



Domino[®] Neutron Detector D411S-20-D0025-V5

Solid-State Neutron Detection Applications

Neutron detector applications include those for homeland security (e.g., border screening), fundamental research (e.g., at neutron scattering beamlines), and industrial monitoring (e.g., personnel monitoring, water content in soil). Solid-state neutron detectors provide an alternative to the ³He-based detectors, maintaining a high thermal-neutron detection efficiency, at a fraction of the volume, mass, voltage, and power required from gas or liquid detectors.

The RDT Domino[®]

A strong demand for thin form factor neutron detectors with the flexibility to adjust available detection area has driven RDT to offer the end-to-end pluggable Domino[®] with 4-cm² detection area, 20% to 30% thermal neutron efficiency, less than 0.3-mW power consumption, and digital output per module. The digital outputs of the Domino[®] may also be tied together in the tiled format.

MSND[®] Technology

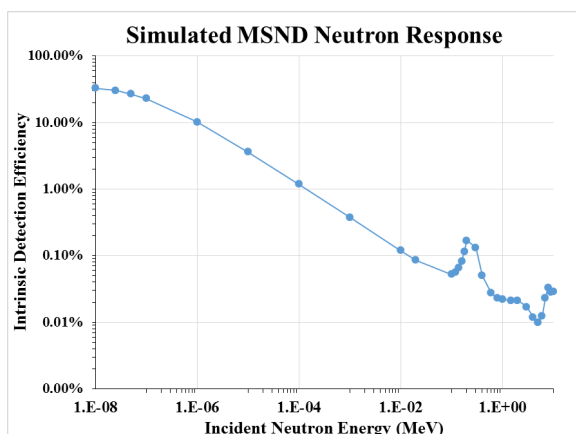
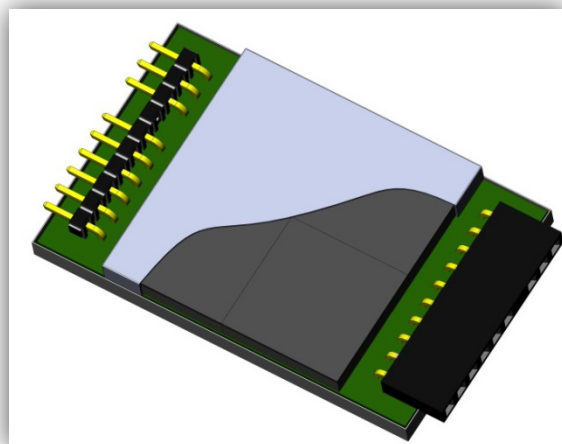
The detector utilizes microstructured semiconductor neutron detector (MSND[®]) technology[‡] with ⁶Li conversion to yield a thermal neutron detection efficiency of 30%. Optimum HDPE moderator for ²⁵²Cf neutron source at 1-m is 3-4 cm in front and 3-6 cm behind the MSND[®] sensor.

Electronics & Interfacing

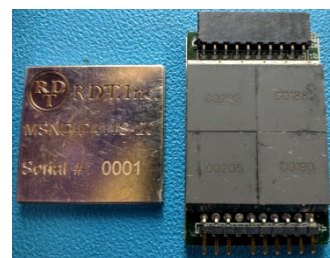
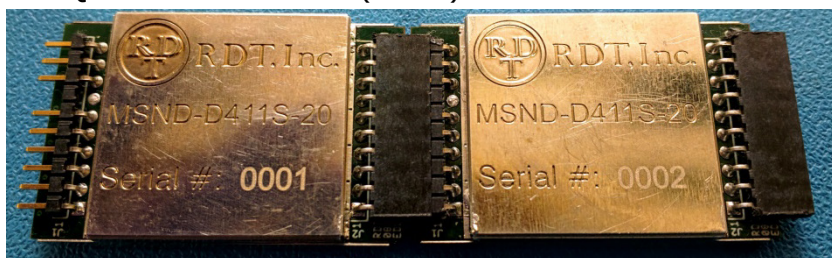
The onboard electronics package includes a preamplifier, shaping-amplifier, discriminator, analog-to-digital converter, temperature sensor, and voltage regulator.

Specifications

- | | |
|---|------------------------------------|
| Detector Area: 4 cm ² | Pulse width: 5-50 μs |
| E _{thermal} : 20(±1)%@ 20°C | γ-reject: 1:10 ⁷ |
| ε _{Cf-252} : 0.034%(no mod) | Mass: 9.5 grams |
| ε _{Cf-252} : ~0.07%(1in. ³ mod) | Pileup limit: <33 kcps |
| I _{cont} : 290 μA | Rad Hard: <10 ¹⁰ Rads/s |
| V _{input} : 2.9-5.5 V | Stackable: yes |
| V _{output} : 2.7 V (≥1kΩ) | Tileable: yes, 1-D |
| Sensitivity to Ambient Light : No | |
| Temp. Range: -40°C to 50°C | |
| Connector: Samtec (2mm Center) | |
| • TMM-110-01-L-S-RA-007 (male) | |
| • SQT-110-01-L-S-RA-007 (socket) | |



Sales Inquiries: sales@radectech.com
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[‡]US Patents 6,545,281, 7,164,138, & 8,778,715; ECCN: 1A999a

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Electronic Specifications

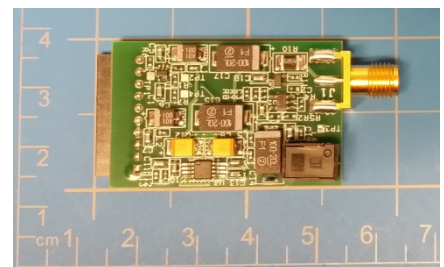
If provided power is particularly noisy, decouple the power to local ground as close as possible to the connectors (ceramic in parallel with a tantalum is always best and a series bead never hurts). Be sure to use all ground pins (tie to a plane if possible). Do not tie anything to the "Do not connect" pins. Some are used for internal diagnostics during the test process and connections may cause device failure.

Pin #	Domino [®] V5.0	
	J1 MAIN CONNECTOR (Samtec TMM-110-01-L-S-RA-007)	J2 CASCADE CONNECTOR (Samtec SQT-110-01-L-S-RA-007)
1	DO NOT CONNECT	DO NOT CONNECT
2	GROUND	GROUND
3	GROUND	GROUND
4	+VDC INPUT (+2.9 VDC MIN. +5.5 VDC MAX)	+VDC CASCADE OUT
5	+VDC INPUT (+2.9 VDC MIN. +5.5 VDC MAX)	+VDC CASCADE OUT
6	SDA (+2.7 VDC)	DO NOT CONNECT
7	POLARITY KEY (CLIPPED PIN)	POLARITY KEY (PLUGGED SOCKET)
8	SCL (+2.7 VDC)	DO NOT CONNECT
9	PULSE OUT (DRIVEN - LV CMOS +2.7 VDC)	DO NOT CONNECT
10	PULSE OUT (CASCADE - OPEN DRAIN W/O INTERNAL PULL-UP)	PULSE IN CASCADE

Accessories

- ❑ *Driver Board:* A great way to quickly test the Domino[®] detector in your lab. Connection for the driven PULSE OUT are made via a standard SMA connection and power is supplied via a standard 12VDC wall wart power supply.

- ❑ *Panel Array Readout Motherboard:* Another way to panelize the Dominos[®] into an array. Individual Domino[®] strings can be readout individually or as a single unit.



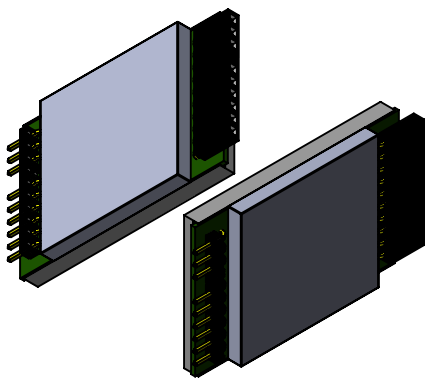
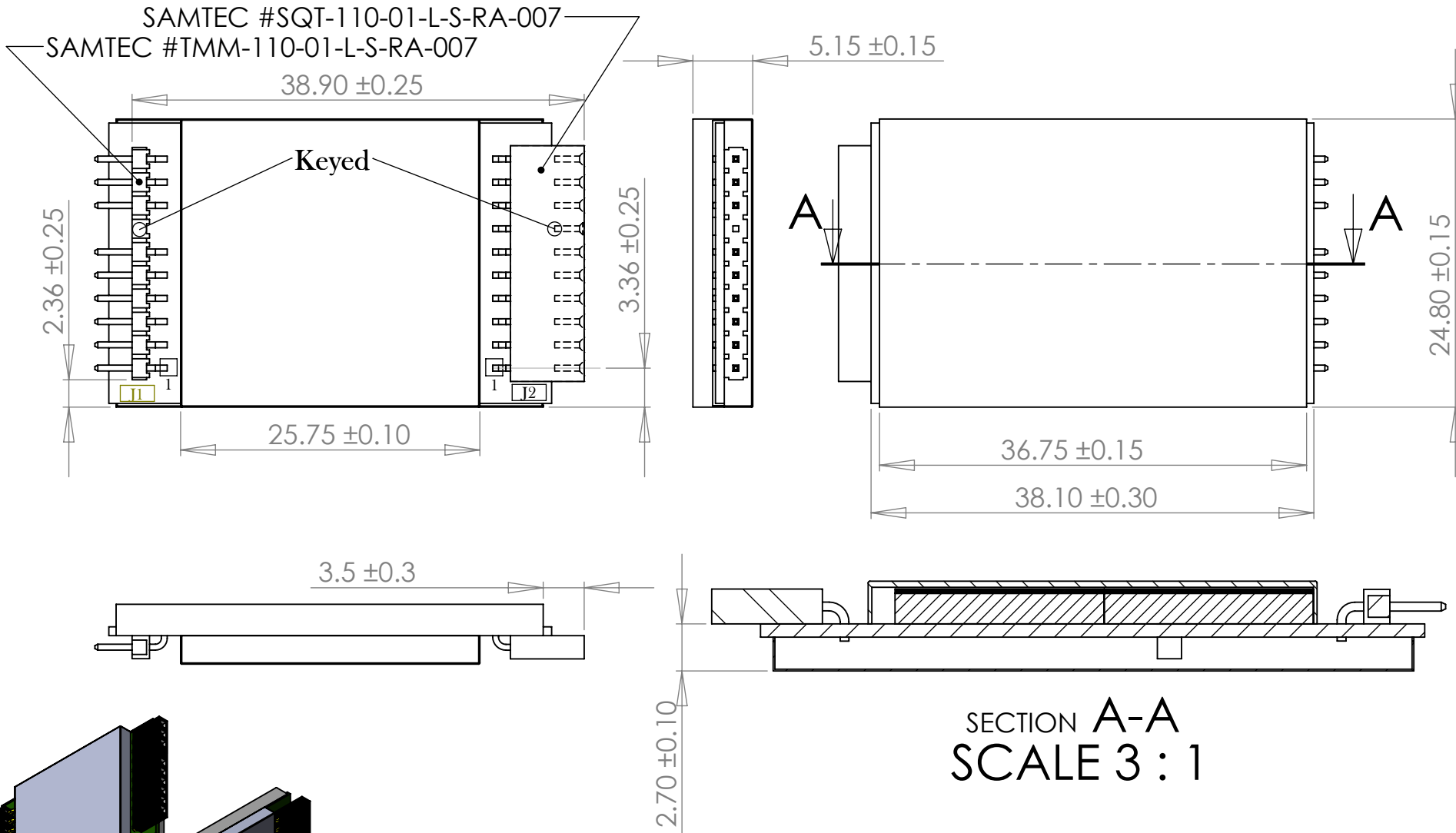
Domino[®] Neutron Detector



Radiological Sensitivity Specifications

All measurements were performed with detectors between 1-in. thick sheets of HDPE (5 in. x 5 in.) and irradiated with an ANSI-Moderated Cf-252 source and compared directly to a calibrated He-3 neutron detector.

Model	Detector Type	Gamma-ray Reject Rate	Neutron Sensitivity	Power Req. (mW)
D11S-20-D0010-V3 RDT Domino[®] Version 3	Semiconductor-based detector w/ MSND [®] Technology	< 1-cpm at 50 mR/h with a Cs-137 Source	0.57 cps/nv	2.4-mW at 3V
D411S-20-D0010-V4 RDT Domino[®] Version 4	Semiconductor-based detector w/ MSND [®] Technology	< 1-cpm at 50 mR/h with a Cs-137 Source	0.57 cps/nv	0.87-mW at 3V
D411S-30-D0010-V4 RDT Domino[®] Version 4	Semiconductor-based detector w/ MSND [®] Technology	< 1-cpm at 50 mR/h with a Cs-137 Source	0.85 cps/nv	0.87-mW at 3V
D411S-30-D0025-V5 RDT Domino[®] Version 5 <i>[Available Summer 2016]</i>	Semiconductor-based detector w/ MSND [®] Technology	< 1-cpm at 50 mR/h with a Cs-137 Source	0.85 cps/nv	0.3-mW at 3V
D411S-40-D0025-V5 RDT Domino[®] Version 5 <i>[In Development, Available Fall 2016]</i>	Semiconductor-based detector w/ MSND [®] Technology	< 1-cpm at 50 mR/h with a Cs-137 Source	1.25 cps/nv	0.87-mW at 3V
He-3 Neutron Detector Comparison	He-3 Gas-Filled Detector at 10-atm Dimensions: 0.75-in. dia. by 3-in. length	Not Reported. Measured at < 1-cpm at 50 mR/h with a Cs-137 Source.	Reported: 5.2 cps/nv	N/A, depends on the ancillary readout electronics.



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Address: 4615 S. Dwight Dr. Manhattan, KS 66502	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN: Millimeter (mm)	DRAWN (UPDATED) 8/1/2016	DATE 8/1/2016	Radiation Detection Technologies, Inc. TITLE: Domino V5.0
	Material:	COMMENTS:		
Contact: Steven Bellinger email: bellinger@radectech.com Tel: O: (785) 532-7087 & C: (785) 477-1338				SIZE DWG. NO. REV A D411S-20-D0025-V5 1
				SCALE: 2:1 WEIGHT: SHEET 1 OF 1