

# ALPHA SEMICONDUCTOR

Excellence in Analog Power Products

## AS04/05

### Precision Voltage Reference

#### FEATURES

- Tight Initial voltage tolerance
- Low dynamic impedance ..... 1  $\Omega$  Max.
- Operating current ..... AS04, 10 $\mu$ A & AS05, 20 $\mu$ A
- Wide operating current range..... 10 $\mu$ 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  $\pm 10$ mV for AS04 and  $\pm 20$ 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.

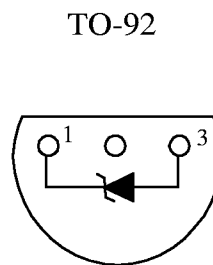
The AS04/05 can be used as a pin-to-pin replacement of the TC04 and TC05. The AS04/05 is available in TO-46, TO-92, SO-8 packages and Die at the operating temperature range of 0 $^{\circ}$ C to 70 $^{\circ}$ C and -55 $^{\circ}$ C to 150 $^{\circ}$ C.

#### ORDERING INFORMATION

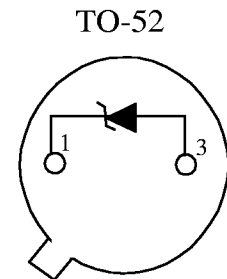
PART NUMBER	MAX TEMPCO <sup>1</sup> ppm/ $^{\circ}$ C	PACKAGE TYPE	TEMP. RANGE
AS04T/05T	25	TO-52	MIL.
AS04AT/05AT	50	TO-52	MIL
AS04BT/05BT	100	TO-52	MIL
AS04N/05N	25	TO-92	COM
AS04AN/05AN	50	TO-92	COM
AS04BN/05BN	100	TO-92	COM
AS04S/05S	25	SO-8	COM
AS04AS/05AS	50	SO-8	COM
AS04BS/05BS	100	SO-8	COM

1. For lower Tempco, consult factory

#### PIN CONNECTIONS

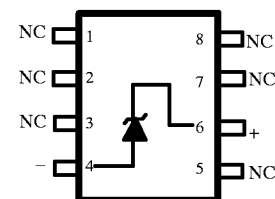


Bottom View



Bottom View

#### 8-Pin Surface Mount



Top View

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## 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

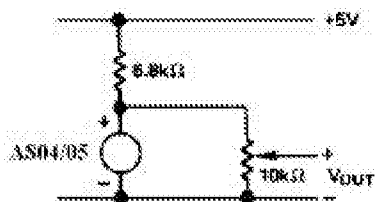
## ELECTRICAL CHARACTERISTICS

Electrical 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	$\Omega$
Output Voltage Change with current	15 $\mu A \leq I_{in} \leq 20mA$ 20 $\mu A \leq I_{in} \leq 1mA$ 20 $\mu A \leq I_{in} \leq 20mA$ 25 $\mu A \leq I_{in} \leq 1mA$			20 1.0 20 1.0			20 1.0 20 1.0	mV mV mV mV
Min. Operating Current	AS04 AS05			10 20			10 20	mA mA
Wide Band Noise	10Hz f 10KHz		60			60		$\mu V$
Temperature Coeff.				50			100	ppm/ $^\circ C$
Long Term Stability	$T_a = 25^\circ C \pm 1^\circ C$		20			20		ppm/KHr

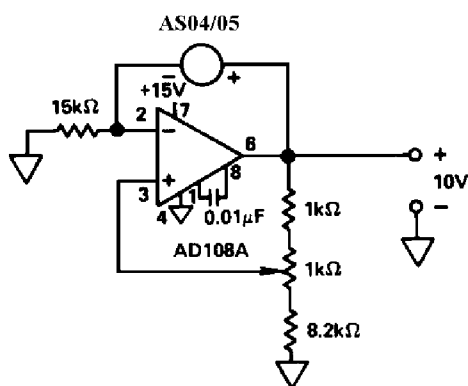
## APPLICATION INFORMATION

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 $\mu$ 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.



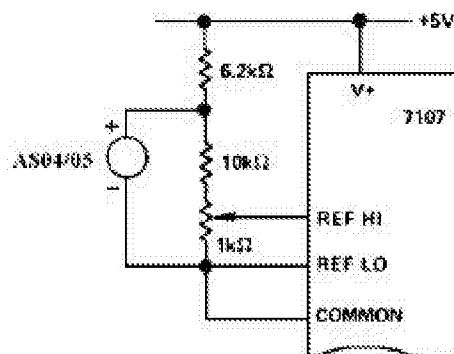
*Basic Configuration for 1.2V or Less*

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*

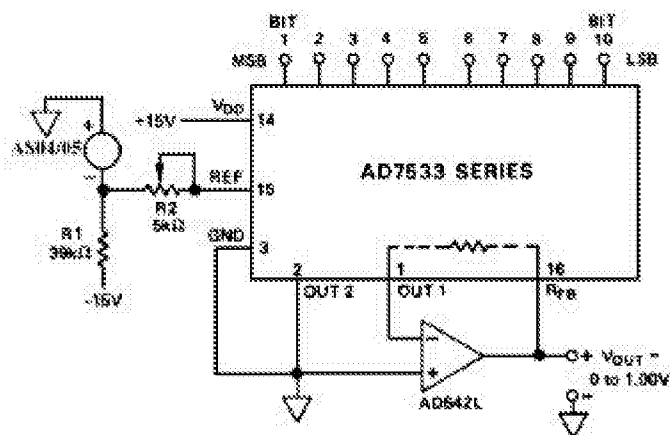
The AS04/05 low power operation makes it suitable for battery operated equipment. This device is ideal for use with CMOS analog-to-digital converter as a reference. The below figure shows this device used with two common integrating type CMOS A/D converters.



*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*