

μA709AM, μA709M, μA709C
GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

electrical characteristics at specified free-air temperature (unless otherwise noted $V_{CC} \pm = \pm 15$ V)

PARAMETER	TEST CONDITIONS†	μA709C			UNIT
		MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{CC} \pm = \pm 9$ V to ± 15 V, $V_O = 0$	25°C	2	7.5	mV
		Full range		10	
I_{IO} Input offset current	$V_{CC} \pm = \pm 9$ V to ± 15 V, $V_O = 0$	25°C	100	500	nA
		Full range		750	
I_B Input bias current	$V_{CC} \pm = \pm 9$ V to ± 15 V, $V_O = 0$	25°C	0.3	1.5	μA
		Full range		2	
V_{ICR} Common-mode input voltage range		25°C	±8	±10	V
V_{OPP} Maximum peak-to-peak output voltage swing	$R_L \geq 10$ kΩ	25°C	24	28	V
		Full range		24	
	$R_L = 2$ kΩ	25°C	20	26	
	$R_L \geq 2$ kΩ	Full range		20	
A_{VD} Large-signal differential voltage amplification	$R_L \leq 2$ kΩ, $V_O = \pm 10$ V	25°C	15	45	V/mV
		Full range	12		
r_i Input resistance		25°C	50	250	kΩ
		Full range	35		
r_o Output resistance	$V_O = 0$, See Note 5	25°C		150	Ω
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICR \text{ min}}$	25°C	65	90	dB
kg_{VS} Supply voltage sensitivity	$V_{CC} = \pm 9$ V to ± 15 V	25°C	25	200	μV/V
P_D Total power dissipation	$V_O = 0$, No load	25°C	80	200	mW

† All characteristics are specified under open-loop operation with zero volts common-mode voltage unless otherwise specified. Full range for μA709C is 0°C to 70°C.

NOTE 5: This typical value applies only at frequencies above a few hundred hertz because of the effects of drift and thermal feedback.

operating characteristics $V_{CC} \pm = \pm 9$ V to ± 15 V, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	μA709AM μA709M μA709C			UNIT
		MIN	TYP	MAX	
t_r Rise time	$V_I = 20$ mV, $R_L = 2$ kΩ, See Figure 1	$C_L = 0$	0.3	1	μs
Overshoot factor		$C_L = 100$ pF	6%	30%	

PARAMETER MEASUREMENT INFORMATION

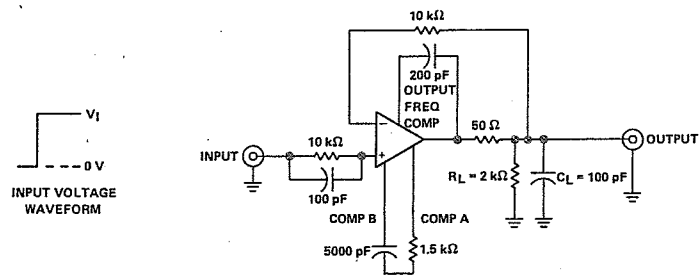


FIGURE 1. RISE TIME AND SLEW RATE

μA741C, μA741I, μA741M
GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

D920, NOVEMBER 1970 — REVISED JANUARY 1992

- Short-Circuit Protection
- Offset-Voltage Null Capability
- Large Common-Mode and Differential Voltage Ranges
- No Frequency Compensation Required
- Low Power Consumption
- No Latch-Up
- Designed to Be Interchangeable With Fairchild μA741

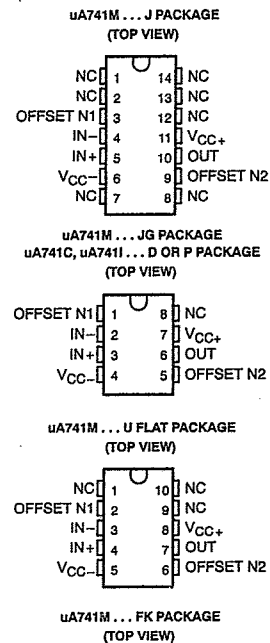
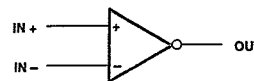
description

The μA741 is a general-purpose operational amplifier featuring offset-voltage null capability.

The high common-mode input voltage range and the absence of latch-up make the amplifier ideal for voltage-follower applications. The device is short-circuit protected and the internal frequency compensation ensures stability without external components. A low potentiometer may be connected between the offset null inputs to null out the offset voltage as shown in Figure 2.

The μA741C is characterized for operation from 0°C to 70°C. The μA741I is characterized for operation from -40°C to 85°C. The μA741M is characterized for operation over the full military temperature range of -55°C to 125°C.

symbol



NC—No internal connection

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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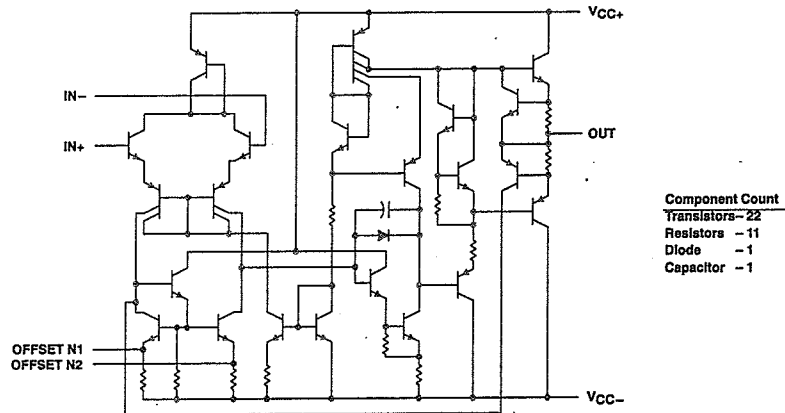
uA741C, uA741I, uA741M
GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

AVAILABLE OPTIONS

T _A	PACKAGE					
	SMALL OUTLINE (D)	CHIP CARRIER (FK)	CERAMIC DIP (J)	CERAMIC DIP (JG)	PLASTIC DIP (P)	FLAT PACK (U)
0°C to 70°C	uA741CD				uA741CP	
-40°C to 85°C	uA741ID				uA741IP	
-55°C to 125°C		uA741MFK	uA741MJ	uA741MJG		uA741MU

The D package is available taped and reeled. Add the suffix R (e.g., uA741CDR).

schematic



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

	uA741C	uA741I	uA741M	UNIT
Supply voltage V _{CC+} (see Note 1)	18	22	22	V
Supply voltage V _{CC-} (see Note 1)	-18	-22	-22	V
Differential input voltage (see Note 2)	±15	±30	±30	V
Input voltage any input (see Notes 1 and 3)	±15	±15	±15	V
Voltage between either offset null terminal (N1/N2) and V _{CC-}	±15	±0.5	±0.5	V
Duration of output short circuit (see Note 4)	unlimited	unlimited	unlimited	
Continuous total power dissipation	See Dissipation Rating Table			
Operating free-air temperature range	0 to 70	-40 to 85	-55 to 125	°C
Storage temperature range	-65 to 150	-65 to 150	-65 to 150	°C
Case temperature for 60 seconds	FK package			260 °C
Lead temperature 1.6 mm (1/16 inch) from case for 60 seconds	J, JG, or U package			300 °C
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds	D or P package			260 °C

- NOTES: 1. All voltage values, unless otherwise noted, are with respect to the midpoint between V_{CC+} and V_{CC-}.
2. Differential voltages are at the noninverting input terminal with respect to the inverting input terminal.
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.
4. The output may be shorted to ground or either power supply. For the uA741M only, the unlimited duration of the short circuit applies at (or below) 125°C case temperature or 75°C free-air temperature.

uA741C, uA741I, uA741M
GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

DISSIPATION RATING TABLE

PACKAGE	T _A = 25°C		DERATE ABOVE T _A	T _A = 70°C		T _A = 85°C		T _A = 125°C	
	POWER RATING	DERATING FACTOR		POWER RATING	DERATING FACTOR	POWER RATING	DERATING FACTOR	POWER RATING	DERATING FACTOR
D	500 mW	5.8 mW/°C	64°C	464 mW	5.8 mW/°C	377 mW	5.8 mW/°C	N/A	
FK	500 mW	11.0 mW/°C	105°C	500 mW	11.0 mW/°C	500 mW	11.0 mW/°C	275 mW	5.8 mW/°C
J	500 mW	11.0 mW/°C	105°C	500 mW	11.0 mW/°C	500 mW	11.0 mW/°C	275 mW	5.8 mW/°C
JG	500 mW	8.4 mW/°C	90°C	500 mW	8.4 mW/°C	500 mW	8.4 mW/°C	210 mW	5.8 mW/°C
P	500 mW	N/A	N/A	500 mW	N/A	500 mW	N/A	N/A	
U	500 mW	5.4 mW/°C	57°C	432 mW	5.4 mW/°C	351 mW	5.4 mW/°C	135 mW	5.4 mW/°C

electrical characteristics at specified free-air temperature, V_{CC} = ±15 V

PARAMETER		TEST CONDITIONS	T _A [†]	UA741C			UA741I, UA741M			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V _{IO}	Input offset voltage	V _O = 0	25°C	1			6			mV
			Full range				7.5			6
ΔV _{IO} (adj)	Offset voltage adjust range	V _O = 0	25°C	±15			±15			mV
			25°C	20			200			20
I _{IO}	Input offset current	V _O = 0	25°C							500
			Full range							500
I _{IB}	Input bias current	V _O = 0	25°C	80			500			80
			Full range							1500
V _{ICR}	Common-mode input voltage range		25°C	±12 ±13			±12 ±13			V
			Full range	±12			±12			
V _{OM}	Maximum peak output voltage swing	R _L = 10 kΩ	25°C	±12 ±14			±12 ±14			V
		R _L ≥ 10 kΩ	Full range	±12			±12			
		R _L = 2 kΩ	25°C	±10 ±13			±10 ±13			
		R _L ≥ 2 kΩ	Full range	±10			±10			
A _{VD}	Large-signal differential voltage amplification	R _L ≥ 10 kΩ	25°C	20			200			50
		V _O = ±10 V	Full range	15			25			200
r _i	Input resistance		25°C	0.3			2			0.3
r _o	Output resistance	V _O = 0, See Note 5	25°C				75			75
C _i	Input capacitance		25°C	1.4			1.4			pF
			25°C	70			90			70
CMRR	Common-mode rejection ratio	V _{IC} = V _{ICR} min	Full range	70			70			90
			Full range	70			70			
k _{SVS}	Supply voltage sensitivity (ΔV _{IO} /ΔV _{CC})	V _{CC} = ±9 V to ±15 V	25°C	30			150			30
			Full range				150			150
I _{OS}	Short-circuit output current		25°C	±25			±40			±25
			25°C	1.7			2.8			1.7
I _{CC}	Supply current	No load, V _O = 0	Full range	3.3			3.3			3.3
			Full range	50			85			50
P _D	Total power dissipation	No load, V _O = 0	25°C	50			85			50
			Full range	100			100			100

† All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified. Full range for the uA741C is 0°C to 70°C, the uA741I is -40°C to 85°C, and the uA741M is -55°C to 125°C.
NOTE 5: This typical value applies only at frequencies above a few hundred hertz because of the effects of drift and thermal feedback.

operating characteristics, $V_{CC} \pm = \pm 15$ V, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	uA741C			uA741I, uA741M			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
t_r Rise time	$V_i = 20$ mV, $R_L = 2$ k Ω		0.3			0.3		μs
Overshoot factor	$C_L = 100$ pF, See Figure 1		5%			5%		
SR Slew rate at unity gain	$V_i = 10$ V, $R_L = 2$ k Ω , $C_L = 100$ pF, See Figure 1		0.5			0.5		V/ μs

PARAMETER MEASUREMENT INFORMATION

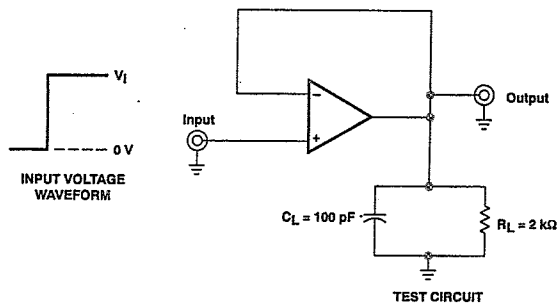


Figure 1. Rise Time, Overshoot, and Slew Rate

APPLICATION INFORMATION

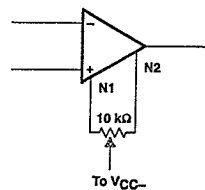


Figure 2. Input Offset Voltage Null Circuit

TYPICAL CHARACTERISTICS†

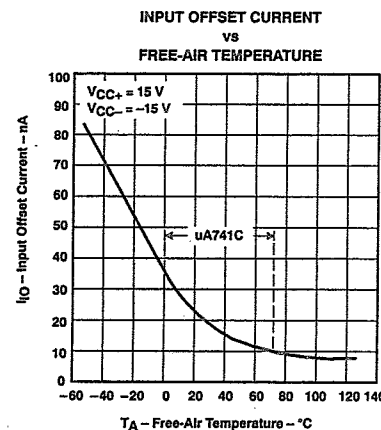


Figure 3

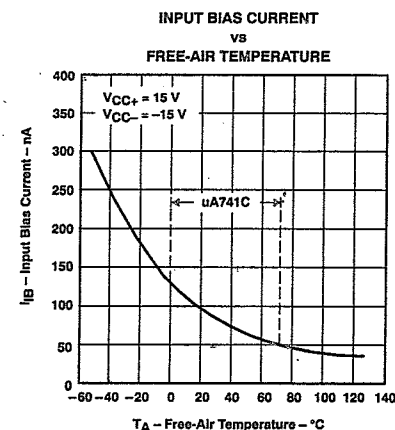


Figure 4

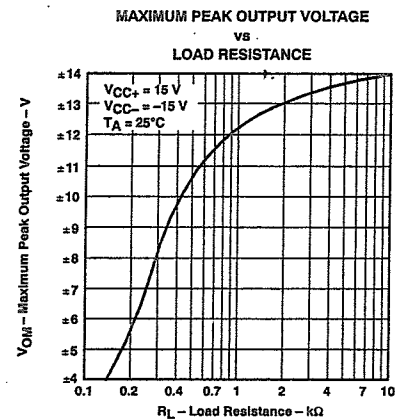


Figure 5

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

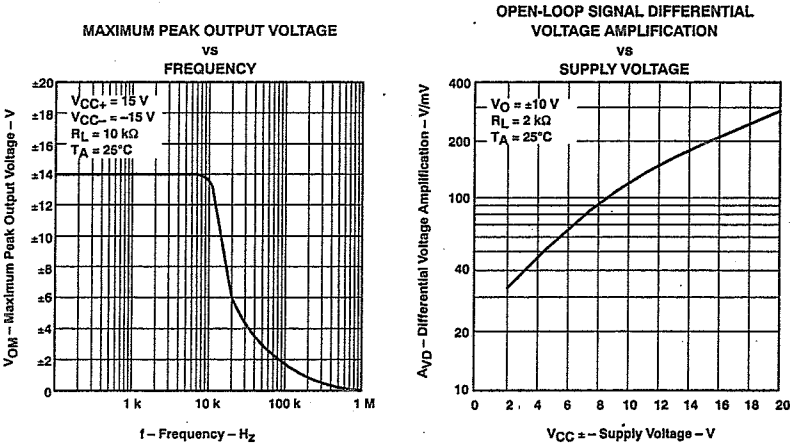


Figure 6

Figure 7

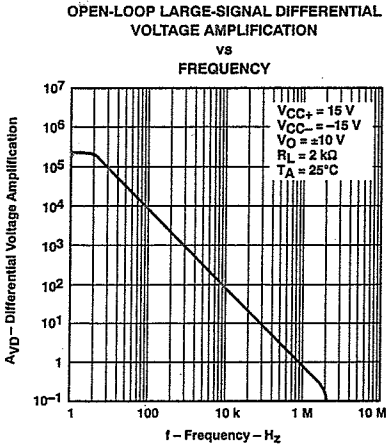


Figure 8

TYPICAL CHARACTERISTICS

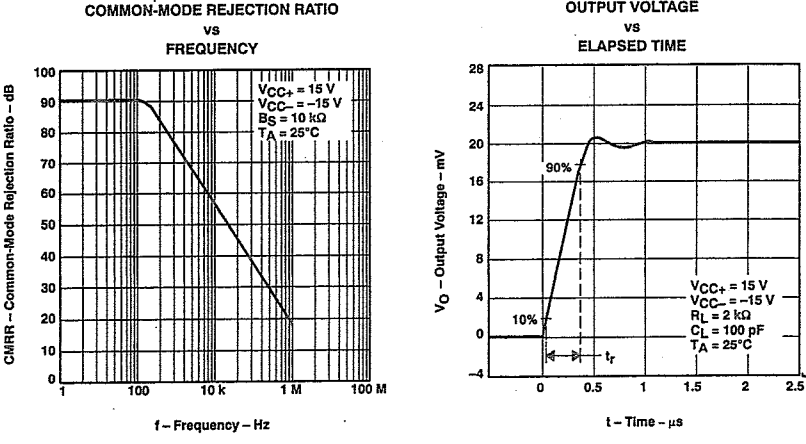


Figure 9

Figure 10

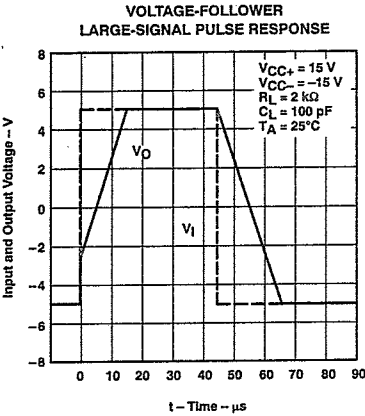


Figure 11