

KEYWORDS:**A/D CONVERTER, AREF, VREF, ANALOG VOLTAGE REFERENCE, ANALOG COMPARATOR**

This document is originally distributed by AVRfreaks.net, and may be distributed, reproduced, and modified without restrictions. Updates and additional design notes can be found at: www.avrfreaks.net

Using AVR Analog Voltage Reference (AREF)

Introduction

This document explains how to use Internal or External AREF for applications using A/D Converter or Analog Comparator.

Overview

Using External AREF

The AVR internal A/D Converter can measure voltages between ground (GND) and the Analog Reference Voltage (AREF). The External AREF pin can be connected directly to AVCC to allow measurement of signals between GND and AVCC. To measure analog signals more accurately, or to limit the dynamic range of the measured signal, an External Voltage Reference can be connected to the AREF pin. For 10-bit resolution, the voltage reference should be higher than 2V.

When selecting External Voltage References note that the accuracy of the measured A/D signal is directly dependent of the accuracy of the External Voltage Reference. The AREF input resistance is typically 10K. This gives a leakage current of 300A (at 3V) when using external AREF.

Using Internal AREF

Some AVR device types have an internal AREF of 2.56V. Please consult the individual AVR datasheet for details. This can be used as reference voltage for the A/D Converter. When using internal AREF, the external AREF pin can either be used for decoupling with a 10 nF capacitor to AGND, or it can be connected to AVCC. On some AVR parts it can even be used as a general I/O pin.

When switching to internal AREF measurement, a dummy A/D conversion should be performed before a real A/D measurement is done.