

Processing & Reliability



1、 Dielectric Material

- 1) The product is constructed from selected ceramic filled PTFE composites, typically the Rogers and Taconic boards, which possess **low insertion loss, high heat resistance, excellent RF characteristics.**
- 2) Each layer of dielectric material has **low thermal coefficient of expansion (CTE)**, with similar expansion rate to each other in x、 y and z axis, avoiding risks of delamination, deforming or cracking under high temperature condition.
- 3) Thermal Coefficient of Expansion (CTE) is **compatible** with most commonly used board substrates, such as FR4,G-10,RF-35, RO4350.
- 4) Compared with LTCC, PTFE processing has superior compatibility in its CTE, dielectric constant. Besides, PTFE has better **heat resistance and shock resistance.**

2、 Prepreg Material

- 1) Using reliable thermosetting prepreg material which features **high heat resistance and mechanical stability** (No gasification or decomposition problems in a second heating circumstance) to ensure bonding strength between circuit layers.
- 2) Or it is made by direct pressing techniques(without prepreg material), leading to lower insertion loss and higher reliability。

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3、 High Heat Resistance

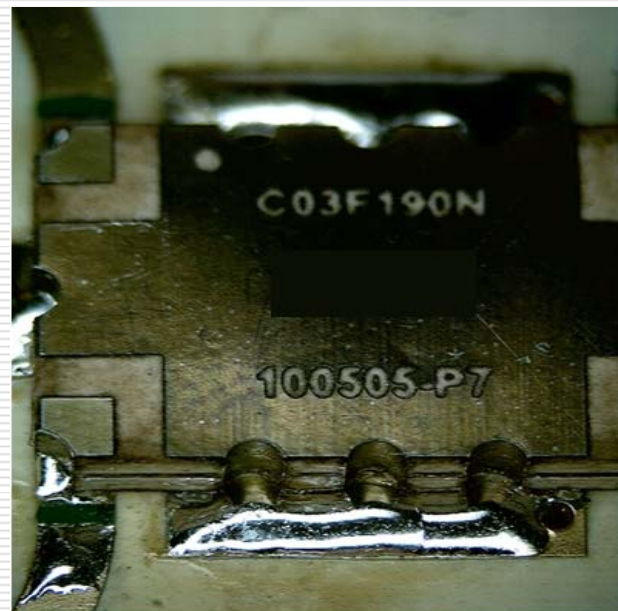
Capable of being soldered and desoldered by hot air gun at 400°C, no problems of deforming or delaminating. All specs including coupling value, insertion loss, amplitude balance, isolation, VSWR remain stable.

Image of Yantel Hybrid coupler after three-time solder and desolder by 400°C hot air gun.

No delaminating is examined even after microsection.



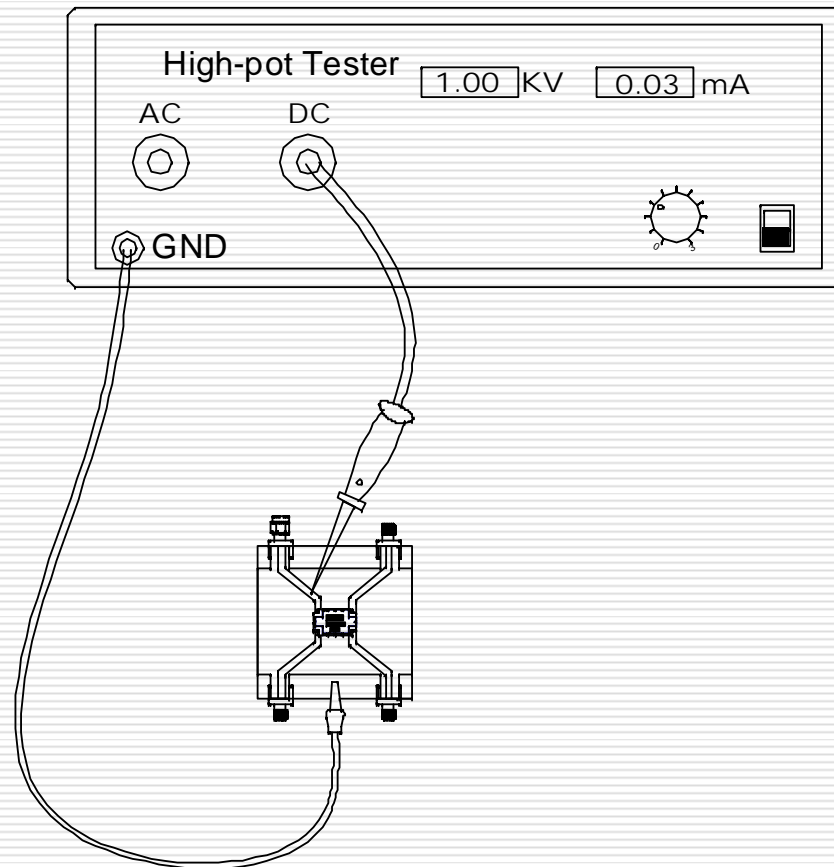
Image of Company A Hybrid coupler after hot air soldering at 400°C. Noticeably the device surface turns darkened and raised, delivering "damaged" RF test results.



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4、 The dielectric materials possess high capability of enduring breakdown voltage up to 1.0kV.



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5、 High Power Handling

- 1) High power RF test is required to each lot at a 0.1% sampling rate. Input a signal 1.2 times of rated power for a duration of 4 hours.
- 2) Perform Accelerated Life Testing(100 °C on the substrate) with rated power input for 100 hours. RF test results are consistent before and after this test. No delaminating or weak bonding is examined after microsection.



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6、 Immersion Gold Exterior Finish

In comparison with immersion tin, immersion gold features better compactness, scratch-proof, anti-oxidization capability, and a longer storage life up to 2 years.



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7、 Quality Management & Assurance

No.	Test Item	Description	Inspection Rate
1	Visual Examination	Inspect the unit appearance under 75X magnification for any damage or burr defects, check logo printing and P/N markings.	100% per lot
2	DC Test	Test resistance respectively in the open and short circuit by multimeter.	100% per lot
3	RF Test	Test the insertion loss ,return loss ,coupling , isolation , phase balance and amplitude balance etc. within the operating frequency range .	100% per lot
4	High Power Test	Input RF signal in 1.2 times of rating power and maintain the input for 4hours	0.1% per lot
5	Thermal Shock	Conduct thermal shock 3 cycles at 288°C, 10 sec each cycle.	0.3% per lot
6	High Heat Resistance	Subject the unit to a three-time solder and desolder process by 400°C hot air gun. Examine the sample for any color change, deforming or pad fall-off.	0.3% per lot

Reliability Comparison (PTFE VS LTCC)

Processing	PTFE	LTCC
	1. As the CTE of PTFE substrate is similar to that of most customer's PCB, there is no risk of "cracking" problem by heating to the hybrid coupler when operating at high power.	1. The fact that CTE of LTCC substrate is incompatible with CTE of most customer's PCB, it would result in coupler cracking by heating when operating at high power. This has been a serious concern to our customers, for example, ZTE, Datang, Comba have refused using LTCC couplers due to the cracking problem.
	2. Excellent solder heat resistance: the product can endure a three-time solder and desolder at 400°C by hot air gun, resulting in no deformation, bulging or darkening problems.	2. Manufacturers of LTCC coupler has expressly indicated in datasheet that "Any couplers which are desoldered from PCB should not be used again".
	3. PTFE substrate features superior shock resistance.	3. LTCC substrate is prone to crack or break due to the ceramic nature. Manufacturers of LTCC coupler has expressly indicated in datasheet that "Products may be cracked or broken by uneven forces from a claw device" "A dropped product is recommended not to be used". E.g., Comba has deterred using LTCC coupler due to the broken coupler when they try to hole the PCB.
	4. Strong pad adhesion : the layers of nickel and gold is well adhered to electrodes through mature PCB processing technology, product is bearable of a pull of 3kg(min).	4. LTCC coupler is notorious for its weak pad adhesion due to the bad adhesion between ceramics and silver paste on electrodes. One of typical example is that when customer is screwing on the PCB, the pad of LTCC coupler would fall off due to PCB deforming.

* Both Yantel 3dB 90° Hybrid Coupler and Directional Coupler use PTFE processing technology.