# Dual general-purpose operational amplifier NE/SA/SE4558

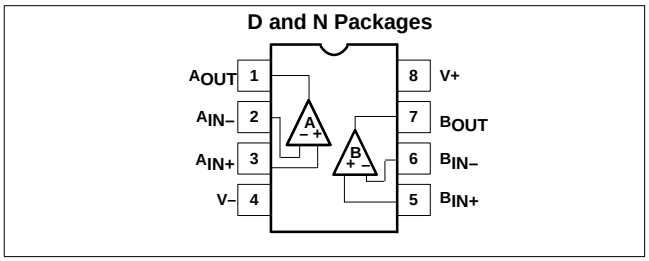
## DESCRIPTION

The 4558 is a dual operational amplifier that is internally compensated. Excellent channel separation allows the use of a dual device in a single amp application, providing the highest packaging density. The NE/SA/SE4558 is a pin-for-pin replacement for the RC/RM/RV4558.

## FEATURES

- 2MHz unity gain bandwidth guaranteed
- Supply voltage ±22V for SE4558 and ±18V for NE4558
- Short-circuit protection
- No frequency compensation required
- No latch-up
- Large common-mode and differential voltage ranges
- Low power consumption

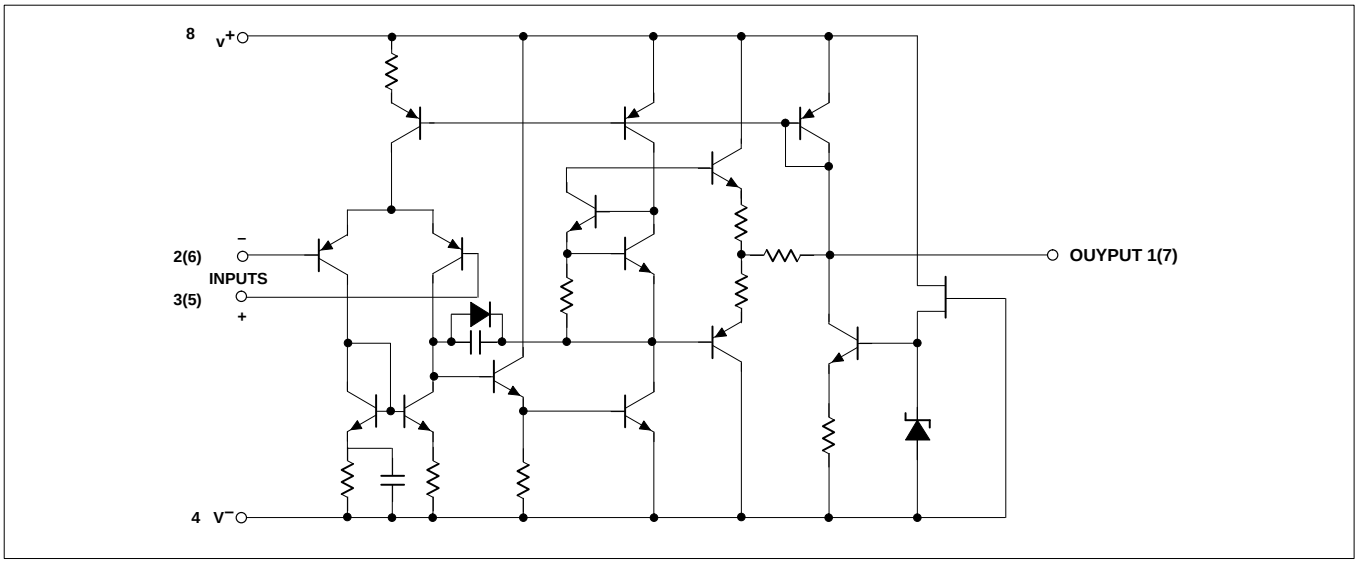
## PIN CONFIGURATIONS




## ORDERING INFORMATION

| DESCRIPTION | TEMPERATURE RANGE | ORDER CODE | DWG # |
|---|---|---|---|
| 8-Pin Plastic Small Outline (SO) Package | 0 to +70°C | NE4558D | 0174C |
| 8-Pin Plastic Dual In-Line Package (DIP) | 0 to +70°C | NE4558N | 0404B |
| 8-Pin Plastic Dual In-Line Package (DIP) | -40 to +85°C | SA4558N | 0404B |
| 8-Pin Plastic Dual In-Line Package (DIP) | -40 to +85°C | SA4558D | 0404B |
| 8-Pin Plastic Dual In-Line Package (DIP) | -55 to +125°C | SE4558N | 0404B |

## EQUIVALENT SCHEMATIC



## ABSOLUTE MAXIMUM RATINGS

| SYMBOL | PARAMETER | RATING | UNIT |
|---|---|---|---|
| $V_{CC}$ | Supply voltage | | |
| | SE4558 | ±22 | V |
| | NE4558, SA4558 | ±18 | V |
| $P_{D\ MAX}$ | Maximum power dissipation, | | |
| | $T_A$=25°C (Still air)[1] | | |
| | N package | 1160 | mW |
| | D package | 780 | mW |
| | Differential input voltage | ±30 | V |
| $V_{IN}$ | Input voltage[2] | ±15 | V |
| $T_{STG}$ | Storage temperature range | -65 to +150 | °C |
| $T_A$ | Operating ambient temperature range | | |
| | SE4558 | -55 to +125 | °C |
| | SA4558 | -40 to +85 | °C |
| | NE4558 | 0 to +70 | °C |
| $T_{SOLD}$ | Lead soldering temperature (10sec max) | 300 | °C |
| | Output short-circuit duration[3] | Indefinite | |

**NOTES:**
1. Derate above 25°C at the following rates:
   N package at 9.3mW/°C
   D package at 6.2mW/°C
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 NE4558 and to +85°C ambient temperature for SA4558.

## DC ELECTRICAL CHARACTERISTICS

$V_{CC}$=+15V, TA= 25°C unless otherwise specified.

| SYMBOL | PARAMETER | TEST CONDITIONS | SE4558 | | | SA/NE4558 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Typ | Max | |
| $V_{OS}$ | Input offset voltage | $R_S$≤10kΩ | | 1.0 | 5.0 | | 2.0 | 6.0 | mV |
| | $\Delta V_{OS}/\Delta T$ | Over temp. | | 4 | | | 4 | | µV/°C |
| $I_{OS}$ | Input offset current | | | 50 | 200 | | 30 | 200 | nA |
| | $\Delta I_{OS}/\Delta T$ | Over temp. | | 20 | | | 20 | | pA/°C |
| $I_{BIAS}$ | Input bias current | | | 40 | 500 | | 200 | 500 | nA |
| | $\Delta I_B/\Delta T$ | Over temp. | | 40 | | | 40 | | pA/°C |
| $R_{IN}$ | Input resistance | | 0.3 | 1.0 | | 0.3 | 1.0 | | MΩ |
| $A_V$ | Large-signal voltage gain | $R_L$≥2kΩ<br>$V_{OUT}$=±10V | 50,000 | 300,000 | | 20,000 | 300,000 | | V/V |
| | Output voltage swing | $R_L$≥10kΩ<br>$R_L$≥2kΩ | ±12<br>±10 | ±14<br>±13 | | ±12<br>±10 | ±14<br>±13 | | V<br>V |
| $V_{IN}$ | Input voltage range | | ±12 | ±13 | | ±12 | ±13 | | V |
| CMRR | Common-mode rejection ratio | $R_S$≤10kΩ | 70 | 100 | | 70 | 100 | | dB |
| PSRR | Power supply rejection ratio | $R_S$≤10kΩ | | 10 | 150 | | 10 | 150 | µV/V |
| $I_{SC}$ | Short-circuit current | | 5 | 25 | 60 | 5 | 25 | 60 | mA |
| | Power consumption (all amplifiers) | $R_L$=∞ | | 120 | 170 | | 120 | 170 | mW |

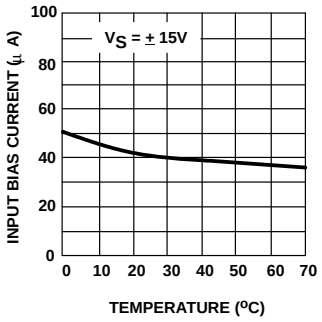
## DC ELECTRICAL CHARACTERISTICS (Continued)

| SYMBOL | PARAMETER | TEST CONDITIONS | SE4558 | | | SA/NE4558 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Typ | Max | |
| $t_R$ | Transient response (unity gain)<br>Rise time<br>Overshoot | $V_{IN}$=20mV<br>$R_L$=2kΩ<br>$C_L$≤100pF | | <br>100<br>15.0 | | | <br>100<br>15.0 | | <br>ns<br>% |
| SR | Slew rate (unity gain) | $R_L$≥2kΩ | | 1.0 | | | 1.0 | | V/μs |
| | Channel separation (gain=100) | f=10kHz<br>$R_S$=1kΩ | | 90 | | | 90 | | dB |
| GBW | Unity gain bandwidth (gain=1) | | 2.0 | 3.0 | | 2.0 | 3.0 | | MHz |
| $\theta_M$ | Phase margin | | | 45 | | | 45 | | De-gree |
| $V_{NOISE}$ | Input noise voltage | f=1kΩ | | 25 | | | 25 | | nV/$\sqrt{Hz}$ |
| **NOTE:** The following specifications apply over operating temperature range. | | | | | | | | | |
| $V_{OS}$ | Input offset voltage | $R_S$≤10kΩ | | | 6.0 | | | 7.5 | mV |
| $I_{OS}$ | Input offset current | | | | 500 | | | 300/500[1] | nA |
| $I_{BIAS}$ | Input bias current | | | | 1500 | | | 800/1500[1] | nA |
| $A_V$ | Large-signal voltage gain | $R_L$≥2kΩ<br>$V_{OUT}$=±10V | 25,000 | | | 15,000 | | | V/V |
| | Output voltage swing | $R_L$≥2kΩ | ±10 | | | ±10 | | | V |
| $P_C$ | Power consumption | $T_A$=HIGH<br>$T_A$=LOW | | 105<br>125 | 150<br>200 | | 115<br>120 | 150<br>200 | mW<br>mW |

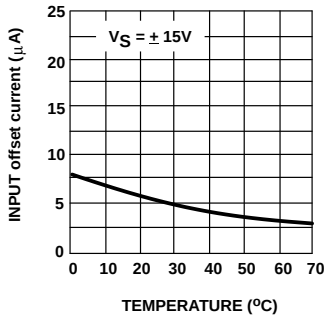
**NOTES:**
1. SA4558 only.

## TYPICAL PERFORMANCE CURVES

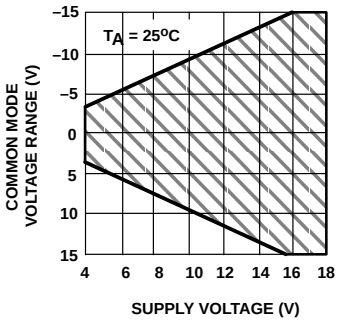
**Input Bias as a Function of Ambient Temperature**



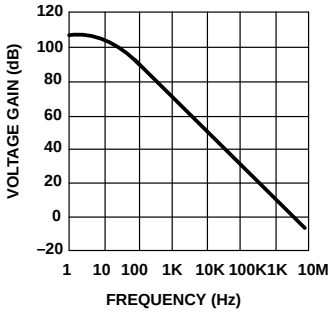

**Input Offset Current as as a Function of Ambient Temperature**



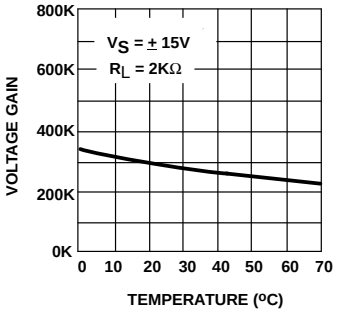

**Common–Mode Range as a Function of Supply Voltage**



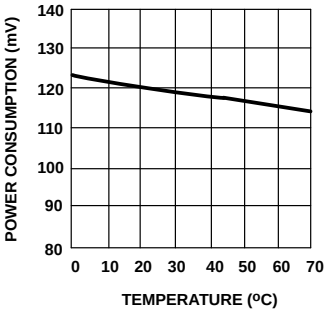

**Open–Loop Voltage Gain as a Function of Frequency**



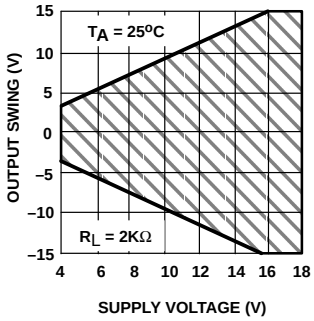

**Open–Loop Gain as a Function of Temperature**



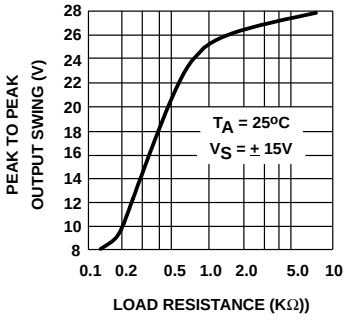

**Power Consumption as a Function of Ambient Temperature**



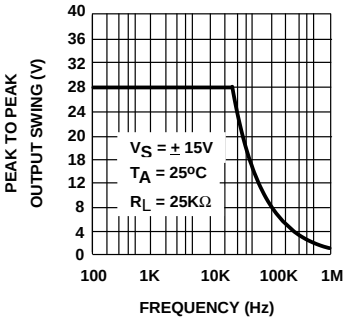

**Typical Output Voltage as a Function of Supply Voltage**




**Output Voltage Swing as a Function of Load Resistance)**

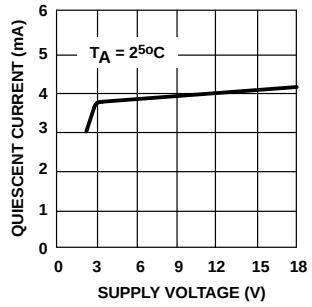



**Output Voltage Swing as a Function of Frequency**

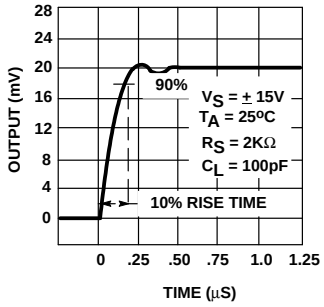


## TYPICAL PERFORMANCE CURVES (Continued)

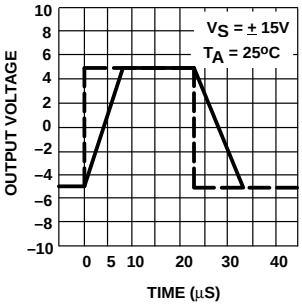
**Quiescent Current as a Function of Supply Voltage**



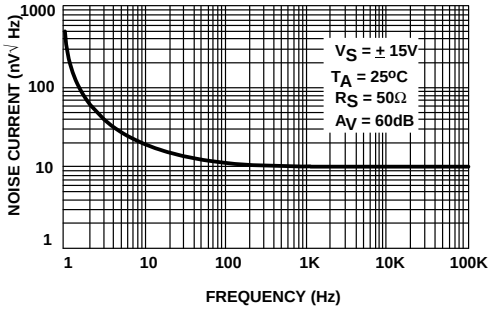

**Transient Response**



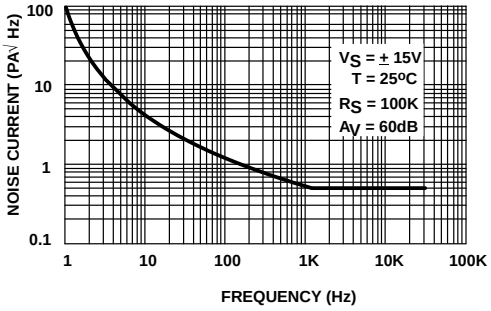

**Voltage–Follower Large–Signal Pulse Response**



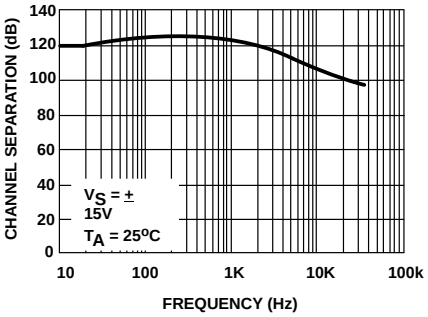

**Input Noise Voltage as a Function of Frequency**



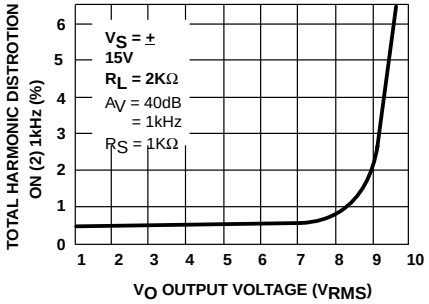

**Input Noise Current as a Function of Frequency**




**Channel Separation**




**Total Harmonic Distortion vs Output Voltage**




**Distortion vs Frequency $V_O = 1V_{RMS}$**