Megapixel-Format

Readout Integrated Circuits

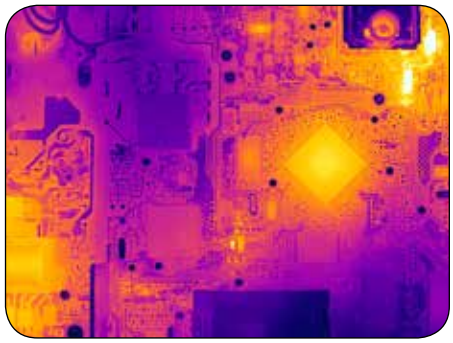
Key Features:

- 1024 x 1024 pixel arrays
- Common electrical interfaces & features
- Use in InSb, QWIP, SLS and MCT IR detectors

Readout Integrated Circuits

At the heart of today's high-resolution IR systems

If you're designing high-resolution infrared imaging systems, FLIR's line of megapixel-format standard Readout Integrated Circuit (ROIC) products provide an off-the-shelf solution for the most demanding applications. Where requirements call for low noise, variable charge storage capacitance, selectable integration times, adjustable gain and power settings, all with a simple user interface, our mixed-signal ROICs offer a proven design without the schedule, resources and risk of a product development task.



Product Offering

We offer a family of new megapixel-format 1024 × 1024 pixel arrays, including the ISC0404, ISC0904, and ISC0501. These arrays make excellent imagers for high-resolution IR systems and are used in many advanced commercial and military applications.

Pixel Pitch

Our megapixel arrays include a variety of pixel pitches, from 30 to 18 microns, for customers with a wide range of optical designs, dewar/cooler configurations and resolution requirements.

The ISC0404, with an 18-micron pixel pitch is designed for use with InSb detectors. The user interface is similar to other smaller format devices such as the ISC9705 and ISC9803. The ROIC can be operated as 4, 8, or 16 outputs, selectable by the user, and achieves a 120 Hz frame rate for 1024 × 1024 pixels. Two well size options are available for the ISC0404, 2.5M or 10M electrons. These options are fabricated separately at the silicon wafer level.

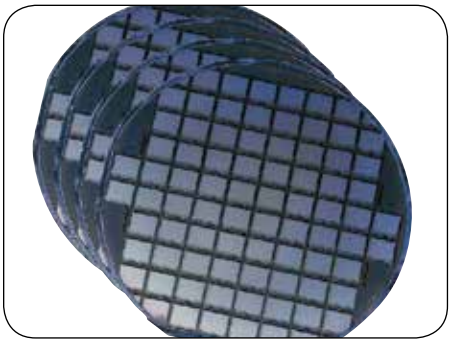
The ISC0904 is derived from the ISC0404 but designed for n-on-p detectors such as strained-layer superlattice devices or MCT. The pixel pitch is identical and the user interface is similar. The ISC0904 has a well capacity of 11M electrons and can be operated in 4, 8, or 16 output mode. A frame rate of 120 Hz can be achieved for 1024 × 1024 pixels using the 16-output mode.

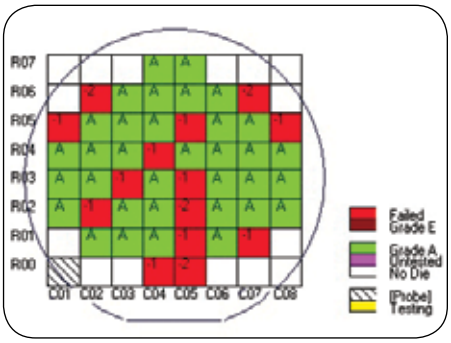
The ISC0501 was designed for quantum well infrared photodetectors (QWIPs). This is a two-color 1024 × 1024 format array with a 30 micron pixel pitch. The ROIC contains a separate analog signal path for each wavelength band, MWIR and LWIR. Separate signal paths allow the two colors to have optimized detector biases, integration times, offsets, and gains. This architecture also allows both colors to simultaneously sample a scene and readout the pixel data.

Delivery

Standard ROIC devices are delivered in wafer form, probe tested and labeled according to pass/fail criteria. Test data is included on CD-ROM for each device. A User Guide is provided that describes all device electrical interfaces. A Mechanical Interface Database provides the layout information needed by customers to design their detector interface.

If our standard ROIC products do not meet your requirements, we offer full custom design services from trade study through fabrication of wafers.





STANDARD READOUT FUNCTIONS

	ISC0404	ISC0904	ISC0501
Array Size	1024 x 1024	640 x 512	640 x 512
Input Circuit	Direct Injection	Direct Injection	Direct Injection
Integration Type	Snapshot mode	Snapshot mode	Snapshot mode
Integration Time	Adjustable integration time >0.5 µs	Adjustable integration time >0.5 µs	Adjustable integration 10 bit per color
Integration Modes	Integrate-While-Read Integrate-Then-Read Non-destructive Read	Integrate-While-Read Integrate-Then-Read Non-destructive Read	Integrate-While-Read Integrate-Then-Read Variable integration for each color
Gain Adjustment	N/A	N/A	2 bits adjustment
Operational Modes	"Hands-off" default User configurable	"Hands-off" default User configurable	"Hands-off" default User configurable
Windowing	Dynamic windowing Window size-position	Dynamic windowing Window size-position	Dynamic windowing Window size-position
Readout Modes	Invert [row] Revert [column] Inverse [row-column]	Invert [row] Revert [column] Inverse [row-column]	N/A
Number of Outputs	Selectable 4, 8, or 16 Reference output	Selectable 4, 8, or 16 Reference output	4 or 8 outputs per color Reference output for each color
Detector Application	p-on-n InSb	n-on-p SLS, MCT	p-on-n, 2-color QWIP

Specifications

	ISC0404	ISC0904	ISC0501
Array Size	1024 x 1024	1024 x 1024	1024 x 1024
Pixel Pitch	18 µm	18 µm	30 µm
Operating Temperatures	80 K	65 to 300 K	60 to 77 K
Detector Bias Range (I_{det} = 1nA)	0 to 0.5 V	0 to -0.8 V	>2 V
Detector Bias Resolution	5 mV	6 mV	<20 mV
RoA Min.	$\geq 1 \times 10^4\ \Omega{\cdot}cm^2$	$>1 \times 10^3\ \Omega{\cdot}cm^2$	$\sim 2 \times 10^7\ \Omega{\cdot}cm^2$ (MWIR) $\sim 7 \times 10^5\ \Omega{\cdot}cm^2$ (LWIR)
Detector Capacitance Max.	≤0.1 pF	≤0.1 pF	≤100 fF (MWIR) ≤30 fF (LWIR)
Well Capacity (Min – Max Gain)	12×10^6 option 1 $2.5 \pm 0.5 \times 10^6$ option 2	$\geq 7 \times 10^6$	$\geq 17 \times 10^6$
Input Current			(MWIR) (LWIR)
Min	1 pA	20 pA	1 pA 10 pA
Nom	0.5 nA	1 nA	7.5 pA 110 pA
Max	10 nA	10 nA	1 nA 1 nA
ROIC Noise (Min. Gain)	$\leq 1026 e^-_{RMS}$* option 1	$\leq 899 e^-_{RMS}$*	$\leq 420 e^-_{RMS}$* (MWIR)
ROIC Noise (Max. Gain)	$\leq 282 e^-_{RMS}$* option 2	N/A	$\leq 1250 e^-_{RMS}$** (LWIR)
Output Range	2.0 V	2.3 V +/-0.2 V	≥ 2 V
Output Interface (R_{out}, C_{out})	≥100 kΩ ≤18 pF	≥100 kΩ ≤15 pF	≥100 kΩ ≤20 pF
Pixel Rate	12.5 MHz	12.5 MHz	10 MHz
Full Frame Rate (4 output)	>30 Hz	>30 Hz	N/A
Full Frame Rate (8 output)	>60 Hz	>60 Hz	60 Hz
Full Frame Rate (16 output)	>120 Hz	>120 Hz	N/A
Power (4 output)	≤72 mW	≤72 mW	N/A
Power (8 output)	≤95 mW	≤95 mW	≤350 mW
Power (16 output)	≤130 mW	≤130 mW	N/A
	* T_{int} = 3msec, T = 80 K C_{det} = 100 fF $R_oA = 1 \times 10^4 \Omega{\cdot}cm^2$	* T_{int} = 3msec, T = 77 K C_{det} = 200 fF $R_oA = 1 \times 10^3 \Omega{\cdot}cm^2$	* Charge Capacity $4.2 \times 10^6 e^-$ T_{int} = 3msec, T = 65 K C_{det} = 30 fF $R_oA = 2 \times 10^7 \Omega{\cdot}cm^2$ ** Charge capacity $16.7 \times 10^6 e^-$ T_{int} = 3msec, T = 65 K C_{det} = 100 fF $R_oA = 7 \times 10^5 \Omega{\cdot}cm^2$

SANTA BARBARA
Commercial Systems
FLIR Systems, Inc.
70 Castilian Drive.
Goleta, CA 93117
USA
PH: 805.964.9797

PORTLAND
Corporate Headquarters
FLIR Systems, Inc.
27700 SW Parkway Avenue
Wilsonville, OR 97070
USA
PH: 877.773.3547

Contact Sales:
Susan Petronio
PH: +1 970.349.5045
susan.petronio@flir.com

www.FLIR.com/OEM