钍地半导体
Tudi Semiconductor

Product Specification

TUDI-LTC1482

Low Power RS485 Transceiver with Carrier Detect and Receiver Fail-Safe

网址 www.sztdbdt.com

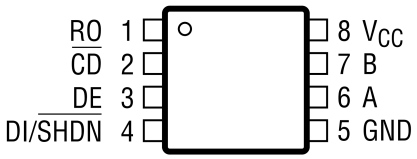
用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

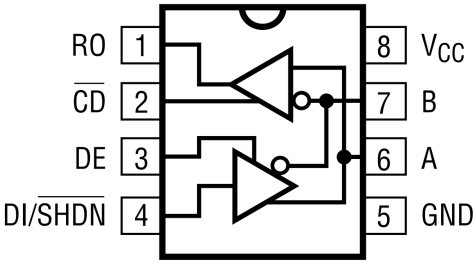
FEATURES

- No Damage or Latchup to ±15kV (Human Body Model), IEC1000-4-2 Level 4 (±8kV) Contact and Level 3 (±8kV) Air Discharge
- Active Low Carrier Detect Output
- Guaranteed High Receiver Output State for Floating, Shorted or Terminated Inputs with No Signal Present
- Drives Low Cost Residential Telephone Wires
- Low Power: ICC = 700µA Max with Driver Disabled
- ICC = 900µA Max in Driver Mode Without Load
- 20µA Max Quiescent Current in Shutdown Mode
- Single 5V Supply
- – 7V to 12V Common Mode Range Permits ±7V Ground Difference Between Devices on the Data Line
- Maximum Data Rate of 4Mbps
- Power Up/Down Glitch-Free Driver Outputs
- Up to 32 Transceivers on the Bus
- Available in 8-Lead MSOP, PDIP and SO Packages



MS8 PACKAGE
8-LEAD PLASTIC MSOP

T_{JMAX} = 125°C, θ_{JA} = 200°C/ W



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} = 135°C/ W (S8)

APPLICATIONS

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

DESCRIPTION

The LTC1482 is a low power RS485 compatible transceiver that offers an active low carrier detect output. The open-drain carrier detect pin allows several transceivers to share the same carrier detect line and can be used to detect the insertion or removal of a driven RS485/RS422 cable.

Enhanced ESD protection allows the LTC1482 to with-stand ±15kV (human body model), IEC-1000 -4-2 level 4 (±8kV) contact and level 3 (±8kV) air discharge ESD without latchup or damage.

The LTC1482 receiver stays alive at all times except in shutdown. The supply current is a maximum of 700µA and 900µA when the driver is disabled and enabled respectively. In shutdown, the quies cent current of the LTC1482 drops to a maximum of 20µA.

When the driver is disabled or the LTC1482 is in shut-down, the driver outputs are three-stated and remain in a high impedance state over the RS485 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 LTC1482 is fully specified over the commercial and industrial temperature ranges and is available in 8-lead MSOP, PDIP and SO packages.

PIN FUNCTIONS

RO (Pin 1): Receiver Output. If a carrier is present ($\overline{CD}$ low) and the part is not in shutdown, RO is high if the receiver input differential voltage (A – B) ≥ $V_{THRO(MAX)}$ and low if (A – B) ≤ $V_{THRO(MIN)}$. RO is forced to high (fail-safe state) if a carrier is not present ($\overline{CD}$ = 1). In shutdown, RO is three-stated. If the driver is enabled, RO follows the logic level at the driver input.

$\overline{CD}$ (Pin 2): Open-Drain Carrier Detect Output. Provided that the part is not in shutdown, the $\overline{CD}$ output is low if $V_{THCD(MIN)}$ ≥ (A – B) ≥ $V_{THCD(MAX)}$ and high if $V_{THCD(MIN)}$ < (A – B) < $V_{THCD(MAX)}$. This is true regardless of whether the A and B pins are driven by the internal (DE = 1) or an external (DE = 0) driver. A weak internal pull-up removes the need for an external pull-up resistor if fast rise times are not important. Several LTC1482s can share the same $\overline{CD}$ line. $\overline{CD}$ = 1 forces RO to the high fail-safe state. In shutdown, $\overline{CD}$ is three-stated. This pin can be pulled above V_{CC} but should not be taken above 8V to avoid damage.

DE (Pin 3): Driver Enable Input. DE = 0 disables or three-states the driver outputs. DE = 1 enables the driver outputs with the high/low state of the outputs set by DI/$\overline{SHDN}$.

DI/$\overline{SHDN}$ (Pin 4): Driver Input and Shutdown Input. It is used together with the DE pin to put the part in shutdown (DE = 0, DI/SHDN = 0) or to disable the driver while keeping the receiver alive (DE = 0, DI/$\overline{SHDN}$ = 1). When the driver is enabled (DE = 1), DI/$\overline{SHDN}$ = 0 forces the A output low and the B output high. DI/$\overline{SHDN}$ = 1 forces the A output high and the B output low.

When the driver is enabled, the A output follows the logic level at the DI/$\overline{SHDN}$ pin.

GND (Pin 5): Ground.

A (Pin 6): Driver Output/Receiver Input. The input resistance is typically 22k when the driver is disabled (DE = 0).

B (Pin 7): Driver Output/Receiver Input. The input resistance is typically 22k when the driver is disabled (DE = 0). When the driver is enabled, the B output is inverted from the logic level at the DI/$\overline{SHDN}$ pin.

V_{CC} (Pin 8): Positive Supply. 4.75V < V_{CC} < 5.25V. A 0.1µF bypass capacitor is recommended.

ABSOLUTE MAXIMUM RATINGS

(Note 1)

Supply Voltage (V_{CC}) 6.5V
Control Input Voltages ..... –0.3V to (V_{CC} + 0.3V)
Carrier Detect Voltage ..... –0.3V to 8V
Driver Input Voltage ..... –0.3V to (V_{CC} + 0.3V)
Driver Output Voltages ..... –7V to 10V
Receiver Input Voltages (Driver Disabled) .. –12V to 14V
Receiver Output Voltage ..... –0.3V to (V_{CC} + 0.3V)
Junction Temperature ..... 125°C
Operating Temperature Range
LTC1482C ..... 0°C ≤ T_A ≤ 70°C
LTC1482I ..... –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, otherwise specifications are at T_A = 25°C. V_{CC} = 5V ±5% (Notes 2 and 3) unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_{OD1}	Differential Driver Output Voltage (Unloaded)	I_{OUT} = 0	●			V_{CC}	V
V_{OD2}	Differential Driver Output Voltage (with Load)	R = 50Ω (RS422) R = 27Ω (RS485) Figure 1 R = 22Ω, Figure 1	● ● ●	2 1.5 1.5		 5 5	V V V
V_{OD3}	Differential Driver Output Voltage (with Common Mode)	V_{TST} = –7V to 12V, Figure 2	●	1.5		5	V
ΔV_{OD}	Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	R = 22Ω, 27Ω or R = 50Ω, Figure 1 V_{TST} = –7V to 12V, Figure 2	●			0.2	V
V_{OC}	Driver Common Mode Output Voltage	R = 22Ω, 27Ω or R = 50Ω, Figure 1	●			3	V
$\Delta\lvert V_{OC}\rvert$	Change in Magnitude of Driver Common Mode Output Voltage for Complementary Output States	R = 22Ω, 27Ω or R = 50Ω, Figure 1	●			0.2	V
V_{IH}	Input High Voltage	DE, DI/$\overline{SHDN}$	●	2			V
V_{IL}	Input Low Voltage	DE, DI/$\overline{SHDN}$	●			0.8	V
I_{IN1}	Input Current	DE, DI/$\overline{SHDN}$	●			±2	µA
I_{IN2}	Input Current (A, B) with Driver Disabled	DE = 0, V_{CC} = 0 or 5V, V_{IN} = 12V DE = 0, V_{CC} = 0 or 5V, V_{IN} = –7V	● ●			1.0 –0.8	mA mA
V_{THRO}	Differential Input Threshold Voltage for Receiver	–7V ≤ V_{CM} ≤ 12V, DE = 0	●	–0.20		–0.015	V

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. V_{CC} = 5V ±5% (Notes 2 and 3) unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_{THCD}	Differential Input Threshold Voltage for $\overline{CD}$ = 1	–7V ≤ V_{CM} ≤ 12V, DE = 0	●	–0.20		0.20	V
ΔV_{TH}	Receiver Input Hysteresis	V_{CM} = 0V, DE = 0			±30		mV
V_{OH}	$\overline{CD}$ Output High Voltage	I_{OUT} = –10µA, (V_A – V_B) = 0V	●	3.4			V
	RO Output High Voltage	I_{OUT} = –4mA, (V_A – V_B) = 200mV	●	3.5			V
V_{OL}	RO and $\overline{CD}$ Output Low Voltage	I_{OUT} = 4mA, (V_A – V_B) = –200mV	●			0.4	V
I_{OZR}	Three-State (High Impedance) Receiver Output Current in Shutdown	V_{CC} = Max, 0.4V ≤ V_{OUT} ≤ 2.4V DI/$\overline{SHDN}$ = 0, DE = 0	●			±1	µA
R_{IN}	Receiver Input Resistance	–7V ≤ V_{CM} ≤ 12V	●	12	22		kΩ
I_{CC}	Supply Current	No Load, Driver Enabled (DE = V_{CC}) No Load, Driver Disabled (DE = 0)	● ●		580 430	900 700	µA µA
I_{SHDN}	Supply Current in Shutdown Mode	DE = 0, DI = 0	●		10	20	µA
I_{OSD1}	Driver Short-Circuit Current, V_{OUT} = High (Note 4)	–7V ≤ V_{OUT} ≤ 10V		35		250	mA
I_{OSD2}	Driver Short-Circuit Current, V_{OUT} = Low (Note 4)	–7V ≤ V_{OUT} ≤ 10V		35		250	mA
I_{OS}	RO and $\overline{CD}$ Short-Circuit Current	0V ≤ V_{OUT} ≤ V_{CC}	●	7		85	mA
$I_{PULL-UP}$	$\overline{CD}$ Pull-Up Current	$\overline{CD}$ = 0V	●	15	30	60	µA

SWITCHING CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. V_{CC} = 5V ±5% (Notes 2 and 3) unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
t_{PLH}	Driver Input to Output	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF	●	10	28	60	ns
t_{PHL}	Driver Input to Output	(Figures 4, 6)	●	10	30	60	ns
t_{SKEW}	Driver Output to Output		●		2	10	ns
t_r, t_f	Driver Rise or Fall Time		●	3	15	40	ns
t_{ZH}	Driver Enable to Output High	C_L = 100pF (Figures 5, 7) S2 Closed	●		40	70	ns
t_{ZL}	Driver Enable to Output Low	C_L = 100pF (Figures 5, 7) S1 Closed	●		40	100	ns
t_{LZ}	Driver Disable Time from Low	C_L = 15pF (Figures 5, 7) S1 Closed	●		40	70	ns
t_{HZ}	Driver Disable Time from High	C_L = 15pF (Figures 5, 7) S2 Closed	●		40	70	ns
$t_{ZH(SHDN)}$	Driver Enable from Shutdown to Output High (Note 5)	C_L = 100pF (Figures 5, 7) S2 Closed	●		40	100	ns
$t_{ZL(SHDN)}$	Driver Enable from Shutdown to Output Low	C_L = 100pF (Figures 5, 7) S1 Closed	●		40	100	ns
$t_{HZ(SHDN)}$	Driver Disable on Shutdown from Output High	C_L = 15pF (Figures 5, 7) S2 Closed	●		40	100	ns
$t_{LZ(SHDN)}$	Driver Disable on Shutdown from Output Low	C_L = 15pF (Figures 5, 7) S1 Closed	●		40	100	ns
f_{MAX}	Maximum Data Rate (Note 6)		●	4	5		Mbps
t_{PLH}	Receiver Input to Output (Note 7)	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF, (Figures 4, 8)	●	30	138	200	ns
t_{PHL}	Receiver Input to Output	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF, (Figures 4, 8)	●	30	122	200	ns
t_{SKD}	$\lvert t_{PLH} - t_{PHL} \rvert$ Differential Receiver Skew	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF, (Figures 4, 8)			16		ns
t_{CDH}	Receiver Input to $\overline{CD}$ Output High (Note 7)	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF, (Figures 4, 10) DI/$\overline{SHDN}$ = V_{CC}	●		2900	5000	ns
t_{CDL}	Receiver Input to $\overline{CD}$ Output Low (Note 7)	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF, (Figures 4, 10) DI/$\overline{SHDN}$ = V_{CC}	●		150	300	ns

SWITCHING CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C. V_{CC} = 5V ±5% (Notes 2 and 3) unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
$t_{CDH(SHDN)}$	Receiver Input to $\overline{CD}$ Output High at Shutdown	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF, (Figures 4, 11) DI/$\overline{SHDN}$ = DE	●		2600	5000	ns
$t_{CDL(SHDN)}$	Receiver Input to $\overline{CD}$ Output Low from Shutdown	R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF, (Figures 4, 11) DI/$\overline{SHDN}$ = DE	●		2600	5000	ns
$t_{ZH(SHDN)}$	Receiver Enable from Shutdown to Output High	C_L = 15pF (Figures 3, 9) S2 Closed, A = 750mV, B = −750mV, DE = 0, DI/$\overline{SHDN}$ = ⌐	●		30	600	ns
$t_{ZL(SHDN)}$	Receiver Enable from Shutdown to Output Low	C_L = 15pF (Figures 3, 9) S1 Closed, A = −750mV, B = 750mV, DE = 0, DI/$\overline{SHDN}$ = ⌐	●		2600	5000	ns
$t_{HZ(SHDN)}$	Receiver Disable from High on Shutdown	C_L = 15pF (Figures 3, 9) S2 Closed, A = 750mV, B = −750mV, DE = 0, DI/$\overline{SHDN}$ = ¬	●		200	600	ns
$t_{LZ(SHDN)}$	Receiver Disable from Low on Shutdown	C_L = 15pF (Figures 3, 9) S1 Closed, A = −750mV, B = 750mV, DE = 0, DI/$\overline{SHDN}$ = ¬	●		200	600	ns

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

Note 2: All typicals are given for V_{CC} = 5V and T_A = 25°C.

Note 3: All currents into device pins are positive; all currents out of device pins are negative. All voltages are referenced to device ground unless otherwise specified.

Note 4: For higher ambient temperatures, the part may enter thermal shutdown during short-circuit conditions.

Note 5: Both driver input and driver enable pins are pulled high simultaneously.

Note 6: Guaranteed by design.

Note 7: Measured with an external LTC1485 driver.

PIN FUNCTIONS

(DE = 0, DI/$\overline{SHDN}$ = 0) or to disable the driver while keeping the receiver alive (DE = 0, DI/$\overline{SHDN}$ = 1). When the driver is enabled (DE = 1), DI/$\overline{SHDN}$ = 0 forces the A output low and the B output high. DI/$\overline{SHDN}$ = 1 forces the A output high and the B output low.

GND (Pin 5): Ground.

A (Pin 6): Driver Output/Receiver Input. The input resistance is typically 22k when the driver is disabled (DE = 0). When the driver is enabled, the A output follows the logic level at the DI/$\overline{SHDN}$ pin.

B (Pin 7): Driver Output/Receiver Input. The input resistance is typically 22k when the driver is disabled (DE = 0). When the driver is enabled, the B output is inverted from the logic level at the DI/$\overline{SHDN}$ pin.

V_{CC} (Pin 8): Positive Supply. 4.75V < V_{CC} < 5.25V. A 0.1µF bypass capacitor is recommended.

FUNCTION TABLES

Driver Enabled (DE = 1)

DI/$\overline{SHDN}$	A	B	RO	$\overline{CD}$
0	0	1	0	0
1	1	0	1	0
X	A Shorted to B		1	1

Note 1: DE = 0, DI/$\overline{SHDN}$ = 0 puts the part in I_{CC} shutdown and the supply current drawn by the V_{CC} pin drops to 20µA max. The receiver is always alive except in shutdown.

Note 2: The table is valid regardless of the presence of an external termination resistor.

Note 3: Although the RO and the driver outputs are three-stated, the A and B pins each present a 22kΩ receiver input resistance to ground.

Driver Disabled (DE = 0, Notes 1, 2)

DI/$\overline{SHDN}$	A – B	RO	$\overline{CD}$
0	X (Note 3)	Z	1 (Internal Pull-Up)
1	$V_{THCD(MIN)} < (A - B) < V_{THCD(MAX)}$	1	1
1	A and B are Open	1	1
1	A and B are Shorted	1	1
1	$V_{THCD(MIN)} \geq (A - B) \geq V_{THCD(MAX)}$ and $(A - B) \leq V_{THRO(MIN)}$	0	0
1	$V_{THCD(MIN)} \geq (A - B) \geq V_{THCD(MAX)}$ and $(A - B) \geq V_{THRO(MAX)}$	1	0

X = Don't Care
Z = High Impedance

TEST CIRCUITS

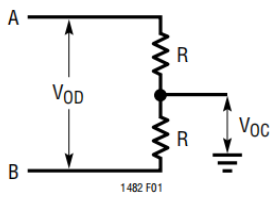


Figure 1. Driver DC Test Load #1

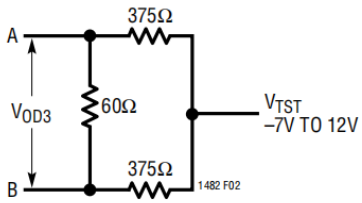


Figure 2. Driver DC Test Load #2

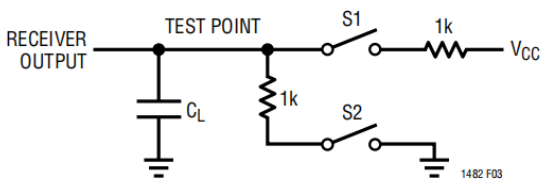


Figure 3. Receiver Timing Test Load

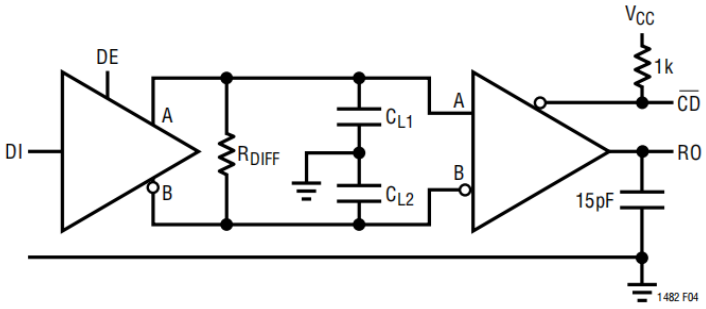


Figure 4. Driver/Receiver Timing Test Load

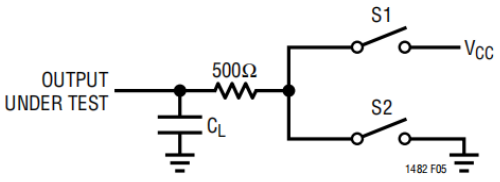
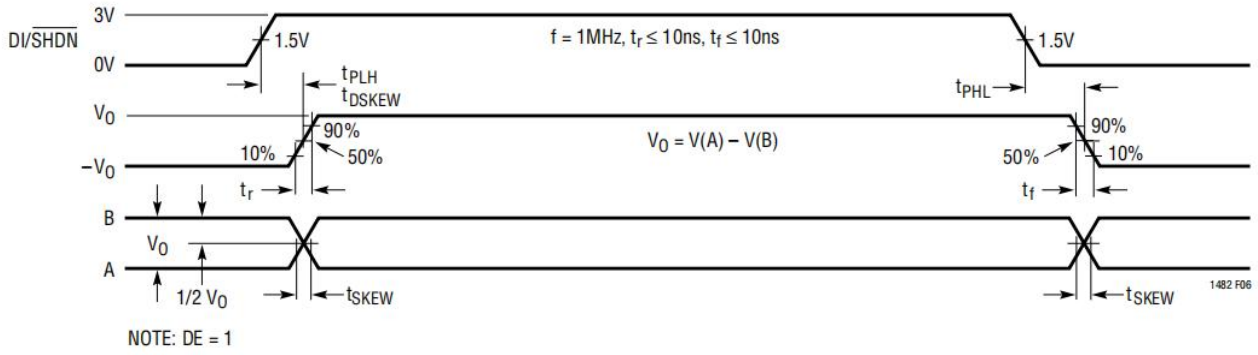


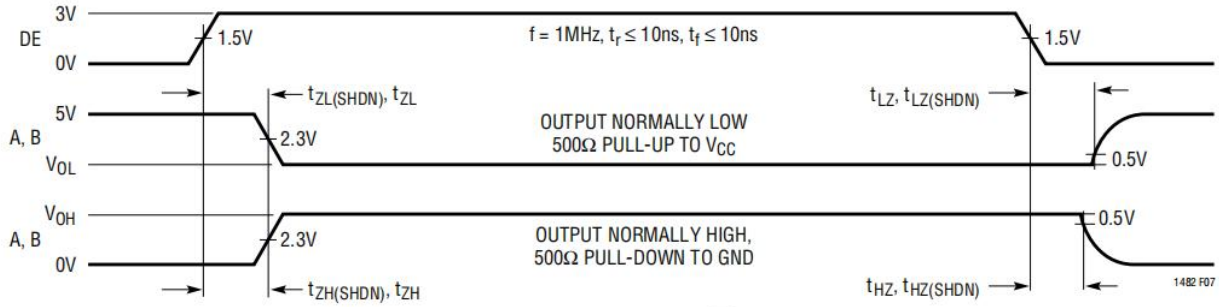
Figure 5. Driver Timing Test Load

SWITCHING TIME WAVEFORMS



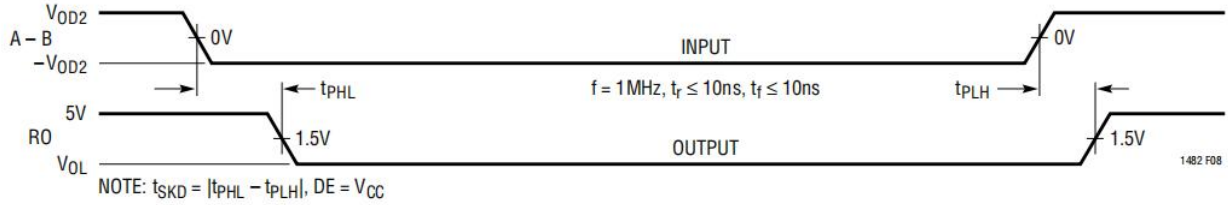
NOTE: DE = 1

Figure 6. Driver Propagation Delays



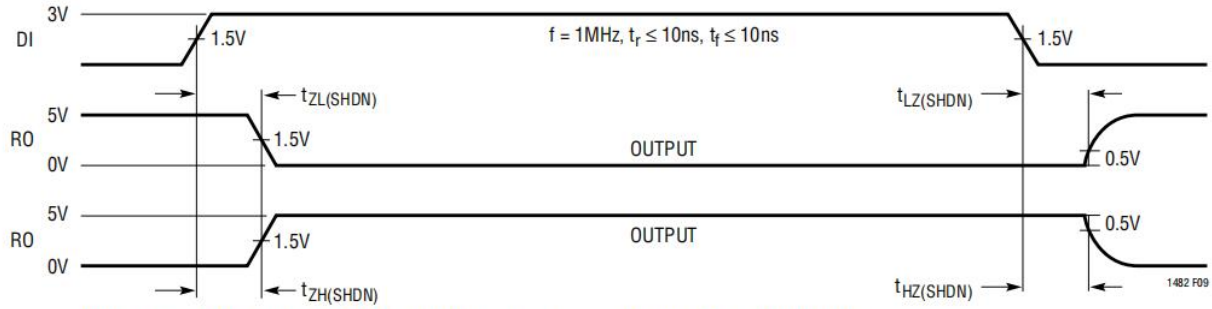
NOTE: DI = 0 FOR $t_{ZL(SHDN)}$, $t_{LZ(SHDN)}$; DI = DE FOR $t_{ZH(SHDN)}$, $t_{HZ(SHDN)}$; DI = $\overline{DE}$ FOR t_{ZL}, t_{LZ}; DI = V_{CC} FOR t_{ZH}, t_{HZ}

Figure 7. Driver Enable and Disable Timing



NOTE: $t_{SKD} = |t_{PHL} - t_{PLH}|$, DE = V_{CC}

Figure 8. Receiver Propagation Delays



NOTE: DE = 0, RO IS THREE-STATED IN SHUTDOWN, 1kΩ PULL-UP FOR NORMALLY LOW OUTPUT, 1kΩ PULL-DOWN FOR NORMALLY HIGH OUTPUT

Figure 9. Receiver Enable and Shutdown Timing

SWITCHING TIME WAVEFORMS

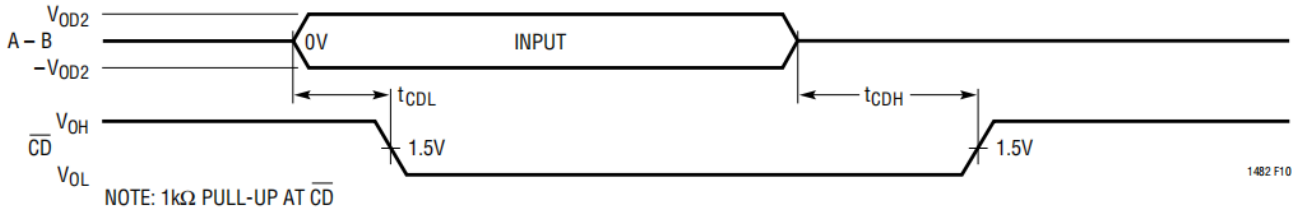


Figure 10. Carrier Detect Timing

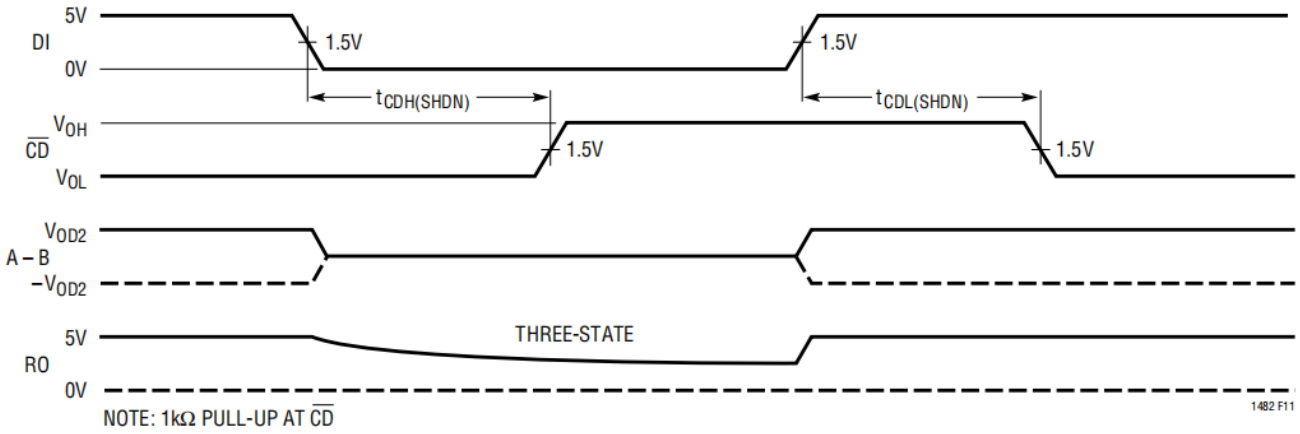
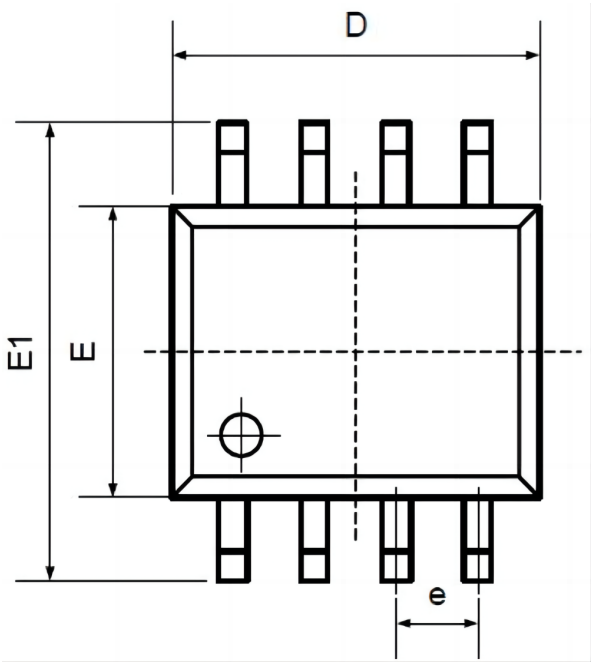


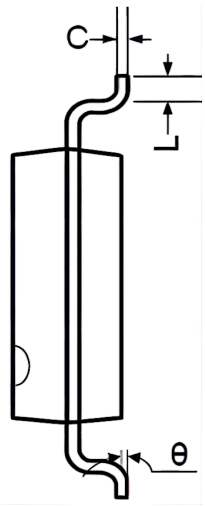
Figure 11. Shutdown Carrier Detect Timing

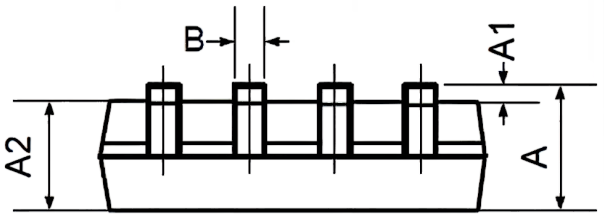
ORDERING INFORMATION

Order Number	Package	Package Quantity	Marking On The park
LTC1482CMS8-TUDI	MSOP8	Tape,Reel,2500	LTCB
LTC1482CN8-TUDI	DIP8	Tube,50,A box of 2000	LTC1482CN8
LTC1482CS8-TUDI	SOP8	Tape,Reel,2500	1482
LTC1482IN8-TUDI	DIP8	Tube,50,A box of 2000	LTC1482IN8
LTC1482IS8-TUDI	SOP8	Tape,Reel,2500	1482I

Package SOP8

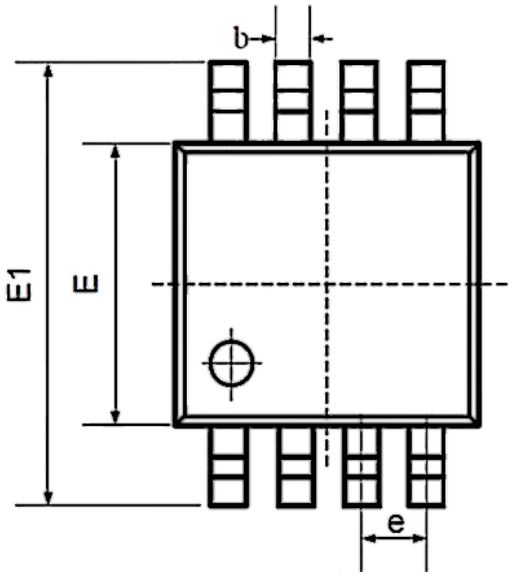


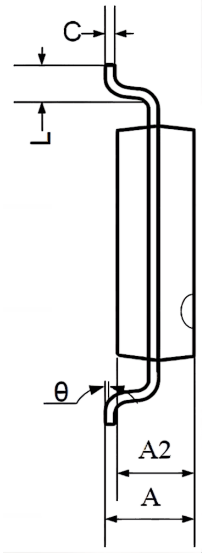


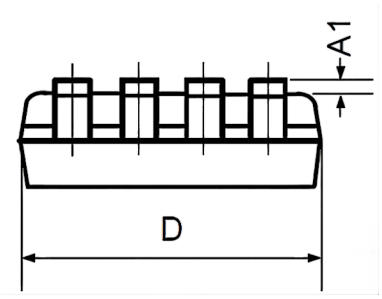


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP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

Package MSOP8

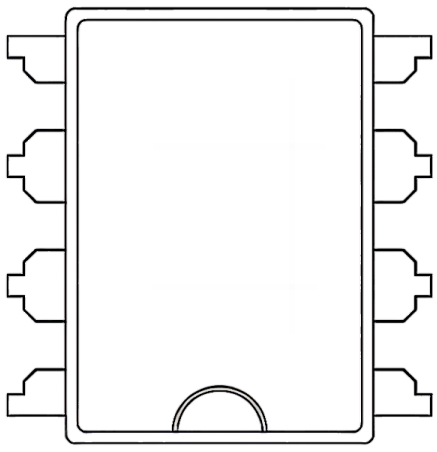


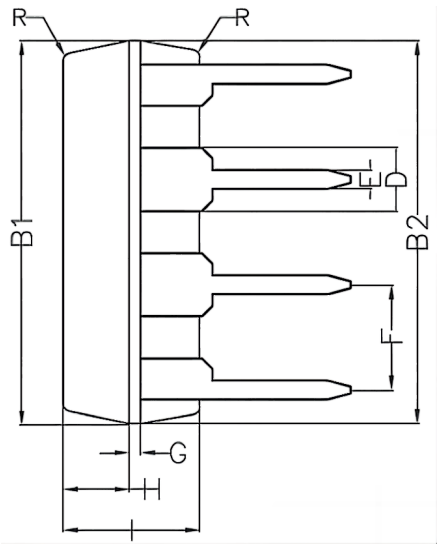


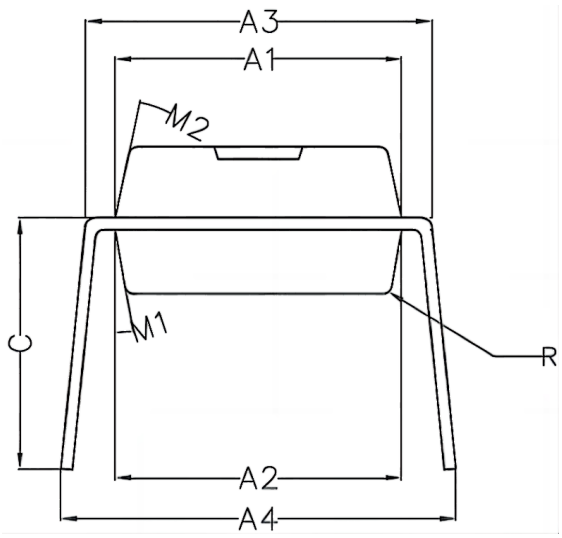


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026 TYP	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
L	0.410	0.650	0.016	0.026
θ	0°	6°	0°	6°

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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