# General purpose operational amplifier

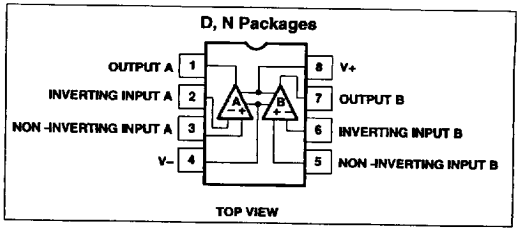
# MC/SA1458/MC1558

## DESCRIPTION

The MC1458 is a high-performance operational amplifier with high open-loop gain, internal compensation, high common-mode range and exceptional temperature stability. The MC1458 is short-circuit protected.

The MC1458/SA1458/MC1558 consists of a pair of 741 operational amplifiers on a single chip.

## PIN CONFIGURATION




## FEATURES

- Internal frequency compensation
- Short-circuit protection
- Excellent temperature stability
- High input voltage range
- No latch-up
- 1558/1458 are 2 "op amps" in space of one 741 package



## ORDERING INFORMATION

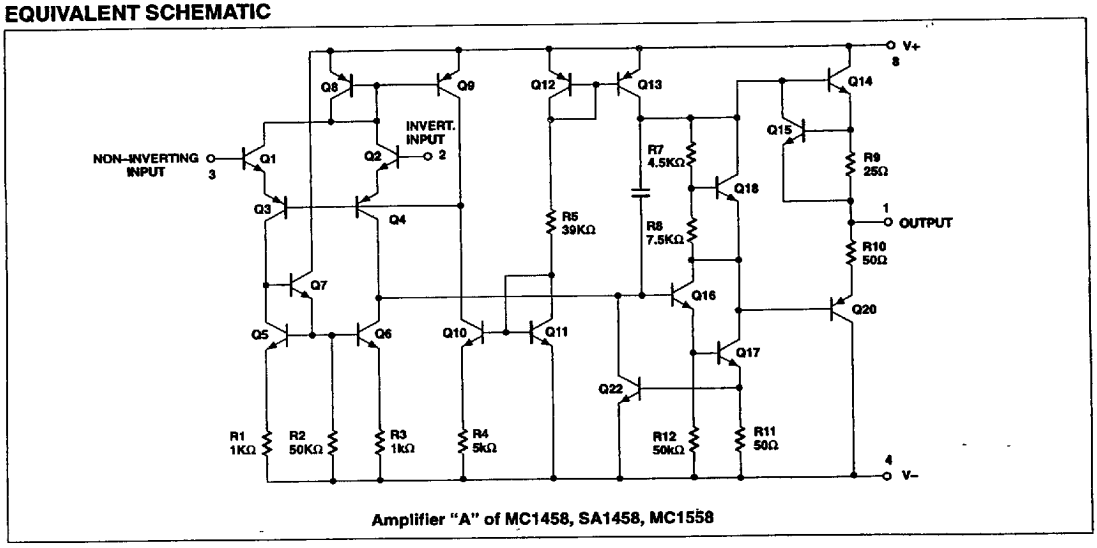
| DESCRIPTION | TEMPERATURE RANGE | ORDER CODE | DWG # |
|---|---|---|---|
| 8-Pin Plastic Small Outline (SO) Package | 0 to +70°C | MC1458D | 0174C |
| 8-Pin Plastic Dual In-Line Package (DIP) | 0 to +70°C | MC1458N | 0404B |
| 8-Pin Plastic Small Outline (SO) Package | -40°C to +85°C | SA1458D | 0174C |
| 8-Pin Plastic Dual In-Line Package (DIP) | -40°C to +85°C | SA1458N | 0404B |
| 8-Pin Plastic Dual In-Line Package (DIP) | -55°C to +125°C | MC1558N | 0404B |

## ABSOLUTE MAXIMUM RATINGS

| SYMBOL | PARAMETER | RATING | UNIT |
|---|---|---|---|
| $V_S$ | Supply voltage | | |
| | MC1458 | ±18 | V |
| | SA1458 | ±18 | V |
| | MC1558 | ±22 | V |
| $T_J$ | Junction temperature | +150 | °C |
| $P_{D\ MAX}$ | Maximum power dissipation, $T_A$=25°C (still-air)[1] | | |
| | N package | 1160 | mW |
| | D package | 780 | mW |
| $V_{DIFF}$ | Differential input voltage | ±30 | V |
| $V_{IN}$ | Input voltage[2] | ±15 | V |
| | Output short-circuit duration | Continuous | |
| $T_A$ | Operating ambient temperature range | | |
| | MC1458 | 0 to +70 | °C |
| | SA1458 | -40 to +85 | °C |
| | MC1558 | -55 to +125 | °C |
| $T_{STG}$ | Storage temperature range | -65 to +150 | °C |
| $T_{SOLD}$ | Lead soldering temperature (10sec max) | 300 | °C |

**NOTES:**
1. The following derating factors should be applied above 25°C; 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.

## EQUIVALENT SCHEMATIC




Amplifier "A" of MC1458, SA1458, MC1558

## DC ELECTRICAL CHARACTERISTICS

$T_A$=25°C, $V_S$=±15V, unless otherwise specified.

| SYMBOL | PARAMETER | TEST CONDITIONS | MC1558 | | | UNIT |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $V_{OS}$ | Offset voltage | $R_S$=10kΩ | | 1.0 | 5.0 | mV |
| | | $R_S$=10kΩ, over temperature | | | 6.0 | mV |
| $\Delta V_{OS}$ | Offset voltage | Over temperature | | 10 | | µV/°C |
| $I_{OS}$ | Offset current | | | 20 | 200 | nA |
| | | Over temperature | | | 500 | nA |
| $\Delta I_{OS}$ | Offset current | Over temperature | | 0.10 | | nA/°C |
| $I_{BIAS}$ | Input bias current | | | 80 | 500 | nA |
| | | Over temperature | | | 1500 | nA |
| $\Delta I_{BIAS}$ | Bias current | Over temperature | | 1.0 | | nA/°C |
| $V_{OUT}$ | Output voltage swing | $R_L$=10kΩ, over temperature | ±12 | ±14 | | V |
| | | $R_L$=2kΩ, over temperature | ±10 | ±13 | | |
| $A_{VOL}$ | Large-signal voltage gain | $R_L$=2kΩ, $V_O$=±10V | 50 | 100 | | V/mV |
| | | $R_L$=2kΩ, $V_O$=± temperature | 20 | | | |
| | Offset voltage adjustment range | | | ±30 | | mV |
| PSRR | Power supply rejection ratio | $R_S$≤10kΩ | | 30 | 150 | µV/V |
| CMRR | Common mode rejection ratio | | 70 | 90 | | dB |
| $I_{CC}$ | Supply current | | | 2.3 | 5.0 | mA |
| $V_{IN}$ | Input voltage range | | ±12 | ±13 | | V |
| $P_D$ | Power consumption | | | 70 | 150 | mW |
| | Channel separation | | | 120 | | dB |
| $R_{OUT}$ | Output resistance | | | 75 | | Ω |
| $I_{SC}$ | Output short-circuit current | | 10 | 25 | 60 | mA |

## DC ELECTRICAL CHARACTERISTICS (Continued)

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

| SYMBOL | PARAMETER | TEST CONDITIONS | MC1458 | | | SA1458 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Typ | Max | |
| $V_{OS}$ | Offset voltage | $R_S$=10kΩ | | 2.0 | 6.0 | | 2.0 | 6.0 | mV |
| | | $R_S$=10kΩ, over temp. | | | 7.5 | | | 7.5 | mV |
| $\Delta V_{OS}$ | Offset voltage | Over temperature | | 12 | | | 12 | | µV/°C |
| $I_{OS}$ | Offset current | | | 20 | 200 | | 20 | 200 | nA |
| | | Over temperature | | | 300 | | | 500 | nA |
| $\Delta I_{OS}$ | Offset current | Over temperature | | 0.10 | | | 0.10 | | nA/°C |
| $I_{BIAS}$ | Input bias current | | | 80 | 500 | | 80 | 500 | nA |
| | | Over temperature | | | 800 | | | 1500 | nA |
| $\Delta I_{BIAS}$ | Bias current | Over temperature | | 1.0 | | | 1.0 | | nA/°C |
| $V_{OUT}$ | Output voltage swing | $R_L$=10kΩ, over temp. | ±12 | ±14 | | ±12 | ±14 | | V |
| | | $R_L$=2kΩ, over temp. | ±10 | ±13 | | ±10 | ±13 | | |
| $A_{VOL}$ | Large-signal voltage gain | $R_L$=2kΩ, $V_O$=±10V | 25 | 200 | | 20 | 200 | | V/mV |
| | | $R_L$=2kΩ, $V_O$=±10V, | | | | | | | |
| | | Over temperature | 15 | | | 15 | | | V/mV |
| | Offset voltage adjustment range | | | ±30 | | | ±30 | | mV |
| PSRR | Power supply rejection ratio | $R_S$≤10kΩ | | 30 | 150 | | 30 | 150 | µV/V |
| CMRR | Common-mode rejection ratio | | 70 | 90 | | 70 | 90 | | dB |
| $I_{CC}$ | Supply current | | | 2.3 | 5.6 | | 2.3 | 5.6 | mA |
| $V_{IN}$ | Input voltage range | | ±12 | ±13 | | ±12 | ±13 | | V |
| $R_{IN}$ | Input resistance | | 0.3 | 1 | | 0.3 | 1 | | MΩ |
| $P_D$ | Power consumption | | | 70 | 170 | | 70 | 170 | mW |
| | Channel separation | | | 120 | | | 120 | | dB |
| $I_{SC}$ | Output short-circuit current | | | 25 | | | 25 | | mA |

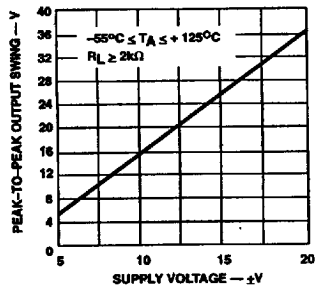
## AC ELECTRICAL CHARACTERISTICS

$T_A$=25°C $V_S$=±15V, unless otherwise specified.

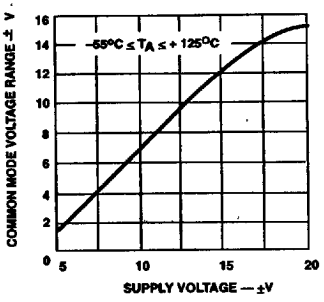
| SYMBOL | PARAMETER | TEST CONDITIONS | MC1458, SA1458, MC1558 | | | UNIT |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $R_{IN}$ | Parallel input resistance | Open-loop, f=20Hz | 0.3 | | | MΩ |
| | Common-mode input impedance | f=20Hz | | 200 | | MΩ |
| | Equivalent input noise voltage | $A_V$=100, $R_S$=10kΩ, BW=1.0kHz, f=1.0kHz | | 30 | | nV/$\sqrt{Hz}$ |
| BW | Power bandwidth | $A_V$=1, $R_L$=2.0kΩ, THD≤5%, $V_{OUT}$=20$V_{P-P}$ | | 14 | | kHz |
| | Phase margin | | | 65 | | degrees |
| $A_V$ | Gain margin | | | 11 | | dB |
| | Unity gain crossover frequency | Open loop | | 1.0 | | MHz |
| | Transient response unity gain | $V_{IN}$=20mV, $R_L$=2kΩ, $C_L$≤100pF | | | | |
| $t_R$ | Rise time | | | 0.3 | | µs |
| | Overshoot | | | 5.0 | | % |
| SR | Slew rate | $C_L$≤100pF, $R_L$≥2kΩ, $V_{IN}$=±10V | | 0.8 | | V/µs |

## TYPICAL PERFORMANCE CHARACTERISTICS

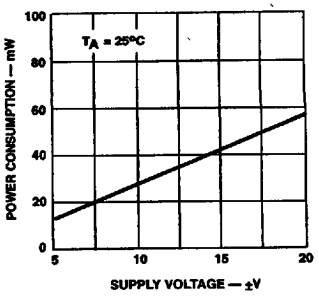
Output Voltage Swing as a Function of Supply Voltage



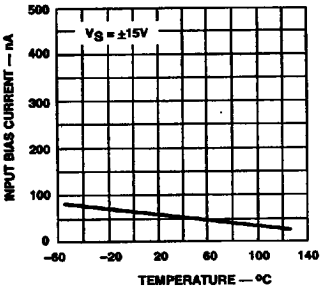

Input Common-Mode Range as a Function of Supply Voltage



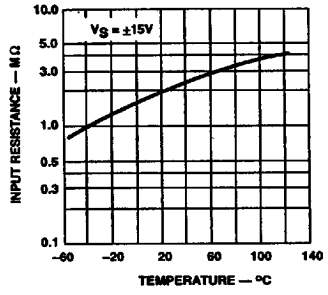

Power Consumption as a Function of Supply Voltage



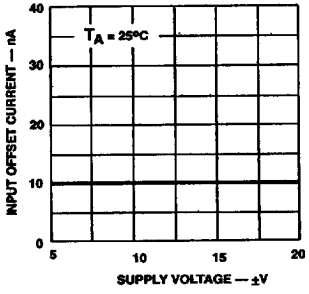

Input Bias Current as a Function Of Ambient Temperature



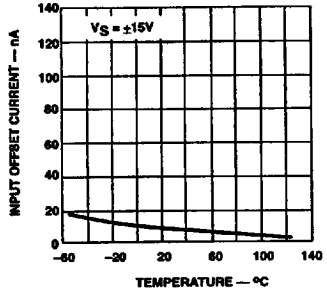

Input Resistance as a Function of Ambient Temperature



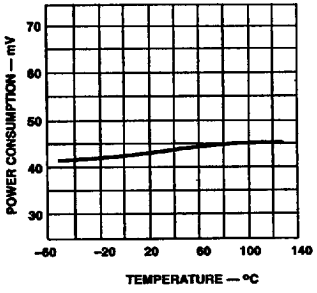

Input Offset Current as a Function of Supply Voltage



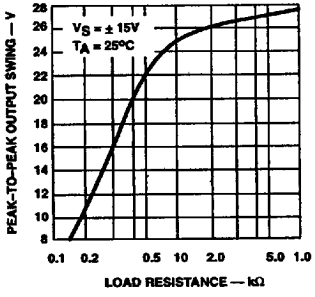

Input Offset Current as a Function of Ambient Temperature




Power Consumption as a Function of Ambient Temperature

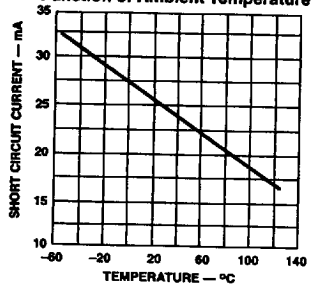



Output Voltage Swing as a Function of Load Resistance

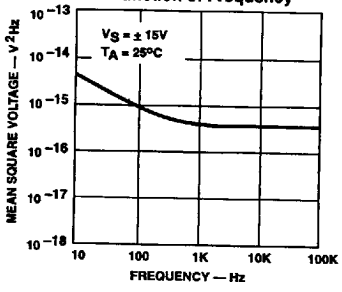


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

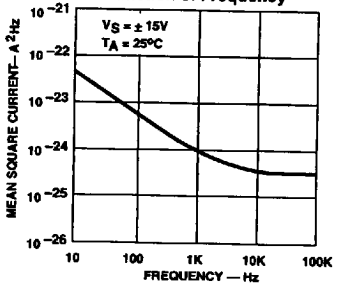
Output Short–Circuit Current as a Function of Ambient Temperature



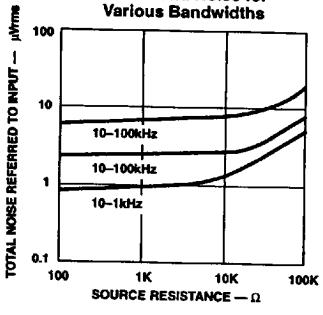

Input Noise Voltage as a Function of Frequency



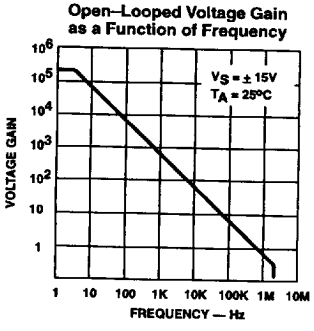

Input Noise Current as a Function of Frequency



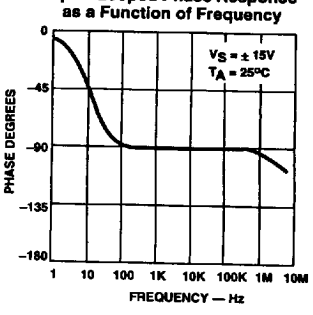

Broadband Noise for Various Bandwidths



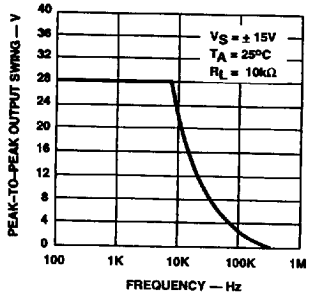

Open–Looped Voltage Gain as a Function of Frequency



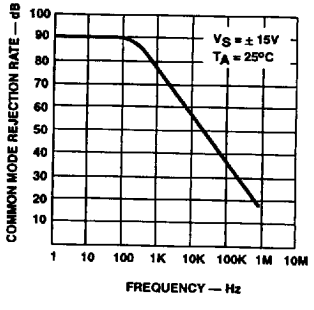

Open–Looped Phase Response as a Function of Frequency



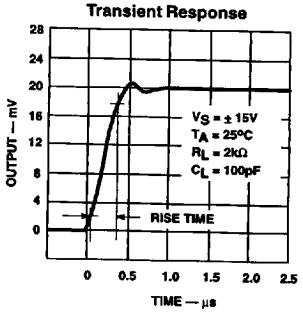

Output Voltage Swing as a Function of Frequency




Common–Mode Rejection Ratio as a Function of Frequency




Transient Response



## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)