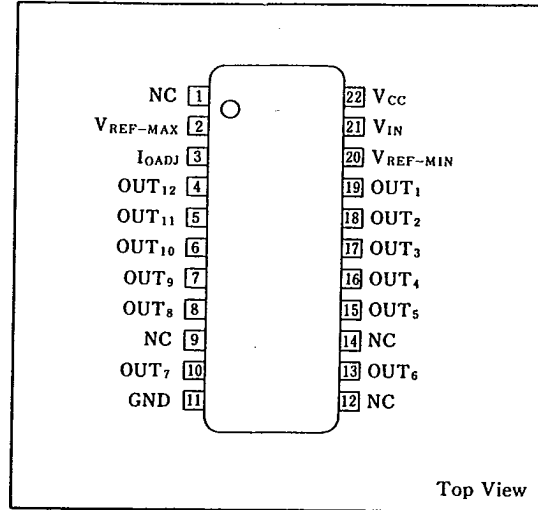
The IR2431/IR2432/IR2433 is suitable for driving 12 LED level meters.

The IR2433 is cascadable for 144 dots of bar graphic display.

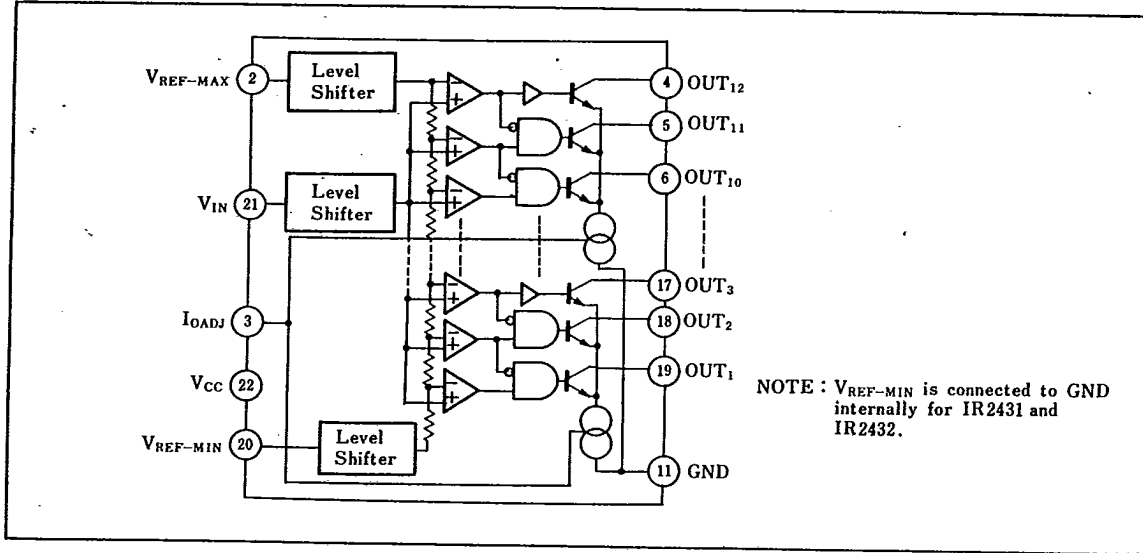
## Features

1. LED current can be set by an external resistor
2. IR2431 is a log-scale driver  
IR2432 is a VU meter scale driver  
IR2433 is a linear-scale driver
3. Cascaded connection is possible for IR2433
4. 22-pin dual-in-line package

## Pin Connections



## Block Diagram



SHARP

12-Dot LED Display Driver

IR2431/IR2432/IR2433

Absolute Maximum Ratings

Parameter	Symbol	Condition	Rating	Unit
Supply voltage	V <sub>CC</sub>		18	V
Input voltage	V <sub>IN</sub>	V <sub>CC</sub> < 10V	10	V
Reference voltage	V <sub>REF-MAX</sub>	V <sub>CC</sub> < 10V	10	V
	V <sub>REF-MIN</sub>		10	
Power dissipation	P <sub>D</sub>	T <sub>a</sub> ≤ 25°C	1,000	mW
P <sub>D</sub> derating ratio	ΔP <sub>D</sub> /°C	T <sub>a</sub> > 25°C	10	mW/°C
Operating temperature	T <sub>opr</sub>		-20 ~ +75	°C
Storage temperature	T <sub>str</sub>		-25 ~ +125	°C

Electrical Characteristics

(V<sub>CC</sub>=12V, T<sub>a</sub>=25°C)

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit	
Operating supply voltage	V <sub>CC</sub>		8	12	16	V	
Supply current	I <sub>CC</sub>			4	6	mA	
Operating reference voltage	V <sub>REF-MAX</sub>	V <sub>CC</sub> - V <sub>REF-MAX</sub> ≥ 2.5V	IR2431	5.5		6.0	V
			IR2432	0.6	0.8	1.6	
		V <sub>CC</sub> - V <sub>REF-MAX</sub> ≥ 2.5V	IR2433	0.5		6.0	
Input current	I <sub>IN</sub>	Take the current flowing into IC for positive.		-1		μA	
	I <sub>REF-MAX</sub>			-1			
	I <sub>REF-MIN</sub>		Applies to IR2433				1
Output current	I <sub>OUT</sub>	V <sub>IN</sub> =6.5V, R <sub>O</sub> =96kΩ	7.5	10	12.5	mA	
Output leakage current	I <sub>OL</sub>				10	μA	

Description of Operation

With V<sub>REF-MAX</sub> and V<sub>REF-MIN</sub> (IR2431 and IR2432 are connected inside to the GND) given, the reference voltage is 12-divided by the resistance ratio. This is compared with the V<sub>IN</sub> in each of the comparator circuits to cause the output "High" or "Low" in the AND gate to turn the corresponding transistor on and the LED will glow.

Basic Connection Diagram

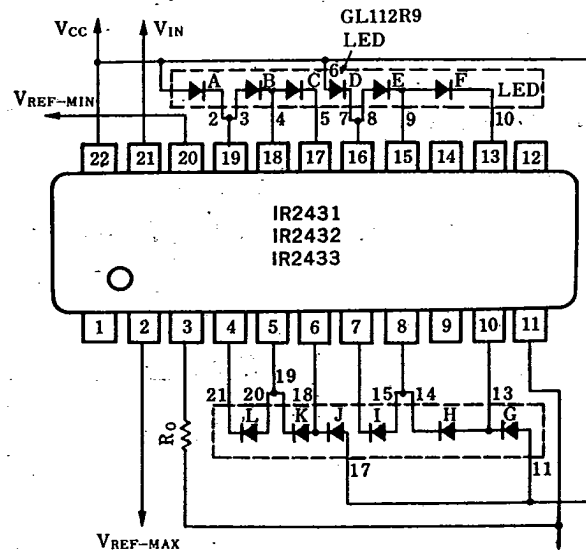
(Example GL112R9 Series)

Apply the power supply voltage across the V<sub>CC</sub>-GND and apply to V<sub>REF-MAX</sub> and V<sub>REF-MIN</sub> their reference voltage (IR2431, IR2432 and V<sub>REF-MIN</sub> are connected inside to the GND). Apply the input voltage to V<sub>IN</sub>. The current to flow through the LED, I<sub>LED</sub> can be altered by varying R<sub>O</sub>.

The current I<sub>LED</sub> can be given by the following equation.

$$I_{LED} = 90 \times \frac{V_{CC} - 1.3}{R_O + 1} \text{ (mA)}$$

V<sub>CC</sub>: V, R<sub>O</sub>: kΩ



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■ Comparator Level  
IR2431, IR2432

Model \ LED	A	B	C	D	E	F	G	H	I	J	K	L
IR2431	-44	-40	-36	-32	-28	-24	-20	-16	-12	-8	-4	0
IR2432	-20	-15	-10	-7	-4	-2	-1	0	+1	+2	+3	+6

(Unit: dB)

IR2433

As  $V_{IN}$  is increased from 0V, the bar type LEDs light up in order. The input level at which the n-th LED lights up can be nearly represented by the following formula.

$$V_n = n \frac{V_{REF-MAX} - V_{REF-MIN}}{12} + V_{REF-MIN}$$

■ Example of IR2433 Circuit Application

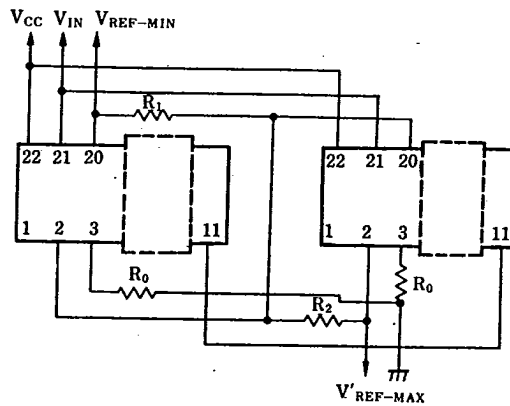
(1) 2-chip cascaded

$V_{CC}$ ,  $V_{IN}$ ,  $V_{REF-MIN}$ ,  $V_{REF-MAX}$  and BND are connected as shown in the right Fig.

By selecting  $R_1 = R_2$ ,  $V_{REF-MAX} - V_{REF-MIN}$  can be divided into 24 equal voltage.

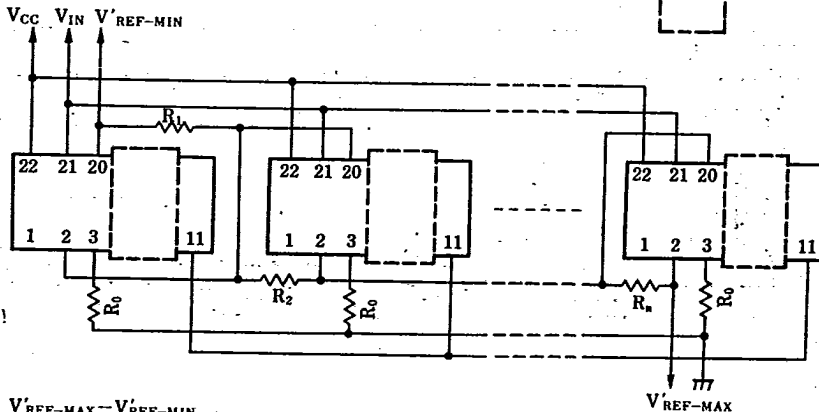
Also, the desired division is possible provided that  $R_1$  and  $R_2$  satisfy the following formula.

$$\frac{V_{REF-MAX} - V_{REF-MIN}}{R_1 + R_2} > 100 \text{ } (\mu A)$$



For the connection, refer to the typical connection diagram.

(2) 3~12-chip cascaded



$$\frac{V_{REF-MAX} - V_{REF-MIN}}{\sum R_i} > (n-1) \times 100 \text{ } (\mu A)$$

(i=1,2,...,n)

