Ordering number: EN 3797A

Monolithic linear IC

LA7698

Color-Difference Signal Correction IC for Color TVs

Overview

The LA7698 performs flesh-tone correction and green enhancement for color TV color-difference signals, and includes a color limiter function that prevents color saturation on the screen and color noise reduction (CNR) circuitry that eliminates color- difference output noise.

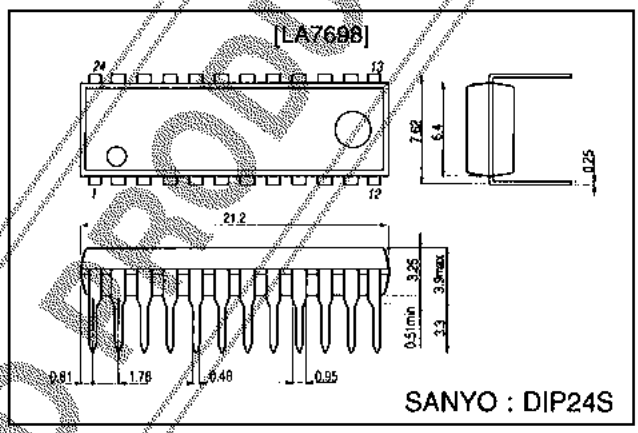
Functions and Features

- Flesh-tone correction, green enhancement, color limiter and CNR.
- The center axis of flesh-tone correction can be adjusted.
- Because green detection is performed through R-Y and B-Y detection, OSD green is not enhanced.
- The demo mode switch makes it possible to turn flesh-tone correction and green enhancement on and off for the left and right sides of the screen independently.
- The effectiveness of CNR can be adjusted through an external capacitor.

Package Dimensions

unit: mm

3067-DIP24S



Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC}max		13	V
Allowable power dissipation	Pd max	Ta ≦ 65°C	700	mW
Operating temperature	Topr		−15 to +65	°C
Storage temperature	Tstg		−55 to +150	°C

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		9	V
Operating supply voltage range	V_{CC}op		8 to 10	V

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Operating Characteristics at Ta = 25°C, V_{CC} = 9 V

Parameter	Symbol	Conditions	min	typ	max	Unit	Note
Current consumption	I_{CC}		19	27	41	mA	*1,2
Output voltage	V_O	Pin 9 (H-BLK IN) = 2 V	5	5.25	5.5	V	*1,2
Output voltage difference	ΔV_O	Pin 9 (H-BLK IN) = 2 V		0	50	mV	*1,2
Output voltage variation	ΔV_{O-H}	INPUT C = 1 µF	−1	−0.1	0	mV	*1,2
Input/output gain	G_O	INPUT = Sin : 100 kHz	−0.70	−0.35	−0.05	dB	*1,2
Input/output gain difference	ΔG_O	INPUT = Sin : 100 kHz		0	0.15	dB	*1,2
Frequency characteristics	F_O	Assuming 100 kHz as 0 dB, the frequency where a 3 dB decrease results	5			MHz	*1,2
Maximum output amplitude	Emax		4.1	4.7		Vp-p	*1,2
BLK threshold voltage	TH_{BLK}		1.0	1.4	1.8	V	*1,2
BLK minus allowable voltage	$-V_{BL}$		−0.7			V	*1,2
DEMO threshold voltage	TH_{DEMO}		3.5	3.7	3.9	V	*1,2
Color difference input voltage	$V_{IN,\ C-Y}$	Pin 9 (H-BLK IN) = 2 V	6.15	6.40	6.65	V	*1,2
Output voltage temperature characteristic	$\alpha V_O / \alpha T$	Pin 9 (H-BLK IN) = 2 V		0		mV/°C	*1,2
Variation for no green enhancement input	ΔV_{C-YG}	No input pin 11 = 0 V/9 V	−10	0	+10	mV	*1
Maximum green enhancement level	ΔV_{G-YGM}	P_{IN} = 227°, E_{B-Y} = 2 Vp-p, pin 11 = 9 V	200	225	245	mV	*1
	ΔV_{R-YGM}	P_{IN} = 227°, E_{B-Y} = 2 Vp-p, pin 11 = 9 V	−245	−225	−200	mV	*1
Green enhancement range + 1	ΔV_{G-YG+}	P_{IN} = 180°, E_{B-Y} = 2 Vp-p, pin 11 = 9 V	9	16	26	mV	*1
Green enhancement range + 2	ΔV_{R-YG+}	P_{IN} = 180°, E_{B-Y} = 2 Vp-p, pin 11 = 9 V	−26	−16	−9	mV	*1
Green enhancement range − 1	ΔV_{C-YG-}	P_{IN} = 270°, E_{B-Y} = 2 Vp-p, pin 11 = 9 V	5	10	18	mV	*1
Green enhancement range − 2	ΔV_{R-YG-}	P_{IN} = 270°, E_{B-Y} = 2 Vp-p, pin 11 = 9 V	−18	−10	−5	mV	*1
Green enhancement starting amplitude	E_{B-YGS}	P_{IN} = 227°, pin 11 = 9 V ΔV_{G-Y}, G = 5 mV	0.36	0.45	0.75	Vp-p	*1
G OSD variation during green enhancement	ΔVG_{OSD}	Only G-Y ± 2 V, pin 7 = 9 V		0	50	mV	*1
Flesh-tone correction voltage variation	ΔV_{C-YF}	No input pin 12 0 V/9 V	−10	0	+10	mV	*1
Flesh-tone correction phase	P_{AF-1}	P_{IN} = 120°, E_{B-Y} = 1 Vp-p, pin 14 = open, pin 12 = 9 V	117	120	123	deg	*1
	P_{AF-2}	P_{IN} = 105°, E_{B-Y} = 1 Vp-p, pin 14 = 1 V, pin 12 = 9 V	102	105	108	deg	*1
	P_{AF-3}	P_{IN} = 138°, E_{B-Y} = 1 Vp-p, pin 14 = 6 V, pin 12 = 9 V	135	138	141	deg	*1
Maximum correction level + 1	$\Delta V_{B-Y\ FM+}$	P_{IN} = 135°, E_{B-Y} = 1 Vp-p, pin 14 = open, pin 12 = 9 V	68	85	103	mV	*1
Maximum correction level + 2	$\Delta V_{R-Y\ FM+}$	P_{IN} = 135°, E_{B-Y} = 1 Vp-p, pin 14 = open, pin 12 = 9 V	21	26	31	mV	*1
Maximum correction level − 1	$\Delta V_{B-Y\ FM-}$	P_{IN} = 105°, E_{B-Y} = 1 Vp-p, pin 14 = open, pin 12 = 9 V	−120	−100	−80	mV	*1
Maximum correction level − 2	$\Delta V_{R-Y\ FM-}$	P_{IN} = 105°, E_{B-Y} = 1 Vp-p, pin 14 = open, pin 12 = 9 V	−10	0	+10	mV	*1
Flesh-tone correction range + 1	$\Delta V_{B-Y\ F+}$	P_{IN} = 50°, E_{B-Y} = 1 Vp-p, pin 14 = open, pin 12 = 9 V	−10	0	+10	mV	*1
Flesh-tone correction range − 1	$\Delta V_{B-Y\ F-}$	P_{IN} = 200°, E_{B-Y} = 1 Vp-p, pin 14 = open, pin 12 = 9 V	−10	0	+10	mV	*1
Flesh-tone correction range − 2	$\Delta V_{R-Y\ F-}$	P_{IN} = 200°, E_{B-Y} = 1 Vp-p, pin14 = open, pin 12 = 9 V	−10	0	+10	mV	*1
Flesh-tone correction starting amplitude	$E_{B-Y\ FS}$	P_{IN} = 105°, pin14 = open ΔV_{B-Y}, F = 5 mV	0.1	0.2	0.35	Vp-p	*1
Limiter red detection level	$E_{B-Y\ RD}$	P_{IN} = 104°, pin 13 = 9 V, pin 15 = open	2.6	3.0	3.4	Vp-p	*1
Limiter magenta detection level	$E_{B-Y\ MD}$	P_{IN} = 61°, pin 13 = 9 V, pin 15 = open	1.7	2.0	2.3	Vp-p	*1

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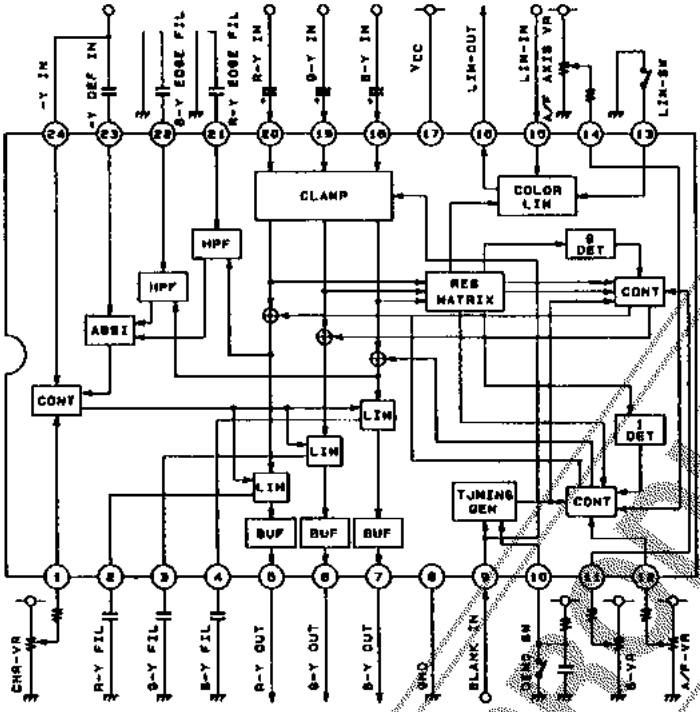
Parameter	Symbol	Conditions	Min	Typ	Max	Unit	Note
Tracking magenta detection	$E_{B\text{-}Y\ MDT}$	P_{IN} = 61°, pin 13 = 9 V, pin 15 = 3.4 V	2.9	3.3	3.7	Vp-p	*1
Limiter switch off voltage	$V_{CL\ OFF}$	P_{IN} = 61°, $E_{B\text{-}Y}$ = 3 Vp-p, pin 15 = open	0.4	0.6	0.8	V	*1
Green enhancement release voltage	$V_{GL\ OPEN}$	pin 11 open level	6.8	7.0	7.2	V	*1
Flesh-tone correction release voltage	$V_{FL\ OPEN}$	pin 12 open level	6.8	7.0	7.2	V	*1
Flesh-tone phase release voltage	$V_{FP\ OPEN}$	pin 14 open level	3.3	3.5	3.7	V	*1
CNR-ON voltage variation	$\Delta V_{C\text{-}Y\ CNR}$	No input pin 1 0 V/9 V	−10	0	+10	mV	
Maximum limiter amount	R-Y	V_{CNR} = 9 V, pin 23 = GND, pin 24 = 7 V V2 (+100 µA) − V2 (−100 µA)	600	715	785	mV	
	G-Y	V_{CNR} = 9 V, pin 23 = GND, pin 24 = 7 V V3 (+100 µA) − V3 (−100 µA)	295	340	370	mV	
	B-Y	V_{CNR} = 9 V, pin 23 = GND, pin 24 = 7 V V4 (+100 µA) − V4 (−100 µA)	600	715	785	mV	
Minimum limiter amount	R-Y	V_{CNR} = 0 V, pin 23 = GND, pin 24 = 7 V V2 (+100 µA) − V2 (−100 µA)		0		mV	
	G-Y	V_{CNR} = 0 V, pin 23 = GND, pin 24 = 7 V V3 (+100 µA) − V3 (−100 µA)		0		mV	
	B-Y	V_{CNR} = 9 V, pin 23 = GND, pin 24 = 7 V V4 (+100 µA) − V4 (−100 µA)		0		mV	
Maximum limiter level	$G_{R\text{-}Y}max$	INPUT = 500 kHz, 2 Vp-p, V_{CNR} = 9 V, pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		−4.2		dB	
	$G_{G\text{-}Y}max$	INPUT = 500 kHz, 1 Vp-p, V_{CNR} = 9 V, pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		−3.5		dB	
	$G_{B\text{-}Y}max$	INPUT = 500 kHz, 2 Vp-p, V_{CNR} = 9 V, pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		−4.2		dB	
Minimum limiter level	$G_{R\text{-}Y}min$	INPUT = 500 kHz, 0.2 Vp-p, V_{CNR} = 0 V, pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		−0.5		dB	
	$G_{G\text{-}Y}min$	INPUT = 500 kHz, 0.1 Vp-p, V_{CNR} = 0 V, pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		−0.5		dB	
	$G_{B\text{-}Y}min$	INPUT = 500 kHz, 0.2 Vp-p, V_{CNR} = 0 V, pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		−0.5		dB	
Normal limiter level	$G_{R\text{-}Y}typ$	INPUT = 50 kHz, 2 Vp-p, V_{CNR} = open, pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		−1.2		dB	
	$G_{G\text{-}Y}typ$	INPUT = 50 kHz, 1 Vp-p, V_{CNR} = open, pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		−0.6		dB	
	$G_{B\text{-}Y}typ$	INPUT = 50 kHz, 2 Vp-p, V_{CNR} = open, pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		−1.2		dB	
Color edge detection sensitivity	ΔV_{SCE}	Voltage difference between open voltage of pins 21 and 22 and edge detection	±60	±85	±110	mV	
Y edge detection sensitivity	ΔV_{SYE}	Voltage difference between open voltage of pin 23 and edge detection	±130	±160	±190	mV	
Y level detection voltage	$V_{Y}min$	No edge detection V_{CNT} = 9 V	0.9	1.2	1.5	V	
Y level detection voltage	$V_{Y}max$	No edge detection V_{CNT} = 9 V	3.6	3.9	4.2	V	
Limiter level control	V_{LCNT1}	Control voltage at which limiter amount is 50 mV	4.5	4.75	5.0	V	
Limiter level control	V_{LCNT2}	Control voltage which is −50 mV from maximum limiter amount	7.0	7.25	7.5	V	
Color edge filter voltage	$V_{EF\ OPEN}$	Open DC voltage of pins 21 and 22	4.65	4.9	5.15	V	
−Y differential input voltage	$V_{dY\ OPEN}$	Open DC voltage of pin 23	3.7	3.9	4.1	V	
Limiter control voltage	$V_{CNT\ OPEN}$	Open DC voltage of pin 1	5.8	6.0	6.2	V	
Limiter filter voltage	$V_{LF\ OPEN}$	Open DC voltage of pins 2, 3 and 4	3.95	4.2	4.45	V	

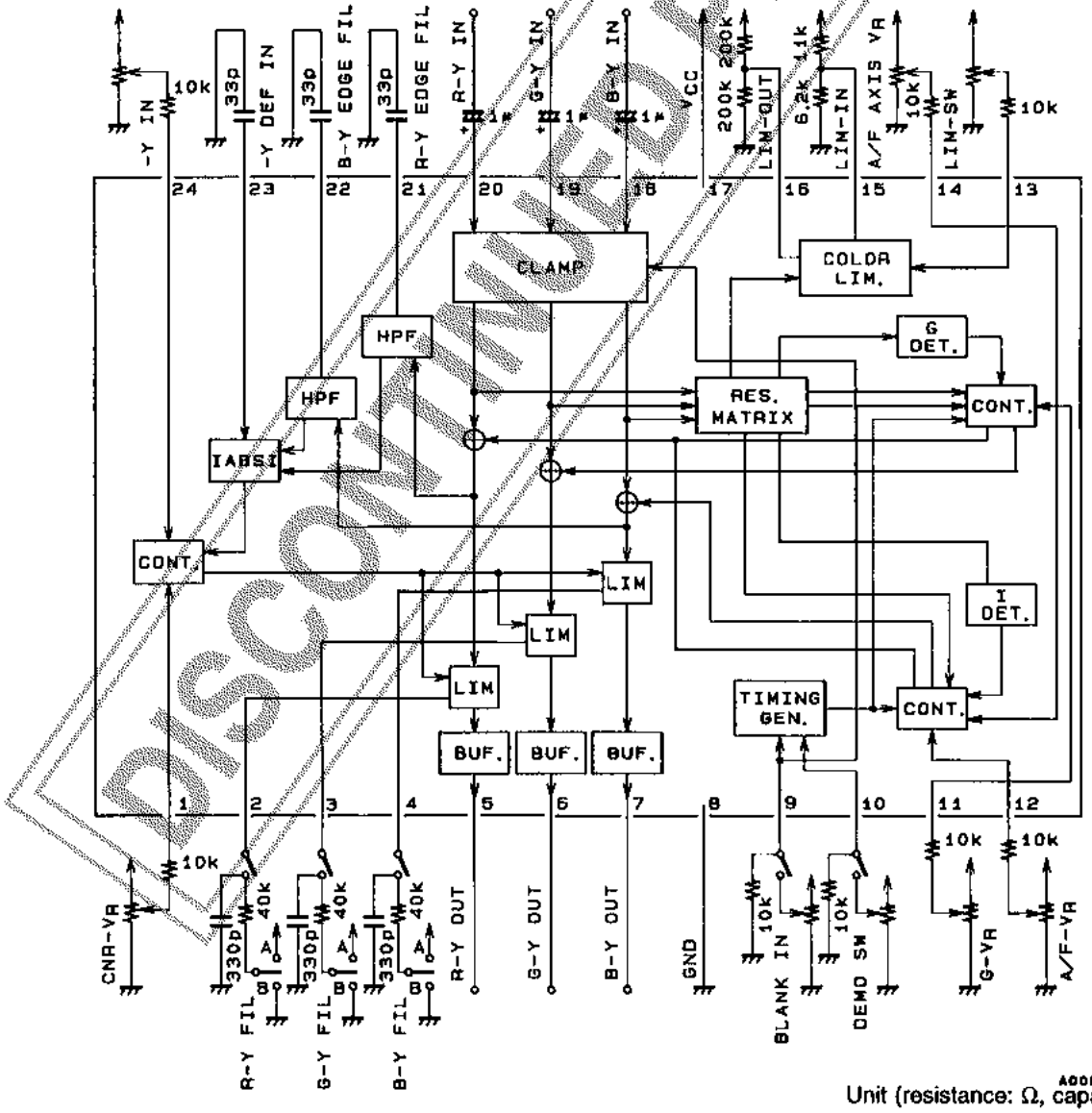
Notes: *1) When the CNR limiter level is at a minimum (pin 1 = 0 V)

*2) When both the green enhancement level and flesh-tone correction level are both at a minimum (pin 11 = 0 V; pin 12 = 0 V)

Block Diagram



Test Circuit



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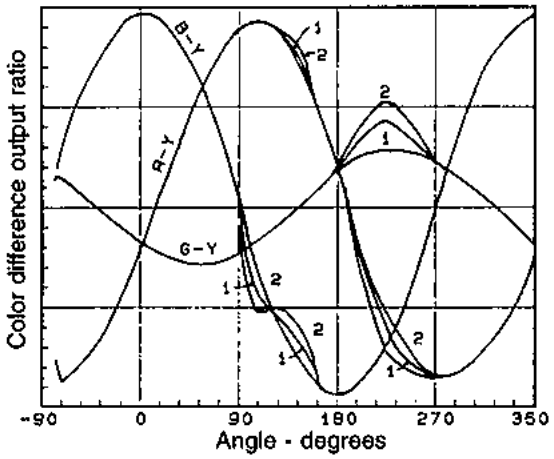
Unit (resistance: Ω, capacitance: F)

Note: All V_Rs are 10 kΩ variable resistors

Flesh-tone correction and green enhancement characteristics



Flesh-tone center adjustment