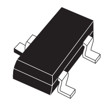
TS2431

PROGRAMMABLE SHUNT VOLTAGE REFERENCE

- ADJUSTABLE OUTPUT VOLTAGE
  2.5 to 24V
- SEVERAL PRECISION @ 25°C
  ±2%, ±1% and ±0.5%
- SINK CURRENT CAPABILITY
  1 to 100mA
- INDUSTRIAL TEMPERATURE RANGE:
  -40 to +105°C
- PERFORMANCES COMPATIBLE WITH INDUSTRY STANDARD TL431



L
SOT23-3L
(Plastic Micropackage)

DESCRIPTION

The TS2431 is a programmable shunt voltage reference with guaranteed temperature stability over the entire temperature range of operation (-40 to +105°C). The output voltage may be set to any value between 2.5V and 24V with an external resistor bridge.

Available in SOT23-3 surface mount package, it can be designed in applications where space saving is a critical issue.

APPLICATION

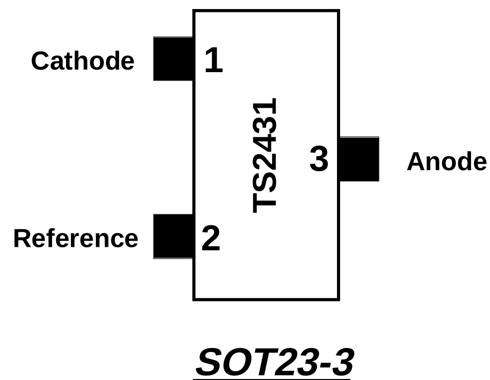
- Computers
- Instrumentation
- Battery chargers
- Switch Mode Power Supply
- Battery operated equipments

ORDER CODE

Precision	Part Number in SOT23-3	SOT23 Marking
2%	TS2431ILT	L285
1%	TS2431AILT	L286
0.5%	TS2431BILT	L287
Single temperature range: -40 to +105°C		

LT = Tiny Package (SOT23-3) - only available in Tape & Reel (LT)

PIN CONNECTIONS (top view)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
Vka	Cathode to Anode voltage	25	V
I_K	Reverse Breakdown Current	-100 to +150	mA
I_{REF}	Reference input current range	-0.05 to +10	mA
P_d	Power Dissipation [1] SOT23-3	360	mW
T_{std}	Storage Temperature	-65 to +150	°C
ESD	Human Body Model (HBM)	2	kV
	Machine Model (MM)	200	V
T_{LEAD}	Lead Temperatue (soldering, 10 seconds)	260	°C

1. Pd has been calculated with Tamb = 25°C, Tjunction =150°C and Rthja = 340°C/W for the SOT23-3 package

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{KA}	Cathode to Anode voltage	V_{REF} to 24	V
I_K	Cathode operating current[1]	1 to 100	mA
T_{oper}	Operating Free Air Temperature Range	-40 to +105	°C

1. Maximum power dissipation must be strictly observed to avoid the component destruction.

ELECTRICAL CHARACTERISTICS

$T_{AMBIENT}$ = 25°C (unless otherwise specified)

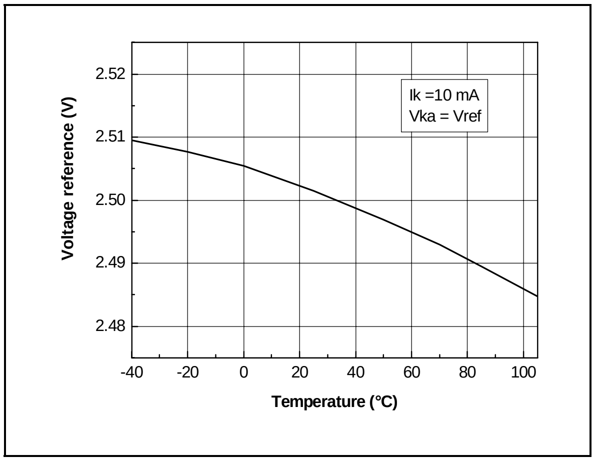
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{REF}	Reference input Voltage	V_K=V_{REF}, I_K=10mA		2.5		V
		TS2431 (2%)	2.45		2.55	
		TS2431A (1%)	2.475		2.525	
		TS2431B (0.5%)	2.488		2.512	
$\|\Delta V_{REF}\|$	Reference input Voltage deviation over temperature, V_K=V_{REF}, I_K=10mA (note 1,2)	0°C < T < +70°C		10	20	mV
		-40°C < T < +85°C		17	30	
		-40°C < T < +105°C		20	35	
T_C	Temperature coefficient (note 2)	-40°C < T < +105°C		50	100	ppm/°C
I_{KMIN}	Minimum Operating Current	T = 25°C		0.3	0.8	mA
		-40°C < T < +105°C			1	
$\left\|\frac{\Delta Vref}{\Delta Vk}\right\|$	Ratio of change in reference input voltage to change in cathode to anode voltage	I_K=10mA Vka= 24 to 2.5V		0.3	2	mV/V
I_{REF}	Reference input current I_K=10mA, R1=10KΩ, R2=+∞ (note 3)	T=25°C		0.5	2.5	µA
		-40°C < T < +105°C			3	
$\|\Delta I_{REF}\|$	Reference input current deviation I_K=10mA, R1=10KΩ, R2=+∞ (note 3)	-40°C < T < +105°C		0.4	1.2	µA
I_{OFF}	Off-state cathode current	V_K=24V, V_{REF}=GND		10	500	nA
$\|Z_{KA}\|$	Reverse dynamic impedance	V_K=V_{REF} ΔI_K=1 to 50mA, f<10kHz		0.5	0.75	Ω
E_N	Wide Band Noise	Ik = 10mA 10Hz < f < 10kHz		300		nV/√Hz

Note 1: Limits are 100% production tested at 25°C. Limits over temperature are guaranteed through correlation and by design.

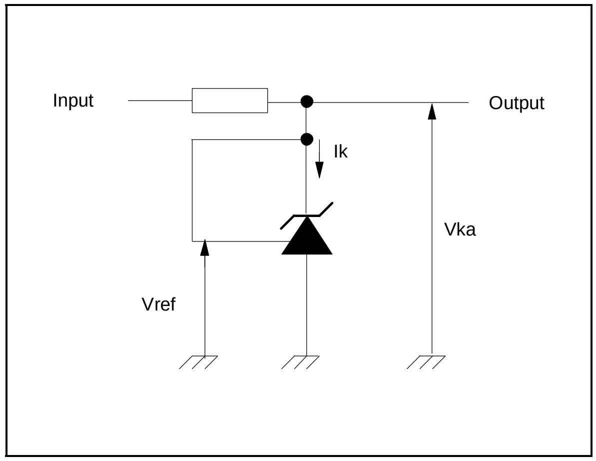
Note 2: $|\Delta V_{REF}|$ is defined as the difference between the maximum and minimum values of V_{REF} obtained over the full temperature range

Note 3: Refer to figure "Test circuit for Vka>Vref" page 4

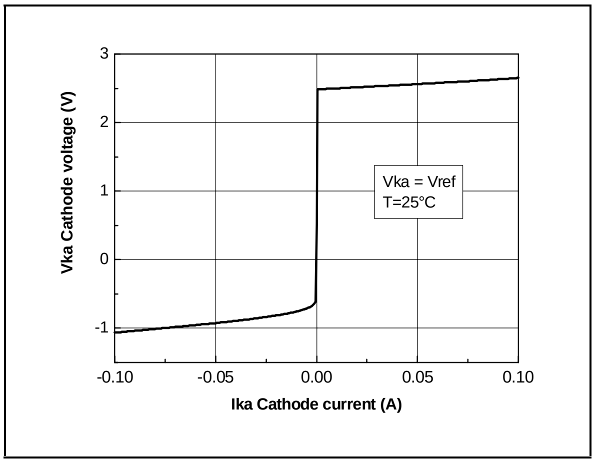
Reference voltage vs temperature



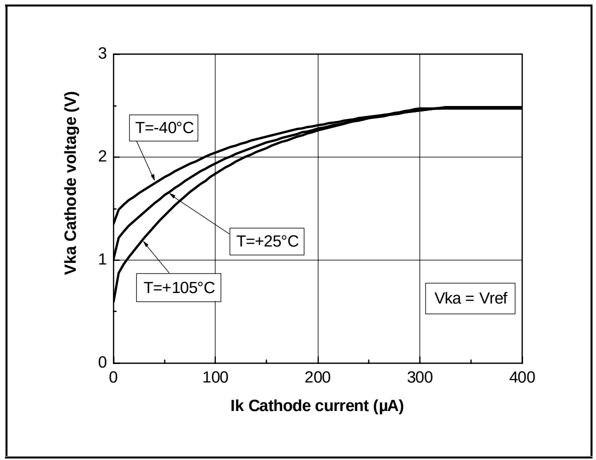
Test circuit for Vka = Vref



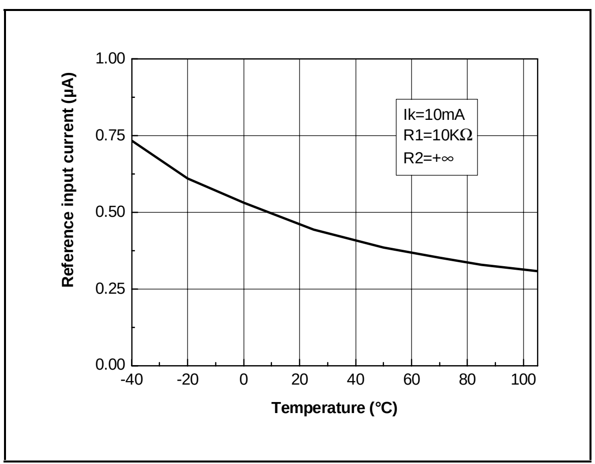
Cathode voltage vs cathode current



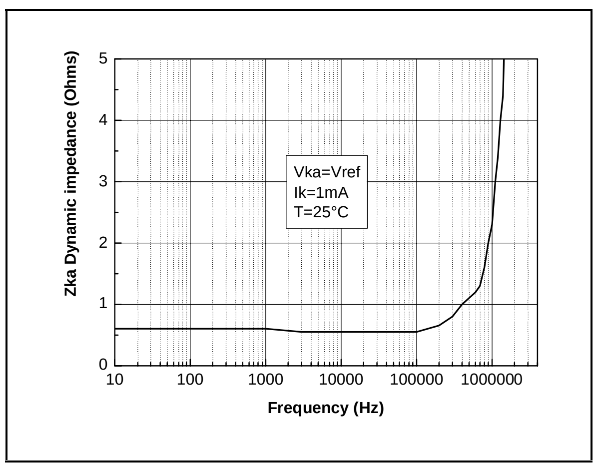
Cathode voltage vs cathode current



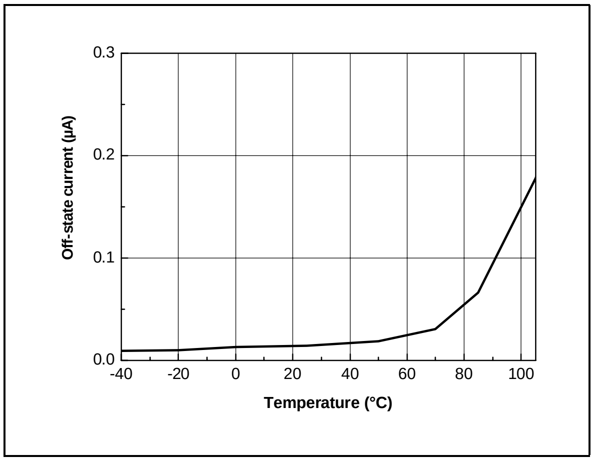
Reference input current vs temperature



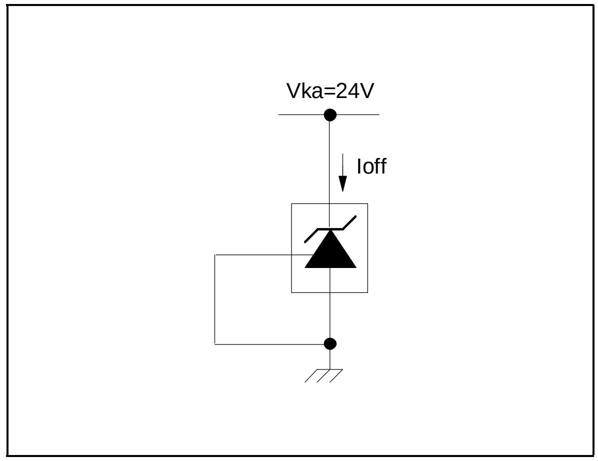
Dynamic impedance vs frequency



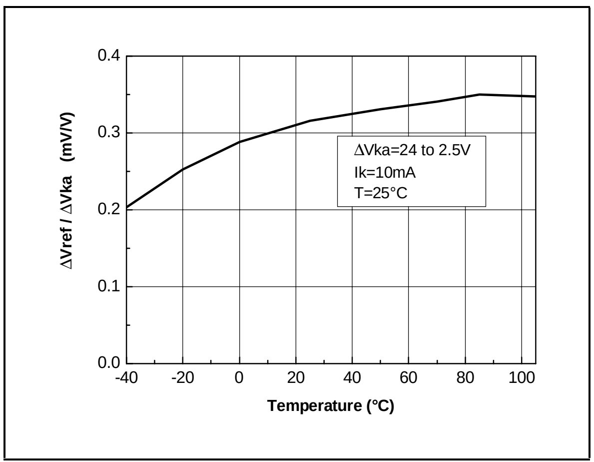
Off-State current vs temperature



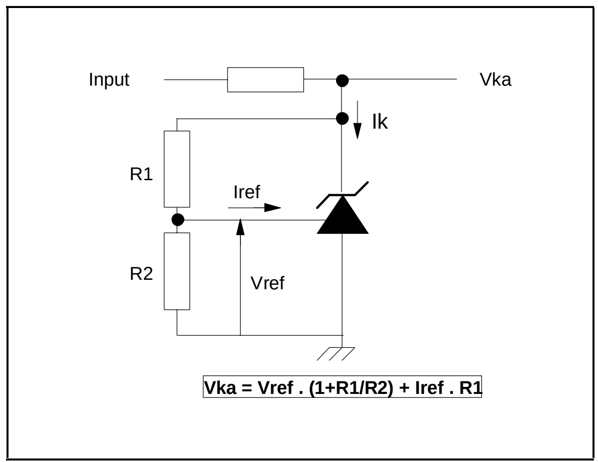
Test circuit for Off-State current measurement



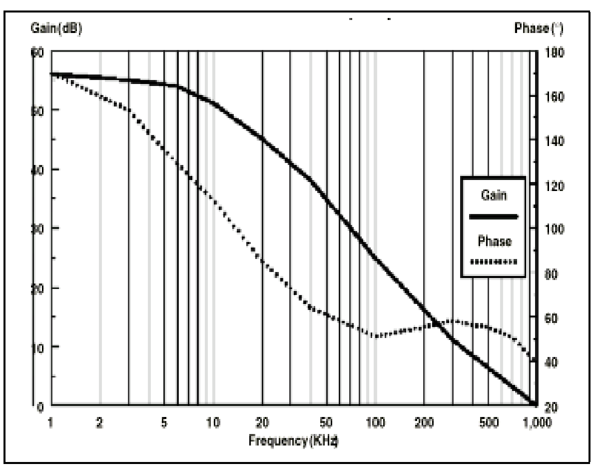
Ratio of change in reference input voltage to change in Vka voltage vs temperature



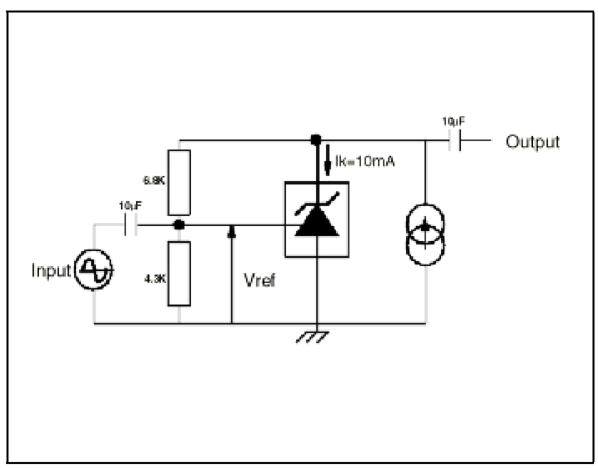
Test circuit for Vka > Vref



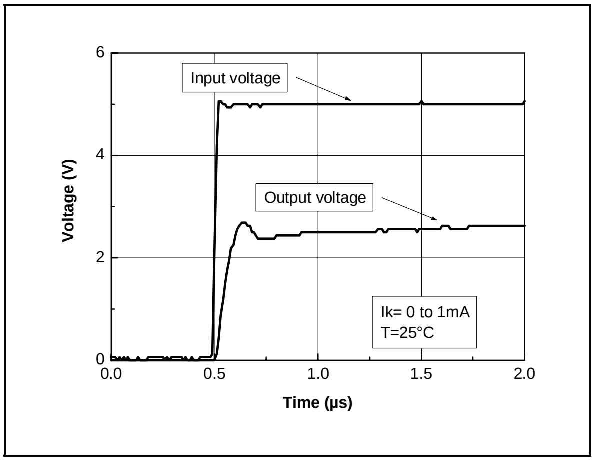
Phase and Gain vs frequency



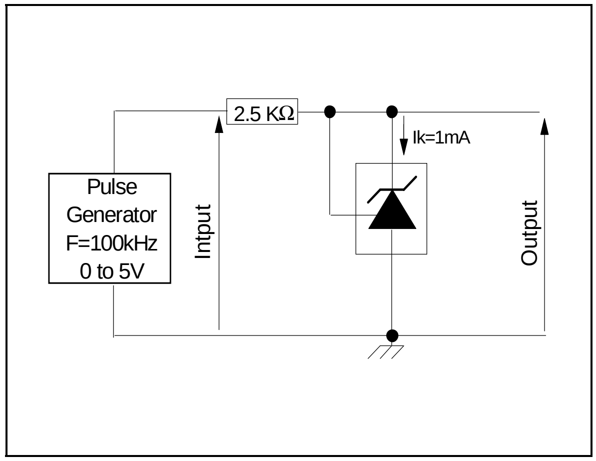
Test circuit for phase and gain measurement



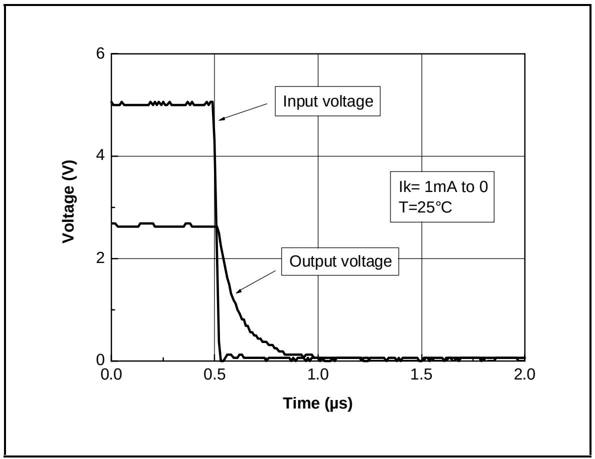
Pulse response at Ik=1mA



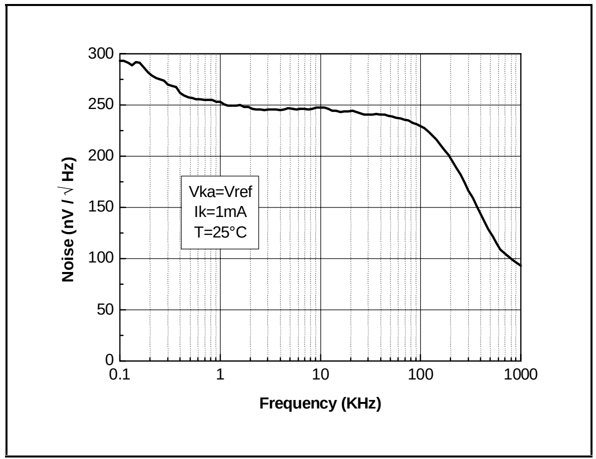
Test circuit for pulse response at Ik = 1mA



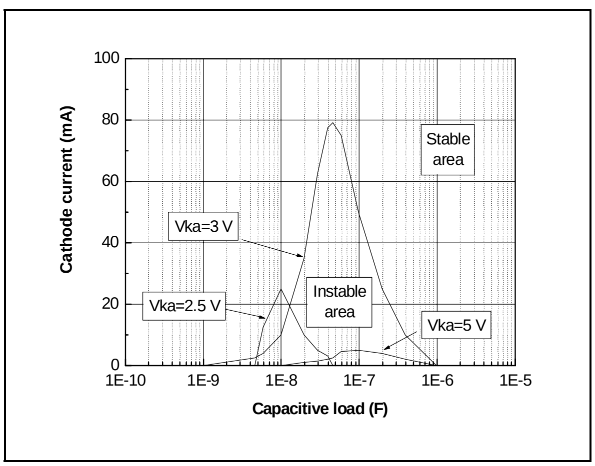
Pulse response at Ik = 1mA



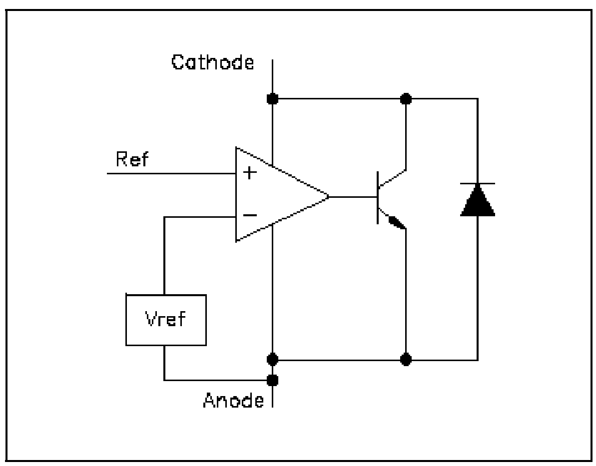
Equivalent input noise vs frequency



Stability boundary conditions

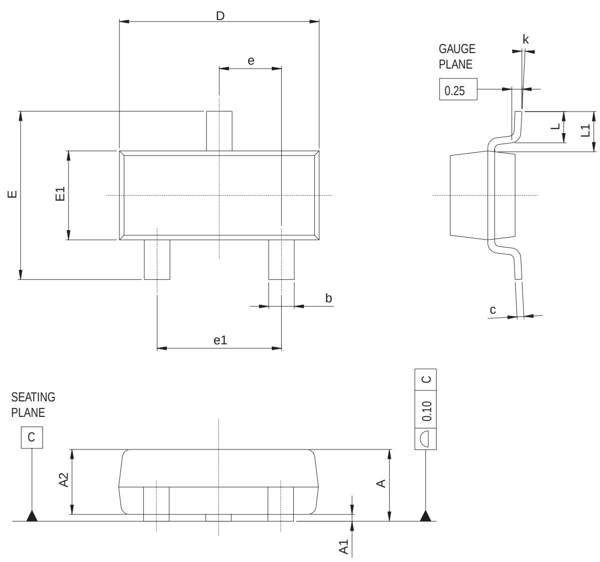


Block Diagram



PACKAGE MECHANICAL DATA

3 PINS - TINY PACKAGE (SOT-23)



Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.890		1.120	0.035		0.044
A1	0.010		0.100	0.0004		0.004
A2	0.880	0.950	1.020		0.037	0.040
b	0.300		0.500	0.012		0.020
c	0.080		0.200	0.003		0.008
D	2.800	2.900	3.040	0.110	0.114	0.120
E	2.100		2.640	0.083		0.104
E1	1.200	1.300	1.400	0.047	0.051	0.055
e		0.950			0.037	
e1		1.900			0.075	
L	0.400	0.500	0.600	0.016	0.020	0.024
L1		0.540			0.021	
k	0°		8°			