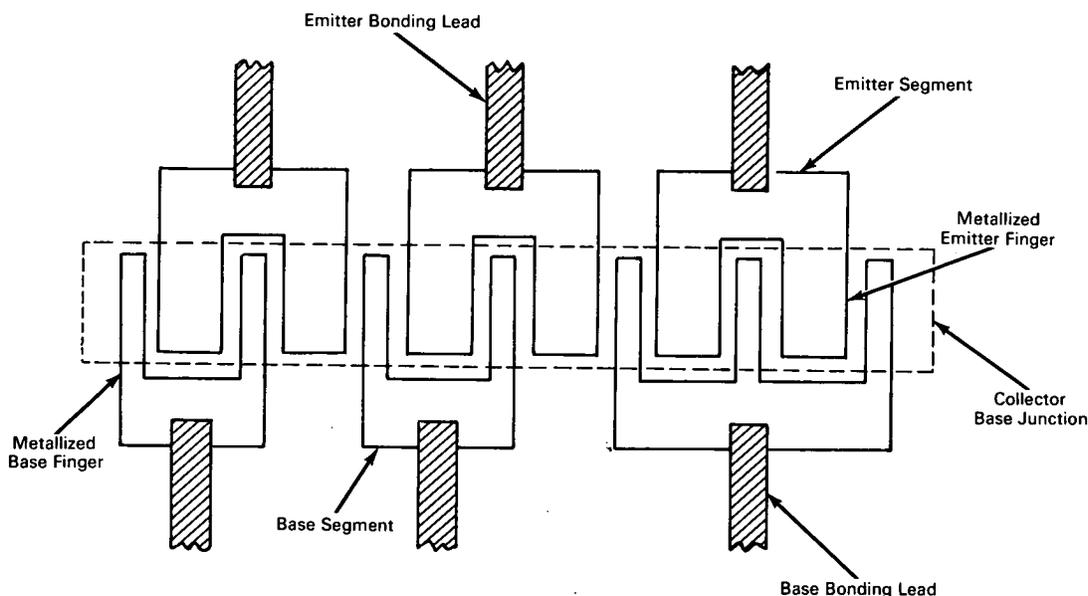


NASA TECH BRIEF



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Increased Junction Lead Inductance Ballasts High-Frequency Transistors



The problem: To evenly distribute the current across the junctions of a high-frequency transistor in order to prevent one section from drawing a destructive amount of current. Resistance balancing of each junction accomplishes this but seriously degrades the gain of the device.

The solution: The transistor bonding stripes are divided into segments and the inherent inductance of the individual leads is used to provide the necessary ballast to inhibit current runaway.

How it's done: The base and emitter bonding stripes are broken up into separate segments or pellets. If one section starts to draw more current, the voltage drop in both the emitter and base bonding leads of that segment, due to the inherent inductance of the bonding wires, will inhibit that segment from draw-

ing further current. For example, the leads of a certain transistor are 40 mils long and 1 mil in diameter. The inductance is 1 nanohenry and the inductive reactance at 430 megacycles is 2.5 ohms. Each segment draws approximately 100 milliamps at high levels. If one segment starts to draw 25 milliamps more than another segment, a 62-millivolt additional voltage drop will occur in the emitter bonding lead alone. This is more than enough potential difference across the emitter-base junction to prevent any further current draw by the segment attempting to hog the current.

Notes:

1. One advantage of this technique is that use is being made of inductance inherently present in the device.
2. Because it lends itself to high-frequency (430 mc),

(continued overleaf)

high-power (20 watt) transistors, this invention should interest manufacturers of components for uhf equipment.

3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland, 20771
Reference: B65-10259

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

Source: George J. Gilbert of
Radio Corporation of America
under contract to
Goddard Space Flight Center
(GSFC-387)