

Precision Operational Amplifier

DESCRIPTION

The RH37C combines very low noise with excellent precision and high speed specifications. The low $1/f$ noise corner frequency of 2.7Hz combined with $3.5nV/\sqrt{Hz}$ 10Hz noise and low offset voltage make the RH37C an excellent choice for low frequency military instrumentation applications. The wafer lots are processed to Analog Devices' in-house Class S flow to yield circuits usable in stringent military applications.

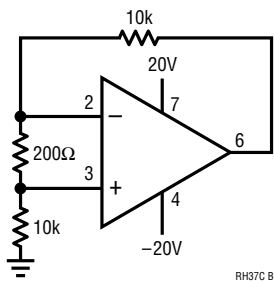
For complete electrical specifications and performance curves see the OP-27/OP-37 data sheet.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	$\pm 22V$
Internal Power Dissipation	500mW
Input Voltage	Equal to Supply Voltage
Output Short-Circuit Duration	Indefinite
Differential Input Current (Note 8)	$\pm 25mA$
Operating Temperature Range	$-55^{\circ}C$ to $125^{\circ}C$
Junction Temperature Range	$-55^{\circ}C$ to $150^{\circ}C$
Storage Temperature Range	$-65^{\circ}C$ to $150^{\circ}C$
Lead Temperature (Soldering, 10 sec)	$300^{\circ}C$

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BURN-IN CIRCUIT



PACKAGE/ORDER INFORMATION

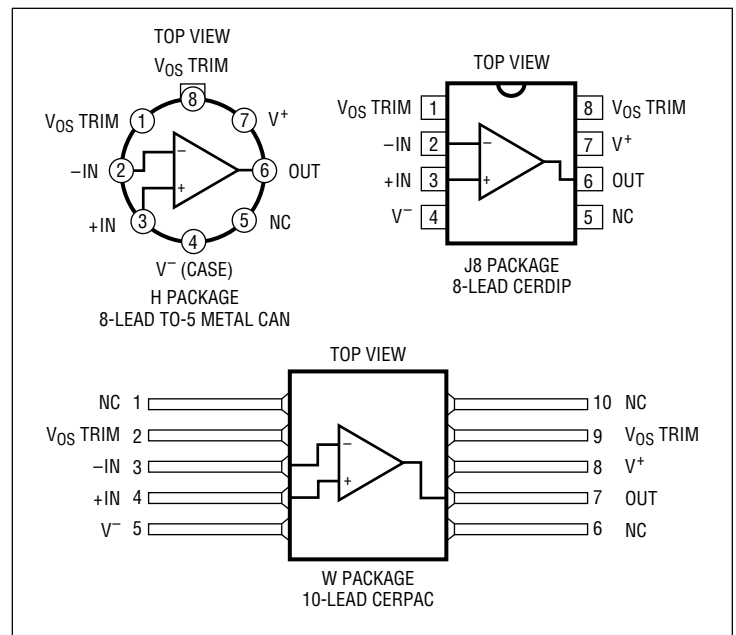


TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation) (Note 9)

SYMBOL	PARAMETER	CONDITIONS	NOTES	$T_A = 25^{\circ}C$			SUB-GROUP	$-55^{\circ}C \leq T_A \leq 125^{\circ}C$			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
V_{OS}	Input Offset Voltage		1			100	4			300	2, 3	μV
$\frac{\Delta V_{OS}}{\Delta Temp}$	Average Offset Drift		4, 7							1.8		$\mu V/^{\circ}C$
$\frac{\Delta V_{OS}}{\Delta Time}$	Long-Term Input Offset Voltage Stability		2, 4			2						$\mu V/$ Month
I_{OS}	Input Offset Current					75	1			135	2, 3	nA
I_B	Input Bias Current					± 80	1			± 150	2, 3	nA

TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation) (Note 9)

SYMBOL	PARAMETER	CONDITIONS	NOTES	$T_A = 25^\circ\text{C}$			SUB-GROUP	$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
e_n	Input Noise Voltage	0.1Hz to 10Hz	4, 5			0.25						$\mu\text{V}_{\text{P-P}}$
	Input Noise Voltage Density	$f_0 = 10\text{Hz}$	3			8.0						$\text{nV}/\sqrt{\text{Hz}}$
		$f_0 = 30\text{Hz}$	4			5.6						$\text{nV}/\sqrt{\text{Hz}}$
		$f_0 = 1000\text{Hz}$	4			4.5						$\text{nV}/\sqrt{\text{Hz}}$
i_n	Input Noise Current Density	$f_0 = 1000\text{Hz}$	4, 6			0.6						$\text{pV}/\sqrt{\text{Hz}}$
	Input Resistance Common Mode					2						$\text{G}\Omega$
	Input Voltage Range		4			± 11			± 10.2			V
CMRR	Common Mode Rejection Ratio	$V_{\text{CM}} = \pm 11\text{V}$ $V_{\text{CM}} = \pm 10\text{V}$				100			94		2, 3	dB dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 4\text{V}$ to $\pm 18\text{V}$ $V_S = \pm 4.5\text{V}$ to $\pm 18\text{V}$				94			86		2, 3	dB dB
A_{VOL}	Large-Signal Voltage Gain	$R_L \geq 2\text{k}$, $V_O = \pm 10\text{V}$ $R_L \geq 600\Omega$, $V_O = \pm 1\text{V}$ $V_S = \pm 4\text{V}$	4			700 200			300		5, 6	V/mV V/mV
V_{OUT}	Maximum Output Voltage Swing	$R_L = 2\text{k}$ $R_L = 600\Omega$				± 11.5 ± 10.0			± 10.5		5, 6	V V
SR	Slew Rate	$R_L = 2\text{k}$, $A_{\text{VCL}} \geq 5$				11					7	$\text{V}/\mu\text{s}$
GBW	Gain-Bandwidth Product	$f_0 = 10\text{kHz}$ ($A_{\text{VCL}} \geq 5$) $f_0 = 1\text{MHz}$ ($A_{\text{VCL}} \geq 5$)	4			45						MHz MHz
Z_0	Open-Loop Output Resistance	$V_O = 0$, $I_O = 0$				470						Ω
P_D	Power Dissipation										1	mW

TABLE 1A: ELECTRICAL CHARACTERISTICS (Postirradiation) (Note 10, 11)

SYMBOL	PARAMETER	CONDITIONS	NOTES	10KRAD(Si)		20KRAD(Si)		50KRAD(Si)		100KRAD(Si)		200KRAD(Si)		UNITS	
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
V_{OS}	Input Offset Voltage		1			100			130			180			μV
I_{OS}	Input Offset Current					75			75			90			nA
I_B	Input Bias Current					± 80			± 80			± 125			nA
	Input Resistance Common Mode					2 (Typ)			2 (Typ)			2 (Typ)			$\text{G}\Omega$
	Input Voltage Range		4			± 11			± 11			± 11			V
CMRR	Common Mode Rejection Ratio	$V_{\text{CM}} = \pm 11\text{V}$				100			100			97			dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 4\text{V}$ to $\pm 18\text{V}$				94			94			92			dB
A_{VOL}	Large-Signal Voltage Gain	$R_L \geq 2\text{k}$, $V_O = \pm 10\text{V}$				700			700			700			V/mV
V_{OUT}	Maximum Output Voltage Swing	$R_L \geq 10\text{k}$ $R_L \geq 600\Omega$				± 11.5 ± 10.0			± 11.5 ± 10.0			± 11.5 ± 10.0			V V
SR	Slew Rate	$R_L \geq 2\text{k}$				1.7			1.7			1.7			$\text{V}/\mu\text{s}$
Z_0	Open-Loop Output Resistance	$V_O = 0$, $I_O = 0$				70 (Typ)			70 (Typ)			70 (Typ)			Ω
P_D	Power Dissipation											170			mW

TABLE 1A: ELECTRICAL CHARACTERISTICS

Note 1: Input offset voltage measurements are performed by automatic test equipment approximately 0.5 seconds after application of power.

Note 2: Long-term input offset voltage stability refers to the average trend line of offset voltage vs time over the first 30 days of operation. Excluding the initial hour of operation, changes in V_{OS} during the first 30 days are typically $2.5\mu\text{V}$. Refer to the typical performance curves.

Note 3: Sample tested to an LTPD of 15 on every lot. Contact factory for 100% testing of 10Hz voltage density noise.

Note 4: Parameter is guaranteed by design, characterization, or correlation to other tested parameters.

Note 5: See test circuit and frequency response curve for 0.1Hz to 10Hz tester on OP-27/OP-37 data sheet.

Note 6: See test circuit for current noise measurement on OP-27/OP-37 data sheet.

Note 7: The average input offset drift performance is within the specifications unnullled or when nulled with a pot having a range $8\text{k}\Omega$ to $20\text{k}\Omega$.

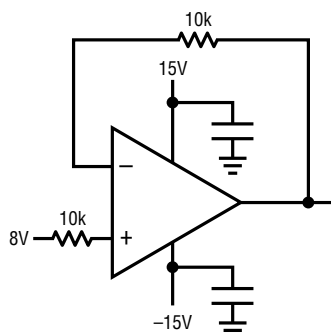
Note 8: The RH37C's inputs are protected by back-to-back diodes. Current limiting resistors are not used in order to achieve low noise. If differential input voltage exceeds $\pm 0.7\text{V}$, the input current should be limited to 25mA.

Note 9: $V_S = \pm 15\text{V}$, $V_{CM} = 0\text{V}$ unless otherwise noted.

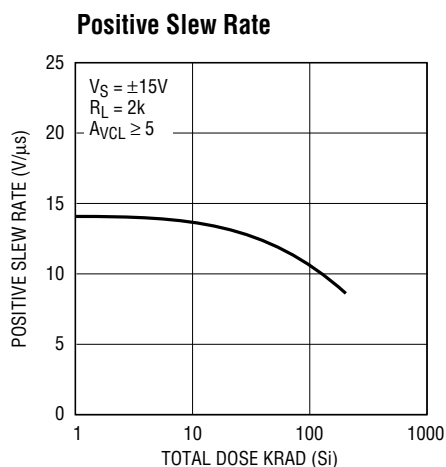
Note 10: $T_A = 25^\circ\text{C}$, $V_S = \pm 15\text{V}$, $V_{CM} = 0\text{V}$, unless otherwise noted.

Note 11: Device is characterized at 10KRAD, 20KRAD, 50KRAD, 100KRAD and 200KRAD and is production tested at 100KRAD only.

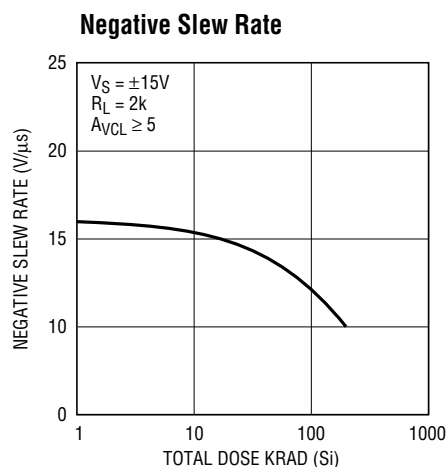
TOTAL DOSE BIAS CIRCUIT



TYPICAL PERFORMANCE CHARACTERISTICS

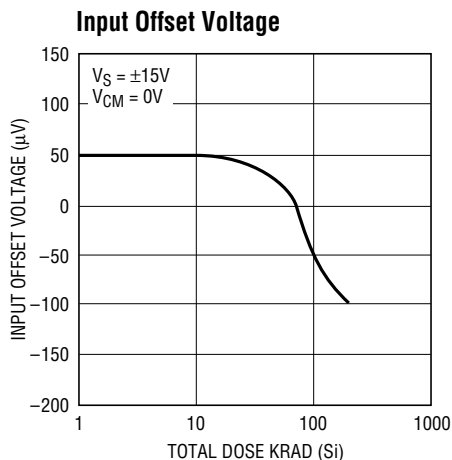


RH37C G01

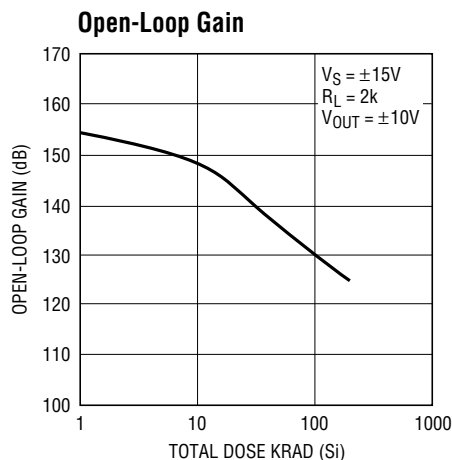


RH37C G02

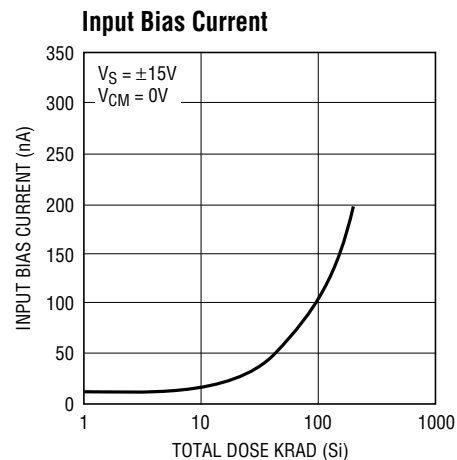
TYPICAL PERFORMANCE CHARACTERISTICS



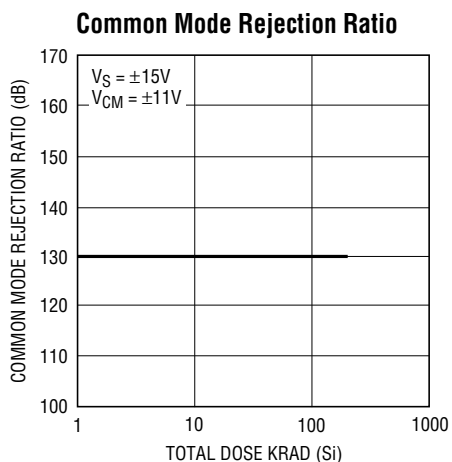
RH37C G03



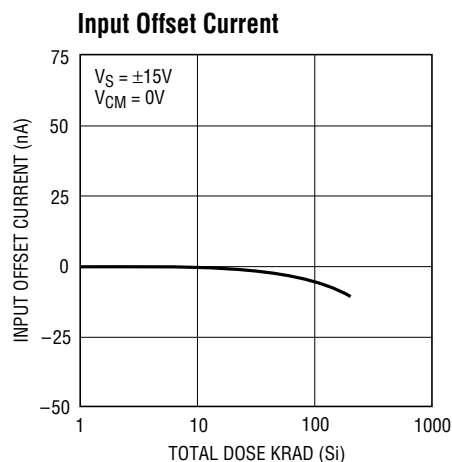
RH37C G04



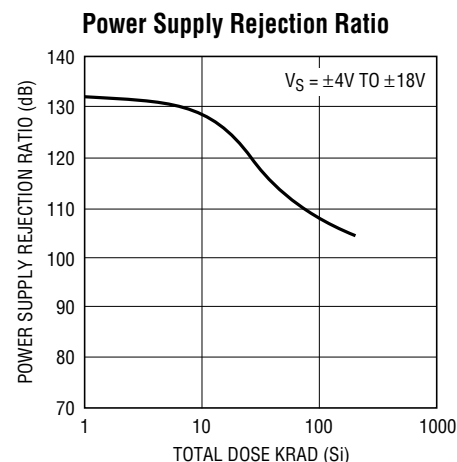
RH37C G05



RH37C G06



RH37C G07



RH37C G08

TABLE 2: ELECTRICAL TEST REQUIREMENTS

MIL-PRF-38535 TEST REQUIREMENTS	SUBGROUP
Final Electrical Test Requirements	1*,2,3,4,5,6,7
Group A Test Requirements	1,2,3,4,5,6,7
Group C End Point Electrical Parameters	1
Group D End Point Electrical Parameters	1
Group E End Point Electrical Parameters	1

* PDA applies to subgroup 1. See PDA Test Notes.

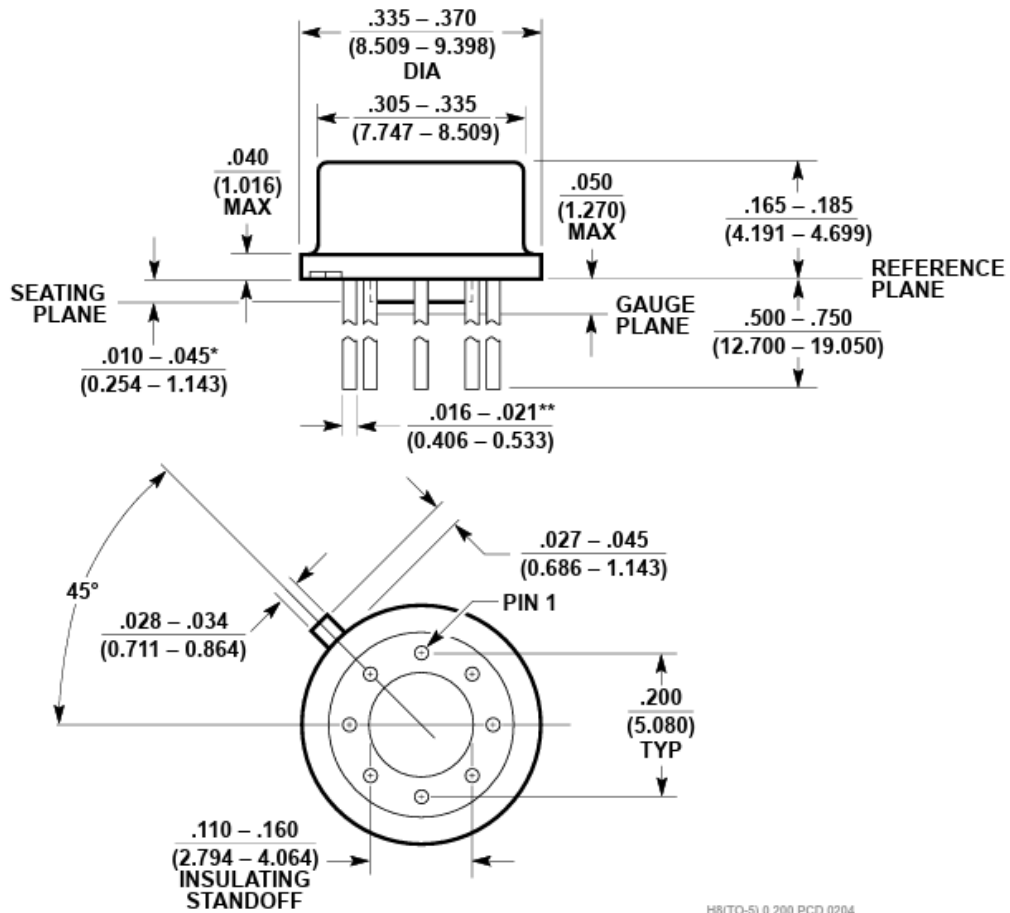
PDA Test Notes

The PDA is specified as 5% based on failures from group A, subgroup 1, tests after cooldown as the final electrical test in accordance with method 5004 of MIL-STD-883 Class B. The verified failures of group A, subgroup 1, after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent for the lot.

Analog Devices reserves the right to test to tighter limits than those given.

PACKAGE OUTLINE DRAWINGS

H Package
8-Lead TO-5 Metal Can (.200 Inch PCD)
 (Reference LTC DWG # 05-08-1320)



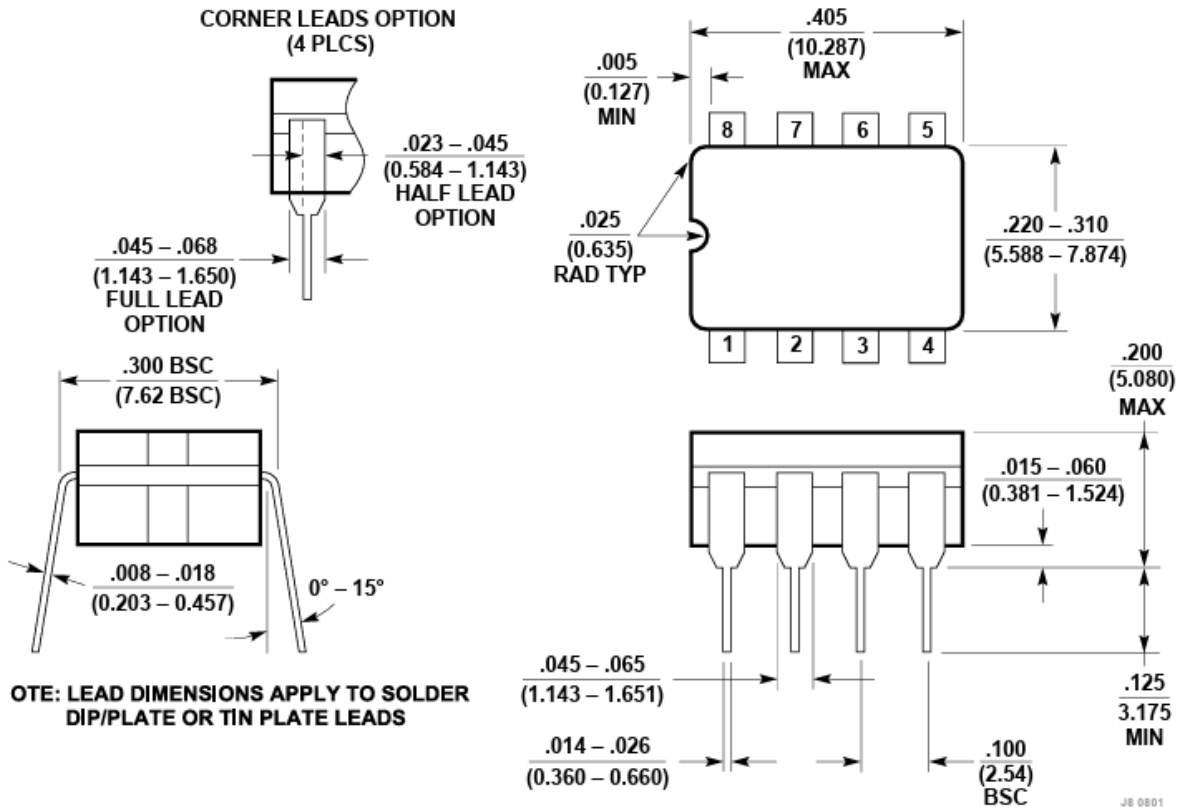
H8(TO-5) 0.200 PCD 0204

*LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND THE SEATING PLANE

**FOR SOLDER DIP LEAD FINISH, LEAD DIAMETER IS $.016 - .024$ (0.406 - 0.610)

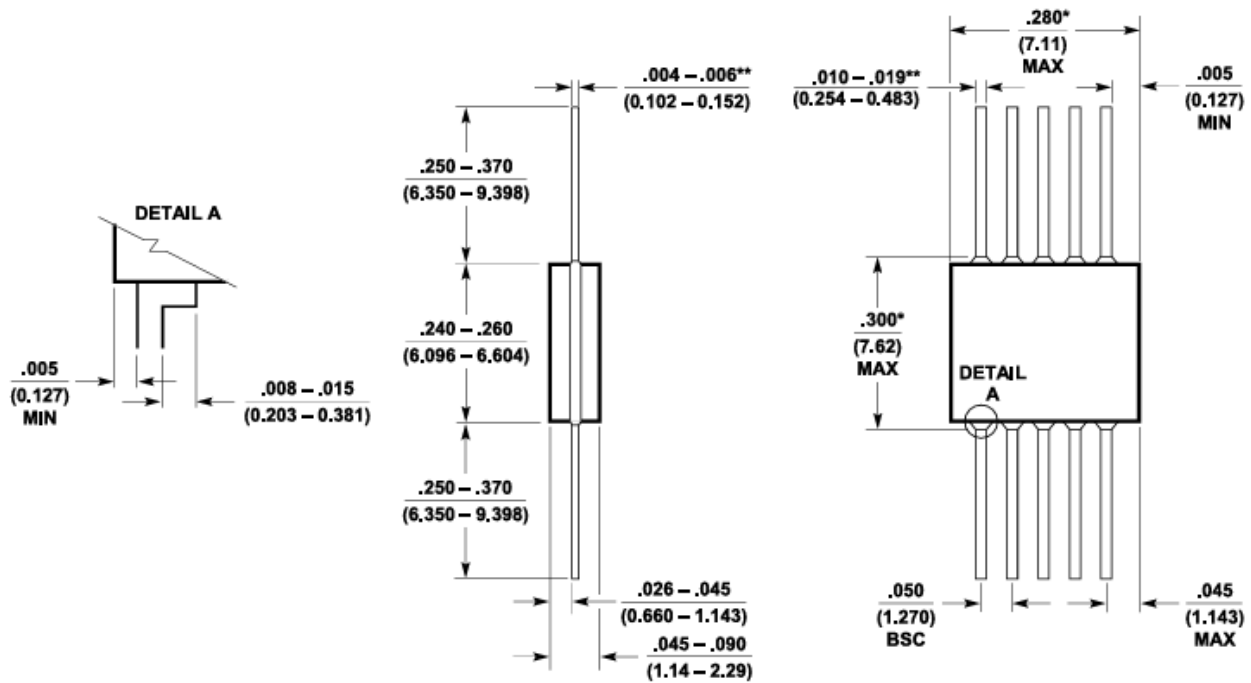
PACKAGE OUTLINE DRAWINGS

J8 Package
8-Lead CERDIP (Narrow .300 Inch, Hermetic)
 (Reference LTC DWG # 05-08-1110)



PACKAGE OUTLINE DRAWINGS

W Package
10-Lead Flatpak Glass Sealed (Hermetic)
 (Reference LTC DWG # 05-08-1130)



NOTES:

*THIS DIMENSION ALLOWS FOR OFF-CENTER LID, MENISCUS AND GLASS OVERRUN

**INCREASE DIMENSIONS BY 0.003 INCHES (0.076 mm) WHEN LEAD FINISH A IS APPLIED (SOLDER DIPPED)

W10 (GLASS) 0033

REVISION HISTORY (Revision history begins at Rev C)

REV	DATE	DESCRIPTION	PAGE NUMBER
C	07/24	Updates to Table 2: Electrical Test Requirements	4
D	07/25	Updates to Table 1A: Electrical	3
		Added Package Outline Drawings	5-7