

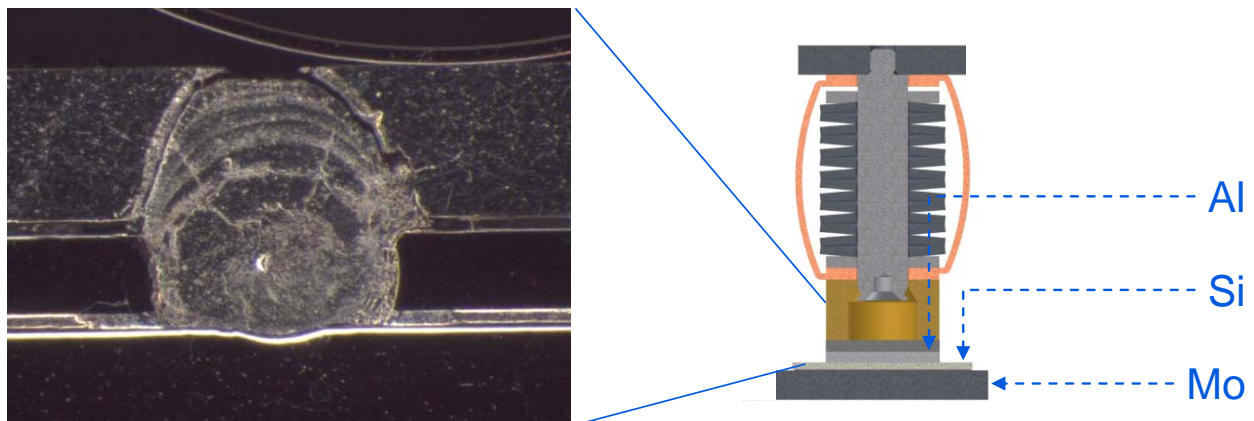
StakPak technology

StakPak is a family of high power IGBT press-pack modules in an advanced modular housing that guarantees uniform chip pressure in multiple-device stacks.

Although the most common package for IGBTs is the isolated module, for applications requiring series connection, press-packs are preferred because of the ease with which they can be connected electrically and mechanically in series. Unlike standard IGBT modules, StakPak modules fail into a stable short circuit failure mode (SCFM). StakPaks thus are ideally suited for applications with series connections *requiring* redundancy; in such applications, additional devices are inserted in the series string so that a device's failure will not interrupt converter operation. The failed device will continue to conduct current for a time period greater than the planned service interval of the equipment. This period of time, during which load current must flow in the failed device without external degradation of the housing or internal degradation of the electrical contact, is a function of the load-current time-dependence. ABB offers SCFM ratings for users requiring this feature and who are able to specify the load current waveforms and profiles.

Since IGBTs feature multiple parallel chips, there is a challenge - with conventional press-packs - in assuring uniform pressure on all chips. ABB has solved this problem with a patented spring technology, where the mounting force is not directly transferred to the sensitive IGBT emitter area, but decoupled with the spring of the press pin. Thus each chip gets its mounting force from an individual spring. The clamping force for each individual semiconductor is defined by the travel distance of the spring (defined by the frame height) and the spring constant. Surplus mounting force will be taken by the rugged frame. This makes the module design less dependent on material thickness variations of the used material layers. Additionally introduced force inhomogeneity from outside, e.g. in case of large stacks, are decoupled from the chip.

A further important function of the press pin is to ensure a reliable electrical contact and in case of device failure a stable short-circuit. In case of a chip failure the specifically selected materials and the design of the press-pins allows the pin and chip to alloy together and for a low ohmic path between collector and emitter. Since after a failure the whole current from up to 72 pins is flowing in one pin, the lifetime of a press-pin in short circuit failure mode (SCFM) is limited. Thus the design of the module must allow current transition from one pin to another once the first pin is at its end of life.



Left: cross section through an alloy of the press-pin with the silicon chip after a failure. Right: principal design of a press-pin

The present line-up of ABB StakPak module consists of two voltage classes 2500 V and 4500 V and a current range between 1000 and 2000 A.

Target Applications are FACTS, HVDC and heavy duty industrial drives.

