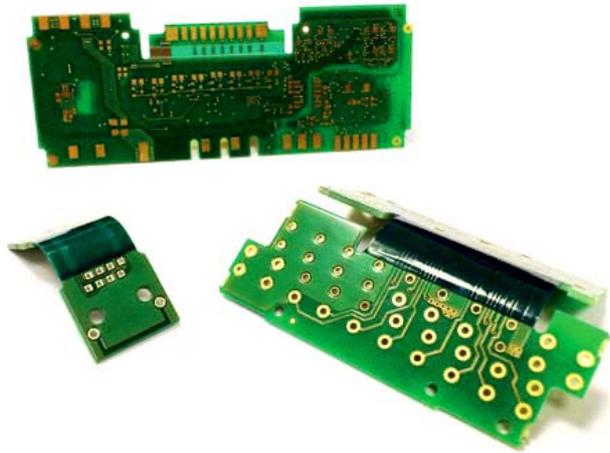


Semiflex Circuits made of FR4 Material

Along with its well-known product range, GGP also offers semiflex circuits made of conventional (rigid) FR4 basic materials.



This technology is suited to double-sided and multi-layered circuit boards. The manufacturing method is basically quite simple and consists of selectively reducing the thickness of the regular circuits in the semiflex area until they can be easily bent. This is achieved by depth-controlled routing in just the places that are later to be flexed.

This secure process can be guaranteed by GGP's newest routing machines. These machines are controlled by linear motors and include integrated measuring and mapping functions. Thus, they can deliver a constant routing depth and can cut across the complete production panel with excellent and reproducible quality.

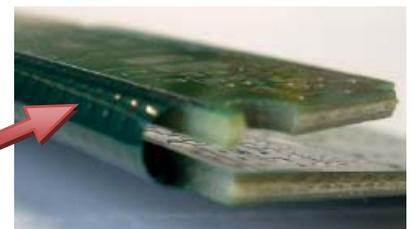
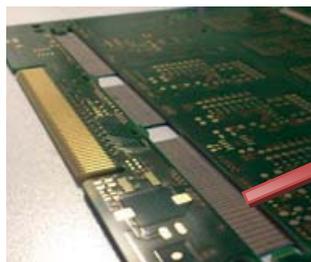
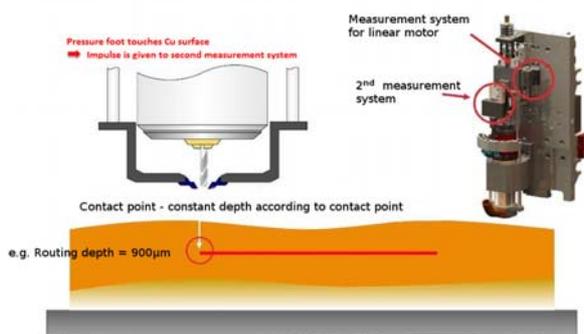
This special process is rounded off by applying a special, flex solder mask specifically qualified for just this process. This way, there is no further need for extra stabilizations (i.e. using a prepreg) for the semiflex areas.

Since the production process of such semi-flex circuits is only moderately more complex than that of rigid circuits, GGP's customers have the opportunity of implementing semi-flexible PCBs at a reasonable price. In contrast to regular semi-flex and rigid circuits, it isn't necessary to employ polyimide foils here. Complex preparation of prepregs and cover foils can thus be omitted. This technology is also very user-friendly; the usual tempering – or annealing – required by polyimide materials before the soldering process can also be omitted here.

With the design, there are only a few but nonetheless essential details to take into consideration. A maximum of 6 flexing cycles is possible; only one pattern layer is possible in the semiflex area. The construction of the layers for multi-layered circuits should always be coordinated together with GGP.

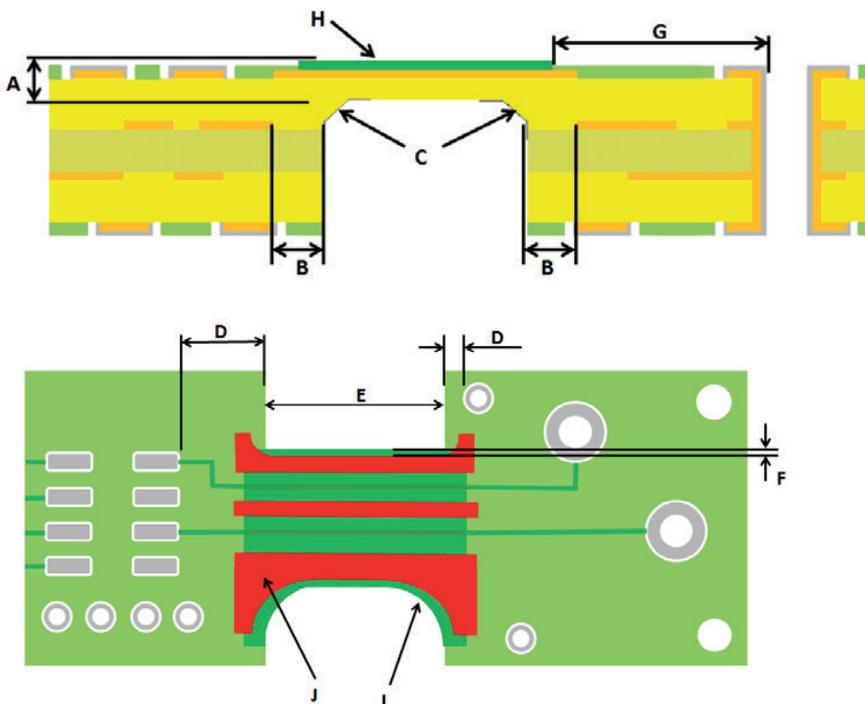
GGP guarantees a uniform flexing radius. Following the flexing up, no changes in the F-4 material can be observed on the circuit boards under the flex solder mask. The use of special routing tools has a positive effect on the transition area from rigid to flexible. Our optimized process control ensures a high standard of quality.

Principle of depth routing



Design Rules for FR4-Semiflex Circuits

symbol	description	note
A	remaining material thickness at semiflex area	0,2mm ±0,05mm inkl.LSL
B	distance copper to transition area from rigid to flexible	>= 0,35mm
C	bevel	0,4mm x 45°
D	distance exposed copper to transition area from rigid to flexible	>= 0,8mm
E	minimal length of semiflex area at	45° 5,0mm 90° 8,5mm 180° 16,0mm
F	distance (conducting track/path/strip conductor) to contour at semiflex area	>= 0,3mm
G	distance edge of bore to semiflex area	>=1,0mm
H	flexible solder mask	
--	smallest permissible bending radius	5mm
--	max. bending cycles	6
--	max. bending angle	180°
--	choice of material	according to requirements
--	surfaces	chemical surfaces only
J	to stabilize edges of semiflex area fill copper free areas with copper	insulation at semiflex area max. 0.25mm between copper layers
I	bending aid (round off ends of semiflex area)	
X	mounting instruction tip	copper allowed only on the outside



Instruction for installation (X):

