64-Position OTP Digital Potentiometer

AD5171

FEATURES

64 positions
OTP (one-time programmable)[1] set-and-forget resistance setting—low cost alternative over EEMEM
Unlimited adjustments prior to OTP activation
5 kΩ, 10 kΩ, 50 kΩ, 100 kΩ end-to-end resistance
Low tempco 5 ppm/°C in potentiometer mode
Low tempco 35 ppm/°C in rheostat mode
Compact standard SOT-23-8 package
Low power, I_{DD} = 10 µA max
Fast settling time, t_s = 5 µs typ in power-up
I²C compatible digital interface
Computer software replaces µC in factory programming applications
Full read/write of wiper register
Extra I²C device address pin
Power-on preset to midscale
6 V one-time programming voltage
Low operating voltage, 2.7 V to 5.5 V
OTP validation check function
Automotive temperature range −40°C to +125°C

APPLICATIONS

Systems calibrations
Electronics level settings
Mechanical potentiometers and trimmers® replacements
Automotive electronics adjustments
Gain control and offset adjustments
Transducer circuits adjustments
Programmable filters up to 1.5 MHz BW

GENERAL DESCRIPTION

The AD5171 is a 64-position, one-time programmable (OTP) digital potentiometer[2] that uses fuse link technology to achieve the memory retention of the resistance setting function. OTP is a cost-effective alternative over the EEMEM approach for users who do not need to reprogram new memory settings in the digital potentiometer. This device performs the same electronic adjustment function as most mechanical trimmers and variable resistors. The AD5171 is programmed using a 2-wire I²C compatible digital control. It allows unlimited adjustments before permanently setting the resistance value. During the OTP activation, a permanent fuse blown command is sent after the final value is determined, therefore freezing the wiper position at a given setting (analogous to placing epoxy on a mechanical trimmer). When this permanent setting is achieved, the value does not change regardless of supply variations or environmental stresses under normal operating conditions. To verify the success of permanent programming, Analog Devices patterned the OTP validation such that the fuse status can be discerned from two validation bits in read mode.

For applications that program the AD5171 in factories, Analog Devices offers device programming software that operates across Windows® 95 to XP® platforms including Windows NT®. This software application effectively replaces the need for external I²C controllers or host processors and therefore significantly reduces users' development time.

An AD5171 evaluation kit is available, which includes the software, connector, and cable that can be converted for factory programming applications.

The AD5171 is available in a compact SOT-23-8 package. All parts are guaranteed to operate over the automotive temperature range of −40°C to +125°C. Besides its unique OTP feature, the AD5171 lends itself well to other general-purpose digital potentiometer applications due to its temperature performance, small form factor, and low cost.

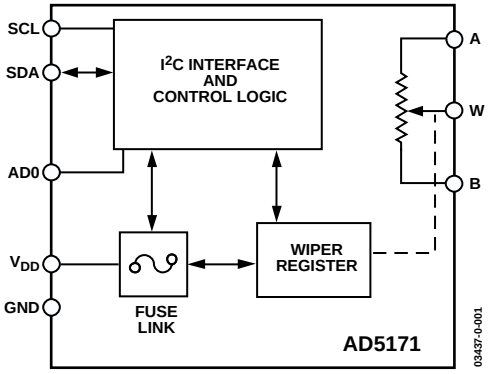

Figure 1. Functional Block Diagram

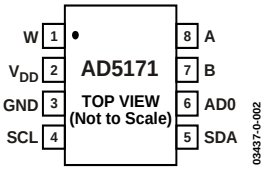

Figure 2. Pin Configuration

[1]One-time programmable (OTP)—Unlimited adjustments before permanent setting.
[2]The terms digital potentiometer and RDAC are used interchangeably.

Rev. 0

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OUTLINE DIMENSIONS

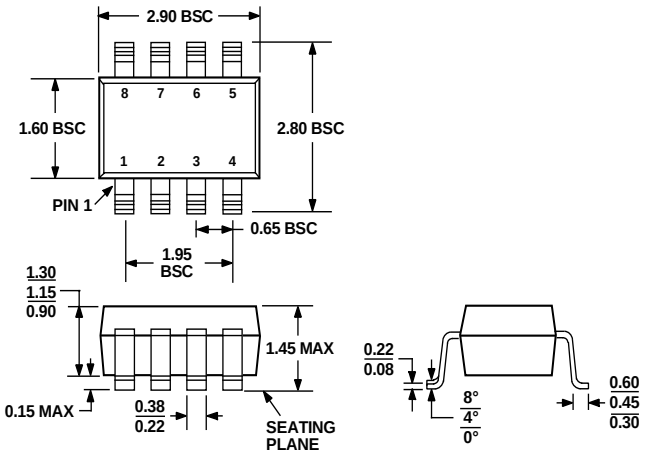

Figure 51. 8-Lead Small Outline Transistor Package [SOT-23] (RJ-8)
Dimensions shown in millimeters

ORDERING GUIDE

Model	R_{AB} (kΩ)	Package Code	Package Description	Full Container Quantity	Branding
AD5171BRJ5-R2	5	RJ-8	SOT-23-8	250	D12
AD5171BRJ5-RL7	5	RJ-8	SOT-23-8	3000	D12
AD5171BRJZ5-R2[1]	5	RJ-8	SOT-23-8	250	D12
AD5171BRJZ5-R7[1]	5	RJ-8	SOT-23-8	3000	D12
AD5171BRJ10-R2	10	RJ-8	SOT-23-8	250	D13
AD5171BRJ10-RL7	10	RJ-8	SOT-23-8	3000	D13
AD5171BRJZ10-R2[1]	10	RJ-8	SOT-23-8	250	D13
AD5171BRJZ10-R7[1]	10	RJ-8	SOT-23-8	3000	D13
AD5171BRJ50-R2	50	RJ-8	SOT-23-8	250	D14
AD5171BRJ50-RL7	50	RJ-8	SOT-23-8	3000	D14
AD5171BRJZ50-R2[1]	50	RJ-8	SOT-23-8	250	D14
AD5171BRJZ50-R7[1]	50	RJ-8	SOT-23-8	3000	D14
AD5171BRJ100-R2	100	RJ-8	SOT-23-8	250	D15
AD5171BRJ100-RL7	100	RJ-8	SOT-23-8	3000	D15
AD5171BRJZ100-R2[1]	100	RJ-8	SOT-23-8	250	D15
AD5171BRJZ100-R7[1]	100	RJ-8	SOT-23-8	3000	D15
AD5171EVAL[2]	10		Evaluation Board	1	

[1] Z = Pb-free part.
[2] The evaluation board is shipped with three pieces of 10 kΩ parts. Users should order extra samples or different resistance options if needed.

Purchase of licensed I²C components of Analog Devices or one of its sublicensed Associated Companies conveys a license for the purchaser under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philips.