钍地半导体
Tudi Semiconductor

Product Specification

TUDI-LTC1480

3.3V Ultralow Power RS485 Transceiver

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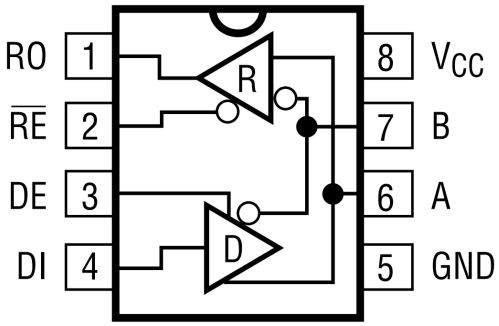
semiconductor device manufacturer

- Design
- research and development
- production
- and sales

FEATURES

- True RS485 from a Single 3.3V Supply
- Low Power: ICC = 500μA Max with Driver Disabled
- ICC = 600μA Max with Driver Enabled, No Load
- 1μA Quiescent in Shutdown Mode
- –7V to 12V Common Mode Range Permits ±7V Ground Difference Between Devices on the Data Line
- Thermal Shutdown Protection
- Power Up/Down Glitch-Free Driver Outputs Permit Live Insertion or Removal of Transceiver
- Driver Maintains High Impedance in Three-State or with the Power Off
- Up to 32 Transceivers on the Bus
- 50ns Typical Driver Propagation Delays with 10ns Skew
- Pin Compatible with the LTC485
- Available in 8-Lead DIP and SO Packages

TOP VIEW



N8 PACKAGE
8-LEAD PDIP

S8 PACKAGE
8-LEAD PLASTIC SO

T_{JMAX} = 125°C, θ_{JA} = 130°C/W (N8)
T_{JMAX} = 125°C, θ_{JA} = 150°C/W (S8)

APPLICATIONS

- Battery-Powered RS485/RS422 Applications
- Low Power RS485/RS422 Transceiver
- Level Translator

DESCRIPTION

The LTC1480 is an ultralow power differential line trans-ceiver which provides full RS485 compatibility while oper-ating from a single 3.3V supply. It is designed for data transmission standard RS485 applications with extended common mode range (12V to –7V). It also meets the requirements of RS422 and features high speed operation up to 2.5Mb/s. The CMOS design offers significant power savings without sacrificing ruggedness against overload or ESD damage. Typical quiescent current is only 300μA while operating and 1μA in shutdown. The driver and receiver feature three-state outputs, with the driver outputs maintaining high impedance over the entire common mode range. Excessive power dissipation caused by bus contention or faults is prevented by a thermal shutdown circuit which forces the driver outputs into a high impedance state. The receiver has a fail-safe feature which guarantees a high output state when the inputs are left open.
The LTC1480 is fully specified over the commercial and extended industrial temperature range. The LTC1480 is available in 8-pin SO and DIP packages.

PIN FUNCTIONS

RO (Pin 1): Receiver Output. If the receiver output is enabled ($\overline{RE}$ LOW) and A > B by 200mV, then RO will be HIGH. If A < B by 200mV, then RO will be LOW.

$\overline{RE}$ (Pin 2): Receiver Output Enable. A LOW enables the receiver output, RO. A HIGH input forces the receiver output into a high impedance state.

DE (Pin 3): Driver Outputs Enable. A HIGH on DE enables the driver output. A, B and the chip will function as a line driver. A low input will force the driver outputs into a high impedance state and the chip will function as a line receiver. If $\overline{RE}$ is high and DE is LOW, the part will enter a low power (1μA) shutdown state. If $\overline{RE}$ is low and DE is high, the driver outputs will be fed back to the receiver and the receive output will correspond to the driver input.

DI (Pin 4): Driver Input. If the driver outputs are enabled (DE HIGH) then a low on DI forces the outputs A LOW and B HIGH. A HIGH on DI with the driver outputs enabled will force A HIGH and B LOW.

GND (Pin 5): Ground.

A (Pin 6): Driver Output/Receiver Input.

B (Pin 7): Driver Output/Receiver Input.

V_{CC} (Pin 8): Positive Supply. 3.0V < V_{CC} < 3.6V.

ABSOLUTE MAXIMUM RATINGS

(Note 1)

Supply Voltage (V_{CC}) 7V
Control Input Voltage ..... −0.3V to V_{CC} + 0.3V
Driver Input Voltage ..... −0.3V to V_{CC} + 0.3V
Driver Output Voltage ..... ±14V
Receiver Input Voltage ..... ±14V
Receiver Output Voltage ..... −0.3V to V_{CC} + 0.3V
Operating Temperature Range
LTC1480C ..... 0°C ≤ T_A ≤ 70°C
LTC1480I ..... −40°C ≤ T_A ≤ 85°C
Storage Temperature Range ..... −65°C to 150°C
Lead Temperature (Soldering, 10 sec) ..... 300°C

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range. V_{CC} = 3.3V (Notes 2, 3).

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_{OD1}	Differential Driver Output Voltage (Unloaded)	I_O = 0V	●			3.3	V
V_{OD2}	Differential Driver Output Voltage (with Load)	R = 27Ω (RS485) (Figure 1) R = 50Ω (RS422)	● ●	1.5 2.0		3.3	V V
ΔV_{OD}	Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	R = 27Ω or R = 50Ω (Figure 1)	●			0.2	V
V_{OC}	Driver Common Mode Output Voltage	R = 27Ω or R = 50Ω (Figure 1)	●			2	V
$\Delta\lvert V_{OC}\rvert$	Change in Magnitude of Driver Common Mode Output Voltage for Complementary Output States	R = 27Ω or R = 50Ω (Figure 1)	●			0.2	V
V_{IH}	Input HIGH Voltage	DE, DI, $\overline{RE}$	●	2			V
V_{IL}	Input LOW Voltage	DE, DI, $\overline{RE}$	●			0.8	V
I_{IN1}	Input Current	DE, DI, $\overline{RE}$	●			±2	µA
I_{IN2}	Input Current (A, B)	DE = 0, V_{CC} = 0V or 3.6V, V_{IN} = 12V DE = 0, V_{CC} = 0V or 3.6V, V_{IN} = −7V	● ●			1.0 −0.8	mA mA
V_{TH}	Differential Input Threshold Voltage for Receiver	−7V ≤ V_{CM} ≤ 12V	●	−0.2		0.2	V
ΔV_{TH}	Receiver Input Hysteresis	V_{CM} = 0V			70		mV
V_{OH}	Receiver Output HIGH Voltage	I_O = −4mA, V_{ID} = 200mV	●	2			V
V_{OL}	Receiver Output LOW Voltage	I_O = 4mA, V_{ID} = −200mV	●			0.4	V
I_{OZR}	Three-State (High Impedance) Output Current at Receiver	V_{CC} = Max, 0.4V ≤ V_O ≤ 2.4V	●			±1	µA
R_{IN}	Receiver Input Resistance	−7V ≤ V_{CM} ≤ 12V	●	12			kΩ
I_{CC}	Supply Current	No Load, Output Enabled No Load, Output Disabled	● ●		400 300	600 500	µA µA
I_{SHDN}	Supply Current in Shutdown Mode	DE = 0, $\overline{RE}$ = V_{CC}			1	10	µA

SWITCHING CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range. V_{CC} = 3.3V (Notes 2, 3).

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
I_{OSD1}	Driver Short-Circuit Current, V_{OUT} = HIGH	$-7V \le V_O \le 12V$	●	35		250	mA
I_{OSD2}	Driver Short-Circuit Current, V_{OUT} = LOW	$-7V \le V_O \le 12V$	●	35		250	mA
I_{OSR}	Receiver Short-Circuit Current	$0V \le V_O \le V_{CC}$	●	7		85	mA
t_{PLH}	Driver Input to Output	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF, (Figures 3, 5)	●	25	50	80	ns
t_{PHL}	Driver Input to Output		●	25	50	80	ns
t_{SKEW}	Driver Output to Output		●		10	20	ns
t_R, t_F	Driver Rise or Fall Time		●	5	15	40	ns
t_{ZH}	Driver Enable to Output HIGH	C_L = 100pF (Figures 4, 6), S2 Closed	●		70	120	ns
t_{ZL}	Driver Enable to Output LOW	C_L = 100pF (Figures 4, 6), S1 Closed	●		70	120	ns
t_{LZ}	Driver Disable Time from LOW	C_L = 15pF (Figures 4, 6), S1 Closed	●		70	120	ns
t_{HZ}	Driver Disable Time from HIGH	C_L = 15pF (Figures 4, 6), S2 Closed	●		70	120	ns
t_{PLH}	Receiver Input to Output	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF, (Figures 3, 7)	●	30	140	200	ns
t_{PHL}	Receiver Input to Output		●	30	140	200	ns
t_{SKD}	$\lvert t_{PLH} - t_{PHL} \rvert$ Differential Receiver Skew				13		ns
t_{ZL}	Receiver Enable to Output LOW	C_{RL} = 15pF (Figures 2, 8), S1 Closed	●		50	80	ns
t_{ZH}	Receiver Enable to Output HIGH	C_{RL} = 15pF (Figures 2, 8), S2 Closed	●		50	80	ns
t_{LZ}	Receiver Disable from LOW	C_{RL} = 15pF (Figures 2, 8), S1 Closed	●		50	80	ns
t_{HZ}	Receiver Disable from HIGH	C_{RL} = 15pF (Figures 2, 8), S2 Closed	●		50	80	ns
f_{MAX}	Maximum Data Rate		●	2.5			Mbits/s
t_{SHDN}	Time to Shutdown	DE = 0, RE = ⎍	●	50	200	600	ns
$t_{ZH(SHDN)}$	Driver Enable from Shutdown to Output HIGH	C_L = 100pF (Figures 4, 6), S2 Closed	●		70	120	ns
$t_{ZL(SHDN)}$	Driver Enable from Shutdown to Output LOW	C_L = 100pF (Figures 4, 6), S1 Closed	●		70	120	ns
$t_{ZH(SHDN)}$	Receiver Enable from Shutdown to Output HIGH	C_L = 15pF (Figures 2, 8), S2 Closed	●			4500	ns
$t_{ZL(SHDN)}$	Receiver Enable from Shutdown to Output LOW	C_L = 15pF (Figures 2, 8), S1 Closed	●			4500	ns

Note 1: Absolute maximum ratings are those beyond which the safety of the device cannot be guaranteed.

Note 2: All currents into device pins are positive; all currents out ot device pins are negative. All voltages are referenced to device ground unless otherwise specified.

Note 3: All typicals are given for V_{CC} = 3.3V and T_A = 25°C.

FUNCTION TABLES

LTC1480 Transmitting

INPUTS			OUTPUTS	
$\overline{RE}$	DE	DI	B	A
X	1	1	0	1
X	1	0	1	0
0	0	X	Z	Z
1	0	X	Z*	Z*

*Shutdown mode

LTC1480 Receiving

INPUTS			OUTPUTS
$\overline{RE}$	DE	A – B	RO
0	0	≥0.2V	1
0	0	≤–0.2V	0
0	0	Inputs Open	1
1	0	X	Z*

*Shutdown mode

TEST CIRCUITS

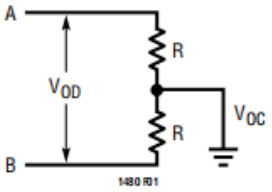


Figure 1. Driver DC Test Load

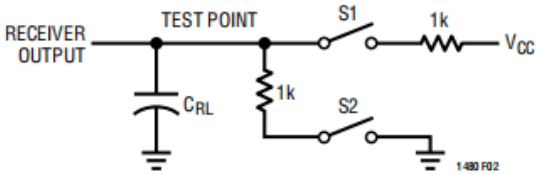


Figure 2. Receiver Timing Test Load

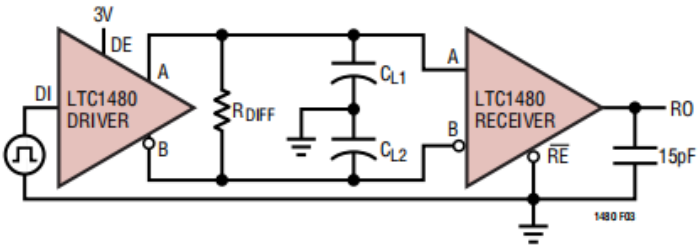


Figure 3. Driver/Receiver Timing Test Circuit

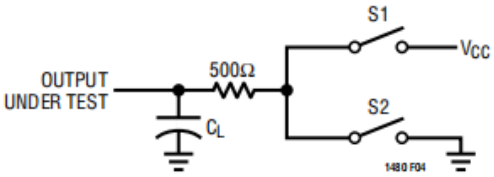


Figure 4. Driver Timing Test Load

SWITCHING TIME WAVEFORMS

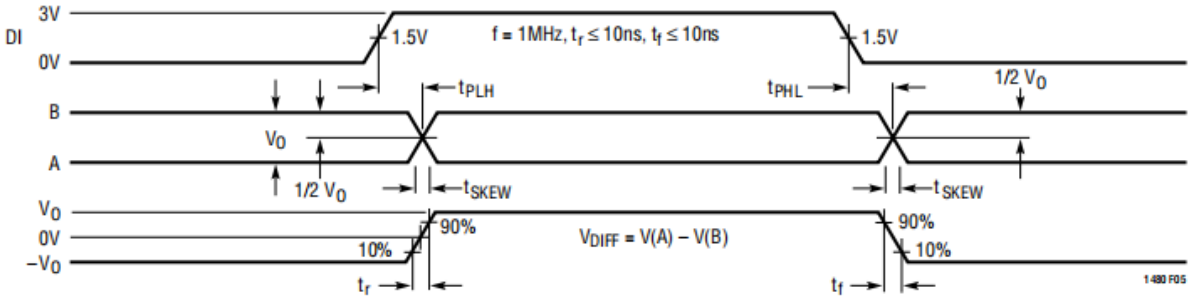


Figure 5. Driver Propagation Delays

SWITCHING TIME WAVEFORMS

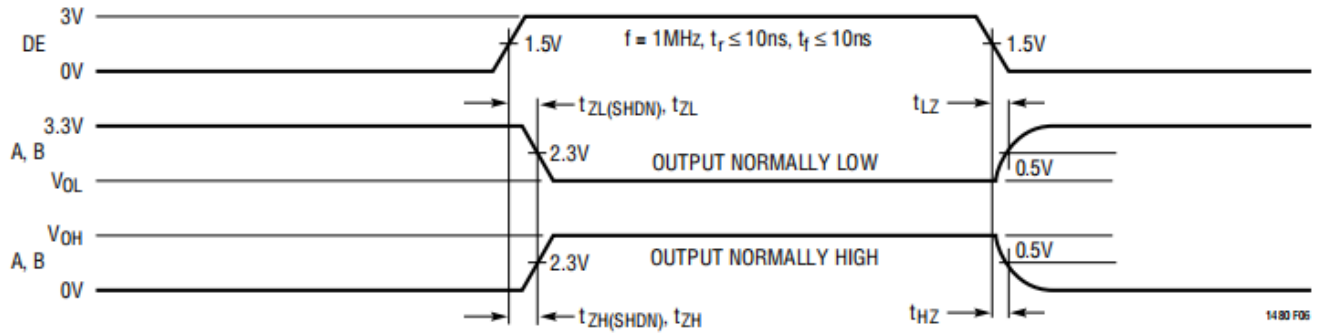


Figure 6. Driver Enable and Disable Times

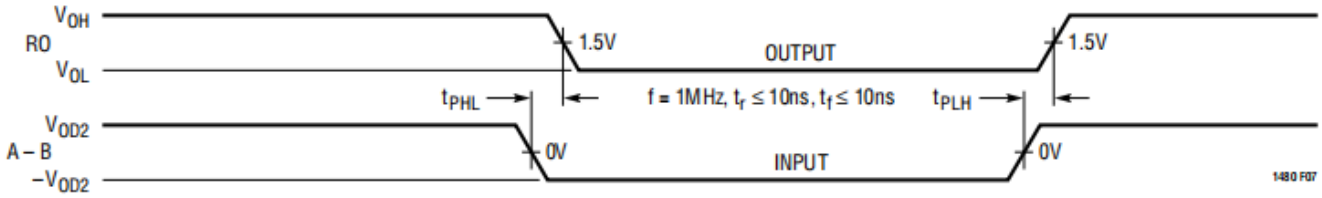


Figure 7. Receiver Propagation Delays

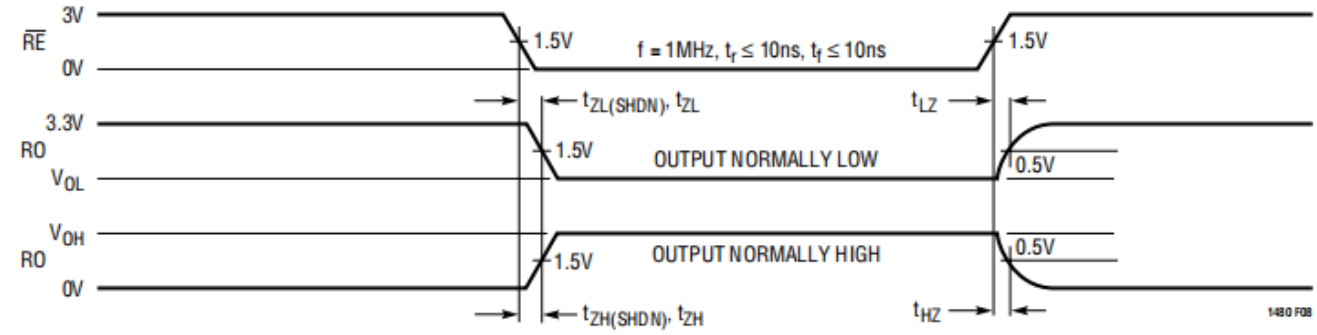
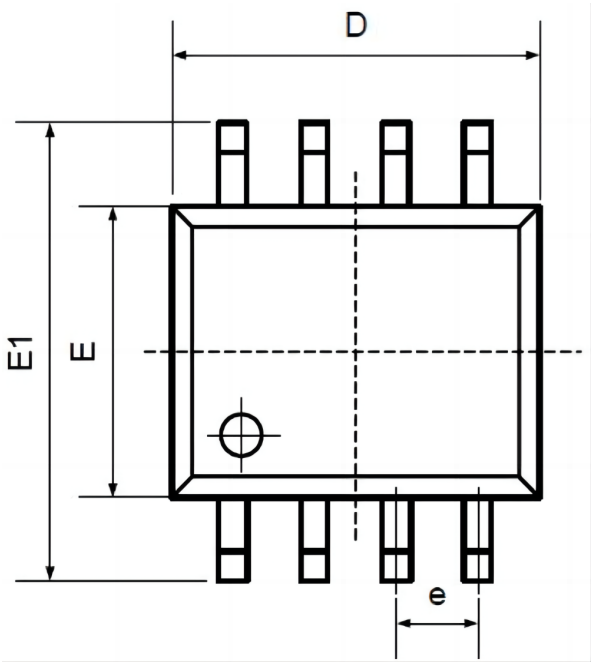


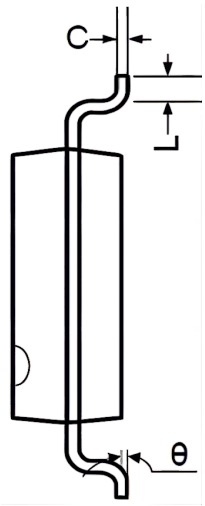
Figure 8. Receiver Enable and Disable Times

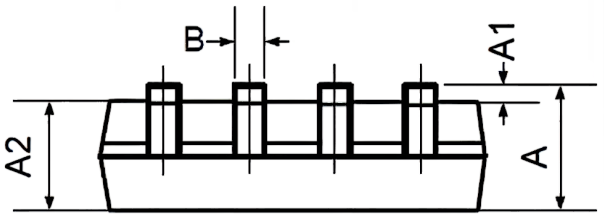
ORDERING INFORMATION

Order Number	Package	Package Quantity	Marking On The park
LTC1480CN8-TUDI	DIP8	Tube,50,A box of 2000	LTC1480CN8
LTC1480CS8-TUDI	SOP8	Tape,Reel,2500	1480
LTC1480IN8-TUDI	DIP8	Tube,50,A box of 2000	LTC1480IN8
LTC1480IS8-TUDI	SOP8	Tape,Reel,2500	14801

Package SOP8

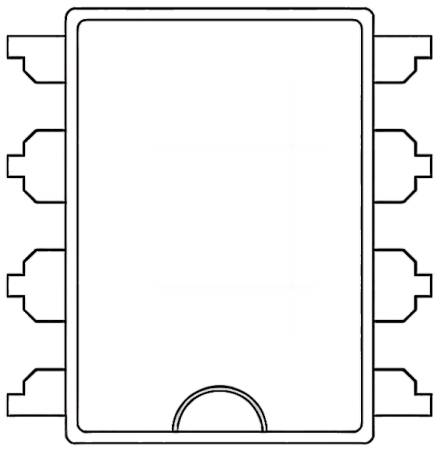


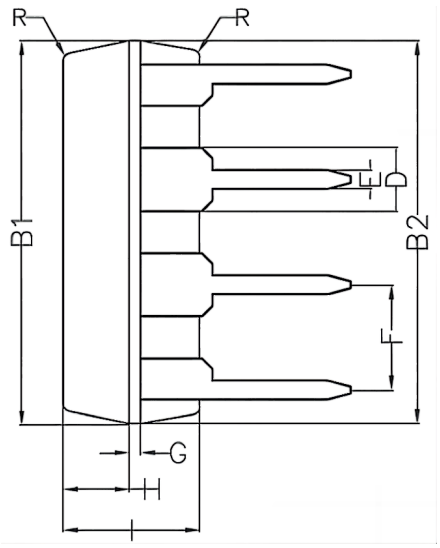


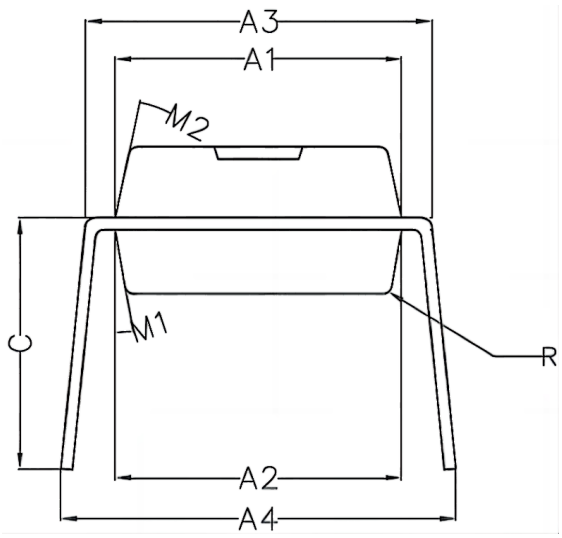


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Package DIP8







Symbol	Min	Non	Max
A1	6.28	6.33	6.38
A2	6.33	6.38	6.43
A3	7.52	7.62	7.72
A4	7.80	8.40	9.00
B1	9.15	9.20	9.25
B2	9.20	9.25	9.30
C		5.57	
D		1.52	
E	0.43	0.45	0.47
F		2.54	
G		0.25	
H	1.54	1.59	1.64
工	3.22	3.27	3.32
R		0.20	
M1	9°	10°	11°
M2	11°	12°	13°

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