



# 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).

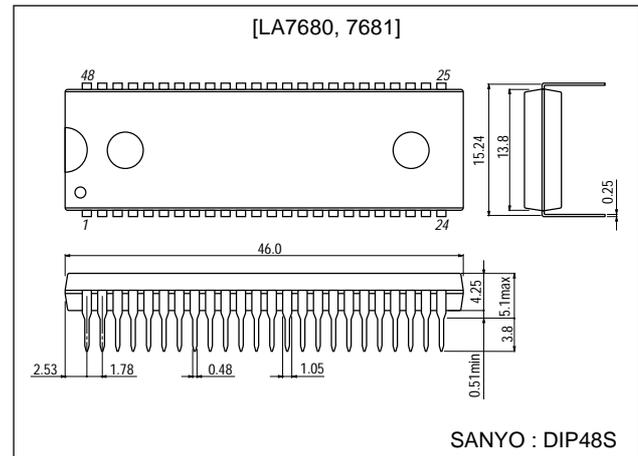
#### Deflection drivers

- 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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# LA7680, 7681

## Specifications

### Maximum Ratings at Ta = 25°C

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

### Recommended Operating Conditions at Ta = 25°C

| Parameter               | Symbol             | Conditions | Ratings  | Unit |
|-------------------------|--------------------|------------|----------|------|
| Supply voltage          | V <sub>13</sub>    |            | 9        | V    |
|                         | V <sub>11</sub>    |            | 9        | V    |
| Supply current          | I <sub>25</sub>    |            | 13       | mA   |
| Operating voltage range | V <sub>13</sub> op |            | 8 to 10  | V    |
|                         | V <sub>11</sub> op |            | 8 to 10  | V    |
| Operating current range | I <sub>25</sub> op |            | 10 to 16 | mA   |

### Operating Characteristics at Ta = 25°C, V<sub>CC</sub>=V<sub>13</sub>=V<sub>11</sub>=9V, I<sub>CC</sub>=I<sub>25</sub>=13mA

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

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# LA7680, 7681

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| Parameter                                  | Symbol                  | Conditions  | Ratings   |       |       | Unit  |
|--|-------------------------|---|-----------|-------|-------|-------|
|  |                         |   | min       | typ   | max   |       |
| [Video characteristics]                    |                         |   |           |       |       |       |
| Video softener range                       | $\Delta\text{Soft}$     | f=2MHz, 100mVp-p, voltage at video tone variable resistor, 4 to 0V  | -6        | -4    | -2    | dB    |
| Video sharpener range                      | $\Delta\text{Sharp}$    | 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 variable resistor 4V                                | 17        | 20    | 23    | dB    |
| Contrast control center setting            | $C_{\text{CEN}}$        | f=100kHz, 100mVp-p, voltage at contrast variable resistor 6V  | 0.45      | 0.57  | 0.69  | Vp-p  |
| Contrast control range                     | $\Delta C_V$            | 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     |
|  | $B_{\text{TCEN}}$       | 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               | $R_{\text{DC}}$         | 200mVp-p staircase input  | 88        | 93    |       | %     |
| [PAL/NTSC chroma characteristics]          |                         |   |           |       |       |       |
| Color control chrominance residue          | $E_C \text{ min}$       | Voltage at color variable resistor 0V, voltage at color contrast variable resistor 9V   |           |       | 30    | mVp-p |
| LA7680 color contrast range                | $\Delta C_C$            | 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       | $V_{\text{cout}}$       | 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 | $E_{\text{car}}$        |   |           |       | 0.3   | Vp-p  |
| APC pull-in range                          | $\Delta f_{\text{APC}}$ |   | $\pm 500$ |       |       | Hz    |
| [PAL chroma characteristics]               |                         |   |           |       |       |       |
| Contrast control center setting            | $E_C \text{ cen}$       | Voltage at color variable resistor :4.5V (LA7680).<br>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               | $\text{ACCM1p}$         | +6dB  | -3        | 0     | +3    | dB    |
|  | $\text{ACCM2p}$         | -20dB   | -5        | -1    | +1    | dB    |
| Demodulator output 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                 | $E_{\text{ch}}$         | Voltage at color variable resistor 9V, voltage at contrast variable resistor 9V   | 1.0       | 1.5   | 2.0   | Vp-p  |
| Maximum demodulator output                 | $E_{\text{cmax}}$       | Voltage at color variable resistor 9V, voltage at contrast variable resistor 9V   | 3.4       | 4.0   |       | Vp-p  |
| Killer trigger point                       | $E_{\text{konp}}$       |   | -35       | -31   | -27   | dB    |
| [NTSC chroma characteristics]              |                         |   |           |       |       |       |
| Contrast control center setting            | $E_C \text{ cenN}$      | Voltage at color variable resistor 4.5V (LA7680)<br>Voltage at contrast variable resistor 6V (LA7681)                                   | 0.7       | 1.1   | 1.5   | Vp-p  |
|  |                         |   | 1.3       | 1.8   | 2.3   | Vp-p  |
| ACC amplitude characteristic               | $\text{ACCM1N}$         | +6dB  | -3        | 0     | +3    | dB    |
|  | $\text{ACCM2N}$         | -20dB   | -5        |       | +1    | dB    |
| ACC phase characteristic                   | $\text{ACCP1N}$         | +6dB  | -3        | 0     | +3    | °C    |
|  | $\text{ACCP2N}$         | -20dB   | -7        |       | +7    | °C    |
| Tint control center setting                | $T_{\text{CEN}}$        | Voltage at tint variable resistor 4.5V<br>Voltage at color variable resistor 4.5V<br>Voltage at contrast variable resistor 6V           | -9        | +3    | +15   | °C    |
| Tint range                                 | $\Delta T$              | Voltage at tint variable resistor 0 to 4.5 to 9V<br>Voltage at color variable resistor 4.5V<br>Voltage at contrast variable resistor 6V | $\pm 40$  |       |       | °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                       | $E_{\text{KONN}}$       |   | -38       | -34   | -30   | dB    |
| Maximum demodulator output                 | $E_{\text{cmaxN}}$      | Voltage at color variable resistor 9V, voltage at contrast variable resistor 9V   | 2.8       | 3.4   |       | Vp-p  |

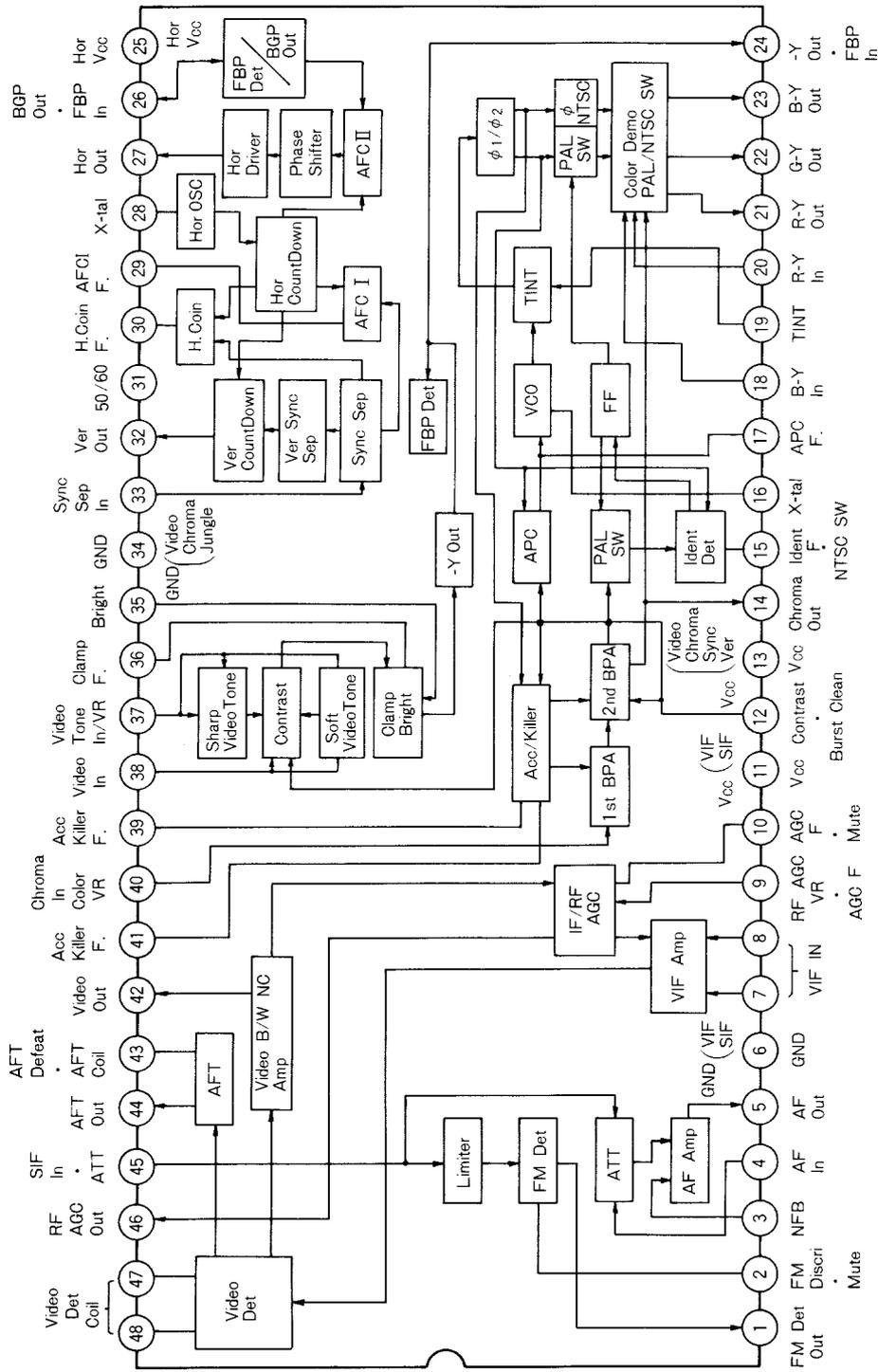
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# LA7680, 7681

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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)            | $T_{Vmax50}$        | With horizontal synchronization signal only |           | 357   |      | H          |
| Maximum vertical synchronization frequency (60Hz)            | $T_{Vmax60}$        | With horizontal synchronization signal only |           | 297   |      | H          |
| Minimum vertical synchronization frequency (60Hz)            | $T_{Vmin60}$        |   |           | 225   |      | H          |
| Minimum vertical synchronization frequency (50Hz)            | $T_{Vmin50}$        |   |           | 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 output pulse width                                  | $P_{WVOUT}$         |   |           | 8.5   |      | H          |
| Vertical output voltage                                      | $V_{OUTH}$          |   | 5.7       | 6     | 6.3  | V          |
|  | $V_{OUTM}$          |   | 4.3       | 4.6   | 4.9  | V          |
|  | $V_{OUTL}$          |   |           |       | 0.3  | V          |
| Vertical deflection external trigger load impedance          | $R_{TR}$            |   | 2.5       | 3.6   |      | k $\Omega$ |
| 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                  | $\Delta f_H$        | Deviation from 15.680kHz                    | -100      | 0     | +100 | Hz         |
| Horizontal free running frequency dependence on $V_{CC}$     | $\Delta f_H V_{CC}$ | $V_{25}=6.6V$ (reference value)             |           | 2     |      | Hz         |
| Horizontal pull-in range                                     | $f_H PULL$          | Deviation from 15.680kHz                    | $\pm 450$ |       |      | Hz         |
| Horizontal output pulse $V_{CC}$ starting level              | $S_{HV}$            |   |           | 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 | $\mu s$    |
| Horizontal output pulse phase                                | $H_{PF}$            |   |           | 12    |      | $\mu s$    |
|  | $H_{PCEN}$          |   | 3.4       | 4.4   | 5.4  | $\mu s$    |
|  | $H_{PR}$            |   |           |       | 0    | $\mu s$    |
| Burst gate pulse width                                       | $P_{WBGP}$          |   | 2.7       | 3.7   | 4.7  | $\mu s$    |
| Burst gate pulse phase                                       | $T_{dBGP}$          |   | 0.2       | 0.6   | 1.2  | $\mu s$    |
| 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          |

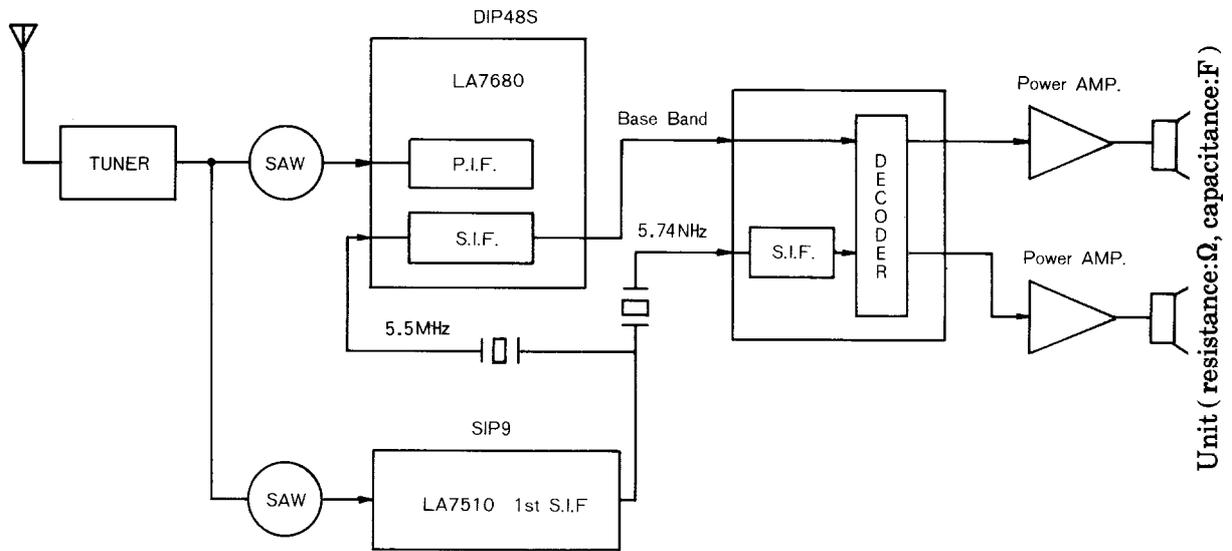
Block Diagram : PAL/NTSC System



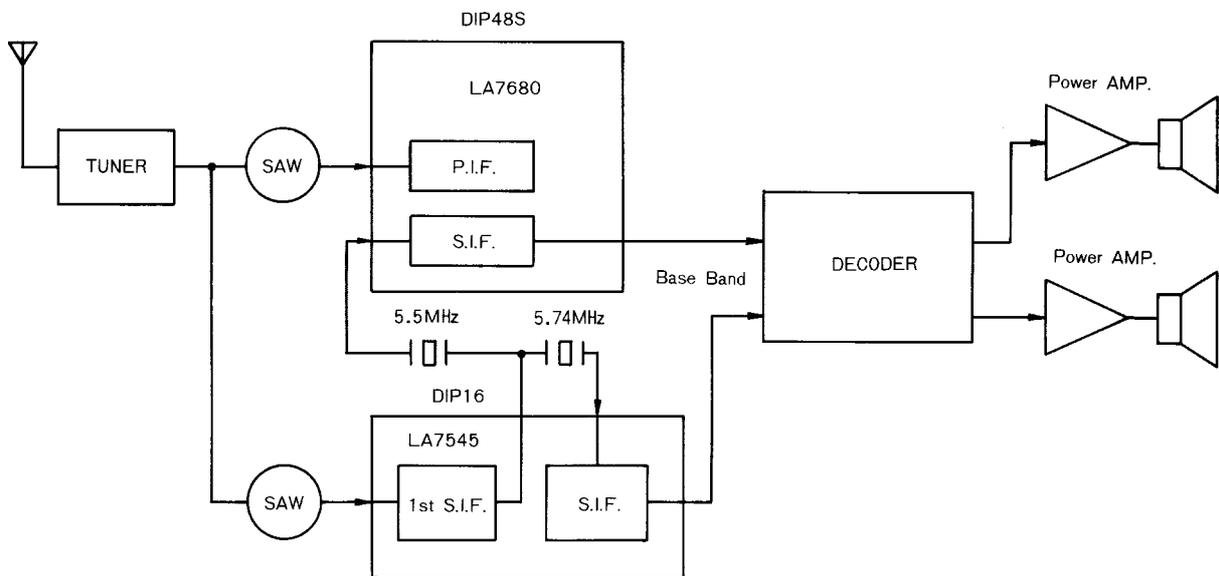


# LA7680, 7681

## PAL Multi-sound System

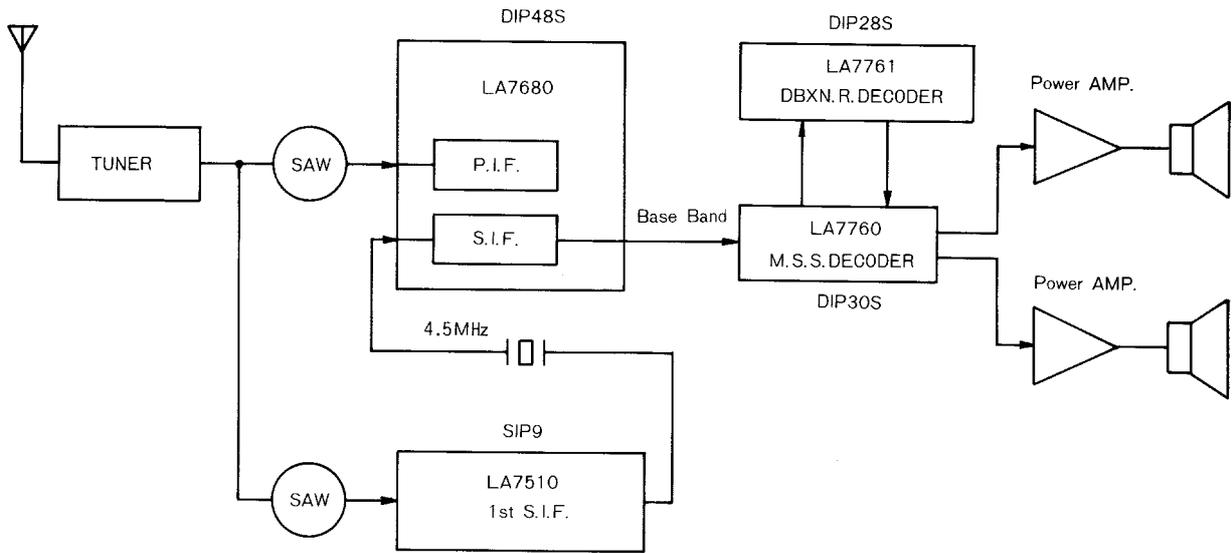


## PAL Multi-sound System

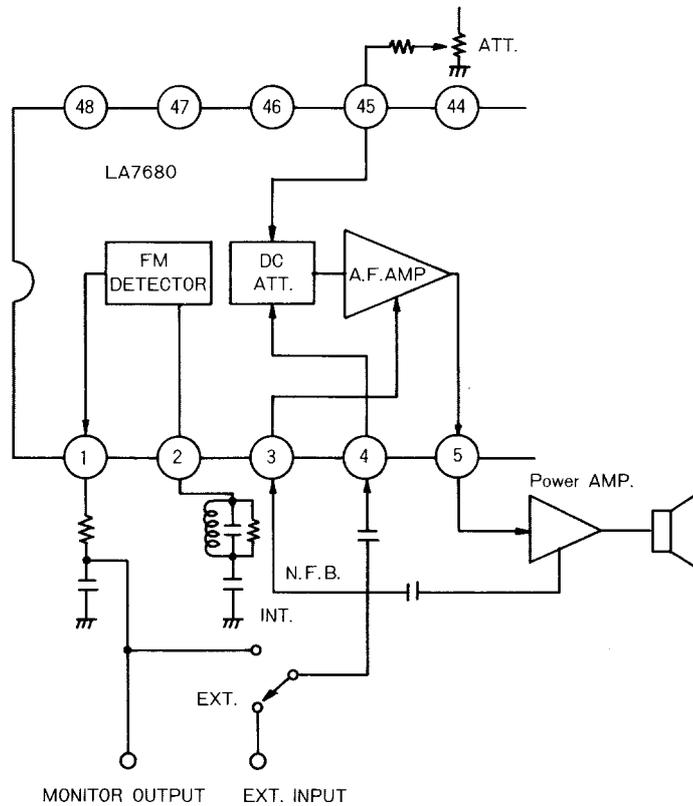


# LA7680, 7681

## U.S. Multi-sound System

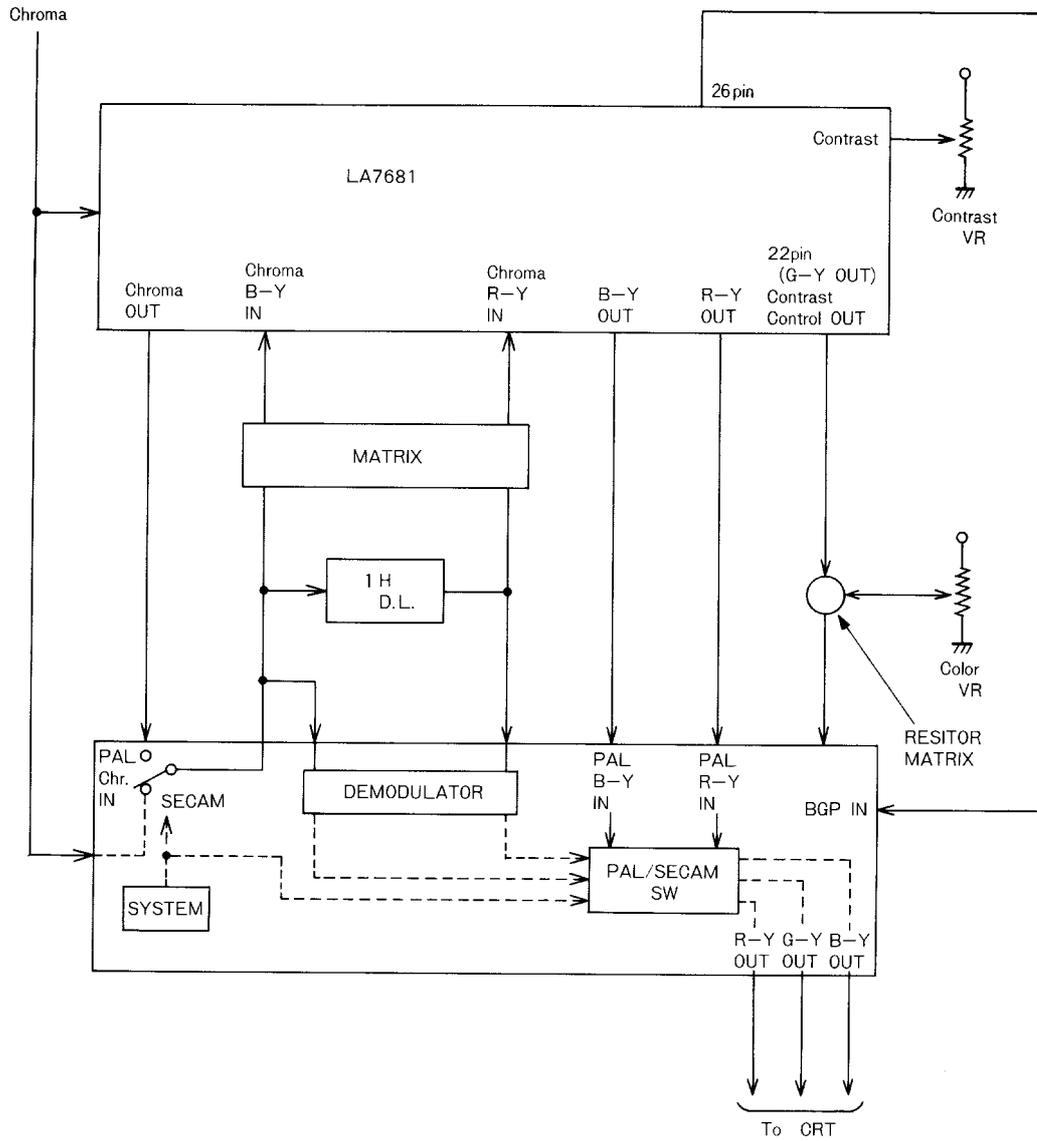


## Sound Input/Output



# LA7680, 7681

## PAL/SECAM Chroma Demodulator Interface



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

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