

PIC Microcontroller: CCP modules

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ABSTRACT

There are many applications which based on Microcontroller. They are user friendly and capable of interacting with the external peripherals. To accomplish these tasks, a microcontroller device has digital inputs/outputs, pulsed inputs/outputs analog inputs/outputs, etc. There are serial and parallel data communications which are used in data communication. Parallel communication required more number of wires, and can communicate more number of bits at a time whereas Serial communication has gained more importance now-a-day. This is more appropriate to discuss some more PIC functions that can support the above mentioned requirements. Another requirement is External events and their occurrence at the exact point of time and generation of precise timing at the output pins of the microcontroller on a real time. There are two CCP modules in 16F877 supporting capture/compare and PWM functions discuss in present paper. This module allows detecting exact timing of the occurrence of an event or can generate exact timing at the output.

Keywords: PIC 16F877, CCP1, CCP2, PWM

I. INTRODUCTION

Microcontroller-based designs are very flexible and compact. Use of supporting integrated circuits for interfacing sensors and transducers makes the design very simple and cost effective. Use of serial ADC, SPI and I²C bus interface can save the number of microcontroller pins.

Measurement of physical quantities is an integral part of any engineering application. Various sensors are used to extract the information from a physical media and this information is then converted into suitable form.

Transmission of this information to a remote place is a need where it is monitored and used to take certain action. The role of microcontrollers must be very clear in all these systems. Earlier measurement systems used to have analog circuits for signal conditioning. However, due to digital processing of signals, today it is possible to carry out more complex functions in a better manner and then communicate this information more precisely to the display or controlling device. Two-way communication among various instruments is possible due to the built-in facilities of serial communication in microcontrollers. Newer design of signal transmitters, converters and controllers use digital processing of signals. Use of microcontroller-based instruments makes the system more reliable, flexible and powerful with many more facilities to fulfill the needs of control systems.

II. CAPTURE/COMPARE/PWM (CCP) MODULES IN PIC 16F877

A Capture/Compare/PWM (CCP) module supports the measurement, control and the generation of pulsed signals with respect to time precisely. In capture mode, it is possible to transfer the contents of an internal 16-bit timer into a special function register, upon detection of a rising or falling edge. The compare mode generates an interrupt, or changes the status of an output pin, when timer 1 matches a predefined comparison value.

Pulse Width modulation (PWM) mode allows generating a rectangular wave with programmable duty cycle at the user set frequency. There are two CCP modules in PIC 16F877, namely, CCP1 and CCP2. Both have almost similar operations in supporting capture, compare and PWM functions. Each of the CCP modules has a 16-bit capture register, a 16-bit compare register and a PWM

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PIC'n Techniques David Benson,1999-01-01 **PIC Microcontroller and Embedded Systems** Muhammad Ali Mazidi,Danny Causey,Rolin McKinlay,2016-08-16 The PIC microcontroller from Microchip is one of the most widely used 8 bit microcontrollers in the world In this book the authors use a step by step and systematic approach to show the programming of the PIC18 chip Examples in both Assembly language and C show how to program many of the PIC18 features such as timers serial communication ADC and SPI *Programming PIC Microcontrollers with XC8* Armstrong Subero,2017-12-06 Learn how to use microcontrollers without all the frills and math This book uses a practical approach to show you how to develop embedded systems with 8 bit PIC microcontrollers using the XC8 compiler It s your complete guide to understanding modern PIC microcontrollers Are you tired of copying and pasting code into your embedded projects Do you want to write your own code from scratch for microcontrollers and understand what your code is doing Do you want to move beyond the Arduino Then Programming PIC Microcontrollers with XC8 is for you Written for those who want more than an Arduino but less than the more complex microcontrollers on the market PIC microcontrollers are the next logical step in your journey You ll also see the advantage that MPLAB X offers by running on Windows MAC and Linux environments You don t need to be a command line expert to work with PIC microcontrollers so you can focus less on setting up your environment and more on your application What You ll Learn Set up the MPLAB X and XC8 compilers for microcontroller development Use GPIO and PPS Review EUSART and Software UART communications Use the eXtreme Low Power XLP options of PIC microcontrollers Explore wireless communications with WiFi and Bluetooth Who This Book Is For Those with some basic electronic device and some electronic equipment and knowledge This book assumes knowledge of the C programming language and basic knowledge of digital electronics though a basic overview is given for both A complete newcomer can follow along but this book is heavy on code schematics and images and focuses less on the theoretical aspects of using microcontrollers This book is also targeted to students wanting a practical overview of microcontrollers outside of the classroom **The Quintessential PIC® Microcontroller** Sid Katzen,2013-03-09 Written specifically for readers with no prior knowledge of computing electronics or logic design Uses real world hardware and software products to illustrate the material and includes numerous fully worked examples and self assessment questions PIC Microcontrollers Milan Verle,2009 PIC Microcontrollers Martin P. Bates,2004-06-09 The use of microcontroller based solutions to everyday design problems in electronics is the most important development in the field since the introduction of the microprocessor itself The PIC family is established as the number one microcontroller at an introductory level Assuming no prior knowledge of microprocessors Martin Bates provides a comprehensive introduction to microprocessor systems and applications covering all the basic principles of microelectronics Using the latest Windows development software MPLAB the author goes on to

introduce microelectronic systems through the most popular PIC devices currently used for project work both in schools and colleges as well as undergraduate university courses Students of introductory level microelectronics including microprocessor microcontroller systems courses introductory embedded systems design and control electronics will find this highly illustrated text covers all their requirements for working with the PIC Part A covers the essential principles concentrating on a systems approach The PIC itself is covered in Part B step by step leading to demonstration programmes using labels subroutines timer and interrupts Part C then shows how applications may be developed using the latest Windows software and some hardware prototyping methods The new edition is suitable for a range of students and PIC enthusiasts from beginner to first and second year undergraduate level In the UK the book is of specific relevance to AVCE as well as BTEC National and Higher National programmes in electronic engineering A comprehensive introductory text in microelectronic systems written round the leading chip for project work Uses the latest Windows development software MPLAB and the most popular types of PIC for accessible and low cost practical work Focuses on the 16F84 as the starting point for introducing the basic architecture of the PIC but also covers newer chips in the 16F8X range and 8 pin mini PICs

Microcontroller Programming Julio Sanchez, Maria P. Canton, 2018-10-03 From cell phones and television remote controls to automobile engines and spacecraft microcontrollers are everywhere Programming these prolific devices is a much more involved and integrated task than it is for general purpose microprocessors microcontroller programmers must be fluent in application development systems programming and I O operation as well as memory management and system timing Using the popular and pervasive mid range 8 bit Microchip PIC as an archetype *Microcontroller Programming* offers a self contained presentation of the multidisciplinary tools needed to design and implement modern embedded systems and microcontrollers The authors begin with basic electronics number systems and data concepts followed by digital logic arithmetic conversions circuits and circuit components to build a firm background in the computer science and electronics fundamentals involved in programming microcontrollers For the remainder of the book they focus on PIC architecture and programming tools and work systematically through programming various functions modules and devices Helpful appendices supply the full mid range PIC instruction set as well as additional programming solutions a guide to resistor color codes and a concise method for building custom circuit boards Providing just the right mix of theory and practical guidance *Microcontroller Programming* The Microchip PIC is the ideal tool for any amateur or professional designing and implementing stand alone systems for a wide variety of applications

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PIC in Practice David W Smith, 2006-01-16 PIC in Practice is a graded course based around the practical use of the PIC microcontroller through project work Principles are introduced gradually through hands on experience enabling students to develop their understanding at their own pace Dave Smith has based the book on his popular short courses on the PIC for professionals students and teachers at Manchester Metropolitan University The result is a graded text formulated around practical exercises which truly guides the reader from square one The book can be used at a variety of levels and the carefully graded projects make it ideal for colleges schools and universities Newcomers to the PIC will find it a painless introduction whilst electronics hobbyists will enjoy the practical nature of this first course in microcontrollers PIC in Practice introduces applications using the popular 16F84 device as well as the 16F627 16F877 12C508 12C629 and 12C675 In this new edition excellent coverage is given to the 16F818 with additional information on writing and documenting software Gentle introduction to using PICs for electronic applications Principles and programming introduced through graded projects Thoroughly up to date with new chapters on the 16F818 and writing and documenting programs

The Essential PIC18® Microcontroller Sid Katzen, 2010-06-18

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Interfacing PIC Microcontrollers Martin P. Bates,2013-09-18 Interfacing PIC Microcontrollers 2nd Edition is a great introductory text for those starting out in this field and as a source reference for more experienced engineers Martin Bates has drawn upon 20 years of experience of teaching microprocessor systems to produce a book containing an excellent balance of theory and practice with numerous working examples throughout It provides comprehensive coverage of basic microcontroller system interfacing using the latest interactive software Proteus VSM which allows real time simulation of microcontroller based designs and supports the development of new applications from initial concept to final testing and deployment Comprehensive introduction to interfacing 8 bit PIC microcontrollers Designs updated for current software versions MPLAB v8 Proteus VSM v8 Additional applications in wireless communications intelligent sensors and more

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Table of Contents Pic Microcontroller Ccp Modules International Journal Of

1. Understanding the eBook Pic Microcontroller Ccp Modules International Journal Of
 - The Rise of Digital Reading Pic Microcontroller Ccp Modules International Journal Of
 - Advantages of eBooks Over Traditional Books
2. Identifying Pic Microcontroller Ccp Modules International Journal Of
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Pic Microcontroller Ccp Modules International Journal Of
 - User-Friendly Interface
4. Exploring eBook Recommendations from Pic Microcontroller Ccp Modules International Journal Of
 - Personalized Recommendations

- Pic Microcontroller Ccp Modules International Journal Of User Reviews and Ratings
- Pic Microcontroller Ccp Modules International Journal Of and Bestseller Lists
- 5. Accessing Pic Microcontroller Ccp Modules International Journal Of Free and Paid eBooks
 - Pic Microcontroller Ccp Modules International Journal Of Public Domain eBooks
 - Pic Microcontroller Ccp Modules International Journal Of eBook Subscription Services
 - Pic Microcontroller Ccp Modules International Journal Of Budget-Friendly Options
- 6. Navigating Pic Microcontroller Ccp Modules International Journal Of eBook Formats
 - ePub, PDF, MOBI, and More
 - Pic Microcontroller Ccp Modules International Journal Of Compatibility with Devices
 - Pic Microcontroller Ccp Modules International Journal Of Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Pic Microcontroller Ccp Modules International Journal Of
 - Highlighting and Note-Taking Pic Microcontroller Ccp Modules International Journal Of
 - Interactive Elements Pic Microcontroller Ccp Modules International Journal Of
- 8. Staying Engaged with Pic Microcontroller Ccp Modules International Journal Of
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Pic Microcontroller Ccp Modules International Journal Of
- 9. Balancing eBooks and Physical Books Pic Microcontroller Ccp Modules International Journal Of
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Pic Microcontroller Ccp Modules International Journal Of
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Pic Microcontroller Ccp Modules International Journal Of
 - Setting Reading Goals Pic Microcontroller Ccp Modules International Journal Of
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Pic Microcontroller Ccp Modules International Journal Of
 - Fact-Checking eBook Content of Pic Microcontroller Ccp Modules International Journal Of

- Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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