

FEATURES

Extreme high temperature operation
 -40°C to $+210^{\circ}\text{C}$
Temperature coefficient: 40 ppm/ $^{\circ}\text{C}$ typical
High output current: 10 mA
Low supply current: 60 μA maximum
Initial accuracy: $\pm 2.4\%$ (± 60 mV maximum)
Low dropout voltage

APPLICATIONS

Downhole drilling and instrumentation
Avionics
Heavy industrial
High temperature environments

GENERAL DESCRIPTION

The **ADR225-KGD-CHIPS** is a precision 2.5 V band gap voltage reference specified for a high temperature operation of 210°C . It uses a micropower core topology and laser trimming of highly stable, thin film resistors to achieve a temperature coefficient of 80 ppm/ $^{\circ}\text{C}$ (maximum) up to 210°C and an initial accuracy of 2.4% (± 60 mV maximum). A maximum operating current of 60 μA and a low dropout voltage allow the **ADR225-KGD-CHIPS** to function very well in battery-powered equipment.

METAL MASK DIE IMAGE

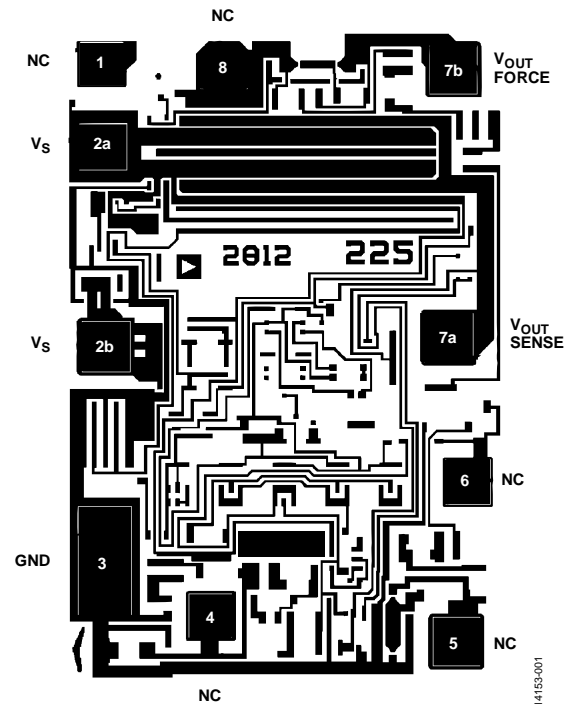


Figure 1.

The **ADR225-KGD-CHIPS** is a member of a growing series of high temperature qualified products offered by Analog Devices, Inc. For a complete selection table of the available high temperature products, see the high temperature product list and qualification data available at www.analog.com/hightemp.

Additional application and technical information can be found in the **ADR225** data sheet.

Rev. 0

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REVISION HISTORY

2/16—Revision 0: Initial Version

SPECIFICATIONS

$V_{IN} = 3.3\text{ V}$, $V_{OUT} = 2.5\text{ V}$, $T_{MIN} < T_A < T_{MAX}$, unless otherwise noted. Due to variations in assembly methods and normal yield loss, yield after packaging is not guaranteed for standard product dice.

Table 1.

| Parameter | Symbol | Test Conditions/Comments | Min | Typ | Max | Unit |
|--------------------------------------|----------------------------------|---|-----|---------|-----------------------|-------------------------|
| SUPPLY CURRENT | I_{SY} | No load | | 40 | 60 | μA |
| INITIAL ACCURACY ¹ | V_{OUT} | $I_{OUT} = 0\text{ mA}$ | | ± 5 | ± 60 ± 2.4 | mV % |
| TEMPERATURE COEFFICIENT ² | TCV_{OUT} | $I_{OUT} = 0\text{ mA}$ | | 40 | 80 | ppm/ $^{\circ}\text{C}$ |
| REGULATION | | | | | | |
| Line Regulation | $\Delta V_{OUT}/\Delta V_{IN}$ | $3.0\text{ V} \leq V_S \leq 15\text{ V}$, $I_{OUT} = 0\text{ mA}$ | | 0.25 | 1.5 | mV/V |
| Load Regulation ³ | $\Delta V_{OUT}/\Delta I_{LOAD}$ | $V_S = 5.0\text{ V}$, $0\text{ mA} \leq I_{OUT} \leq 10\text{ mA}$ | | 0.25 | 1.5 | mV/mA |
| VOLTAGE | | | | | | |
| Dropout Voltage | $V_S - V_{OUT}$ | $I_{LOAD} = 10\text{ mA}$ | | | 1.00 | V |
| Noise Voltage | e_N | 0.1 Hz to 10 Hz | | 25 | | $\mu\text{V p-p}$ |

¹ For proper operation, a 1 μF capacitor is required between the outputs ($V_{OUT\text{ SENSE}}$ and $V_{OUT\text{ FORCE}}$) and the GND pad of the device.

² TCV_{OUT} is defined as the ratio of output change with temperature variation to the specified temperature range, expressed in ppm/ $^{\circ}\text{C}$.

$$TCV_{OUT} = (V_{MAX} - V_{MIN})/V_{OUT}(T_{MAX} - T_{MIN})$$

³ The load regulation specification includes the effect of self heating.

ABSOLUTE MAXIMUM RATINGS

Table 2.

| Parameter | Rating |
|-----------------------------|--------------------------------|
| Supply Voltage | −0.3 V to +18 V |
| Output to GND | −0.3 V to $V_S + 0.3\text{ V}$ |
| Operating Temperature Range | −40°C to +210°C |

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

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.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

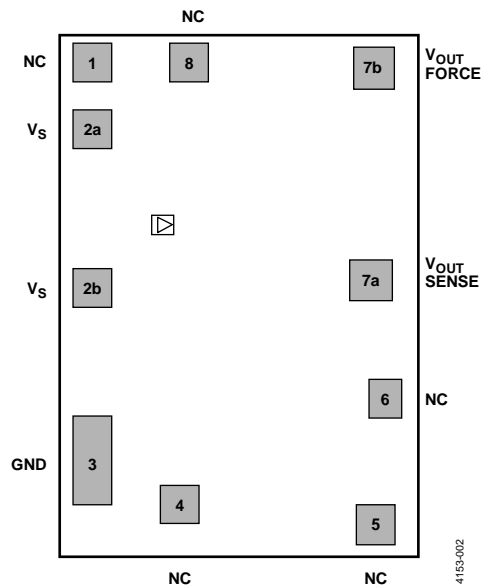


Figure 2. Pad Configuration

Table 3. Pad Function Descriptions¹

| Pad No. | X-Axis (μm) | Y-Axis (μm) | Mnemonic | Description |
|---------|--------------------------|--------------------------|-----------------|--|
| 1 | -368 | +587 | NC | No Connect. Do not connect to this pad. |
| 2a | -362 | +423 | V_S | Input. The input must be connected to both V_S pads. |
| 2b | -360 | +18 | V_S | Input. The input must be connected to both V_S pads. |
| 3 | -362 | -401 | GND | Ground. |
| 4 | -149 | -525 | NC | No Connect. Do not connect to this pad. |
| 5 | +345 | -577 | NC | No Connect. Do not connect to this pad. |
| 6 | +368 | -256 | NC | No Connect. Do not connect to this pad. |
| 7a | +330 | +36 | V_{OUT} SENSE | Sense Output. The output must be connected to both V_{OUT} SENSE and V_{OUT} FORCE pads. |
| 7b | +339 | +576 | V_{OUT} FORCE | Force Output. The output must be connected to both V_{OUT} SENSE and V_{OUT} FORCE pads. |
| 8 | -122 | +576 | NC | No Connect. Do not connect to this pad. |

¹ The die center is the reference location at 0.0 μm \times 0.0 μm . The pad coordinates are to the center of each pad.

OUTLINE DIMENSIONS

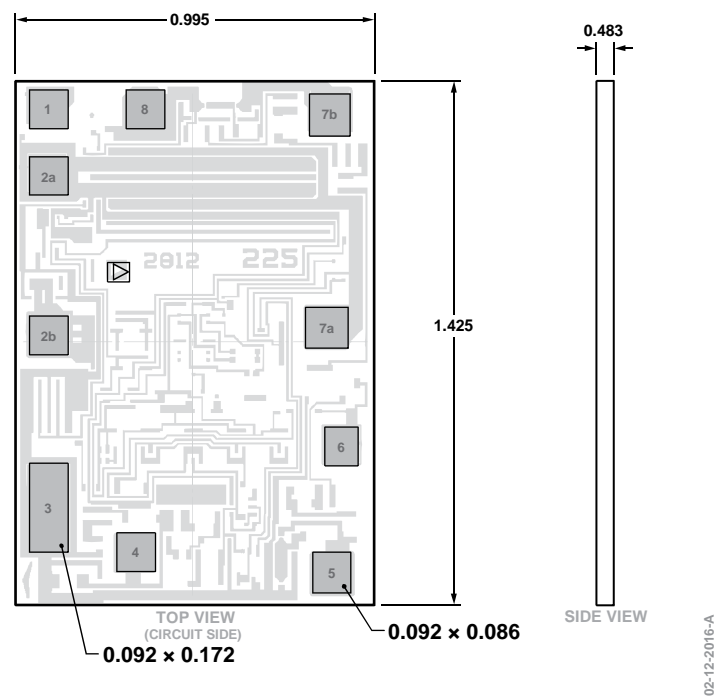


Figure 3. 8-Pad Bare Die [CHIP]
(C-8-7)
Dimensions shown in millimeters

Table 4. Die Specifications

| Parameter | Value | Unit |
|----------------------|------------|----------------|
| Chip Size | 920 × 1350 | μm |
| Scribe Line Width | 75 × 75 | μm |
| Die Size | 995 × 1425 | μm |
| Thickness | 483 | μm |
| Bond Pad | 92 × 86 | μm |
| Bond Pad Composition | AlCu (0.5) | % |
| Passivation | Oxynitride | Not applicable |
| Polyimide | None | Not applicable |
| Die Marker | 225 | Not applicable |
| Backside | GND | Not applicable |

Table 5. Assembly Recommendations

| Assembly Component | Recommendation |
|--------------------|-----------------------------|
| Die Attach | Epoxy adhesive |
| Bonding Method | Gold ball or aluminum wedge |
| Bonding Sequence | GND pad first |

ORDERING GUIDE

| Model | Temperature Range | Package Description | Package Option |
|-----------------|-------------------|-----------------------|----------------|
| ADR225-KGD-CHIP | −40°C to +210°C | 8-Pad Bare Die [CHIP] | C-8-7 |