ZHHXDZ 珠海海芯电子有限公司

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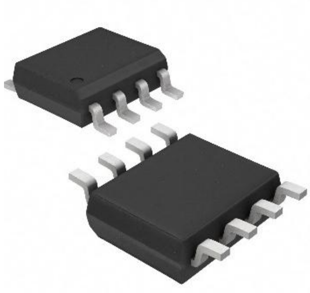
# HX07-S General Purpose Amplifier

## General Description

The HX07-S is an industry standard for instrumentation applications due to its excellent accuracy and stability. It offers a wide input voltage range of ±13 V minimum, high CMRR of 106 dB, and high input impedance, ensuring high accuracy in the noninverting circuit configuration. Even at high closed-loop gains, the HX07-S maintains excellent linearity and gain accuracy. It exhibits outstanding stability of offsets and gain over time and variations in temperature. With its accuracy and stability, combined with the freedom from external nulling, the HX07-S has become widely recognized and used in the instrumentation industry.



SOP-8

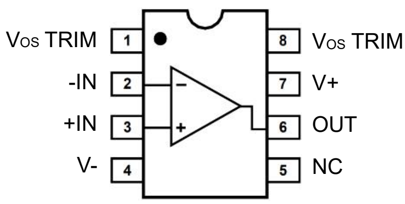
## Features

- Low VOS: maximum 75 μV
- Low VOS drift: maximum 1.3 μV/°C
- Low noise: maximum 0.6 μV p-p
- Ultrastable vs. time: maximum 1.5 μV per month
- Wide supply voltage range: ±3V to ±18 V
- Wide input voltage range: typical ±14 V
- 125°C temperature-tested dice

## Applications

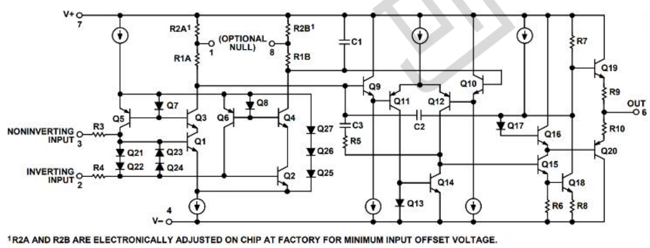
- Wireless base station control circuits
- Optical network control circuits
- Instrumentation
- Sensors and controls
  - Thermocouples
  - Strain bridges
  - Shunt current measurements
  - Resistor thermal detectors (RTDs)
- Precision filters

## PIN CONFIGURATIONS




NC = NO CONNECT

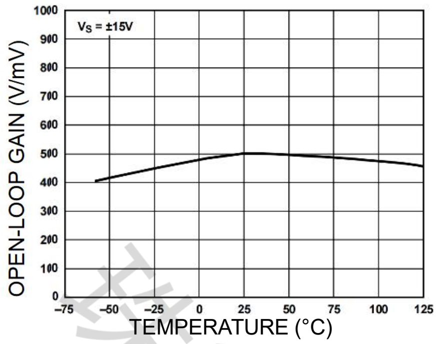
## Simplified Schematic



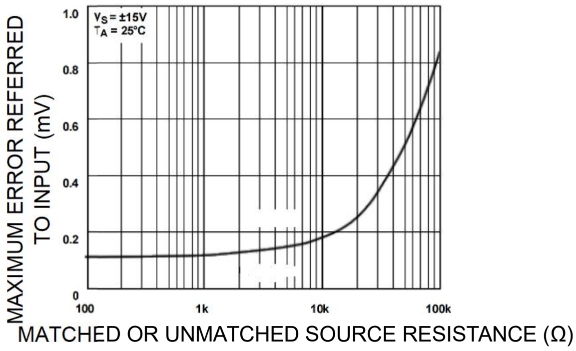
## ELECTRICAL CHARACTERISTICS

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **INPUT CHARACTERISTICS** | | | | | | |
| **TA = 25°C** | | | | | | |
| Input Offset Voltage | $V_{OS}$ | | | 60 | 150 | µV |
| Long-Term VOS Stability | $V_{OS}$/Time | | | 0.4 | 2.0 | µV/Month |
| Input Offset Current | $I_{OS}$ | | | 0.8 | 6.0 | nA |
| Input Bias Current | $I_B$ | | | ±1.8 | ±7.0 | nA |
| Input Noise Voltage | $e_n$ p-p | 0.1 Hz to 10 Hz | | 0.38 | 0.65 | µV p-p |
| Input Noise Voltage Density | $e_n$ | $f_O$ = 10 Hz | | 10.5 | 20.0 | nV/√Hz |
| | | $f_O$ = 100 Hz[C] | | 0.2 | 13.5 | |
| | | $f_O$ = 1 kHz | | 9.8 | 11.5 | |
| Input Noise Current | $I_n$ p-p | | | 15 | 35 | pA p-p |
| Input Noise Current Density | $I_n$ | $f_O$ = 10 Hz | | 0.35 | 0.90 | pA/√Hz |
| | | $f_O$ = 100 Hz[C] | | 0.15 | 0.27 | |
| | | $f_O$ = 1 kHz | | 0.13 | 0.18 | |
| Input Resistance, Differential Mode | $R_{IN}$ | | 8 | 33 | | MΩ |
| Input Resistance, Common Mode | $R_{INCM}$ | | | 120 | | GΩ |
| Input Voltage Range | IVR | | ±13 | ±14 | | V |
| Common-Mode Rejection Ratio | CMRR | $V_{CM}$ = ±13 V | 100 | 120 | | dB |
| Power Supply Rejection Ratio | PSRR | $V_S$ = ±3 V to ±18 V | | 7 | 32 | µV/V |
| Large Signal Voltage Gain | $A_{VO}$ | $R_L$ ≥ 2 kΩ, $V_O$ = ±10 V | 120 | 400 | | V/Mv |
| | | $R_L$ ≥ 500 Ω, $V_O$ = ±0.5 V, $V_S$ = ±3 V | 100 | 400 | | |
| **−40°C ≤ TA ≤ +85°C** | | | | | | |
| Input Offset Voltage | $V_{OS}$ | | | 85 | 250 | µV |
| Voltage Drift Without External Trim | $TCV_{OS}$ | | | 0.5 | 1.8 | µV/°C |
| Voltage Drift with External Trim | $TCV_{OSN}$ | $R_P$ = 20 kΩ | | 0.4 | 1.6 | µV/°C |
| Input Offset Current | $I_{OS}$ | | | 1.6 | 8.0 | nA |
| Input Offset Current Drift | $TCI_{OS}$ | | | 12 | 50 | pA/°C |
| Input Bias Current | $I_B$ | | | ±2.2 | ±9.0 | nA |
| Input Bias Current Drift | $TCI_B$ | | | 18 | 50 | pA/°C |
| Input Voltage Range | IVR | | ±13 | ±13.5 | | V |
| Common-Mode Rejection Ratio | CMRR | $V_{CM}$ = ±13 V | 97 | 120 | | dB |
| Power Supply Rejection Ratio | PSRR | $V_S$ = ±3 V to ±18 V | | 10 | 51 | µV/V |
| Large Signal Voltage Gain | $A_{VO}$ | $R_L$ ≥ 2 kΩ, $V_O$ = ±10 V | 100 | 400 | | V/mV |
| **OUTPUT CHARACTERISTICS** | | | | | | |
| **TA = 25°C** | | | | | | |
| Output Voltage Swing | $V_O$ | $R_L$ ≥ 10 kΩ | ±12.0 | ±13.0 | | V |
| | | $R_L$ ≥ 2 kΩ | ±11.5 | ±12.8 | | |
| | | $R_L$ ≥ 1 kΩ | | ±12.0 | | |
| **−40°C ≤ TA ≤ +85°C** | | | | | | |
| Output Voltage Swing | $V_O$ | $R_L$ ≥ 2 kΩ | ±12 | ±12.6 | | V |
| **DYNAMIC PERFORMANCE** | | | | | | |
| **TA = 25°C** | | | | | | |
| Slew Rate | SR | $R_L$ ≥ 2 kΩ | 0.1 | 0.3 | | V/µs |
| Closed-Loop Bandwidth | BW | $A_{VOL}$ = 1[E] | 0.4 | 0.6 | | MHz |
| Open-Loop Output Resistance | $R_O$ | $V_O$ = 0, $I_O$ = 0 | | 60 | | Ω |
| Power Consumption | $P_d$ | $V_S$ = ±15 V, No load | | 80 | 150 | mW |
| | | $V_S$ = ±3 V, No load | | 4 | 8 | |
| Offset Adjustment Range | | $R_P$ = 20 kΩ | | ±4 | | mV |

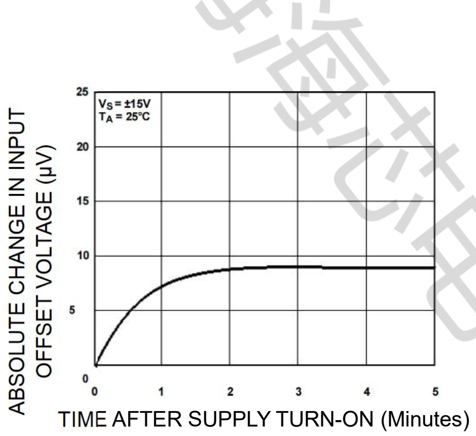
## TYPICAL PERFORMANCE CHARACTERISTICS



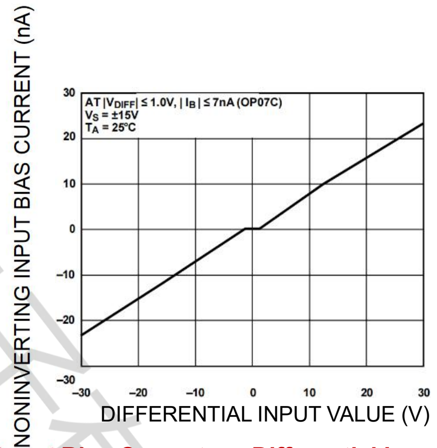

**Open-Loop Gain vs. Temperature**



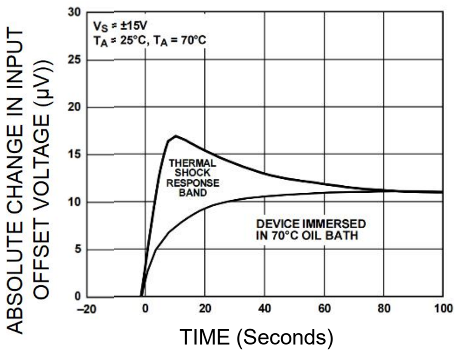

**Maximum Error *vs. Source Resistance***



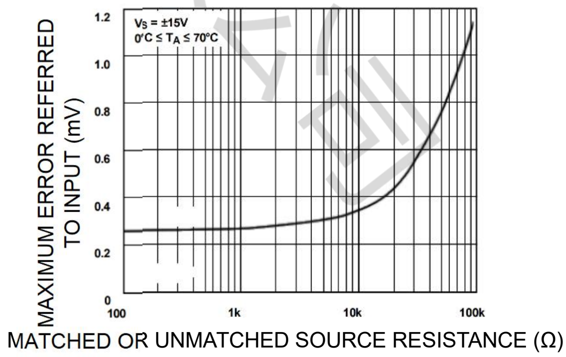

**Warm-Up Drift**



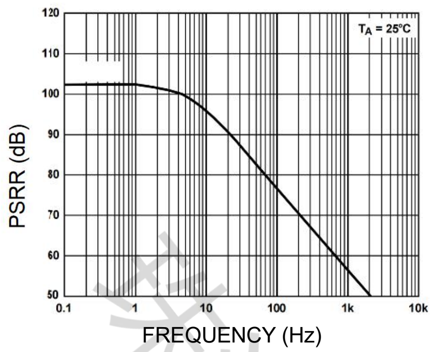

**Input Bias Current vs. Differential Input Voltage**



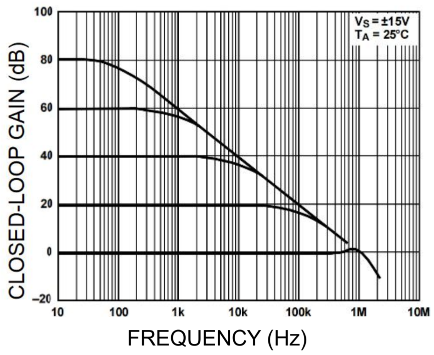

**Offset Voltage Change due to Thermal**



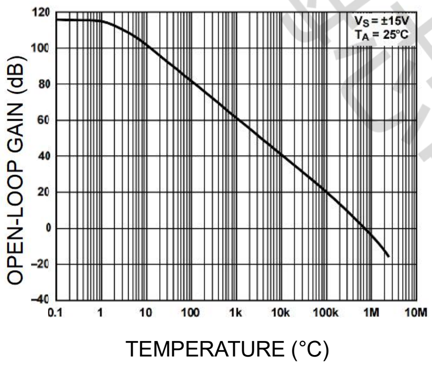

**Maximum Error vs. Source Resistance**



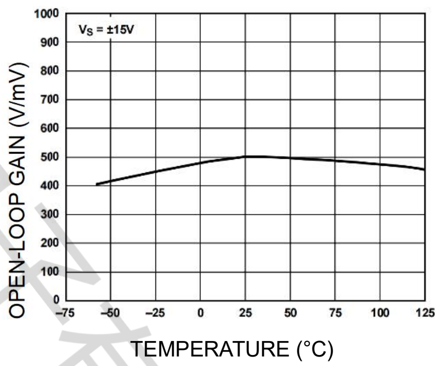

**PSRR vs. Frequency**



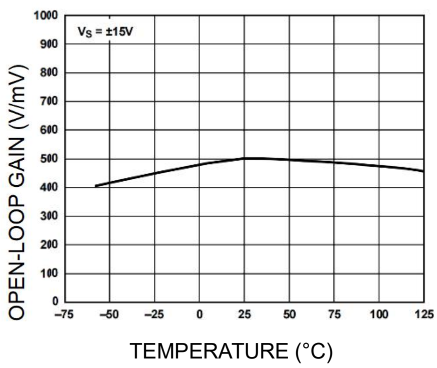

**Closed-Loop Frequency Response for Various Gain**



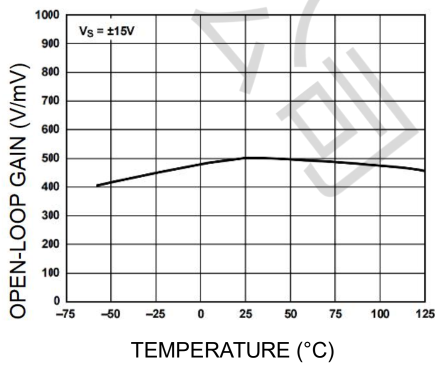

**Open-Loop Gain vs. Temperature**



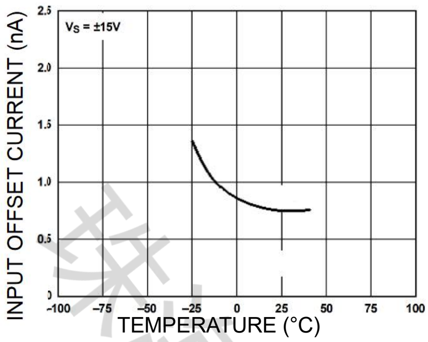

**Open-Loop Gain vs. Temperature**



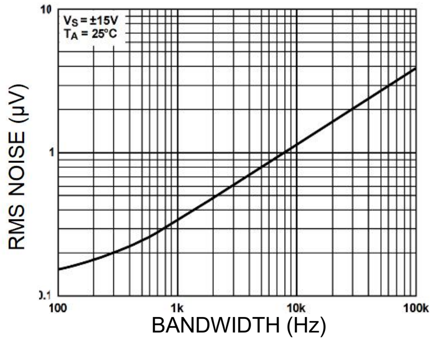

**Open-Loop Gain vs. Temperature**



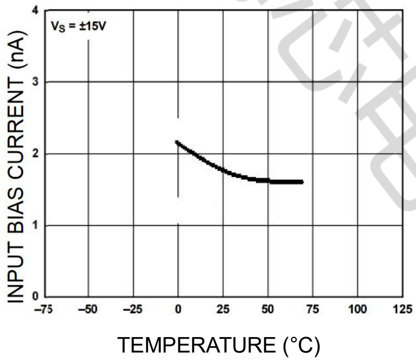

**Open-Loop Gain vs. Temperature**



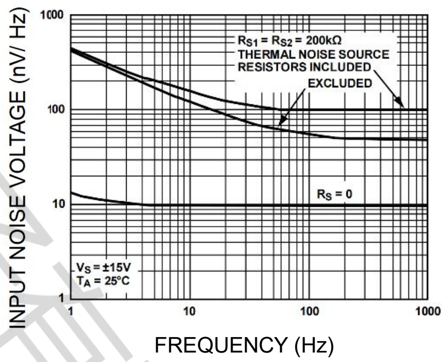

**Input Offset Current vs. Temperature**



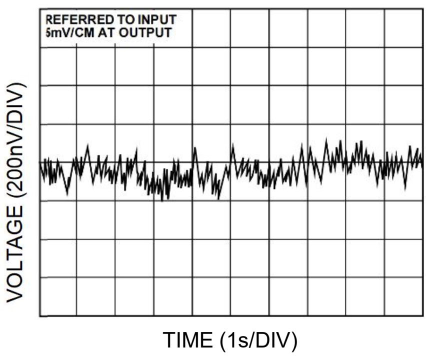

**Input Wideband Noise vs. Bandwidth, 0.1 Hz to Frequency Indicated**



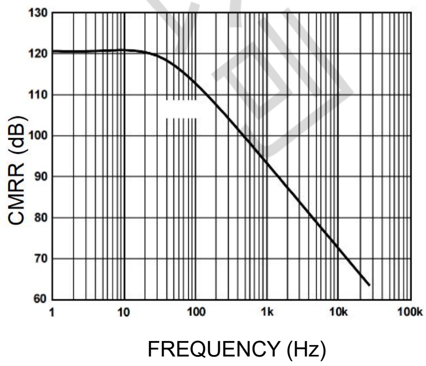

**Input Bias Current vs. Temperature**



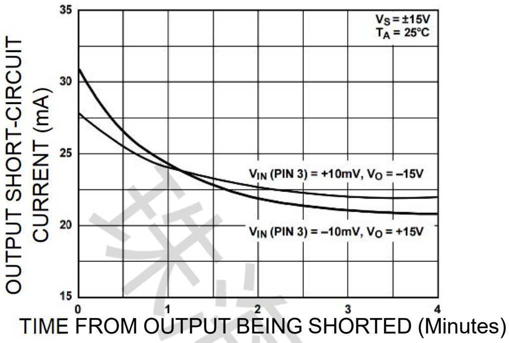

**Total Input Noise Voltage vs. Frequency**



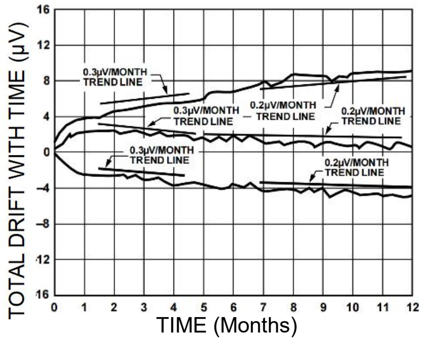

**Low Frequency Noise**



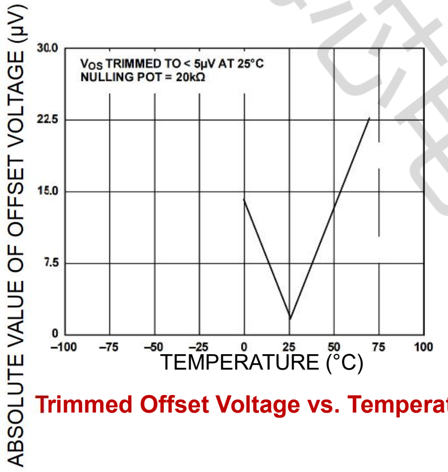

**CMRR vs. Frequency**



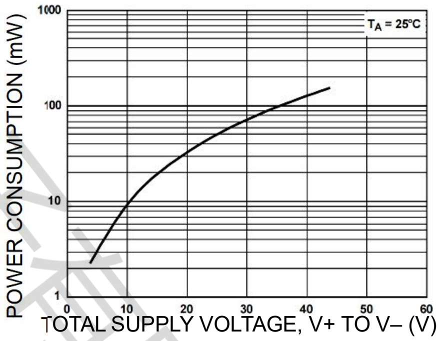

**Output Short-Circuit Current vs. Time**



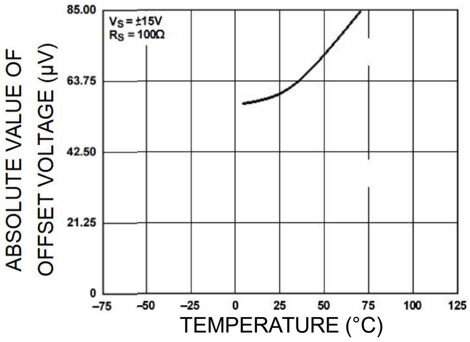

**Offset Voltage Drift vs. Time**



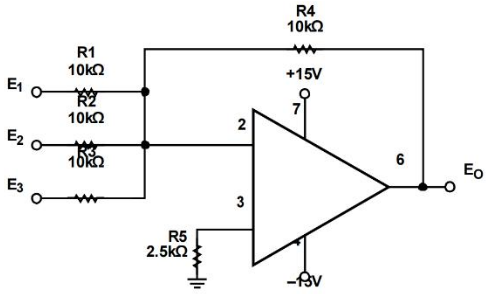

**Trimmed Offset Voltage vs. Temperature**



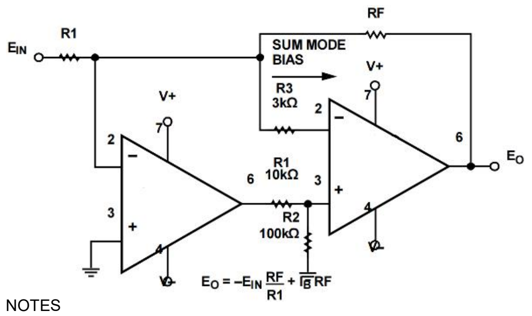

**Power Consumption vs. Power Supply**




**Untrimmed Offset Voltage vs. Temperature**

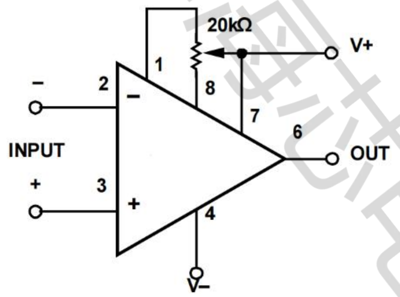



Typical Low Frequency Noise Circuit

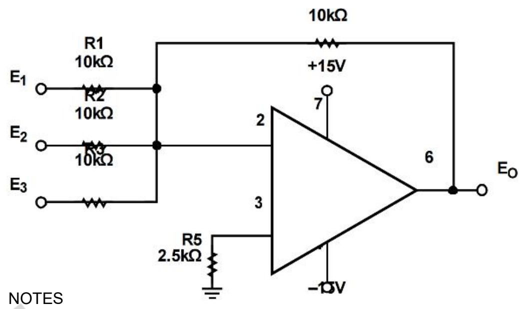



NOTES
1. PINOUT SHOWN FOR P PACKAGE

High Speed, Low VOS Composite Amplifier

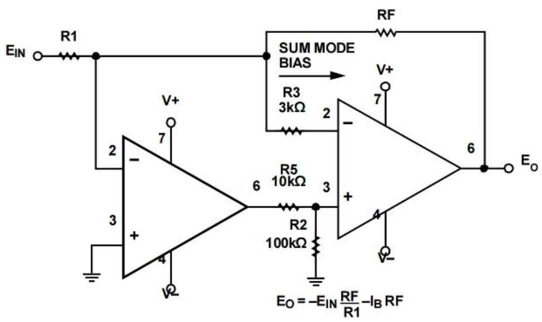



Optional Offset Nulling Circuit

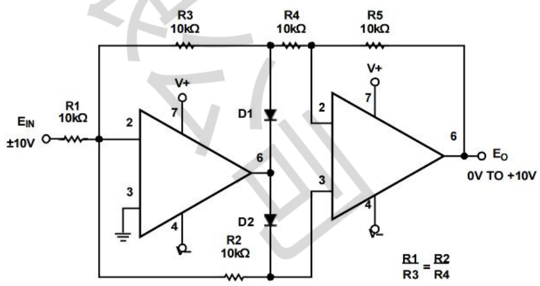



NOTES
1. PINOUT SHOWN FOR P PACKAGE

TEN Test Circuit and Voltage Waveforms



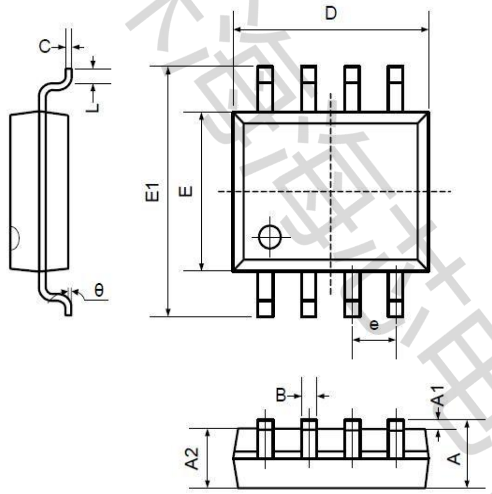

Typical Offset Voltage Test Circuit



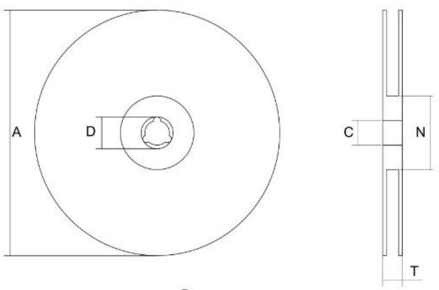

Absolute Value Circuit

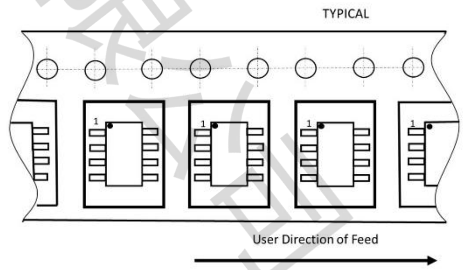
## DIMENSIONAL DRAWINGS

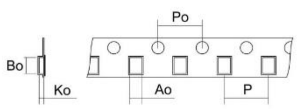
### SOP-8 (Package Outline Dimensions)




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| B | 0.330 | 0.510 | 0.013 | 0.020 |
| C | 0.190 | 0.250 | 0.007 | 0.010 |
| D | 4.780 | 5.000 | 0.188 | 0.197 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.300 | 0.228 | 0.248 |
| e | 1.270TYP | | 0.050TYP | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |




| Package Type | package | quantity |
|---|---|---|
| SOP-8 | Taping | 2500 |

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