

Bi-CMOS Integrated Circuit Silicon Monolithic

# TB1239BF

# Luminance, Chroma and Synchronizing Signals Processor IC for PAL/NTSC/SECAM COLOR $\mathsf{TV}$

TB1239BF integrates luminance, chroma and synchronizing signals processing circuits for PAL/NTSC/SECAM color TV system.

TB1239BF incorporates high performance picture quality compensation circuits in luminance section, an automatic PAL/NTSC/SECAM discrimination and decode circuits in chroma section, and an automatic 50/60 Hz discrimination circuit in synchronizing section.

Besides a crystal oscillator generates 4.43 MHz, 3.58 MHz and M/N-PAL clock signals internally for color demodulation. A horizontal PLL circuit is also built in this IC.

PAL/SECAM demodulation circuits which are adjustment-free circuits incorporates a 1 H DL circuit inside for operating the base band signal processing system.

Also, TB1239BF makes it possible to set and to control various functions through the built-in I<sup>2</sup>C BUS line.

#### Features

#### **Luminance Section**

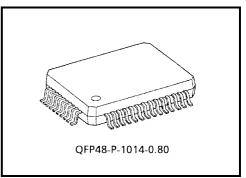
- Built-in chroma trap filter
- Black stretch circuit
- DC restoration circuit
- Y delay line
- Sharpness control
- Sub-Contrast control (-/+2dB)
- Black set-up for PAL plus

#### **Chroma Section**

- Built-in 1 H delay circuit (PAL/SECAM base band demodulation system)
- One crystal color demodulation circuit (4.43 MHz, 3.58 MHz, M/N-PAL)
- Automatic system discrimination system and forced system mode
- 1 H delay line also serves as comb filter in NTSC demodulation
- Built-in band-pass and take-off filter, SECAM bell filter
- Sub-Color control (-/+2dB)

#### Synchronizing Section

- Built-in horizontal VCO resonator
- Adjustment-free horizontal and vertical oscillation by count-down circuit
- Automatic vertical frequency discrimination circuit
- Noise detection circuit



Weight: 0.83 g (typ.)

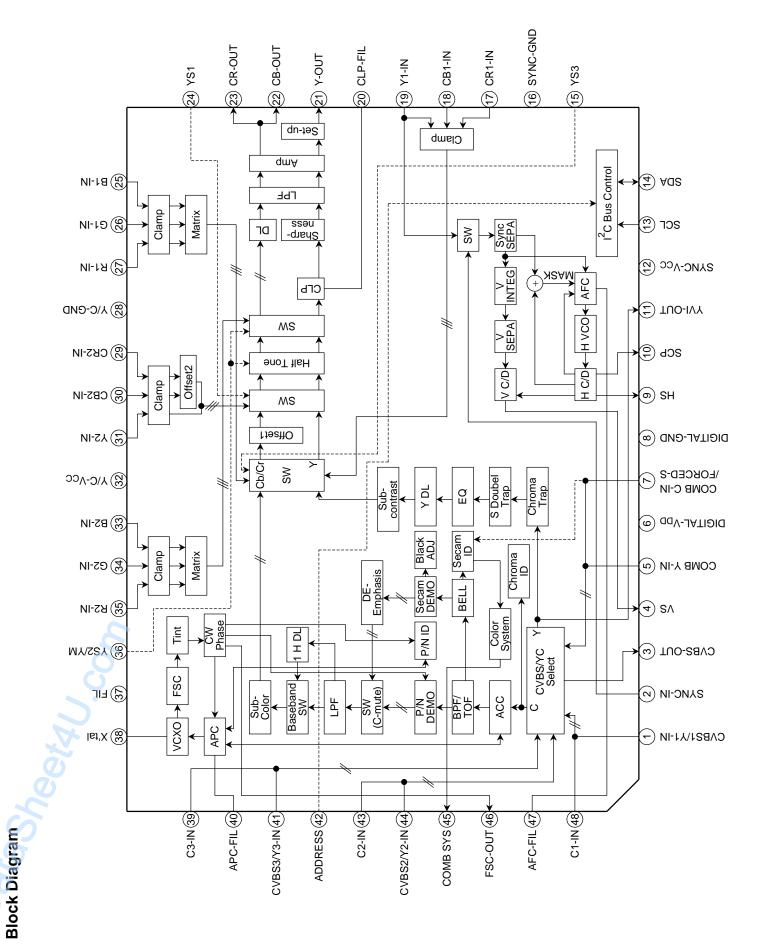
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#### Others

- Y/C out level control
- 4-channels inputs switching
- 2-input circuit for RGB
- 2-input circuit for Y/Cb/Cr
- Y/Cb/Cr outputs
- Cb/Cr offset adjustment
- Built-in pre filters for A/D converter

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# Terminal Descriptions (YC – V<sub>CC</sub>/SYNC – V<sub>CC</sub>/D – V<sub>DD</sub> = 5 V and Ta = 25°C, unless otherwise specified)

Pin No.	Pin Name	Function	Interface Circuit	Input/Output Signals
1	CVBS1/Y1-IN	Input CVBS1/Y1 signal through a clamping capacitor.	$1 \xrightarrow{S_{1}} 1 \xrightarrow{S_{2}} 1 \xrightarrow{S_{1}} 1 \xrightarrow{S_{1}$	CVBS: 1 V <sub>p-p</sub> Y: 1 V <sub>p-p</sub> (with sync) DC: 1.8 V
2	SYNC-IN	Input signal to synchronize.		1 V <sub>p-p</sub> (with sync) DC: 1.7 V
3	CVBS-OUT	CVBS or Y + C signal output pin.	3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 V <sub>p-p</sub> (with sync) DC: 0.6 V
4	vs	Output pin of vertical synchronizing signal. Minimun pull-up resister is 6.8 kΩ.		Hi Low 4.7 V ≦ Hi ≦ 5.2 V 0 V ≦ Low ≦ 0.8 V
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	Pin No.	Pin Name	Function	Interface Circuit	Input/Output Signals
	5	COMB Y-IN	Input luminance signal from Comb filter through a clamping capacitor.	5 250 Ω (32) (	1 V <sub>p-p</sub> (with sync) DC: 1.8 V
	6	D-V <sub>DD</sub>	Power supply pin for DDS/BUS/V-CD/H-CD sections.	_	DC 5 V
	7	COMB C-IN /FORCED-S	Input chroma signal from Comb filter through a clamping capacitor. When this pin is connected to $V_{CC}$ , color killer is OFF and SECAM ID is ON forcibly. (forced SECAM mode) Refer to FUNCTION DESCRIPTION.	(7)	0.3 V <sub>p-p</sub> (burst) DC: 2.4 V 4.0 V ≤ Forced-S ≤ 5.0 V (Th: 3.5 V)
	8	D-GND	GND pin for DDS/BUS/V-CD/H-CD sections.	_	
	9	нs	Output pin of horizontal synchronizing signal. Minimun pull-down resister is 2.7 kΩ.		$J = Hi$ Low $3.8 V \leq Hi \leq 4.6 V$ $0 \leq Low \leq 1.0 V$
	10	SCP	Sand Castle Pulse output pin. The clamping pulse and the horizontal blanking pulse are outputted.		$CP = H-BLK$ $CP \leq 4.4 V$ $CP \leq 4.4 V$ $COV \leq H-BLK \leq 2.4 V$ $COV \leq Low \leq 0.8 V$ with pull-down resister (7.5 k\Omega)
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Yvi-OUT SYNC-V <sub>CC</sub> SCL	Output pin to synchronize inputs. Y signal from video-SW is outputted. Power supply pin for liner SYNC/HVCO sections. SCL pin for I <sup>2</sup> CBUS.	(13)	1 V <sub>p-p</sub> (with sync) DC: 2.1 V DC 5 V
	liner SYNC/HVCO sections.		DC 5 V
SCL	SCL pin for I <sup>2</sup> CBUS.		
SDA	SDA pin for I <sup>2</sup> CBUS.	14 50 Ω 3 kΩ CY CY CY CY CY CY CY CY CY CY	
YS3 (RGB1-in)	Pin to switch main signals and RGB1 signals. If the voltage of this pin is HI and the RGB1-ENB data is "enable" via I <sup>2</sup> C BUS, RGB1-IN is selected. And its status is responded to the Read Bus data.	(15) 6 KΩ G KΩ C Y C Y C Y C Y C Y C Y C Y C Y	1.0 V ≦ RGB1 ≦ 5.0 V (Th: 0.7 V)
SYNC-GND	GND pin for liner SYNC/HVCO sections.	_	
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	YS3 (RGB1-in)	YS3 (RGB1-in) Pin to switch main signals and RGB1 signals. If the voltage of this pin is HI and the RGB1-ENB data is "enable" via I <sup>2</sup> C BUS, RGB1-IN is selected. And its status is responded to the Read Bus data.	SDA       SDA pin for I <sup>2</sup> CBUS.         YS3       Pin to switch main signals and RGB1 signals. If the voltage of this pin is HI and the RGB1-ENB data is "enable" via i <sup>2</sup> C BUS, RGB1-In) is selected.         And its status is responded to the Read Bus data.         SYNC-GND       GND pin for liner SYNC/HVCO sections.

	Pin No.	Pin Name	Function	Interface Circuit	Input/Output Signals
	17	Cr1-IN		17, 18 17, 18 17, 18 18 17, 18	
	18	Cb1-IN	Input Y1/Cb1/Cr1 signal	$18 \qquad \qquad$	Y: 1 V <sub>p-p</sub> (with sync)
	19	Y1-IN	through a clamping capacitor. (selected by I <sup>2</sup> C BUS.) When Y/Cb/Cr1-IN is active, Y1 signal is synchronized.	(19)	DC: 1.7 V Cb/Cr: 0.7 V <sub>p-p</sub> (100% color bar) DC: 2.5 V
	20	CLP-FIL	Connect a filter for clamping Y signal.		
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	Pin No.	Pin Name	Function	Interface Circuit	Input/Output Signals
	21	Y-OUT			DC; Y: 1.3 V, Cb/Cr: 1.8 V
	22	Cb-OUT	Y/Cb/Cr output pins. The output's amplitudes is variable from 0.5 to 1.6 $V_{p-p}$ by I <sup>2</sup> C BUS.	21, 22, 23 50 Ω 4 00 50 Ω	АС; Y: 0.7 V <sub>p-p</sub> (0 dB, non-sync)
	23	Cr-OUT		28	(0 dB, non-sync) Cb/Cr: 0.7 V <sub>p-p</sub> (0 dB)
	24	YS1 (YCbCr2-in)	Pin to switch main signals and YCbCr2 signals.		1.0 V ≦ YCbCr2 ≦ 5.0 V (Th: 0.7 V)
	25	B1-IN			
	26	G1-IN	Input RGB1 signal through a clamping capacitor. (selected by YS3 and I <sup>2</sup> C BUS.)	$\begin{array}{c} 25, \\ 26, \\ 27 \\ 250 \Omega \end{array}$	0.7 V <sub>p-p</sub> DC: 2.5 V
	27	R1-IN			
	28	Y/C-GND	GND pin for Y/C/Text/Video-SW/ 1 H DL sections.	_	
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	Pin No.	Pin Name	Function	Interface Circuit	Input/Output Signals
	29	Cr2-IN		29, 30 270 Ω 270 Ω 240 Ω	
	30	Cb2-IN	Input Y2/Cb2/Cr2 signal through a clamping	30 270 Ω 270 Ω 27	Y: 1 V <sub>p-p</sub> (with sync) DC: 1.7 V
	31	Y2-IN	capacitor. (selected by YS1.)	(31)	Cb/Cr: 0.7 V <sub>p-p</sub> (100% color bar) DC: 2.5 V
	32	Y/C-V <sub>CC</sub>	Power supply pin for Y/C/Text/Video-SW/ 1HDL sections.	_	DC 5 V
	33	B2-IN			
	34 35	G2-IN R2-IN	Input RGB2 signal through a clamping capacitor. (selected by YS2.)	33, 34, 35 250 Ω 250 Ω	0.7 V <sub>p-p</sub> DC: 2.5 V
WW.Datao	36	YS2/YM (RGB2-in)	Pin to switch main signals and RGB2 inputs. Half-tone ON/OFF SW is also included. Half tone gain is selected by I <sup>2</sup> C BUS.		1.0 V ≦ YM ≦ 1.5 V 2.5 V ≦ RGB2 ≦ 5.0 V (Th1: 0.7 V, Th2: 2.0 V)
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]	Pin No.	Pin Name	Function	Interface Circuit	Input/Output Signals
	37	FIL	Connect this terminal to Y/C $V_{CC}$ .		
	38	X'TAL	Pin to connect a 16.2 MHz crystal. Recommended crystal: NR-18 NT162020A, made by NIHON DENPA KOGYO CO, LTD.	(38)	16.2 MHz wave
	39	C3-IN	Input C3 signal through a clamping capacitor.	39	0.3 V <sub>p-p</sub> (burst) DC: 1.6 V
	40	APC-FIL	Connect APC filer.	40 40 40 40 40 40 40 40 40 40	
	41	CVBS3/Y3-IN	Input CVBS3/Y3 signal through a clamping capacitor.	(41)	CVBS: 1 V <sub>p-p</sub> Y: 1 V <sub>p-p</sub> (with sync) DC: 1.8 V
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	Pin No.	Pin Name	Function	Interface Circuit	Input/Output Signals
	42	ADDRESS	Slave address setting pin. Select slave address. When this pin is open, 8A/8B <sub>H</sub> is selected. W 88 <sub>H</sub> 8A <sub>H</sub> 8E <sub>H</sub> R 89 <sub>H</sub> 8B <sub>H</sub> 8F <sub>H</sub>	(6) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	88/89 <sub>H</sub> ≦ 1.3 V 3.9 V ≦ 8E/8F <sub>H</sub> (Th1: 1.5 V, Th2: 3.2 V)
	43	C2-IN	Input C2 signal through a clamping capacitor.	32 43 43 43 40 40 40 43 43 43 43 43 43 43 43 43 43	0.3 V <sub>p-p</sub> (burst) DC: 1.6 V
	44	CVBS2/Y2-IN	Input CVBS2/Y2 signal through a clamping capacitor.	(44)	CVBS: 1 V <sub>p-p</sub> Y: 1 V <sub>p-p</sub> (with sync) DC: 1.8 V
	45	COMB SYS	The status of color system is responded to pin 45 and pin 46. It is the same as Read BUS status.ColorPinPinSystem4546M-PALLowLow4.43PAL, SECAM, B/WLowLow3.58/4.43 NTSCLowHighN-PALHighHighN-PALHighHighN-PALHighHigh		5 V High Low 0 V
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	Pin No.	Pin Name	Function	Interface Circuit	Input/Output Signals
	46	Fsc-OUT	Sub-carrier output pin. Refer to FUNCTION DESCRIPTION.	46 100 Ω 46 32 46 46 28	AC: 0.84 V <sub>p-p</sub> DC: as blow figure. (3.1 V) High Low (2.1 V)
	47	AFC-FIL	Connect AFC filter.		
	48	C1-IN	Input C1 signal through a clamping capacitor.	(32) (32)	0.3 V <sub>p-p</sub> (burst) DC: 1.6 V
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Write Mode

# Slave Address: 88<sub>H</sub>/8A<sub>H</sub>/8E<sub>H</sub>

Preset	0000	1000	0000	0000	0000	0000	1000	0000	1000	1000	0000	1000	0000	0000	0000	0000
Pre	0010	1000	1000	0010	0010	0000	0010	0000	1000	1000	0000	1000	0000	1000	0000	0000
LSB D0			SHARPNESS f <sub>0</sub>			BPF f <sub>0</sub>							BELL/HPF	RGB1 ENB	0	
50		SUB-COLOR	AAAHS			da	COLOR SYSTEM	VIDEO SELECT	Cr OFFSET1	Cr OFFSET2	V-FREQ	S R-Y ADJ	BELI	SETUP-SW	0	
D2	TINT	SUB-C	SHARPNESS EQ	Y-OUT LEVEL	C-OUT LEVEL	BPF Q		NIDEO (	Cr OFI	Cr OFI		S R-)	BELL f <sub>0</sub>	0	0	
D3	I		NARAN	Y-OUT	C-OUT	d8					V C/D MODE		al-v S	Hd-SH	0	TEST MODE
D4						FILTER SW	ЭГ	SELECT			V C/D		3P	0	0	TEST
D5	2	NTRAST	SHARPNESS GAIN			C-TRAP SW	Ч-Л	RGB S	FSET1	Cb OFFSET2	AFC GAIN	, ADJ	S GP	0	0	
D6	P/N GW	SUB-CONTRAST	SHARPNE	OINT	REST	S-D TRAP		HALF TONE	Cb OFFSET1	Cb OFI	AFC	S B-Y ADJ	al s	0	0	
MSB D7	DI N/A			BS POINT	DC REST	LPF	N-COMB	Cb/Cr-MUTE			MVM		S-INHBT	0	0	
Sub Address	80	81	82	83	84	85	86	87	88	68	8A	88	8C	8D	8E	8F

# **Read Mode**

# Slave Address: 89<sub>H</sub>/8B<sub>H</sub>/8F<sub>H</sub>

	D6 D5 D5 COLOR SYSTEM	D4 X'TAL	L D3	D2 N-DET	D1 ET	LSB D0 H-LOCK
V-STD	CID	V-SIG	V15	(note1)	(note1)	0

Note1: Don't care

#### **Bus Control Function**

#### Write Mode

#### Slave Address: 88<sub>H</sub>/8A<sub>H</sub>/8E<sub>H</sub>

ILLSB = 1.1 deg)         (ILSB = 1.1 deg)           PN IGW(1)         PAL/NTSC gate width         0: 2.0 µs, 1: 3.2 µs         2.4           PN ID(1)         PAL/NTSC sensitivity SW         0: Normal, 1: Low         No           SUB-COLOR/&         Sub-color control         0 H: -2 dB to FH: 2 dB         0           SUB-CONTRAST/@         Sub-contrast control         0 H: -2 dB to FH: 2 dB         0           SHARPNESS fo/@         Sharpness center frequency changing         00: 2.5 MHz, 01: 32 MHz         2.5           SHARPNESS GAIN/@         Sharpness gain control         0 H: -6 dB to FH: 6 dB         0           Y-OUT LEVEL/®         Sharpness gain control         0 H: -6 dB to FH: 6 dB         0           Y-OUT LEVEL/®         Y output level control (pin 21)         0 H: -6 dB to FH: 6 dB         0           SN OPP.         Y output level control (pin 22/23)         0 H: 0.5 to 3 FH: 1.6 Vp-p         1.00           BS POINT/2         Black Stretch start point changing         00: 100%, 01: 98%         10           DC REST/2         DC restoration ratio adjustment         00: 100%, 01: 98%         10           DC REST/2         DC restoration ratio adjustment         00: 10, 01: 1.5         11           FILTER SW/(1)         BPF/TOF f0 adjustment         00: 0.0, 1: 0.5         10	Item/Number of Bits	Function	Variable Range	Preset
P/N GW/(1)         PAL/NTSC gate width         0: 2.0 µs, 1: 3.2 µs         2.4           P/N ID/(1)         PAL/NTSC sensitivity SW         0: Normal, 1: Low         No           SUB-COLOR/(4)         Sub-color control         0 H - 2 dB to F H: 2 dB         0           SUB-COLOR/(4)         Sub-color control         0 H - 2 dB to F H: 2 dB         0           SUB-CONTRAST/(4)         Sub-contrast control         0 H: -2 dB to F H: 2 dB         0           SHARPNESS [Q/(2)         Sharpness center frequency changing         00: 2.5 MHz, 01: 3.2 MHz         2.5           SHARPNESS GAIN/(4)         Sharpness qain control         0 H: -6 dB to F H: 6 dB         0           Y-OUT LEVEL(5)         Y output level control (pin 21)         00 H: 0.5 to 3 F H: 1.6 Vp-p.         1.02           BS POINT/(2)         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE         0           C-OUT LEVEL(6)         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 Vp-p.         1.02           DC REST/(2)         DC restoration ratio adjustment         00: 100%, 01: 95%         10           DC REST/(2)         DC restoration ratio adjustment         00: 10.0 01: 1.5         10           BPF [g/(2)         BPF/TOF f_0 adjustment         00: 10.0, 01: 1.5         10           BPF [g/(2)	INT/6	TINT adjustment for NTSC	00H: -33 deg to 3F H: +33 deg	0 deg
P/N ID/C)         PAL/NTSC sensitivity SW         0: Normal, 1: Low         No           SUB-COLOR/@         Sub-color control         0 H: -2 dB to F H: 2 dB         0           SUB-COLOR/@         Sub-contrast control         0 H: -2 dB to F H: 2 dB         0           SUB-CONTRAST/@         Sub-contrast control         0 H: -2 dB to F H: 2 dB         0           SHARPNESS fo/2         Sharpness center frequency changing         00: 2.5 MHz, 01: 3.2 MHz         2.5           Id: 4.0 MHz, 11: OFF         11: 4.1         11:         11:         11:           SHARPNESS GAIN/@         Sharpness gain control         0 H: -6 dB to F H: 6 dB         0         0           Y-UUT LEVEL/@         Y output level control (pin 221)         00 H: 0.5 to 3 F H: 1.6 Vp-p         1.05           BS POINT/2         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE         OC           C-OUT LEVEL/@         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 Vp-p         1.06           DC REST/2         DC restoration ratio adjustment         00: -400 KHz, 01: 40 KHz,         -40           10: 3096, 11: 85%         100         10: 9096, 11: 85%         100           BPF fo/2         BPF/TOF fo adjustment         00: -400 KHz, 01: 40 KHz,         -40           FILTER SW/(1)			(1LSB = 1.1 deg)	
SUB-COLOR/@         Sub-color control         0 H: -2 dB to F H: 2 dB         0           SUB-COLOR/@         Sub-contrast control         0 H: -2 dB to F H: 2 dB         0           SUB-COLOR/@         Sharpness center frequency changing         00: 2.5 MHz, 01: 3.2 MHz         2.5           SHARPNESS EQ/②         Sharpness equalizer characteristic         00: 1: 1.2, 01: 1: 1         1:           SHARPNESS GAIN/@         Sharpness gain control         0 H: -6 dB to F H: 6 dB         0           Y-OUT LEVEL/®         Y output level control (pin 21)         00 H: 0.5 to 3 F H: 1.6 Vp.p         1.00           BS POINT/②         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE         0           C-OUT LEVEL/®         C b/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 Vp.p         1.00           DC REST/②         DC restoration ratio adjustment         00: 100%, 01: 95%         10           DC REST/②         DC restoration ratio adjustment         00: 400 kHz, 11: OFF (by-pass)         -40           BPF fo/②         BPF/TOF Q adjustment         00: 0, 0, 1: 05F         -40           C:TRAP SW/①         BPF/TOF adjustment         0: ON, 1: 0FF         00           COLOR SYSTEM/③         BPF/TOF sewitch         0: ON, 1: 0FF         00           SOUNA America automatic mod	/N GW/①	PAL/NTSC gate width	0: 2.0 μs, 1: 3.2 μs	2.0 μs
SUB-CONTRAST/@         Sub-contrast control         0 H: -2 dB to F H: 2 dB         0           SHARPNESS fp/@         Sharpness center frequency changing         00: 2.5 MHz, 01: 3.2 MHz         2.5           SHARPNESS EQ/@         Sharpness equalizer characteristic         00: 1: 1.2, 01: 1: 1         1:           (evaluation with 2T-pulse)         10: 1.2: 1, 11: 1.4: 1         1:         1:           SHARPNESS GAIN/@         Sharpness gain control         0 H: -6 dB to F H: 6 dB         0           Y-OUT LEVEL/@         Y output level control (pin 21)         00 H: 0.5 to 3 F H: 1.6 Vp-p         1.02           BS POINT/@         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE         C           C-OUT LEVEL/@         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 Vp-p         1.02           DC REST/@         DC restoration ratio adjustment         00: 100%, 01: 95%         100           DC REST/@         DF/TOF fo adjustment         00: 1.00, 01: 1.5         101           10: 2.0, 11: 2.5         IT         IT         IT         IT           FILTER SW/①         BPF/TOF switch         0: ON, 1: OFF         0C         C           COLOR SYSTEM/②         Chroma trap switch         0: OFF, 1: ON         CC         C         IT	/N ID/①	PAL/NTSC sensitivity SW	0: Normal, 1: Low	Normal
SHARPNESS fo/②         Sharpness center frequency changing         00: 2.5 MHz, 01: 3.2 MHz         2.5           SHARPNESS EQ/②         Sharpness equalizer characteristic         00: 1: 1.2, 01: 1: 1         1:           SHARPNESS EQ/②         Sharpness equalizer characteristic         00: 1: 1.2, 01: 1: 1         1:           SHARPNESS GAIN/④         Sharpness gain control         0 H: -6 dB to F H: 6 dB         0           Y-OUT LEVEL/⑥         Y output level control (pin 21)         00 H: 0.5 to 3 F H: 1.6 Vp.p         1.02           BS POINT/②         Black Stretch start point changing         00: CFF (by-pass), 01: 20 IRE         0           C-OUT LEVEL/⑥         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 Vp.p         1.02           DC REST/②         DC restoration ratio adjustment         00: 100%, 01: 95%         10           DC REST/②         BPF/TOF f <sub>0</sub> adjustment         00: 1.00%, 11: 85%         -40           BPF Q/②         BPF/TOF Q adjustment         00: 1.0, 01: 1.5         11           D: 2.0, 11: 2.5         11         11         11         11           FILTER SW/③         BPF/TOF Switch         0: OF, F: 1: OF         00           COLOR SYSTEM③         SECAM double trap switch         0: CN, 1: OFF (by-pass)         00           COLOR SYSTEM⑤	UB-COLOR/④	Sub-color control	0 H: -2 dB to F H: 2 dB	0 dB
10: 4.0 MHz, 11: OFF           SHARPNESS EQ/2         Sharpness equalizer characteristic (evaluation with 2T-pulse)         00: 1: 1.2, 01: 1: 1         1:           SHARPNESS GAIN/4)         Sharpness gain control         0 H: -6 dB to F H: 6 dB         0           Y-OUT LEVEL/6         Y output level control (pin 21)         00 H: 0.5 to 3 F H: 1.6 V <sub>P-P</sub> 1.00           BS POINT/2         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE         C           C-OUT LEVEL/6         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 V <sub>P-P</sub> 1.00           DC REST/2         DC restoration ratio adjustment         00: 100%, 01: 95%         100           DC REST/2         DC restoration ratio adjustment         00: -400 kHz, 01: +0 kHz,         -40           BPF fo/2         BPF/TOF f <sub>0</sub> adjustment         00: -400 kHz, 11: OFF (by-pass)         10           BPF Q/2         BPF/TOF switch         0: BPF, 1: TOF         B           C-TRAP SW/(1)         BPF/TOF switch         0: ON, 1: OFF (by-pass)         C           COLOR SYSTEM(3)         Color system switching         0: ON, 1: OFF (by-pass)         C           EUrope automatic mode; 3.56NTSC, M=PAL, N-PAL         0: ON, 1: OFF (by-pass)         C           COLOR SYSTEM(3)         Y-DL time adjustment (LLSB = 40 ns)	UB-CONTRAST/④	Sub-contrast control	0 H: -2 dB to F H: 2 dB	0 dB
SHARPNESS EQ/(2)         Sharpness equalizer characteristic (evaluation with 2T-pulse)         00: 1: 1.2, 0: 1: 1: 1         1:           SHARPNESS GAIN/@         Sharpness gain control         0 H: -6 dB to F H: 6 dB         0           Y-OUT LEVEL/@         Y output level control (pin 21)         00 H: 0.5 to 3 F H: 1.6 V <sub>P-P</sub> 1.02           BS POINT/(2)         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE 10: 30 IRE, 11: 40 IRE         0           C-OUT LEVEL/@         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 V <sub>P-P</sub> 1.02           DC REST/@         DC restoration ratio adjustment         00: 100%, 01: 95%         1.02           DC REST/@         BPF/TOF f <sub>0</sub> adjustment         00: -400 kHz, 01: +0 kHz, 10: 90%, 11: 85%         -400           BPF fq/2         BPF/TOF Q adjustment         00: 1.0, 01: 1.5         1           BPF Q/@         BPF/TOF Switch         0: BPF, 1: OF         BE           C-TRAP SW/(1)         Chroma trap switch         0: OFF, 1: ON         C           COLOR SYSTEM(3)         Color system switching         00: Europe automatic 3.58NTSC, M-PAL, N-PAL         10: SecAM         10: SecAM           COLOR SYSTEM(3)         Color system switching         000: 0: 10: 0: 10: 52 0 ns         32           South America automatic mode: 3.58NTSC, M-PAL, N-PAL	HARPNESS f <sub>0</sub> /2	Sharpness center frequency changing	00: 2.5 MHz, 01: 3.2 MHz	2.5 MHz
(evaluation with 2T-pulse)         10: 1.2: 1, 11: 1.4: 1           SHARPNESS GAIN(④         Sharpness gain control         0 H: -6 dB to F H: 6 dB         0           Y-OUT LEVEL(⑥         Y output level control (pin 21)         00 H: 0.5 to 3 F H: 1.6 V <sub>P-P</sub> 1.05           BS POINT/②         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE         00           C-OUT LEVEL(⑥         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 V <sub>P-P</sub> 1.06           DC REST/②         DC restoration ratio adjustment         00: 100%, 01: 95%         1.06           DC REST/②         DC restoration ratio adjustment         00: 100%, 01: 95%         1.06           BPF fo/②         BPF/TOF f <sub>0</sub> adjustment         00: -400 kHz, 01: +0 kHz,         -400           BPF Q/②         BPF/TOF Q adjustment         00: 00: 1.0, 01: 1.5         10: 2.0, 11: 2.5           FILTER SW/①         BPF/TOF Switch         0: BPF, 1: TOF         BE           C-TRAP SW/①         Chroma trap switch         0: OFF, 1: ON         CC           COLOR SYSTEM(③         Color system switching         00: Europe automatic         01: 5.04 ANTSC, 3.58NTSC, 3.58NTSC, SECAM         01: 5.44 ANTSC           South America automatic mode: 3.58NTSC, M-PAL, N-PAL         101: SeCAM         101: SECAM         101: SECAM			10: 4.0 MHz, 11: OFF	
SHARPNESS GAIN/④         Sharpness gain control         0 H: -6 dB to F H: 6 dB         0           Y-OUT LEVEL/⑤         Y output level control (pin 21)         00 H: 0.5 to 3 F H: 1.6 Vp-p         1.00           BS POINT/②         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE         C           C-OUT LEVEL/⑥         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 Vp-p         1.00           DC REST/②         DC restoration ratio adjustment         00: 100%, 01: 95%         100           DC REST/②         DC restoration ratio adjustment         00: -400 kHz, 01: +0 kHz, 11: 0FF (by-pass)         -40           BPF fg/②         BPF/TOF f <sub>0</sub> adjustment         00: -400 kHz, 01: +0 kHz, 11: 0FF (by-pass)         -40           BPF Q/②         BPF/TOF Q adjustment         00: 10, 01: 1.5 10: 2.0, 11: 2.5         10           FILTER SW/①         BPF/TOF switch         0: BPF, 1: TOF         BE           C-TRAP SW/①         Chroma trap switch         0: OFF, 1: ON         C           CDC SYSTEM/③         SecAM double trap switch         0: OFF, 1: ON         C           COLOR SYSTEM/③         Color system switching         000: Europe automatic         Europe a.3.58NTSC, M=PAL, N=PAL           South America automatic mode; 3.58NTSC, M=PAL, N=PAL         100: 4.33 FAL         100: 4.33 FAL <t< td=""><td>HARPNESS EQ/2</td><td>Sharpness equalizer characteristic</td><td>00: 1: 1.2, 01: 1: 1</td><td>1: 1.2</td></t<>	HARPNESS EQ/2	Sharpness equalizer characteristic	00: 1: 1.2, 01: 1: 1	1: 1.2
Y-OUT LEVEL/©         Y output level control (pin 21)         00 H: 0.5 to 3 F H: 1.6 V <sub>p-p</sub> 1.00           BS POINT/②         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE         C           C-OUT LEVEL/©         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 V <sub>p-p</sub> 1.00           DC REST/②         DC restoration ratio adjustment         00: 100%, 01: 95%         100           DC REST/②         DC restoration ratio adjustment         00: 1-400 kHz, 01: +0 kHz,         -40           BPF fg/②         BPF/TOF f <sub>0</sub> adjustment         00: 1-0, 01: 1.5         -40           10: 2-0, 11: 2.5         FILTER SW/①         BPF/TOF adjustment         00: 10, 01: 1.5         10:           SD TRAP (3)         SECAM double trap switch         0: OFF, 1: OF         BE         C           S-D TRAP (3)         SECAM double trap switch         0: OFF, 1: ON         CC         C           COLOR SYSTEM(3)         Color system switching         000: Europe automatic         Europe         01: 4.43 NTSC         3:58 NTSC           South America automatic mode:         3.58 NTSC, M-PAL, N-PAL         100: 520 ns         3:2         32           V-DL/④         Y-DL time adjustment (1LSB = 40 ns)         0000: 120 to 1010: 520 ns         32         32 <td< td=""><td></td><td>(evaluation with 2T-pulse)</td><td>10: 1.2: 1, 11: 1.4: 1</td><td></td></td<>		(evaluation with 2T-pulse)	10: 1.2: 1, 11: 1.4: 1	
BS POINT/(2)         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE         C           C-OUT LEVEL/(6)         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 V <sub>p-p</sub> 1.06           DC REST/(2)         DC restoration ratio adjustment         00: 100%, 01: 95%         10           DC REST/(2)         DC restoration ratio adjustment         00: -400 kHz, 01: +0 kHz,         -40           BPF fg/(2)         BPF/TOF f <sub>0</sub> adjustment         00: -400 kHz, 01: +0 kHz,         -40           10: +400 kHz, 11: OFF (by-pass)         01         -40         10: +400 kHz, 11: OFF (by-pass)           BPF Q/(2)         BPF/TOF Q adjustment         00: 1.0, 01: 1.5         11           BPF Q/(2)         BPF/TOF Switch         0: BPF, 1: TOF         B           C-TRAP SW/(1)         Chroma trap switch         0: ON, 1: OFF         C           COLOR SYSTEM/(3)         Color system switching         000: Europe automatic         Europe           Europe automatic mode;         3.58NTSC, M-PAL, N-PAL         101: SO 1010: 520 ns         32           Y-DL/(4)         Y-DL time adjustment (1LSB = 40 ns)         0000: 120 to 1010: 520 ns         32           N-COMB/(1)         1 H addition switch, when NTCS.         0: OFF, 1: ADD         C           VIDEO SELECT/(4)         <	HARPNESS GAIN/④	Sharpness gain control	0 H: –6 dB to F H: 6 dB	0 dB
BS POINT/(2)         Black Stretch start point changing         00: OFF (by-pass), 01: 20 IRE         C           C-OUT LEVEL/(6)         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 Vp-p         1.00           DC REST/(2)         DC restoration ratio adjustment         00: 100%, 01: 95%         10           DC REST/(2)         DC restoration ratio adjustment         00: -400 kHz, 01: +0 kHz,         -40           BPF fg/(2)         BPF/TOF f <sub>0</sub> adjustment         00: -400 kHz, 01: +0 kHz,         -40           10: +400 kHz, 11: OFF (by-pass)         01         -40         10: +400 kHz, 11: OFF (by-pass)           BPF Q/(2)         BPF/TOF Q adjustment         00: 1.0, 01: 1.5         11           BPF Q/(2)         BPF/TOF S witch         0: BPF, 1: TOF         B           C-TRAP SW/(1)         Chroma trap switch         0: ON, 1: OFF         C           COLOR SYSTEM/(3)         Color system switching         000: Europe automatic         Europe           Europe automatic mode;         3.58NTSC, M-PAL, N-PAL         101: SO 1010: 520 ns         32           Y-DL/(4)         Y-DL time adjustment (1LSB = 40 ns)         0000: 120 to 1010: 520 ns         32           N*COMB/(1)         1 H addition switch, when NTCS.         0: OFF, 1: ADD         CO           VIDEO SELECT/(4)         <	-OUT LEVEL/6	Y output level control (pin 21)	00 H: 0.5 to 3 F H: 1.6 V <sub>p-p</sub>	1.05 V <sub>p-p</sub>
C-OUT LEVEL/®         Cb/Cr output level control (pin 22/23)         00 H: 0.5 to 3 F H: 1.6 V <sub>p-p</sub> 1.05           DC REST/②         DC restoration ratio adjustment         00: 100%, 01: 95%         10           DC REST/②         DC restoration ratio adjustment         00: 100%, 01: 95%         10           BPF fg/②         BPF/TOF f <sub>0</sub> adjustment         00: -400 kHz, 01: +0 kHz, 01: +0 kHz, 11: OFF (by-pass)         -40           BPF Q/②         BPF/TOF Q adjustment         00: 1.0, 01: 1.5         10           BPF Q/②         BPF/TOF Switch         0: BPF, 1: TOF         B           C-TRAP SW/①         Chroma trap switch         0: O. N, 1: OFF         0           S-D TRAP/①         SECAM double trap switch         0: O. N, 1: OFF (by-pass)         0           COLOR SYSTEM/③         Y/Cb/Cr LPF switch         0: ON, 1: OFF (by-pass)         0           COLOR SYSTEM/③         South America automatic mode; 4.43PAL, 4.43NTSC, 3.58NTSC, SECAM         000: Europe automatic         Europe           Y-DL/④         Y-DL time adjustment (1LSB = 40 ns)         0000: 120 to 1010: 520 ns         32           NCCOMB/①         1 H addition switch, when NTCS.         0: OFF, 1: ADD         0           NCOMB/①         1 H addition switch, when NTCS.         0: OFF, 1: ADD         00           VIDEO SELECT/④	S POINT/2	Black Stretch start point changing	00: OFF (by-pass), 01: 20 IRE	OFF
DC REST/2         DC restoration ratio adjustment         00: 100%, 01: 95%         10           BPF fg/2         BPF/TOF f <sub>0</sub> adjustment         00: -400 kHz, 01: +0 kHz, 11: OFF (by-pass)         -40           BPF Q/2         BPF/TOF Q adjustment         00: 10, 01: 1.5         -40           BPF Q/2         BPF/TOF Q adjustment         00: 10, 01: 1.5         11           BPF Q/2         BPF/TOF Switch         0: BPF, 1: TOF         B           C-TRAP SW/①         Chroma trap switch         0: ON, 1: OFF         0           C-TRAP SW/①         SECAM double trap switch         0: ON, 1: OFF         0           COLOR SYSTEM/3         Color system switching         000: Europe automatic 01: 3.58 NTSC 3.58NTSC, SECAM         01: South America automatic 01: 3.58 NTSC         01: 3.43 NTSC           South America automatic mode; 3.58NTSC, SECAM         South America automatic mode; 3.58NTSC, SECAM         011: 4.43 NTSC         011: 4.43 NTSC           Y-DL/3         Y -DL time adjustment (1LSB = 40 ns)         0000: 120 to 1010: 520 ns         32           NCCOMB/①         1 H addition switch, when NTCS.         0: OFF, 1: ADD         OC           VIDEO SELECT/3         Selection of input sources.         00: Main, 01: YCDCr1         M			10: 30 IRE, 11: 40 IRE	
DC REST/2         DC restoration ratio adjustment         00: 100%, 01: 95%         10           BPF fg/2         BPF/TOF f <sub>0</sub> adjustment         00: -400 kHz, 01: +0 kHz, 11: OFF (by-pass)         -40           BPF Q/2         BPF/TOF Q adjustment         00: 10, 01: 1.5         -40           BPF Q/2         BPF/TOF Q adjustment         00: 10, 01: 1.5         11           BPF Q/2         BPF/TOF Switch         0: BPF, 1: TOF         B           C-TRAP SW/①         Chroma trap switch         0: ON, 1: OFF         0           C-TRAP SW/①         SECAM double trap switch         0: ON, 1: OFF         0           COLOR SYSTEM/3         Color system switching         000: Europe automatic 01: 3.58 NTSC 3.58NTSC, SECAM         01: South America automatic 01: 3.58 NTSC         01: 3.43 NTSC           South America automatic mode; 3.58NTSC, SECAM         South America automatic mode; 3.58NTSC, SECAM         011: 4.43 NTSC         011: 4.43 NTSC           Y-DL/3         Y -DL time adjustment (1LSB = 40 ns)         0000: 120 to 1010: 520 ns         32           NCCOMB/①         1 H addition switch, when NTCS.         0: OFF, 1: ADD         OC           VIDEO SELECT/3         Selection of input sources.         00: Main, 01: YCDCr1         M	-OUT LEVEL/6	Cb/Cr output level control (pin 22/23)		1.05 V <sub>p-p</sub>
10: 90%, 11: 85%           BPF fg/②         BPF/TOF f0 adjustment         00: -400 kHz, 01: +0 kHz, 1 0 FF (by-pass)         -40           BPF Q/②         BPF/TOF Q adjustment         00: 1.0, 01: 1.5         11           BPF Q/②         BPF/TOF Q adjustment         00: 1.0, 01: 1.5         11           BPF Q/②         BPF/TOF switch         0: BPF, 1: TOF         B           C-TRAP SW/①         Chroma trap switch         0: ON, 1: OFF         0           S-D TRAP/①         SECAM double trap switch         0: ON, 1: OFF         0           LPF/①         Y/Cb/Cr LPF switch         0: ON, 1: OFF (by-pass)         0           COLOR SYSTEM/③         Color system switching         000: Europe automatic mode; 4.43PAL, 4.43NTSC, 3.58NTSC, SECAM         001: South America automatic 010: 3.58 NTSC         011: 3.58 NTSC           South America automatic mode; 3.58NTSC, M-PAL, N-PAL         Net Adamerica automatic mode; 10: 3.58 NTSC         011: 4.43 NTSC         100: 4.43 PAL           Y-DL/④         Y-DL time adjustment (1LSB = 40 ns)         0000: 120 to 1010: 520 ns         32           N-COMB/①         1 H addition switch, when NTCS.         0: OFF, 1: ADD         OC           VIDEO SELECT/④         Selection of input video signals         Refer to FUNCTION DESCRIPTION.         001           RGB SELECT/②         Selection	C REST/2			100%
BPF Q/2BPF/TOF Q adjustment10: +400 kHz, 11: OFF (by-pass)BPF Q/2BPF/TOF Q adjustment00: 1.0, 01: 1.5 10: 2.0, 11: 2.511FILTER SW/①BPF/TOF switch0: BPF, 1: TOFBC-TRAP SW/①Chroma trap switch0: ON, 1: OFF0SECAM double trap switch0: OFF, 1: ONCLPF/①Y/Cb/Cr LPF switch0: ON, 1: OFF (by-pass)0COLOR SYSTEM/3Color system switching000: Europe automatic 01: South America automatic 01: 3.58 NTSC 010: 3.58 NTSCEuropeSouth America automatic mode; 3.58NTSC, M-PAL, N-PAL Refer to FUNCTION DESCRIPTION.0000: 120 to 1010: 520 ns 1011 to 1111: don't use32Y-DL/@Y-DL time adjustment (1LSB = 40 ns) Refer to FUNCTION DESCRIPTION.0000: 120 to 1010: 520 ns 1011 to 1111: don't use32N-COMB/①1 H addition switch, when NTCS.0: OFF, 1: ADDOC FUNCTION DESCRIPTION.RGB SELECT/②Selection of input sources.00: Main, 01: YCbCr1M	-			
BPF Q/2BPF/TOF Q adjustment10: +400 kHz, 11: OFF (by-pass)BPF Q/2BPF/TOF Q adjustment00: 1.0, 01: 1.5 10: 2.0, 11: 2.511FILTER SW/①BPF/TOF switch0: BPF, 1: TOFBC-TRAP SW/①Chroma trap switch0: ON, 1: OFF0SECAM double trap switch0: OFF, 1: ONCLPF/①Y/Cb/Cr LPF switch0: ON, 1: OFF (by-pass)0COLOR SYSTEM/3Color system switching000: Europe automaticEuropeEurope automatic mode; 3.58NTSC, M-PAL, A.43NTSC, 3.58NTSC, SECAM000: Europe automatic01: 3.58 NTSCSouth America automatic mode; 3.58NTSC, M-PAL, N-PAL011: 4.43 NTSC100: 4.43 PALRefer to FUNCTION DESCRIPTION.101: SECAM101: SECAM101: SECAMY-DL/@Y-DL time adjustment (1LSB = 40 ns) Refer to FUNCTION DESCRIPTION.0000: 120 to 1010: 520 ns32N-COMB/①1 H addition switch, when NTCS.0: OFF, 1: ADDOCVIDEO SELECT/@Selection of input video signalsRefer to FUNCTION DESCRIPTION.00RGB SELECT/2Selection of input sources.00: Main, 01: YCbCr1M	PF f <sub>0</sub> /2	BPF/TOF f₀ adjustment		-400 kHz
BPF Q/2BPF/TOF Q adjustment00: 1.0, 01: 1.5 10: 2.0, 11: 2.511FILTER SW/①BPF/TOF switch0: BPF, 1: TOFBC-TRAP SW/①Chroma trap switch0: ON, 1: OFFCS-D TRAP/①SECAM double trap switch0: OFF, 1: ONCLPF/①Y/Cb/Cr LPF switch0: ON, 1: OFF (by-pass)CCOLOR SYSTEM/③Color system switching Europe automatic mode; 3.58NTSC, M-PAL, N-PAL000: Europe automatic 01: South America automatic 010: 3.58 NTSC 100: 4.43 PALEuropeY-DL/④Y-DL time adjustment (1LSB = 40 ns) Refer to FUNCTION DESCRIPTION.00000: 120 to 1010: 520 ns 1011 to 1111: don't use32N-COMB/①1 H addition switch, when NTCS. Selection of input video signals0: OFF, 1: ADDOCRGB SELECT/②Selection of input sources.00: Main, 01: YCbCr1M	0			
FILTER SW/①BPF/TOF switch0: BPF, 1: TOFBC-TRAP SW/①Chroma trap switch0: ON, 1: OFF0SECAM double trap switch0: OFF, 1: ON0LPF/①Y/Cb/Cr LPF switch0: ON, 1: OFF (by-pass)0COLOR SYSTEM/③Color system switching000: Europe automatic000: Europe automaticCOLOR SYSTEM/③Color system switching000: Europe automatic001: South America automaticCOLOR SYSTEM/③Color system switching000: Europe automatic011: South America automaticSouth America automatic mode; 3.58NTSC, M-PAL, N-PAL011: 3.58 NTSC011: 4.43 NTSCSouth America automatic mode; 3.58NTSC, M-PAL, N-PAL000: 120 to 1010: 520 ns32Y-DL/④Y-DL time adjustment (1LSB = 40 ns) Refer to FUNCTION DESCRIPTION.0000: 120 to 1010: 520 ns32N-COMB/①1 H addition switch, when NTCS.0: OFF, 1: ADDOCVIDEO SELECT/④Selection of input video signalsRefer to FUNCTION DESCRIPTION.00RGB SELECT/②Selection of input sources.00: Main, 01: YCbCr1M	PF Q/2	BPF/TOF Q adjustment		1.0
FILTER SW/①BPF/TOF switch0: BPF, 1: TOFBC-TRAP SW/①Chroma trap switch0: ON, 1: OFFCS-D TRAP/①SECAM double trap switch0: OFF, 1: ONCLPF/①Y/Cb/Cr LPF switch0: ON, 1: OFF (by-pass)CCOLOR SYSTEM/③Color system switching000: Europe automaticEuropeEurope automatic mode; 4.43PAL, 4.43NTSC, 3.58NTSC, SECAM000: Europe automaticEuropeSouth America automatic mode; 3.58NTSC, M-PAL, N-PAL011: 3.58 NTSC011: 4.43 NTSCY-DL/④Y-DL time adjustment (1LSB = 40 ns)0000: 120 to 1010: 520 ns32N-COMB/①1 H addition switch, when NTCS.0: OFF, 1: ADDCVIDEO SELECT/④Selection of input video signalsRefer to00RGB SELECT/②Selection of input sources.00: Main, 01: YCbCr1M			10: 2.0, 11: 2.5	
S-D TRAP/①       SECAM double trap switch       0: OFF, 1: ON       CC         LPF/①       Y/Cb/Cr LPF switch       0: ON, 1: OFF (by-pass)       CC         COLOR SYSTEM/③       Color system switching       000: Europe automatic       Europe         Europe automatic mode; 4.43PAL, 4.43NTSC, 3.58NTSC, SECAM       000: Europe automatic       001: South America automatic       Europe         South America automatic mode; 3.58NTSC, M-PAL, N-PAL       011: 4.43 NTSC       010: 4.43 PAL       100: 4.43 PAL         Refer to FUNCTION DESCRIPTION.       101: SECAM       101: SECAM       101: SECAM       32         Y-DL/④       Y-DL time adjustment (1LSB = 40 ns)       0000: 120 to 1010: 520 ns       32         N-COMB/①       1 H addition switch, when NTCS.       0: OFF, 1: ADD       CC         VIDEO SELECT/④       Selection of input video signals       Refer to FUNCTION DESCRIPTION.       00: Main, 01: YCbCr1       M	ILTER SW/1	BPF/TOF switch		BPF
LPF/①Y/Cb/Cr LPF switch0: ON, 1: OFF (by-pass)0COLOR SYSTEM/③Color system switching Europe automatic mode; 4.43PAL, 4.43NTSC, 3.58NTSC, SECAM000: Europe automatic 011: South America automatic 011: 3.58 NTSCEurope 001: South America automatic 011: 4.43 NTSC 100: 4.43 PAL 101: SECAMEurope 011: 4.43 NTSC 100: 4.43 PAL 101: SECAM 	-TRAP SW/①	Chroma trap switch	0: ON, 1: OFF	ON
COLOR SYSTEM/③       Color system switching       000: Europe automatic       Europe         Europe automatic mode; 4.43PAL, 4.43NTSC, 3.58NTSC, SECAM       000: Europe automatic       001: South America automatic         South America automatic mode; 3.58NTSC, M-PAL, N-PAL       010: 3.58 NTSC       011: 4.43 NTSC         Refer to FUNCTION DESCRIPTION.       000: 120 to 1010: 520 ns       32         Y-DL/④       Y-DL time adjustment (1LSB = 40 ns)       0000: 120 to 1010: 520 ns       32         N-COMB/①       1 H addition switch, when NTCS.       0: OFF, 1: ADD       CO         VIDEO SELECT/④       Selection of input video signals       Refer to FUNCTION DESCRIPTION.       00: Main, 01: YCbCr1       M	-D TRAP/①	SECAM double trap switch	0: OFF, 1: ON	OFF
Europe automatic mode; 4.43PAL, 4.43NTSC, 3.58NTSC, SECAM001: South America automatic 010: 3.58 NTSC 011: 4.43 NTSC 100: 4.43 PAL 101: SECAM001: South America automatic 010: 3.58 NTSC 011: 4.43 NTSC 100: 4.43 PAL 101: SECAM 110: M-PAL, 111: N-PALY-DL/④Y-DL time adjustment (1LSB = 40 ns) Refer to FUNCTION DESCRIPTION.00000: 120 to 1010: 520 ns 	PF/①	Y/Cb/Cr LPF switch	0: ON, 1: OFF (by-pass)	ON
Europe automatic mode; 4.43PAL, 4.43NTSC, 3.58NTSC, SECAM001: South America automatic 010: 3.58 NTSC 011: 4.43 NTSC 001: South America automatic 010: 3.58 NTSC 011: 4.43 NTSC 100: 4.43 PAL 101: SECAM 110: M-PAL, 111: N-PAL001: South America automatic 010: 3.58 NTSC 011: 4.43 NTSC 100: 4.43 PAL 101: SECAM 110: M-PAL, 111: N-PALY-DL/④Y-DL time adjustment (1LSB = 40 ns) Refer to FUNCTION DESCRIPTION.0000: 120 to 1010: 520 ns 1011 to 1111: don't use32N-COMB/①1 H addition switch, when NTCS.0: OFF, 1: ADDCC OU FUNCTION DESCRIPTION.VIDEO SELECT/④Selection of input video signalsRefer to FUNCTION DESCRIPTION.00 Main, 01: YCbCr1RGB SELECT/②Selection of input sources.00: Main, 01: YCbCr1M	OLOR SYSTEM/3	Color system switching	000: Europe automatic	Europe automa
SECAM010: 3.58 NTSCSouth America automatic mode; 3.58NTSC, M-PAL, N-PAL011: 4.43 NTSC100: 4.43 PAL100: 4.43 PALRefer to FUNCTION DESCRIPTION.101: SECAM110: M-PAL, 111: N-PAL110: M-PAL, 111: N-PALY-DL/4Y-DL time adjustment (1LSB = 40 ns)0000: 120 to 1010: 520 nsRefer to FUNCTION DESCRIPTION.1011 to 1111: don't use32N-COMB/11 H addition switch, when NTCS.0: OFF, 1: ADDCOVIDEO SELECT/4Selection of input video signalsRefer to00RGB SELECT/2Selection of input sources.00: Main, 01: YCbCr1M		Europe automatic mode;	001: South America automatic	
South America automatic mode; 3.58NTSC, M-PAL, N-PAL Refer to FUNCTION DESCRIPTION.011: 4.43 NTSC 100: 4.43 PAL 101: SECAM 110: M-PAL, 111: N-PALY-DL 4Y-DL time adjustment (1LSB = 40 ns) Refer to FUNCTION DESCRIPTION.0000: 120 to 1010: 520 ns 1011 to 1111: don't use32 32 32 32 32 1011 to 1111: don't useN-COMB/①1 H addition switch, when NTCS.0: OFF, 1: ADDCC 9000: 120 to 1010: 520 ns 1011 to 1111: don't useN-COMB/①1 H addition switch, when NTCS.0: OFF, 1: ADDCC 9000: 120 to 1010: 520 ns 1011 to 1111: don't useRGB SELECT/④Selection of input video signalsRefer to 900: Main, 01: YCbCr100 900: Main, 01: YCbCr1			010: 3.58 NTSC	
3.58NTSC, M-PAL, N-PAL Refer to FUNCTION DESCRIPTION.100: 4.43 PAL 101: SECAM 110: M-PAL, 111: N-PALY-DL/④Y-DL time adjustment (1LSB = 40 ns) Refer to FUNCTION DESCRIPTION.0000: 120 to 1010: 520 ns 1011 to 1111: don't use32N-COMB/①1 H addition switch, when NTCS.0: OFF, 1: ADDCCVIDEO SELECT/④Selection of input video signalsRefer to FUNCTION DESCRIPTION.000: Main, 01: YCbCr1RGB SELECT/②Selection of input sources.00: Main, 01: YCbCr1M			011: 4.43 NTSC	
Y-DL (a)Y-DL time adjustment (1LSB = 40 ns) Refer to FUNCTION DESCRIPTION.0000: 120 to 1010: 520 ns 1011 to 1111: don't use32 32 32 0000: 120 to 1010: 520 ns 1011 to 1111: don't useN-COMB/(1)1 H addition switch, when NTCS.0: OFF, 1: ADDCC 00 FUNCTION DESCRIPTION.VIDEO SELECT/(4)Selection of input video signalsRefer to FUNCTION DESCRIPTION.00 00: Main, 01: YCbCr1RGB SELECT/(2)Selection of input sources.00: Main, 01: YCbCr1M	5		100: 4.43 PAL	
Y-DL/④Y-DL time adjustment (1LSB = 40 ns) Refer to FUNCTION DESCRIPTION.0000: 120 to 1010: 520 ns 1011 to 1111: don't use32 32 32 1011 to 1111: don't useN-COMB/①1 H addition switch, when NTCS.0: OFF, 1: ADDCC CVIDEO SELECT/④Selection of input video signalsRefer to FUNCTION DESCRIPTION.00 OFF, 1: ADDRGB SELECT/②Selection of input sources.00: Main, 01: YCbCr1M		Refer to FUNCTION DESCRIPTION.	101: SECAM	
Refer to FUNCTION DESCRIPTION.       1011 to 1111: don't use         N-COMB/①       1 H addition switch, when NTCS.       0: OFF, 1: ADD       C         VIDEO SELECT/④       Selection of input video signals       Refer to FUNCTION DESCRIPTION.       00         RGB SELECT/②       Selection of input sources.       00: Main, 01: YCbCr1       M			110: M-PAL, 111: N-PAL	
N-COMB/①       1 H addition switch, when NTCS.       0: OFF, 1: ADD       CC         VIDEO SELECT/④       Selection of input video signals       Refer to FUNCTION DESCRIPTION.       00         RGB SELECT/②       Selection of input sources.       00: Main, 01: YCbCr1       M	-DL/④	Y-DL time adjustment (1LSB = 40 ns)	0000: 120 to 1010: 520 ns	320 ns
VIDEO SELECT/④         Selection of input video signals         Refer to FUNCTION DESCRIPTION.         OU           RGB SELECT/②         Selection of input sources.         00: Main, 01: YCbCr1         M		Refer to FUNCTION DESCRIPTION.	1011 to 1111: don't use	
FUNCTION DESCRIPTION.       RGB SELECT/②     Selection of input sources.     00: Main, 01: YCbCr1     M	-COMB/①	1 H addition switch, when NTCS.	0: OFF, 1: ADD	OFF
RGB SELECT/②     Selection of input sources.     00: Main, 01: YCbCr1     M	IDEO SELECT/④	Selection of input video signals	Refer to	0000
			FUNCTION DESCRIPTION.	
Refer to FUNCTION DESCRIPTION. 10: RGB1, 11: don't use	GB SELECT/2	Selection of input sources.	00: Main, 01: YCbCr1	Main
		Refer to FUNCTION DESCRIPTION.	10: RGB1, 11: don't use	
HALF TONE/①     Half tone gain switch     0: -10 dB, 1: -6 dB     -10	ALF TONE/①	Half tone gain switch	0: –10 dB, 1: –6 dB	-10 dB

Cb/Cr-MUTE/①	Function	Variable Range	Preset
	Cb/Cr output mute switch	0: OFF, 1: ON	OFF
Cb/Cr OFFSET1/4/4	Cb/Cr offset adjustment (main route)	0 H: –12 to F H: +10.5 mV	0 mV
Cb/Cr OFFSET2/④/④	Cb/Cr offset adjustment (YCbCr2 input)	0 H: –12 to F H: +10.5 mV	0 mV
/-FREQ/③	V count down frequency switch.	000: Automatic mode 1,	Automatic mode
	Automatic mode 1;	001: 50 Hz, 010: 60 Hz,	
	50/60 Hz automatic distinction. At no-signal, the last statement is	011: Automatic mode 2,	
	kept. Right after power-on, 50 Hz mode is run.	100: Forced 312.5 H (AFC free-run),	
	Automatic mode 2;	101: Forced 262.5 H (AFC free-run),	
	50/60 Hz automatic distinction. And 50 Hz mode is run at	110: Forced 313 H (AFC free-run),	
	no-signal.	111: Forced 263 H (AFC free-run)	
	Refer to FUNCTION DESCRIPTION.		
/ C/D MODE/2	V count down judge switch.	00: Normal, 01: Teletext,	Normal
	Refer to FUNCTION DESCRIPTION.	10: Fast, 11: Normal	
AFC GAIN/2	AFC sensitivity switch	00: +6 dB, 01: 0 dB,	+6 dB
		10: –6 dB, 11: –17 dB	(data: 00)
MVM/①	Macrovision Mask + AFC Mask	0: Narrow, 1: Always masked	Narrow
S R-Y ADJ/④	SECAM R-Y black adjustment	0 H: –10 to F H: 8.8 mV	0 mV
S B-Y ADJ/④	SECAM B-Y black adjustment	0 H: –10 to F H: 8.8 mV	0 mV
BELL/HPF/2	SECAM bell/HPF switching. Or the high	00: Bell, 01: Boost 1,	Bell
	frequency side on SECAM bell filter is boosted.	10: Boost 2, 11: HPF	
	Refer to FUNCTION DESCRIPTION.		
BELL f <sub>0</sub> /①	BELL f <sub>0</sub> adjustment	0: Normal, 1: +15 kHz	Normal
S V-ID SW/①	SECAM V-ID switch	0: OFF, 1: ON	OFF
5 GP/2	SECAM gate position adjustment (its width is same)	00: Normal, 01: 0.4 $\mu s$ delay,	Normal
		10: Normal, 11: 0.4 μs forward	
S ID/①	SECAM sensitivity switch	0: Normal, 1: Low	Normal
S-INHBT/①	SECAM inhibition switch	0: Normal, 1: Inhibited	Normal
RGB1 ENB/①	Enable YS3 to switch to RGB1-IN.	0: Disable, 1: Enable	Disable
	Refer to FUNCTION DESCRIPTION.		ļ
SETUP-SW/①	Y black level set-up	0: Normal, 1: Set-up	Normal
HS-PH/①	HS Output phase switch	0: H-Sync (4.7 μs),	H-Sync
TEST MODE/8		1: GP (3.2 μs)	
	Factory test mode. Set all zero.		00 <sub>H</sub>

#### **Read Mode**

#### Slave Address: 89<sub>H</sub>/8B<sub>H</sub>/8F<sub>H</sub>

	Function	Variable Range
H-LOCK/①	H.Lock detection	0: Un-lock, 1: Lock
N-DET/2	Noise judgment	00: SN > 30 dB,
		01: —,
		10: 30 $dB > SN > 20 dB$ ,
		11: 20 dB > SN
X'TAL/2	Crystal mode judgment	00: 4.433619 MHz (PAL)
		01: 3.579545 MHz (NTSC)
		10: 3.575611 MHz (M-PAL)
		11: 3.582056 MHz (N-PAL)
COLOR SYSTEM/2	Color system judgment	00: B/W, 01: PAL
		10: NTSC, 11: SECAM
POR/①	Power On Reset	0: Normal, 1: Resistor preset
V15/①	Status of pin 15 voltage	0: Low, 1: High
	Refer to FUNCTION DESCRIPTION.	
V-SIG/①	Internal V.pulse detection for V.lock	0: Existing, 1: Not existing
C ID/①	Input signal condition	0: Not detected (CVBS),
~	(detection of burst signal on C-IN pins)	1: Detected (Y/C)
	Refer to FUNCTION DESCRIPTION.	· · · · /
V-STD/①	Decision on the standard of the vertical frequency.	0: Non-STD, 1: STD
	When no-signal, 1: STD is responded.	-
V-FREQ/①	Vertical frequency judgment.	0: 50 Hz, 1: 60 Hz
	Right after power-on, 0: 50 Hz is responded.	
	At no-signal, the last statement is kept.	
Mos. Neveral		

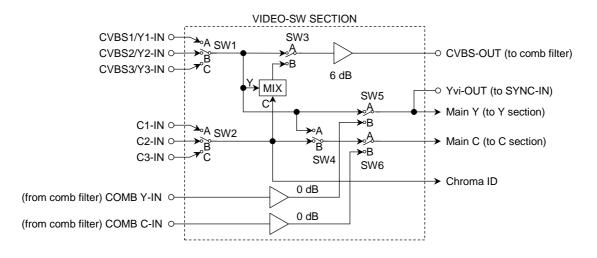
# <u>TOSHIBA</u>

#### **Function Description**

#### Video Select, Auto-SW

(1) "AUTO-SW" = (1) Manual Select

In video SW section, input signal is selected by the BUS as Figure 1 and Table 1. Mainly, CVBS-OUT (pin 3) is used for the comb filter input, and Yvi-OUT (pin 11) is used for synchronization (pin 2). Besides, on chroma line from video SW to main route, the peak detection is done during the burst period. The result is responded to the Read BUS data, C ID.



#### Figure 1 Signal Route at Video SW Section

Bus		SW Mode					To Y/C Section Output from V-SW			
				WICCC			10 1/0	Occuon	Output in	
Data	1	2	3	4	5	6	Main Y	Main C	CVBS-Out	Yvi-Out
0000	А		А	А	А	А	CVBS1	CVBS1	CVBS1	CVBS1
0001	В		А	А	А	А	CVBS2	CVBS2	CVBS2	CVBS2
0010	С		А	А	А	А	CVBS3	CVBS3	CVBS3	CVBS3
0100	А	А	В	В	А	А	Y1	C1	Y1 + C1	Y1
0101	В	В	В	В	А	А	Y2	C2	Y2 + C2	Y2
0110	С	С	В	В	А	А	Y3	C3	Y3 + C3	Y3
1000	А		А		В	В	COMB Y	COMB C	CVBS1	COMB Y
1001	В		А		В	В	COMB Y	COMB C	CVBS2	COMB Y
1010	С		А		В	В	COMB Y	COMB C	CVBS3	COMB Y
others	_						Don't use.			

#### Table 1 Selected Input and Pin 3/11 Output from Video SW Section

#### **External Input SWs**

External inputs are selected by the BUS data and fast SWs. Final outputs from pin 21/22/23 are shown in Table 2. RGB1-IN interface complies with SCART connector. Therefore it is active, when RGB1-IN is enable by the BUS data and when YS3 (pin 15) is also high. The status of YS3 (pin 15) is responded to the Read BUS data, V15.

RGB Select	RGB1 ENB	YS3 (RGB1)	YS1 (YCbCR2)	YS2 (RGB2)	Output	
	0	L				
00	0	Н			Main (from V-SW)	
00	1	L				
	Ι	Н			RGB1	
	0	L				
01	0	Н	L			YCbCr1
01	1	L		L		
	I	Н		L	RGB1	
	0	L				
10	0	Н			RGB1	
10	1	L			NGDT	
	I	н				
11	_				—	
_	_	_	Н		YCbCr2	
			L	Н	RGB2	
_	_	_	Н	11	NODZ	

Table 2 Outputs from Pin 21/22/23

#### **Color System**

Distinguishable color systems are selected by the write BUS data, COLOR SYSTEM. The demodulated color system is responded to the read BUS data, COLOR SYSTEM and X'TAL. (refer to BUS CONTROL FUNCTION) The system data is also responded to Comb SYS (pin 45) and fsc-OUT (pin 46) as Table 3. If distinguishable color system signal is not received, the system data is responded with B/W.

Besides, if pin 7 is connected to  $V_{CC}$  (more than 3.5 V), Forced SECAM mode is active. In this mode, SECAM system is identified forcibly. It has priority over the BUS selection.

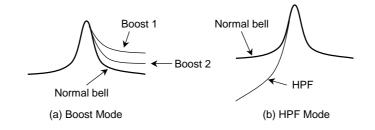
Table 3         DC Level of Pin 45 and 46 on Each Color System
--

Color System	Pin 45	Pin 46
M-PAL	Low	Low
4.43PAL, SECAM, B/W	High	Low
3.58/4.43NTSC	Low	High
N-PAL	High	High

Note2: RGB SELECT/RGB1 ENB: I<sup>2</sup>C BUS data, YS1/2/3: Fast SW

#### Secam Bell Filter

SECAM bell filter characteristics can be changed by the BUS data, BELL/HPF. The group delay near chroma band is corrected by changing filter characteristic. As a result, S/N looks better. Besides, center frequency f<sub>0</sub> of bell is changed by BELL f<sub>0</sub>. Indirectly, it is changed by BPF (TOF) f<sub>0</sub>.



#### Figure 2 SECAM Bell Filter Characteristics



#### Vertical Count-Down

In Automatic of V C/D MODE, the vertical synchronization is controlled by internal PLL. In Fast mode, it is synchronized with the inputted synchronizing signal and the pull-in time is short. Furthermore the time is shorter in Very fast mode by the expanded pull-in range. Pull-in range of vertical count-down is determined by the BUS data, V C/D MODE and V-FREQ as Table 4.

	V C/D Mode	Normal	Teletext	Fast		
V C/D FREQ		00, 11	01	10		
000	Automatic 1	224-353 H	224-353 H	32-353 H		
001	50 Hz	274-353 H	274-353 H	32-353 H		
010	60 Hz	224-297 H	224-297 H	32-297 H		
011	Automatic 2	224-353 H	224-353 H	32-353 H		
100	312.5 H	Forced 312.5 H mode&AFC free-run				
101	262.5 H	Forced 262.5 H mode&AFC free-run				
110	313 H	Forced 313 H mode&AFC free-run				
111	263 H	Forced 26	3 H mode&AF	C free-run		

#### Table 4 V C/D Pull-In Range

Note 3: 00, 11; Normal	Normal vertical input mode. It is good performance of vertical phase keeping for standard TV signal sync. This mode is recommended in the state of stability. And this mode can detect teletext or VCR skew sync.
Note 4: 01; Teletext	This mode is less performance of vertical phase keeping for standard TV signal sync against "Normal". However, pull-in speed is faster few vertical periods than "Normal". Therefore this mode is recommended for tesetext sync. On the other hand, this mode can detect standard TV signal sync in the state of stability but it is less performance of vertical phase keeping in week signal as about –3 dB against "Normal".
Note 5: 10; Fast	This mode is same performance of vertical phase keeping for standard TV signal sync of "Teletext". But it is faster pull-in

speed faster than "Teletext" because pull-in ranges wider than "Teletext". (refer to Table 5) Therefore, this mode is better to use when channel changing, but is not recommended to use in the state of stability or in week signal due to too wide pull-in range

and incorrect actions of vertical keeping appearing.

#### Y-DL Adjustment

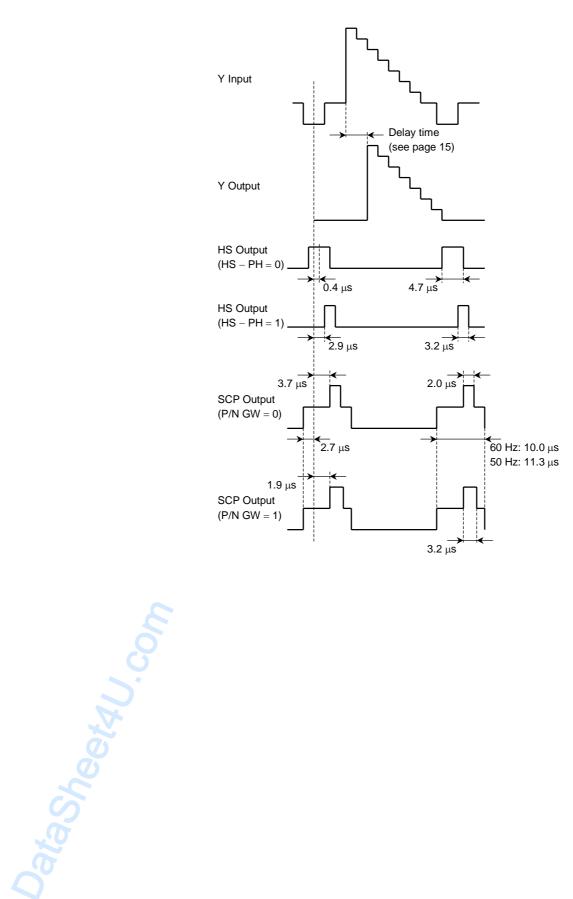
Table 5 shows Y output delays against Y input on condition with  $BPF = f_0$ , Q = 2.0, Y-DL = Min and LPF = ON. Y-out signal can be delayed by the BUS data, Y-DL. The adjustment time of one step is 40 ns.

#### Table 5 Y Ddelays According to the Color System

Color System	Y Delay (ns)
PAL	420
NTSC	460
SECAM	645

#### **Pulses Timming**

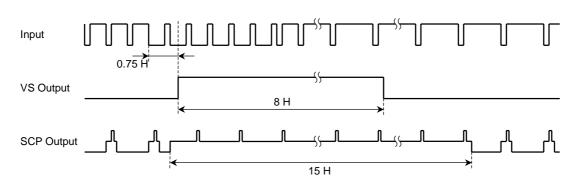
#### Horizontal Period (typical output phase of horizontal pulses)



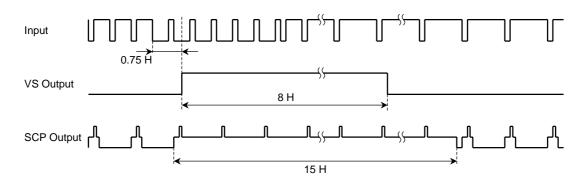
2002-02-12

#### Vertical Period (typical output phase of vertical pulse)

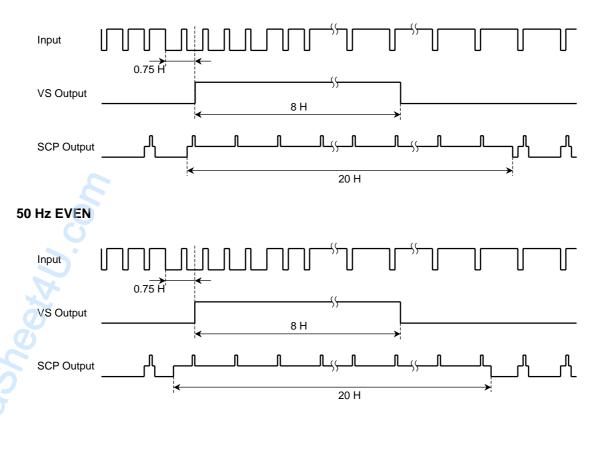
#### 60 Hz ODD



#### 60 Hz EVEN



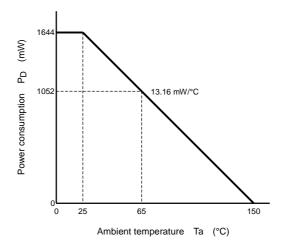
50 Hz ODD

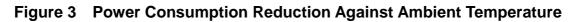


#### Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage	V <sub>CC/DDmax</sub>	5.5	V
Signal voltage at each input pin	e <sub>inmax</sub>	5	V <sub>p-p</sub>
Power consumption	P <sub>D</sub> (Note6)	1644	mW
Power consumption reduction ratio	1/θ <sub>ja</sub>	13.16	mW/°C
Operating temperature	T <sub>opr</sub>	-25 to 65	°C
Storage temperature	T <sub>stg</sub>	-55 to 150	°C

Note 6: Put on the circuit board. Refer to the figure below.





#### **Supply Voltage**

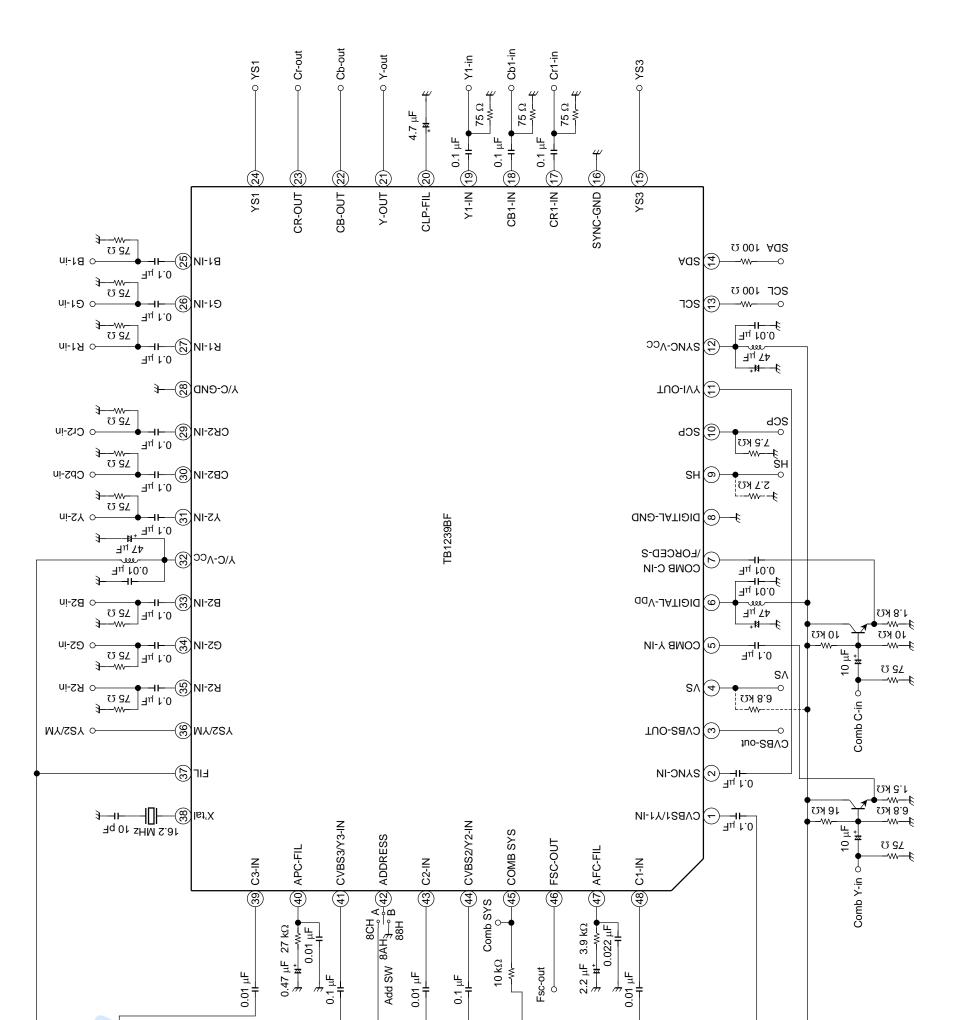
Characteristics	Description	Min	Тур.	Max	Unit
Supply voltage	Pin 6, 12, 32	4.75	5.0	5.25	V

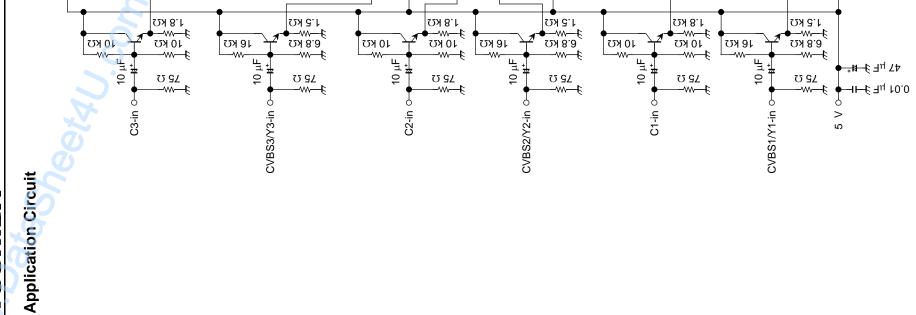
#### Electrical Characteristics

 $(YC - V_{CC}/SYNC - V_{CC}/D - V_{DD} = 5 V and Ta = 25^{\circ}C$ , unless otherwise specified)

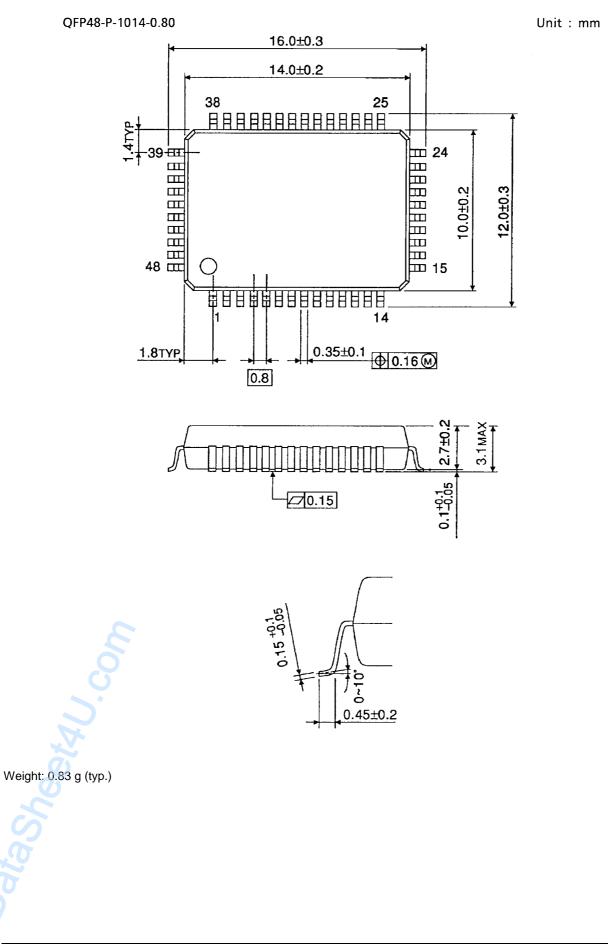
#### **Current Consumption**

Pin No.	Pin Name	Symbol	Min	Тур.	Max	Unit
6	DVDD	I <sub>DD</sub>	4	7	15	
12	SYNC V <sub>CC</sub>	I <sub>CC1</sub>	9	13.5	20	mA
32	Y/C V <sub>CC</sub>	I <sub>CC2</sub>	75	100	130	





#### **Package Dimensions**





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