

REDUCING DEVELOPMENT COSTS

Ways of Avoiding the Cost of a Custom PCB

The costs of custom PCBs can make the difference between an expensive and an affordable solution for one-off or short run products that require hardware development.

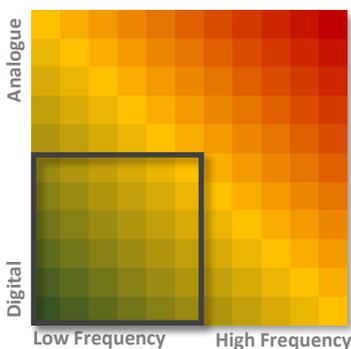
We will discuss here the different ways in which PTP keep costs down on small projects.

PROTOTYPING TECHNIQUES

One of the assumptions made when creating a prototype is that it is temporary. Therefore, usually, there is not a strong requirement for long term use and reliability. Ease of change and flexibility are often considered far more important when creating prototypes.

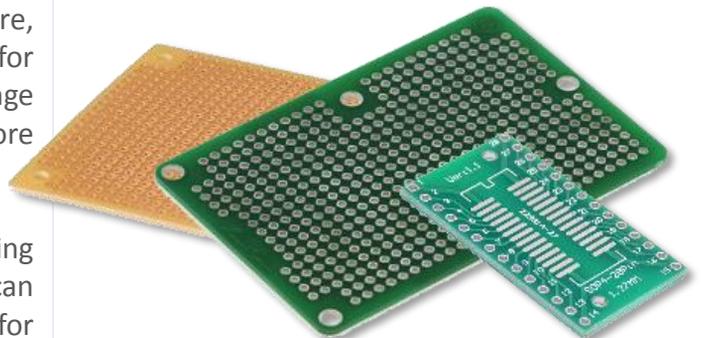
However, there are many prototyping techniques that, when used correctly can produce robust devices that are adequate for long term use, eliminating the need for an expensive custom made PCB.

Here we need to break down the possible applications into different categories because they often require different prototyping techniques:



The techniques used here suit best those applications which are predominantly digital (even though some analogue signals may be present) and those applications with low frequency signals.

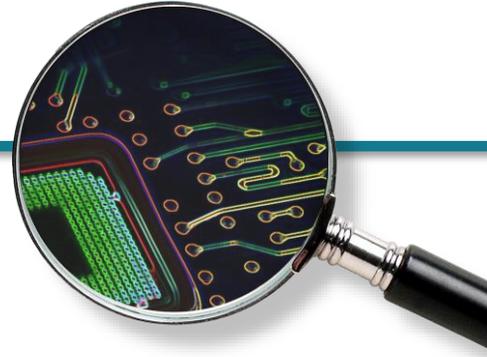
We have also to consider that ball grid array (BGA) packages are nearly impossible to solder manually and therefore, circuits using this type of ICs should follow conventional methods.



Methods commonly used include non copper-clad matrix board (perfboard), “deadbug” boards, milled boards, solderable perforated boards, wire-wrap, IC breakout boards and plug-in breadboard systems. It is also worth mentioning that vibration is a common source of problems when components are not directly soldered.

ICs on SMT packages should use breakout adapter boards to facilitate their connection.

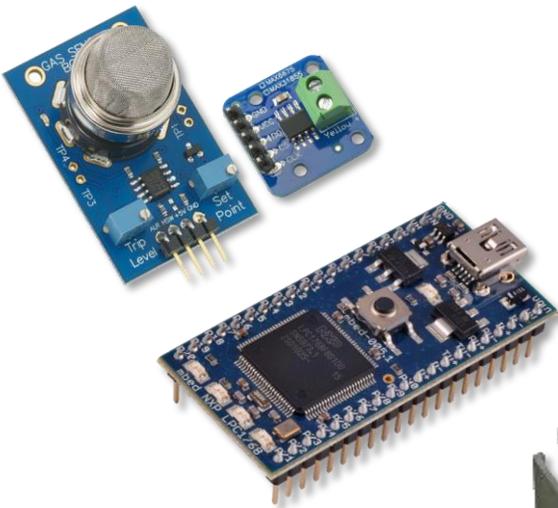
When using these prototyping boards, a good practice is to select double sided boards, mounting components on one side and use short interconnects to minimise noise.



EVALUATION & DEV BOARDS

Significant gains in speed of development and cost reductions can be achieved when off-the-shelf boards are used. There is a large number of microcontroller, interface, sensor and I/O boards available today.

Evaluation boards typically have input/output connectors for the analogue, digital, and power interfaces to facilitate interfacing with external test equipment. Any required support circuitry such as voltage references, crystal oscillators for clock generation, etc., are generally included as part of the board.



INSTALLATION ASPECTS

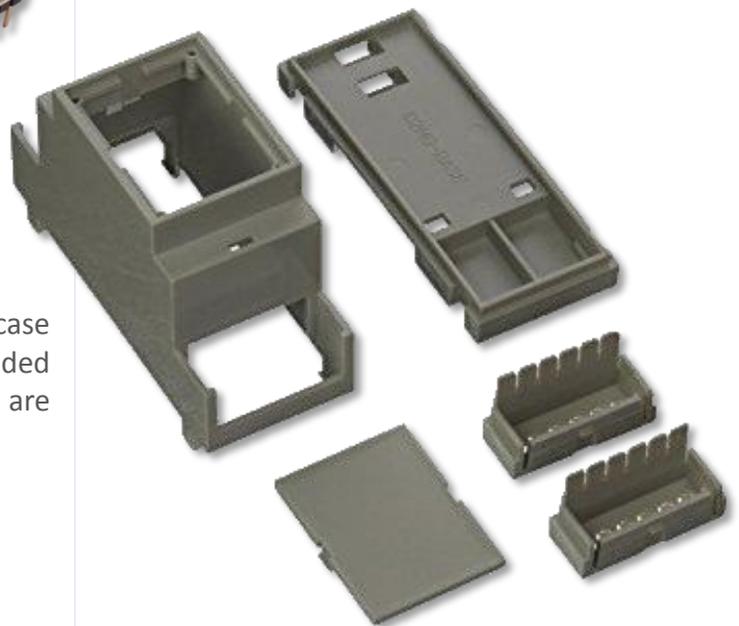
The final product should be in any case robust, safe and compatible with its intended use. The preferred methods used by PTP are resin potting and DIN rail mounting.

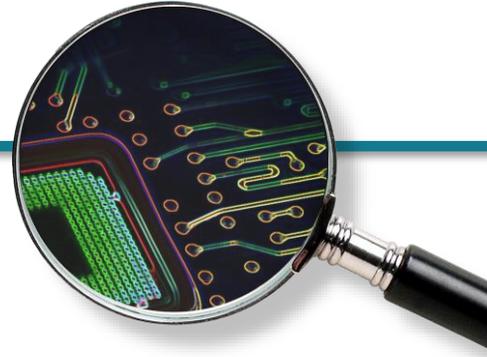
Potting has several advantages over other methods such as:

- Excellent electrical isolation
- Good vibration & shock resistance
- Finger safety
- Good thermal distribution
- Allow more compact assemblies
- Good immunity to dust and liquids

Some times it is not desirable to have the final assembly potted. In those cases other boxes (metal or ABS) can be used.

If the final circuit needs to be mounted inside a cabinet, a good solution is to use DIN rail mountable boxes such as the one shown below.





INTERFACE

It is usually a requirement to connect the device with other components of the system. For I/O and low power/low frequency signals, terminal block is usually a good option. If the number of signals to be connected is big, board to wire connectors can be used. When signals have to interconnect different systems, other types of connectors, such as DSub, M12 or M8, usually using circular cables may be used.

For data transfer it is common to use UART, SPI, I2C, RS485/RS232/RS422, Ethercat, CAN bus, Bluetooth and other interface standards. UART, SPI and I2C should be used within the same board or between two sister boards (board-to-board data interface). For longer distances and higher data rates, other interfaces should be preferred.

Again, preference should be given to of-the-shelf boards that include the required data interface.

SUMMARY

The right balance between the reduction in the cost of the development of a custom PCB and the effort required for planning, assembling and testing each solution using the techniques discussed here is some times difficult to assess.

In most cases, when the solution can be achieved solely using of-the-shelf boards as building blocks, the reduction in the time to market together with the absence of PCB design and fabrication justifies the adoption of these techniques.

PTP has developed a number of solutions using both traditional and the type of alternative methods mentioned here. Being flexible when choosing the best hardware approach often significantly reduces the overall costs of the proposed solution.

If you would like to know more about how PTP can help you with your hardware and software developments, please contact us.

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