

钍地半导体
Tudi Semiconductor

Product Specification

TUDI-ADM3070E-3078E

3.3 V, ±15 kV ESD-Protected, Half- and Full-Duplex, RS-485/RS-422 Transceivers

网址 www.sztdbdt.com

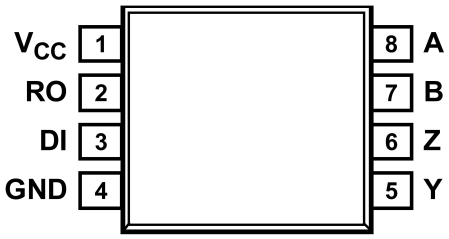
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semiconductor device manufacturer

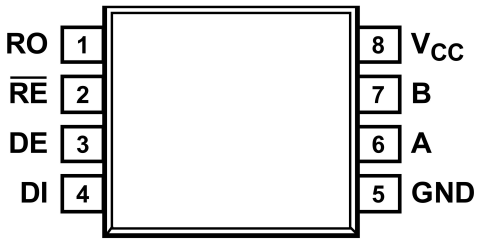
- Design
- research and development
- production
- and sales

FEATURES

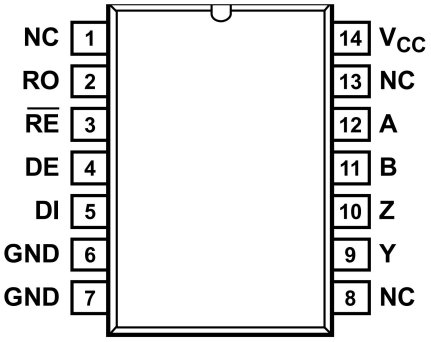
- TIA/EIA RS-485/RS-422 compliant
- ±15 kV ESD protection on RS-485 input/output pins
- Data rates
- ADM3070E/ADM3071E/ADM3072E: 250 kbps
- ADM3073E/ADM3074E/ADM3075E: 500 kbps
- ADM3076E/ADM3077E/ADM3078E: 16 Mbps
- Half- and full-duplex options
- True fail-safe receiver inputs
- Up to 256 nodes on the bus
- -40 ° C to +125 ° C temperature option
- Hot-swap input structure on DE and RE pins
- Reduced slew rates for low EMI
- Low power shutdown current (all except ADM3071E/ ADM3074E/ADM3077E)
- Outputs high-Z when disabled or powered off
- Common-mode input range: -7 V to +12 V
- Thermal shutdown and short-circuit protection
- 8-lead and 14-lead narrow SOIC packages



ADM3071E/ADM3074E/ADM3077E
Pin Configuration



ADM3072E/ADM3075E/ADM3078E
Pin Configuration



ADM3070E/ADM3073E/ADM3076E
Pin Configuration

APPLICATIONS

- Power/energy metering
- Industrial control
- Lighting systems
- Telecommunications
- Security systems
- Instrumentation

DESCRIPTION

The ADM307xE are 3.3 V, low power data transceivers with ±15 kV ESD protection suitable for full- and half-duplex communication on multipoint bus transmission lines. They are designed for balanced data transmission, and they comply with TIA/EIA standards: RS-485 and RS-422.
The devices have a $^{1}/_{8}$ unit load receiver input impedance, which allows up to 256 transceivers on a bus. Because only one driver should be enabled at any time, the output of a disabled or powered?down driver is tristated to avoid overloading the bus.
The receiver inputs have a true fail-safe feature, which eliminates the need for external bias resistors and ensures a logic high output level when the inputs are open or shorted. This guarantees that the receiver outputs are in a known state before communication begins and when communication ceases.

Pin Function

ADM3070E/ ADM3073E/ ADM3076E	ADM3071E/ ADM3074E/ ADM3077E	ADM3072E/ ADM3075E/ ADM3078E	Mnemonic	Description
Pin No.	Pin No.	Pin No.		
2	2	1	RO	Receiver Output.When enabled,if(A-B)≥-50 mV,RO is high.If(A-B)≤-200 mV,RO is low.
3	N/A	2	RE	Receiver Output Enable.A low level enables the receiver output.A high level places it in a high impedance state.If RE is high and DE is low,the device enters a low power shutdown mode.
4	N/A	3	DE	Driver Output Enable.A high level enables the driver differential A and B outputs.A low level places it in a high impedance state.If RE is high and DE is low,the device enters alow power shutdown mode.
5	3	4	DI	Driver Input.With a half-duplex part when the driver is enabled,alogic low on DI forces A low and Bhigh;a logic high on Dl forces A high and B low.With a full-duplex part when the driver is enabled,a logic low on Dl forces Y low and Z high;a logichigh on DlforcesYhigh and Z low.
6,7	4	5	GND	Ground.
9	5	N/A	Y	Noninverting Driver Output.
N/A	N/A	6	A	Noninverting Receiver Input A and Noninverting Driver Output A.
12	8	N/A	A	Noninverting Receiver Input A.
10	6	N/A	Z	Inverting Driver Output.
N/A	N/A	7	B	Inverting Receiver Input B and Inverting Driver Output B.
11	7	N/A	B	Inverting Receiver Input B.
14	1	8	Vcc	Power Supply,3.3V±10%.Bypass Vcc to GND with a 0.1 μF capacitor.
1,8,13	N/A	N/A	NC	No Connect.Not internally connected;can be connected to GND.

ABSOLUTE MAXIMUM RATINGS

TA = 25 ° C, unless otherwise noted.

Parameter	Rating
Vcc to GND	-0.3 V to +6V
Digital Input/Output Voltage(DE,RE,DI)	-0.3 V to +6V
Receiver Output Voltage(RO)	-0.3V to (Vcc+0.3V)
Driver Output(A,B,Y,Z)/ReceiverInput(A,B) Voltage	-8V to +13V
Driver Output Current	±250 mA
Operating Temperature Range	
ADM307xEA	-40℃ to+85℃
ADM307xEY	-40℃ to+125℃
Storage Temperature Range	-65℃ to+150℃
θ_{JA} Thermal Impedance	
8-Lead SOIC_N	158℃/W
14-Lead SOIC_N	120℃/W
Lead Temperature	
Soldering(10 sec)	300℃
Vapor Phase(10 sec)	215℃
Infrared (15 sec)	220℃

SPECIFICATIONS

V_{CC} = 3.3 V ± 10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
DRIVER						
Differential Outputs						
Differential Output Voltage	V_{OD}	2.0		Vcc	V	R_L=100Ω(RS-422)(see Figure 7)
		1.5		Vcc	V	R_L=54Ω(RS-485)(see Figure 7)
				Vcc	V	No load
△Voo|for Complementary Output States(1)	$\triangle V_{OD}$			0.2	V	R_L=54Ωor 100Ω(see Figure 7)
Common-Mode Output Voltage	V_{OC}		Vcc/2	3	V	R_L=54Ωor 100Ω(see Figure 7)
△|Voc|for Complementary Output States	$\triangle V_{OC}$			0.2	V	R_L=54Ωor 100Ω(see Figure 7)
Short-Circuit Output Current	I_{OSD}	40		250	mA	0V<V_{OUT}<12V
		-250		-40	mA	-7V<V_{OUT}<Vcc
Short-Circuit Foldback Output Current	I_{OSDF}	20			mA	(Vcc-1V)<V_{OUT}<12V
				-20	mA	-7V<V_{OUT}<+1V
Output Leakage(Y,Z)Full Duplex	Io			125	μA	DE=0V,RE=0V,Vcc=0V or 3.6V, V_{IN}=12V
		-100			μA	DE=0V,RE=0V,Vcc=0V or 3.6V, V_{IN}=-7V
Logic Inputs						
Input High Voltage	V_{IH}	2.0			V	DE,DI,RE
Input Low Voltage	V_{IL}			0.8	V	DE,DI,RE
Input Hysteresis	V_{HYS}		100		mV	DE,DI,RE
Logic Input Current	I_{IN}			± 1	μA	DE,DI,RE
Input Impedance First Transition		1		10	kΩ	DE
Thermal Shutdown Threshold	T_{TS}		175		℃	
Thermal Shutdown Hysteresis	T_{TSH}		15		℃	

SPECIFICATIONS(continued)

V_{CC} = 3.3 V ± 10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
RECEIVER						
Differential Inputs						
Differential Input Threshold Voltage	V_{TH}	-200	-125	-50	mV	-7V<V_{CM}<+12V
Input Hysteresis	△V_{TH}		15		mV	VA+VB=0V
Input Resistance(A,B)	R_{IN}	96			kΩ	-7V<V_{CM}<+12V
Input Current(A,B)	I_A,I_B			125	μA	DE=0V,Vcc=0V or 3.6V,V_{IN}=12V
		-100			μA	DE=0V,Vcc=0V or 3.6V,V_{IN}=-7V
RO Logic Output						
Output High Voltage	V_{OH}	Vcc-0.6			V	I_{OUT}=-1 mA
Output Low Voltage	V_{OL}			0.4	V	I_{OUT}=1 mA
Short-Circuit Output Current	I_{OSR}			± 80	mA	0V<V_{RO}<V_{CC}
Tristate Output Leakage Current	I_{OZR}			± 1	μA	Vcc=3.6V,0V<V_{OUT}<V_{CC}
POWER SUPPLY						
Supply Current	Icc		0.8	1.5	mA	No load,DE=Vcc,RE=0V
			0.8	1.5	mA	No load,DE=Vcc,RE=V_{CC}
			0.8	1.5	mA	No load,DE=0V,RE=0V
Shutdown Current	I_{SHDN}		0.05	10	μA	DE=0V,RE=Vcc
ESD PROTECTION						
A,B,Y,ZPins			±15		kV	Human body model
All Pins Except A,B,Y,Z Pins			±4		kV	Human body model

(1) Δ|V_{OD}| and Δ|V_{OC}| are the changes in V_{OD} and V_{OC}, respectively, when the DI input changes state.

TIMING SPECIFICATIONS-ADM3070E/ADM3071E/ADM3072E

V_{CC} = 3.3 V ± 10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
DRIVER						
Maximum Data Rate		250			kbps	
Propagation Delay,Low-to-High Level	t_{DPLH}	250		1500	ns	CL=50 pF,RL=54Ω(see Figure 2 and Figure 3)
Propagation Delay,High-to-Low Level	t_{DPHL}	25		1500	ns	CL=50 pF,RL=54Ω(see Figure 2 and Figure 3)
Rise Time/Fall Time	t_{DR}/t_{DF}	350		1600	ns	CL=50 pF,RL=54Ω(see Figure 2 and Figure 3)
tDPLH-tDPHLl Differential Driver Output Skew	t_{DSKEW}			200	ns	CL=50 pF,RL=54Ω(see Figure 2 and Figure 3)(1)
Enable to Output High	t_{DZH}			2500	ns	See Figure 4
Enable to Output Low	t_{DZL}			2500	ns	See Figure 5
Disable Time from Low	t_{DLZ}			100	ns	See Figure 5
Disable Time from High	t_{DHZ}			100	ns	See Figure 4
Enable Time from Shutdown to High	$t_{DZH(SHDN)}$			5500	ns	See Figure 4
Enable Time from Shutdown to Low	$t_{DZL(SHDN)}$			5500	ns	See Figure 5

(1)V_{CC} = 3.3 V

TIMING SPECIFICATIONS-ADM3070E/ADM3071E/ADM3072E(continued)

V_{CC} = 3.3 V ± 10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
RECEIVER						
Maximum Data Rate		25			kbps	
Propagation Delay,Low-to-High Level	t_{RPLH}			200	ns	CL=15 pF(see Figure 6 and Figure 7)
Propagation Delay,High-to-Low Level	t_{RPHL}			200	ns	CL=15 pF(see Figure 6 and Figure 7)
|tRPLH-tRPHL|Output Skew	t_{RSKEW}			30	ns	CL=15 pF(see Figure 6 and Figure 7)
Enable to Output High	t_{RZH}			50	ns	See Figure 8
Enable to Output Low	t_{RZL}			50	ns	See Figure 8
Disable Time from Low	t_{RLZ}			50	ns	See Figure 8
Disable Time from High	t_{RHZ}			50	ns	See Figure 8
Enable Time from Shutdown to High	$t_{RZH(SHDN)}$			4000	ns	See Figure 8
Enable Time from Shutdown to Low	$t_{RZL(SHDN)}$			4000	ns	See Figure 8
TIMETO SHUTDOWN	t_{SHDN}	50	200	600	ns	

(1)V_{CC} = 3.3 V

TIMING SPECIFICATIONS-ADM3073E/ADM3074E/ADM3075E

V_{CC} = 3.3 V ± 10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
DRIVER						
Maximum Data Rate		500			kbps	
Propagation Delay,Low-to-High Level	t_{DPLH}	180		800	ns	C_L=50 pF,R_L=54Ω(see Figure 2 and Figure 3)
Propagation Delay,High-to-Low Level	t_{DPHL}	180		800	ns	C_L=50 pF,R_L=54Ω(see Figure 2 and Figure 3)
Rise Time/Fall Time	t_{DR}/t_{DF}	200		800	ns	C_L=50 pF,R_L=54Ω(see Figure 2 and Figure 3)
tDPLH-tDPHL|Differential Driver Output Skew	t_{DSKEW}			100	ns	C_L=50 pF,R_L=54Ω(see Figure 2 and Figure 3)
Enable to Output High	t_{DZH}			2500	ns	See Figure 4
Enable to Output Low	t_{DZL}			2500	ns	See Figure 5
Disable Time from Low	t_{DLZ}			100	ns	See Figure 5
Disable Time from High	t_{DHZ}			100	ns	See Figure 4
Enable Time from Shutdown to High	$t_{DZH(SHDN)}$			4500	ns	See Figure 4
Enable Time from Shutdown to Low	$t_{DZL(SHDN)}$			4500	ns	See Figure 5

TIMING SPECIFICATIONS-ADM3073E/ADM3074E/ADM3075E(continued)

V_{CC} = 3.3 V ± 10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
RECEIVER						
Maximum Data Rate		500			kbps	
Propagation Delay,Low-to-High Level	t_{RPLH}			200	ns	C_L=15 pF(see Figure 6 and Figure 7)
Propagation Delay,High-to-Low Level	t_{RPHL}			200	ns	C_L=15 pF(see Figure 6 and Figure 7)
tRPLH-tRPHLI Output Skew	t_{RSKEW}			30	ns	C_L=15 pF(see Figure 6 and Figure 7)
Enable to Output High	t_{RZH}			50	ns	See Figure 8
Enable to Output Low	t_{RZL}			50	ns	See Figure 8
Disable Time from Low	t_{RLZ}			50	ns	See Figure 8
Disable Time from High	t_{RHZ}			50	ns	See Figure 8
Enable Time from Shutdown to High	$t_{RZH(SHDN)}$			4000	ns	See Figure 8
Enable Time from Shutdown to Low	$t_{RZL(SHDN)}$			4000	ns	See Figure 8
TIMETO SHUTDOWN	t_{SHDN}	50	200	600	ns	

TIMING SPECIFICATIONS-ADM3076E/ADM3077E/ADM3078E

V_{CC} = 3.3 V ± 10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
DRIVER						
Maximum Data Rate		16			Mbps	
Propagation Delay,Low-to-High Level	t_{DPLH}			50	ns	C_L=50 pF,R_L=54Ω(see Figure 2 and Figure 3)
Propagation Delay,High-to-Low Level	t_{DPHL}			50	ns	C_L=50 pF,R_L=54Ω(see Figure 2 and Figure 3)
Rise Time/Fall Time	t_{DR}/t_{DF}			15	ns	C_L=50 pF,R_L=54Ω(see Figure 2 and Figure 3)
tDPLH-tDPHL|Differential Driver Output Skew	t_{DSKEW}			8	ns	C_L=50 pF,R_L=54Ω(see Figure 2 and Figure 3)
Enable to Output High	t_{DZH}			150	ns	See Figure 4
Enable to Output Low	t_{DZL}			150	ns	See Figure 5
Disable Time from Low	t_{DLZ}			100	ns	See Figure 5
Disable Time from High	t_{DHZ}			100	ns	See Figure 4
Enable Time from Shutdown to High	$t_{DZH(SHDN)}$		1250	1800	ns	See Figure 4
Enable Time from Shutdown to Low	$t_{DZL(SHDN)}$		1250	1800	ns	See Figure 5

TIMING SPECIFICATIONS-ADM3076E/ADM3077E/ADM3078E(continued)

V_{CC} = 3.3 V ± 10%, T_A = T_{MIN} to T_{MAX}, unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
RECEIVER						
Maximum Data Rate		16			Mbps	
Propagation Delay,Low-to-High Level	t_{RPLH}		40	75	ns	C_L=15 pF(see Figure 6 and Figure 7)
Propagation Delay,High-to-Low Level	t_{RPHL}		40	75	ns	C_L=15 pF(see Figure 6 and Figure 7)
|t_{RPLH}-t_{RPHL}| Output Skew	t_{RSKEW}			8	ns	C_L=15 pF(see Figure 6 and Figure 7)
Enable to Output High	t_{RZH}			50	ns	See Figure 8
Enable to Output Low	t_{RZL}			50	ns	See Figure 8
Disable Time from Low	t_{RLZ}			50	ns	See Figure 8
Disable Time from High	t_{RHZ}			50	ns	See Figure 8
Enable Time from Shutdown to High	$t_{RZH(SHDN)}$			1800	ns	See Figure 8
Enable Time from Shutdown to Low	$t_{RZL(SHDN)}$			1800	ns	See Figure 8
TIMETO SHUTDOWN	t_{SHDN}	50	200	600	ns	

TEST CIRCUITS AND SWITCHING CHARACTERISTICS

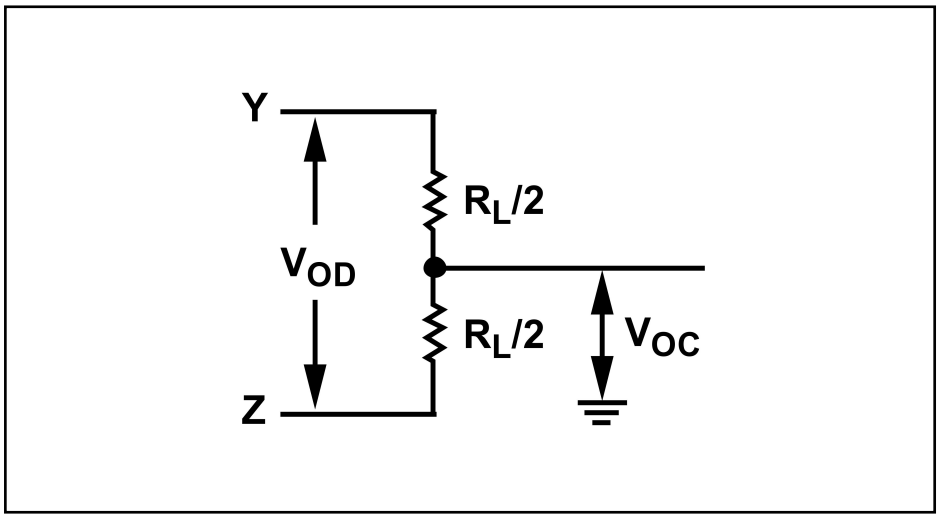


Figure 1. Driver DC Test Load

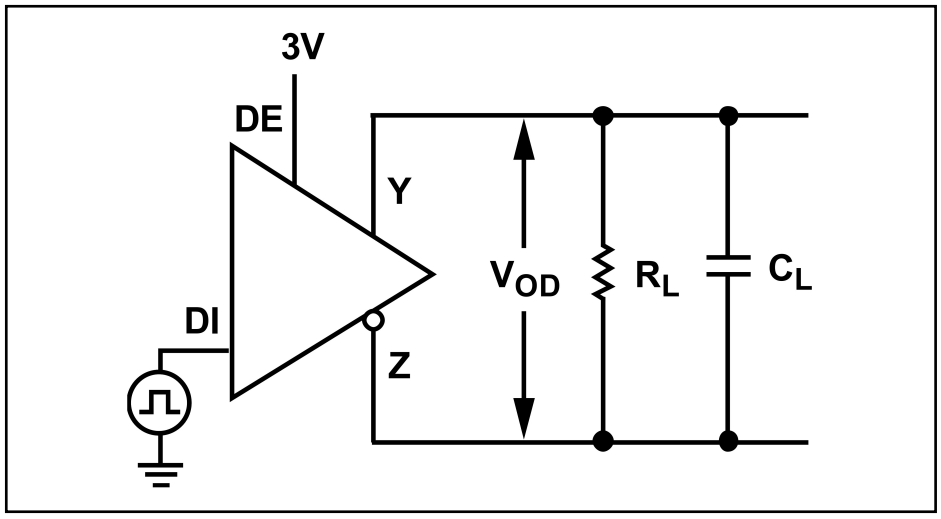


Figure 2. Driver Timing Test Circuit

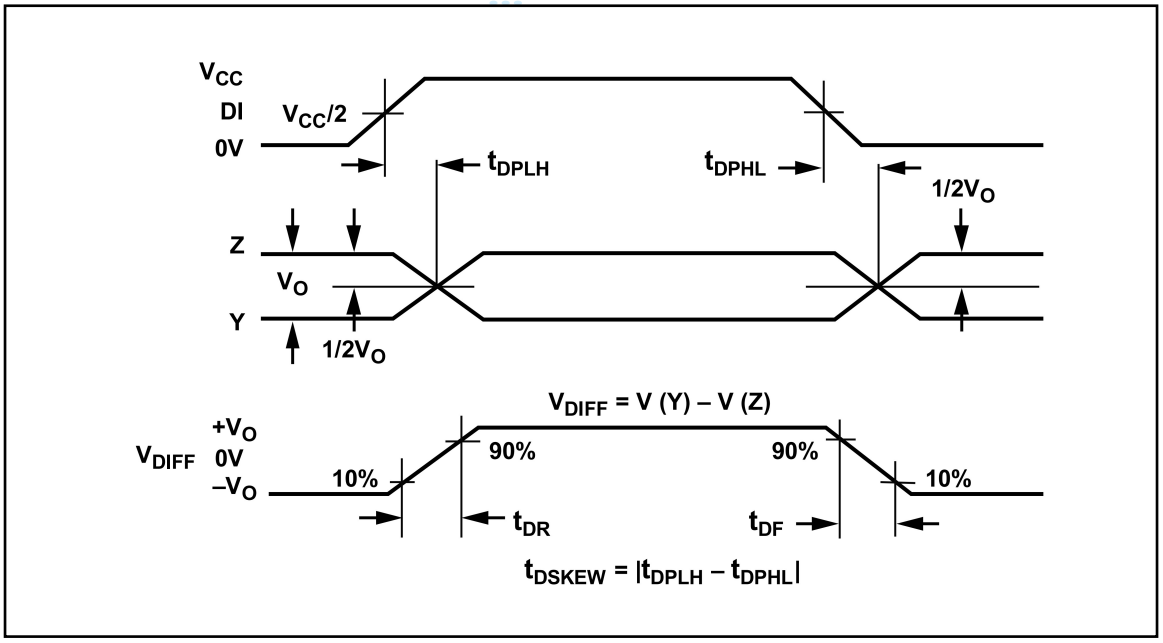


Figure 3. Driver Propagation Delays

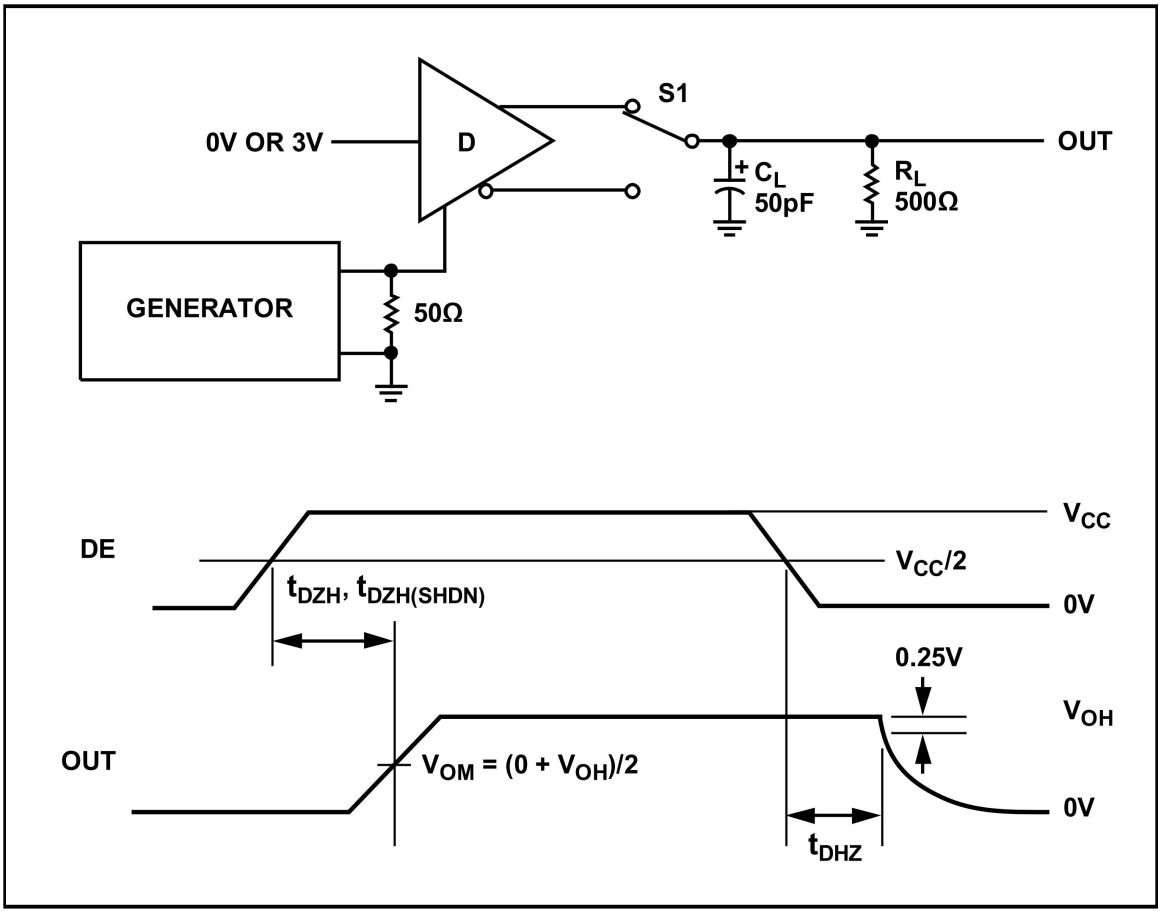


Figure 4. Driver Enable and Disable Times (t_{DHZ}, t_{DZH}, $t_{DZH(SHDN)}$)

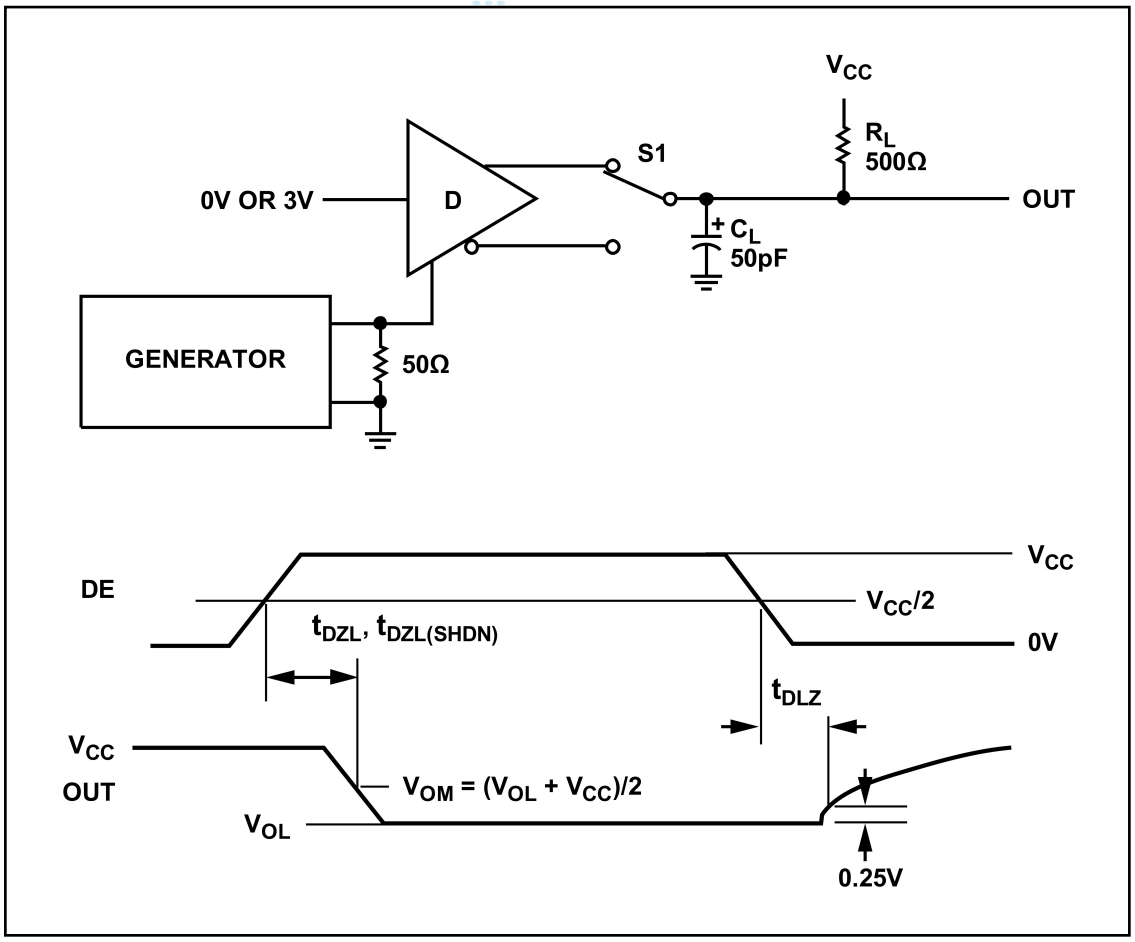


Figure 5. Driver Enable and Disable Times (t_{DZL}, t_{DLZ}, $t_{DZL(SHDN)}$)

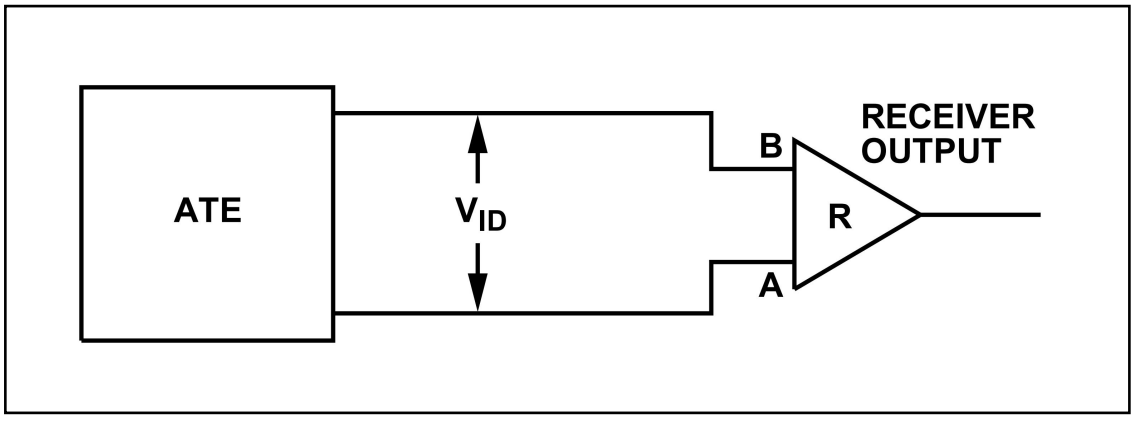
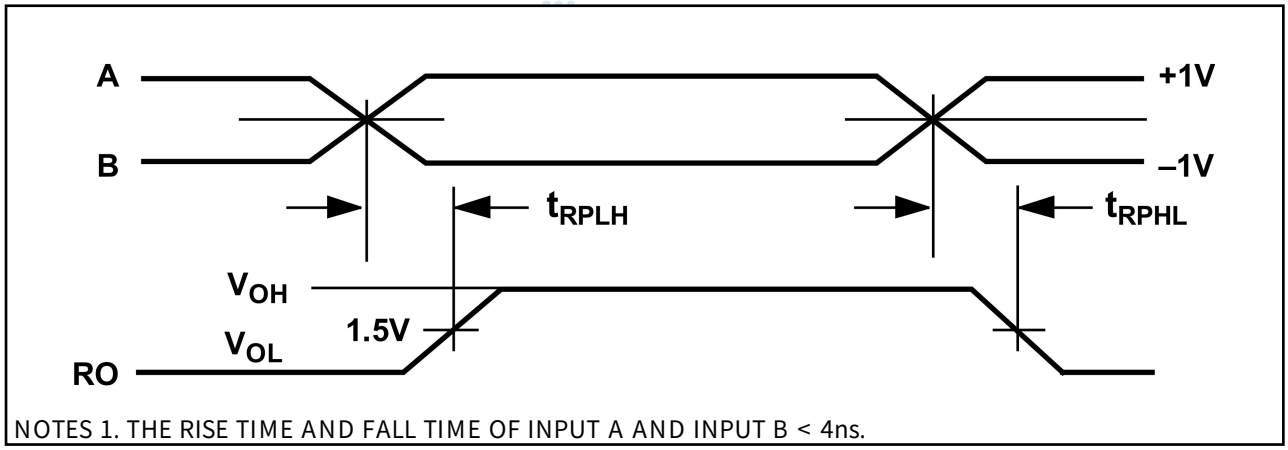


Figure 6. Receiver Propagation Delay Test Circuit



NOTES 1. THE RISE TIME AND FALL TIME OF INPUT A AND INPUT B < 4ns.

Figure 7. Receiver Propagation Delays

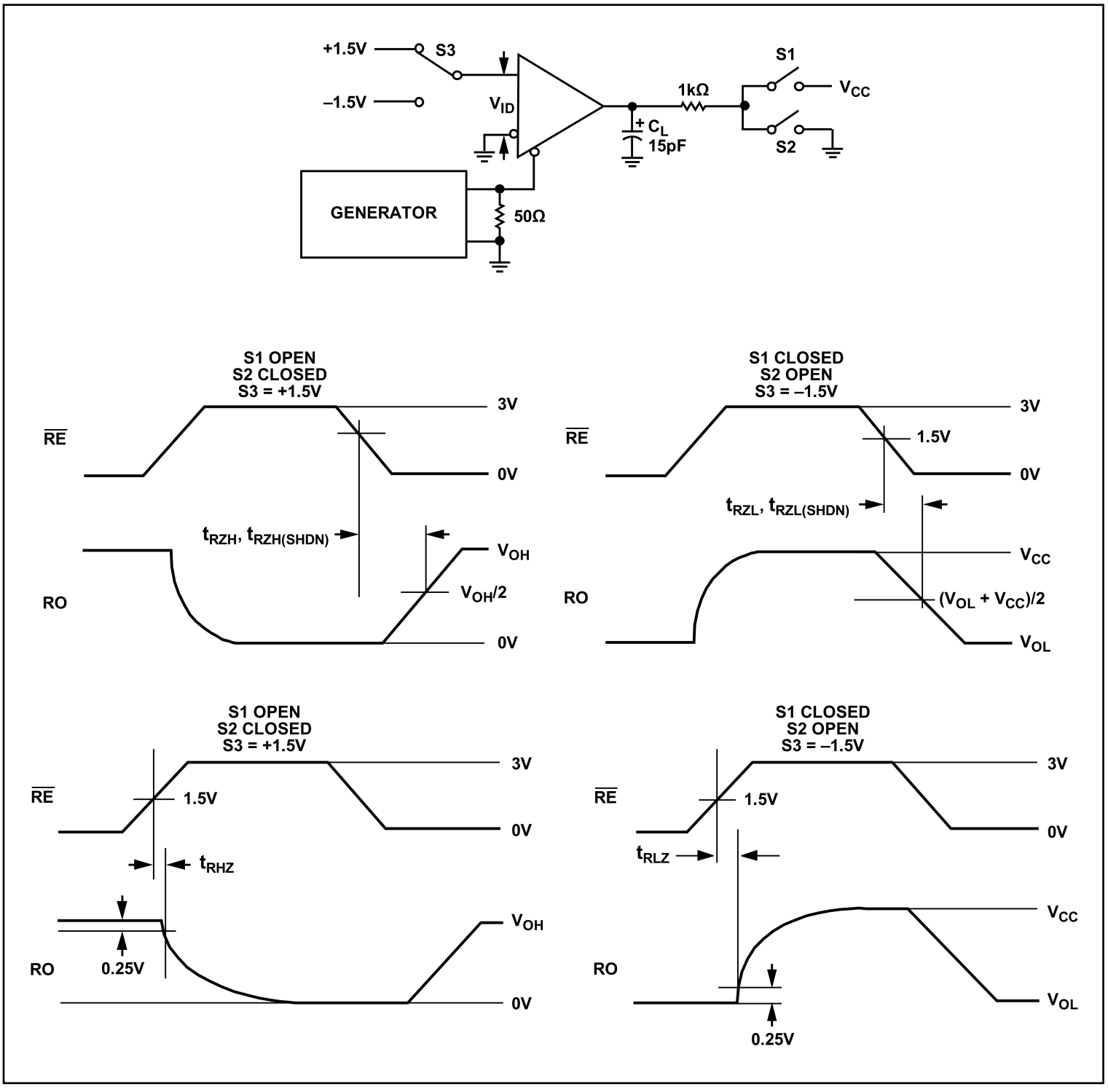


Figure 8. Receiver Enable and Disable Times

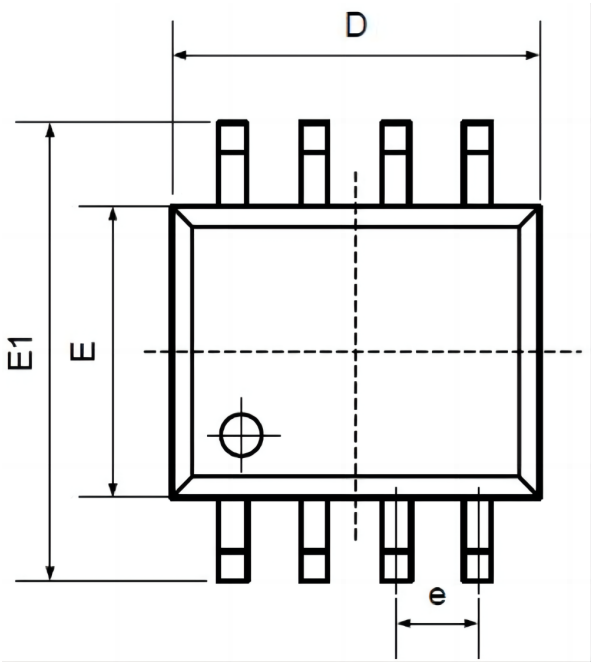
ORDERING INFORMATION

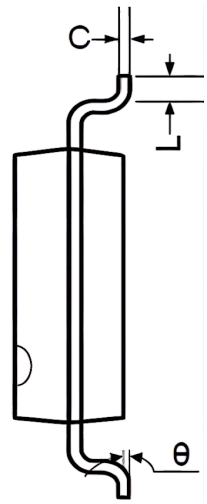
Order Number	Package	Package Quantity	Marking On The park	Temperature
ADM3070EARZ-TUDI	SOP14	Tape,Reel,2500	ADM3070EARZ	-40℃ to +85℃
ADM3070EYRZ-TUDI	SOP14	Tape,Reel,2500	ADM3070EYRZ	-40℃ to +125℃
ADM3071EARZ-TUDI	SOP8	Tape,Reel,2500	ADM3071EARZ	-40℃ to +85℃
ADM3071EYRZ-TUDI	SOP8	Tape,Reel,2500	ADM3071EYRZ	-40℃ to +125℃
ADM3072EARZ-TUDI	SOP8	Tape,Reel,2500	ADM3072EARZ	-40℃ to +85℃
ADM3072EYRZ-TUDI	SOP8	Tape,Reel,2500	ADM3072EYRZ	-40℃ to +125℃
ADM3073EARZ-TUDI	SOP14	Tape,Reel,2500	ADM3073EARZ	-40℃ to +85℃
ADM3073EYRZ-TUDI	SOP14	Tape,Reel,2500	ADM3073EYRZ	-40℃ to +125℃
ADM3074EARZ-TUDI	SOP8	Tape,Reel,2500	ADM3074EARZ	-40℃ to +85℃
ADM3074EYRZ-TUDI	SOP8	Tape,Reel,2500	ADM3074EYRZ	-40℃ to +125℃
ADM3075EARZ-TUDI	SOP8	Tape,Reel,2500	ADM3075EARZ	-40℃ to +85℃
ADM3075EYRZ-TUDI	SOP8	Tape,Reel,2500	ADM3075EYRZ	-40℃ to +125℃
ADM3075EWYRZ-REEL	SOP8	Tape,Reel,2500	ADM3075EWYRZ	
ADM3076EARZ-TUDI	SOP14	Tape,Reel,2500	ADM3076EARZ	-40℃ to +85℃
ADM3076EYRZ-TUDI	SOP14	Tape,Reel,2500	ADM3076EYRZ	-40℃ to +125℃
ADM3077EARZ-TUDI	SOP8	Tape,Reel,2500	ADM3077EARZ	-40℃ to +85℃
ADM3077EYRZ-TUDI	SOP8	Tape,Reel,2500	ADM3077EYRZ	-40℃ to +125℃
ADM3078EARZ-TUDI	SOP8	Tape,Reel,2500	ADM3078EARZ	-40℃ to +85℃
ADM3078EYRZ-TUDI	SOP8	Tape,Reel,2500	ADM3078EYRZ	-40℃ to +125℃

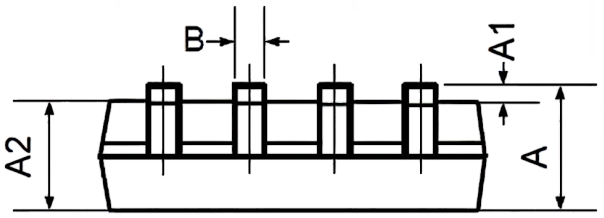
Revision history

	Date	Revision	Page
V1.0	2023/2	New	1-22

Package SOP8

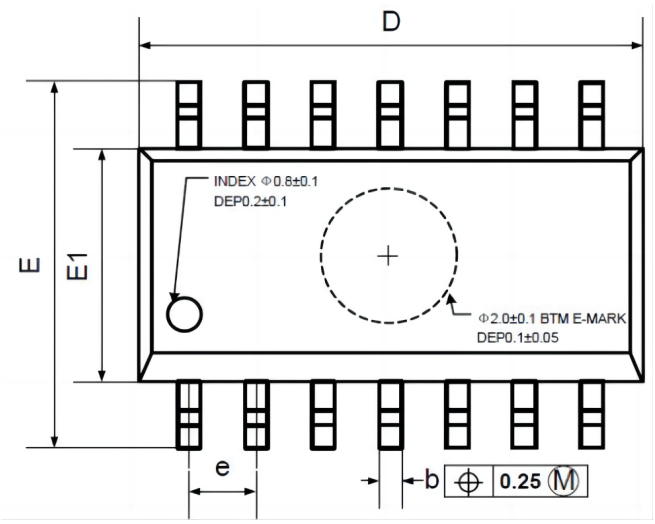


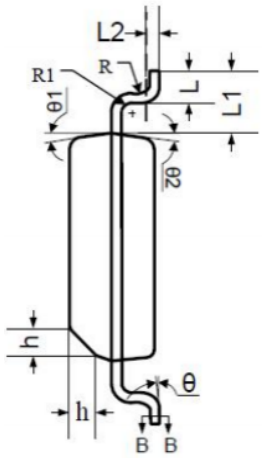


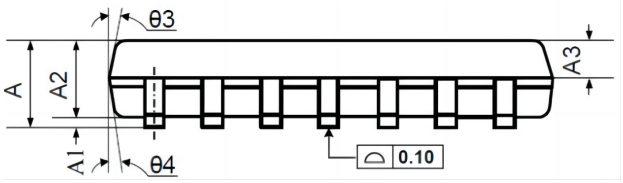


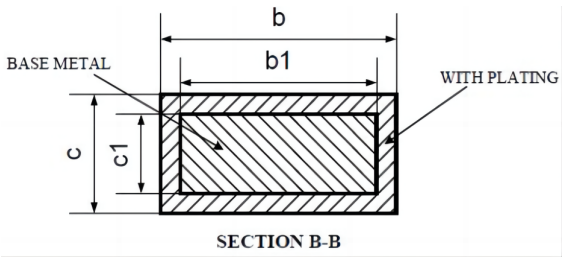
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP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

Package 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°

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