INTERSIL

# ICL8007
# FET Input Operational Amplifier

## GENERAL DESCRIPTION

The Intersil 8007 integrated circuit is a low input current FET input operational amplifier. The 8007A is selected for 1 pA max input current.

The devices are designed for use in very high input impedance applications. Because of their high slew rate, high common mode voltage range and absence of "latch-up", they are ideal for use as a voltage follower.

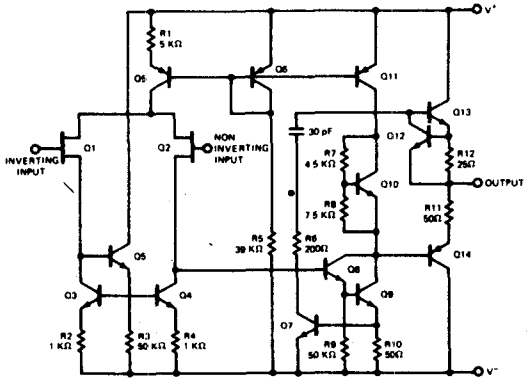
The Intersil 8007 and 8007A are short circuit protected. They require no external components for frequency compensation because the internal 6 dB/roll-off insures stability in closed loop applications. A unique bootstrap circuit insures unusually good commonmode rejection for an FET input amp and prevents large input currents as seen in some amplifiers at high common mode voltage.

## ABSOLUTE MAXIMUM RATINGS

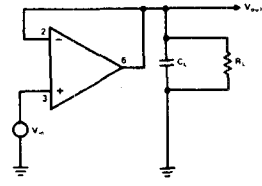
| | |
|---|---|
| Supply Voltage | ±18V |
| Internal Power Dissipation (Note 1) | 500 mW |
| Differential Input Voltage | ±30V |
| Input Voltage (Note 2) | ±15V |
| Storage Temperature Range | -65°C to +150°C |
| Operating Temperature Range | |
| 8007M, 8007AM | -55°C to +125°C |
| 8007C, 8007AC | 0°C to +70°C |
| Lead Temperature (Soldering, 10 sec.) | 300°C |
| Output Short-Circuit Duration (Note 3) | Indefinite |

**NOTES:**
1. Rating applies for case temperatures to 125°C; derate linearly at 6.5 mW/°C for ambient temperatures above +75°C.
2. For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.
3. Short circuit may be to ground or either supply. Rating applies to +125°C case temperature or +75°C ambient temperature.

## EQUIVALENT CIRCUIT




## TRANSIENT RESPONSE TEST CIRCUIT



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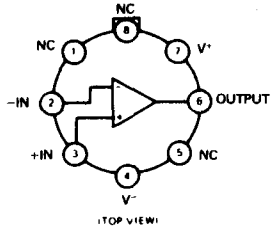
## PIN CONFIGURATION (outline dwg TO-99)




NOTE: Pin 4 connected to case

## ORDERING INFORMATION

| Part Number | Temperature Range | dice | To-99 Can |
|---|---|---|---|
| ICL8007C<br>ICL8007AC | 0°C to +70°C | ICL8007C/D<br>ICL8007AC/D | ICL8007CTV<br>ICL8007ACTV |
| ICL8007M<br>ICL8007AM | -55°C to +125°C | ICL8007M/D<br>ICL8007AM/D | ICL8007MTV<br>ICL8007AMTV* |

* Add /883B to order number if 883B processing is desired.

## ELECTRICAL CHARACTERISTICS ($V_S$ = ±15V unless otherwise specified)

| CHARACTERISTICS | CONDITIONS | 8007M | | | 8007C | | | 8007AM & 8007AC | | | UNITS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | |
| **The following specifications apply for $T_A$ = 25°C:** | | | | | | | | | | | |
| Input Offset Voltage | $R_S \leq 100\ k\Omega$ | | 10 | 20 | | 20 | 50 | | 15 | 30 | mV |
| Input Offset Current | | | 0.5 | | | 0.5 | | | 0.2 | | pA |
| Input Current (either input) | | | 2.0 | 20 | | 3.0 | 50 | | 0.5 | 4.0 | pA |
| Input Resistance | | | $10^6$ | | | $10^6$ | | | $10^8$ | | MΩ |
| Input Capacitance | | | 2.0 | | | 2.0 | | | 2.0 | | pF |
| Large Signal Voltage Gain | $R_L \geq 2\ k\Omega$, $V_{OUT}$ = ±10V | 50,000 | | | 20,000 | | | 20,000 | | | V/V |
| Output Resistance | | | 75 | | | 75 | | | 75 | | Ω |
| Output Short-Circuit Current | | | 25 | | | 25 | | | 25 | | mA |
| Supply Current | | | 3.4 | 5.2 | | 3.4 | 6.0 | | 3.4 | 6.0 | mA |
| Power Consumption | | | 102 | 156 | | 102 | 180 | | 102 | 180 | mW |
| Slew Rate | | | 6.0 | | | 6.0 | | 2.5 | 6.0 | | V/μs |
| Unity Gain Bandwidth | | | 1.0 | | | 1.0 | | | 1.0 | | MHz |
| Transient Response (Unity Gain) | $C_L \leq 100\ pF$, $R_L$ = 2 kΩ | | | | | | | | | | |
| Risetime | | | 300 | | | 300 | | | 300 | | ns |
| Overshoot | | | 10 | | | 10 | | | 10 | | % |
| **The following specifications apply for 0°C ≤ $T_A$ ≤ +70°C (8007C and 8007AC), −55°C ≤ $T_A$ ≤ +125°C (8007M and 8007AM):** | | | | | | | | | | | |
| Input Voltage Range | | ±10 | ±12 | | ±10 | ±12 | | ±10 | ±12 | | V |
| Common Mode Rejection Ratio | | 70 | 90 | | 70 | 90 | | 86 | 95 | | dB |
| Supply Voltage Rejection Ratio | | | 70 | 300 | | 70 | 600 | | 70 | 200 | μV/V |
| Large Signal Voltage Gain | | 25,000 | | | 15,000 | | | 15,000 | | | V/V |
| Output Voltage Swing | $R_L \geq 10\ k\Omega$ | ±12 | ±14 | | ±12 | ±14 | | ±12 | ±14 | | V |
| | $R_L \geq 2\ k\Omega$ | ±10 | ±13 | | ±10 | ±13 | | ±10 | ±13 | | V |
| Input Current (either input) | $T_A$ = +125°C | | 2.0 | | | | | | 1.0 | | nA |
| | $T_A$ = +70°C | | | | | 50 | | | 30 | | pA |
| Average Temperature Coefficient of Input Offset Voltage | | | | 75 | | | 75 | | | 50 | μV/°C |

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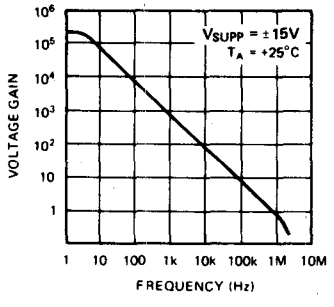
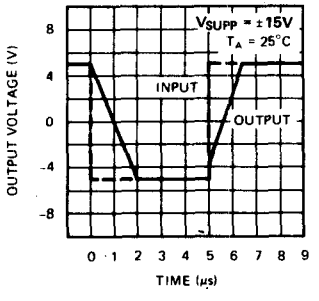
## TYPICAL PERFORMANCE CURVES

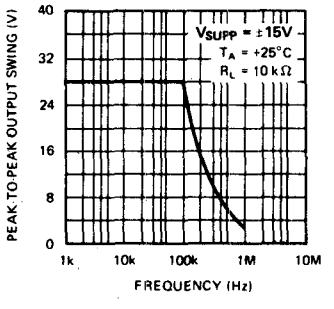
OPEN LOOP VOLTAGE GAIN



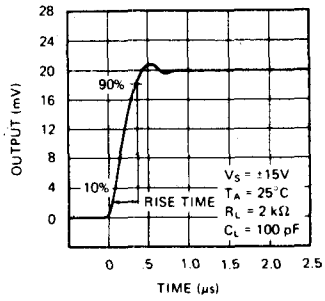

VOLTAGE FOLLOWER LARGE-SIGNAL PULSE RESPONSE



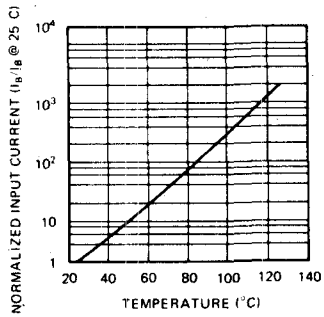

OUTPUT VOLTAGE SWING AS A FUNCTION OF FREQUENCY



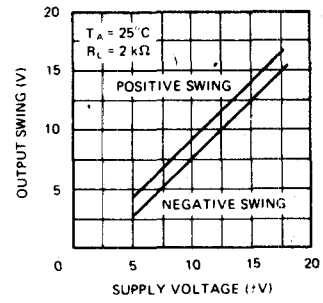
TRANSIENT RESPONSE



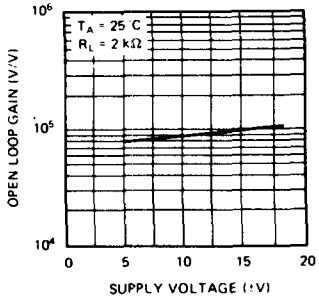

INPUT CURRENT AS A FUNCTION OF TEMPERATURE



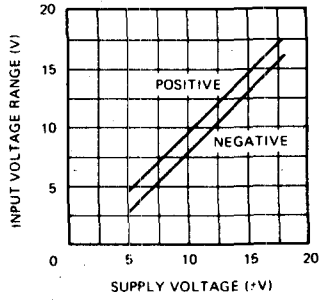

OUTPUT SWING AS A FUNCTION OF SUPPLY VOLTAGE



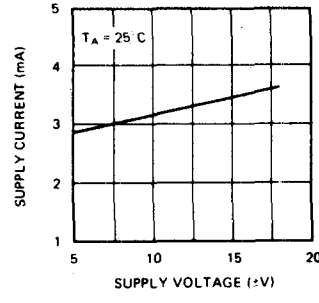

OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF SUPPLY VOLTAGE




INPUT VOLTAGE RANGE AS A FUNCTION OF SUPPLY VOLTAGE




QUIESCENT SUPPLY CURRENT AS A FUNCTION OF SUPPLY VOLTAGE

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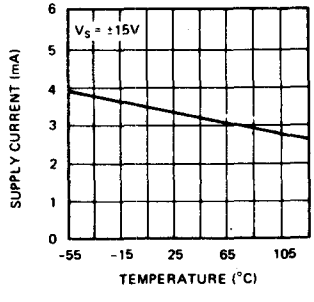
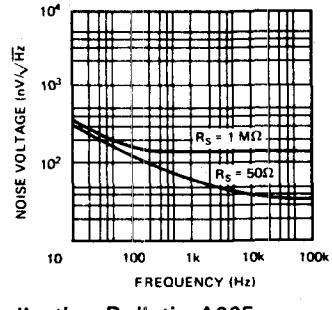
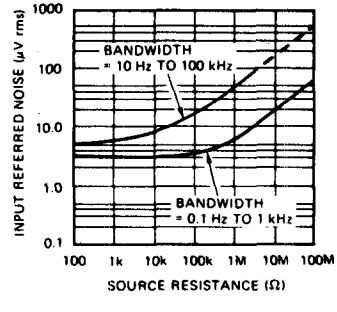
QUIESCENT SUPPLY CURRENT AS A FUNCTION OF TEMPERATURE




INPUT VOLTAGE NOISE AS A FUNCTION OF FREQUENCY




WIDEBAND NOISE AS A FUNCTION OF SOURCE RESISTANCE




For additional information, see Application Bulletin A005.