## ABSOLUTE MAXIMUM RATINGS (Note 1)

**Amplifier (LTKA0x)**

Supply Voltage (Total $V^+$ to $V^-$) ..... 40V
Differential Input Current (Note 2) ..... ±10mA
Common Mode Input Voltage ..... Equal to Supplies
Output Short-Circuit Duration ..... Indefinite

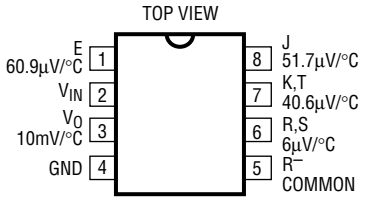
**Compensator (LT1025)**

Supply Voltage ($V_{IN}$ to Ground Pin) ..... 36V
Output Voltage (Forced) ..... 5V
Output Short-Circuit Duration ..... Indefinite

**Both Devices**

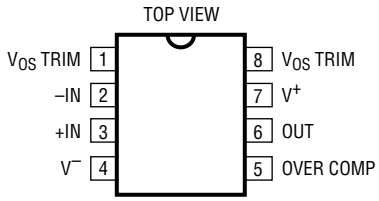
Operating Temperature Range
LTK001AMJ8, LTK001MJ8 **(OBSOLETE)** ..... –55°C to 125°C
LTK001ACN8, LTK001CN8 ..... 0°C to 70°C
Storage Temperature Range ..... –65°C to 150°C
Lead Temperature Range (Soldering, 10 sec.)..... 300°C

## PACKAGE/ORDER INFORMATION



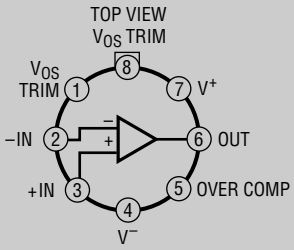

N8 PACKAGE
8-LEAD PDIP
COMPENSATOR
(LT1025)

$T_{JMAX}$ = 100°C, $\theta_{JA}$ = 130°C/W (N8)




N8 PACKAGE
8-LEAD PDIP AMPLIFIER
(LTKA0x)

$T_{JMAX}$ = 100°C, $\theta_{JA}$ = 130°C/W




H PACKAGE
8-LEAD TO-5 METAL CAN
AMPLIFIER (LTKA0x)

$T_{JMAX}$ = 150°C, $\theta_{JA}$ = 150°C/W, $\theta_{JC}$ = 45°C/W

| ORDER PART NUMBER | ORDER PART NUMBER | ORDER PART NUMBER |
|---|---|---|
| **KIT**<br>LTK001CN8<br>LTK001ACN8 | **AMPLIFIER ONLY**<br>**(Note A)**<br>LTKA00CN8<br>LTKA01CN8 | **AMPLIFIER ONLY**<br>**(Note A)**<br>LTKA00MH<br>LTKA01MH |
| J8 PACKAGE<br>8-LEAD CERDIP<br>COMPENSATOR<br>(LT1025)<br>$T_{JMAX}$ = 150°C, $\theta_{JA}$ = 100°C/W (J8)<br>LTK001MJ8<br>LTK001AMJ8<br>**OBSOLETE PACKAGE**<br>Consider the N8 Package for Alternate Source | | **OBSOLETE PACKAGE** |

**Note A:** The polarity of the amplifier is indicated by the 0 or 1 in the part number. An LT1025 with a 0 identifier is properly matched with an LTKA00, while an LT1025 with a 1 identifier should be used with an LTKA01.

Consult factory for parts specified with wider operating temperature ranges.



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## ELECTRICAL CHARACTERISTICS (Matched Amplifier and Compensator)

**$T_A$ = 25°C, $V_S$ = ±15V (Amplifier), $V_S$ = 5V (Compensator)**

| PARAMETER | CONDITIONS | | LTK001A MIN | LTK001A TYP | LTK001A MAX | LTK001 MIN | LTK001 TYP | LTK001 MAX | UNITS |
|---|---|---|---|---|---|---|---|---|---|
| Total Temperature Error at 25°C (Note 3) | | Type E | | | 0.75 | | | 2.5 | °C |
| | | Type J | | | 0.75 | | | 2.5 | °C |
| | | Type K, T | | | 0.86 | | | 2.5 | °C |
| | | Type R, S | (Note 12) | | 5.0 | | | 5.0 | °C |
| Slope Error (Notes 4 and 9) | 0°C ≤ $T_J$ ≤ 70°C | Type E | | | 0.05 | | | 0.09 | °C/°C |
| | | Type J | | | 0.06 | | | 0.09 | °C/°C |
| | | Type K, T | | | 0.07 | | | 0.10 | °C/°C |
| | | Type R, S | | | 0.28 | | | 0.32 | °C/°C |
| Total Temperature Error at Temperature Extremes (Note 9) | 0°C ≤ $T_J$ ≤ 70°C | Type E | | | 2.0 | | | 5 | °C |
| | | Type J | | | 2.1 | | | 5 | °C |
| | | Type K, T | | | 2.6 | | | 5.2 | °C |
| | | Type R, S | (Note 12) | | 16 | | | 16 | °C |
| | –55°C ≤ $T_J$ ≤ 125°C | Type E | | | 6 | | | 8.5 | °C |
| | | Type J | | | 6 | | | 8.5 | °C |
| | | Type K, T | | | 6.3 | | | 9 | °C |
| | | Type R, S | (Note 12) | | 30 | | | 30 | °C |
| Temperature Error Change with Supply Voltage (Note 5) | | | | | 0.1 | | | 0.1 | °C/V |
| Supply Current | | | | 480 | 900 | | 480 | 900 | µA |



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## ELECTRICAL CHARACTERISTICS (Compensator LT1025)

**The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at $T_A$ = 25°C. $V_S$ = 5V unless otherwise noted.**

| PARAMETER | CONDITIONS | | COMPENSATOR (LT1025) MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Temperature Error at 10mV/°C Output (Note 9) | $T_J$ = 25°C, LTK001A<br>$T_J$ = 25°C, LTK001 | | | 0.3<br>0.5 | 0.5<br>2.0 | °C<br>°C |
| | Full Temperature Span | ● | See Curve on LT1025 Data Sheet | | | |
| Temperature Error at Individual Outputs (Note 10) | LTK001A: E, J, K, T<br>LTK001A: R, S | | | 0.4<br>0.4 | 0.75<br>1.5 | °C<br>°C |
| | LTK001: E, J, K, T<br>LTK001: R, S | | | 0.8<br>1.2 | 2.4<br>3.5 | °C<br>°C |
| | Full Temperature Span | ● | See Curve on LT1025 Data Sheet | | | |
| Supply Current | 4V ≤ $V_{IN}$ ≤ 36V | | | 80 | 100 | µA |
| | 0°C ≤ $T_J$ ≤ 70°C | ● | | | 150 | µA |
| | –55°C ≤ $T_J$ ≤ 125°C | ● | | | 200 | µA |
| Change in Supply Current | 4V ≤ $V_{IN}$ ≤ 36V | | | 0.01 | 0.05 | µA/V |
| Line Regulation (Note 11) | 4V ≤ $V_{IN}$ ≤ 36V<br>10mV/°C Output | ● | | 0.003 | 0.02 | °C/V |
| Load Regulation (Note 11) | 0 ≤ $I_O$ ≤ 1mA<br>10mV/°C Output | ● | | 0.04 | 0.2 | °C |
| Divider Impedance | E<br>J<br>K, T<br>R, S | | | 2.5<br>2.1<br>4.4<br>3.8 | | kΩ<br>kΩ<br>kΩ<br>kΩ |



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## ELECTRICAL CHARACTERISTICS (Amplifier LTKA0x)

**The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at $T_A$ = 25°C. $V_S$ = ±15V, $V_{CM}$ = 0V, $T_J$ = 25°C unless otherwise noted.**

| PARAMETER | CONDITIONS | | | AMPLIFIER (LTKA0x) MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|
| Input Offset Voltage | | | | | 10 | 35 | µV |
| Input Offset Voltage Drift with Temperature | (Note 6) | | ● | | 0.3 | 1.5 | µV/°C |
| Input Bias Current | 0°C ≤ $T_A$ ≤ 70°C<br>–55°C ≤ $T_A$ ≤ 125°C | | ●<br>● | | ±200<br>±300 | ±600<br>±1500 | pA<br>pA |
| Input Bias Current Drift with Temperature | (Note 6) | | | | 1 | 5 | pA/°C |
| Input Offset Current | 0°C ≤ $T_A$ ≤ 70°C<br>–55°C ≤ $T_A$ ≤ 125°C | | ●<br>● | | ±100<br>±200 | ±500<br>±700 | pA<br>pA |
| Input Offset Current Drift with Temperature | (Note 6) | | ● | | 0.6 | 4 | pA/°C |
| Large Signal Voltage Gain | $R_L$ = 10kΩ | | ● | 400 | 2000 | | V/mV |
| Common Mode Rejection Ratio | $V_{CM}$ = ±13.5V | | ● | 106 | 130 | | dB |
| Power Supply Rejection Ratio | ±2.5V ≤ $V_S$ ≤ ±20V (Note 5) | | ● | 106 | 125 | | dB |
| Common Mode Input Voltage Range | Notes 6, 7 | Above $V^-$ | | 0.75 | | | V |
| | | Below $V^+$ | | | | 1.0 | V |
| Output Voltage Swing (Notes 6, 8) | Referred to Supplies | $I_{OUT}$ = 0.1mA | | | 0.8 | | V |
| | | $I_{OUT}$ = 1mA | | | 1.1 | | V |
| Supply Current | | | ● | | 400 | 800 | µA |
| Supply Voltage Range | Total $V^+$ to $V^-$ Voltage | | ● | 4.5 | | 40 | V |

**Note 1:** Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

**Note 2:** The inputs of the LTKA0x amplifier are clamped with diodes, so a differential voltage rating does not apply.

**Note 3:** Total temperature error is the overall error at 25°C taking into account the offset of the amplifier, the offset at the compensator 10mV/°C output, and the error in the compensator divider network. Warmup drift is not included.

**Note 4:** Slope error is the increase in total temperature error as ambient temperature is increased. It is guaranteed by design and by other tests, but is not tested directly.

**Note 5:** This is a worst-case limit assuming that any or all supply voltages change.

**Note 6:** Guaranteed, but not tested.

**Note 7:** By referring common mode range to the supplies, the range referred to ground can be quickly calculated for any given supply voltage. With a single 5V supply, for instance, which has a worst-case low value of 4.7V, the upper common mode limit is 4.7V – 1V = 3.7V. The lower common mode limit is 0V + 0.75V = 0.75V. With ±15V supplies, the limits would be 14V and –14.25V, respectively. Common mode range has a temperature sensitivity of ≈2mV/°C.

**Note 8:** Absolute output voltage swing is calculated by subtracting the given limits from actual supply voltage. These limits indicate the point where offset voltage has changed suddenly by 5µV.

**Note 9:** Temperature error is defined as the deviation from the following formula:

$V_{OUT} = \alpha(T) + \alpha\beta(T - 25°C)^2$

$\alpha$ = Typical thermocouple Seebeck coefficient as follows, E = 60.9µV/°C, J = 51.7µV/°C, K, T = 40.6µV/°C, R, S = 5.95µV/°C.

$\alpha$ = 10mV/°C at the 10mV output.

$\beta$ = Nonlinearity coefficient built into the LT1025 to help compensate for the nonlinearities of thermocouples. $\beta = 5.5 \times 10^{-4}$, generating 0.34°C bow for 25°C temperature change, and 1.36°C bow for 50°C change.

**Note 10:** Temperature error at the individual outputs is the sum of the 10mV/°C output error plus the resistor divider error.

**Note 11:** Line and load regulation do not take into account the effects of self-heating. Output changes due to self-heating can be calculated as follows:

$\Delta V_{OUT}$ (Line) = $\Delta V_{IN}(I_q + I_{load})(150°C/W)$

$\Delta V_{OUT}$ (Load) = $(\Delta I_{load})(V_{IN})(150°C/W)$
= LT1025 supply current

Load regulation is 30µA ≤ $I_O$ ≤ 1mA for $T_A$ ≤ 0°C.

**Note 12:** Larger errors with type R and S thermocouples are due mostly to 35µV offset of the amplifier. This error can be reduced to 5µV max with the LTC®1050 or LTC1052 operational amplifiers.



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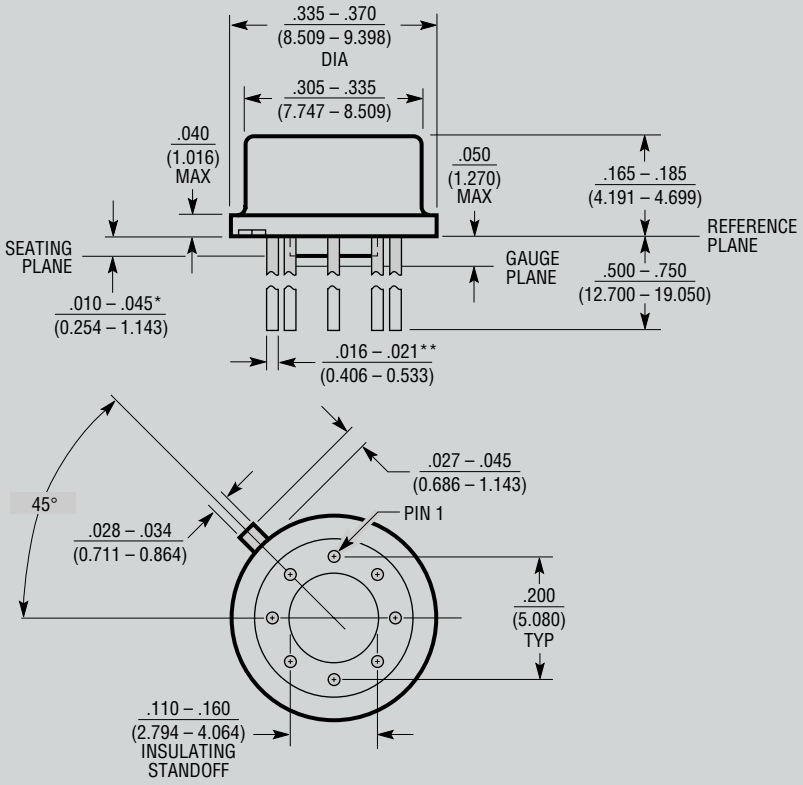
# PACKAGE DESCRIPTION

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




*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)

H8(TO-5) 0.200 PCD 0204

**OBSOLETE PACKAGE**



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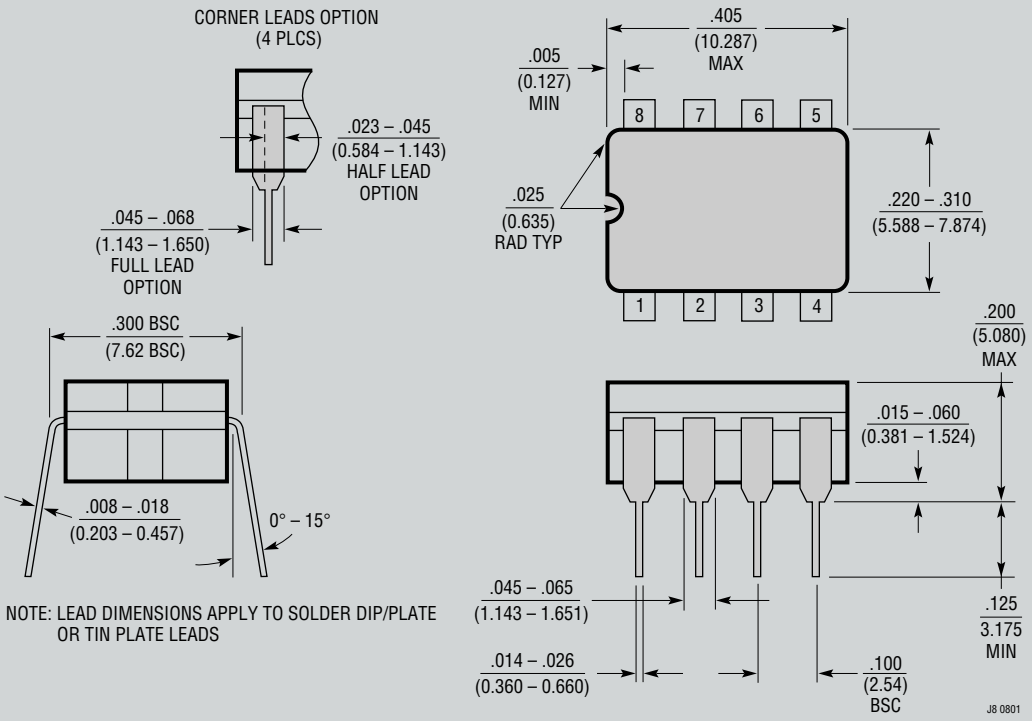
# PACKAGE DESCRIPTION

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




**OBSOLETE PACKAGE**



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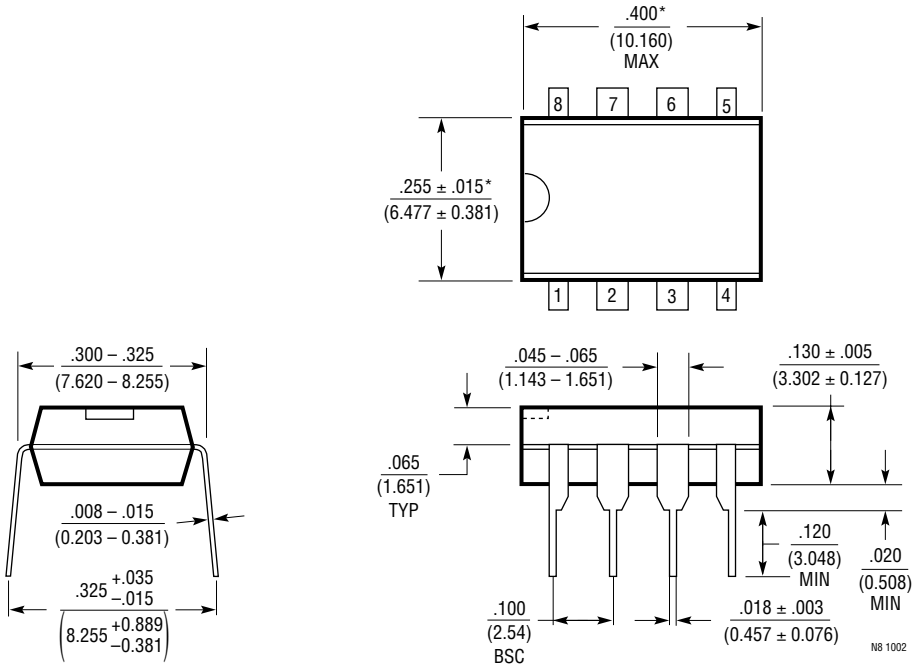
# PACKAGE DESCRIPTION

**N8 Package**
**8-Lead PDIP (Narrow .300 Inch)**
(Reference LTC DWG # 05-08-1510)




NOTE:
1. DIMENSIONS ARE INCHES / MILLIMETERS

*THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCH (0.254mm)

# RELATED PARTS

| PART NUMBER | DESCRIPTION | COMMENTS |
|---|---|---|
| LT1012 | Picoamp Input Current Amplifier | $V_{OS}$ = 120μV MAX, $I_{OS}$ = 280pA MAX |
| LT1025 | Thermocouple Cold Junction Comparator | Micropower, 0.5°C Initial Accuracy |
| LTC1050 | Zero Drift Amplifier | $V_{OS}$ = 5μV MAX, $A_{VOL}$ = 1V/μV MAX |
| LTC2050 | SOT-23 Zero Drift Amplifier | $V_{OS}$ = 3μV MAX |



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