CD4017B Decade Counter/Divider with 10 Decoded Outputs
CD4022B Divide-by-8 Counter/Divider with 8 Decoded Outputs

Features

- Wide supply voltage range: 3.0V to 15V
- High noise immunity: 0.45 VDD (typ.)
- Low power: Fan out of 2 driving 74L
- TTL compatibility or 1 driving 74LS
- Medium speed operation 5.0 MHz (typ.): with 10V VDD
- Low power: 10 μW (typ.)
- Fully static operation

DIP-16

SOP-16


TSSOP-16

Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
CD4017BE/ CD4017BN	DIP-16	CD4017B	TUBE	1000pcs/box
CD4017BM/TR	SOP-16	CD4017B	REEL	2500pcs/reel
CD4017BMT/TR	TSSOP-16	CD4017B	REEL	2500pcs/reel
CD4022BE/ CD4022BN	DIP-16	CD4022B	TUBE	1000pcs/box
CD4022BM/TR	SOP-16	CD4022B	REEL	2500pcs/reel
CD4022BMT/TR	TSSOP-16	CD4022B	REEL	2500pcs/reel

General Description

The CD4017B is a 5-stage divide-by-10 Johnson counter with 10 decoded outputs and a carry out bit. The CD4022B is a 4-stage divide-by-8 Johnson counter with 8 decoded outputs and a carry-out bit. These counters are cleared to their zero count by a logical ‘‘1’’ on their reset line. These counters are advanced on the positive edge of the clock signal when the clock enable signal is in the logical ‘‘0’’ state.

The configuration of the CD4017B and CD4022B permits medium speed operation and assures a hazard free counting sequence. The 10/8 decoded outputs are normally in the logical ‘‘0’’ state and go to the logical ‘‘1’’ state only at their respective time slot. Each decoded output remains high for 1 full clock cycle.

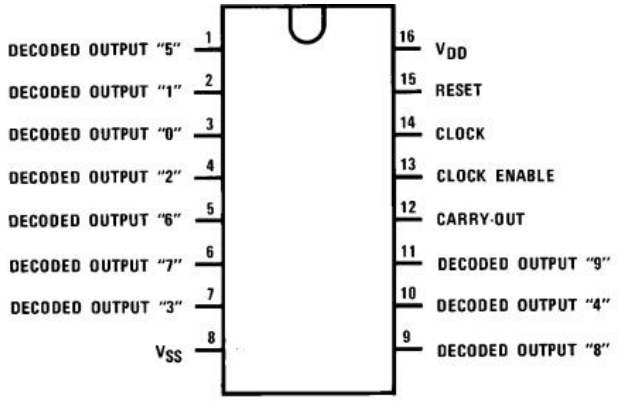
The carry-out signal completes a full cycle for every 10/8 clock input cycles and is used as a ripple carry signal to any succeeding stages.

Applications

- Automotive
- Instrumentation
- Medical electronics
- Alarm systems
- Industrial electronics
- Remote metering

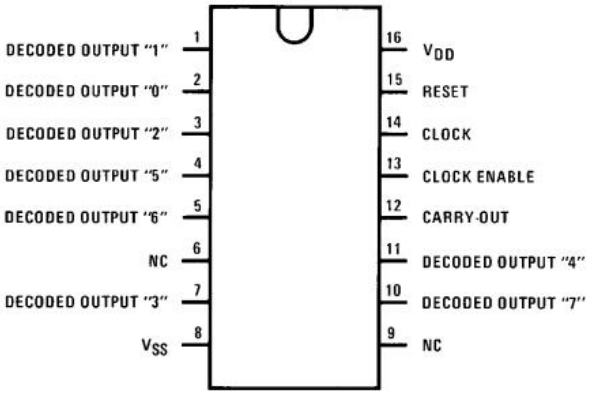
Connection Diagrams

CD4017B
Dual-In-Line Package



Top View

CD4022B
Dual-In-Line Package



Top View

Absolute Maximum Ratings (Notes 1 & 2)

Condition	Min	Max	UNITS
DC Supply Voltage (V_{DD})	-0.5	+18	V
Input Voltage (V_{IN})	-0.5	+0.5	V
Storage Temperature (T_S)	-65	150	°C
Power Dissipation (P_D)			
Dual-In-Line	-	700	mW
Small Outline	-	500	mW
Lead Temperature (T_L) (Soldering, 10 seconds)	-	260	°C

Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

Recommended Operating Conditions (Note 2)

Condition	Min	Max	UNITS
DC Supply Voltage (V_{DD})	+3	+15	V
Input Voltage (V_{IN})	0 to V_{DD}		-
Operating Temperature Range (T_A)	-40	+85	°C

DC Electrical Characteristics CD4017B, CD4022B (Note 2)

Symbol	Parameter	Conditions	-40°C		+25°			+85°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	V_{DD} = 5V		20		0.5	20		150	mA
		V_{DD} = 10V		40		1.0	40		300	mA
		V_{DD} = 15V		80		5.0	80		600	mA
V_{OL}	Low Level Output Voltage	$\|I_O\|$ < 1.0 μA								
		V_{DD} = 5V		0.05		0	0.05		0.05	V
		V_{DD} = 10V		0.05		0	0.05		0.05	V
		V_{DD} = 15V		0.05		0	0.05		0.05	V
V_{OH}	High Level Output Voltage	$\|I_O\|$ < 1.0 μA								
		V_{DD} = 5V	4.95		4.95	5		4.95		V
		V_{DD} = 10V	9.95		9.95	10		9.95		V
		V_{DD} = 15V	14.95		14.95	15		14.95		V
V_{IL}	Low Level Input Voltage	$\|I_O\|$ < 1.0 mA								
		V_{DD} = 5V, V_O = 0.5V or 4.5V		1.5			1.5		1.5	V
		V_{DD} = 10V, V_O = 1.0V or 9.0V		3.0			3.0		3.0	V
		V_{DD} = 15V, V_O = 1.5V or 13.5V		4.0			4.0		4.0	V
V_{IH}	High Level Input Voltage	$\|I_O\|$ < 1.0 mA								
		V_{DD}=5V, V_O=0.5V or 4.5V	3.5		3.5			3.5		V
		V_{DD}=10V, V_O=1.0V or 9.0V	7.0		7.0			7.0		V
		V_{DD}=15V, V_O=1.5V or 13.5V	11.0		11.0			11.0		V
I_{OL}	Low Level Output Current (Note 3)	V_{DD} = 5V, V_O = 0.4V	0.52		0.44	0.88		0.36		mA
		V_{DD} = 10V, V_O = 0.5V	1.3		1.1	2.25		0.9		mA
		V_{DD} = 15V, V_O = 1.5V	3.6		3.0	8.8		2.4		mA
I_{OH}	High Level Output Current (Note 3)	V_{DD} = 5V, V_O = 4.6V	-0.2		-0.16	-0.36		-0.12		mA
		V_{DD} = 10V, V_O = 9.5V	-0.5		-0.4	-0.9		-0.3		mA
		V_{DD} = 15V,V_O = 13.5V	-1.4		-1.2	-3.5		-1.0		mA
I_{IN}	Input Current	V_{DD} = 15V, V_{IN} = 0V		-0.3		-10^{-5}	-0.3		-1.0	μA
		V_{DD} =15V, V_{IN} = 15V		0.3		10^{-5}	0.3		1.0	μA

Note 1: ‘‘Absolute Maximum Ratings’’ are those values beyond which the safety of the device cannot be guaranteed, they are not meant to imply that the devices should be operated at these limits. The table of ‘‘Recommended Operating Conditions’’ and ‘‘Electrical Characteristics’’ provides condtions for actual device operation.
Note 2: VSS e 0V unless otherwise specified.
Note 3: I_{OL} and I_{OH} are tested one output at a time

AC Electrical Characteristics*

T_A = 25°C, C_L = 50 pF, R_L = 200k, trCL and tfCL = 20 ns, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
CLOCK OPERATION						
t_{PHL}, t_{PLH}	Propagation Delay Time Carry Out Line	V_{DD} = 5V		415	800	ns
		V_{DD} =10V		160	320	ns
		V_{DD} = 15V		130	250	ns
	Carry Out Line	VDD = 5V, C_L = 15 pF		240	480	ns
		VDD = 10V, C_L = 15 pF		85	170	ns
		VDD = 15V, C_L = 15 pF		70	140	ns
	Decode Out Lines	V_{DD} = 5V		500	1000	ns
		V_{DD} = 10V		200	400	ns
		V_{DD} = 15V		160	320	ns
t_{TLH}, t_{THL}	Transition Time Carry Out and Decode Out Lines t_{TLH}	V_{DD} = 5V		200	360	ns
		V_{DD} = 10V		100	180	ns
		V_{DD} = 15V		80	130	ns
	t_{THL}	V_{DD} = 5V		100	200	ns
		V_{DD} = 10V		50	100	ns
		V_{DD} = 15V		40	80	ns
fCL	Maximum Clock Frequency	VDD = 5V, Measured with Respect to Carry Output Line	1.0	2		MHz
		VDD = 10V, Measured with Respect to Carry Output Line	2.5	5		MHz
		VDD = 15V, Measured with Respect to Carry Output Line	3.0	6		MHz
t_{WL}, t_{WH}	Minimum Clock Pulse Width	V_{DD} = 5V		125	250	Ns
		V_{DD} = 10V		45	90	Ns
		V_{DD} = 15V		35	70	ns
t_{rCL}, t_{fCL}	Clock Rise and Fall Time	V_{DD} = 5V			20	μs
		V_{DD} = 10V			15	μs
		V_{DD} =15V			5	μs
t_{SU}	Minimum Clock Inhibit Data Setup Time	V_{DD} = 5V		120	240	Ns
		V_{DD} = 10V		40	80	Ns
		V_{DD} = 15V		32	65	ns
C_{IN}	Average Input Capacitance			5	7.5	pF

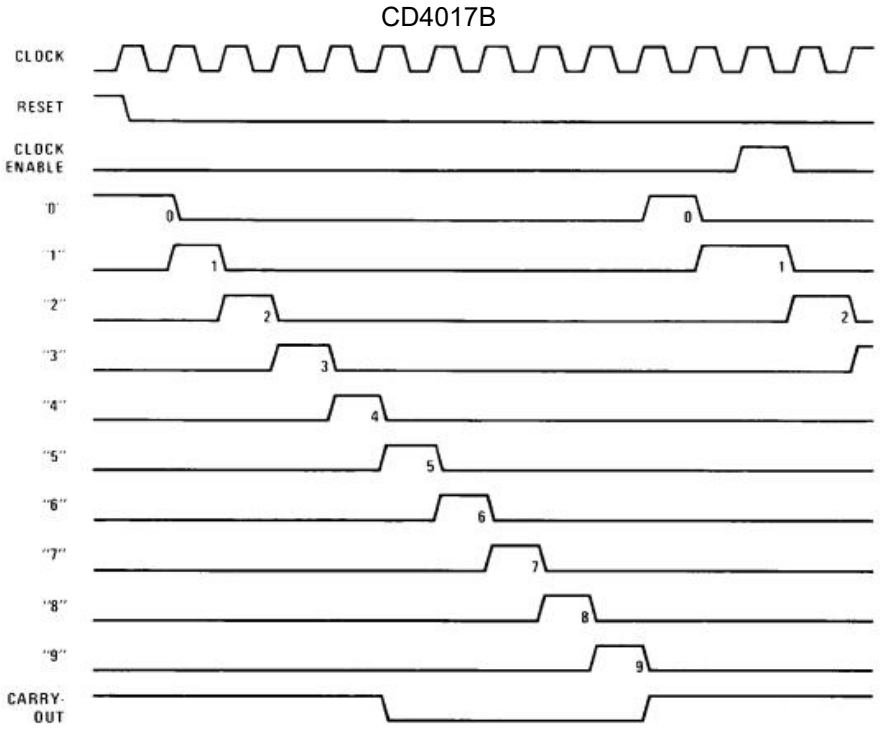
AC Electrical Characteristics

T_A = 25°C, C_L = 50 pF, RL = 200k, trCL and tf CL = 20 ns, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
RESET OPERATION						
t_{PHL}, t_{PLH}	Propagation Delay Time Carry Out Line	V_{DD} = 5V		415	800	ns
		V_{DD} = 10V		160	320	ns
		V_{DD} = 15V		130	250	ns
	Carry Out Line	VDD = 5V, C_L = 15 pF		240	480	ns
		VDD = 10V, C_L = 15 pF		85	170	ns
		VDD = 15V, C_L = 15 pF		70	140	ns
	Decode Out Lines	V_{DD} = 5V		500	1000	ns
		V_{DD} = 10V		200	400	ns
		V_{DD} = 15V		160	320	ns
t_W	Minimum Reset Pulse Width	V_{DD} = 5V		200	400	ns
		V_{DD} = 10V		70	140	ns
		V_{DD} = 15V		55	110	ns
t_{REM}	Minimum Reset Removal Time	V_{DD} = 5V		75	150	ns
		V_{DD} = 10V		30	60	ns
		V_{DD} = 15V		25	50	ns

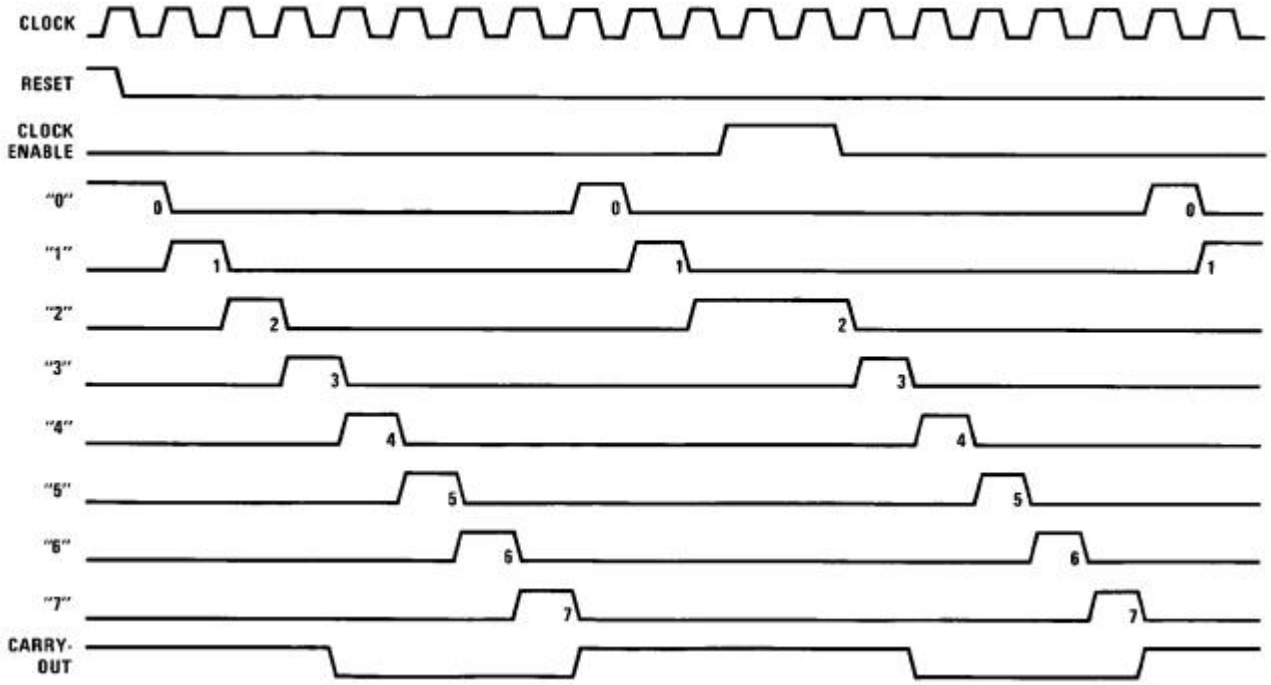
*AC Parameters are guaranteed by DC correlated testing.

Timing Diagrams



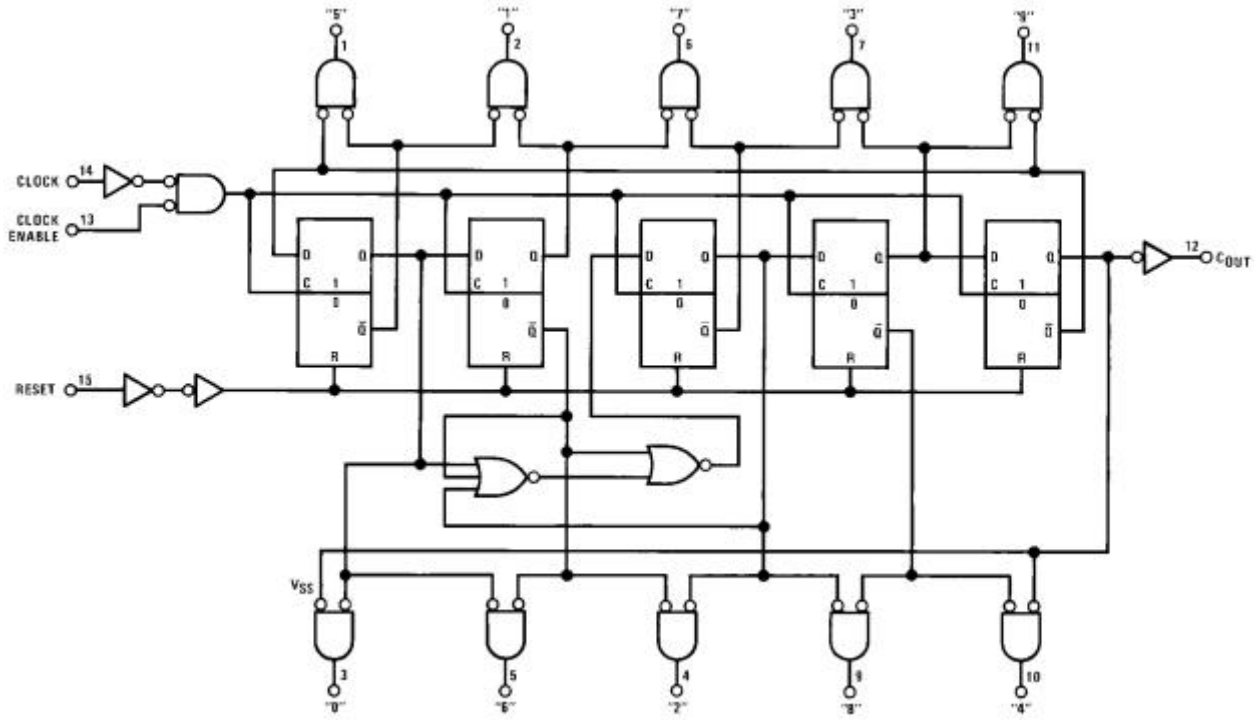
Timing Diagrams (Continued)

CD4022B



Logic Diagrams

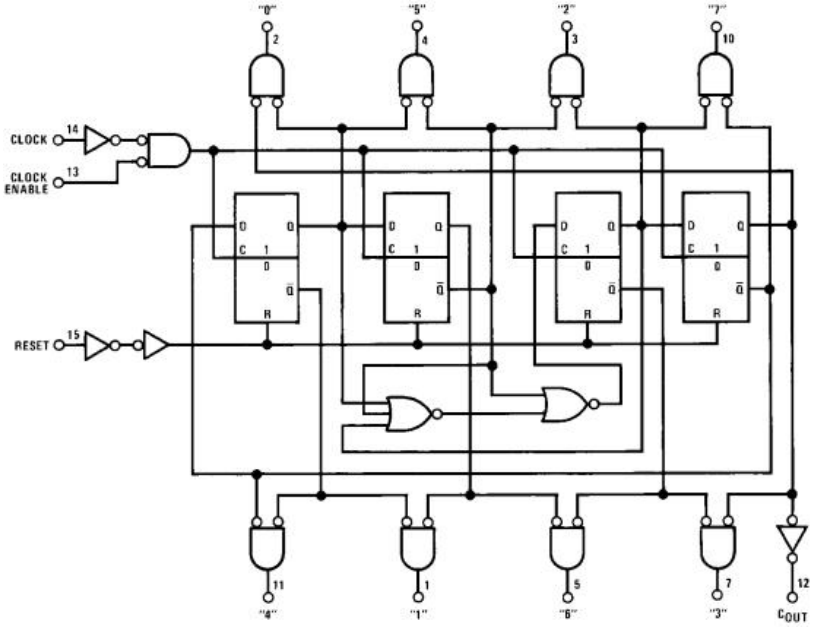
CD4017B



Terminal No. 8 = GND

Terminal No. 16 = V_{DD}

CD4022B

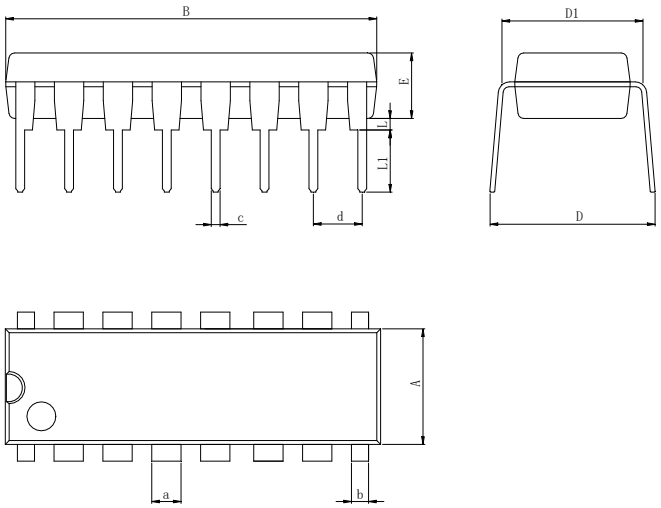


Terminal No. 16 = V_{DD}

Terminal No. 8 = GND

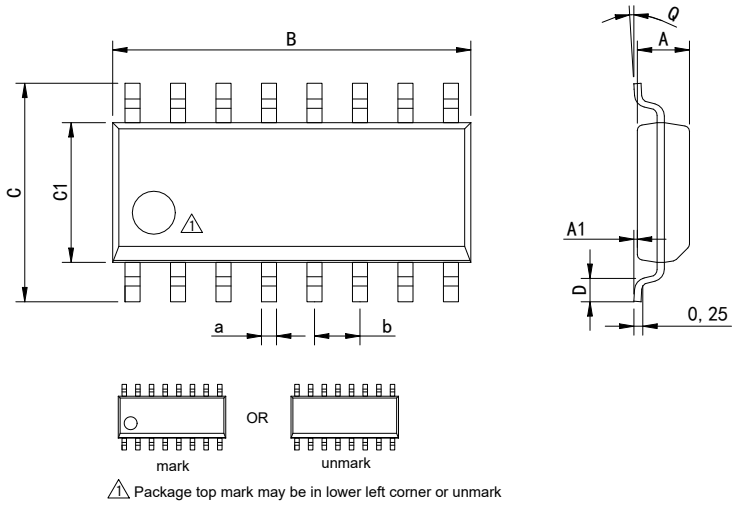
Physical Dimensions

DIP-16



Dimensions In Millimeters(DIP-16)											
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	18.94	8.10	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	19.56	10.9	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

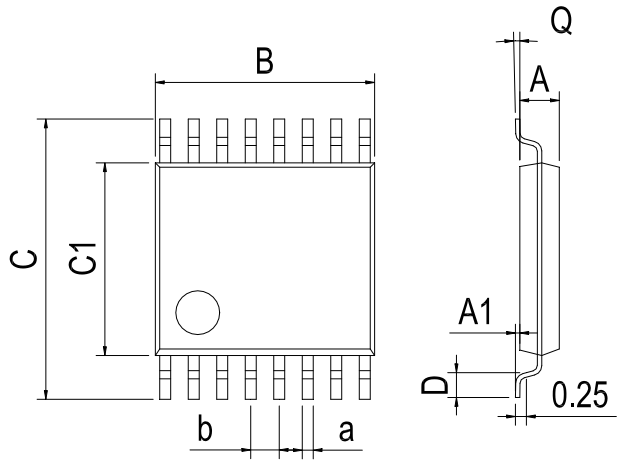
SOP-16



Dimensions In Millimeters(SOP-16)									
Symbol:	**A**	**A1**	**B**	**C**	**C1**	**D**	**Q**	**a**	**b**
Min:	1.35	0.05	9.80	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	10.0	6.20	4.00	0.80	8°	0.45	

Physical Dimensions

TSSOP-16



Dimensions In Millimeters(TSSOP-16)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	

Revision History

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2014-6	New	1-12
V1.1	2016-11	Modify the package dimension diagram SSOP-16、Updated DIP-16 dimension、Update DIP Package New Mode	9、11
V1.2	2020-8	Add annotation for Maximum Ratings、Update encapsulation type	1、3
V1.3	2024-10	Update Lead Temperature	3
V1.4	2025-11	Update important statements、Update SOP-16 Dimension drawing	9、12

IMPORTANT STATEMENT:

Huaguan Semiconductor reserves the right to change products and services offered without prior notice. Customers should obtain the latest relevant information before placing orders and verify that such information is current and complete. Huaguan Semiconductor assumes no responsibility or liability for altered documents.

Customers are responsible for complying with safety standards and implementing safety measures when using Huaguan Semiconductor products in system design and end-product manufacturing. You assume full responsibility for: selecting the appropriate Huaguan Semiconductor products for your application; designing, validating, and testing your application; and ensuring that your application complies with applicable standards and all other safety, security, or other requirements. This is to prevent potential risks that may lead to personal injury or property damage.

Huaguan Semiconductor products are not approved for use in life support, military, aerospace, or other high-risk applications. Huaguan products are neither intended nor warranted for use in such systems or equipment. Any failure or malfunction may lead to personal injury or severe property damage. Such applications are deemed "Unsafe Use." Unsafe Use includes, but is not limited to: surgical and medical equipment, nuclear energy control equipment, aircraft or spacecraft instruments, control or operation of vehicle power, braking, or safety systems, traffic signal instruments, all types of safety devices, and any other applications intended to support or sustain life. Huaguan Semiconductor shall not be liable for consequences resulting from Unsafe Use in these fields. Users must independently evaluate and assume all risks. Any issues, liabilities, or losses arising from the use of products beyond their approved applications shall be solely borne by the user. Users may not claim any compensation from Huaguan Semiconductor based on these terms. If any third party claims against Huaguan Semiconductor due to such Unsafe Use, the user shall compensate Huaguan Semiconductor for all resulting damages and liabilities.

Huaguan Semiconductor provides technical and reliability data (including datasheets), design resources (including reference designs), application or other design advice, web tools, safety information, and other resources for its semiconductor products. However, no guarantee is made that these resources are free from defects, and no express or implied warranties are provided. The use of testing and other quality control techniques is limited to Huaguan Semiconductor's quality assurance scope. Not all parameters of each device are tested.

Huaguan Semiconductor's documentation authorizes you to use these resources only for developing applications related to the products described herein. You are not granted rights to any other intellectual property of Huaguan Semiconductor or any third party. Any other reproduction or display of these resources is strictly prohibited. You shall fully indemnify Huaguan Semiconductor and its agents against any claims, damages, costs, losses, and liabilities arising from your use of these resources. Huaguan Semiconductor shall not be held responsible.