

SINGLE SUPPLY RS-232 STANDARD TRANSCEIVER

DESCRIPTION

MAX3232 is compatible with RS-232 standard, have dual transceiver. Each receiver converts TIA/EIA-232-E levels into TTL/CMOS levels. Each driver converts TTL/CMOS levels into TIA/EIA-232-E levels. The MAX3232 is characterized for operation from -40°C to +85°C for all packages.

MAX3232 is purposed for application in high-performance information processing systems and control devices of wide application.

FEATURES

- Input voltage levels are compatible with standard CMOS levels
- Output voltage levels are compatible with TIA/EIA-232-E levels
- Supply voltage: 3.3V
- Low input current: 0.1μA at T_A = 25°C
- Output current: 24mA
- Latching current not less than 450mA at T_A = 25°C
- The transmitter outputs and receiver inputs are protected to ±15kV Air ESD

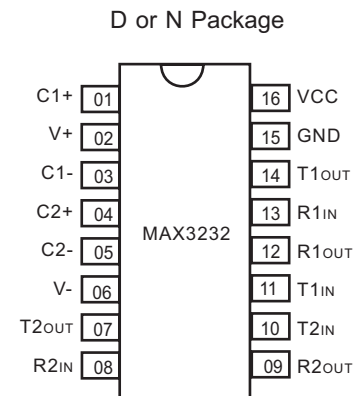
APPLICATION

- Battery-Powered RS232 Systems
- Terminals
- Modems
- Computers

ORDERING INFORMATION

Temperature Range	Package		Orderable Device	Package Qty
-40°C to +85°C	SOP16L	Pb-Free	MAX3232D	50Units/Tube
			MAX3232DR	3000Units/R&T
	DIP16L		MAX3232N	25Units/Tube

PIN CONFIGURATION



(Top View)



PIN DESCRIPTION

No.	Name	Function
1	C1+	External capacitance of positive voltage multiplier unit
2	V+	Output of positive voltage of multiplier unit
3	C1-	External capacitance of positive voltage multiplier unit
4	C2+	External capacitance of negative voltage multiplier unit
5	C2-	External capacitance of negative voltage multiplier unit
6	V-	Output of negative voltage of multiplier unit
7	T2 _{OUT}	Output of transmitter data (levels RS – 232)
8	R2 _{IN}	Input of receiver data (levels RS – 232)
9	R2 _{OUT}	Output of receiver data (levels TTL/CMOS)
10	T2 _{IN}	Input of transmitter data (levels TTL/CMOS)
11	T1 _{IN}	Input of transmitter data (levels TTL/CMOS)
12	R1 _{OUT}	Output of receiver data (levels TTL/CMOS)
13	R1 _{IN}	Input of receiver data (levels RS – 232)
14	T1 _{OUT}	Output of transmitter data (levels RS – 232)
15	GND	Ground
16	V _{CC}	Supply voltage

TRUTH TABLE

Inputs	Outputs
R _{IN} , T _{IN}	R _{OUT} , T _{OUT}
H	L
L	H

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Supply voltage	V _{CC}	-0.3 to 6.0	V
Transmitter high output voltage	V+	V _{CC} -0.3 to 14	
Transmitter low output voltage	V-	-0.3 to -14	
Transmitter input voltage	V _{TIN}	-0.3 to (V+) + 0.3	
Receiver input voltage	V _{RIN}	-30 to 30	
Dissipated power	DIP package	842	mW
	SOP package	762	
Output current of transmitter short circuit	I _{SC}	Continuously	
Ambient temperature	T _A	-40 to +85	°C



RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Max	Unit
Supply voltage	V_{CC}	3.0	5.5	V
Transmitter output high voltage	V+	V_{CC}		
Transmitter output low voltage	V-	$-V_{CC}$		
Transmitter input voltage	V_{TIN}	0	V_{CC}	
Receiver input voltage	V_{RIN}	-30	30	
Transmitter short circuit output current	I_{SC}		± 60	mA

DC ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	25°C		-40°C to +85°C		Unit	
			Min	Max	Min	Max		
Consumption current static	I_{CC}	$V_{CC} = 3.3V, V_{IL} = 0V$		10.0		14.0*	mA	
Receiver								
Hysteresis voltage	V_H	$V_{CC} = 3.3V$	0.2	0.9	0.2	1.0	V	
On (operation) voltage	V_{ON}	$V_O \leq 0.1V, I_{OL} \leq 20\text{ mA}$		2.4		2.3		
Off (dropout) voltage	V_{OFF}	$V_O \geq V_{CC} - 0.1V, I_{OH} \leq -20\text{ mA}$	0.6		0.7			
Output low voltage	V_{OL}	$I_{OL} = 3.2\text{ mA}, V_{CC} = 4.5V, V_{IH} = 2.4V$		0.3		0.4		
Output high voltage	V_{OH}	$I_{OH} = -1.0\text{ mA}, V_{CC} = 4.5V, V_{IL} = 0.8V$	2.4		2.3			
Input resistance	R_I	$V_{CC} = 5.0V$	3.0	7.0	3.0	7.0	kΩ	
Transmitter								
Output low voltage	V_{OL}	$V_{CC} = 3.0V, V_{IH} = 2.0V, R_L = 3.0\text{ k}\Omega$		-3.5		-3.3	V	
Output high voltage	V_{OH}	$V_{CC} = 3.0V, V_{IL} = 0.8V, R_L = 3.0\text{ k}\Omega$	3.5		3.3			
Input low current	I_{IL}	$V_{CC} = 3.3V, V_{IL} = 0V$		-1.0		-10.0	μA	
Input high current	I_{IH}	$V_{CC} = 3.3V, V_{IH} = V_{CC}$		1.0		10.0	μA	
Speed of output front change	SR	$V_{CC} = 3.3V, C_L = 50\text{ to }1000\text{ pF}, R_L = 3.0\text{ to }7.0\text{ k}\Omega$	3.0	30	2.7	27	V/μs	
Output resistance	R_O	$V_{CC} = V_+ = V_- = 0V, V_O = \pm 2V$	350		300		Ω	
Short circuit output current	I_{SC}	$V_{CC} = 3.3V, V_O = 0V$	$V_I = V_{CC}$		-50		-60	mA
			$V_I = 0V$		50		60	
Speed of information transmission	ST	$V_{CC} = 3.0V, C_L = 1000\text{ pF}, R_L = 3.0\text{ k}\Omega, t_w = 7\mu\text{ s (for extreme } t_w = 8\text{ ms)}$	140		120		kbits/s	



AC ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	25°C		-40°C to +85°C		Unit
			Min	Max	Min	Max	
Signal propagation delay time when switching on (off)	t_{PHLR} (t_{PLHR})	$V_{CC} = 3.0V$, $C_L = 150pF$, $V_{IL} = 0V$, $V_{IH} = 3.0V$, $t_{LH} = t_{HL} \leq 10ns$		9.7		10	μs
Signal propagation delay time when switching on (off)	t_{PHLT} (t_{PLHT})	$V_{CC} = 3.0V$, $C_L = 150pF$, $V_{IL} = 0V$, $V_{IH} = 3.0V$, $t_{LH} = t_{HL} \leq 10ns$		5.0		6.0	μs

CAPACITANCE

Parameter	Symbol	Test Conditions	Value	Unit
Input capacitance	C_{IN}	$V_{CC}=3.3V$	9.0	pF
Dynamic capacitance	C_{PD}		90	pF

TIMING DIAGRAM

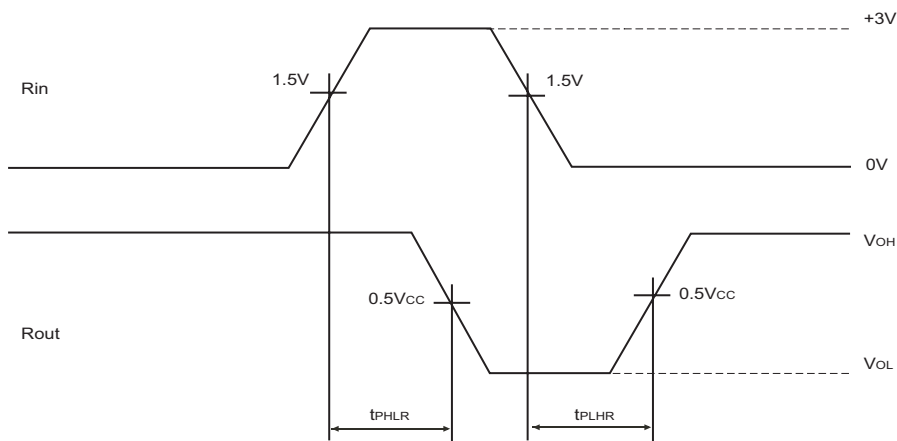


Figure 1. Waveforms for t_{PHLR} and t_{PLHR} Measurement

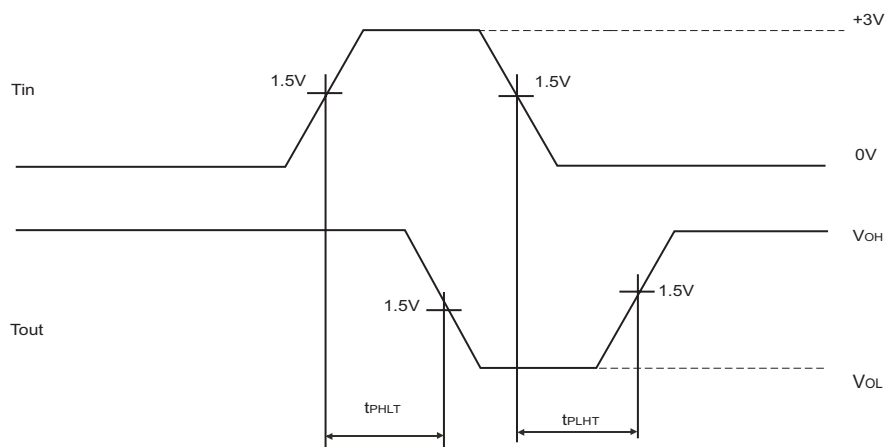


Figure 2. Waveforms for t_{PHLT} and t_{PLHT} Measurement



TYPICAL PERFORMANCE CHARACTERISTICS

($T_A=25^\circ\text{C}$, unless otherwise noted)

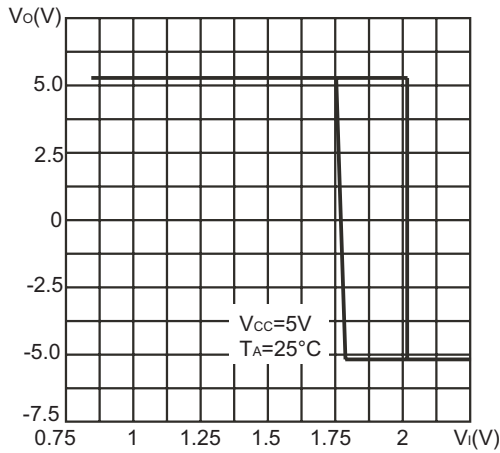


Figure 3. Driver Voltage Transfer Characteristics for Transmitter Inputs

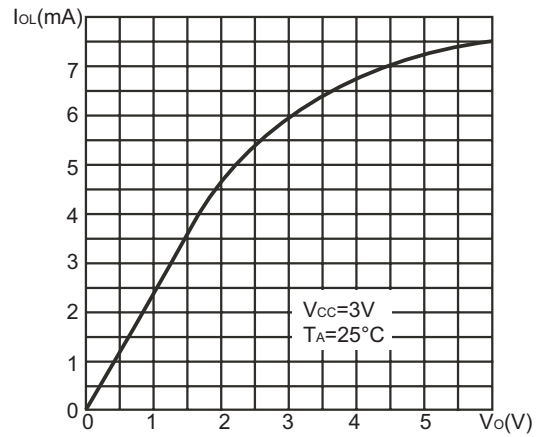


Figure 4 .Output Current vs. Output Low Voltage

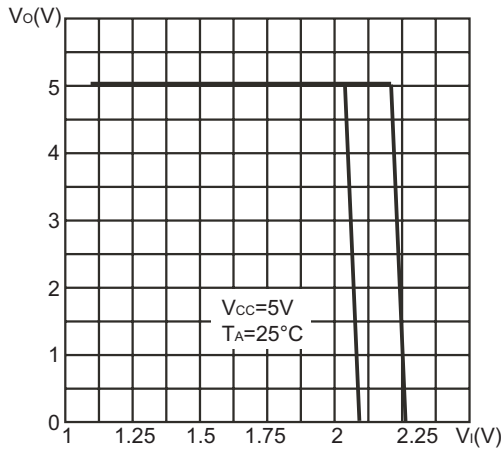


Figure 5. Driver Voltage Transfer Characteristics for Receiver Inputs

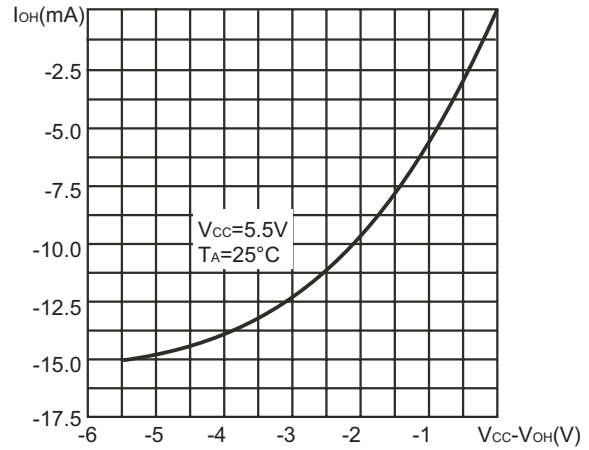


Figure 6 .Output Current vs. Output High Voltage

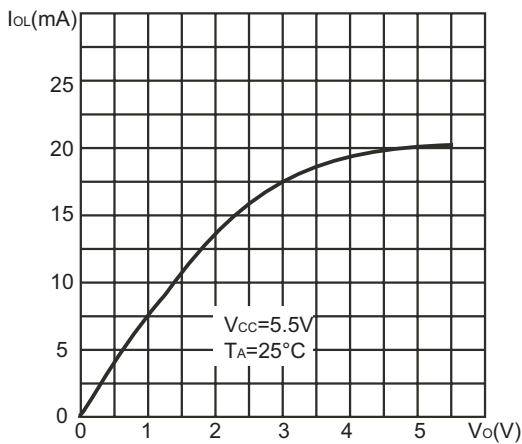


Figure 7. Output Current vs. Output Low Voltage

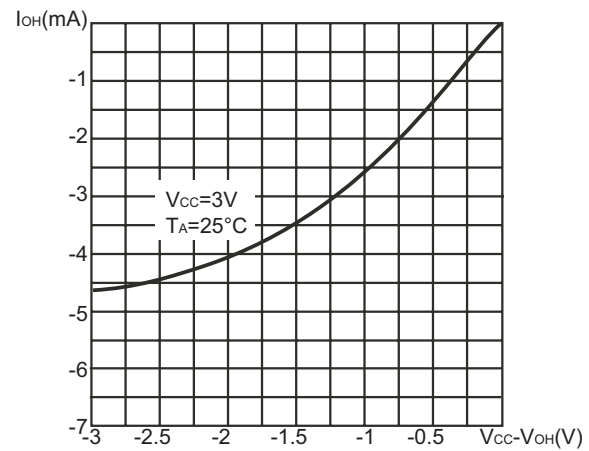


Figure 8 .Output Current vs. Output High Voltage



TYPICAL PERFORMANCE CHARACTERISTICS(CONTINUED)

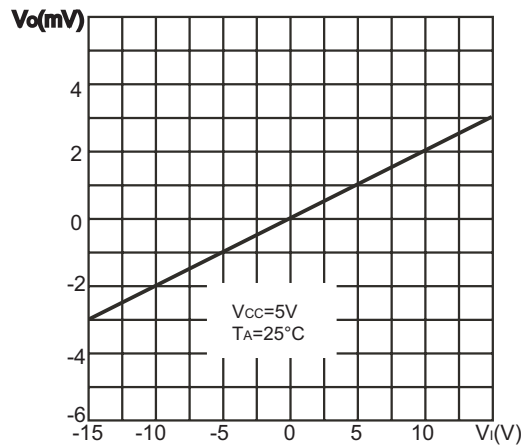


Figure 9. Receiver Input Resistance

TYPICAL APPLICATION

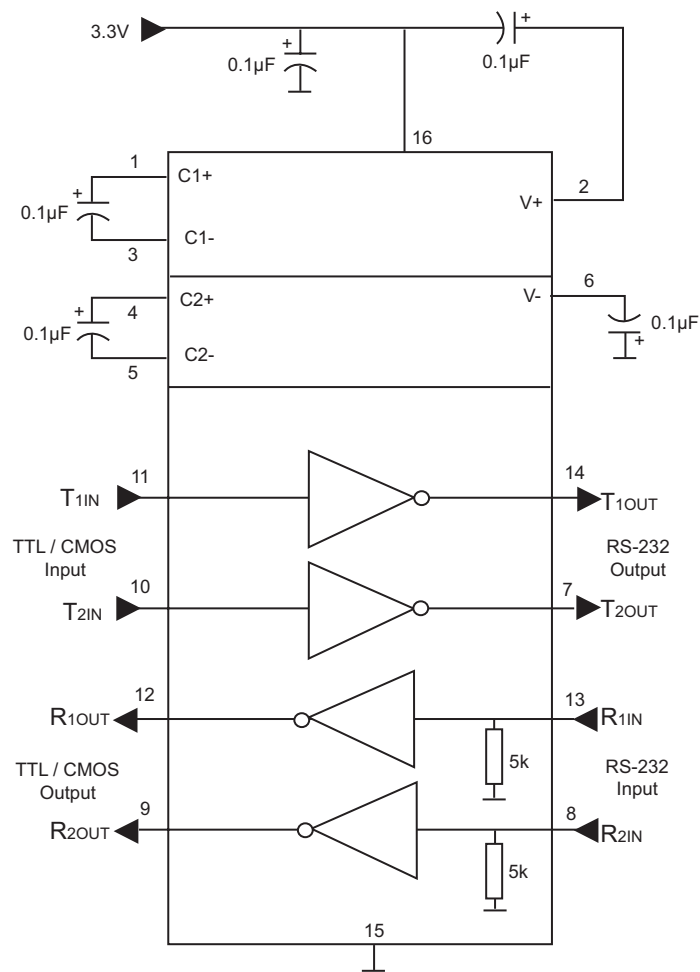
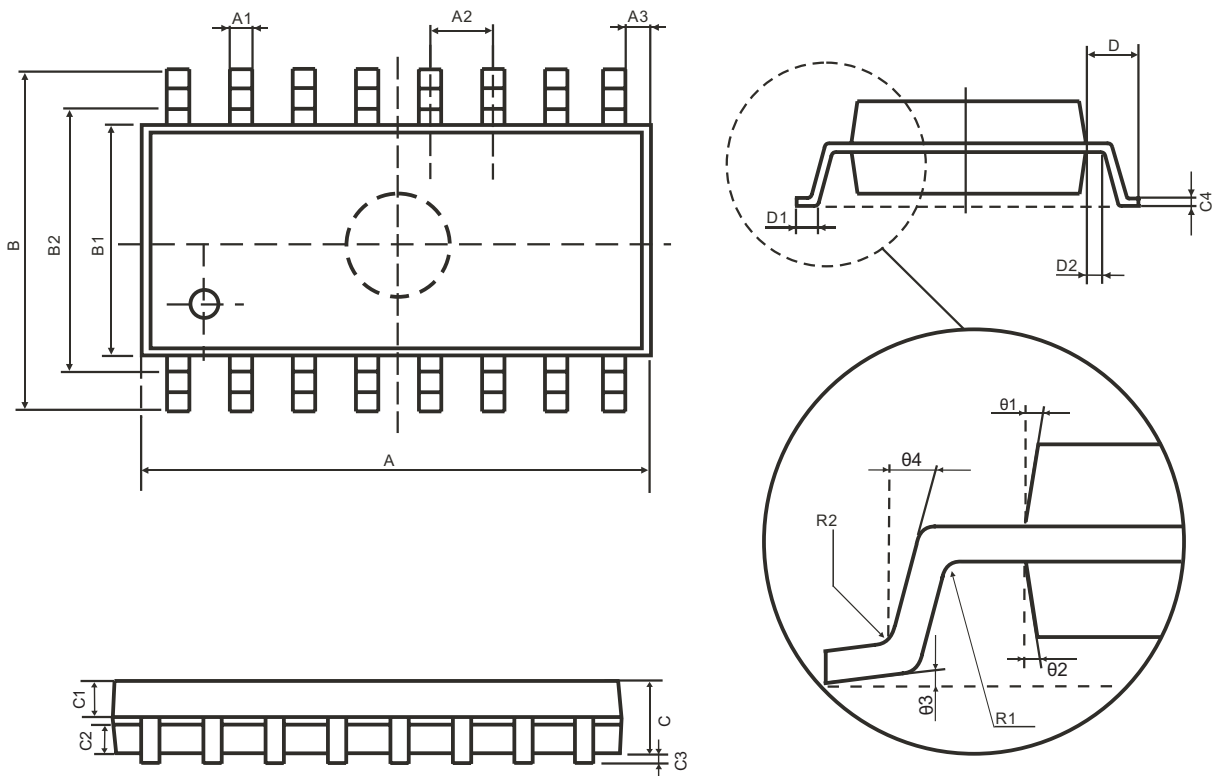


Figure 10. Application circuit

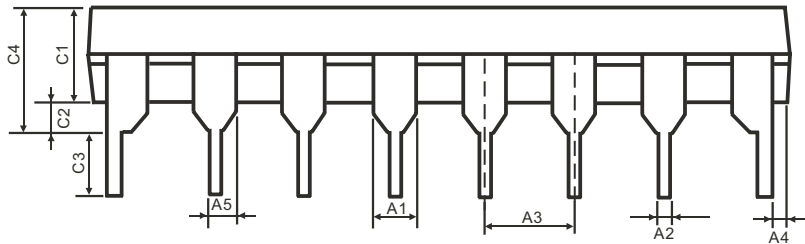
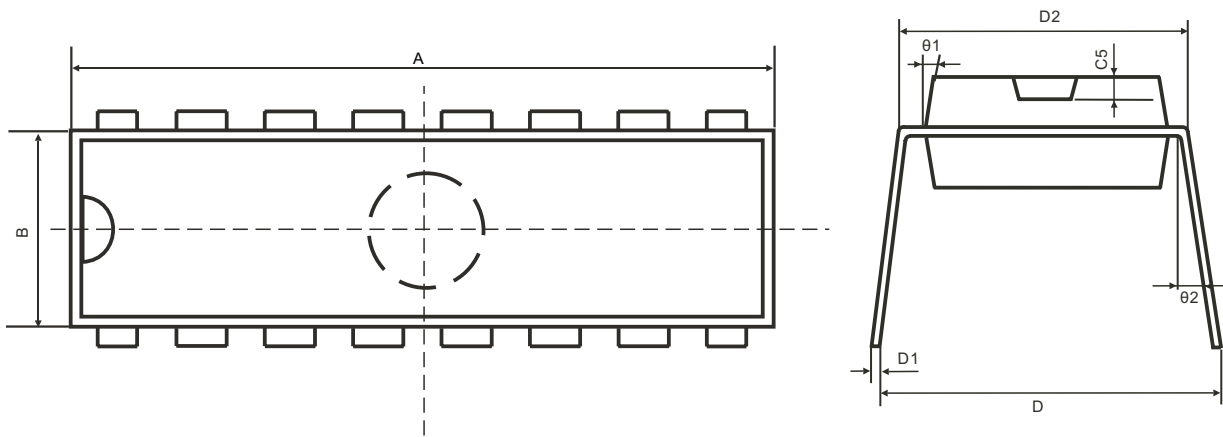


PHYSICAL DIMENSIONS SOP16L



Symbol	Dimension(mm)		Symbol	Dimension(mm)	
	Min	Max		Min	Max
A	9.90	10.10	C4	0.20(TYP)	
A1	0.36	0.46	D	1.05(TYP)	
A2	1.27(TYP)		D1	0.40	0.70
A3	0.35(TYP)		D2	0.22	0.42
B	5.84	6.24	R1	0.15(TYP)	
B1	3.84	4.04	R2	0.15(TYP)	
B2	5.00(TYP)		θ1	8°(TYP)	
C	1.35	1.55	θ2	8°(TYP)	
C1	0.61	0.71	θ3	4°(TYP)	
C2	0.54	0.64	θ4	15°(TYP)	
C3	0.10	0.25			

DIP16L



Symbol	Dimension(mm)		Symbol	Dimension(mm)	
	Min	Max		Min	Max
A	19.05	19.45	C3	3.00	3.60
A1	1.52(TYP)		C4	3.85	4.45
A2	0.46(TYP)		C5	0.80(TYP)	
A3	2.54(TYP)		D	8.10	8.60
A4	0.51(TYP)		D1	0.20	0.35
A5	0.99(TYP)		D2	7.62(TYP)	
B	6.20	6.60	theta1	8°(TYP)	
C1	3.30	3.70	theta2	5°(TYP)	
C2	0.51(TYP)				