

Product Brief

PressFIT

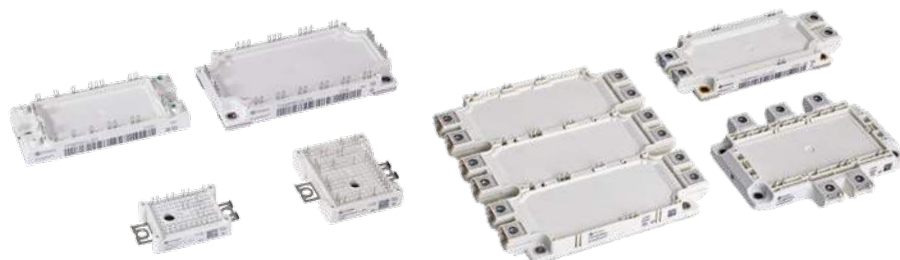
Our established, reliable mounting technology

Infineon's established PressFIT technology offers the possibility for reliable, solder-less mounting of power modules, meeting the nowadays demands of lead-free technology. According to the RoHS directive, since 2006 most lead-containing solder alloys have to be replaced by lead-free solders. This results in higher melting point solders and lead-free tin metallization of the PCB, which has significant effects on the mounting process.

PressFIT technology is one time-saving possibility for lead-free solderless mounting of power modules. The low electrical and thermal contact resistance makes the contact suitable for a wide range of currents and applications.

Environmental tests show that vibration loads and climate sequences have no negative influence on the contact resistance. This results from the gas-tight contact and high contact force. The high holding forces of the contact are independent of the PCB hole tolerances. This reduces the effort for mechanical fixing.

The PressFIT process can be separated from soldering and allows module mounting on the soldering and the component side of the PCB. This increases the design flexibility. Additionally, the module mounting process can be separated from the soldering process of the PCB. The high reliability of PressFIT contacts in general promises increased system reliability. This is especially of interest if modules are operating in harsh environments.



Key features

- > PressFIT saves process time
- > Reliable cold welding connection of module pins and PCB
- > Low ohmic resistance
- > Module mounting possible on soldering and component side of PCB
- > Established technology in automotive, communication & industrial applications
- > Decrease of FIT rate

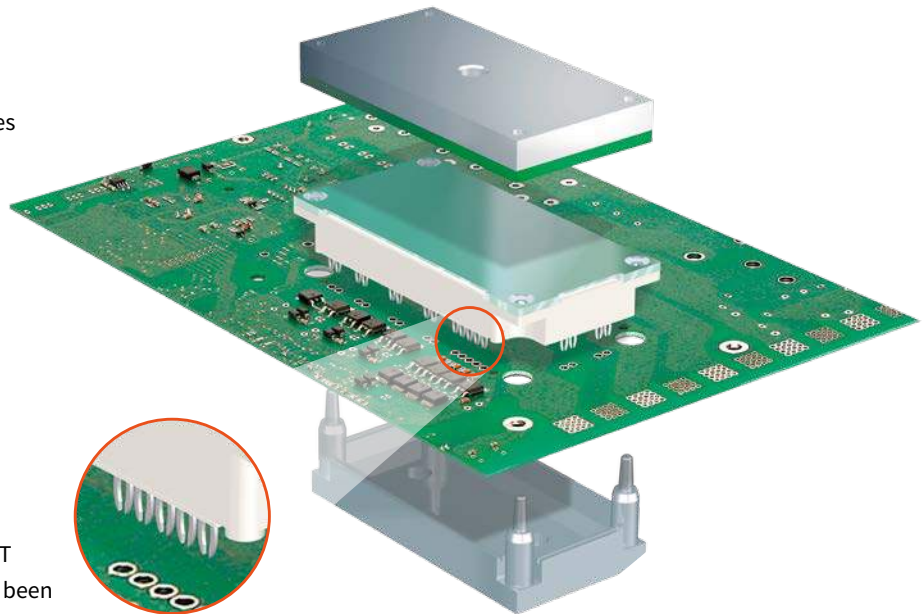
Applications

- > Industrial drives
- > Uninterruptable power supplies
- > Renewable energy systems
- > Air conditioning
- > Welding
- > Inductive heating
- > Medical equipment
- > Commercial and agricultural vehicles (CAV)

PressFIT

Background of PressFIT technology

As mentioned above, the PressFIT technology enables lead-free solderless solderless mounting of power modules. In addition, it offers the possibility of quicker mounting of the assembly, thus saving process time and costs with the resulting potential of higher output capacity. The possibility of mounting the module on either the soldering or the component side of the PCB provides further flexibility to meet the requirements of modern assembly lines.

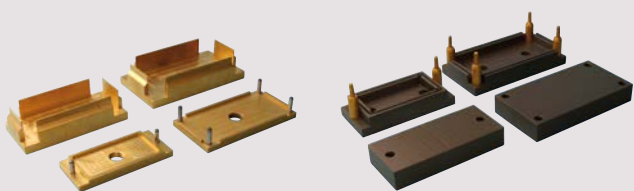


Quality of PressFIT modules

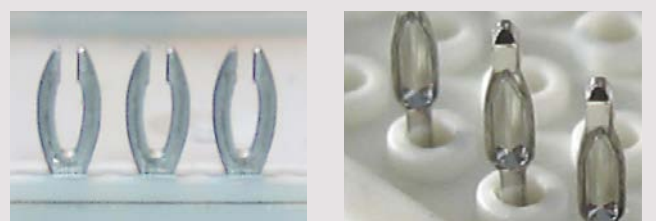
Several tests regarding the application of the PressFIT technology and its reliability in power modules have been performed according to the well-known IEC standards (e.g. IEC 60352-5), but with enhanced conditions. The result of the whole program can be concluded as follows: Not one of the tests caused any measurable contact degradation. The resistance of the connection, which is the leading indicator for the quality of the connection, is very stable during and after several loadings. This means not only that high current can be handled safely over the lifetime, but also the advanced integrated functions with low voltage and current (e.g. current sensing) will be kept absolutely stable beyond the lifetime of the system. Due to this, the PressFIT technology is well suited to power semiconductor modules – especially for future high-reliability requirements.

Overview

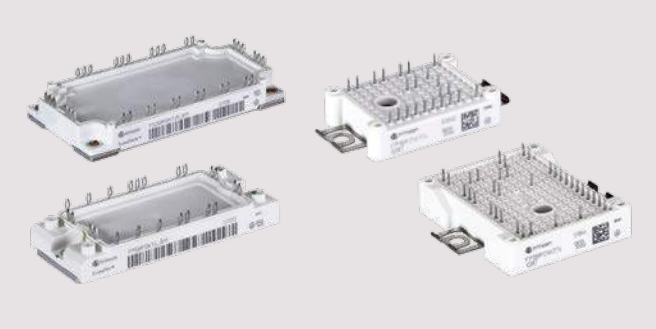
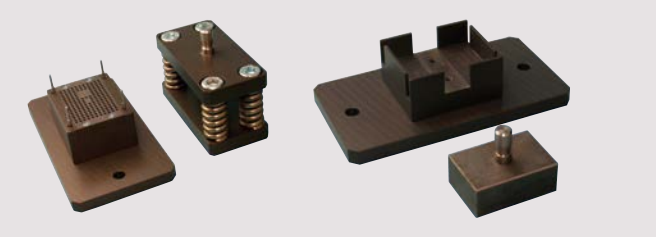
Econo press-in & press-out tools



Modules



Easy press-in & press-out tools



PressFIT

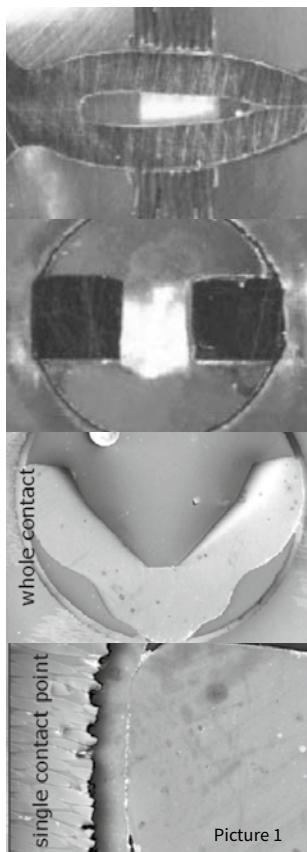
Background of PressFIT technology



| Type of connection | Conductor cross-section in mm ²⁾ | Failure rate λ_{ref} in FIT ¹⁾ | Notes: Standards/Guide |
|-------------------------------------|---|---|---|
| Solder manual machine | | 0.5 0.03 | IPC 610 ²⁾ , class 2 |
| Wire bond for hybrid circuits Au | | 0.1 0.1 | 28 μ m / Wetch - Bond 25 μ m / Ball - Bond |
| Wire-warp | 0.05 to 0.5 | 0.002 | DIN EN 60352 - 1 / IEC 60352 - 1 CORR1 |
| Crimp manual, machine | 0.05 to 300 | 0.25 | DIN EN 60352 - 2 / IEC 60352 - 2A 1+2 |
| Termi-point | 0.1 to 0.5 | 0.02 | DIN 41611-4 |
| Press in | 0.3 to 2 | 0.005 | IEC 60352 - 5 |
| Insulation displacement | 0.05 to 1 | 0.25 | IEC 60352 - 3. IEC 60352 - 4 |
| Screw | 0.5 to 16 | 0.5 | DIN EN 60999 - 1 |
| Clamp (elastic force) | 0.5 to 16 | 0.5 | DIN EN 60999 - 1 |

¹⁾ 1 FIT equals one failure in 10⁹ component hours

²⁾ Acceptability of Printed Board Assemblies



Usually if two contact faces are assembled, there are only a few spots which are really connected (metal to metal) and which carry the current – this is also true for polished surfaces. The minimum radius of such a microscopic metal-metal contact is typically 10 μ m. In force-fitting technologies like PressFIT, there is always a necessary plastic deformation on these truly effective contact points within the contact zone. The contact radius increases due to the high contact pressure that occurs since the macroscopic contact force concentrates on a small microscopic contact area. That means the two faces will be merged.

Thus, the effective contact zone will be increased and – most importantly – a gas-tight contact zone is generated, which is very robust against corrosive environments. The connection principle is the well-known cold welding effect. Here, free electrons are generated from the plastic deformation of both contact faces. The metal-bond electron cloud links the free electrons and connects them again with the same mechanism as in the basic metal. The bonding force is indeed lower than in the prior grid, but is increasing within the first hours of the connection due to recrystallization effects. Cold welding is not suitable for detachable contacts (e.g. bonding of relay contacts) but is well suited for permanent contacts, where the requirements regarding reliability are often much higher.

Picture 1:

SEM micrograph from a cross section of well-merged surfaces in a force-fitting connection

PressFIT Portfolio

From 10 A to 600 A



| I _c [A] | 6-pack modules | | | PIM modules | |
|--------------------|-------------------|------------------|------------------|------------------|-----------------|
| | 650 V | 1200 V | 1700 V | 650 V | 1200 V |
| 500 | | | FS500R17OE4D* | | |
| 450 | | FS450R12OE4 | FS450R17OE4 | | |
| 300 | | FS300R12OE4 | FS300R17OE4 | | |
| 225 | | FS225R12OE4 | FS225R17OE4 | | |
| 200 | FS200R07N3E4R_B11 | FS200R12PT4 | | | |
| | FS200R07PE4 | FS200R12KT4R_B11 | | | |
| 150 | FS150R07N3E4_B11 | FS150R12PT4 | FS150R17PE4 | FP150R07N3E4_B11 | |
| | FS150R07PE4 | FS150R12KT4_B11 | FS150R17N3E4_B11 | | |
| 100 | FS100R07N3E4_B11 | FS100R12PT4 | FS100R17PE4 | | |
| | FS100R07N2E4_B11 | FS100R12KT4G_B11 | | FP100R07N3E4_B11 | FP100R12KT4_B11 |
| | FS100R07PE4 | FS100R12KT4_B11 | FS100R17N3E4_B11 | | |
| 75 | FS75R07N2E4_B11 | FS75R12KT4_B11 | | FP75R07N2E4_B11 | FP75R12KT4_B11 |
| | | FS75R12W2T4_B11 | | | |
| 50 | FS50R07N2E4_B11 | FS50R12KT4_B11 | | FP50R07N2E4_B11 | FP50R12KT4_B11 |
| | FS50R06W1E3_B11 | FS50R12W2T4_B11 | | FP50R06W2E3_B11 | |
| 35 | | FS35R12W1T4_B11 | | | FP35R12KT4_B11 |
| | | FS35R12KT4_B11 | | | FP35R12W2T4_B11 |
| 30 | FS30R06W1E3_B11 | | | FP30R06W1E3_B11 | |
| 25 | | FS25R12W1T4_B11 | | | FP25R12W2T4_B11 |
| | | | | | FP25R12KT4_B11 |
| 20 | FS20R06W1E3_B11 | | | FP20R06W1E3_B11 | |
| 15 | | | | FP15R06W1E3_B11 | FP15R12W1T4_B11 |
| 10 | | | | FP10R06W1E3_B11 | FP10R12W1T4_B11 |

| I _c [A] | Dual modules | | | Bridge rectifier 1600 V | <ul style="list-style-type: none"> ■ EconoPACK™ + / PressFIT ■ EconoDUAL™ 3 PressFIT ■ EconoPACK™ 4 ■ Econo3 PressFIT ■ Econo2 PressFIT ■ Easy2B PressFIT ■ Easy1B PressFIT |
|--------------------|-----------------|------------------|-----------------|----------------------------|---|
| | 650 V | 1200 V | 1700 V | | |
| 600 | FF600R07ME4_B11 | FF600R12ME4A_B11 | FF600R17ME4_B11 | | |
| | | FF600R12ME4_B11 | | | |
| 500 | | FF600R12ME4C_B11 | | | |
| 450 | FF450R07ME4_B11 | FF450R12ME4_B11 | FF450R17ME4_B11 | | |
| 360 | | | | TDB6HK360N16P | |
| 300 | FF300R07ME4_B11 | FF300R12ME4_B11 | FF300R17ME4_B11 | | |
| 240 | | | | TDB6HK240N16P | |
| 225 | | FF225R12ME4_B11 | FF225R17ME4_B11 | | |
| 180 | | | | DDB6U180N16RR_B11 | * with enhanced diode |
| | | | | DDB6U180N16RRP_B37 | |
| | | | | TDB6HK180N16RR_B11 | |
| 134 | | | | DDB6U134N16RR_B11 | |
| 104 | | | | DDB6U104N16RRP_B37 | |
| 75 | | | | DDB6U75N16W1R_B11 | |

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