SONY

对角线 8.2 毫米 (类型 1/2) 带方形像素的 SWIR 图像传感器

暂定

IMX990-AABA-C

SenSWIR

描述

IMX990-AABA-C 是一款对角线长 8.2 毫米(1/2 型)CMOS 有源像素型固态图像传感器,具有方形像素阵列和 1.31 M 有效像素。该芯片具有可变电荷积分时间的全局快门。该芯片具有宽波段($0.4~\mu$ m 至 $1.7~\mu$ m),具有高灵敏度、高分辨率、低暗电流和低功耗。

(应用: FA 相机、科学研究)

特点

CMOS有源像素类型点可见光+SWIR宽带传感器(0.4µm至1.7µm) 内置时序调整电路、H/V驱动器和串行通信电路全局快门功能 输入频率

37.125 MHz / 74.25 MHz / 54 MHz

◆建议记录像素数:1280(H)×1024(V),约131万像素

读出模式

全像素扫描模式

垂直/水平 1/2 子采样模式

ROI 模式

垂直/水平正常/反转读出模式

- ◆8-bit / 10-bit / 12-bit A/D转换器
- ◆ 读出率

全像素扫描模式下最大帧率:8bit:134.73帧/秒,10bit:125.27帧/秒,12bit:71.53帧/秒

◆ 变速快门功能(分辨率1H单位)

PGA功能

0 dB 至 18 dB:模拟增益(0.1 dB 步进)

18.1 dB 至 42 dB:模拟增益:18 dB+数字增益:0.1 dB 至 24 dB(0.1 dB 步进)

◆I/O 接口

SLVS(2通道/4通道切换)输出

- ◆建议出瞳距离:-100 mm 至 -∞
- ◆内置数字温度计
- ◆内置热电冷却器

*本文档中的登记内容可能会发生改变。

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设备结构

SWIR图像传感器

图像尺寸

对角线 8.2mm (1/2型) 约 131 万像素

总像素数

1392 (H) x 1056 (V) 约 147 万像素

有效像素数

1296 (H) x 1032 (V) 约 134 万像素

有效像素数

1296 (H) x 1032 (V) 约 134 万像素

建议记录像素数

1280 (H) x 1024 (V) 约 131 万像素

晶胞尺寸

 $5 \mu m (H) \times 5 \mu m (V)$

光学黑色

水平(H)方向:前0像素,后96像素 垂直(V)方向:前24像素,后0像素

基板材料

硅 FPA材料

InGaAs

绝对最大额定值

Item	Symbol		Rating			Remarks
Supply voltage (Analog 3.3 V)	AV _{DD1}	-0.3	to	+4.0	V	
Supply voltage (Analog 2.2 V)	AV _{DD2}	-0.3	to	+4.0	V	
Supply voltage (Interface 1.8 V)	OV _{DD}	-0.3	to	+3.3	V	
Supply voltage (Digital 1.2 V)	DV _{DD}	-0.3	to	+2.0	V	
Supply voltage (Pixel 2.2V)	TV _{DD}	-0.3	to	+3.0	V	VDDFM
Supply voltage (Pixel 1.2V)	BV _{DD}	-0.3	То	+2.0	V	VDDDR
Input voltage	VI	-0.3	to	OV _{DD} +0.3	V	Not exceed 3.3 V
Output voltage	VO	-0.3	to	OV _{DD} +0.3	V	Not exceed 3.3 V
Operating temperature	Topr1	0	to	+75	°C	Built-in digital thermometer output value
operating temperature	Topr2	0	to	+75	°C	Та
Storage temperature	Tstg	-40	to	+85	°C	
Thermoelectric cooler voltage	Vcooler	-9.6	to	+9.6	V	Voltage difference between PE1A and PE1B
Thermoelectric cooler current	Icooler	-1.8	to	+1.8	Α	Current from PE1A to PE1B

建议工作条件

Item	Symbol	Min.	Тур.	Max.	Unit
Supply voltage (Analog 3.3 V)	AV _{DD1}	3.15	3.30	3.45	V
Supply voltage (Analog 2.2 V)	AV _{DD2}	2.10	2.20	2.30	V
Supply voltage (Interface 1.8 V)	OV_DD	1.70	1.80	1.90	V
Supply voltage (Digital 1.2 V)	DV _{DD}	1.10	1.20	1.30	V
Supply voltage (Pixel 2.2V)	TVdd	2.15	2.20	2.25	V
Supply voltage (Pixel 1.2V)	BVdd	1.15	1.20	1.25	V
Performance guarantee temperature	Tspec	_	+15 [*]	_	°C

^{*}内置数字温度计输出值

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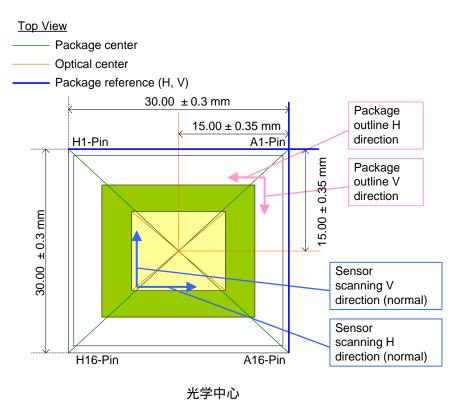
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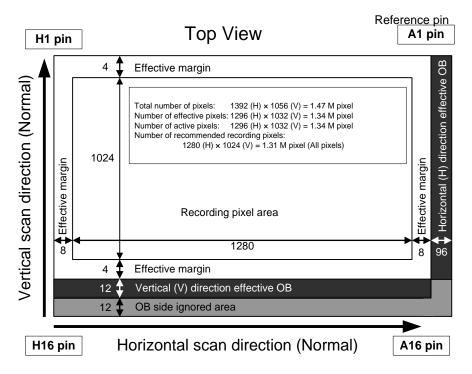
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Sequential Write Starting from Random Location	
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Chip ID = 02 (Write: Chip ID = 02h, Read: Chip ID = 82h, I ² C: 30**h)	
Chip ID = 03 (Write: Chip ID = 03h, Read: Chip ID = 83h, I ² C: 31**h)	
Chip ID = 04 (Write: Chip ID = 04h, Read: Chip ID = 84h, I ² C: 32**h)	
Chip ID = 05 (Write: Chip ID = 05h, Read: Chip ID = 85h, I ² C: 33**h)	
Chip ID = 06 (Write: Chip ID = 06h, Read: Chip ID = 86h, I ² C: 34**h)	
Chip ID = 07 (Write: Chip ID = 07h, Read: Chip ID = 87h, I ² C: 35**h)	
Chip ID = 08 (Write: Chip ID = 08h, Read: Chip ID = 88h, I ² C: 36**h)	
Chip ID = 09 (Write: Chip ID = 09h, Read: Chip ID = 89h, I ² C: 37**h)	
Chip ID = 0A (Write: Chip ID = 0Ah, Read: Chip ID = 8Ah, I ² C: 38**h)	
Chip ID = 0B (Write: Chip ID = 0Bh, Read: Chip ID = 8Bh, I ² C: 39**h)	
Chip ID = 0C (Write: Chip ID = 0Ch, Read: Chip ID = 8Ch, I ² C: 3A**h)	
Chip ID = 10 (Write: Chip ID = 10h, Read: Chip ID = 90h, I ² C: 3E**h)	
Chip ID = 11 (Write: Chip ID = 11h, Read: Chip ID = 91h, I ² C: 3F**h)	
Chip ID = 12 (Write: Chip ID = 12h, Read: Chip ID = 92h, I ² C: 40**h)	
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Chip ID = 16 (Write: Chip ID = 16h, Read: Chip ID = 96h, I ² C: 44**h)	
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芯片中心和光学中心 (待定)



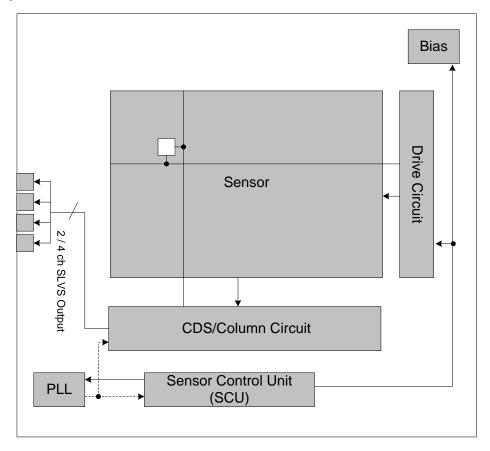
像素排列



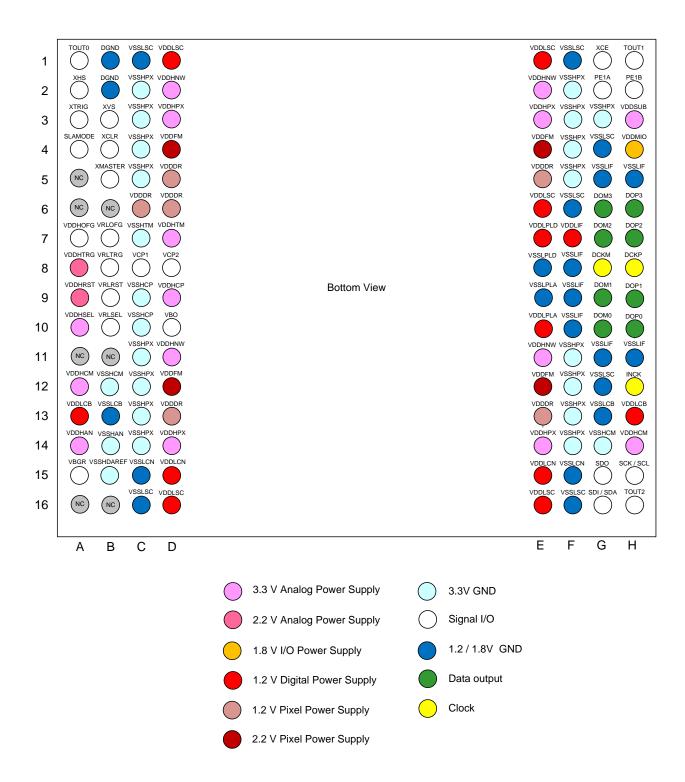
像素排列

框图和引脚配置

(Top View)



框图



引脚配置

引脚描述

No.	Pin No.	I/O	Analog / Digital	Symbol	Description
1	A1	0	D	TOUT0	Pulse0 output pin
2	A2	I/O	D	XHS	Horizontal sync signal
3	A3	1	D	XTRIG	Trigger input 1
4	A4	I	D	SLAMODE	Slave address select (37h: High, 36h: Low, 1Ah: both polarities)
5	A5	_	_	N.C.	_
6	A6	_	_	N.C.	_
7	A7	Power	Α	VDDHOFG	connect to VBO
8	A8	Power	Α	VDDHTRG	2.2 V power supply
9	A9	Power	Α	VDDHRST	2.2 V power supply
10	A10	Power	Α	VDDHSEL	3.3 V power supply
11	A11		_	N.C.	_
12	A12	Power	Α	VDDHCM	3.3 V power supply
13	A13	Power	Α	VDDLCB	1.2 V power supply
14	A14	Power	Α	VDDHAN	3.3 V power supply
15	A15	0	Α	VBGR	Connect to 0.22 µF to GND
16	A16			N.C.	_
17	B1			DGND	Connect to 1.2V GND
18	B2			DGND	Connect to 1.2V GND
<u>19</u>	B3	I/O	D	XVS	Vertical sync signal
20	B4		<u>D</u>	XCLR	System clear (Normal: High, Clear: Low)
21	B5	ı	D	XMASTER	Master / Slave select
22	B6			N.C.	Connect to VCD4
23 24	B7 B8	1	<u>А</u> А	VRLOFG VRLTRG	Connect to VCP1 Connect to VCP1
	B9	1			Connect to VCP1
25 26	B10		A A	VRLRST VRLSEL	Connect to VCP1
27	B10			N.C.	Connect to VCF2
28	B12	GND	A	VSSHCM	3.3 V GND
29	B13	GND	A	VSSLCB	1.2 V GND
30	B14	GND	A	VSSHAN	3.3 V GND
31	B15	GND	A	VSSHDAREF	3.3 V GND
32	B16	_	_	N.C.	_
33	C1	GND	D	VSSLSC	1.2 V GND
34	C2	GND	Α	VSSHPX	3.3 V GND
35	C3	GND	Α	VSSHPX	3.3 V GND
36	C4	GND	Α	VSSHPX	3.3 V GND
37	C5	GND	Α	VSSHPX	3.3 V GND
38	C6	Power	Α	VDDDR	1.2 V pixel power supply
39	C7	GND	Α	VSSHTM	3.3 V GND
40	C8	0	Α	VCP1	Connect to VRLOFG, VRLRST, VRLTRG
					(Connect to 4.7 µF × 2 to GND)
41	C9	GND	Α .	VSSHCP	3.3 V GND
42	C10	GND	A	VSSHCP	3.3 V GND
43	C11	GND	A	VSSHPX	3.3 V GND
44 45	C12 C13	GND GND	<u>А</u> А	VSSHPX VSSHPX	3.3 V GND 3.3 V GND
46	C14	GND	A	VSSHPX	3.3 V GND
47	C14	GND	A	VSSLCN	1.2 V GND
48	C16	GND	D	VSSLSC	1.2 V GND
49	D1	Power	D	VDDLSC	1.2 V power supply
50	D2	Power	A	VDDHNW	3.3 V power supply
51	D3	Power	A	VDDHPX	3.3 V power supply
52	D4	Power	А	VDDFM	2.2 V pixel power supply
53	D5	Power	А	VDDDR	1.2 V pixel power supply
54	D6	Power	Α	VDDDR	1.2 V pixel power supply
55	D7	Power	А	VDDHTM	3.3 V power supply
56	D8	0	А	VCP2	Connect to VRLSEL
					(Connect to 4.7 µF × 2 to GND)
57	D9	Power	Α	VDDHCP	3.3 V power supply
58	D10	0	Α	VBO	Connect to VDDHOFG
					(Connect to 4.7 µF × 2 to GND)
59	D11	Power	Α	VDDHNW	3.3 V power supply

No. Pin No. I/O	61	D12	Power		VDDEM	
Care				, ,	VDDFIVI	2.2 v pixor porror cappry
63 D15 Power D VDDLCN 1.2 V power supply 64 D16 Power D VDDLSC 1.2 V power supply 65 E1 Power D VDDLSC 1.2 V power supply 66 E2 Power A VDDHNW 3.3 V power supply 67 E3 Power A VDDPM 3.3 V power supply 68 E4 Power A VDDPM 2.2 V pixel power supply 69 E5 Power A VDDDRD 1.2 V power supply 70 E6 Power D VDDLPLD 1.2 V power supply 71 E7 Power D VDDLPLD 1.2 V gnD 71 E7 Power D VDDLPLD 1.2 V gnD 71 E7 Power D VDDLPLD 1.2 V gnD 71 E10 Power D VDDLPM 1.2 V gower supply 72 E8 GND D VSSLPLA 1.	00	D13	Power	Α		1.2 V pixel power supply
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72 E8 GND D VSSLPLD 1.2 V GND 73 E9 GND D VSSLPLA 1.2 V GND 74 E10 Power D VDDLPLA 1.2 V power supply 75 E11 Power A VDDFM 2.2 V pixel power supply 76 E12 Power A VDDFM 2.2 V pixel power supply 77 E13 Power A VDDDR 1.2 V pixel power supply 78 E14 Power A VDDLCN 1.2 V power supply 79 E15 Power D VDDLCN 1.2 V power supply 80 E16 Power D VDDLSC 1.2 V power supply 81 F1 GND D VSSLSC 1.2 V GND 82 F2 GND A VSSHPX 3.3 V GND 83 F3 GND A VSSHPX 3.3 V GND 85 F5 GND A VSSHPX 3.3 V GND						
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104 G8 O D DCKM Digital output timing clock 105 G9 O D DOM1 SLVS IF output (Data)						
105 G9 O D DOM1 SLVS IF output (Data)						
						0 1 0
106 G10 O D DOM0 SLVS IF output (Data)	106	G10	0	D	DOM0	SLVS IF output (Data)
107 G11 GND D VSSLIF 1.2 V GND						. ,
108 G12 GND D VSSLSC 1.2 V GND						1.2 V GND
109 G13 GND A VSSLCB 1.2 V GND	109	G13		A		1.2 V GND
110 G14 GND A VSSHCM 3.3 V GND						
	111	G15	0	D	SDO	4-wire: Serial communication I/F SDO pin I2C: OPEN
112 G16 I/O D SDI / SDA 4-wire: Serial communication I/F SDI pin 12C: Serial data line			I/O	D		12C: Serial data line
113 H1 O D TOUT1 Pulse1 output pin			0			
114 H2 I A PE1B Built-in thermoelectric cooler pin (-)			I			,
115 H3 Power A VDDSUB 3.3 V power supply						
116 H4 Power D VDDMIO 1.8 V power supply						
117 H5 GND D VSSLIF 1.2 V GND						
118 H6 O D DOP3 SLVS IF output (Data) 119 H7 O D DOP2 SLVS IF output (Data)						
120 H8 O D DCKP Digital output timing clock						
121 H9 O D DOP1 SLVS IF output (Data)						
122 H10 O D DOPO SLVS IF output (Data)						
123 H11 GND D VSSLIF 1.2 V GND						
	123				INCK	Master clock input

No.	Pin No.	I/O	Analog / Digital	Symbol	Description		
125	H13	Power	Α	VDDLCB	1.2 V power supply		
126	H14	Power	Α	VDDHCM	3.3 V power supply		
127	H15		D	SCK / SCL	4 - wire: Serial communication I/F SCK pin I2C: Serial clock line"		
128	H16	0	D	TOUT2	Pulse2 output pin		

^{*} 上表中的 N.C. 引脚在电路板上应保持开路。

电气特性

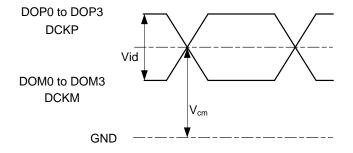
直流特性

11	em	Pins	Symbol	Conditions	Min.	Тур.	Max.	Unit
	Analog (3.3 V)	V _{DD} Hx*1	AV _{DD1}	_	3.15	3.30	3.45	V
	Analog (2.2 V)	VDDHTRG, VDDHRST	AV _{DD2}	_	2.1	2.2	2.3	V
Supply	Interface	V _{DD} Mx	OV _{DD}	_	1.70	1.80	1.90	V
voltage	Digital	V _{DD} Lx	DV _{DD}	_	1.10	1.20	1.30	V
	Pixel (2.2 V)	VDDFM	TV _{DD}	_	2.15	2.20	2.25	٧
	Pixel (1.2 V)	VDDDR	BV _{DD}	_	1.15	1.20	1.25	V
Digital input voltage		XHS XVS XCLR INCK		XVS / XHS	0.7 × OV _{DD}	_	_	V
		SLAMODE SCK SDI XCE XTRIG	VIL	in Slave mode	_	_	0.3 × OV _{DD}	>
Digital output voltage		XHS XVS SDO	VOH	XVS / XHS	OV _{DD} -0.4	_	_	V
		TOUT0 TOUT1 TOUT2	VOL	in Master mode	_	_	0.4	V

^{*1} 除 VDDHTRG 和 VDDHRST 外

SLVS 输出直流特性

单端输出



SLVS(单端输出)特性定义

Symbol	Item	Min.	Тур.	Max.	Unit	Remarks
Ro	Sensor output impedance	30	_	65	Ω	_
Vcm	Voltage center	150	_	250	mV	*1
Vid	Differential voltage	140	_	300	mV	*1

^{*1} Rin = 100Ω .

SONY IMX990-AABA-C

功耗

Item	Pins	Symbol	Тур.	Max.	Unit
Operating current	V _{DD} H *1	IAV _{DD1}	62	150	mA
SLVS 4 ch	VDDHRST VDDHTRG	IAV _{DD2}	1 *²	2 *2	mA
10 bit 120.27 Hamo/5	V _{DD} M	IOV _{DD}	1	2	mA
	V _{DD} L	IDV_{DD}	140	240	mA
	VDDFM	ITV _{DD}	1	2	mA
	VDDDR	IBV _{DD}	1	2	mA
Standby current	V _{DD} H *1	IAV _{DD1} _STB	_	1	mA
	VDDHRST VDDHTRG	IAV _{DD2} STB	_	0.1 *2	mA
	$V_{DD}M$	IOV _{DD} _STB	_	0.1	mA
	V _{DD} L	IDV _{DD} _STB	_	10	mA
	VDDFM	ITV _{DD} _STB	_	0.1	mA
	VDDDR	IBV _{DD} _STB	_	0.1	mA

^{*1} 除 VDDHTRG 和 VDDHRST 外

工作电流:

(典型值条件): Supply voltage: 3.30 V / 2.20 V / 1.80 V / 1.20 V / 2.2 V / 1.2 V, Tj = $15 \,^{\circ}\text{C}$ (最大值条件): Supply voltage: 3.45 V / 2.30 V / 1.90 V / 1.30 V / 2.25 V / 1.25 V, Tj = 15 °C 内部电路工作电流消耗的最坏状态。

待机电流:

(最大值条件): Supply voltage: 3.45 V / 2.30 V / 1.90 V / 1.30 V / 2.25 V / 1.25 V, Ta = $15 \,^{\circ}\text{C}$,

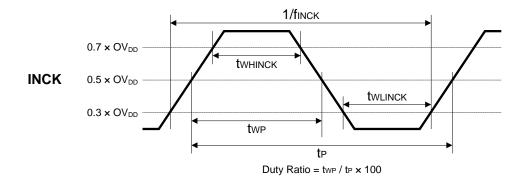
INCK = 0 V, 热电冷却器关闭 设备处于光线遮挡状态。

^{*2} VDDHTRG 和 VDDHRST 之和

SONY

交流特性

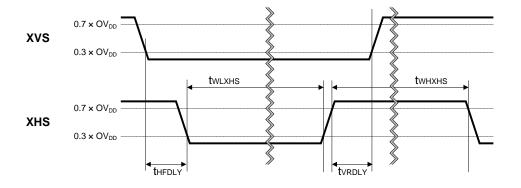
主时钟(INCK)波形图



Item	Symbol	Min.	Тур.	Max.	Unit	Remarks
INCK clock frequency	f _{INCK}	f _{INCK} × 0.96	f _{INCK}	f _{INCK} × 1.02	MHz	f _{INCK} = 37.125 MHz, 74.25 MHz, 54 MHz
INCK Low level pulse width	t _{WLINCK}	4	_	_	ns	
INCK High level pulse width	t _{WHINCK}	4	_	_	ns	
INCK clock duty	_	40.0	50.0	60.0	%	Define with 0.5 × OV _{DD}

^{*}INCK 波动会影响帧速率

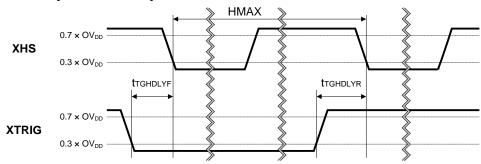
从属模式下的 XVS/XHS 输入特性 (XMASTER = 高)



Item	Symbol	Min.	Тур.	Max.	Unit
XHS Low level pulse width	twlxHs	4/finck	_	_	ns
XHS High level pulse width	twnxns	4/finck	_	_	ns
XVS - XHS fall width	t _{HFDLY}	1/f _{INCK}	_	_	ns
XHS - XVS rise width	tvrdly	1/finck	_	_	ns

在主模式下,无法通过 CVS 和 CHS 信号进行同步。检测同步代码。

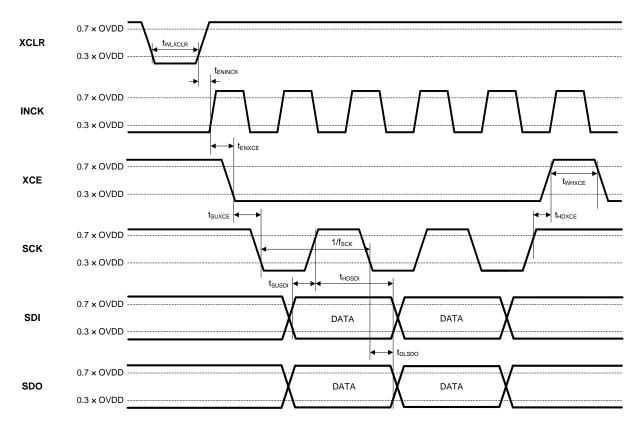
仅限从属模式 (XMASTER = 高) 下的 XTRIG 输入特性



Item	Symbol	Min.	Тур.	Max.	Unit
XTRIG fall - XHS fall width	t _{TGHDLYF}	10	_	HMAX-10	INCK
XTRIG rise - XHS fall width	t _{TGHDLYR}	10	_	HMAX-10	INCK

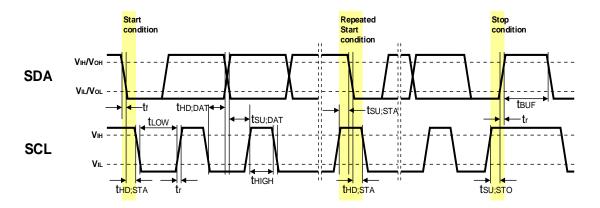
串行通信

4-wire



Item	Symbol	Min.	Тур.	Max.	Unit	Remarks
SCK clock frequency	f _{SCK}	_	_	13.5	MHz	
XCLR Low level pulse width	twlxclr	4/f _{INCK}	_	_	ns	
INCK effective margin	t _{ENINCK}	1	_	_	μs	
XCE effective margin	t _{ENXCE}	20	_	_	μs	
XCE input setup time	tsuxce	20	_	_	ns	
XCE input hold time	thoxce	20	_	_	ns	
XCE High level pulse width	twhxce	20	_	_	ns	
SDI input setup time	tsuspi	10	_	_	ns	
SDI input hold time	thospi	10	_	_	ns	
SDO output delay time	tolsdo	0	_	25	ns	Output load capacitance: 20 pF

 I^2C



I²C规格

Item	Symbol	Min.	Тур.	Max.	Unit	Remarks
Low level input voltage	V _{IL}	-0.3	-	$0.3 \times OV_{DD}$	V	
High level input voltage	V _{IH}	0.7 × OV _{DD}	_	1.9	V	
Low level output voltage	V _{OL}	0	_	0.2 x OV _{DD}	V	OV _{DD} < 2 V, Sink 3 mA
High level output voltage	V _{OH}	0.8 × OV _{DD}	1	_	V	
Output fall time	tof	_	_	250	ns	Load 10 pF - 400 pF, $0.7 \times OV_{DD} - 0.3 \times OV_{DD}$
Input current	li	-10	_	10	μΑ	$0.1 \times OV_{DD} - 0.9 \times OV_{DD}$
Capacitance for SCK (/SCL) , SDI (/SDA)	Ci	_		10	pF	

I²C 交流特性

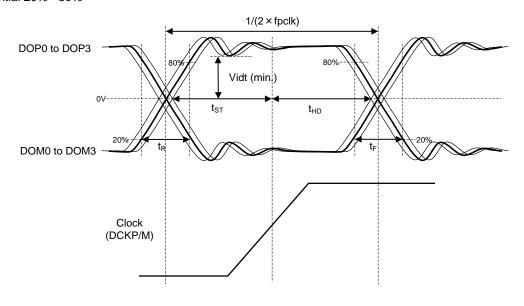
Item	Symbol	Min.	Тур.	Max.	Unit
SCL clock frequency	f _{SCL}	0	_	400	kHz
Hold time (Start Condition)	t _{HDSTA}	0.6	_	_	μs
Low period of the SCL clock	t _{LOW}	1.3	ı	_	μs
High period of the SCL clock	t _{HIGH}	0.6	_	_	μs
Set-up time (Repeated Start Condition)	t _{SUSTA}	0.6	_	_	μs
Data hold time	t _{HDDAT}	0	_	0.9	μs
Data set-up time	t _{SUDAT}	100	ı	_	ns
Rise time of both SDA and SCL signals	t _R	_	_	300	ns
Fall time of both SDA and SCL signals	t _F	_		300	ns
Set-up time (Stop Condition)	t _{susto}	0.6	_	_	μs
Bus free time between a Stop and Start Condition	t _{BUF}	1.3	_	_	μs

SLVS 输出交流特性

Symbol	Item	Min.	Тур.	Max.	Unit	Remarks
f _{clk}	Output frequency	_	594	_	Mbps	_
f _{pclk}	Clock frequency	_	297	_	MHz	_
t _{ST}	Setup time	505	_	_	ps	*1
t _{HD}	Hold time	505	_	_	ps	*1
t _R	DOP/DOM rise time	_	_	300	ps	*1, *2
t _F	DOP/DOM fall time	_	_	300	ps	*1, *2
Vidt	Differential voltage	140	_	_	mV	*1

 $^{^{\}star 1}$ Rin = 100Ω

^{*2} Differential 20% - 80%



SLVS 特征定义

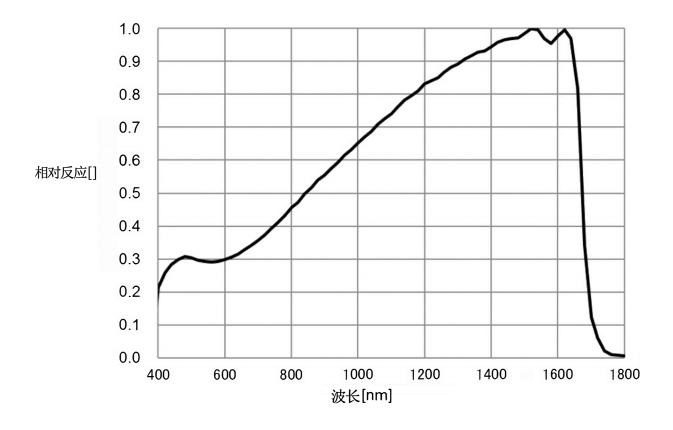
I/O 等效电路图

☐ : External pin

Symbol	Equivalent circuit	Symbol	Equivalent circuit
INCK	VSSMx	XVS XHS	Digital I/O VSSMx
XCLR XCE XMASTER XTRIG SLAMODE	Digital input VSSMx	SDI / SDA SCK / SCL	Digital I/O VSSMx
SDO	Digital output VSSMx	VBO VDDHOFG	Analog I/O VSSHx
VCP1 VCP2	Analog I/O VSSHx	VRLOFG VRLTRX VRLTRY VRLSEL VRLTRG	Analog I/O VSSHx
VBGR	Analog I/O VSSHx	DOPx DOMx DCKP DCKM x:0 to 3	Data output VSSLx

光谱灵敏度特性

(Tj = 15 °C, 封装状态的特征)



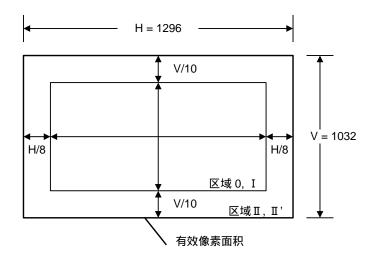
图像传感器特性

(AV_{DD1} = 3.3 V, AV_{DD2} = 2.2 V, TV_{DD} = 2.2 V, BV_{DD} = 1.2 V, OV_{DD} = 1.8 V, DV_{DD} = 1.2 V, 全像素扫描模式, AD: 10 bit, Tj = 15 $^{\circ}$ C, Gain = 0 dB)

项	Symbol	Min.	Тур.	Max.	Unit	measurement method	Remarks
敏感度	S	291 (102.7)	343 (121)	_	Digit (mV)	1	1/30 s storage
饱和信号	Vsat2D	1022 (361*1)	_	_	Digit (mV)	2	Zone 0 ~ II'
视频信号遮蔽	SH01	_	_	20	%	3	Zone 0, I
12000 ID TO DESMIX	SH2D	_	_	25	%	3	Zone 0 ~ II'
暗信号	Vdt	_	_	2.83 (1.0)	Digit (mV)	4	1/30 s storage
暗信号阴影	ΔVdt	_	_	4.53 (1.6)	Digit (mV)	5	1/30 s storage

- - 2. 视频信号阴影是在晶圆状态下测量的值,并不包含密封玻璃的特性。

视频信号阴影区域定义



^{*1} 如果是 8 位,则 Vsat2D 变为 10 位时的 1/4。

图像传感器特性测量方法

测量条件

在以下测量中,器件的驱动条件采用偏置条件和时钟电压条件的典型值。在以下测量中,排除坏点像素,除非另有说明,否则信号输出参考使用光学黑(OB)电平,并将其作为测量系统的信号输出值。

标准成像条件的定义

◆标准成像条件I:

使用波长为1550 nm、半高全宽为50 nm的光源,传感器表面的辐照度为12.0 mW/m²,传感器表面的光均匀性在± 2.5%以内,在F = 8.0环境下进行测量。

◆标准成像条件II:

使用波长为1550 nm、半高全宽为50 nm的光源,传感器表面的光均匀性在±2.5%以内。在每个测试项目中,调整传感器表面的辐照度。

测量方法

1. 敏感度

将测量条件设置为标准成像条件 I。在将电子快门模式设置为 1/30 秒的快门速度后,测量屏幕中心的信号输出 (S)。

2. 饱和信号

将测量条件设置为标准成像条件 II。在将光强度调整为信号输出平均值 121 mV 的 10 倍后,测量信号输出的最小值。

3. 视频信号阴影

将测量条件设置为标准成像条件 I。在将电子快门模式设置为 1/30 秒的快门速度后,测量信号输出的平均值 (Vave [mV])、最大值 (Vmax [mV]) 和最小值 (Vmin [mV]),并将这些值代入以下公式:

 $SH = (Vmax - Vmin) / Vave \times 100 [\%]$

4. 暗信号

在设备结温为 15°C 且设备处于遮光状态下,将在每秒3帧下1/3秒积分和每秒30帧下1/30秒积分之间的输出差除以9,并计算转换为1/30秒积分的信号输出。测量该输出的平均值 (Vdt [mV])。

5. 暗信号阴影

在设备结温为 15° C 且设备处于遮光状态下,测量转换为1/30秒积分的暗信号输出的最大值 (Vdmax [mV]) 和最小值 (Vdmin [mV])。测量值代入以下公式:

 $\Delta Vdt = Vdmax - Vdmin [mV]$

使用串行通信设置寄存器

设置寄存器描述 (4线)

串行数据输入顺序为低位优先传输。下表显示了各种数据类型及其描述。

串行数据传输顺序

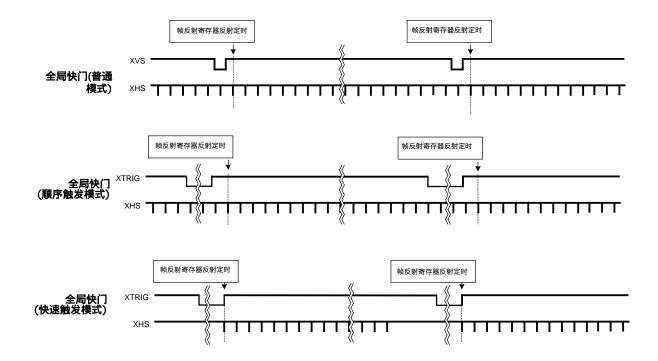
Ī	芯片ID	起始地址	数据	数据	数据	
Ī	(8 bit)					

类型和描述

类型	描述
	Chip ID: 02 Write: 02h / Read: 82h
	Chip ID: 03 Write: 03h / Read: 83h
	Chip ID: 04 Write: 04h / Read: 84h
	Chip ID: 05 Write: 05h / Read: 85h
	Chip ID: 06 Write: 06h / Read: 86h
	Chip ID: 07 Write: 07h / Read: 87h
	Chip ID: 08 Write: 08h / Read: 88h
	Chip ID: 09 Write: 09h / Read: 89h
	Chip ID: 0A Write: 0Ah / Read: 8Ah
	Chip ID: 0B Write: 0Bh / Read: 8Bh
芯片ID	Chip ID: 0C Write: 0Ch / Read: 8Ch
	Chip ID: 10 Write: 10h / Read: 90h
	Chip ID: 11 Write: 11h / Read: 91h
	Chip ID: 12 Write: 12h / Read: 92h
	Chip ID: 13 Write: 13h / Read: 93h
	Chip ID: 14 Write: 14h / Read: 94h
	Chip ID: 15 Write: 15h / Read: 95h
	Chip ID: 16 Write: 16h / Read: 96h
	Chip ID: 17 Write: 17h / Read: 97h
	Chip ID: 18 Write: 18h / Read: 98h
	Chip ID: 19 Write: 19h / Read: 99h
地址	根据寄存器映射指定地址。当使用指定连续地址的通信方法时,地址会从先前传输的地址自动递增。
数据	根据寄存器映射输入设置值。

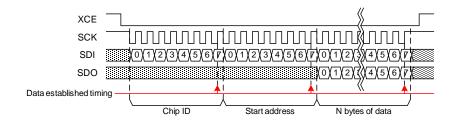
寄存器通信时序(4线)

在传感器待机模式或流式传输中执行串行通信。对于反映时序项目中标记为" \lor "的寄存器,它们通过下图中的帧反映时序反映。对于反映时序项目中标记为"立即"的寄存器,在执行通信时会反映设置。

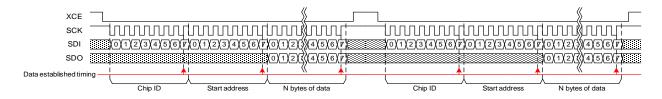


寄存器写入和读取(4线)

- ◆写入寄存器时,请遵循以下通信步骤。
- (1) 将 XCE 设置为低,以启用芯片的通信功能。使用 SCK 和 SDI 执行串行数据输入。
- (2) 使用 SDI 从 LSB 开始,与 SCK 同步传输 1 位数据。与 SCK 的下降沿同步传输 SDI。(数据在 SCK 的上升沿加载。)
- (3) 将芯片 ID (CID = 02h 至 0Ch、10h 至 19h) 输入到第一个字节。如果芯片 ID 不同,则忽略后续数据。
- (4) 将起始地址输入到第二个字节。地址会自动递增。
- (5) 将数据输入到第三个字节及后续字节。第三个字节中的数据写入第二个字节指定的寄存器地址,此后在写入 第四个字节及后续字节的数据时,寄存器地址会自动递增。常规寄存器数据加载到传感器内部并以 8 位为单位建 立。
- (6) 从第二个字节指定的寄存器地址开始的寄存器值从 SDO 引脚输出。输出写入操作之前的寄存器值。实际的寄存器值为输入数据。
- (7) 将 XCE 置高以结束通信。
- ◆读取寄存器时,请遵循以下通信步骤。
- (1) 将 XCE 设置为低,以启用芯片的通信功能。使用 SCK 和 SDI 执行串行数据输入。
- (2) 使用 SDI 从 LSB 开始,与 SCK 同步传输 1 位数据。与 SCK 的下降沿同步传输 SDI。(数据在 SCK 的上升沿加载。)
- (3) 将芯片 ID (CID = 82h 至 8Ch、90h 至 99h) 输入到第一个字节。如果芯片 ID 不同,则忽略后续数据。
- (4) 将起始地址输入到第二个字节。地址会自动递增。
- (5) 将数据输入到第三个字节及后续字节。输入虚拟数据以读取寄存器。虚拟数据不会写入寄存器。要读取连续数据,请输入所需字节数的虚拟数据。
- (6) 从第二个字节指定的寄存器地址开始的寄存器值从 SDO 引脚输出。输入数据未被写入,因此输出的是实际的寄存器值。
- (7) 将 XCE 设置为高电平以结束通信。
- 注)当将数据写入具有不连续地址的多个寄存器时,可以通过多次重复上述过程来避免访问不需要的寄存器。



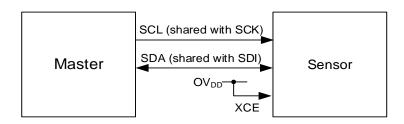
串行通信(连续地址)



串行通信(不连续地址)

设置寄存器的描述 (I2C)

串行数据输入顺序为MSB优先传输。下表列出了各种数据类型及其说明。



串行通信引脚连接

传感器可通过切换 SLAMODE 引脚极性为一条 I2C 总线使用两种从属地址,并可在一条 I2C 总线的 SLAMODE 引脚两种极性中使用一个公共从属地址。

SLAVE Address (SLAMODE = 0)

MSB							LSB
0	1	1	0	1	1	0	R/W

SLAVE Address (SLAMODE = 1)

MSB							LSB
0	1	1	0	1	1	1	R/W

SLAVE Address (SLAMODE = 0 / 1)

MSB							LSB
0	0	1	1	0	1	0	R/W

^{*} R/W is data direction bit

R/W

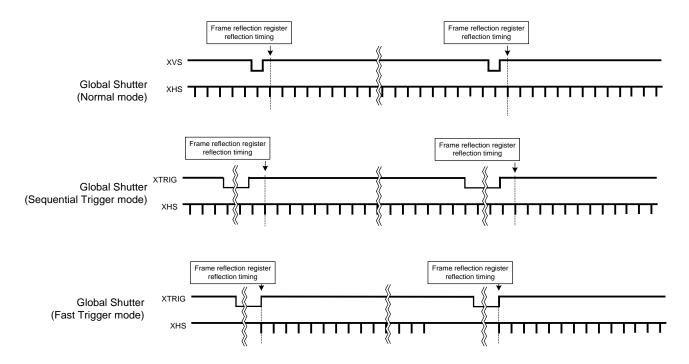
R / W bit	Data direction	
0	Write (Master → Sensor)	
1	Read (Sensor → Master)	

I²C pin description

Symbol	Description	
SCL (common to SCK)	Serial clock input	
SDA (common to SDI)	Serial data communication	

寄存器通信时序 (I²C)

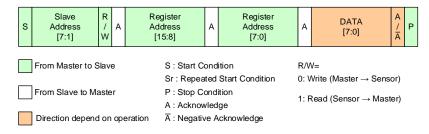
反射时序项中标记为"V"的寄存器,在下图中按帧反射时序进行反射。反射时序项中标记为"Immediately"的寄存器,在通信时进行设置。使用 I2C 通信进行寄存器设置时,建议使用 REGHOLD 函数。有关 REGHOLD 函数,请参阅"功能说明"中的"寄存器传输设置"。



SONY IMX990-AABA-C

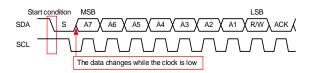
I2C 通信协议

I2C串行通信支持16位寄存器地址和8位数据消息类型。

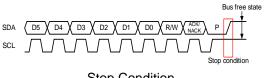


通信协议

数据以 8 位为单位串行传输,MSB 优先。传输完每个数据字节后,将传输 A(确认)/ A(否定确认)。数据(SDA)以时钟(SCL)周期传输。SDA 只能在 SCL 为低时改变,因此 SCL 为高时必须保持 SDA 值。启动条件定义为 SCL 为高时 SDA 从高变为低。当前一个通信阶段未生成停止条件且生成下一个通信的启动条件时,该启动条件将被视为重复启动条件。



Start Condition

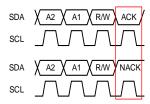


Stop Condition



Repeated Start Condition

传输完每个数据字节后,主设备或传感器会发送确认/否定确认并释放(不驱动)SDA。当产生否定确认时,主设备必须立即生成停止条件并结束通信。



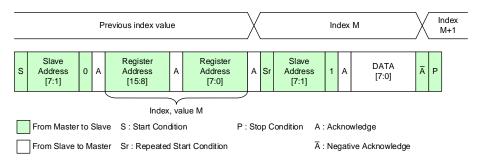
承认与否定承认

I2C 串行通信读/写操作

该传感器支持以下四种读取操作和两种写入操作。

从随机位置单次读取

传感器具有索引功能,可指示其关注的地址。在读取可选单个地址的数据时,主设备必须将索引值设置为要读取的地址。为此,它会执行虚拟写入操作直至寄存器地址。下图的上层显示传感器内部索引值,下层显示 SDA I/O 数据流。主设备通过用写入请求指定传感器从属地址,然后指定地址 (M),将传感器索引值设置为 M。然后,主设备生成启动条件。启动条件是在不生成停止条件的情况下生成的,因此它成为重复启动条件。接下来,当主设备发送带有读取请求的从属地址时,传感器会在 SDA 上输出确认,然后紧接着输出索引地址数据。主设备收到数据后,会生成否定确认和停止条件以结束通信。

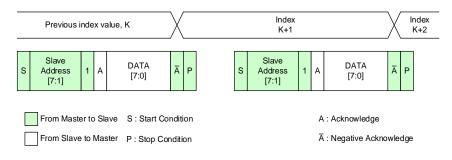


从随机位置单次读取

从当前位置进行单次读取

通过写入请求发送从机地址后,该地址由下一次通信指定,索引保持该值。此外,在执行数据读取/写入时,索引会按后续的确认/否定确认时序递增。当已知索引值指示要读取的地址时,通过读取请求发送从机地址,可以在确认后立即读取数据。接收到数据后,主机会生成否定确认和停止条件以结束通信,但索引值会递增,因此可以通过

通过读取请求发送从机地址



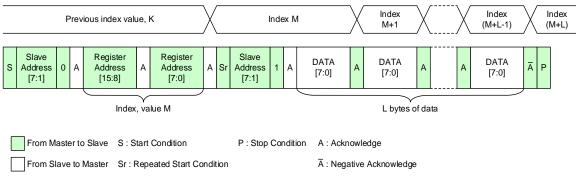
从当前位置进行单次读取



从随机位置开始顺序读取

在从可选地址开始顺序读取数据时,主设备必须将索引值设置为要读取的地址的开头。为此,虚拟写入操作包括寄存器地址设置。

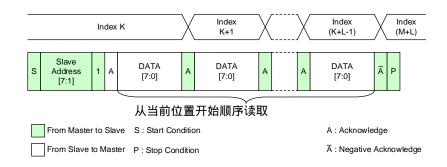
主设备通过用读取请求指定传感器从属地址,然后指定地址(M),将传感器索引值设置为 M。然后,主设备生成重复启动条件。接下来,当主设备用读取请求发送从属地址时,传感器在 SDA 上输出确认,然后立即输出索引地址数据。当主设备在收到数据后输出确认时,传感器内的索引值将递增,下一个地址的数据将输出到 SDA 上。这允许主设备顺序读取数据。读取必要的数据后,主设备生成否定确认和停止条件以结束通信。



从随机位置开始顺序读取

从当前位置开始顺序读取

当已知索引值指示要读取的地址时,将从属地址与读取请求一起发送,即可在确认后立即读取数据。当主设备在收到数据后输出确认时,传感器内的索引值将递增,并在 SDA 上输出下一个地址的数据。这允许主设备按顺序读取数据。在读取必要的数据后,主设备会生成否定确认和停止条件以结束通信。

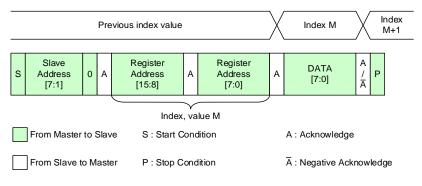


Sequential Read Starting from Current Location

SONY IMX990-AABA-C

单次写入随机位置

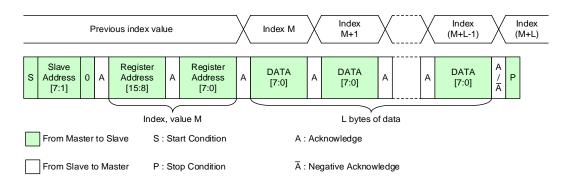
主设备通过写入请求指定传感器从设备地址,并指定地址(M),将传感器索引值设置为M。之后,主设备可以通过传输要写入的数据将值写入指定寄存器。写入必要的数据后,主设备生成停止条件以结束通信。



单次写入随机位置

从随机位置开始顺序写入

主设备可以通过使用写入请求指定传感器从设备地址、指定地址 (M),然后传输要写入的数据,将值写入寄存器地址 M。传感器收到写入数据后,会输出确认,同时增加寄存器地址,因此主设备只需继续传输数据即可写入下一个地址。主设备写入所需数量的字节后,会生成停止条件以结束通信。



从随机位置开始顺序写入

寄存器映射(此文档中的寄存器可以更改。)

本传感器共有5376字节寄存器,由地址为00h至FFh的寄存器组成,这些寄存器对应于芯片ID = 02h至0Ch、10h至19h。空地址使用初始值。一些寄存器必须从初始值更改,因此传感器控制端应能够设置5376字节。

有三种不同的寄存器反映时序。

关于寄存器映射的反映时序列,标记为"I"的寄存器在写入寄存器后立即反映,标记为"S"的寄存器在 待机模式期间设置并在待机取消后反映,标记为"V"的寄存器在"使用串行通信设置寄存器"部分中描述的图中的"Fame反映寄存器反映时序"处反映。

请勿对寄存器映射中未列出的地址和设置进行通信。这样做可能会导致操作错误。

Chip ID = 02 (Write: Chip ID = 02h, Read: Chip ID = 82h, I²C: 30**h)

对于未描述的寄存器,请参考其他寄存器映射文件。

Address					Default value after reset		Reflection
		bit	Register Name	Description	Ву	By timing	
4-wire	I ² C				register	address	9
		•	CTANDDV [O]	Standby mode	1	01h	ı
00h		0	STANDBY [0]	0: Normal operation 1: Standby	1		ı
	3000h	1		Fixed to 0	0		_
		2		Fixed to 0	0		_
		3		Fixed to 0	0		_
		4		Fixed to 0	0		_
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
				Setting of master mode operation			
		0	XMSTA	0: Master mode operation start	1		1
				1: Master mode operation stop			
		1		Fixed to 0	0		_
0Ch	300Ch	2		Fixed to 0	0	0.41	_
UCII	300Cn	3		Fixed to 0	0	01h	_
		4		Fixed to 0	0		_
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
	3034h	0	REGHOLD	Register hold	0	00h	1
		U		0: Invalid 1: Valid	U		
34h		1		Fixed to 0	0		_
		2		Fixed to 0	0		_
		3		Fixed to 0	0		_
		4		Fixed to 0	0		_
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
3Ch 3		0 WINMODE		Drive mode setting of V direction			
	303Ch		0: All-pixel mode. 1: 1/2 Subsampling mode	0		S	
				Others: Setting prohibited			
		1		Fixed to 0	0		_
		2		Fixed to 0	0		_
		3		Fixed to 0	0	00h	_
		4 HMODE	Drive mode setting of H direction	0		S	
			I IIVIODE	0: All-pixel 1: 1/2 Subsampling mode		_	
		5		Fixed to 0	0		_
		6		Fixed to 0	0	_	_
		7		Fixed to 0	0		_

Add	Iress	1.7	D. data No.	D	Defaul after		Reflection
4-wire	I ² C	bit	Register Name	Description	By register	By address	timing
		0		LSB			
		1					
		2					
D4h	30D4h	3				36h	
		4					
		5					
		6 7	-				
		0	-				
		1	-				
		2	-				
		3		When sensor master mode			
D5h	30D5h	4	VMAX [23:0]	vertical span setting.	000436h	04h	V
		5	-	(Number of operation lines count from 1)			
		6	1				
		7					
		0					
		1					
		2					
		3					
D6h	30D6h	4				00h	
		5					
		6	1				
		7		MSB			
		0		LSB			
		1					
		2					
D8h	30D8h	3				35h	
Doll	300011	4				3311	
		5					
		6		When sensor master mode			
		7	HMAX [15:0]	horizontal span setting.	0235h		S
		0	[]	(Number of operation clocks count from 1)	1_30		
		1					
		2					
D9h	30D9h	3	-			02h	
		4	-				
		5	1				
		6 7	1	MSB			
				Set to data rate.			
		0	FREQ [1:0]	0: Normal 1: Data rate 1/2	0h		S
		1		Others: Setting prohibited			
		2		Fixed to 0	0		_
DCh	30DCh	3		Fixed to 0	0	00h	
		4		Fixed to 0	0		_
		5		Fixed to 0	0		_
		6		Fixed to 0	0		
		7		Fixed to 0	0		_

Add	ress		2	2		t value reset	Reflection
4-wire	I ² C	bit	Register Name	Description	By	By	timing
		0			register	address	
	E2h 30E2h 3						
						6h	
E2h			GTWAIT [7:0]	Refer to the register list in each Readout mode	6h		S
		5					
		6					
		7					
		0					
		1					
		2					
E3h	E3h 30E3h	3	GSDLY [7:0]	Refer to the register list in each Readout mode	4h	4h	S
Lon	302311	4	00021 [7.0]	interest to the register list in each readout mode	711	711	3
		5					
		6			[
		7					

Chip ID = 03 (Write: Chip ID = 03h, Read: Chip ID = 83h, I²C: 31**h)

Add	dress					t value reset	Reflection	
4-wire	I ² C	bit	Register Name	Description	By register	By address	timing	
		0	FID0_ROIH1ON [0]	The horizontal setting of FID0 ROI area (1, y) (y = 1 to 8) 0: Disable 1: Enable	0		V	
		1	FID0_ROIV1ON [1]	The vertical setting of FID0 ROI area (x, 1) (x = 1 to 8) 0: Disable 1: Enable	0		٧	
		2	FID0_ROIH2ON [2]	The horizontal setting of FID0 ROI area (2, y) (y = 1 to 8) 0: Disable 1: Enable	0		V	
			3	FID0_ROIV2ON [3]	The vertical setting of FID0 ROI area (x, 2) (x = 1 to 8) 0: Disable 1: Enable	0		V
04h		4	FID0_ROIH3ON [4]	The horizontal setting of FID0 ROI area (3, y) (y = 1 to 8) 0: Disable 1: Enable	0	00h	V	
		5	FID0_ROIV3ON [5]	The vertical setting of FID0 ROI area (x, 3) (x = 1 to 8) 0: Disable 1: Enable	0		V	
		6	FID0_ROIH4ON [6]	The horizontal setting of FID0 ROI area (4, y) (y = 1 to 8) 0: Disable 1: Enable	0		V	
		7	FID0_ROIV4ON [7]	The vertical setting of FID0 ROI area (x, 4) (x = 1 to 8) 0: Disable 1: Enable	0		V	
		0	FID0_ROIH5ON [0]	The horizontal setting of FID0 ROI area (5, y) (y = 1 to 8) 0: Disable 1: Enable	0		V	
		1	FID0_ROIV5ON [1]	The vertical setting of FID0 ROI area (x, 5) (x = 1 to 8) 0: Disable 1: Enable	0		V	
		2	FID0_ROIH6ON [2]	The horizontal setting of FID0 ROI area (6, y) (y = 1 to 8) 0: Disable 1: Enable	0		V	
05h	3105h	3	FID0_ROIV6ON [3]	The vertical setting of FID0 ROI area (x, 6) (x = 1 to 8) 0: Disable 1: Enable	0	200	٧	
0311	310311	4	FID0_ROIH7ON [4]	The horizontal setting of FID0 ROI area (7, y) (y = 1 to 8) 0: Disable 1: Enable	0	0011	٧	
		5	FID0_ROIV7ON [5]	The vertical setting of FID0 ROI area (x, 7) (x = 1 to 8) 0: Disable 1: Enable	0		V	
		6	FID0_ROIH8ON [6]	The horizontal setting of FID0 ROI area (8, y) (y = 1 to 8) 0: Disable 1: Enable	0		V	
		7	FID0_ROIV8ON [7]	The vertical setting of FID0 ROI area (x, 8) (x = 1 to 8) 0: Disable 1: Enable	0	- 00h	V	



Add	ress					lt value reset	Reflection
4-wire	I ² C	bit	Register Name	Description	By register	By address	timing
20h	3120h	[7:0]		Designation of horizontal cropping position		00h	
		[4:0]	FID0_ROIPH1 [12:0]	for FID0 on area (1, y) (y = 1 to 8)	0000h		V
21h	3121h			*Set the value of multiple of 8		00h	
		[7:5]		Fixed to 0h	0h		_
22h	3122h	[7:0]		Designation of vertical cropping position		00h	
001	0.4.001	[3:0]	FID0_ROIPV1 [11:0]	for FID0 on area $(x, 1)$ $(x = 1 \text{ to } 8)$	000h	0.01	V
23h	3123h	[7, 4]		*Set the value of multiple of 8 Fixed to 0h	0h	00h	
24h	3124h	[7:4] [7:0]		Designation of horizontal cropping size	Un	00h	_
2411	312411	[7.0]	FID0_ROIWH1 [12:0]	for FID0 on area $(1, y)$ $(y = 1 \text{ to } 8)$	0000h	0011	V
25h	3125h	[4:0]	TIDO_ROWITI [12.0]	*Set the value of multiple of 4	000011	00h	· •
2011	012011	[7:5]		Fixed to 0h	0h	0011	_
26h	3126h	[7:0]		Designation of vertical cropping size		00h	
			FID0_ROIWV1 [11:0]	for FID0 on area $(x, 1)$ $(x = 1 \text{ to } 8)$	000h		V
27h	3127h	[3:0]		*Set the value of multiple of 8		00h	
		[7:4]		Fixed to 0h	0h		_
28h	3128h	[7:0]		Designation of horizontal cropping position		00h	
		[4:01	FID0_ROIPH2 [12:0]	for FID0 on area (2, y) (y = 1 to 8)	0000h		V
29h	3129h	[4:0]		*Set the value of multiple of 8		00h	
		[7:5]		Fixed to 0h	0h		_
2Ah	312Ah	[7:0]	1	Designation of vertical cropping position		00h	
		[3:0]	FID0_ROIPV2 [11:0]	for FID0 on area (x, 2) (x = 1 to 8)	000h		V
2Bh	312Bh			*Set the value of multiple of 8		00h	
		[7:4]		Fixed to 0h	0h		_
2Ch	312Ch	[7:0]		Designation of horizontal cropping size		00h	
o.D.I	04001	[4:0]	FID0_ROIWH2 [12:0]	for FID0 on area (2, y) (y = 1 to 8)	0000h	0.01	V
2Dh	312Dh	[7:5]		*Set the value of multiple of 4	Oh	00h	_
2Eh	312Eh	[7:5] [7:0]		Fixed to 0h Designation of vertical cropping size	0h	00h	_
ZEII	SIZEII	[7.0]	FID0_ROIWV2 [11:0]	for FID0 on area $(x, 2)$ $(x = 1 \text{ to } 8)$	000h	0011	V
2Fh	312Fh	[3:0]	1 100_1(0100 02 [11.0]	*Set the value of multiple of 8	00011	00h	v
2111	012111	[7:4]		Fixed to 0h	0h	0011	_
30h	3130h	[7:0]		Designation of horizontal cropping position	0	00h	
			FID0_ROIPH3 [12:0]	for FID0 on area (3, y) (y = 1 to 8)	0000h		V
31h	3131h	[4:0]		*Set the value of multiple of 8		00h	
		[7:5]		Fixed to 0h	0h		_
32h	3132h	[7:0]		Designation of vertical cropping position		00h	
		[3:0]	FID0_ROIPV3 [11:0]	for FID0 on area $(x, 3)$ $(x = 1 \text{ to } 8)$	000h		V
33h	3133h			*Set the value of multiple of 8		00h	
		[7:4]		Fixed to 0h	0h		_
34h	3134h	[7:0]		Designation of horizontal cropping size		00h	
		[4:0]	FID0_ROIWH3 [12:0]	for FID0 on area $(3, y)$ $(y = 1 \text{ to } 8)$	0000h		V
35h	3135h			*Set the value of multiple of 4	21	00h	-
20h	24265	[7:5]		Fixed to 0h Designation of vertical cropping size	0h	004	_
36h	3136h	[7:0]	FID0 ROIWV3 [11:0]	Designation of vertical cropping size for FID0 on area $(x, 3)$ $(x = 1 \text{ to } 8)$	000h	00h	V
37h	3137h	[3:0]	100_1\OIVV V3 [11.0]	*Set the value of multiple of 8	00011	00h	'
5711	010/11	[7:4]		Fixed to 0h	0h	0011	_
38h	3138h	[7:0]		Designation of horizontal cropping position		00h	
			FID0_ROIPH4 [12:0]	for FID0 on area $(4, y)$ $(y = 1 \text{ to } 8)$	0000h		V
39h	3139h	[4:0]		*Set the value of multiple of 8		00h	
		[7:5]		Fixed to 0h	0h	<u> </u>	_
3Ah	313Ah	[7:0]		Designation of vertical cropping position		00h	
		[3:0]	FID0_ROIPV4 [11:0]	for FID0 on area $(x, 4)$ $(x = 1 to 8)$	000h		V
3Bh	313Bh			*Set the value of multiple of 8		00h	
		[7:4]		Fixed to 0h	0h		_
3Ch	313Ch	[7:0]		Designation of horizontal cropping size		00h	1
		[4:0]	FID0_ROIWH4 [12:0]	for FID0 on area $(4, y) (y = 1 \text{ to } 8)$	0000h		V
3Dh	313Dh			*Set the value of multiple of 4	21	00h	
251	04051	[7:5]		Fixed to 0h	0h	001	-
3Eh	313Eh	[7:0]	EIDO BOIMA/4 544:01	Designation of vertical cropping size	0004	00h	.,
2Eh	24256	[3:0]	FID0_ROIWV4 [11:0]	for FID0 on area (x, 4) (x = 1 to 8) *Set the value of multiple of 8	000h	006	V
3Fh	313Fh			·	Ωh	00h	
		[7:4]		Fixed to 0h	0h		<u> </u>



Add	ress					t value reset	Reflection
4-wire	I ² C	bit	Register Name	Description	By register	By address	timing
40h	3140h	[7:0]		Designation of horizontal cropping position	- 5	00h	
41h	3141h	[4:0]	FID0_ROIPH5 [12:0]	for FID0 on area (5, y) (y = 1 to 8) *Set the value of multiple of 8	0000h	00h	V
	0	[7:5]		Fixed to 0h	0h	00	_
42h	3142h	[7:0]		Designation of vertical cropping position		00h	
		[0.0]	FID0_ROIPV5 [11:0]	for FID0 on area (x, 5) (x = 1 to 8)	000h		V
43h	3143h	[3:0]		*Set the value of multiple of 8		00h	
		[7:4]		Fixed to 0h	0h		_
44h	3144h	[7:0]	51D 0 D 0 11 11 1 1 1 0 0 1	Designation of horizontal cropping size	20001	00h	.,
45h	24.4Eb	[4:0]	FID0_ROIWH5 [12:0]	for FID0 on area (5, y) (y = 1 to 8) *Set the value of multiple of 4	0000h	006	V
45h	3145h	[7:5]		Fixed to 0h	0h	00h	_
46h	3146h	[7:0]		Designation of vertical cropping size	OII	00h	
			FID0_ROIWV5 [11:0]	for FID0 on area $(x, 5)$ $(x = 1 \text{ to } 8)$	000h		V
47h	3147h	[3:0]		*Set the value of multiple of 8		00h	
		[7:4]		Fixed to 0h	0h		_
48h	3148h	[7:0]	-	Designation of horizontal cropping position		00h	
		[4:0]	FID0_ROIPH6 [12:0]	for FID0 on area (6, y) (y = 1 to 8)	0000h		V
49h	3149h			*Set the value of multiple of 8	0.1	00h	
4 A b	2111	[7:5]		Fixed to 0h	0h	00h	_
4Ah	314Ah	[7:0]	FID0_ROIPV6 [11:0]	Designation of vertical cropping position for FID0 on area (x, 6) (x = 1 to 8)	000h	00h	V
4Bh	314Bh	[3:0]	1 100_1(011 \(\psi \) [11.0]	*Set the value of multiple of 8	00011	00h	v
15.1	011511	[7:4]		Fixed to 0h	0h	0011	_
4Ch	314Ch	[7:0]		Designation of horizontal cropping size		00h	
		[4.0]	FID0_ROIWH6 [12:0]	for FID0 on area (6, y) (y = 1 to 8)	0000h		V
4Dh	314Dh	[4:0]		*Set the value of multiple of 4		00h	
		[7:5]		Fixed to 0h	0h		_
4Eh	314Eh	[7:0]		Designation of vertical cropping size		00h	
455	04.455	[3:0]	FID0_ROIWV6 [11:0]	for FID0 on area (x, 6) (x = 1 to 8)	000h	001-	V
4Fh	314Fh	[7:4]		*Set the value of multiple of 8 Fixed to 0h	0h	00h	
50h	3150h	[7:0]		Designation of horizontal cropping position	OH	00h	
0011	010011		FID0_ROIPH7 [12:0]	for FID0 on area $(7, y)$ $(y = 1 \text{ to } 8)$	0000h	0011	V
51h	3151h	[4:0]		*Set the value of multiple of 8		00h	
		[7:5]		Fixed to 0h	0h		_
52h	3152h	[7:0]		Designation of vertical cropping position		00h	
		[3:0]	FID0_ROIPV7 [11:0]	for FID0 on area $(x, 7)$ $(x = 1 \text{ to } 8)$	000h		V
53h	3153h			*Set the value of multiple of 8	01	00h	
5.4h	24546	[7:4]		Fixed to 0h	0h	00h	_
54h	3154h	[7:0]	FID0_ROIWH7 [12:0]	Designation of horizontal cropping size for FID0 on area (7, y) (y = 1 to 8)	0000h	00h	V
55h	3155h	[4:0]	150_ROWIN [12.0]	*Set the value of multiple of 4	000011	00h	
00	0.00	[7:5]		Fixed to 0h	0h	00	_
56h	3156h	[7:0]		Designation of vertical cropping size		00h	
		[3:0]	FID0_ROIWV7 [11:0]	for FID0 on area (x, 7) (x = 1 to 8)	000h		V
57h	3157h			*Set the value of multiple of 8	1	00h	
501	0450	[7:4]		Fixed to 0h	0h	201	_
58h	3158h	[7:0]	FID0 ROIPH8 [12:0]	Designation of horizontal cropping position	00004	00h	V
59h	3159h	[4:0]	וייסי_ועורחס [12:0]	for FID0 on area (8, y) (y = 1 to 8) *Set the value of multiple of 8	0000h	00h	v
0011	010011	[7:5]		Fixed to 0h	0h	0011	_
5Ah	315Ah	[7:0]		Designation of vertical cropping position		00h	
		[3:0]	FID0_ROIPV8 [11:0]	for FID0 on area (x, 8) (x = 1 to 8)	000h		V
5Bh	315Bh	[3.0]		*Set the value of multiple of 8		00h	
		[7:4]		Fixed to 0h	0h		_
5Ch	315Ch	[7:0]	FIDO DONANIO TOTAL	Designation of horizontal cropping size	0005:	00h	
ED!	2450-	[4:0]	FID0_ROIWH8 [12:0]	for FID0 on area (8, y) (y = 1 to 8) *Set the value of multiple of 4	0000h	004	V
5Dh	315Dh	[7:5]		Fixed to 0h	0h	00h	_
5Eh	315Fh	[7:0]		Designation of vertical cropping size		00h	
			FID0_ROIWV8 [11:0]	for FID0 on area $(x, 8)$ $(x = 1 \text{ to } 8)$	000h		V
5Fh	315Fh	[3:0]		*Set the value of multiple of 8		00h	
		[7:4]		Fixed to 0h	0h		_

Chip ID = 04 (Write: Chip ID = 04h, Read: Chip ID = 84h, I²C: 32**h)

Add	Iress	bit	Register Name	Description		t value reset	Reflection
4-wire	I ² C	Dit	Register Name	Description	By register	By address	timing
		0		Fixed to 1	1		
		1		Fixed to 0	0		
		2		Fixed to 1	1		_
		3		Fixed to 0	0		_
00h	3200h	4		Fixed to 0	0	05h	_
		5		AD conversion bits setting			
			ADBIT [6:5]	0h: 10 bit 1h: 12 bit 2h: 8 bit	0h		S
		6		3h: Setting prohibited			
		7		Fixed to 0	0		
				Vertical (V) direction readout			
		0	VREVERSE	inversion control	0		V
				0: Normal 1: Inverted			
				Horizontal (H) direction readout			
		1	HREVERSE	inversion control	0		V
04h	3204h			0: Normal 1: Inverted	_	00h	
0	020	2		Fixed to 0	0	00	_
		3		Fixed to 0	0		_
		4		Fixed to 0	0		_
		5		Fixed to 0	0		
		6		Fixed to 0	0		
		7		Fixed to 0	0		
		0					
		1					
		2					
20h	3220h	3	INCKSEL0 [7:0]	Set according to INCK frequency and drive	52h	52h	S
2011	OLLON	4	1110110220 [7:0]	mode.	02.11	0211	Ü
		5					
		6					
		7					
		0					
		1					
		2		Set according to INCK frequency and drive			
21h	3221h	3	INCKSEL1 [7:0]	mode.	20h	20h	S
	OLLIN	4	. TOROLLY [7.0]	inodo.	2011	2011	Ü
		5					
		6	1				
		7					
		0	_				
		1	_				
		2	_				
24h	3224h	3	INCKSEL2 [7:0]	Set according to INCK frequency and drive	52h	52h	S
		4		mode.			_
		5	_				
		6	-				
		7					
		0	-				
		1	_				
		2	_				
25h	3225h	3	INCKSEL3 [7:0]	Set according to INCK frequency and drive	20h	20h	S
		4		mode.			
		5	1				
		6	_				
		7			1		

Add	Iress	bit	Register Name	Description		t value reset	Reflection
4-wire	I ² C	Dit	register Name	Description	Ву	Ву	timing
	_	_			register	address	
		0	-				
		2	-				
		3	1				
26h	3226h	4	FREQ_SYNC [7:0]	Refer to the register list in each Readout mode	93h	93h	S
		5					
		6					
		7					
		0		Fixed to 1	1		_
		1	FASTTRIG	Selection of trigger mode 0: Except for Fast trigger mode 1: Fast trigger mode	0		S
30h	3230h	2				11h	
30n	3230n	3				1111	
		4	-				
		5	LLBLANK	Refer to the register list in each readout mode	04h		S
		6	-				
		7	-				
		1	1				
		2		Fixed to 0	0		_
		3		Fixed to 0	0		_
31h	3231h	4		Fixed to 0	0	00h	_
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
				Setting of Interrupt mode in Trigger Mode			
		0	VINT_EN	0: V interrupt is disabled	1		S
				1: V interrupt is enabled			
		2		Fixed to 0	0		_
32h	3232h	3		Fixed to 0 Fixed to 0	0	01h	
		4		Fixed to 0	0		_
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
		0		LSB			
		1					
		2	-				
40h	3240h	3				18h	
		4	-				
		5 6	<u> </u>				
		7	-				
		0	1				
		1	†				
		2	1				
4	00111	3	0110 100 03	Storage time adjustment	0000101	061	
41h	3241h	4	SHS [23:0]	Designated in line unit	000018h	00h	V
		5]				
		6					
		7	_				
		0	-				
		1	-				
		2	-				
42h	3242h	3	-			00h	
		4	-				
		5 6	1				
		7	1	MSB			
	1	<u>'</u>	1	Imos			

Chip ID = 05 (Write: Chip ID = 05h, Read: Chip ID = 85h, I²C: 33**h)

对于未描述的寄存器,请参考其他寄存器映射文件。

Chip ID = 06 (Write: Chip ID = 06h, Read: Chip ID = 86h, I²C: 34**h)

Ado	dress	bit	Dogistor Name	Description		lt value reset	Reflection
4-wire	I ² C	DIL	Register Name	Description	By register	By address	timing
		0	TRIGEN	Global shutter mode setting 0: Normal mode 1: Trigger mode	0		J*1
		1		Fixed to 0	0		_
		2		Fixed to 0	0		_
00h	3400h	3		Fixed to 0	0	00h	_
		4		Fixed to 0	0		_
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
		0		Number of output bit setting			
		1	ODBIT [1:0]	0h: 10 bit 1h: 12 bit 2h: 8 bit 3h: Setting prohibited	0h		S
		2		Fixed to 0	0		_
30h	3430h	3		Fixed to 0	0	00h	_
		4		Fixed to 0	0		_
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
		0	TOUT1SEL [1:0]	TOUT1 pin setting	0h		S
		2	TOUT2SEL [3:2]	Oh: Low fixed 3h: Pulse output TOUT2 pin setting	0h		S
35h	3435h	3	100120LL [3.2]	0h: Low fixed 3h: Pulse output	OII	00h	
3311	343311	4		Fixed to 0	0	0011	
		5		Fixed to 0	0		_
		6		Fixed to 0	0		
		7		Fixed to 0	0		_
		0					
		1	TRIG_TOUT1_SEL [3:0]	TOUT1 output setting	0h		s
		2		0h: Low fixed 1h: Pulse1 output			
3Ah	343Ah	3				00h	
		4					
		5	TRIG_TOUT2_SEL [7:4]	TOUT2 output setting	0h		s
		6		0h: Low fixed 2h: Pulse2 output			
		7					
		0		Fixed to 0	0	-	
		1		Fixed to 0	0	-	
		2		Fixed to 0	0	-	
3Ch	343Ch	3		Fixed to 0	0	C0h	
		4	SYNCSEL [5:4]	XHS, XVS pin setting	0h		s
		5		0h: Normal Output 3h: Hi-Z		1	
		6		Fixed to 1	1	1	
		7		Fixed to 1	1	1	

^{·1} 请参阅"全局快门操作的模式转换"

Add	dress	hit	Pogister Name	Description		t value reset	Reflection
4-wire	I ² C	bit	Register Name	Description	By register	By address	timing
		0 1 2 3	-STBSLVS [3:0]	Channel standby control of SLVS 2h: activate 4 ch 3h: activate 2 ch Others: Setting prohibited	2h		S
44h	3444h	4		Fixed to 0	0	02h	_
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
		0					
		1	OPORTSEL [3:0]	SLVS channel selection	3h		S
		2	OI OITTOLL [0.0]	3h: 4 ch 4h: 2 ch Others: Setting prohibited	011		
45h	3445h	3				03h	
4011	044011	4		Fixed to 0	0	0011	_
		5		Fixed to 0	0		
		6		Fixed to 0	0		
		7		Fixed to 0	0		_
		0	PULSE1_EN_NOR [0]	Pulse1 output in normal mode 0: Disable 1: Enable	0		S
		1	PULSE1_EN_TRIG [1]	Pulse1 output in trigger mode 0: Disable 1: Enable	0		S
78h	3478h	2	PULSE1_POL [2]	Pulse1 polarity selection 0: High active 1: Low active	0	00h	S
		3		Fixed to 0	0		_
		4		Fixed to 0	0		_
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
		0		LSB			
		1					
		2			004		
79h	3479h	3				00h	
7 911	347311	4				0011	
		5					
		6	1				
		7					
		0	4				
		1	4				
		2	4	Pulse1 active period start timing setting			
7Ah	347Ah	3	PULSE1_UP [23:0]	Designated in line units from reference point	000000h	00h	S
		4		(For details, see the "Pulse Output Function")			
		5	4				
		6	-				
	-	7	-				
		0	-				
		1	-				
		2	1				
7Bh	347Bh	3	1			00h	
		5	1				
		6	+				s
		7	=	MSB			
	l	'	I .	טטוווו	l	L	L

Add	Iress				Defaul after	t value reset	Reflection
4-wire	I ² C	bit	Register Name	Description	Ву	Ву	timing
4-wire	I-C				register	address	
		0		LSB			
		1					
		2					
7Ch	347Ch	3				00h	
7011	017011	4				0011	
		5					
		6					
		7					
		0					
		1					
		2		Pulse1 active period end timing setting			
7Dh	347Dh	3	PULSE1_DN [23:0]	Designated in line units from readout start	000000h	00h	s
		4		(For details, see the "Pulse Output Function")			
		5					
		6					
		7	-				
		0	-				
		2	-				
			-				
7Eh	347Eh	3 4	-			00h	
		5	-				
		6	-				
		7		MSB			
		'		Pulse2 output in normal mode			
		0	PULSE2_EN_NOR [0]	0: Disable 1: Enable	0		S
				Pulse2 output in trigger mode			
		1	PULSE2_EN_TRIG [1]	0: Disable 1: Enable	0		S
				Pulse2 polarity selection			_
80h	3480h	2	PULSE2_POL [2]	0: High active 1: Low active	0	00h	S
		3		Fixed to 0	0		_
		4		Fixed to 0	0		_
		5		Fixed to 1	0		S
		6		Fixed to 0	0		
		7		Fixed to 0	0		
		0		LSB			
		1					
		2					
81h	3481h	3				00h	
	040111	4				0011	
		5					
		6					
<u> </u>		7	-				
		0					
		1	-				
		2	-	Pulse2 active period start timing setting			
82h	3482h	3	PULSE2_UP [23:0]	Designated in line units from reference point	000000h	00h	S
		4	1	(For details, see the "Pulse Output Function")			
		5	-				
		6 7	1				
-		0	1				
		1	1				
		2	-				
		3	1				
83h	3483h	4	1			00h	
		5	1				
		6	1				
		7	1	MSB			
L	Î.		1	1 -	l		

Add	Iress				Defaul after	t value reset	Reflection
4	120	bit	Register Name	Description	Ву	Ву	timing
4-wire	I ² C				register	address	-
		0		LSB			
		1					
		2					
84h	3484h	3				00h	
0	0.0	4				00	
		5					
		6					
		7	-				
		0					
		1					
		2		Pulse2 active period end timing setting			
85h	3485h	3	PULSE2_DN [23:0]	Designated in line units from reference point	000000h	00h	s
		4		(For details, see the "Pulse Output Function")			
		5					
		6					
		7	-				
		0	-				
		2	-				
		3	-				
86h	3486h	4				00h	
		5					
		6	-				
		7	-	MSB			
		0		INIOD			
		1	1				
		2					
		3	1				
90h	3490h	4	1			00h	
		5		Output of the digital thermometer.			
		6	TMP_OUT[11:0]	Read only.	00h		_
		7	1				
		0	1				
		1					
		2					
0415	0.4041	3				001-	
91n	91h 3491h	4		Fixed to 0	0	00h	
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		

Chip ID = 07 (Write: Chip ID = 07h, Read: Chip ID = 87h, I²C: 35**h)

Add	lress		5	5		t value reset	Reflection
4-wire	I ² C	bit	Register Name	Description	By register	By address	timing
		0	GAINUPDSL	Setting of Gain Reflection Timing at Normal mode. 0: Gain reflect at the frame 1: Gain reflect at the next frame (Same timing as SHS reflecting output.) Set 0 at Triger modes.	0		S
02h	3502h	1		Fixed to 0	0	00h	_
0211	000211	2		Fixed to 0	0	0011	_
		3		Fixed to 0	0		_
		4		Fixed to 0	0		
		5		Fixed to 0	0		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
		0		LSB			
		1	-				
		2	-	Gain setting			
14h	3514h	3	-	0 dB (000d) to 42 dB (420d)		00h	
		4	GAIN [8:0]	0.1 dB Step	000h		V
		5	-	(Refer to Address 02h about detail of Reflection			
		6		Timing.)			
		7	-				
		0		MSB		00h	
		1		Fixed to 0	0		
		2		Fixed to 0	0		
15h	3515h	3		Fixed to 0	0		_
		5		Fixed to 0 Fixed to 0	0		
		6		Fixed to 0	0		
		7		Fixed to 0	0		_
		0	TMDLATCH	Thermometer output is updated when this register is set from 0h to 1h.	0		I
		1		Fixed to 1	0		_
		2		Fixed to 0	0		_
88h	3588h	3		Fixed to 0	0	30h	_
		4		Fixed to 1	1		_
		5		Fixed to 1	1		_
		6		Fixed to 0	0		_
		7		Fixed to 0	0		_
		0	_	LSB			
		1					
		2	1				
C0h	35C0h	3	_			3Ch	
••••	0000	4	=	Black level offset value setting		00	
		5	BLKLEVEL [11:0]	Recommended value.	03Ch		V
		6		00Fh: 8 bit 03Ch: 10 bit 0F0h: 12 bit			
		7	-				
		0	4				
		1	-				
		2	-	MOD			
C1h	35C1h	3		MSB		00h	
		4		Fixed to 0	0		
		5 6		Fixed to 0 Fixed to 0	0		<u> </u>
		. n	i .	IFIXEG IO U	U	•	_

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Chip ID = 08 (Write: Chip ID = 08h, Read: Chip ID = 88h, I^2 C: 36**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 09 (Write: Chip ID = 09h, Read: Chip ID = 89h, I^2 C: 37**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 0A (Write: Chip ID = 0Ah, Read: Chip ID = 8Ah, I²C: 38**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 0B (Write: Chip ID = 0Bh, Read: Chip ID = 8Bh, I^2 C: 39**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 0C (Write: Chip ID = 0Ch, Read: Chip ID = 8Ch, I^2 C: 3A**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 10 (Write: Chip ID = 10h, Read: Chip ID = 90h, I^2 C: 3E**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 11 (Write: Chip ID = 11h, Read: Chip ID = 91h, I^2 C: 3F**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 12 (Write: Chip ID = 12h, Read: Chip ID = 92h, I^2 C: $40^{**}h$)

Please refer to the other register map file for the register that has not been described.

Chip ID = 13 (Write: Chip ID = 13h, Read: Chip ID = 93h, I2C: 41**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 14 (Write: Chip ID = 14h, Read: Chip ID = 94h, I^2 C: $42^{**}h$)

Please refer to the other register map file for the register that has not been described.

Chip ID = 15 (Write: Chip ID = 15h, Read: Chip ID = 95h, I2C: 43**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 16 (Write: Chip ID = 16h, Read: Chip ID = 96h, I^2 C: 44**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 17 (Write: Chip ID = 17h, Read: Chip ID = 97h, I^2 C: 45^{**} h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 18 (Write: Chip ID = 18h, Read: Chip ID = 98h, I^2 C: 46**h)

Please refer to the other register map file for the register that has not been described.

Chip ID = 19 (Write: Chip ID = 19h, Read: Chip ID = 99h, I^2 C: 47**h)

Please refer to the other register map file for the register that has not been described.

读出驱动模式

下表列出了此传感器可用的操作模式。(每个值是每个通道的最大帧速率)

FREQ (CID = 02h, Address = DCh, [1:0]) = 0h

Drive	Frame	Data		A/D	Numl			number Average)*3		Number of INCK in 1H	
mode	rate [frame/s]	rate [Gbps]	SLVS ch*1	conversion	Н	V	Н	V	INCK: 37.125	INCK: 74.25	INCK: 54
	404 =0		_						MHz	MHz	MHz
-	134.73	2.376	4	8			2064		258.0	516.0	375.3
	92.69	1.188	2	·			1500		375.0	750.0	545.5
A II i I	125.27	2.376	4	40	4000	4004	1776	4000	277.5	555.0	403.7
All pixel	74.76	1.188	2	10	1280	1024	1488	1068	465.0	930.0	676.4
	71.53	2.376	4	40			2592		486.0	972.0	706.9
	62.97	1.188	2	12			1472		552.0	1104.0	802.9
	260.68	2.376	4				2064		258.0	516.0	375.3
All pixel	260.68	1.188	2	8			1032		258.0	516.0	375.3
(Vertical /	242.36	2.376	4	40		0.40	540	1776		277.5	555.0
Horizontal 1/2	242.36	1.188	2	10	640	512	888	552	277.5	555.0	403.7
subsampling)	138.39	2.376	4	12			2592		486.0	972.0	706.9
	138.39	1.188	2	12			1296		486.0	972.0	706.9
	*2	2.376	4	0			2064		258.0	516.0	375.3
	*2	1.188	2	8			1500		375.0	750.0	545.5
DOL	*2	2.376	4	40	*1	*1	1776	*2	277.5	555.0	403.7
ROI	*2	1.188	2	10			1488	3	465.0	930.0	676.4
	*2	2.376	4	12	1		2592		486.0	972.0	707.0
	*2	1.188	2	12			1472		552.0	1104.0	803.0

FREQ (CID = 02h, Address = DCh, [1:0]) = 1h

Drive	Frame	Data		A/D	Numb	per of		number Average)*3		Number of INCK in 1H	
mode	rate [frame/s]	rate [Gbps]	SLVS ch ^{*1}	conversion	Н	V	Н	V	INCK: 37.125 MHz	INCK: 74.25 MHz	INCK: 54 MHz
	91.71	1.188	4				1516		379.0	758.0	551.3
•	47.81	0.594	2	8			1454		727.0	1454.0	1057.5
	73.96	1.188	4				1504		470.0	940.0	683.6
All pixel	38.41	0.594	2	10	1280	1024	1448	1068	905.0	1810.0	1316.4
•	62.29	1.188	4	40			1488		558.0	1116.0	811.7
	32.18	0.594	2	12			1440		1080.0	2160.0	1571.0
	260.67	1.188	4				1032		258.0	516.0	375.3
All pixel	177.45	0.594	2	8		540	758		379.0	758.0	551.3
(Vertical /	242.36	1.188	4	40	0.40		888	552	277.5	555.0	403.7
Horizontal 1/2	143.09	0.594	2	10	640	512	752		470.0	940.0	683.6
subsampling)	138.38	1.188	4	12			1296		486.0	972.0	707.0
ouboumpiing)	120.52	0.594	2	12			744		558.0	1116.0	811.7
	*2	1.188	4				1516		379.0	758.0	551.3
•	*2	0.594	2	8 I I		1454		727.0	1454.0	1057.5	
DOL	*2	1.188	4	40	*1	*1	1504	*2	470.0	940.0	683.6
ROI	*2	0.594	2	10			1448	3	905.0	1810.0	1316.4
	*2	1.188	4	12	1		1488		558.0	1116.0	811.7
	*2	0.594	2				1440		1080.0	2160.0	1571.0

¹ 指定裁剪区域 (ROI)。 12 请参阅 "ROI 模式"部分。 14 的空白像素数可能会变化 1 个像素。

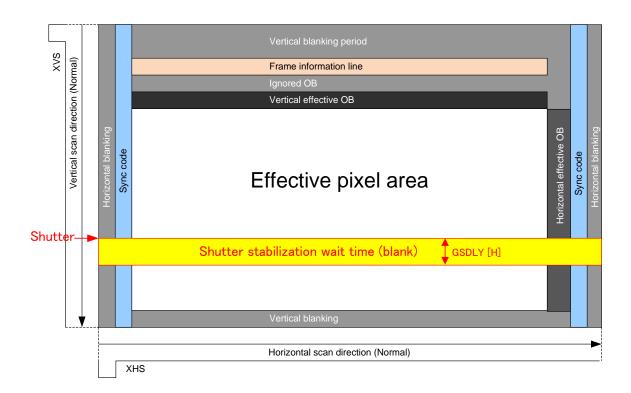
有关注册 HMAX / VMAX 的设置值,请参阅各驱动模式设置部分。

图像数据输出限制

如果在输出本产品中的图像数据时释放快门,则由于快门稳定等待时间,图像数据中会插入空白代码。 快门稳定等待时间的插入时间根据快门释放时间而变化。

在快门稳定等待时间内,不会输出同步代码。请参考传感器的同步代码并执行同步。

有关在图像数据输出期间快门释放对图像质量的影响,请参阅应用说明。



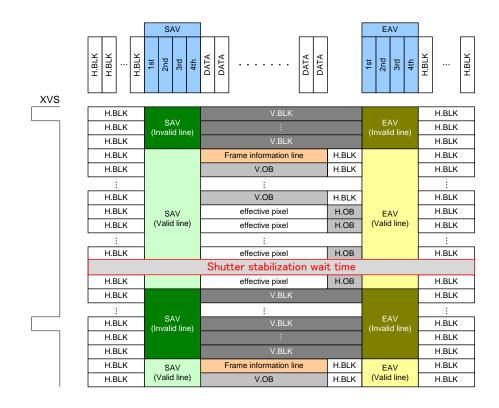
插入 Sutter 稳定等待时间的图像绘制

GSDLY请参考各扫描模式的寄存器列表

图像数据输出格式

同步码

同步码紧接着"虚拟信号+OB信号+有效像素数据"前后添加并输出。同步码按第1、第2、第3、第4的顺序输出。第1至第3输出固定值。(BLK:消隐期)



同步码输出时序

同步代码列表

Sun	Sync code		1st code		2nd code				3rd code		4th code		
Syli	ic code	8 bit	10 bit	12 bit	8 bit	10 bit	12 bit	8 bit	10 bit	12 bit	8 bit	10 bit	12 bit
SAV ((Valid line)	FFh	3FFh	FFFh	00h	000h	000h	00h	000h	000h	80h	200h	800h
EAV ((Valid line)	FFh	3FFh	FFFh	00h	000h	000h	00h	000h	000h	9Dh	274h	9D0h
SAV (li	nvalid line)	FFh	3FFh	FFFh	00h	000h	000h	00h	000h	000h	ABh	2ACh	AB0h
EAV (li	nvalid line)	FFh	3FFh	FFFh	00h	000h	000h	00h	000h	000h	B6h	2D8h	B60h

同步码输出时序

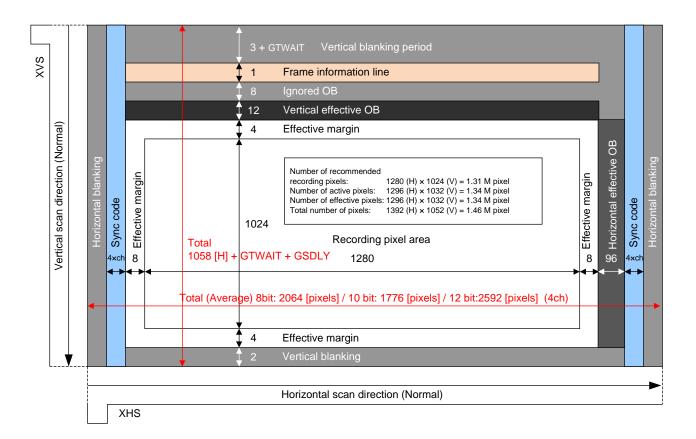
传感器输出信号通过内部电路,并以相对于水平同步信号的延迟时间(系统延迟)输出。此系统延迟值对于每条线而言未定义,因此请参考传感器输出的同步码并执行同步。



全像素扫描

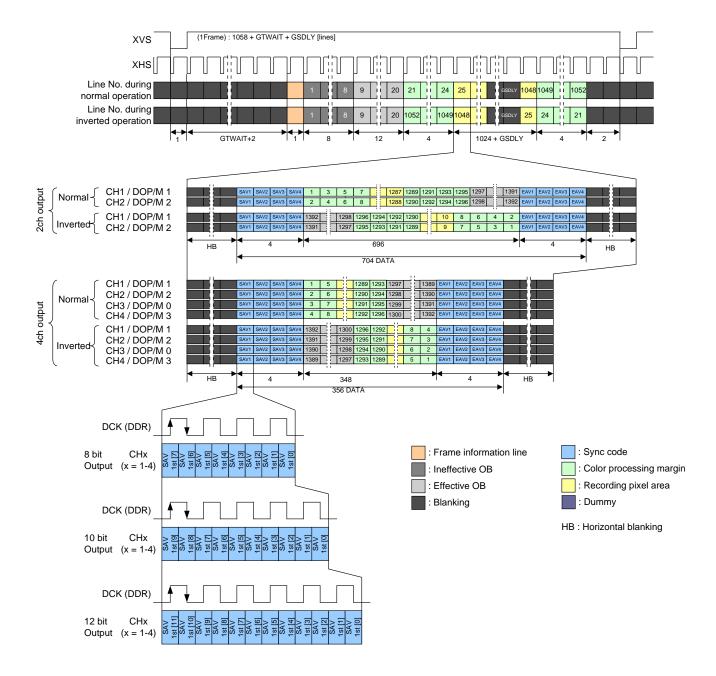
寄存器全部列表 - 像素扫描模式

						Setting	yalue					
				AD =	8 bit	_	10 bit	AD =	12 bit	Remarks		
			1.20.1	SLVS 4 ch	SLVS 2 ch	SLVS 4 ch	SLVS 2 ch	SLVS 4 ch	SLVS 2 ch]		
Address	bit	Register name	Initial Value	134.73	92.70	125.27	74.76	71.53	62.97			
			value	[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]	FREQ = 0h		
				91.72	47.81	73.96	38.41	62.30	32.19	FREQ = 1h		
				[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]	FREQ = III		
Chip ID	= 02h											
3Ch	[0]	WINMODE	0)			All-pixel mode		
	[4]	HMODE	0			()			All-pixel		
D4h	[7:0]											
D5h	[7:0]	VMAX	436h			42	Ch					
D6h	[7:0]			00.41	0551	0001	0.4.01	2001	4501			
D8h	[7:0]	HMAX	235h	204h	2EEh	22Bh	3A2h	3CCh	450h	FREQ = 0h		
D9h	[7:0]	FREQ	Oh	2F6h	5AEh	3ABh	712h / 1h	45Ch	870h	FREQ = 1h		
DCh E2h	[1:0] [7:0]	GTWAIT	0h 6h			6						
E3h	[7:0]	GSDLY	4h				h					
Chip ID			411				11					
Chip iD	- 0411											
00h	[6:5]	ADBIT	0h	2	2h Oh 1h							
00	[0.0]	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0	_	211							
0.01	r= 01	11101/051.0	=01		IN	CK = 37.125 M	Hz / 54 MHz: 5	50h				
20h	[7:0]	INCKSEL0	52h			INCK = 74.2	25 MHz: 52h					
21h	[7:0]	INCKSEL1	20h		INC	K = 37.125 MH	z / 74.25 MHz	: 20h				
2111	[7:0]	INCRSELI	2011			INCK = 54	MHz: 16h					
24h	[7:0]	INCKSEL2	52h		IN	CK = 37.125 M	Hz / 54 MHz: 5	50h				
2-111	[7.0]	INOROLLE	0211			INCK = 74.2	25 MHz: 52h					
25h	[7:0]	INCKSEL3	20h		INC	K = 37.125 MH		: 20h				
20	[]		20				MHz: 16h					
26h	[7:0]	FREQ_SYNC	93h			FREQ =						
001						FREQ =	= 1: A3h					
30h	[7:2] [1:0]	LLBLANK	04h			04	4h					
31h Chip ID												
Chip iD	= 0611				0: 10 bit							
30h	[1:0]	ODBIT	0h	2h 0h 1h						1: 12 bit		
3011	[1.0]	ODDIT	OII	211 011 111				2: 8 bit				
				2h N/A 2h N/A 2h N/A				4 ch SLVS				
44h	[3:0]	STBSLVS	1h	N/A 3h N/A 3h N/A 3h					2 ch SLVS			
				3h	N/A	3h	N/A	3h	N/A	4 ch SLVS		
45h	[3:0]	OPORTSEL	1h	N/A 4h N/A 4h N/A 4h						2 ch SLVS		
Chip ID	= 07h									·		
C0h	[7:0]	DI KI EVE	0205	00	Eh	00	Ch	٥٢	:Oh	Recommended		
C1h	[3:0]	BLKLEVEL	03Ch	Ch 00Fh 03Ch 0F0h								



PixelArray 图像绘制在全像素扫描模式

SONY



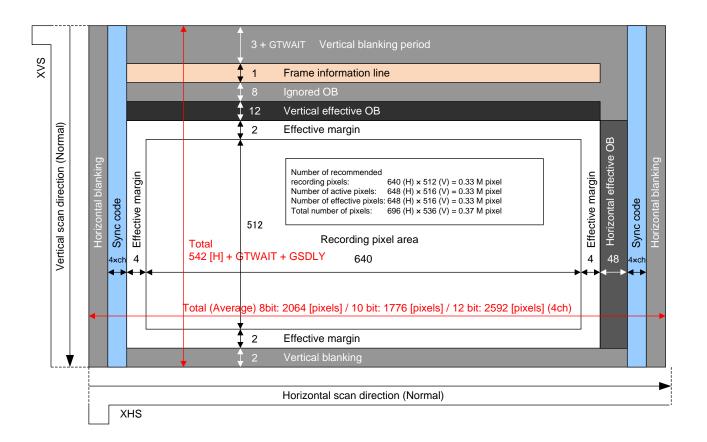
全像素扫描模式下串行输出驱动时序图

垂直/水平 1/2 子采样模式

在此模式下必须设置 V 方向和 H 方向。(WINMODE = 1h,HMODE = 1) 垂直/水平 1/2 子采样模式寄存器列表

请将全像素扫描模式设置为除以下设置以外的设置。

						Setting	yalue				
				AD =	8 bit	AD =	10 bit	AD =	12 bit	Remarks	
			1-20-1	SLVS 4 ch	SLVS 2 ch	SLVS 4 ch	SLVS 2 ch	SLVS 4 ch	SLVS 2 ch		
Address	bit	Register name	Initial Value	260.68	260.28	242.36	242.36	138.39	138.39	FREQ = 0h	
				[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]	FREQ = UII	
				260.68	177.45	242.36	143.10	138.39	120.53	FREQ = 1h	
				[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]	FREQ = III	
Chip ID	= 02h	1									
3Ch	[0]	WINMODE	0				1			Subsampling mode	
	[4]	HMODE	0				I			Subsampling	
D4h	[7:0]										
D5h	[7:0]	VMAX	436h			22	8h				
D6h	[7:0]										
D8h	[7:0]	1.18.4.6.37	0051	204h	204h	22Bh	22Bh	3CCh	3CCh	FREQ = 0h	
D9h	[7:0]	HMAX	235h	204h	2F6h	22Bh	3ACh	3CCh	45Ch	FREQ = 1h	
DCh	[1:0]	FREQ	0h		0h / 1h						
E2h	[7:0]	GTWAIT	6h		6h						
E3h	[7:0]	GSDLY	4h		4h						
Chip ID	0 = 04h										
20h	[7:0]	INCKSEL0	52h		IN	CK = 37.125 M		50h			
2011	[1.0]	INCINOLLO	OZII				25 MHz: 52h				
21h	[7:0]	INCKSEL1	20h		INC	K = 37.125 MH		20h			
							MHz: 16h				
24h	[7:0]	INCKSEL2	52h		IN	CK = 37.125 M		50h			
					INIO		25 MHz: 52h	201			
25h	[7:0]	INCKSEL3	20h		INC	K = 37.125 MH	z / 74.25 MHz: MHz: 16h	20n			
26h	[7:0]	FREQ_SYNC	93h	FREQ = 0: 93h FREQ = 1: A3h							
30h	[7:2]		2.11	04h							
31h	[1:0]	LLBLANK	04h	U4n 							
Chip ID) = 06h										
44h	[3:0]	STBSLVS	1h	2h	N/A	2h	N/A	2h	N/A	4 ch SLVS	
4411	[3.0]	SIBSLVS	111	N/A	3h	N/A	3h	N/A	3h	2 ch SLVS	
45h	[3:0]	OPORTSEL	1h	3h	N/A	3h	N/A	3h	N/A	4 ch SLVS	
4011	[3.0]	OI OINTOLL	'''	N/A	4h	N/A	4h	N/A	4h	2 ch SLVS	



PixelArray 图像以垂直/水平 1/2 子采样模式绘制

ROI模式

该传感器具有 ROI 功能,可在多个任意位置剪切和读出信号。

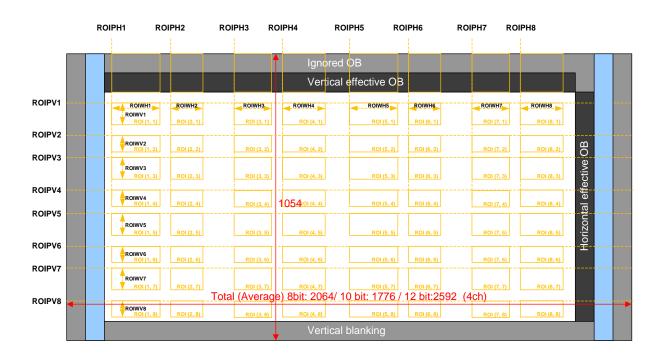
在所有像素扫描模式下,裁剪位置最多可设置 64 个区域,由水平 8 点和垂直 8 点指定,将有效像素起始位置作为原点 (0, 0)。 在所有像素扫描模式下均可进行裁剪,水平周期固定为该模式的值。

这些通过水平裁剪设置 (ROI (1, y) 至 ROI (8, y)) 裁剪的区域以左对齐输出,从而延长了水平消隐周期。 在垂直裁剪区域 (ROI (x, 1) 至 ROI (x, 8)) 中,图像数据的数量也从裁剪起始线输出,并且可以通过在从属模式下更改输入 XVS 线的数量或在主模式下更改寄存器 VMAX 来调整帧速率。

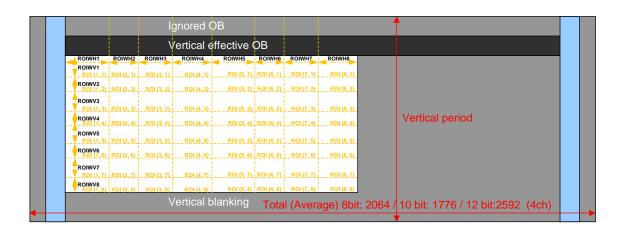
当 ROI 区域改变大小或裁剪地址时,会产生一个无效帧。

ROI 图像如下图所示。

在垂直/水平 1/2 子采样模式下,该传感器不支持 ROI 模式。



ROI 模式下指定区域的图像绘制



图像绘制细节



ROI模式寄存器列表

请将全像素扫描模式设置为除以下设置以外的设置。

				Setting value									
				AD =	8 bit	-	10 bit	AD =	12 bit				
Address	bit	Register name	Initial	SLVS 4 ch	SLVS 2 ch	SLVS 4 ch	SLVS 2 ch	SLVS 4 ch	SLVS 2 ch	Remarks			
			Value	*1	*2	*3	*4	*5	*6				
				[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]				
Chip ID	1		0	l			<u> </u>			All pival made			
3Ch	[0] [4]	WINMODE HMODE	0))			All-pixel mode All-pixel			
D4h	[7:0]	TIMOBE	0							7 III PIXOI			
D5h	[7:0]	VMAX	436h	*1	*2	*3	*4	*5	*6				
D6h	[7:0]												
D8h	[7:0]	HMAX	235h	204h	2EEh	22Bh	3A2h	3CCh	450h	FREQ = 0h			
D9h	[7:0]	EBEO	Oh	2F6h	5AEh	3ABh	712h	45Ch	870h	FREQ = 1h			
DCh E2h	[7:0]	FREQ GTWAIT	0h 6h				/ 1h ih						
E3h	[7:0]	GSDLY	4h				.h						
Chip ID				1									
	[0]	FID0_ROIH1ON	0	The horizontal	setting of FID	0 ROI area (1,	y) (y = 1 to 8)						
	[0]	TIBO_ROIITION	0	0: Disable 1:									
	[1]	FID0_ROIV1ON	0	The vertical se 0: Disable 1:	•	ROI area (x, 1)	(x = 1 to 8)						
						0 ROI area (2,	v) (v = 1 to 8)						
	[2]	FID0_ROIH2ON	0	0: Disable 1:	•	0 1101 a10a (2,	<i>y</i>						
	[3]	FID0_ROIV2ON	0			ROI area (x, 2)	(x = 1 to 8)						
04h	[၁]	FIDU_ROIVZON	0	0: Disable 1:									
"	[4]	FID0_ROIH3ON	0			0 ROI area (3,	y) (y = 1 to 8)						
				0: Disable 1:		201 area (v. 3)	(v = 1 to 8)						
	[5]	FID0_ROIV3ON	0		ne vertical setting of FID0 ROI area (x, 3) (x = 1 to 8) Disable 1: Enable								
	[6]	FIDO DOULION				0 ROI area (4,	y) (y = 1 to 8)						
	[6]	FID0_ROIH4ON	0	0: Disable 1:	Enable								
	[7]	FID0_ROIV4ON	0		•	ROI area (x, 4)	(x = 1 to 8)						
				0: Disable 1:		0 ROI area (5,	v) (v = 1 to 8)						
	[0]	FID0_ROIH5ON	0	0: Disable 1:	-	o itoi alea (o,	y) (y = 1 to 0)						
	[4]	FIDO DON/FON				ROI area (x, 5)	(x = 1 to 8)						
	[1]	FID0_ROIV5ON	0	0: Disable 1:	Enable								
	[2]	FID0_ROIH6ON	0		•	0 ROI area (6,	y) (y = 1 to 8)						
				0: Disable 1: The vertical se		201 area (v. 6)	(v = 1 to 8)						
	[3]	FID0_ROIV6ON	0	0: Disable 1:		(X, U)	(X = 1 10 0)						
05h	F 43	FIDA DOUITON				0 ROI area (7,	y) (y = 1 to 8)						
	[4]	FID0_ROIH7ON	0	0: Disable 1:	Enable								
	[5]	FID0_ROIV7ON	0		-	ROI area (x, 7)	(x = 1 to 8)						
				0: Disable 1:		0 ROI area (8,	w) (w = 1 to 9)						
	[6]	FID0_ROIH8ON	0	0: Disable 1:	•	o ROI alea (o,	y) (y = 1 to 6)						
	[-7]	FIDe Double		The vertical se		ROI area (x, 8)	(x = 1 to 8)						
	[7]	FID0_ROIV8ON	0	0: Disable 1:	-	. ,	•						
20h	[7:0]	FID0_ROIPH1	0000h	- C	Designation of horizontal cropping position for FID0 on area (1, y) (y = 1 to 8)								
21h	[4:0]		-	*Set the value									
22h 23h	[7:0] [3:0]	FID0_ROIPV1	000h	_	vertical cropp of multiple of 8	ing position for 3	LIDO OU area	(x, 1) (X = 1)	0)				
24h	[7:0]					pping size for I	FID0 on area (1, y) (y = 1 to 8	3)				
25h	[4:0]	FID0_ROIWH1	0000h	•	of multiple of			2, 3					
26h	[7:0]	FID0_ROIWV1	000h	•		ing size for FID	00 on area (x, 1	(x = 1 to 8)					
27h	[3:0]				of multiple of 8		(EID)		0)				
28h 29h	[7:0] [4:0]	FID0_ROIPH2	0000h	•	horizontal cro of multiple of 8	pping position	tor FID0 on are	ea (2, y) (y = 1	to 8)				
2Ah	[7:0]					ing position for	FID0 on area	(x, 2) (x = 1 to	8)				
2Bh	[3:0]	FID0_ROIPV2	000h	•	of multiple of 8	٠.	20 311 4104	,, _ , (<i>n</i> = 1 to	-,				
2Ch	[7:0]	FID0_ROIWH2	0000h			pping size for I	FID0 on area (2	2, y) (y = 1 to 8	3)				
2Dh	[4:0]	I IDO_INDIVITIZ	000011	*Set the value	of multiple of	1							

Address bit Register name Initial Value Initial Valu		Setting value									
Style="blook of the color: 150% of the color: 150		12 bit	AD =	•	`	8 bit	AD =				
The color of the	Remarks								Register name	bit	Address
Designation of vertical cropping size for FID0 on area (x, 2) (x = 1 to 8)		*6	*5	*4	*3	*2	*1	Value			
Set the value of multiple of 8		[frame/s]									
Set the value of multiple of 8 Set the value of multiple of 8			(x = 1 to 8)	00 on area (x, 2				000h	FID0 ROIWV2		
31h 4:01 FID0_ROIPH3 FID0_ROIPH3 FID0_ROIPH3 FID0_ROIPH3 FID0_ROIPH3 FID0_ROIPH3 FID0_ROIPH3 FID0_ROIPH3 FID0_ROIPH4 FID0_ROIPH4 FID0_ROIPH4 FID0_ROIPH4 FID0_ROIPH4 FID0_ROIPH5 F						•					
32h 17:01 FIDD_ROIPV3 33h 17:01 FIDD_ROIPV3 35h 14:01 FIDD_ROINV3 35h 14:01 FIDD_ROINV4 35h 14:01 FIDD_ROINV5 35h 3:01 FIDD_ROINV6 35h 44h 17:01 44h 17:0		to 8)	ea (3, y) (y = 1	for FID0 on are				0000h	FID0_ROIPH3		
Set the value of multiple of 8 Set the value of multiple of 8		<u></u>	(v 2) (v = 1 to	FID0 on area							
34h [7:0] 35h [4:0] 7:0] 36h [7:0] 37h 370 37h 370 37h		5)	(x, 3) (x = 1)0	FIDU UII alea	0.1			000h	FID0_ROIPV3		
Set the value of multiple of 4 Designation of vertical cropping position for FID0 on area (x, 3) (x = 1 to 8))	3, y) (y = 1 to 8	FID0 on area (†				
37h 3:0 FIDO_ROIPH4 3:0 FIDO_ROIPH4 3:0 FIDO_ROIPH5 4:0		,	,,,,	(_	0000h	FID0_ROIWH3		
38h [7:0] 38h			(x = 1 to 8)	00 on area (x, 3	ing size for FID	vertical cropp	Designation of	0006	FIDO DOIMA/2	[7:0]	36h
39h 4-0 FID0_ROIPH4 0000h Set the value of multiple of 8					3	of multiple of	*Set the value	00011	FIDU_KOIWV3	[3:0]	37h
3Ah 17:0 3Bh 13:0 3Bh 33:0 35h 33:0		to 8)	ea (4, y) (y = 1	for FID0 on are			_	0000h	FID0 ROIPH4		
Set the value of multiple of 8											
3Ch (7:0] 3Dh (4:0)		3)	(x, 4) (x = 1 to)	FID0 on area	٠.		, and the second	000h	FID0_ROIPV4		
3Dh (4:0) FIDO_ROIWH4 0000h *Set the value of multiple of 4 Designation of vertical cropping size for FIDO on area (x, 4) (x = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping position for FIDO on area (5, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping position for FIDO on area (5, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of vertical cropping position for FIDO on area (x, 5) (x = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping position for FIDO on area (x, 5) (x = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping size for FIDO on area (5, y) (y = 1 to 8) *Set the value of multiple of 4 Designation of horizontal cropping size for FIDO on area (5, y) (y = 1 to 8) *Set the value of multiple of 4 Designation of horizontal cropping size for FIDO on area (6, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping position for FIDO on area (6, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping position for FIDO on area (6, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping size for FIDO on area (6, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping size for FIDO on area (6, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping size for FIDO on area (7, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping position for FIDO on area (7, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping position for FIDO on area (7, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping position for FIDO on area (7, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping position for FIDO on area (7, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of ho		\	1 v) (v = 1 to 9	EIDO on area (
Set Tr.0 3Fh Tr.0 3Fh 3.0 3.0 FiDo_ROIWV4 40h 7r.0 41h 44.0 42h 7r.0 42h 7r.0 43h 3.0 44h 7r.0 44h 7r.0 44h 7r.0 45h 47.0 47h 3.0 48h 7r.0 49h 44h 49h 41h		,	i, y) (y = 1 10 o	-IDU UII alea (4			_	0000h	FID0_ROIWH4		
Set the value of multiple of 8			(x = 1 to 8)	00 on area (x. 4							
41h [4:0] FIDO_ROIPH5 0000h 42h [7:0] FIDO_ROIPV5 000h 43h [3:0] FIDO_ROIPV5 000h 43h [7:0] FIDO_ROIWH5 000h 45h [4:0] FIDO_ROIWH5 000h 45h [4:0] FIDO_ROIWH5 000h 47h [3:0] FIDO_ROIWH5 000h 48h [7:0] FIDO_ROIPH6 000h 48h [7:0] FIDO_ROIPH7 000h 58h [7:0] FIDO_ROIPH7 000h 5			, (-		_	000h	FID0_ROIWV4		
41h [4:0] 42h [7:0] 43h [3:0] FIDO_ROIPV5 43h [7:0] 45h [7:0] 45h [7:0] 45h [7:0] 47h [3:0] 47h [3:0] 48h [7:0] 48h		to 8)	ea (5, y) (y = 1	for FID0 on are	pping position	horizontal cro	Designation of	00001-	FIDA DOIDLIE	[7:0]	40h
43h [3:0] FIDO_ROIPV5 000h *Set the value of multiple of 8					3	of multiple of	*Set the value	0000h	FID0_ROIPH5	[4:0]	41h
43h [3:0]		B)	(x, 5) (x = 1 to	FID0 on area	ing position for	vertical cropp	Designation of	000h	FIDO ROIPVS		42h
45h [4:0] FIDO_ROIWH5 0000h *Set the value of multiple of 4 46h [7:0] 47h [3:0] FIDO_ROIWV5 000h *Set the value of multiple of 8 48h [7:0] 48h [3	of multiple of	*Set the value	00011	TIDO_ROII VS		
A6h [7:0] A7h [3:0] FIDD_ROIWV5 A9h [4:0] FIDD_ROIPH6 A9h A9h A9h [4:0] FIDD_ROIPH6 A9h A9)	(5, y) (y = 1 to 8)	FID0 on area (_	0000h	FID0_ROIWH5		
47h [3:0] FIDD_ROIWVS 000h *Set the value of multiple of 8 48h [7:0] 49h [4:0] FIDD_ROIPH6 0000h *Set the value of multiple of 8 4Ah [7:0] 4Bh [3:0] FIDD_ROIPV6 1000h *Set the value of multiple of 8 4Ch [7:0] 4Ch [7:0] 4Ch [7:0] 4Ch [7:0] 4Ch [7:0] 5Ch) (41.0)								
48h[7:0] 49h[4:0]FIDO_ROIPH60000hDesignation of horizontal cropping position for FID0 on area (6, y) (y = 1 to 8) *Set the value of multiple of 84Ah[7:0] 4Bh[3:0]FIDO_ROIPV6000hDesignation of vertical cropping position for FID0 on area (x, 6) (x = 1 to 8) 			(X = 1 to 8)	on area (x, t	-		_	000h	FID0_ROIWV5		
49h [4:0] FIDD_ROIPH6		to 8)	a (6 v) (v – 1	for FID0 on are							
4Ah [7:0] 4Bh [3:0] 4Ch [7:0] 4Dh [4:0] 4Eh [7:0] 4FIDO_ROIWH6 4Eh [7:0] 50h [7:0] 51h [4:0] 52h [7:0] 53h [3:0] 55h [4:0] 55		.0 0)	a (0, y) (y = 1	ioi i ibo oii aii			, and the second	0000h	FID0_ROIPH6		
4Sh [3:0] "Set the value of multiple of 8 4Ch [7:0] 4Dh [4:0] FIDO_ROIWH6 4Eh [7:0] 4Fh [3:0] FIDO_ROIWV6 4Fh [3:0] FIDO_ROIWV6 50h [7:0] 51h [4:0] FIDO_ROIPH7 53h [3:0] FIDO_ROIPH7 53h [3:0] FIDO_ROIPH7 5000h 55h [4:0] FIDO_ROIWH7 5000h 55h [4:0] FIDO_ROIWH7 5000h 56h [7:0] 5000h		8)	(x, 6) $(x = 1 to$	FID0 on area							
4Dh [4:0] FIDD_ROIWH6 0000h *Set the value of multiple of 4 4Eh [7:0] FIDD_ROIWV6 000h *Set the value of multiple of 4 4Fh [3:0] FIDD_ROIWV6 000h *Set the value of multiple of 8 50h [7:0] FIDD_ROIPH7 0000h *Set the value of multiple of 8 Designation of horizontal cropping position for FID0 on area (7, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping position for FID0 on area (x, 7) (x = 1 to 8) *Set the value of multiple of 8 Designation of vertical cropping position for FID0 on area (x, 7) (x = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping size for FID0 on area (7, y) (y = 1 to 8) *Set the value of multiple of 8 Designation of horizontal cropping size for FID0 on area (7, y) (y = 1 to 8) *Set the value of multiple of 4 Designation of vertical cropping size for FID0 on area (x, 7) (x = 1 to 8)			· · · · ·		3	of multiple of	*Set the value	000h	FID0_ROIPV6	[3:0]	4Bh
4Dh [4:0] "Set the value of multiple of 4 4Eh [7:0] FIDO_ROIWV6 O00h Designation of vertical cropping size for FIDO on area (x, 6) (x = 1 to 8) 50h [7:0] FIDO_ROIPH7 O000h Set the value of multiple of 8 52h [7:0] FIDO_ROIPH7 O000h Set the value of multiple of 8 53h [3:0] FIDO_ROIPH7 O000h Set the value of multiple of 8 54h [7:0] FIDO_ROIWH7 O000h Set the value of multiple of 8 56h [7:0] FIDO_ROIWH7 O000h Designation of horizontal cropping position for FIDO on area (x, 7) (x = 1 to 8) 56h [7:0] FIDO_ROIWH7 O000h Designation of vertical cropping size for FIDO on area (x, 7) (x = 1 to 8) 56h [7:0] FIDO_ROIWH7 O000h Designation of vertical cropping size for FIDO on area (x, 7) (x = 1 to 8) 56h [7:0] FIDO_ROIWH7 O000h Designation of vertical cropping size for FIDO on area (x, 7) (x = 1 to 8))	6, y) (y = 1 to 8	FID0 on area (pping size for F	horizontal cro	Designation of	0000h	EIDO POIWHE	[7:0]	4Ch
4Fh [3:0] FID0_ROIWV6					1	of multiple of	*Set the value	000011	TIDO_ROTWITO	[4:0]	4Dh
4Fh [3:0] Set the value of multiple of 8			(x = 1 to 8)	00 on area (x, 6	•			000h	FID0_ROIWV6		
Sth [4:0] FIDD_ROIPH7 0000h *Set the value of multiple of 8		t- 0\	- /7 \ / .	4 FIDO			1				
52h [7:0] FID0_ROIPV7 000h Designation of vertical cropping position for FID0 on area (x, 7) (x = 1 to 8) 53h [3:0] FID0_ROIPV7 000h *Set the value of multiple of 8 54h [7:0] FID0_ROIWH7 0000h 55h [4:0] FID0_ROIWV7 000h Designation of vertical cropping size for FID0 on area (x, 7) (x = 1 to 8) *Set the value of multiple of 4 Designation of vertical cropping size for FID0 on area (x, 7) (x = 1 to 8)		10 8)	ea (7, y) (y = 1	for FID0 on are			_	0000h	FID0_ROIPH7		
Set the value of multiple of 8 Set the value of multiple of 8		8)	(x 7) (x - 1 to	FID0 on area							
54h [7:0] 55h [4:0] FID0_ROIWH7 0000h Designation of horizontal cropping size for FID0 on area (7, y) (y = 1 to 8) *Set the value of multiple of 4 56h [7:0] FID0_ROIWH7 0000h Designation of vertical cropping size for FID0 on area (x, 7) (x = 1 to 8)		-)	(A, 1) (A = 1 lO	. ibo on alea	٠.		, and the second	000h	FID0_ROIPV7		
55h [4:0] FID0_ROIWV7 0000h *Set the value of multiple of 4 56h [7:0] FID0_ROIWV7 0000h Designation of vertical cropping size for FID0 on area (x, 7) (x = 1 to 8))	', y) (y = 1 to 8	FID0 on area (
FIDO ROIW/7 000h 5		· 			•		, and the second	0000h	FID0_ROIWH7		
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			(x = 1 to 8)	00 on area (x, 7	ing size for FID	vertical cropp	Designation of	0006	EIDO POIMAZ	[7:0]	56h
57h [3:0] *Set the value of multiple of 8					3	of multiple of	*Set the value	UUUN	טעו ו_ע_טערו ו	[3:0]	57h
58h [7:0] FIDO_ROIPH8 O000h Designation of horizontal cropping position for FIDO on area (8, y) (y = 1 to 8)		to 8)	ea (8, y) (y = 1	for FID0 on are			, and the second	0000h	FID0 ROIPH8		58h
59h [4:0] *Set the value of multiple of 8											
5Ah [7:0] FID0_ROIPV8 Designation of vertical cropping position for FID0 on area (x, 8) (x = 1 to 8)		3)	(x, 8) (x = 1 to	FID0 on area	0 1			000h	FID0_ROIPV8		
Set the value of multiple of 8 Set the value of multiple of 8		١) v) (v = 1 +c 0	IDO on oros (
SCh [7:0] FIDO_ROIWH8 O000h Designation of horizontal cropping size for FID0 on area (8, y) (y = 1 to 8))	y, y = 1 to 8	ווט טעו area (ז	0			0000h	FID0_ROIWH8		
5Eh [7:0] Designation of vertical cropping size for FID0 on area (x. 8) (x = 1 to 8)			(x = 1 to 8)	00 on area (x 8							
5Fh [3:0] FIDO_ROIWV8 000h *Set the value of multiple of 8			, ,,		•		, and the second	000h	FID0_ROIWV8		

						Setting	yalue					
			1.50.1	AD =	8 bit	AD =	10 bit	AD =	12 bit			
Address	bit	Register name	Initial Value	SLVS 4 ch	SLVS 2 ch	SLVS 4 ch	SLVS 2 ch	SLVS 4 ch	SLVS 2 ch	Remarks		
			value	*1	*2	*3	*4	*5	*6			
				[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]	[frame/s]			
Chip ID	= 04h											
										0: 10 bit		
00h	[6:5]	ADBIT	0h	2	h	0	h	1	h	1: 12 bit		
										2: 8 bit		
20h	[7:0]	INCKSEL0	52h		IN	CK = 37.125 M		50h				
						INCK = 74.2		201				
21h	[7:0]	INCKSEL1	20h		INC	K = 37.125 MH		: 20h				
					INI	INCK = 54		-01-				
24h	[7:0]	INCKSEL2	52h		INCK = 37.125 MHz / 54 MHz: 50h INCK = 74.25 MHz: 52h							
					INCK = 74.25 MHz: 52h							
25h	[7:0]	INCKSEL3	20h		1140	INCK = 54		2011				
							= 0: 93h					
26h	[7:0]	FREQ_SYNC	93h			FREQ =						
30h	[7:2]		0.41									
31h	[1:0]	LLBLANK	04h			04	4h					
Chip ID	= 06h											
										0: 10 bit		
30h	[1:0]	ODBIT	0h	2	h	0	h	1	h	1: 12 bit		
				2								
44h	[3:0]	STBSLVS	1h	2h	N/A	2h	N/A	2h	N/A	4 ch SLVS		
7711	[0.0]	0.50LV0		N/A	3h	N/A	3h	N/A	3h	2 ch SLVS		
45h	[3:0]	OPORTSEL	1h	3h	N/A	3h	N/A	3h	N/A	4 ch SLVS		
	<u> </u>			N/A	4h	N/A 4h N/A 4h			4h	2 ch SLVS		
Chip ID												
C0h	[7:0]	BLKLEVEL	03Ch	h 00Fh 03Ch					0h	Recommended		
C1h	[3:0]			00			-	0.	value			

ROI 模式的限制

寄存器设置应满足以下条件:

* 不要指定重叠的区域。

ROIPH1 + ROIWH1 ≤ ROIPH2 ROIPH2 + ROIWH2 ≤ ROIPH3 ROIPH3 + ROIWH3 ≤ ROIPH4

. .

ROIPH8 + ROIWH8 ≤ 1392d

ROIPV1 + ROIWV1 ≤ ROIPV2 ROIPV2 + ROIWV2 ≤ ROIPV3 ROIPV3 + ROIWV3 ≤ ROIPV4

٠.

ROIPV8 + ROIWV8 ≤ 1032d

- * 将水平宽度设置为 4 的倍数,将水平位置、垂直宽度/位置设置设置为 8 的倍数。
- *窗口的最小宽度如下所示。

ROIWH1 + ROIWH2 + ROIWH3 + + ROIWH8 ≥ 8d

ROIWV1 + ROIWV2 + ROIWV3 + ... + ROIWV8 ≥ 8d

ROI 模式的帧率

帧速率 [帧/秒] = 1 / (("每帧的行数"或 VMAX) x (1 H 周期))

* 每帧的行数或 VMAX

V_{TR} = ROIWV1 + ROIWV2 + ROIWV3 + ... + ROIWV8 + GTWAIT + GSDLY + 26 GTWAIT 和 GSDLY 请参阅各扫描模式的寄存器列表。 * 1H 周期:根据数据速率设置和 SLVS 通道数而变化。

根据1H内INCK的数量和INCK的周期进行计算。

ROI设置示例如下。

ROIWV1 + ROIWV2 + ROIWV3 + ... + ROIWV8 = 600 ROIWV1 + ROIWV2 + ROIWV3 + ... + ROIWV8 = 8 (minimum value)

帧速率 各设置列表

B. data and Market	1 H per	iod [µs]	Frame rate [frame/s]						
Register settings No.	FREQ	FREQ	Total number of	f ROI: 600 [line]	Total number of ROI: 8 [line]				
in register list	0h	1h	FREQ = 0h	FREQ = 1h	FREQ = 0h	FREQ = 1h			
*1	6.95	10.21	226.25	154.01	3270.34	2226.25			
*2	10.1	19.58	155.66	80.29	2250.00	1160.59			
*3	7.47	12.66	210.35	124.19	3040.54	1795.21			
*4	12.53	24.38	125.53	64.50	1814.51	932.32			
*5	13.09	15.03	120.10	104.61	1736.11	1512.09			
*6	14.87	29.09	105.74	54.04	1528.53	781.25			

各项功能说明

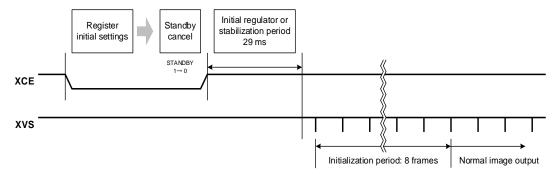
待机模式

通过将"1"写入待机控制寄存器STANDBY,该传感器将停止运行并进入待机模式,从而降低功耗。开机或其他系统复位操作后也会建立待机模式。

待机设置寄存器列表

	Re	gister details	S	Initial		
Register	Chip ID	Address (): I ² C	bit	value	Setting value	Remarks
STANDBY	02h	00h (3000h)	[0]	1h	1h: Standby 0h: Operating	Register communication is executed even in standby mode.

串行通信寄存器保持先前的值。但是,待机模式下传输的地址寄存器将被覆盖。串行通信块即使在待机模式下也能运行,因此可以通过将 STANDBY 寄存器设置为 " 0 "来取消待机模式。待机模式取消后,传感器内部电路需要一些时间才能稳定。有关待机模式设置和取消顺序的详细信息,请参阅通电后的传感器设置流程。待机模式取消后,内部调节器稳定(29 毫秒或更长)后,从 9 帧输出正常图像。



从待机取消到稳定图像输出的顺序

从属模式和主模式

传感器可以在从属模式和主模式之间切换。切换由 XMASTER 引脚完成。

在取消系统复位之前建立 XMASTER 引脚状态。(请勿在操作期间切换此引脚状态。)

当传感器处于从属模式时,向 XVS 输入垂直同步信号,向 XHS 输入水平同步信号。

对于同步信号间隔,输入数据线以输出垂直同步信号,并在每个操作模式下为水平同步信号指定 1H 周期。有关输出数据线的数量和 1H 周期,请参阅"读出驱动模式"部分。

将 XMSTA 寄存器设置为"0",以便在设置为主模式后启动操作。此外,通过 VMAX [23:0] 寄存器设置垂直方向的同步信号计数,通过 HMAX [15:0] 寄存器设置水平方向的时钟数。有关"读出驱动模式"部分的详细信息,请参阅操作模式的描述。

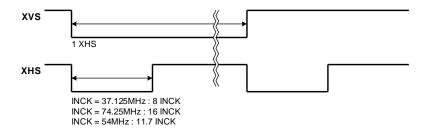
引脚处理

Pin name	Pin processing	Operation mode	Remarks
VMA CTED ::-	Low fixed	Master mode	High: OV _{DD}
XMASTER pin	High fixed	Slave mode	Low: GND

从机模式和主机模式的RegisterList

	Reg	ister details		Initial		
Register	Chip ID	Address (): I ² C	Bit	value	Setting value	Remarks
XMSTA		0Ch (300Ch)	[0]	1h	1h: Master operation ready (Initial value) 0h: Master operation start	The master operation starts by setting 0.
		D4h (30D4h)	[7:0]			Line number per frame
VMAX [23:0]	02h	D5h (30D5h)	[7:0]	000436h	See the item of each drive mode	designated (Master mode and Slave
		D6h (30D6h)	[7:0]			mode common setting.)
HMAX [15:0]		D8h (30D8h)	[7:0]	·	See the item of	Clock number per line designated
ПійіАЛ [15.0]		D9h (30D9h)	[7:0]	0235h	each drive mode	(Master mode and Slave mode common setting.)

XVS/XHS 主模式下的输出波形



增益调整功能

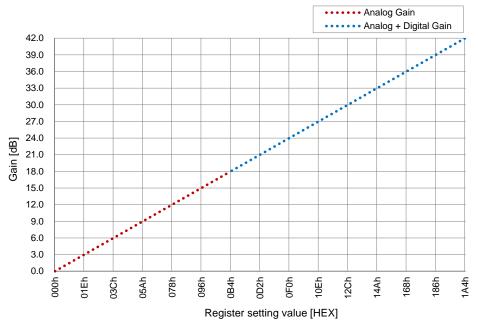
PGC

本装置的可编程增益控制 (PGC) 由模拟模块和数字模块组成。通过 GAIN[8:0] 寄存器设置 , 可将模拟增益和数字增益之和设置为最高 42 dB。将增益的十倍值设置为寄存器

例如)

设置为 6 dB 时:

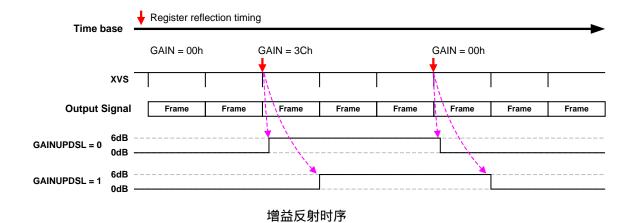
 $6 \times 10 = 60d$, GAIN = 03Ch



增益设定寄存器列表

Register	Register details			Initial	Setting value	Domorko
	Chip ID	Address (): I ² C	bit	value	Setting range	Remarks
GAIN [8:0]	07h	14h (3514h)	[7:0]	000h	000h to 1A4h (0d to 420d)	Setting value:
	0/11	15h (3515h)	[0]			Gain [dB] × 10

正常模式下增益反映时序通过GAINUPDSL的设定值改变,如下所示。在触发模式下,将寄存器GAINUPDSL设定为0。



黑色等级调整功能

可以相对于通过 BLKLEVEL [11:0] 寄存器执行数字增益调制的数据添加黑电平偏移(偏移可变范围: 000h 至 FFFh)。当 BLKLEVEL [11:0] 设置增加 1 LSB 时,黑电平增加 1 LSB。

*建议使用以下所示的值。

8 bit output: 00Fh (15 d) 10 bit output: 03Ch (60 d) 12 bit output: 0F0h (240 d)

黑色等级调整寄存器列表

Register	Register details			Initial		
	Chip ID	Address (): I ² C	bit	value	Setting value	
BLKLEVEL [11:0]	07h	C0h (35C0h)	[7:0]	03Ch	000h to FFFh	
	U/N	C1h (35C1h)	[3:0]	USCN	00011 (0 FFF11	

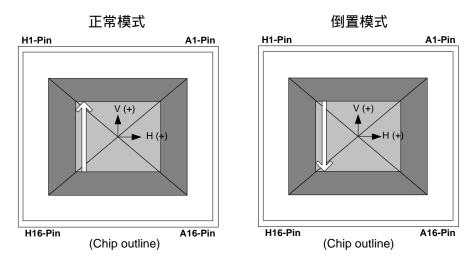
SONY IMX990-AABA-C

水平/垂直正常运行和倒置运行

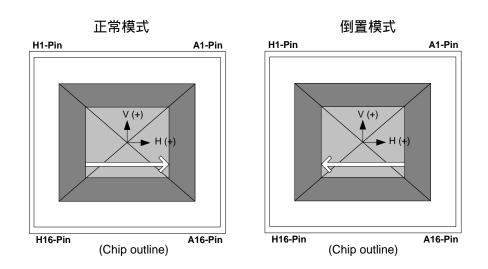
垂直方向的传感器读出方向(正常/反转)可通过 VREVERSE 寄存器设置切换,水平方向的传感器读出方向(正常/反转)可通过 HREVERSE 寄存器设置切换。有关正常和反转模式下读出线的顺序,请参阅"读出驱动模式"部分。

读出驱动方向设定寄存器列表

庆山龙 <i>约</i> /7月·庆尼司门丽/73代								
Register	Register details							
	Chip ID	Address (): I ² C	bit	Initial value	Setting value			
VREVERSE		04h	[0]	0h	0h: Normal (Initial value) 1h: Inverted			
HREVERSE	04h (3204h		[1]	0h	0h: Normal (Initial value) 1h: Inverted			



垂直方向正反转驱动轮廓(顶视图)



水平方向正反转驱动轮廓图(顶视图)

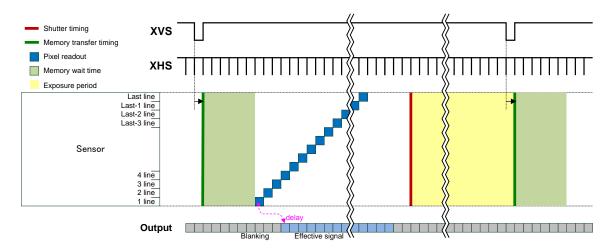
快门和积分时间设置

该传感器具有全局快门功能,可使用每个像素中的内存对所有行进行集体积分。

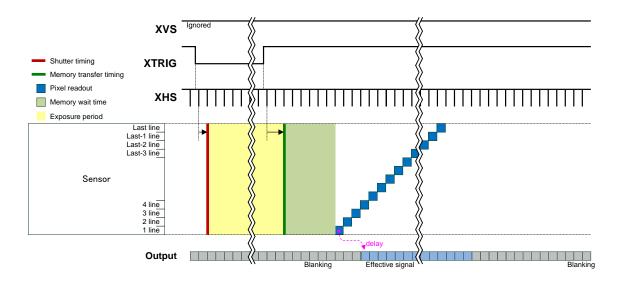
该传感器具有可变电子快门功能,可以控制以行为单位的积分时间,以调整曝光时间。该传感器在曝光 后将信号传输到像素中的内存(内存传输),然后该传感器执行输出,其中读出操作与XHS信号同步,按 顺序对每行执行。该传感器具有触发模式,可以通过触发器控制曝光开始时间和内存传输时间。

注)对于积分时间控制,在设置更改后,从帧输出反映设置的图像

在本条目中,快门操作和存储时间如下图所示,横轴为时间序列,纵轴为垂直地址。为简单起见,快门和读出操作 以行为单位表示。



全局快门(普通模式)操作示意图



全局快门(顺序触发模式)操作示意图

全局快门(正常模式)操作

可以通过改变电子快门时序来控制积分时间。在电子快门设置中,积分时间由 SHS [23:0] 寄存器控制。有关 SHS [23:0] 的设置值,请参阅"曝光设置列表"表。当传感器在从属模式下工作时,每帧的行数由 XVS 间隔(行数)决定,使用输入的 XHS 间隔作为行单位。当传感器在主模式下工作时,每帧的行数由 VMAX [23:0] 寄存器决定。每帧的行数根据工作模式而不同。

曝光时间计算公式

Exposure time [s] = (1 H period) x (Number of lines per frame - SHS) + $7.372 \, [\mu s]^{-1}$: Exposure time error (toffset)

快门设置注册列表

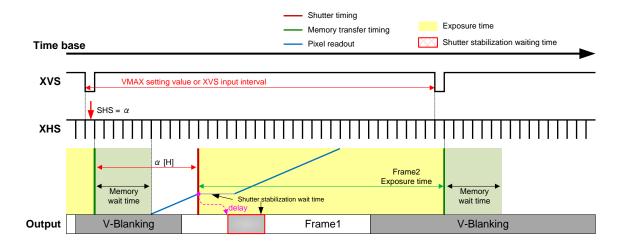
	Reg	ister detail:	S	Initial	Setting value	
Register	Chip ID	Address (): I ² C	bit	value		
	02h	D4h (30D4h)	[7:0]	000436h		
VMAX [23:0]		D5h (30D5h)	[7:0]		Set the number of lines per frame (only in master mode)	
		D6h (30D6h)	[7:0]			
GTWAIT [7:0]		E2h (30E2h)	[7:0]	6h	Refer to the register setting lists of each scan mode .	
	04h	40h (3240h)	[7:0]	000018h		
SHS [23:0]		41h (3241h)	[7:0]		Set the shutter sweep time. (GTWAIT + 9) to (Number of lines per frame - 1)	
		42h (3242h)	[7:0]			



曝光设置列表

5	memory wait time	Number of	SHS Setting value	Exposure Setting value [H]	AD 10bit, FREQ 0, 4 ch output		
Drive mode	Drive mode wait time [H]	lines per frame [DEC]	[DEC]		Frame rate [frame/s]	Actually exposure [ms]*3	
			1067	1067 1		0.015	
	6	1068	1066	2	125.27	0.022	
All - pixel	(GTWAIT)	(VMAX)	• • •	•••		•••	
	(GTWAIT)	(VIVIAA)	16	1052		7.871	
			15	1053		7.878	
	6	552	551	1	242.36	0.015	
Vertical /			550	2		0.022	
Horizontal 1/2	(GTWAIT)	(VMAX)	•••	•••		•••	
Subsampling mode	(OTWAIT)	(VIVIAX)	16	536		4.014	
mode			15	537		4.021	
		V _{TR} *1	V _{TR} -1	1		0.015	
	6 (GTWAIT)		V _{TR} -2	2	*2	0.022	
ROI			•••			•••	
			16	VTR-16		*3	
			15	VTR-15			

- *1 V_{TR} 和帧率请参考"读出驱动模式"中的"ROI模式"部分
- ^{*2} INCK 频率按典型值输入,并包含t0FFSET(7.372[μs]) ^{*3} 符合曝光时间计算公式。(每帧行数 = VTR)



全局快门图像图(普通模式)

全局快门(顺序触发模式)操作

可以通过改变输入到 XTRIG 引脚的脉冲宽度来控制积分时间。脉冲宽度以 XHS 单位 [H] 指定。要从正常模式过渡到触发模式,请将寄存器 TRIGEN 设置为 1。在触发模式操作期间,将忽略 XVS 输入信号。如果连续输入触发,则存在基于前一个触发上升沿禁止触发上升沿输入(tTGPD)和下降沿输入(tTGES)的时间段。

当在上升沿输入禁止时间段(tTGPD)之前输入触发上升沿时,中断操作开始。此功能仅适用于从属模式。每帧的行数根据操作模式而不同。

曝光时间计算公式

Exposure time [s] = (XTRIG low level pulse width $[H]^{*2}$) + 7.372 $[\mu s]^{*1}$

- *1: 曝光时间误差(t OFFSET)
- *2: 低电平脉冲宽度以XHS脉冲计数。

快门设置注册列表

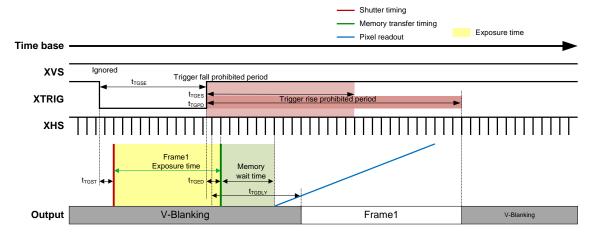
	Register details			Initial		
Register	Chip ID	Address (): I ² C	bit	value	Setting value	
XMSTA	02h	0Ch (300Ch)	[0]	1	Setting of master mode operation 0: Master mode operation start 1: Master mode operation stop	
VINT_EN	04h	32h (3232h)	[0]	1	Setting of Interrupt mode in Trigger Mode 0: V interrupt is disabled 1: V interrupt is enabled	
TRIGEN	06h	00h (3400h)	[0]	0	Global shutter mode setting 0: Normal mode 1: Trigger mode	

全局快门(顺序触发模式)参数列表

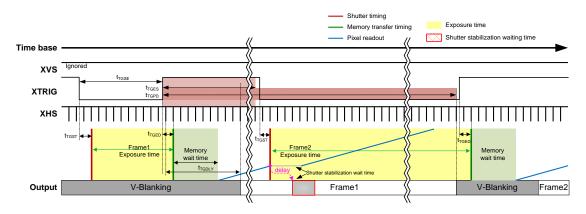
Item	Symbol	Min.	Тур.	Max.	Unit
Integration start delay	t _{TGST}	1	_	2	Н
Integration end delay	t _{TGED}	1 + toffset	_	2 + toffset	Н
Pulse width	trgse	1	_	_	Н
Next trigger fall prohibited period	trges	10 + GTWAIT*1	_	_	Н
Next trigger rise prohibited period (All - pixel / 1/2 Subsampling)	t _{TGPD}	VMAX	_	_	Н
Next trigger rise prohibited period (ROI)		V _{TR} *2	_	_	
Data output delay	t _{TGDLY}	_	4 + GTWAIT*1		Н

^{*1} 参考各个扫描模式下的寄存器设置列表。

^{*2} V TR (请参阅"读出驱动模式"中的"ROI模式"部分)



全局快门的单次快门图像绘制 (顺序触发模式)

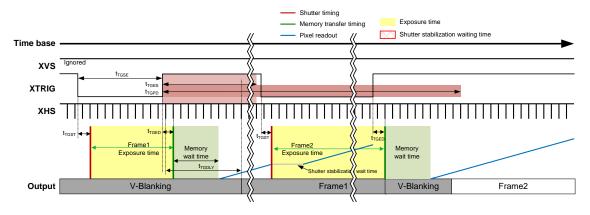


多重快门图像 全局快门 (顺序触发模式) 绘图

中断操作

如果 VINT_EN = 1h,则中断操作发生时的图像绘制如下。如果在读取由触发器上升沿启动的帧 (下图中的帧 1)期间再次上升触发器并输出下一帧,则帧 1 变为无效帧。中断发生的触发时序 对应于全局快门(触发模式)参数列表中的 tTGPD

如果 VINT_EN = Oh,则在 tTGPD(禁止期间)内,触发信号的上升沿和下降沿均被忽略。



全局快门(顺序触发模式)中断操作示意图

全局快门(快速触发模式)操作

快速触发模式是在XTRIG下降时立即开始曝光的触发模式。 此模式仅支持主模式。

曝光时间计算公式

Exposure time [s] = (XTRIG low level pulse width [µs]) + 7.372 [µs]^{*1}: Exposure time error (toffset)

快门设置寄存器列表

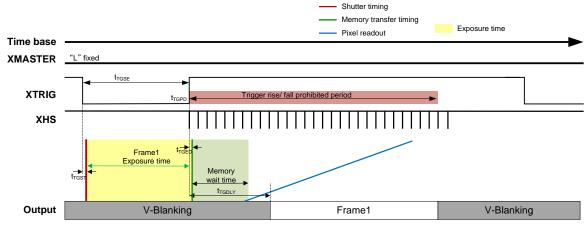
	Register details			Initial		
Register	Chip ID Address		bit	value	Setting value	
XMSTA	02h	0Ch (300Ch)	[0]	1	Setting of master mode operation 0: Master mode operation start 1: Master mode operation stop	
FASTTRIG	04h	30h (3230h)	[1]	0	Selection of trigger mode 0: Except for Fast trigger mode 1: Fast trigger mode	
TRIGEN	Och	00h (3400h)	[0]	0	Global shutter mode setting 0: Normal mode 1: Trigger mode	
SYNCSEL	06h	3Ch (343Ch)	[5:4]	0h	XHS, XVS pin setting 0h: Normal Output 3h: Hi-Z	

全局快门参数列表 (FastTrigger 模式)

Item	Symbol	Min.	Тур.	Max.	Unit
Integration start delay	t TGST		_	0.13	μs
Integration end delay	tTGED	_	_	0.13 + toffset	μs
Pulse width	t _{TGSE}	0.05	_	_	μs
Next trigger rise / fall prohibited period (All - pixel / 1 / 2 Subsampling)	t _{TGPD}	VMAX	_	_	Н
Next trigger rise / fall prohibited period (ROI)		V _{TR} *2	_	_	
Data output delay	ttgdly	_	3 + GTWAIT*1	_	Н

^{*1} 参考各个扫描模式下的寄存器设置列表。

^{*2} V TR (请参阅"读出驱动模式"中的"ROI模式"部分)



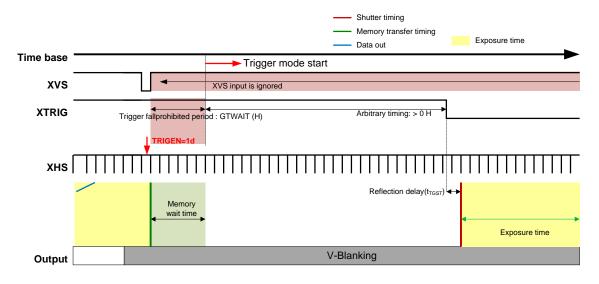
全局快门图像图(快速触发模式)(4线)

全局快门操作的模式转换

通过设置寄存器 TRIGEN,可以在全局快门操作中将传感器在正常模式和触发模式之间切换。 设置寄存器 TRIGEN 后,传感器将转换到正常模式或触发模式 GTWAIT (H)。TRIGEN 寄存器可以 在 V-blank 期间或待机模式下更改。(转换期间禁止 XVS 和 XTRIG 输入) 如果是快速触发模式,则必须通过传感器待机进行模式转换。

从正常模式转换到顺序触发模式

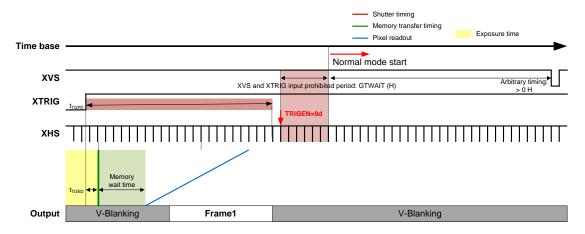
将 1d 设置为寄存器 TRIGEN 后,传感器将从正常模式转换为触发模式。转换为触发模式后, XVS 输入将被忽略。设置寄存器 TRIGEN 后,在 GTWAIT (H) 周期内禁止触发输入。



从正常模式到顺序触发模式的转换图像图

从顺序触发模式转换到正常模式

将 Od 设置为寄存器 TRIGEN 后,传感器将从触发模式转换为正常模式。转换为正常模式后启动 XVS 输入。在下一个触发上升禁止期 (tTGPD) 过去后设置 TRIGEN。



顺序触发模式到普通模式的转换示意图



脉冲输出功能

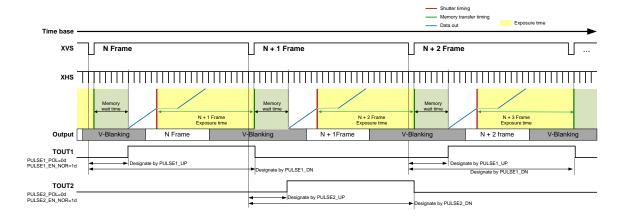
该传感器具有脉冲输出功能,可指示快门操作的各个状态。脉冲从TOUT1 引脚和 TOUT2 引脚输出。脉冲的上升时间和下降时间由寄存器设置。要设置的参考点(寄存器值设置为 0 时的时序)请参阅"参考点列表"表。脉冲以"参考点列表"中所示的传感器内部时序为基础与其他信号异步输出。此功能不支持快速触发模式。

寄存器脉冲输出功能列表

	Reg	gister details		Initial	0	
Register	Chip ID	Address (): I ² C	bit	value	Setting value	
TOUT1SEL [1:0]		35h	[1:0]	0h	TOUT1 pin setting Oh: Low fixed 3h: Pulse output	
TOUT2SEL [1:0]		(3435h)	[3:2]	0h	TOUT2 pin setting Oh: Low fixed 3h: Pulse output	
TRIG_TOUT1_SEL [3:0]		3Ah	[3:0]	0h	TOUT1 pin output selection Oh: Low fixed 1h: Pulse1 output	
TRIG_TOUT2_SEL [3:0]		(343Ah)	[7:4]	0h	TOUT2 pin output selection Oh: Low fixed 2h: Pulse2 output	
PULSE1_EN_NOR			[0]	0	Pulse1 enable in normal mode 0: disable 1: enable	
PULSE1_EN_TRIG	-	78h (3478h)	[1]	0	Pulse1 enable in trigger mode 0: disable 1: enable	
PULSE1_POL			[2]	0	Pulse1 polarity selection 0: High active 1: Low active	
		79h (3479h)	[7:0]			
PULSE1_UP [23:0]		7Ah (347Ah)	[7:0]	000000h	Pulse1 active period start timing setting Designated in line units from reference point	
		7Bh (347Bh)	[7:0]			
	06h	7Ch (347Ch)	[7:0]			
PULSE1_DN [23:0]		7Dh (347Dh)	[7:0]	000000h	Pulse1 active period end timing setting Designated in line units from reference point	
		7Eh (347Eh)	[7:0]			
PULSE2_EN_NOR			[0]	0	Pulse2 enable in normal mode 0: disable 1: enable	
PULSE2_EN_TRIG		80h	[1]	0	Pulse2 enable in trigger mode 0: disable 1: enable	
PULSE2_POL		(3480h)	[2]	0	Pulse2 polarity selection 0: High active 1: Low active	
			[5]	0	Fixed to 1	
		81h (3481h)	[7:0]			
PULSE2_UP [23:0]		82h (3482h)	[7:0]	000000h	Pulse2 active period start timing setting Designated in line units from reference point	
		83h (3483h)	[7:0]			
		84h (3484h)	[7:0]			
PULSE2_DN [23:0]		85h (3485h)	[7:0]	000000h	Pulse2 active period end timing setting Designated in line units from reference point	
		86h (3486h)	[7:0]			

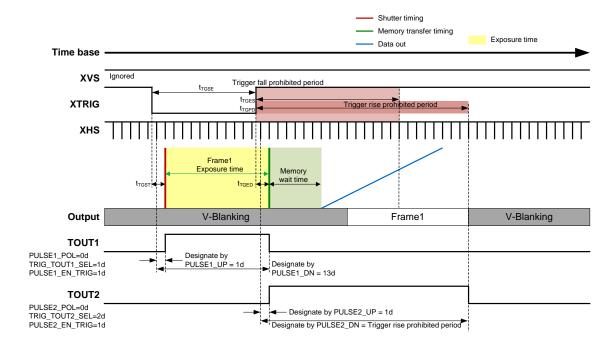
参考点列表

	Normal mode	Trigger mode
Reference point of Pulse1	XVS fall edge in N frame	Fall edge of input trigger
Reference point of Pulse2	XVS fall edge in N +1 frame	Rise edge of input trigger



全局快门脉冲输出功能示意图 (普通模式)

正常模式下,每次输入XVS时,TOUT1和TOUT2交替输出。



全局快门(顺序触发模式)脉冲输出功能示意图

信号输出

输出引脚设置

该传感器支持 SLVS(2 通道/4 通道切换)输出。此外,每个通道的数据速率是可调的。下表显示了输出格式设置。

输出设定登记表

	Register details			Initial		
Register	Chip ID	Address (): I ² C	bit	Initial value	Setting value	
FREQ [1:0]	02h	DCh (30DCh)	[1:0]	0h	Frame rate adjust	
FREQ_SYNC [7:0]	04h	26h (3226h)	[7:0]	93h	Refer to the register list in each Readout mode	
STBSLVS [3:0]		44h (3444h)	[3:0]	1h	The un-using SLVS channel go into standby	
OPORTSEL [3:0]		45h (3445h)	[3:0]	1h	SLVS Output channel selection (Refer the list of output pins below)	

输出引脚

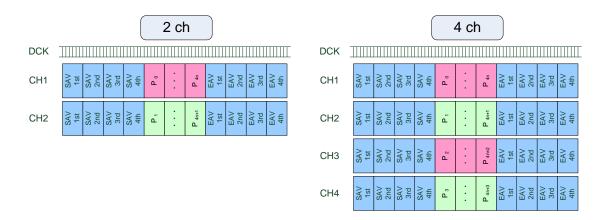
	SLVS output				
Output pins	2 ch	4 ch			
DOP0 / DOM0	Hi-Z	Ch 3			
DOP1 / DOM1	Ch 1	Ch 1			
DOP2 / DOM2	Ch 2	Ch 2			
DOP3 / DOM3	Hi-Z	Ch 4			
DCKP / DCKM	DCK	DCK			

SLVS 2 ch / 4 ch 输出格式如下图所示

当设置 2 ch 时,在按 CH1 至 CH2 的顺序输出 4 个 SAV 数据后,像素数据以相同顺序重复输出,然后 EAV 的 4 个数据以相同顺序分别输出到 CH1 至 CH2。

当设置 4 ch 时,在按 CH1 至 CH4 的顺序输出 4 个 SAV 数据后,像素数据以相同顺序重复输出,然后 EAV 的 4 个数据以相同顺序分别输出到 CH1 至 CH4。

数据先发送 MSB。有关详细信息,请参阅"读出驱动模式"部分中每种模式下的驱动时序。



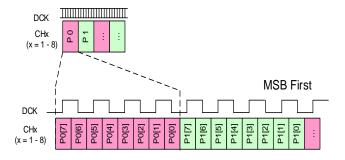
SLVS 2 通道 / 4 通道输出格式

输出引脚位宽选择

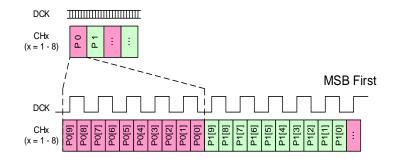
输出引脚宽度可通过寄存器 ADBIT、ODBIT 选择 8 位、10 位或 12 位输出。同步码根据这些寄存器的位宽设置输出。

位宽选择寄存器列表

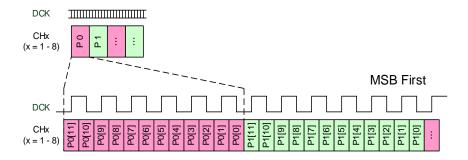
	Register details			Initial					
Register	Chip ID	Address (): I ² C	bit	value	Setting value	Remarks			
ADBIT	04h	00h (3200h)	[6:5]	0h	0h: 10 bit 1h: 12 bit 2h: 8 bit	Set same value to both			
ODBIT	06h	30h (3430h)	[1:0]	0h	0h: 10 bit 1h: 12 bit 2h: 8 bit	ADBIT and ODBIT			



Example of Data format in SLVS 8-bit output



Example of Data format in SLVS 10-bit output



Example of Data format in SLVS 12-bit output

输出信号范围

传感器输出有 8 位、10 位或 12 位等级,但 SLVS 输出并非全范围输出,最大输出值为"FFh-1"(8 位输出)、"3FFh-1"(10 位输出)和"FFFh-1"(12 位输出)。最小值为 001h。各输出等级的输出范围如下表所示。最大等级和最小等级仅在同步码中输出。同步码请参见"操作模式"部分中的"同步码"项。

输出等级和输出范围

	Output value					
Output gradation	Min.	Max.				
8 bit	01h	FEh				
10 bit	001h	3FEh				
12 bit	001h	FFEh				

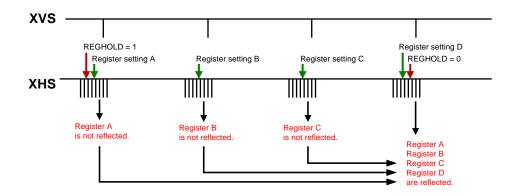
寄存器保持设置

对于反映时序项中标记为"V"的寄存器,寄存器设置可以分为几个帧传输,并可以通过寄存器 REGHOLD 在某个帧全局反映。通过设置 REGHOLD = 1,此后设置的寄存器不会在"帧反映寄存器反映时序"中反映。在 REGHOLD = 1 期间设置的寄存器,通过设置 REGHOLD = 0 可以在要反映寄存器的帧之前的"帧反映寄存器反映时序"中全局反映。

有关"帧反射寄存器反射时序"的信息,请参阅"寄存器通信时序(4线)"和"寄存器通信时序(I2C)"。

寄存器保持的寄存器列表

	Register details			Initial		
Register	Chip ID	Address (): I ² C	bit	value	Setting value	
REGHOLD	02h	34h (3034h)	[0]	0h	0h: Invalid 1h: Valid (Register hold)	



寄存器保持设置

模式转换

操作之间的模式转换如下所示。这些示例显示的是在一次通信时间内完成设置的情况。

模式转换列表

Т	ransitio	on	State
ROI	Via the Standby state		
All - pixel	is unnecessary		
 Transition between modes other than th Change the input frequency of INCK*1 Change the register setting noted "S" in 		re flection timing column of the Register Map	Via the standby state is necessary

¹ 改变输入 INCK 频率时,应注意不要输入宽度短于频率变化时 INCK 脉冲前后高/低电平宽度的脉冲。如果频率变化时产生上述脉冲,请在 XCLR = Low 状态下系统复位时改变 INCK 频率,然后按照"电源开/关顺序"一节中的"电源开机顺序"项,在 XCLR = High 状态下执行系统清除。系统清除后,寄存器设置变为默认状态,因此请重新执行初始设置。

数字温度计

该传感器有一个数字温度计,可指示传感器的结温(Tj)。可以通过读取 TMP_OUT 寄存器来了解温度。计算温度的方法如下。

```
Temperature [^{\circ}C] = (-256d * TMP_OUT[11]) + TMP_OUT[10:3]
+ (0.5 * TMP_OUT[2]) + (0.25 * TMP_OUT[1]) + (0.125 * TMP_OUT[0])
```

例如)

If TMP_OUT[11] = 1h, TMP_OUT[10:3] = F9h, TMP_OUT[2] = 0h, TMP_OUT[1] = 1h, and TMP_OUT[0] = 1h, Temperature [$^{\circ}$ C] = (-256d * 1) + 249d + (0.5 * 0) + (0.25 * 1) + (0.125 * 1) = -6.625 [$^{\circ}$ C].

If TMP_OUT[11] = 0h, TMP_OUT[10:3] = 0Fh, TMP_OUT[2] = 0h, TMP_OUT[1] = 0h, and TMP_OUT[0] = 0h, Temperature [°C] = (-256d * 0) + 15d + (0.5 * 0) + (0.25 * 0) + (0.125 * 0) = 15.000 [°C].

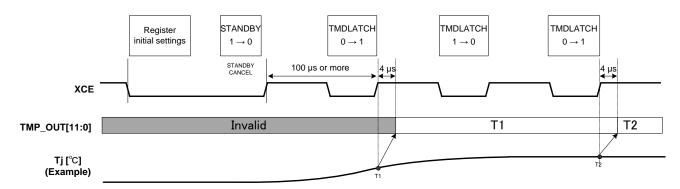
数字温度计的分辨率约为0.3°C。

注册列表

	Register details			Initial		
Register	Chip ID	Address (): I ² C	bit	value	value	
TMDLATCH	07h	88h (3588h)	0	0	Thermometer output is updated when this register is set from 0h to 1h.	
TMP_OUT[11:0]	06h	90h 91h	[7:0] [3:0]	0	Output of the digital thermometer	

温度计更新时间

TMP_OUT[11:0] 在 TMDLATCH 寄存器从"0"变为"1"后 4 μ s 内更新。TMP_OUT[11:0] 在待机模式下为无效值。若要在待机取消后更新温度计输出,请在待机取消后 100 μ s 或更长时间后将TMDLATCH 寄存器从"0"更改为"1"。



数字温度计更新时间

其他功能

该传感器具有以下功能。有关详细信息,请参阅每个应用说明。

- 多帧设置输出模式(2/4帧)
- 多帧ROI模式
- 长时间曝光时驱动低功耗
- 渐变压缩
- 模式生成器(参考支持包)

扩展功能

经过充分的检查和评估后使用这些功能。

● 黑色级别自动调整关闭

开机和关机顺序

开机顺序

按照以下顺序打开电源。

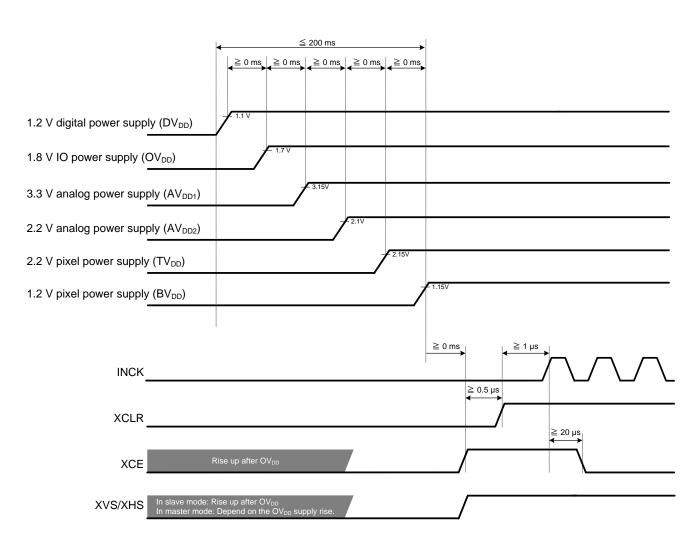
1. 打开电源,使电源按以下顺序上升: 1.2 V 数字电源 (DVDD) 1.8 V IO 电源 (OVDD) 3.3 V 模拟电源 (AVDD1) 2.2 V 模拟电源 (AVDD2) 2.2 V 像素电源 (TVDD) 1.2 V 像素电源 (BVDD)。此外,所有电源应在 200 毫秒内完成上升。

每个数字输入端子(INCK、XCE、SCK、SDI、XCLR、XMASTER、XTRIG、SLAMODE、XVS 和 XHS)设置为 OV 或 Hi -Z。

2. 上电后,寄存器值未定义,因此必须清除系统。所有电源完成上升后,将 XCLR 保持在低电平 500 ns 或更长时间。(系统清除后的寄存器值为默认值。)

此外,在此期间将 XCE 保持在高电平。 1.8 V 电源(OVDD)后,XCE 上升,直到 INCK 输入,XCE 保持高电平。

- 3. XCLR 变为高电平后,开始 INCK 的输入。
- 4. 主时钟(INCK)稳定后,通过寄存器通信进行传感器设置。

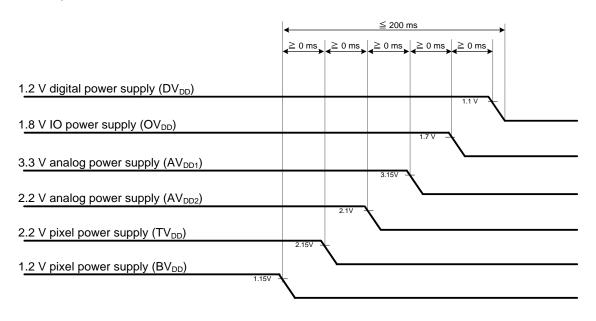


开机顺序

断电顺序

关闭电源,使电源按以下顺序下降: 1.2 V 像素电源(BVDD) 2.2 V 像素电源(TVDD) 2.2 V 模拟电源(AVDD2) 3.3 V 模拟电源(AVDD1) 1.8 V IO 电源(OVDD) 1.2 V 数字电源(DVDD)。此外,所有电源应在200毫秒内完成下降。

在1.8 V电源 (OVDD)下降之前,将每个数字输入引脚 (INCK、XCE、SCK、SDI、XCLR、XMASTER、XTRIG、SLAMODE、XVS 和 XHS) 设置为 0 V 或高阻抗。



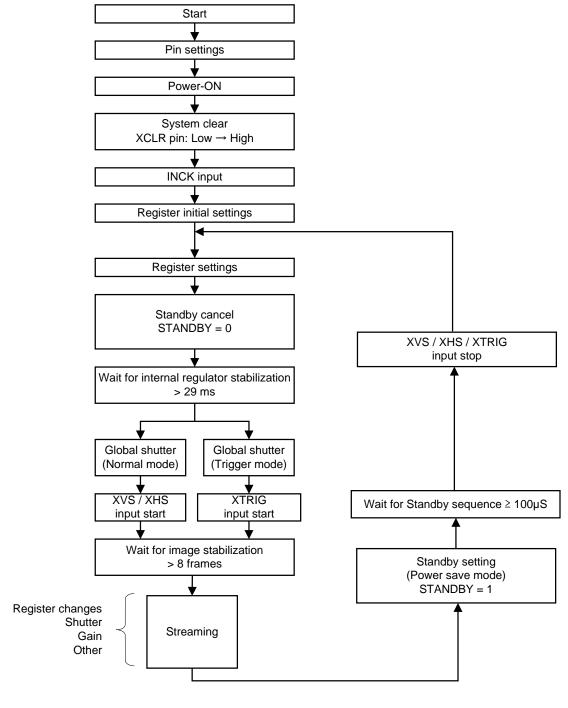
断电顺序

传感器设置流程

传感器从属模式下的设置流程

下图显示了传感器从属模式下的操作流程。

有关"开机"至"系统清除"的详细信息,请参阅本节中的"开机顺序"项。有关"待机取消"至"等待图像稳定"的详细信息,请参阅"待机模式"项。"待机设置(省电模式)可以通过在"操作"期间将 STANDBY 寄存器设置为"1"来进行。



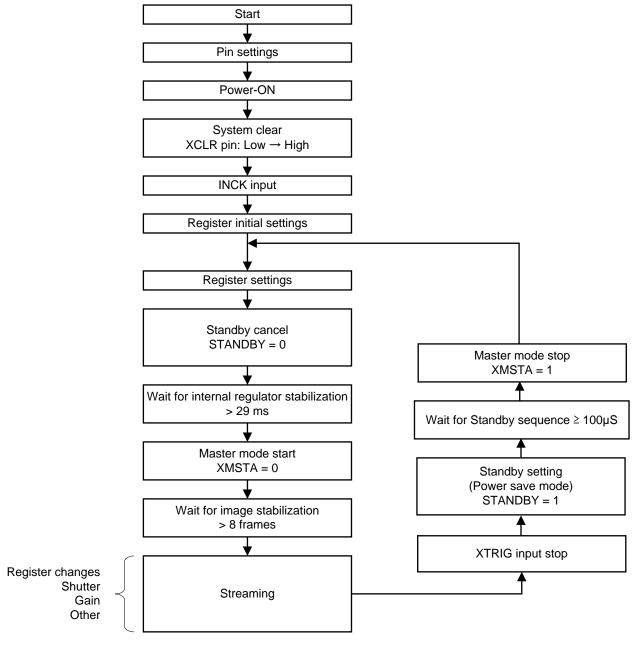
传感器设置流程 (传感器从属模式)

在传感器主模式下设置流量

下图显示了传感器主模式下的操作流程。

有关"电源开启"到"系统清除"的详细信息,请参阅本节中的"电源开启顺序"项目。有关"待机取消"到"等待图像稳定"的详细信息,请参阅"待机模式"项目。在主模式下,在"等待内部调节器稳定"之后,通过将主模式启动寄存器 XMSTA 设置为"0"来"启动主模式"。

" 待机设置(省电模式)可以通过在"操作"期间将 STANDBY 寄存器设置为"1"来进行。这次,通过将 XMSTA 设置为"1"来设置"主模式停止"。



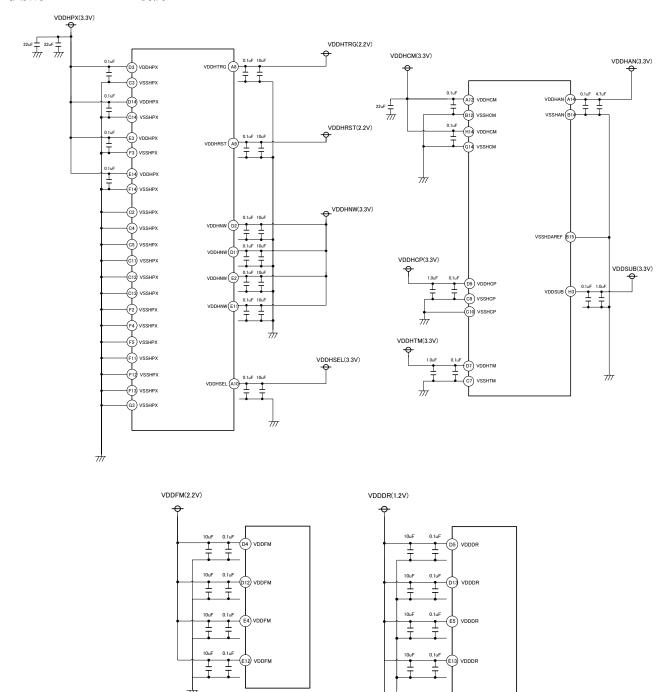
传感器设置流程 (传感器主模式)

SONY

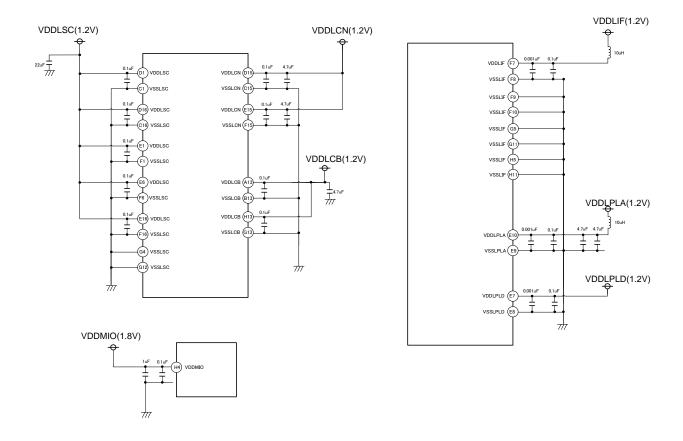
IMX990-AABA-C

外围电路

模拟和 PixelPower 引脚

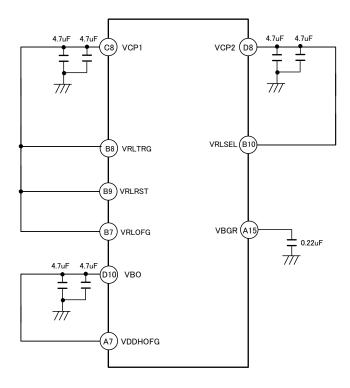


数字电源引脚

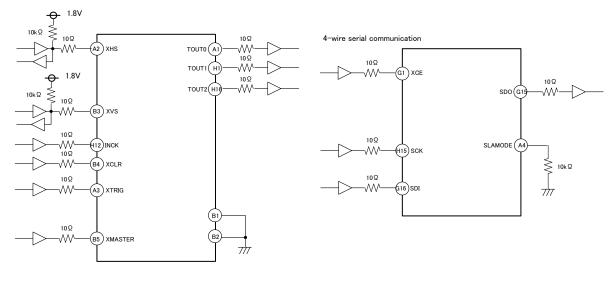


J13 (VDDLCB) 是模拟电源引脚,但这些引脚可以连接到数字电源引脚,如上图所示。这些引脚可以与数字电源引脚分开。

模拟其他引脚



数字 I/O 引脚



IPC communication

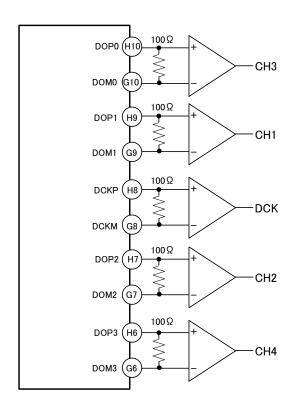
1.8V

10k Ω 1.8V

SDO GIS OPEN

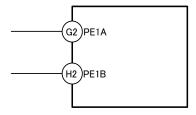
1k Ω

输出引脚



所示的应用电路是说明设备操作的典型示例。索尼半导体解决方案公司对因使用这些电路而产生的任何问题或由此造成的任何第三方和其他权利的侵犯不承担任何责任。

电热冷却器针脚



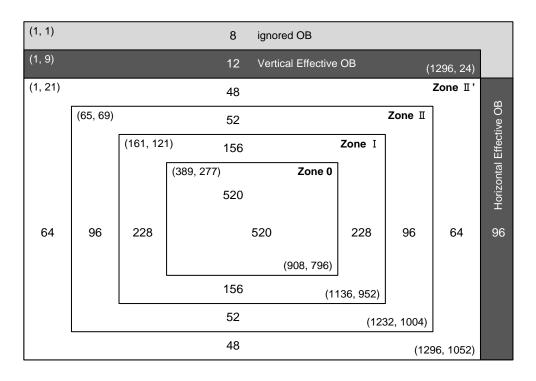
点像素规格

(Tj = 15 °C)

		Maximum	distorted pixels in	Measurement		
Type of distortion	Type of distortion Level	0 to II'	Effective OB	Ineffective OB	method	Remarks
Black and white pixels at high light	30 % ≤ D	A No evaluation		criteria applied	1	
White pixels in the dark	23 mV ≤ D	ı	В	No evaluation criteria applied	2	1/30 s storage
Black pixels at signal saturated	D ≤ 289 mV	С	No evaluation	criteria applied	3	

- A、B和C的总和为 6687 或更小。
- 注)1. 区域基于全像素驱动模式指定 2. D...点像素级别 3. 有关像素和黑色像素接近的规格,请参阅点像素图案规格。

运动像素区域定义



关于白色像素规格的通知

CMOS 图像传感器在出厂检查后,宇宙射线等粒子辐射可能会扭曲 SWIR 图像传感器的像素,然后扭曲的像素可能会导致图片中暗信号出现白点效应。(此类白点效应在下文中称为"白色像素")遗憾的是,目前的科学技术无法防止 SWIR 图像传感器出现此类白色像素。建议您在使用 SWIR 图像传感器时考虑采取措施来防止此类白色像素,例如采用暗信号中白色像素的自动补偿系统和建立质量保证标准。索尼半导体解决方案公司及其经销商均不对白色像素承担任何责任。请自行承担因白色像素引起的或与白色像素相关的任何问题或麻烦。

关于点像素规格的通知

有些像素在相同条件下,其输出值在每个读出帧中都会发生变化。建议您考虑采取措施,例如采用补偿系统和建立质量保证标准。

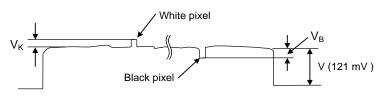
点像素的测量方法

器件驱动器应设置为满足偏置和时钟电压条件。根据示例配置驱动电路并进行测量。

1. 高光下的黑色或白色像素

将测量条件设置为标准成像条件 II。调整光强,使信号输出的平均值 V 为 121 mV,测量信号输出 V 中的局部下降点(高光下的黑色像素,VB)和峰值点(高光下的白色像素,VK),并将该值代入以下公式。

Spot pixel level D = ((VB or VK) / Average value of V) x 100 [%]



信号输出波形

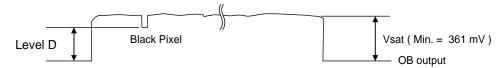
2. 暗色中的白色像素

将设备设置为暗色设置,并使用

暗色信号输出的平均值作为参考,测量信号输出波形的局部峰值。

3. 信号饱和时的黑色像素

将测量条件设置为标准成像条件 II。将设备设置为饱和状态,并使用 OB 输出作为参考,测量局部下降点。



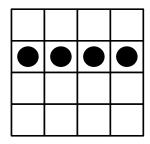
信号输出波形

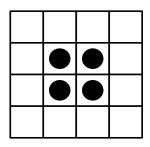
点像素图案规范(暂定)

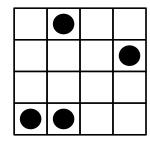
以下白色像素、黑色像素和亮点模式将被拒绝。

4x4 像素区域中有 4 个或更多白色像素、黑色像素、亮点

例如)



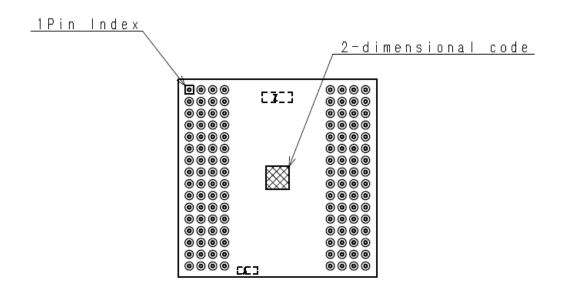




注)"●"表示白像素、黑像素、亮点的位置。

根据模式分别指定白色像素、黑色像素和亮点。 (例如:如果黑色像素和白色像素分别位于上述模式中,则它们不会被判定为被拒 绝。) Marking





Y part contains 2 alphanumeric characters (No Au coat) Z part contains 4 alphanumeric characters

处理注意事项

1. 防静电

图像传感器很容易因静电放电而损坏。操作前请务必采取以下保护措施。

- (1) 裸手操作或使用不带电的手套、衣服或材料。还要穿导电鞋。
- (2) 直接操作时使用腕带。
- (3) 在地板和工作台上安装接地的导电垫,以防止产生静电。
- (4) 操作图像传感器时建议使用电离空气进行放电。
- (5) 对于安装板的运输,请使用经过防静电处理的盒子。

2. 防尘防污

图像传感器的包装和交付都经过精心设计,以保护元件玻璃表面免受有害灰 尘和污垢的侵害。使用前请根据需要按照以下操作清洁玻璃表面。

- (1) 在干净的环境中(1000级或以下)进行所有镜头组装和其他工作。
- (2) 请勿用手触摸玻璃表面或让任何物体与其接触。
- 如果玻璃表面粘有灰尘等,请用吹风机吹掉。(对于通过静电粘附的灰尘, 建议使用离子化空气。)
- (3)如果沾有油脂,请用棉签蘸乙醇擦拭。注意不要划伤玻璃。
- (4)请存放在专用盒子中以防止灰尘和污垢。为防止结露,在移至温差大的房间时,请预热或预冷。
- (5)如果在发货前贴有保护胶带,请在使用前撕下用于静电保护的胶带。请勿重复使用胶带。

3. 安装 (连接)

- (1)如果用硬部件对整个表面施加负载,则可能会产生弯曲应力,并且根据封装底部的平整度,封装可能会破裂等。
- 因此,安装时,请使用弹性负载(例如弹簧板)或粘合剂。
- (2)粘合剂可能会导致背面的标记消失。
- (3)如果金属等与封装表面碰撞或摩擦,封装可能会碎裂或破碎并产生灰尘。
- (4)通常使用丙烯酸厌氧粘合剂来粘贴本产品。此外,有时还会将氰基丙烯酸酯瞬时粘合剂与丙烯酸厌氧粘合剂一起使用,以将产品固定到位,直到粘合剂完全硬化。(参考)
- (5)请注意,使用紫外线和红外激光安装传感器时可能会损坏传感器。

4. 焊接

4.1 手工焊接安装条件

- (1) 使用带地线的 30 W 烙铁,在 3 秒或更短的时间内焊接每个引脚。 对于维修和重新安装,请充分冷却。
- (2) 确保焊料的烙铁头温度不超过 350°C。
- (3) 拆卸图像传感器时,请勿使用吸锡设备。使用除焊工具时,请使用零交叉 ON/OFF 型温控系统,并将控制器接地。
- (4)请在贵公司内对焊点可靠性进行评估。
- (5)请注意,如果实际温度和时间超过上述条件或变化迅速,可能会在玻璃上 发生结露或在树脂界面上发生变色。

4.2 流动焊接安装条件

建议在流动焊接安装时注意以下事项。最佳条件随焊料种类而变化,因此请根据使 用情况进行设置。

- (1) 流动焊接工作条件
 - (a)假设焊接安装条件如下。

温度:245 至 260°C 时间:10 秒或更短

在距离封装底部 1.0 毫米以上的地方进行焊接。

- (b)确保封装密封玻璃树脂粘合剂部分的上表面温度不超过 150°C。
- (c) 仅进行一次流动焊接。
- (d)在打开脱气包装后 72 小时内完成流动焊接。

打开封装后,将产品存放在温度为 30°C 以下、湿度为 60% RH 或更低的条件

下。

(e) 在 125°C 条件下 24 小时仅进行一次重新烘烤。

(2)其他

- (a)请贵公司对焊点可靠性进行评估。
- (b) 流动后,密封玻璃周围有时会出现保护胶带的糊状残留物。

(保护胶带的糊状残留物应忽略,除非有显著的残留物。) (C) 请注意,如果实际温度和时间超过上述流动焊接安装条件,玻璃上可能会 结露或树脂界面可能会变色。

5. 其他

- (1)请勿长时间暴露在强光(阳光)下。
- (2) 暴露在高温或高湿环境中会影响特性。因此,请避免在此类条件下储存或使用
- `(3)本产品为精密光学部件,因此应注意不要施加过度的机械冲击或力,
- (4)请注意,操作过程中接近强电磁波或磁场时,传感器的成像特性可能会受到影 响。

Material No.26-0.0.1

内置热电冷却器

请参阅支持包,了解如何使用内置热电冷却器冷却图像传感器。

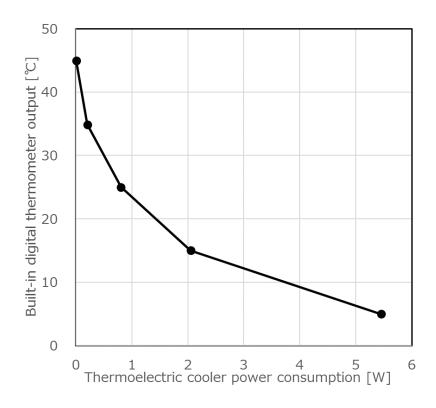
热电冷却器电阻

Symbol	Item	Min.	Тур.	Max.	Unit	Remarks
Rcooler	电阻区间:	3	4	5	Ω	热电致冷器温度
	PE1A - PE1B					25 *1

¹ Ta=25 ,交流电阻测量,传感器断电。

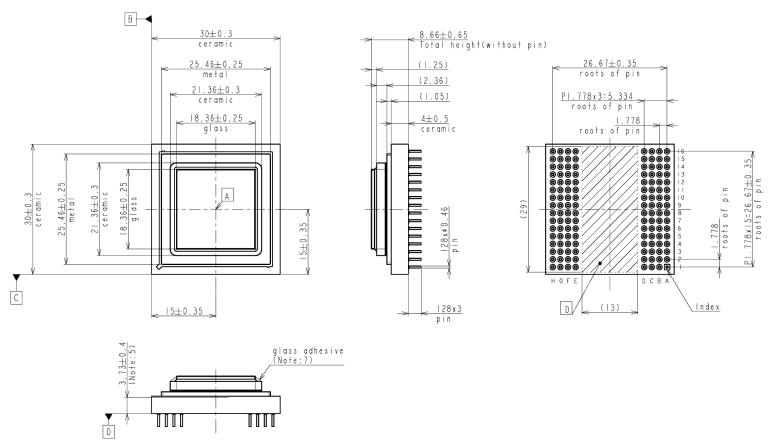
热电冷却器性能示例

(典型值Ta = 45 , 散热器热阻=1 /W)



封装外形

(单位:毫米mm)



- Note:

 1) "A" is the center of the effective image area.

 2) The point "B" of the package is the horizontal reference.

 The point "C" of the package is the vertical reference.

 3) The bottom "D" of the package is the height reference.

 4) The rotation angle of the effective image area relative "B" and "C" is ±1°.

 5) The height from the bottom "D" to the center of effective image area.

 6) The tilt of the effective image area relative to the bottom "D" is less than 0.2.

 7) Adhesive overflow area: Up to the maximum outline of ceramic.

- 8) The thickness of the cover glass is I.I.

TENTATIVE

UNIT mm GENERAL TOLERANCE ±0.2 SCALE 2:1

PACKAGE STRUCTURE

PACKAGE MATERIAL	Ceramic
LEAD TREATMENT	GOLD PLATING
LEAD MATERIAL	
PACKAGE WEIGHT	x . x g

注:(上面图片里的注意事项翻译)

- 1) "A"为有效成像区中心。
 2)封装的点"B"为水平基准。
 封装的点"C"为垂直基准。
 3)封装底部"D"为高度基准
 4)有效成像区相对"B"和"C"的旋转角度为±1。
 5)底部"D"到有效成像区中心的高度。
 6)有效成像区相对底部"D"的倾斜度小于0.2

- 7)胶水溢流区:至陶瓷最大轮廓8)盖玻片厚度为1.1

商标标识及定义说明列表

SenSWIR

*SenSWIR 是索尼公司的商标。SenSWIR 是一种宽带高灵敏度 SWIR 图像传感器技术,通过 Cu-Cu 键合将复合半导体 InGaAs 光电二极管与 Si 读出电路相结合实现。