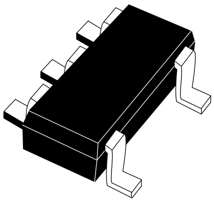
TS4061V

Datasheet

Precision micropower shunt voltage reference



SOT323-5L

Features

- Fixed 2.048 V output voltage
- Ultra low operating current: 10 μA at 25 °C
- High initial accuracy: ± 0.2%
- Stable when used with capacitive loads
- Industrial (-40 to +85 °C) temperature range
- 20 ppm / °C typ., 70 ppm / °C max. temperature coefficient
- Available in SOT323-5L package

Applications

- Portable, battery-operated equipment
- Data acquisition systems
- Instrumentation

Description

The TS4061V is a low power high accuracy shunt voltage reference providing a stable output voltage over the industrial temperature range, with a maximum temperature coefficient of 70 ppm/°C.

The SOT323-5L package is ideal in applications where space saving is a critical issue.

The very low operating current is a key advantage for power budgeted designs. In addition, the TS4061V is very stable and can be used in a broad range of application conditions.

Maturity status link
TS4061V

1 Pin configuration

Figure 1. Pin connections (top view)

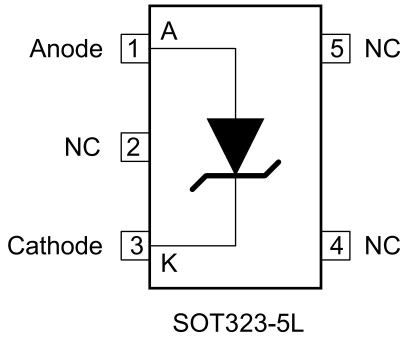


Table 1. Order code

Part number	Cathode-to-anode voltage	Precision	Package	Temperature range
TS4061VIBT-205	2.048 V	0.2%	SOT323-5L	-40 to +85 °C

2 Maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
I_k	Reverse breakdown current	20	mA
I_f	Forward current	15	mA
P_d	Power dissipation (1) SOT323-5L	500	mW
T_{std}	Storage temperature	-65 to +150	°C
ESD	Human body model (HBM)	2	kV
	Charged device model	1500	V
T_{lead}	Lead temperature (Soldering) 10 s.	260	°C
T_j	Max junction temperature	+150	°C

1. *P_d has been calculated with T_{amb} = 25 °C and T_{jmax} = 150 °C*

Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

Table 3. Thermal data

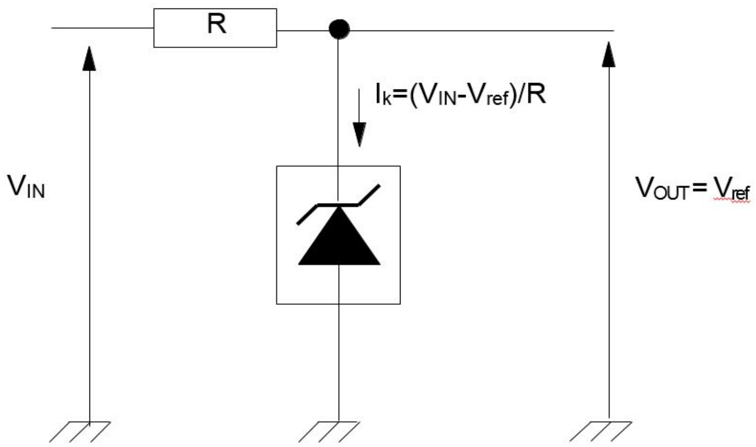
Symbol	Parameter	Value	Unit
R_{thJA}	Thermal resistance junction-ambient	250	°C/W
R_{thJC}	Thermal resistance junction-case	171	°C/W

Table 4. Operating conditions

Symbol	Parameter	Value	Unit
I_{kmin}	Minimum operating current	10	µA
I_{kmax}	Maximum operating current	15	mA
T_{oper}	Operating free air temperature range	-40 to +85	°C

3 Typical application circuit

Figure 2. Application circuit



Note: The value of R must be chosen in order to ensure $I_K \geq I_{Kmin}$ in all the operating conditions (V_{IN}, load and temperature).

4 Electrical characteristics

I_k = 10 µA, T_{amb} = 25 °C (unless otherwise specified).

Table 5. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_k	Initial accuracy TS4061VIBT-205	I_k = 10 µA	-0.2		+0.2	%
I_{kmin}	Minimum operating current	T_{amb} = 25 °C		7.5	10	µA
		-40 °C < T_{amb} < +85 °C			12	
$\Delta V_k / \Delta T$	Average temperature coefficient	10 µA < I_k < 15 mA, -40 °C < T_{amb} < +85 °C		20	70	ppm/°C
$\Delta V_k / \Delta I_k$	Reverse breakdown voltage change with operating current range	I_{kmin} < I_k < 1 mA -40 °C < T amb < +85 °C		0.2	1	mV
		1 mA < I_k < 15 mA -40 °C < T_{amb}< +85 °C		1.7	4	
R_{ka}	Static impedance	I_k = 10 µA to 10 mA		0.15	0.3	Ω
Hys	Thermal hysteresis	I_k = 10 µA		120		ppm
Noise	Wide band noise	I_k = 10 µA 10 Hz < f < 10 kHz		90		μV_{RMS}
	Low frequency noise	I_k = 10 µA 0.1 Hz < f < 10 Hz		45		μV_{p-p}

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

5 Typical performance characteristics

The following plots are referred to the typical application circuit and, unless otherwise noted, at T_A = 25 °C.

Figure 3. Cathode voltage vs. temperature (I_K = 10 µA)

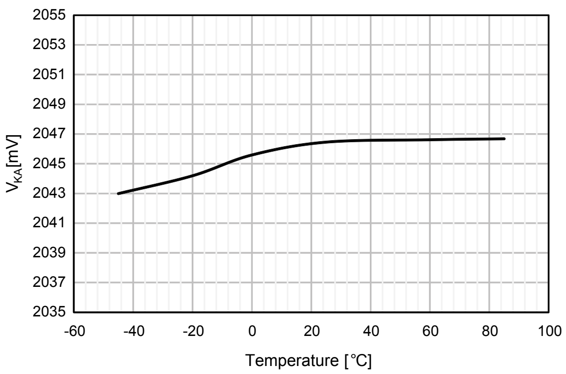


Figure 4. Cathode voltage vs. temperature (I_K = 1 mA)

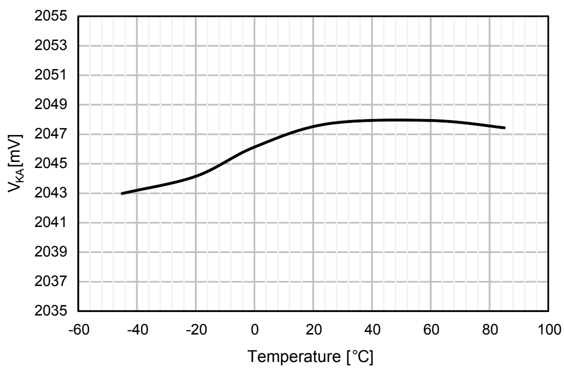


Figure 5. Cathode voltage vs. temperature (I_K = 15 mA)

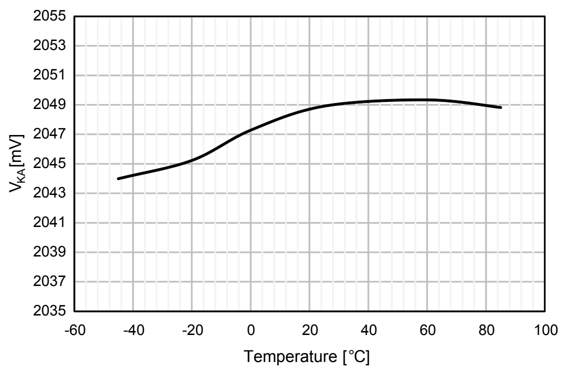


Figure 6. Static impedance vs. temperature

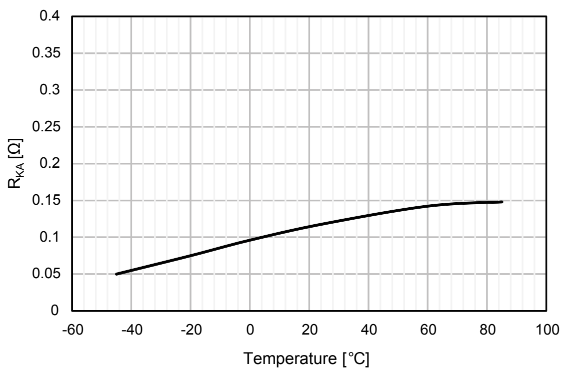


Figure 7. ΔV_k / ΔI_k vs. temperature (I_K = 8 µA to 1 mA)

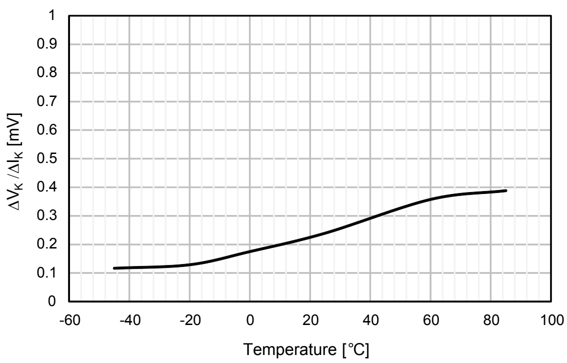


Figure 8. ΔV_k / ΔI_k vs. temperature (I_K = 1 mA to 15 mA)

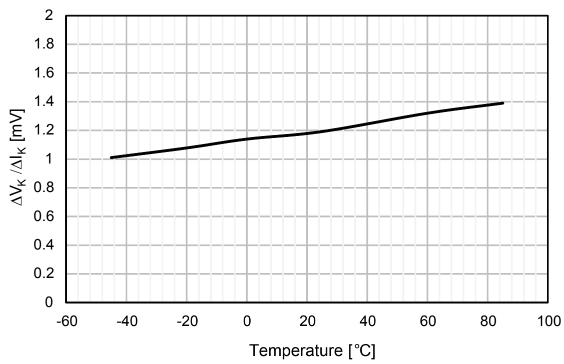


Figure 9. Minimum operating cathode current vs. temperature

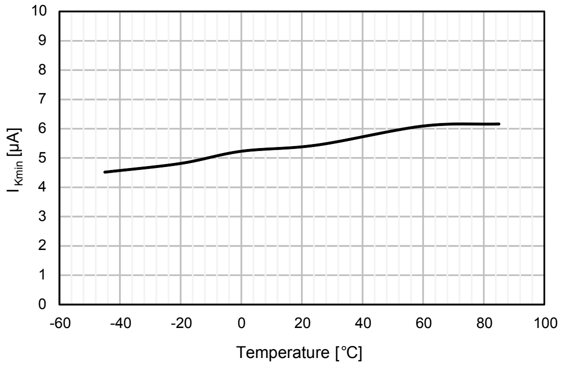


Figure 10. Reverse characteristic

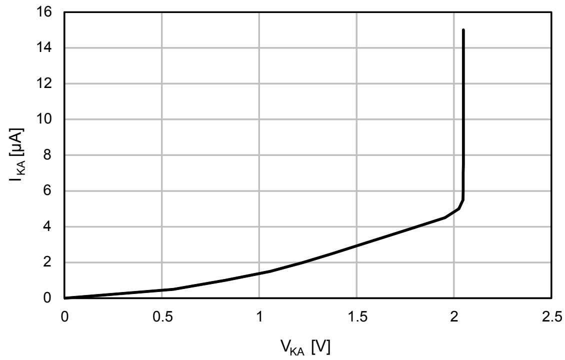


Figure 11. Forward characteristic

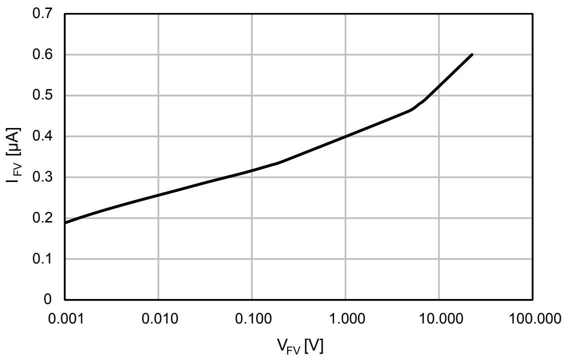


Figure 12. Temperature coefficient

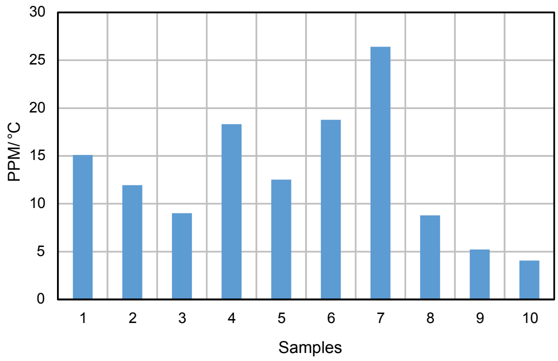


Figure 13. Turn-on transient (t_{rise} = 10 µs, no C_{OUT})

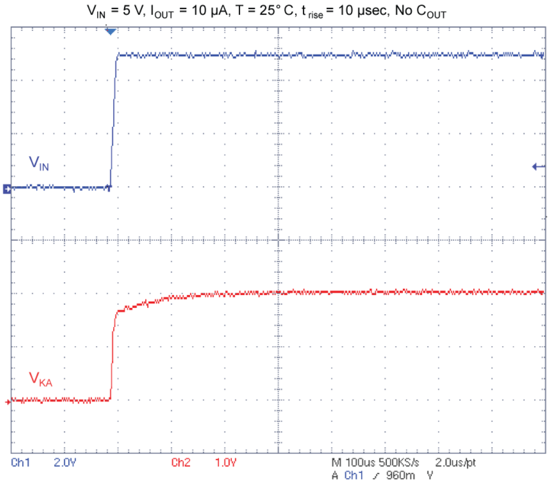


Figure 14. Turn-on transient (t_{rise} = 1.2 ms, no C_{OUT})

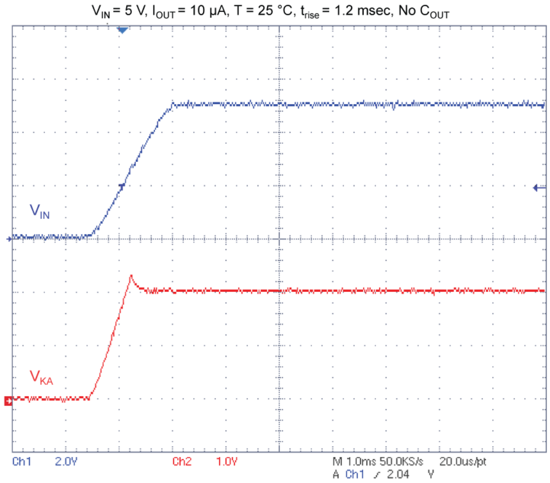


Figure 15. Turn-on transient (t_{rise} = 1.2 ms, C_{OUT} = 100 nF)

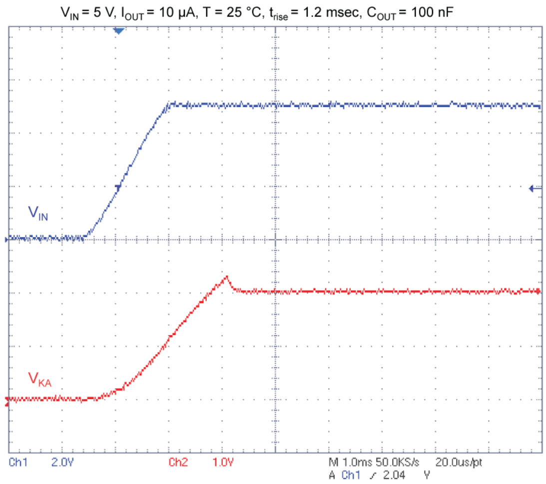
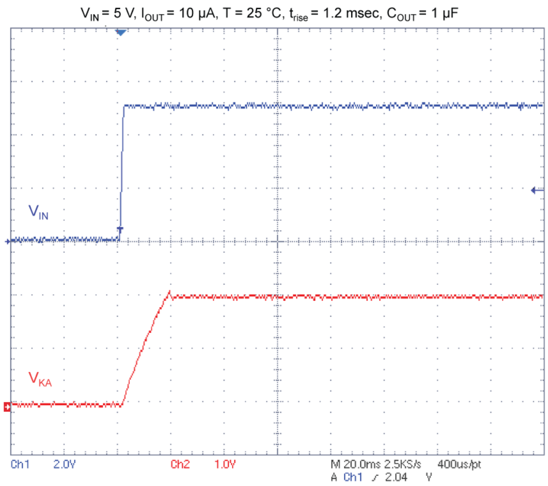


Figure 16. Turn-on transient (t_{rise} = 1.2 ms, C_{OUT} = 1 µF)



6 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

6.1 SOT323-5L package information

Figure 17. SOT323-5L package outline

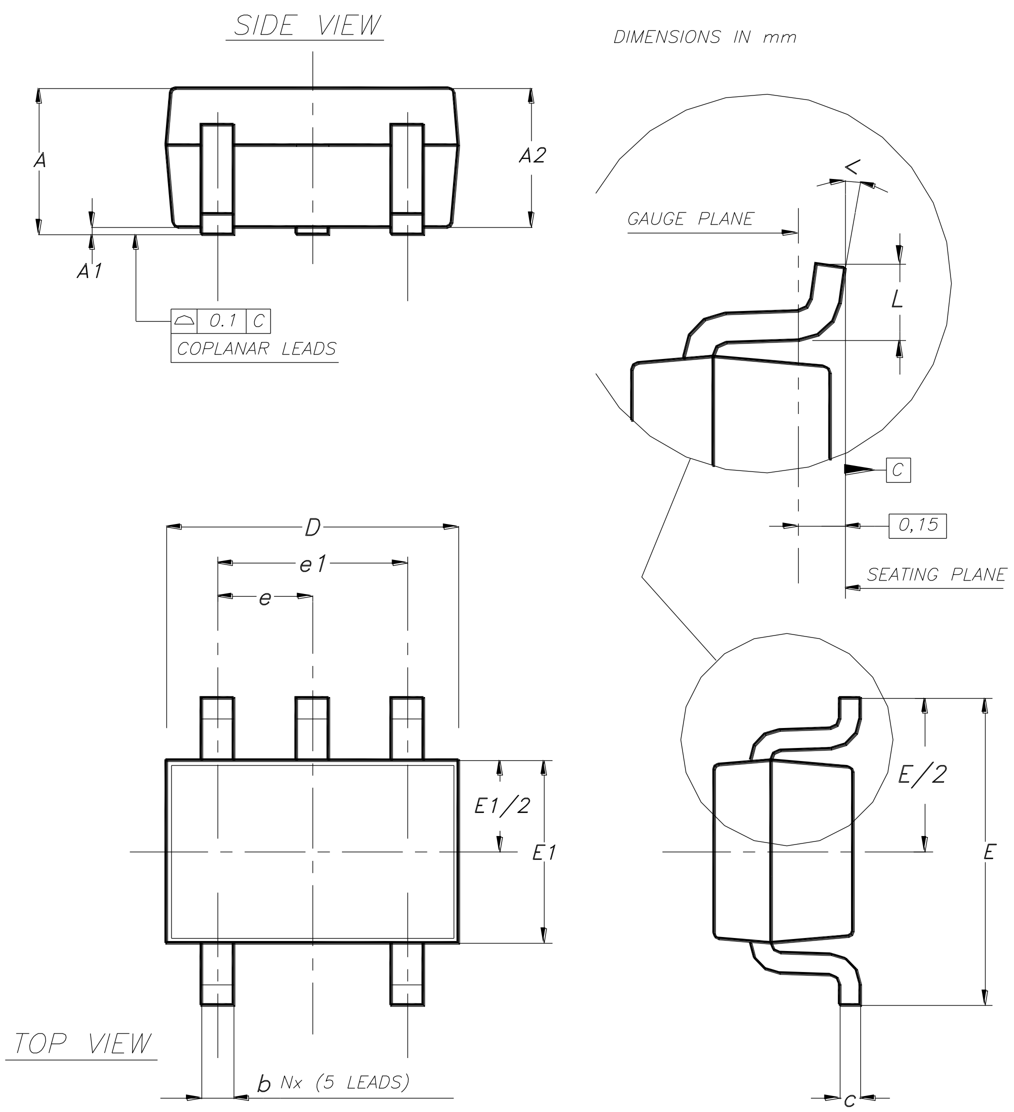


Table 6. **SOT323-5L package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.10
A1	0		0.10
A2	0.80	0.90	1.00
b	0.15		0.30
c	0.10		0.22
D	1.80	2.00	2.20
E	1.80	2.10	2.40
E1	1.15	1.25	1.35
e		0.65	
e1		1.30	
L	0.26	0.36	0.46
θ	0°		8°

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
07-Jun-2018	1	Initial release.

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