

**MOTOROLA**  
**SEMICONDUCTOR**  
**TECHNICAL DATA**

2

**INTERNALLY COMPENSATED, HIGH PERFORMANCE  
OPERATIONAL AMPLIFIERS**

... designed for use as a summing amplifier, integrator, or amplifier with operating characteristics as a function of the external feedback components.

- No Frequency Compensation Required
- Short-Circuit Protection
- Offset Voltage Null Capability
- Wide Common-Mode and Differential Voltage Ranges
- Low-Power Consumption
- No Latch Up

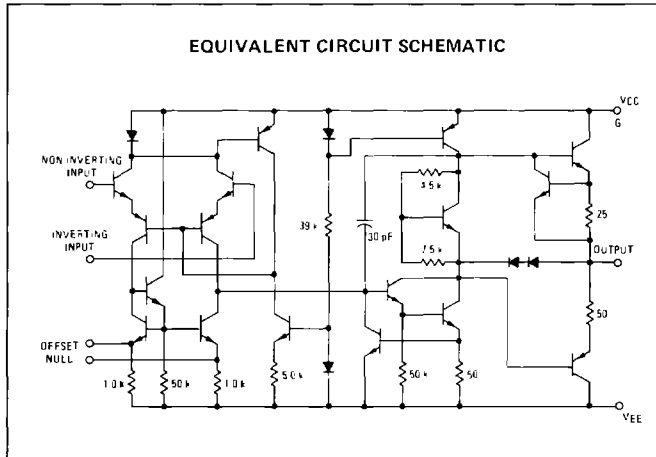
**MAXIMUM RATINGS** ( $T_A = +25^\circ\text{C}$  unless otherwise noted)

Rating	Symbol	MC1741C	MC1741	Unit
Power Supply Voltage	$V_{CC}$	+18	+22	Vdc
	$V_{EE}$	-18	-22	Vdc
Input Differential Voltage	$V_{ID}$	$\approx 30$		Volts
Input Common Mode Voltage (Note 1)	$V_{ICM}$	$\approx 15$		Volts
Output Short Circuit Duration (Note 2)	$t_S$	Continuous		
Operating Ambient Temperature Range	$T_A$	0 to +70	-55 to +125	$^\circ\text{C}$
Storage Temperature Range Metal and Ceramic Packages Plastic Packages	$T_{stg}$	-65 to +150		$^\circ\text{C}$
		-55 to +125		

**NOTES:**

1. For supply voltages less than -15 V, the absolute maximum input voltage is equal to the supply voltage
2. Supply voltage equal to or less than 15 V.

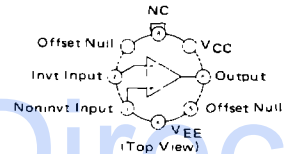
**EQUIVALENT CIRCUIT SCHEMATIC**



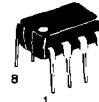
**MC1741**  
**MC1741C**

**OPERATIONAL AMPLIFIER**

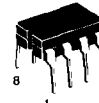
**SILICON MONOLITHIC  
INTEGRATED CIRCUIT**



**G SUFFIX**  
METAL PACKAGE  
CASE 601



**P1 SUFFIX**  
PLASTIC PACKAGE  
CASE 626

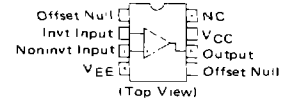


**U SUFFIX**  
CERAMIC PACKAGE  
CASE 693



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

**PIN CONNECTIONS**



**ORDERING INFORMATION**

Device	Alternate	Temperature Range	Package
MC1741CD	—	0 $^\circ\text{C}$ to +70 $^\circ\text{C}$	SO-8
MC1741CG	LM741CH, $\mu\text{A}741\text{HC}$		Metal Can
MC1741CP1	LM741CN, $\mu\text{A}741\text{TC}$	-55 $^\circ\text{C}$ to +125 $^\circ\text{C}$	Plastic DIP
MC1741CU	—		Ceramic DIP
MC1741G	—	-55 $^\circ\text{C}$ to +125 $^\circ\text{C}$	Metal Can
MC1741U	—		Ceramic DIP

# MC1741, MC1741C

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

Characteristic	Symbol	MC1741			MC1741C			Unit
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage ( $R_S \leq 10\text{ k}$ )	$V_{IO}$	—	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	—	M $\Omega$
Input Capacitance	$C_i$	—	1.4	—	—	1.4	—	pF
Offset Voltage Adjustment Range	$V_{IO\text{R}}$	—	$\pm 15$	—	—	$\pm 15$	—	mV
Common Mode Input Voltage Range	$V_{ICR}$	$\pm 12$	$\pm 13$	—	$\pm 12$	$\pm 13$	—	V
Large Signal Voltage Gain ( $V_O = \pm 10\text{ V}$ , $R_L \geq 2.0\text{ k}$ )	$A_v$	50	200	—	20	200	—	V/mV
Output Resistance	$r_o$	—	75	—	—	75	—	$\Omega$
Common Mode Rejection Ratio ( $R_S \leq 10\text{ k}$ )	CMRR	70	90	—	70	90	—	dB
Supply Voltage Rejection Ratio ( $R_S \leq 10\text{ k}$ )	PSRR	—	30	150	—	30	150	$\mu\text{V/V}$
Output Voltage Swing ( $R_L \geq 10\text{ k}$ ) ( $R_L \geq 2\text{ k}$ )	$V_O$	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	—	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	—	V
Output Short-Circuit Current	$I_{OS}$	—	20	—	—	20	—	mA
Supply Current	$I_D$	—	1.7	2.8	—	1.7	2.8	mA
Power Consumption	$P_C$	—	50	85	—	50	85	mW
Transient Response (Unity Gain — Non-Inverting) ( $V_i = 20\text{ mV}$ , $R_L \geq 2\text{ k}$ , $C_L \leq 100\text{ pF}$ ) Rise Time ( $V_i = 20\text{ mV}$ , $R_L \geq 2\text{ k}$ , $C_L \leq 100\text{ pF}$ ) Overshoot ( $V_i = 10\text{ V}$ , $R_L \geq 2\text{ k}$ , $C_L \leq 100\text{ pF}$ ) Slew Rate	$T_{LH}$ $os$ SR	—	0.3 15 0.5	— — —	—	0.3 15 0.5	—	$\mu\text{s}$ % V/ $\mu\text{s}$

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

Characteristic	Symbol	MC1741			MC1741C			Unit
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage ( $R_S \leq 10\text{ k}\Omega$ )	$V_{IO}$	—	1.0	6.0	—	—	7.5	mV
Input Offset Current ( $T_A = 125^\circ\text{C}$ ) ( $T_A = -55^\circ\text{C}$ ) ( $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ )	$I_{IO}$	—	7.0 85 —	200 500 —	—	— — 300	—	nA
Input Bias Current ( $T_A = 125^\circ\text{C}$ ) ( $T_A = -55^\circ\text{C}$ ) ( $T_A = 0^\circ\text{C}$ 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
Common Mode Rejection Ratio ( $R_S \leq 10\text{ k}$ )	CMRR	70	90	—	—	—	—	dB
Supply Voltage Rejection Ratio ( $R_S \leq 10\text{ k}$ )	PSRR	—	30	150	—	—	—	$\mu\text{V/V}$
Output Voltage Swing ( $R_L \geq 10\text{ k}$ ) ( $R_L \geq 2\text{ k}$ )	$V_O$	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	—	— $\pm 10$	— $\pm 13$	—	V
Large Signal Voltage Gain ( $R_L \geq 2\text{ k}$ , $V_{out} = \pm 10\text{ V}$ )	$A_v$	25	—	—	15	—	—	V/mV
Supply Currents ( $T_A = 125^\circ\text{C}$ ) ( $T_A = -55^\circ\text{C}$ )	$I_D$	—	1.5 2.0	2.5 3.3	—	— —	—	mA
Power Consumption ( $T_A = +125^\circ\text{C}$ ) ( $T_A = -55^\circ\text{C}$ )	$P_C$	—	45 60	75 100	—	— —	—	mW

\* $T_{high} = 125^\circ\text{C}$  for MC1741 and  $70^\circ\text{C}$  for MC1741C  
 $T_{low} = -55^\circ\text{C}$  for MC1741 and  $0^\circ\text{C}$  for MC1741C



# MC1741, MC1741C

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FIGURE 1 – BURST NOISE versus SOURCE RESISTANCE

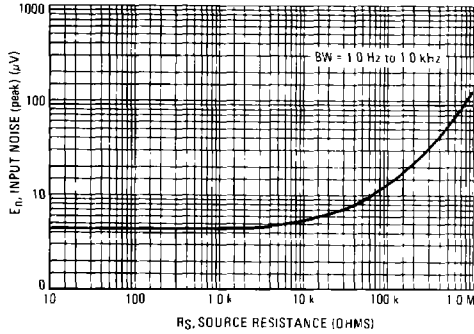


FIGURE 2 – RMS NOISE versus SOURCE RESISTANCE

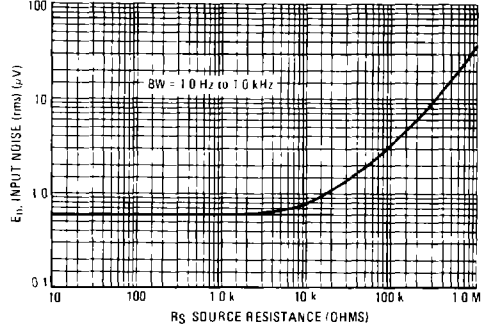


FIGURE 3 – OUTPUT NOISE versus SOURCE RESISTANCE

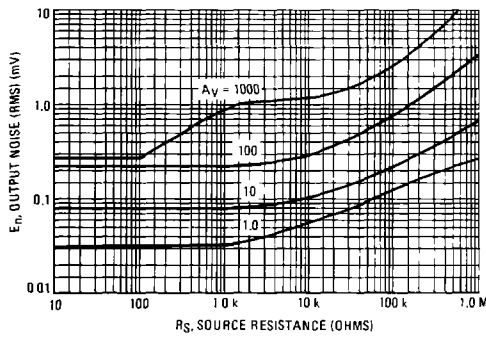


FIGURE 4 – SPECTRAL NOISE DENSITY

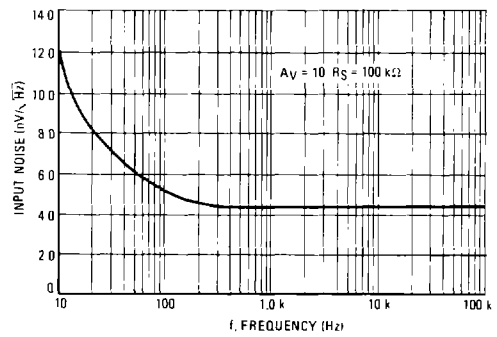
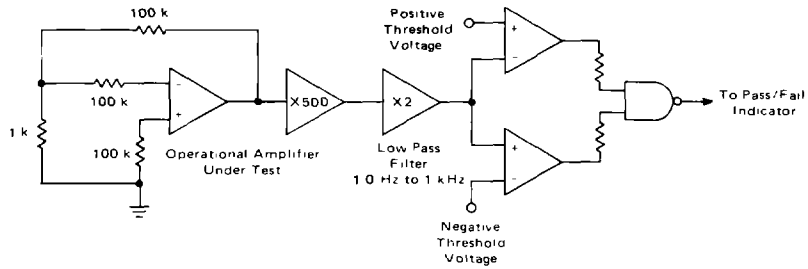


FIGURE 5 – BURST NOISE TEST CIRCUIT



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

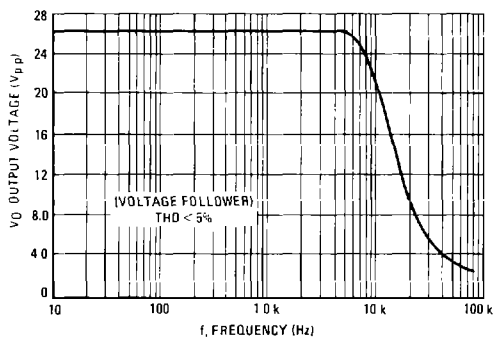
The test time employed is 10 seconds and the 20  $\mu$ V peak limit refers to the operational amplifier input thus eliminating errors in the closed-loop gain factor of the operational amplifier under test

# MC1741, MC1741C

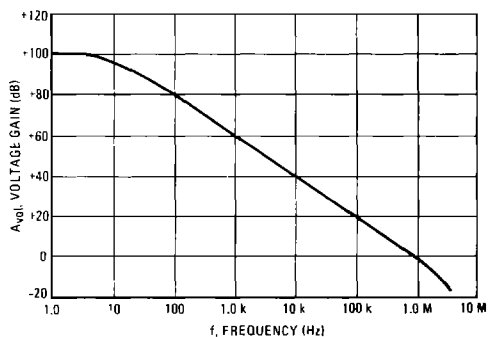
## TYPICAL CHARACTERISTICS

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

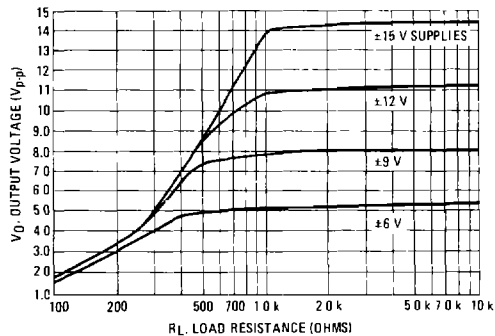
**FIGURE 6 – POWER BANDWIDTH  
(LARGE SIGNAL SWING versus FREQUENCY)**



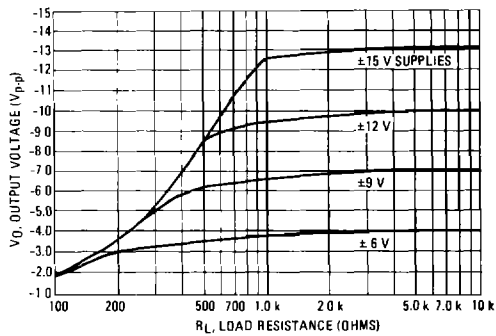
**FIGURE 7 – OPEN LOOP FREQUENCY RESPONSE**



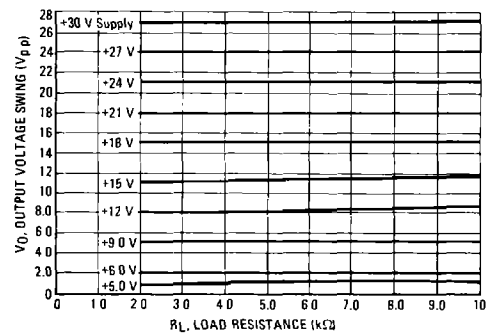
**FIGURE 8 – POSITIVE OUTPUT VOLTAGE SWING  
versus LOAD RESISTANCE**



**FIGURE 9 – NEGATIVE OUTPUT VOLTAGE SWING  
versus LOAD RESISTANCE**



**FIGURE 10 – OUTPUT VOLTAGE SWING versus  
LOAD RESISTANCE (Single Supply Operation)**



**FIGURE 11 – SINGLE SUPPLY INVERTING AMPLIFIER**

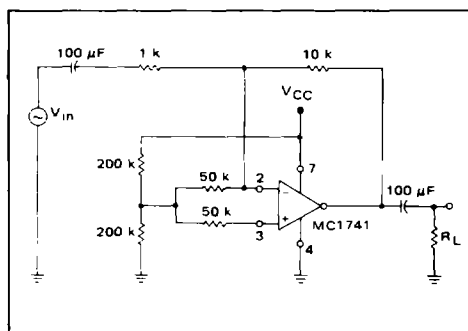


FIGURE 12 — NONINVERTING PULSE RESPONSE

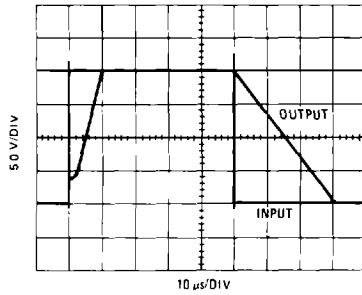


FIGURE 13 — TRANSIENT RESPONSE TEST CIRCUIT

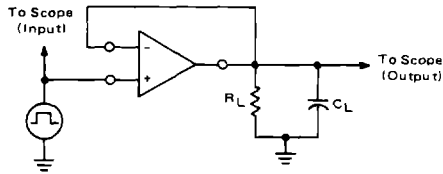


FIGURE 14 — OPEN LOOP VOLTAGE GAIN versus SUPPLY VOLTAGE

