

MR282xx

(CU and CC)

Camera Core

Specification

February 26, 2008

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2 Revision History

Revision	Date	Who	What
0.10	05.01.2007	ML	Initial draft created from MM282. Updated with CCD vs. housing tolerances, quantum efficiency, power consumption, storage and transportation environments, absolute maximum operation conditions
020	19.05.2007	ML	Changes to bit depths and modes
1.00	26.02.2008	ML	Modes table updated, VPP references changed to CTP, optical path specs added, release

3 Disclaimers

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4 Privacy Information

This document contains information of a sensitive nature. This information should not be given to persons other than those who are involved in the MR282 project or who will become involved during the lifecycle.

5 Trademarks

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6 Glossary of Terms, Acronyms and Abbreviations

ADU	Analog to Digital Units
API	Application Program Interface
CCD	Charge Coupled Device
CTP	Compliance Test Procedure
DDRAM	Dual Data rate Random Access Memory
DLL	Dynamic Link Library
FPGA	Field Programmable Gate Array
FWC	Full Well Capacity
GUI	Graphical User Interface
OHCI	Open Host Controller Interface
PC	Personal Computer
PCB	Printed Circuit Board

7 Document Scope and Purpose

The purpose of this document is to specify MR282 camera core parameters and their dependencies.

8 Referenced Documents

- MR282 Compliance Test Procedure (MR282CTP)
- MR282 Validation and Verification Plan (MR282VVP)
- Sony datasheet E00Z37-PS

9 Parameter tables

9.1 Mechanical

Description	Symbol	Value	Units
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Height	H	32	mm
Width	W	60	mm
Depth	D	60	mm
Weight	M	100	g
Alignment of CCD chip sensitive area relative to the housing		±0.25	mm
Housing material and technology		Machined Aluminium alloy, no further surface treatments	
Lens adapter, material and technology		C-Mount, machined Aluminium alloy, anodized to black color	

9.2 Sensor

Description	Symbol	Value	Units
Brand		Sony ICX282AQ	
Type		Frame readout CCD image sensor, 2 fields	
Pixel resolution		2560 (H) × 1920 (V)	pixels
Chip size		9.74(H) × 7.96(V)	mm
Unit cell size		3.4(H) × 3.4(V)	µm
Color filter		RGB Bayer mosaic	
FWC (*), typical		9800	ē
Dark current (**), typical		9	ē/p/s

All parameters in this table, except FWC and Dark current, are reprinted from Sony datasheet E00Z37-PS

(*) – FWC, no limits specified by CCD chip vendor, typical value provided here is for informational purposes only. It can not be used as a unit qualification parameter.

(**) – Dark current, limit specified by CCD chip vendor is ~200ē/p/s. A typical value provided here is for informational purposes only. It can not be used as a unit qualification parameter.

9.3 Optical path

Description	Symbol	Value	Units
IR Filter Brand		Hoya E-CM500S	
Thickness		1.0±0.1	mm
Specification		HOYA 8405E	
Coating		NA	
CCD Spot blemishes and stain specification		Sony E00Z38B4Y	
Filter cleanness (spots, scratches)		±3 (*)	%
Size of the cosmetics defects free aperture on filter		21.5	mm

(*) – Filter cleanness is measured with the method and set of tools described in MR282CTP.

9.4 Camera core

Description	Symbol	Value	Units
Digitization		14	Bit
Supported bit resolutions		8, 10, 12 and 14	Bit/pix
Exposure time		20µs ... 500sec	
Variable Gain Range	VGA	36	dB
Refresh rate		8.5	Fps
Trigger/sync input (r)		Asynchronous CMOS 3.3V	
Trigger/sync output (rr)		CMOS 3.3V	
Dynamic range, Typical		>58	dB
Linearity (*)		<1	%

Acquisition Gain		2.4 $\pm$ 0.5	$\bar{e}$ /ADU
Lens adapter		C-Mount	
External interface		IEEE1394A	
Acquisition noise (**), typical		1.3	ADU
Acquisition noise (**), max		2.0	ADU
Readout noise (***), typical		3.5	ADU
Readout noise (***), max		NA	ADU

All parameters in this table are subject to qualification measurements specified in MR282CTP and Sony data sheet E00Z37-PS

(r) – Pull up resistor of 100k Ω

(rr) – Serial resistor of 1k Ω

(*) – Linearity of 1% guaranteed in the range of exposures 1ms to 16s.

(**) – Acquisition noise means noise generated by the camera with ADC input connected to ground via resistor equivalent to CCD output impedance of 200 Ω .

(***) – Readout noise means noise generated by the camera with ADC input connected to CCD chip. Typical value provided here is for informational purposes only. It can not be used as a unit qualification parameter.

9.5 Power

Description	Symbol	Value	Units
Power supply, via IEEE1394 system connector	V _{nom}	12 $\pm$ 10%	V
Consumption, typical no cooling	P _{nom}	1.5	W
Consumption, maximum no cooling	P _{max}	2.2	W
Consumption, typical cooling on (MR252CC only)	P _{nom-cool}	3.2	W
Consumption, maximum cooling on (MR252CC only)	P _{max-cool}	5.0	W

All parameters in this table are subject to qualification measurements specified in MR282CTP

9.6 Cooling performance (MR282CC only)

Description	Symbol	Value	Units
Lowest possible temperature on the CCD chip	T _{chip}	10	$^{\circ}$ C
Housing temperature accuracy	T _{h-acc}	2	$^{\circ}$ C
CCD chip temperature accuracy	T _{c-acc}	3	$^{\circ}$ C
Maximum achievable temperature difference between housing and chip	T _{diff}	26	$^{\circ}$ C

All parameters in this table are subject to qualification measurements specified in MR282VVP

9.7 Environment

Description	Symbol	Value	Units
Ambient temperature operation	T _{norm}	+10 ... +25	$^{\circ}$ C
Absolute maximum of ambient temperature operation (*)	T _{max}	+5 ... +60	$^{\circ}$ C
Ambient temperature for storage and transportation	T _{storage}	-25 ... +70	$^{\circ}$ C
Relative Humidity, non condensing	RH	80	%

All parameters in this table are subject to qualification measurements specified in MR282VVP

(*) – Housing temperature shall not exceed +65 $^{\circ}$ C, also beyond of the optimal range the following parameters are not guaranteed:

Dark current, Dynamical Range, Linearity, Acquisition and readout noise, S/N ratio, cooling performance (MR252CC only), durability.

9.8 Firmware/Host driver/API features

Description	Symbol	Value	Units
Interpolation method		9331, SHT_advanced	
White balance coefficients ranges		0.0 ... 3.9	x
Sharpness filter		0 ... 100	%
Gamma		0.3 ... 1.0	
Full color correction matrix (3+1)x3 coefficients ranges		-3.9 ... 3.9	x
Partial readout granularity @ (1x binning)		2 (H) x 2 (V)	pixels
Max refresh rate x1 binning (intrl)		8.8	Fields/s
Refresh rate x2 binning (intrl)		16.5	Fields/s
Refresh rate x3 binning (intrl)		24.5	Fields/s
Refresh rate x4 binning (intrl)		30	Fields/s
Refresh rate x6 binning (prgr)		25	Frames/s

All parameters in this table are subject to qualification measurements specified in MR282VVP

9.9 Supported readout modes

Mode	Binning	Scan	Mode	Pixels	Frames/s	Fiedls/s
0	2x2	Progressive	Color	1288 (H) x 966 (V)	9.0	-
1	1x1	Interlace 1L	Color	2576 (H) x 1932 (V)	4.5	9.0
2	2x2	Interlace 1L	Color	1288 (H) x 966 (V)	8.8	17.5
3	4x4	Interlace 1L	Color	640 (H) x 480 (V)	16.5	33
4	6x6	Progressive	Color(*)	424 (H) x 318 (V)	24.5	-
5	2x2	Progressive	BW	1288 (H) x 966 (V)	9.0	-
6	2x2	Progressive	BW	1294 (H) x 980 (V)	8.5	-
7	2x2	Progressive HS	BW	1294 (H) x 980 (V)	17.5	-
8	4x4	Progressive	BW	646 (H) x 490 (V)	17.5	-
9	4x4	Progressive HS	BW	646 (H) x 490 (V)	33	-
10	6x6	Progressive	BW	430 (H) x 326 (V)	25	-
11	6x6	Progressive HS	BW	430 (H) x 326 (V)	47	-
12	1x1	Interlace 1L	Color	2588 (H) x 1960 (V)	4.5	9.0
13	1x1	Interlace 1L HS8	Color	2588 (H) x 1960 (V)	8.0	16
14	1x1	Interlace 2L	Color	2588 (H) x 1960 (V)	4.5	9.0
15	1x1	Interlace 2L HS8	Color	2588 (H) x 1960 (V)	8.0	16
16	2x2	Progressive	Color	1294 (H) x 980 (V)	9.0	-
17	2x2	Progressive HS	Color	1294 (H) x 980 (V)	17.5	-
18	2x2	Interlace 1L	Color	1294 (H) x 980 (V)	8.8	17.5
19	2x2	Interlace 1L HS	Color	1294 (H) x 980 (V)	16.5	33
20	3x3	Interlace 1L	Color	862 (H) x 652 (V)	12.8	25.4
21	3x3	Interlace 1L HS	Color	862 (H) x 652 (V)	12.8	25.4
22	4x4	Interlace 1L	Color	646 (H) x 490 (V)	16.5	33
23	4x4	Interlace 1L HS	Color	646 (H) x 490 (V)	30	60
24	6x6	Progressive	Color(*)	430 (H) x 326 (V)	25	-
25	6x6	Progressive HS	Color(*)	430 (H) x 326 (V)	47	-

All parameters in this table are subject to qualification measurements specified in MR282VVP

(*) – Color matrix is RGR

HS – High speed mode

HS8 – High speed mode, only 8bit/pix supported