FEATURES

- Low Voltage Operation: 1.24 V
- Programmable Out Voltage to 18V
- Sink Current Capability of 0.8mA to 100mA
- Equivalent full range Temperature Coefficient of 50ppm/℃
- Temperature Compensated for operation over full rated operating Temperature Range
- Low Output Noise Voltage
- Moisture Sensitivity Level 3

TO-92

SOT-23-3

ORDERING INFORMATION

DEVICE	Package Type	MARKING	Packing	Packing Qty
LMV431AIZ	TO-92	LMV431AI	TUBE	1000pcs/box
LMV431BIZ	TO-92	LMV431BI	TUBE	1000pcs/box
LMV431IZ	TO-92	LMV431I	TUBE	1000pcs/box
LMV431ACZ	TO-92	LMV431AC	TUBE	1000pcs/box
LMV431BCZ	TO-92	LMV431BC	TUBE	1000pcs/box
LMV431CZ	TO-92	LMV431C	TUBE	1000pcs/box
LMV431AIM3/TR	SOT-23-3	RLA,Y3TS,Y3TU	REEL	3000pcs/reel
LMV431BIM3/TR	SOT-23-3	RLB,Y3KS,Y3KU	REEL	3000pcs/reel
LMV431IM3/TR	SOT-23-3	Y3VS,Y3VS	REEL	3000pcs/reel
LMV431ACM3/TR	SOT-23-3	Y3PS,Y3PU	REEL	3000pcs/reel
LMV431BCM3/TR	SOT-23-3	Y3JS,Y3JU	REEL	3000pcs/reel
LMV431CM3/TR	SOT-23-3	Y3US,Y3UU	REEL	3000pcs/reel

DESCRIPSION

The LMV431 is a three-terminal Shunt Voltage Reference providing a highly accuracy 1.24V band-gap reference with 0.5% and 1.0% tolerance. The LMV431 thermal stability and wide operating current(100mA) makes is suitable for all variety of applications that are looking for a low cost solution with high performance. The LMV431 is an ideal voltage reference in an isolated feed circuit for 3.0V to 3.3V switching mode power supplies.

APPLICATION

- Shunt Regulator
- Voltage Monitoring
- Current Source and Sink Circuits
- Analog & Digital Circuits Requiring Precision References Low Out Voltage (3.0V to 3.3V) Switching Power Supply Error Amplifier

ABSOLUTE MAXIMUM RATINGS

(Full operating ambient temperature range applies unless otherwise noted.)

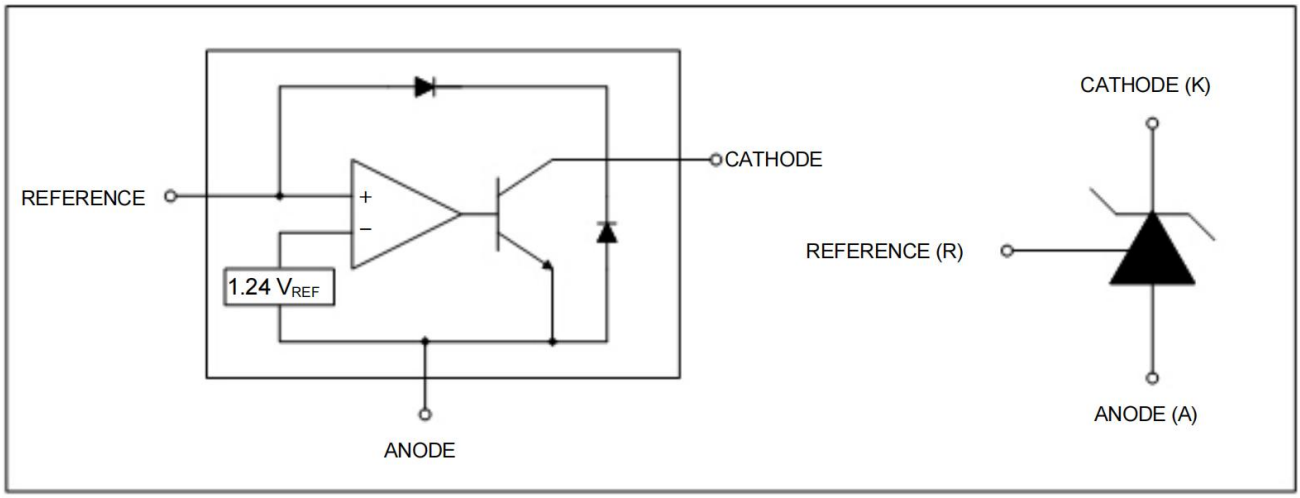
CHARACTERISTIC		SYMBOL	MIN.	MAX.	UNIT
Cathode Voltage		V_{KA}	-	20	V
Cathode Current Range(Continuous)		I_K	-	100	mA
Reference Input Current Range		I_{REF}	-	3	mA
Junction Temperature Range		T_J	-40	150	°C
Operating Temperature Range	LMV431AI,LMV431BI，LMV431I	T_{OPR}	-40	85	°C
	LMV431AC,LMV431BC,LMV431C	T_{OPR}	0	70	°C
Storage Temperature Range		T_{STG}	-65	150	°C
Total Power Dissipation		P_D	770		mW
Lead Temperature (Soldering, 10 seconds)		T_L	245		°C

Note:Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

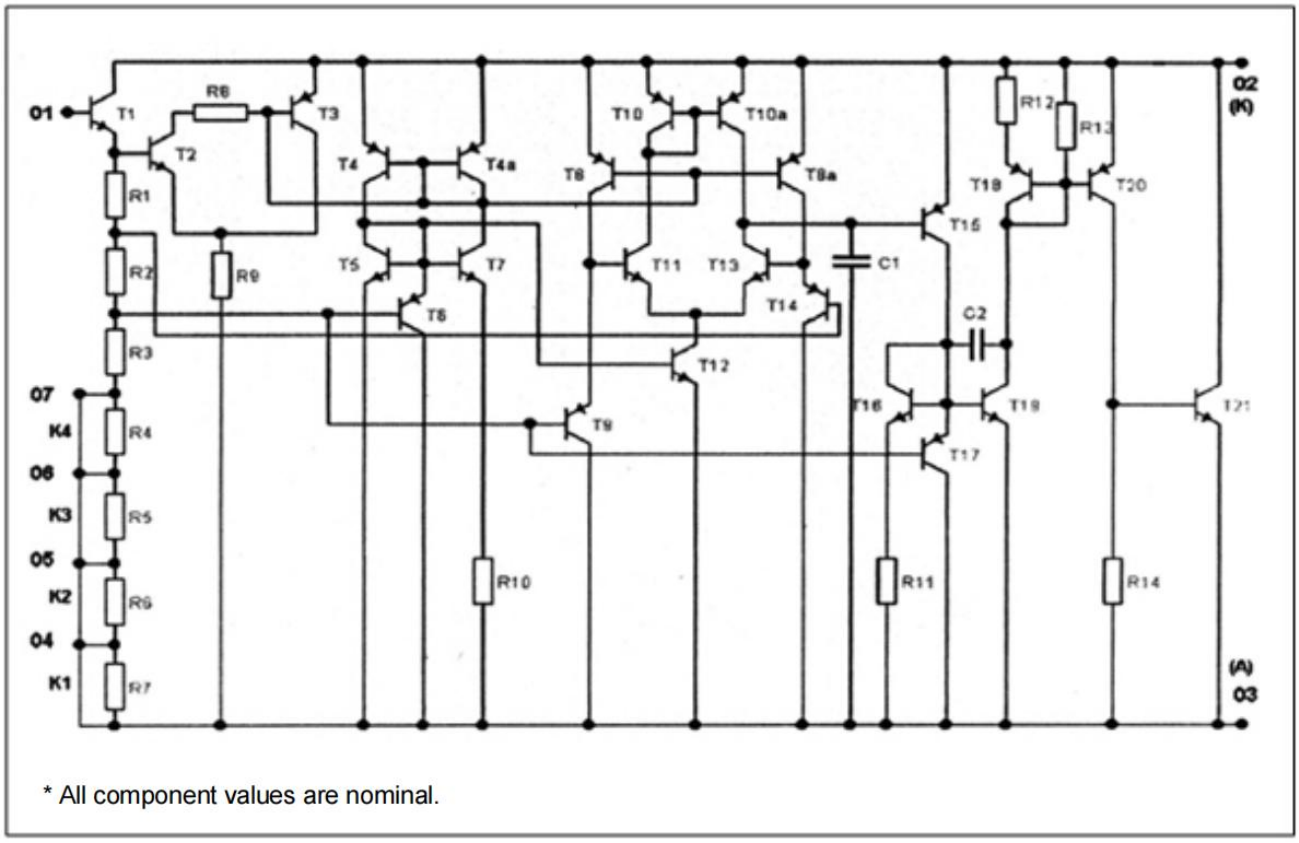
RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Cathode Voltage	V_{KA}	V_{REF}	18	V
Cathode Current	I_K	0.1	100	mA

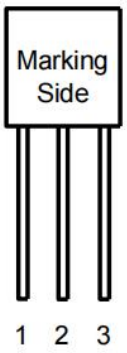
FUNCTION BLOCK DIAGRAM



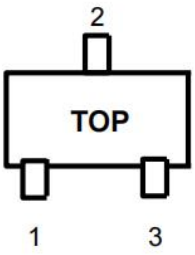
EQUIVALENT SCHEMATIC



PIN CONFIGURATION



TO-92



SOT-23

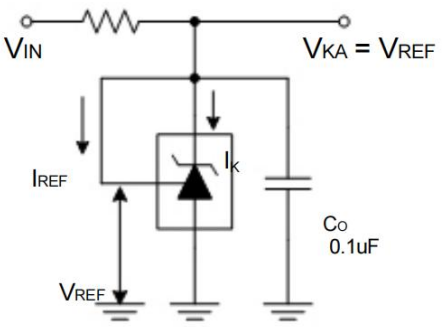
PIN DESCR

Pin No.	TO-92 / SOT-23	
	Name	Function
1	Reference	Reference Voltage
2	Anode	Ground
3	Cathode	Input Supply Voltage

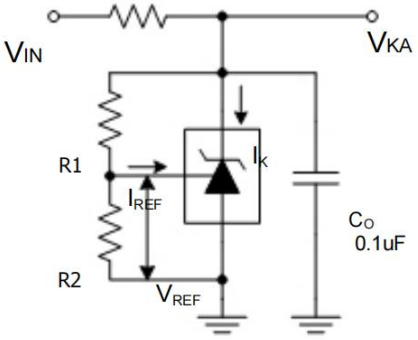
ELECTRICAL CHARACTERISTICS(TA=25°C,unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Reference Input Voltage	V_{REF}	V_{KA} =V_{REF}, I_K =10mA	LMV431B	1.234	1.240	1.246	V
			LMV431A	1.228	1.240	1.252	
			LMV431	1.202	1.240	1.278	
Deviation of Reference Input Voltage	$\Delta V_{REF}/\Delta T$	V_{KA} = V_{REF}, I_K =10mA T_A =Full Range			15	25	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta V_{REF}/\Delta V_{KA}$	V_{KA} = 1.25V to 14.5V			1.0	2.7	mV/V
Reference Input Current	I_{REF}	R1=10KΩ , R2=∞			0.25	0.5	uA
Deviation of Reference Input Current	$\Delta I_{REF}/\Delta T$	R1=10KΩ , R2=∞, T_A = Full Range			0.05	0.3	uA
Minimum Cathode Current for Regulation	$I_{K(MIN)}$	V_{KA} = V_{REF}			60	80	uA
Off-State Cathode Current	$I_{K(OFF)}$	V_{KA} =16V, V_{REF} =0			0.04	0.5	uA
Dynamic Impedance	Z_{KA}	V_{KA}= V_{REF}, I_K =0.1mA~100mA f ≤ 1kHz			0.2	0.4	Ω

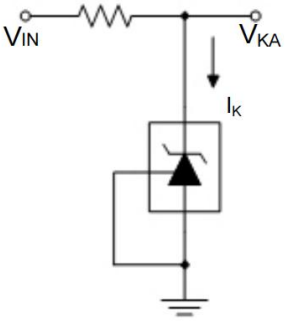
TEST CIRCUITS



< Fig 1. Test circuit for $V_{KA} = V_{REF}$ >

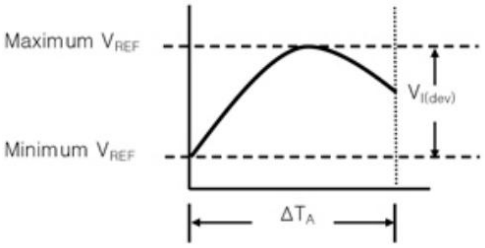


< Fig 2. Test circuit for $V_{KA} \geq V_{REF}$ >



< Fig 3. Test circuit for $I_{KA(OFF)}$ >

The deviation parameters $\Delta V_{REF}/\Delta T$ and $\Delta I_{REF}/\Delta T$ are defined as the differences between the maximum and minimum values obtained over the recommended temperature range. The average full-range temperature coefficient of the reference voltage, α V_{REF}, is defined as:



$$\alpha V_{REF}(ppm/°C)=\frac{\frac{(VI(dev))}{VREF\ at\ 25°C}}{\Delta TA}\times 10^6$$

Where:

ΔT_A is the recommended operating free-air temperature range of the device.

α V_{ERF} can be positive or negative,depending on whether minimum V_{REF} of maximum V_{REF},respectively, occurs at the lower temperature.

Example: Maximum V_{REF}=1190mV at 30°C， maximum V_{ERF}=1262mV at 0°C， V_{REF}=1241mV at 25°C，

ΔT_A=125°C for LMV431

$$\alpha V_{REF} = \frac{(\frac{72mV}{1241mV}) \times 10^{6}}{125℃} \approx 46ppm/℃$$

Because minimum V_{REF} occurs at the lower temperature, the coefficient is positive.

Calculating Dynamic Impedance

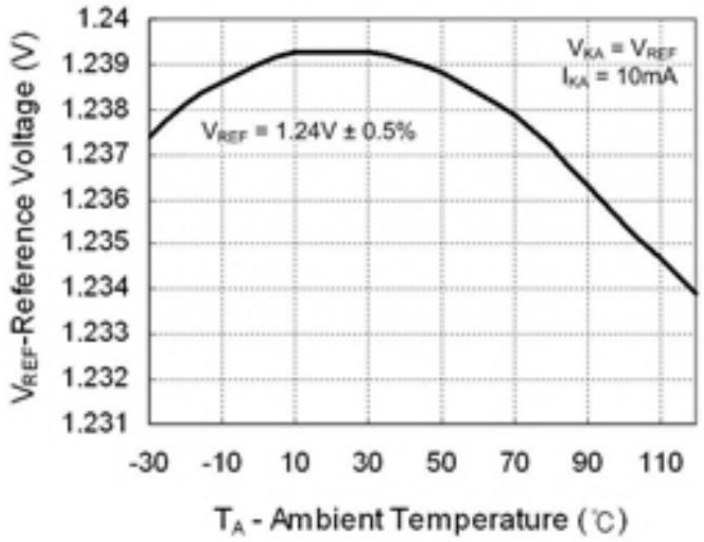
The dynamic impedance is defined as: $|Z_{KA}| = \frac{\Delta V_{KA}}{\Delta I_{KA}}$

When the device is operating with two external resistors, the total dynamic impedance of the circuit is given by:

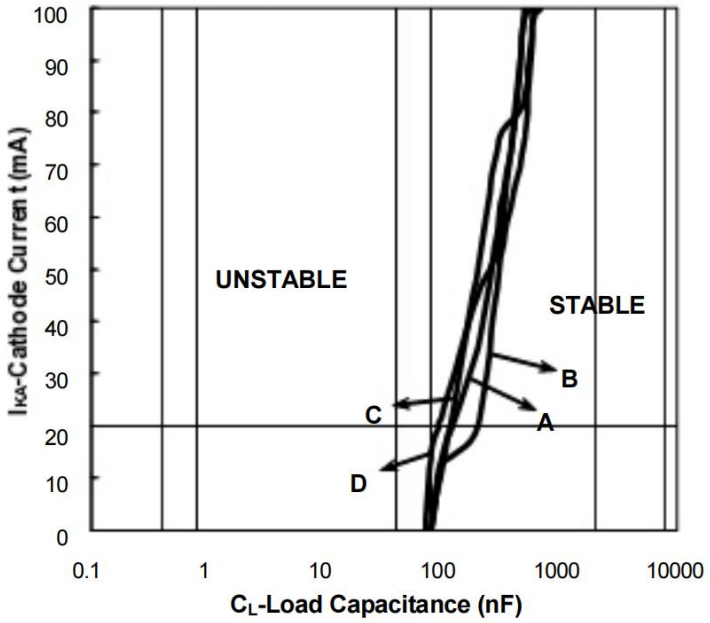
$$Z' = \frac{V}{\Delta I} \approx Z_{KA}\ (1 + R1/R2)$$

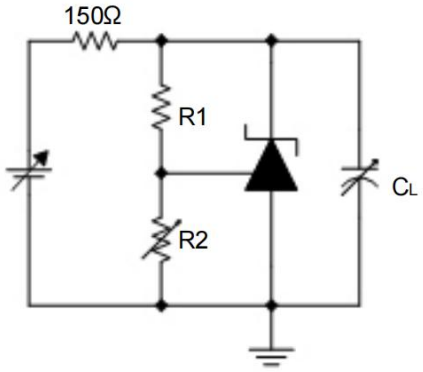
TYPICAL OPERATING CHARACTERISTICS

Reference Voltage vs. Junction Temperature



Stability Boundary Conditions



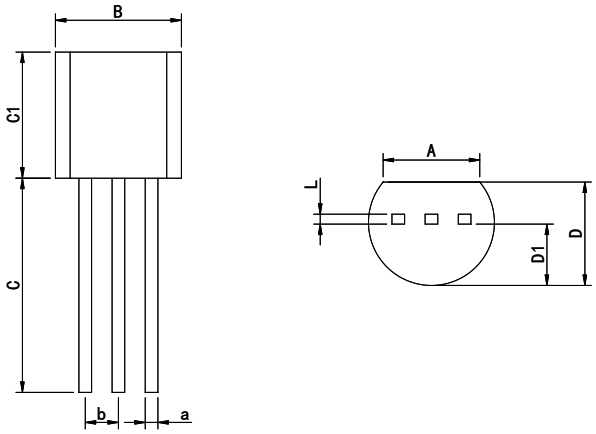


< Fig 4. Test Circuit >

A $V_{KA}=V_{REF}$ R1= 0Ω, R2 = ∞
B V_{KA}=5.0V, R1=10kΩ, R2 = 3.3kΩ
C V_{KA}=10.0V R1=10kΩ, R2 = 1.42kΩ
D V_{KA}=15.0V R1=10kΩ, R2 = 900Ω

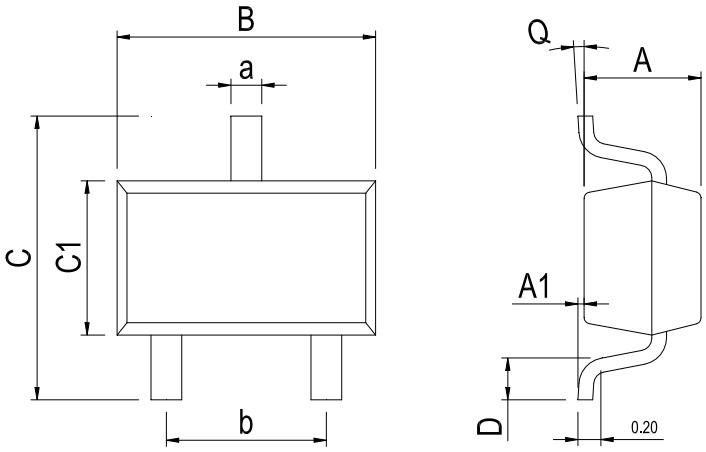
PHYSICAL DIMENSIONS

TO-92



Dimensions In Millimeters(TO-92)									
Symbol:	A	B	C	C1	D	D1	L	a	b
Min:	3.43	4.44	13.5	4.32	3.17	2.03	0.33	0.40	1.27BSC
Max:	3.83	5.21	15.3	5.34	4.19	2.67	0.42	0.52	

SOT-23-3



Dimensions In Millimeters(SOT-23-3)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.00	0.00	2.82	2.65	1.50	0.30	0°	0.30	1.90 BSC
Max:	1.15	0.15	3.02	2.95	1.70	0.60	8°	0.50	

REVISION HISTORY

DATE	REVISION	PAGE
2014-6-8	New	1-10
2023-9-14	Update encapsulation type、Update Lead Temperature、Add annotation for Maximum Ratings.	1、2
2024-10-25	Update TO-92 Physical Dimensions、Update SOT-23-3 Physical dimension	8

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