

**SANYO**

No. 3797A

**Color-Difference Signal  
Correction IC for Color TVs****Overview**

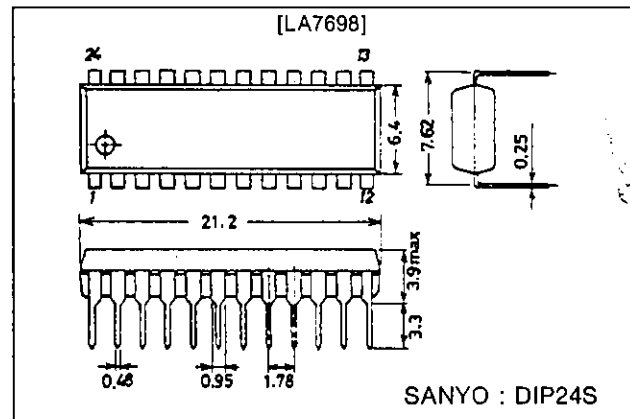
The LA7698 performs flesh-tone correction and green enhancement for color TV color-difference signals, and includes a color limiter function that prevents color saturation on the screen and color noise reduction (CNR) circuitry that eliminates color-difference output noise.

**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 <sub>CCmax</sub>		13	V
Allowable power dissipation	P <sub>d max</sub>	T <sub>a</sub> ≤ 65°C	700	mW
Operating temperature	T <sub>opr</sub>		-15 to +65	°C
Storage temperature	T <sub>stg</sub>		-55 to +150	°C

**Operating Conditions at Ta = 25°C**

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V <sub>CC</sub>		9	V
Operating supply voltage range	V <sub>CCOP</sub>		8 to 10	V

Operating Characteristics at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 9\text{ V}$ 

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	$\Delta V_O$	Pin 9 (H-BLK IN) = 2 V		0	50	mV	*1,2
Output voltage variation	$\Delta V_{O-H}$	INPUT C = 1 $\mu\text{F}$	-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	$\Delta G_O$	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	$E_{max}$		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	$\Delta V_{C-YG}$	No input pin 11 0 V/9 V	-10	0	+10	mV	*1
Maximum green enhancement level	$\Delta V_{G-YGM}$	$P_{IN} = 227^\circ$ , $E_{B-Y} = 2\text{ Vp-p}$ , pin 11 = 9 V	200	225	245	mV	*1
	$\Delta V_{R-YGM}$	$P_{IN} = 227^\circ$ , $E_{B-Y} = 2\text{ Vp-p}$ , pin 11 = 9 V	-245	-225	-200	mV	*1
Green enhancement range + 1	$\Delta V_{G-YG+}$	$P_{IN} = 180^\circ$ , $E_{B-Y} = 2\text{ Vp-p}$ , pin 11 = 9 V	9	16	26	mV	*1
Green enhancement range + 2	$\Delta V_{R-YG+}$	$P_{IN} = 180^\circ$ , $E_{B-Y} = 2\text{ Vp-p}$ , pin 11 = 9 V	-26	-16	-9	mV	*1
Green enhancement range - 1	$\Delta V_{C-YG-}$	$P_{IN} = 270^\circ$ , $E_{B-Y} = 2\text{ Vp-p}$ , pin 11 = 9 V	5	10	18	mV	*1
Green enhancement range - 2	$\Delta V_{R-YG-}$	$P_{IN} = 270^\circ$ , $E_{B-Y} = 2\text{ Vp-p}$ , pin 11 = 9 V	-18	-10	-5	mV	*1
Green enhancement starting amplitude	$E_{B-YGS}$	$P_{IN} = 227^\circ$ , pin 11 = 9 V $\Delta V_{G-Y}$ , G = 5 mV	0.36	0.45	0.75	Vp-p	*1
G OSD variation during green enhancement	$\Delta V_{GOSD}$	Only G-Y $\pm 2\text{ V}$ , pin 7 = 9 V		0	50	mV	*1
Flesh-tone correction voltage variation	$\Delta V_{C-YF}$	No input pin 12 0 V/9 V	-10	0	+10	mV	*1
Flesh-tone correction phase	$P_{AF-1}$	$P_{IN} = 120^\circ$ , $E_{B-Y} = 1\text{ Vp-p}$ , pin 14 = open, pin 12 = 9 V	117	120	123	deg	*1
	$P_{AF-2}$	$P_{IN} = 105^\circ$ , $E_{B-Y} = 1\text{ Vp-p}$ , pin 14 = 1 V, pin 12 = 9 V	102	105	108	deg	*1
	$P_{AF-3}$	$P_{IN} = 138^\circ$ , $E_{B-Y} = 1\text{ Vp-p}$ , pin 14 = 6 V, pin 12 = 9 V	135	138	141	deg	*1
Maximum correction level + 1	$\Delta V_{B-YFM+}$	$P_{IN} = 135^\circ$ , $E_{B-Y} = 1\text{ Vp-p}$ , pin 14 = open, pin 12 = 9 V	68	85	103	mV	*1
Maximum correction level + 2	$\Delta V_{R-YFM+}$	$P_{IN} = 135^\circ$ , $E_{B-Y} = 1\text{ Vp-p}$ , pin 14 = open, pin 12 = 9 V	21	26	31	mV	*1
Maximum correction level - 1	$\Delta V_{B-YFM-}$	$P_{IN} = 105^\circ$ , $E_{B-Y} = 1\text{ Vp-p}$ , pin 14 = open, pin 12 = 9 V	-120	-100	-80	mV	*1
Maximum correction level - 2	$\Delta V_{R-YFM-}$	$P_{IN} = 105^\circ$ , $E_{B-Y} = 1\text{ Vp-p}$ , pin 14 = open, pin 12 = 9 V	-10	0	+10	mV	*1
Flesh-tone correction range + 1	$\Delta V_{B-YF+}$	$P_{IN} = 50^\circ$ , $E_{B-Y} = 1\text{ Vp-p}$ , pin 14 = open, pin 12 = 9 V	-10	0	+10	mV	*1
Flesh-tone correction range - 1	$\Delta V_{B-YF-}$	$P_{IN} = 200^\circ$ , $E_{B-Y} = 1\text{ Vp-p}$ , pin 14 = open, pin 12 = 9 V	-10	0	+10	mV	*1
Flesh-tone correction range - 2	$\Delta V_{R-YF-}$	$P_{IN} = 200^\circ$ , $E_{B-Y} = 1\text{ Vp-p}$ , pin 14 = open, pin 12 = 9 V	-10	0	+10	mV	*1
Flesh-tone correction starting amplitude	$E_{B-YFS}$	$P_{IN} = 105^\circ$ , pin 14 = open $\Delta V_{B-Y}$ , F = 5 mV	0.1	0.2	0.35	Vp-p	*1
Limiter red detection level	$E_{B-YRD}$	$P_{IN} = 104^\circ$ , pin 13 = 9 V, pin 15 = open	2.6	3.0	3.4	Vp-p	*1
Limiter magenta detection level	$E_{B-YMD}$	$P_{IN} = 61^\circ$ , pin 13 = 9 V, pin 15 = open	1.7	2.0	2.3	Vp-p	*1

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## LA7698

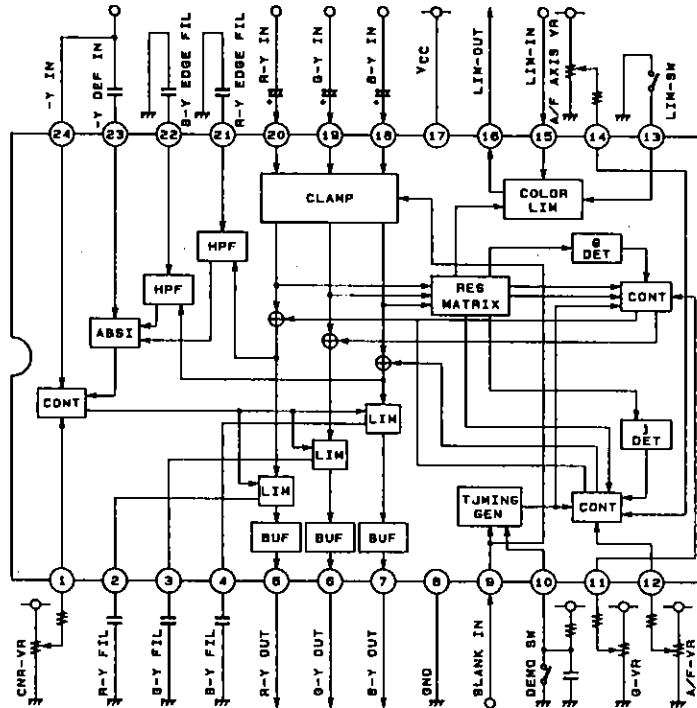
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Parameter	Symbol	Conditions	Min	Typ	Max	Unit	Note
Tracking magenta detection	$E_{B-Y} \text{ MDT}$	$P_{IN} = 61^\circ$ , pin 13 = 9 V, pin 15 = 3.4 V	2.9	3.3	3.7	Vp-p	*1
Limiter switch off voltage	$V_{CL \text{ OFF}}$	$P_{IN} = 61^\circ$ , $E_{B-Y} = 3 \text{ Vp-p}$ , pin 15 = open	0.4	0.6	0.8	V	*1
Green enhancement release voltage	$V_{GL \text{ OPEN}}$	pin 11 open level	6.8	7.0	7.2	V	*1
Flesh-tone correction release voltage	$V_{FL \text{ OPEN}}$	pin 12 open level	6.8	7.0	7.2	V	*1
Flesh-tone phase release voltage	$V_{FP \text{ OPEN}}$	pin 14 open level	3.3	3.5	3.7	V	*1
CNR-ON voltage variation	$\Delta V_{C-Y \text{ CNR}}$	No input pin 1 0 V/9 V	-10	0	+10	mV	
Maximum limiter amount	R-Y	$V_{CNR} = 9 \text{ V}$ , pin 23 = GND, pin 24 = 7 V $V_2 (+100 \mu\text{A}) - V_2 (-100 \mu\text{A})$	600	715	785	mV	
	G-Y	$V_{CNR} = 9 \text{ V}$ , pin 23 = GND, pin 24 = 7 V $V_3 (+100 \mu\text{A}) - V_3 (-100 \mu\text{A})$	285	340	370	mV	
	B-Y	$V_{CNR} = 9 \text{ V}$ , pin 23 = GND, pin 24 = 7 V $V_4 (+100 \mu\text{A}) - V_4 (-100 \mu\text{A})$	600	715	785	mV	
Minimum limiter amount	R-Y	$V_{CNR} = 0 \text{ V}$ , pin 23 = GND, pin 24 = 7 V $V_2 (+100 \mu\text{A}) - V_2 (-100 \mu\text{A})$		0		mV	
	G-Y	$V_{CNR} = 0 \text{ V}$ , pin 23 = GND, pin 24 = 7 V $V_3 (+100 \mu\text{A}) - V_3 (-100 \mu\text{A})$		0		mV	
	B-Y	$V_{CNR} = 9 \text{ V}$ , pin 23 = GND, pin 24 = 7 V $V_4 (+100 \mu\text{A}) - V_4 (-100 \mu\text{A})$		0		mV	
Maximum limiter level	$G_{R-Y \text{ max}}$	INPUT = 500 kHz, 2 Vp-p, $V_{CNR} = 9 \text{ V}$ , pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		-4.2		dB	
	$G_{G-Y \text{ max}}$	INPUT = 500 kHz, 1 Vp-p, $V_{CNR} = 9 \text{ V}$ , pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		-3.5		dB	
	$G_{B-Y \text{ max}}$	INPUT = 500 kHz, 2 Vp-p, $V_{CNR} = 9 \text{ V}$ , pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		-4.2		dB	
Minimum limiter level	$G_{R-Y \text{ min}}$	INPUT = 500 kHz, 0.2 Vp-p, $V_{CNR} = 0 \text{ V}$ , pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		-0.5		dB	
	$G_{G-Y \text{ min}}$	INPUT = 500 kHz, 0.1 Vp-p, $V_{CNR} = 0 \text{ V}$ , pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		-0.5		dB	
	$G_{B-Y \text{ min}}$	INPUT = 500 kHz, 0.2 Vp-p, $V_{CNR} = 0 \text{ V}$ , pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		-0.5		dB	
Normal limiter level	$G_{R-Y \text{ typ}}$	INPUT = 50 kHz, 2 Vp-p, $V_{CNR} = \text{open}$ , pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		-1.2		dB	
	$G_{G-Y \text{ typ}}$	INPUT = 50 kHz, 1 Vp-p, $V_{CNR} = \text{open}$ , pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		-0.6		dB	
	$G_{B-Y \text{ typ}}$	INPUT = 50 kHz, 2 Vp-p, $V_{CNR} = \text{open}$ , pin 23 = GND, pin 24 = 7 V, pin 1 = 9 V		-1.2		dB	
Color edge detection sensitivity	$\Delta V_{SCE}$	Voltage difference between open voltage of pins 21 and 22 and edge detection	$\pm 60$	$\pm 85$	$\pm 110$	mV	
Y edge detection sensitivity	$\Delta V_{SYE}$	Voltage difference between open voltage of pin 23 and edge detection	$\pm 130$	$\pm 160$	$\pm 190$	mV	
Y level detection voltage	$V_{Y \text{ min}}$	No edge detection $V_{CNT} = 9 \text{ V}$	0.9	1.2	1.5	V	
Y level detection voltage	$V_{Y \text{ max}}$	No edge detection $V_{CNT} = 9 \text{ V}$	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	$V_{EF \text{ OPEN}}$	Open DC voltage of pins 21 and 22	4.65	4.9	5.15	V	
-Y differential input voltage	$V_{dY \text{ OPEN}}$	Open DC voltage of pin 23	3.7	3.9	4.1	V	
Limiter control voltage	$V_{CNT \text{ OPEN}}$	Open DC voltage of pin 1	5.8	6.0	6.2	V	
Limiter filter voltage	$V_{LF \text{ OPEN}}$	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)

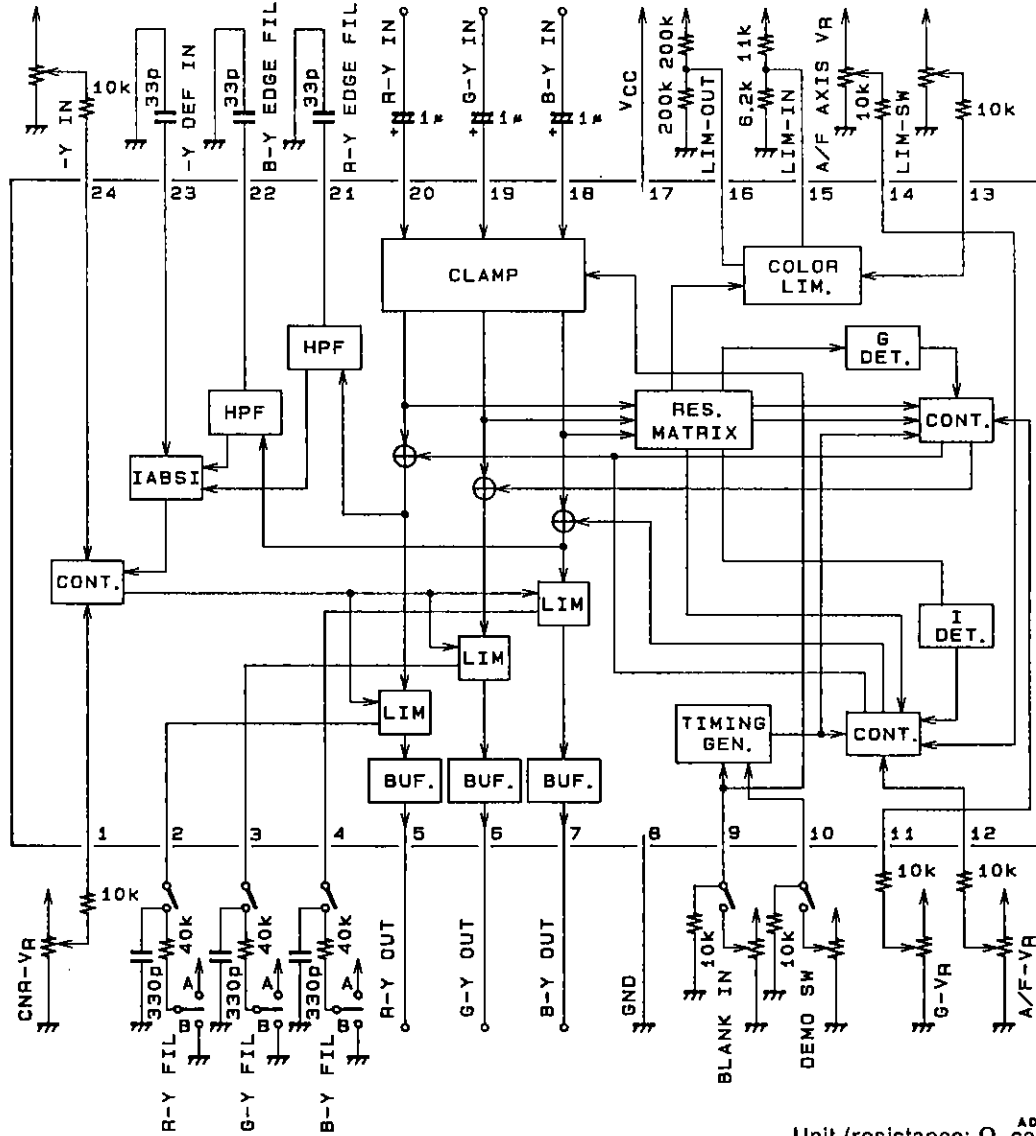
\*2) When both the green enhancement level and flesh-tone correction level are both at a minimum  
(pin 11 = 0 V; pin 12 = 0 V)

Block Diagram



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Test Circuit

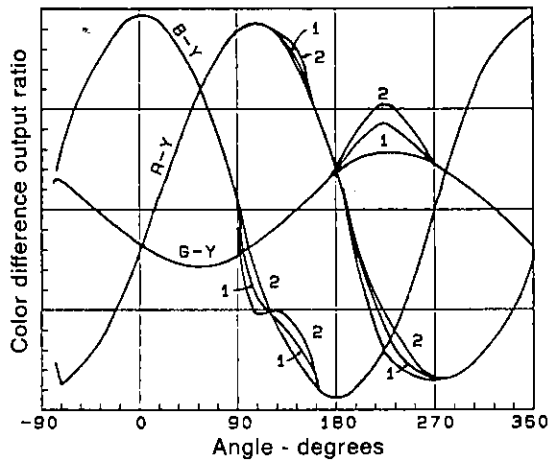


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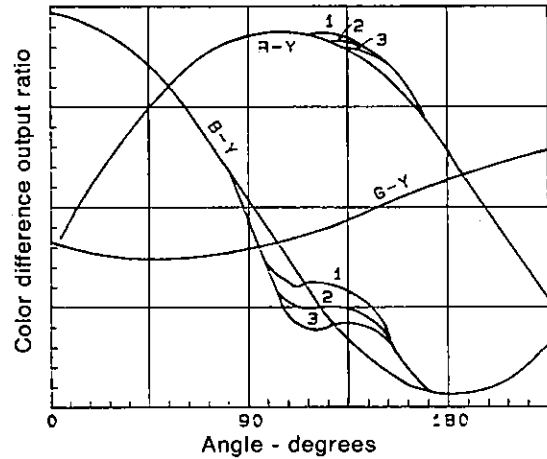
Unit (resistance: Ω, capacitance: F)

Note: All VRs are 10 kΩ variable resistors

## Flesh-tone correction and green enhancement characteristics



## Flesh-tone center adjustment



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