μA101A • μA201A • μA301A General Purpose Operational Amplifiers

Linear Division Operational Amplifiers

Description

The μA101A, μA201A, and μA301A are general purpose monolithic operational amplifiers constructed using the Fairchild Planar Epitaxial process. These integrated circuits are intended for applications requiring low input offset voltage or low input offset current. The accuracy of long interval integrators, timers, and sample-and-hold circuits is improved due to the low drift and low bias currents of the μA101A, μA201A, or μA301A. Frequency response may be matched to the individual circuit need with one external capacitor. The absence of latch up coupled with internal short circuit protection make the μA101A, μA201A and μA301A virtually foolproof.

- **Low Offset Current And Voltage**
- **Low Offset Current Drift**
- **Low Bias Current**
- **Short Circuit Protected**
- **Low Power Consumption**

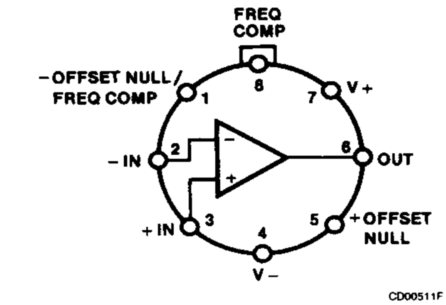
Absolute Maximum Ratings

Storage Temperature Range	
Metal Can	−65°C to +175°C
Molded DIP and SO-8	−65°C to +150°C
Operating Temperature Range	
Extended (μA101AM)	−55°C to +125°C
Industrial (μA201AV)	−25°C to +85°C
Commercial (μA301AC)	0°C to +70°C
Lead Temperature	
Metal Can (soldering, 60 s)	300°C
Molded DIP and SO-8 (soldering, 10 s)	265°C
Internal Power Dissipation[1, 2]	
8L-Metal Can	1.00 W
8L-Molded DIP	0.93 W
SO-8	0.81 W
Supply Voltage	
μA101A, μA201A	±22 V
μA301A	±18 V
Differential Input Voltage	±30 V
Input Voltage[3]	±15 V
Output Short Circuit Duration[4]	Indefinite

Notes

1. $T_{J\ Max}$ = 150°C for the Molded DIP and SO-8, and 175°C for the Metal Can.
2. Ratings apply to ambient temperature at 25°C. Above this temperature, derate the 8L-Metal Can at 6.7 mW/°C, the 8L-Molded DIP at 7.5 mW/°C and the SO-8 at 6.5 mW/°C.
3. For supply voltage less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.
4. Short circuit may be ground or either supply. μA101A and μA201A ratings apply to +125°C case temperature or +75°C ambient temperature. μA301A ratings apply for case temperatures to 70°C.

Connection Diagram
8-Lead Metal Package
(Top View)

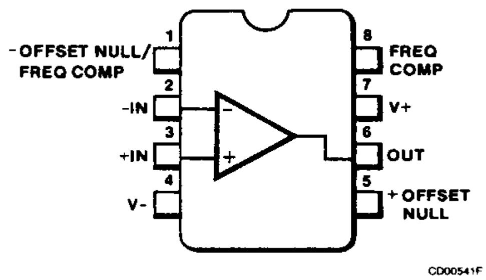


Lead 4 connected to case.

Order Information

Device Code	Package Code	Package Description
μA101AHM	5W	Metal
μA201AHV	5W	Metal
μA301AHC	5W	Metal

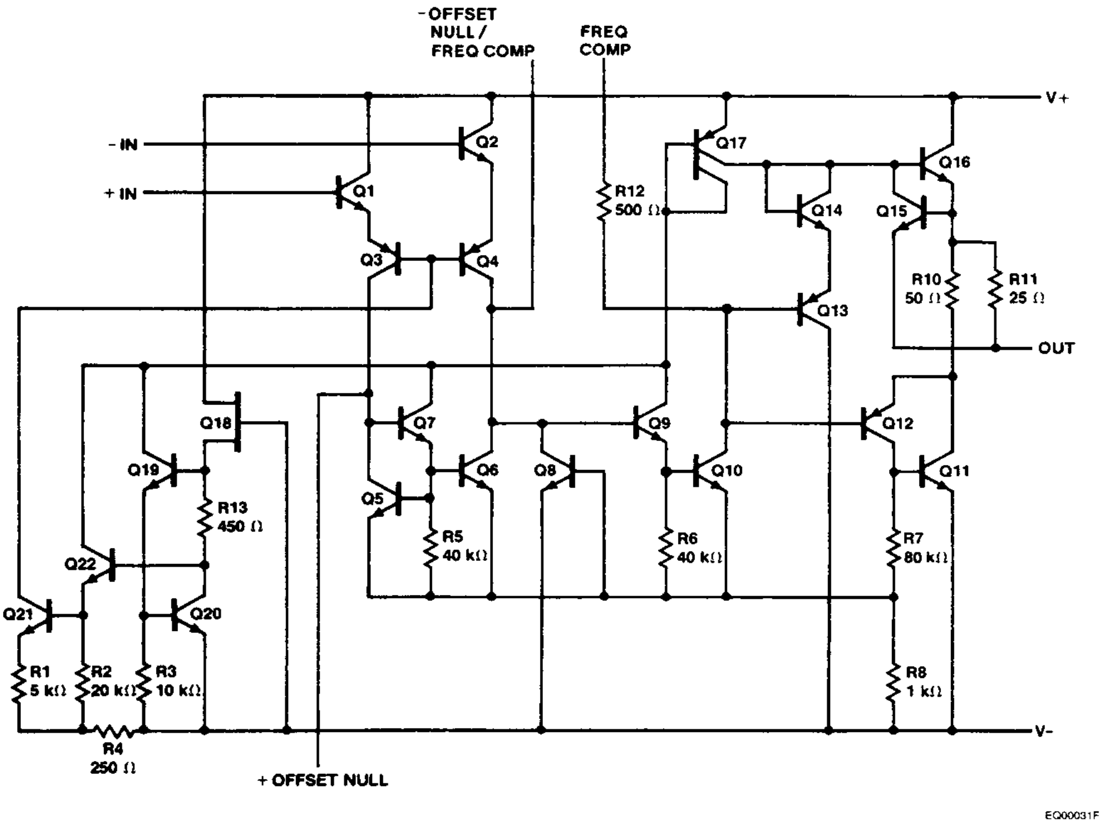
Connection Diagram
8-Lead DIP and SO-8 Package
(Top View)



Order Information

Device Code	Package Code	Package Description
μA301ASC	KC	Molded Surface Mount
μA301ATC	9T	Molded DIP

Equivalent Circuit

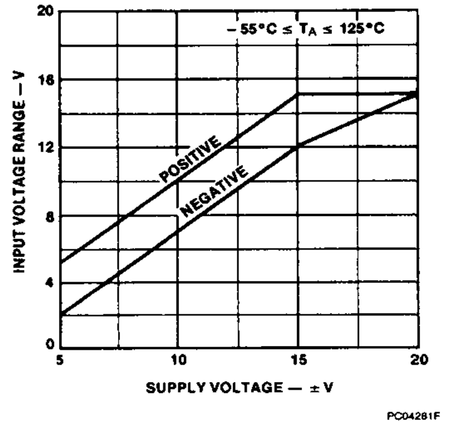


μA101A, μA201A and μA301A
Electrical Characteristics $T_A = 25°C$, $\pm 5.0\ V \leqslant V_{CC} \leqslant \pm 20\ V$ for the μA101A and μA201A, $\pm 5.0\ V \leqslant V_{CC} \leqslant \pm 15\ V$ for the μA301A, unless otherwise specified.

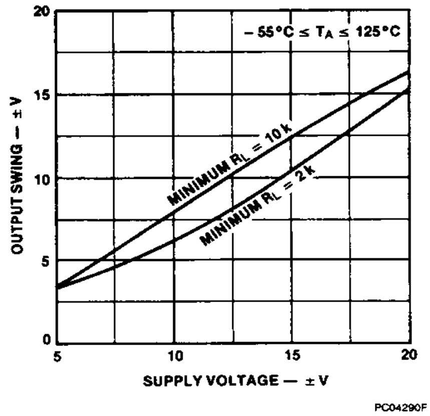
Symbol	Characteristic	Condition		μA101A, μA201A Min	μA101A, μA201A Typ	μA101A, μA201A Max	μA301A Min	μA301A Typ	μA301A Max	Unit
V_{IO}	Input Offset Voltage	$R_S \leqslant 50\ k\Omega$			0.7	2.0		2.0	7.5	mV
I_{IO}	Input Offset Current				1.5	10		3.0	50	nA
I_{IB}	Input Bias Current				30	75		70	250	nA
Z_I	Input Impedance			1.5	4.0		0.5	2.0		MΩ
I_{CC}	Supply Current	$V_{CC} = \pm 20\ V$			1.8	3.0				mA
		$V_{CC} = \pm 15\ V$						1.8	3.0	
A_{VS}	Large Signal Voltage Gain	$V_{CC} = \pm 15\ V$, $V_O = \pm 10\ V$, $R_L \geqslant 2.0\ k\Omega$		50	160		25	160		V/mV
The following specifications apply over the range of $-55°C \leqslant T_A \leqslant +125°C$ for the μA101A, and $-25°C \leqslant T_A \leqslant +85°C$ for the μA201A, and $0°C \leqslant T_A \leqslant +70°C$ for the μA301A.										
V_{IO}	Input Offset Voltage	$R_S \leqslant 50\ k\Omega$				3.0			10	mV
$\Delta V_{IO}/\Delta T$	Input Offset Voltage Temperature Sensitivity	$T_{A\ Min} \leqslant T_A \leqslant T_{A\ Max}$			6.0	15		6.0	30	μV/°C
I_{IO}	Input Offset Current					20			70	nA
$\Delta I_{IO}/\Delta T$	Input Offset Current Temperature Sensitivity	$25°C \leqslant T_A \leqslant T_{A\ Max}$			0.01	0.1		0.01	0.3	nA/°C
		$T_{A\ Min} \leqslant T_A \leqslant 25°C$			0.02	0.2		0.02	0.6	
I_{IB}	Input Bias Current					100			300	nA
I_{CC}	Supply Current	$T_A = T_{A\ Max}$, $V_{CC} = \pm 20\ V$			1.2	2.5				mA
CMR	Common Mode Rejection	$R_S \leqslant 50\ k\Omega$		80	96		70	90		dB
V_{IR}	Input Voltage Range	$V_{CC} = \pm 20\ V$		±15						V
		$V_{CC} = \pm 15\ V$					±12			
PSRR	Power Supply Rejection Ratio	$R_S \leqslant 50\ k\Omega$		80	96		70	96		dB
A_{VS}	Large Signal Voltage Gain	$V_{CC} = \pm 15\ V$, $V_O = \pm 10\ V$, $R_L \geqslant 2.0\ k\Omega$		25			15			V/mV
V_{OP}	Output Voltage Swing	$V_{CC} = \pm 15\ V$	$R_L = 10\ k\Omega$	±12	±14		±12	±14		V
			$R_L = 2.0\ k\Omega$	±10	±13		±10	±13		

Typical Performance Curves

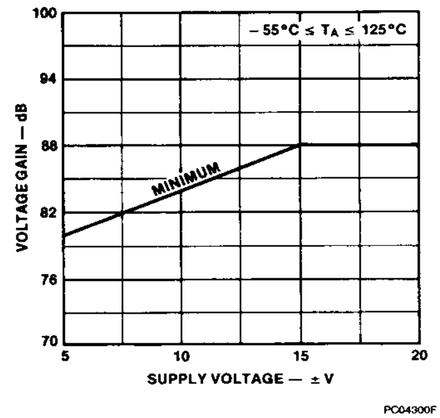
Input Voltage Range vs Supply Voltage (μA101A and 201A)



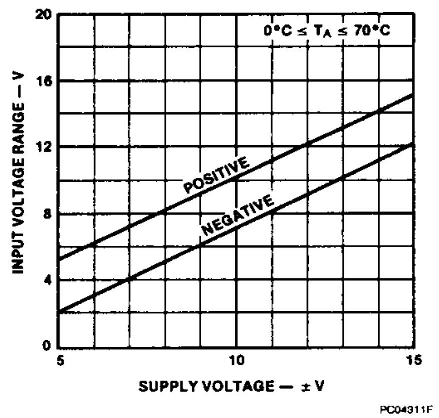
Output Swing vs Supply Voltage (μA101A and 201A)



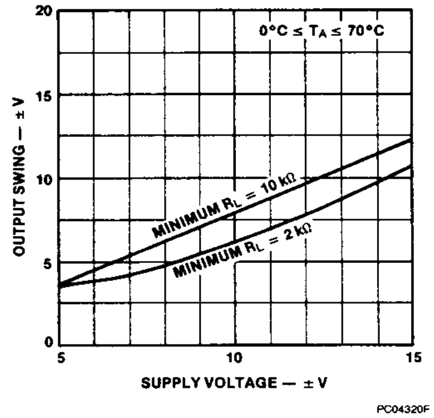
Voltage Gain vs Supply Voltage (μA101A and 201A)



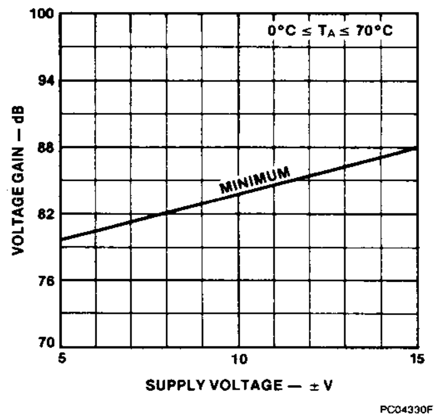
Input Voltage Range vs Supply Voltage (μA301A)



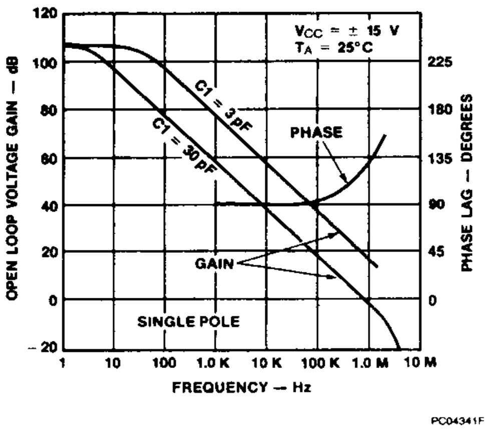
Output Swing vs Supply Voltage (μA301A)



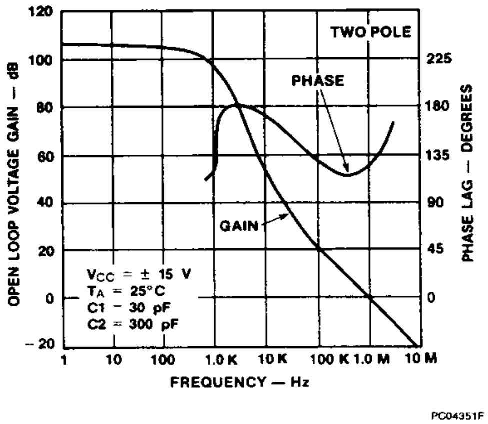
Voltage Gain vs Supply Voltage (μA301A)



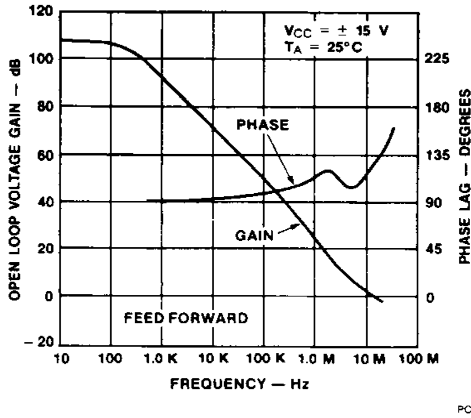
Open Loop Frequency Response (μA101A, 201A, and 301A)



Open Loop Frequency Response (μA101A, 201A, and 301A)

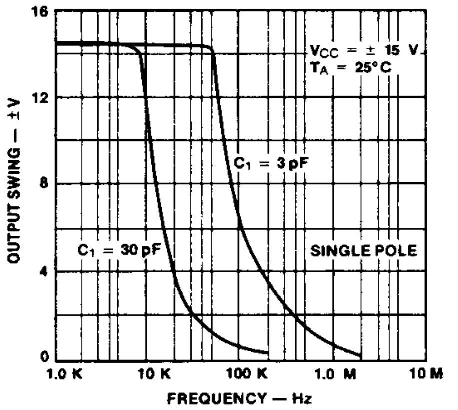


Open Loop Frequency Response (μA101A, 201A, and 301A)



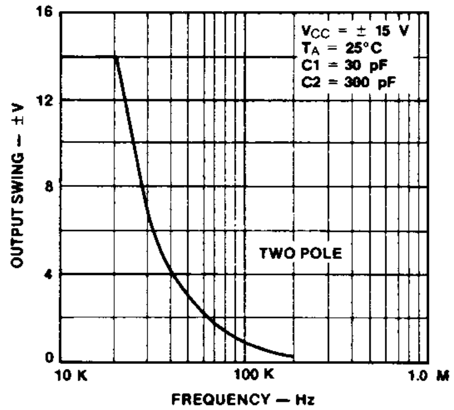
Typical Performance Curves for μA101A, μA201A, and μA301A (Cont.)

Large Signal Frequency Response



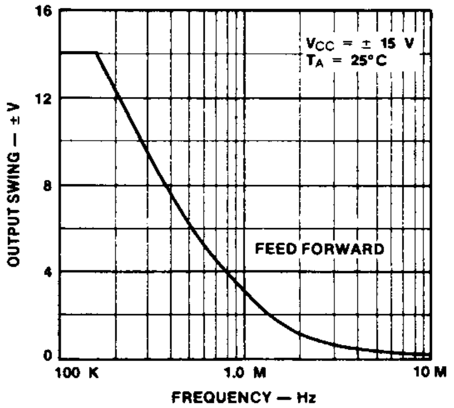
PC04371F

Large Signal Frequency Response



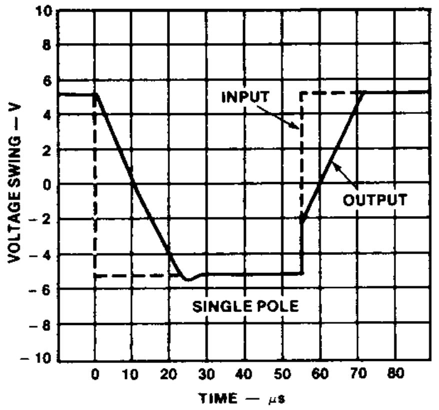
PC04381F

Large Signal Frequency Response



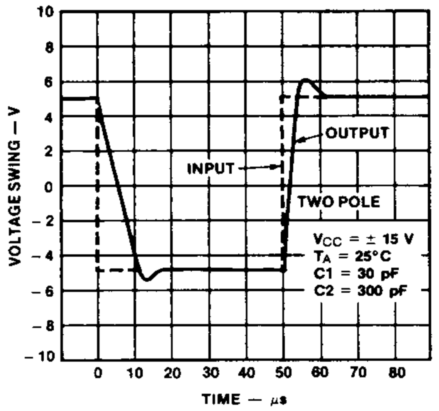
PC04391F

Voltage Follower Pulse Response



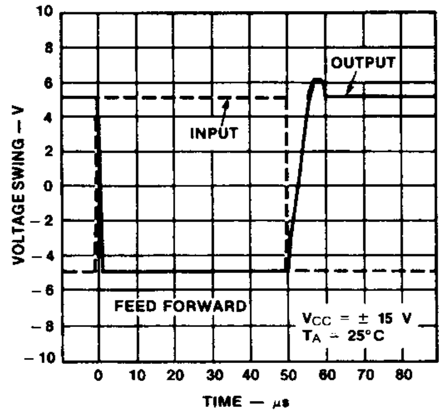
PC04400F

Voltage Follower Pulse Response



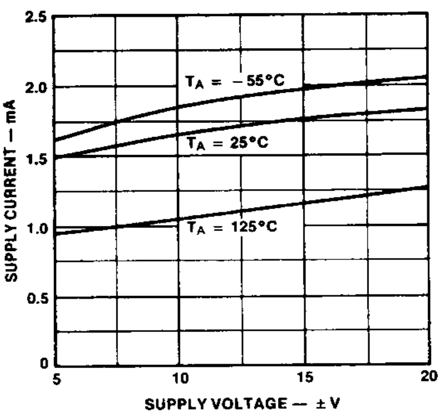
PC04410F

Voltage Follower Pulse Response



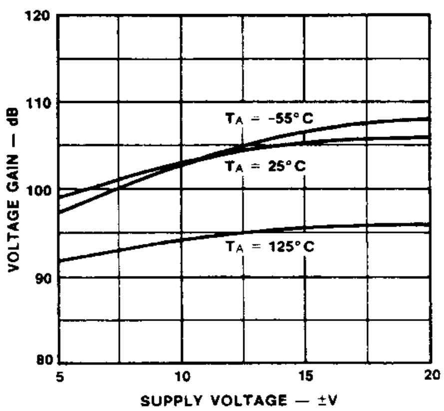
PC04421F

Supply Voltage Current vs Supply Voltage



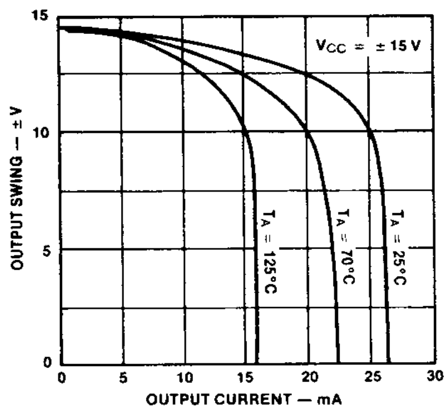
PC04431F

Voltage Gain vs Supply Voltage



PC04441F

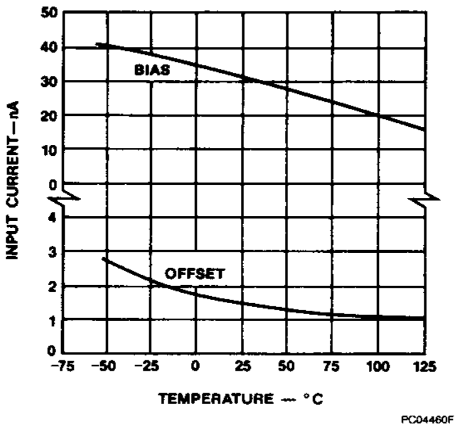
Current Limiting



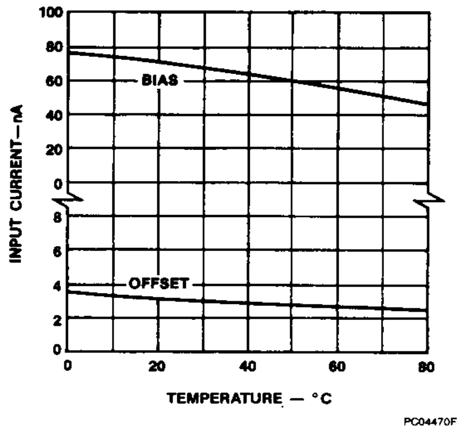
PC04450F

Typical Performance Curves for μA101A, μA201A, and μA301A (Cont.)

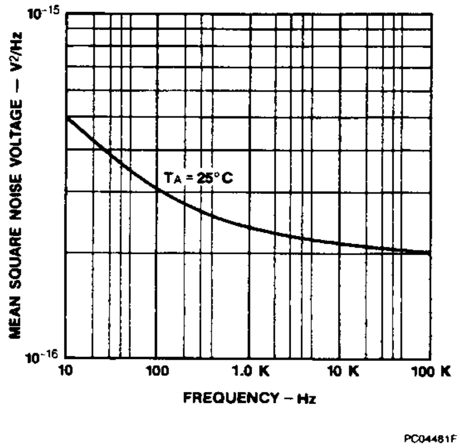
Input Current vs Temperature (μA101A and μA201A)



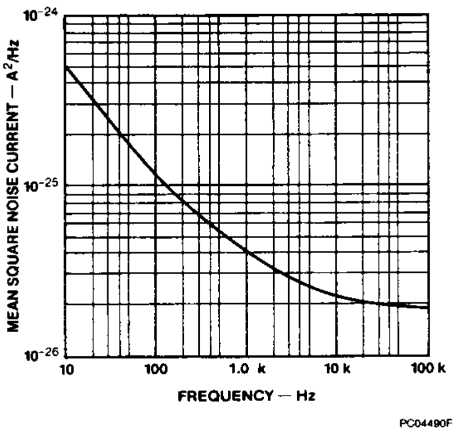
Input Current vs Temperature (μA301A only)



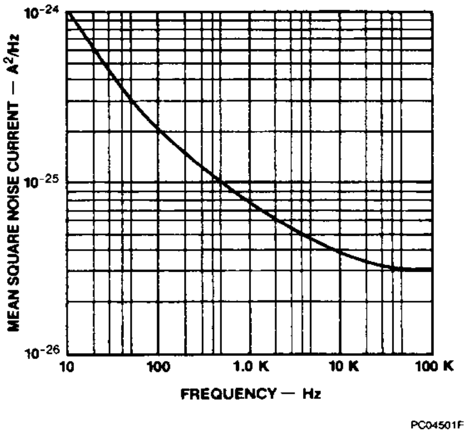
Input Noise Voltage vs Frequency



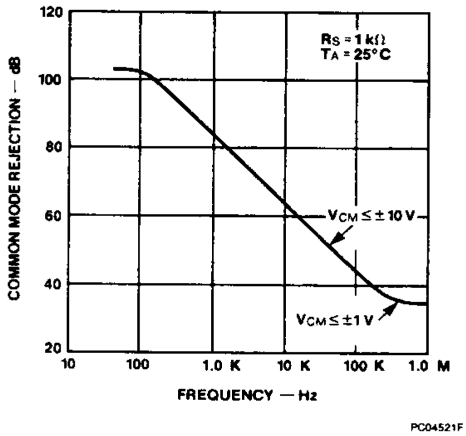
Input Noise Current vs Frequency (μA101A and μA201A)



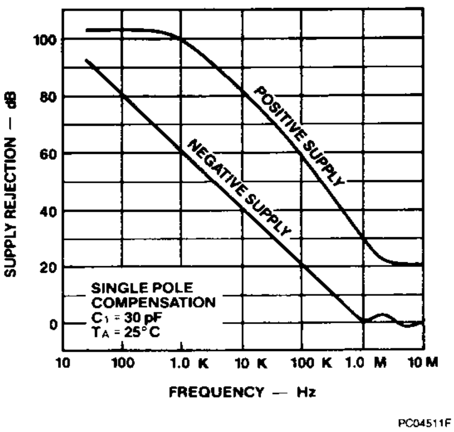
Input Noise Current vs Frequency (μA301A)



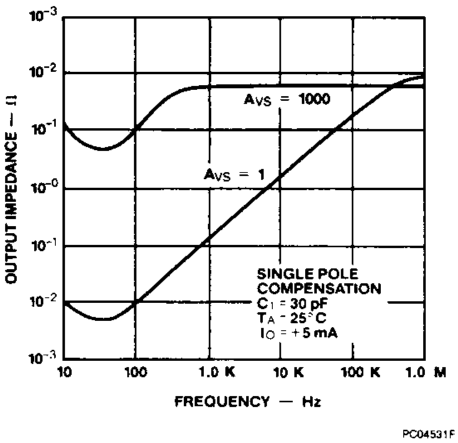
Common Mode Rejection vs Frequency



Supply Rejection vs Frequency

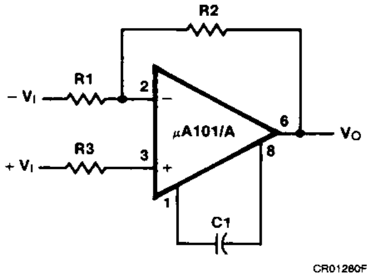


Closed Loop Output Impedance vs Frequency



Compensation Circuits (Note 2)

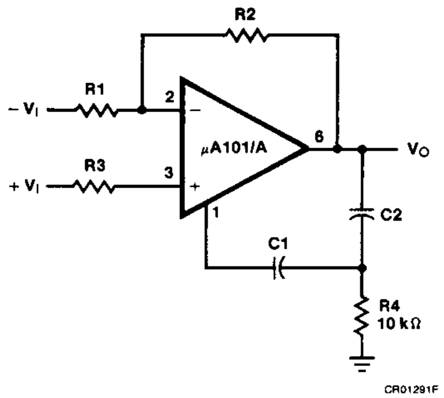
Single Pole Compensation



$$C_1 \geq \frac{R_1 C_S}{R_1 + R_2}$$

$C_S = 30$ pF

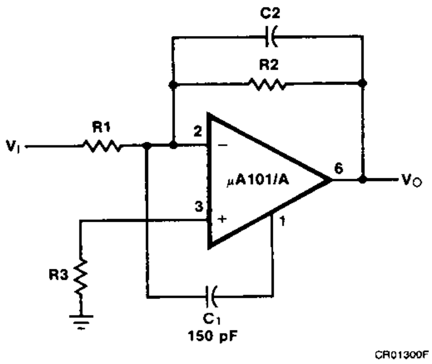
Two Pole Compensation



$$C_1 \geq \frac{R_1 C_S}{R_1 + R_2}$$

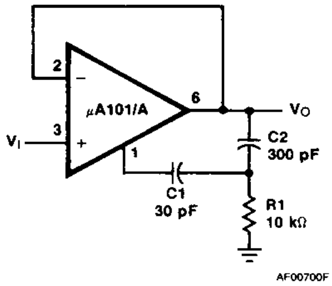
$C_S = 30$ pF
$C_2 = 10\ C_1$

Feed Forward Compensation



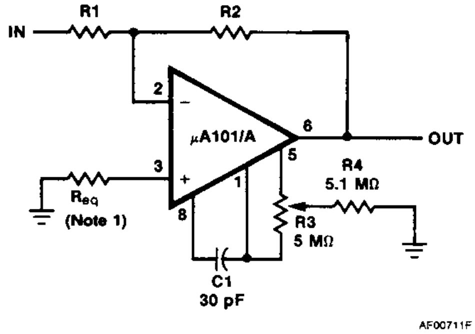
Typical Applications (Note 2)

Fast Voltage Follower

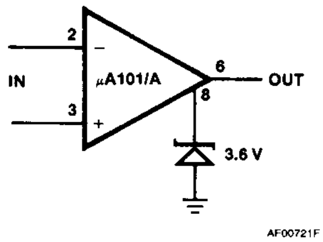


Power Bandwidth: 15 kHz
Slew Rate: 1 V/μs

Inverting Amplifier With Balancing Circuit



Voltage Comparator For Driving Or DTL Integrated Circuits

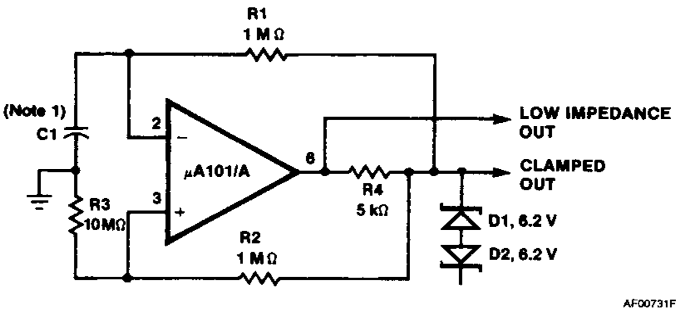


Notes

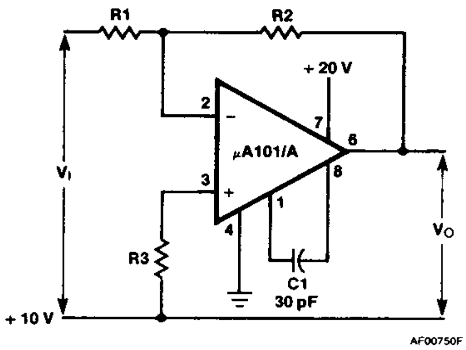
1. May be zero or equal to parallel combination of R1 and R2 for minimum offset.
2. All lead numbers shown refer to 8-lead metal package.

Typical Applications (Cont.) (Note 2)

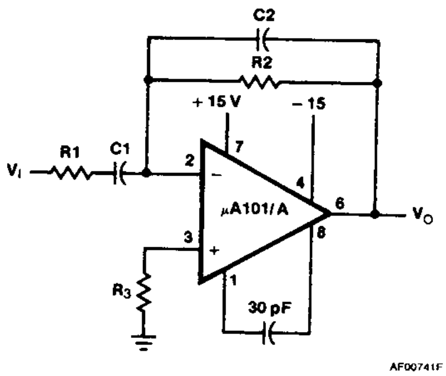
Low Frequency Square Wave Generator



Circuit For Operating Without A Negative Supply



Practical Differentiator



$$f_c = \frac{1}{2\pi R2C1}$$

$$f_h = \frac{1}{2\pi R1C1} = \frac{1}{2\pi R2C2}$$

$$f_c < f_h < f_{unity\ gain}$$

Notes

1. Adjust C_1 for frequency
2. All lead numbers shown refer to 8-lead metal package