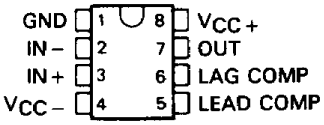
TYPE uA702M
GENERAL-PURPOSE OPERATIONAL AMPLIFIER

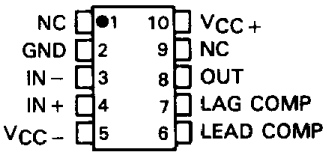
D1004, JUNE 1976—REVISED OCTOBER 1983

- **Open-Loop Voltage Amplification . . . 3600 Typ**
- **CMRR . . . 100 dB Typ**
- **Designed to be Interchangeable with Fairchild μA702**

JG DUAL-IN-LINE PACKAGE
(TOP VIEW)



U FLAT PACKAGE
(TOP VIEW)



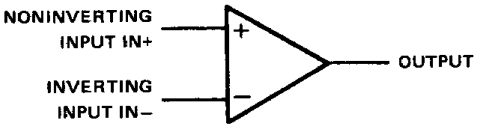
NC—No internal connection

description

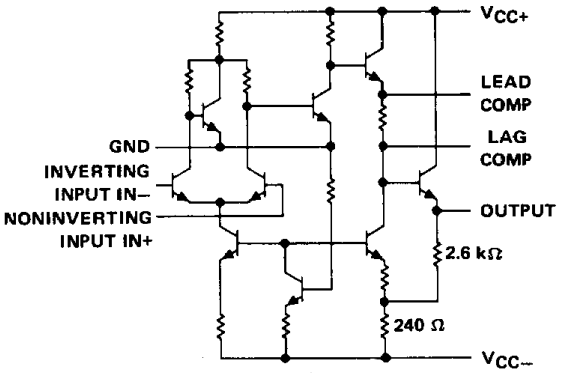
The uA702 is a high-gain, wideband operational amplifier having differential inputs and single-ended emitter-follower outputs. Provisions are incorporated within the circuit whereby external components may be used to compensate the amplifier for stable operation under various feedback or load conditions. Component matching, inherent in silicon monolithic circuit-fabrication techniques, produces an amplifier with low-drift and low-offset characteristics. The uA702 is particularly useful for applications requiring transfer or generation of linear and nonlinear functions up to a frequency of 30 MHz.

The uA702 is characterized for operation over the full military temperature range of −55°C to 125°C.

symbol



schematic



Component values shown are nominal

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

Supply voltage V_{CC+} (see Note 1)	14 V
Supply voltage V_{CC-} (see Note 1)	−7 V
Differential input voltage (see Note 2)	±5 V
Input voltage (either input, see Notes 1 and 3)	−6 V to 1.5 V
Peak output current ($t_w \leq 1$ s)	50 mA
Continuous total dissipation at (or below) 70°C free-air temperature (see Note 4)	300 mW
Operating free-air temperature range	−55°C to 125°C
Storage temperature range	−65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	300°C

NOTES: 1. All voltage values, unless otherwise noted, are with respect to the network ground terminal.
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 lesser of the two supply voltages.
4. For operation above 70°C free-air temperature, refer to Dissipation Derating Curves, Section 2. In the JG packages, uA702M chips are alloy-mounted.

TEXAS INSTRUMENTS
POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

electrical characteristics at specified free-air temperature

PARAMETER		TEST CONDITIONS†			V_{CC+} = 12 V, V_{CC-} = −6 V MIN	TYP	MAX	V_{CC+} = 6 V, V_{CC-} = −3 V MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	$R_S \le 2$ kΩ		25°C		0.5	2		0.7	3	mV
				Full range			3			4	
α_{VIO}	Average temperature coefficient of input offset voltage	R_S = 50 Ω		−55°C to 25°C		2	10		3	15	μV/°C
				25° C to 125°C		2.5	10		3.5	15	
I_{IO}	Input offset current			25°C		0.2	0.5		0.12	0.5	μA
				−55°C		0.4	1.5		0.3	1.5	
				125°C		0.08	0.5		0.05	0.5	
α_{IIO}	Average temperature coefficient of input offset current			−55°C to 25°C		3	16		2	13	nA/°C
				25°C to 125°C		1	5		0.7	4	
I_{IB}	Input bias current			25°C		2	5		1.2	3.5	μA
				−55°C		4.3	10		2.6	7.5	
V_{ICR}	Common-mode input voltage range	Positive swing		25°C	0.5	1		0.5	1		V
		Negative swing			−4	−5		−1.5	−2		
V_{OM}	Maximum peak output voltage swing	$R_L \ge 100$ kΩ		25°C	±5	±5.3		±2.5	±2.7		V
				Full range	±5			±2.5			
		R_L = 10 kΩ		25°C	±3.5	±4		±1.5	±2		
		$R_L \ge 10$ kΩ		Full range	±3.5			±1.5			
A_{VD}	Large-signal differential voltage amplification	$R_L \ge 100$ kΩ	V_O = ±5 V	25°C	2500	3600	6000				
				Full range	2000		7000				
			V_O = ±2.5 V	25°C				600	900	1500	
				Full range				500		1750	
r_i	Input resistance			25°C	16	40		22	67		kΩ
				Full range	6			8			
r_o	Output resistance	V_O = 0,	See Note 5	25°C		200	500		300	700	Ω
CMRR	Common-mode rejection ratio	$R_S \le 2$ kΩ		25°C	80	100		80	100		dB
				Full range	70			70			
k_{SVS}	Supply voltage sensitivity ($\Delta V_{IO}/\Delta V_{CC}$)	$R_S \le 2$ kΩ		25°C		75			75		μV/V
				Full range			200			200	
I_{CC}	Supply current	No load,	No signal	25°C		5	6.7		2.1	3.3	mA
				−55°C		5	7.5		2.1	3.9	
				125°C		4.4	6.7		1.7	3.3	
P_D	Total power dissipation	No load,	No signal	25°C		90	120		19	30	mW
				−55°C		90	135		19	35	
				125°C		80	120		15	30	

†All characteristics are specified under open-loop operation. Full range 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+} = 12 V, V_{CC-} = −6 V, T_A = 25°C

PARAMETER		TEST FIGURE	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_r	Rise time	1	V_I = 10 mV, C_L = 0		25	120	ns
		2	V_I = 1 mV		10	30	ns
	Overshoot factor	1	V_I = 10 mV, C_L = 100 pF		10%	50%	
		2	V_I = 1 mV		20%	40%	
SR	Slew rate	1	V_I = 6 V, C_L = 100 pF		1.7		V/μs
		2	V_I = 100 mV		11		

PARAMETER MEASUREMENT INFORMATION

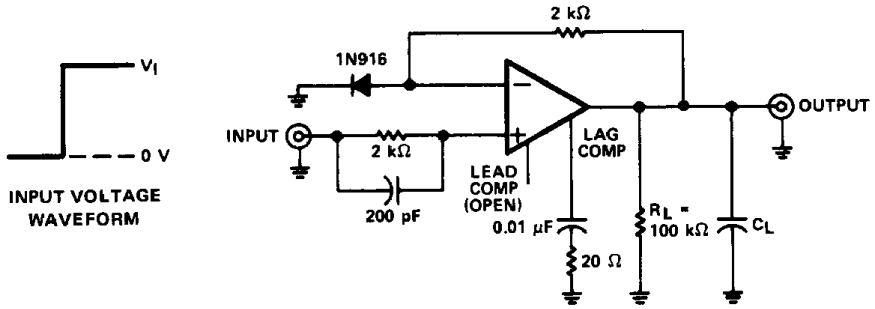


FIGURE 1—UNITY-GAIN AMPLIFIER

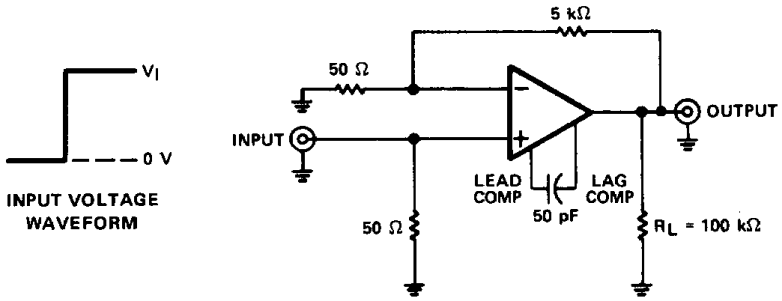


FIGURE 2—GAIN-OF-100 AMPLIFIER

TYPICAL CHARACTERISTICS

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE
vs
FREQUENCY
(for various lag compensations)

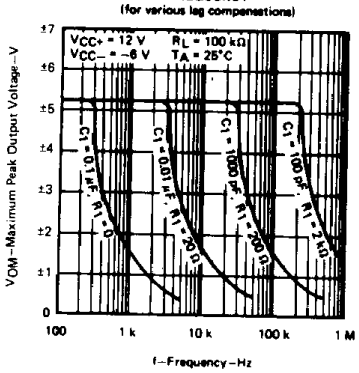
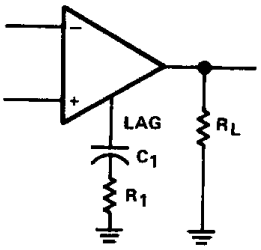


FIGURE 3



LAG COMPENSATION CIRCUIT
FOR FIGURES 3, 4, AND 5

LARGE SIGNAL DIFFERENTIAL
VOLTAGE AMPLIFICATION
vs
FREQUENCY

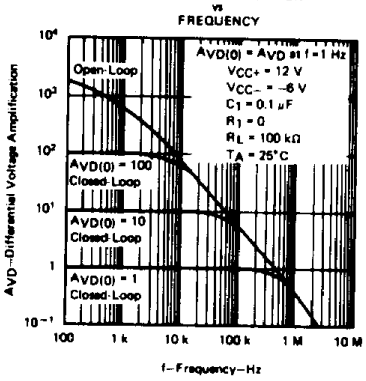


FIGURE 4

LARGE-SIGNAL DIFFERENTIAL
VOLTAGE AMPLIFICATION
vs
FREQUENCY
(for various lag compensations)

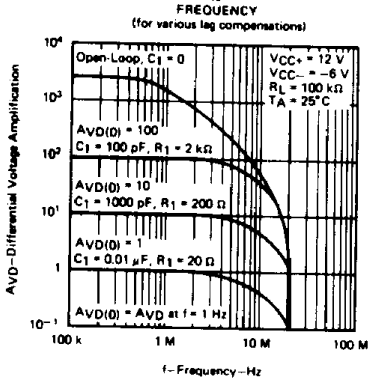


FIGURE 5

LARGE-SIGNAL DIFFERENTIAL
VOLTAGE AMPLIFICATION
vs
FREQUENCY
(for various lag compensations)

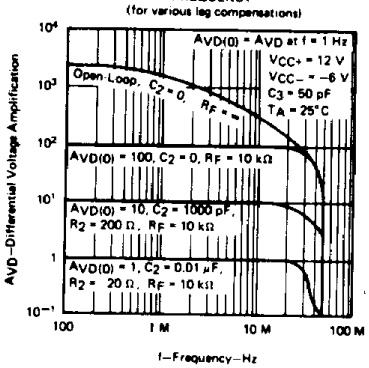
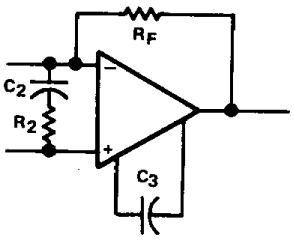


FIGURE 6



LEAD-LAG COMPENSATION CIRCUIT
FOR FIGURE 6