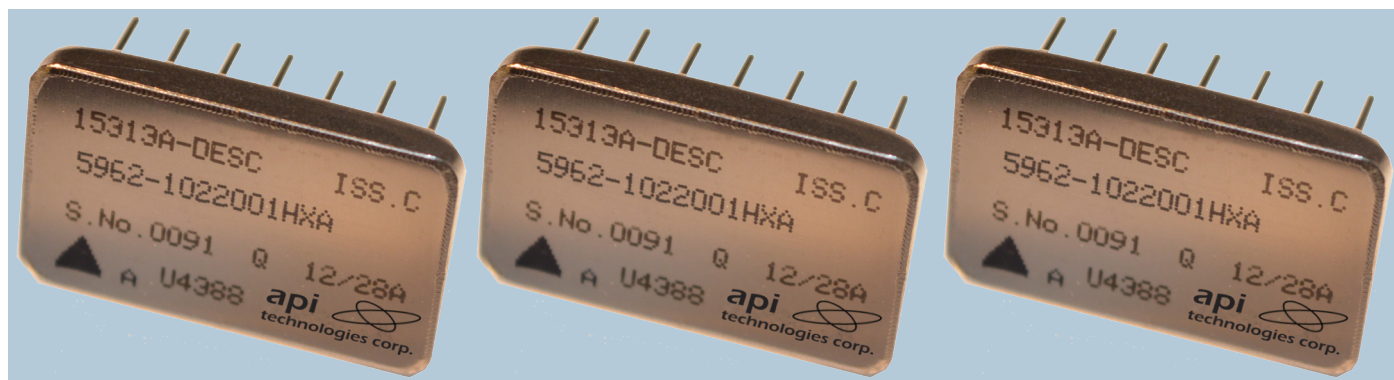


Low Power Nuclear Event Detector (NED)

High Reliability Electronic Modules for Extreme Environments



- Radiation hard to tactical/strategic nuclear environments
- Low power consumption at 2mA from single 5V supply
- Operates within specification over -55°C to +125°C
- Precise radiation detection level with single external resistor
- Accurate monostable pulse duration with single external capacitor
- 100% Detection tested
- Built-in self test
- Resettable output, bistable flag

Industry Standard Packages

- 14 pin DIL package version qualified to MIL-PRF-38534 Class H
- 14 pin surface mount version (available if required, Class H qualification pending)

API Technologies, in association with MBDA, introduces 15313A-DESC, a low power Nuclear Event Detector (NED) equipped with the latest materials and technology to mitigate the effect of nuclear weapon outputs. This cutting-edge product detects the event and sets a system flag which can either remove power from the electronics to be protected or drive the system into a known and controllable state. It is readily integrated into systems to support nuclear hardening.

Addressing the problem of nuclear event detection

Designing circuits to operate through an event requires specialist expertise. Ideally, electronic system hardware is designed to be 'rad-hard' to the necessary level. This requires the use of exotic semiconductor processing and technologies such as Silicon-On-Sapphire (SOS) or Silicon-On-Insulator (SOI). Many electronic functions are not realised in these technologies and devices currently available usually carry a major cost penalty.

The Nuclear Event Detector is a highly effective, low cost solution for protecting system electronics exposed to a nuclear event by detecting and enabling power-down and allowing the system to be re-powered once the event has passed.

System shutdown or power supply isolation can be implemented in response to the NED in a manner that avoids potentially permanent and catastrophic failures for example during crowbar protection. The system can then implement power-up in an appropriately controlled manner.

Low Power NED

Inputs and Outputs

The NED has provision for setting a nominal trigger threshold between 1E3 and 1E6 Gy(Si)/s [1E5 and 1E8 rad(Si)/s] using a single external resistor. The detection output pulse width can be set between 10µs and >1s (nominal) with a single external capacitor.

- Nuclear Event Flag (NEF) output - can be reset by either of two complementary inputs
- Nuclear Event Detection (NED) output
- Built-in test (BIT)

AC Characteristics - Inputs

| Parameter | Description | Condition | Min. | Typ. | Max. | Units |
|-----------|--------------|----------------|------|------|------|-------|
| TEST | Pulse Width¶ | Vtest=0 to 4V | 250 | | | ns |
| | NED delay¶ | | | 5 | 10 | µs |
| | NEF delay | | | 5 | 10 | µs |
| FR | Pulse width | Vfr=0 to 4V | 250 | | | ns |
| | NED delay | | | 0.2 | 1 | µs |
| NFR | Pulse width | Vnfr=5 to 0.7V | 500 | | | ns |
| | NED delay | | | 0.25 | 1 | µs |

AC Characteristics - Outputs

| Parameter | Description | Condition | Min. | Typ. | Max. | Units |
|-------------|-------------|-----------------|------|------|------|-------|
| NED | Delay | Pull up=220ohms | | 25 | 50 | ns |
| NEF | Delay | Pull up=220ohms | | 50 | 200 | ns |
| Pulse width | | Vh=4.5 to 5.5V | 10 | 20 | 30 | µs/nF |

Notes : § Electrical characteristic specifications valid over full environmental ranges

† Maximum charge during irradiation = 50nC

‡ Maximum charge into Rth input = 2nC excluding current into threshold set resistor

¶ NED active when TEST input active - pulse duration timed from negative edge of TEST input

Outputs inactive during power up provided Vh rises at less than 5000 V/s (5 V/ms)

Absolute Maximum Ratings

| Parameter | Limit |
|---|---------------------|
| Voltage at pins 6 11 12 and 14 w.r.t. pin 7 | 7.0V |
| Voltage at pins 1 and 8 w.r.t. pin 7 | 20.0V |
| Storage temperature range | -65°C < Ta < +150°C |

Electrical Characteristics

Maximum environmental operating conditions

| Parameter | Limit |
|------------------------------|---------------------------------|
| Operating temperature range | -55°C < Ta < +125°C |
| Ionising radiation dose rate | >1E8 Gy(Si)/s (>1E10 rad(Si)/s) |
| Ionising total dose | >100 Gy(Si) (>1E4 rad (Si)) |
| Neutron fluence | >1E13 n/cm ² |

DC Characteristics - Power

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Units |
|-----------|--------|------------------------------------|------|------|------|-------|
| VH | VH | | 4.5 | 5.0 | 5.5 | V |
| | IH | Standby VH=5.5V | | | 2.0 | mA |
| | | Flag set VH=5.5V | | | 6.0 | mA |
| | | Operational VH=5.5V | | | 15.0 | mA |
| | | During irradiation VH=5.5V † | | | 100 | mA |
| VL | VL | | 4.5 | 15.0 | 20.0 | V |
| | IL | VL=20.0V | | | 100 | μA |
| VB | VB | Standby / flag set | 4.5 | 5.0 | 5.5 | V |
| | IB | Standby / flag set | | | 2.0 | μA |
| | | During irradiation VB=5V ‡ | | | 100 | mA |

DC Characteristics - Inputs

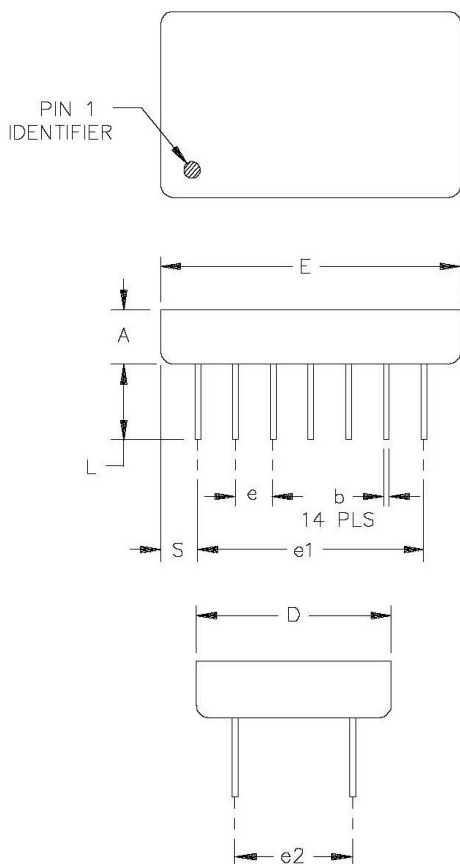
| Parameter | Symbol | Condition | Min. | Typ. | Max. | Units |
|-----------|--------|-----------|------|------|------|-------|
| FR | Vil | | | | 0.7 | V |
| | Iil | Vi=0.7V | | 0.5 | 1.0 | mA |
| | Vih | | 3.0 | | | V |
| | Iih | Vi=3.0V | | 2.3 | 3.0 | mA |
| | Vsw | | 0.7 | 2.1 | 3.0 | V |
| NFR | Vil | | | | 0.7 | V |
| | Iil | Vi=0.7V | | -1.0 | -3.0 | mA |
| | Vih | | 4.0 | | | V |
| | Iih | Vi=4.0V | | -0.1 | -1.0 | mA |
| | Vsw | | 0.8 | 0.7 | 2.0 | V |
| TEST | Vil | | | | 0.7 | V |
| | Iil | Vi=0.7V | | 0.5 | 1.0 | mA |
| | Vih | | 4.0 | | | V |
| | Iih | Vi=4.0V | | 3.3 | 4.0 | mA |
| | Vsw | | 0.7 | 2.1 | 3.0 | V |

DC Characteristics - Outputs

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Units |
|-----------|--------|----------------------|------|------|------|-------|
| NED | Voh | VL=20V Io=- 100μA | 18.5 | | | V |
| | Vol | Iol=10mA | | | 0.6 | V |
| | | Iol=20mA | | | 0.7 | V |
| NEF | Voh | VL=20V Io=- 100μA | 18.5 | | | V |
| | Vol | Iol=10mA | | | 0.6 | V |
| | | Iol=20mA | | | 0.7 | V |

Low Power NED

Outline Drawings and Pin Out



Package Option
 Qualified to MIL-PRF-38534 Class H
 (Surface mount version available if required, qualification pending)

| Symbol | DIMENSIONS in | | DIMENSIONS mm | |
|--------|---------------|-------|---------------|-------|
| | MIN | MAX | MIN | MAX |
| A | - | 0.145 | - | 3.68 |
| b | 0.16 | 0.022 | 0.41 | 0.56 |
| D | 0.490 | 0.500 | 12.45 | 12.70 |
| e | 0.100 BSC | | 2.54 BSC | |
| e1 | 0.600 BSC | | 15.24 BSC | |
| e2 | 0.295 | 0.305 | 7.49 | 7.75 |
| E | 0.790 | 0.800 | 20.06 | 20.32 |
| L | 0.195 | 0.215 | 4.95 | 5.46 |
| S | 0.095 | 0.105 | 2.41 | 2.68 |

1. Soldering leads, temperature of leads must not exceed 270°C for a time of 10 seconds.
2. Package must not be ultrasonically cleaned without prior consultation with RF2M Microelectronics Ltd.

Ordering Information

15313A-DESC (SnPb solder)
 15313-DESC (Gold)

This product may be subject to export control regulations

| Pin | Designation | Description / function |
|-----|-------------|---|
| 1 | VL | Output load supply - provides a supply to the NED and NEF outputs via internal 10 kohm resistors. External pull up resistors may also be used. |
| 2 | NED | Nuclear Event Detection output - provides an active low output for the period set by the external timing capacitor. |
| 3 | n/c | No connection |
| 4 | CB | External timing capacitor (low) - connection for external timing capacitor. If an electrolytic capacitor is used, this pin should be connected to the -ve side. |
| 5 | CA | External timing capacitor (high) - connection for external timing capacitor. If an electrolytic capacitor is used, this pin should be connected to the +ve side. |
| 6 | TEST | Built in test input - provides means for electrical stimulation of the NED. |
| 7 | GND | Ground and case |
| 8 | VB | PIN diode bias supply - provides a separate supply to the radiation detector. |
| 9 | Rth | External threshold set resistor - connection for the external radiation threshold set resistor. The other end of the resistor should be connected to ground (Pin 13). The resistor should be as close as possible to the NED. |
| 10 | n/c | No connection |
| 11 | NFR | Flag reset (active low) - provides an active low reset input to the NEF bistable. |
| 12 | FR | Flag reset (active high) - provides an active high reset input to the NEF bistable. |
| 13 | NEF | Nuclear Event Flag output - provides an active low bistable output. The bistable output is set when the NED triggers. |
| 14 | VH | Device supply - provides supply to the internal NED electronics. |

Whilst every effort is made to ensure the accuracy of the information contained in this document, no responsibility can be accepted for any errors and/or omissions.

Descriptions and specifications of products are subject to change without notice.

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