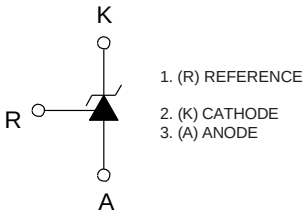
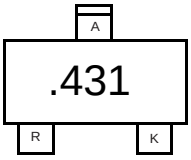
Programmable Precision Regulator

SOT-23

Features

- The Reference Input Voltage Tolerance is 0.5%
- Sink Current Capability of 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/℃
- Moisture Sensitivity Level 3
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free. “Green” Device
- Lead Free Finish/RoHS Compliant ("P" Suffix designates RoHS Compliant. See ordering information)





Mechanical Data

- **Case**: SOT-23
- **Terminals**: Tin plated leads, solderable per J-S-002 and JESD22-B102

■ Maximum Ratings (Ta=25℃ Unless otherwise specified)

Parameter	Symbol	Unit	Value
Cathode Voltage	VKA	V	40
Cathode Current Range	IK	mA	-100~150
Reference Input Current Range	IREF	mA	0.05~10
Power Dissipation at 25 ℃	PD	W	0.3
Thermal Resistance Junction to Ambient	RθJA	℃/W	400
Operating Temperature	Topr	℃	-40~125
Storage Temperature Range	TSTG	℃	-65~150

■ Recommended Operating Conditions

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

■ **Electrical Characteristics** (VKA=VREF, IK=10mA, TA=25°C, Unless Otherwise Specified)

Item	Symbol	Unit	Conditions	Min	Typ	Max
Reference output Voltage	V_{REF}	V	$V_{KA}=V_{REF}$, $I_{KA}=10mA$	2.483	2.495	2.507
Deviation of Reference Input Voltage	$\triangle V_{REF}$ / $\triangle T$	mV	$V_{KA}=V_{REF}$, $I_{KA}=10mA$ $-40°C \le T_A \le 125°C$		4.5	8
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\triangle V_{REF}$ / $\triangle V_{KA}$	mV mV	$\triangle V_{KA}=10V \sim V_{REF}$, $I_{KA}=10mA$ $\triangle V_{KA}=36V \sim 10V$, $I_{KA}=10mA$	-4.0 -0.4	0 0	2.7 2.0
Reference Input Current	I_{ref}	uA	$I_{KA}=10mA$, $R_1=10K\Omega$, $R_2=\infty$		1.8	4.0
Deviation of Reference Input Current Over Full Temperature Range	$\triangle I_{REF}$ / $\triangle T$	uA	$I_{KA}=10mA$, $R_1=10K\Omega$, $R_2=\infty$ $-40°C \le T_A \le 125°C$		0.4	1.2
Minimum Cathode Current for Regulation	$I_{KA(min)}$	uA	$V_{KA}=V_{REF}$		0.25	0.5
Off-State Cathode Current	$I_{KA(off)}$	mA	$V_{KA}=40V$, $V_{REF}=0V$		0.2	0.9
Dynamic Impedance	Z_{KA}	Ω	$V_{KA}=V_{REF}$, $I_{KA}=1$ to 100mA, $f \le 1.0KHz$		0.27	0.5

■ **Ordering Information** (Example)

PREFERED P/N	PACKING CODE	UNIT WEIGHT(g)	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
TL431LB	F2	Approximate 0.008	3000	30000	120000	7” reel

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

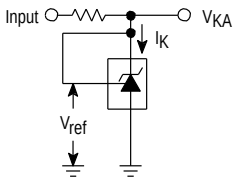


Figure 2. Test Circuit for $V_{KA} > V_{ref}$

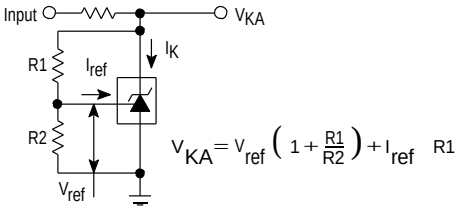
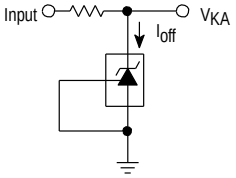
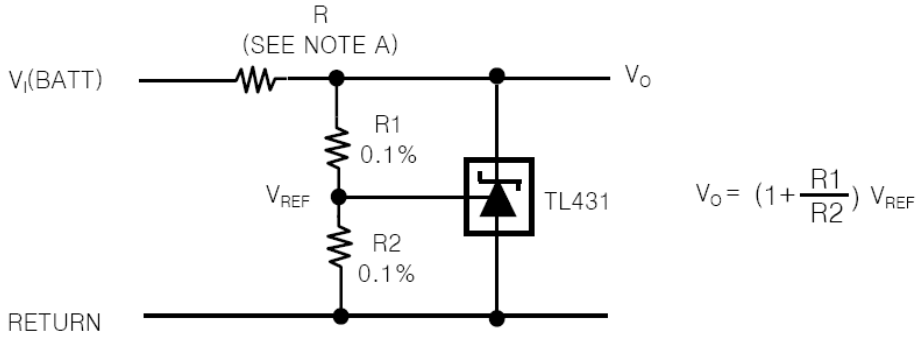


Figure 3. Test Circuit for I_{off}



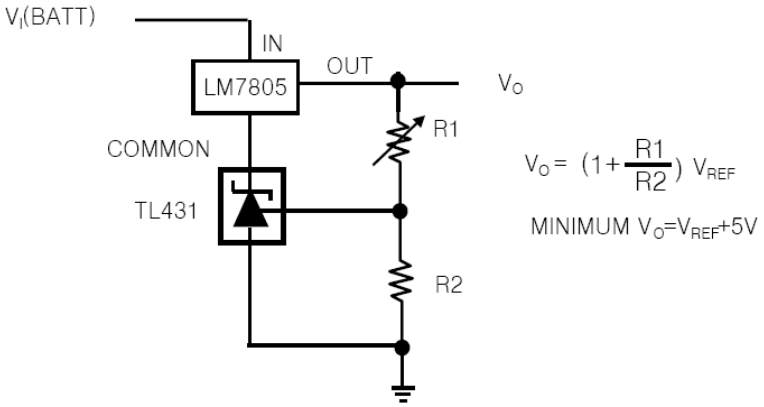
APPICATION INFORMATION

1. Shunt Regulator

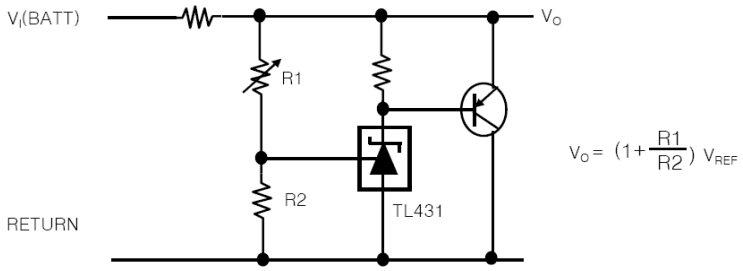


Note A : R Should provide cathode current 1mA to the TL431 at minimum $V_{I(BATT)}$

2. Output Control of a Three-Terminal Fixed Regulator

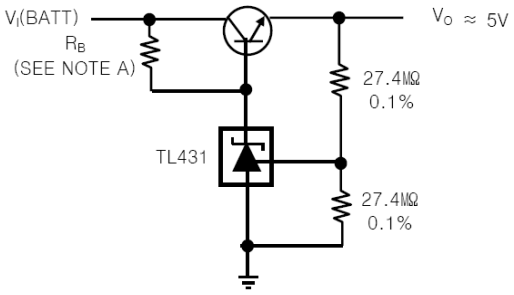


3. High-Current Shunt Regulator

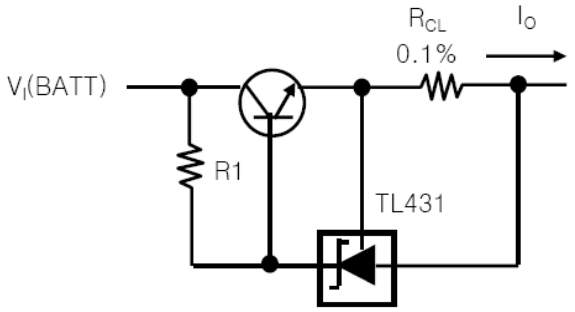


NOTE A : R_B Should provide cathode current≥1mA to the TL431.

4. Efficient 5-V Precision Regulator



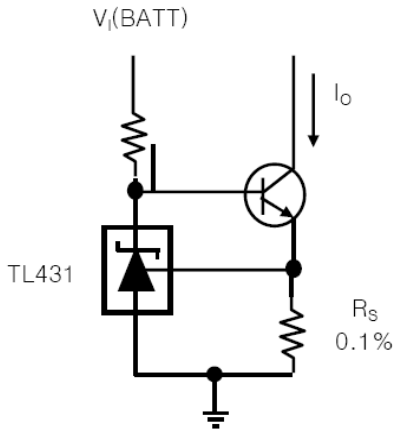
5. Precision Current Limiter



$$I_{OUT} = \frac{V_{REF}}{R_{CL}} + I_{KA}$$

$$R1 = \frac{V_{I(BATT)}}{\frac{I_O}{H_{FE}}} + I_{KA}$$

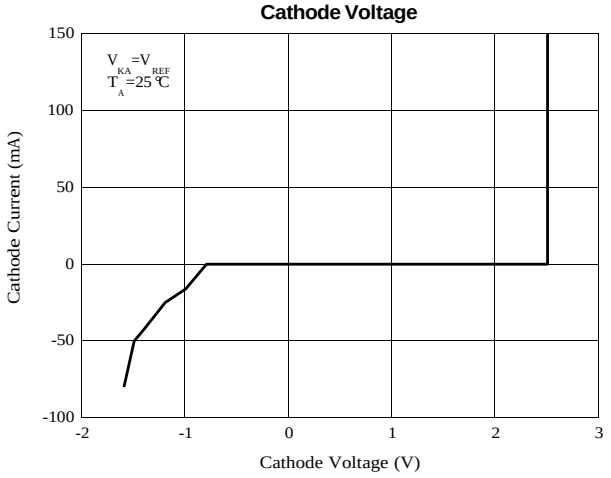
6. Precision Constant-Current Sink



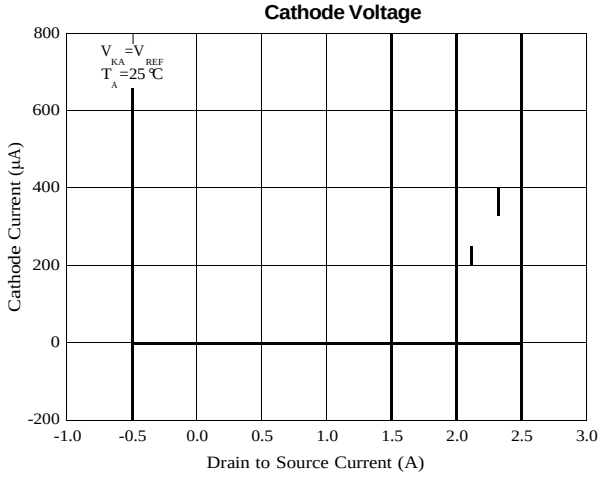
$$I_O = \frac{V_{REF}}{R_S}$$

Curve Characteristics

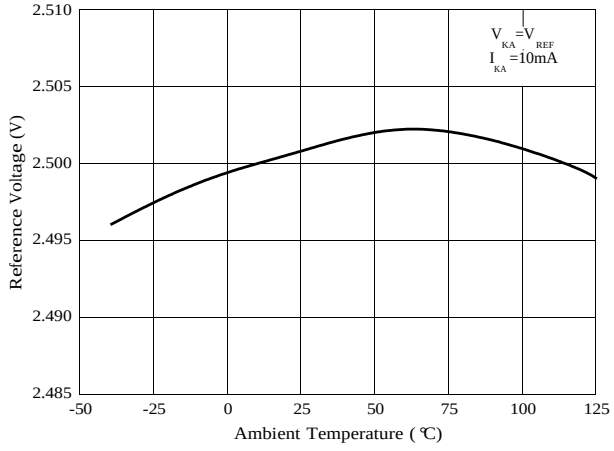
Cathode Current versus Cathode Voltage

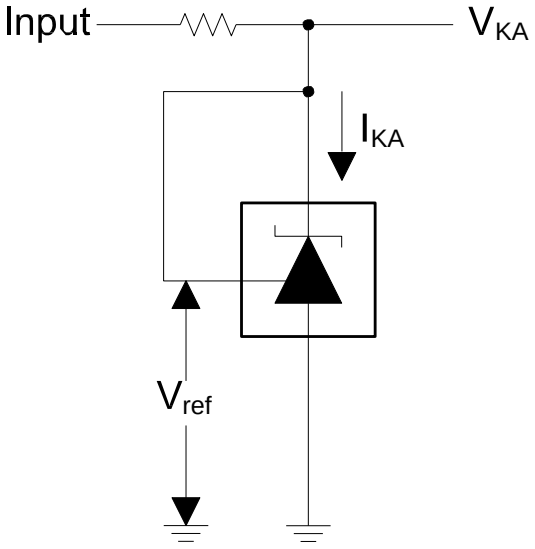


Cathode Current versus Cathode Voltage



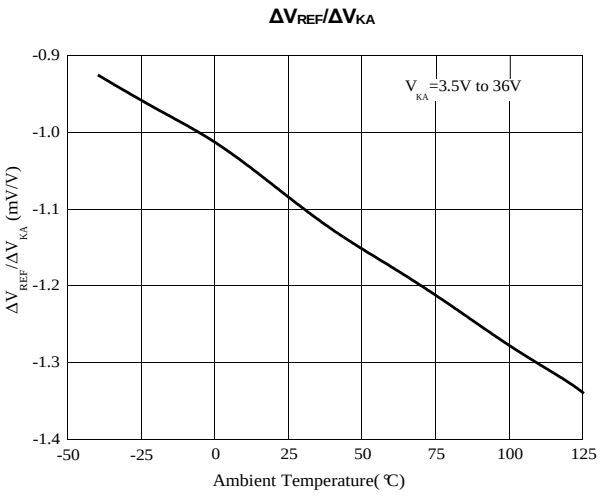
Reference Input Voltage versus Ambient Temperature

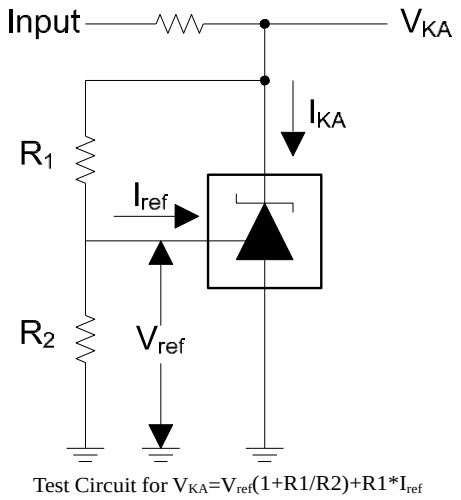




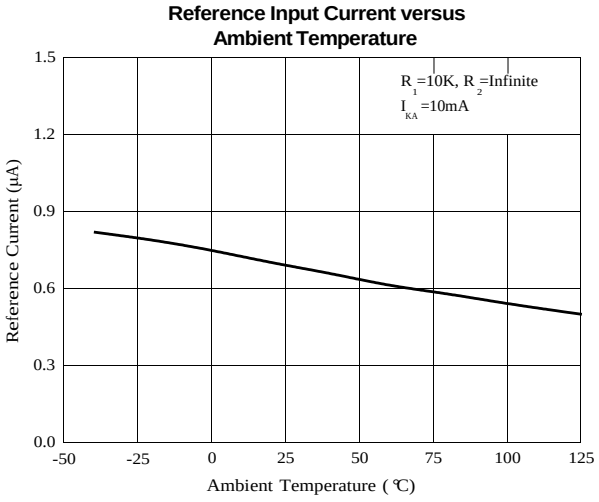
Test Circuit for $V_{KA}=V_{ref}$

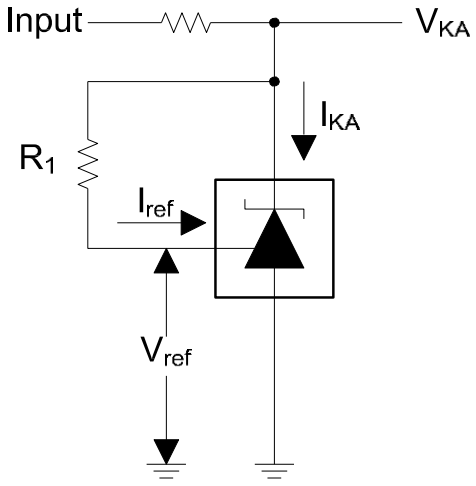
Curve Characteristics



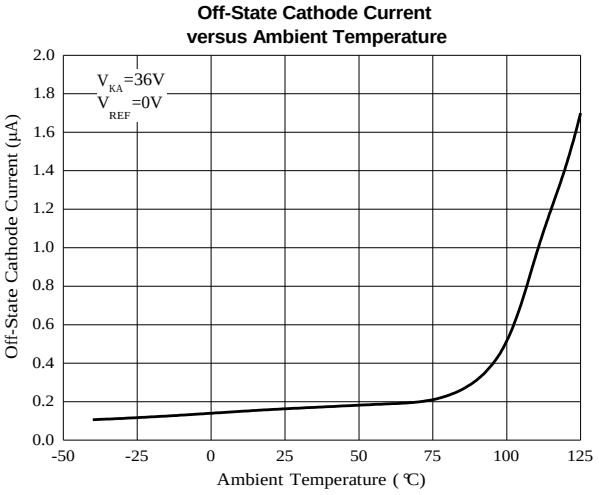


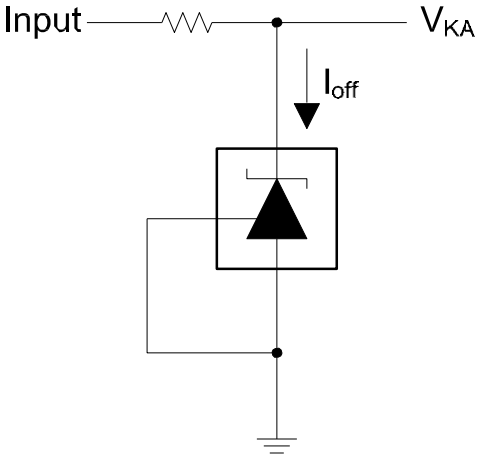
Test Circuit for $V_{KA}=V_{ref}(1+R1/R2)+R1*I_{ref}$





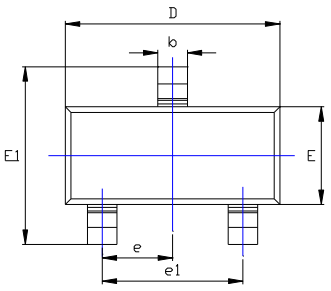
Test Circuit for I_{ref}



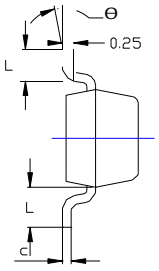


Test Circuit for I_{off}

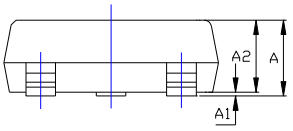
■ Outline Dimensions



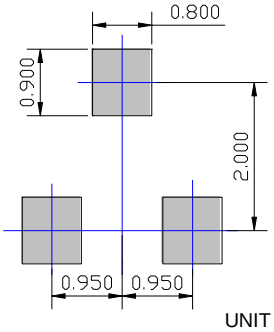
TOP VIEW



SIDE VIEW



SIDE VIEW



UNIT：mm

SUGGESTED SOLDER PAD LAYOUT

DIMENSIONS				
SYMBOL	INCHES		Millimeter	
	MIN.	MAX.	MIN.	MAX.
A	0.035	0.045	0.900	1.150
A1	0.000	0.004	0.000	0.100
A2	0.035	0.041	0.900	1.050
b	0.012	0.020	0.300	0.500
c	0.004	0.008	0.100	0.200
D	0.110	0.118	2.800	3.000
E	0.047	0.055	1.200	1.400
E1	0.089	0.100	2.250	2.550
e	0.037TYP		0.950TYP	
e1	0.071	0.079	1.800	2.000
L	0.022REF		0.550REF	
L1	0.012	0.020	0.300	0.500
θ	0°	8°	0°	8°

NOTE:
1.PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
2.TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.
3.THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.

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ISSUE	REVISION	DATE
1.0	1. ADD New datasheet	20-Jan-26