MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

MC4558, MC4558AC MC4558C

2

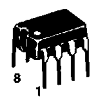
Dual Wide Bandwidth Operational Amplifier

The MC4558, AC, and C combine all the outstanding features of the MC1458 and, in addition, possess three times the unity gain bandwidth of the industry standard.

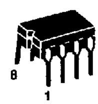
- 2.5 MHz Unity Gain Bandwidth Guaranteed (MC4558 and MC4558AC)
- 2.0 MHz Unity Gain Bandwidth Guaranteed (MC4558C)
- Internally Compensated
- Short Circuit Protection
- Gain and Phase Match between Amplifiers
- Low Power Consumption

DUAL WIDE BANDWIDTH OPERATIONAL AMPLIFIER

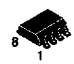
SILICON MONOLITHIC INTEGRATED CIRCUIT



P1 SUFFIX
PLASTIC PACKAGE
CASE 626



U SUFFIX
CERAMIC PACKAGE
CASE 693



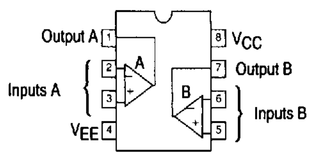
D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO-8)

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

Rating	Symbol	MC4558 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	−55 to +125 0 to +70		
Storage Temperature Range Ceramic Package Plastic Package	T_{stg}	 −65 to +150 −55 to +125		°C
Junction Temperature Ceramic Package Plastic Package	T_J	 175 150		°C

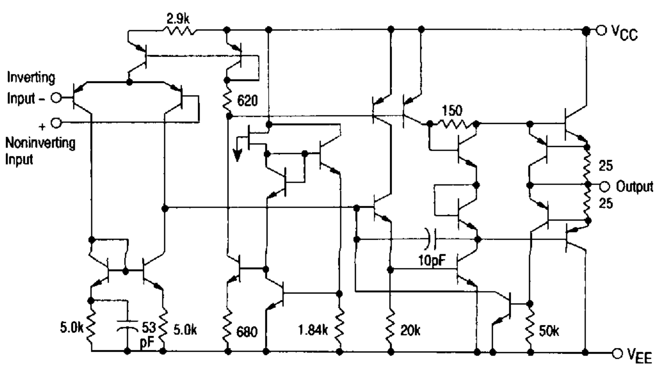
NOTES: 1. For supply voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage
2. Short circuit may be to ground or either supply.

PIN CONNECTIONS



(Top View)

Equivalent Circuit Schematic
(1/2 of Circuit Shown)



ORDERING INFORMATION

Device	Temperature Range	Package
MC4558U	−55° to +125°C	Ceramic DIP
MC4558CD	0° to +70°C	SO-8
MC4558ACP1, CP1		Plastic DIP
MC4558CU		Ceramic DIP

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

Characteristics	Symbol	MC4558, MC4558AC Min	MC4558, MC4558AC Typ	MC4558, MC4558AC Max	MC4558C Min	MC4558C Typ	MC4558C Max	Unit
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.)

Characteristics	Symbol	MC4558, MC4558AC Min	MC4558, MC4558AC Typ	MC4558, 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.)

Characteristics	Symbol	MC4558, MC4558AC Min	MC4558, MC4558AC Typ	MC4558, 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} = +125°C for MC4558 T_{low} = −55°C for MC4558
= +70°C for MC4558C and MC4558AC   = 0°C for MC4558C and MC4558AC.

MC4558, MC4558AC, MC4558C

Figure 1. Burst Noise versus Source Resistance

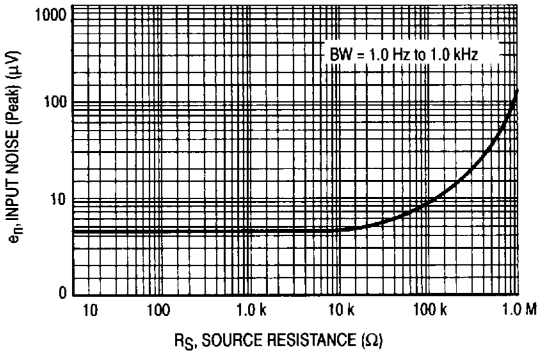


Figure 2. RMS Noise versus Source Resistance

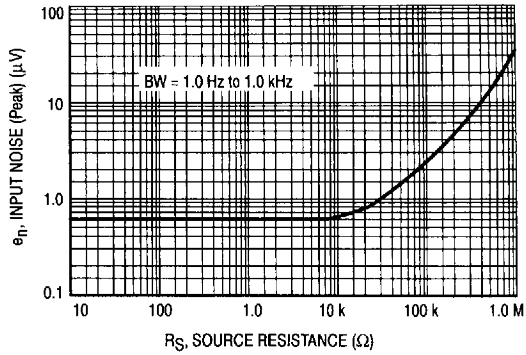


Figure 3. Output Noise versus Source Resistance

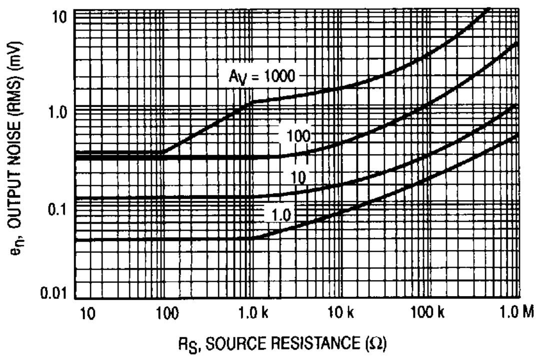


Figure 4. Spectral Noise Density

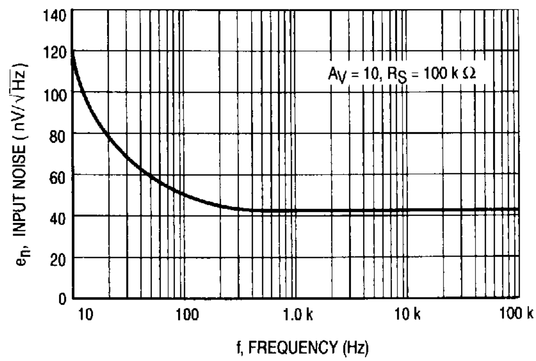
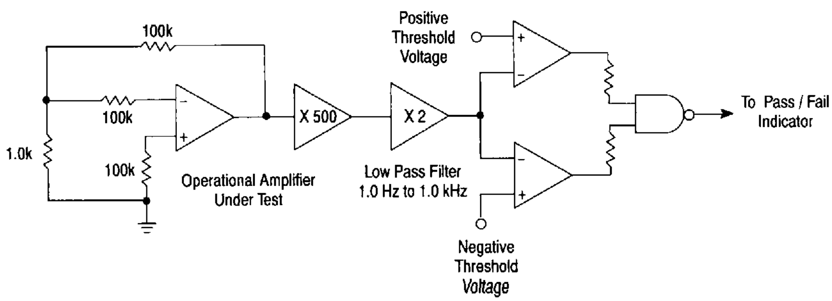


Figure 5. Burst Noise Test Circuit



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 µV peak limit refers to the operational amplifier input thus eliminating errors in the closed-loop gain factor of the operational amplifier.

MC4558, MC4558AC, MC4558C

Figure 6. Open-Loop Frequency Response

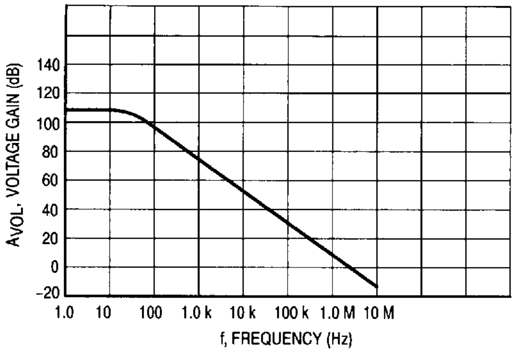


Figure 7. Phase Margin versus Frequency

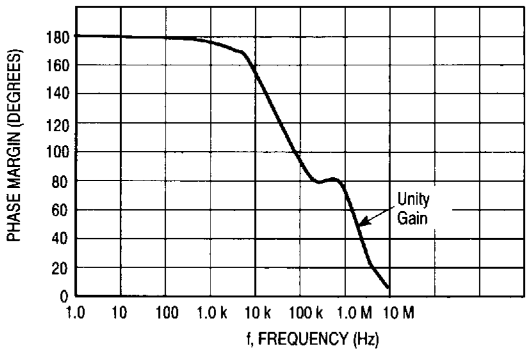


Figure 8. Positive Output Voltage Swing versus Load Resistance

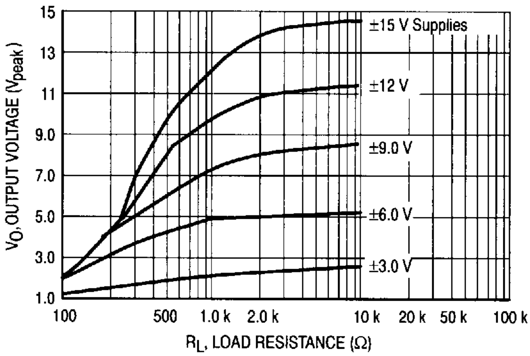


Figure 9. Negative Output Voltage Swing versus Load Resistance

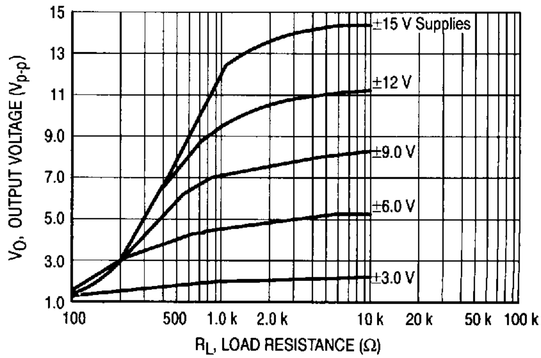


Figure 10. Power Bandwidth
(Large Signal Swing versus Frequency)

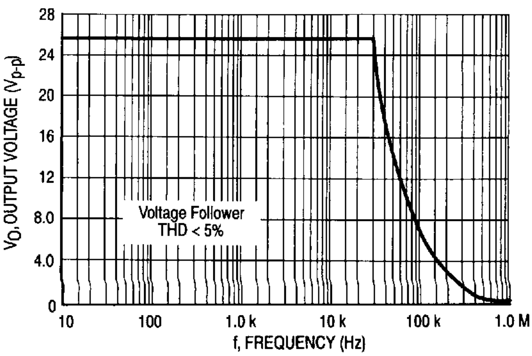


Figure 11. Transient Response Test Circuit