



MOTOROLA

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# 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

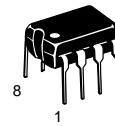
### DUAL WIDE BANDWIDTH OPERATIONAL AMPLIFIERS

#### SEMICONDUCTOR TECHNICAL DATA

#### MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise noted.)

Rating	Symbol	MC4558AC	MC4558C	Unit
Power Supply Voltage	V <sub>CC</sub> V <sub>EE</sub>	+22 -22	+18 -18	Vdc
Input Differential Voltage	V <sub>ID</sub>	±30		V
Input Common Mode Voltage (Note 1)	V <sub>ICM</sub>	±15		V
Output Short Circuit Duration (Note 2)	t <sub>SC</sub>	Continuous		
Ambient Temperature Range	T <sub>A</sub>	0 to +70		°C
Storage Temperature Range	T <sub>stg</sub>	-55 to +125		°C
Junction Temperature	T <sub>J</sub>	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.

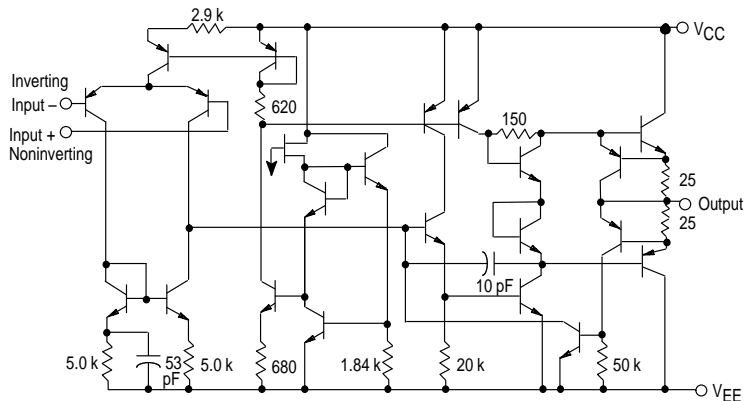


**P1 SUFFIX**  
PLASTIC PACKAGE  
CASE 626

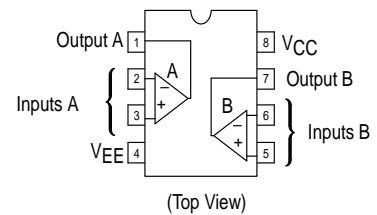


**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751  
(SO-8)

#### Representative Schematic Diagram (1/2 of Circuit Shown)



#### PIN CONNECTIONS



#### ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC4558CD	T <sub>A</sub> = 0° to +70°C	SO-8
MC4558ACP1,CP1		Plastic DIP

## MC4558AC MC4558C

### FREQUENCY CHARACTERISTICS ( $V_{CC} = +15\text{ V}$ , $V_{EE} = -15\text{ V}$ , $T_A = 25^\circ\text{C}$ )

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 ( $V_{CC} = 15\text{ V}$ , $V_{EE} = -15\text{ V}$ , $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

Input Offset Voltage ( $R_S \leq 10\text{ k}\Omega$ )	$V_{IO}$	–	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	–	M $\Omega$
Input Capacitance	$C_i$	–	1.4	–	–	1.4	–	pF
Common Mode Input Voltage Range	$V_{ICR}$	$\pm 12$	$\pm 13$	–	$\pm 12$	$\pm 13$	–	V
Large Signal Voltage Gain ( $V_O = \pm 10\text{ V}$ , $R_L = 2.0\text{ k}\Omega$ )	$A_{VOL}$	50	200	–	20	200	–	V/mV
Output Resistance	$r_o$	–	75	–	–	75	–	$\Omega$
Common Mode Rejection ( $R_S \leq 10\text{ k}\Omega$ )	CMR	70	90	–	70	90	–	dB
Supply Voltage Rejection Ratio ( $R_S \leq 10\text{ k}\Omega$ )	PSRR	–	30	150	–	30	150	$\mu\text{V/V}$
Output Voltage Swing ( $R_L \geq 10\text{ k}\Omega$ ) ( $R_L \geq 2.0\text{ k}\Omega$ )	$V_O$	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	– –	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	– –	V
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) ( $V_I = 20\text{ mV}$ , $R_L \geq 2.0\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ ) Rise Time	$t_{TLH}$	–	0.3	–	–	0.3	–	$\mu\text{s}$
( $V_I = 20\text{ mV}$ , $R_L \geq 2.0\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ ) Overshoot	$os$	–	15	–	–	15	–	%
( $V_I = 10\text{ V}$ , $R_L \geq 2.0\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ ) Slew Rate	SR	1.5	1.6	–	1.0	1.6	–	V/ $\mu\text{s}$

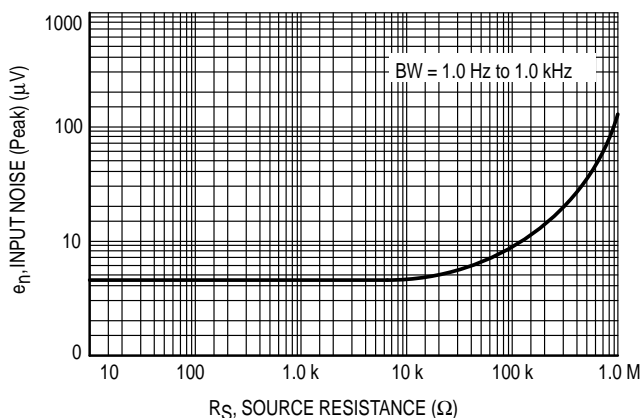
### ELECTRICAL CHARACTERISTICS ( $V_{CC} = +15\text{ V}$ , $V_{EE} = -15\text{ V}$ , $T_A = T_{high}$ to $T_{low}$ , unless otherwise noted. See Note 2.)

Input Offset Voltage ( $R_S \leq 10\text{ k}\Omega$ )	$V_{IO}$	–	1.0	6.0	–	–	7.5	mV
Input Offset Current ( $T_A = T_{high}$ ) ( $T_A = T_{low}$ ) ( $T_A = 0^\circ$ to $+70^\circ\text{C}$ )	$I_{IO}$	– – –	7.0 85 –	200 500 –	– – –	– – –	– – 300	nA
Input Bias Current ( $T_A = T_{high}$ ) ( $T_A = T_{low}$ ) ( $T_A = 0^\circ$ to $+70^\circ\text{C}$ )	$I_{IB}$	– – –	30 300 –	500 1500 –	– – –	– – –	– – 800	nA
Common Mode Input Voltage Range	$V_{ICR}$	$\pm 12$	$\pm 13$	–	–	–	–	V
Large Signal Voltage Gain ( $V_O = \pm 10\text{ V}$ , $R_L = 2.0\text{ k}\Omega$ )	$A_{VOL}$	25	–	–	15	–	–	V/mV
Common Mode Rejection ( $R_S \leq 10\text{ k}\Omega$ )	CMR	70	90	–	–	–	–	dB
Supply Voltage Rejection Ratio ( $R_S \leq 10\text{ k}\Omega$ )	PSRR	–	30	150	–	–	–	$\mu\text{V/V}$
Output Voltage Swing ( $R_L \geq 10\text{ k}\Omega$ ) ( $R_L \geq 2.0\text{ k}\Omega$ )	$V_O$	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	– –	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	– –	V
Supply Currents (Both Amplifiers) ( $T_A = T_{high}$ ) ( $T_A = T_{low}$ )	$I_D$	– –	– –	4.5 6.0	– –	– –	5.0 6.7	mA
Power Consumption (Both Amplifiers) ( $T_A = T_{high}$ ) ( $T_A = T_{low}$ )	$P_C$	– –	– –	135 180	– –	– –	150 200	mW

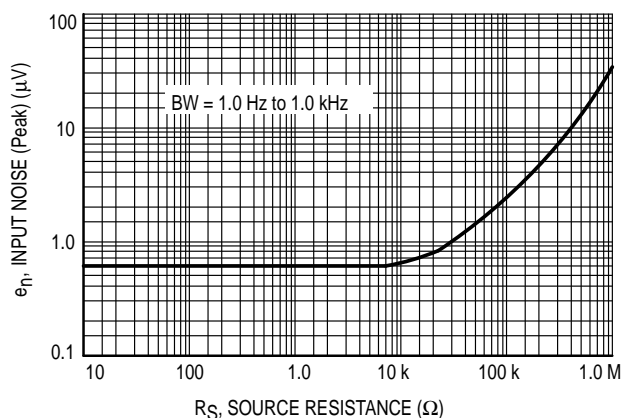
**NOTES:** 1.  $I_{IB}$  is out of the amplifier due to PNP input transistors.  
2.  $T_{high} = +70^\circ\text{C}$ ,  $T_{low} = 0^\circ\text{C}$ .

# MC4558AC MC4558C

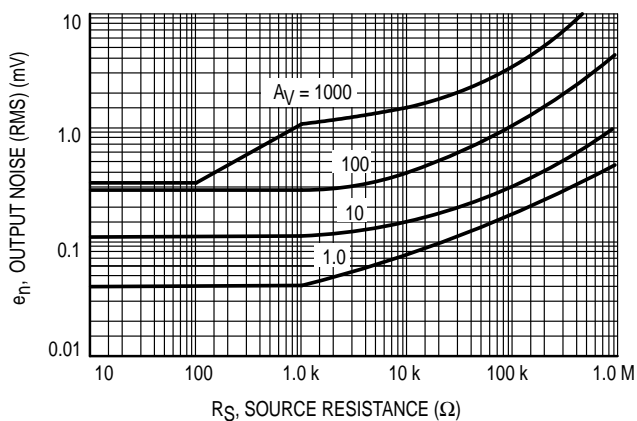
**Figure 1. Burst Noise versus Source Resistance**



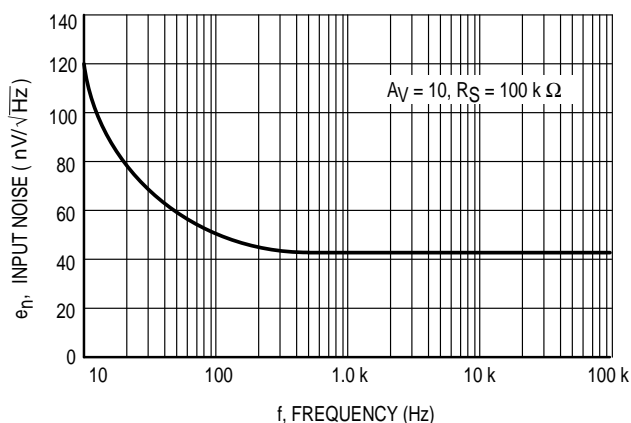
**Figure 2. RMS Noise versus Source Resistance**



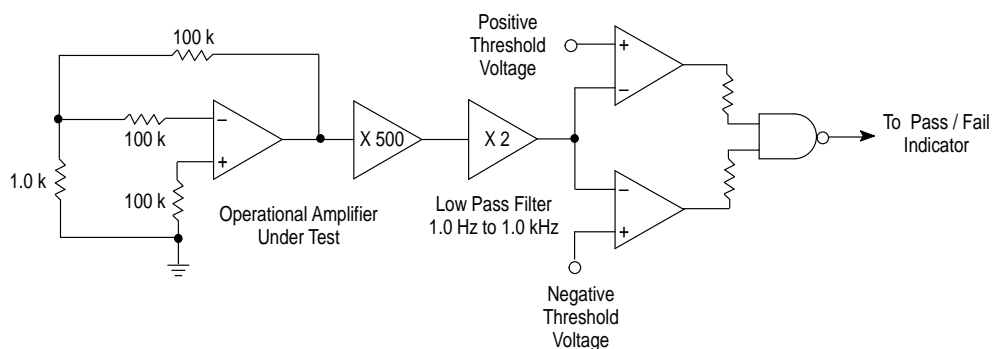
**Figure 3. Output Noise versus Source Resistance**



**Figure 4. Spectral Noise Density**



**Figure 5. Burst Noise Test Circuit**

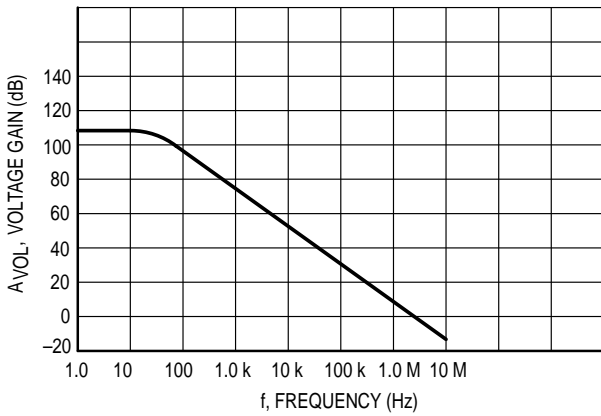


Unlike conventional peak reading or RMS meters, this system was especially designed to provide the quick response time essential to burst (popcorn) noise testing.

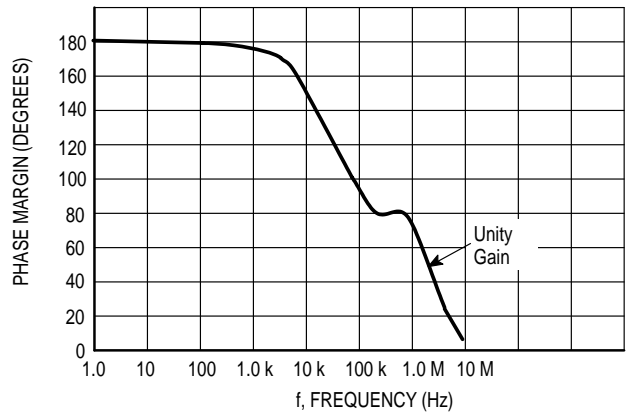
The test time employed is 10 sec and the 20  $\mu\text{V}$  peak limit refers to the operational amplifier input thus eliminating errors in the closed loop gain factor of the operational amplifier.

# MC4558AC MC4558C

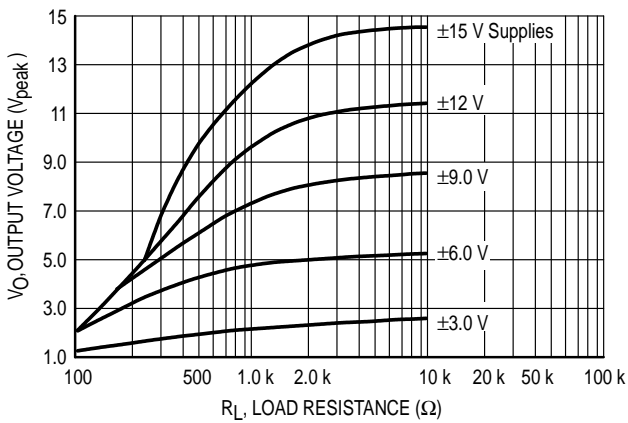
**Figure 6. Open Loop Frequency Response**



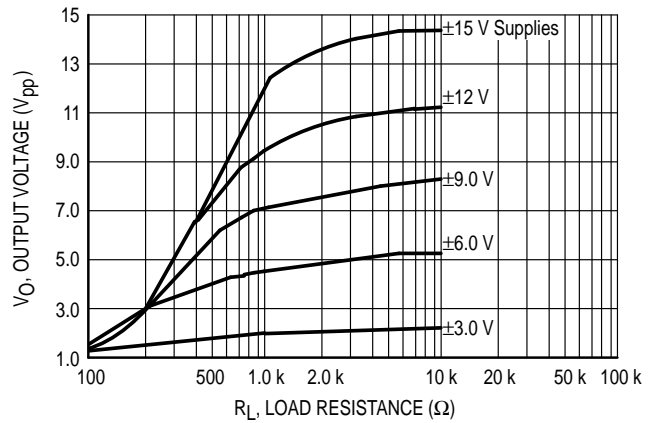
**Figure 7. Phase Margin versus Frequency**



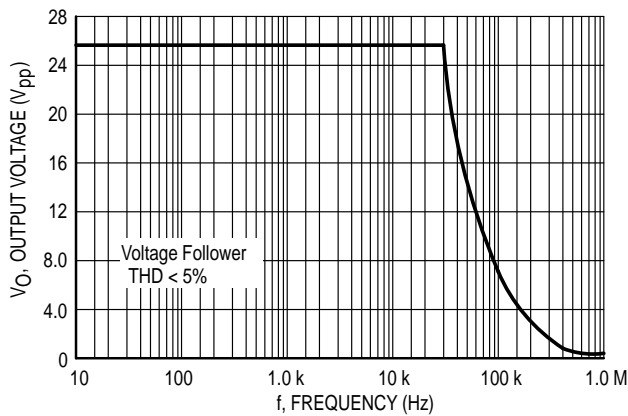
**Figure 8. Positive Output Voltage Swing versus Load Resistance**



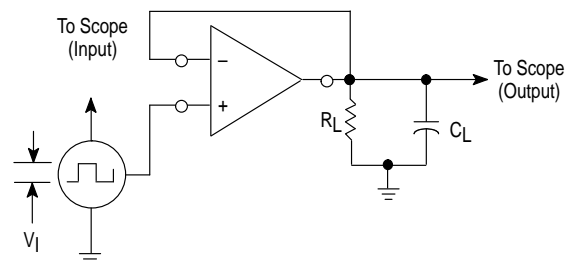
**Figure 9. Negative Output Voltage Swing versus Load Resistance**



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



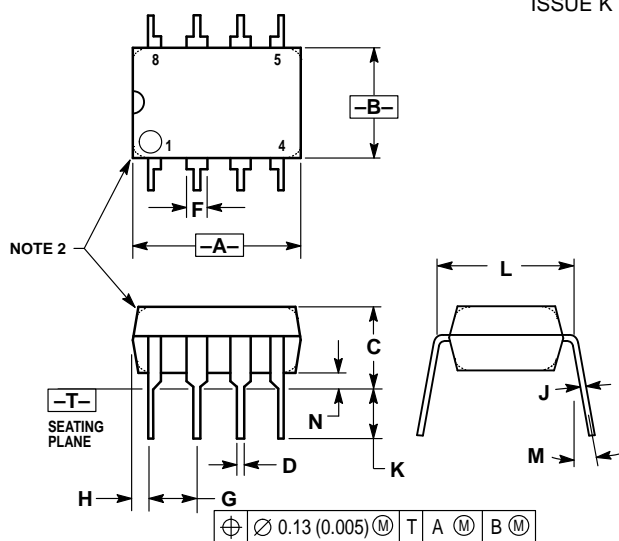
**Figure 11. Transient Response Test Circuit**



# MC4558AC MC4558C

## OUTLINE DIMENSIONS

**P1 SUFFIX**  
**PLASTIC PACKAGE**  
**CASE 626-05**  
**ISSUE K**

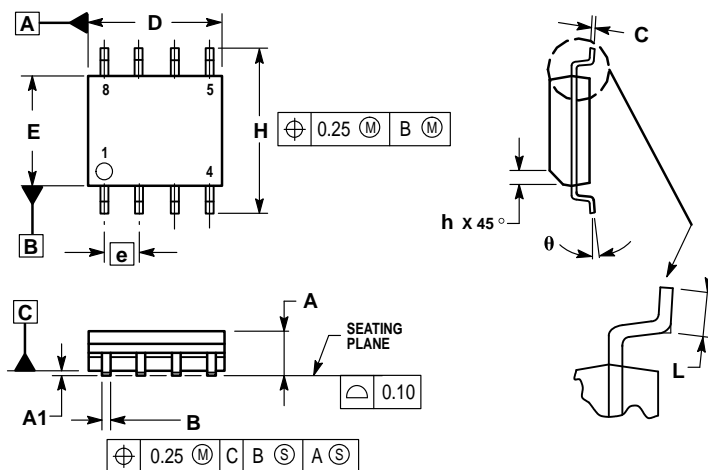


NOTES:

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		INCHES	
	MIN	MAX	MIN	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**  
**(SO-8)**  
**ISSUE R**



NOTES:


1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE MOLD PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.35	0.49
C	0.18	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.25
θ	0° 7°	

**MC4558AC MC4558C**  
**NOTES**

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**NOTES**

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