Overview of the Characteristics of Thick Film Hybrid Technologies and PCB's

The following table indicates Thick Film Hybrids have somewhat higher material and setup costs than Printed Circuit Boards (PCB's) but competitive overall costs, combined with the advantages of superior reliability, tolerances, accuracy, security, performance and smaller size.

ATTRIBUTE	STAINLESS STEEL THICK FILM HYBRID	CERAMIC THICK FILM HYBRID	PRINTED CIRCUIT BOARDS
1. Set up costs	AUS$2,000-$5,000	AUS$2,000-$5,000	AUS$1,000-$3,000
2. Unit costs	Stainless steel is much smaller than PCB, therefore use less of it.	Ceramic size is much smaller than PCB, therefore use less of it.	Raw material of PCB's is lower cost.
3. Size	Up to 100mm x 100mm but it is generally 50% of the most complex PCB's.	Up to 100mm x 100mm but it is generally 50% of the most complex PCB's.	Up to 500mm x 500mm.
4. Components	Fewer components required as the resistors are printed.	Fewer components required as the resistors are printed.	Large components can be mounted onto the board.
5. Reliability	Excellent	Excellent	Good
6. Tolerance to: **a. Temperature**	-50oC to +100oC	-50°C to +100°C	-20°C to +85°C
b. Moisture	Encapsulated - good	Encapsulated - good	Potential problem
c. Vibration	Encapsulated - good	Encapsulated - good	Potential problem
d. Heat build up	Excellent - better than ceramic	Excellent	Not good
e. Corrosion	Encapsulated - good	Encapsulated - good	Potential problem
7. Security	Much more difficult to reverse engineer even if encapsulation is removed.	Much more difficult to reverse engineer even if encapsulation is removed.	Can be readily reversed engineered.
8. Accuracy	Can use more precise resistors and can be precision calibrated for high accuracy.	Can use more precise resistors and can be precision calibrated for high accuracy.	It depends on accuracy of components purchased.
9. Functional Modularity	Excellent - the hybrid includes the box.	Good - boxes are much smaller.	Poor - PCB's need to be mounted in boxes.
10. "Real World" Integration	Excellent - stainless steel hybrids as "real world" sensors of strain, flow, pressure, humidity, etc. can be integrated with microprocessor technology to create a single "bolt on" unit.	Good - ceramic hybrids can include sensor elements however mechanical attachment is limited.	Poor - PCB's need to be connected into the "real world" via separate sensor transducers.

Hybrid Electronics Australia Pty. Ltd. 924 Mountain Highway, Bayswater Victoria 3153 Australia
Ph: +61 (3) 9729 2177 Fax: +61 (3) 9729 8014 E-mail: hybrid@hybrid-electronics.com