



LA7680, 7681

Single-Chip Signal Processor for Color TV Use

Overview

The LA7680 and LA7681 signal processors provide all the components required to decode PAL or NTSC Color television signals. On-chip circuits include VIF, SIF, a video processor, a chroma demodulator, and deflection drivers. The self-adjusting signal processors support vertical field scanning rates of both 50 and 60Hz, allowing the LA7837 and LA7838 vertical output drivers to maintain a constant picture height.

The LA7681 replaces the LA7680's G-Y output at pin 22 with a color contrast signal for input to a SECAM chroma demodulator. This contrast signal is fixed at the maximum.

The LA7680/7681 is available in 48-pin shrink DIPs.

Features

- Minimized external components.
- 48-pin shrink DIP.

VIF/SIF

- High-gain VIF amplifier.
- Fast-response automatic gain control (AGC).
- No delay between audio input and output.
- Muting for both audio and video signals or for audio alone.

Video processor

- On-chip two-dimensional differential circuit.
- Variable current transfer.
- 7MHz bandwidth.

Chroma demodulator

- PAL and NTSC system compatible.
- Optimized demodulation angles and ratios.
- High performance burst cleaning filter and ACC/killer detector.
- On-chip tint circuit (NTSC only).

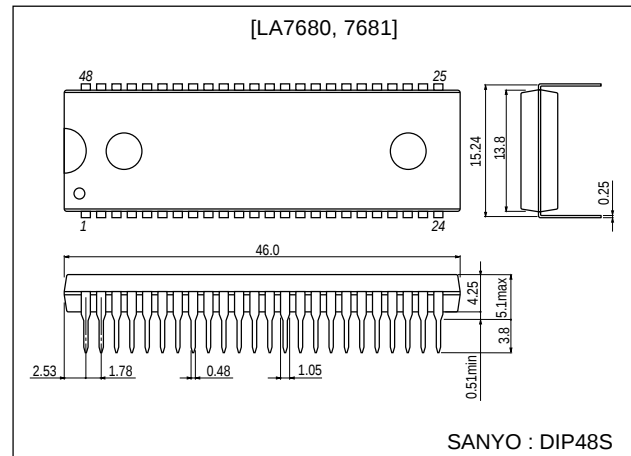
Deflection drivers

- Adjustment-free vertical or horizontal synchronization.
- Two-stage automatic frequency control.
- Adjustable separation sensitivity for vertical synchronization.
- Fixed picture height for both PAL and NTSC.
- Fixed picture height.

Package Dimensions

unit:mm

3149-DIP48S



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30801TN (KT)/32593TS/6290TA KI 8-6402, 6403 No.3343-1/10

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	V ₁₃ max		12	V
	V ₁₁ max		12	V
Input current	I ₂₅ max		16	mA
Allowable power dissipation	Pd max	Ta≤65°C	1.35	W
FBP input current	I ₂₆ max		5	mA
	I ₂₄ max		10	mA
FBP input voltage	V ₂₆ min		-5	V
Operating temperature	Topr		-10 to +65	°C
Storage temperature	Tstg		-55 to +150	°C

Recommended Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V ₁₃		9	V
	V ₁₁		9	V
Supply current	I ₂₅		13	mA
Operating voltage range	V ₁₃ op		8 to 10	V
	V ₁₁ op		8 to 10	V
Operating current range	I ₂₅ op		10 to 16	mA

Operating Characteristics at Ta = 25°C, V_{CC}=V₁₃=V₁₁=9V, I_{CC}=I₂₅=13mA

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Supply characteristics]						
Horizontal supply voltage	V ₂₅		7.0	7.5	8.0	V
Supply current	I ₁₁₊₁₃		90	110	140	mA
[VIF characteristics] fp=38.9MHz						
Video output voltage	V ₄₂	With no inputs	4.2	4.6	5.0	V
AFT output voltage	V ₄₄	With no inputs	2.8	4.2	5.7	V
Maximum RF AGC voltage	V _{46H}	CW=85dBμ, RF AGC, VR=min	7.6	8.0	8.3	V
Minimum RF AGC voltage	V _{46L}	CW=85dBμ, RF AGC, VR=max	0	0.01	0.3	V
Input sensitivity	V _i	VIF input level generating 0.8Vp-p video output with 40% modulation	30	36	42	dBμ
AGC range	GR	Maximum input (Vo=0.8Vp-p), less input sensitivity	60	68		dB
Maximum input	V _i max	VIF input level generating +1dB video output	100	107		dBμ
Video output amplitude	V _{O42}	Vi=80dBμ, AM=78% MOD	1.7	2.0	2.3	Vp-p
Differential gain	DG	Vi=80dBμ, 87.5% video MOD		3.0	10	%
Differential phase	DP	Vi=80dBμ, 87.5% video MOD		3.0	10	°C
Video signal-to-noise ratio	S/N	Vi=80dBμ, 20log $\frac{1.43 (Vp-p)}{\text{noise } (Vrms)}$	47	53		dB
Sync signal tip level	V _{42TIP}	CW=80dBμ	2.0	2.3	2.6	V
Frequency characteristic	fc	Frequency generating −3dB video output	7	10		MHz
VIF intermodulation	I _{1.07}	V _{4.43MHz} /V _{1.07MHz} , Vi=80dBμ	35	42		dB
Maximum AFT output voltage	V _{44H}	CW=80dBμ, over a range of frequencies	8.0	8.3	8.7	V
Minimum AFT output voltage	V _{44L}	CW=80dBμ, over a range of frequencies	0.2	0.4	0.9	V
AFT detector sensitivity	Sf	CW=80dBμ, over a range of frequencies	35	60	90	mV/kHz
AFT defeat switching voltage	V _{AFT SW}	Measured at sweep signal	1.0	5.0		V
Black noise threshold	V _{BTH}	Measured at sweep signal	1.2	1.5	1.8	V
[SIF characteristics] fs=5.5MHz						
SIF limiting voltage	V _{ilim}	SIF input level generating −3dB video output		45	52	dBμ
FM detector output voltage	V _{O1}	Vi=100dBμ, Δf=±30kHz	480	680	880	mVrms
FM detector output distortion	THD	Vi=100dBμ, Δf=±30kHz		0.4	1.0	%
AM rejection	AMR	Vi=100dBμ $\frac{FM : \Delta f=30kHz}{AM : 30\%}$	43	56		dB
AF amplifier voltage gain	G _{AF}	Vi=100mVrms, f=400Hz	18	20	22	dB
Maximum AF amplifier output voltage	V _{O5} max	Output level generating 10% AF amplifier output distortion	2.0	2.8		Vrms
Maximum attenuation for electronically variable resistors	ATT	Vi=200mVrms, f=400Hz	70	80		dB

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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Video characteristics]						
Video softener range	ΔSoft	f=2MHz, 100mVp-p, voltage at video tone variable resistor, 4 to 0V	-6	-4	-2	dB
Video sharpener range	ΔSharp	f=2MHz, 100mVp-p, voltage at video tone variable resistor, 4 to 9V	7	10	13	dB
Video voltage gain	GV	f=100kHz, 100mVp-p, voltage at contrast variable resistor 9V, voltage at video tone variabel resistor 4V	17	20	23	dB
Contrast control center setting	C_{CEN}	f=100kHz, 100mVp-p, voltage at contrast variable resistor 6V	0.45	0.57	0.69	Vp-p
Contrast control range	ΔC_V	f=100kHz, 100mVp-p, voltage at contrast variable resistor 3 to 9V	20	22	24	dB
Brightness control	BR_H	Voltage at brightness variable resistor 2V	5.8			V
	B_{rCEN}	Voltage at brightness variable resistor 4.5V	2.6	3.1	3.6	V
	BR_L	Voltage at brightness variable resistor 7V			1.2	V
Video frequency characteristic	f_V	Voltage at contrast variable resistor 6V, voltage at video tone variable resistor 4V, 3dB down	5	7		MHz
Direct current transfer rate	R_{DC}	200mVp-p staircase input	88	93		%
[PAL/NTSC chroma characteristics]						
Color control chrominance residue	E_C min	Voltage at color variable resistor 0V, voltage at color contrast variable resistor 9V			30	mVp-p
LA7680 color contrast range	ΔC_C	Voltage at color variable resistor B-Y=2.5Vp-p, voltage at contrast variable resistor : 3 to 9V	18.5	20	21.5	dB
LA7681 Color contrast output voltage	V_{cout}	Voltage at color variable resistor 4.5V, voltage at contrast variable resistor 6V	5.8	6.0	6.1	V
Demodulator output DC voltage	$V_{\text{C-Y}}$	For burst signals only. Voltage at color variable resistor 0V	4.7	5.2	5.7	V
Demodulator output DC voltage difference	$\Delta V_{\text{C-Y}}$	For burst signals only. Voltage at color variable resistor 0V	-300	0	+300	mV
Demodulator output carrier leakage voltage	E_{car}				0.3	Vp-p
APC pull-in range	Δf_{APC}		±500			Hz
[PAL chroma characteristics]						
Contrast control center setting	E_C cen	Voltage at color variable resistor :4.5V (LA7680). Voltage at contrast variable resistor : 6V (LA7681)	1.0	1.5	2.0	Vp-p
			1.9	2.6	3.3	Vp-p
ACC amplitude characteristic	ACCM1p	+6dB	-3	0	+3	dB
	ACCM2p	-20dB	-5	-1	+1	dB
Demodulator ouput ratios	B/R_p	(Common to both LA7680 and LA7681)	1.50	1.78	2.00	
	G/R_p	With no B-Y signal (LA7680 only)	-0.56	-0.51	-0.46	
	G/B_p	With no R-Y signal (LA7680 only)	-0.21	-0.19	-0.17	
Demodulation angle	$\angle RB_p$		85	90	95	°C
Maximum chrominance output	E_{ch}	Voltage at color variable resistor 9V, voltage at contrast variable resistor 9V	1.0	1.5	2.0	Vp-p
Maximum demodulator output	E_{cmax}	Voltage at color variable resistor 9V, voltage at contrast variable resistor 9V	3.4	4.0		Vp-p
Killer trigger point	E_{konp}		-35	-31	-27	dB
[NTSC chroma characteristics]						
Contrast control center setting	E_C cenN	Voltage at color variable resistor 4.5V (LA7680) Voltage a contrast variable resistor 6V (LA7681)	0.7	1.1	1.5	Vp-p
			1.3	1.8	2.3	Vp-p
ACC amplitude characteristic	ACCM1_N	+6dB	-3	0	+3	dB
	ACCM2_N	-20dB	-5		+1	dB
ACC phase characteristic	ACCP1_N	+6dB	-3	0	+3	°C
	ACCP2_N	-20dB	-7		+7	°C
Tint control center setting	T_{CEN}	Voltage at tint variable resistor 4.5V Voltage at color variable resistor 4.5V Voltage at contrast variable resistor 6V	-9	+3	+15	°C
Tint range	ΔT	Voltage at tint variable resistor 0 to 4.5 to 9V Voltage at color variable resitor 4.5V Voltage at contrast variabel resistor 6V	±40			°C
Demodulator output ratio	R/B_N		0.81	0.90	0.98	
	G/B_N	(LA7680)	0.24	0.3	0.38	
Demodulator angle	$\angle RB_N$		90	96	102	°C
	$\angle GB_N$	(LA7680)	-131	-121	-111	°C
Killer trigger point	E_{KONN}		-38	-34	-30	dB
Maximum demodulator output	E_{cmax_N}	Voltage at color variable resistor 9V, voltage at contrast variable resistor 9V	2.8	3.4		Vp-p

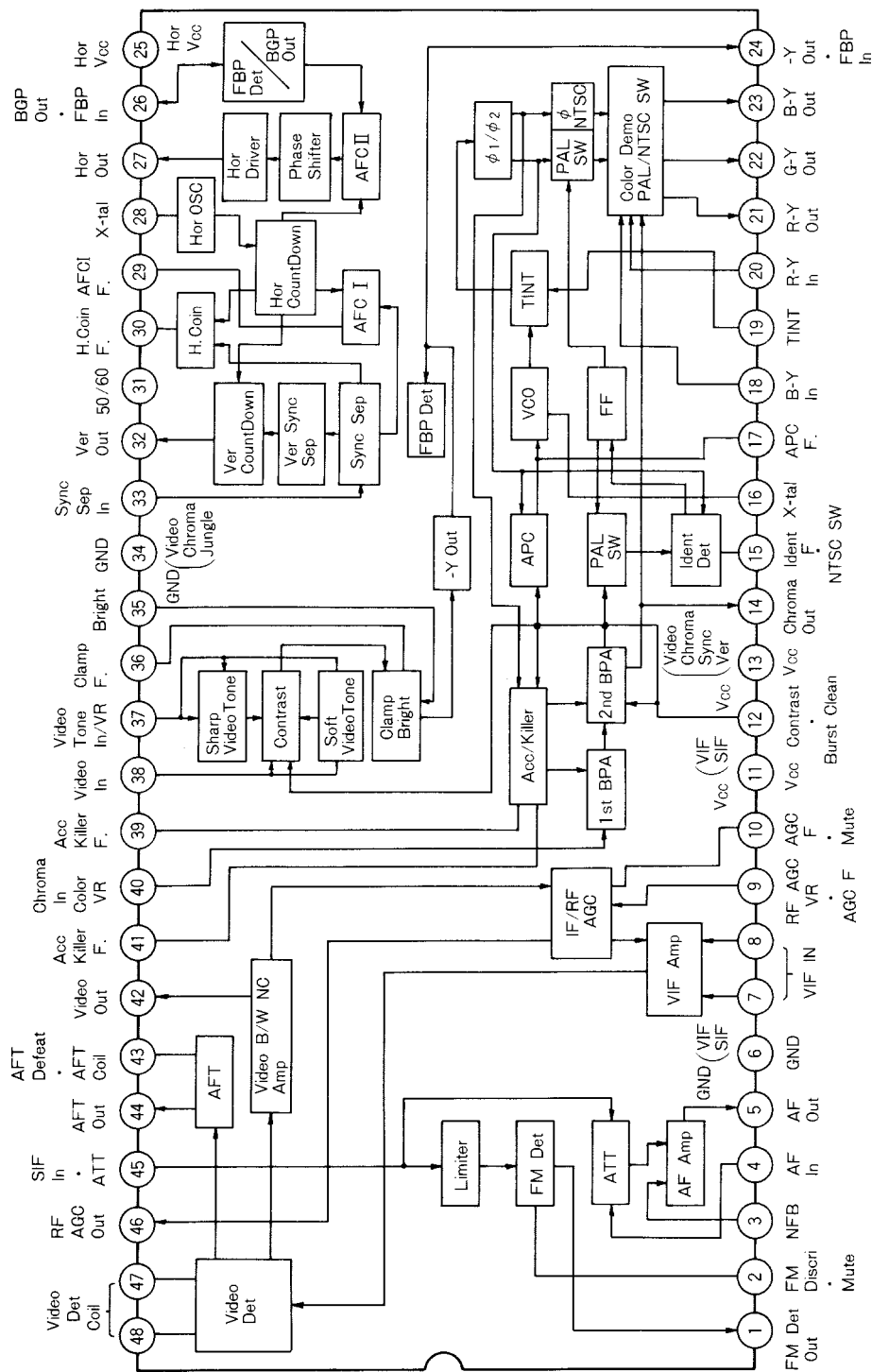
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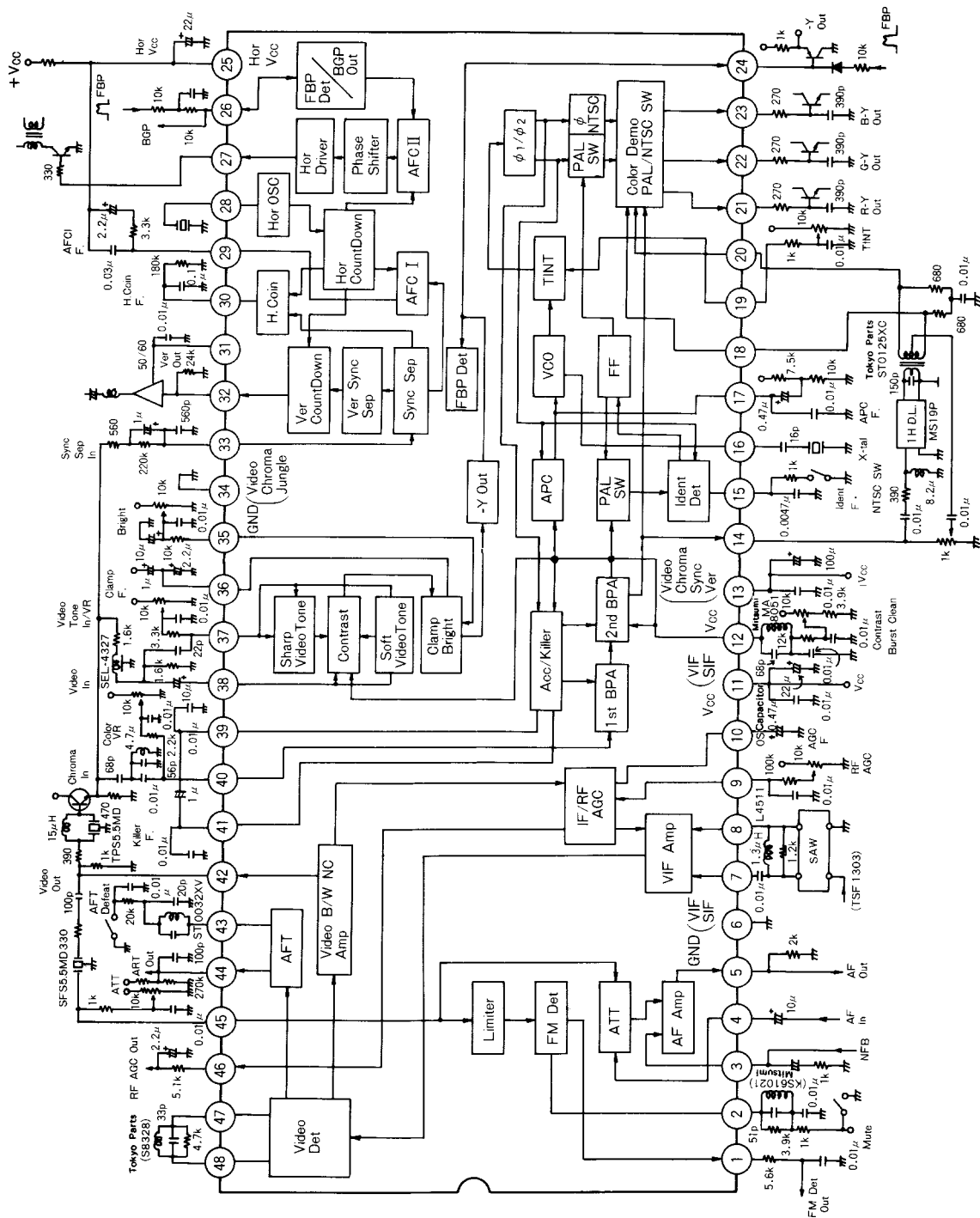
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Deflection characteristics]						
Synchronization separator input voltage	V _{SDC}		6.0	6.3	6.6	V
Vertical free-running frequency (50Hz)	T _{Vfree50}			312.5		H
Vertical free-running frequency (60Hz)	T _{Vfree60}			262.5		H
Maximum vertical synchronization frequency (50Hz)	T _{V max50}	With horizontal synchronization signal only		357		H
Maximum vertical synchronization frequency (60Hz)	T _{V max60}	With horizontal synchronization signal only		297		H
Minimum vertical synchronization frequency (60Hz)	T _{V min60}			225		H
Minimum vertical synchronization frequency (50Hz)	T _{V min50}			269		H
Vertical blanking pulse level	V _{H VBL}		7.0	7.5		V
Vertical blanking pulse width (50Hz)	P _{WBLK50}			21.5		H
Vertical blanking pulse width (60Hz)	P _{WBLK60}			17.5		H
Vertical ouput pulse width	P _{W VOUT}			8.5		H
Vertical ouput 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
Verrtical deflection external trigger load impedance	R _{TR}		2.5	3.6		kΩ
Vertical deflection automatic synchronization cutoff voltage	V _{SAS}			1.9	2.4	V
Vertical output pulse V _{CC} starting level	S _{VV}				4	V
Horizontal free-running frequency deviation	Δf _H	Deviation from 15.680kHz	−100	0	+100	Hz
Horizontal free running frequency dependence on V _{CC}	Δf _H V _{CC}	V ₂₅ =6.6V (reference value)		2		Hz
Horizontal pull-in range	f _{H PULL}	Deviation from 15.680kHz	±450			Hz
Horizontal output pulse V _{CC} starting level	SH _V			4.3	5	V
AFC II FBP peak level	FBP _H		4.1	4.6	5.1	V
VCR switch input level	V _{CR}			1.3	2.0	V
Horizontal output pulse width	P _{WHOUT}		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 _{WBGP}		2.7	3.7	4.7	μs
Burst gate pulse phase	T _{dBGP}		0.2	0.6	1.2	μs
Horizontal synchronization detector, threshold level	H _{coin}		4.2	4.5	4.8	V
50/60Hz, output voltage	V ₅₀			0.4	0.5	V
	V ₆₀		2.8	3.5		V
50/60Hz, input voltage	V _{in60}				8.7	V
	V _{in50}		0.15			V

Block Diagram : PAL/NTSC System

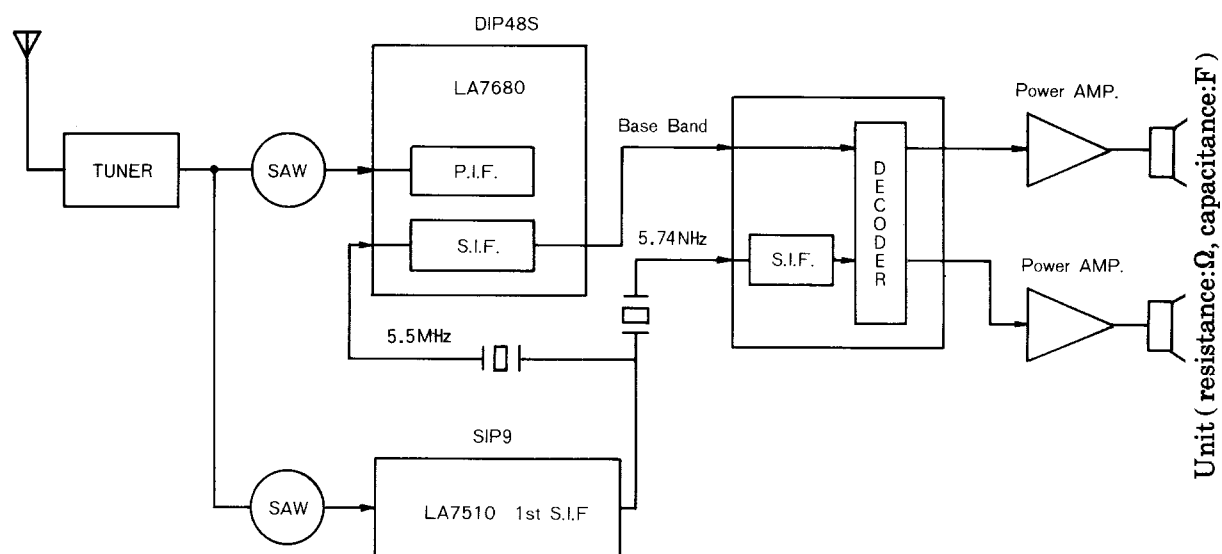


Sample Application Circuit : PAL/NTSC System

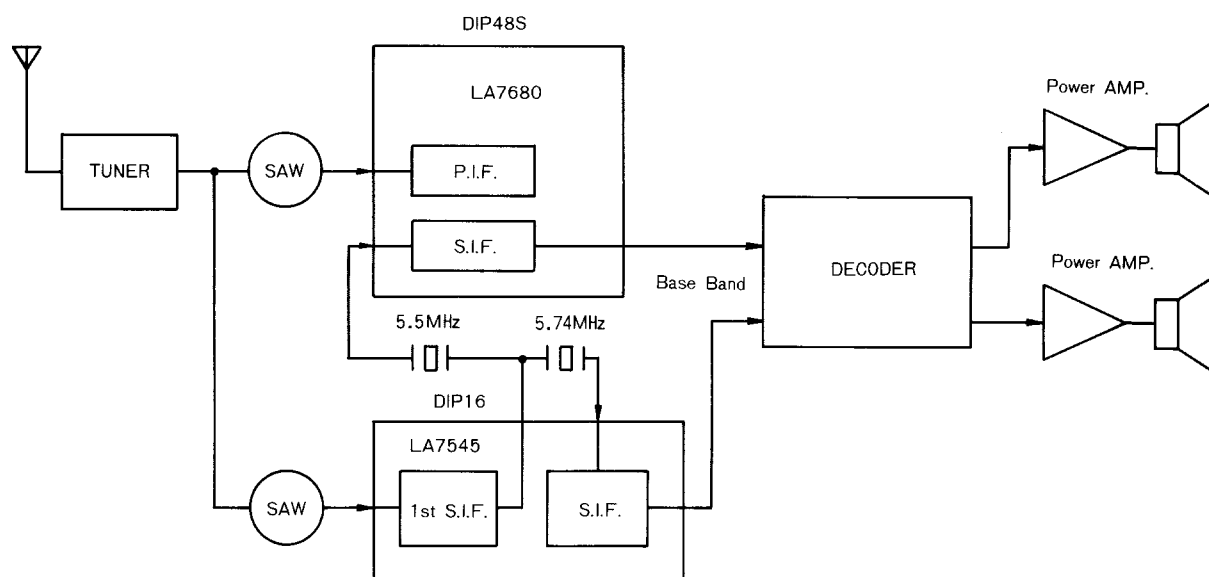


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PAL Multi-sound System

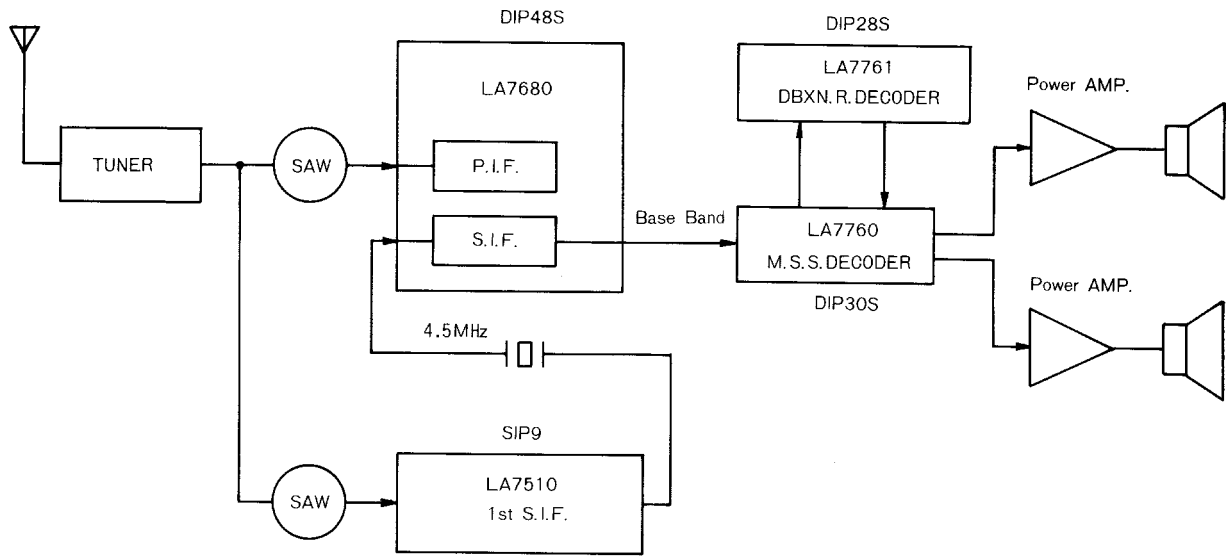


PAL Multi-sound System

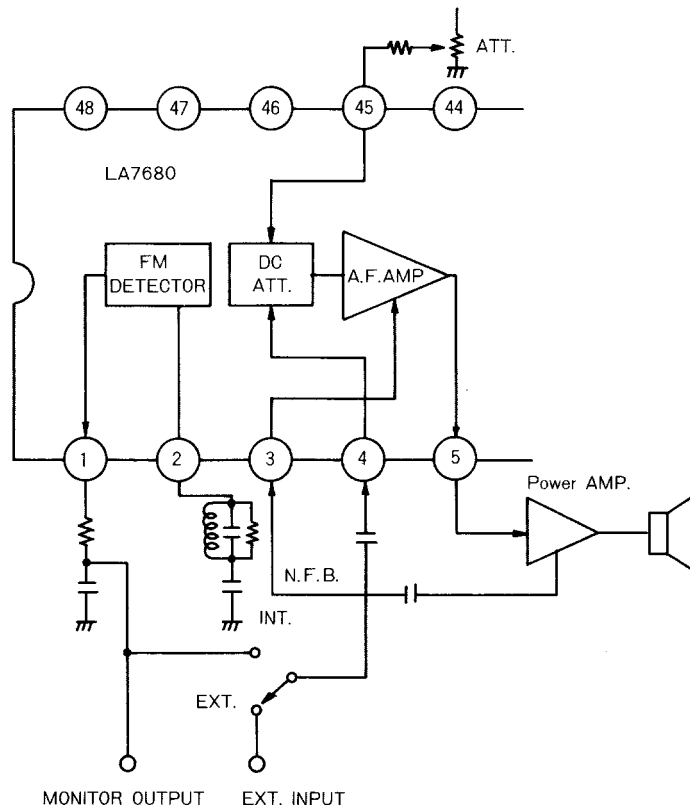


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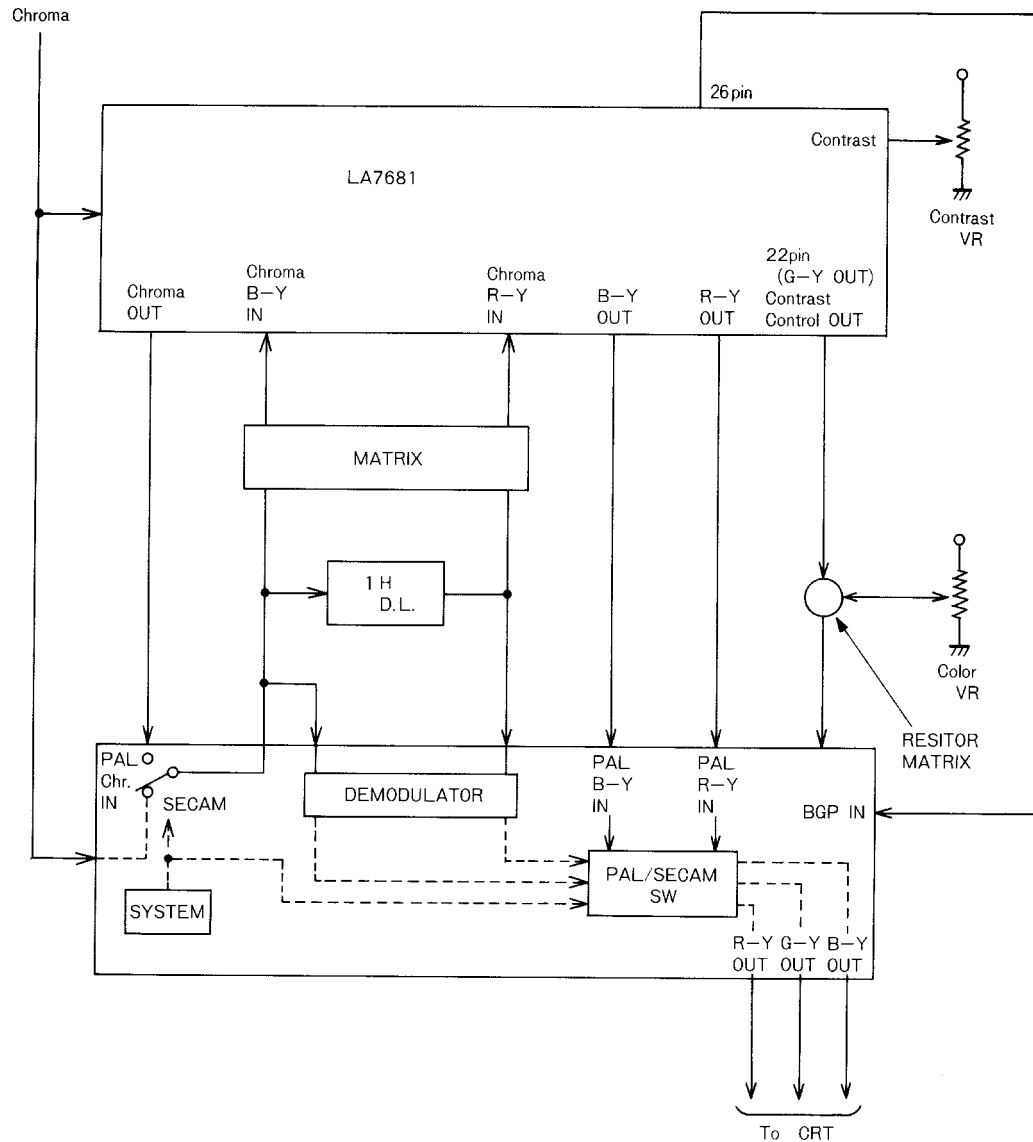
U.S. Multi-sound System



Sound Input/Output



PAL/SECAM Chroma Demodulator Interface



Note : The LA7680 may be used with the transcode type of SECAM chroma demodulators.

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