



**Low-voltage Adjustable Precision Shunt Regulators**

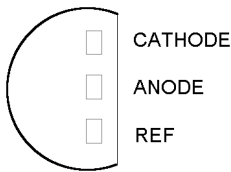
**GENERAL DESCRIPTION**

The LND431LV are three-terminal low-voltage adjustable shunt regulators with specified thermal stability. The output voltage may be set to any value between  $V_{ref}$  (approximately 1.24V) and 6V with two external resistors. These devices have typical output impedance of  $0.2\Omega$ .

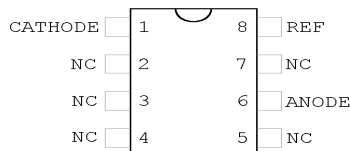
**FEATURES**

- Equivalent Full-Range Temperature Coefficient 30ppm/°C
- Temperature Compensated for Operation Over Full Rated Operating Temperature Range
- Adjustable Output Voltage
- Sink Current Capability 1mA to 100mA
- Low ( $0.2\ \Omega$  Typ) Dynamic Output Impedance
- Low Output Noise

**PIN CONFIGURATION**



**SYMBOL**





## ABSOLUTE MAXIMUM RATINGS

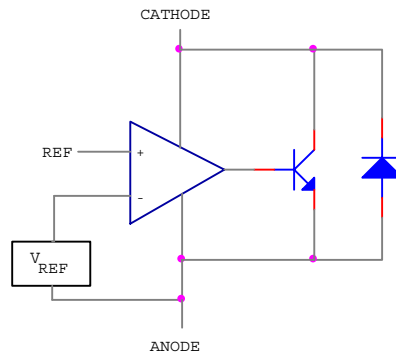
PARAMETER	VALUE	UNITS
Cathode voltage (see note 1)	7	V
Continuous cathode current range	-20 to 20	mA
Reference input current range	-.050 to 3.0	
Operating free-air temperature range	0 to 70	°C
Lead temperature 1.6mm from case for 10 seconds	260	

Note1: Voltage values are with respect to the anode terminal unless otherwise noted

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	VALUE	MAX	UNITS
Cathode voltage, $V_{KA}$	$V_{ref}$	6	V
Cathode current, $I_k$ (for regulation)	.1	15	mA

## FUNCTIONAL BLOCK DIAGRAM

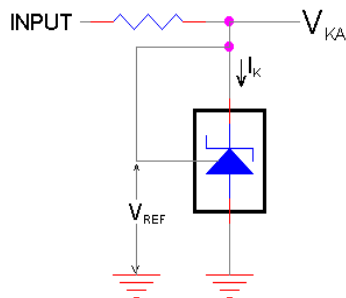




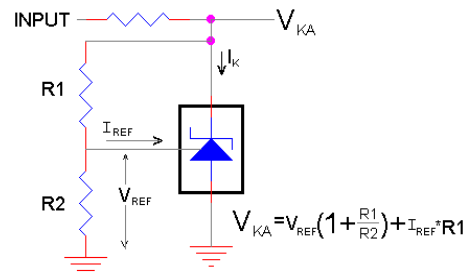
**ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	TEST CIRCUIT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference input voltage	$V_{ref}$	1	$V_{KA} = V_{ref}, I_k = 10mA$	1222	1240	1258	mV
Deviation of reference input voltage over full temperature range	$V_{ref(dev)}$	1	$V_{KA} = V_{ref}, I_k = 10mA, T_A = \text{Full range}$		4	12	
Ratio of change in reference input voltage to the change in cathode voltage	$\Delta V_{ref}/\Delta V_{KA}$	2	$I_k = 10mA, \Delta V_{KA} = 6V \text{ to } V_{ref}$		-1.4	-2.7	mV/V
Reference input current	$I_{ref}$	2	$I_k = 10mA, R1 = 10K\Omega, R2 = \infty, T_A = \text{full range}$		0.15	0.5	$\mu A$
Deviation of reference input current over full temperature range	$I_{ref(dev)}$	2	$I_k = 10mA, R1 = 10K\Omega, R2 = \infty, T_A = \text{full range}$		0.05	0.3	
Minimum cathode current for regulation	$I_{min}$	1	$V_{KA} = V_{ref}$		55	80	$\mu A$
Off- state cathode current	$I_{off}$	3	$V_{KA} = 6V, V_{ref} = 0$		0.001	1	$\mu A$
Dynamic impedance	$ Z_{KA} $	1	$V_{KA} = V_{ref}, I_k = 1mA \text{ to } 100mA, f \leq 1KHz$		0.2	0.4	$\Omega$

**PARAMETER MEASUREMENT INFORMATION**



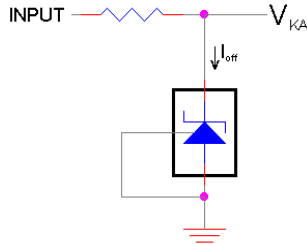
Test Circuit 1. For  $V_{KA} = V_{REF}$



Test Circuit 2. For  $V_{KA} > V_{REF}$

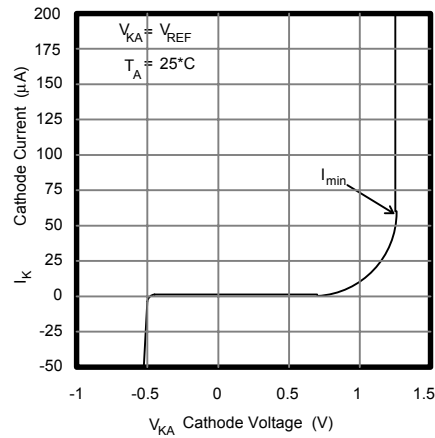
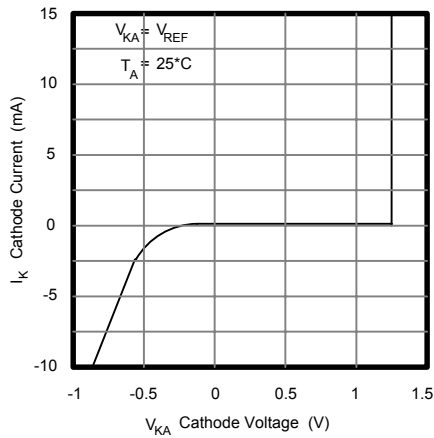


### PARAMETER MEASUREMENT INFORMATION

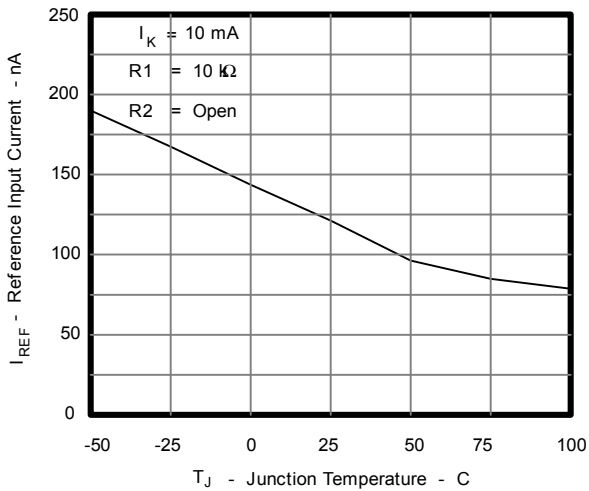


Test Circuit 3. For I<sub>OFF</sub>

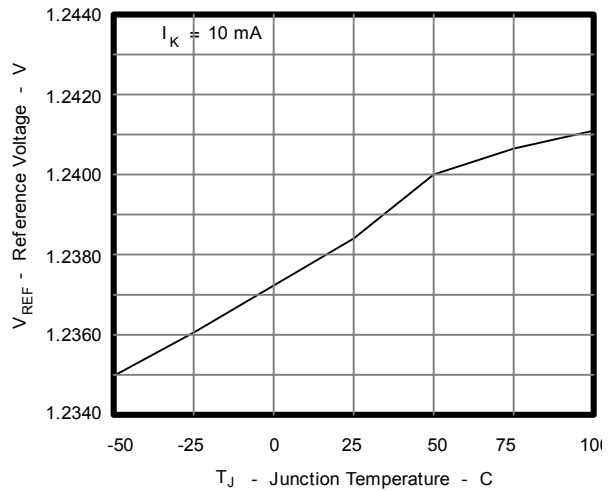
### TYPICAL CHARACTERISTICS



Cathode Current v/s Cathode Voltage



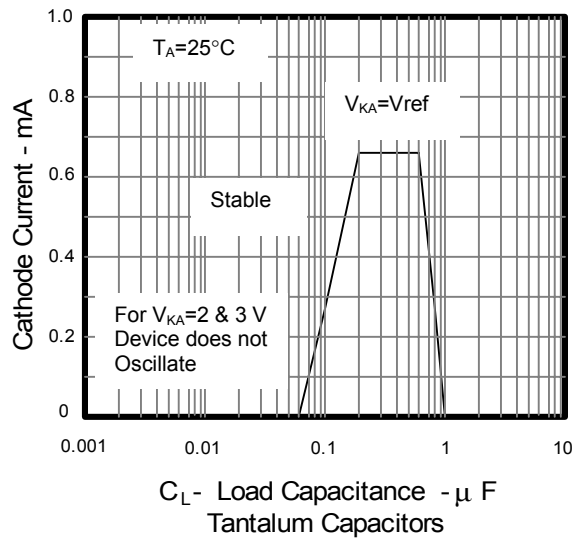
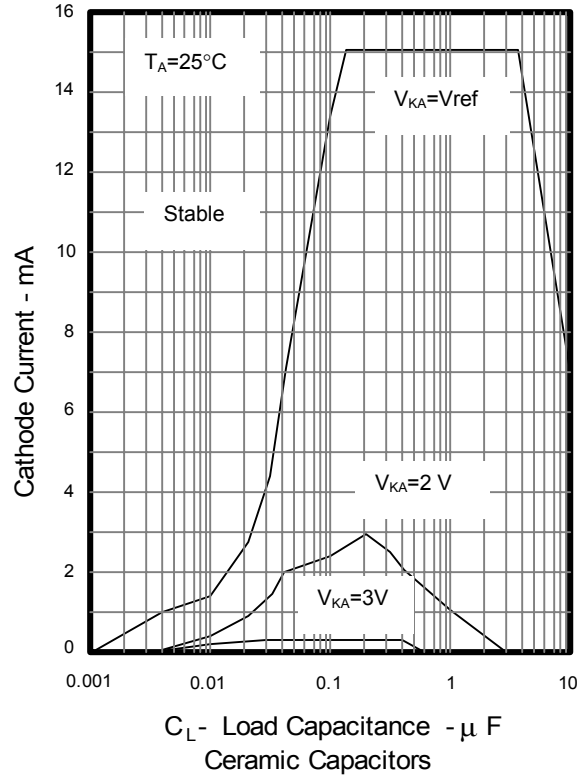
Ref Voltage v/s Junction Temperature



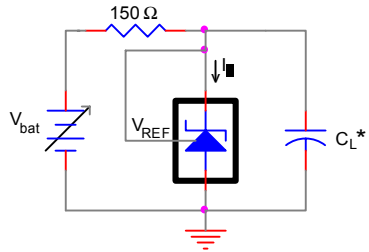
Ref Input Current v/s Junction Temperature



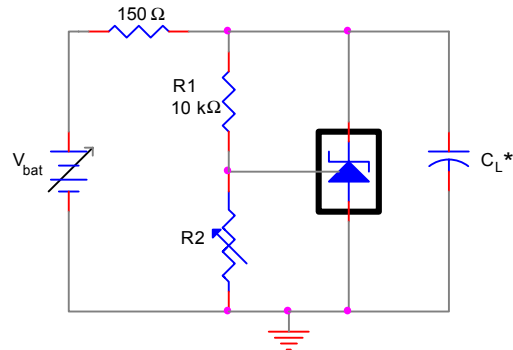
Stability Boundary Condition



\* Stability boundary condition test shows that tantalum capacitors are recommended to minimize the conditions that may cause the device to oscillate.



TEST CIRCUIT FOR  $V_{KA} = V_{REF}$



TEST CIRCUIT FOR  $V_{KA} = 2\text{ V}, 3\text{ V}$

The Areas under the curves represent conditions that may cause the device to oscillate. For  $V_{KA} = 2\text{ V}$  and  $3\text{ V}$  curves,  $R_2$  and  $V_{bat}$  were adjusted to establish the initial  $V_{KA}$  and  $I_K$  conditions with  $C_L = 0$ .  $V_{bat}$  and  $C_L$  then were adjusted to determine the ranges of stability.

## TYPICAL APPLICATIONS

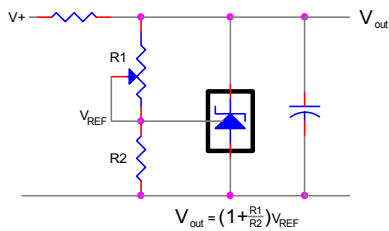


Figure 1. Shunt Regulator

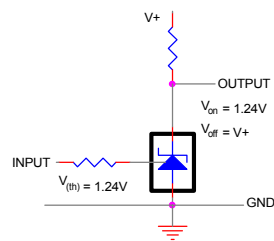


Figure 2. Single-supply comparator  
With temperature compensated threshold