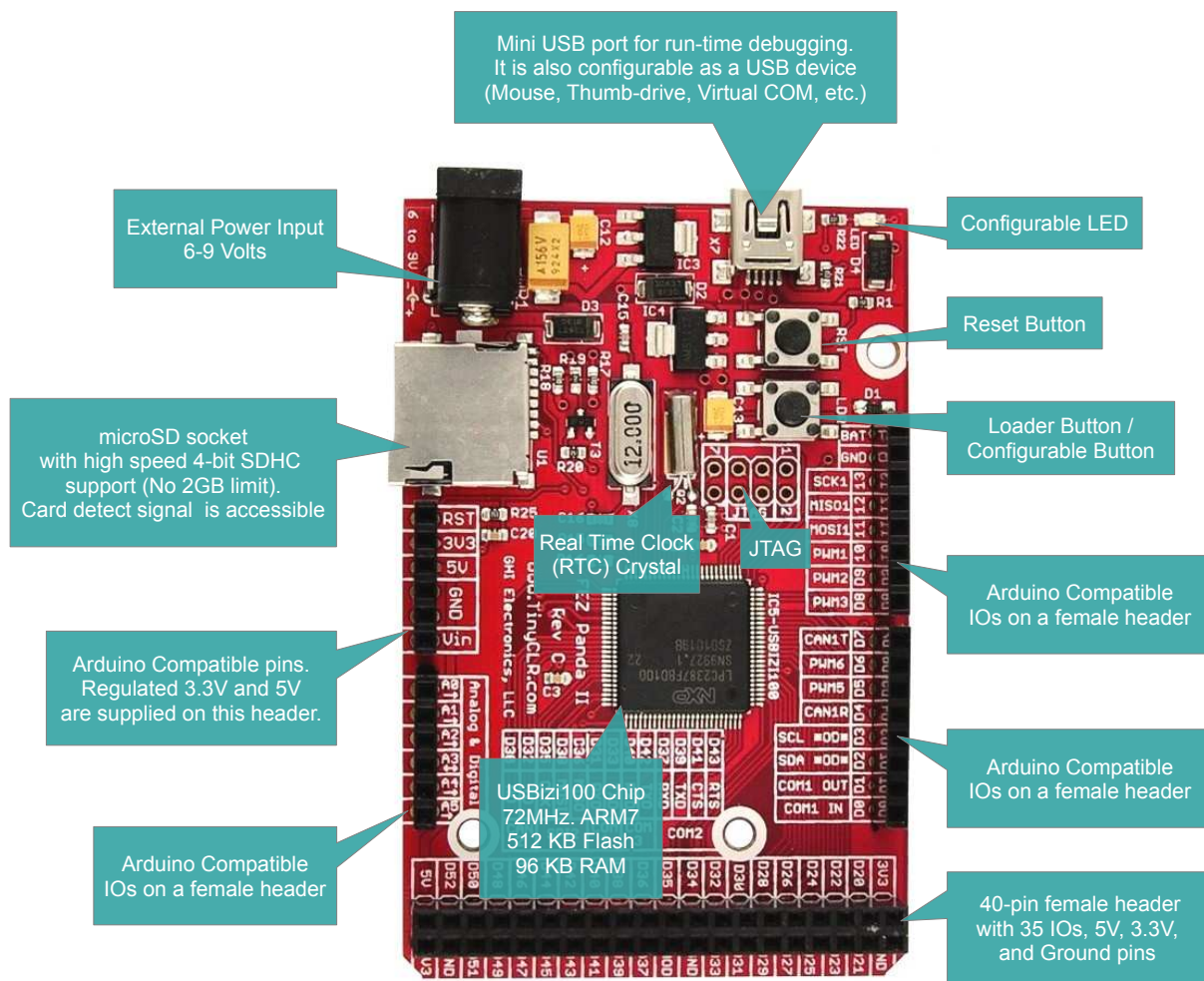
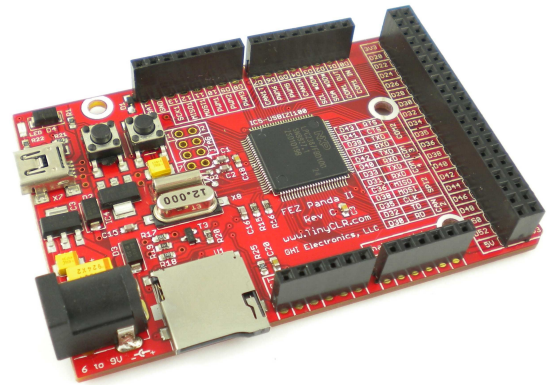


# FEZ Panda II Board

**FEZ Panda II** ( a member of [.NET FEZ boards](#)) is a small low-cost board running Microsoft .NET Micro Framework, allowing users to program and debug FEZ Panda II using Microsoft's free Visual C# Express. Applications are loaded over USB cable (or serial) with full featured debugging capabilities, such as stepping in code or inspecting variables.

The board is based on NXP's LPC2387 micro controller with GHI Electronics' commercial, highly optimized, USBizi firmware/software package. It is a **72MHz, 32-bit ARM7** processor with **512KB Flash** (148KB for user application) and **96 KB RAM** (62KB for user application).



## FEZ Panda II Key Features

- ✓ Based on NXP's LPC2387 micro-controller with GHI's commercial, highly optimized, USBizi firmware/software package.
  - ✓ 72MHz. 32-bit ARM7 processor.
  - ✓ 512 KB Flash (148 KB for user application).
  - ✓ 96 KB RAM (62 KB for user application).
- ✓ Compatible with most Arduino shields.
- ✓ USB device connection for run-time debugging.
- ✓ Specialized libraries to configure the USB Client port to emulate devices like thumb-drive, virtual COM (CDC), mouse, keyboard.
- ✓ USB Debugging and Virtual COM (CDC) can work simultaneously.
- ✓ Built-in Micro SD card socket (4-bit high speed SDHC support, no 2GB limit) with card detect signal.
- ✓ 54x Digital I/O ports.
- ✓ 6x 10-bit analog Inputs.
- ✓ 10-bit analog output (with audio WAV playback).
- ✓ 6x Hardware PWM channels.
- ✓ 2x CAN channels.\*
- ✓ Battery backup RAM 2KB.
- ✓ Configurable on-board LED and button.
- ✓ 4x UART serial ports (one with hardware handshaking capability).
- ✓ OneWire interface (available on any IO).
- ✓ Built-in Real Time Clock (RTC) with the suitable crystal.
- ✓ Processor register access.
- ✓ OutputCompare (OC) for generating waveforms with high accuracy, for example, generate software PWM or simulate infrared remote control signal.
- ✓ Run-time Loadable Procedures (RLP) allowing users to load native code (C/Assembly) for higher performance and real-time requirements.
- ✓ Ethernet support through W5100 chipset with full TCP, UDP, HTTP, DHCP and DNS support. Ethernet throughput is 400Kbps. Perfect match for [FEZ Connect Shield](#).
- ✓ Extended double-precision math class.
- ✓ Parallel Port (ideal for color displays).
- ✓ JTAG is exposed (available only when firmware is erased).
- ✓ Multi-Threading.
- ✓ XML.
- ✓ FAT File System.
- ✓ Cryptography (AES and XTEA).
- ✓ Low Power and hibernate Modes.
- ✓ In-field update (from SD, network or other).



Most features are GHI exclusive, see [software documentation](#) for details.



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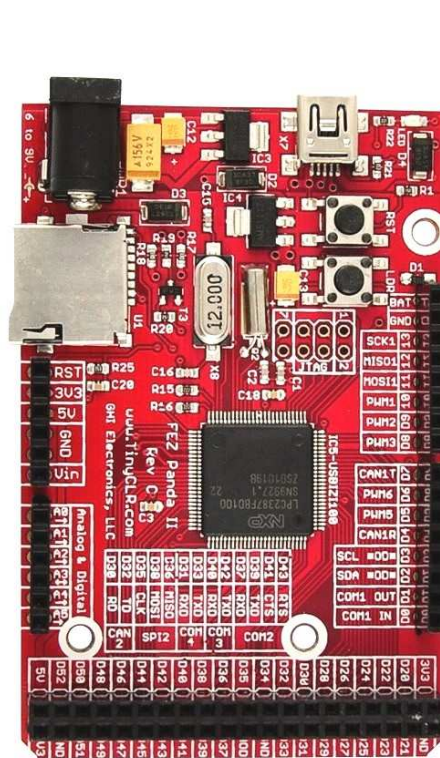
## FEZ Panda Pins Features

All pins can be used as digital input/output. Some pins have secondary feature as well.

### FEZ Panda II Arduino-compatible Pins Features

Details	
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.

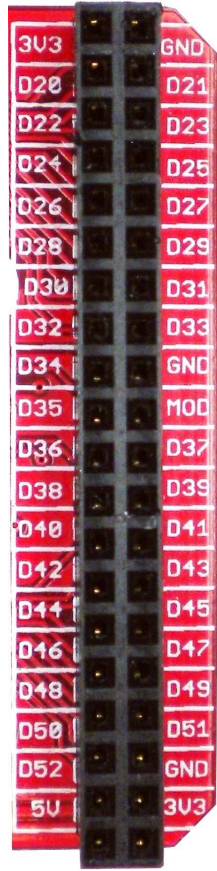
Secondary Features	
VBAT	Real Time Clock Vin (Connect to 3V battery or 1F supper capacitor)
GND	Ground
Di13*	SPI1 SCK (Clock)
Di12*	SPI1 MISO (Input)
Di11*	SPI1 MOSI (Output)
Di10	PWM
Di9	PWM
Di8	PWM

Secondary Features	
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



## FEZ Panda II Extended Pins Features

Secondary Features	
3.3 Volts Out	3V3
Digital IO Only	D20
Digital IO Only	D22
Digital IO Only	D24
Digital IO Only	D26
Digital IO Only	D28
CAN Bus Channel 2 Input	D30*
CAN Bus Channel 2 Output	D32*
Digital IO Only	D34*
SPI2 SCK (Clock)	D35*
SPI2 MISO (Input)	D36*
SPI2 MOSI (Output)	D38*
COM3 Input	D40*
COM3 Output	D42*
Digital IO Only	D44
Digital IO Only	D46
Digital IO Only	D48
Digital IO Only	D50
Digital IO Only	D52
5 Volts In/Out	5V



Secondary Features	
GND	Ground
D21	Digital IO Only
D23	Digital IO Only
D25	Digital IO Only
D27	Digital IO Only
D29	Digital IO Only
D31	COM4 Input
D33	COM4 Output
GND	Ground
MOD*	MODE/ PWM
D37*	COM2 Input
D39*	COM2 Output
D41*	COM2 CTS
D43*	COM2 RTS
D45	Digital IO Only
D47	Digital IO Only
D49	Digital IO Only
D51	Digital IO Only
GND	Ground
3V3	3.3 Volts Out

\* These pins can work as interrupt inputs



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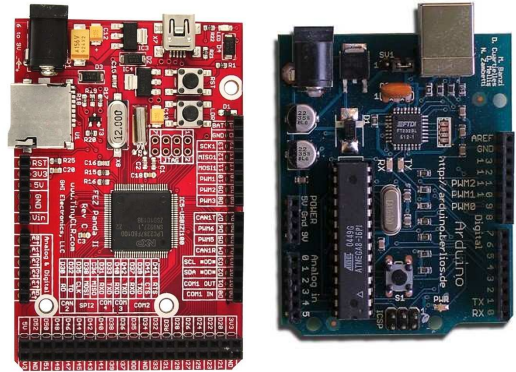
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## FEZ Panda II and Arduino Comparison

FEZ Panda II is not an Arduino board, but it makes use of the idea of having a stackable hardware platform. The similar form factor between FEZ Panda II and Arduino allows developers to use almost any of the available Arduino shields.

While using the same shields, FEZ Panda II offers more powerful hardware and software platform, 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.

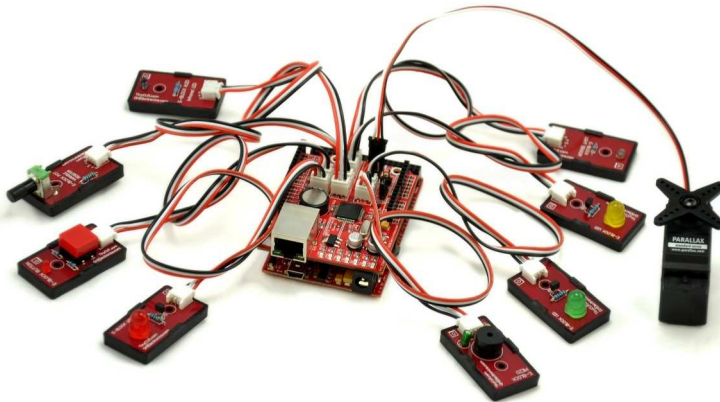
Additionally FEZ Panda has extra IOs exposed on an easily accessible 40-pin female header.



## Expandability of FEZ Panda II

Boards that install directly on top of FEZ Panda II are called shields. The most common shield for FEZ Panda II is [FEZ Connect shield](#) which provides an Ethernet connection plus exposes sockets compatible with the main 3-pin e-blocks GHI offers.

[FEZ Touch](#) is also another way to expand FEZ Panda II. It is a 240x320 full 16-bit color display with touch screen.



## Powering FEZ Panda II

The easiest way to power FEZ Panda II 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).

## What's Next?

To get started with FEZ, please take a look at the FEZ Tutorial and .NET Micro Micro Framework Beginners Guide e-book available on our community website [www.tinyclr.com](http://www.tinyclr.com)



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