



LA7685J

PAL/NTSC Single-chip Color Television Signal Processing Circuit

Overview

The LA7685J is a single-chip IC (with VIF, SIF, video, chroma, and deflection circuits built in) for use in PAL or NTSC television sets.

Because the PLL+ splitting method is used in the VIF circuit, the LA7685J is suited for use in top-of-the-line small and mid-size television sets. In addition, when used in combination with the LA7640N SECAM chroma IC, the LA7685J can be used in a PAL/NTSC/SECAM multisystem set.

Features

[VIF Block]

- PLL+ splitting (for excellent image and sound quality)
- High-gain VIF amplifier
- High-speed AGC
- APC time constant switch built in

[SIF Block]

- Simultaneous audio IN/OUT
- Video/audio simultaneous muting, or audio only muting also possible
- 1st amplifier with AGC function

[AV Switching Block]

- INT/EXT AV switch

Delay line	Video EXT, audio EXT	Switch conditions
OFF	IN	D
OFF	EXT	C
ON	EXT	B
ON	IN	A

[OSD Block]

- Three RGB inputs
- RGB linear amplifier (−6 dB input: 2 V to 5 V)
- First blanking (also used for B input)

[Chroma Block]

- ACC filter, carrier filter built in
- Ident detection output
- Killer detection output

[Video Block]

- Black extension
- DC restoration
- Delay line built in
- Wide band: 9 MHz (with delay line shorted)
- Built-in double differential circuits that also enable soft tone
- Supports S input (for VCRs)
- DC transmission amount can be varied (externally adjustable)

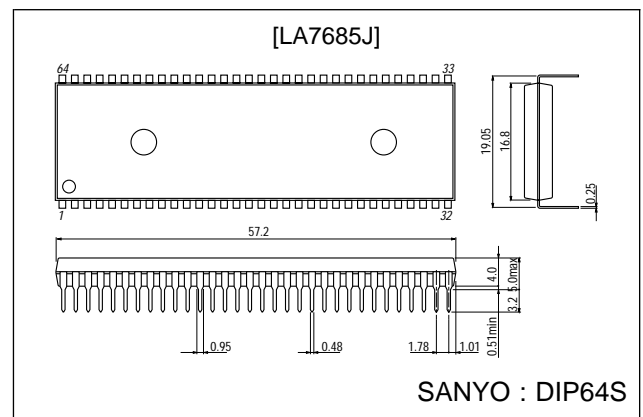
[Deflection Block]

- Adjustment-free horizontal and vertical sync
- Excellent anti-noise characteristics due to adoption of duplex AFC
- Vertical sync sensitivity can be adjusted externally
- Constant vertical size with no signal (constant for 60/50 Hz)
- Highly stable image during copy guard tape playback (macrovision tapes, etc.)
- Excellent stability against VCR skew distortion

Package Dimensions

unit : mm

3071-DIP64S



■ Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.

■ SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

SANYO Electric Co.,Ltd. Semiconductor Company

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

63095HA(II) No.5153-1/10

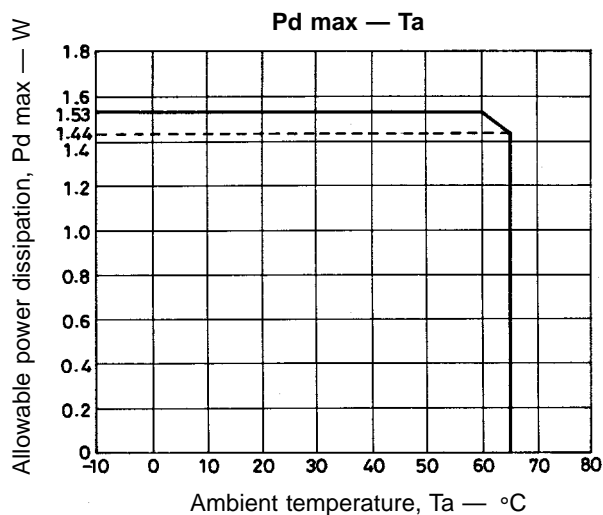
Specifications

Maximum Ratings at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V ₂ max		11	V
	V ₁₂ max		11	V
Maximum supply current	I ₃₂ max		16	mA
Allowable power dissipation	Pd max	Ta ≤ 60 °C	1.53	W
Operating temperature	T _{opr}		-10 to +65	°C
Storage temperature	T _{stg}		-55 to +150	°C
Circuit current	I ₅₆		-6	mA
	I ₆		-3	mA
FBP input current	I ₃₃ max	Peak current	5	mA
	I ₂₇ max	Peak current	10	mA

Operating Conditions at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V ₂		9	V
	V ₁₂		9	V
Recommended supply current	I ₃₂		13	mA
Operating supply voltage range	V _{20p}		8 to 9.5	V
	V _{120p}		8 to 9.5	V
Operating supply current range	I _{320p}		10 to 16	mA



LA7685J

Electrical Characteristics at $T_a = 25\text{ }^\circ\text{C}$, $V_{CC} = V_2 = V_{12} = 9\text{ V}$, $I_{CC} = I_{32} = 13\text{ mA}$

Parameter	Symbol	Conditions	min	typ	max	Unit
[Circuit Voltage, Current]						
Horizontal supply voltage	V_{32}	$V_{CC} = 9\text{ V}$, $I_{CC} = 13\text{ mA}$	7.1	7.6	8.1	V
Supply current	$I_2 + I_{12}$	$V_{CC} = 9\text{ V}$, $I_{CC} = 13\text{ mA}$, $I_{FAGC} = 4\text{ V}$	102	120	138	mA
[VIF Block] $f_p = 38.9\text{ MHz}$						
Video output voltage with no signal	V_{56}	No signal	4.3	4.7	5.1	V
AFT output voltage with no signal	V_{60}	No signal	3.0	4.5	6.0	V
Maximum RF AGC voltage	V_{5H}	CW = 85 dB μ , RF AGC VR = min	7.6	8.0	8.3	V
Minimum RF AGC voltage	V_{5L}	CW = 85 dB μ , RF AGC VR = max	0	0.01	0.3	V
Input sensitivity	V_i	Video output is 0.8 Vp-p (40 % MOD), VIF input level	33	39	45	dB μ
AGC range	GR	Maximum input ($V_0 = 0.8\text{ Vp-p}$) – Input sensitivity	54	62		dB
Maximum allowable input	$V_i\text{ max}$	Video output is +1 dB. VIF input level	97	104		dB μ
Video output amplitude	V_{O56}	$V_i = 80\text{ dB}\mu$, AM = 78 % MOD	1.7	2.0	2.3	Vp-p
Differential gain	DG	$V_i = 80\text{ dB}\mu$, 87.5 %, VIDEO MOD		3.0	10	%
Differential phase	DP	$V_i = 80\text{ dB}\mu$, 87.5 %, VIDEO MOD		1.0	10	deg
Video S/N	S/N	$V_i = 80\text{ dB}\mu$, $20 \log \frac{1.46 (Vp-p)}{\text{Noise } (V_{rms})}$	47	54		dB
Sync signal tip level	$V_{56\text{ TIP}}$	CW = 80 dB μ	2.1	2.4	2.7	V
Frequency characteristics	f_C	Frequency when video output is –3 dB	6.5	8.0		MHz
1.07 kHz beat level	$I_{1.07}$	V4.43 MHz/V1.07 MHz, $V_i = 80\text{ dB}\mu$	35	50		dB
Maximum AFT output voltage	V_{60H}	CW = 80 dB μ , frequency change	7.6	8.0	8.4	V
Minimum AFT output voltage	V_{60L}	CW = 80 dB μ , frequency change	0.6	1.0	1.4	V
AFT detection sensitivity	Sf	CW = 80 dB μ , frequency change	50	80	110	mV/kHz
AFT defeat start voltage	$V_{AFT\ SW}$	Measure with sweep signal	0.5	1.0		V
Black noise threshold level	V_{BTH}	Measure with sweep signal	1.1	1.4	1.7	V
APC pull-in range (U)	f_{PU}	CW = 80 dB μ , $f_p = 34\text{ MHz}$ to 44 MHz	0.8	1.7		MHz
APC pull-in range (L)	f_{PL}	CW = 80 dB μ , $f_p = 53\text{ MHz}$ to 64 MHz		–2	–1	MHz
VCO maximum variable range	Δf_U	No signal	0.9	1.7		MHz
	Δf_L	No signal		–2	–1	MHz
VCO control sensitivity	β	No signal	1.3	2.5	5.3	kHz/mV
[AVSW Block]						
Image output DC voltage	V_{50}	No signal	3.0	3.4	3.8	V
Internal image input voltage	V_{54}	No signal	4.4	4.8	5.2	V
External image input voltage	V_{52}	No signal	4.4	4.8	5.2	V
External audio input voltage	V_4	No signal	5.2	5.6	6.0	V
[1st SIF Block]						
5.5 MHz conversion gain	VG	$V_i = 70\text{ dB}\mu$, 33.4 MHz	21	26	31	dB
Output level	V_{59}	$V_i = 10\text{ mV}$, 33.4 MHz	210	320	480	mVp-p
Maximum input level	$V_{11\text{ max}}$	$f_S = 33.4\text{ MHz}$	96	101		dB μ
[SIF ATT Block] $f_S = 5.5\text{ MHz}$						
SIF limiting voltage	$V_i\text{ lim}$	SIF input when detection output is –3 dB.		40	47	dB μ
FM detection output voltage	V_{O1}	$V_i = 100\text{ dB}\mu$, $\Delta f = \pm 30\text{ kHz}$	390	500	630	mVrms
FM detection output distortion	THD	$V_i = 100\text{ dB}\mu$, $\Delta f = \pm 30\text{ kHz}$		0.4	1.0	%
AM rejection ratio	AMR	$V_i = 100\text{ dB}\mu$, $\frac{FM : \Delta f = \pm 30\text{ kHz}}{AM : 30\%}$	40	60		dB
ATT voltage gain	G_{AF}	$V_i = 1\text{ Vrms}$, $f = 400\text{ Hz}$	–1	0	1	dB
Maximum attenuation of electronic volume control	ATT	$V_i = 2\text{ Vrms}$, $f = 400\text{ Hz}$	70	80		dB
[Video Block]						
Black extension threshold	BS_{TH}	APL variable, input 0.5 Vp-p	40	50	60	IRE
Maximum black extension gain	BS_{max}	APL variable, input 0.5 Vp-p	–30	–22	–13	IRE
Soft video tone variable range	ΔSoft	$f = 2\text{ MHz}$, 100 mVp-p Video tone $V_R : 4\text{ V} \rightarrow 0\text{ V}$	–6	–4	–2	dB

Continued on next page.

LA7685J

Continued from preceding page.

Parameter	Symbol	Conditions	min	typ	max	Unit
Sharp video tone variable range	Δ Sharp	f = 2 MHz, 100 mVp-p, video tone V_R : 4 V \rightarrow 9 V, contrast V_R : 6 V	7	10	13	dB
Video voltage gain AC switch 9 V	GV_{9V}	f = 100 kHz, 100 mVp-p, contrast V_R : 9 V, video tone V_R : 4 V	15	18	21	dB
Video voltage gain AV switch 0 V	GV_{0V}	f = 100 kHz, 100 mVp-p, contrast V_R : 0 V, video tone V_R : 4 V	15	18	21	dB
Contrast control center	C_{CEN}	f = 100 kHz, 100 mVp-p, contrast V_R : 6 V	0.35	0.44	0.53	Vp-p
Contrast control variable range	ΔC_V	Contrast V_R : 3 V \rightarrow 9 V	22	24	26	dB
Bright control	BR_H	Bright V_R : 2.0 V	5.5	6.5	7.5	V
	BR_{CEN}	Bright V_R : 5.25 V	2.3	2.8	3.3	V
	BR_L	Bright V_R : 7.5 V		0.5	1.5	V
Frequency characteristics D.L.ON	f_{V0V}	Contrast V_R : 6 V, video tone V_R : 4 V, 3 dB down	4.5	6		MHz
DC transmission amount	R_{DC}	Input : STAIR STEP signal, 200 mVp-p	88	93		%
Delay line delay amount (one level)	T_{DL1}	Input : WHITE 100 %	300	350	400	ns
Delay line delay amount (two levels)	T_{DL2}	Input : WHITE 100 %	370	420	470	ns
[Chroma Block PAL/NTSC Common]						
Color control color residue	E_{Cmin}	Color V_R : 0 V, contrast V_R : 9 V			30	mVp-p
Color contrast variable range	ΔC_C	Color V_R : B-Y = 2.5 Vp-p, contrast V_R : 3 V \rightarrow 9 V	18.5	20	21.5	dB
Demodulation output DC voltage	V_{C-Y}	Burst signal only, color V_R : 0 V	4.8	5.3	5.8	V
Demodulation output DC difference voltage	ΔV_{C-Y}	Burst signal only, color V_R : 0 V	-300	0	+300	mV
Demodulation output carrier leakage	E_{car}	No signal, killer off, color V_R : 0 V			0.03	Vp-p
APC pull-in range	ΔF_{APC}		± 500			Hz
Kill output	V_{KiOUT}				0.35	V
[Chroma Block PAL]						
Color control center	E_{CCEN}	Color V_R : 4.5 V, contrast V_R : 6 V	1.5	2.0	2.5	Vp-p
ACC amplitude characteristics	ACC_{M1P}	+6 dB	-3	0	+3	dB
	ACC_{M2P}	-20 dB	-5	-1	+1	dB
Demodulation output ratio	B/Rp		1.10	1.35	1.60	
	G/Rp	B-Y no signal	-0.56	-0.51	-0.46	
	G/Bp	R-Y no signal	-0.21	-0.19	-0.17	
Demodulation angle	RBp		85	90	95	deg
Maximum chroma output	E_{ch}	Color V_R : 9 V, contrast V_R : 9 V	1.5	2.0	2.5	Vp-p
Maximum demodulation output	E_{Cmax}	Color V_R : 9 V, contrast V_R : 9 V	3.6	4.2		Vp-p
Killer operating point	E_{KONP}		-37	-33	-29	dB
PAL output					0.3	V
[Chroma Block NTSC]						
Color control center	E_{CEN}	Color V_R : 4.5 V, contrast V_R : 6 V	1.4	1.9	2.4	Vp-p
ACC amplitude characteristics	ACC_{M1N}	+6 dB	-3	0	+3	dB
	ACC_{M2N}	-20 dB	-3	0	+3	dB
ACC phase characteristics	ACC_{P1N}	+6 dB	-3	0	+3	deg
	ACC_{P2N}	-20 dB	-7	0	+7	deg
Tint center	T_{CEN}	Tint V_R = 4.5 V, color V_R : 4.5 V, contrast V_R : 6 V	-12	0	+12	deg
Tint variable range	ΔT	Tint V_R : 0 V \leftarrow 4.5 V \rightarrow 9 V, color V_R : 4.5 V, contrast V_R : 6 V	± 35			deg
Demodulation output ratio	R/B_N		0.82	0.91	0.99	
	G/B_N		0.18	0.25	0.32	
Demodulation angle	RB_N		99	105	111	deg
	GB_N		-130	-120	-110	deg
Maximum demodulation output	E_{CmaxN}	Color V_R : 9 V, contrast V_R : 9 V	3.5	4.1		Vp-p
Kill operation point	E_{KONN}		-39	-35	-31	dB
NTSC/SECAM output	E_{KONN}		1.4	1.9	2.4	V

Continued on next page.

LA7685J

Continued from preceding page.

Parameter	Symbol	Conditions	min	typ	max	Unit
[Deflection Block]						
Sync separation input voltage	$V_{S\ DC}$		6.0	6.3	6.6	V
Vertical free-running frequency	$T_{V\ free50}$		312.0	312.5	313.0	H
	$T_{V\ free60}$		262.0	262.5	263.0	H
Vertical sync maximum period	$T_{V\ max50}$	Horizontal sync signal only	356.5	357	357.5	H
	$T_{V\ max60}$	Horizontal sync signal only	296.5	297	297.5	H
Vertical sync minimum period	$T_{V\ min50}$		268.5	269	269.5	H
	$T_{V\ min60}$		224.5	225	225.5	H
Vertical blanking pulse peak value	$V_{H\ VBL}$		7.0	7.5		V
Vertical blanking pulse width	$P_{W\ BLK50}$		21.0	21.5	22.0	H
	$P_{W\ BLK60}$		17.0	17.5	18.0	H
Vertical output pulse width	$P_{W\ VOUT}$		8.0	8.5	9.0	H
Vertical output voltage	$V_{OUT\ H}$		5.7	6	6.3	V
	$V_{OUT\ M}$		4.3	4.6	4.9	V
	$V_{OUT\ L}$				0.3	V
Vertical external trigger load resistance	R_{TR}		2.5	3.6		k Ω
Vertical automatic sync stop voltage	V_{SAS}		1.2	1.4	1.6	V
Vertical output pulse start V_{CC} voltage	S_{VV}				4	V
Horizontal free-running frequency deviation	Δf_H	Deviation from 15.680 kHz	-100	0	+100	Hz
Dependence of horizontal free-running frequency on V_{CC}	Δf_{HVCC}	$V_{25} = 6.5\ V$, reference value		2		Hz
Horizontal pull-in range	f_{HPULL}	Deviation from 15.680 kHz	± 450			Hz
Horizontal output pulse start V_{CC} voltage	S_{HV}			4.8	5.5	V
AFC II FBP peak value	FBP_H		4.1	4.6	5.1	V
VCR switch input voltage	V_{CR}			0.7	0.9	V
Horizontal output pulse width	$P_{W\ HOUT}$		21.8	23.8	25.8	μs
Horizontal output pulse phase	H_{PF}		12			μs
	H_{PCEN}		3.4	4.4	5.4	μs
	H_{PR}				0	μs
Burst gate pulse width	$P_{W\ BGP}$		2.7	3.7	4.7	μs
Burst gate pulse phase	$T_{d\ BGP}$		0.2	0.6	1.2	μs
Horizontal sync detection threshold level	H_{coin}		4.2	4.5	4.8	V
50/60 output voltage	V_{50}			0.5	0.7	V
	V_{60}		4.0	4.7		V
50/60 input voltage	V_{in50}				0.5	V
	V_{in60}		7.2			V
X ray protection circuit operation input voltage	V_{HD}		0.64	0.74	0.84	V
Sandcastle H.BLK peak value	$V_H\ SHBL$		3.7	4.0	4.3	V
Sandcastle BGP peak value	$V_H\ SBGP$		7.7	8.0	8.3	V
Sandcastle BP peak value	$V_H\ SBP$		5.7	6.0	6.3	V
Sandcastle BGP width	$P_W\ SBGP$		1.4	1.9	2.4	μs
Sandcastle BGP phase	$T_{d\ SBGP}$		1.7	2.2	2.7	μs
Sandcastle field ID width	$P_W\ SFID$		11.5	12	12.5	H
Sandcastle H.BLK width 50	$P_W\ SHBL50$		11.0	12.0	13.0	μs
Sandcastle H.BLK width 60	$P_W\ SHBL60$		10.0	11.0	12.0	μs

Continued on next page.

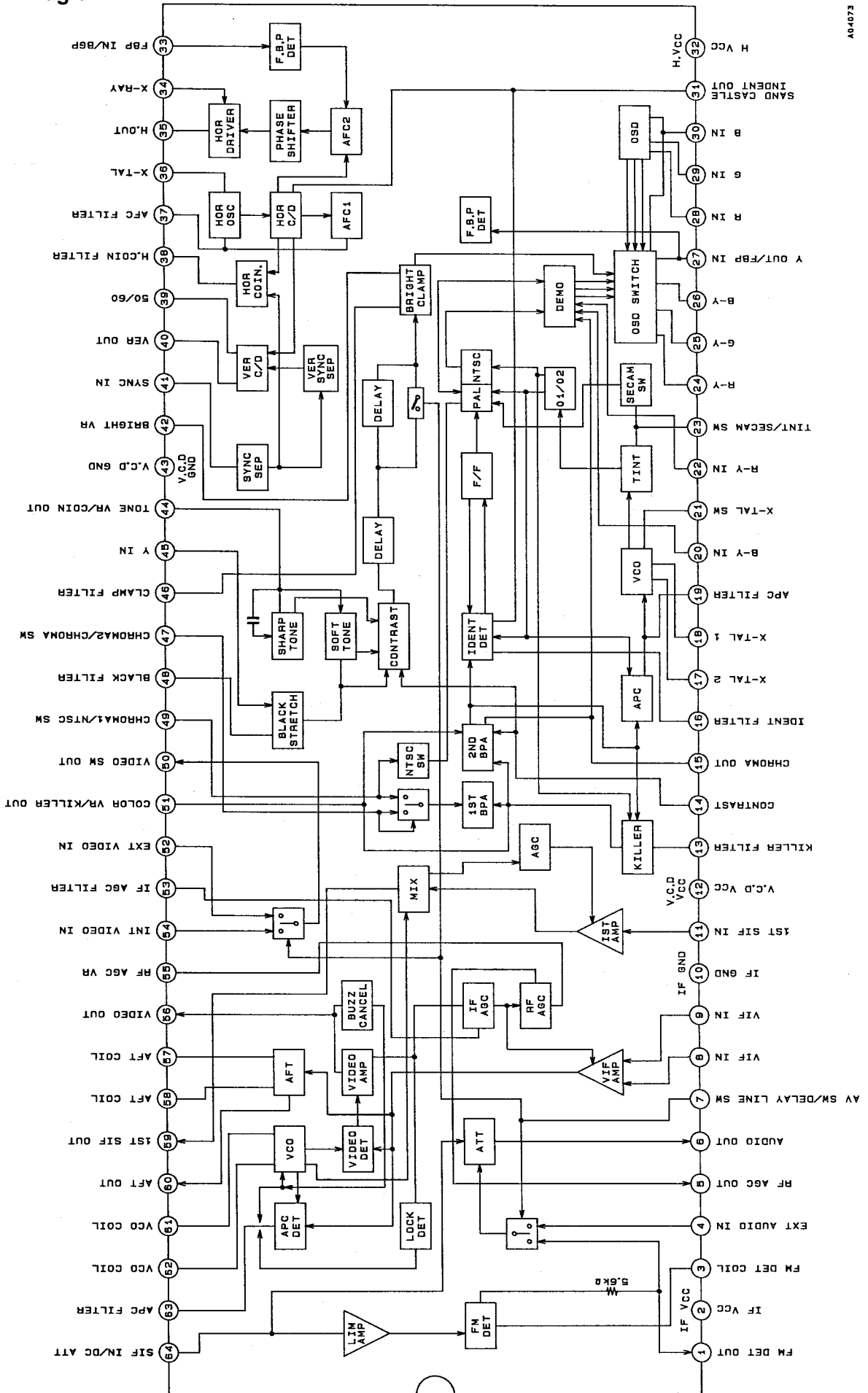
LA7685J

Continued from preceding page.

Parameter	Symbol	Conditions	min	typ	max	Unit
[OSD Block]						
Blanking pulse threshold level	TH _{BL}	C-IN : color bar, B-IN : variable	0.6	0.9	1.2	V
-Y OUT DC voltage (OSD mode)	V _Y	B-IN : 1.5 V	2.4	2.7	3.0	V
R.G.B. -IN threshold level	TH _R	R-IN : variable, B-IN : 1.5 V	1.4	1.7	2.0	V
	TH _G	G-IN : variable, B-IN : 1.5 V				
	TH _B	B-IN : variable				
R.G.B. -Y OUT DC voltage (3 V)	V _{R3V}	R, G, B-IN : 3 V	5.2	5.5	5.8	V
	V _{G3V}					
	V _{B3V}					
R.G.B. -Y OUT DC voltage (4 V)	V _{R4V}	R, G, B-IN : 4 V	5.8	6.1	6.4	V
	V _{G4V}					
	V _{B4V}					
R.G.B. -Y OUT DC voltage (5 V)	V _{R5V}	R, G, B-IN : 5 V	6.3	6.6	6.9	V
	V _{G5V}					
	V _{B5V}					

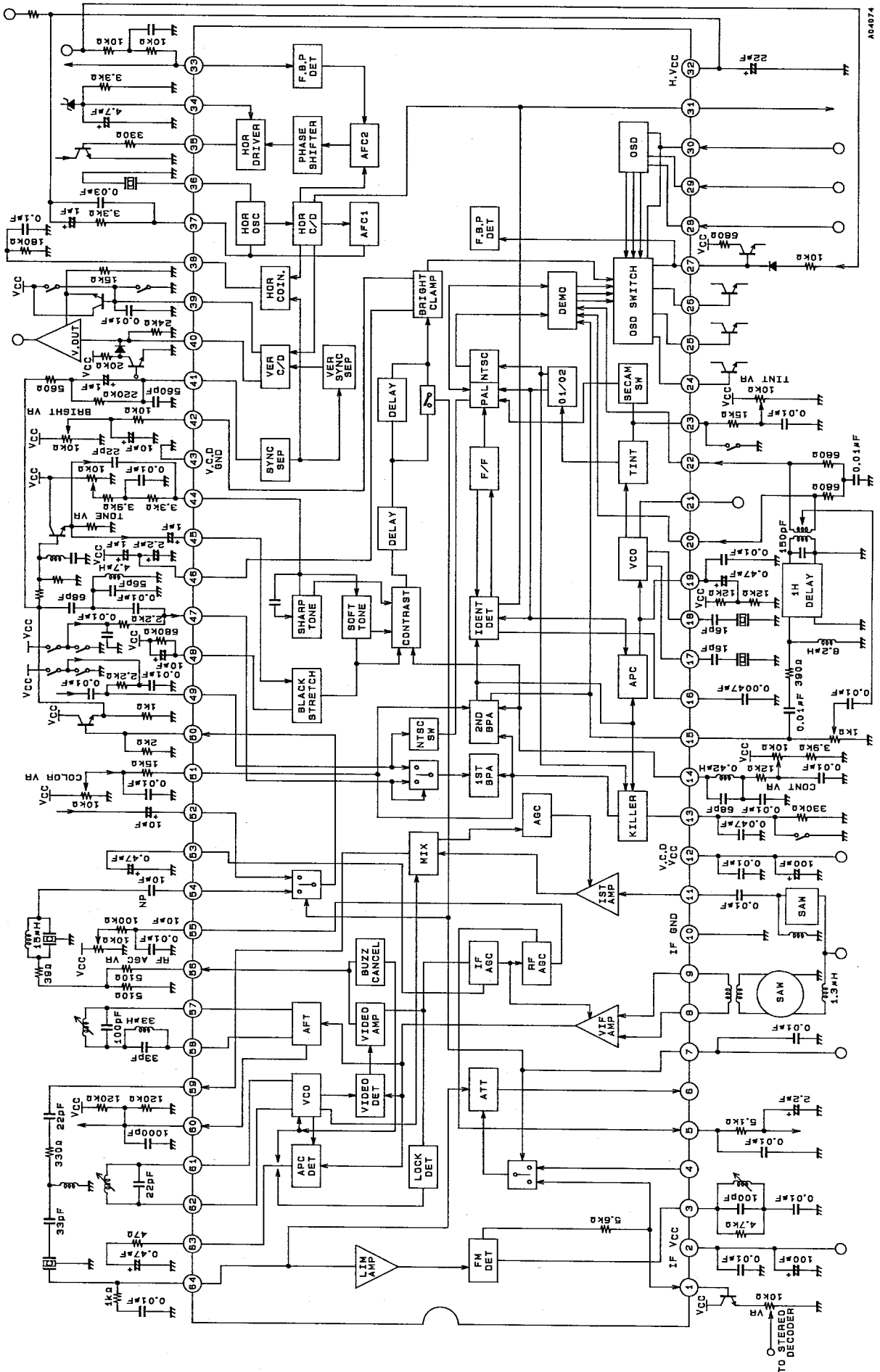
LA7685J

Block Diagram



AG-073

Sample Application Circuit

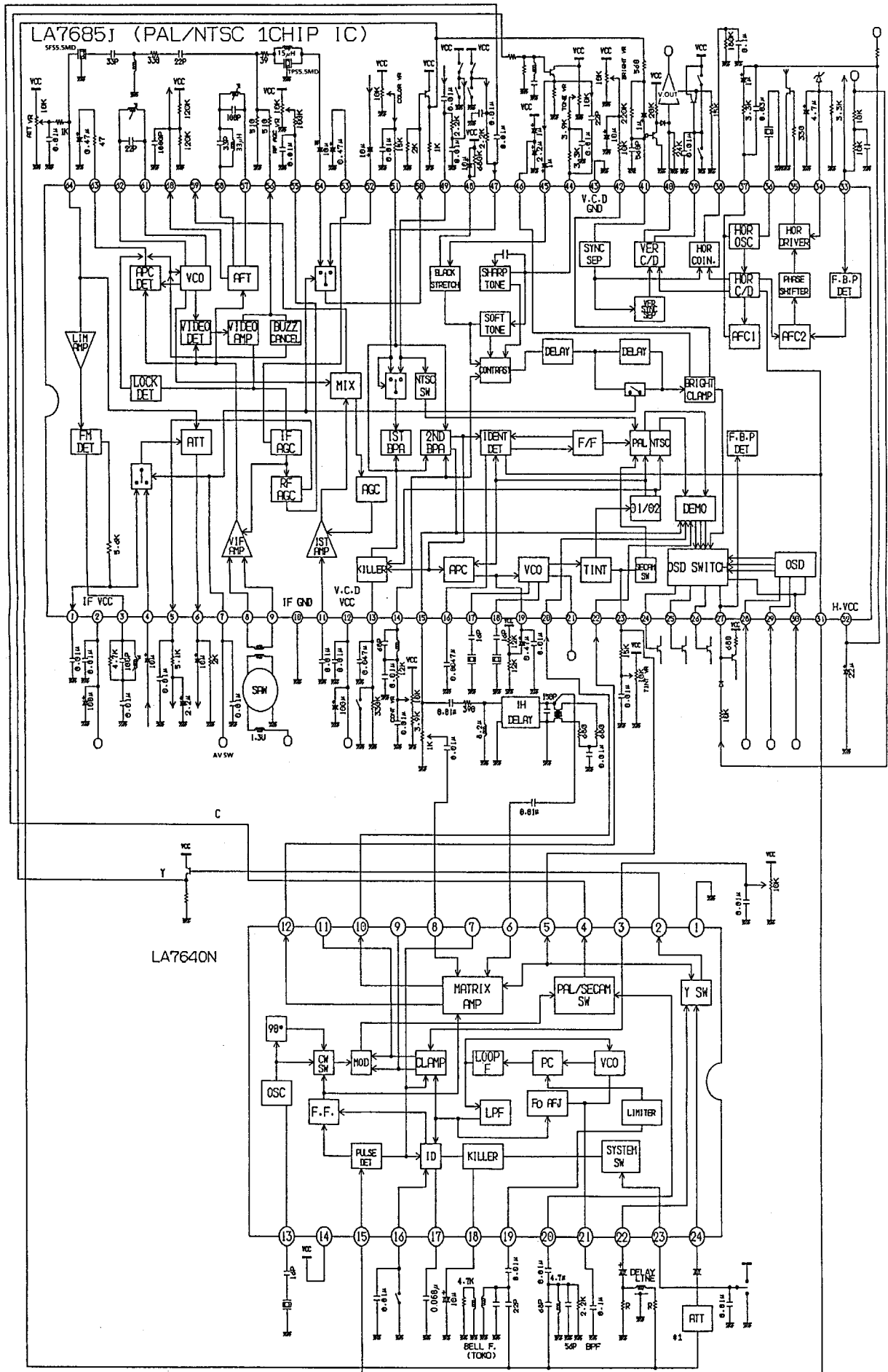


AG-4074

LA7685J

LA7685J and LA7640N Connection Diagram (Reference)

Unit (resistance: Ω, capacitance: F)



- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of June, 1995. Specifications and information herein are subject to change without notice.