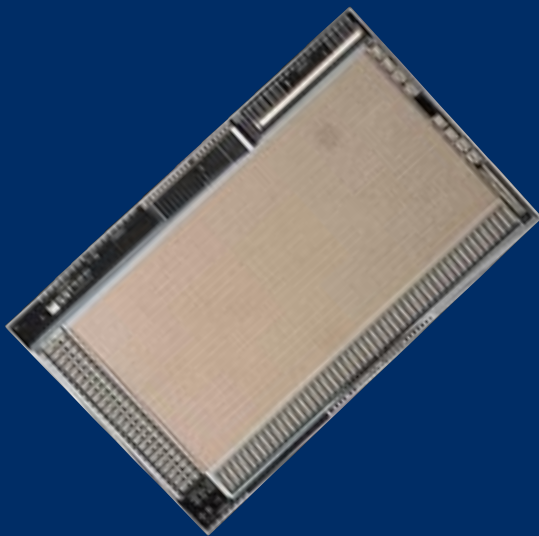


# MARY™

## Charge Readout Chip



### An Imaging Pixel Detector

*For high resolution, high dynamic range industrial or medical X-ray imaging such as digital MAMmographY, digital radiography and high resolution non-destructive evaluation (NDE).*

| Standard Features  | Applications  |
|--|---|
| <p>Time Delayed Integration (TDI) Readout<br/>50 x 50 Micron Pixel Size<br/>High Dynamic Range (16 bits)<br/>384 Channels<br/>Low Noise<br/>Internal and External Clock Drivers<br/>Fat Zero Test Input<br/>Overflow Control<br/>24 Independent Readout Taps</p> | <p>Developed for high resolution, high dynamic range medical and industrial scanning type imaging applications such as digital mammography (Digi MAM™), digital radiography, non-destructive evaluation (NDE) and inspection (NDI). Can be hybridized with pixel detector arrays such as:</p> <ul style="list-style-type: none"><li>• Silicon pixel detectors</li><li>• CdZnTe pixel detectors</li><li>• GaAs pixel detectors</li></ul> |
| Availability   | Contact   |
| <p>MARY™ is available as individual chips or integrated with solid state detectors such as Silicon, GaAs, CdTe, CdZnTe and Si pixel detectors. Interface electronics with data acquisition software, test and evaluation systems are also available.</p>         | <p>NOVA R&amp;D Inc.<br/>1525 Third Street, Suite C<br/>Riverside, CA 92507-3429<br/>Tel: (909) 781-7332<br/>Fax: (909) 781-0178<br/>nova@novarad.com<br/>www.pe.net/~nova</p>  |

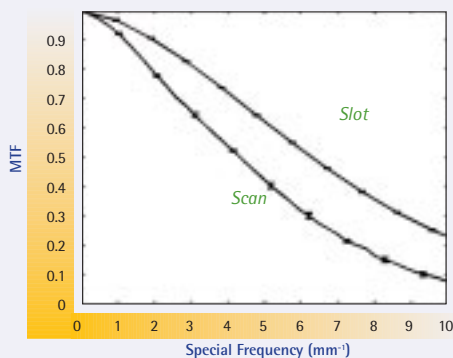


# MARY™ Specifications



|                                    |   |
|------------------------------------|---|
| Pixel size:                        | 50 x 50 micron.   |
| Power Supply:                      | Analog: 10 V, 25 mA; Digital: 10 V, 6 mA.   |
| TDI stages and Scan Time:          | 192 pixels in the Time Delayed Integration (TDI) direction, 128 or 384 pixels in the non-TDI direction for the Small and Large size MARY chips, respectively. Scan Time < 4 seconds.  |
| Charge Transfer Efficiency:        | > 99.8% per transfer.   |
| DOE and MTF:                       | High modulation transfer function (MTF) and detective quantum efficiency (DOE): A limiting spatial resolution of 10 lp/mm and a DOE of well over 85% at zero spatial frequency are anticipated after hybridization with a properly selected pixel detector array. |
| Dynamic range:                     | > 16,000 (14 bits) @ 9 Meg samples/s output rate  |
| Linear response and well capacity: | Linear throughout the dynamic range with total maximum well capacity of $\approx 4 \times 10^8$ electrons or holes (corresponds to $\approx 71,000$ incident x-rays per pixel for GaAs detector).   |
| Readout noise:                     | < 20,000 electrons RMS (corresponds to < 3 incident x-ray quanta per pixel on the average for GaAs detectors).  |
| Active area:                       | (0.96 cm wide detector active width) x 24 cm linear array for scanning up to 30 cm length   |
| Image size:                        | $\approx 4,800$ by 6,000 pixels   |
| Operation temperature:             | $-10 < T < 40$ °C   |

## MTF and Test Pattern Image Measured Using MARY™ Chip Hybridized with 1 mm Silicon PIN Detector



Measured MTF derived from a slanted edge image using the oversampling technique.



Large MARY chip hybridized with a 2 mm thick CdZnTe detector.



Image of a bar pattern X-ray image using a 1 mm thick Silicon detector hybrid. Nyquist limit is 10 lp/mm.

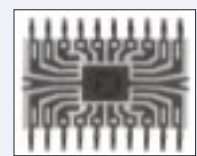


Image of an IC using a 1.5 mm thick Silicon detector where the 0.025 mm wire bonds are visible.



Image of a collimator using a 2 mm thick CdZnTe detector. Smallest holes are 0.15 mm dia.



Image of a jaw with teeth using a 1.5 mm thick Silicon detector.



Image of a collimator using a 1.5 mm thick Silicon detector. Smallest holes are 0.15 mm dia.

