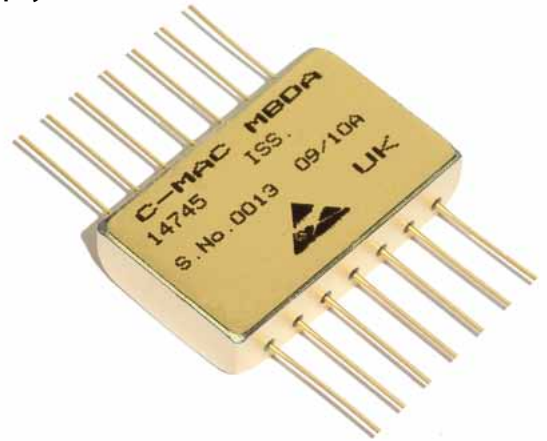


C-MAC MicroTechnology, in association with MBDA, introduces a low power Nuclear Event Detector (NED) equipped with the latest materials and technology to mitigate the effect of nuclear weapon outputs. This cutting-edge product detects the event and sets a system flag which can either remove power from 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.

Key Benefits and Features:

- » 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
- » Built-in self test
- » Resettable output, bistable flag
- » Qualification to MIL-PRF-38534 Class H



Industry Standard Packages:

- » 14 pin surface mount version
- » 14 pin DIL package version



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)

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	30.0V
Storage temperature range	-65°C < Ta < +150°C

ELECTRICAL CHARACTERISTICS

Maximum environmental operating conditions §

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	15.0	20.0	V
	IB	Standby / flag set			2.0	µA
		During irradiation VB=20V ‡			100	mA

Inputs

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	2.9	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	1.2	1.6	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	2.9	V

Outputs

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

AC Characteristics

Inputs

PARAMETER	DESCR	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

Outputs

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)

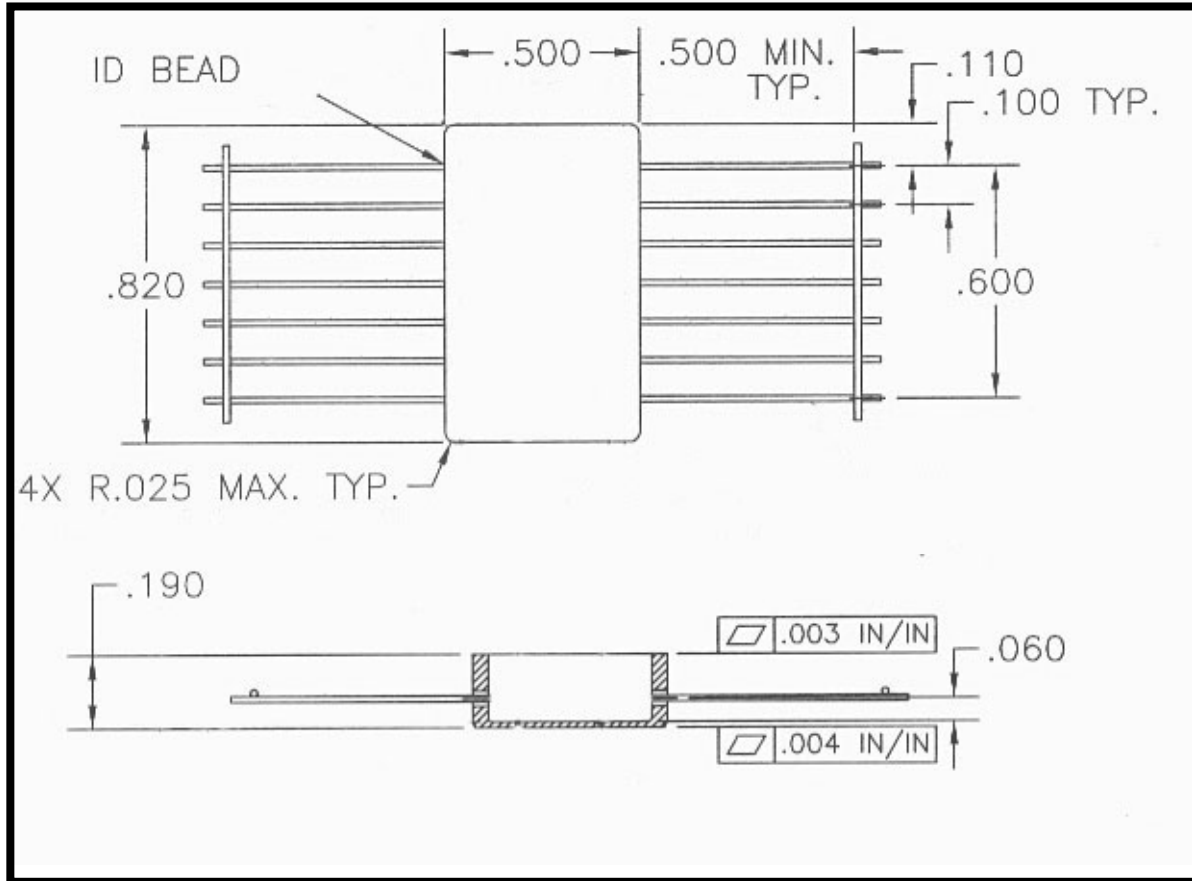
Addressing the problem of nuclear event detection

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.

Outline Drawing



Dimensions in inches

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.

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