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Datasheet for the decision of 16 November 2023

Case Number: T 2245/21 - 3.4.02

Application Number: 05018904.2

Publication Number: 1631133

IPC: H05K1/11

Language of the proceedings: EN

Title of invention:
Visually inspectable surface mount device pad

Applicant:
Synergy Microwave Corporation

Headword:

Relevant legal provisions:
EPC Art. 83, 56
RPBA 2020 Art. 13(1), 13(2)

Keyword:
Sufficiency of disclosure - main and auxiliary requests 1 to 5 (no)
Amendment to appeal case - auxiliary requests 6 and 7 - amendment overcomes issues raised (no)
Amendment after summons - auxiliary request 8 - exceptional circumstances (yes)
Inventive step - auxiliary request 8 (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 2245/21 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 16 November 2023

Appellant: (Applicant)	Synergy Microwave Corporation 201 McLean Boulevard Paterson, N.J. 07504 (US)
Representative:	Körfer, Thomas Mitscherlich PartmbB Patent- und Rechtsanwälte Karlstraße 7 80333 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 11 June 2021 refusing European patent application No. 05018904.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	R. Bekkering
Members:	C. Kallinger
	C. Almberg

Summary of Facts and Submissions

I. The appellant appealed against the examining division's decision to refuse the European patent application, and requested that the appealed decision be set aside and that a patent be granted based on the claims of the main request or, in the alternative, one of the auxiliary requests I to IV underlying the decision, or the auxiliary request V filed with the statement of grounds of appeal.

II. On 27 July 2023 the board summoned to oral proceedings.

III. In a communication pursuant to Article 15(1) RPBA 2020 and dated 23 August 2023 the board presented its preliminary assessment on certain aspects of the case and raised new objections under Articles 83 and 84 EPC against all pending requests.

IV. With the letter dated 16 October 2023 the appellant provided further arguments and filed the auxiliary requests VI and VII.

V. On 16 November 2023 oral proceedings took place during which the appellant filed amended claims according to the auxiliary request VIII, and an amended description.

VI. The appellant's final requests were that the appealed decision be set aside and that a patent be granted on the basis of the claims of one of

- the main request subject of the appealed decision and filed with letter dated 11 April 2018,

- the auxiliary requests I and II subject of the appealed decision and filed with letter dated 11 May 2020,
- the auxiliary requests III and IV subject of the appealed decision and filed with letter dated 16 February 2021,
- the auxiliary request V filed with the statement of grounds of appeal,
- the auxiliary requests VI and VII filed with letter dated 16 October 2023 and
- the auxiliary request VIII filed during the oral proceedings on 16 November 2023 at 15:04.

VII. This decision refers to the following documents:

D1 US 5,838,549

D2 JP 2001-15881

D2a Machine translation in English of D2

D3 US 6,496,384 B1

D4 M. E. Goldfarb et al: *"Modeling Via Hole Grounds in Microstrip"*, IEEE MICROWAVE AND GUIDED WAVE LETTERS, vol. 1, no. 6, 1 June 1991, pages 135-137, XP011419942

D5 WO 02/23963 A2

D6 Howard Johnson: *"Via Inductance II"*, High-Speed Digital Design Online Newsletter, vol. 6, Issue 08, 10 September 2003, XP055654081, Retrieved from the Internet: URL:http://www.sigcon.com/Pubs/news/6_08.htm

VIII. Claim 1 of the main request reads as follows:

"1. A printed circuit board (300) including a substrate (302), comprising:
a substantially planar upper surface (306) having an edge;
a pad (304) formed along the edge of the planar upper surface (306), the pad (304) extending over a portion of the planar upper surface (306) and having at least one via (308) extending through the substrate (302) to a pad (316) formed along the edge of the planar lower surface (312),
the via (308) formed at a short distance away from the edge of the substrate (302) within the pads (304,316) providing a circuit connection point and a physical connection point between the substrate (302) and another printed circuit board, wherein an inner diameter of the via (308) is variable depending upon an operating frequency."

IX. Claim 1 of the auxiliary request VIII reads as follows:

"1. A process for making a printed circuit assembly, comprising:
- forming at least one conductive track each on an upper (306) and on a lower surface (312) of a substrate (302),
- forming a pad (304; 316) each along an edge of the planar upper surface (306) and on the lower surface (312) of the substrate (302) and at an end of the at least one conductive track, which serves as a circuit connection point and a physical connection point between the substrate (302) and a main board (208), such that at least two vias (308) are positioned within the pads (304) at a short distance away from the edge

of the substrate (302) in a manner that the vias remain intact along a cutting surface (533), wherein no metal is exposed along the edge of the substrate (302),
- mounting the substrate (302) onto the main board (208), wherein the pad (316) on the lower surface (312) of the substrate (302) is disposed above a solder pad (212) of the main board (208), such that the solder pad (212) is arranged beneath the at least two vias (308) and is viewable through the vias (308), and
- visually inspecting a solder flow beneath the pad (316) on the lower surface (312) of the substrate (302) by looking through at least one of the vias (308)."

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Reasons for the Decision

1. Main request - Sufficiency of disclosure - Article 83 EPC

Independent claim 1 of the main request relates to a printed circuit board and defines, inter alia, that *"an inner diameter of the via (308) is variable depending upon an operating frequency."*

Independent claim 12 defines a corresponding process for making a printed circuit board and defines, inter alia, that *"an inner diameter of the via (308) is varied depending upon an operating frequency"*.

The appellant argued that the necessary calculation principles for determining the inner diameters of the

vias could be derived by the skilled person, on the condition that the specifications of the patent claims would have been known to him or her. During the oral proceedings, the representative argued that it would be well known to the skilled person to choose smaller inner diameters for higher frequencies and the appellant's technical expert stated that it would be routine practice for the skilled person to calculate an inner diameter of the via based on the electrical and geometrical properties of the printed circuit board.

The Board is not convinced by these arguments for the following reasons:

The application as originally filed does not disclose a single exemplary value for an inner diameter and a corresponding operating frequency. Nor does the application disclose any relationship between the two values which would allow the skilled person to select one depending on the other, as claimed in the main request. The only disclosure in this respect is found in paragraph [0014] of the application as filed, from which the skilled person learns only that *"[t]he inner diameter of the full via may vary depending upon the operating frequency"*.

The Board also notes that the appellant did not provide a single concrete example of two corresponding values in the course of the proceedings.

In the absence of a concrete example or a general relationship in the application, the skilled person has to rely on his common general knowledge in order to decide which inner diameter to choose for the operating frequency of a given printed circuit board.

However, the appellant did not provide any evidence of this common general knowledge, e.g. by means of a textbook or monograph. An expert opinion submitted by the appellant which contains general considerations but is not supported by verifiable facts, does not establish the common general knowledge.

In view of the above, the Board is of the opinion that the European patent application does not disclose the invention as defined in independent claims 1 and 12 of the main request in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

2. Auxiliary requests I to IV - Sufficiency of disclosure - Article 83 EPC

The independent claims of these auxiliary requests also define that *an inner diameter of the via (308) is variable/varied depending upon an operating frequency*.

For the same reasons as set out above for the main request, the Board is of the opinion that the European patent application does not disclose the invention as defined in the respective independent claims of the auxiliary requests I to IV in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

3. Auxiliary request V - Sufficiency of disclosure - Article 83 EPC

Irrespective of the considerations regarding admittance of the auxiliary request V under Article 12 RPBA 2020,

the independent claims 1 and 11 of this request evidently also define that *an inner diameter of the via (308) is variable/varied depending upon an operating frequency.*

Therefore, for the same reasons as set out above for the main request, the Board is of the opinion that the European patent application does not disclose the invention as defined in independent claims 1 and 11 of the auxiliary request V in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

4. Auxiliary request VI and VII - Admittance - Article 13 RPBA 2020

The auxiliary requests VI and VII were filed for the first time with the appellant's letter dated 16 October 2023, i.e. after the notification of the summons to oral proceedings. Their admittance is therefore at the Board's discretion subject to all relevant parts of Article 13 RPBA 2020.

The independent claims of auxiliary requests VI and VII also define that *an inner diameter of the via (308) is variable/varied depending upon an operating frequency.* Since the amendments made are evidently not overcoming the objection under Article 83 EPC, the auxiliary requests VI and VII are not admitted into the appeal proceedings (Article 13(1) RPBA 2020).

5. Auxiliary request VIII

5.1 Admittance

The auxiliary request VIII was submitted for the first time during the oral proceedings before the Board. Its admittance is therefore subject to all relevant parts of Article 13 RPBA 2020.

The filing of this request was in response to new objections under Article 83 and 84 EPC, which the Board had raised for the first time in its communication of 23 August 2023, i.e. less than three months before the oral proceedings. Furthermore, the Board was of the opinion that the amendments prima facie overcame all objections raised against the higher ranking requests, i.e. the objections under Articles 83, 84 and 56 EPC. The Board therefore acknowledges the presence of exceptional circumstances and, consequently, takes this request into account.

5.2 Amendments

The sole claim of the auxiliary request VIII relates to a process for making a printed circuit assembly. It is based on originally filed independent method claim 19. The amendments are based on Figures 2A and 2B in conjunction with Figure 3, Figure 6, Figure 7 and the corresponding passages of the originally filed description, in particular paragraphs [0002], [0010], [0021] and [0038] to [0048].

5.3 Inventive step

5.3.1 Document D2 as closest prior art

Document D2 (see Figure 2) discloses a printed circuit assembly comprising a substrate (1) mounted on a main board (8). Document D2 (see Figures 1 and 2) further discloses a conductive track on an upper (1a) and on a lower surface (1b) of the substrate, a pad (2, 3) along an edge of the planar upper surface and on the lower surface of the substrate and at an end of each conductive track, which serve as a circuit connection point and a physical connection point between the substrate and a main board, such that a via (1e, 5) is positioned within the pads at a short distance away from the edge of the substrate in such a manner that the via is intact along a cutting surface (1c). The pad (3) on the lower surface of the substrate is disposed above a solder pad (9) of the main board such that the solder pad is arranged beneath the via. Document D2 also discloses the use of more than one via (see D2a, paragraph [0018]).

The Board is of the opinion that document D2 implicitly discloses the corresponding process for making the disclosed printed circuit assembly.

5.3.2 Distinguishing features and objective technical problem

Document D2 does not disclose that no metal is exposed along the edge of the substrate, that the solder pad of the main board is viewable through the vias, and that a solder flow beneath the pad on the lower surface of the substrate is visually inspected by looking through at least one of the vias.

The absence of metal along the edge of the substrate prevents solder build-up along the edge and thus improves solder flowing underneath the lower pad. The inspection of the solder flow through the vias allows verifying the quality of the solder connection between the substrate and the main board.

The objective technical problem to be solved can therefore be seen as providing a process for making a printed circuit assembly which allows easier visual inspection and provides better electrical and mechanical connection (see also paragraph [0047] of the originally filed description).

5.3.3 Inventive step

The distinguishing features identified above were not known from any of the cited documents:

Document D1 describes a memory module in which pads (41) are formed only on one side of the substrate (2). There is no disclosure in document D1 regarding the mounting of the substrate on a main board.

Document D3 relates to a circuit board assembly in which a second circuit board (14) is mounted perpendicularly into an aperture (22) in a first circuit board (12). Document D3 does not disclose the mounting of a substrate onto a main board, the absence of metal on the side of the printed circuit board (14), and the visual inspection of the solder by looking through at least one of the vias.

Document D5 is similar to document D2 and discloses (see Figure 2) a printed circuit board (2) with conductive tracks (5), pads (6) along the side of the

board and vias (7). The board is mounted on another board (B). However, unlike the assembly resulting from the claimed process, D5 explicitly shows metal around the edge of the printed circuit board (2). In addition, D5 does not disclose visually inspecting the solder by looking through at least one of the vias.

Documents D4 and D6 relate to the characteristics of vias and do not contain any disclosure relating to the quality or inspection of soldered connections in printed circuit board assemblies.

In addition, the Board is of the opinion that the distinguishing features are not part of the skilled person's common general knowledge.

In conclusion, the Board is of the opinion that the skilled person, starting from D2 as closest prior art and in combination with any of the other cited documents or the common general knowledge, would not have arrived at the claimed invention.

Therefore, the subject-matter of claim 1 involves an inventive step.

5.4 Description

The description has been adapted to the amended claim.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent based on the following documents:

Claim
1 according to auxiliary request VIII filed at oral proceedings before the Board on 16 November 2023 at 15:04.

Description, pages
1 to 13 filed at oral proceedings before the Board on 16 November 2023 at 15:04.

Drawings, sheets
1/4 to 4/4 as originally filed.

The Registrar: The Chair:

L. Gabor R. Bekkering

Decision electronically authenticated