

WHAT MAKES FLEX CIRCUIT ASSEMBLY DIFFERENT?

Every product with an on/off switch has some kind of circuit board inside of it.

For the most part, manufacturers and consumers are used to seeing circuit boards in their traditional format – flat, rectangular boards inserted into flat, rectangular products like televisions and laptop computers.

But new ergonomic product designs and the proliferation of wearable tech are changing the game for manufacturers.

Now, you can build circuit boards to fit in tight, three-dimensional spaces while ensuring resistance to mechanical wear and vibration.

Flex circuits allow manufacturers to be more creative than ever.

Until the early 2010s, assembling flex circuits was prohibitively expensive, both in terms of materials and man-hours needed to finish a design. Additionally, these early flex circuits rarely functioned as reliably as their rigid counterparts.

But as these flex circuit assembly costs drop, their presence in everyday products is booming.

What makes flex circuit assembly different and how have things changed in the past decade?

Quite a bit, it turns out.

Overcoming Flex Circuit Assembly Challenges

Flex circuits and rigid-flex boards provide manufacturers with significant challenges.

Whereas the standardized dimensions of rigid PCBs make it easy for assemblers to create highly engineered, conveyor belt-style processes that work for creating a broad range of boards, each individual flex circuit needs to be assessed on an individual scale.

First, the pallet that supports the flex circuit needs to fit its unique, flexible shape.

Ultra-light flex circuits rarely sit flat on a pallet surface, and in the case of double-sided flex circuits, assemblers must design a pallet that accommodates both the top and bottom circuit configuration.

If the flex circuit does not lay flat on the pallet, an air cushion beneath the circuit can generate mechanical resistance during solder paste screening and SMT pick-and-place processes.

Essentially, the air cushion will act like a trampoline and cause components to bounce off the assembly instead of sticking to the circuit membrane.

This requires special tooling and backup fixtures that can be calibrated for unique flexible circuit designs.

Customized pallet geometry ensures that the circuit lays flat even if it has a different thickness at different locations.

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SMT pick-and-place machines typically operate at high speed and with an extremely small margin of error. The slightest difference between nominal circuit dimensions and actual flex circuit geometry can **generate problems in the assembly process**.

Accommodating Heat Constraints with Flexible Circuits

Another issue that circuit board assemblers need to address is heat sensitivity.

Since flex circuits are much thinner than rigid boards, heat applied for soldering purposes has nowhere to dissipate – it all goes directly through the barrel.

Soldering flexible circuits requires the use of a precise soldering tool in the hands of a highly experienced technician. The margin for error is far lower than with rigid boards.

Continuing advances in the support technology for creating flex circuits ensure that assemblers who invest in state-of-the-art tooling kits and technician training can reduce costs and improve productivity when assembling flex circuits for new products.

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