LM108-N/LM108AQML Operational Amplifiers

Check for Samples: LM108-N, LM108AQML

FEATURES

- **Maximum Input Bias Current of 3.0 nA Over Temperature**
- **Offset Current Less Than 400 pA Over Temperature**
- **Supply Current of Only 300 μA, Even in Saturation**
- **Guaranteed Drift Characteristics**

DESCRIPTION

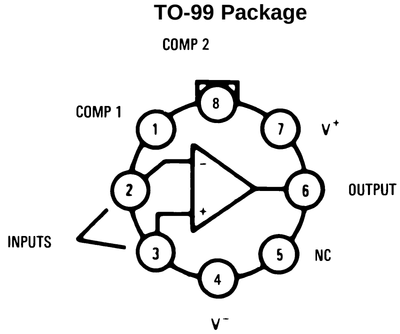
The LM108-N is a precision operational amplifier having specifications a factor of ten better than FET amplifiers over a −55°C to +125°C temperature range.

The devices operate with supply voltages from ±2V to ±20V and have sufficient supply rejection to use unregulated supplies. Although the circuit is interchangeable with, and uses the same compensation as the LM101A, an alternate compensation scheme can be used to make it particularly insensitive to power supply noise and to make supply bypass capacitors unnecessary.

The low current error of the LM108-N makes possible many designs that are not practical with conventional amplifiers. In fact, it operates from 10 MΩ source resistances, introducing less error than devices like the 709 with 10 kΩ sources. Integrators with drifts less than 500 μV/sec and analog time delays in excess of one hour can be made using capacitors no larger than 1 μF.

Connection Diagrams

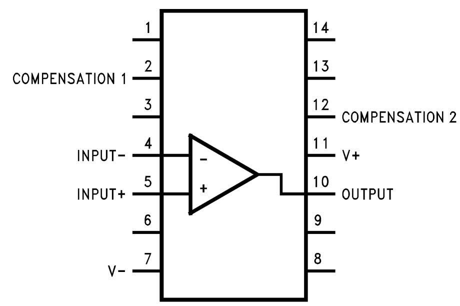
TO-99 Package



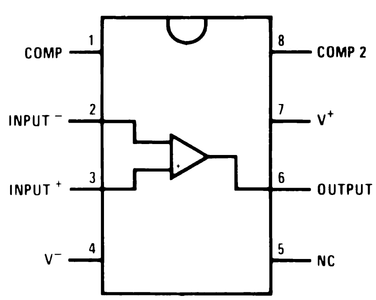
*Package is connected to Pin 4 (V−)

**Unused pin (no internal connection) to allow for input anti-leakage guard ring on printed circuit board layout.

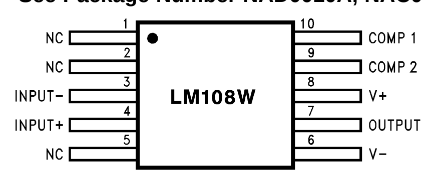
14 Lead Dual-In-Line Package (Top View)
See Package Number J0014A



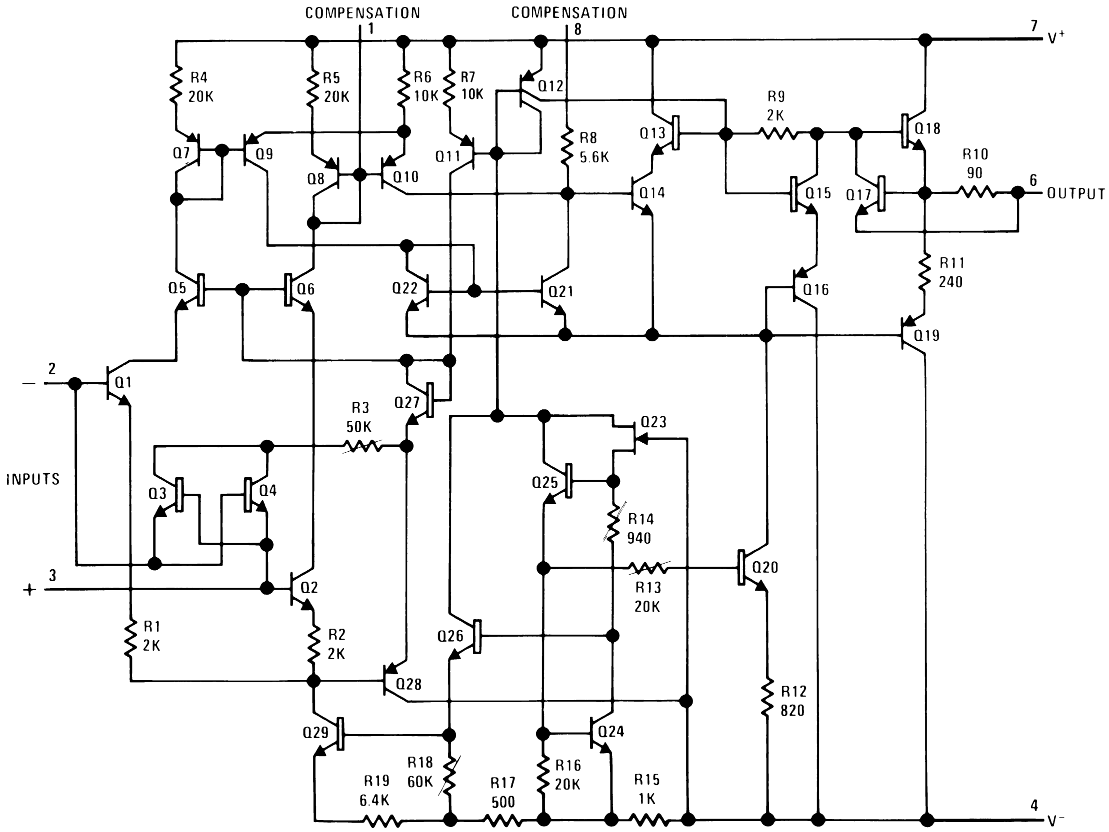
8 Lead Dual-In-Line Package (Top View)
See Package Number LMC0008C



10 Lead Flatpack/CLGA Package (Top View)
See Package Number NAD0010A, NAC0010A

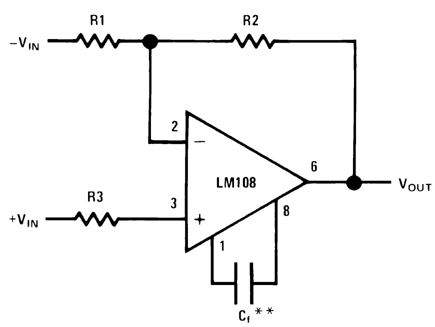


Schematic Diagram



Compensation Circuits

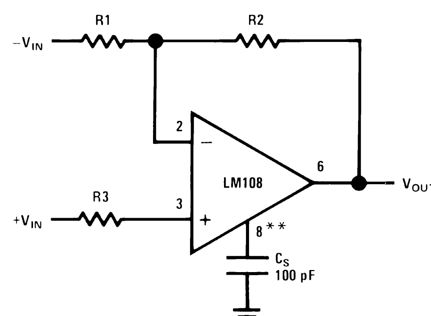
Standard Compensation Circuit



$C_f \geq \frac{R1\ C_O}{R1 + R2}$ $C_O = 30$ pF

**Bandwidth and slew rate are proportional to 1/C_f

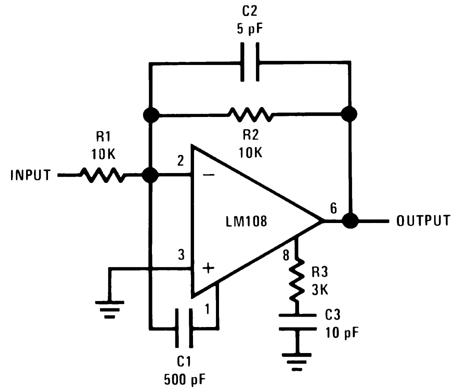
Alternate Frequency Compensation



**Bandwidth and slew rate are proportional to 1/C_S

Note: Improves rejection of power supply noise by a factor of ten.

Figure 1. Feedforward Compensation



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings[1][2][3]

				LM108-NRH	LM108-N/LM108-NA
Supply Voltage				±22V	±20V
Power Dissipation[4]			TO-99 8 LD	330mW @ +125°C	
			CDIP 14LD	400mW @ +125°C	
			CDIP 8LD	400mW @ +125°C	
			CLGA 10LD	330mW @ +125°C	
			CLGA 10 LD	330mW @ +125°C	
Differential Input Current[5]				±10 mA	
Differential Input Voltage[6]				±30V	N/A
Input Voltage[7]				±20V	±15V
Output Short-Circuit Duration				Continuous	
Operating Temperature Range				$-55°C \le T_A \le +125°C$	
Storage Temperature Range				$-65°C \le T_A \le +150°C$	
Thermal Resistance	θ_{JA}	TO-99	8 LD Still Air	150°C/W	
			500LF / Min Air Flow	86°C/W	
		CDIP	14LD Still Air	94°C/W	
			500LF / Min Air Flow	55°C/W	
		CDIP	8LD Still Air	120°C/W	
			500LF / Min Air Flow	68°C/W	
		CLGA	10LD Still Air	225°C/W	
			500LF / Min Air Flow	142°C/W	
		CLGA	10 LD Still Air	225°C/W	
			500LF / Min Air Flow	142°C/W	
	θ_{JC}		TO-99 8 LD	38°C/W	
			CDIP 14LD	13°C/W	
			CDIP 8LD	17°C/W	
			CLGA 10LD	21°C/W	
			CLGA 10 LD	21°C/W	
Package Weight (typical)			TO-99 8 LD	990mg	
			CDIP 14LD	2,180mg	
			CDIP 8LD	1,090mg	
			CLGA 10LD	225mg	
			CLGA 10 LD	210mg	
Maximum Junction Temperature				175°C	150°C
Lead Temperature (Soldering, 10 sec)				300°C	
ESD Tolerance[8]				2000V	

(1) Parameters have only been entered in the LM108-N / LM108-NA column if different from LM108-NRH
(2) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
(3) If Military/Aerospace specified devices are required, please contact the TI Sales Office/Distributors for availability and specifications.
(4) The maximum power dissipation must be derated at elevated temperatures and is dictated by $T_J$max (maximum junction temperature), θ_{JA} (package junction to ambient thermal resistance), and T_A (ambient temperature). The maximum allowable power dissipation at any temperature is $P_D max = (T_J max - T_A) / \theta_{JA}$ or the number given in the Absolute Maximum Ratings, whichever is lower.
(5) The inputs are shunted with back-to-back diodes for over voltage protection. Therefore, excessive current will flow if a differential input voltage in excess of 1V is applied between the inputs unless some limiting resistance is used.
(6) This rating is ±1.0V unless resistances of 2K Ohms or greater are inserted in series with the inputs to limit current in the input shunt diodes to the maximum allowable value..
(7) For supply voltages less than ±20V, the absolute maximum input voltage is equal to the supply voltage.
(8) Human body model, 1.5 kΩ in series with 100 pF.

Table 1. Quality Conformance Inspection(1)

Subgroup	Description	Temp (°C)
1	Static tests at	+25°C
2	Static tests at	+125°C
3	Static tests at	−55°C
4	Dynamic tests at	+25°C
5	Dynamic tests at	+125°C
6	Dynamic tests at	−55°C
7	Functional tests at	+25°C
8A	Functional tests at	+125°C
8B	Functional tests at	−55°C
9	Switching tests at	+25°C
10	Switching tests at	+125°C
11	Switching tests at	−55°C

(1) Mil-Std-883, Method 5005 - Group A

LM108-N Electrical Characteristics DC Parameters

The following conditions apply to all the following parameters, unless otherwise specified.
V_{CC} = ±20V, V_{CM} = 0V

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
V_{IO}	Input Offset Voltage	V_{CM} = -15V		-2.0	2.0	mV	1
				-3.0	3.0	mV	2, 3
		V_{CM} = 15V		-2.0	2.0	mV	1
				-3.0	3.0	mV	2, 3
				-2.0	2.0	mV	1
				-3.0	3.0	mV	2, 3
		V_{CC} =±5V		-2.0	2,0	mV	1
				-3.0	3.0	mV	2, 3
I_{IO}	Input Offset Current	V_{CM} = -15V		-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
		V_{CM} = 15V		-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
				-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
		V_{CC} = ±5V		-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
$\pm I_{IB}$	Input Bias Current	V_{CM} = -15V		-0.1	2.0	nA	1
				-1.0	3.0	nA	2,
				−0.1	3.0	nA	3
		V_{CM} = 15V		-0.1	2.0	nA	1
				-1.0	3.0	nA	2,
				−0.1	3.0	nA	3
				-0.1	2.0	nA	1
				-1.0	3.0	nA	2,
				−0.1	3.0	nA	3
		V_{CC} = ±5V		-0.1	2.0	nA	1
				-1.0	3.0	nA	2,
				−0.1	3.0	nA	3
PSRR	Power Supply Rejection ±Ratio	±20V <= Vcc <= ±5V		80		dB	1, 2, 3

LM108-N Electrical Characteristics DC Parameters (continued)

The following conditions apply to all the following parameters, unless otherwise specified.
V_{CC} = ±20V, V_{CM} = 0V

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
CMRR	Common Mode Rejection Ratio	-15V <= V_{CM} <= 15V		85		dB	1, 2, 3
$+I_{OS}$	Short Circuit Current	V_{CC} = ±15V		-30	-1.0	mA	1, 2, 3
$-I_{OS}$	Short Circuit Current	V_{CC} = ±15V		1	30	mA	1, 2, 3
I_{CC}	Power Supply Current				0.6	mA	1
					0.4	mA	2
					0.8	mA	3
R_{IN}	Input Resistance		See (1)	30		MΩ	1
V_{IN}	Input Voltage Range	V_{CC} = ±15V	See (2)	14		V	1, 2
			See (2)		−14	V	1, 2
			See (2)	13.5		V	3
			See (2)		−13.5	V	3
			See (2)	15		V	1, 2, 3
			See (2)		−15	V	1, 2, 3
$+V_{OP}$	Output Voltage Swing	V_{CC} = ±15V, R_L = 10KΩ		13		V	4, 5, 6
$-V_{OP}$	Output Voltage Swing	V_{CC} = ±15V, R_L = 10KΩ			-13	V	4, 5, 6
$+A_{VS}$	Open Loop Voltage Gain	V_{CC} = ±15V, R_L = 10KΩ, Vout = 0 to 10V	See (3)	50		V/mV	4
			See (3)	25		V/mV	5, 6
$-A_{VS}$	Open Loop Voltage Gain	V_{CC} = ±15V, R_L = 10KΩ Vout = 0 to -10V	See (3)	50		V/mV	4
			See (3)	25		V/mV	5, 6

(1) Guaranteed parameter not tested.
(2) Parameter tested Go-No-Go
(3) Datalog reading in K = V/mV

LM108-N Electrical Characteristics AC Parameters

The following conditions apply to all the following parameters, unless otherwise specified.
V_{CC} = ±20V, V_{CM} = 0V.

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
TR_{TR}	Rise Time		See (1)		1.0	µS	7
TR_{OS}	Overshoot		See (1)		30	%	7

(1) Guaranteed parameter not tested.

LM108-NA Electrical Characteristics DC Parameters

The following conditions apply to all the following parameters, unless otherwise specified.
V_{CC} = ±20V, V_{CM} = 0V

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
V_{IO}	Input Offset Voltage	V_{CM} = -15V		-0.5	0.5	mV	1
				-1.0	1.0	mV	2, 3
		V_{CM} = 15V		-0.5	0.5	mV	1
				-1.0	1.0	mV	2, 3
				-0.5	0.5	mV	1
				-1.0	1.0	mV	2, 3
		V_{CC} =±5V		-0.5	0.5	mV	1
				-1.0	1.0	mV	2, 3

LM108-NA Electrical Characteristics DC Parameters (continued)

The following conditions apply to all the following parameters, unless otherwise specified.
V_{CC} = ±20V, V_{CM} = 0V

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
I_{IO}	Input Offset Current	V_{CM} = -15V		-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
		V_{CM} = 15V		-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
				-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
		V_{CC} = ±5V		-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
$\pm I_{IB}$	Input Bias Current	V_{CM} = -15V		-0.1	2.0	nA	1
				-1.0	3.0	nA	2
				-0.1	3.0	nA	3
		V_{CM} = 15V		-0.1	2.0	nA	1
				-1.0	3.0	nA	2
				-0.1	3.0	nA	3
				-0.1	2.0	nA	1
				-1.0	3.0	nA	2
				-0.1	3.0	nA	3
		V_{CC} = ±5V		-0.1	2.0	nA	1
				-1.0	3.0	nA	2
				-0.1	3.0	nA	3
PSRR	Power Supply Rejection Ratio	±20V < = V_{CC} < = ±5V		96		dB	1, 2, 3
CMRR	Common Mode Rejection Ratio	-15V < = V_{CM} < = 15V		96		dB	1, 2, 3
$+I_{OS}$	Short Circuit Current	V_{CC} = ±15V		-30	-1.0	mA	1, 2, 3
$-I_{OS}$	Short Circuit Current	V_{CC} = ±15V		1.0	30	mA	1, 2, 3
I_{CC}	Power Supply Current				0.6	mA	1
					0.4	mA	2
					0.8	mA	3
R_{IN}	Input Resistance		See (1)	30		MΩ	1
V_{IN}	Input Voltage Range	V_{CC} = ±15V	See (2)	14		V	1, 2
			See (2)		−14	V	1, 2
			See (2)	13.5		V	3
			See (2)		−13.5	V	3
			See (2)	15		V	1, 2, 3
			See (2)		−15	V	1, 2, 3

(1) Guaranteed parameter not tested.
(2) Parameter tested Go-No-Go#SNOSAH42270

LM108-NA Electrical Characteristics DC Parameters (continued)

The following conditions apply to all the following parameters, unless otherwise specified.
V_{CC} = ±20V, V_{CM} = 0V

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
Delta V_{IO} / Delta T	Temperature Coefficient of Input Offset Voltage		See (3)		5.0	µV/°C	1, 2, 3
Delta I_{IO}/ Delta T	Temperature Coefficient of Input Offset Current		See (3)		2.5	pA/°C	1, 2, 3
$+V_{OP}$	Output Voltage Swing	V_{CC} = ±15V, R_L = 10KΩ		13		V	4, 5, 6
$-V_{OP}$	Output Voltage Swing	V_{CC} = ±15V, R_L = 10KΩ			-13	V	4, 5, 6
$+A_{VS}$	Open Loop Voltage Gain	V_{CC} = ±15V, R_L = 10KΩ, Vout = 0 to 10V	See (4)	80		V/mV	4
			See (4)	40		V/mV	5, 6
$-A_{VS}$	Open Loop Voltage Gain	V_{CC} = ±15V, R_L = 10KΩ, Vout = 0 to -10V	See (4)	80		V/mV	4
			See (4)	40		V/mV	5, 6

(3) Guaranteed parameter not tested.
(4) Datalog reading in K = V/mV

LM108-NA Electrical Characteristics AC Parameters

The following conditions apply to all the following parameters, unless otherwise specified.
V_{CC} = ±20V, V_{CM} = 0V

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
TR_{TR}	Transient Response Rise Time		See (1)		1.0	µS	7

(1) Guaranteed parameter not tested.

LM108-NA Rad Hard — Electrical Characteristics DC Parameters

The following conditions apply to all the following parameters, unless otherwise specified.
$\pm V_{CC}$ = ±20V, V_{CM} = 0V, R_S = 50Ω

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
V_{IO}	Input Offset Voltage	$+V_{CC}$ = 35V, $-V_{CC}$ = -5V, V_{CM} = -15V		-0.5	0.5	mV	1
				-1.0	1.0	mV	2, 3
		$+V_{CC}$ = 5V, $-V_{CC}$ = -35V, V_{CM} = 15V		-0.5	0.5	mV	1
				-1.0	1.0	mV	2, 3
				-0.5	0.5	mV	1
				-1.0	1.0	mV	2, 3
		$+V_{CC}$ = +5V, $-V_{CC}$ = -5V		-0.5	0.5	mV	1
				-1.0	1.0	mV	2, 3
Delta V_{IO} / Delta T	Temperature Coefficient of Input Offset Voltage	25°C ≤ T_A ≤ +125°C	See (1)	-5.0	5.0	µV/°C	2
		-55°C ≤ T_A ≤ 25°C	See (1)	-5.0	5.0	µV/°C	3
I_{IO}	Input Offset Current	$+V_{CC}$ = 35V, $-V_{CC}$ = -5V, V_{CM} = -15V		-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
		$+V_{CC}$ = 5V, $-V_{CC}$ = -35V, V_{CM} = 15V		-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
				-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
		$+V_{CC}$ = +5V, $-V_{CC}$ = -5V		-0.2	0.2	nA	1
				-0.4	0.4	nA	2, 3
Delta I_{IO}/ Delta T	Temperature Coefficient of Input Offset Current	25°C ≤ T_A ≤ +125°C	See (1)	-2.5	2.5	pA/°C	2
		-55°C ≤ T_A ≤ 25°C	See (1)	-2.5	2.5	pA/°C	3

(1) Calculated Parameter

LM108-NA Rad Hard — Electrical Characteristics DC Parameters (continued)

The following conditions apply to all the following parameters, unless otherwise specified.
$\pm V_{CC} = \pm 20V$, $V_{CM} = 0V$, $R_S = 50\Omega$

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
$\pm I_{IB}$	Input Bias Current	$+V_{CC} = 35V$, $-V_{CC} = -5V$, $V_{CM} = -15V$		-0.1	2.0	nA	1
				-1.0	2.0	nA	2
				-0.1	3.0	nA	3
		$+V_{CC} = 5V$, $-V_{CC} = -35V$, $V_{CM} = 15V$		-0.1	2.0	nA	1
				-1.0	2.0	nA	2
				-0.1	3.0	nA	3
				-0.1	2.0	nA	1
				-1.0	2.0	nA	2
				-0.1	3.0	nA	3
		$+V_{CC} = +5V$, $-V_{CC} = -5V$		-0.1	2.0	nA	1
				-1.0	2.0	nA	2
				-0.1	3.0	nA	3
+PSRR	Power Supply Rejection Ratio	$+V_{CC} = 10V$, $-V_{CC} = -20V$		-16	16	µV/V	1, 2, 3
-PSRR	Power Supply Rejection Ratio	$+V_{CC} = 20V$, $-V_{CC} = -10V$		-16	16	µV/V	1, 2, 3
CMRR	Common Mode Rejection Ratio	$V_{CM} = \pm 15V$		96		dB	1, 2, 3
$+I_{OS}$	Short Circuit Current	$+V_{CC} = +15V$, $-V_{CC} = -15V$, $t \le 25mS$		-20		mA	1, 2, 3
$-I_{OS}$	Short Circuit Current	$+V_{CC} = +15V$, $-V_{CC} = -15V$, $t \le 25mS$			20	mA	1, 2, 3
I_{CC}	Power Supply Current	$+V_{CC} = +15V$, $-V_{CC} = -15V$			0.6	mA	1, 2
					0.8	mA	3
$+V_{OP}$	Output Voltage Swing	$R_L = 10K\Omega$		16		V	4, 5, 6
$-V_{OP}$	Output Voltage Swing	$R_L = 10K\Omega$			-16	V	4, 5, 6
$+A_{VS}$	Open Loop Voltage Gain	$R_L = 10K\Omega$, Vout = +15V	See (2)	80		V/mV	4
			See (2)	40		V/mV	5, 6
$-A_{VS}$	Open Loop Voltage Gain	$R_L = 10K\Omega$, Vout = -15V	See (2)	80		V/mV	4
			See (2)	40		V/mV	5, 6
A_{VS}	Open Loop Voltage Gain	$\pm V_{CC} = \pm 5V$, $R_L = 10K\Omega$, Vout = ±2V	See (2)	20		V/mV	4, 5, 6

(2) Datalog reading in K = V/mV

LM108-NA Rad Hard — Electrical Characteristics DC Drift Parameters

The following conditions apply to all the following parameters, unless otherwise specified.
$\pm V_{CC} = \pm 20V$, $V_{CM} = 0V$, $R_S = 50\Omega$
Delta calculations performed on JAN S and QMLV devices at group B, subgroup 5 only.

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
V_{IO}	Input Offset Voltage			-0.25	0.25	mV	1
$\pm I_{IB}$	Input Bias Current			-0.5	0.5	nA	1

LM108-NA Rad Hard — Electrical Characteristics AC Parameters

The following conditions apply to all the following parameters, unless otherwise specified.
AC $\pm V_{CC} = \pm 20V$, $V_{CM} = 0V$, $R_S = 50\Omega$

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
TR_{TR}	Transient Response Rise Time	$R_L = 10K\Omega$, $C_L = 100pF$, f < 1KHz, Vin = +50mV			1,000	nS	9, 10, 11

LM108-NA Rad Hard — Electrical Characteristics AC Parameters (continued)

The following conditions apply to all the following parameters, unless otherwise specified.
AC $\pm V_{CC} = \pm 20V$, $V_{CM} = 0V$, $R_S = 50\Omega$

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
TR_{OS}	Transient Response Overshoot	$R_L = 10K\Omega$, $C_L = 100pF$, f < 1KHz, Vin = +50mV			50	%	9, 10, 11
$+S_R$	Slew Rate	$A_V = 1$, V_{IN} = -5V to +5V		0.05		V/µS	9, 10, 11
$-S_R$	Slew Rate	$A_V = 1$, V_{IN} = +5V to -5V		0.05		V/µS	9, 10, 11
NI_{BB}	Noise Broadband	BW = 10Hz to 5KHz, $R_S = 0\ \Omega$			15	μV_{RMS}	9
NI_{PC}	Noise Popcorn	BW = 10Hz to 5KHz, $R_S = 100K\Omega$			40	μV_{PK}	9

LM108-NA Rad Hard — Electrical Characteristics Post Radiation Parameters @ +25°C (1)(2)

The following conditions apply to all the following parameters, unless otherwise specified.
DC: $\pm V_{CC} = \pm 20V$, $V_{CM} = 0V$, $R_S = 50\Omega$

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
$\pm I_{IB}$	Input Bias Current	$+V_{CC} = 35V$, $-V_{CC} = -5V$, $V_{CM} = -15V$	See (1)		5.0	nA	1
		$+V_{CC} = 5V$, $-V_{CC} = -35V$, $V_{CM} = -15V$	See (1)		5.0	nA	1
			See (1)		5.0	nA	1
		$+V_{CC} = +5V$, $-V_{CC} = -5V$	See (1)		5.0	nA	1
I_{IO}	Input Offset Current	$+V_{CC} = 35V$, $-V_{CC} = -5V$, $V_{CM} = -15V$	See (1)		0.5	nA	1
		$+V_{CC} = 5V$, $-V_{CC} = -35V$, $V_{CM} = -15V$	See (1)		0.5	nA	1
			See (1)		0.5	nA	1
		$+V_{CC} = +5V$, $-V_{CC} = -5V$	See (1)		0.5	nA	1

(1) Pre and post irradiation limits are identical to those listed under AC and DC electrical characteristics except as listed in the Post Radiation Limits Table. These parts may be dose rate sensitive in a space environment and demonstrate enhanced low dose rate effect. Radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, Method 1019.5.
(2) Calculated parameter for Class "S" only

Typical Performance Characteristics

Input Currents

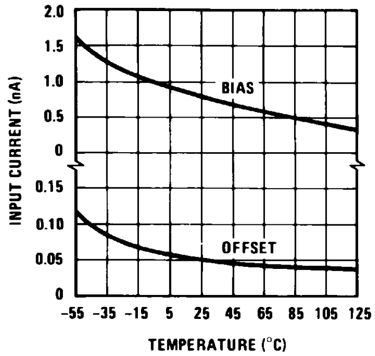


Figure 2.

Offset Error

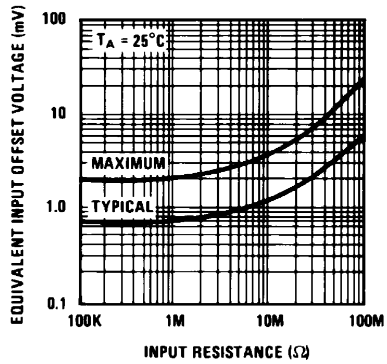


Figure 3.

Drift Error

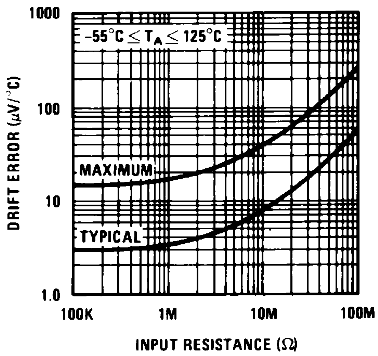


Figure 4.

Input Noise Voltage

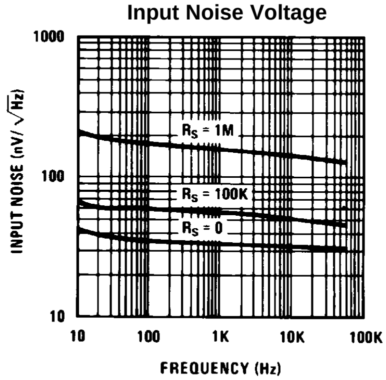


Figure 5.

Power Supply Rejection

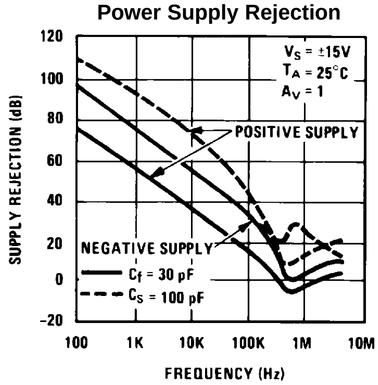


Figure 6.

Closed Loop Output Impedance

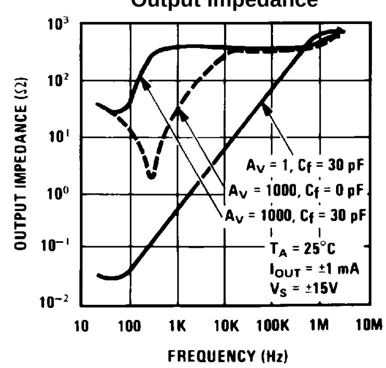


Figure 7.

Typical Performance Characteristics (continued)

Voltage Gain

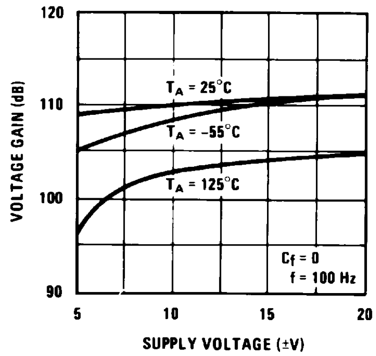


Figure 8.

Output Swing

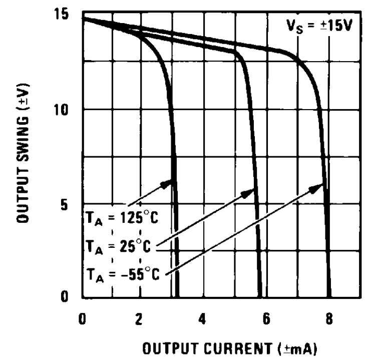


Figure 9.

Supply Current

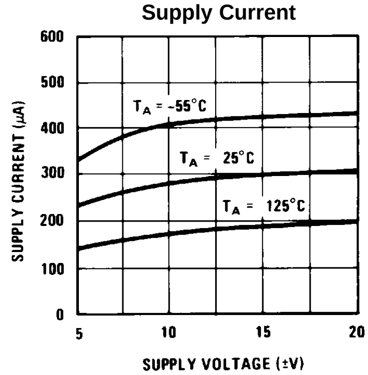


Figure 10.

Open Loop
Frequency Response

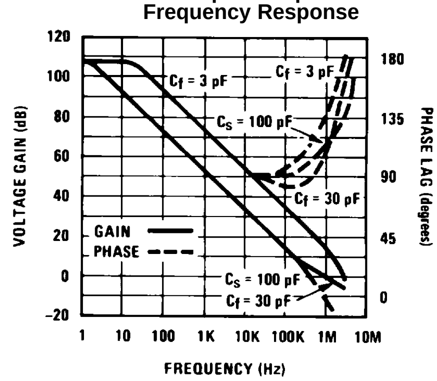


Figure 11.

Large Signal
Frequency Response

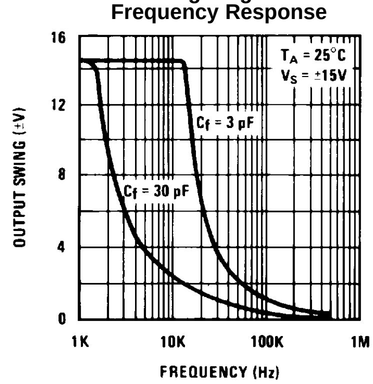


Figure 12.

Voltage Follower
Pulse Response

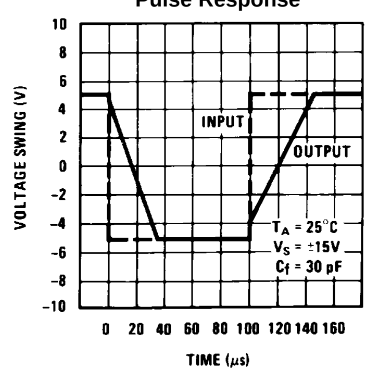
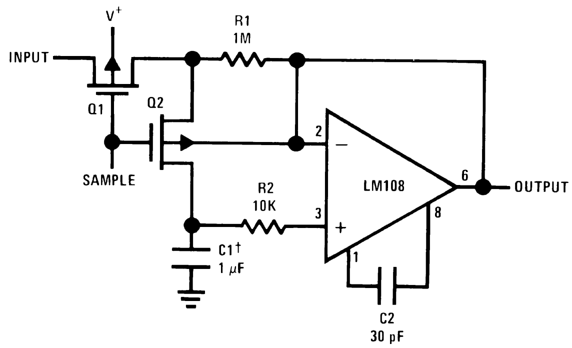


Figure 13.

TYPICAL APPLICATIONS

Figure 14. Sample and Hold



†Teflon polyethylene or polycarbonate dielectric capacitor
Worst case drift less than 2.5 mV/sec

Figure 15. High Speed Amplifier with Low Drift and Low Input Current

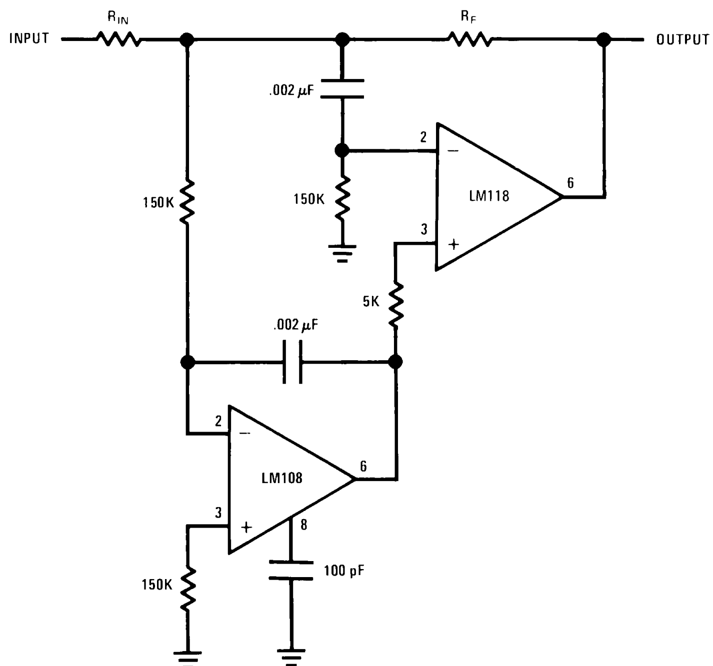
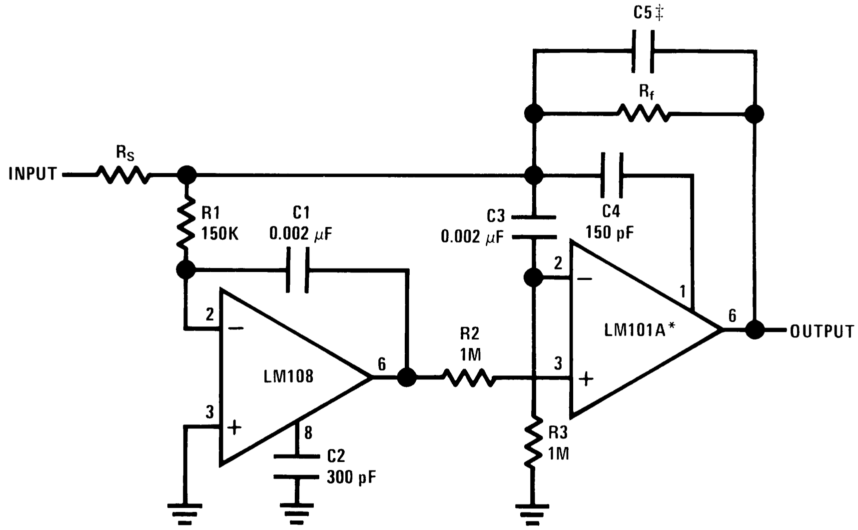


Figure 16. Fast Summing Amplifier



$‡C5 = \frac{6 \times 10^{-8}}{R_f}$

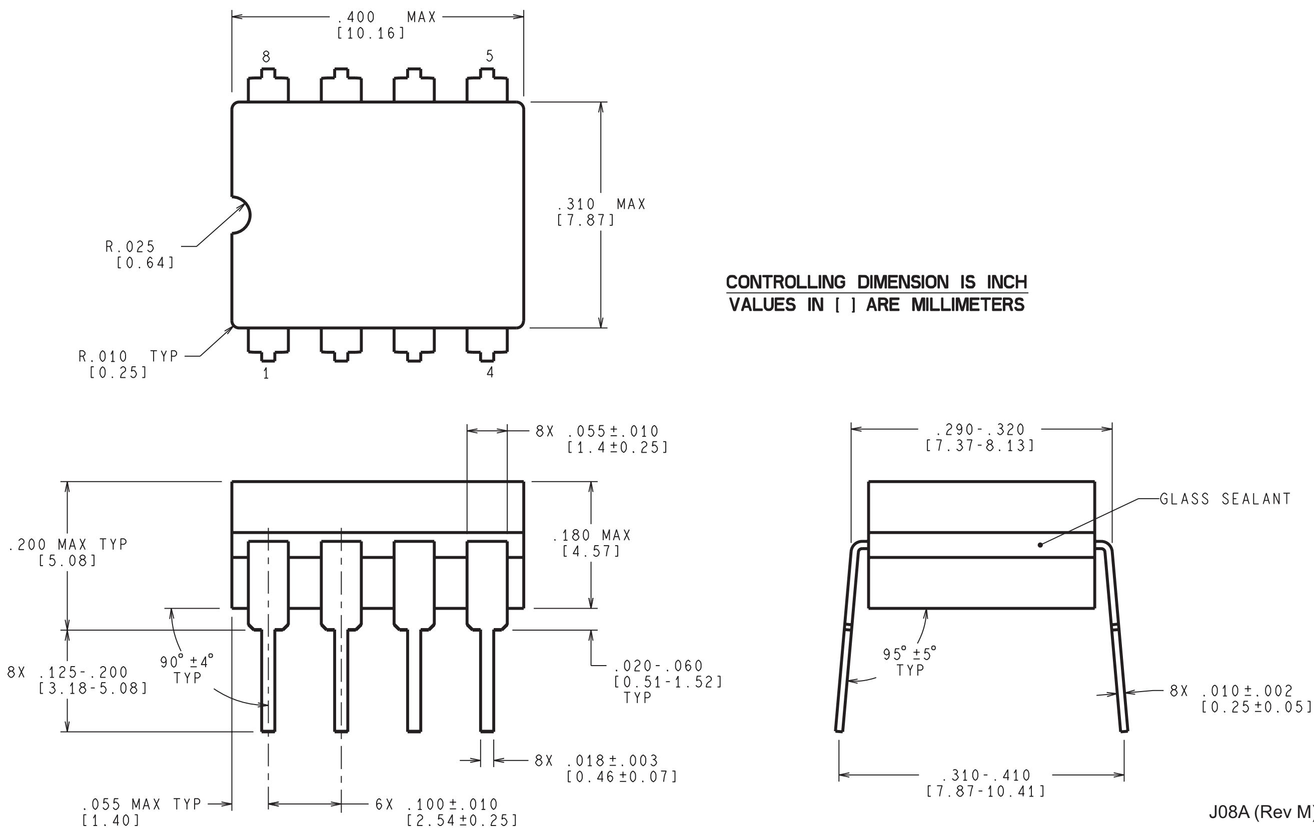
*In addition to increasing speed, the LM101A raises high and low frequency gain, increases output drive capability and eliminates thermal feedback.

Note: Power Bandwidth: 250 KHzSmall
Signal Bandwidth: 3.5 MHz
Slew Rate: 10V/μS

Table 2. Revision History

Date Released	Revision	Section	Originator	Changes
03/23/05	A	New release, corporate format. Ordering information table, Electrical sections for the LM108-N and LM108-NA.	L. Lytle	3 MDS data sheets converted into one Corp. datasheet format. MRLM108-NA-X-RH rev. 1A0, MNLM108-NA-X rev 1A1, MNLM108-N–X rev 0BL. Deleted following: NSID LM108-NAW/883 and LM108-NAJ-8RQML, no longer offered; from LM108-N electrical's Delta V_{IO}/Delta T, Delta I_{IO}/Delta T, Drift Parameters; from LM108-NA electrical's Drift Parameters. Reason: referenced products are 883 only.
12/14/05	B	Rad Hard Electricals, DC Parameters	R. Malone	$+I_{OS}$ from -15 mA min to -20 mA min and $-I_{OS}$ from +15 mA max to +20 mA max. Reason: To reflect SMD update. Revision A will be archived.

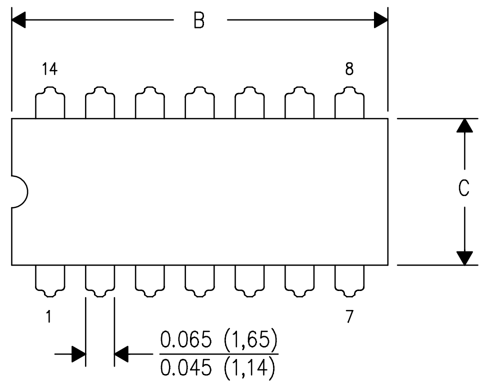
NAB0008A



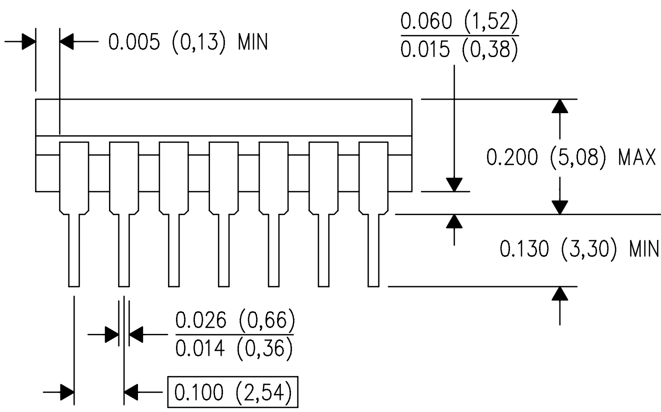
J08A (Rev M)

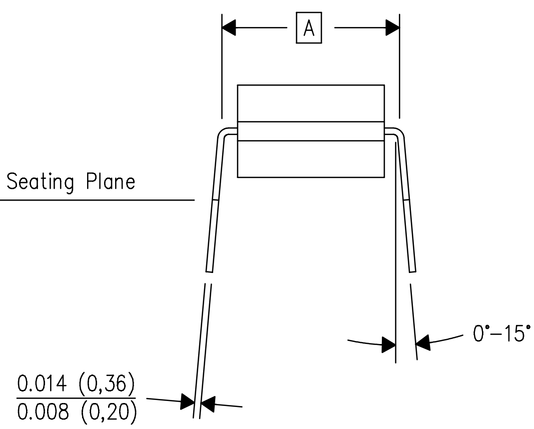
J (R–GDIP–T**) CERAMIC DUAL IN–LINE PACKAGE

14 LEADS SHOWN



PINS ** / DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

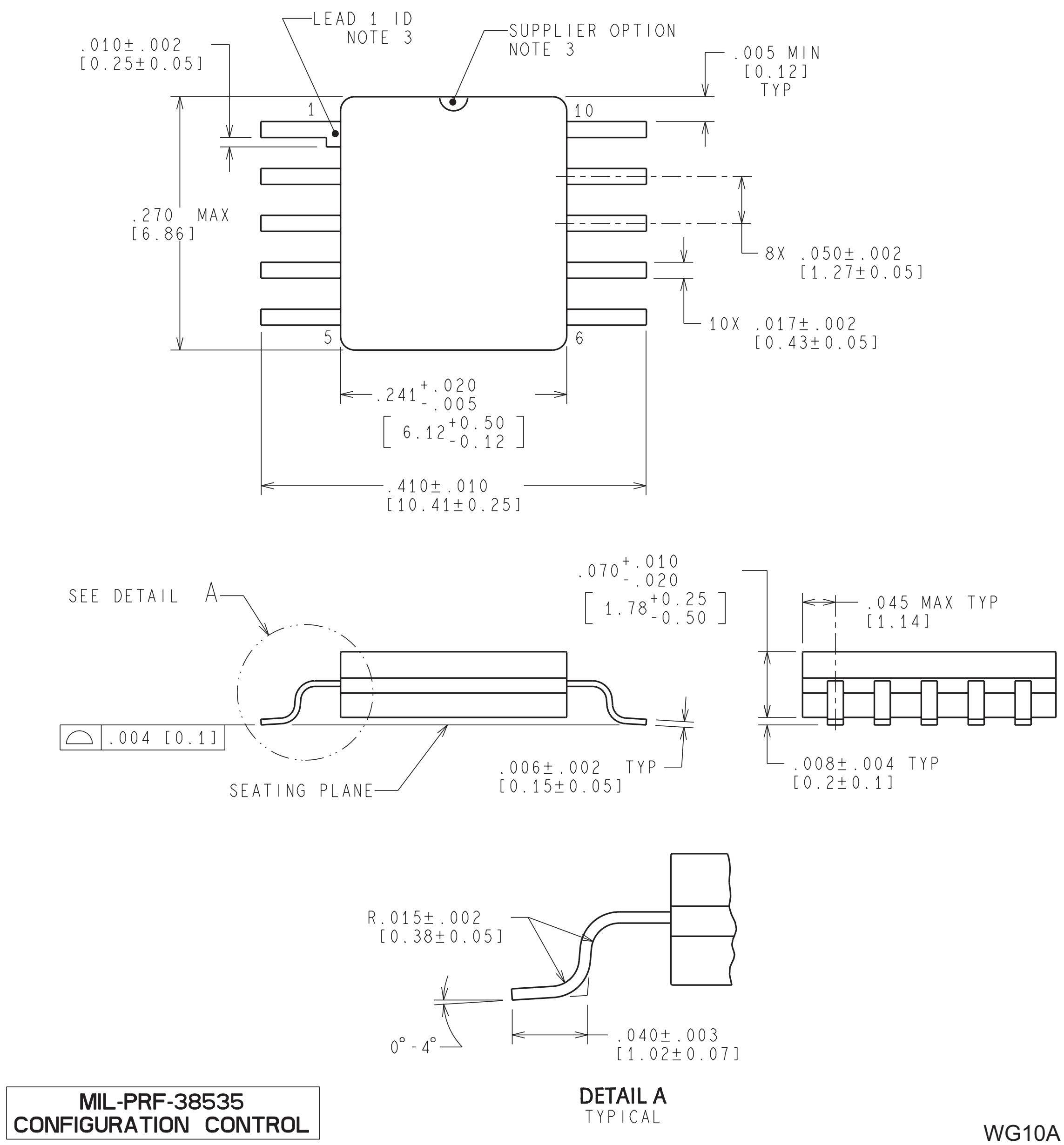




4040083/F 03/03

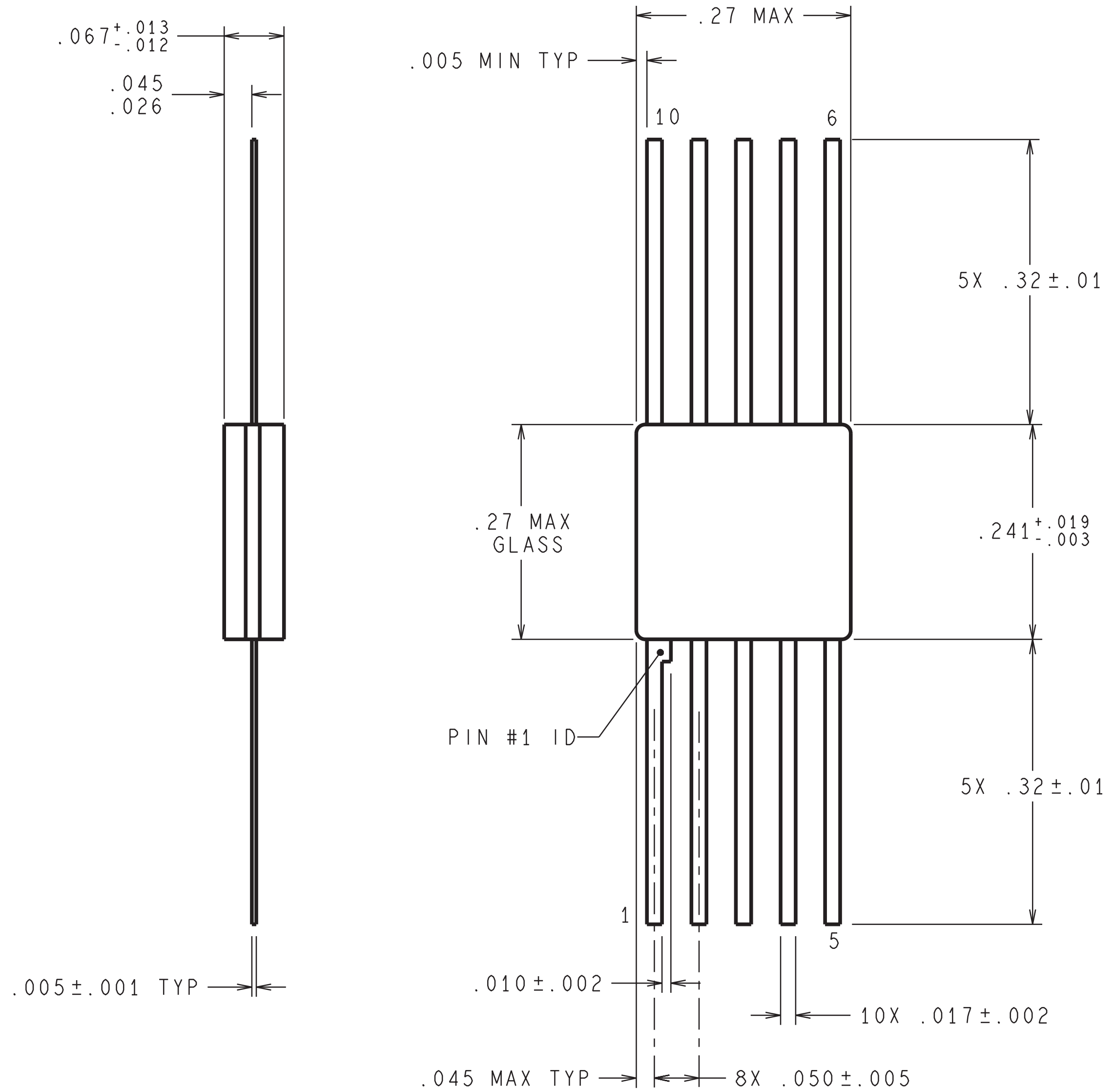
NOTES:
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package is hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1–T14, GDIP1–T16, GDIP1–T18 and GDIP1–T20.

NAC0010A



WG10A (Rev H)

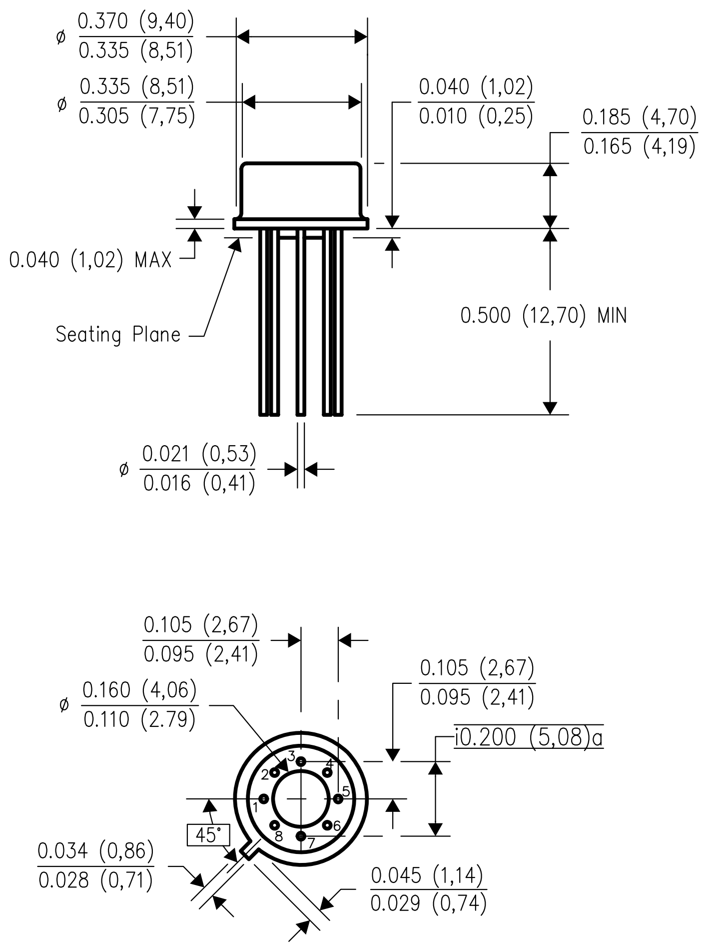
NAD0010A



DIMENSIONS ARE IN INCHES

W10A (Rev H)

LMC (O-MBCY-W8) METAL CYLINDRICAL PACKAGE



4202483/B 09/07

NOTES:
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Leads in true position within 0.010 (0,25) R @ MMC at seating plane.
- D. Pin numbers shown for reference only. Numbers may not be marked on package.
- E. Falls within JEDEC MO-002/TO-99.