



# BumbleBee®

High Voltage Differential Probe

Ord.-No: 880-102-501

## Features:

- 2000 V rms Measurement Category I, 6000 V transient Overvoltage
- 1000 V CAT III
- 400 MHz Bandwidth
- < 1 % Deviation within Specified Operating Temperatures (0 °C to +50 °C)
- High CMRR
- 4 Mode Attenuation
- Useable with any 50 Ω Measuring Instrument



BumbleBee® is a 400 MHz, 2 kV Measurement Category I or 1 kV CAT III Differential High-Voltage Probe, that can be used with every instrument having 50 Ω Input Impedance.

The probe is very effective at power device evaluation such as measurements in IGBT circuits used in the design of motor drives, switching power supplies and frequency converters. Especially 1700 V IGBT modules for inverters and converters.

BumbleBee® is also very effective at fast transient measurements with bandwidths of up to 400 MHz. Measurements at GaN and SiC modules as part of new semiconductor techniques profit from that in particular. It provides a 4 Mode Attenuation, which allows higher resolution measurements.

The probe provides overload indicators for each input channel as well as for the output.

That makes it easy to observe, that the differential probe is working in the specified range.

The probe also provides an active offset correction in a range of  $\pm 4$  V, related to the output voltage, with a resolution of 15 Bit.

These and many other functions can be remotely controlled with the free PC-Software "PMK Probe Control". The Software included in the scope of delivery of PMKs PS-02 and PS-03 Power Supplies.

The intuitive graphical user interface makes all interactions with BumbleBee® clear and easy.

## Electrical Specifications <sup>(1)</sup>

Attenuation Ratio (switchable)	50:1	100:1	250:1	500:1
<b>Bandwidth (-3dB)</b>				
Input Voltage 50 V	300 MHz	300 MHz	400 MHz	400 MHz
Input Voltage 500 V	n.a	n.a	300 MHz	300 MHz
Input Voltage 1000 V	n.a	n.a	n.a	300 MHz
<b>Risetime (10 %- 90%)</b>				
Input Voltage 50 V	1.2 ns	1.2 ns	875 ps	875 ps
Input Voltage 500 V	n.a	n.a	1.2 ns	1.2 ns
Input Voltage 1000 V	n.a	n.a	n.a	1.2 ns
Typical Noise (rms) <sup>(2)</sup> (referred to input)	55 mV	55 mV	75 mV	75 mV
Typical Propagation Delay	12 ns			
<b>Max. Input Voltage</b>				
Measurement Category I	2000 V rms 6000 V transiente Overvoltage			
Measurement Category III	1000 V CAT III			
Pollution Degree	2			
Max. Differential Input Voltage (incl. AC peak)	±200 V DC	± 400 V DC	± 1000 V DC	±2000 V DC
Common Mode Voltage	± 2000 V pk (± 1400 V rms)			
DC Gain Accuracy	± 0.7 %	± 0.7 %	± 0.35 %	± 0.35 %
Offset Range <sup>(3)</sup>	± 4 V			
Offset Resolution <sup>(3)</sup>	15 Bit / minimum Step < 125 µV			
Offset Drift <sup>(3)</sup>	150 µV / °C	150 µV / °C	40 µV / °C	40 µV / °C
<b>Input Impedance</b>				
Each Input to Ground	5 MΩ    4 pF			
Differential Input Impedance	10 MΩ    2 pF			
Input Coupling of the Measuring Instrument <sup>(4)</sup>	50 Ω			
Typical CMRR	DC	> 80 dB		
	100 kHz	> 70 dB		
	1 MHz	> 62 dB		
	3.2 MHz	> 50 dB		

(1) Measured at + 23 °C environment connected to PS-02 Power Supply

(2) Broadband Noise, Bandwidth 30 MHz

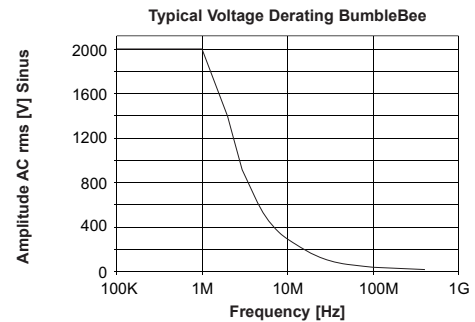
(3) Referred to Output

(4) Must be met to achieve best Performance and avoid Damage to the Probe

## Voltage Derating



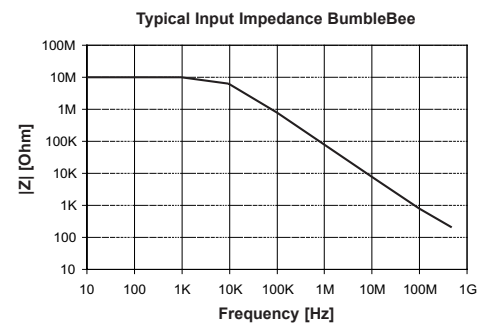
Note that the max. input voltage rating of the probe decreases as the frequency of the applied signal increases.



## Input Impedance



Note that the input impedance of the probe decreases as the frequency of the applied signal increases.



## Mechanical Specifications

Weight (Probe only)	370 g
Cable Length	2 m
Input Leads Length	25 cm
Input Connectors	2 x 4 mm (male)
Output Connector	BNC (male)

## Environmental Specifications

Altitude	<b>operating</b> up to 2000 m	<b>non- operating</b> up to 15000 m
Temperature Range		
Probe Assembly	0 °C to +50 °C	-20 °C to +70 °C
Input Leads only	-40 °C to +85 °C	
Maximum Relative Humidity	80 % RH for temperatures of up to +31 °C, decreasing linearly to 40 % at +50 °C.	

### Standard Scope of Delivery BumbleBee®

890-880-105	Pair of 2-Footers (black)
890-880-116	4 mm Coupler f-f
M80-102-501	Manual
890-880-115	Pair of Clamps, hook (black & red)
890-880-114	Pair of Clamps, jaws (black & red)
890-880-113	Pair of Clamps, rotating grip jaw (black & red)
890-880-109	Pair of Magnet Connectors 4 mm (black & red)
890-880-103	Pair of Probe Tip Adaptors 4 mm to 0.8 mm (black)
890-880-108	Pair of Alligator Clips, big (black & red)
890-880-111	Pair of Alligator Clips, small (black & red)
890-880-110	Pair of Spade Terminals, narrow (black & red)
890-880-107	Pair of Spade Terminals, wide (black & red)
890-880-106	Pair of Spring Tip Probes 4 mm (black & red)
890-520-900	Power Supply Cable
890-102-501	Probe
890-880-101	Set of 10 Contact Pins 0.64 mm
890-880-102	Set of 4 Spring Tips (fine)

*Note: All BumbleBee® Models need a Power Supply to function. PMK recommends either a PS-02 or PS-03 Power Supply to ensure highest performance of BumbleBee® as well as other PMK active probes. There is no Power Supply included in the standard scope of delivery. See 889-09V-PS2 and 889-09V-PS3 for more information on PMK Power Supplies available at <http://www.pmk.de/en/products/ps02>*



Keyboard Layout - BumbleBee®

Accessories for BumbleBee® HV- Differential Probes



## WEEE/ RoHS Directives



(EC conformity marking)

Your help and efforts are required to protect and keep clean our environment. Therefore return this electronic product at the end of its life either to the Service Department of PMK Mess- und Kommunikationstechnik GmbH or take care of separate WEEE collection and professional WEEE treatment yourself. Do not dispose as unsorted municipal waste.

EC Directives:

WEEE Directive 2002/96/EC	–	Waste Electrical and Electronic Equipment
RoHS Directive 2002/95/EC	–	Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment

## Safety Information

To avoid personal injury and to prevent fire or damage to this product or products connected to it, review and comply with the safety informations stated in the manual before using this product. Be aware that if you use this probe assembly in a manner not specified the protection this product provides may be impaired.

**Only Qualified Personnel should use this Probe Assembly.**

## Manufacturer

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This datasheet supersedes all previously published material. Specifications that are not marked as guaranteed are published as general information to the user. The specifications stated are achieved with a PMK Power Supply and can vary, if BumbleBee® is powered by another source.

The instrument should have warmed up for at least 20 minutes and the environmental conditions must not exceed the specified limits of the probe. We recommend a calibration period of 1 year or less. Note that specifications are subject to change without notice.