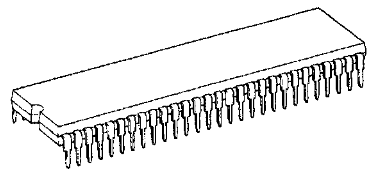
TENTATIVE

TOSHIBA Bi-CMOS INTEGRATED CIRCUIT
SILICON MONOLITHIC

TB1245N

VIDEO, CHROMA AND SYNCHRONIZING SIGNALS PROCESSING IC FOR PAL / NTSC / SECAM SYSTEM COLOR TV

TB1245N that is a signal processing IC for the PAL / NTSC / SECAM color TV system integrates video, chroma and synchronizing signal processing circuits together in a 56pin shrink DIP plastic package.
TB1245N incorporates a high performance picture quality compensation circuit in the video section, an automatic PAL / NTSC / SECAM discrimination circuit in the chroma section, and an automatic 50 / 60 Hz discrimination circuit in the synchronizing section. Besides a crystal oscillator that internally generates 4.43 MHz, 3.58 MHz and M / N-PAL clock signals for color demodulation, there is a horizontal PLL circuit built in the IC.
The PAL / SECAM demodulation circuit which is an adjustment-free circuit incorporates a 1H DL circuit inside for operating the base band signal processing system.
Also, TB1245N makes it possible to set or control various functions through the built-in I^2C bus line.



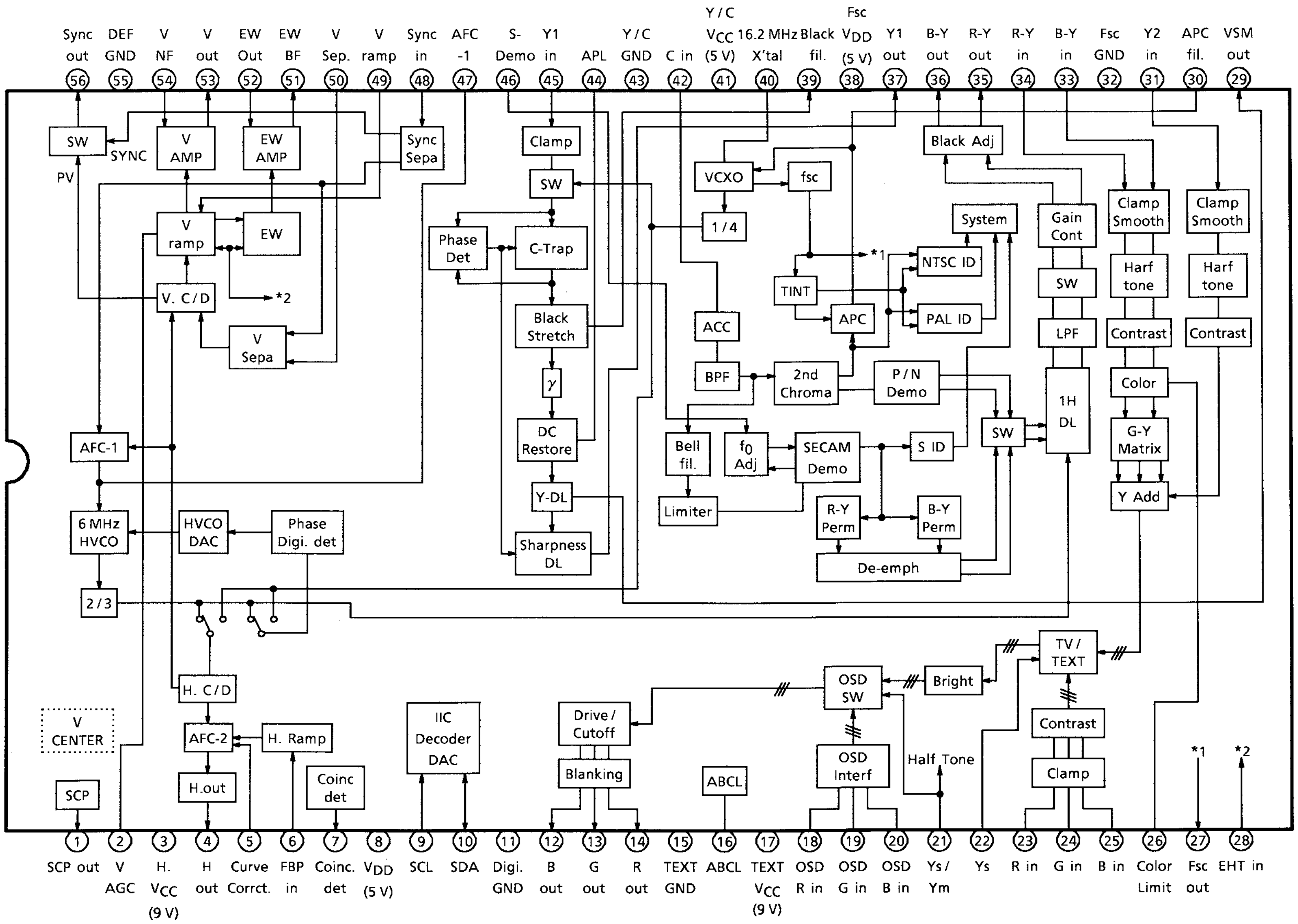
SDIP56-P-600-1.78

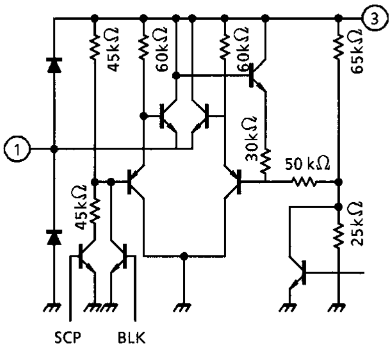
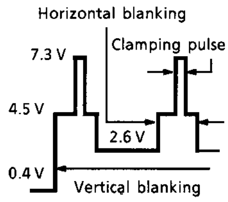
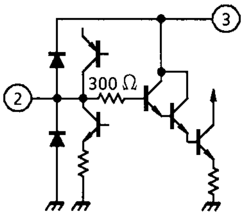
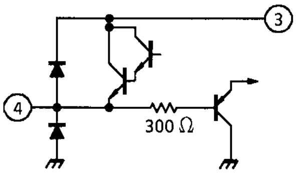
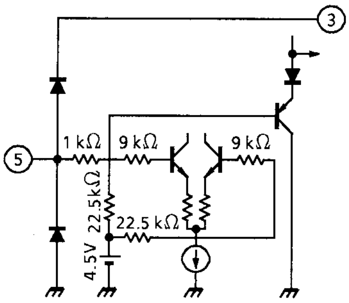
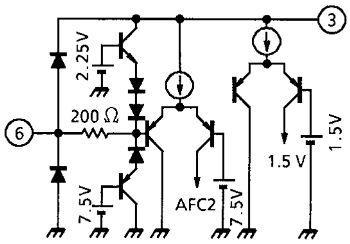
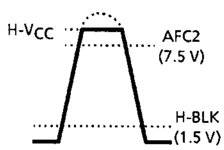
Weight: 5.55 g (Typ.)

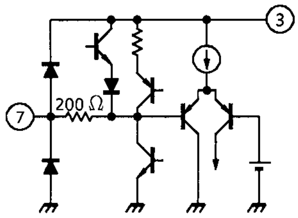
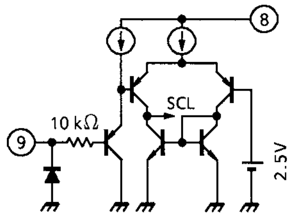
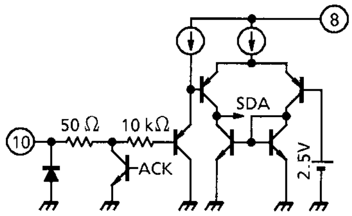
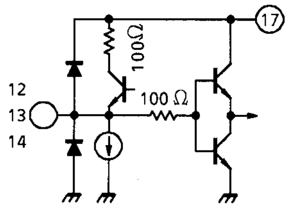
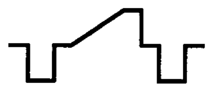
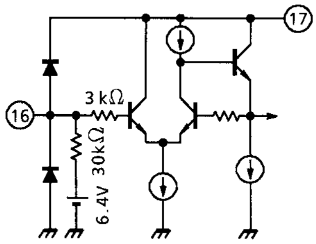
FEATURES

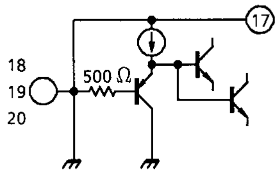
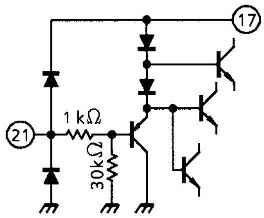
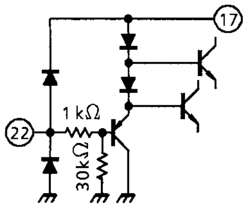
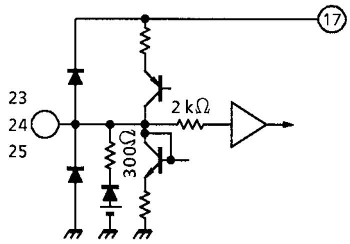
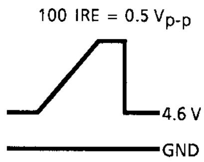
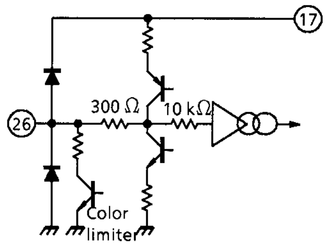
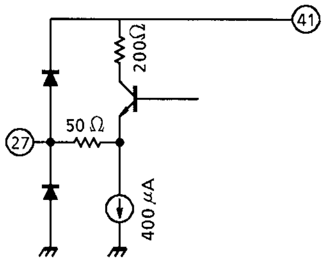
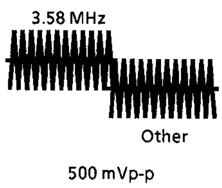
- Video section
  - Built-in trap filter
  - Black expansion circuit
  - Variable DC regeneration rate
  - Y delay line
  - Sharpness control by aperture control
  - γ correction
- Chroma section
  - Built-in 1 H Delay circuit
  - PAL base band demodulation
  - One crystal color demodulation circuit
  - Automatic system discrimination
  - Built-in band-pass filter
  - Color limiter circuit
- Synchronizing deflecting section
  - Built-in horizontal VCO resonator
  - Adjustment-free horizontal / vertical oscillation By count-down circuit
  - Double AFC circuit
  - Vertical frequency automatic discrimination circuit
  - Horizontal / vertical holding adjustment
  - Vertical ramp output
  - Vertical amplitude adjustment
  - Vertical linearity / S-shaped curve adjustment
  - E / W output
- Text section
  - Linear RGB input
  - OSD RGB input
  - Cut / off-drive adjustment
  - RGB primary signal output

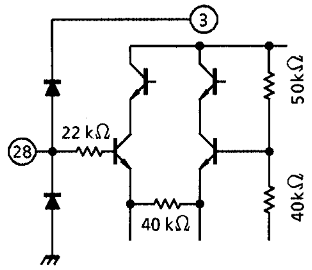
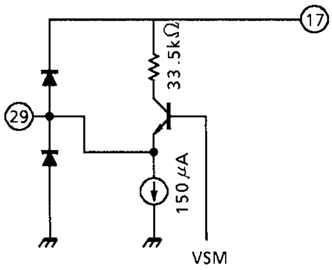
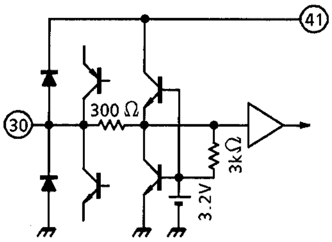
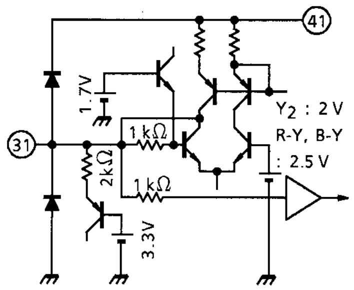
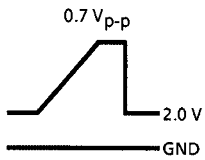
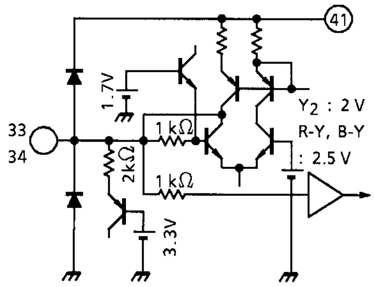
BLOCK DIAGRAM

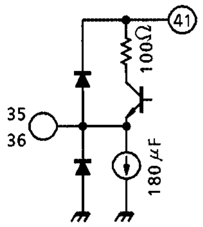
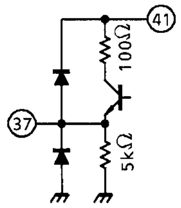
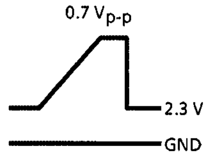
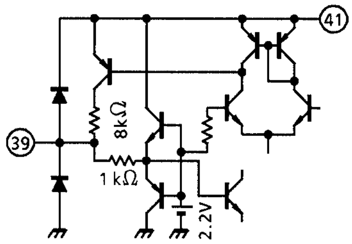
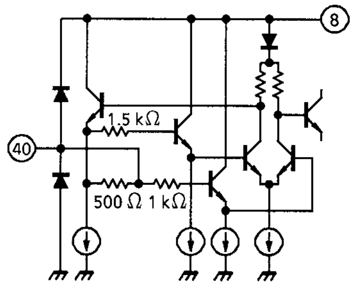


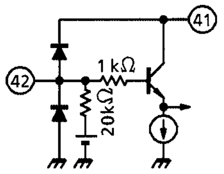
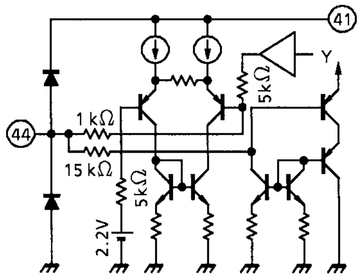
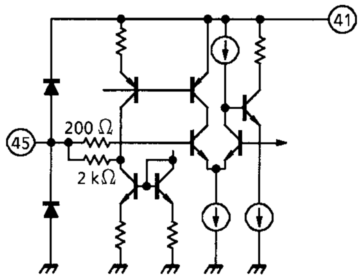
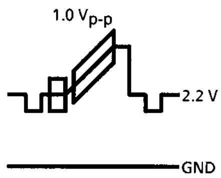
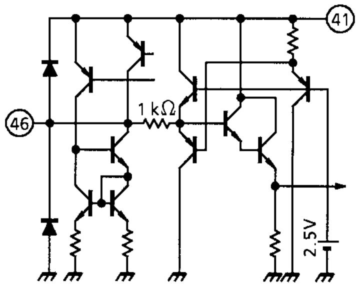
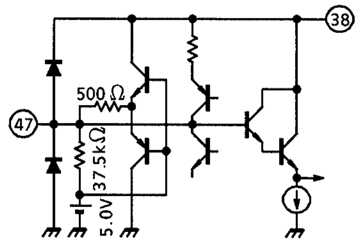
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
1	SCP OUTPUT	Output terminal of Sand Castle Pulse. (SCP) To connect drive resistor for SCP.		
2	V-AGC	Controls pin 52 to maintain a uniform V-ramp output. Connect a current smoothing capacitor to this pin.		—
3	H-V_{CC} (9 V)	V_{CC} for the DEF block (deflecting system). Connect 9 V (Typ.) to this pin.	—	—
4	Horizontal Output	Horizontal output terminal.		
5	Picture Distortion Correction	Corrects picture distortion in high voltage variation. Input AC component of high voltage variation. For inactivating the picture distortion correction function, connect 0.01 μF capacitor between this pin and GND.		4.5 V at Open
6	FBP Input	FBP input for generating horizontal AFC2 detection pulse and horizontal blanking pulse. The threshold of horizontal AFC2 detection is set H.V_{CC}-2V_f (V_f ≈ 0.75 V). Confirming the power supply voltage, determine the high level of FBP.		

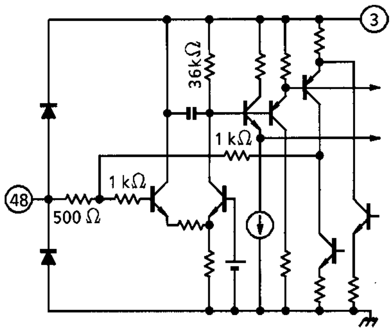
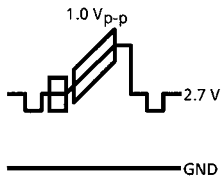
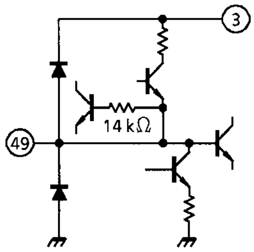
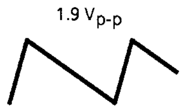
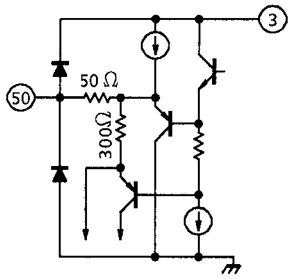
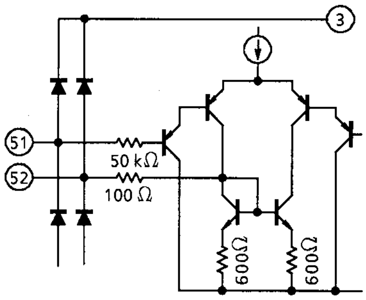
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
7	Coincident Det.	To connect filter for detecting presence of H. synchronizing signal or V. synchronizing signal.		—
8	V_{DD} (5 V)	V_{DD} terminal of the LOGIC block. Connect 5 V (Typ.) to this pin.	—	—
9	SCL	SCL terminal of I^2C bus.		—
10	SDA	SDA terminal of I^2C bus.		—
11	Digital GND	Grounding terminal of LOGIC block.	—	—
12 13 14	B Output G Output R Output	R, G, B output terminals.		
15	TEXT GND	Grounding terminal of TEXT block.	—	—
16	ABCL	External unicolor brightness control terminal. Sensitivity and start point of ABL can be set through the bus.		6.4 V at Open
17	RGB-V_{CC} (9 V)	V_{CC} terminal of TEXT block. Connect 9 V (Typ.) to this pin.	—	—

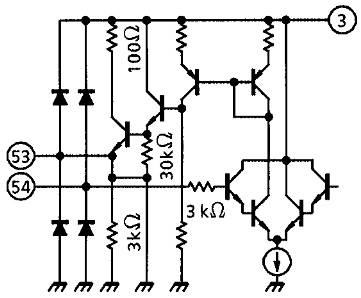
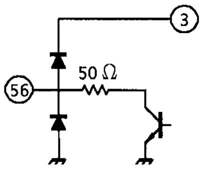
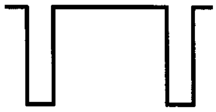
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
18 19 20	Digital R Input Digital G Input Digital B Input	Input terminals of digital R, G, B signals. Input DC directly to these pins. OSD or TEXT signal can be input to these pins.		OSD ———3.0 V TEXT ———2.0 V ———GND
21	Digital YS / YM	Selector switch of halftone / internal RGB signal / digital RGB (pins 18, 19, 20).		OSD ———3.2 V TEXT ———2.1 V H.T. ———0.7 V TV ———GND
22	Analog YS	Selector switch of internal RGB signal or analog RGB (pins 23, 24, 25).		Analog RGB ———0.5 V TV ———GND
23 24 25	Analog R Input Analog G Input Analog B Input	Analog R, G, B input terminals. Input signal through the clamping capacitor. Standard input level : 0.5 V_{p-p} (100 IRE).		
26	Color Limiter	To connect filter for detecting color limit.		—
27	FSC Output	Output terminal of FSC.		

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
28	EHT Input	Input terminal of EHT.		—
29	VSM Output Terminal	Power output the signal that is primary differentiated Y signal. Enable to change output amplifier and phase by the Bus.		—
30	APC Filter	To connect APC filter for chroma demodulation.		DC 3.2 V
31	Y_2 Input	Input terminal of processed Y signal. Input Y signal through clamping capacitor. Standard input level : 0.7 V_{p-p}		
32	Fsc GND	Grounding terminal of VCXO block. Insert a decoupling capacitor between this pin and pin 38 (Fsc V_{DD}) at the shortest distance from both.	—	—
33 34	B-Y Input R-Y Input	Input terminal of B-Y or R-Y signal. Input signal through a clamping capacitor.		DC 2.5 V AC B-Y : 650 mV_{p-p} R-Y : 510 mV_{p-p} (with input of PAL-75% color bar signal)

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
35 36	R-Y Output B-Y Output	Output terminal of demodulated R-Y or B-Y signal. There is an LPF for removing carrier built in this pin.		DC 1.9 V AC B-Y : 650 mV_{p-p} R-Y : 510 mV_{p-p} (with input of PAL-75% color bar signal)
37	Y_1 Output	Output terminal of processed Y signal. Standard output level : 0.7 V_{p-p}		
38	Fsc V_{DD}	V_{DD} terminal of DDS block. Insert a decoupling capacitor between this pin and pin 32 (Fsc GND) at the shortest distance from both. If decouping capacitor is inserted at a distance from the pins, it may cause spurious deterioration.	—	—
39	Black Stretch	To connect filter for controlling black expansion gain of the black expansion circuit. Black expansion gain is determined by voltage of this pin.		DC 1.6 V
40	16.2 MHz X'tal	To connect 16.2 MHz crystal clock for generating sub-carrier.Lowest resonance frequency (f_0) of the crystal oscillation can be varied by changing DC capacity. Adjust f_0 of the oscillation frequency with the board pattern.		DC 4.1 V

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
41	Y / C V_{CC} (5 V)	V_{CC} terminal of Y / C signal processing block.	—	—
42	Chroma Input	Chroma signal input terminal. Input negative 1.0 V_{p-p} sync composite video signal to this pin through a coupling capacitor.		DC 2.4 V AC : 300 mVp-p burst
43	Y / C GND	Grounding terminal of Y / C signal processing block.	—	—
44	APL	To connect filter for DC regeneration compensation.Y signal after black expansion can be monitored by opening this pin.		DC 2.2 V
45	Y_1 Input	Input terminal of Y signal. Input negative 1.0 V_{p-p} sync composite video signal to this pin through a clamping capacitor.		
46	S-Demo-Adj.	To connect f_0 adjustment filter for SECAM demodulation.		DC 3.2 V
48	AFC1 Filter	To connect filter for horizontal AFC1 detection.Horizontal frequency is determined by voltage of this pin.		DC 5.0 V

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
48	Sync Input	Input terminal of synchronizing separator circuit. Input signal through a clamping capacitor to this pin. Negative 1.0 V_{p-p} sync.		
49	V-Ramp	To connect filter for generating V-ramp waveform.		
50	V-Sepa.	To connect filter for vertical synchronizing separation.		DC 5.9 V
51	EW FB	E / W feedback terminal		
52	EW OUT	Output terminal for driving E / W		

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
53	Vertical Output	Output terminal of vertical ramp signal.		
54	V-NF	Input terminal of vertical NF signal.		
55	DEF GND	Grounding terminal of DEF (deflection) block.	—	—
56	Sync Output	Output terminal of synchronizing signal separated by sync separator circuit.Connect a pull-up resistor to this pin because it is an open-collector output type.		

BUS CONTROL MAP
WRITE DATA
Slave address : 88 Hex (10001000)

SUB AD-DRESS	D_7 MSB	D_6	D_5	D_4	D_3	D_2	D_1	D_0 LSB	PRESET MSB	PRESET LSB
00	UNI-COLOR								1 0 0 0	0 0 0 0
01	BRIGHT								1 0 0 0	0 0 0 0
02	COLOR								1 0 0 0	0 0 0 0
03	N-COMB	TINT							0 1 0 0	0 0 0 0
04	PN-ID	BLK SW	SHARPNESS						0 0 1 0	0 0 0 0
05	S-D-Trap	R-Moni	B-Moni	Y SUB CONTRAST					1 0 0 1	0 0 0 0
06	RGB-CONTRAST								1 0 0 0	0 0 0 0
07	OSD LEVEL		0	0	0	0	0	0	0 0 0 0	0 0 0 0
08	Yγ	WPL	DRG SW	BLUE BACK		Y-DL			0 0 0 0	0 0 1 0
09	G DRIVE								1 0 0 0	0 0 0 0
0A	B DRIVE								1 0 0 0	0 0 0 0
0B	HORIZONTAL POSITION					AFC MODE		H-CK SW	1 0 0 0	0 0 0 1
0C	R CUTOFF								0 0 0 0	0 0 0 0
0D	G CUTOFF								0 0 0 0	0 0 0 0
0E	B CUTOFF								0 0 0 0	0 0 0 0
0F	BS SW	C-TRAP	OFST SW	C-BPF	P / N GP	CLL SW	WBLK SW	V-AGC	0 0 0 0	0 0 0 0
10	S-INHBIT	0	F-BW	X'tal MODE			COLOR SYSTEM		0 0 0 0	0 0 0 0
11	R-Y BLACK OFFSET				B-Y BLACK OFFSET				1 0 0 0	1 0 0 0
12	CLL LEVEL		PN CD ATT		BPF Q		BPF f_0		1 0 0 1	1 0 1 0
13	H-STOP1	VSM PH	VSM GAIN		C-TRAP Q		C-TRAP f_0		1 0 1 1	1 0 1 0
14	BLACK STRACK POINT			DC TRAN RATE			APA-CON f_0		1 0 0 0	0 0 1 0
15	ABL POINT			ABL GAIN			HALF TONE SW		0 0 0 0	0 0 0 0
16	H BLANKING PHASE			V-CD		V OUT PHASE			0 0 0 0	0 0 0 0
17	VERTICAL SIZE						SYNC / VP	ZOOM SW	1 0 0 0	0 0 0 0
18	HORIZONTAL SIZE						COINCIDENT DET		1 0 0 0	0 0 1 0
19	E / W PARABOLA					V-FREQ			1 0 0 0	0 0 0 0
1A	V-LIN CORRECTION				V-S CORRECTION				1 0 0 0	1 0 0 0
1B	E / W TRAPEZIUM				E / W CORNER				1 0 0 0	1 0 0 0
1C	MUTE MODE		H COMPENSATION			V COMPENSATION			0 1 0 0	0 0 0 0
1D	NOISE DET		V-BLK START PHASE						1 0 1 1	1 1 1 1
1E	H-STOP2	V-BLK STOP PHASE							0 0 0 0	0 0 0 0
1F	S-FIELD	S-CD ATT	DEMP f_0	S GP	V-ID SW	S KIL	BELL f_0		0 0 0 0	0 0 0 1

READ-IN DATA
Slave address : 89 Hex (10001001)

SUB AD-DRESS	D_7 MSB	D_6	D_5	D_4	D_3	D_2	D_1	D_0 LSB
1	PORES	COLOR SYSTEM		X'tal		V-FREQ	V-STD	N-DET
2	LOCK	RGB OUT	Y1-IN	UV-IN	Y2-IN	H	V	V-GUARD

BUS CONTROL FUNCTION
WRITE FUNCTION

ITEM	DESCRIPTION	NUMBER OF BITS	VARIABLE RANGE	PRESET VALUE
UNI-COLOR	—	8 bit	−18 dB~0 dB	80h CENTER VALUE
BRIGHT	—	8 bit	−40 IRE ~ 40 IRE	80h CENTER VALUE
COLOR	—	8 bit	~4 dB	80h 0 dB
N COMB	1H addition selection	1 bit	OFF / ADD	00h OFF
TINT	—	7 bit	−32°~32°	40h 0°
P / N ID	P / N IDENT sensitivity control	1 bit	Normal / Low (DIGITAL Comb FILTER use : −3 dB)	00h NORMAL
BLK SW	Blanking ON / OFF	1 bit	ON / OFF	00h ON
SHARPNESS	—	6 bit	~14 dB	20h +3 dB
S-D-Trap	SECAM double trap ON / OFF	1 bit	ON / OFF	01h OFF
R-Mon	TEXT-11 dB pre-amplification UV output	1 bit	Normal / Monitor (Pin 36)	00h Normal
B-Mon	TEXT-11 dB pre-amplification UV output	1 bit	Normal / Monitor (Pin 35)	00h Normal
Y SUB CONTRAST	—	5 bit	−3 dB~+3 dB	10h 0 dB
RGB-CONTRAST	EXT RGB UNI-COLOR control	8 bit	−18 dB~0 dB	80h CENTER VALUE
OSD LEVEL		2 bit	2.15, 2.27, 2.38, 2.50 V_{p-p}	00h 2.15 V_{p-p}
Yγ	γ ON / OFF	1 bit	OFF / ON (95 IRE)	00h ON
WPL	White peak limit level	1 bit	ON (130 IRE) / OFF	00h 130 IRE
DRG SW	Drive reference axis selection	1 bit	R / G	00h R
BLUE BACK	Luminance selector switch	2 bit	IRE ; OFF, 40, 50, 60	00h OFF
Y-DL	Y-DL TIME (280, 330, 380, 430, 480)	3 bit	280~480 ns after Y IN (101H~111H : Not used)	02h 380 ns
G DRIVE GAIN	—	8 bit	−5 dB~3 dB	80h CENTER VALUE
B DRIVE GAIN	—	8 bit	−5 dB~3 dB	80h CENTER VALUE
HORIZONTAL POSITION	Horizontal position adjustment	5 bit	−3 μs~+3 μs	10h 0 μs

ITEM	DESCRIPTION	NUMBER OF BITS	VARIABLE RANGE	PRESET VALUE
AFC MODE	AFC1 detection sensitivity selector	2 bit	dB ; AUTO, 0, −10, −10	00h AUTO
H-CK SW	HOUT generation clock selector	1 bit	384 fh-VCO, FSC-VCXO	01h FSC-VCXO
R CUT OFF	—	8 bit	−0.5~0.5 V	00h −0.5 V
G CUT OFF	—	8 bit	−0.5~0.5 V	00h −0.5 V
B CUT OFF	—	8 bit	−0.5~0.5 V	00h −0.5 V
BS OFF	Black strech ON / OFF	1 bit	ON / OFF	00h ON
C-TRAP	Chroma Trap ON / OFF SW	1 bit	ON / OFF	00h ON
OFST SW	Black offset SECAM discrimination interlocking switch	1 bit	SECAM only / All systems	00h S only
C-BPF	P / N BPF ON / OFF SW	1 bit	ON / OFF	00h ON
P / N GP	PAL GATE position	1 bit	Standard / 0.5 μs delay	00h Standard
CLL SW	COLOR LIMIT ON / OFF	1 bit	ON / OFF	00h ON
WBLK SW	WIDE V-BLK ON / OFF	1 bit	OFF / ON	00h OFF
V-AGC	V-AGC switch	1 bit	Normal / Fast	00h Normal
S-INHBT	To detect or not to detect SECAM	1 bit	Yes / No	00h Yes
F-BW	Force B / W switch	1 bit	AUTO / Forced B / W	00h AUTO
X'tal MODE	APC oscillation frequency selector switch	3 bit	000 ; European system AUTO, 001 ; 3N 010 ; 4P 011 ; 4P (N inhi bited) 100 ; S.American system AUTO, 101 ; 3N 110 ; MP, 111 ; NP	00h European system AUTO
COLOR SYSTEM	Chroma system selection	2 bit	AUTO, PAL, NTSC, SECAM	00h AUTO
R-Y BLACK OFFSET	R-Y color difference output black offset adjustment	4 bit	−24~21 mV STEP 3 mV	08h 0 mV
B-Y BLACK OFFSET	B-Y color difference output black offset adjustment	4 bit	−24~21 mV STEP 3 mV	08h 0 mV
CLL LEVEL	Color limit level adjustment	2 bit	91, 100, 108, 116%	02h 108%

Note: 3N ; 3.58-NTSC, 4P ; 4.43-PAL, MP ; M-PAL, NP ; N-PAL
European system AUTO ; 4.43-PAL, 4.43-NTSC, 3.58-NTSC, SECAM
S.American system AUTO ; 3.58-NTSC, M-PAL, N-PAL

ITEM	DESCRIPTION	NUMBER OF BITS	VARIABLE RANGE	PRESET VALUE
PN CD ATT	P / N color difference amplitude adjustment	2 bit	−2~+1 dB STEP 1 dB	01h 0 dB
BPF Q	TOF Q adjustment	2 bit	1.0, 1.5, 2.0, 2.5	02h 2.0
BPF f_0	TOF f_0 adjustment	2 bit	kHz ; 0, 500, 600, 700	02h 600 kHz
H-STOP1	H-OUT ON / OFF SW1	1 bit	H-STOP2 = 1 and H-STOP1 = 1 → STOP	00h OUTPUT
VSM PHASE	VSM output phase	1 bit	0 ns, +20 ns	00h 0 ns
VSM GAIN	VSM output gain	2 bit	0 dB, 0 dB, −6 dB, OFF	03h OFF
C-TRAP Q	Chroma trap Q control	2 bit	1.0, 1.5, 2.0, 2.5	02h 2.0
C-TRAP F_0	Chroma trap f_0 control	2 bit	kHz ; −100, −50, 0, +50	02h 0 kHz
BLACK STRETCH POINT	Black expansion start point setting	3 bit	27~70% IRE × 0.4	05h 51.6% IRE
DC TRAN RATE	Direct transmission compensation degree selection	3 bit	100~130% APL	00h 100% APL
APA-CON PEAK f_0	Sharpness peak frequency selection	2 bit	MHz ; 2.5, 3.1, 4.2, OFF	02h 4.2 MHz
ABL POINT	ABL detection voltage	3 bit	ABL point ; 5.9 V~6.5 V	00h 5.9 V
ABL GAIN	ABL sensitivity	3 bit	Brightness ; 0~−2 V	00h 0 V
HALF TONE SW	Halftone gain selection	2 bit	Normal + Pin control, Forced −6 dB Normal (not pin control)	00h Normal
H BLK PHASE	Horizontal blanking end position	3 bit	0~3.5 μs step 0.5 μs	00h 0 μs
V-CD	Vertical count-down mode selection	2 bit	Normal / Normal / Teletext / Fast	00h Normal
V OUTPUT PHASE	Vertical position adjustment	3 bit	0~7H STEP 1H	00h 0H
VERTICAL SIZE	Vertical amplitude adjustment	6 bit	−45~+45%	20h CENTER VALUE
SYNC / VP	SYNC OUT / VP OUTOUTPUT Select, PIN 56	1 bit	SYNC OUT / VP OUT	00h SYNC OUT
ZOOM SW	Vertical ZOOM	1 bit	Normal / ZOOM	00h Normal
HORIZONTAL SIZE	Horizontal amplitude adjustment	6 bit	1.5~6.5 V	20h CENTER VALUE
COINCIDENT MODE	Discriminator output signal selection	2 bit	00 ; DSYNC 01 ; DSYNC×AFC 10 ; Field counting 11 ; VP is present.	02h Field counting
E / W PARABOLA	Parabola amplitude adjustment	5 bit	0~2.7 V	10h CENTER VALUE
V FREQ	Vertical frequency	3 bit	AUTO, 50 Hz, 60 Hz, No Use, Forced 312.5H, Forced 313H, Forced 262.5H, Forced 263H	00h AUTO

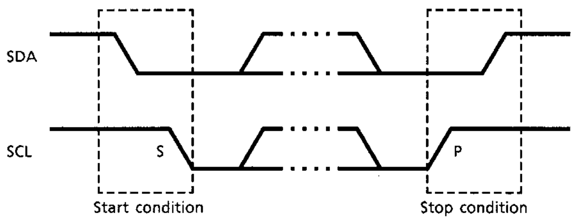
ITEM	DESCRIPTION	NUMBER OF BITS	VARIABLE RANGE	PRESET VALUE
V-LINE CORRECTION	Vertical linearity correction	4 bit	−13~+13%	08h CENTER VALUE
V S-CORRECTION	Vertical S-curve correction	4 bit	−16~+13%	08h CENTER VALUE
E / W TRAPEZIUM	Parabola symmetry correction	4 bit	−10~+10%	10h CENTER VALUE
E / W CORNER	Corner correction	4 bit	−1.5~+1.5 V	10h CENTER VALUE
MUTE MODE	OFF, RGB mute, Y mute, transverse	2 bit	OFF, RGB, Y, Transverse	01h RGB
H-CONPENSATION	Horizontal EHT correction	3 bit	0~1.0 V	00h 0 V
V-CONPENSATION	Vertical EHT correction	3 bit	0~9%	00h 0%
NOISE DET	Noise detection level selection	2 bit	0.12, 0.25, 0.39, 0.55	02h 0.39
V-BLK START PHASE	Vertical pre-position selection	6 bit	−64~−1H STEP 1H	3Fh −1H
H-STOP2	H-OUT ON / OFF SW2	1 bit	H-STOP2 = 1 and H-STOP1 = 1 → OUTPUT	00h OUTPUT
V-BLK STOP PHASE	Vertical post-position selection	7 bit	0~128H STEP 1H	00h 0H
S-FIELD	SECAM color and Q selection in weak electric field	1 bit	Weak electric field control ON / OFF	00h ON
S-CD ATT	SECAM color difference amplitude adjustment	1 bit	0 / −1 dB	00h 0 dB
DEMO F_0	SECAM deemphasis time constant selection	1 bit	85 kHz / 100 kHz	00h 85 kHz
S GP	SECAM gate position selection	1 bit	Standard / 0.5 μs delay	00h Standard
V-ID SW	SECAM V-ID ON / OFF switch	1 bit	OFF / ON	00h OFF
S KIL	SECAM KILLER sensitivity selection	1 bit	NORMAL / LOW (−3 dB)	00h NORMAL
BELL F_0	Bell f_0 adjustment	2 bit	−46~92 kHz STEP 46 kHz	01h 0 kHz

READ-IN FUNCTION

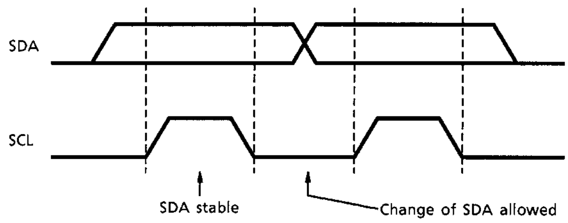
ITEM	DESCRIPTION	NUMBER OF BITS
PONRES	0 : POR cancel, 1 : POR ON	1 bit
COLOR SYSTEM	00 : B / W, 01 : PAL 10 : NTSC, 11 : SECAM	2 bit
X'tal	00 : 4.433619 MHz 01 : 3.579545 MHz 10 : 3.575611 MHz (M-PAL) 11 : 3.582056 MHz (N-PAL)	2 bit
V-FREQ	0 : 50 Hz, 1 : 60 Hz	1 bit
V-STD	0 : NON-STD, 1 : STD	1 bit
N-DET	0 : Low, 1 : High	1 bit
LOCK	0 : UN-LOCK, 1 : LOCK	1 bit
RGBOUT, Y_1-IN, UV-IN, Y_2-IN, H, V	Self-diagnosis 0 : NG, 1 : OK	1 bit each
V-GUARD	Detection of breaking neck 0 : Abnormal, 1 : Normal	1 bit

DATA TRANSFER FORMAT VIA I^2C BUS

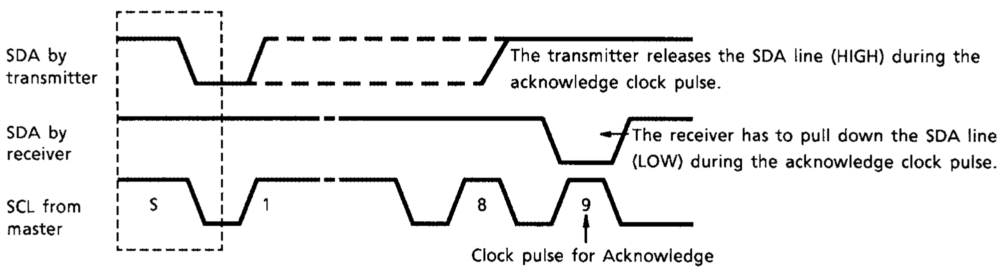
Start and stop condition



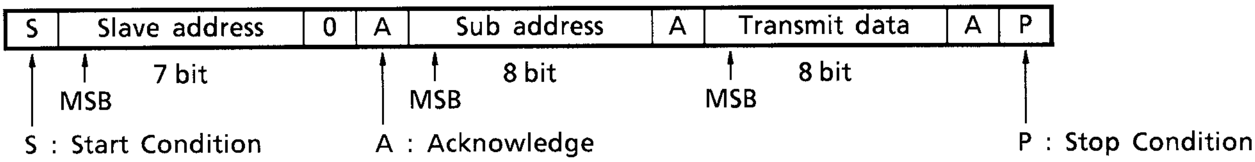
Bit transfer



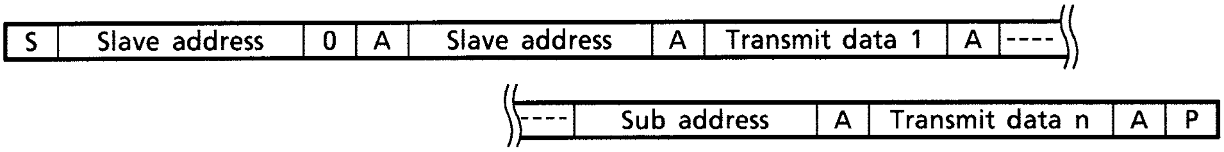
Acknowledge



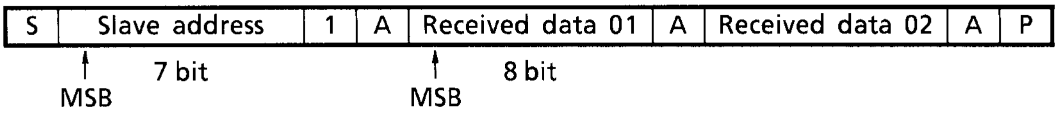
Data transmit format 1



Data transmit format 2



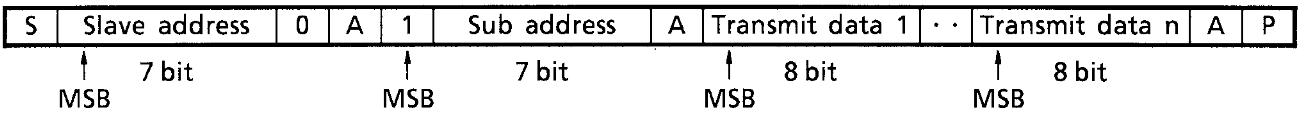
Data receive format



At the moment of the first acknowledge, the master transmitter becomes a master receiver and the slave receiver becomes a slave transmitter. This acknowledge is still generated by the slave.

The STOP condition is generated by the master.

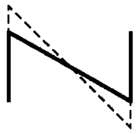
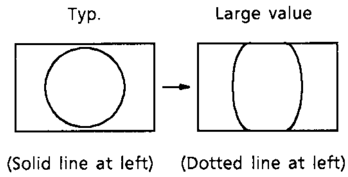
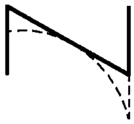
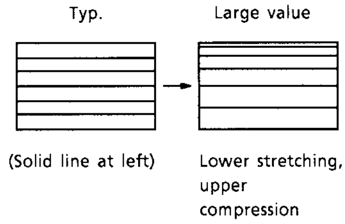
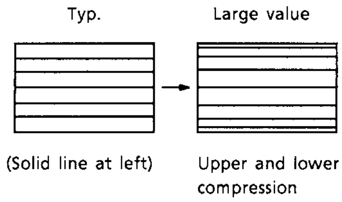
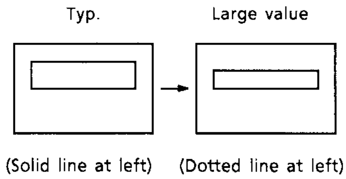
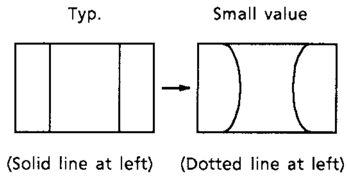
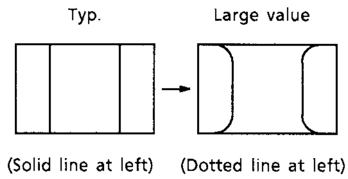
Optional data transmit format : Automatic increment mode

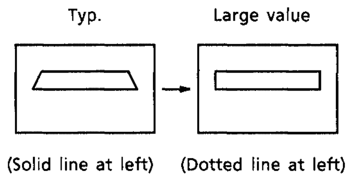
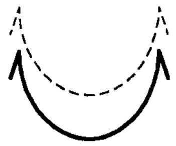
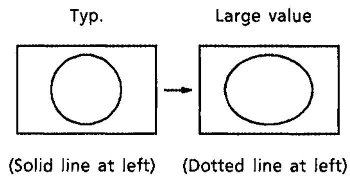
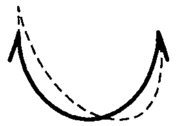
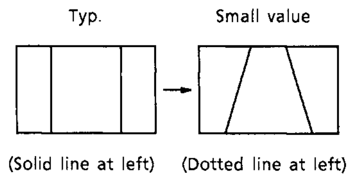


In this transmission method, data is set on automatically incremented sub-address from the specified sub-address.

Purchase of TOSHIBA I^2C components conveys a license under the Philips I^2C Patent Rights to use these components in an I^2C system, provided that the system conforms to the I^2C Standard Specification as defined by Philips.

DEFLECTION CORRECTION TABLE

FUNCTION	OUTPUT WAVEFORM	PICTURE CHANGE	VARIABLE RANGE
Vertical Amplitude Adjustment [VERTICAL SIZE]			−45~+45%
Vertical Linearity Correction [V-LINEARITY]			−13~+13%
Vertical S Correction [V-S CORRECTION]			−16~+16%
Vertical EHT Correction [V-COMPENSATION]			0~9%
Parabola Amplitude Adjustment [EW PARABOLA]			0~2.7 V
Corner Correction [EW CORNER]			−1.5~+1.5 V

FUNCTION	OUTPUT WAVEFORM	PICTURE CHANGE	VARIABLE RANGE
Horizontal EHT Correction [H-COMPENSATION]			0~+1.0 V%
Horizontal Amplitude Adjustment [HORIZONTAL SIZE]			1.5~6.5 V
Parabola Symmetry Correction [EW TRAPEZIUM]			−10~+10%

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CCMAX}	12	V
Permissible Loss	P_{DMAX}	2190 (Note 1)	mW
Power Consumption Declining Degree	$1 / Q_{ja}$	17.52	mW / °C
Input Terminal Voltage	V_{in}	GND − 0.3~V_{CC} + 0.3	V
Input Signal Voltage	e_{in}	7	V_{p-p}
Operating Temperature	T_{opr}	−20~65	°C
Conserving Temperature	T_{stg}	−55~150	°C

Note 1: In the condition that IC is actually mounted. See the diagram below.

Note 2: This IC is not proof enough against a strong E-M field by CRT which may cause function errors and / or poor characteristics.
Keeping the distance from CRT to the IC longer than 20 cm, or if cannot, placing shield metal over the IC, is recommended in an application.

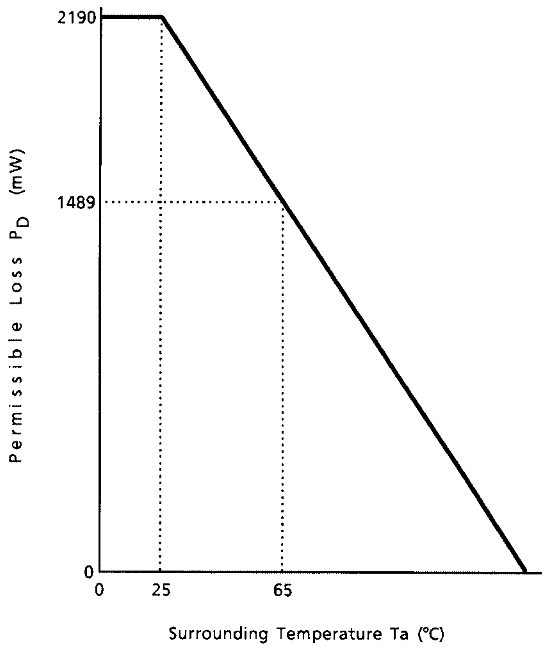


Fig. Power consumption declining curve relative to temperature change

RECOMMENDED OPERATING CONDITION

CHARACTERISTIC	DESCRIPTION	MIN	TYP.	MAX	UNIT
Supply Voltage	Pin 3, pin 17	8.50	9.0	9.50	V
	Pin 8, pin 38, pin 41	4.75	5.0	5.25	
Video Input Level	100% white, negative sync	0.9	1.0	1.1	V_{p-p}
Chroma Input Level		0.9	1.0	1.1	
Sync Input Level		0.9	1.0	2.2	
FBP Width	—	11	12	13	μs
Incoming FBP Current (Note)	—	—	—	1.5	mA
H. Output Current	—	—	1.0	2.0	
RGB Output Current	—	—	1.0	2.0	V
Analog RGB Input Level	—	—	0.7	0.8	
OSD RGB Input Level	In TEXT input	0.7	1.0	1.3	
	In OSD input	—	4.2	5.0	
Incoming Current to Pin 56	Sync-out	—	0.5	1.0	mA

Note: The threshold of horizontal AFC2 detection is set $H.V_{CC}$-2 V_f (V_f ≈ 0.75 V). Confirming the power supply voltage, determine the high level of FBP.

ELECTRICAL CHARACTERISTIC
(Unless otherwise specified, H, RGB V_{CC} = 0V, V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V, Ta = 25±3°C)
CURRENT CONSUMPTION

PIN No.	CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	MIN	TYP.	MAX	UNIT
3	$H.V_{CC}$ (9V)	I_{CC1}	—	16.0	19.0	23.5	mA
8	V_{DD} (5V)	I_{CC2}	—	8.8	11.0	14.0	
17	RGB V_{CC} (9V)	I_{CC3}	—	25.0	31.5	39.0	
38	Fsc V_{CC} (5V)	I_{CC4}	—	1.0	1.5	2.0	
41	Y / C V_{CC} (9V)	I_{CC5}	—	70	90	120	

TERMINAL VOLTAGE

PIN No.	PIN NAME	SYMBOL	TEST CIR-CUIT	MIN	TYP.	MAX	UNIT
16	ABCL	V_{16}	—	5.9	6.4	6.9	V
18	OSD R Input	V_{18}	—	—	0	0.3	V
19	OSD G Input	V_{19}	—	—	0	0.3	V
20	OSD B Input	V_{20}	—	—	0	0.3	V
21	Digital Y_s	V_{21}	—	—	0	0.3	V
22	Analog Y_s	V_{22}	—	—	0	0.3	V
23	Analog R Input	V_{23}	—	4.2	4.6	5.0	V
24	Analog G Input	V_{24}	—	4.2	4.6	5.0	V
25	Analog B Input	V_{25}	—	4.2	4.6	5.0	V
28	ETH Input	V_{28}	—	—	—	—	V
31	Y_2 Input	V_{31}	—	1.7	2.0	2.3	V
33	B-Y Input	V_{33}	—	2.2	2.5	2.8	V
34	R-Y Input	V_{34}	—	2.2	2.5	2.8	V
35	R-Y Output	V_{35}	—	1.5	1.9	2.3	V
36	B-Y Output	V_{36}	—	1.5	1.9	2.3	V
37	Y_1 Output	V_{37}	—	1.9	2.3	2.7	V
40	16.2 MHz X’tal Oscillation	V_{40}	—	3.6	4.1	4.6	V
42	Chroma Input	V_{42}	—	2.0	2.4	2.8	V
50	V-Sepa.	V_{50}	—	5.4	5.9	6.4	V

AC CHARACTERISTIC
Video section

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Y Input Pedestal Clamping Voltage	VYclp	—	(Note Y_1)	2.0	2.2	2.4	V
Chroma Trap Frequency	ftr3	—	(Note Y_2)	3.429	3.58	3.679	MHz
	ftr4	—		4.203	4.43	4.633	
Chroma Trap Attenuation (3.58 MHz)	Gtr3a	—	(Note Y_3)	20	26	52	dB
	Gtr3f	—					
(4.43 MHz)	Gtr4	—	(Note Y_4)	20	26	52	
(SECAM)	Gtrs	—	(Note Y_5)	18	26	52	
Yγ Correction Point	γp	—	(Note Y_6)	90	95	99	—
Yγ Correction Curve	γc	—	(Note Y_7)	−2.6	−2.0	−1.3	dB
APL Terminal Output Impedance	Zo44	—	(Note) Y_8	15	20	25	kΩ
DC Transmission Compensation Amplifier Gain	Adrmax	—	(Note Y_9)	0.11	0.13	0.15	times
	Adrcnt	—		0.44	0.06	0.08	
Maximum Gain of Black Expansion Amplifier	Ake	—	(Note Y_{10})	1.20	1.5	1.65	
Black Expansion Start Point	VBS9MX	—	(Note Y_{11})	65	77.5	80	IRE
	VBS9CT	—		55	62.5	70	
	VBS9MN	—		48	55.5	63	
	VBS2MX	—		35	42.5	50	
	VBS2CT	—		25	31.5	38	
	VBS2MN	—		19	25.5	32	
Black Peak Detection Period (Horizontal)	TbpH	—	(Note Y_{12})	15	16	17	μs
(Vertical)	TbpV	—		33	34	35	H
Picture Quality Control Peaking Frequency	fp25	—	(Note Y_{13})	1.5	2.5	3.4	MHz
	fp31	—		1.9	3.1	4.3	
	fp42	—		3.0	4.2	5.4	
Picture Quality Control Maximum Characteristic	GS25MX	—	(Note Y_{14})	12.0	14.5	17.0	dB
	GS31MX	—		12.0	14.5	17.0	
	GS42MX	—		10.6	13.5	16.4	
Picture Quality Control Minimum Characteristic	GS25MN	—	(Note Y_{15})	−22.0	−19.5	−17.0	
	GS31MN	—		−22.0	−19.5	−17.0	
	GS42MN	—		−19.5	−16.5	−13.5	
Picture Quality Control Center Characteristic	GS25CT	—	(Note Y_{16})	6.0	8.5	11.0	
	GS31CT	—		6.0	8.5	11.0	
	GS42CT	—		4.6	7.5	10.4	
Y Signal Gain	Gy	—	(Note Y_{17})	−1.0	0	1.6	
Y Signal Frequency Characteristic	Gfy	—	(Note Y_{18})	−6.5	0	1.0	
Y Signal Maximum Input Range	Vyd	—	(Note Y_{19})	0.9	1.2	1.5	V

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
ACC Characteristic	f_o = 3.58	$3N_{eAT}$	—	(Note C_1)	30	35	90	mV_{p-p}
		$3N_{F1T}$	—		68	85	105	mV_{p-p}
		$3N_{AT}$	—		0.9	1.0	1.1	times
		$3N_{eAE}$	—		18	35	—	times
		$3N_{F1E}$	—		71	85	102	times
		$3N_{AE}$	—		0.9	1.0	1.1	times
	f_o = 4.43	$4N_{eAT}$	—		18	35	—	mV_{p-p}
		$4N_{F1T}$	—		71	85	102	mV_{p-p}
		$4N_{AT}$	—		0.9	1.0	1.1	times
		$4N_{eAE}$	—		18	35	—	times
		$4N_{F1E}$	—		71	85	102	times
		$4N_{AE}$	—		0.9	1.0	1.1	times
Band Pass Filter Characteristic	f_o = 3.58	$3Nfo_0$	—	(Note C_2)	3.43	3.579	3.73	MHz
		$3Nfo_{500}$	—		3.93	4.079	4.23	MHz
		$3Nfo_{600}$	—		4.03	4.179	4.33	MHz
		$3Nfo_{700}$	—		4.13	4.279	4.43	MHz
	f_o = 4.43	$4Nfo_0$	—		4.28	4.433	4.58	MHz
		$4Nfo_{500}$	—		4.78	4.933	4.58	MHz
		$4Nfo_{600}$	—		4.88	5.033	5.18	MHz
		$4Nfo_{700}$	—		4.98	5.133	5.28	MHz
Band Pass Filter, −3 dB Band Characteristic	f_o = 3.58	fo_0	—	(Note C_3)	1.64	1.79	1.94	MHz
		fo_{500}	—					
		fo_{600}	—					
		fo_{700}	—					
	f_o = 4.43	fo_0	—		2.07	2.22	2.37	MHz
		fo_{500}	—					
		fo_{600}	—					
		fo_{700}	—					
Band Pass Filter, Q Characteristic Check	f_o = 3.58	Q_1	—	(Note C_4)	—	3.58	—	MHz
		$Q_{1.5}$	—		—	2.39	—	MHz
		$Q_{2.0}$	—		1.64	1.79	1.94	MHz
		$Q_{2.5}$	—		—	1.43	—	MHz
	f_o = 4.43	Q_1	—		—	4.43	—	MHz
		$Q_{1.5}$	—		—	2.95	—	MHz
		$Q_{2.0}$	—		2.07	2.22	2.37	MHz
		$Q_{2.5}$	—		—	1.77	—	MHz

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
1 / 2 f_c Trap Characteristic f_o = 3.58	fo_0	—	(Note C_5)	1.45	1.60	1.75	MHz
	fo_{500}	—		1.70	1.85	2.00	
	fo_{600}	—		1.75	1.90	2.06	
	fo_{700}	—		1.80	1.95	2.10	
f_o = 4.43	fo_0	—		1.85	2.00	2.15	
	fo_{500}	—		2.00	2.15	2.30	
	fo_{600}	—		2.05	2.20	2.35	
	fo_{700}	—		2.10	2.25	2.40	
Tint Control Range (f_o = 600 kHz)	3NΔθ1	—	(Note C_6)	35.0	45.0	55.0	°
	3NΔθ2	—		−55.0	−45.0	−35.0	
	4NΔθ1	—		35.0	45.0	55.0	
	4NΔθ2	—					
Tint Control Variable Range (f_o = 600 kHz)	3NΔθT	—	(Note C_7)	70.0	90.0	110.0	
	4NΔθT	—					
Tint Control Characteristic	3TθTin	—	(Note C_8)	39	40	47	bit
	3EθTin	—					
	3NΔTin	—		73	80	87	Step
	4TθTin	—		39	40	47	bit
	4EθTin	—					
	4NΔTin	—		73	80	87	Step
APC Lead-In Range (Lead-In Range)	4.433PH	—	(Note C_9)	350	500	1500	Hz
	4.433PL	—		−350	−500	−1500	
	3.579PH	—		350	500	1700	
	3.579PL	—		−350	−500	−1700	
(Variable Range)	4.433HH	—		400	500	1100	
	4.433HL	—		−400	−500	−1100	
	3.579HH	—		400	500	1100	
	3.579HL	—		−400	−500	−1100	
APC Control Sensitivity	3.58β3	—	(Note C_{10})	1.50	2.2	2.90	—
	4.43β3	—		1.70	2.4	3.10	
	M-PALβM	—		1.50	2.2	2.90	
	N-PALβN	—					

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Killer Operation Input Level	3N-VTK1	—	(Note C_{11})	1.8	2.5	3.2	mV_{p-p}
	3N-VTC1	—		2.2	3.2	4.0	
	3N-VTK2	—		2.5	3.6	4.5	
	3N-VTC2	—		3.2	4.5	5.6	
	4N-VTK1	—		1.8	2.5	3.2	
	4N-VTC1	—		2.2	3.2	4.0	
	4N-VTK2	—		2.5	3.6	4.5	
	4N-VTC2	—		3.2	4.5	5.6	
	4P-VTK1	—		1.8	2.5	3.2	
	4P-VTC1	—		2.2	3.2	4.0	
	4P-VTK2	—		2.5	3.6	4.5	
	4P-VTC2	—		3.2	4.5	5.6	
	MP-VTK1	—		1.8	2.5	3.2	
	MP-VTC1	—		2.2	3.2	4.0	
	MP-VTK2	—		2.5	3.6	4.5	
	MP-VTC2	—		3.2	4.5	5.6	
	NP-VTK1	—		1.8	2.5	3.2	
	NP-VTC1	—		2.2	3.2	4.0	
	NP-VTK2	—		2.5	3.6	4.5	
	NP-VTC2	—		3.2	4.5	5.6	
Color Difference Output (Rainbow Color Bar)	3NeB-Y	—	(Note C_{12})	320	380	460	
	3NeR-Y	—		240	290	350	
	4NeB-Y	—		320	380	460	
	4NeR-Y	—		240	290	350	
	4PeB-Y	—		360	430	520	
	4PeR-Y	—		200	240	290	
(75% Color Bar)	4Peb-y	—		540	650	780	
	4Per-y	—		430	510	610	
Demodulation Relative Amplitude	$3NG_{R/B}$	—	(Note C_{13})	0.69	0.77	0.86	times
	$4NG_{R/B}$	—		0.70	0.77	0.85	
	$4PG_{R/B}$	—		0.49	0.56	0.64	
Demodulation Relative Phase	3NθR-B	—	(Note C_{14})	85	93	100	°
	4NθR-B	—		87	93	99	
	4PθR-B	—		85	90	95	
Demodulation Output Residual Carrier	3N-SCB	—	(Note C_{15})	0	5	15	mV_{p-p}
	3N-SCR	—					
	4N-SCB	—					
	4N-SCR	—					

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Demodulation Output Residual Higher Harmonic	3N-HCB	—	(Note C_{16})	0	10	30	mV_{p-p}
	3N-HCR	—					
	4N-HCB	—					
	4N-HCR	—					
Color Difference Output ATT Check	B-Y − 1 dB	—	(Note C_{17})	−1.20	−0.9	−0.60	dB
	B-Y − 2 dB	—		−2.30	−1.7	−1.55	
	B-Y + 1 dB	—		0.60	0.8	1.20	
16.2 MHz Oscillation Frequency	ΔfoF	—	(Note C_{18})	−2.0	0	2.0	kHz
16.2 MHz Oscillation Start Voltage	VFon1	—	(Note C_{19})	3.0	3.2	3.4	V
f_{sc} Free-Run Frequency (3.58 M)	3fr	—	(Note C_{20})	−100	50	200	Hz
(4.43 M)	4fr	—		−125	25	175	
(M-PAL)	Mfr	—					
(N-PAL)	Nfr	—		−140	10	160	
f_{sc} Output Amplitude	4.43e27	—	(Note C_{21})	420	500	580	mV_{p-p}
	3.58e27	—					
f_{sc} Output DC Voltage	3.58eV27	—	—	2.6	2.9	3.2	V
	0th V27	—		1.6	1.9	2.2	

DEF section

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
H. Reference Frequency	FHVCO	—	(Note DH1)	5.95	6.0	6.10	MHz
H. Reference Oscillation Start Voltage	VSHVCO	—	(Note DH2)	2.3	2.6	2.9	V
H. Output Frequency 1	fH1	—	(Note DH3)	15.5	15.625	15.72	kHz
H. Output Frequency 2	fH2	—	(Note DH4)	15.62	15.734	15.84	
H. Output Duty 1	Hφ1	—	(Note DH5)	39	41	43	%
H. Output Duty 2	Hφ2	—	(Note DH6)	35	37	39	
H. Output Duty Switching Voltage 1	$V_{5\text{-}1}$	—	(Note DH7)	1.2	1.5	1.8	V
H. Output Voltage	VHH	—	(Note DH8)	4.5	5.0	5.5	
	VHL	—		—	—	0.5	
H. Output Oscillation Start Voltage	VHS	—	(Note DH9)	—	5.0	—	
H. FBP Phase	φFBP	—	(Note DH10)	6.2	6.9	7.6	μs
H. Picture Position, Maximum	HSFTmax	—	(Note DH11)	17.7	18.4	19.1	
H. Picture Position, Minimum	HSFTmin	—	(Note DH12)	12.4	13.1	13.8	
H. Picture Position Control Range	ΔHSFT	—	(Note DH13)	4.5	5.3	6.1	
H. Distortion Correction Control Range	ΔHCC	—	(Note DH14)	0.5	1.0	1.5	μs / V
H. BLK Phase	φBLK	—	(Note DH15)	6.2	6.9	7.6	μs
H. BLK Width, Minimum	BLKmin	—	(Note DH16)	9.8	10.5	11.3	
H. BLK Width, Maximum	BLKmax	—	(Note DH17)	13.2	14.0	14.7	
P / N-GP Start Phase 1	SPGP1	—	(Note DH18)	3.45	3.68	3.90	
P / N-GP Start Phase 2	SPGP2	—	(Note DH19)	3.95	4.18	4.40	
P / N-GP Gate Width 1	PGPW1	—	(Note DH20)	1.65	1.75	1.85	
P / N-GP Gate Width 2	PGPW2	—	(Note DH21)	1.70	1.75	1.85	
SECAM-GP Start Phase 1	SSGP1	—	(Note DH22)	5.2	5.4	5.6	
SECAM-GP Start Phase 2	SSGP2	—	(Note DH23)	5.7	6.0	6.2	
SECAM-GP Gate Width 1	SGPW1	—	(Note DH24)	1.9	2.0	2.1	
SECAM-GP Gate Width 2	SGPW2	—	(Note DH25)	1.9	2.0	2.1	
Noise Detection Level 1	NL1	—	(Note DH26)	0.09	0.12	0.15	V
Noise Detection Level 2	NL2	—	(Note DH27)	0.20	0.25	0.31	
Noise Detection Level 3	NL3	—	(Note DH28)	0.31	0.39	0.49	
Noise Detection Level 4	NL4	—	(Note DH29)	0.44	0.55	0.68	

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
AFC-MASK Start Phase	φAFCf	—	(Note DV1)	2.6	3.2	3.8	H
AFC-MASK Stop Phase	φAFCe	—	(Note DV2)	4.4	5.0	5.6	
VNFB phase	φVNFB	—	(Note DV3)	0.45	0.75	1.05	
V. Output Maximum Phase	Vφmax	—	(Note DV4)	7.3	8.0	8.7	
V. Output Minimum Phase	Vφmin	—	(Note DV5)	0.5	1.0	1.5	
V. Output Phase Variable Range	ΔVφ	—	(Note DV6)	6.3	7.0	7.7	
50 System VBLK Start Phase	V50BLKf	—	(Note DV7)	0.4	0.55	0.7	
50 System VBLK Stop Phase	V50BLKe	—	(Note DV8)	20	23	26	
60 System VBLK Start Phase	V60BLKf	—	(Note DV9)	0.4	0.55	0.7	
60 System VBLK Stop Phase	V60BLKe	—	(Note DV10)	15	18	21	
Pin 56 VBLK Max Voltage	V56H	—		4.7	5.0	5.3	V
Pin 56 VBLK Min Voltage	V56L	—		0	—	0.3	
V. Lead-In Range 1	VAcaL	—	(Note DV11)	—	224.5	—	Hz
	VAcaH	—		—	344.5	—	
V. Lead-In Range 2	V60caL	—	(Note DV12)	—	224.5	—	
	V60caH	—		—	294.5	—	
VBLK Start Phase	SWVB	—	(Note DV13)	9	—	88	H
VBLK Stop Phase	STWVB	—	(Note DV14)	10	—	120	

Deflection correction stage

CHARACTERISTICS	SYMBOL	TEST CIR-CUIT	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Vertical Ramp Amplitude	V_{P49}	—	(Note G1)	1.76	1.95	2.15	V_{p-p}
Vertical Amplification	G_V	—	(Note G2)	20	26	32	dB
Vertical Amp Maximum Output Voltage	V_{H53}	—	(Note G3)	2.5	3	3.5	V
Vertical Amp Minimum Output Voltage	V_{L53}	—	(Note G4)	—	0	0.3	V
Vertical Amp Maximum Output Current	I_{MAX1}	—	(Note G5)	32	45	58	mA
Vertical NF Sawtooth Wave Amplitude	V_{P54}	—	(Note G6)	1.62	1.8	1.98	V_{p-p}
Vertical Amplitude Range	V_{PH}	—	(Note G7)	±41	±45	±49	%
Vertical Linearity Correction Maximum Value	V_{ℓ}	—	(Note G8)	±10	±13	±16	%
Vertical S Correction Maximum Value	V_S	—	(Note G9)	±11	±16	±21	%
Vertical NF Center Voltage	V_C	—	(Note G10)	4.3	4.5	4.7	V_{p-p}
Vertical Amplitude EHT Correction	V_{EHT}	—	(Note G11)	8	9	10	%
EHT Dynamic Range	V_L	—	(Note G12)	1.3	1.8	2.3	V
	V_H	—		5.7	6.2	6.7	
E-W NF Maximum DC Value (Picture Width)	V_{H51}	—	(Note G13)	5.5	6.5	7.5	V
E-W NF Minimum DC Value (Picture Width)	V_{L51}	—	(Note G14)	0.55	1.5	2.45	V
E-W NF Parabola Maximum Value (Parabola)	V_{PB}	—	(Note G15)	2.2	2.7	3.2	V_{p-p}
E-W NF Corner Correction (Corner)	V_{CR}	—	(Note G16)	2	3	4	V_{p-p}
Parabola Symmetry Correction	V_{TR}	—	(Note G17)	8	10	12	%
E-W Parabola EHT Value	V_{EH1}	—	(Note G18)	2	3.3	4.5	%
E-W DC EHT Value	V_{EH2}	—	(Note G19)	0.6	1	1.4	V
E-W Amp Maximum Output Current	I_{MAX2}	—	(Note G20)	0.14	0.2	0.28	mA
AGC Operating Current 1	V_{AGC0}	—	(Note G21)	160	200	240	μA
AGC Operating Current 2	V_{AGC1}	—	(Note G22)	480	600	720	μA
Vertical Guard Voltage	V_{VG}	—	(Note G23)	0.8	1	1.2	V
V Centering DAC Output	I_{54}	—	(Note G24)	—	10	100	nA

1H DL section

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
1HDL Dynamic Range, Direct	VNBD	—	(Note H_1)	0.8	1.2	—	V
	VNRD	—					
1HDL Dynamic Range, Delay	VPBD	—	(Note H_2)	0.8	1.2	—	
	VPRD	—					
1HDL Dynamic Range, Direct+Delay	VSBD	—	(Note H_3)	0.9	1.2	—	
	VSRD	—					
Frequency Characteristic, Direct	GHB1	—	(Note H_4)	−3.0	−2.0	0.5	dB
	GHR1	—					
Frequency Characteristic, Delay	GHB2	—	(Note H_5)	−8.2	−6.5	−4.3	
	GHR2	—					
AC Gain, Direct	GBY1	—	(Note H_6)	−2.0	−0.5	2.0	
	GRY1	—					
AC Gain, Delay	GBY2	—	(Note H_7)	−2.4	−0.5	1.1	
	GRY2	—					
Direct-Delay AC Gain Difference	GBYD	—	(Note H_8)	−1.0	0.0	1.0	
	GRYD	—					
Color Difference Output DC Stepping	VBD	—	(Note H_9)	−5	0.0	5	mV
	VRD	—					
1H Delay Quantity	BDt	—	(Note H_{10})	63.7	64.0	64.4	μs
	RDt	—					
Color Difference Output	Bomin	—	(Note H_{11})	22	36	55	mV
DC-Offset Control	Bomax	—		−55	−36	−22	
Bus-Min Data	Romin	—		22	36	55	
Bus-Max Data	Romax	—		−55	−36	−22	
Color Difference Output DC-Offset Control / Min. Control Quantity	Bo1	—	(Note H_{12})	1	4	8	
	Ro1	—					
NTSC Mode Gain / NTSC-COM Gain	GNB	—	(Note H_{13})	−0.90	0	1.20	dB
	GNR	—		0.92	0	1.58	

Text section

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Y Color Difference Clamping Voltage	Vcp31	—	(Note T_1)	1.7	2.0	2.3	V
	Vcp33	—		2.2	2.5	2.8	
	Vcp34	—					
Contrast Control Characteristic	Vc12mx	—	(Note T_2)	2.50	3.00	3.50	
	Vc12mn	—		0.06	0.14	0.21	
	D12c80	—		0.83	1.24	1.86	
	Vc13mx	—		2.50	3.00	3.50	
	Vc13mn	—		0.06	0.14	0.21	
	D13c80	—		0.83	1.24	1.86	
	Vc14mx	—		2.50	3.00	3.50	
	Vc14mn	—		0.06	0.14	0.21	
	D14c80	—		0.83	1.24	1.86	
AC Gain	Gr	—	(Note T_3)	2.8	4.0	5.2	times
	Gg	—					
	Gb	—					
Frequency Characteristic	Gf	—	(Note T_4)	—	−1.0	−3.0	dB
Y Sub-Contrast Control Characteristic	ΔVscnt	—	(Note T_5)	3.0	6.0	9.0	V
Y_2 Input Range	Vy2d	—	(Note T_6)	0.7	—	—	
Unicolor Control Characteristic	Vn12mx	—	(Note T_7)	1.6	2.3	4.3	
	Vn12mn	—		0.05	0.12	0.19	
	D12n80	—		0.67	1.16	1.68	
	Vn14mx	—		1.6	2.3	4.3	
	Vn14mn	—		0.05	0.12	0.19	
	D14n80	—		0.67	1.16	1.68	
	ΔV14un	—		22	27	32	dB
Relative Amplitude (NTSC)	Mnr-b	—	(Note T_8)	0.70	0.77	0.85	times
	Mng-b	—		0.30	0.34	0.38	
Relative Phase (NTSC)	θnr-b	—	(Note T_9)	87	93	99	°
	θng-b	—		235	241.5	248	
Relative Amplitude (PAL)	Mpr-b	—	(Note T_{10})	0.50	0.56	0.63	times
	Mpg-b	—		0.30	0.34	0.38	
Relative Phase (PAL)	θpr-b	—	(Note T_{11})	86	90	94	°
	θpg-b	—		232	237	242	

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Color Control Characteristic	Vcmx	—	(Note T_{12})	1.19	1.41	1.68	V_{p-p}
	e_{col}	—		80	128	160	step
	Δ_{col}	—		142	192	242	
Color Control Characteristic, Residual Color	e_{cr}	—	(Note T_{13})	0	12.5	25	mV_{p-p}
	e_{cg}	—					
	e_{cb}	—					
Chroma Input Range	Vcr	—	(Note T_{14})	700	—	—	
Brightness Control Characteristic	Vbrmx	—	(Note T_{15})	3.05	3.45	3.85	V
	Vbrmn	—		1.05	1.35	1.65	
Brightness Center Voltage	Vbcnt	—	(Note T_{16})	2.05	2.30	2.55	
Brightness Data Sensitivity	ΔVbrt	—	(Note T_{17})	6.3	7.8	9.4	mV
RGB Output Voltage Axes Difference	ΔVbct	—	(Note T_{18})	−150	0	150	
White Peak Limit Level	Vwpl	—	(Note T_{19})	2.63	3.25	3.75	V
Cutoff Control Characteristic	Vcomx	—	(Note T_{20})	2.55	2.75	2.95	
	Vcomn	—		1.55	1.75	1.95	
Cutoff Center Level	Vcoct	—	(Note T_{21})	2.05	2.3	2.55	
Cutoff Variable Range	ΔDcut	—	(Note T_{22})	2.3	3.9	5.5	mV
Drive Variable Range	DR+	—	(Note T_{23})	2.7	3.85	5.0	dB
	DR−	—		−6.5	−5.6	−4.7	
DC Regeneration	TDC	—	(Note T_{24})	0	50	100	mV
RGB Output S / N Ratio	SNo	—	(Note T_{25})	—	−50	−45	dB
Blanking Pulse Output Level	Vv	—	(Note T_{26})	0.7	1.0	1.3	V
	Vh	—					
Blanking Pulse Delay Time	t_{don}	—	(Note T_{27})	0.05	0.25	0.45	μs
	t_{doff}	—		0.05	0.35	0.85	
RGB Min. Output Level	Vmn	—	(Note T_{28})	0.8	1.0	1.2	V
RGB Max. Output Level	Vmx	—	(Note T_{29})	6.85	7.15	7.45	
Halftone Ys Level	Vthtl	—	(Note T_{30})	0.7	0.9	1.1	
Halftone Gain	G6htl3	—	(Note T_{31})	−7.5	−6.0	−4.5	dB
Text ON Ys Level	Vttxl	—	(Note T_{32})	1.8	2.0	2.2	V
Text / OSD Output, Low Level	Vtxl13	—	(Note T_{33})	−0.45	−0.25	−0.05	
Text RGB Output, High Level	Vmt13	—	(Note T_{34})	1.15	1.4	1.85	
OSD Ys ON Level	Vtosl	—	(Note T_{35})	2.8	3.0	3.2	
OSD RGB Output, High Level	Vmos13	—	(Note T_{36})	1.75	2.15	2.55	
Text Input Threshold Level	Vtxtg	—	(Note T_{37})	0.7	1.0	1.3	
OSD Input Threshold Level	Vosdg	—	(Note T_{38})	1.7	2.0	2.3	

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
OSD Mode Switching Rise-Up Time	τ_{Rosr} τ_{Rosg} τ_{Rosb}	— — —	(Note T_{39})	—	40	100	ns
OSD Mode Switching Rise-Up Transfer Time	t_{PRosr} t_{PRosg} t_{PRosb}	— — —	(Note T_{40})	—	40	100	ns
OSD Mode Switching Rise-Up Transfer Time, 3 Axes Difference	Δt_{PRos}	—	(Note T_{41})	—	15	40	ns
OSD Mode Switching Breaking Time	τ_{Fosr} τ_{Fosg} τ_{Fosb}	— — —	(Note T_{42})	—	30	100	ns
OSD Mode Switching Breaking Transfer Time	t_{PFosr} t_{PFosg} t_{PFosb}	— — —	(Note T_{43})	—	30	100	ns
OSD Mode Switching Breaking Transfer Time, 3 Axes Difference	Δt_{FRos}	—	(Note T_{44})	—	20	40	ns
OSD Hi DC Switching Rise-Up Time	τ_{Roshr} τ_{Roshg} τ_{Roshb}	— — —	(Note T_{45})	—	20	100	ns
OSD Hi DC Switching Rise-Up Transfer Time	t_{PRohr} t_{PRohg} t_{PRohb}	— — —	(Note T_{46})	—	20	100	ns
OSD Hi DC Switching Rise-Up Transfer Time, 3 Axes Difference	Δt_{PRoh}	—	(Note T_{47})	—	0	40	ns
OSD Hi DC Switching Breaking Time	τ_{Foshr} τ_{Foshg} τ_{Foshb}	— — —	(Note T_{48})	—	20	100	ns
OSD Hi DC Switching Breaking Transfer Time	t_{PFohr} t_{PFohg} t_{PFohb}	— — —	(Note T_{49})	—	20	100	ns
OSD Hi DC Switching Breaking Transfer Time, 3 Axes Difference	Δt_{PFoh}	—	(Note T_{50})	—	0	40	ns

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
RGB Contrast Control Characteristic	Vc12mx	—	(Note T_{51})	2.10	2.5	2.97	V
	Vc12mn	—		0.05	0.12	0.19	
	D12c80	—		0.84	1.25	1.87	
	Vc13mx	—		2.10	2.5	2.97	
	Vc13mn	—		0.05	0.12	0.19	
	D13c80	—		0.84	1.25	1.87	
	Vc14mx	—		2.10	2.5	2.97	
	Vc14mn	—		0.05	0.12	0.19	
	D14c80	—		0.84	1.25	1.87	
Analog RGB AC Gain	Gag	—	(Note T_{52})	4.0	5.1	6.3	times
Analog RGB Frequency Characteristic	Gfg	—	(Note T_{53})	−0.5	−1.75	−3.0	dB
Analog RGB Dynamic Range	Dr24	—	(Note T_{54})	0.5	—	—	V
RGB Brightness Control Characteristic	Vbrmxg	—	(Note T_{55})	3.05	3.25	3.45	
	Vbrmng	—		1.05	1.25	1.45	
RGB Brightness Center Voltage	Vbcntg	—	(Note T_{56})	2.05	2.25	2.45	
RGB Brightness Data Sensitivity	ΔVbrtg	—	(Note T_{57})	6.3	7.8	9.4	mV
Analog RGB Mode ON Voltage	Vanath	—	(Note T_{58})	0.8	1.0	1.2	V
Analog RGB Switching Rise-Up Time	τ_{Ranr}	—	(Note T_{59})	—	50	100	ns
	τ_{Rang}	—					
	τ_{Ranb}	—					
Analog RGB Switching Rise-Up Transfer Time	t_{PRanr}	—	(Note T_{60})	—	20	100	
	t_{PRang}	—					
	t_{PRanb}	—					
Analog RGB Switching Rise-Up Transfer Time, 3 Axes Difference	Δt_{PRas}	—	(Note T_{61})	—	0	40	
Analog RGB Switching Breaking Time	τ_{Fanr}	—	(Note T_{62})	—	50	100	
	τ_{Fang}	—					
	τ_{Fanb}	—					
Analog RGB Switching Breaking Transfer Time	t_{PFanr}	—	(Note T_{63})	—	30	100	
	t_{PFang}	—					
	t_{PFanb}	—					
Analog RGB Switching Breaking Transfer Time, 3 Axes Difference	Δt_{PFas}	—	(Note T_{64})	—	0	40	

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Analog RGB Hi Switching Rise-Up Time	τ_{Ranhr}	—	(Note T_{65})	—	50	100	ns
	τ_{Ranhg}	—					
	τ_{Ranhb}	—					
Analog RGB Hi Switching Rise-Up Transfer Time	t_{PRahr}	—	(Note T_{66})	—	20	100	
	t_{PRahg}	—					
	t_{PRahb}	—					
Analog RGB Hi Switching Rise-Up Transfer Time, 3 Axes Difference	Δt_{PRah}	—	(Note T_{67})	—	0	40	
Analog RGB Hi Switching Breaking Time	t_{Fanhr}	—	(Note T_{68})	—	50	100	
	t_{Fanhg}	—					
	t_{Fanhb}	—					
Analog RGB Hi Switching Breaking Transfer Time	t_{PFahr}	—	(Note T_{69})	—	20	100	
	t_{PFahg}	—					
	t_{PFahb}	—					
Analog RGB Hi Switching Breaking Transfer Time, 3 Axes Difference	Δt_{PFah}	—	(Note T_{70})	—	0	40	
TV-Analog RGB Crosstalk	Crtvag	—	(Note T_{71})	−80	−50	−40	dB
Analog RGB-TV Crosstalk	Crantg	—	(Note T_{72})				
ABL Point Characteristic	Vablpl	—	(Note T_{73})	5.5	5.6	5.7	V
	Vablpc	—		5.7	5.8	5.9	
	Vablph	—		5.9	6.0	6.1	
ACL Characteristic	Vcal	—	(Note T_{74})	−19	−16	−13	dB
ABL Gain Characteristic	Vabll	—	(Note T_{75})	−0.3	0	0.3	V
	Vablc	—		−1.3	−1.0	−0.7	
	Vablh	—		−2.3	−2.0	−1.7	

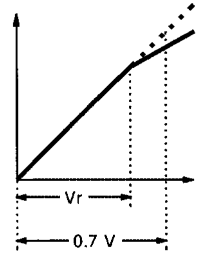
SECAM section

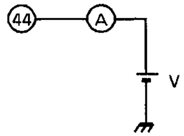
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Bell Monitor Output Amplitude	embo	—	(Note S_1)	200	300	400	mV_{p-p}
Bell Filter f_o	foB-C	—	(Note S_2)	−23	0	23	kHz
Bell Filter f_o Variable Range	foB-L	—	(Note S_3)	−69	−46	−23	
	foB-H	—		69	92	115	
Bell Filter Q	QBEL	—	(Note S_4)	14	16	18	—
Color Difference Output Amplitude	VBS	—	(Note S_5)	0.50	—	0.91	V_{p-p}
	VRS	—		0.39	—	0.73	
Color Difference Relative Amplitude	R / B-S	—	(Note S_6)	0.70	—	0.90	—
Color Difference Attenuation Quantity	SATTB	—	(Note S_7)	−1.50	—	−0.50	dB
	SATTR	—					
Color Difference S / N Ratio	SNB-S	—	(Note S_8)	−85	—	−25	
	SBR-S	—					
Linearity	LinB	—	(Note S_9)	75	—	117	%
	LinR	—		85	—	120	
Rising-Fall Time (Standard De-Emphasis)	trfB	—	(Note S_{10})	—	1.3	1.5	μs
	trfR	—					
Rising-Fall Time (Wide-Band De-Emphasis)	trfBw	—	(Note S_{11})	—	1.1	1.3	
	trfRw	—					
Killer Operation Input Level (Standard Setting)	eSK	—	(Note S_{12})	0.5	1	2	mV_{p-p}
	eSC	—					
Killer Operation Input Level (VID ON)	eSFK	—	(Note S_{13})				
	eSFC	—					
Killer Operation Input Level (Low Sensitivity, VID OFF)	eSWK	—	(Note S_{14})	0.7	1.5	3	
	eSWC	—					

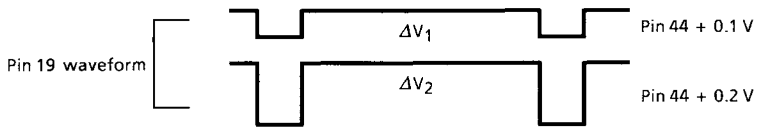
TEST CONDITION
VIDEO SECTION

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)											
		SW MODE					SUB-ADDRESS & BUS DATA						MEASURING METHOD
		S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	04H	08H	0FH	10H	13H	14H	
Y_1	Y Input Pedestal Clamping Voltage	A	C	B	A	A	20H	04H	80H	00H	3AH	03H	(1) Short circuit pin 45 (Y_1 IN) in AC coupling. (2) Input synchronizing signal to pin 48 (SYNC IN). (3) Measure DC voltage at pin 45, and express the measurement result as VYclp.
Y_2	Chroma Trap Frequency	↑	↑	A	B	↑	↑	↑	↑	↑	↑	↑	(1) Set the 358 TRAP mode to AUTO by setting the bus data. (2) Set the bus data so that chroma trap is ON and f_0 is 0. (3) Input TG7 sine wave signal whose frequency is 3.58 MHz (NTSC) and video amplitude is 0.5 V to pin 45 (Y_1 IN). (4) While observing waveform at pin 37 (Y_{1out}), find a frequency with minimum amplitude of the waveform. The obtained frequency shall be expressed as fIr3. (5) Change the frequency of the signal 1 to 4.43 MHz (PAL) and perform the same measurement as the preceding step4. The obtained frequency shall be expressed as fIr4.
Y_3	Chroma Trap Attenuation (3.58 MHz)	↑	↑	↑	↑	↑	↑	↑	Vari-able	↑	Vari-able	↑	(1) Set the bus data so that Q of chroma trap is 1.5. (2) Set the bus data so that f_0 of chroma trap is 0. (3) Input TG7 sine wave signal whose frequency is 3.58 MHz (NTSC) and video amplitude is 0.5 V to pin 45 (Y_1 IN). (4) While turning on and off the chroma trap by controlling the bus, measure chroma amplitude (VTon) at pin 37 (Y_{1out}) with the chroma trap being turned on and measure chroma amplitude (VToff) at pin 37 (Y_{1out}) with the chroma trap being turned off. Gtr = 20ℓog (VToff / VTon) (5) Change f_0 of the chroma trap to −100 kHz, −50 kHz, 0 and +50 kHz, and perform the same measurement as the preceding steps 4 and 5 with the respective f_0 settings. (6) Change Q of the chroma trap to 1, 1.5, 2 and 2.5, and perform the same measurement as the preceding steps 4 through 6. The maximum Gtr shall be expressed as Gtr3a.

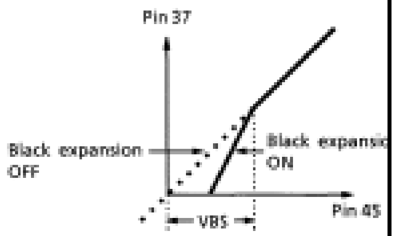
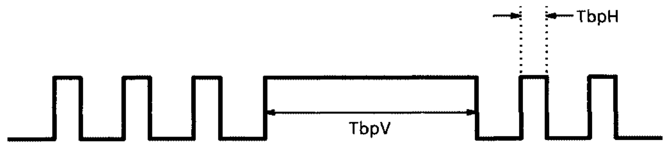
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)											MEASURING METHOD
		SW MODE					SUB-ADDRESS & BUS DATA						
		S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	04H	08H	0FH	10H	13H	14H	
Y_4	Chroma Trap Attenuation (4.43 MHz)	A	C	A	B	A	20H	04H	Vari-able	00H	3AH	03H	(1) Set the S-D-Trap is ON. (2) Set the bus data so that Q of chroma trap is 1.5. (3) Set the bus data so that f_0 of chroma trap is 0. (4) Input TG7 sine wave signal whose frequency is 4.43 MHz and video amplitude is 0.5 V to pin 45 (Y_1 IN). (5) Perform the same measurement as the steps 4 through 6 of the preceding item Y_3. The measurement result shall be expressed as Gtr4.
Y_5	Chroma Trap Attenuation (SECAM)	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) Set the Dtrap is ON. (2) Set the bus data so that Q of chroma trap is 1.5. (3) Set the bus data so that f_0 of chroma trap is 0. (4) Input SECAM signal whose amplitude in video period is 0.5 V to pin 45 (Y_1 IN). (5) Perform the same measurement as the steps 5 through 7 of the preceding item Y_3 to find the maximum attenuation (Gtrs).
Y_6	Yγ Correction Point	↑	↑	↑	↑	↑	↑	Vari-able	80H	↑	3AH	↑	(1) Connect the power supply to pin 45 (Y_1 IN). (2) Turn off Y_γ by setting the bus data. (3) While raising the supply voltage from the level measured in the preceding item Y_1, measure voltage change characteristic of Y_1 output at pin 37. (4) Set the bus data to turn on Yγ (5) Perform the same measurement as the above step 3. (6) Find a gamma (γ) point from the measurement results of the steps3 and 5. $\gamma p = Vr \div 0.7\ V$
Y_7	Yγ Correction Curve	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	From the measurement in the above item Y_6, find gain of the portion that the γ correction has an effect on.



<table>
<tr><th rowspan="3">NOTE</th><th rowspan="3">ITEM</th><th colspan="12">TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)</th></tr>
<tr><th colspan="5">SW MODE</th><th colspan="6">SUB-ADDRESS & BUS DATA</th><th rowspan="2">MEASURING METHOD</th></tr>
<tr><th>S_{39}</th><th>S_{42}</th><th>S_{44}</th><th>S_{45}</th><th>S_{51}</th><th>04H</th><th>08H</th><th>0FH</th><th>10H</th><th>13H</th><th>14H</th></tr>
<tr><td>Y_8</td><td>APL Terminal Output Impedance</td><td>A</td><td>C</td><td>B</td><td>A</td><td>A</td><td>20H</td><td>04H</td><td>80H</td><td>00H</td><td>3AH</td><td>03H</td><td>(1) Short circuit pin 45 (Y_1 IN) in AC coupling.
(2) Input synchronizing signal to pin 51.
(3) Connect power supply and an ammeter to the APL of pin 44 as shown in the figure, and adjust the power supply so that the ammeter reads 0 (zero).
(4) Raise the voltage at pin 44 by 0.1 V, and measure the current (Iin) at that time.


Zo44 (Ω) = 0.1 V÷ Iin (A)</td></tr>
<tr><td>Y_9</td><td>DC Transmission Compensation Amplifier Gain</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>Vari-able</td><td>(1) Set the bus data so that DC transmission factor correction gain is maximum.
(2) In the condition of the Note Y_8, observe Y_{1out} waveform at pin 37 and measure voltage change in the video period.
(3) Set the bus data so that DC transmission factor correction gain is centered, and measure voltage in the same manner as the above step 2


Adr = ($\Delta V_2 - \Delta V_1$) ÷ 0.1 V ÷ Y_1 gain</td></tr>
<tr><td>Y_{10}</td><td>Maximum Gain of Black Expansion Amplifier</td><td>↑</td><td>↑</td><td>A</td><td>B</td><td>↑</td><td>↑</td><td>↑</td><td>00H</td><td>↑</td><td>↑</td><td>E3H</td><td>(1) Set the bus data so that black expansion is on and black expansion point is maximum.
(2) Input TG7 sine wave signal whose frequency is 500 kHz and video amplitude is 0.1 V to pin 45 (Y_1 IN).
(3) While impressing 1.0 V to pin 39 (Black Peak Hold), measure amplitude (Va) of Y_{1out} signal at pin 37.
(4) While impressing 3.5 V to pin 39 (Black Peak Hold), measure amplitude (Vb) of Y_{1out} signal at pin 37.
Akc = Va ÷ Vb</td></tr>
</table>

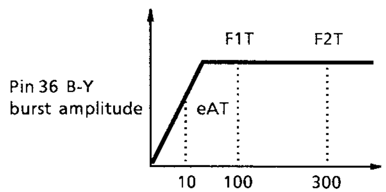
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)											MEASURING METHOD
		SW MODE					SUB-ADDRESS & BUS DATA						
		S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	04H	08H	0FH	10H	13H	14H	
Y_{11}	Black Expansion Start Point	A	C	A	A	A	20H	04H	00H	00H	3AH	Vari-able	(1) Set the bus data so that black expansion is on and black expansion point is maximum. (2) Supply 1.0 V to pin 39 (Black Peak Hold). (3) Supply 2.9 V to the APL of pin 44. (4) Connect the power supply to pin 45 (Y_1 IN). While raising the supply voltage from the level measured in the preceding item Y_1, measure voltage change at pin 37 (Y_{1out}). (5) Set the bus data to center the black expansion point, and perform the same measurement as the above steps 2 through 4.  (6) Set the black expansion point to the minimum by setting the bus data, and perform the same measurement as the above steps 2 through 4. (7) While supplying 2.2 V to the APL of pin 44, perform the same measurement as the above step 4 with the black expansion point set to maximum, center and minimum
Y_{12}	Black Peak Detection Period (Horizontal) Black Peak Detection Period (Vertical)	B	↑	↑	↑	↑	↑	↑	↑	↑	↑	E3H	In the condition of the Note Y_1, measure waveform at pin 39 (Black Peak Hold). 

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)											MEASURING METHOD
		SW MODE					SUB-ADDRESS & BUS DATA						
		S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	04H	08H	0FH	10H	13H	14H	
Y_{13}	Picture Quality Control Peaking Frequency	A	C	A	B	A	3FH	04H	80H	00H	3AH	Vari-able	(1) Set the bus data so that picture quality control frequency is 2.5 MHz. (2) Input TG7 sine wave (sweeper) signal whose video level is 0.1 V to pin 45 (Y_1 IN) and pin 51 (Sync. IN). (3) Maximize the picture quality control data. (4) While observing Y_{1out} of pin 37, find an SG frequency as the waveform amplitude is maximum (fp25). (5) Set the bus data so that picture quality control frequency is 3.1 MHz and 4.2 MHz, and perform the same measurement as the above steps 2 through 4 at the respective frequencies (fp31, fp42).
Y_{14}	Picture Quality Control Maximum Characteristic	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) Input TG7 sine wave (sweeper) signal whose video level is 0.1 V to pin 45 (Y_1 IN) and pin 48 (Sync. IN). (2) Set the picture quality control data to maximum. (3) Set the picture quality control frequency is 2.5 MHz by setting the bus data. (4) Measure amplitude (V100k) of the output of pin 37 (Y_1 OUT) as the SG frequency is 100 kHz, and the amplitude (Vp25) of the same as the SG frequency is 2.5 MHz. GS25MX = 20 ℓog (Vp25 / V100k) (5) Set the picture quality control frequency data to 3.1 MHz by setting the bus data. (6) Measure amplitude (V100k) of the output of pin 37 (Y_1 OUT) as the SG frequency is 100 kHz, and the amplitude (Vp31) of the same as the SG frequency is 3.1 MHz. GS31MX = 20 ℓog (Vp31 / V100k) (7) Set the picture quality control frequency to 4.2 MHz by setting the bus data. (8) Measure amplitude (V100k) of the output of pin 37 (Y_1 OUT) as the SG frequency is 100 kHz, and the amplitude (Vp42) of the same as the SG frequency is 4.2 MHz. GS42MX = 20 ℓog (Vp42 / V100k)

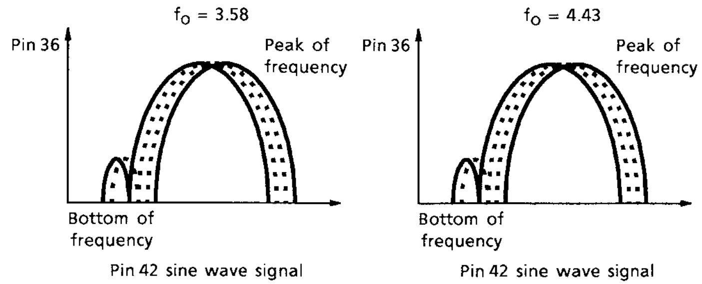
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)											MEASURING METHOD
		SW MODE					SUB-ADDRESS & BUS DATA						
		S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	04H	08H	0FH	10H	13H	14H	
Y_{15}	Picture Quality Control Minimum Characteristic	A	C	A	B	A	00H	04H	80H	00H	3AH	Vari-able	(1) In the condition of the Note Y_{14}, set the picture quality control bus data to minimum. (2) Perform the same measurement as the steps 3 through 8 of the Note Y_{14} to find respective gains as the picture quality control frequency is set to 2.5 MHz, 3.1 MHz and 4.2 MHz. GS25MN = 20 ℓog (Vp25 / V100k) GS31MN = 20 ℓog (Vp31 / V100k) GS42MN = 20 ℓog (Vp42 / V100k)
Y_{16}	Picture Quality Control Center Characteristic	↑	↑	↑	↑	↑	20H	↑	↑	↑	↑	↑	(1) In the condition of the Note Y_{14}, set the picture quality control bus data to center. (2) Perform the same measurement as the steps 3 through 8 of the Note Y_{14} to find respective gains as the picture quality control frequency is set to 2.5 MHz, 3.1 MHz and 4.2 MHz. GS25CT = 20 ℓog (Vp25 / V100k) GS31CT = 20 ℓog (Vp31 / V100k) GS42CT = 20 ℓog (Vp42 / V100k)
Y_{17}	Y Signal Gain	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	03H	(1) Set the bus data so that black expansion is off, picture quality control is off and DC transmission compensation is minimum. (2) Input TG7 sine wave signal whose frequency is 100 kHz and video level is 0.5 V to pin 45 (Y_1 IN) and pin 48 (Sync. IN). (Vyi100) (3) Measure amplitude of Y_1 output at pin 37 (Vyout). Gy = 20 ℓog (Vyout / Vyi100)
Y_{18}	Y Signal Frequency Characteristic	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) Set the bus data so that black expansion is off, picture quality control is off and DC transmission compensation is minimum. (2) Input TG7 sine wave signal whose frequency is 6 MHz and video level is 0.5 V to pin 45 (Y_1 IN) and pin 48 (Sync. IN). (Vyi6M) (3) Measure amplitude of Y_1 output at pin 37 (Vyo6M). Gy6M = 20 ℓog (Vyo6M / Vyi6M) (4) Find Gfy from the result of the Note Y_{17} Gfy = Gy6M − Gy

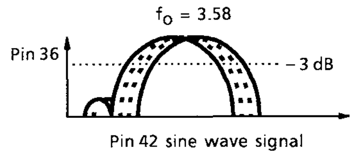
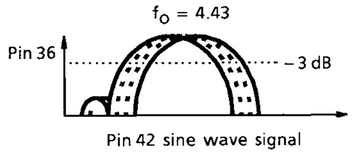
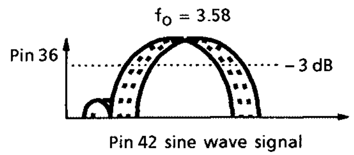
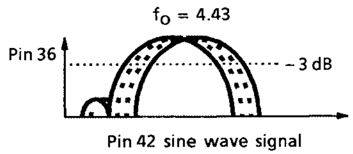
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)											MEASURING METHOD
		SW MODE					SUB-ADDRESS & BUS DATA						
		S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	04H	08H	0FH	10H	13H	14H	
Y_{19}	Y Signal Maximum Input Range	A	C	A	B	A	20H	04H	80H	00H	3AH	03H	(1) Set the bus data so that black expansion is off, picture quality control is off and DC transmission compensation is minimum. (2) Input TG7 sine wave signal whose frequency is 100 kHz to pin 45 (Y_1 IN) and pin 48 (Sync. IN). (3) While increasing the amplitude Vyd of the signal in the video period, measure Vyd just before the waveform of Y_1 output (pin 37) is distorted.

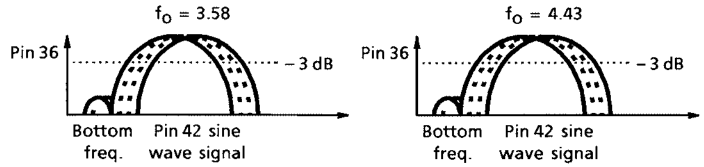
CHROMA SECTION

<table>
<tr><th rowspan="3">NOTE</th><th rowspan="3">ITEM</th><th colspan="11">TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)</th></tr>
<tr><th colspan="10">SW MODE</th><th rowspan="2">MEASURING METHOD</th></tr>
<tr><th>S_{26}</th><th>S_1</th><th>S_{31}</th><th>S_{33}</th><th>S_{34}</th><th>S_{39}</th><th>S_{42}</th><th>S_{44}</th><th>S_{45}</th><th>S_{51}</th></tr>
<tr><td>C_1</td><td>ACC Characteristic</td><td>ON</td><td>A</td><td>B</td><td>B</td><td>B</td><td>A</td><td>A</td><td>A</td><td>A</td><td>B</td><td>
(1) Activate the test mode (S26-ON, Sub Add 02 ; 01h).
(2) Set as follows : band pass filter Q = 2, f_o = 600 kHz, crystal clock = conforming to European, Asian system.
(3) Set the gate to the normal status.
(4) Input 3N rainbow color bar signal to pin 42 (Chroma IN).
(5) When input signal to pin 42 is the same in the burst and chroma levels (10 mV_{p-p}), burst amplitude of B-Y output signal from pin 36 is expressed as eAT. When the level of input signal to pin 42 is 100 mV_{p-p} or 300 mV_{p-p}, burst amplitude of the B-Y output signal is expressed as F1T or F2T. The ratio between F1T and F2T is expressed as AT.
F2T / F1T = AT
(6) Perform the same measurement in the EXT. mode (f_o = 0).
(eAE, F1E, AE)


(7) Input 4N rainbow color bar signal to pin 42 (Chroma IN), and perform the same measurement as the above-mentioned steps with 3N rainbow color bar signal input.
</td></tr>
</table>

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)										
		SW MODE										MEASURING METHOD
		S_{26}	S_1	S_{31}	S_{33}	S_{34}	S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	
C_2	Band Pass Filter Characteristic	ON	A	B	B	B	A	B	A	A	B	(1) Activate the test mode (S26-ON, Sub Add 02 ; 01h). (2) Set as follows : band pass filter Q = 2, crystal clock = conforming to 3.579 / 4.43 MHz, gate = normal status. (3) Input 3N composite sine wave signal (1 V_{p-p}) to pin 42 (Chroma IN). (4) Measure frequency characteristic of B-Y output of pin 36 and measure the peak frequency, too. (5) Changing f_o to 0, 500, 600 and 700 by the bus control and measure peak frequencies respectively with different f_o. (6) For measuring frequency characteristic as f_o is 4.43, use 4.43 MHz crystal clock. Measure the following items in the same manner. 

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)										
		SW MODE										MEASURING METHOD
		S_{26}	S_1	S_{31}	S_{33}	S_{34}	S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	
C_3	Band Pass Filter, −3 dB Band Characteristic	ON	A	B	B	B	A	B	A	A	B	(1) Activate the test mode (S26-ON, Sub Add 02 ; 01h). (2) Set as follows : band pass filter Q = 2, crystal clock = conforming to 3.579 / 4.43 MHz. (3) Set the gate to the normal status. (4) Input 3N composite sine wave signal (1 V_{p-p}) to pin 42 (Chroma IN). (5) Measure frequency characteristic of B-Y output of pin 36, and measure peak frequency in the −3 dB band. (6) Changing f_o to 0, 500, 600 and 700 by the bus control and measure peak frequencies in the −3 dB band respectively with different f_o. 
C_4	Band Pass Filter, Q Characteristic Check	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) Activate the test mode (S26-ON, Sub Add 02 ; 01h). (2) Set as follows : TV mode (f_o = 600), Crystal mode = conforming to 3.579 / 4.43 MHz, gate = normal status. (3) Input 3N composite sine wave signal (1 V_{p-p}) to pin 42 (Chroma IN). (4) Measure frequency characteristic of B-Y output of pin 36, and measure peak frequency in the −3 dB band. (5) Changing f_o of the band pass filter to 0, 500, 600 and 700 by the bus control and measure peak frequencies in the −3 dB band respectively with different f_o. 

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)										
		SW MODE										MEASURING METHOD
		S_{26}	S_1	S_{31}	S_{33}	S_{34}	S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	
C_5	1 / 2 f_o Trap Characteristic	ON	A	B	B	B	A	B	A	A	B	(1) Activate the test mode (S26-ON, Sub Add 02 ; 01h). (2) Set as follows : band pass filter Q = 2, crystal clock = conforming to 3.579 / 4.43 MHz, gate = normal status. (3) Input 3N composite sine wave signal (1 V_{p-p}) to pin 42 (Chroma IN). (4) Measure frequency characteristic of B-Y output of pin 36, and measure bottom frequency. (5) Changing f_o to 0, 500, 600 and 700 by the bus control and measure bottom frequencies respectively with different f_o. 

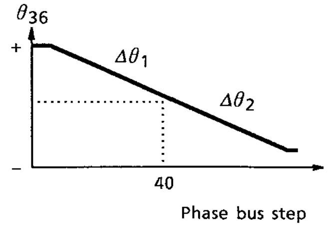
<table>
<tr><th rowspan="3">NOTE</th><th rowspan="3">ITEM</th><th colspan="11">TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)</th></tr>
<tr><th colspan="10">SW MODE</th><th rowspan="2">MEASURING METHOD</th></tr>
<tr><th>S_{26}</th><th>S_1</th><th>S_{31}</th><th>S_{33}</th><th>S_{34}</th><th>S_{39}</th><th>S_{42}</th><th>S_{44}</th><th>S_{45}</th><th>S_{51}</th></tr>
<tr><td>C_6</td><td>Tint Control
Sharing Range
(f_o = 600 kHz)</td><td>ON</td><td>A</td><td>B</td><td>B</td><td>B</td><td>A</td><td>A</td><td>A</td><td>A</td><td>B</td>
<td rowspan="3">(1) Activate the test mode (S26-ON, Sub Add 02 ; 08h).

(2) Connect band pass filter (Q = 2), set crystal mode to conform to European, Asian system and set the gate to normal status.

(3) Input 3N rainbow color bar signal (100 mVp-p) to pin 42 (Chroma IN).

(4) Measure phase shift of B-Y color difference output of pin 36.

(5) While shifting color phase (tint) from minimum to maximum by the bus control, measure phase change of B-Y color difference output of pin 36. On the condition that 6 bars in the center have the peak level (regarded as center of color phase), the side of 5 bars is regarded as positive direction while the side of 7 bars is regarded as negative direction when the 5 bars or the 7 bars are in the peak level. Based on this assumption, open angle toward the positive direction is expressed as $\Delta\theta_1$ and that toward the negative direction is expressed as $\Delta\theta_2$ as viewed from the phase center. $\Delta\theta_1$ and $\Delta\theta_2$ show the tint control sharing range.

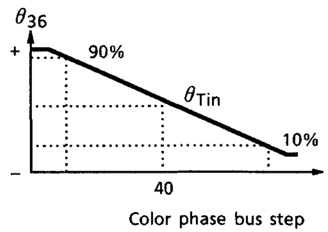


(6) Variable range is expressed by sum of $\Delta\theta_1$ sharing range and $\Delta\theta_2$ sharing range.

$\Delta\theta_T = \Delta\theta_1 + \Delta\theta_2$

(7) While shifting color phase from minimum to maximum with the bus control, measure phase shift of B-Y color difference output of pin 36. When center 6 bars have peak level, value of color phase bus step is expressed as θ_{Tin}.

(8) While shifting color phase from minimum to maximum with the bus control, measure values of color phase bus step corresponding to 10% and 90% of absolutely variable phase shift of B-Y color difference output of pin 36. The range of color phase shifted by the bus control is expressed as While shifting color phase from minimum to maximum with the bus control, measure phase shift of B-Y color difference output of pin 36. When center 6 bars have peak level, value of color phase bus step is expressed as Δ_{Tin} (conforming to TV mode, f_o = 600 kHz).



(9) Input 4N rainbow color bar signal to pin 42 (Chroma IN), and perform the same measurement as the 3N signal.</td></tr>
<tr><td>C_7</td><td>Tint Control
Variable Range
(f_o = 600 kHz)</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td></tr>
<tr><td>C_8</td><td>Tint Control
Characteristic</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td><td>↑</td></tr>
</table>

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)										
		SW MODE										MEASURING METHOD
		S_{26}	S_1	S_{31}	S_{33}	S_{34}	S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	
C_9	APC Lead-In Range	OFF ↓ ON	A	B	B	B	A	A ↓ C	A	A	B	(1) Connect band pass filter (Q = 2), set to TV mode (f_o = 600 kHz) with X'tal clock conforming to European, Asian system. (2) Set the gate to normal status. (3) Input 3N CW signal of 100 mV_{p-p} to pin 42 of the chroma input terminal. (4) While changing frequency of the CW (continuous waveform) signal, measure its frequency when B-Y color difference signal of pin 36 is colored. (5) Input 4N CW (continuous waveform) 100 mV_{p-p} signal to pin 42 (Chroma IN). (6) While changing frequency of the CW signal, measure frequencies when B-Y color difference output of pin 36 is colored and discolored. Find difference between the measured frequency and f_c (4.433619 MHz) and express the differences as fPH and fPL, which show the APC lead-in range. (7) Variable frequency of VCXO is used to cope with lead-in of 3.582 MHz / 3.575 MHz PAL system. (8) Activate the test mode (S26-ON, Sub Add 02 ; 02h). (9) Input nothing to pin 42 (Chroma IN). (10) While varying voltage of pin 30 (APC Filter), measure variable frequency of VCXO at pin 35 (R-Y OUT) while observing color and discoloring of R-Y color difference signal. Express difference between the high frequency (fH) and f_o center as 3.582HH, and difference between the low frequency (fL) and f_o center as 3.582HL. Perform the same measurement for the NP system (3.575 MHz PAL).
C_{10}	APC Control Sensitivity	ON	↑	↑	↑	↑	↑	C	↑	↑	↑	(1) Activate the test mode (S26-ON, Sub Add 02 ; 02h). (2) Connect band pass filter as same as the Note C_9. (3) Change the X'tal mode properly to the system. (4) Input nothing to pin 42 (Chroma IN). (5) When V_{30}'s APC voltage ±50 mV is impressed to pin 30 (APC Filter) while its voltage is being varied, measure frequency change of pin 35 output signal as frH or frL and calculate sensitivity according to the following equation. b = (frH − frL) / 100

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)										
		SW MODE										MEASURING METHOD
		S_{26}	S_1	S_{31}	S_{33}	S_{34}	S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	
C_{11}	Killer Operation Input Level	OFF	A	B	B	B	A	A	A	A	B	(1) Connect band pass filter (Q = 2) and set to TV mode (f_o = 600 kHz). (2) Set the crystal mode to conform to European, Asian system and set the gate to normal status. (3) Input 3N color signal having 200 mV_{p-p} burst to pin 42 (Chroma IN). (4) While attenuating chroma input signal, measure input burst amplitudes of the signal when B-Y color difference output of pin 36 is discolored and when the same signal is colored. Measured input burst amplitudes shall be expressed as 3N-VTK1 and 3N-VTC1 respectively (killer operation input level). (5) Killer operation input level in the condition that P / N killer sensitivity is set to LOW with the bus control is expressed as 3N-VTK2 or 3N-VTC2. (6) Perform the same measurement as the above step 4 with different inputs of 4N, 4P, MP, NP color signals having 200 mV_{p-p} burst to pin 42 (Chroma IN). (When measuring with MP / NP color signal, set the crystal system to conform to South American system.) (7) Killer operation input level at that time is expressed as follows. Normal killer operation input level in the 4N system is expressed as 4N-VTK1, 4N-VTC1. Normal killer operation input level in the 4P system is expressed as 4P-VTK1, 4P-VTC1. Killer operation input level with low killer sensitivity is expressed as 4P-VTK2, 4P-VTC2 Normal killer operation input level in the MP system is expressed as MP-VTK2, MP-VTC2. Normal killer operation input level in the NP system is expressed as NP-VTK1, NP-VTC1. Killer operation input level with low killer sensitivity is expressed as NP-VTK2, NP-VTC2. [Reference] 3N system : 3.579545 MHz NTSC 4N system : 4.433619 MH z False NTSC 4P system : 4.433619 MHz PAL MP system : 3.575611 MHz M-PAL NP system : 3.582056 MHz N-PAL

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)										
		SW MODE										MEASURING METHOD
		S_{26}	S_1	S_{31}	S_{33}	S_{34}	S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	
C_{12}	Color Difference Output	ON	A	B	B	B	A	A	A	A	B	(1) Activate the test mode (S26-ON, Sub Add 02 ; 08h). (2) Connect band pass filter (Q = 2), set to TV mode (f_o = 600 kHz) with 0dB attenuation. (3) Set the crystal mode to conform to European, Asian system and set the gate to normal status. (4) Input 3N, 4N and 4P rainbow color bar signals having 100 mV_{p-p} burst to pin 42 of the chroma input terminal one after another. (5) Measure amplitudes of color difference signals of pin 36 (B-Y) and pin 35 (R-Y) respectively, and express them as 3NeB-Y / R-Y, 4NeB-Y / R-Y and 4PeB-Y / R-Y respectively. (6) While inputting 4P 75% color bar signal (100 mV_{p-p} burst) to pin 42 of the chroma input terminal, measure amplitudes of color difference signals of pin 36 (B-Y OUT) and pin 35 (R-Y OUT) respectively. (Ratio of those amplitudes is expressed as 4Peb-y / r-y for checking color level of SECAM system.)
C_{13}	Demodulation Relative Amplitude	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) Activate the test mode (S26-ON, Sub Add 02 ; 08h). (2) Connect band pass filter (Q = 2), set to TV mode (f_o = 600 kHz) with 0dB attenuation. (3) Set the crystal mode to conform to European, Asian system and set the gate to normal status. (4) Input 3N, 4N and 4P rainbow color bar signals having 100 mV_{p-p} burst to pin 42 of the chroma input terminal one after another. (5) Measure amplitudes of color difference signals of pin 36 (B-Y) and pin 35 (R-Y) respectively, and express ratio between the two amplitudes as 3NG R / B, 4NG R / B and 4PG R / B respectively. (Note) Relative amplitude of G-Y color difference signal shall be checked later in the Text section

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)										
		SW MODE										MEASURING METHOD
		S_{26}	S_1	S_{31}	S_{33}	S_{34}	S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	
C_{14}	Demodulation Relative Phase	ON	A	B	B	B	A	A	A	A	B	(1) Activate the test mode (S26-ON, Sub Add 02 ; 08h). (2) Connect band pass filter (Q = 2), set to TV mode (f_o = 600 kHz) with 0 dB attenuation. (3) Set the crystal mode to conform to European, Asian system and set the gate to normal status. (4) Input 3N, 4N and 4P rainbow color bar signals having 100 mV_{p-p} burst to pin 42 of the chroma input terminal one after another. (5) Measure phases of color difference signals of pin 36 (B-Y) and pin 35 (R-Y) respectively, and express them as 3NθR-B, 4NθR-B and 4PθR-B respectively. (6) For measuring with 3N and 4N color bar signals in NTSC system, set six bars of the B-Y color difference waveform to the peak level with the Tint control and measure its phase difference from phase of R-Y color difference signal of pin 35 (R-Y OUT). Note: Relative phase of G-Y color difference signal shall be checked later in the Text section
C_{15}	Demodulation Output Residual Carrier	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) Activate the test mode (S26-ON, Sub Add 02 ; 08h). (2) Connect band pass filter (Q = 2), set to TV mode (f_o = 600 kHz) with 0 dB attenuation. (3) Set the crystal mode to conform to European, Asian system. (4) Set the gate to normal status. (5) Input 3N and 4N rainbow color bar signals having 100 mV_{p-p} burst to pin 42 of the chroma input terminal one after another. (6) Measure subcarrier leak of 3N and 4N color bar signals appearing in color difference signals of pin 36 (B-Y OUT) and pin 35 (R-Y OUT) respectively, and express those leaks as 3N-SCB / R and 4N-SCB / R.

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)										
		SW MODE										MEASURING METHOD
		S_{26}	S_1	S_{31}	S_{33}	S_{34}	S_{39}	S_{42}	S_{44}	S_{45}	S_{51}	
C_{16}	Demodulation Output Residual Higher Harmonic	ON	A	B	B	B	A	A	A	A	B	(1) Activate the test mode (S26-ON, Sub Add 02 ; 08h). (2) Connect band pass filter (Q = 2), set to TV mode (f_o = 600 kHz) with 0 dB attenuation. (3) Set the crystal mode to conform to European, Asian system and set the gate to normal status. (4) Input 3N and 4N rainbow color bar signals having 100 mV_{p-p} burst to pin 42 of the chroma input terminal one after another. (5) Measure higher harmonic ($2f_c$ = 7.16 MHz or 8.87 MHz) of 3N and 4N color bar signals appearing in color difference signals of pin 36 (B-Y OUT) and pin 35 (R-Y OUT) respectively, and express them as 3N-HCB / R and 4N-HCB / R.
C_{17}	Color Difference Output ATT Check	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) Activate the test mode (S26-ON, Sub Add 02 ; 08h). (2) Connect band pass filter (Q = 2) and set bus data for the TV mode (f_o = 600 kHz). (3) Set the X'tal clock mode to conform to European, Asian system and set the gate to normal status. (4) Input 3N rainbow color bar signal whose burst is 100 mV_{p-p} to pin 42 of the chroma input terminal. (5) Measure amplitude of color difference output signal of pin 36 (B-Y OUT) with 0 dB attenuation set by the bus control. Set the amplitude of the color difference output of pin 36 (B-Y OUT) to 0 dB, and measure amplitude of the same with different attenuation of −2 dB, −1 dB and +1 dB set by the bus control.

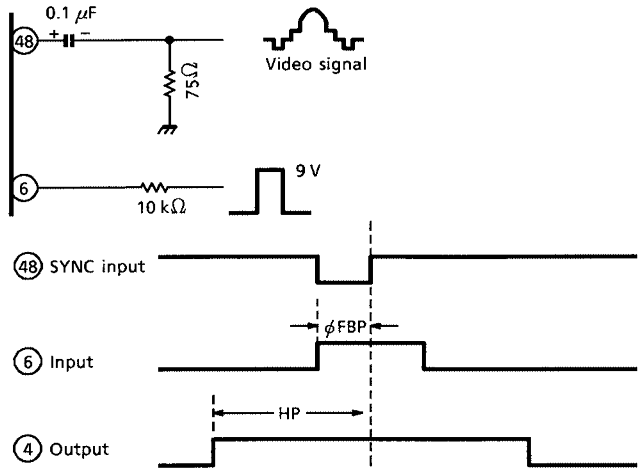
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)															MEASURING METHOD
		S	BUS : TEST MODE							BUS : NORMAL CONTROL MODE							
			02H				07H			10H						OTHER CONDITION	
		26	D_5	D_2	D_1	D_0	D_7	D_4	D_3	D_5	D_4	D_3	D_2	D_1	D_0		
C_{18}	16.2 MHz Oscillation Frequency	ON	0	0	0	1	0	0	0	0	0	0	0	0	0	—	(1) Input nothing to pin 42. (2) Measure frequency of CW signal of pin 35 as fr, and find oscillation frequency by the following equation.) $\Delta foF = (fr - 0.05\ MHz) \times 4$
C_{19}	16.2 MHz Oscillation Start Voltage	ON	0	0	0	1	0	0	0	0	0	0	0	0	0	Impress pin 38 individually with separate power supply.	While raising voltage of pin 38, measure voltage when oscillation waveform appears at pin 40.
C_{20}	f_{sc} Free-Run Frequency	ON	0	0	0	1	0	0	0	0	Variable			0	0	—	(1) Input nothing to pin 42. (2) Change setting of SUB (10H) D_4, D_3 and D_2 according to respective frequency modes, and measure frequency of CW signal of pin 35. Detail of D_4, D_3 and D_2 3.58M = 1 : (001), 4.43M = 2 : (010) M-PAL = 6 : (110), N-PAL = 7 : (111)
C_{21}	f_{sc} Output Amplitude	OFF	0	0	0	0	0	0	0	0	0	0 ↓ 1	1 ↓ 0	0	0	—	(1) Input nothing to pin 42. (2) Change setting of SUB (10H) D_4, D_3 and D_2 according to respective frequency modes. Measure the amplitude of output signal of pin 27.

DEF SECTION

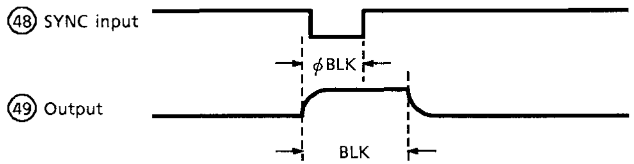
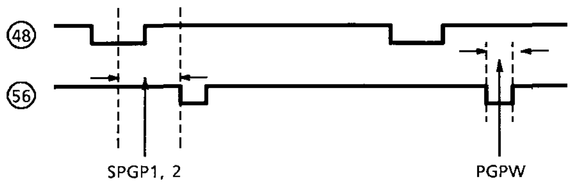
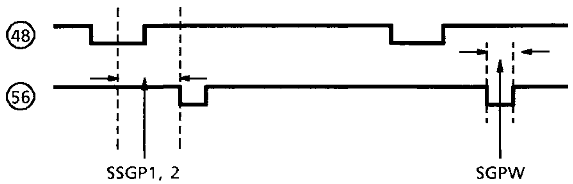
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC}=9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC}=5V ; Ta=25±3°C ; BUS=preset value ; pin 48 input video signal=50 system) (Note) "×" in the data column represents preset value at power ON.									
		SUB-ADDRESS & BUS DATA									MEASURING METHOD
DH1	H. Reference Frequency	Sub 02H	0	0	0	0	0	0	0	1	(1) Supply 5 V to pin 26. (2) Set bus data as indicated on the left. (3) Measure the frequency of sync. output of pin 49.
DH2	H. Reference Oscillation Start Voltage	Sub 02H	0	0	0	0	0	0	0	1	In the test condition of the Note DH1, turning down the voltage supplied to pin 26 from 5 V, measure the voltage when oscillation of pin 49 stops.
DH3	H. Output Frequency 1	Sub 10H	×	0	×	×	×	×	0	1	(1) Set bus data as indicated on the left. (2) In the condition of the above step 1, measure frequency (TH1) at pin 4.
DH4	H. Output Frequency 2	Sub 10H	×	0	×	×	×	×	1	0	(1) Set the input video signal of pin 51 to the 60 system. (2) Set bus data as indicated on the left. (3) In the above-mentioned condition, measure frequency (TH2) at pin 4.
DH5	H. Output Duty 1	—	—	—	—	—	—	—	—	—	(1) Supply 4.5 V DC to pin 5 (or, make pin 5 open-circuited). (2) Measure duty of pin 4 output.
DH6	H. Output Duty 2	—	—	—	—	—	—	—	—	—	(1) Make a short circuit between pin 5 and ground. (2) Measure duty of pin 4 output.
DH7	H. Output Duty Switching Voltage	—	—	—	—	—	—	—	—	—	Supply 2 V DC to pin 5. While turning down the voltage from 2 V, measure voltage when the output duty ratio becomes 41 to 37%.
DH8	H. Output Voltage	—	—	—	—	—	—	—	—	—	Measure the low voltage and high voltage of pin 4 output whose waveform is shown below. 
DH9	H. Output Oscillation Start Voltage	—	—	—	—	—	—	—	—	—	While raising H. V_{CC} (pin 3) from 0 V, measure voltage when pin 4 starts oscillation.

TEST CONDITION
(Unless otherwise specified : H, RGB V_{CC}=9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC}=5V ; Ta=25±3°C ; BUS=preset value ; pin 48 input video signal=50 system)
(Note) "×" in the data column represents preset value at power ON.

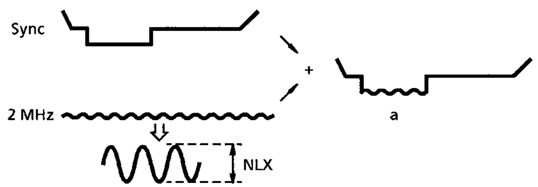
NOTE	ITEM	SUB-ADDRESS & BUS DATA									MEASURING METHOD
DH10	H. FBP Phase										(1) Supply 4.5 V DC to pin 5. (2) Input video signal to pin 48. (3) Set the width of pin 6 input pulse to 8 μs. (4) Measure φFBP shown in the figure below (φFBP). (5) Adjust the phase of pin 6 input pulse so that the center of pin 4's output pulse corresponds to the trailing edge of input sync. signal. (6) Set bus data as indicated on the left and measure the horizontal picture position with respective bus data settings (HSFTmax, HSFTmin). (7) Find HP difference between the conditions mentioned in the above step 6 (ΔHSFT). (8) Reset bus data to the preset value. (9) While impressing 5 V DC to pin 5, measure HP. (10) While impressing 4 V DC to pin 5, measure HP. (11) Find difference between the two measurement results obtained in the preceding steps 9 and 10 (ΔHCC).
DH11	H. Picture Position, Maximum										
DH12	H. Picture Position, Minimum	Sub 0BH	0	0	0	0	0	×	×	×	
			1	1	1	1	1	×	×	×	
DH13	H. Picture position Control Range										
DH14	H. Distortion Correction Control Range										

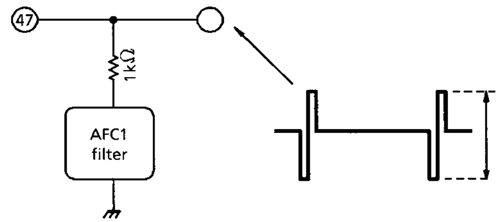


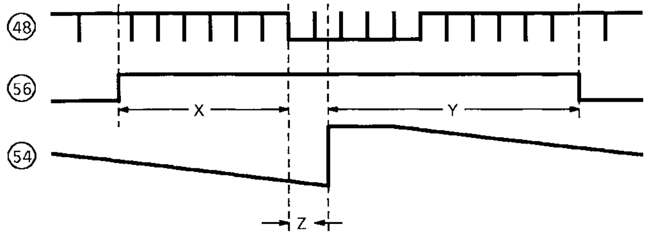
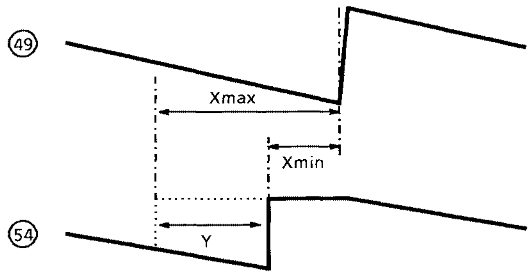
TEST CONDITION
(Unless otherwise specified : H, RGB V_{CC}=9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC}=5V ; Ta=25±3°C ; BUS=preset value ; pin 48 input video signal=50 system)
(Note) "x" in the data column represents preset value at power ON.

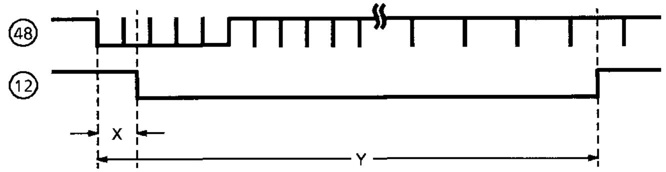
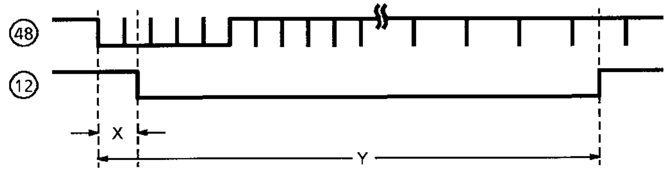
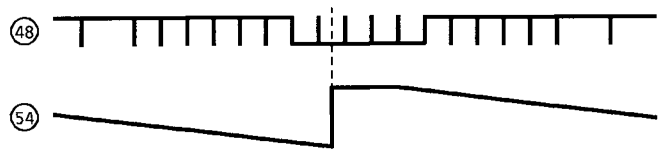
NOTE	ITEM	SUB-ADDRESS & BUS DATA									MEASURING METHOD
DH15	H. BLK Phase	Sub 02H	0	0	0	0	0	1	0	0	(1) In the condition of the steps 1 through 4 of the Note DH10, perform the following measurement. (2) Supply 5 V DC to pin 26. (3) Set bus data as indicated on the left. (4) Measure phase difference between pin 48 and pin 49 as shown below. (5) Change the bus data as shown on the left and measure BLK width. 
DH16	H. BLK Width, Minimum	Sub 16H	0	0	0	×	×	×	×	×	
DH17	H. BLK Width, Maximum		1	1	1	×	×	×	×	×	
DH18	P / N-GP Start Phase 1										(1) Supply 5 V to pin 26. (2) Set bus data as indicated on the left. (3) With the respective bus data settings mentioned above, measure the phase and gate width as shown in the figure below. 
DH19	P / N-GP Start Phase 2	Sub 0FH	×	×	×	×	0	×	×	×	
DH20	P / N-GP Gate Width 1		×	×	×	×	1	×	×	×	
DH21	P / N-GP Gate Width 2										
DH22	SECAM-GP Start Phase 1										(1) Supply 5 V to pin 26. (2) Set bus data as indicated on the left. (3) With the respective bus data settings mentioned above, measure the phase and gate width as shown in the figure below. 
DH23	SECAM-GP Start Phase 2	Sub 1FH	×	×	×	0	×	×	×	×	
DH24	SECAM-GP Gate Width 1		×	×	×	1	×	×	×	×	
DH25	SECAM-GP Gate Width 2										

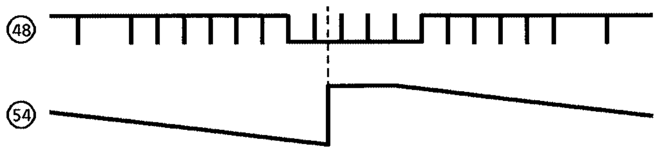
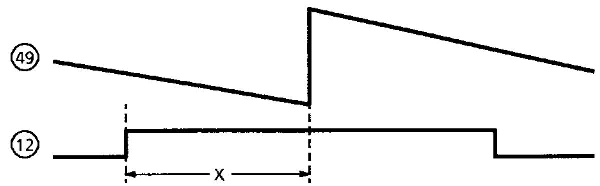
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC}=9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC}=5V ; Ta=25±3°C ; BUS=preset value ; pin 48 input video signal=50 system) (Note) "×" in the data column represents preset value at power ON. SUB-ADDRESS & BUS DATA										MEASURING METHOD
DH26	Noise Detection Level 1	Sub 1DH	0	0	×	×	×	×	×	×	(1) Input such a signal as shown by "a" of the following figure to pin 48. (2) Set bus data as indicated in the first line of the left table. (3) Measure NLX when amplitude of pin 47 changes. → NL1 (4) Set bus data as indicated in the second line of the left table. (5) Measure NLX when amplitude of pin 47 changes. → NL2 (6) Set bus data as indicated in the third line of the left table. (7) Measure NLX when amplitude of pin 47 changes. → NL3 (8) Set bus data as indicated in the fourth line of the left table. (9) Measure NLX when amplitude of pin 47 changes. → NL4
DH27	Noise Detection Level 2		0	1	×	×	×	×	×	×	
DH28	Noise Detection Level 3		1	0	×	×	×	×	×	×	
DH29	Noise Detection Level 4		1	1	×	×	×	×	×	×	

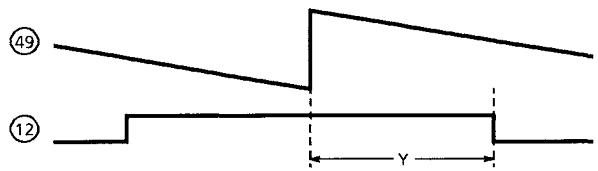




NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC}=9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC}=5V ; Ta=25±3°C ; BUS=preset value ; pin 48 input video signal=50 system) (Note) "×" in the data column represents preset value at power ON.									
		SUB-ADDRESS & BUS DATA									MEASURING METHOD
DV1	AFC-MASK Start Phase	Sub 02H	0	0	0	0	0	0	0	1	(1) Supply 5 V DC to pin 26. (2) Set bus data as indicated on the left and activate the test mode. (3) Measure the AFC-MASK start phase (X) and AFC-MASK stop phase (Y) of pin 56. (4) Set the Sub 16H as indicated on the left. (5) Measure the VNFB start phase (Z) of pin 54 
DV2	AFC-MASK Stop Phase	Sub 16H	×	×	×	×	×	0	0	0	
DV3	VNFB Phase										
DV4	V. Output Maximum Phase	Sub 16H	×	×	×	×	×	0	0	0	(1) Input video signal to pin 48. (2) Measure both phases (Xmax, Xmin) of pin 49 and pin 54 with the respective bus data settings shown on the left. (3) Find difference between the two phases measured in the above step 2. Y = Xmax − Xmin 
DV5	V. Output Minimum Phase		×	×	×	×	×	1	1	1	
DV6	V. Output Phase Variable Range										

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC}=9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC}=5V ; Ta=25±3°C ; BUS=preset value ; pin 48 input video signal=50 system) (Note) "×" in the data column represents preset value at power ON.									
		SUB-ADDRESS & BUS DATA									MEASURING METHOD
DV7	50 System VBLK Start Phase	Sub 1CH	0	1	×	×	×	×	×	×	(1) Input such a video signal of the 50 system as shown in the figure to pin 48. (2) Set bus data as indicated on the left. (3) Measure the VBLK start phase (X) and VBLK stop phase (Y) of pin 12. 
DV8	50 System VBLK Stop Phase	Sub 04H	×	0	×	×	×	×	×	×	
DV9	60 System VBLK Start Phase	Sub 1CH	0	1	×	×	×	×	×	×	(1) Input such a video signal of the 60 system as shown in the figure to pin 48. (2) Set bus data as indicated on the left. (3) Measure the VBLK start phase (X) and VBLK stop phase (Y) of pin 12. 
DV10	60 System VBLK Stop Phase	Sub 04H	×	0	×	×	×	×	×	×	
DV11	V. Lead-In Range 1	Sub 16H	×	×	×	×	×	0	0	0	(1) Set bus data as indicated on the left. (2) Input 262.5 H video signal to pin 48. (3) Set a certain number of field lines in which signals of pin 48 and pin 54 completely synchronize with each other as shown in the figure below. (4) Decrease the field lines in number and measure number of lines in which pin 48 and pin 54 signals do not synchronize with each other. (5) Again set a certain number of field lines in which pin 48 and pin 54 signals synchronize with each other. (6) Increase the field lines in number and measure number of lines in which pin 48 and pin 54 signals do not synchronize with each other. 
		Sub 19H	×	×	×	×	×	0	0	0	

NOTE	ITEM	SUB-ADDRESS & BUS DATA									MEASURING METHOD
		TEST CONDITION (Unless otherwise specified : H, RGB V_{CC}=9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC}=5V ; Ta=25±3°C ; BUS=preset value ; pin 48 input video signal=50 system) (Note) "×" in the data column represents preset value at power ON.									
DV12	V. Lead-In Range 2	Sub 16H Sub 19H	× ×	× ×	× ×	× ×	× ×	0 0	0 1	0 0	(1) Set bus data as indicated on the left. (2) Input 262.5 H video signal to pin 48. (3) Set a certain number of field lines in which signals of pin 48 and pin 54 completely synchronize with each other as shown in the figure below. (4) Decrease the field lines in number and measure number of lines in which pin 48 and pin 54 signals do not synchronize with each other. (5) Again set a certain number of field lines in which pin 48 and pin 54 signals synchronize with each other. (6) Increase the field lines in number and measure number of lines in which pin 48 and pin 54 signals do not synchronize with each other 
DV13	VBLK Start Phase (Note) : Only the 60 system is subject to evaluation.	Sub 1DH	× ×	× ×	0 1	0 1	0 1	0 1	0 1	0 1	(1) Set bus data as specified for the Sub 1DH in the left columns, and measure the value of X shown in the figure below. W-VBLK start phase : MAX, MIN 

<table>
<tr><th rowspan="2">NOTE</th><th rowspan="2">ITEM</th><th colspan="9">TEST CONDITION
(Unless otherwise specified : H, RGB V_{CC}=9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC}=5V ; Ta=25±3°C ; BUS=preset value ; pin 48 input video signal=50 system
(Note) "×" in the data column represents preset value at power ON.)</th></tr>
<tr><th colspan="9">SUB-ADDRESS & BUS DATA</th><th>MEASURING METHOD</th></tr>
<tr><td rowspan="2">DV14</td><td rowspan="2">VBLK Stop Phase
(Note) : Only the 60 system is subject to evaluation.</td><td rowspan="2">Sub 1EH</td><td>×</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td rowspan="2">(1) Set bus data as specified for the Sub 1EH in the left columns, and measure the value of Y shown in the figure below.
W-VBLK stop phase : MAX, MIN

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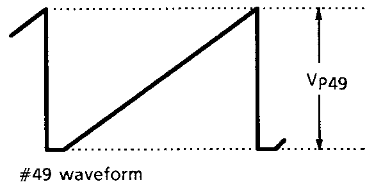
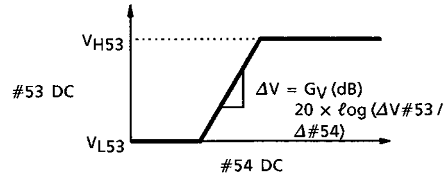
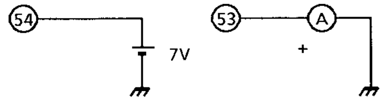
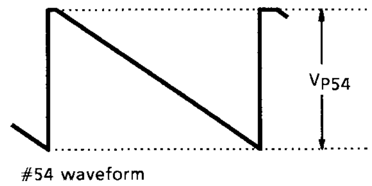
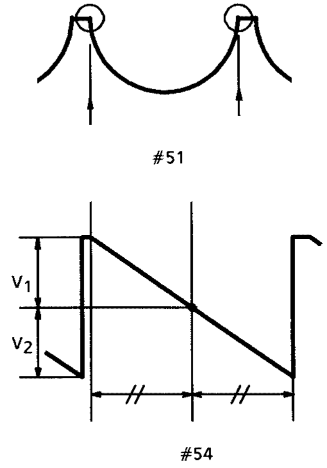
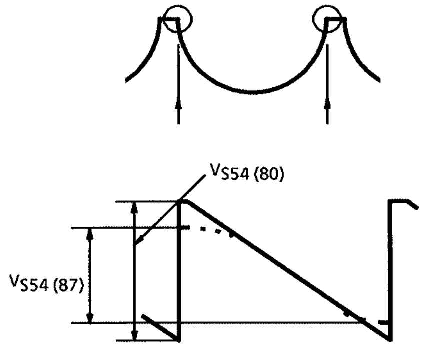
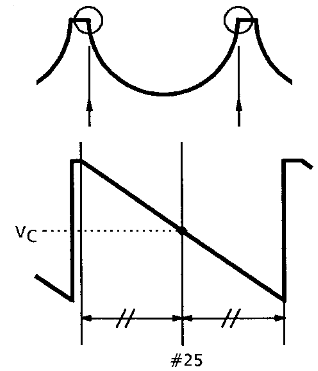
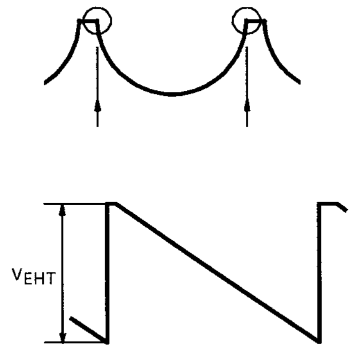
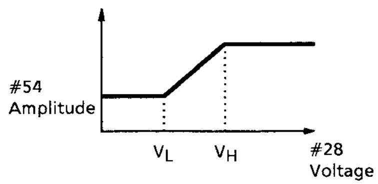
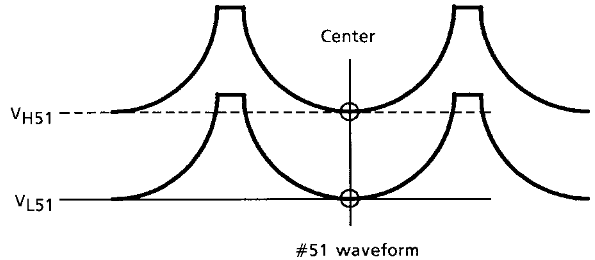
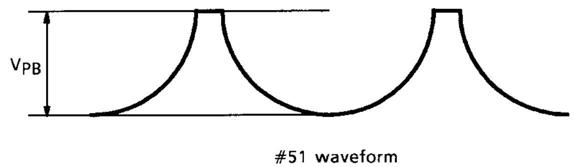
</table>

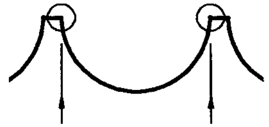
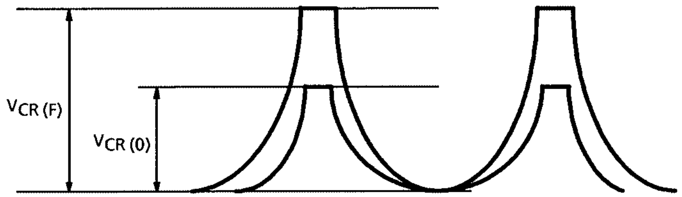
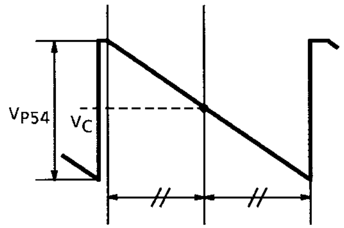
Deflection correction stage

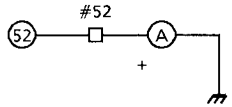
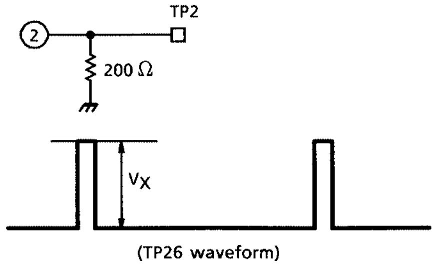
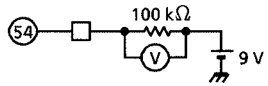
NOTE	ITEM	TEST CONDITIONS (DEF V_{CC} = 9 V, Ta = 25 ± 3°C, BUS DATA = POWER-ON RESET)	
		SW MODE SW_{28}	MEASUREMENT METHOD
G_1	Vertical Ramp Amplitude	A	Measure the amplitude of the vertical ramp wave on #49. 
G_2	Vertical Amplification	A	Set #53 and #54 to open. Set the subaddress (17) data to (80). Connect #54 to an external power supply. When the voltage is varied from 4.0 V to 6.0 V, measure the vertical amplification on the #53 voltage. (G_V) (V_{H53}) (V_{L53}) 
G_3	Vertical Amp Maximum Output Voltage	A	
G_4	Vertical Amp Minimum Output Voltage	A	
G_5	Vertical Amp Maximum Output Current	A	Set #53 and #54 to open. Apply 7 V to #54 from an external source. Insert an ammeter between #53 and GND, and measure the current. 
G_6	Vertical NF Sawtooth Wave Amplitude	A	Measure the amplitude of the #54 waveform (vertical sawtooth waveform). 
G_7	Vertical Amplitude Range	A	When the subaddress (17) data are set to (MIN) and (MAX), measure the amplitudes of the #54 waveform (vertical sawtooth waveform) $V_{P54\,(00)}$ and $V_{P54\,(FC)}$. $V_{PH} = \pm \frac{V_{P54(FC)} - V_{P54(00)}}{V_{P54(FC)} + V_{P54(00)}} \times 100(\%)$

NOTE	ITEM	SW MODE SW_{28}	TEST CONDITIONS (DEF V_{CC} = 9 V, Ta = 25 ± 3°C, BUS DATA = POWER-ON RESET) MEASUREMENT METHOD
G_8	Vertical Linearity Correction Maximum Value	A	Set the subaddress (19) data to (F8). Change the subaddress (1B) D_7~D_4 so that the #51 parabola waveform is symmetrical. When the subaddress (1A) data are (80), measure the #54 waveform $V_{1\ (80)}$ and $V_{2\ (80)}$. Likewise, when the subaddress (0F) data are (00) and (F0), measure $V_{1\ (00)}$, $V_{2\ (00)}$, $V_{1\ (F0)}$, and $V_{2\ (F0)}$. $V_I = \pm \frac{V_{1(00)} - V_{1(F0)} + V_{2(F0)} - V_{2(00)}}{2 \times (V_{1(80)} + V_{2(80)})}$ 
G_9	Vertical S Correction Maximum Value	A	Set the subaddress (19) data to (F8). Change the subaddress (1B) D_7~D_4 so that the #51 parabola waveform is symmetrical. When the subaddress (1A) data are (80), measure the amplitude of the #54 waveform $V_{S54\ (80)}$. Likewise, when the subaddress (19) data are (87), measure the amplitude of the #54 waveform $V_{S54\ (87)}$. $V_S = \pm \frac{V_{S54(80)} - V_{S54(87)}}{V_{S54(80)} + V_{S54(87)}} \times 100\ (\%)$ 

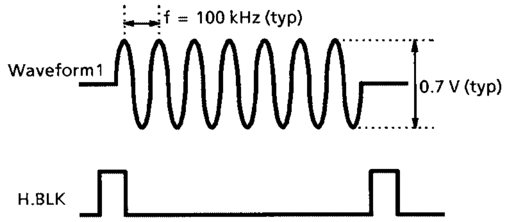
NOTE	ITEM	TEST CONDITIONS (DEF V_{CC} = 9 V, Ta = 25 ± 3°C, BUS DATA = POWER-ON RESET)	
		SW MODE SW_{28}	MEASUREMENT METHOD
G_{10}	Vertical NF Center Voltage	A	Set the subaddress data (19) to (F8). Change the subaddress (1B) D_7~D_4 so that the #51 parabola waveform is symmetrical. Measure the center voltage V_C of the #54 waveform. 
G_{11}	Vertical Amplitude EHT Correction	A	Set the subaddress (19) data to (F8). Change the subaddress (1B) D_7~D_4 so that the #51 parabola waveform is symmetrical. Set the subaddress (1C) data to (40) and measure the amplitude of the #54 waveform $V_{EHT\ (40)}$. Set the subaddress (1C) data to (47) and measure the amplitude of the #54 waveform $V_{EHT\ (47)}$. $VEHT = \frac{V_{EHT(40)} - V_{EHT(47)}}{V_{EHT(40)}} \times 100\ (\%)$ 
G_{12}	EHT Dynamic Range	A	Set the subaddress data (19) to (F8). Change the subaddress (1B) D_7~D_4 so that the #51 parabola waveform is symmetrical. Set the subaddress (1C) data to (47). Change #28 input voltage at 1~7 V and measure the amplitude of the #54 waveform. 

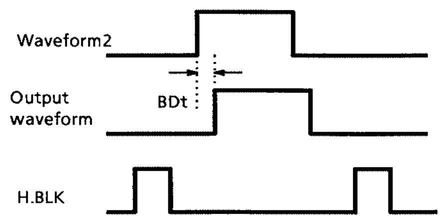
NOTE	ITEM	TEST CONDITIONS (DEF V_{CC} = 9 V, Ta = 25 ± 3°C, BUS DATA = POWER-ON RESET)	
		SW MODE SW_{28}	MEASUREMENT METHOD
G_{13}	E-W NF Maximum DC Value (Picture Width)	B	Set the subaddress (19) data to (F8). Change the subaddress (1B) D_7~D_4 so that the #22 parabola waveform is symmetrical. Set the subaddress (19) data to (80). Set the subaddress (18) data to (00) and measure the #51 voltage V_{L51}. Set the subaddress (18) data to (FE) and measure the #51 voltage V_{H51}. 
G_{14}	E-W NF Minimum DC Value (Picture Width)		
G_{15}	E-W NF Parabola Maximum Value (Parabola)	B	Set the subaddress (18) data to (00) and the subaddress (19) data to (F8). Measure the amplitude of the #51 waveform (parabola waveform) V_{PB}. 

NOTE	ITEM	SW MODE SW_{28}	TEST CONDITIONS (DEF V_{CC} = 9 V, Ta = 25 ± 3°C, BUS DATA = POWER-ON RESET) MEASUREMENT METHOD
G_{16}	E-W NF Corner Correction (Corner)	B	Set the subaddress (19) data to (F8). Change the subaddress (1B) D_7~D_4 so that the #51 parabola waveform is symmetrical. Set the subaddress (1B) D_3~D_0 to (0) and measure the amplitude of the #51 waveform $V_{CR\ (0)}$. Likewise, when the subaddress (1B) data are set to (F), measure the #51 waveform amplitude $V_{CR\ (F)}$. $V_{CR} = V_{CR\ (0)} - V_{CR\ (F)}$  
G_{17}	Parabola Symmetry Correction	A	Set the subaddress (1B) data to (08) and measure the vertical NF center voltage of the #54 waveform $V_{C\ (00)}$. Likewise, when the subaddress (1B) data are set to (F8), measure the #54 waveform $V_{C\ (FC)}$. $V_{TR} = \pm \frac{V_{C\ (00)} - V_{C\ (FC)}}{2 \times V_{P54}} \times 100\ (\%)$ 
G_{18}	E-W Parabola EHT Value	—	Set the subaddress (19) data to (F8). Change the subaddress (1B) D_7~D_4 so that the #51 parabola waveform is symmetrical. Set the subaddress data (1C) to (40). While suppling 1.0 V to pin 28, measure amplitude V_{EH} (1) at pin 51.While suppling 7.0 V to pin 28, measure amplitude V_{EH} (7) at pin 51. $V_{EH}1 = \frac{V_{EH}\ (7) - V_{EH}\ (1)}{V_{EH}\ (7)} \times 100\ (\%)$

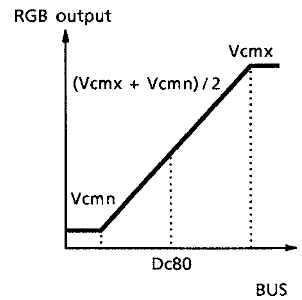
NOTE	ITEM	SW MODE SW_{28}	TEST CONDITIONS (DEF V_{CC} = 9 V, Ta = 25 ± 3°C, BUS DATA = POWER-ON RESET) MEASUREMENT METHOD
G_{19}	E-W DC EHT Value	A	Set the subaddress (19) data to (F8). Change the subaddress (1B) D_7~D_4 so that the #51 parabola waveform is symmetrical. Set the subaddress (1C) data to (40) and measure amplitude V_{EH} (40) at pin 51. Set the subaddress (1C) data to (78) and measure amplitude V_{EH} (78) at pin 51. $V_{EH}2 = V_{EH}(78) - V_{EH}(40)$ (V)
G_{20}	E-W Amp Maximum Output Current	A	Connect an ammeter between #52 and GND. Measure the current. 
G_{21}	AGC Operating Current 1	A	Measure the #2 waveform peak value. (V_{AGC0}) Set the subaddress (0F) D_0 to (1) and repeat the measurement. (V_{AGC1}) $I_{AGC0} = V_X \div 200$ (μA) (I_{AGC1}) 
G_{22}	AGC Operating Current 2	A	
G_{23}	Vertical Guard Voltage	A	Set #54 to open. Connect an external power supply to #54. Decrease the voltage from 5 V. When full blanking is applied to #14, measure the voltage.
G_{24}	V NFB Pin Input Current	A	Connect a 9-V V_{CC} via a 100-kΩ resistor to #54. Measure the sink current on #54 according to the voltage difference of the 100-kΩ resistance. I_{54} = V / 100 kΩ 

1H DL SECTION

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value ; pin3 = 9V ; pin8 · 38 · 41 = 5V)				
		SW MODE	SUB ADDRESS & DATA			MEASURING METHOD
		S26	07H	0FH	11H	
H_1	1HDL Dynamic Range Direct	ON	94H	—	—	(1) Input waveform 1 to pin 33 (B-Yin) , and measure VNBD, that pin 36 (B-Yout) is saturated input level. (2) Measure VNRD of R-Y input in the same way as VNBD. 
H_2	1HDL Dynamic Range Delay	↑	8CH	—	—	(1) Input waveform 1 to pin 33 (B-Yin), and measure VPBD, that pin 36 (B-Yout) is saturated input level. (2) Measure VPRD of R-Y input in the same way as VPBD.
H_3	1HDL Dynamic Range,Direct + Delay	↑	A4H	—	—	(1) Input waveform 1 to pin 33 (B-Yin), and measure VSBD, that pin 36 (B-Yout) is saturated input level. (2) Measure VNRD of R-Y input in the same way as VSBD.
H_4	Frequency Characteristic, Direct	↑	94H	—	—	(1) In the same measuring as H_1, set waveform 1 to 0.3 V_{p-p} and f = 100 kHz. Measure VB100, that is pin 36 (B-Yout) level. And set waveform 1 to f = 700 kHz. Measure VB700, that is pin 36 (B-Yout) level. GHB1 = 20 ℓog (VB700 / VB100) (2) Measure GHR1 of R-Y out in the same way as GHB1.
H_5	Frequency Characteristic, Delay	↑	8CH	—	—	(1) In the same measuring as H_1, set waveform 1 to 0.3 V_{p-p} and f = 100 kHz. Measure VB100, that is pin 36 (B-Yout) level. And set waveform 1 to f = 700 kHz. Measure VB700, that is pin 36 (B-Yout) level. GHB2 = 20 ℓog (VB700 / VB100) (2) Measure GHR2 of R-Y out in the same way as GHB2.
H_6	AC Gain Direct	↑	94H	—	—	(1) In the same measuring as H_1, set waveform 1 to 0.7 V_{p-p}. Measure VByt1, that is pin 36 (B-Yout) level. GBY_1 = 20 ℓog (VByt1 / 0.7) (2) Measure GRY1 of R-Y out in the same way as GBY1.
H_7	AC Gain Delay	↑	8CH	—	—	(1) In the same measuring as H_1, set waveform 1 to 0.7 V_{p-p}. Measure VByt2, that is pin 36 (B-Yout) level. GBY_2 = 20 ℓog (VByt2 / 0.7) (2) Measure GRY2 of R-Y out in the same way as GBY2.

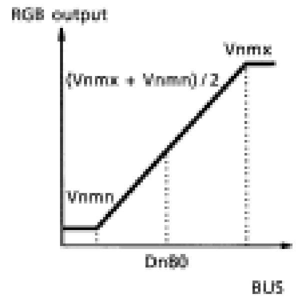
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value ; pin3 = 9V ; pin8 · 38 · 41 = 5V)				
		SW MODE	SUB ADDRESS & DATA			MEASURING METHOD
		S26	07H	0FH	11H	
H_8	Direct · Delay AC Gain Difference	↑	94H 8CH	—	—	(1) GBYD = GBY1 − GBY2 (2) GRYD = GRY1 − GRY2
H_9	Color Difference Output DC Stepping	↑	8CH	—	—	(1) Measure pin 36 (B-Yout) DC stepping of the picture period. (2) Measure pin 35 (R-Yout) DC stepping of the picture period.
H_{10}	1H Delay Quantity	ON	8CH	—	—	(1) Input waveform 2 to pin 33 (B-Yin). And measure the time deference BDt of pin 36 (B-Yout). (2) Input waveform 2 to pin 34 (R-Yin). And measure the time diference RDt of pin 36 (B-Yout). 
H_{11}	Color Difference Output DC-Offset Control	↑	8CH	20H	00H 88H FFH	(1) Set Sub-Address 11h ; data 88h. Measure the pin 36 DC voltage, that is BDC1. (2) Set Sub-Address 11h ; data 88h. Measure the pin 35 DC voltage, that is RDC1. (3) Set Sub-Address 11h ; data 00h. Measure the pin 36 DC voltage, that is BDC2. (4) Set Sub-Address 11h ; data 00h. Measure the pin 35 DC voltage, that is RDC2. (5) Set Sub-Address 11h ; data FFh. Measure the pin 36 DC voltage, that is BDC3. (6) Set Sub-Address 11h ; data FFh. Measure the pin 35 DC voltage, that is RDC3. (7) Bomin = BDC2 − BDC1, Bomax = BDC3 − BDC1, Romin = RDC2 − RDC1, Romax = RDC3 − RDC1
H_{12}	Color Difference Output DC-Offset Control / Min. Control Quantity	↑	A4H	00H	89H	(1) Measure the pin 36 DC voltage, that is BDC4. (2) Measure the pin 35 DC voltage, that is RDC4. (3) Bo1 = BDC4 − BDC1, Ro1 = RDC4 − RDC1.
H_{13}	NTSC Mode Gain / NTSC-COM Gain	↑	94H	80H	—	(1) Input waveform 1, that is set 0.3 V_{p-p} and f = 100 kHz, to pin 33. Measure pin 36 output level, that is VBNC. (2) GNB = 20 ℓog (VBNC / VB100) (3) In the same way as (1) and (2), measure the pin 36 output level, that is VRNC. GNR = 20 ℓog (VRNC / VR100)

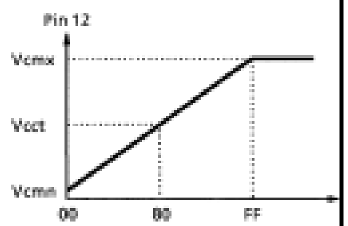
TEXT SECTION

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	00H	02H	—	—	—	—	
T_1	Y Color Difference Clamping Voltage	B	B	B	B	B	A	—	—	—	FFH	00H	—	—	—	—	(1) Short circuit pin 31 (Y IN), pin 34 (R-Y IN) and pin 33 (B-Y IN) in AC coupling. (2) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (3) Measure voltage at pin 31, pin 34 and pin 33 (Vcp31, Vcp34, Vcp33).
T_2	Contrast Control Characteristic	↑	↑	↑	↑	↑	↑	—	—	—	FFH 80H 00H	00H	—	—	—	—	(1) Input TG7 sine wave signal whose frequency is 100 kHz and video amplitude is 0.7 V to pin31 (Y IN). (2) Input 0.3 V Synchronizing Signal to pin 48 (Sync IN). (3) Connect both pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) Set bus data so that Y sub contrast and drive are set at each center value and color is minimum.  (5) Varying data on contrast from maximum (FF) to minimum (00), measure maximum and minimum amplitudes of respective outputs of pin 14 (R OUT), pin 13 (G OUT) and pin 12 (B OUT) in video period, and read values of bus data at the same time. Also, measure the respective amplitudes with the bus data set to the center value (80) (Vc12mx, Vc12mn, D12c80) (Vc13mx, Vc13mn, D13c80) (Vc14mx, Vc14mn, D14c80) (6) Find ratio between amplitude with maximum unicolor and that with minimum unicolor in conversion into decibel (ΔV13ct).
T_3	AC Gain	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	In the test condition of Note T_2, find output / input gain (double) with maximum contrast. G = Vc13mx / 0.7 V

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															
		SW MODE									SUB-ADDRESS & BUS DATA						MEASURING METHOD
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	00H	02H	—	—	—	—	
T_4	Frequency Characteristic	B	B	B	B	B	A	—	—	—	FFH	00H	—	—	—	—	(1) Input TG7 sine wave signal whose frequency is 6 MHz and video amplitude is 0.7 V to pin 31 (Y IN). (2) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (3) Connect both pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) Set bus data so that contrast is maximum, Y sub contrast and drive are set at each center value and color is minimum. (5) Measure amplitude of pin 13 signal (G OUT) and find the output / input gain (double) (G6M). (6) From the results of the above step 5 and the Note T_3, find the frequency characteristic. Gf = 20 ℓog (G6M / G)

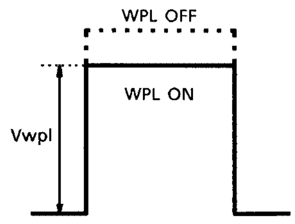
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	S_{42}	—	—	00H	02H	05H	1CH	08H	1DH	
T_5	Y Sub-Contrast Control Characteristic	B	B	B	B	B	A	—	—	—	FFH	00H	1FH 00H	—	—	—	(1) Connect both pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (2) Input TG7 sine wave signal whose frequency is 100 kHz and video amplitude is 0.7 V to pin 31 (Y IN). (3) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (4) Set bus data so that contrast is maximum, drive is set at center value and color is minimum. (5) Set bus data on Y sub contrast at maximum (FF) and measure amplitude (Vscmx) of pin 14 output (R OUT). Then, set data on Y sub contrast at minimum (00), measure the same (Vscmn). (6) From the results of the above step 5, find ratio between Vscmx and Vscmn in conversion into decibel (ΔVscnt).
T_6	Y_2 Input Level	↑	↑	↑	↑	↑	↑	—	—	—	↑	—	—	80H	44H	3FH	(1) Set bus data so that contrast is maximum, Y sub contrast and drive are at each center value. (2) Input 0.3 V synchronizing signal to pin 48 while inputting TG7 sine wave signal whose frequency is 100 kHz to pin 31 (TY IN). (3) While increasing the amplitude of the sine wave signal, measure video amplitude of signal 1 just before R output of pin 14 is distorted. (Vy2d)

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	S_{42}	—	—	00H	02H	05H	1CH	08H	1DH	
T_7	Unicolor Control Characteristic	B	B	B	B	B	A	—	—	—	FFH 80H 00H	—	—	80H	—	3FH	(1) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (2) Input 100 kHz, 0.3 V_{p-p} sine wave signal to both pin 33 (B-Y IN) and pin 34 (R-Y IN). (3) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) Set bus data so that drive is at center value, Y mute is on and color limiter is OFF. (5) While changing bus data on unicolor from maximum (FF) to minimum (00), measure maximum and minimum amplitudes of pin 12 (B OUT) in video period respectively, and read the bus data together with. Also, measure respective amplitudes as unicolor data is set at center value (80). (Vn12mx, Vn12mn, D12n80) (Vn14mx, Vn14mn, D14n80)  (6) Find ratio between amplitude with maximum unicolor data and that with minimum unicolor data in conversion into decibel (ΔV14un).
T_8	Relative Amplitude (NTSC)	↑	↑	A	A	A	↑	A	—	—	FFH	—	—	↑	—	↑	While inputting rainbow color bar signal (3.58 MHz for NTSC) to pin 42 and 0.3 V synchronizing signal to pin 48 so that video amplitude of pin 33 is 0.38 V_{p-p}, find the relative amplitude. (Mnr-b = Vu14mx / Vu12mx, Mng-b = Vu13mx / Vu12mx)
T_9	Relative Phase (NTSC)	↑	↑	↑	↑	↑	↑	↑	—	—	↑	—	—	↑	—	↑	(1) In the test condition of the Note T_8, adjust bus data on tint so that output of pin 12 (B OUT) has the peak level in the 6th bar. (2) Regarding the phase of pin 12 (B OUT) as a reference phase, find comparative phase differences of pin 14 (R OUT) and pin 13 (G OUT) from the reference phase respectively (θnr-b, θng-b).

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	S_{42}	—	—	00H	02H	1CH	1DH	—	—	
T_{10}	Relative Amplitude (PAL)	B	B	A	A	A	A	A	—	—	FFH	—	80H	3FH	—	—	While inputting rainbow color bar signal (4.43 MHz for PAL) to pin 42 and 0.3 V synchronizing signal to pin 48 so that video amplitude of pin 33 is 0.38 Vp-p, find the relative amplitude. (Mpr-b = Vu14mx / Vu12mx, Mpg-b = Vu13mx / Vu12mx)
T_{11}	Relative Phase (PAL)	↑	↑	↑	↑	↑	↑	↑	—	—	↑	—	—	—	—	—	(1) In the test condition of the Note T_{10}, adjust bus data on tint so that output of pin 12 (B OUT) has the peak level in the 6th bar. (2) Regarding the phase of pin 12 (B OUT) as a reference phase, find comparative phase differences of pin 14 (R OUT) and pin 13 (G OUT) from the reference phase respectively (θpr-b, θpg-b).
T_{12}	Color Control Characteristic	↑	↑	B	B	B	↑	—	—	—	↑	FFH	↑	—	—	—	(1) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (2) Input 100 kHz, 0.1 V_{p-p} sine wave signal to both pin 33 (B-Y IN) and pin 34 (R-Y IN). (3) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) Set bus data so that unicolor is maximum, drive is at center value and Y mute is on. (5) Measure amplitude of pin 12 (B OUT) as bus data on color is set maximum (FF). (Vcmx) (6) Read bus data when output level of pin 12 is 10%, 50% and 90% of Vcmx respectively (Dc10, Dc50, Dc90).
T_{13}	Color Control Characteristic, Residual Color	↑	↑	↑	↑	↑	↑	—	—	—	↑	00H	↑	—	—	—	(7) From results of the above step 6, calculate number of steps from Dc10 to Dc90 (Δcol) and that from 00 to Dc50 (ecol). (8) Measure respective amplitudes of pin 12 (B OUT), pin 13 (G OUT) and pin 14 (R OUT) with color data set at minimum, and regard the results as color residuals (ecb, ecg, ecr). 

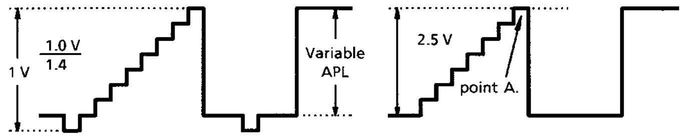
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	S_{42}	—	—	00H	02H	1CH	1DH	—	—	
T_{14}	Chroma Input Range	B	B	A	A	A	A	A	—	—	FFH	88H	80H	3FH	—	—	(1) Input rainbow color bar signal (3.58 MHz for NTSC or 4.43 MHz for PAL) to pin 42 (C IN) and 0.3 V synchronizing signal to pin 48 (Sync IN). (2) Connect pin 36 (B-Y OUT) and pin 33 (B-Y IN), pin 35 (R-Y OUT) and pin 34 (R-Y IN) in AC coupling respectively. (3) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) Set bus data so that unicolor is maximum, drive and color are set at each center value (80) and mute is on. (5) While increasing amplitude of chroma signal input to pin 42, measure amplitude just before any of pin 12 (B OUT), pin 13 (G OUT) and pin 14 (R OUT) output signals is distorted (Vcr).

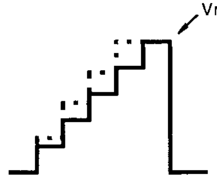
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	01H	05H	—	—	—	—	
T_{15}	Brightness Control Characteristic	B	B	B	B	B	A	—	—	—	FFH 00H	10H	—	—	—	—	(1) Short circuit pin 31 (Y IN), pin 33 (B-Y IN) and pin 34 (R-Y IN) in AC coupling. (2) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (3) Set bus data so that R, G, B cut off data are set at center value. (4) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (5) While changing bus data on brightness from maximum to minimum, measure video voltage of pin 13 (G OUT) to find maximum and minimum voltages (max : Vbrmx, min : Vbrmn). (6) With bus data on brightness set at center value, measure video voltage of pin 13 (G OUT) (Vbcnt). (7) On the conditon that bus data with which Vbrmx is obtained in measurement of the above step 5 is Dbrmx and bus data with which Vbrmn is obtained in measurement of the above step 5 is Dbrmn, calculate sensitivity of brightness data (ΔVbrt). ΔVbrt = (Vbrmxg − Vbrmng) / (Dbrmxg − Dbrmng)
T_{16}	Brightness Center Voltage	↑	↑	↑	↑	↑	↑	—	—	—	80H	↑	—	—	—	—	
T_{17}	Brightness Data Sensitivity	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{18}	RGB Output Voltage Axes Difference	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	(1) In the same manner as the Note T_{16}, measure video voltage of pin 12 (B OUT) with bus data on brightness set at center value. (2) Find maximum axes difference in the brightness center voltage.
T_{19}	White Peak Limit Level	↑	↑	↑	↑	↑	↑	—	—	—	00H	1FH	—	—	—	—	(1) Set bus data so that contrast and Y sub contrast are maximum and brightness is minimum. (2) Input TG7 sine wave signal whose frequency is 100 kHz and amplitude in video period is 0.9 V to pin 31 (Y IN). (3) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) While turning on / off WPL with bus, measure video amplitude of pin 14 (R OUT) with WPL being activated (Vwpl).



Pin 14 output waveform

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	09H	0AH	0CH	0DH	0EH	—	
T_{20}	Cutoff Control Characteristic	B	B	B	B	B	A	—	—	—	80H	80H	FFH 00H	FFH 00H	FFH 00H	—	(1) Short circuit pin 31 (Y IN), pin 33 (B-Y IN) and pin 34 (R-Y IN) in AC coupling. (2) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (3) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) Set bus data on brightness at center value. (5) While changing data on cutoff from maximum to minimum, measure video voltage of pin 13 (G OUT) to find maximum and minimum values (max : Vcomx, min : Vcomn). (6) Set cutoff data at center value and measure video voltage of pin 13 (G OUT) (Vcoct). (7) On the condition that bus data with which Vcomx is obtained in measurement of the above step 5 is Dcomx and bus data with which Vcomn is obtained in the same is Dcomn, calculate number of steps (ΔDcut). ΔDcut = Dcomx − Dcomn
T_{21}	Cutoff Center Level	↑	↑	↑	↑	↑	↑	—	—	—	↑	↑	80H	80H	80H	—	
T_{22}	Cutoff Variable Range	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{23}	Drive Variable Range	↑	↑	↑	↑	↑	↑	—	—	—	FFH 00H	FFH 00H	80H	80H	80H	—	(1) Short circuit pin 33 (B-Y IN) and pin 34 (R-Y IN) in AC coupling. (2) Input a stepping signal whose amplitude in video period is 0.3 V to pin 31 (Y IN). (3) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (4) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (5) Set bus data so that contrast is maximum and Y sub contrast is minimum. (6) While changing drive data from minimum to maximum, measure video amplitude of pin 13 (G OUT) to find maximum and minimum values (max : Vdrmx, min : Vdrmn). (7) Set drive data at center value and measure video amplitude of pin 13 (G OUT) (Vdrct). Calculate amplitude ratio of the measured value to the maximum and minimum amplitudes measured in the above step 6 respectively (DR+, DR−).

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															
		SW MODE									SUB-ADDRESS & BUS DATA						MEASURING METHOD
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	S_{45}	S_{39}	S_{44}	—	—	—	—	—	—	
T_{24}	DC Regeneration	B	B	A	B	B	A	B	A	A	—	—	—	—	—	—	(1) Short circuit pin 33 (B-Y IN) and pin 34 (R-Y IN) in AC coupling. (2) Input such the step-up signal as shown below to pin 45 (Y IN) and pin 48 (Sync IN). (3) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) Set bus data so that contrast is maximum and DC transmission correction factor is minimum. (5) Adjust data on Y sub contrast so that video amplitude of pin 13 (G OUT) is 2.5 V. (6) While varying APL of the step-up signal from 10% to 90%, measure change in voltage at the point A. 
T_{25}	RGB Output S / N Ratio	↑	↑	B	↑	↑	↑	—	—	—	—	—	—	—	—	—	(1) Short circuit pin 31 (Y IN), pin 33 (B-Y IN) and pin 34 (R-Y IN) in AC coupling. (2) Input synchronizing signal of 0.3 V in amplitude to pin 48 (Sync IN). (3) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) Set bus data on contrast at maximum. (5) Set bus data on Y sub contrast at center value. (6) Measure video noise level of pin 13 (G OUT) with oscilloscope (no). SNo = −20 ℓog (2.5 / (1 / 5) × no)

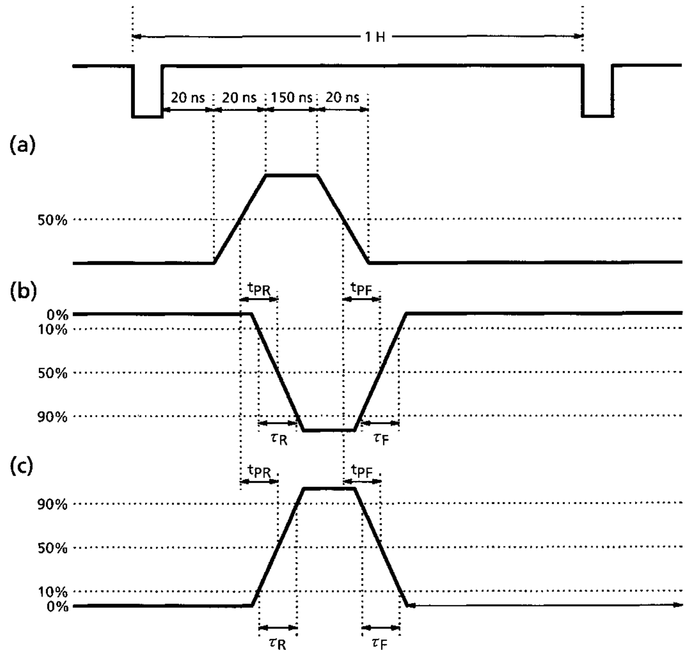
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)																MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	01H	05H	08H	0CH	0DH	0EH	
T_{26}	Blanking Pulse Output Level	B	B	B	B	B	A	—	—	—	80H	10H	04H	80H	80H	80H	(1) Input synchronizing signal of 0.3 V in amplitude to pin 48 (Sync IN). (2) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (3) Set bus data so that blanking is on. (4) Measure voltage of pin 13 (G OUT) in V. blanking period (Vy). (5) Measure voltage of pin 13 (G OUT) in H. blanking period (Vh).
T_{27}	Blanking Pulse Delay Time	↑	↑	↑	↑	↑	↑	—	—	—	↑	↑	↑	↑	↑	↑	In the setting condition of the Note T_{26}, find "t_{don}" and "t_{doff}" (see figure below) between the signal impressed to pin 6 (BFP IN) and output signal of pin 13 (G OUT). 
T_{28}	RGB Min. Output Level	↑	↑	↑	↑	↑	↑	—	—	—	00H	↑	↑	00H	00H	00H	(1) Short circuit pin 31 (Y IN), pin 33 (B-Y IN) and pin 34 (R-Y IN) in AC coupling. (2) Input synchronizing signal of 0.3 V in amplitude to pin 48 (Sync IN). (3) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) Set bus data so that brightness and RGB cutoff are minimum. (5) Measure video voltage of pin 13 (G OUT) (Vmn).
T_{29}	RGB Max. Output Level	↑	↑	↑	↑	↑	↑	—	—	—	80H	1fH	44H	80H	80H	80H	(1) Short circuit pin 33 (B-Y IN) and pin 34 (R-Y IN) in AC coupling. (2) Input stepping signal to pin 31 (Y IN) and synchronizing signal of 0.3 V in amplitude to pin 48 (Sync IN). (3) Connect pin 21 (Digital Ys) and pin 22 (Analog Ys) to ground. (4) Set bus data so that contrast and Y sub contrast are maximum. (5) While increasing amplitude of the stepping signal, measure maximum output level just before video signal of pin 13 (G OUT) is distorted (Vmn). 

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															
		SW MODE									SUB-ADDRESS & BUS DATA						MEASURING METHOD
		S_{18}	S_{19}	S_{20}	S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	15H	04H	—	—	—	—	
T_{30}	Halftone Ys Level	B	B	B	A	B	B	B	B	A	00H	40H	—	—	—	—	(1) Input stepping signal whose amplitude is 0.3 V in video period to pin 31 (Y IN) and pin 48 (Sync IN). (2) Set bus data so that blanking is off and halftone is −3 dB in on status. (3) Connect power supply to pin 21 (Digital Ys). While impressing 0 V to it, measure amplitude and pedestal level of pin 13 (G OUT) in video period (Vm13, Vp13). (4) Raising supply voltage to pin 21 gradually from 0 V, measure level (Vtht1) of pin 21 when amplitude of pin 13 output signal changes. At the same time, measure amplitude and pedestal level of pin 13 in video period after the pin 13 output signal changed in amplitude. (Vm13b, Vp13b) (5) Set bus data so that halftone is −6 dB in on status, and perform the same measurement as the above step 4 to find gain of −6 dB halftone and variation of pedestal level (G6th13). G6th13 = 20 ℓog (Vm13b / Vm13) (6) Raising supply voltage to pin 21 further from Vtht1, measure level (Vttx1) of pin 21 when output signal of pin 13 (G OUT) changes in amplitude and DC level of pin 13 after the change of its output (Vtx13). (7) From results of the above steps 3 and 6, calculate low level of the output in the text mode. Vtxl13 = Vtx13 − Vp13 (8) Raising supply voltage to pin 21 by 3 V from that in the above step 6, confirm that there is no change in output level of pin 13.
T_{31}	Halftone Gain	↑	↑	↑	↑	↑	↑	↑	↑	↑	01H	↑	—	—	—	—	
T_{32}	Text ON Ys, Low Level	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	
T_{33}	Text / OSD Output, Low Level	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{18}	S_{19}	S_{20}	S_{21}	S_{22}	S_{31}	S_{33}	S_{51}	—	15H	04H	—	—	—	—	
T_{34}	Text RGB Output, High Level	A	A	A	A	B	B	B	A	—	02H	40H	—	—	—	—	(1) Input stepping signal whose amplitude is 0.3 V in video period to pin 31 (Y IN) and pin 48 (Sync IN). (2) Set bus data so that blanking and halftone are off. (3) Connect power supply to pin 21 (Digital Ys). While impressing 0 V to it, measure pedestal level of pin 13 output signal (G OUT) (Vpl13). (4) Connect power supply to pin 19 (Digital G IN) and impress it with 2 V. (5) Raising supply voltage to pin 21 gradually from 0 V, measure video level of pin 21 after output signal of pin 13 changed (Vlx13). (6) From measurement results of the above steps 3 and 5, calculate high level in the text mode. Vmt13 = Vtx13 − Vpt13 (7) Raising supply voltage to pin 21 further from that in the step 5, measure level (Vtost) of pin 21 when the level of pin 13 output signal changes from that in the step 5 to −6 dB as halftone data is set to ON (the 6th step of Notes T_{30} to T_{34}). (8) In the condition of the above step 7, raise voltage impressed to pin 19 to 3 V and measure output voltage of pin 13 (Vos13). (9) From results of the above steps 3 and 7, calculate high level of the output in the OSD mode. Vmos13 = Vos13 − Vpt13
T_{35}	OSD Ys ON, Low Level	↑	↑	↑	↑	↑	↑	↑	↑	—	↑	↑	—	—	—	—	
T_{36}	OSD RGB Output, High Level	↑	↑	↑	↑	↑	↑	↑	↑	—	↑	↑	—	—	—	—	

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{18}	S_{19}	S_{20}	S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	—	—	—	
T_{37}	Text Input Threshold Level	A	A	A	A	B	B	B	B	A	—	—	—	—	—	—	(1) Connect power supply to pin 21 (Digital Ys) and impress 1.5 V to it. (2) Connect power supply to pin 19 (Digital G IN). While raising supply voltage gradually from 0 V, measure supply voltage when output signal of pin 13 (G OUT) changes (Vtxt). (3) Raising the supply voltage to pin 19 furthermore to 4 V, confirm that there is no change in the output signal of pin 13 (G OUT).
T_{38}	OSD Input Threshold Level	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	(1) Connect power supply to pin 21 (Digital Ys) and impress 2.5 V to it. (2) Connect power supply to pin 19 (Digital G IN). While raising supply voltage gradually from 0 V, measure supply voltage when output signal of pin 13 (G OUT) changes (Vosd). (3) Raising the supply voltage to pin 19 furthermore to 4 V, confirm that there is no change in the output signal of pin 13 (G OUT).

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{18}	S_{19}	S_{20}	S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	—	—	—	
T_{39}	OSD Mode Switching Rise-Up Time	A	A	A	A	B	B	B	B	A	—	—	—	—	—	—	(1) Input a Signal Shown by (a) in the following figure to pin 21 (Digital Ys). (2) According to (b) in the figure, measure τ_{Rosd}, t_{PRos}, τ_{Fosd} and t_{PFos} for output signals of pin 14 (R OUT), pin 13 (G OUT) and pin 12 (B OUT) respectively. (3) Find maximum values of t_{PRos} and t_{PFos} respectively (Δt_{PRos}, Δt_{PFos}).
T_{40}	OSD Mode Switching Rise-Up Transfer Time	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	
T_{41}	OSD Mode Switching Rise-Up Transfer Time, 3 Axes Difference	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	
T_{42}	OSD Mode Switching Breaking Time	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	
T_{43}	OSD Mode Switching Breaking Transfer Time	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	
T_{44}	OSD Mode Switching Breaking Transfer Time, 3 Axes Difference	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	



NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)														
		SW MODE									SUB-ADDRESS & BUS DATA					
		S_{18}	S_{19}	S_{20}	S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	—	—	—
T_{45}	OSD Hi DC Switching Rise-Up Time	A	A	A	A	B	B	B	B	A	—	—	—	—	—	—
T_{46}	OSD Hi DC Switching Rise-Up Transfer Time	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—
T_{47}	OSD Hi DC Switching Rise-Up Transfer Time, 3 Axes Difference	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—
T_{48}	OSD Hi DC Switching Breaking Time	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—
T_{49}	OSD Hi DC Switching Breaking Transfer Time	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—
T_{50}	OSD Hi DC Switching Breaking Transfer Time, 3 Axes Difference	↑	↑	↑	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—

MEASURING METHOD

(1) Supply pin 21 (Digital Ys) with 2.5 V.

(2) Input 5 V_{p-p} signal shown by (a) in the figure to pin 18 (Digital R IN).

(3) Referring to (b) of the following figure, measure τ_{Rosh}, t_{PRoh}, τ_{Fosh} and t_{PFoh} for output signal of pin 14 (R OUT).

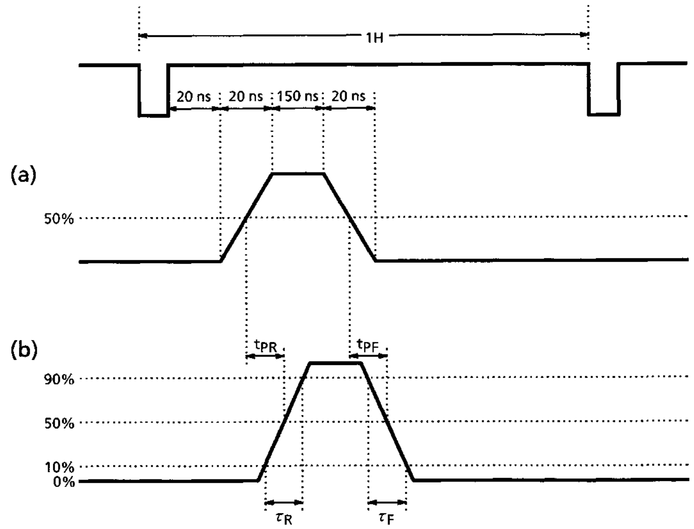
(4) Input 5 V_{p-p} signal shown by (a) in the figure to pin 19 (Digital G IN).

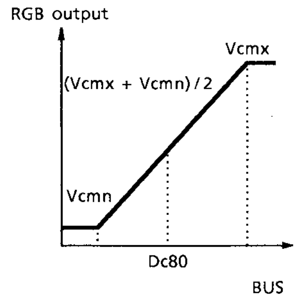
(5) Perform the same measurement as the above step 3 for pin 13 output (G OUT) referring to (b) of the following figure.

(6) Input 5 V_{p-p} signal shown by (a) in the figure to pin 20 (Digital B IN).

(7) Perform the same measurement as the above step 3 for pin 12 output (B OUT) referring to (b) of the following figure.

(8) Find maximum axes differences in t_{PRoh} and t_{PFoh} among the three outputs (Δt_{PRoh}, Δt_{PFoh}).

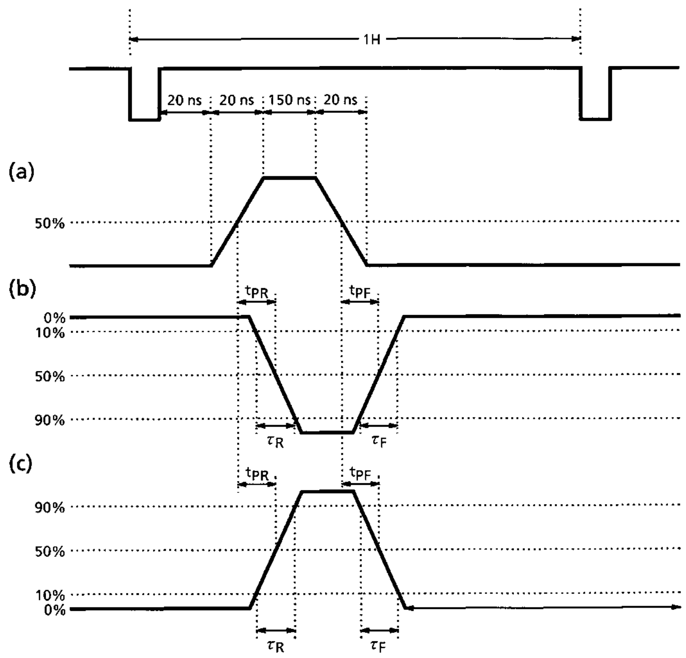


NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	06H	—	—	—	—	—	
T_{51}	RGB Contrast Control Characteristic	B	A	B	B	B	A	—	—	—	FFH 80H 00H	—	—	—	—	—	(1) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (2) Supply 5 V of external supply voltage to pin 22 (Analog Ys). (3) Set bus data on drive at center value. (4) Input TG7 sine wave signal (f = 100 kHz, video amplitude = 0.5 V) to pin 23 (Analog R IN). (5) While changing data on RGB contrast from maximum (FF) to minimum (00), measure maximum and minimum amplitudes of pin 14 (R OUT) in video period. At the same time, measure video amplitude of pin 14 when the bus data is set at the center value (80). (Vc14mx, Vc14mn, D14c80) (6) In the same manner as the above steps 4 and 5, measure output signal of pin 13 with input of the same external power supply to pin 24 (Analog G IN), and measure output signal of pin 12 with input of the same power supply to pin 25 (Analog B IN). (Vc12mx, Vc12mn, D12c80). (7) Find amplitude ratio between signal with maximum unicolor data and signal with minimum unicolor data in conversion into decibel (ΔV13ct). 

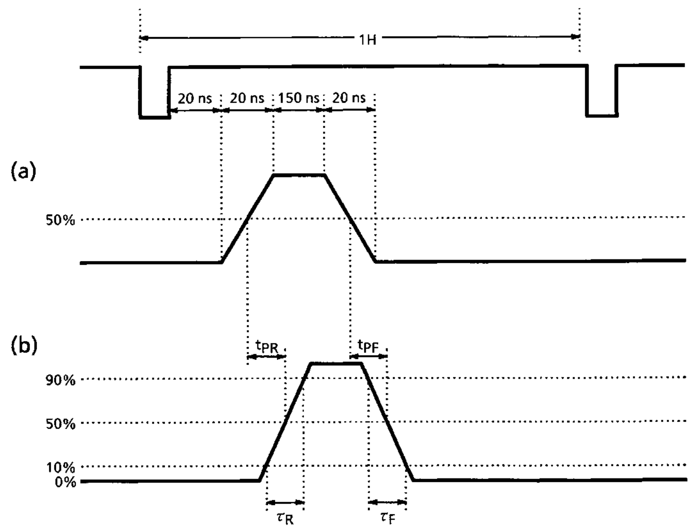
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															
		SW MODE									SUB-ADDRESS & BUS DATA						MEASURING METHOD
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	06H	—	—	—	—	—	
T_{52}	Analog RGB AC Gain	B	A	B	B	B	A	—	—	—	—	—	—	—	—	—	In the setting condition of the Note T_{52}, calculate output / input gain (double) with contrast data being set maximum. G = Vc13mx / 0.5 V
T_{53}	Analog RGB Frequency Characteristic	↑	↑	↑	↑	↑	↑	—	—	—	FFH	—	—	—	—	—	(1) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (2) Supply 5 V of external supply voltage to pin 22 (Analog Ys). (3) Input TG7 sine wave signal (f = 100 kHz, video amplitude = 0.5 V) to pin 24 (Analog G IN). (4) Set bus data so that contrast is maximum and drive is set at center value. (5) Measure video amplitude of pin 13 (G OUT) and calculate output / input gain (double) (G6M). (6) From measurement results of the above step 5 and the preceding Note 53, find frequency characteristic. Gf = 20 ℓog (G6M / G)

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	01H	06H	—	—	—	—	
T_{54}	Analog RGB Dynamic Range	B	A	B	B	B	A	—	—	—	—	00H	—	—	—	—	(1) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (2) Supply 5 V of external supply voltage to pin 22 (Analog Ys). (3) Set bus data so that contrast is minimum and drive is set at center value. (4) While inputting stepping signal to pin 24 (Analog G IN), increase video amplitude gradually from 0. (5) Measure video amplitude of pin 24 when video voltage of pin 13 (G OUT) does not change.
T_{55}	RGB Brightness Control Characteristic	↑	↑	↑	↑	↑	↑	—	—	—	FFH 00H	—	—	—	—	—	(1) Short circuit pin 31 (Y IN), pin 33 (B-Y IN) and pin 34 (R-Y IN) in AC coupling. (2) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (3) Set bus data on RGB cutoff at center value. (4) Supply 5 V of external supply voltage to pin 22 (Analog Ys). (5) While changing data brightness from maximum to minimum, measure maximum and minimum voltages of pin 13 (G OUT) in video period. (max : Vbrmx, min : Vbrmn) (6) Set bus data on brightness at center value and measure video voltage of pin 13 (G OUT) (Vbcnt). (7) On the condition that bus data with which Vbrmx is obtained in measurement of the above step 5 is Dbrmx and bus data with which Vbrmn is obtained in measurement of the above step 5 is Dbrmn, calculate sensitivity of brightness data (ΔVbrt). ΔVbrt = (Vbrmx − Vbrmn) / (Dbrmx − Dbrmn)
T_{56}	RGB Brightness Center Voltage	↑	↑	↑	↑	↑	↑	—	—	—	80H	—	—	—	—	—	
T_{57}	RGB Brightness Data Sensitivity	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{58}	Analog RGB Mode ON Voltage	↑	↑	↑	↑	↑	↑	—	—	—	80H	—	—	—	—	—	(1) Input TG7 sine wave signal (f = 100 kHz, video amplitude = 0.3 V) to pin 23 (Analog R IN). (2) Supply 5 V of external supply voltage to pin 22 (Analog Ys) and raise the voltage gradually from 0 V. (3) Measure voltage at pin 22 when signal 1 is output from pin 14 (R OUT) (Vanath).

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	—	—	—	—	—	—	
T_{59}	Analog RGB Switching Rise-Up Time	B	A	B	B	B	A	—	—	—	—	—	—	—	—	—	(1) Supply signal (2 V_{p-p}) shown by (a) in the following figure to pin 22 (Analog Ys). (2) Referring to (b) of the following figure, measure τ_{Rana}, t_{PRan}, τ_{Fana} and t_{PFan} for outputs of pin 14 (R OUT), pin 13 (G OUT) and pin 12 (B OUT). (3) Find maximum values of t_{PRan} and t_{PFan} respectively (Δt_{PRan}, Δt_{PFan}).
T_{60}	Analog RGB Switching Rise-Up Transfer Time	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{61}	Analog RGB Switching Rise-Up Transfer Time, 3 Axes Difference	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{62}	Analog RGB Switching Breaking Time	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{63}	Analog RGB Switching Breaking Transfer Time	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{64}	Analog RGB Switching Breaking Transfer Time, 3 Axes Difference	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	



NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	—	—	—	—	—	—	
T_{65}	Analog RGB Hi Switching Rise-Up Time	B	A	B	B	B	A	—	—	—	—	—	—	—	—	—	(1) Supply 2 V to pin 22 (Analog Ys). (2) Input 0.5 V_{p-p} signal shown by (a) in the following figure to pin 23 (Analog R IN). (3) Referring to (b) of the following figure, measure τ_{Ranh}, t_{PRah}, τ_{Fanh} and t_{PFah} for output of pin 14 (R OUT). (4) Input 0.5 V_{p-p} signal shown by (a) in the following figure to pin 24 (Analog G IN). (5) Referring to (b) of the following figure, perform the same measurement as the above step 3 for output of pin 13 (G OUT). (6) Input 0.5 V_{p-p} signal shown by (a) in the following figure to pin 25 (Analog B IN). (7) Referring to (b) of the following figure, perform the same measurement as the above step 3 for output of pin 12 (B OUT). (8) Find maximum axes difference in t_{PRoh} and t_{PFoh} among the three outputs (Δt_{PRah}, Δt_{PFah}).
T_{66}	Analog RGB Hi Switching Rise-Up Transfer Time	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{67}	Analog RGB Hi Switching Rise-Up Transfer Time, 3 Axes Difference	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{68}	Analog RGB Hi Switching Breaking Time	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{69}	Analog RGB Hi Switching Breaking Transfer Time	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	
T_{70}	Analog RGB Hi Switching Breaking Transfer Time, 3 Axes Difference	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	



NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															
		SW MODE									SUB-ADDRESS & BUS DATA						MEASURING METHOD
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	—	—	—	—	—	—	
T_{71}	TV-Analog RGB Crosstalk	B	A	B	B	B	A	—	—	—	—	—	—	—	—	—	(1) Input TG7 sine wave signal (f = 4 MHz, video amplitude = 0.5 V) to pin 31 (Y_2 IN). (2) Short circuit pin 25 (Analog G IN) in AC coupling. (3) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (4) Set bus data so that contrast is maximum, Y sub contrast and drive are set at center value. (5) Supply pin 22 (Analog Ys) with 0 V of external power supply. (6) Measure video voltage of output signal of pin 13 (G OUT) (Vtg). (7) Supply pin 22 (Analog Ys) with 2 V of external power supply. (8) Measure video voltage of output signal of pin 13 (G OUT) (Vana). (9) From measurement results of the above steps 5 and 7, calculate crosstalk from TV to analog RGB. Crtva = 20 ℓog (Vana / Vtv)
T_{72}	Analog RGB-TV Crosstalk	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	(1) Short circuit pin 31 (Y_2 IN), pin 34 (R-Y IN) and pin 33 (B-Y IN) in AC coupling. (2) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (3) Set bus data so that contrast is maximum and drive is set at center value. (4) Input TG7 sine wave signal (f = 4 MHz, video amplitude = 0.5 V) to pin 24 (Analog G IN). (5) Supply pin 22 (Analog Ys) with 0 V of external power supply. (6) Measure video voltage of output signal of pin 13 (G OUT) (Vant). (7) Supply pin 22 (Analog Ys) with 2 V of external power supply. (8) Measure video voltage of output signal of pin 13 (G OUT) (Vtan). (9) From measurement results of the above steps 6 and 8, calculate crosstalk from analog RGB to TV. Crant = 20 ℓog (Vant / Vtan)

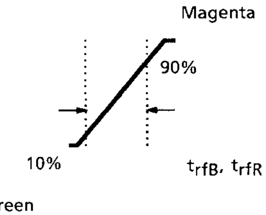
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C ; BUS = preset value)															MEASURING METHOD
		SW MODE									SUB-ADDRESS & BUS DATA						
		S_{21}	S_{22}	S_{31}	S_{33}	S_{34}	S_{51}	—	—	—	01H	15H	—	—	—	—	
T_{73}	ABL Point Characteristic	B	B	B	B	B	A	—	—	—	FFH	10H 90H F0H	—	—	—	—	(1) Input TG7 sine wave signal (f = 4 MHz, video amplitude = 0.5 V) to pin 31 (Y_2 IN). (2) Short circuit pin 23 (Analog R IN), pin 25 (Analog G IN) and pin 26 (Analog B IN) in AC coupling. (3) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (4) Set bus data so that brightness is maximum and ABL gain is at center value, and supply pin 16 with external supply voltage. While turning down voltage supplied to pin 16 gradually from 7 V, measure voltage at pin 16 when the voltage supplied to pin 12 decreases by 0.3 V in three conditions that data on ABL point is set at minimum, center and maximum values respectively. (Vablpl, Vablpc, Vablph)
T_{74}	ACL Characteristic	↑	↑	↑	↑	↑	↑	—	—	—	—	—	—	—	—	—	(1) Input TG7 sine wave signal (f = 4 MHz, video amplitude = 0.5 V) to pin 31 (Y_2 IN). (2) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (3) Measure video amplitude at pin 12. (Vacl1) (4) Measure DC voltage at pin 16 (ABCL). (5) Supply pin 16 with a voltage that the voltage measured in the above step 4 minus 2 V. (6) Measure video amplitude at pin 12 (Vacl2) and its ratio to the amplitude measured in the above step 3. Vacl = 20 ℓog (Vacl2 / Vacl1)
T_{75}	ABL Gain Characteristic	↑	↑	↑	↑	↑	↑	—	—	—	FFH	00H 10H 1CH	—	—	—	—	(1) Short circuit pin 31 (Y_2 IN), pin 34 (R-Y IN) and pin 33 (B-Y IN) in AC coupling. (2) Input 0.3 V synchronizing signal to pin 48 (Sync IN). (3) Set bus data on brightness at maximum and measure video DC voltage at pin 12 (Vmax). (4) Measure voltage at pin 16 which is being supplied with the voltage measured in the step 5 of the preceding Note 75. (5) Changing setting of bus data on ABL gain at minimum, center and maximum values one after another, measure video DC voltage at pin 12. (Vabl1, Vabl2, Vabl3) (6) Find respective differences of Vabl1, Vabl2 and Vabl3 from the voltage measured in the above step 3. Vabll = Vmax − Vabl1 Vablc = Vmax − Vabl2 Vablh = Vmax − Vabl3

SECAM SECTION

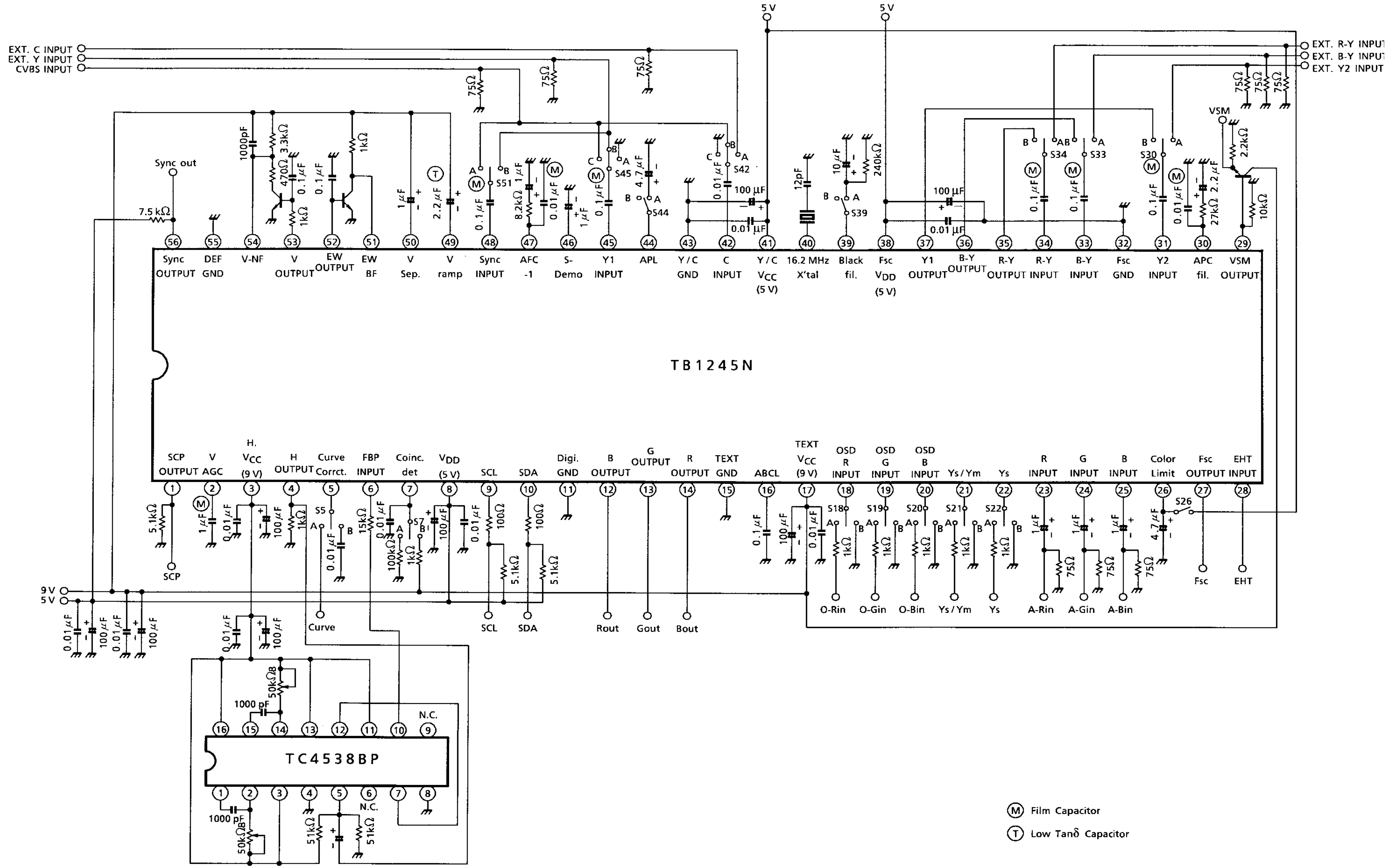
NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)																							MEASURING METHOD
		S	BUS : TEST MODE						BUS : NORMAL CONTROL MODE																
			02H		07H				0FH	10H							1FH								
		26	D_4	D_3	D_2	D_7	D_5	D_4	D_4	D_7	D_5	D_4	D_3	D_2	D_1	D_0	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	
S_1	Bell Monitor Output Amplitude	ON	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	(1) Input 200 mV_{p-p} (R-Y ID), 75% chroma color bar signal (SECAM system) to pin 42. (2) Measure amplitude of R-Y ID output of pin 36 as ebmo.
S_2	Bell Filter f_o	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) While supplying 20 mV_{p-p} CW sweep signal from network analyzer to pin 42 and monitoring output signal of pin 36 with the network analyzer, measure frequency having maximum gain as foBEL of the bell frequency characteristic. (2) Find difference between foBEL and 4.286 MHz as foB-C.
S_3	Bell Filter f_o Variable Range	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	Vari-able	Vari-able	(1) The same procedure as the steps 1 and 2 of the Note S_2. (2) Measure foBEL in different condition that SUB (IF) D_1D_0 = (00) or (11), and find difference of each measurement result from 4.286 MHz as foB-L or foB-H.
S_4	Bell Filter Q	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	0	1	(1) The same procedure as the step 1 of the Note S_2. (2) While monitoring output signal of pin 36 with network analyzer, measure Q of bell frequency characteristic as QBEL. QBEL = (QMAX −3 dB band width) / FoBEL
S_5	Color Difference Output Amplitude	OFF	—	—	—	—	—	—	0	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) Input 200 mV_{p-p} (R-Y ID), 75% chroma color bar signal (SECAM system) to pin 42. (2) Measure color difference levels VRS and VBS with signals of pin 35 and pin 36. (3) Calculate relative amplitude from VRS / VBS.
S_6	Color Difference Relative Amplitude	↑	—	—	—	—	—	—	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	

NOTE	ITEM	TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)																							MEASURING METHOD
		S	BUS : TEST MODE						BUS : NORMAL CONTROL MODE																
			02H		07H				0FH	10H							1FH								
		26	D_4	D_3	D_2	D_7	D_5	D_4	D_4	D_7	D_5	D_4	D_3	D_2	D_1	D_0	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	
S_7	Color Difference Attenuation Quantity	OFF	—	—	—	—	—	—	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	(1) The same procedure as the steps 1 and 2 of the Note S_5. (2) In the condition that SUB (IF) D_6 = 1, measure amplitudes of color difference signals of pin 35 and pin 36 as VRSA and VBSA respectively, and find SATTR and SATTB from measurement results. SATTR = 20 ℓog (VRSA / VRS), SATTB = 20 ℓog (VBSA / VBS)
S_8	Color Difference S / N Ratio	↑	—	—	—	—	—	—	↑	↑	↑	↑	↑	↑	↑	↑	↑	0	↑	↑	↑	↑	↑	↑	(1) The same procedure as the steps 1 and 2 of the Note S_5. (2) Input non-modulated 200 V_{p-p} (R-Y) chroma signal to pin 42. (3) Measure noise amplitude nR and nB (mV_{p-p}) appearing in color difference signals of pin 35 and pin 36 respectively. (4) Find S / N ratio by the following equation. SNB - S = 20ℓog (2$\sqrt{2}$ × VBS / nB × 10E - 3) SNR - S = 20ℓog (2$\sqrt{2}$ × VRS / nR × 10E - 3)
S_9	Linearity	↑	—	—	—	—	—	—	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) The same procedure as the step 1 of the Note S_5. (2) Measure and calculate amplitude of black bar levels in output waveforms of pin 35 and pin 36 as shown below. LinB = V [cyan] / V [red] (Maximum positive / negative amplitudes in respective axes) LinR = V [yellow] / V [blue]

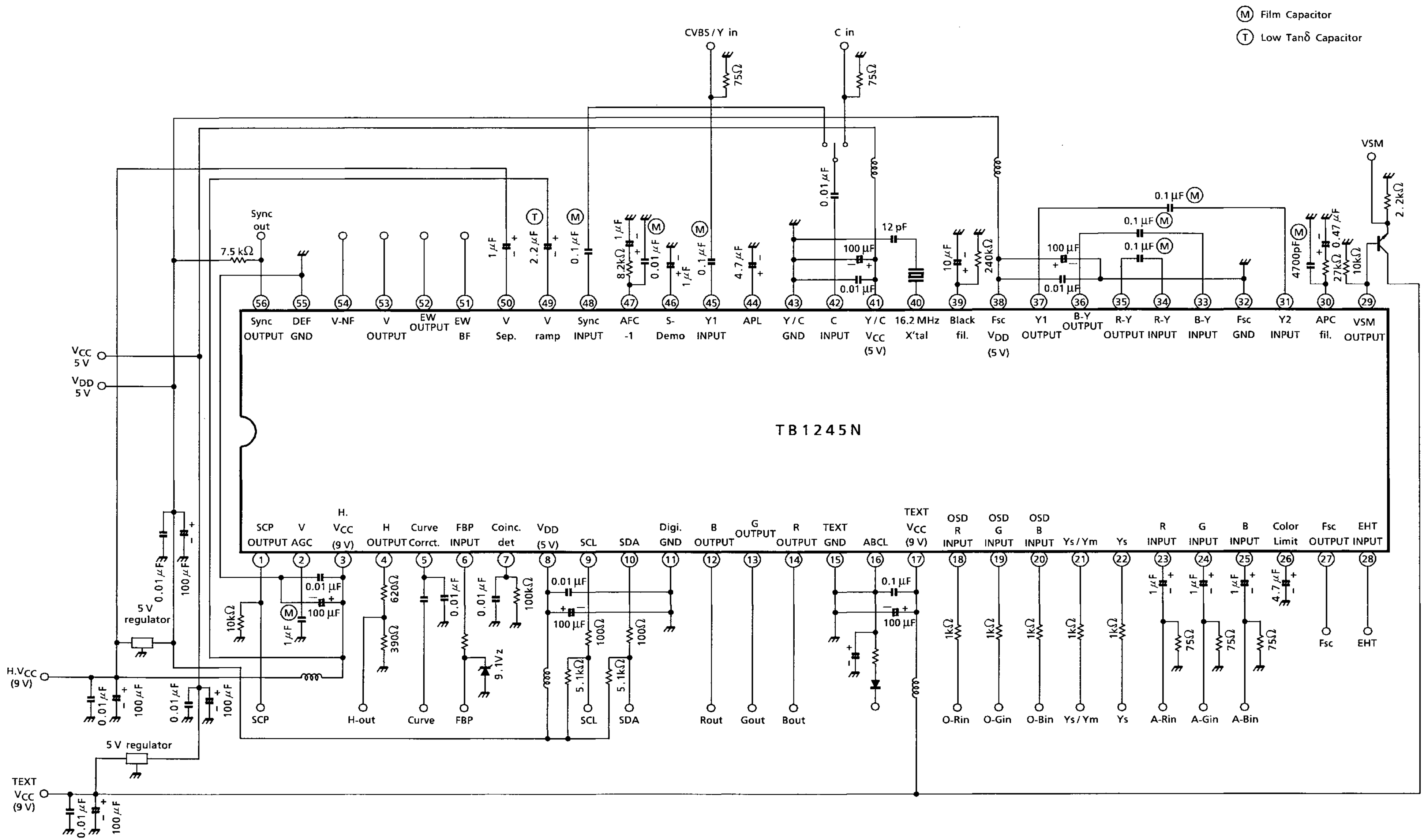
TEST CONDITION (Unless otherwise specified : H, RGB V_{CC} = 9V ; V_{DD}, Fsc V_{DD}, Y / C V_{CC} = 5V ; Ta = 25±3°C)

NOTE	ITEM	S	BUS : TEST MODE						BUS : NORMAL CONTROL MODE																MEASURING METHOD
			02H			07H			0FH	10H							1FH								
		26	D_4	D_3	D_2	D_7	D_5	D_4	D_4	D_7	D_5	D_4	D_3	D_2	D_1	D_0	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	
S_{10}	Rising-Fall Time (Standard De-Emphasis)	OFF	—	—	—	—	—	—	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	(1) The same procedure as the step 1 of the Note S_5. (2) Measure output waveforms of pin 35 and pin 36 to find the period between the two points shown in the figure in time. 
S_{11}	Rising-Fall Time (Wide-Band De-Emphasis)	↑	—	—	—	—	—	—	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(3) In the condition that SUB (IF) D_5 = 1, perform the same measurement as the above step 2. Measurement results are expressed as t_{rfBW} and t_{rfRW}.
S_{12}	Killer Operation Input Level (Standard Setting)	↑	—	—	—	—	—	—	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	(1) Input 200 mV_{p-p} (R-Y ID) standard 75% color bar signal (SECAM system) to pin 42. (2) Attenuate the input signal to pin 42. Measure R-Y ID signal level at pin 42 that turns on / off the killer as eSK and eSC. (3) In the condition that SUB (IF) D_3 = 1, perform the same measurement as the above step 2 and express the measurement results as eSFK and eSFC. (4) In the condition that SUB (IF) D_3 = 0, D_2 = 1, perform the same measurement as the above step 2 and express the measurement results as eSWK and eSWC.
S_{13}	Killer Operation Input Level (VID ON)	↑	—	—	—	—	—	—	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	0	↑	↑	↑	↑	↑	
S_{14}	Killer Operation Input Level (Low Sensitivity, VID OFF)	↑	—	—	—	—	—	—	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	0	↑	↑	↑	

TEST CIRCUIT

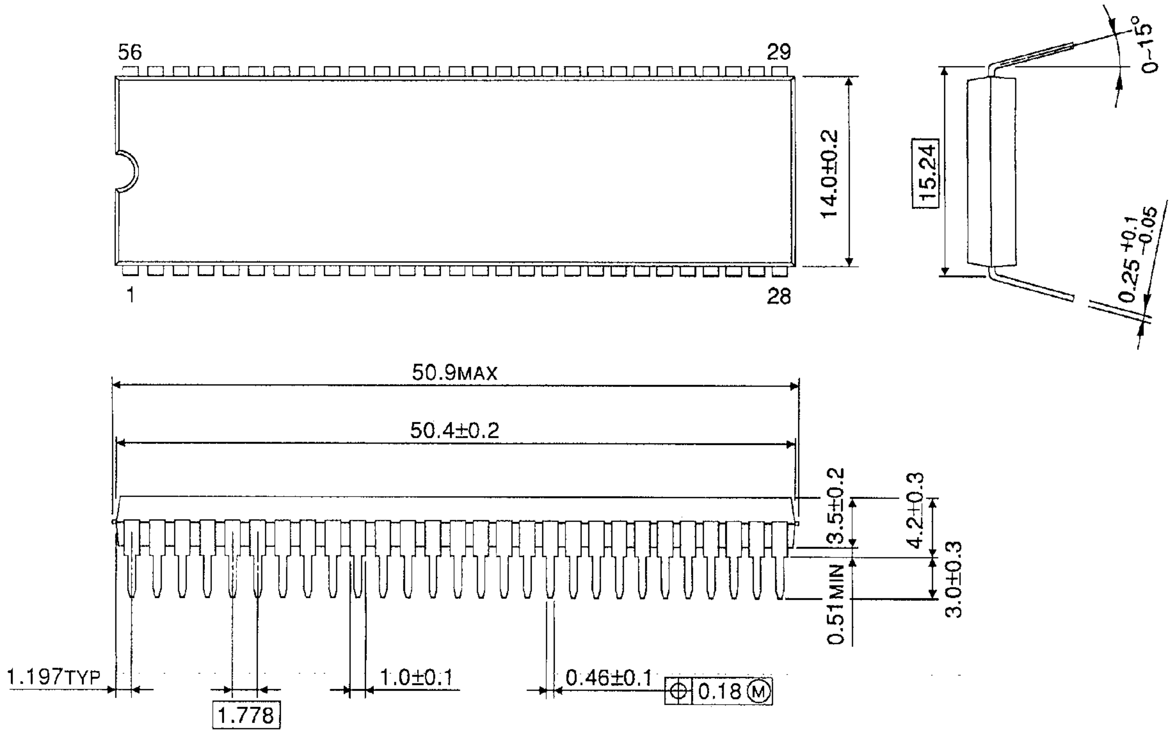


APPLICATION CIRCUIT



PACKAGE DIMENSIONS

SDIP56-P-600-1.78 Unit : mm



Weight: 5.55 g (Typ.)

RESTRICTIONS ON PRODUCT USE