

# NASA TECH BRIEF



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## Two Terminal Current Limiter

This simple and inexpensive device offers current limiting protection for dc electronic circuits, and can be used to replace fuses and circuit breakers directly with great speed, accuracy and reliability.

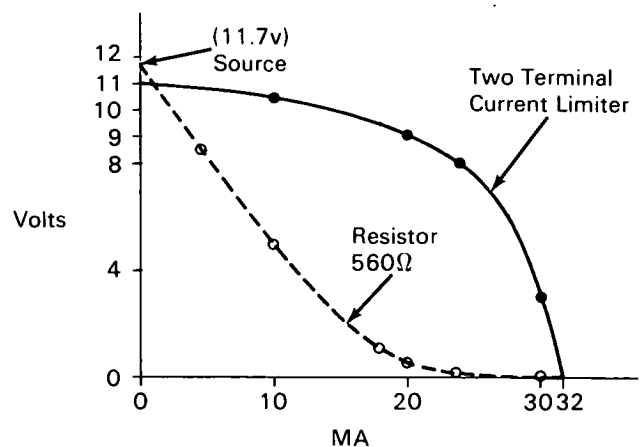
In many phases of electronic development, the power supply source can be overloaded or delicate components can be damaged when excessive currents flow due to accidental shorting, component failure, or circuit changes. Fuses and circuit breakers are commonly used for protection, but these devices are neither fast enough to cope with instantaneous over-currents nor accurate or reliable enough to provide suitable protection for some power sources and some solid state experimental units.

A two terminal current limiter, which could be fabricated in the size of a type 3AG fuse, can be used instead of a fuse to provide sensitive protection for dc power supplies or experimental solid state devices under test and development. The device consists of two transistors and two resistors. The necessary supply voltage for operation is obtained from the power source being protected, with the load functioning as the return to the power source from the device. One of the transistors acts as a series element which allows current, up to a desired maximum, to flow to the load. One resistor provides a suitable bias for the series transistor to permit such current flow. A second sensing resistor interposed between the series transistor and the load, provides bias for the second transistor. Normally this bias is low enough to prevent conduction by the second transistor. The collector of the second transistor is connected to the base of the series transistor to reduce the bias applied to the series transistor. When current in excess of the desired maximum flows through the sensing resistor as a result of a cir-

cuit malfunction or a short across the load, the voltage drop across the sensing resistor rises to a value which is sufficient to bias the second transistor into conduction.

When the second transistor turns on, it reduces the bias of the series transistor to limit the amount of current that can flow through the series transistor so that it cannot exceed the desired maximum. The magnitude of the desired maximum current flow can be varied by changing the value of the sensing resistor.

The figure shows a comparison of the two terminal device and an ordinary limiting resistor used in series with the load as a protective device. As current in the



Comparison of Two Terminal Device and an Ordinary Limiting Resistor

load rises, the voltage available for the load using a limiting resistor drops in accordance with the load current. With the two terminal device, the voltage remains reasonably constant until the current limiting

(continued overleaf)

point is reached, at which the voltage drops sharply. Thus the two terminal device exhibits some of the characteristics of a voltage regulator.

**Note:**

Requests for further information may be directed to:

Technology Utilization Officer  
NASA Pasadena Office  
4800 Oak Grove Drive  
Pasadena, California 91103  
Reference: B70-10232

**Patent status:**

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

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