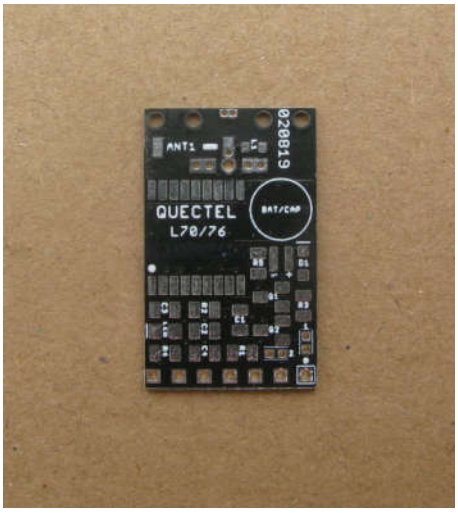
Breakout board for Quectel L70 and L76 GPS modules

This is a board that allows you to use a Quectel L70 or L76 GPS with your microcontroller projects. With a simple wire antenna the board and GPS will weight as little as 2g. The version with a small ceramic patch antenna weighs 5.9g. In is simplest build all you need to do is solder the GPS module to the board, add a 7 pin 0.1” header, a bit of stiff wire for an antenna and make two links.



There are options you can add to the board;

LED fix indicator

Decoupling capacitors

GPS backup for hot fixing

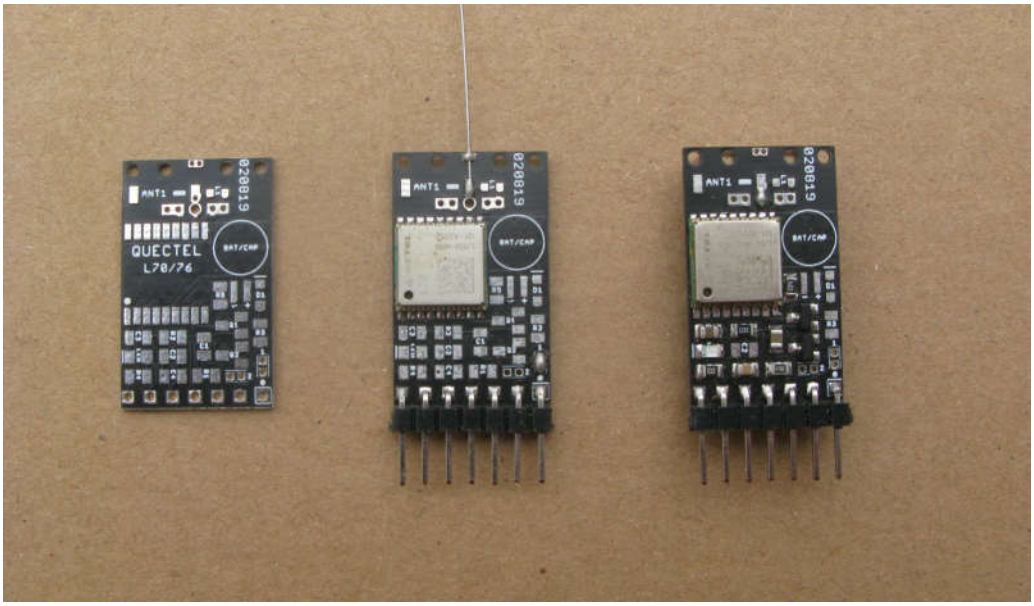
Lithium battery or super capacitor

Power switching to turn the GPS off and save power

The board uses 0805 sized surface mount components to keep the size and weight down. All capacitors are ceramic chip types. The assembled GPS module is for use on 3.3V microcontroller projects only, do not connect directly to 5V microcontrollers such as the Arduino UNO.

Basic mode build

Solder the GPS in place, note the correct orientation, the GPS could be damaged if you fit it the wrong way around. Solder a 7 pin angled 0.1” connector in place for CONA. Bridge LK1 with a blob of solder or solder a wire link in place.



LED fix indicator

Fit LED and R4, these are 0805 size surface mount components. A red LED is preferred, it will be brighter at the 3.3V operating voltage of the GPS. Note the cathode end of the LED has a bar marking on the PCB. The GPS on the right above has the fix LED added.

Decoupling capacitors

Fitting C3 can help the GPS perform better in a noisy electrical environment.

GPS backup for hot fixing

You can fit an independent backup for the GPS, but its a whole lot easier to supply VCC (as in 3.3V) to the VBKP pin on CONA pin 5. When the GPS is powered off via the power switching option then the VBKP pin keeps the GPS going. Fitting C2 will keep the VBKP stable.

Lithium battery or super capacitor

If you want the GPS to save its current satellite data if the connected project is powered down completely fit the battery or super capacitor and R3 and D1. The cathode end of D1 is marked with a bar on the PCB. The battery would be a MS621FE and the super capacitor a DMS3R3224R. Fit C2 and C4 also. This should allow the GPS to get a new fix more quickly when power is restored. The MS621FE has a max charge current of 100uA,

so an R3 value of 15K should keep the charge current mostly under this value. For the super capacitor option a value of 1K for R3 should be adequate. Use a bit of glue or double sided tape under the battery to keep it in place.

Power switching to turn the GPS off and save power

This option will allow you to use a logic pin to power the GPS on and off, using pin 6 of CONA. When off in backup mode the current consumption can drop to as low as 8uA, compared to 20-30mA when running.

Fit C1, R1, R2, C3 and Q1. Make sure LK1 is open and not connected. If you want to use a logic low to turn the GPS on, then bridge LK2 with blobs of solder or bit of wire. If you want to use a logic high to turn the GPS on than also fit R5 and Q2 and do not bridge LK2.

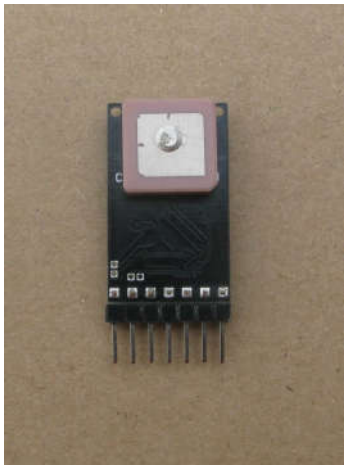
When the power switching option is in use, its implicit the microcontroller controlling the GPS is connected and active so its easier to connect a source of VCC (3.3V) to pin 5 of the connector which will then supply a backup voltage to the GPS when its powered off.

The GPS on the right in the picture above shows the logic high active power switching components fitted.

Antenna options

Several choice here. For simplicity a short bit of stiff wire can be fitted, its ¼ wavelength at the GPS frequency so 4.75cm long. There are also holes to allow 4 x 1\4 wave radials to be fitted which improves the antenna. A ¾ wavelength antenna will give slightly stronger signals. I use Ernie Ball Custom Gauge 13 guitar wire. Do protect the pointy end of the antenna with a bit of cork or similar.

The PCB antenna connection on the GPS does accept the centre pin of a self adhesive ceramic patch antenna which fits on the back. See picture.



Anti Static precautions

The antenna input pin of the GPS can be sensitive to static damage so do take precautions when handling the GPS. You can fit an inductor that will act as a DC short to protect the antenna input if you wish, I have used a 0603 33nH inductor, Farnell part 242 4724, which is a Wurth 744786133A.

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