1/5’’ 2M SOC CMOS Image Sensor
GT2005

Datasheet
V1.1

2010-12-21

GalaxyCore Inc.

Content

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1. 总述

1.1 GT2005 描述

GT2005 是格科微电子（上海）有限公司最新推出的一款 UXGA SOC Image Sensor，光学尺寸为 1/5 英寸。通过独特的芯片工艺设计和强大的图像处理功能（ISP），实现了高性能的图像效果。同时通过优化的电路设计，使得 GT2005 功耗比较小，能广泛应用于要求高品质、低功耗的手机、电脑摄像头及其他移动设备。

1.2 特性

1.2.1 概况

- 输入时钟 : 6-27MHz (with built-in PLL, Selectable)
- 帧率 : 15 fps @UXGA output, 30fps @VGA output
- 输出数据格式 : YUV422/RAW, Parallel output
- 供电电源 : Analog 2.6 to 3.0 V
  Digital 1.5 to 1.8 V
  I/O 1.8 to 3.3 V
- 工作温度 : 20 to +60 ^{o}C
- 存储温度 : -30 to +85 ^{o}C
- 功耗 : <200mW
- 待机电流 :<70uA

1.2.2 芯片描述

- 光学尺寸 : 1/5 inch
- 有效像素 : 1616(H) x 1216(V) (1.96mega pixel)

- 像素尺寸 : 1.75µm(H) x 1.75µm(V) (square pixel)
- 图像区域尺寸 : 2849µm (H) x 2184µm (V)
- 彩色滤膜 : Primary color filter, Bayer arrangement
- 图像窗口可任意调整
- 数字变焦
- 图像上下翻转与左右镜像
- 支持各种特效
- 自动曝光控制
- 自动白平衡控制
- 坏点补偿
- Gamma 纠正
- 镜头暗角补偿
- 颜色管理系统

1.3 Technical Specifications

Parameter	Typical value
光学尺寸	1/5 inch
有效像素个数	1616(H) x 1216(V) (1.96mega pixel)
图像区域尺寸	2849um(H) x 2184um(V)
单个像素尺寸	1.75um(H) x 1.75um(V)
图像比例	30fps@24Mhz,VGA
输入时钟范围	6 to 27Mhz (with PLL,可编程)
信号输出方式	Progressive scanning
Color filter	RGB primary color filter Bayer arrangement
图像输出格式	YUV422 / RAW 并行输出
帧率	15fps @ UXGA 30fps @ VGA
封装形式	TSV

1.4 模块图

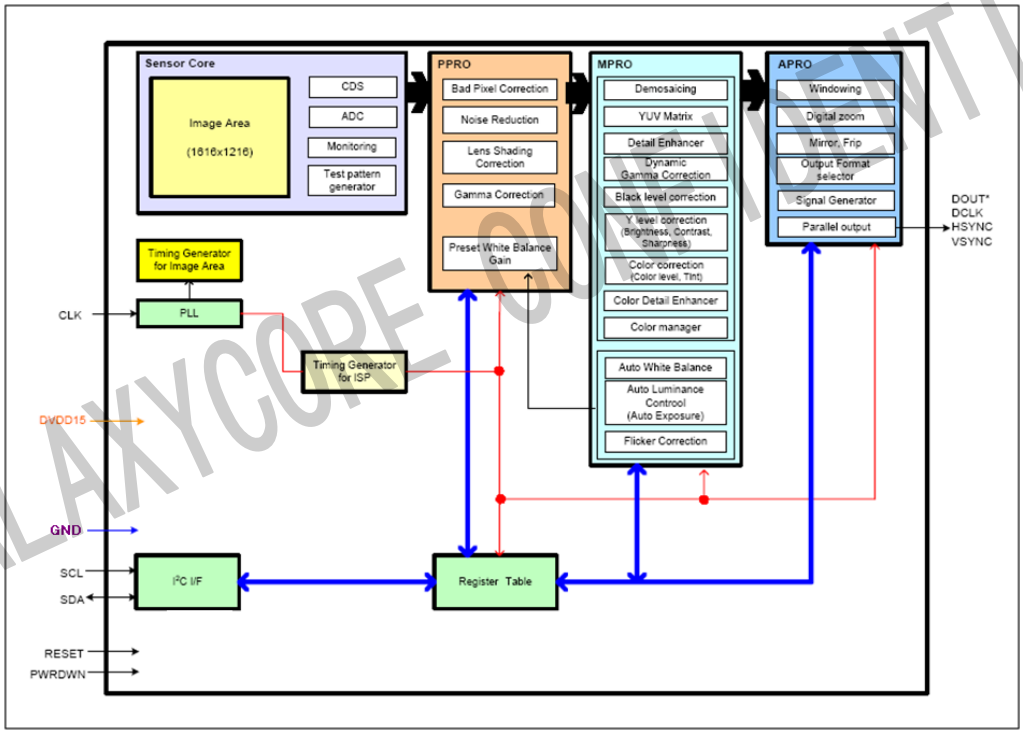


图 1.1 GT2005 芯片模块图

1.5 像素阵列

GT2005 阵列大小为 1268 列、1248 行，有效像素为 1616 列, 1216 行。GT2005 的像素阵列上覆盖着彩色滤光片（Color Filter），并且彩色滤光片以 BG/GR 的方式每行交错排列，如下图：

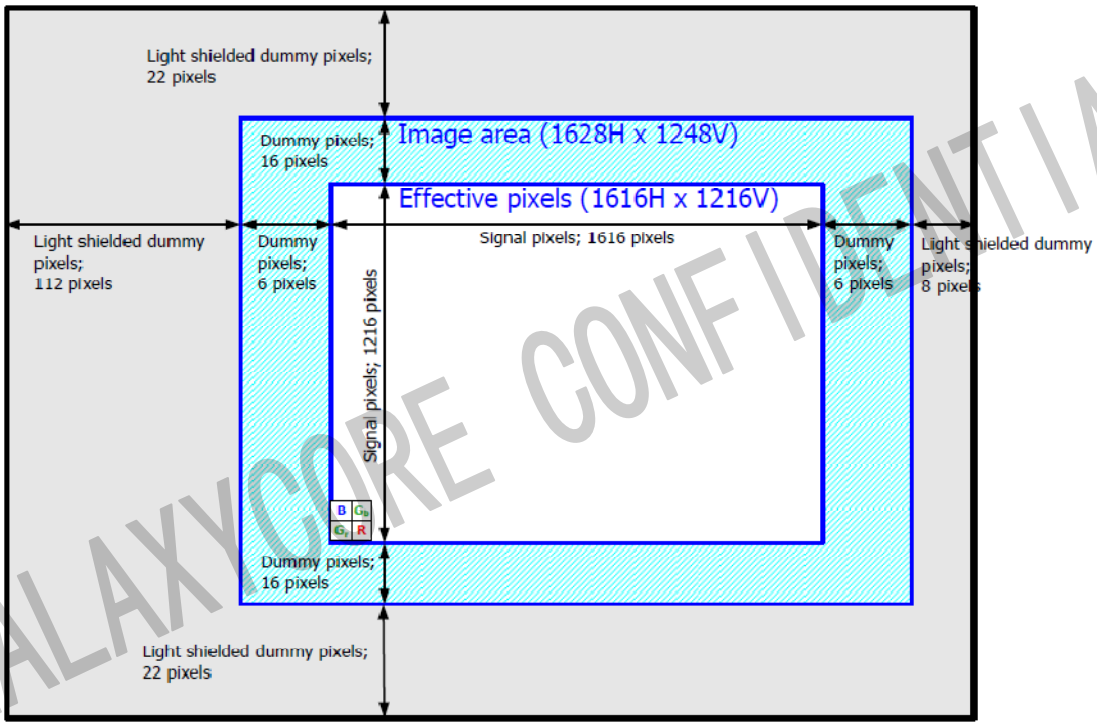


图 1.2 Pixel Array

2. I²C 通行协议

GT2005 Device Address:

serial bus write address = 0x78, serial bus read address = 0x79

2.1 Protocol

Single Register Writing：

S	78H	A	Reg_High_Bit	A	Reg_Low_Bit	A	Value	A	P

Single Register Reading:

S	78H	A	Reg_High_Bit	A	Reg_Low_Bit	A	79H	Value	A	P

Notes:

From master to slave From slave to master

S: Start condition **P:** Stop condition

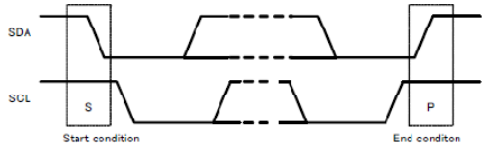
A: Acknowledge bit **NA:** No acknowledge

Register Address: Sensor register address

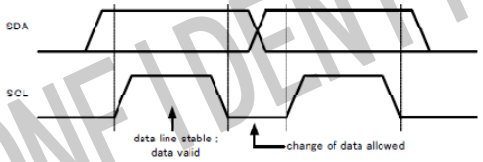
Data: Sensor registers value

2.2 Serial Bus Timing

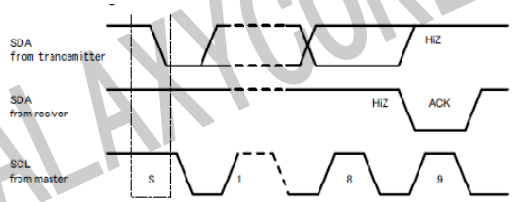
Start condition, End Condition



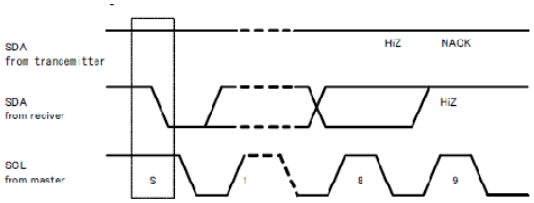
Bit Transfer



Acknowledge

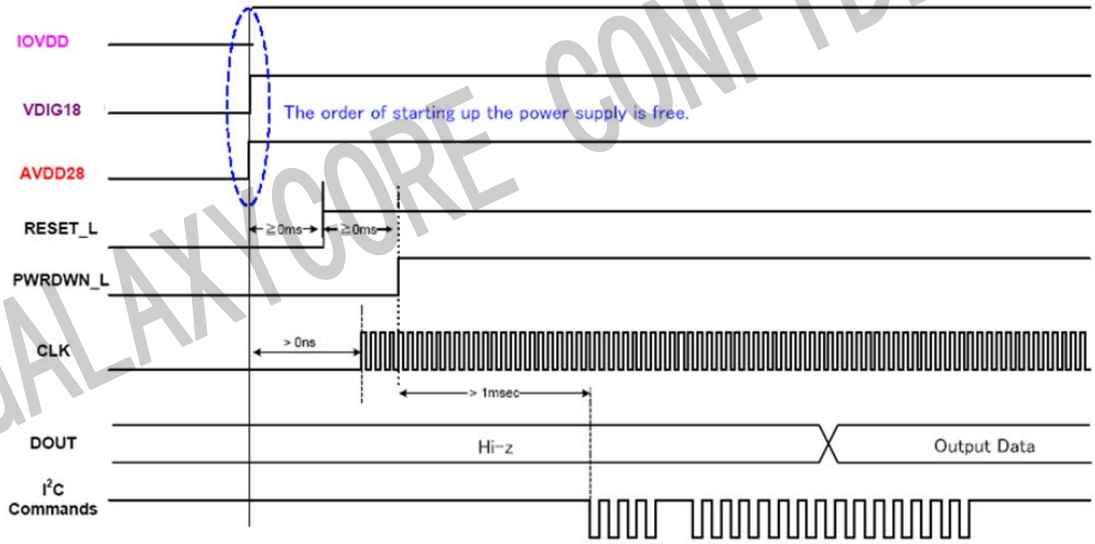


Not Acknowledge

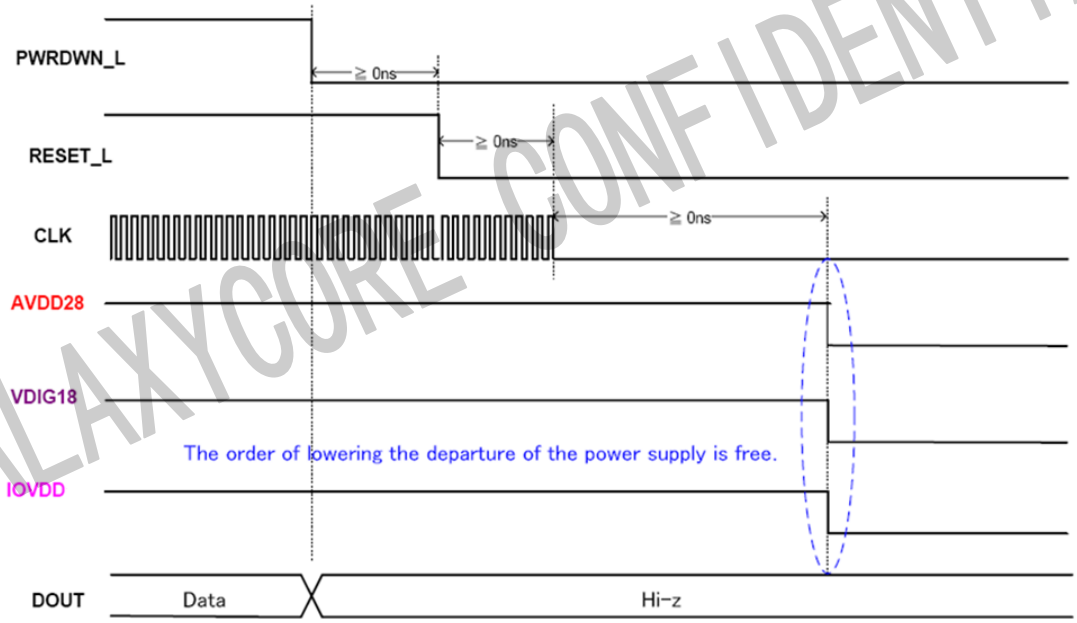


3. 时序

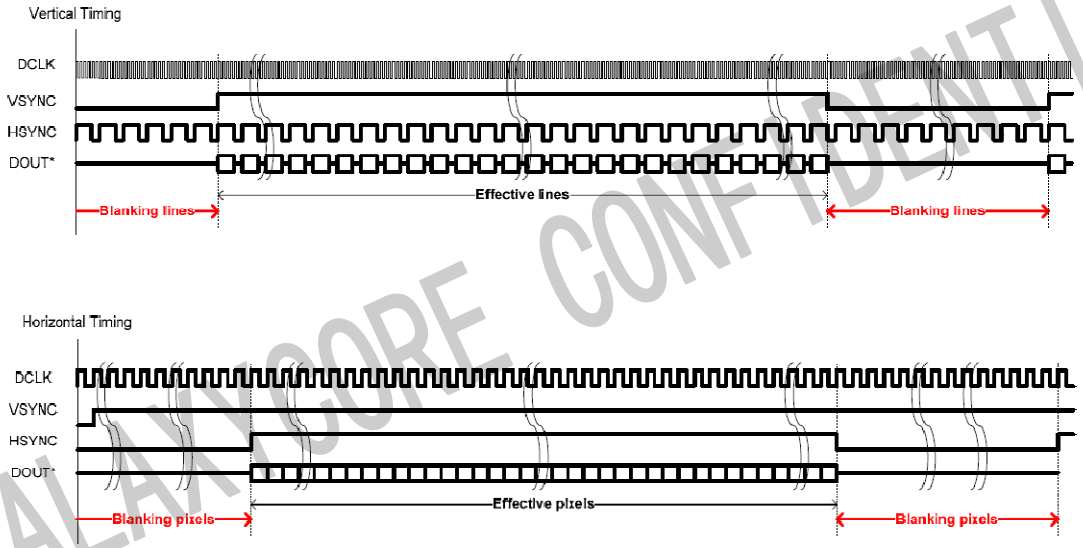
3.1 上电时序



3.2 下电时序



3.3 同步时序



4. Register List

Address	Name	Bits	Default Value	R/W	Description
0x0000	**VenderID[15:8]**	**8**	**0x51**	**RO**	**The code to identify "GT2005" and chip version.**
0x0001	**VenderID[7:0]**	**8**	**0x38**	**RO**	
0x0002	Frame Counter[7:0]	8	-	RO	Number of output frame from starting streaming
0x0010	APL_O[9:8]	2	-	RO	Value of ALC calculation data
0x0011	APL_O[7:0]	8	-	RO	
0x0012	ALC_ES[15:8]	8	-	RO	Value of Electrical Shutter (number of line)
0x0013	ALC_ES[7:0]	8	-	RO	
0x0014	ALC_AG[11:8]	4	-	RO	Value of Analog gain
0x0015	ALC_AG[7:0]	8	-	RO	
0x0016	ALC_DG[9:8]	8	-	RO	Value of Digital gain
0x0017	ALC_DG[7:0]	8	-	RO	
0x0018	FR_TIM[5:0]	8	-	RO	Ratio of expand frame 0h:x1 ～ 3Fh:x9 (0.125 step)
0x0019	ALC_OK AC60M	1 1	-	RO	[1] ALC_OK Confirmation of ALC end 0h : In ALC operating 1h : ALC end [0] AC60M Confirmation frequency of flickerless mode 0h : 50Hz 1h : 60Hz
0x001A	reserved	2	-	RO	
0x001B	reserved	8	-	RO	
0x0020	AVE_USIG[9:8]	2	-	RO	calculation value of U signal of AWB target pixels
0x0021	AVE_USIG[7:0]	8	-	RO	
0x0022	AVE_VSIG[9:8]	2	-	RO	calculation value of V signal of AWB target pixels
0x0023	AVE_VSIG[7:0]	8	-	RO	
0x0024	NUM_UVON[15:8]	8	-	RO	Pixel count of AWB target (16pixels step)
0x0025	NUM_UVON[7:0]	8	-	RO	
0x0026	AWBGAINR[9:8]	2	-	RO	R gain for WB
0x0027	AWBGAINR[7:0]	8	-	RO	
0x0028	AWBGAING[9:8]	2	-	RO	G gain for WB
0x0029	AWBGAING[7:0]	8	-	RO	
0x002A	AWBGAINB[9:8]	2	-	RO	G gain for WB

0x002B	AWBGAINB[7:0]	8	-	RO	
0x0100	MODSEL	1	0x00	RW	[0] Selection Software standby or Streaming 0 : Software standby 1 : Streaming
0x0101	VREVON HREVON	1 1	0x00	RW	[1] VREVON Selection verical flip 0h : Normal 1h : vertical flip [0] HREVON Selection Horizontal mirror 0h : Normal 1h : Horizontal mirror
0x0102	VLAT_ON GROUP_HOLD	1 1	0x00	RW	[1] VLAT_ON Function to reflect command synchronizing with V by specific register. 0h : OFF 1h : ON 0102 Please select "1". [0] GROUP_HOLD Two or more commands become effective at the same time by setting GROUP_HOLD from "1" to "0". 0h : Release commands 1h : Hold commands
0x0103	MASK_FRAME	1	0x00	RW	[0] Selection to output black frame at changing vertical flip, horizontal mirror, binning and windowing. 0h : OFF 1h : ON
0x0104	PARALLEL_OUT_SW[1:0]	2	0x00	RW	Control parallel output. (DOUT, VBLK, HBLK, DCLK) 3h : Normal (Streaming) 2h : All "L" 1h : All "H" 0h : All "Hi-Z"
0x0105	HCOUNT[8]	1	0x00	RW	Setting number of pixels in 1 line. Number of pixels = HCOUNT x 8 (default : F0h(240)x8=1920 pixels)
0x0106	HCOUNT[7:0]	7	0xF0	RW	
0x0107	VCOUNT[10:8]	3	0x00	RW	Setting number of lines in 1 fram. Number of lines = VCOUNT x 48 (default : 1Ch(28)x48=1344 lines)
0x0108	VCOUNT[7:0]	8	0x1C	RW	

0x0109	VC_MODE	1	0x00	RW	[0]Selection of VCOUNT mode depend on binning or windowing. 0h : Changed the number of lines depend on binning or windowing mode automatically. (For example, in case of 1/2binning mode, the number of lines is VCOUNT/2=672lines at defalt.) 1h : Fixed the number of lines by VCOUNT setting. (0x0107-0x0108)
0x010A	MONI_MODE[1:0]	2	0x00	RW	[3:2] MONI_MODE Selection line binning mode. 0h : Full 1h : 1/2 line binning 2h : 1/4 line binning 3h : reserved
	PIC_SIZE[1:0]	2			[1:0] PIC_SIZE Selection central line windowing mode. 0h : Full 1h : 1/2 central line windowing 2h : 1/4 central line windowing 3h : reserved
0x010B	HFILON[1:0]	2	0x00	RW	[3:2] HFILON Selection filter after digital zooming 0h : OFF 1h : 3tap LPF 2h : averaging 2pixels 3h : averaging 4 pixels
	DZV_SW	1			[1] DZV_SW Selection of ON/OFF vertical digital zooming. 0h : OFF 1h : ON
	DZH_SW	1			[0] DZH_SW Selection of ON/OFF horizontall digital zooming. 0h : OFF 1h : ON
0x010C	HSTART[9:8]	2	0x00	RW	Starting horizontal position output area. (0h to 327h(807)) 000h : horizontal size = 1616 pixels ~
0x010D	HSTART[7:0]	8			

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					008h : horizontal size = 1600 pixels (default) ~ 327h : horizontal size = 2 pixels
0x010E	VSTART[9:8]	2	0x00	RW	Starting vertical position output area.(0h to 25Fh(607)) 000h : vertical size = 1216 lines ~ 008h : vertical size = 1200 lines (default) ~ 25Fh : vertical size = 2 lines
0x010F	0] VSTART[7:0]	8	0x00	RW	
0x0110	HWIDTH[10:8]	3	0x06	RW	Horizontal output size 0640h : default (1600pixels)
0x0111	HWIDTH[7:0]	8	0x40	RW	
0x0112	V_OUTPUT[10:8]	3	0x04	RW	Vertical output size 04B0h : default (1200lines)
0x0113	V_OUTPUT[7:0]	8	0xB0	RW	
0x0114	YUV422 FOYCSEL FOUVSEL RAWOUT	1 1 1 1	0x00	RW	[3] YUV422 Select YUV mode.Please select "0". [2:1] Selection YUV order 0h : UYVY 1h : VYUY 2h : YUYV 3h : YVYU [0] Selection output format 0h : YUV422 1h : Raw 10bits
0x0115	PICEFF[3:0]	4	0x00	RW	Selection picture effect 0-5h : Normal 6h : Monochrome 7h : Y Negative 8h : C Negative 9h : Negative Ah : Sepia Bh : Antique Ch : Black sketch Dh : White Sketch Eh : Emboss Fh : Color emboss
0x0116	DIV_REFCLK[1:0]	2	0x02	RW	Ratio of divider for input clock to PLL 0h : 1/1 1h : 1/2 2h : 1/4 3h : 1/1

0x0117	PLL_MULTI[8]	1	0x00	RW	Control PLL divider 000h-00Fh : Not avairable 010h : 1/16 ～ 067h : 1/103 (default) ～ 1FFh : 1/511
0x0118	PLL_MULTI[7:0]	8	0x67	RW	
0x0119	VT_SYS_CNTL[2:0]	3	0x01	RW	Ratio of divider for internal clock1 0h : 1/1 1h : 1/2 2h : 1/4 3h : 1/4 4h : 1/6 5h : 1/8 6h : 1/10 7h : 1/12
0x011A	DIV_VT_PIX[2:0]	3	0x01	RW	Ratio of divider for internal clock1 0h : 1/1 1h : 1/2 2h : 1/4 3h : 1/4 4h : 1/6 5h : 1/8 6h : 1/10 7h : 1/12
0x011B	DIV_OP_SYS[2:0]	3	0x00	RW	Ratio of divider for output clock (DCLK) 0h : 1/1 1h : 1/2 2h : 1/4 3h : 1/4 4h : 1/6 5h : 1/8 6h : 1/10 7h : 1/12
0x011C	OUTBITS DCLK_POL	1 1	0x00	RW	[1] Selection output bit width 0h : 8 bits 1h : 10 bits [0] Selection polarity of DCLK 0h : Normal 1h : Inverted
0x011D	FIFODLY[9:8]	2	0x00	RW	Contorol output delay timing
0x011E	FIFODLY[7:0]	8	0x20	RW	Do not change this regiser.

0x011F	HENLALL	1	0x00	RW	[0] Selection HBLK output mode 0h : in VBLK="H" 1h : at all time
0x0120 ~ 0x0128 reserved					
0x0200	SUBCNT[7:0]	8	0x00	RW	Control contrast gain 80h : x -1.8 ～ 00h : x 1 ～ 7Fh : x 1.35
0x0201	BRIGHT[7:0]	8	0x00	RW	Control brightness 80h:-352LSB ～ 00h:0LSB ～ 7Fh:350LSB
0x0202	COLORLV[7:0]	8	0x40	RW	Control color level 00h : x 0 ～ 40h : x 1 ～ FFh : x 3.98
0x0203	THROUGH CONVOFF UNICOLR[5:0]	1 1 6	0x00	RW	[7] Select ON/OFF image signal processing 0 : ON 1 : OFF [6] Select ON/OFF YUV converting 0 : ON 1 : OFF [5:0] Unicolor gain 00 : x 1 ～ 3Fh : x 0.51
0x0204	HUE[6:0]	7	0x00	RW	Color hue 40h : -45°～ 00h:0°～ 3Fh:+44.3°
0x0205	CBAMP[5:0]	6	0x00	RW	Color gain of U 20h : x 0.75 ～ 3Fh:x 1.008 , 00 : x 1 ～ 1Fh : x 1.242
0x0206	HUEBIAS[5:0]	6	0x00	RW	Color hue based on U 00h:0°～ 3Fh:+44.3°
0x0207	SHPGAIN[6:0]	7	0x20	RW	Sharpness gain 00h : x -0.5 ～ 20h : x 1 ～ 7Fh : x 2.5
0x0208	SHPLIM[3:0] SHPCORE[3:0]	4 4	0x00	RW	[7:4] Limiter level of sharpness 0h : 0.8IRE ～ Fh : 14.4IRE [3:0] Coring level of sharpness 0h : OFF ～ Fh : 1.7IRE
0x0209	YNCGAIN[2:0] YNCGAIN[2:0]	3 3	0x00	RW	[6:4] Y noise canceler gain 0h : OFF ～ 7h : x 1.75 [3:0] Limiter level of Y noise caceler 0h : 0.3IRE ～ Fh : 7IRE
0x020A	CDEGAIN[1:0] CDECORE[1:0] CDEGREEN	2 2 1	0x00	RW	[7:6] CDEGAIN CDE (Color Detail Enhancer) gain 0h : OFF, 1h : x1, 2h : x1.5, 3h : x2 [5:4] CDECORE CDE coring level 0h : 2IRE, 1h : 5IRE, 2h : 10IR, 3h : 15IRE [3] CDEGREEN Select Green CDE

					0h : OFF, 1h : ON
	CDEBLUE	1			[2] CDEBLUE Select Blue CDE 0h : Y gain, 1h : U level
	CDEAUTO	1			[1] CDEAUTO Select CDE depend on 0h : OFF, 1h : ON
	DEMZMODE	1			[0] DEMZMODE Select demosaicing mode. Please select "0h"
0x020B	GAXENHP[7:0]	8	0x00	RW	Enhancer gain (white side) 00h : OFF ～ FFh : x 23.9
0x020C	GAXENHN[7:0]	8	0x00	RW	Enhancer gain (black side) 00h : OFF ～ FFh : x 23.9
0x020D	SEL_CORE	1	0x00	RW	[7] SEL_CORE Select coring depend on AG 0h : Fixed value, 1h : Increase coring depend on AG
	XENHLIM[6:0]	7			[6:0] XENHLIM Enhancer limiter level 00h : 1LSB ～ 7Fh : 255LSB
0x020E	SELKNEE	1	0x00	RW	[7] SELKNEE Select knee level 0h : 1/2 , 1h : 1/4
	XENHKNEE[5:0]	6			[5:0] XENHKNEE Knee level 00h : 0LSB ～ 3Fh : 63LSB
0x020F	XENHCORE[3:0]	4	0x00	RW	Enhancer coring level 0h : 0LSB ～ Fh : 15LSB
0x0210	DYGMON_W	1	0x00	RW	[7] DYGMON_W Select white side dynamic gamma correction 0h : OFF, 1h : ON
	DYGMON_B	1			[6] DYGMON_B Select black side dynamic gamma correction 0h : OFF, 1h : ON
	SYGM75[1:0]	2			[5:4] SYGM75 Select level of white side static gamma correction 0h : OFF 1h : 7% 2h : 15% 3h : 22%

	SYGM75SEL	1			[3] SYGM75SEL Select direction of white dynamic gamma correction 0h : Up , 1h : Down 0210
	SYGM25[2:0]	3			[2:0] SYGM25 Select level of black side static gamma correction 0h : OFF ～ 3h : +42% 4h : -50% ～ 7h : -12.5% R/W 00
0x0211	DYSPEED[2:0]	3	0x00	RW	[6:0] DYSPEED Selct time constant of dynamic gamma 0h : 12V ～ 7h : 137V (80%)
	DYSEN25[2:0]	3			[2:0] DYSEN25 Gain of black side dynamic gamma 0h : 25% ～ 7h : 68.75%
0x0212	DETBLKON	1	0x00	RW	[7] DETBLKON Select black in detection period 0h : OFF, 1h : ON
	DYGM25W[2:0]	3			[6:4] DYGM25W Width of black side dyanamic gamma correction 0h : 0% ～ 7h : 150%
	DYDETW	1			[3] DYDETW Width of detection 0:7IRE ～14IRE
	DYNOSEN[2:0]	3			[2:0] DYNOSEN No detection region 0h : OFF ～ 3h : +3 , 4h : -4 ～ 7h : -1
0x0213	BLEXPON	1	0x00	RW	[7] BLEXPON Select black expansion function 0h : OFF, 1h : ON
	BLLVLON	1			[6] BLLVLON Select black level correction 0h : OFF , 1h : ON
	BPGTHR	1 1			[5] BPGTHR Level of black detection 0h : 0IRE, 1h: 3IRE R/W 00
	BPGAREA	1			[4] BPGAREA Detection area of balck

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					0h : 1.1%, 1h : 4.5%
	BLEXPST[1:0]	2			[3:2] BLEXPST Start level of black expansion 0h : 30IRE 1h : 35IRE 2h : 40IRE 3h : 45IRE
	GBLEXP[1:0]	2			[1:0] GBLEXP Gain of black expansion 0h : OFF 1h : 2dB 2h : 4dB 3h : 6d
0x0214	BLPRVON[2:0]	2	0x00	RW	[7:6] BLPRVON Start point of reverse-correction 0h : OFF 1h : x 5 IRE 2h : x 7.6 IRE 3h : x 12.5 IRE
	VNCSEL[1:0]	2			[5:4] VNCSEL Line NR gain 0h : OFF 1h : x 0.5 2h : x 0.75 3h : x 1
	HVNCLIM[3:0]	4			[3:0] HVNCLIM Limiter level of lineNR 0h : OFF ~ Fh : 3.4IRE
0x0215	BPGGAIN1[3:0]	4	0x00	RW	[7:4] BPGGAIN1 Speed when no black area is detected. 0h : slow ~ Fh : fast
	BPGGAIN2[3:0]	4			[3:0] BPGGAIN2 Speed of black detection. 0h : slow ~ Fh : fast
0x0216	reserved				
0x0217	reserved				
0x0218	GSTRECH[1:0]	2	0x00	RW	[7:6] GSTRECH Green color emphasis 0h : OFF 1h : 1dB 2h : 2dB 3h : 3.5dB

	FRESHON[1:0]	2			[5:4] FRESHON Flesh color correction 0h : OFF 1h : 7 degree 2h : 10.5 degree 3h : 14 degree
	FRESHNW	1			[3] FRESHNW Width of flesh color correction 0h : +/- 33 degree 1h : +/- 18 degree
	ADGWNC	1			[2] ADGWNC Color suppression depend on Analog gain 0h : OFF, 1h : ON
	AGDSEL	1			[1] AGDSEL Level of color suppression 0h : 1/2, 1h : 1/4
	CNZCORE	1			[0] CNZCORE Color coring depend on Analog gain 0h: OFF, 1h : ON
0x0219	CLPMODE	1	0x00	RW	[7] CLPMODE Select type of color LPF 0h : FIR , 1h: IIR
	CLPFON[1:0]	2			[5:4] CLPFON Number of clor LPF 0h : OFF ～ 3h : 3
	GCTI[2:0]	3			[2:0] GCTI Gain of improved color edge (Color Transient Improver) 0h : OFF ～ 7h : x3.5
0x021A	CMRKON	1	0x03	RW	[7] CMRKON Switch of Center mark 0h : OFF, 1h : ON
	CMRKSPD[1:0]	2			[6:5] CMRKSPD Blink speed of Cener mark 0h : 4 frame 1h : 8 frame 2h : 16 frame 3h : 32 frame
	HADR[10:8]	3			[2:0] HADR[10:8] Horizontal position of Center mark 000h : left side ～ 328h : Center ～ 650h : Right side

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0x021B	HADR[7:0]	8	0x28	RW	Horizontal position of Center mark 000h : left side ～ 328h : Center ～ 650h : Right side
0x021C	VADR[10:8]	3	0x02	RW	Vertical position of Center mark 000h : Upper side ～ 260h : Center ～ 4C0h : Bottom side
0x021D	VADR[7:0]	8	0x60	RW	
0x021E	RCOLRLVL[7:0]	8	-	RO	Read data of color level at Center mark
0x021F	RCOLRTIN[7:0]	8	-	RO	Read data of hue at Center mark
0x0220	TINT0[4:0]	5	0x00	RW	Tint at 0 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0221	TINT1[4:0]	5	0x00	RW	Tint at 15 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0222	TINT2[4:0]	5	0x00	RW	Tint at 30 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0223	TINT3[4:0]	5	0x00	RW	Tint at 45 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0224	TINT4[4:0]	5	0x00	RW	Tint at 60 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0225	TINT5[4:0]	5	0x00	RW	Tint at 75 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0226	TINT6[4:0]	5	0x00	RW	Tint at 90 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0227	TINT7[4:0]	5	0x00	RW	Tint at 105 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0228	TINT8[4:0]	5	0x00	RW	Tint at 120 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0229	TINT9[4:0]	5	0x00	RW	Tint at 135 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x022A	TINT10[4:0]	5	0x00	RW	Tint at 150 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x022B	TINT11[4:0]	5	0x00	RW	Tint at 165 degree of color maneger

					10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x022C	TINT12[4:0]	5	0x00	RW	Tint at 180 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x022D	TINT13[4:0]	5	0x00	RW	Tint at 195 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x022E	TINT14[4:0]	5	0x00	RW	Tint at 210 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x022F	TINT15[4:0]	5	0x00	RW	Tint at 225 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0230	TINT16[4:0]	5	0x00	RW	Tint at 240 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0231	TINT17[4:0]	5	0x00	RW	Tint at 255 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0232	TINT18[4:0]	5	0x00	RW	Tint at 270 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0233	TINT19[4:0]	5	0x00	RW	Tint at 285 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0234	TINT20[4:0]	5	0x00	RW	Tint at 300 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0235	TINT21[4:0]	5	0x00	RW	Tint at 315 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0236	TINT22[4:0]	5	0x00	RW	Tint at 330 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0237	TINT23[4:0]	5	0x00	RW	Tint at 345 degree of color maneger 10h : -11.25 degree ～ 00h : 0 degree ～ 0Fh : +10.5 degree
0x0238	CGAIN1[7:4] CGAIN1[3:0]	4 4	0x00	RW	[7:4]Color level of middle range at 0 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22 [3:0] Color level of maximun range at 0

					degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0239	CGAIN1[7:4]	4	0x00	RW	[7:4] Color level of middle range at 15 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN1[3:0]	4			[3:0]Color level of maximun range at 15 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x023A	CGAIN2[7:4]	4	0x00	RW	[7:4] Color level of middle range at 30 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN2[3:0]	4			[3:0]Color level of maximun range at 30 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x023B	CGAIN3[7:4]	4	0x00	RW	[7:4] Color level of middle range at 45 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN3[3:0]	4			[3:0] Color level of maximun range at 45 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x023C	CGAIN4[7:4]	4	0x00	RW	[7:4] Color level of middle range at 60 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN4[3:0]	4			[3:0]Color level of maximun range at 60 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x023D	CGAIN5[7:4]	4	0x00	RW	[7:4] Color level of middle range at 75 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN5[3:0]	4			[3:0] Color level of maximun range at 75 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x023E	CGAIN6[7:4]	4	0x00	RW	[7:4] Color level of middle range at 90 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN6[3:0]	4			[3:0] Color level of maximun range at 90 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x023F	CGAIN7[7:4]	4	0x00	RW	[7:4] Color level of middle range at 105 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN7[3:0]	4			[3:0] Color level of maximun range at 105

					degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0240	CGAIN8[7:4]	4	0x00	RW	[7:4] Color level of middle range at 120 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN8[3:0]	4			[3:0] Color level of maximun range at 120 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0241	CGAIN9[7:4]	4	0x00	RW	[7:4] Color level of middle range at 135 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN9[3:0]	4			[3:0] Color level of maximun range at 135 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0242	CGAIN10[7:4]	4	0x00	RW	[7:4] Color level of middle range at 150 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN10[3:0]	4			[3:0] Color level of maximun range at 150 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0243	CGAIN11[7:4]	4	0x00	RW	[7:4] Color level of middle range at 165 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN11[3:0]	4			[3:0] Color level of maximun range at 165 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0244	CGAIN12[7:4]	4	0x00	RW	[7:4] Color level of middle range at 180 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN12[3:0]	4			[3:0] Color level of maximun range at 180 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0245	CGAIN13[7:4]	4	0x00	RW	[7:4] Color level of middle range at 195 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN13[3:0]	4			[3:0] Color level of maximun range at 195 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0246	CGAIN14[7:4]	4	0x00	RW	[7:4] Color level of middle range at 210 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN14[3:0]	4			[3:0] Color level of maximun range at 210

					degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0247	CGAIN15[7:4]	4	0x00	RW	[7:4] Color level of middle range at 225 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN15[3:0]	4			[3:0] Color level of maximun range at 225 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0248	CGAIN16[7:4]	4	0x00	RW	[7:4] Color level of middle range at 240 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN16[3:0]	4			[3:0] Color level of maximun range at 240 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0249	CGAIN17[7:4]	4	0x00	RW	[7:4] Color level of middle range at 255 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN17[3:0]	4			[3:0] Color level of maximun range at 255 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x024A	CGAIN18[7:4]	4	0x00	RW	[7:4] Color level of middle range at 270 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN18[3:0]	4			[3:0] Color level of maximun range at 270 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0024B	CGAIN19[7:4]		0x00	RW	[7:4] Color level of middle range at 285 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN19[3:0]				[3:0] Color level of maximun range at 285 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x024C	CGAIN20[7:4]	4	0x00	RW	[7:4] Color level of middle range at 300 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN20[3:0]	4			[3:0] Color level of maximun range at30 0 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x024D	CGAIN21[7:4]	4	0x00	RW	[7:4] Color level of middle range at 315 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
	CGAIN21[3:0]	4			[3:0] Color level of maximun range at 315

					degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x024E	CGAIN22[7:4] CGAIN22[3:0]	4 4	0x00	RW	[7:4] Color level of middle range at 330 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22 [3:0] Color level of maximun range at 330 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x024F	CGAIN23[7:4] CGAIN23[3:0]	4 4	0x00	RW	[7:4] Color level of middle range at 345 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22 [3:0] Color level of maximun range at 345 degree of color manager 8h : x0.75 ～ 0h : x1 ～ 7h : x1.22
0x0250	BRITE0[7:4] BRITE0[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 0 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 0 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0251	BRITE1[7:4] BRITE1[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 15 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 15 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0252	BRITE2[7:4] BRITE2[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 30 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 30 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0253	BRITE3[7:4] BRITE3[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 45 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE

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					[3:0] Brightness of maximun range at 45 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0254	BRITE4[7:4] BRITE4[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 60 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 60 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0255	BRITE5[7:4] BRITE5[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 75 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 75 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0256	BRITE6[7:4] BRITE6[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 90 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 90 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0257	BRITE7[7:4] BRITE7[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 105 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 105degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0258	BRITE8[7:4] BRITE8[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 120 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 120 degree of color manager

					8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0259	BRITE9[7:4] BRITE9[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 135 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 135 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x025A	BRITE10[7:4] BRITE10[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 150 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 150 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x025B	BRITE11[7:4] BRITE11[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 165 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 165 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x025C	BRITE12[7:4] BRITE12[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 180 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 180 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x025D	BRITE13[7:4] BRITE13[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 195 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 195 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE

0x025E	BRITE14[7:4] BRITE14[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 210 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 210 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x025F	BRITE15[7:4] BRITE15[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 225 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 225 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0260	BRITE16[7:4] BRITE16[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 240 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 240 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0261	BRITE17[7:4] BRITE17[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 255 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 255 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0262	BRITE18[7:4] BRITE18[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 270 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 270 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0263	BRITE19[7:4]	4	0x00	RW	[7:4] Brightness of middle range at 285 degree of color manager

	BRITE19[3:0]	4			8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 285 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0264	BRITE20[7:4] BRITE20[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 300 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 300 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0265	BRITE21[7:4] BRITE21[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 315 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 315 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0266	BRITE22[7:4] BRITE22[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at 330 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 330 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0267	BRITE23[7:4] BRITE23[3:0]	4 4	0x00	RW	[7:4] Brightness of middle range at34 0 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE [3:0] Brightness of maximun range at 340 degree of color manager 8h : -14.5 IRE ～ 0h : x1 ～ 7h : +12.7 IRE
0x0268	R2CR[7:0]	8	0x41	RW	Coefficient of R in CR 00h : x0 ～ 41h : x 0.508 ～ FFh : x1.992
0x0269	G2CR[7:0]	8	0x2B	RW	Coefficient of G in CR 00h : x0 ～ 2Bh : x 0.336 ～ FFh : x1.992

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0x026A	B2CB[7:0]	8	0x41	RW	Coefficient of B in CB 00h : x0 ～ 41h : x 0.508 ～ FFh : x1.992
0x026B	B2CB[7:0]	8	0x37	RW	Coefficient of G in CB 00h : x0 ～ 37h : x 0.430 ～ FFh : x1.992
0x026C	reseverd				
0x026D	SEPIASFT[1:0]	2	0xD0	RW	[7:6] SEPIASFT Gain of sepia color 0h : x1 1h : x1/2 2h : x1/4 3h : x1/8
	ANTQSFT[1:0]	2			[5:4] ANTQSFT Gain of antique color 0h : x1 1h : x1/2 2h : x1/4 3h : x1/8
	Sensor settings	4			[3:0] Reserved
0x026E	SEPIAOFSU[7:0]	8	0x60	RW	Offset of sepia color at U axis (default 60h : +96)
0x026F	SEPIAOFSV[7:0]	8	0xA0	RW	Offset of sepia color at V axis (default D0h : -96)
0x0270	GADTLMAX[7:0]	8	0x40	RW	Gain of enhancer in effect mode (default 40h : +64)
0x0300	ALCSW	1	0x81	RW	[7] ALCSW Select operation of Auto Luminance Control.
	ALCLOCK	1			0h : OFF , 1h : ON [6] ALCLOCK Stop ALC operation.
	ALCCLR	1			0h : ALC operation , 1h : ALC stop [5] ALCCLR 1h : Clear ALC intergration
	ALCAIM[9:8]	2			(change to "0" automatically.) [1:0] ALCAIM[9:8] Target level of ALC
0x0301	ALCAIM[7:0]	8	0x00	RW	Target level of ALC
0x0302	AGMIN[7:0]	8	0x00	RW	Minimum value of AG
0x0303	AGMAX[7:0]	8	0x1F	RW	Maximum value of AG
0x0304	MES[15:8]	8	0x03	RW	Set ES(Electrical Shutter) time by manual when ALC is off. ES time is the number of line. (1H = 1line)
0x0305	MES[7:0]	8	0x83	RW	
0x0306	ESLIMMODE	1	0x00	RW	Limit of ES time

	MAG[11:8]	3			0 : frame 0306 , 1h : Manual value Set AG by manual when ALC is off.
0x0307	MAG[[7:0]	8	0x20	RW	Set AG by manual when ALC is off.
0x0308	MDG[7:0]	8	0x00	RW	
0x0309	A1 WEIGHT[1:0] A2 WEIGHT[1:0] A3 WEIGHT[1:0] A4 WEIGHT[1:0]	2 2 2 2	0x15	RW	[7:6] A1 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3 [5:4] A2 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3 [3:2] A3 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3 [1:0] A4 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3
0x030A	A5 WEIGHT[1:0] B1 WEIGHT[1:0] B2 WEIGHT[1:0] B3 WEIGHT[1:0]	2 2 2 2	0x15	RW	[7:6] A5 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3 [5:4] B1 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3 [3:2] B2 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3 [1:0] B3 WEIGHT] Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3
0x030B	B4 WEIGHT[1:0] B5 WEIGHT[1:0] C1 WEIGHT[1:0] C2 WEIGHT[1:0]	2 2 2 2	0x51	RW	[7:6] B4 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3 [5:4] B5 WEIGHT] Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3 [3:2] C1 WEIGHT] Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3 [1:0] C2 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3
0x030C	C3 WEIGHT[1:0]	2	0x50	RW	[7:6] C3 WEIGHT Weight of ALC calculation

	C4 WEIGHT[1:0] C5 WEIGHT[1:0]	2 2			0h : OFF , 1h : x1, 2h : x2, 3h : x3 [5:4] C4 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3 [3:2] C5 WEIGHT Weight of ALC calculation 0h : OFF , 1h : x1, 2h : x2, 3h : x3
0x030D	UDMODE1 UDMODE0 UPDNSPD[4:0]	1 1 5	0x10	RW	[7] UDMODE1 Mode of ALC speed at middle level to ALC target, 0h : OFF, 1h : speed up (x1.5) [6] UDMODE0 Mode ALC speed near ALC target. 0h : OFF, 1h : Select NEARSPD setting. [4:0] UPDNSPD ALC speed 00h : Stop, 1h : x1 ～ 10h : x15 ～ 1Fh : x31
0x030E	Sensor settings NEARSPD[4:0]	3 5	0x08	RW	[7:5] Reserved. [4:0] NEARSPD ALC speed near ALC target 00h : Stop, 1h : x1 ～ 10h : x15 ～ 1Fh : x31
0x030F	ALCFRZLV[7:0]	8	0x10	RW	Range that ALC stops to ALC target. 00h : 1LSB ～ 10h : 17LSB ～ FFh : 256LSB
0x0310	ALCFRZTIM[7:0]	8	0x0F	RW	Number of frames for re-ALC operation. ALC operates again when the difference between the ALC integrated value and the ALC target is greater than that of the value set with ALCFRZLV during the number of frames set with ALCFRZTIM. 00h : 1 frame ～ 10h : 15 frames ～ FFh : 256 frames
0x0311	ALCSIGMAX[7:0]	8	0xFF	RW	Limitter of input Y level for ALC 00h : 3LSB ～ FFh : 1023LSB (OFF)
0x0312	FAUTO	1	0x00	RW	[7] FAUTO Auto frame rate function 0 h: Fixed frame rate depend on FCOUNT 1h : Changed frame rate into the value set with FCOUNT

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	FCOUNT[2:0]	3			[6:4] FCOUNT Setting of expand frame rate 0h : OFF, 1h : 2 frames ～ 7h : 8 frames
	FCLSBON	1			[3] FCLSBON Expand unit 0h : frame , 1h : 1/8 frame rate
	EXPLIM[2:0]	3			[2:0] EXPLIM Limitter of maximum gain of ALC 0h : OFF 1h : x8192 2h : x2048 3h : x512 4h : x128 5h : x32 6h : x8 7h : x2
0x0313	FLLONGON	1	0x38	RW	[7] FLLONGON ES step over 50ms 0h : other step in 50 and 60Hz mode. 1h : 50ms step commonness
	FRMSPD[1:0]	2			[5:4] FRMSPD Frame rate setting for flicker collection 0h : 1.875fps 1h : 3.75fps 2h : 7.5fps 3h : 15fps
	FL600S[11:8]	4			[3:0] FL600S[11:8] Standard time of flicker correction The number of lines that corresponds to 64/600sec of 15 fps.
0x0314	FL600S[7:0]	8	0x66	RW	The number of lines that corresponds to 64/600sec of 15 fps.
0x0315	ACFDET	1	0xD6	RW	[7] ACFDET Change flicker correction 50/60Hz mode automatically. 0h : Manual, 1h : Auto
	AC60M	1			[6] AC60M Flicker corection mode in manual mode. (ACFDET=0h) 0h : 50Hz, 1h : 60Hz
	FLMANU	1			[5] FLMANU Mode of period of detection

	ACDETDLY	1			0h : Auto , 1h : Manual [4] ACDETDLY Number of frames to change 50/60Hz mode. 0h : 5 frames 1h : 10 frames
	MSKLINE[1:0]	2			[3:2] MSKLINE Accuracy of flicker detection 0h : 4phases, 1h : 3phases , 2h : 2phases, 3h : 1 phase
	ACDPWAIT[1:0]	2			[1:0] ACDPWAIT Delay time to start flicker detection 0h : 0 frame , 1h : +1frame, 2h : +2frames , 3h : +3frames
0x0316	FLDETM[7:0]	8	0x26	RW	Period of detection in manual mode. (FLMANU=1h) 0～4 : Prohibition, 5h : 5lines ～ 26h : 38lines ～ FFh : 255lines
0x0317	ALCPDET	1	0x02	RW	[7] ALCPDET Period of ALC detection 0h : 1frame, 1h : 2 frames
	ACDET1LV	7			[6:0] ACDET1LV Level of flicker detection If the brightness difference with the previous frame is larger than ACDET1LV, flicker is corrected.
0x0318	ACDET2LV	8	0x08	RW	Exclusion level of flicker detection. If the brightness difference with the previous frame is larger than ACDET2LV, flicker is NOT corrected.
0x0319	DETSEL[3:0]	4	0x0C	RW	Confirmation time of continuous flicker 0h : short ～ Fh : long
0x031A	AWBSW	1	0x81	RW	[7] AWBSW White balance mode 0h : Manual, 1h : Auto
	AWBONDOT[2:0]	3			[6:4] AWBONDOT Number of pixels that AWB operates. 0h : 1pixel 1h : 64 pixels 2h : 128 pixels 3h : 256 pixels 4h : 512 pixels 5h : 1024 pixels

	WBMRG[9:8]	2			6h : 2048 pixels 7h : 4096 pixels [1:0] WBMRG[9:8] Start value of R gain in auto mode. Manual R gain in manual mode.
0x031B	WBMRG[7:0]	8	0x00	RW	Start value of R gain in auto mode. Manual R gain in manual mode.
0x031C	CAREASEL[1:0]	2	0x0D	RW	[7:6] CAREASEL Center area for AWB setting in 5(H) x 3 (V) blocks. 0h : Horizontal 3 blocks of center 1h : 5 cross blocks of center 2h : 7 cross blocks of center 3h : 9 blocks of center 3x3.
	AREAMODE[1:0]	2			[5:4] AREAMODE Area setting for SQ3 0h,1h : Center set CAREASEL 2h : Exclusion center area 3h : All area
	HEXSW	1			[3] HEXSW Main color detetion gate 0h : OFF, 1h : ON
	YGATESW	1			[2] YGATESW Y level detection gate 0h : OFF , 1h : ON
	WBMGG[9:8]	2			[1:0] WBMGG[9:8] Start value of G gain in auto mode. Manual G gain in manual mode.
0x031D	WBMGG[7:0]	8	0x00	RW	Start value of G gain in auto mode. Manual G gain in manual mode.
0x031E	SQ1SW	1	0x55	RW	[7] SQ1SW Square color detection gate1 0h : OFF, 1h : ON
	SQ1POL	1			[6 SQ1POL Color detection gate function of SQ1 0h : Exclusion, 1h : Addition
	SQ2SW	1			[5] SQ2SW Square detection color gate2 0h : OFF, 1h : ON
	SQ2POL	1			[4] SQ2POL Color detection gate function of SQ2 0h : Exclusion, 1h : Addition

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	SQ3SW	1			[3] SQ3SW Square color detection gate3 0h : OFF, 1h : ON
	SQ3POL	1			[2] SQ3POL Color detection gate function of SQ3 0h : Exclusion, 1h : Addition
	WBMBG[9:8]	2			[1:0] WBMBG[9:8] Start value of B gain in auto mode. Manual B gain in manual mode.
0x031F	WBMBG[7:0]	8	0x00	RW	Start value of B gain in auto mode. Manual B gain in manual mode.
0x0320	WBGRMAX[7:0]	8	0xFF	RW	Upper limit for R gain on AWB.
0x0321	WBGRMIN[7:0]	8	0x10	RW	Lower limit for R gain on AWB. Set prohibition that becomes WBGRMIN < WBGRMAX
0x0322	WBGBMAX[7:0]	8	0xFF	RW	Upper gain for B gain on AWB.
0x0323	WBGBMIN[7:0]	8	0x10	RW	Lower limit for B gain on AWB. Set prohibition that becomes WBGBMIN < WBGBMAX
0x0324	RBCUT0H[7:0]	8	0x1C	RW	Upper cross point V/Y axis for main color detection gate
0x0325	RBCUT0L[7:0]	8	0xF2	RW	lower cross point V/Y axis for main color detection gate
0x0326	RYCUT0P[6:0]	8	0x50	RW	Upper limit for V/Y of main color detection gate.
0x0327	RYCUT0N[6:0]	8	0x20	RW	Lower limit for V/Y of main color detection gate.
0x0328	BYCUT0P[6:0]	8	0x20	RW	Upper limit for U/Y of main color detection gate.
0x0329	BYCUT0N[6:0]	8	0x38	RW	Lower limit for U/Y of main color detection gate.
0x032A	RYCUT1H[7:0]	8	0x00	RW	Center point for V/Y of SQ1 color detection gate.
0x032B	RYCUT1L[6:0]	7	0x00	RW	Width for V/Y of SQ1 color detection gate.
0x032C	BYCUT1H[7:0]	8	0x00	RW	Center point for U/Y of SQ1 color detection gate.
0x032D	BYCUT1L[6:0]	7	0x00	RW	Width for U/Y of SQ1 color detection gate.
0x032E	RYCUT2H[7:0]	8	0x00	RW	Center point for V/Y of SQ2 color detection gate.
0x032F	RYCUT2L[6:0]	7	0x00	RW	Width for V/Y of SQ2 color detection gate.
0x0330	BYCUT2H[7:0]	8	0x00	RW	Center point for U/Y of SQ2 color detection gate.

0x0331	BYCUT2L[6:0]	7	0x00	RW	Width for U/Y of SQ2 color detection gate.
0x0332	RYCUT3H[7:0]	8	0x00	RW	Center point for V/Y of SQ3 color detection gate.
0x0333	RYCUT3L[6:0]	7	0x00	RW	Width for V/Y of SQ3 color detection gate.
0x0334	BYCUT3H[7:0]	8	0x00	RW	Center point for U/Y of SQ3 color detection gate.
0x0335	BYCUT3L[6:0]	7	0x00	RW	Width for U/Y of SQ3 color detection gate.
0x0336	YGATEH[7:0]	8	0xFF	RW	Upper limit for Y level detection gate.
0x0337	YGATEL[7:0]	8	0x10	RW	Lower limit for Y level detection gate.
0x0338	CGRANGE[1:0] AWBSPD[3:0]	2 4	0x44	RW	[7:6] CGRANGE[1:0] Gain of input signals for color detection gate. 0h : x1/2, 1h : x1, 2h : x2, 3h : x4 [3:0] AWBSPD[3:0] AWB speed 0h : stop, 1h : x1 ～ 7h : x7
0x0339	AWBHUECOLOR AWBULV[4:0]	1 5	0x00	RW	[7] AWBHUECOLOR Locks AWB to prevent WB from being unbalance when R or B gain 00reach upper or lower limit. 0h : OFF, 1h : ON [4:0] AWBULV[4:0] Range that AWB stops to AWB target of U.
0x033A	AWBFZTIM[2:0] AWBVLV[4:0]	3 5	0x00	RW	[7:5] AWBFZTIM Number of frames for re-AWB operation. 0h : OFF 1h : 128 frames 2h : 64 frames 3h : 32 frames 4h : 16 frames 5h : 8 frames 6h : 4 frames 7h : 2 frames 033A [4:0] AWBVLV Range that AWB stops to AWB target of V.
0x033B	AWBSFTU[7:0]	8	0x00	RW	Offset of U for AWB target
0x033C	AWBSFTV[7:0]	8	0x00	RW	Offset of V for AWB target
0x033D	AWBWAIT[7:0]	8	0x00	RW	Sensitivity of AWB operation (Set number of frame)
0x033E	SPLMKON	1	0x03	RW	[7] SPLMKON Display marker for sampling AWB data

					0h : OFF, 1h : ON
	SPLMKBL	1			[6] SPLMKBL Color of marker 0h : White, 1h : Black
	FAREAMK	1			[5] FAREAMK Display detection area. 0h : OFF, 1h : ON (blue)
	CAREAMK	1			[4] CAREAMK Display center area. 0h : OFF, 1h : ON (green)
	CGATEMK	1			[3] CGATEMK Display pixles used for AWB.
	SPLADRH[10:8]	3			SPLADRH[10:8] Horizontal position of marker for sampling AWB data
0x033F	SPLADRH[7:0]	8	0x28	RW	Horizontal position of marker for sampling AWB data
0x0340	MKFLKON	1	0x02	RW	[7] MKFLKON Blink setting for marker. 0h : OFF, 1h : ON
	MKFLKSPD	2			[6:5] MKFLKSPD Blink speed of marker 0h : 4 frame 1h : 8 frame 2h : 16 frame 3h : 32 frame
	SPLADRV[10:8]	3			[2:0] SPLADRV[10:8] Vertical position of marker for sampling AWB data
0x0341	SPLADRV[7:0]	8	0x60	RW	Vertical position of marker for sampling AWB data
0x0342	MKY_DATA[7:0]	8	-	RO	Sampling data of Y at marker position.
0x0343	MKU_DATA[7:0]	8	-	RO	Sampling data of U/Y at marker position.
0x0344	MKV_DATA[7:0]	8	-	RO	Sampling data of V/Y at marker position.
0x0400	HLNRSW	1	0x00	RW	[7] HLNRSW Horizontal noise reduction 0h : OFF , 1h : ON
	Sensor settings	1			Do not change this register [6] Sensor settings Reserved. Do not change this register
		1			[5] Sensor settings Reserved. Do not change this register

		1 1 1			[4] Sensor settings Reserved. Do not change this register [3] Sensor settings Reserved. Do not change this register 0400 [2] Sensor settings Reserved. Do not change this register
0x0401	BLKADJ[7:0]	8	0x40	RW	Black level 00h : 0LSB ～ 40h : 64LSB ～ FFh : 255LSB Do not change this register.
0x0402	BLKGR[3:0] BLKR[3:0]	4 4	0x00	RW	[7:4] BLKGR Black level adjustment of Gr 8h : -16LSB ～0h : 0+SB ～ 7h : +14LSB [3:0] BLKR Black level adjustment of R 8h : -16LSB ～0h : 0+SB ～ 7h : +14LSB
0x0403	BLKB[3:0] BLKGB[3:0]	4 4	0x00	RW	[7:4] BLKB Black level adjustment of B 8h : -16LSB ～0h : 0+SB ～ 7h : +14LSB [3:0] BLKGB Black level adjustment of Gb 8h : -16LSB ～0h : 0+SB ～ 7h : +14LSB
0x0404	WBPCON BBPCON Sensor settings	1 1 6	0xD8	RW	[7] WBPCON White bad pixel correction 0h : OFF, 1h : ON [6] BBPCON Black bad pixel correction 0h : OFF, 1h : ON [5:0] Sensor settings Reserved. Do not change this register
0x0405	BBPCLV[7:0]	8	0x10	RW	Detection level of black bad pixel. 00h : 4LSB ～ 10h : 68LSB ～ FEh : 1020LSB, FFh : OFF
0x0406	WBPCLV[7:0]	8	0x10	RW	Detection level of white bad pixel. 00h : 4LSB ～ 10h : 68LSB ～ FEh : 1020LSB, FFh : OFF
0x0407	Sensor settings ABCTH	1 2 1	0x80	RW	[7] Sensor settings Reserved. Do not change this register [6:5] Sensor settings Reserved. Do not change this register [4] ABCTH

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					Operation of bad pixel correction 0h : Operation , 1h : Stop
	LDNRGA[2:0]	3			[3:1] LDNRGA Gain of noise reduction in line 0h : OFF ～ 7h : x0.875
	HNCDET	1			[0] HNCDET Detection the difference
0x0408	HNCLIM0[3:0]	4	0x44	RW	[7:4] HNCLIM0 Limiter of noise reduction in line 0h : 2LSB ～ 4h : 10LSB ～ Fh : 32LSB
	HNCLIM1[3:0]	4			[3:0] HNCLIM1 Limiter of noise reduction in line depend on AG 0h : 2LSB ～ 4h : 10LSB ～ Fh : 32LSB
0x0409	NZMP0	4	0x44	RW	[7:4] NZMP0 Coefficient for noise reduction in ANR circuit
	NZMP1	4			0h : x0 ～ 4h : x1 ～ Fh : x3.75 [3:0] NZMP1 Coefficient for noise reduction in ANR circuit depend on AG 0h : x0 ～ 4h : x1 ～ Fh : x3.75
0x040A	EDMP0	4	0x44	RW	[7:4] EDMP0 Coefficient for edge in ANR circuit 0h : x0 ～ 4h : x1 ～ Fh : x3.75
	EDMP1	4			[3:0] EDMP1 Coefficient for edge in ANR circuit depend on AG 0h : x0 ～ 4h : x1 ～ Fh : x3.75
0x040B	FLNZMP	4	0x30	RW	[7:4] FLNZMP Coefficient for noise reduction in flat area 0h : x0 ～ 3h : x1 ～ Fh : x4
	GAINMP	4			[3:0] GAINMP Auto Noise Reduction(ANR) gain 0h : x0 (weak) ～ 4h : x1 ～ Fh : x3.75 (strong)
0x040C	LSSCON	1	0x00	RW	[7] LSSCON Lens shading correction 0h : OFF, 1h : ON
	LSASIGN	1			[6] LSASIGN Polarity of |xy| shading gain 0h : +, 1h : -

	LSQSIGN	1			[5] LSQSIGN Polarity of 4th power shading gain 0h : +, 1h : -
0x040D	LSHGA[3:0]	4	0x00	RW	[7:4] Horizontal area of lens shding correction 0h : 99.4% ~ Fh : 84%
	LSVGA[3:0]	4			[3:0] Vertical area of lens shding correction 0h : 99.6% ~ Fh : 84.2%
0x040E	LSHOFS[7:0]	8	0x00	RW	Horizontal center position of lens shading 80h : Right 9.8% ~ FFh : Right 0.1%, 00h : Center ~ 7Fh : Left 9.7%
0x040F	LSVOFS[7:0]	8	0x00	RW	Vertical center position of lens shading 80h : Lower 13.1% ~ FFh : Lower 0.1%, 00h : Center ~ 7Fh : Upper 13%
0x0410	LSALGR[7:0]	8	0x00	RW	Lens shading gain : |xy|, Upper-Left area, Gr 00h : x1 ~ FFh : max
0x0411	LSALGB[7:0]	8	0x00	RW	Lens shading gain : |xy|, Upper-Left area, Gb 00h : x1 ~ FFh : max
0x0412	LSALR[7:0]	8	0x00	RW	Lens shading gain : |xy|, Upper-Left area, R 00h : x1 ~ FFh : max
0x0413	LSALB[7:0]	8	0x00	RW	Lens shading gain : |xy|, Upper-Left area, B 00h : x1 ~ FFh : max
0x0414	LSARGR[7:0]	8	0x00	RW	Lens shading gain : |xy|, Upper-Right area, Gr 00h : x1 ~ FFh : max
0x0415	LSARGB[7:0]	8	0x00	RW	Lens shading gain : |xy|, Upper-Right area, Gb 00h : x1 ~ FFh : max
0x0416	LSARR[7:0]	8	0x00	RW	Lens shading gain : |xy|, Upper-Right area, R 00h : x1 ~ FFh : max
0x0417	LSARB[7:0]	8	0x00	RW	Lens shading gain : |xy|, Upper-Right area, B 00h : x1 ~ FFh : max
0x0418	LSAUGR[7:0]	8	0x00	RW	Lens shading gain : |xy|, Lower-Left area, Gr 00h : x1 ~ FFh : max
0x0419	LSAUGB[7:0]	8	0x00	RW	Lens shading gain : |xy|, Lower-Left area, Gb 00h : x1 ~ FFh : max
0x041A	LSAUR[7:0]	8	0x00	RW	Lens shading gain : |xy|, Lower-Left area, R

GALAXYCORE CONFIDENTIAL

					00h : x1 ～ FFh : max
0x041B	LSAUB[7:0]	8	0x00	RW	Lens shading gain : |xy|, Lower-Left area, B 00h : x1 ～ FFh : max
0x041C	LSADGR[7:0]	8	0x00	RW	Lens shading gain : |xy|, Lower-Right area, Gr 00h : x1 ～ FFh : max
0x041D	LSADGB[7:0]	8	0x00	RW	Lens shading gain : |xy|, Lower-Right area, Gb 00h : x1 ～ FFh : max
0x041E	LSADR[7:0]	8	0x00	RW	Lens shading gain : |xy|, Lower-Right area, R 00h : x1 ～ FFh : max
0x041F	LSADB[7:0]	8	0x00	RW	Lens shading gain : |xy|, Lower-Right area, B 00h : x1 ～ FFh : max
0x0420	LSBLGR[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Left side, Gr 00h : x1 ～ FFh : max
0x0421	LSBLGB[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Left side, Gb 00h : x1 ～ FFh : max
0x0422	LSBLR[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Left side, R 00h : x1 ～ FFh : max
0x0423	LSBLB[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Left side, B 00h : x1 ～ FFh : max
0x0424	LSBRGR[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Right side, Gr 00h : x1 ～ FFh : max
0x0425	LSBRGB[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Right side, Gb 00h : x1 ～ FFh : max
0x0426	LSBRR[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Right side, R 00h : x1 ～ FFh : max
0x0427	LSBRB[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Right side, B 00h : x1 ～ FFh : max
0x0428	LSCUGR[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Upper side, Gr 00h : x1 ～ FFh : max
0x0429	LSCUGB[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Upper side, Gb 00h : x1 ～ FFh : max

0x042A	LSCUR[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Upper side, R 00h : x1 ～ FFh : max
0x042B	LSCUB[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Upper side, B 00h : x1 ～ FFh : max
0x042C	LSCDGR[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Lower side, Gr 00h : x1 ～ FFh : max
0x042D	LSCDGB[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Lower side, Gb 00h : x1 ～ FFh : max
0x042E	LSCDR[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Lower side, R 00h : x1 ～ FFh : max
0x042F	LSCDB[7:0]	8	0x00	RW	Lens shading gain : 2nd power, Lower side, B 00h : x1 ～ FFh : max
0x0430	LSDLGR[7:0]	8	0x00	RW	Lens shading gain : 4th power, Left side, Gr 00h : x1 ～ FFh : max
0x0431	LSDLGB[7:0]	8	0x00	RW	Lens shading gain : 4th power, Left side, Gb 00h : x1 ～ FFh : max
0x0432	LSDLR[7:0]	8	0x00	RW	Lens shading gain : 4th power, Left side, R 00h : x1 ～ FFh : max
0x0433	LSDLB[7:0]	8	0x00	RW	Lens shading gain : 4th power, Left side, B 00h : x1 ～ FFh : max
0x0434	LSDRGR[7:0]	8	0x00	RW	Lens shading gain : 4th power, Right side, Gr 00h : x1 ～ FFh : max
0x0435	LSDRGB[7:0]	8	0x00	RW	Lens shading gain : 4th power, Right side, Gb 00h : x1 ～ FFh : max
0x0436	LSDRR[7:0]	8	0x00	RW	Lens shading gain : 4th power, Right side, R 00h : x1 ～ FFh : max
0x0437	LSDRB[7:0]	8	0x00	RW	Lens shading gain : 4th power, Right side, B 00h : x1 ～ FFh : max
0x0438	LSEUGR[7:0]	8	0x00	RW	Lens shading gain : 4th power, Upper side, Gr 00h : x1 ～ FFh : max
0x0439	LSEUGB[7:0]	8	0x00	RW	Lens shading gain : 4th power, Upper side, Gb 00h : x1 ～ FFh : max

0x043A	LSEUR[7:0]	8	0x00	RW	Lens shading gain : 4th power, Upper side, R 00h : x1 ～ FFh : max
0x043B	LSEUB[7:0]	8	0x00	RW	Lens shading gain : 4th power, Upper side, B 00h : x1 ～ FFh : max
0x043C	LSEDGR[7:0]	8	0x00	RW	Lens shading gain : 4th power, Lower side, Gr 00h : x1 ～ FFh : max
0x043D	LSEDGB[7:0]	8	0x00	RW	Lens shading gain : 4th power, Lower side, Gb 00h : x1 ～ FFh : max
0x043E	LSEDR[7:0]	8	0x00	RW	Lens shading gain : 4th power, Lower side, R 00h : x1 ～ FFh : max
0x043F	LSEDB[7:0]	8	0x00	RW	Lens shading gain : 4th power, Lower side, B 00h : x1 ～ FFh : max
0x0440	PWBBLNOFF	1	0x00	RW	Enable PWB (Preset White Balance) gain. 0h : Enable, 1h : Disable
0x0441	PWBGAINR[7:0]	8	0x00	RW	PWB R gain 00h : x1 ～ FFh : x2.992
0x0442	PWBGAINGR[7:0]	8	0x00	RW	PWB Gr gain 00h : x1 ～ FFh : x2.992
0x0443	PWBGAINB[7:0]	8	0x00	RW	PWB B gain 00h : x1 ～ FFh : x2.992
0x0444	PWBGAINGB[7:0]	8	0x00	RW	PWB Gb gain 00h : x1 ～ FFh : x2.992
0x0445	BLOFSR[7:0]	8	0x00	RW	Black level offset for R 00h : OFF ～ FFh : +255LSB
0x0446	BLOFSGR[7:0]	8	0x00	RW	Black level offset for Gr 00h : OFF ～ FFh : +255LSB
0x0447	BLOFSB[7:0]	8	0x00	RW	Black level offset for B 00h : OFF ～ FFh : +255LSB
0x0448	BLOFSGB[7:0]	8	0x00	RW	Black level offset for Gb 00h : OFF ～ FFh : +255LSB
0x0449	IDRSET[7:0]	8	0x00	RW	Digital gain setting 00h : x1 ～ FFh : x1.995 Do not change this register.
0x044A	BBPSLP[3:0]	4	0x00	RW	[7:4] BBPSLP[3:0] Correction level of black bad pixel depend on AG.

	WBPSLP[3:0]	4			0h : OFF, 1h : +32LSB ～ Fh : +476LSB [3:0] WBPSLP[3:0] Correction level of white bad pixel depend on AG. 0h : OFF, 1h : +32LSB ～ Fh : +476LSB
0x044D	TPATRGBSWR	1	0xE0	RW	[7] TPATRGBSWR Switch of R level for test pattern. 0h : OFF, 1h : ON
	TPATRGBSWG	1			[6] TPATRGBSWG Switch of G level for test pattern. 0h : OFF, 1h : ON
	TPATRGBSWB	1			[5] TPATRGBSWB Switch of B level for test pattern. 0h : OFF, 1h : ON
	TESTPAT[3:0]	4			[3:0] TESTPAT Test pattern 0h : Normal output 1h : raster 2h : Color bar 3h : Color bar with fade 4h : Horizontal ramp 5h : Vertical ramp 6h : Diagonal ramp 7h : Color ramp 8h : Lens shading correction 9h ～ Fh : OFF
0x044E	TPATSLPH[7:0]	8	0x05	RW	Horizontal inclination setting of ramp test pattern.
0x044F	TPATSLPV[7:0]	8	0x07	RW	Vertical inclination setting of ramp test pattern.
0x0450	TDATARE[9:8]	2	0x00	RW	R level for test pattern.
0x0451	TDATARE[7:0]	8	0x00	RW	
0x0452	TDATAGR[9:8]	2	0x00	RW	Gr level for test pattern.
0x0453	TDATAGR[7:0]	8	0x00	RW	
0x0454	TDATABL[9:8	2	0x00	RW	B level for test pattern.
0x0455	TDATABL[7:0]	8	0x00	RW	
0x0456	TDATAGB[9:8]	2	0x00	RW	Gb level for test pattern.
0x0457	TDATAGB[7:0]	8	0x00	RW	
0x0458	Sensor settings	3	0x00	RW	[2:0] Reserved. Do not change this register
0x0459	Sensor settings	8	0x00	RW	[7:0] Reserved. Do not change this register
0x045A	Sensor settings	3	0x00	RW	[2:0] Reserved. Do not change this register
0x045B	Sensor settings	8	0x00	RW	[7:0] Reserved. Do not change this register

0x045C	Sensor settings	3	0x00	RW	[2:0] Reserved. Do not change this register
0x045D	Sensor settings	8	0x00	RW	[7:0] Reserved. Do not change this register
0x045E	Sensor settings	3	0x00	RW	[2:0] Reserved. Do not change this register
0x045F	Sensor settings	8	0x00	RW	[7:0] Reserved. Do not change this register
0x0460	GAMSW GAM00P[6:0]	1 7	0x80	RW	[7] GAMSW Gamma correction 0h : OFF, 1h : ON [6:0] GAM00P Zero offset for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0461	GAM01P[6:0]	7	0x67	RW	Input level from 0LSB to 16LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0462	GAM02P[6:0]	7	0x30	RW	Input level from 16LSB to 32LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0463	GAM03P[6:0]	7	0x25	RW	Input level from 32LSB to 48LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0464	GAM04P[6:0]	7	0x10	RW	Input level from 48LSB to 56LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0465	GAM05P[6:0]	7	0x0F	RW	Input level from 56LSB to 64LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0466	GAM06P[6:0]	7	0x0E	RW	Input level from 64LSB to 72LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0467	GAM07P[6:0]	7	0x0E	RW	Input level from 72LSB to 80LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0468	GAM08P[6:0]	7	0x1A	RW	Input level from 80LSB to 96LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0469	GAM09P[6:0]	7	0x18	RW	Input level from 96LSB to 112LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x046A	GAM010P[6:0]	7	0x17	RW	Input level from 112LSB to 128LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x046B	GAM011P[6:0]	7	0x2A	RW	Input level from 128LSB to 160LSB for RGB gamma correction.

					00h : 0LSB ～ 7F : 127LSB
0x046C	GAM012P[6:0]	7	0x26	RW	Input level from 160LSB to 192LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x046D	GAM013P[6:0]	7	0x24	RW	Input level from 192LSB to 224LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x046E	GAM014P[6:0]	7	0x21	RW	Input level from 224LSB to 256LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x046F	GAM015P[6:0]	7	0x3E	RW	Input level from 256LSB to 320LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0470	GAM016P[6:0]	7	0x38	RW	Input level from 320LSB to 384LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0471	GAM017P[6:0]	7	0x34	RW	Input level from 384LSB to 448LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0472	GAM018P[6:0]	7	0x31	RW	Input level from 448LSB to 512LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0473	GAM019P[6:0]	7	0x45	RW	Input level from 512LSB to 608LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0474	GAM020P[6:0]	7	0x40	RW	Input level from 608LSB to 704LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0475	GAM21P[6:0]	7	0x3C	RW	Input level from 704LSB to 800LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0476	GAM22P[6:0]	7	0x39	RW	Input level from 800LSB to 896LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0477	GAM23P[6:0]	7	0x48	RW	Input level from 896LSB to 1023LSB for RGB gamma correction. 00h : 0LSB ～ 7F : 127LSB
0x0600~0x0F01 Reserved.					

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