



Micro Commercial Components



Micro Commercial Components  
20736 Marilla Street Chatsworth  
CA 91311  
Phone: (818) 701-4933  
Fax: (818) 701-4939

## TL431K

### Features

- Lead Free Finish/RoHS Compliant ("P" Suffix designates RoHS Compliant. See ordering information)
- Epoxy meets UL 94 V-0 flammability rating
- Moisture Sensitivity Level 1
- Programmable Output Voltage 36V
- Sink Current Capability of 0.1mA to 100 mA
- The typical value of the equivalent temperature factor in the whole temperature scope is 50 ppm/°C
- Low output noise voltage and Fast turn on response
- The Reference Input Voltage tolerance is 0.5%
- Marking Code: 431K
- Halogen free available upon request by adding suffix "-HF"

### 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    |
| Operating Temperature         | $T_{opr}$ | -40~+85  | °C   |
| Storage Temperature Range     | $T_{STG}$ | -65~+150 | °C   |

### Recommended Operating Conditions

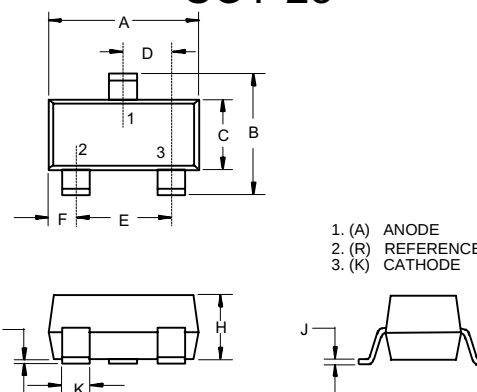
| Parameter             | Sym      | Min       | Max | Unit |
|-----------------------|----------|-----------|-----|------|
| Cathode Voltage       | $V_{KA}$ | $V_{REF}$ | 36  | V    |
| Cathode Current Range | $I_K$    | 1.0       | 100 | mA   |

### Electrical Characteristics @ 25°C Unless Otherwise Specified

| Parameter                                                                   | Sym                                    | Min    | Typ    | Max    | Test conditions                                                              |
|-----------------------------------------------------------------------------|----------------------------------------|--------|--------|--------|------------------------------------------------------------------------------|
| Reference Input Voltage                                                     | $V_{ref}$                              | 2.482V | 2.500V | 2.508V | $V_{KA}=V_{REF}$ , $I_{KA}=10mA$                                             |
| Deviation of reference input voltage                                        | $\frac{\Delta V_{ref}}{\Delta T}$      |        | 4.5mV  | 17mV   | $V_{KA}=V_{REF}$ , $I_{KA}=10mA$<br>$T_{min} \leq T_A \leq T_{max}$          |
| Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage | $\frac{\Delta V_{ref}}{\Delta V_{KA}}$ |        | -1.0   | -2.7   | $\Delta V_{KA}=10V \sim V_{ref}$                                             |
|                                                                             |                                        |        | -0.5   | -2.0   | $\Delta V_{KA}=36V \sim 10V$                                                 |
| Reference Input Current                                                     | $I_{ref}$                              |        | 1.5μA  | 4.0μA  | $I_{KA}=10mA$ ,<br>$R_1=10K\Omega$ , $R_2=\infty$                            |
| Deviation of Reference Input Current Over Full Temperature Range            | $\frac{\Delta I_{ref}}{\Delta T}$      |        | 0.4μA  | 1.2μA  | $I_{KA}=10mA$ ,<br>$R_1=10K\Omega$ , $R_2=\infty$<br>$T_A=full\ Temperature$ |
| Minimum Cathode Current for Regulation                                      | $I_{KA(min)}$                          |        | 0.45mA | 1.0mA  |                                                                              |
| Off-State Cathode Current                                                   | $I_{KA(off)}$                          |        | 0.05μA | 0.5μA  | $V_{KA}=40V$ , $V_{REF}=0V$                                                  |
| Dynamic Impedance                                                           | $Z_{KA}$                               |        | 0.15Ω  | 0.5Ω   | $I_{KA}=1\ to\ 100mA$ ,<br>$f \leq 1.0KHz$                                   |

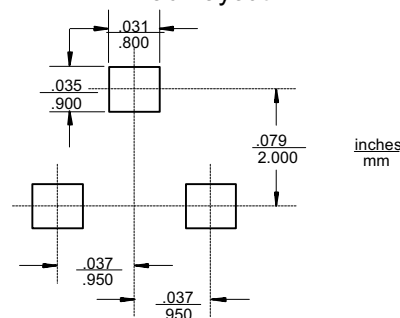
## Programmable Precision Regulator

### SOT-23



| DIM | INCHES |       | MM   |      | NOTE |
|-----|--------|-------|------|------|------|
|     | MIN    | MAX   | MIN  | MAX  |      |
| A   | .110   | .120  | 2.80 | 3.04 |      |
| B   | .083   | .104  | 2.10 | 2.64 |      |
| C   | .047   | .055  | 1.20 | 1.40 |      |
| D   | .035   | .041  | .89  | 1.03 |      |
| E   | .070   | .081  | 1.78 | 2.05 |      |
| F   | .018   | .024  | .45  | .60  |      |
| G   | .0005  | .0039 | .013 | .100 |      |
| H   | .035   | .044  | .89  | 1.12 |      |
| J   | .003   | .007  | .085 | .180 |      |
| K   | .015   | .020  | .37  | .51  |      |

### Suggested Solder Pad Layout



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

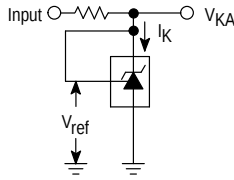


Figure 2. Test Circuit for  $V_{KA} > V_{ref}$

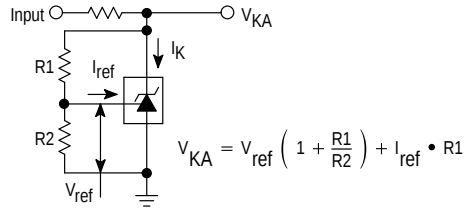
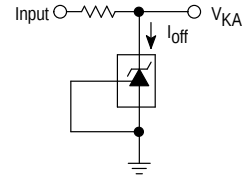
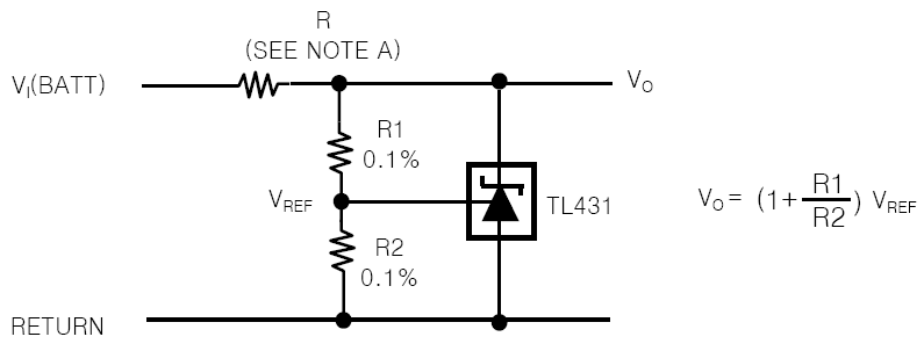


Figure 3. Test Circuit for  $I_{off}$



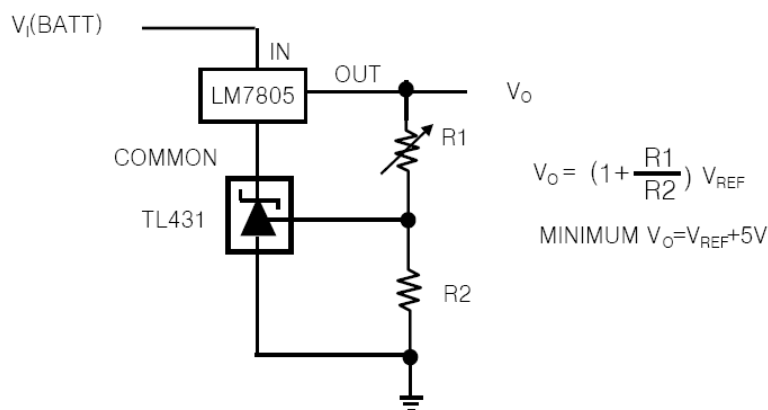
## APPLICATION INFORMATION

### 1. Shunt Regulator

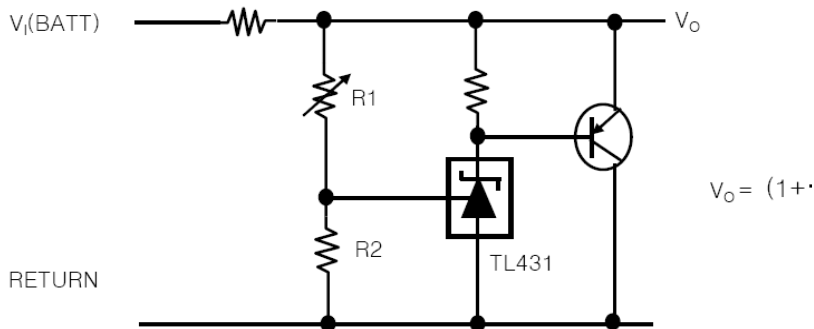


Note A : R Should provide cathode current 1mA to the TL431 at minimum  $V_{I(BATT)}$

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

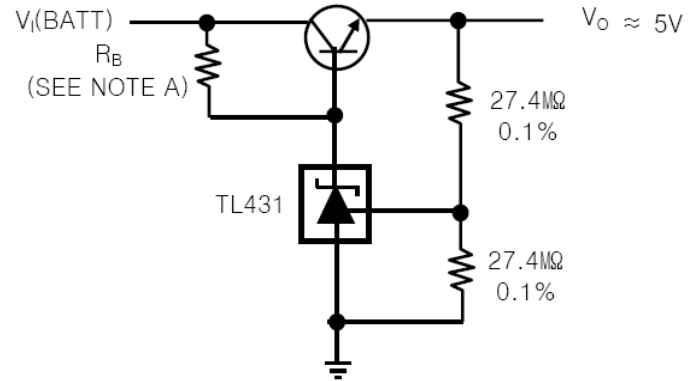


### 3. High-Current Shunt Regulator

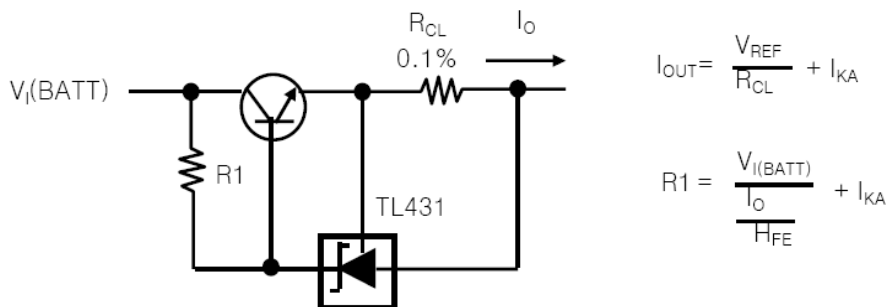


NOTE A :  $R_B$  Should provide cathode current  $\geq 1\text{mA}$  to the TL431.

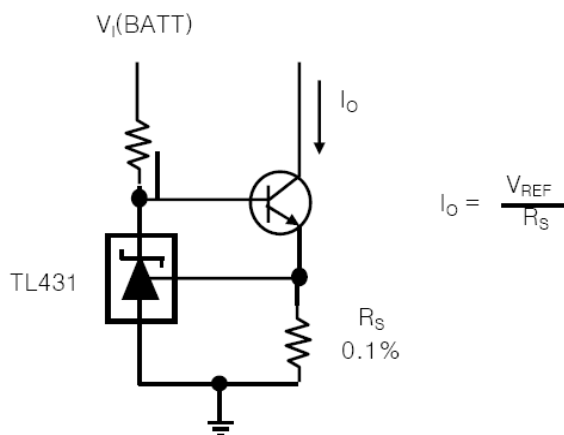
### 4. Efficient 5-V Precision Regulator



### 5. Precision Current Limiter



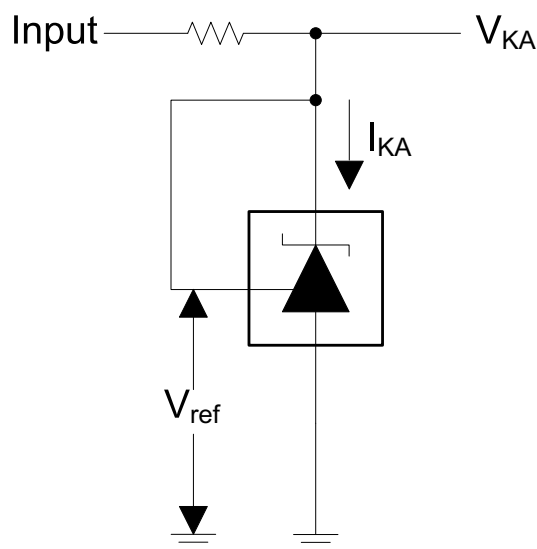
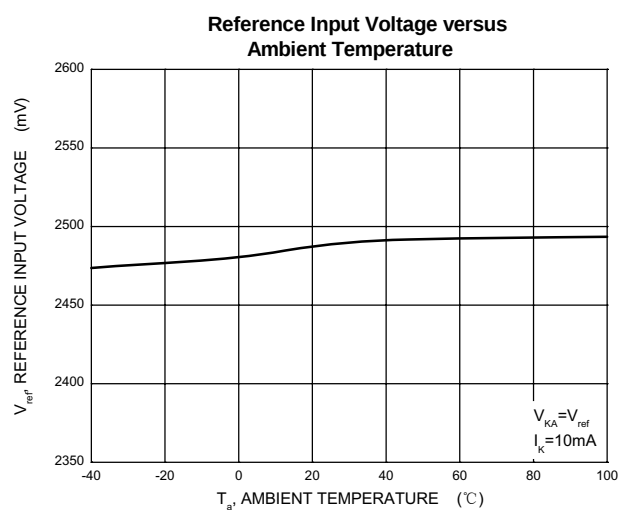
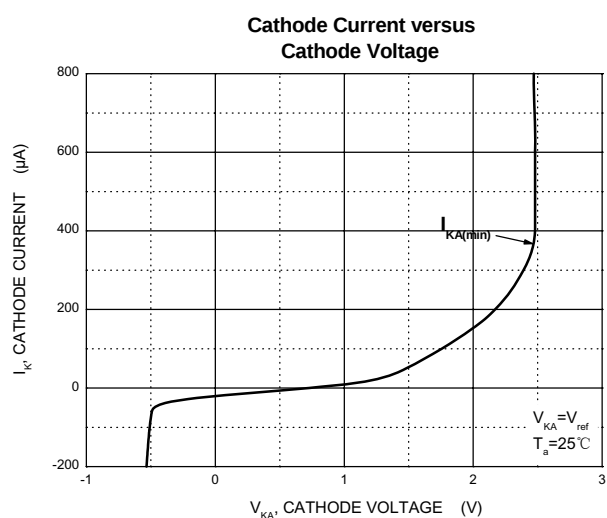
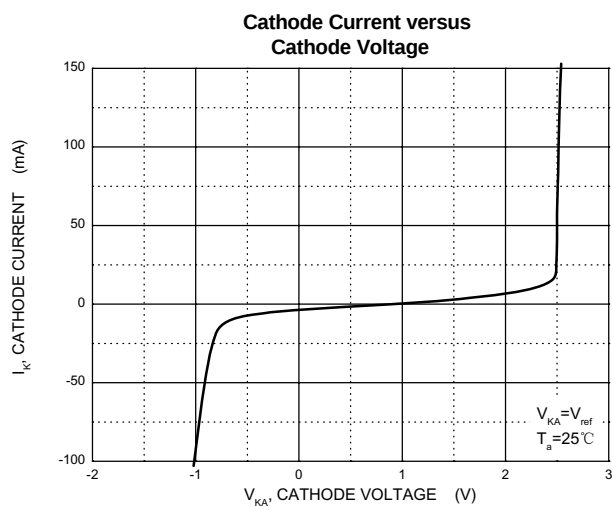
### 6. Precision Constant-Current Sink



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**MCC**

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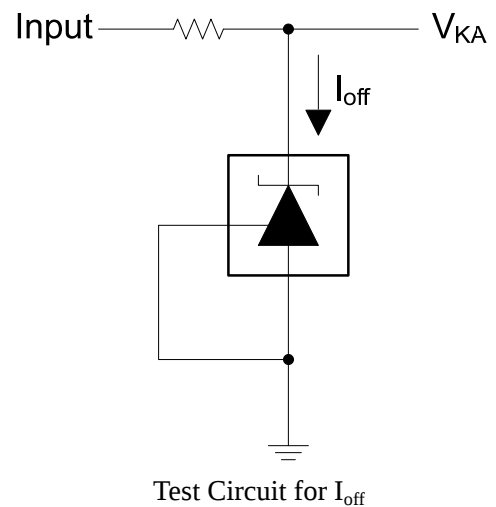
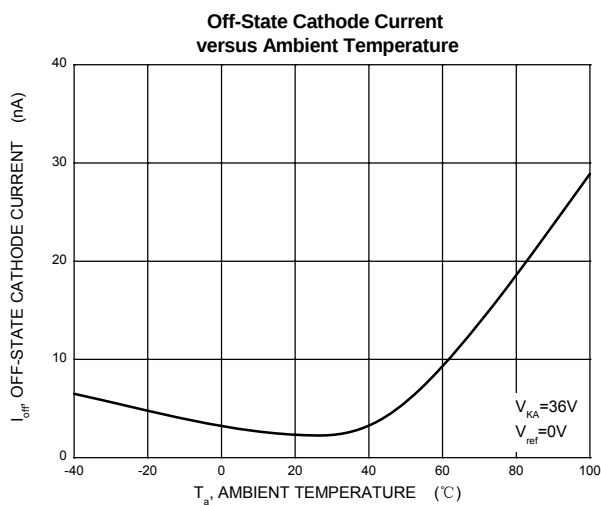
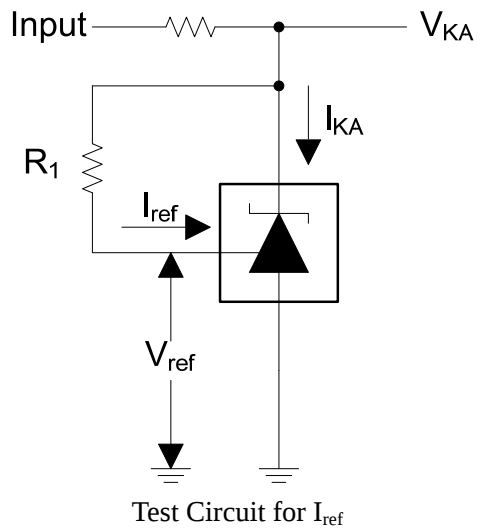
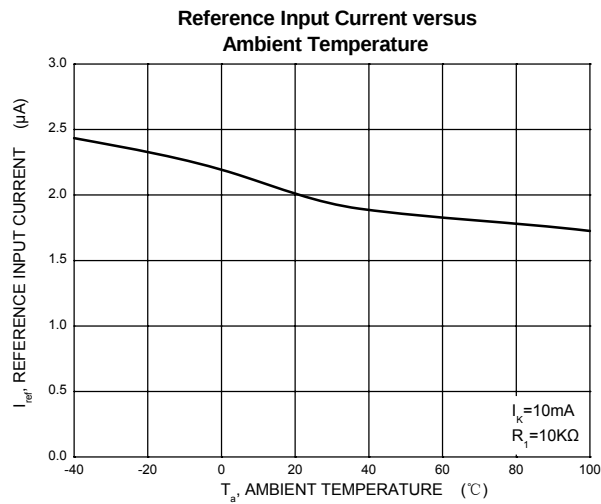
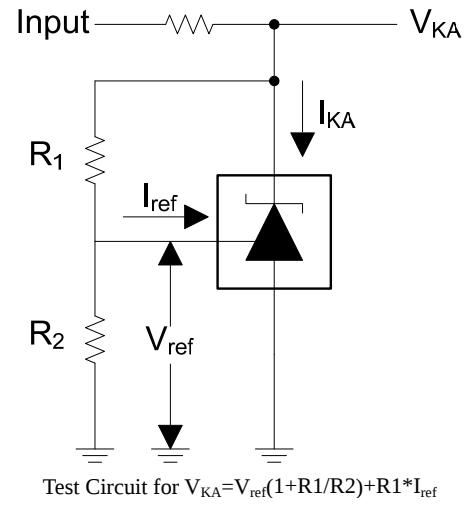
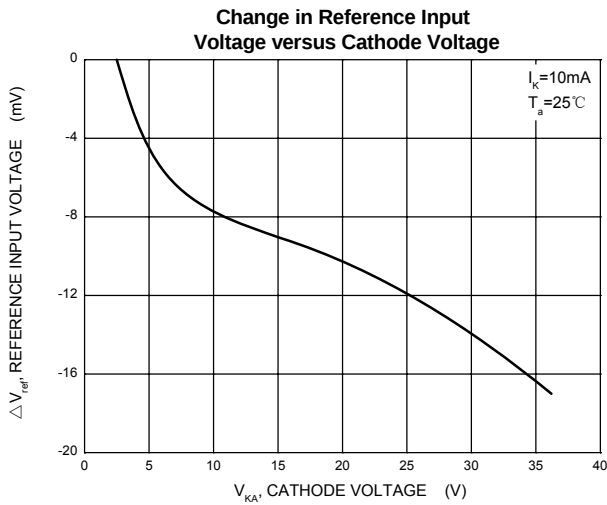


Test Circuit for  $V_{KA} = V_{ref}$

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## Ordering Information :

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

Note : Adding "-HF" suffix for halogen free, eg. Part Number-TP-HF

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