



LINEAR

TECHNOLOGY

325MHz, 140V/ μ s Rail-to-Rail Input and Output Low Distortion, Low Noise Precision Op Amp

June 2000

FEATURES

- Gain Bandwidth Product: 325MHz
- Slew Rate: 140V/ μ s
- Wide Supply Range: 2.5V to 12V
- Large Output Current: 85mA
- Low Distortion, 5MHz: -80 dBc
- Low Voltage Noise: 3.5nV/ $\sqrt{\text{Hz}}$
- Input Common Mode Range Includes Both Rails
- Output Swings Rail-to-Rail
- Input Offset Voltage (Rail-to-Rail): 550 μ V Max
- Common Mode Rejection: 106dB Typ
- Power Supply Rejection: 105dB Typ
- Open-Loop Gain: 300V/mV Typ
- Power Down Pin
- SO-8 Package
- Operating Temperature Range -40°C to 85°C

APPLICATIONS

- Active Filters
- Rail-to-Rail Buffer Amplifiers
- Driving A/D Converters
- Low Voltage Signal Processing
- Video Line Driver

DESCRIPTION

The LT[®]1806 is a rail-to-rail input and output op amp that features a 325MHz gain bandwidth product, a 140V/ μ s slew rate and a 85mA output current to fit the need for low voltage, high performance signal conditioning systems.

The LT1806 has a very low distortion of -80 dBc at 5MHz, a low input referred noise voltage of 3.5nV/ $\sqrt{\text{Hz}}$ and a maximum offset voltage of 550 μ V that allows it to be used in high performance data acquisition systems.

The LT1806 has an input range that includes both supply rails and an output that swings within 20mV of either supply rail to maximize the signal dynamic range in low supply applications.

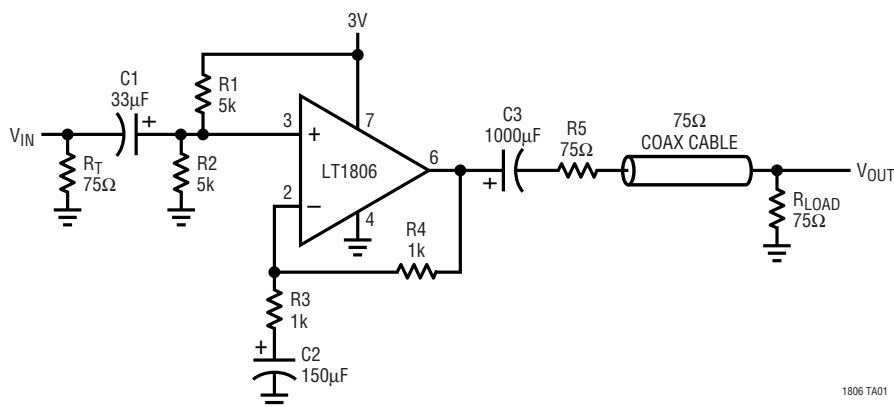
The LT1806 maintains its performance for supplies from 2.5V to 12V and is specified at 3V, 5V and ± 5 V supplies. The inputs can be driven beyond the supplies without damage or phase reversal of the output.

The LT1806 is available in an 8-pin SO package with the standard op amp pinout. This device can be used as a plug-in replacement for many op amps to improve input/output range and performance.

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TYPICAL APPLICATION

3V Single Supply Video Line Driver



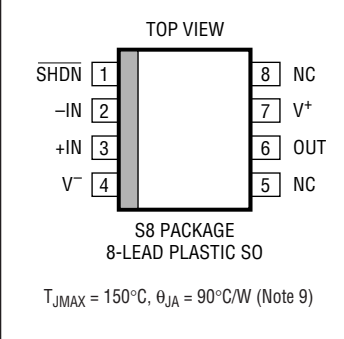
1806 TA01

ABSOLUTE MAXIMUM RATINGS

(Note 1)

| | |
|---|--|
| Total Supply Voltage (V^+ to V^-) | 12.6V |
| Input Voltage (Note 2) | $\pm V_S$ |
| Input Current (Note 2) | $\pm 10\text{mA}$ |
| Output Short-Circuit Duration (Note 3) | Indefinite |
| Operating Temperature Range (Note 4) .. | -40°C to 85°C |
| Specified Temperature Range (Note 5) ... | -40°C to 85°C |
| Junction Temperature | 150°C |
| Storage Temperature Range | -65°C to 150°C |
| Lead Temperature (Soldering, 10 sec) | 300°C |

PACKAGE/ORDER INFORMATION

| | |
|--|------------------------|
|  | ORDER PART NUMBER |
| | LT1806CS8 LT1806IS8 |
| | S8 PART MARKING |
| | 1806 1806I |

Consult factory for Military grade parts.

ELECTRICAL CHARACTERISTICS

$T_A = 25^\circ\text{C}$. $V_S = 5\text{V}$, 0V ; $V_S = 3\text{V}$, 0V ; $V_{\text{SHDN}} = \text{open}$; $V_{\text{CM}} = V_{\text{OUT}} = \text{half supply unless otherwise noted}$.

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|------------------------|------------------------------------|--|----------------------|----------------------|------------------|--|
| V_{OS} | Input Offset Voltage | $V_{\text{CM}} = V^+$ $V_{\text{CM}} = V^-$ | | 100 | 550 | μV μV |
| ΔV_{OS} | Input Offset Voltage Shift | $V_{\text{CM}} = V^-$ to V^+ | | 50 | 500 | μV |
| I_{B} | Input Bias Current | $V_{\text{CM}} = V^+$ $V_{\text{CM}} = V^-$ | -13 | 1 -5 | 4 | μA μA |
| ΔI_{B} | Input Bias Current Shift | $V_{\text{CM}} = V^-$ to V^+ | | 6 | 17 | μA |
| I_{OS} | Input Offset Current | $V_{\text{CM}} = V^+$ $V_{\text{CM}} = V^-$ | | 0.03 0.05 | 0.6 1.5 | μA μA |
| ΔI_{OS} | Input Offset Current Shift | $V_{\text{CM}} = V^-$ to V^+ | | 0.08 | 2.1 | μA |
| | Input Noise Voltage | 0.1Hz to 10Hz | | 40 | | $\text{nV}_{\text{p-p}}$ |
| e_{n} | Input Noise Voltage Density | $f = 10\text{kHz}$ | | 3.5 | | $\text{nV}/\sqrt{\text{Hz}}$ |
| i_{n} | Input Noise Current Density | $f = 10\text{kHz}$ | | 4 | | $\text{pA}/\sqrt{\text{Hz}}$ |
| C_{IN} | Input Capacitance | | | 2 | | pF |
| A_{VOL} | Large Signal Voltage Gain | $V_S = 5\text{V}$, $V_O = 0.5\text{V}$ to 4.5V , $R_L = 1\text{k}$ $V_S = 5\text{V}$, $V_O = 1\text{V}$ to 4V , $R_L = 100$ $V_S = 3\text{V}$, $V_O = 0.5\text{V}$ to 2.5V , $R_L = 1\text{k}$ | 90 10 75 | 220 22 150 | | V/mV V/mV V/mV |
| CMRR | Common Mode Rejection Ratio | $V_S = 5\text{V}$, $V_{\text{CM}} = V^-$ to V^+ $V_S = 3\text{V}$, $V_{\text{CM}} = V^-$ to V^+ | 80 75 | 100 95 | | dB dB |
| | Input Common Mode Range | | V^- | | V^+ | V |
| PSRR | Power Supply Rejection Ratio | $V_S = 2.5\text{V}$ to 10V , $V_{\text{CM}} = 0\text{V}$ | 91 | 105 | | dB |
| | Minimum Supply Voltage (Note 6) | | | 2.3 | 2.5 | V |
| V_{OL} | Output Voltage Swing LOW (Note 7) | No Load $I_{\text{SINK}} = 5\text{mA}$ $I_{\text{SINK}} = 25\text{mA}$ | | 6 45 170 | 35 130 400 | mV mV mV |
| V_{OH} | Output Voltage Swing HIGH (Note 7) | No Load $I_{\text{SOURCE}} = 5\text{mA}$ $I_{\text{SOURCE}} = 25\text{mA}$ | | 12 85 350 | 50 180 700 | mV mV mV |
| I_{SC} | Short-Circuit Current | $V_S = 5\text{V}$ $V_S = 3\text{V}$ | ± 35 ± 30 | ± 70 ± 60 | | mA mA |
| I_{S} | Supply Current | | | 9 | 13 | mA |

ELECTRICAL CHARACTERISTICS

T_A = 25°C. V_S = 5V, 0V; V_S = 3V, 0V; V_{SHDN} = open; V_{CM} = V_{OUT} = half supply unless otherwise noted.

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|----------------|---------------------------|---|-----|--------------|------------|----------|
| | Disable Supply Current | V _S = 5V, V _{SHDN} = 0V V _S = 3V, V _{SHDN} = 0V | | 0.30 0.16 | 0.9 0.7 | mA mA |
| GBW | Gain Bandwidth Product | Frequency = 2MHz | | 325 | | MHz |
| SR | Slew Rate | V _S = 5V, A _V = -1, R _L = 1k, V _O = 4V _{P-P} | | 130 | | V/μs |
| THD | Total Harmonic Distortion | V _S = 5V, A _V = 1, R _L = 1k, V _O = 2V _{P-P} , f _C = 5MHz | | -78 | | dB |
| t _S | Settling Time | 0.01%, V _S = 5V, V _{STEP} = 2V, A _V = 1, R _L = 1k | | 60 | | ns |
| ΔG | Differential Gain (NTSC) | V _S = 5V, A _V = 2, R _L = 150 | | 0.015 | | % |
| Δθ | Differential Phase (NTSC) | V _S = 5V, A _V = 2, R _L = 150 | | 0.05 | | Deg |

The ● denotes specifications which apply over the 0°C < T_A < 70°C temperature range. V_S = 5V, 0V; V_S = 3V, 0V; V_{SHDN} = open; V_{CM} = V_{OUT} = half supply unless otherwise noted.

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|--------------------|-------------------------------------|---|-------------|------------------|------------------|----------------------|
| V _{OS} | Input Offset Voltage | V _{CM} = V ⁺ V _{CM} = V ⁻ | ● ● | 200 200 | 700 700 | μV μV |
| V _{OS} TC | Input Offset Voltage Drift (Note 8) | V _{CM} = V ⁺ V _{CM} = V ⁻ | ● ● | 1.5 1.5 | 5 5 | μV/°C μV/°C |
| ΔV _{OS} | Input Offset Voltage Shift | V _{CM} = V ⁻ to V ⁺ | ● | 100 | 700 | μV |
| I _B | Input Bias Current | V _{CM} = V ⁺ - 0.1V V _{CM} = V ⁻ + 0.2V | ● ● | 1 -14 | 5 | μA μA |
| ΔI _B | Input Bias Current Shift | V _{CM} = V ⁻ + 0.2V to V ⁺ - 0.1V | ● | 6 | 19 | μA |
| I _{OS} | Input Offset Current | V _{CM} = V ⁺ - 0.1V V _{CM} = V ⁻ + 0.2V | ● ● | 0.03 0.05 | 0.75 1.8 | μA μA |
| ΔI _{OS} | Input Offset Current Shift | V _{CM} = V ⁻ + 0.2V to V ⁺ - 0.1V | ● | 0.08 | 2.55 | μA |
| A _{VOL} | Large Signal Voltage Gain | V _S = 5V, V _O = 0.5V to 4.5V, R _L = 1kΩ V _S = 5V, V _O = 1V to 4V, R _L = 100Ω V _S = 3V, V _O = 0.5V to 2.5V, R _L = 1kΩ | ● ● ● | 75 9 65 | 175 20 140 | V/mV V/mV V/mV |
| CMRR | Common Mode Rejection Ratio | V _S = 5V, V _{CM} = V ⁻ to V ⁺ V _S = 3V, V _{CM} = V ⁻ to V ⁺ | ● ● | 77 72 | 94 89 | dB dB |
| | Input Common Mode Range | | ● | V ⁻ | V ⁺ | V |
| PSRR | Power Supply Rejection Ratio | V _S = 2.5V to 10V, V _{CM} = 0V | ● | 89 | 105 | dB |
| | Minimum Supply Voltage (Note 6) | | ● | 2.3 | 2.5 | V |
| V _{OL} | Output Voltage Swing LOW (Note 7) | No Load I _{SINK} = 5mA I _{SINK} = 25mA | ● ● ● | 8 50 180 | 60 150 450 | mV mV mV |
| V _{OH} | Output Voltage Swing HIGH (Note 7) | No Load I _{SOURCE} = 5mA I _{SOURCE} = 25mA | ● ● ● | 30 110 370 | 80 220 750 | mV mV mV |
| I _{SC} | Short-Circuit Current | V _S = 5V V _S = 3V | ● ● | ±30 ±25 | ±65 ±55 | mA mA |
| I _S | Supply Current | | ● | 10 | 14 | mA |
| | Disable Supply Current | V _S = 5V, V _{SHDN} = 0V V _S = 3V, V _{SHDN} = 0V | ● ● | 0.3 0.18 | 1.1 0.9 | mA mA |
| GBW | Gain Bandwidth Product | Frequency = 2MHz | ● | 300 | | MHz |
| SR | Slew Rate | V _S = 5V, A _V = -1, R _L = 1k, V _O = 4V _{P-P} | ● | 100 | | V/μs |

ELECTRICAL CHARACTERISTICS The ● denotes the specifications which apply over the $-40^{\circ}\text{C} < T_A < 85^{\circ}\text{C}$ temperature range. $V_S = 5\text{V}, 0\text{V}; V_S = 3\text{V}, 0\text{V}; V_{\text{SHDN}} = \text{open}; V_{\text{CM}} = V_{\text{OUT}} = \text{half supply unless otherwise noted. (Note 5)}$

| SYMBOL | PARAMETER | CONDITIONS | | MIN | TYP | MAX | UNITS |
|------------------------|-------------------------------------|---|---|----------|----------|-------|--------------------------------|
| V_{OS} | Input Offset Voltage | $V_{\text{CM}} = V^+$ | ● | | 200 | 800 | μV |
| | | $V_{\text{CM}} = V^-$ | ● | | 200 | 800 | μV |
| $V_{\text{OS TC}}$ | Input Offset Voltage Drift (Note 8) | $V_{\text{CM}} = V^+$ | ● | | 1.5 | 5 | $\mu\text{V}/^{\circ}\text{C}$ |
| | | $V_{\text{CM}} = V^-$ | ● | | 1.5 | 5 | $\mu\text{V}/^{\circ}\text{C}$ |
| ΔV_{OS} | Input Offset Voltage Shift | $V_{\text{CM}} = V^-$ | ● | | 100 | 800 | μV |
| I_{B} | Input Bias Current | $V_{\text{CM}} = V^+ - 0.1\text{V}$ | ● | | 1 | 6 | μA |
| | | $V_{\text{CM}} = V^- + 0.2\text{V}$ | ● | -16 | -5 | | μA |
| ΔI_{B} | Input Bias Current Shift | $V_{\text{CM}} = V^- + 0.2\text{V to } V^+ - 0.1\text{V}$ | ● | | 6 | 22 | μA |
| I_{OS} | Input Offset Current | $V_{\text{CM}} = V^+ - 0.1\text{V}$ | ● | | 0.02 | 0.9 | μA |
| | | $V_{\text{CM}} = V^- + 0.2\text{V}$ | ● | | 0.05 | 2.1 | μA |
| ΔI_{OS} | Input Offset Current Shift | $V_{\text{CM}} = V^- + 0.2\text{V to } V^+ - 0.1\text{V}$ | ● | | 0.07 | 3 | μA |
| A_{VOL} | Large Signal Voltage Gain | $V_S = 5\text{V}, V_O = 0.5\text{V to } 4.5\text{V}, R_L = 1\text{k}\Omega$ | ● | 60 | 140 | | V/mV |
| | | $V_S = 5\text{V}, V_O = 1\text{V to } 4\text{V}, R_L = 100\Omega$ | ● | 7 | 16 | | V/mV |
| | | $V_S = 3\text{V}, V_O = 0.5\text{V to } 2.5\text{V}, R_L = 1\text{k}\Omega$ | ● | 50 | 100 | | V/mV |
| CMRR | Common Mode Rejection Ratio | $V_S = 5\text{V}, V_{\text{CM}} = V^- \text{ to } V^+$ | ● | 75 | 94 | | dB |
| | | $V_S = 3\text{V}, V_{\text{CM}} = V^- \text{ to } V^+$ | ● | 71 | 89 | | dB |
| | Input Common Mode Range | | ● | V^- | | V^+ | V |
| PSRR | Power Supply Rejection Ratio | $V_S = 2.5\text{V to } 10\text{V}, V_{\text{CM}} = 0\text{V}$ | ● | 87 | 105 | | dB |
| | | Minimum Supply Voltage (Note 6) | ● | | 2.3 | 2.5 | V |
| V_{OL} | Output Voltage Swing LOW (Note 7) | No Load | ● | | 10 | 70 | mV |
| | | $I_{\text{SINK}} = 5\text{mA}$ | ● | | 50 | 160 | mV |
| | | $I_{\text{SINK}} = 20\text{mA}$ | ● | | 170 | 400 | mV |
| V_{OH} | Output Voltage Swing HIGH (Note 7) | No Load | ● | | 300 | 100 | mV |
| | | $I_{\text{SOURCE}} = 5\text{mA}$ | ● | | 110 | 240 | mV |
| | | $I_{\text{SOURCE}} = 20\text{mA}$ | ● | | 310 | 650 | mV |
| I_{SC} | Short-Circuit Current | $V_S = 5\text{V}$ | ● | ± 22 | ± 45 | | mA |
| | | $V_S = 3\text{V}$ | ● | ± 20 | ± 40 | | mA |
| I_{S} | Supply Current | | ● | | 11 | 16 | mA |
| | | Disable Supply Current | ● | | 0.4 | 1.2 | mA |
| | | $V_S = 5\text{V}, V_{\text{SHDN}} = 0\text{V}$ | ● | | 0.4 | 1.2 | mA |
| | | $V_S = 3\text{V}, V_{\text{SHDN}} = 0\text{V}$ | ● | | 0.2 | 1 | mA |
| GBW | Gain Bandwidth Product | Frequency = 2MHz | ● | | 250 | | MHz |
| SR | Slew Rate | $V_S = 5\text{V}, A_V = -1, R_L = 1\text{k}, V_O = 4\text{V}_{\text{P-P}}$ | ● | | 80 | | $\text{V}/\mu\text{s}$ |

ELECTRICAL CHARACTERISTICS

$T_A = 25^\circ\text{C}$. $V_S = \pm 5\text{V}$, $V_{\text{SHDN}} = \text{open}$; $V_{\text{CM}} = 0\text{V}$, $V_{\text{OUT}} = 0\text{V}$ unless otherwise noted.

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|------------------------|------------------------------------|--|----------|----------|-------|------------------------------|
| V_{OS} | Input Offset Voltage | $V_{\text{CM}} = V^+$ | | 100 | 650 | μV |
| | | $V_{\text{CM}} = V^-$ | | 100 | 650 | μV |
| ΔV_{OS} | Input Offset Voltage Shift | $V_{\text{CM}} = V^-$ to V^+ | | 50 | 600 | μV |
| I_{B} | Input Bias Current | $V_{\text{CM}} = V^+$ | | 1 | 5 | μA |
| | | $V_{\text{CM}} = V^-$ | -14 | -5 | | μA |
| ΔI_{B} | Input Bias Current Shift | $V_{\text{CM}} = V^-$ to V^+ | | 6 | 19 | μA |
| I_{OS} | Input Offset Current | $V_{\text{CM}} = V^+$ | | 0.03 | 0.7 | μA |
| | | $V_{\text{CM}} = V^-$ | | 0.04 | 1.6 | μA |
| ΔI_{OS} | Input Offset Current Shift | $V_{\text{CM}} = V^-$ to V^+ | | 0.07 | 2.3 | μA |
| | Input Noise Voltage | 0.1Hz to 10Hz | | 40 | | $\text{nV}_{\text{P-P}}$ |
| e_{n} | Input Noise Voltage Density | $f = 10\text{kHz}$ | | 3.5 | | $\text{nV}/\sqrt{\text{Hz}}$ |
| i_{n} | Input Noise Current Density | $f = 10\text{kHz}$ | | 5 | | $\text{pA}/\sqrt{\text{Hz}}$ |
| C_{IN} | Input Capacitance | $f = 100\text{kHz}$ | | 2 | | pF |
| A_{VOL} | Large Signal Voltage Gain | $V_{\text{O}} = -4\text{V}$ to 4V , $R_{\text{L}} = 1\text{k}\Omega$ | 120 | 300 | | V/mV |
| | | $V_{\text{O}} = -2.5\text{V}$ to 2.5V , $R_{\text{L}} = 100\Omega$ | 12 | 27 | | V/mV |
| CMRR | Common Mode Rejection Ratio | $V_{\text{CM}} = V^-$ to V^+ | 84 | 106 | | dB |
| | Input Common Mode Range | | V^- | | V^+ | V |
| PSRR | Power Supply Rejection Ratio | $V^+ = 2.5\text{V}$ to 10V , $V_{\text{CM}} = 0\text{V}$ | 91 | 105 | | dB |
| V_{OL} | Output Voltage Swing LOW (Note 7) | No Load | | 10 | 60 | mV |
| | | $I_{\text{SINK}} = 5\text{mA}$ | | 45 | 140 | mV |
| | | $I_{\text{SINK}} = 25\text{mA}$ | | 180 | 450 | mV |
| V_{OH} | Output Voltage Swing HIGH (Note 7) | No Load | | 20 | 70 | mV |
| | | $I_{\text{SOURCE}} = 5\text{mA}$ | | 90 | 200 | mV |
| | | $I_{\text{SOURCE}} = 25\text{mA}$ | | 360 | 700 | mV |
| I_{SC} | Short-Circuit Current | | ± 40 | ± 85 | | mA |
| I_{S} | Supply Current | | | 11 | 16 | mA |
| | Disable Supply Current | $V_{\text{SHDN}} = 0\text{V}$ | | 0.4 | 1.2 | mA |
| GBW | Gain Bandwidth Product | Frequency = 2MHz | 180 | 325 | | MHz |
| SR | Slew Rate | $A_{\text{V}} = -1$, $R_{\text{L}} = 1\text{k}$, $V_{\text{O}} = \pm 4\text{V}$, Measure at $V_{\text{O}} = \pm 2\text{V}$ | 70 | 140 | | $\text{V}/\mu\text{s}$ |
| THD | Total Harmonic Distortion | $A_{\text{V}} = 1$, $R_{\text{L}} = 1\text{k}$, $V_{\text{O}} = 2V_{\text{P-P}}$, $f_{\text{C}} = 5\text{MHz}$ | | -80 | | dB |
| t_{S} | Settling Time | 0.01%, $V_{\text{STEP}} = 5\text{V}$, $A_{\text{V}} = 1$, $R_{\text{L}} = 1\text{k}$ | | 85 | | ns |
| ΔG | Differential Gain (NTSC) | $A_{\text{V}} = 2$, $R_{\text{L}} = 150$ | | 0.01 | | $\%$ |
| $\Delta\theta$ | Differential Phase (NTSC) | $A_{\text{V}} = 2$, $R_{\text{L}} = 150$ | | 0.01 | | Deg |

ELECTRICAL CHARACTERISTICS The ● denotes specifications which apply over the $0^{\circ}\text{C} < T_A < 70^{\circ}\text{C}$ temperature range. $V_S = \pm 5\text{V}$, $V_{\text{SHDN}} = \text{open}$; $V_{\text{CM}} = 0\text{V}$, $V_{\text{OUT}} = 0\text{V}$ unless otherwise noted.

| SYMBOL | PARAMETER | CONDITIONS | | MIN | TYP | MAX | UNITS |
|------------------------|-------------------------------------|--|---|----------|----------|-------|--------------------------------|
| V_{OS} | Input Offset Voltage | $V_{\text{CM}} = V^+$ | ● | | 200 | 800 | μV |
| | | $V_{\text{CM}} = V^-$ | ● | | 200 | 800 | μV |
| $V_{\text{OS TC}}$ | Input Offset Voltage Drift (Note 8) | $V_{\text{CM}} = V^+$ | ● | | 1.5 | 5 | $\mu\text{V}/^{\circ}\text{C}$ |
| | | $V_{\text{CM}} = V^-$ | ● | | 1.5 | 5 | $\mu\text{V}/^{\circ}\text{C}$ |
| ΔV_{OS} | Input Offset Voltage Shift | $V_{\text{CM}} = V^-$ to V^+ | ● | | 100 | 800 | μV |
| I_{B} | Input Bias Current | $V_{\text{CM}} = V^+ - 0.1\text{V}$ | ● | | 1 | 6 | μA |
| | | $V_{\text{CM}} = V^- + 0.2\text{V}$ | ● | -15 | -6 | | μA |
| ΔI_{B} | Input Bias Current Shift | $V_{\text{CM}} = V^- + 0.2\text{V}$ to $V^+ - 0.1\text{V}$ | ● | | 7 | 21 | μA |
| I_{OS} | Input Offset Current | $V_{\text{CM}} = V^+ - 0.1\text{V}$ | ● | | 0.03 | 0.9 | μA |
| | | $V_{\text{CM}} = V^- + 0.2\text{V}$ | ● | | 0.04 | 1.9 | μA |
| ΔI_{OS} | Input Offset Current Shift | $V_{\text{CM}} = V^- + 0.2\text{V}$ to $V^+ - 0.1\text{V}$ | ● | | 0.07 | 2.8 | μA |
| A_{VOL} | Large Signal Voltage Gain | $V_{\text{O}} = -4\text{V}$ to 4V , $R_{\text{L}} = 1\text{k}\Omega$ | ● | 100 | 250 | | V/mV |
| | | $V_{\text{O}} = -2.5\text{V}$ to 2.5V , $R_{\text{L}} = 100\Omega$ | ● | 10 | 25 | | V/mV |
| CMRR | Common Mode Rejection Ratio | $V_{\text{CM}} = V^-$ to V^+ | ● | 81 | 100 | | dB |
| | Input Common Mode Range | | ● | V^- | | V^+ | V |
| PSRR | Power Supply Rejection Ratio | $V^+ = 2.5\text{V}$ to 10V , $V_{\text{CM}} = 0\text{V}$ | ● | 89 | 105 | | dB |
| V_{OL} | Output Voltage Swing LOW (Note 7) | No Load | ● | | 10 | 100 | mV |
| | | $I_{\text{SINK}} = 5\text{mA}$ | ● | | 45 | 160 | mV |
| | | $I_{\text{SINK}} = 25\text{mA}$ | ● | | 200 | 550 | mV |
| V_{OH} | Output Voltage Swing HIGH (Note 7) | No Load | ● | | 40 | 120 | mV |
| | | $I_{\text{SOURCE}} = 5\text{mA}$ | ● | | 110 | 240 | mV |
| | | $I_{\text{SOURCE}} = 25\text{mA}$ | ● | | 320 | 750 | mV |
| I_{SC} | Short-Circuit Current | | ● | ± 35 | ± 75 | | mA |
| I_{S} | Supply Current | | ● | | 14 | 20 | mA |
| | Disable Supply Current | $V_{\text{SHDN}} = 0\text{V}$ | ● | | 0.4 | 1.4 | mA |
| GBW | Gain Bandwidth Product | Frequency = 2MHz | ● | 150 | 300 | | MHz |
| SR | Slew Rate | $A_{\text{V}} = -1$, $R_{\text{L}} = 1\text{k}$, $V_{\text{O}} = \pm 4\text{V}$, Measure at $V_{\text{O}} = \pm 2\text{V}$ | ● | 60 | 120 | | $\text{V}/\mu\text{s}$ |

ELECTRICAL CHARACTERISTICS The ● denotes the specifications which apply over the $-40^{\circ}\text{C} < T_A < 85^{\circ}\text{C}$ temperature range. $V_S = \pm 5\text{V}$, $V_{\text{SHDN}} = \text{open}$; $V_{\text{CM}} = 0\text{V}$, $V_{\text{OUT}} = 0\text{V}$ unless otherwise noted. (Note 5)

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|------------------------|-------------------------------------|--|-----|-------------------------------|----------|--------------------------------|
| V_{OS} | Input Offset Voltage | $V_{\text{CM}} = V^+$ | ● | 200 | 900 | μV |
| | | $V_{\text{CM}} = V^-$ | ● | 200 | 900 | μV |
| $V_{\text{OS TC}}$ | Input Offset Voltage Drift (Note 8) | $V_{\text{CM}} = V^+$ | ● | 1.5 | 5 | $\mu\text{V}/^{\circ}\text{C}$ |
| | | $V_{\text{CM}} = V^-$ | ● | 1.5 | 5 | $\mu\text{V}/^{\circ}\text{C}$ |
| ΔV_{OS} | Input Offset Voltage Shift | $V_{\text{CM}} = V^-$ to V^+ | ● | 100 | 900 | μV |
| I_{B} | Input Bias Current | $V_{\text{CM}} = V^+ - 0.1\text{V}$ | ● | 1.2 | 7 | μA |
| | | $V_{\text{CM}} = V^- + 0.2\text{V}$ | ● | -16 | -5 | μA |
| ΔI_{B} | Input Bias Current Shift | $V_{\text{CM}} = V^- + 0.2\text{V}$ to $V^+ - 0.1\text{V}$ | ● | 6.2 | 23 | μA |
| I_{OS} | Input Offset Current | $V_{\text{CM}} = V^+ - 0.1\text{V}$ | ● | 0.03 | 1 | μA |
| | | $V_{\text{CM}} = V^- + 0.2\text{V}$ | ● | 0.04 | 2.2 | μA |
| ΔI_{OS} | Input Offset Current Shift | $V_{\text{CM}} = V^- + 0.2\text{V}$ to $V^+ - 0.1\text{V}$ | ● | 0.07 | 3.2 | μA |
| A_{VOL} | Large Signal Voltage Gain | $V_{\text{O}} = -4\text{V}$ to 4V , $R_{\text{L}} = 1\text{k}\Omega$ | ● | 80 | 175 | V/mV |
| | | $V_{\text{O}} = -2\text{V}$ to 2V , $R_{\text{L}} = 100\Omega$ | ● | 8 | 17 | V/mV |
| CMRR | Common Mode Rejection Ratio | $V_{\text{CM}} = V^-$ to V^+ | ● | 80 | 100 | dB |
| | | Input Common Mode Range | ● | V^- | V^+ | V |
| PSRR | Power Supply Rejection Ratio | $V^+ = 2.5\text{V}$ to 10V , $V_{\text{CM}} = 0\text{V}$ | ● | 87 | 105 | dB |
| V_{OL} | Output Voltage Swing LOW (Note 7) | No Load | ● | 20 | 120 | mV |
| | | $I_{\text{SINK}} = 5\text{mA}$ | ● | 60 | 170 | mV |
| | | $I_{\text{SINK}} = 20\text{mA}$ | ● | 200 | 500 | mV |
| V_{OH} | Output Voltage Swing HIGH (Note 7) | No Load | ● | 50 | 140 | mV |
| | | $I_{\text{SOURCE}} = 5\text{mA}$ | ● | 115 | 260 | mV |
| | | $I_{\text{SOURCE}} = 20\text{mA}$ | ● | 360 | 700 | mV |
| I_{SC} | Short-Circuit Current | | ● | ± 25 | ± 55 | mA |
| I_{S} | Supply Current | | ● | 15 | 22 | mA |
| | | Disable Supply Current | ● | $V_{\text{SHDN}} = 0\text{V}$ | 0.45 | 1.5 |
| GBW | Gain Bandwidth Product | Frequency = 2MHz | ● | 125 | 250 | MHz |
| SR | Slew Rate | $A_{\text{V}} = -1$, $R_{\text{L}} = 1\text{k}$, $V_{\text{O}} = \pm 4\text{V}$, Measure at $V_{\text{O}} = \pm 2\text{V}$ | ● | 50 | 100 | $\text{V}/\mu\text{s}$ |

Note 1: Absolute maximum ratings are those values beyond which the life of the device may be impaired.

Note 2: The inputs are protected by back-to-back diodes. If the differential input voltage exceeds 1.4V, the input current should be limited to less than 10mA.

Note 3: A heat sink may be required to keep the junction temperature below the absolute maximum rating when the output is shorted indefinitely.

Note 4: The LT1806C/LT1806I are guaranteed functional over the temperature range of -40°C and 85°C .

Note 5: The LT1806C is guaranteed to meet specified performance from 0°C to 70°C . The LT1806C is designed, characterized and expected to

meet specified performance from -40°C to 85°C but is not tested or QA sampled at these temperatures. The LT1806I is guaranteed to meet specified performance from -40°C to 85°C .

Note 6: Minimum supply voltage is guaranteed by power supply rejection ratio test.

Note 7: Output Voltage swings are measured between the output and power supply rails.

Note 8: This parameter is not 100% tested.

Note 9: Thermal resistance varies depending upon the amount of PC board metal attached to Pin 4 of the device. θ_{JA} is specified for a 2500mm² test board covered with 2 oz copper on both sides.

APPLICATIONS INFORMATION

Single Supply Video Line Driver

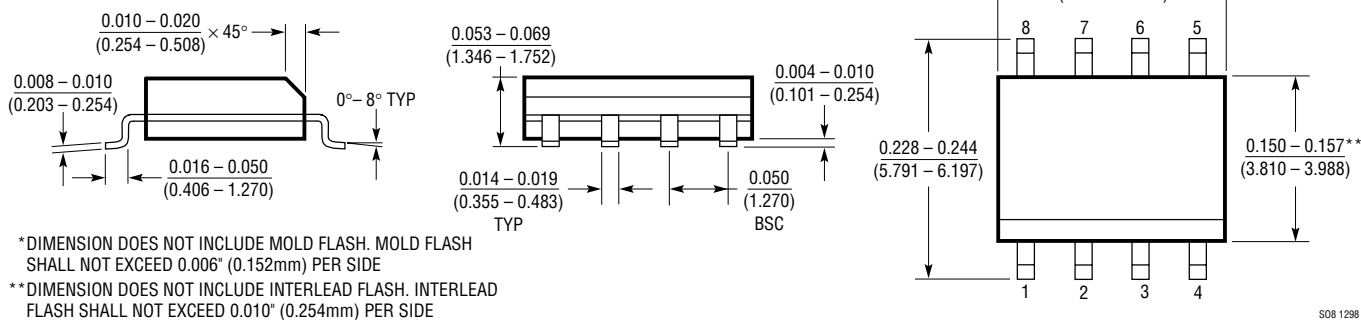
The LT1806 is a wideband rail-to-rail op amp with high output current that allows it to drive video signals in low supply applications. The figure on the front page depicts a single supply video line driver with AC coupling to minimize the quiescent power dissipation. Resistors R1 and R2 are used to level-shift the input and output to provide the largest signal swing. The gain of two is set up with R3 and R4 to restore the signal at V_{OUT} which is

attenuated by 6dB due to the matching of the 75Ω line with the back-terminated resistor, R5. The back termination will eliminate any reflection of the signal that comes from the load. The input termination resistor, R_T , is optional—it is used only if matching of the incoming line is necessary. The values of C1, C2 and C3 are selected to minimize the droop of the luminance signal. In some less stringent requirements, the value of capacitors could be reduced.

PACKAGE DESCRIPTION

Dimensions in inches (millimeters) unless otherwise noted.

S8 Package
8-Lead Plastic Small Outline (Narrow 0.150)
 (LTC DWG # 05-08-1610)



RELATED PARTS

| PART NUMBER | DESCRIPTION | COMMENTS |
|-------------|--|---|
| LT1395 | 400MHz Current Feedback Amplifier | 800V/μs Slew Rate, Shutdown |
| LT1399 | Triple 300MHz Current Feedback Amplifier | 0.1dB Gain Flatness to 150MHz, Shutdown |
| LT1809 | 180MHz Rail-to-Rail Amplifier | 350V/μs Slew Rate, Shutdown |

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