

## 1.24V ADJUSTABLE SHUNT VOLTAGE REFERENCE

- **1.24V TYP OUTPUT VOLTAGE**
- **ULTRA LOW OPERATING CURRENT :**  
60 $\mu$ A maximum at 25°C
- **HIGH PRECISION @ 25°C**  
+/- 1%  
+/- 0.5%
- **HIGH STABILITY WHEN USED WITH CAPACITIVE LOADS**
- **INDUSTRIAL TEMPERATURE RANGE:**  
-40 to +85°C
- **100ppm/°C TEMPERATURE COEFFICIENT**

### DESCRIPTION

The TS432 is an adjustable low power shunt voltage reference providing an output voltage from 1.24V to 10V over the industrial temperature range (-40 to +85°C). Available in SOT23-3 surface mount package, it can be designed in applications where space saving is a critical issue.

The low operating current is a key advantage for power restricted designs. In addition, the TS432 is very stable and can be used in a broad range of application conditions.

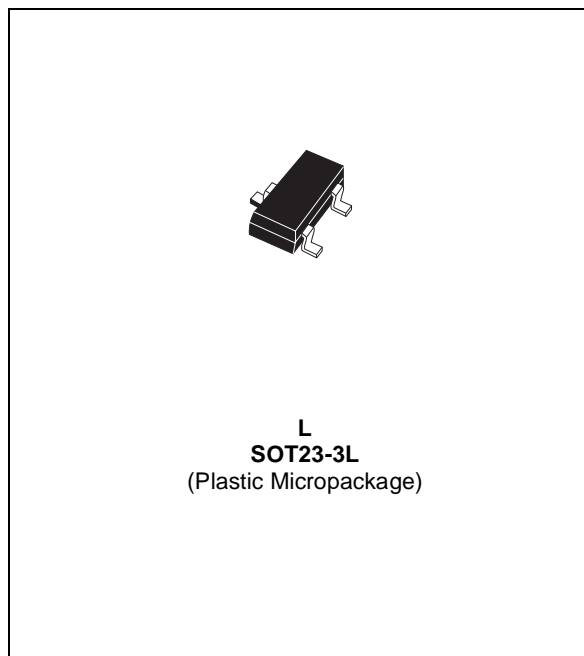
### APPLICATION

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

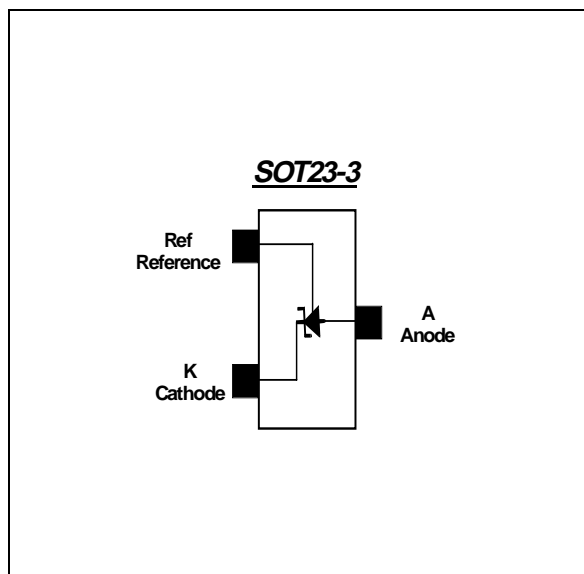
### ORDER CODE

Precision	SOT23-3	SOT23 Marking
1%	TS432ILT	L235
0.5%	TS432AILT	L236
Single temperature range: -40 to +85°C		

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



### PIN CONNECTIONS (top view)



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_K$	Cathode voltage	12	V
$I_K$	Cathode current	-10 to +20	mA
$I_{REF}$	Reference input current	-0.05 to +3	mA
$P_D$	Power dissipation <sup>1)</sup> SOT23-3	340	mW
$R_{THJA}$	Thermal resistance junction to ambient for SOT23-3	360	°C/W
$T_{LEAD}$	Lead temperature (soldering 10 seconds)	250	°C
$T_{STG}$	Storage temperature	-65 to +150	°C
$T_J$	Junction temperature	150	°C
ESD	Human Body Model (HBM)	1.5	kV
	Machine Model (MM)	150	V

1. Pd has been calculated with  $T_{amb} = 25^{\circ}C$ ,  $T_j = 150^{\circ}C$  and  $R_{thja} = 360^{\circ}C/W$  for the SOT23-3L package

**OPERATING CONDITIONS**

Symbol	Parameter	Value	Unit
$V_K$	Cathode voltage	1.24 to 10	V
$I_K$	Cathode current	60μ to 12m	A
$T_{AMB}$	Ambient temperature	-40 to +85	°C

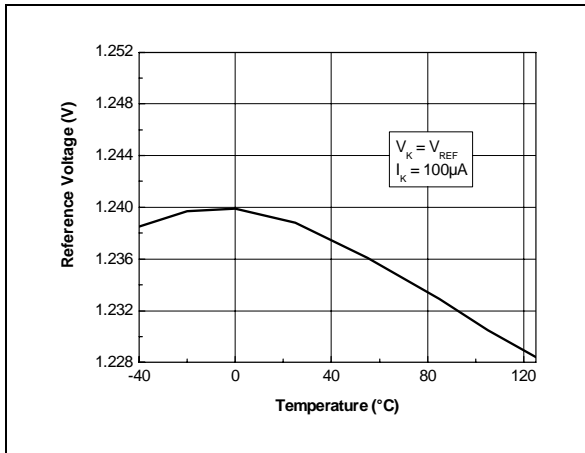
**ELECTRICAL CHARACTERISTICS**

$T_{amb} = 25^{\circ}C$  (unless otherwise specified)

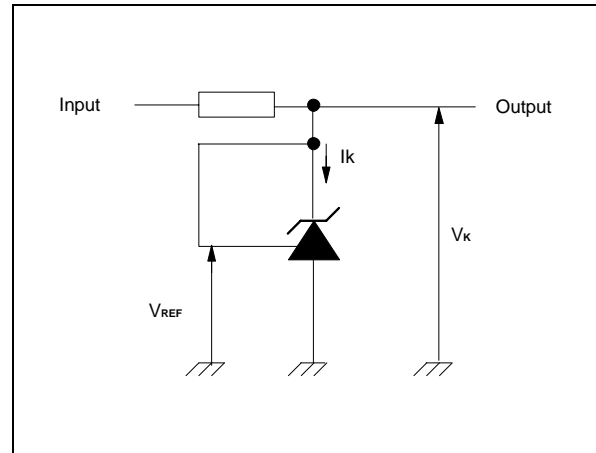
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{REF}$	Reference voltage	$I_K = 100\mu A, V_K = V_{REF}$		1.24		V
		TS432 (1%)	1.228		1.252	
		TS432A (0.5%)	1.234		1.246	
$\Delta V_{REF}$	Reference voltage tolerance over temperature	$I_K = 100\mu A, V_K = V_{REF}$		7	16	mV
$I_{KMIN}$	Minimum operating current	$T_{amb} = 25^{\circ}C$		40	60	μA
		$-40^{\circ}C < T_{AMB} < +85^{\circ}C$			65	
$\Delta V_{REF}$	Reverse breakdown voltage change with operating current range	$I_{KMIN} < I_K < 1mA$		0.7	1.5	mV
		$-40^{\circ}C < T_{AMB} < +85^{\circ}C$			2	
		$1mA < I_K < 12mA$		2	4	
		$-40^{\circ}C < T_{AMB} < +85^{\circ}C$			6	
$\Delta V_{REF} / \Delta V_K$	Reference voltage change with output voltage change	$I_K = 10mA, V_K = 10V$ to $V_{REF}$		1.8	2.5	mV/V
		$-40^{\circ}C < T_{AMB} < +85^{\circ}C$			3	
$I_{REF}$	Reference input current	$I_K = 10mA, R_1 = 10K\Omega, R_2 = +\infty$		50	100	nA
		$-40^{\circ}C < T_{AMB} < +85^{\circ}C$			200	
$I_{OFF}$	Off-state cathode current	$V_{REF} = 0, V_K = 10V$		1	100	nA
		$-40^{\circ}C < T_{AMB} < +85^{\circ}C$			150	
$R_{KA}$	Static impedance	$\Delta I_K = 100\mu A$ to 12mA		0.25	0.5	Ω
$K_{VH}$	Long term stability	$I_K = 100\mu A, t = 1000hrs$		120		ppm
$E_N$	Wide band noise	$I_K = 100\mu A, 100Hz < F < 10kHz$		200		nV/√Hz

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

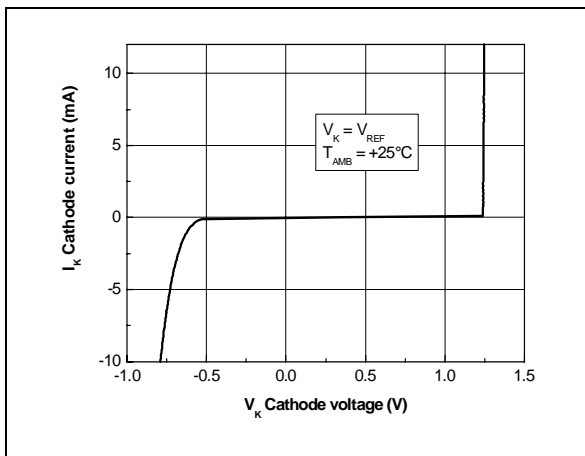
Reference voltage vs temperature



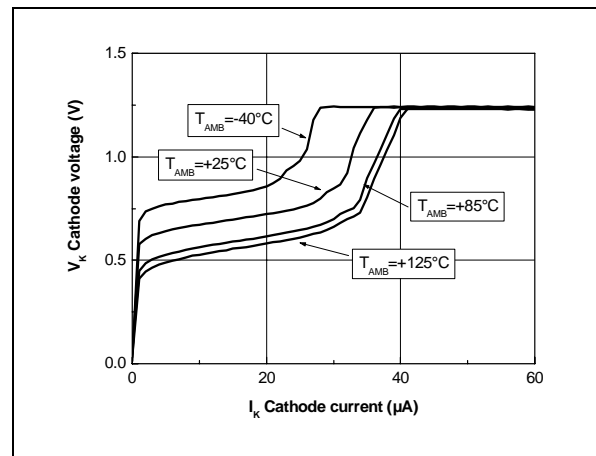
Test circuit for  $V_K = V_{REF}$



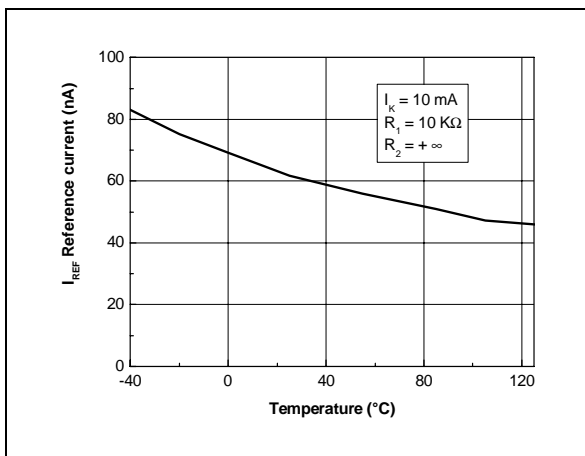
Cathode voltage vs cathode current



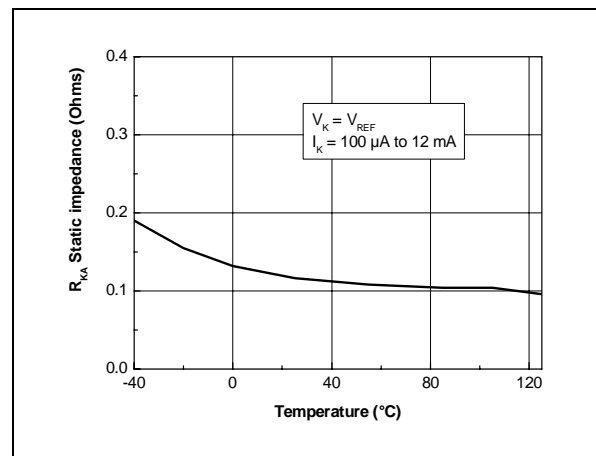
Cathode voltage vs cathode current



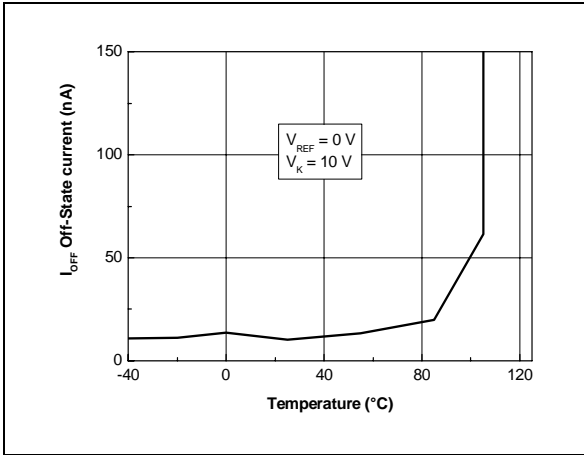
Reference input current vs temperature



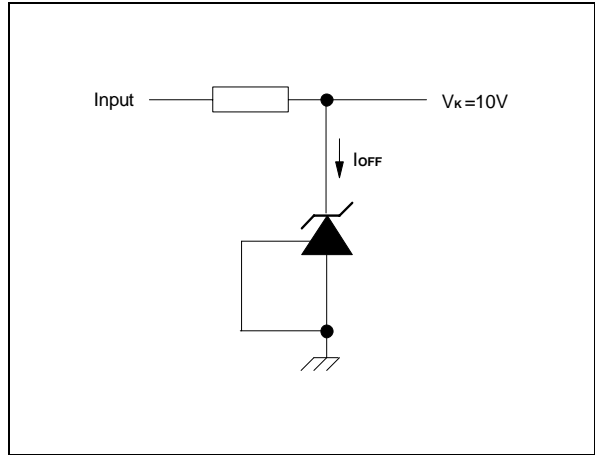
Static impedance vs temperature



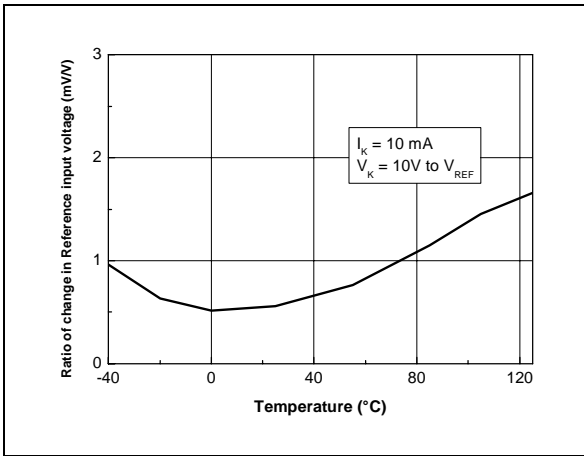
Off-State current vs temperature



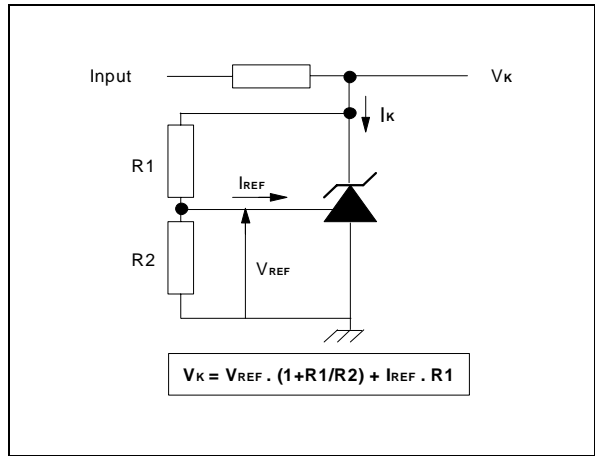
Test circuit for Off-State current measurement



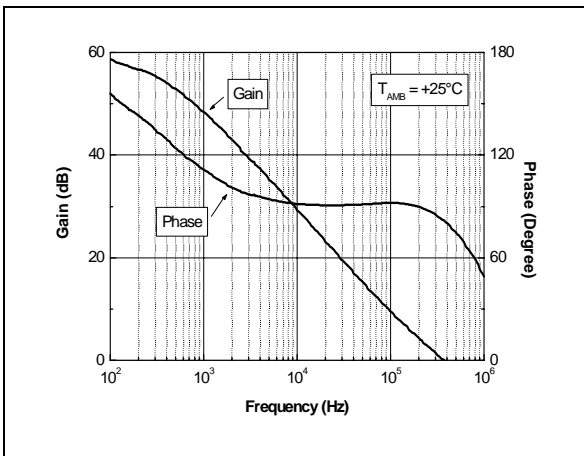
Ratio of change in reference input voltage to change in V\_K voltage vs temperature



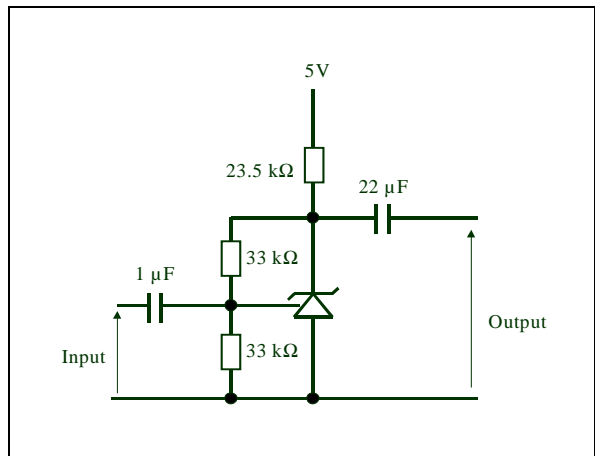
Test circuit for V\_KA > V\_REF



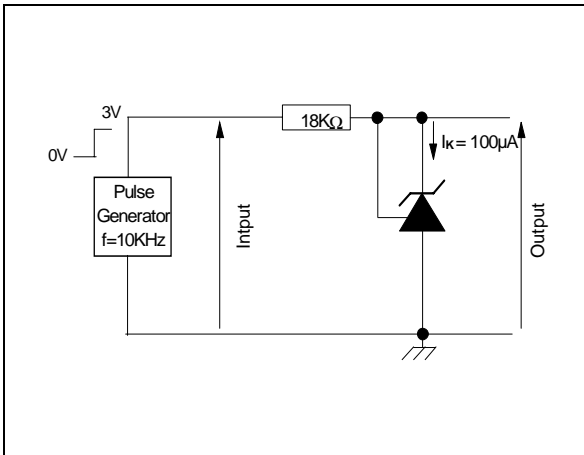
Phase and Gain vs frequency



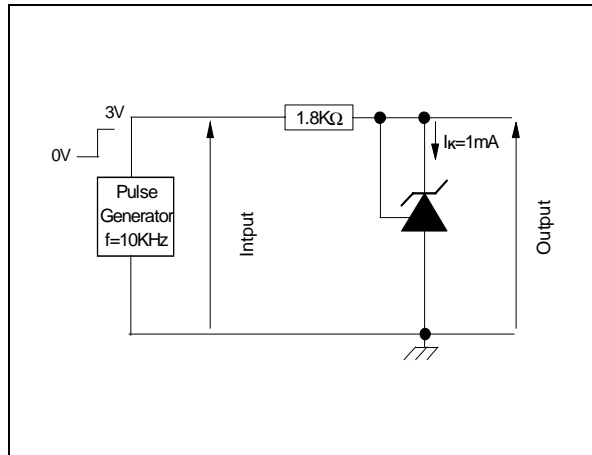
Test circuit for phase and gain measurement



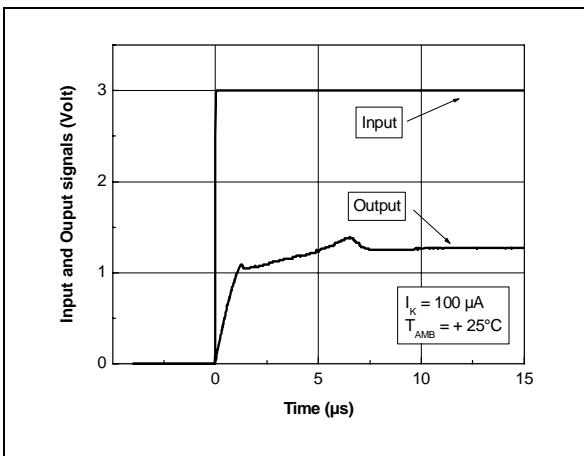
Test circuit for pulse response at  $I_K=100 \mu A$



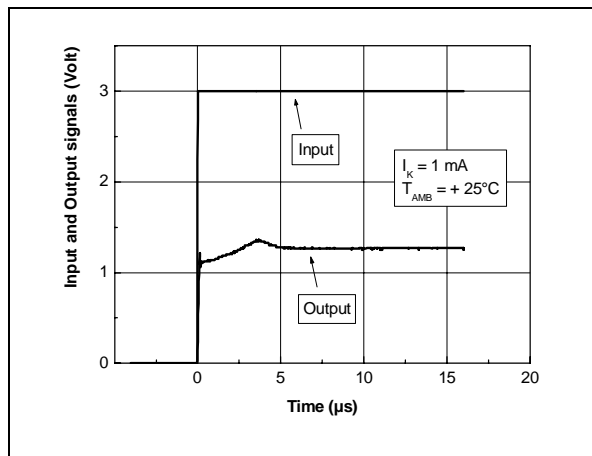
Test circuit for pulse response at  $I_K = 1 mA$



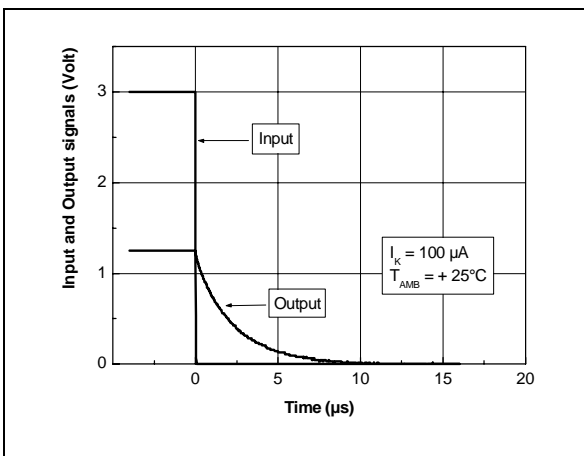
Pulse response at  $I_K = 100 \mu A$



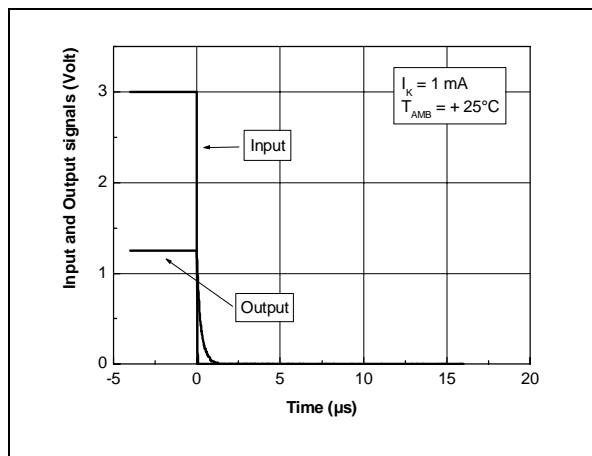
Pulse response at  $I_K = 1 mA$



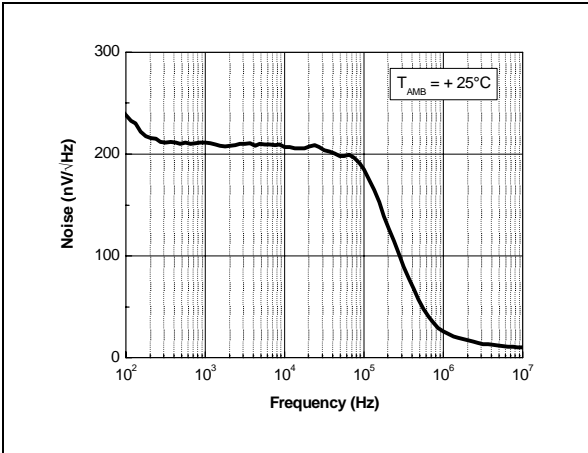
Pulse response at  $I_K = 100 \mu A$



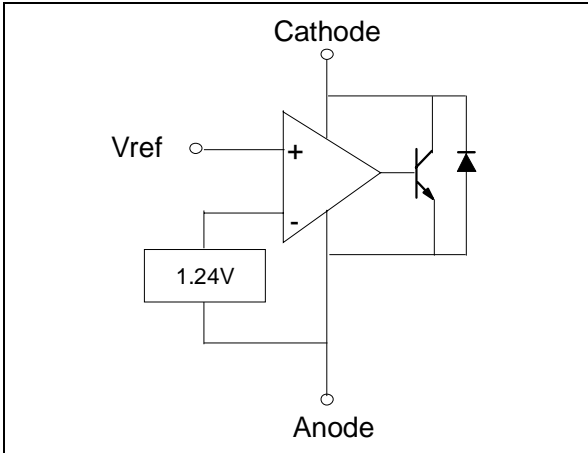
Pulse response at  $I_K = 1 mA$



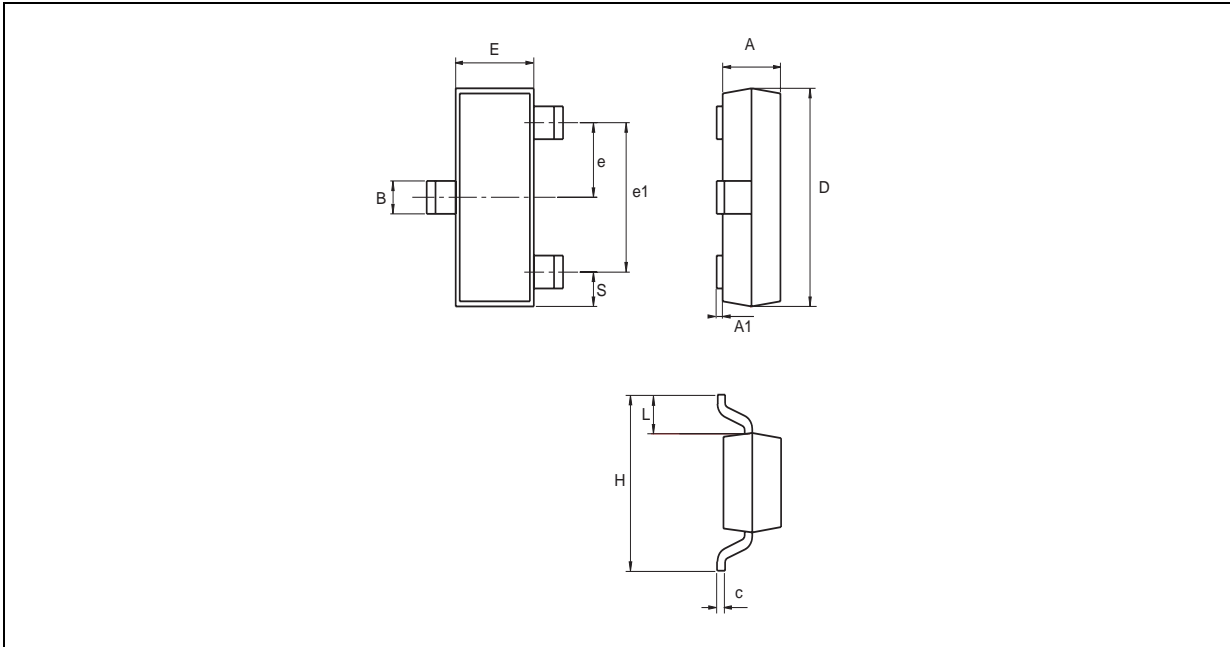
Equivalent input noise vs frequency



Block diagram



**PACKAGE MECHANICAL DATA**  
**3 PINS - TINY PACKAGE (SOT23)**



Dim.	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°			

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

2002 STMicroelectronics - All Rights Reserved  
 STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco  
 Singapore - Spain - Sweden - Switzerland - United Kingdom

<http://www.st.com>

