Raytheon

High Performance Low Noise Operational Amplifier

RC5534

Features

- Small signal bandwidth — 10MHz
- Output drive capability — 600Ω, $10V_{RMS}$ at $V_S = \pm 18V$
- Input noise voltage — $4nV/\sqrt{Hz}$
- DC voltage gain — 100,000
- AC voltage gain — 6000 at 10kHz
- Power bandwidth — 200kHz
- Slew rate — $13V/\mu S$
- Large supply voltage range — ±3V to ±20V

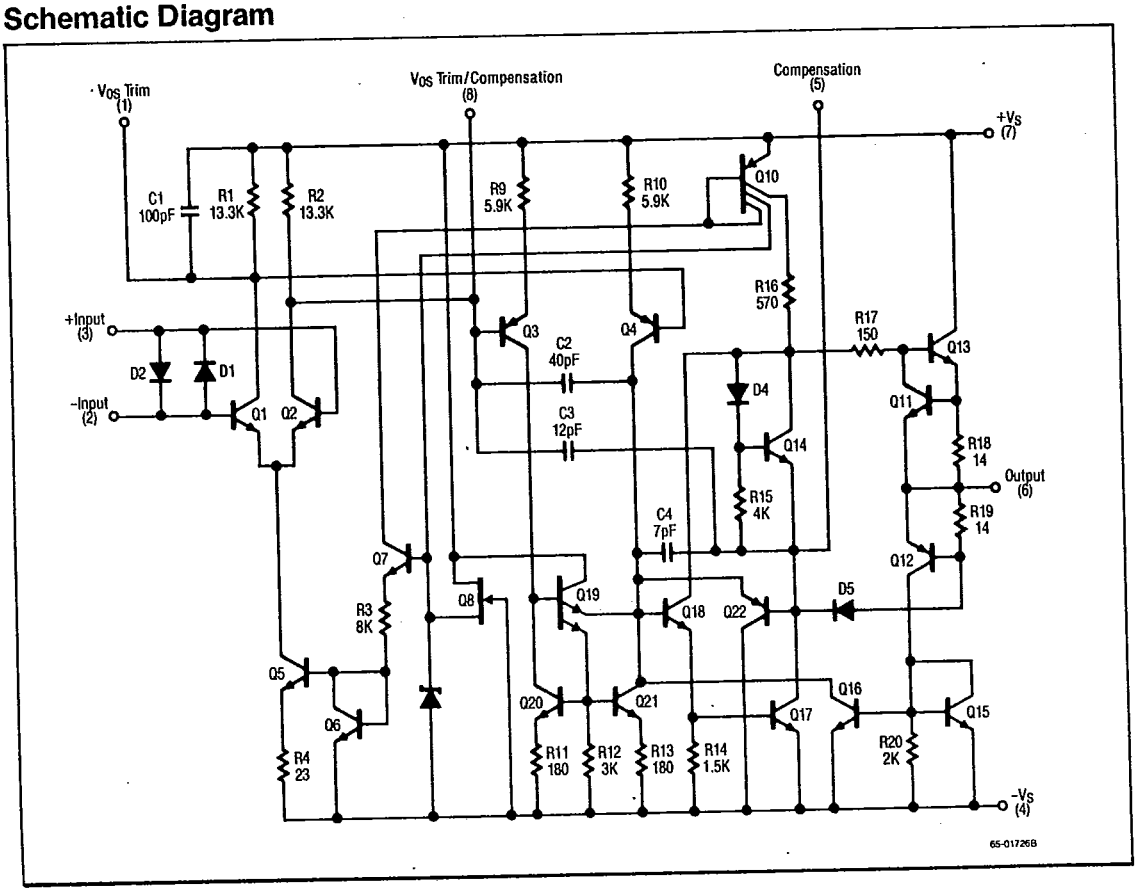
Description

The 5534 is a high performance, low noise operational amplifier. This amplifier features popular pin-out, superior noise performance, and high output drive capability.

This amplifier also features guaranteed noise performance with substantially higher gain-bandwidth product, power bandwidth, and slew rate which far exceeds that of the 741 type amplifiers. The 5534 is internally compensated for a gain of three or higher and may be externally compensated for optimizing specific performance requirements of various applications such as unity-gain voltage followers, drivers for capacitive loads or fast settling.

The specially designed low noise input transistors allow the 5534 to be used in very low noise signal processing applications such as audio preamplifiers and servo error amplifiers.

Schematic Diagram



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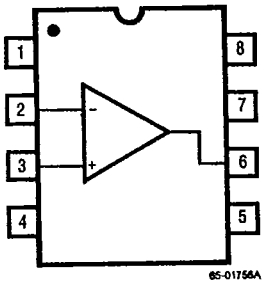
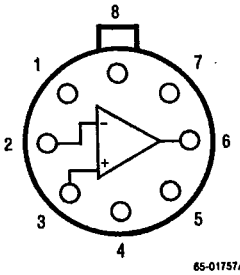
Connection Information

8-Lead Ceramic DE and Plastic NB Dual In-Line Package (Top View)



8-Lead TO-99 Metal Can (Top View)



Pin	Function
1	V_{OS} Trim
2	-Input
3	+Input
4	$-V_S$
5	Compensation
6	Output
7	$+V_S$
8	V_{OS} Trim/Compensation

Absolute Maximum Ratings

Supply Voltage ..... ±22V
Differential Input Voltage 0.5V
Input Voltage ..... ±V Supply
Storage Temperature
Range ..... -65°C to +150°C
Operating Temperature Range
RM5534/A ..... -55°C to ±125°C
RC5534/A ..... 0°C to +70°C
Lead Soldering Temperature
(10 Sec) ..... +300°C
Output Short Circuit Duration[1] ..... Indefinite

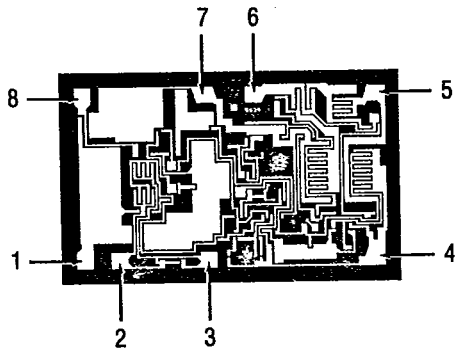
Notes: 1. Short circuit may be to ground only. Rating applies to +125°C case temperature or +75°C ambient temperature.

Ordering Information

Part Number	Package	Operating Temperature Range
RC5534DE	Ceramic	0°C to +70°C
RC5534ADE	Ceramic	0°C to +70°C
RC5534NB	Plastic	0°C to +70°C
RC5534ANB	Plastic	0°C to +70°C
RC5534T	Metal Can	0°C to +70°C
RC5534AT	Metal Can	0°C to +70°C
RC5534DE	Ceramic	-55°C to +125°C
RC5534ADE	Ceramic	-55°C to +125°C
RC5534T	Metal Can	-55°C to +125°C
RC5534AT	Metal Can	-55°C to +125°C
RC5534T/883C*	Metal Can	-55°C to +125°C
RC5534AT/883C*	Metal Can	-55°C to +125°C

*MIL-STD-883, Level C Processing

Mask Pattern



Die Size: 83 x 51 mils
Min. Pad Dimensions: 4 x 4 mils

Thermal Characteristics

	8-Lead Plastic DIP	8-Lead Ceramic DIP	8-Lead TO-99 Metal Can
Max. Junction Temp.	125°C	175°C	175°C
Max. P_D T_A < 50°C	468mW	833mW	658mW
Therm. Res. θ_{JC}	—	45°C/W	50°C/W
Therm. Res. θ_{JA}	160°C/W	150°C/W	190°C/W
For T_A > 50°C Derate at	6.25mW per °C	8.33mW per °C	5.26mW per °C

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Electrical Characteristics ($V_S = \pm 15V$ and $T_A = +25°C$ unless otherwise noted)

Parameters	Test Conditions	RM5534/A			RC5534/A			Units
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	$R_S \leq 10k\Omega$		0.5	2.0		0.5	4.0	mV
Input Offset Current			10	200		20	300	nA
Input Bias Current			400	800		500	1500	nA
Input Resistance (Differential Mode)		50	100		30	100		kΩ
Large Signal Voltage Gain	$R_L \geq 600\Omega$, $V_{OUT} = \pm 10V$	50	100		25	100		V/mV
Output Voltage Swing	$R_L \geq 600\Omega$	±12	±13		±12	±13		V
Input Voltage Range		±12	±13		±12	±13		V
Common Mode Rejection Ratio	$R_S \leq 10k\Omega$	80	100		70	100		dB
Power Supply Rejection Ratio	$R_S \leq 10k\Omega$	86	100		86	100		dB
Supply Current	$R_L = \infty$		4.0	6.5		4.0	8.0	mA
Transient Response Rise Time	$V_{IN} = 50mV$, $R_L = 600\Omega$, $C_L = 100pF$, $C_C = 22pF$		35			35		nS
Overshoot			17			17		%
Slew Rate	$C_C = 0$		13			13		V/μS
Gain Bandwidth Product	$C_C = 22pF$, $C_L = 100pF$		10			10		MHz
Power Bandwidth	$V_O = 20V_{p-p}$, $C_C = 0$		200			200		kHz
Input Noise Voltage	f = 20Hz to 20kHz		1.0			1.0		μV_{RMS}
Input Noise Current	f = 20Hz to 20kHz		25			25		pA_{RMS}
Supply Current	$V_S = \pm 15V$, $R_L = \infty$			9.0			14	mA
Channel Separation	f = 1kHz, $R_S = 5k\Omega$		110			110		dB
		5534A			5534			
Input Noise Voltage Density	$f_O = 30Hz$		5.5	7.0		7.0		$nV/\sqrt{Hz}$
	$f_O = 1kHz$		3.5	4.5		4.0		
Input Noise Current Density	$f_O = 30Hz$		1.5			2.5		$pA/\sqrt{Hz}$
	$f_O = 1kHz$		0.4			0.6		
Broadband Noise Figure	f = 10Hz – 20kHz, $R_S = 5k\Omega$		0.9					dB
The following specifications apply for $-55°C \leq T_A \leq \pm 125°C$ for RM; $0°C \leq T_A \leq \pm 70°C$ for RC, $V_S = \pm 15V$								
		RM5534/A			RC5534/A			
Input Offset Voltage	$R_S \leq 10k\Omega$			3.0			5.0	mV
Input Offset Current				500			400	nA
Input Bias Current				1500			2000	nA
Large Signal Voltage Gain	$R_L \geq 600\Omega$, $V_{OUT} = \pm 10V$	25			15			V/mV
Output Voltage Swing	$R_L \geq 600\Omega$	±10			±10			V

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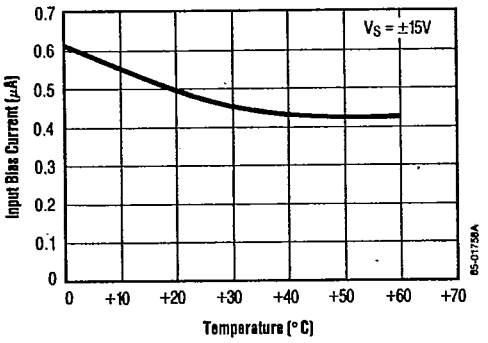
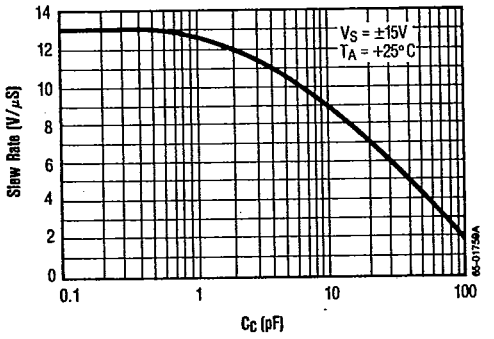
T-79-06-10

Typical Performance Characteristics

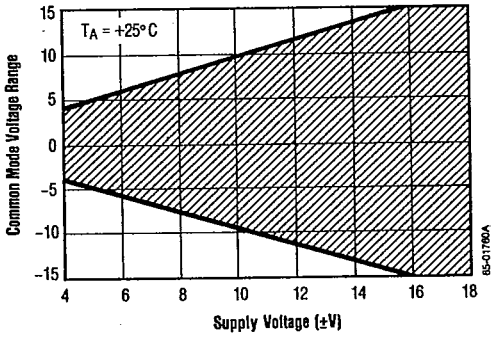
Input Bias Current vs. Temperature



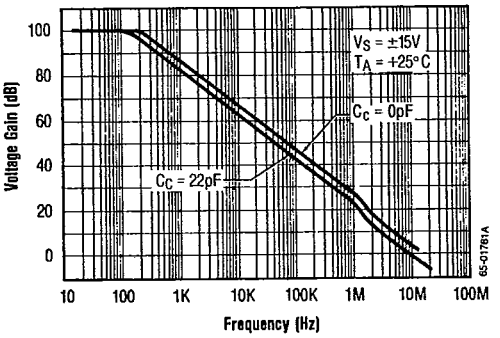
Slew Rate vs. Compensation Capacitor



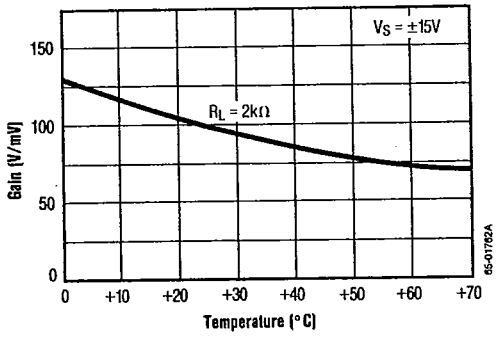
Common Mode Range as a Function of Supply Voltage



Open Loop Gain vs. Frequency



Open Loop Gain vs. Temperature



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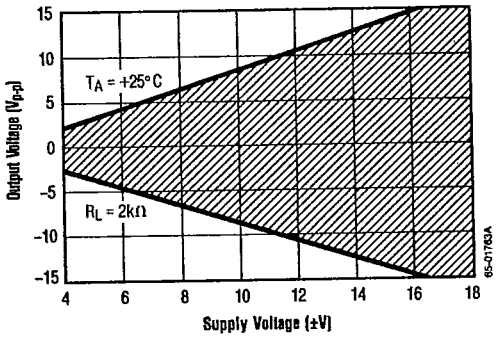
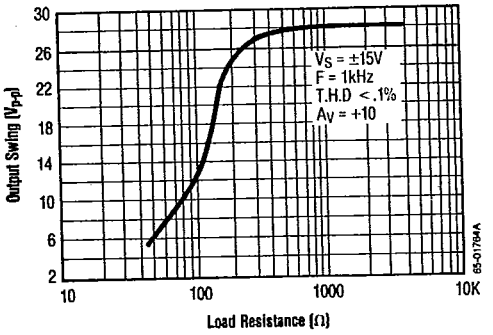
Typical Performance Characteristics (Continued)

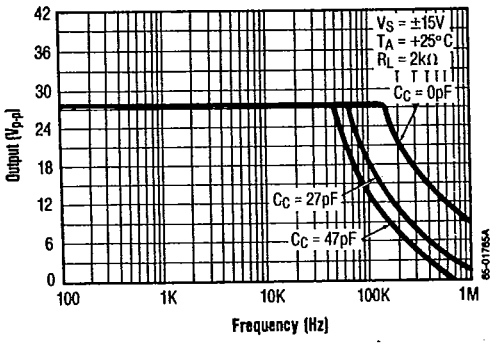
Typical Output Voltage as a Function of Supply Voltage



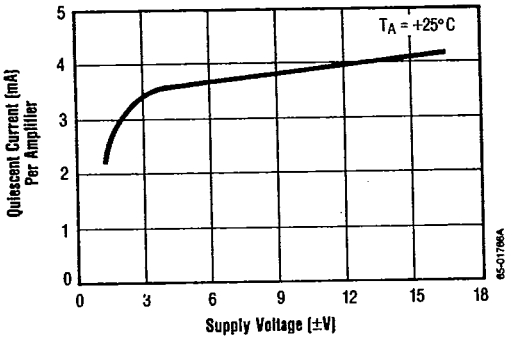
Output Voltage vs. Load Resistance



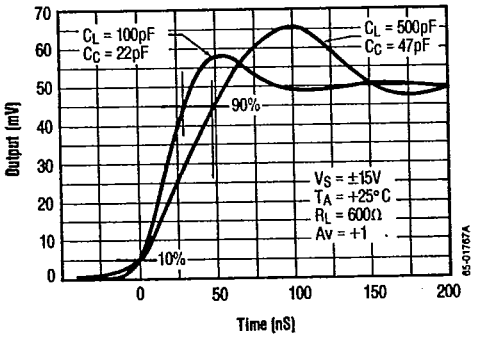
Output Voltage vs. Frequency



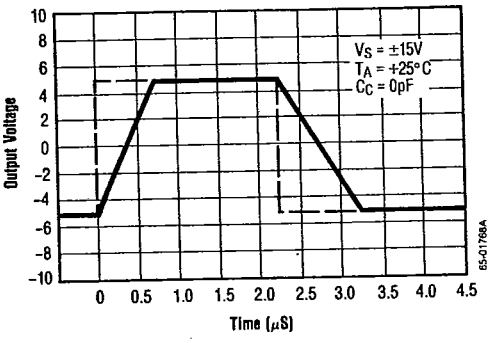
Quiescent Current as a Function of Supply Voltage



Transient Response



Voltage Follower Large Signal Pulse Response



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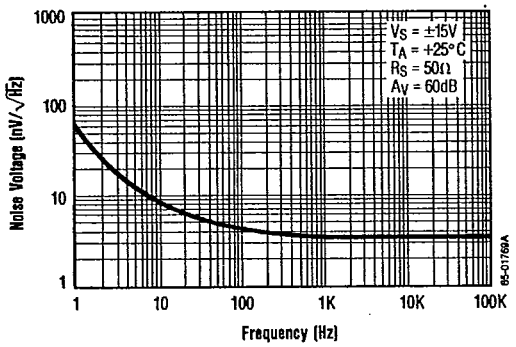
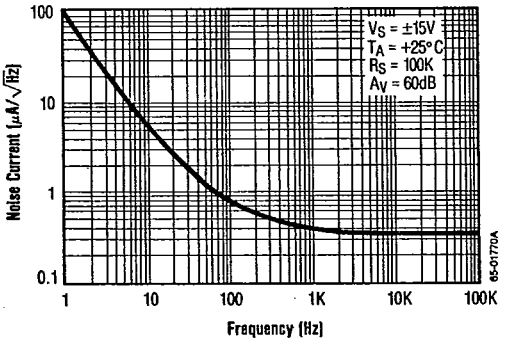
Typical Performance Characteristics (Continued)

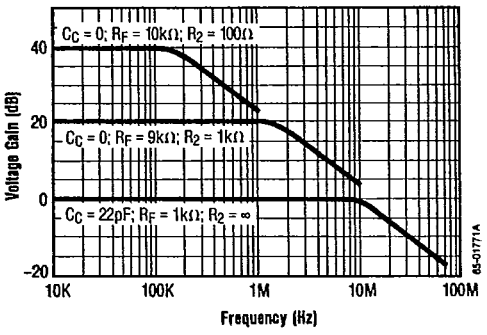
Input Noise Voltage as a Function of Frequency



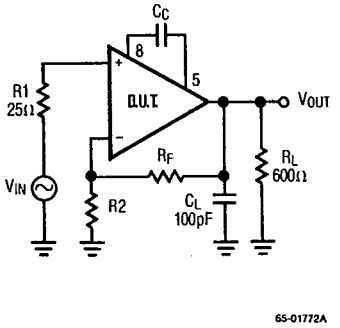
Input Noise Current as a Function of Frequency



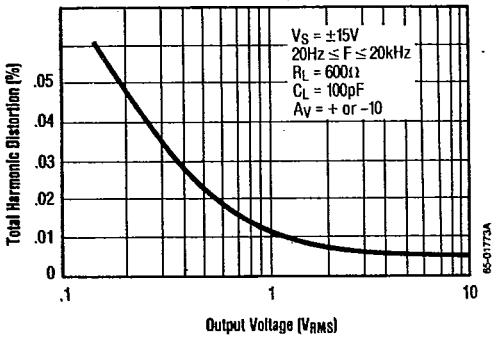
Closed Loop Frequency Response



Test Circuit



Total Harmonic Distortion vs. Output Voltage



Offset Voltage Adjust Circuit