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MOTOROLA

MC4558, MC4558AC, MC4558C

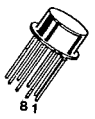
DUAL WIDEBAND OPERATIONAL AMPLIFIER

The MC4558, MC4558AC, and MC4558C combine all the outstanding features of the MC1458 and, in addition, possess three times the unity gain bandwidth of the industry standard.

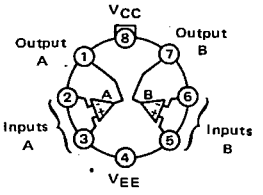
- 2.5 MHz Unity Gain Bandwidth Guaranteed on MC4558 and MC4558AC
- 2 MHz Unity Gain Bandwidth Guaranteed on MC4558C
- Internally Compensated
- Short-Circuit Protection
- Gain and Phase Match between Amplifiers
- Low Power Consumption

DUAL WIDE BANDWIDTH OPERATIONAL AMPLIFIER

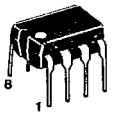
SILICON MONOLITHIC INTEGRATED CIRCUIT



G SUFFIX
METAL PACKAGE
CASE 601-04

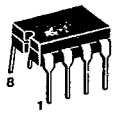


(Top View)

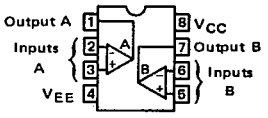


P1 SUFFIX
PLASTIC PACKAGE
CASE 626-05

U SUFFIX
CERAMIC PACKAGE
CASE 693-02



D SUFFIX
PLASTIC PACKAGE
CASE 751-02
SO-8



(Top View)

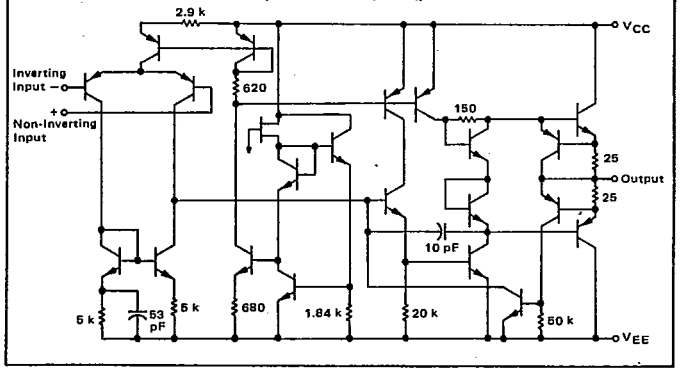
MAXIMUM RATINGS (T_A = +25°C unless otherwise noted)

Rating	Symbol	MC4558 MC4558AC	MC4558C	Unit
Power Supply Voltage	V_{CC}	+22	+18	Vdc
	V_{EE}	-22	-18	Vdc
Input Differential Voltage	V_{ID}	±30		Volts
Input Common Mode Voltage (Note 1)	V_{ICM}	±15		Volts
Output Short-Circuit Duration (Note 2)	t_S	Continuous		
Operating Ambient Temperature Range	T_A	See Ordering Information Below		
Storage Temperature Range Metal and Ceramic Packages Plastic Package	T_{stg}	 -65 to +150 -55 to +125		°C
Junction Temperature Metal and Ceramic Packages Plastic Package	T_J	 175 150		°C

Note 1. For supply voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.

Note 2. Short circuit may be to ground or either supply.

EQUIVALENT CIRCUIT SCHEMATIC
(1/2 of Circuit Shown)



ORDERING INFORMATION

Device	Temperature Range	Package
MC4558G	-55 to +125°C	Metal Can
MC4558U		Ceramic DIP
MC4558CD	0 to +70°C	SO-8
MC4558CG		Metal Can
MC4558ACP1, CP1		Plastic DIP
MC4558CU		Ceramic DIP

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MC4558, MC4558AC, MC4558C

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

Characteristic	Symbol	MC4558, 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.)

Input Offset Voltage ($R_S \leq 10$ 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†	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_v	50	200	–	20	200	–	V/mV
Output Resistance	r_o	–	75	–	–	75	–	Ω
Common Mode Rejection Ratio ($R_S \leq 10$ kΩ)	CMRR	70	90	–	70	90	–	dB
Supply Voltage Rejection Ratio ($R_S \leq 10$ kΩ)	PSRR	–	30	150	–	30	150	μV/V
Output Voltage Swing ($R_L \geq 10$ kΩ) ($R_L \geq 2$ kΩ)	V_O	±12 ±10	±14 ±13	– –	±12 ±10	±14 ±13	– –	V
Output Short-Circuit Current	I_{os}	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, $R_L \geq 2$ kΩ, $C_L \leq 100$ pF) Rise Time	t_{TLH}	–	0.3	–	–	0.3	–	μs
(V_I = 20 mV, $R_L \geq 2$ kΩ, $C_L \leq 100$ pF) Overshoot	os	–	15	–	–	15	–	%
(V_I = 10 V, $R_L \geq 2$ kΩ, $C_L \leq 100$ 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).

Input Offset Voltage ($R_S \leq 10$ kΩ)	V_{IO}	–	1.0	6.0	–	–	7.5	mV
Input Offset Current ($T_A = T_{high}$) ($T_A = T_{low}$) (T_A = 0°C to +70°C)	I_{IO}	– – –	7.0 85 –	200 500 –	– – –	– – –	– – 300	nA
Input Bias Current ($T_A = T_{high}$) ($T_A = T_{low}$) (T_A = 0°C to +70°C)	I_{IB}	– – –	30 300 –	500 1500 –	– – –	– – –	– – 800	nA
Common Mode Input Voltage Range	V_{ICR}	±12	±13	–	–	–	–	V
Large Signal Voltage Gain (V_O = ±10 V, R_L = 2 kΩ)	A_v	25	–	–	15	–	–	V/mV
Common Mode Rejection Ratio ($R_S \leq 10$ kΩ)	CMRR	70	90	–	–	–	–	dB
Supply Voltage Rejection Ratio ($R_S \leq 10$ kΩ)	PSRR	–	30	150	–	–	–	μV/V
Output Voltage Swing ($R_L \geq 10$ kΩ) ($R_L \geq 2$ kΩ)	V_O	±12 ±10	±14 ±13	– –	±12 ±10	±14 ±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

*T_{high} = 125°C for MC4558 and 70°C for MC4558C and MC4558AC.
T_{low} = −55°C for MC4558 and 0°C for MC4558C and MC4558AC.
†I_{IB} is out of the amplifier due to PNP input transistors.

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FIGURE 1 – BURST NOISE versus SOURCE RESISTANCE

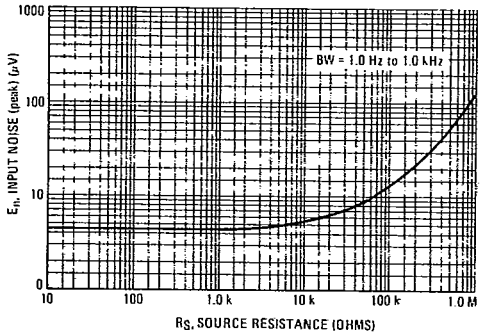


FIGURE 2 – RMS NOISE versus SOURCE RESISTANCE

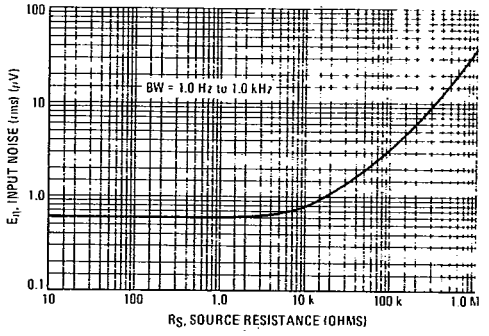


FIGURE 3 – OUTPUT NOISE versus SOURCE RESISTANCE

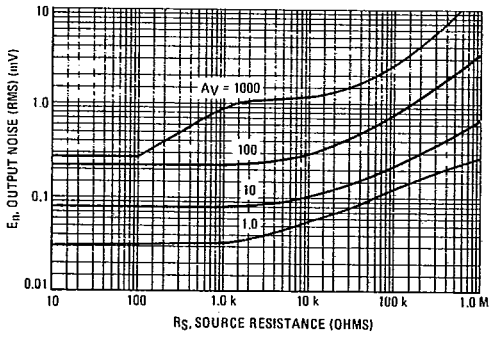


FIGURE 4 – SPECTRAL NOISE DENSITY

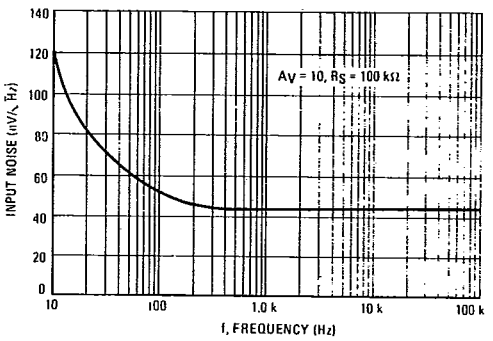
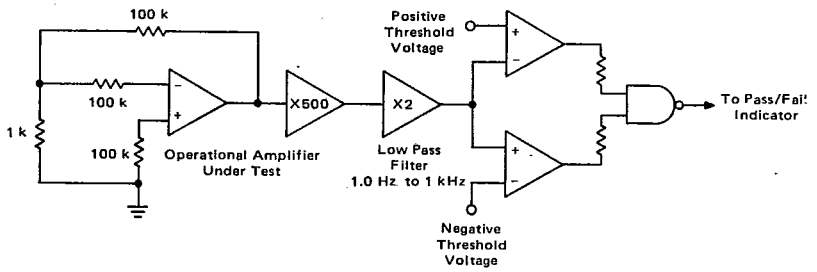


FIGURE 5 – BURST NOISE TEST CIRCUIT



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 seconds 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 under test.

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FIGURE 6 – OPEN LOOP FREQUENCY RESPONSE

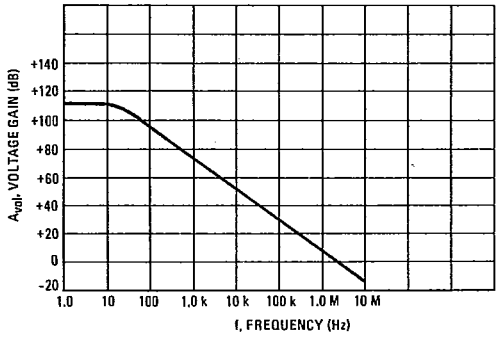

FIGURE 7 – PHASE MARGIN versus FREQUENCY

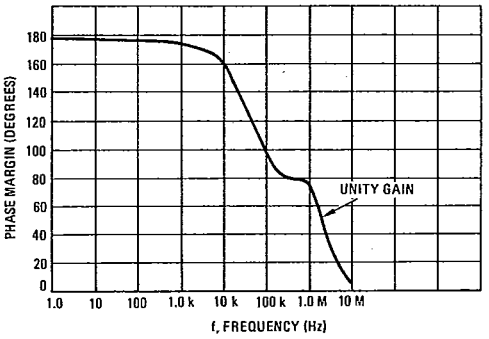

FIGURE 8 – POSITIVE OUTPUT VOLTAGE SWING versus LOAD RESISTANCE

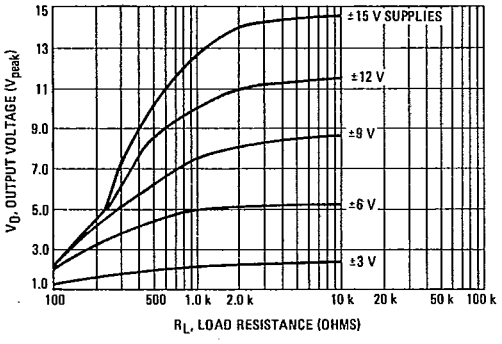

FIGURE 9 – NEGATIVE OUTPUT VOLTAGE SWING versus LOAD RESISTANCE

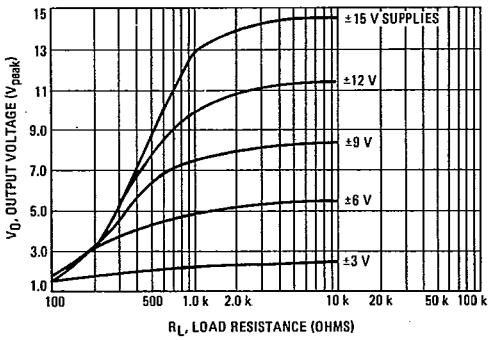

FIGURE 10 – POWER BANDWIDTH (LARGE SIGNAL SWING versus FREQUENCY)

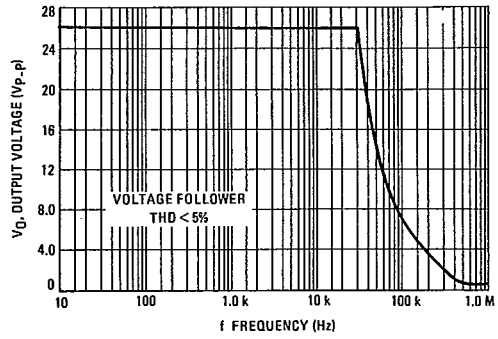

FIGURE 11 – TRANSIENT RESPONSE TEST CIRCUIT