

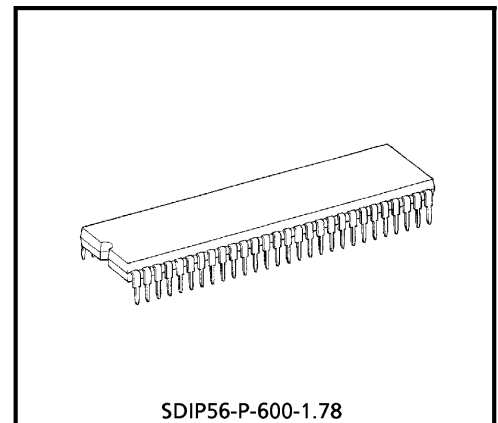
TA1298AN

PAL / NTSC VIDEO CHROMA AND DEFLECTION IC FOR CTV (NORMAL SCAN / DOUBLE SCAN MODE)

TA1298AN provides Video, Chroma and Deflection (Sync, when double scan mode) circuit for a PAL / NTSC Color TV, and suitable for a high picture quality, large screen size, wide and / or double scanning TV. These functions are integrated in a 56 pin dual-in-line shrink-type plastic package.

TA1298AN provides a high-performance video processor in which a YUV double scanning signal can be applied in Video, PAL / NTSC auto-detection circuit in Chroma and 50 / 60 Hz auto-detection circuit in Sync. PAL demodulation circuit includes Baseband signal processing system. And this demodulation circuit does not required any adjustment.

TA1298AN includes I²C bus interface, so you can adjust various functions and controls via the bus.



SDIP56-P-600-1.78

Weight : 5.55 g (Typ.)

FEATURES

Video / Chroma section

- Y delay line
- Chroma trap
- IQ demodulation for NTSC, UV demodulation for PAL
- Color decoder TINT

BEP (Back End Processor) section

- Enable to process a YUV signal independently
- Double scanning signal processing capability

(Y processing section)

- Black Stretcher (Controlled by I²C bus)
- DC Restoration Circuit (Controlled by I²C bus)
- Highbright-color Circuit
- D.L. Aperture Sharpness Circuit + Super Real Transcend Circuit (LTI)
- γ Correction (Enable to control Binary line, Gain / Start point)
- Y noise reduction circuit
- Velocity Scan Modulation output (The first order differential output and phase / amplitude adjustment)

(Color difference section)

- Color Detail Enhancer
- Selectable relative phase and amplitude
- Flesh-color restoration (only IQ demodulation)
- Color γ circuit
- Baseband tint color

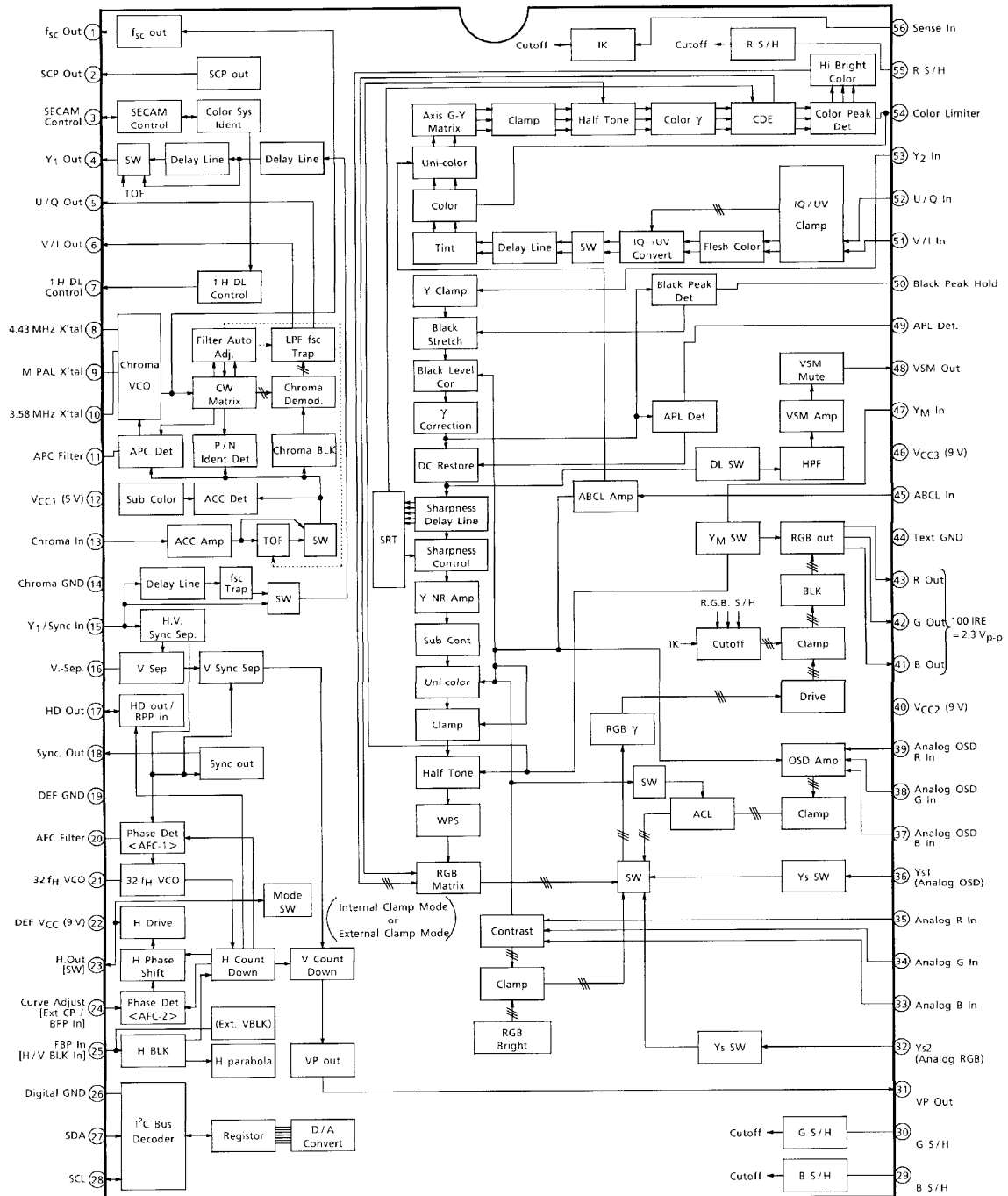
(Text section)

- RGB primary color output
- On Screen Display interface
- Linear RGB interface
- Fast Blanking
- Drive control
- AKB (only black level) or Cut-off Bus control

Deflection section

- High Performance Sync. Separation Circuit
- Adjustment free H and V oscillation circuit by Countdown system
- Horizontal and Vertical position adjustment
- Sync separation, HD output
- Horizontal and Vertical pulse output in normal mode

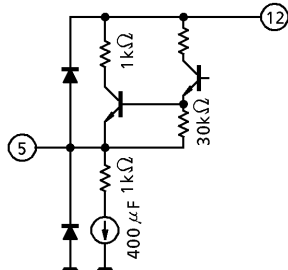
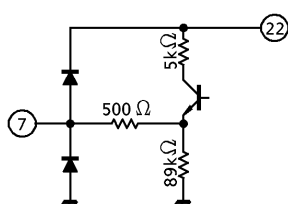
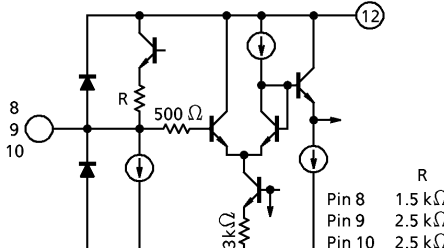
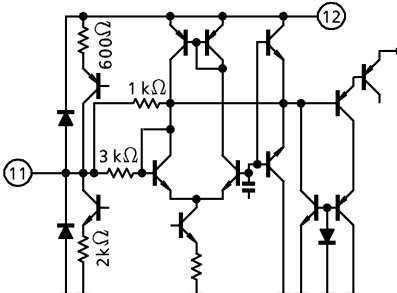
BLOCK DIAGRAM



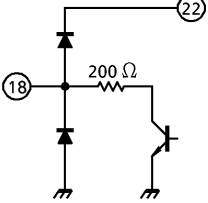
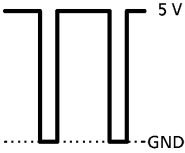
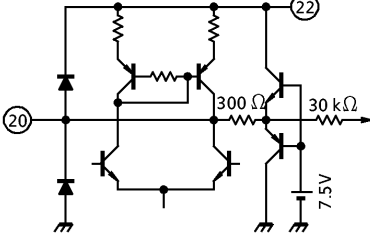
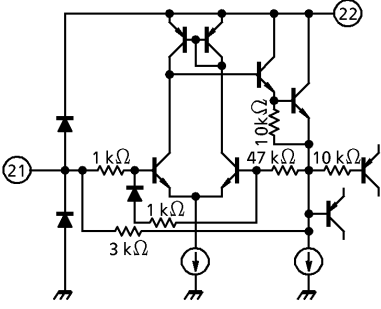
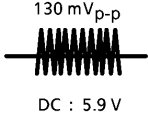
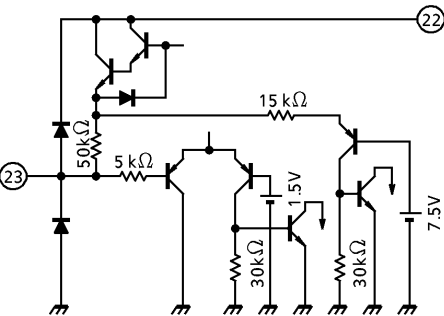
- Pin 23 connect to V_{CC} : Double Scan mode
- (Note) [] : for Double Scan mode only (External clamping pulse input mode)

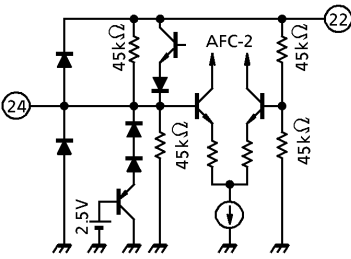
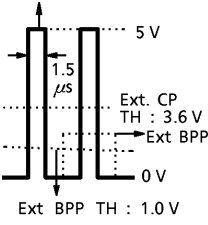
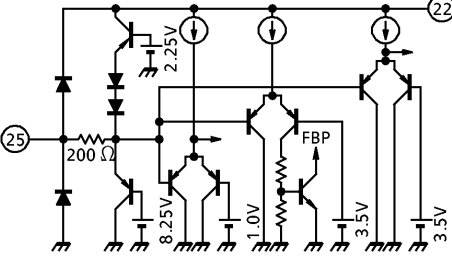
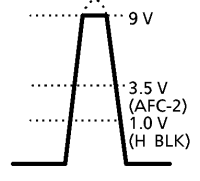
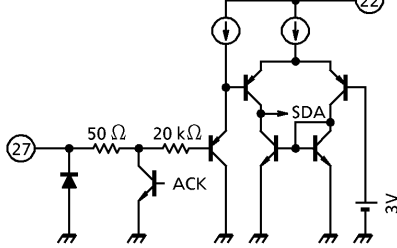
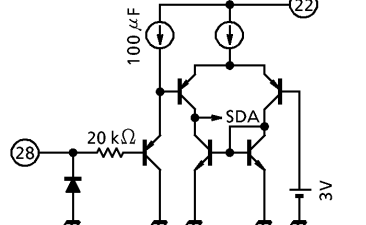
TERMINAL FUNCTIONS

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
1	f _{sc} output	Outputs oscillation waveform of VCXO. When 3.58NTSC killer-off this pin voltage sets 3.2 V. When B/W or other systems killer-off, this pin voltage sets 1.4 V.		DC 3.58NTSC : 3.2 V B/W or Others system : 1.4 V AC 0.6 V _{p-p}
2	SCP output	Outputs SCP (Sand Castle Pulse). The output signal consists of clamp pulse, horizontal blanking pulse, and vertical blanking. The minimum load resistance is 3 kΩ.		
3	SECAM control	The input/output pin that is used to control the SECAM demodulation IC. When current stronger than 250 μA flows from this pin, that is recognized as SECAM.		When PAL / NTSC 4.0 V When SECAM 0.75 V
4	Y1 output	Outputs the Y signal that routed the f _{sc} TRAP (TRAP can be turned on or off with Bus.) and the Y delay line circuit.		
5	U/Q output	Outputs B-Y (U) or I signal. It includes LPF that can remove carrier.		DC 2.5 V Rainbow color bar : 360 mV _{p-p}

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
6	V/I output	Outputs R-Y (V) or Q signal. It includes LPF that can remove carrier. The chroma signal that routed ACC and TOF circuits (before demo input) can be monitored by pulling up this pin at 10 kΩ.		DC 2.5 V Rainbow color bar : 360 mV _{p-p}
7	1 H DL control	Outputs the result of whether the signal is PAL, SECAM or NTSC. Connect the output to the 1 H DL IC. In the case of discrimination between white or black, the voltage just before that is retained. The voltage immediately after turning-on is not fixed.		8.4 V : PAL 4.3 V : SECAM 0 V : NTSC
8 9 10	4.43 MHz X'tal M PAL X'tal 3.58 MHz X'tal	Connect X'tal. In the case of series capacity, the oscillation frequency (f ₀) can be changed. In the case of parallel capacity, the changeable range of frequency can be changed.		DC 4.0 V 90 mV _{p-p}
11	APC filter	Connect APC filter demodulating the chroma. The oscillation frequency of VCXO varies depending on the voltage at this pin.		DC
12	V _{CC1} (5 V)	The V _{CC} of the chroma and I ² C Bus blocks. Connect 5 V (Typ.)	—	—

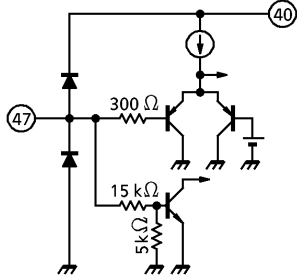
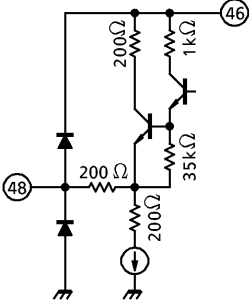
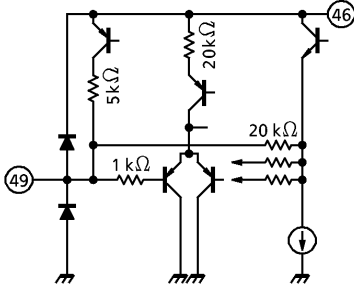
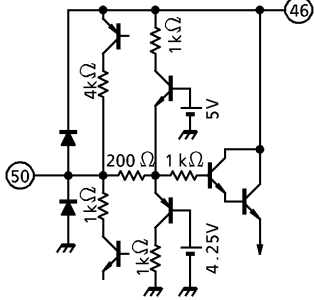
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
13	Chroma input	The pin through which the chroma is input. Input the chroma signal that was subjected to Y/C separation.		
14	Chroma GND	The GND pin of the chroma processing block.	—	—
15	Y1/SYNC input	The pin through which the composite video signal or Y signal is input. Input via clamp capacitor.		
16	V-Sep.	Connect the filter separating the vertical synchronization.		DC 6.4 V
17	HD output	<p>(1) When BUS HD-OUT = 0 Output the HD pulse (pulse duration : 1 μs) together with AFC. This pin also serves as the external input pin that accepts BPP (black peak detection stopping pulse) signal.</p> <p>(2) When BUS HD-OUT = 1 When AKB mode is ON, the pulse which covers AKB reference period is output.</p>		<p>(1)</p> <p>(2)</p>

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
18	SYNC. output	Output the synchronizing signal that was separated in the synchronous separation circuit. This pin is of the open collector system. Connect the pull-up resistor.		
19	DEF GND	The GND pin of DEF block.	—	—
20	AFC filter	Connect the filter for horizontal AFC. The frequency of the horizontal output varies depending on the voltage at this pin.		DC
21	32 fH VCO	Connect the ceramic oscillator for horizontal oscillation. The oscillator to be used is CSBLA503KECZF30, made by Murata electronics.		
22	DEF V _{CC} (9 V)	The V _{CC} of DEF block. Connect 9 V (Typ.) to this pin.	—	—
23	Horizontal output (Mode SW)	Produces the horizontal output. Connecting the DEF V _{CC} to this pin can switch Double Scan mode. In this case, the horizontal output is not produced.		HIGH : 3.2 V LOW : 0.2 V

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
24	Curve correction (Ext. CP / BPP input)	<p>(1) Used to correct distortion of picture in the case of high-tension fluctuation. Input the AC component of high-tension fluctuation. To deactivate the distortion correction feature, connect a capacitor of 0.01 μF between this pin and GND.</p> <p>(2) Double scan mode This pin is to input external CP (Clamping Pulse) and BPP (Black Peak detection stopping Pulse).</p>		<p>(1) DC 4.5 V (2) Ext. Clamp Pulse</p>  <p>Ext. CP TH : 3.6 V Ext BPP TH : 1.0 V</p>
25	FBP input	<p>The pin through which FBP is input to generate pulses for horizontal AFC2, Y smoothing, and horizontal blanking. When double SCAM mode, input H blanking pulse (5 V or over).</p>		 <p>9 V 3.5 V (AFC-2) 1.0 V (H BLK)</p>
26	Digital GND	The GND pin of I ² L block.	—	—
27	SDA	The SDA pin of I ² C bus.		—
28	SCL	The SCL pin of I ² C bus.		—

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
29 30	B S/H G S/H	These pins are to be connected with a capacitor for sampling and holding a bias voltage in the AKB operation, or for clamping to set DC voltage of RGB outputs in the no-AKB mode.		DC
31	VP output	Outputs the vertical pulse. This pin also serves as the external blanking input. When current stronger than 350 μ A flows, blanking takes place due to the internal blanking and OR logic circuit.		
32	YS2	Switches between the internal RGB signal and analog RGB (pin 33, 34, 35) signal. When this switch is on, the VSM output is muted.		
33 34 35	Analog B input Analog G input Analog R input	The pin through which the analog RGB is input. Input the RGB signal via clamp capacitor.		
36	YS1	Switches between the internal RGB signal and OSD /analog RGB (pin 37, 38, 39). When this switch is on, the VSM output is muted.		

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
37 38 39	Analog OSD B input Analog OSD G input Analog OSD R input	The pin through which the OSD signal or analog RGB is input. (1) When inputting an OSD signal, input the ODS signal with a voltage of 0~5 V (4.1 V or more). (2) When inputting an analog RGB, input the RGB signal via clamp capacitor. ACL works on this input signal only when the entire screen is YS1-HI (the entire screen : OSD).		<p>(1) </p> <p>(2) </p>
40	VCC2 (9 V)	The VCC pin of the text block. Connect 9 V (Typ.).	—	—
41 42 43	B output G output R output	Outputs RGB.		<p>100 IRE : 2.3 V_{p-p}</p> <p>2.5 V</p> <p>GND</p> <p>At Cont Max. BRT Cent.</p>
44	TEXT GND	The GND pin of TEXT block.	—	—
45	ABCL input	Used to control the external uni-color, brightness, and dynamic ABL. Use this pin when using ABL or ACL. The sensitivity and starting point of the ABL and dynamic ABL can be set by using bus.		<p>ABCL OFF : 6 V or more</p>

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
46	VCC3 (9 V)	The VCC pin of picture quality and color difference blocks. Connect 9 V (Typ.).	—	—
47	YM input	The half-tone switch for internal RGB signal. When the voltage at this pin is set to 7.0 V or more, the RGB output voltage.		<p>Soft AKB 7.0 V</p> <p>Half Tone 0.75 V</p> <p>TV GND</p>
48	VSM output	Outputs the Y-signal that routed HPF after it had been subjected to DC restoration. The output is muted with the switches of pins 32 and 36.		DC 3.5 V
49	APL detection	Connect the filter correcting DC restoration ratio. Opening this pin can monitor the Y-signal that was subjected to black stretching.		DC
50	Black peak hold	Connect the filter controlling the black stretching gain of the black stretching circuit. The black stretching gain varies depending on the voltage at this pin.		DC

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT SIGNAL
51 52	V/I input U/Q input	The pin through which R-Y (V)/I and B-Y (U)/Q signals are input. Input via clamp capacitor.		<p>When Burst : Chroma = 1 : 1 360 mV_{p-p} DC : 5.0 V</p>
53	Y2 input	The pin through which B-Y (V)/I and R-Y (U)/Q signals are input. Input via clamp capacitor.		
54	Color limiter	Color the filter detecting the color limit.		DC
55	R S/H	The same as pin 29 and 30.	The same as pin 29 and 30.	DC
56	SENSE input	This pin is to sense IK voltage feed-back from a CRT Drive circuit.		

BUS CONTROL MAP

WRITE MODE

SLAVE ADDRESS : 88 H (10001000)

SUB ADDRESS	D7 MSB	D6	D5	D4	D3	D2	D1	D0 LSB	PRESET	
									MSB	LSB
00	P-MUTE	UNI-COLOR							1000	0000
01	BRIGHTNESS							1000	0000	
02	COLOR							Y-MUTE	1000	0000
03	TINT							YM-SW	1000	0000
04	SHARPNESS (YNR Level)					(00)	YNR	1000	0000	
05	RGB BRIGHTNESS							WPS L	1000	0000
06	HI BRT	RGB CONTRAST							1000	0000
07	SUB COLOR				COLOR γ		CLT	1000	0000	
08	SUB CONTRAST				Y- γ CURVE		FLESH	1000	0000	
09	G (R) DRIVE							DR-SW	1000	0000
0A	B DRIVE							Yout- γ	1000	0000
0B	HORIZONTAL POSITION				TEST2	V-OFF	H-BLK	1000	0000	
0C	R CUT OFF							1000	0000	
0D	G CUT OFF							1000	0000	
0E	B CUT OFF							1000	0000	
0F	R-Y PHASE	R/B GAIN	G/B GAIN	G-Y PHASE				0000	0000	
10	COLOR SYSTEM		P/N-ID	BB SW	OSD-SL	OS-ACL	TX-ACL	0000	0000	
11	VSM PHASE		VSM GAIN		APACON PEAK f_0				0000	0000
12	DC RESTORATION POINT		DC RESTORATION RATE		DC REST. LIMIT				0000	0000
13	BLACK STRETCH POINT		APL VS BSP	Y- γ PNT	CDE				0000	0000
14	SHR-TRACKING	TEST	RGB- γ	B.L.C.	B.S.G.	B.D.L.	BS-ARE	0000	0000	
15	DYNAMIC ABL POINT		DYNAMIC ABL GAIN			ACB SW	VM-LMT	0000	0000	
16	ABL POINT		ABL GAIN			RGB OUT MODE			0000	0000
17	HD-OUT	V-BLK	VERTICAL FREQUENCY			VERTICAL POSITION			0000	0000
18	Y-DELAY TIME		TOF f_0			TOF-Q			0000	0000
19	DECODER TINT							C-TRAP	1000	0000

READ MODE

SLAVE ADDRESS : 89 H (10001001)

	D7	D6	D5	D4	D3	D2	D1	D0
0	PORSET	COLOR SYSTEM		X'tal		V-FREQ	V-STD	H-LOCK
1	N-DET	RGBOUT	Y1-IN	IQ-IN	Y2-IN	H-OUT	VP-OUT	IK-IN

**BUS CONTROL FEATURE
WRITE MODE**

ITEM	EXPLAIN	PRESET
P-MUTE	Picture mute SW ; (0) : OFF, (1) : ON	ON
UNI-COLOR	Uni-color adjustment ; - 17 dB~0 dB	Center
BRIGHTNESS	Brightness adjustment (including sub adjustment) ; - 37 IRE~ + 37 IRE	Center
COLOR	Color adjustment ; - 20 dB (Color mute)~ + 4 dB	0 dB
Y-MUTE	Y mute SW ; (0) : ON, (1) : OFF	ON
TINT	Hue adjustment ; - 33°~ + 33°	0°
TM-SW	Half-tone SW (YUV input) ; (0) : OFF, (1) : ON	OFF
SHARPNESS	Sharpness adjustment ; - 20 dB~ + 15 dB	+ 10 dB
YNR-Level	YNR Gain Control ; (00) : MAX, YNR : When a YNR switch is turned ON, it controls by 5 bits of the higher order of SHARPNESS. At this time, 2 bits of the low of SHARPNESS are taken as fixation (00).	(00)
YNR	Y Noise Reduction SW ; (0) : OFF, (1) : ON	OFF
RGB BRIGHTNESS	RGB Brightness Adjustment ; - 20 IRE~ + 20 IRE	0IRE
WPS L	White Peak Suppression Level ; (0) : 130 IRE, (1) : 110 IRE	130 IRE
HI BRT	High-bright color ; (0) : OFF, (1) : ON	OFF
RGB CONTRAST	RGB Contrast ; - 17 dB~0 dB	- 18 dB
SUB COLOR	Sub-color ; - 5.9 dB~0 dB~ + 3.5 dB	0 dB
COLOR γ	Color γ correction point ; (00) : OFF, (01) : 0.23 V_{p-p} , (10) : 0.4 V_{p-p} , (11) : 0.65 V_{p-p}	OFF
CLT	Color Limiter Level ; (0) : 1.65 V_{p-p} , (11) : 2 V_{p-p}	1.65 V_{p-p}
SUB CONTRAST	Sub-contrast adjustment ; - 3.3 dB~ + 2.5 dB	0 dB
Y- γ CURVE	Y- γ curve switching ; (00) : OFF, (01) : - 2.5 dB, (10) : - 4.8 dB, (11) : - 6.5 dB	OFF
FLESH	Flesh color ; (0) : OFF, (1) : ON	OFF
G (R) / B DRIVE	R (G) / B drive gain adjustment ; - 5 dB~0 dB~ + 3 dB	0 dB (40 h)
DG-SW	Drive gain base axis switching ; (0) : G, (1) : R	G
Yout- γ	Y γ SW (The contrast stage or later) ; (0) : OFF, (1) : ON	OFF
HORIZONTAL POSITION	Horizontal position adjustment ; - 3 μs ~ + 3 μs	0 μs
V-Sep	Vertical Sync separation ; (0) : OFF, (1) : ON	OFF
V-OFF	Vertical output SW ; (0) : ON, (1) : OFF	ON
H-BLK	Horizontal blanking SW ; (0) : ON, (1) : OFF	ON
R / G / B CUTOFF	R / G / B cut-off adjustment ; ● When AKB-OFF : RGB output 2 V~2.5 V~3 V ● When AKB-ON : SENS input 1 V_{p-p} ~1.5 V_{p-p} ~2 V_{p-p} (± 5 IRE)	Center (80 h)
R-Y PHASE	R-Y relative phase switching ; (00) : 90°, (01) : 92°, (10) : 94°, (11) : 111°	90°
R / B GAIN	R / B relative amplitude switching ; (00) : 0.58, (01) : 0.7, (10) : 0.81, (11) : 0.88	0.58
G / B GAIN	G / B relative amplitude switching ; (00) : 0.31, (01) : 0.34, (10) : 0.42, (11) : 0.48	0.31
G-Y PHASE	G-Y relative phase switching ; (00) : 237°, (01) : 241°, (10) : 245°, (11) : 254°	237°

ITEM	EXPLAIN	PRESET
COLOR SYSTEM	Color system ; System X'tal Color Color TINI difference difference control mute input (000) : NTSC 3.58 Forced OFF I/Q Enable (001) : NTSC 3.58 Forced OFF U/V Enable (010) : NTSC 4.43 Forced OFF U/V Enable (011) : PAL 4.43 (N) Forced OFF U/V Enable (100) : PAL M Forced OFF U/V Enable (101) : SECAM 4.43 Forced OFF U/V Enable (110) : MULTI 3.58 / 4.43 Forced OFF U/V Enable (111) : Trinorma 3.58 / M / N Forced OFF U/V Enable	NTSC (000)
P / N ID	PAL / NTSC ident sensitivity switching ; (0) : LOW (When digital comb filter used), (1) : Hi	LOW
BB SW	Blue Back SW ; (0) : OFF, (1) : ON	OFF
OSD-SL	OSD peak suppressing level switching ; (0) : 93 IRE, (1) : 76 IRE	93 IRE
OS-ACL	OSD ACL SW ; (0) : ON, (1) : OFF	ON
TX-ACL	RGB ACL SW ; (0) : -6 dB, (1) : Normal	-6 dB
VSM PHASE	VSM output phase switching ; (00) : -40 ns, (01) : -20 ns, (10) : 0 ns, (11) +20 ns	-40 ns
VSM GAIN	VSM output gain switching ; (00) : 0 dB, (01) : -6 dB, (10) : -9 dB, (11) : OFF	0 dB
APACON PEAK f_0	Apacon peak frequency switching ; (000) : Through (Apacon off), (001) : 4.2 MHz, (010) : 3.3 MHz, (011) : 2.5 MHz, (100) : Through (Apacon off), (101) : 14 MHz, (110) : 11 MHz, (111) : 7.7 MHz	(000) Through
VSM PB	VSM output horizontal parabolic modulation SW ; (0) : Parabolic modulation OFF, (1) : ON (Nearby sharpness -3 dB)	Parabolic modulation OFF
DC RESTORATION POINT	DC restoration start point ; (000) : 0% ~ (111) : 42%	0%
DC RESTORATION RATE	DC restoration rate ; (000) : 100% ~ (111) : 130%	100%
DC REST. LIMIT	DC restoration limit point ; (APL) (00) : 100%, (01) : 87%, (10) : 73%, (11) : 60%	100%
BLACK STRETCH POINT (BSP)	Black stretcher start point ; When APL 0% (000) : 22IRE ~ (111) : 56IRE	22 IRE
APL VS BSP (AVS)	APL level vs. black stretcher start point ; (00) : 0 dB ~ (11) : 1.5 dB, BSP + APL \times BSP \times AVS	0 dB
Y- γ PNT	Y- γ point switching ; (0) : 100 IRE, (1) : 95 IRE	100 IRE
C.D.E	Color detail enhancer ; (11) : MAX (When screen thru, en phasice OFF) : HIGH, (00) OFF	ON
SHR-TRACKING	Sharpness tracking ; (00) : HIGH, (11) : LOW	HIGH

ITEM	EXPLAIN	PRESET
TEST	Test mode ; (0) : NORMAL (1) : Test mode (For factory test) Switched by sub-address 17 H <during gate-pulse> D ₂ (0) : during V-BLK, (1) : NORMAL Y/RGB smoothing OFF, Monitor of DAC at HD output	NORMAL
RGB- γ	RGB- γ SW ; (0) : OFF, (1) : ON	OFF
B.L.C.	Block level automatic correction (Priority over black stretcher) ; MAX 7.5 IRE (0) : OFF, (1) : ON	OFF
B.S.G.	Black stretcher gain SW ; (0) ON, (1) : OFF	ON
B.D.L.	Black detection SW ; (0) : 3 IRE, (1) : 0IRE	3 IRE
BS-ARE	Black area reinforcement SW ; For wide TV (When using time axis compression IC) (0) : ON, (1) : OFF	ON
DYNAMIC ABL POINT	Dynamic ABL detection voltage ; (000) : MIN~(111) : MAX	MIN
DYNAMIC ABL GAIN	Dynamic ABL sensitivity ; (000) : MIN~(111) : MAX	MIN
ACB SW	ACB MODE ; (0) : ACB OFF (CUT OFF BUS CONTROL), (1) : ACB ON	OFF
VM-LMT	VM Limiter Level ; (0) : OFF, (1) : ON (6 dB up / 1.4 V _{p-p})	OFF
ABL POINT	ABL detect voltage ; (000) : MIN~(111) : MAX	MIN
ABL GAIN	ABL GAIN ; (000) : MIN~(111) : MAX	MIN
RGB OUT MODE	RGB output mode SW ; (00) : NORMAL, (01) : Only R, (10) : Only G, (11) : Only B	NORMAL
HD-OUT	HD output SW ; (0) : HD output, (1) : AKB period pulse	HD output
V-BLK	Vertical Blanking SW ; (0) : ON, (1) : OFF	ON
VERTICAL FREQUENCY	Vertical Frequency ; (000) : AUTO (50, 60 Hz), (001) : AUTO (50, 60 Hz / V MASK OFF), (010) : 60 Hz, (011) : 60 Hz (V MASK OFF), (100) : Forced 262.5 H, (101) : Forced 263 H, (110) : Forced 312.5 H, (111) : Forced 313 H, When (100), (101), (110), (111) : AFC Free-run	(000) AUTO
VERTICAL POSITION	Vertical position ; (000) : 0 H~(111) : 7 H (1H STEP)	0 H
Y-DELAY TIME	Y-DELAY TIME switching ; (00) : OFF, (01) : +40 ns ; (10) : +80 ns ; (11) : +120 ns	OFF
TOF-f ₀	Selectable TOF Peak Frequency ; (000) : 0.8 f _{sc} + TOF OFF~(111) : 1.5 f _{sc}	TOF OFF
TOF-Q	Selectable TOF Q ; (000) : 0.6~(111) : 1.2	0.6
DECODER TINT	Hue adjustment ; -32°~ +32° (1STEP = 0.5°)	0°
C-TRAP	Chroma Trap SW ; (0) : OFF, (1) : ON	OFF

DELAY TIME FROM Y₁ INPUT (PIN 15) TO Y₁ OUTPUT (PIN 4)

COLOR	TRAP	Y-DL	DELAY TIME	
B/W	—	OFF (00)	365	ns
		(01)	415	ns
		(10)	465	ns
		(11)	515	ns
PAL/NTSC	OFF	OFF (00)	365	ns (4.43)
		OFF (00)	365	ns (3.58 / M / N)
		(01)	415	ns (4.43)
		(01)	415	ns (3.58 / M / N)
		(10)	465	ns (4.43)
		(10)	465	ns (3.58 / M / N)
		(11)	515	ns (4.43)
		(11)	515	ns (3.58 / M / N)
	ON	OFF (00)	355	ns (4.43)
		OFF (00)	360	ns (3.58 / M / N)
		(01)	405	ns (4.43)
		(01)	410	ns (3.58 / M / N)
		(10)	455	ns (4.43)
		(10)	460	ns (3.58 / M / N)
SECAM	—	OFF (00)	580	ns
		(01)	630	ns
		(10)	680	ns
		(11)	730	ns

READ MODE

CHARACTERISTIC	EXPLAIN
PORES	Power On Reset ; (0) : RESISTER PRESET, (1) : NORMAL
COLOR SYSTEM	Color system ; Receiving system (Judgement of ID ON/OFF) (00) : B/W, (01) : SECAM, (10) : PAL, (11) : NTSC
X'tal	X'tal Mode ; (00) : —, (01) : 4.43 (N), (10) : M, (11) : 3.58
V-FREQ	Vertical frequency ; (0) : 50 Hz, (1) : 60 Hz
V-STD	Vertical Standard ident ; (0) NON-STANDARD, (1) : STANDARD
H-LOCK	Horizontal Lock ident ; (0) : LOCK, (1) : UN-LOCK
N-DET	Noise ident result ; (0) : FEW, (1) : MANY
RGBOUT, Y ₁ -IN, IQ-IN, Y ₂ -IN, H-OUT, VP-OUT	Self-ident result ; (0) : NG, (1) : OK
IK IN	IK input ident result ; (0) : NG, (1) : OK

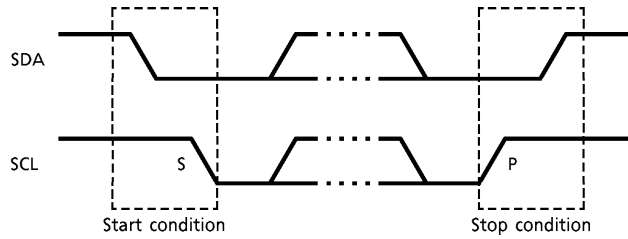
(Note) There is noise on the internal line to control UNI-COLOR, while reading I²C bus data. This generated noise changes RGB output amplitude, which should be recognized as horizontal line noise. TOSHIBA recommends to read bus data while a vertical blanking period, otherwise, Please evaluate about this. Writing data in any case do not cause this noise.

I²C BUS TRANSMISSION / RECEIVING

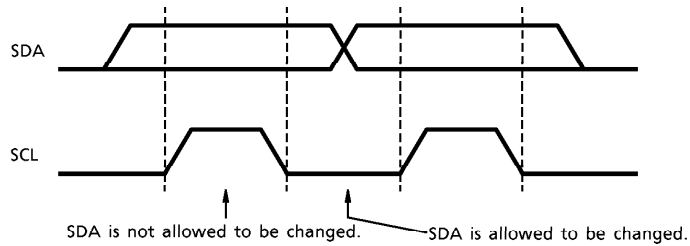
SLAVE ADDRESS : 88 H

A ₆	A ₅	A ₄	A ₃	A ₂	A ₁	A ₀	W/R
1	0	0	0	1	0	0	0/1

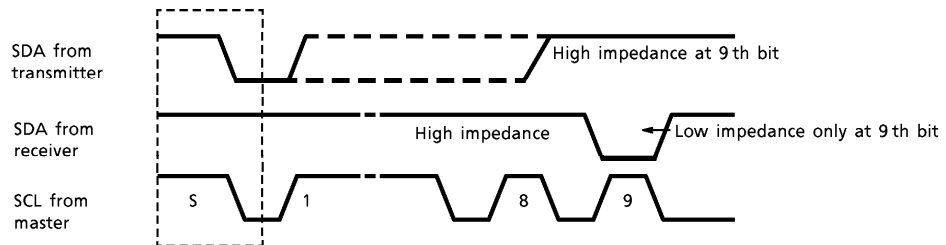
Start / stop condition



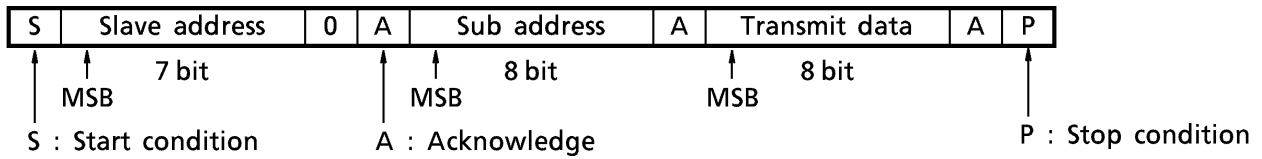
Bit transmission



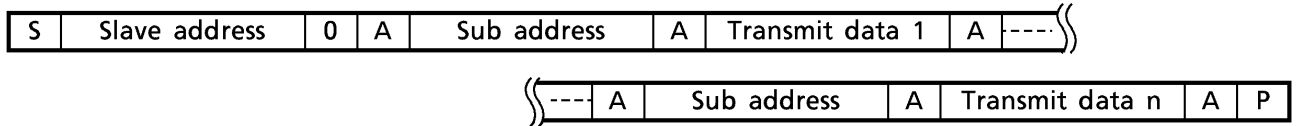
Confirmation response



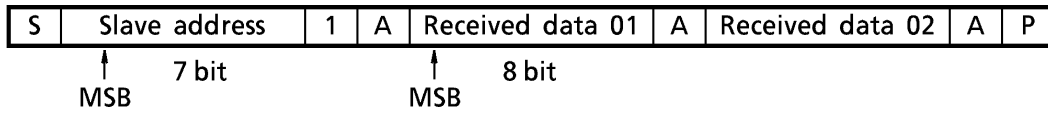
DATA TRANSMIT FORMAT 1



DATA TRANSMIT FORMAT 2



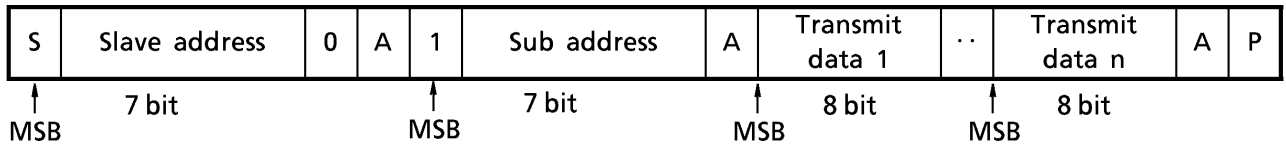
DATA RECEIVE FORMAT



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 I²C components conveys a license under the Phillips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C standard Specification as defined by Phillips.

○ Pin 23 H-out (Mode SW)

You can select the Double Scan Mode (External CP (Clamping Pulse) input Mode), by connecting Pin 23 to DEF V_{CC} . (The threshold of Pin 23 : $8.7V = DEF V_{CC} - 0.3V$)

When Double Scan Mode, function of Pin 24 and 25 are changed.

● Normal Scan (Internal CP) Mode : Pin 23 — H-out

The function of Pin 24 is curve correction input, that of Pin 25 is FBP (Flay Back Pulse) input.

The input signals of Y2, U/I and V/I inputs (Pin 53, 52 and 51), Analog OSD inputs (Pin 39, 38 and 37), Analog RGB inputs (Pin 35, 34 and 33) are clamped of the internal CP based on the Y1/Sync input (Pin 15).

● Double Scan (External CP input) Mode : Pin 23 — H-out

The function of Pin 24 is EXT/BPP (Note) input, that of Pin 25 is H/V BLK (blanking) input.

The input signals of Y2, U/I and V/I inputs (Pin 53, 52 and 51), Analog OSD inputs (Pin 39, 38 and 37), Analog RGB inputs (Pin 35, 34 and 33) are clamped of the external CP based on Pin 24.

In case of Double Scan Mode, bus "V-BLK" should be set (1) ; OFF.

TERMINAL FUNCTIONS

MODE PIN No.	NORMAL SCAN MODE (INTERNAL CP)	DOUBLE SCAN MODE (EXTERNAL CP INPUT)
Pin 23	H-out	DEF V_{CC} (9V)
Pin 24	Curve correction signal input	EXT CP/BPP input
Pin 25	FBP input (for AFC-2 detection, H BKL)	H/V BLK input (for RGB H/V BLK, AKB)
Pin 53, 52, 51	Clamping by internal CP (based on Pin 15)	Clamping by external CP (based on Pin 24)
Pin 39, 38, 37		
Pin 35, 34, 33		
Pin 15	Normal scan ; Y/Sync signal input	
Pin 17	Normal scan ; HD pulse output (based on Pin 15)	
Pin 31	Normal scan ; VP output (based on Pin 15)	

(Note) BPP : Black Peak detection stopping Pulse

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CCmax}	12	V
Input Terminal Voltage	e_{inmax}	9	V_{p-p}
Power Dissipation	P_D (Note 1)	1920	mW
Power Dissipation Reduction Rate	$1/\theta_{ja}$	15.4	$mW/°C$
Operating Temperature	T_{opr}	-20~65	°C
Storage Temperature	T_{stg}	-55~150	°C

(Note 1) Refer to the figure below.

(Note 2) This IC have a horizontal line noise caused by reading BUS data.

TOSHIBA recommends to read bus data while a vertical blanking period, otherwise enough evaluation about this and careful programming of the micro controller are necessary to be done.

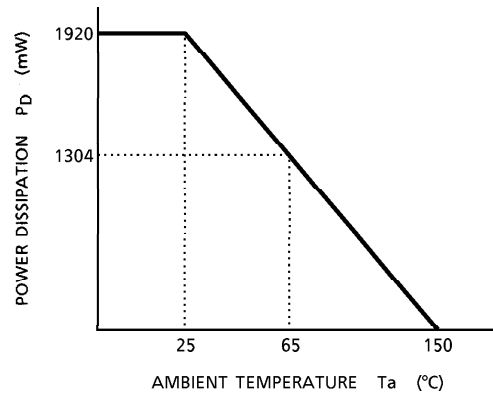


Fig. Power dissipation reduction against higher temperature

RECOMMENDED CONDITION IN USE

CHARACTERISTIC	DESCRIPTION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	Pin 5	4.3	5.0	5.3	V
	Pin 22, Pin 40, Pin 46	8.7	9.0	9.3	
Y ₁ /Sync, Y ₂ Input Signal Level	White : 100%, including, synchronization (Synchronization : minus)	0.9	1.0	1.1	V _{p-p}
Chroma Input Signal Level	When TOF OFF (Burst level)	200	300	400	mV _{p-p}
	When TOF ON (Burst level)	100	200	300	
I/Q, U/V Input Level	B : C = 1 : 1	—	300	—	mV _{p-p}
OSD/Analog RGB Input Level	When OSD input (DC coupling)	4.2	—	5.0	V
	When analog RGB input (AC coupling)	0.4	0.5	0.6	V _{p-p}
Analog RGB Input Level	—	0.4	0.5	0.6	
FBP Width	—	11	12	13	μs
FBP Input Current	—	—	—	1.5	mA
RGB Output Current	—	—	1.0	2.0	
H. Output Current	—	—	3.0	10.0	
Pin 18 Input Current	—	—	0.5	1.0	

ELECTRICAL CHARACTERISTICS

(V_{CC1} = 5 V, V_{CC2}/V_{CC3}/DEF V_{CC} = 9 V, Ta = 25°C, unless otherwise specified)

SUPPLY CURRENT

PIN NAME	SYMBOL	TEST CIR-CUIT	MIN.	TYP.	MAX.	UNIT
V _{CC1}	I _{CC1}	—	37.6	43.4	49.9	mA
V _{CC2}	I _{CC2}	—	37.6	43.3	49.8	
V _{CC3}	I _{CC3}	—	36.2	41.7	48.0	
DEF V _{CC}	I _{CC4}	—	9.7	11.2	13.0	

TERMINAL VOLTAGE

PIN No.	PIN NAME	SYMBOL	TEST CIR-CUIT	MIN.	TYP.	MAX.	UNIT
3	SECAM CONT.	V ₃	—	3.7	4.0	4.3	V
4	Y ₁ OUTPUT	V ₄	—	1.7	2.0	2.3	
5	U/Q OUTPUT	V ₅	—	2.2	2.5	2.8	
6	V/I OUTPUT	V ₆	—	2.2	2.5	2.8	
8	4.43 MHz X'tal	V ₈	—	3.7	4.0	4.3	
9	M PAL X'tal	V ₉	—	3.7	4.0	4.3	
10	3.58 MHz X'tal	V ₁₀	—	3.7	4.0	4.3	
13	CHROMA INPUT	V ₁₃	—	2.2	2.5	2.8	
15	Y ₁ INPUT / SYNC. IN	V ₁₅	—	2.6	2.85	3.1	
16	V SEP.	V ₁₆	—	5.7	6.2	6.7	
21	32 f _H VCO	V ₂₁	—	5.6	5.85	6.10	
24	CURVE CORRECTION	V ₂₄	—	4.3	4.5	4.7	
32	Y _{s2}	V ₃₂	—	0	0.1	0.3	
33	ANALOG B INPUT	V ₃₃	—	3.2	3.5	3.8	
34	ANALOG G INPUT	V ₃₄	—	3.2	3.5	3.8	
35	ANALOG R INPUT	V ₃₅	—	3.2	3.5	3.8	
36	Y _{s1}	V ₃₆	—	0	0.1	0.3	
37	OSD / ANALOG B INPUT	V ₃₇	—	3.3	3.6	3.9	
38	OSD / ANALOG G INPUT	V ₃₈	—	3.3	3.6	3.9	
39	OSD / ANALOG R INPUT	V ₃₉	—	3.3	3.6	3.9	
45	ABCL INPUT	V ₄₅	—	5.85	6.10	6.35	
48	VM OUTPUT	V ₄₈	—	3.5	3.6	3.7	
49	APL DET	V ₄₉	—	4.95	5.0	5.05	
50	BLACK PEAK HOLD	V ₅₀	—	5.7	5.8	5.9	
51	V/I INPUT	V ₅₁	—	4.8	5.0	5.2	
52	U/Q INPUT	V ₅₂	—	4.8	5.0	5.2	
53	Y ₂ INPUT	V ₅₃	—	6.1	6.3	6.5	
54	COLOR LIMITER	V ₅₄	—	6.35	6.60	6.85	

**AC CHARACTERISTIC
VIDEO SECTION**

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Y ₂ Input Dynamic Range	DR ₅₃	—	—	0.7	1.0	1.5	V _{p-p}
Black Level Shift	V _B	—	(Note V ₁)	-5	0	5	mV
	V _{B3}	—		33	40	47	
Black Stretching Amplifier Maximum Gain	G _{B5}	—	(Note V ₂)	1.30	1.40	1.50	times
Black Stretching Start Point (1)	P _{BST1}	—	(Note V ₃)	17	22	27	IRE
	P _{BST2}	—		51	56	61	
Black Stretching Start Point (2)	P _{BS1}	—	(Note V ₄)	—	0	4	
	P _{BS2}	—		40	46	52	
D.ABL Detection Voltage	ΔV ₀₀₁	—	(Note V ₅)	30	50	70	mV
	ΔV ₀₁₀	—		90	110	130	
	ΔV ₁₀₀	—		220	240	260	
D.ABL Sensitivity	S _{DAMIN}	—	(Note V ₆)	—	0	0.04	V/V
	S _{DAMAX}	—		0.280	0.295	0.310	
Black Level Correction	B _{LC}	—	(Note V ₇)	6.5	7.0	7.5	IRE
Y γ Correction Point	P _{γ0}	—	—	95	100	105	IRE
	P _{γ100}	—		2	5	8	
Y γ Correction Gain	G _{γ01}	—	—	-3.5	-2.5	-1.5	dB
	G _{γ10}	—		-5.8	-4.8	-3.8	
	G _{γ11}	—		-7.5	-6.5	-5.5	
Black Peak Detection Level	ΔV _{BP}	—	(Note V ₈)	-15	0	15	mV
DC Restoration Gain	ADT ₁₀₀	—	(Note V ₉)	0.9	1.0	1.1	times
	ADT ₁₃₀	—		1.25	1.30	1.40	
DC Restoration Start Point	V _{DT0}	—	(Note V ₁₀)	-3	0	3	%
	V _{DT48}	—		42	47	50	
DC Restoration Limit Point	P _{DTL60}	—	(Note V ₁₁)	60	63	66	
	P _{DTL73}	—		72	75	78	
	P _{DTL87}	—		84	87	90	
	P _{DTL100}	—		96	99	102	
Sharpness Peak Frequency	F _{APL01}	—	—	3.8	4.2	4.6	MHz
	F _{APL10}	—		3.0	3.3	3.6	
	F _{APL11}	—		2.2	2.5	2.8	
	F _{APH01}	—		13.0	14.5	16.0	
	F _{APH10}	—		10.7	11.9	13.1	
	F _{APH11}	—		7.3	8.1	8.9	

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Sharpness Control Range	GMAXL	—	(Note V ₁₂)	13	15	17	dB
	GMINL	—		-12	-9	-6	
	GMAXH	—		13	15	17	
	GMINH	—		-9	-6	-4	
Sharpness Control Center Gain	GCENL	—	—	7	9	13	
	GCENH	—		7	9	13	
YNR Characteristic	GYL	—	(Note V ₁₃)	-12	-9	-6	
	GYH	—		-9	-6	-4	
	GYLX	—		-2	-1	0	
	GYHX	—		-2.5	-1.5	0	
SRT Response to 2T Pulse Input	TSL1	—	(Note V ₁₄)	170	190	210	ns
	TSRTL	—		125	140	155	
	TSH1	—		190	210	230	
	TSRTH	—		58	65	72	
VSM Peak Frequency	FVL	—	When normal mode	7.2	9	10.8	MHz
	FVH	—	When double scan mode	12.8	16	19.2	
VSM Gain	GVL00	—	(Note V ₁₅)	12	14	16	dB
	GVL01	—		-7	-6	-5	
	GVL10	—		-10	-9	-8	
	GVL11	—		-∞	-35	-30	
	GVH00	—		11	13	15	
	GVH01	—		-7	-6	-5	
	GVH10	—		-10	-9	-8	
	GVH11	—		-∞	-32	-27	
VM Limit	VMLU	—	(Note V ₁₆)	0.66	0.69	0.71	V _{p-p}
	VMLD	—		0.65	0.67	0.71	
	GVLML	—		4	5	6.5	dB
	GVLMH	—		3.5	4.6	6.5	
Threshold Voltage of VSM Muting	VSR36	—	Pin 32, Pin 36	0.65	0.75	0.85	V
Response Time for VSM High Speed Muting	TVML1	—	(Note V ₁₇)	0	50	100	ns
	TVML2	—		0	50	100	
	TVML3	—		0	50	100	
	TVML4	—		0	50	100	
	TVMH1	—		0	50	100	
	TVMH2	—		0	50	100	
	TVMH3	—		0	50	100	
	TVMH4	—		0	50	100	
Between Y2 Input and R Output Delay Time	TY2RD	—	When through	25	35	45	
	TY2RL	—	When normal mode	185	205	225	
	TY2RH	—	When double scan mode	112	125	138	

CHROMA SECTION

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
ACC Characteristic		F ₆₀₀	—	(Note C ₁)	0.280	0.330	0.380	V _{p-p}
		F ₃₀₀	—		0.280	0.330	0.380	
		F ₃₀	—		0.280	0.330	0.380	
		F ₁₀	—		0.10	0.115	0.130	
		A	—		0.95	0.10	1.05	times
Sub Color Control Characteristic		es +	—	—	2.5	3.5	4.5	dB
		es -	—		-6.9	-5.9	-4.9	
APC Frequency Control Sensitivity		β_3	—	(Note C ₂)	0.50	1.00	1.50	Hz / mV
		β_4	—		0.50	1.00	1.50	
		β_M	—		0.50	1.00	1.50	
APC Pull-In / Hold Range		f _{3PH}	—	(Note C ₃)	250	500	2000	Hz
		f _{3HH}	—		250	500	2000	
		f _{3PL}	—		-2000	-500	-250	
		f _{3HL}	—		-2000	-500	-250	
		f _{4PH}	—		250	500	2000	
		f _{4HH}	—		250	500	2000	
		f _{4PL}	—		-2000	-500	-250	
		f _{4HL}	—		-2000	-500	-250	
		f _{MPH}	—		250	500	2000	
		f _{MHH}	—		250	500	2000	
		f _{MPL}	—		-2000	-500	-250	
f _{MHL}	—	-2000	-500	-250				
3.58 MHz / 4.43 MHz Free Run Frequency		f ₀₃	—	f ₀ = 3.579545 MHz	-200	0	200	Hz
		f ₀₄	—	f ₀ = 4.433619 MHz	-200	0	200	
		f _{0M}	—	f ₀ = 3.575611 MHz	-200	0	200	
f _{sc} Output Amplitude		f _{3c}	—	When 3.58 NTSC	0.54	0.78	0.96	V _{p-p}
		f _{4c}	—	When 4.43 PAL	0.35	0.59	0.77	
		f _{Mc}	—	When M-PAL	0.54	0.78	0.96	
f _{sc} Output DC Level		V _{1a}	—	When 3.58 NTSC	2.80	3.20	3.50	V
		V _{1b}	—	Except for 3.58 NTSC	1.15	1.55	1.75	
IQ Color Difference Signal Output Level	Q Axis	v _{BN}	—	When B : C = 1 : 1 signal	290	330	380	mV _{p-p}
	I Axis	v _{RN}	—		300	350	400	
IQ Signal Demodulation Ratio		v _{RN} / v _{BN}	—	R-Y / B-Y	1.00	1.06	1.20	—
IQ Demodulation Angle	Q Axis	θ_{BN}	—	—	35.0	38.0	41.0	°
	I Axis	θ_{RN}	—		127.0	130.0	133.0	
IQ Demodulation Angle		Relative	θ_{BRN}	I-Q	89.0	92.0	95.0	
UV Color Difference Signal Output Level	B-Y	v _{BP}	—	When B : C = 1 : 1 signal	300	350	400	mV _{p-p}
	R-Y	v _{RP}	—		300	350	400	
UV Signal Demodulation Ratio		v _{RP} / v _{BP}	—	R-Y / B-Y	0.94	1.00	1.10	—
UV Demodulation Angle	B-Y	θ_{BP}	—	—	-3.0	0.0	3.0	°
	R-Y	θ_{RP}	—		89.0	92.0	95.0	
UV Demodulation Angle		Relative	θ_{BRP}	—	89.0	92.0	95.0	

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT		
Residual Carrier Level		V _{BNe}	—	f _{sc} level	—	1.90	4.00	mV _{p-p}		
		V _{RNe}	—		—	1.90	4.00			
		V _{BPe}	—		—	1.90	4.00			
		V _{RPe}	—		—	1.90	4.00			
Residual Higher Harmonics Level		V _{BHNe}	—	f _{sc} × 2 level	—	1.90	4.00			
		V _{RHNe}	—		—	1.90	4.00			
		V _{BHPe}	—		—	1.90	4.00			
		V _{RHPe}	—		—	1.90	4.00			
Color Difference Output DC Voltage		3.58 NTSC		V _{BN}	—	B-Y output	2.06	2.36	2.66	V
				V _{RN}	—	R-Y output	1.94	2.24	2.54	
		4.43 NTSC		V _{BP}	—	B-Y output	2.06	2.36	2.66	
				V _{RP}	—	R-Y output	2.06	2.36	2.66	
1HDL Output DC Level		PAL	V _{DLP}	—	Output from pin	8.00	8.30	8.60		
		NTSC	V _{DLS}	—		4.00	4.30	4.60		
		SECAM	V _{DLN}	—		0.01	0.50	0.20		
Sand Castle Pulse Height		CP	SCH	—	—	7.50	7.80	8.10		
		HD	SCM	—		3.95	4.20	4.45		
		VD	SCL	—		2.25	2.50	2.75		
SECAM Output DC Level		SEN	—	(Note C ₄)	3.70	4.00	4.30	mV _{p-p}		
		SEP	—		3.70	4.00	4.30			
		SES	—		0.40	0.70	1.00			
NTSC Ident Sensitivity		v _{NCL}	—	(Note C ₅)	3.80	4.8	6.8			
		v _{NCH}	—		2.7	3.7	5.7			
		v _{NBL}	—		3.5	4.5	6.5			
		v _{NBH}	—		2.5	3.5	5.5			
PAL Ident Sensitivity		v _{PCL}	—	(Note C ₆)	7.3	8.5	10.5			
		v _{PCH}	—		5.3	6.5	8.5			
		v _{PBL}	—		7.3	8.5	10.5			
		v _{PBH}	—		4.6	5.8	7.8			
TOF Characteristic		GF _{H3}	—	(Note C ₇)	21.0	22.5	24.0	dB		
		GF _{C3}	—		19.0	20.5	22.0			
		GF _{L3}	—		16.5	18.0	19.5			
		GF _{H4}	—		20.0	21.5	23.0			
		GF _{C4}	—		19.0	20.5	22.0			
		GF _{L4}	—		17.0	18.5	20.0			
Y ₁ In~Y ₁ Out AC Gain		Through	GY _s	—	20 log (output level / input level)	-1.21	0.00		1.06	
		Normal	GY _d	—		-1.21	0.00		1.06	
		Double Scan	GY _t	—		-1.21	0.00	1.06		
Y ₁ In~Y ₁ Out Frequency Bandwidth		Gf _{Y1}	—	—	-3.0	-1.0	0.0			
Trap Filter Gain		3.58	GT _{C3}	—	—	-30	-25	-20		
		4.43	GT _{C4}	—	—	-30	-25	-20		
Y ₁ Input Dynamic Range		3.58 NTSC	VD ₃	—	—	1.30	1.60	V _{p-p}		
		4.43 PAL	VD ₄	—	—	1.30	1.60			

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
TINT Control Characteristic	ΔTB_{MAX}	—	(Note C _g)	+ 31.0	+ 35.0	+ 39.0	deg
	ΔTR_{MAX}	—		+ 34.0	+ 38.0	+ 42.0	
	ΔTB_{MIN}	—		- 26.0	- 30.0	- 34.0	
	ΔTR_{MIN}	—		- 33.0	- 37.0	- 41.0	

TEXT SECTION

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
AC Gain		G_R	—	(Note T ₁)	2.95	3.30	3.70	times	
		G_G	—		2.95	3.30	3.70		
		G_B	—		2.95	3.30	3.70		
AC Gain Axial Difference		G_G/R	—	—	0.94	1.00	1.06	—	
		G_B/R	—		0.94	1.00	1.06		
Output Bandwidth	R	G_{fR}	—	at -3 dB point	25	30	—	MHz	
	G	G_{fG}	—		25	30	—		
	B	G_{fB}	—		25	30	—		
Uni-Color Control Characteristic		v_U MAX	—	(Note T ₂)	0.62	0.69	0.77	V_{p-p}	
		v_U CNT	—		0.34	0.39	0.44		
		v_U MIN	—		0.08	0.1	0.12	dB	
		Δv_U	—		15.5	16.5	17.5		
Brightness Control Characteristic		V_{br} MAX	—	(Note T ₃)	4.05	4.35	4.65	V	
		V_{br} CNT	—		3.2	3.5	3.8		
		V_{br} MIN	—		2.35	2.65	2.95		
Brightness Control Sensitivity		G_{br}	—	(Note T ₄)	5.7	6.6	7.5	mV	
White Peak Slice Level		V_{wps1}	—	(Note T ₅)	2.75	2.95	3.15	V_{p-p}	
		V_{wps2}	—		2.30	2.50	2.70		
Black Peak Slice Level		V_{BPS}	—	(Note T ₆)	2.10	2.26	2.42	V	
Signal-to-Noise Ratio of RGB Output	R	N_{41}	—	—	—	-58	-49	dB	
	G	N_{42}	—		—	-58	-49		
	B	N_{43}	—		—	-58	-49		
Half-Tone Gain		G_{HT1}	—	(Note T ₇)	0.45	0.50	0.55	times	
		G_{HT2}	—		0.45	0.50	0.55		
Half-Tone ON Voltage		V_{HT}	—	Pin 47	0.65	0.85	1.05	V	
V-BLK Pulse Output Level	R	V_{VR}	—	—	0.3	0.8	1.3		
	G	V_{VG}	—		0.3	0.8	1.3		
	B	V_{VB}	—		0.3	0.8	1.3		
H-BLK Pulse Output Level	R	V_{HR}	—	—	0.3	0.8	1.3		
	G	V_{HG}	—		0.3	0.8	1.3		
	B	V_{HB}	—		0.3	0.8	1.3		
Blanking Pulse Delay Time		t_{dON}	—	(Note T ₈)	—	0.0	0.3		μs
		t_{dOFF}	—		—	0.08	0.3		
Sub-Contrast Control Range		ΔV_{SU+}	—	—	2.0	2.5	3.0	dB	
		ΔV_{SU-}	—		-3.8	-3.3	-2.8		
RGB Output Voltage		$V_{\#41}$	—	(Note T ₉)	2.25	2.50	2.75	V	
		$V_{\#42}$	—		2.25	2.50	2.75		
		$V_{\#43}$	—		2.25	2.50	2.75		
RGB Output Voltage Triaxial Difference		ΔV_{out}	—	—	—	0	150	mV	
Cut-Off Voltage Control Range		CUT +	—	(Note T ₁₀)	0.45	0.50	0.55	V	
		CUT -	—		0.45	0.50	0.55		

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Drive Adjustment Control Range	DRG +	—	(Note T ₁₁)	2.35	2.85	3.35	dB
	DRG -	—		-5.75	-5.00	-4.25	
	DRB +	—		2.35	2.85	3.35	
	DRB -	—		-5.75	-5.00	-4.25	
	DRR +	—		2.35	2.85	3.35	
	DRR -	—		-5.75	-5.00	-4.25	
Output Voltage of Muting	MURD	—	(Note T ₁₂)	2.1	2.26	2.42	V
	MUGD	—		2.1	2.26	2.42	
Output Voltage of Blue Back	BB _R	—	(Note T ₁₃)	2.1	2.26	2.42	V
	BB _G	—		2.1	2.26	2.42	
	BB _B	—		1.15	1.30	1.45	V _{p-p}
ACL Characteristic	ACL1	—	(Note T ₁₄)	-5.5	-3.5	-1.5	dB
	ACL2	—		-15	-13.5	-12	
ABL Point	ABLp ₁	—	(Note T ₁₅)	0.2	0.15	0.1	V
	ABLp ₂	—		0.03	0.08	0.13	
	ABLp ₃	—		-0.07	-0.02	0.03	
	ABLp ₄	—		-0.17	-0.12	-0.07	
	ABLp ₅	—		-0.27	-0.22	-0.17	
	ABLp ₆	—		-0.36	-0.31	-0.26	
	ABLp ₇	—		-0.44	-0.39	-0.34	
	ABLp ₈	—		-0.50	-0.45	-0.40	
ABL Gain	ABLG ₁	—	(Note T ₁₆)	-0.04	0.00	0.00	V
	ABLG ₂	—		-0.09	-0.04	0.00	
	ABLG ₃	—		-0.24	-0.19	-0.14	
	ABLG ₄	—		-0.40	-0.35	-0.30	
	ABLG ₅	—		-0.56	-0.51	-0.46	
	ABLG ₆	—		-0.73	-0.68	-0.63	
	ABLG ₇	—		-0.90	-0.85	-0.80	
	ABLG ₈	—		-0.10	-0.92	-0.87	
RGB Output Mode	V43 _R	—	(Note T ₁₇)	2.25	2.5	2.75	V
	V42 _R	—		0.3	0.8	1.3	
	V41 _R	—		0.3	0.8	1.3	
	V43 _G	—		0.3	0.8	1.3	
	V42 _G	—		2.25	2.5	2.75	
	V41 _G	—		0.3	0.8	1.3	
	V43 _B	—		0.3	0.8	1.3	
	V42 _B	—		0.3	0.8	1.3	
V41 _B	—	2.25	2.5	2.75			
ACB Pulse Phase / Amplitude	θ_{ACBR}	—	(Note T ₁₈)	—	1	—	H
	θ_{ACBG}	—		—	2	—	
	θ_{ACBB}	—		—	3	—	
	V _{ACBR}	—		0.26	0.31	0.36	V _{p-p}
	V _{ACBG}	—		0.26	0.31	0.36	
	V _{ACBB}	—		0.26	0.31	0.36	

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
IK Input Level		IKR	—	Pin 56 input level	0.73	0.93	1.13	V
		IKG	—		0.73	0.93	1.13	
		IKB	—		0.73	0.93	1.13	
RGB γ Correction Characteristic		γ 1R	—	(Note T ₁₉)	50	60	70	IRE
		γ 2R	—		68	78	88	
		Δ 1R	—		0.9	1.65	2.4	
		Δ 2R	—		-0.75	0.00	0.75	dB
		Δ 3R	—		-3.55	-2.8	-2.05	
		γ 1G	—		50	60	70	
		γ 2G	—		68	78	88	IRE
		Δ 1G	—		0.9	1.65	2.4	
		Δ 2G	—		-0.75	0.00	0.75	
		Δ 3G	—		-3.55	-2.8	-2.05	dB
		γ 1B	—		50	60	70	
		γ 2B	—		68	78	88	
		Δ 1B	—		0.9	1.65	2.4	IRE
		Δ 2B	—		-0.75	0.00	0.75	
		Δ 3B	—		-3.55	-2.8	-2.05	
Analog RGB Gain		GTXR	—	(Note T ₂₀)	4.0	4.5	5.0	times
		GTXG	—		4.0	4.5	5.0	
		GTXB	—		4.0	4.5	5.0	
Analog RGB Gain Triaxial Difference		GTXG/R	—	—	0.94	1.00	1.06	—
		GTXB/R	—		0.94	1.00	1.06	
Analog RGB Bandwidth	R	GfTXR	—	at -3 dB point	25	30	—	dB
	G	GfTXG	—		25	30	—	
	B	GfTXB	—		25	30	—	
Analog RGB Input Dynamic Range	R	DR35	—	—	0.6	1.0	1.5	V _{p-p}
	G	DR34	—		0.6	1.0	1.5	
	B	DR33	—		0.6	1.0	1.5	
Analog RGB White Peak Slice Level		VTXWPSR	—	(Note T ₂₁)	2.30	2.55	2.80	V _{p-p}
		VTXWPSG	—		2.30	2.55	2.80	
		VTXWPSB	—		2.30	2.55	2.80	
Analog RGB Black Peak Limiter Level		VBPSR	—	(Note T ₂₂)	2.10	2.26	2.42	V
		VBPSG	—		2.10	2.26	2.42	
		VBPSB	—		2.10	2.26	2.42	

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
RGB Contrast Control Characteristic	vuTXR _{MAX}	—	(Note T23)	0.8	0.9	1.0	V _{p-p}
	vuTXG _{MAX}	—		0.8	0.9	1.0	
	vuTXB _{MAX}	—		0.8	0.9	1.0	
	vuTXR _{CNT}	—		0.45	0.52	0.59	
	vuTXG _{CNT}	—		0.45	0.52	0.59	
	vuTXB _{CNT}	—		0.45	0.52	0.59	
	vuTXR _{MIN}	—		0.10	0.12	0.14	
	vuTXG _{MIN}	—		0.10	0.12	0.14	
	vuTXB _{MIN}	—		0.10	0.12	0.14	
	ΔvuTXR	—		15.5	17.0	18.5	dB
	ΔvuTXG	—		15.5	17.0	18.5	
	ΔvuTXB	—		15.5	17.0	18.5	
	Analog RGB Brightness Control Characteristic	VbrTX _{MAX}		—	(Note T24)	3.25	3.45
VbrTX _{CNT}		—	2.80	3.00		3.20	
VbrTX _{MIN}		—	2.35	2.55		2.75	
Analog RGB Brightness Control Sensitivity	GbrTX	—	(Note T25)	6.0	6.8	7.6	mV
Analog RGB Mode ON Voltage	VTXON	—	Pin 32	0.65	0.85	1.05	V
Text ACL Characteristic	TXACL1	—	(Note T26)	-2	-1	-0.05	dB
	TXACL2	—		-6.5	-4.5	-2.5	
	TXACL3	—		-6.5	-4.5	-2.5	
	TXACL4	—		-16.5	-15.0	-13.5	
Analog OSD Gain	GOSD _R	—	(Note T27)	4.1	4.8	5.4	times
	GOSD _G	—		4.1	4.8	5.4	
	GOSD _B	—		4.1	4.8	5.4	
Analog OSD Gain Triaxial Difference	GOSD _{G/R}	—	G/R	0.94	1.00	1.06	—
	GOSD _{B/R}	—	B/R	0.94	1.00	1.06	
Analog OSD Band Width	GfOSD _R	—	at -3 dB point	25	30	—	dB
	GfOSD _G	—		25	30	—	
	GfOSD _B	—		25	30	—	
Analog OSD White Peak Slice Level	VOSD1 _R	—	(Note T28)	1.95	2.15	2.35	V _{p-p}
	VOSD1 _G	—		1.95	2.15	2.35	
	VOSD1 _B	—		1.95	2.15	2.35	
	VOSD2 _R	—		1.55	1.75	1.95	
	VOSD2 _G	—		1.55	1.75	1.95	
	VOSD2 _B	—		1.55	1.75	1.95	
Analog OSD Black Peak Limiter Level	VOSD3 _R	—	(Note T29)	2.10	2.26	2.42	V
	VOSD3 _G	—		2.10	2.26	2.42	
	VOSD3 _B	—		2.10	2.26	2.42	
Analog OSD Output DC Voltage	VOSDDC _R	—	(Note T30)	2.3	2.5	2.7	V
	VOSDDC _G	—		2.3	2.5	2.7	
	VOSDDC _B	—		2.3	2.5	2.7	

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Analog OSD Mode ON Voltage	V _{OSDON}	—	Pin 36	2.05	2.30	2.55	V
OSD ACL Characteristic	OSDA _{CL1}	—	(Note T ₃₁)	—	0	—	dB
	OSDA _{CL2}	—		—	0	—	
	OSDA _{CL3}	—		-6.5	-4.5	-2.5	
	OSDA _{CL4}	—		-16.5	-15	-13.5	
Crosstalk of RGB Inputs	GCT	—	—	—	-50	-45	
Y-OUT γ Characteristic	γ 1	—	(Note T ₃₂)	42	52	62	IRE
	γ 2	—		61	71	81	
	Δ 1	—		1.55	2.3	3.05	dB
	Δ 2	—		-0.85	-0.1	0.65	
	Δ 3	—		-2.35	-3.1	-3.85	

COLOR DIFFERENCE SECTION

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Color Difference Signal Contrast Control Characteristic	vuCY _{MAX}	—	(Note A ₁)	1.5	1.8	2.13	V _{p-p}
	vuCY _{CNT}	—		0.85	1.0	1.2	
	vuCY _{MIN}	—		0.21	0.245	0.3	dB
	Δ vuCY	—		15.5	17.0	18.5	
Color Control Characteristic	vuCY _{MAX}	—	(Note A ₂)	1.22	1.45	1.74	V _{p-p}
	vuCY _{CNT}	—		0.75	0.88	1.06	
	vuCY _{MIN}	—		0.055	0.065	0.078	dB
	Δ vuCY +	—		3.35	4.35	5.35	
	Δ vuCY -	—		-24.5	-22.5	-20.5	
R - Y Relative Phase	00	θ R ₉₀	—	88	90	92	°
	01	θ R ₉₃		90	92	94	
	10	θ R ₉₆		92	94	96	
	11	θ R ₁₁₂		109	111	113	
R - Y Relative Amplitude	00	vR ₅₆ / vB	—	0.55	0.58	0.61	times
	01	vR ₆₈ / vB		0.67	0.7	0.73	
	10	vR ₇₆ / vB		0.78	0.81	0.84	
	11	vR ₈₄ / vB		0.85	0.88	0.91	
G - Y Relative Phase	00	θ G ₂₃₆	—	234	237	240	°
	01	θ G ₂₄₀		238	241	244	
	10	θ G ₂₄₄		242	245	248	
	11	θ G ₂₅₃		251	254	257	
G - Y Relative Amplitude	00	vG ₃₀ / vB	—	0.285	0.31	0.335	times
	01	vG ₃₂₅ / vB		0.325	0.35	0.375	
	10	vG ₃₅ / vB		0.395	0.42	0.445	
	11	Gv ₃₇₅ / vB		0.455	0.48	0.505	
Color Difference Half-Tone Gain	R	GHT _{RY}	(Note A ₃)	0.47	0.50	0.53	
	G	GHT _{GY}		0.47	0.50	0.53	
	B	GHT _{BY}		0.47	0.50	0.53	

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Color γ Characteristic		$V\gamma 1$	—	(Note A4)	0.09	0.23	0.37	V_{p-p}
		$V\gamma 2$	—		0.26	0.40	0.54	
		$V\gamma 3$	—		0.44	0.58	0.72	
		$\Delta\gamma$	—		0.60	0.70	0.80	—
Color Limiter Characteristic		CLT0	—	(Note A5)	1.45	1.65	1.85	V_{p-p}
		CLT1	—		1.8	2.0	2.2	
High Bright Color Gain		HBC1	—	(Note A6)	0.02	0.04	0.06	times
Base Band Tint Control Characteristic	Max	θ_{TRMAX}	—	R	29	33	37	°
		θ_{TBMAX}	—	B	29	33	37	
	Min	θ_{TRMIN}	—	R	-37	-33	-29	
		θ_{TBMIN}	—	B	-37	-33	-29	
Flesh Color Characteristic		Fa33	—	(Note A7)	0.38	0.48	0.58	—
Color Difference Signal Input Dynamic Range		DR_{R-Y}	—	—	0.9	1.2	1.5	V_{p-p}
		DR_{B-Y}	—		0.9	1.2	1.5	
Color Detail Emphasis Characteristic		GCD0	—	(Note A8)	19.5	22.5	25.5	V_{p-p}
		GCD1	—		—	-14.0	0.0	
Phase Shift at IQ \rightarrow UV Conversion		$\theta_{I \rightarrow U}$	—	—	31	33	35	°
		$\theta_{Q \rightarrow V}$	—		31	33	35	

DEF SECTION

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
32 f _H VCO Oscillation Start Voltage		V _{VCO}	—	DEF V _{CC} Voltage	2.0	2.3	2.6	V
Horizontal Output Start Voltage		V _{HON23}	—		4.7	5.0	5.3	
Horizontal Output Duty Cycle		T ₂₃	—	Pin 23	38.5	40.5	42.5	%
Horizontal Output Free-Run Frequency		f _{H050}	—	Vertical freq. ; Auto	15475	15625	15775	Hz
		f _{H060}	—	Vertical freq. ; 60 Hz	15585	15734	15885	
Variable Range of Horizontal Output Frequency		f _{HMIN}	—	Variable pin 20 voltage	14700	15000	15300	
		f _{HMAX}	—		16500	16700	16900	
Horizontal Output Frequency Control Sensitivity		β _H	—	(Note D ₁)	180	230	280	Hz / 0.1 V
Horizontal Output Voltage	High Level	V _{H23}	—	Pin 23	2.7	3.0	3.3	V
	Low Level	V _{L23}	—		—	0.15	0.30	
Horizontal Output Phase		SPH1	—	(Note D ₂)	11.1	11.3	11.5	V
		SPH2	—		0.35	0.45	0.55	
		SPH3	—		0.11	0.21	0.31	
Curve Correction Characteristic		ΔH ₂₄	—	(Note D ₃)	2.3	2.5	2.7	
Variable Range of Horizontal Picture Position		ΔH _{SFT}	—	(Note D ₄)	5.7	6.2	6.7	
Clamp Pulse Start Phase		CP _S	—	(Note D ₅)	2.7	2.9	3.1	
Clamp Pulse Width		CP _W	—		1.0	1.2	1.4	
Threshold of External Clamp Pulse Input		CP _{V30}	—	Pin 24	3.3	3.6	3.9	V
Threshold of External Clamp Mode Switching		CPM _{V23}	—	Pin 23	8.5	8.7	8.9	
Threshold of External Black Peak Hold Stopping Pulse		BP _{V17}	—	Pin 17, at normal scan	0.9	1.1	1.3	—
		BP _{V24}	—	Pin 24, at double scan	0.8	1.0	1.2	
SPC Gate Pulse Start Phase		GP _S	—	(Note D ₆)	1.9	2.1	2.3	
SPC Gate Pulse Width		GP _W	—		1.9	2.1	2.3	
SPC Horizontal Blanking Pulse Start Phase		HP _S	—	(Note D ₇)	4.6	4.8	5.0	μs
SPC Horizontal Blanking Pulse Pulse Width		HP _{W50}	—		10.5	11.0	11.5	
		HP _{W60}	—		9.9	10.4	10.9	

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
HD Output Start Phase	HD _S	—	(Note D ₈)	0.7	0.9	1.1	μ S
HD Output Pulse Width	HD _W	—		0.7	0.9	1.1	
HD Output Voltage	VH _D	—		4.5	4.8	5.1	
Threshold of AFC-2 Detection	VHBLK1	—	Pin 25, at normal scan	3.2	3.5	3.8	V
Threshold of Horizontal Timing	VHBLK2	—	Pin 25, at double scan	3.2	3.5	3.8	
Threshold of Blanking Pulse	VHBLK3	—	Pin 25, H/V blanking	0.8	1.1	1.4	
Vertical Blanking Pulse Start Phase	VP50S1	—	(Note D ₉)	46	48	50	μ S
Vertical Blanking Pulse Stop Phase	VP50S2	—		—	23	—	H
Vertical Blanking Pulse Start Phase	VP60S1	—	(Note D ₁₀)	46	48	50	μ S
Vertical Blanking Pulse Stop Phase	VP60S2	—		—	21	—	H
External Blanking Threshold Current	ABLK	—	Pin 31 input current	150	300	400	μ A
Vertical Output Start Voltage	V _{ON}	—	DEF V _{CC} voltage	4.7	5.0	5.3	V
Vertical Output Free-Run Frequency	f _{V050}	—	Vertical freq. ; Auto	40	45	50	Hz
	f _{V060}	—	Vertical freq. ; 60 Hz	48	53	58	
Vertical Output Voltage	V _{VH}	—	Pin 31	4.7	5.0	5.3	V
	V _{VL}	—		—	0.0	0.3	
Vertical Pull-In Range (1)	f _{PL1}	—	(Note D ₁₁)	—	224.5	—	H
	f _{PH1}	—		—	353	—	
Vertical Pull-In Range (2)	f _{PL2}	—		—	224.5	—	
	f _{PH2}	—		—	297	—	
Vertical Pull-In Range (3)	f _{50P}	—		—	288.5	—	
Vertical Pull-In Range (4)	f _{60P}	—		—	288	—	
RGB Vertical Blanking Pulse Start Phase (1)	VR50S1	—	(Note D ₁₂)	44	46	48	μ S
	VG50S1	—		44	46	48	
	VB50S1	—		44	46	48	
RGB Vertical Blanking Pulse Stop Phase (1)	VR50S2	—		—	19	—	H
	VG50S2	—		—	19	—	
	VB50S2	—		—	19	—	
RGB Vertical Blanking Pulse Start Phase (2)	VR60S1	—	(Note D ₁₃)	44	46	48	μ S
	VG60S1	—		44	46	48	
	VB60S1	—		44	46	48	
RGB Vertical Blanking Pulse Stop Phase (2)	VR60S2	—		—	17	—	H
	VG60S2	—		—	17	—	
	VB60S2	—		—	17	—	

TEST CONDITIONS

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} / V _{CC3} / DEF V _{CC} = 9 V, T _a = 25 ± 3°C)		
		SW15	SW49	SW50
				SW53
	Video Block			
V1	Black Detect Level Shift	C	OFF	C C
V2	Black Stretch Amp Maximum Gain	↑	↑	A A

TEST CONDITIONS	
Video block common test conditions	
① SW13 : A, SW18 : ON, SW20 : ON, SW23 : ON, SW33 : A, SW34 : A, SW35 : A, SW37 : A, SW38 : A, SW39 : A, SW46 : ON, SW51 : B, SW52 : B ② For testing, see the picture sharpness AC characteristics testing circuit diagram. After using the preset values to transmit the BUS control data, set ACB operation switching to ACB off (01). ③ Ensure the composite signal is always input to pin 15 (Y1 / sync input). ④ Set the BUS control data to the preset value. ⑤ Connect pin 53 to an external power supply (PS) and observe pin 50. ⑥ Turn the Y mute off (1), turn the black stretch gain off (1), and set the black detect level to 0IRE (1). ⑦ Increase the PS voltage from 5 V and measure the DC differential V _B of pin 49 where the picture period (high period) of pin 50 goes low. ⑧ Set the black detect level to 3IRE (0). ⑨ As in ④, measure the DC differential V _{B3} of pin 49.	

The diagram shows two waveforms. The top waveform, labeled 'pin 49', is a square wave that is high for most of the period and then drops to a low level for a short duration. The bottom waveform, labeled 'pin 25', is a square wave that is high for most of the period and then drops to a low level for a short duration. A vertical double-headed arrow between the two waveforms during the low period of pin 49 is labeled 'V_B - V_{B3}'.

① Set the BUS control data to the preset value.
② Set SW50 to A (maximum gain) and input a 500 kHz sine wave to TP53.
③ Use pin 53 to adjust the signal amplitude to 0.1 V _{p-p} .
④ Turn the Y mute off (1), turn the black stretch gain off (1), and measure the amplitude V _A of pin 49.
⑤ Turn the black stretch gain on (0) and measure the amplitude V _B of pin 49.
⑥ Calculate the GBS using the following formula. $GBS = V_B \div V_A$

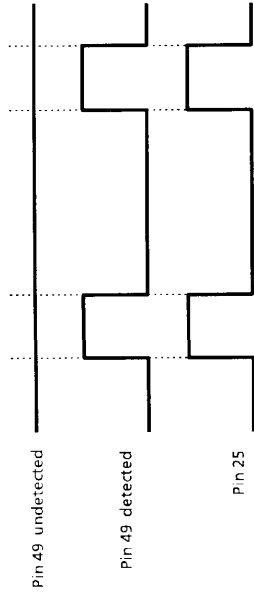
NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, T _a = 25 ± 3 °C)		
		SW ₁₅	SW ₄₉	SW ₅₀ SW ₅₃
				TEST CONDITIONS
V ₃	Black Stretch Start Point (1)	C	OFF	A C

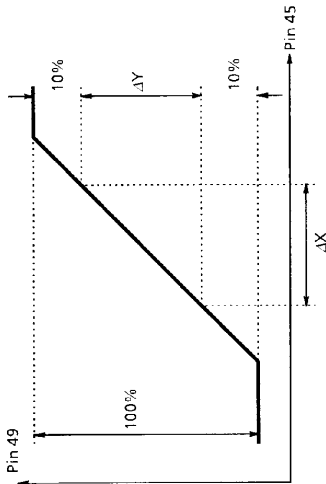
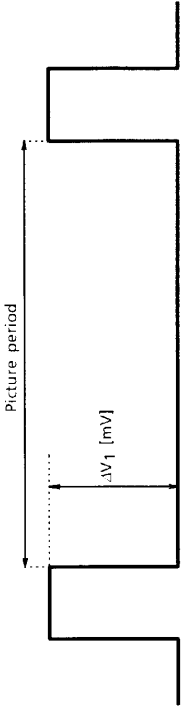
① Set the BUS control data to the preset value.
 ② Set SW₅₀ to A (maximum gain), turn the Y mute off (1), and turn the black stretch gain off.
 ③ Connect pin 53 to an external power supply (PS), increase the voltage from V₅₃, and plot the resulting change in voltage S₁ of pin 49.
 ④ Next, turn the black stretch gain on (0), set the black stretch point 1 to the minimum (000), increase the PS voltage from V₅₃ as in ③, and plot the resulting change in voltage S₂ of pin 49.
 ⑤ Set the black stretch point 1 to the maximum (111), increase the PS voltage from V₅₃ as in ③, and plot the change in voltage S₃ of pin 49.
 ⑥ Use the diagram below to calculate the intersections V_{BST1} and V_{BST2} of S₁, S₂, and S₃. Use the following formulas to calculate PBST1 and PBST2.
 PBST1 [(IRE)] = (V_{BST1} [V] - V₄₉ [V]) ÷ 1.4 [V] × 100 [(IRE)]
 PBST2 [(IRE)] = (V_{BST2} [V] - V₄₉ [V]) ÷ 1.4 [V] × 100 [(IRE)]

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9V, Ta = 25 ± 3°C)		
		SW ₁₅	SW ₄₉	SW ₅₀ SW ₅₃
				TEST CONDITIONS
V4	Black Stretch Start Point (2)	C	ON	A

① Set the BUS control data to the preset value.
 ② Turn the black stretch gain off (1), turn the Y mute off (1), and turn the video mute off (0).
 Input the TG7 linearity to TP53, use pin 53 to adjust the amplitude as in the diagram, set unicolor to the center (1000000), and measure the resulting amplitude (V43) of pin 43 (R OUT).
 ③ Turn the black stretch gain on (0), connect pin 49 to an external power supply (PS), and measure pin 43 (R OUT).
 ④ When the black stretch start point 2 data are at the minimum (000), calculate as in the diagram the black stretch start point differential ΔV000 for when P is V49 (APL 0%) and for when P is V49 + 1.0 [V] (APL 100%).
 ⑤ Next, when the black stretch start point 2 data are maximum (111), calculate differential ΔV111 in the same way.
 ⑥ Calculate the following formulas.
 PBS1 = (ΔV000 / V43) × 100
 PBS2 = (ΔV111 / V43) × 100

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} / V _{CC3} / DEF V _{CC} = 9 V, T _a = 25 ± 3°C)		
		SW15	SW49	SW50 SW53
				TEST CONDITIONS
				<ol style="list-style-type: none"> ① Set the BUS control data to the preset value. ② Turn the Y mute off (1), set the ABL sensitivity to the minimum (000), set the D.ABL sensitivity to the maximum (111), and turn the black stretch gain off (1). ③ Connect pin 45 to an external power supply (PS) and decrease the voltage from 6.5 V. ④ Repeat ③ when the D.ABL detect voltage bus data are 000, 001, 010, and 100 respectively. Measure PS voltages V₀₀₀, V₀₀₁, V₀₁₀, and V₁₀₀ when the picture period of pin 49 changes to low. (Enlarge the range before measuring.) ⑤ Next, calculate the ΔV_{001}, ΔV_{010}, and ΔV_{100} voltage differentials from V₀₀₀ and V₀₀₁, V₀₁₀, and V₁₀₀. $\Delta V^{***} = V_{000} - V_{001}$ (V₀₁₀, V₁₀₀)
V5	D.ABL Detect Voltage	C	OFF	A C



NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, T _a = 25 ± 3°C)			TEST CONDITIONS
		SW ₁₅	SW ₄₉	SW ₅₀ /SW ₅₃	
V6	D.ABL Sensitivity	C	ON	A C	<p>① Set the BUS control data to the preset value.</p> <p>② Turn the Y mute off (1), turn the black stretch gain off (1), and connect pin 45 to an external power supply.</p> <p>③ With the D.ABL detect voltage at the minimum (000), plot the voltage characteristics of pin 49 in relation to the voltage of pin 45 when D.ABL sensitivity is at the minimum (000) and the maximum (111).</p> <p>④ From the diagram, calculate the SDAMIN and SDAMAX gradients.</p> <p>SDAMIN. SDAMAX = $\Delta Y / \Delta X$</p> 
V7	Black Level Compensation	↑	OFF	↑	<p>① Set the BUS control data to the preset value.</p> <p>② Turn the Y mute off (1), turn the black stretch gain off (1), and observe pin 49.</p> <p>③ Turn the black level compensation on (1), measure ΔV_1 [mV], and calculate the following formula.</p> <p>BLC = $(\Delta V_1 / 1.4 \times 10^3) \times 100$ (IRE)</p> 

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V$, $V_{CC2}/V_{CC3}/DEF V_{CC} = 9V$, $T_a = 25 \pm 3^\circ C$)		
		SWITCHING MODE		
		SW15	SW49	SW50
			SW53	
V8	Black Peak Detect Level	C	ON	C C
		TEST CONDITIONS ① Set the BUS control data to the preset value. ② Measure the DC voltage V49 of pin 49. ③ Connect pin 53 to an external power supply (PS). ④ Turn the Y mute off (1), the black stretch gain off (1), and set the black detect level shift to 0 IRE (1). ⑤ Increase the PS from 0V and measure the voltage VBP of pin 49 where the DC level of the picture period of pin 50 shifts from high to low. ⑥ Calculate ΔV_{BP} from the following formula. $\Delta V_{BP} = V_{BP} - V_{49}$		

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5V, V _{CC2} / V _{CC3} / DEF V _{CC} = 9V, Ta = 25 ± 3°C)		
		SW15	SW49	SW50 SW53
				TEST CONDITIONS
V ₉	DC Transmission Rate Compensation Gain	C	ON	<p>① Set the BUS control data to the preset value.</p> <p>② Turn the Y mute off (1), turn the video mute off (0), and connect pin 53 to an external power supply (PS).</p> <p>③ Measure the amplitude V₄₃ of pin 43, set the PS to V₅₃ + 0.7V, and adjust V₄₃ to 0.7V_{p-p} using unicolor.</p> <p>④ With the DC transmission rate compensation gain at the minimum (000), measure ΔV₁ and ΔV₂ as in the diagram below.</p> <p>⑤ Next, with the DC transmission rate compensation gain at the maximum (111), measure ΔV₃ and ΔV₄.</p> <p>⑥ Calculate ADT100 and ADT130 from the following formula.</p> <p>ADT100 = (ΔV₂ [V] - ΔV₁ [V]) ÷ 0.1 [V]</p> <p>ADT130 = (ΔV₄ [V] - ΔV₃ [V]) ÷ 0.1 [V]</p>

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, Ta = 25 ± 3°C)		
		SW15	SW49	SW50
		SW50	SW53	
V10	DC Transmission Compensation Start Point	C	ON	B C

TEST CONDITIONS

- ① Repeat steps ① and ② of V21.
- ② Measure the amplitude V₄₃ of pin 43, set the PS to V₅₃ + 0.7 V, and adjust V₄₃ to around 1.0 V_{p-p} using unicolor.
- ③ With the DC transmission compensation rate at the minimum (000), increase PS from V₅₃ and plot the relationship between the voltages of pins 49 and 43.
- ④ Next, with the DC transmission compensation rate at the maximum (111), increase PS from V₅₃ and plot the relationship between the voltages of pins 49 and 43.
- ⑤ With the DC transmission compensation rate at the maximum (111), increase the PS from V₅₃ when the DC transmission compensation start point reaches the maximum (111) and plot the relationship between the voltages of pins 49 and 43.
- ⑥ Calculate V_{DT0} and V_{DT42} from the following formula.

$$V_{DT0} = ((V_{SP0} - V_{49}) / 1 [V]) \times 100 [\%]$$

$$V_{DT42} = ((V_{SP42} - V_{49}) / 1 [V]) \times 100 [\%]$$

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5V, VCC2/VCC3/DEF VCC = 9V, Ta = 25 ± 3°C)		
		SW15	SW49	SW50
V11	DC Transmission Compensation Limit Point	C	ON	B
		C		C
		<p>TEST CONDITIONS</p> <ol style="list-style-type: none"> Set the BUS control data to the preset value. Turn the Y mute off (1), turn the video mute off (0), and with the unicolor set at maximum (111111), connect pin 49 to an external power supply (PS). Set the DC transmission compensation rate to the maximum (111). Increase the PS from 5V, observe pin 43, and plot the DC transmission compensation rate. Repeat ④ above but change the DC transmission compensation limit point data. Calculate PCTL60, PCTL73, PCTL87, and PCTL100 from the measured data and the following formulas. $PCTL60 = ((VL60 - V49) / 1.0) \times 100 [\%]$ $PCTL73 = ((VL73 - V49) / 1.0) \times 100 [\%]$ $PCTL87 = ((VL87 - V49) / 1.0) \times 100 [\%]$ $PCTL100 = ((VL100 - V49) / 1.0) \times 100 [\%]$ 		

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V$, $V_{CC2}/V_{CC3}/DEF V_{CC} = 9V$, $T_a = 25 \pm 3^\circ C$)				
		SWITCHING MODE SW15 SW49 SW50 SW53			TEST CONDITIONS	
V12	Picture Sharpness Control Range	C	OFF	B	A	<ol style="list-style-type: none"> ① Set the BUS control data to the preset value. ② Input a sine wave to TP53. ③ Set the amplitude of pin 53 to 20 mV_{p-p}. ④ Set the unicolor to the maximum (1111111), set SHR tracking to SRT-gain low (11), and set the aperture compensator peak frequency to 4.2 M (001). ⑤ Turn the Y mute off (1), the video mute off (0), connect TP43 and TP41b, and observe TP41e. ⑥ Set the picture sharpness to the maximum (1111111). When the frequencies are 100 kHz and FAPL01, measure the V_{100} and V_L amplitudes respectively and calculate GMAXL by the formula shown below. ⑦ Next, set the picture sharpness to the minimum (0000000). As in ⑥, when the frequencies are 100 kHz and 2.4 MHz, measure the V_{100} and V_L amplitudes respectively and calculate GMINL by the formula shown below. ⑧ Set the aperture compensator peak frequency to 7.7 M (111) and the picture sharpness to the maximum (1111111). When the frequencies are 100 kHz and FAPH11, measure the V_{100} and V_H amplitudes respectively and calculate GMAXH by the formula shown below. ⑨ Next, set the picture sharpness to the minimum (0000000). When the frequencies are 100 kHz and 4 MHz, measure the V_{100} and V_H amplitudes respectively and calculate GMINH by the following formula. $G^{***} [dB] = 20 \times \text{Log} (V_L (H) \div V_{100})$
V13	YNR Characteristics	↑	↑	↑	↑	<ol style="list-style-type: none"> ① Repeat steps ① to ⑤ of V12. ② With YNR on (1) and the picture sharpness at minimum (0000000), measure the TP41e amplitudes V_{100} and V_L when the input signal frequencies are 100 kHz and 2.4 MHz respectively. ③ Next, set the aperture compensator peak frequency to 7.7 M (111). When the input signal frequencies are 100 kHz and 4 MHz, measure the V_{100} and V_H amplitudes respectively and calculate GYL and GYH by the following formula. $GYL (H) [dB] = 20 \times \text{Log} (V_L (H) \div V_{100})$

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V, V_{CC2}/V_{CC3}/DEF V_{CC} = 9V, T_a = 25 \pm 3^\circ C$)		
		SW15	SW49	SW50 SW53
V14	2T Pulse Response SRT Control	C	ON	A

TEST CONDITIONS

- ① Set the BUS control data to the preset value.
- ② Input a 2T pulse (STD) signal to TP53, turn the Y mute off (1), turn the video mute off (0), set unicolor to maximum (1111111), and set SHR tracking to SRT-gain low (11).
- ③ Set the sharpness control to the center (1000000), set the aperture compensator peak frequency to 4.2 M (001), connect TP43 and TP41b, and observe TP41e.
- ④ Measure T_{SL1} as in the diagram below.
- ⑤ Set SHR tracking to SRT-gain high (00) and measure T_{SL2} .
- ⑥ Next, set the aperture compensator peak frequency to 7.7 M (111) and measure T_{SH1} and T_{SH2} as above.
- ⑦ Calculate the following formula.
 $T_{SRTL} = T_{SL1} - T_{SL2}$
 $T_{SRTH} = T_{SH1} - T_{SH2}$

The diagram shows a pulse response waveform. It starts with a sharp rise, followed by a peak, then a fall. The 10% rise time is labeled T_{SL1} and the 10% fall time is labeled T_{SH1} . The 10% rise time for a second, lower pulse is labeled T_{SL2} and the 10% fall time is labeled T_{SH2} . The 100% rise and fall times are also indicated with dashed lines.

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5 V, VCC2/VCC3/DEF VCC = 9 V, Ta = 25 ± 3°C)		
		SW15	SW49	SW50 SW53
V15	VSM Gain	C	ON	A

TEST CONDITIONS	
①	Set the BUS control data to the preset value.
②	Input the frequency F _{VL} sine wave to TP53.
③	Turn the Y mute off (1), turn the video mute off (0), set the aperture compensator peak frequency to 4.2 M (001), and set the amplitude of pin 53 to 0.1 V _{p-p} .
④	Measure the TP48 amplitudes V _{L00} , V _{L01} , V _{L10} , and V _{L11} in the following cases. VSM gain 0 dB (00) → V _L (H) 00 -6 dB (01) → V _L (H) 01 -9 dB (10) → V _L (H) 10 OFF (11) → V _L (H) 11
⑤	Input the sine wave of frequency F _{VH} to TP53, set the aperture compensator peak frequency to 7.7 M (111), and measure the TP48 amplitudes V _{H00} , V _{H01} , V _{H10} , and V _{H11} as above.
⑥	Calculate the following formulas. G _{VL} (H) 00 = 20 × Log (V _L (H) 00 / 0.1) [dB] G _{VL} (H) 01 = 20 × Log (V _L (H) 01 / 0.1) [dB] - 20 × Log (V _L (H) 00 / 0.1) [dB] G _{VL} (H) 10 = 20 × Log (V _L (H) 10 / 0.1) [dB] - 20 × Log (V _L (H) 00 / 0.1) [dB] G _{VL} (H) 11 = 20 × Log (V _L (H) 11 / 0.1) [dB]

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, T _a = 25 ± 3 °C)		
		SW15	SW49	SW50 SW53
V16	VM Limit	C	ON	A

TEST CONDITIONS	
① Repeat steps ① to ③ of V ₁₅ , then observe pin 48.	
② Turn on the VM limit (1).	
③ As in the diagram, measure the amplitudes VL of TP48.	
④ Input the amplitudes 0.7 V _{p-p} , measure the amplitude V _{MLU} and V _{MLD} [V _{p-p}] of TP48.	
⑤ Input the amplitudes 0.1 V _{p-p} , sine wave of frequency F _{VH} to TP53, set the aperture compensator peak frequency to 7.7M (111), and measure the amplitudes V _H of TP48 as above.	
⑥ Input the amplitudes 0.7 V _{p-p} , measure the amplitude V _{MHU} and V _{MHD} [V _{p-p}] of TP48.	
⑦ Calculate the following formulas. G _{VLL} (LH) = 20 × Log (V _L (H) / 0.1) [dB] G _{VLM} = G _{VLL} - G _{VL00} G _{VLMH} = G _{VLH} - G _{VH00}	

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5 V, VCC2/VCC3/DEF VCC = 9 V, Ta = 25 ± 3°C)		
		SW15	SW49	SW50/SW53
V17	VSM High-Speed Mute Response Time	C	ON	A
		<p>TEST CONDITIONS</p> <p>① Repeat steps ① to ③ of V15, then observe pin 48.</p> <p>② Input a pulse like that shown below to pin 32 and measure the response time T_{VML1} (2) at that input.</p> <p>③ Similarly, input the pulse to pin 36 and measure the response time T_{VML3} (4) at that input.</p> <p>④ Input the sine wave of frequency F_{VH} to TP53, set the aperture compensator peak frequency to 7.7 M (111), and measure the response time T_{VMH1} (2) as in ② above.</p> <p>⑤ Similarly, input the pulse to pin 36 and measure the response time T_{VMH3} (4) at the input.</p>		
		<p>The diagram illustrates the test setup for measuring the VSM High-Speed Mute Response Time. It shows two waveforms: a square wave input to Pin 32 (Pin) and the resulting Pin 48 waveform. The square wave has a peak-to-peak voltage of 2V. The Pin 48 waveform shows a sine wave followed by a mute period. Key timing points are labeled: T_{VML1} (3), T_{VMH1} (3), T_{VML2} (4), and T_{VMH2} (4).</p>		

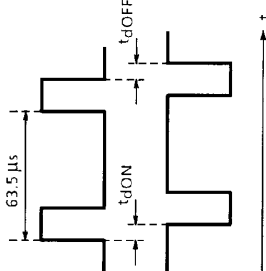
NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, T _a = 25 ± 3°C)											
		SUBADDRESS					SWITCHING MODE						
		07	10	17	18	SW5	SW6	SW13	SW15	TEST CONDITIONS			
	Chroma Block												Chroma block common test conditions SW13 : B, SW15 : C, SW18 : ON, SW20 : ON, SW23 : ON, SW24 : ON, SW25 : ON, SW33 : A, SW34 : A, SW35 : A, SW37 : A, SW38 : A, SW39 : A, SW46 : ON
C1	ACC Characteristics	80	00	00	00	OPEN	OPEN	B	A				<ol style="list-style-type: none"> Input 3.58-NTSC rainbow signal (C-4 signal) burst/chroma signals with the same burst/chroma amplitude to the chroma input pin (TP13). Measure the output amplitudes F10, F30, F300, and F600 of the UQ output pin 5 when the chroma input amplitude levels are set to 10, 30, 300, and 600 mV_{p-p}. Calculate A = F30/F300.
C2	APC Frequency Control Sensitivity	↑	↑	↑	↑	↑	↑	A	↑				<ol style="list-style-type: none"> Connect SW13 to A. Switch the color system mode (10) to 3.58 NTSC (00), 4.43 PAL (60), and M-PAL (80) and measure the following for each of those cases. Connect external voltage source (V11) to APC filter pin 11. Vary the voltage of the external voltage source (V11) and observe the fsc output pin 1 using a frequency counter. Measure the free-run sensitivity β for the V11 + ΔV11 (100 mV) near the f_c (3.5 NTSC = β₃, 4.3 ; PAL = β₄ ; M-PAL = β_M)
C3	APC Pull-in and Hold Range	↑	↑	↑	↑	↑	↑	↑	↑				<ol style="list-style-type: none"> Input 3.579545 MHz, 4.433619 MHz, and 3.575611 MHz continuous waves (200 mV_{p-p} to the chroma input pin (TP13). Switch the color system mode (10) to 3.58 NTSC (00), 4.43 PAL (60), and M-PAL (80), and measure the following for each of those cases. Vary the input signal frequency in 10 Hz-steps within a range of ±3 kHz. Clamp B/W → color mode (f*p*). While holding color → B/W mode (f*H*), measure the ± deviations from the frequency at each continuous wave input.

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, Ta = 25 ± 3°C)									
		SUBADDRESS			SWITCHING MODE						
		07	10	17	18	SW5	SW6	SW13	SW15	TEST CONDITIONS	
C4	SECAM Output DC Level Change	80	C0	00 or 30 or 60	00	OPEN	OPEN	A	A	① Connect SW13 to A. ② Measure the output DC level of the SECAM control pin 3 when the color system mode (10) is switched to 3.58 NTSC (00), 4.43 PAL (30), and SECAM (60). (3.58 NTSC mode: SEN) (4.43 PAL mode : SEP) (SECAM mode : SES)	
C5	NTSC Ident Sensitivity	↑	C0 or D0	00	↑	↑	↑	B	↑	① Input a 3.58-NTSC rainbow (C-4 signal) burst/chroma signal with the same burst/chroma amplitudes to the chroma input pin (TP13). ② Observe the BUS READ mode (5th and 6th bits of the 1st byte). ③ Switch the indent sensitivity (set the subaddress (10) data low (C0) and high (D0)) and perform the following measurements. ④ Increase the input signal amplitude from 0 and measure the input signal amplitude at the switch to 3.58 NTSC mode. (LOW (C0) : v _{NCL} , High (D0) : v _{NCH}) ⑤ Lower the input signal amplitude from 100 mV _{p-p} and measure the input signal amplitude at the deviation from 3.58 NTSC mode. (LOW (C0) : v _{NBL} , High (D0) : v _{NBH})	

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5 V, VCC2/VCC3/DEF VCC = 9 V, Ta = 25 ± 3°C)							
		SUBADDRESS		SWITCHING MODE					
		07	10	17	18	SW5	SW6	SW13	SW15
									TEST CONDITIONS
									(1) Input a 4.43-PAL rainbow (C-4 signal) burst/chroma signal with the same burst/chroma amplitude to the chroma input pin (TP13). (2) Observe the BUS READ mode (5 th and 6 th bits of the 1st byte). (3) Switch the indent sensitivity (set the subaddress (10) data low (C0) and high (D0)) and perform the following measurements. (4) Increase the input signal amplitude from 0 and measure the input signal amplitude at the switch to 4.43 PAL mode. (LOW (C0) : vPCL, High (D0) : vPCH) (5) Lower the input signal amplitude from 100 mV _{p-p} and measure the input signal amplitude at the deviation from 4.43 PAL mode. (LOW (C0) : vPBL, High (D0) : vPBH)
C6	PAL Ident Sensitivity	80		00	00	OPEN	OPEN	B	A
C7	TOF Characteristics	↑		↑	38	↑	↑	↑	↑
									(1) Input the signal C-1 to the chroma input pin. (Signal amplitude = 50 mV _{p-p}). (2) When the subaddress (10) data are f ₀ = 3.58 MHz (00) and f ₀ = 4.43 MHz (60), and subaddress (18) data are (38), connect 1.5 kΩ between the V _I output pin 6 and the 5 V-VCC and observe the V _I output pin 6. (3) Measure the output amplitude when f ₀ = 3.58 MHz and calculate the gain in decibels from the input (GFC3). (4) Measure the output amplitude when f ₀ = 3.58 MHz ± 500 kHz and calculate the gain in decibels from the input (+500 kHz : GFH3, -500 kHz : GFL3). (5) Measure the output amplitude when f ₀ = 4.43 MHz and calculate the gain in decibels from the input (GFC4). (6) Measure the output amplitude when f ₀ = 4.43 MHz ± 500 kHz and calculate the gain in decibels from the input (+500 kHz : GFH4, -500 kHz : GFL4).

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V$, $V_{CC2} / V_{CC3} / DEF V_{CC} = 9V$, $T_a = 25 \pm 3^\circ C$)												
		SUBADDRESS					SWITCHING MODE							
		07	10	17	18	19	SW5	SW6	SW13	SW15	TEST CONDITIONS			
C8	TINT Characteristic	80	20	00	00					00 or FE				<ol style="list-style-type: none"> ① Input a 3.58 NTSC rainbow (C-1 signal) to the chroma input pin (TP13). (burst : chroma = 300 mV_{p-p}) ② Set the color system mode (subaddress (10H)) data (20). (3.58 NTSC UV demodulation) ③ Set the TINT (subaddress (03H)) data of Max (FE), and measure the QTBM_{MAX} and QTR_{MAX} of UQ output pin (#5) and VI output pin (#6). Calculate the following formulas. $\Delta TB_{MAX} = \theta_{BN} - \theta_{TB_{MAX}}$ $\Delta TR_{MAX} = \theta_{RN} - \theta_{TR_{MAX}}$ ④ Set the TINT (subaddress (03H)) data of Min (00), and measure the QTBM_{MIN} and QTR_{MIN} of UQ output pin (#5) and VI output pin (#6). Calculate the following formulas. $\Delta TB_{MIN} = \theta_{BN} - \theta_{TB_{MIN}}$ $\Delta TR_{MIN} = \theta_{RN} - \theta_{TR_{MIN}}$

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
	Text Block										Text block common test conditions SW13 : A, SW15 : C, SW18 : ON, SW20 : ON, SW23 : ON, SW24 : ON, SW25 : ON
T1	AC Gain	A	A	A	A	A	A	B	B	A	① Input signal 1 (f ₀ = 100 kHz, picture period amplitude = 0.2 V _{p-p}) to pin 53. ② Measure the picture period amplitude of pins 41, 42, 43 (V41, V42, and V43). ③ GR = V43 / 0.2 GG = V42 / 0.2 GB = V41 / 0.2
T2	Unicolor Adjustment Characteristics	↑	↑	↑	↑	↑	↑	↑	↑	↑	① Input signal 1 (f ₀ = 100 kHz, picture period amplitude = 0.2 V _{p-p}) to pin 53. ② Set the unicolor data to maximum (7F), center (40), and minimum (00) and measure the pin 43 picture period amplitudes for each case. (V _U MAX, v _U CNT, v _U MIN) ③ Calculate the unicolor maximum and minimum amplitude ratios using digital conversion. (av _U)
T3	Brightness Adjustment Characteristics	↑	↑	↑	↑	↑	↑	↑	↑	↑	① Input signal 2 to pin 53 and adjust the picture period amplitude output of pin 43 to 1 V _{p-p} . ② Measure the voltage of pin 43 when the brightness is changed to maximum (FF), center (80), and minimum (00). (VbrMAX, VbrCNT, VbrMIN)
T4	Brightness Sensitivity	↑	↑	↑	↑	↑	↑	↑	↑	↑	① Using the results obtained from T3, calculate the brightness sensitivity from the following formula. ② Gbr = (VbrMAX - VbrMIN) / 256
T5	White Peak Slice Level	↑	↑	↑	↑	↑	↑	↑	↑	↑	① Change the bus data and set the sub-contrast to maximum. ② Connect an external power supply to pin 53 and increase the voltage gradually from 5.8 V. ③ Measure the picture period amplitude voltage of pin 43 when pin 43's picture period is clipped (Vwps1). ④ Change the subaddress (05) data to (81) and repeat steps ① to ③ above. (Vwps2)

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5V, VCC2 / VCC3 / DEF VCC = 9V, Ta = 25 ± 3°C)										
		SWITCHING MODE										
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS	
T6	Black Peak Slice Level	A	A	A	A	A	A	A	B	B	C	① Repeat step ① of T5. ② Connect an external power supply to pin 53 and decrease the voltage gradually from 5.8V. ③ Measure the voltages of pins 41, 42, and 43 when their picture periods are clipped.
T7	Half Tone Characteristics	↑	↑	↑	↑	↑	↑	↑	↑	↑	A	① Input signal 1 (f0 = 100 kHz, picture period amplitude = 0.2 Vp-p) to pin 53. ② Measure the picture period amplitude of pin 41 (V41A). ③ Apply 1.5V from an external power supply to pin 47. ④ Measure the picture period amplitude of pin 41 (V41B). ⑤ GHT1 = V41B / V41A ⑥ Halt the voltage applied to pin 47, set the subaddress (03) data to (81), and measure the picture period amplitude of pin 41 (V41C). ⑦ GHT2 = V41C / V41A
T8	BLK Pulse Delay Time	↑	↑	↑	↑	↑	↑	↑	↑	↑	C	① Calculate t _{dON} , t _{dOFF} from the signal applied to pin 25 (H:BLK input) (A below) and the output signals from pins 41, 42, and 43 (B below). (A) Signal applied to pin 25  (B) Output signals from pins 41, 42, 43
T9	RGB Output Voltage	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	① Measure the picture period voltages for pins 41, 42, and 43.

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V$, $V_{CC2}/V_{CC3}/DEF V_{CC} = 9V$, $T_a = 25 \pm 3^\circ C$)										TEST CONDITIONS
		SWITCHING MODE										
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53		
T10	Cutoff Voltage Variable Range	A	A	A	A	A	A	B	B	C		① Set the subaddress (17) data to (07). ② Measure the picture period voltage of pin 43 when the cutoff (subaddress 0C) data are changed to maximum (FF), center (80), and minimum (00), and calculate the amount of change of maximum and minimum from the center. (CUT+, CUT-). ③ In steps ① and ② above, make the following changes and remeasure : Change the subaddress (0D) data and measure pin 42. Change the subaddress (0E) data and measure pin 41.
T11	Drive Adjustment Variable Range	↑	↑	↑	↑	↑	↑	↑	↑	A		① Input signal 1 ($f_0 = 100$ kHz, picture period amplitude = $0.2 V_{p-p}$) to pin 53. ② Measure the picture period amplitude of pin 42 when the drive (subaddress-09) data are changed to maximum (FE), center (80), and minimum (00). ③ Calculate the maximum and minimum amplitude ratios for the drive center using decibel conversion. (DRG+, DRG-) ④ In steps ① to ③ above, change the subaddress (0A) data, measure pin 41, and repeat the calculations. (DRB+, DRB-) ⑤ In steps ① to ③ above, set data of the LSB of subaddress (09) to 1, measure pin 43, and repeat the calculations. (DRR+, DRR-)
T12	Output Voltage During Muting	↑	↑	↑	↑	↑	↑	↑	↑	C		① Set the subaddress (00) data to (FF). ② Measure the picture period voltages of pins 43, 42, and 41. (MURD, MUGD, MUBD)
T13	Output Voltage at Blue Back	↑	↑	↑	↑	↑	↑	↑	↑	↑		① Set the subaddress (10) data to (08). ② Measure the picture period voltages of pins 43 and 42 and the picture period amplitude of pin 41. (BBR, BBG, BBG)

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5 V, VCC2 / VCC3 / DEF VCC = 9 V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
T14	ACL Characteristics	A	A	A	A	A	A	B	B	A	① Input signal 1 (f0 = 100 kHz, picture period amplitude = 0.2 Vpp) to pin 53. ② Measure the picture period amplitude of pin 43 (VACL1). ③ Measure the picture period amplitude of pin 43 when -0.5 V DC is applied to pin 45 from an external power supply. (VACL2) ④ Measure the picture period amplitude of pin 43 when -1 V DC is applied to pin 45 from an external power supply. (VACL3) ⑤ ACL1 = -20 × f0g (VACL2 / VACL1) ACL2 = -20 × f0g (VACL3 / VACL1)
T15	ABL Point	↑	↑	↑	↑	↑	↑	↑	↑	↑	① Measure the DC voltage of pin 45. (VABL1) ② Set the subaddress (16) data to (1C). ③ Applying external voltage to pin 45, lower the pin voltage from 6.5 V. Measure the voltage of pin 45 when the voltage of pin 43 starts to change. (VABL2) ④ Change the data of subaddress (16) to (3C), (5C), (7C), (9C), (BC), (DC), and (FC), and repeat step ③ for each of these data. (VABL3, VABL4, VABL5, VABL6, VABL7, VABL8, VABL9) ⑤ ABLP1 = VABL2 - VABL1, ABLP5 = VABL6 - VABL1 ABLP2 = VABL3 - VABL1, ABLP6 = VABL7 - VABL1 ABLP3 = VABL4 - VABL1, ABLP7 = VABL8 - VABL1 ABLP4 = VABL5 - VABL1, ABLP8 = VABL9 - VABL1

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
T16	ABL Gain	A	A	A	A	A	A	B	B	C	<ol style="list-style-type: none"> ① Apply 6.5 V from an external power supply to pin 45. ② Set the subaddress (16) data to (00). Set the brightness to the maximum. ③ Measure the voltage of pin 43. (VABL10) ④ Apply 4.5 V from an external power supply to pin 45. ⑤ Change the data of subaddress (16) to (00), (04), (08), (0C), (10), (14), (18), and (1C), and repeat step ③ for each of these data. (VABL11, VABL12, VABL13, VABL14, VABL15, VABL16, VABL17, VABL18) ⑥ ABLG1 = VABL11 – VABL10, ABLG5 = VABL15 – VABL10 ABLG2 = VABL12 – VABL10, ABLG6 = VABL16 – VABL10 ABLG3 = VABL13 – VABL10, ABLG7 = VABL17 – VABL10 ABLG4 = VABL14 – VABL10, ABLG8 = VABL18 – VABL10
T17	RGB Output Mode	↑	↑	↑	↑	↑	↑	↑	↑	↑	<ol style="list-style-type: none"> ① Adjust the brightness so that the picture period voltage of pin 43 is set to 2.5 V. ② Set the subaddress (16) data to (01). ③ Measure the picture period voltages of pins 43, 42, and 41. (V43R, V42R, V41R) ④ Change the subaddress (16) data to (02) and repeat step ③. ⑤ Change the subaddress (16) data to (03) and repeat step ③. (V43B, V42B, V41B)

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5 V, VCC2/VCC3/DEF VCC = 9 V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
T18	ACB Insertion Pulse Phase and Amplitude	A	A	A	A	A	A	B	B	A or C	

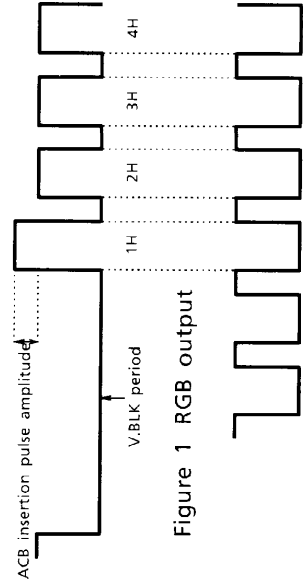
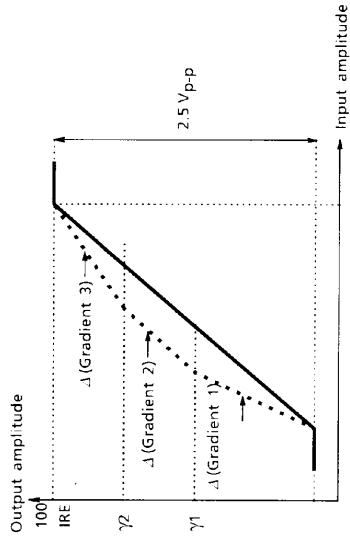


Figure 2 FBP input (No.25)

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V$, $V_{CC2}/V_{CC3}/DEF V_{CC} = 9V$, $T_a = 25 \pm 3^\circ C$)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	
T19	RGB γ Characteristics	A	A	A	A	A	A	A	B	B	A
		<p>① Input a ramp waveform to pin 53 and adjust the input amplitude so that the picture period amplitude of pin 43 is $2.3 V_{p-p}$.</p> <p>② Adjust the drive adjustment data so that the picture period amplitudes of pins 41 and 42 are equal to that of pin 43.</p> <p>③ Set the subaddress (14) data to (10).</p> <p>④ From pins 43, 42, and 41, calculate the RGB γ start point and its gradient (decibel conversion) in relation to the off point in accordance with Fig.1.</p>									



NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5 V, VCC2 / VCC3 / DEF VCC = 9 V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
T20	Analog RGB Gain	A or B	A or B	A or B	A	A	A	B	B	A	① Input signal 1 (f ₀ = 100 kHz, picture period amplitude = 0.2 V _{p-p}) to pin 53 and adjust the drive adjustment data so that the picture period amplitudes of pins 41 and 42 are equal to that of pin 43. ② Apply 5 V from an external power supply to pin 32. ③ Input signal 1 (f ₀ = 100 kHz, picture period amplitude = 0.2 V _{p-p}) to pin 35. ④ Measure the picture period amplitude of pin 43. (V43R) ⑤ As in steps ② and ③ above, input to pin 34 and measure pin 42, then input to pin 33 and measure pin 41. (V42G, V41B) ⑥ GTXR = V43R / 0.2 GTXG = V42G / 0.2 GTXB = V41B / 0.2
T21	Analog RGB White Peak Slice Level	A	A	A	↑	↑	↑	↑	↑	↑	① Repeat step ① of T20. ② Apply 5 V from an external power supply to pin 32. ③ Set the RGB contrast data to the maximum (7 F). ④ Connect an external power supply to pin 35, increase the voltage gradually from 3.0 V, and measure the picture period amplitude voltage when pin 43 is clipped. ⑤ As in steps ③ and ④ above, input to pin 34 and measure pin 42, then input to pin 33 and measure pin 41.
T22	Analog RGB Black Peak Limiter Level	↑	↑	↑	↑	↑	↑	↑	↑	↑	① Repeat step ① of T20. ② Apply 5 V from an external power supply to pin 32. ③ Set the RGB contrast data to the maximum (7 F). ④ Connect an external power supply to pin 35, decrease the voltage gradually from 4.5 V, and measure the voltage when pin 43 is clipped. ⑤ As in steps ③ and ④ above, input to pin 34 and measure pin 42, then input to pin 33 and measure pin 41.

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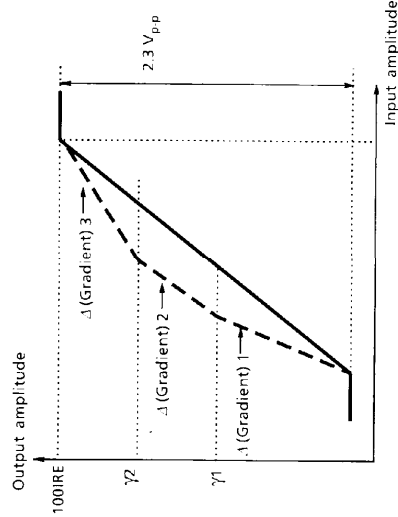
NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5 V, VCC2 / VCC3 / DEF VCC = 9 V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
T23	RGB Contrast Adjustment Characteristics	A or B	A or B	A or B	A	A	A	B	B	A	① Repeat step ① of T20. ② Apply 5V from an external power supply to pin 32. ③ Input signal 1 (f ₀ = 100 kHz, picture period amplitude = 0.2 V _{p-p}) to pin 35. ④ Measure the picture period amplitude of pin 43 when the RGB contrast data change to the maximum (7 F), the center (40), and the minimum (00). (vuTXRMAX, vuTXRCNT, vuTXRMIN) ⑤ Calculate the maximum and minimum amplitude ratios using decibel conversion. (DRG+, DRG-) ⑥ As in steps ③, ④ and ⑤ above, input to pin 34 and measure pin 42, then input to pin 33 and measure pin 41.
T24	Analog RGB Brightness Adjustment Characteristics	A or B	A or B	A or B	↑	↑	↑	↑	↑	↑	① Repeat step ① of T20. ② Input signal 2 to pins 33, 34, and 35. ③ Apply 5V from an external power supply to pin 32. ④ Adjust the signal 2 amplitude A so that the picture period amplitude of pin 43 is 0.5 V _{p-p} . ⑤ Measure the picture period voltage of pins 43, 42, and 41 when the RGB brightness change to the maximum (7 F), the center (40), and the minimum (00). (VbrTXMAX, VbrTXCNT, VbrTXMIN)
T25	Analog RGB Brightness Sensitivity	↑	↑	↑	↑	↑	↑	↑	↑	↑	① Using the results obtained from T24, calculate the RGB brightness sensitivity for pins 43, 42, and 41. ② GbrTX = (VbrTXMAX - VbrTXMIN) / 128

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, T _a = 25 ± 3°C)									
		SWITCHING MODE					TEST CONDITIONS				
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	
T26	Text ACL Characteristics	A	A	B	A	A	A	B	B	A	<ol style="list-style-type: none"> ① Repeat step ① of T20. ② Apply 5 V from an external power supply to pin 32. ③ Input signal 1 (f₀ = 100 kHz, picture period amplitude = 0.2 V_{p-p}) to pin 35. ④ Measure the picture period amplitude of pin 43. (VTXACL1) ⑤ Measure the picture period amplitude of pin 43 when -0.5 V DC is applied to pin 45 from an external source. (VTXACL2) ⑥ Measure the picture period amplitude of pin 43 when -1V DC is applied to pin 45 from an external source. (VTXACL3) ⑦ TXACL1 = -20 × log (VTXACL2 / VTXACL1) TXACL2 = -20 × log (VTXACL3 / VTXACL1) ⑧ Set the subaddress (10) data to (01) and repeat the calculations in steps ⑤ and ⑥. (TXACL3, TXACL4)
T27	Analog OSD Gain	↑	↑	A	A or B	A or B	A or B	↑	↑	↑	<ol style="list-style-type: none"> ① Input signal 1 (f₀ = 100 kHz, picture period amplitude = 0.2 V_{p-p}) to pin 53 and adjust the drive adjustment data so that the picture period amplitudes of pins 41 and 42 are equal to that of pin 43. ② Apply 5 V from an external power supply to pin 36. ③ Input signal 1 (f₀ = 100 kHz, picture period amplitude = 0.2 V_{p-p}) to pin 39. ④ Measure the picture period amplitude of pin 43. (V43R) ⑤ As in steps ③ and ④ above, input to pin 38 and measure pin 42, then input to pin 37 and measure pin 41. (V42G, V41B) ⑥ GOSDR = V43R / 0.2 GOSDG = V42G / 0.2 GOSDB = V41B / 0.2

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
T28	Analog OSD White Peak Slice Level	A	A	A	A	A	A	B	B	A	<ol style="list-style-type: none"> ① Repeat step ① of T27. ② Apply 5V from an external power supply to pin 36. ③ Apply external voltage to pin 39, increase the voltage gradually from 0.0V, and measure the picture period amplitude voltage when pin 43 is clipped. (VOSD1R) ④ As in step ③ above, input to pin 38 and measure pin 42. Input to pin 37 and measure pin 41. ⑤ Set the subaddress (10) data to (04) and repeat the measurements in steps ③ and ④. (VOSD2R, VOSD2G, VOSD2B)
T29	Analog OSD Black Peak limiter Level	↑	↑	↑	↑	↑	↑	↑	↑	↑	<ol style="list-style-type: none"> ① Repeat step ① of T27. ② Apply 5V from an external power supply to pin 36. ③ Apply external voltage to pin 39, decrease the voltage gradually from 4.5V, and measure the voltage when pin 43 is clipped. ④ As in step ③ above, input to pin 38 and measure pin 42. Input to pin 37 and measure pin 41.
T30	Analog OSD Output DC Voltage	↑	↑	↑	↑	↑	↑	↑	↑	↑	<ol style="list-style-type: none"> ① Repeat step ① of T27. ② Apply 5V from an external power supply to pin 36. ③ Measure the picture period voltages of pins 43, 42, and 41. (VOSDDCR, VOSDDCG, VOSDDCB)

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
T31	OSD ACL Characteristics	A	A	A	A	A	B	B	B	A	<ol style="list-style-type: none"> ① Repeat step ① of T27. Set the subaddress (10) data to (02). ② Apply 5 V from an external power supply to pin 36. ③ Input signal 1 (f₀ = 100 kHz, picture period amplitude = 0.2 V_{p-p}) to pin 39. ④ Measure the picture period amplitude of pin 43. (VOSDACL1) ⑤ Measure the picture period amplitude of pin 43 when -0.5 V DC is applied to pin 45 from an external source. (VOSDACL2) ⑥ Measure the picture period amplitude of pin 43 when -1 V DC is applied to pin 45 from an external source. (VOSDACL3) ⑦ OSDACL1 = -20 × log (VOSDACL2 / VOSDACL1) OSDACL2 = -20 × log (VOSDACL3 / VOSDACL1) ⑧ Change the subaddress (10) data to (00) and repeat the measurements in steps ① to ⑦. (OSDACL3, OSDACL4)

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V$, $V_{CC2}/V_{CC3}/DEF V_{CC} = 9V$, $T_a = 25 \pm 3^\circ C$)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	
T32	Y-OUTy	A	A	A	A	A	A	B	B	A	<p>① Input a ramp waveform to pin 53 and adjust the input amplitude so that the picture period amplitude of pin 43 is 2.3 V_{p-p}.</p> <p>② Set the subaddress (OA) data to (11).</p> <p>③ From pin 43 calculate the Y-OUTy start pointed its gradient (decibel conversion) in relation to the off point in accordance with following figure.</p>



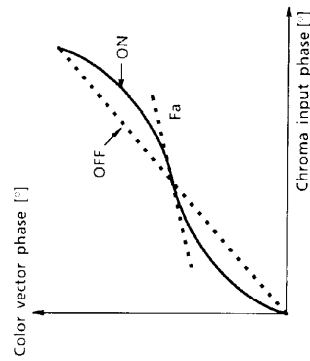
NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5V, VCC2/VCC3/DEF VCC = 9V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
	Color Difference Block										Color difference block common test conditions SW13 : A, SW15 : C, SW18 : ON, SW20 : ON, SW23 : ON, SW24 : ON, SW25 : ON
A1	Color Difference Contrast Adjustment Characteristics	A	A	A	A	A	A	A or B	A or B	C	<ol style="list-style-type: none"> ① Change the G and B drive data to the value resulting from the adjustment in step ① of T20. ② Set the brightness to maximum, set the subaddress (0F) data to (30), and set the subaddress (10) data to (20). ③ Input signal 3 (f0 = 100 kHz, picture period amplitude = 0.23 Vp-p) to pin 51. ④ Measure the picture period amplitude of pin 43 when the unicolor data change to the maximum (7F), the center (40), and the minimum (00). (vuCYMAX, vuCYCNT, vuCYMIN) ⑤ Calculate the unicolor maximum and minimum amplitude ratios using decibel conversion. (ΔvuCY) ⑥ Repeat steps ③, ④, and ⑤ above, inputting the picture period amplitude 0.2 Vp-p to pin 52 and measuring pin 41.
A2	Color Adjustment Characteristics	↑	↑	↑	↑	↑	↑	↑	↑	↑	<ol style="list-style-type: none"> ① Measure the voltage of pin 51. Set the brightness to maximum, set the subaddress (0F) data to (30), and set the subaddress (10) data to (20). ② Input signal 3 (f0 = 100 kHz, picture period amplitude = 0.115 Vp-p) to pin 51. ③ Measure the picture period amplitude of pin 43 when the color data are changed to the maximum (7F), the center (40), and the minimum (01). (vuCYMAX, vuCYCNT, vuCYMIN) ④ Calculate the color maximum and minimum amplitude ratios for the center using decibel conversion. (ΔvuCY + , ΔvuCY -) ⑤ Repeat steps ② to ④ above, inputting the picture period amplitude 0.1 Vp-p to pin 52 and measuring pin 41.

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NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, T _a = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
A3	Color Difference Half Tone Characteristics	A	A	A	A	A	A	A or B	A or B	C	<ol style="list-style-type: none"> ① Set the subaddress (10) data to (20). ② Input signal 3 (f₀ = 100 kHz, picture period amplitude = 0.2 V_{p-p}) to pin 51. ③ Measure the picture period amplitude of the waveform output from pin 43. (vHTARY) ④ Apply 1.5 V from an external power supply to pin 47. ⑤ Measure the picture period amplitude of the waveform output from pin 43. (vHTBRY) ⑥ GHTRY = vHTBRY/vHTARY ⑦ Repeat steps ① to ⑤ above with pin 42. GHTGY = vHTBGY/vHTAGY ⑧ Repeat steps ① to ⑤ above, inputting signal to pin 52 and measuring pin 41. GHTBY = vHTBgy/vHTAgy

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5 V, VCC2/VCC3/DEF VCC = 9 V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
A4	Color γ Characteristics	A	A	A	A	A	A	B	B	C	① Set the subaddress (10) data to (20). ② Input signal 2 to pin 51. ③ When the subaddress (07) data are: (80) — γ OFF (82) — γ 1ON (84) — γ 2ON (86) — γ 3ON measure the changes in the amplitude level of the pin 43 output signal at an increase the amplitude A of signal 2 and plot the characteristics. ④ Calculate the γ ON gradient Δ , using $V\gamma$, which represents the point at which the γ characteristics become effective, and the gradient of the linear section with γ OFF as (1).
A5	Color Limiter Characteristics	↑	↑	↑	↑	↑	↑	↑	↑	↑	① Measure the voltage of pin 51. ② Set the subaddress (10) data to (20). ③ Input signal 2 (picture period amplitude = 0.4 Vp-p) to pin 52. ④ Measure the picture period amplitude of the pin 43 output signal when the subaddress (07) data are (80) and (81). (CLT0, CLT1)

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, VCC1 = 5 V, VCC2/VCC3/DEF VCC = 9 V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
A6	High-Brightness Color Gain	A	A	A	A	A	A	B	A	C	<ol style="list-style-type: none"> ① Set subaddress (10) data to (20). ② Input signal 2 (picture period amplitude = 0.2 V_{p-p}) to pin 52. ③ Adjust the color control so that the picture period amplitude output from pin 41 is 1.2 V_{p-p}. ④ Measure the picture period amplitude of the pin 41 output signal when the subaddress (06) data are (FF). (V₄₁) ⑤ HBC1 = (1.2 - V₄₁) / 1.2
A7	Flesh Color Characteristics	↑	↑	↑	↑	↑	↑	A	↑	↑	<ol style="list-style-type: none"> ① Input IQ demodulated flesh-bar signals (15°-step rainbow signals in the range -30° to +240°) to pin 52 (Q signal) and pin 51 (I signal) as 0.2 V_{p-p}. Set the brightness to maximum. ② Set subaddress (10) data to (00). ③ Measure the signals output from pins 41 and 43 and switch to subaddress (10) data to (06). Measure the output signals and calculate the variation characteristics of the color vector phase. ④ Draw the vector variation characteristics curve showing the on state from the off state and calculate the gradient in the vicinity of the I axis as Fa33. Subaddress (08) Data (80) off Data (81) on



NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V$, $V_{CC2}/V_{CC3}/DEF V_{CC} = 9V$, $T_a = 25 \pm 3^\circ C$)									
		SWITCHING MODE									
		SW33	SW34	SW35	SW37	SW38	SW39	SW51	SW52	SW53	TEST CONDITIONS
A8	Color Detail Emphasis	A	A	A	A	A	A	A	A	A	<ol style="list-style-type: none"> ① Connect SG to Y-IN and input a 4 MHz frequency sine wave at 20 mV_{p-p}. ② Set the subaddress (02) data to (01). ③ Set the subaddress (10) data to (20). ④ Set the subaddress (11) data to (01). ⑤ Read the 4 MHz amplitude output to pin 43. (VCDE0) ⑥ Input signal 2 (picture period amplitude = 0.3 V_{p-p}) to pin 51. ⑦ Set the subaddress (02) data to (81). ⑧ Read the 4 MHz amplitude output to pin 43. (VCDE1) (mV_{p-p}) ⑨ Set the subaddress (0A) data to (81) and read the amplitude of frequency Fp output to pin 43. (VCDE2) (mV_{p-p}) ⑩ $GCD0 = 20 \times \log (VCDE1 - VCDE0 / 20)$ $GCD1 = 20 \times \log (VCDE2 - VCDE0 / 20)$

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, Ta = 25 ± 3°C)					
		SWITCHING MODE					
		SW16	SW17	SW18	SW20	SW23	SW25
	DEF Block						
D1	Horizontal Oscillation Control Sensitivity	D	B	ON	OFF	A	ON
D2	Horizontal Sync Phase	↑	C	↑	ON	↑	↑

TEST CONDITIONS

DEF Block common test conditions
 SW13 : A, SW33 : A, SW34 : A, SW35 : A, SW37 : A, SW38 : A,
 SW39 : A, SW48 : ON, SW49 : ON, SW51 : B, SW52 : B,
 SW56 : ON, BUS Data = power on reset

Calculate the pin 23 (H.out) frequency variation rate when the voltage on pin 20 is varied by ±0.05 V with a horizontal oscillation frequency of 15.734 kHz.

Measure the phase difference SPH1 of the pin 23 (H.out) waveform in relation to the pin 17 (HD.out) waveform when a 50 Hz composite video signal is applied to TP15. Measure the phase difference SPH2 of the pin 20 waveform in relation to the center of the input signal's horizontal sync signal. Also, apply a 60 Hz composite video signal to pin 15 and measure SPH3.

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V$, $V_{CC2}/V_{CC3}/DEF V_{CC} = 9V$, $T_a = 25 \pm 3^\circ C$)						
		SWITCHING MODE						
		SW16	SW17	SW18	SW20	SW23	SW25	
D3	Range of Curve Correction		D	C	ON	ON	A	ON
D4	Horizontal Screen Phase Adjustment Range							

TEST CONDITIONS

Vary the voltage by 1.5V to 3.5V, apply a 50 Hz composite video signal to pin TP15, and measure the phase variation of the pin 23 (H.out) waveform.

Under the same conditions as those for D3, measure phase variation of the pin 23 (H.out) waveform when subaddress (08) data D7 to D3 are varied by (00000) to (11111).

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5 V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9 V, Ta = 25 ± 3°C)									
		SWITCHING MODE									
		SW16	SW17	SW18	SW20	SW23	SW25	SW35			
D5	Clamp Pulse Start Phase										
	Pulse Width of Clamp Pulse	D	C	ON	ON	A	ON	OPEN			
D6	Gate Pulse Start Phase										
	Pulse Width of Gate Pulse										

TEST CONDITIONS	
<p>Apply a 50 Hz composite video signal to TP15, then measure the phase difference CP_S and the pulse width CP_W of the pin 35 (R in) waveform in relation to the pin 17 (HD.out) waveform.</p>	<p>Apply a 50 Hz composite video signal to TP15, then measure the phase difference CP_S and the pulse width CP_W of the pin 2 (SCP) waveform in relation to the pin 17 (HD.out) waveform.</p>

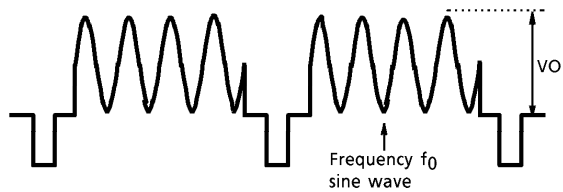
NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V$, $V_{CC2}/V_{CC3}/DEF V_{CC} = 9V$, $T_a = 25 \pm 3^\circ C$)					
		SWITCHING MODE					
		SW16	SW17	SW18	SW20	SW23	SW25
D7	Horizontal Blanking Pulse Start Phase Pulse Width of Horizontal Blanking Pulse	D	C	ON	ON	A	ON
		<p>Under the same conditions as those for D6, measure the phase difference HP_S and HP_W of the horizontal blanking pulse. Also measure HP_W at 60 Hz.</p>					
D8	HD Output Start Phase HD Output Pulse Width HD Output Amplitude						
		<p>Apply a 50 Hz composite video signal to TP15, then measure the phase difference HP_S and the pulse width HP_W/V_{HD} of the pin 17 (HD out) waveform in relation to the pin 20 (AFC1 filter) waveform.</p>					

NOTE	PARAMETER	TEST CONDITIONS (UNLESS OTHERWISE STATED, V _{CC1} = 5V, V _{CC2} /V _{CC3} /DEF V _{CC} = 9V, Ta = 25 ± 3°C)					TEST CONDITIONS	
		SWITCHING MODE						
		SW16	SW17	SW18	SW20	SW23	SW25	
D ₉	Vertical Blanking Pulse Start Phase (1)						<p>Apply a 50 Hz composite video signal to TP15, then measure the phase difference VP_{50S1} and the pulse width VP_{50S2} of the pin 2 (SCP) waveform in relation to the pin 17 (sync input) waveform.</p>	
	Vertical Blanking Pulse End Phase (1)	D	C	ON	ON	A		ON
D ₁₀	Vertical Blanking Pulse Start Phase (2)						<p>Apply the same conditions as those for D₉ except change the input signal to a 60 Hz composite video signal and measure the phase difference VP_{60S} and pulse width VP_{60W}.</p>	
	Vertical Blanking Pulse End Phase (2)	↑	↑	↑	↑	↑		↑
D ₁₁	Vertical Pull-in Range (1)						<p>Input a 50 Hz composite video signal to pin TP15, vary the vertical frequency of this signal in 0.5 H-steps, and measure the vertical pull-in range.</p> <p>Set D₅ to D₃ of subaddress (17) to (001), vary the vertical frequency of a 60 Hz composite video signal input to pin TP15 in 0.5 H-steps, and measure the vertical pull-in range.</p> <p>Input a 50 Hz composite video signal to pin TP15, vary the vertical frequency of this signal in 0.5 H-steps, and measure the number of Hs when D₂ of the 1st byte changes from 0 to 1 in bus read mode. Also check that D₁ of the 1st byte is 0 when 1V = 312.5 H, when D₁ is 1 in bus read mode, and 1V < 311.5 or 1V > 313.5 H.</p> <p>Input a 60 Hz composite video signal to pin TP15, vary the vertical frequency of this signal in 0.5 H-steps, and measure the number of Hs when D₂ of the 1st byte changes from 1 to 0 in bus read mode. Also check that D₁ of the 1st byte is 0 when 1V = 262.5 H, D₁ is 1 in bus read mode, and 1V < 261.5 or 1V > 263.5 H.</p>	
	Vertical Pull-in Range (2)							
	Vertical pull-in range (3)	↑	↑	↑	↑	↑		↑
	Vertical pull-in range (4)							

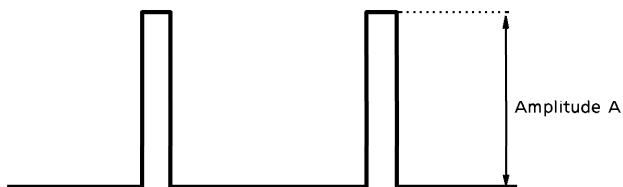
TEST CONDITIONS (UNLESS OTHERWISE STATED, $V_{CC1} = 5V$, $V_{CC2} / V_{CC3} / DEF V_{CC} = 9V$, $T_a = 25 \pm 3^\circ C$)		SWITCHING MODE							TEST CONDITIONS		
		SW16	SW17	SW18	SW20	SW23	SW25	SW33 SW34 SW35 SW37 SW38 SW39		#32 #36 #47	
D12	RGB Output Vertical Blanking Pulse Start Phase (1) RGB Output Vertical Blanking Pulse End Phase (1)		D	C	ON	A	ON	A	ON	Ground	<p>Apply a 50 Hz composite video signal to TP15, then measure the phase difference VR50S1 and the pulse width VR50S2 of the pin43 (R.out) waveform in relation to the pin 15 (sync input) waveform. Similarly, measure pins 42 and 41.</p>
D13	RGB Output Vertical Blanking Pulse Start Phase (2) RGB Output Vertical Blanking Pulse End Phase (2)										<p>Apply the same conditions as those for D12 except change the input signal to a 60 Hz composite video signal and measure the phase difference VP60S1 and pulse width VP60S2.</p>
D14	ACB Pulse Output Mode										<p>Apply a 50 Hz composite video signal to TP15, set the subaddress (17) data to (07), then measure the pulse width of the pin 17.</p>

CHROMA TEST SIGNALS

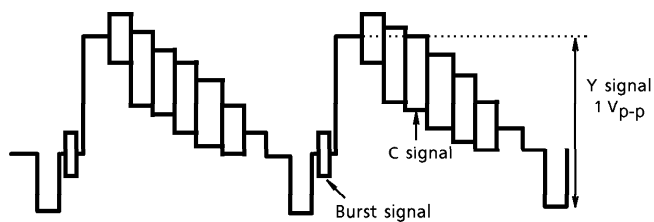
① Input signal C-1



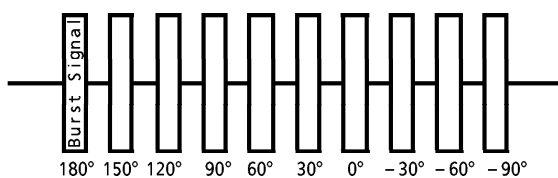
② Input signal C-2



③ Input signal C-3

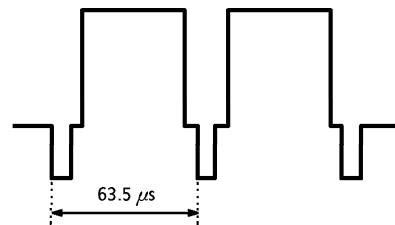


④ Input signal C-4

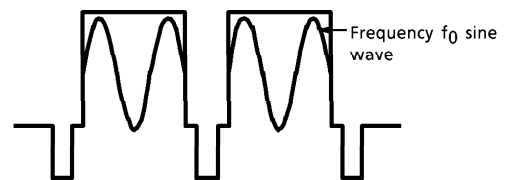


TEXT / COLOR DIFFERENCE TEST SIGNALS

① Video signal



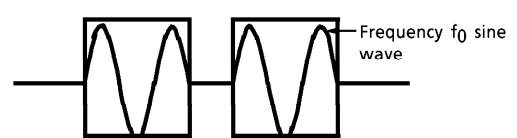
② Input signal 1



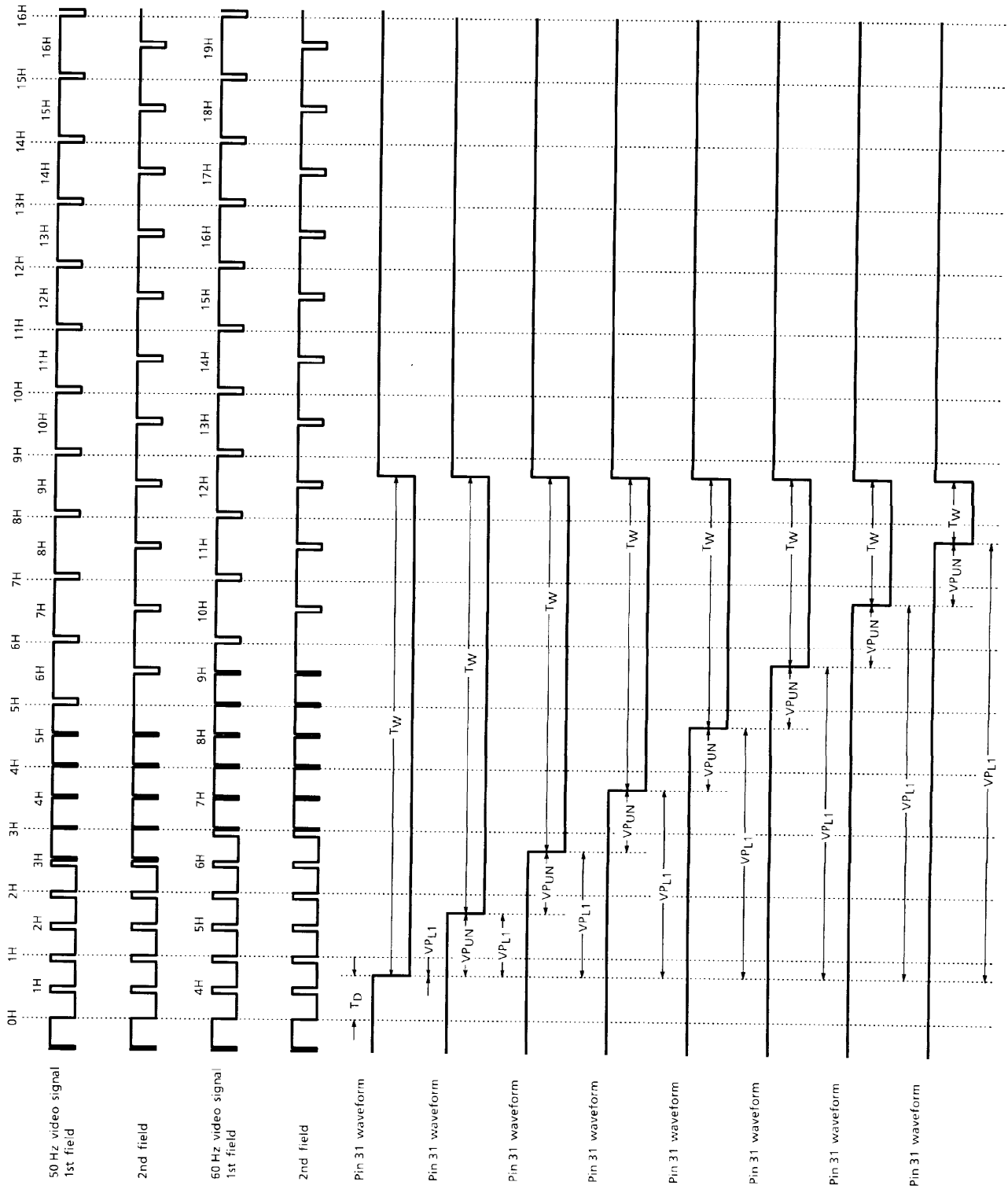
③ Input signal 2



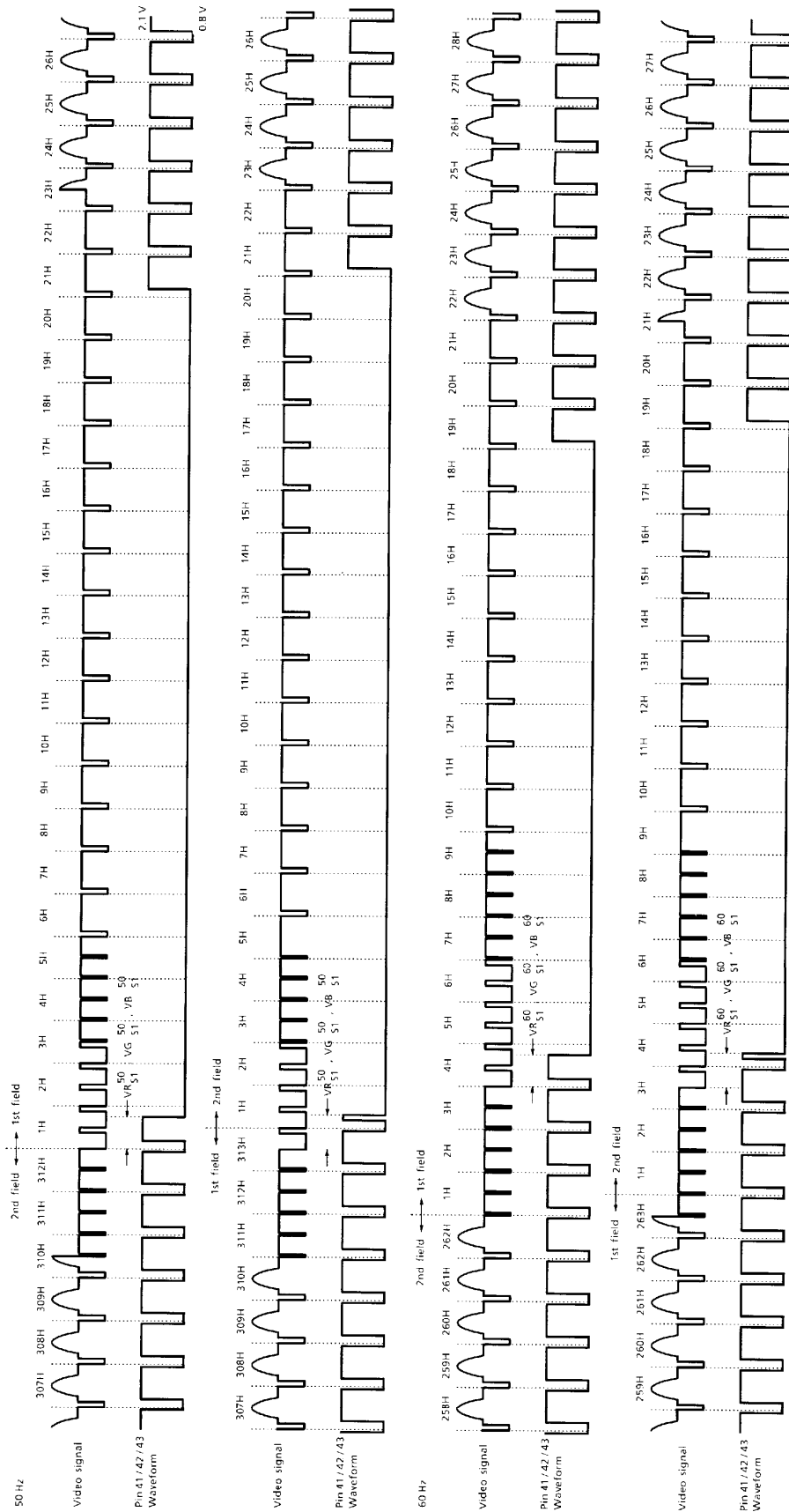
④ Input signal 3



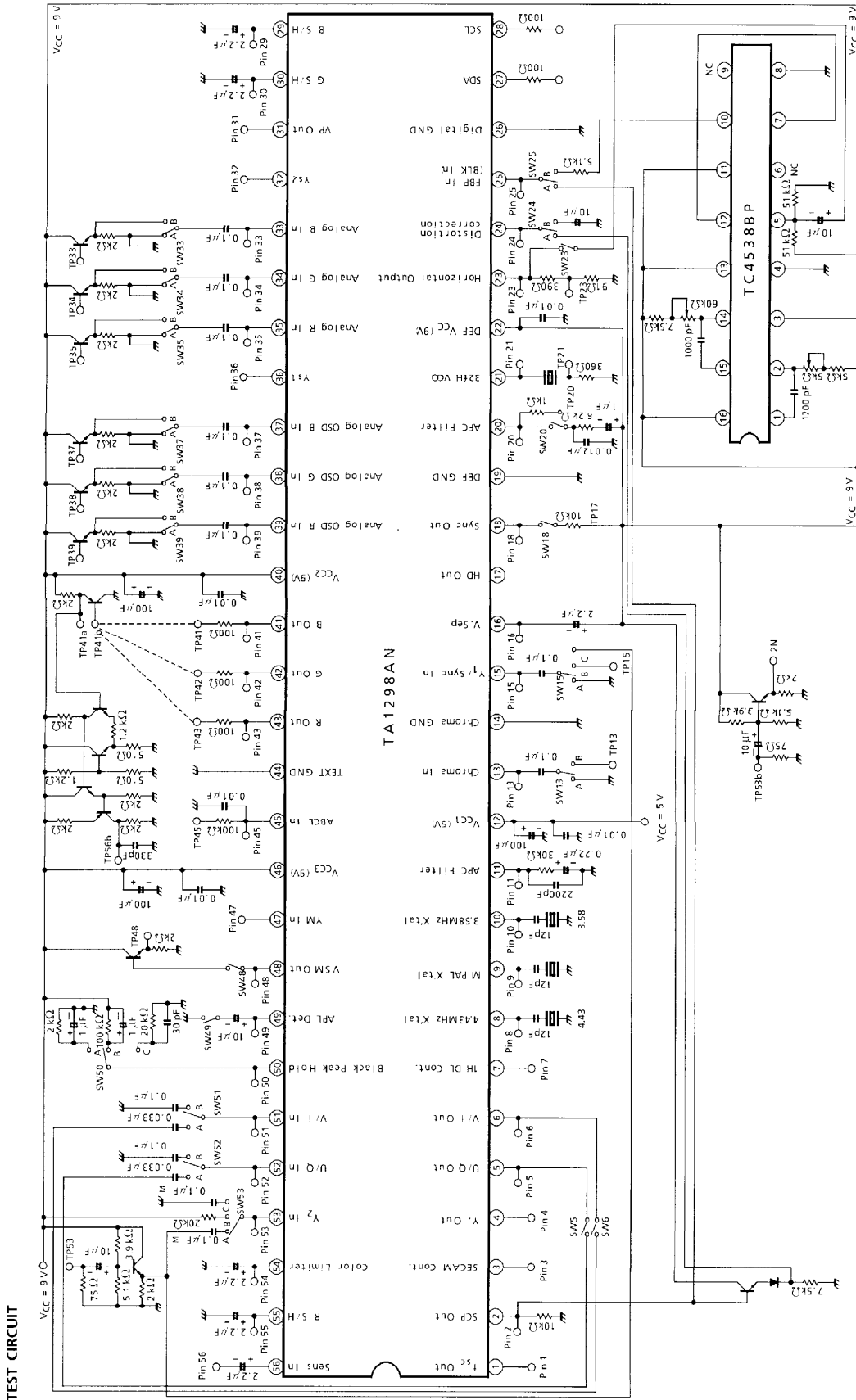
VERTICAL OUTPUT PULSE WIDTH / VERTICAL OUTPUT PULSE PHASE VARIATION / VERTICAL OUTPUT PULSE PHASE RANGE



RGB VERTICAL BLANKING PULSE START PHASE / END PHASE



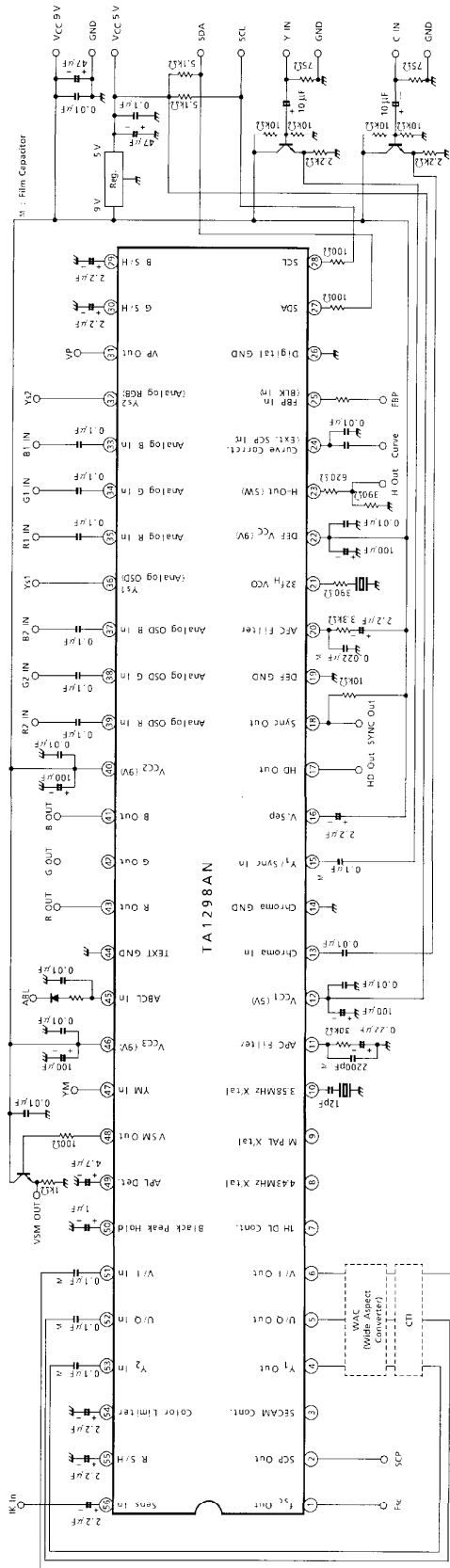
TA1298AN-80



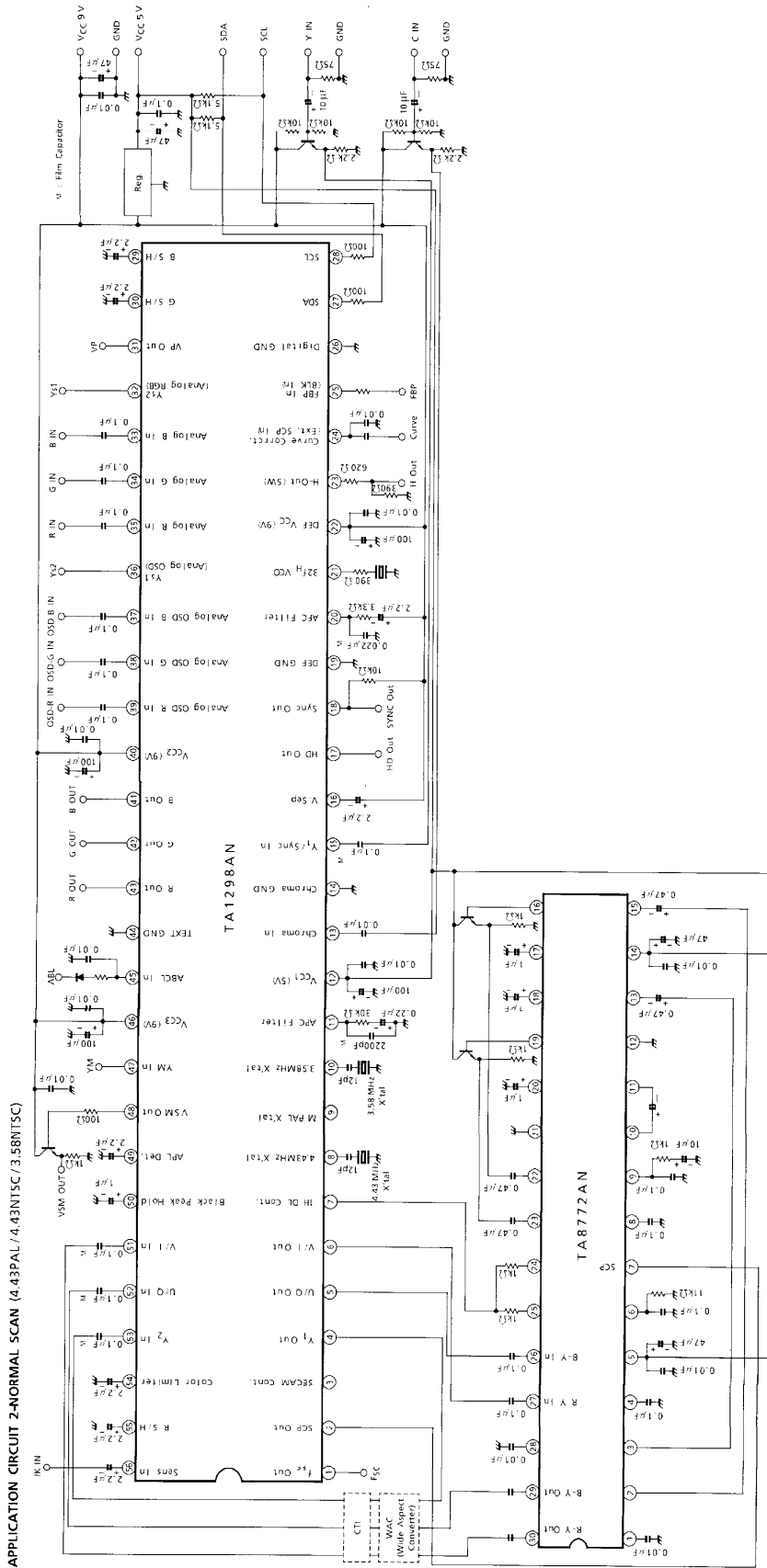
TEST CIRCUIT

TA1298AN-81

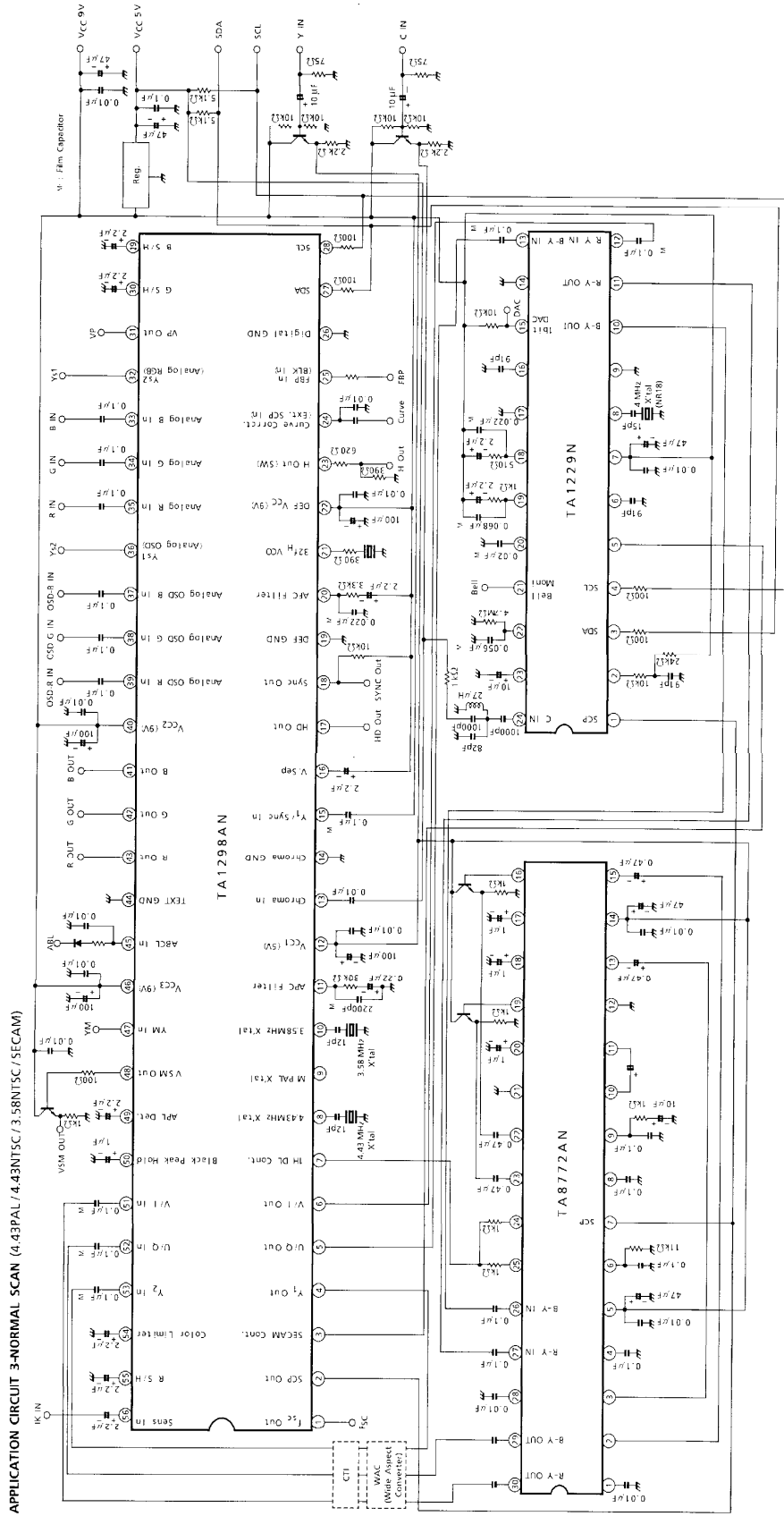
APPLICATION CIRCUIT 1-NORMAL SCAN (3.58NTSC)



TA1298AN-82



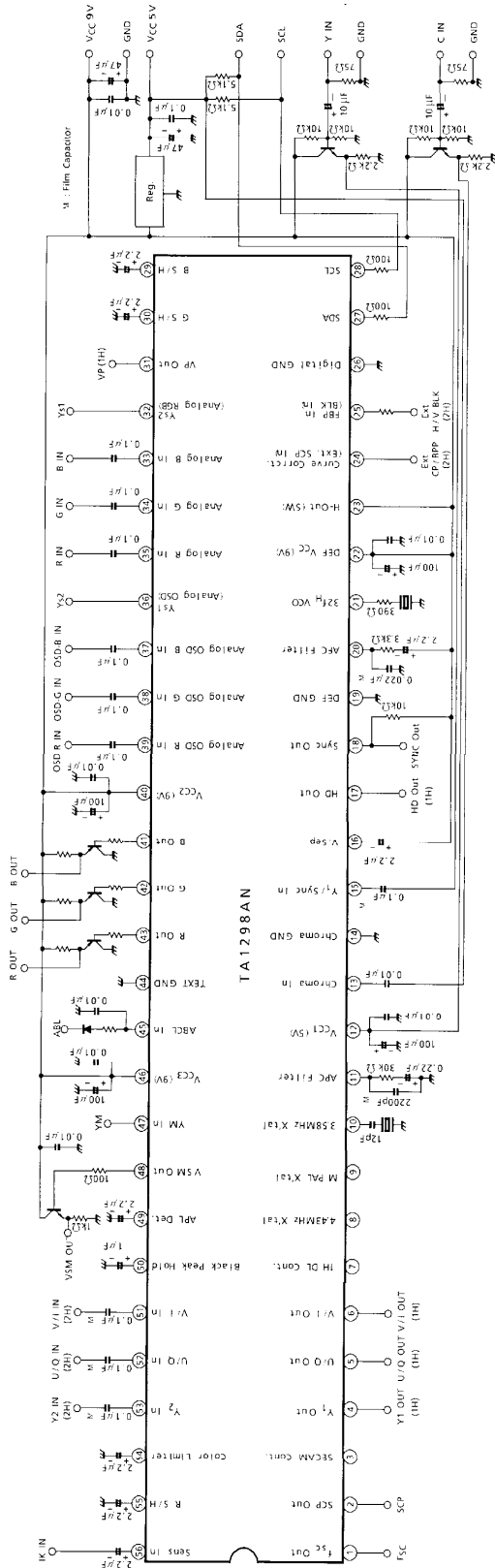
TA1298AN-83



APPLICATION CIRCUIT 3-NORMAL SCAN (4.43PAL/4.43NTSC/3.58NTSC/SECAM)

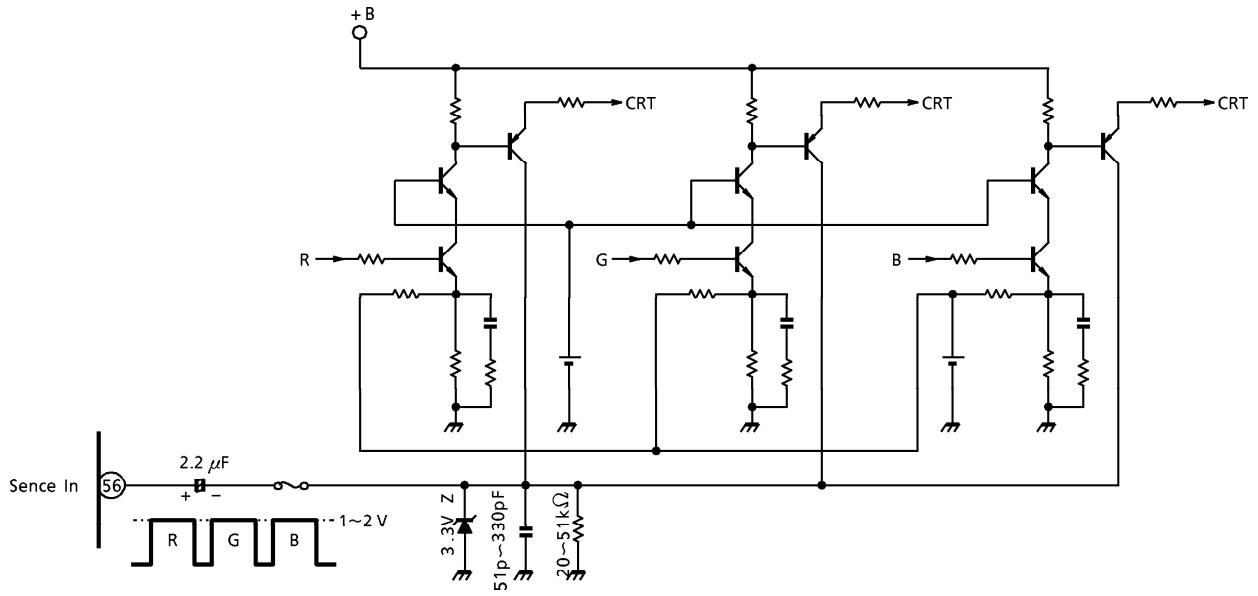
TA1298AN—84

APPLICATION CIRCUIT 5-DOUBLE SCAN (3.58NTSC)



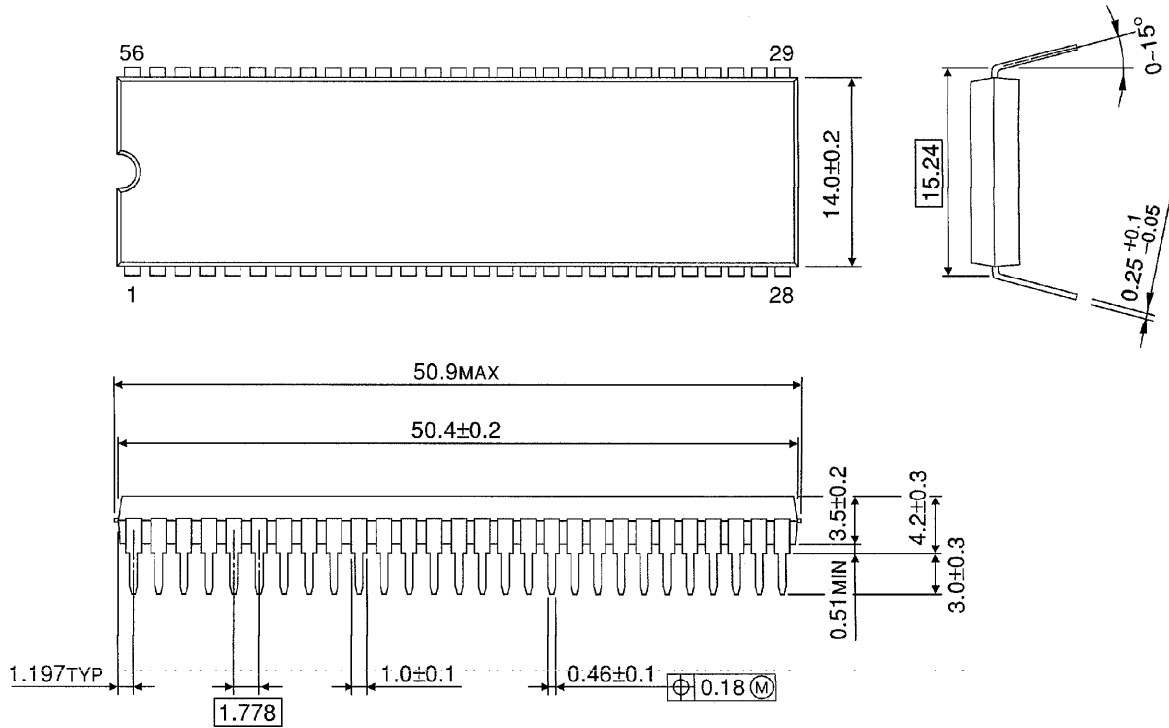
TA1298AN-86

AKB APPLICATION CIRCUIT



PACKAGE DIMENSIONS
SDIP56-P-600-1.78

Unit : mm



Weight : 5.55 g (Typ.)

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000707EBA

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