

## Micro Unit CCD

### Description

The micro unit CCD is a CCD color camera unit with a built-in CCD image sensor, drive system IC, sample-and-hold IC, signal processor IC and lens system.

### Features

- Ultra-small size:
  - MCX18LG0A: 18.3mm × 18.3mm × 8.4mm
  - MCX18LG0B: 18.3mm × 18.3mm × 9.6mm
- Y, U/V 16-bit digital output
- 180,000-pixel color CCD image sensor
- Equipped with a fixed focus lens:
  - MCX18LG0A: F2.8 f = 2.9mm
  - MCX18LG0B: F2.8 f = 4.0mm

### Applications

- TV conference cameras
- Image input cameras

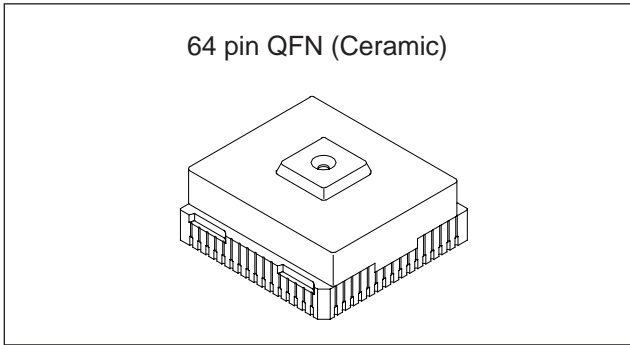
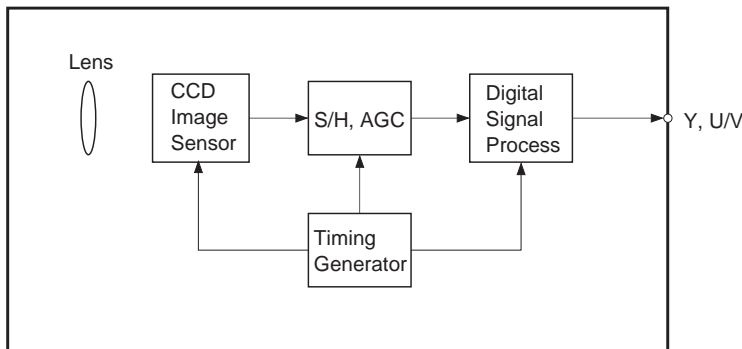
### Absolute Maximum Ratings

• Supply voltage	$V_H$	+18	V
	$DV_{DD1}, DV_{DD2}$	+7.0	V
	$AV_{DD1}, AV_{DD2}, AV_{DD3}$	+7.0	V
	$AV_{DD4}$	+7.0	V
	$V_{CC}$	+14.0	V
	$V_L$	-17.5	V
• Input voltage	$V_I$	-0.5 to $DV_{DD} + 0.5$	V
• Operating temperature	$T_{opr}$	0 to +40	°C
• Storage temperature	$T_{stg}$	-30 to +80	°C

### Recommended Operating Conditions

• Supply voltage	$V_H$	14.25 to 15.75	V
	$DV_{DD1}, DV_{DD2}$	3.0 to 3.6	V
	$AV_{DD1}, AV_{DD2}, AV_{DD3}$	4.75 to 5.25	V
	$AV_{DD4}$	4.7 to 5.5	V
	$V_{CC}$	4.5 to 5.25	V
	$V_L$	-8.5 to -7.5	V
• Input voltage	$V_{DCIN}$	1.0 to 4.5	V
• Operating temperature	$T_{opr}$	0 to +40	°C

### Block Diagram

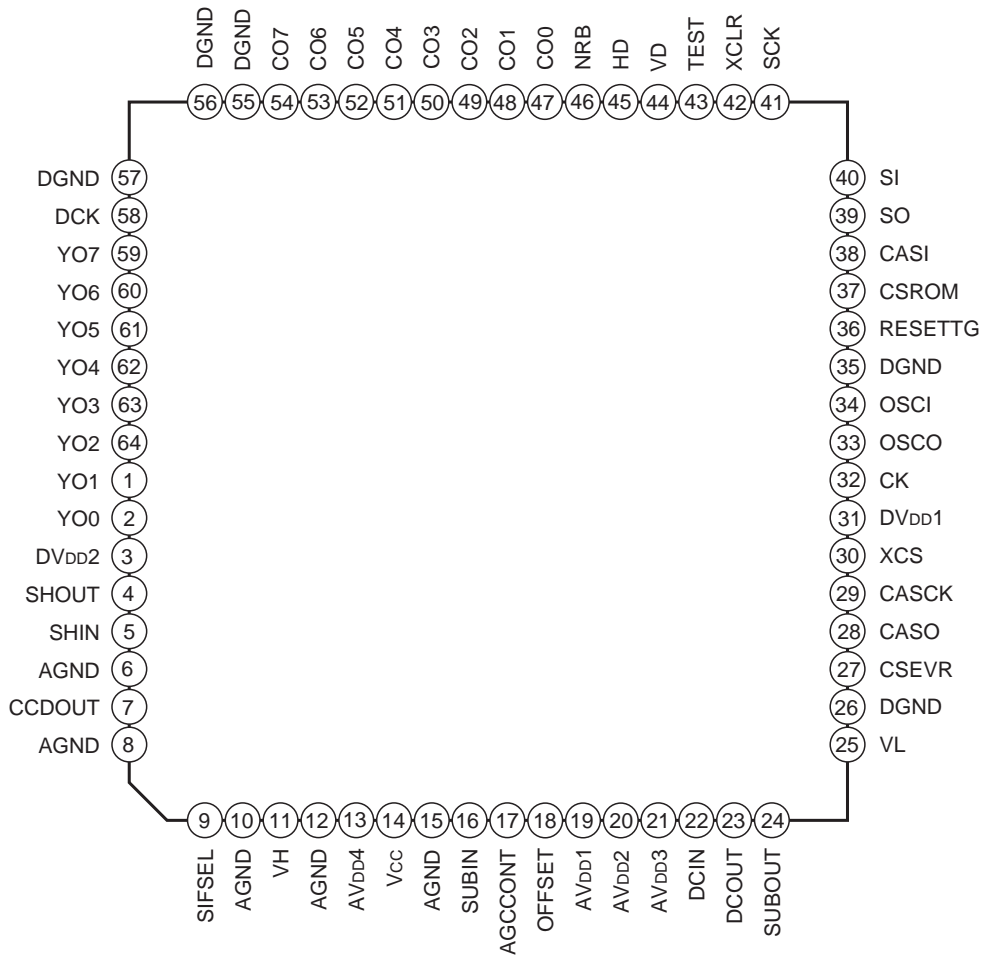


### Peripheral ICs

- EVR: MB88347 (Fujitsu Limited.)
- EEPROM: AK6420 (Asahi Kasei Microsystems Co., Ltd.)

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Pin Configuration



## Pin Description

Pin No.	Symbol	I/O	Description
1	YO1	O	Luminance signal output.
2	YO0	O	Luminance signal output.
3	DV <sub>DD2</sub>	—	+3.3V power supply for signal processing system.
4	SHOUT	O	Sample-and-hold output. Connect directly to Pin 5.
5	SHIN	I	Sample-and-hold input.
6	AGND	—	Analog GND
7	CCDOUT	O	CCD image sensor buffer output.
8	AGND	—	Analog GND
9	SIFSEL	I	Serial communication mode selection: Microcomputer (low) /RS232C (high).
10	AGND	—	Analog GND
11	VH	—	+15V power supply for CCD image sensor drive.
12	AGND	—	Analog GND
13	AV <sub>DD4</sub>	—	+5V power supply for A/D converter.
14	V <sub>CC</sub>	—	+5V power supply for sample-and-hold.
15	AGND	—	Analog GND
16	SUBIN	I	CCD image sensor SUB voltage input.
17	AGCCONT	I	AGC control.
18	OFFSET	I	OFFSET control.
19	AV <sub>DD1</sub>	—	+5V power supply for sample-and-hold pulse.
20	AV <sub>DD2</sub>	—	+5V power supply for RG pulse.
21	AV <sub>DD3</sub>	—	+5V power supply for H pulse.
22	DCIN	I	DC amplifier input.
23	DCOUT	O	DC amplifier output.
24	SUBOUT	O	SUB pulse output.
25	VL	—	−8V power supply for CCD image sensor drive.
26	DGND	—	Digital GND
27	CSEVR	O	EVR chip select.
28	CASO	O	Serial communication data output for peripheral ICs (EVR, EEPROM).
29	CASCK	O	Serial communication clock output for peripheral ICs (EVR, EEPROM).
30	XCS	I	Switched by the SIFSEL setting. Chip select during microcomputer mode. Baud rate setting (4800bps (low)/9600bps (high)) during RS232C mode.
31	DV <sub>DD1</sub>	—	+3.3V power supply for timing generator.
32	CK	I	27MHz clock input.
33	OSCO	O	27MHz oscillator output.
34	OSCI	I	27MHz oscillator input.
35	DGND	—	Digital GND

Pin No.	Symbol	I/O	Description
36	RESETTG	I	Reset pin (active low) with pull-up resistor for timing generator.
37	CSROM	O	EEPROM chip select.
38	CASI	I	Serial communication data input for peripheral ICs (EVR, EEPROM).
39	SO	O	Serial communication data output.
40	SI	I	Serial communication data input.
41	SCK	I	Serial communication clock input.
42	XCLR	I	Initialization pin (active low). EEPROM re-read.
43	TEST	I	Test pin. Leave this pin open.
44	VD	O	Vertical sync signal output.
45	HD	O	Horizontal sync signal output.
46	NRB	O	Color identification signal output.
47	CO0	O	Chroma signal output.
48	CO1	O	Chroma signal output.
49	CO2	O	Chroma signal output.
50	CO3	O	Chroma signal output.
51	CO4	O	Chroma signal output.
52	CO5	O	Chroma signal output. System setting pin during power on. (Connect pull-down resistor.)
53	CO6	O	Chroma signal output. System setting pin during power on. (Connect pull-down resistor.)
54	CO7	O	Chroma signal output. System setting pin during power on. (Connect pull-down resistor.)
55	DGND	—	Digital GND
56	DGND	—	Digital GND
57	DGND	—	Digital GND
58	DCK	O	Clock output pin for digital output.
59	YO7	O	Luminance signal output.
60	YO6	O	Luminance signal output.
61	YO5	O	Luminance signal output.
62	YO4	O	Luminance signal output.
63	YO3	O	Luminance signal output.
64	YO2	O	Luminance signal output.

## Electrical Characteristics

## DC Characteristics

Item	Pins	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage		DV <sub>DD1</sub>		3.0	3.3	3.6	V
		DV <sub>DD2</sub>		3.0	3.3	3.6	V
		AV <sub>DD1</sub>		4.75	5.00	5.25	V
		AV <sub>DD2</sub>		4.75	5.00	5.25	V
		AV <sub>DD3</sub>		4.75	5.00	5.25	V
		AV <sub>DD4</sub>	A/D input amplitude = 2Vp-p	4.5	5.0	5.5	V
		V <sub>CC</sub>		4.5	5.0	5.25	V
		V <sub>H</sub>		14.25	15.00	15.75	V
		V <sub>L</sub>		-8.5	-8.0	-7.5	V
Operating current		I <sub>DD1</sub>	DV <sub>DD1</sub> = 3.3V		7.0		mA
		I <sub>DD2</sub>	DV <sub>DD2</sub> = 3.3V		38.5		mA
		I <sub>ADD1</sub>	AV <sub>DD1</sub> = 5.0V		3.1		mA
		I <sub>ADD2</sub>	AV <sub>DD2</sub> = 5.0V		1.0		mA
		I <sub>ADD3</sub>	AV <sub>DD3</sub> = 5.0V		5.3		mA
		I <sub>ADD4</sub>	AV <sub>DD4</sub> = 5.0V		16.1		mA
		I <sub>CC</sub>	V <sub>CC</sub> = 5.0V		53.5		mA
		I <sub>H</sub>	V <sub>H</sub> = 15.0V		7.1		mA
		I <sub>L</sub>	V <sub>L</sub> = -8.0V		1.5		mA
Input voltage 1	*1, *6, *8	V <sub>T+</sub> V <sub>T-</sub>		DV <sub>DD2</sub> × 0.8		DV <sub>DD2</sub> × 0.2	V
Input voltage 2	*2, *7	V <sub>IH1</sub> V <sub>IL1</sub>		DV <sub>DD1</sub> × 0.7		DV <sub>DD1</sub> × 0.3	V
Input voltage 3	DCIN	V <sub>DCIN</sub>		1.0		4.5	V
Input voltage 4	SUBIN	V <sub>SUB</sub>		Display value - 0.1	Display value	Display value + 0.1	V
Output voltage 1	*3	V <sub>OH1</sub> V <sub>OL1</sub>	I <sub>OH1</sub> = -1.2mA I <sub>OL1</sub> = 2.4mA	DV <sub>DD2</sub> - 0.8		0.4	V
Output voltage 2	*4	V <sub>OH2</sub> V <sub>OL2</sub>	I <sub>OH2</sub> = -2.4mA I <sub>OL2</sub> = 4.8mA	DV <sub>DD2</sub> - 0.8		0.4	V
Output voltage 3	*5	V <sub>OH3</sub> V <sub>OL3</sub>	I <sub>OH3</sub> = -8mA I <sub>OL3</sub> = 8mA	DV <sub>DD1</sub> /2		DV <sub>DD1</sub> /2	V
Output voltage 4	SUBOUT	V <sub>OH4</sub> V <sub>OL4</sub>	I <sub>OH4</sub> = -4mA I <sub>OL4</sub> = 5.4mA	V <sub>H</sub> - 0.25		V <sub>L</sub> + 0.25	V
Hysteresis 1	*1, *8				0.5		V
Hysteresis 2	*6				0.6		V

Item	Pins	Symbol	Conditions	Min.	Typ.	Max.	Unit
Threshold value	*7	V <sub>TH</sub>			DV <sub>DD1</sub> /2		V
Feedback resistance	OSC	RFE1	OSCI = DV <sub>DD1</sub> or GND	250k	1M	2.5M	Ω
Input amplitude	CK		50MHz sine wave	0.5			V <sub>p-p</sub>
Pull-up resistor	*2	RPU		25k	50k	75k	Ω
DC amplifier gain		G			4.4		
Input leak current 1	SIFSEL	I <sub>I1</sub>	V <sub>IN</sub> = DV <sub>DD2</sub>	12	30	75	μA
Input leak current 2	*6	I <sub>I2</sub>	V <sub>IN</sub> = GND or DV <sub>DD2</sub>	-10		10	μA
Input leak current 3	*1	I <sub>I3</sub>	V <sub>IN</sub> = GND or DV <sub>DD2</sub>	-40		40	μA

\*1 CO0 to 7

\*2 RESETTG

\*3 CSEVR, CSROM, SO, TEST, VD, HD, YO0 to 7, CO0 to 7, NRB

\*4 CASO, CASCK, DCK

\*5 OSCO

\*6 XCS, SI, SCK, XCLR, CASI

\*7 OSCI, CK

\*8 SIFSEL

**Note) V<sub>SUB</sub> display value**

The V<sub>SUB</sub> display value is displayed by a code on the rear surface of the MUC.

Code	—	=	0	1	2	3	4	6	7	8	9	A	C	D
Actual voltage (V)	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25	7.50	7.75	8.00	8.25

Code	E	f	G	h	J	K	L	m	N	P	R	S	U	V
Actual voltage (V)	8.50	8.75	9.00	9.25	9.50	9.75	10.00	10.25	10.50	10.75	11.00	11.25	11.50	11.75

Code	W	X	Y	Z
Actual voltage (V)	12.00	12.25	12.50	12.75

(CL = 20pF, within recommended operating range)

Classification	Item	Symbol	Min.	Typ.	Max.	Unit
XCLR	Minimum low interval	$T_{wCLR}$	500	—	—	ns
RESETTG	Minimum low interval	$T_{wRST}$	35	—	—	ns
Serial communication	SCK input pulse width (high interval)	$T_{WH SCK}$	430	—	—	ns
	SCK input pulse width (low interval)	$T_{WL SCK}$	430	—	—	ns
	XCS input setup time, activated by the falling edge of SCK	$T_{SU XCS}$	430	—	—	ns
	XCS input hold time, activated by the rising edge of SCK	$T_{H XCS}$	640	—	—	ns
	SI input setup time, activated by the rising edge of SCK	$T_{SU SI}$	140	—	—	ns
	SI input hold time, activated by the rising edge of SCK	$T_{H SI}$	140	—	—	ns
	SO output transition time (Hi-Z → Data active), activated by the falling edge of XCS	$T_{ZD SO}$	70	—	200	ns
	SO transition time (Data active → Hi-Z), activated by the rising edge of XCS	$T_{DZ SO}$	70	—	200	ns
	SO output delay time, activated by the falling edge of SCK	$T_{PD SO}$	70	—	240	ns
Digital output	Y00 to 7 output delay time, activated by the falling edge of DCK	$T_{PD YO}$		7		ns
	CO0 to 7 output delay time, activated by the falling edge of DCK	$T_{PD CO}$		7		ns
	NRB output delay time, activated by the falling edge of DCK	$T_{PD NRB}$		7		ns

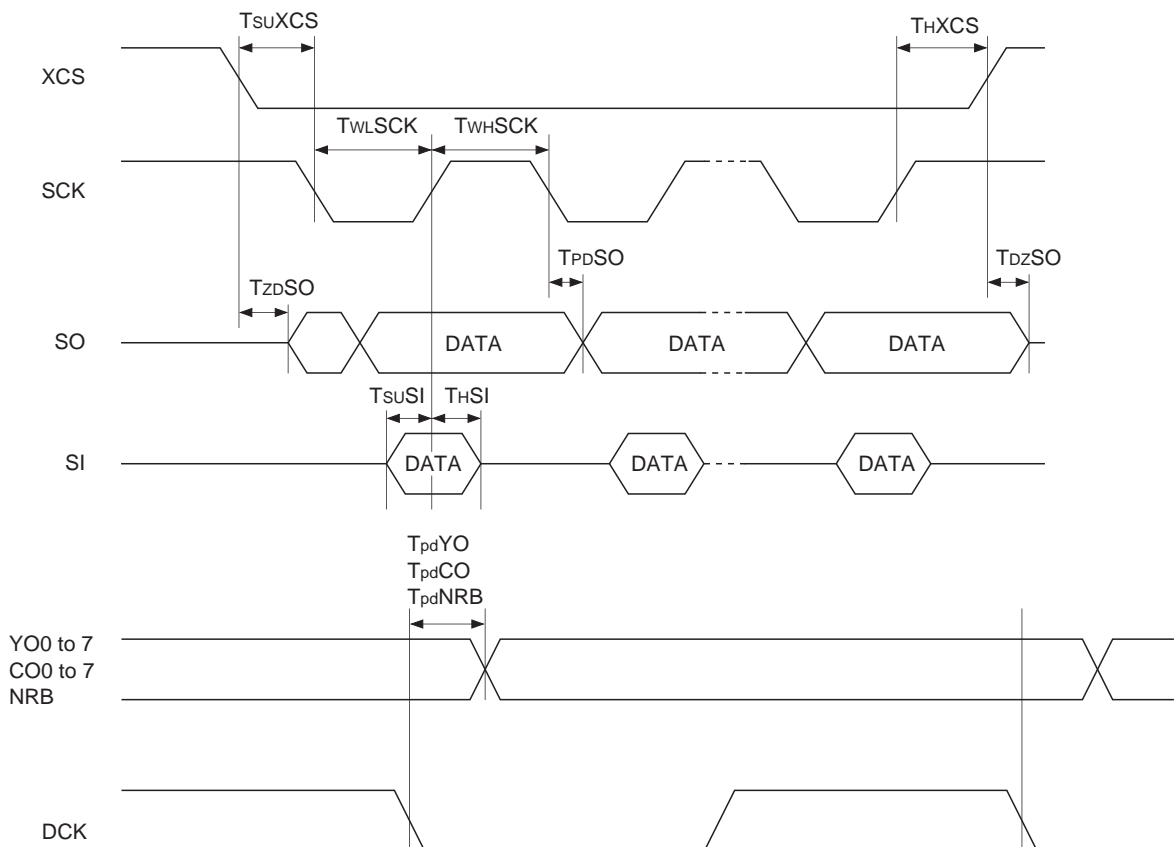
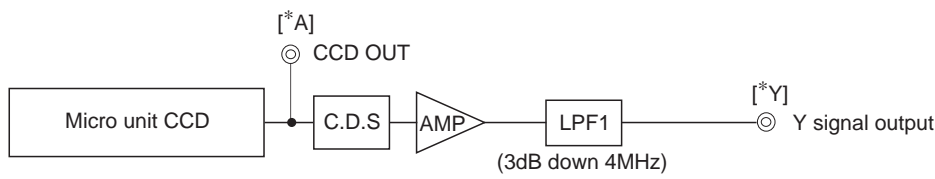


Image Sensor Characteristics

(Ta = 25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Measurement method	Remarks
Sensitivity	S	285	360		mV	1	Center of screen
Saturation signal	Ysat	700			mV	2	Ta = 60°C, center of screen
Smear	Sm		0.007	0.012	%	3	
Dark signal	Ydt			2	mV	4	Ta = 60°C
Dark signal shading	$\Delta Ydt$			1	mV	5	Ta = 60°C

Measurement System



**Note)** Adjust the amplifier gain so that the gain between [\*A] and [\*Y] equals 1.



## Image Sensor Characteristics Measurement Method

### ◎ Measurement conditions

- (1) In the following measurements, each supply voltage is at the typical values.
- (2) In the following measurements, spot blemishes are excluded and, unless otherwise specified, the optical black level (OB) is used as the reference for the signal output, which is taken as the value of Y signal output of the measurement system.

### ◎ Definition of Standard Imaging Conditions

- 1) Standard imaging condition I: Use a pattern box (luminance 706cd/m<sup>2</sup>, color temperature of 3200K halogen source) as a subject. (Pattern for evaluation is not applicable.) Use a ND2 filter and image at F5.6 or equivalent. The luminous intensity to the sensor receiving surface at this point is defined as the standard sensitivity testing luminous intensity.
- 2) Standard imaging condition II: Image a light source with a uniformity of brightness within 2% at all angles (color temperature of 3200K).

#### 1. Sensitivity

Set to standard imaging condition I. After selecting the electronic shutter mode with a shutter speed of 1/250s, measure the Y signal (Y<sub>s</sub>) at the center of the screen and substitute the values into the following formula.

$$S = Y_s \times \frac{250}{60} \text{ [mV]}$$

#### 2. Saturation signal

Set to standard imaging condition II. After adjusting the luminous intensity to 10 times the intensity applying with an average value of Y signal output, 200mV, measure the minimum value of the Y signal.

#### 3. Smear

Set to standard imaging condition II. With using ND2 filter and the lens diaphragm at F5.6 or equivalent, adjust the luminous intensity to 500 times the intensity applying with an average value of Y signal output, 200mV. When the readout clock is stopped and the charge drain is executed by the electronic shutter at the respective H blankings, measure the maximum value Y<sub>Sm</sub> [mV] of the Y signal output, and substitute the values into the following formula.

$$S_m = \frac{Y_{Sm}}{200} \times \frac{1}{500} \times \frac{1}{10} \times 100 \text{ [%]} \text{ (1/10V method conversion value)}$$

#### 4. Dark signal

Measure the average value of the Y signal output (Y<sub>dt</sub> [mV]) with the device ambient temperature of 60°C and the device in the light-obstructed state, using the horizontal idle transfer level as a reference.

#### 5. Dark signal shading

After measuring 4, measure the maximum (Y<sub>dmax</sub> [mV]) and minimum (Y<sub>dmin</sub> [mV]) values of the Y signal output, and substitute the values into the following formula.

$$\Delta Y_{dt} = Y_{dmax} - Y_{dmin} \text{ [mV]}$$

**Optical Characteristics**

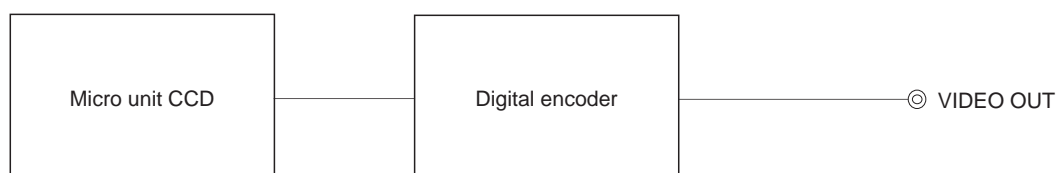
**MCX18LG0A**

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Focus length	f		2.9			
Aperture	F		2.8			
Shading	SH			50	%	Horizontal
	SV			25	%	Vertical
Resolution	R		220		TV lines	Center of screen

**MCX18LG0B**

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Focus length	f		4.0			
Aperture	F		2.8			
Shading	SH			30	%	Horizontal
	SV			15	%	Vertical
Resolution	R		220		TV lines	Center of screen

**Measurement System**



Communication Code Table

Category	Byte	Bit	Symbol	Description	Recommended value (H)	Initial value (H)	EEPROM Address (H)
1	1	0 to 2			0	0	01
1	1	3	DIGITAL1	Digital output ON/OFF 0: OFF, 1: ON	1	0	01
1	1	4	DIGITAL2	Digital output ON/OFF 0: OFF, 1: ON	1	0	01
1	1	5	DIGITAL3	Digital output ON/OFF 0: OFF, 1: ON	1	0	01
1	1	6	DIGITAL4	Digital output ON/OFF 0: OFF, 1: ON	1	0	01
1	1	7	DIGITAL5	Digital output ON/OFF 0: OFF, 1: ON	1	0	01
1	2	0 to 3			01	1	02
1	2	4 to 6	MODE1	Operation mode switching, normally "5h"	01	0	02
1	2	7			01	0	02
1	3	0 to 3	SETUP	Setup level 0 (0h) to 8.5 (Fh) IRE	0	D	03
1	3	4 to 6			6	6	03
1	3	7	SUP601	Digital output setup ON/OFF 0: OFF, 1: ON	0	0	03
1	4	0 to 7			8E	2E	04
1	5	0 to 7			24	24	05
1	6	0 to 7			34	34	06
1	7	0 to 7			0B	0B	07
1	8	0 to 7	RMATY	Matrix coefficient	2D	32	08
1	9	0 to 7	RMATC	Matrix coefficient	00	F8	09
1	10	0 to 7	BMATY	Matrix coefficient	45	32	0A
1	11	0 to 7	BMATC	Matrix coefficient	BB	D3	0B
1	12	0 to 7			0C	2C	0C
1	13	0 to 5			00	00	0D
1	13	6	VDBUSY	VD output signal switching 0: VD, 1: SCSBUSY	0	0	0D
1	13	7			0	0	0D
1	14	0 to 7			FF	00	0E
1	15	0 to 7			24	24	5F
2	1	0 to 7	YGAIN	Luminance signal gain	9E	86	0F
2	2	0 to 7			AA	AA	10
2	3	0 to 7			26	26	11
2	4	0 to 7			A4	84	12

Category	Byte	Bit	Symbol	Description	Recommended value (H)	Initial value (H)	EEPROM Address (H)
2	5	0 to 7			04	04	13
2	6	0 to 7			FC	FC	14
2	7	0 to 3	RBQUAD	Linear matrix quadrant control bit 0: 1st, bit 1: 2nd, bit 2: 3rd, bit 3: 4th 0: invalid, 1: valid	—	F	—
2	7	4	CONGAIN	Linear matrix gain 0: invalid, 1: valid	—	1	—
2	7	5	CONHUE	Linear matrix hue 0: invalid, 1: valid	—	1	—
2	7	6 to 7		Dummy	—	—	—
2	8	0 to 7	RYGAIN	Linear matrix coefficient	Adjustment value	20	4F, 51, 53, 55* <sup>2</sup>
2	9	0 to 7	BYGAIN	Linear matrix coefficient	Adjustment value	11	50, 52, 54, 56* <sup>2</sup>
2	10	0 to 7	RYHUE	Linear matrix coefficient	Adjustment value	D0	57, 59, 5B, 5D* <sup>2</sup>
2	11	0 to 7	BYHUE	Linear matrix coefficient	Adjustment value	F8	58, 5A, 5C, 5E* <sup>2</sup>
3	1	0 to 7			00	00	15
3	2	0 to 7			00	00	16
3	3	0 to 7			00	00	17
3	4	0 to 7	SHOFST	Sample-and-hold output offset	3D	3D	18
3	5	0 to 7	EVRUSR	EEPROM error write prevention 00h: write enabled, A0h: write unenabled	A0	89	19
3	6	0 to 7			FF	FF	60
3	7	0 to 7			FF	FF	61
3	8	0 to 7			FF	FF	62
3	9	0 to 7			FF	FF	63
3	10	0 to 7			FF	FF	64
3	11	0 to 7			40	10	65
3	12	0 to 7	YGAIN	Luminance signal gain	00	00	66
3	13	0 to 7			51	51	67
4	1	0 to 7	VREFY	VREFY adjustment	Adjustment value	70	1C
4	2	0 to 7	VREFC	VREFC adjustment	Adjustment value	66	1D
4	3	0 to 7	VSUB	VSUB adjustment	Adjustment value	80	1E
4	4	0 to 7			80	80	1F
4	5	0 to 7			00	00	60* <sup>1</sup>
4	6	0 to 7			00	00	61* <sup>1</sup>
4	7	0 to 7			00	00	62* <sup>1</sup>
4	8	0 to 7			00	00	63* <sup>1</sup>
4	9	0 to 7			00	00	64* <sup>1</sup>

Category	Byte	Bit	Symbol	Description		Recommended value (H)	Initial value (H)	EEPROM Address (H)
5	1	0 to 7	AGCCONT	Gain control		1E	1E	20
5	2	0 to 7				FF	FF	21
5	3	0	SHTSPDM	Shutter speed (lower 8 bits, MSB)		—	0	—
5	3	1	SHTHL	Electronic shutter high speed/low speed switching 0: high speed, 1: low speed		—	0	—
5	3	2	SHTON	Electronic shutter ON/OFF 0: OFF, 1: ON		—	0	—
5	3	3 to 7				—	10	—
5	4	0 to 7	SHTSPDL	Shutter speed (upper 8 bits)		—	00	—
5	5	0 to 7					00	—
5	6	0 to 7					00	—
5	7	0 to 7					00	—
6	1	0 to 7	WBR	Write	White balance control	3A	3A	22
			AWBCNTL	Read	ATW adjustment integral data			
6	2	0 to 7	WBG	Write	White balance control	26	26	23
			AWBCNTM	Read	ATW adjustment integral data			
6	3	0 to 7	WBB	Write	White balance control	48	48	24
			INTGRL	Read	ATW adjustment integral data			
6	4	0 to 7		Write	White balance control	—	80	—
			INTGR	Read	ATW adjustment integral data			
6	5	0 to 7		Write		—	04	—
			INTGRM	Read	ATW adjustment integral data			
7	1	0 to 7				01	00	25
7	2	0 to 7				14	15	26
7	3	0 to 7				05	08	27
7	4	0 to 7				55	55	28
7	5	0 to 7				74	74	29
8	1	0 to 2	AWBADJUST	AWB adjustment mode switching 0h: OFF, 2h: ON		—	0	—
8	1	3	AWB	AWB control 0: ON, 1: OFF		—	0	—
8	1	4 to 6	AEADJUST	AE adjustment mode switching 0h: OFF, 3h: ON		—	0	—
8	1	7	AE	AE control 0: ON, 1: OFF		—	0	—
8	2	0	MCR	Microcontroller control 0: ON, 1: OFF		—	0	—
8	2	1	SPRS	Suppress control 0: ON, 1: OFF		—	0	—

Category	Byte	Bit	Symbol	Description		Recommended value (H)	Initial value (H)	EEPROM Address (H)
8	2	2				—	0	—
8	2	3	SW	Serial communication based AE/AWB mode switching 0: invalid, 1: valid		—	0	—
8	2	4 to 7				—	0	—
8	3	0 to 7				—	00	—
8	4	0	FLON	Flickerless ON/OFF 0: OFF, 1: ON		—	0	—
8	4	1	BLCOF	Backlight compensation ON/OFF 0: ON, 1: OFF		—	0	—
8	4	2				—	0	—
8	4	3	AEREF	AE convergence level switching 0: 100 IRE, 1: [AWB] setting with USR		—	0	—
8	4	4				—	0	—
8	4	5		AWB mode setting		—	0	—
			AWB1	0: Auto	1: Fixed	—	0	—
8	4	6	AWB2	(AWB2, AWB3) = (0, 0): ATW (1, 0): Pull-in	(AWB2, AWB3) = (0, 0): 3,200K (1, 0): [AWB] USRR/B (0, 1): 4,200K (1, 1): 6,300K	—	0	—
8	4	7	AWB3			—	0	—
8	5	0	E2WR	EEPROM write control 0: OFF, 1: Write		—	0	—
8	5	1	E2WEN	EEPROM write enable send 0: OFF, 1: Send		—	0	—
8	5	2	E2LSB	EEPROM lower 8 bits selection 0: upper 8 bits, 1: lower 8 bits		—	0	—
8	5	3	E2RSW	EEPROM read control 0: OFF, 1: ON		—	0	—
8	5	4	E2RAL1	EEPROM read range specification 0: OFF, 1: Select		—	0	—
8	5	5	E2RAL2	EEPROM read range specification 0: OFF, 1: Select		—	0	—
8	5	6	E2RAL3	EEPROM read range specification 0: OFF, 1: Select		—	0	—
8	5	7	E2RAL4	EEPROM read range specification 0: OFF, 1: Select		—	0	—
8	6	0 to 7	E2CODE	EEPROM control code		—	00	—
8	7	0 to 7	E2ADRS	EEPROM address		—	00	—
8	8	0 to 7	E2DATA	EEPROM data (upper 8 bits)		—	00	—
8	9	0 to 7	SPCODE	SPEC code		—	00	—
8	10	0 to 7	SPCDAT	SPEC data		—	00	—
8	11	0 to 7				—	00	—

Category	Byte	Bit	Symbol	Description	Recommended value (H)	Initial value (H)	EEPROM Address (H)
8	12	0 to 7	E2DATAL	EEPROM data (lower 8 bits)	—	00	—
9	1	0 to 7			00	07	2A
9	2	0 to 7			00	00	2B
9	3	0 to 7			02	02	2C
9	4	0 to 7			00	00	2D
9	5	0 to 5			00	00	2E
9	5	6	DIGITAL6	Digital output ON/OFF 0: OFF, 1: ON	1	0	2E
9	5	7			1	1	2E
9	6	0 to 7			00	00	65*1
9	7	0 to 7			00	00	66*1
9	8	0 to 7			00	00	67*1
9	9	0 to 7			00	00	68*1
9	10	0 to 7			00	00	69*1
9	11	0 to 7			00	00	6A*1
9	12	0 to 7			00	00	6B*1
9	13	0 to 7			00	00	6C*1
9	14	0 to 7			00	00	6D*1
10	1	0 to 7			—	00	—
10	2	0 to 7			—	00	—
10	3	0 to 7			—	00	—
10	4	0	PGON	Pattern generator ON/OFF 0: OFF, 1: ON	—	0	—
10	4	1			—	0	—
10	4	2			—	0	—
10	4	3			—	0	—
10	4	4	PGCOLSEL	Color bar/monochrome switching 0: Color bar, 1: Monochrome	—	0	—
10	4	5 to 7	PGCOL	Color specification 0h: OFF, 1h: Blue, 2h: Red, 3h: Magenta, 4h: Green, 5h: Cyan, 6h: Yellow, 7h: White	—	0	—
10	5	0	PGHV	Horizontal/vertical switching 0: H, 1: V	—	0	—
10	5	1	PGRSTR	Raster setting 0: OFF, 1: ON	—	0	—
10	5	2 to 3	PGPTSEL	Pattern switching 0h: OFF, 1h: ramp, 2h: impulse, 3h: invert impulse	—	0	—
10	5	4			—	0	—

Category	Byte	Bit	Symbol	Description	Recommended value (H)	Initial value (H)	EEPROM Address (H)
10	5	5			—	0	—
10	5	6 to 7			—	0	—
10	6	0 to 7			—	0	—
10	7	0 to 7			—	00	—
10	8	0 to 7			—	00	—
10	9	0 to 7			—	00	—

\*1 Lower 8 bits used. Without a "\*1", upper 8 bits used.

\*2 (1st, 2nd, 3rd, 4th) quadrant

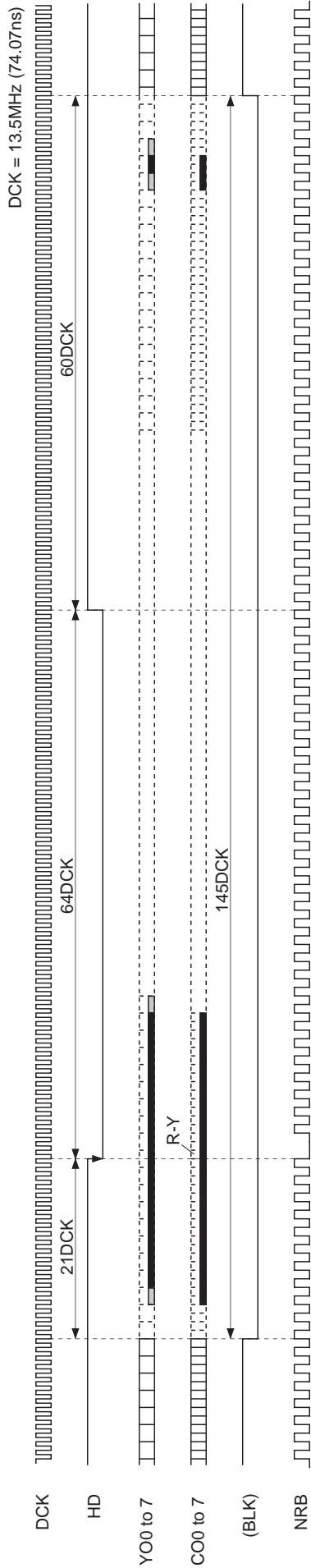


## SPEC Code Table

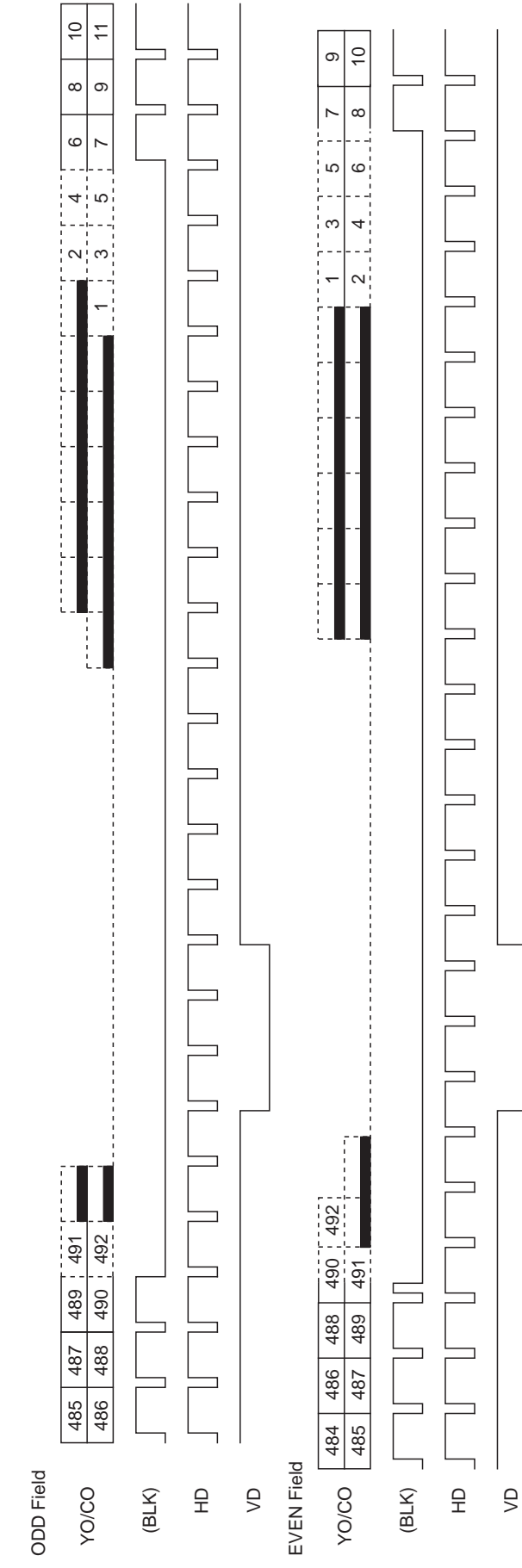
Code (H)	Symbol	Description	Recommended value (H)	Initial value (H)	Address (H)
01	[AE] SPD	AE response speed	30	08	2F
02	[AE] USR	AE convergence level	03	04	30
03	[AE] MAX	AE maximum gain	BB	BB	31
04	[AE] MIN	AE minimum gain	Adjustment value	11	32
05	[AE] LIM	AE shutter speed upper limit	07	07	33
06			EE	EE	34
07	[AE] BLC	Backlight compensation control	0C	0C	35
08	[AE] HIST	Histogram backlight compensation control	01	00	36
09			01	01	37
0A			01	01	38
0B			03	03	39
0C			03	03	3A
0D			66	66	4E
11	[AWB] SPD	bit0 to 3: AWB response speed bit4 to 7: fixed to "1h"	11	02	3B
12	[AWB] FRM	AWB detection window setting	00	00	3C
13	[AWB] RSFT	Manual mode shift volume setting	03	03	3D
14	[AWB] BSFT	Manual mode shift volume setting	01	01	3E
15	[AWB] USRR	User mode setting	4C	4C	3F
16	[AWB] USRB	User mode setting	2C	2C	40
17	[AWB] RGAIN1	R gain for 3,200K	Adjustment value	37	41
18	[AWB] BGAIN1	B gain for 3,200K	Adjustment value	39	42
21			08	08	43
22			05	05	44
23			05	05	45
24			04	04	46
25			07	07	47
31			52	52	48
32			80	80	49
33			8A	8A	4A
34			3D	3D	4B
35			80	80	4C
36			00	00	4D
37	RYGAIN1	R-Y GAIN (1st)	Adjustment value	20	4F
38	BYGAIN1	B-Y GAIN (1st)	Adjustment value	11	50
39	RYGAIN2	R-Y GAIN (2nd)	Adjustment value	20	51

Code (H)	Symbol	Description	Recommended value (H)	Initial value (H)	Address (H)
3A	BYGAIN2	B-Y GAIN (2nd)	Adjustment value	11	52
3B	RYGAIN3	R-Y GAIN (3rd)	Adjustment value	20	53
3C	BYGAIN3	B-Y GAIN (3rd)	Adjustment value	11	54
3D	RYGAIN4	R-Y GAIN (4th)	Adjustment value	20	55
3E	BYGAIN4	B-Y GAIN (4th)	Adjustment value	11	56
—	RYHUE1	R-Y HUE (1st)	Adjustment value	D0	57
—	BYHUE1	B-Y HUE (1st)	Adjustment value	F8	58
—	RYHUE2	R-Y HUE (2nd)	Adjustment value	D0	59
—	BYHUE2	B-Y HUE (2nd)	Adjustment value	F8	5A
—	RYHUE3	R-Y HUE (3rd)	Adjustment value	D0	5B
—	BYHUE3	B-Y HUE (3rd)	Adjustment value	F8	5C
—	RYHUE4	R-Y HUE (4th)	Adjustment value	D0	5D
—	BYHUE4	B-Y HUE (4th)	Adjustment value	F8	5E
41			90	90	6A
42			00	00	6B
43			06	06	68
44			01	01	69
51	MODE2	Operation mode switching, normally "80h"	80	00	6C
52			1E	1E	6D
53			52	52	6E
61			00	00	6F
62			00	00	70
63			37	37	71
64			39	39	72
65	[AWB] RBL	ATW operation frame adjustment data	Adjustment value	00	73
66	[AWB] RBM	ATW operation frame adjustment data	Adjustment value	E6	74
67	[AWB] RBGL	ATW operation frame adjustment data	Adjustment value	00	75
68	[AWB] RBGM	ATW operation frame adjustment data	Adjustment value	0B	76
69	[AWB] RGAIN2	R gain for 9,500K	Adjustment value	60	77
6A	[AWB] BGAIN2	B gain for 9,500K	Adjustment value	20	78
6B	[AWB] GLIM	ATW operation frame adjustment data	Adjustment value	18	79
6C			18	18	7A
6D	[AWB] BLIM	ATW operation frame adjustment data	Adjustment value	28	7B
6E			80	80	7C
6F			00	00	7D
70			00	00	7E

Horizontal Timing Chart



Vertical Timing Chart



**Notes on Handling**

## 1) Static charge prevention

Micro unit CCDs are easily damaged by static discharge. Before handling be sure to take the following protective measures.

a) Either handle bare handed or use non-chargeable gloves, clothes or material.

Also use conductive shoes.

b) When handling directly use an earth band.

c) Install a conductive mat on the floor or working table to prevent the generation of static electricity.

d) Ionized air is recommended for discharge when handling micro unit CCD.

e) For the shipment of mounted substrates, use boxes treated for the prevention of static charges.

## 2) Please use IC socket for mounting of micro unit CCD.

IC socket : HS6401-K YAMATO SCIENTIFIC CO., LTD.

## 3) Dust and dirt protection

a) Operate in clean environments.

b) Do not either touch lens by hand or have any object come in contact with glass surfaces.

Should dirt stick to a lens surface, blow it off with an air blower.

(For dirt stuck through static electricity ionized air is recommended.)

c) Clean with a cotton bud and ethyl alcohol if the grease stained. Be careful not to scratch the lens.

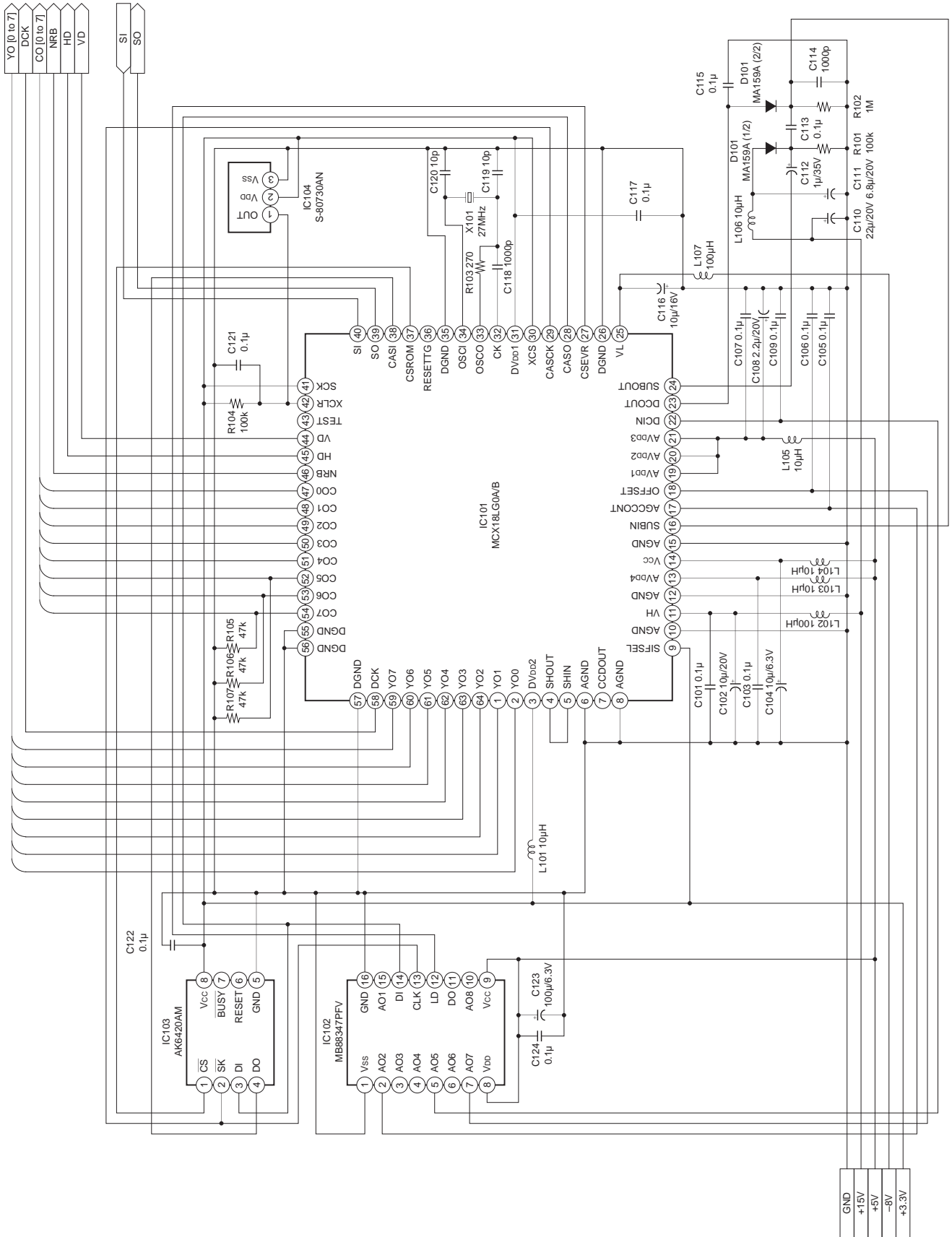
d) Keep in a case to protect from dust and dirt. To prevent dew condensation, preheat or precool when moving to a room with great temperature differences.

## 4) Do not expose to strong light (sun rays) for long periods.

## 5) Exposure to high temperature or humidity will affect the characteristics.

Accordingly avoid storage or usage in such conditions.

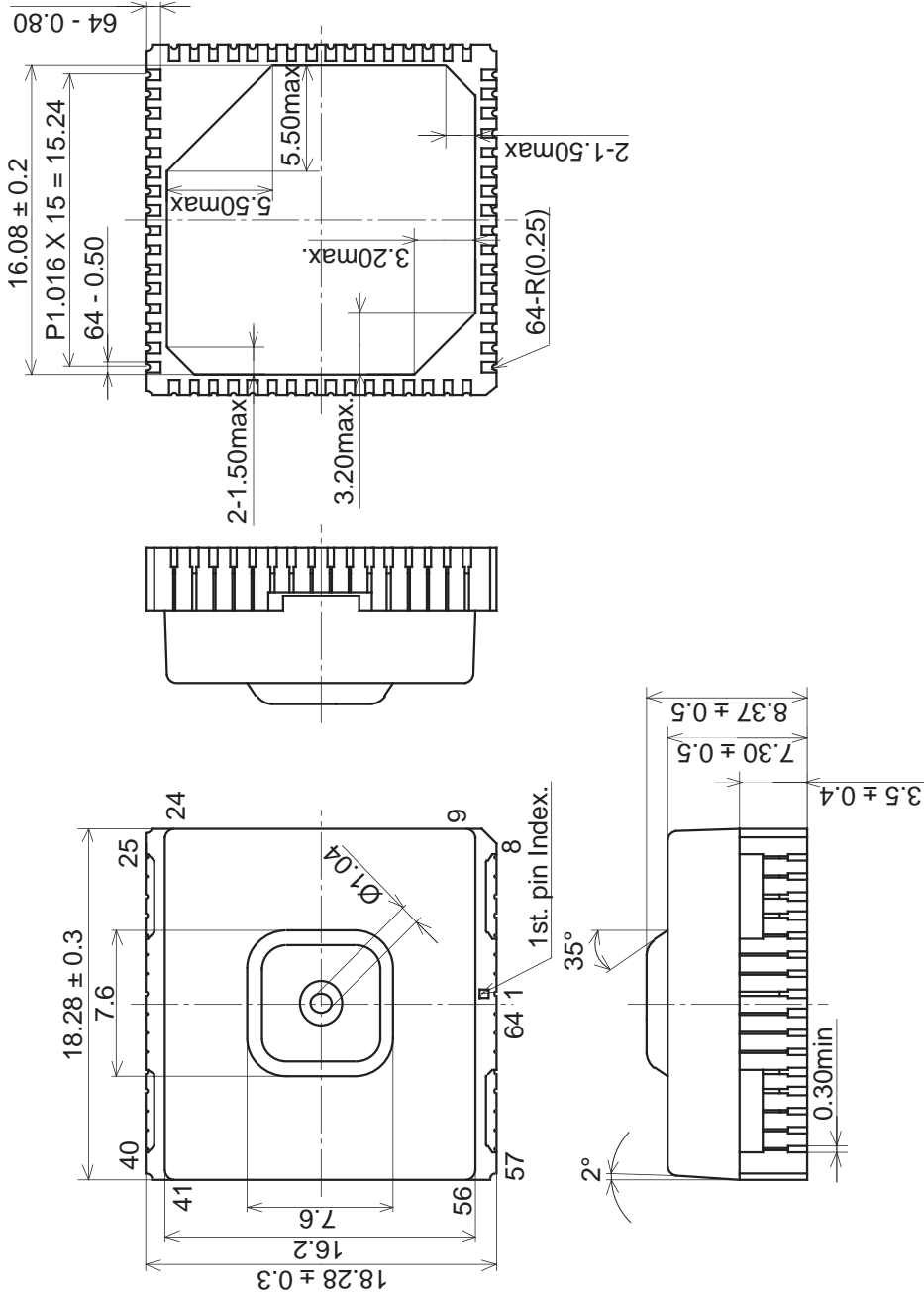
## 6) Micro unit CCDs are precise optical equipment that should not be subject to mechanical shocks.



Package Outline Unit: mm

MCX18LG0A

64pin QFN (720mil)



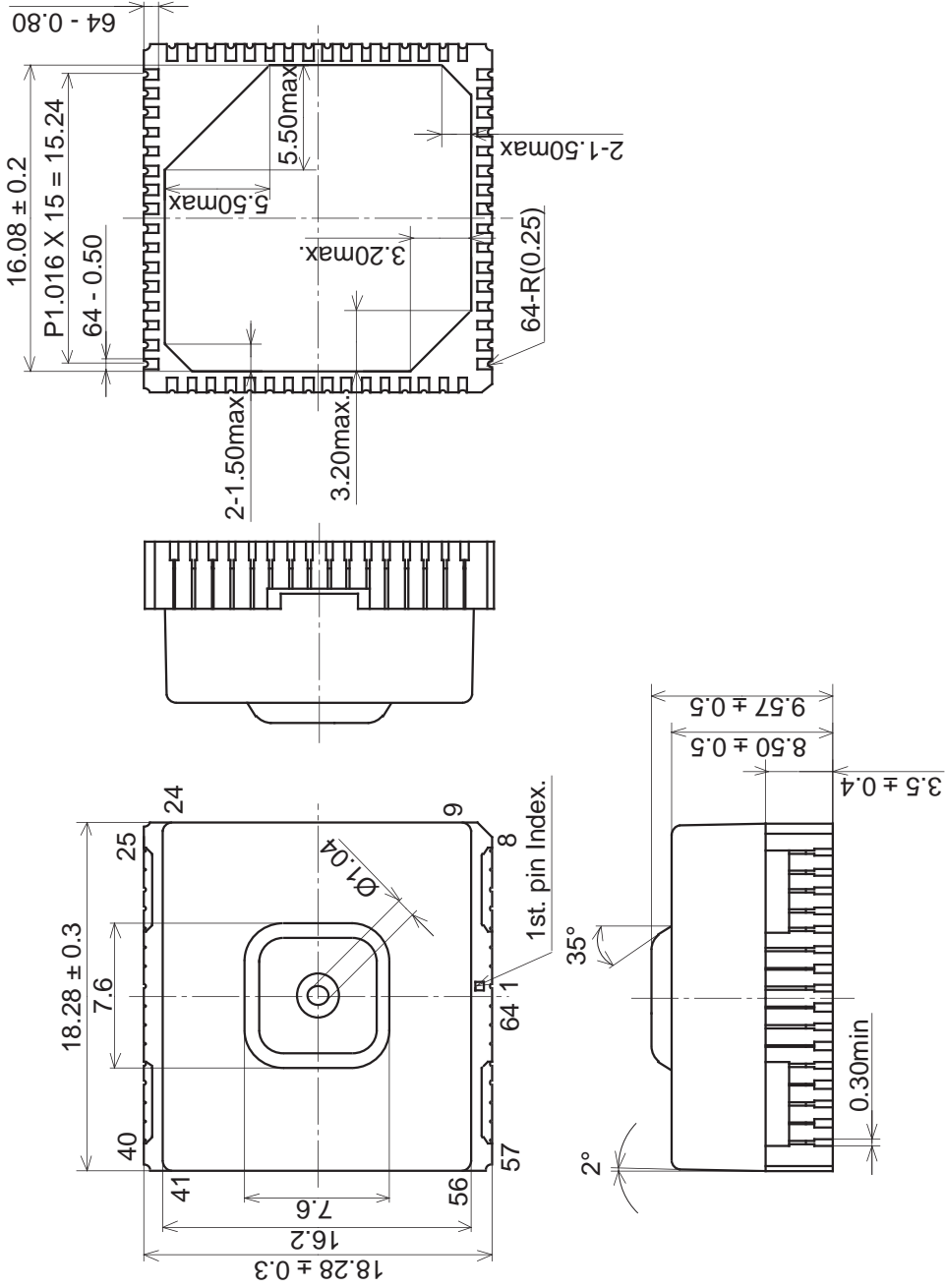
PACKAGE STRUCTURE

PACKAGE MATERIAL	ceramic
LEAD TREATMENT	Au
LEAD MATERIAL	—
PACKAGE WEIGHT	4.20g

Package Outline Unit: mm

MCX18LG0B

64pin QFN (720mil)



PACKAGE STRUCTURE

PACKAGE MATERIAL	ceramic
LEAD TREATMENT	Au
LEAD MATERIAL	—
PACKAGE WEIGHT	4.20g