

Features

- The Reference Input Voltage Tolerance is 0.5%
- Programmable Output Voltage 36V
- Low Output Noise Voltage and Fast Turn On Response
- 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}	40	V
Cathode Current Range	I_k	100	mA
Reference Input Current Range	I_{REF}	10	mA
Power Dissipation at 25 °C	P_D	0.31	W
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	390	°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

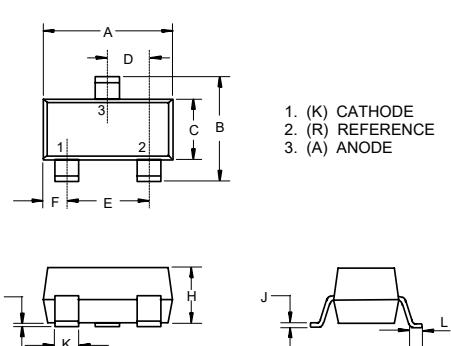
Note:

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

Marking Code: 431HA

A circuit diagram showing a resistor R in series with a diode and a switch. The switch is represented by a vertical line with a horizontal bar across it, indicating it is open. The diode is shown with its arrow pointing to the right, and the switch is positioned between the diode and the resistor.

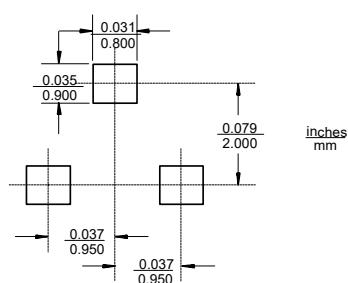
Programmable Precision Regulator



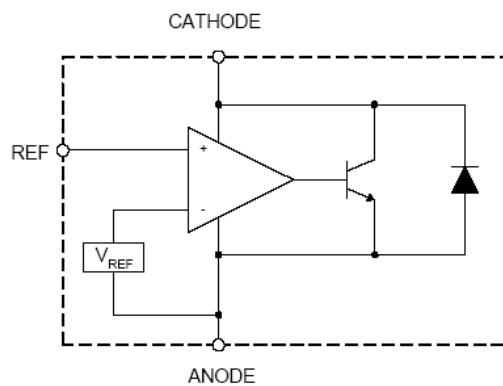
DIMENSIONS

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	
I	0.007	0.020	0.20	0.50	

Suggested Solder Pad Layout



Functional Block Diagram

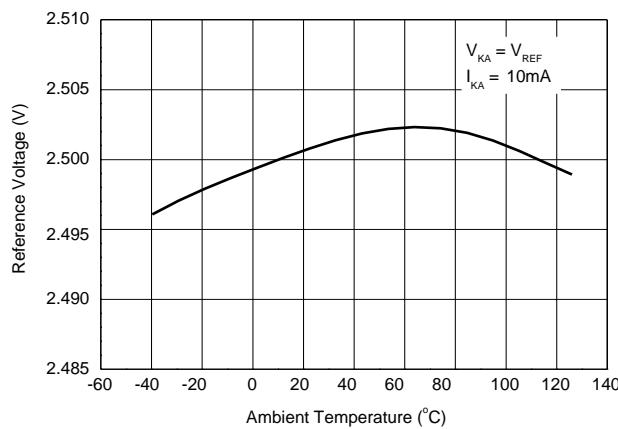


Electrical Characteristics @ 25°C (Unless Otherwise Specified)

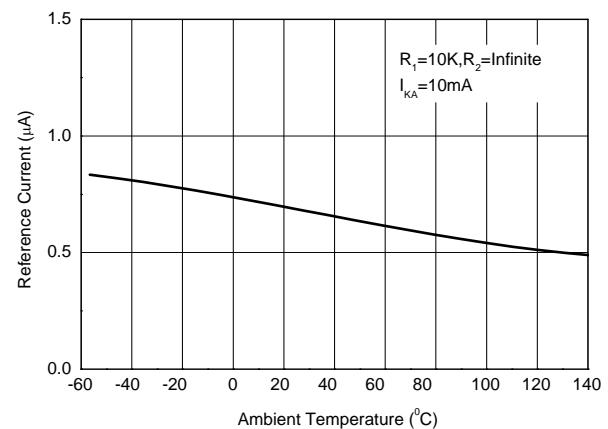
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Reference output Voltage	V_{ref}	$V_{\text{KA}}=V_{\text{REF}}, I_{\text{KA}}=10\text{mA}$	2.487	2.5	2.512	V
Deviation of Reference Voltage Over Full Temperature Range	ΔV_{ref}	$V_{\text{KA}}=V_{\text{REF}}, I_{\text{KA}}=10\text{mA}$ $T_A=-40\text{~}125^\circ\text{C}$		4.5		mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta V_{\text{ref}} / \Delta V_{\text{KA}}$	$\Delta V_{\text{KA}}=10\text{V} \sim V_{\text{ref}}$		-1.0		mV/V
		$\Delta V_{\text{KA}}=36\text{V} \sim 10\text{V}$		-0.5		
Reference Input Current	I_{ref}	$I_{\text{KA}}=10\text{mA},$ $R_1=10\text{K}\Omega, R_2=\infty$		0.7	4.0	μA
Deviation of Reference Input Current Over Full Temperature Range	$\Delta I_{\text{ref}} / \Delta T$	$I_{\text{KA}}=10\text{mA},$ $R_1=10\text{K}\Omega, R_2=\infty$ $T_A=-40\text{~}125^\circ\text{C}$		-0.4		μA
Minimum Cathode Current for Regulation	$I_{\text{KA(min)}}$			0.4	1.0	mA
Off-State Cathode Current	$I_{\text{KA(off)}}$	$V_{\text{KA}}=36\text{V}, V_{\text{REF}}=0\text{V}$		0.15	1.0	μA
Dynamic Impedance	Z_{KA}	$V_{\text{KA}}=V_{\text{REF}}, I_{\text{KA}}=1\text{~}100\text{mA}, f \leq 1.0\text{KHz}$		0.2	0.5	Ω

Curve Characteristics

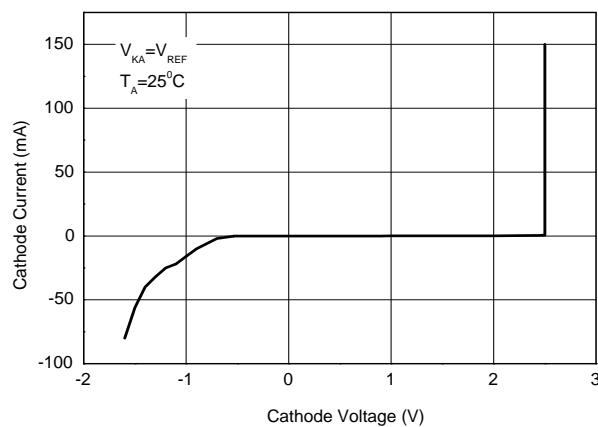
Reference Voltage vs. Ambient Temperature



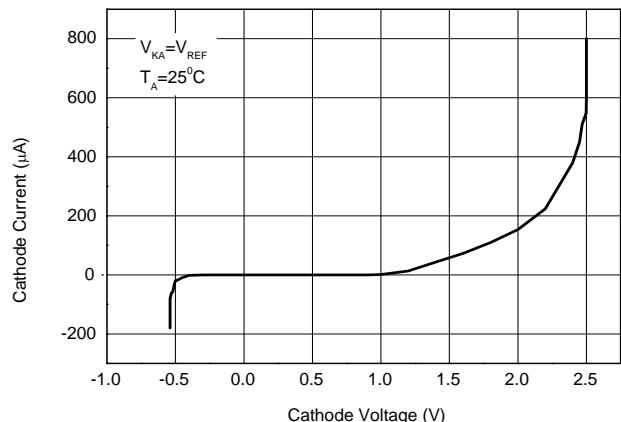
Reference Current vs. Ambient Temperature



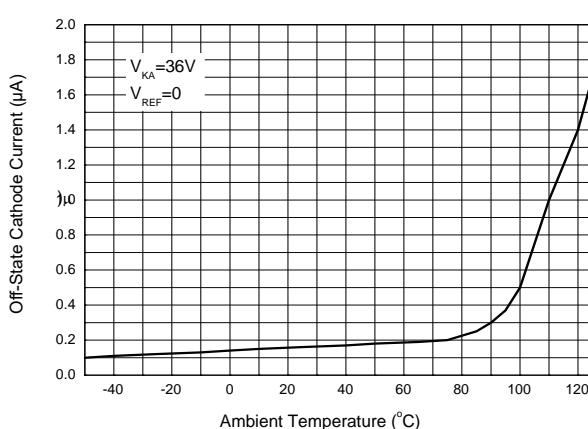
Cathode Current vs. Cathode Voltage



Cathode Current vs. Cathode Voltage



Off-State Cathode Current vs. Ambient Temperature



Ratio of Delta Reference Voltage to the Ratio of Delta Cathode Voltage

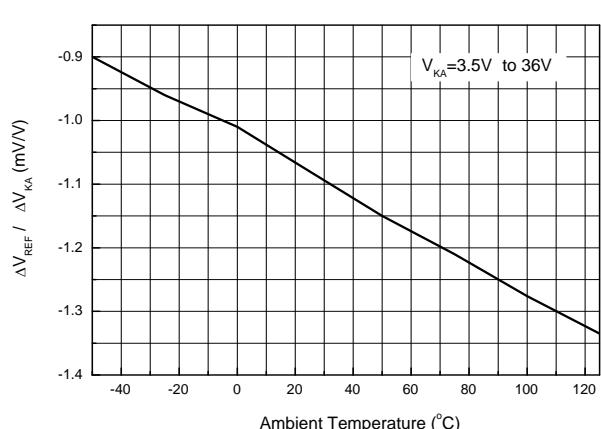


Figure 1. Test Circuit for $V_{KA} = V_{ref}$

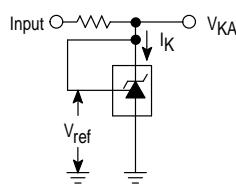


Figure 2. Test Circuit for $V_{KA} > V_{ref}$

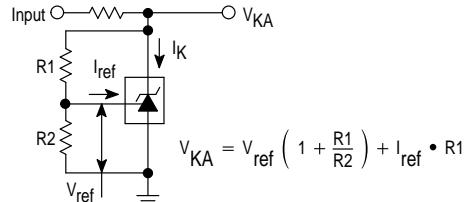
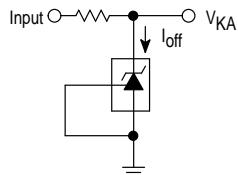
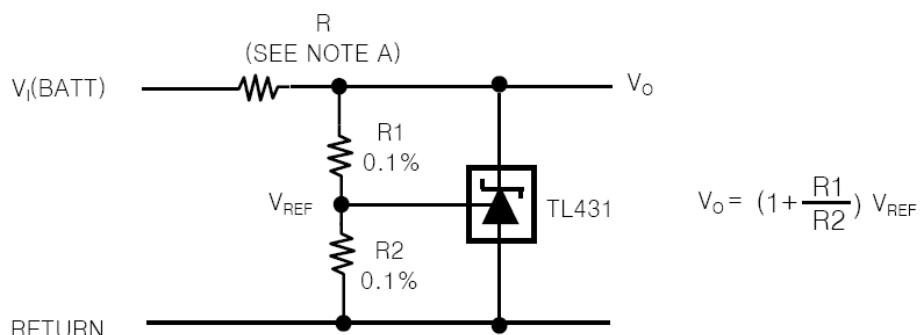


Figure 3. Test Circuit for I_{off}



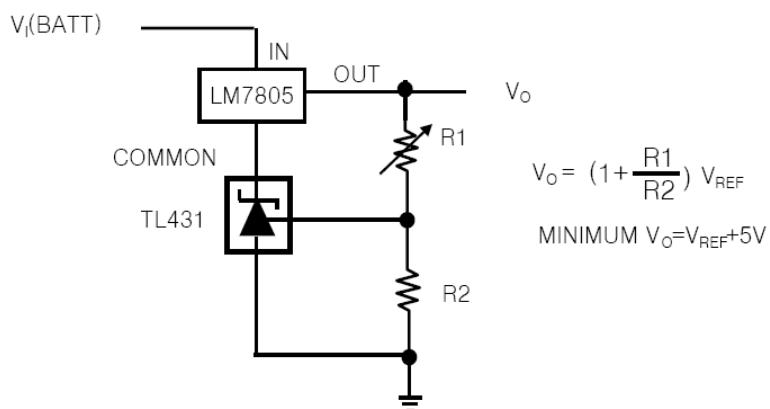
APPLICATION INFORMATION

1. Shunt Regulator

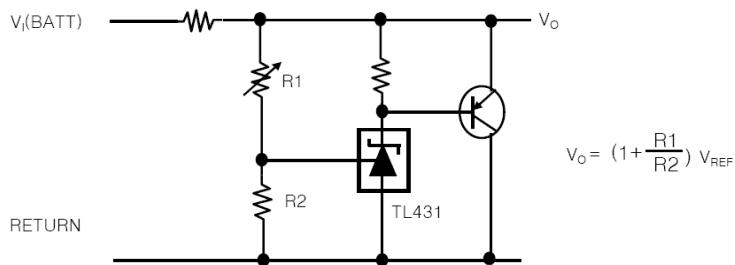


Note A : R Should provide cathode current 1mA to the TL431 at minimum $V_{I(BATT)}$

2. Output Control of a Three-Terminal Fixed Regulator

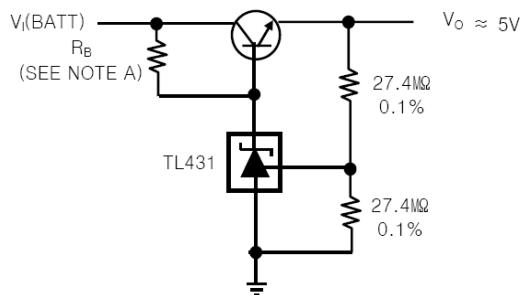


3. High-Current Shunt Regulator

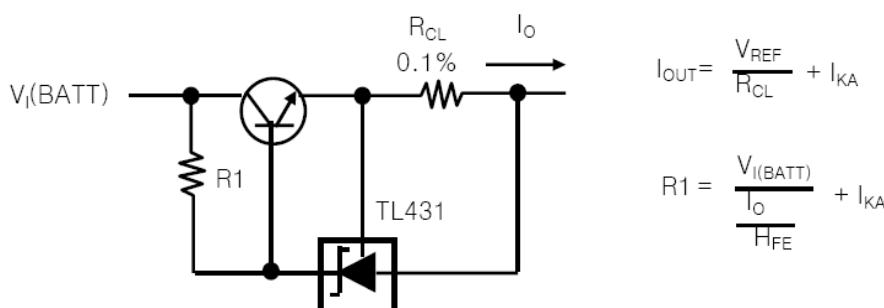


NOTE A : R_B Should provide cathode current $\geq 1\text{mA}$ to the TL431.

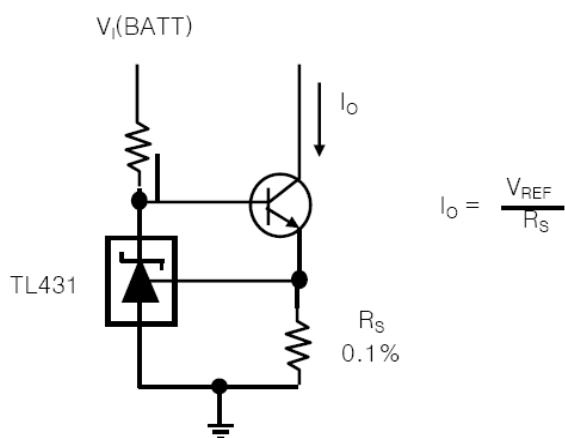
4. Efficient 5-V Precision Regulator



5. Precision Current Limiter



6. Precision Constant-Current Sink



Ordering Information

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

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