

3.3V Low Power EIA/TIA562 Transceiver

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

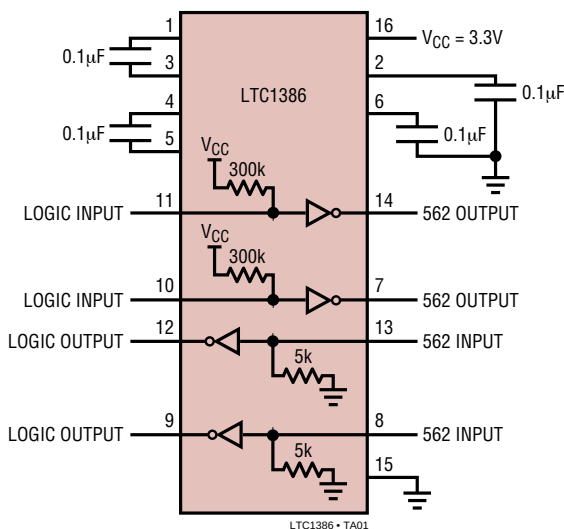
DESCRIPTION

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 0.1μF capacitors. The supply current (I_{CC}) of the transceiver is only 200μA with driver outputs unloaded.

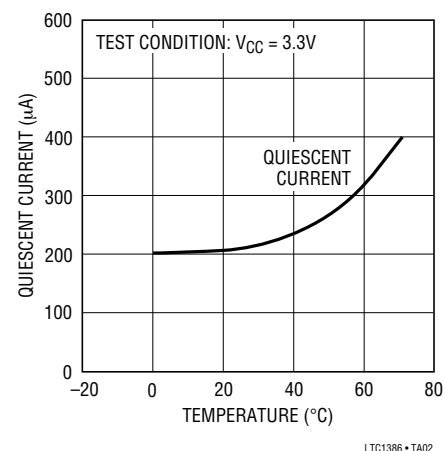
The LTC1386 is fully compliant with all data rate and overvoltage EIA/TIA562 specifications. The transceiver can operate up to 120kbaud with a 1000pF, 3k Ω load. Both driver outputs and receiver inputs can be forced to $\pm 25\text{V}$ without damage and can survive multiple $\pm 10\text{kV}$ ESD strikes.

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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 ($V_{OUT} = \text{High}$)	●	1.4	0.8	V
	Input High Level ($V_{OUT} = \text{Low}$)	● 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	$-10V \leq V_{IN} \leq 10V$	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.

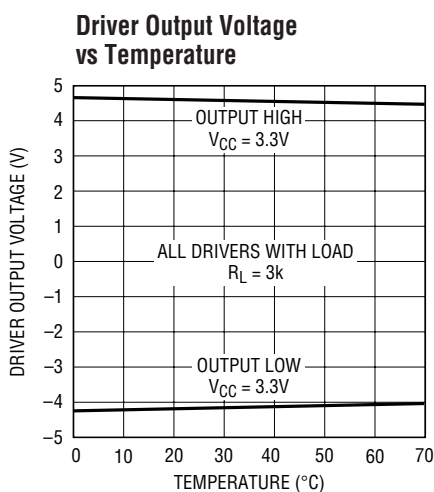
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Slew Rate	$R_L = 3k$, $C_L = 51pF$ $R_L = 3k$, $C_L = 1000pF$	3	8 5	30	$V/\mu s$ $V/\mu s$
Driver Propagation Delay (TTL to EIA/TIA562)	t_{HLD} (Figure 1) t_{LHD} (Figure 1)	● ●	2 2	3.5 3.5	μs μs
Receiver Propagation Delay (EIA/TIA562 to TTL)	t_{HLR} (Figure 2)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

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

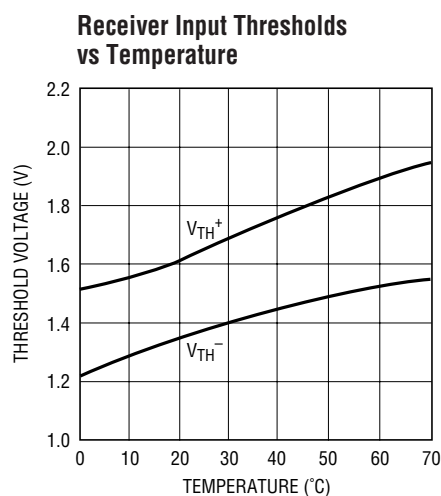
Note 2: Supply current is measured with driver and receiver outputs unloaded.

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

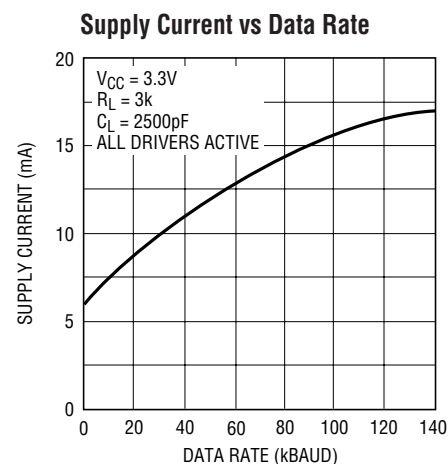
TYPICAL PERFORMANCE CHARACTERISTICS



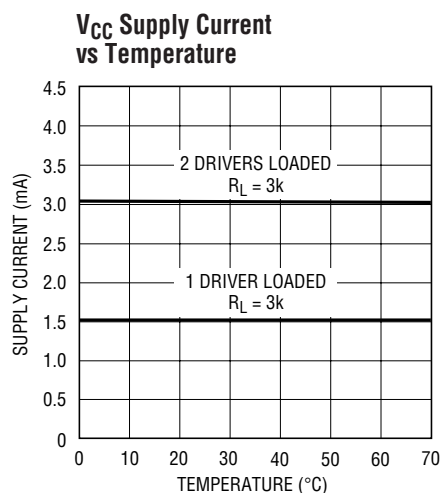
LTC1386 • TPC01



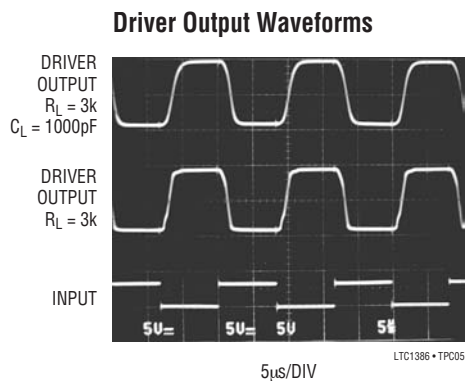
LTC1386 • TPC02



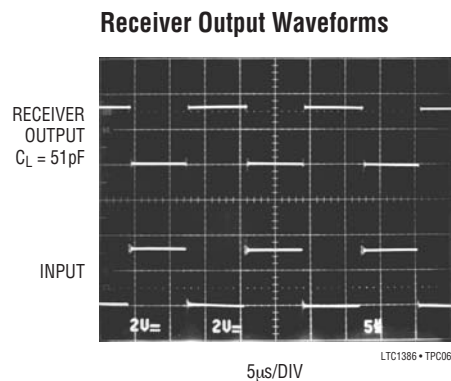
LTC1386 • TPC03



LTC1386 • TPC04



LTC1386 • TPC05



LTC1386 • TPC06

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 $C = 0.1\mu F$ 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 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

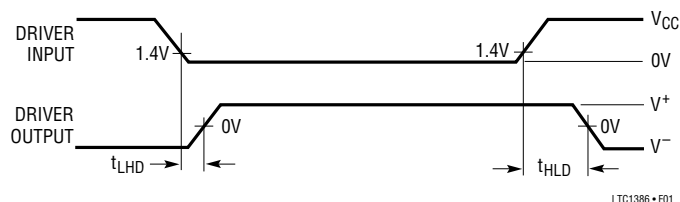


Figure 1. Driver Propagation Delay Timing

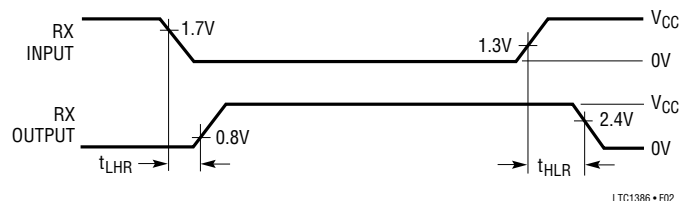
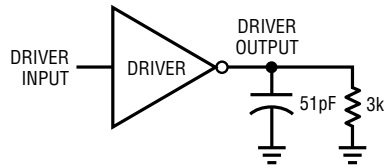


Figure 2. Receiver Propagation Delay Timing

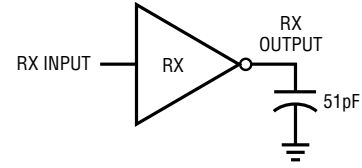
TEST CIRCUITS

Driver Timing Test Load



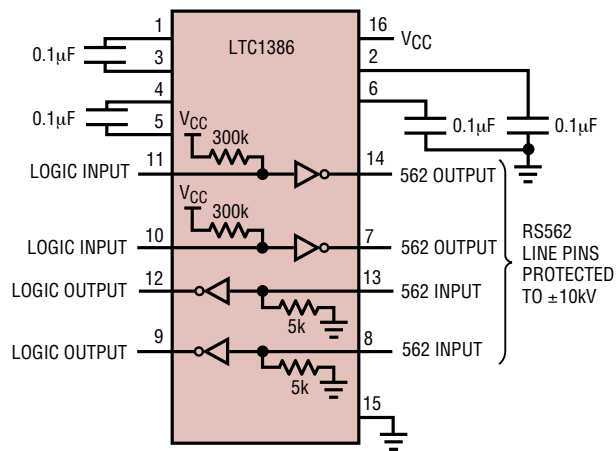
LTC1386 • TA03

Receiver Timing Test Load



LTC1386 • TA04

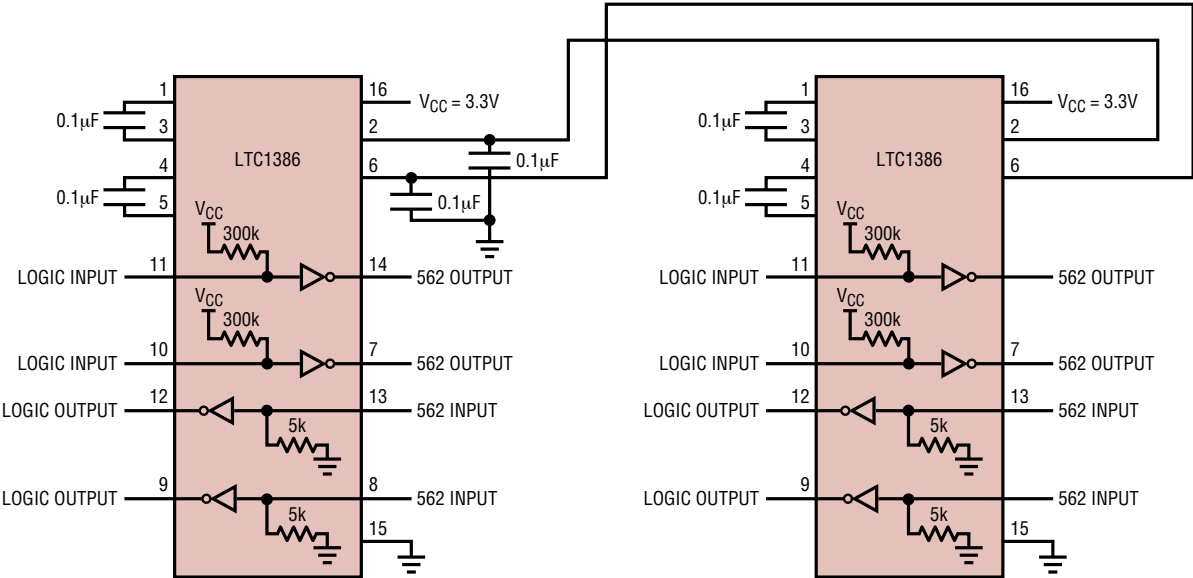
ESD Test Circuit



1386 TA05

TYPICAL APPLICATIONS

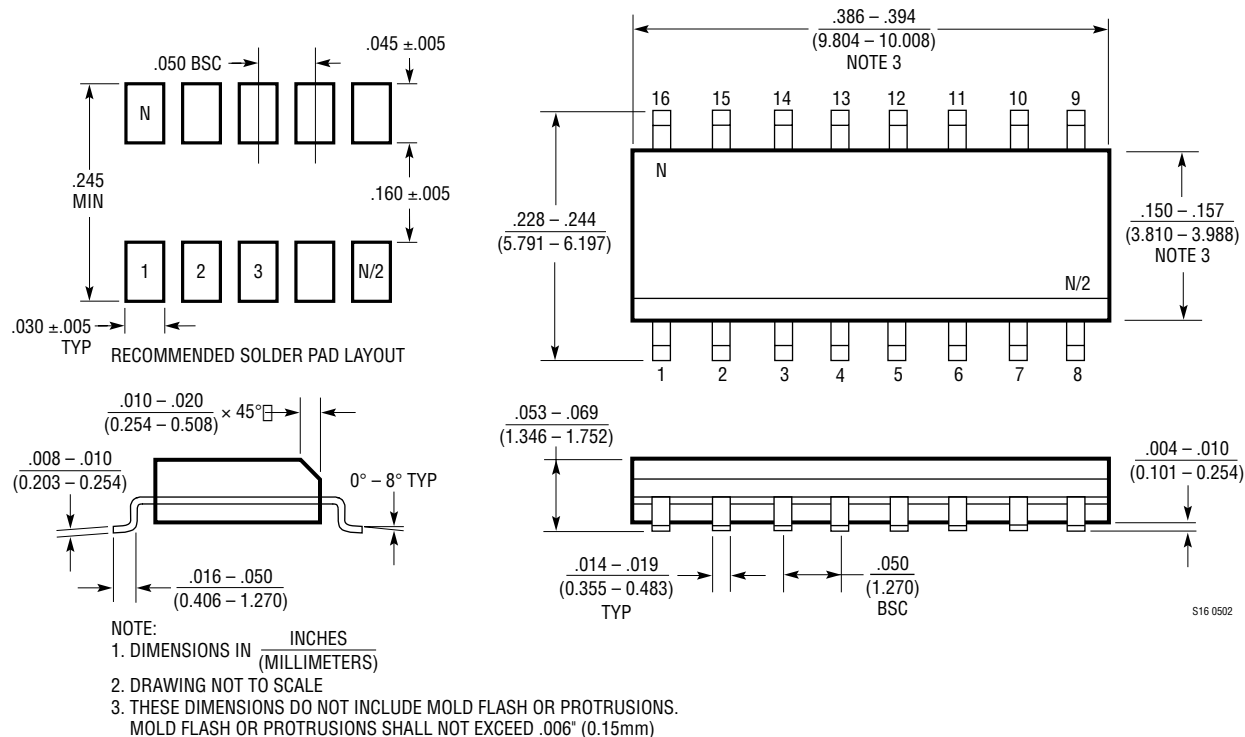
Paralleling Power Supply Generator
with Common Storage Capacitors



LTC1386 • TA06

PACKAGE DESCRIPTION

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



S16 0502

RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1780/LT1781	5V, 2 Driver, 2 Receiver RS232 Transceivers	$\pm 15\text{kV}$ ESD per IEC 1000-4
LTC1327	3.3V, 3 Driver, 5 Receiver RS562 Transceiver	300 μA Supply Current, 0.2 μA 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	220 μA Supply Current, 0.2 μA in Shutdown
LTC1383	5V, 2 Driver, 2 Receiver RS232 Transceiver	220 μA Supply Current, Narrow 16-pin SO
LTC1384	5V, 2 Driver, 2 Receiver RS232 Transceiver	220 μA Supply Current, 2 Receivers Active in Shutdown
LTC1385	3.3V, 2 Driver, 2 Receiver RS562 Transceiver	220 μA Supply Current, 2 Receivers Active in Shutdown