RC6333

Triple Video Amplifier

Features

- Triple video amplifier
- 175 MHz -3 dB Bandwidth (A_V = 2)
- 50 MHz ±0.1 dB gain flatness
- Unity gain stable
- 0.06% differential gain (A_V = 1, R_L = 150Ω)
- 0.06° differential phase (A_V = 1, R_L = 150Ω)
- High CMRR (95dB), High PSRR (80 dB)
- Dual ±5V power supply
- Low offset 3.0 mV typical
- 14-pin narrow SO package
- 250V/µs slew rate
- Fast settling time: 0.1% in 15 ns
- TTL or CMOS compatible

Applications

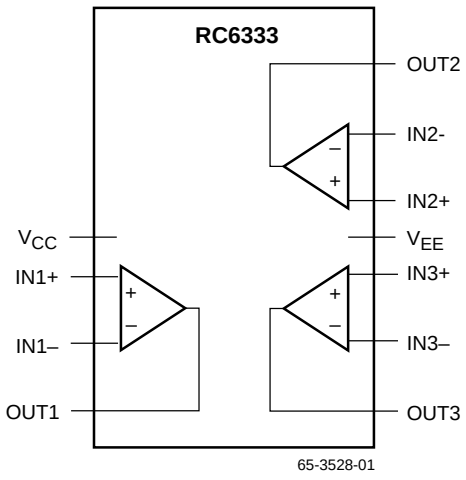
- RGB amplifiers
- Video instrumentation amplifier
- Selectable gain amplifier
- Active filters
- Set-top Buffers/Drivers

Description

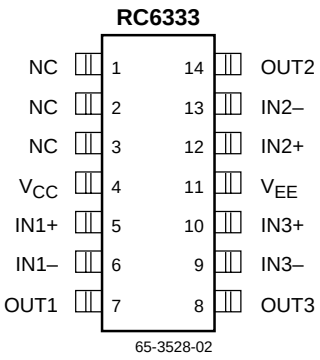
The RC6333 consists of three low power, wide band voltage feedback operational amplifiers. Each channel is capable of delivering a load current of at least 35mA.

The amplifiers are optimized for video applications where low differential gain and low phase distortion are significant requirements.

Block Diagram



Pin Assignments



Pin Definitions

Pin Name	Pin Number	Pin Function Description
IN1–	6	Amplifier 1 inverting input
IN1+	5	Amplifier 1 non-inverting input
IN2–	13	Amplifier 2 inverting input
IN2+	12	Amplifier 2 non-inverting input
IN3–	9	Amplifier 3 inverting input
IN3+	10	Amplifier 3 non-inverting input
NC	1–3	Not Connected.
OUT1	7	Amplifier 1 output
OUT2	14	Amplifier 2 output
OUT3	8	Amplifier 3 output
V_{CC}	4	Analog positive supply
V_{EE}	11	Analog negative supply

Absolute Maximum Ratings

(beyond which the device may be damaged)[1]

Parameter		Min	Typ	Max	Units
V_{CC}	Positive power supply			7	V
V_{EE}	Negative power supply			-7	V
	Differential input voltage			10	V
	Operating Temperature	0		+70	°C
	Storage Temperature	-40		±125	°C
	Junction Temperature			150	°C
	Lead Soldering (10 seconds)			240	°C
Short circuit tolerance: No more than one output can be shorted to ground.					

Notes:

1. Functional operation under any of these conditions is NOT implied.

Operating Conditions

Parameter		Min	Typ	Max	Units
V_{CC}	Power Supply Voltage	4.75	5.0	5.25	V
V_{EE}	Negative Supply Voltage	-4.75	-5.0	-5.25	V
θ_{JA}	SO14 Thermal Resistance		105		°C/W

DC Characteristics

V_{CC} = 5V, V_{EE} = -5V, A_V = 2, R_{LOAD} = 150Ω, T_A = 0°C to 70°C, unless otherwise specified. Open Loop.

Parameter		Conditions	Min	Typ	Max	Units
V_{OS}	Input Offset Voltage	No Load		3	±10	mV
$\Delta V_{OS}/\Delta T$	Offset Voltage Drift[1]			±6	±30	µV/°C
I_B	Input Bias Current			±1	±5	µA
$\Delta I_B/\Delta T$	Input Bias Current Drift[1]			±8	±40	nA/°C
Rin	Input Resistance[1]		1			MΩ
Cin	Input Capacitance[1]			0.5	2	pF
CMIR	Common Mode Input Range		±2.5			V
CMRR	Common Mode Rejection Ratio	No Load	70	100		dB
PSRR	Power Supply Rejection Ratio	No Load	65	80		dB
Is	Quiescent Supply Current	No Load		26	40	mA
R_{OUT}	Output Impedance (Closed Loop)[1]	Enabled, At DC		0.2		Ω
I_{OUT}	Output Current	Per Amplifier	35			mA
V_{OUT}	Output Voltage Swing	No Load	±2.5	±3.0		V
		R_L = 150Ω	±2.5	±3.0		V
A_{VOL}	Open-loop Gain		60	75		dB

Note:

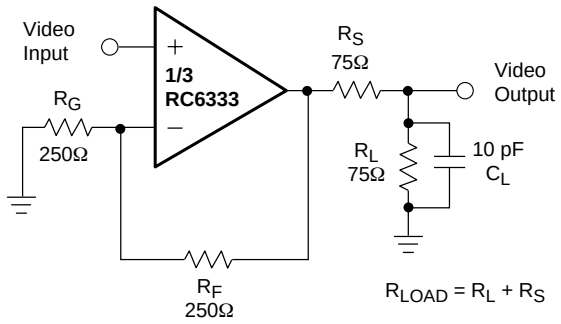
1. Guaranteed by design.

AC Characteristics

V_{CC} = 5V, V_{EE} = -5V, A_V = 2, T_A = 0 to 70°C, R_{LOAD} = 150Ω, R_G = R_F = 250Ω, C_L = 10 pF, unless otherwise specified. Closed Loop. Guaranteed by Design. See Typical Test Circuit.

Parameter		Conditions	Min	Typ	Max	Units
Frequency Response						
BW	-3 dB Bandwidth (A_V = 2)	V_{OUT} = 0.4 Vpp		+175		MHz
		V_{OUT} = 0.8 Vpp	75	90		MHz
Flat	±0.1 dB Bandwidth	V_{OUT} = 0.4 Vpp	50	75		MHz
Peak	Maximum Small Signal AC Peaking	V_{OUT} = 0.8 Vpp		0.01		dB
X_{TALK}	Crosstalk Isolation	@ 5 MHz		50		dB
Time Domain Response						
t_{r1}, t_{f1}	Rise and Fall Time 10% to 90%	2V Output Step		10	15	ns
ts	Settling Time to 0.1%	2V Output Step		15		ns
OS	Overshoot	2V Output Step		5		%
US	Undershoot	2V Output Step		2		%
SR	Slew Rate	V_{OUT} = ±2.0V	200	250		V/µs
Distortion						
HD_2	2nd Harmonic Dist. @ 20 MHz	V_{OUT} = 0.8 Vpp		-48		dB
HD_3	3nd Harmonic Dist. @ 20 MHz	V_{OUT} = 0.8 Vpp		-56		dB
Video Performance						
DG	Diff. Gain (p-p), NTSC & PAL	R_L = 150Ω, V_{OUT} = ±1.5V		0.06		%
DP	Diff. Phase (p-p), NTSC & PAL	R_L = 150Ω, V_{OUT} = ±1.5V		0.06		Deg.
NF	Noise Floor	>100kHz		-130		dB rms

Test Circuit



Applications Discussion

Capacitive Load

The RC6333 can drive a capacitive load from 10 to over 50 pF. In back terminated video applications, bandwidth will only be limited by the RC time constants of the external output components. When driving a 75Ω cable, place the 75Ω source termination resistor as close to the amplifier output as possible.

DC Accuracy

Since the RC6333 is a voltage-feedback amplifier, the inverting and non-inverting inputs have similar impedances and bias currents. To minimize offset voltage, match the source resistances seen by inverting and non-inverting inputs.

Feedback Components

Because the RC6333 is a voltage-feedback amplifier, it facilitates using reactive (capacitive and inductive) feedback components for implementing filters, integrators, sample/hold circuits, etc. The feedback network and the parasitic capacitance at the inverting (summing junction) input create a pole and affect the transfer function of the circuit. For stable operation, minimize the parasitic capacitance and equivalent resistance of the components used in the feedback circuit.

Circuit Board

High-frequency applications require good grounding, power supply decoupling, low parasitic capacitance and inductance, and good isolation between the inputs to minimize their crosstalk. Avoid coupling from output to input to prevent positive feedback.

Notes:

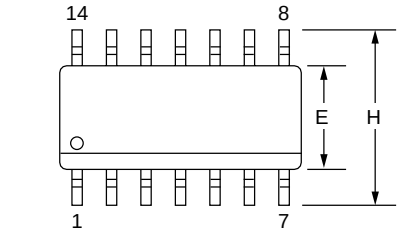
Notes:

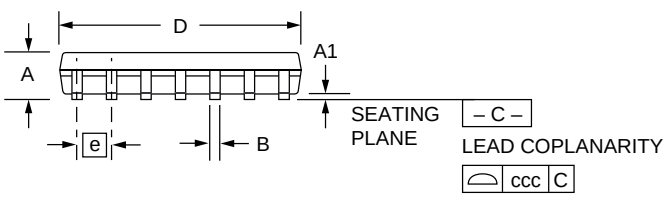
Mechanical Dimensions – 14 Pin SOIC Package

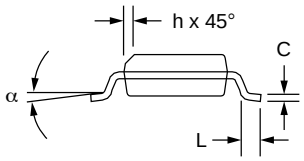
Symbol	Inches		Millimeters		Notes
	Min.	Max.	Min.	Max.	
A	.053	.069	1.35	1.75	
A1	.004	.010	0.10	0.25	
B	.013	.020	0.33	0.51	
C	.008	.010	0.19	0.25	5
D	.336	.345	8.54	8.76	2
E	.150	.158	3.81	4.01	2
e	.050 BSC		1.27 BSC		
H	.228	.244	5.79	6.20	
h	.010	.020	0.25	0.50	
L	.016	.050	0.40	1.27	3
N	14		14		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
RC6333M	0° to 70°C	Commercial	14 Pin Narrow SOIC	RC6333M