

LR431 LINEAR INTEGRATED CIRCUIT

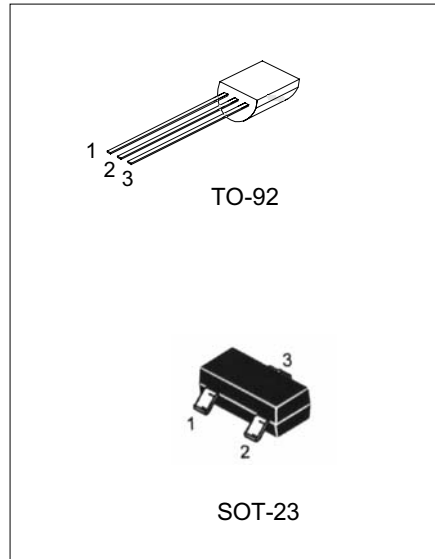
PROGRAMMABLE PRECISION REFERENCE

DESCRIPTION

The LRC LR431 is a three-terminal adjustable regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{ref} (approximately 2.5V) and 36V with two external resistors. It provides very wide applications, including shunt regulator, series regulator, switching regulator, voltage reference and others.

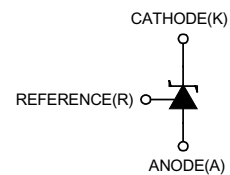
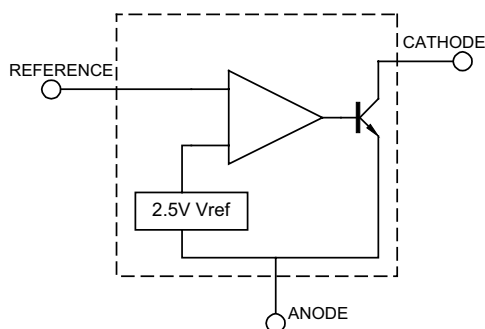
FEATURES

- *Programmable output Voltage to 36V.
- *Low dynamic output impedance 0.2 Ω .
- *Sink current capability of 1 to 100mA.
- *Equivalent full-range temperature coefficient of 50ppm/ $^{\circ}\text{C}$ typical for operation over full rated operating temperature range.



TO-92 1: Ref ; 2: Anode; 3: Cathode
 SOT-23 1: Ref; 2: Cathode; 3: Anode

BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS (Operating temperature range applies unless otherwise specified)

PARAMETER	SYMBOL	VALUE	UNIT
Cathode Voltage	V _{KA}	37	V
Cathode Current Range(Continuous)	I _{KA}	-100 ~ +150	mA
Reference Input Current Range	I _{ref}	-0.05 ~ +10	mA
Operating Junction Temperature	T _j	150	°C
Operating Ambient Temperature	T _{opr}	-40 ~ +70	°C
Storage Temperature	T _{stg}	-65 ~ +150	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Cathode Voltage	V _{KA}	V _{REF}		36	V
Cathode Current	I _{KA}	1		100	mA

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Input Voltage	V _{ref}	V _{KA} =V _{REF} , I _{KA} =10mA		2.50		V
Deviation of reference Input Voltage Over temperature(note 1)	ΔV _{ref} /ΔT	V _{KA} =V _{REF} , I _{KA} =10mA T _{MIN} ≤T _A ≤T _{MAX}		4.5	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	ΔV _{ref} / ΔV _{KA}	I _{KA} =10mA ΔV _{KA} =10V~V _{REF} ΔV _{KA} =36V~10V		-1.0 -0.5	-2.7 -2.0	mV/V
Reference Input Current	I _{ref}	I _{KA} =10mA, R ₁ =10kΩ, R ₂ =∞		1.5	4	μA
Deviation of Reference Input Current Over Full Temperature Range	ΔI _{ref} /ΔT	I _{KA} =10mA, R ₁ =10kΩ, R ₂ =∞ T _A =full Temperature		0.4	1.2	μA
Minimum Cathode Current for Regulation	I _{KA} (min)	V _{KA} =V _{REF}		0.45	1.0	mA
Off-State Cathode Current	I _{KA} (OFF)	V _{KA} =36V, V _{REF} =0		0.05	1.0	μA
Dynamic Impedance	Z _{KA}	V _{KA} =V _{REF} , I _{KA} =1 to 100mA f≤1.0kHz		0.15	0.5	Ω

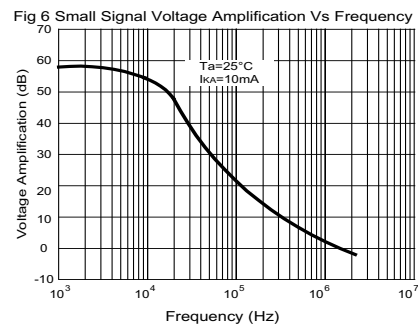
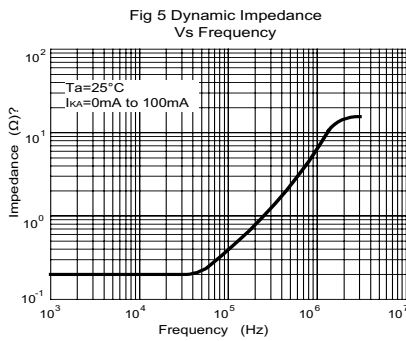
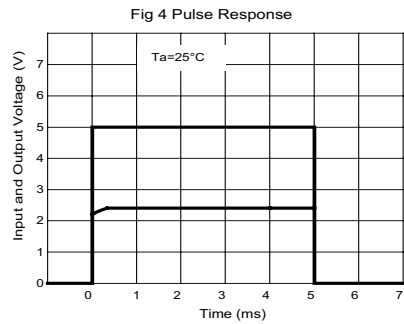
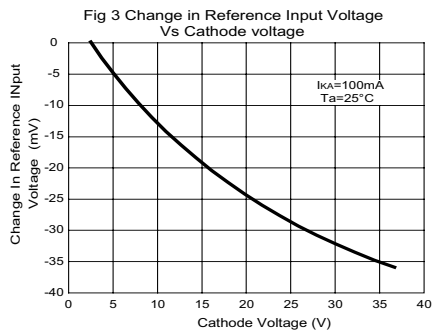
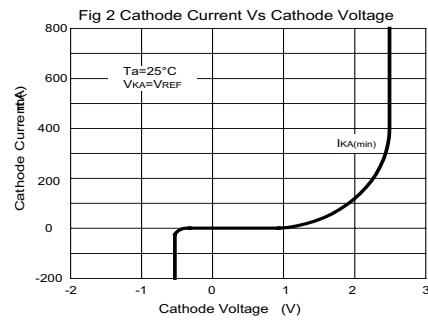
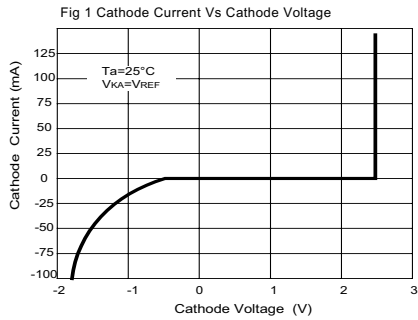
Note: T_{MIN}=0°C, T_{MAX}=+70°C

CLASSIFICATION OF V_{ref} AND PACKAGE

Device	LR431A	LR431B	LR431C	LR431ALT1	LR431BLT1	LR431CLT1
Rank	0.5%	1%	2%	0.5%	1%	2%
Range(V)	2.487~2.512	2.475~2.525	2.450~2.550	2.487~2.512	2.475~2.525	2.450~2.550
Marking	LR431A	LR431B	LR431C	RA	RB	RC
Package	TO-92	TO-92	TO-92	SOT-23	SOT-23	SOT-23

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TYPICAL PERFORMANCE CHARACTERISTICS



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TEST CIRCUIT

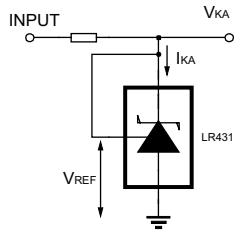


Fig 7 Test Circuit For $V_{KA} = V_{REF}$

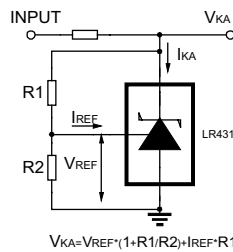


Fig 8 Test Circuit for $V_{KA} \geq V_{REF}$

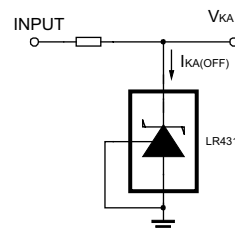


Fig 9 Test Circuit For $I_{KA(OFF)}$

APPLICATION CIRCUIT

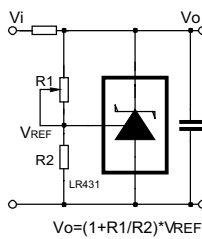


Fig 10 Shutdown Regulator

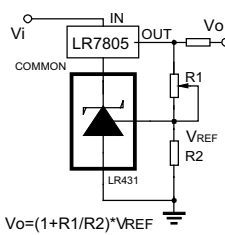


Fig 11 Output Control of a Three-Terminal Fixed Regulator

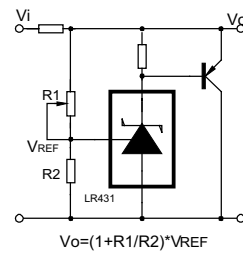


Fig 12 Higher-current Shunt Regulator

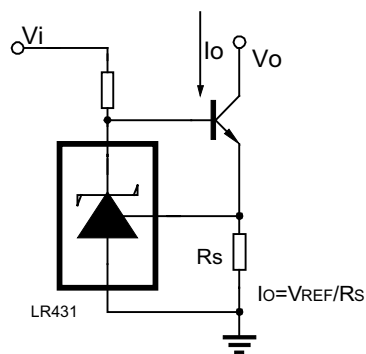


Fig 13 Constant-current Sink

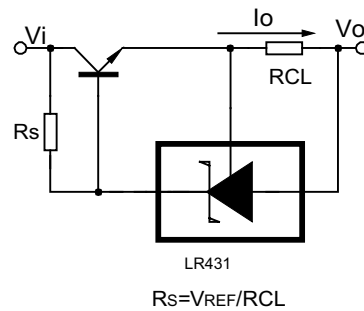
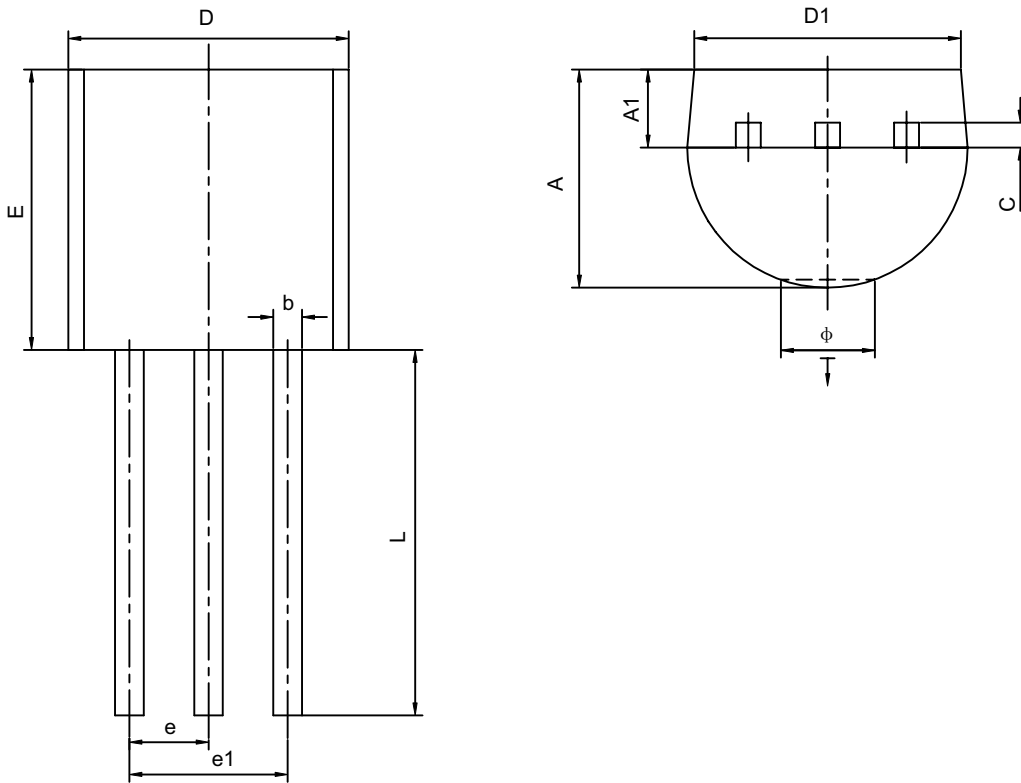
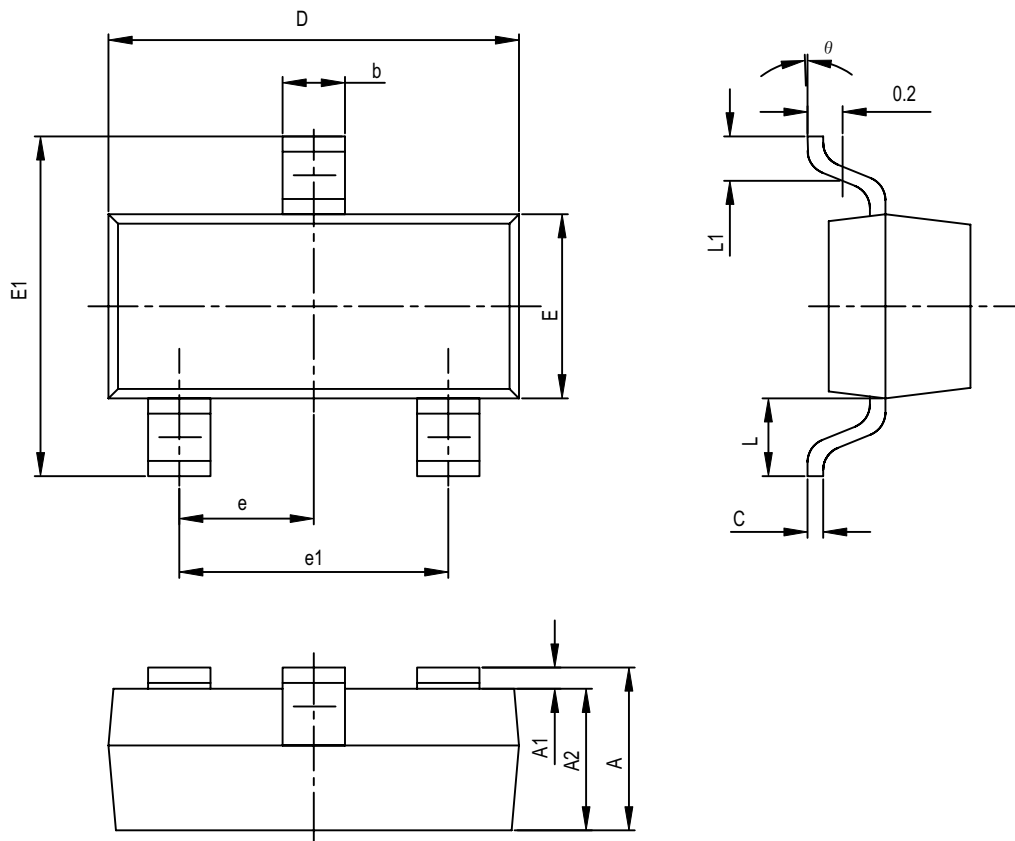


Fig 14 Current Limiting or Current Source

TO-92 PACKAGE OUTLINE DIMENSIONS


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270TYP		0.050TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
φ		1.600		0.063
↓	0.000	0.380	0.000	0.015

SOT-23 PACKAGE OUTLINE DIMENSIONS


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.100	0.110	0.118
E	1.200	1.610	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950TPY		0.037TPY	
e1	1.800	2.000	0.071	0.079
L	0.550REF		0.022REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°