TO-8 and Surface-Mount Threshold Detectors

Introduction:
The models DTD01904, DTD05026, DTD01960, DTD08052, DTD05045, DTD01999, DAD02006 are a new line of sensitive threshold detectors that provide efficient and accurate RF level measurement at critical system points. They provide precision power level detection and a TTL output throughout the frequency range of 0.01 to 4 GHz. These tiny thin-film detectors feature a threshold adjustment range of -30 to 0 dBm. The flatness is ±1 dB; and hysteresis is 1 dB. The adjustable threshold level can be externally selected with one resistor, or, can be preset for a specific detection value at the factory, output is TTL compatible.

Applications:
These new threshold detectors, designed for commercial and military requirements, are ruggedly constructed, small in size and hermetically-sealed. Typical applications include system built-in test, shown in Figure 1; range switching/overload protection, shown in Figure 2; and RF activity monitoring, shown in Figure 3. They are available in standard TO-8 and 0.5" square surface mount packages. These threshold detectors are two or three-port devices. Port one is the RF input, terminated in a nominal 50Ω. Port two is the logic output port. When RF power into port one exceeds a predetermined threshold level, the output at port two goes from a logic 0 to a logic 1. This output is compatible with standard

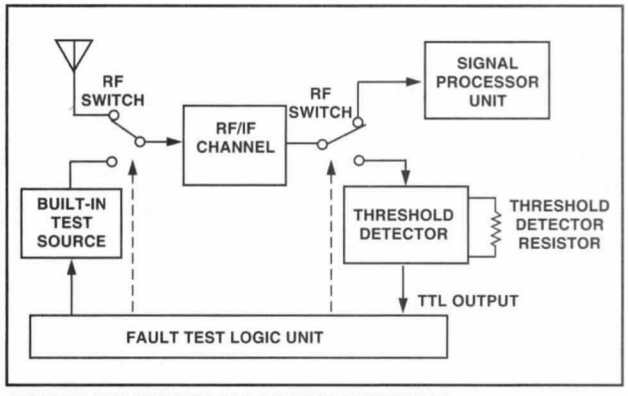

FIGURE 1 THE SYSTEM'S BUILT-IN TEST APPLICATION.

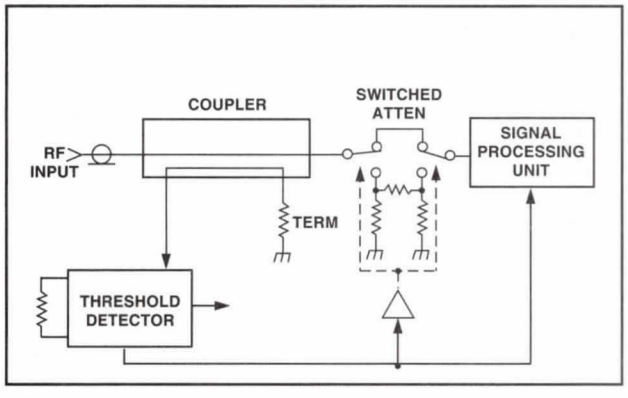

FIGURE 2 THE RANGE SWITCHING/OVERLOAD PROTECTION APPLICATION.

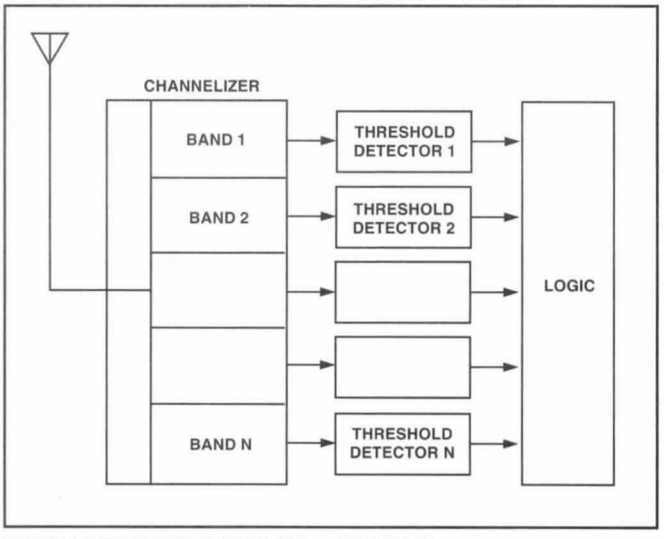

FIGURE 3 THE RF ACTIVITY DETECTOR APPLICATION.

low power Schottky logic. For externally set threshold detectors, port three is the threshold adjust port. The threshold level is determined by resistance at this port, the lower the desired threshold level, the smaller the resistance.

Performance:
The threshold detectors are shown in Figure 4. When an RF signal is connected to the input of the device, it terminates at 50Ω and the RF signal is detected, thereby converting to a DC signal whose level is proportional to the RF power applied to the input. Since the detected signal level is small (<0.5mV @ -30 dBm), it must be amplified to a more usable level. This is accomplished by an op-amp. The gain of the op-amp is controlled by the feedback loop and the external threshold resistor sets this gain. The lower the value of the

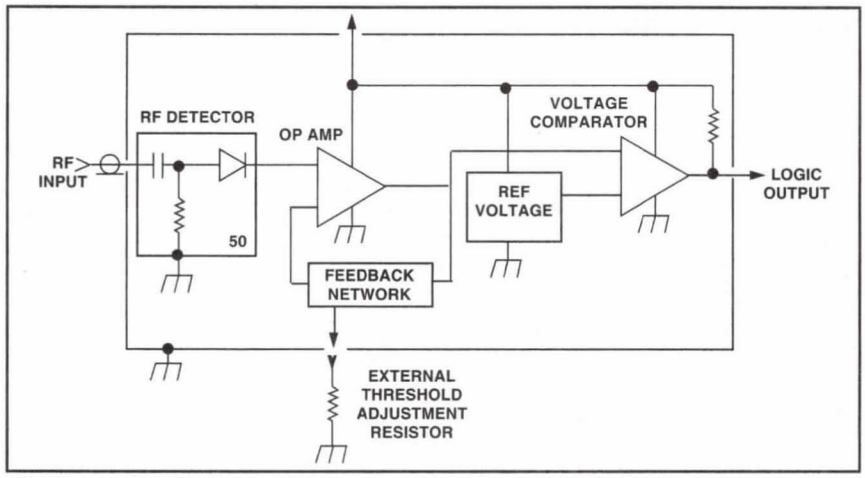

FIGURE 4 A SCHEMATIC DIAGRAM OF THE THRESHOLD DETECTORS.

value of the resistor, the greater the gain. The amplified output from the op-amp is connected to one input of the voltage comparator; the other input of the comparator is connected to a reference voltage. When the output voltage from the op-amp exceeds the reference voltage, the comparator output goes from a logic 0 to a logic 1.

The threshold level is set by inputting an RF signal of the desired level into the unit and adjusting the external resistor until the output changes from a logic 0 to a logic 1. To monitor the signal level in an RF path, a switch is used to divert the signal at the monitoring point to the threshold detector.

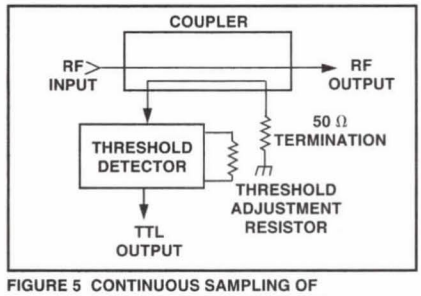

FIGURE 5 CONTINUOUS SAMPLING OF THE THRESHOLD DETECTOR.

Continuous monitoring of the signal level is accomplished by using a directional coupler to divert a portion of the signal to the threshold detector, allowing the remaining signal to continue along the signal processing chain, as shown in Figure 5. A terminated RF threshold detector has many advantages over a detector that taps directly onto the signal line. It is broadband; it allows the threshold detector to be located at some distance from the main signal without affecting the flatness of the response; and it measures the power, not just the voltage on the transmission line, eliminating the uncertainty in power level caused by SWR. By their nature, detectors are non-linear devices that can cause harmonics and intermodulation if connected directly to the RF line. the use of a directional coupler reduces the signal level to the detector, resulting in a reduced spurious generation level. Also, these unwanted signals are further reduced by the directivity of the coupler.

Conclusion:

Threshold detectors are useful in appplications where it is necessary to identify the presence or absence of an RF signal at a specified level. They may be used to identify and/or locate system failures, provide overload protection and/or ranging, and provide transmitter output amplifier protection against high SWR loads. The high sensitivity of these threshold detectors makes them useful in low level signal environments.