MITSUBISHI ELECTRIC
Changes for the Better

SiC MOSFET Joining Technologies and Recommended Metallization Specifications

MITSUBISHI ELECTRIC CORPORATION

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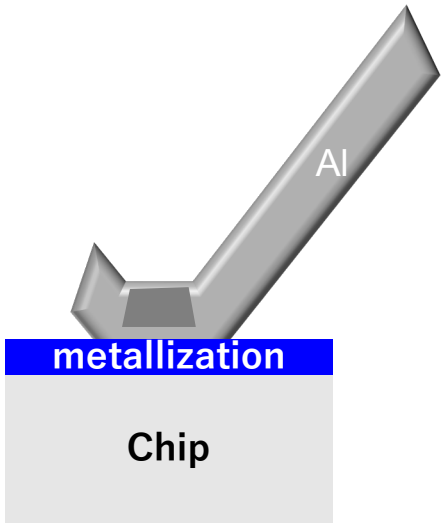
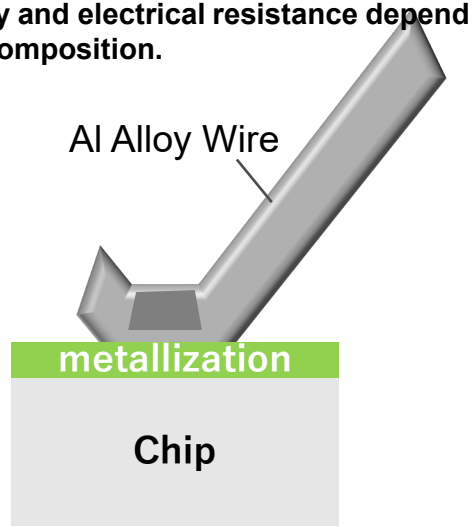
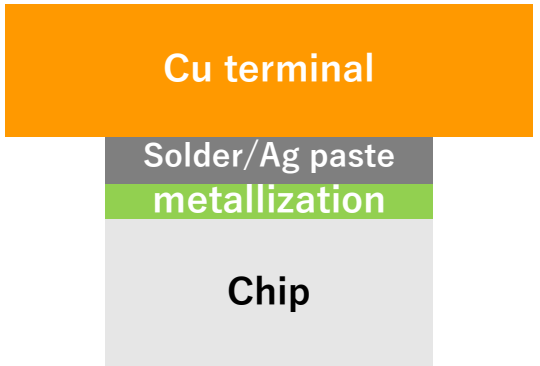
- Various joining technologies are employed in power modules.
- Our mass-production-proven chips offer surface metallization specifications compatible with these joining technologies.
- The table below lists Mitsubishi Electric's recommended electrode specifications corresponding to each joining technology.

Joining Technology	Al wire bonding	Al alloy wire bonding	Direct lead bonding (Solder or Ag Sintering)
Features	・Extensive mass-production experience and well-established manufacturing infrastructure are available in the market, enabling a relatively low-cost solution. 	・Offers higher current capability, improved high-temperature performance, and longer lifetime compared with Al wire bonding. ・Bonding process optimization is more challenging than with Al wire bonding because bondability and electrical resistance depend on the alloy composition. 	• Offers higher current capability, lower electrical resistance, and lower inductance compared with Al alloy wire bonding. • Enables module miniaturization and high power-density packaging. • However, higher equipment costs and a more complex manufacturing process are required. 
Recommendation (Mass-Production Proven)	AlSi	AlSi / Ni / Au	AlSi / Ni / Au

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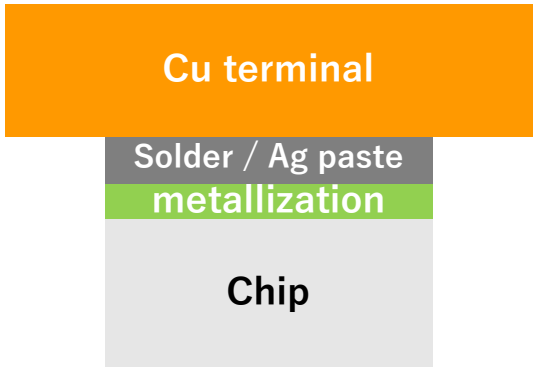
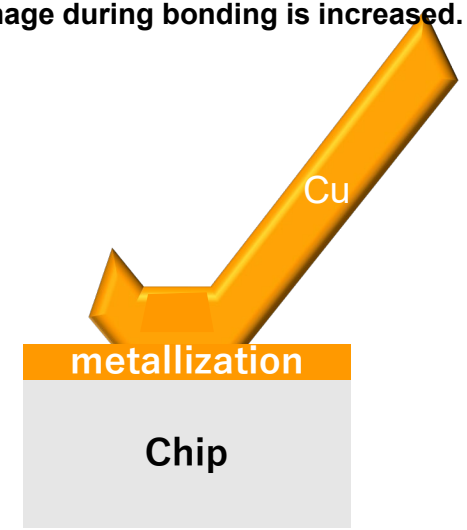
To achieve higher current capability, increased power density, and longer lifetime for power modules, we are developing surface metallization technologies compatible with a variety of joining methods, as summarized in the table below. (Mass production planned for 2029)

Joining Technology	Direct lead bonding (Solder or Ag Sintering)	Cu wire bonding
Features	・Offers higher current capability, lower resistance, and lower inductance than Al alloy wire bonding. ・Contributes to module miniaturization and high power-density packaging. ・Requires higher equipment investment and a more complex manufacturing process. ・The addition of a Pd layer to the chip surface metallization is expected to improve interconnection reliability with Cu leads and wires, while suppressing surface oxidation and corrosion. 	• Offers higher current capability, lower resistance, and lower inductance compared with Al wire bonding. • Enables module miniaturization and high power-density packaging. • Because of its higher hardness than Al, the risk of chip damage during bonding is increased. 
Recommendation (Mass-Production Proven)	**AlSi / Ni / Pd / Au**	**Cu**

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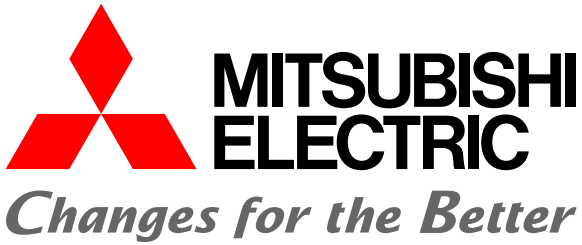
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