datasheet

PRODUCT SPECIFICATION

1/3.2" color CMOS 8 megapixel(3264×2448) image sensor
with OmniBSI^{TM} technology

OV8820

SD08820

color CMOS 8 megapixel(3264×2448) image sensor with OmniBSI^{TM} technology

applications

- digital still cameras
- digital video camcorders (DVC)
- cellular phones

features

- automatic black level calibration (ABLC)
- programmable controls for frame ratel, mirror and flip, cropping, windowing, and scaling
- image quality controls: lens correction and defective pixel canceling
- support for output formats: 10-bit RAW RGB (MIPI)
- support for horizon and vertical subampling
- support for images sizes:8 Mpixel ,EIS1080p, 1080P,EIS720p,EISQ 1080p, EIS VGA , VGA   QVGA etc.

- support 2×2 binning
- standard serial SCCB interface
- MIPI serial output interface
- 256 bytes of embedded one-time programmable (OTP) memory for part identification ,etc.
- on-chip phase lock loop (PLL)
- built-in 1.5V regulator for core power
- programmable I/O drive capability, I/O tri-state configurability

key specifications (typical)

- **active array size:** 3296 x 2460
- **power supply:**
  core: 1.5V ± 5%
  analog: 2.6 ~ 3.0V
  I/O: 1.7V~ 3.0V
- **power requirements:**
  active: 170 mA
  standby: 30 µA
- **temperature range:**
  operating: -30°C to 70°C junction temperature
  stable image: 0°C to 50°C junction temperature
- **output formats:** 10-bit RGB RAW output
- **lens size:** 1/3.2"
- **lens chief ray angle:** 27° non-linear

- **input clock frequency:** 6~27 MHz
- **max S/N ratio:** 35 dB
- **dynamic range:** 68 dB @ 8x gain
- **maximum image transfer rate:**
  8Mpixel : 24 fps
  EIS1080p: 30 fps
  EIS720p: 60 fps
- **sensitivity:** 600mV/Lux-sec
- **scan mode:** prigressive
- **maximum exposure interval:** 2480 x t_{ROW}
- **pixel size:** 1.4 µm x 1.4 µm
- **dark current:** <8 mV/s @ 60°C junction temperature
- **image area:** 4614 µm x 3444 µm
- **package dimensions:** 10.0 mm x 10.0 mm

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1. signal descriptions

table 1-1 lists the signal descriptions and their corresponding pin numbers for the SD08820 image sensor. The package information is shown in **section 4**.

table 1-1   signal descriptions (sheet 1 of 2)

Pad number	signal name	pad type	description	default SCCB status
01	FREX	I/O	frame exposure input / mechanical shutter output	
02	VSYNC	I/O	video output vertical signal or video data input	
03	SIO_D	input	SCCB interface data pin	
04	SIO_C	input	SCCB interface input clock	
05	DOVDD	power	power for I/O circuit	
06	DGND	ground	digital logic ground	
07	VN	reference	internal analog reference	
08	VNH	reference	internal analog reference	
09	VNL	reference	internal analog reference	
10	DGND	ground	digital logic ground	
11	DOVDD	power	power for I/O circuit	
12	VSNK	analog I/O	VCM driver current sink input	
13	VGNG	ground	ground for VCM driver	
14	MDN3	I/O	MIPI TX fourth data Lane negative output	
15	MDP3	I/O	MIPI TX fourth data Lane positive output	
16	MDN1	I/O	MIPI TX second data Lane negative output	
17	MDP1	I/O	MIPI TX second data Lane positive output	
18	MCN	I/O	MIPI TX clock Lane negative output	
19	MCP	I/O	MIPI TX clock Lane positive output	
20	MDN0	I/O	MIPI TX first data Lane negative output	
21	MDP0	I/O	MIPI TX first data Lane positive output	
22	MDN2	I/O	MIPI TX third data Lane negative output	
23	MDP2	I/O	MIPI TX third data Lane positive output	
24	AGND	ground	analog ground	
25	DVDD	power	power for digital circuit	

table 1-1　signal descriptions (sheet 2 of 2)

Pad number	signal name	pad type	description	default SCCB status
26	DGND	ground	digital logic ground	
27	XVCLK	input	system input clock	
28	SHUTTER	I/O	illumination control output	
29	STROBE	I/O	strobe output	
30	RESETB	input	reset (active low with internal pull up transistors) Depending on process condition and DOVDD voltage ,thepull up resistance ranges from 1MΩ~7 MΩ when it is low and ranges from 200KΩ to 1MΩ when it is high	
31	POWDN	input	power down (active low with internal pull up resistor) Depending on process condition ,the pull up resistance is 700KΩ~1.3 MΩ	
32	AVDD	power	power for analog circuit	
33	AVDD	power	power for analog circuit	
34	AGND	ground	analog ground	
35	DVDD	power	power for digital circuit	
36	DGND	ground	digital logic ground	

table 1-2 configuration under various conditions

signal name	RESET	after RESET release	software standby	hardware standby (PWDNB=0)
VSYNC	high-z	high-z	high-z by default (configurable)	high-z by default (configurable)
FREX	high-z	high-z	high-z by default (configurable)	high-z by default (configurable)
SHUTTER	high-z	high-z	high-z by default (configurable)	high-z by default (configurable)
RESETB	input	input	input	input
PWDNB	input	input	input	input
STROBE	high-z	high-z	high-z by default (configurable)	high-z by default (configurable)
XVCLK	input	input	input	hihg-z
VSNK	high-z	open drain	open drain	hihg-z
SIOD	open drain	I/O	I/O	open drain
SIOC	input	input	input	high-z
MCP	0	0	0 by default (configurable)	0 by default (configurable)
MCN	0	0	0 by default (configurable)	0 by default (configurable)
MDP	high-z	high-z	high-z by default (configurable)	high-z by default (configurable)
MDN	high-z	high-z	high-z by default (configurable)	high-z by default (configurable)

figure 1-1   pin diagram

2. system level description

2.1 overview

The OV8820color image sensor is a low voltage, high performance 1/3.2-inch , 8 megapixel CMOS image sensor that provides 3264x2448 video output using OmniBSI™ technology. It provides full-frame,sub-sampled,windowed 10-bit MIPI images in various via the control of the Serial Camera Cont Bus (SCCB) interface .

The OV8820 has an image array capable of operating at up to 24 fps in 10-bit 8megapixel resolution with complete user control over image quality, data transfer, camera functions through the SCCB interface.   All required image processing functions,including exposure control ,white balance ,defective pixel canceling ,etc., are programmable through the SCCB interface .

In addition ,omnivision image sensors use proprietary sensor technolagy to improve improve image quality by reducing or eliminating common lighting /elect sources of image contamination,such as fixed pattem noise, smearing,etc., to priduce a clean,fully stable,color image.

For customized information purposes,the OV8820 includes a one-time programmble(OTP)memory. The ov8820 has up to four lanes of MIPI interface.
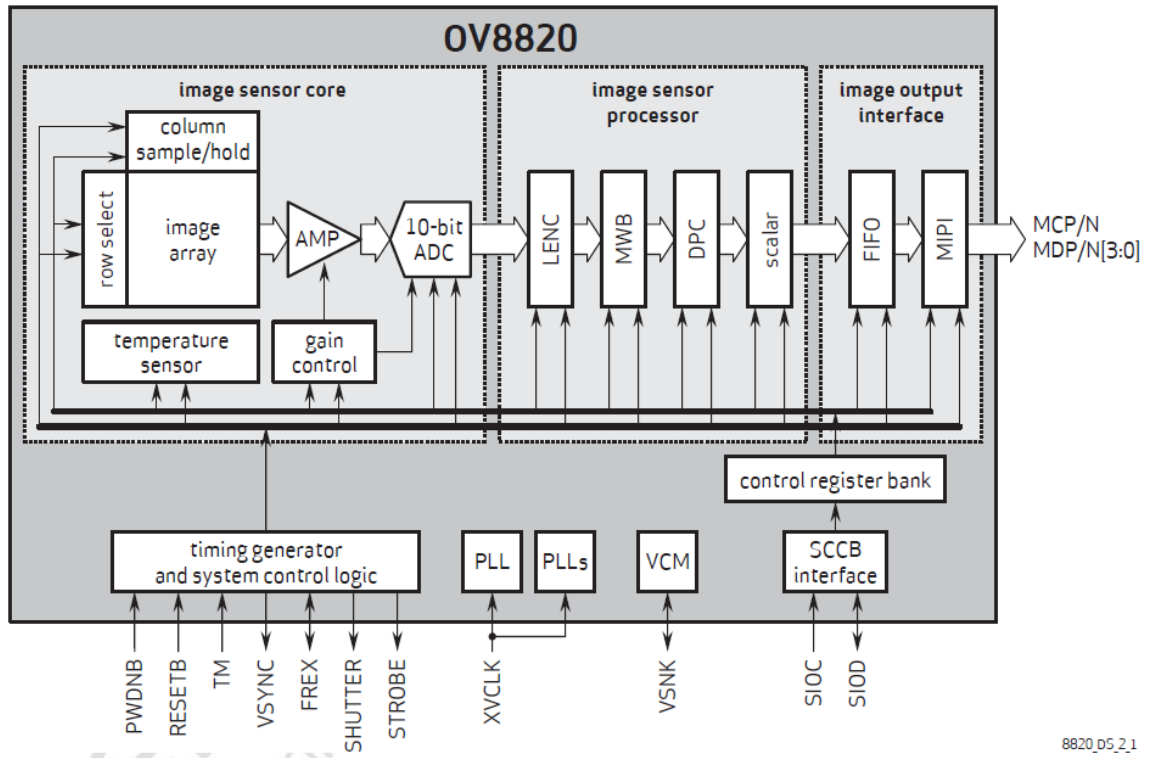
2.2 architecture

The OV8820 sensor core generates streaming pixel data at a constant frame rate,

The timing generator outputs clocks to access the rows of the imaging array , precharging and samping the rows of the array sequentially. In the time between precharging and sampling row ,the charge ing the pixls decrease with exposure to incident light .this is the exposure time in rolling shutter architecture .

The exposure time is controlled by adjusting the time interval between precharging and sampling. After the data of the pixels is the row has been sampled, it is processed through analog circuitry to correct the offset and multiply the data with corresponding gain. Following analog processing identification the ADC Chichester outputs 10-bit data for echinacea pixel in the array.

figure 2-1   OV8820 block diagram

3.　format and frame

The OV8820 supports RAW RGB output with a one ,two ,or four Lane MIPI interface .

table 3-1　MIPI supported frame and frame rate(using 4lanes,700Mbps max data rate)

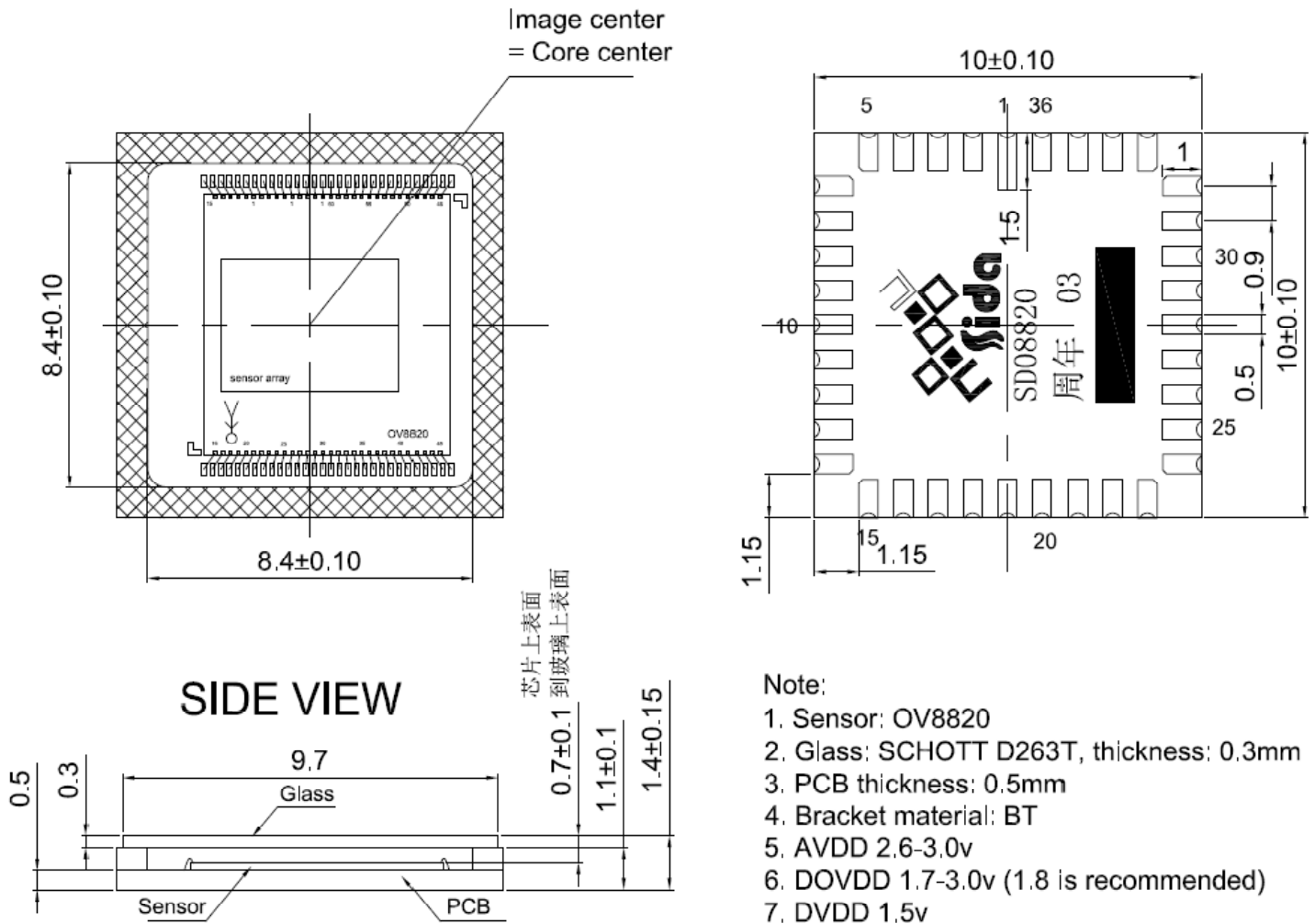| format	resolution	maximum frame rate with MIPI	methodology
full resolution	3264×2448	24 fps	full
EIS 1080p	2112×1188	30 fps	crop+scale1.5(3168×1782)
1080p	1920×1080	30 fps	crop+scale1.7(3264×1836)
quartersize	1632×1224	30 fps	binning +scale (3264×2448)
EIS 720p	1408×792	30 fps / 60fps	crop+binning×2 +scale2.3(3138×1822) HB2 /VB2
720p	1280×720	30 fps / 60fps	crop+binning×2 +scale2.5(3200×1800) HB2 /VB2
EIS Q1080p	1056×594	30 fps / 60fps	crop+binning×2 +scale3.0(3168×1782) HB2 /VB2
Q1080p	960×540	30 fps / 60fps	crop+binning×2 +scale3.4(3264×1836) HB2 /VB2
EIS VGA	704×528	90 fps / 120fps	crop+binning+skip+scale
VGA	640×480	90 fps / 120fps	crop+binning+skip+scale

table 3-1　MIPI supported frame and frame rate(using 2lanes,800Mbps max data rate)

resolution	frame rate	description
4:3 full resolution(8megapixel)	15 fps	full
16:9 full resolution (cropped)	30 fps	crop (3264×1838)
16:9 1080p using scalar	30 fps	crop +scale (3264×1863)
16:9 720p using scalar	30 fps	crop +scale (3200×1800)

4　mechanical specifications

4.1　physical specifications

4.1figure　package specifications

Image center
= Core center

sensor array

OV8820

8.4±0.10

8.4±0.10

SIDE VIEW

9.7

Glass

Sensor

PCB

0.5

0.3

0.7±0.1

1.1±0.1

1.4±0.15

芯片上表面 到玻璃上表面

10±0.10

5　　1　36

1

1.5

30　0.9

10±0.10

0.5

25

SD08820　03

周年

1.15

15
1.15

20

Note:
1. Sensor: OV8820
2. Glass: SCHOTT D263T, thickness: 0.3mm
3. PCB thickness: 0.5mm
4. Bracket material: BT
5. AVDD 2.6-3.0v
6. DOVDD 1.7-3.0v (1.8 is recommended)
7. DVDD 1.5v

Note1　all exposed metallized areas shall be gold-plate 0.05um min. thickness over nickel plate
unless otherwise specified in purchase order

Note2　seal area and die attach area shall be without metallization

table 4-1   package dimensions (sheet 1 of 2)

dimensions	millimeters	inches
Package size	10.0±0.10 sq	0.394±0.004 sq
Package height	1.4±0.15	0.055±0.006
Substrate base height	0.5±0.05	0.0197±0.002
Cavity size	8.40±0.20 sq	0.331±0.008 sq
Castellation height	0.65±0.05	0.026±0.002
Pin 1# pad size	0.50 x 1.50	0.0197 x 0.059
Pad size	0.50 x 1.00	0.0197 x 0.0394
Pad pitch	0.90±0.05	0.0354±0.002
Package edge to first lead side	0.75±0.10	0.213±0.004
Glass size	9.70±0.10 sq	0.382±0.004 sq
Glass height	0.30±0.05	0.012±0.002
Die thickness	0.20±0.015	0.008±0.0006
Top of glass to image plane	0.70±0.10	0.028±0.004
Substrate height	1.00±0.10	0.039±0.004

4.2   IR reflow specifications

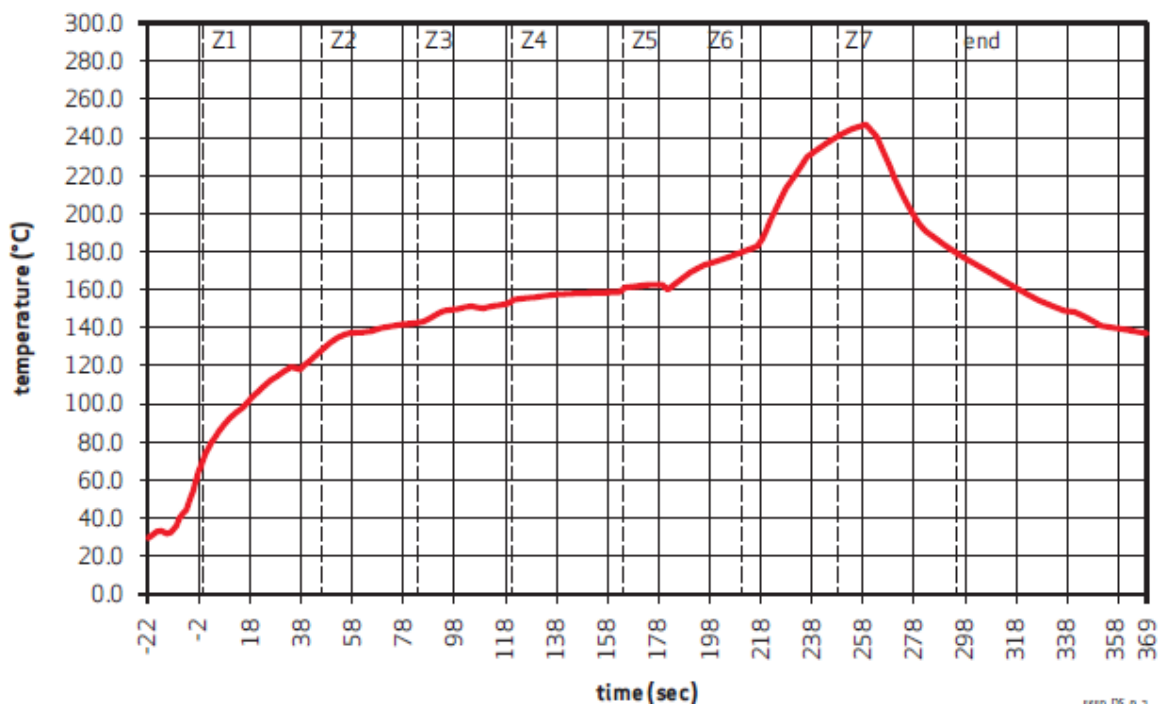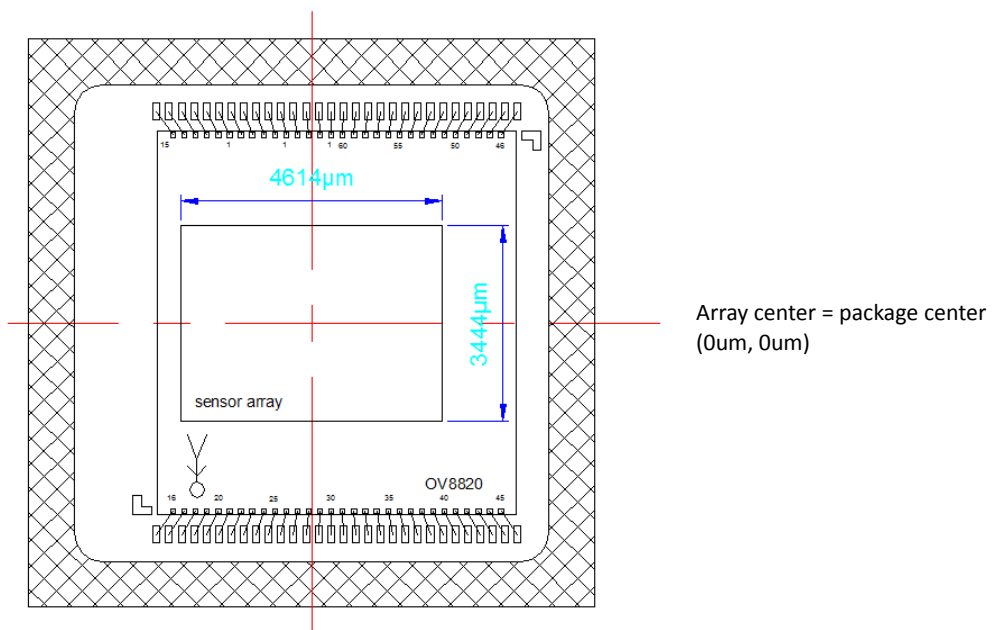**figure 4-2   IR reflow ramp rate requirements**

table 4-2   reflow conditions

condition	exposure
Average ramp-up rate (30℃ to 217℃)	Less than 3℃per second
> 100℃	Between 330 – 600 seconds
> 150℃	At least 210 seconds
> 217℃	At least 30 seconds (30 ~ 120 seconds)
Peak temperature	245℃
Cool-down rate (peak to 50℃)	Lesss than 6℃ per second
Time from 30℃ to 245℃	No greater than 390 seconds

5   optical specifications

5.1   sensor array center

figure   5-1 sensor array center

5.2   lens chief ray angle (CRA)
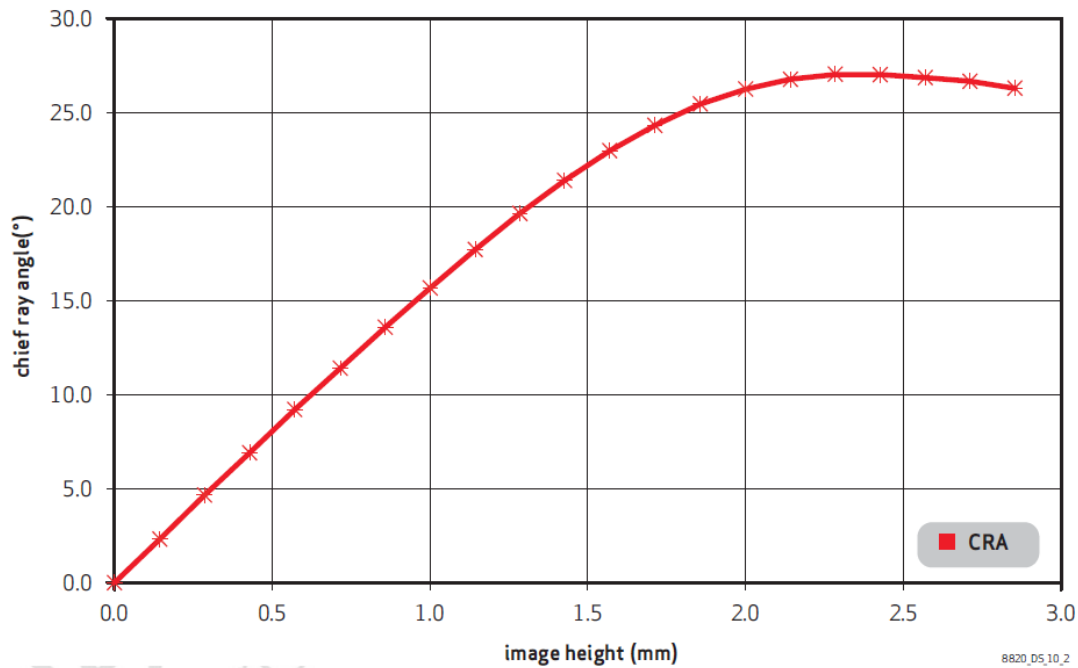
figure   5-2 chief ray angle (CRA)

table 5-1   CRA versus image height plot (sheet 1 of 2)

Field (%)	Image height (mm)	CRA (degrees)
0	0	0
0.05	0.143	2.3
0.10	0.286	4.6
0.15	0.428	6.9
0.20	0.571	9.2
0.25	0.714	11.4
0.30	0.857	13.6
0.35	1.000	15.7
0.40	1.142	17.7
0.45	1.285	19.6
0.50	1.428	21.4
0.55	1.571	23.0
0.60	1.714	24.4
0.65	1.856	25.5
0.70	1.999	26.3

table 5-1   CRA versus image height plot (sheet 2 of 2)

Field (%)	Image height (mm)	CRA (degrees)
0.75	2.142	26.8
0.80	2.285	27.0
0.85	2.428	27.0
0.90	2.570	26.9
0.95	2.713	26.7
1.00	2.856	26.3