

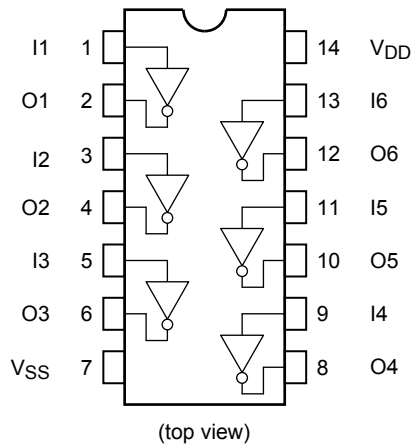
TC4069UBP, TC4069UBF, TC4069UBFT

TC4069UB Hex Inverter

TC4069UB contains six circuits of inverters. Since the internal circuit is composed of a single stage inverter, this is suitable for the applications of CR oscillator circuits, crystal oscillator circuits and linear amplifiers in addition to its application as inverters.

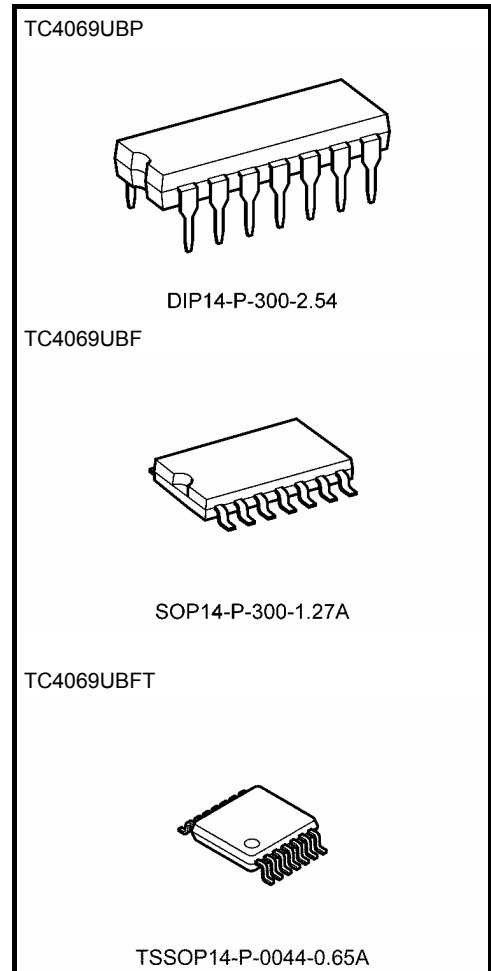
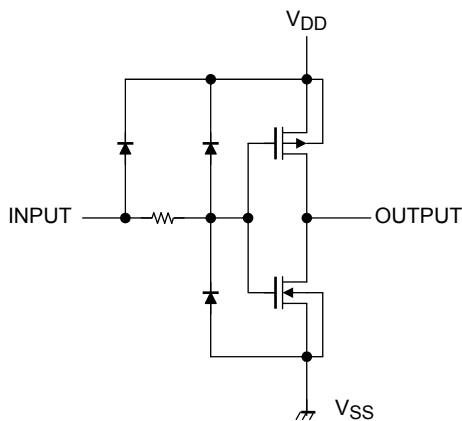
Because of one stage gate configuration, the propagation time has been reduced.

Pin Assignment



Circuit Diagram

1/6 TC4069UB



Weight		
DIP14-P-300-2.54	:	0.96 g (typ.)
SOP14-P-300-1.27A	:	0.18 g (typ.)
TSSOP14-P-0044-0.65A	:	0.06 g (typ.)

Start of commercial production
1978-04

Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
DC supply voltage	V_{DD}	$V_{SS} - 0.5$ to $V_{SS} + 20$	V
Input voltage	V_{IN}	$V_{SS} - 0.5$ to $V_{DD} + 0.5$	V
Output voltage	V_{OUT}	$V_{SS} - 0.5$ to $V_{DD} + 0.5$	V
DC input current	I_{IN}	± 10	mA
Power dissipation	P_D	300 (DIP)/180 (SOP)	mW
Operating temperature range	T_{opr}	-40 to 85	°C
Storage temperature range	T_{stg}	-65 to 150	°C

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Operating Ranges ($V_{SS} = 0$ V) (Note)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
DC supply voltage	V_{DD}	—	3	—	18	V
Input voltage	V_{IN}	—	0	—	V_{DD}	V

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either V_{DD} or V_{SS} .

Static Electrical Characteristics (V_{SS} = 0 V)

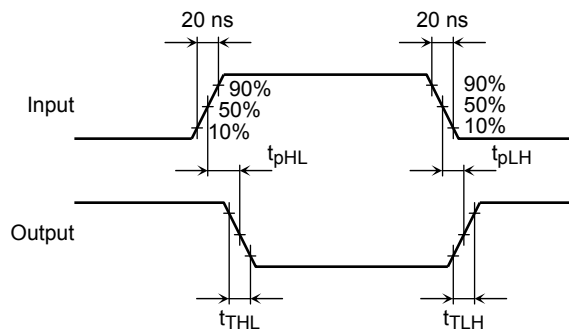
Characteristics	Symbol	Test Condition	V _{DD} (V)	-40°C		25°C			85°C		Unit	
				Min	Max	Min	Typ.	Max	Min	Max		
High-level output voltage	V _{OH}	I _{OUT} < 1 μA V _{IN} = V _{SS} , V _{DD}	5	4.95	—	4.95	5.00	—	4.95	—	V	
			10	9.95	—	9.95	10.00	—	9.95	—		
			15	14.95	—	14.95	15.00	—	14.95	—		
Low-level output voltage	V _{OL}	I _{OUT} < 1 μA V _{IN} = V _{SS} , V _{DD}	5	—	0.05	—	0.00	0.05	—	0.05	V	
			10	—	0.05	—	0.00	0.05	—	0.05		
			15	—	0.05	—	0.00	0.05	—	0.05		
Output high current	I _{OH}	V _{OH} = 4.6 V	5	-0.61	—	-0.51	-1.0	—	-0.42	—	mA	
		V _{OH} = 2.5 V	5	-2.50	—	-2.10	-4.0	—	-1.70	—		
		V _{OH} = 9.5 V	10	-1.50	—	-1.30	-2.2	—	-1.10	—		
		V _{OH} = 13.5 V	15	-4.00	—	-3.40	-9.0	—	-2.80	—		
V _{IN} = V _{SS}												
Output low current	I _{OL}	V _{OL} = 0.4 V	5	0.61	—	0.51	1.2	—	0.42	—	mA	
		V _{OL} = 0.5 V	10	1.50	—	1.30	3.2	—	1.10	—		
		V _{OL} = 1.5 V	15	4.00	—	3.40	12.0	—	2.80	—		
		V _{IN} = V _{DD}										
Input high voltage	V _{IH}	V _{OUT} = 0.5 V, 4.5 V	5	4.0	—	4.0	—	—	4.0	—	V	
		V _{OUT} = 1.0 V, 9.0 V	10	8.0	—	8.0	—	—	8.0	—		
		V _{OUT} = 1.5 V, 13.5 V	15	12.0	—	12.0	—	—	12.0	—		
		I _{OUT} < 1 μA										
Input low voltage	V _{IL}	V _{OUT} = 0.5 V, 4.5 V	5	—	1.0	—	—	1.0	—	1.0	V	
		V _{OUT} = 1.0 V, 9.0 V	10	—	2.0	—	—	2.0	—	2.0		
		V _{OUT} = 1.5 V, 13.5 V	15	—	3.0	—	—	3.0	—	3.0		
		I _{OUT} < 1 μA										
Input current	"H" level	I _{IH}	V _{IL} = 18 V	18	—	0.1	—	10 ⁻⁵	0.1	—	1.0	μA
	"L" level	I _{IL}	V _{IL} = 0 V	18	—	-0.1	—	-10 ⁻⁵	-0.1	—	-1.0	
Quiescent supply current	I _{DD}	V _{IN} = V _{SS} , V _{DD} (Note)	5	—	0.25	—	0.001	0.25	—	7.5	μA	
			10	—	0.50	—	0.001	0.50	—	15.0		
			15	—	1.00	—	0.002	1.00	—	30.0		

Note: All valid input combinations.

Dynamic Electrical Characteristics (Ta = 25°C, VSS = 0 V, CL = 50 pF)

Characteristics	Symbol	Test Condition	VDD (V)	Min	Typ.	Max	Unit
Output transition time (low to high)	t _{TLH}	—	5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Output transition time (high to low)	t _{THL}	—	5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Propagation delay time (low to high)	t _{pLH}	—	5	—	55	110	ns
			10	—	30	60	
			15	—	25	50	
Propagation delay time (high to low)	t _{pHL}	—	5	—	55	110	ns
			10	—	30	60	
			15	—	25	50	
Input capacitance	C _{IN}	—	—	7.5	15	pF	

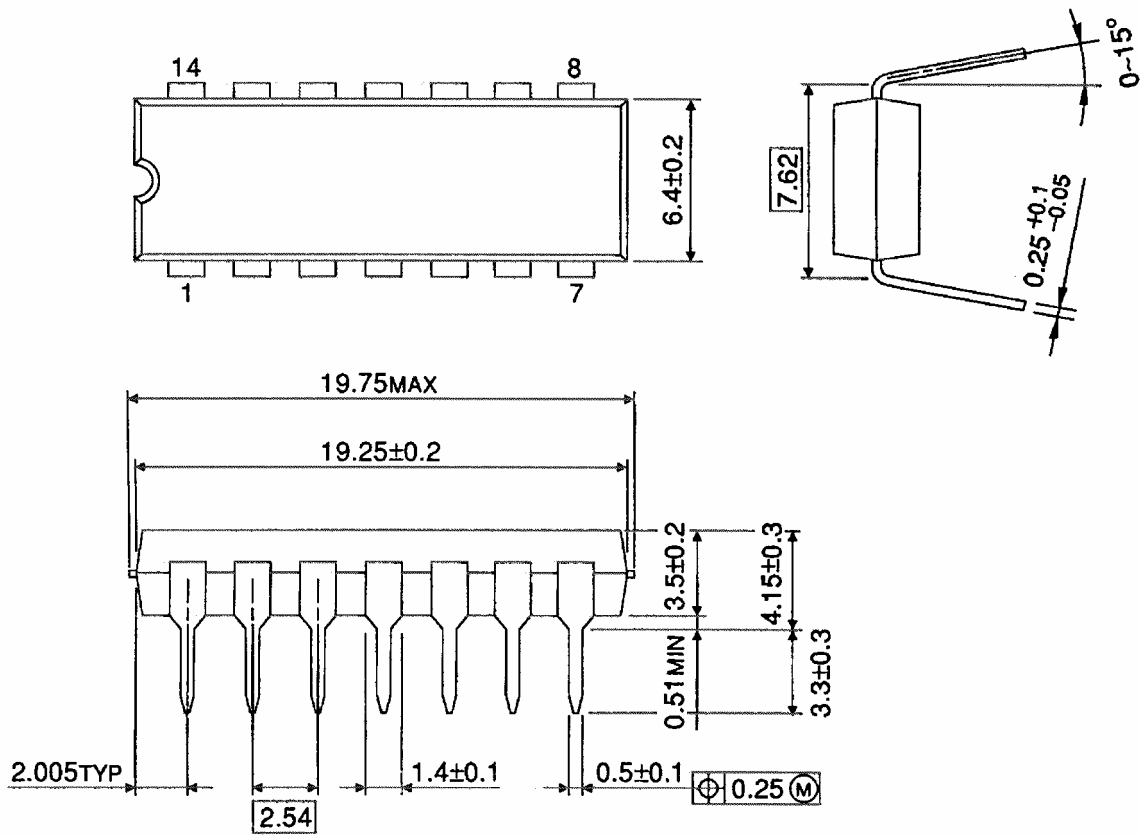
Waveform for Measurement of Dynamic Characteristics



Package Dimensions

DIP14-P-300-2.54

Unit : mm

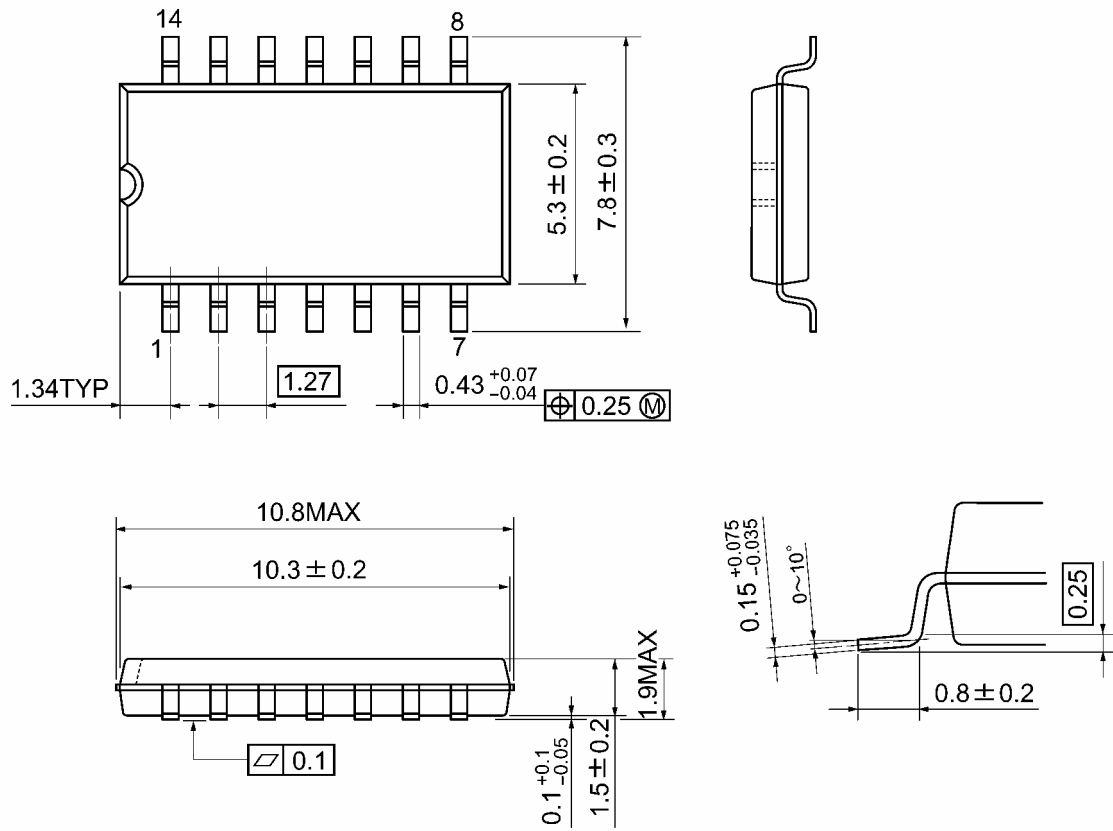


Weight: 0.96 g (typ.)

Package Dimensions

SOP14-P-300-1.27A

Unit: mm

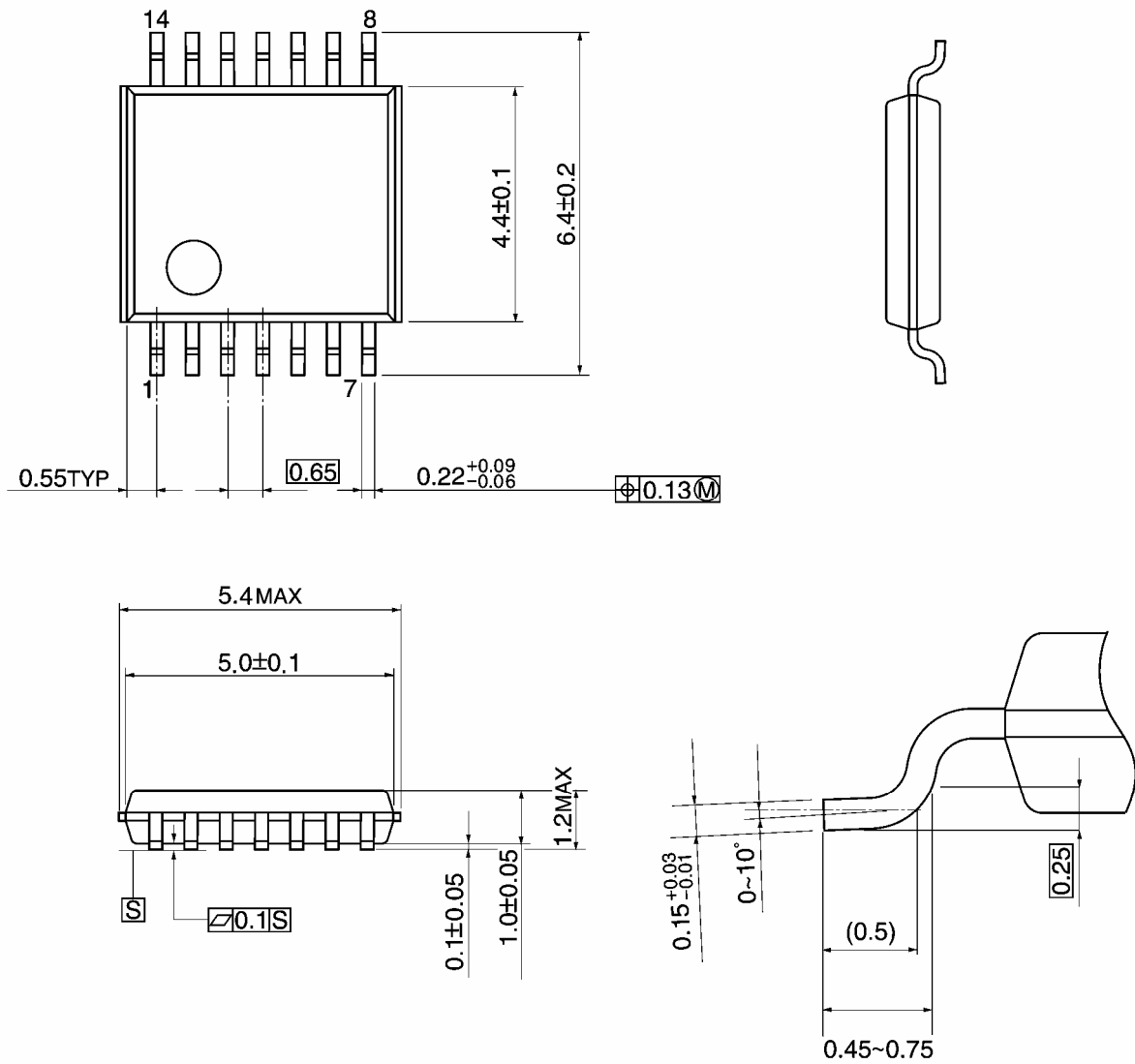


Weight: 0.18 g (typ.)

Package Dimensions

TSSOP14-P-0044-0.65A

Unit: mm



Weight: 0.06 g (typ.)

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