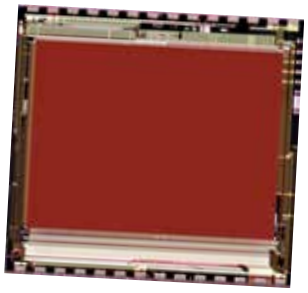


Mid-Format

Readout Integrated Circuits

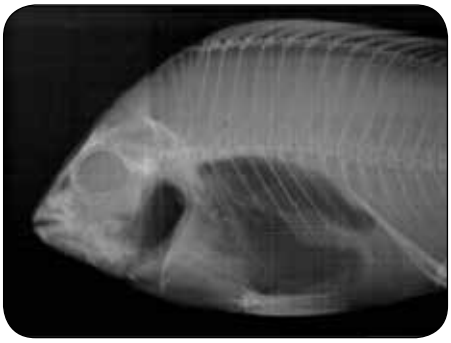
Key Features:

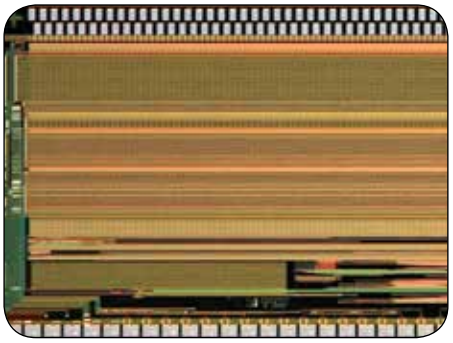
- Use in IR, visible, ultraviolet, x-ray or gamma ray imaging systems
- 2-dimensional arrays well-suited to camera products
- 320 x 256 and 384 x 288 formats available

Readout Integrated Circuits

Mega-resolution for advanced applications

If you're designing imaging systems for Infrared, Visible, Ultraviolet, X-Ray, or Gamma Ray detection, FLIR's mixed-signal Readout Integrated Circuits (ROICs) offer a proven design without the schedule, resources, and risk of a custom development. Our line of ROIC products provides an off-the-shelf solution for applications requiring low noise, variable charge storage capacitance, selectable integration times, adjustable gain and power settings, and a simple user interface.





2-Dimensional Arrays

Our family of 2-dimensional mid-format arrays includes the ISC9705, ISC9809, ISC0903, and ISC0208. These arrays make excellent imagers for camera products, and are used in many of FLIR's IR imaging systems. The ISC9809, with ultra-low noise and low background sensitivity, is ideal for spectroscopy and astronomy applications. It's also compatible with ultraviolet and visible sensors.

The ISC0903 is a two-color, dual polarity device for use with p-on-n or n-on-p detectors such as strained-layer superlattice devices. It is based on the ISC9705, so the pixel pitch is identical and interface is similar. 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.

Key Features:

- Formats include 320 x 256 and 384 x 288 elements
- Designed for use with infrared detectors including InSb, QWIP, MCT, SLS, and InGaAs
- Common electrical interfaces and features

Linear Array

Our linear array, the ISC9802, is a 512 x 1 device for photodiodes. It is ideal for use in spectroscopy systems and DWDM channel monitors.

Key Features:

- Supports both wire- and bump-bonding detector interfaces
- User-configurable as a 512 x 1, 256 x 1, or 128 x 1 array
- Low noise, low input impedance front end, correlated double sampling stage, and wide range of selectable integration capacitors

X-Ray Devices

The ISC9717, our 128 x 1 ROIC for X-Ray detection systems, offers the ultimate in flexible architecture. It supports applications involving digital radiography, mammography, fluoroscopy, angiography, tomography, non-destructive testing, or industrial instrumentation.

The ISC9717 is ideal for X-Ray medical imaging applications, from high-resolution radiography in single frame mode to fluoroscopy with frame rates up to 30 Hz.

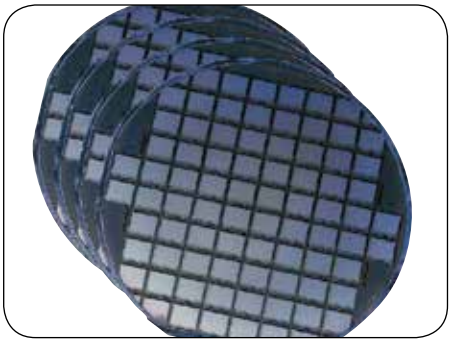
Key Features:

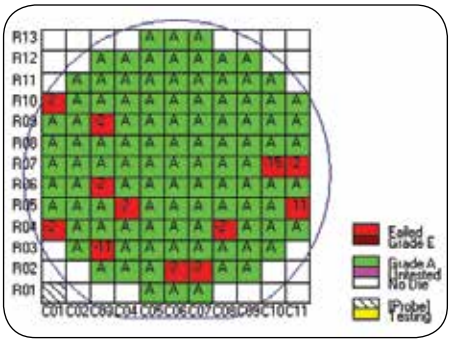
- Designed for use with Se, CsI, Si, Amorphous Si, GaAs, and CdZnTe detectors
- Adjustable parameters for integration capacitor selection, low-pass filter time constant, gain, integration mode, ADC resolution, and readout direction
- Designed for abutting multiple chips to read out large array flat panel X-Ray detector panels

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 design and fabrication of wafers.





STANDARD READOUT FUNCTIONS

	ISC9705	ISC9809	ISC0903	ISC0208	ISC9802 (linear array)	ISC9717 (linear X-Ray)
Array Size	320 × 256	320 × 256	320 × 256	384 × 288	512 × 1 (256 × 1, 128 × 1)	128 × 1
Pixel Pitch	30 µm	30 µm	30 µm	25 µm	25 µm 50 µm 100 µm	80 µm
Input Circuit	Direct Injection	CTIA	Direct Injection	Direct Injection	CTIA	CTIA
Integration Type	Snapshot mode	Snapshot mode	Snapshot mode	Snapshot mode	Snapshot mode	Snapshot mode
Integration Time	Adjustable integration time > 5 µs	Adjustable integration time > 0.5 µs*	Adjustable integration time > 100 µs	Adjustable integration time > 9.6 µs	Adjustable integration time > 0.2 µs	Adjustable integration time 24 µs to few µs
Integration Modes	Integrate-While-Read Integrate-Then-Read	Integrate-While-Read Integrate-Then-Read Non-destructive readout Continuous integ. with multiple readout	Integrate-While-Read Integrate-Then-Read	Integrate-While-Read Integrate-Then-Read	Integrate-While-Read Integrate-Then-Read	Integrate-While-Read Integrate-Then-Read
Gain Adjustment	2 bit (1, 1.3, 2, or 4x)	1 bit (1, 20x)	N/A	2 bit (1, 1.3, 2, or 4x)	3 bit integ. capacitor 2 bit CDS gain (1, 1.3, 2, or 4x)	3 bit integ. capacitor 4 bit CDS gain (1, 2, 4, 8, or 32x)
Operational Modes	"Hands-off" default, or user configurable	"Hands-off" default, or user configurable	"Hands-off" default, or user configurable	"Hands-off" default, or user configurable	"Hands-off" default, or user configurable	Programmable Low Pass Filter Programmable 9- to 14-bit ADC
Windowing	Dynamic windowing	Dynamic windowing	Dynamic windowing	Dynamic windowing	N/A	Adjacent channel averaging mode
Readout Modes	Invert [row] Revert [column] Inverse [row-column] Line repeat mode	Invert [row] Revert [column] Inverse [row-column] Line repeat mode	IInvert [row] Revert [column] Inverse [row-column]	Invert [row] Revert [column] Inverse [row-column]	N/A	N/A
Number of Outputs	Selectable 1, 2, or 4 Refer. output	Selectable 1, 2, or 4 Refer. output	Selectable 1, 2, or 4 Refer. output	Selectable 1, 2, or 4 Refer. output	1 or 2 (odd/even) for 512 Refer. output	Parallel output 9 to 14 bits (current mode)
Detector Application	p-on-n	p-on-n or n-on-p	n-on-p or p-on-n	p-on-n	p-on-n or n-on-p	Hole or e⁻ collection, direct or indirect detector interface

*Dependent on operating temperatures and internal bias and amplifier settings.

Specifications

	ISC9705	**ISC9809**	**ISC0903**	**ISC0208**	**ISC9802** (linear array)	**ISC9717** (linear array)
Array Size	320 x 256	320 x 256	320 x 256	384 x 288	512 x 1	128 x 1
Pixel Pitch	30 µm	30 µm	30 µm	25 µm	25 µm, 50 µm, 100 µm	80 µm
Operating Temperatures	77 to 310 K	77 to 310 K	65 to 300 K Stability <0.1 K	77 to 310 K	77 to 340 K	283 to 333 K
Detector Bias Range (I_{det} = 1nA)	-0.10 V to 0.5 V+ (up to 0.8 V)	0 to 2.5 V	50 mV to -800 mV (p on n) -50 mV to +800 mV (n on p)	0 to 0.5 V+	-0.25 V to 0.25 V Uniformity ≤ 250 µV	1.5 to 3.5 V
Detector Bias Resolution	5 mV	External adjust	8 mV bit bias or external adjust	5 mV	External adjust	External adjust
RoA Min.	≥1 x 10^3 Ω·cm^2	≥10 x 10^7 Ω·cm^2	≥1 x 10^3 Ω·cm^2	≥1 x 10^3 Ω·cm^2	≥1 x 10^{10} Ω·cm^2	N/A
Detector Capacitance Max.	≤0.5 pF	≤0.1 pF	≤0.6 pF	≤0.5 pF	<10 pF	≤50 pF
Well Capacity (Min-Max Gain)	18 x 10^6e$^-$ 13.5 x 10^6e$^-$ 9 x 10^6e$^-$ 4.5 x 10^6e$^-$	3.5 x 10^6e$^-$ 0.17 x 10^6e$^-$	18 x 10^6e$^-$	18.5 x 10^6e$^-$ 13.9 x 10^6e$^-$ 9.3 x 10^6e$^-$ 4.6 x 10^6e$^-$	256 x 10^6e$^-$ to 2 x 10^6e$^-$ (in 8 increments)	75 x 10^6e$^-$ to 9.3 x 10^6e$^-$ (in 8 increments)
Input Current (Nominal Operating Range)*	1 pA 1 nA 10 nA	0.01 pA 1 pA 50 nA	20 pA 1 nA 10 nA	1 pA 1 nA 20 nA	Depends on T_{int}	Depends on T_{int}
ROIC Noise (Min. Gain)	≤900e$^-_{RMS}$*	≤700e$^-_{RMS}$*	≤80 dB input referred*	≤850e$^-_{RMS}$*	≤3700e$^-_{RMS}$ (low speed)*	≤17000e$^-_{RMS}$* (low speed)*
ROIC Noise (Min. Gain)	≤600e$^-_{RMS}$*	≤70e$^-_{RMS}$*	N/A	≤570e$^-_{RMS}$*	≤100e$^-_{RMS}$ (high speed)**	≤2000e$^-_{RMS}$**
Output Range	3 V	2.7 V	<2.5 V +/-0.2 V	2.5 V	2.5 V	0.5 mA ±10%/bit
Output Interface (R_{out}, C_{out})	>100 kΩ ≤25 pF	>500 kΩ ≤25 pF	>100 kΩ ≤12 pF	>100 kΩ ≤25 pF	>100 kΩ ≤25 pF	N/A ≤30 pF
Pixel Rate	10 MHz	10 MHz	6.25 MHz	10 MHz	3.85 MHz (at 77 K) 2.7 MHz (at 300 K)	12.5 MHz
Full Frame Rate (1 output)	110 Hz	110 Hz	≥60 Hz	80 Hz	7.1 kHz (at 77 K) 5 kHz (at 300 K)	0.9 Hz for 14 bit up to 36 Hz for 9 bit
Full Frame Rate (2 outputs)	200 Hz	200 Hz	≥120 Hz	150 Hz	14 kHz (at 77 K) 9.8 kHz (at 300 K)	N/A
Full Frame Rate (4 outputs)	346 Hz	346 Hz	≥240 Hz	260 Hz	N/A	N/A
Power (1 output)	≤30 mW	≤100 mW	≤60 mW	≤75 mW	≤55 mW (256)***	≤256 mW
Power (4 outputs)	≤120 mW	≤175 mW	≤150 mW	≤160 mW	≤110 mW (512)***	≤2 mW per channel
*Dependent upon T_{int} and operating conditions	+ QWIP bias option available *T_{int} = 1 msec T = 80 K	*T_{int} = 16 msec, T = 250 K C_{det} + C_{int} = 0.126 pF R_oA ≥ 5 x 10^4Ω·cm^2	*Based on T_{int} = 3.75msec, 77 K, C_{det} = 0.6pF R_oA ≥ 1.0 x 10^3Ω·cm^2	*theoretical, no detector or system noise + QWIP bias option available	*T_{int} = 10 msec, T = 300 K, C_{det} = 0.5pF **T_{int} = 0.2 msec, T = 80 K, no CDS, ITR, C_{det} = 0.5pF *** T = 300 K (x1.4 @77K)	*C_{int} = 4pF, x1 CDS, 14 bit ADC, C_{det} = 50pF **C_{int} = 0.5pF, x32 CDS, 9 bit ADC, C_{det} = 50pF

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