



Precision Voltage Reference

FEATURES

- Tight Initial voltage tolerance
- Low dynamic impedance 1 Ω Max.
- Operating current AS04, 10 μ A & AS05, 20 μ A
- Wide operating current range..... 10 μ A to 20mA
- Output Voltage option.....AS04 (1.25V), AS05 (2.5V)
- Direct replacement for TC04 and TC05

APPLICATIONS

- A/D and D/A Reference
- Threshold Detectors
- Digital Voltmeter
- Power Supply Monitor
- Current Source Generation

PRODUCT DESCRIPTION

The ALPHA Semiconductor AS04/05 is a 2-terminal band-gap precision voltage reference which provides a stable fixed output voltage of 1.25 and 2.5 volts respectively with a tolerance less than ± 10 mV for AS04 and ± 20 mV for AS05. ALPHA Semiconductor's design, process, and precise on chip trimming enable us to achieve low temperature coefficient as low as 25ppm/ $^{\circ}$ C.

The AS04/05 can be used as a pin-to-pin replacement of the TC04 and TC05. The AS04/05 is available in TO-46, TO-92, SO-8 packages and Die at the operating temperature range of 0 $^{\circ}$ C to 70 $^{\circ}$ C and -55 $^{\circ}$ C to 150 $^{\circ}$ C.

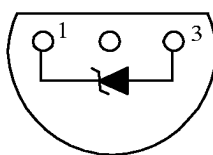
ORDERING INFORMATION

PART NUMBER	MAX TEMPCO ¹ ppm/ $^{\circ}$ C	PACKAGE TYPE	TEMP. RANGE
AS04T/05T	25	TO-52	MIL.
AS04AT/05AT	50	TO-52	MIL
AS04BT/05BT	100	TO-52	MIL
AS04N/05N	25	TO-92	COM
AS04AN/05AN	50	TO-92	COM
AS04BN/05BN	100	TO-92	COM
AS04S/05S	25	SO-8	COM
AS04AS/05AS	50	SO-8	COM
AS04BS/05BS	100	SO-8	COM

1. For lower Tempco, consult factory

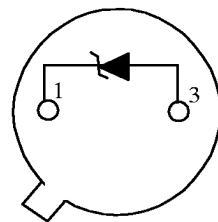
PIN CONNECTIONS

TO-92



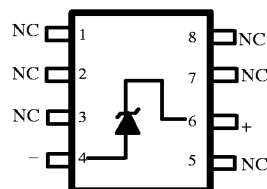
Bottom View

TO-52



Bottom View

8-Pin Surface Mount



Top View

ABSOLUTE MAXIMUM RATINGS

Forward Current 10 mA

Reverse Current 30 mA

Operating Temperature

AS-46 PKG -55°C to +125°C

AS-92 & SO-8 PKGS 0°C to 70°C

Storage Temperature Range

TO-46 PKG -65°C to +200°C

TO-92 PKG -65°C to +150°C

Lead Temperature Range (10Sec.)

TO-92 PKG +260°C

TO-52 PKG +300°C

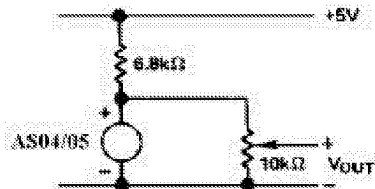
SO-8 PKG +260°C

ELECTRICAL CHARACTERISTICSElectrical Characteristics at $I_{in} = 100 \mu A$, and $T_a = +25^\circ C$ unless otherwise noted.

PARAMETERS	CONDITIONS	AS04A/05A			AS04B/05B			Units
		Min	Typ.	Max	Min	Typ.	Max	
Reference breakdown Voltage	AS04 AS05	1.235 2.475	1.250 2.500	1.265 2.525	1.230 2.475	1.250 2.500	1.270 2.525	V V
Reverse Dynamic Impedance				1			1	Ω
Output Voltage Change with current	$15\mu A \leq I_{in} \leq 20mA$			20			20	mV
	$20\mu A \leq I_{in} \leq 1mA$			1.0			1.0	mV
	$20\mu A \leq I_{in} \leq 20mA$			20			20	mV
	$25\mu A \leq I_{in} \leq 1mA$			1.0			1.0	mV
Min. Operating Current	AS04			10			10	mA
	AS05			20			20	mA
Wide Band Noise	10Hz f 10KHz		60			60		μV
Temperature Coeff.				50			100	ppm/ $^\circ C$
Long Term Stability	$T_a = 25^\circ C \pm 1^\circ C$		20			20		ppm/KHr

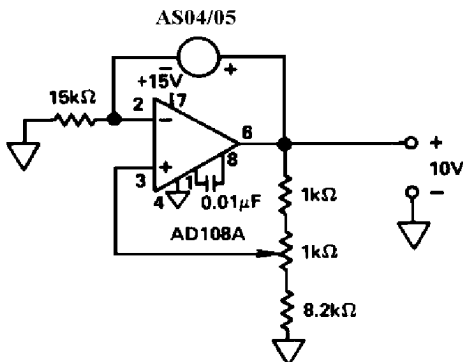
APPLICATION INFORMATION

The AS04/05 acts as a two terminal shunt type regulator. This device provides a constant output current at a wide range of input current of 50 μ A to 20mA. The below figure shows a simplified connection of an output voltage of 1.2 or less. The minimum capacitor of 1000pF is required for additional filtering to provide lower noise.



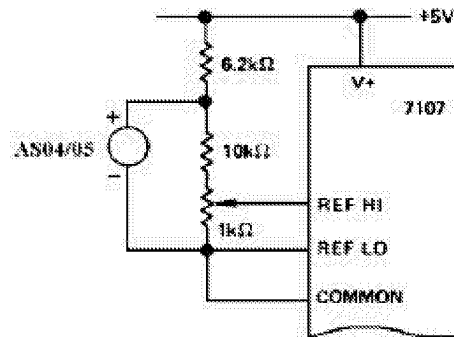
Basic Configuration for 1.2V or Less

The AS04/05 can be used as a building block for reference voltage. The below figure will show the circuit design that produces a buffer 10V output and a supply current of 2mA.



Single-Supply Buffered 10V Reference

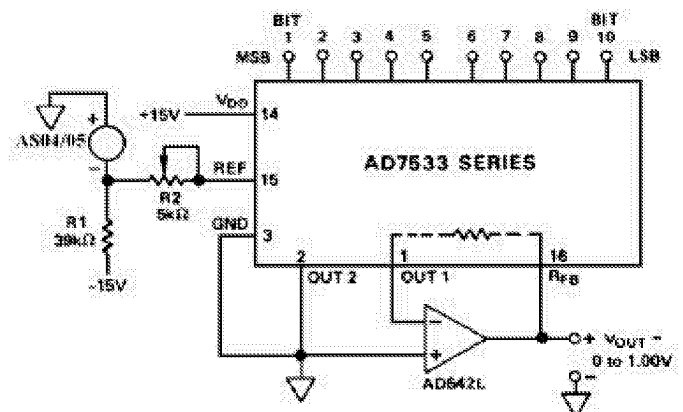
The AS04/05 low power operation makes it suitable for battery operated equipment. This device is ideal for use with CMOS analog-to-digital converter as a reference. The below figure shows this device used with two common integrating type CMOS A/D converters.



With 7107 Panel Meter A/D

AS04/05 Used as Reference for CMOS A/D Converters

The AS04/05 is also suitable to use with CMOS digital-to-analog converter. This figure shows the requirement of DAC in negative reference voltage in order to provide a positive output range. The below circuit shows AS04/05 supplying the -1.0V reference to multiplying DAC.



AS04/05 as Reference for 10-Bit CMOS DAC