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MOTOROLA

MC4558AC
MC4558C

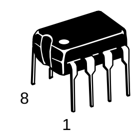
Dual Wide Bandwidth Operational Amplifiers

The MC4558AC, C combine all the outstanding features of the MC1458 and, in addition offer three times the unity gain bandwidth of the industry standard.

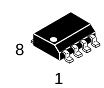
- 2.5 MHz Unity Gain Bandwidth Guaranteed (MC4558AC)
- 2.0 MHz Unity Gain Bandwidth Guaranteed (MC4558C)
- Internally Compensated
- Short Circuit Protection
- Gain and Phase Match between Amplifiers
- Low Power Consumption

DUAL WIDE BANDWIDTH OPERATIONAL AMPLIFIERS

SEMICONDUCTOR TECHNICAL DATA



P1 SUFFIX
PLASTIC PACKAGE
CASE 626



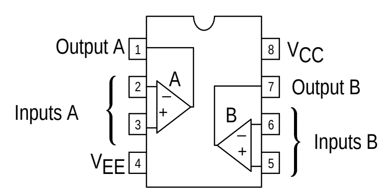
D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO–8)

MAXIMUM RATINGS (T_A = +25°C, unless otherwise noted.)

Rating	Symbol	MC4558AC	MC4558C	Unit
Power Supply Voltage	V_{CC} V_{EE}	+22 –22	+18 –18	Vdc
Input Differential Voltage	V_{ID}	±30		V
Input Common Mode Voltage (Note 1)	V_{ICM}	±15		V
Output Short Circuit Duration (Note 2)	t_{SC}	Continuous		
Ambient Temperature Range	T_A	0 to +70		°C
Storage Temperature Range	T_{stg}	–55 to +125		°C
Junction Temperature	T_J	150		°C

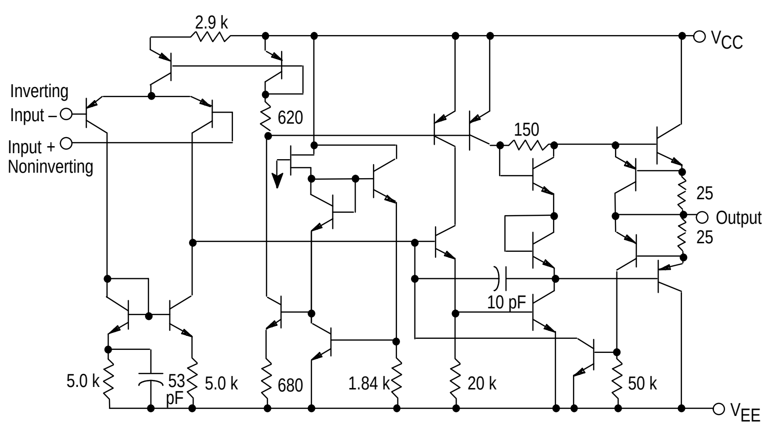
NOTES: 1. For supply voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.
2. Short circuit may be to ground or either supply.

PIN CONNECTIONS



(Top View)

Representative Schematic Diagram
(1/2 of Circuit Shown)



ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC4558CD	T_A = 0° to +70°C	SO–8
MC4558ACP1,CP1		Plastic DIP

FREQUENCY CHARACTERISTICS (V_{CC} = +15 V, V_{EE} = –15 V, T_A = 25°C)

Characteristic	Symbol	MC4558AC			MC4558C			Unit
		Min	Typ	Max	Min	Typ	Max	
Unity Gain Bandwidth	BW	2.5	2.8	–	2.0	2.8	–	MHz

ELECTRICAL CHARACTERISTICS (V_{CC} = 15 V, V_{EE} = –15 V, T_A = 25°C, unless otherwise noted.)

Characteristic	Symbol	MC4558AC Min	MC4558AC Typ	MC4558AC Max	MC4558C Min	MC4558C Typ	MC4558C Max	Unit
Input Offset Voltage (R_S ≤ 10 kΩ)	V_{IO}	–	1.0	5.0	–	2.0	6.0	mV
Input Offset Current	I_{IO}	–	20	200	–	20	200	nA
Input Bias Current (Note 1)	I_{IB}	–	80	500	–	80	500	nA
Input Resistance	r_i	0.3	2.0	–	0.3	2.0	–	MΩ
Input Capacitance	C_i	–	1.4	–	–	1.4	–	pF
Common Mode Input Voltage Range	V_{ICR}	±12	±13	–	±12	±13	–	V
Large Signal Voltage Gain (V_O = ±10 V, R_L = 2.0 kΩ)	A_{VOL}	50	200	–	20	200	–	V/mV
Output Resistance	r_o	–	75	–	–	75	–	Ω
Common Mode Rejection (R_S ≤ 10 kΩ)	CMR	70	90	–	70	90	–	dB
Supply Voltage Rejection Ratio (R_S ≤ 10 kΩ)	PSRR	–	30	150	–	30	150	µV/V
Output Voltage Swing	V_O							V
(R_L ≥ 10 kΩ)		±12	±14	–	±12	±14	–	
(R_L ≥ 2.0 kΩ)		±10	±13	–	±10	±13	–	
Output Short Circuit Current	I_{SC}	10	20	40	10	20	40	mA
Supply Currents (Both Amplifiers)	I_D	–	2.3	5.0	–	2.3	5.6	mA
Power Consumption (Both Amplifiers)	P_C	–	70	150	–	70	170	mW
Transient Response (Unity Gain)								
(V_I = 20 mV, R_L ≥ 2.0 kΩ, C_L ≤ 100 pF) Rise Time	t_{TLH}	–	0.3	–	–	0.3	–	µs
(V_I = 20 mV, R_L ≥ 2.0 kΩ, C_L ≤ 100 pF) Overshoot	os	–	15	–	–	15	–	%
(V_I = 10 V, R_L ≥ 2.0 kΩ, C_L ≤ 100 pF) Slew Rate	SR	1.5	1.6	–	1.0	1.6	–	V/µs

ELECTRICAL CHARACTERISTICS (V_{CC} = +15 V, V_{EE} = –15 V, T_A = T_{high} to T_{low}, unless otherwise noted. See Note 2.)

Characteristic	Symbol	MC4558AC Min	MC4558AC Typ	MC4558AC Max	MC4558C Min	MC4558C Typ	MC4558C Max	Unit
Input Offset Voltage (R_S ≤ 10 kΩ)	V_{IO}	–	1.0	6.0	–	–	7.5	mV
Input Offset Current	I_{IO}							nA
(T_A = T_{high})		–	7.0	200	–	–	–	
(T_A = T_{low})		–	85	500	–	–	–	
(T_A = 0° to +70°C)		–	–	–	–	–	300	
Input Bias Current	I_{IB}							nA
(T_A = T_{high})		–	30	500	–	–	–	
(T_A = T_{low})		–	300	1500	–	–	–	
(T_A = 0° to +70°C)		–	–	–	–	–	800	
Common Mode Input Voltage Range	V_{ICR}	±12	±13	–	–	–	–	V
Large Signal Voltage Gain (V_O = ±10 V, R_L = 2.0 kΩ)	A_{VOL}	25	–	–	15	–	–	V/mV
Common Mode Rejection (R_S ≤ 10 kΩ)	CMR	70	90	–	–	–	–	dB
Supply Voltage Rejection Ratio (R_S ≤ 10 kΩ)	PSRR	–	30	150	–	–	–	µV/V
Output Voltage Swing	V_O							V
(R_L ≥ 10 kΩ)		±12	±14	–	±12	±14	–	
(R_L ≥ 2.0 kΩ)		±10	±13	–	±10	±13	–	
Supply Currents (Both Amplifiers)	I_D							mA
(T_A = T_{high})		–	–	4.5	–	–	5.0	
(T_A = T_{low})		–	–	6.0	–	–	6.7	
Power Consumption (Both Amplifiers)	P_C							mW
(T_A = T_{high})		–	–	135	–	–	150	
(T_A = T_{low})		–	–	180	–	–	200	

NOTES: 1. I_{IB} is out of the amplifier due to PNP input transistors.
2. T_{high} = +70°C, T_{low} = 0°C.

Figure 1. Burst Noise versus Source Resistance

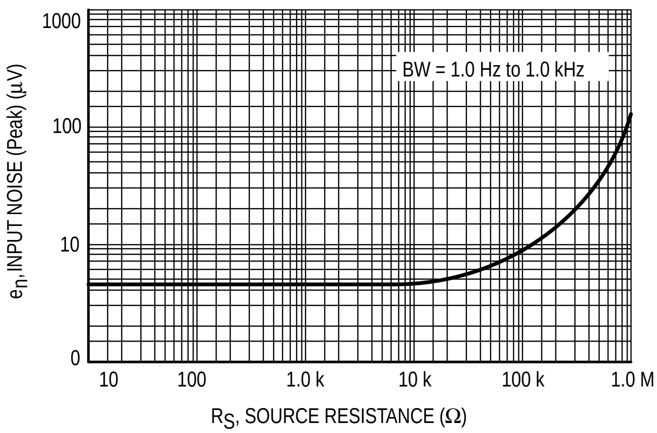


Figure 2. RMS Noise versus Source Resistance

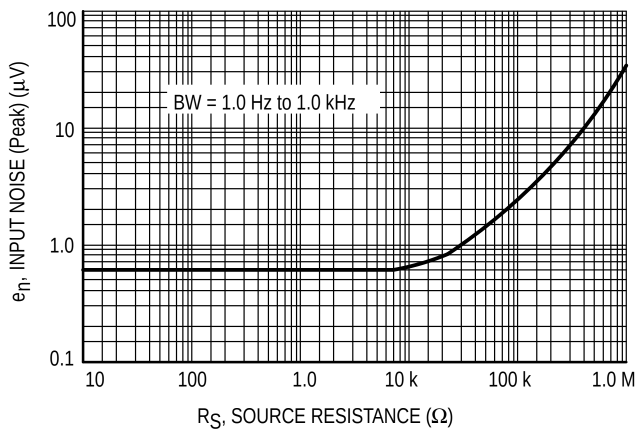


Figure 3. Output Noise versus Source Resistance

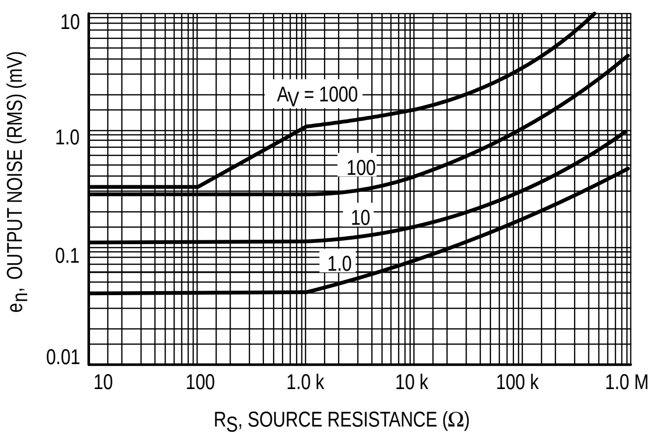


Figure 4. Spectral Noise Density

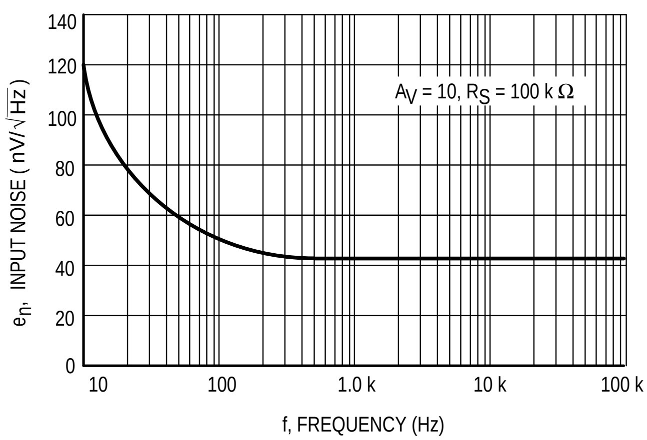
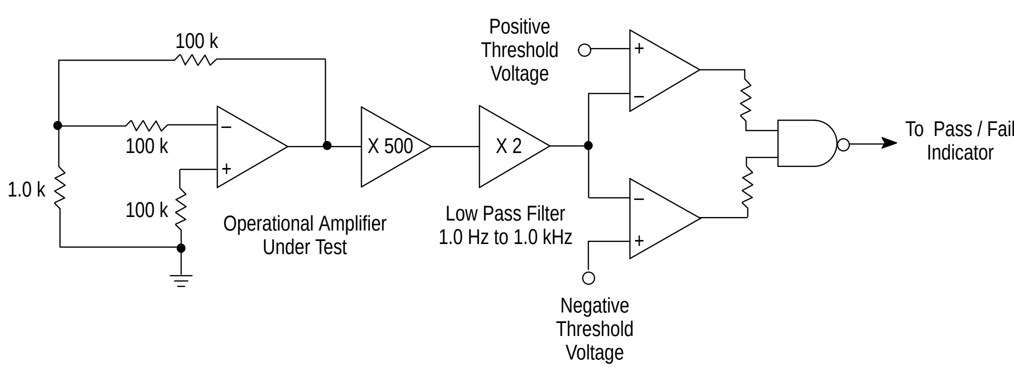


Figure 5. Burst Noise Test Circuit



Unlike conventional peak reading or RMS meters, this system was especially designed to provide the quick response time essential to burst (popcorn) noise testing.

The test time employed is 10 sec and the 20 µV peak limit refers to the operational amplifier input thus eliminating errors in the closed loop gain factor of the operational amplifier.

Figure 6. Open Loop Frequency Response

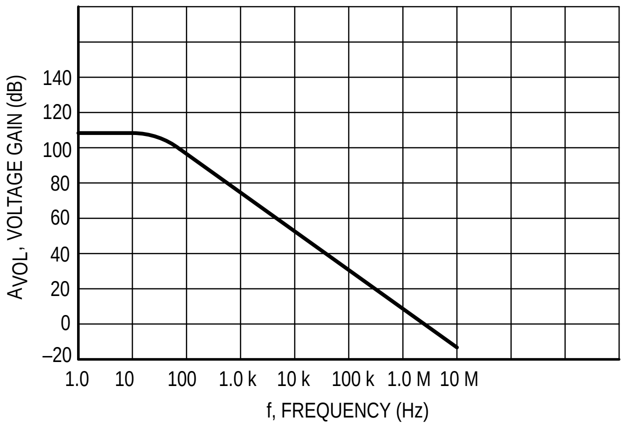


Figure 7. Phase Margin versus Frequency

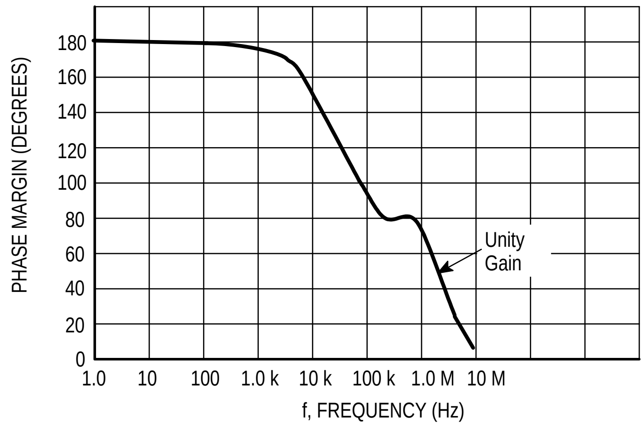


Figure 8. Positive Output Voltage Swing versus Load Resistance

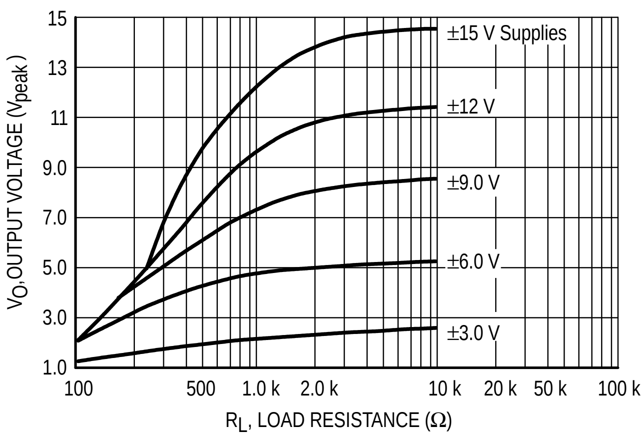


Figure 9. Negative Output Voltage Swing versus Load Resistance

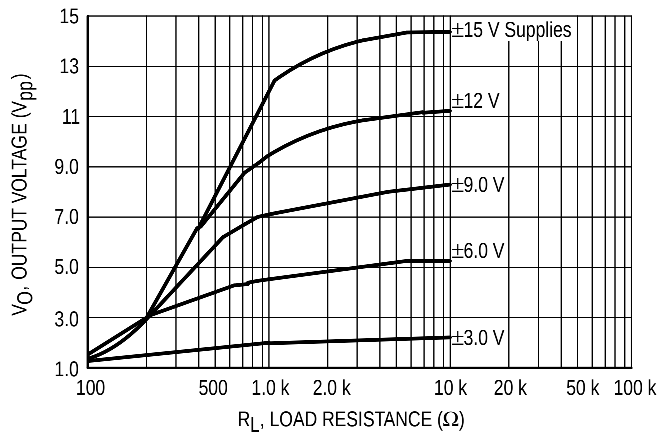


Figure 10. Power Bandwidth (Large Signal Swing versus Frequency)

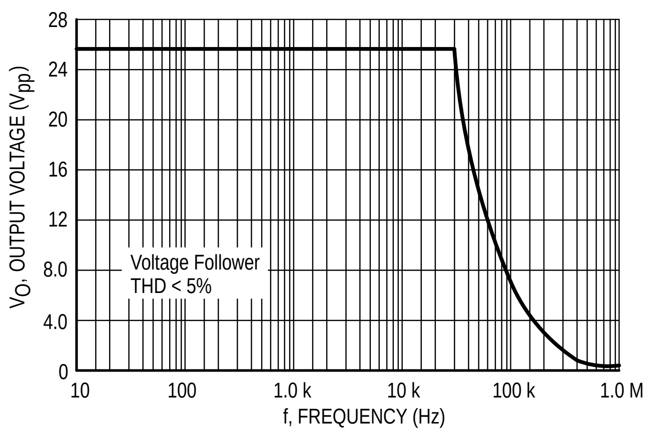
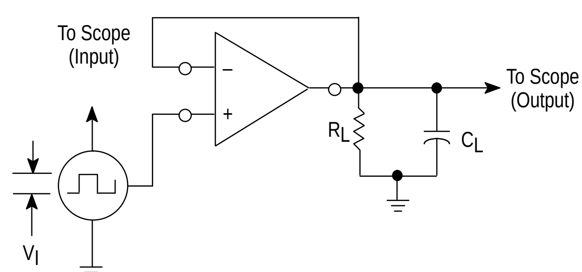
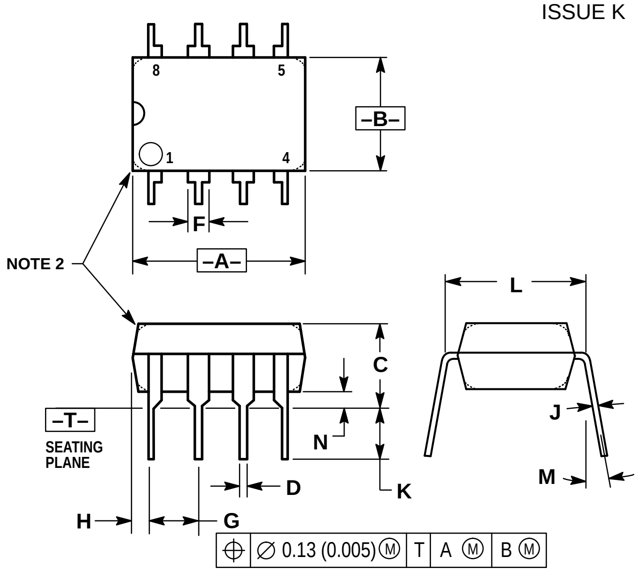


Figure 11. Transient Response Test Circuit



OUTLINE DIMENSIONS

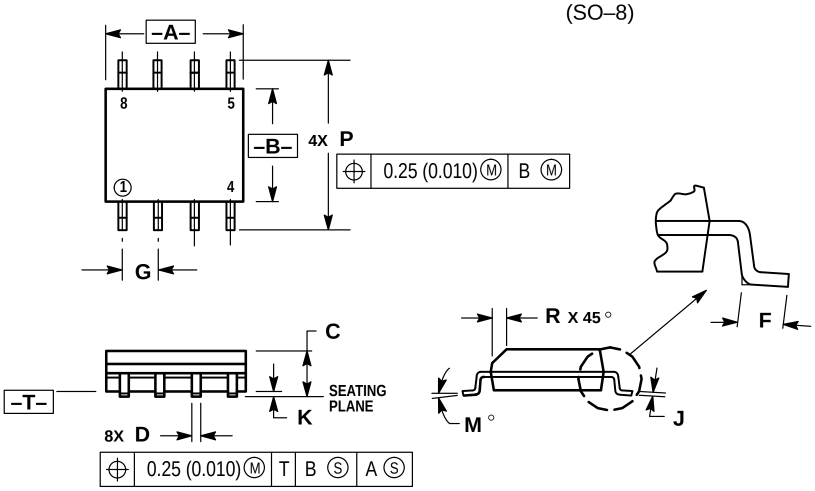
P1 SUFFIX
PLASTIC PACKAGE
CASE 626–05
ISSUE K



NOTES:
1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	—	10°	—	10°
N	0.76	1.01	0.030	0.040

D SUFFIX
PLASTIC PACKAGE
CASE 751–05
ISSUE N
(SO–8)



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.18	0.25	0.007	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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