M52023SP

NTSC VIDEO CHROMA DEFLECTION

DESCRIPTION

The M52023SP is semiconductor integrated circuit that processes video, color, and vertical/horizontal sync signals for NTSC system television sets of average class to top of the line.

FEATURES

- Equipped with delay-line contour adjustment for sharper images.
- Features improved 9 MHz (-3 dB) video signal circuit frequency characteristics for higher picture quality.
- IQ demodulator reproduces chroma difference signals with no deviation from the original. The M52023SP is also equipped with a built-in on-screen character display circuit, and because it facilitates connection with external RGB input, the number of external components required is dramatically reduced.
- Vertical and horizontal count-down by 32fH oscillator eliminates need for adjustment.
- Features selectable R-Y matrix ratio.

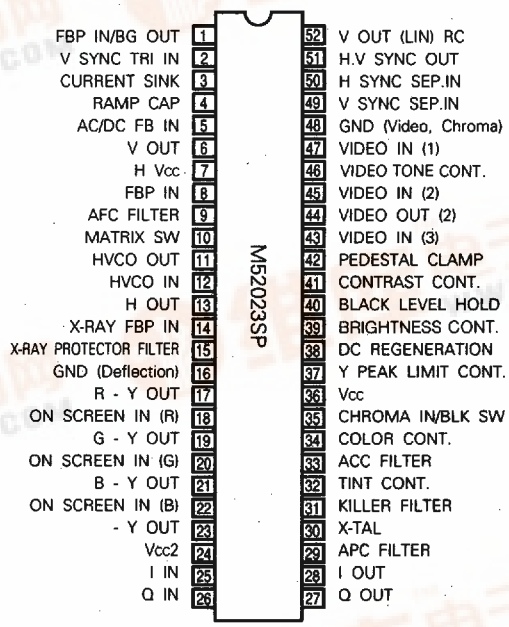
APPLICATION

NTSC System Color Televisions

RECOMMENDED OPERATING CONDITION

Operating Supply Voltage ..... 8.5~9.5V (Pin㊱)
Rated Supply Voltage ..... 9V (Pin㊱)
Operating Supply Voltage ..... 11.0~13.0V (Pin㉔)
Rated Supply Voltage ..... 12V (Pin㉔)
Operating Input Current Range ..... 20~35mA (Pin⑦)
Rated Input Current ..... 25mA (Pin⑦)

PIN CONFIGURATION (TOP VIEW)



Outline 52P4B

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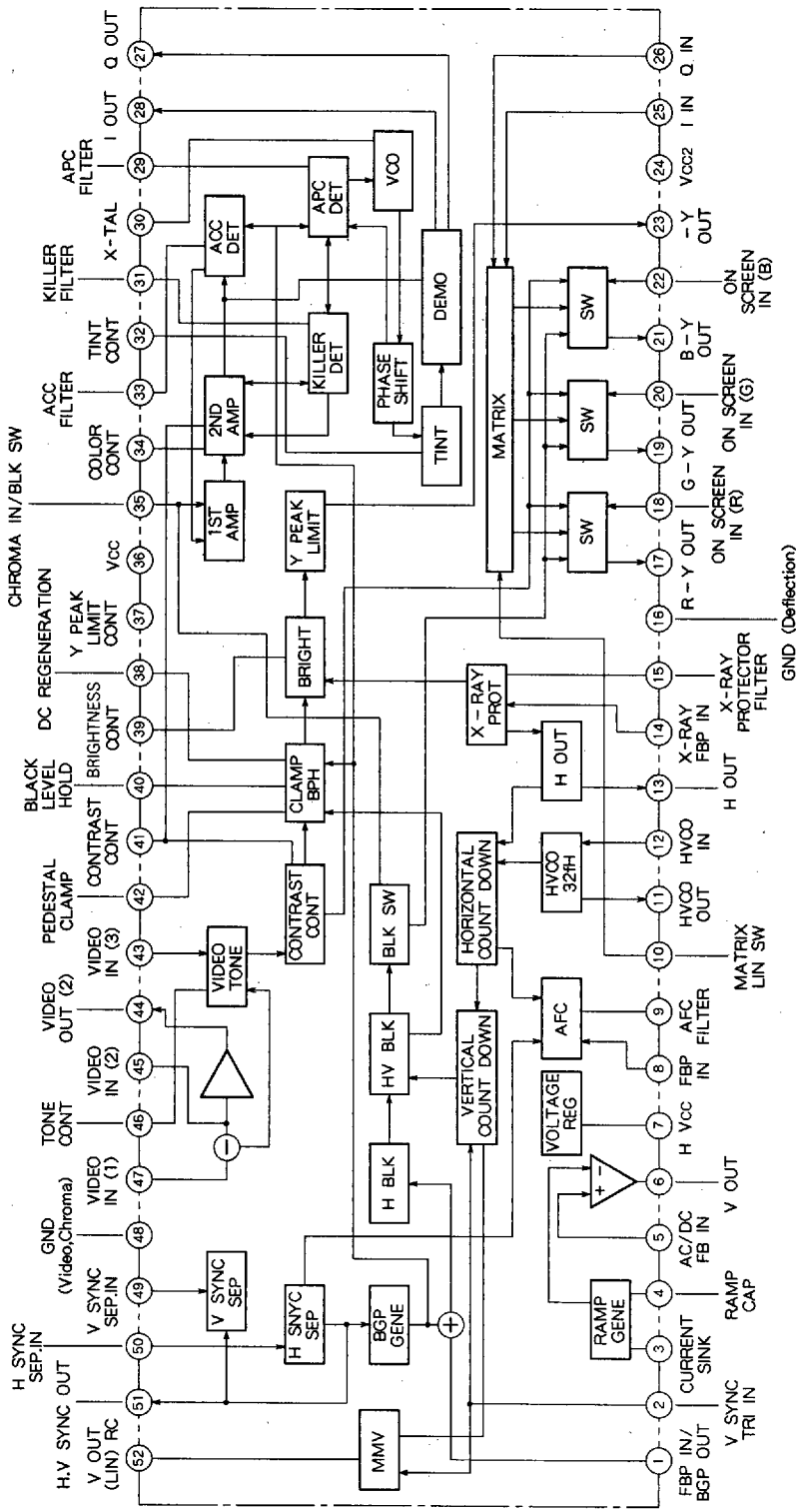
BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Ratings	Unit
V_{CC}	Supply voltage	12	V
P_d	Power dissipation	1.4	W
Surge	Surge voltage resistance	200	V
T_{opr}	Operating temperature	−20~65	℃
T_{stg}	Storage temperature	−40~125	℃

ELECTRICAL CHARACTERISTICS (Ta = 25℃, unless otherwise noted)

VIDEO/CHROMA SECTION

Symbol	Parameter	Test point	Input (B)	Test conditions* 18	20	22	23	32 A	34 A	35	36 A	37	39 A	40	41 A	42	46 A	S 25	S 26	S 31	S 38	S 40	S 42	S 43	S 45	S 47	SD	1A	Note	Limits Min.	Typ.	Max.	Unit
Iss	Circuit current	A1	−	0V	0V	0V	12V	−	−	−	9V	−	−	−	−	−	−	3	3	OFF	OFF	2	1	2	2	2	1	9V		26	38	50	mA
Ymax	Video maximum output	23	SG1 +20 dB	0V	0V	0V	12V	−	−	−	9V	−	−	−	9V	2.4V	−	3	3	OFF	OFF	2	1	1	2	2	1	9V	1	5.9	6.4		VP-P
GY	Video standard gain	23	SG1	0V	0V	0V	12V	−	−	−	9V	−	−	−	−	2.4V	−	3	3	OFF	OFF	2	1	1	2	2	1	9V	2	11.5	14.5	17.5	dB
GYmid	Video gain variation characteristics − 1	23	SG1	0V	0V	0V	12V	−	−	−	9V	−	−	−	4.5V	2.4V	−	3	3	OFF	OFF	2	1	1	2	2	1	9V	3	−3	0	+3	dB
GYmin	Video gain variation characteristics − 2	23	SG1	0V	0V	0V	12V	−	−	−	9V	−	−	−	0V	2.4V	−	3	3	OFF	OFF	2	1	1	2	2	1	9V	4		−40	−30	dB
GYmax	Video gain variation characteristics − 3	23	SG1	0V	0V	0V	12V	−	−	−	9V	−	−	−	9V	2.4V	−	3	3	OFF	OFF	2	1	1	2	2	1	9V	5	3	6	9	dB
Y_{BRTmid}	Brightness variation characteristics − 1	23	−	0V	0V	0V	12V	−	−	−	9V	−	3V	−	−	OPEN	−	3	3	OFF	OFF	2	1	2	2	2	1	9V	6	4.0	4.3	4.6	VO-P
Y_{BRTmin}	Brightness variation characteristics − 2	23	−	0V	0V	0V	12V	−	−	−	9V	−	1V	−	−	OPEN	−	3	3	OFF	OFF	2	1	2	2	2	1	9V	7	6.8	7.1	7.4	VO-P
Y_{BRTmax}	Brightness variation characteristics − 3	23	−	0V	0V	0V	12V	−	−	−	9V	−	6V	−	−	OPEN	−	3	3	OFF	OFF	2	1	2	2	2	1	9V	8	1.9	2.2	2.5	VO-P
Y_L	Video output minimum voltage	23	SG2	0V	0V	0V	12V	−	−	−	9V	−	9V	−	9V	OPEN	−	3	3	OFF	OFF	2	1	1	2	2	1	9V	9	0.25	0.75	1.25	VO-P
Y_{BLK1}	Black level correction variation characteristics − 1	23	−	0V	0V	0V	12V	−	−	−	9V	−	−	3.5V	−	OPEN	−	3	3	OFF	OFF	1	1	2	2	2	1	9V	10	5.7	6.0	6.3	VO-P
Y_{BLK2}	Black level correction variation characteristics − 2	23	−	0V	0V	0V	12V	−	−	−	9V	−	−	5.4V	−	OPEN	−	3	3	OFF	OFF	1	1	2	2	2	1	9V	11	4.7	5.0	5.3	VO-P
DG	Video differential gain characteristics	23	SG1	0V	0V	0V	12V	−	−	−	9V	−	−	−	−	23/25	−	3	3	OFF	OFF	2	1	1	2	2	1	9V	12			10	%
G_{YHi}	Video high − range standard gain	23	SG13	0V	0V	0V	12V	−	−	−	9V	−	−	−	−	2.4V	−	3	3	OFF	OFF	2	1	2	2	1	1	9V	13	20	23	26	dB

* : "−" indicates OPEN.

Symbol	Parameter	Test point	Input (B)	Test conditions* 18	20	22	24	32 A	34 A	35	36 A	37	39 A	40	41 A	42	46 A	S 25	S 26	S 31	S 38	S 40	S 42	S 43	S 45	S 47	SD	1A	Note	Limits Min.	Typ.	Max.	Unit
GT_{mid}	Video tone control characteristics − 1	23	SG3	0V	0V	0V	12V	−	−	−	9V	−	−	−	−	2.4V	−4.5V	3	3	OFF	OFF	2	1	3	1	2	1	9V	14	−3	0	+3	dB
GT_{min}	Video tone control characteristics − 2	23	SG3	0V	0V	0V	12V	−	−	−	9V	−	−	−	−	2.4V	9V	3	3	OFF	OFF	2	1	3	1	2	1	9V	15	−21	−18	−15	dB
GT_{max}	Video tone control characteristics − 3	23	SG3	0V	0V	0V	12V	−	−	−	9V	−	−	−	−	2.4V	0V	3	3	OFF	OFF	2	1	3	1	2	1	9V	16	1.0	4.0	7.0	dB
G_f	Video frequency characteristics	23	SG1 SG4	0V	0V	0V	12V	−	−	−	9V	−	−	−	−	2.4V	−	3	3	OFF	OFF	2	1	1	2	2	1	9V	17	7	9	−	MHz
Y_{HBLK}	Horizontal blanking operating characteristics	23 1A	−	0V	0V	0V	12V	−	−	−	9V	−	−	−	−	2.4V	−	3	3	OFF	OFF	2	1	2	2	2	1	Variable	18	2.9	3.3	3.7	V
Y_{VBLK}	Vertical blanking voltage	23	−	0V	0V	0V	12V	−	−	−	9V	−	−	−	−	2.4V	−	3	3	OFF	OFF	2	1	2	2	2	1	9V	19	10.0	10.4	−	VO-P

* : "−" indicates OPEN.

VIDEO/CHROMA SECTION (cont.)

Symbol	Parameter	Test point	Input (B)	Test conditions* 18	20	22	24	32 A	34 A	35	36 A	37	39 A	40	41 A	42 A	46 A	S 25	S 26	S 31	S 38	S 40	S 42	S 43	S 45	S 47	SD	1A	Note	Limits Min.	Typ.	Max.	Unit
Y_{DCBLK}	DC playback ratio correction alteration characteristics	23	SG2	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	OPEN	–	3	3	OFF	ON/OFF	2	1	1	2	2	1	9V	20	0.05	0.1	0.2	V
Y_{PLmid}	Video peak limiter characteristics – 1	23	SG2	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	2.4V	–	3	3	OFF	OFF	2	1	1	2	2	1	9V	21	2.1	2.6	3.1	V_{O-P}
Y_{PLmax}	Video peak limiter characteristics – 2	23	SG2	0V	0V	0V	12V	–	–	–	9V	GND	–	–	–	2.4V	–	3	3	OFF	OFF	2	1	1	2	2	1	9V	22	4.7	5.2	5.7	V_{O-P}
V_{41}	Pin ㊶ voltage	41	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	2.4V	–	3	3	OFF	OFF	2	1	2	2	2	1	9V		4.1	4.5	4.9	V
V_{46}	Pin ㊻ voltage	46	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	2.4V	–	3	3	OFF	OFF	2	1	2	2	2	1	9V		4.1	4.5	4.9	V
T_{BLKV}	V blanking amplitude	23	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	2.4V	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	23	0.95	1.10	1.25	ms
Y_{BTH}	Black level replacement threshold voltage	23	–	0V	0V	0V	12V	–	–	Variable	9V	–	–	–	–	2.4V	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	24	4.0	4.4	4.8	V
ACC1	ACC characteristics – 1	27A	SG5 -18 dB	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	25	– 6	– 3	0	dB
ACC2	ACC characteristics – 2	27A	SG5 -6dB	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	26	– 2	0	+ 2	dB
Ccmid	Color control variation characteristics – 1	27A	SG5	0V	0V	0V	12V	–	4.5V	–	9V	–	–	–	–	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	27	– 3	0	+ 3	dB
Ccmin	Color control variation characteristics – 2	27A	SG5	0V	0V	0V	12V	–	0V	–	9V	–	–	–	–	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	28		– 40	– 30	dB
Ccmax	Color control variation characteristics – 3	27A	SG5	0V	0V	0V	12V	–	9V	–	9V	–	–	–	–	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	29	3	6	9	dB
Cumid	Color tracking variation characteristics – 1	27A	SG5	0V	0V	0V	12V	–	–	–	9V	–	–	–	4.5V	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	30	– 3	0	+ 3	dB
Cumin	Color tracking variation characteristics – 2	27A	SG5	0V	0V	0V	12V	–	–	–	9V	–	–	–	0V	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	31		– 40	– 30	dB
Cumax	Color tracking variation characteristics – 3	27A	SG5	0V	0V	0V	12V	–	–	–	9V	–	–	–	9V	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	32	3	6	9	dB
fpc1	APC pull-in range – 1	27A	SG7	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	33	200	750		Hz
fpc2	APC pull-in range – 2	27A	SG7	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	34	200	750		Hz
KIL	Killer operation input level	27A	SG6 Variable	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	35	– 45	– 39	– 33	dB
DKIL	Killer color residual	27A	SG6 No burst	0V	0V	0V	12V	–	9V	–	9V	–	–	–	9V	–	–	3	3	OFF	OFF	2	1	2	2	2	1	9V	36			60	mV_{P-P}
Cleak	Demodulated output carrier leak	27A	SG5	0V	0V	0V	12V	–	9V	–	9V	–	–	–	9V	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V	37			200	mV_{P-P}
T	Tint control variance	17 21	SG6	0V	0V	0V	12V	0V / 9V	9V	–	9V	–	–	–	9V	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V	38	70	90	110	deg.
Tmin	Tint control characteristics – 1	17 21	SG6	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V	39	– 70	– 50	– 30	deg.
Tmax	Tint control characteristics – 2	17 21	SG6	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V	40	23	43	63	deg.
Q_{IR}	Demodulated phase angle – 1	27A 28A	SG8	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V	41	80	90	100	deg.
V_{32}	Pin ㉜ voltage	32	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V		4.1	4.5	4.9	V
V_{34}	Pin ㉞ voltage	34	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	ON	ON	2	1	2	2	2	1	9V		– 4.5	4.5	4.9	V

* : "–" indicates OPEN.

VIDEO/CHROMA SECTION (cont.)

Symbol	Parameter	Test point	Input (A)	Test conditions*																																			Limits			Unit
				18	20	22	24	32 A	34 A	35	36 A	37	39 A	40	41 A	42	46 A	S 25	S 26	S 31	S 38	S 40	S 42	S 43	S 45	S 47	SD	1A	Note											Min.	Typ.	Max.	
CS	Color signal suppression characteristics	27A	A:SG5, B:SG14	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	ON	ON	2	1	1	2	2	1	9V	42											– 4.5	– 3.3	– 1.5	dB
BLKON	On-screen blanking threshold voltage	23	–	Variable	Variable	Variable	12V	–	–	–	9V	–	–	–	–	–	–	1	1	ON	ON	2	1	2	2	2	1	9V											0.6	1.0	1.4	V
A_{24}	Pin ㉔ input current	A3	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V											14	20	26	mA
R/Ta G/Ta B/Ta	Chroma difference output pin voltage temperature coefficient	17 19 21	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V											– 2	– 0.9	0	mV/℃
DC offset	Chroma difference DC offset	17 19 21	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V													0.3	V
DC offset/Ta	Voltage difference temperature coefficient between chroma difference output pins	17 19 21	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V											– 0.1	0	0.1	mV/℃
I/Q	Demodulated output amplitude ratio	27A 28A	SG8	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	1	1	OFF	OFF	2	1	2	2	2	1	9V											0.84	1.14	1.44	–

* : "–" indicates OPEN.

VIDEO/CHROMA SECTION (MATRIX)

Symbol	Parameter	Test point	Input (B)	Test conditions*																																					Limits			Unit
				18	20	22	24	32 A	34 A	35	36 A	37	39 A	40	41 A	42	46 A	S 10	S 25	S 26	S 31	S 38	S 40	S 42	S 43	S 45	S 47	S D	Note	Remarks											Min.	Typ.	Max.	
MIR	Matrix gain I – R	17	SG16	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	OFF	2	1	OFF	OFF	2	1	2	2	2	1	43											1.0	1.3	1.6	VP-P
MIR	Matrix gain I – R	17	SG16	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	2	1	OFF	OFF	2	1	2	2	2	1	44											1.5	1.9	2.3	VP-P
MIG	Matrix gain I – G	19	SG16	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	2	1	OFF	OFF	2	1	2	2	2	1	45											0.2	0.4	0.6	VP-P
MIB	Matrix gain I – B	21	SG16	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	2	1	OFF	OFF	2	1	2	2	2	1	46											1.2	1.5	1.8	VP-P
MQR	Matrix gain Q – R	17	SG16	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	1	2	OFF	OFF	2	1	2	2	2	1	47											0.6	0.8	1.0	VP-P
MQG	Matrix gain Q – G	19	SG16	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	1	2	OFF	OFF	2	1	2	2	2	1	48											0.6	0.8	1.0	VP-P
MQB	Matrix gain Q – B	21	SG16	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	1	2	OFF	OFF	2	1	2	2	2	1	49											1.8	2.2	2.6	VP-P
OS1	On – screen characteristics – 1	17	–	0V / 3V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	3	3	OFF	OFF	2	1	2	2	2	1	50	6.8 – 3.2										2.2	2.4	2.6	V
OS2	On – screen characteristics – 2	19	–	0V	0V / 3V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	3	3	OFF	OFF	2	1	2	2	2	1	51											2.2	2.4	2.6	V
OS3	On – screen characteristics – 3	21	–	0V	0V	0V / 3V	12V	–	–	–	9V	–	–	–	–	–	–	ON	3	3	OFF	OFF	2	1	2	2	2	1	52											2.2	2.4	2.6	V
V_{25}	Pin ㉕ voltage	25	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	3	3	OFF	OFF	2	1	2	2	2	1	53											3.2	3.7	4.2	V
V_{26}	Pin ㉖ voltage	26	–	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	3	3	OFF	OFF	2	1	2	2	2	1	54											3.2	3.7	4.2	V
Qnorm	Demodulated typical output – 1	27A	SG5	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	3	3	OFF	OFF	2	1	2	2	2	1	55	800 mV										500	720	940	mV
Inorm	Demodulated typical output – 2	28A	SG5	0V	0V	0V	12V	–	–	–	9V	–	–	–	–	–	–	ON	3	3	OFF	OFF	2	1	2	2	2	1	56	720 mV										560	800	1040	mV

* : "–" indicates OPEN.

VIDEO/CHROMA SECTION (MATRIX) (cont.)

Symbol	Parameter	Test point	Input (A)	18	20	22	24	32A	34A	35	36A	37	39A	40	41A	42	46A	S10	S25	S26	S31	S38	S40	S42	S43	S45	S47	SD	Note	Remarks	Min.	Typ.	Max.	Unit
Qmax	Demodulated maximum output-1	27A	SG5	0V	0V	0V	12V	–	9V	–	9V	–	–	–	–	–	–	OFF	3	3	OFF	OFF	2	1	2	2	2	1	57		1.2	1.7	–	V_{P-P}
Imax	Demodulated maximum output-2	28A	SG5	0V	0V	0V	12V	–	9V	–	9V	–	–	–	–	–	–	OFF	3	3	OFF	OFF	2	1	2	2	2	1	58		1.3	1.8	–	V_{P-P}
Rmax	Chroma difference maximum output-1	17	SG5	0V	0V	0V	12V	–	9V	–	9V	–	–	–	9V	–	–	OFF	1	1	OFF	OFF	2	1	2	2	2	1	59		5.0	5.5	–	V_{P-P}
Gmax	Chroma difference maximum output-2	19	SG5	0V	0V	0V	12V	–	9V	–	9V	–	–	–	9V	–	–	OFF	1	1	OFF	OFF	2	1	2	2	2	1	60		2.6	3.1	–	V_{P-P}
Bmax	Chroma difference maximum output-3	21	SG5	0V	0V	0V	12V	–	9V	–	9V	–	–	–	9V	–	–	OFF	1	1	OFF	OFF	2	1	2	2	2	1	61		6.7	7.2	–	V_{P-P}
Rmax	Chroma difference maximum output-4	17	SG5	0V	0V	0V	12V	–	9V	–	9V	–	–	–	9V	–	–	ON	1	1	OFF	OFF	2	1	2	2	2	1	62		6.5	7.0	–	V_{P-P}

*: "–" indicates OPEN.

DEFLECTION SECTION

Symbol	Parameter	Test point	Input (C)	1A	5A	7A	8A	10	14	S1	S4	S5	S6	S8	S9	S10	S13	S14	S49	S50	36A	Note	Min.	Typ.	Max.	Unit
I7	Pin ⑦ recommended input current	A2	SG9	9V	–	12V	9V	–	–	ON	ON	1	OFF	ON	ON	ON	ON	ON	1	1	9V			25		mA
V_7	Pin ⑦ voltage	7	SG9	9V	–	12V	9V	–	–	ON	ON	1	OFF	ON	ON	ON	ON	ON	1	1	9V		8.9	9.2	9.5	V
V_{OSH}	Horizontal sync output amplitude	51	SG10	9V	–	12V	9V	–	–	ON	ON	1	OFF	ON	ON	ON	ON	ON	1	1	9V	63	5.2	5.7	6.2	V_{P-P}
V_{OSV}	Vertical sync output amplitude	51	SG10	9V	–	12V	9V	–	–	ON	ON	1	OFF	ON	ON	ON	ON	ON	1	1	9V		3.3	3.8	4.2	V_{P-P}
f_H	Oscillator frequency	13	–	9V	–	12V	9V	–	–	ON	ON	1	OFF	ON	ON	ON	ON	ON	3	3	9V		15.55	15.80	16.05	kHz
f_H/T_a	Oscillator frequency temperature coefficient	13	–	9V	–	12V	9V	–	–	ON	ON	1	OFF	ON	ON	ON	ON	ON	3	3	9V	64		– 0.8		Hz/℃
V_{7min}	Oscillator starting pin ⑦ voltage	7	–	9V	–	Variable	9V	–	–	ON	ON	1	OFF	ON	ON	ON	ON	ON	3	3	–	65		3.6	4.5	V
f_{PH-1}	Pull – in Range1	13	SG11	9V	–	12V	9V	–	–	ON	ON	1	OFF	ON	ON	ON	ON	ON	1	1	9V	66	300 –1800	520 –2200		Hz
τ H	H. pulse amplitude	13	SG9	9V	–	12V	9V	–	–	ON	ON	1	OFF	ON	ON	ON	ON	ON	1	1	9V	67	21	25	29	μs
V_{Hmin} V_{Hmax}	H. output voltage	13	SG9	9V	–	12V	9V	–	–	ON	ON	1	OFF	ON	ON	ON	OFF	ON	1	1	9V	68	 5.5	0 6.1	0.3 6.7	V
f_V	Oscillator frequency (vertical free run)	6	–	9V	–	12V	9V	–	–	ON	ON	2	ON	ON	ON	ON	ON	ON	3	3	9V		51.5	53.1	55.5	Hz
T_{V1}	V. pulse amplitude – 1	6	SG9	9V	–	12V	9V	–	–	ON	OFF	3	OFF	ON	ON	ON	ON	ON	1	1	9V	69	600	670	730	μs
f_{PV}	Pull – in Range	6	SG12	9V	5V	12V	9V	–	–	ON	OFF	2	ON	ON	ON	ON	ON	ON	1	1	9V	70	71	73.5	76	Hz
V_{OH4}	Ramp maximum output voltage	4	–	9V	5V	12V	9V	–	–	ON	OFF	1	OFF	ON	ON	ON	ON	ON	3	3	9V	71	5.8	6.3	4.5	V_{O-P}
V_{OL4}	Ramp minimum output voltage	4	–	9V	5V	12V	9V	–	–	ON	OFF	1	ON	ON	ON	ON	ON	ON	3	3	9V	72	3.5	4.0	4.5	V_{O-P}
V3	Pin ③ voltage	3	–	9V	–	12V	9V	–	–	ON	ON	1	ON	ON	ON	ON	ON	ON	3	3	9V		2.4	2.8	3.2	V
T_{GP}	Burst gate pulse position	1	SG9	9V	–	12V	9V	–	–	ON	ON	1	ON	ON	ON	ON	ON	ON	1	1	9V	73	6.4	6.9	7.4	μs

*: "–" indicates OPEN.

DEFLECTION SECTION (cont.)

Symbol	Parameter	Test point	Input (B)	Test conditions*																				Limits			Unit
				1A	5A	7A	8A	10	14	S1	S4	S5	S6	S8	S9	S10	S13	S14	S49	S50	36A	Note		Min.	Typ.	Max.	
T_{BGP1}	Burst gate pulse timing – 1	1	SG9	9V	–	12V	9V	–	–	ON	ON	1	ON	ON	ON	ON	ON	ON	1	1	9V	74		0.4	0.7	1.0	μS
T_{BGP2}	Burst gate pulse timing – 2	1	SG9	9V	–	12V	9V	–	–	ON	ON	1	ON	ON	ON	ON	ON	ON	1	1	9V	75		1.0	1.4	1.8	μS
V_{FBP}	FBP clamp voltage	1	SG9	9V	–	12V	9V	–	–	ON	ON	1	ON	ON	ON	ON	ON	ON	1	1	9V	76		3.6	4.1	4.6	Vo-p
V_{BGP}	Burst gate pulse voltage	1	SG9	9V	–	12V	9V	–	–	ON	ON	1	ON	ON	ON	ON	ON	ON	1	1	9V	77		7.5	8.0	8.5	Vo-p
V_{THAFC}	AFC detector voltage	1	SG9	9V	–	12V	Variable	–	–	ON	ON	1	ON	ON	ON	ON	ON	ON	1	1	9V	78		–	0.4	1.0	V
V_{Vmax}	Vertical output maximum voltage	1	SG9	9V	5V	12V	9V	–	–	ON	ON	3	ON	ON	ON	ON	ON	ON	1	1	9V	79		4.0	4.7	5.4	Vo-p
I_{SSH}	Sync separation input sensitivity current (horizontal)	51	–	9V	5V	12V	9V	–	–	ON	ON	1	ON	ON	ON	ON	ON	ON	3	2	9V	80		10	40	100	μA
I_{SSV}	Sync separation input sensitivity current (vertical)	51	–	9V	5V	12V	9V	–	–	ON	ON	1	ON	ON	ON	ON	ON	ON	3	2	9V	81		10	40	100	μA
V_{14P}	Overvoltage protector circuit operating voltage	14, 23, 13,6	–	9V	5V	12V	9V	–	Variable	ON	ON	2	ON	ON	ON	ON	ON	OFF	3	3	9V	82		0.4	0.7	1.0	V
V_{32P1}	Supply voltage detector circuit operating characteristics – 1	36A, 23, 13,6	–	32A	–	12V	32A	–	–	ON	ON	2	ON	ON	ON	ON	ON	ON	3	3	Variable	83		11.3	11.65	12.0	V
V_{32P2}	Supply voltage detector circuit operating characteristics – 2	36A 6	–	32A	–	12V	32A	–	–	ON	ON	2	ON	ON	ON	ON	ON	ON	3	3	Variable	84		1.5	2.0	2.5	V

* : "–" indicates OPEN.

ELECTRICAL CHARACTERISTICS TEST METHOD

Note 1. Video Maximum Output "Ymax"

a. Make SG1 input level +20dB.

b. Test amplitude of ㉓ wehn not blanking.

Note 2. Video Standard Gain "GY"

a. Test amplitude of ㉓ when not blanking and make VCO the testing value.

b. $Gy=20 \log \frac{Vco\ (mV_{p\text{-}p})}{200\ (mV_{p\text{-}p})}$ (dB)

Note 3. Video Gain Variation Characteristics-1 "GYmid"

Note 4. Video Gain Variation Characteristics-2 "GYmin"

Note 5. Video Gain Variation Characteristics-3 "GYmax"

a. Make V_{C1}, V_{C2}, and V_{C3} the output amplitude of ㉓ when 37A is 4.5V, 0V, and 9V.

b. $GYmid=20 \log \frac{V_{C1}}{V_{C0}}$ (dB), $GYmin=\log \frac{V_{C2}}{V_{C0}}$ (dB)

$GYmax=20 \log \frac{V_{C3}}{V_{C0}}$ (dB)

Note 6. Brightness Variation Characteristics-1 "Y_{BRTmid}"

Note 7. Brightness Variation Characteristics-2 "Y_{BRTmin}"

Note 8. Brightness Variation Characteristics-3 "Y_{BRTmax}"

a. Test DC voltage of ㉓ when not blanking.

Note 9. Video Output Minimum Voltage "YL"

a. Test DC voltage of ㉓ when not blanking.

Note 10. Black Level Correction Variation Characteristics-1 "Y_{BLC1}"

Note 11. Black Level Correction Variation Characteristics-2 "Y_{BLC2}"

a. Test DC voltage of ㉓ when not blanking.

Note 12. Video Differential Gain Characteristics "DG"

a. Make V_{G1} and V_{G2} the output amplitude of ㉓ when ㊷ is 2.5V and 2.3V.

b. $DG=\frac{[V_{G1}-V_{G2}]}{V_{G2}} \times 100$ (%)

Note 13. Video High-Pass Standard Gain "GYHi"

Test the amplitude of ㉓ when not blanking and make VHi the testing value.

b. $GYHi=20 \log \frac{V_{Hi}(mV_{p\text{-}p})}{200(mV_{p\text{-}p})}$ (dB)

Note 14. Video Tone Characteristics-1 "GTmid"

Note 15. Video Tone Characteristics-2 "GTmin"

Note 16. Video Tone Characteristics-3 "GTmax"

a. Make V_{T0}, V_{T1}, V_{T2}, and V_{T3} the output amplitude of ㉓ when 46A is changed to open, 4.5V, 9V, and 0V.

b. $GTmid=20 \log \frac{V_{T1}}{V_{T0}}$ (dB),

$GTmin=20 \log \frac{V_{T2}}{V_{T0}}$ (dB)

$GTmax=20 \log \frac{V_{T3}}{V_{T0}}$ (dB)

Note 17. Video Frequency Characteristics "Gf"

a. Input SG4 and change the frequency. Make SG4 input frequency the frequency when ㉓ output amplitude is −3dB less than when SG1 was being input.

Note 18. Horizontal Blanking Operation Voltage "Y_{HBLK}"

a. Make voltage of 1A the voltage where horizontal blanking for ㉓ ceases as the voltage of 1A is gradually dropped below 9V.

Note 19. Vertical Blanking Voltage "Y_{VBLK}"

a. Test DC voltage during vertical blanking of ㉓.

Note 20. DC Playback Ratio Correction Variation Characteristics "Y_{DCREG}"

a. Test DC voltage variance when ㉓ is not blanking and switch 38 is turned from ON to OFF.

Note 21. Video Peak Limiter Variation Characteristics-1 "Y_{PLmid}"

Note 22. Video Peak Limiter Variation Characteristics-2 "Y_{PLmax}"

a. Test DC voltage of ㉓ when not blanking.

Note 23. V Blanking Amplitude "T_{BLKV}"

a. Test DC voltage during vertical blanking of ㉓.

Note 24. Black Level Replacement Threshold Voltage "Y_{BTH}"

a. Gradually increase voltage of ㉟ from 2.5V.

b. Make Y_{BTH} the voltage of ㉟ when blanking of ㉓ is replaced by black level voltage.

Note 25. ACC Characteristics-1 "ACC1"

Note 26. ACC Characteristics-2 "ACC2"

a. Make V_{A0}, V_{A1}, and V_{A2} the demodulated output amplitude of 27A when SG5 input level is 0dB, −18dB, +6dB.

b. $ACC1=20 \log \frac{V_{A1}}{V_{A0}}$ (dB),

$ACC2=20 \log \frac{V_{A2}}{V_{A0}}$ (dB)

Note 27. Color Control Variation Characteristics-1 "Ccmid"

Note 28. Color Control Variation Characteristics-2 "Ccmin"

Note 29. Color Control Variation Characteristics-3 "Ccmax"

a. Make V_{C10}, V_{C11}, V_{C12}, and V_{C13} the demodulated output amplitude of 27 when 34A is open, 4.5V, 0V, and 9V.

b. $Ccmid=20 \log \frac{V_{c11}}{V_{c10}}$ (dB),

$Ccmin=20 \log \frac{V_{c12}}{V_{c10}}$ (dB)

$Ccmax=20 \log \frac{V_{c13}}{V_{c10}}$ (dB)

Note 30. Color Tracking Variation Characteristics-1 "Cumid"

Note 31. Color Tracking Variation Characteristics-2 "Cumin"

Note 32. Color Tracking Variation Characteristics-3 "Cumax"

a. Make V_{U0}, V_{U1}, V_{U2}, and V_{U3} the demodulated output amplitude of 27A when 41A is open, 4.5V, 0V, and 9V.

b. Cumid=20 log $\frac{V_{u1}}{V_{u0}}$ (dB),

Cumin=20 log $\frac{V_{u2}}{V_{u0}}$ (dB)

Cumax=20 log $\frac{V_{u3}}{V_{u0}}$ (dB)

Note 33. APC Pull-in Range-1 "fpc1"

Note 34. APC Pull-in Range-2 "fpc2"

a. Frequency range where the 27A output signal changes from off to on as the burst and chroma frequency (f_{SB}=fsc) are altered during SG7 input. The standard value is 3.579545MHz.

Note 35. Killer Operating Level "KIL"

a. SG6 input level where the ㉑ output signal changes from off on as SG6 input level is gradually decreased.

Note 36. Killer Color Residual "D_{KIL}"

a. ㉑ output signal amplitude when e_b=0mV$_{P-P}$, e_C=100 mV$_{P-P}$, and frequency fsc=3.579545MHz during SG6 input.

Note 37. Demodulated Output Carrier Leak "Cleak"

a. Test carrier element output by 17, 19, and 21.

Note 38. Tint Control Variance "T"

a. Using an oscilloscope (X-Y display), test the variation of amplitude phase of the ⑲ and ㉑ output signals when 28A is 0V and 9V.

Note 39. Tint Control Characteristics-1 "Tmin"

Note 40. Tint Control Characteristics-2 "Tmax"

a. Using an oscilloscope (X-Y display), test the variation of amplitude phase of the ⑲ and ㉑ output signals when 28A is 4.5V, 0V, and 9V. Use the phase at 4.5V as reference.

Note 41. Demodulated Phase Angle-1 "θ_{IR}"

a. Make θ_{IR} the phase angle of 27A and 28A.

Note 42. Color Signal Suppression Characteristics "CS"

a. Input APL 10% SG14 from B, and make V_{CS1} the demodulated output amplitude of 27A.

b. Input APL 35% SG14 from B, and make V_{CS1} the demodulated output amplitude of 27A.

c. CS=20 log $\frac{V_{CS1}}{V_{CS2}}$ (dB)

Note 43. Matrix Gain I-R "MIR"

Note 44. Matrix Gain I-R "MIR"

Note 45. Matrix Gain I-G "MIG"

Note 46. Matrix Gain I-B "MIB"

Note 47. Matrix Gain Q-R "MQR"

Note 48. Matrix Gain Q-G "MQG"

Note 49. Matrix Gain Q-B "MQB"

1. Input SG16 from E and test the output amplitude of ⑰, ⑲, and ㉑.

Note 50. On-screen Characteristics-1 "OS1"

a. With pins ⑳ and ㉒ at 0V, test the output voltage of pin ⑰ when 0V and 3V are applied to pin ⑱ and make OS1 the difference in electric potentials.

Note 51. On-screen Characteristics-2 "OS2"

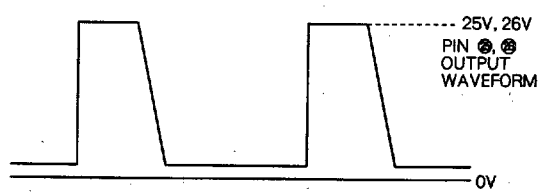
a. With pins ⑱ and ㉒ at 0V, test the output voltage of pin ⑲ when 0V and 3V are applied to pin ⑳ and make OS2 the difference in electric potentials.

Note 52. On-screen Characteristics-3 "OS3"

a. With pins ⑱ and ⑳ at 0V, test the output voltage of pin ㉑ when 0V and 3V are applied to pin ㉒ and make OS3 the difference in electric potentials.

Note 53. Pin ㉕ "V_{25}"

Note 54. Pin ㉖ "V_{26}"



Note 55. Demodulated Typical Output-1 "Qnorm"

Note 56. Demodulated Typical Output-2 "Inorm"

a. With conditional input (A), test output amplitude of 27A and 28A when SG5 is input and 34A and 41A are open.

Note 57. Demodulated Maximum Output-1 "Qmax"

Note 58. Demodulated Maximum Output-2 "Imax"

a. With conditional input (A), test output amplitude of 27A and 28A when color contrast is maximum and 9V is applied to 34A and 41A respectively.

Note 59. Chroma Maximum Output-1 "Rmax"

Note 60. Chroma Maximum Output-2 "Gmax"

Note 61. Chroma Maximum Output-3 "Bmax"

Note 62. Chroma Maximum Output-4 "Rmax"

a. Apply 9V to 34A and 41A respectively and test output amplitude of chroma difference output of ⑰, ⑲, and ㉑ while SG5 is input at maximum color contrast.

Note 63. Horizontal/Vertical Sync Output Amplitude "V_{OSHV}"

Note 64. Oscillator Frequency Temperature Coefficient "f_H/T_a"

a. Make –20~+65°C the temperature variation range.

Note 65. Oscillator Starting Pin ⑦ Voltage "V_{7min}"

a. Gradually increase the applied voltage of 7A.

b. V_{7min} is the voltage of ⑦ when the cycle of ⑬ output waveform becomes approx. 63.5μs.

Note 66. Pull-in Range-1 "f_{PH-1}"

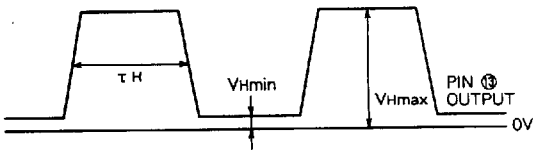
a. Gradually increase the SG11 input signal frequency so that the input signal and ⑬ output become unsynchronized.

b. Decreasing the input signal frequency, make this the difference between the input signal frequency and oscillator frequency (f_H) precisely when the input signal and ⑬ output become synchronized.

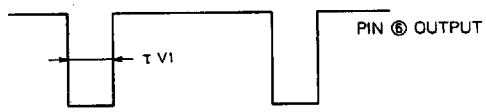
c. Perform the same procedure for the lower side pull-in range.

Note 67. H. Pulse Amplitude "τ_H"

Note 68. H. Output Voltage "V_{Hmin} V_{Hmax}"



Note 69. V.Pulse Amplitude-1 "τ_{V1}"



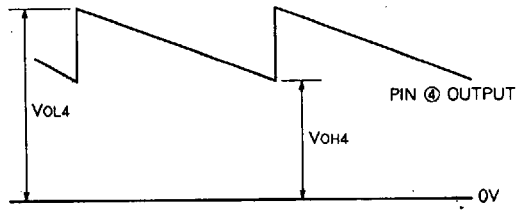
Note 70. Pull-in Range "f_{PV}"

a. Gradually increase the SG12 input signal frequency so that the input signal and ⑥ output become unsynchronized.

b. Decreasing the input signal frequency, make this the input signal frequency precisely when the input signal and ⑥ output become synchronized.

Note 71. Ramp Maximum Output Voltage "V_{OH4}"

Note 72. Ramp Minimum Output Voltage "V_{OL4}"



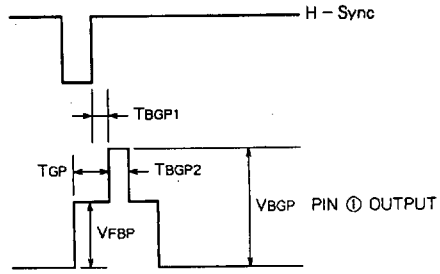
Note 73. Burst Gate Pulse Position "T_{GP}"

Note 74. Burst Gate Pulse Timing-1 "T_{BGP1}"

Note 75. Burst Gate Pulse Timing-2 "T_{BGP2}"

Note 76. FBP Clamp Voltage "V_{FBP}"

Note 77. Burst Gate Pulse Voltage "V_{BGP}"

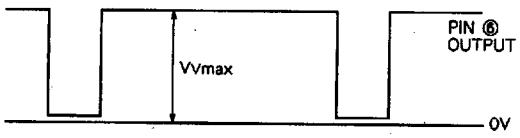


Note 78. AFC Detector Voltage "V_{THAFC}"

a. Set voltage of 8A to 9V.

b. Make V_{THAFC} the applied voltage of 8A precisely when AFC begins to behave abnormally as voltage of 8A is gradually increased.

Note 79. Vertical Output Maximum Voltage "Vvmax"



Note 80. Sync Separation Input Sensitivity Current (Horizontal) "I_{SSH}"

a. Set I_{S1} to 0mA.

b. Make I_{SSH} the value of I_{S1} when the voltage of ㊶ is in the area of 3V as I_{S1} is gradually increased.

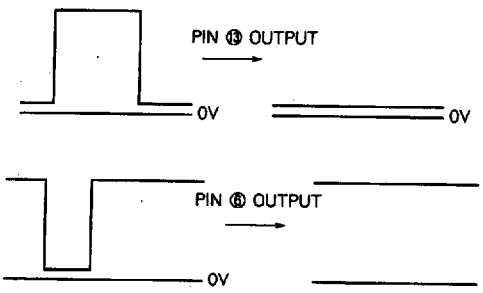
Note 81. Sync Separation Input Sensitivity Current (Vertical) "I_{SSV}"

a. Same as Note 80.

Note 82. Overvoltage Protector Circuit Operating Voltage "V_{14P}"

a. Set voltage of ⑭ to 0V.

b. As voltage of ⑭ is gradually increased, (??) begins blanking and output waveform of ⑬ ceases. Make V_{14P} the applied voltage of ⑭ when output waveform of ⑬ ceases.



c. In order to perform the following test, first turn off all applied voltages.

Note 83. Supply Voltage Detector Circuit Operating Voltage-1 "V_{32P1}"

a. Set voltage of 36A to 9V.

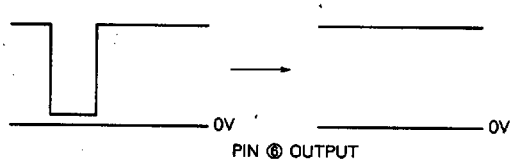
b. Gradually increase voltage of 36A and make V_{32P1} the applied voltage of 36A when status becomes as described in step ② of Note 83.

c. In order to perform the following test, first turn off all applied voltages.

Note 84. Supply Voltage Detector Circuit Operating Voltage-2 "V_{32P2}"

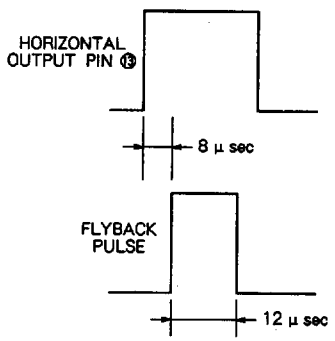
a. Set voltage of 36A to 9V.

b. As voltage of 36A is gradually decreased, 6 output ceases. Make V_{32P2} the applied voltage of 32A when DC voltage becomes approx. 1.3V.



Precautions Concerning Electrical Characteristics

1. Adjust the one-shot multivibrator's potentiometer so that the timing of the horizontal input flyback pulse for pins ①, ⑧ and pulse amplitude are as shown in the figure below.



2. Standard Conditions of Deflection Section for Testing Video/Chroma Sections

Input C	5 A	7 A	8 A	10	14	S 1	S 4	S 5	S 6	S 8	S 9	S 10	S 13	S 14	S 49	S 50
SG9	–	12V	9V	–	–	ON	ON	1	OFF	ON	ON	ON	ON	ON	1	1

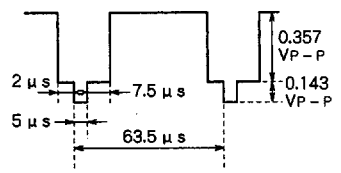
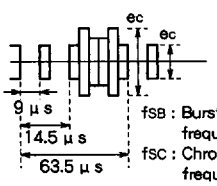
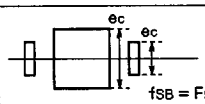
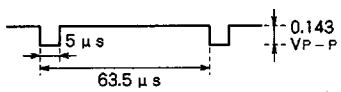
"–" indicates OPEN.

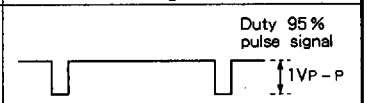
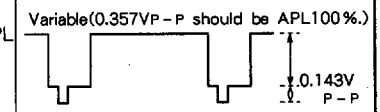
3. Standard Conditions of Video/Chroma Sections for Testing Deflection Section

Input A,B,D	18	20	22	32 A	34 A	35	37	39 A	40	41 A	42	46 A	S 31	S 38	S 40	S 42	S 43	S 45	S 47	SD
–	0 V	0 V	0 V	–	–	–	–	–	–	–	–	–	OFF	OFF	2	1	2	2	2	1

"–" indicates OPEN.

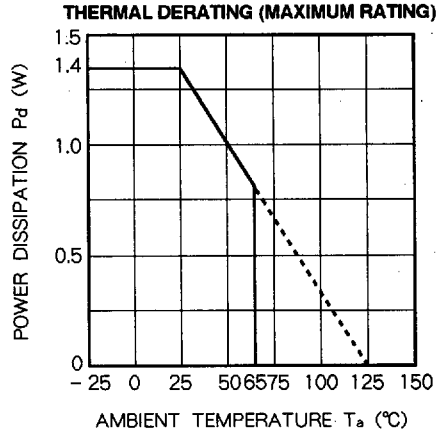
INPUT SIGNAL

SG No.	Signal name	Signals
SG1	200kHz sine wave	Establish 0dB as 200mVP-P.
SG2	APL100% standard signal	
SG3	2MHz sine wave	Establish 0dB as 100mVP-P.
SG4	Sine wave	Sine wave with variable frequency where 0dB is set to 200mVP-P.
SG5	Chroma standard signal (color bar)	 fSB : Burst signal frequency fSC : Chroma signal frequency fSB = fSC = 3.579545MHz 0dB : eb = 50mVP-P eb = 100mVP-P
SG6	Chroma signal – 1	 fSB = Fsc = 3.579545MHz (same phase) 0dB : eb = 50mVP-P eb = 100mVP-P
SG7	Chroma signal – 2	Chroma signal with variable frequency where all burst and chroma signals are the same phase with respect to chroma signal 1 of SG6.
SG8	Chroma signal – 3	Chroma signal where fSB = 3.579545MHz, fSB = 5.529545MHz (fSB – 50kHz) with respect to chroma signal 1 of SG6.
SG9	Standard sync signal	
SG10	APL 50% standard signal	
SG11	Sync signal-1	

SG No.	Signal name	Signals
SG12	Sync signal – 2	
SG13	5MHz sine wave	Establish 0dB as 100mVP-P.
SG14	Variable APL standard signal	
SG16	1kHz sine wave	Burst should be 0mVP-P, chroma frequency should be 100kHz, and amplitude should be 500mVP-P in relation to chroma signal 1 of SG6.

TYPICAL CHARACTERISTICS

THERMAL DERATING (MAXIMUM RATING)



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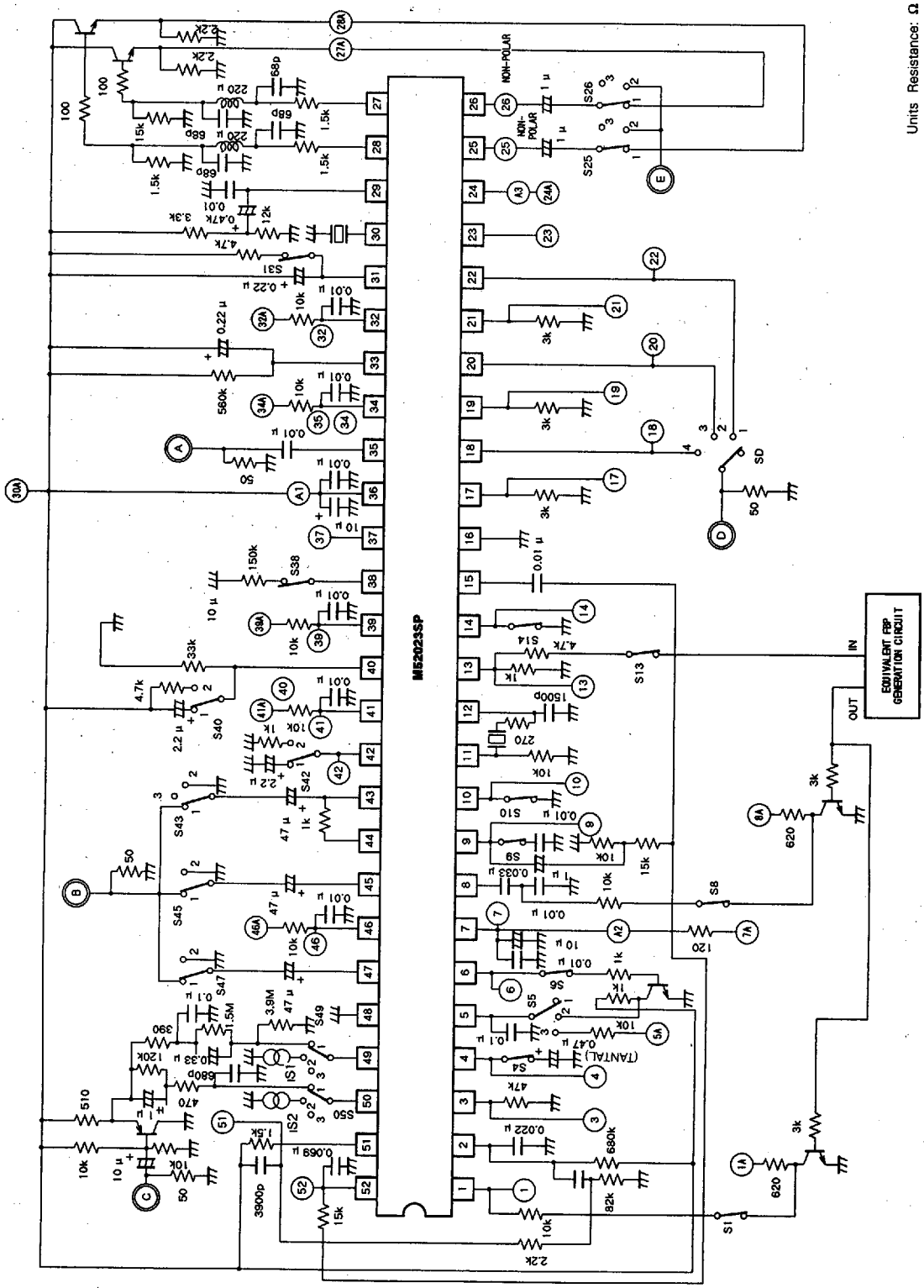
TEST CIRCUIT



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NTSC VIDEO CHROMA DEFLECTION

APPLICATION EXAMPLE