4559 Dual High Performance Operational Amplifier

GENERAL DESCRIPTION

The 4559 integrated circuit is a dual high performance operational amplifier internally compensated and constructed on a single silicon chip using the planar epitaxial process.

These amplifiers feature guaranteed AC performance which far exceeds that of the 741-type amplifiers. The specially designed low-noise input transistors allow the 4559 to be used in low-noise signal processing applications such as audio pre amplifiers and signal conditioners.

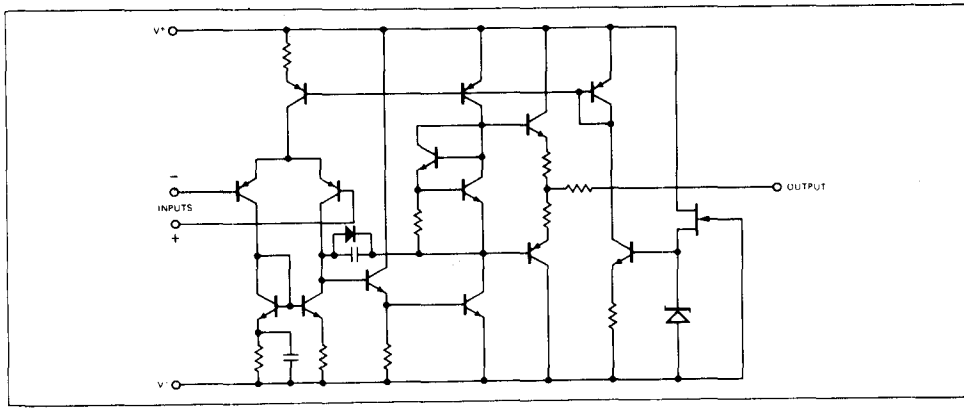
The 4559 also has more output drive than 741-type amplifiers and can be used to drive a 600 ohm load.

FEATURES

	Typical	Guaranteed
• *Unity Gain Bandwidth*	4.0 MHz	3.0 MHz
• Slew Rate	2.0 V/μsec	1.5 V/μsec
• Low Noise Voltage	1.4 μV_{RMS}	2.0 μV_{RMS}

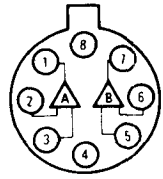
- Supply Voltage ±22V for RM4559 and ±18V for RC4559
- No Frequency Compensation Required
- No Latch Up
- Large Common Mode and Differential Voltage Ranges
- Low Power Consumption
- Parametric Tracking Over Temperature Range
- Gain and Phase Match Between Amplifiers

SCHEMATIC DIAGRAM (1/2 Shown)



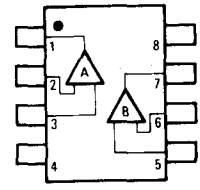
CONNECTION INFORMATION

TE (TO-99)
Metal Can Package
(Top View)



Order Part Nos.:
RC4559T, RM4559T

DE and NB
Dual In-line Packages
(Top View)



Order Part Nos.:
RC4559NB, RV4559NB
RC4559DE, RV4559DE
RM4559DE

PIN	FUNCTION
1	A OUTPUT
2	A -INPUT
3	A +INPUT
4	V^-
5	B +INPUT
6	B -INPUT
7	B OUTPUT
8	V^+

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ABSOLUTE MAXIMUM RATINGS

Supply Voltage . . . . . RM4559: ±22V
RC4559: ±18V
Internal Power Dissipation (Note 1) 500mW
Differential Input Voltage . . . . . ±30V
Input Voltage (Note 2) . . . . . ±15V
Storage Temperature Range . . . . . −65°C to +150°C

Operating Temperature Range
RM4559 . . . . . −55°C to +125°C
RV4559 . . . . . −40°C to +85°C
RC4559 . . . . . 0°C to +70°C
Lead Temperature (Soldering, 60 sec) . . . . . 300°C
Output Short-Circuit Duration (Note 3) . . . . . Indefinite

ELECTRICAL CHARACTERISTICS (T_A = 25°C, V_{CC} = ±15 V unless otherwise specified.)

		RM4559			RV/RC4559			
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 10k\Omega$		1.0	5.0		2.0	6.0	mV
Input Offset Current			5	100		5	100	nA
Input Bias Current			40	250		40	250	nA
Input Resistance		0.3	1.0		0.3	1.0		MΩ
Large Signal Voltage Gain	$R_L \geq 2k\Omega$, V_{out} = ±10V	50,000	300,000		20,000	300,000		V/V
Output Voltage Swing	$R_L \geq 3k\Omega$ $R_L \geq 600\Omega$	±12 ±9.5	±13 ±10		±12 ±9.5	±13 ±10		V V
Input Voltage Range		±12	±13		±12	±13		V
Common Mode Rejection Ratio	$R_S \leq 10k\Omega$	80	100		80	100		dB
Supply Voltage Rejection Ratio	$R_S \leq 10k\Omega$		10	75		10	75	μV/V
Supply Current	$R_L = \infty$ (All Amplifiers)		3.3	5.6		3.3	5.6	mA
Transient Response (unity gain) Rise Time	V_{IN} = 20mV, R_L = 2kΩ, $C_L \leq 100pf$		80			80		nsec
Overshoot			18			18		%
Slew Rate (unity gain)		1.5	2.0		1.5	2.0		V/μs
Unity Gain Bandwidth		3.0	4.0		3.0	4.0		MHz
Full Power Bandwidth	V_o = 20 $V_{p\text{-}p}$	24	32		24	32		kHz
Input Noise Voltage	f = 20 Hz to 20 kHz		1.4	2.0		1.4	2.0	μV RMS
Input Noise Current	f = 20 Hz to 20 kHz		25			25		pA RMS
Channel Separation	Gain = 100 f = 10 kHz, R_S = 1kΩ		90			90		dB
The following specifications apply for −55°C ≤ T_A ≤ +125°C for RM4559; 0°C ≤ T_A ≤ +70°C for RC4559								
Input Offset Voltage	$R_S \leq 10k\Omega$			6.0			7.5	mV
Input Offset Current				300			200	nA
Input Bias Current				500			500	nA
Large-Signal Voltage Gain	$R_L \geq 2k\Omega$, V_{out} = ±10V	25,000			15,000			
Output Voltage Swing	$R_L \geq 2k\Omega$	±10			±10			V
Supply Current (All Amplifiers)	V_S = ±15 V, $R_L = \infty$ T_A = +125°C T_A = −55°C		3 4	5 6.6		3 4	5 6.6	mA

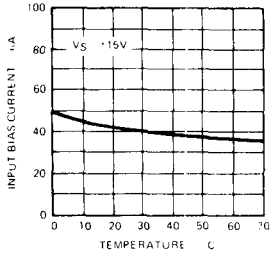
MATCHING CHARACTERISTICS (V_{CC} = ±15V, T_A = 25°C unless otherwise specified)

PARAMETER	CONDITIONS	RM4559 TYP	RC4559 TYP	UNITS
Voltage Gain	$R_L \geq 2k\Omega$	±0.5	±1.0	dB
Input Bias Current		±15	±15	nA
Input Offset Current		±7.5	±7.5	nA
Input Offset Voltage	$R_S \geq 10k\Omega$	±0.1	±0.2	mV

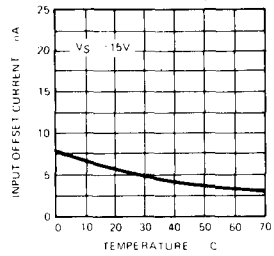
NOTES:
1. Rating applies for case temperatures to 125°C; derate linearly at 6.5mW/°C for ambient temperatures above +75°C for RM4559.
2. For supply voltages less than −15V, the absolute maximum input voltage is equal to the supply voltage.
3. Short circuit may be to ground on one amp only. Rating applies to +125°C case temperature or +75°C ambient temperature for RC4559 and to +85°C ambient temperature for RV4559.

TYPICAL ELECTRICAL DATA

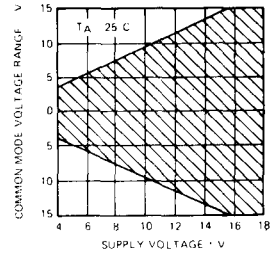
Input Bias Current as a Function of Ambient Temperature



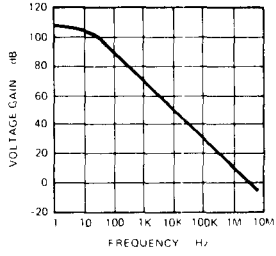
Input Offset Current as a Function of Ambient Temperature



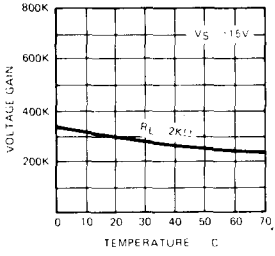
Common Mode Range as a Function of Supply Voltage



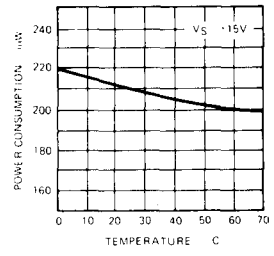
Open Loop Voltage Gain as a Function of Frequency



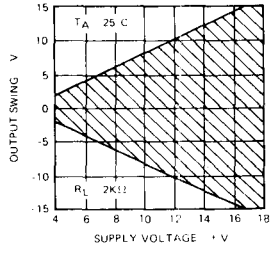
Open Loop Gain as a Function of Temperature



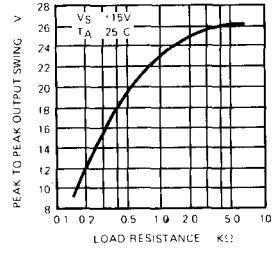
Power Consumption as a Function of Ambient Temperature



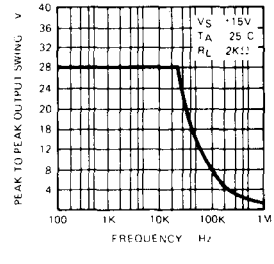
Typical Output Voltage as a Function of Supply Voltage



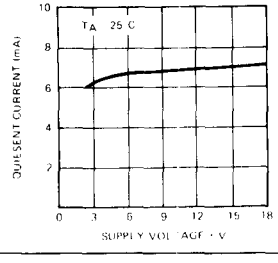
Output Voltage Swing as a Function of Load Resistance



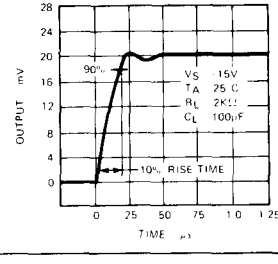
Output Voltage Swing as a *Function of Frequency*



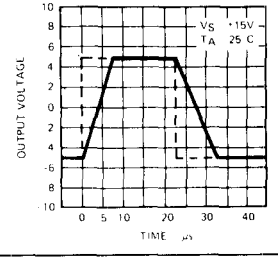
Quiesent Current as a Function of Supply Voltage



Transient Response



Voltage Follower Large-Signal Pulse Response



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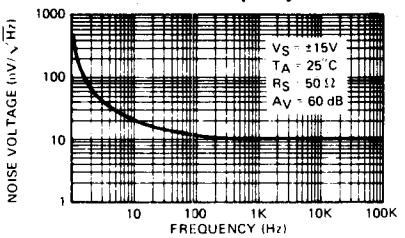
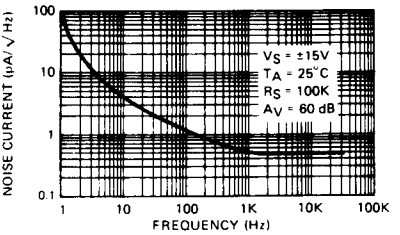
TYPICAL ELECTRICAL DATA

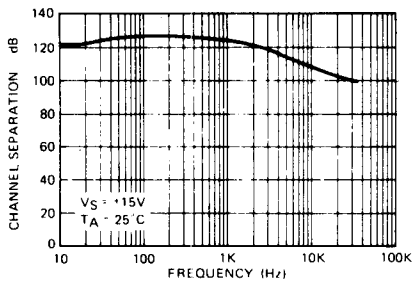
Input Noise Voltage as a Function of Frequency



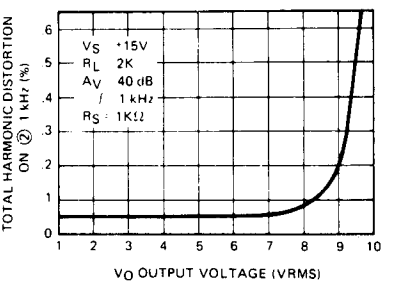
Input Noise Current as a Function of Frequency



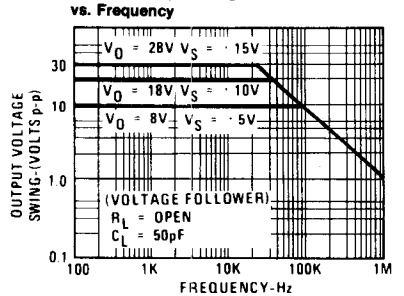
Channel Separation



Total Harmonic Distortion vs Output Voltage



Output Voltage Swing vs. Frequency



Distortion vs Frequency VO = 1vrms