# RC4558

## Dual High-Gain Operational Amplifier

## Features

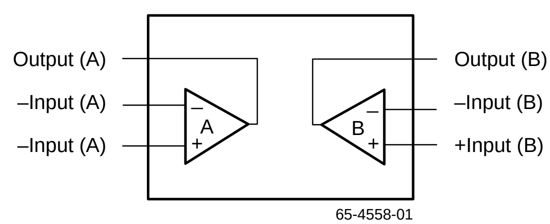
- 2.5 MHz unity gain bandwidth
- Supply voltage ±22V for RM4558 and ±18V for RC/RV4558
- Short-circuit protection
- No frequency compensation required
- No latch-up
- Large common-mode and differential voltage ranges
- Low power consumption
- Parameter tracking over temperature range
- Gain and phase match between amplifiers

## Description

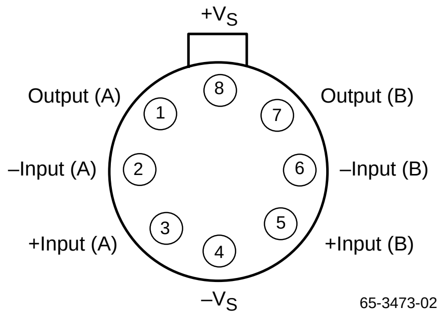
The RC4558 integrated circuit is a dual high-gain operational amplifier internally compensated and constructed on a single silicon IC using an advanced epitaxial process.

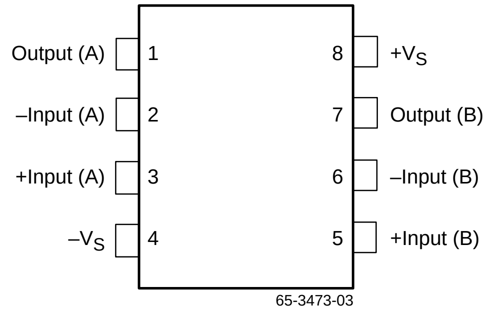
Combining the features of the 741 with the close parameter matching and tracking of a dual device on a monolithic chip results in unique performance characteristics. Excellent channel separation allows the use of this dual device in dense single 741 operational amplifier applications. It is especially well suited for applications in differential-in, differential-out as well as in potentiometric amplifiers and where gain and phase matched channels are mandatory.

## Block Diagram



## Pin Assignments




## Absolute Maximum Ratings

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

| Parameter | | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Supply Voltage | RM4558 | | | ±22 | V |
| | RC4558 | | | ±18 | |
| Input Voltage[2] | | | | ±15 | V |
| Differential Input Voltage | | | | 30 | V |
| $P_D T_A$ < 50°C | SOIC | | | 300 | mW |
| | PDIP | | | 468 | |
| | CerDIP | | | 833 | |
| | TO-99 | | | 658 | |
| Junction Temperature | SOIC, PDIP | | | 125 | °C |
| | CerDIP, TO-99 | | | 175 | |
| Operating Temperature | RM4558 | -55 | | 125 | °C |
| | RC4558 | 0 | | 70 | |
| Lead Soldering Temperature | PDIP, CerDIP, TO-99 (60 sec) | | | 300 | °C |
| | SOIC (10 sec) | | | 260 | |
| Output Short Circuit Duration[3] | | Indefinite | | | |

**Notes:**

1. Functional operation under any of these conditions is NOT implied.
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 op amp only. Rating applies to +75°C ambient temperature.

## Matching Characteristics

($V_S$ = ±15V, $T_A$ = +25°C unless otherwise specified)

| Parameter | Test Conditions | Typ | Units |
|---|---|---|---|
| Voltage Gain | $R_L \geq 2$ kΩ | ±1.0 | dB |
| Input Bias Current | $R_L \geq 2$ kΩ | ±15 | nA |
| Input Offset Current | $R_L \geq 2$ kΩ | ±7.5 | nA |

## Electrical Characteristics

($V_S$ = ±15V and $T_A$ = +25°C unless otherwise specified)

| Parameters | Test Conditions | RM4558 | | | RC4558 | | | Units |
|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | |
| Input Offset Voltage | $R_S$ ≤ 10kΩ | | 1.0 | 5.0 | | 2.0 | 6.0 | mV |
| Input Offset Current | | | 5.0 | 200 | | 5.0 | 200 | nA |
| Input Bias Current | | | 40 | 500 | | 40 | 500 | nA |
| Input Resistance | | 0.3 | 1.0 | | 0.3 | 1.0 | | MΩ |
| Large Signal Voltage Gain | $R_L$ ≥ 2kΩ, $V_{OUT}$ = ±10V | 50 | 300 | | 20 | 300 | | V/mV |
| Output Voltage Swing | $R_L$ ≥ 10kΩ | ±12 | ±14 | | ±12 | ±14 | | V |
| | $R_L$ ≥ 2kΩ | ±10 | ±13 | | ±10 | ±13 | | V |
| Input Voltage Range | | ±12 | ±13 | | ±12 | ±13 | | V |
| Common Mode Rejection Ratio | $R_S$ ≤ 10kΩ | 70 | 100 | | 70 | 100 | | dB |
| Power Supply Rejection Ratio | $R_S$ ≤ 10kΩ | 76 | 100 | | 76 | 100 | | dB |
| Power Consumption | $R_L$ = ∞ | | 100 | 170 | | 100 | 170 | mW |
| Transient Response | $V_{IN}$ = 20 mV | | | | | | | |
| Rise Time | $R_L$ = 2kΩ | | 0.3 | | | 0.3 | | µS |
| Overshoot | $C_L$ ≤ 100pF | | 35 | | | 35 | | % |
| Slew Rate | $R_L$ ≥ 2kΩ | | 0.8 | | | 0.8 | | V/µS |
| Channel Separation | F = 10kHz, $R_S$ = 1kΩ | | 90 | | | 90 | | dB |
| Unity Gain Bandwidth (Gain = 1) | | 2.5 | 3.0 | | 2.0 | 3.0 | | MHz |

The following specifications apply for RM = -55°C ≤ $T_A$ ≤ +125°C, RC = 0° ≤ $T_A$ ≤ +70°C

| Parameters | Test Conditions | RM4558 | | | RC4558 | | | Units |
|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | |
| Input Offset Voltage | $R_S$ ≤ 10kΩ | | | 6.0 | | | 7.5 | mV |
| Input Offset Current RC4558 | | | | 500 | | | 300 | nA |
| Input bias Current RC4558 | | | | 1500 | | | 800 | nA |
| Large Signal Voltage Gain | $R_L$ ≥ 2kΩ, $V_{OUT}$ = ±10 | 25 | | | 15 | | | V/mV |
| Output Voltage Swing | $R_L$ ≥ 2kΩ | ±10 | | | ±10 | | | V |
| Power Consumption | $R_L$ = ∞ | | 120 | 200 | | 120 | 200 | mW |

# Typical Performance Characteristics

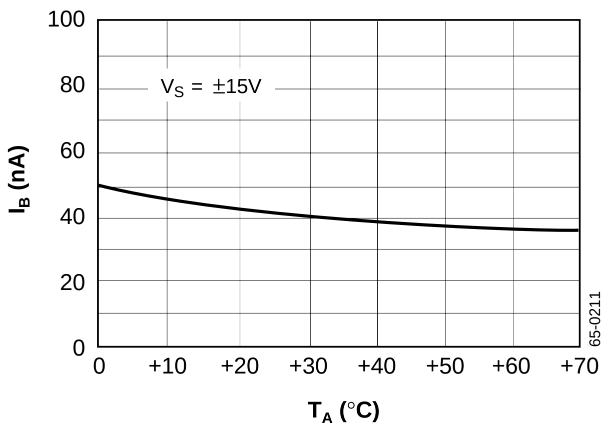



**Figure 1. Input Bias Current vs. Temperature**

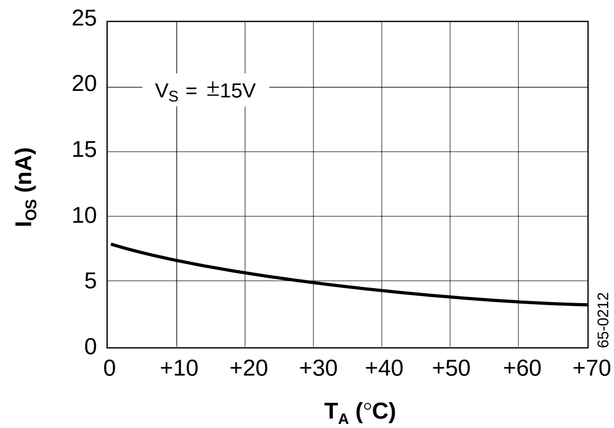



**Figure 2. Input Offset Current vs. Temperature**

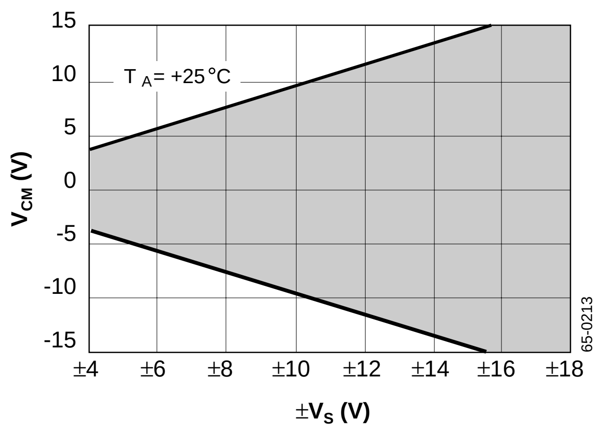



**Figure 3. Input Common Mode Voltage Range vs. Supply Voltage**

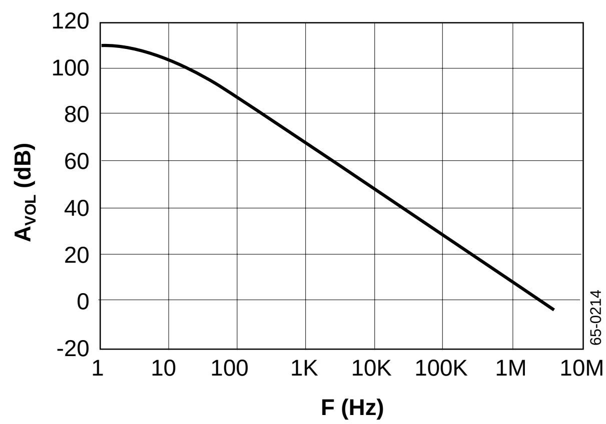



**Figure 4. Open Loop Voltage Gain vs. Frequency**

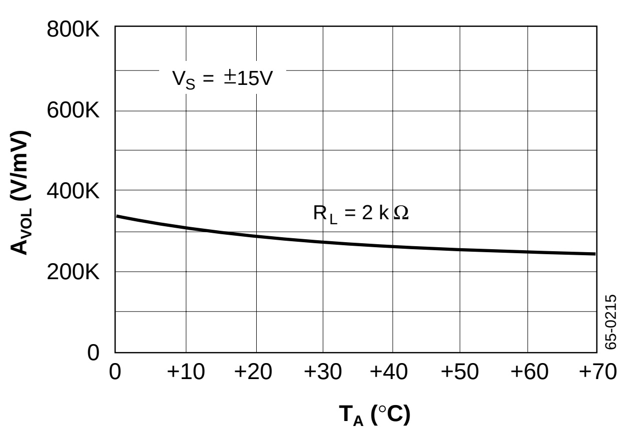



**Figure 5. Open Loop Voltage Gain vs. Temperature**

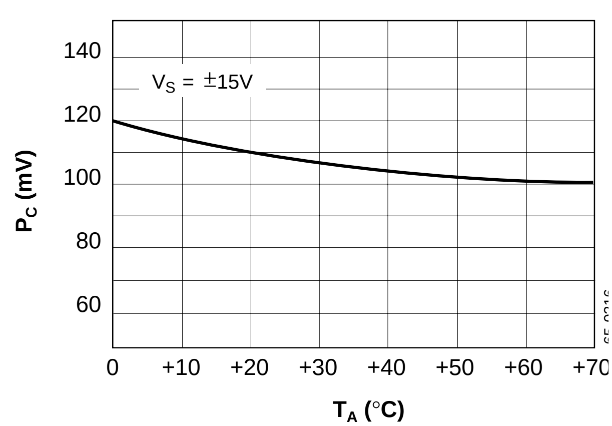



**Figure 6. Power Consumption vs. Temperature**

# Typical Performance Characteristics (continued)

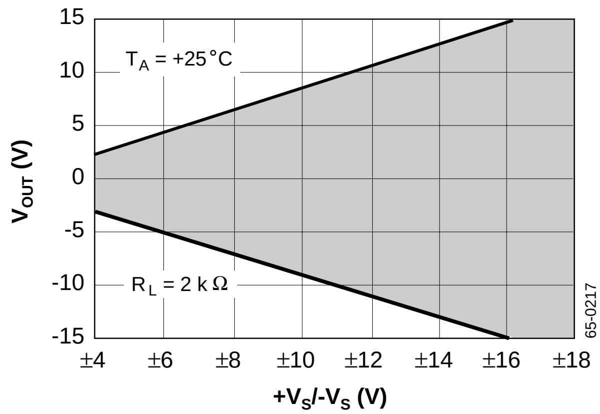



**Figure 7. Output Voltage Swing vs. Supply Voltage**

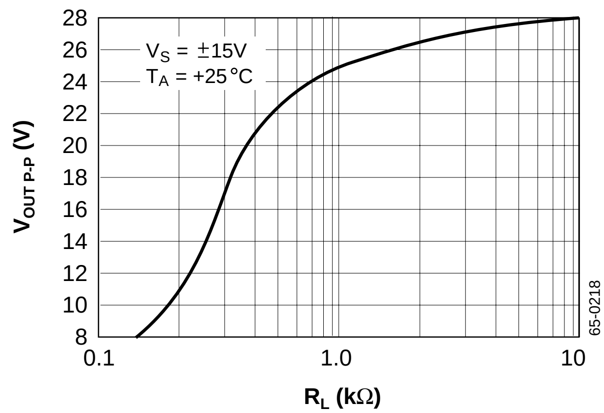



**Figure 8. Output Voltage Swing vs. Load Resistance**

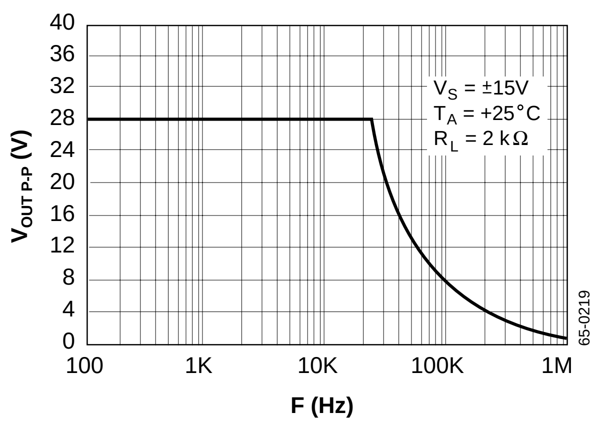



**Figure 9. Output Voltage Swing vs. Freqeuncy**

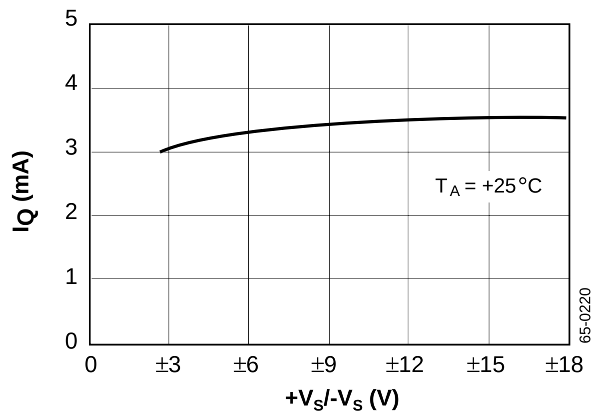



**Figure 10. Quiescent Current vs. Supply Voltage**

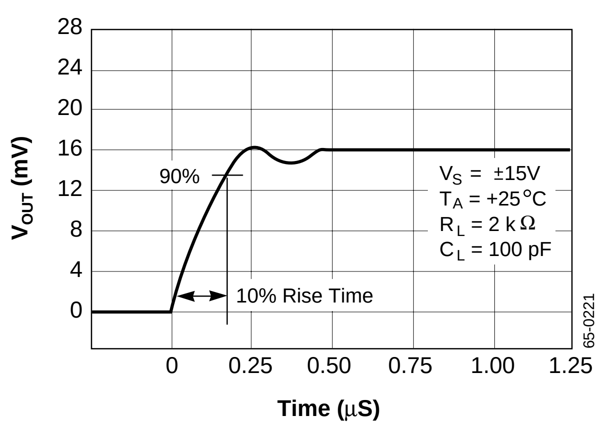



**Figure 11. Transient Response Output Voltage vs. Time**

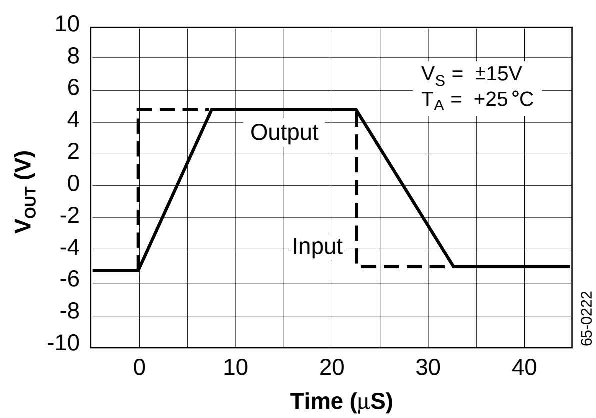



**Figure 12. Follower Large Signal Pulse Response Output Voltage vs. Time**

## Typical Performance Characteristics (continued)

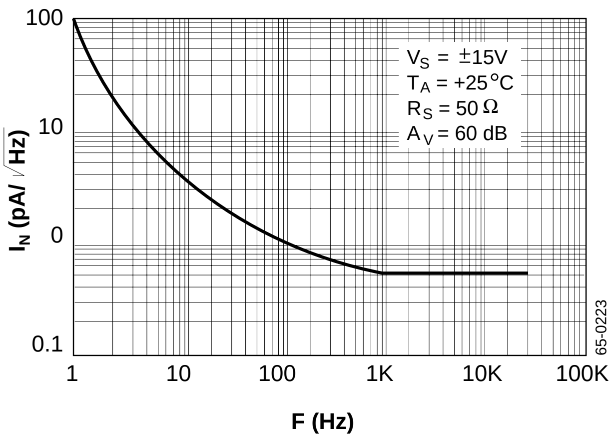



Figure 13. Input Noise Current Density vs. Frequency

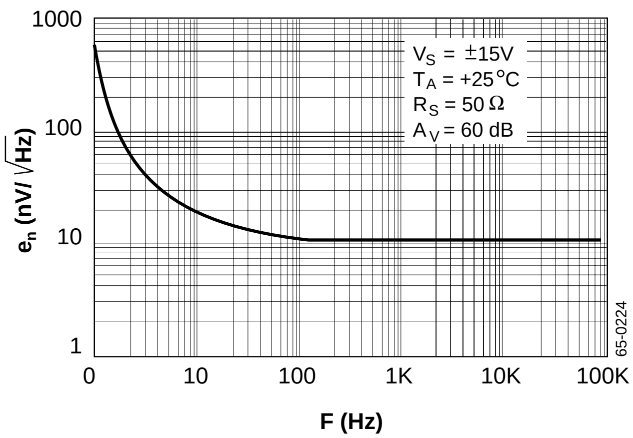



Figure 14. Input Noise Voltage Density vs. Frequency

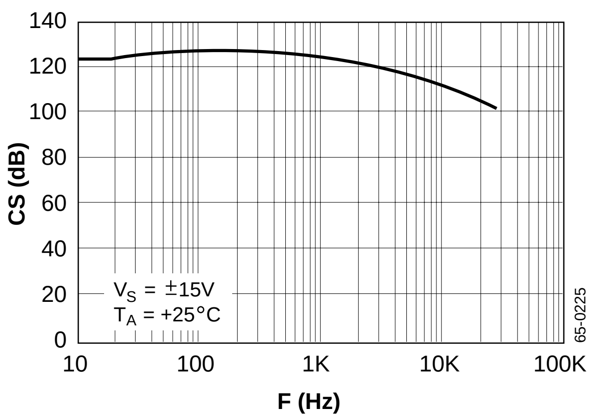



Figure 15. Channel Separation vs. Frequency

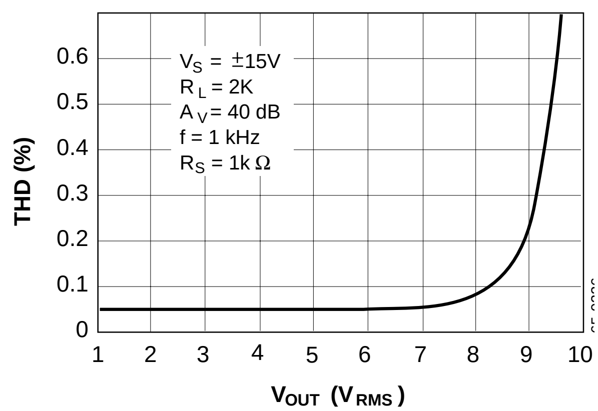



Figure 16. Total Harmonic Distortion vs Output Voltage

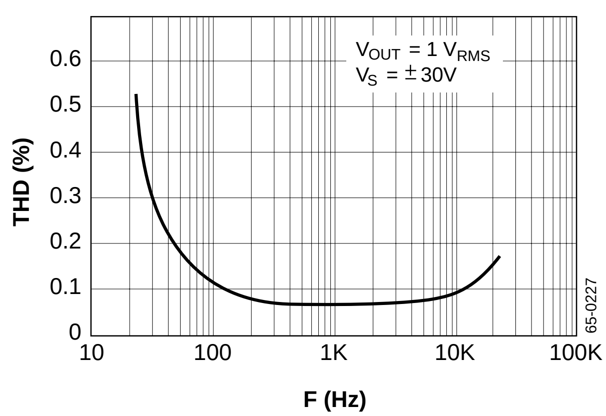



Figure 17. Distortion vs. Frequency

# Typical Applications

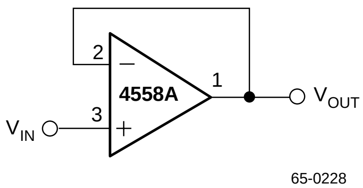



Figure 18. Voltage Follower

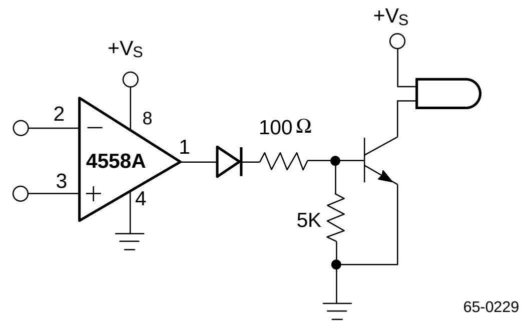



Figure 19. Lamp Driver

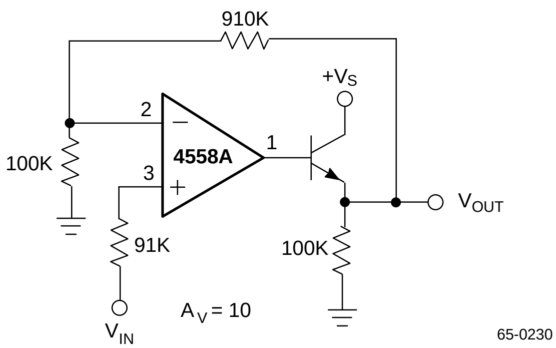



Figure 20. Power Amplifier

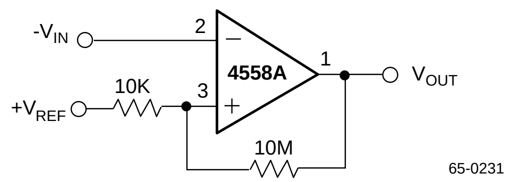



Figure 21. Comparator With Hysteresis

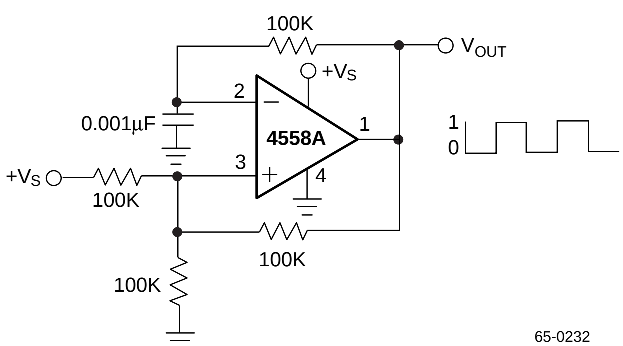



Figure 22. Squarewave Oscillator

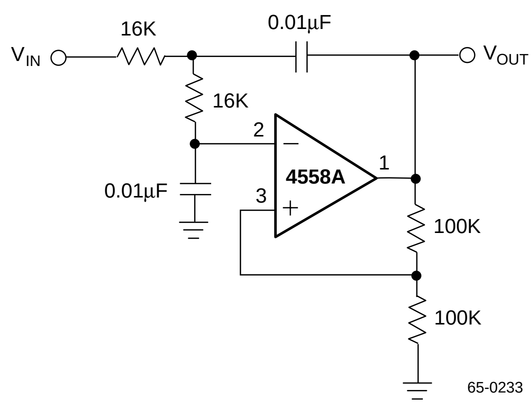



Figure 23. DC Coupled 1kHz Low-Pass Active Filter

## Typical Applications (continued)

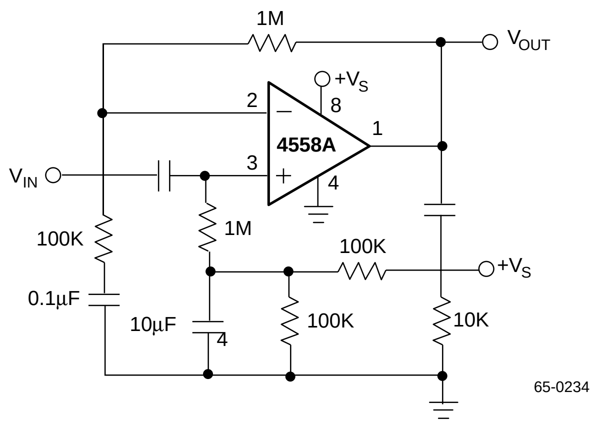



Figure 24. AC Coupled Non-Inverting Amplifier

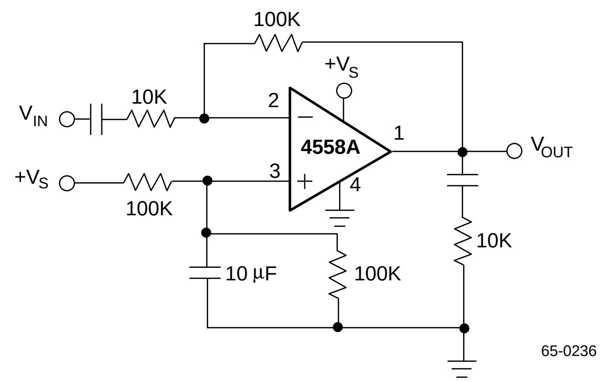



Figure 25. AC Coupled Inverting Amplifier

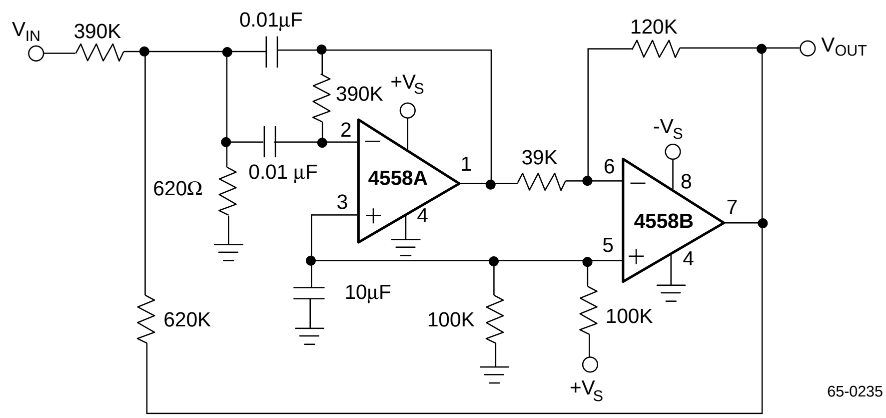



Figure 26. 1kHz Bandpass Active Filter

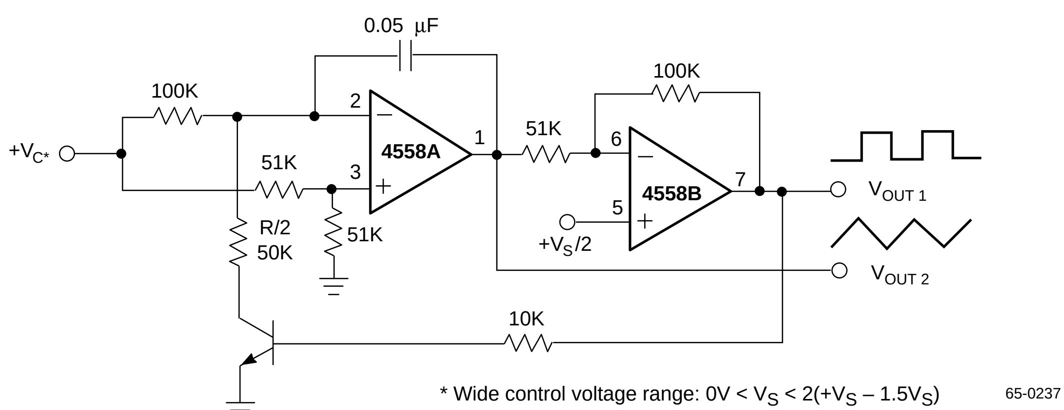
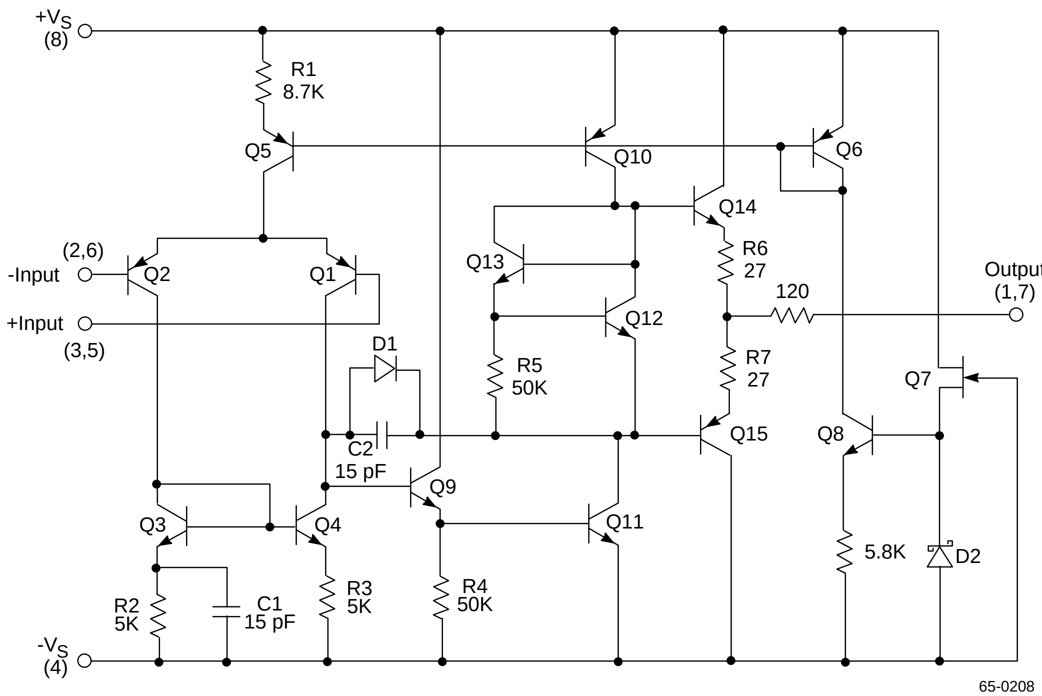



Figure 27. Voltage Controlled Oscillator (VCO)

## Simplified Schematic Diagram



## Ordering Information

| Product Number | Temperature Range | Screening | Package |
|---|---|---|---|
| RC4558M | 0° to 70°C | Commercial | 8 Pin Wide SOIC |
| RC4558N | 0° to 70°C | Commercial | 8 Pin Plastic DIP |
| RM4558D | 0° to 70°C | Commercial | 8 Pin Ceramic DIP |
| RM4558D/883B | -55°C to +125°C | Military | 8 Pin Ceramic DIP |

**Note:**
1. /883B suffix denotes MIL-STD-883, Par. 1.2.1 compliant device.



Raytheon Electronics
Semiconductor Division
350 Ellis Street
Mountain View CA 94043
415 968 9211
FAX 415 966 7742

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