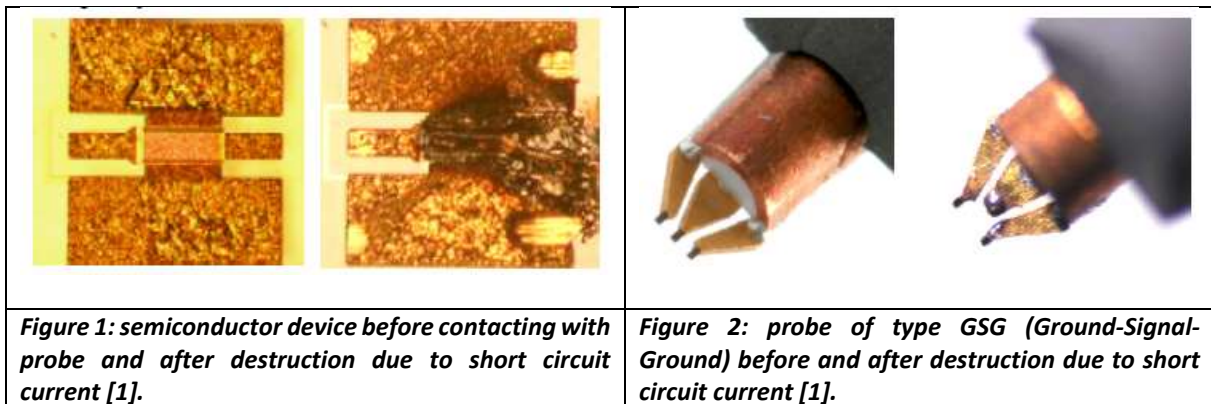


New eFuse device for protection of probes up to 30A short circuit current

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During on-wafer testing of high power semiconductor devices slight mechanical deviation of the probe or unreliable contacting may result in destruction of the device under test and the expensive probe due to high short circuit current.



In production test equipment, automated test setups and daily experiments with sensitive devices and boards the generation of short circuit due to mishandling may lead to high commercial damage. High quality probes for DC and RF testing are frequently used also for the development of boards with chip on board technology or packaged devices. Once semiconductor devices are soldered in, the removal of the device for test represents a high risk as removal process may lead to additional damage due to thermal stress. This yields the risk of misinterpretation of the test result. Implementing simple 0Ω -jumpers and grounded coplanar micro strip line in the design enables the use of probes for contacting the device without additional stress. The 50Ω probe connected to the 50Ω test instrument represents a matched termination. An example for such a measurement is shown in Figure 3. The gain of an amplifier mounted on the test board is measured using two probes and a network analyzer. Bias current is applied using a bias tee. The new eFuse for protection of the probe is placed on the network analyzer. The DC voltage from the DC source is applied to the input and the probe bias is connected to the output of the eFuse.



Figure 3: the new eFuse 3-080-30 together with the MAPS probe station [2] for boards

The maximum allowable DC current is configured in the eFuse device. If this current limit is exceeded during operation the eFuse switches off the current within approximately 300ns. Due to this short shut down time the total electrical energy during the short circuit incident is low enough to avoid damage of the probe and the device under test in many cases. In switch off state the eFuse represents an open loop and no noteworthy energy is consumed in the eFuse. For easy integration in automated test setup the eFuse is equipped with a RS232 interface. Beside control also actual DC current and state of operation can be retrieved.



Figure 4: the new eFuse 3-080-30 for 0-80V DC voltage and 0-30A DC current

All commercially available eFuse devices together with the new 3-080-30 are listed in Table 1. As 10A DC current was not sufficient for various applications the manufacturer AGIL-Elektronik [3] decided to enlarge its portfolio with a device for 30A. With the maximum DC voltage of 80V a DC power of 2400Watt results for protection against short circuit. This represents a remarkable high power for such a compact device.

Part number	Maximum DC voltage	Maximum DC current	Typical shut down time	Dimensions (width-length-height)
eFuse 2-100-10	100V	10A	<300ns	23cm-20cm-8cm
eFuse 2-200-10	200V	10A	<300ns	23cm-20cm-8cm
eFuse 3-080-30	80V	30A	<300ns	29cm-26cm-8cm

Table 1: commercially available eFuse devices

Beside application in research and development it is possible to use the eFuse also as auxiliary device for protection of power supplies which shut down time is not fast enough. For any older equipment which can cause excess current due to ageing or defect the eFuse constitutes an easy way securing their daily operation.

Literature

[1] M. I. Khalil, A. Liero, A. von Müller and T. Hoffmann, "Current Switch-Off Solution to Protect RF Power Transistors during Measurements", *Microwave Journal*, Vol. 50, Issue 7, pp. 102-106, 2007.

[2] MAPS Probe Station: commercially available probe station building blocks; bsw TestSystems & Consulting AG, Waldenbucherstr. 42, D-71065 Sindelfingen, www.bsw-ag.com

[3] AGIL-Elektronik GmbH; Wittestr. 49, D-13509 Berlin, www.agil-elektronik.de