

钍地半导体
Tudi Semiconductor

Product Specification

TUDI-ADM1490E/ADM1491E

16 Mbps, ESD Protected, Full-Duplex RS-485 Transceivers

网址 www.sztdbdt.com

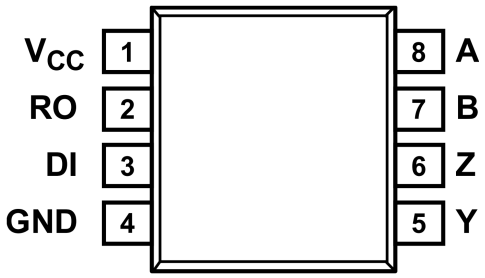
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semiconductor device manufacturer

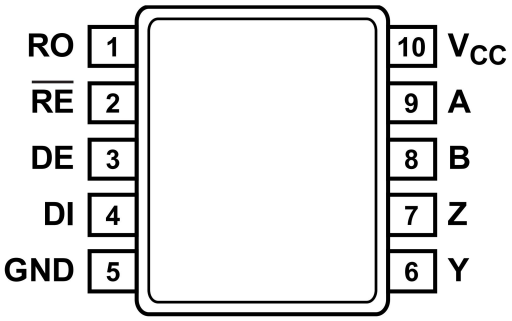
- Design
- research and development
- production
- and sales

FEATURES

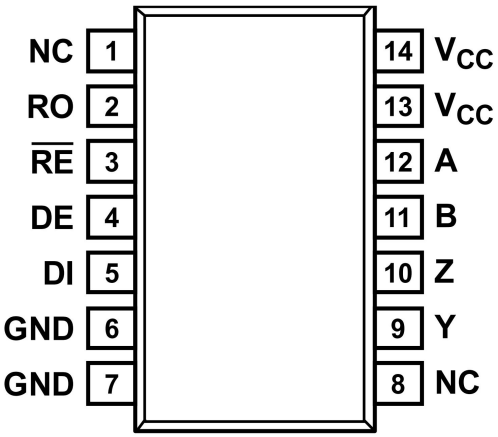
- RS-485/RS-422 full-duplex transceiver for high speed motor control applications
- 16 Mbps data rate
- ±8 kV ESD protection on RS-485 input/ output pins
- Complies with ANSI/TIA/EIA-485-A-1998
- Open circuit fail-safe
- Suitable for 5 V power supply applications
- 32 nodes on the bus (1 unit load)
- Thermal shutdown protection
- Operating temperature range: ?40 ° C to +85 ° C
- ADM1490E packages
  - Narrow body, 8-lead SOIC
  - 8-lead MSOP
- ADM1491E packages
  - Narrow-body, 14-lead SOIC
  - 10-lead MSOP



ADM1490E SOP8/MSOP8



ADM1491E MSOP10



ADM1491E SOP14

APPLICATIONS

- RS-485/RS-422 interfaces
- Industrial field networks
- High data rate motor control
- Multipoint data transmission systems
- Single-ended-to-differential signal conversion

DESCRIPTION

The ADM1490E/ADM1491E are RS-485/RS-422 transceivers with ±8 kV ESD protection and are suitable for high speed, full-duplex communication on multipoint transmission lines. In particular, the ADM1490E/ADM1491E are designed for use in motor control applications requiring communications at data rates up to 16 Mbps.

The ADM1490E/ADM1491E are designed for balanced trans-mission lines and comply with TIA/EIA-485-A-98. The devices each have a 12 kΩ receiver input impedance for unit load RS-485 operation, allowing up to 32 nodes on the bus.

The differential transmitter outputs and receiver inputs feature electrostatic discharge circuitry that provides protection to ±8 kV using the human body model (HBM).

The ADM1490E/ADM1491E operate from a single 5 V power supply. Excessive power dissipation caused by bus contention or output shorting is prevented by short-circuit protection and thermal circuitry. Short-circuit protection circuits limit the maximum output current to ±250 mA during fault conditions. A thermal shutdown circuit senses if the die temperature rises above 150 ° C and forces the driver outputs into a high impedance state under this condition.
The receiver of the ADM1490E/ADM1491E contains a fail-safe feature that results in a logic high output state if the inputs are unconnected (floating).
The ADM1490E/ADM1491E feature extremely fast and closely matched switching times. Minimal driver propagation delays permit transmission at data rates up to 16 Mbps, and low skew minimizes EMI interference.
The ADM1490E/ADM1491E are fully specified over the commercial and industrial temperature ranges. The ADM1490E is available in two packages: a narrow body, 8-lead SOIC and an 8-lead MSOP. The ADM1491E is also available in two packages: a narrow body, 14-lead SOIC and a 10-lead MSOP.

ABSOLUTE MAXIMUM RATINGS

TA = 25 ° C, unless otherwise noted.

Parameter	Rating
Vcc to GND	-0.3V to+7V
Digital I/O Voltage (DE,RE)	-0.3V to Vcc+0.3V
DriverInput Voltage(DI)	-0.3V to Vcc+0.3V
Receiver Output Voltage(RO)	-0.3 V to Vcc+0.3V
Driver Output/Receiver Input Voltage (A, B,Y,Z)	-9 V to+14V
Operating Temperature Range	-40℃ to+85℃
Storage Temperature Range	-55℃ to+150℃
ESD(HBM)on A,B,Y,and Z	±8 kV

THERMAL RESISTANCE

θ_{JA} is specified for the worst-case conditions, that is, a device soldered in a circuit board for surface-mount packages.

Package Type	θ_{JA}	Unit
8-Lead SOIC	121	℃/W
14-Lead SOIC	86	℃/W
8-Lead MSOP	133	℃/W
10-Lead MSOP	133	℃/W

Pin Function Descriptions

Pin No.			Mnemonic	Description
8-Lead SOIC, 8-Lead MSOP	14-Lead SOIC	10-Lead MSOP		
N/A[1]	1	N/A[1]	NC	No Connect.This pin is available on the 14-lead SOIC only.
2	2	1	RO	Receiver Output.
N/A[1]	3	2	RE	Receiver Output Enable.A low level enables the receiver output,whereas a high level places the receiver output in a high impedance state.
N/A[1]	4	3	DE	Driver Output Enable.A logichigh enables the differential driver outputs,A and B,whereas a logic low places the differential driver outputs in a high impedance state.
3	5	4	DI	Driver Input.When the driver is enabled,alogic low on DIforces Pin A low and Pin B high,whereas a logic high on DIforces Pin A high and Pin Blow.
4	6	5	GND	Ground.
N/A[1]	7	N/A[1]	GND	Ground.This pin is available on the 14-lead SOIC only.
N/A[1]	8	N/A[1]	NC	No Connect.This pin is available on the 14-lead SOIC only.
5	9	6	Y	Noninverting Driver Output Y.
6	10	7	Z	Inverting Driver Output Z.
7	11	8	B	Inverting Receiver Input B.
8	12	9	A	Noninverting Receiver Input A.
1	13	10	Vcc	Power Supply (5V±5%).
N/A[1]	14	N/A[1]	Vcc	Power Supply (5V±5%).This pin is available on the 14-lead SOIC only.

SPECIFICATIONS

4.75 V ≤ V_{CC} ≤ 5.25 V; all minimum/maximum specifications apply over the entire recommended operation range, unless otherwise noted. All typical specifications are at T_A = 25 ° C, V_{CC} = 5.0 V, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
SUPPLY CURRENT						
Outputs Enabled	I_{CC1}		1.2	2.0	mA	Outputs unloaded,digital inputs= Vcc or GND
Outputs Disabled	I_{CC2}		0.8	1.5	mA	Outputs unloaded,digital inputs= Vcc or GND
DRIVER						
Differential Outputs						
Differential Output Voltage, Loaded	$\|V_{OD2}\|$	2.0		5.0	V	R_L=100Ω(RS-422),see Figure 5
		1.5		5.0	V	R_L=54Ω(RS-485),see Figure 5
	$\|V_{OD3}\|$	1.5		5.0	V	-7V≤V_{TEST}≤+12V,see Figure 6
△|VOD| for Complementary Output States	$\triangle V_{OD2}$			0.2	V	R_L=54Ωor 100Ω,see Figure 5
Common-Mode Output Voltage	V_{OC}			3.0	V	R_L=54Ωor 100Ω,see Figure 5
△|VocI for Complementary Output States	$\triangle\|V_{OC}\|$			0.2	V	R_L=54Ωor 100Ω,see Figure 5
Output Leakage Current(Y,Z)	Io			100	μA	DE=0V,V_{DD}=0V or 5V,V_{IN}=12V
	Io	-100			μA	DE=0V,V_{DD}=0V or 5V,V_{IN}=-7V
Output Short-Circuit Current	Ios			250	mA	-7V<V_{OUT}<+12V
Logic Inputs DE,RE,DI						
Input Low Voltage	V_{IL}			0.8	V	DE,RE,DI
Input High Voltage	V_{IH}	2.0			V	DE,RE,DI
Input Current	I_I	-1		+1	μA	DE,RE,DI

SPECIFICATIONS(continued)

4.75 V ≤ V_{CC} ≤ 5.25 V; all minimum/maximum specifications apply over the entire recommended operation range, unless otherwise noted. All typical specifications are at T_A = 25 ° C, V_{CC} = 5.0 V, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
RECEIVER						
Differential Inputs						
Differential Input Threshold Voltage	V_{TH}	-0.2		+0.2	V	-7V<V_{CM}<+12V
Input Voltage Hysteresis	V_{HYS}		30		mV	V_{CM}=0V
Input Current(A,B)	I_I			1.0	mA	V_{CM}=12V
		-0.8			mA	V_{CM}=-7V
Line Input Resistance	R_{IN}	12	30		kΩ	-7V≤V_{CM}≤+12V
Logic Outputs						
Output Voltage Low	V_{OL}			0.4	V	I_{OUT}=+4.0 mA,VA-VB=-0.2V
Output Voltage High	V_{OH}	4.0			V	I_{OUT}=-4.0 mA,VA-VB=+0.2V
Short-Circuit Current				85	mA	
Three-State Output Leakage Current	I_{OZR}			± 1	μA	V_{CC}=5.25V,0.4V<V_{OUT}<2.4V

TIMING SPECIFICATIONS

TA = -40 ° C to +85 ° C.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
DRIVER						
Maximum Data Rate		16			Mbps	
Propagation Delay	t_{DPLH},t_{DPHL}		11	17	ns	R_L=54Ω,C_L=100 pF,see Figure7 and Figure 1
Driver Output Skew	t_{SKEW}		0.5	2	ns	R_L=54Ω,C_L=100 pF, see Figure7 and Figure 1, t_{SKEW}=|t_{DPLH}-t_{DPHL}|
Rise Time/Fall Time	t_{DR},t_{DF}		8	15	ns	R_L=54Ω,C_L=100 pF,see Figure7 and Figure 1
Enable Time	t_{ZH},t_{ZL}			20	ns	R_L=110Ω,C_L=50 pF,see Figure7 and Figure 3
Disable Time	t_{HZ},t_{LZ}			20	ns	R_L=110Ω,C_L=50 pF,see Figure8 and Figure 3
RECEIVER						
Propagation Delay	t_{PLH},t_{PHL}		12	20	ns	C_L=15 pF,see Figure 9 and Figure2
Skew |t_{PLH}-t_{PHL}|	t_{SKEW}		0.4	2	ns	C_L=15 pF,see Figure 9 and Figure2
Enable Time	t_{ZH},t_{ZL}			13	ns	R_L=1kΩ,C_L=15 pF,see Figure 10and Figure 4
Disable Time	t_{HZ},t_{LZ}			13	ns	R_L=1kΩ,C_L=15 pF,see Figure 10and Figure 4

Timing Diagrams

Switching Characteristics

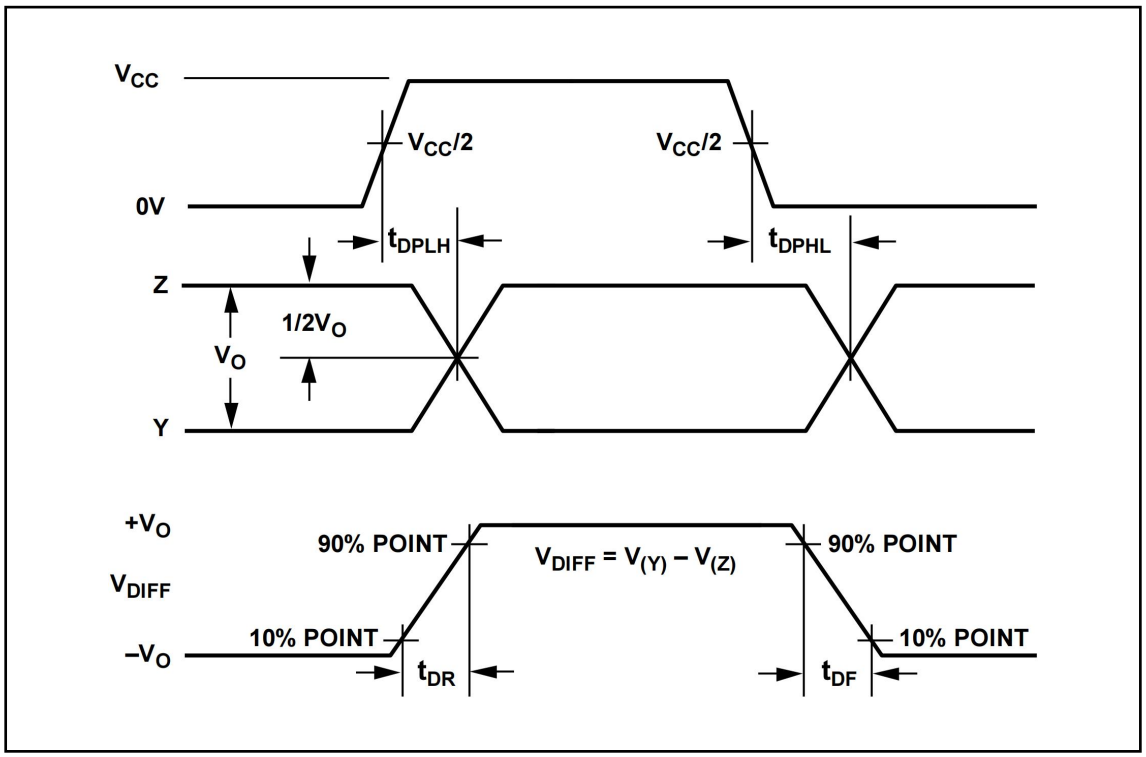


Figure 1. Driver Propagation Delay Rise/Fall Timing

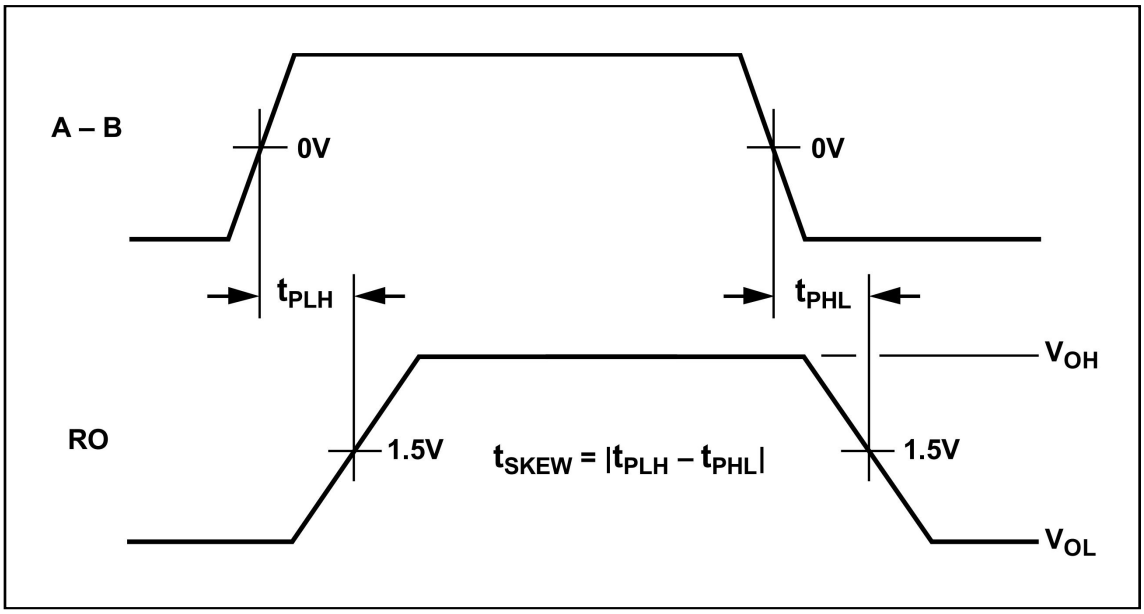


Figure 2. Receiver Propagation Delay Timing

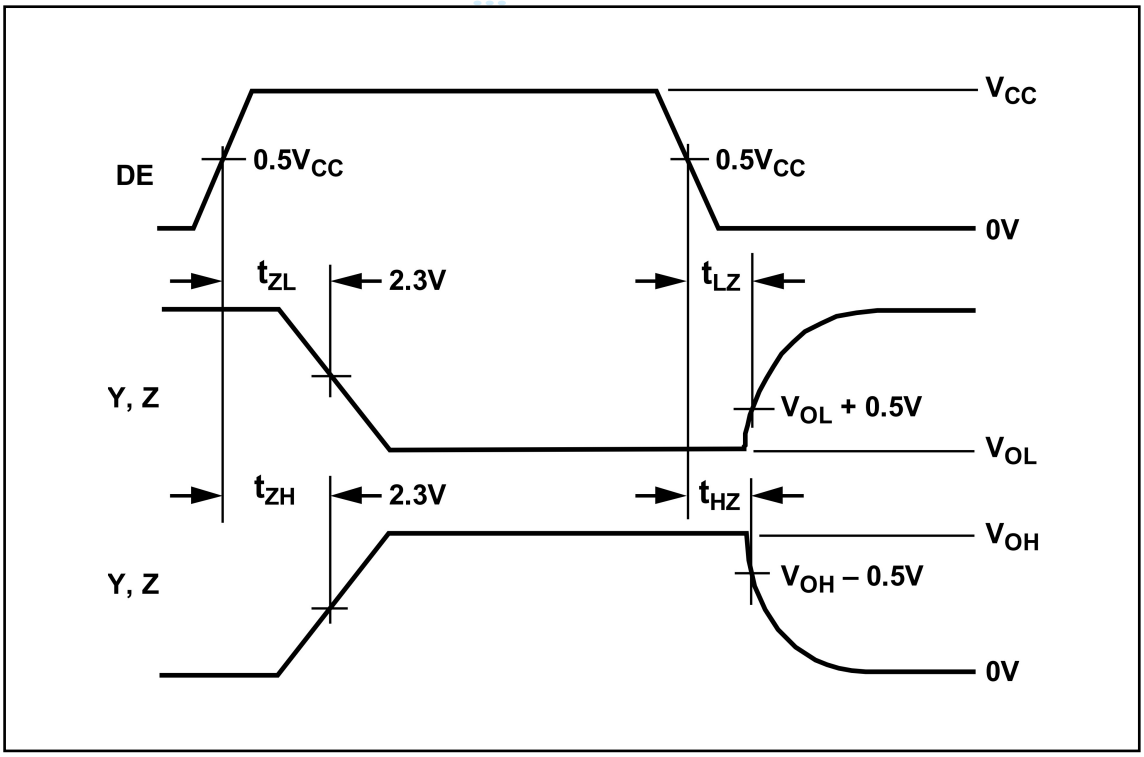


Figure 3. Driver Enable/Disable Timing

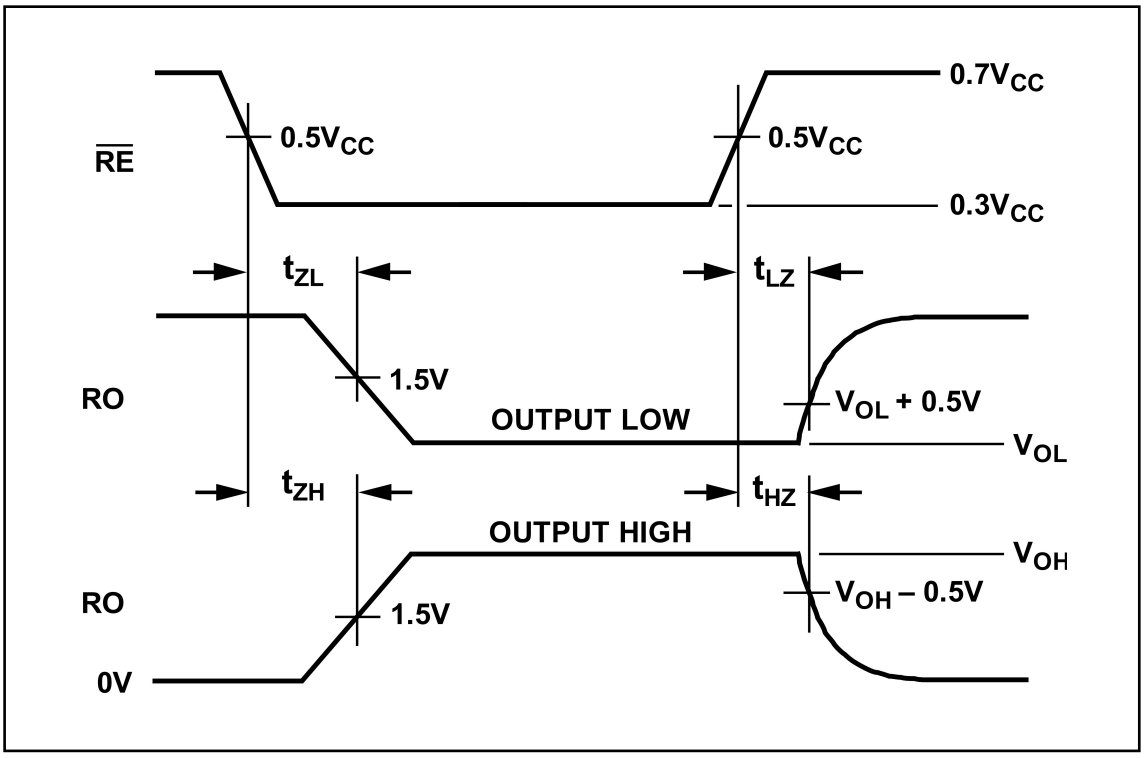


Figure 4. Receiver Enable/Disable Timing

TEST CIRCUITS

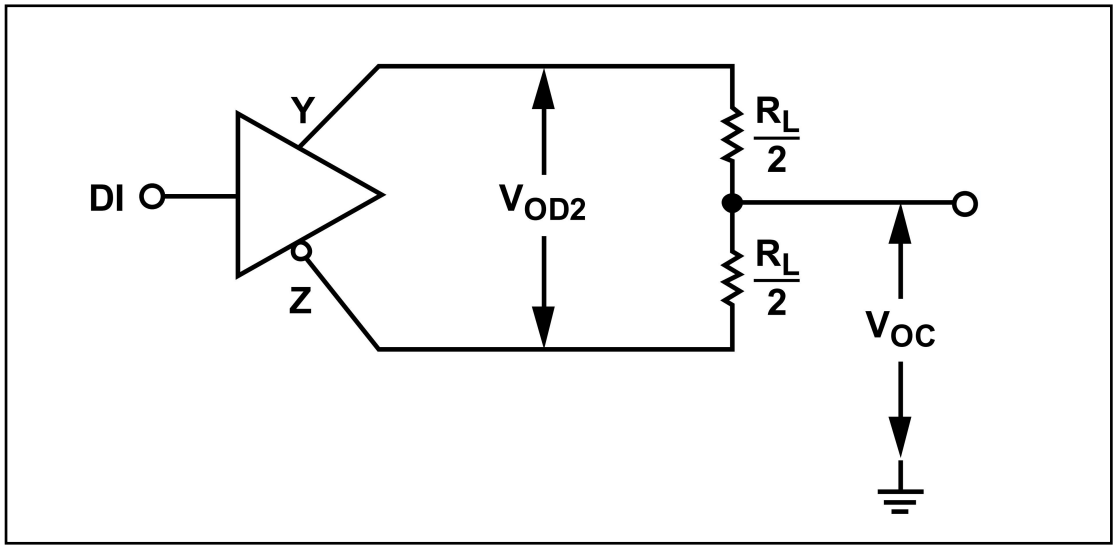


Figure 5. Driver Voltage Measurements

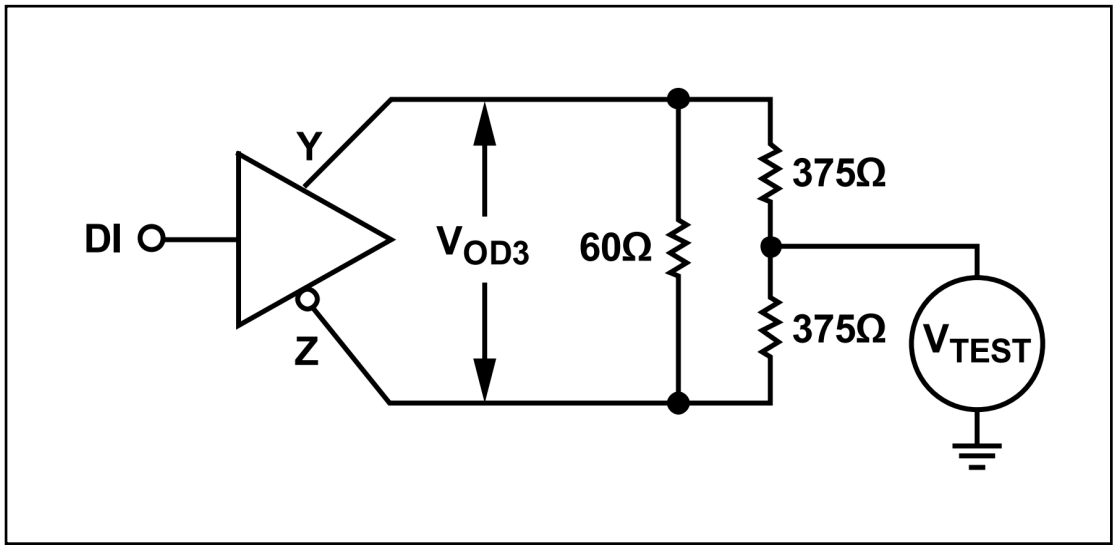


Figure 6. Driver Voltage Measurements

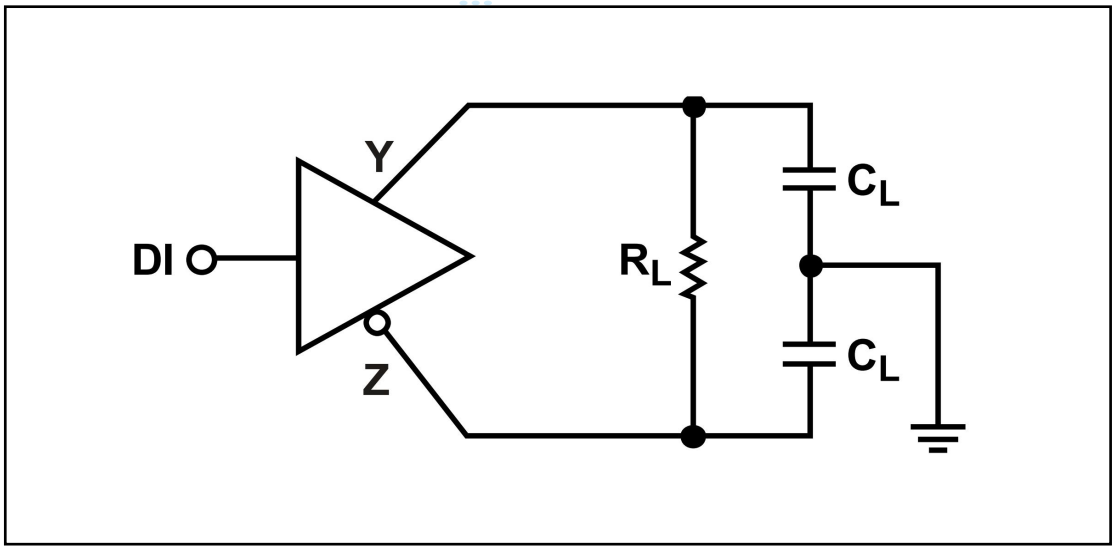


Figure 7. Driver Propagation Delay

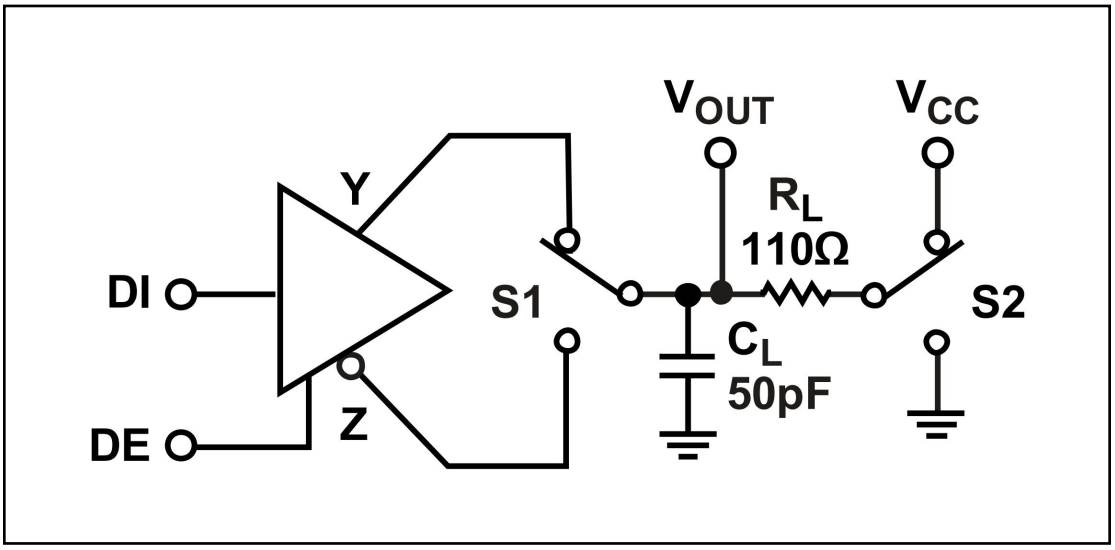


Figure 8. Driver Enable/Disable Timing

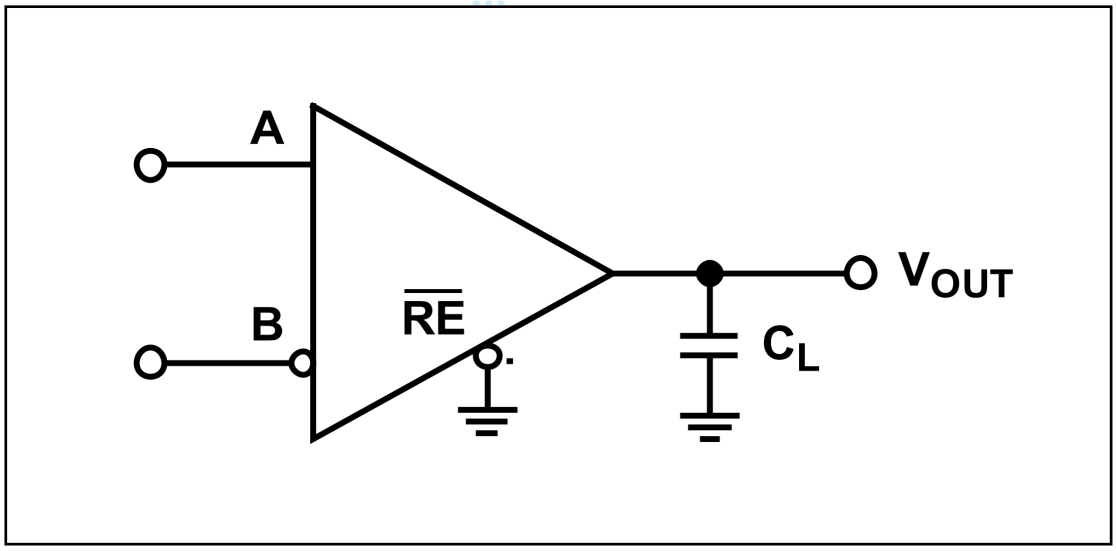


Figure 9. Receiver Propagation Delay

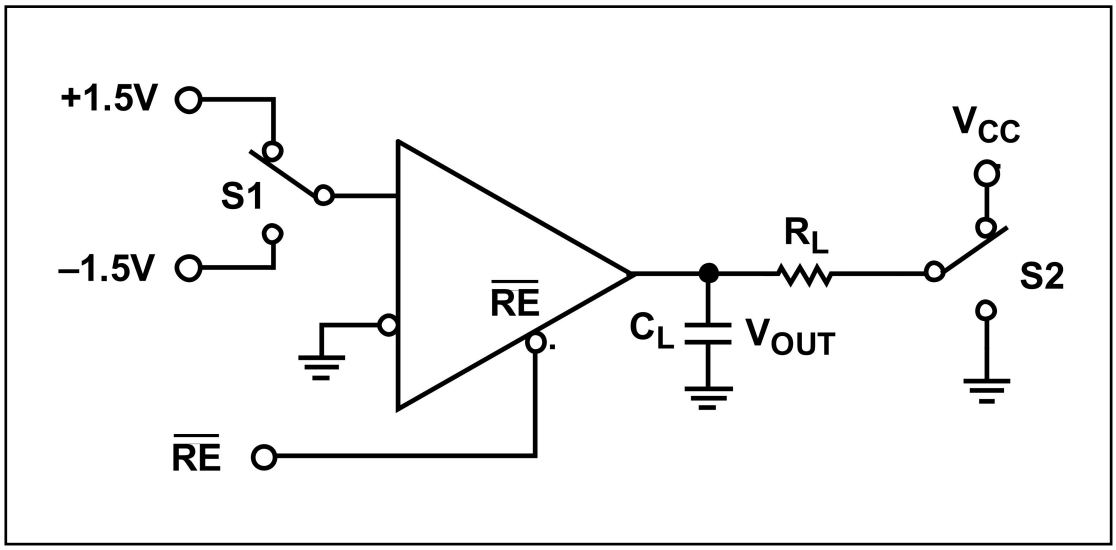


Figure 10. Receiver Enable/Disable Timing

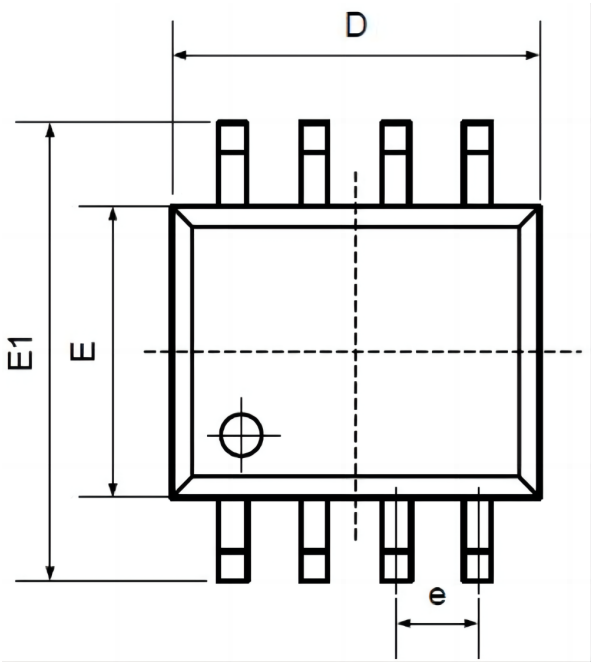
ORDERING INFORMATION

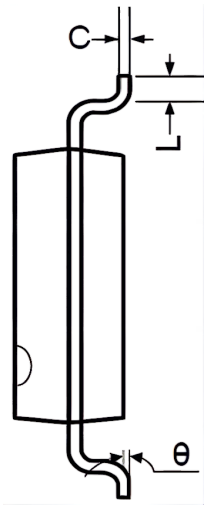
Order Number	Package	Package Quantity	Marking On The park	Temperature
ADM1490EBRZ-REEL-TUDI	SOP8	Tape,Reel,4000	ADM1490EBRZ	-40℃ to +85℃
ADM1490EBRMZ-REEL-TUDI	MSOP8	Tape,Reel,4000	F0E	
ADM1491EBRZ-REEL-TUDI	SOP14	Tape,Reel,4000	ADM1491EBRZ	
ADM1491EBRMZ-REEL-TUDI	MSOP10	Tape,Reel,4000	F0D	

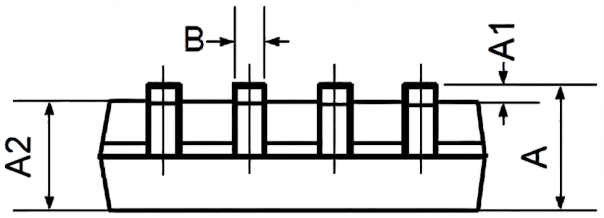
Revision history

	Date	Revision	Page
V1.0	2021/9	New	1-12
V1.1	2026/7	Update model and PDF template	1-18

Package SOP8

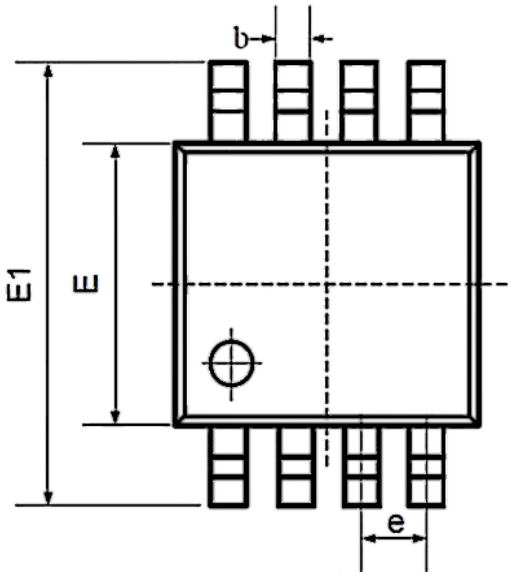


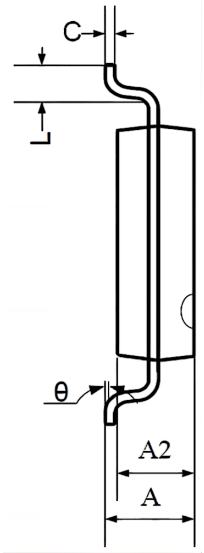


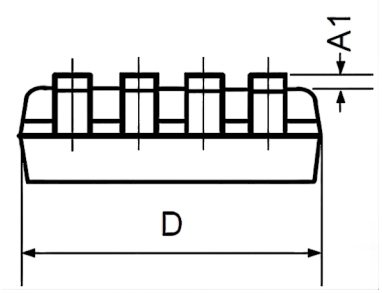


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP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

Package MSOP8

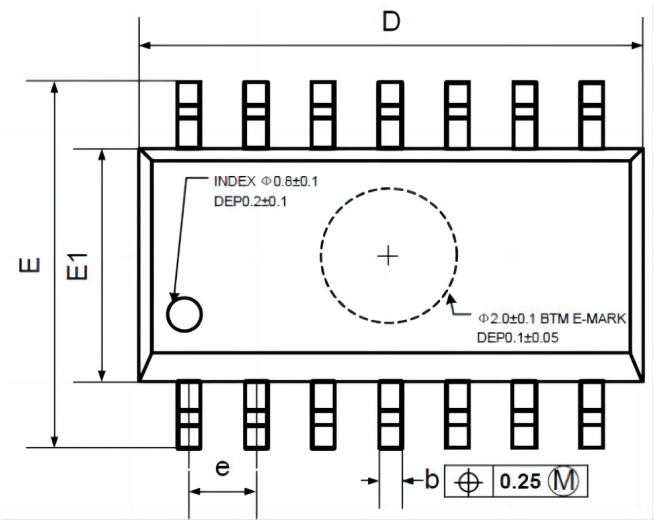


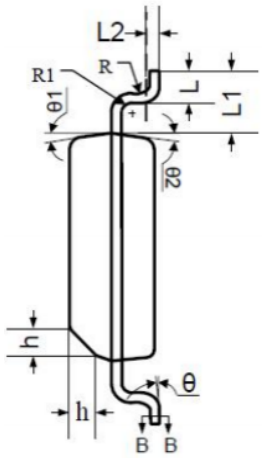


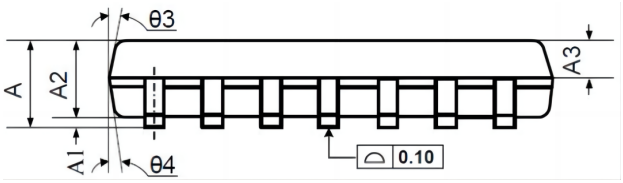


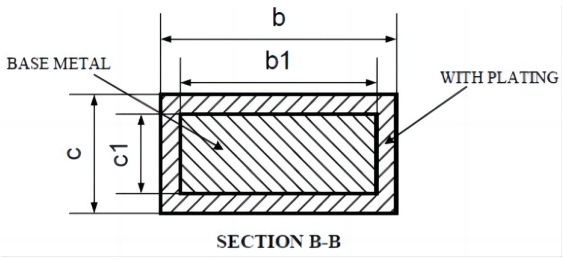
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026 TYP	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201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

Package SOP14



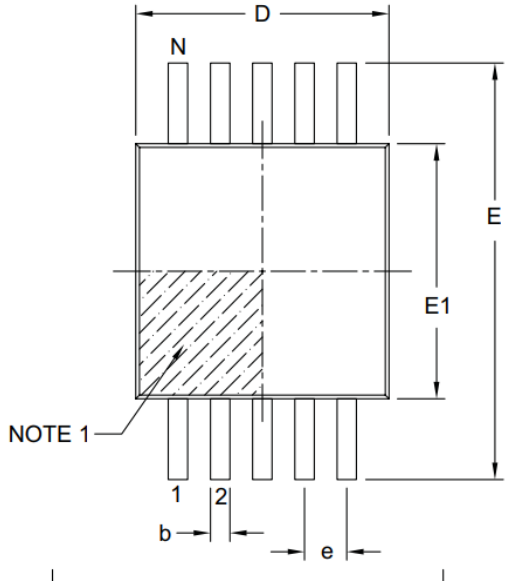


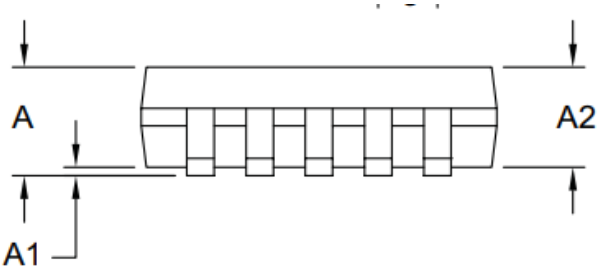


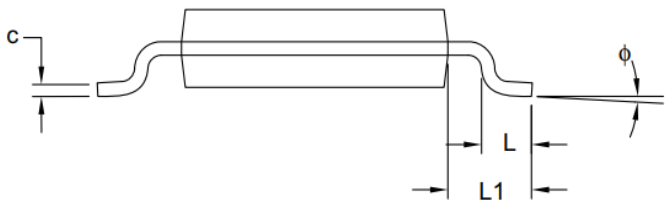


Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	1.35	1.60	1.75
A1	0.10	0.15	0.25
A2	1.25	1.45	1.65
A3	0.55	0.65	0.75
b	0.36		0.49
b1	0.35	0.40	0.45
C	0.16		0.25
c1	0.15	0.20	0.25
D	8.53	8.63	8.73
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.45	0.60	0.80
L1	1.04 REF		
L2	0.25 BSC		
R	0.07		
R1	0.07		
h	0.30	0.40	0.50
θ	0°		8°
θ1	6°	8°	10°
θ2	6°	8°	10°
θ3	5°	7°	9°
θ4	5°	7°	9°

Package MSOP10







Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N	10		
Pitch	e	0.50 BSC		
Overall Height	A	-	-	1.10
Molded Package Thickness	A2	0.75	0.85	0.95
Standoff	A1	0.00	-	0.15
Overall Width	E	4.90 BSC		
Molded Package Width	E1	3.00 BSC		
Overall Length	D	3.00 BSC		
Foot Length	L	0.40	0.60	0.80
Footprint	L1	0.95 REF		
Foot Angle	φ	0°	—	8°
Lead Thickness	C	0.08	—	0.23
Lead Width	b	0.15		0.33

Important statement:

●TUDI Semiconductor reserves the right to modify the product manual without prior notice! Before placing an order, customers need to confirm whether the obtained information is the latest version and verify the completeness of the relevant information.

●Any semi-guide product is subject to failure or malfunction under specified conditions. It is the buyer's responsibility to comply with safety standards when using TUDI Semiconductor products for system design and whole machine manufacturing.And take the appropriate safety measures to avoid the potential in the risk of loss of personal injury or loss of property situation!

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