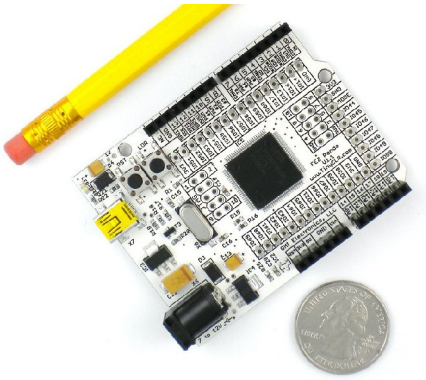
FEZ Panda Board



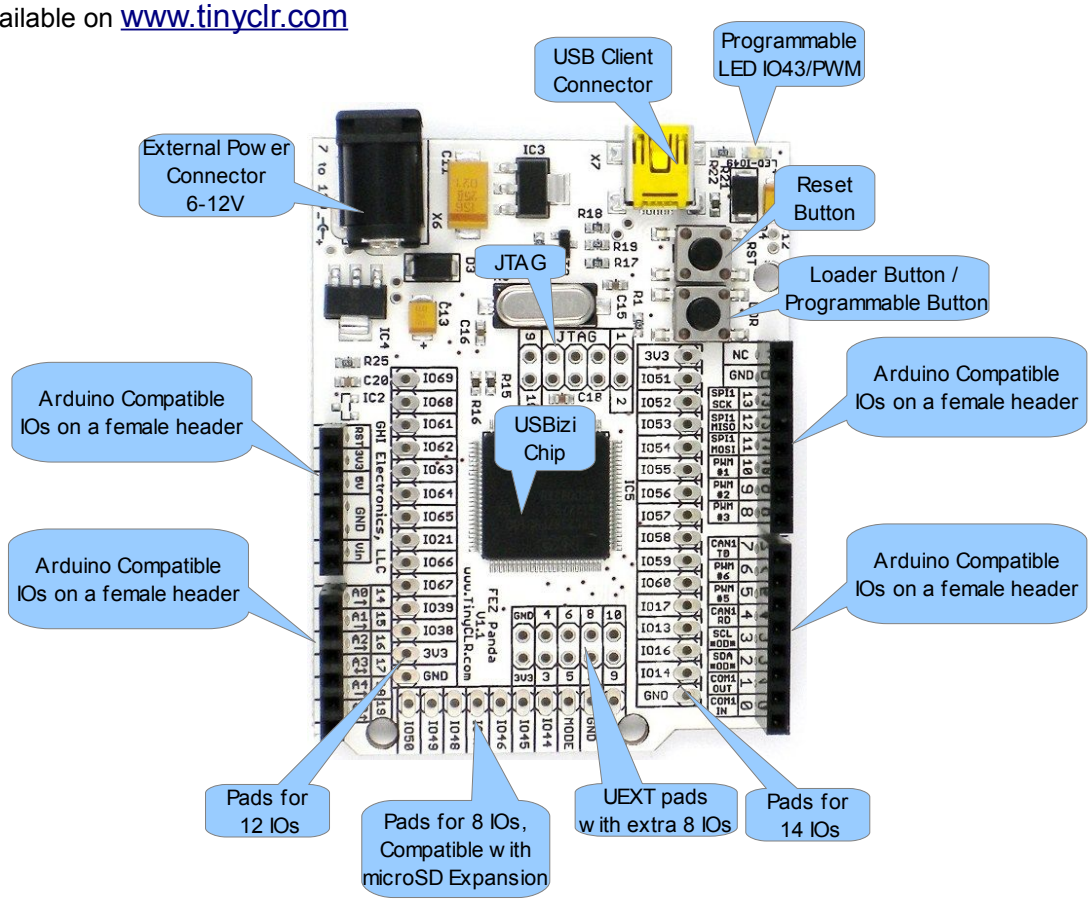
FEZ Panda is a small low-cost board running Microsoft .NET Micro Framework. This means you can write code with greater efficiency using C# programming language and Microsoft's free Visual C# Express edition.

You can see that FEZ Panda outline looks similar to Arduino Duemilanove. The reason for this compatibility is that many shields already exist for the Arduino board. TinyCLR.com offers several shields (Ethernet, Display, Motor Driver, etc.) that are fully tested and supported with FEZ Panda.

Furthermore, with the **FEZ Domino Expansion** shield and on-board **extension header**, the user can easily add extensions and components. This allows FEZ Panda to remain simple yet extremely flexible, making it one of the easiest devices to use in the embedded market. Developers, professionals, and hobbyists can now create a multitude of designs using simple plug-in components.

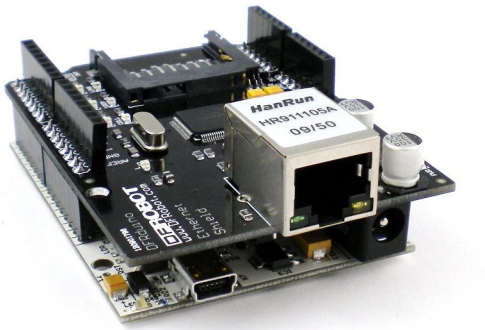
Many libraries come included, such as FAT file system, threading, UART, SPI, I2C, GPIO, PWM, ADC, DAC, CAN, Ethernet and more.

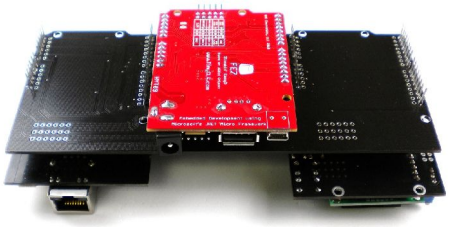
To get started with FEZ, please take a look at the FEZ Tutorial and .NET Micro Micro Framework Beginners Guide available on www.tinyclr.com



Stackable Shields

Boards that install directly on top of FEZ Panda are called shields. The pin-out is compatible with Arduino allowing developers to use most of the available Arduino shields.
Although shields plug in directly to all the pin headers, not all signals are actually used; therefore, multiple shields maybe used. Multiple shields can be stacked up, like an LCD shield and Ethernet shield.





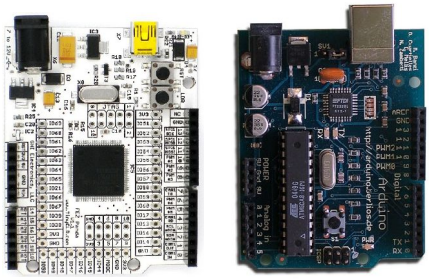
For shields that can't be stacked up, an extender shield can be used instead. Extender shields are available from www.liquidware.com.

To use multiple shields, we need to make sure they are not using the same pin. This can be accomplished by looking at the schematics of each shield. A simpler option is to create a project and include the driver files of all shields. If the shields are using the same pins then an exception will be raised signaling an error.

Powering FEZ Panda

The easiest way to power FEZ Panda is through the USB cable. Optionally, the power connector can be used as well. Using either power source will efficiently supply power to the 3.3V and 5V pins (exposed for shields).
The 5V shield pin is a special case, it can be used to power the shields and FEZ Panda as well.
In case, the board is powered through USB, the voltage on the 5V pins will be sourced directly from the PC USB 5 volts which is in most cases less than 5volts (4.5 to 5 volts).

FEZ Panda and Arduino Compatibility



The similar form factor between FEZ Panda and Arduino allows developers to use almost any of the available Arduino shields.

While using the same shields, FEZ offers greater flexibility and far more features. Starting with Microsoft Visual C# Express and the possibility for debugging and ending with high-end libraries like USB device, threading, XML, Better Ethernet networking and many others.

Not to forget that FEZ Panda has extra 40 IOs distributed all around the board.

Note that all digital/analog pins, PWM, COM1 and SPI are in the same place, other peripherals can be different. For example FEZ Panda provides three serial ports that are available for developers. Arduino only has one and it is used for debugging!

An optional enclosure for your project with FEZ Panda

This plastic enclosure is custom made for Arduino and fits perfectly with FEZ Panda. The opening on one side exposes all the connectors and the opening on top side is ready for the 2x16 character display. Also there is enough space to include a shield (not all the shields fit in) over the FEZ panda.

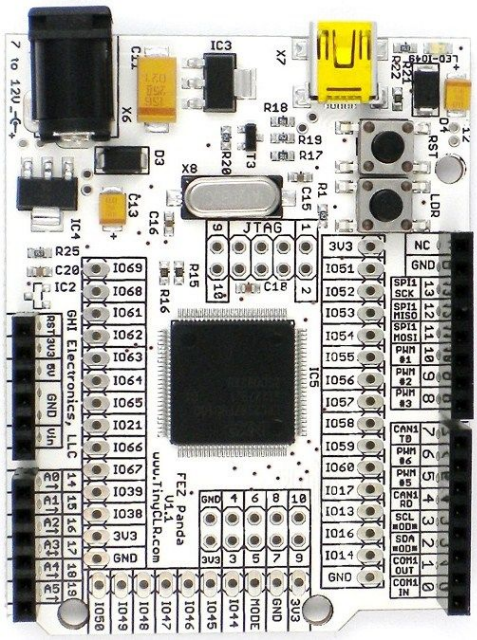
FEZ Panda Pins Features

All pins on the 0.1" headers and extension headers can be used as digital input/output. Some pins have secondary features. Do not attempt to use a pin as digital and as a secondary feature simultaneously. For example, when using IO2 as PWM, do not use IO2 as a digital I/O until you release the PWM feature (in code).

FEZ Panda Arduino compatible Pins Features

Secondary Features	
Reset Input	RST
3.3 Volts Out	3V3
5 Volts In/Out	5V
Ground	GND
	GND
Vin for external power 6 to 12Volts	Vin

Secondary Features	
Analog Input	A0*
Analog Input	A1*
Analog Input	A2*
Analog Input / Analog Output	A3*
Analog Input	A4
Analog Input	A5



* These pins can work as interrupt inputs
+Di2 and Di3 are open drain pins with 2.2K pull up resistors.

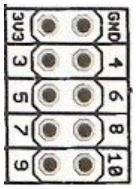
Secondary Features	
NC	Not Connected
GND	Ground
Di13*	SPI1 SCK (Clock)
Di12*	SPI1 MISO (Input)
Di11*	SPI1 MOSI (Output)
Di10	PWM
Di9	PWM
Di8	PWM

Di7*	CAN Bus Channel 1 Output
Di6*	PWM
Di5*	PWM
Di4*	CAN Bus Channel 1 Input
Di3*	(Open Drain Pin+) I2C SCL
Di2*	(Open Drain Pin+) I2C SDA
Di1*	COM1 Output
Di0*	COM1 Input

UEXT Connector (Requires Soldering)

UEXT connector is made to be compatible with extensions such as MP3 decoder, GPS or 3-axis accelerometer. Many extensions are already available on www.tinyclr.com. Noting that the .1" male connector is not included with FEZ Panda. Minimum soldering experience is required to add a connector.

Secondary Features	
3.3 Volts Out	3V3
COM2 Output	3*
COM2 RTS	5*
SPI2 MISO (Input)	7*
SPI2 SCK (Clock)	9*

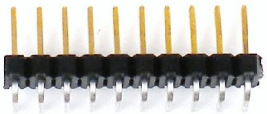


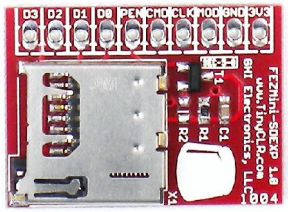
	Secondary Features
GND	Ground
4*	COM2 Input
6*	COM2 CTS
8*	SPI2 MOSI (Output)
10*	Only GPIO

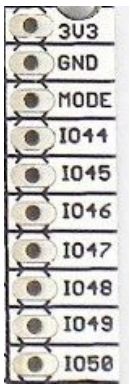
* These pins can work as interrupt inputs

SD Interface Connector (Requires Soldering)

This connector exposes the necessary signals to connect a SD or micro SD socket. FEZ Panda has the ability to access files on SD memory cards by attaching the Micro SD Card Expansion available on www.tinyclr.com.
Basic soldering experience is needed to attach the included pin header.





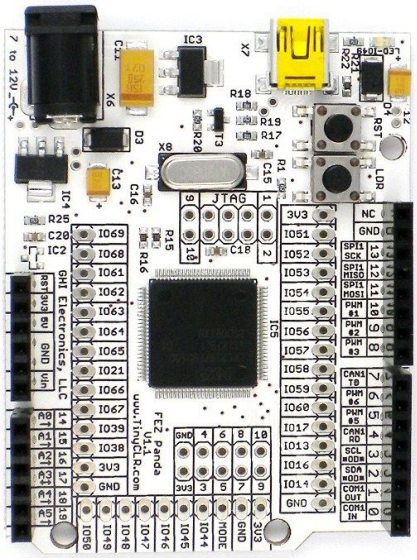


	Secondary Features
3V3	3.3 Volts Out
GND	Ground
IO4*/MODE	PWM
IO44*	SD Clock Line
IO45*	SD Command Line
IO46*	Memory card (SD/MMC) power enable signal
IO47*	SD Data Line 0
IO48*	SD Data Line 1
IO49*	SD Data Line 2
IO50*	SD Data Line 3

* These pins can work as interrupt inputs

FEZ Panda Extra Pins Features

Secondary Features	
Digital IO Only	IO69
Digital IO Only	IO68
Digital IO Only	IO61
Digital IO Only	IO62
Digital IO Only	IO63
Digital IO Only	IO64
Digital IO Only	IO65
Digital IO Only	IO21
Digital IO Only	IO66
Digital IO Only	IO67
COM3 Output	IO39*
COM3 Input	IO38*
3.3 Volts Out	3V3
Ground	GND



* These pins can work as interrupt inputs

	Secondary Features
3V3	3.3 Volts Out
IO51	Digital IO Only
IO52	Digital IO Only
IO53	Digital IO Only
IO54	Digital IO Only
IO55	Digital IO Only
IO56	Digital IO Only
IO57	Digital IO Only
IO58	Digital IO Only
IO59	Digital IO Only
IO60	Digital IO Only
IO17	COM4 Input
IO13	COM4 Output
IO16*	CAN Bus Channel 2 Input
IO14*	CAN Bus Channel 2 Output
GND	Ground

Open source firmware (optional advanced information)

FEZ Panda is also provided with JTAG signals exposed for open source lovers who would like to try out porting .NET Micro Framework on LPC2387 chipset or to try adding native drivers. To make this task even easier, GHI Electronics provides a free guiding e-book "Beginners Guide to Porting .NET Micro Framework" available on www.tinyclr.com downloads page.