

FEATURES

- Operates from a Single 3.3V Supply
- Low Supply Current: $I_{CC} = 200\mu A$
- ESD Protection Over $\pm 10kV$
- Available in 16-Pin SOIC Narrow Package
- Uses Small Capacitors: $0.1\mu F$
- Operates to 120kbaud
- Output Overvoltage Does Not Force Current Back into Supplies
- EIA/TIA562 I/O Lines Can Be Forced to $\pm 25V$ Without Damage
- Pin Compatible with LT1181A


APPLICATIONS

- Notebook Computers
- Palmtop Computers

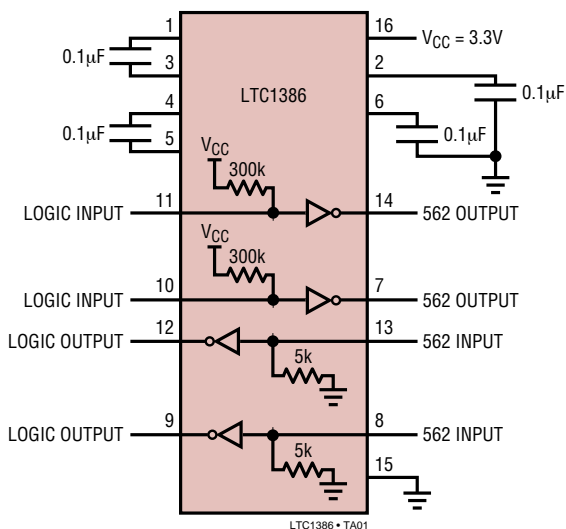
DESCRIPTION

The LTC[®]1386 is an ultra-low power 2-driver/2-receiver EIA/TIA562 transceiver that operates from a single 3.3V supply. The charge pump requires only four space-saving $0.1\mu F$ capacitors. The supply current (I_{CC}) of the transceiver is only $200\mu A$ with driver outputs unloaded.

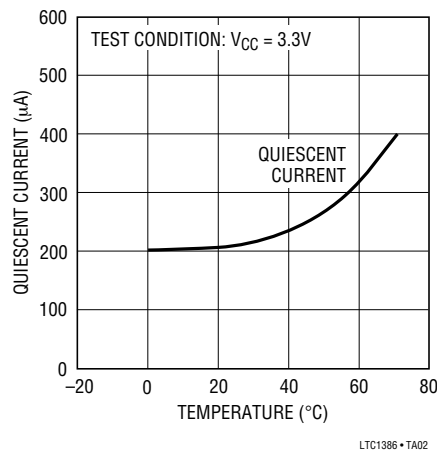
The LTC1386 is fully compliant with all data rate and overvoltage EIA/TIA562 specifications. The transceiver can operate up to 120kbaud with a $1000pF$, $3k\Omega$ load. Both driver outputs and receiver inputs can be forced to $\pm 25V$ without damage and can survive multiple $\pm 10kV$ ESD strikes.

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TYPICAL APPLICATION



Quiescent Supply Current vs Temperature



ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{CC}) 5V

Input Voltage

Driver $-0.3V$ to $V_{CC} + 0.3V$

Receiver $-25V$ to $25V$

Digital Input $-0.3V$ to $V_{CC} + 0.3V$

Output Voltage

Driver $-25V$ to $25V$

Receiver $-0.3V$ to $V_{CC} + 0.3V$

Short-Circuit Duration

V^+ 30 sec

V^- 30 sec

Driver Output Indefinite

Receiver Output Indefinite

Operating Temperature Range

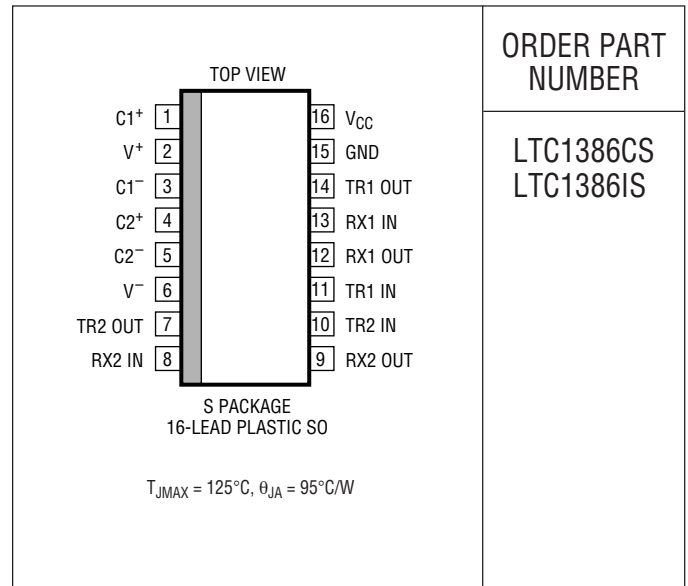
LTC1386C $0^\circ C$ to $70^\circ C$

LTC1386I $-40^\circ C$ to $85^\circ C$

Storage Temperature Range $-65^\circ C$ to $150^\circ C$

Lead Temperature (Soldering, 10 sec) $300^\circ C$

PACKAGE/ORDER INFORMATION



ORDER PART NUMBER

LTC1386CS
LTC1386IS

Consult LTC Marketing for parts specified with wider operating temperature ranges.

DC ELECTRICAL CHARACTERISTICS

The ● denotes specifications which apply over the full operating temperature range. $V_{CC} = 3.3V$, $C1 = C2 = C3 = C4 = 0.1\mu F$, unless otherwise noted.

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|-------------------------------|---|--------|------|-----|------------|
| Any Driver | | | | | |
| Output Voltage Swing | 3k to GND | ● 3.7 | 4.5 | | V |
| | Positive | ● -3.7 | -4.5 | | V |
| Logic Input Voltage Level | Input Low Level ($V_{OUT} = \text{High}$) | ● 2.0 | 1.4 | 0.8 | V |
| | Input High Level ($V_{OUT} = \text{Low}$) | ● | 1.4 | | V |
| Logic Input Current | $V_{IN} = V_{CC}$ | ● | | 5 | μA |
| | $V_{IN} = 0V$ | ● | -20 | -40 | μA |
| Output Short-Circuit Current | $V_{OUT} = 0V$ | ±9 | ±10 | | mA |
| Any Receiver | | | | | |
| Input Voltage Thresholds | Input Low Threshold | ● 0.8 | 1.3 | | V |
| | Input High Threshold | ● | 1.7 | 2.4 | V |
| Hysteresis | | ● 0.1 | 0.4 | 1 | V |
| Input Resistance | $-10V \leq V_{IN} \leq 10V$ | 3 | 5 | 7 | k Ω |
| Output Voltage | Output Low, $I_{OUT} = -1.6mA$ ($V_{CC} = 3.3V$) | ● | 0.2 | 0.4 | V |
| | Output High, $I_{OUT} = 160\mu A$ ($V_{CC} = 3.3V$) | ● 3.0 | 3.2 | | V |
| Output Short-Circuit Current | Sinking Current, $V_{OUT} = V_{CC}$ | -5 | -20 | | mA |
| | Sourcing Current, $V_{OUT} = GND$ | 2 | 7 | | mA |
| Power Supply Generator | | | | | |
| V^+ Output Voltage | $I_{OUT} = 0mA$ | | 5.7 | | V |
| | $I_{OUT} = 5mA$ | | 5.5 | | V |
| V^- Output Voltage | $I_{OUT} = 0mA$ | | -5.3 | | V |
| | $I_{OUT} = -5mA$ | | -5.0 | | V |
| Power Supply | | | | | |
| V_{CC} Supply Current | No Load (Note 2), $0^\circ C$ to $70^\circ C$ | ● | 0.2 | 0.5 | mA |
| | No Load (Note 2), $-40^\circ C$ to $85^\circ C$ | ● | 0.35 | 1.0 | mA |

AC CHARACTERISTICS The ● denotes specifications which apply over the full operating temperature range.
 $V_{CC} = 3.3V$, $C_1 = C_2 = C_3 = C_4 = 0.1\mu F$, unless otherwise noted.

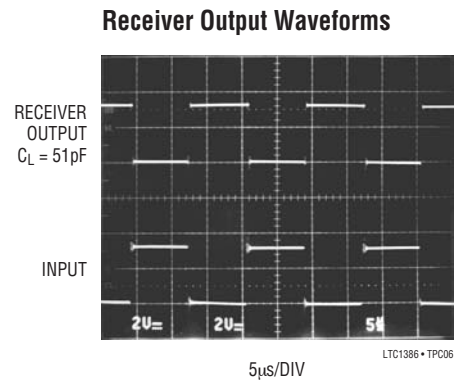
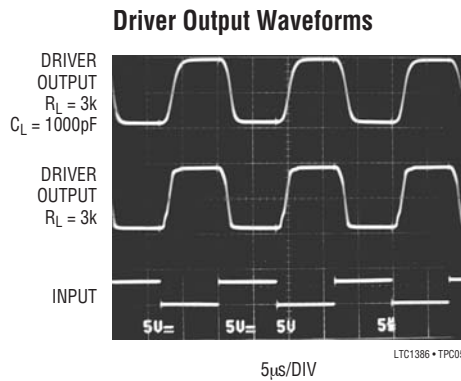
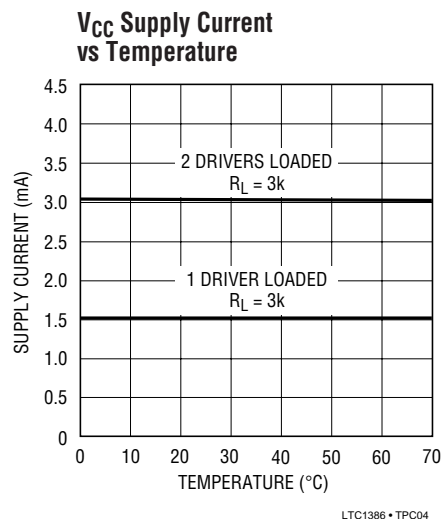
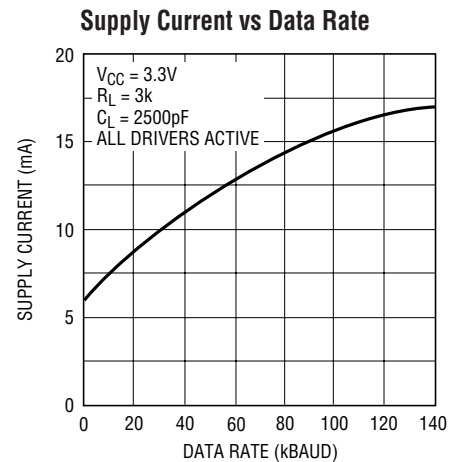
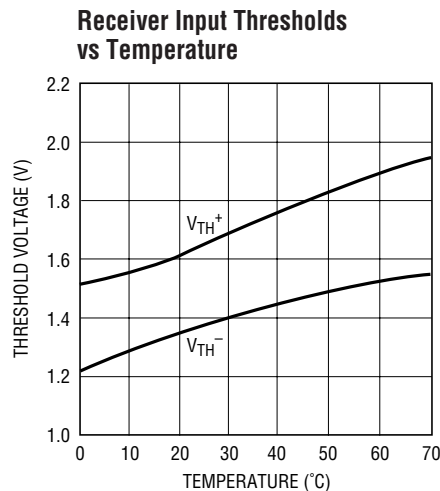
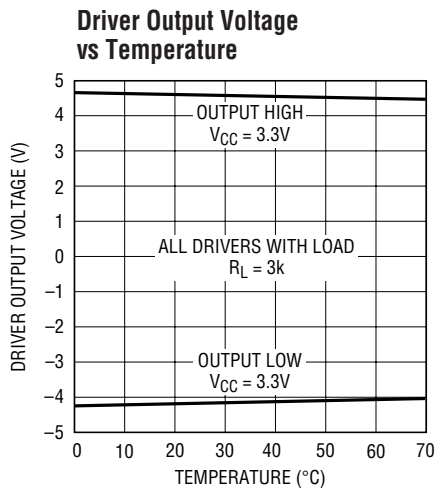
| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|-----------------------------|-----|-----|-----|-----------|
| Slew Rate | $R_L = 3k$, $C_L = 51pF$ | | 8 | 30 | $V/\mu S$ |
| | $R_L = 3k$, $C_L = 1000pF$ | 3 | 5 | | $V/\mu S$ |
| Driver Propagation Delay (TTL to EIA/TIA562) | t_{HLD} (Figure 1) | ● | 2 | 3.5 | μS |
| | t_{LHD} (Figure 1) | ● | 2 | 3.5 | μS |
| Receiver Propagation Delay (EIA/TIA562 to TTL) | t_{HLR} (Figure 2) | ● | 0.3 | 0.8 | μS |
| | t_{LHR} (Figure 2) | ● | 0.3 | 0.8 | μS |

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

Note 2: Supply current is measured with driver and receiver outputs unloaded.

Note 3: Measurements made in the shutdown mode are performed with $V_{ON/OFF} = 0V$.

TYPICAL PERFORMANCE CHARACTERISTICS



PIN FUNCTIONS

V_{CC}: 3.3V Input Supply Pin. This pin should be decoupled with a 0.1 μ F ceramic capacitor.

GND: Ground Pin.

V⁺: Positive Supply Output (EIA/TIA562 Drivers). $V^+ \cong 2V_{CC} - 1V$. This pin requires an external capacitor $C = 0.1\mu F$ for charge storage. The capacitor may be tied to ground or V_{CC} . With multiple devices, the V^+ and V^- pins may share a common capacitor. For large numbers of devices, increasing the size of the shared common storage capacitors is recommended to reduce ripple.

V⁻: Negative Supply Output (RS232 Drivers). $V^- \cong -(2V_{CC} - 1.3V)$. This pin requires an external capacitor $C = 0.1\mu F$ for charge storage.

C1⁺, C1⁻, C2⁺, C2⁻: Commutating Capacitor Inputs. These pins require two external capacitors $C = 0.1\mu F$: one from C1⁺ to C1⁻ and another from C2⁺ to C2⁻. To maintain

charge pump efficiency, the capacitor's effective series resistance should be less than 2 Ω .

TR IN: EIA/TIA562 Driver Input Pins. Inputs are TTL/CMOS compatible. The inputs of unused drivers can be left unconnected since 300k input pull-up resistors to V_{CC} are included on chip.

TR OUT: Driver Outputs at EIA/TIA562 Voltage Levels. The driver outputs are protected against ESD to $\pm 10kV$ for human body model discharges.

RX IN: Receiver Inputs. These pins can be forced to $\pm 25V$ without damage. The receiver inputs are protected against ESD to $\pm 10kV$ for human body model discharges. Each receiver provides 0.4V of hysteresis for noise immunity.

RX OUT: Receiver Outputs with TTL/CMOS Voltage Levels.

SWITCHING TIME WAVEFORMS

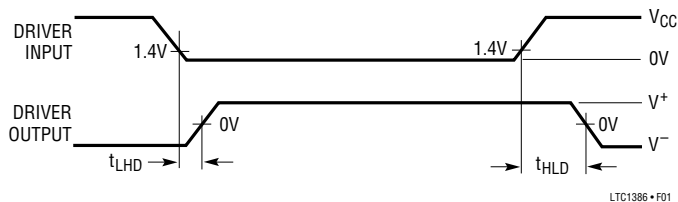


Figure 1. Driver Propagation Delay Timing

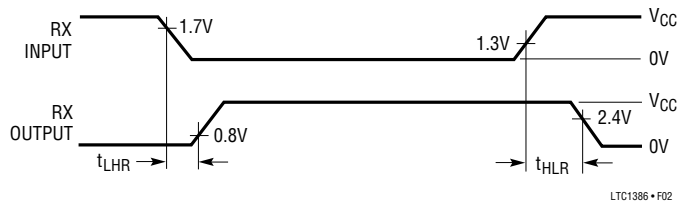
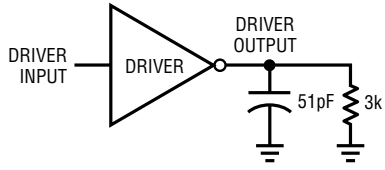


Figure 2. Receiver Propagation Delay Timing

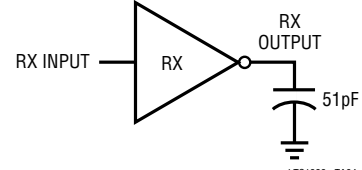
TEST CIRCUITS

Driver Timing Test Load



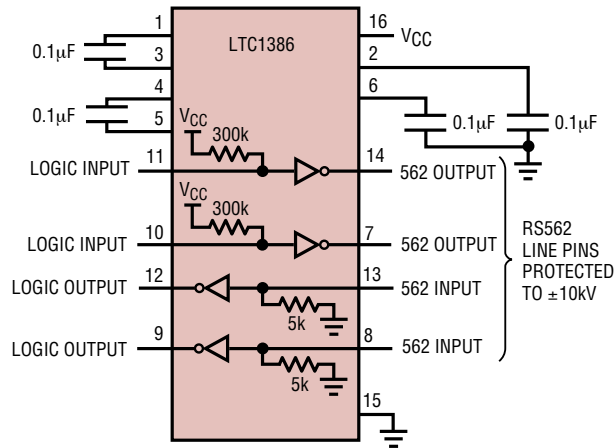
LTC1386 • TA03

Receiver Timing Test Load



LTC1386 • TA04

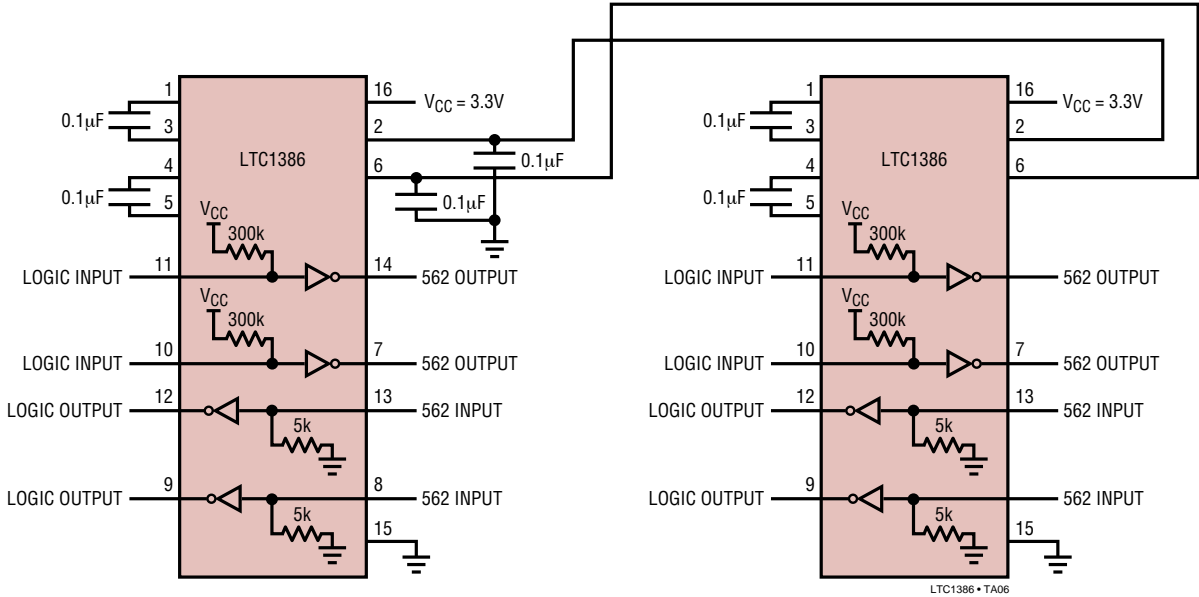
ESD Test Circuit



1386 TA05

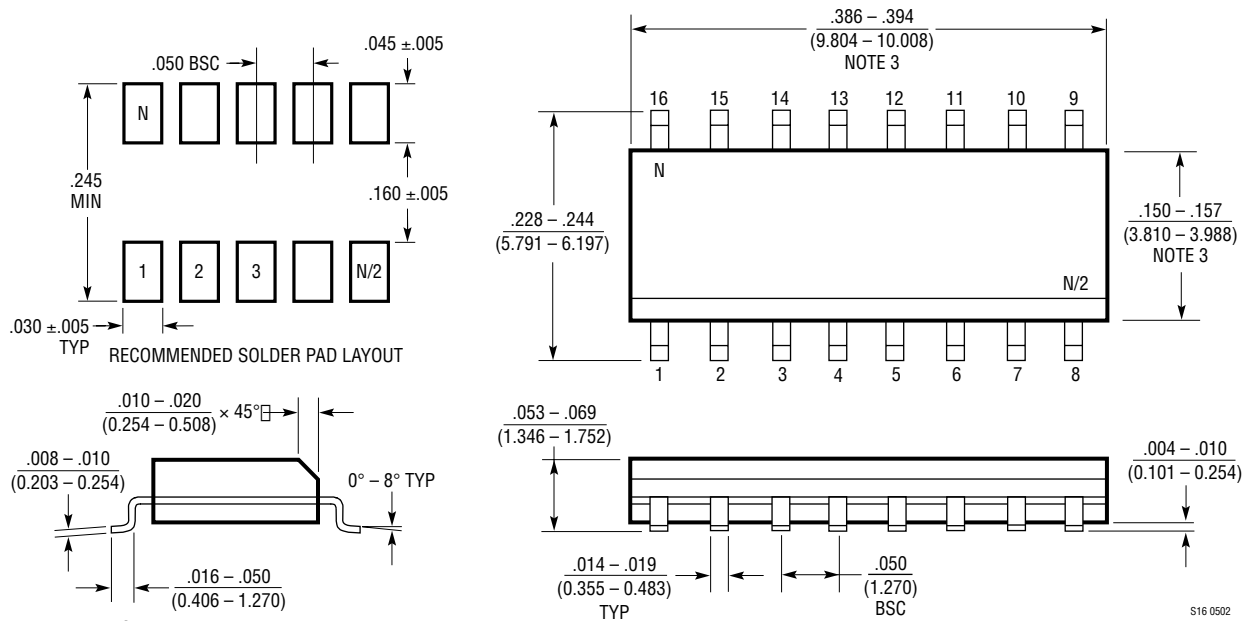
TYPICAL APPLICATIONS

Paralleling Power Supply Generator with Common Storage Capacitors



PACKAGE DESCRIPTION

S Package 16-Lead Plastic Small Outline (Narrow .150 Inch) (Reference LTC DWG # 05-08-1610)



- NOTE:
1. DIMENSIONS IN $\frac{\text{INCHES}}{\text{MILLIMETERS}}$
 2. DRAWING NOT TO SCALE
 3. THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED $.006"$ (0.15mm)

S16 0502

RELATED PARTS

| PART NUMBER | DESCRIPTION | COMMENTS |
|--------------------|--|--|
| LT1780/LT1781 | 5V, 2 Driver, 2 Receiver RS232 Transceivers | ±15kV ESD per IEC 1000-4 |
| LTC1327 | 3.3V, 3 Driver, 5 Receiver RS562 Transceiver | 300µA Supply Current, 0.2µA in Shutdown |
| LTC1348 | 3.3V to 5V, 3 Driver, 5 Receiver RS232 Transceiver | True RS232 on 3.3V, 5 Receivers Active in Shutdown |
| LTC1382 | 5V, 2 Driver, 2 Receiver RS232 Transceiver | 220µA Supply Current, 0.2µA in Shutdown |
| LTC1383 | 5V, 2 Driver, 2 Receiver RS232 Transceiver | 220µA Supply Current, Narrow 16-pin SO |
| LTC1384 | 5V, 2 Driver, 2 Receiver RS232 Transceiver | 220µA Supply Current, 2 Receivers Active in Shutdown |
| LTC1385 | 3.3V, 2 Driver, 2 Receiver RS562 Transceiver | 220µA Supply Current, 2 Receivers Active in Shutdown |

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- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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