

# AN5607NK

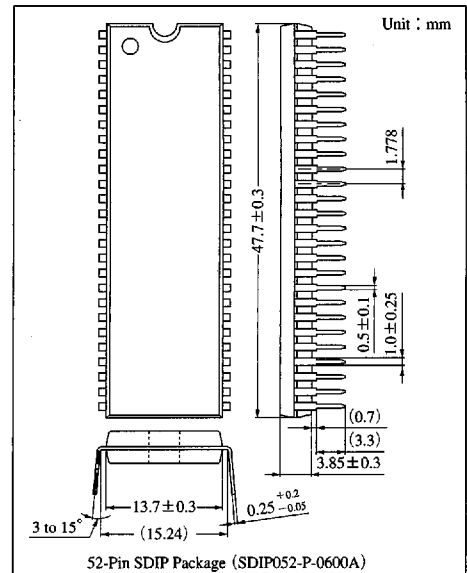
## Video Signal Processor IC for PAL/NTSC Color-TV

### Overview

The AN5607NK is a PAL/NTSC video signal processor IC to process video, chroma, and deflection signals. It incorporates an I<sup>2</sup>C bus interface for rationalization of set production line.

### Features

- Built-in I<sup>2</sup>C bus interface for automatic adjustment
- CRT highlight/lowlight adjustment circuit.
- Compatible with PAL, NTSC, and SECAM TV (when used with the AN5636K)
- 52-pin, SDIP package (SDIP052-P-0600A)
- Supply voltage : 5V and 9V



### Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V <sub>CC1</sub>	9.8	V
	V <sub>CC2</sub>	5.5	
	V <sub>CC3</sub>	6.8	
Supply current	I <sub>CC1</sub>	59	mA
	I <sub>CC2</sub>	90	
	I <sub>CC3</sub>	18	
Power dissipation <sup>Note 2)</sup>	P <sub>D</sub>	1480	mW
Operating ambient temperature <sup>Note 1)</sup>	T <sub>opr</sub>	-20 to +70	°C
Storage temperature <sup>Note 1)</sup>	T <sub>stg</sub>	-55 to +150	°C

Note 1) T<sub>a</sub> = 25°C except operating ambient temperature and storage temperature.

Note 2) Allowable power dissipation of the package at T<sub>a</sub> = 70°C.

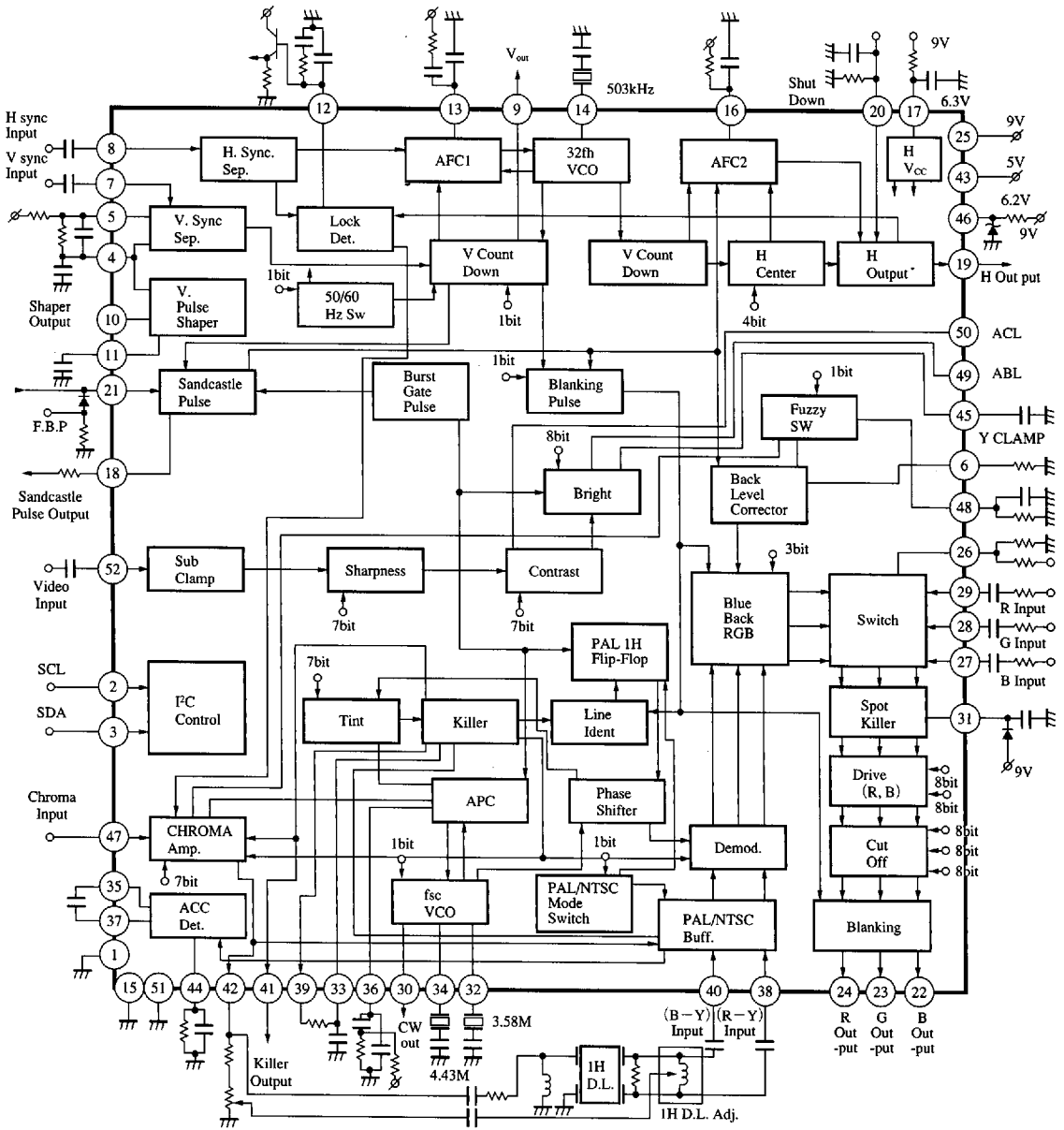
### Recommended Operating Range (T<sub>a</sub> = 25°C)

Parameter	Symbol	Range
Operating supply voltage range	V <sub>CC1</sub> (V <sub>25-1, 15, 51</sub> )	8.3V to 9.7V
	V <sub>CC2</sub> (V <sub>43-1, 15, 51</sub> )	4.6V to 5.4V
	V <sub>CC3</sub> (V <sub>46-1, 15, 51</sub> )	5.7V to 6.7V
Operating supply current range	I <sub>17</sub>	13mA to 25mA

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■ Block Diagram



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### ■ Electrical Characteristics (Ta=25±2°C)

Parameter	Symbol	Condition	min	typ	max	Unit
Circuit current 1	I <sub>CC1</sub>	V <sub>CC1</sub> =9V, V <sub>CC2</sub> =5V V <sub>CC3</sub> =6.2V, Sync. input	34.0	44.0	54.0	mA
Circuit current 2	I <sub>CC2</sub>		56.0	68.0	82.0	mA
Circuit current 3	I <sub>CC3</sub>		8.0	12.0	16.0	mA
Circuit voltage	V <sub>I7</sub>	I <sub>I7</sub> =12mA	5.8	6.3	6.9	V
Constant voltage operation resistor	R <sub>I7</sub>	V <sub>CC1</sub> =9V, V <sub>CC2</sub> =5V I <sub>I7</sub> =12 to 30mA	—	—	30	Ω
Pin④7 voltage	V <sub>47-51</sub>	V <sub>CC1</sub> =9V, V <sub>CC2</sub> =5V V <sub>CC3</sub> =6.2V	1.7	2.0	2.3	V
Pin⑤2 voltage	V <sub>52-51</sub>		2.7	3.0	3.3	V
Pin③8 voltage	(PAL) V <sub>38-51</sub>	V <sub>CC1</sub> =9V, V <sub>CC2</sub> =5V V <sub>CC3</sub> =6.2V (PAL MODE)	1.9	2.2	2.5	V
Pin④0 voltage	(PAL) V <sub>40-51</sub>		1.9	2.2	2.5	V
<b>I<sup>2</sup>C • DAC</b>						
Sink current at ACK time	V <sub>ACK</sub>	I <sub>3</sub> =2mA	—	—	0.5	V
SCL-SDA signal input LOW level	V <sub>LOW</sub>		—	—	0.9	V
SCL-SDA signal input HIGH level	V <sub>HIGH</sub>		4.0	—	—	V
Input signal frequency	f <sub>in</sub>		—	—	100	$\frac{\text{kbit}}{\text{S}}$
<b>Y Signal Processing</b>						
Video input terminal voltage	V <sub>52</sub>	V <sub>CC1</sub> =9V, V <sub>CC2</sub> =5V V <sub>CC3</sub> =6.2V, I <sub>I7</sub> =15mA	2.7	3.0	3.3	V
Pedestal fluctuation due to the drive	Y <sub>PL-D</sub>	No input, Drive ; min./max. Cutoff ; "18", Bright ; typ.	-400	0	400	mV
RGB output pedestal level	Y <sub>PL</sub>	No input, Drive ; typ. Cutoff ; "18", Bright ; typ.	1.7	2.4	3.1	V
RGB output pedestal difference voltage (1)	$\frac{Y_{PL}}{(B-G)}$	B-G	-250	0	+250	mV
RGB output pedestal difference voltage (2)	$\frac{Y_{PL}}{(R-G)}$	R-G	-250	0	+250	mV
Video voltage gain	A <sub>V</sub>	Input 0.4V <sub>P-P</sub> , Cont ; typ. Sharp ; min., Bright ; typ.	4.7	5.5	6.7	times
Video voltage gain relative ratio (1)	A <sub>VB/G</sub>		0.85	1.0	1.15	times
Video voltage gain relative ratio (2)	A <sub>VR/G</sub>		0.85	1.0	1.15	times
Video frequency characteristics	f <sub>YC</sub>	Output attenuation quantity of f=5MHz to output level of input f=2MHz	-7	-3	—	dB
Picture quality variable range (1)	$\frac{A_{Styp.}}{A_{Smin.}}$	Input sine wave 0.1V <sub>P-P</sub> f=3.3MHz, Bright ; "B0" Sharp = typ./min.	4.0	7.0	10.0	dB
Black level fluctuation due to variable picture quality	Y <sub>PL-S</sub>	Pedestal measurement Sharp = max./min.	-50	—	50	mV
Contrast ratio	$\frac{e_{max.}}{e_{min.}}$	Input sine wave 0.2V <sub>P-P</sub> f=2MHz, Bright ; "B0" Cont = max./min.	18	21.5	29	dB
RGB output tracking (1)	e <sub>OT</sub> (1)	Cont = 20→60	7	10	13	dB
RGB output tracking (2)	e <sub>OT</sub> (2)	R/B	0.96	1.0	1.04	times
RGB output tracking (3)	e <sub>OT</sub> (3)	G/B	0.96	1.0	1.04	times
Brightness variable range	B	Input 0.4V <sub>P-P</sub> stair step Bright = min.→max. Pedestal level measurement	2.1	2.6	3.1	V
Brightness control sensitivity	B <sub>G</sub>	Bright = 5F→9F	0.55	0.85	1.15	V
Brightness relative control sensitivity (1)	B <sub>R/G</sub>	Bright = 5F→9F R/G	0.85	1.0	1.15	times
Brightness relative control sensitivity (2)	B <sub>B/G</sub>	Bright = 5F→9F B/G	0.85	1.0	1.15	times

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**Electrical Characteristics (cont.)** ( $T_a = 25 \pm 2^\circ\text{C}$ )

Parameter	Symbol	Condition	min	typ	max	Unit
DC restoration rate	$T_{DC}$	Input $0.4V_{P-P}$ Cont = typ., Sharp ; min. APL10→90%	91	95	105	%
RGB output BLK level	$Y_{BL}$	$V_{CC1} = 9V, V_{CC2} = 5V$ $V_{CC3} = 6.2V, H, VBLK$ level at $I_{17} = 15mA$	0.5	1.0	1.5	V
<b>Black Level Correction</b>						
Correction quantity (amplitude variable) (1)	$V_{BL}$ (b) - (a)	Input signal ; full black (a) Pin $\text{\textcircled{48}}$ ; RC externally mounted (b) Pin $\text{\textcircled{48}}$ ; 9V	-100	0	100	mV
Correction quantity (amplitude variable) (2)	$V_{BL}$ (a) - (c)	Input signal ; full black (c) Pin $\text{\textcircled{48}}$ ; 3V R = 220k $\Omega$	0.45	0.75	1.05	V
Correction quantity (amplitude variable) (3)	$V_{BL}$ (b) - (a)	Output amplitude adjusted to $0.6V_{OP}$ . R = 220k $\Omega$	100	300	500	mV
Correction quantity (amplitude variable) (4)	$V_{BL}$ (b) - (a)	Output amplitude adjusted to $1.5V_{OP}$ . R = 220k $\Omega$	-100	0	150	mV
Y signal delay time	$\tau_D$	Input stair step $0.4V_{P-P}$	150	220	270	ns
ACL characteristics	ACL	Input stair step Pin $\text{\textcircled{5}}$ = 3.0→3.4V	6.5	8.5	10.5	dB/V
ABL characteristics	ABL	Pedestal level variation quantity at Pin $\text{\textcircled{49}}$ = 3.0→3.4V	0.9	1.4	1.9	V/V
<b>On-screen Circuit</b>						
Ys threshold	$e_{STH}$	Pin $\text{\textcircled{2}}$ switch level	0.45	0.7	0.95	V
External RGB frequency characteristics	$e_{RGB}$	Input sine wave $0.2V_{P-P}$ $Y_S = 1V$ $f = 2MHz$ to 5MHz	-4	-2	—	dB
External RGB output DC voltage	$E_{OEXT}$	No input, $Y_S = 1V$ Cutoff = "18" B measurement	1.45	2.15	2.85	V
External RGB output DC difference voltage (1)	$E_{OEXT (R-B)}$	No input, $Y_S = 1V$ Cutoff = "18" B measurement R-B	-250	0	250	mV
External RGB output DC difference voltage (2)	$E_{OEXT (G-B)}$	No input, $Y_S = 1V$ Cutoff = "18" B measurement G-B	-250	0	250	mV
Internal external pedestal difference voltage	$E_{OYS}$	Measure pedestal level difference when $Y_S = 0.4$ (OFF) / $1.2V$ (ON) (internal·external)	-50	300	600	mV
External RGB output signal level	$e_{EXT}$	Input sine wave $0.2V_{P-Pf} = 2MHz$ Cont : max., B measurement	4.6	6.6	8.6	dB
External RGB relative output signal level (1)	$e_{EXT G/B}$	Input sine wave $0.2V_{P-Pf} = 2MHz$ G/B	-1	0	1	dB
External RGB relative output signal level (2)	$e_{EXT R/B}$	Input sine wave $0.2V_{P-Pf} = 2MHz$ R/B	-1	0	1	dB
Internal external crosstalk	$e_{CT}$	Input sine wave $f = 1MHz$ $0.4V_{P-P}$ $Y_S = 1.2V$ External·internal crosstalk	—	—	-45	dB
External RGB frequency characteristics ratio (1)	$e_{fRGB R/B}$	Input sine wave $0.2V_{P-P}$ $f = 5MHz$ , R/B measurement	-1	0	1	dB
External RGB frequency characteristics ratio (2)	$e_{fRGB G/B}$	Input sine wave $0.2V_{P-P}$ $f = 5MHz$ , G/B	-1	0	1	dB
External RGB output blanking voltage	$Y_{BLK (RGB)}$	$V_{CC1} = 9V, V_{CC2} = 5V$ $V_{CC3} = 6.2V$ , No input when $I_{17} = 15mA$	0.5	1.0	1.5	V
External RGB contrast control characteristics	$e_{EXT-C}$	Input $2V_{P-P}$ Output ratio when Cont = max. /min.	9.5	12.5	15.5	dB

### ■ Electrical Characteristics (cont.) (Ta=25±2°C)

Parameter	Symbol	Condition	min	typ	max	Unit
<b>Color Signal Processing Circuit</b>						
PAL color difference output (B-Y) (1)	e <sub>01</sub>	Color bar signal burst 150mV <sub>P-P</sub> Cont, Color; typ. Bright; "B0"	2.0	2.6	3.2	V <sub>P-P</sub>
PAL color difference output (B-Y) (2)	e <sub>02</sub>	Color bar signal burst 150mV <sub>P-P</sub> Cont; typ., Color; max. Bright; "E6"	4.1	5.2	6.3	V <sub>P-P</sub>
PAL color difference output (residual color) (3)	e <sub>03</sub>	Color bar signal burst 150mV <sub>P-P</sub> Cont; max., Color; min.	—	—	80	mV <sub>P-P</sub>
PAL ACC characteristics (1)	A <sub>CC1</sub>	Color bar signal burst 300mV <sub>P-P</sub> (+6dB)	0.8	1.0	1.2	times
PAL ACC characteristics (2)	A <sub>CC2</sub>	Color bar signal burst 30mV <sub>P-P</sub> (-14dB)	0.7	0.9	1.1	times
PAL demodulation output ratio (1)	R/B	Color bar signal burst 150mV <sub>P-P</sub> Cont, Color; typ.	0.67	0.78	0.88	times
PAL demodulation output ratio (2)	G/B		0.31	0.36	0.41	times
PAL demodulation angle R	∠R		84	90	96	deg
PAL demodulation angle G	∠G		228	235	242	deg
PAL demodulation output residual carrier	e <sub>car</sub>	No signal input. Measure 4.43MHz component at each output pin	—	—	90	mV <sub>P-P</sub>
Contrast slope	Δe <sub>TPY</sub>	Color bar signal burst 150mV <sub>P-P</sub> Cont; 20→60 Color; typ.	8	10.5	14	dB
NTSC tint center	T <sub>c</sub>	Color bar signal burst 150mV <sub>P-P</sub> Measure phase-shift at tint data of 37	-7	0	+7	deg
NTSC tint variable range	Δθ <sub>T</sub>	Same as above tint; min. to max.	70	90	120	deg
PAL color variable range	Δe <sub>O-COL</sub>	Color bar signal burst 150mV <sub>P-P</sub> Cont; typ. Color; variation quantity at 10→7F	17	20	25	dB
PAL APC pull-in range	f <sub>PCP</sub>	Burst frequency variable	±450	±500	—	Hz
NTSC APC pull-in range	f <sub>PCN</sub>		±450	±500	—	Hz
PAL VCO free-run frequency	f <sub>COP</sub>	No signal Acc; OFF	-200	0	+200	Hz
NTSC VCO free-run frequency	f <sub>CON</sub>		-200	0	+200	Hz
PAL f <sub>CO</sub> supply voltage dependency	Δf <sub>COP-V</sub>	V <sub>CC2</sub> =5V±10% variation Variation quantity to V <sub>CC2</sub> =5V	-120	0	+120	Hz
NTSC f <sub>CO</sub> supply voltage dependency	Δf <sub>CON-V</sub>	V <sub>CC2</sub> =5V±10% variation Variation quantity to V <sub>CC2</sub> =5V	-120	0	+120	Hz
PAL VCO output level	e <sub>CW-P</sub>	V <sub>CC1</sub> =9V, V <sub>CC2</sub> =5V V <sub>CC3</sub> =6.2V, Pin④ output level	0.3	0.4	0.5	V <sub>P-P</sub>
NTSC VCO output level	e <sub>CW-N</sub>	when I <sub>17</sub> =15mA	0.3	0.4	0.5	V <sub>P-P</sub>
PAL color killer tolerance	e <sub>KP</sub>	Color bar signal. burst 150mV <sub>P-P</sub> =0dB Color, Cont; max.	-30	-36	-41	dB
NTSC color killer tolerance	e <sub>KN</sub>		-37	-42	-48	dB
Killer residual color	e <sub>ck</sub>	Input sine wave 150mV <sub>P-P</sub> f=2MHz. Measure (4.43-2) component of color. Cont; max.	—	—	30	mV <sub>P-P</sub>
Color killer detection output voltage (color)	V <sub>41-C</sub>	Pin④; measurement burst signal exists	4.5	5.0	5.5	V
Color killer detection output voltage (black and white)	V <sub>41-B/W</sub>	No burst signal	—	0.06	0.5	V
Chroma input terminal voltage	V <sub>47</sub>	Pin④ is opened	1.7	2.0	2.3	V

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**Electrical Characteristics (cont.)** ( $T_a = 25 \pm 2^\circ\text{C}$ )

Parameter	Symbol	Condition	min	typ	max	Unit
PAL/SECAM change-over voltage	$V_{47-P/S}$	Pin <sup>④</sup> PAL/SECAM Change-over threshold	2.35	2.5	2.65	V
B-Y output amplitude when Lock detection pin is LD	$e_{04}$	Color bar signal, Pin <sup>⑫</sup> = 0V burst 150mV <sub>P-P</sub> Color, Cont ; max.	—	200	600	mV <sub>P-P</sub>
<b>RGB Output Circuit</b>						
Drive adjustment range	$A_{VD}$	External input 0.2V <sub>P-P</sub> , input YS=1V Drive ; min. to max. R, B output	3	6	9	dB
Cut-off adjustment range (1 stage)	$V_{CUT1}$	No input Pedestal level Cut-off ; min. to max. Variation quantity When DAC change-over switch not used yet	1.0	1.3	1.6	V
Cut-off adjustment range (2 stage)	$V_{CUT2}$	No input Pedestal level Cut-off ; min. to max. Variation quantity When DAC change-over switch used	1.6	2.25	2.9	V
<b>Deflection Signal Processing</b>						
Horizontal natural oscillation frequency	$f_{HO}$	No input Output frequency at Pin <sup>⑩</sup>	15.45	15.75	16.05	kHz
Horizontal natural oscillation frequency supply voltage dependency	$\frac{\Delta f_{HO}}{V_{CC3}}$	$f_{HO}$ (I <sub>17</sub> = 30mA) $f_{HO}$ (I <sub>17</sub> = 15mA)	-100	0	100	Hz
Horizontal oscillation starting voltage	$V_{FH(S)}$	Where horizontal oscillation output is over 1V <sub>P-P</sub> , f = 10k to 20kHz	—	—	5.2	V
Horizontal oscillation pulse duty ratio	$\tau_{HO}$	I <sub>17</sub> = 15mA, V <sub>CC1</sub> = 9V V <sub>CC2</sub> = 5V, V <sub>CC3</sub> = 6.2V	35.0	38.0	41.0	%
Horizontal pull-in range	$f_{H0}$	$f_{H0} = 15.75\text{kHz}$	$\pm 400$	—	—	Hz
H pulse output voltage	$V_{19}$	At V <sub>CC</sub> ; typ.	2.3	2.8	3.3	V
High voltage detection circuit operation voltage (shut-down)	$V_{5th}$	I <sub>20</sub> = 50 $\mu\text{A}$	0.70	0.83	0.95	V
Shut-down leak current	$I_{5th}$	Measure I <sub>20</sub> , at Pin <sup>⑳</sup> = 0V	—	—	5.0	$\mu\text{A}$
AFC1 pin operation voltage	$V_{13}$	At V <sub>CC1</sub> = 9V, V <sub>CC2</sub> = 5V V <sub>CC3</sub> = 6.2V, I <sub>17</sub> = 15mA	3.8	4.2	4.6	V
<b>Vertical Signal Processing</b>						
PAL vertical free-run oscillation frequency	$f_{VO-P}$	$\left(\frac{2}{625} f_{H-P}\right)$	48.5	50	51.5	Hz
NTSC vertical free-run oscillation frequency	$f_{VO-N}$	$\left(\frac{2}{525} f_{H-N}\right)$	58.5	60	61.5	Hz
Vertical free-run oscillation pulse width	$\tau_{VO}$	PAL ; $f_{H} = 15.625\text{kHz}$ NTSC ; $f_{H} = 15.75\text{kHz}$	9.5	10.0	10.5	1/ $f_H$
PAL vertical pull-in to lerant frequency	$f_{PV-P}$	$f_{V-P} = 50\text{Hz}$	46	50	54	Hz
NTSC vertical pull-in to lerant frequency	$f_{PV-N}$	$f_{V-N} = 60\text{Hz}$	56	60	64	Hz
Vout output voltage	$V_9$	At V <sub>CC1</sub> = 9V, V <sub>CC2</sub> = 5V V <sub>CC3</sub> = 6.2V, I <sub>17</sub> = 15mA	0	0.2	0.5	V
V pulse shaper output pulse width	$\tau_{10}$		1.4	2.2	3.0	ms
<b>Sandcastle Pulse</b>						
PAL burst gate pulse width	$\tau_{BGP-P}$	Pin <sup>⑬</sup> PAL Burst gate pulse width	3.4	4.0	4.6	$\mu\text{s}$
NTSC burst gate pulse width	$\tau_{BGP-N}$	Pin <sup>⑬</sup> NTSC Burst gate pulse width	2.5	3.0	3.5	$\mu\text{s}$
PAL V-blanking width	$\tau_{-PVBLK}$	Pin <sup>⑬</sup> PAL Blanking pulse width ( $22 \pm 1.5$ ) H	1.31	1.41	1.51	ms

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### ■ Electrical Characteristics (cont.) (Ta=25±2°C)

Parameter	Symbol	Condition	min	typ	max	Unit
NTSC V-blanking width	$\tau_{-NVBLK}$	Pin⑬ NTSC Blanking pulse width (17.5±1.5) H	1.01	1.11	1.21	ms
Burst gate pulse output voltage	$V_{BGP}$	At $V_{CC1}=9V$ , $V_{CC2}=5V$ $V_{CC3}=6.2V$ , $I_{17}=15mA$	3.6	4.0	4.5	V
H blanking pulse output voltage	$V_{HBLK}$		2.5	2.9	3.4	V
V blanking pulse output voltage	$V_{VBLK}$		1.0	1.5	2.0	V
<b>H Center Circuit</b>						
H center variable range (1)	$\tau_{DH(1)}$	H center ; typ.→min. Hsync rise-up and HBLK delay	-2.2	-1.6	-1.3	$\mu s$
H center variable range (2)	$\tau_{DH(2)}$		1.3	1.6	2.2	$\mu s$
<b>Lock Detector Circuit</b>						
Lock detector output voltage (Hi)	$V_{12-HI}$	Pin⑫ voltage when horizontal sync. signal is input, with Hor, Loop ON.	7.9	8.5	9.0	V
Lock detector output voltage (Lo)	$V_{12-LO}$	Pin⑫ voltage at no input, Hor, Loop ON.	—	0.2	0.5	V
<b>Service Switch Circuit</b>						
Service switch threshold	$V_{sth}$		0.35	0.65	1.10	V
Service SW operation	$e_{ser}$	Input ; stair step Measure amplitude at 0.4V <sub>P-P</sub> Pin⑩ (ACL)=0V	—	—	150	mV <sub>P-P</sub>
<b>Spot Killer</b>						
Spot killer operation	$K_{SP}$	Measure each output pedestal level, when current 1mA flowed into Pin③	6.8	7.5	8.2	V
<b>Other</b>						
Video circuit dynamic range	$Y_D$	0.6V <sub>P-P</sub> (0.492V <sub>OP</sub> ) input Bright ; 7F, Cont ; 7F Cutoff ; 7F	3.8	—	—	V <sub>OP</sub>

### ■ Electrical Characteristics (Ta=25±2°C) [Reference Value]

Parameter	Symbol	Condition	min	typ	max	Unit
<b>Y Signal Processing Circuit</b>						
Y signal input	$e_Y$	Input : Pin⑫ positive polarity	0.6V <sub>P-P</sub> ±3dB			—
Picture quality variable range (2)	$\frac{A_{Smax.}}{A_{Smin.}}$	Input sine wave 0.1V <sub>P-P</sub> f=3.3MHz Bright ; "B0" Sharp ; max./min.	8	11	14	dB
Video output (Eo) DC supply voltage dependency	$\frac{\Delta E_O}{\Delta T}$	Input sine wave 0.1V <sub>P-P</sub> Variation ratio of video output pedestal	—	—	400	mV/V
Eo ambient temperature dependency	$\frac{\Delta E_O}{\Delta T}$	$V_{CC1}=9V$ , $V_{CC2}=5V$ Video pedestal variation ratio at Ta= -20 to +70°C	—	-1.8	—	mV/°C
Contrast fluctuation due to variable picture quality	$V_{CA}$	Video input steps wave 0.4V <sub>P-P</sub> Cont ; typ. Sharp ; min./max.	—	—	150	mV <sub>P-P</sub>
Black level fluctuation voltage due to the variable contrast	$V_{BAC}$	Sharp ; min. Cont ; min./max.	—	—	200	mV
Black level fluctuation difference voltage due to the variable contrast	$\Delta V_{BAC}$	Sharp ; min. Cont ; min./max.	-20	0	20	mV
Delay line dynamic range	$V_{DDR}$		—	1.1	—	V <sub>P-P</sub>

Note) The characteristics value in parentheses is not a guaranteed value, but reference one on design.

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**Electrical Characteristics (cont.)** ( $T_a = 25 \pm 2^\circ\text{C}$ ) [Reference Value]

Parameter	Symbol	Condition	min	typ	max	Unit
Peak clamp input terminal inflow current	$I_{IN52}$	Inflow current when 5V applied to Pin⑤	—	55	—	$\mu\text{A}$
Video signal output supply voltage dependency	$\frac{\Delta e_0}{\Delta V}$	Input signal 0.4V <sub>P-P</sub> Stair step Output amplitude variation ratio at $V_{CC} = \pm 5\%$	0.15	0.2	0.25	$V_{P-P}/V$
$e_0$ ambient temperature dependency	$\frac{\Delta e_0}{\Delta T}$	$V_{CC1} = 9V, V_{CC2} = 5V$ Output amplitude variation ratio at $T_a = -20$ to $+70^\circ\text{C}$	—	11	—	%
C-Y/Y ratio	C-Y/Y	Color bar input Color ; max., Cont ; typ.	1.0	1.15	1.5	times
Delay line group delay	D <sub>FL</sub>	Flat	—	3	—	MHz
Video signal output	$E_{OD}$	Input 0.4V <sub>P-P</sub> Stair step Cont ; max.	—	4	—	$V_{P-P}$
Supply-voltage-dependency of video-output-DC-difference-voltage	$\frac{\Delta E_{EO}}{\Delta V}$	$V_{CC1} = 9V \pm 10\%$ $V_{CC2} = 5V$	-250	0	250	mV/V
Differential gain	DG	APL 10 to 90%	—	—	5.0	%
Temperature dependency of each output	$\frac{\Delta E_{RGB}}{\Delta T}$	Relative variation quantity of each RGB output	—	—	$\pm 35$	mV
Y noise level	$Y_{NL}$	No input 1 to 4MHz component	—	—	50	mV
Y S/N	$Y_{SM}$	Input 600mV, Sharpness ; min. Measure by noise meter at 3.3V output	—	53	—	dB

## On-screen Circuit

Change-over speed	$T_{SW}$		7	—	—	MHz
External RGB input dynamic range	$V_{DREXT}$		—	2.4	—	$V_{P-P}$

## Color Signal Processing Circuit

PAL/NTSC ratio	P/N	Measure demodulation output ratio at PAL/NTSC	0.7	1.0	1.3	times
Maximum color difference output	$e_{OM}$	Color bar signal burst 150mV <sub>P-P</sub> Cont, Color ; max.	3.8	4.7	5.4	$V_{OP}$
Color difference output supply voltage dependency of	$\Delta e_0 - V_{CC}$	Variation width to $V_{CC1} = 9V,$ $V_{CC2} = 5V \pm 10\%$	—	—	1.3	$V_{P-P}/V$
Color difference output ambient temperature dependency	$\Delta e_0 - T$	$T_a = -20$ to $+70^\circ\text{C}$ $T_a = 25^\circ\text{C}$ as center	—	18	—	%
Demodulation output IH change-over DC step voltage	$\Delta E_{PAL}$		—	0	40	mV
$f_0$ ambient temperature dependency PAL	$\Delta f_{COP-T}$	$T_a = -20$ to $+70^\circ\text{C}$ Color signal no input	—	-2	—	Hz/ $^\circ\text{C}$
VCO control sensitivity PAL	$\beta_P$		—	3.3	—	Hz/mV
APC phase detection sensitivity PAL	$\mu_P$	Killer ; OFF	—	30	—	$\frac{\text{mV}}{\text{deg}}$
Phase hold characteristics PAL	$\Delta \Phi_P$	$\frac{1}{\mu \times \beta} \times 100$	—	1.33	—	$\frac{\text{deg}}{100\text{Hz}}$
$f_0$ ambient temperature dependency NTSC	$\Delta f_{CON-T}$	$T_a = -20$ to $+70^\circ\text{C}$ Color signal no input	—	-2	—	Hz/ $^\circ\text{C}$
VCO control sensitivity NTSC	$\beta_N$	Burst Gate ; OFF	—	2.3	—	Hz/mV
APC phase detection sensitivity NTSC	$\mu_N$	Killer ; OFF	—	30	—	$\frac{\text{mV}}{\text{deg}}$
Phase hold characteristics NTSC	$\Delta \Phi_N$	$\frac{1}{\mu \cdot \beta} \times 100$	—	1.45	—	$\frac{\text{deg}}{100\text{Hz}}$
Carrier filter frequency characteristics	$e_{ef}$	Frequency to be -3dB at output pin	—	1.1	—	MHz

Note) The characteristics value in parentheses is not a guaranteed value, but reference one on design.

**Electrical Characteristics (cont.)** ( $T_a = 25 \pm 2^\circ\text{C}$ ) [Reference Value]

Parameter	Symbol	Condition	min	typ	max	Unit
$E_C$ to color fluctuation	$\Delta E_R^{(C)}$ $\Delta E_G^{(C)}$ $\Delta E_B^{(C)}$	Color ; min. $\rightarrow$ max. Cont ; max., Acc=5V	—	—	50	mV
$E_C$ to ACC fluctuation	$\Delta E_R^{(A)}$ $\Delta E_G^{(A)}$ $\Delta E_B^{(A)}$	$E_C$ variation quantity for Acc voltage change Color, Cont ; max.	—	—	20	mV/V
Color/black and white DC difference voltage	$\Delta E_{C/BW}$	Measure output pedestal fluctuation at killer terminal=H/L	—	0	60	mV
Line crawling	$\Delta e_{OPAL}$		—	—	50	mV
Demodulation output frequency characteristics	$f_{C-Y}$		—	1.1	—	MHz
Color difference contrast ratio	$\Delta e_{OC}$	Color bar signal burst 150 mV <sub>P-P</sub> Cont ; min. $\rightarrow$ max. Color ; typ.	20	26	33	dB
NTSC tint control sensitivity	$\theta_T$	Color bar signal burst 150 mV <sub>P-P</sub> Tint ; phase shift quantity at 20 $\rightarrow$ 60	30	40	50	deg
<b>Deflection Processing Circuit</b>						
Separable sync. signal input	$V_{in}$	APL ; 50%	1.0	2.0	2.8	$V_{P-P}$
$f_{HO}$ ambient temperature dependency	$\frac{\Delta f_{HO}}{T_a}$	$T_a = -20$ to $+70^\circ\text{C}$	—	5.5	—	Hz/ $^\circ\text{C}$
Phase detection sensitivity	$\mu$	$V_{CC1}=9\text{V}$ , $V_{CC2}=5\text{V}$	—	31	—	$\mu\text{A}/\mu\text{s}$
Horizontal oscillation frequency control sensitivity	$\beta$		—	-1.6	—	Hz/mV
Vertical free-run oscillation frequency supply voltage dependency	$\Delta f_{v_0}$	$V_{CC1}=9\text{V}$ , $V_{CC3}=6.2\text{V}$ $I_{I7}=15\text{mA}$ $V_{CC2}=4.5$ to $5.5\text{V}$	-0.8	0	0.8	Hz
FBP slice level (blanking)	$V_{FBP-1}$	FBP input level at which blanking applied to RGB output	0.3	0.75	1.1	V
<b>RGB Back</b>						
RGB Back output level	$E_{RGB-B}$	No input DC fluctuation when RGB back is operating	2.3	2.75	3.2	V
<b>Sandcastle Pulse</b>						
Burst gate pulse position	$P_{BGP}$	From horizontal sync. signal rear, edge to burst gate pulse front edge	—	0.1	—	$\mu\text{s}$
<b>H Center Circuit</b>						
FBP delay time tolerance range	$T_{H-FBP}$	Range in which screen center position fluctuates more than $\pm 1.3\mu\text{s}$ , when delay time varied from Hout rise-up to FBP center	12	—	19	$\mu\text{s}$
FBP slice level (AFC2)	$V_{FBP-2}$	FBP input level at which AFC2 operates	1.5	2.0	3.0	V
<b>DAC · IIC</b>						
4 bit DAC DNLE	$L_1$	1 LSB = $\{ DATA(\text{max.}) - DATA(\text{min.})\} / 15$	0.5	1	1.5	$\frac{\text{LSB}}{\text{STEP}}$
7 bit DAC DNLE	$L_2$	1 LSB = $\{ DATA(\text{max.}) - DATA(\text{min.})\} / 127$	0.1	1	1.9	$\frac{\text{LSB}}{\text{STEP}}$
8 bit DAC DNLE (40, 80, CO excepted)	$L_{3-1}$	1 LSB = $\{ DATA(\text{max.}) - DATA(\text{min.})\} / 255$	0.1	1	1.9	$\frac{\text{LSB}}{\text{STEP}}$
8 bit DAC DNLE (40, 80, CO only)	$L_{3-2}$	1 LSB = $\{ DATA(\text{max.}) - DATA(\text{min.})\} / 255$	-2	1	4	$\frac{\text{LSB}}{\text{STEP}}$

Note) The characteristics value in parentheses is not a guaranteed value, but reference one on design.

**Electrical Characteristics (cont.)** ( $T_a = 25 \pm 2^\circ\text{C}$ ) [Reference Value]

Parameter	Symbol	Condition	min	typ	max	Unit
$t_{\text{BUF}}$	—		4.0	—	—	$\mu\text{s}$
$t_{\text{SU}} \cdot \text{STA}$	—		4.0	—	—	$\mu\text{s}$
$t_{\text{HD}} \cdot \text{STA}$	—		4.0	—	—	$\mu\text{s}$
$t_{\text{HI}}$	—		4.0	—	—	$\mu\text{s}$
$t_{\text{LO}}$	—		4.0	—	—	$\mu\text{s}$
$t_{\text{R}}$	—		—	—	1.0	$\mu\text{s}$
$t_{\text{F}}$	—		—	—	0.35	$\mu\text{s}$
$t_{\text{SU}} \cdot \text{DAT}$	—		0.25	—	—	$\mu\text{s}$
$t_{\text{HD}} \cdot \text{DAT}$	—		0	—	—	$\mu\text{s}$
$t_{\text{SU}} \cdot \text{STO}$	—		4.0	—	—	$\mu\text{s}$

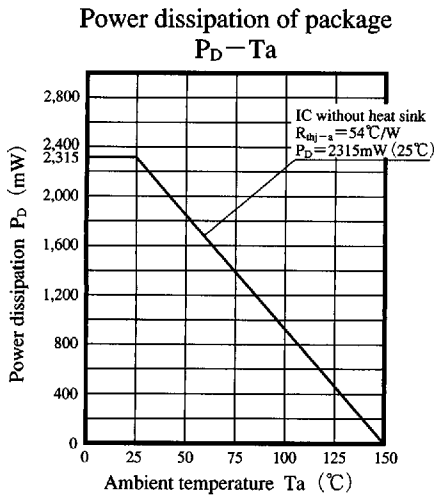
Note) The characteristics value in parentheses is not a guaranteed value, but reference one on design.

**Pin Descriptions**

Pin No.	Pin name	Pin No.	Pin name
1	IC system GND	27	B input
2	SCL input	28	G input
3	SDA input	29	R input
4	Ver. integral filter	30	CW output
5	Ver. sync. separation input	31	Spot killer input
6	Black level correction start point adj.	32	3.58MHz oscillation
7	Ver. sync. input	33	Killer bias
8	Hor. sync. input	34	4.43MHz oscillation
9	Vertical output	35	ACC filter 1
10	50/60Hz Pulse output	36	APC filter
11	50/60Hz shaper	37	ACC filter 2
12	Hor. sync. detection filter	38	R - Y input
13	Hor. AFC1 filter	39	Killer filter
14	503kHz ( $32f_{\text{H}}$ ) oscillation	40	B - Y input
15	Vertical system GND	41	Killer output
16	Hor. AFC2 filter	42	Chroma signal output
17	Supply voltage 4 (Hor. system supply voltage)	43	Supply voltage 2 (Chroma system)
18	Sand-castle pulse output	44	ACC detection filter
19	Hor. drive pulse output	45	Y clamp capacitor
20	High voltage detection input (shut down input)	46	Supply voltage 3 (Video system)
21	Flyback pulse input	47	Chroma signal input
22	B output	48	Black level detection Filter, FUZZY input
23	G output	49	ABL
24	R output	50	ACL
25	Supply voltage 1 (Video, RGB output system)	51	Video/chroma system GND
26	$Y_{\text{S}}$ input	52	Video signal input



■ Characteristics Chart



■ Operational Descriptions

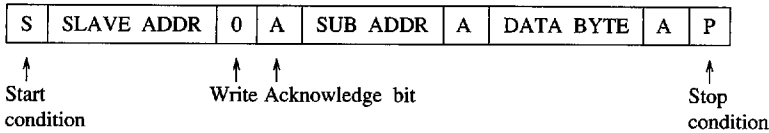
• I<sup>2</sup>C Bus protocol (1)

I<sup>2</sup>C-BUS Format

(1) Slave address :

1000101 (0)

(2) Slave address format :



(3) Subaddress byte and data byte format :

Sub-addr <sup>(H)</sup>	functions	Data byte								Initial setting at power-on	
		D7	D6	D5	D4	D3	D2	D1	D0		
00	color	0	A06	A05	A04	A03	A02	A01	A00	41 (TYP)	
01	tint	0	A16	A15	A14	A13	A12	A11	A10	41 (TYP)	
02	brightness	A27	A26	A25	A24	A23	A22	A21	A20	81 (TYP)	
03	contrast	0	A36	A35	A34	A33	A32	A31	A30	41 (TYP)	
04	sharpness	0	A46	A45	A44	A43	A42	A41	A40	41 (TYP)	
05	cutoff R	A57	A56	A55	A54	A53	A52	A51	A50	81 (TYP)	
06	cutoff G	A67	A66	A65	A64	A63	A62	A61	A60	81 (TYP)	
07	cutoff B	A77	A76	A75	A74	A73	A72	A71	A70	81 (TYP)	
08	drive R	A87	A86	A85	A84	A83	A82	A81	A80	81 (TYP)	
09	drive B	A97	A96	A95	A94	A93	A92	A91	A90	81 (TYP)	
0A	H center	AA7	AA6	AA5	AA4	AA3	AA2	AA1	AA0	08 (TYP)	
0B	MODE SW (PAL/NTSC)									PNS	Refer to the next page
0B	50/60Hz SW									VFS	Refer to the next page
0B	RGB Back MODE									RGB	Refer to the next page
0B	RGB Back									R G B	Refer to the next page
0B	Blanking SW									BLK	Refer to the next page
0B	VCO SW									VCO	Refer to the next page

※ AA4, AA5, AA6 : CUTOFF SW (R, G, B) → Pedestal DC rises at HI (Approx. 0.95V)  
 AA7 : FUZZY SW (R, G, B) → FUZZY ON at HI

6932852 0014367 T65

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■ Operational Descriptions (cont.)

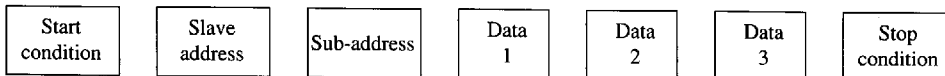
• I<sup>2</sup>C Bus Protocol (2)

Data byte Condition at Sub-addr. (OB<sub>H</sub>)

Functions	Data (*Initial condition at power-on)		Condition
Mode SW	PNS	*1	PAL
		0	NTSC
50/60Hz	VFS	*0	50Hz
		1	60Hz
RGB Back MODE	RGB	1	No Vsync lock
		*0	With Vsync lock
RGB Back	B	1	ON
		*0	OFF
	G	1	ON
		*0	OFF
	R	1	ON
		*0	OFF
Blanking SW	BLK	1	No blanking
		*0	With blanking
VCO SW	VCO	1	3.58MHz
		*0	4.43MHz

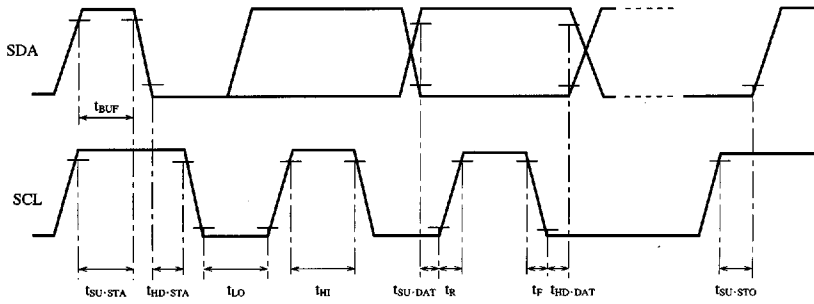
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※Auto increment function

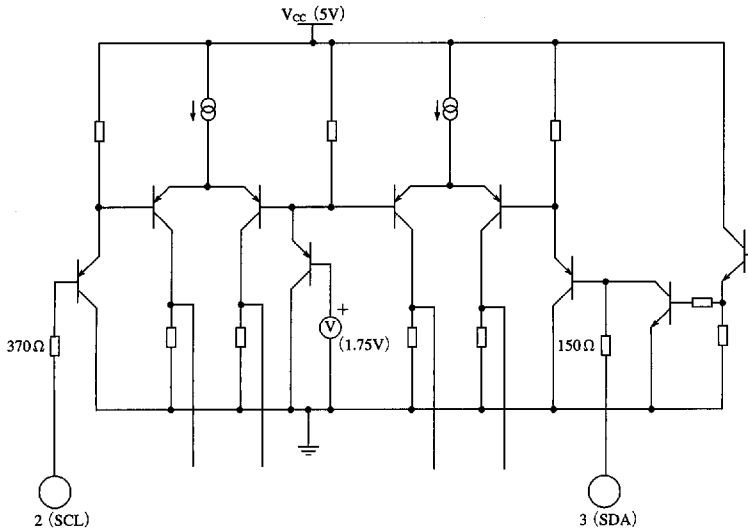


When data is input as shown above, more than one DAC can be controlled. For example, the data-1 is sent to the specified sub-address DAC, data-2 is sent to the 1-increment-sub-address DAC, and the data-3 is sent to the 2-increment-sub-address DAC and so on.

■ Operational Descriptions (cont.)  
• I<sup>2</sup>C Bus input signal timing



• I<sup>2</sup>C Bus input circuit of AN5607NK



■ Operational Descriptions (cont.)

• Color difference output amplitude conversion (Input : color bar → offset color bar)

The standard signal for the color signal processing circuit of the AN5607NK is color bar signal (1). If color difference output by means of offset color bar signal (2) is required, its amplitude value is given by the following conversion equation :

(1) B-Y Axis

• Color difference output by color bar signal

$$e_{B-Y} = |Y'| + |B'|$$

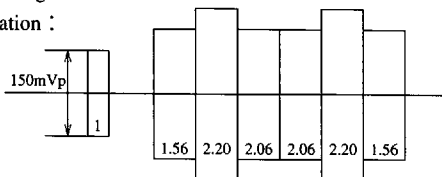
• Color difference output by offset color bar signal

$$(|Y'| + |B'|) / \cos\theta$$

When considering the ratio of signal level between color bar signal and offset color bar signal,

$$e_{B-Y} = \frac{a}{C_B} (|Y'| + |B'|) / \cos\theta_B$$

( $\theta_B : 13^\circ$ ,  $a : a$  : Signal level of offset color bar,  $C_B$  : Signal level of color bar)



(1) Color bar signal

(2) R-Y Axis

• In the same way as (1)

$$e_{R-Y} = \frac{a}{C_R} (|R'| + |S'|) / \cos\theta_R$$

( $\theta_R : 103^\circ - \angle R-Y$ )



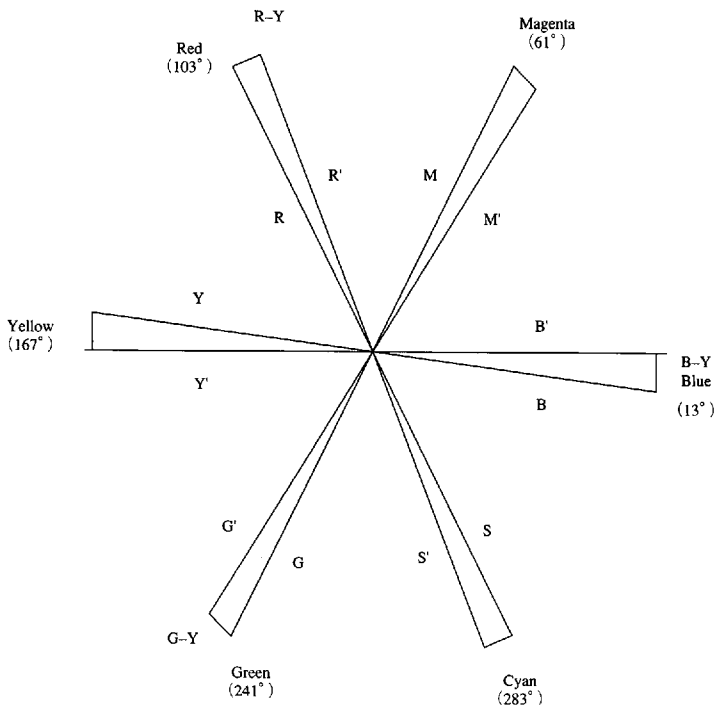
(2) Offset color bar signal

(3) G-Y Axis

• In the same way as (1)

$$e_{G-Y} = \frac{a}{C_G} (|G'| + |S'|) / \cos\theta_G$$

( $\theta_G : 241^\circ - \angle G-Y$ )



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