

HIGH THERMAL STABILITY MICROPOWER SHUNT VOLTAGE REFERENCE

- LOW Tc: 50 ppm/°C MAXIMUM
- 1.225V OUTPUT VOLTAGE
- LOW OPERATING CURRENT: 45µA max @ 25°C
- HIGH PRECISION AT 25°C: ±1%
- STABLE WHEN USED WITH CAPACITIVE LOADS
- INDUSTRIAL TEMPERATURE RANGE: -40 to +85°C

DESCRIPTION

The TS824 is a low power shunt voltage reference featuring a very low temperature coefficient of 50ppm/°C as a maximum value. Providing 1.225V output voltage, the TS824 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.

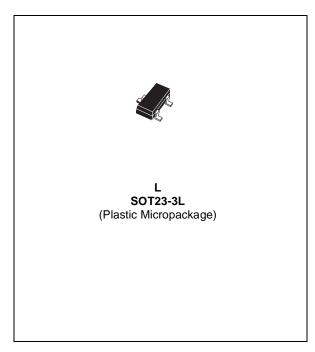
APPLICATION

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

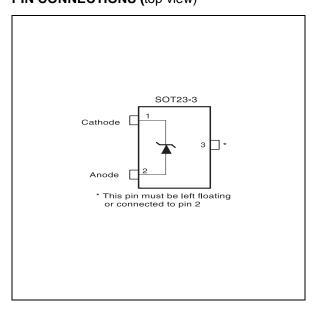
ORDER CODE

Voltage	Precision	SOT23-3	SOT23 Marking			
1.225V	1%	TS824ILT-1.2	L251			
Single temperature range: -40 to +85°C						

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



PIN CONNECTIONS (top view)



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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
I _K	Reverse Breakdown Current	20	mA
I _F	Forward Current	10	mA
P _D	Power Dissipation (note 1) SOT23-3	360	mW
T _{Std}	Storage Temperature	-65 to +150	°C
TJ	Junction Temperature	+150	°C
T _{Lead}	Lead Temperature (soldering, 10 seconds)	+260	°C
ESD	Human Body Model (HBM) (note 2)	2	kV
	Machine Model (MM) (note 2)	200	V

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 $P_{DMAX} = (T_{JMAX} - T_A) / R_{THJA}$. $R_{THJA} = 340 \, \text{C/W}$ for the SOT23-3 package.

Note 2: The Human Body Model (HBM) is defined as a 100pF capacitor discharge through a $1.5 \mathrm{k}\Omega$ 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	40	μΑ
I _{max}	Maximum Operating Current	12	mA
T _{oper}	Operating Free Air Temperature Range	-40 to +85	°C

ELECTRICAL CHARACTERISTICS (note 3)

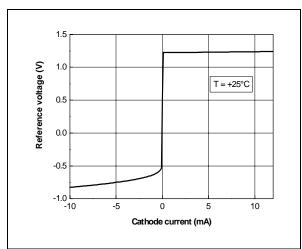
 $T_{amb} = 25$ °C (unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Тур.	Max.	Unit
	Reverse Breakdown Voltage	I _K = 100μA	1.213	1.225	1.237	V
V _K	Reverse Breakdown Voltage Tolerance	$I_{K} = 100\mu A$ -40°C < T_{amb} < +85°C	-12 -16		+12 +16	mV
1	Minimum Operating Current	T _{amb} = 25°C		40	45	
'KMIN	$V_{K} \ \ \text{Reverse Breakdown Voltage Tolerance} \ \ \frac{I_{K} = 100 \mu A}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{KMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{KMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C} < T_{amb}} < +85^{\circ} \text{C}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C}} < I_{CMIN}}{-40^{\circ} \text{C} < I_{CMIN}} < I_{CMIN}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C}} < I_{CMIN}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C}} < I_{CMIN}}{-40^{\circ} \text{C}} < I_{CMIN}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C}} < I_{CMIN}}{-40^{\circ} \text{C}} < I_{CMIN}} \ \ \frac{I_{CMIN}}{-40^{\circ} \text{C}} < I_{CMIN}} \$			50	μΑ	
$\Delta V_{K}/\Delta T$		I _K = 100μA			50	ppm/°C
A)/ /AI	Reverse Breakdown Voltage Change			0.3	1 1.5	mV
ΔνκιΔικ	with Operating Current Range	1.		2.5	8 10	IIIV
В	Ctatic Immediance			0.3	1 1.5	
INKA	Static impedance	7.5		0.25	0.7 0.9	Ω
K _{VH}	Long Term Stability	$I_K = 100 \mu A, t = 1000 hrs$		120		ppm
E _N	Wide Band Noise	$I_K = 100\mu A$ 100Hz < f < 10kHz		200		nV/√Hz

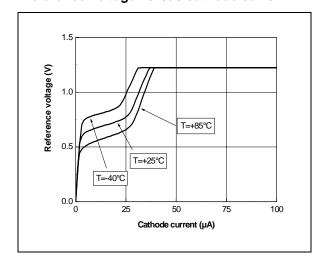
Note 3: Limits are 100% production tested at 25°C. Limits over temperature are guaranteed through correlation and by design.

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

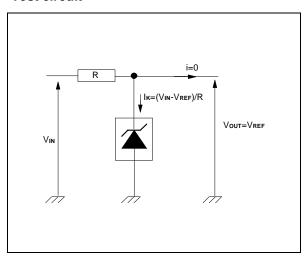
Reference voltage versus cathode current



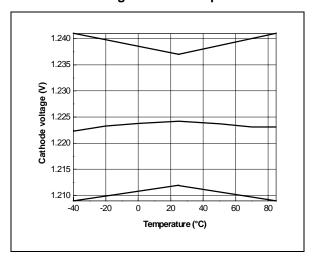
Reference voltage versus cathode current



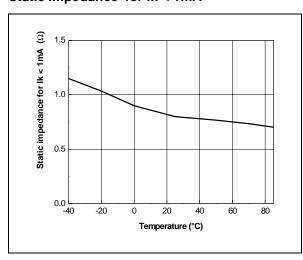
Test circuit



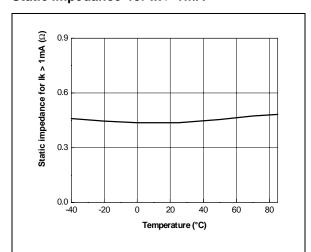
Reference voltage versus Temperature



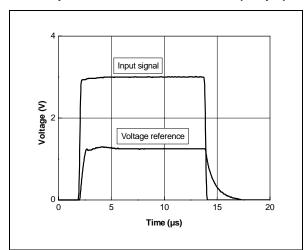
Static impedance for lk < 1mA



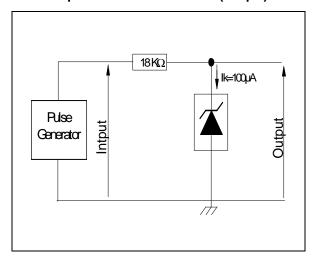
Static impedance for Ik > 1mA



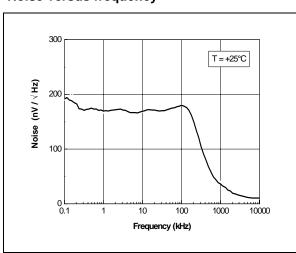
Start-Up characteristics with low lk (100µA)



Start-Up schematic with low lk (100µA)



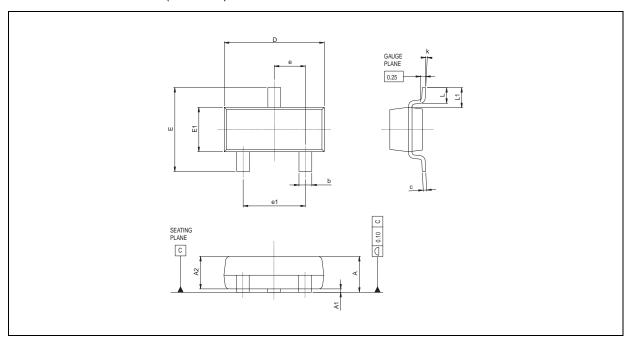
Noise versus frequency



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PACKAGE MECHANICAL DATA

3 PINS - TINY PACKAGE (SOT23-3)



Dimensions -	Millimeters			Inches			
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α	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	
С	0.080		0.200	0.003		0.008	
D	2.800	2.900	3.040	0.110	0.114	0.120	
Е	2.100		2.640	0.083		0.104	
E1	1.200	1.300	1.400	0.047	0.051	0.055	
е		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°				

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