MC1712
MC1712C

OPERATIONAL AMPLIFIERS

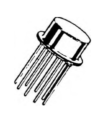
MONOLITHIC WIDEBAND DC AMPLIFIER

. . . designed for use as an operational amplifier utilizing operating characteristics as a function of the external feedback components.

- Open Loop Gain A_{VOL} = 3600 typical
- Low Temperature Drift – ±2.5 µV/°C
- Output Voltage Swing –
  ±5.3 V typical @ +12 V and -6 V Supplies
- Low Output Impedance – Z_{out} = 200 ohms typical

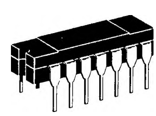
WIDEBAND DC AMPLIFIER INTEGRATED CIRCUIT

MONOLITHIC SILICON EPITAXIAL PASSIVATED



G SUFFIX
METAL PACKAGE
CASE 601
TO-99

F SUFFIX
CERAMIC PACKAGE
CASE 606
TO-91



L SUFFIX
CERAMIC PACKAGE
CASE 632
TO-116

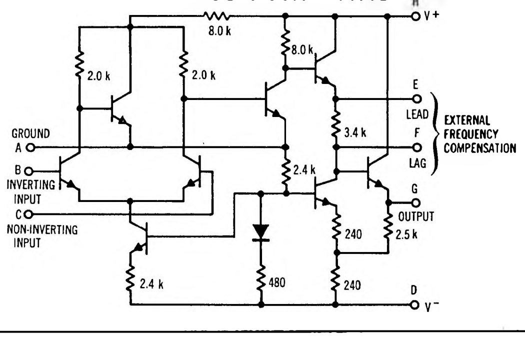
PIN CONNECTIONS

Schematic	A	B	C	D	E	F	G	H
"G" Package	1	2	3	4	5	6	7	8
"F" Package	2	3	4	5	6	7	8	10
"L" Package	3	4	5	6	9	10	12	13

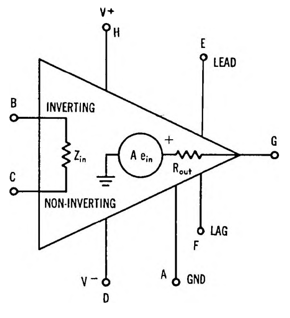
MAXIMUM RATINGS (T_A = +25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Power Supply Voltage (Total between V^+ and V^- terminals)	$\lvert V^+\rvert+\lvert V^-\rvert$	21	Vdc
Differential Input Signal	V_{in}	±5.0	Volts
Common Mode Input Swing	CMV_{in}	+1.5 -6.0	Volts
Peak Load Current	I_L	50	mA
Power Dissipation (Package Limitation) Metal Package Derate above T_A = +25°C Flat Ceramic Package Derate above T_A = +25°C Dual In-Line Ceramic Package Derate above T_A = +25°C	P_D	 680 4.6 500 3.3 625 5.0	 mW mW/°C mW mW/°C mW mW/°C
Operating Temperature Range MC1712 MC1712C	T_A	-55 to +125 0 to +75	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

CIRCUIT SCHEMATIC



EQUIVALENT CIRCUIT



See Packaging Information Section for outline dimensions.

MC1712, MC1712C (continued)

ELECTRICAL CHARACTERISTICS (T_A = +25°C unless otherwise noted)

Characteristic	Symbol	MC1712 Min	MC1712 Typ	MC1712 Max	MC1712C Min	MC1712C Typ	MC1712C Max	Unit
Open-Loop Voltage Gain (R_L = 100 kΩ)	A_{VOL}							V/V
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc, V_o = ±2.5 V)		600	900	1500	500	800	1500	
(V^+ = 12 Vdc, V^- = −6.0 Vdc, V_o = ±5.0 V)		2500	3600	6000	2000	3400	6000	
(V^+ = 12 Vdc, V^- = −6.0 Vdc, V_o = ±5.0 Vdc, T_A = T_{low} ①, T_{high} ①)		2000	–	7000	1500	–	7000	
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc, V_o = ±2.5 V, T_A = T_{low} to T_{high})		500	–	1750	400	–	1750	
Output Impedance	Z_{out}							ohms
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc, f = 20 Hz)		–	300	700	–	300	800	
(V^+ = 12 Vdc, V^- = −6.0 Vdc, f = 20 Hz)		–	200	500	–	200	600	
Input Impedance	Z_{in}							k ohms
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc, f = 20 Hz)		22	70	–	16	55	–	
(V^+ = 6.0 Vdc V^- = −3.0 Vdc, f = 20 Hz, T_A = T_{low}, T_{high})		8.0	–	–	10	32	–	
(V^+ = 12 Vdc, V^- = −6.0 Vdc, f = 20 Hz)		16	40	–	–	–	–	
(V^+ = 12 Vdc, V^- = −6.0 Vdc, f = 20 Hz, T_A = T_{low}, T_{high})		6.0	–	–	–	–	–	
Output Voltage Swing	V_o							V_{peak}
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc, R_L = 100 kΩ)		±2.5	±2.7	–	±2.5	±2.7	–	
(V^+ = 12 Vdc, V^- = −6.0 Vdc, R_L = 100 kΩ)		±5.0	±5.3	–	±5.0	±5.3	–	
(V^+ = +6.0 Vdc, V^- = −3.0 Vdc, R_L = 10 kΩ)		±1.5	±2.0	–	±1.5	±2.0	–	
(V^+ = +12 Vdc, V^- = −6.0 Vdc, R_L = 10 kΩ)		±3.5	±4.0	–	±3.5	±4.0	–	
Input Common-Mode Voltage Swing	CMV_{in}							V_{peak}
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc)		+0.5	–	–	+0.5	–	–	
		−1.5	–	–	−1.5	–	–	
(V^+ = 12 Vdc, V^- = −6.0 Vdc)		+0.5	–	–	+0.5	–	–	
		−4.0	–	–	−4.0	–	–	
Common-Mode Rejection Ratio	CM_{rej}							dB
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc, f ≤ 1.0 kHz)		80	100	–	70	95	–	
(V^+ = 12 Vdc, V^- = −6.0 Vdc, f ≤ 1.0 kHz)		80	100	–	70	95	–	
Input Bias Current $I_b = \frac{I_1 + I_2}{2}$,	I_b							μA
T_A = +25°C								
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc)		–	1.2	3.5	–	1.5	5.0	
(V^+ = 12 Vdc, V^- = −6.0 Vdc)		–	2.0	5.0	–	2.5	7.5	
T_A = T_{low}								
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc)		–	2.5	7.5	–	2.5	8.0	
(V^+ = 12 Vdc, V^- = −6.0 Vdc)		–	4.0	10	–	4.0	12	
Input Offset Current ($I_{io} = I_1 - I_2$)	$\lvert I_{io} \rvert$							μA
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc)		–	0.1	0.5	–	0.3	2.0	
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc, T_A = T_{low} to T_{high})		–	–	1.5	–	–	2.5	
(V^+ = 12 Vdc, V^- = −6.0 Vdc)		–	0.2	0.5	–	0.5	2.0	
(V^+ = 12 Vdc, V^- = −6.0 Vdc, T_A = T_{low} to T_{high})		–	–	1.5	–	–	2.5	
Input Offset Voltage (R_S = 2.0 kΩ)	$\lvert V_{io} \rvert$							mV
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc)		–	1.3	3.0	–	1.7	6.0	
(V^+ = 6.0 Vdc, V^- = −3.0 Vdc, T_A = T_{low}, T_{high})		–	–	4.0	–	–	7.5	
(V^+ = 12 Vdc, V^- = −6.0 Vdc)		–	1.1	2.0	–	1.5	5.0	
(V^+ = 12 Vdc, V^- = −6.0 Vdc, T_A = T_{low}, T_{high})		–	–	3.0	–	–	6.5	
Step Response								
{ V^+ = 12 Vdc, V^- = −6.0 Vdc	V_{os}	–	20	40	–	20	40	%
Gain = 100, V_{in} = 1.0 mV,	t_f	–	10	30	–	10	30	ns
R_1 = 1.0 kΩ, R_2 = 100 kΩ,	t_{pd}	–	10	–	–	10	–	ns
C_2 = 50 pF, R_3 = ∞, C_1 = open }	dV_{out}/dt ②	–	12	–	–	12	–	V/μs
{ V^+ = 12 Vdc, V^- = −6.0 Vdc	V_{os}	–	10	50	–	10	50	%
Gain = 1.0, V_{in} = 10 mV,	t_f	–	25	120	–	25	120	ns
R_1 = 10 kΩ, R_2 = 10 kΩ,	t_{pd}	–	16	–	–	16	–	ns
C_1 = 0.01 μF, R_3 = 20Ω, C_2 = open }	dV_{out}/dt ②	–	1.5	–	–	1.5	–	V/μs
Average Temperature Coefficient of Input Offset Voltage (R_S = 50Ω)	$\lvert TC_{Vio} \rvert$							μV/°C
(T_A = +25°C to T_{high})		–	2.5	–	–	–	–	
(T_A = T_{low} to +25°C)		–	2.0	–	–	–	–	
(T_A = T_{low}, T_{high})		–	–	–	–	5.0	–	
Average Temperature Coefficient Input Offset Current	$\lvert TC_{Iio} \rvert$							nA/°C
(T_A = +25°C to T_{high})		–	0.05	–	–	4.0	–	
(T_A = T_{low} to +25°C)		–	1.5	–	–	6.0	–	
DC Power Dissipation	P_D							mW
(V_{out} = 0, V^+ = 6.0 Vdc, V^- = −3.0 Vdc)		–	17	30	–	17	30	
(V_{out} = 0, V^+ = 12 Vdc, V^- = −6.0 Vdc)		–	70	120	–	70	120	
Positive Supply Sensitivity (V^- constant = −6.0 Vdc, V^+ = 12 Vdc to 6.0 Vdc)	S^+	–	60	200	–	60	300	μV/V
Negative Supply Sensitivity (V^+ constant = 12 Vdc, V^- = −6.0 Vdc to −3.0 Vdc)	S^-	–	60	200	–	60	300	μV/V

① T_{low} = 0°C for MC1712C, T_{high} = +75°C for MC1712C
−55°C for MC1712 +125°C for MC1712

② dV_{out}/dt = Slew Rate

TYPICAL OUTPUT CHARACTERISTICS

(V^+ = 12 Vdc, V^- = -6.0 Vdc, T_A = +25°C)

FIGURE 1 – OPEN LOOP GAIN versus POWER SUPPLY VARIATIONS

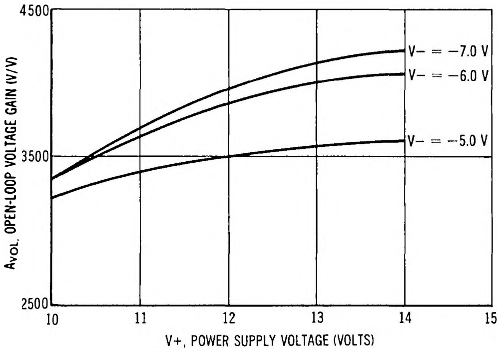


FIGURE 2 – OPEN LOOP VOLTAGE GAIN versus FREQUENCY

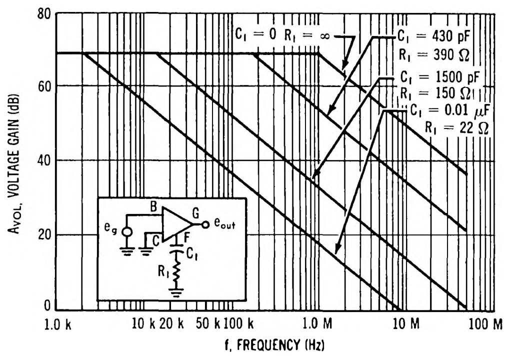


FIGURE 3 – VOLTAGE GAIN versus FREQUENCY

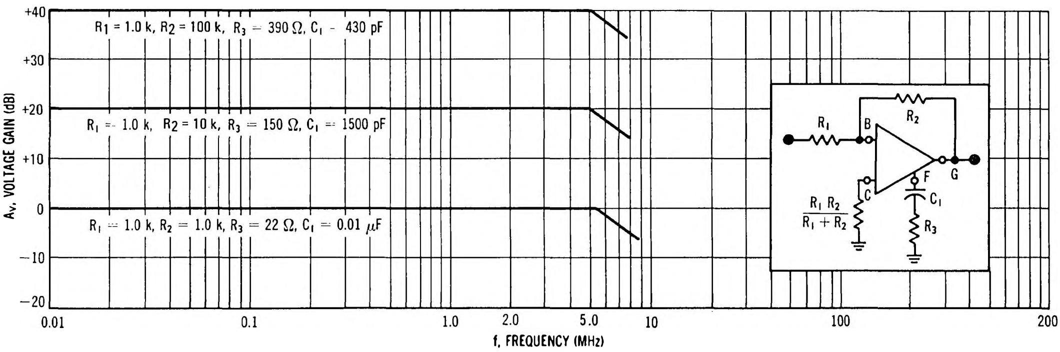


FIGURE 4 – MAXIMUM OUTPUT SWING versus FREQUENCY

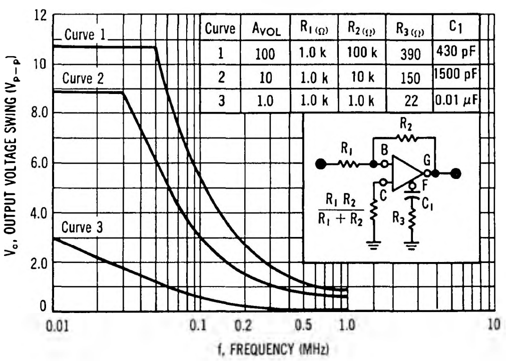
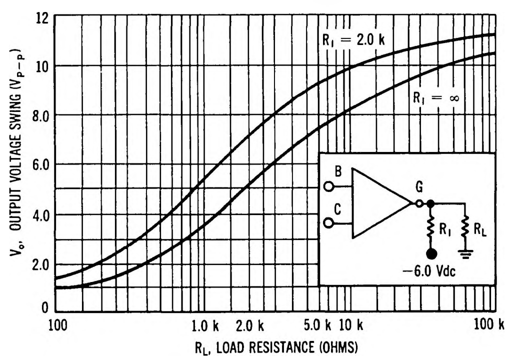


FIGURE 5 – OUTPUT VOLTAGE SWING versus LOAD RESISTANCE



TYPICAL CHARACTERISTICS (continued)

FIGURE 6 – INPUT BIAS CURRENT versus TEMPERATURE

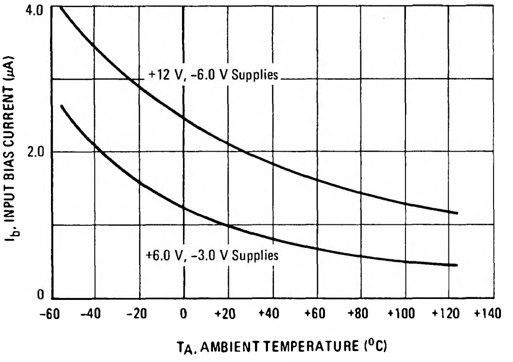


FIGURE 7 – INPUT OFFSET CURRENT versus TEMPERATURE

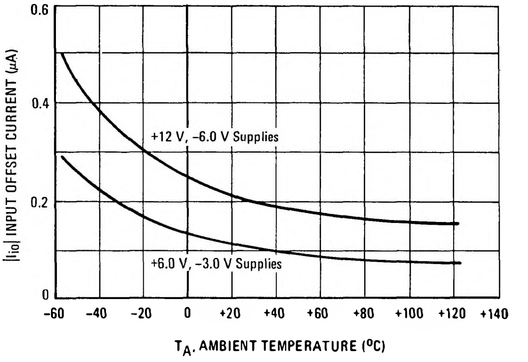


FIGURE 8 – INPUT OFFSET VOLTAGE versus TEMPERATURE

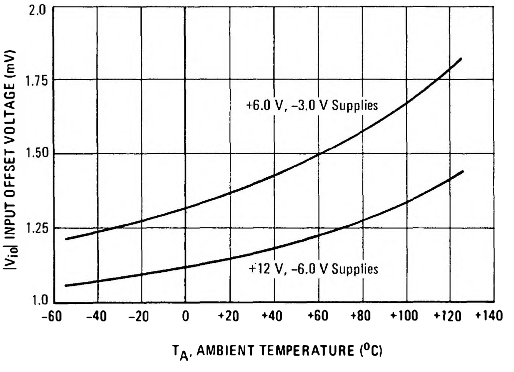


FIGURE 9 – OUTPUT NOISE VOLTAGE versus SOURCE IMPEDANCE