LMH6702QML-SP 1.7GHz, Ultra-Low-Distortion, Wideband Op Amp

1 Features

- V_S = ±5V, T_A = 25°C, A_V = +2V/V, R_L = 100Ω, V_{OUT} = $2V_{PP}$, typical unless noted otherwise
- Available with radiation ensurance
  - High dose rate 300krad(Si)
  - ELDRS free 300krad(Si)
- −3dB bandwidth (V_{OUT} = $0.2V_{PP}$) 720MHz
- Low noise 1.83nV/√Hz
- Fast settling to 0.1% 13.4ns
- Fast slew rate 3100V/µs
- Supply current 12.5mA
- Output current 80mA
- Low intermodulation distortion (75MHz) −67dBc
- Improved replacement for CLC409 and CLC449

2 Applications

- Flash A/D driver
- D/A transimpedance buffer
- Wide dynamic range IF amp
- Radar and communication receivers
- Line driver
- High-resolution video

3 Description

The LMH6702QML-SP is a very wideband, dc-coupled, monolithic operational amplifier designed specifically for wide-dynamic-range systems requiring exceptional signal fidelity. Benefiting from TI's current-feedback architecture, the LMH6702QML-SP offers unity gain stability at exceptional speed without need for external compensation.

With a 720MHz bandwidth (A_V = 2V/V, V_O = $2V_{PP}$), 10-bit distortion levels through 60MHz (R_L = 100Ω), 1.83nV/√Hz input-referred noise, and 12.5mA supply current, the LMH6702QML-SP is an excellent driver or buffer for high-speed flash analog-to-digital (A/D) and digital-to-analog (D/A) converters.

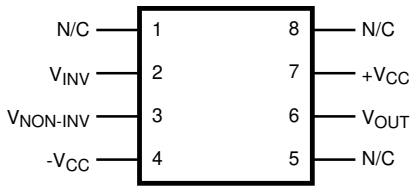
The LMH6702QML-SP benefits wide dynamic range systems, such as radar and communication receivers, that require a wideband amplifier offering exceptional signal purity. The low input-referred noise and low harmonic and intermodulation distortion make this device an excellent choice for high-speed applications.

The LMH6702QML-SP is constructed using TI's VIP10 complimentary bipolar process and TI's proven current-feedback architecture.

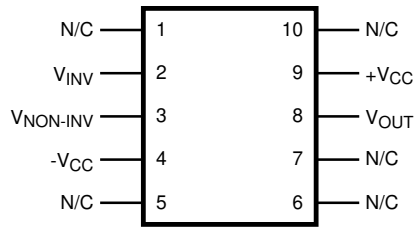
Package Information

PART NUMBER	PACKAGE(1)	PACKAGE SIZE(2)
LMH6702QML-SP	NAB (CDIP, 8)	10.16mm × 7.87mm
	NAC (CFP, 10)	9.91mm × 6.45mm

(1) For more information, see Section 9.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.



NAB Package, 8-Pin CDIP (Top View)



NAC Package, 10-Pin CLGA (Top View)

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4 Pin Configuration and Functions

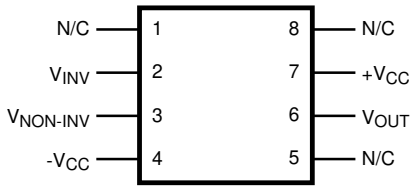


Figure 4-1. NAB Package, 8-Pin CDIP (Top View)

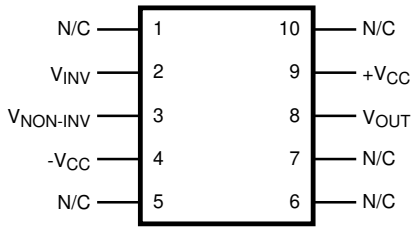


Figure 4-2. NAC Package, 10-Pin CLGA (Top View)

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

	VALUE
Supply voltage (V_{CC})	±6.75V_{DC}
Common-mode input voltage (V_{CM})	V^- to V^+
Power dissipation (P_D) (2)	1W
Junction temperature (T_J)	175°C
Lead temperature (soldering, 10 seconds)	300°C
Storage temperature	–65°C ≤ T_A ≤ +150°C
Thermal resistance	
θ_{JA}	
CDIP (still air)	170°C/W
CDIP (500LF/min air flow)	100°C/W
CLGA (still air)	220°C/W
CLGA (500LF/min air flow)	150°C/W
θ_{JC}	
CDIP	35°C/W
CLGA	37°C/W
Package weight (typical)	
CDIP	1078mg
CLGA	227mg
ESD tolerance (3)	1000V

(1) Operation outside the *Absolute Maximum Ratings* may cause permanent device damage. *Absolute Maximum Ratings* do not imply functional operation of the device at these or any other conditions beyond those listed under *Recommended Operating Conditions*. If used outside the *Recommended Operating Conditions* but within the *Absolute Maximum Ratings*, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.

(2) The maximum power dissipation must be derated at elevated temperatures and is dictated by T_{Jmax} (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 $P_{Dmax} = (T_{Jmax} – T_A) / \theta_{JA}$ or the number given in the *Absolute Maximum Ratings*, whichever is lower.

(3) Human body model, 1.5kΩ in series with 100pF.

5.2 Recommended Operating Conditions

	VALUE
Supply voltage (V_{CC})	±5V_{DC} to ±6V_{DC}
Gain	±1 to ±10
Ambient operating temperature (T_A)	–55°C to +125°C

5.3 Quality Conformance Inspection

MIL-STD-883, Method 5005, Group A

SUBGROUP	DESCRIPTION	TEMPERATURE (°C)
1	Static tests at	25
2	Static tests at	125
3	Static tests at	–55
4	Dynamic tests at	25
5	Dynamic tests at	125
6	Dynamic tests at	–55
7	Functional tests at	25
8A	Functional tests at	125
8B	Functional tests at	–55
9	Switching tests at	25
10	Switching tests at	125
11	Switching tests at	–55

5.4 Electrical Characteristics: DC Parameters

The following conditions apply (unless otherwise specified)(1) (2):
R_L = 100Ω, V_{CC} = ±5V_{DC}, A_V = +2 feedback resistor (R_F) = 250Ω, gain resistor (R_G) = 250Ω

PARAMETER		TEST CONDITIONS	NOTES	MIN	MAX	UNIT	SUB-GROUPS
I_{BN}	Input bias current, noninverting			–15	15	µA	1, 2
				–21	21	µA	3
I_{BI}	Input bias current, inverting			–30	30	µA	1, 2
				–34	34	µA	3
V_{IO}	Input offset voltage			–4.5	4.5	mV	1, 3
				–6.0	6.0	mV	2
I_{CC}	Supply current, no load	R_L = ∞			15	mA	1, 2, 3
PSSR	Power supply rejection ratio	$-V_{CC}$ = –4.5V to –5.0V, $+V_{CC}$ = 4.5V to 5.0V		45		dB	1, 2, 3

(1) The algebraic convention, whereby the most negative value is a minimum and most positive is a maximum, is used in this table. Negative current shall be defined as conventional current flow out of a device terminal.
(2) Pre- and post-irradiation limits are identical to those listed under the dc parameter tables. Post-irradiation testing is conducted at room temperature, 25°C, only. Testing is performed as specified in MIL-STD-883 Test Method 1019 Condition A. The ELDRS-Free part is also tested per Test Method 1019 Conditions D.

5.5 Electrical Characteristics: AC Parameters

The following conditions apply (unless otherwise specified)(1) (2):
R_L = 100Ω, V_{CC} = ±5V_{DC}, A_V = +2 feedback resistor (R_F) = 250Ω, gain resistor (R_G) = 250Ω

PARAMETER		TEST CONDITIONS	NOTES	MIN	MAX	UNIT	SUB-GROUPS
HD_3	3rd harmonic distortion	$2V_{PP}$ at 20MHz			–62	dBc	4
GFPL	Gain flatness peaking	0.1MHz to 75MHz, $V_O < 0.5V_{PP}$			0.4	dB	4
GFPH	Gain flatness peaking	> 75MHz, $V_O < 0.5V_{PP}$			2.0	dB	4
GFRH	Gain flatness rolloff	75MHz to 125MHz, $V_O < 0.5V_{PP}$			0.2	dB	4
HD_2	2nd harmonic distortion	$2V_{PP}$ at 20MHz			–52	dBc	4

(1) The algebraic convention, whereby the most negative value is a minimum and most positive is a maximum, is used in this table. Negative current shall be defined as conventional current flow out of a device terminal.
(2) These parameters are not post irradiation tested.

5.6 Electrical Characteristics: Drift Values Parameters

The following conditions apply (unless otherwise specified)(1):
R_L = 100Ω, V_{CC} = ±5V_{DC}, A_V = +2 feedback resistor (R_F) = 250Ω, gain resistor (R_G) = 250Ω
Delta not required on B level product. Delta required for S-level product at Group B5 only, or as specified on the internal processing instruction (IPI).

PARAMETER		TEST CONDITIONS	PACKAGE	MIN	MAX	UNIT	SUB-GROUPS
I_{BN}	Input bias current noninverting		NAB	–0.3	0.3	µA	1
			NAC	–0.75	0.75		
I_{BI}	Input bias current inverting			–3.0	3.0	µA	1
V_{IO}	Input offset voltage		NAB	–0.3	0.3	mV	1
			NAC	–1.0	1.0		

(1) The algebraic convention, whereby the most negative value is a minimum and most positive is a maximum, is used in this table. Negative current shall be defined as conventional current flow out of a device terminal.

5.7 Typical Characteristics

at T_A = 25°C, V_S = ±5V, R_L = 100Ω, and R_F = 237Ω (unless otherwise noted)

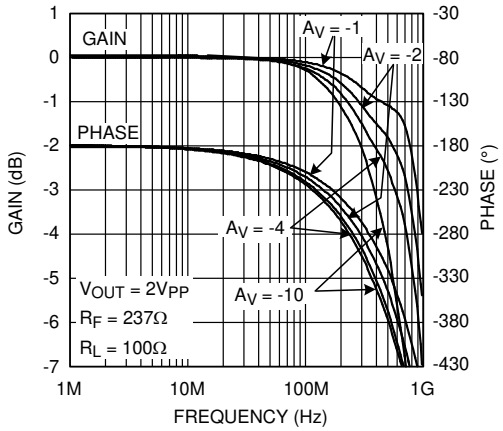


Figure 5-1. Inverting Frequency Response

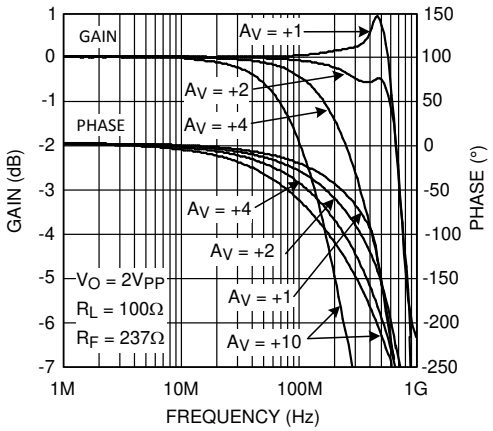


Figure 5-2. Noninverting Frequency Response

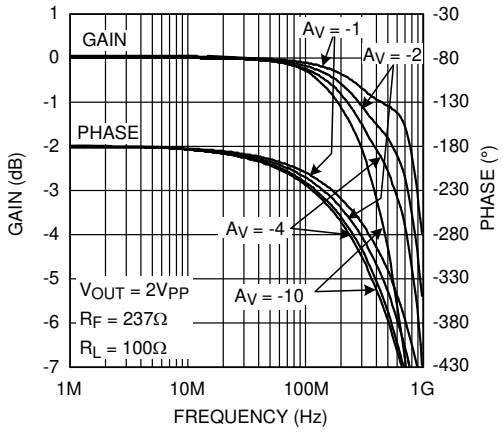


Figure 5-3. Inverting Frequency Response

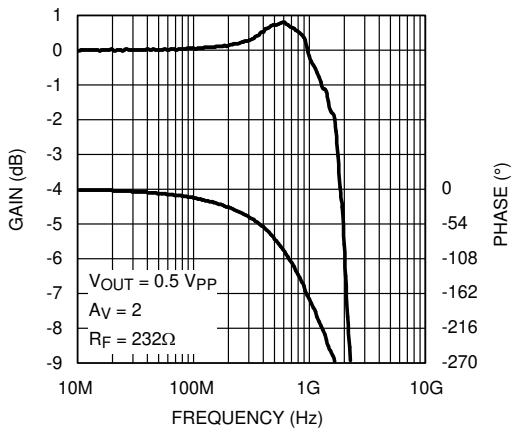


Figure 5-4. Small-Signal Bandwidth

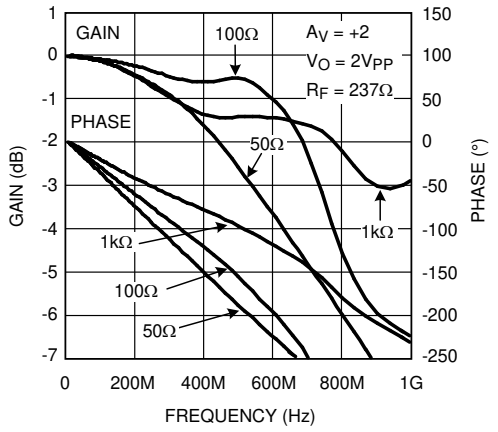


Figure 5-5. Frequency Response for Various R_L, A_V = +2

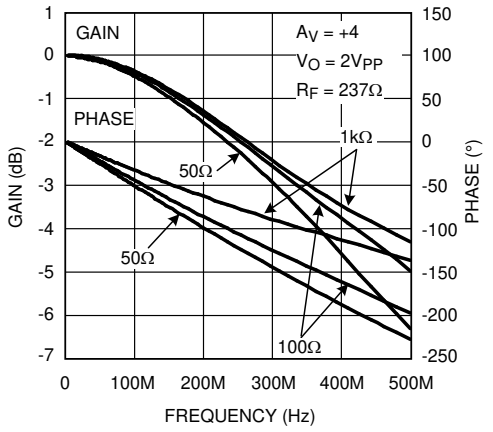


Figure 5-6. Frequency Response for Various R_L, A_V = +4

5.7 Typical Characteristics (continued)

at T_A = 25°C, V_S = ±5V, R_L = 100Ω, and R_F = 237Ω (unless otherwise noted)

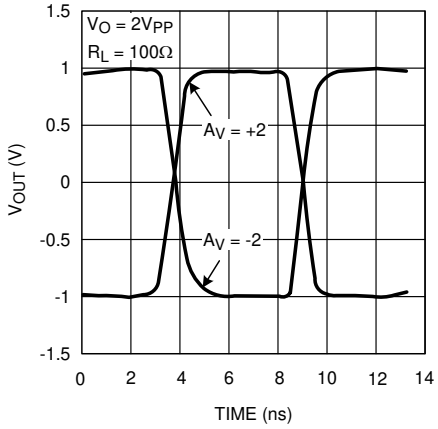


Figure 5-7. Step Response, $2V_{PP}$

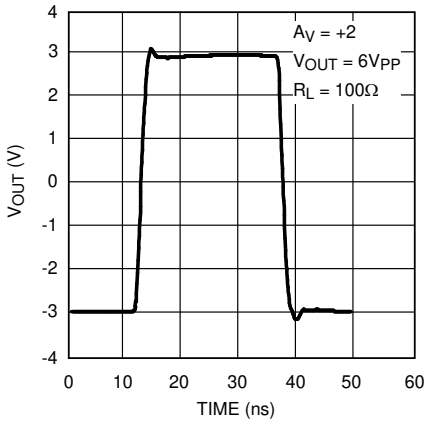


Figure 5-8. Step Response, $6V_{PP}$

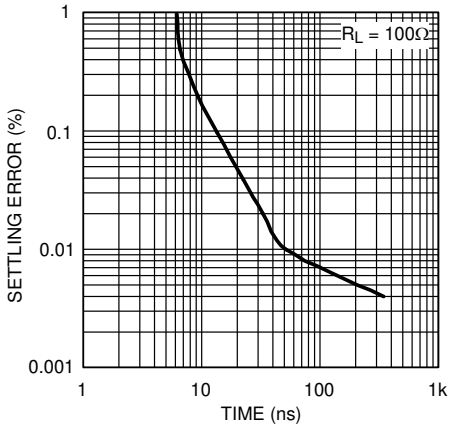


Figure 5-9. Percent Settling vs Time

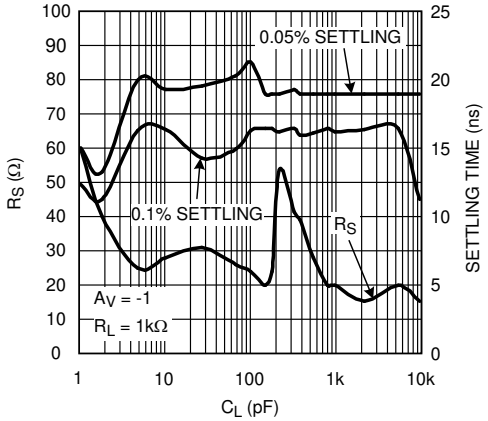


Figure 5-10. R_S and Settling Time vs C_L

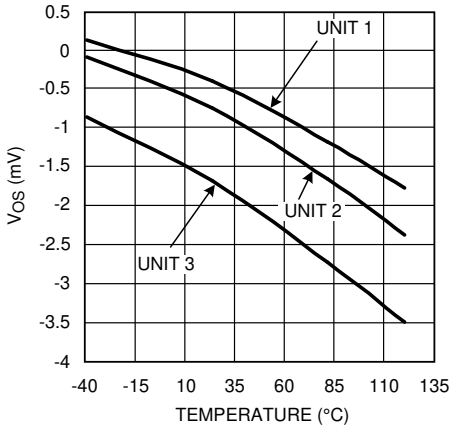


Figure 5-11. Input Offset for Three Representative Units

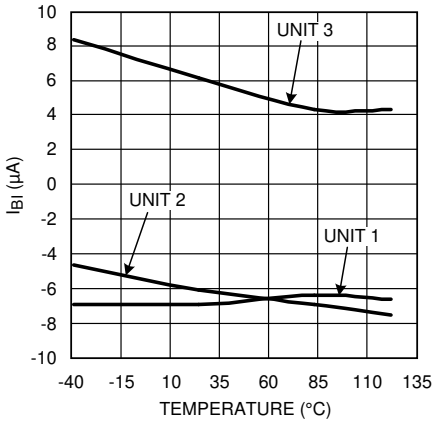


Figure 5-12. Inverting Input Bias for Three Representative Units

5.7 Typical Characteristics (continued)

at T_A = 25°C, V_S = ±5V, R_L = 100Ω, and R_F = 237Ω (unless otherwise noted)

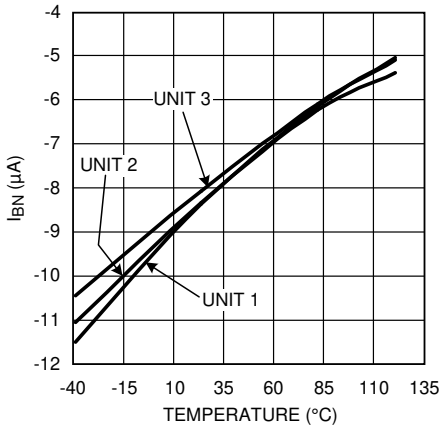


Figure 5-13. Noninverting Input Bias for Three Representative Units

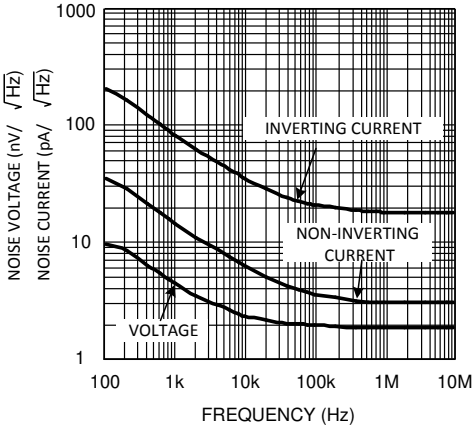


Figure 5-14. Noise

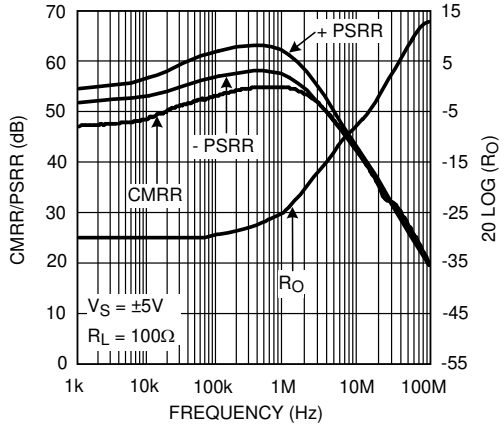


Figure 5-15. CMRR, PSRR, R_{OUT}

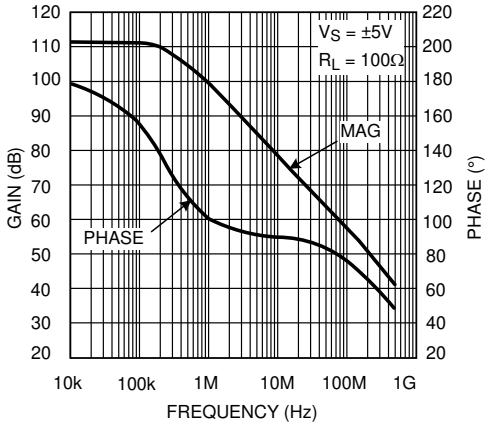


Figure 5-16. Transimpedance

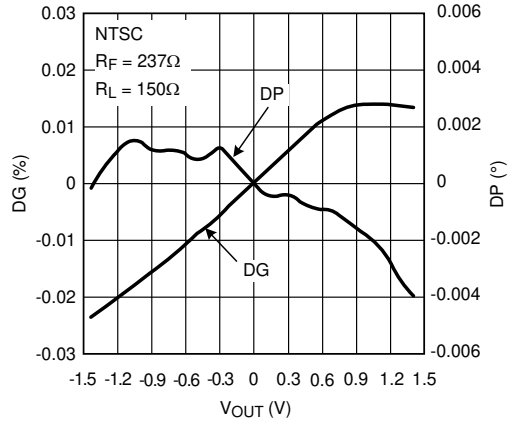


Figure 5-17. DG/DP (NTSC)

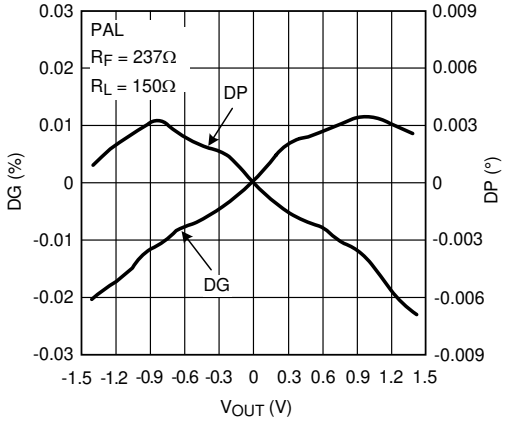


Figure 5-18. DG/DP (PAL)

6 Application and Implementation

Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

6.1 Application Information

6.1.1 Feedback Resistor

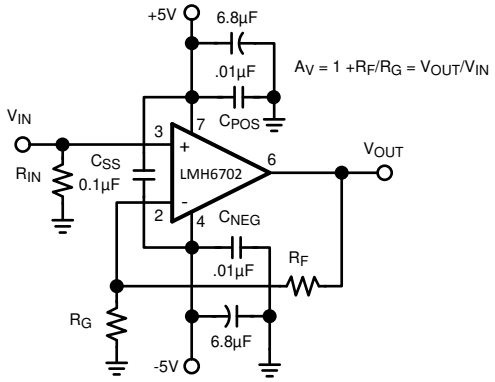


Figure 6-1. Recommended Noninverting Gain Circuit

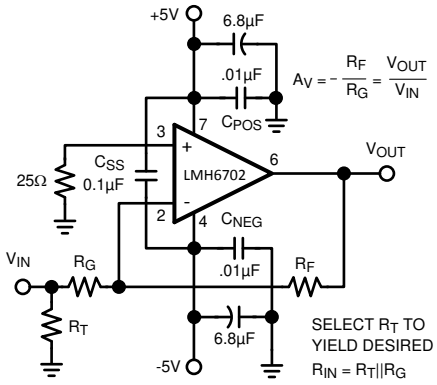


Figure 6-2. Recommended Inverting Gain Circuit

The LMH6702 achieves excellent pulse and distortion performance by using current feedback topology. The loop gain for a current-feedback op amp, and thus the frequency response, is predominantly set by the feedback-resistor value. The LMH6702 is optimized for use with a 237Ω feedback resistor. Using lower values can lead to excessive ringing in the pulse response while a higher value limits the bandwidth. Application Note OA-13 SNOA366 discusses this configuration in detail along with the occasions where a different R_F can be advantageous.

6.1.2 Harmonic Distortion

The LMH6702 has been optimized for exceptionally low harmonic distortion while driving very demanding resistive or capacitive loads. Generally, when used as the input amplifier to very high-speed flash ADCs, the distortions introduced by the converter dominate over the low LMH6702 distortions. Capacitor C_{SS}, shown across the supplies in Figure 6-1 and Figure 6-2, is critical to achieving the lowest 2nd harmonic distortion.

For absolute minimum distortion levels, keep the supply decoupling currents (ground connections to C_{POS}, and C_{NEG} in Figure 6-1 and Figure 6-2) separate from the ground connections to sensitive input circuitry (such as R_G, R_T, and R_{IN} ground connections). Splitting the ground plane in this manner, and separately routing the high frequency current spikes on the decoupling caps back to the power supply (similar to a *star connection* layout technique) provides minimum coupling back to the input circuitry and results in best harmonic distortion response (especially 2nd-order distortion).

If this layout technique has not been observed on a particular application board, the supply decoupling capacitors can adversely affect HD2 performance by increasing the coupling phenomenon already mentioned. Figure 6-3 shows actual HD2 data on a board where the ground plane is shared between the supply decoupling capacitors and the rest of the circuit. After these capacitors are removed, the HD2 distortion levels reduce significantly, especially between 10MHz to 20MHz, as shown in Figure 6-3.

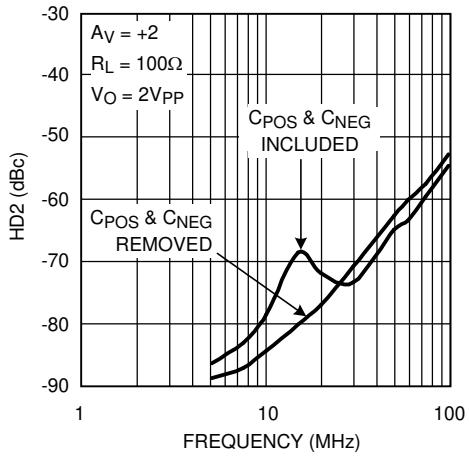


Figure 6-3. Decoupling Current Adverse Effect on a Board With Shared Ground Plane

At these extremely low distortion levels, the high-frequency behavior of decoupling capacitors themselves can be significant. In general, lower-value decoupling capacitors tend to have higher resonance frequencies, making lower-value decoupling capacitors more effective for higher-frequency regions. A particular application board that has been laid out correctly with ground returns split to minimize coupling benefits the most by having low-value and higher-value capacitors paralleled to take advantage of the effective bandwidth of each, and extend the low-distortion frequency range.

6.1.3 Capacitive Load Drive

Figure 6-4 shows a typical application using the LMH6702 to drive an ADC.

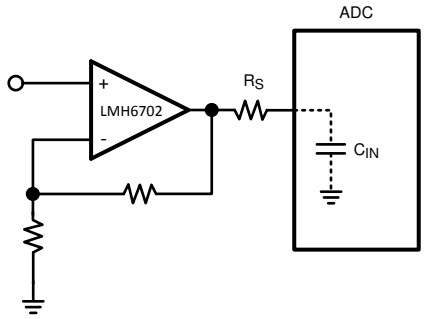


Figure 6-4. Input Amplifier to ADC

The series resistor, R_S, between the amplifier output and the ADC input is critical to achieving best system performance. This load capacitance, if applied directly to the output pin, can quickly lead to unacceptable levels of ringing in the pulse response. The plot of *R_S and Settling Time vs C_L* in the *Typical Characteristics* is an

excellent starting point for selecting R_S. The value derived in that plot minimizes the step settling time into a fixed discrete capacitive load with the output driving a very light resistive load (1kΩ). Sensitivity to capacitive loading is greatly reduced after the output is loaded more heavily. Therefore, for cases where the output is heavily loaded, R_S value can be reduced. The exact value can best be determined experimentally for these cases.

In applications where the LMH6702 is replacing the CLC409, take care when the device is lightly loaded and some capacitance is present at the output. As a result of the much higher frequency response of the LMH6702 compared to the CLC409, increased susceptibility to low value output capacitance (parasitic or inherent to the board layout or otherwise being part of the output load) is possible. As previously mentioned, this susceptibility is most noticeable when the LMH6702 resistive load is light. Parasitic capacitance can be minimized by careful layout. Addition of an output snubber R-C network also helps by increasing the high-frequency resistive loading.

Referring back to Figure 6-4, consider several additional constraints in driving the capacitive input of an ADC. There is an option to increase R_S, band-limiting at the ADC input for either noise or Nyquist band-limiting purposes. However, increasing R_S too much can induce an unacceptably large input glitch due to switching transients coupling through from the convert signal. Also, C_{IN} is often a voltage-dependent capacitance. This input impedance nonlinearity induces distortion terms that increase as R_S is increased. Therefore, attempt only slight adjustments up or down from the recommended R_S value in optimizing system performance.

6.1.4 DC Accuracy and Noise

Example below shows the output offset computation equation for the noninverting configuration using the typical bias current and offset specifications for A_V = +2:

Output Offset: $V_O = (\pm I_{BN} \times R_{IN} \pm V_{IO}) (1 + R_F/R_G) \pm I_{BI} \times R_F$

Where R_{IN} is the equivalent input impedance on the noninverting input.

Example computation for A_V = +2, R_F = 237Ω, R_{IN} = 25Ω:

$V_O = (\pm 6\mu A \times 25\Omega \pm 1mV) (1 + 237/237) \pm 8\mu A \times 237 = \pm 4.20mV$

A good design, however, includes a worst-case calculation using minimum and maximum numbers in the data sheet tables to provide worst-case operation.

Further improvement in the output offset voltage and drift is possible using composite amplifiers. The two input bias currents are physically unrelated in both magnitude and polarity for the current feedback topology. Therefore, to cancel the effects by matching the source impedance for the two inputs (as is commonly done for matched input bias current devices) is not possible.

The total output noise is computed in a similar fashion to the output offset voltage. Using the input noise voltage and the two input noise currents, the output noise is developed through the same gain equations for each term but combined as the square root of the sum of squared contributing elements. See the *OA-12 Noise Analysis for Comlinear Amplifiers* application report for a full discussion of noise calculations for current-feedback amplifiers.

6.2 Layout

6.2.1 Layout Guidelines

Generally, a good high frequency layout keeps power supply and ground traces away from the inverting input and output pins. Parasitic capacitance on these nodes to ground cause frequency-response peaking and possible circuit oscillations (see the *OA-15 Frequent Faux Pas in Applying Wideband Current Feedback Amplifiers* application report for more information). Texas Instruments suggests the following evaluation boards as a guide for high-frequency layout and as an aid in device testing and characterization:

DEVICE	PACKAGE	EVALUATION BOARD PART NUMBER
LMH6702QMLMF	SOT-23-5	CLC730216
LMH6702QMLMA	Plastic SOIC	CLC730227

7 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

7.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

7.2 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

7.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

7.4 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

7.5 Glossary

TI Glossary	This glossary lists and explains terms, acronyms, and definitions.

8 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision E (March 2013) to Revision F (August 2024)	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document	1
• Changed input bias current noninverting limits from ±0.3µA to ±0.75µA for NAC package type in *LMH6702 Electrical Characteristics Drift Values Parameters*	5
• Changed input offset voltage limits from ±0.3mA to ±1mV for NAC package type in *LMH6702 Electrical Characteristics Drift Values Parameters*	5

Changes from Revision D (October 2011) to Revision E (March 2013)	Page
• Changed layout of National data sheet to TI format	1

9 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
5962-0254601VPA	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702J-QV 5962-02546 01VPA Q ACO 01VPA Q >T
5962-0254601VZA	Active	Production	CFP (NAC) | 10	54 | JEDEC TRAY (5+1)	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702 WGQMLV Q 5962-02546 01VZA ACO 01VZA >T
5962F0254601VPA	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702JFQV 5962F02546 01VPA Q ACO 01VPA Q >T
5962F0254601VZA	Active	Production	CFP (NAC) | 10	54 | JEDEC TRAY (5+1)	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702 WGFQMLV Q 5962F02546 01VZA ACO 01VZA >T
5962F0254602VPA	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702JFLQV 5962F02546 02VPA Q ACO 02VPA Q >T
LMH6702J-QMLV	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702J-QV 5962-02546 01VPA Q ACO 01VPA Q >T
LMH6702J-QMLV.A	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702J-QV 5962-02546 01VPA Q ACO 01VPA Q >T
LMH6702JFLQMLV	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702JFLQV 5962F02546 02VPA Q ACO 02VPA Q >T

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
LMH6702JFQMLV	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702JFQV 5962F02546 01VPA Q ACO 01VPA Q >T
LMH6702JFQMLV.A	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702JFQV 5962F02546 01VPA Q ACO 01VPA Q >T
LMH6702WG-QMLV	Active	Production	CFP (NAC) | 10	54 | JEDEC TRAY (5+1)	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702 WGQMLV Q 5962-02546 01VZA ACO 01VZA >T
LMH6702WG-QMLV.A	Active	Production	CFP (NAC) | 10	54 | JEDEC TRAY (5+1)	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702 WGQMLV Q 5962-02546 01VZA ACO 01VZA >T
LMH6702WGFQMLV	Active	Production	CFP (NAC) | 10	54 | JEDEC TRAY (5+1)	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702 WGFQMLV Q 5962F02546 01VZA ACO 01VZA >T
LMH6702WGFQMLV.A	Active	Production	CFP (NAC) | 10	54 | JEDEC TRAY (5+1)	No	Call TI	Level-1-NA-UNLIM	-55 to 125	LMH6702 WGFQMLV Q 5962F02546 01VZA ACO 01VZA >T

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

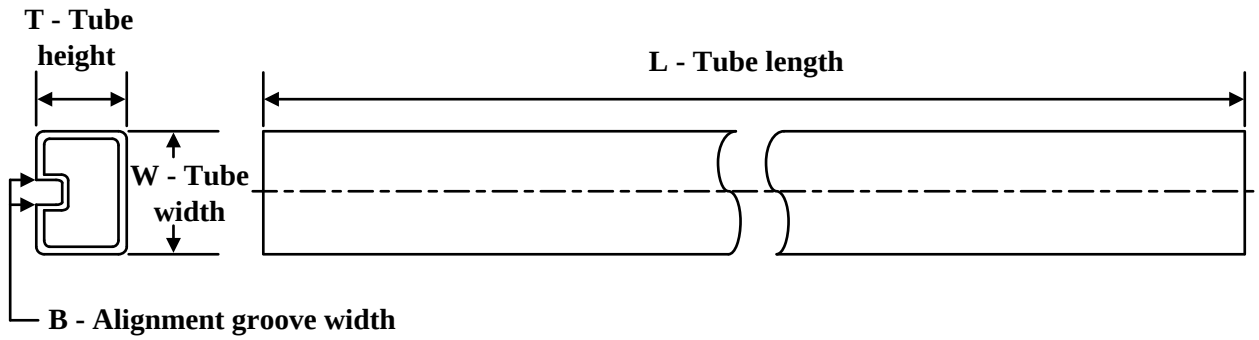
(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

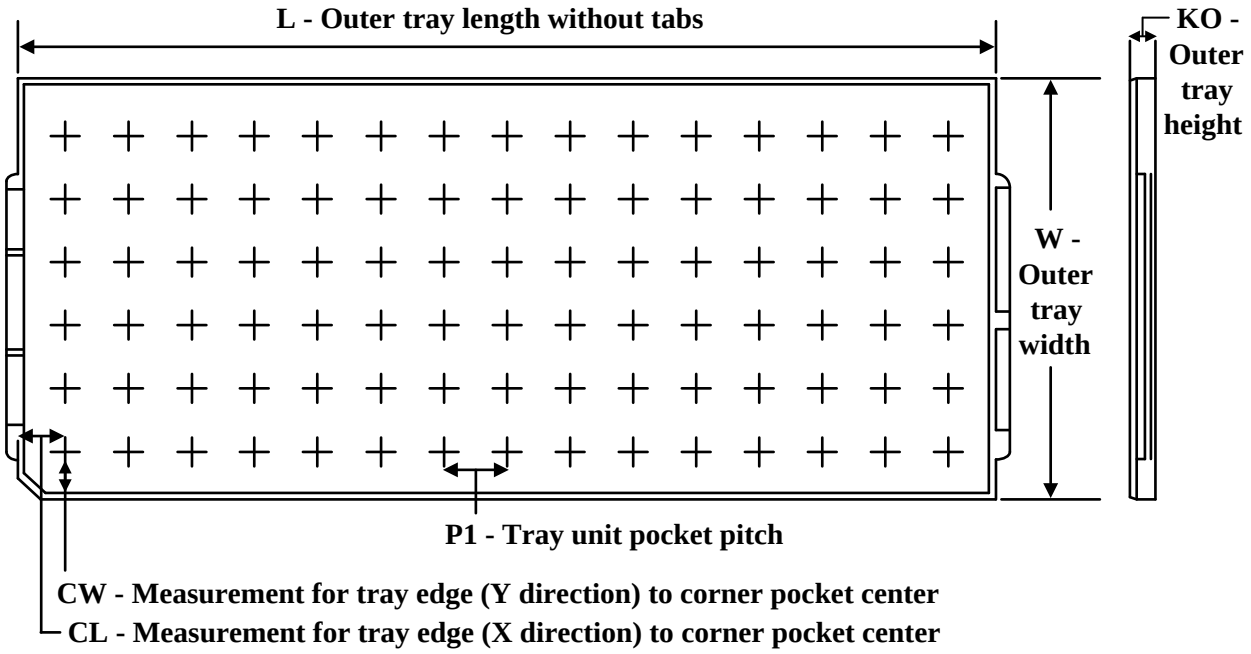
TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-0254601VPA	NAB	CDIP	8	40	506.98	15.24	13440	NA
5962F0254601VPA	NAB	CDIP	8	40	506.98	15.24	13440	NA
LMH6702J-QMLV	NAB	CDIP	8	40	506.98	15.24	13440	NA
LMH6702J-QMLV.A	NAB	CDIP	8	40	506.98	15.24	13440	NA
LMH6702JFQMLV	NAB	CDIP	8	40	506.98	15.24	13440	NA
LMH6702JFQMLV.A	NAB	CDIP	8	40	506.98	15.24	13440	NA

TRAY

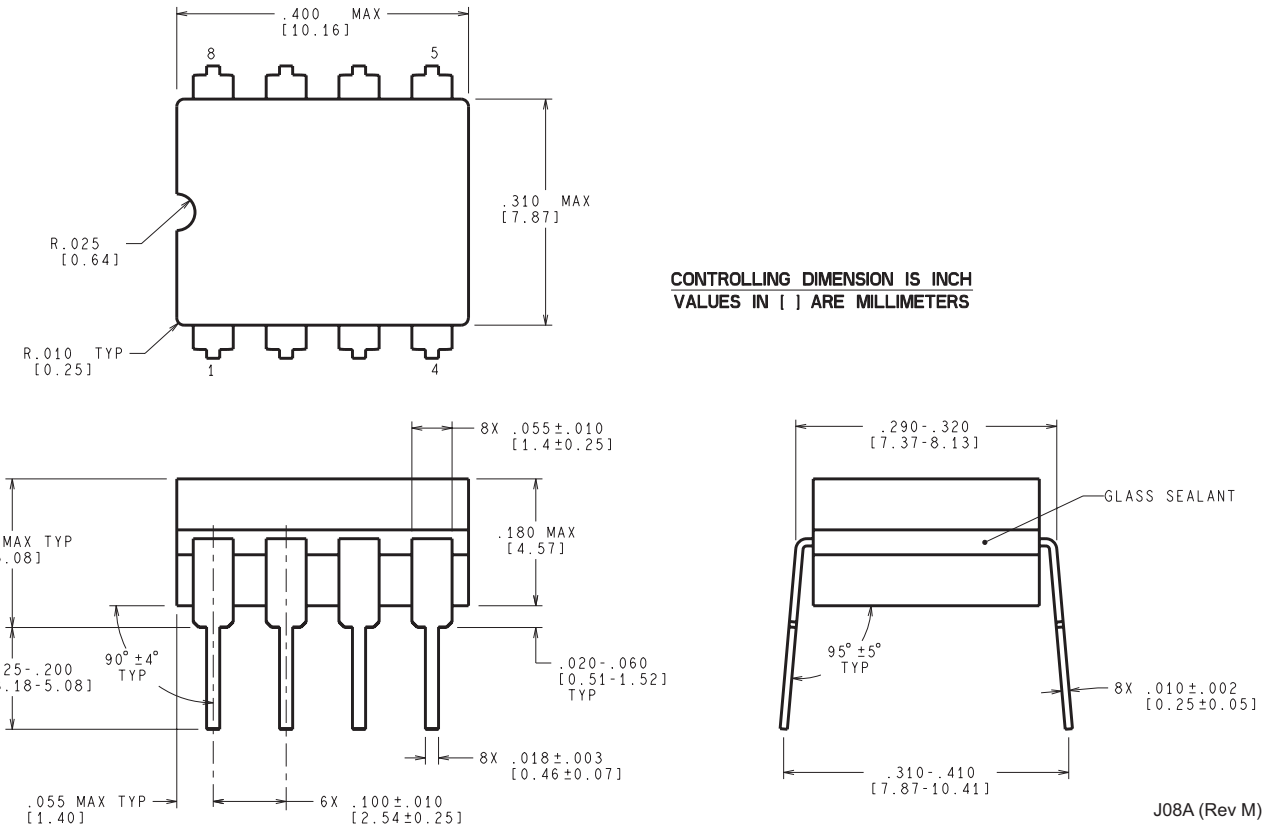


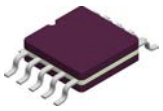
Chamfer on Tray corner indicates Pin 1 orientation of packed units.

*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	Unit array matrix	Max temperature (°C)	L (mm)	W (mm)	K0 (µm)	P1 (mm)	CL (mm)	CW (mm)
5962-0254601VZA	NAC	CFP	10	54	6 X 9	100	101.6	101.6	8001	2.78	16.08	16.08
5962F0254601VZA	NAC	CFP	10	54	6 X 9	100	101.6	101.6	8001	2.78	16.08	16.08
LMH6702WG-QMLV	NAC	CFP	10	54	6 X 9	100	101.6	101.6	8001	2.78	16.08	16.08
LMH6702WG-QMLV.A	NAC	CFP	10	54	6 X 9	100	101.6	101.6	8001	2.78	16.08	16.08
LMH6702WGFQMLV	NAC	CFP	10	54	6 X 9	100	101.6	101.6	8001	2.78	16.08	16.08
LMH6702WGFQMLV.A	NAC	CFP	10	54	6 X 9	100	101.6	101.6	8001	2.78	16.08	16.08

NAB0008A


.400 MAX
[10.16]
8
5
.310 MAX
[7.87]
R.025
[0.64]
R.010 TYP
[0.25]
1
4
CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS
8X .055±.010
[1.4±0.25]
.200 MAX TYP
[5.08]
.180 MAX
[4.57]
8X .125-.200
[3.18-5.08]
90° ±4°
TYP
.020-.060
[0.51-1.52]
TYP
8X .018±.003
[0.46±0.07]
.055 MAX TYP
[1.40]
6X .100±.010
[2.54±0.25]
.290-.320
[7.37-8.13]
GLASS SEALANT
95° ±5°
TYP
8X .010±.002
[0.25±0.05]
.310-.410
[7.87-10.41]
J08A (Rev M)

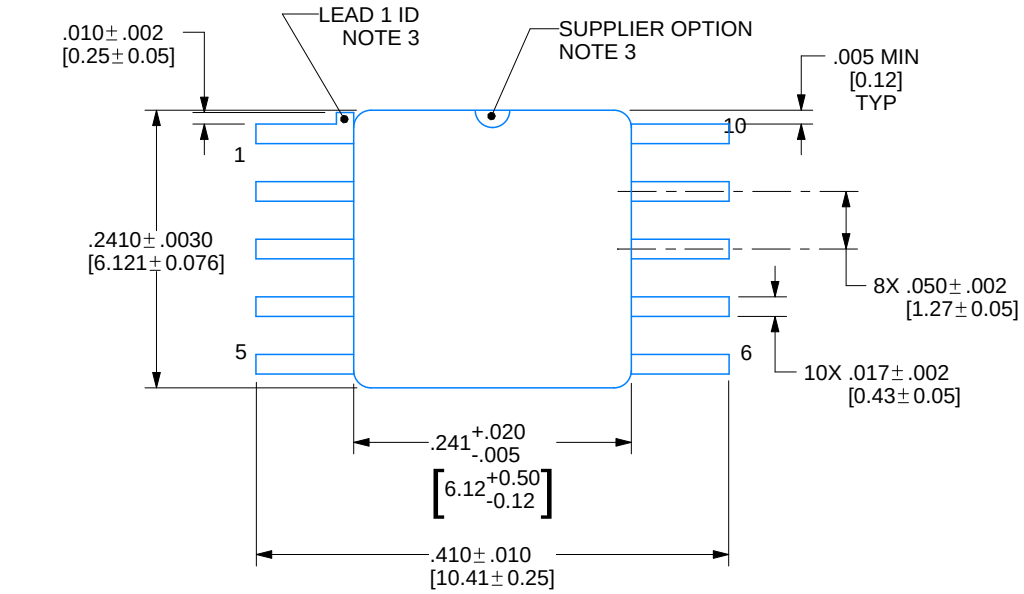


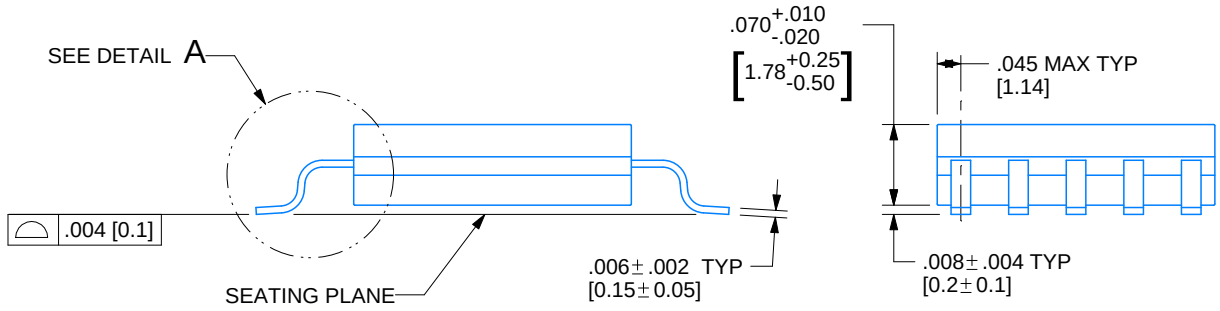
PACKAGE OUTLINE

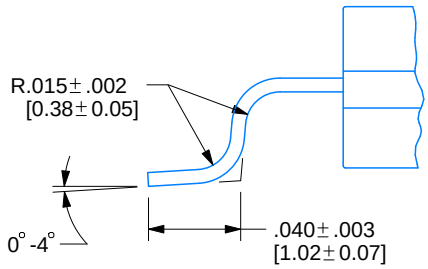
NAC0010A

CFP - 2.33mm max height

CERAMIC FLATPACK







DETAIL A
TYPICAL

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NOTES:

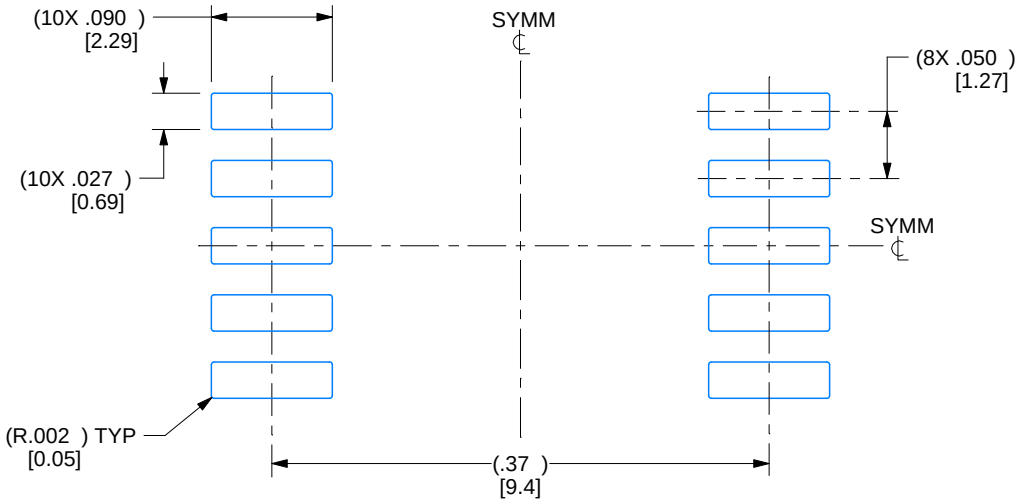
1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. For solder thickness and composition, see the "Lead Finish Composition/Thickness" link in the packaging section of the Texas Instruments website
3. Lead 1 identification shall be:
   a) A notch or other mark within this area
   b) A tab on lead 1, either side
4. No JEDEC registration as of December 2021

EXAMPLE BOARD LAYOUT

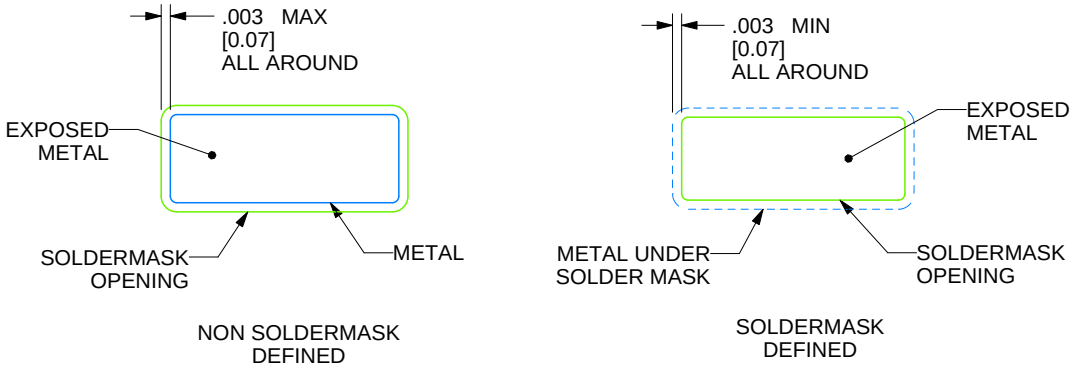
NAC0010A

CFP - 2.33mm max height

CERAMIC FLATPACK



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 7X



4215196/D 08/2022

REVISIONS

REV	DESCRIPTION	E.C.N.	DATE	BY/APP'D
A	RELEASE TO DOCUMENT CONTROL	2197877	12/30/2021	DAVID CHIN / ANIS FAUZI
B	NO CHANGE TO DRAWING; REVISION FOR YODA RELEASE;	2198820	02/14/2022	K. SINCERBOX
C	CHANGE PIN 1 ID LOCATION ON PIN	2198845	02/18/2022	D. CHIN / K. SINCERBOX
D	.2410± .0030 WAS .2700 +.0012/-.0002;	2200915	08/08/2022	D. CHIN / K. SINCERBOX

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