



# LA7674

## Color TV Single-Chip Signal Processor for NTSC Systems (PLL Detection)

### Overview

The LA7674 improves upon the black-level, horizontal-jitter, switch-on drift performance of the single-chip LA7672 used to date. Also a single-chip IC, the LA7674 is for color TVs based on the NTSC (National Television System Committee) system with an on-chip circuit for all VIF, SIF, video, chroma and deflection signal processing.

### Functions and Features

#### [VIF]

- PLL detection (high video and audio quality)
- High-gain VIF amplifier
- High speed AGC
- On-chip APC time constant switch

#### [SIF]

- Simultaneous sound IN/OUT
- Video/audio simultaneous muting, or audio-only muting possible

#### [Audio-visual switch]

- Internal/external audio-visual switch ( $V_{CC} = 9V$ )

Delay line	Video external, audio external	Switch rating
OFF	IN	6.9 to 9.0V
OFF	EXT	4.7 to 6.6V
ON	EXT	2.4 to 4.3V
ON	IN	0 to 2.1V

#### [OSD]

- RGB 3 input
- RGB linear amplifier (– 6dB input: 2V to 5V)
- Fast blanking (B input combined use)

#### [Chroma]

- On-chip ACC filter, On-chip killer filter, Killer-circuit hysteresis operation
- On-chip carrier filter

#### [Video]

- Black enhancement

- DC playback
- On-chip delay line
- Wide band width (9MHz): delay line short
- Dual rank on-chip differentiation circuit also available for soft also
- S input supported (VCR application)
- Variable DC transmission volume available (externally attached circuit adjustment)

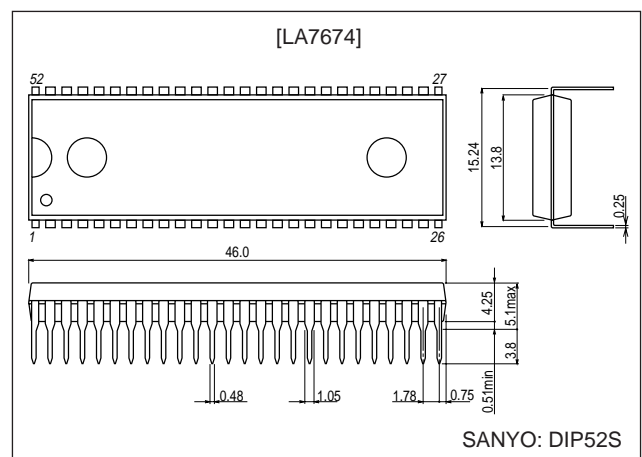
#### [Deflection]

- Adjustment-free horizontal, vertical synchronization
- Dual AFC system with excellent anti-noise characteristics
- External adjustment of vertical synchronization sensitivity
- Vertical size is constant with no-signal
- Highly stable image during playback of copy protected tapes (macro-vision tape etc.)
- High stability against VCR skew distortion

### Package Dimensions

unit: mm

#### 3128-DIP52S



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## Specifications

### Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V11 max		11	V
	V14 max		11	V
Maximum supply current	I30max		16	mA
Allowable power dissipation	Pd max	$T_a \leq 60^\circ\text{C}$	1.35	W
Operating temperature range	Topr		-10 to +65	$^\circ\text{C}$
Storage temperature range	Tstg		-55 to +150	$^\circ\text{C}$
Circuit current	I44		-6	mA
	I6		-3	mA
FBP input current	I22 max	Peak current	5	mA
	I21 max	Peak current	10	mA

### Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V11		9	V
	V14		9	V
Recommended supply current	I30		13	mA
Operating voltage range	V11op		8 to 9.5	V
	V14op		8 to 9.5	V
Operating current range	I30op		10 to 16	mA

### Operating Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = V11 = V14 = 9\text{V}$ , $I_{CC} = I30 = 13\text{mA}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Circuit Voltage and Current]						
Horizontal supply voltage	V30	$V_{CC} = 9\text{V}$ , $I_{CC} = 13\text{mA}$	7.3	7.8	8.3	V
Supply current	I11 + 14	$V_{CC} = 9\text{V}$ , $I_{CC} = 13\text{mA}$ , $I_F$ AGC 4V	102	120	138	mA
[VIF]						
Quiescent video output voltage	V44	Quiescent	4.3	4.7	5.1	V
Quiescent AFT output voltage	V47	Quiescent	3.1	4.7	6.1	V
Maximum RFAGC voltage	V49H	$CW = 85\text{dB}\mu$ , RFAGCVR = min	7.6	8.0	8.3	V
Minimum RFAGC voltage	V49L	$CW = 85\text{dB}\mu$ , RFAGCVR = max	0	0.01	0.3	V
Input sensitivity	$V_i$	VIF input level for video output at 0.8Vp-p (40% mod).	33	39	45	dB $\mu$
AGC range	GR	Maximum input ( $V_0 = 0.8\text{Vp-p}$ ) - input sensitivity	54	62	70	dB
Maximum permissible input	$V_i$ max	VIF input level for video output at +1dB	97	104	111	dB $\mu$
Video output detection	$V_{O44}$	$V_i = 80\text{dB}\mu$ , AM = 78% mod	1.7	2.0	2.3	Vp-p
Differential gain	DG	$V_i = 80\text{dB}\mu$ , AM = 87.5%, video mod		3.0	10	%
Differential phase	DP	$V_i = 80\text{dB}\mu$ , AM = 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	61	dB
Synchronization signal tip level	V44 TIP	$CW = 80\text{dB}\mu$	2.1	2.4	2.7	V
Frequency characteristic	$f_C$	Frequency at video output of -3dB	6.0	9.0	12.0	MHz
920 kHz VIF intermodulation	I920	V3.58MHz/V920kHz, $V_i = 80\text{dB}\mu$	35	42	49	dB
Maximum AFT output voltage	V47H	$CW = 80\text{dB}\mu$ , frequency change	8.3	8.7	9.0	V
Minimum AFT output voltage	V47L	$CW = 80\text{dB}\mu$ , frequency change	0.1	0.3	0.8	V
AFT detection sensitivity	Sf	$CW = 80\text{dB}\mu$ , frequency change	45	70	100	mV/kHz
AFT switch operation start voltage	$V_{AFTSW}$	Measuring with sweep signal	0.5	1.0	1.5	V
Black noise threshold level	$V_{BTH}$	Measuring with sweep signal	1.1	1.4	1.7	V
APC pull-in range (U)2	$f_{PU-2}$	$CW = 80\text{dB}\mu$ , $f_P = 53\text{MHz}$ to 64MHz	0.8	1.7	4.0	MHz
APC pull-in range (L)2	$f_{PL-2}$	$CW = 80\text{dB}\mu$ , $f_P = 53\text{MHz}$ to 64MHz		-2	-1	MHz
VCO maximum variable range	$\Delta f_U$	Quiescent	0.9	1.7	4.0	MHz
	$\Delta f_L$	Quiescent	-4	-2	-1	MHz
VCO control sensitivity	$\beta$	Quiescent	1.5	3.0	5.5	kHz/mV

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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Audio-visual Switches]						
Video output DC voltage	V38	Quiescent	3.0	3.4	3.8	V
Internal video input voltage	V42	Quiescent	4.4	4.8	5.2	V
External video input voltage	V40	Quiescent	4.4	4.8	5.2	V
External audio input voltage	V3	Quiescent	5.2	5.6	6.0	V
[SIF AF]						
SIF limiting voltage	V <sub>i</sub> lim	SIF output level for detection output at -3dB	33	40	47	dB $\mu$
FM detection output voltage	V <sub>O1</sub>	V <sub>i</sub> = 100dB $\mu$ , $\Delta f = \pm 25$ kHz	440	550	670	mVrms
FM detection output distortion ratio	THD	V <sub>i</sub> = 100dB $\mu$ , $\Delta f = \pm 25$ kHz	0	0.4	1.0	%
AM rejection	AMR	V <sub>i</sub> = 100dB $\mu$ , $\frac{FM : \Delta f = \pm 25kHz}{AM : 30\%}$	40	60	80	dB
AF amplifier voltage gain	G <sub>AF</sub>	V <sub>i</sub> = 100mVrms, f = 400Hz	18	20	22	dB
AF maximum output voltage	V <sub>O6</sub> max	Output level for AF amplifier output distortion at 10%	2.0	2.8	3.6	Vrms
AF electronic attenuator range	ATT	V <sub>i</sub> = 200mVrms, f = 400Hz	70	80	100	dB
[Video]						
Black enhancement threshold	B <sub>STH</sub>	APL variable	40	50	60	IRE
Maximum black enhancement gain	BS max	APL variable	-35	-27	-20	IRE
Soft video tone variable range	$\Delta$ Soft	f = 2MHz, 100mVp-p video tone VR: 4V $\rightarrow$ 0V	-6	-4	-2	dB
Sharp video tone variable range	$\Delta$ Sharp	f = 2MHz, 100mVp-p video tone VR: 4V $\rightarrow$ 9V, contrast VR: 6V	7	10	13	dB
Video voltage gain audio-visual Switch 9V	GV9V	f = 100kHz, 100mVp-p, contrast VR: 9V, video tone VR: 4V	15	18	21	dB
Video voltage gain audio-visual Switch 0V	GV0V	f = 100kHz, 100mVp-p, contrast VR: 0V, video tone VR: 4V	15	18	21	dB
Contrast control center	C <sub>CEN</sub>	f = 100kHz, 100mVp-p, contrast VR: 6V	0.4	0.48	0.57	Vp-p
Contrast variable control range	$\Delta$ C <sub>V</sub>	Contrast VR: 3V $\rightarrow$ 9V	18	20	22	dB
Bright control	B R <sub>H</sub>	Bright VR: 2V	5.5	6.5	7.5	V
	B R <sub>CEN</sub>	Bright VR: 4.5V	3.1	3.6	4.1	V
	B R <sub>L</sub>	Bright VR: 7.5V		0.3	1.2	V
D.L. off frequency characteristics	f <sub>v</sub> 9V	Contrast VR: 6V, video tone VR: 4V, 3dB down	7	9		MHz
D.L. on frequency characteristics	f <sub>v</sub> 0V	Contrast VR: 6V, video tone VR: 4V, 3dB down	2.5	3	4	MHz
DC transmission	R <sub>DC</sub>	Input: stair step signal, 500mVp-p	100	103	106	%
Delay line delay	T <sub>DL</sub>	Input: white 100%	290	340	390	ns
[Chroma]						
ACC amplitude characteristics	A <sub>CC1</sub>	+6dB	-3	0	+3	dB
	A <sub>CC2</sub>	-20dB	-7	0	+2	dB
ACC phase characteristics	A <sub>CCP1</sub>	+6dB	-3	0	+3	$^{\circ}$ C
	A <sub>CCP2</sub>	-20dB	-7	0	+7	$^{\circ}$ C
Killer operation point	E <sub>K</sub>		-35	-28	-21	dB
Color control color residual	E <sub>C</sub> min	Color VR: 0V, contrast VR: 9V			50	mVp-p
Color control center	E <sub>C</sub> CEN	Color VR: 4.5V, contrast VR: 6V	1.2	1.8	2.4	Vp-p
Maximum demodulation output	E <sub>C</sub> max	Color VR: 9V, contrast VR: 9V	3.2	4.0	4.8	Vp-p
Color contrast variable range	$\Delta$ C <sub>C</sub>	Color VR: B - Y = 2.5Vp-p, contrast VR: 3V $\rightarrow$ 9V	17.5	19.5	21.5	dB
Tint control center	T <sub>CEN</sub>	Tint VR: 4.5V, color VR: 4.5V, contrast VR: 6V	0	12	24	$^{\circ}$ C
Tint variable range	$\Delta$ T	Tint VR: 0V $\leftarrow$ 4.5V $\rightarrow$ 8V, color VR: 4.5V, contrast VR: 6V	$\pm 40$	$\pm 55$	$\pm 70$	$^{\circ}$ C
APC pull-in range	$\Delta f_{APC}$		$\pm 300$	$\pm 500$		Hz

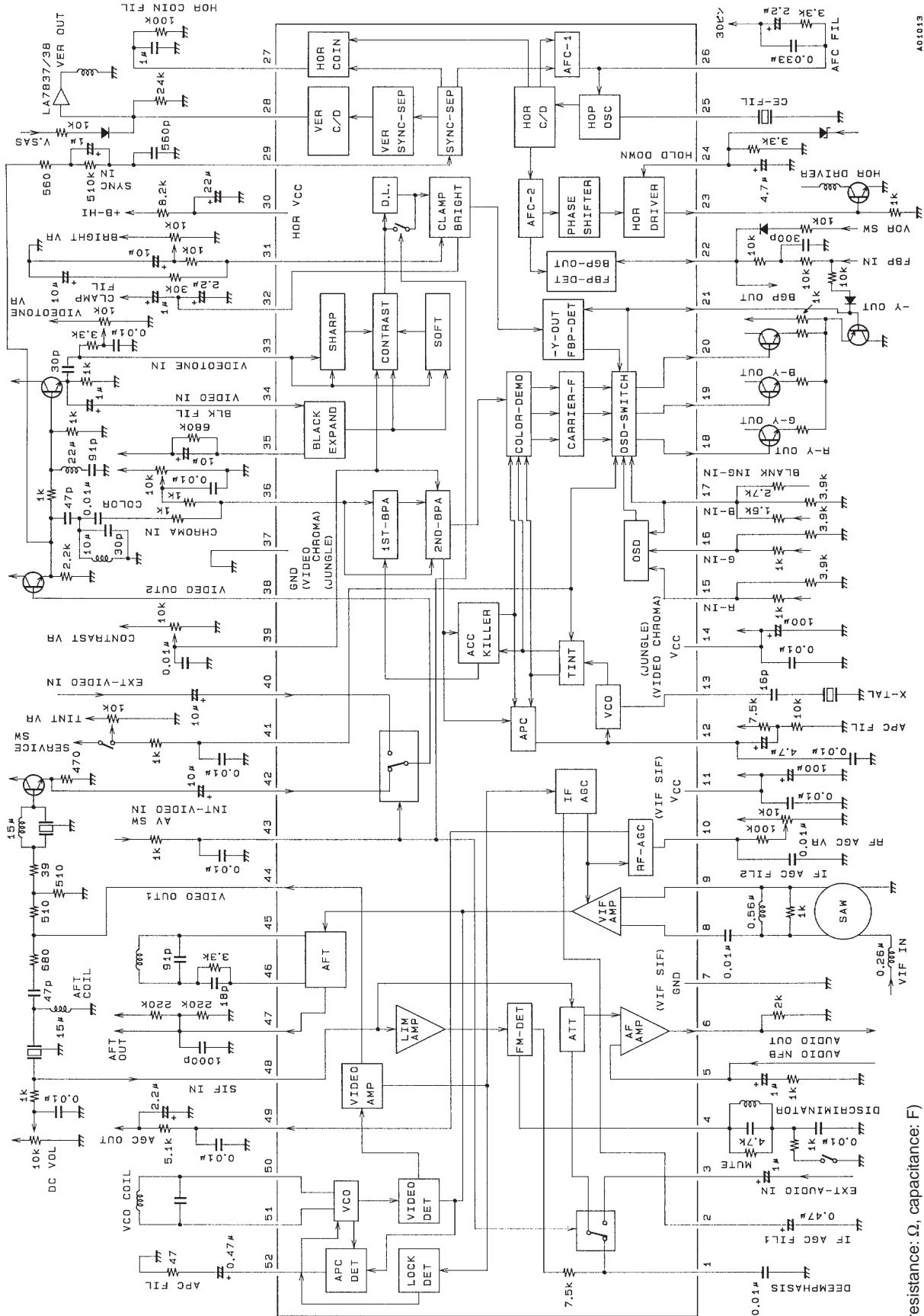
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Demodulator output ratio	R/B	Monochrome signal, contrast VR: 6V, color VR: B – Y = 1Vpo	0.81	0.90	0.98	
	G/B	Monochrome signal, contrast VR: 6V, color VR: B – Y = 1Vpo	0.24	0.30	0.38	
Demodulator phase angle	RB	Monochrome signal, contrast VR: 6V, color VR: B – Y = 1Vpo	97	105	113	DEG
	GB	Monochrome signal, contrast VR: 6V, color VR: B – Y = 1Vpo	-130	-120	-110	DEG
Demodulator output DC voltage	V <sub>C-Y</sub>	Burst signal only, color VR: 0V	4.7	5.2	5.7	V
Demodulator output DC offset voltage	ΔV <sub>C-Y</sub>	Burst signal only, color VR: 0V	-200	0	+200	mV
Demodulator output residual carrier	E car	Quiescent, killer off, color VR: 0V			0.05	Vp-p
[OSD]						
Blanking pulse threshold level	TH <sub>BL</sub>	C – IN: color bar, B – IN: variable	0.5	0.8	1.1	V
- Y out DC voltage (OSD mode)	V <sub>-Y</sub>	B-IN : 1.5V	2.5	2.8	3.1	V
RGB – in threshold level	TH <sub>R</sub>	R – IN: variable, B – IN: 1.5V	1.9	2.2	2.5	V
	TH <sub>G</sub>	G – IN: variable, B – IN: 1.5V				
	TH <sub>B</sub>	B – IN, variable				
RGB – Y out DC voltage (3 V)	V <sub>R3V</sub>	R, G, B – IN :3V	5.2	5.5	5.8	V
	V <sub>G3V</sub>					
	V <sub>B3V</sub>					
RGB – Y out DC voltage (4 V)	V <sub>R4V</sub>	R, G, B – IN : 4V	5.7	6.0	6.3	V
	V <sub>G4V</sub>					
	V <sub>B4V</sub>					
RGB – Y out DC voltage (5 V)	V <sub>R5V</sub>	R, G, B – IN : 5V	6.2	6.5	6.8	V
	V <sub>G5V</sub>					
	V <sub>B5V</sub>					
[Deflection]						
Synchronization separator input DC level	V <sub>SDC</sub>		6.0	6.3	6.6	V
Vertical free-running period	T <sub>V free</sub>		262	262.5	263	H
Maximum vertical synchronization period	T <sub>V max</sub>	Input: horizontal synchronization signal only	296.5	297	297.5	H
Minimum vertical synchronization period	T <sub>V min</sub>		224.5	225	225.5	H
Vertical blanking pulse width	P <sub>W VBL</sub>		20.25	20.5	20.75	H
Vertical blanking pulse wave Height value	P <sub>H VBL</sub>		7.0	7.5		V
Vertical output pulse width	P <sub>W VOUT</sub>		8.25	8.5	8.75	H
Vertical output voltage	V <sub>OUT H</sub>		5.7	6	6.3	V
	V <sub>OUT M</sub>		4.2	4.5	4.8	V
	V <sub>OUT L</sub>			0.1	0.3	V
Vertical external trigger load resistance	R <sub>TR</sub>		2.7	3.6		kΩ
Vertical automatic synchronization stop voltage	V <sub>SAS</sub>			1.9	2.4	V
Vertical output pulse start V <sub>CC</sub> voltage	S <sub>VV</sub>			3	4	V
Horizontal free-running frequency deviation	Δf <sub>H</sub>	Deviation from 15.734kHz	-90	+30	+150	Hz
Horizontal pull-in range	f <sub>H PULL</sub>	Deviation from 15.734kHz	±400	±550		Hz
Horizontal output pulse width	P <sub>WH OUT</sub>		21.8	23.8	25.8	μs
Horizontal output pulse phase	H <sub>PF</sub>		15	17	19	μs
	H <sub>PCEN</sub>		3.4	4.4	5.4	μs
	H <sub>PR</sub>		0	3	6	μs
Horizontal output pulse start V <sub>CC</sub> voltage	S <sub>HV</sub>			4.5	5.3	V
AFC II FBP peak voltage	F <sub>BPH</sub>		4.1	4.6	5.1	V
Burst gate pulse delay time	T <sub>d BGP</sub>		0.2	0.6	1.2	μs
Burst gate pulse width	P <sub>W BGP</sub>		2.7	3.7	4.7	μs
VCR SW input voltage	V <sub>CR</sub>			1.3	2.0	V
X-ray protector circuit operation input voltage	V <sub>HD</sub>		0.64	0.74	0.84	V
Horizontal synchronization detection Threshold level	H <sub>coin</sub>		4.2	4.5	4.8	V
Horizontal output current	H <sub>OUT</sub>	I <sub>CC</sub> = 13mA	3.8	4.7	5.5	mA

# Sample Application Circuit



Unit (resistance: Ω, capacitance: F)

AO1013

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