

+15kV ESD Protected、500kbps Data Rate RS-485

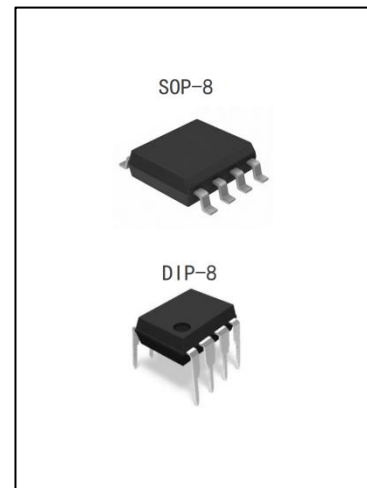
SSP3085

General Description

The SSP3085 is a half-duplex high speed transceiver for RS-485 and RS422 communication. IC contains one driver and one receiver.

The SSP3085 has a fail-safe circuit, ensure logical high level of receiver output when receiver input is open or short. It can achieve error-free data transmission of up to 500kbps. Each driver output and receiver input is protected against $\pm 15\text{kV}$ electrostatic discharge (HBM) (ESD) shocks.

The SSP3085 receiver has 1/8 unit load input impedance, allows up to 256 devices can be attached to the bus.



Features

- I/O pin ESD protection: +15kV HBM
Other pins have level 3 ESD protection: >+8kV HBM
- Fractional unit load allows up to 256 devices on the bus
- + 5V operating voltage
- Data transmission up to 500kbps
- Tri-state output
- SOP8 and DIP8 package

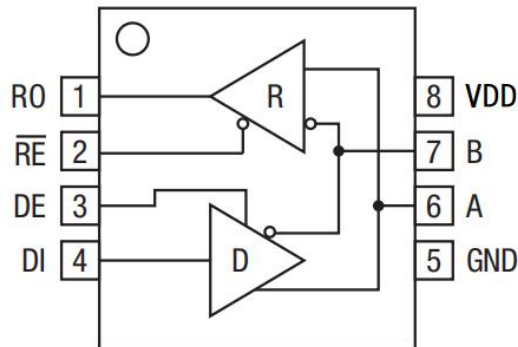
Applications

- RS-485/RS-422 transceiver
- Industrial process control
- Electric meter
- Industrial motor drive
- Automatic HVAC system

Order specification

Part No	Package	Manner of Packing	Devices per bag/reel
SSP3085	SOP8	Reel	4000

Block Diagram and Pin Arrangement Diagram



Pin Assignment

Pin No.	Pin Name	Description	I/O
1	RO	Receiver output: If $A-B \geq -0.05V$, RO will be high; If $A-B \leq -0.2V$, RO will be low; If A and B are open or shorted, RO will be high.	O
2	\overline{RE}	Receiver output enable: RO is enabled when \overline{RE} is low; RO is high impedance when \overline{RE} is high.	I
3	DE	Driver output enable: The driver outputs, A and B are enabled by bringing DE high. They are high impedance when DE is low.	I
4	DI	Driver input: A low on DI forces output A low and output B high. Similarly, a high on DI forces output A high and output B low.	I
5	GND	Ground	
6	A	Receiver input and driver output	I/O
7	B	Receiver input and driver output	I/O
8	VDD	Supply voltage	

Functional Description

The SSP3085 is a half-duplex high speed transceiver for RS-485 and RS422 communication. IC contains one driver and one receiver. The SSP3085 receiver has 1/8 unit load input impedance, allows up to 256 devices can be attached to the bus.

Receiver Truth Table

Input			Output
\overline{RE}	DE	A - B	RO
L	X	$\geq -0.05V$	H
L	X	$\leq -0.2V$	L
L	X	Open/shorted	H
H	H	X	Z
H	L	X	Z

Driver Truth Table

Input			Output	
\overline{RE}	DE	DI	B	A
X	H	H	L	H
X	H	L	H	L
L	L	X	Z	Z
H	L	X	Z	

Absolute Maximum Ratings

Unless specified otherwise, $T_{amb} = 25^{\circ}C$

Parameter	Symbol	Value	Unit
Supply Voltage	V_{DD}	-0.5~6	V
Input Voltage	V_{IN}	-0.5~6	V
Output Voltage	V_{OUT}	GND-0.3~ $V_{DD}+0.3$	V
A/B Input / Output Voltage	$V_{INA/B}/V_{OUTA/B}$	-7~12	V
Operating Temperature	T_{amb}	-40~85	$^{\circ}C$
Storage Temperature	T_{stg}	-65~150	$^{\circ}C$
Soldering Temperature(10s)	T_{sol}	300	$^{\circ}C$

DC Electrical Characteristics

Unless specified otherwise, $V_{CC}=5V\pm 5\%$, $T_{amb}= 25^{\circ}C$

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Driver							
Differential driver output	V_{OD1}	No load			5	V	
Differential driver output	V_{OD2}	$R=50\Omega$ or $27\Omega^{(1)}$	2.0	3.0		V	
Change in magnitude of driver differential output voltage for complementary output states	ΔV_{OD}	$R=50\Omega$ or $27\Omega^{(1)}$			0.2	V	
Driver common-mode output voltage	V_{OC}	$R=50\Omega$ or $27\Omega^{(1)}$		$V_{DD}/2$	3	V	
Change in magnitude of driver common-mode output voltage for complementary output states	ΔV_{OC}	$R=50\Omega$ or $27\Omega^{(1)}$			0.2	V	
Input high voltage	V_{IH1}	DE、 \overline{RE} 、DI	2.0			V	
Input low voltage	V_{IL1}	DE、 \overline{RE} 、DI			0.8	V	
Input current	I_{IN1}	DE、 \overline{RE} 、DI			± 2	μA	
Input current (A, B)	I_{IN2}	DE=GND,	$V_{in}=5V$		40	90	μA
		$V_{CC}=5V$	$V_{in}=-0V$		60	100	μA
Receiver							
Differential threshold voltage	V_{TH}	$-7V \leq V_{CM} \leq 12V$	-250		-10	mV	
input hysteresis voltage	ΔV_{TH}			25		mV	
output high voltage	V_{OH}	$I_o=-4mA$	$V_{CC}-1.5$			V	
output low voltage	V_{OL}	$I_o=4mA$			0.4	V	
3-state(high impedance) output current at receiver	I_{OZR}	$0.4V \leq V_o \leq 2.4V$		± 1		μA	
input resistance	R_{IN}	$-7V \leq V_{CM} \leq 12V$	96			k Ω	
Receiver short-circuit current	I_{OSR}	$0V \leq V_{RO} \leq V_{DD}$		± 80		mA	
Supply Current	I_{CC}	No load, $\overline{RE}=DI$ =GND or V_{DD}	DE= V_{DD}		480	800	μA
			DE=GND		450	700	μA
ESD Protection (A/B)	ESD	Human Body Model	± 15			kV	

Transmission characteristics

Unless specified otherwise, $V_{CC}=5V\pm 5\%$, $T_{amb}=25^{\circ}C$

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
slew-rate-limited						
Driver Input to Output	t_{DPLH}	$R_{DIFF}=50\Omega$, $C_{L1}=C_{L2}=100pF^{(3)(6)}$	250		1000	ns
Driver Input to Output	t_{DPHL}	$R_{DIFF}=50\Omega$, $C_{L1}=C_{L2}=100pF^{(3)(6)}$	250		1000	ns
$ t_{DPLH}-t_{DPHL} $	t_{DSKEW}	$R_{DIFF}=50\Omega$, $C_{L1}=C_{L2}=100pF^{(3)(6)}$		-3	± 100	ns
Driver Rise or Fall Time	t_{DR}, t_{DF}	$R_{DIFF}=50\Omega$, $C_{L1}=C_{L2}=100pF^{(3)(6)}$	200		750	ns
Maximum Data Rate	f_{MAX}			500		kbps
Driver Enable to Output High	t_{DZH}	$C_L=100pF$, S2 closed ⁽⁴⁾⁽⁷⁾			2500	ns
Driver Enable to Output Low	t_{DZL}	$C_L=100pF$, S1 closed ⁽⁴⁾⁽⁷⁾			2500	ns
Driver Disable Time from Low	t_{DLZ}	$C_L=15pF$, S1 closed ⁽⁴⁾⁽⁷⁾			100	ns
Driver Disable Time from High	t_{DHZ}	$C_L=15pF$, S2 closed ⁽⁴⁾⁽⁷⁾			100	ns
Receiver Input to Output	t_{RPLH}	$ V_{ID} \geq 2.0V$ Rise or Fall Time \leq 15ns ⁽⁵⁾⁽⁸⁾			200	ns
Receiver Input to Output	t_{RPHL}				200	ns
$ t_{RPLH}-t_{RPHL} $	t_{RSKD}	$ V_{ID} \geq 2.0V$ Rise or Fall Time \leq 15ns ⁽⁵⁾⁽⁸⁾		3	± 30	ns
Receiver Enable to Output Low	t_{RZL}	$C_L=100pF$, S1 closed ⁽²⁾⁽⁹⁾		20	50	ns
Receiver Enable to Output High	t_{RZH}	$C_L=100pF$, S2 closed ⁽²⁾⁽⁹⁾		20	50	ns
Receiver Disable Time from Low	t_{RLZ}	$C_L=100pF$, S1 closed ⁽²⁾⁽⁹⁾		20	50	ns
Receiver Disable Time from High	t_{RHZ}	$C_L=100pF$, S2 closed ⁽²⁾⁽⁹⁾		20	50	ns

Note:

- (1) Test circuit is shown in Figure 1
- (2) Test circuit is shown in Figure 2
- (3) Test circuit is shown in Figure 3
- (4) Test circuit is shown in Figure 4

- (5) Test circuit is shown in Figure 5
- (6) Test circuit is shown in Figure 6
- (7) Test circuit is shown in Figure 7
- (8) Test circuit is shown in Figure 8
- (9) Test circuit is shown in Figure 9

Test Circuit

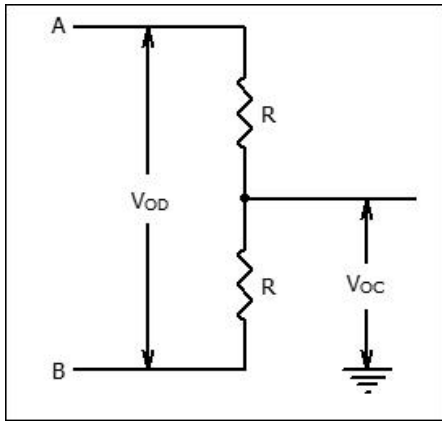


Figure 1 Driver DC Test Load

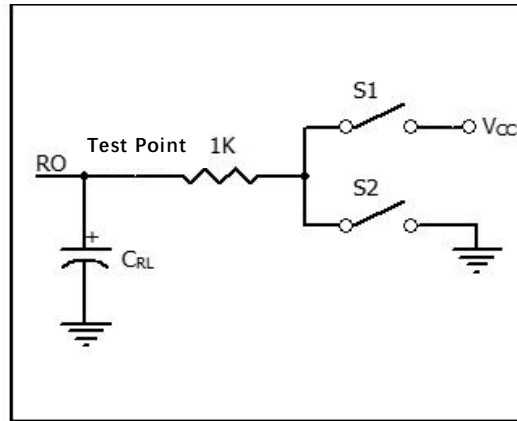


Figure 2 Receiver Enable/Invalid Timing Test Circuit

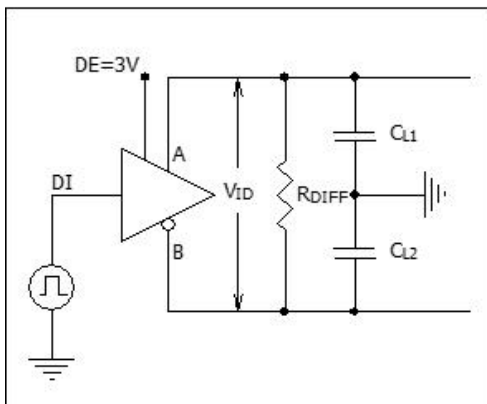


Figure 3 Driver Timing Test Circuit

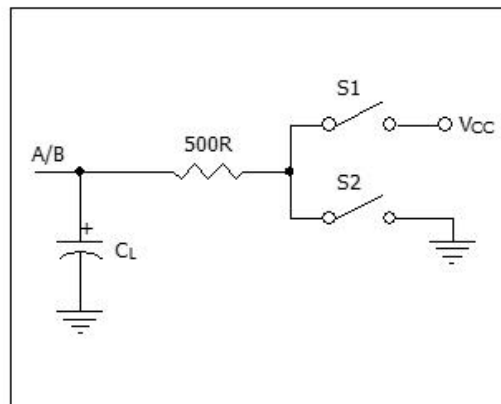


Figure 4 Driver Enable/Invalid Timing Test Circuit

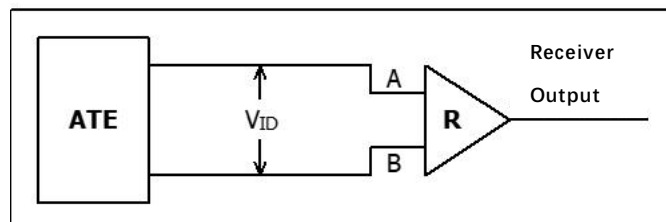


Figure 5 Receiver Propagation Delay Test Circuit

Switching Waveforms

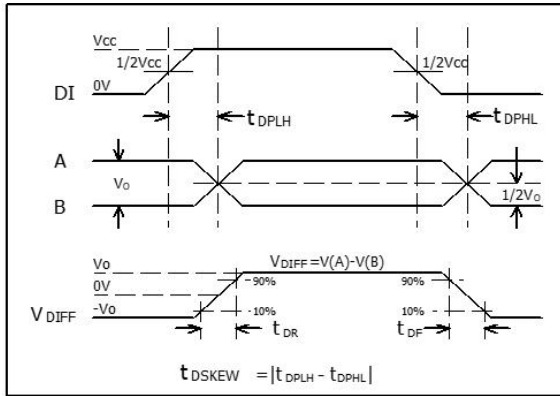


Figure 6 Driver Propagation Delays

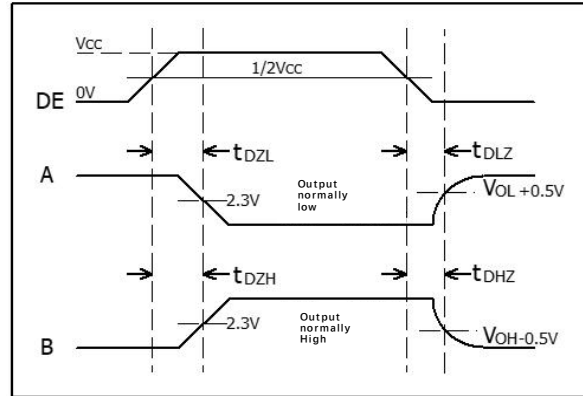


Figure 7 Driver Enable and Disable Times

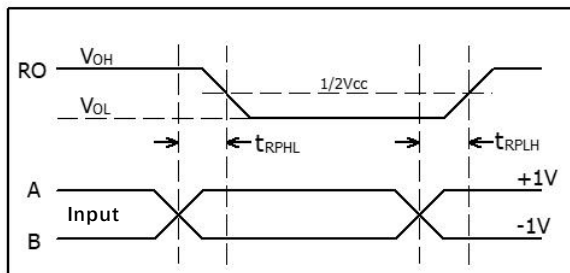


Figure 8 Receiver Propagation Delays

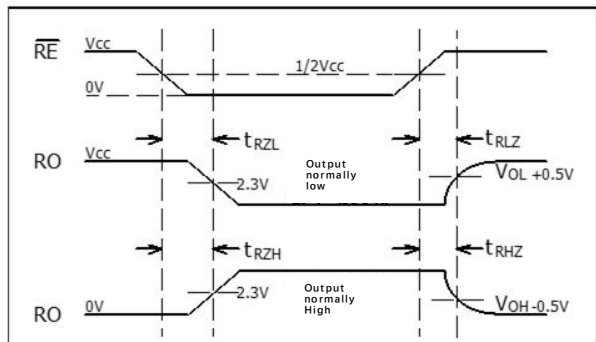


Figure 9 Receiver Enable and Disable Times

Application Circuits

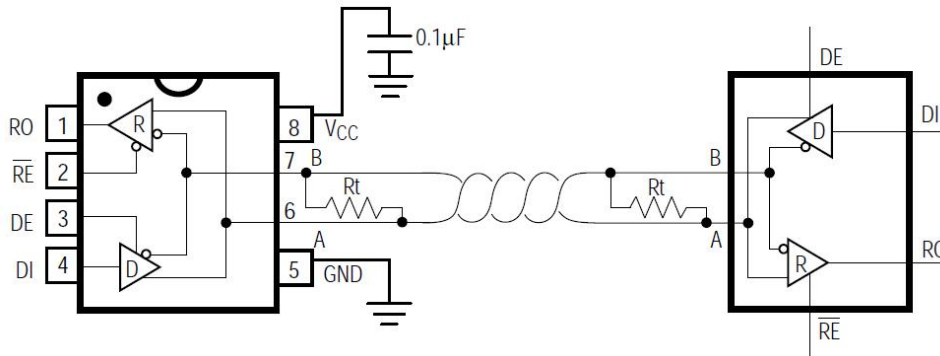


Figure 10 Typical Application Chart

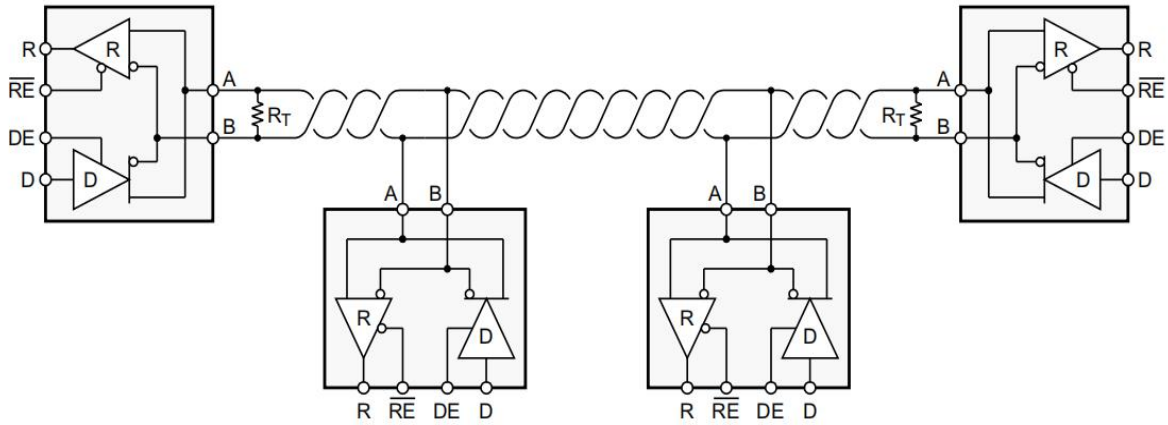
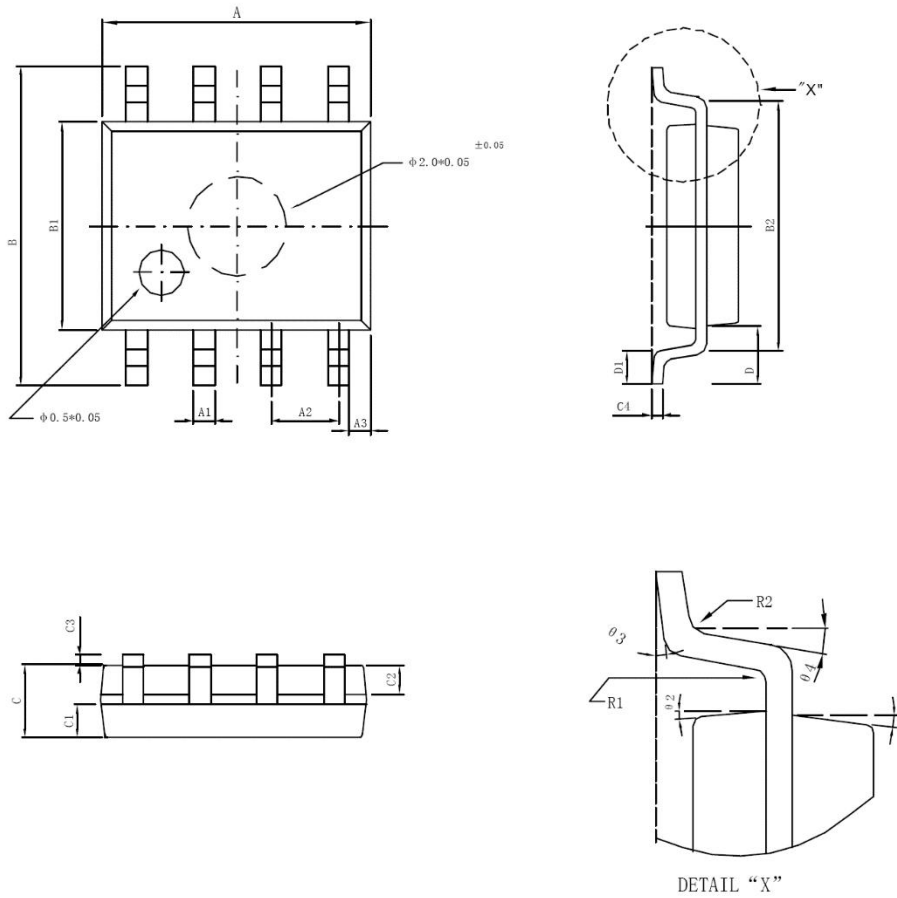
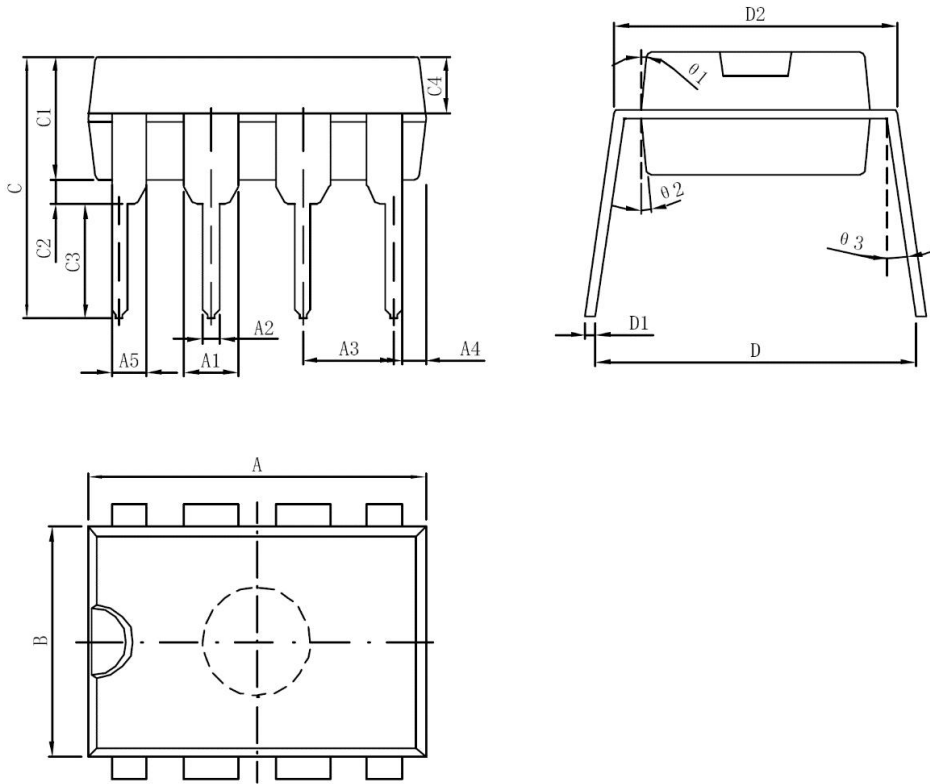


Figure 11 Typical Half-duplex 485 Network

Package Information (SOP8)



Symbol	Min. (mm)	Max.(mm)	Symbol	Min. (mm)	Max. (mm)
A	4.95	5.15	C3	0.10	0.20
A1	0.37	0.47	C4	0.20TYP	
A2	1.27TYP		D	1.05TYP	
A3	0.41TYP		D1	0.50TYP	
B	5.80	6.20	R1	0.07TYP	
B1	3.80	4.00	R2	0.07TYP	
B2	5.0TYP		θ1	17°TYP	
C	1.30	1.50	θ2	13°TYP	
C1	0.55	0.65	θ3	4°TYP	
C2	0.55	0.65	θ4	12°TYP	

Package Information (DIP8)


Symbol	Min. (mm)	Max. (mm)	Symbol	Min. (mm)	Max. (mm)
A	9.30	9.50	C2	0.50	
A1	1.524		C3	3.3	
A2	0.39	0.53	C4	1.57TYP	
A3	2.54		D	8.20	8.80
A4	0.66TYP		D1	0.20	0.35
A5	0.99TYP		D2	7.62	7.87
B	6.3	6.5	theta 1	8°TYP	
C	7.20		theta 2	8°TYP	
C1	3.30	3.50	theta 3	5°TYP	

Special Instructions

The company reserves the right of final interpretation of this specification.

Version Change Description

Version: V1.3

Author: Yangyang

Time: 2021.8.12

Modify the record:

1. Re-typesetting the manual and checking some data
-

Statement

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