3.3V Low Power EIA/TIA562 Transceiver

FEATURES

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

APPLICATIONS

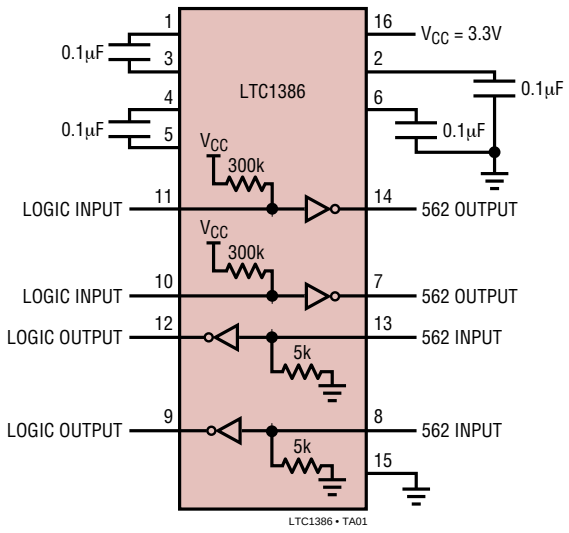
- Notebook Computers
- Palmtop Computers

DESCRIPTION

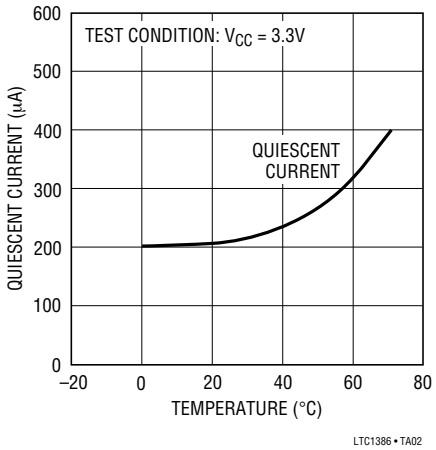
The LTC®1386 is an ultra-low power 2-driver/2-receiver EIA/TIA562 transceiver that operates from a single 3.3V supply. The charge pump requires only four space-saving 0.1μF capacitors. The supply current (I_{CC}) of the transceiver is only 200μA with driver outputs unloaded.

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

TYPICAL APPLICATION



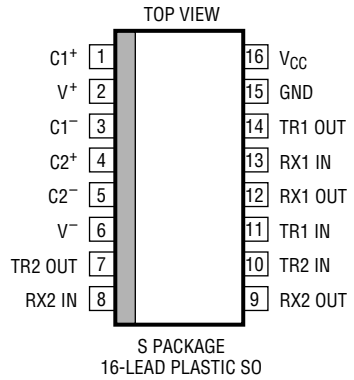
Quiescent Supply Current vs Temperature



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°C to 70°C
  LTC1386I ..... $-40°C$ to 85°C
Storage Temperature Range ..... $-65°C$ to 150°C
Lead Temperature (Soldering, 10 sec) ..... 300°C

PACKAGE/ORDER INFORMATION



S PACKAGE
16-LEAD PLASTIC SO

$T_{JMAX} = 125°C$, $\theta_{JA} = 95°C/W$

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 = 0.1µF, unless otherwise noted.

PARAMETER	CONDITIONS			MIN	TYP	MAX	UNITS
Any Driver							
Output Voltage Swing	3k to GND	Positive	●	3.7	4.5		V
		Negative	●	–3.7	–4.5		V
Logic Input Voltage Level	Input Low Level (V_{OUT} = High)		●		1.4	0.8	V
	Input High Level (V_{OUT} = Low)		●	2.0	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	$-10V \le V_{IN} \le 10V$			3	5	7	kΩ
Output Voltage	Output Low, $I_{OUT} = -1.6mA$ (V_{CC} = 3.3V)		●		0.2	0.4	V
	Output High, $I_{OUT} = 160µA$ (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°C to 70°C		●		0.2	0.5	mA
	No Load (Note 2), –40°C to 85°C		●		0.35	1.0	mA

AC CHARACTERISTICS

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

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Slew Rate	R_L = 3k, C_L = 51pF			8	30	V/µs
	R_L = 3k, C_L = 1000pF		3	5		V/µs
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

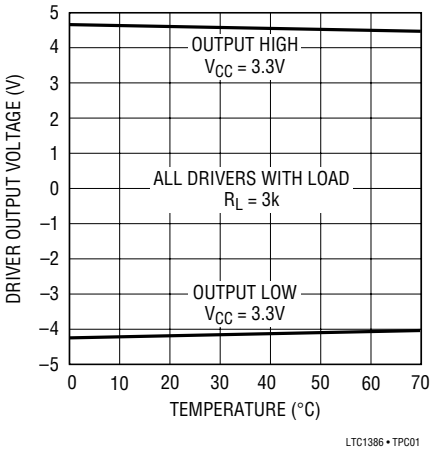
Note 1: Absolute Maximum Ratings are those values beyond which the life of the device may be impaired.

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

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

TYPICAL PERFORMANCE CHARACTERISTICS

Driver Output Voltage vs Temperature



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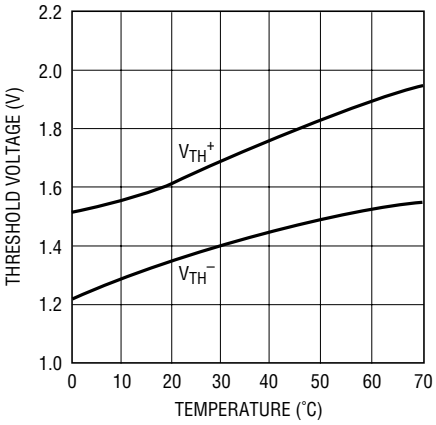
Receiver Input Thresholds vs Temperature



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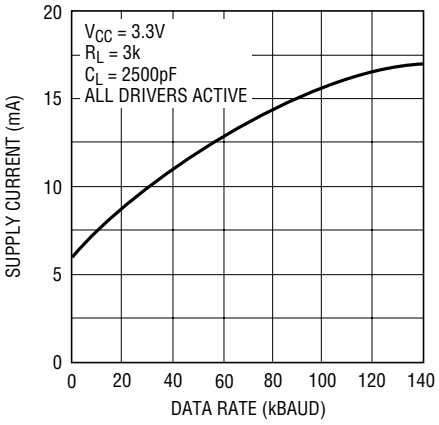
Supply Current vs Data Rate



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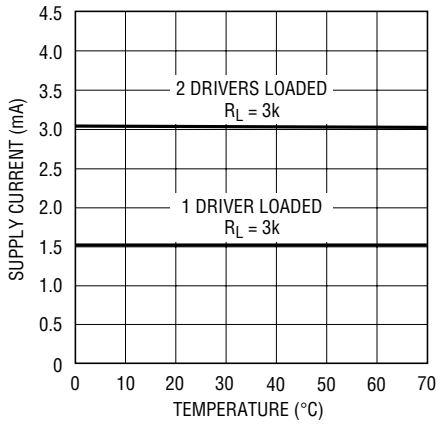
V_{CC} Supply Current vs Temperature



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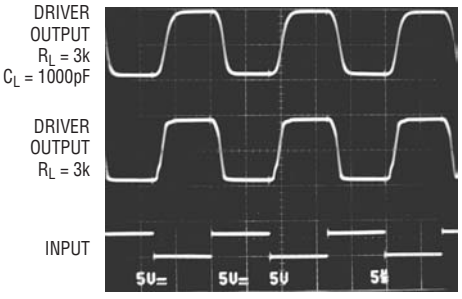
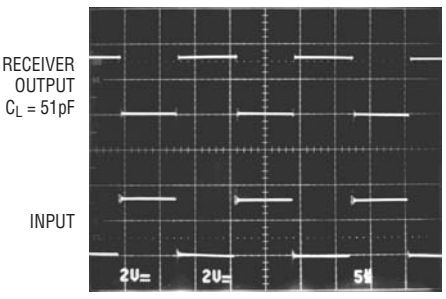
Driver Output Waveforms



LTC1386 • TPC05

5µs/DIV

Receiver Output Waveforms



LTC1386 • TPC06

5µs/DIV

PIN FUNCTIONS

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

GND: Ground Pin.

V^+: Positive Supply Output (EIA/TIA562 Drivers). $V^+ \cong 2V_{CC} - 1V$. This pin requires an external capacitor C = 0.1μF 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 = 0.1μF for charge storage.

$C1^+$, $C1^-$, $C2^+$, $C2^-$: Commutating Capacitor Inputs. These pins require two external capacitors C = 0.1μF: 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 2Ω.

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 ±10kV for human body model discharges.

RX IN: Receiver Inputs. These pins can be forced to ±25V without damage. The receiver inputs are protected against ESD to ±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

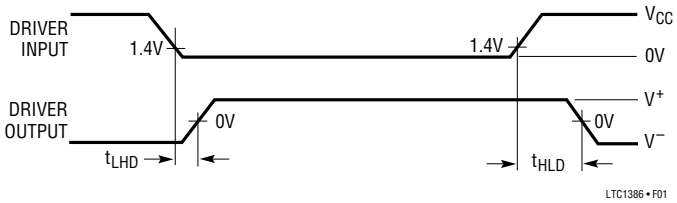


Figure 1. Driver Propagation Delay Timing

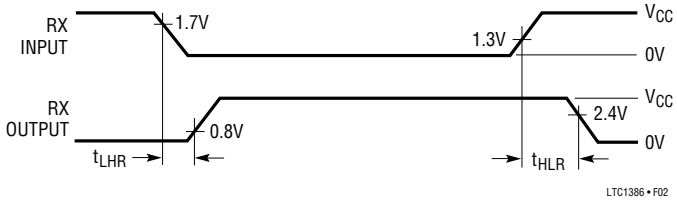
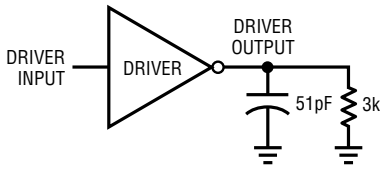


Figure 2. Receiver Propagation Delay Timing

TEST CIRCUITS

Driver Timing Test Load



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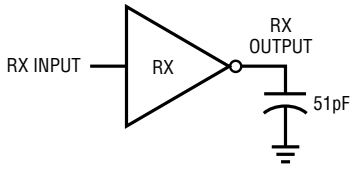
Receiver Timing Test Load



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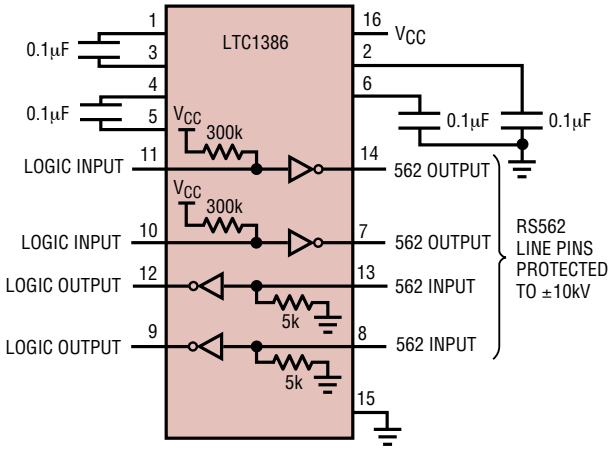
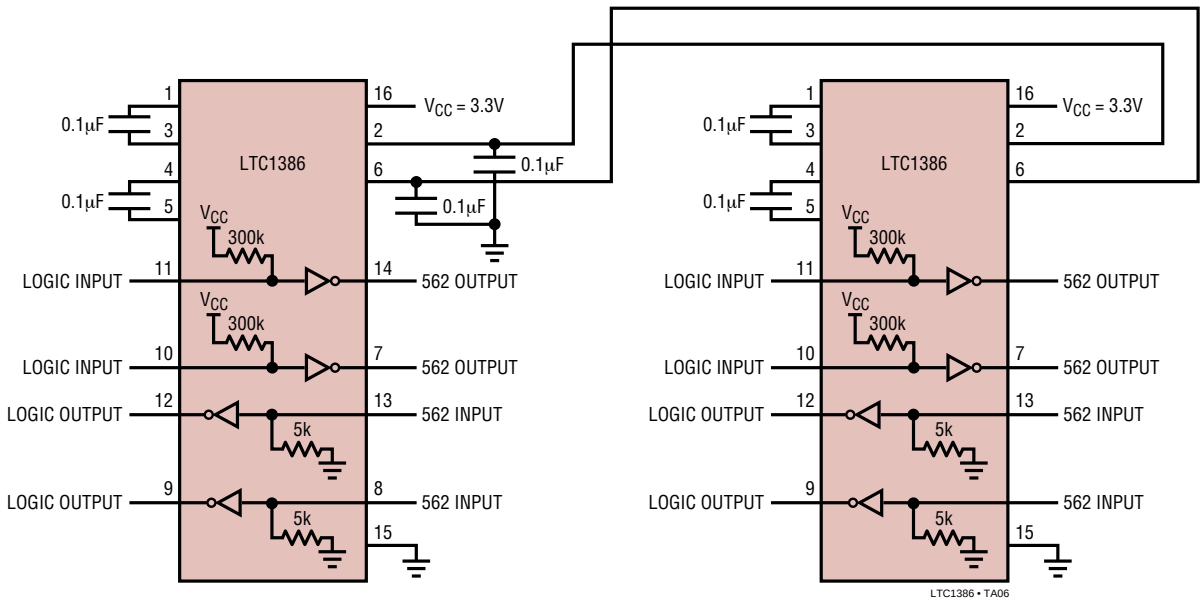
ESD Test Circuit



1386 TA05

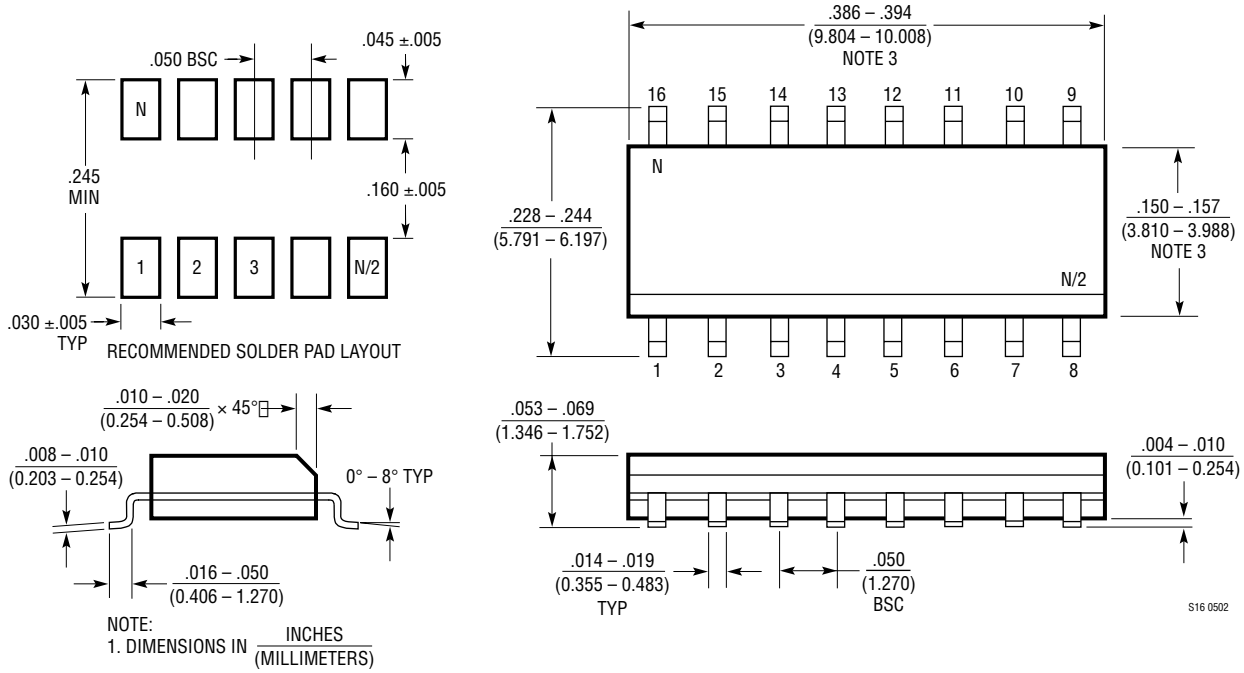
TYPICAL APPLICATIONS

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)

RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1780/LT1781	5V, 2 Driver, 2 Receiver RS232 Transeivers	±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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