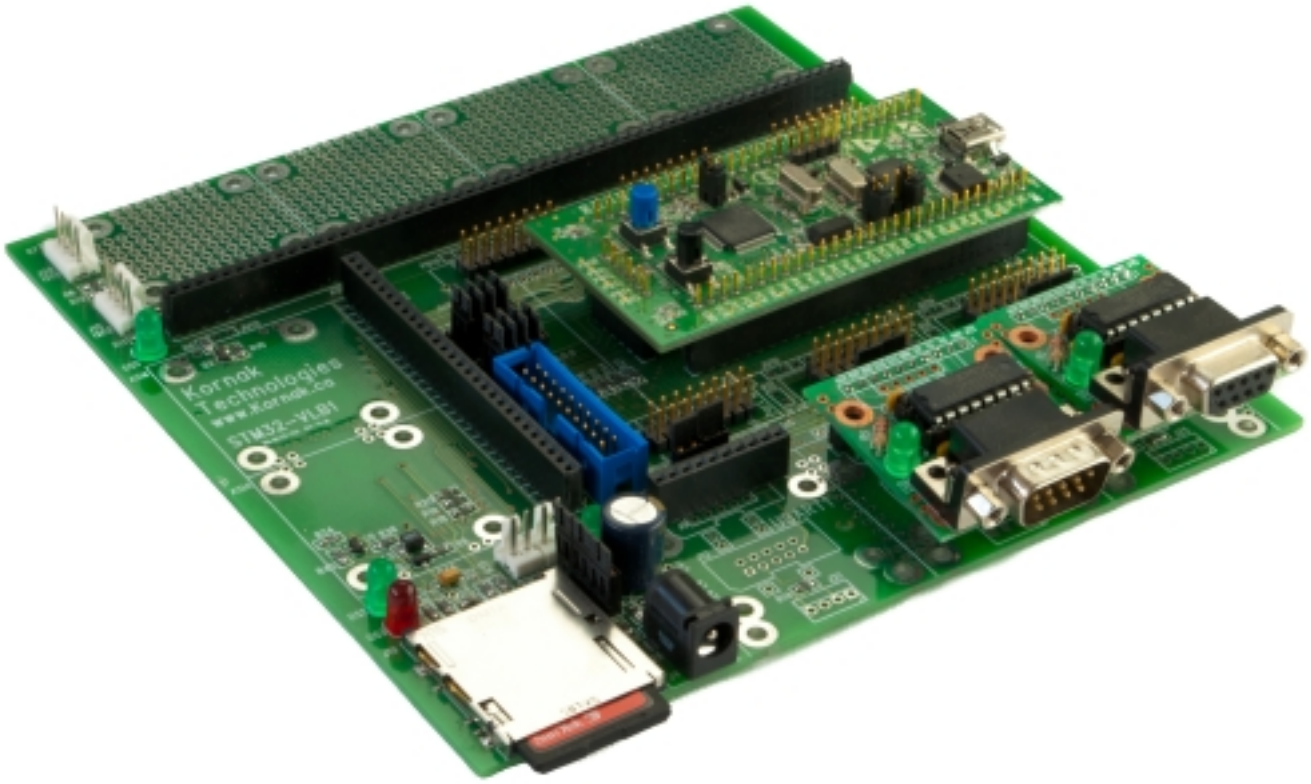
PCB-STM32-VLB1

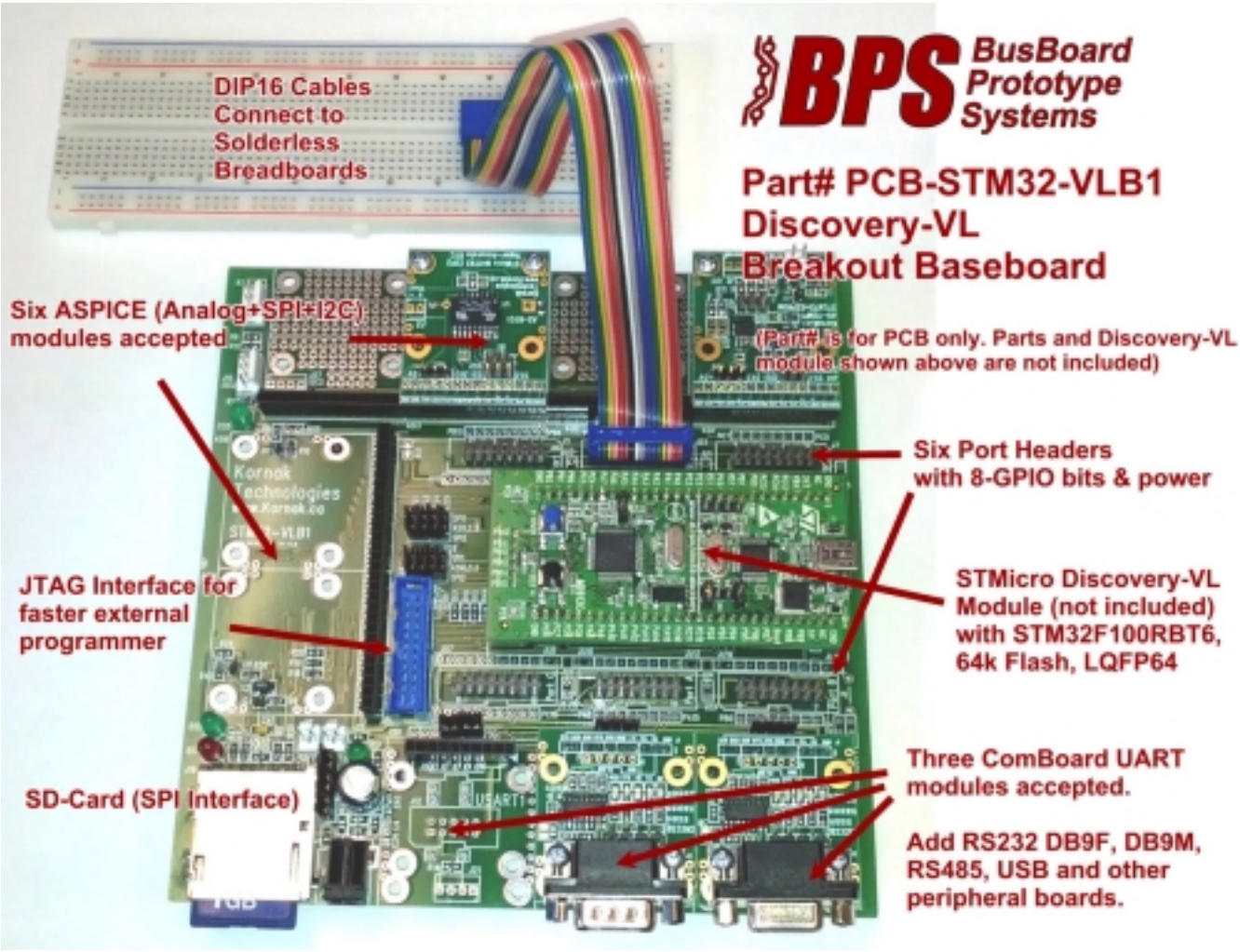
Development baseboard for the ST Micro Discovery VL module.



Part Number: PCB-STM32-VLB1 (unpopulated PCB with Discovery module sockets, no other parts)
STM32-VLB1 (assembled board, not presently available)

Features

- STM32-VLB1 is a breakout board for the STMicro Discovery VL board with STM32F100RBT6 microcontroller (128k program flash, 8k RAM). Bare PCB with Discovery module sockets provided. BOM and schematic available for download.
- Six GPIO port headers providing 8 data bits and 3V/5V power.
- Three async. serial ports. ComBoard footprints provide RS232-DTE (male), RS232-DCE (female) and RS485 USART interfaces. Circuitry can be built on the board or added with interchangeable ComBoard modules. Six ASPICE board footprints provide I2C, and SPI expansion signals on 14-pin headers. SD card connector footprint provided.
- Mostly thru-hole construction allows for easy assembly and expansion (optional power input, JTAG header and SD card have SMT parts).
- 2-layer, FR4 glass-epoxy PCB, 1oz/ft2 copper. Soldermask & silkscreen. Lead free and RoHS compatible. 6.30 x 6.30in (160 x 160mm).



Details

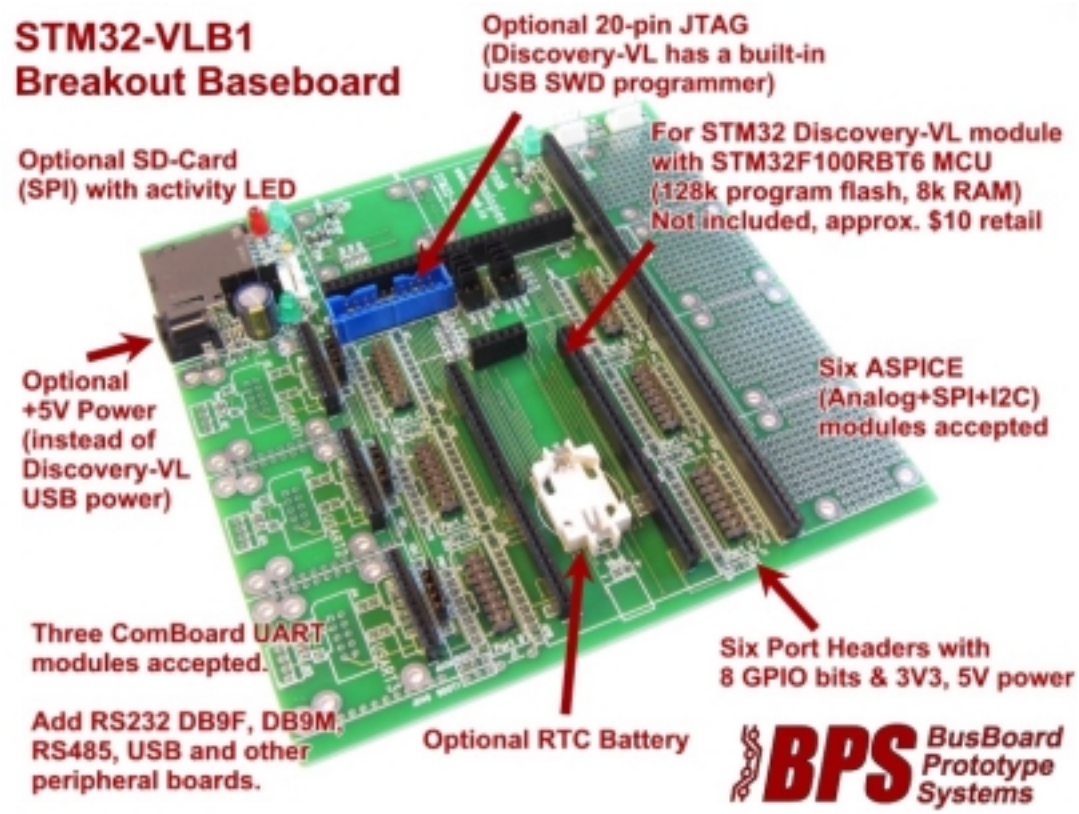
The STM32-VLB1 breakout board provides port connectors, USART, I2C, and SPI expansion headers to make it easy to prototype with the ST Micro Discovery VL board.

The Discovery VL module includes a STM32F100RBT6 microcontroller with 128k program flash, 8k RAM, in a LQFP64 package. An on-board ST-LINK/V2 programmer allows code to be loaded and debugged via PC USB port. Power comes from the Discovery board USB connector or a barrel connector.

Six 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.

Three ComBoard module footprints allow RS232 or RS485 serial interfaces to be added and quickly changed. Six ASPICE module footprints allow I2C, SPI or analog modules to be added. Other footprints include: SD card with activity LED and power switch circuitry. RTC CR2032 battery holder. Barrel power connector and filter.

PCB-STM32-VLB1 is an unpopulated board and no parts are provided. The BOM (bill of materials) and schematic diagram are available at http://www.busboard.us/products/PCB-STM32-VLB1/ 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 DiscoveryVL Board With STM32F100RB

STM32-VLB1 is a breakout board for the STMicro Discovery VL board with STM32F100RBT6 microcontroller (128k program flash, 8k RAM).

An on-board ST-LINK/V2 programmer allows code to be loaded and debugged via PC USB port.

Information on the Discovery-CL module can be found on the STMicro web site at http://www.st.com/internet/evalboard/product/250863.jsp

Backup Battery

A coin cell battery holder can be installed to provide power to the Discovery STM32 RTC (Real Time Clock) circuit and also to some RAM.

GPIO Port Expansion Connectors

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.

6 Headers are provided for: Port A0-7, Port A8-15
Port B0-7, Port B8-15
Port C0-7, Port C8-15

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

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.

USART1, USART2 and USART3 ComBoard Expansion

USART1, USART2 and USART 3 are the three serial ports brought out from the STM32 Discovery-VL module. Serial port circuitry can be added directly to the baseboard for one RS485 and two RS232 ports. For the RS232 ports, one is DTE (DB9M connector) and the other is DCE (DB9F connector).

These serial ports can also be used with ComBoard Serial Modules. ComBoard is an open standard for USART peripheral modules that provides all handshaking signals. The 1x10 connector allows ComBoard modules to be plugged into solderless breadboards, soldered into prototyping boards, or plugged into connectors on dev boards.

If you are adding the RS232 interface directly on the board, we recommend you use sockets for the driver ICs so they can simply be removed to use to a ComBoard module.

ComBoard 1x10 Pinout

The 1x10 socket connector in the CB1, CB2, and CB3 locations is for use with ComBoard modules. Alternatively, the 2x5 ComBoard connector can also be used with 10 pin ribbon cables.

The CB485, CB232F and CB232M modules use the same 1x10 connector signals so that they can be interchanged. Note that DTE signals names and directions are used on the 1x10 connector regardless of whether the module and DB9 connector is DTE (DB9M) or DCE (DB9F).

The ComBoard 1x10 pinout is as follows:

Pin	Name	Description	Signal Direction
1	GND	Ground	
2	Rx	Receive Data	Input (to MCU)
3	Tx	Transmit Data	Output (from MCU)
4	+5V (or +3.3V)	Power	Power to ComBoard
5	Ring	Ring	Input
6	CTS	Clear To Send	Input
7	RTS	Request To Send	Output
8	DSR	Data Set Ready	Input
9	DCD	Data Carrier Detect	Input
10	DTR	Data Terminal Ready	Output

MCU = the microcontroller

The ComBoard 1x10 pin out provides all 9 pins required for full serial port handshaking plus a power pin. Some modules may only use some of the pins, such as Tx and Rx for 2-wire serial, or Tx, Rx, RTS and CTS for 4-wire serial with flow control.

The power supplied on pin 4 is +5V by default. The track under the power jumper can be cut and +3V3 power can be connected if it is required by the ComBoard module. The logic signals are +3V3 levels but are +5V tolerant.

Alternate ComBoard 2x5 Pinout

The ComBoard 2x5 header is an alternative pinout that allows the serial port to be used with 10-pin ribbon cables. This can be useful to interface to another board or to locate the serial driver away from the main board.

The ComBoard 2x5 pin out is as follows:

Direction	Signal Function	Pin	Pin	Signal Function	Direction
	DCD Data Carrier Detect	1	2	DSR Data Set Ready	Input
Input (to MCU)	Rx, Receive Data	3	4	RTS Request To Send	Output
Output (from MCU)	Tx, Transmit Data	5	6	CTS Clear To Send	Input
Output	DTR Data Terminal Ready	7	8	RING	Input
	GND Ground	9	10	+5V (or +3.3V)	Output

MCU = the microcontroller

The ComBoard 2x5 pin order is designed so that the serial signals are on the correct DB9 pins when a 2x5 to DB9 ribbon cable is used. One side of the 2x5 connector overlaps with the 1x10 ComBoard connector, so only one or the other is used.

Note: The ComBoard 2x5 pinout is different from the Olimex UEXT standard, which also uses 10-pin ribbon cables. ComBoard has all 9 serial signals plus power. UEXT serial signals only have Tx, Rx and power.

ASPICE Expansion Modules (Up to 6 Modules)

ASPICE is an open standard for peripheral boards with Analog, SPI, and I2C interfaces. Footprints are provided for six ASPICE boards, ASI1 to ASI6. A prototyping area is provided under these modules to allow circuits to be added directly to the baseboard.

The ASPICE 1x14 pinout is as follows:

Pin	Name	Description	Signal Direction
1	DGND	Digital Ground	
2	I2C-SCL	I2C Clock	Output
3	I2C-SDA	I2C Data	Bi-directional
4	+5V	+5V Power	Output
5	+3V3	+3V3 Power	Output
6	SPI-MOSI	SPI Master Out Slave In Data	Input or Output
7	SPI-MISO	SPI Master in Slave Out Data	Input or Output
8	SPI-CLK	SPI Clock	Output
9	SPI-SS-N	SPI Slave Select 1	Output
10	SPI-SS2-N	SPI Slave Select 2	Output
11	SPI-SS3-N	SPI Slave Select 3	Output
12	ANALOG-R	Analog Right Signal (ADC or DAC)	Input or Output
13	ANALOG-L	Analog Left Signal (ADC or DAC)	Input or Output
14	AGND	Analog Ground	

MCU = the microcontroller

Multiple SPI slave select signals are provided to allow multiple peripherals to be used on a board. Some GPIO signals may have alternative uses, so confirm which signals are available to avoid conflicts.

SPI Select For ASI1, 2, 3

JU21, JU23, JU24, and JU25 allow either SPI1 or SPI2 to be selected for ASI1, 2, and 3.

SPI Select For ASI4, 5, 6

JU26, JU27, JU28, and JU29 allow either SPI1 or SPI2 to be selected for ASI4, 5, and 6.

I2C1, I2C2, I2C3

J20 and J15 provide 4 pin connections for I2C interfaces #1 and 2. Note that I2C ports 1 and 2 are shared with ASPICE boards ASI1 and ASI2.

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	+5V	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 SMT pull-up resistors must be installed on the baseboard or on a peripheral board for the I2C to function.

Power Input Options

The board is typically powered with 5V from the Discovery module USB connector CN1.

It may be desirable to power the board when it is not connected to a PC. The power input must be well regulated 5VDC power.
Footprints are provided for three DC power input connector options:

1. Barrel connector (J4). Polarity is center + and outside -.
2. 2-position removable terminal block (J3), 0.2" pitch.
3. MTA-100 2-pin polarized connector (J6), 0.1" pitch

Note: The ferrites in the input filter are rated at 0.5A. They may need to be replaced with other components or jumpers depending on the total current required.

Power Out

Two MTA-100 2-pin polarized connectors (J16 and J17) are provided to supply off board circuitry with 5V power.

ARM 20-pin JTAG Header

A 20-pin polarized JTAG connector (0.1" pitch) is provided on connector J2 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.

Secure Digital Card (SD Card)

A SPI based SD card interface is provided. The SD card power can be controlled to allow a hard-reset of the SD card if needed.

The SD card activity LED is controlled by the MCU, so it can be used for other purposes as needed. JU30 allows the LED to be connected to an alternate signal.

JU15 and JU20 allow the card detect signals to be disconnected if the signals are used elsewhere.

The parts in this area are all SMD (surface mount devices) and population is only required if the interface is required.

Boot Option Headers

The STM32F4 Discovery board can be made to boot in different modes by selecting different configuration options with JU39 and JU38. See the schematic diagram for details.

I'm Alive LED/Debug LED

The "I'm Alive" LED is controlled by the MCU. We recommend flashing the LED during normal operation to indicate that the program is running. JU13 allows the LED to be connected to an alternate signal.