



COVID-19  
CORONAVIRUS  
Update (Live)

USA

Check Corona Stats from all over the World !!!

Confirmed  
2,007,449

Dead  
112,469

Recovered  
2,007,449

Cases today  
1

Deaths today  
2

Tests  
21,291,677

Critical  
16,923

Active  
1,133,272

Cases/IM  
6067

Deaths/IM  
340

Search

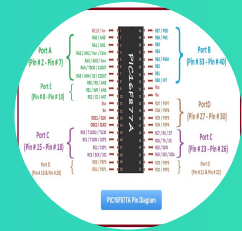
LOGIN

SIGNUP

## Introduction to PIC16F877a

Today, I am going to give you guys an Introduction to PIC16F877a. It's a most commonly used PIC Microcontroller because ...

[Home](#) / [Blog](#) / [PIC Projects](#) / [Introduction to PIC16F877a](#)



Posted at: [Tuesday, June 20, 2017](#)

Category: [PIC Projects](#)

Author: [Syed Zain Nasir](#)

[5 Comments](#)

PCBWay

Start from \$30

SMT & THT ASSEMBLY

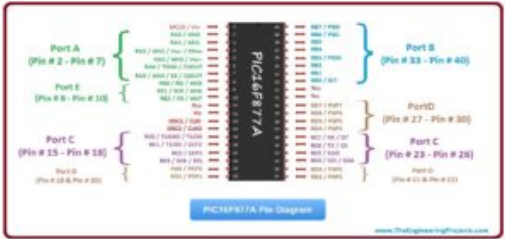
- Free worldwide shipping + Free stencil
- Component Sourcing
- Quality Assurance

PCBWay

Start from \$30

SMT & THT ASSEMBLY

- Free worldwide shipping + Free stencil
- Component Sourcing
- Quality Assurance



Hello friends, I hope you all are doing great and having fun with your lives. Today, I am going to give you guys an **Introduction to PIC16F877a**. It's a most commonly used [PIC](#)

[Microcontroller](#) because of its operational flexibility, availability and cheapness. You can buy this PIC Microcontroller from almost every online electronic shop and you will get it just for \$2 - \$3.I have got a lot of requests about PIC16F877a from engineering students because this PIC Microcontroller is used in [Engineering Projects](#) a lot. So, that's why I have thought to share all details about PIC16F877a. If you are new to PIC Microcontroller then I must suggest you to read this complete post carefully and ask your queries in comments.You should also have a look at this video in which I have given an Introduction to PIC16F877a:

003 - Introduction to PIC16F877a



NOTE:

### Join Our Fb Groups !!!

ARDUINO

2K+

PROTEUS

3K+

### Categories

- 01 Arduino Projects100
- 02 Proteus Projects10
- 03 PIC Projects10
- 04 Visual Studio Projects10
- 05 8051 Projects10
- 06 555 Timer Projects10
- 07 MATLAB Projects10
- 08 LabView Projects10
- 09 PLC Projects10
- 10 Electronics Projects10
- 11 C# Tutorials10
- 12 Embeded Systems10
- 13 SEO Tutorials10

### Engineering Books



**COVID-19**  
CORONAVIRUS  
Update (Live)



**Check Corona Stats from all over the World !!!**

Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



Search

LOGIN

SIGNUP



## Introduction to PIC16F877a

» PIC16F877a is a 40-pin PIC Microcontroller and is used mostly in [Embedded Projects](#) and Applications. Few of its features are as follows:

» It has five Ports on it starting from **Port A to Port E**.

» It has **three Timers** in it, two of which are 8 bit Timers while 1 is 16 Bit.

» It supports many communication protocols like:

» Serial Protocol.

» Parallel Protocol.

» I2C Protocol.

» It supports both hardware pin interrupts and timer interrupts.

» Here's the PIC16F877a Pin Diagram, I have mentioned the names of all the Pins and have also given different colors to different Ports.

### Subscribe Now !!!

BY FEEDBURNER

Learn Free Pro Tricks



RSS



YT



FB



TW



Receive Quality Tutorials Straight in your Inbox by submitting your Email ID below.

enter your email here...

SUBMIT

### Join Us !!!



### Top PCB Design Service

J@LC JLCPCB

**1-4 Layer PCBs \$2**

SMT Assembly Fee \$0

Get Coupons ▶





**COVID-19**  
CORONAVIRUS  
Update (Live)



**Check Corona Stats from all over the World !!!**

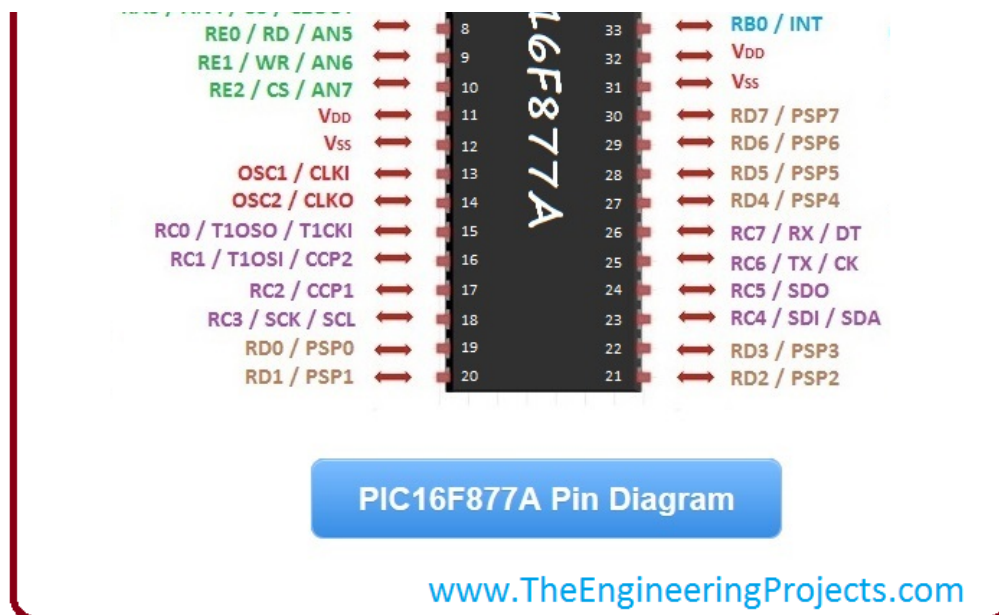
Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



Search

LOGIN

SIGNUP



- » The above image gives you the overall idea of PIC16F877a Pins and Ports.
- » You should also have a look at [Introduction to Atmega328](#), it's another [microcontroller](#), you should compare them.

### IMPORTANT NOTE:

- » You can see in the above image that pins of PIC [Microcontroller](#) has more than one name, its because each pin of PIC can perform many tasks.
- » For example, check Pin # 25, it can be used as a digital Port C Pin # 6 (RC6) and can also be used as a Transmitter (TX) for serial communication.
- » So, now its up to you how you wanna use each pin, and we will check most of these pin functions in today's tutorial.
- » In the next section, I am gonna explain all of these Pin features one by one.



COVID-19

CORONAVIRUS

Update (Live)

USA

Check Corona Stats from all over the World !!!

Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



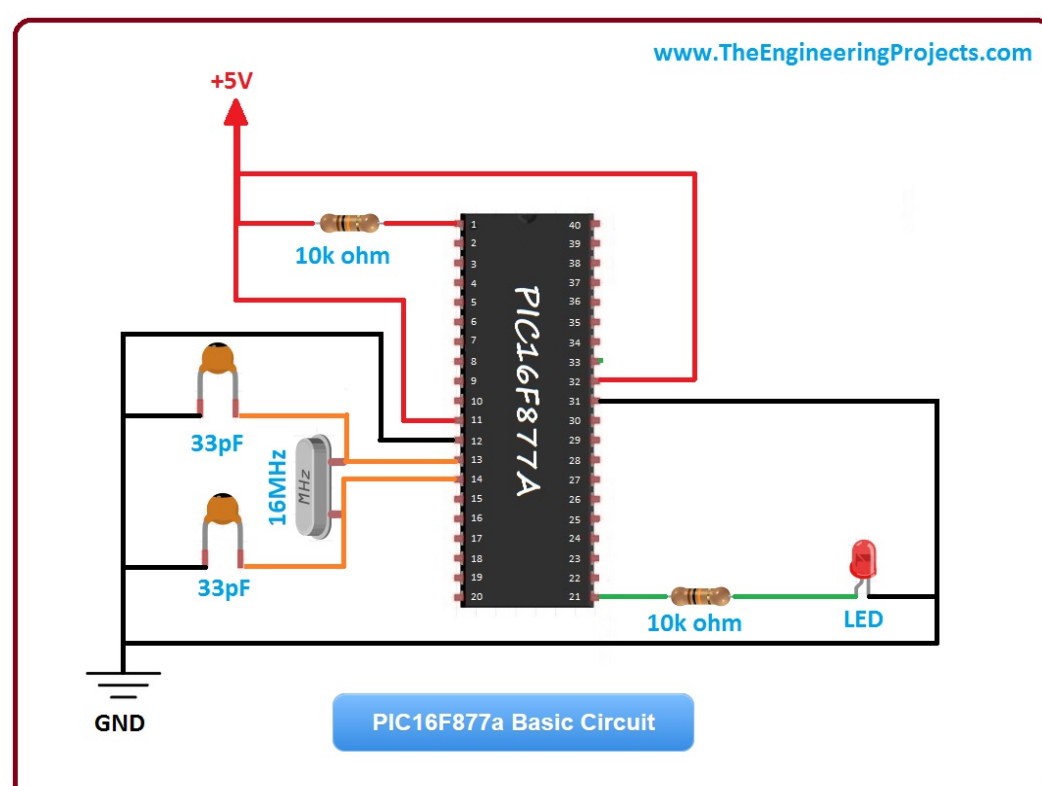
Search

LOGIN

SIGNUP



- » Each PIC Microcontroller has a basic circuit and if you won't design the basic circuit then it won't work.
- » It's just like providing power to your PIC Microcontroller and it works on +5V level.
- » If you want to turn ON fan then what will you do? You will simply provide it power and that's what we are gonna do with PIC but in PIC case we also need to provide the frequency at which it will work.
- » So, now we know that we need to design the basic circuit and this basic circuit contains power as well as the frequency at which it will work.
- » In order to provide frequency to PIC Microcontroller, we use crystal oscillator and for PIC 16F877a, you can use crystal oscillator of frequency range from **4MHz to 40MHz**.
- » So, here's the **PIC16F877a Basic Circuit** which you need to design:



- » I have tried my best to make this PIC16F877a basic circuit as simple as possible.
- » The above circuit may seem you a bit complex but it is really not, let me explain it pin by pin:



COVID-19  
CORONAVIRUS  
Update (Live)

USA

Check Corona Stats from all over the World !!!

Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



Search

LOGIN

SIGNUP



**Vdd** so we also need to provide it +5V and you can see these lines are in red color in above figure.

» **Pin # 12 & Pin # 31:** These Pins are **Vss**, so we have provided **GND (Ground)** at this pin and its lines are in black color.

» **Pin # 13 & 14:** These Pins are named as **OSC1 (Oscillator 1)** and **OSC2 (Oscillator 2)**, now we have to attach our **Crystal Oscillator (16MHz)** at these pins which I have lined in Orange color. After the Crystal Oscillator, we have 33pF capacitors and then they are grounded.

» We have designed our basic circuit and now our PIC Microcontroller is ready to work but you can also see an LED attached at Pin # 21 and that's because we also need to check whether its running or not so we can turn on or off this LED.

» You should have a look at [LED Blinking Project on PIC Microcontroller](#), in which I have blinked the LED using PIC Microcontroller.

» Here's the video in which I have designed this PIC16F877a basic circuit:

004 - Basic Circuit of PIC Microcontroller



## 2. PIC16F877a Ports

» So, now I hope that you got the complete understanding of PIC16F877a Basic Circuit, so now if you have noticed that in





COVID-19  
CORONAVIRUS  
Update (Live)

USA

Check Corona Stats from all over the World !!!

Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340

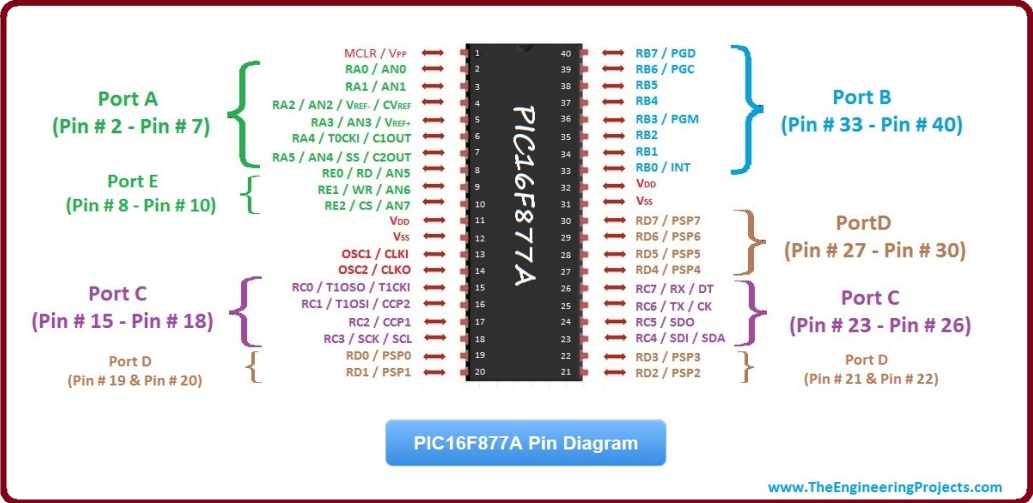
Search

LOGIN

SIGNUP

...ing we need to do is to design some code and use the PIC  
Microcontroller Ports. First let's have a look at these  
PIC16F877a Ports.

- » PIC16F877a has 5 Ports in total which are:
  - » **Port A:** It has 6 Pins in total starting from **Pin # 2** to **Pin # 7**. Port A Pins are labelled from RA0 to RA5 where RA0 is the label of first Pin of Port A.
  - » **Port B:** It has 8 Pins in total starting from **Pin # 33** to **Pin # 40**. Port B Pins are labelled from RB0 to RB7 where RB0 is the label of first Pin of Port B.
  - » **Port C:** It has 8 Pins in total. It's pins are not aligned together. First four Pins of Port C are located at **Pin # 15 - Pin # 18**, while the last four are located at **Pin # 23 - Pin # 26**.
  - » **Port D:** It has 8 Pins in total. It's pins are also not aligned together. First four Pins of Port D are located at **Pin # 19 - Pin # 22**, while the last four are located at **Pin # 27 - Pin # 30**.
  - » **Port E:** It has 3 Pins in total starting from **Pin # 8** to **Pin # 10**. Port E Pins are labelled from RE0 to RE2 where RE0 is the label of first Pin of Port E.
- » All these Ports are labelled in below figure:



- » You can see all these PIC16F877a Ports in above figure, now let's have a look at how to use them.



COVID-19

CORONAVIRUS

Update (Live)

USA

Check Corona Stats from all over the World !!!

Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



Search

LOGIN

SIGNUP



Want to get the value then you have to connect the [sensor](#) with PIC Microcontroller, now in this case your PIC Pin will be acting as **Input Pin** because it will be inputting value from [sensor](#). Sensor is sending the value and PIC is receiving it.

- » Now in case you have some DC Motor and you want to move that [DC Motor using PIC Microcontroller](#). So, in this case you have to send command from PIC Microcontroller to DC Motor so your PIC Pin is acting as **Output Pin**.

### IMPORTANT NOTE:

- » Each Port of PIC Microcontroller is associated with two registers, for examples Port D registers are:
  - » PortD
  - » TRISD
- » Both of these registers are of 8 bit because Port D contains 8 Pins.
- » **TRISD** decides whether the Port is output or input and we can also assign values to each pin separately. If we have assigned 0 then it will be OUTPUT and if we have provided 1 then it will be INPUT.
- » For example, if I have assigned TRISD = 0x01, then first 7 pins of Port D will be Output but the last pin will be input because 0x01 is actually 00000001 in binary.
- » PortD register contain the actual value and this value is actually the



COVID-19

CORONAVIRUS

Update (Live)

USA

Check Corona Stats from all over the World !!!

Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



Search

LOGIN

SIGNUP

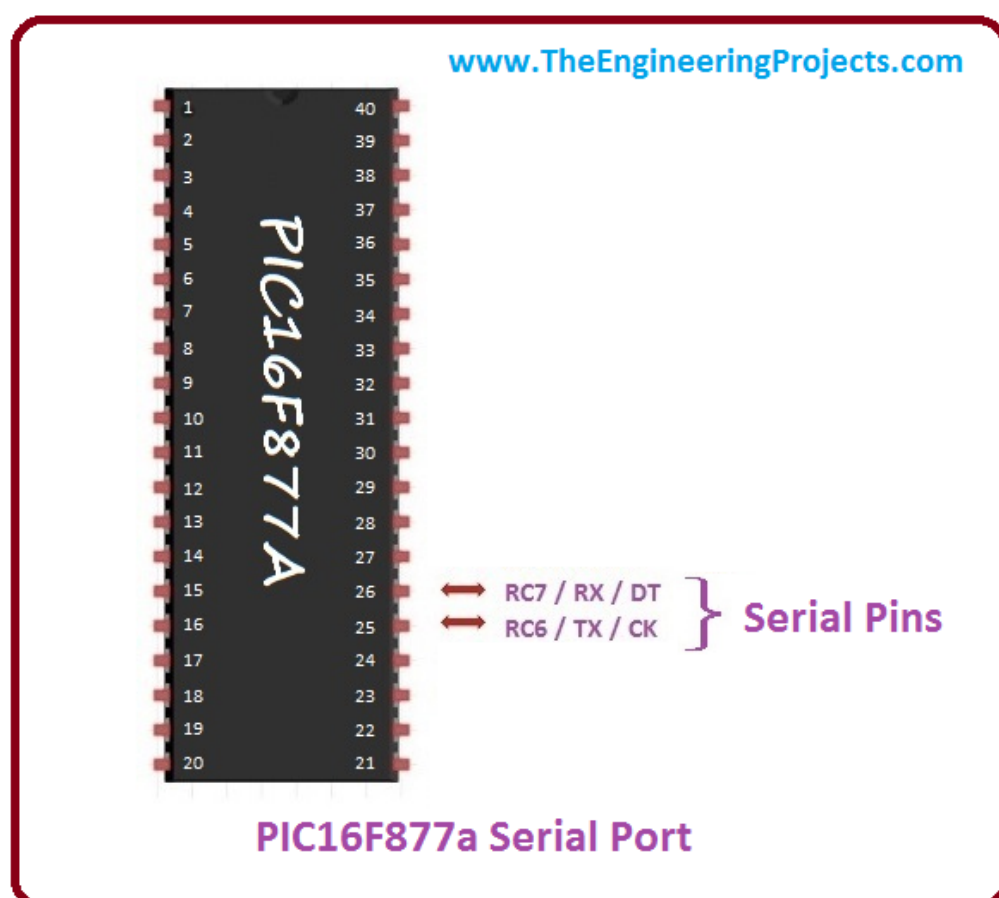


[Compiler](#), which is available online from Microchip Official Site.

- » There are also other compilers available and the one I normally use is [MikroC Pro For PIC](#).
- » You should have a look at this list of [Top 3 PIC C Compilers](#).
- » We write code in PIC Compilers and then compile it. After compilation a hex file is generated which we upload in PIC Microcontroller.

#### 4. PIC16F877a Serial Port

- » PIC16F877a has one serial port in it which is used for data communication.
- » In below figure, I have mentioned the Serial Pins of PIC16F877a.



- » AS you can see in the above figure that:
- » **Pin # 25** is acting as TX as well so if you want to do Serial Communication then it will be used for [sending the serial data](#).





COVID-19

CORONAVIRUS

Update (Live)

USA

Check Corona Stats from all over the World !!!

Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



Search

LOGIN

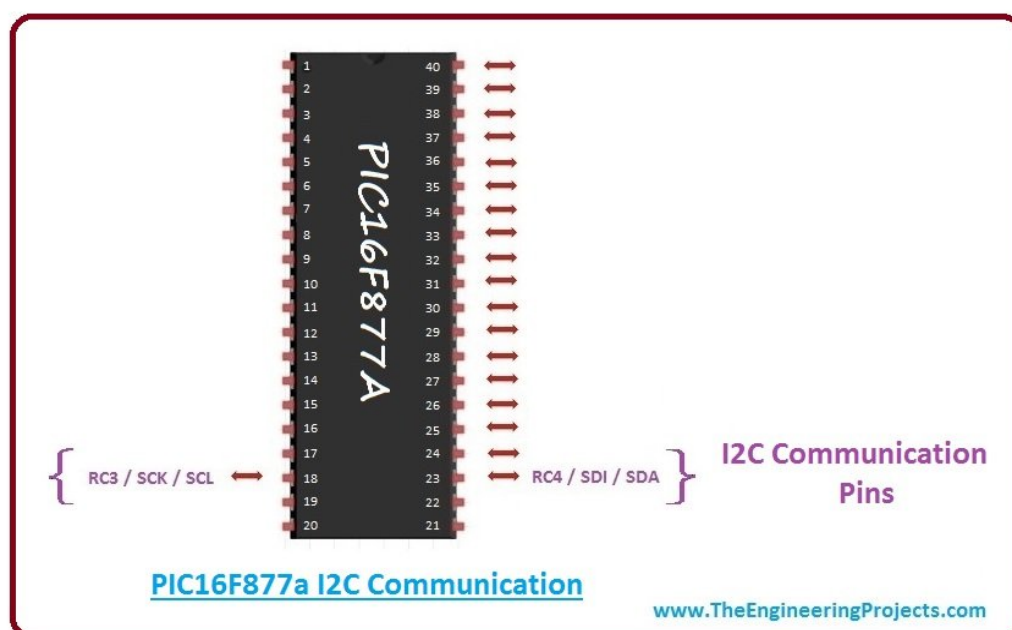
SIGNUP



you should also have a look at [What is Serial Port](#) if you don't know much about Serial Port.

## 5. PIC16F877a I2C Communication

- » PIC16F877a also has one I2C Port using which we can easily do the I2C Communication.
- » These **PIC16F877a I2C Communication Pins** are shown in below figure:



- » As you can see in above figure, PIC16F877a I2C Communication Pins are:
- » **Pin # 18:** It is acting as **SCL** which is an abbreviation of **Serial Clock Line**.
- » **Pin # 23:** It is acting as **SDA** which is an abbreviation of **Serial Data Line**.
- » Now you can see we have Serial Port and I2C Port in Port C, so we can use Port C as a simple Port but can also do these two communications with its pins, so its totally on the programmer.

## 6. PIC16F877a Interrupts

- » I hope you all know about interrupts, if not then you should have a look at Interrupts in PIC Microcontroller.



COVID-19

CORONAVIRUS

Update (Live)

USA

Check Corona Stats from all over the World !!!

Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



Search

LOGIN

SIGNUP



changed then interrupt will be generated.

» So, PIC16F877a Interrupts can be generated by following 8 ways:

- » External Interrupts.
- » Timer Interrupts ( Timer0 / Timer1).
- » Port B State Change.
- » Parallel Slave Port Read/Write.
- » A/D Converter.
- » Serial Receive / Transmit.
- » [PWM](#) (CCP1 / CCP2).
- » EEPROM Write Operation.

» **PIC16F877a Interrupts** are associated with below 5 registers:

- » INTCON
- » PIE1
- » PIR1
- » PIE2
- » PIR2

So, that was all about **PIC16F877a**, I hope you have enjoyed today's tutorial. I have tried my best to cover all aspects of this PIC Microcontroller and I would suggest you to must read the links which I have provided in each section. These links will also help you more because they are focusing on that particular topic. If you have any problem in this Introduction to PIC16F877a, then you can ask in comments below. Thanks for reading. Take care and have fun !!! :)

[JLCPCB – Prototype 10 PCBs for \\$2 \(For Any Color\)](#)

[China's Largest PCB Prototype Enterprise, 600,000+ Customers & 10,000+ Online Orders Daily](#)

[How to Get PCB Cash Coupon from JLCPCB: https://bit.ly/2GMCH9w](https://bit.ly/2GMCH9w)



COVID-19		USA		Check Corona Stats from all over the World !!!									
CORONAVIRUS		Update (Live)		Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
				2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



Search

LOGIN

SIGNUP



-Website Author

# Syed Zain Nasir

[@syedzainnasir](#)

I am Syed Zain Nasir, the founder of [The Engineering Projects](#) (TEP). I am a programmer since 2009 before that I just search things, make small projects and now I am sharing my knowledge through this platform. I also work as a freelancer and did many projects related to programming and electrical circuitry. [My Google Profile+](#)

Follow

Get Connected



## — Leave a Reply —

You must be [logged in](#) to post a comment.



Comments on "Introduction to PIC16F877a" ( 5 )


**THIAGO CANOVA** says:

[May 20, 2018 at 1:09 pm](#)

Thank you for sharing this material on pic 16f877a, I was looking for material so some time ago. I was a layman in programming but this tutorial helped me a lot. My name is thiago I'm in Brazil.

thank you.

[Log in to Reply.](#)



COVID-19

CORONAVIRUS

Update (Live)

USA

Check Corona Stats from all over the World !!!

Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



Search

LOGIN

SIGNUP



Gracias.

[Log in to Reply.](#)**Johnny says:**[July 1, 2018 at 4:30 am](#)

Can we copy all data from an existing pic 16f877a?

[Log in to Reply.](#)

2

**Himanshu Kumar singh says:**[February 16, 2019 at 5:24 pm](#)

Thanks for sharing the important information

[Log in to Reply.](#)

3

**devanshi says:**[March 23, 2019 at 3:30 am](#)

can you provide servomotor code for robotic arm with pwm using pic 16f877a?  
we are going to use 4 motor and port c.

[Log in to Reply.](#)

4



## THE ENGINEERING PROJECTS

“A platform for engineers & technical professionals to share their engineering projects, solutions & experience with TEP Community & support open source.”

### Newsletter

Get weekly notification of engineering articles, straight to your inbox ...

Your email address



### Recent Post



COVID-19

CORONAVIRUS

Update (Live)

Check Corona Stats from all over the World !!!

Confirmed	Dead	Recovered	Cases today	Deaths today	Tests	Critical	Active	Cases/IM	Deaths/IM
2,007,449	112,469	2,007,449	1	2	21,291,677	16,923	1,133,272	6067	340



Search

LOGIN

SIGNUP



What is Velocity? Definition, SI Unit, Examples & Applications

Oct 5,2020



Real estate management: The Need for Routine Repair and Maintenance

Oct 5,2020



12V to 220V Step Up Inverter using transformer in Proteus

Oct 5,2020

Popular Tutorials Series

- [Arduino](#)
- [PLC](#)
- [PIC Microcontroller](#)
- [8051 Microcontroller](#)
- [Embedded Systems](#)
- [C#](#)
- [LabView](#)
- [Proteus](#)
- [555 Timer](#)
- [MATLAB](#)
- [SEO Tutorials](#)

Contact Us



Skype

[theengineeringprojects](#)



Email

[info@theengineeringprojects.com](mailto:info@theengineeringprojects.com)

[help@theengineeringprojects.com](mailto:help@theengineeringprojects.com)

[support@theengineeringprojects.com](mailto:support@theengineeringprojects.com)




Follow us

*Follow us on social media*








COVID-19

CORONAVIRUS

Update (Live)



USA

Confirmed

2,007,449

Dead

112,469

Recovered

2,007,449

Cases today

1

Deaths today

2

Tests

21,291,677

Critical

16,923

Active

1,133,272

Cases/IM

6067

Deaths/IM

340

Check Corona Stats from all over the World !!!

Search

LOGIN

SIGNUP

Technopreneur

⌵