TS824-2.5

HIGH THERMAL STABILITY MICROPOWER SHUNT VOLTAGE REFERENCE

- LOW Tc: 50 ppm/°C MAXIMUM
- 2.5V OUTPUT VOLTAGE
- LOW OPERATING CURRENT: 60µA max @ 25°C
- HIGH PRECISION AT 25°C: ±0.5% AND ±1%
- STABLE WHEN USED WITH CAPACITIVE LOADS
- INDUSTRIAL TEMPERATURE RANGE: -40 to +85°C

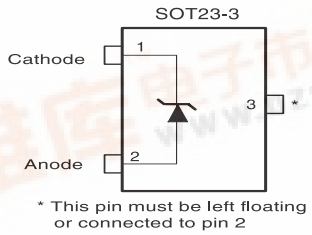
L
SOT23-3L
(Plastic Micropackage)

DESCRIPTION

The TS824-2.5 is a low power shunt voltage reference featuring a very low temperature coefficient of 50ppm/°C as a maximum value. Providing a 2.5V output voltage, the TS824-2.5 operates over the industrial temperature range (-40 to +85°C). Ideal for battery-powered equipments where power conservation is critical, the TS824 is housed in a tiny SOT23-3 package allowing space saving.

The TS824 is typically stable with any capacitive loads within the entire temperature range. The product is thus easy to use and the design simplified.

PIN CONNECTIONS (top view)



APPLICATION

- Instrumentation,
- Data acquisition systems,
- Portable, Battery powered equipments
- Power management

ORDER CODE

Voltage	Precision	SOT23-3	SOT23 Marking
2.5V	±1%	TS824ILT-2.5	L252
	±0.5%	TS824AILT-2.5	L253
Single temperature range: -40 to +85°C			

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

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
I_K	Reverse Breakdown Current	20	mA
I_F	Forward Current	10	mA
P_D	Power Dissipation (note1) SOT23-3	360	mW
T_{Std}	Storage Temperature	-65 to +150	°C
ESD	Human Body Model (HBM) (note2)	2	kV
	Machine Model (MM) (note 2)	200	V
T_{Lead}	Lead Temperature (soldering, 10 seconds)	260	°C

Note 1: The maximum power dissipation must be derated at high temperature. It can be calculated using T_{JMAX} (maximum junction temperature), R_{THJA} (Thermal resistance junction to ambient) and T_A (Ambient temperature). The maximum power dissipation formula at any temperature is $P_{DMAX} = (T_{JMAX} - T_A) / R_{THJA}$. R_{THJA} is 340°C/W for the SOT23-3 package.

Note 2: The Human Body Model (HBM) is defined as a 100pF capacitor discharge through a 1.5kΩ resistor into each pin. The Machine Mode (MM) is defined as a 200pF capacitor discharge directly into each pins.

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
I_{min}	Minimum Operating Current	60	µA
I_{max}	Maximum Operating Current	15	mA
T_{oper}	Operating Free Air Temperature Range	-40 to +85	°C

ELECTRICAL CHARACTERISTICS (note 3)

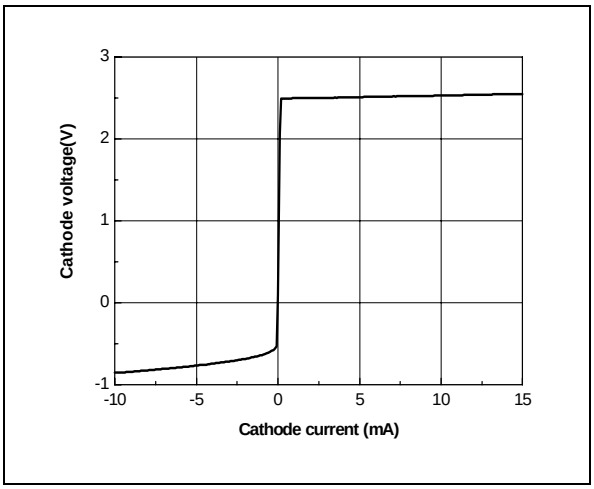
T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_K	Reverse Breakdown Voltage	I_K = 100µA, ±0.5%	2.4875	2.500	2.5125	V
		I_K = 100µA, ±1%	2.475	2.500	2.525	
	Reverse Breakdown Voltage Tolerance	I_K = 100µA, ±0.5% -40°C < T_{amb} < +85°C	-12.5 -20		+12.5 +20	mV
		I_K = 100µA, ±1% -40°C < T_{amb} < +85°C	-25 -33		+25 +33	
I_{KMIN}	Minimum Operating Current	T_{amb} = 25°C		50	60	µA
		-40°C < T_{amb} < +85°C			65	
$\Delta V_K / \Delta T$	Average Temperature Coefficient (note 5)	I_K = 100µA			50	ppm/°C
$\Delta V_K / \Delta I_K$	Reverse Breakdown Voltage Change with Operating Current Range	I_{KMIN} < I_K < 1mA -40°C < T_{amb} < +85°C		0.4	1 1.2	mV
		1mA < I_K < 15mA -40°C < T_{amb} < +85°C		4.5	8 10	
R_{KA}	Static Impedance	ΔI_K = I_{KMIN} to 1mA -40°C < T_{amb} < +85°C		0.4	1 1.2	Ω
		ΔI_K = 1mA to 15mA -40°C < T_{amb} < +85°C		0.3	0.6 0.7	
K_{VH}	Long Term Stability	I_K = 100µA, t = 1000hrs		120		ppm
E_N	Wide Band Noise	I_K = 100µA 100Hz < f < 10kHz		350		nV/√Hz

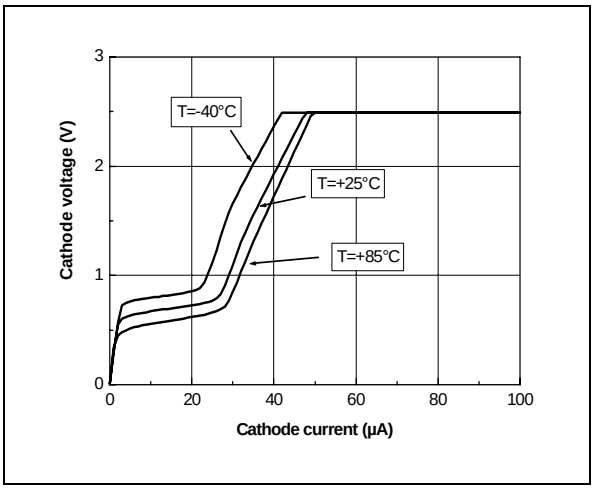
Note 3: Limits are 100% production tested at 25°C. Limits over temperature are guaranteed through correlation and by design.

Note 4: The total tolerance within the industrial range, where the maximum ΔT versus 25°C is 65°C, is explained hereafter:
± 1 % + (± 50 ppm/°C x 65°C) = ± 1.325 %

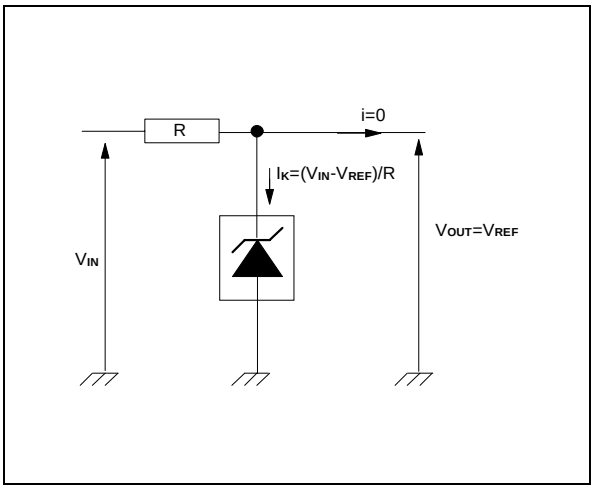
Reference voltage versus cathode current



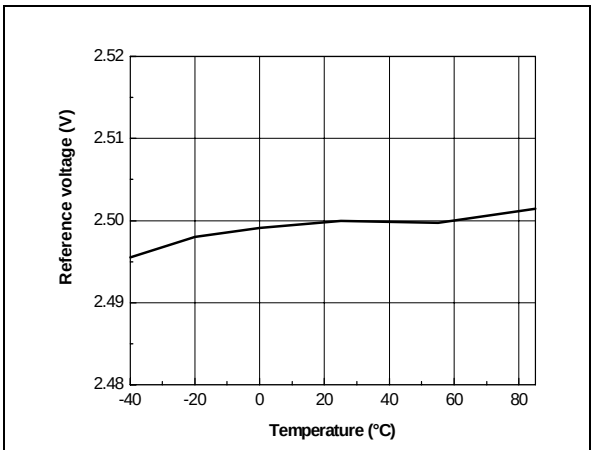
Reference voltage versus cathode current



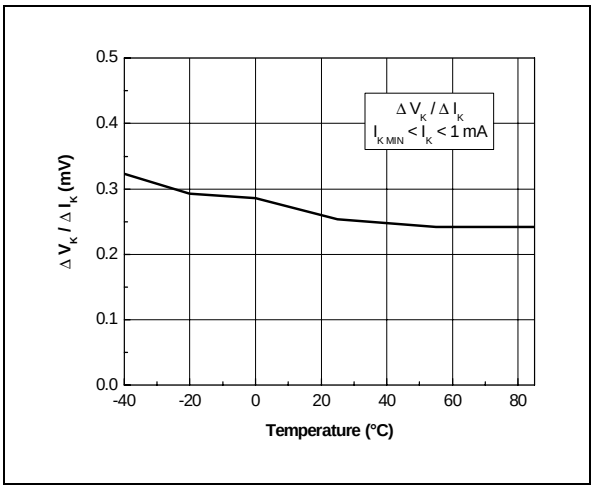
Test circuit



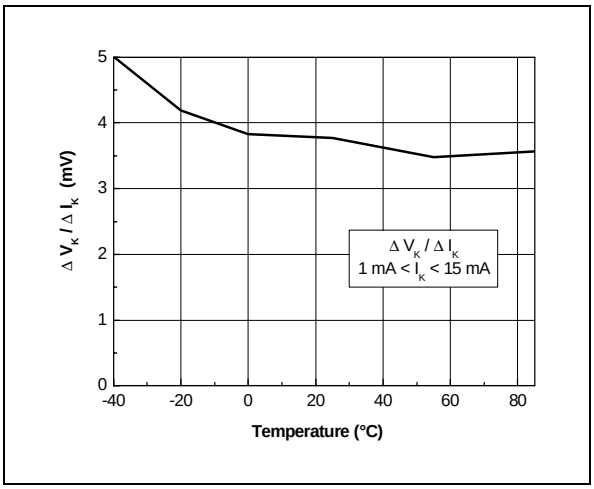
Reference voltage versus Temperature



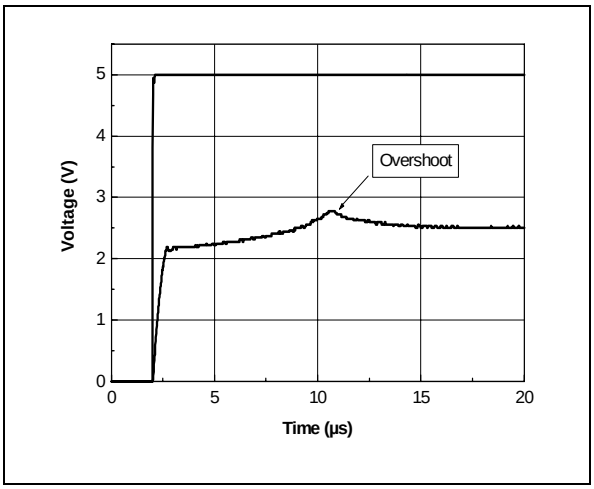
$\Delta V_K/\Delta I_K$ for I_K < 1mA versus temperature



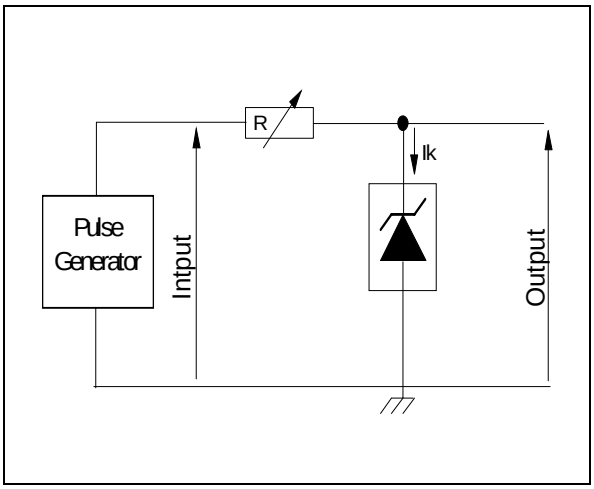
$\Delta V_K/\Delta I_K$ for I_K > 1mA versus temperature



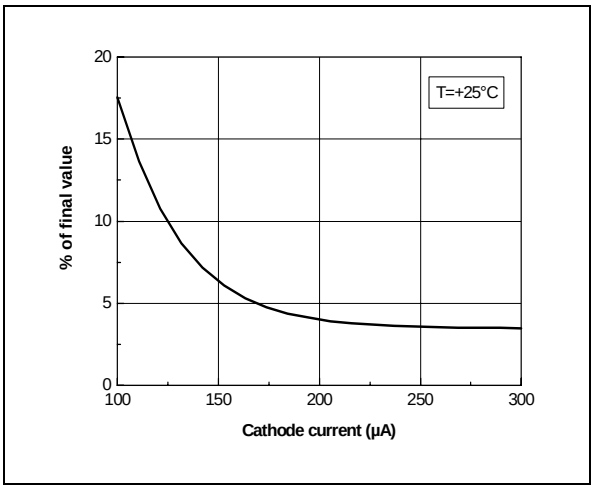
Start-up response with low cathode current



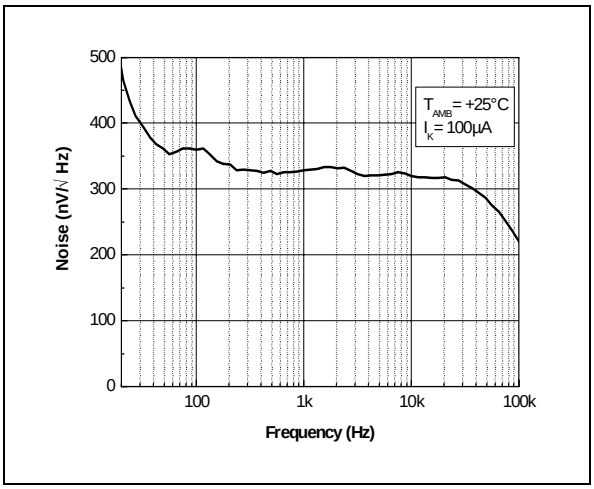
Start-up schematic with low cathode current



Overshoot versus cathode current

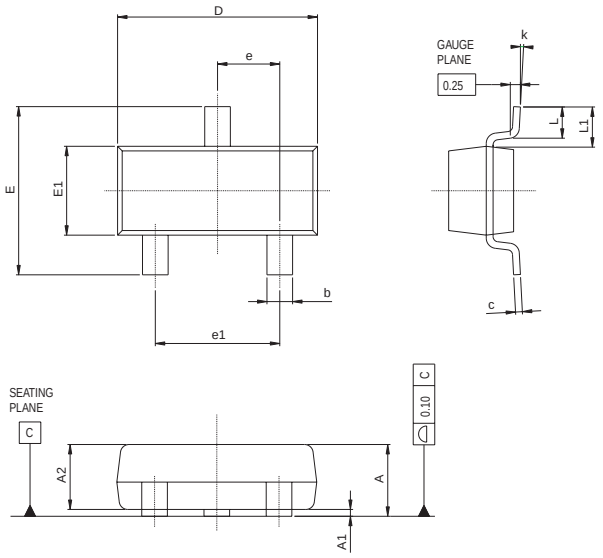


Noise versus frequency



PACKAGE MECHANICAL DATA

3 PINS - TINY PACKAGE (SOT23-3)



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°			