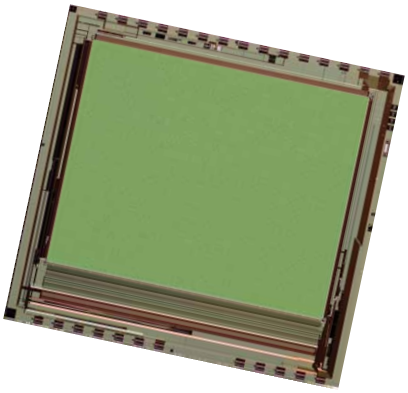
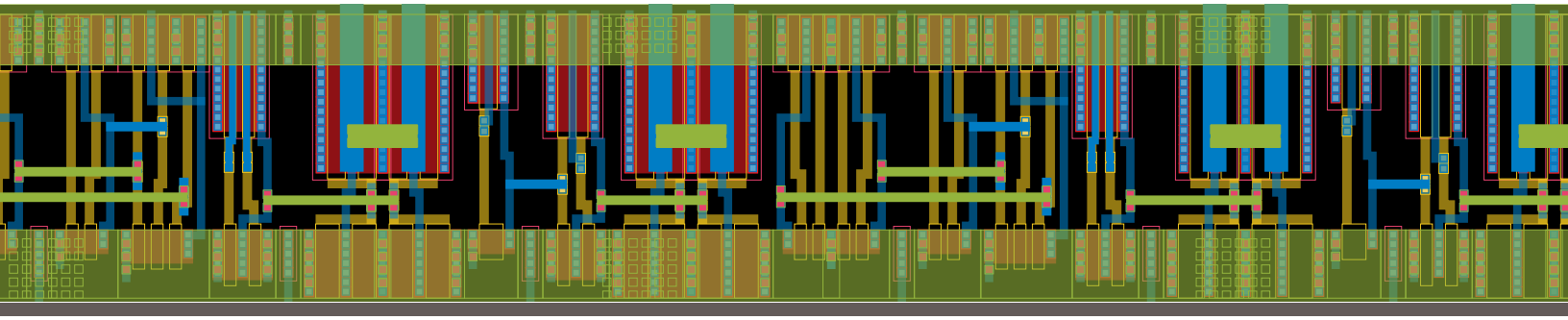


Large-Format Readout Integrated Circuits



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

FLIR®

Readout Integrated Circuits

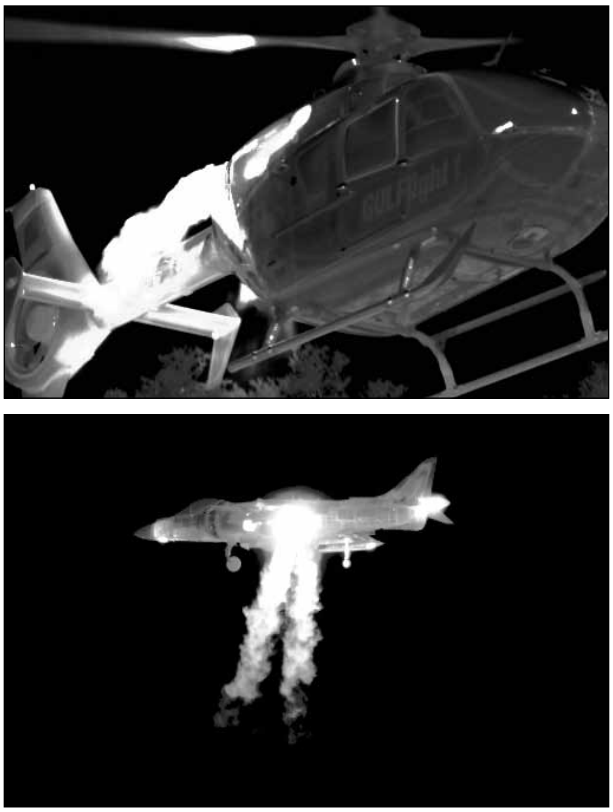
If you're designing high-resolution infrared imaging systems, FLIR's line of large-format standard Readout Integrated Circuit (ROIC) products provide an off-the-shelf solution for the most demanding applications. Where requirements call for low noise, variable charge storage capacitance, selectable integration 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 large-format 640 x 512 pixel arrays, including the ISC9803, ISC0002, ISC9901, ISC0402, ISC0403, and ISC0905. These arrays make excellent imagers for high-performance IR systems and are used in many advanced commercial and military products.

Key Features:

- Electrical interfaces and features are common between arrays
- Designed for use with infrared detectors such as InSb, QWIP, SLS, MCT, and InGaAs



Images of a helicopter and Harrier jet taken with the ISC0403-based InSb SC6700 FLIR camera.

Pixel Pitch

Our large-format arrays include a variety of pixel pitches, from 30 to 15 microns, for customers with a wide range of optical designs, dewar/cooler configurations, and resolution requirements.

The ISC0403's 15-micron pixel pitch gives this 640 x 512 format array the same physical dimensions as the industry-standard ISC9705, our 320 x 256 30-micron pitch array. This size matching makes it easy to upgrade systems from mid- to large-format resolution without dewar or optics redesign.

Two well size options are available for the 20-micron 640 array, the ISC0402. These options are fabricated separately at the silicon wafer level.

The ISC0905 is a two-color, dual polarity device for use with p-on-n or n-on-p detectors such as strained-layer superlattice devices. This large format device is based on the mid-format ISC0903 with the same pixel pitch and similar interface. The ROIC has been specifically designed to allow for both polarities of detectors to be placed back-to-back and to connect to the ROIC through one input pad to obtain a two-color image.

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.

ROICs in wafer form with test data CD

Standard Readout Functions

	ISC9803	ISC0002	ISC9901	ISC0402*	ISC0403	ISC0905
Array Size	640 x 512	640 x 512	640 x 512	640 x 512	640 x 512	640 x 512
Input Circuit	Direct Injection	CTIA	Direct Injection	Direct Injection	Direct Injection	Direct Injection
Integration Type	Snapshot mode	Snapshot mode	Snapshot mode	Snapshot mode	Snapshot mode	Snapshot mode
Integration Time	Adjustable integration time > 9.6 µs	Adjustable integration time > 5.4 µs	Adjustable integration time > 100 µs	Adjustable integration time > 0.5 µs	Adjustable integration time > 0.5 µs	Adjustable integration time > 100 µs
Integration Modes	Integrate-While-Read Integrate-Then-Read	Integrate-While-Read Integrate-Then-Read	Integrate-Then-Read	Integrate-While-Read Integrate-Then-Read Non-destructive Read	Integrate-While-Read Integrate-Then-Read	Integrate-While-Read Integrate-Then-Read
Gain Adjustment	2 bit (x1, x1.3, x2, x4)	1 bit (x1, x27)	2 bit (x1, x1.3, x2, x4)	N/A	N/A	N/A
Operational Modes	"Hands-off" default User configurable	"Hands-off" default User configurable	"Hands-off" default User configurable	"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	Dynamic windowing Window size-position	Dynamic windowing Window size-position	Dynamic windowing Window size-position
Readout Modes	Invert [row] Revert [column] Inverse [row-column] Interlaced mode	Invert [row] Revert [column] Inverse [row-column] Interlaced mode	Invert [row] Revert [column] Inverse [row-column] Interlaced mode	Invert [row] Revert [column] Inverse [row-column]	Invert [row] Revert [column] Inverse [row-column]	Invert [row] Revert [column] Inverse [row-column]
Number of Outputs	Selectable 1, 2, or 4 Reference output	Selectable 1, 2, or 4 Reference output	Selectable 1, 2, or 4 Reference output	Selectable 1, 2, or 4 Reference output	Selectable 1, 2, or 4 Reference output	Selectable 4 or 8 Reference output
Detector Application	p-on-n InSb or QWIP	p-on-n InGaAs or MCT	p-on-n InSb or QWIP	p-on-n InSb, InGaAs, MCT, or QWIP	p-on-n InSb	p-on-n or n-on-p InSb, InGaAs, MCT, SLS

* two well size options available

Specifications

	ISC9803	ISC0002	ISC9901	ISC0402	ISC0403	ISC0905
Array Size	640 × 512	640 × 512	640 × 512	640 × 512	640 × 512	640 × 512
Pixel Pitch	25 µm	25 µm	20 µm	20 µm	15 µm	30 µm
Operating Temperatures	80 to 310 K	80 to 310 K	80 to 310 K	80 K	80 K	65 to 300 K
Detector Bias Range (I_{det} = 1nA)	0 to 0.5 V	0 to 2.5 V	0 to 0.5 V	0 to 0.5 V	0 to 0.5 V	0 to -0.8 V (p-on-n) 0 to 0.8 V (n-on-p)
Detector Bias Resolution	5 mV	External adjust.	5 mV	5 mV	6 mV	8 mV bit bias per color
RoA Min.	≥1 × 10^3 Ω·cm^2	≥1 × 10^7 Ω·cm^2	≥1 × 10^3 Ω·cm^2	>2 × 10^4 Ω·cm^2	≥1 × 10^4 Ω·cm^2	≥1 × 10^3 Ω·cm^2
Detector Capacitance Max.	≤0.5 pF	≤0.05 pF	≤0.5 pF	≤0.04 pF	≤0.1 pF	≤0.6 pF
Well Capacity (Min – Max Gain)	11.2 × 10^6 8.4 × 10^6 5.6 × 10^6 2.8 × 10^6	2.5 × 10^6 0.093 × 10^6	7.0 × 10^6 5.2 × 10^6 3.5 × 10^6 1.8 × 10^6	11 × 10^6 option 1 3.0 ± 0.5 × 10^6 option 2	6.5 × 10^6	18 × 10^6 (~24.5 × 10^6 predicted)
Input Current Min Nom Max	1 pA 1 nA 10 nA	0.01 pA 1 pA 50 nA	1 pA 1 nA 10 nA	1 pA 0.5 nA 10 nA	1 pA 0.5 nA 10 nA	20 pA 1 nA 10 nA
ROIC Noise (Min. Gain)	≤550e^-_{RMS}*	≤360e^-_{RMS}*	≤350e^-_{RMS}*	≤1279e^-_{RMS}* option 1	≤760e^-_{RMS}*	~1434e^-_{RMS} nominal*
ROIC Noise (Max. Gain)	≤350e^-_{RMS}*	≤70e^-_{RMS}*	≤200e^-_{RMS}*	≤368e^-_{RMS}* option 2	N/A	N/A
Output Range	2.5 V	2.5 V	2.5 V	3 V	2.0 V	2.5 V +/-0.2 V
Output Interface (R_{out}, C_{out})	≥100 kΩ ≤25 pF	≥100 kΩ ≤25 pF	≥100 kΩ ≤25 pF	≥100 kΩ ≤18 pF	≥100 kΩ ≤15 pF	≥100 kΩ ≤12 pF
Pixel Rate	10 MHz	10 MHz	10 MHz	12.5 MHz	12 MHz	18 MHz
Full Frame Rate (1 output)	30 Hz	30 Hz	30 Hz	>30 Hz	>30 Hz	N/A
Full Frame Rate (2 output)	58 Hz	58 Hz	55 Hz	>60 Hz	>60 Hz	N/A
Full Frame Rate (4 output)	107 Hz	107 Hz	97 Hz	>120 Hz	>120 Hz	≥120 Hz
Full Frame Rate (8 output)	N/A	N/A	N/A	N/A	N/A	≥240 Hz
Power (1 output)	≤90 mW	≤225 mW	≤90 mW	≤50 mW	≤50 mW	N/A
Power (4 output)	≤180 mW	≤325 mW	≤180 mW	≤89 mW	≤77 mW	≤235 mW
Power (8 output)	N/A	N/A	N/A	N/A	N/A	≤330 mW
	* T_{int} = 3msec, T = 80K C_{det} = 0.3pF R_oA ≥ 5 × 10^4Ω·cm^2	* T_{int} = 6msec, T = 250K Det Bias =-0.5V C_{det} = 50fF R_oA = 1×10^7Ω·cm^2	* T_{int} = 2.49msec, T = 80K C_{det} = 0.3pF R_oA ≥ 5 × 10^4Ω·cm^2	* T_{int}=3msec, T=80K C_{det} = 50fF R_oA = 2 × 10^4Ω·cm^2	* T_{int} = 3msec, T = 80K C_{det} = 0.1pF R_oA = 1 × 10^4Ω·cm^2	* T_{int} = 3.75msec, T = 80K C_{det} = 0.6 pF R_oA = 1 × 10^3Ω·cm^2

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