



# curamik® SUBSTRATES for Wire Bonding

tech note

Wire bonding is a technique widely used to provide electrical interconnection between semiconductor chips and relative metal pads on substrates or lead frames.

The most commonly used method in the field of power electronics is ultrasonic bonding. During the process, a metal wire is bonded between chips and a metal pad using ultrasonic energy and pressure to break the interface of different layers and form the bonding.

This process can be done with aluminum, copper, copper/aluminum clad and gold wires or ribbons. The low cost and high efficiency enable wire bonding to be the basic technology in the assembly of power modules.

## Key Parameters for reliable Wire Bonding

<b>Substrate</b>	metallization, plating, roughness, copper grain configuration, contamination
<b>Bonding</b>	downward pressure, downward speed, ultrasonic energy
<b>Bonding type</b>	Wedge Bonding (e.g. Al wire on chip and pad)
<b>Bonding order</b>	first on chip, then on pad

### Definition:

- // A process which uses force, time and ultrasonic energy on the bonding surface at room temperature to make two metal materials bonded
- // The process needs a bonding machine, bonding wire and bonding tool

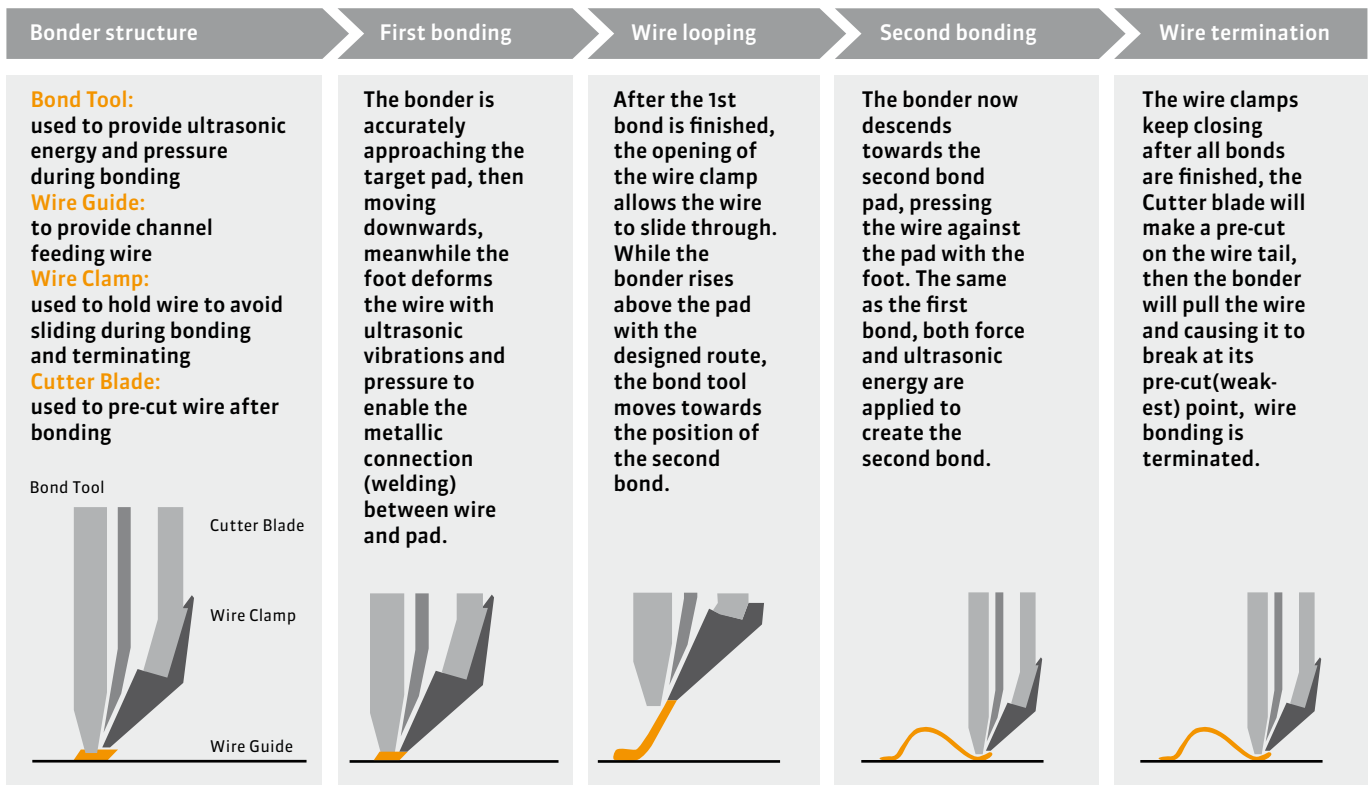
### Key Material Properties:

- // Normally used wire: Al, Cu, Al/Cu clad material, Au
- // Wire Diameter: Thin wire 25~100µm, Heavy wire 100~500µm
- // Normally bonded surface: bare Cu, Ni/Au, Al

### Advantages:

- // Inexpensive and fast process enable the high cost-effective technology
- // Common and flexible way to make complex interconnection, especially for fine pitch design
- // Mature processability and stability after half century development

## Process Flow



## curamik® Solution

- // All curamik products in any ceramic grade ( $Al_2O_3$ , HPS, AlN,  $Si_3N_4$ ) and any material combination, according to design rules, are suitable for wedge wire bonding.
- // Depending on the wire bonding process parameters, bare copper, Ni and flash Au surface with curamik standard roughness is suitable to achieve the best adhesion between heavy Al wire and DBC.