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**D E C I S I O N**  
**of 6 April 2006**

**Case Number:** T 0305/04 - 3.5.02

**Application Number:** 02003055.7

**Publication Number:** 1233514

**IPC:** H03K 17/06

**Language of the proceedings:** EN

**Title of invention:**

Control circuit for a semiconductor switch

**Applicant:**

AUTONETWORKS TECHNOLOGIES, LTD., et al

**Opponent:**

-

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 54

**Keyword:**

"Admissibility of late-filed claim - yes"

"Novelty - no"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0305/04 - 3.5.02

**D E C I S I O N**  
of the Technical Board of Appeal 3.5.02  
of 6 April 2006

**Appellants:**

AUTONETWORKS TECHNOLOGIES, LTD.  
7-10, Kikuzum 1-chome  
Minami-ku  
Nagoya-shi  
Aichi (JP)

Sumitomo Wiring Systems, Ltd.  
1-14, Nishisuehiro-cho  
Yokkaichi-shi  
Mie (JP)

Sumitomo Electric Industries, Ltd.  
5-33, Kitahama 4-chome  
Chuo-ku, Osaka-shi  
Osaka (JP)

**Representative:**

Winter, Brandl, FURNISS, Hübner Röss, Kaiser  
Polte Partnerschaft Patent- und  
Rechtsanwaltskanzlei  
Alois-Steinecker-Strasse 22  
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**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office posted 23 September 2003  
refusing European application No. 02003055.7  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** W. J. L. Wheeler

**Members:** M. Rognoni  
E. Lachacinski

## Summary of Facts and Submissions

I. The appellants (applicants) appealed against the decision of the examining division refusing the European application No. 02 003 055.7 because of lack of novelty of the subject-matter of claim 1 with respect to the following prior art document:

D1: DE-A- 195 15 417.

II. In the contested decision, the examining division further referred to the following document:

D3: US-A- 5 352 932.

III. In a communication dated 25 October 2005 accompanying the summons to attend oral proceedings, the Board expressed its preliminary view that the subject-matter of claim 1 lacked novelty with respect not only to document D1 but also to document D3, and drew the appellants' attention to a claim feature which appeared to constitute added subject-matter under Article 123(2) EPC. Furthermore, the Board informed the appellants that any comments, amended documents or requests should be at the Board's disposal at least one month before the date of the oral proceedings.

IV. In the oral proceedings held before the Board on 6 April 2006, the appellants, who had not made any written submissions in reply to the Board's communication, requested permission to replace claim 1 with a new independent claim. After deliberation, the Board decided to admit the late-filed claim 1 into the appeal proceedings.

V. The appellants requested that the decision under appeal be set aside and that a patent be granted on the basis of:

**Claims:** 1 as filed in the oral proceedings on  
6 April 2006,  
2 to 13 filed with a letter dated  
2 April 2003,

**Description:** pages 1, 2 and 5a filed with a letter  
dated 12 August 2003,  
pages 3 to 52 as originally filed,

**Drawings:** Figures 1 to 9 of the published  
application.

VI. Claim 1 of the appellants' request reads as follows:

"A semiconductor circuit component (10) capable of being driven when an externally provided switch unit (SW) is turned on by closing contacts of said switch unit in order to supply a power supply voltage (+B) to said semiconductor circuit component (10),  
said semiconductor circuit component comprising:  
a load-control semiconductor switching device (12) having a control terminal (G), a Source (S) being connected to a load (L) and a Drain (D) being connected to said power supply voltage (+B);  
a control signal supply circuit (14) for supplying a control signal to said control terminal of said load-control semiconductor switching device (12) to drive said load-control semiconductor switching device; and

a drive control circuit (16) for supplying said power supply voltage (+B) to said control signal supply circuit (14) in order to make said control signal supply circuit (14) to output said control signal when the contacts of said switch unit (SW) are closed, said drive control circuit (16) further being adapted to prevent the supply of the power supply voltage to said control signal supply circuit (14) when the contacts of said switch unit (SW) are open or when a leakage resistance between these contacts occurs."

VII. The appellants' arguments can be summarised as follows:

Claim 1 related to a semiconductor circuit component comprising a drive control circuit for supplying a power supply voltage to a control signal supply circuit and thus turning on a power FET when the contacts of an externally provided switch unit were closed. When the switch contacts were open, or when a leakage resistance was present between them, the drive control circuit did not supply the power supply voltage to the control circuit and thus the power FET remained in the non-conductive state. The claimed subject-matter was different from the circuit shown in Figure 1 of D3 essentially because in the latter the combination of circuit elements linking the drive control circuit to the gate of the power FET formed a pumping circuit for pumping charge into the gate of the power FET and thus did not constitute a control signal supply circuit as specified in claim 1. Furthermore, in the prior art circuit, the switch unit was connected to a predetermined input voltage lower than the power supply voltage, whereas claim 1 specified that the circuit component of the present invention required only one

supply voltage. Hence, the subject-matter of claim 1 was new within the meaning of Article 54 EPC.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Admissibility of late-filed claim*
  - 2.1 In a communication issued more than five months before the date of the oral proceedings, the Board had drawn the appellants' attention to the fact that the request submitted with the statement of grounds of appeal did not appear to satisfy the requirement of Article 123(2) EPC and had informed them that any comments or requests should be filed at least one month before the date of the oral proceedings. The appellants, however, did not make any written submissions in reply to the Board's communication, but waited for the oral proceedings to file a new claim 1 replacing the independent claim of the previous request. As a justification for the late filing, the representative of the appellants (three Japanese companies) argued that, due to an illness of the Japanese representative, he had been unable to get timely instructions from his client.
  - 2.2 In view of the explanation for the late filing offered by the appellants and, in particular, considering that the new claim sought to overcome the objection of added subject-matter, it related to the same circuit component specified in the claim referred to in the contested decision and its examination did not cause

any procedural delay, the Board agreed to admit the new claim 1 into the appeal proceedings.

3. *Novelty*

3.1 Figure 1 of document D3 shows a "*trigger circuit for a power FET with a load on the source side*", which is turned on when the contacts of an external switch 12 are closed. In the claim language, D3 thus relates to a semiconductor circuit component capable of being driven when an externally provided switch unit 12 is turned on by closing contacts of said switch unit in order to supply a power supply voltage  $+U_{BB}$  to said semiconductor circuit component. In the circuit diagram of Figure 1 the following circuit blocks recited in claim 1 of the appellants' request can be identified:

- (a) "*a load-control semiconductor switching device*" (power FET) 1 having a control terminal (gate), a source (S) connected to a load 2 and a drain (D) connected to the power supply voltage;
- (b) "*a control signal supply circuit*" comprising a bipolar transistor 8, a diode 9, a Zener diode 15 and resistors 14, 17 and 19 for supplying a control signal to the control terminal of the load-control semiconductor switching device 1 to drive the load-control semiconductor switching device 1;
- (c) "*a drive control circuit*" comprising a FET 5, two resistors 6 and 20 and a Zener diode 7 for supplying the power supply voltage  $+U_{BB}$  to the control signal supply circuit in order to make

said control signal supply circuit output the control signal when the contacts of an externally provided switch unit are closed.

3.2 As explained in D3 (column 3, line 55 to column 4, line 2) and shown in Figure 1, the gate terminal of the FET 5 is connected to a power supply voltage  $+U_{BB}$  via a resistor 6 and to one of the two contacts of a controllable switch unit 12 via a resistor 20. When the controllable switch unit 12 is closed, an input voltage, lower than the supply voltage  $+U_{BB}$ , is applied to the resistor 20. This causes a current to flow from terminal 3 linked to the power supply voltage  $+U_{BB}$  through the resistor 6, the resistor 20 and the controllable switch unit to terminal 13. The resistors 6 and 20 are dimensioned in such a way as to generate a voltage across the resistor 6 (ie between the source and gate terminals of the FET 5) sufficient to make the FET 5 conducting when the switch 12 is closed. The current flowing through the drain-to-source path of the FET 5 through the resistor 14 and into the base terminal of the bipolar transistor 8 turns the transistor 8 on. The current flowing through the diode 9 and the resistors 17 and 19 to the gate terminal of the power FET 1 charges the gate-to-source capacitance of the latter and switches it on. It is implicit that if the controllable switch 12 is not closed (ie it is open or a leakage resistance is present between its two contacts) the voltage applied to the gate of the FET 5 will not switch this transistor on.

Hence, the drive control circuit shown in Figure 1 of D3 is also adapted to prevent the supply of the power supply voltage to the control signal supply circuit



when the contacts of the switch 12 are open or when a leakage resistance between these contacts occurs, as specified in claim 1.

- 3.3 The appellants essentially argued that the semiconductor circuit component according to claim 1 differed from the circuit known from D3 because the combination of the circuit elements deemed to constitute "*a control signal supply circuit*" formed in fact a charge pumping arrangement for pumping a charge into the gate of the power FET 1. A further difference was that the controllable switch 12 shown in Figure 1 of D3 connected the semiconductor circuit component to a voltage lower than the power supply voltage. Thus, the circuit known from D3 effectively required both a power supply voltage and a different input voltage.
- 3.4 As to the first objection raised by the appellants, it is noted that the application as originally filed is silent about the actual layout of the "*control signal supply circuit*", which according to claim 1 has merely the function of "*supplying a control signal to said control terminal of said load-control semiconductor switching device (12) to drive said load-control semiconductor switching device*". The description of the application as filed (see published application, column 10, lines 17 to 19), however, specifies that the "*control signal supply circuit 14 is made of a charging pump circuit for supplying a control signal to a gate G, as a control terminal, of the MOS-FET 12*". Thus, the combination of circuit elements identified as "*a control signal supply circuit*" in the embodiment of Figure 1 of D3 performs the function attributed to the corresponding circuit of the present invention.

As to the appellants' second objection concerning a particular input voltage required by the prior art circuit, it is noted that claim 1 does not specify any voltage to be applied to one of the contacts of the switch unit. In fact, the switch need not provide a further link between the power supply and the semiconductor circuit component, as shown in Figure 1 of the application, or a further connection to ground, as shown of Figure 4. According to the teaching of the present application, the FET of the "*drive control circuit*" has to be turned on only when the contacts of the switch SW are closed so as to make the power FET 12 conductive. In other words, when the switch unit is closed, the voltage across the S and G terminals of the FET of the drive control unit should be sufficient to make this transistor conductive. In the embodiment of Figure 4, this condition can be met by any current flowing from the power supply terminal 26 to the terminal 28, and thus by any voltage applied to terminal 28 lower than the power supply voltage, provided that the resistors 162 and 163 are selected accordingly.

- 3.5 In the result, the Board considers that document D3 discloses a semiconductor circuit component falling within the terms of claim 1 of the appellants' only request. The subject-matter of this claim is thus not new within the meaning of Article 54 EPC.
4. As the appellants' only request does not provide a basis for an allowable claim, the application has to be refused.

**Order**

**For the above reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

U. Bultmann

W. J. L. Wheeler