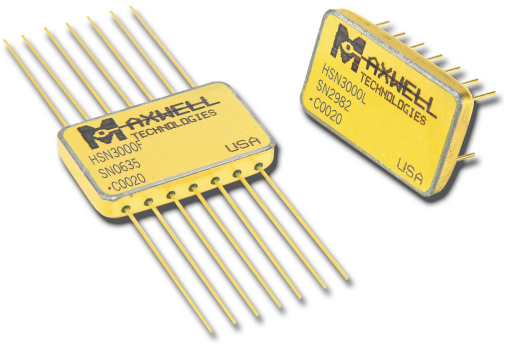
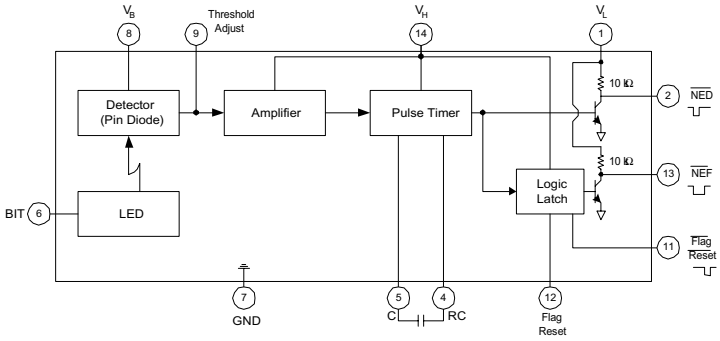
HSN-3000
Nuclear Event Detector





Logic Diagram

FEATURES:

- Detects ionizing radiation pulses
- 100% tested/certified detection threshold level
- Adjustable circumvention period
- Flag remembers event occurred
- 100% testable with built-in test
- Detection threshold adjustability
- Single +5V operation
- Radiation hardness guaranteed
- Compliant to MIL-PRF-38534 Class H[1]
- Flat pack (F) or DIP (L) packages

RADIATION HARDNESS CHARACTERISTICS:

- Dose Rate (operate-through): 1 x 10^{12} rad(Si)/sec
- Total Dose: 1 x 10^{6} rad(Si)
- Neutron Fluence: 5 x 10^{13} n/cm^2
- Approximate Detection Range: 2 x 10^{5} - 2 x 10^{7} rad(Si)/sec
- Maxwell Technologies Specified, Controlled, Tested and Guaranteed

DESCRIPTION:

Maxwell Technologies' HSN-3000 radiation-hardened Hybrid Nuclear Event Detector (NED) senses ionizing radiation pulses generated by a nuclear event, such as the detonation of a nuclear weapon, and rapidly switches its outputs from the normal high state to a low state with a propagation delay time of less than 20ns. The active low Nuclear Event Detection signal ($\overline{\text{NED}}$) is used to initiate a wide variety of circumvention functions, thus preventing upset and burnout of electronic components. The $\overline{\text{NED}}$ output is also used to initiate both hardware and software recovery. The Nuclear Evet Flag signal ($\overline{\text{NEF}}$) remembers the event occurred and is used to distinguish between an actual event and power up. The signal input of either Flag Reset or $\overline{\text{Flag Reset}}$ can be used to reset the $\overline{\text{NEF}}$ output. This high-speed, 14-pin hybrid detector is used in electronic systems as a general-purpose circumvention device to protect memory, stop data processing, and drive power supply switches as well as signal clamps.

The HSN-3000 is guaranteed to operate through three critical environments: ionizing dose rate [10^{12} rad(Si)/s], gamma total dose [10^{6} rad(Si)], and neutron fluence [5 x 10^{13} n/cm^2]. In addition, the device is designed to function throughout the transient neutron pulse. The hybrid's discrete design ensures a controlled response in these radiation environments as well as immunity to latchup. Each HSN-3000's detection level and functionality are tested in an ionizing dose rate environment. A certificate is provided with each serialized hybrid, reporting the radiation test results and guaranteeing its performance. The device is also lot qualified in the total dose and neutron environments to ensure performance.

The detection threshold of the HSN-3000 is adjustable within the range of 2 x 10^{5} rad(Si)/s to 2 x 10^{7} rad(Si)/s. This detection level can be preset by Maxwell or adjusted by the user. Less than a 30% variation in detection threshold can be expected over the entire operating temperature range.

1. Manufactured for Maxwell Technologies by Teledyne Microelectronic Technologies to MIL-PRF-38534, Class H, No RHA

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TABLE 1. PIN DESCRIPTION

PIN NUMBER	PIN FUNCTION
1	Load Voltage, V_L
2	Nuclear Event Detector, $\overline{NED}$
3	No Connection
4	External Capacitor
5	External Capacitor
6	Built In Test, BIT
7	Package Ground and Case
8	PIN Diode Bias, V_B
9	Threshold Adjust
10	No Connection
11	$\overline{\text{Flag Reset}}$
12	Flag Reset
13	Nuclear Event Flag, $\overline{NEF}$
14	Hardened Supply Voltage, V_H

TABLE 2. ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITIONS $-55^{\circ}C \le T_A \le 125^{\circ}C$	MIN	MAX	UNIT	GROUP A SUBGROUP
Hardened Supply Voltage	V_H		4.5	5.5	V	1,2,3
Hardened Supply Current - Standby [1] - Flag Set [2] - Operational [3]	I_H	V_H = 5.5V	 -- -- --	-- 30 60 150	mA	1,2,3
Load Voltage	V_L		--	20	V	1,2,3
Load Current - Standby [1] - Operational [3]	I_L	V_L = 20V	 -- --	 100 4.5	 µA mA	1,2,3
PIN Diode Bias Voltage - Standby [1]	V_B		4.5	20	V	1,2,3
PIN Diode Bias Current - Standby [1]	I_B		--	100	µA	1,2,3
FLAG RESET (Pin 12)	V_{IH} I_{IH} V_{IL} I_{IL} t_{PW}	 V_{IH} = 4.0V V_{IL} = 0.5V V_{IH} = 4.0V	4.0 -- -- -- 250	-- 4.0 0.5 100 --	V mA V µA ns	7,8 1,2,3 7,8 1,2,3 9,10,11

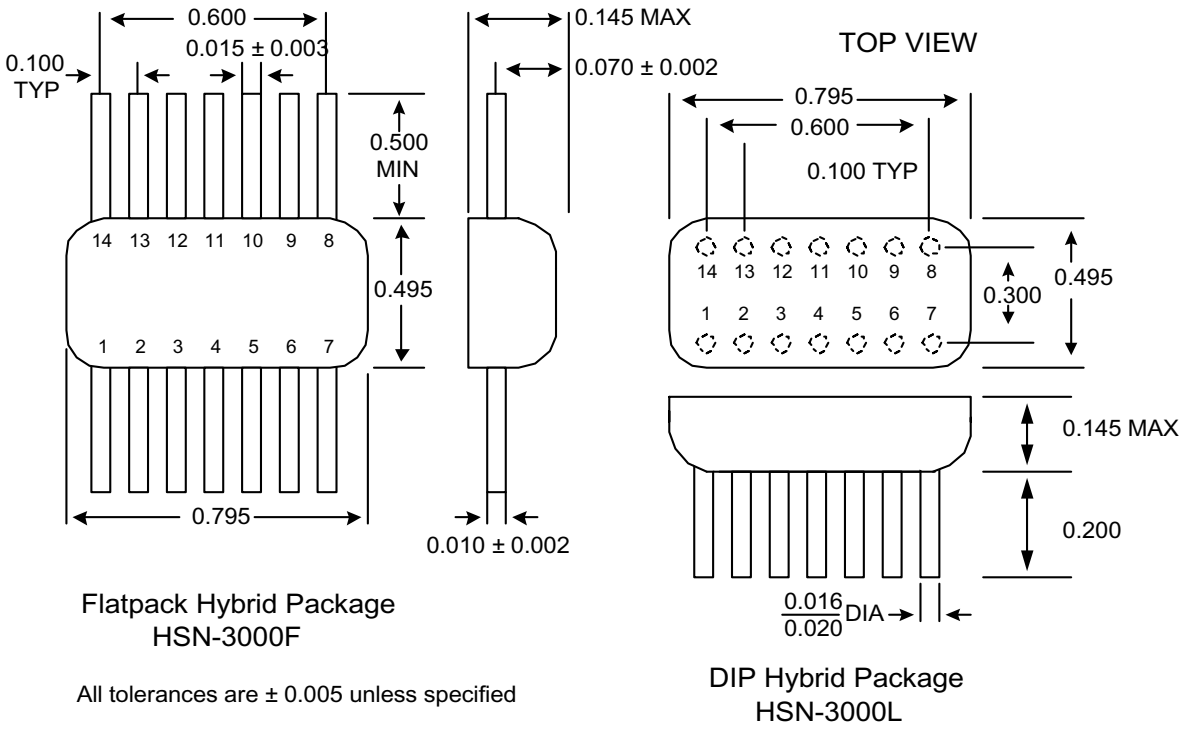
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TABLE 2. ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITIONS $-55^{\circ}C \le T_A \le 125^{\circ}C$	MIN	MAX	UNIT	GROUP A SUBGROUP
$\overline{\text{FLAG RESET}}$ (Pin 11)	V_{IL} I_{IL} t_{PW}	 V_{IL} = 0.5V, V_H = 5.5V V_{IL} = 0.5V	-- -- 250	0.5 -30 --	V mA ns	7,8 1,2,3 9,10,11
Built-In-Test (BIT) [4,5]	V_{IH} I_{IH} V_{IL} I_{IL} t_{PW}	 V_{IH} = 4.0V V_{IL} = 0.5V Pin 9 Open, V_{IH} = 4.0V	4.0 -- -- -- 10	5.5 25 0.5 10 --	V mA V µA µs	7,8 1,2,3 7,8 1,2,3 9,10,11
$\overline{\text{NED}}$	V_{OH} V_{OL}	V_L = 20V, I_{OH} = -100 µA I_{OL} = 10 mA I_{OL} = 100 mA	18.5 -- --	-- 0.6 1.0	V	1,2,3 1,2,3
Radiation Propagation Delay Time [6]	t_D		--	20	ns	
$\overline{\text{NEF}}$	V_{OH} V_{OL}	V_L = 20V, I_{OH} = -100 µA I_{OL} = 10 mA	18.5 --	-- 0.6	V	1,2,3 1,2,3

1. Standby mode is the normal state of the device, defined as having both the $\overline{\text{NED}}$ and $\overline{\text{NEF}}$ outputs (pins 2 and 13) in the “high” state.
2. Flag Set mode occurs after an event has been detected or BIT has been initiated and the NED output has timed out (i.e., has transitioned to the “high” state), leaving the NEF output as the only remaining output in the low state.
3. Operational mode is in effect during the timeout period of the NED signal, characterized by having both the NED and NEF outputs in the “low” state, causing the greatest current draw of the device.
4. BIT electrical characteristics are not guaranteed over the radiation range.
5. BIT may not meet specification when only a resistor is used to adjust the detection level. To use BIT in this situation, it is advised that a series resistor/capacitor combination is used.
6. Guaranteed but not tested over temperature. Time delay, t_D, is measured at 50% points from the rising edge of the radiation pulse to the falling edge of the $\overline{\text{NED}}$ output at approximately 10 times the detection level.

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MECHANICAL DIMENSIONS

Note: All dimensions in inches.

Important Notice:

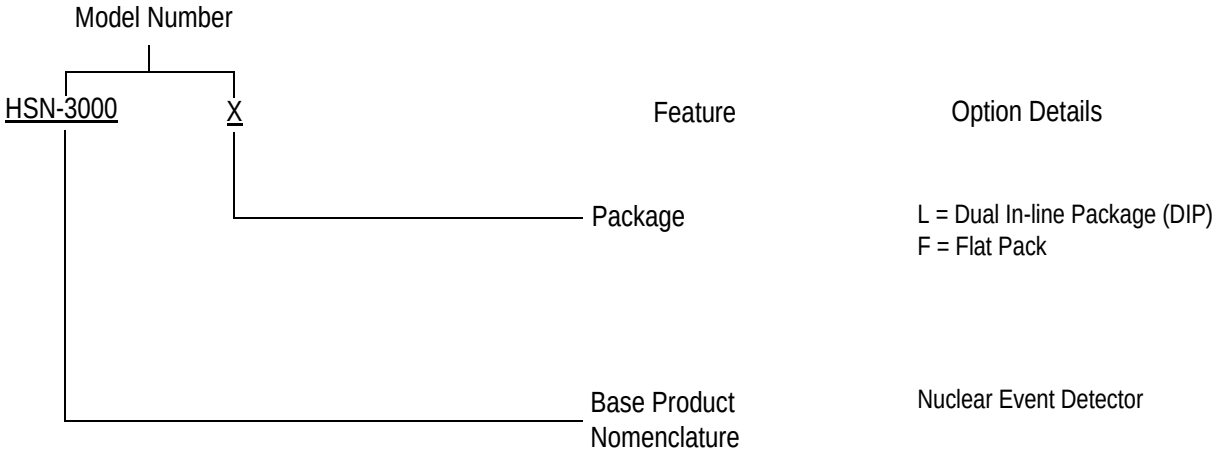
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