

## ICs, PICs and Arduinos

Most members know what a diode is for or what a transistor does. But what about those black objects with multiple pins that you see everywhere – inside your phone, your TV, your games console and many of your MERG kits? What do they do and how do they differ?

Here is a brief introduction.

### Integrated Circuits

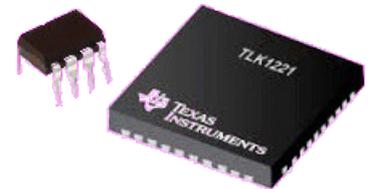
Their name says it all. They cram many circuit components (transistors, diodes, resistors, capacitors, etc.) inside a single case. Sometimes they contain dozens of components; sometimes they contain millions of components.

As the picture shows, they can vary greatly in size, depending on the complexity inside and the number of external connections.

They are designed to do a single job, with a few possible variations.

Examples are logic gate chips, where certain fixed combinations of inputs are required to produce a change of output.

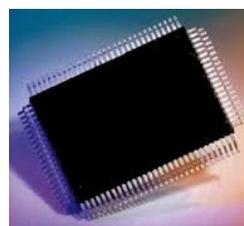
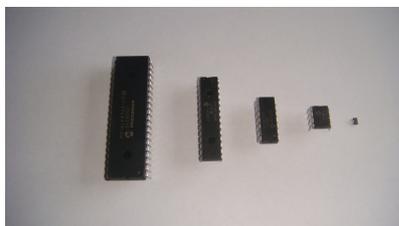
Others are slightly more flexible. For example, the 555 chip can be used as a timer or as an oscillator depending on the value of the components and how they are connected.



### PICs and Arduinos

PIC chips have been around for a long time and are used in many domestic, industrial, scientific and military applications. They also form the heart of many of the MERG range of kits. They can be found in the 'Servo4' module, the 'Hector' infrared detector, CBUS modules and many of the Pocket Money Kits.

They are 'Microcontrollers' which are like small computers that are used to control hardware. They look the same as 'normal' ICs with a black case and multiple pins. However, there is one crucial difference – you can program a PIC chip.



For example, the kits for the welder, lighthouse, automatic signals, EzyPoints, versatile timer, laser detector and steam emulator use exactly the same 12F675 PIC chip. Different programs have been written for each of those modules and then saved into the PIC chip.

If you are not sure what kind you have, find the writing on the body of the chip and then Google it.

## Arduinos

PICs are produced by Microchip Technology and are usually purchased as individual chips as shown in the above pictures.

The Arduino range of boards use Atmel microcontroller chips.

You can buy the Atmel chips on their own but they are more commonly available to hobbyists already mounted on boards that provide extra features (voltage regulators, USB, serial and I<sup>2</sup>C connections, etc.).

The Arduino range support '*Shields*' which are boards that can plug directly in to some of the Arduino modules, with no soldering. Example shields are keypads, LCD screens, motor drivers, touch panels. etc.

We used the Arduino Nano (pictured on the right) for our Sound Player and our '*Backen Forth*' demo layout.

We use the Uno as the controller in the EzyBus system. The output module started off using the Nano but now uses the Atmel ATmega328P chip.



## Last thoughts

PICs are best for small projects, although they can be used on very large projects.

Arduinos are considerably more expensive but can be easier to work with.

PICs and Arduinos allow us to create modules specially tailored for our needs or our layouts.

Of course, to to this, we have to learn programming.

If you want more details on how to program chips, join one of our workshops.

*Davy Dick*