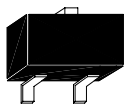
Adjustable Precision Shunt Regulators

TL431IN3



SOT-23

Description

The TL431IN3 series are three-terminal adjustable regulators with guaranteed thermal stability over applicable temperature range. The output voltage may be set to any value between V_{REF} (approximately 2.500 volts) and 36 volts with two external resistors. These devices have a typical dynamic output impedance of 0.2Ω. Active output circuitry provides a very sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.

Features

- Programmable output voltage
- Temperature coefficient is 20ppm/°C typical
- Temperature compensated for operation over full temperature range
- Low output noise voltage
- Fast turn on response
- Heat Resistance, Soldering iron : 300°C, 5 seconds
- Pb-free and halogen-free package
- ESD protection up to 7500V

Classification

Rank	A	B	C
V_{REF}	2.500±0.5%	2.500±1%	2.500±2%

Ordering Information

Device	Package	Shipping
TL431IN3- X - T1 - G	SOT-23 (Pb-free lead plating and halogen-free package)	3000 pcs / tape & reel

Environment friendly grade : S for RoHS compliant products, G for RoHS compliant and green compound products

Packing spec, T1 : 3000 pcs / tape & reel, 7” reel

Product rank, zero for no rank products

Product name

Absolute Maximum Ratings

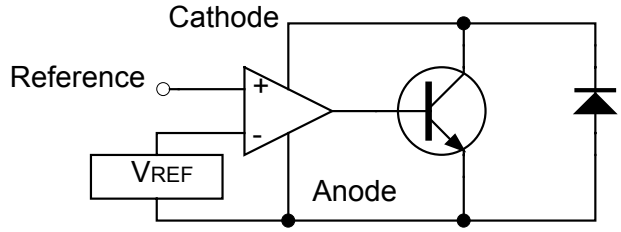
(Operating temperature range applies unless otherwise specified)

Characteristics	Symbol	Value	Unit
Cathode Voltage	V_{KA}	37	V
Cathode Current Range (Continuous)	I_K	-100~+150	mA
Reference Input Current Range	I_{REF}	0.05~+10	mA
Power Dissipation	P_D	300	mW
ESD susceptibility	V_{ESD}	7500 *	V
Operating Temperature Range	T_{opr}	-40~+125	°C
Junction Temperature Range	Tj	-40~+150	°C
Storage Temperature Range	T_{stg}	-65~+150	°C

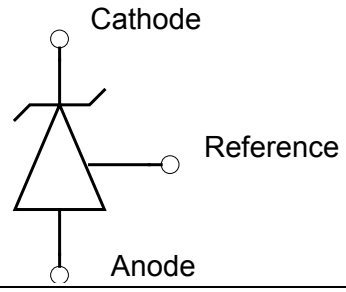
* Human body model, 1.5kΩ in series with 100pF

Functional Block Diagram & Symbol

Functional Block Diagram :



Symbol :



Test Circuits

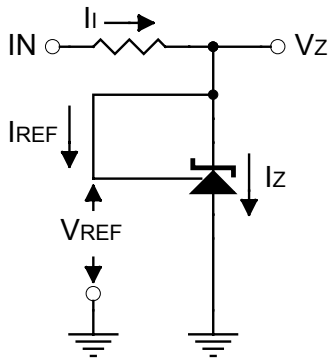


Fig1. Test Circuit for $V_Z=V_{REF}$

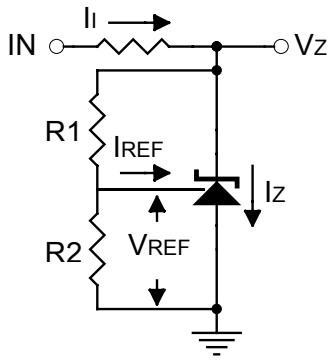


Fig 2. Test Circuit for $V_Z>V_{REF}$
Note : $V_Z=V_{REF}(1+R_1/R_2)+I_{REF}xR_1$

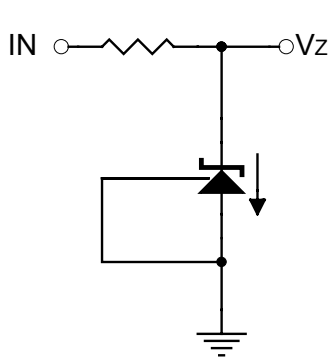
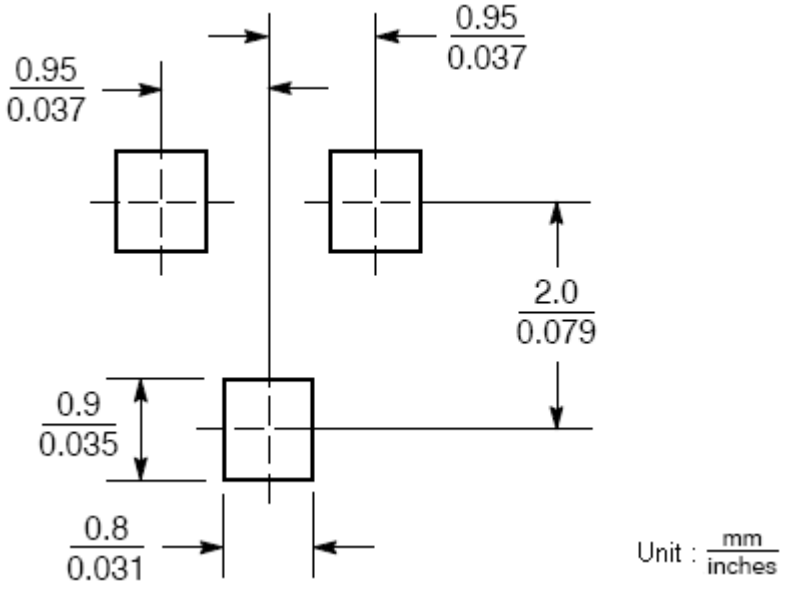


Fig3. Test Circuit for Off-State Current

Electrical Characteristics (Ta=25°C unless otherwise specified)

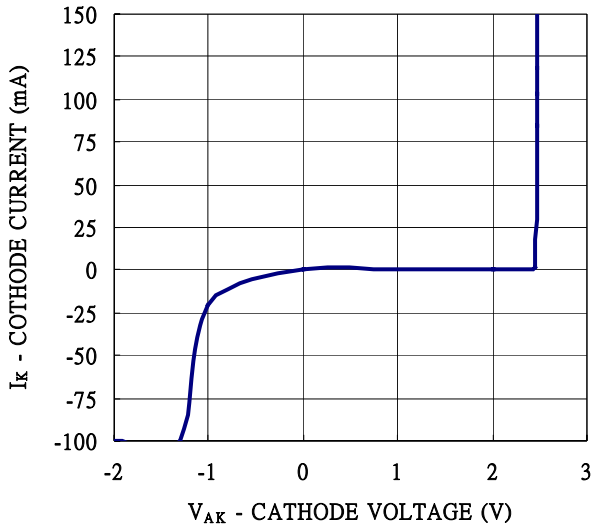
Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit
Reference Input Voltage A-RANK	V_{REF}	$V_{KA}=V_{REF}$, I_K=10mA	2.488	2.500	2.513	V
B-RANK			2.475	2.500	2.525	
C-RANK			2.450	2.500	2.550	
Deviation of Reference Input Voltage Over-Temperature	$V_{REF(dev)}$	$V_{KA}=V_{REF}$, I_K=10mA $T_{min}\le T_a\le T_{max}$	-	4	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta V_{REF}/\Delta V_{KA}$	I_K=10mA, ΔV_{KA}=10V-V_{REF}	-	-1.4	-2.7	mV/V
		I_K=10mA, ΔK_{KA}=36V-10V	-	-1.0	-2.0	mV/V
Reference Input Current	I_{REF}	I_K=10mA, R_1=10kΩ, R_2=∞	-	2	4	μA
Deviation of Reference Input Current Over Full Temperature Range	$I_{REF(dev)}$	I_K=10mA, R_1=10kΩ, R_2=∞, T_a=Full Range	-	0.4	1.2	μA
Minimum Cathode Current for Regulation	$I_{K(min)}$	$V_{KA}=V_{REF}$	-	0.34	1.0	mA
Off-State Cathode Current	$I_{K(off)}$	V_{KA}=36V, V_{REF}=0	-	0.1	1.0	μA
Dynamic impedance	Z_{KA}	$V_{KA}=V_{REF}$, f≤1.0KHz I_K=1 to 100mA	-	0.2	0.5	Ω

Recommended Soldering Footprint

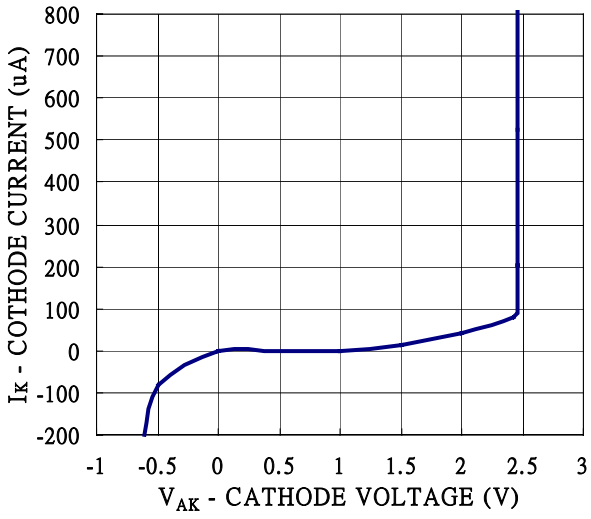


Characteristic Curves

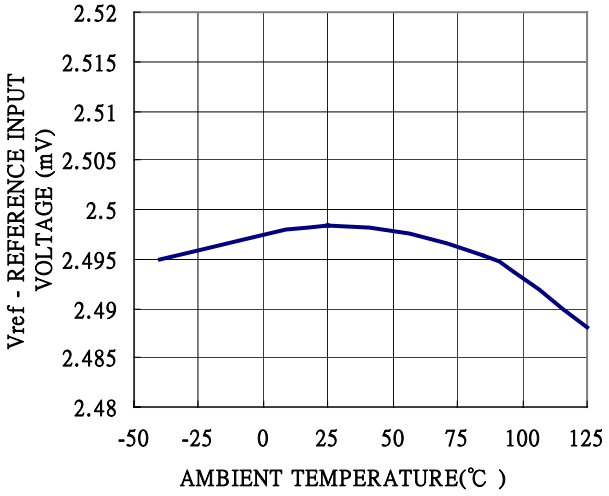
CATHODE CURRENT vs CATHODE VOLTAGE



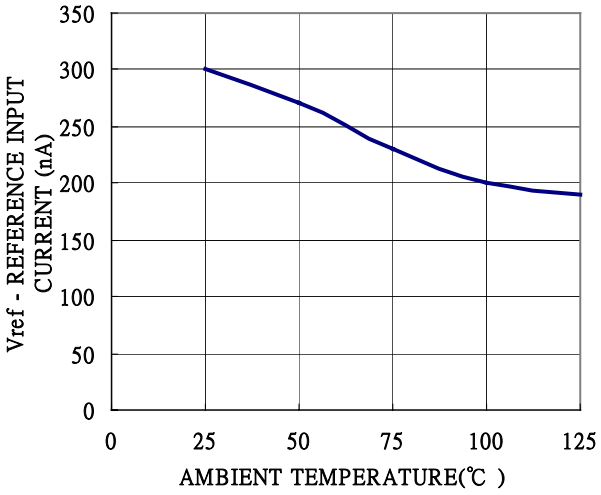
CATHODE CURRENT vs CATHODE VOLTAGE



REFERENCE INPUT VOLTAGE vs AMBIENT TEMPERATURE

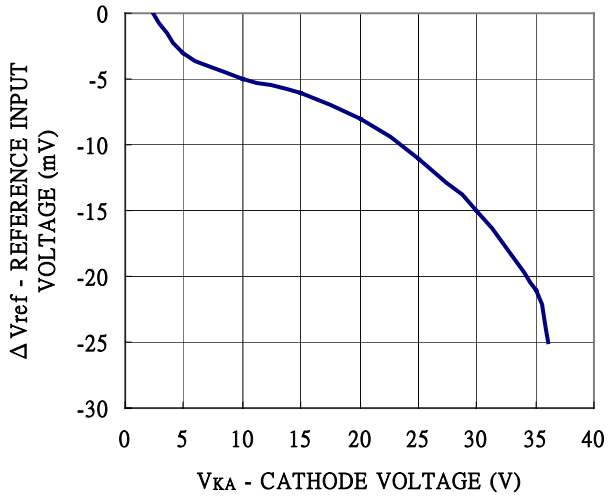


REFERENCE INPUT CURRENT vs AMBIENT TEMPERATURE

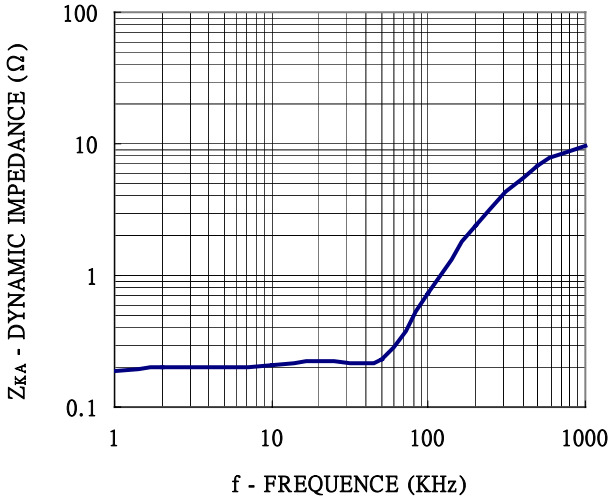


Characteristic Curves(Cont.)

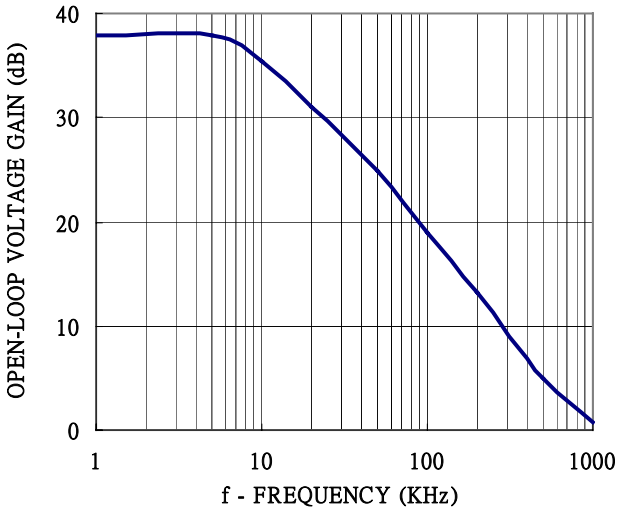
CATHODE VOLTAGE vs REFERENCE INPUT VOLTAGE



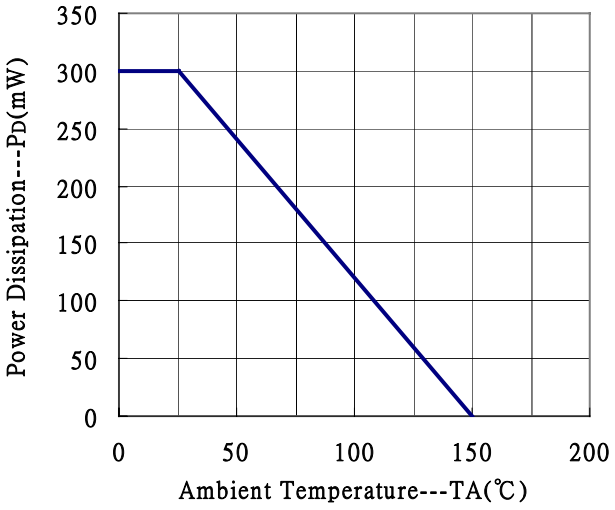
DYNAMIC IMPEDANCE vs FREQUENCE



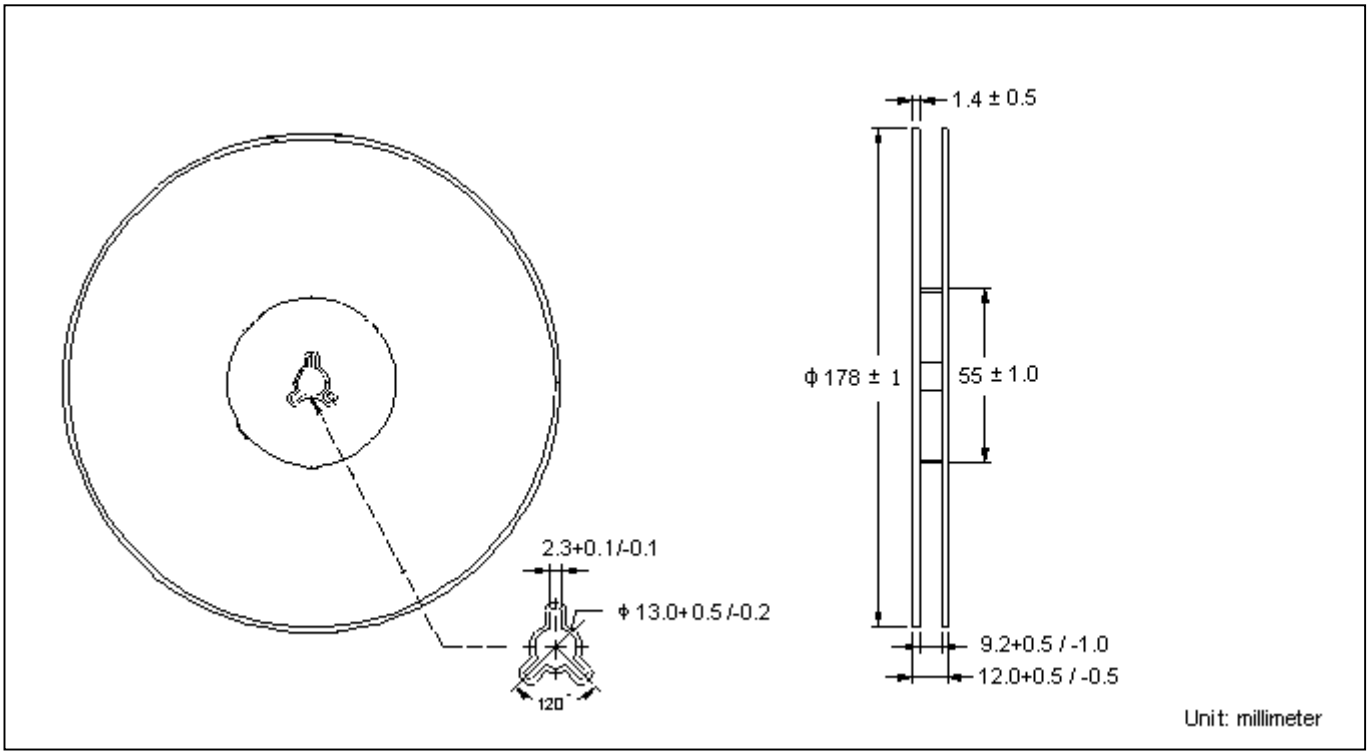
OPEN-LOOP VOLTAGE GAIN vs FREQUENCY



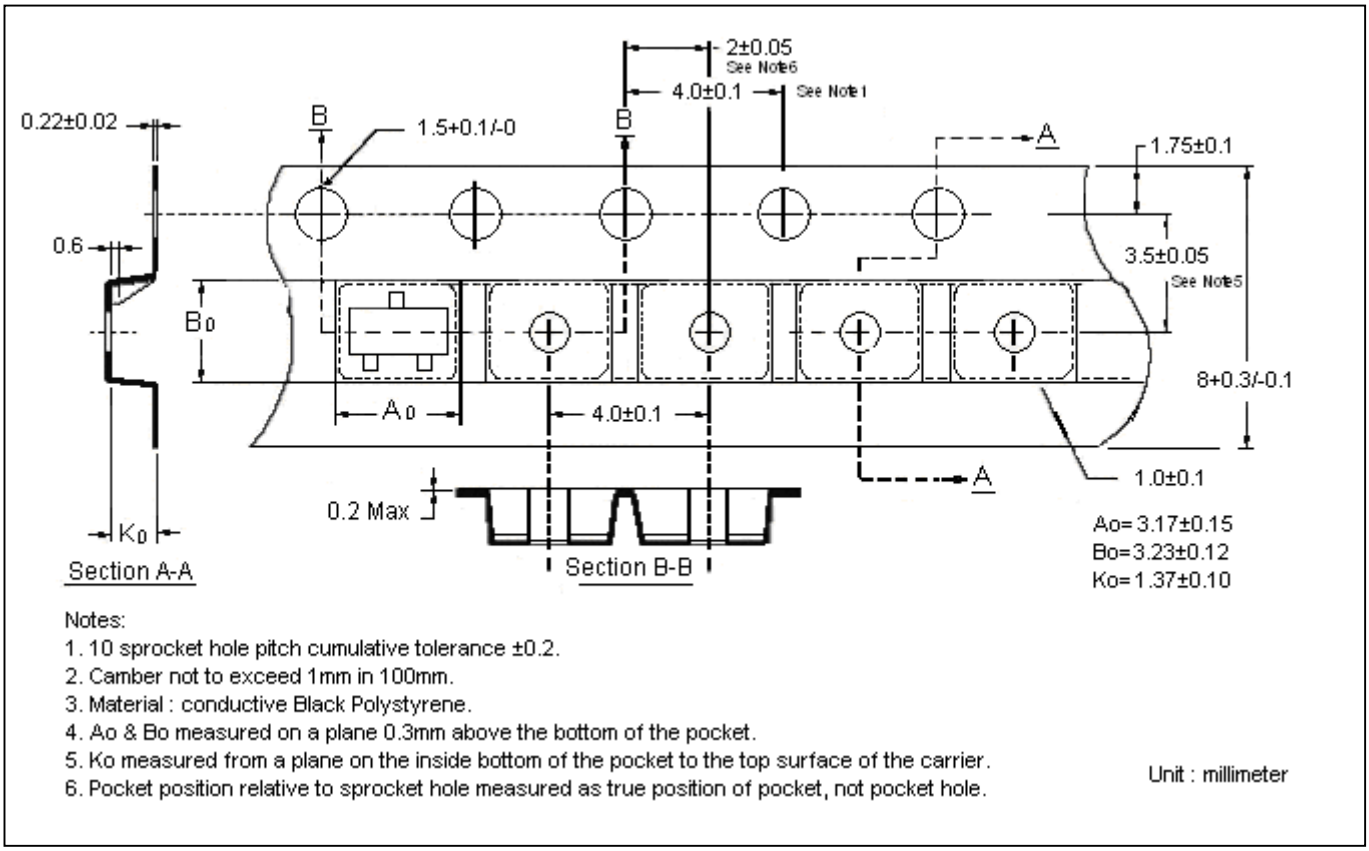
Power Derating Curve



Reel Dimension



Carrier Tape Dimension



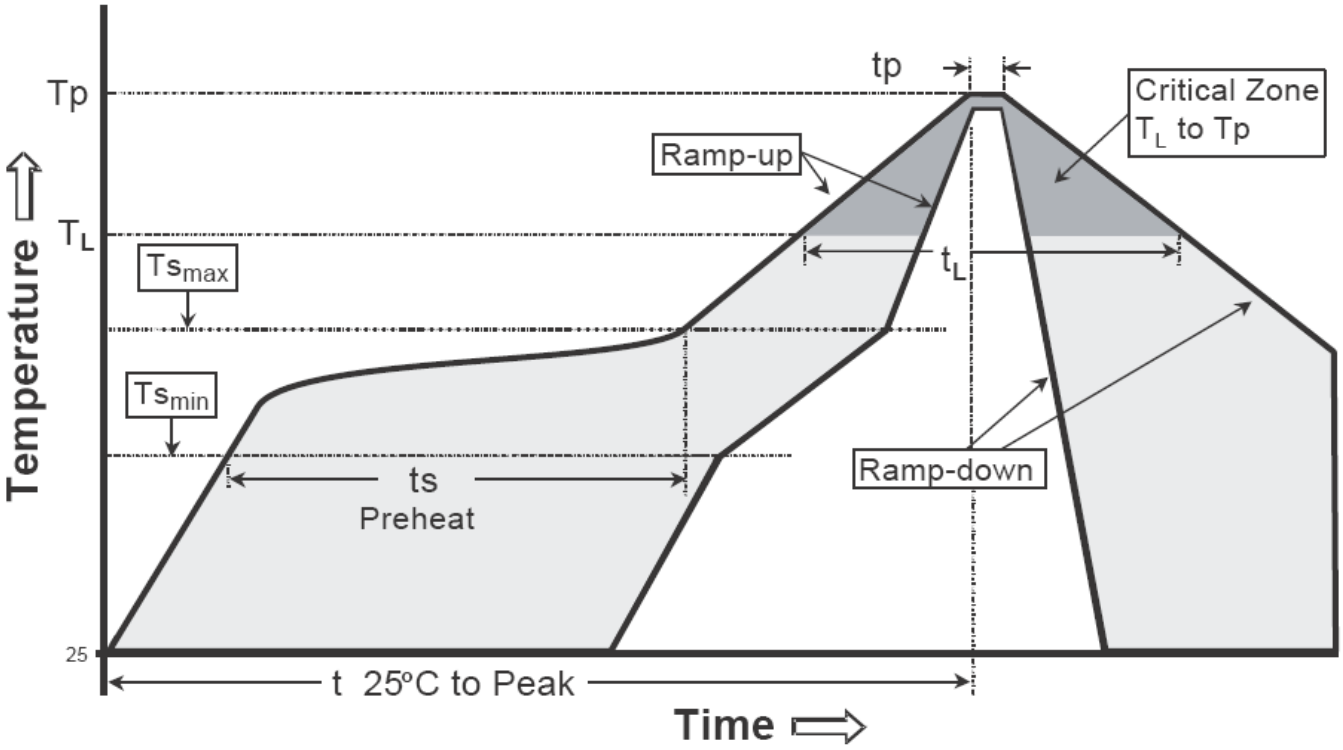
Notes:
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material : conductive Black Polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Unit : millimeter

Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

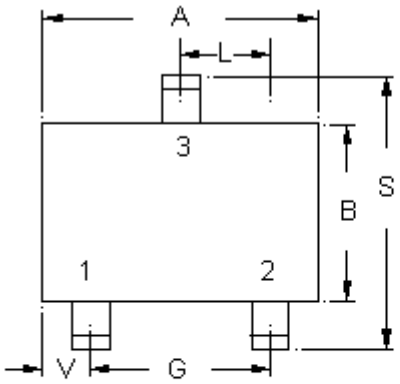
Recommended temperature profile for IR reflow

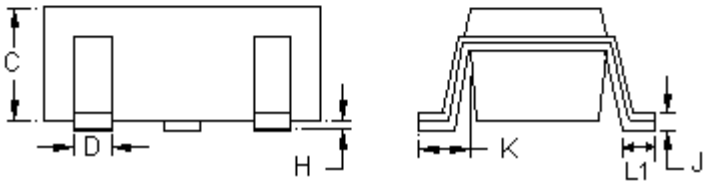


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 60-150 seconds
Peak Temperature(T_P)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

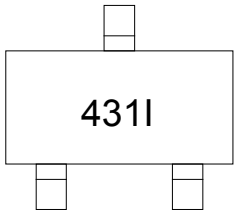
Note : All temperatures refer to topside of the package, measured on the package body surface.

SOT-23 Dimension





Marking:



3-Lead SOT-23 Plastic
Surface Mounted Package
CYStek Package Code: N3

Style: Pin 1.Cathode 2.Reference
3.Anode

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1102	0.1204	2.80	3.04	J	0.0032	0.0079	0.08	0.20
B	0.0472	0.0669	1.20	1.70	K	0.0118	0.0266	0.30	0.67
C	0.0335	0.0512	0.89	1.30	L	0.0335	0.0453	0.85	1.15
D	0.0118	0.0197	0.30	0.50	S	0.0830	0.1161	2.10	2.95
G	0.0669	0.0910	1.70	2.30	V	0.0098	0.0256	0.25	0.65
H	0.0000	0.0040	0.00	0.10	L1	0.0118	0.0197	0.30	0.50

Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYCtek sales office.

Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.