Ordering number : EN5635

Monolithic Linear IC

LA7688

Single-Chip CTV Signal-Processing Circuit for PAL and NTSC Formats

Overview

The LA7688 integrates VIF, SIF, video, chrominance, and deflection processing circuits for PAL/NTSC format TV sets on a single chip and is provided in a 52-pin shrink package.

The VIF and SIF circuits achieve semi-adjustment-free operation, and are adjustment-free except for the VCO coil and the RF AGC circuit. The chrominance circuit can be made adjustment-free by using the LC89950 1H delay line IC. All the signal processing required for a multi-format color TV can be implemented by combining this product with the LA7642 SECAM decoder IC.

Features

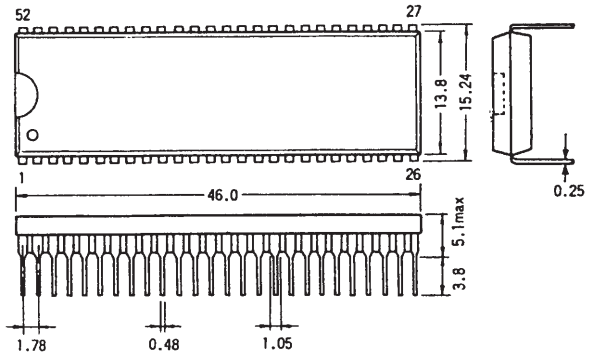
[VIF] • PLL detector • Buzz canceller
[SIF] • PLL detector • Audio switch
[VIDEO] • Built-in trap • Built-in DL
• Aperture control
• Video switch (SVO output)
• Black expansion
[CHROMA] • PAL/NT • Base band processing (adjustment free)
• Built-in bandpass filter
[OSD] • Analog OSD
[DEF] • Automatic 50/60 Hz discrimination
• Fixed vertical size • Double AFC
• Built-in sync separator circuit
[Other features] • Sandcastle pulse (for the 1H delay line)
• fsc output (for SECAM systems)
• Primary color output

Package Dimensions

unit: mm

3218-DIP52S

[LA7688]



SANYO: DIP52S

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{40} max		9	V
	V_{45} max		9	V
Maximum supply current	I_{24} max		16	mA
FBP input current	I_{26} max		5	mA
	I_{32} max		10	mA
FBP input voltage	I_{26} min		–5	V
Allowable power dissipation	Pd max	Ta ≤ 65°C When mounted on a printed circuit board*	1.3	W
Operating temperature	Topr		–10 to +65	°C
Storage temperature	Tstg		–55 to +150	°C

Note : * Printed circuit board size: 83 × 86 × 1.5 mm, material: Bakelite

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{40}		7.6	V
	V_{45}		7.6	V
Recommended supply current	I24		12	mA
Operating voltage range	V_{40} op		7 to 8.2	V
	V_{45} op		7 to 8.2	V
Operating current range	I_{24} op		10 to 16	mA

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Operating Characteristics at Ta = 25°C, $V_{CC40, 45}$ = 7.8 V, I_{24} = 12 mA

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Circuit Voltages and Currents]						
Horizontal power-supply voltage	$V_{CC}H$	Deflection system (V_{24})	6.4	6.9	7.4	V
Current drain	I_{40}		78	90	100	mA
	I_{45}		34	40	48	mA
[VIF Block]						
RF AGC maximum voltage	V_{50H}		7.5	7.8	7.8	V
RF AGC minimum voltage	V_{50L}			0.2	0.6	V
Input sensitivity	V_i			39	45	dBμ
AGC range	GR		56	60		dB
Maximum allowable input	$V_{IN\ max}$		95	100		dBμ
Quiescent video output voltage	V_8		4.1	4.4	4.7	V
Synchronizing signal tip voltage	V_{8tip}		1.7	2.0	2.3	V
Video output amplitude	V_O		1.7	2.0	2.3	Vp-p
Black noise threshold voltage	V_{BTH}		1.0	1.3	1.7	V
Black noise clamp voltage	V_{BCL}		2.7	3.0	3.3	V
Output signal-to-noise ratio	S/N		48	52		dB
1.07 MHz beat level	C/S		40	44		dB
Frequency characteristics	f_C		6	9		MHz
Differential gain	DG			5	10	%
Differential phase	DP			6	10	deg
Quiescent AFT voltage	V_7		3.6	3.9	4.2	V
Maximum AFT voltage	V_{7H}		7.3	7.6	7.8	V
Minimum AFT voltage	V_{7L}		0	0.3	0.7	V
AFT detection sensitivity	Sf		10	15	20	mV/kHz
VIF input resistance	Ri	f = 38.9 MHz	1.0	1.3	1.6	kΩ
VIF input capacitance	Ci	f = 38.9 MHz	2	3	5	pF
APC pull-in range (U)	f_{PU}		0.8	2.0		MHz
APC pull-in range (L)	f_{PL}			–2	–0.8	MHz
VCO1 maximum variation range	Δ_{fU1}		0.8	2.0		MHz
	Δ_{fL1}			–2.0	–0.8	MHz
SIF signal level	S_{OUT}		110	140	170	mVrms
VCO1 control sensitivity	ß		2.4	4.8	9.6	kHz
[SIF Block]						
SIF limiting sensitivity	V_i (lim)		40	46	52	dBμ
FM detector output voltage	V_O (FM)		390	500	710	mVrms
AMR	AMR		40	60		dB
Total harmonic distortion	THD			0.3	1.0	%
SIF S/N	S/N (SIF)		55	62		dB
FM detector range (L)	W_{FML}			2.5	4.0	MHz
FM detector range (H)	W_{FMH}		7.0	8.0		MHz
FM detector output variability	ΔV_O		0	2.0	3.0	dB
[INT/EXT Switching Block]						
AFT EXT gain	G_{AF}		–0.7	–0.2	+0.3	dB
AFT EXT distortion	THD_{AF}			0.03	0.5	%
System switch I-SE	$V1_{TH1}$	Notes:	0		1.2	V
System switch I-P/N	$V1_{TH2}$	I = INT, E = EXT	1.7		2.6	V
System switch E-P/N	$V1_{TH3}$	P/N = PAL/NTSC	2.9		3.8	V
System switch E-SE	$V1_{TH4}$	SE = SECAM	4.1		5	V
[Video Switching Block]						
Video signal input 1 DC voltage	V_{10DC}		3.2	3.5	3.8	V
Video signal input 1 AC voltage	V_{10AC}			1.0		Vp-p
Video signal input 2 DC voltage	V_{14DC}		3.2	3.5	3.8	V
Video signal input 2 AC voltage	V_{14AC}			1.0		Vp-p
SVO pin DC voltage	V_{16DC}		2.5	2.8	3.1	V
SVO pin AC voltage	V_{16AC}		1.7	2.0	2.3	Vp-p

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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Filter Block]						
Filter automatic adjustment open voltage	V_{9OPN}	f_{SC} = 4.43 MHz	3.3	3.8	4.3	V
S input threshold	V_{9TH}		1.5	2.0	2.5	V
C-TRAP	G_{TRAP}		–20	–26	–32	dB
C-BPF1	G_{BPF1}		–5	–3	–1	dB
C-BPF2	G_{BPF2}		–2	–1	0	dB
C-BPF3	G_{BPF3}		–6	–4	–2	dB
Y-DL TIME1	T_{dy1}	PAL	400	450	500	ns
Y-DL TIME2	T_{dy2}	NTSC	410	460	510	ns
Y-DL TIME3	T_{dy3}	S (PAL)	230	280	330	ns
Y-DL TIME4	T_{dy4}	SECAM	510	560	610	ns
[Video Block]						
Contrast center	E_{CCEN}		1.0	1.2	1.4	Vp-p
Contrast variation range	dGC		18	22	26	dB
Brightness minimum (0.5 V)	VB min		0.4	0.7	1.0	V
Brightness typical (2.5 V)	VB typ		1.9	2.2	2.5	V
Brightness maximum (4.5 V)	VB max		3.4	3.7	4.0	V
Soft control characteristics	dG_{SOFT}		–6.0	–4.0	–2.0	dB
Sharp control characteristics	dG_{SHARP}		4.5	7.5	10.5	dB
Y signal frequency characteristics (1)	BW1	S-VHS	3.9	4.4	4.9	MHz
Y signal frequency characteristics (2)	BW2	PAL	3.0	3.35	3.7	MHz
Y signal frequency characteristics (3)	BW3	NTSC	2.5	2.85	3.2	MHz
DC transmission ratio	dVAPL			100		%
Black expansion threshold	BS_{TH}		40	50	60	IRE
Black expansion maximum gain	BSmax		–20	–13	–6	IRE
[Chrominance Common]						
R-Y output DC voltage	V_{39DC}		3.6	4.0	4.4	V
R-Y output AC voltage	E_{39AC}		0.45	0.60	0.75	Vp-p
B-Y output DC voltage	V_{38DC}		3.6	4.0	4.4	V
B-Y output AC voltage	E_{38AC}		0.35	0.5	0.65	Vp-p
R-Y input DC voltage	V_{37DC}		4.2	4.6	5.0	V
R-Y input AC voltage	E_{37AC}		0.45	0.60	0.75	Vp-p
R-Y input AC range	E_{37ALC}		160	200	250	mVp-p
B-Y input DC voltage	V_{36DC}		4.2	4.6	5.0	V
B-Y input AC voltage	E_{36AC}		0.35	0.5	0.65	Vp-p
B-Y input AC range	E_{36ALC}		160	200	250	mVp-p
Residual color	E_{CMIN}				200	mVp-p
Contrast color amplitude characteristics	dG_{CC}		30	35	40	dB
RGB output DC difference voltage	dVC	With no chrominance signal input	–0.3	0	+0.3	V
RGB output DC voltage temperature characteristics	∂VC/∂T	With no chrominance signal input		0		mV/°C
RGB output residual high-frequency level	E car				0.2	Vp-p
RGB output residual carrier level	e car	With no chrominance signal input			0.3	Vp-p
fSC output pin DC voltage	V_{27OPN}		4.5	5.0	5.3	V
fSC output level P	V_{27ACP}	PAL	0.14	0.2	0.26	Vp-p
fSC output level N	V_{27ACN}	NTSC	0.19	0.26	0.33	Vp-p
DEF COIN-L	V_{27LO}		1.0	1.3	1.6	V
Crystal switching threshold	V_{27TH}			400		µA
PAL switching threshold	V_{18PTH}				0.6	V
NT switching threshold	V_{18NTH}		0.9			V

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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Chrominance System PAL Block]						
ACC amplitude characteristics 1	ACC1p		–2	+1	+4	dB
ACC amplitude characteristics 2	ACC2p		–4	0	+2	dB
Killer operating point	E KILp		–37	–30	–25	dB
Killer hysteresis	dE KILp		1	3	7	dB
RGB output level	E Bp	Chrominance: 50%, color: typical	4.1	4.6	5.1	Vp-p
Maximum RGB output	EBmaxp	Chrominance: 50%, color: maximum	5.4	5.9	6.4	Vp-p
APC pull-in range +	df scp+		500			Hz
APC pull-in range −	df scp−				–500	Hz
Demodulated output ratio B/R	B/Rp		1.50	1.78	2.00	double
Demodulated output ratio G/R	G/Rp	With no B-Y signal	–0.56	–0.51	–0.46	double
Demodulated output ratio G/B	G/Bp	With no R-Y signal	–0.21	–0.91	–0.17	double
Demodulation angle	RBp		85	90	95	deg
[Chrominance System NTSC Block]						
ACC amplitude characteristics 1	ACC1n		–2	+1	+4	dB
ACC amplitude characteristics 2	ACC2n		–4	0	+2	dB
ACC phase characteristics 1	PCC1n		–3	0	+3	deg
ACC phase characteristics 2	PCC2n		–5	0	+5	deg
Killer operating point	E KILn		–40	–34	–29	dB
Killer hysteresis	dE KILn		1	4	8	dB
RGB output level	E Bn	Chrominance: 50%, color: typical	3.4	3.9	4.4	Vp-p
Maximum RGB output	EBmaxn	Chrominance: 50%, color: maximum	5.0	5.5	6.0	Vp-p
APC pull-in range +	df scn+		350			Hz
APC pull-in range –	df scn−				–350	Hz
Tint control variation range	dP TI		–33		+50	deg
Demodulated output ratio R	R/Bn		0.81	0.90	0.99	double
Demodulated output ratio G	G/Bn		0.24	0.30	0.36	double
Demodulation angle RB	RBn		95	105	115	deg
Demodulation angle GB	GBn		–130	–120	–110	deg
[RGB Block]						
OSD input level	E_{OSD}	Standard input, 100% white level		0.7		Vp-p
OSD input DC voltage	V_{OSD}	With no signal	2.9	3.2	3.5	V
F-BLK input threshold level	V_{28TH}		0.8	1.0	1.2	V
OSD output pedestal level difference	V_{OSDC}		–0.3	0	+0.3	Vp-p
OSD output maximum	E_{OSD}max		4.3	4.8	5.3	Vp-p
OSD output minimum	E_{OSD}min		0.3	0.6	0.9	Vp-p
Character signal output frequency characteristics	BW_{OSD}		5	7		MHz
TV-OSD crosstalk (C-Y)	CT_{TVC}		50			dB
OSD-TV crosstalk (C-Y)	CT_{OSDC}		40			dB
Character signal inter-character crosstalk	CT_{OSD}		30			dB
[DEF Block]						
Vertical free-running period 50	TV_{FREE50}		312.0	312.5	313.0	H
Vertical free-running period 60	TV_{FREE60}		262.0	262.5	263.0	H
Vertical synchronization maximum period 50	TVmax50	Horizontal synchronizing signal only	356.5	357.0	357.5	H
Vertical synchronization maximum period 60	TVmax60	Horizontal synchronizing signal only	296.5	297.0	297.5	H
Vertical synchronization minimum period 50	TVmin50		268.5	269.0	269.5	H
Vertical synchronization minimum period 60	TVmin60		224.5	225.0	225.5	H
Vertical blanking peak value	V_{HVBL}			0.6	1.0	V
Vertical blanking pulse width 50	PW_{BLK50}		23	23.5	24	H
Vertical blanking pulse width 60	PW_{BLK60}		19	19.5	20	H
Vertical output pulse width	PW_{VOUT}		8.0	8.5	9.0	H
Vertical output voltage H	V_{OUTH}		5.3	5.6	5.9	V
Vertical output voltage M	V_{OUTM}		4.0	4.3	4.6	V
Vertical output voltage L	V_{OUTL}				0.3	V

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Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Vertical external trigger load resistance	RTR		3.0	4.7		kΩ
Vertical automatic synchronization stop voltage	V_{SAS}			1.4	1.9	V
Horizontal AFC gate release voltage	V_{GS}			2.0	2.5	V
Vertical output start V_{CC} voltage	SVV			4.2	4.7	V
Horizontal free-running deviation	Δf_H		–150	0	+150	Hz
Horizontal free-running frequency V_{CC} dependence	$\Delta f_H/V_{CC}$			2		Hz
Horizontal pull-in range	f_{HPLL}		±450			Hz
Horizontal output start V_{CC} voltage	S_{HV}			4.8	5.2	V
AFC2 FBP peak value H	F_{BPH}		6.0	6.5	7.0	V
AFC2 FBP peak value M	F_{BPM}		3.2	3.7	4.2	V
AFC2 FBP peak value L	F_{BPL}		–0.3	+0.2	+0.7	V
Horizontal output pulse width	P_{WHOUT}		21.8	23.8	25.8	µs
Horizontal output phase maximum	HPmax		14	17		µs
Horizontal output phase center	HPcen		4.8	5.8	6.8	µs
Horizontal output phase minimum	HPmin			3.8	4.8	µs
Burst gate pulse width	PW_{BGP}		3	4	5	µs
Burst gate pulse phase	Td_{BGP}		–0.2	+0.3	+0.8	µs
50/60 Hz output voltage 50	V50			1.1	1.5	V
50/60 Hz output voltage 60	V60		3.8	4.1		V
50/60 Hz input voltage 50	$V_{IN}50$		0.5			V
50/60 Hz input voltage 60	$V_{IN}60$				7.0	V
SECAM V pulse peak value	SVH		1.8	2.2	2.6	V
SECAM V pulse width	SVW		11.0	11.5	12.0	H

Test Circuit