

钛地半导体
Tudi Semiconductor

Product Specification

TUDI-SN65LBC180/SN75LBC180

Low power RS-485 line driver and receiver pair

网址 www.sztdbdt.com

用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

Features

- Designed for high-speed multi-point data transmission through long cables
- Operates with pulse durations as low as 30ns
- supply current: 5 mA (max)
- Three-state output for shared bus
- Common mode voltage range of -7V to 12V
- Overheat shutdown protection to driver damage due to bus contention
- Positive and negative output current limiting

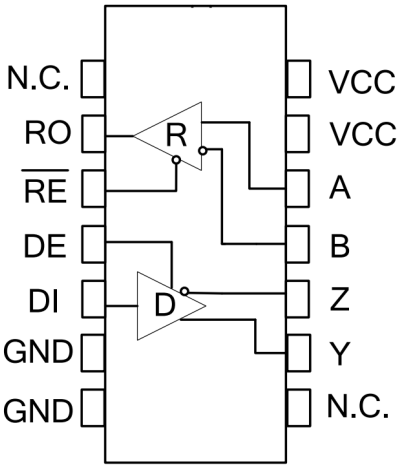


Figure 1 Pin diagram

Description

The SN65LBC180/SN75LBC180 differential drivers and are monolithic integrated circuits designed for bidirectional data communication across long cables with transmission line characteristics. They are balanced or differential voltage-mode devices which meet or exceed the requirements of industry ANSIRS-485 . These devices are which combines the low power consumption of CMOS with the precision and robustness of bipolar transistors in the same circuit.

The SN65LBC180/SN75LBC180 combine line drivers and receivers with three-state outputs and operate from a single 5V supply. The drivers and receivers feature separate high- and low -active enable inputs and can be together externally to function as direction control. The driver differential outputs and receiver differential inputs are connected to separate terminals to achieve full-duplex operation and are designed to present a minimum load the bus when disabled or when power is removed (VCC = 0). These devices feature a wide common-mode voltage range, making them suitable for point-to- or multipoint data bus applications. These devices also provide positive and negative output current limiting and thermal shutdown to prevent line fault conditions. The SN75LBC180 is guaranteed to operate over the commercial temperature range of 0°C to 70°C The SN65LBC180 is guaranteed to operate over the industrial temperature range of －40°C to 85°C.

Pin description

Pin number	Pin name	Pin function
1	NC	No internal connections required
2	RO	Receiver output.When RE is low,the RO output is high if A-B is ≥-10mV,and low if A-B is≤-200mV.
3	/RE	Receiver output enable control.When/RE is low,the receiver output is enabled and RO is active;when/REis high,the receiver output is disabled and RO is in high-impedance state.When RE is at a high level and DE is at a low level,the device enters low-power shutdown mode
4	DE	The driver output enables the control.When DE is at high level, the driver outputs effectively;when DE is low,it outputs high-impedance state.When/RE is high and DE is low,the device enters low-power shutdown mode.
5	DI	DI driver input.When DE is high,the low level on DI makes the in-phase output A of the driver low and the in-phase output B high;the high levelon DI makes the in-phase output high and the in-phase output Blow.
6	GND	Landing
7	GND	Landing
8	NC	No internal connections required
9	Y	Driver in-phase output terminal
10	Z	Driver inverting output
11	B	Receiver inverting input
12	A	Receiver in phase input
13	VCC	This pin can be connected to power or left unconnec-ted
14	VCC	Power connection

Extreme parameter

Parameter	Symbol	Unit	size
Continuous power consumption	SOP14	mW	600
	DIP14	mW	700
Power supply voltage	VCC	V	+7
working temperature range		℃	-40~125
Storage temperature range		℃	-60~150
Welding temperature range		℃	300
Control port voltage	DI	V	-0.3~VCC+0.3
Bus side input voltage	A、B	V	-8~13
Receiver output voltage	RO	V	-0.3~VCC+0.3

The maximum limit parameters are values beyond which the device can be damaged in an irreversible manner. Operation of the device under these conditions is not intended to be normal and may affect the reliability of the device if operated continuously at the maximum rated limit. All voltages are referenced to ground.

ESD Protect						
Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
A、B、Y、Z		Human bodymodel		±15		KV
Other ports		Human bodymodel		±6		KV

Receiver Switching Characteris-tics						
Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
Acceptor	tRPLH	See Figure 7 and Figure 8	20	60	90	ns
Input to output propag-ation delay from low to high		V≥2.0V;risingand falling edgetime ViD≤15ns				
The propagation delay from receiverinput to output is from high to low	tRPHL		20	60	90	ns
|tRPLH-tRPHLl	tsKEW2			7	10	ns
Enable low time out	tRPZL	CL=15pF SeeFigures 7 and 8		20	50	ns
Enable to output high time	tRPZH	CL=15pF SeeFigures 7 and 8		20	50	ns
Time from output low to disable	tpRLZ	CL=15pF SeeFigures 7 and 8		20	45	ns
Time from output high to disable	tpRHZ	CL=15pF SeeFigures 7 and 8		20	45	ns
Off stateEnable to output high time	tRPSH	CL=15pF SeeFigures 7 and 8		200	1400	ns
Off stateEnable low time out	tRPSL	CL=15pF SeeFigures 7 and 8		200	1400	ns
Time to turn off	tsHDN	NOTE2	80		300	ns

(If not otherwise, VCC=3V~5.5V, Temp = TMIN ~ TMAX, typical value at Temp = 25) NOTE 1:? VO D and? VOC is the change in VOD and VOC amplitude caused when the DI state of the input signal changes, respectively.

DC electrical characteristics of thedriver						
Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
Driver differential output (non-loaded)	VoD_1			4.5	VCC	V
Drive differential output	VoD_2	graph 2,RL=27Ω	1.5	2.3	VCC	V
		graph 2,RL=50Ω	2	2.8	VCC	
Variation in the amplitude of the output voltage (NOTE1)	△VoD	graph 2,RL=27Ω			0.2	V
Output common mode voltage	Voc	graph 2,RL=27Ω			3	V
Amplitude Variation of Common Mode Output Voltage(NOTE1)	△Voc	graph 2,RL=27Ω			0.2	V
High-level input	VH	DI	2.0			V
Low level input	Vπ	DI			0.8	V
Logic input current	IN1	DI	-2		2	uA
Output the current during ashort circuit,with high short-circuit	$IosD_1$	Short circuit to OV~12V	35		250	mA
Output the current during ashort circuit,down to low	$IosD_2$	Short circuit to-7V~0V	-250		-35	mA

(If not otherwise, VCC=3V~5.5V, Temp = TMIN ~ TMAX, typical value at Temp = 25) NOTE 1:? VO D and? VOC is the change in VOD and VOC amplitude caused when the DI state of the input signal changes, respectively.

drive switch characteristics						
Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
Input to output propag-ation delay (low to high)	tDPLH	RDIFF=54 Ω,CL= CL?=100pF(see Fi-gure 3 and Figure 4)		12	35	ns
Input to output propag-ation delay (high to low)	tDPHL			12	35	ns
|tDPLH-tDPHLl	tsKEW1			6	10	ns
Rise time /fall time	tDR,tDF			9	25	ns
Enable to high output	tpZH	R=110Ω (seeFigure 5 and 6)		20	90	ns
Enable to output low	tpZL			20	90	ns
Input low to disable	tpLZ	R=110Ω (seeFigure 5 and 6)		20	80	ns
Enable high input	tpHZ			20	80	ns
Enable high outputunder off condition	tDSH	R=110Ω (seeFigure 5 and 6)		500	900	ns
Enable low outputunder shutdown conditions	tDSL	RL=110Ω (seeFigure 5 and 6)		500	900	ns

Supply Current						
Parameter	symbol	Test condition	Minimum	Typicel case	Maximum	Unit
Supply current	Iccl	/RE=0V,DE=0V		220	400	uA
	Icc2	/RE=VCC, DE=VCC		240	400	uA
Turn-off current	IsHDN	/RE=VCC,DE=0V		0.5	10	uA

DC Electrical Characteristics of the Receiver						
Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
Input current(A,B)	IN2	VCC=0 or 3.3V VIn=12V			125	uA
		VCC=0 or 3.3V VIn=-7V	-100			uA
Forward input threshold voltage	VIT+	-7V≤Vcm≤12V			-10	mV
Reverse input threshold voltage	VIT-	-7V≤Vcm≤12V	-200			mV
Input hysteresis voltage	Vhys	-7V≤Vcm≤12V	10	30		mV
High level output voltage	VoH	IoUT=-4mA, VID=+200 mV	VCC-1.5			V
Low level output voltage	VoL	IoUT=+4mA, VID=-200 mV			0.4	V
Three state input leakage cur-rent	IozR	0.4V<Vo<2.4V			±1	uA
Input resistance of receiver	RIN	-7V≤VcM≤12V	96			kΩ
Receiver short circuit curr-ent	IosR	0V≤Vo≤VCC	±7		±95	mA

Function table

Receiving function table			
control		input	output
/RE	DE	A-B	RO
0	X	≥-10mV	H
0	X	≤-200mV	L
0	X	Open/short circuit	H
1	X	X	Z
X: any level; Z: high impedance.			

Send function table				
control		input	output	
/RE	DE	DI	Y	Z
X	1	1	H	L
X	1	0	L	H
0	0	X	Z	Z
1	0	X	Z(shutdown)	
X: any level; Z: high impedance.				

Additional description

Introduction

The LBC180 is a full-duplex high-speed transceiver for RS-485/RS-42 communication,containing a driver and a receiver.It has fail-safe,overvoltage protection,and overcurrent protection.The LBC180 achieves error-free transmission up to 12Mbps.

fail-safe

The LBC180 guarantees a logic high receiver output if the receiver input is short-circuited or open-circuited,or drivers connected to the terminated transmission line are disabled (idle).This is achieved by setting the receiver input thresholds to -10mV and -20mV, respectively.RO is logic high if the differential receiver input voltage(A-B)≥-10mV,and RO is logic low the voltage(A-B)≤-200mV.Logic high with a minimum noise margin of 50mV can be realized depending the receiver thresholds.The-10mV to -200mV threshold voltage is in accordance with the EIA/TIA-485 of±200mV.

256 transceivers on the bus

The input impedance of the standard RS485 receiver is 12kΩ(1 unit load),and the standard driver can drive to 32 unit loads.The receiver of the LBC180 transceiver has an input impedance of 1/8 unit load (96kΩ,allowing up to 256 transceivers to be connected in parallel on the samecommunication bus.These devices can be combined arbitrarily,or combined with other485 transceivers,as long as the total load does not exceed 256 unit loads,they can be connected to the same bus.

Drive output protection

Protection against excessive output current and dissipation by fault or bus contention is provided by overcurrent and overvoltage protection mechanisms,with fast short-circuit throughout the common-mode voltage range(see Typical Operating Characteristics).

Test circuit

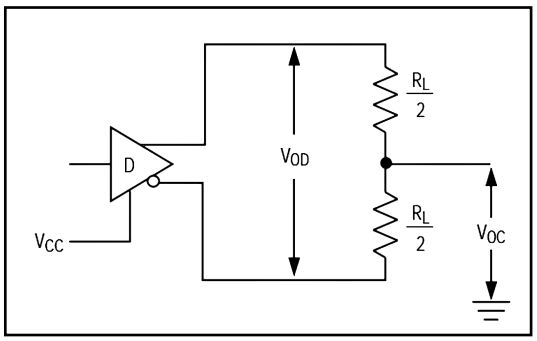


Figure 2: DC test load for the drive

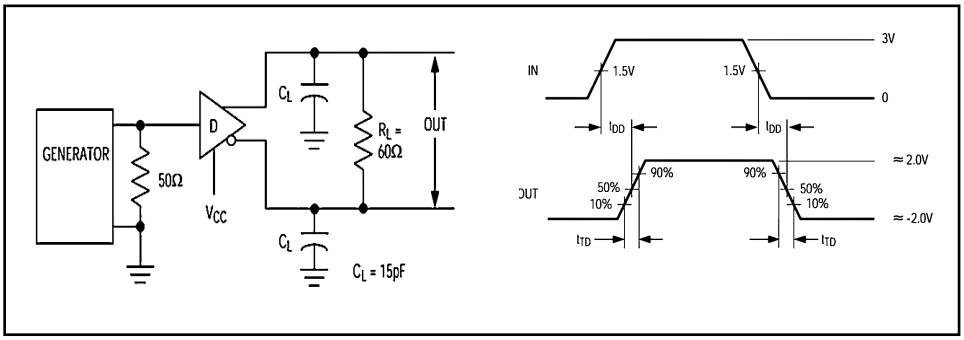


Figure 3 Drive-line Differential Delay and Transit Time

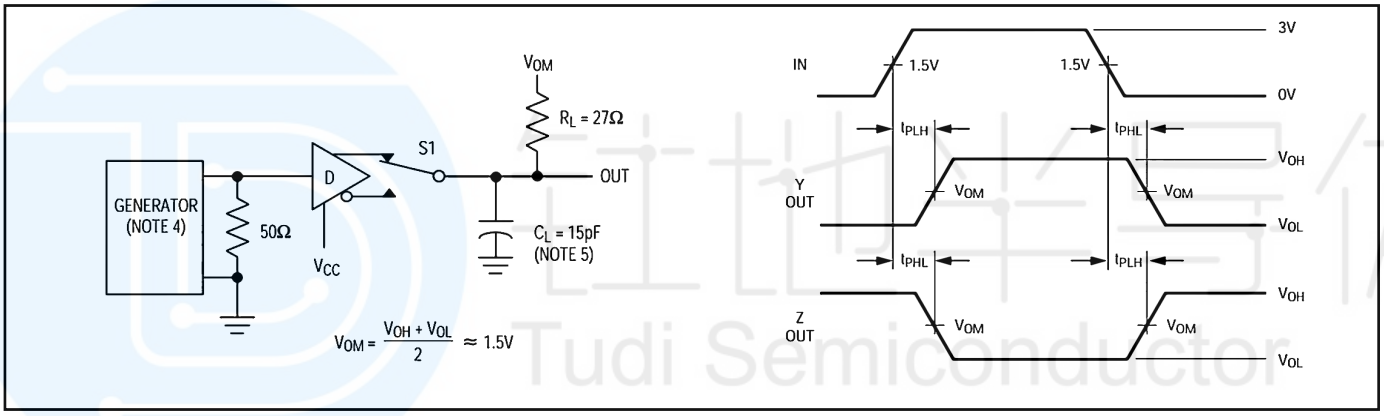


Figure 4 Drive propagation delay

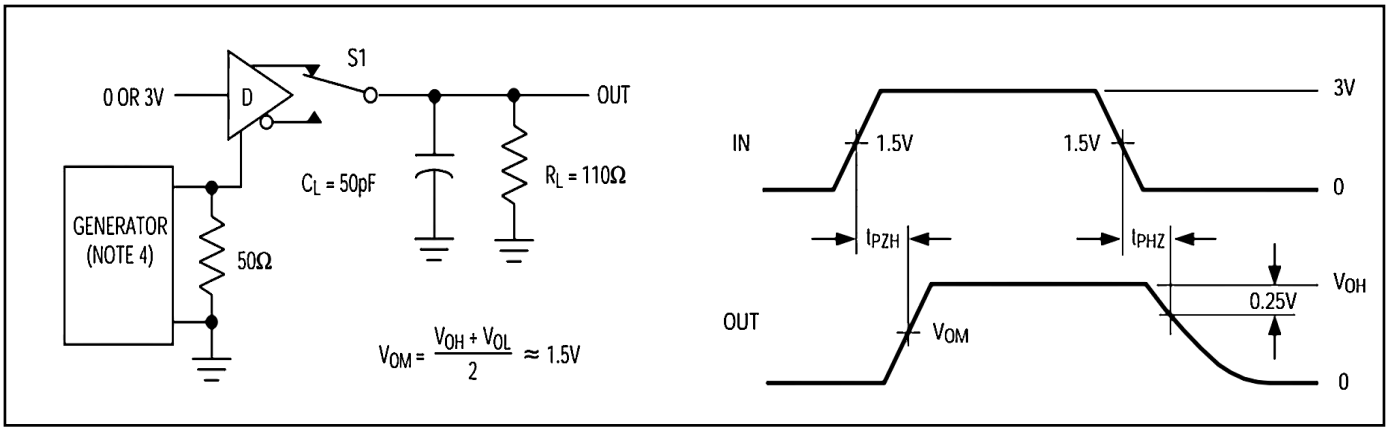


Figure 5 Drive enable and disable time

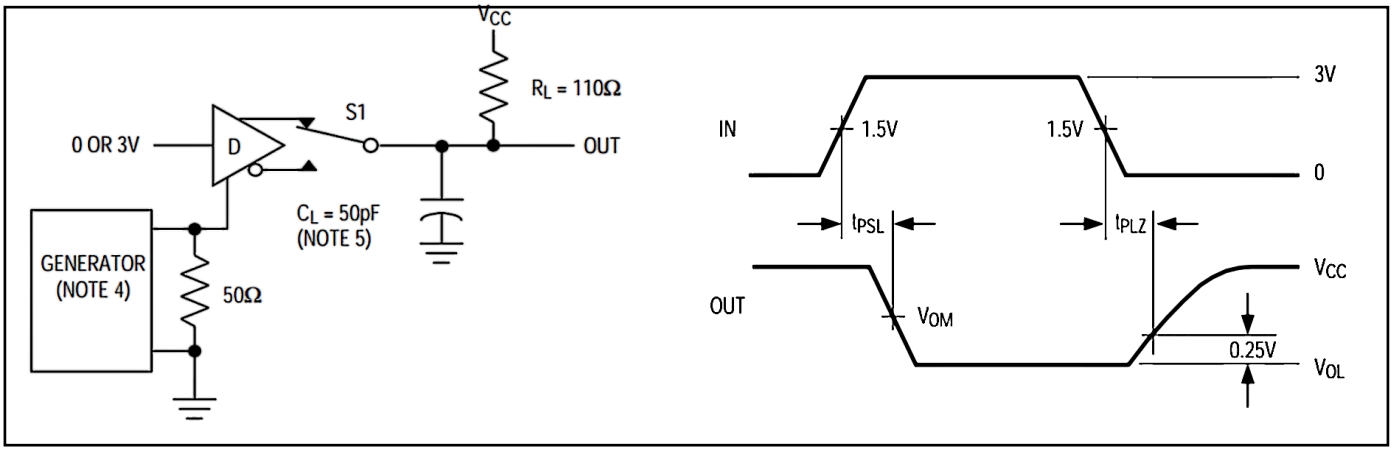


Figure 6 Drive enable and disable time

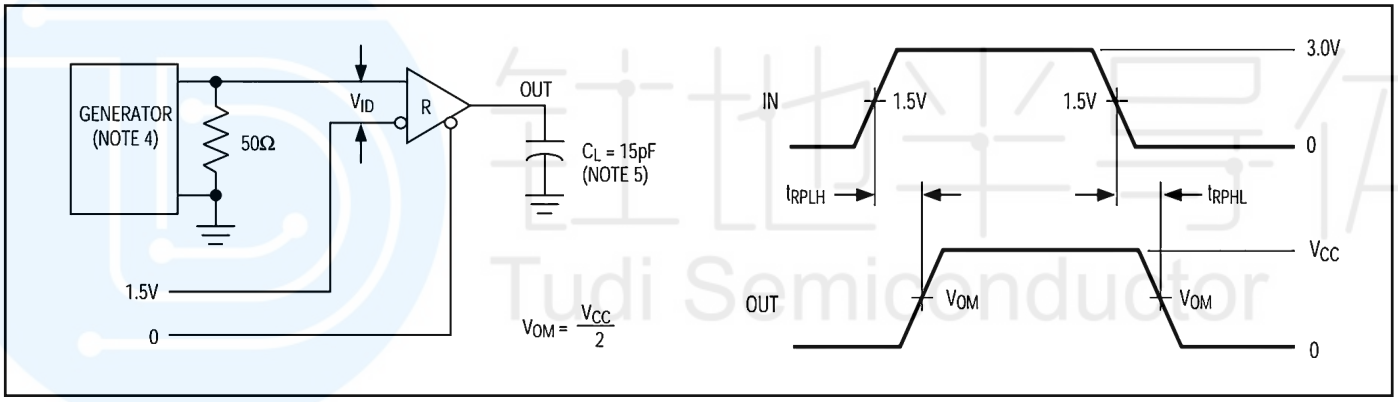
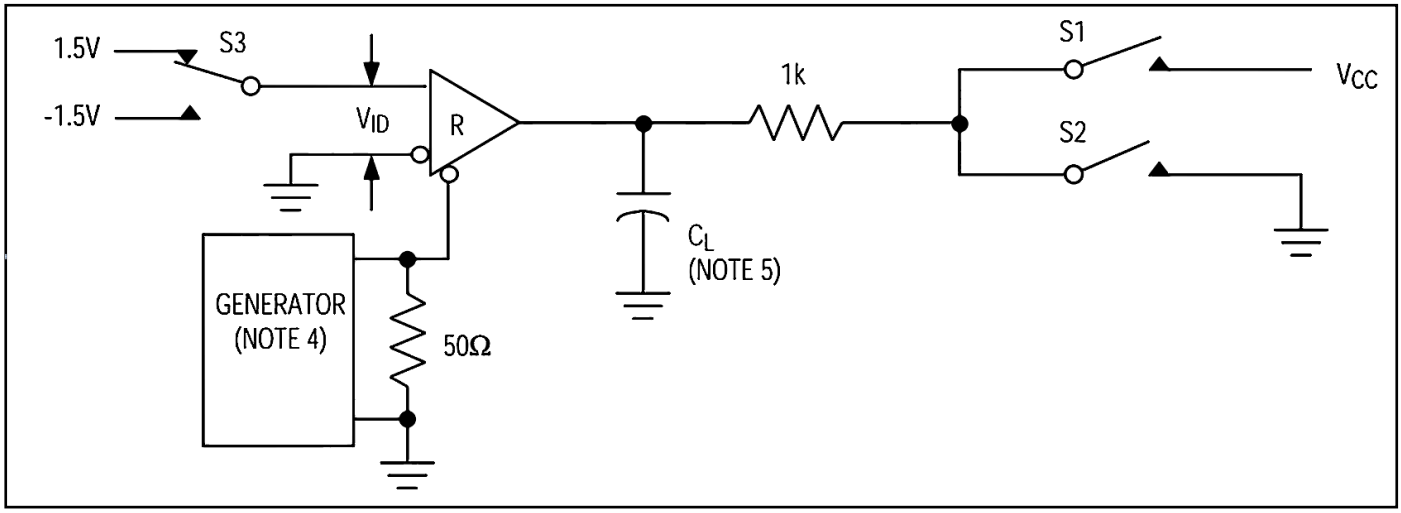


Figure 7: Receiver Propagation Delay Test Circuit



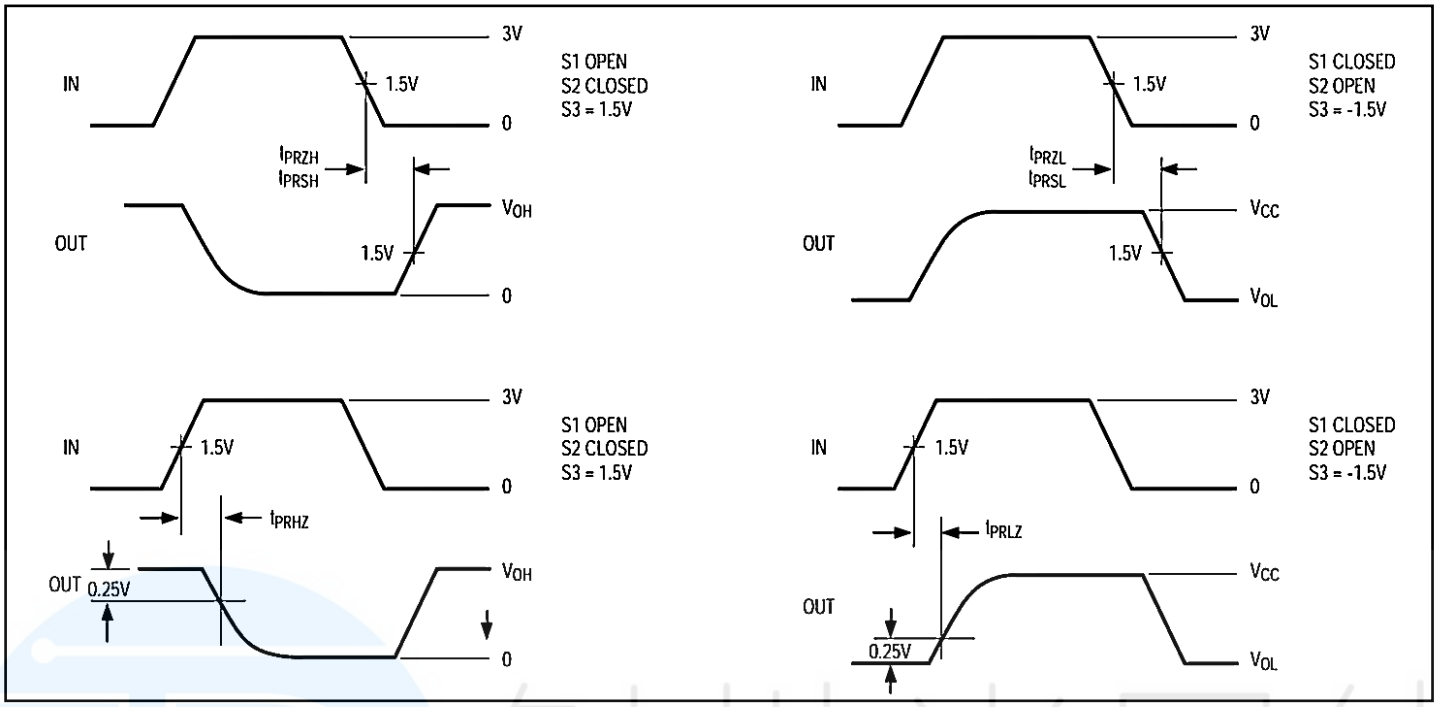
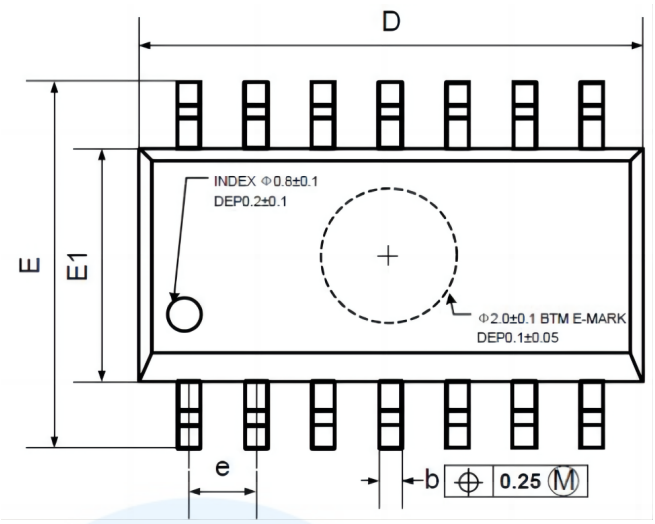


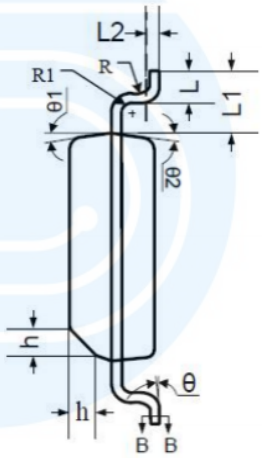
Figure 8 Receive enable and disable time

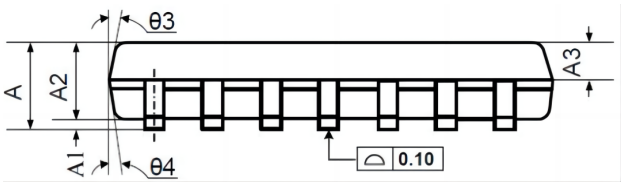
Order information

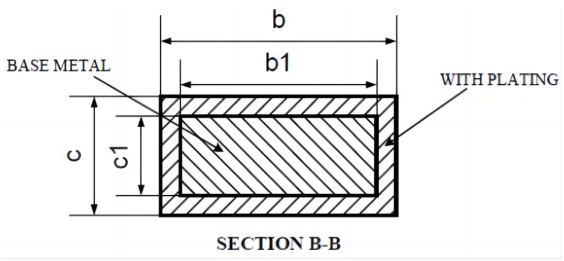
Order Number	Package	Package Quantity	Marking On The park	Temperature
SN75LBC180N-TUDI	DIP14	Tube,25,A box of 1000	SN75LBC180N	0℃ to 70℃
SN75LBC180AN-TUDI	DIP14	Tube,25,A box of 1000	75LBC180A	
SN75LBC180DR-TUDI	SOP14	Tape,Reel,2500	75LBC180	
SN75LBC180ADR-TUDI	SOP14	Tape,Reel,2500	75LBC180A	
SN65LBC180DR-TUDI	SOP14	Tape,Reel,2500	6LB180	- 40°C to 85°C
SN65LBC180ADR-TUDI	SOP14	Tape,Reel,2500	BL180A	
SN65LBC180N-TUDI	DIP14	Tube,25,A box of 1000	SN65LBC180N	
SN65LBC180AN-TUDI	DIP14	Tube,25,A box of 1000	65LBC180A	

Package SOP14



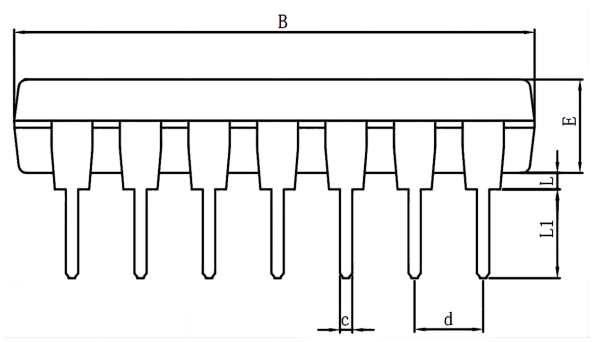


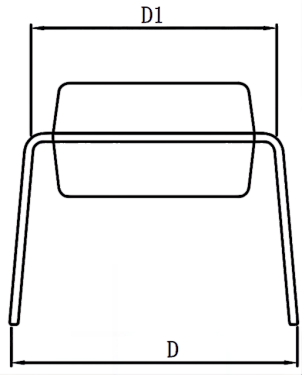


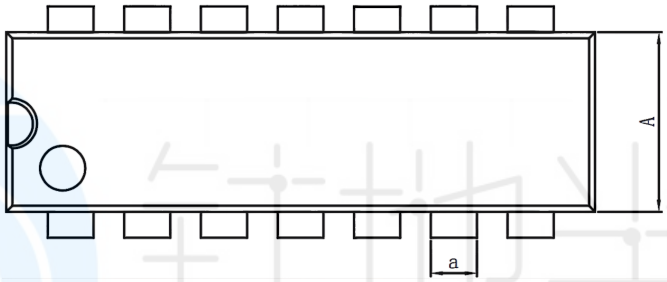


Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	1.35	1.60	1.75
A1	0.10	0.15	0.25
A2	1.25	1.45	1.65
A3	0.55	0.65	0.75
b	0.36		0.49
b1	0.35	0.40	0.45
C	0.16		0.25
c1	0.15	0.20	0.25
D	8.53	8.63	8.73
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.45	0.60	0.80
L1	1.04 REF		
L2	0.25 BSC		
R	0.07		
R1	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 DIP14







DIM.	MIN	TYP	MAX	DIM.	MIN	TYP	MAX
A	6.100	6.300	6.680	a	1.504	1.524	1.544
B	18.940	19.200	19.560	C	0.437	0.457	0.477
D	8.200	8.700	9.200	d	2.530	2.540	2.550
D1	7.42	7.62	7.82	L	0.500	—	0.800
E	3.100	3.300	3.550	L1	3.000	3.200	3.600

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