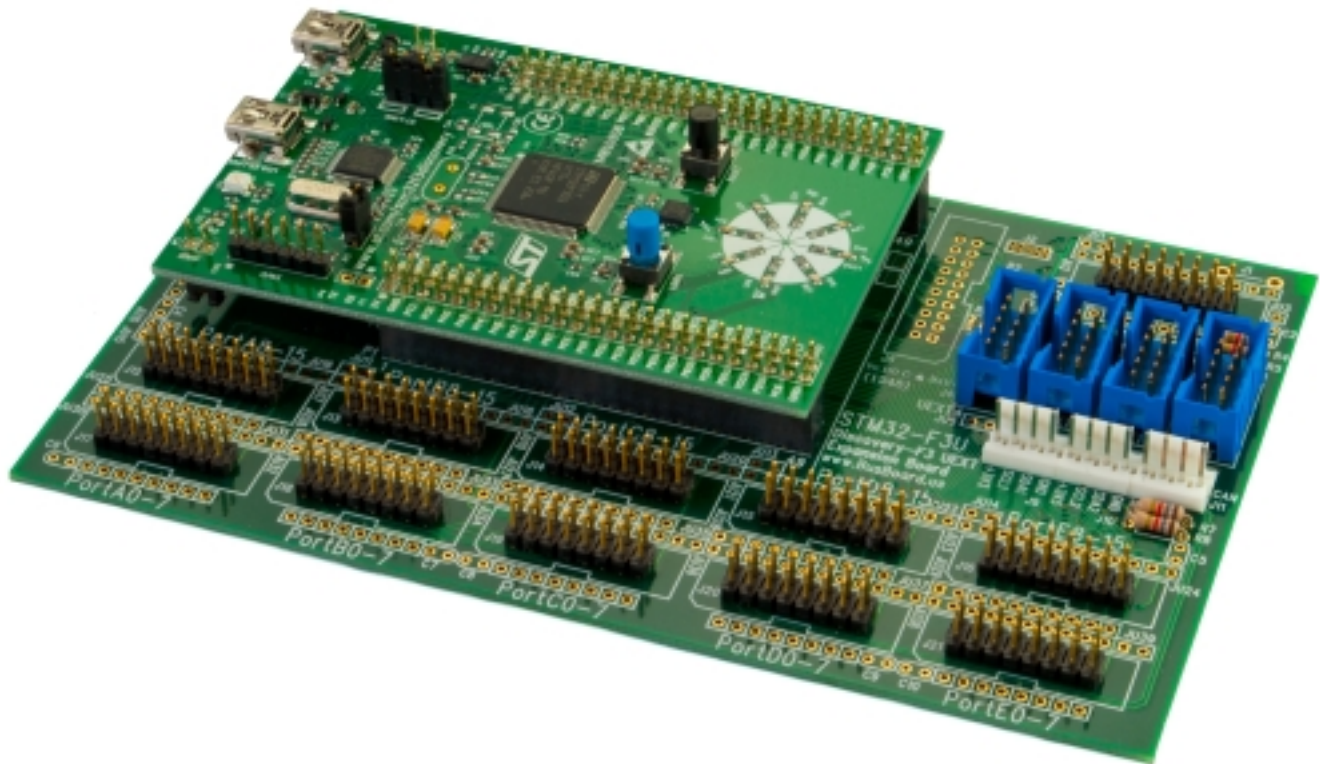


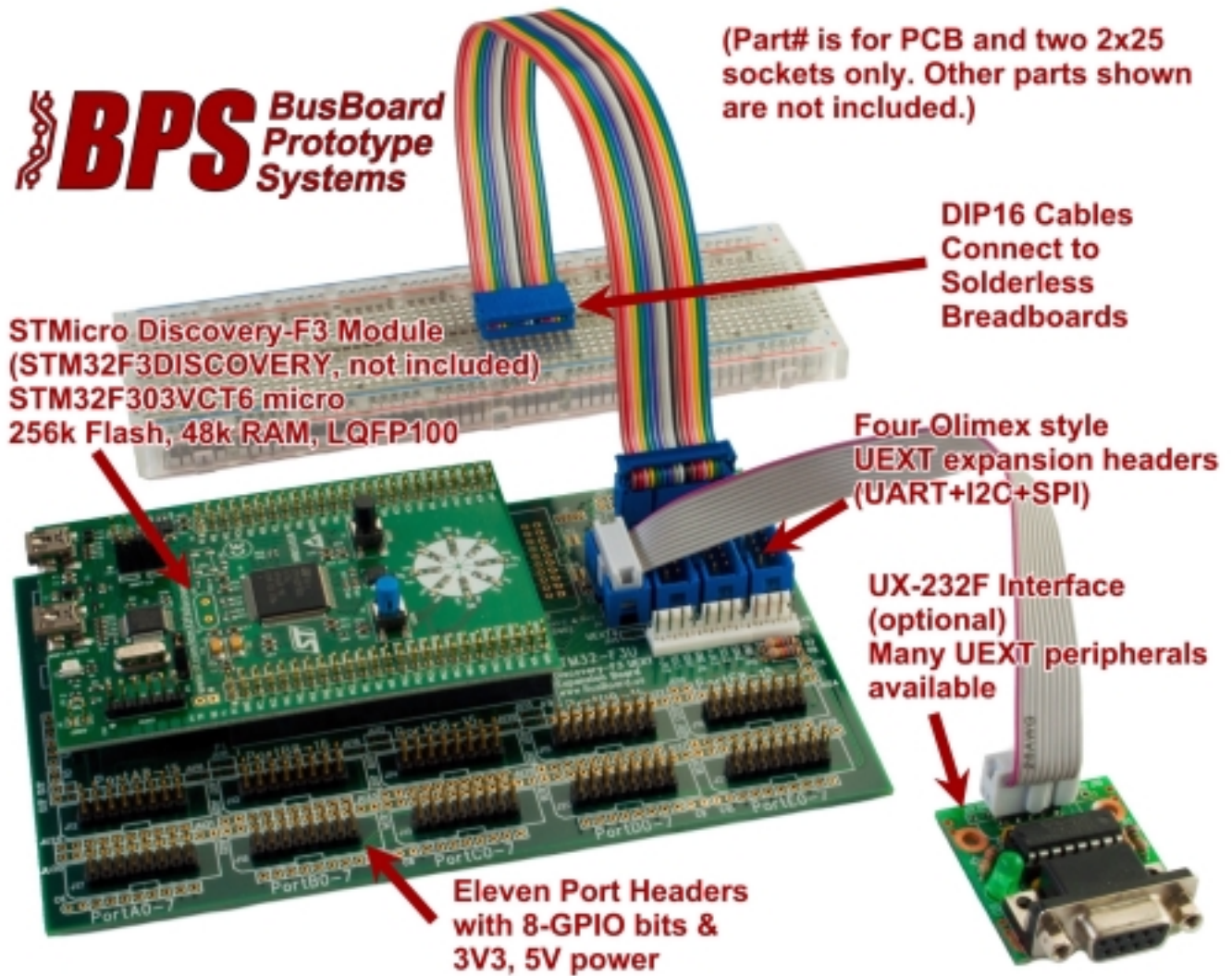
*Development baseboard for the STMicro Discovery-F3 module  
(STMicro part# STM32F3DISCOVERY)*



**Part Number:** PCB-STM32-F3U (unpopulated PCB with Discovery module sockets, no other parts)  
STM32-F3U (assembled board, not presently available)

## **Features**

- STM32-F3U is a breakout board for the STMicro Discovery F3 board with STM32F303 microcontroller (256k program flash, 48k RAM, DSP, and floating point instructions).
- Eleven GPIO port headers providing 8 data bits and 3V/5V power.
- Four UEXT connector footprints provide UART, I2C, and SPI signals on 10-pin headers. Use 10-pin ribbon cables to connect to UEXT peripheral boards.
- Bare PCB with two 2x25 DIL sockets provided for STMicro Discovery-F3 module. No other parts provided. BOM and schematic available for download.
- Mostly thru-hole construction allows for easy assembly.
- 4-layer, FR4 glass-epoxy PCB, 1oz/ft<sup>2</sup> copper. Soldermask & silkscreen. Lead free and RoHS compatible. 3.94 x 6.30in (100 x 160mm).



## Details

The STM32-F3U breakout board provides port connectors and UEXT expansion headers to make it easy to prototype with the ST Micro Discovery F3 board.

The Discovery F3 module includes a STM32F303VCT6 microcontroller with 256k program flash, 48k RAM, and a floating-point/DSP unit in a LQFP100 package. An on-board ST-LINK/V2 programmer allows code to be loaded and debugged via PC USB port. Accelerometer, compass, and gyroscope peripherals are provided.

Eleven 2x8 headers are used for GPIO port expansion. Each header has 8 data bits, 3V power, 5V power, ground, and 5 uncommitted pins for customization.

Four Olimex style UEXT 2x5 header are used for peripheral expansion. UEXT is an open standard developed by Olimex providing 3 Volt I2C, SPI, and USART signals on one connector. A 10-pin ribbon cable is used to connect to UEXT peripheral boards.

Power comes from the Discovery board USB connector.

PCB-STM32-F3U is an unpopulated board and only the 2x25 sockets for the Discovery module are included (no other parts provided). The BOM (bill of materials) and schematic diagram are available at <http://www.busboard.us/products/PCB-STM32-F3U/> to construct the board. Soldering is required. Mostly thru-hole construction allows for easy assembly, maintenance, and modification.

### **Customer Comments**

**The boards work great. I'm impressed with the high build quality. I've used them in a few different prototypes, and I haven't had any issues with them.**

**It's great having the GPIO pins in order! The Discovery pinout is pretty ridiculous if you ask me.**

**Thanks again for taking the initiative to design this board!  
- AZ, California**

### **STMicro Discovery-F3 Board With STM32F303VCT6**

The Discovery F3 module includes a STM32F303VCT6 microcontroller with 256k program flash, 48k RAM, and a floating-point/DSP unit in a LQFP100 package. An on-board ST-LINK/V2 programmer allows code to be loaded and debugged via PC USB port. Accelerometer, compass, and gyroscope peripherals are provided.

### **UEXT Expansion Headers**

The Universal-EXTension-Connector (UEXT) is an expansion connector standard created by Olimex Ltd. ([www.Olimex.com](http://www.Olimex.com)). It provides an asynchronous serial port (USART), SPI and I2C all on the same connector.

Peripheral modules for UEXT are available from Olimex (and stocked at [www.Mouser.com](http://www.Mouser.com)) as well as from other suppliers.

The STM32-F3U baseboard provides four UEXT connectors. There is a different USART on each UEXT port. Two SPIs and two I2C ports are shared between the two connectors. A different SPI slave select was used for each connector so four different SPI devices can be used.

Headers are provided for:

- UEXT1 Expansion (USART1 + SPI1 + I2C1)
- UEXT2 Expansion (USART2 + SPI1 + I2C1)
- UEXT3 Expansion (USART3 + SPI2 + I2C2)
- UEXT4 Expansion (USART4 + SPI2 + I2C2)

The UEXT interface standard uses a 2x5 polarized header with 0.1" spacing. Modules connect to the UEXT connector with a 10-pin ribbon cable.

The UEXT pinout is as follows:

Direction	Signal Function	Pin	Pin	Signal Function	Direction
Output	+3.3 Volts	1	2	GND	-
Output from MCU	USART-TX	3	4	USART-RX	Input to MCU
Output	I2C-SCL	5	6	I2C-SDA	Bi-directional
Master In Slave Out	SPI-MISO	7	8	SPI-MOSI	Master Out Slave In
Master Out Slave In	SPI-SCK	9	10	SPI-SSN	Master Out Slave In

Please refer to the baseboard schematic for the actual pin assignments for the 4 connectors.

Each SPI-SSN slave select signal has a jumper that can be installed after cutting a track to make it easy to route a different signal for the select line.

Most UEXT modules are designed for 3.3V operation only. Therefore, no +5V power option is provided on UEXT headers.

### **GPIO Port Expansion Connectors**

Most of the GPIO signals available on the STM32F4 are brought out to GPIO headers.

Each 16-bit STM32 port is brought out to two headers, 8 bits on each. This allows the port signals plus power and ground to be carried on a single 16-pin ribbon cable to interface to other boards.

A 2x8 socket to DIP16 ribbon cable can be used to carry the port signals and power to a solderless breadboard for experimenting as shown on the photo on page 2.

Headers are provided for:

Port A0-7,	Port A8-15
Port B0-7,	Port B8-15
Port C0-7,	Port C8-15
Port D0-7,	Port D8-15
Port E0-7,	Port E8-15
Port F0,1,2,4,6,9,10	

The GPIO signals are on the odd pins on one side of each 16-pin Port Expansion Connector. The even side of each header has +5V power on pin 2, +3V3 power on pin 4, and ground on pin 16. There are also 5 uncommitted pins 6, 8, 10, 12, 14.

The GPIO 2x8 pinout is as follows:

Signal Function	Pin	Pin	Signal Function
Port bit 0 or 8	1	2	+5V
Port bit 1 or 9	3	4	+3V3
Port bit 2 or 10	5	6	Uncommitted Pin
Port bit 3 or 11	7	8	Uncommitted Pin
Port bit 4 or 12	9	10	Uncommitted Pin
Port bit 5 or 13	11	12	Uncommitted Pin
Port bit 6 or 14	13	14	Uncommitted Pin
Port bit 7 or 15	15	16	Ground

Note: Port F pin numbers are different. Refer to the schematic.

The +5V, +3V3, and ground have in-line jumpers (JUxx) that allow the power to be disconnected so the pin can be used differently. There is a track underneath each jumper connecting the power pin so that the jumper does not need to be installed for normal use. Cut the track to disconnect the pin or to install the jumper connector.



Each pin has a test point for monitoring, or to make it easy to add alternate connections.

If it is desirable to have all 16 port pins to be on one connector, wire jumpers can be added to connect the test points after the power and ground are disconnected at the jumpers.

### **CAN #1 Header**

J11 provides Rx and Tx connections to the CAN1 interface plus +5V power and ground.

Pin	Name	Description	Signal Direction
1	GND	Ground	
2	CAN-Rx	Receive Data	Input (to MCU)
3	CAN-Tx	Transmit Data	Output (from MCU)
4	+5V	Power	+5V Power to CAN

### **I2C1, I2C2**

J9 and J10 provide alternate 4 pin connections for I2C interfaces #1 and 2. They are shared with the UEXT connectors, so they can be used as test points for the signals.

The I2C connector signals are as follows:

Pin	Name	Description	Signal Direction
1	GND	Ground	
2	SDA	I2C Data	Bi-directional
3	SCL	I2C Clock	Output
4	+3.3V	Power	Power to ComBoard

A Tyco MTA-100 type polarized connector is typically used, but the 0.1" pin spacing allows other connector types to be fitted as well.

The pull-up resistors must be installed on the baseboard or on a peripheral board for the I2C to function.

The I2C headers have +5V power instead of the +3.3V power on the UEXT headers. I2C signals are open-collector and can tolerate signal voltages higher than their power rail.

### **STMicro Discovery F3 Board**

Connectors P1 and P2 are used to plug in the STM32F3 Discovery board using two 2x25 sockets with 0.1" spacing.

#### **Backup Battery**

A coin cell battery holder can be installed to provide power to the STM32F3 Discovery RTC circuit and also to some RAM.

### **Boot Option Headers**

The STM32F3 Discovery board can be made to boot in different modes by selecting different configuration options with JU4 and JU9.

SB2 and SB16 must be removed from the STM32F3 Discovery board to allow the configuration to work using JU4 and JU9. Note: SB16 must be removed to use the serial bootloader option.

Boot0 JU4	Boot1 JU9	Action
Jumper 2-3	Don't care	Run user program from Flash
Jumper 1-2	Jumper 2-3	Run USART1 Boot loader from ROM
Jumper 1-2	Jumper 1-2	Run SRAM program

### **ARM 20-pin JTAG Header**

A 20-pin polarized JTAG connector (0.1" pitch) is provided on connector J26 for programming and debugging. This connector is typically not used because the Discovery module has an on-board SWD programmer. However, it may be desirable to use a faster JTAG programmer to help speed development.

Series resistor are provided for partial ESD protection along with the required pull-up and pull-down resistors. These parts are all fine pitch SMD (surface mount devices). Population is only required if the interface is required.

### **ARM 10-pin JTAG Header**

A 10-pin polarized JTAG connector (0.050" pitch) is provided on connector J23 for programming and debugging. This connector is typically not used because the Discovery module has an on-board SWD programmer. However, it may be desirable to use a faster JTAG programmer to help speed development.



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