



TELEDYNE FLIR
Everywhereyoulook™

ISC0309
Standard - 640 x 512

Specification

October 29, 2021

- **Version 2.00: January 30, 2014**
 - Initial Release
- **Version 2.10: October 29, 2021**
 - Update to markings and logos

ISC0309 Specification and Requirements Review (1 of 6)

ROIC PARAMETER	SPECIFICATION REQUIREMENT	COMMENTS
Array Configuration	640 x 512	
Pixel Pitch in Columns (640)	25um	
Pixel Pitch in Rows (512)	25um	
Input Polarity	P-on-N (Current Flows into Inputs)	InSb, InGaAs, HCT, QWIP
Input Configuration	Direct Injection (DI)	
Core Multiplexing Configuration	Voltage Mode	
Detector Impedance	> 1.0E3 (Ohm-cm ²)	Used for Simulation
Detector Capacitance	≤ 0.5pF	Used for Simulation

ISC0309 Specification and Requirements Review (2 of 6)

ROIC PARAMETER	SPECIFICATION REQUIREMENTS	COMMENTS												
Input Biases	VDETCOM 5.5V VPOS 5.5V VPOSOUT 5.5V VPD 5.5V VREF 1.6V VREFOUT 1.6V VNEG 0.0V VNEGOUT 0.0V VND 0.0V VOS 1.6V-5.5V	Detector Common Analog Positive Output Pos Supply Digital Positive Analog Reference Analog Output Reference Analog Negative Output Neg Supply Digital Negative Offset/Skim Supply req'd if OE=1 See Interface Definition												
Input Clocks	<table border="0"> <tr> <td><u>Name</u></td> <td><u>Vhigh to Vlow</u></td> </tr> <tr> <td>CLK</td> <td>VPD to VND</td> </tr> <tr> <td>LSYNC</td> <td>VPD to VND</td> </tr> <tr> <td>FSYNC</td> <td>VPD to VND</td> </tr> <tr> <td>DATA</td> <td>VPD to VND</td> </tr> <tr> <td>FIELD</td> <td>VPD to VND</td> </tr> </table>	<u>Name</u>	<u>Vhigh to Vlow</u>	CLK	VPD to VND	LSYNC	VPD to VND	FSYNC	VPD to VND	DATA	VPD to VND	FIELD	VPD to VND	Master Clock Line Sync Frame Sync (Integ. Control) Mode Control Interlace Field Sync
<u>Name</u>	<u>Vhigh to Vlow</u>													
CLK	VPD to VND													
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Input Clock Rise and Fall	10% to 90% in 10nS													
Outputs	Selectable 1,2, or 4 with Reference Output													
Output Interface	> 100k Ohms ≤ 25 Pf													
Output Voltage Swing	4.1V ± 0.2V to 1.6V ± 0.2V (2.5V Swing))	Default mode T=300k 2.6V Typical												

ISC0309 Specification and Requirements Review (3 of 6)

ROIC PARAMETER	SPECIFICATION REQUIREMENTS	COMMENTS
Power	< 90mW Single Output PAL / NTSC < 180mW 4 Output Mode at max frame rate	Power controllable using external bias or on-chip DAC
Control Register Functions	Programmable Test I/O Power Control Master Current Gain Select Skimming Enable Detector Bias Adj. Invert/Revert Windowing 1, 2, or 4 Outputs Interlace Read Out Integration Mode Reference Output Enable Global Reset	
Programmable Test	Test Row Input Unit Cell Test Injection VET Circuit	
Detector Bias Adjust	0 - 500mV reverse bias @ nominal current (1nA) ~ 5mV resolution	

ISC0309 Specification and Requirements Review (4 of 6)

ROIC PARAMETER	SPECIFICATION REQUIREMENTS	COMMENTS																																																												
Input Current Min Nominal Max	1 pA 1.0 nA 10 nA	Simulation Range																																																												
Gain Control	For ISC0309-1 <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2"></th> <th colspan="3" style="text-align: center;">Rel.</th> </tr> <tr> <th style="text-align: left;">G1</th> <th style="text-align: left;">G0</th> <th style="text-align: left;">uV/e-</th> <th style="text-align: left;">Gain</th> <th style="text-align: left;">Max e-</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0.29</td> <td>1.0*</td> <td>11.2M *</td> </tr> <tr> <td>0</td> <td>1</td> <td>0.39</td> <td>1.33</td> <td>8.4M</td> </tr> <tr> <td>1</td> <td>0</td> <td>0.59</td> <td>2.0</td> <td>5.6M</td> </tr> <tr> <td>1</td> <td>1</td> <td>1.17</td> <td>4.0</td> <td>2.8M</td> </tr> </tbody> </table> *Default Gain Setting			Rel.			G1	G0	uV/e-	Gain	Max e-	0	0	0.29	1.0*	11.2M *	0	1	0.39	1.33	8.4M	1	0	0.59	2.0	5.6M	1	1	1.17	4.0	2.8M	For ISC0309-2 <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2"></th> <th colspan="3" style="text-align: center;">Rel.</th> </tr> <tr> <th style="text-align: left;">G1</th> <th style="text-align: left;">G0</th> <th style="text-align: left;">uV/e-</th> <th style="text-align: left;">Gain</th> <th style="text-align: left;">Max e-</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>1.24</td> <td>1.0*</td> <td>3.2M *</td> </tr> <tr> <td>0</td> <td>1</td> <td>1.65</td> <td>1.33</td> <td>2.4M</td> </tr> <tr> <td>1</td> <td>0</td> <td>2.48</td> <td>2.0</td> <td>1.6M</td> </tr> <tr> <td>1</td> <td>1</td> <td>4.95</td> <td>4.0</td> <td>0.8M</td> </tr> </tbody> </table> *Default Gain Setting			Rel.			G1	G0	uV/e-	Gain	Max e-	0	0	1.24	1.0*	3.2M *	0	1	1.65	1.33	2.4M	1	0	2.48	2.0	1.6M	1	1	4.95	4.0	0.8M
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Input Charge Handling	> 11x10 ⁶ carriers (350fF @ 5.1V) (0309-1)	>3x10 ⁶ carriers (100fF @ 5.1V) (0309-2)																																																												
Transimpedance Non-Linearity	< ± 0.5% from least squares line fit	Output Voltage vs. Tint Typical ± 0.1%, Max Dev. from least squares fit over 10% to 80% of full range																																																												
Noise	For ISC0309-1, At 80Kelvin, Without Detector or System Noise <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2"></th> <th style="text-align: center;">Output Noise</th> <th style="text-align: center;">Input Noise</th> </tr> <tr> <th style="text-align: left;">G1</th> <th style="text-align: left;">G0</th> <th style="text-align: left;">e-</th> <th style="text-align: left;">e-</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>160uV</td> <td>550</td> </tr> <tr> <td>0</td> <td>1</td> <td>180uV</td> <td>460</td> </tr> <tr> <td>1</td> <td>0</td> <td>235uV</td> <td>400</td> </tr> <tr> <td>1</td> <td>1</td> <td>400uV</td> <td>345</td> </tr> </tbody> </table>			Output Noise	Input Noise	G1	G0	e-	e-	0	0	160uV	550	0	1	180uV	460	1	0	235uV	400	1	1	400uV	345	ISC0309-2, At 300Kelvin, Without Detector or System Noise <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2"></th> <th style="text-align: center;">Output Noise</th> <th style="text-align: center;">Input Noise</th> </tr> <tr> <th style="text-align: left;">G1</th> <th style="text-align: left;">G0</th> <th style="text-align: left;">e-</th> <th style="text-align: left;">e-</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>510uV</td> <td>490</td> </tr> <tr> <td>0</td> <td>1</td> <td>610uV</td> <td>450</td> </tr> <tr> <td>1</td> <td>0</td> <td>830uV</td> <td>410</td> </tr> <tr> <td>1</td> <td>1</td> <td>1530uV</td> <td>380</td> </tr> </tbody> </table>			Output Noise	Input Noise	G1	G0	e-	e-	0	0	510uV	490	0	1	610uV	450	1	0	830uV	410	1	1	1530uV	380												
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ISC0309 Specification and Requirements Review (5 of 6)

ROIC PARAMETER	SPECIFICATION REQUIREMENTS	COMMENTS
Column Output Order Output A Output B Output C Output D	Column 0,4,...,636 Column 1,5,...,637 Column 2,6,...,638 Column 3,7,...,639	Four Output Mode Normal Readout Direction
Column Output Order Output A Output B	Column 0,2,4,6,...,638 Column 1,3,5,7,...,639	Two Output Mode Normal Readout Direction
Column Output Order Output A	0,1,2,3,4,...,639	Single Output Mode Normal Readout Direction
Invert / Revert	Reverse Order of Rows and/or Columns	Select using Control Register
Temperature Sensor	0.7V +/- 0.05V @ 300K 1.070V +/- 0.05V at 78K	Test/Temp Pad

ISC0309 Specification and Requirements Review (6 of 6)

ROIC PARAMETER	SPECIFICATION REQUIREMENTS	COMMENTS
Frame Rate Pixel Rate 10MHZ	4 Output - 107 FPS 2 Output - 58 FPS 1 Output - 30 FPS	640 X 480 (Non-interlace) IWR @ 80K, Maximum Power
Data Valid / Settling Time	Settle to 0.1% @ T=80K in $\leq 65\text{ns}$ Settle to 0.39% @ T=300K in $\leq 65\text{ns}$	55ns Typical, Single output
Adjacent Pixel Crosstalk	$< 0.1\%$ @ T=80K $< 0.39\%$ @ T=300K	
Non-Adjacent Pixel Crosstalk	$< 0.05\%$ @ T=80K $< 0.2\%$ @ T=300K	
Minimum Window Size (Max Frame Rate)	≥ 32 columns X 8 Rows ≥ 64 columns X 8 Rows ≥ 128 columns X 8 Rows	1 Output Mode (14.16KFPS) 2 Output Mode (14.16KFPS) 4 Output Mode (14.16KFPS) Non-Interlaced, IWR, 10MHz @ 80k, Maximum Power