



LA7672

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

Overview

The LA7672 is a single-chip IC for color TVs based on the NTSC system with on-chip circuit for all VIF, SIF, video, chroma and deflection signal processing.

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 ($V_{CC} = 9\text{ V}$)

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

[OSD]

- RGB 3 input
- RGB linear up (–6 dB input: 2 V to 5 V)
- 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
- On-chip delay line
- Wide band width (9 MHz): delay line short
- Duel rank on-chip differentiation circuit also available for soft also
- S input supported (VCR application)
- Variable DC transmission volume available (externally attached circuit adjustment)

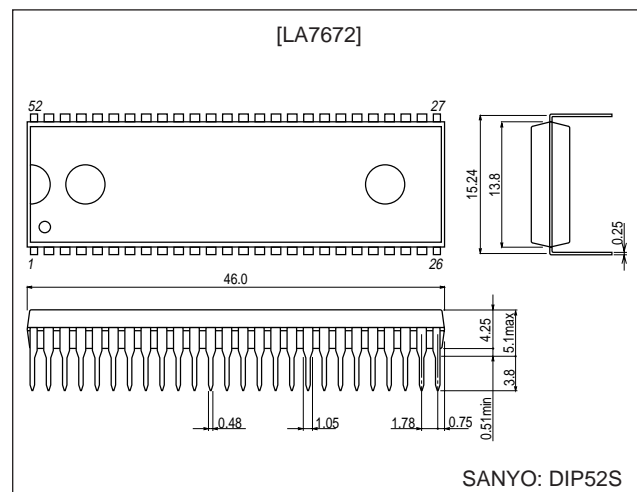
[Deflection]

- Adjustment-free horizontal, vertical synchronization
- Duel 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)
- High stability against VCR skew distortion

Package Dimensions

unit : mm

3128-DIP52S



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Specifications

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	$V_{CC} = 9\text{ V}$, $I_{CC} = 13\text{ mA}$, $I_F\text{ AGC } 4\text{ V}$	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	$CW = 85\text{ dB}\mu$, $\text{RFAGCVR} = \text{min}$	7.6	8.0	8.3	V
Minimum RFAGC Voltage	V49L	$CW = 85\text{ dB}\mu$, $\text{RFAGCVR} = \text{max}$	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	$\text{dB}\mu$
AGC Range	GR	Maximum input ($V_0 = 0.8\text{ Vp-p}$) - input sensitivity	54	62		dB
Maximum Permissible Input	$V_i\text{ max}$	VIF input level for video output at +1dB	97	104		$\text{dB}\mu$
Video Output Detection	V_{O44}	$V_i = 80\text{ dB}\mu$, $\text{AM} = 78\% \text{ mod}$	1.7	2.0	2.3	Vp-p
Differential Gain	DG	$V_i = 80\text{ dB}\mu$, $\text{AM} = 87.5\%$, video mod		3.0	10	%
Differential Phase	DP	$V_i = 80\text{ dB}\mu$, $\text{AM} = 87.5\%$, video mod		1.0	10	deg
Video S/N	S/N	$V_i = 80\text{ dB}\mu$, $20 \log \frac{1.46 (Vp-p)}{\text{noise (Vrms)}}$	47	54		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		MHz
920 kHz VIF Intermodulation	I920	$V3.58\text{ MHz}/V920\text{ kHz}$, $V_i = 80\text{ dB}\mu$	35	42		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		V
Black Noise Threshold Level	V_{BTH}	Measuring with sweep signal	1.1	1.4	1.7	V
APC Pull-in Range (U)2	$f_{\text{PU-2}}$	$CW = 80\text{ dB}\mu$, $f_P = 53\text{ MHz to } 64\text{ MHz}$	0.8	1.7		MHz
APC Pull-in Range (L)2	$f_{\text{PL-2}}$	$CW = 80\text{ dB}\mu$, $f_P = 53\text{ MHz to } 64\text{ MHz}$		-2	-1	MHz
VCO Maximum Variable Range	Δf_U	Quiescent	0.9	1.7		MHz
	Δf_L	Quiescent		-2	-1	MHz
VCO Control Sensitivity	b	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 _i lim	SIF output level for detection output at -3dB		40	47	dB μ
FM Detection Output Voltage	V _{O1}	V _i = 100dB μ , $\Delta f = \pm 25$ kHz	380	550	750	mVrms
FM Detection Output Distortion Ratio	THD	V _i = 100dB μ , $\Delta f = \pm 25$ kHz		0.4	1.0	%
AM Rejection	AMR	V _i = 100dB μ , $\frac{FM}{AM} : \Delta f = \pm 25$ kHz AM : 30 %	40	60		dB
AF Amplifier Voltage Gain	G _{AF}	V _i = 100mVrms, f = 400Hz	18	20	22	dB
AF Maximum Output Voltage	V _{O6} max	Output level for AF amplifier output distortion at 10%	2.0	2.8		Vrms
AF Electronic Attenuator Range	ATT	V _i = 200mVrms, f = 400Hz	70	80		dB
[Video]						
Black Enhancement Threshold	B _{STH}	APL variable	40	50	60	IRE
Maximum Black Enhancement Gain	BS max	APL variable	-35	-27	-20	IRE
Soft Video Tone Variable Range	Δ Soft	f = 2MHz, 100mVp-p video tone VR: 4V \rightarrow 0V	-6	-4	-2	dB
Sharp Video Tone Variable Range	Δ 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 _{CEN}	f = 100kHz, 100mVp-p, contrast VR: 6V	0.4	0.48	0.57	Vp-p
Contrast Variable Control Range	Δ C _V	Contrast VR: 3V \rightarrow 9V	18	20	22	dB
Bright Control	B R _H	Bright VR: 1.5V	5.5	6.5	7.5	V
	B R _{CEN}	Bright VR: 4.5V	2.3	2.8	3.3	V
	B R _L	Bright VR: 7V		0.3	1.2	V
DL Off Frequency Characteristics	f _V 9V	Contrast VR: 6V, video tone VR: 4V, 3dB down	7	9		MHz
DL On Frequency Characteristics	f _V 0V	Contrast VR: 6V, video tone VR: 4V, 3dB down	2.5	3		MHz
DC Transmission	R _{DC}	Input: stair step signal, 500mVp-p	100	103	106	%
Delay Line Delay	T _{DL}	Input: white 100%	290	340	390	ns
[Chroma]						
ACC Amplitude Characteristics	A _{CC1}	+6dB	-3	0	+3	dB
	A _{CC2}	-20dB	-7		+2	dB
ACC Phase Characteristics	A _{CCP1}	+6dB	-3	0	+3	deg
	A _{CCP2}	-20dB	-7		+7	deg
Killer Operation Point	E _K		-35	-28	-21	dB
Color Control Color Residual	E _C min	Color VR: 0V, contrast VR: 9V			30	mVp-p
Color Control Center	E _C CEN	Color VR: 4.5V, contrast VR: 6V	1.2	1.8	2.4	Vp-p
Maximum Demodulation Output	E _C max	Color VR: 9V, contrast VR: 9V	3.2	4.0		Vp-p
Color Contrast Variable Range	Δ C _C	Color VR: B - Y = 2.5Vp-p, contrast VR: 3V \rightarrow 9V	17.5	19.5	21.5	dB
Tint Control Center	T _{CEN}	Tint VR: 4.5V, color VR: 4.5V, contrast VR: 6V	0	12	24	deg
Tint Variable Range	Δ T	Tint VR: 0V \leftarrow 4.5V \rightarrow 8V, color VR: 4.5V, contrast VR: 6V	± 40			deg
APC Pull-in Range	Δ f _{APC}		± 300			Hz
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	

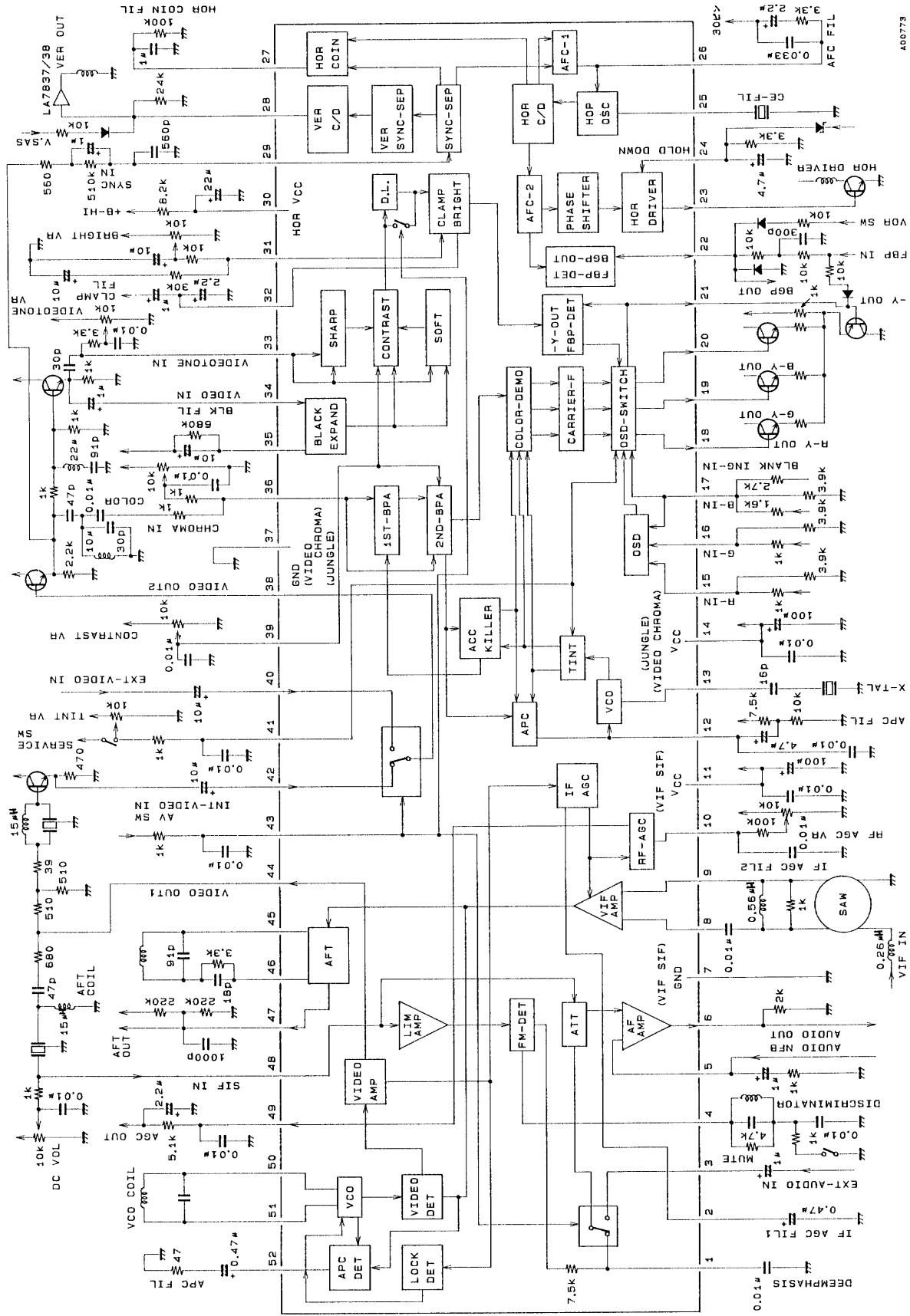
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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Demodulator Phase Angle	RB	Monochrome signal, contrast VR: 6V, color VR: B – Y = 1V _{po}	97	105	113	deg
	GB	Monochrome signal, contrast VR: 6V, color VR: B – Y = 1V _{po}	–130	–120	–110	deg
Demodulator Output DC Voltage	V _{C-Y}	Burst signal only, color VR: 0V	4.7	5.2	5.7	V
Demodulator Output DC Offset Voltage	ΔV _{C-Y}	Burst signal only, color VR: 0V	–200	0	+200	mV
Demodulator Output Residual Carrier	E _{car}	Quiescent, killer off, color VR: 0V			0.03	V _{p-p}
[OSD]						
Blanking Pulse Threshold Level	TH _{BL}	C – IN: color bar, B – IN: variable	0.5	0.8	1.1	V
– Y Out DC Voltage (OSD mode)	V _{-Y}	B–IN : 1.5V	2.5	2.8	3.1	V
RGB – In Threshold Level	TH _R	R – IN: variable, B – IN: 1.5V	1.9	2.2	2.5	V
	TH _G	G – IN: variable, B – IN: 1.5V				
	TH _B	B – IN, variable				
RGB – Y Out DC Voltage (3 V)	V _{R3V}	R, G, B – IN :3V	5.2	5.5	5.8	V
	V _{G3V}					
	V _{B3V}					
RGB – Y Out DC Voltage (4 V)	V _{R4V}	R, G, B – IN : 4V	5.7	6.0	6.3	V
	V _{G4V}					
	V _{B4V}					
RGB – Y Out DC Voltage (5 V)	V _{R5V}	R, G, B – IN : 5V	6.2	6.5	6.8	V
	V _{G5V}					
	V _{B5V}					
[Deflection]						
Synchronization Separator Input DC Level	V _{SDC}		6.0	6.3	6.6	V
Vertical Free-Running Period	T _{V free}		262	262.5	263	H
Maximum Vertical Synchronization Period	T _{V max}	Input: horizontal synchronization signal only	296.5	297	297.5	H
Minimum Vertical Synchronization Period	T _{V min}		224.5	225	225.5	H
Vertical Blanking Pulse Width	P _{W VBL}		20.25	20.5	20.75	H
Vertical Blanking Pulse Wave Height Value	P _{H VBL}		7.0	7.5		V
Vertical Output Pulse Width	P _{W VOUT}		8.25	8.5	8.75	H
Vertical Output Voltage	V _{OUT H}		5.7	6	6.3	V
	V _{OUT M}		4.2	4.5	4.8	V
	V _{OUT L}				0.3	V
Vertical External Trigger Load Resistance	R _{TR}		2.7	3.6		kΩ
Vertical Automatic Synchronization Stop Voltage	V _{SAS}			1.9	2.4	V
Vertical Output Pulse Start V _{CC} Voltage	S _{VV}				4	V
Horizontal Free-Running Frequency Deviation	Δf _H	Deviation from 15.734kHz	–90	+30	+150	Hz
Dependence of Horizontal Free-Running Frequency on V _{CC}	Δf _{H VCC}	V30 = 6.7V, reference value		2		Hz
Horizontal Pull-in Range	f _{H PULL}	Deviation from 15.734kHz	±400			Hz
Horizontal Output Pulse Width	P _{WH OUT}		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
Horizontal Output Pulse Start V _{CC} Voltage	S _{HV}			4.5	5.3	V
AFC II FBP Peak Voltage	F _{BPH}		4.1	4.6	5.1	V
Burst Gate Pulse Delay Time	T _{d BGP}		0.2	0.6	1.2	μs
Burst Gate Pulse Width	P _{W BGP}		2.7	3.7	4.7	μs
VCR SW Input Voltage	V _{CR}			1.3	2.0	V
X-ray Protector Circuit Operation Input Voltage	V _{HD}		0.64	0.74	0.84	V
Horizontal Synchronization Detection Threshold Level	H _{coin}		4.2	4.5	4.8	V

Sample Application Circuit



Unit (resistance:Ω, capacitance:F)

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