ORDERING INFORMATION

Device	Temperature Range	Package
MC1712F	−55°C to +125°C	Ceramic Flat
MC1712G	−55°C to +125°C	Metal Can
MC1712L	−55°C to +125°C	Ceramic DIP
MC1712CF	0°C to +70°C	Ceramic Flat
MC1712CG	0°C to +70°C	Metal Can
MC1712CL	0°C to +70°C	Ceramic DIP
MC1712CP	0°C to +70°C	Plastic DIP

MC1712
MC1712C

WIDEBAND DC AMPLIFIER

SILICON MONOLITHIC INTEGRATED CIRCUIT

WIDEBAND DC AMPLIFIER

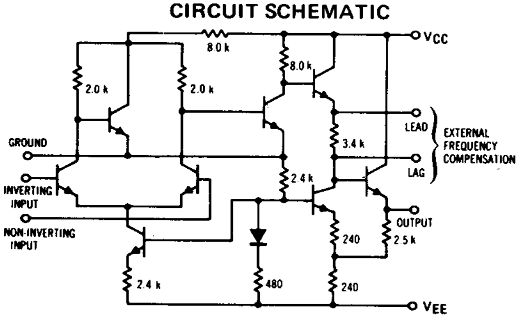
. . . designed for use as an operational amplifier utilizing operating characteristics as a function of the external feedback components.

- 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_o = **200 ohms typical**

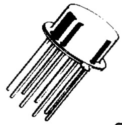
MAXIMUM RATINGS (T_A = +25°C unless otherwise noted)

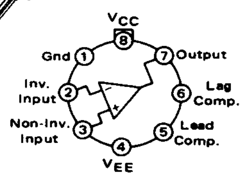
Rating	Symbol	Value	Unit
Power Supply Voltage (Total between V_{CC} and V_{EE} terminals)	$\lvert V_{CC}\rvert + \lvert V_{EE}\rvert$	21	Vdc
Input Differential Voltage Range	V_I	±5.0	Volts
Input Common Mode Range	V_{ICR}	+1.5 -6.0	Volts
Peak Load Current	I_L	50	mA
Power Dissipation (Package Limitation)	P_D		
Metal Package		680	mW
Derate above T_A = +25°C		4.6	mW/°C
Flat Ceramic Package		500	mW
Derate above T_A = +25°C		3.3	mW/°C
Dual In-Line Ceramic Package		625	mW
Derate above T_A = +25°C		5.0	mW/°C
Operating Ambient Temperature Range MC1712 / MC1712C	T_A	-55 to +125 0 to +70	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

CIRCUIT SCHEMATIC



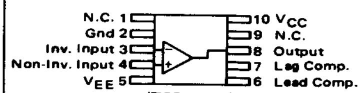
G SUFFIX
METAL PACKAGE
CASE 601





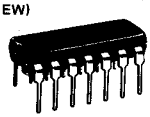
(TOP VIEW)

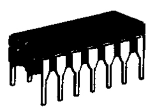
F SUFFIX
CERAMIC PACKAGE
CASE 606
TO-91



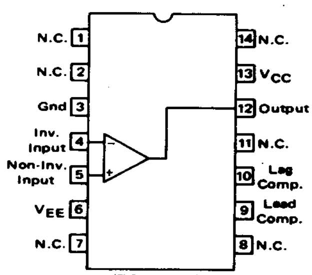
(TOP VIEW)

P SUFFIX
PLASTIC PACKAGE
CASE 646





L SUFFIX
CERAMIC PACKAGE
CASE 632
TO-116



(TOP VIEW)

3

MC1712 ELECTRICAL CHARACTERISTICS ($T_A = 25^{\circ}C$ unless otherwise specified)

Characteristic	Symbol	$V_{CC} = 12$ V, $V_{EE} = -6.0$ V Min	Typ	Max	$V_{CC} = 6.0$ V, $V_{EE} = -3.0$ V Min	Typ	Max	Unit
Input Offset Voltage ($R_S \leq 2$ kΩ)	V_{IO}	–	0.5	2.0	–	0.7	3.0	mV
Input Offset Current	I_{IO}	–	180	500	–	120	500	nA
Input Bias Current	I_{IB}	–	2.0	5.0	–	1.2	3.5	µA
Input Resistance	r_i	16	40	–	22	67	–	kΩ
Input Voltage Range	V_I	-4.0	–	+0.5	-1.5	–	+0.5	V
Common Mode Rejection Ratio ($R_S \leq 2$ kΩ, $f \leq 1$ kHz)	CMRR	80	100	–	80	100	–	dB
Large Signal Voltage Gain ($R_L \geq 100$ kΩ, $V_{out} = \pm 5.0$ V) ($R_L \geq 100$ kΩ, $V_{out} = \pm 2.5$ V)	A_{VOL}	 2000 –	 3600 –	 – –	 – 600	 – 900	 – –	
Output Resistance	r_o	–	200	500	–	300	700	Ω
Supply Current ($V_{out} = 0$)	I_D	–	5.0	6.7	–	2.1	3.3	mA
Power Consumption ($V_{out} = 0$)	P_C	–	90	120	–	19	30	mW
Transient Response (Unity-Gain) (C1 = 0.01 µF, R1 = 20 Ω, $R_L \leq 100$ kΩ, $V_{in} = 10$ mV, $C_L \leq 100$ pF) Rise Time Overshoot	 t_{TLH} OS	 – –	 25 10	 120 50	 – –	 – –	 – –	 ns %
Transient Response (x100 Gain) (C3 = 50 pF, $R_L \geq 100$ kΩ, $V_{in} = 1$ mV) Rise Time Overshoot	 t_{TLH} OS	 – –	 10 20	 30 40	 – –	 – –	 – –	 ns %

The following specifications apply for $-55^{\circ}C \leq T_A \leq +125^{\circ}C$:

Characteristic	Symbol	$V_{CC} = 12$ V, $V_{EE} = -6.0$ V Min	Typ	Max	$V_{CC} = 6.0$ V, $V_{EE} = -3.0$ V Min	Typ	Max	Unit
Input Offset Voltage ($R_S \leq 2$ kΩ)	V_{IO}	–	–	3.0	–	–	4.0	mV
Average Temperature Coefficient of Input Offset Voltage ($R_S = 50$ Ω, $T_A = 25^{\circ}C$ to $125^{\circ}C$) ($R_S = 50$ Ω, $T_A = 25^{\circ}C$ to $-55^{\circ}C$)	$\Delta V_{IO}/\Delta T$	 – –	 2.5 2.0	 10 10	 – –	 3.5 3.0	 15 15	 µV/°C µV/°C
Input Offset Current ($T_A = +125^{\circ}C$) ($T_A = -55^{\circ}C$)	I_{IO}	 – –	 80 400	 500 1500	 – –	 50 280	 500 1500	 nA nA
Average Temperature Coefficient of Input Offset Current ($T_A = 25^{\circ}C$ to $+125^{\circ}C$) ($T_A = 25^{\circ}C$ to $-55^{\circ}C$)	$\Delta I_{IO}/\Delta T$	 – –	 1.0 3.0	 5.0 16	 – –	 0.7 20	 4.0 13	 nA/°C nA/°C
Input Bias Current ($T_A = -55^{\circ}C$)	I_{IB}	–	4.3	10	–	2.6	7.5	µA
Input Resistance	r_i	6.0	–	–	8.0	–	–	kΩ
Common Mode Rejection Ratio ($R_S \leq 2$ kΩ, $f \leq 1$ kHz)	CMRR	70	95	–	70	95	–	dB
Supply Voltage Rejection Ratio ($V_{CC} = 12$ V, $V_{EE} = -6.0$ V to $V_{CC} = 6.0$ V, $V_{EE} = -3.0$ V, $R_S \leq 2$ kΩ)	PSRR	–	75	200	–	75	200	µV/V
Large Signal Voltage Gain ($R_L \geq 100$ kΩ, $V_{out} = \pm 5.0$ V) ($R_L \geq 100$ kΩ, $V_{out} = \pm 2.5$ V)	A_{VOL}	 2000 –	 – –	 – –	 – 500	 – –	 – –	
Output Voltage Swing ($R_L \geq 100$ kΩ) ($R_L \geq 10$ kΩ)	V_O	 ±5.0 ±3.5	 ±5.3 ±4.0	 – –	 ±2.5 ±1.5	 ±2.7 ±2.0	 – –	 V V
Supply Current ($T_A = +125^{\circ}C$, $V_{out} = 0$) ($T_A = -55^{\circ}C$, $V_{out} = 0$)	I_D	 – –	 4.4 5.0	 6.7 7.5	 – –	 1.7 2.1	 3.3 3.9	 mA mA
Power Consumption ($T_A = +125^{\circ}C$, $V_{out} = 0$) ($T_A = -55^{\circ}C$, $V_{out} = 0$)	P_C	 – –	 80 90	 120 135	 – –	 15 19	 30 35	 mW mW

3

MC1712C ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise specified)

Characteristic	Symbol	V_{CC} = 12 V, V_{EE} = −6.0 V Min	Typ	Max	V_{CC} = 6.0 V, V_{EE} = −3.0 V Min	Typ	Max	Unit
Input Offset Voltage ($R_S \leq 2$ kΩ)	V_{IO}	–	1.5	5.0	–	1.7	6.0	mV
Input Offset Current	I_{IO}	–	0.5	2.0	–	0.3	2.0	µA
Input Bias Current	I_{IB}	–	2.5	7.5	–	1.5	5.0	µA
Input Resistance	r_i	10	32	–	16	55	–	kΩ
Input Voltage Range	V_I	−4.0	–	+0.5	−1.5	–	+0.5	V
Common Mode Rejection Ratio ($R_S \leq 2$ kΩ, f ≤ 1 kHz)	CMRR	70	92	–	70	92	–	dB
Large Signal Voltage Gain ($R_L \geq 100$ kΩ, V_{out} = ±5.0 V) ($R_L \geq 100$ kΩ, V_{out} = ±2.5 V)	A_{VOL}	 2000 –	 3400 –	 – –	 – 500	 – 800	 – –	
Output Resistance	r_o	–	200	600	–	300	800	Ω
Supply Current (V_{out} = 0)	I_D	–	5.0	6.7	–	2.1	3.3	mA
Power Consumption (V_{out} = 0)	P_C	–	90	120	–	19	30	mW
Transient Response (Unity-Gain) (C1 = 0.01 µF, R_1 = 20 Ω, $R_L \leq 100$ kΩ, V_{in} = 10 mV, $C_L \leq 100$ pF) Rise Time Overshoot	 t_{TLH} OS	 – –	 25 10	 120 50	 – –	 – –	 – –	 ns %
Transient Response (×100 Gain) (C3 = 50 pF, $R_L \geq 100$ kΩ, V_{in} = 1 mV) Rise Time Overshoot	 t_{TLH} OS	 – –	 10 20	 30 40	 – –	 – –	 – –	 ns %

The following specifications apply for 0°C ≤ T_A ≤ +70°C:

Characteristic	Symbol	V_{CC} = 12 V, V_{EE} = −6.0 V Min	Typ	Max	V_{CC} = 6.0 V, V_{EE} = −3.0 V Min	Typ	Max	Unit
Input Offset Voltage ($R_S \leq 2$ kΩ)	V_{IO}	–	–	6.5	–	–	7.5	mV
Average Temperature Coefficient of Input Offset Voltage (R_S = 50 Ω, T_A = +70°C to 0°C)	$\Delta V_{IO}/\Delta T$	–	5.0	20	–	7.5	25	µV/°C
Input Offset Current	I_{IO}	–	–	2.5	–	–	2.5	µA
Average Temperature Coefficient of Input Offset Current (T_A = 25°C to +70°C) (T_A = 25°C to 0°C)	$\Delta I_{IO}/\Delta T$	 – –	 4.0 6.0	 10 20	 – –	 3.0 5.5	 8.0 18	 nA/°C nA/°C
Input Bias Current (T_A = 0°C)	I_{IB}	–	4.0	12	–	2.7	8	µA
Input Resistance	r_i	6.0	18	–	9.0	27	–	kΩ
Common Mode Rejection Ratio ($R_S \leq 2$ kΩ, f ≤ 1 kHz)	CMRR	6.5	86	–	65	86	–	dB
Supply Voltage Rejection Ratio (V_{CC} = 12 V, V_{EE} = −6.0 V to V_{CC} = 6.0 V, V_{EE} = −3.0 V, $R_S \leq 2$ kΩ)	PSRR	–	90	300	–	90	300	µV/V
Large Signal Voltage Gain ($R_L \geq 100$ kΩ, V_{out} = ±5.0 V) ($R_L \geq 100$ kΩ, V_{out} = ±2.5 V)	A_{VOL}	 1500 –	 – –	 – –	 – 400	 – –	 – –	
Output Voltage Swing ($R_L \geq 100$ kΩ) ($R_L \geq 10$ kΩ)	V_O	 ±5.0 ±3.5	 ±5.3 ±4.0	 – –	 ±2.5 ±1.5	 ±2.7 ±2.0	 – –	 V V
Supply Current (V_{out} = 0)	I_D	–	5.0	7.0	–	2.1	3.9	mA
Power Consumption (V_{out} = 0)	P_C	–	90	125	–	19	35	mW

TYPICAL OUTPUT CHARACTERISTICS

(V_{CC} = 12 Vdc, V_{EE} = -6.0 Vdc, T_A = +25°C)

FIGURE 1 – OPEN LOOP GAIN versus POWER SUPPLY VARIATIONS

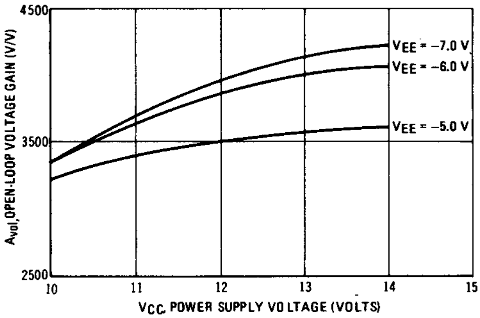


FIGURE 2 – OPEN LOOP VOLTAGE GAIN versus FREQUENCY

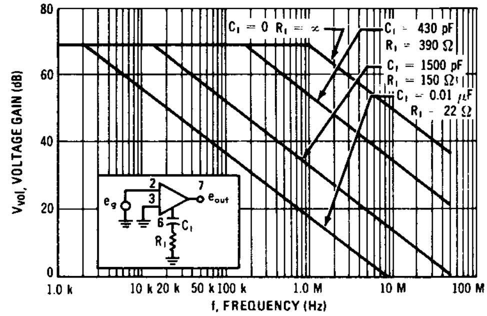


FIGURE 3 – VOLTAGE GAIN versus FREQUENCY

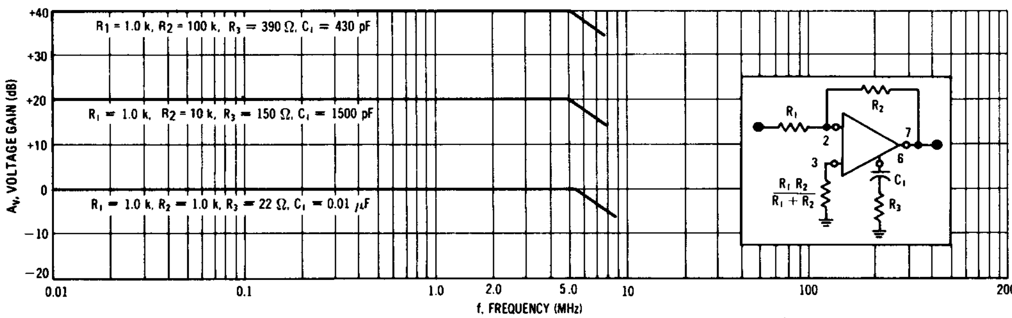
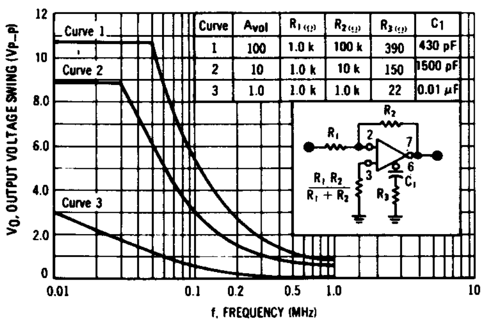
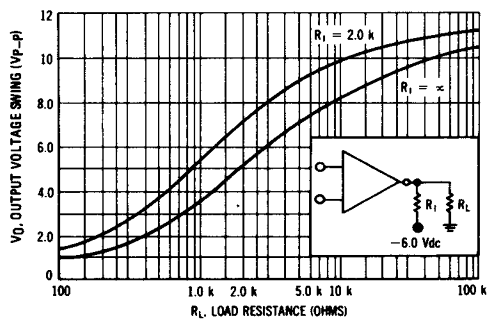


FIGURE 4 – MAXIMUM OUTPUT SWING versus FREQUENCY



Curve	A_{vol}	R_1 (Ω)	R_2 (Ω)	R_3 (Ω)	C_1
1	100	1.0 k	100 k	390	430 pF
2	10	1.0 k	10 k	150	1500 pF
3	1.0	1.0 k	1.0 k	22	0.01 μF

FIGURE 5 – OUTPUT VOLTAGE SWING versus LOAD RESISTANCE



TYPICAL CHARACTERISTICS (continued)

FIGURE 6 – INPUT BIAS CURRENT versus TEMPERATURE

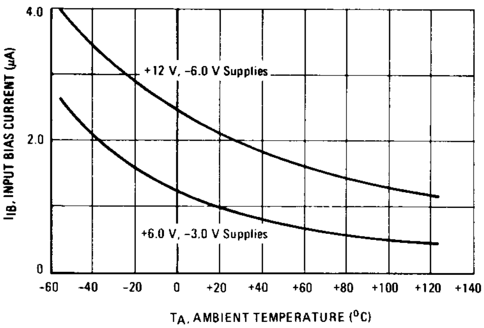


FIGURE 7 – INPUT OFFSET CURRENT versus TEMPERATURE

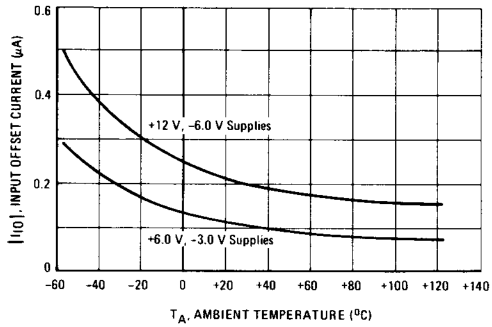


FIGURE 8 – INPUT OFFSET VOLTAGE versus TEMPERATURE

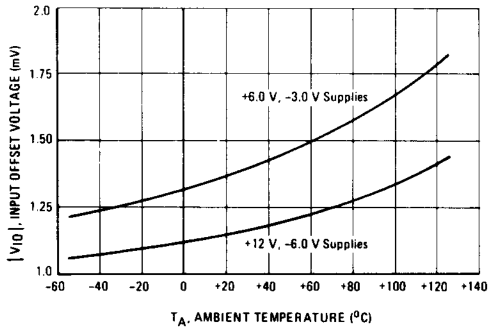


FIGURE 9 – OUTPUT NOISE VOLTAGE versus SOURCE IMPEDANCE