

TA8819F

NTSC VIDEO CHROMA SIGNAL PROCESSOR SYNC PLAYBACK IC FOR LCD TV

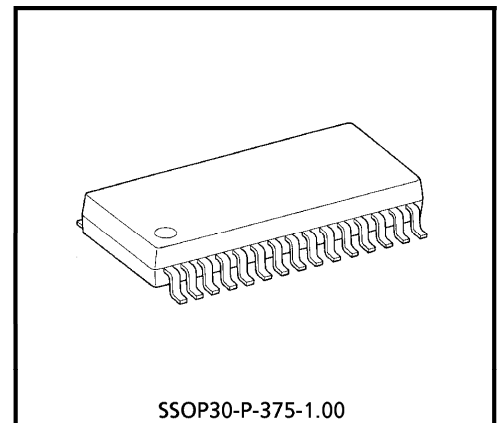
TA8819F can be directly driven by battery because it operates on 3.3 to 7.5 V.

Effect of fluctuations in supply voltage are minimized.

Built-in automatic contrast limiter (ACL) utilizes LCD panel dynamic range, delivering clear image reproduction.

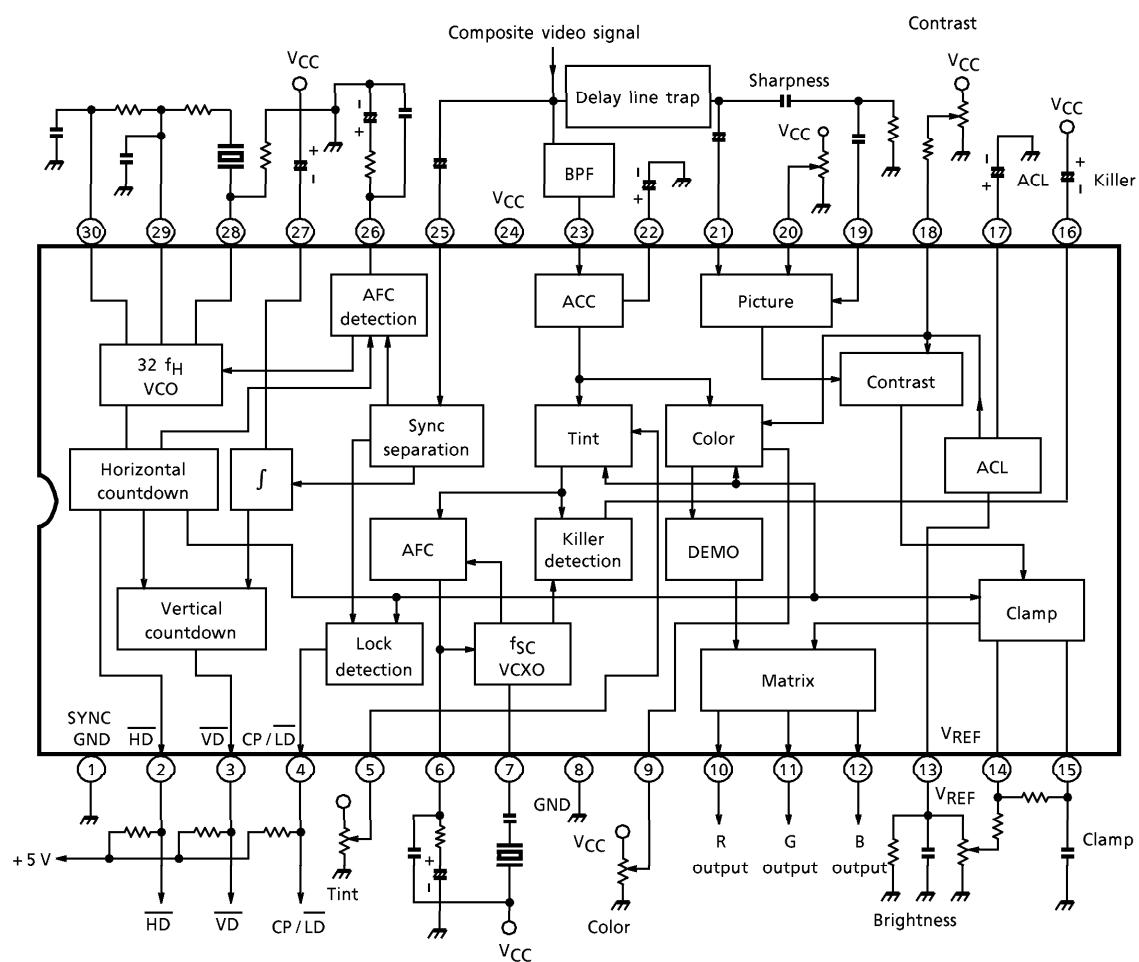
FEATURES

- Video circuit block
 - Secondary differential sharpness adjustment (DC control)
 - Unicolor contrast control
- Chroma circuit block
 - 2-axis demodulation primary color output
- Sync playback circuit block
 - High-performance sync separation
 - Countdown oscillation frequency adjustment-free
 - Stable vertical sync performance even when synchronization fails



Weight : 0.63 g (Typ.)

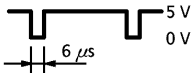
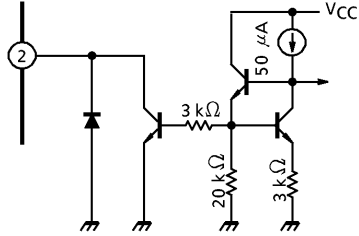
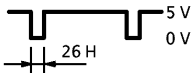
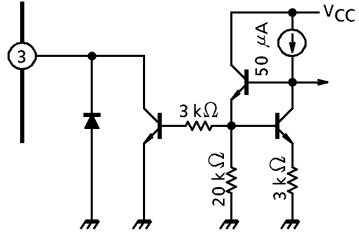
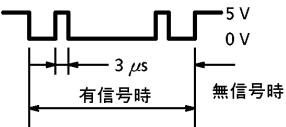
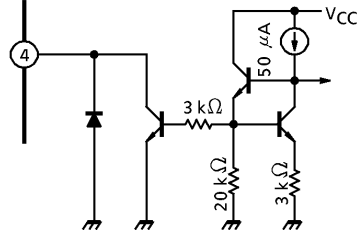
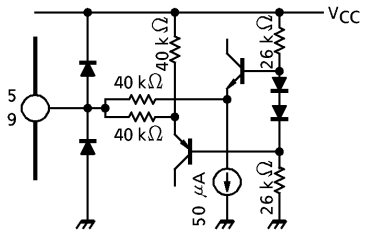
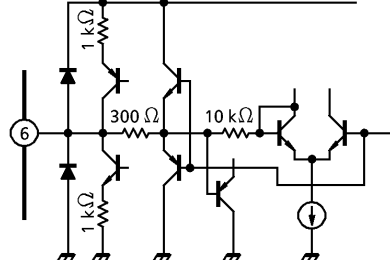
BLOCK DIAGRAM



PIN FUNCTIONS

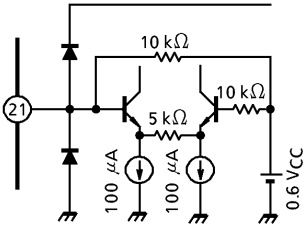
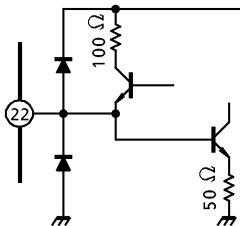
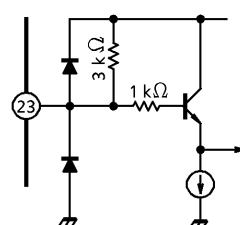
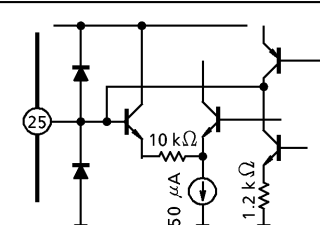
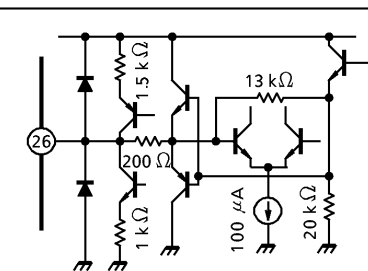
PIN NUMBER	PIN NAME	FUNCTION
1	SYNC GND	Ground for sync playback circuit
2	$\overline{\text{HD}}$ OUT	Horizontal output pulse to controller (open collector)
3	$\overline{\text{VD}}$ OUT	Vertical output pulse to controller (open collector)
4	CP/ $\overline{\text{LD}}$ OUT	Sync pull-in signal output for selecting channel (open collector)
5	TINT	Tint adjustment pin
6	APC FILTER	Color subcarrier automatic control filter
7	f_{SC} X	f_{SC} resonator
8	V/C GND	Ground for video chroma circuit
9	COLOR	Color adjustment pin
10	R OUT	Primary color output pin (R)
11	G OUT	Primary color output pin (G)
12	B OUT	Primary color output pin (B)
13	V_{REF} /ACL LEVEL	Reference voltage / ACL level adjustment
14	BRIGHTNESS	Brightness adjustment pin
15	CLAMP C	Video DC playback capacitor
16	KILLER FILTER	Color killer filter
17	ACL FILTER	ACL filter
18	CONTRAST	Contrast (unicolor) adjustment pin
19	YH IN	Input of video high-frequency components
20	SHARPNESS	Sharpness adjustment pin
21	Y IN	Video signal input pin
22	ACC FILTER	Chroma automatic amplitude control filter
23	CHROMA IN	Chroma signal input pin
24	V_{CC}	Power supply
25	SYNC IN	Video signal input pin for sync playback
26	AFC FILTER	Horizontal automatic frequency control filter
27	VRET INTEG	Vertical sync integral capacitor
28	$32f_{\text{H}}$ X	$32f_{\text{H}}$ resonator
29	PH1	$32f_{\text{H}}$ oscillation phase pin
30	PH2	$32f_{\text{H}}$ oscillation phase pin

PIN DESCRIPTION

PIN NUM-BER	PIN NAME & FUNCTION	TYPICAL SIGNAL LEVEL	INTERNAL CIRCUIT
2	$\overline{\text{HD}}$ OUT Horizontal drive pulse output	Saturated open collector output Maximum sink current 2 mA  $V_{\text{OH}} = 5 \text{ V}$ (uses separate power supply)	
3	$\overline{\text{VD}}$ OUT Vertical drive pulse output	Saturated open collector output Maximum sink current 2 mA  $V_{\text{OH}} = 5 \text{ V}$ (uses separate power supply)	
4	$\text{CP} / \overline{\text{LD}}$ Clamp pulse / signal output Pulse output	Saturated open collector output Maximum sink current 2 mA  $V_{\text{OH}} = 5 \text{ V}$ (uses separate power supply)	
5 9	TINT Tint adjustment COLOR Color amplitude adjustment	Internal bias $V_{\text{CC}}/2$ $V_{\text{iH}} \text{ max} = V_{\text{CC}}$ $V_{\text{iL}} \text{ min} = \text{GND}$	
6	APC DET APC filter connecting pin	Internal bias 2.5 V	

PIN NUM-BER	PIN NAME & FUNCTION	TYPICAL SIGNAL LEVEL	INTERNAL CIRCUIT
7	f _{SC} VXO f _{SC} resonator connecting pin	Internal bias 2.5 V V _{OSC} = 50 mV _{p-p}	
10 11 12	R-OUT G-OUT B-OUT Primary color output pins	 (when ACL used) (when ACL not used)	
13	V REF Constant voltage supply output pin	Internal bias 1.8 V	
14	BRIGHT Brightness adjustment control pin	V _{iH} max V REF (= 1.8 V) V _{iL} min GND	
15	CLAMP Clamp capacitor connecting pin	External capacitance 2.2 μF V _{OH} = V REF (= 1.8 V) V _{OL} = GND	

PIN NUM-BER	PIN NAME & FUNCTION	TYPICAL SIGNAL LEVEL	INTERNAL CIRCUIT
16	KILLER Color killer filter connecting pin	External capacitance $V_{OH} = 3.3\text{ V}$ $V_{OL} = 2.6\text{ V}$	
17	ACL ACL sample-and-hold capacitor pin	Internal bias 0 V	
18	CONTRAST Contrast (unicolor) adjustment control pin	Internal bias $(V_{CC}/2)$ $V_{iH} = V_{CC}$ $V_{iL} = \text{GND}$	
19	Y_H IN Brightness signal (secondary differential) input pin	Internal bias $(V_{CC}/2)$ Maximum input level 150 mV_{p-p}	
20	SHARPNESS Sharpness adjustment control pin	Internal bias $(V_{CC}/2)$ $V_{iH} = V_{CC}$ $V_{iL} = \text{GND}$	

PIN NUMBER	PIN NAME & FUNCTION	TYPICAL SIGNAL LEVEL	INTERNAL CIRCUIT
21	Y _{IN} Brightness signal input pin	Internal bias 2.5 V Maximum input level 1 V _{p-p}	
22	ACC DET ACC sample-and-hold capacitor connecting pin	Permissible load current 0 V _{OL} = GND Load capacitance 0.1 μF	
23	C IN Chroma signal input pin	Internal bias V _{CC} Burst input 75 mV _{p-p} Chroma input 225 mV _{p-p}	
25	SYNC IN Composite sync signal input pin	Video signal 1 V _{p-p} (sync signal 0.28 V _{p-p}) Internal bias 1.5 V	
26	AFC DET AFC filter connecting pin	Internal bias 1.5 V	

PIN NUMBER	PIN NAME & FUNCTION	TYPICAL SIGNAL LEVEL	INTERNAL CIRCUIT
27	VERT INT Vertical sync signal integral capacitor pin.	Internal bias 3.2 V Load capacitance 1 μ F	
28	32f _H VXO 32f _H phase shift signal input pin	Internal bias 2.1 V V _{OL} = 2.5 V V _{OL} = 1.8 V	
29	PS-1 32f _H phase shift signal input pin 1	Internal bias 4.0 V (V _{CC})	
30	PS-2 32f _H phase shift signal input pin 2	Further shifts phase of pin 29 signal and inputs.	

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V _{CC}	8	V
Power Dissipation	P _D (Note)	890	mW
Power Dissipation Reduction Ratio	θ_{ja}	7.2	mW / °C
Operating Temperature	T _{opr}	-20~75	°C
Storage Temperature	T _{stg}	-55~150	°C

RECOMMENDED SUPPLY VOLTAGE

PIN NUMBER	PIN NAME	MIN	TYP.	MAX	UNIT
24	V _{CC}	3.3	5.0	7.5	V

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Quiescent Supply Current	I_{CCQ}	—		20	27	38	mA

Video block

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Pin 21 Input Impedance	R_{i21}	—	Note V-1	7	10	12.5	$k\Omega$
Pin 19 Input Impedance	R_{i19}	—	Note V-2	1.8	2.5	3.25	$k\Omega$
Brightness Adjustment Voltage	V_{BR}	—	Note V-3	0.7	0.84	0.98	V
Brightness Adjustment Sensitivity	G_{BR}	—	Note V-4	1.0	1.2	1.4	
Brightness Adjustment Range	ΔV_{BR}	—	Note V-5	1.9	2.1	2.3	V_{p-p}
Minimum Linear Video Input	$V_{di\ 1}$	—	Note V-6	—	2.6	3.1	V
Maximum Linear Video Input	$V_{di\ 2}$	—	Note V-7	3.3	4	—	V
Video Input Dynamic Range	V_{di}	—	Note V-8	0.75	0.88	—	V_{p-p}
Minimum Contrast Output	$V_{do\ 1}$	—	Note V-9	—	0.2	0.4	V
Maximum Contrast Output	$V_{do\ 2}$	—	Note V-10	2.6	3.1	—	V
Secondary Differential Input Dynamic Range	V_{dip}	—	Note V-11	0.09	0.12	0.15	V_{p-p}
AC Gain	G_V	—	Note V-12	12	14	15.6	dB
Frequency Characteristic	G_f	—	Note V-13	1.8	2.5	—	MHz
Contrast Adjustment Voltage Range	ΔV_{ct}	—	Note V-14	2.2	2.6	—	V
Contrast Adjustment Gain Range	ΔG_{ct}	—	Note V-15	14	15	—	dB
Frequency Characteristic Change Due to Contrast Adjustment	ΔG_f	—	Note V-16	−3	—	3	dB
Gain Change Amount at Minimum Sharpness Adjustment	G_{p5MIN}	—	Note V-17	14	—	—	dB
Gain Change Amount at Maximum Sharpness Adjustment	G_{p5MAX}	—	Note V-18	3	6	10	dB
Sharpness Adjustment Characteristic	G_{p5O}	—	Note V-19	−8	−4	0	dB
Pin 13 Output Voltage	V_{ref}	—	Note V-20	1.8	1.9	2.0	V
Pedestal Potential After ACL Adjustment	$A_{on/of}$	—	Note V-21	1.0	1.05	1.1	V
White Amplitude After ACL Adjustment	$A_H\ 1$	—	Note V-22	0.56	0.67	0.80	V_{p-p}
3-Axis Output DC Deviation (B / G)	$V_{of\ B/G}$	—	Note V-23	−200	—	200	mV

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
3-Axis Output DC Deviation (R / G)	$V_{ofR / G}$	—	Note V-24	– 200	—	200	mV
3-Axis AC Gain Deviation (B / G)	$\Delta G B / G$	—	Note V-25	– 6	—	0.5	dB
3-Axis AC Gain Deviation (R / G)	$\Delta G R / G$	—	Note V-26	– 6	—	0.5	dB

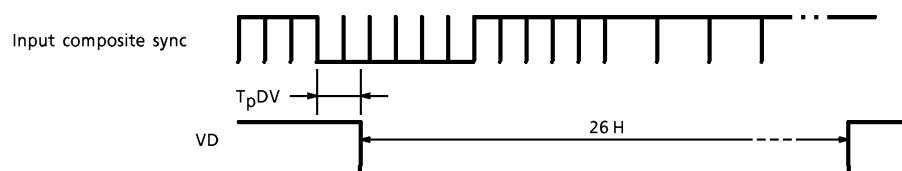
Chroma block

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Pin 23 Input Resistance	Ri23	—	Note C-1	2.25	3.0	3.75	k Ω
Color Difference Output (R-Y)	eR2	—	Note C-2	0.30	0.43	0.56	V _{p-p}
Color Difference Output (G-Y)	eG2	—	Note C-3	0.12	0.18	0.24	V _{p-p}
Color Difference Output (B-Y)	eB2	—	Note C-4	0.35	0.50	0.65	V _{p-p}
Color Change Amount	eC	—	Note C-5	4	6	—	dB
Unicolor Change Amount	eU	—	Note C-6	14	15	—	dB
Tint Change Amount	θ_t	—	Note C-7	80	100	130	°
Tint Center	θ_{tc}	—	Note C-8	– 15	—	5	°
Residual Color		—	Note C-9	—	—	– 40	dB
Demodulation Relative Amplitude (R-Y / B-Y)	R / B	—	Note C-10	0.72	0.84	0.96	—
Demodulation Relative Amplitude (G-Y / B-Y)	G / B	—	Note C-11	0.27	0.34	0.41	—
Demodulation Relative Phase (R-Y / B-Y)	R-B	—	Note C-12	97	104	111	°
Demodulation Relative Phase (G-Y / B-Y)	G-B	—	Note C-13	225	240	250	°
Demodulation Output Residual Carrier	eCR	—	Note C-14	—	—	15	mV _{p-p}
Killer Operation Input Level	eK	—	Note C-15	– 58	– 50	– 44	dB
ACC Characteristic	ACC	—	Note C-16	24	30	—	dB
Control Sensitivity	β_{fs}	—	Note C-17	0.8	—	2.0	Hz / mV
APC Pull-In Range	fsp	—	Note C-18	± 300	—	—	Hz
APC Hold Range	fsh	—	Note C-19	± 300	—	—	Hz

Sync block

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Horizontal Output Pulse Width	PWHD	—	Note D-1	6.0	6.2	6.6	μs
Horizontal Output Pulse Delay Time	T _{pdH}	—	Note D-2	0.36	0.52	0.68	μs
Horizontal Output Saturation Level	V _{oIH}	—	Note D-3	—	0.2	0.4	V
Vertical Output Pulse Width	PWVD	—	Note D-4	—	26	26.5	H
Vertical Output Pulse Delay Time	T _{pdV}	—	Note D-5	0.65	0.84	1.03	H
Horizontal Oscillation Frequency	fH	—	Note D-6	15655	15734	15813	Hz
Horizontal AFC Pull-In Range	Δf_{pul}	—	Note D-7	600	700	—	Hz
Horizontal AFC Hold Range	Δf_{hol}	—	Note D-8	600	700	—	Hz
Horizontal AFC Hold Limit Input	V _{inPM}	—	Note D-9	—	—	-20	dB
Gate Pulse Width	PWGP	—	Note D-10	2.6	3.0	3.45	μs
Gate Pulse Delay Time	T _{pdGP}	—	Note D-11	0.65	0.90	1.15	μs
Gate Pulse Generation Limit Input	V _{inGM}	—	Note D-12	—	—	-17	dB
Vertical Sync Pull-In Range	f _{pv} 1	—	Note D-13	—	—	228	H
	f _{pv} 2	—	Note D-14	228	—	—	
Vertical Sync Hold Limit Input	V _{inVM}	—	Note D-15	—	—	-15	dB

VD TIMING PULSE



TEST CONDITIONS
 Video block

NOTE NUM- BER	CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)										TEST METHOD
		SW & VR MODE								SHARP- NESS	BRT	
		SV1	SV2	SW2	SW3	SW4	CONT					
V-1	Pin 21 input impedance (video input pin)	OPEN	OFF	OFF	INT	OFF	center	center	center		(1) Apply $0.2V_{p-p}$ AC, 1-kHz signal to pin 21 via a 10-k Ω resistor. (2) Measure the AC amplitude voltage of pin 21 (V21). (3) $Z21 = V21 \times 10\text{ k}\Omega / (0.2 - V21)$	
V-2	Pin 19 input impedance (secondary differential signal input pin)	OPEN	OFF	OFF	INT	OFF	center	center	center		(1) Apply $0.05V_{p-p}$ AC, 1-kHz signal to pin 19 via a 10-k Ω resistor. (2) Measure the AC amplitude voltage of pin 19 (V19). (3) $Z19 = V19 \times 10\text{ k}\Omega / (0.05 - V19)$	
V-3	Brightness adjustment voltage	a	OFF	OFF	INT	OFF	center	center	center	speci- fied	(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Measure the DC voltage of pin 14.	
V-4	Brightness adjustment sensitivity	a	OFF	OFF	INT	OFF	center	center	center	speci- fied	(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Measure the DC voltage of pin 11 (V11L). (3) Increase BRT VR by 0.1 V. (4) Measure the DC voltage of pin 11 (V11H). (5) Calculate the following formula. $GBR = (V11H - V11L) / 0.1$	
V-5	Brightness adjustment range	a	OFF	OFF	INT	OFF	center	center	center	speci- fied	(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Set BRT VR to the maximum and minimum and measure the DC voltage of pin 11. (3) $dVBR = V11max - V11min$	

TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)									
NOTE NUM- BER	CHARACTERISTIC	SW & VR MODE						TEST METHOD	
		SV1	SV2	SW2	SW3	SW4	CONT		SHARP- NESS
V-6	Minimum linear video input								(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V.
V-7	Maximum linear video input	a	OFF	OFF	INT	OFF	mini- mum	center	(2) Measure the DC voltage of pin 15 (V15). (3) Apply DC voltage V15 to pin 15 and fix the voltage. (4) Change the DC voltage of pin 21 and set the pin 11 output voltage change width to 100%.
V-8	Video input dynamic range								(5) Define the DC voltage of pin 21 when the pin 11 output voltage change is 10% as Vdi1 ; when 90%, as Vdi2. (6) $Vdi = Vdi2 - Vdi1$
V-9	Minimum contrast output								Pin 11 voltage Pin 21 voltage Vdi1 Vdi2 Vdo1 Vdo2 100% 90% 10% 0%
V-10	Maximum contrast output	a	OFF	OFF	INT	OFF	maxi- mum	center	(7) Set CONT VR to the maximum. (8) Repeat steps (1) to (4). (9) Measure the maximum (Vdo2) and minimum (Vdo1) values of pin 11 output change.

TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)									
NOTE NUM- BER	CHARACTERISTIC	SW & VR MODE						TEST METHOD	
		SV1	SV2	SW2	SW3	SW4	CONT		SHARP- NESS
V-11	Secondary differential input dynamic range	a	ON	OFF	INT	OFF	mini- mum	mini- mum	speci- fied
V-12	AC gain	OPEN	OFF	OFF	INT	OFF	center	center	speci- fied

(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V.

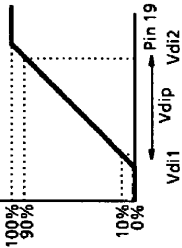
(2) Measure the DC voltage of pin 15 (V15).

(3) Apply DC voltage V15 to pin 15 and fix the voltage.

(4) Change the DC voltage of pin 19 and set the pin 11 output voltage change width to 100%.

(5) Define the DC Pin 11 voltage voltage of pin 19 100% 90% when the pin 11 output voltage change is 10% as Vdp1 ; when 90%, as Vdp2.

(6) $V_{dip} = V_{dp2} - V_{dp1}$



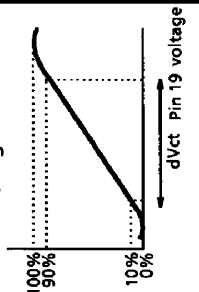
Pin 11 voltage

Pin 19 voltage

100% 90% 10% 0%

Vdi1 Vdi2

TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^\circ C$)										
NOTE NUM- BER	CHARACTERISTIC	SW & VR MODE								TEST METHOD
		SV1	SV2	SW2	SW3	SW4	CONT	SHARP- NESS	BRT	
V-13	Frequency characteristic	OPEN	OFF	OFF	INT	OFF	center	center	speci- fied	(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Apply a 0.1-V _{p-p} sine wave to pin 21 via a 10-μF capacitor. (3) Measure the frequency which decreases by 3 dB from the amplitude when pin 11 AC amplitude is at 10 kHz.
V-14	Contrast adjustment voltage range	b	OFF	OFF	INT	OFF	speci- fied	center	speci- fied	(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Measure DC voltage V15 or pin 15. (3) Apply DC voltage V15 to pin 15 and fix the voltage. (4) Apply a 10-kHz, 0.1-V _{p-p} sine wave to pin 21. (5) Set CONT VR to the maximum and minimum, and measure the AC amplitude of pin 11. Define them as 100% and 10%, respectively. (6) Adjust CONT VR. Measure the CONT pin (pin 18) voltage when the pin 11 amplitude is 90% and 10% (V90%, V10%). $\Delta V_{ct} = V_{90\%} - V_{10\%}$



NOTE NUM- BER	CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5\text{ V}$, $T_a = 25 \pm 3^\circ\text{C}$)										TEST METHOD
		SW & VR MODE						SHARP- NESS	BRT			
		SV1	SV2	SW2	SW3	SW4	CONT					
V-15	Contrast adjustment gain range	b	OFF	OFF	INT	OFF	specified	center	specified		(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Measure the DC voltage of pin 15 (V15). (3) Apply DC voltage V15 to pin 15 and fix the voltage. (4) Apply a 10-kHz, 0.1- V_{p-p} sine wave to pin 21. (5) Set CONT VR to the maximum and minimum, and measure the AC amplitude of pin 11. Define them as V_{max} and V_{min} , respectively. $dGct = 20 \log (V_{max} / V_{min})$	
V-16	Frequency characteristic change due to contrast adjustment	b	OFF	OFF	INT	OFF	specified	center	specified		(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Apply a 4-MHz, 0.2- V_{p-p} sine wave to pin 21. (3) Set CONT VR to the maximum and minimum, and measure the AC amplitude of pin 11. Define them as V_{max} (4M) and V_{min} (4M), respectively. (4) Measure the AC amplitude of pin 11 when input signal frequency $f = 100\text{ kHz}$. Define them as V_{max} (100k) and V_{min} (100k), respectively. (5) Calculate the following formula using the measured values. $dGf = - \frac{20 \log (V_{max} (4M) / V_{max} (100k))}{20 \log (V_{min} (4M) / V_{min} (100k))}$	

TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)												
NOTE NUM- BER	CHARACTERISTIC	SW & VR MODE								TEST METHOD		
		SW & VR MODE										
		SV1	SV2	SW2	SW3	SW4	CONT	SHARP- NESS	BRT			
V-17	Gain change amount at minimum sharpness adjustment	b	ON	OFF	INT	OFF	center	speci- fied	speci- fied	(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Apply a 2.4-MHz, 0.2- V_{p-p} sine wave to pins 19 and 21. (3) Set sharpness VR to the maximum and minimum, and measure the AC amplitude of pin 11. Define them as V_{max} and V_{min} , respectively. (4) $G_{psmin} = 20 \log (V11min / V11max)$		
V-18	Gain change amount at maximum sharpness adjustment	a	ON	OFF	INT	OFF	maxi- mum	maxi- mum	speci- fied	(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Apply a 2.4-MHz, 0.2- V_{p-p} sine wave to pin 19. (3) Measure the AC amplitude of pin 11 and define it as V11 (2.4M). (4) Measure the AC amplitude of pin 11 when input signal frequency $f = 100$ kHz and define it as V11 (100k). (5) $G_{psmax} = 20 \log (V11 (2.4M) / V11 (100k))$		
V-19	Sharpness adjustment characteristic	a	ON	OFF	INT	OFF	maxi- mum	center	speci- fied	(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Apply a 2.4-MHz, 0.2- V_{p-p} sine wave to pin 19. (3) Measure the AC amplitude of pin 11 and define it as V11 (2.4M). (4) Measure the AC amplitude of pin 11 when input signal frequency $f = 100$ kHz and define it as V11 (100k). (5) $G_{ps0} = 20 \log (V11 (2.4M) / V11 (100k))$		
V-20	Pin 13 output voltage	a	OFF	OFF	INT	OFF	center	center	speci- fied	(1) Measure the DC voltage of pin 13.		

NOTE NUM- BER		CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)										TEST METHOD	
			SW & VR MODE								CONT	SHARP- NESS		BRT
			SV1	SV2	SW2	SW3	SW4	SW4	CONT	BRT				
V-21	Pedestal potential after ACL adjustment	b	OFF	OFF	INT	switch- ing	speci- fied	center	speci- fied	(1) Connect pin 17 (ACL) to GND (SW4 : on). (2) Input 100% white signal of $0.38 V_{p-p}$ to pin 21. (3) Adjust BRT VR so that the pin 11 pedestal level equals 1.0 V ; adjust CONT VR so that the pin 11 white level equals 2.1 V (pedestal to white : $1.1 V_{0-p}$). (4) Disconnect pin 17 from GND. Measure the pin 11 pedestal potential and pedestal to white amplitude (SW4 : off).				
V-22	White amplitude after ACL adjustment													
V-23	3-axis output DC deviation (B / G)	a	OFF	OFF	INT	OFF	center	center	speci- fied	(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Measure the DC voltage of pins 10, 11, and 12 (V10, V11, V12). (3) $V_{ofB} / G = V_{12} - V_{11}$ $V_{ofR} / G = V_{10} - V_{11}$				
V-24	3-axis output DC deviation (R / G)													
V-25	3-axis AC gain deviation (B / G)	b	OFF	OFF	INT	ON	center	center	speci- fied	(1) Adjust BRT VR so that the DC voltage of pin 11 equals 0.9 V. (2) Measure the DC voltage of pin 15 (V15). (3) Apply DC voltage V15 to pin 15 and fix the pin voltage. (4) Apply a 10-kHz, $0.1 V_{p-p}$ sine wave to pin 21. (5) Measure the AC voltage of pins 10, 11, and 12 (V10, V11, V12). $dGB / G = 20 \log (V_{12} - V_{11})$ $dGR / G = 20 \log (V_{10} - V_{11})$ (Note) V11 here is the same as V11 in V-12.				
V-26	3-axis AC gain deviation (R / G)													

Chroma block

NOTE NUM- BER		CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)										TEST METHOD
			SW & VR MODE										
			SV1	SV2	SW1	SW2	SW3	SW4	TINT	COLOR	CONT		
C-1	Pin 23 input resistance	a	OFF	OFF	ON	OFF	OFF	center	center	center	(1) Turn V_{CC} off. (2) Measure the resistance between pin 23 and V_{CC} . (3) The voltage applied between the pins must be less than 0.5 V.		
C-2	Color difference output (R-Y)										(1) Input unicolor signal with amplitude 75 mV _{p-p} and burst chroma ratio 1:1, or rainbow color bar signal.		
C-3	Color difference output (G-Y)	a	OFF	OFF	ON	ON	OFF	speci- fied	center	center	(2) Adjust (or change chroma tint) TINT VR for pins 10, 11, and 12 separately. When the color difference output is at the maximum, measure the output amplitude (V_{0-p}). (Note) When the unicolor signal is input, measure the red signal on pin 10 ; the green signal on pin 11 ; and the blue signal on pin 12.		
C-4	Color difference output (B-Y)										(1) Input unicolor signal (blue) with amplitude 75 mV _{p-p} and burst chroma ratio 1:1, or rainbow color bar signal.		
C-5	Color change amount	a	OFF	OFF	ON	ON	OFF	center	speci- fied	center	(2) Measure the B-Y color difference output amplitudes (V_{omax} , V_{osent}) when COLOR VR is at the maximum and center on pin 12. (3) $ec = 20 \log (V_{omax}/V_{osent})$		
C-6	Unicolor change amount	a	OFF	OFF	ON	ON	OFF	center	speci- fied	center	(1) Input unicolor signal (blue) with amplitude 75 mV _{p-p} and burst chroma ratio 1:1, or rainbow color bar signal. (2) Measure the B-Y color difference output amplitudes (V_{omax} , V_{omin}) when CONT VR is at the maximum and center on pin 12. (3) $eu = 20 \log (V_{omax}/V_{omin})$		

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NOTE NUM- BER	CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^\circ C$)									
		SW & VR MODE						TEST METHOD			
		SV1	SV2	SW1	SW2	SW3	SW4	TINT	COLOR	CONT	
C-7	Tint change amount	a	OFF	OFF	ON	ON	OFF	speci- fied		center	(1) Input standard color bar signal. (pin 23 signal level) Burst : $75 mV_{p-p}$, R bar : $225 mV_{p-p}$ G bar : $210 mV_{p-p}$, B bar : $160 mV_{p-p}$ (2) Change TINT VR, measuring the maximum value of R bar on pin 10, G bar on pin 11, and B bar on pin 12. Define them as V Rmax, V Gmax, and V Bmax. (3) Fix TINT VR to the maximum. Measure the amplitude of R bar on pin 10, G bar on pin 11, and B bar on pin 12. Define them as R Tmax, G Tmax, and B Tmax. (4) Fix TINT VR to minimum. Measure the amplitude of R bar on pin 10, G bar on pin 11, and B bar on pin 12. Define them as R Tmin, G Tmin, and B Tmin. $R \theta (+) = \cos^{-1} (R \text{ Tmax} / V \text{ Rmax}) + 1.5$ $G \theta (+) = \cos^{-1} (G \text{ Tmax} / V \text{ Gmax}) + 0.6$ $B \theta (+) = \cos^{-1} (B \text{ Tmax} / V \text{ Bmax}) - 12.4$ $R \theta (-) = \cos^{-1} (R \text{ Tmin} / V \text{ Rmax}) - 1.5$ $G \theta (-) = \cos^{-1} (G \text{ Tmin} / V \text{ Gmax}) - 0.6$ $B \theta (-) = \cos^{-1} (B \text{ Tmin} / V \text{ Bmax}) + 12.4$

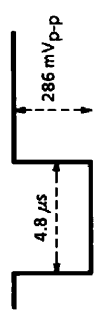
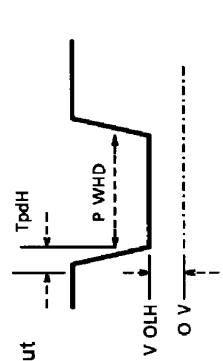
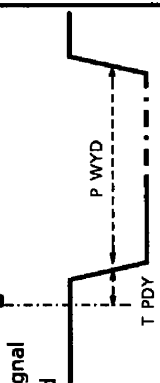
NOTE NUM- BER	CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)										TEST METHOD	
		SW & VR MODE								TINT	COLOR		CONT
		SV1	SV2	SW1	SW2	SW3	SW4						
C-8	Tint center (R θ , G θ , B θ)	a	OFF	OFF	ON	ON	OFF	speci- fied	center	center		(1) Input rainbow color bar signal. (pin 23 signal level). Burst and chroma : 75 mV _{p-p} (2) Set TINT VR to the center. (3) Measure the amplitude difference between R bar (third bar) on pin 10 and its adjacent bars. Where the difference from the second bar is A and from the fourth bar is B : $R \theta = 90 - \tan^{-1} (2 - \sqrt{3})$ $(1 - 2A / (A + B))$ (4) Measure the amplitude difference between G bar (fourth bar) on pin 11 and its adjacent bars. Where the difference from the third bar is A and from the fifth bar is B : $G \theta = 240 - \tan^{-1} (2 - \sqrt{3})$ $(1 - 2A / (A + B))$ (5) Measure the amplitude difference between B bar (sixth bar) on pin 12 and its adjacent bars. Where the difference from the fifth bar is A and from the seventh bar is B : $B \theta = \tan^{-1} (2 - \sqrt{3}) (1 - 2A / (A + B))$	
C-9	Residual color	a	OFF	OFF	ON	ON	OFF	center	speci- fied	center		(1) Input standard color bar signal. (pin 23 signal level) Burst : 75 mV _{p-p} , R bar : 225 mV _{p-p} G bar : 210 mV _{p-p} , B bar : 160 mV _{p-p} (2) Set COLOR VR to the center. Use a spectrum analyzer to measure the level of the 15.734- kHz component in the R bar on pin 10, G bar on pin 11, and B bar on pin 12. (3) Set COLOR VR to the minimum, fix pin 16 to 0.5V (killer off), and measure the levels as in step (2) above. (4) Calculate on each axis the level difference when COLOR VR is set to the center and the minimum.	

NOTE		TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)									
NUM-BER	CHARACTERISTIC	SW & VR MODE								TEST METHOD	
		SV1	SV2	SW1	SW2	SW3	SW4	TINT	COLOR		
C-10	Demodulation relative amplitude (R-Y/B-Y)	a	OFF	OFF	ON	ON	OFF	specified	center	center	(Note) Calculate the following based on the measured values in C2 to C4 above. $R/B = VR/VB$ $G/B = VG/VB$
C-11	Demodulation relative amplitude (G-Y/B-Y)										
C-12	Demodulation relative phase (R-Y/B-Y)	a	OFF	OFF	ON	ON	OFF	specified	center	center	(Note) Calculate the following based on the measured values in C8 above. $R - B = 105 + R \theta - B \theta$ $G - B = 240 + G \theta - B \theta$
C-13	Demodulation relative phase (G-Y/B-Y)										
C-14	Demodulation output residual carrier	a	OFF	OFF	ON	ON	OFF	specified	center	center	(1) Use a spectrum analyzer to measure the level of a sine wave of amplitude 200 mV _{p-p} and frequency f _{SC} and define it as L200. (2) Use the spectrum analyzer to measure the residual carrier level of the color difference output for pins 10, 11, and 12. Define them as LR, LG, and LB, respectively. (3) Calculate the demodulation output residual carrier for each axis using the following formula. $K = (LC - L200) / 20$ (CはR、G、Bに置き替える) $e CR = 200 \cdot (10^K)$
C-15	Killer operation input level	a	OFF	OFF	ON	ON	OFF	center	center	center	(1) Input unicolor signal with amplitude 75 mV _{p-p} and burst chroma ratio 1:1, or rainbow color bar signal to the chroma input pin via the attenuator. (2) While monitoring the color difference output of pin 10, 11, or 12, decrease the chroma input level. (3) Read the attenuation amount when output stops. (Note) Input, to the sync and video input pins, signals which do not pass the attenuator.

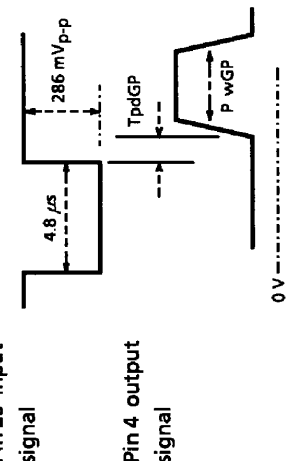
NOTE NUM- BER	CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)										TEST METHOD
		SW & VR MODE										
		SV1	SV2	SW1	SW2	SW3	SW4	TINT	COLOR	CONT		
C-16	ACC characteristic	a	OFF	OFF	ON	ON	OFF	center	center	center	(1) Input sine wave with amplitude 75 mV _{p-p} and frequency f_{SC} to the chroma input pin via the attenuator. (2) Measure the 1-H interval pulse amplitude output on pin 12 (B axis output) and use this as the reference output level. (3) Increase / decrease the attenuation level and determine the attenuation amount when the output level change equals ± 1 dB. (Note) Input, to the sync and video input pins, signals which do not pass the attenuator.	
C-17	Control sensitivity	a	OFF	OFF	OFF	OFF	OFF	center	center	center	(1) Provide an electrically floating test pin near pin 7. Use an FET probe to measure the sub carrier frequency induced on the test pin. (2) Connect external power supply to pin 6. Supply voltages of 0.5V and 1.5V and measure frequencies f_{05} and f_{15} and calculate the following. $\beta_s = \frac{(f_{05} - f_{15})}{1000 \text{ mV}}$	
C-18	APC pull-in range	a	OFF	OFF	OFF	OFF	OFF	center	center	center	(1) Input to pin 23 a sine wave with a reference frequency of 3.579545 MHz and an amplitude of 75 mV _{p-p} . (2) Input composite sync signal to pin 25. (3) Use an oscilloscope to monitor pin 6. (4) Increase or decrease the signal frequency of step (1) above. Unlock the synchronization of the signal in step (1) with the oscillator output signal (out-of-sync when monitor waveform starts fluctuating). (5) Decrease or increase the signal frequency of step (1) above. Measure the difference between the oscillator frequency and the reference frequency (peak and bottom) when the signal in step (1) and the oscillator output signal lock.	

NOTE NUM- BER	CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, V _{CC} = 5V, T _a = 25 ± 3°C)										TEST METHOD
		SW & VR MODE										
		SV1	SV2	SW1	SW2	SW3	SW4	TINT	COLOR	CONT		
C-19	APC hold range	a	OFF	OFF	OFF	OFF	OFF	center	center	center	(1) Input a sine wave with a reference frequency of 3.579545 MHz and an amplitude of 75 mV _{p-p} to pin 23. (2) Input composite sync signal to pin 25. (3) Use the oscilloscope to monitor pin 6. (4) Increase or decrease the signal frequency of step (1) above. Measure the difference between the oscillator frequency and the reference frequency (peak and bottom) when the signal in step (1) and the oscillator output signal unlock (out-of-sync when monitor waveform starts fluctuating).	

Sync block

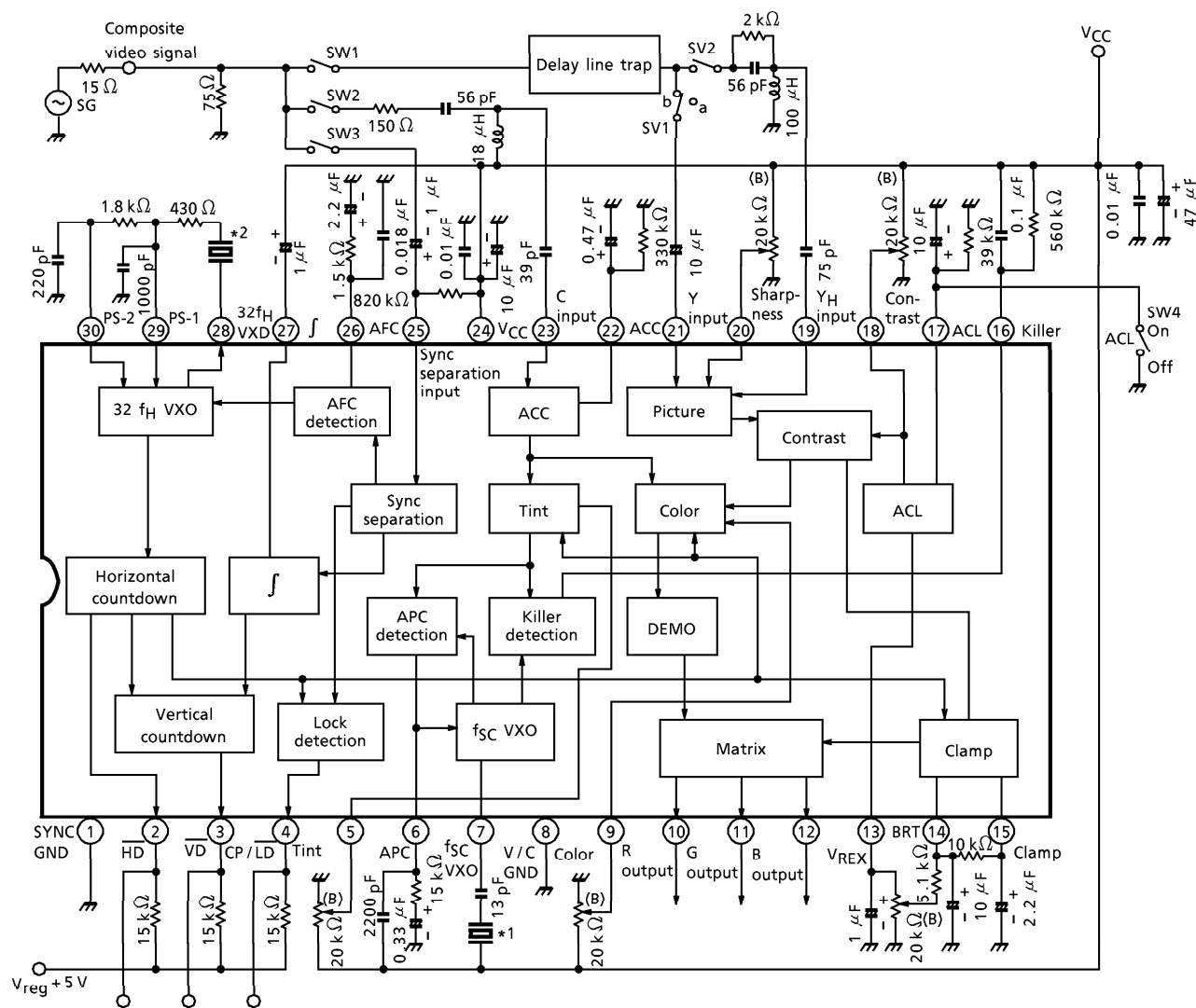
NOTE NUM- BER		CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)							TEST METHOD
			SW & VR MODE							
			SW3							
D-1	Horizontal output pulse width	INT								Pin 25 input signal 
D-2	Horizontal output pulse delay time									Pin 2 output signal 
D-3	Horizontal output saturation level									
D-4	Vertical output pulse width	INT								Pin 2 output signal 
D-5	Vertical output pulse delay time									Pin 3 output signal (odd-numbered field) 
D-6	Horizontal oscillation frequency	EXT								(1) Connect pin 25 to V_{CC} . (2) Measure pin 2 frequency.
D-7	Horizontal AFC pull-in range	INT								(1) Apply a horizontal sync signal (PG) with amplitude 286 mV and pulse width 4.8 μs to pin 25. Set the standard horizontal frequency to 15.734 kHz. (2) Use the oscilloscope to monitor the signals on pins 2 and 25. Change the PG frequency, measuring it at the moment when the state changes from out-of-sync to sync. (3) Define the frequency when it is pulled in from high as f_{HH} ; from low, as f_{HL} . $d f_{pul} = (f_{HH} - f_{HL}) / 2$

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NOTE NUM- BER		CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^\circ C$)								TEST METHOD
			SW & VR MODE								
			SW3								
D-8	Horizontal AFC hold range	INT									(1) Apply a horizontal sync signal (PG) with amplitude 286 mV and pulse width 4.8 μs to pin 25. Set the standard horizontal frequency to 15.734 kHz. (2) Use the oscilloscope to monitor the signals on pins 2 and 25. Change the PG frequency, measuring it at the moment when the state changes from sync to out-of-sync. (3) Define the frequency when it is out-of-sync to high as f_{HH} ; to low, as f_{HL} . $d f_{hol} = (f_{HH} - f_{HL}) / 2$
D-9	Horizontal AFC hold limit input	EXT									(1) Use an attenuator to apply a horizontal sync signal (PG) with amplitude 286 mV and pulse width 4.8 μs to pin 25. Set the standard horizontal frequency to 15.734 kHz. (2) Use the attenuator to change the pin 25 input signal level, reading the attenuation amount at the moment when the state changes from sync to out-of sync.
D-10	Gate pulse width	INT									
D-11	Gate pulse delay time										

NOTE NUM- BER		CHARACTERISTIC	TEST CONDITIONS (UNLESS OTHERWISE SPECIFIED, $V_{CC} = 5V$, $T_a = 25 \pm 3^{\circ}C$)										TEST METHOD
			SW & VR MODE										
			SW3										
D-12	Gate pulse generation limit input	INT										(1) Use the attenuator to apply a horizontal sync signal (PG) with amplitude 286 mV and pulse width 4.8 μs to pin 25. Set the standard horizontal frequency to 15.734 kHz. (2) Use the oscilloscope to monitor the pin 4 signal. (3) Use the attenuator to attenuate the pin 25 input signal level, reading the attenuation amount when gate pulse output becomes unstable.	
D-13	Vertical sync pull-in range 1	INT										(1) Apply a variable-interval composite sync signal (PG) with amplitude 286 mV to pin 25. Set the standard horizontal frequency to 15.734 kHz, the horizontal sync pulse width to 4.8 μs , the vertical frequency fV to fH/262.5, and the vertical sync pulse width to 3 H. (2) Use the oscilloscope to monitor pin 3 and 25 signals. Change the PG frequency, measuring the PG frequency at the moment when the state changes from out-of-sync to sync. (3) Define the frequency when it is pulled in from high as fVh ; from low, as fVL.	
D-14	Vertical sync pull-in range 2												(1) Apply a variable-interval composite sync signal (PG) with amplitude 286 mV to pin 25. Set the standard horizontal frequency to 15.734 kHz, the horizontal sync pulse width to 4.8 μs , the vertical frequency fV to fH/262.5, and the vertical sync pulse width to 3 H. (2) Use the oscilloscope to monitor pin 3 and 25 signals. (3) Use the attenuator to attenuate the pin 25 input signal level, reading the attenuation amount just before the state changes from sync to out-of-sync.
D-15	Vertical sync hold limit input	INT										(1) Apply a variable-interval composite sync signal (PG) with amplitude 286 mV to pin 25. Set the standard horizontal frequency to 15.734 kHz, the horizontal sync pulse width to 4.8 μs , the vertical frequency fV to fH/262.5, and the vertical sync pulse width to 3 H. (2) Use the oscilloscope to monitor pin 3 and 25 signals. (3) Use the attenuator to attenuate the pin 25 input signal level, reading the attenuation amount just before the state changes from sync to out-of-sync.	

V/C/S IC TEST CIRCUIT



(*1) : 3.58 MHz X'tal

NR-18 (HC-49/U) (made by Nihon Denpa Kogyo Co, Ltd)

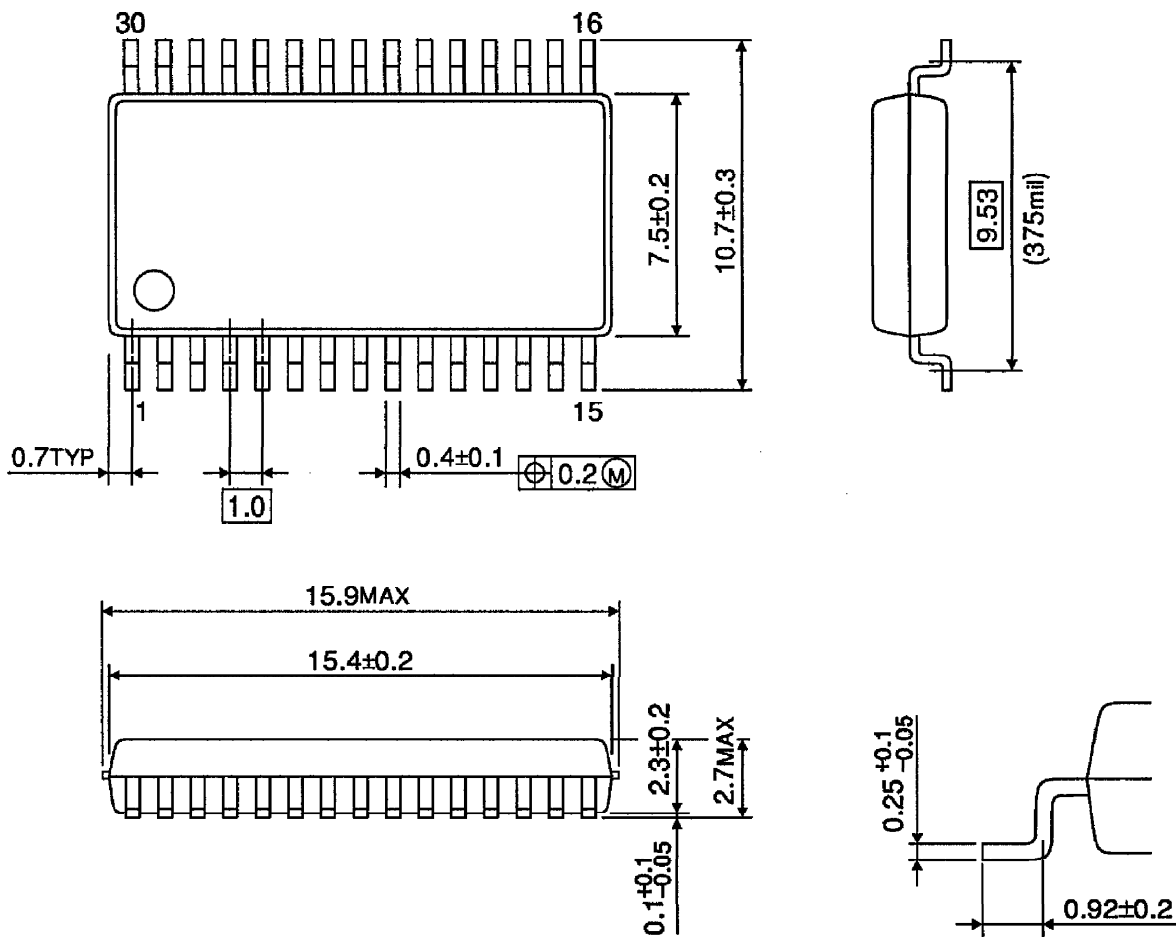
(*2) : 32-f_H ceramic oscillator

CSB503F10

(made by Murata Manufacturing, Co, Ltd)

PACKAGE DIMENSIONS
SSOP30-P-375-1.00

Unit : mm



Weight : 0.63 g (Typ.)

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000707EBA

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