AN5607NK

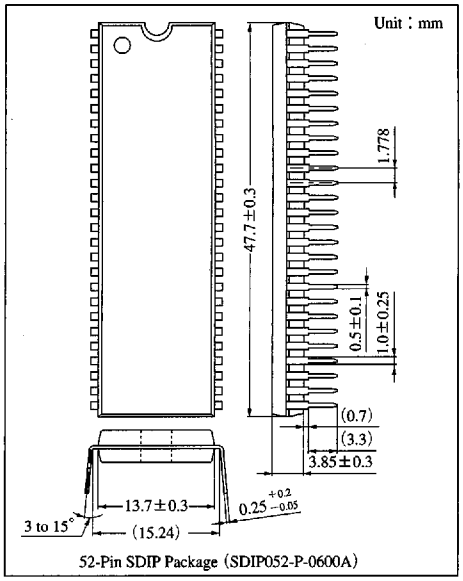
Video Signal Processor IC for PAL/NTSC Color-TV

■ Overview

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

■ Features

- Built-in I^2C 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



52-Pin SDIP Package (SDIP052-P-0600A)

■ Absolute Maximum Ratings

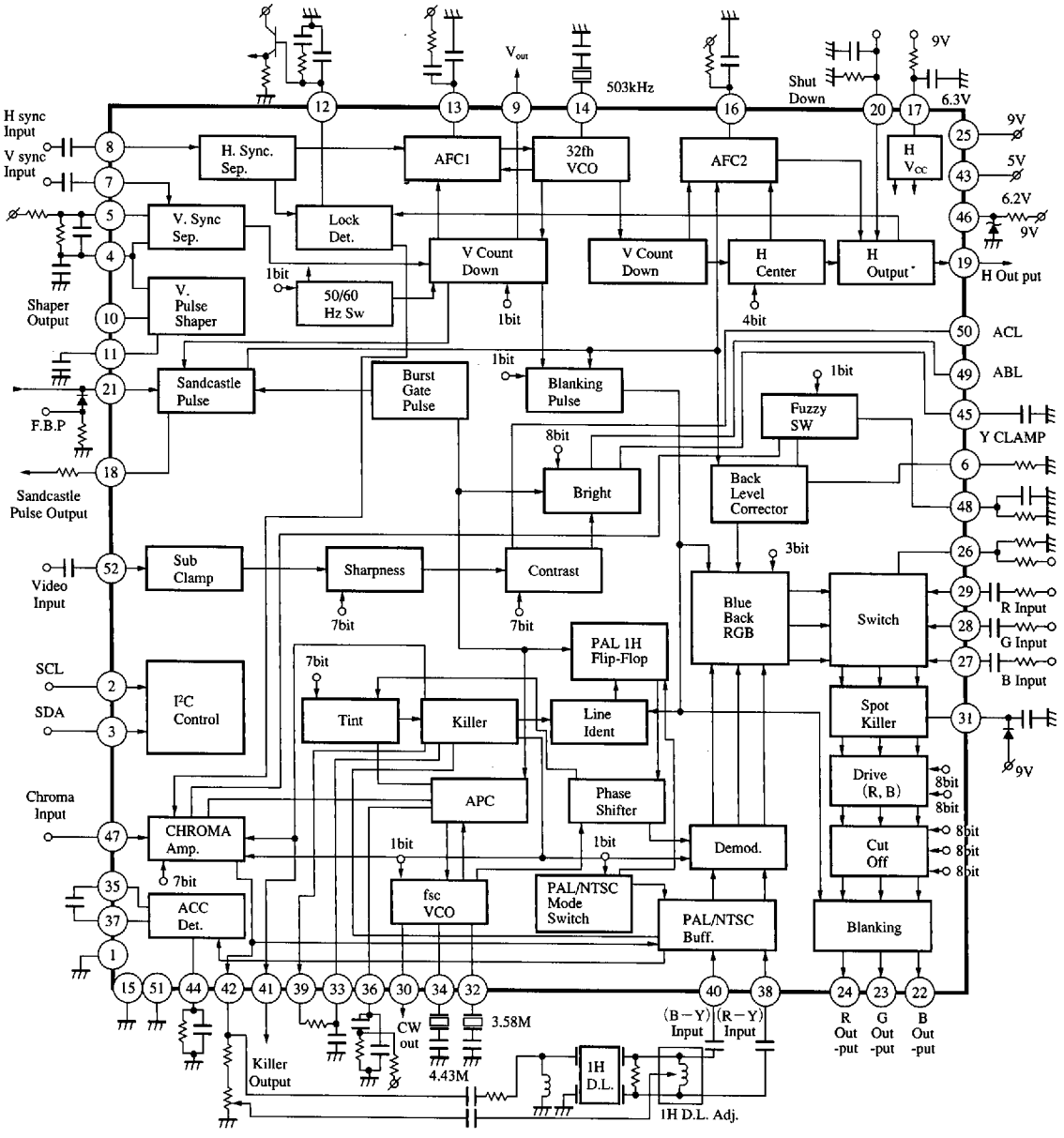
Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC1}	9.8	V
	V_{CC2}	5.5	
	V_{CC3}	6.8	
Supply current	I_{CC1}	59	mA
	I_{CC2}	90	
	I_{CC3}	18	
Power dissipation Note 2)	P_D	1480	mW
Operating ambient temperature Note 1)	T_{opr}	−20 to +70	℃
Storage temperature Note 1)	T_{stg}	−55 to +150	℃

Note 1) Ta=25℃ except operating ambient temperature and storage temperature.
Note 2) Allowable power dissipation of the package at Ta=70℃.

■ Recommended Operating Range (Ta=25℃)

Parameter	Symbol	Range
Operating supply voltage range	V_{CC1} ($V_{25-1,15,51}$)	8.3V to 9.7V
	V_{CC2} ($V_{43-1,15,51}$)	4.6V to 5.4V
	V_{CC3} ($V_{46-1,15,51}$)	5.7V to 6.7V
Operating supply current range	I_{17}	13mA to 25mA

Block Diagram



■ Electrical Characteristics (Ta=25±2℃)

Parameter	Symbol	Condition	min	typ	max	Unit
Circuit current 1	I_{CC1}	V_{CC1}=9V, V_{CC2}=5V V_{CC3}=6.2V, Sync. input	34.0	44.0	54.0	mA
Circuit current 2	I_{CC2}		56.0	68.0	82.0	mA
Circuit current 3	I_{CC3}		8.0	12.0	16.0	mA
Circuit voltage	V_{17}	I_{17}=12mA	5.8	6.3	6.9	V
Constant voltage operation resistor	R_{17}	V_{CC1}=9V, V_{CC2}=5V I_{17}=12 to 30mA	—	—	30	Ω
Pin㊼ voltage	V_{47-51}	V_{CC1}=9V, V_{CC2}=5V V_{CC3}=6.2V	1.7	2.0	2.3	V
Pin㊷ voltage	V_{52-51}		2.7	3.0	3.3	V
Pin㊳ voltage	(PAL) V_{38-51}	V_{CC1}=9V, V_{CC2}=5V V_{CC3}=6.2V (PAL MODE)	1.9	2.2	2.5	V
Pin㊵ voltage	(PAL) V_{40-51}		1.9	2.2	2.5	V
I²C・DAC						
Sink current at ACK time	V_{ACK}	I_3=2mA	—	—	0.5	V
SCL-SDA signal input LOW level	V_{LOW}		—	—	0.9	V
SCL-SDA signal input HIGH level	V_{HIGH}		4.0	—	—	V
Input signal frequency	fin		—	—	100	$\frac{kbit}{S}$
Y Signal Processing						
Video input terminal voltage	V_{52}	V_{CC1}=9V, V_{CC2}=5V V_{CC3}=6.2V, I_{17}=15mA	2.7	3.0	3.3	V
Pedestal fluctuation due to the drive	Y_{PL-D}	No input, Drive ; min./max. Cutoff ; "18", Bright ; typ.	−400	0	400	mV
RGB output pedestal level	Y_{PL}	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_V	Input 0.4V_{P-P}, Cont ; typ. Sharp ; min., Bright ; typ.	4.7	5.5	6.7	times
Video voltage gain relative ratio (1)	$A_{VB/G}$		0.85	1.0	1.15	times
Video voltage gain relative ratio (2)	$A_{VR/G}$		0.85	1.0	1.15	times
Video frequency characteristics	f_{YC}	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_{P-P} f=3.3MHz, Bright ; "B0" Sharp=typ./min.	4.0	7.0	10.0	dB
Black level fluctuation due to variable picture quality	Y_{PL-S}	Pedestal measurement Sharp=max./min.	−50	—	50	mV
Contrast ratio	$\frac{e_{max.}}{e_{min.}}$	Input sine wave 0.2V_{P-P} f=2MHz, Bright ; "B0" Cont=max./min.	18	21.5	29	dB
RGB output tracking (1)	$e_{OT\,(1)}$	Cont=20→60	7	10	13	dB
RGB output tracking (2)	$e_{OT\,(2)}$	R/B	0.96	1.0	1.04	times
RGB output tracking (3)	$e_{OT\,(3)}$	G/B	0.96	1.0	1.04	times
Brightness variable range	B	Input 0.4V_{P-P} stair step Bright=min.→max. Pedestal level measurement	2.1	2.6	3.1	V
Brightness control sensitivity	B_G	Bright=5F→9F	0.55	0.85	1.15	V
Brightness relative control sensitivity (1)	$B_{R/G}$	Bright=5F→9F R/G	0.85	1.0	1.15	times
Brightness relative control sensitivity (2)	$B_{B/G}$	Bright=5F→9F B/G	0.85	1.0	1.15	times

■ Electrical Characteristics (cont.) (Ta=25±2℃)

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
Black Level Correction						
Correction quantity (amplitude variable) (1)	V_{BL} (b)−(a)	Input signal ; full black (a) Pin㊽ ; RC externally mounted (b) Pin㊽ ; 9V	−100	0	100	mV
Correction quantity (amplitude variable) (2)	V_{BL} (a)−(c)	Input signal ; full black (c) Pin㊽ ; 3V R=220kΩ	0.45	0.75	1.05	V
Correction quantity (amplitude variable) (3)	V_{BL} (b)−(a)	Output amplitude adjusted to 0.6$V_{OP.}$ R=220kΩ	100	300	500	mV
Correction quantity (amplitude variable) (4)	V_{BL} (b)−(a)	Output amplitude adjusted to 1.5$V_{OP.}$ R=220kΩ	−100	0	150	mV
Y signal delay time	τ_D	Input stair step 0.4V_{P-P}	150	220	270	ns
ACL characteristics	ACL	Input stair step Pin㊿=3.0→3.4V	6.5	8.5	10.5	dB/V
ABL characteristics	ABL	Pedestal level variation quantity at Pin㊾=3.0→3.4V	0.9	1.4	1.9	V/V
On-screen Circuit						
Ys threshold	e_{STH}	Pin㉖ switch level	0.45	0.7	0.95	V
External RGB frequency characteristics	e_{fRGB}	Input sine wave 0.2V_{P-P} Y_S=1V f=2MHz to 5MHz	−4	−2	—	dB
External RGB output DC voltage	E_{OEXT}	Input 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-P}f=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-P}f=2MHz G/B	−1	0	1	dB
External RGB relative output signal level (2)	$e_{EXT\ R/B}$	Input sine wave 0.2V_{P-P}f=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℃)

Parameter	Symbol	Condition	min	typ	max	Unit
Color Signal Processing Circuit						
PAL color difference output (B−Y) (1)	e_{01}	Color bar signal burst 150mV_{P-P} Cont, Color ; typ. Bright ; "B0"	2.0	2.6	3.2	V_{P-P}
PAL color difference output (B−Y) (2)	e_{02}	Color bar signal burst 150mV_{P-P} Cont ; typ., Color ; max. Bright ; "E6"	4.1	5.2	6.3	V_{P-P}
PAL color difference output (residual color) (3)	e_{03}	Color bar signal burst 150mV_{P-P} Cont ; max., Color ; min.	—	—	80	mV_{P-P}
PAL ACC characteristics (1)	A_{CC1}	Color bar signal burst 300mV_{P-P} (+6dB)	0.8	1.0	1.2	times
PAL ACC characteristics (2)	A_{CC2}	Color bar signal burst 30mV_{P-P} (−14dB)	0.7	0.9	1.1	times
PAL demodulation output ratio (1)	R/B	Color bar signal burst 150mV_{P-P} 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_{car}	No signal input.Measure 4.43MHz component at each output pin	—	—	90	mV_{P-P}
Contrast slope	Δe_{TPY}	Color bar signal burst 150mV_{P-P} Cont ; 20→60 Color ; typ.	8	10.5	14	dB
NTSC tint center	Tc	Color bar signal burst 150mV_{P-P} Measure phase-shift at tint data of 37	−7	0	+7	deg
NTSC tint variable range	$\Delta\theta_T$	Same as above tint ; min. to max.	70	90	120	deg
PAL color variable range	Δe_{O-COL}	Color bar signal burst 150mV_{P-P} Cont ; typ. Color ; variation quantity at 10→7F	17	20	25	dB
PAL APC pull-in range	f_{PCP}	Burst frequency variable	±450	±500	—	Hz
NTSC APC pull-in range	f_{PCN}		±450	±500	—	Hz
PAL VCO free-run frequency	f_{COP}	No signal A_{CC} ; OFF	−200	0	+200	Hz
NTSC VCO free-run frequency	f_{CON}		−200	0	+200	Hz
PAL f_{CO} supply voltage dependency	Δf_{COP-V}	V_{CC2}=5V±10% variation Variation quantity to V_{CC2}=5V	−120	0	+120	Hz
NTSC f_{CO} supply voltage dependency	Δf_{CON-V}	V_{CC2}=5V±10% variation Variation quantity to V_{CC2}=5V	−120	0	+120	Hz
PAL VCO output level	e_{CW-P}	V_{CC1}=9V, V_{CC2}=5V V_{CC3}=6.2V, Pin㉚ output level when I_{17}=15mA	0.3	0.4	0.5	V_{P-P}
NTSC VCO output level	e_{CW-N}		0.3	0.4	0.5	V_{P-P}
PAL color killer tolerance	e_{KP}	Color bar signal. burst 150mV_{P-P}=0dB Color, Cont ; max.	−30	−36	−41	dB
NTSC color killer tolerance	e_{KN}		−37	−42	−48	dB
Killer residual color	e_{ck}	Input sine wave 150mV_{P-P} f=2MHz.Measure (4.43−2) component of color. Cont ; max.	—	—	30	mV_{P-P}
Color killer detection output voltage (color)	V_{41-C}	Pin㊶ ; measurement burst signal exists	4.5	5.0	5.5	V
Color killer detection output voltage (black and white)	$V_{41-B/W}$	No burst signal	—	0.06	0.5	V
Chroma input terminal voltage	V_{47}	Pin㊼ is opened	1.7	2.0	2.3	V

■ Electrical Characteristics (cont.) (Ta=25±2℃)

Parameter	Symbol	Condition	min	typ	max	Unit
PAL/SECAM change-over voltage	$V_{47-P/S}$	Pin㊼ 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, Pin⑫=0V burst 150mV_{P-P} Color, Cont ; max.	—	200	600	mV_{P-P}
RGB Output Circuit						
Drive adjustment range	A_{VD}	External input 0.2V_{P-P}, 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
Deflection Signal Processing						
Horizontal natural oscillation frequency	f_{HO}	No input Output frequency at Pin⑲	15.45	15.75	16.05	kHz
Horizontal natural oscillation frequency supply voltage dependency	$\frac{\Delta f_{HO}}{V_{CC3}}$	f_{HO} (I17=30mA) f_{HO} (I17=15mA)	−100	0	100	Hz
Horizontal oscillation starting voltage	$V_{fH(S)}$	Where horizontal oscillation output is over 1V_{P-P}, f=10k to 20kHz	—	—	5.2	V
Horizontal oscillation pulse duty ratio	τ_{HO}	I_{17}=15mA, V_{CC1}=9V V_{CC2}=5V, V_{CC3}=6.2V	35.0	38.0	41.0	%
Horizontal pull-in range	f_{H0}	f_{HO}=15.75kHz	±400	—	—	Hz
H pulse output voltage	V_{19}	At V_{CC} ; typ.	2.3	2.8	3.3	V
High voltage detection circuit operation voltage (shut-down)	V_{sth}	I_{20}=50 μA	0.70	0.83	0.95	V
Shut-down leak current	I_{sth}	Measure I_{20}, at Pin⑳=0V	—	—	5.0	μA
AFC1 pin operation voltage	V_{13}	At V_{CC1}=9V, V_{CC2}=5V V_{CC3}=6.2V, I_{17}=15mA	3.8	4.2	4.6	V
Vertical Signal Processing						
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	τ_{VO}	PAL ; f_H=15.625kHz NTSC ; f_H=15.75kHz	9.5	10.0	10.5	1/f_H
PAL vertical pull-in to lerant frequency	f_{PV-P}	f_{V-P}=50Hz	46	50	54	Hz
NTSC vertical pull-in to lerant frequency	f_{PV-N}	f_{V-N}=60Hz	56	60	64	Hz
Vout output voltage	V_9	At V_{CC1}=9V, V_{CC2}=5V V_{CC3}=6.2V, I_{17}=15mA	0	0.2	0.5	V
V pulse shaper output pulse width	τ_{10}		1.4	2.2	3.0	ms
Sandcastle Pulse						
PAL burst gate pulse width	τ_{BGP-P}	Pin⑱ PAL Burst gate pulse width	3.4	4.0	4.6	μs
NTSC burst gate pulse width	τ_{BGP-N}	Pin⑱ NTSC Burst gate pulse width	2.5	3.0	3.5	μs
PAL V-blanking width	τ_{-PVBLK}	Pin⑱ PAL Blanking pulse width (22±1.5) H	1.31	1.41	1.51	ms

■ Electrical Characteristics (cont.) (Ta=25±2℃)

Parameter	Symbol	Condition	min	typ	max	Unit
NTSC V-blanking width	τ_{-NVBLK}	Pin⑱ 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
H Center Circuit						
H center variable range (1)	$\tau_{DH\ (1)}$	H center ; typ.→min. Hsync rise-up and HBLK delay	−2.2	−1.6	−1.3	μs
H center variable range (2)	$\tau_{DH\ (2)}$		1.3	1.6	2.2	μs
Lock Detector Circuit						
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
Service Switch Circuit						
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_{P-P} Pin⑩ (ACL)=0V	—	—	150	mV_{P-P}
Spot Killer						
Spot killer operation	K_{SP}	Measure each output pedestal level, when current 1mA flowed into Pin㉛	6.8	7.5	8.2	V
Other						
Video circuit dynamicrange	Y_D	0.6V_{P-P} (0.492V_{OP}) input Bright ; 7F, Cont ; 7F Cutoff ; 7F	3.8	—	—	V_{OP}

■ Electrical Characteristics (Ta=25±2℃) [Reference Value]

Parameter	Symbol	Condition	min	typ	max	Unit
Y Signal Processing Circuit						
Y signal input	e_Y	Input : Pin㊷ positive polarity	0.6V_{P-P}±3dB			—
Picture quality variable range (2)	$\frac{A_{Smax.}}{A_{Smin.}}$	Input sine wave 0.1V_{P-P} 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_{P-P} 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℃	—	−1.8	—	mV/℃
Contrast fluctuation due to variable picture quality	V_{CA}	Video input steps wave 0.4V_{P-P} Cont ; typ. Sharp ; min./max.	—	—	150	mV_{P-P}
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	ΔV_{BAC}	Sharp ; min. Cont ; min./max.	−20	0	20	mV
Delay line dynamic range	V_{DDR}		—	1.1	—	V_{P-P}

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

■ Electrical Characteristics (cont.) (Ta=25±2℃) [Reference Value]

Parameter	Symbol	Condition	min	typ	max	Unit
Peak clamp input terminal inflow current	I_{IN52}	Inflow current when 5V applied to Pin㊷	—	55	—	μA
Video signal output supply voltage dependency	$\frac{\Delta e_0}{\Delta V}$	Input signal $0.4V_{P-P}$ Stair step Output amplitude variation ratio at $V_{CC}=\pm5\%$	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 Ta=−20 to +70℃	—	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_{FL}	Flat	—	3	—	MHz
Video signal output	E_{OD}	Input $0.4V_{P-P}$ Stair step Cont ; max.	—	4	—	V_{P-P}
Supply-voltage-dependency of video-output-DC-difference-voltage	$\frac{\Delta E_O}{\Delta V}$	$V_{CC1}=9V\pm10\%$ $V_{CC2}=5V$	−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	—	—	±35	mV
Y noise level	Y_{NL}	No input 1 to 4MHz component	—	—	50	mV
Y S/N	$Y_{S/N}$	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 $150mV_{P-P}$ Cont, Color ; max.	3.8	4.7	5.4	V_{OP}
Color difference output supply voltage dependency of	Δe_0-V_{CC}	Variation width to $V_{CC1}=9V$, $V_{CC2}=5V\pm10\%$	—	—	1.3	V_{P-P}/V
Color difference output ambient temperature dependency	Δe_{o-T}	Ta=−20 to +70℃ Ta=25℃ as center	—	18	—	%
Demodulation output IH change-over DC step voltage	ΔE_{PAL}		—	0	40	mV
f_0 ambient temperature dependency PAL	Δf_{cop-T}	Ta=−20 to +70℃ Color signal no input	—	−2	—	Hz/℃
VCO control sensitivity PAL	β_P		—	3.3	—	Hz/mV
APC phase detection sensitivity PAL	μP	Killer ; OFF	—	30	—	$\frac{mV}{deg}$
Phase hold characteristics PAL	$\Delta\Phi_P$	$\frac{1}{\mu\times\beta}\times100$	—	1.33	—	$\frac{deg}{100Hz}$
f_0 ambient temperature dependency NTSC	Δf_{CON-T}	Ta=−20 to +70℃ Color signal no input	—	−2	—	Hz/℃
VCO control sensitivity NTSC	β_N	Burst Gate ; OFF	—	2.3	—	Hz/mV
APC phase detection sensitivity NTSC	μ_N	Killer ; OFF	—	30	—	$\frac{mV}{deg}$
Phase hold characteristics NTSC	$\Delta\Phi_N$	$\frac{1}{\mu\cdot\beta}\times100$	—	1.45	—	$\frac{deg}{100Hz}$
Carrier filter frequency characteristics	e_{cf}	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.

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■ Electrical Characteristics (cont.) (Ta=25±2℃) [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.→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	Δe_{OPAL}		—	—	50	mV
Demodulation output frequency characteristics	f_{C-Y}		—	1.1	—	MHz
Color difference contrast ratio	Δe_{OC}	Color bar signal burst 150 mV_{P-P} Cont ; min.→max. Color ; typ.	20	26	33	dB
NTSC tint control sensitivity	θ_T	Color bar signal burst 150 mV_{P-P} Tint ; phase shift quantity at 20→60	30	40	50	deg
Deflection Processing Circuit						
Separable sync. signal input	Vin	APL ; 50%	1.0	2.0	2.8	V_{P-P}
f_{HO} ambient temperature dependency	$\frac{\Delta f_{HO}}{Ta}$	Ta=−20 to +70℃	—	5.5	—	Hz/℃
Phase detection sensitivity	μ	V_{CC1}=9V, V_{CC2}=5V	—	31	—	μA/μs
Horizontal oscillation frequency control sensitivity	β		—	−1.6	—	Hz/mV
Vertical free-run oscillation frequency supply voltage dependency	Δf_{vo}	V_{CC1}=9V, V_{CC3}=6.2V I_{17}=15 mA V_{CC2}=4.5 to 5.5V	−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
RGB Back						
RGB Back output level	E_{RGB-B}	No input DC fluctuation when RGB back is operating	2.3	2.75	3.2	V
Sandcastle Pulse						
Burst gate pulse position	P_{BGP}	From horizontal sync. signal rear, edge to burst gate pulse front edge	—	0.1	—	μs
H Center Circuit						
FBP delay time tolerance range	T_{H-FBP}	Range in which screen center position fluctuates more than ±1.3 μs, when delay time varied from Hout rise-up to FBP center	12	—	19	μs
FBP slice level (AFC2)	V_{FBP-2}	FBP input level at which AFC2 operates	1.5	2.0	3.0	V
DAC • IIC						
4 bit DAC DNLE	L_1	1 LSB = {DATA (max.) −DATA (min.)} /15	0.5	1	1.5	$\frac{LSB}{STEP}$
7 bit DAC DNLE	L_2	1 LSB = {DATA (max.) −DATA (min.)} /127	0.1	1	1.9	$\frac{LSB}{STEP}$
8 bit DAC DNLE (40, 80, CO excepted)	L_{3-1}	1 LSB = {DATA (max.) −DATA (min.)} /255	0.1	1	1.9	$\frac{LSB}{STEP}$
8 bit DAC DNLE (40, 80, CO only)	L_{3-2}	1 LSB = {DATA (max.) −DATA (min.)} /255	−2	1	4	$\frac{LSB}{STEP}$

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

■ Electrical Characteristics (cont.) (Ta=25±2℃) [Reference Value]

Parameter	Symbol	Condition	min	typ	max	Unit
t_{BUF}	—		4.0	—	—	μs
$t_{SU \cdot STA}$	—		4.0	—	—	μs
$t_{HD \cdot STA}$	—		4.0	—	—	μs
t_{HI}	—		4.0	—	—	μs
t_{LO}	—		4.0	—	—	μs
t_R	—		—	—	1.0	μs
t_F	—		—	—	0.35	μs
$t_{SU \cdot DAT}$	—		0.25	—	—	μs
$t_{HD \cdot DAT}$	—		0	—	—	μs
$t_{SU \cdot STO}$	—		4.0	—	—	μs

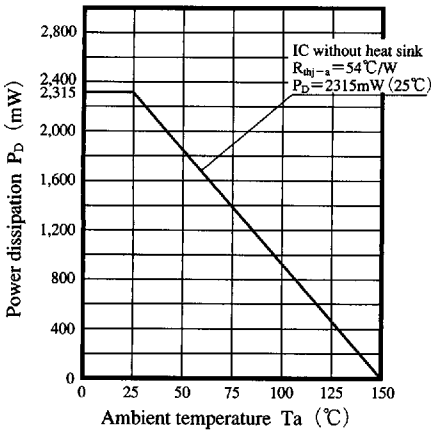
Note) The characteristics value in parentheses is not a guaranteed value, but reference one on design.

■ Pin Descriptions

Pin No.	Pin name	Pin No.	Pin name
1	I^2C 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 ($32f_H$) 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_S input	52	Video signal input

■ Characteristics Chart

Power dissipation of package
$P_D - Ta$



■ Operational Descriptions

• I²C Bus protocol (1)

I²C−BUS Format

(1) Slave address : 1000101 (0)

(2) Slave address format :

S	SLAVE ADDR	0	A	SUB ADDR	A	DATA BYTE	A	P

↑ Start condition ↑ Write ↑ Acknowledge bit ↑ Stop condition

(3) Subaddress byte and data byte format :

Sub-addr' (HI)	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

■ Operational Descriptions (cont.)

• I²C Bus Protocol (2)

Data byte Condition at Sub-addr. (OB_H)

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

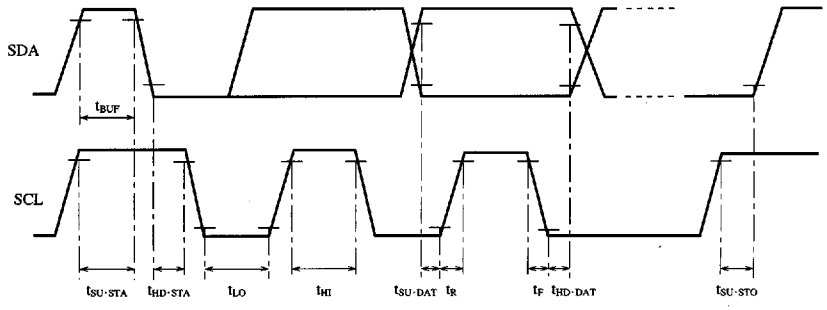
※Auto increment function

Start condition	Slave address	Sub-address	Data 1	Data 2	Data 3	Stop condition

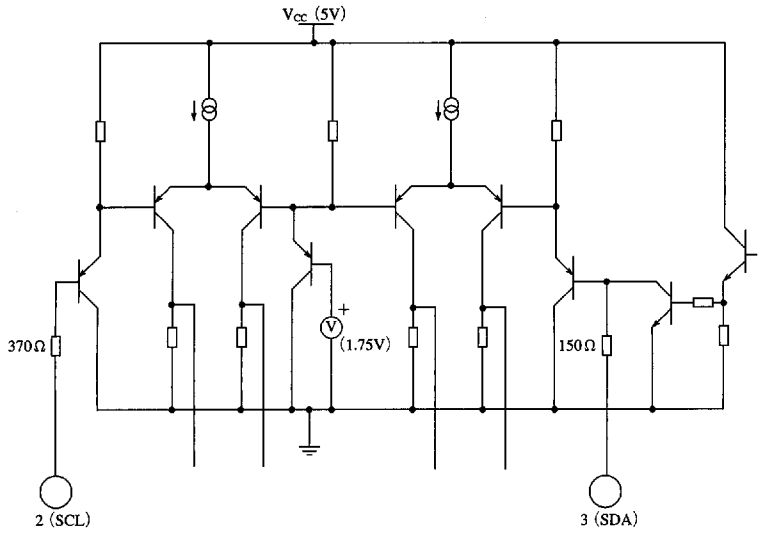
When data is input as shown above, more than one DAC can be controlled. For example, the data-1 is sent to the specified sub- address DAC, data-2 is sent to the 1-increment-sub-address DAC, and the data-3 is sent to the 2-increment- sub-address DAC and so on.

■ Operational Descriptions (cont.)

• I²C Bus input signal timing



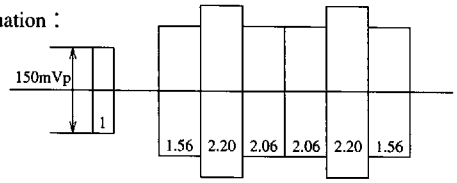
• I²C Bus input circuit of AN5607NK



■ 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 AN5670NK 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) Color bar signal

(1) B−Y Axis

· Color difference output by color bar signal

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

· Color difference output by offset color bar signal

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

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

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

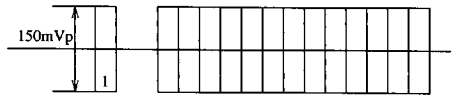
(θ_B : 13°, a : , a : Signal level of offset color bar, C_B : Signal level of color bar)

(2) R−Y Axis

· In the same way as (1)

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

(θ_R : 103°−∠R−Y)



(2) Offset color bar signal

(3) G−Y Axis

· In the same way as (1)

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

(θ_G : 241°−∠G−Y)