

RC6702

RGB to Y, CR, CB Transcoder

Features

- RGB to Y, CR, CB matrix, meets CCIR 601-1
- Thin film gain setting resistors
- External gain adjustments pins
- 60 MHz -3 dB bandwidth
- 10 MHz 0.1 dB gain flatness
- 0.06 % differential gain, $R_L \geq 150 \Omega$
- 0.06° differential phase, $R_L \geq 150 \Omega$
- 300 V/ μ S slew rate
- Dual ± 5 V power supply
- Low power consumption: 70 mW per amplifier
- 16 pin SO package
- Low offset: 3.0 mV

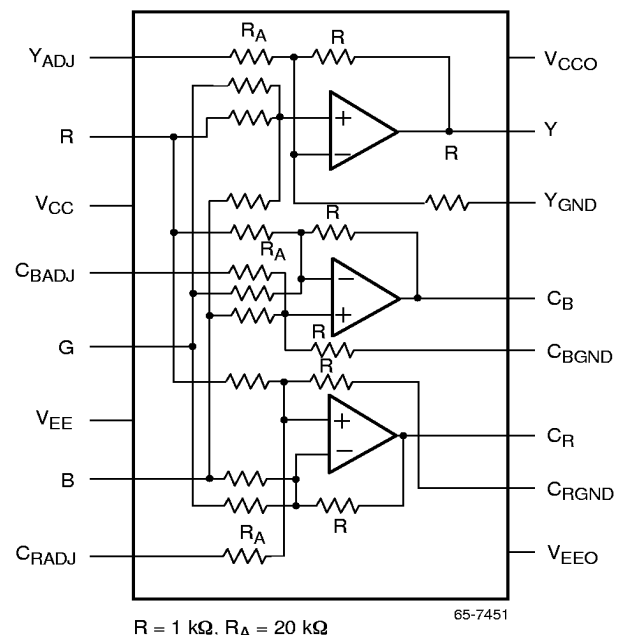
Description

The RC6702 contains three low power, wide bandwidth voltage feedback amplifiers. Internal thin film resistors perform the RGB to Y, CR, CB matrixing. The RGB to Y, CR, CB matrix is normalized to a gain of two for use in back-terminated video applications. (The sum of the absolute values of R, G and B components in a row is equal to 2.) The matrix gain accuracy is better than 1.0% and the gain temperature drift is below 25 ppm/ $^{\circ}$ C.

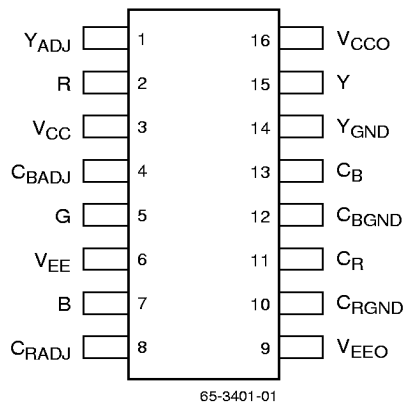
Each transcoder has a 60 MHz bandwidth and is flat to ± 0.1 dB to 10 MHz. If required, three adjustment inputs allow trimming of the Y gain and CR, CB white balance to accuracies better than 0.5%. A 20k Ω potentiometer between +V and -V is required, together with a 50 k Ω series resistor to adjust these offsets (see application circuit).

The pinout and layout of the RC6702 minimizes the crosstalk between channels. Each amplifier can drive 35 mA to the load.

Block Diagram



Pin Assignments



Pin Definitions

Pin Name	Pin Number	Pin Function Description
CBADJ	4	CB Matrix Adjustment Pin
CRADJ	8	CR Matrix Adjustment Pin
YADJ	1	CR Matrix Adjustment Pin
B	7	B Input
G	5	G Input
R	2	R Input
CB	13	CB Output
CR	11	CR Output
Y	15	Y Output
VCC	3	+5V Supply
VCCO	16	+5V Output Supply
VEE	6	-5V Supply
VEEO	9	-5V Output Supply
YGND	14	Y Analog Ground
CBGND	12	CB Analog Ground
CRGND	10	CR Analog Ground

Absolute Maximum Ratings

(beyond which the device may be damaged)¹

Parameter	Min	Typ	Max	Units
Positive power supply, VCC			7	V
Negative power supply, VEE			-7	V
Differential input voltage			0	V
Operating Temperature	0		+70	°C
Storage Temperature	-40		+125	°C
Junction Temperature			150	°C
Lead Soldering Temperature (10 seconds)			300	°C
Operating Temperature	0		+70	°C
Short circuit tolerance: No more than one output can be shorted to ground.				

Note:

- Functional operation under any of these conditions is NOT implied. Performance and reliability are guaranteed only if Operating Conditions are not exceeded.

Operating Conditions

Parameter		Min	Typ	Max	Units
VCC	Power Supply Voltage	4.75	5.0	5.25	V
VEE	Negative Supply Voltage	-4.75	-5.0	-5.25	V
θJA	SO16 Thermal Resistance		105		°C/W

DC Characteristics

$V_{CC} = 5V$, $V_{EE} = -5V$, $A_V = 2$, $R_{LOAD} = 150\Omega$, $T_A = 0^\circ C$ to $70^\circ C$, unless otherwise specified. Open Loop.

Parameter		Conditions	Min	Typ	Max	Units
VOS	Input Offset Voltage	No load		± 2	± 7	mV
$\Delta V_{OS}/\Delta T$	Offset Voltage Drift ¹			± 12		$\mu V/^\circ C$
I _B	Input Bias Current ¹			± 2	± 10	μA
$\Delta I_B/\Delta T$	Input Bias Current Drift ¹			± 10	± 50	nA/ $^\circ C$
R _{in}	Input Resistance ¹		1			M Ω
C _{in}	Input Capacitance ¹			0.5	2	pF
CMIR	Common Mode Input Range		± 2.5			V
PSRR	Power Supply Rejection Ratio	No Load	60	70		dB
I _s	Quiescent Supply Current	No Load, Whole IC		25	35	mA
R _{OUT}	Output Impedance ¹	Enabled, at DC		0.2		Ω
I _{OUT}	Output Current		35			mA
V _{OUT}	Output Voltage Swing	No load	± 2.5	± 3.0		V
		$R_L = 150\Omega$	± 2.5	± 3.0		V
Y	White Balance: Gain	$R = G = B = 1V_{pp}$	1.97	2.0	2.03	V _{pp}
C _R , C _B	White Balance, Residual Chroma	$R = G = B = 1V_{pp}$	-10	0.0	+10	mV _{pp}
$\Delta A_V/\Delta T$	Closed-loop Gain Drift ¹		25			ppm/ $^\circ C$
Resistor Matrix Characteristics						
A _V	Matrix Gain Accuracy		-1.0		+1.0	%
$\Delta A_V/\Delta T$	Matrix Gain Drift ¹			20		ppm/ $^\circ C$

Note:

1. Guaranteed by design.

AC Characteristics

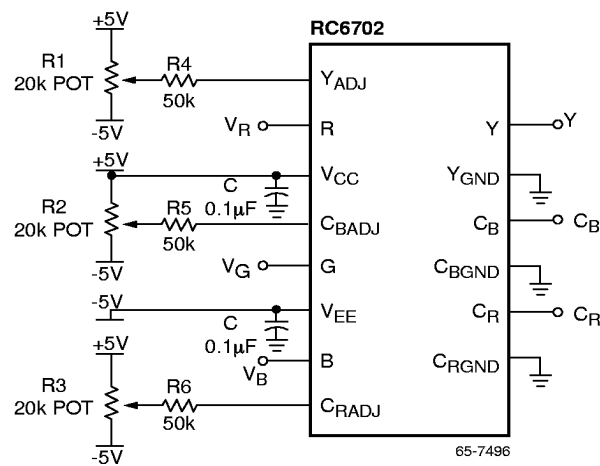
VCC = 5V, VEE = -5V, RLOAD = 150Ω, Av = 2, TA = 0 to 70°C, CL = 10 pF unless otherwise specified.

Parameter		Conditions	Min	Typ	Max	Units
Frequency Response						
BW	-3 dB Bandwidth (Av = 2) ¹	VOUT = 0.4 Vpp		60		MHz
		VOUT = 0.8 Vpp		55		MHz
Flat	±0.1 dB Bandwidth ¹		10	15		MHz
Peak	Maximum Small Signal AC Peaking ¹			0.4		dB
Time Domain Response						
td	Matrix Delay ¹			20		ns
Δtd	Output's Skew ¹			2		ns
tr1, tf1	Rise and Fall Time 10% to 90% ¹	2V Output Step		7	10	ns
ts	Settling Time to 0.1 % ¹	2V Output Step		35		ns
OS	Overshoot ¹	2V Output Step		6		%
US	Undershoot ¹	2V Output Step		1.5		%
SR	Slew Rate ¹	VOUT = ±2.0V	200	300		V/μs
Distortion						
HD2	2nd Harmonic Distortion ¹	VOUT = 0.8 Vpp, @ FO = 20 MHz		-50		dB
HD3	3nd Harmonic Distortion ¹	VOUT = 0.8 Vpp, @ FO = 20 MHz		-50		dB
Equivalent Input Noise						
NF	Noise Floor > 100 KHz ¹			-140		dBm
SND	Spectral Noise Density ¹	100 kHz to 200 MHz		10		nV/√Hz

Note:

1. Guaranteed by design.

Typical Application Circuit



RGB to Y, CB, CR matrix, normalized to 2

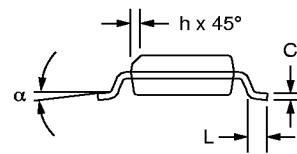
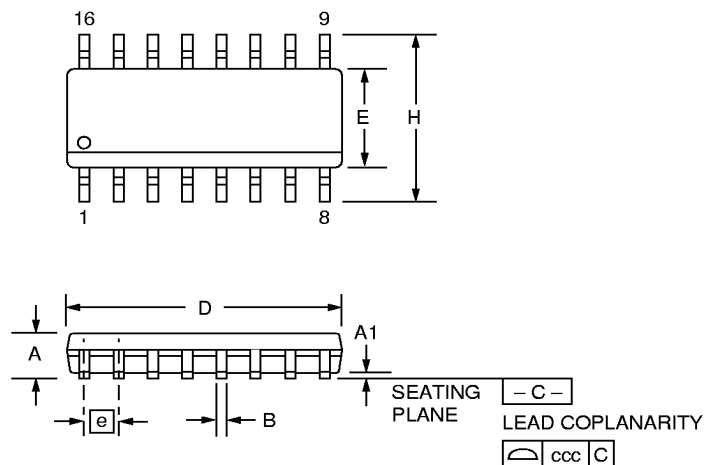
	R	G	B
Y	+0.299	+0.587	+0.114
CB	-0.169	-0.331	±0.5
CR	+0.5	-0.419	-0.081

Mechanical Dimensions – 16-Lead SOIC

Symbol	Inches		Millimeters		Notes
	Min.	Max.	Min.	Max.	
A	.053	.069	1.35	1.75	
A1	.004	.010	0.10	0.25	
B	.013	.020	0.33	0.51	
C	.008	.010	0.19	0.25	5
D	.386	.394	9.80	10.00	2
E	.150	.158	3.81	4.00	2
e	.050 BSC		1.27 BSC		
H	.228	.244	5.80	6.20	
h	.010	.020	0.25	0.50	
L	.016	.050	0.40	1.27	3
N	16		16		6
α	0°	8°	0°	8°	
ccc	—	.004	—	0.10	

Notes:

1. Dimensioning and tolerancing per ANSI Y14.5M-1982.
2. "D" and "E" do not include mold flash. Mold flash or protrusions shall not exceed .010 inch (0.25mm).
3. "L" is the length of terminal for soldering to a substrate.
4. Terminal numbers are shown for reference only.
5. "C" dimension does not include solder finish thickness.
6. Symbol "N" is the maximum number of terminals.



Ordering Information

Product Number	Temperature Range	Screening	Package	Package Marking
RC6702M	0° to 70°C	Commercial	16 Pin Narrow SOIC	RC6702M

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