NASA TECH BRIEF

Folded Stick Module

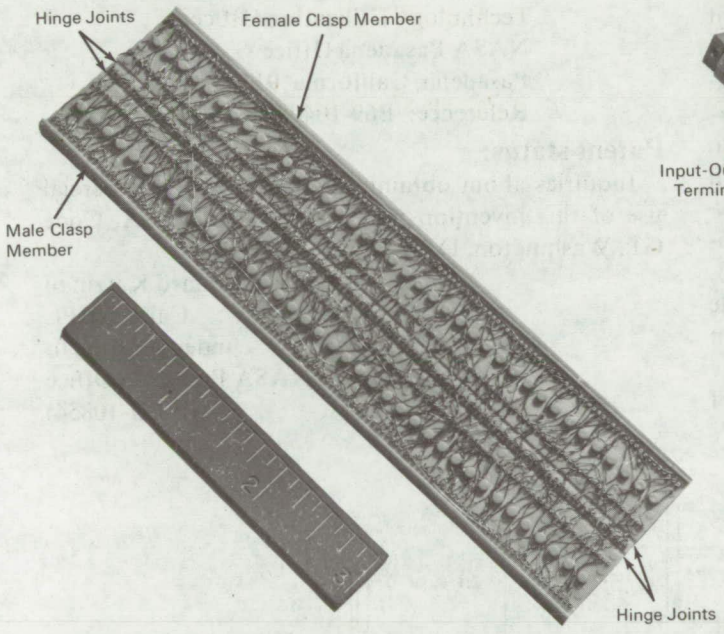

Figure 1. Folded Stick Module—Open Configuration

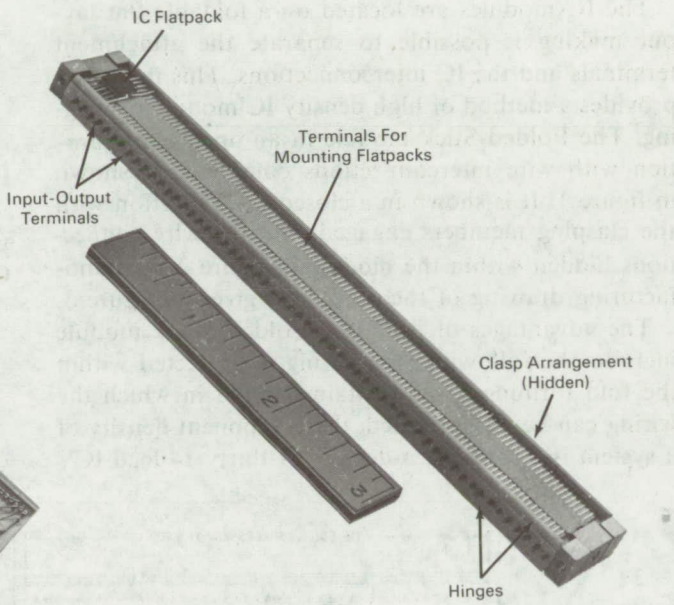

Figure 2. Folded Stick Module—Closed Configuration

The problem:

To develop a high-density integrated circuit (IC) module packaging technique for use in industrial operations that require the fabrication and assembly of compact circuitry configurations, such as those used in the central processing units of computers.

The solution:

IC modules can now be compactly assembled into short-run complex electronic assemblies by mounting them on a "Stick" module. This module is an elongated flat member with terminals on one face to which leads of IC flatpacks can be mounted, and an opposite face to which interconnections can be made between IC flatpacks by running wires from terminal to terminal.

A logical extension of this original Stick module is a similar one of higher density, which consists of two sections molded of polypropylene plastic, known as the "Folded Stick" module. This module provides a method of high-density packaging for industrial operations that require the fabrication and assembly of physically compact circuitry configurations. The Folded Stick module has integral flexible hinges extending longitudinally along the two sections joining them together so that they can be folded upon one

(continued overleaf)

another. The folded-over sections are held in place by a clasping arrangement consisting of integrally molded mating male and female protrusions along opposite edges of the sections. In the unfolded position insulated magnet wire interconnections can be made as on the original Stick module by welding from terminal to terminal on the inner plane of each of the sections; in addition, interconnections can be made between terminals on both sections. When the sections are folded, the interconnections are completely hidden within the module. Flatpack IC modules subsequently soldered by their leads to the web terminals on the outside planes of the sections can be replaced without disturbing the hidden interconnections.

How it's done:

The IC modules are located on a foldable flat layout making it possible to separate the attachment terminals and the IC interconnections. This invention provides a method of high density IC module packaging. The Folded Stick module in an open configuration with wire interconnections completed is shown in figure 1. It is shown in a closed configuration with the clasping members engaged with the wire connections hidden within the module in figure 2. A manufacturing drawing of the module is given in figure 3.

The advantages of using the Folded Stock module include the following: the wiring is protected within the fold forming a self-contained mold in which the wiring can be encapsulated; the component density of a system is improved, a density of thirty 14-lead IC's per cubic inch being possible with relatively little density being lost in the subsystem for packaging; a very simple back panel can be used to combine many of these modules into the electronic system; only a one-sided printed circuit board is needed; and the total number of terminals required for the complete electronic system can be reduced as a result of the number of interconnections that can be made between the two sections, thus improving reliability.

Notes:

1. This invention could be of interest to designers and manufacturers of computer hardware and mobile communication equipment.
2. No additional documentation is available for this Tech Brief.
3. Questions concerning this invention may be directed to:

   Technology Utilization Officer
   NASA Pasadena Office
   Pasadena, California 91103
   Reference: B69-10498

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546

Source: Leonard Katzin of
Caltech/JPL
under contract to
NASA Pasadena Office
(NPO-10854)

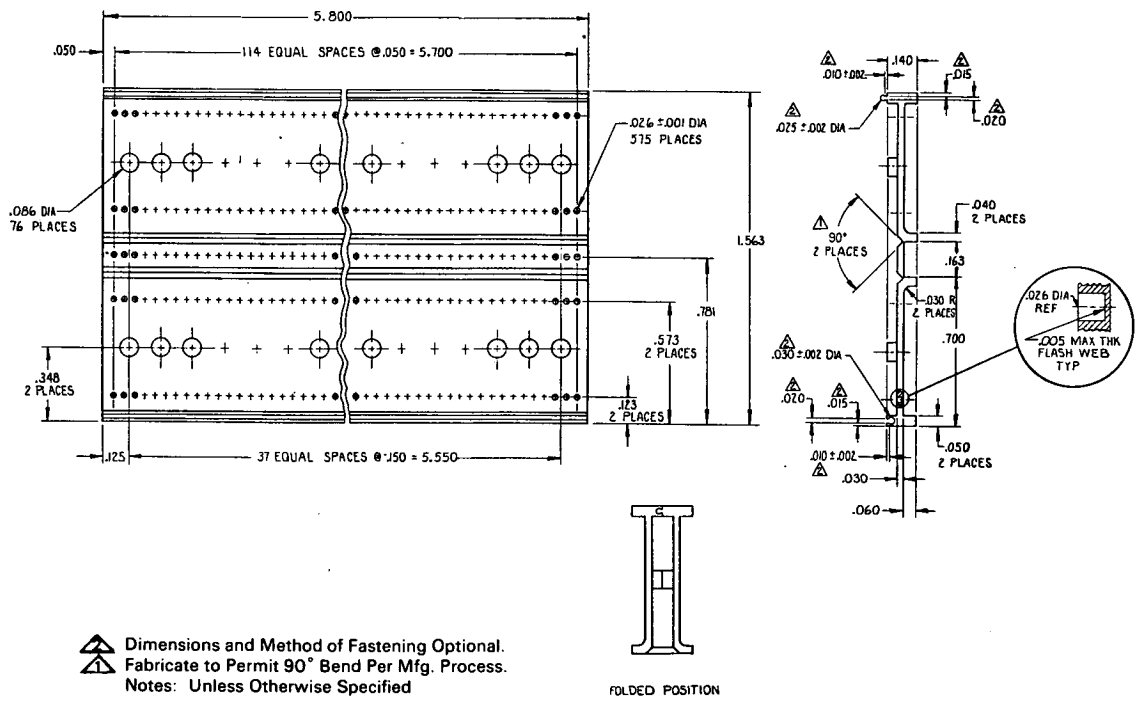

Figure 3. Folded Stick Module — Manufacturing Drawing