

# RC6333

## Triple Video Amplifier

### Features

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

### Description

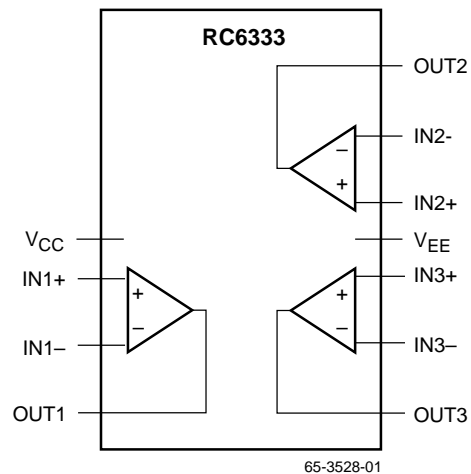
The RC6333 consists of three low power, wide band voltage feedback operational amplifiers. Each channel is capable of delivering a load current of at least 35mA.

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

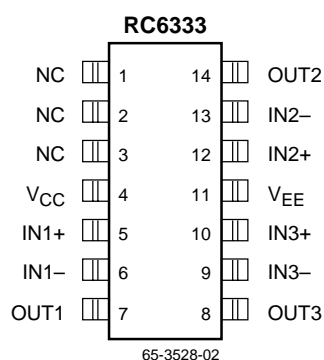
### Applications

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

### 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
VCC	4	Analog positive supply
VEE	11	Analog negative supply

## Absolute Maximum Ratings

(beyond which the device may be damaged)<sup>1</sup>

Parameter	Min	Typ	Max	Units
VCC			7	V
VEE			-7	V
			10	V
	0		+70	°C
	-40		±125	°C
			150	°C
			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
VCC	4.75	5.0	5.25	V
VEE	-4.75	-5.0	-5.25	V
θJA		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	3	±10	mV
$\Delta V_{OS}/\Delta T$	Offset Voltage Drift <sup>1</sup>		±6	±30	$\mu V/^\circ C$
I <sub>B</sub>	Input Bias Current		±1	±5	$\mu A$
$\Delta I_B/\Delta T$	Input Bias Current Drift <sup>1</sup>		±8	±40	nA/ $^\circ C$
R <sub>in</sub>	Input Resistance <sup>1</sup>	1			M $\Omega$
C <sub>in</sub>	Input Capacitance <sup>1</sup>		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
I <sub>s</sub>	Quiescent Supply Current	No Load	26	40	mA
R <sub>OUT</sub>	Output Impedance (Closed Loop) <sup>1</sup>	Enabled, At DC	0.2		$\Omega$
I <sub>OUT</sub>	Output Current	Per Amplifier	35		mA
V <sub>OUT</sub>	Output Voltage Swing	No Load	±2.5	±3.0	V
		$R_L = 150\Omega$	±2.5	±3.0	V
A <sub>VOL</sub>	Open-loop Gain		60	75	dB

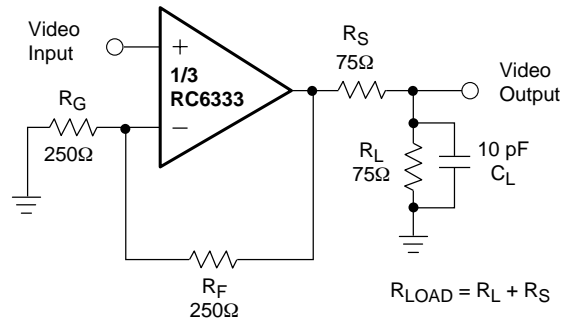
### Note:

1. Guaranteed by design.

**AC Characteristics**  $V_{CC} = 5V$ ,  $V_{EE} = -5V$ ,  $A_V = 2$ ,  $T_A = 0$  to  $70^\circ C$ ,  $R_{LOAD} = 150\Omega$ ,  $R_G = R_F = 250\Omega$ ,  $C_L = 10$  pF, unless otherwise specified. Closed Loop. Guaranteed by Design. See Typical Test Circuit.

Parameter	Conditions	Min	Typ	Max	Units	
<b>Frequency Response</b>						
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	
XTALK	Crosstalk Isolation	@ 5 MHz		50	dB	
<b>Time Domain Response</b>						
$t_{r1}$ , $t_{f1}$	Rise and Fall Time 10% to 90%	2V Output Step		10	15	ns
$t_s$	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	$V_{OUT} = \pm 2.0V$	200	250		V/ $\mu s$
<b>Distortion</b>						
HD <sub>2</sub>	2nd Harmonic Dist. @ 20 MHz	$V_{OUT} = 0.8$ Vpp		-48		dB
HD <sub>3</sub>	3rd Harmonic Dist. @ 20 MHz	$V_{OUT} = 0.8$ Vpp		-56		dB
<b>Video Performance</b>						
DG	Diff. Gain (p-p), NTSC & PAL	$R_L = 150\Omega$ , $V_{OUT} = \pm 1.5V$		0.06		%
DP	Diff. Phase (p-p), NTSC & PAL	$R_L = 150\Omega$ , $V_{OUT} = \pm 1.5V$		0.06		Deg.
NF	Noise Floor	>100kHz		-130		dB rms

## Test Circuit



65-3528-04

## 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:**

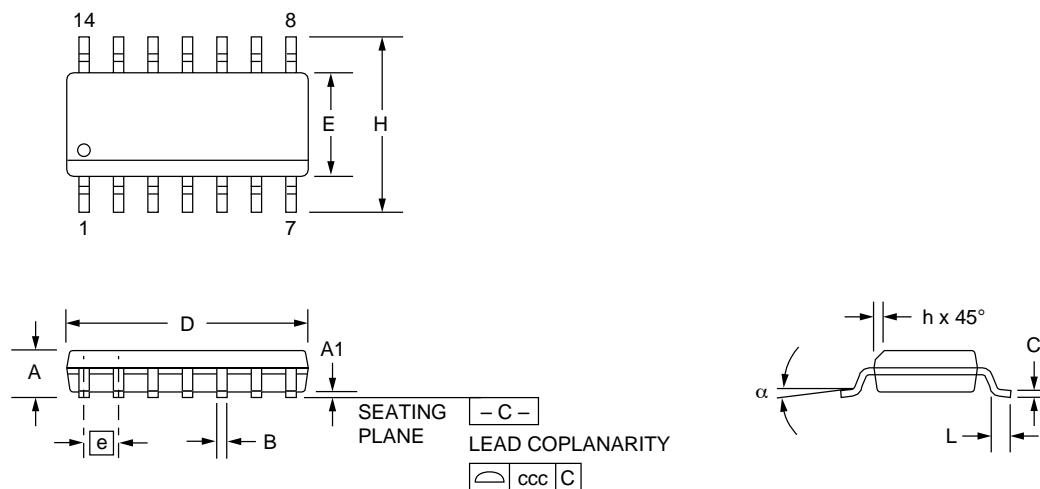
**Notes:**

# 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
$\alpha$	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

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