

TOSHIBA

TB1240AN

TENTATIVE TOSHIBA Bi-CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

TB1240AN

PAL / NTSC 1CHIP (IF + VCD PROCESSOR) IC

TB1240AN is the IF & Video processing IC for PAL / NTSC color TV system. This IC demodulates PAL / NTSC PIF, SIF and composite video signal to R / G / B primary colors and Audio signals. This IC can constitute Multi-Color System by combined with TA1275AZ (SECAM Processor).

TB1240AN has the analog R / G / B interface, therefore it is easy to make up PIP system by using this IC.

TB1240AN has an I²C BUS interface. Various controls (Brightness, Color etc.) can be done via two bus lines.



Weight : 5.55 g (Typ.)

FEATURES

IF stage

- Intercarrier / Splitcarrier Input
- Double Time Constant IF AGC
- Bus Controlled RF AGC
- Bus Controlled PIF VCO
- L-SECAM Demodulation
- PLL SIF Demodulation (for 4.5~6.5 MHz multi-SIF, Thankless)

980910EBA1

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Video stage

- Built-in Chroma Trap
- Built-in Y Delay Line
- Black Expansion
- DL Type Sharpness Control

Chroma stage

- 1 X'tal for Multi-System (3.58 MHz / 4.43 MHz / M-PAL / N-PAL)
- Built-in 1H DL
- Built-in BPF / TOF
- SECAM R-Y, B-Y Input
- Automatic Color System Detection
- fsc Continuous Wave Output

Text stage

- Fast Blanking
- Analog R / G / B Interface
- Cut-Off / Drive Adjustment
- ABCL
- UV Input

Deflection stage

- Resonator less H-VCO
- Dual Horizontal AFC
- Horizontal Phase Control
- Vertical Phase Control
- H/V Lock Detection
- Sand Castle Pulse Output (HD + VD + Gate Pulse)
- E/W correction
- Vertical correction

TERMINAL INTERFACE		FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
PIN No.	PIN NAME			
1	AFT Output / Self-Adj. Output	<p>The terminal for AFT output and Self-adj. output.</p> <p>AFT voltage, half of RF AGC Voltage, Red signal or Blue signal is outputted (Switched by bus) for self alignment.</p> <p>AFT output impedance is 50 Ω (typ.).</p>		0.3 V~4.7 V
2	Audio Output / DE-EMP.	<p>The terminal for audio output.</p> <p>FM Det. signal is outputted.</p> <p>Connect with 0.01µF capacitor for de-emphasis.</p> <p>75 µs / 50 µs de-emphasis is switched by BUS.</p> <p>The output impedance is as follows ;</p> <p>PAL : 5 kΩ</p> <p>NTSC : 7.5 kΩ</p>		

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
3	IF V _{CC} (9V)	<p>The terminal for V_{CC} of PIF circuit. Supply 9 V. In order to prevent leakage through V_{CC}, inserting traps for IF carrier and f_H is recommended.</p>	—	—
4	SIF IN	<p>The terminal for SIF signal. This IC can supply NICAM signal to NICAM processor. Connect this pin to GND in Intercarrier style. SIF amplitude gain becomes minimum.</p>		—
5	IF GND	<p>The terminal for GND of PIF circuit. In order to realize good PIF Det. performance for low IF input, separate IF GND wiring from VCO GND (Pin 49) as far as possible.</p>	—	—

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
6 7	IF Input	The terminal for IF signal input. Pin 6 & Pin 7 are the both input poles of a differential amplifier.		Typical Input 90 dBμV
8	RF AGC	The terminal for RF AGC output (Open corrector Output). To get rid of noises, connect a capacitor to this terminal.		0 V~9 V

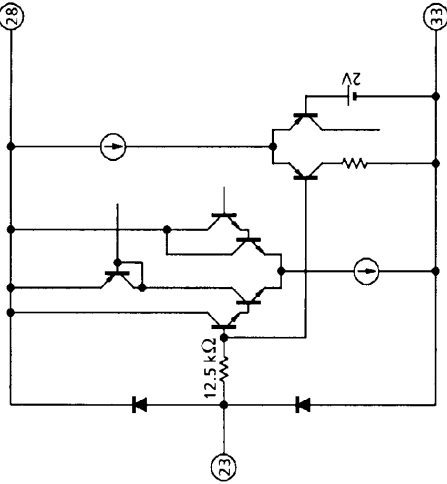
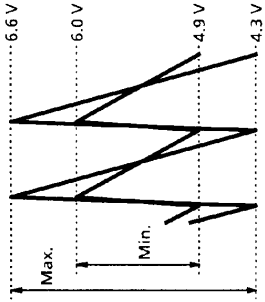
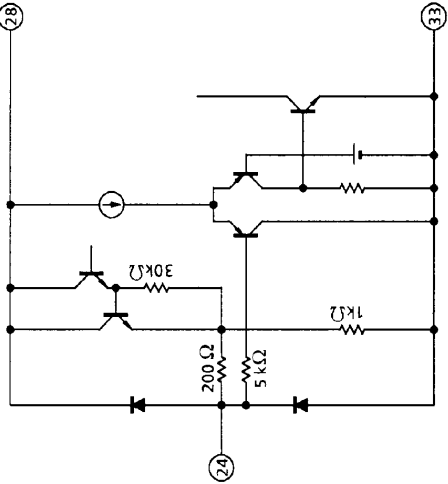
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
9	IF AGC	<p>The terminal to be connected with an IF AGC filter. Peak AGC works n-sync. tip level of PIF Det. signal. For L-SECAM, the capacitor on pin 56 filters for AGC.</p>		2 V~8 V
10	APC Filter	<p>The terminal to be connected with APC filter for chroma demodulation. This terminal voltage controls the frequency of VCXO.</p>		-

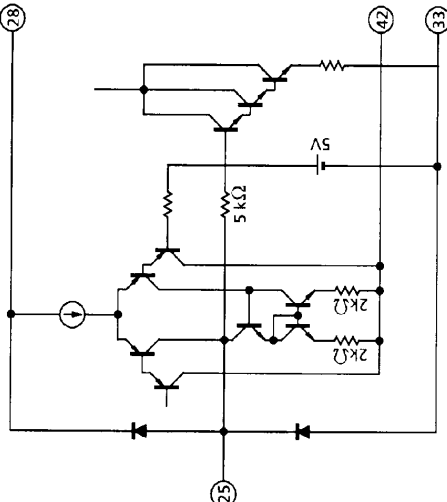
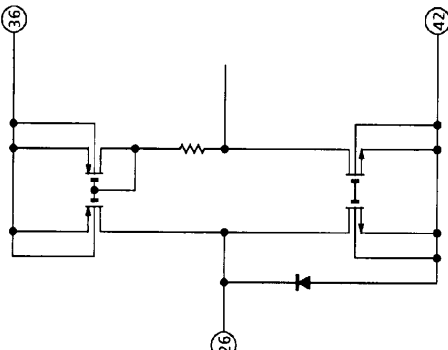
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT								
11	X'tal	<p>The terminal to be connected with a 4.433619 MHz X'tal oscillator.</p> <p>This is the standard of both of 4.43 MHz / 3.58 MHz chroma demodulation and horizontal VCO.</p> <p>MIL : HC-49 / U is recommended.</p>		—								
12	Y / C GND	<p>The terminal for GND of Y / C circuit.</p>	—	—								
13	Y _S / Y _m .	<p>The terminal for switching of Analog RGB Mode and fast Half tone.</p> <p>On Analog RGB Mode, the signal inputted into Pin 14, 15, 16 are outputted from Pin 18, 19, 20.</p> <p>For Half tone, the S16, D1 of I²C BUS SW has to be "1".</p>		<table border="1"> <tr> <td>Analog RGB</td> <td>-----2.4 V</td> </tr> <tr> <td>Half tone</td> <td>-----0.8 V</td> </tr> <tr> <td>TV / TV</td> <td>-----GND</td> </tr> <tr> <td>Hex 16 D1 = 0</td> <td>Hex 16 D1 = 1</td> </tr> </table>	Analog RGB	-----2.4 V	Half tone	-----0.8 V	TV / TV	-----GND	Hex 16 D1 = 0	Hex 16 D1 = 1
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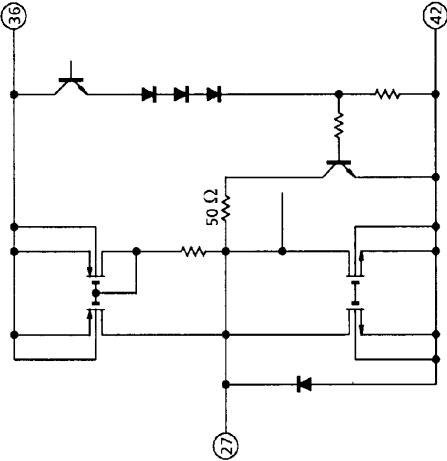
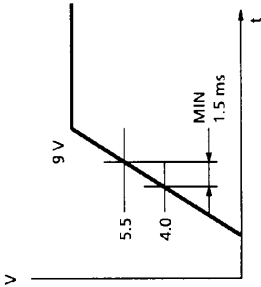
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT	
14	Analog R Input	The terminal for Analog RGB signals input.		<p>100 IRE 0.5 V_{p-p}</p>	
15	Analog G Input	Input signals are clamped by charging/discharging coupling capacitors, therefore			
16	Analog B Input	input with low impedance. 100 Ω or less is recommended.			
17	RGB V _{CC} (9 V)	The terminal for V _{CC} of RGB circuit (TEXT circuit). Supply 9 V.		<p>—</p>	
18	R Output	The terminals for R signals output. Because of the limit of output current, set the resistance 2.0 kΩ or more to GND.		<p>100 IRE 2.5 V_{p-p}</p>	

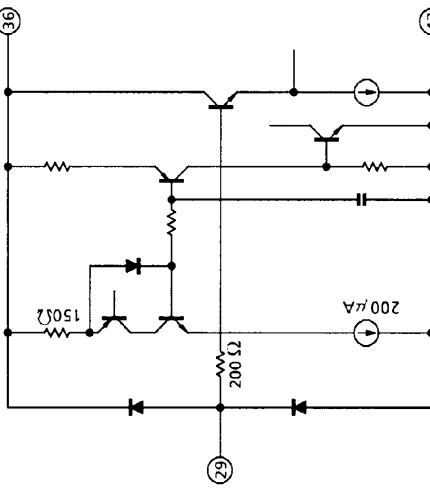
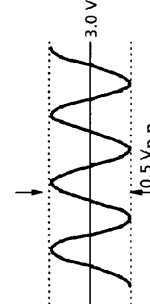
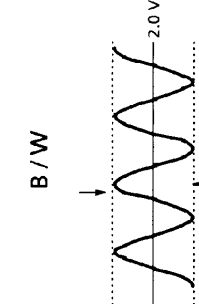
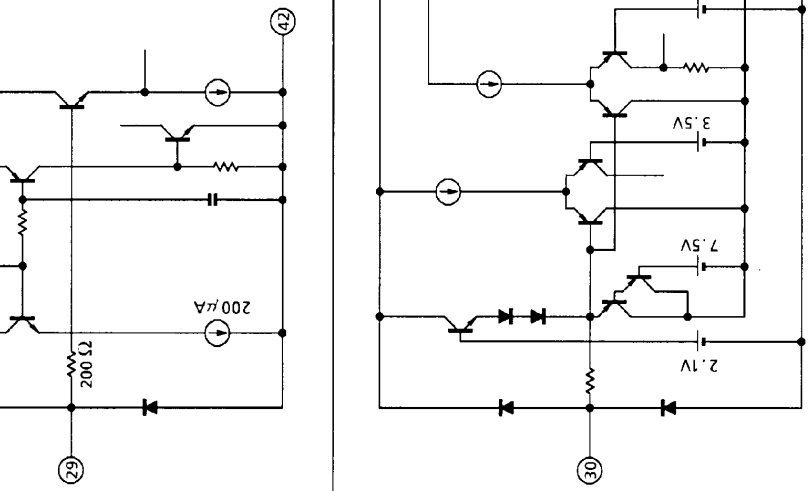
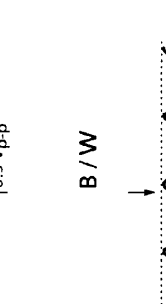
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
19	G Output	<p>The terminals for G signals output. Because of the limit of output current, set the resistance 2.0 kΩ or more to GND.</p>		
20	B Output	<p>The terminals for B signals output. Because of the limit of output current, set the resistance 2.0 kΩ or more to GND.</p>		

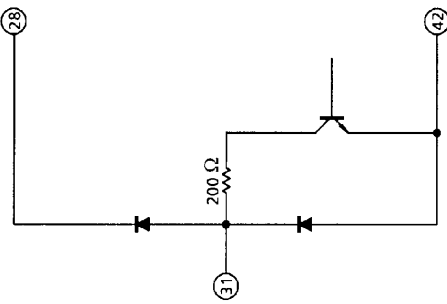

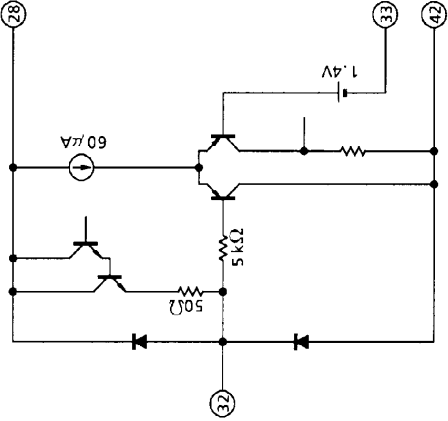
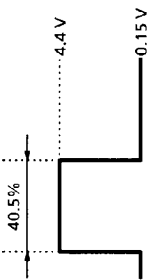
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
21	ABCL	<p>The terminal for ABL/ACL control. Control voltage range is 5.5 V~6.0 V. ABL Gain & ABL start point are selectable by bus.</p>		<p>At Open 6 V</p>
22	V.Ramp	<p>The terminal to be connected with a capacitor to make V.Ramp signal. V.Ramp amplitude depends on Y/C VCC, and it is kept constant by V.AGC function.</p>		

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
23	V.NFB	<p>The terminal for input of V.sawteeth signal feedback. The amplitude of feedback signal is controlled by bus.</p>		
24	V.Output	<p>The terminal for output of Vertical drive signal.</p>		<p style="text-align: center;">—</p>

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
25	V.AGC	<p>The terminal to be connected with a capacitor for V.AGC. V.AGC keeps V.Ramp amplitude constant.</p>		-
26	SCL	<p>The terminal for input of I²C bus clock.</p>		-

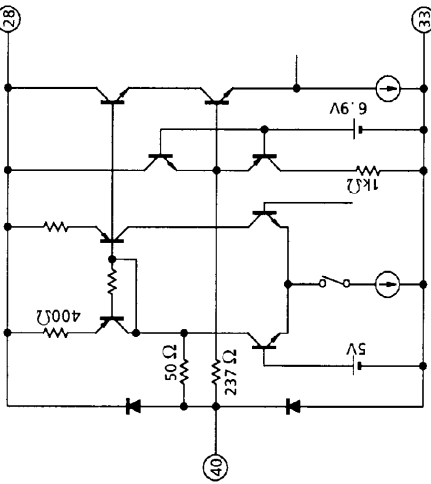
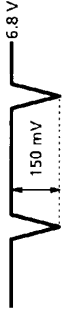
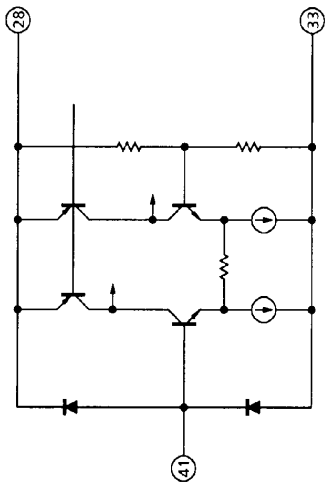
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
27	SDA	The terminal for input / output of I ² C bus data.		-
28	H. VCC (9V)	The terminal for VCC of deflection circuit. Supply 9V. For 4V or more, VCXO oscillates and for 5.5V or more, H OUT signal is outputted. Set the raising time between 4V and 5.5V longer than 1.5ms.	-	

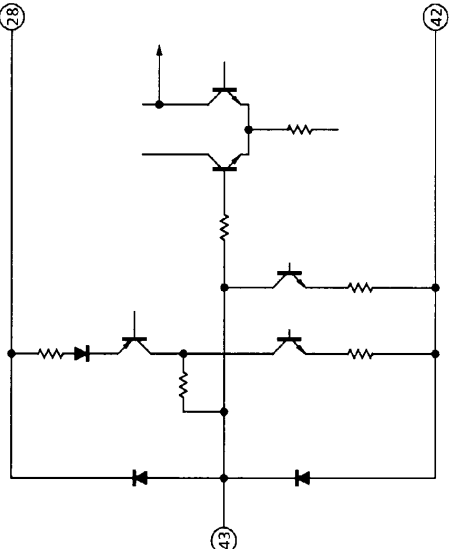
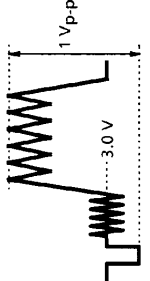
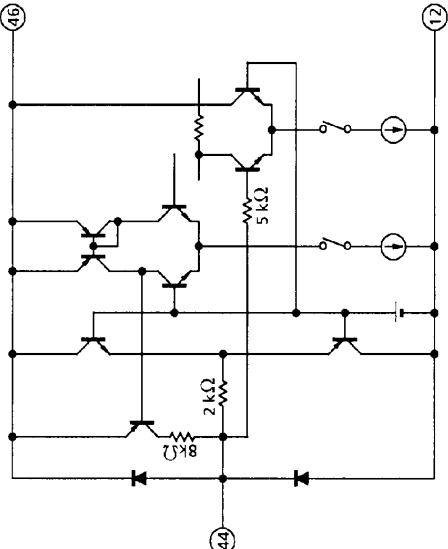
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
29	ID In / Output / Fsc CW Output	<p>The terminal for PAL / NTSC ID output and SECAM ID input. By sinking 150 μA or more from this terminal, this IC turns to be SECAM mode. By sinking 220 ~ 380 μA from this terminal, this IC gives priority to SECAM mode. And the terminal for chroma sub-carrier frequency, switched by bus (Fixed 4.43 MHz / Auto).</p>		<p>PAL / NTSC</p>  <p>B / W</p> 
30	FBP Input	<p>The terminal for FBP Input.</p>		

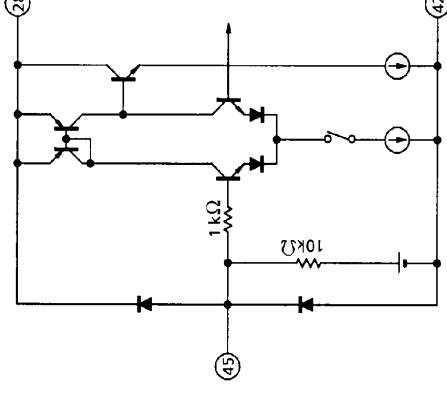
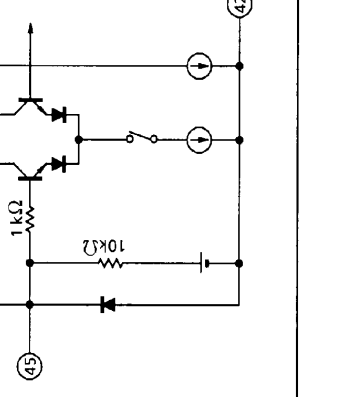
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
31	SYNC Output	The terminal for composite sync. output (Open corrector output).		
32	H. Output	The terminal for output of horizontal drive signal.		

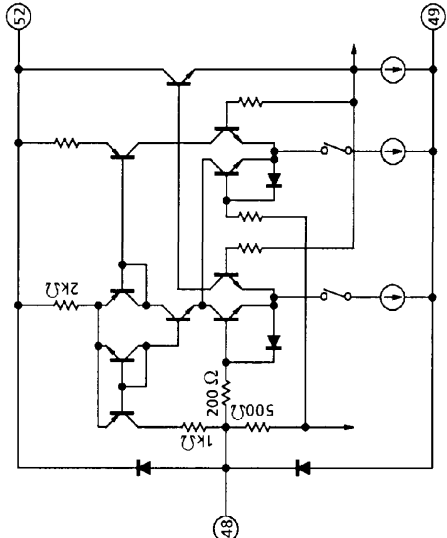
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
33	DEF GND	The terminal for GND of deflection circuit.	—	—
34	SCP Output	The terminal for Sand Castle Pulse (VD + HD + Gp) output.		
35	EW OUT	The terminal for E-W OUT.		

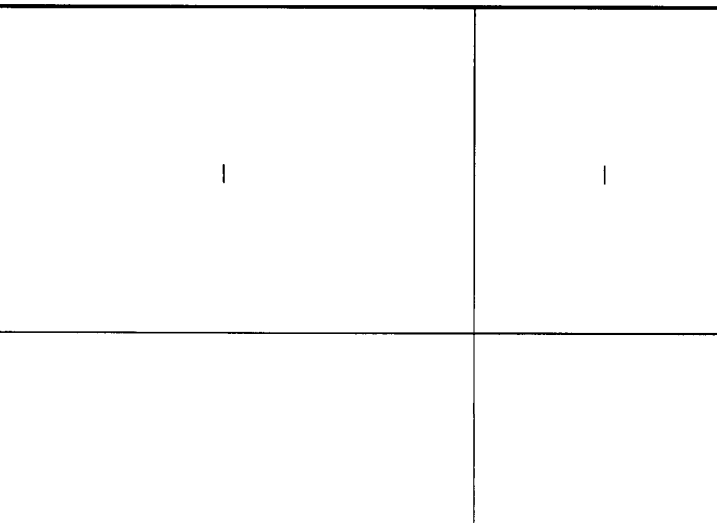
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
36	Dig. V _{DD} (5 V)	The Terminal for V _{DD} of digital block. Supply 5 V.	—	—
37	B-Y / SECAM B-Y Input	The terminal for component R-Y/B-Y signal input and SECAM B-Y/R-Y signal input. Input signals are clamped by charging / discharging coupling capacitors, therefore input with low impedance.		
38	R-Y / SECAM R-Y Input	The terminal for component R-Y/B-Y signal input and SECAM B-Y/R-Y signal input. Input signals are clamped by charging / discharging coupling capacitors, therefore input with low impedance.		
39	Y Input	The terminal for Y input. Input signal is clamped by charging / discharging coupling capacitor, therefore input with low impedance. 100 Ω or less is recommended. Typical input amplitude is 1.0 V _{p-p} .		

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
40	H. AFC	<p>The terminal to be connected with H.AFC filter. This terminal voltage controls H. frequency.</p>		
41	EHT IN	<p>The terminal for EHT. EW/V is controlled by BUS.</p>		-
42	Dig. GND	<p>The terminal for GND of digital block.</p>	-	-

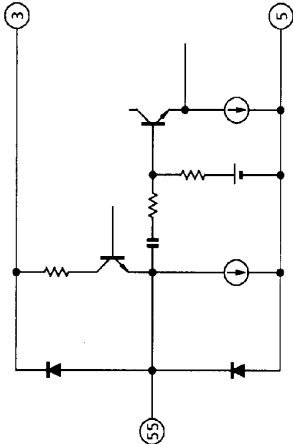
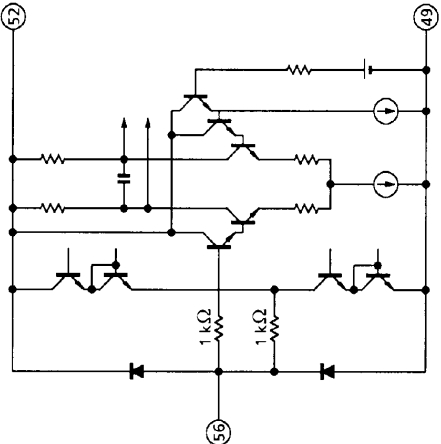
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
43	Sync In	<p>The terminal for input of the synchronous separation circuit. Input via clamp capacitor.</p>		
44	Black Det.	<p>The terminal to be connected with Black Det. filter. This terminal voltage controls Black stretching gain.</p>		<p style="text-align: center;">—</p>

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
45	EXT. C Input	The terminal for input of chroma signal. Input through a coupling capacitor.		Burst Amplitude 286 mV _{p-p}
46	Y / C V _{CC} (5V)	The terminal for V _{CC} of Y / C circuit. Supply 5 V.	—	—
47	IF Det. Output	The terminal for output of composite video signal and SIF signal detected in IF circuit. Typical video output amplitude is 2.2 V _{p-p} . In order to reduce 920 kHz beat, connect a emitter follower to drive audio trap and band-pass-filter.		2 V _{p-p}

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
48	Loop Filter	<p>The terminal to be connected with loop filter for IF PLL. This terminal voltage controls the frequency of IF VCO.</p>		-
49	VCO GND	<p>The terminal for GND of VCO and SIF circuit. In order to realize good PIF Det. performance for low IF input, please separate VCO GND wiring from IF GND (Pin 5) as far as possible.</p>	-	-

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
50	VCO	The terminal to be connected with a tank coil for IF VCO.		-
51		IF VCO frequency is controlled by bus. For 27 pF ext. capacitance, frequency variable range is ± 2 MHz.		
52	VCO V _{CC} (9 V)	The terminal for V _{CC} of IF VCO and SIF. Supply 9 V. In order to prevent leakage through V _{CC} , inserting traps for IF carrier and f _H is recommended.		-

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
53	Limiter Input / H. Correction	<p>The terminal for SIF signal input and H. curve correction.</p> <p>By this terminal DC (3.5 V ~ 5.5 V), it is possible to adjust H. phase ($-1 \mu\text{s} \sim +1 \mu\text{s}$). This can be used to correct horizontal curve caused by change of High-Voltage.</p>		<p>Typical 90 dBμV</p>
54	Ripple Filter	<p>The terminal to be connected with a capacitor to stabilize the performance of SIF injection-lock circuit.</p>		-

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT	INPUT / OUTPUT
55	SIF OUT	The terminal for output of the 2'nd SIF signal that is beaten down by the regenerative carrier.		—
56	FM DC NF	The terminal for FM DC Negative Feedback and AGC Filter for L-SECAM. Connect a capacitor to stabilize audio output DC level.		DC : 5.2 V

BUS CONTROL MAP

Write mode

Slave address : 88 HEX

SUB ADDRESS	D7 MSB	D6	D5	D4	D3	D2	D1	D0 LSB	PRESET
00	Au Gain	WPS	Uni-Color						0000 0000
01	Mute	Brightness (TV / Text)						0100 0000	
02		Color						1100 0000	
03	V AGC	TINT						0100 0000	
04	AF-G	Vi Pol	Sharpness						0010 0000
05	C-BPF	C-Trap	*	*	*	Half Tone	ABL Gain	0000 0000	
06	Color System			CW SW	Sub Contrast				0000 1000
07	R Cut Off						1000 0000		
08	G Cut Off						1000 0000		
09	B Cut Off						1000 0000		
0A	G Drive Gain						0100 0000		
0B	AFT M	B Drive Gain						0100 0000	
0C	Vertical Position			Horizontal Position				0001 0000	
0D	B. B.	*	*	*	*	*	*	DC NF speed	0000 0000
0E	V-Freq		RF AGC						0000 0000
0F	AFC Gain		Vertical Size						0010 0000
10	V Linearity				V S Correction				1000 1000
11	PIF VCO						1000 0000		
12	SECAM R-Y Black Adjust				SECAM B-Y Black Adjust				1000 1000
13	N-COM	BLK	RGB Contrast						0000 0000
14		H-STP	F ID	Self Adj.	ID SW	ABL Start point	0000 0000		
15	Factory TEST MODE						0000 0000		
16	0	SE Adj.	IF Freq.			AFT ON	BGP P	Ym enb	0000 0000
17	TEST MODE						0000 0000		
18	YUV SW	TEST	Horizontal Size						xx10 0000
19	TEST MODE		Parabola Correction						xx10 0000
1A	Trapezium Correction					V. EHT			1000 0000
1B	Corner Correction					H. EHT			x100 0000

Read mode

	7	6	5	4	3	2	1	0
W1	POR	IF Lock	H Lock	IF Level	V Freq	Color System		
W2	Y-IN	RGB OUT	H-OUT	V-OUT	*	V Lock	AFT	

BUS CONTROL CONTENTS

Write mode

CHARACTERISTIC	DESCRIPTION	PRESET
Au Gain (Audio Gain SW)	0 : 50 kHz 1 : 25 kHz (X2 on 4.5 MHz mode)	50 kHz
WPS (White Peak Suppressor)	0 : ON 1 : OFF	ON
Uni-Color	Min : - 11.6 dB~Cen : 6.6 dB~Max : 11.6 dB	- 11.6 dB
Mute (Mute Mode)	00 : Normal 01 : Y-Mute 10 : RGB Out-Cut Off DC 11 : RGB Out-Cut Off DC + VP Out Hi (Service mode)	Y-Mute
Brightness	Min : 1.9 V~Cen : 2.6 V~Max : 3.4 V (Pedestal Level)	2.6 V
Color	Min : - 20 dB or less~Cen : 0 dB~Max : 8.15 dB	0 dB
V-AGC (Vertical AGC Speed)	0 : Normal 1 : x3	Normal
TINT	Min : - 38°~Cen : 0°~Max : 38°	0°
AF-G (AF Gain SW)	0 : 50 μs (5.5 / 6.0 / 6.5 MHz) 1 : 75 μs (4.5 MHz)	50 μs
Vi POL (Video Polarity)	0 : Normal 1 : Reverse (For L-SECAM)	Normal
Sharpness	Min : - 11 dB~Cen : 5 dB~Max : 12 dB	0 dB
C-BPF	0 : BPF 1 : TOF	BPF
C-Trap (Chroma Trap)	0 : OFF 1 : ON	OFF
Half Tone	0 : OFF 1 : ON	OFF
ABL Gain	00 : -0.74 V 01 : -0.64 V 10 : -0.37 V 11 : -0.12 V	-0.74 V
Color System	000 : Auto1... 443 PAL / 358 NTSC (/ SECAM) / 443 NTSC 001 : Auto2... 358 NTSC / M-PAL / N-PAL 010 : Fixed 443 PAL 011 : Fixed M-PAL 100 : Fixed N-PAL 101 : Fixed 358 NTSC 110 : Fixed 443 NTSC 111 : SECAM	Auto1
CW SW	0 : Auto 1 : 4.43 MHz	Auto
Sub-Contrast	Min : - 3.5 dB~Cen : 0 dB~Max : 2.3 dB	0 dB
RGB Cut Off	Min : - 0.5 V~Cen : 0 V~Max : 0.5 V	± 0 V
G / B Drive	Min : - 5.5 dB~Cen : 0 dB~Max : 3.5 dB	- 5 dB
AFT M (AFT Mute)	0 : Normal 1 : Mute	Normal
Vertical Position	000 : 0 H 111 : 7 H Delay / Pulse Width : 8 H	0 H
Horizontal Position	Min : - 3 μs~Cen : 0 μs~Max : 3 μs	0 μs
B.B. (Blue Back)	0 : OFF 1 : 50 IRE	OFF
DC NF SPEED	0 : Fast 1 : Normal	Fast
V-Freq (Vertical Frequency)	00 : Auto 01 : 60 Hz 10 : 263 H Fixed 11 : 313 H Fixed	Auto
RF AGC	000000 : IF Mute Min : 65 dBμV~Max 100 dBμV	IF Mute
AFC Gain	00 : Normal 01 : 1/3 10 : x3 at VBLK 11 : AFC Off	Normal
Vertical Size	Min : - 40%~Cen : 0%~Max : 40%	0%

CHARACTERISTIC	DESCRIPTION	PRESET
V Linearity	Upper Side ; Min : 16%~Cen : 0%~Max : - 14% Lower Side ; Min : - 20%~Cen : 0%~Max : 17.5%	0%
V-S Correction	Upper Side ; Min : 12%~Cen : 0%~Max : - 12% Lower Side ; Min : 15%~Cen : 0%~Max : - 15%	0%
PIF VCO (PIF VCO f ₀ Adj.)	Min : - 2 MHz~Cen : 0 MHz~Max : 2 MHz	0 MHz
SECAM R-Y Black Adj	Min : - 176 mV~Cen : 0 mV ~Max : 154 mV (At R Output)	0 mV
SECAM B-Y Black Adj	Min : - 280 mV~Cen : 0 mV~ Max : 245 mV (At B Output)	0 mV
N-Com (NTSC Comb SW)	0 : ON 1 : OFF	ON
BLK (Blanking SW)	0 : BLK ON 1 : BLK OFF	ON
RGB Contrast	Min : - 6.0 dB~Cen : 9.4 dB~Max : 14.0 dB	- 6.0 dB
H-STP (H-Out Stop)	0 : Normal 1 (& Mute data ; 11) : H-Out Stop & Low RGB Output	Normal
FID (Forced ID ON)	0 : Normal 1 : Killer OFF on Fixed System (This function doesn't work on Auto1 & Auto2 Mode.)	Normal
Self Adj. (AFT Output SW for Self Adj.)	00: AFT 01 : Blue 10 : Red 11 : RF AGC × 1/2	AFT
ID SW (ID Sensitivity Switching)	0 : Normal Mode 1 : Low Mode (This function works on only for NTSC Mode)	Normal
ABL Start Point	00 : -0.01 V 01 : -0.11 V 10 : -0.3 V 11 : -0.45 V	-0.01 V
TEST (TEST MODE)	For factory-TEST. Leave these bits preset data.	00HEX
SE Adj.	0 : Normal 1 : SECAM Black Level Alignment Mode 18 pin : R-Y 20 pin : B-Y	0
IF Freq.	000 : 58.75 MHz 001 : 45.75 MHz 010 : 39.50 MHz 011 : 38.90 MHz 100 : 38.00 MHz 101 : 34.47 MHz 110 : 33.95 MHz 111 : 33.90 MHz	000
AFT ON	0 : Normal 1 : AFT-MUTE OFF	0
BGP P	0 : Normal 1 : 1.5 μs	0
Ym enb	0 : 0~0.8 V TV more than 0.8V OSD 1 : 0~0.8 V TV 0.8~2.4 V Half Tone more than 2.4 V OSD	0
YUV SW	0 : YC 1 : YUV	YC
Horizontal Size	000000 : MIN 111111 : MAX	100000 (center)
parabola Correction	000000 : MIN 111111 : MAX	CEN
Trapezium Correction	11111 : Expansion upward 00000 : Expansion downward	CEN

CHARACTERISTIC	DESCRIPTION	PRESET
V.EHT	000 : MIX 111 : MAX	MIN
Corner Correction	00000 : Vertical expansion 11111 : Vertical compression	CEN
H.EHT	000 : MIX 111 : MAX	MIN

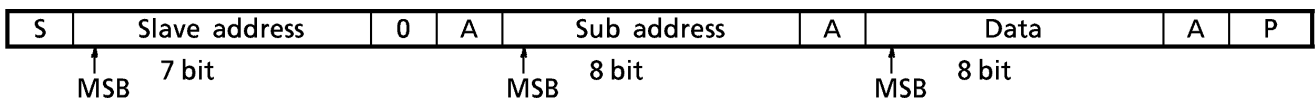
Read mode

CHARACTERISTIC	DESCRIPTION
POR (Power On Resection)	0 : Normal 1 : Resister Preset
IF Lock (IF Lock Detection)	0 : Lock Out 1 : Lock In
H-Lock (Horizontal Lock Detection)	0 : Lock Out 1 : Lock In
IF Level (IF AGC Gain Detection)	0 : High IF AGC Gain 1 : Low IF AGC Gain
V Frq (Vertical Frequency)	0 : 50 Hz 1 : 60 Hz
Color System	000 : B/W 001 : 4.43 PAL 010 : M-PAL 011 : N-PAL 100 : 3.58 NTSC 101 : 4.43 NTSC 110 : SECAM 111 : N/A
Y-IN (For Self-Diagnostic)	0 : No Signal 1 : OK
RGB Output (For Self-Diagnostic)	0 : No Signal 1 : OK
H-OUT (For Self-Diagnostic)	0 : No Signal 1 : OK
V-OUT (For Self-Diagnostic)	0 : No Signal 1 : OK
V-Lock (Vertical Lock Detection)	0 : Lock Out 1 : Lock In
AFT (AFT Lock Detection)	00 : Lock Out 01 : High Freq. 10 : Low Freq. 11 : Lock In

I²C BUS CONTROLLED FORMAT SUMMARY

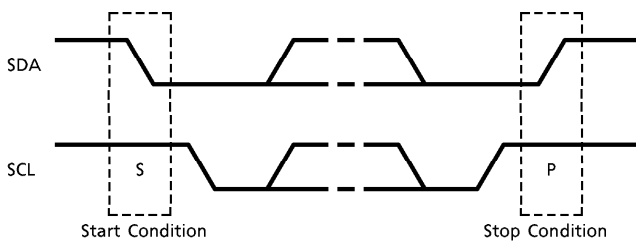
Bus controlled format of TB1240N is based on I²C Bus Control format of Philips.

Data transfer format

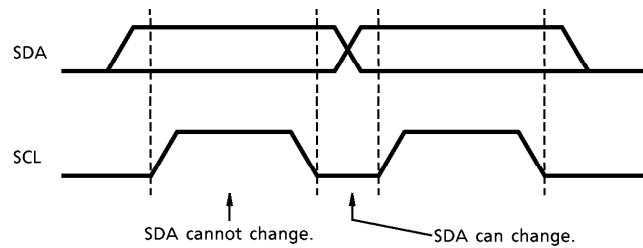


S : Start Condition
P : Stop Condition
A : Acknowledge

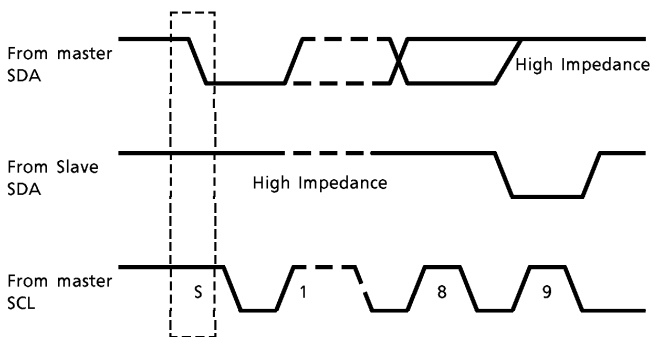
(1) Start and stop condition



(2) Bit transfer



(3) Acknowledge



(4) Slave address

A ₆	A ₅	A ₄	A ₃	A ₂	A ₁	A ₀	R/ \overline{W}
1	0	0	0	1	0	0	0

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

MAXIMUM RATINGS (Ta = 25°C)

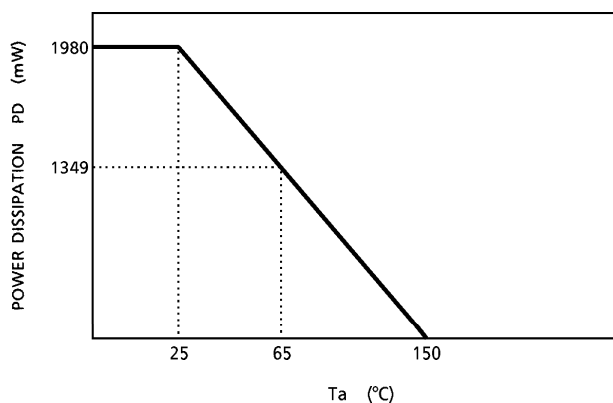
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage (9 V V _{CC})	V _{CCmax9}	12	V
Supply Voltage (5 V V _{CC})	V _{CCmax5}	8	V
Power Dissipation	PD _{max}	1980 (*)	mW
Input Terminal Voltage	V _{in}	GND - 0.3~V _{CC} + 0.3	V
Operating Temperature	T _{opr}	- 20~65	°C
Storage Temperature	T _{stg}	- 55~150	°C

(*) When using this device at above Ta = 25°C, the power dissipation decreases by 15.9 mW per 1°C rise.

This IC is not proof enough against a strong E-M field by CRT which may cause function errors and/or poor characteristics.

Keeping the distance from CRT to the IC longer than 20 cm, or if cannot, placing shield metal over the IC, is recommended in an application.

Ta-PD CURVE



ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

Pin voltage

PIN No.	PIN NAME	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
1	AFT OUTPUT	V ₁	—	—	2.0	2.5	3.0	V
2	AUDIO OUTPUT	V ₂	—	—	3.8	4.3	4.8	V
3	IF V _{CC}	V ₃	—	Supply 9 V	—	9.0	—	V
4	SIF IN	V ₄	—	—	4.6	5.1	5.6	V
7	IF Input	V ₇	—	—	2.1	2.7	3.3	V
10	APC Filter	V ₁₀	—	—	1.8	2.5	3.2	V
11	X'tal	V ₁₁	—	—	3.7	4.0	4.3	V
13	Y _S	V ₁₃	—	—	—	0.17	0.4	V
14	Analog R Input	V ₁₄	—	—	1.8	2.5	3.2	V
15	Analog G Input	V ₁₅	—	—	1.8	2.5	3.2	V
16	Analog B Input	V ₁₆	—	—	1.8	2.5	3.2	V
17	RGB V _{CC}	V ₁₇	—	Supply 9 V	—	9.0	—	V
18	R Output	V ₁₈	—	—	2.30	2.65	3.00	V
19	G Output	V ₁₉	—	—	2.30	2.65	3.00	V
20	B Output	V ₂₀	—	—	2.30	2.65	3.00	V
21	ABCL	V ₂₁	—	—	5.70	6.05	6.30	V
26	SCL	V ₂₆	—	—	4.5	5.0	5.5	V
27	SDA	V ₂₇	—	—	4.5	5.0	5.5	V
28	H.V _{CC}	V ₂₆	—	Supply 9 V	—	9.0	—	V
29	ID In/Output /Fsc CW Output	V ₂₉	—	—	1.40	1.75	2.00	V
36	Digital V _{DD}	V ₃₆	—	Supply 5 V	—	5.0	—	V
37	SECAM B-Y Input	V ₃₇	—	—	2.3	2.5	2.7	V
38	SECAM R-Y Input	V ₃₈	—	—	2.3	2.5	2.7	V
39	Y Input	V ₃₉	—	—	2.5	2.8	3.2	V
40	H.AFC	V ₄₀	—	—	6.0	6.8	7.5	V
43	SYNC IN	V ₄₃	—	—	1.9	2.2	2.5	V
44	Black Detection	V ₄₄	—	—	2.00	2.25	2.60	V
45	Ext. C Input	V ₄₅	—	—	2.7	3.0	3.4	V
46	Y/C V _{CC}	V ₄₆	—	Supply 5 V	—	5.0	—	V
47	PIF Det. Output	V ₄₇	—	—	4.8	5.3	5.8	V
48	Loop Filter	V ₄₈	—	—	4.1	4.6	5.1	V

PIN No.	PIN NAME	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
50	PIF VCO	V50	—	—	7.4	8.0	8.6	V
51	PIF VCO	V51	—	—	7.4	8.0	8.6	V
52	VCO V _{CC}	V52	—	Supply 9 V	—	9.0	—	V
53	Limiter Input/ Curre Correction	V53	—	—	3.9	4.5	5.1	V
54	Ripple Filter	V54	—	—	5.2	5.9	6.6	V
55	SIF OUT	V55	—	—	3.0	3.5	4.0	V

Current dissipation

PIN No.	PIN NAME	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
3	IF V _{CC}	I _{CC3}	—	Supply 9 V	11	20	25	mA
17	RGB V _{CC}	I _{CC17}	—	Supply 9 V	7	10	12	mA
28	H.V _{CC}	I _{CC26}	—	Supply 9 V	18	24	33	mA
36	Digital V _{CC}	I _{CC36}	—	Supply 5 V	7	13	16	mA
46	Y/C V _{CC}	I _{CC46}	—	Supply 5 V	53	76	89	mA
52	VCO V _{CC}	I _{CC52}	—	Supply 9 V	15.5	23	29	mA

RECOMMENDED OPERATING POWER SUPPLY VOLTAGE

PIN No.	PIN NAME	MIN.	TYP.	MAX.	UNIT	NOTE
3	IF V _{CC}	8.5	9	9.5	V	—
17	RGB V _{CC}	8.5	9	9.5	V	—
28	H.V _{CC}	8.5	9	9.5	V	—
36	Digital V _{CC}	4.5	5	5.5	V	—
46	Y/C V _{CC}	4.5	5	5.5	V	The thermal drift of the Y/C V _{CC} should be less than 50 mV. Because the Amplitude of V-RAMP depends on this DC voltage.
52	VCO V _{CC}	8.5	9	9.5	V	—

AC CHARACTERISTIC

PIF stage (Unless otherwise specified, $V_{CC} = 9V$ (3, 17, 28 & 52 pin)/ $5V$ (36 & 46 pin), $T_a = 25^\circ C$)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
PIF Det. Output Level	87.5%	V_{DET875}	—	P ₁	2.0	2.2	2.4	V_{p-p}
	L-SECAM	V_{DETLS}			2.0	2.2	2.4	
	110%	V_{DET110}			2.0	2.5	3.0	
PIF Input Sensitivity	MIN.	$E_{PIFINMIN}$	—	P ₂	—	37	—	$dB_{\mu V}$
	MAX.	$E_{PIFINMAX}$			100	107	—	
IF AGC Range		ΔE_{IFAGC}	—		65	70	—	dB
PIF Det. Sync. Tip Level		V_{SYNC}	—	P ₃	2.6	2.9	3.2	V
L-SECAM White Peak Level		V_{LSW}	—		4.6	4.9	5.2	V
Output Level for No Input	—	V_{NOIF}	—	P ₄	4.8	5.2	5.6	V
	L-SECAM	V_{NOIFLS}			2.2	2.6	3	
Differential Gain		DG	—	P ₅	—	2	5	%
Differential Phase		DP	—		—	2	5	°
PIF Output Freq. Response		FR_{DET}	—	P ₆	5	7	—	MHz
S/N		S/N_{PIF}	—	P ₇	52	55	—	dB
Intermodulation		I_{107}	—	P ₈	42	45	—	dB
I _F AGC Voltage	MAX.	$V_{IFAGCMAX}$	—	P ₉	7.3	7.5	—	V
	MIN.	$V_{IFAGCMIN}$			—	3.8	—	
R _F AGC Voltage	MAX.	$V_{RFAGCMAX}$	—	P ₁₀	—	9	—	V
	MIN.	$V_{RFAGCMIN}$			—	0.2	0.5	
R _F AGC Control Range		ΔE_{RFAGC}	—	P ₁₁	35	—	—	dB
AFT Center Voltage		V_{AFTCEN}	—	P ₁₂	—	2.5	—	V
AFT Voltage	MAX.	V_{AFTMAX}	—	P ₁₃	4.4	4.8	5.2	V
	MIN.	V_{AFTMIN}			—	0.2	0.5	
AFT Sensitivity		μAFT	—	P ₁₄	—	40	—	kHz/V
PIF VCO Control Sensitivity		β_{IFVCO}	—	P ₁₅	—	1.5	—	MHz/V
PIF VCO Pull-In Range	High	F_{PIFINH}	—	P ₁₆	1	1.5	—	MHz
	Low	F_{PIFINL}			1	1.5	—	
PIF Input Resistance		$Z_{in R (p)}$	—	P ₁₇	—	3	—	k Ω
PIF Input Capacity		$Z_{in C (p)}$	—		—	6	—	pF

SIF & audio stage

(Unless otherwise specified, $V_{CC} = 9\text{ V}$ (3, 17, 28 & 52 pin) / 5 V (36 & 46 pin), $T_a = 25^\circ\text{C}$)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
FM Det. Output Level	5.5 MHz / P	V_{AUAC5P}	—	S ₁	695	927	1236	mV _{rms}
	4.5 MHz / P	V_{AUAC4P}			649	927	1324	
	4.5 MHz / N	V_{AUAC4N}			350	500	700	
Audio Distortion	5.5 MHz / P	$D_{AUDIO P}$	—	S ₂	—	0.3	1	%
	4.5 MHz / N	$D_{AUDIO N}$			—	0.3	1	
Audio S / N	5.5 MHz / P	$S / N_{SIF P}$	—	S ₃	55	60	—	dB
	4.5 MHz / N	$S / N_{SIF N}$			52	58	—	
AMR		AMR	—	S ₄	50	60	—	dB
Limiting Sensitivity		ELIM	—	S ₅	—	35	—	dB μ V
Band Width (5.5 MHz / PAL)	High	F_{AUH5P}	—	S ₆	6.7	8.7	—	MHz
	Low	F_{AUL5P}			—	3.8	5.4	
Band Width (4.5 MHz / NTSC)	High	F_{AUH4N}	—	S ₇	4.9	6.4	—	
	Low	F_{AUL4N}			—	2.8	4	
SIF MAX. Permissible Input		$V_{in\ MAX (S)}$	—	S ₈	105	110	—	dB μ
SIF AGC Range		RAGC (s)	—		55	70	—	dB
SIF Input Resistance		$Z_{in\ R (s)}$	—	S ₉	—	10	—	k Ω
SIF Input Capacity		$Z_{in\ C (s)}$	—		—	5	—	pF

Video stage (Unless otherwise specified, $V_{CC} = 9\text{ V}$ (3, 17, 28 & 52 pin) / 5 V (36 & 46 pin), $T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Y Input Dynamic Range	DR _Y	—	V ₁	1.1	1.3	—	V _{p-p}
Y Input Pedestal Clamp Voltage	V _{YCLP}	—	V ₂	2.5	2.7	2.9	V
Y Delay Time	t _{YDEL}	—	V ₃	500	550	600	ns
Brightness Chara.	V _{BRTMAX}	—	V ₄	3.0	3.4	3.7	V
	V _{BRTCEN}			2.3	2.6	2.8	
	V _{BRTMIN}			1.6	1.9	2.1	
Brightness Data Sensitivity	ΔV _{BRT}	—	V ₄	9.4	13.6	16.3	mV/bit
Uni-Color Chara. for Y	G _{UCYMAX}	—	V ₅	10.2	11.6	13.2	dB
	G _{UCYCEN}			5.1	6.6	8.3	
	G _{UCYMIN}			-9.1	-6.9	-5.2	
Sub-Contrast Chara.	G _{SCONMAX}	—	V ₆	1.8	2.3	2.8	dB
	G _{SCONMIN}			-3.0	-3.5	-4.0	
Sharpness Peaking Frequency	F _{SHP}	—	V ₇	3.0	3.3	3.6	MHz
Sharpness Control Characteristics	G _{SHMAX}	—	V ₈	7.0	12.0	15.0	dB
	G _{SHCEN}			2.0	5.0	7.0	
	G _{SHMIN}			-14.0	-11.0	-8.0	
Y Frequency Response	F _{RY}	—	V ₉	5.5	—	—	MHz
Black Expansion AMP Gain	G _{BLEX}	—	V ₁₀	1.2	1.4	1.6	—
Black Expansion Start Point	V _{BLEX}			0.79	0.96	1.14	V
Black Peak Detection Level	V _{BLPD}	—	V ₁₁	-50	0	50	mV
WPS Level	V _{WPS}	—	V ₁₂	2.5	2.8	3.2	V _{p-p}
Chrome Trap Gain	G _{TRAP 358}	—	V ₁₃	—	—	-20	dB
	G _{TRAP 443}			—	—	-20	dB
Half Tone Chara. for Y	G _{HTY}	—	V ₁₄	-6.9	-6.0	-5.1	dB

Chroma stage (Unless otherwise specified, $V_{CC} = 9\text{ V}$ (3, 17, 28 & 52 pin) / 5 V (36 & 46 pin), $T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT				
ACC Chara.	V_{ACCL}	—	C_1	—	20	30	mV _{p-p}				
	V_{ACCH}			600	—	—					
TOF Chara. (4.43 MHz)	F_{0T443}	—	C_2	—	5.13	—	MHz				
	Q_{T443}			—	2.0	—	—				
BPF Chara. (4.43 MHz)	F_{0B443}			—	4.43	—	MHz				
	Q_{B443}			—	2.0	—	—				
TOF Chara. (3.58 MHz)	F_{0T358}			—	4.28	—	MHz				
	Q_{T358}			—	2.0	—	—				
BPF Chara. (3.58 MHz)	F_{0B358}			—	3.58	—	MHz				
	Q_{B358}			—	2.0	—	—				
C Delay Time	t_{CDEL}			—		550	600	650	ns		
Delay Time Difference between Y/C	$\Delta t_{Y/C}$			—	C_3	-60	0	60	ns		
Color Chara.	G_{COLMAX}			—	C_4	6.93	8.15	9.37	dB		
	G_{COLMIN}					—	—	-20			
Uni-Color Chara. for C	G_{UCCMIN}	—	C_5	-21.5	-18.8	-16.0	dB				
Tint Chara. (4.43 MHz)	$\Delta \theta_{443MAX}$	—	C_6	30	38	46	deg				
	$\Delta \theta_{443MIN}$			-46	-38	-30					
Tint Chara. (3.58 MHz)	$\Delta \theta_{358MAX}$			30	38	46	deg				
	$\Delta \theta_{358MIN}$			-46	-38	-30					
Relative Amplitude (PAL)	$V_{PR/B}$			—	C_7	0.45	0.55	0.65	—		
	$V_{PG/B}$					0.30	0.36	0.42			
Relative Amplitude (NTSC)	$V_{PR/B}$					0.6	0.7	0.8	—		
	$V_{PG/B}$					0.25	0.31	0.37			
Relative Phase (PAL)	θ_{PR-B}					—	C_8	85	90	95	deg
	θ_{PG-B}							230	236	242	
Relative Phase (NTSC)	θ_{PR-B}							86	91	96	deg
	θ_{PG-B}							232	240	245	
APC Pull-In Range (4.43 MHz)	F_{4APCP+}	—	C_9					350	500	—	Hz
	F_{4APCP-}							350	500	—	
APC Hold Range (4.43 MHz)	F_{4APCH+}							350	500	—	Hz
	F_{4APCH-}							350	500	—	
APC Pull-In Range (3.58 MHz)	F_{3APCP+}			350	500			—	Hz		
	F_{3APCP-}			350	500			—			
APC Hold Range (3.58 MHz)	F_{3APCH+}			350	500			—	Hz		
	F_{3APCH-}			350	500			—			
APC Control Sensitivity (4.43 MHz)	β_{443}			—	C_{10}	0.8	1.0	1.2	Hz / mV		
APC Control Sensitivity (3.58 MHz)	β_{358}					0.7	0.9	1.1	Hz / mV		

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
PAL ID Sensitivity (Normal Mode)	VPALIDON	—	C11	1.0	3.0	5.0	mV _{p-p}
	VPALIDOFF			1.0	3.0	5.0	
NTSC ID Sensitivity (Normal Mode)	VNTIDON			0.4	0.8	1.2	mV _{p-p}
	VNTIDOFF			0.4	0.8	1.2	
NTSC ID Sensitivity (Low Mode)	VNTIDLON			2	4	6	mV _{p-p}
	VNTIDLOFF			2	4	6	
ID Output Level	VIDH	—	C12	2.9	3.2	3.5	V
	VIDL			1.5	1.8	2.1	
SECAM ID Det. Current	I _{SECAM}	—	C13	50	70	150	μA
SECAM ID Det. Current (Strong)	I _{SECAM-S}	—	C14	220	300	380	μA
fsc Continuous Wave Output Level	V _{CW}	—	C15	0.35	0.50	0.70	V _{p-p}
Sub-Carrier Remain on RGB Output	V _{SCR}	—	C16	0	20	40	mV _{p-p}
	V _{SCG}			0	20	40	
	V _{SCB}			0	20	40	
Half Tone Chara. for C	G _{HTC}	—	C17	-6.9	-6.0	-5.1	dB
Freerun Frequency	f ₀₃	—	C18	-200	0	200	Hz
	f ₀₄	—		-200	0	200	
	f _{0M}	—		-200	0	200	
	f _{0N}	—		-200	0	200	

Text stage (Unless otherwise specified, $V_{CC} = 9\text{ V}$ (3, 17, 28 & 52 pin) / 5 V (36 & 46 pin), $T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
V-BLK Pulse Output Level	V_{VBLK}	—	T_1	0.5	1.0	1.5	V	
H-BLK Pulse Output Level	V_{HBLK}			0.5	1.0	1.5	V	
RGB Output Black Level (0 IRE DC)	V_{BLACK}	—	T_2	2.35	2.60	2.85	V	
RGB Output White Level (100 IRE AC)	V_{WHITE}	—	T_3	—	2.50	—	V_{p-p}	
Cut-Off Voltage Variable Range	ΔV_{CUT+}	—	T_4	0.45	0.50	0.55	V	
	ΔV_{CUT-}			-0.55	-0.50	-0.45		
Drive Control Variable Range	G_{DR+}	—	T_5	3.0	3.5	4.0	dB	
	G_{DR-}			-6.0	-5.5	-5.0		
ABCL Control Voltage Range	V_{ABCLH}	—	T_6	5.9	6.0	6.1	V	
	V_{ABCLL}			5.4	5.5	5.6		
ACL Gain	G_{ACL}	—		-16.5	-15	-13.5	dB	
ABL Point	V_{ABLP1}	—	T_7	-0.06	-0.01	0.04	V	
	V_{ABLP2}			-0.16	-0.11	-0.06		
	V_{ABLP3}			-0.35	-0.30	-0.25		
	V_{ABLP4}			-0.47	-0.42	-0.37		
ABL Gain	V_{ABLG1}	—	T_8	-0.17	-0.12	-0.07	V	
	V_{ABLG2}			-0.42	-0.37	-0.32		
	V_{ABLG3}			-0.69	-0.64	-0.59		
	V_{ABLG4}			-0.79	-0.74	-0.69		
Analog RGB Dynamic Range	DR_{TX}	—	T_9	0.5	—	—	V_{p-p}	
Analog RGB Contrast Control Characteristic	MAX.	G_{TXCMAX}	—	T_{10}	0.85	1.00	1.20	V_{p-p}
	CEN.	G_{TXCCEN}			0.50	0.59	0.71	
	MIN.	G_{TXCMIN}			0.08	0.10	0.12	
Analog RGB Brightness Control Characteristic	MAX.	$V_{TXBRMAX}$	—	T_{11}	3.0	3.4	3.7	V
	CEN.	$V_{TXBRCEN}$			2.3	2.6	2.8	
	MIN.	$V_{TXBRMIN}$			1.6	1.9	2.1	
Analog RGB Mode Switching Level	V_{YS}	—	T_{12}	0.6	0.8	1.0	V	
Analog RGB Mode Transfer Characteristic	τ_{RYS}	—	T_{13}	—	25	100	ns	
	t_{PRYS}			—	30	100		
	τ_{FYS}			—	10	100		
	t_{PFYS}			—	25	100		
Cross Talk from Analog RGB to TV	CT_{TX-TV}	—	T_{14}	—	-55	-50	dB	
Cross Talk from TV to Analog RGB	CT_{TV-TX}	—	T_{15}	—	-55	-50	dB	

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
RGB Output Amplitude	R	V _{ROUT}	—	T ₁₆	1.0	1.2	1.4	V _{p-p}
	G	V _{GOUT}			0.45	0.60	0.75	
	B	V _{BOUT}			2.0	2.2	2.4	
SECAM Black Level Adj. Chara.		V _{SECBMAX}	—	T ₁₇	210	245	280	mV
		—			—	—	—	
		V _{SECRMAX}			133	154	175	mV
		V _{SECBMIN}			-320	-280	-240	
	V _{SECRMIN}	-200	-176	-152				
SECAM Black Level Adj. Data Sensitivity		ΔV _{SECB}	—	T ₁₇	30	35	40	mV
		ΔV _{SECR}			19	22	25	
SECAM Black Level Alignment Mode Gain		G _{BS}	—	T ₁₈	-2.4	-0.5	1.1	dB
		G _{RS}			-2.4	-0.5	1.1	
SECAM Black Level Alignment Mode Analog RGC Mode SW Level		V _{YSS}	—	T ₁₉	0.6	0.8	1.0	V
Half Tone Mode SW Level		V _{YM1}	—	T ₂₀	0.6	0.8	1.0	V
Half Tone→Analog RGB Mode SW Level		V _{YM2}			2.2	2.4	2.6	
Half Tone Mode Transfer Characteristic		τ _{RYM1}	—	T ₂₁	—	25	100	ns
		t _{PRYM1}			—	30	100	
		τ _{FYM1}			—	10	100	
		t _{PFYM1}			—	25	100	
Half Tone→Analog RGB Mode Transfer Characteristic		τ _{RYM2}	—	T ₂₁	—	25	100	ns
		t _{PRYM2}			—	30	100	
		τ _{FYM2}			—	10	100	
		t _{PFYM2}			—	25	100	
RGB Output Voltage Axes Difference		ΔV _{bct}	—	T ₂₂	—	0	40	mV
RGB Output Amplitude Axes Difference		ΔV _a	—	T ₂₃	—	0	10	mV

1 H DL stage (Unless otherwise specified, $V_{CC} = 9\text{ V}$ (3, 17, 28 & 52 pin) / 5 V (36 & 46 pin), $T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
1 H DL Dynamic Range (Direct)	DR _{BDR}	—	Pin 37~Pin 20	0.8	1.2	—	V
	DR _{RDR}		Pin 38~Pin 18	0.8	1.2	—	
1 H DL Dynamic Range (Delay)	DR _{BDL}	—	Pin 37~Pin 20	0.8	1.2	—	V
	DR _{RDL}		Pin 38~Pin 18	0.8	1.2	—	
1 H DL Dynamic Range (Direct + Delay)	DR _{BDRDL}	—	Pin 37~Pin 20	0.9	1.2	—	V
	DR _{RDRDL}		Pin 38~Pin 18	0.9	1.2	—	
Frequency Response (Direct)	FR _{BDR}	—	At 700 kHz	-3.0	-2.0	0.5	dB
	FR _{RDR}		At 700 kHz	-3.0	-2.0	0.5	
Frequency Response (Delay)	FR _{BDL}	—	At 700 kHz	-8.2	-6.5	-4.3	dB
	FR _{RDL}		At 700 kHz	-8.2	-6.5	-4.3	
AC Gain (Direct)	GBDR	—	Pin 37~Pin 20	-2.0	-0.5	2.0	dB
	GRDR		Pin 38~Pin 18	-2.0	-0.5	2.0	
AC Gain (Delay)	GBDL	—	Pin 37~Pin 20	-2.4	-0.5	1.1	dB
	GRDL		Pin 38~Pin 18	-2.4	-0.5	1.1	
Direct-Delay AC Gain Difference	Δ GBDR / DL	—	GBDR-GBDL	-1.0	0.0	1.0	dB
	Δ GRDR / DL		GRDR-GRDL	-1.0	0.0	1.0	
1 H Delay Time	T _{BDL}	—	Pin 37~Pin 20	63.7	64.0	64.4	μs
	T _{RDL}		Pin 38~Pin 18	63.7	64.0	64.4	

DEF stage (Unless otherwise specified, $V_{CC} = 9\text{ V}$ (3, 17, 28 & 52 pin) / 5 V (36 & 46 pin), $T_a = 25^\circ\text{C}$)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
AFC Inactive Period	50 Hz	$T_{50\text{AFCOFF}}$	—	D ₁	—	309-8	—	H
	60 Hz	$T_{60\text{AFCOFF}}$			—	256-10	—	
H-OUT Start Voltage		V_{HON}	—	D ₂	5.5	—	—	V
H-OUT Pulse Duty		W_{HOUT}	—	D ₃	38.5	40.5	42.5	%
H-OUT Freq. on AFC Stop Mode		F_{HAFCOFF}	—	D ₄	15.585	15.734	15.885	kHz
Horizontal Free-Run Frequency	50 Hz	F_{H50FR}	—	D ₅	15.745	15.625	15.775	kHz
	60 Hz	F_{H60FR}			15.585	15.734	15.885	
Horizontal Freq. Variable Range	MAX.	F_{HMAX}	—	D ₆	16.500	16.700	16.900	kHz
	MIN.	F_{HMIN}			14.700	15.000	15.300	
Horizontal Freq. Control Sensitivity		β_{HAFC}	—	D ₇	2.0	2.5	3.0	Hz / mV
Horizontal Pull-In Range		F_{HPH}	—	D ₈	500	—	—	Hz
		F_{HPL}			500	—	—	
H-OUT Voltage		V_{HOUTH}	—	D ₉	4.0	4.4	4.8	V
		V_{HOUTL}			—	0.15	0.30	
Horizontal Freq. Dependence on V_{CC}		ΔF_{HVCC}	—	D ₁₀	-20	0	20	Hz / V
FBP Phase		PH_{FBP}	—	D ₁₁	2.3	2.5	2.7	μs
H-Sync. Phase		PH_{HSYNC}			0.2	0.3	0.4	
Horizontal Position Variable Range		ΔPH_{HPOS}	—	D ₁₂	5.5	6.0	6.5	μs
AFC-2 Pulse Threshold Level		V_{AFC2}	—	D ₁₃	3.3	3.5	3.7	V
H-BLK Pulse Threshold Level		V_{HBLK}		D ₁₄	0.8	1.1	1.4	
Black Peak Det. Stop Period (H)		PH_{BPDET}	—	D ₁₅	7.5	8.0	8.5	μs
		W_{BPDET}			13.0	13.5	14.0	
Clamp Pulse Start Phase		PH_{CP}	—	D ₁₆	2.8	3.0	3.2	μs
Clamp Pulse Width		W_{CP}			5.6	5.8	6.0	
Gate Pulse Start Phase		PH_{GP}	—	D ₁₇	2.7	2.9	3.1	μs
Gate Pulse Width		W_{GP}			1.8	2.0	2.2	
Sync. Output Low Level		V_{SYNCL}	—	D ₁₈	0.0	0.3	0.5	V
Vertical Oscillation Start Voltage		V_{VON}	—	D ₁₉	4.7	5.0	5.3	V
Vertical Free-Run Frequency	Auto	F_{VAUFR}	—	D ₂₀	40	45	50	Hz
	60 Hz	F_{V60FR}			48	53	58	
Gate Pulse V-Masking Period	50 Hz	$T_{50\text{GPM}}$	—	D ₂₁	—	308-9	—	H
	60 Hz	$T_{60\text{GPM}}$			—	261-10	—	
V.Ramp DC on Service Mode		V_{NOVRAMP}	—	D ₂₂	3.0	3.2	3.4	V
Vertical Pull-In Range (Auto)		F_{VPAUL}	—	D ₂₃	—	224.5	—	H
		F_{VPAUH}			—	353	—	
Vertical Pull-In Range (60 Hz)		F_{VP60L}	—	D ₂₃	—	224.5	—	H
		F_{VP60H}			—	297	—	

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Vertical Period on Fixed Mode	TV313	—	D ₂₄	—	313	—	H
	TV263			—	263	—	
V-BLK Start Phase	50 Hz PH50VBLK	—	D ₂₅	44	46	48	μ s
	60 Hz PH60VBLK			44	46	48	
V-BLK Width	50 Hz W50VBLK	—	D ₂₅	—	23	—	H
	60 Hz W60VBLK			—	21	—	
Picture Mute Period	50 Hz W50PM	—	D ₂₆	—	304-29	—	H
	60 Hz W60PM			—	257-28	—	
Sand Castle Pulse Level	V _{SCPH}	—	D ₂₇	7.70	8.00	8.30	V
	V _{SCPM}			4.00	4.30	4.60	
	V _{SCPL}			2.25	2.55	2.85	
Vertical Ramp Amplitude	V _{VRAMP}	—	D ₂₈	1.50	1.67	1.83	V _{p-p}
Vertical AMP Gain	GVAMP	—	D ₂₉	22	25	28	dB
Vertical AMP Max. Output Level	V _{VOMAX}			2.5	3.0	3.5	V
Vertical AMP Min. Output Level	V _{VOMIN}			—	0.0	0.3	V
Vertical AMP Min. Output Current	I _{VOMAX}	—	D ₃₀	11	14	17	mA
Vertical NFB Amplitude	V _{NFB}	—	D ₃₁	1.50	1.67	1.83	V _{p-p}
Vertical Amplitude Variable Range	Δ V _{VRAMPH}			36	40	44	%
	Δ V _{VRAMPL}	-44	-40	-36			
Vertical Linearity Variable Range	Δ V _{LIN1+}	—	D ₃₂	-17	-14	-11	%
	Δ V _{LIN1-}			13	16	19	
	Δ V _{LIN2+}			14.5	17.5	20.5	
	Δ V _{LIN2-}			-23	-20	-17	
Vertical S Correction Variable Range	Δ V _{S1+}	—	D ₃₃	-14	-12	-10	%
	Δ V _{S1-}			10	12	14	
	Δ V _{S2+}			-18	-15	-12	
	Δ V _{S2-}			12	15	18	
V-AGC Current	I _{VAGCH}	—	D ₃₄	440	550	660	μ A
	I _{VAGCL}			100	120	140	μ A
Vertical Guard Voltage	V _{VG}	—	D ₃₅	1.80	2.00	2.20	V
BGP Phase	Δ BGP	—	D ₃₆	1.45	1.50	1.55	μ s

Deflection collection stage (EW correction)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Vertical Amplitude EHT Correction	V _{EHT}	—	D ₃₇	4	5	6	%
E-W MAX. DC (Picture Width)	V _{35H}	—	D ₃₈	4.9	5.0	5.1	V
E-W MIN. DC (Picture Width)	V _{35L}	—		2.75	3.0	3.25	V
E-W MAX. Parabolic Correction (Parabola)	V _{PBH}	—	D ₃₉	0.9	1.1	1.3	V _{p-p}
E-W Corner Correction (Corner)	V _{CR}	—	D ₄₀	0.31	0.4	0.49	V _{p-p}
E-W Trapezium Correction	V _{TR}	—	D ₄₁	± 5.2	± 6.5	± 7.8	%
E-W Parabolic EHT Correction	V _{EHP}	—	D ₄₂	4.0	6.0	8.0	%
E-W DC EHT Correction	V _{EHD}	—	D ₄₃	0.32	0.4	0.48	V
E-W Amplifier Output Resistance	REW	—	D ₄₄	80	100	120	Ω

TEST CONDITION

PIF stage (Unless otherwise specified, $V_{CC} = 9V$ (3, 17, 28 & 52 pin)/ $5V$ (36 & 46 pin), $T_a = 25^\circ C$)

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
P1	PIF Det. Output Level /VDET875 /VDETLS /VDET110	RF AGC : except 0 PIF VCO : adjust V_i Pol : 0/1 Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, 87.5% modulated white signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Measure the amplitude of PIF det. output at Pin 47 (V_i Pol : 0), that is "VDET875". (4) Input a 38.9 MHz, 90 dB μ V, 87.5% modulated L-SECAM white signal into Pin 6. (5) Measure the amplitude of PIF det. output at Pin 47 (V_i Pol : 1), that is "VDETLS". (6) Input a 38.9 MHz, 90 dB μ V, 110% modulated white signal into Pin 6. (7) Measure the amplitude of PIF det. output at Pin 47 (V_i Pol : 0), that is "VDET110".
P2	PIF Input Sensitivity /EPIFINMIN /EPIFINMAX	RF AGC : except 0 PIF VCO : adjust Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, 87.5% modulated white signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Decreasing the IF input level, measure the input level at which PIF det. output amplitude turns to be -3 dB against VDET875 that is "EPIFINMIN". (4) Increasing the IF input level, measure the input level at which PIF det. output amplitude turns to be -0.5 dB against VDET875 that is "EPIFINMAX". (5) Calculate ; "ΔEIFAGC" = EPIFINMAX - EPIFINMIN
	IF AGC Range /ΔEIFAGC		
P3	PIF Det. Sync. Tip Level /VSYNC	RF AGC : except 0 PIF VCO : adjust V_i Pol : 0/1 Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, non-modulation signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Measure the DC level at Pin 47 (V_i Pol : 0), that is "VSYNC". (4) Measure the DC level at Pin 47 (V_i Pol : 1), that is "VLSW".
	L-SECAM White Peak Level /VLSW		

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
P4	Output Level for No Input /V _{NOIF} /V _{NOIFLS}	RF AGC : except 0 V _i Pol : 0 / 1 Others : Preset	(1) Connect Pin 6 / 7 to GND. (2) Supply 3.0 V to Pin 9. (3) Measure the DC level at Pin 47 (V _i Pol : 0), that is "V _{NOIF} ". (4) Measure the DC level at Pin 47 (V _i Pol : 1), that is "V _{NOIFLS} ".
P5	Differential Gain /DG	RF AGC : except 0 PIF VCO : adjust Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, 87.5% modulated video signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Measure "DG" & "DP" for Pin 47 output.
	Differential Phase /DP		
P6	PIF Output Freq. Response /FR _{DET}	RF AGC : except 0 PIF VCO : adjust Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, 87.5% modulated sweep video signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Measure the Pin 9 DC level and fix it on that value. (4) For PIF det. output signal, measure the frequency at which the amplitude (Without sync) turns to be -3 dB against the one for 10 kHz, that is "FR _{DET} "
P7	S / N /S / N _{PIF}	RF AGC : except 0 PIF VCO : adjust Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, non-modulation signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Measure the amplitude of PIF det. output, that is V _N . (4) Calculate ; "S / N _{PIF} " = 20 * log (V _{DET875} / V _N)
P8	Intermodulation /I ₁₀₇	RF AGC : except 0 PIF VCO : adjust Others : Preset	(1) Input a signal composed of following 3 signals into Pin 6; 38.9 MHz / 90 dB μ V, 34.47 MHz / 84 dB μ V 33.4 MHz / 84 dB μ V (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Adjust Pin 9 voltage so that the bottom of PIF det. output is equal to V _{SYNC} . (4) Measure the 1.07 MHz level against the 4.43 MHz level (= 0 dB), that is "I ₁₀₇ "

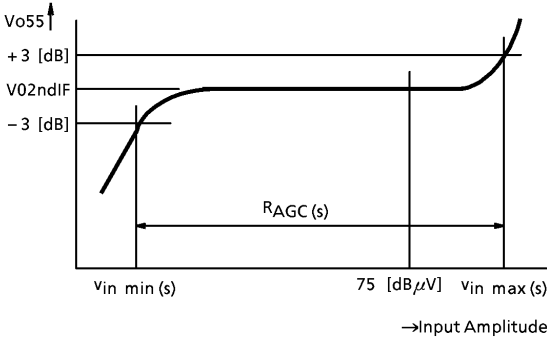
NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
P9	IF AGC Voltage /VIFAGCMAX /VIFAGCMIN	RF AGC : except 0 PIF VCO : adjust Others : Preset	(1) Connect Pin 6 / 7 to GND. (2) Measure the Pin 9 voltage, that is "VIFAGCMAX". (3) Input a 38.9 MHz, 107 dB μ V, non-modulation signal into Pin 6. (4) Adjust PIF VCO so that the AFT voltage is 2.5 V. (5) Measure the Pin 9 voltage, that is "VIFAGCMIN".
P10	RF AGC Voltage /VRFAGCMIN /VRFAGCMAX	RF AGC : adjust PIF VCO : adjust Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, non-modulation signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Adjust RF AGC so that the Pin 9 voltage is 4.5 V. (4) Increase the IF input level to 107 dB μ V. (5) Measure the Pin 8 voltage, that is "VRFAGCMIN" (6) Connect Pin 6 / 7 to GND. (7) Measure the Pin 8 voltage, that is "VRFAGCMAX"
P11	RF AGC Control Range / Δ ERFAGC	RF AGC : 1 / 63 PIF VCO : adjust Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, non-modulation signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Set RF AGC to 1. (4) Decreasing the IF input level, measure the input level at which the Pin 8 voltage is 4.5 V, that is ERFAGCMIN. (5) Set RF AGC to 63. (6) Increasing the IF input level, measure the input level at which the Pin 8 voltage is 4.5 V, that is ERFAGCMAX. (7) Calculate ; $" \Delta \text{ERFAGC} " = \text{ERFAGCMAX} - \text{ERFAGCMIN}$
P12	AFT Center Voltage /VAFTCEN	RF AGC : except 0 Others : Preset	(1) Connect Pin 6 / 7 to GND. (2) Supply 3 V to Pin 9. (3) Measure the Pin 4 voltage, that is "VAFTCEN".

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
P13	AFT Voltage / V_{AFTMAX} / V_{AFTMIN}	RF AGC : except 0 PIF VCO : adjust Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, 87.5% modulated video signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Input a 37.9 MHz, 90 dB μ V, 87.5% modulated video signal into Pin 6. (4) Measure the Pin 4 voltage, that is " V_{AFTMAX} " (5) Input a 39.9 MHz, 90 dB μ V, 87.5% modulated video signal into Pin 6. (6) Measure the Pin 4 voltage, that is " V_{AFTMIN} "
P14	AFT Sensitivity / μ AFT	RF AGC : except 0 PIF VCO : adjust Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, non-modulation signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) When changing the input frequency to ± 20 kHz, measure the change of Pin 4 voltage, that is ΔV_{AFT} . (4) Calculate ; " μ AFT" = $40 / \Delta V_{AFT}$
P15	PIF VCO Control Sensitivity / β_{IFVCO}	RF AGC : except 0 PIF VCO : adjust Others : Preset	(1) Input a 38.9 MHz, 90 dB μ V, non-modulation signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Measure the Pin 48 voltage, that is $V_{LOOP389}$. (4) Input a 38.7 MHz, 90 dB μ V, non-modulation signal into Pin 6. (5) Measure the Pin 48 voltage, that is $V_{LOOP387}$. (6) Calculate ; " β_{IFVCO} " = $0.2 / (V_{LOOP387} - V_{LOOP389})$
P16	PIF VCO Pull-In Range / F_{PIFINH} / F_{PIFINL}	RF AGC : except 0 PIF VCO : adjust Others : Preset	(1) Input a 45 MHz, 90 dB μ V, 87.5% modulated video signal into Pin 6. (2) Adjust PIF VCO so that the AFT voltage is 2.5 V. (3) Decreasing the input frequency, measure the frequency at which detected video signal appears on Pin 47, that is " F_{PIFINH} " (4) Input a 30 MHz, 90 dB μ V, 87.5% modulated video signal into Pin 6. (5) Increasing the input frequency, measure the frequency at which detected video signal appears on Pin 47, that is " F_{PIFINL} "
P17	PIF Input Resistance / $Z_{in R}(\rho)$ PIF Input Capacity / $Z_{in C}(\rho)$	All : preset	(1) Remove all connections from pin 6 and pin 7. (2) Measure resistance between pin 6 and pin 7 by impedance meter, that is " $Z_{in R}(\rho)$ ", and measure capacitance of this pin by impedance meter, that is " $Z_{in C}(\rho)$ "

SIF & audio stage
 (Unless otherwise specified, $V_{CC} = 9\text{ V}$ (3, 17, 28 & 52 pin) / 5 V (36 & 46 pin), $T_a = 25^\circ\text{C}$)

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
S1	FM Det. Output Level /VAUAC5P /VAUAC4P /VAUAC4N	Au Gain : 0 / 1 AF-G : 0 / 1 Others : Preset	(1) Input a 5.5 MHz, 90 dB μ V FM signal (Modulate 400 Hz with 50 kHz deviation) into Pin 53. (2) Measure the output amplitude at Pin 2, that is "VAUAC5P". (Au Gain : 0, AF-G : 0) (3) Input a 4.5 MHz, 90 dB μ V FM signal (Modulate 400 Hz with 50 kHz deviation) into Pin 53. (4) Measure the output amplitude at Pin 2, that is "VAUAC4P". (Au Gain : 0, AF-G : 0) (5) Input a 4.5 MHz, 90 dB μ V FM signal (Modulate 400 Hz with 25 kHz deviation) into Pin 53. (6) Measure the output amplitude at Pin 2, that is "VAUAC4N". (Au Gain : 1, AF-G : 1)
S2	Audio Distortion /DAUDIO	All : Preset	(1) Input a 5.5 MHz, 90 dB μ V FM signal (Modulate 400 Hz with 50 kHz deviation) into Pin 53. (2) Measure the distortion of Pin 2 output, that is "DAUDIOP". (3) Input a 4.5 MHz, 90 dB μ V FM signal (Modulate 400 Hz with 25 kHz deviation) into Pin 53. (4) Measure the distortion of Pin 2 output, that is "DAUDION".
S3	Audio S / N /S / NSIF	All : Preset	(1) Input a 5.5 MHz, 90 dB μ V non-modulation signal into Pin 53. (2) Measure the output amplitude at Pin 2, that is $V_{NOAUACP}$. (3) Calculate ; "S / NSIFP" = $20 \cdot \log (V_{AUAC5P} / V_{NOAUACP})$ (4) Input a 4.5 MHz, 90 dB μ V non-modulation signal into Pin 53. (5) Measure the output amplitude at Pin 2, that is $V_{NOAUACN}$. (6) Calculate ; "S / NSIFN" = $20 \cdot \log (V_{AUAC5P} / V_{NOAUACN})$

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
S4	AMR /AMR	All : Preset	(1) Input a 5.5 MHz, 90 dB μ V AM signal (Modulate 400 Hz with 30%) into Pin 53. (2) Measure the output amplitude at Pin 2, that is V _{AMAU} . (3) Calculate ; "AMR" = 20* \log (V _{AUAC5P} /V _{AMAU})
S5	Limiting Sensitivity /ELIM	All : Preset	(1) Input a 5.5 MHz, 90 dB μ V FM signal (Modulate 400 Hz with 50 kHz deviation) into Pin 53. (2) Decreasing the input level, measure the input level at which Pin 2 output amplitude turns to be -3 dB against V _{AUAC5P} , that is "ELIM".
S6	Band Width (5.5 MHz / PAL) /FAUH5P /FAUL5P	All : Preset	(1) Input a 5.5 MHz, 90 dB μ V FM signal (Modulate 400 Hz with 50 kHz deviation) into Pin 53. (2) Increasing the input frequency, measure the frequency at which Pin 2 output turns to be -3 dB against V _{AUAC5P} , that is "FAUH5P". (2) Decreasing the input frequency, measure the frequency at which Pin 2 output turns to be -3 dB against V _{AUAC5P} , that is "FAUL5P".
S7	Band Width (4.5 MHz / NTSC) /FAUH4N /FAUL4N	Au Gain : 1 AF-G : 1 Others : Preset	(1) Input a 4.5 MHz, 90 dB μ V FM signal (Modulate 400 Hz with 25 kHz deviation) into Pin 53. (2) Increasing the input frequency, measure the frequency at which Pin 2 output turns to be -3 dB against V _{AUAC4N} , that is "FAUH4N". (3) Decreasing the input frequency, measure the frequency at which Pin 2 output turns to be -3 dB against V _{AUAC4N} , that is "FAUL4N".

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
S8	SIF MAX. Permissible Input / $V_{in\ MAX}(S)$ SIF AGC Range / $R_{AGC}(s)$	All : Preset	(1) Input a 38.9 MHz, 85 dB μ continuous wave into pin 6, 33.4 MHz, 75 dB μ continuous wave into pin 4. (2) Measure the amplitude of the waveform at pin 55, that is v_{02ndIF} . (3) Increasing the amplitude of Input signal, measure the amplitude of waveform at pin 55 that is +3 [dB] up from v_{02ndIF} , that is " $V_{in\ MAX}(S)$ " (4) Increasing the amplitude of Input signal, measure the amplitude of waveform at pin 55 that is 3 [dB] down from v_{02ndIF} , that is " $V_{in\ MIN}(S)$ " (5) " $R_{AGC}(s) = V_{in\ MAX}(S) - V_{in\ MIN}(S)$ " 
S9	SIF Input Resistance / $Z_{in\ R}(s)$ SIF Input Capacity / $Z_{in\ C}(s)$	All : Preset	(1) Remove all connections from pin 4. (2) Measure resistance between pin 4 and pin 5 by Impedance meter, that is " $Z_{in\ R}(s)$ ", and measure capacitance of this pin by impedance meter, that is " $Z_{in\ C}(s)$ ".

Video stage (Unless otherwise specified, $V_{CC} = 9V$ (3, 17, 28 & 52 pin) / $5V$ (36 & 46 pin), $T_a = 25^\circ C$)

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
V1	Y Input Dynamic Range / DR_Y	Uni-Color : 32 Brightness : 0 Color : 0 Others : Preset	(1) Input a white signal with sync into Pin 43 & 39. (2) Increasing the Pin 39 input amplitude, measure the amplitude (include sync) at which the Pin 18 output is clipped, that is "DR _Y ".
V2	Y Input Pedestal Clamp Voltage / V_{YCLP}	All : Preset	(1) Input a composite sync signal into Pin 43. (2) Connect Pin 39 to GND via a 1 μF capacitor. (3) Measure the DC Voltage at Pin 39, that is "V _{YCLP} ".
V3	Y Delay Time / t_{YDEL}	Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 2 T pulse with sync into Pin 43 & 39. (2) Observe the Pin 18 output, measure the delay time between Pin 39 and Pin 18, that is "t _{YDEL} ".
V4	Brightness Characteristics / V_{BRTMAX} / V_{BRTCEN} / V_{BRTMIN}	Brightness : 0 / 64 / 127 Color : 0 Others : Preset	(1) Input a 0 IRE black signal with sync into Pin 43 & 39. (2) Measure the DC level of picture period at Pin 18 for Brightness : 127 / 64 / 0, that is "V _{BRTMAX} " / "V _{BRTCEN} " / "V _{BRTMIN} ". (3) Calculate ; "ΔV _{BRT} " = (V _{BRTMAX} - V _{BRTMIN}) / 127
	Brightness Data Sensitivity / ΔV_{BRT}		
V5	Uni-Color Characteristics for Y / G_{UCYMAX} / G_{UCYCEN} / G_{UCYMIN}	Uni-Color : 0 / 32 / 63 Color : 0 Others : Preset	(1) Input a 50 IRE (0.357 V) white signal with sync into Pin 43 & 39. (2) Measure the output picture amplitude at Pin 18 for Uni-Color 63 / 32 / 0, that is $V_{UCYMAX} / V_{UCYCEN} \setminus V_{UCYMIN}$. (3) Calculate ; "G _{UCYMAX} " = 20 * log (V _{UCYMAX} / 0.357) "G _{UCYCEN} " = 20 * log (V _{UCYCEN} / 0.357) "G _{UCYMIN} " = 20 * log (V _{UCYMIN} / 0.357)
V6	Sub-Contrast Characteristics / $G_{SCONMAX}$ / $G_{SCONMIN}$	Sub-Contrast : 0 / 8 / 15 Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 50 IRE white signal with sync into Pin 43 & 39. (2) Measure the output picture amplitude at Pin 18 for Sub-Contrast 15 / 8 / 0, that is $V_{SCONMAX} / V_{SCONCEN} \setminus V_{SCONMIN}$. (3) Calculate ; "G _{SCONMAX} " = 20 * log (V _{SCONMAX} / V _{SCONCEN}) "G _{SCONMIN} " = 20 * log (V _{SCONMIN} / V _{SCONCEN})

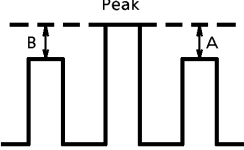
NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
V7	Sharpness Peaking Frequency / F _{SHP}	Sharpness : 63 Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 0.5 V _{p-p} sweep signal with sync into Pin 43 & 39. (2) Measure the frequency at which the Pin 18 output amplitude is Max., that is "F _{SHP} ".
V8	Sharpness Control Characteristics / G _{SHMAX} / G _{SHCEN} / G _{SHMIN}	Sharpness : 0 / 32 / 63 Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 0.5 V _{p-p} sweep signal with sync into Pin 43 & 39. (2) Measure the output picture amplitude for 100 kHz at Pin 18, that is V _{SH100k} . (3) Measure the output picture amplitude for F _{SHP} when Sharpness is max., center and min., that is V _{SHMAX} , V _{SHCEN} and V _{SHMIN} . (4) Calculate ; "G _{SHMAX} " = 20*log (V _{SHMAX} /V _{SH100k}) "G _{SHCEN} " = 20*log (V _{SHCEN} /V _{SH100k}) "G _{SHMIN} " = 20*log (V _{SHMIN} /V _{SH100k})
V9	Y Frequency Response / F _{RY}	Uni-Color : 63 Sharpness : Adjust Color : 0 Others : Preset	(1) Input a 0.5 V _{p-p} sweep signal with sync into Pin 43 & 39. (2) Adjust Sharpness so that the output amplitude for F _{SHP} equals V _{SH100k} . (3) Measure the frequency at which the output amplitude is 3 dB down against V _{SH100k} , which is "F _{RY} ".
V10	Black Expansion Start Point / V _{BLEX}	Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 100 IRE ramp signal with sync into Pin 43 & 39. (2) Supply 2.4 V / 2.0 V to Pin 44 and observe the Pin 18 output. (3) Measure "V _{BLEX} " and "G _{BLEX} ". <div style="text-align: center;"> <p>[Pin 18 Output]</p> <p>Pin 44 : 2.4 V</p> <p>Pin 44 : 2.0 V</p> <p>G_{BLEX} : Ratio of slope below V_{BLEX}</p> <p>V_{BLEX}</p> </div>
	Black Expansion AMP Gain / G _{BLEX}		
V11	Black Peak Detection Level / ΔV _{BLPD}	Others : Preset	(1) Input a composite sync signal into Pin 43. (2) Increasing the Pin 39 DC level, measure the level at which the Pin 44 voltage drops down, that is V _{BLPD} . (3) Calculate ; "ΔV _{BLPD} " = V _{BLPD} - V ₃₉

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
V12	WPS Level /V _{WPS}	Uni-Color : 63 Brightness : 127 Color : 0 Others : Preset	(1) Input a 100 IRE ramp signal with sync into Pin 43 & 39. (2) Measure the amplitude from cut-off level to peak (At which output signal is clipped), that is "V _{WPS} ".
V13	Chroma Trap Gain /GTRAP 358, GTRAP 443	C-Trap : 0 / 1 Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 0.5 V _{p-p} , 3.58 MHz signal with sync into Pin 43 & 39. (2) Measure the 3.58 MHz amplitude at Pin 18 for Chroma Trap : 1 / 0, that is V _{TRAPON} / V _{TRAPOFF} . (3) Calculate ; "GTRAP358" = 20* \log (V _{TRAPON} / V _{TRAPOFF}) (4) Input a 0.5 V _{p-p} , 4.43 MHz signal with sync into Pin 43 & 39. (5) Measure the 4.43 MHz amplitude at Pin 18 for Chroma Trap : 1 / 0, that is V _{TRAPON} / V _{TRAPOFF} . (6) Calculate ; "GTRAP443" = 20* \log (V _{TRAPON} / V _{TRAPOFF})
V14	Half Tone Characteristics for Y /GHTY	Half Tone : 0 / 1 Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 100 IRE white signal with sync into Pin 43 & 39. (2) Measure the output picture amplitude at Pin 18 for Half Tone : 1 / 0, that is V _{HTYON} / V _{HTYOFF} . (3) Calculate ; "GHTY" = 20* \log (V _{HTYON} / V _{HTYOFF})

Chrome stage (Unless otherwise specified, $V_{CC} = 9\text{ V}$ (3, 17, 28 & 52 pin) / 5 V (36 & 46 pin), $T_a = 25^\circ\text{C}$)

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
C1	ACC Characteristics /V _{ACCH} /V _{ACCL}	Mute : 01 Uni-Color : 63 Others : Preset	(1) Input a 4.43 MHz PAL rainbow color-bar (300 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Changing the amplitude of burst and chroma, measure the input amplitude at which Pin 20 output amplitude is +1 dB / -1 dB against the one for 300 mV _{p-p} input, that is "V _{ACCH} " / "V _{ACCL} ".
C2	TOF Characteristics (4.43 MHz) /F _{0T443} /Q _{T443}	TEST : 01000111 C-BPF : 0 / 1 Color : 010 / 101 System : Preset Others : Preset	(1) Set C-BPF to 1 and Color System to 010. (2) Input a sweep signal into Pin 45. (3) Observe the frequency response at Pin 18 and measure the Peaking Frequency/Q of chroma filter, that is "F _{0T443} " / "Q _{T443} ". (4) Set C-BPF to 0 and Color System to 010 and repeat (2) & (3), that is "F _{0B443} " / "Q _{B443} ". (5) Set C-BPF to 1 and Color System to 101 and repeat (2) & (3), that is "F _{0T358} " / "Q _{T358} ". (6) Set C-BPF to 0 and Color System to 101 and repeat (2) & (3), that is "F _{0B358} " / "Q _{B358} ".
	BPF Characteristics (4.43 MHz) /F _{0B443} /Q _{B443}		
	TOF Characteristics (3.58 MHz) /F _{0T358} /Q _{T358}		
	BPF Characteristics (3.58 MHz) /F _{0B358} /Q _{B358}		
C3	C Delay Time /t _{CDEL}	Mute : 01 Uni-Color : 63 Others : Preset	(1) Input a 4.43 MHz, PAL rainbow color-bar (300 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Observe the Pin 18 output, measure the delay time between Pin 45 and Pin 18, that is "t _{CDEL} ". (3) Calculate ; "Δt _{Y/C} " = t _{YDEL} - t _{CDEL}
	Delay Time Difference between Y/C /Δt _{Y/C}		
C4	Color Characteristics /G _{COLMAX} /G _{COLMIN}	Color : 0 / 64 / 127 Mute : 01 Uni-Color : 63 Others : Preset	(1) Input a 4.43 MHz PAL rainbow color-bar (300 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Measure the Pin 18 amplitude for Color 127 / 64 / 0, that is V _{COLMAX} / V _{COLCEN} / V _{COLMIN} . (3) Calculate ; "G _{COLMAX} " = 20 * log (V _{COLMAX} / V _{COLCEN}) "G _{COLMIN} " = 20 * log (V _{COLMIN} / V _{COLCEN})

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
C5	Uni-Color Characteristics for C / GUCC	Uni-Color : 0 / 63 Mute : 01 Others : Preset	(1) Input a 4.43 MHz, PAL rainbow color-bar (300 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Measure the Pin 18 amplitude for Uni-Color 63 / 0, that is V _{UCCMAX} and V _{UCCMIN} . (3) Calculate ; "GUCC" = 20* \log (V _{UCCMIN} /V _{UCCMAX})
C6	Tint Characteristics (3.58 MHz) / $\Delta \theta_{358MAX}$ / $\Delta \theta_{358MIN}$	Tint : 0 / 64 / 127 Mute : 01 Uni-Color : 63 Others : Preset	(1) Input a 3.58 MHz NTSC rainbow color-bar (286 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Set Tint to 64 and adjust the burst phase so that the 6th bar of Pin 20 output is maximum, that is θ_{358CEN} . (3) Change Tint to 127 / 0 and adjust the burst phase so that the 6th bar of Pin 20 output is maximum, that is $\theta_{358MAX} / \theta_{358MIN}$. (4) Calculate ; " $\Delta \theta_{358MAX}$ " = -($\theta_{358MAX} - \theta_{358CEN}$) " $\Delta \theta_{358MIN}$ " = -($\theta_{358MIN} - \theta_{358CEN}$)
	Tint Characteristics (4.43 MHz) / $\Delta \theta_{443MAX}$ / $\Delta \theta_{443MIN}$		(5) Input a 4.43 MHz NTSC rainbow color-bar (286 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45 and repeat (2) & (3), that is $\theta_{443CEN} / \theta_{443MAX} / \theta_{443MIN}$. (6) Calculate ; " $\Delta \theta_{443MAX}$ " = -($\theta_{443MAX} - \theta_{443CEN}$) " $\Delta \theta_{443MIN}$ " = -($\theta_{443MIN} - \theta_{443CEN}$)
C7	Relative Amplitude (PAL) / V _{PR} / B / V _{PG} / B	Mute : 01 Uni-Color : 63 Others : Preset	(1) Input a 4.43 MHz, PAL rainbow color-bar (300 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Measure the amplitude of Pin 18 / 19 / 20 output, that is "V _{PROUT} " / "V _{PGOUT} " / "V _{PBOUT} ". (3) Calculate ; "V _{PR} / B" = V _{PROUT} / V _{PBOUT} "V _{PG} / B" = V _{PGOUT} / V _{PBOUT}
	Relative Amplitude (NTSC) / V _{NR} / B / V _{NG} / B		(4) Input a 3.58 MHz NTSC rainbow color-bar (286 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45, then repeat (2), that is V _{NROUT} / V _{NGOUT} / V _{NBOUT} . (5) Calculate ; "V _{NR} / B" = V _{NROUT} / V _{NBOUT} "V _{NG} / B" = V _{NGOUT} / V _{NBOUT}

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
C8	Relative Phase (PAL) / θ_{PR-B} / θ_{PG-B}	Mute : 01 Uni-Color : 63 Others : Preset	(1) Input a 4.43 MHz PAL rainbow color-bar (300mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Observe the Pin 18 / 19 / 20 output, measure the R / G / B modulation angle (θ_{PR} / θ_{PG} / θ_{PB}) according following figure and equality. $\theta_{P^*} = \theta_{0^*} - \left\{ \tan^{-1} \left(\frac{1}{\frac{2A}{B} + \sqrt{3}} \right) - 15 \right\}$  <p>For θ_{PR} ; Peak : 3rd bar, $\theta_{0R} = 90$ For θ_{PG} ; Peak (Negative) : 4th bar, $\theta_{0G} = 240$ For θ_{PB} ; Peak : 6th bar, $\theta_{0B} = 0$</p> (3) Calculate ; $\theta_{PR-B} = \theta_{PR} - \theta_{PB}$ $\theta_{PG-B} = \theta_{PG} - \theta_{PB}$
	Relative Phase (NTSC) / θ_{NR-B} / θ_{NG-B}		(4) Input a 3.58 MHz NTSC rainbow color-bar (286 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45, then repeat (2), that is θ_{NR} / θ_{NG} / θ_{NB} . (5) Calculate ; $\theta_{NR-B} = \theta_{NR} - \theta_{NB}$ $\theta_{NG-B} = \theta_{NG} - \theta_{NB}$

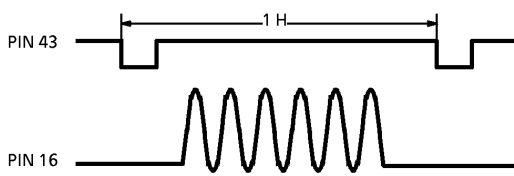
NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
C9	APC Pull-In Range (4.43 MHz) / ΔF_{4APCP+} / ΔF_{4APCP-}	Color System : 010 / 101 Others : Preset	(1) Input a 4.43 MHz PAL rainbow color-bar (300 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Set Color System to 010 (443 PAL). (3) For higher frequency than 4.43 MHz, measure the burst frequency at which Pin 29 DC level changes from low to high / from high to low, that is F_{4APCP+} / F_{4APCH+} . (4) For lower frequency than 4.43 MHz, repeat (2), that is F_{4APCP-} / F_{4APCH-} . (5) Calculate ; ΔF_{4APCP+} = $F_{4APCP+} - 4433619$ ΔF_{4APCP-} = $4433619 - F_{4APCP-}$ ΔF_{4APCH+} = $F_{4APCH+} - 4433619$ ΔF_{4APCH-} = $4433619 - F_{4APCH-}$ (6) Input a 3.58 MHz NTSC rainbow color-bar (286 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (7) Set Color System to 101 (358 NTSC). (8) For higher frequency than 3.58 MHz, repeat (2), that is F_{3APCP+} / F_{3APCH+} . (9) For lower frequency than 3.58 MHz, repeat (2), that is F_{3APCP-} / F_{3APCH-} . (10) Calculate ; ΔF_{3APCP+} = $F_{3APCP+} - 3579545$ ΔF_{3APCP-} = $3579545 - F_{3APCP-}$ ΔF_{3APCH+} = $F_{3APCH+} - 3579545$ ΔF_{3APCH-} = $3579545 - F_{3APCH-}$
	APC Hold Range (4.43 MHz) / ΔF_{4APCH+} / ΔF_{4APCH-}		
	APC Pull-In Range (3.58 MHz) / ΔF_{3APCP+} / ΔF_{3APCP-}		
	APC Hold Range (3.58 MHz) / ΔF_{3APCH+} / ΔF_{3APCH-}		

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
C10	APC Control Sensitivity (4.43 MHz) / β_{443}	Color System : 010 / 101 Others : Preset	(1) Connect Pin 45 to GND via a 1 μ F capacitor. (2) Set Color System to 010 (443 PAL). (3) Adjust Pin 10 voltage so that the Pin 29 output frequency is 4.433619 MHz, that is $V_{4APCCEN}$. (4) Measure the Pin 29 output frequency when Pin 10 voltage is $V_{4APCCEN} + 100$ mV / $V_{4APCCEN} - 100$ mV, that is F_{4APC+} / F_{4APC-} . (5) Calculate ; " β_{443} " = $(F_{4APC+} - F_{4APC-}) / 200$ (6) Set Color System to 101 (358 NTSC). (7) Adjust Pin 10 voltage so that the Pin 29 output frequency is 3.579545 MHz, that is $V_{3APCCEN}$. (8) Measure the Pin 29 output frequency when Pin 10 voltage is $V_{3APCCEN} + 100$ mV / $V_{3APCCEN} - 100$ mV, that is F_{3APC+} / F_{3APC-} . (9) Calculate ; " β_{358} " = $(F_{3APC+} - F_{3APC-}) / 200$
	APC Control Sensitivity (3.58 MHz) / β_{358}		
C11	PAL ID Sensitivity (Normal Mode) / $V_{PALIDON}$ / $V_{PALIDOFF}$	ID SW : 0 / 1 Color System : 010 / 101 Mute : 01 Uni-Color : 63 Others : Preset	(1) Set ID SW to 0. (2) Set Color System to 010 (443 PAL). (3) Input a 4.43 MHz PAL rainbow color-bar (300 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (4) Measure the burst amplitude at which Pin 29 DC level changes from low to high / from high to low, that is " $V_{PALIDON}$ " / " $V_{PALIDOFF}$ ". (5) Set Color System to 101 (358 NTSC). (6) Input a 3.58 MHz NTSC rainbow color-bar (286 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45, and repeat (3), that is " V_{NTIDON} " / " $V_{NTIDOFF}$ ". (7) Set ID SW to 1, repeat (2) ~ (6), that is " $V_{PALIDLON}$ ", " $V_{PALIDLOFF}$ ", " $V_{NTIDLON}$ ", " $V_{NTIDLOFF}$ ".
	PAL ID Sensitivity (Low Mode) / $V_{PALIDLON}$ / $V_{PALIDLOFF}$		
	NTSC ID Sensitivity (Normal Mode) / V_{NTIDON} / $V_{NTIDOFF}$		
	NTSC ID Sensitivity (Low Mode) / $V_{NTIDLON}$ / $V_{NTIDLOFF}$		
C12	ID Output Level / V_{IDH} / V_{IDL}	All : Preset	(1) Input a 4.43 MHz PAL color-bar (300 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Measure the center DC level of Pin 29 output, that is " V_{IDH} ". (3) Connect Pin 45 to GND via a 1 μ F capacitor and repeat (2), that is " V_{IDL} ".

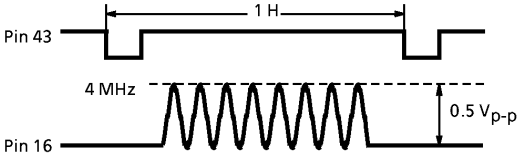
NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
C13	SECAM ID Det. Current /I _{SECAM}	All : Preset	(1) Input a 4.43 MHz NTSC color-bar with sync into Pin 43 & 45. (2) Connect Pin 37 / 38 to GND via a 0.1 μ F capacitor. (3) Pulling the current out of Pin 29, measure the current at which a demodulated output signal disappears at Pin 20, that is "I _{SECAM} ".
C14	SECAM ID Det. Current (Strong) /I _{SECAM-S}	All : Preset	(1) Input a PAL color-bar with sync into Pin 43 & 45. (2) Connect Pin 37 / 38 to GND via a 0.1 μ F capacitor. (3) Pulling the current out of Pin 29, measure the current at which a demodulated output signal disappears at Pin 20, that is "I _{SECAM-S} ".
C15	fsc Continuous Wave Output Level /V _{CW}	CW SW : 1 Others : Preset	Measure the amplitude of Pin 29 output, that is "V _{CW} ".
C16	Sub-Carrier Remain on RGB Output /V _{SCR} /V _{SCG} /V _{SCB}	Mute : 01 Uni-Color : 63 Others : Preset	(1) Input a 4.43 MHz PAL rainbow color-bar (300 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Measure the amplitude of 4.43 MHz signal at Pin 18 / 19 / 20, that is "V _{SCR} " / "V _{SCG} " / "V _{SCB} ".
C17	Half Tone Characteristics for C /G _{HTC}	Half Tone : 1 Mute : 01 Uni-Color : 63 Others : Preset	(1) Input a 4.43 MHz PAL rainbow color-bar (300 mV _{p-p} , burst : chroma = 1 : 1) with sync into Pin 43 & 45. (2) Set Half Tone to 1 and measure the amplitude of Pin 20 output, that is V _{PBHTC} . (3) Calculate ; "G _{HTC} " = 20 * log (V _{PBHTC} / V _{PBOUT})
C18	Freerun Frequency /f ₀₃ /f ₀₄ /f _{0M} /f _{0N}	Color system : 101 / 010 / 011 / 100 Others : Preset	(1) Measure the output frequency at the Pin 29 for the mode of the color system : 3.58 NTSC (101) / 4.43 PAL (010) / M-PAL (011) / N-PAL (100), that is /f ₀₃ / f ₀₄ / f _{0M} / f _{0N} .

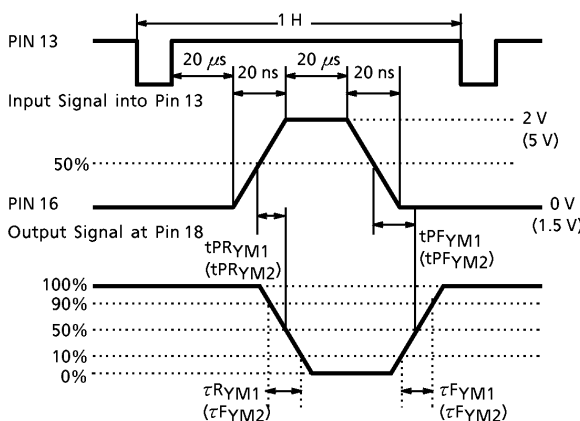
Text stage (Unless otherwise specified, $V_{CC} = 9V$ (3, 17, 28 & 52 pin) / $5V$ (36 & 46 pin), $T_a = 25^\circ C$)

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
T1	V-BLK Pulse Output Level / V_{VBLK}	All : Preset	(1) Input a composite sync signal into Pin 39, 43 & 45. (2) Measure the DC level of V/H blanking period at Pin 20, that is " V_{VBLK} " / " V_{HBLK} ".
	H-BLK Pulse Output Level / V_{HBLK}		
T2	RGB Output Black Level (0 IRE DC) / V_{BLACK}	Color : 0 Others : Preset	(1) Input a 0 IRE Y signal with sync into Pin 39, 43 & 45. (2) Measure the DC level of picture period at Pin 20, that is " V_{BLACK} ".
T3	RGB Output White Level (100 IRE AC) / V_{WHITE}	Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 100 IRE Y signal with sync into Pin 39, 43 & 45. (2) Measure the amplitude from 0 to 100 IRE at Pin 20, that is " V_{WHITE} ".
T4	Cut-Off Voltage Variable Range / ΔV_{CUT+} / ΔV_{CUT-}	B Cut Off : 0 / 255 Color : 0 Others : Preset	(1) Input a 0 IRE Y signal with sync into Pin 39, 43 & 45. (2) Measure the DC level of picture period at Pin 20 for B Cut-off : 255 / 0, that is V_{CUTMAX} / V_{CUTMIN} . (3) Calculate ; " ΔV_{CUT+} " = $V_{CUTMAX} - V_{BLACK}$ " ΔV_{CUT-} " = $V_{CUTMIN} - V_{BLACK}$
T5	Drive Control Variable Range / G_{DR+} / G_{DR-}	B Drive : 0 / 127 Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 100 IRE Y signal with sync into Pin 39, 43 & 45. (2) Measure the amplitude from 0 to 100 IRE at Pin20 for B drive 127 / 0, that is V_{DRMAX} / V_{DRMIN} . (3) Calculate ; " G_{DR+} " = $20 * \log (V_{DRMAX} / V_{WHITE})$ " G_{DR-} " = $20 * \log (V_{DRMIN} / V_{WHITE})$
T6	ABCL Control Voltage Range / V_{ABCLH} / V_{ABCLL}	ABL Gain : 11 Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 100 IRE Y signal with sync into Pin 39, 43 & 45. (2) Decreasing the Pin 21 voltage, measure the voltage at which Pin 20 output begins / stops decreasing, that is V_{ABCLH} / " V_{ABCLL} ". (3) Measure the minimum amplitude of Pin 20 output, that is V_{ACLMIN} . (4) Calculate ; " G_{ACL} " = $20 * \log (V_{ACLMIN} / V_{WHITE})$
	ACL Gain / G_{ACL}		

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
T7	ABL Start Point /VABLP0 /VABLP1 /VABLP2 /VABLP3	ABL Start Point : 00/01/10/11 ABL Gain : 11 Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 0 IRE Y signal with sync into Pin 39, 43 & 45. (2) For ABL Point 00/01/10/11, decreasing the Pin 21 voltage, measure the voltage the voltage at which Pin 20 output begins decreasing, that is VABL1/VABL2/VABL3/VABL4. (3) Calculate ; "VABLP0" = VABL1 - VABCLH "VABLP1" = VABL2 - VABCLH "VABLP2" = VABL3 - VABCLH "VABLP3" = VABL4 - VABCLH
T8	ABL Gain /VABLG0 /VABLG1 /VABLG2 /VABLG3	ABL Gain : 00/01/10/11 Uni-Color : 63 Color : 0 Others : Preset	(1) Input a 0 IRE Y signal with sync into Pin 39, 43 & 45. (2) For ABL Gain 00/01/10/11, measure the DC level of picture period at Pin 20 when Pin 21 voltage is VABCLL, that is VABL5/VABL6/VABL7/VABL8. (3) Calculate ; "VABLG0" = VABL5 - VBLACK "VABLG1" = VABL6 - VBLACK "VABLG2" = VABL7 - VBLACK "VABLG3" = VABL8 - VBLACK
T9	Analog RGB Dynamic Range /DRTX	RGB Contrast : 32 Others : Preset	(1) Input a composite sync signal into Pin 39, 43 & 45. (2) Supply 2 V to Pin 13. (3) Input a signal of following figure into Pin 16.  (4) Increasing the amplitude of Pin 16 input, measure the amplitude at which the Pin 20 amplitude stops increasing, that is "DRTX".

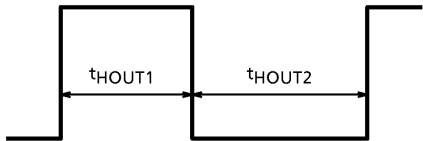
NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
T10	Analog RGB Contrast Control Characteristic / GTXCMAX / GTXCCEN / GTXCMIN	RGB Contrast : 32 Others : Preset	(1) Input a composite sync signal into Pin 39, 43 & 45. (2) Supply 2 V to Pin 13. (3) Input a signal of NOTE : T _g figure into Pin 16. (4) For RGB Contrast 63 / 32 / 0, measure the amplitude of Pin 20 output, that is V _{TXCMAX} / V _{TXCCEN} / V _{TXCMIN} . (5) Calculate ; "GTXCMAX" = 20 * log (V _{TXCMAX} / 0.2) "GTXCCEN" = 20 * log (V _{TXCCEN} / 0.2) "GTXCMIN" = 20 * log (V _{TXCMIN} / 0.2)
T11	Analog RGB Brightness Control Characteristic / VTXBRMAX / VTXBRCEN / VTXBRMIN	Brightness : 0 / 64 / 127 Others : Preset	(1) Supply 2 V to Pin 13. (2) Connect Pin 16 to GND via a 0.1 μF capacitor. (3) For Brightness 127 / 64 / 0, measure the DC level of picture period at Pin 20, that is "VTXBRMAX" / "VTXBRCEN" / "VTXBRMIN".
T12	Analog RGB Mode Switching Level / V _{YS}	RGB Contrast : 32 Others : Preset	(1) Input a composite sync signal into Pin 39, 43 & 45. (2) Input a signal of NOTE : T _g figure into Pin 16. (3) Increasing the Pin 13 voltage, measure the voltage at which the signal inputted into Pin 16 appears at Pin 20, that is "V _{YS} ".
T13	Analog RGB Mode Transfer Characteristic / τ _{RYs} / t _{PRYS} / τ _{FYS} / t _{PFYS}	All : Preset	(1) Input a 50IRE Y signal with sync into Pin 39, 43 & 45. (2) Connect Pin 16 to GND via a 0.1 μF capacitor. (3) According to following figure, measure the Analog RGB Mode Transfer Characteristic

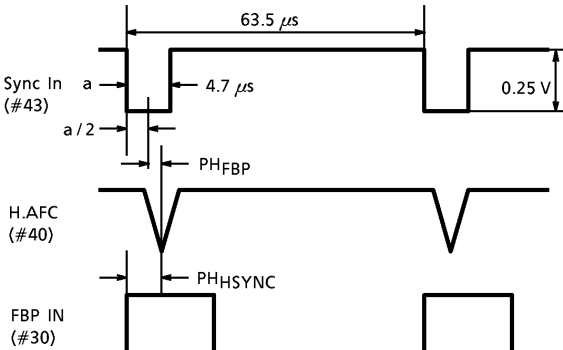
NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
T14	Cross Talk from Analog RGB to TV /CT _{TX-TV}	Uni-Color : 63 RGB Contrast : 63 Others : Preset	<p>(1) Input a composite sync signal into Pin 39, 43 & 45. (2) Connect Pin 39 to GND via a 1 μF capacitor. (3) Input a signal of following figure into Pin 16.</p>  <p>(4) Measure the amplitude of 4 MHz signal at Pin 20, that is V_{TX-TV}. (5) Calculate ; "CT_{TX-TV}" = 20*log (V_{TX-TV} / 0.5)</p>
T15	Cross Talk from TV to Analog RGB /CT _{TV-TX}	Uni-Color : 63 RGB Contrast : 63 Others : Preset	<p>(1) Input a 4 MHz, 0.5 V_{p-p} Y signal with sync into Pin 39, 43 & 45. (2) Connect Pin 16 to GND via a 0.1 μF capacitor. (3) Supply 2 V to Pin 13. (4) Measure the amplitude of 4 MHz signal at Pin 20, that is V_{TV-TX}. (5) Calculate ; "CT_{TV-TX}" = 20*log (V_{TV-TX} / 0.5)</p>
T16	RGB OUTPUT AMPLITUDE /V _{ROUT} /V _{GOOUT} /V _{BOUT}	Mute : 01 Uni-Color : 63 Others : Preset	<p>(1) Input a 4.43 MHz, PAL rainbow color-bar (300 mV_{p-p}, burst : chroma = 1 : 1) with sync into pin 39, 43 & 45. (2) Measure the amplitude of pin 18 / 19 / 20 output, that is "/V_{ROUT} /V_{GOOUT} /V_{BOUT}".</p>
T17	SECAM Black Level Adj. Characteristics /V _{SECBMAX} /V _{SECRMAX} /V _{SECBMIN} /V _{SECRMIN} SECAM Black Level Adj. Data Sensitivity / Δ V _{SECB} / Δ V _{SECR}	Color System : 111 B-Y Black Adj : 0 / 8 / 15 R-Y Black Adj : 0 / 8 / 15	<p>(1) Connect Pin 29 to GND via a 5.1 kΩ resistor. (2) For B-Y / R-Y Black Adj. : 8, measure the DC level of picture period at Pin 20 / 18, that is V_{SECBCE} / V_{SECRCE}. (3) For B-Y Black Adj. : 0 / 15, measure the DC level change of picture period against V_{SECBCE} at Pin 20, that is "V_{SECBMIN}" / "V_{SECBMAX}". (4) For R-Y Black Adj. : 0 / 15, measure the DC level change of picture period against V_{SECRCE} at Pin 18, that is "V_{SECRMIN}" / "V_{SECRMAX}". (5) Calculate ; "ΔV_{SECB}" = (V_{SECBMAX} - V_{SECBMIN}) / 16 "ΔV_{SECR}" = (V_{SECRMAX} - V_{SECRMIN}) / 16</p>

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
T18	SECAM Black level alignment mode gain / GBS / GRS	SE Adj : 1 Mute : 00 Color System : 111 Others : Preset	(1) Input a sin wave (0.3 V _{p-p} , 100 kHz) without sync into Pin 39, 43 & 45. (2) Measure the amplitude of Pin 18 / 20 output, that is V _{ROUTS} / V _{BOUTS} . (3) Calculate ; "GRS" = 20*log (V _{ROUTS} / 0.3) "GBS" = 20*log (V _{BOUTS} / 0.3)
T19	SECAM Black level alignment mode Analog RGB mode SW level / V _{YSS}	RGB Contrast : 32 SE Adj : 1 Color System : 111 Others : Preset	(1) Input a composite sync signal into Pin 39, 43 & 45. (2) Input a signal of Note : T9 figure into Pin 16. (3) Increasing the Pin 13 voltage, measure the voltage at which the signal inputted into Pin 16 appears at Pin 20, that is "V _{YSS} ".
T20	Half tone mode SW level / V _{YM1} Half tone ↔ Analog RGB mode SW level / V _{YM2}	Half tone : 0 RGB Contrast : 32 Ym enb : 1 Others : Preset	(1) Input a composite sync signal into Pin 39, 43 & 45. (2) Input a signal of Note : T9 figure into Pin 16. (3) Increasing the Pin 13 voltage, measure the voltage at which the picture portion amplitude at pin 20 starts changing, that is "V _{YM1} ". (4) Increasing the Pin 13 voltage further, measure the voltage at which the signal inputted into Pin 16 appears at Pin 20, that is "V _{YM2} ".
T21	Half tone mode transfer characteristic / τ _{RYM1} / t _{PRYM1} / τ _{FYM1} / t _{PFYM1} Half tone ↔ Analog RGB mode transfer characteristic / τ _{RYM2} / t _{PRYM2} / τ _{FYM2} / t _{PFYM2}	Half tone : 0 Ym enb : 1 Others : Preset	(1) Input a 50IRE Y signal with sync into pin 39, 43 & 45, a signal as the figure below into Pin 13. (2) Connect Pin 16 to GND via a 0.1 μF capacitor. (3) According to following figure, measure the Half tone Mode transfer characteristic / Half tone ↔ Analog RGB mode transfer characteristic. 

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
T22	RGB output voltage Axes difference / ΔV_{bct}	Brightness : 32 Uni-color : 63 Color : 0 Others : Preset	(1) Input a 0IRE black signal with sync into Pin 39, 43 & 45. (2) Measure the DC level of picture period at Pin 18 / 19 / 20. (3) Find maximum axes difference, that is " ΔV_{bct} ".
T23	RGB output amplitude Axes difference / ΔV_a	Mute : 00	(1) Input a sin wave ($0.3 V_{p-p}$, setup = 0.3 V) with sync into Pin 39, 43 & 45. (2) Measure the amplitude of Pin 18 / 19 / 20 output. (3) Find maximum axes difference, that is " ΔV_a ".

DEF stage (Unless otherwise specified, $V_{CC} = 9\text{ V}$ (3, 17, 28 & 52 pin) / 5 V (36 & 46 pin), $T_a = 25^\circ\text{C}$)

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D1	AFC Inactive Period / $T_{50AFCOFF}$ / $T_{60AFCOFF}$	All : Preset	(1) Input a 50 Hz / 60 Hz composite sync signal into Pin 43. (2) Measure " $T_{50AFCOFF}$ " / " $T_{60AFCOFF}$ " at Pin 40. (cf. Fig.D1)
D2	H-OUT Start Voltage / V_{HON}	All : Preset	(1) Let Pin 3 / 17 / 52 / 36 / 46 be open. (2) Increasing Pin 28 voltage, measure the voltage at which H OUT pulse appears at Pin 32, that is " V_{HON} ".
D3	H-OUT Pulse Duty / W_{HOUT}	All : Preset	(1) Measure t_{HOUT1} & t_{HOUT2} at Pin 32.  (2) Calculate ; " W_{HOUT} " = $t_{HOUT1} / (t_{HOUT1} + t_{HOUT2}) * 100$
D4	H-OUT Freq. on AFC Stop Mode / $F_{HAFCOFF}$	AFC Gain : 11 Others : Preset	(1) Input a 50 Hz composite sync signal into Pin 43. (2) Measure the H OUT frequency at Pin 32, that is " $F_{HAFCOFF}$ ".
D5	Horizontal Free-Run Frequency / F_{H50FR} / F_{H60FR}	V-Freq : 10 / 11 Others : Preset	For V-Freq 10 / 11, measure the H OUT frequency at Pin 32, that is " F_{H50FR} " / " F_{H60FR} "
D6	Horizontal Freq. Variable Range / F_{HMAX} / F_{HMIN}	All : Preset	(1) Connect Pin 40 to V_{CC} via a $10\text{ k}\Omega$ and measure the H OUT frequency at Pin 32, that is " F_{HMAX} ". (2) Connect Pin 40 to GND via a $68\text{ k}\Omega$ and measure the H OUT frequency at Pin 32, that is " F_{HMIN} ".
D7	Horizontal Freq. Control Sensitivity / β_{HAFC}	All : Preset	(1) Measure the Pin 40 voltage at which H OUT frequency is 15.734 kHz, that is V_{H15734} . (2) Measure the H OUT frequency when Pin 40 voltage is $V_{H15734} + 50\text{ mV}$ / $V_{H15734} - 50\text{ mV}$, that is F_{HHIGH} / F_{HLOW} . (3) Calculate ; " β_{HAFC} " = $(F_{HHIGH} - F_{HLOW}) / 100$

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D8	Horizontal Pull-in Range / ΔF_{HPPH} / ΔF_{HPPL}	All : Preset	(1) Input a composite sync signal into Pin 43. (2) Decreasing the horizontal frequency from 17 kHz, measure the frequency at which H OUT synchronized with Sync Out (Pin 31), that is F_{HPPH} . (3) Increasing the horizontal frequency from 14 kHz, measure the frequency at which H OUT synchronized with Sync Out (Pin 31), that is F_{HPPL} . (4) Calculate ; $\Delta F_{HPPH} = F_{HPPH} - 15734$ $\Delta F_{HPPL} = 15625 - F_{HPPL}$
D9	H-OUT Voltage / V_{HOUTH} / V_{HOUTL}	All : Preset	(1) Measure the high level of H OUT at Pin 32, that is " V_{HOUTH} ". (2) Measure the Low level of H OUT at Pin 32, that is " V_{HOUTL} ".
D10	Horizontal Freq. Dependence on V_{CC} / ΔF_{HVCC}	All : Preset	(1) Measure the H OUT frequency when $H V_{CC}$ is 8.5 V / 9.5 V, that is F_{HVCCH} / F_{HVCCL} . (2) Calculate ; $\Delta F_{HVCC} = (F_{HVCCH} - F_{HVCCL}) / 1$
D11	FBP Phase / PH_{FBP}	All : Preset	(1) Input a composite sync signal into Pin 43. (2) According to the following figure, measure " PH_{FBP} " & " PH_{HSYNC} ". 
	H-Sync. Phase / PH_{HSYNC}		

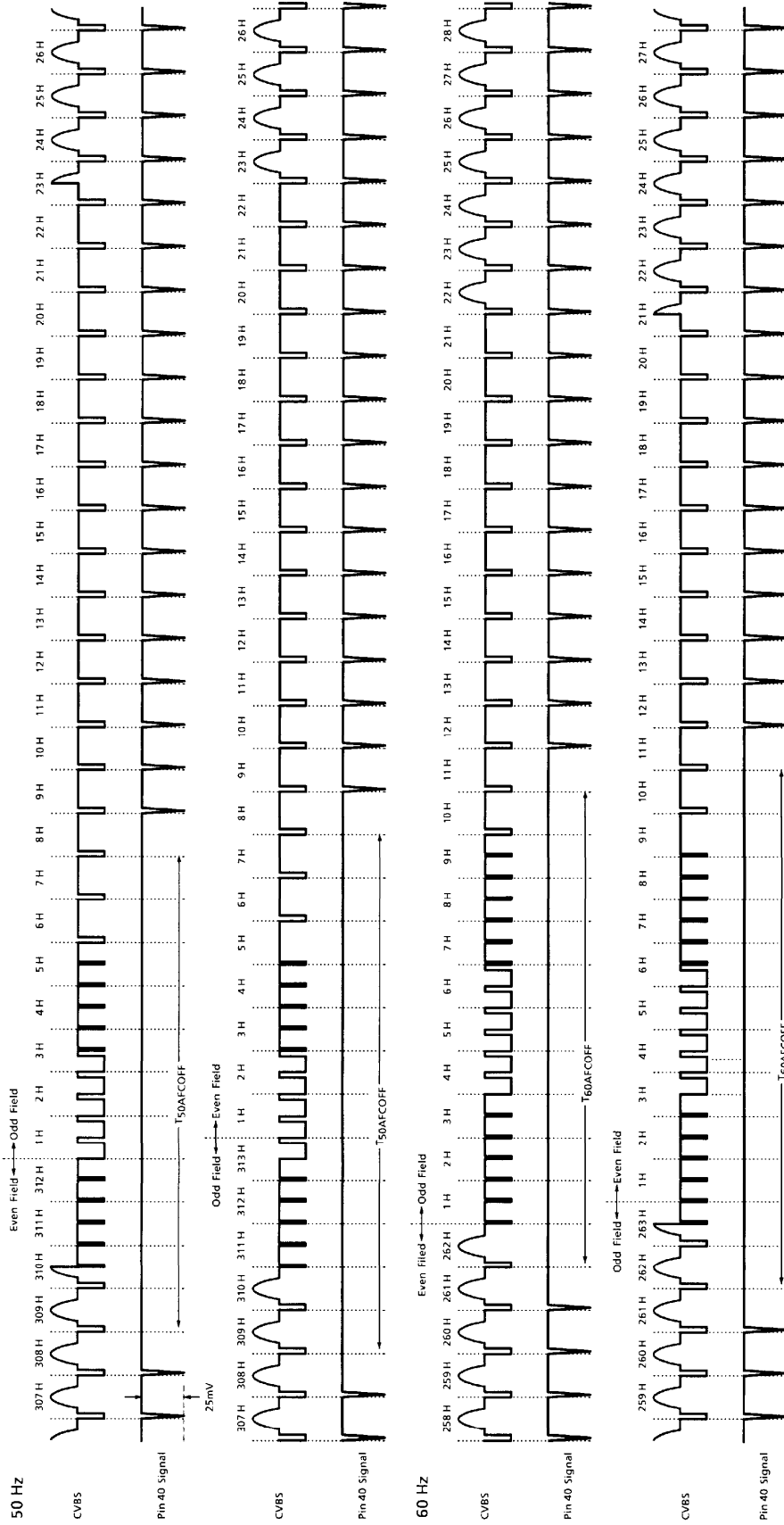
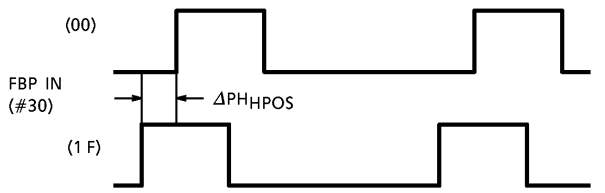
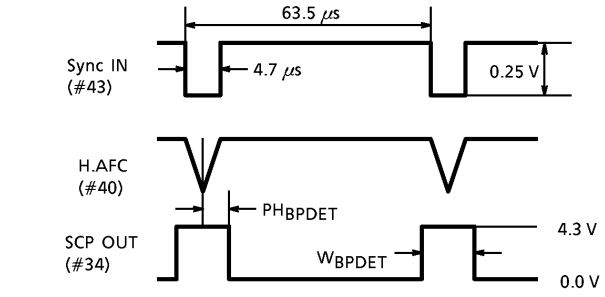
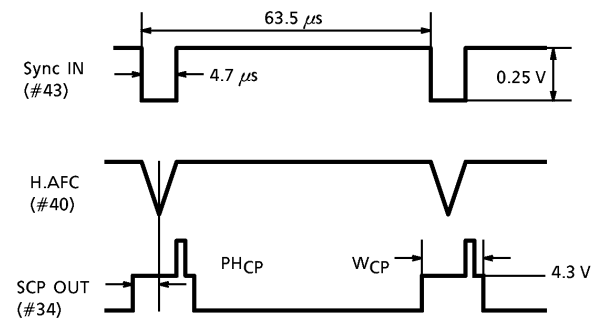
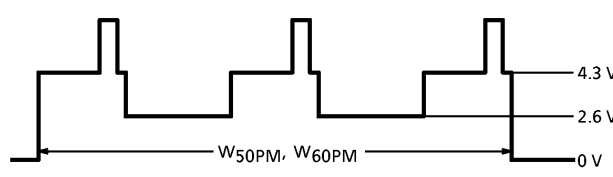


Fig. D1

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D12	Horizontal Position Variable Range / ΔPH_{HPOS}	H Position : 0 / 31 Others : Preset	<p>(1) Input a composite sync signal into Pin 43. (2) Changing Horizontal Position from 0 to 31, measure "ΔPH_{HPOS}" according to the following figure.</p> 
D13	AFC-2 Pulse Threshold Level / V_{AFC2}	All : Preset	<p>(1) Input a composite sync signal into Pin 43. (2) Decreasing the FBP high level, measure the DC level at which H OUT phase changes against Sync Out phase, that is "V_{AFC2}".</p>
D14	H-BLK Pulse Threshold Level / V_{HBLK}	All : Preset	<p>(1) Input a composite sync signal into Pin 43. (2) Increasing the FBP high level, measure the DC level at which H blanking begins to work, that is "V_{HBLK}".</p>
D15	Black Peak Det. Stop Period (H) / PH_{BPDET} / W_{BPDET}	TEST : 00001000 Others : Preset	<p>(1) Input a composite sync signal into Pin 43. (2) According to the following figure, measure "PH_{BPDET}" & "W_{BPDET}".</p> 
D16	Clamp Pulse Start Phase / PH_{CP}	TEST : 00001000 V Position : 001 Others : Preset	<p>(1) Input a composite sync signal into Pin 43. (2) According to the following figure, measure "PH_{CP}" & "W_{CP}".</p> 
	Clamp Pulse Width / W_{CP}		

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D17	Gate Pulse Start Phase / PHGP	All : Preset	<p>(1) Input a composite sync signal into Pin 43. (2) According to the following figure, measure "PHGP" & "WGP".</p>
	Gate Pulse Width / WGP		
D18	Sync. Output Low Level / V _{SYNCL}	All : Preset	(1) Input a composite sync signal into Pin 43. (2) Measure the DC voltage of Sync Out low level, that is "V _{SYNCL} ".
D19	Vertical Oscillation Start Voltage / V _{VON}	All : Preset	(1) Let Pin 3 / 17 / 52 / 36 / 46 be open. (2) Increasing Pin 28 voltage, measure the voltage at which V Ramp signal appears at Pin 22, that is "V _{VON} ".
D20	Vertical Free-Run Frequency / F _{VAUFR} / F _{V60FR}	V-Freq : 00 / 01 Others : Preset	For V-Freq 00 / 01, measure the frequency of V Ramp at Pin 22, that is "F _{VAUFR} " / "F _{V60FR} ".
D21	Gate Pulse V-Masking Period / T _{50GPM} / T _{60GPM}	All : Preset	(1) Input a 50Hz / 60Hz composite sync signal into Pin 43. (2) Measure "T _{50GPM} " / "T _{60GPM} " at Pin 34. (cf. Fig.D21)
D22	V.Ramp DC on Service Mode / V _{NOVRAMP}	MUTE : 11 Others : Preset	Measure the DC level of Pin 22, that is "V _{NOVRAMP} ".

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D23	Vertical Pull-in Range (Auto) /FVPAUL /FVPAUH	V-Freq : 00 / 01 Others : Preset	(1) Input a composite sync signal into Pin 43. (2) For V-Freq 00 / 01, increasing the input vertical period from 220 H by 0.5 H step, measure the period at which V OUT signal synchronized with Sync out, that is "FVPAUL" / "FVP60L". (3) For V-Freq 00 / 01, decreasing the input vertical period from 360 H by 0.5 H step, measure the period at which V OUT signal synchronized with Sync out, that is "FVPAUL" / "FVP60L".
	Vertical Pull-In Range (60Hz) /FVP60L /FVP60H		
D24	Vertical Period on Fixed Mode /TV313 /TV263	V-Freq : 10 / 11 Others : Preset	For V-Freq 10 / 11, measure the vertical period at Pin 34, that is "TV263" / "TV313".
D25	V-BLK Start Phase /PH50VBLK /PH60VBLK	All : Preset	(1) Input a 50 Hz / 60 Hz composite sync signal into Pin 43. (2) Measure "T50AFCOFF" / "T60AFCOFF" at Pin 40. (cf. Fig.D25)
	V-BLK Width /W50VBLK /W60VBLK		
D26	Picture Mute Period /W50PM /W60PM	TEST : 00001000 Others : Preset	(1) Input a 50 Hz / 60 Hz composite sync signal into Pin 43. (2) According to a following figure, measure "W50PM" / "W60PM". 

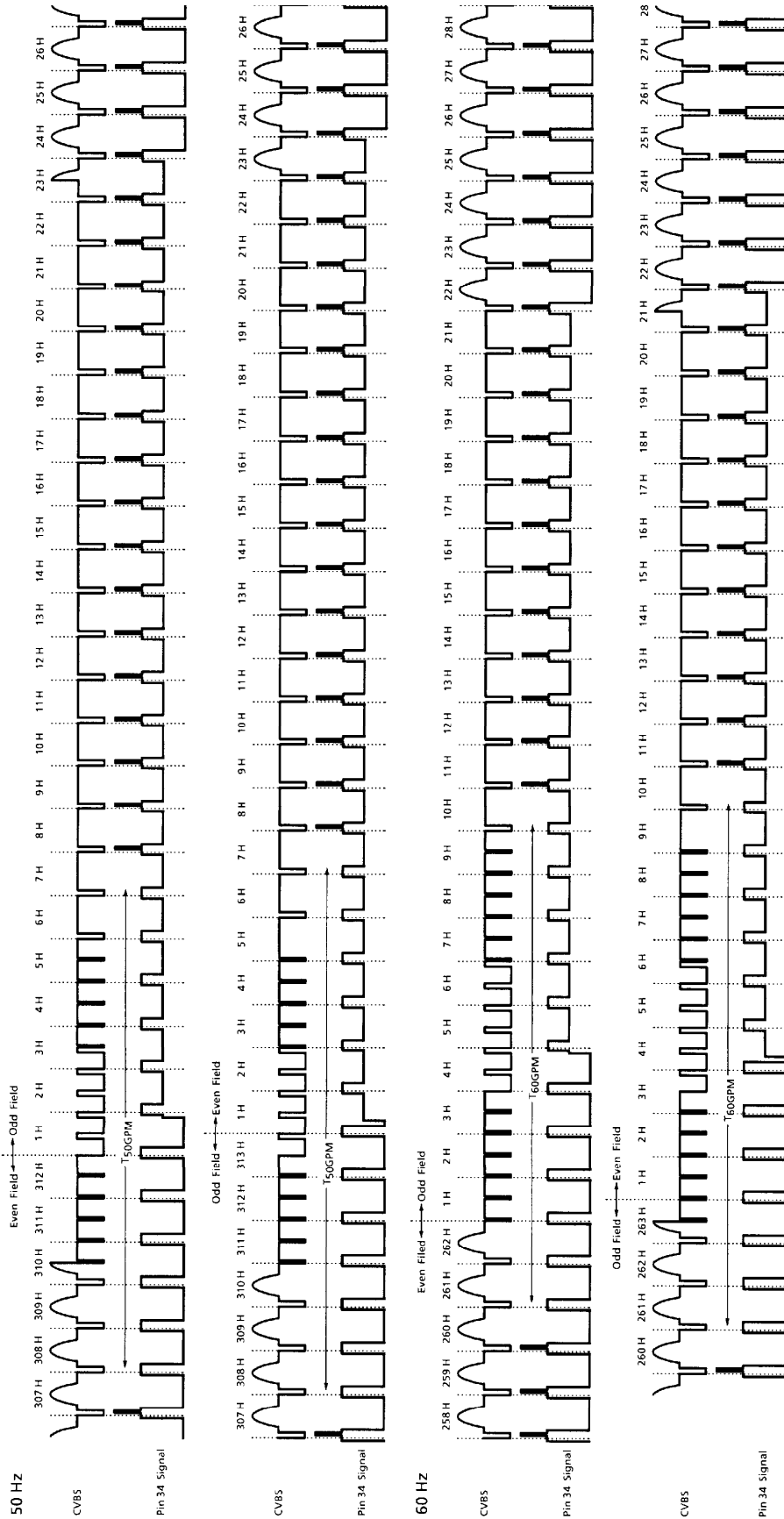


Fig. D21

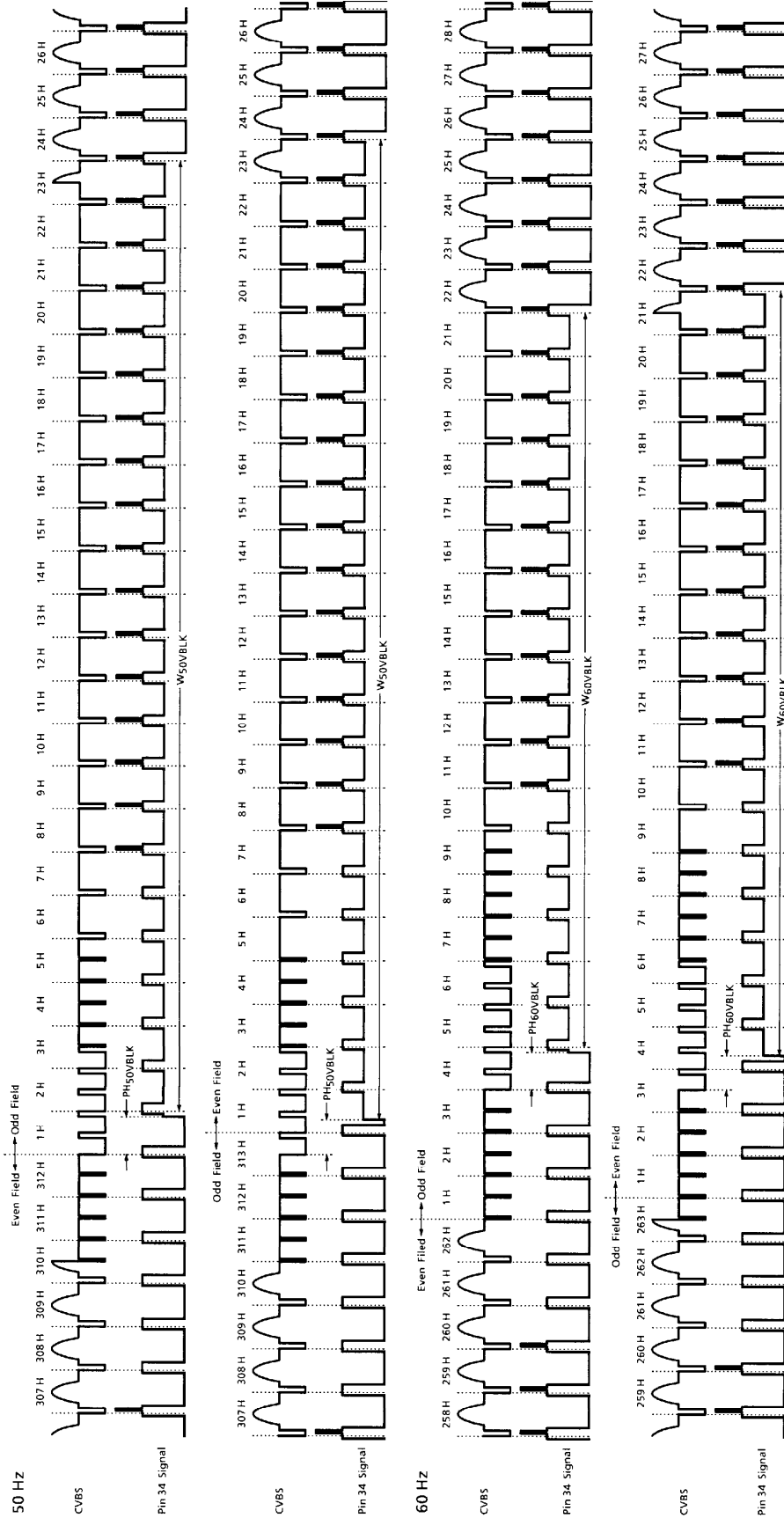
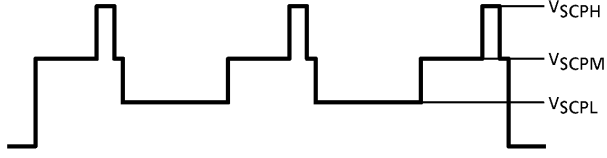
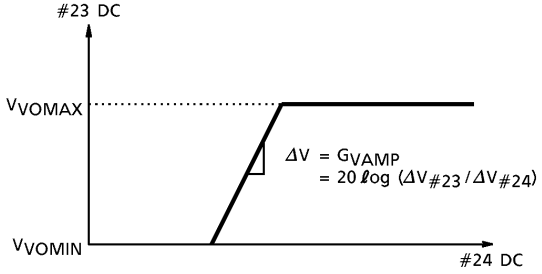
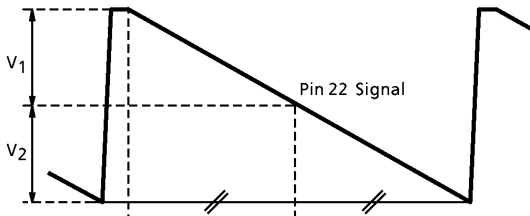
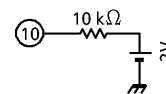
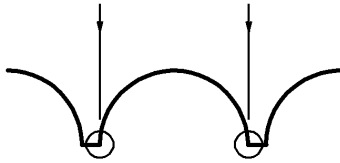
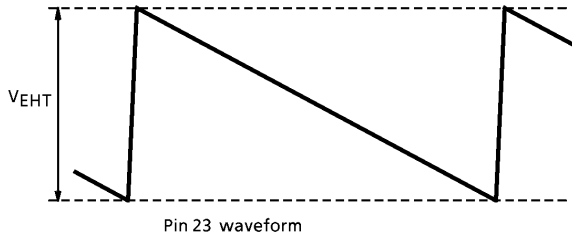


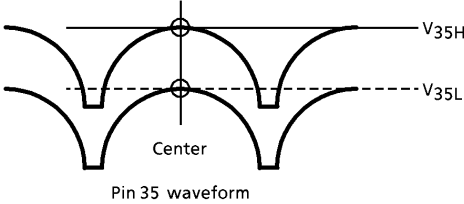
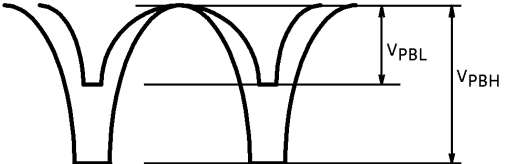
Fig. D25

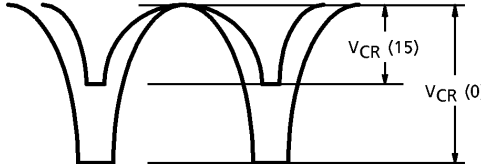
NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D27	Sand Castle Pulse Level /V _{SCPH} /V _{SCPM} /V _{SCPL}	All : Preset	Measure "V _{SCPH} " / "V _{SCPM} " / "V _{SCPL} " at Pin 34. 
D28	Vertical Ramp Amplitude /V _{VRAMP}	All : Preset	Measure the V Ramp amplitude at Pin 22, that is "V _{VRAMP} ".
D29	Vertical AMP Gain /G _{VAMP}	All : Preset	(1) Let Pin 24 be open. (2) Changing the Pin 23 DC voltage, measure "V _{VOMAX} " / "V _{VOMIN} " / "G _{VAMP} " according to a following figure. 
	Vertical AMP Max. Output Level /V _{VOMAX}		
	Vertical AMP Min. Output Level /V _{VOMIN}		
D30	Vertical AMP Max. Output Current /I _{VOMAX}	All : Preset	(1) Supply 7V to Pin 23. (2) Measure the Current from Pin 24 to GND, that is "I _{VOMAX} ".
D31	Vertical NFB Amplitude /V _{NFB}	V Size : 0 / 32 / 63 Others : Preset	(1) Measure the amplitude of NFB V Ramp at Pin 23, that is "V _{NFB} ". (2) Measure the amplitude of NFB V Ramp at Pin 23 for V-Size 0 / 63, that is V _{NFBMIN} / V _{NFBMAX} . (3) Calculate ; "ΔV _{VRAMPH} " = (V _{NFBMAX} - V _{NFB}) / V _{NFB} * 100 "ΔV _{VRAMPL} " = (V _{NFBMIN} - V _{NFB}) / V _{NFB} * 100
	Vertical Amplitude Variable Range /ΔV _{VRAMPH} /ΔV _{VRAMPL}		

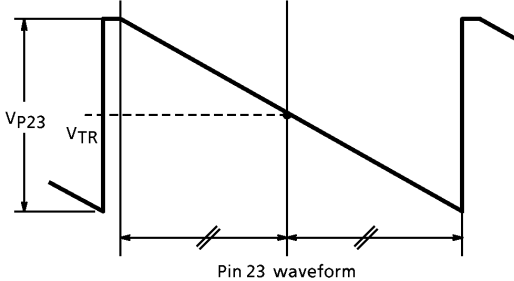
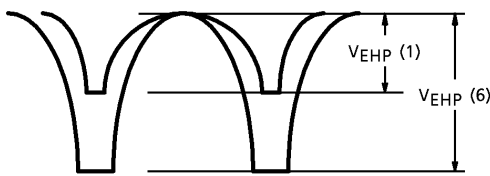
NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D32	Vertical Linearity Variable Range / ΔV_{LIN1+} / ΔV_{LIN1-} / ΔV_{LIN2+} / ΔV_{LIN2-}	V Linearity : 0 / 8 / 15 Others : Preset	(1) For V linearity 8, Measure V_1 (From center to max.) and V_2 (From center to min.) at Pin 22 according to a following figure.  (2) For V linearity 15 / 0, measure V_{LIN1+} / V_{LIN1-} and V_{LIN2+} / V_{LIN2-} . (3) Calculate ; $"\Delta V_{LIN1+}" = (V_{LIN1+} - V_1) / V_1 * 100$ $"\Delta V_{LIN1-}" = (V_{LIN1-} - V_1) / V_1 * 100$ $"\Delta V_{LIN2+}" = (V_{LIN2+} - V_2) / V_2 * 100$ $"\Delta V_{LIN2-}" = (V_{LIN2-} - V_2) / V_2 * 100$
D33	Vertical S Correction Variable Range / ΔV_{S1+} / ΔV_{S1-} / ΔV_{S2+} / ΔV_{S2-}	V S Corr. : 0 / 8 / 15 Others : Preset	(1) For V S Correction : 8, measure V_1 and V_2 at Pin 22 according to a figure of NOTE : D32. (2) For V S Correction : 15 / 0, measure V_{S1+} / V_{S1-} and V_{S2+} / V_{S2-} . (3) Calculate ; $"\Delta V_{S1+}" = (V_{S1+} - V_1) / V_1 * 100$ $"\Delta V_{S1-}" = (V_{S1-} - V_1) / V_1 * 100$ $"\Delta V_{S2+}" = (V_{S2+} - V_2) / V_2 * 100$ $"\Delta V_{S2-}" = (V_{S2-} - V_2) / V_2 * 100$
D34	V-AGC Current / I_{VAGCH} / I_{VAGCL}	V-AGC : 0 / 1 Others : Preset	(1) Connect Pin 25 to GND via a 200 resistor. (2) For V-AGC : 0 / 1, measure V_{VAGCL} / V_{VAGCH} at Pin 25 according to a following figure. (3) Calculate ; $"I_{VAGCL}" = V_{VAGCL} / 200$ $"I_{VAGCH}" = V_{VAGCH} / 200$
D35	Vertical Guard Voltage / V_{VG}	All : Preset	Decreasing the Pin 23 voltage from 5V, measure the voltage at which Pin 20 output drops to blanking level, that is " V_{VG} ".
D36	BGP Phase / ΔBGP	BGP P : 0 / 1 Others : Preset	(1) Input a composite sync signal into Pin 43. (2) Connect Pin 10 as the figure.  (3) Measure the start point difference of BGP at Pin 10 for BGP P : 0 / 1, that is " ΔBGP ".

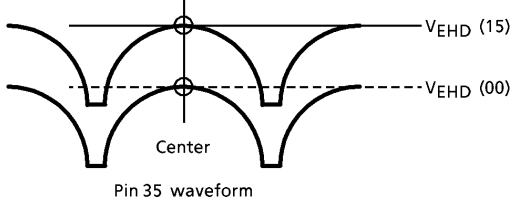
Deflection collection stage

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D37	Vertical Amplitude EHT Correction / V _{EHT}	Parabola correction : 32 / 63 Trapezium correction : 0~31 V.EHT : 0 / 7 Others : Preset	<p>(1) Set the BUS data of Parabola correction to 63 (MAX), and change the BUS data of Trapezium correction so that the parabola waveform at pin 35 (EW OUT) is symmetrical.</p>  <p>(2) Set the BUS data of V.EHT to 32 (CEN). (3) Supply 1 V into pin 41 (EHT in). (4) Set the BUS data of Parabola correction to 0 (MIN). Measure the amplitude of waveform at pin 23 (V NFB), that is V_{EHT} (00). (5) Set the BUS data of V.EHT to 7 (MAX). Measure the amplitude of waveform at pin 23 (V NFB), that is V_{EHT} (07).</p> <p>(6) $V_{EHT} = \frac{V_{EHT} (00) - V_{EHT} (07)}{V_{EHT} (00)} \times 100 (\%)$</p> 

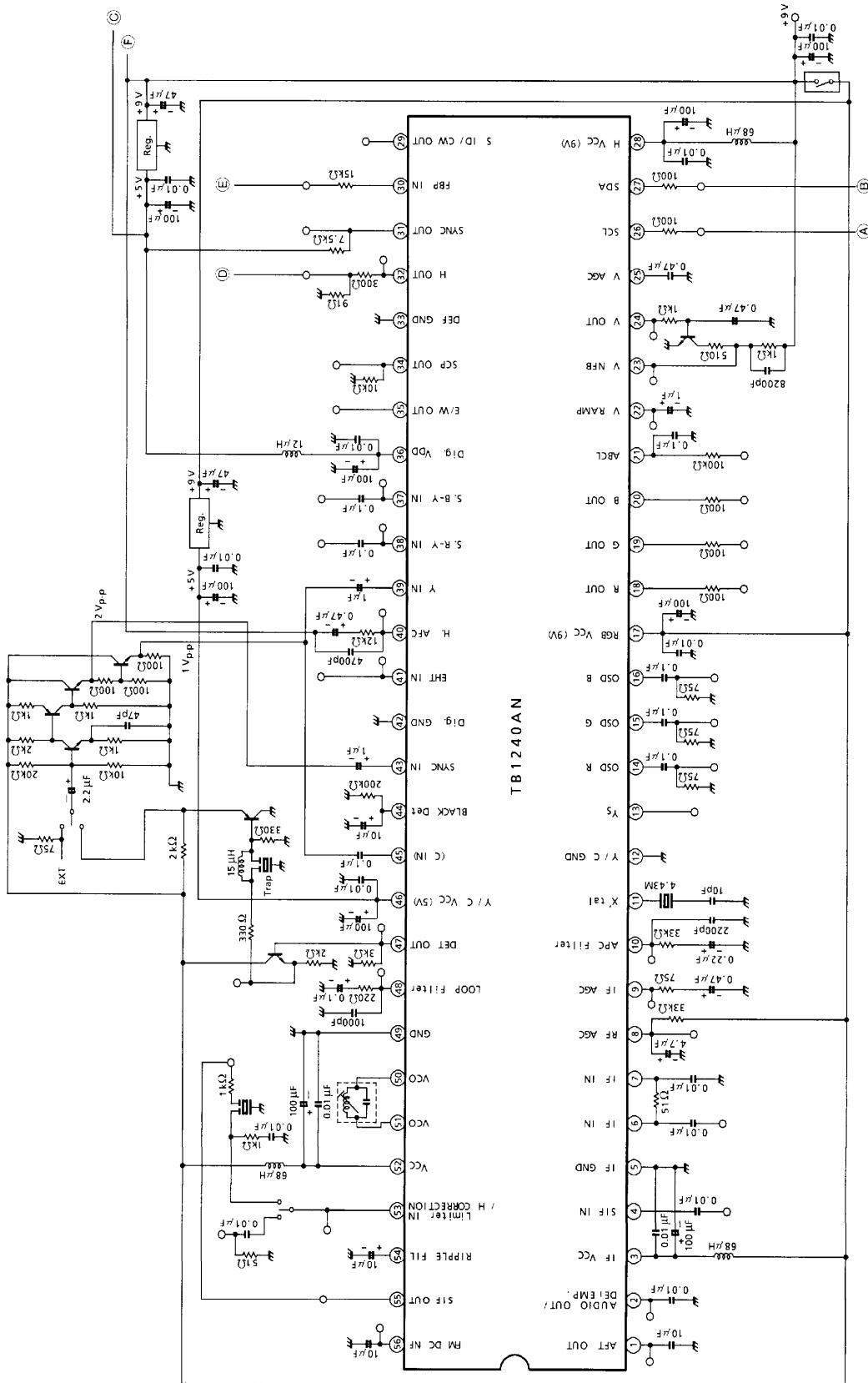
NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D38	E-W MAX. DC (Picture Width) /V _{35H} E-W MIN. DC (Picture Width) /V _{35L}	Parabola correction : 32 / 63 Trapezium correction : 0~31 Horizontal size : 0 / 63 Others : Preset	<ol style="list-style-type: none"> (1) Set the BUS data of Parabola correction to 63 (MAX), and change the BUS data of Trapezium correction so that the parabola waveform at pin 35 (EW OUT) is symmetrical. (2) Set the BUS data of Parabola correction to 32 (CEN). (3) Supply 6 V into pin 41 (EHT in). (4) Set the BUS data of Horizontal size to 63 (MAX). Measure the voltage at pin 35 (EW out), that is "V_{35H}". (5) Set the BUS data of Horizontal size to 0 (MIN). Measure the voltage at pin 35 (EW out), that is "V_{35L}".  <p style="text-align: center;">Pin 35 waveform</p>
D39	E-W MAX. Parabolic Correction (Parabola) /V _{PBH} E-W MIN. Parabolic Correction (Parabola) /V _{PBL}	Trapezium correction : 0~31 Horizontal size : 32 Parabola correction : 0 / 63 Others : Preset	<ol style="list-style-type: none"> (1) Set the BUS data of Parabola correction to 63 (MAX), and change the BUS data of Trapezium correction so that the parabola waveform at pin 35 (EW OUT) is symmetrical. (2) Set the BUS data of Horizontal size to 32 (CEN). (3) Supply 6 V into pin 41 (EHT in). (4) Set the BUS data of Parabola correction to 63 (MAX). Measure the amplitude of waveform at pin 35 (EW out), that is "V_{PBH}". (5) Set the BUS data of Parabola correction to 0 (MIN). Measure the amplitude of waveform at pin 35 (EW out), that is "V_{PBL}".  <p style="text-align: center;">Pin 35 waveform</p>

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D40	E-W Corner Correction (Corner) / V _{CR}	Parabola correction : 63 Trapezium correction : 0~31 Corner correction : 0 / 15 Others : Preset	(1) Set the BUS data of Parabola correction to 63 (MAX), and change the BUS data of Trapezium correction so that the parabola waveform at pin 35 (EW OUT) is symmetrical. (2) Set the BUS data of Parabola correction to 63 (MAX). (3) Supply 1V into pin 41 (EHT in). (4) Set the BUS data of Corner correction to 0. Measure the amplitude of waveform at pin 35, that is V _{CR} (0). (5) Set the BUS data of Corner correction to 15. Measure the amplitude of waveform at pin 35, that is V _{CR} (15). (6) "V _{CR} " = V _{CR} (15) - V _{CR} (0) <div style="text-align: center;">  <p>Pin 35 waveform</p> </div>

NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D41	E-W Trapezium Correction / V _{TR}	Trapezium correction : 0 / 31 Others : Preset	<p>(1) Measure the amplitude of waveform at pin 23 (V NFB), that is V_{p23}.</p> <p>(2) Supply 6 V into pin 41 (EHT in).</p> <p>(3) Set the BUS data of Trapezium correction to 0. Measure the vertical center voltage of waveform at pin 23 (V NFB), that is V_{TR} (00).</p> <p>(4) Set the BUS data of Trapezium correction to 31. Measure the vertical center voltage of waveform at pin 23 (V NFB), that is V_{TR} (31).</p> <p>(5) $V_{TR} = \pm \frac{V_{TR} (00) - V_{TR} (31)}{2 \times V_{p23}} \times 100$</p>  <p style="text-align: center;">Pin 23 waveform</p>
D42	E-W Parabolic EHT Correction / V _{EHP}	Trapezium correction : 0~31 Others : Preset	<p>(1) Set the BUS data of Parabola correction to 63 (MAX), and change the BUS data of Trapezium correction so that the parabola waveform at pin 35 (EW OUT) is symmetrical.</p> <p>(2) Supply 6 V Into pin 41 (EHT in). Measure the amplitude of waveform at pin 35 (EW out), that is V_{EHP} (6).</p> <p>(3) Supply 1 V Into pin 41 (EHT in).</p> <p>(4) Measure the amplitude of waveform at pin 35 (EW out), that is V_{EHP} (1).</p> <p>(5) $V_{EHP} = \frac{V_{EHP} (6) - V_{EHP} (1)}{V_{EHP} (6)} \times 100$</p>  <p style="text-align: center;">Pin 35 waveform</p>

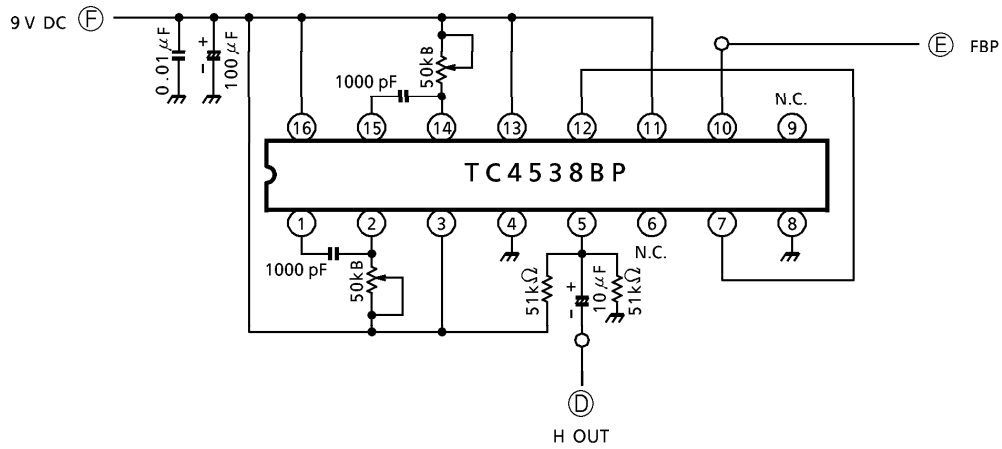
NOTE	ITEM / SYMBOL	BUS CONDITION	MEASUREMENT METHOD
D43	E-W DC EHT Correction / V_{EHD}	Trapezium correction : 0~31 H.EHT : 0 / 15 Others : Preset	(1) Set the BUS data of Parabola correction to 63 (MAX), and change the BUS data of Trapezium correction so that the parabola waveform at pin 35 (EW OUT) is symmetrical. (2) Supply 1V into pin 41 (EHT in). (3) Set the BUS data of H.EHT to 0. Measure the vertical phase center voltage of waveform at pin 35 (EW OUT), that is $V_{EHD} (00)$. (4) Set the BUS data of H.EHT to 15. Measure the vertical phase center voltage of waveform at pin 35 (EW out), that is $V_{EHD} (15)$. (5) $V_{EHD} = V_{EHD} (15) - V_{EHD} (00)$ 
D44	Output Resistance / R_{EW}	All data : Preset	(1) Connect an ammeter between pin 35 and GND. Measure the current, that is I_{35} . (2) Measure the voltage at pin 35, that is V_{35} . (3) " R_{EW} " = V_{35} / I_{35}

TEST CIRCUIT 1

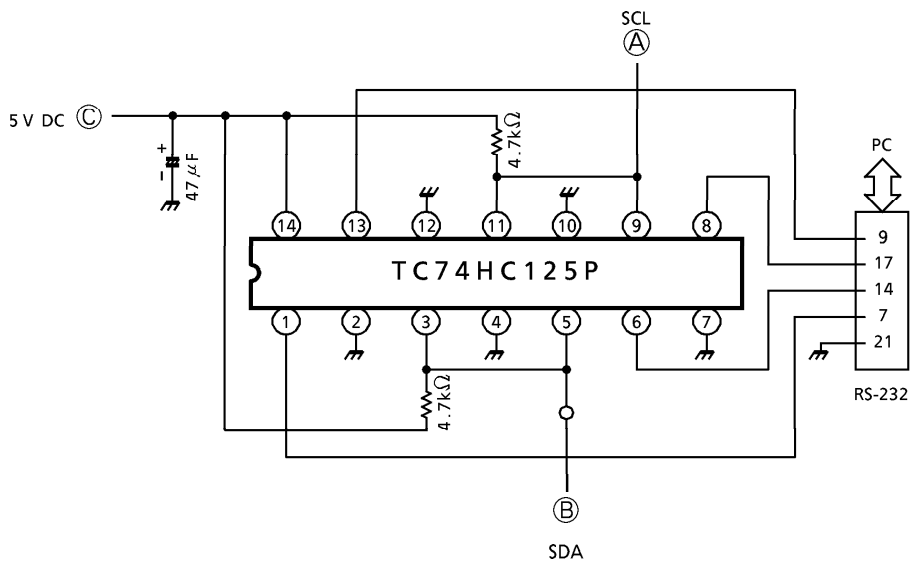


TB1240AN-82

TEST CIRCUIT 2

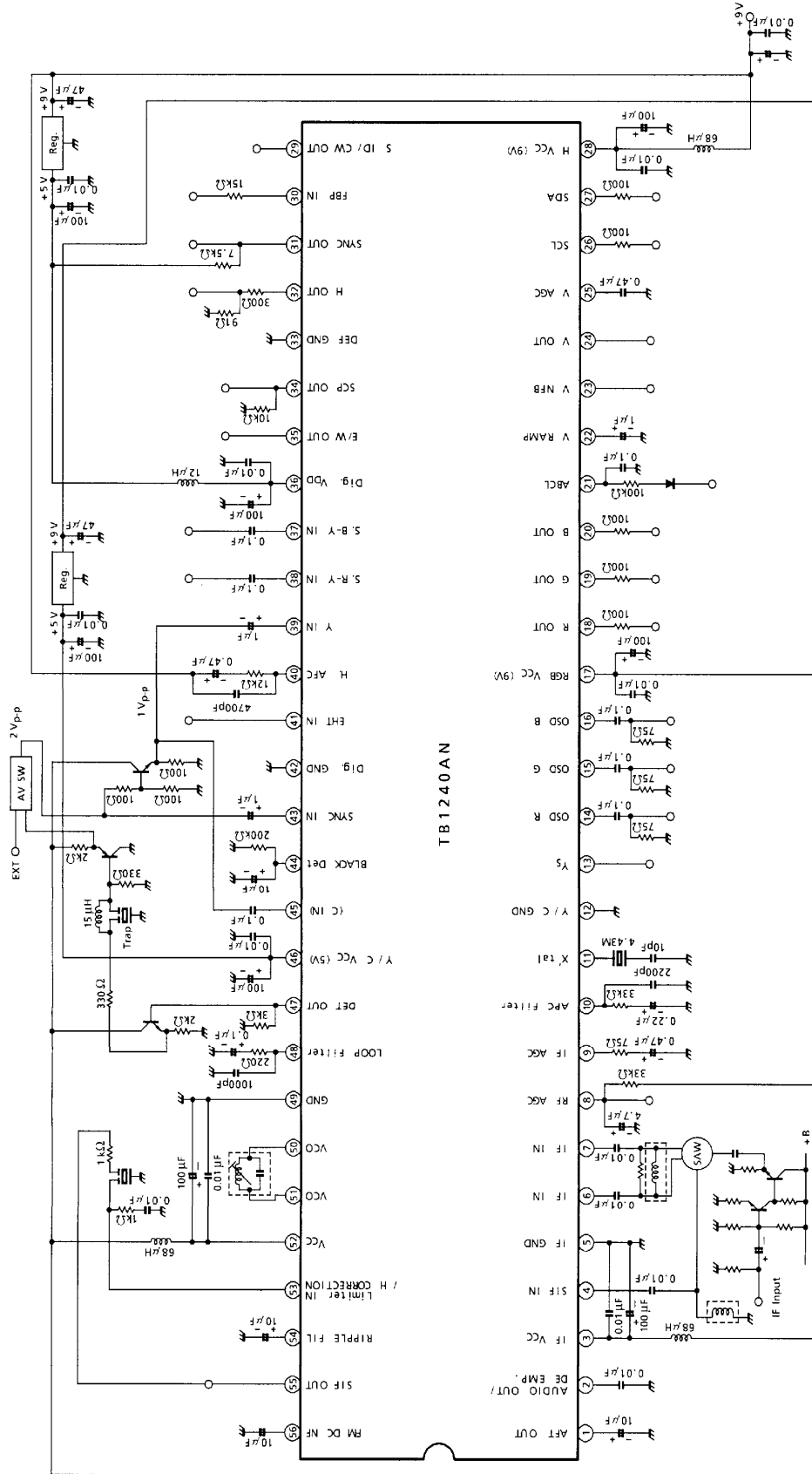


Mono Multi Vibrator



I²C BUS Interface

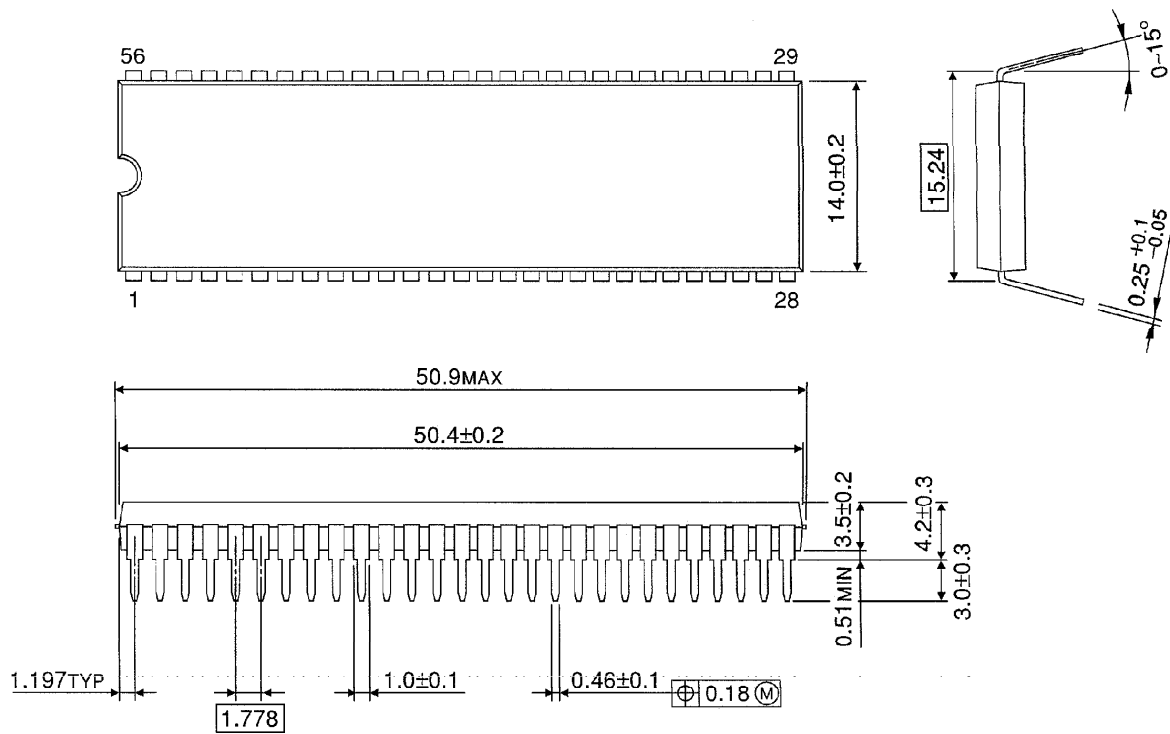
EXAMPLE OF APPLICATION CIRCUIT



TB1240AN-84

OUTLINE DRAWING
SDIP56-P-600-1.78

Unit : mm



Weight : 5.55 g (Typ.)