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Nippon Steel Materials Co., Ltd.
Nippon Micrometal Corporation
Nippon Steel Corporation

Nippon Steel Group Announces the Licensing of the New Copper Bonding Wire (EX1) to Tanaka Denshi Kogyo K.K.

Nippon Steel Material Co., Ltd. (NSMAT: President Yamada Kenji), an advanced materials company in the Nippon Steel Group, and Nippon Micrometal Corporation (NMC: President Inoue Toshio), a subsidiary of NSMAT and semiconductor packaging materials manufacturer, signed a patent licensing agreement with Tanaka Denshi Kogyo K.K., a leading bonding wire manufacturer, for a new-type single layer palladium-coated copper bonding wire "EX1" which is used for LSI packaging. This wire features significant reduction of gold greatly reduced precious metal usage and lower manufacturing costs.

For over the past fifty years in the semiconductor packaging industry, gold, an expensive precious metal, has always been used for bonding wire, which is a fine metal wire that connects a silicon integrated circuit to peripheral electrodes such as the leadframe (see the figures below). All previous attempts to substitute copper for gold have failed in LSI applications because of problems involving connecting strength and reliability. The new copper bonding wire "EX1," patents of which have been licensed, was invented by Nippon Steel Corporation (NSC) and developed to mass production level by NMC. "EX1" is the first copper bonding wire in the world that has been successful in practical use , including use in state-of-the-art, ultra-high-density LSI packaging.

"EX1" has solved all the longstanding problems of copper wire in regard to connecting strength and reliability through its unique structure. "EX1," which is 1/5 the price of gold wire, has already delivered the quality performance demanded for even the most advanced LSI packaging. In addition, "EX1" has excellent electrical conductivity that is 20% better than gold wire, which reduces electricity losses.

Since the start of mass-production in 2009, "EX1" has been adopted as replacement for gold wire on a wide scale by the world's leading companies, including Taiwanese companies, and it has rapidly been penetrating the global bonding wire market. "EX1" has attained more than 80% of the new, skyrocketing global copper bonding wire market, and it is now the industry standard.

Nippon Steel Group has applied for a total of more than 80 patents in various countries around the

world concerning the major technologies for the new-type copper bonding wire product group, including “EX1,” and many of them have already been registered. The Group owns almost all the registered patents for currently commercially viable new-type copper bonding wire, and the number of patents it holds is rapidly increasing. This time, several patents related to the single layer palladium-coated “EX1” have been licensed to Tanaka Denshi Kogyo. This is the first time for “EX1” to be licensed to a competing bonding wire manufacturer. The license agreement ensures a smooth supply and application of the new-type copper bonding wire to the global packaging market, and further market growth of EX1-quality copper bonding wire is anticipated. To protect the soundness of the new market created by this innovative new technology originating from Japan, Nippon Steel Group will take decisive action against patent infringement.

NMC has already increased its production capacity of new-type copper bonding wire in Japan and the Philippines from 150,000 to 250,000 kilo meters per month to meet the growing global market demand. NMC is planning to increase production capacity to satisfy the increasing demand, and it is simultaneously strengthening the development of a new product that meets new customer needs. The new product “EX1p: EX1-plus,” which has been developed by further improving on the single layer palladium-coated “EX1,” has improved connection performance and delivers higher speed bonding and more stable quality. The patents for “EX1p” are not included in the current licensing agreement.

NSMAT and NMC will present a more advanced bonding wire for LSI packaging in the near future in collaboration with the Advanced Technology Research Laboratories of NSC.

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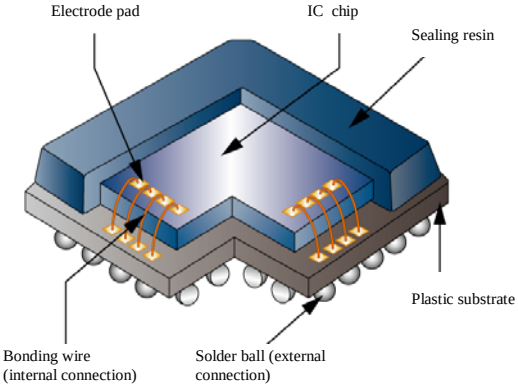
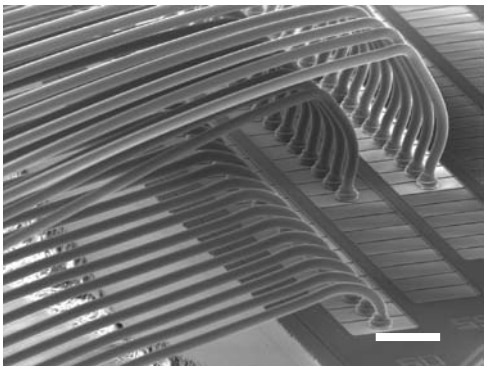
・Structure of a semiconductor package, EX1 palladium-coated copper bonding wire, and an example of packaging





Wire thickness; 18 micorns, pitch: 50 microns, multi-level connection