

TOSHIBA C²MOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC90A70F

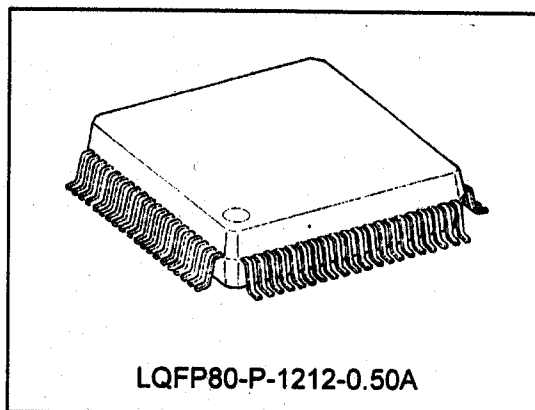
TENTATIVE

CAMERA SIGNAL PROCESSOR FOR VGA CMOS IMAGE SENSOR

This LSI of TC90A70F realizes digital processing of VGA CMOS Image Sensor signals, in combination with ADC included VGA CMOS sensor of TCM5033T(Color Sensor) and TCM5030T(B/W Sensor).

Features

- Applied to VGA Black&White/Color CMOS sensor (TCM5030T / TCM5033T)
 - 10bit sensor input
 - Build-in pulse generator for driving ADC included VGA CMOS sensor
 - Built-in sync signal generator
- Supported several kinds of digital output
 - 16bitRGB=5:6:5
 - 16bit or 8bit YUV=4:2:2
 - 2bit serial output
 - (2bit serial output format is only restricted output image size.QVGA,QQVGA,QCIF whole picture can be outputted.)
- Output Image size
 - VGA (Whole picture)
 - QVGA (Whole picture,Windowing)
 - QQVGA (Whole picture,Windowing)
 - CIF (Windowing)
 - QCIF (Whole picture)
- Built-in auto control function
 - Fluorescent lamp fricker reduction auto level control (ALC)
 - Auto electoronical shutter control (AES)
 - Auto white balance (AWB)
- Built-in various picture adjustment function
 - Lens shading compensation
 - Contrast,Brightness, Color Saturation adjustment etc...
- Micon-less functioning
 - Default values setting by auto loading from an external EEPROM
- Control I/F for setting function
 - Built-in IICBUS I/F
- Small Package
 - 80pin QFP(12X12mm) Package
- Low Voltage Operation
 - 2.5 V (Typical)

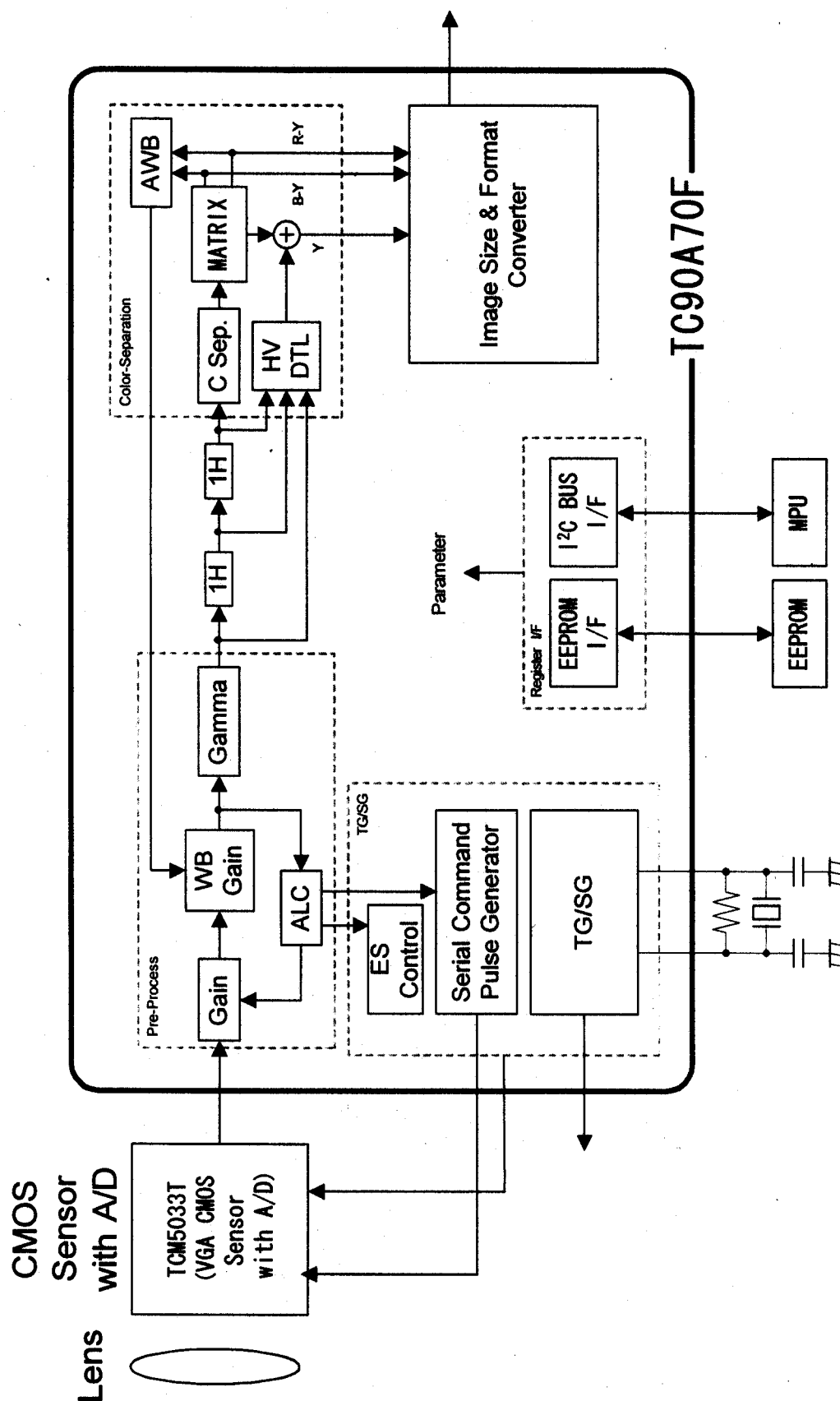


LQFP80-P-1212-0.50A

Weight: 0.82g (Typ.)

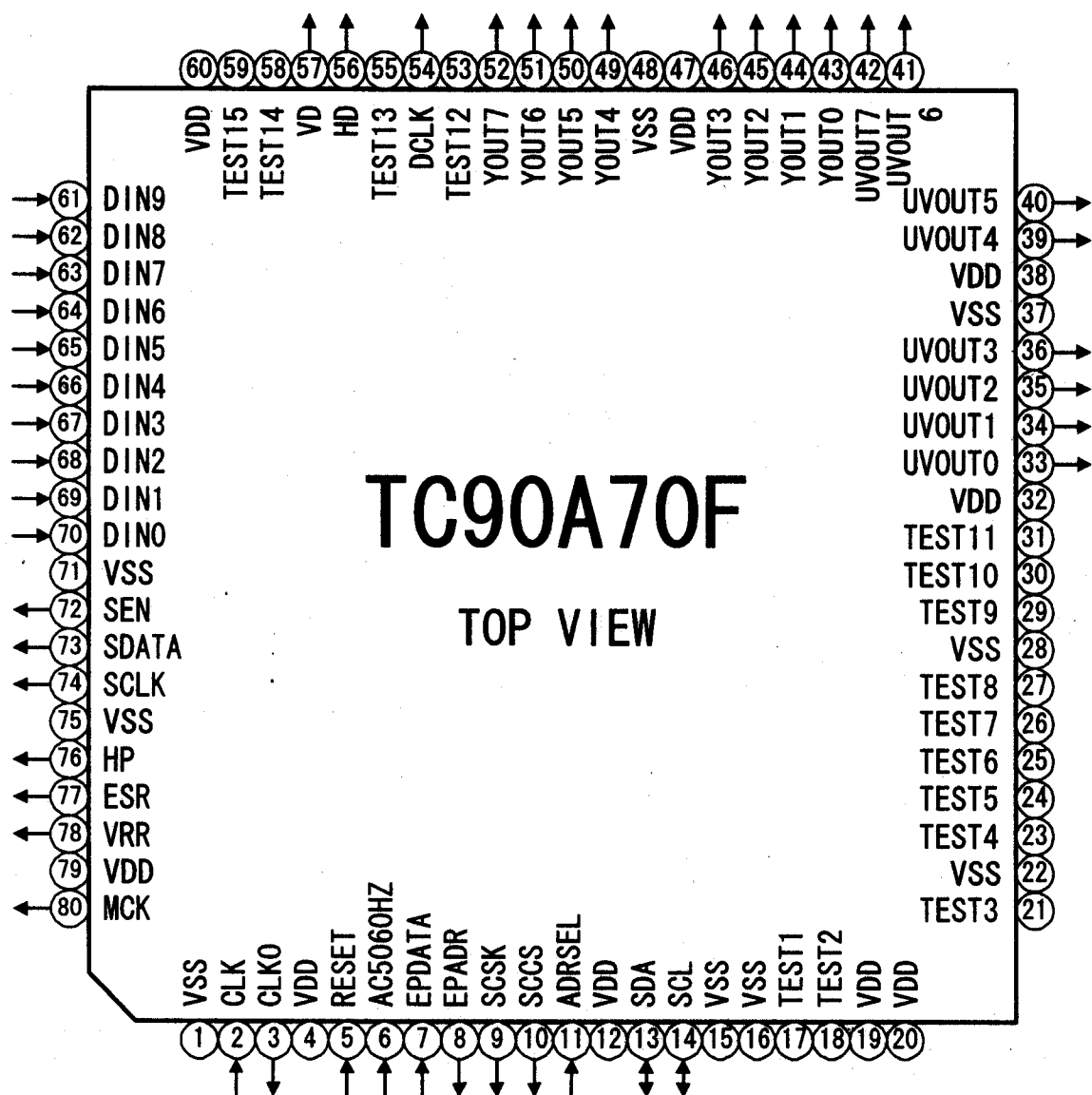
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BLOCK DIAGRAM



◆This circuit is reference circuit
for Sync.Code inserted YUV16bit Output Singnal

PIN CONNECTION



PIN FUNCTIONS

NO.	SYMBOL	I/O	FUNCTION
1	VSS	—	GND
2	CLK	I	OSC Clock (24.5454MHz)
3	CLKO	O	OSC Clock (24.5454MHz)
4	VDD	—	Power supply
5	RESET	I	Power On Reset (L : Reset)
6	AC5060HZ	I	50Hz / 60Hz switch (L : 50Hz / H : 60Hz)
7	EPDATA	I	EEPROM data input
8	EPADR	O	EEPROM address data output
9	SCSK	O	EEPROM clock output
10	SCCS	O	EEPROM chip select
11	ADRSEL	I	IICBUS Slave Address Select (L : 78H / H : 7AH)
12	VDD	—	Power supply for IICBUS I/F (1.8V to 2.5V)
13	SDA	I/O	IICBUS data I/O
14	SCL	I/O	IICBUS clock I/O
15	VSS	—	GND
16	VSS	—	GND
17	TEST1	—	Test Pin 1(This pin must be used with 'OPEN')
18	TEST2	—	Test Pin 2(This pin must be used with 'OPEN')
19	VDD	—	Power supply
20	VDD	—	Power supply
21	TEST3	—	Test Pin 3 (Normally used with ' H ')
22	VSS	—	GND
23	TEST4	—	Test Pin 4 (Normally used with ' L ')
24	TEST5	—	Test Pin 5 (Normally used with ' L ')
25	TEST6	—	Test Pin 6 (This pin must be used with 'OPEN')
26	TEST7	—	Test Pin 7 (This pin must be used with 'OPEN')
27	TEST8	—	Test Pin 8 (Normally used with ' L ')
28	VSS	—	GND
29	TEST9	—	Test Pin 9 (This pin must be used with 'OPEN')
30	TEST10	—	Test Pin 10 (This pin must be used with 'OPEN')
31	TEST11	—	Test Pin 8 (Normally used with ' L ')
32	VDD	—	Power supply
33	UVOUT0	O	UV0 (16bitYUV output) / B0 (16bit RGB output) / ' L ' (8bitYUV output) / D0 (2bit output)
34	UVOUT1	O	UV1 (16bitYUV output) / B1 (16bit RGB output) / ' L ' (8bitYUV output) / ' L ' (2bit output)
35	UVOUT2	O	UV2 (16bitYUV output) / B2 (16bit RGB output) / ' L ' (8bitYUV output) / ' L ' (2bit output)
36	UVOUT3	O	UV3 (16bitYUV output) / B3 (16bit RGB output) / ' L ' (8bitYUV output) / ' L ' (2bit output)
37	VSS	—	GND
38	VDD	—	Power supply
39	UVOUT4	O	UV4 (16bitYUV output) / B4 (16bit RGB output) / ' L ' (8bitYUV output) / ' L ' (2bit output)
40	UVOUT5	O	UV5 (16bitYUV output) / G0 (16bit RGB output) / ' L ' (8bitYUV output)

NO.	SYMBOL	I/O	FUNCTION
			/ ' L ' (2bit output)
41	UVOUT6	O	UV6 (16bitYUV output) / G1 (16bit RGB output) / ' L ' (8bitYUV output) / ' L ' (2bit output)
42	UVOUT7	O	UV7 (16bitYUV output) / G2 (16bit RGB output) / ' L ' (8bitYUV output) / ' L ' (2bit output)
43	YOUT0	O	Y0 (16bitYUV output) / G3 (16bit RGB output) /D0 (8bitYUV output) / D1 (2bit output)
44	YOUT1	O	Y1 (16bitYUV output) / G4 (16bit RGB output) /D1 (8bitYUV output) / ' L ' (2bit output)
45	YOUT2	O	Y2 (16bitYUV output) / G5 (16bit RGB output) /D2 (8bitYUV output) / ' L ' (2bit output)
46	YOUT3	O	Y3 (16bitYUV output) / R0 (16bit RGB output) /D3 (8bitYUV output) / ' L ' (2bit output)
47	VDD	—	Power supply
48	VSS	—	GND
49	YOUT4	O	Y4 (16bitYUV output) / R1 (16bit RGB output) /D4 (8bitYUV output) / ' L ' (2bit output)
50	YOUT5	O	Y5 (16bitYUV output) / R2 (16bit RGB output) /D5 (8bitYUV output) / ' L ' (2bit output)
51	YOUT6	O	Y6 (16bitYUV output) / R3 (16bit RGB output) /D6 (8bitYUV output) / ' L ' (2bit output)
52	YOUT7	O	Y7 (16bitYUV output) / R4 (16bit RGB output) /D7 (8bitYUV output) / ' L ' (2bit output)
53	TEST12	—	Test Pin 12 (Normally used with ' L ')
54	DCLK	O	Clock for output data
55	TEST13	—	Test Pin 13 (Normally used with ' L ')
56	HD	O	H sync for output data
57	VD	O	V sync for output data
58	TEST14	—	Test Pin 14 (Normally used with ' L ')
59	TEST15	—	Test Pin 15 (Normally used with ' L ')
60	VDD	—	Power supply
61	DIN9	I	Digital input from CMOS sensor
62	DIN8	I	Digital input from CMOS sensor
63	DIN7	I	Digital input from CMOS sensor
64	DIN6	I	Digital input from CMOS sensor
65	DIN5	I	Digital input from CMOS sensor
66	DIN4	I	Digital input from CMOS sensor
67	DIN3	I	Digital input from CMOS sensor
68	DIN2	I	Digital input from CMOS sensor
69	DIN1	I	Digital input from CMOS sensor
70	DIN0	I	Digital input from CMOS sensor
71	VSS	—	GND
72	SEN	O	Command output enable for CMOS sensor
73	SDATA	O	Command data output for CMOS sensor
74	SCLK	O	Command clock output for CMOS sensor
75	VSS	—	GND
76	HP	O	H sync pulse for CMOS sensor
77	ESR	O	Electrical Shutter control pulse for CMOS sensor
78	VRR	O	V sync pulse for CMOS sensor

NO.	SYMBOL	I/O	FUNCTION
79	VDD	—	Power supply
80	MCK	O	Master clock for CMOS sensor

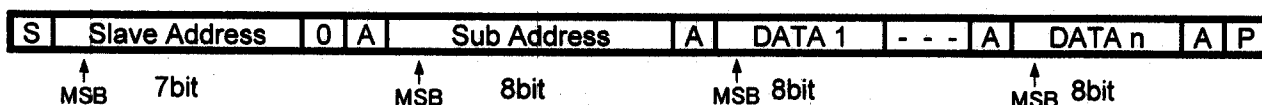
CONTROL I/F

TC90A70F is controlled by setting of internal register. To set internal register I²CBUS I/F can be used.

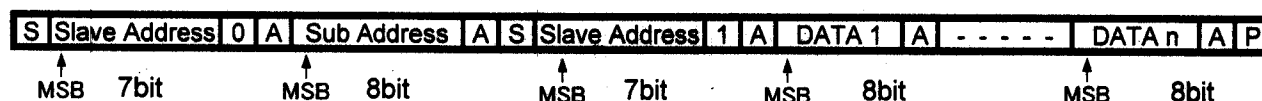
And when E²PROM connected to TC90A70F, this IC automatically read all the internal data of E²PROM after system reset. This function realize the setting of TC90A70F without using of I²CBUS I/F, so this system can be used without microcomputer also.

OUTLINE OF I²CBUS CONTROL FORMAT

DATA SETTING FORMAT

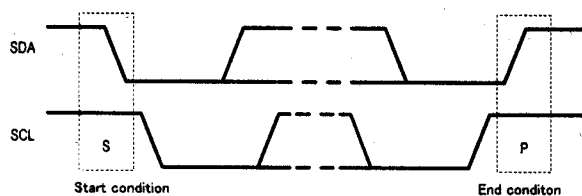


DATA READING FORMAT

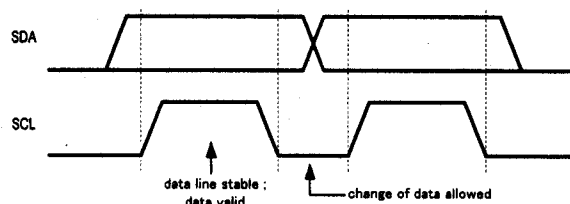


S : Start condition , P : End condition , A : Acknowledge

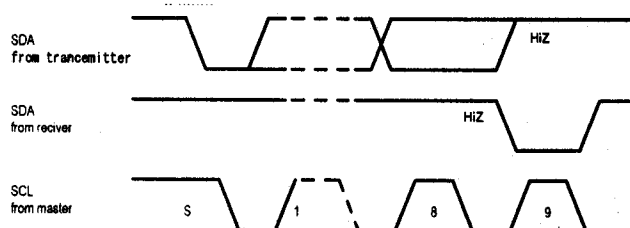
START CONDITION , END CONDITION



BIT TRANSFER



ACKNOWLEDGE



SLAVE ADDRESS

A6	A5	A4	A3	A2	A1	A0	R/W
0	1	1	1	1	0	1/0	

* A0 can select by the connection of 11pin ADRSEL.

11pin = GND ----- A0 = 0

11pin = VDD ----- A0 = 1

Purchase of TOSHIBA I²C components conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philips.

INTERNAL REGISTER

ADDRESS		fast							last		default												
HEX	EEP (HEX)	BIT7(MSB)	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0(LSB)	B7	B6	B5	B4	B3	B2	B1	B0						
00	00																						
01	00																						
02	01	FPS 0:30fps 1:15fps	ACF 0:50Hz 1:60Hz								0	0											
03		DOUTSW 0:ON 1:OFF	DOUTFMT 0:16BITS 1:8BITS	PICSIZ[2:0] 0h:VGA 1h:QVGA(s) 2h:QVGA(w) 3h:QQVGA(s) 4h:QQVGA(w) 5h:CIF 6h:QCIF		PICFRM 0:YUV422 1:RGB565	CM 0:COLOR 1:B/W	0	0		0	0	0	0	0	0	0						
04	02	ALCSW 0:ON 1:OFF	ESRLIM[1:0]	ESRLSW 0:NORMAL 1:LONG EXP	ESRSPD[11:8] 001h:1H ~ 834h:2100H (1H step)					0	0	0	0	0	0	1	0						
05		ESRSPD[7:0]								0	0	0	0	1	1	0	1						
06	03	AG[7:0] 0Ch:+24dB , ~ , 18h:+18dB , ~ , 30h:+12dB , ~ , 60h:+6dB , ~ , C0h:+0dB								1	1	0	0	0	0	0	0						
07				ALCMODE[1:0] 0h:CTR-W 1h:AVERAGE 2h and 3h:CTR only		ALCH[3:0]				0	1	1	0	1	1								
08	04	ALCL[7:0]								0	0	1	0	1	1	1	1						
09		AWBSW 0:ON 1:OFF								0													
0A	05	MRG[7:0] 00h: x0 , ~ , 40h: x1 , ~ , FFh: x4								0	1	0	0	0	0	0	0						
0B		MBG[7:0] 00h: x0 , ~ , 40h: x1 , ~ , FFh: x4								0	1	0	0	0	0	0	0						
0C	06	GMSW 0:ON 1:OFF								0													
0D		HDTG[7:0] 00h: x0 , ~ , 20h: x1 , ~ , FFh: x8								0	0	1	0	0	0	0	0						
0E	07	VDTG[7:0] 00h: x0 , ~ , 20h: x1 , ~ , FFh: x8								0	0	1	0	0	0	0	0						
0F		CONT[7:0] 00h: x0 , ~ , 80h: x1 , ~ , FFh: x2								1	0	0	0	0	0	0	0						
10	08	BRIGHT[7:0] 00h: Black Level 00h , ~ , 31h: Black Level 31h , ~ , FFh: Black Level FFh								0	0	1	1	0	0	0	1						
11		VHUE[6:0] MSB = 0:+ , 1:- [5:0] = 00h: x0 , ~ , 3Fh: x2								0	0	0	0	0	0	0	0						
12	09	UHUE[6:0] MSB = 0:+ , 1:- [5:0] = 00h: x0 , ~ , 3Fh: x2								0	0	0	0	0	0	0	0						
13		SATU[5:0] 00h: x0 , ~ , 20h: x1 , ~ , 3Fh: x2									1	0	0	0	0	0	0						
14	0A																						
15	0B	HSTART[7:0]								0	0	0	0	0	0	0	0						
16		HEND[7:0]								0	0	0	0	0	0	0	0						
17	0C	VSTART[7:0]								0	0	0	0	0	0	1	0						
18		VEND[7:0]								0	0	0	0	0	0	1	1						
19	0D																						
1A																							
1B	0E																						
1C																							
1D	0F																						
1E																							
1F	10																						
20																							
21	11																						
22																							
23	12																						
24																							
25	13																						
26																							
27	14																						
28		HOUTPH[7:0]								0	0	1	1	0	1	0	0						
29	HOUTPH[8]	VOUTPH[6:0]														0	0	0	0	0	1	1	0
2A	15	WDSW 0:OFF 1:ON					WINSH[9:8]		WINSV[8]	0				0	0	0							
2B		WINSH[7:0]								0	0	0	0	0	0	0	0						
2C	16	WINSV[7:0]								0	0	0	0	0	0	0	0						
2D						WINEH[9:8]		WINEV[8]															
2E	17	WINEH[7:0]								0	1	1	1	1	1	1	1						
2F		WINEV[7:0]								1	1	0	1	1	1	1	1						

ADDRESS		fast								last		default																		
HEX	EEP (HEX)	BIT7(MSB)	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0(LSB)	B7	B6	B5	B4	B3	B2	B1	B0													
30	18																													
31																														
32																														
33																														
34	1A	SRST 0:OFF 1:RESET																0												
35																WHICHFST 0:MSB fet 1:LSB fet		SERLOUT 0:OFF 1:ON				0	0							
36	1B	SYNCSW 0:OFF 1:ON		SENPIPSW 0:NORMAL 1:CHANGE																0	0									
37	1C																													
38																														
39																														
3A																														
3B																														
3C																														
3D																														
3E	1F																													
3F																														
40	20															DINPIPSW 0: NORMAL 1: CHANGE				0										
41		KIZUSW 0: OFF 1: ON		FBCBKL[6:0] 00h: CLAMP LEVEL 0LSB , ~ , 40h: 64LSB , ~ , 7Fh: 127LSB														0	1	0	0	0	0	0	0					
42	21	GBPEDC[6:0] 2's 40h: -64LSB , ~ , 00h: ±0 , ~ , 3Fh: +63LSB																0 0 0 0 0 0 0 0												
43		BPEDC[6:0] 2's 40h: -64LSB , ~ , 00h: ±0 , ~ , 3Fh: +63LSB																0 0 0 0 0 0 0 0												
44	22	RPEDC[6:0] 2's 40h: -64LSB , ~ , 00h: ±0 , ~ , 3Fh: +63LSB																0 0 0 0 0 0 0 0												
45		GRPEDC[6:0] 2's 40h: -64LSB , ~ , 00h: ±0 , ~ , 3Fh: +63LSB																0 0 0 0 0 0 0 0												
46	23	LENS[5:0] 00h: OFF , ~ , 35~3Fh: x2(Corner of VGA)																0 0 0 0 0 0 0 0												
47		JAMP 0: GRG+R 1: GRG-R		JAMG[6:0] 00h: 0% , ~ , 7Fh: 25%														0	0	0	0	0	0	0	0					
48	24	DTLC[1:0] 0h: THROUGH 1h: ±128 2h: ±64 3h: ±32		HDTSEL 0: MID 1: HIGH		HDTCORE[4:0] 0h:OFF, 01h: ±1LSB , ~ , 1Fh: ±31LSB												0	0	1	0	0	0	1	0					
49						VDCORE[4:0] 0h:OFF, 01h: ±1LSB , ~ , 1Fh: ±31LSB												0 0 0 0 1 0												
4A	25																													
4B																														
4C																														
4D																														
4E	27	MSKBR[6:0] MSB = 0+, 1:- [5:0] = 00h: 0% , ~ , 3Fh: 50%																0 0 0 0 0 0 0 0												
4F		MSKGR[6:0] MSB = 0+, 1:- [5:0] = 00h: 0% , ~ , 3Fh: 50%																0 0 0 0 0 0 0 0												
50	28	MSKRB[6:0] MSB = 0+, 1:- [5:0] = 00h: 0% , ~ , 3Fh: 50%																0 0 0 0 0 0 0 0												
51		MSKGB[6:0] MSB = 0+, 1:- [5:0] = 00h: 0% , ~ , 3Fh: 50%																0 0 0 0 0 0 0 0												
52	29	MSKRG[6:0] MSB = 0+, 1:- [5:0] = 00h: 0% , ~ , 3Fh: 50%																0 0 0 0 0 0 0 0												
53		MSKBG[6:0] MSB = 0+, 1:- [5:0] = 00h: 0% , ~ , 3Fh: 50%																0 0 0 0 0 0 0 0												
54	2A					DTLLMSW 0: OFF 1: ON		DTLYLIM[3:0] 00h: YH=128 , ~ , 9h: YH=216 , ~ , Fh: YH=229										0 1 0 0 1												
55						VGAIN[5:0]		00h: x0 , ~ , 20h: x1 , ~ , 3Fh: x2										1 0 0 0 0 0 0												
56						UGAIN[5:0]		00h: x0 , ~ , 20h: x1 , ~ , 3Fh: x2										1 0 0 0 0 0 0												
57								UVCORE[3:0] 0h: OFF, 1h: ±1LSB , ~ , Fh: ±15LSB										0 0 1 0												
58	2C	ALCLOCK 0: NORMAL 1: LOCK				ALCSPD[1:0] 0h: LOWEST 1h: LOW 2h: NORMAL 3h: FAST												0	1 0											
59																		ESLIMSEL								0				
5A	2D	ES100S[7:0]				9Eh: 30fps , 4Fh: 15fps												1 0 0 1 1 1 1 0												
5B		ES120S[7:0]				83h: 30fps , 42h: 15fps												1 0 0 0 0 0 1 1												
5C	2E															AGLIM[2:0] 0h: OFF 1h: 6dB 2h: 12dB 3h:18dB 4h:24dB				0 1 1										
5D																DG[5:0] 00h: x1 , ~ , 3Fh: x2				0 0 0 0 0 0										
5E	2F																	0 0 0 0 0 0 0												
5F																		0 0 0 0 0 0 0												

ADDRESS		fast								last		default													
HEX	EEP (HEX)	BIT7(MSB)	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0(LSB)	B7	B6	B5	B4	B3	B2	B1	B0								
60	30				PREGRG[5:0]		00h: x1 , ~ , 3Fh: x3					0	0	0	0	0	0								
61					PREGBG[5:0]		00h: x1 , ~ , 3Fh: x3					0	0	0	0	0	0								
62					PRERG[5:0]		00h: x1 , ~ , 3Fh: x3					0	0	0	0	0	0								
63					PREBG[5:0]		00h: x1 , ~ , 3Fh: x3					0	0	0	0	0	0								
64	32																								
65		UMVSEL 0: NOT CONST 1: CONSTANT	GASOJ[6:0]			00h: NO LIMIT , 01h: 32 White Pixels , ~ , 7Fh: 4064 White Pixels								0	0	0	0	0	0	0					
66	33	YLCUTLMSK 0: ON 1: OFF				YLCUTL[5:0]		0h: more than 0LSB , 1h: 4LSB , ~ , 3Fh: 252LSB			0		1	0	1	1	0	1							
67		YLCUTHMSK 0: ON 1: OFF				YLCUTH[5:0]		0h: less than 3LSB , 1h: 4LSB , ~ , 3Fh: 252LSB			1		0	0	0	0	0	0							
68	34	RBCUTMSK 0: ON 1: OFF				RBCUTM[5:0]		0h: more than -2LSB , 1h: -4LSB , ~ , 3Fh: -128LSB			1		0	0	0	0	0	0							
69		RBCUTPSK 0: ON 1: OFF				RBCUTP[5:0]		0h: less than 1LSB , 1h: 3LSB , ~ , 3Fh: 127LSB			1		0	0	0	0	0	0							
6A	35	BYCUTMSK 0: ON 1: OFF				BYCUT[5:0]		0h: more than -2LSB , 1h: -4LSB , ~ , 3Fh: -128LSB			1		0	0	0	0	0	0							
6B		RYCUTMSK 0: ON 1: OFF				RYCUT[5:0]		0h: more than -2LSB , 1h: -4LSB , ~ , 3Fh: -128LSB			1		0	0	0	0	0	0							
6C	36	ALLAREA 0: ON 1: OFF	UMVSKNC[6:0]			00h: OFF , 01h: ± 1 LSB . ~ . 3Fh: ± 63 LSB								1	0	0	1	1	1	1					
6D		WBLOCK 0: NORMAL 1: LOCK	UMVLJ[6:0]											0	1	1	1	1	0	0	0				
6E	37	RGMIN[7:0]		00h: more than x0 , ~ , 20h: more than x0.25 , ~ , FFh: more than x4														0	0	1	0	0	0	0	0
6F		RGMAX[7:0]		00h: less than x0 , ~ , 80h: less than x2 , ~ , FFh: less than x4														1	0	0	0	0	0	0	0
70	38																								
71																									
72	39																								
73																									
74	3A																								
75																									
76	3B																								
77																									
78	3C																								
79																									
7A	3D																								
7B																									
7C	3E																								
7D																									
7E	3F																								
7F																									

ADDRESS		fast							last		default							
HEX	EEP (HEX)	BIT7(MSB)	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0(LSB)	B7	B6	B5	B4	B3	B2	B1	B0	
80	40								KIZUH01[9:8]								0:0	
81		KIZUH01[7:0]																
82	41								KIZUV01[8]								0	
83		KIZUV01[7:0]																
84	42								KIZUH02[9:8]								0:0	
85		KIZUH02[7:0]																
86	43								KIZUV02[8]								0	
87		KIZUV02[7:0]																
88	44								KIZUH03[9:8]								0:0	
89		KIZUH03[7:0]																
8A	45								KIZUV03[8]								0	
8B		KIZUV03[7:0]																
8C	46								KIZUH04[9:8]								0:0	
8D		KIZUH04[7:0]																
8E	47								KIZUV04[8]								0	
8F		KIZUV04[7:0]																
90	48								KIZUH05[9:8]								0:0	
91		KIZUH05[7:0]																
92	49								KIZUV05[8]								0	
93		KIZUV05[7:0]																
94	4A								KIZUH06[9:8]								0:0	
95		KIZUH06[7:0]																
96	4B								KIZUV06[8]								0	
97		KIZUV06[7:0]																
98	4C								KIZUH07[9:8]								0:0	
99		KIZUH07[7:0]																
9A	4D								KIZUV07[8]								0	
9B		KIZUV07[7:0]																
9C	4E								KIZUH08[9:8]								0:0	
9D		KIZUH08[7:0]																
9E	4F								KIZUV08[8]								0	
9F		KIZUV08[7:0]																
A0	50								KIZUH09[9:8]								0:0	
A1		KIZUH09[7:0]																
A2	51								KIZUV09[8]								0	
A3		KIZUV09[7:0]																
A4	52								KIZUH10[9:8]								0:0	
A5		KIZUH10[7:0]																
A6	53								KIZUV10[8]								0	
A7		KIZUV10[7:0]																
A8	54								KIZUH11[9:8]								0:0	
A9		KIZUH11[7:0]																
AA	55								KIZUV11[8]								0	
AB		KIZUV11[7:0]																
AC	56								KIZUH12[9:8]								0:0	
AD		KIZUH12[7:0]																
AE	57								KIZUV12[8]								0	
AF		KIZUV12[7:0]																
B0	58								KIZUH13[9:8]								0:0	
B1		KIZUH13[7:0]																
B2	59								KIZUV13[8]								0	
B3		KIZUV13[7:0]																
B4	5A								KIZUH14[9:8]								0:0	
B5		KIZUH14[7:0]																
B6	5B								KIZUV14[8]								0	
B7		KIZUV14[7:0]																
B8	5C								KIZUH15[9:8]								0:0	
B9		KIZUH15[7:0]																
BA	5D								KIZUV15[8]								0	
BB		KIZUV15[7:0]																
BC	5E								KIZUH16[9:8]								0:0	
BD		KIZUH16[7:0]																
BE	5F								KIZUV16[8]								0	
BF		KIZUV16[7:0]																

OUTLINE OF INTERNAL REGISTER ITEM

- * Frame rate setting (30fps, 15fps, 7.5fps, 3.75fps)
- * Picture size setting of digital output (VGA, QVGA, QQVGA, CIF, QCIF)
- * Picture windowing setting (ON / OFF , Windowing area setting)
- * Selection of digital data output format (RGB565, YUV422, etc.)
- * Sync. code setting (ON / OFF , each code setting)
- * Color / B&W processing switch
- * Color signal adjustment (Masking , color axis correction , saturation , etc)
- * Luminance signal adjustment (Contrast , Brightness , Gamma , H,V edge enhancement)
- * Electorical shutter speed setting
- * Sensor AGC level control
- * ALC ON / OFF
- * ALC mode setting (area selection , speed selection , fricker reduction mode setting)
- * AWB ON / OFF
- * Some kinds of correction setting (Lends shading correction etc.)

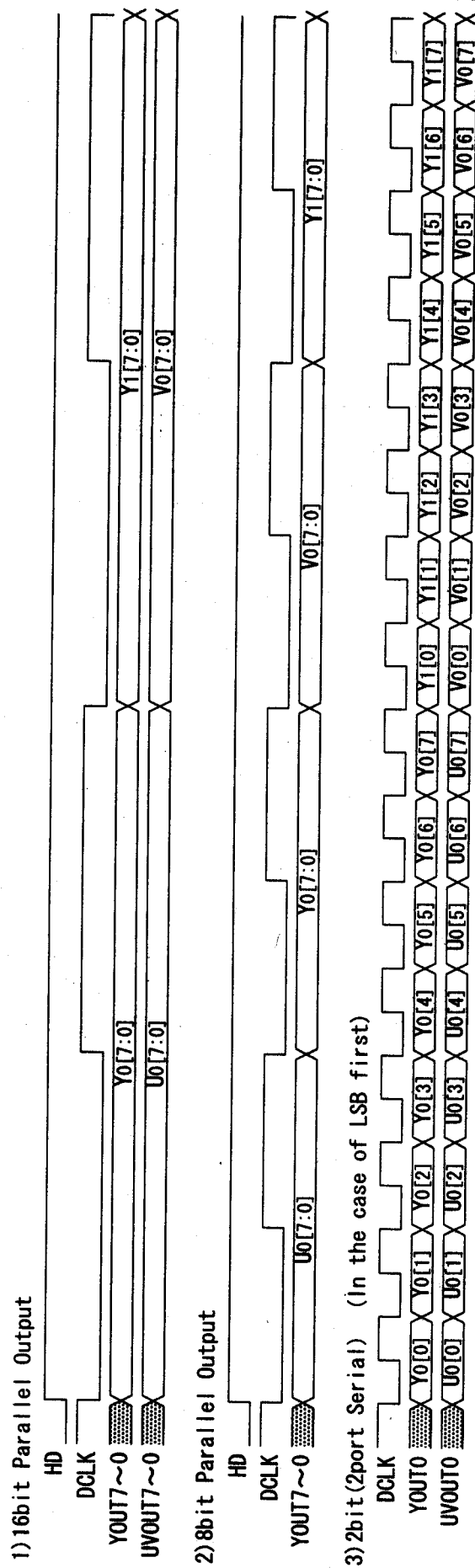


Figure 1. Picture Data Output Timing

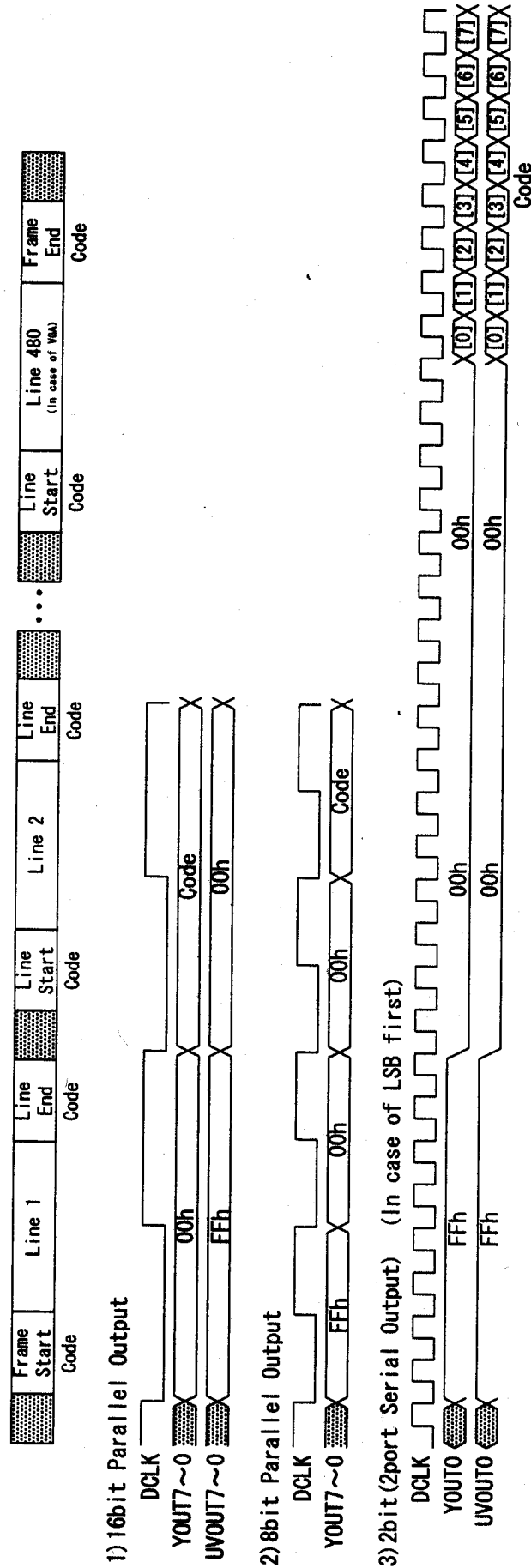


Figure2. Sync. Code Output Timing

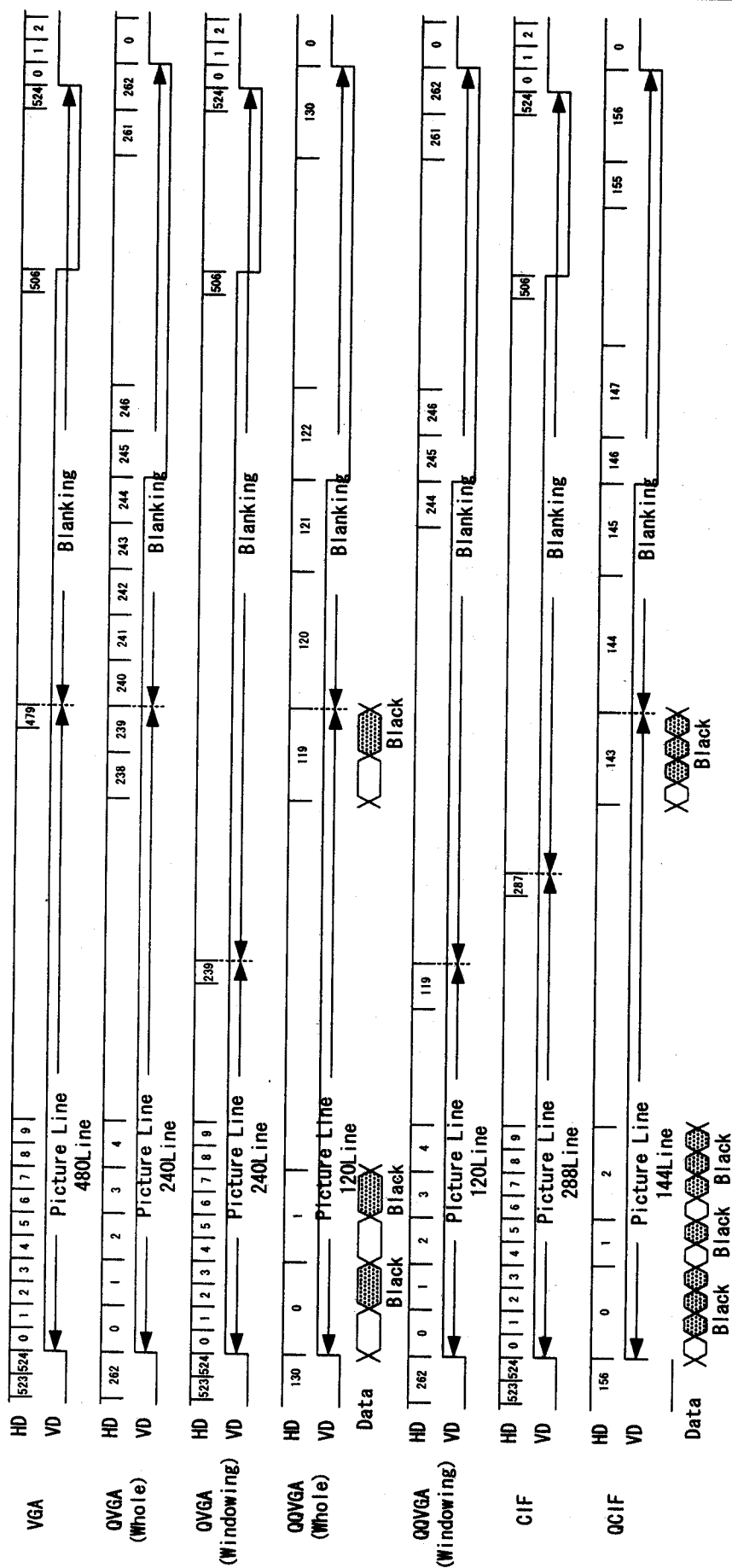


Figure 3. Sync. Signal Timing (V)

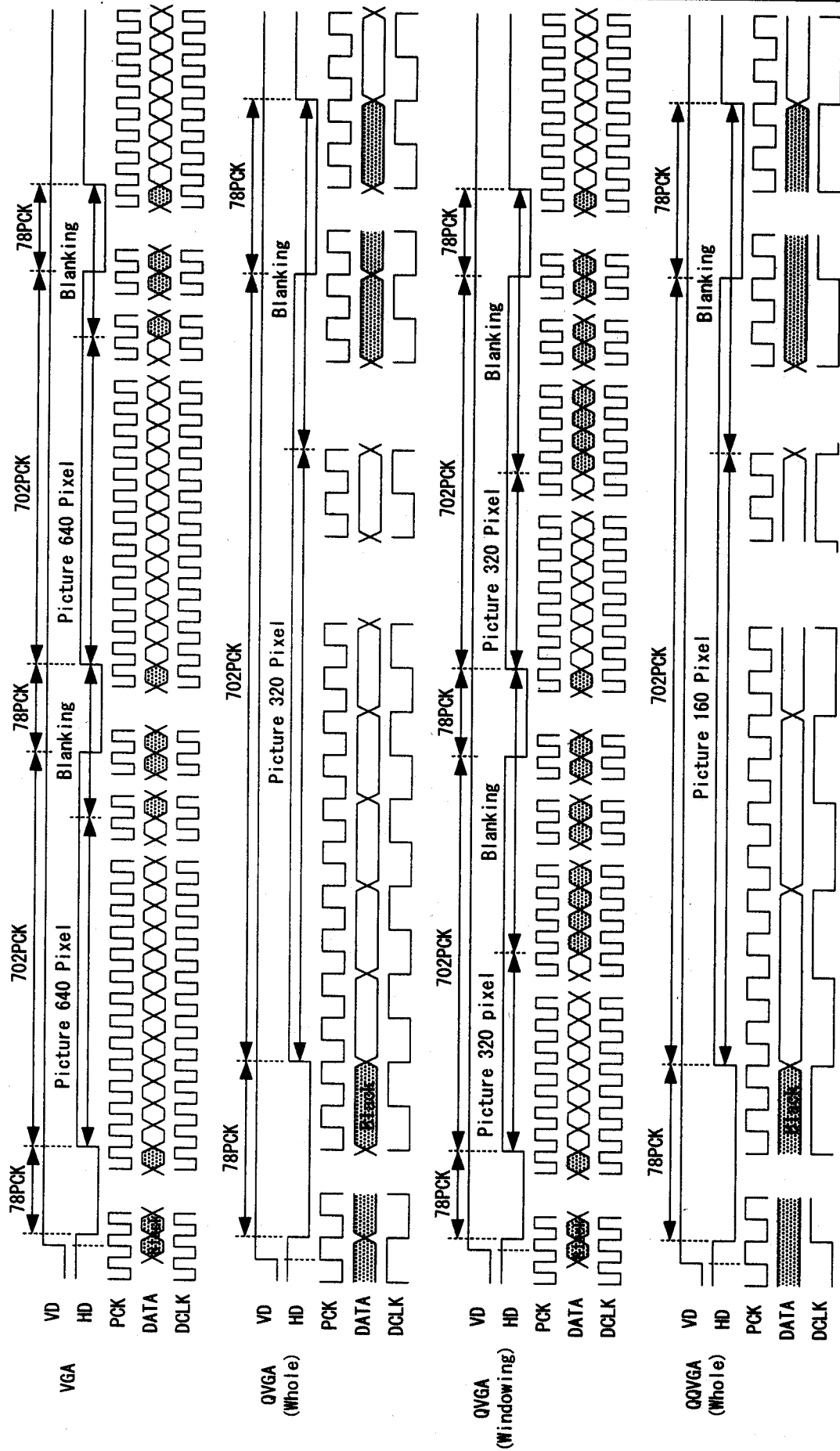


Figure4(a). Sync. Signal Timing (H)

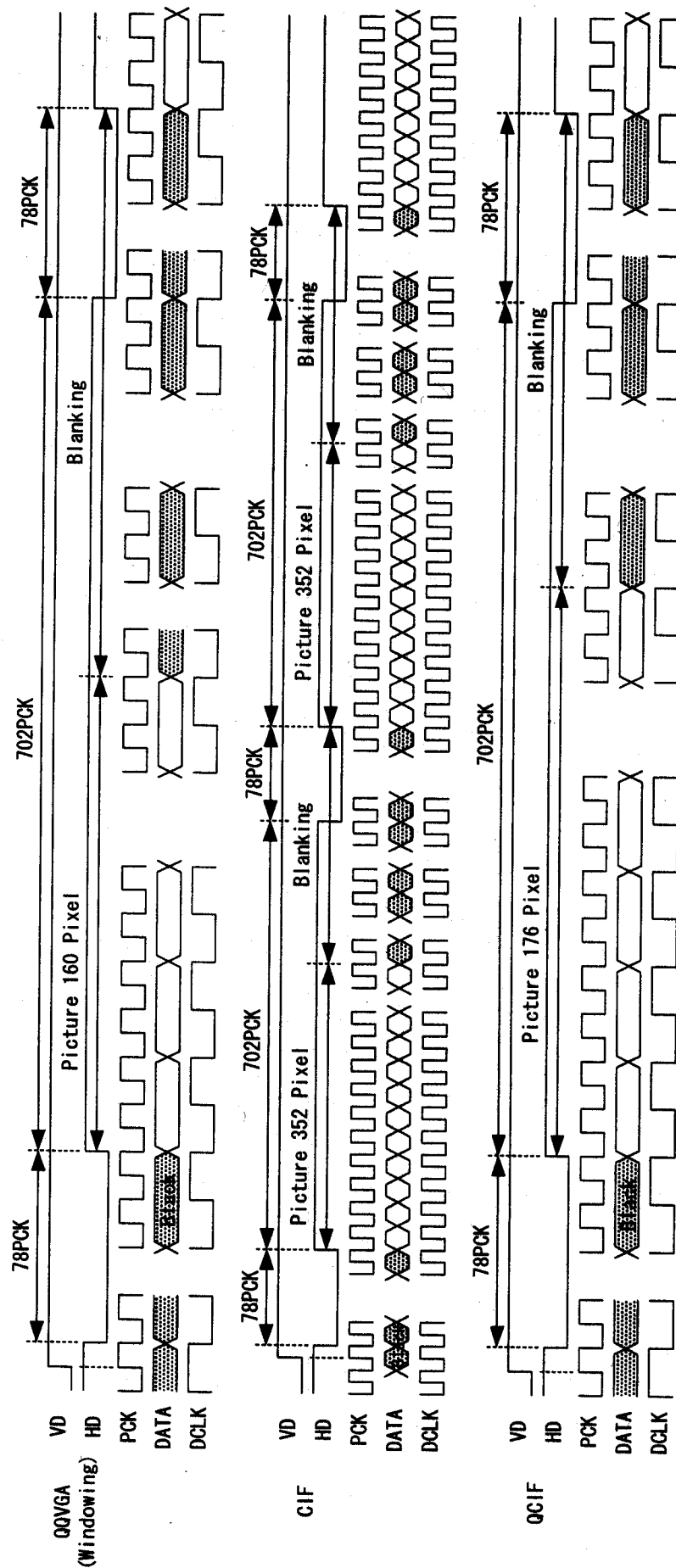


Figure4(b). Sync. Signal Timing (H)

MAXIMUM RATING

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V_{DD}	-0.3 to 3.6	V
Power Dissipation	P_D	950	mW
Input Voltage	V_{IN}	-0.3 to $V_{DD}+0.3$	V
Output Voltage	V_{OUT}	-0.3 to $V_{DD}+0.3$	V
Storage Temperature	T_{stg}	-40 to 125	degree

RECOMMENDED OPERATING CONDITION

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Power Supply Voltage	V_{DD}	2.3	2.5	2.9	V
Input Voltage	V_{IN}	0		V_{DD}	V
Operation Frequency	f_{max}	-	24.5454	-	MHz
Operation Temperature	T_{opr}	-20		75	degree

ELECTORICAL CHARACTERISTIC

DC Characteristic ($T_a=25$ degree , $V_{DD}=2.5V$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Current Consumption	I_{DD}	24.5454MHz, 30fps, VGA output, Lens close, AG up to +18dB			30	mA
High Level Input Voltage	V_{IH}		2.0			V
Low Level Input Voltage	V_{IL}		0		0.5	V
High Level Input Current	I_{IH}	$V_{IN} = V_{DD}$ *1	10		200	μA
		$V_{IN} = V_{DD}$ *2	-10		10	μA
Low Level Input Current	I_{IL}	$V_{IN} = V_{SS}$	-10		10	μA
High Level Output Voltage	V_{OH}	$I_{OH} = -4mA$ *3	1.9			V
		$I_{OH} = -2mA$ *4	1.9			V
Low Level Output Voltage	V_{OL}	$I_{OL} = 4mA$ *3			0.4	V
		$I_{OL} = 2mA$ *4			0.4	V

*1: EPDATA, AC5060Hz, ADRSEL

*2: CLK, RESET, SDA, SCL

*3: YOUT7 to 0, UVOUT7 to 0, VD, HD, CLKO, DCLK

*4: SCCK, SCCS, EPADR

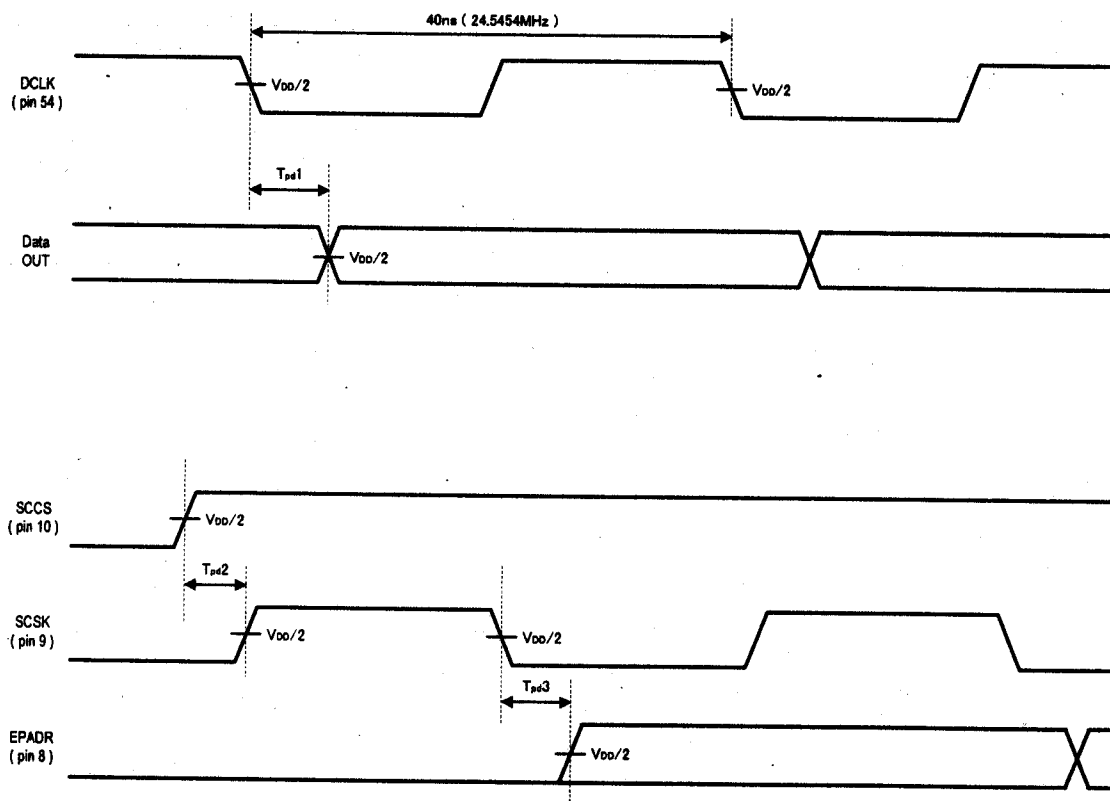
AC Characteristic ($T_a = -20$ to 75 degree , $V_{DD} = 2.3$ to 2.9 V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN .	TYP .	MAX .	UNIT
Output Delay Time	T_{pd1}	*5	-10		10	ns
	T_{pd2}	*6	2			us
	T_{pd3}	*7	20		100	ns

*5 : UVOUT0 to 7 , YOUT0 to 7

*6 : SCSK

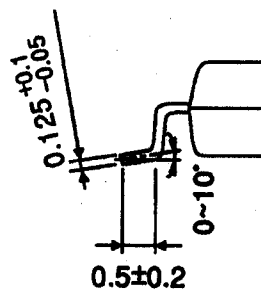
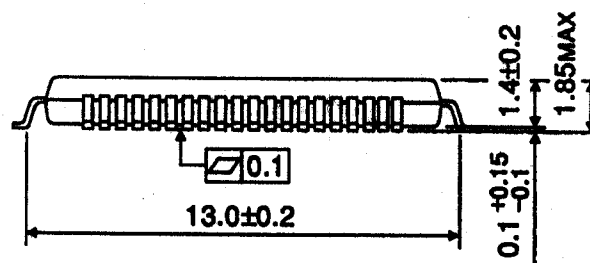
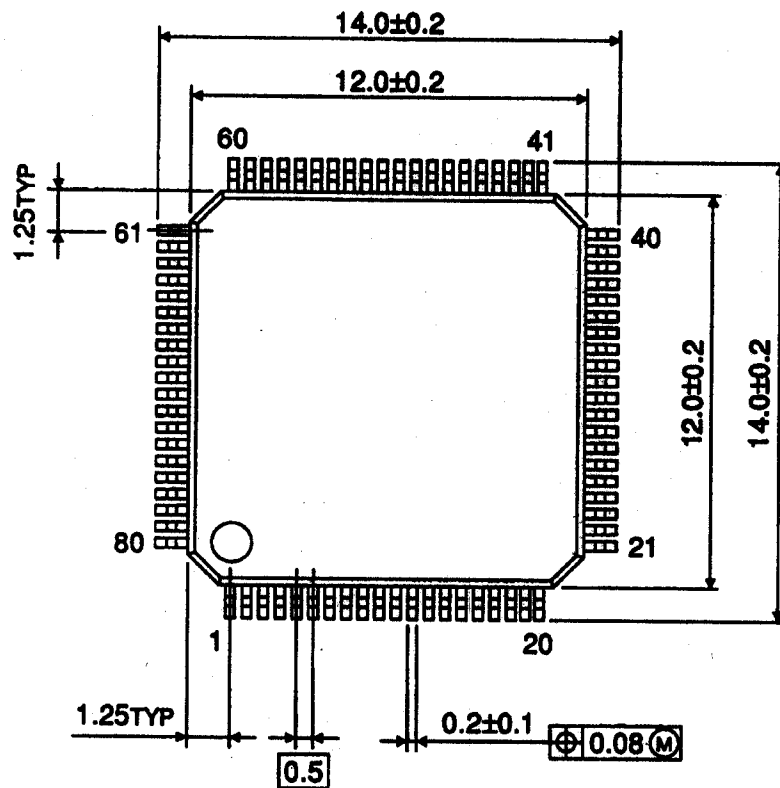
*7 : EPADR



OUTLINE DRAWING

LQFP80 - P - 1212 - 0.50A

Unit : mm



Weight: 0.82 g (Typ.)