

ADR01/ADR02/ADR03/ADR06

FEATURES

Ultracompact SC70 and TSOT packages

Low temperature coefficient

8-lead SOIC: 3 ppm/°C

5-lead SC70: 9 ppm/°C

5-lead TSOT: 9 ppm/°C

Initial accuracy ±0.1%

No external capacitor required

Low noise 10 µV p-p (0.1 Hz to 10.0 Hz)

Wide operating range

ADR01: 12.0 V to 36.0 V

ADR02: 7.0 V to 36.0 V

ADR03: 4.5 V to 36.0 V

ADR06: 5.0 V to 36.0 V

High output current 10 mA

Wide temperature range: -40°C to +125°C

ADR01/ADR02/ADR03 pin compatible to industry-standard REF01/REF02/REF03

APPLICATIONS

Precision data acquisition systems

High resolution converters

Industrial process control systems

Precision instruments

PCMCIA cards

GENERAL DESCRIPTION

The ADR01, ADR02, ADR03, and ADR06 are precision 10.0 V, 5.0 V, 2.5 V, and 3.0 V band gap voltage references featuring high accuracy, high stability, and low power consumption. The parts are housed in tiny, 5-lead SC70 and TSOT packages, as well as in 8-lead SOIC versions. The SOIC versions of the ADR01, ADR02, and ADR03 are drop-in replacements¹ to the industry-standard REF01, REF02, and REF03. The small footprint and wide operating range make the ADR0x references ideally suited for general-purpose and space-constrained applications.

With an external buffer and a simple resistor network, the TEMP terminal can be used for temperature sensing and approximation. A TRIM terminal is provided on the devices for fine adjustment of the output voltage.

¹ ADR01, ADR02, and ADR03 are component-level compatible with REF01, REF02, and REF03, respectively. No guarantees for system-level compatibility are implied. SOIC versions of ADR01/ADR02/ADR03 are pin-to-pin compatible with 8-lead SOIC versions of REF01/REF02/REF03, respectively, with the additional temperature monitoring function.

PIN CONFIGURATIONS

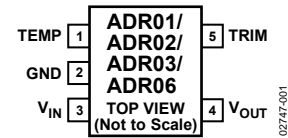
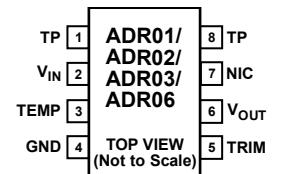


Figure 1. 5-Lead, SC70/TSOT Surface-Mount Packages



NIC = NO INTERNAL CONNECT
TP = TEST PIN (DO NOT CONNECT)

Figure 2. 8-Lead, SOIC Surface-Mount Package

The ADR01, ADR02, ADR03, and ADR06 are compact, low drift voltage references that provide an extremely stable output voltage from a wide supply voltage range. They are available in 5-lead SC70 and TSOT packages, and 8-lead SOIC packages with A, B, and C grade selections. All parts are specified over the extended industrial (-40°C to +125°C) temperature range.

Table 1. Selection Guide

Part Number	Output Voltage
ADR01	10.0 V
ADR02	5.0 V
ADR03	2.5 V
ADR06	3.0 V

ADR01/ADR02/ADR03/ADR06

ADR06 ELECTRICAL CHARACTERISTICS

$V_{IN} = 5.0\text{ V to }36.0\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Table 5.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
OUTPUT VOLTAGE	V_O	A and C grades	2.994	3.000	3.006	V
INITIAL ACCURACY	V_{OERR}	A and C grades			6 0.2	mV %
OUTPUT VOLTAGE	V_O	B grade	2.997	3.000	3.003	V
INITIAL ACCURACY	V_{OERR}	B grade			3 0.1	mV %
TEMPERATURE COEFFICIENT	TCV_O	A grade, 8-lead SOIC, $-40^\circ\text{C} < T_A < +125^\circ\text{C}$ A grade, 5-lead TSOT, $-40^\circ\text{C} < T_A < +125^\circ\text{C}$ A grade, 5-lead SC70, $-40^\circ\text{C} < T_A < +125^\circ\text{C}$ B grade, 8-lead SOIC, $-40^\circ\text{C} < T_A < +125^\circ\text{C}$ B grade, 5-lead TSOT, $-40^\circ\text{C} < T_A < +125^\circ\text{C}$ B grade, 5-lead SC70, $-40^\circ\text{C} < T_A < +125^\circ\text{C}$ C grade, 8-lead SOIC, $-40^\circ\text{C} < T_A < +125^\circ\text{C}$		3 1 10	10 25 25 3 9 9 40	ppm/ $^\circ\text{C}$ ppm/ $^\circ\text{C}$ ppm/ $^\circ\text{C}$ ppm/ $^\circ\text{C}$ ppm/ $^\circ\text{C}$ ppm/ $^\circ\text{C}$ ppm/ $^\circ\text{C}$
DROPOUT VOLTAGE	V_{DO}		2			V
LINE REGULATION	$\Delta V_O/\Delta V_{IN}$	$V_{IN} = 5.0\text{ V to }36.0\text{ V}$, $-40^\circ\text{C} < T_A < +125^\circ\text{C}$		7	30	ppm/V
LOAD REGULATION	$\Delta V_O/\Delta I_{LOAD}$	$I_{LOAD} = 0\text{ mA to }10\text{ mA}$, $-40^\circ\text{C} < T_A < +125^\circ\text{C}$, $V_{IN} = 7.0\text{ V}$		40	70	ppm/mA
QUIESCENT CURRENT	I_{IN}	No load, $-40^\circ\text{C} < T_A < +125^\circ\text{C}$		0.65	1	mA
VOLTAGE NOISE	$e_{N\text{ p-p}}$	0.1 Hz to 10.0 Hz		10		$\mu\text{V p-p}$
VOLTAGE NOISE DENSITY	e_N	1 kHz		510		nV/ $\sqrt{\text{Hz}}$
TURN-ON SETTLING TIME	t_R			4		μs
LONG-TERM STABILITY ¹	ΔV_O	1000 hours		50		ppm
OUTPUT VOLTAGE HYSTERESIS	ΔV_{O_HYS}			70		ppm
RIPPLE REJECTION RATIO	RRR	$f_{IN} = 10\text{ kHz}$		-75		dB
SHORT CIRCUIT TO GND	I_{SC}			30		mA
TEMPERATURE SENSOR						
Voltage Output at TEMP Pin	V_{TEMP}			550		mV
Temperature Sensitivity	TCV_{TEMP}			1.96		mV/ $^\circ\text{C}$

¹ The long-term stability specification is noncumulative. The drift in subsequent 1000 hour periods is significantly lower than in the first 1000 hour period.

ABSOLUTE MAXIMUM RATINGS

Ratings are at 25°C, unless otherwise noted.

Table 6.

Parameter	Rating
Supply Voltage	36.0 V
Output Short-Circuit Duration to GND	Indefinite
Storage Temperature Range	-65°C to +150°C
Operating Temperature Range	-40°C to +125°C
Junction Temperature Range	-65°C to +150°C
Lead Temperature Range (Soldering, 60 sec)	300°C

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

THERMAL RESISTANCE

θ_{JA} is specified for the worst-case conditions, that is, a device soldered in a circuit board for surface-mount packages.

Table 7. Thermal Resistance

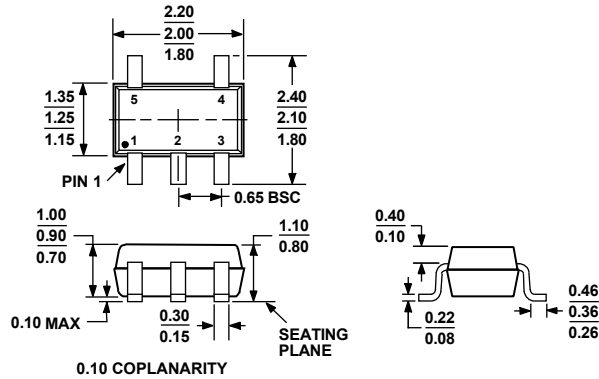
Package Type	θ_{JA}	θ_{JC}	Unit
5-Lead SC70 (KS-5)	376	189	°C/W
5-Lead TSOT (UJ-5)	230	146	°C/W
8-Lead SOIC (R-8)	130	43	°C/W

ESD CAUTION



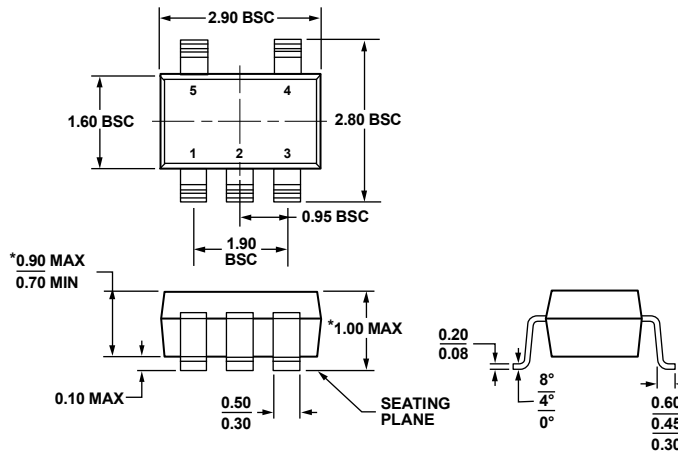
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

OUTLINE DIMENSIONS



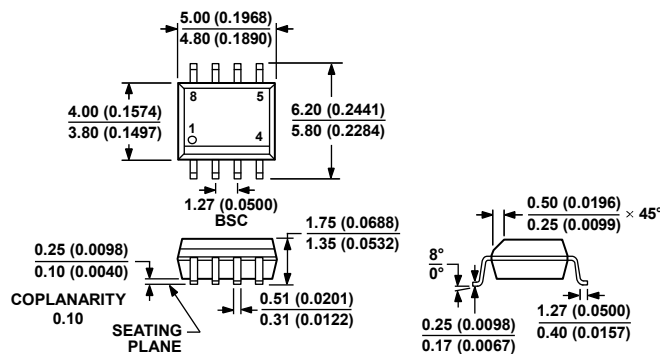
COMPLIANT TO JEDEC STANDARDS MO-203-AA

Figure 44. 5-Lead Thin Shrink Small Outline Transistor Package [SC70] (KS-5)
Dimensions shown in millimeters



*COMPLIANT TO JEDEC STANDARDS MO-193-AB WITH THE EXCEPTION OF PACKAGE HEIGHT AND THICKNESS.

Figure 45. 5-Lead Thin Small Outline Transistor Package [TSOT] (UJ-5)
Dimensions shown in millimeters



COMPLIANT TO JEDEC STANDARDS MS-012-AA
CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS (IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

Figure 46. 8-Lead Standard Small Outline Package [SOIC_N] Narrow Body (R-8)
Dimensions shown in millimeters and (inches)

100708-A

012407-A

ADR01/ADR02/ADR03/ADR06

ADR06 Ordering Guide

Model	Output Voltage V _o (V)	Initial Accuracy		Temperature Coefficient (ppm/°C)	Temperature Range	Package Description	Package Option	Ordering Quantity	Branding
		(mV)	(%)						
ADR06AR	3	6	0.2	10	-40°C to +125°C	8-Lead SOIC_N	R-8	98	
ADR06AR-REEL7	3	6	0.2	10	-40°C to +125°C	8-Lead SOIC_N	R-8	1,000	
ADR06ARZ ¹	3	6	0.2	10	-40°C to +125°C	8-Lead SOIC_N	R-8	98	
ADR06ARZ-REEL7 ¹	3	6	0.2	10	-40°C to +125°C	8-Lead SOIC_N	R-8	1,000	
ADR06BR	3	3	0.1	3	-40°C to +125°C	8-Lead SOIC_N	R-8	98	
ADR06BR-REEL7	3	3	0.1	3	-40°C to +125°C	8-Lead SOIC_N	R-8	1,000	
ADR06BRZ ¹	3	3	0.1	3	-40°C to +125°C	8-Lead SOIC_N	R-8	98	
ADR03BRZ-REEL7 ¹	3	3	0.1	3	-40°C to +125°C	8-Lead SOIC_N	R-8	1,000	
ADR06AUJ-REEL7	3	6	0.2	25	-40°C to +125°C	5-Lead TSOT	UJ-5	3,000	RWA
ADR06AUJ-R2	3	6	0.2	25	-40°C to +125°C	5-Lead TSOT	UJ-5	250	RWA
ADR06AUJZ-REEL7 ¹	3	6	0.2	25	-40°C to +125°C	5-Lead TSOT	UJ-5	3,000	R1L
ADR06BUJ-REEL7	3	3	0.1	9	-40°C to +125°C	5-Lead TSOT	UJ-5	3,000	RWB
ADR06BUJ-R2	3	3	0.1	9	-40°C to +125°C	5-Lead TSOT	UJ-5	250	RWB
ADR06BUJZ-REEL7 ¹	3	3	0.1	9	-40°C to +125°C	5-Lead TSOT	UJ-5	3,000	R1M
ADR06AKS-REEL7	3	6	0.2	25	-40°C to +125°C	5-Lead SC70	KS-5	3,000	RWA
ADR06AKS-R2	3	6	0.2	25	-40°C to +125°C	5-Lead SC70	KS-5	250	RWA
ADR06AKSZ-REEL7 ¹	3	6	0.2	25	-40°C to +125°C	5-Lead SC70	KS-5	3,000	R1L
ADR06BKS-REEL7	3	3	0.1	9	-40°C to +125°C	5-Lead SC70	KS-5	3,000	RWB
ADR06BKS-R2	3	3	0.1	9	-40°C to +125°C	5-Lead SC70	KS-5	250	RWB
ADR06BKSZ-REEL7 ¹	3	3	0.1	9	-40°C to +125°C	5-Lead SC70	KS-5	3,000	R1M
ADR06CRZ ¹	3	6	0.2	40	-40°C to +125°C	8-Lead SOIC_N	R-8	98	
ADR06CRZ-REEL ¹	3	6	0.2	40	-40°C to +125°C	8-Lead SOIC_N	R-8	2,500	

¹ Z = RoHS Compliant Part.