accupr✻be *Probing the World of Microelectronics*

PROBE TIPS #18 A Technical Bulletin for Probing Applications

CURRENT CARRYNG CAPACITY OF PROBES

There are many applications that require sensitivity or concern for the ability of the probes to handle current. Pushing the probe to or beyond their limits can significantly shorten their useful life span and in the worst case damage or destroy a very expensive probe card. One of the burning questions (pardon the pun) is what is the maximum current capacity of a probe.

Maximum continuous current for probes

Tip Diameter "D" (Mils)	I_{CONT}=Current (continuous) in Amps Tungsten	BeCu	Palladium
1.00	0.120	0.127	0.134
1.50	0.163	0.171	0.182
2.00	0.200	0.210	0.220
2.50	0.240	0.250	0.260
3.50	0.320	0.330	0.350
5.00	0.450	0.470	0.500
10.00	0.900	0.950	1.010

Formula

$$I_{CONT} = \frac{0.12D^{.75}}{\sqrt{C_x}}$$

$C_{TUNGSTEN} = 1$

$C_{BeCu} = 0.9$

$C_{PALLADIUM} = 0.8$

Some pulsed DC applications such as HFE testing may pass extremely high currents for short periods of time. These bursts may see levels of current that could effectively turn your test application into a micro arc-welder! Probes can handle much more current when the current is delivered in short bursts. In pulsed DC applications the formula for determining maximum pulsed current is as follows:

$$I_{pulsed} = \frac{I_{continuous}}{\sqrt{F}}$$

Where F = fraction of ON time = $\frac{\text{ON TIME}}{\text{ON TIME + OFF TIME}}$

For example, for a 5 mil tip BeCu probe $I_{continuous}$ = .47 Amps
For an ON time of 1 millisecond and off time of 9 millisecond:

$$F = \frac{1}{1+9} = 0.1$$

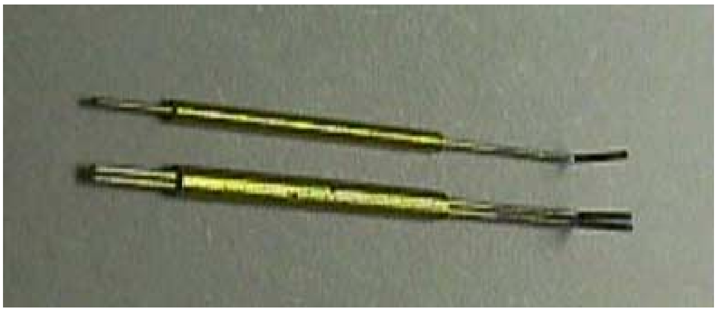
Therefore, the maximum allowable current is:

$$I_{pulsed} = \frac{0.47 \text{ amps}}{\sqrt{.01}} = 1.49 \text{ Amps}$$

This assumes that the probe tips are sanded flat for full surface contact and that the probe tips are clean and free of contamination.

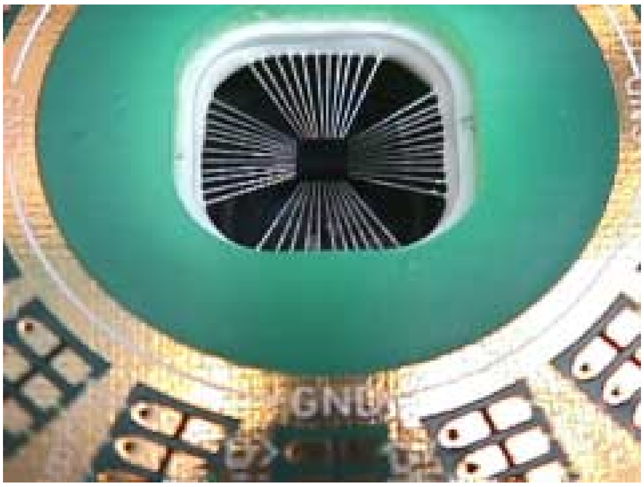
The formulas above suggest that material selection is an important element in the performance of any probe that will be handling higher currents. See Probe Tip PT-12 for more information on probing power devices. In addition, ProbeTip PT-8 reviews the selection criteria for different probe materials and will provide the user with insight relating to contact resistance as a function of overtravel. All of these issues play a role in the selection of the best probe tip for the job.

Accuprobe provides a number of special purpose probes that have been specifically designed for high power applications. Probes can be supplied with dual tips to handle twice the current or provide contact with half the resistance. Replacement probe tips are available to repair or replace worn or burnt probe tips. Alternatively, multiple probe tips can be placed on pads where high current is intended.



Where there is physical space to do so, it is always preferable to use multiple probes to pass high current. The additional surface area of multiple probes will help to dissipate any heat generated from the transmission resistance of the probe. For example, two five mil tips will provide more heat dissipation than a single ten mil diameter tip.

Epoxy Ring applications require careful concern and analysis for heat buildup in the needle. Excess heat rise in probe needles could cause the surrounding epoxy to reach its thermal migration point, soften and corrupt the positional accuracy of the probes.



Please visit the Accuprobe Web Site

www.accuprobe.com

to access all other ProbeTips and other technical data.

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