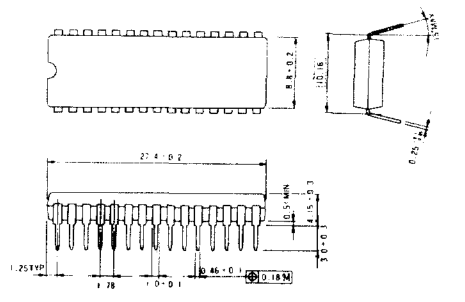
TA7778P

TENTATIVE

AUTOMATIC KINE-BIAS (AKB) RGB INTERFACE

TA7778P is an IC designed to offer the function of optimizing TV CRT drive conditions and eliminating cutoff/drive adjustments that have conventionally involved extensive complications.
R.G.B. data input terminals are provided to enable high-speed switching between TV signals and data signals.
Color difference output and -Y output from TV can be internally added, and brightness control at the step preceding R.G.B. can also be effectively achieved.
Half tone circuit can effect high-speed reduction of contrast by 3 dB at those portions high in brightness. This function facilitates the observation of data during superimposing.
As data signals, available are TV signals and black level signals issued from the input clamp circuit. Independently from TV signals, contrast/brightness controls can be achieved.

Unit: mm



JEDEC	—
TOSHIBA	SDIP30-P-400

MAXIMUM RATINGS (Ta = 25°C)

ITEM	SYMBOL	RATING	UNIT
Power Supply Voltage	V_{CC}	15	V
Input Signal Voltage	e_{IN}	5	V
Primary-color Output Current	I_{OUT}	3.5	mA
Primary-color Output Signal Current	i_{OUT}	5	mA
Video/Data Switching Voltage	V_{12}	-0.5 to 7	V
Half Tone Switching Voltage	V_{13}	-0.5 to 7	V
Contrast Adjusting Terminal Voltage	V_9	V_{CC}	V
Brightness Adjusting Terminal Voltage	V_{10}	V_{CC}	V
Blanking Pulse Input Voltage	V_{18}	5 to 10	V
Power Dissipation	P_D	1.6 (Note)	W
Operating Temperature	T_{opr}	-20 to 65	°C
Storage Temperature	T_{stg}	-55 to 150	°C

Note: When using in excess of Ta = 25°C, reduce 12.8 mW per 1°C.

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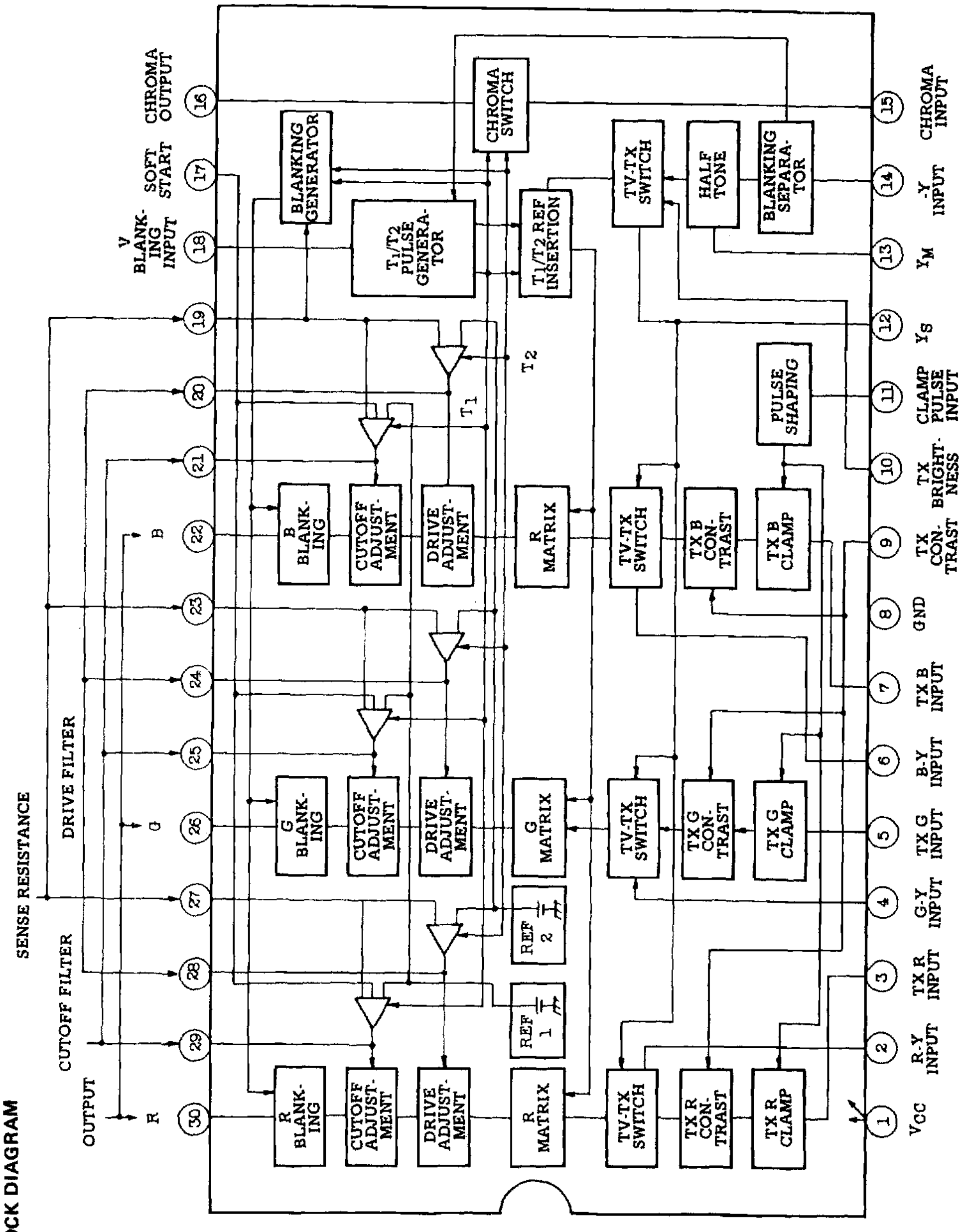
BLOCK DIAGRAM



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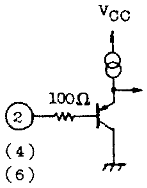
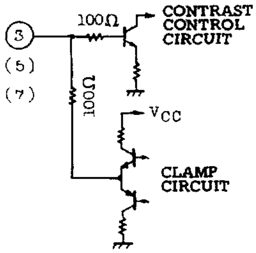
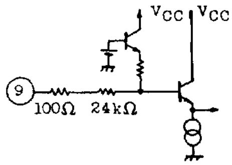
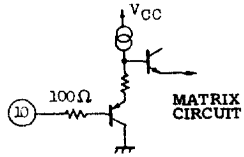
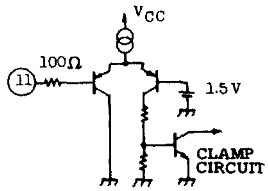
TERMINAL FUNCTIONS AND INTERFACE CIRCUITS

TERMINAL NO.	NAME	TERMINAL FUNCTION	INTERFACE
1	V_{CC}	V_{CC} = 8 to 12V	
2 4 6	R – Y input G – Y input B – Y input	Input terminal for TV color difference signal. Used by DC coupling. Under V_{CC} = 12V, no-signal level is used by 7.8V Typ. Under V_{CC} = 9V, no-signal level is used by 5.2V Typ. Added to Y signal input from terminal 14 by internal matrix circuit and converted to RGB signals.	
3 5 7	R input G input B input	Input terminal for TEXT RGB signal. Used by AC coupling. In IC interior, input clamp circuit equalizes DC voltage during clamping period of R.G.B signal and DC voltage during clamping period of TV color difference signal. After this step, internal matrix circuit adds DC voltage determined by TEXT brightness control.	
8	GND		
9	TEXT contrast control	Terminal for controlling amplitude of RGB input from terminals 3, 5, and 7.	
10	TEXT brightness control	Terminal for controlling DC voltage added to RGB signals input from terminals 3, 5, and 7.	
11	Clamp pulse input	Input terminal of clamp pulse for equalizing black level of RGB signals and that of TV signal.	

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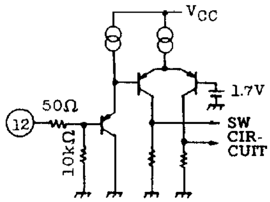
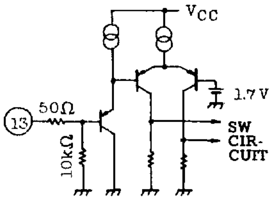
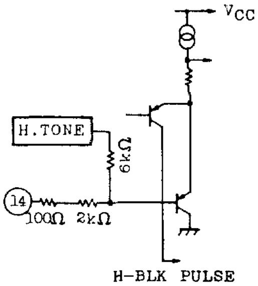
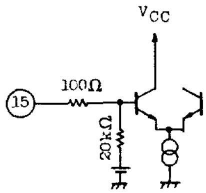
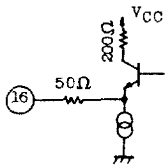
TERMINAL NO.	NAME	TERMINAL FUNCTION	INTERFACE
12	Y_S input	Effects high-speed switching between TV signal (terminals 2, 4, 6, and 14) and RGB signals (terminals 3, 5, and 7). RGB signals are selected under H level; TV signal is selected under L level.	
13	Y_M input	By pulling up Terminal 13 H level, the amplitude of -Y signal input from terminal 14 can be reduced by 3 dB. When text signal is superimposed, this function lowers brightness of the TV signal to make the text signal easy to observe.	
14	-Y & H.BLK input	Input terminal of TV -Y signal concurrently functioning with input terminal of H blanking pulse. Input -Y signal with H blank applied by DC coupling. Under V_{CC} = 12V, pedestal level is used by 6.4V typ. Under V_{CC} = 9V, pedestal level is used by 4.8V typ. Since DC coupling is adopted on TV signal, brightness control can be applied at VIDEO circuit.	
15 16	Chroma SW input Chroma SW output	TV signal input of TA7778P is DC coupled, and cutoff and drive REF pulses are added to this DC level. Therefore, if VITS signal, teletext signal, or another signal exists while these REF pulses are inserted in TA7778P and such a signal is demodulated by the chroma demodulator and DC level during the REF pulse period is deviated from no-signal level, then REF pulse level isn't accurate value. For preventing the above-mentioned deviation. The Chroma SW circuit outputs DC voltage during REF pulse period and outputs very input signals during other periods. Then, insert this chroma SW circuit of TA7778P before the chroma demodulator.	

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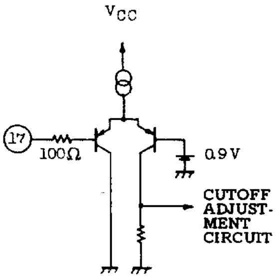
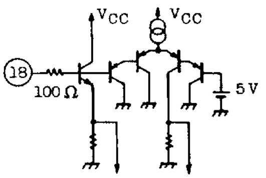
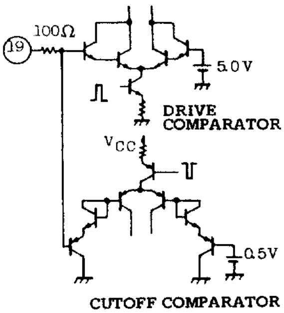
TERMINAL NO.	NAME	TERMINAL FUNCTION	INTERFACE
17	Soft start	If the CRT is not sufficiently warmed up when power supply is turned ON, beam current does not flow even during cutoff and drive sence, resulting in failure to create needed voltage at the sense terminal. Consequently, both cutoff adjustment and drive adjustment are effected to flow current to the CRT. Therefore, at the moment sufficient warmth is obtained on the CRT, the screen display starts from white. For preventing the above-mentioned phenomenon, this soft start circuit is provided to fix cutoff adjustment voltage on black level by using feed back DC voltage from output when terminal 17 level is above the present voltage 0.9V.	
18	V-BLK input	This is the input terminal of V blanking pulse for determining the timing of REF pulses for cutoff adjustment and drive adjustment. The 2H period from fall of V blanking pulse is used as the REF level for cutoff. The subsequent 2H period is used as the REF level for drive. The timing for H is determined by H blanking pulse from terminal 14.	
19 23 27	B sense G sense R sense	This is the sense terminal of beam current of the CRT. Current flowing on CRT cathode during the REF pulses period for cutoff and drive adjustment is detected by converting to voltage on sense resistance. By varying the sense resistance ratio, white balance can be adjusted. The internal comparator synchronizes with the REF pulse.	

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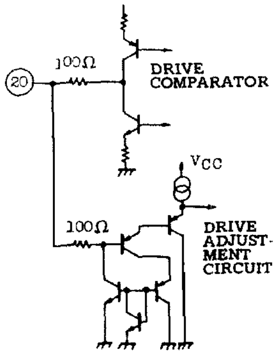
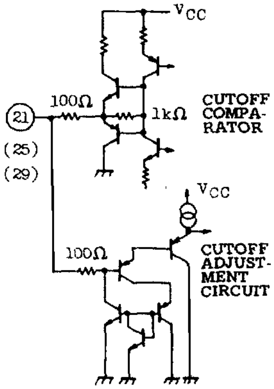
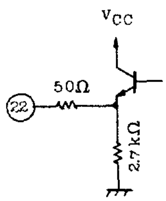
TERMINAL NO.	NAME	TERMINAL FUNCTION	INTERFACE
20 24 28	B drive filter G drive filter R drive filter	Terminal for drive filter to perform 1V-period holding of comparator output during REF pulse period. This voltage controls RGB gain to fix the terminal 19 sense voltage at 5V. Use the filter capacitance with minimum leak current.	
21 25 29	B cutoff filter G cutoff filter R cutoff filter	Terminal for cutoff filter to perform 1V-period holding of comparator output during REF pulse period. This voltage controls the RGB DC level shifts to fix the terminal 19, 23, and 27 sense voltage at 5V. Use the filters with minimum leak current.	
22 26 30	B OUT G OUT R OUT	Output terminal of the RGB signals. DC level and gain are determined so that the sense terminal voltage is 0.5V during cutoff sensing and 5V during drive sensing. This voltage becomes approximately 1V during H blanking or V blanking.	

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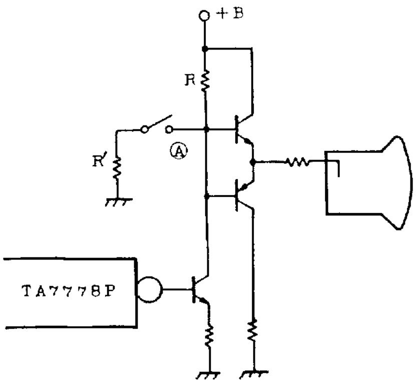
CRT Screen Adjusting Method in Using TA7778P

Fig. 7 shows the output voltage control characteristics against cutoff control voltage of TA7778P.

When the brightness control (determined by the TV signal processing IC) is set at the center, the cutoff adjustment range can be maximized by setting TA7778P output at the dynamic range center of cutoff control characteristics.

Consequently, the adjustment method of screen voltage is that voltage adds to screen for luster to start luminancing with connecting R' resistance between point Ⓐ and GND.

Determine R' value so that voltage at point Ⓐ becomes equal to that when IC output is 4V.



TA7778P

VIDEO (TV) (Ta = 25±1°C. UNLESS OTHERWISE SPECIFIED, V_{CC} = 12V THE H BLANK PULSE IS INCLUDED IN TERMINAL 14 INPUT.)

ITEM	SYMBOL	MEASURED CIRCUIT	MEASURED TERMINAL	MEASURING CONDITIONS	MINI-MUM	TYPI-CAL	MAXI-MUM	UNIT
Recommended Power Supply Voltage	V_{CC1}				8.0	—	12.5	V
Power Supply Current	I_{CC1}				52	68	91	mA
Recommended Color Difference Input DC Voltage	V_{CD}		2, 4, 6	V_{CC} = 12V	7.2	7.8	8.3	V
				V_{CC} = 9V	4.7	5.2	5.7	V
Color Difference Input Dynamic Range	v_{CD}		(2, 30) (4, 26) (6, 22)	With adding multi-burst from terminal 2, input amplitude is measured when output from terminal 30 is saturated. $V_{20}=V_{24}=V_{28}=6V$ $V_{21}=V_{25}=V_{29}=6V$ $V_{CD}=7.8V$, $V_{-Y}=6.4V$	2.5	3.5	—	Vp-p
Recommended Luminance Signal Input DC Voltage	V_{-Y}		14	V_{CC} = 12V	5.9	6.4	6.9	V
				V_{CC} = 9V	4.1	4.8	5.6	V
Luminance Signal Input Dynamic Range	v_{-Y}		14, 22 26 30	With adding multi-burst from terminal 14, input amplitude is measured when output from terminals 22, 26, and 30 is saturated. $V_{CD}=7.8V$, $V_{-Y}=6.4V$	2.5	3.5	—	Vp-p
Maximum Gain	G_m		14, 22 26 30	Terminal 14 input: Stairstep signal 1 Vp-p (Pedestal 6.4V) $V_{20}=V_{24}=V_{28}=12V$ $V_{21}=V_{25}=V_{29}=6V$ $V_2=V_4=V_6=7.8V$	3	5	6	dB
Variable Gain Width	G_R		14, 22 26 30	Terminal 14 input: Stairstep signal 1 Vp-p (Pedestal 6.4V) $V_{21}=V_{25}=V_{29}=6V$ $V_2=V_4=V_6=7.8V$ Output gain variation is measured when V_{20}, V_{24}, and V_{28} are varied in the range of 0-12V.	10	12	13	dB

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ITEM	SYMBOL	MEASURED CIRCUIT	MEASURED TERMINAL	MEASURING CONDITIONS	MINI-MUM	TYPI-CAL	MAXI-MUM	UNIT
Black Detection Voltage	V_B		19, 23, 27	Terminal 14 input: Stairstep signal 1 Vp-p (Pedestal 6.4V) DC voltage during black detection is measured.	0.4	0.55	0.7	V
White Detection Voltage	V_W		19, 23, 27	Terminal 14 input: Stairstep signal 1 Vp-p (Pedestal 6.4V) DC voltage during white detection is measured.	4.0	5.0	6.0	V
Output Blanking Level	V_{OL}		22, 26, 30	Terminal 14 input: Stairstep signal 1 Vp-p (Pedestal 6.4V) Blanking level of output terminal is measured.	—	1.0	1.5	V

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CONTROL

ITEM	SYMBOL	MEASURED CIRCUIT	MEASURED TERMINAL	MEASURING CONDITIONS	MINI-MUM	TYPI-CAL	MAXI-MUM	UNIT
Reset Voltage	V_R		18, 30	With varying pulse peak value of #18, #18 is measured when T_1, T_2 pulse are detected at RGB output.		5.0	6.0	V
Luminance Signal Blanking Detection Level	V_{YBLK}		14, 30	With varying pulse peak value of #14, #14 is measured when blanking pulse is detected at RGB output.	8.4	9.5	10.6	V
Black Detection Voltage Drift	ΔV_B		19, 23, 27	Make color difference input to be DC center, 7.8V, ±0.3V Make output amplitude gain to be +3, −1 dB	−6.0	0	6.0	mV
White Detection Voltage Drift	ΔV_W		19, 23, 27	Color difference input DC ±0.3V variation Output amplitude gain +3/−1 dB variation	−0.18	0	0.18	V
Black Detection Level Temperature Drift	$\partial V_B/\partial T$		19, 23, 27	Ta = −20 to 70°C	—	—	±1	mV/°C
White Detection Level Temperature Drift	$\partial V_W/\partial T$		19, 23, 27	Ta = −20 to 70°C	—	—	±2	mV/°C
Black Detection Difference Voltage	DV_B				—	—	±60	mV
White Detection Difference Voltage	DV_W				—	0	±0.5	V
Output Voltage Vertical-period Sag	ΔV_{OS}		22, 26, 30	AC ripple on output DC is measured.	—	—	±0.1	V
Output Difference Voltage Vertical-period Sag	ΔDV_{OS}		22, 26, 30	AC ripple of difference voltage between output terminals is measured.	—	—	±50	mV
TX Temperature Drift	$\partial V_{TX}/\partial T$		22, 26, 30	Ta = −20 to 70°C Output DC voltage is measured.	—	—	±2	mV/°C

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ITEM	SYMBOL	MEASURED CIRCUIT	MEASURED TERMINAL	MEASURING CONDITIONS	MINI-MUM	TYPI-CAL	MAXI-MUM	UNIT
Output DC Control Sensitivity	β		(21, 22) (25, 26) (29, 30)	$V_{20}=V_{24}=V_{28}=6V$ With Varying V_{21}, V_{25}, and V_{29} from 5 to 6V, output DC variation is measured.	-0.4	-0.7	-1.0	V/V
Video Frequency Characteristics	f_{TV}		22 26 14, 30	Terminal 14 input: 500 kHz to 20 MHz 1 Vp-p $V_{20}=V_{24}=V_{28}=6V$ $V_{21}=V_{25}=V_{29}=6V$ 3 dB bandwidth is measured when output level with 500kHz input is regarded as 0 dB.	10	15	—	MHz
Crosstalk Between Channels	C_{PTV}		2 → 22 26 4 → 22 30 6 → 26 30	Terminal 2 (4, 6) input: 500 kHz 1 Vp-p (DC: 7.8V) Crosstalk to other outputs is measured when terminal 30 (26, 22) output level is regarded as 0dB.	—	-50	-40	dB
TV → TX Crosstalk	$C_{PTV,TX}$		2, 4, 6 14 22,26,30	Terminal 2 (4, 6) input: 500 kHz 1 Vp-p (DC: 7.8V) Output level is measured with V_{12} = 2V when terminal 30 (26, 22) output with V_{12} = 0dB is regarded as 0dB	—	-50	-40	dB
Chroma SW Gain	G_S		15, 16	Terminal 15 input: Multi-burst 1 Vp-p Terminal 16 output is measured.	-1.5	0	0.5	dB
Chroma SW Crosstalk	C_{PS}		15, 16	Terminal 14 input: H blanking signal (Pedestal 6.4V) Terminal 15 input: Multi-burst 1 Vp-p Terminal 16 output during REF pulse is measured.	—	-50	-40	dB

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ITEM	SYMBOL	MEASURED CIRCUIT	MEASURED TERMINAL	MEASURING CONDITIONS	MINI-MUM	TYPI-CAL	MAXI-MUM	UNIT
Chroma SW Frequency Characteristics	f_s		15, 16	V_{14} = 6.4V Terminal 15 input: 500 kHz to 20 MHz Terminal 16 output is measured. 3 dB band-width is measured with regarding out-put level under 500 kHz as 0dB.	8	15	—	MHz

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DATA (TX)

ITEM	SYMBOL	MEASURED CIRCUIT	MEASURED TERMINAL	MEASURING CONDITIONS	MINI-MUM	TYPI-CAL	MAXI-MUM	UNIT
Maximum Gain	G_{TXM}		3, 22 5, 26 7, 30	Terminal 3 (5, 7) input: Multi-burst 0.5 Vp-p V_9 = 12V	7.0	9.0	10	dB
Control Variable Contrast Width	GR_{TX}		3, 22 5, 26 7, 30	Terminal 3 (5, 7) input: Multi-burst 0.5 Vp-p With varying V_9 from 0 to 12V, output amplitude variation is measured.	8	9.5	11	dB
TX Brightness Voltage	V_{TXB}		10	Terminal 10 input voltage is measured when black level difference between TV and TX.	5.4	6.4	7.4	V
TX Contrast Voltage	V_{CTX}		9	DC voltage is measured when circuit is opened at terminal 9.	5.4	6.0	6.6	V
Data Frequency Characteristics	f_{TX}		3, 22 5, 26 7, 30	Terminal 3 (5, 7) input: 500 kHz to 20 MHz 0.5 Vp-p 3 dB bandwidth is measured with regarding output level under 500 kHz as 0dB.	10	15	—	MHz
Gate Input Detection Level	V_{GT}		3 11, 5 7	With varying 11 gate pulse peak values, 11 peak value is measured when DC voltage at text input terminal changes from L to H.	1.2	1.5	1.8	V
Crosstalk Between Channels	C_{PTX}		3, 5, 7 22, 26, 30	Terminal 3 (5, 7) input: 500 kHz 0.5 Vp-p Output level of terminal (22, 25) is measured with regarding output level on terminal 30 (22, 26) as 0dB.	—	-50	-40	dB

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ITEM	SYMBOL	MEASURED CIRCUIT	MEASURED TERMINAL	MEASURING CONDITIONS	MINI-MUM	TYPI-CAL	MAXI-MUM	UNIT
TX → TV Crosstalk	$C_{PTX,TV}$		3, 5, 7 22, 26, 30	Terminal 3 (5, 7) input: 500 kHz 1Vp-p output amplitude at terminal 30 (22, 26) output amplitude with V_{12} = 0V is measured when terminal 30 output amplitude with V_{12} = 2V is regarded as 0dB.	—	-50	-40	dB
TX Variable Brightness Width	ΔV_{TXB}		22 26 10, 30	Through varying $V_{\#10}$, output DC is measured.	—	3	—	V
TX/TV Difference Voltage Drift	ΔV_{def}		22 26 30	V_{19} = 6V V_{10} is adjusted so that TV and TX pedestal levels are equalized. Drift off the pedestal level with varying terminal 9 from 0 to 12V.	-50	0	50	mV
RGB Relative Gain Difference	ΔG_v		22 26 30	Under input multiburst 0.5 Vp-p, gain at output terminal is measured.	-1.0	0	1.0	dB

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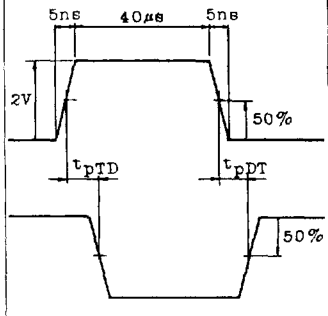
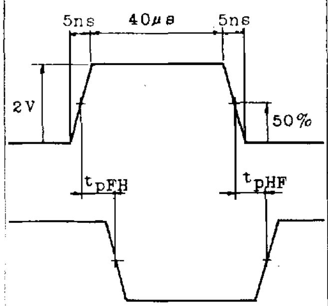
VIDEO/DATA SWITCHING

ITEM	SYMBOL	MEASURED CIRCUIT	MEASURED TERMINAL	MEASURING CONDITIONS	MINIMUM	TYPICAL	MAXIMUM	UNIT
Video/Data Switching Level	V_{YS}		12, 30	With varying $V_{\#12}$ from 0 to 2V, $V_{\#12}$ is measured when output terminal level changes from H to L.	0.7	1.0	1.3	V
Video → Data Switching Delay Time	t_{pTD}		22 26 30		—	20	100	ns
Video → Data Switching Delay Time 3-color Difference	Δt_{pTD}				—	0	±25	ns
Data → Video switching Delay Time	t_{pDT}				—	20	100	ns
Data → Video Switching Delay Time 3-color Difference	Δt_{pDT}				—	0	±25	ns

HALF TONE SWITCHING

ITEM	SYMBOL	MEASURED CIRCUIT	MEASURED TERMINAL	MEASURING CONDITIONS	MINI-MUM	TYPI-CAL	MAXI-MUM	UNIT
Half Tone Switching Level	V_{YM}		13, 30	Input video signal: 500 kHz (1 Vp-p) With varying $V_{\#13}$ from 0 to 12V, $V_{\#13}$ is measured when output amplitude is reduced.	0.7	1.0	1.3	V
Half Tone Contrast Suppression Ratio	ΔG_L		30	Input video signal: 500 kHz (1 Vp-p) Output amplitude variation is measured when V_{13} = 0.2V.	-3.5	-2.5	-1.5	dB
Half Tone Operation Start DC Voltage	V_{YL}		14	Input video signal: 500 kHz (1 Vp-p), $V_{\#13}$ = 2V V_{-Y} DC level is measured when RGB output changes from full tone to half tone with increasing V_{-Y} DC level from 4V	5.4	6.0	6.6	V
Full → Half Tone Switching Delay Time	t_{pFH}		22, 26, 30	(see diagram below)	—	20	100	ns
Full → Half Tone Switching Delay Time 3-axis Difference	Δt_{pFH}				—	0	±25	ns
Half → Full Tone Switching Delay Time	t_{pHF}				—	20	100	ns
Half → full Tone Switching Delay Time 3-axis Difference	Δt_{pHF}				—	0	±25	ns



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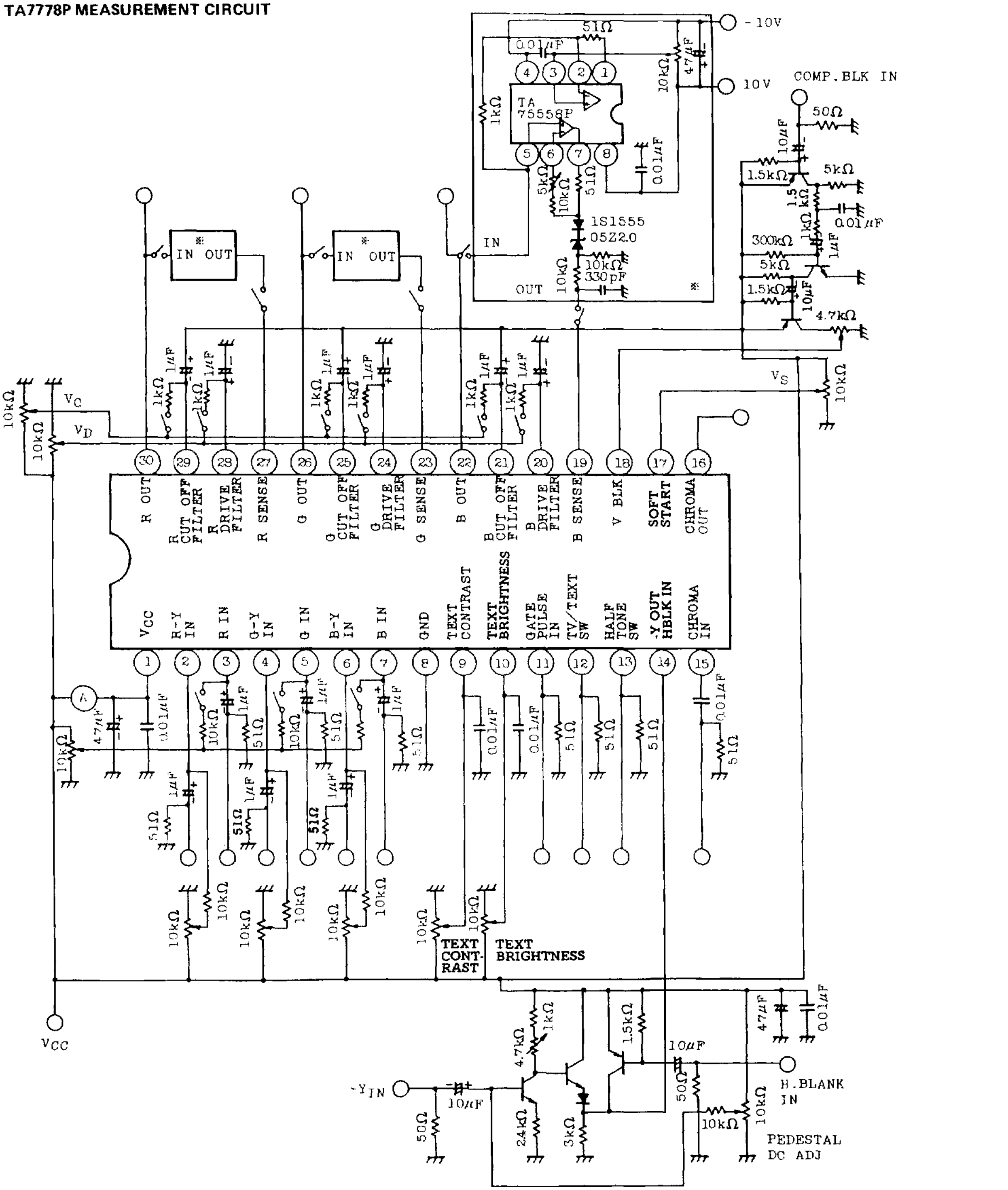
TA7778P MEASUREMENT CIRCUIT



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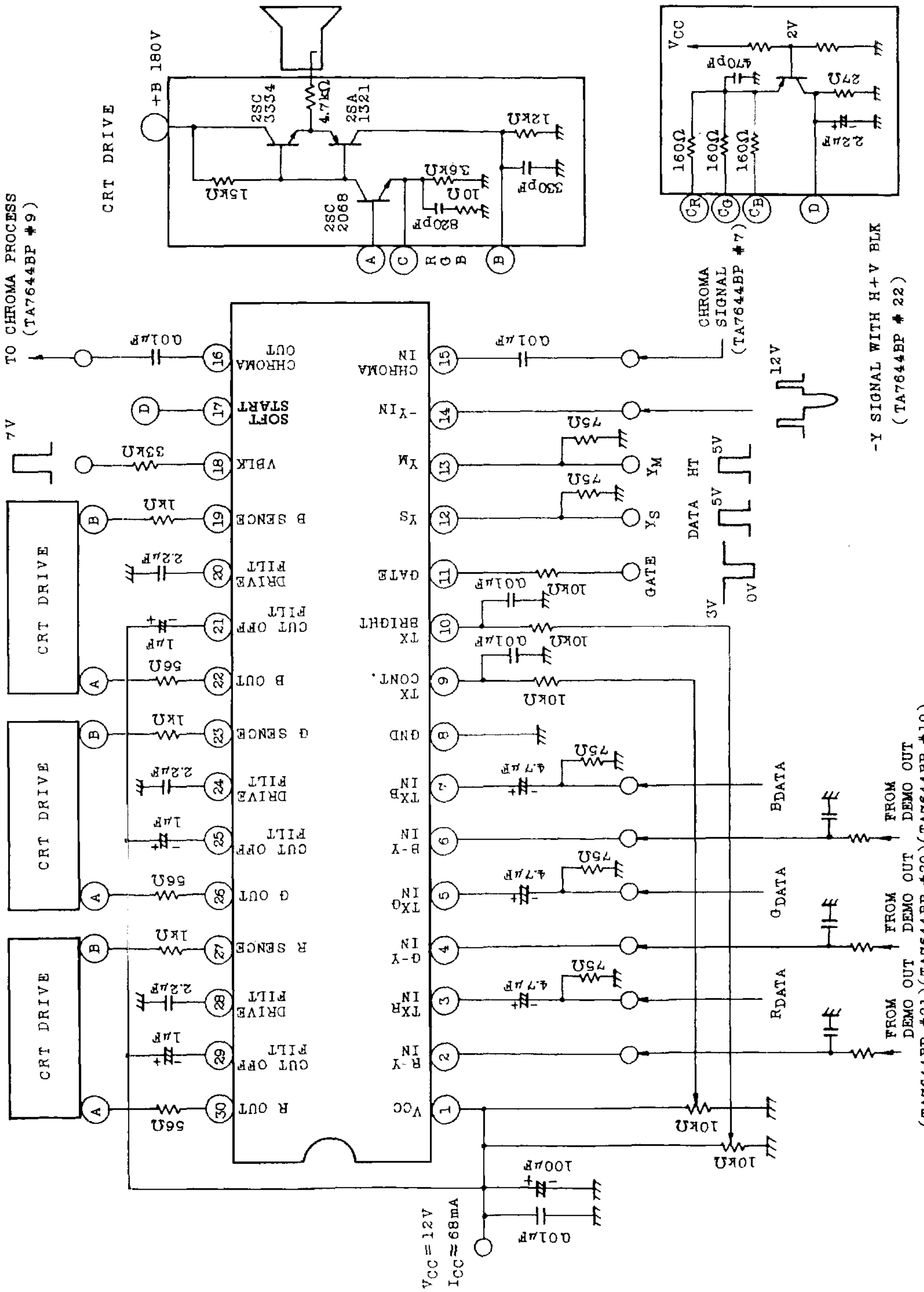

TA7778P APPLICATION CIRCUIT

TA7778P

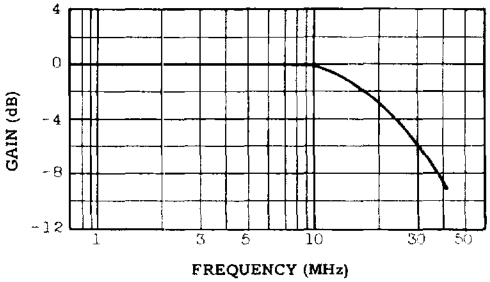

Fig. 1 TEXT FREQUENCY CHARACTERISTICS

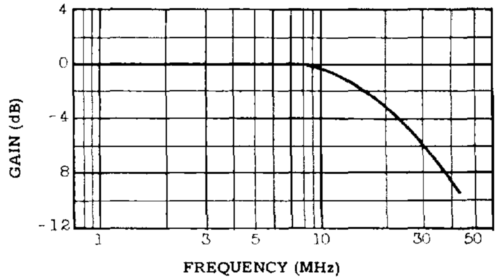

Fig. 2 VIDEO FREQUENCY CHARACTERISTICS

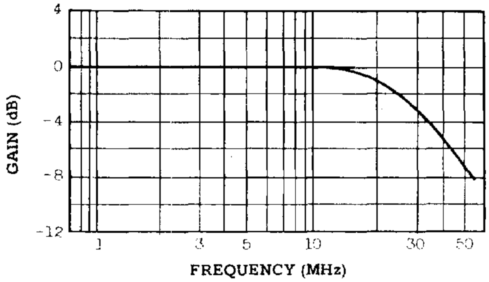

Fig. 3 CHROMA SW FREQUENCY CHARACTERISTICS

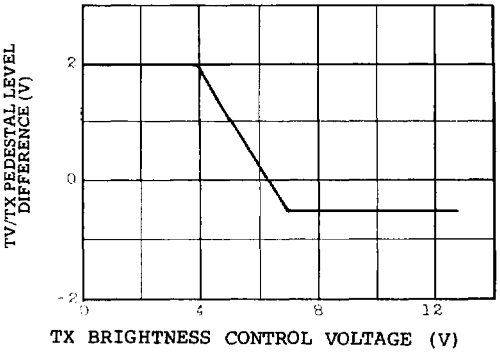

Fig. 4 TX BRIGHTNESS CONTROL CHARACTERISTICS

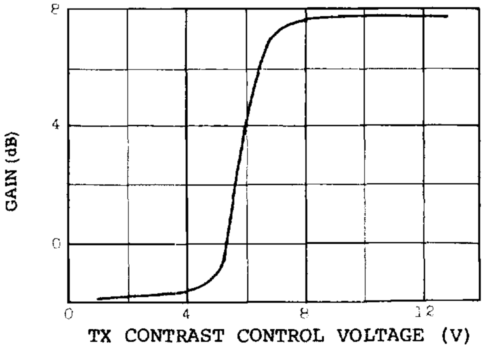

Fig. 5 TX CONTRAST CONTROL CHARACTERISTICS

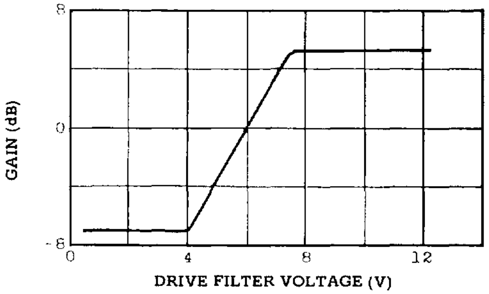

Fig. 6 DRIVE FILTER CONTROL CHARACTERISTICS

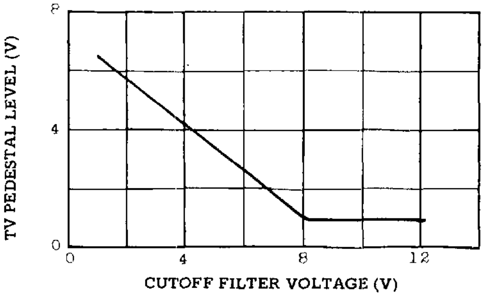

Fig. 7 CUTOFF FILTER CONTROL CHARACTERISTICS