No.2917

LA7655N

Monolithic Linear IC

1-Chip IC for Color TV Signal Processing

The LA7655N, being a single-chip IC for NTSC color TV use, is a performance-improved version of the single-chip IC LA7650K heretofore in use and incorporates a circuit to process all types of signals (VIF, SIF, video, chroma, deflection) for color TVs based on the NTSC system. In designing this IC, its basic characteristics including synchronization performance are greatly improved, and taking into consideration its needed application in AV equipment such as VTRs, the necessity of adjustment is substantially reduced. Also, the number of components is reduced, and the element is made compact to achieve DIP42S (shrink type). A simple, compact color TV can be implemented by simply connecting a tuner, power supply, and output circuit to the LA7655N.

When using the LA7655N in conjunction with vertical output-use IC LA7835/7836, only one connection (vertical timing pulse) is required, with no connection required for feedback, thus simplifying layout of printed circuit pattern.

Single-chip IC variations on mother type LA7655N are available as shown in Table 1. Various needs such as improvement in performance or functions of color TV sets can be met by using these single-chip ICs in conjunction with peripheral ICs shown in Table 2.

Features

- Small-sized package
- Minimum number of external parts required

VIF·SIF

- Excellent buzz beat characteristics
- High-gain VIF amplifier eliminating the need for a preamplifier
- AGC speed can be increased.
- Video/audio simultaneous muting, or audio-only muting possible

Video·Chroma

- A quadratic differentiation circuit allowing soft video tone operation is also incorporated.
- Adjustment-free chroma sync
- The LA7690 (flesh color corrector IC) can be connected to the LA7655N.

Deflection

- Adjustment-free horizontal, vertical sync
- Dual AFC system with excellent horizontal noise characteristics
- Vertical sync stabilizing circuit which is scarcely affected by motor noise.

Maximum Ratings at Ta = 25°C

				unit
Maximum Supply Voltage	V_9 max		12	V
	V_{11} max		12	V
Maximum Supply Current	I_{20} max		16	mA
Allowable Power Dissipation	Pd max	Tℓ ≤ 65°C	1.3	W
Operating Temperature	Topg		−10 to +65	°C

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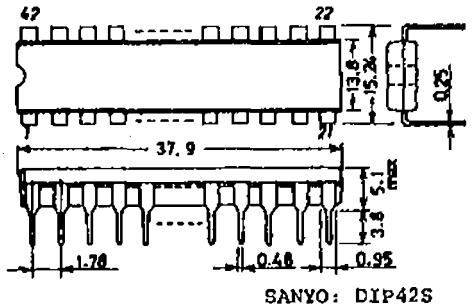
Case Outline 3025B-D42SIC
(unit : mm)



SANYO: DIP42S

Specifications and information herein are subject to change without notice.

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				unit
Storage Temperature	Tstg		−55 to +125	°C
Circuit Current	I_{36} max		−6	mA
	I_4 max		−3	mA
FBP Input Current	I_{21} max	Peak current	5	mA
	I_{19} max	Peak current	10	mA

Operating Conditions at Ta = 25°C

			unit
Recommended Supply Voltage	V_9	9	V
	V_{11}	9	V
Recommended Supply Current	I_{20}	13	mA
Operating Voltage Range	V_9 op	8 to 10	V
	V_{11} op	8 to 10	V
Operating Current Range	I_{20} op	10 to 16	mA

Operating Characteristics at Ta = 25°C, $V_{CC} = V_9 = V_{11} = 9V$, $I_{CC} = I_{20} = 13mA$

[Circuit Voltage, Current]			min	typ	max	unit
Horizontal Supply Voltage	V_{20}	V_{CC} = 9V, I_{CC} = 13mA	7.3	7.8	8.3	V
Supply Current	$I_9 + I_{11}$	V_{CC} = 9V, I_{CC} = 13mA	67	93	124	mA
[VIF] fp = 58.75MHz						
Video Detector DC Output Voltage	V_{36}	Quiescent	4.2	4.6	5.0	V
AFT Output Voltage	V_{38}	Quiescent	2.8	4.2	5.7	V
Maximum RF AGC Control Voltage	V_{40H}	CW = 85dBμ, RF AGC VR = min	7.6	8.0	8.3	V
Minimum RF AGC Control Voltage	V_{40L}	CW = 85dBμ, RF AGC VR = max	0	0.01	0.3	V
VIF Input Sensitivity	Vi	VIF input level at which video output is 0.8Vp-p (40%MOD).	30	36	42	dBμ
VIF AGC Control Range	GR	Maximum input (V0 = 0.8Vp-p) -input sensitivity	62	70		dB
VIF Maximum Permissible Input	Vi max	VIF input level at which video output is +1dB.	102	110		dBμ
Video Detector Output	V_{O36}	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	deg
Video S/N	S/N	Vi = 80dBμ, $\frac{AM = 78\%\ MOD}{CW}$	47	53		dB
Sync-Tip Level	V_{36} TIP	CW = 80dBμ	2.0	2.3	2.6	V
Video Frequency Characteristic	f_C	Frequency at which video output is down 3dB.	5.0	7.0		MHz
VIF Intermodulation	I_{920}	V3.58MHz/V920kHz, Vi = 80dBμ	28	35		dB
Maximum AFT Control Voltage	V_{38H}	CW = 80dBμ, frequency change	8.2	8.6	8.9	V
Minimum AFT Control Voltage	V_{38L}	CW = 80dBμ, frequency change	0.1	0.3	0.8	V
AFT Detector Sensitivity	Sf	CW = 80dBμ, frequency change	50	80	120	mV/kHz
AFT Switch Operation Start Voltage	V_{AFT} SW	Test with sweep signal.	1.0	5.0		V
BlackNoise Threshold Level	V_{BTH}	Test with sweep signal.	1.2	1.5	1.8	V
White Noise Threshold Level	V_{WTH}	Test with sweep signal.	4.9	5.3	5.7	V
[SIF, ΔF] fs = 4.5MHz						
Sound D Input Limiting Sensitivity	Vilim	SIF input level at which detection output is down 3dB.		48	55	dBμ

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			min	typ	max	unit
FM Detector Output Voltage	V_{O1}	Vi=100dBμ,Δf=±25kHz	380	550	750	mVrms
FM Detector Output Distortion	THD	Vi=100dBμ,Δf=±25kHz		0.4	1.0	%
AM Rejection	AMR	Vi=100dBμ, FM:Δf=±25k / AM:30%	40	53		dB
AF Amp Voltage Gain	G_{AF}	Vi=100mVrms,f=400Hz	18	20	22	dB
AF Maximum Output Voltage	V_{O4} max	Output level at which AF amp output distortion is 10%	2.0	3.0		Vrms
AF Electronic Attenuator Range	A_{TT}	Vi=200mVrms,f=400Hz	70	80		dB
[Video]						
Soft Video Tone Variable Range	ΔSoft	f=2MHz,100mVp-p, video tone VR:4V→0V	−6	−4	−2	dB
Sharp Video Tone Variable Range	ΔSharp	f=2MHz,100mVp-p video tone VR:4V→9V	8	11	14	dB
Video Voltage Gain	GV	f=100kHz,100mVp-p contrast VR:9V, video tone VR: 4V	17	20	23	dB
Contrast Control Center	C_{CEN}	f=100kHz,100mVp-p contrast VR:6V	0.45	0.57	0.69	Vp-p
Contrast Variabl Range	ΔCV	Contrast VR:3V→9V	19	21	23	dB
Bright Control	B_{RH}	Bright VR:2V	5.8			V
	B_{RCEN}	Bright VR:4.5V	2.6	3.1	3.6	V
	B_{RL}	Bright VR:7V			1.2	V
Frequency Response	f_V	Contrast VR:6V, video tone VR:4V, 3dB down	5	7		MHz
DC Transmission	R_{DC}	Input: stair step signal, 200mVp-p	88	93		%
[Chroma]						
ACC Amplitude Characteristics	ACC1	+6dB	−3	0	+3	dB
	ACC2	−20dB	−7		+2	dB
ACC Phase Characteristics	ACCP1	+6dB	−3	0	+3	deg
	ACCP2	−20dB	−7		+7	deg
Killer Operating Point	EK		−51	−44	−37	dB
Color Control Minimum	EC min	Color VR:0V, Contrast VR:9V			30	mVp-p
Color Residue Color Control Center	EC CEN	Color VR:4.5V, Contrast VR:6V	1.6	2.4	3.2	Vp-p
Minimum Demodulator Output	EC max	Color VR:9V, contrast VR:9V	4.0	5.0		Vp-p
Contrast Color Variable Range	ΔCC	Color VR:B-Y=2.5mVp-p contrast VR:3V→9V	17.5	19	20.5	dB
Tint Control Center	T_{CEN}	Tint VR=4.5V, color VR:4.5V, contrast VR:6V	−16	−4	+8	dog
Tint Variable Range	ΔT	Tint VR:0V←4.5V→9V, color VR:4.5V, contrast VR:6V	±40			deg
APC Pull-In Range	Δf_{APC}		±350			Hz
Demodulator Output Ratio	R/B	Monochrome signal, contrast VR:6V, color VR:B-Y=1Vpo	0.81	0.90	0.98	times
	G/B	Monochrome signal, contrast VR:6V, color VR:B-Y=1Vpo	0.24	0.30	0.38	times

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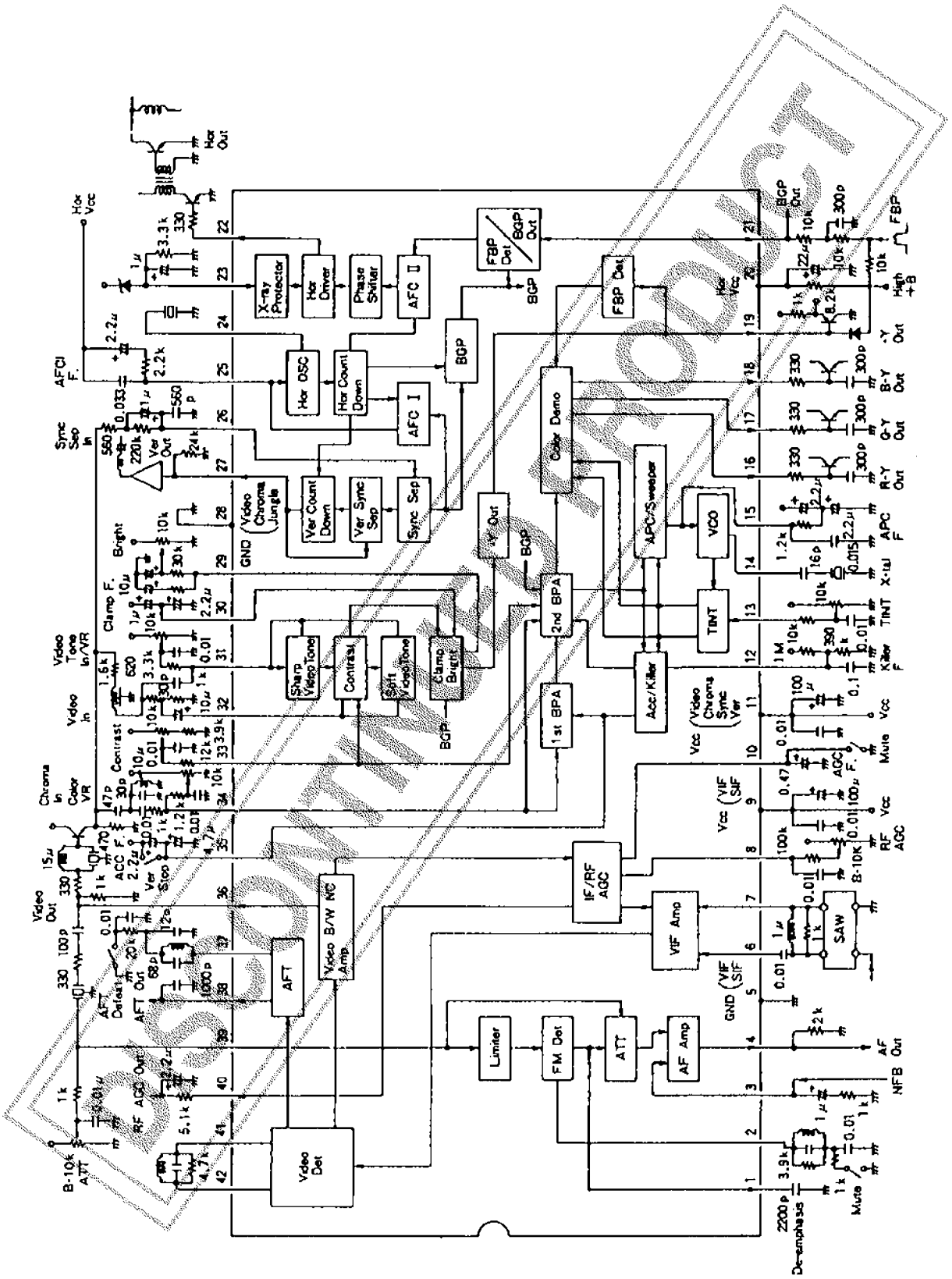
			min	typ	max	unit
Demodulator Phase Angle	$\angle R_B$	Monochrome signal, contrast VR:6V, color VR:B-Y=1Vpo	97	105	113	deg
	$\angle G_B$	Monochrome signal, contrast VR:6V, color VR:B-Y=1Vpo	−130	−120	−110	deg
Demodulator Output DC Voltage	$V_{C\text{-}Y}$	Burst signal only, color VR:0V	4.7	5.2	5.7	V
Demodulator Output Offset Voltage	$\Delta V_{C\text{-}Y}$	Burst signal only, color VR:0V	−300	0	+300	mV
Dependence of Demodulation Output on V_{CC}	ΔE_C	$V_{CC}=9V\pm1V$	0	10	20	%/V
Residual Carrier	Ecar	Quiescent,killer OFF, color VR:0V			0.3	Vp-p
[Deflection]						
Sync Separator Input DC Level	VS DC		6.0	6.3	6.6	V
Vertical Free-Running Period	TV max	Input:horizontal sync signal only	296.5	297	297.5	H
Vertical Minimum-Running Period	TV min		224.5	225	225.5	H
Vertival Blanking Pulse Width	$P_{W\,VBL}$		17.25	17.5	17.75	H
Vertical Blanking Pulse Voltage	$P_{H\,VBL}$		7.0	7.5		V
Vertical Output Pulse Width	PW V_{OUT}		8.25	8.5	8.75	H
Vertical Output Pulse 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 Synchronizer Stop Voltage	V_{SAS}			1.9	2.4	V
Vertical Operation Start Voltage	S_{VV}				4	V
Horizontal Free-Running Frequency Deviation	Δf_H	Deviation from 15.734kHz	−70	30	130	Hz
Dependence of Horizontal Free-Running Frequency on V_{CC}	Δf_H V_{CC}	$V_{20}=6.7V$ reference value		2		Hz
Horizontal Sync 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}		13	15		μs
	H_P CEN		3.4	3.9	5.4	μs
	H_{PR}				0	μs
Horizontal Operation Start Voltage	S_{HV}			4.3	5	V
AFC II FBP Peak Voltage	F_{BPF}		3.3	3.9	4.5	V
Burst Gate Pulse Delay Time	Td $_{BGP}$		0.2	0.6	1.2	μs
Burst Gate Pulse Width	PW_{BGP}		2.7	3.7	4.7	μs
VCR SW Input Voltage	VCR			0.65	1.3	V
X-ray Protector Operation Voltage	V_{HD}		0.55	0.65	0.75	V

NTSC 1 chip IC

LA7655N



Single-chip ICs (Table 1)

	LA7656N	LA7651P		LA7652N
		Pin 4 open	Pin 4 GND	
Applications	· Mother type · Suited for general-purpose CTV	· High-grade AV set	· Intended for standard base band interface of CATV	· Making use of video signal during vertical blanking period (ex. automatic kine-bias)
(Features) · Quadratic differention input polarity	Positive	Negative	Negative	Positive
· Vertical blanker	With	With	With	Without
· Black noise cancelar	With	With	Without	With
· Screen brightness at no video signal input mode	※1 Dark	※2 Bright	※3 Bright	Dark
· IF AGC	With	With	Without	With
· ATT & AF amp	With	Without	Without	With
Remarks	· Advanced model of LA7650K · Pin-compatible with LA7650K, with no change required in applications	· Quadratic differentiation possible using external TR,L,C	· Can be used in conjunction with base band interface IC LA7970 to satisfy EIA IS-15.	· Vertical blanker removed for applications where video signal is required during vertical blanking period (ex. automatic kine-bias)
Availability of sample (Schedule)	Available	January, 1989		Unfixed

*1 Brightness uncontrollable. Can be made brighter by using an external circuit.
*2 Brightness controllable
*3 For availability of sample, contact our sales department.

Peripheral ICs (Table 2)

	Applications	Package	Features
LA7510	Quasi-parallel 1st SIF	SEP9	· Quasi-parallel circuit configuration can be implemented simply by connecting a very small-sized SEP9.
LA7970	CATV base band interface	DIP24S	· Can be used in conjunction with LA7651P to satisfy complicated EIA IS-15 easily.
LA7696	ON-screen diaplay interface	DIP20S	· External input··· R,G,B graphic input (TTL level) · Black border function to make characters clear · Auto green circuit
LA7760 LA7761	US stereo decoder	DIP30S DIP28S	· US bilingual, stereo decoder
LA7952 LA7953 and others	AV switch	SEP9 to DIP30S	· Switch IC for external input
LA7835 LA7836	Vertical output	SEP13H	· Selected according to CRT size. Vert-ical output with ramp generator LA7835 1.8Ap-p LA7836 2.2Ap-p