avr555+: a general purpose firmware for AVR microcontrollers

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1 Definitions

P Linear dimension of final print

W Angle-of-view factor

AOV Angle of view

2 Introduction

Concept

avr555+ is a firmware for AVR microcontrollers that allows a variety of common timing, sensing, and control functions to be implemented using only passive components and wiring changes, with no need for a PC, code changes, or serial-port programmer.

AVR microcontrollers flashed with this firmware can function as timers, thermostats, motor controllers, simple human interface devices, and more, without the need for any conventional programming changes. Devices preflashed with avr555+ firmware can simply be ”programmed” for the desired function at the time of use.

avr555+ is written for ATMEGA328 microcontrollers in common DIP packages. It uses the internal oscillator to eliminate the need for a crystal oscillator, and many functions assume 5V power supply.

Here are some of the applications that can be done with avr555+. All functions can be implemented without reprogramming:

- Simple oscillator – outputs a square wave at 50% duty cycle. The frequency can be chosen by choice of resistor, and by extension, frequency can be adjusted with a potentiometer. In this case the AVR replaces a timer such as a 555 timer.

- Simple comparator – compares voltages and toggles an output based on comparison. In this case the AVR replaces a comparator, such as LM311P.
- Thermostat – Similar to the comparator, but the reference voltage (which varies based on transducer used), voltage hysteresis, and ”compressor delay” function can be programmed by resistors for a variety of common temperature transducers such as PT100, thermistors, and LM335.
- Debouncer – filter digital inputs to remove noise, using Schmitt-trigger-like filtering in software.
- Bistable memory – output switches between on or off when triggered
- ADC – read an analog voltage and output a digital value by direct binary, serial port, or PWM.
- Stepper motor driver – Drive a bipolor stepper motor using step-and-direction inputs, using the microcontroller to do the step translation
- Stepper motor speed controller – Control a bipolor stepper motor continuously using direction-and-speed inputs.
- PWM controller – output a variable duty cycle pulse-width modulation. The frequency of the PWM can be configured by wiring. This mode can also be ”stacked” with the thermostat function, allowing output power to be adjusted separately.

3 Programming

Pin voltage	Top, Bottom resistors	Function	Description
0V	0, 0	Default	Analog comparator
50mV	100k, 1k	Default	Thermostat

oscillator

TO BE CONTINUED

