

## Features

- The Reference Input Voltage Tolerance is 0.5%
- Sink Current Capability of 0.1mA to 100 mA
- Programmable Output Voltage 36V
- Low Output Noise Voltage and Fast Turn On Response
- The Typical Value of the Equivalent Temperature Factor in the Whole Temperature Scope is 50 ppm/°C
- Epoxy Meets UL 94 V-0 Flammability Rating
- Moisture Sensitivity Level 1
- Halogen Free. "Green" Device (Note 1)
- Lead Free Finish/RoHS Compliant ("P" Suffix designates RoHS Compliant. See ordering information)

## Maximum Ratings

Parameter	Symbol	Value	Unit
Cathode Voltage	$V_{KA}$	37	V
Cathode Current Range	$I_K$	-100~150	mA
Reference Input Current Range	$I_{REF}$	0.05~10	mA
Power Dissipation at 25 °C	$P_D$	0.3	W
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	°C/W
Operating Temperature	$T_{opr}$	-40~125	°C
Storage Temperature Range	$T_{STG}$	-65~150	°C

## Recommended Operating Conditions

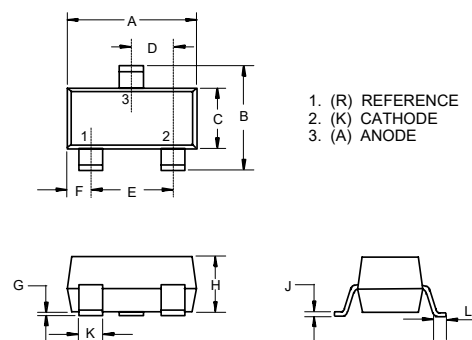
Parameter	Symbol	Min	Max	Unit
Cathode Voltage	$V_{KA}$	$V_{REF}$	36	V
Cathode Current Range	$I_K$	1.0	100	mA

## Marking Code: 431K<sub>a</sub>

Note: 1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

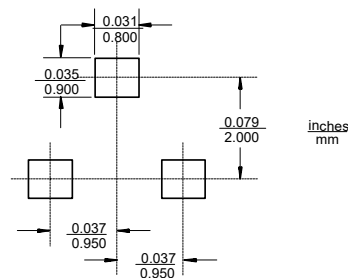
# Programmable Precision Regulator

## SOT-23



DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.110	0.120	2.80	3.04	
B	0.083	0.104	2.10	2.64	
C	0.047	0.055	1.20	1.40	
D	0.034	0.041	0.85	1.05	
E	0.067	0.083	1.70	2.10	
F	0.018	0.024	0.45	0.60	
G	0.0004	0.006	0.01	0.15	
H	0.035	0.043	0.90	1.10	
J	0.003	0.007	0.08	0.18	
K	0.012	0.020	0.30	0.51	
L	0.007	0.020	0.20	0.50	

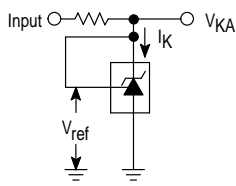
## Suggested Solder Pad Layout



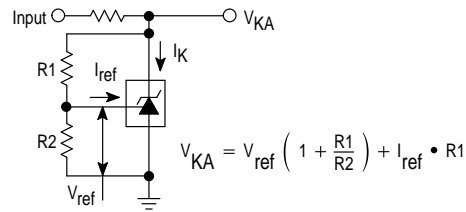
**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Reference output Voltage	$V_{ref}$	$V_{KA}=V_{REF}, I_{KA}=10mA$	2.483	2.495	2.507	V
Deviation of Reference Input Voltage	$\frac{\Delta V_{ref}}{\Delta T}$	$V_{KA}=V_{REF}, I_{KA}=10mA$ $T_{min} \leq T_a \leq T_{max}$		4.5	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\frac{\Delta V_{ref}}{\Delta V_{KA}}$	$\Delta V_{KA}=10V \sim V_{ref}$		-1.0	-2.7	
		$\Delta V_{KA}=36V \sim 10V$		-0.5	-2.0	
Reference Input Current	$I_{ref}$	$I_{KA}=10mA,$ $R_1=10K\Omega, R_2=\infty$		1.5	4.0	$\mu A$
Deviation of Reference Input Current Over Full Temperature Range	$\frac{\Delta I_{ref}}{\Delta T}$	$I_{KA}=10mA,$ $R_1=10K\Omega, R_2=\infty$ $T_A=full\ Temperature$		0.4	1.2	$\mu A$
Minimum Cathode Current for Regulation	$I_{KA(min)}$			0.45	1.0	mA
Off-State Cathode Current	$I_{KA(off)}$	$V_{KA}=40V, V_{REF}=0V$		0.05	0.5	$\mu A$
Dynamic Impedance	$Z_{KA}$	$I_{KA}=1\ to\ 100mA, f \leq 1.0KHz$		0.15	0.5	$\Omega$

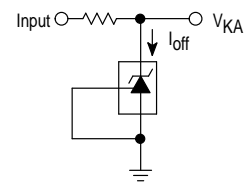
**Figure 1. Test Circuit for  $V_{KA} = V_{ref}$**



**Figure 2. Test Circuit for  $V_{KA} > V_{ref}$**

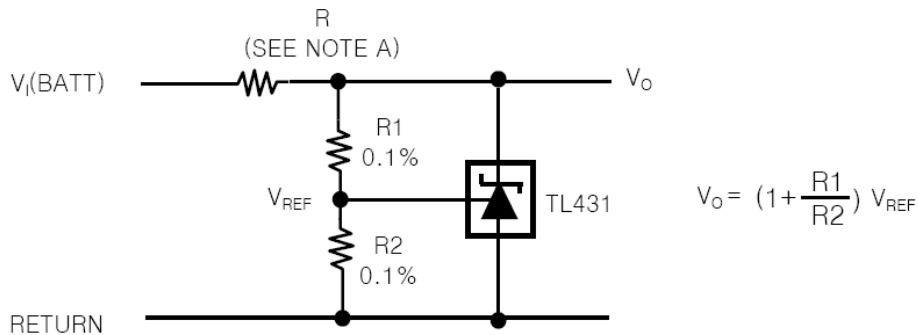


**Figure 3. Test Circuit for  $I_{off}$**



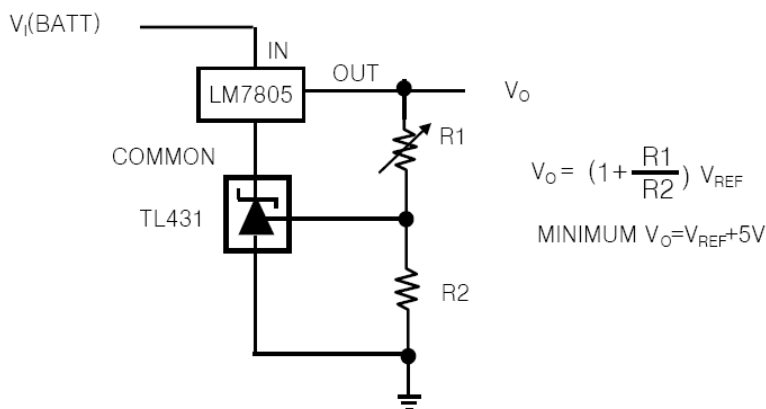
## APPLICATION INFORMATION

### 1. Shunt Regulator

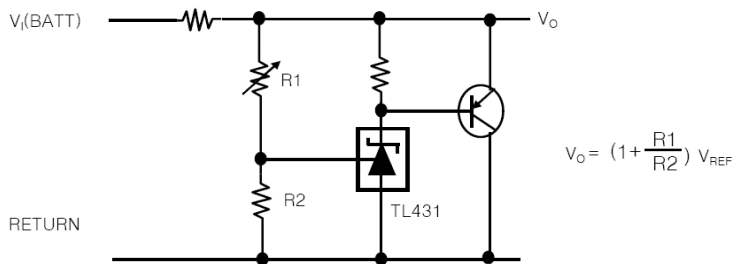


Note A : R Should provide cathode current 1mA to the TL431 at minimum  $V_{i(BATT)}$

### 2. Output Control of a Three-Terminal Fixed Regulator

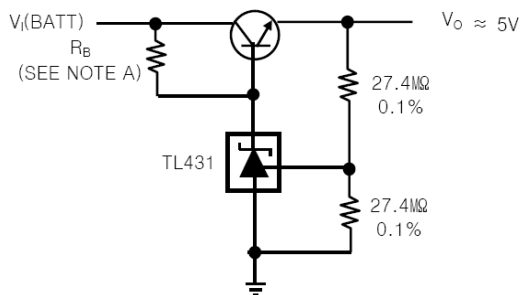


### 3. High-Current Shunt Regulator

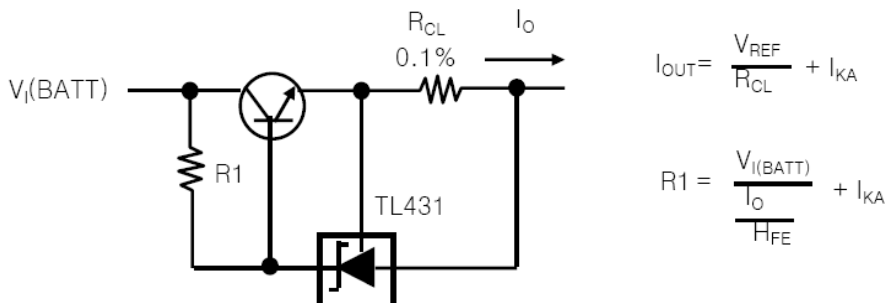


NOTE A : R<sub>B</sub> Should provide cathode current ≥ 1mA to the TL431.

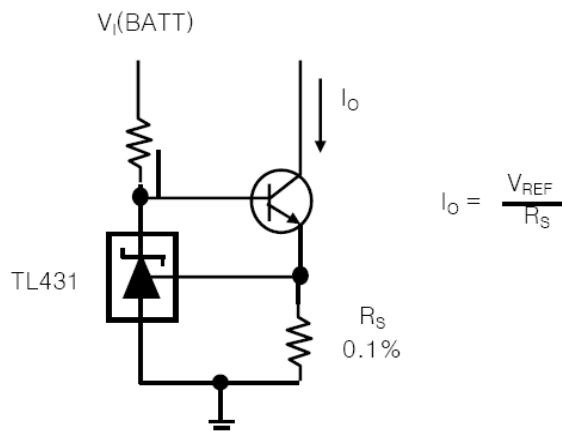
### 4. Efficient 5-V Precision Regulator



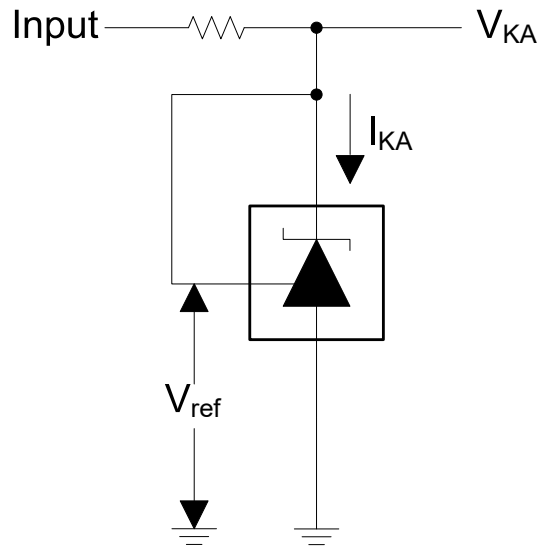
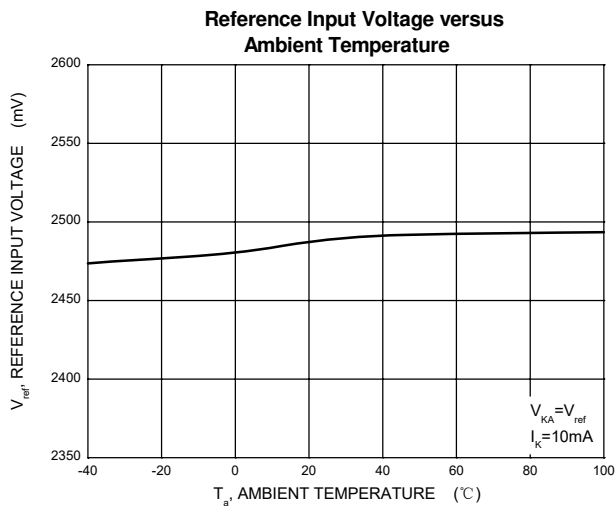
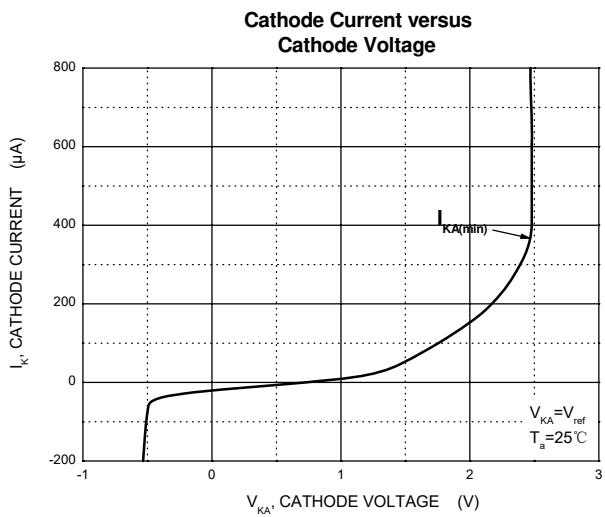
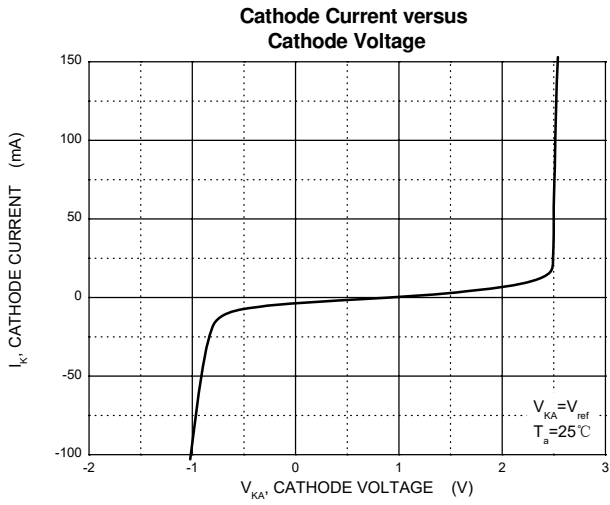
### 5. Precision Current Limiter



### 6. Precision Constant-Current Sink



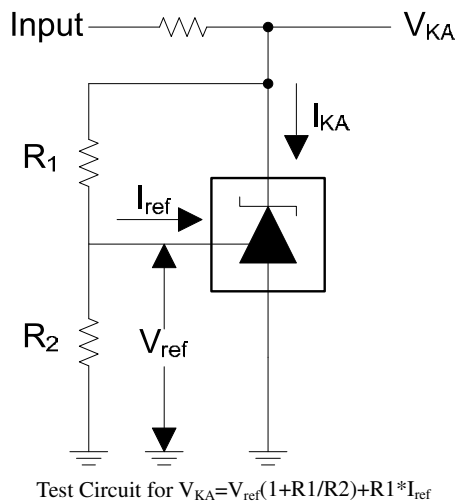
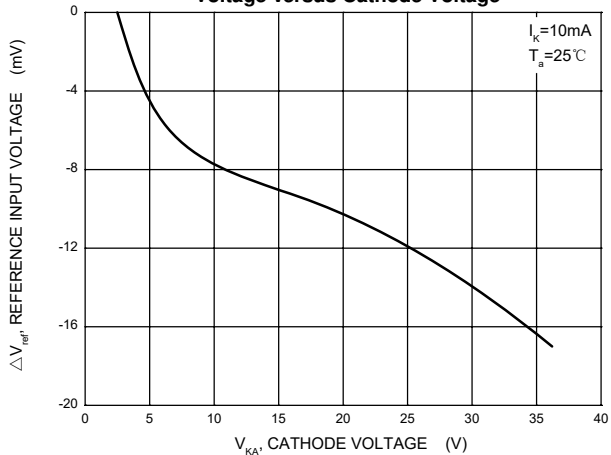
Curve Characteristics



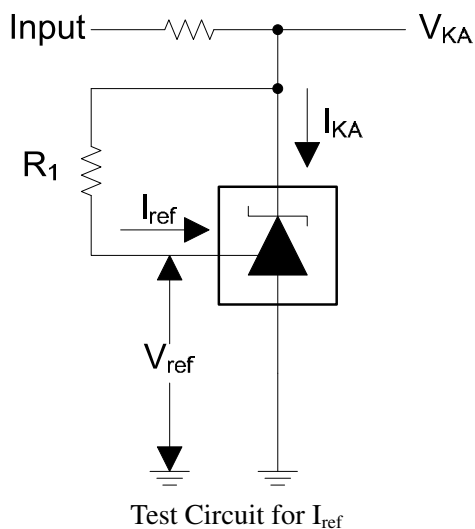
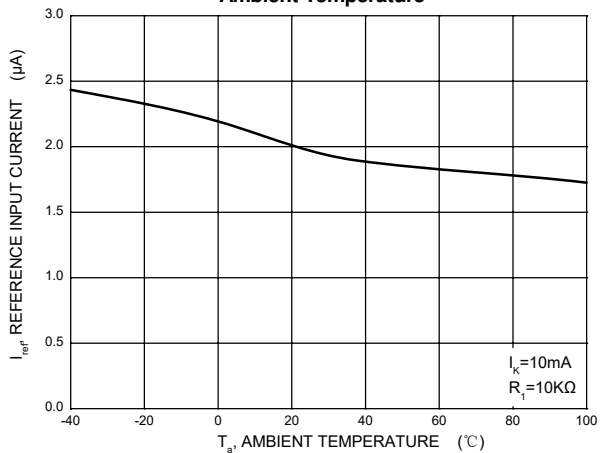
Test Circuit for  $V_{KA} = V_{ref}$

## Curve Characteristics

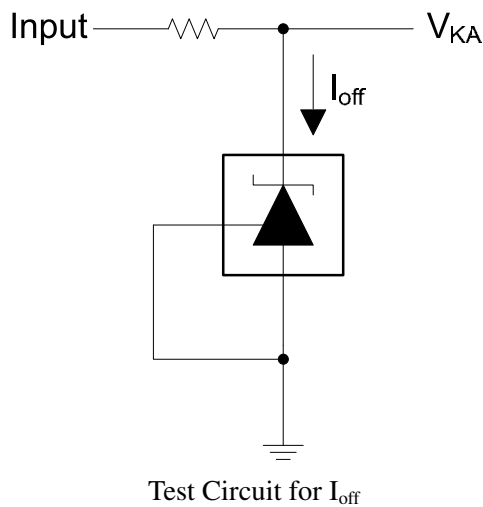
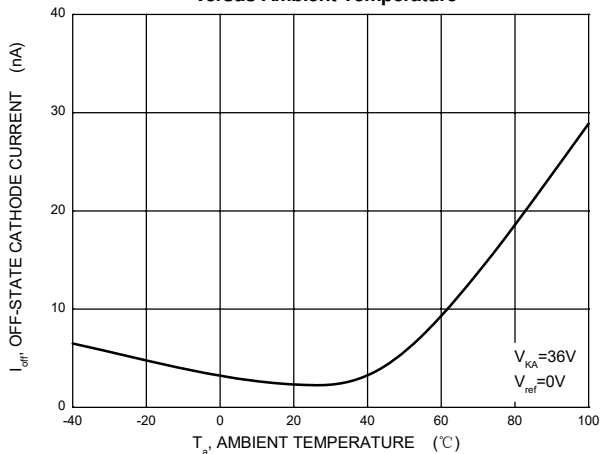
**Change in Reference Input Voltage versus Cathode Voltage**



**Reference Input Current versus Ambient Temperature**



**Off-State Cathode Current versus Ambient Temperature**



## Ordering Information

Device	Packing
Part Number-TP	Tape&Reel: 3Kpcs/Reel

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