

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

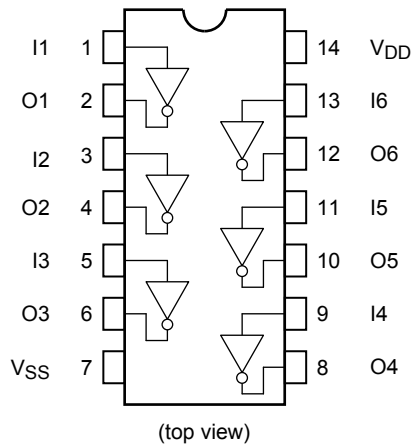
## TC4069UBP, TC4069UBF, TC4069UBFN, TC4069UBFT

### 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.

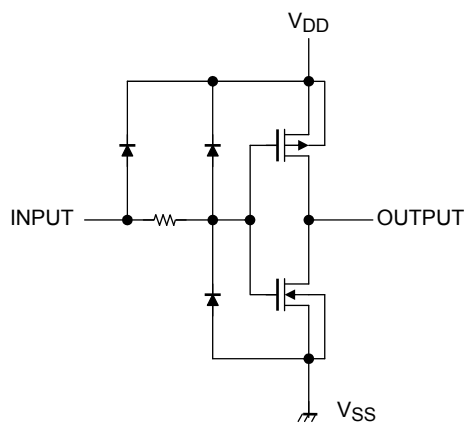
Because of one stage gate configuration, the propagation time has been reduced.

### Pin Assignment



### Circuit Diagram

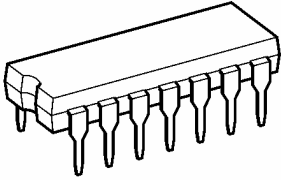
1/6 TC4069UB



Weight	
DIP14-P-300-2.54	: 0.96 g (typ.)
SOP14-P-300-1.27A	: 0.18 g (typ.)
SOP14-P-300-1.27	: 0.18 g (typ.)
SOL14-P-150-1.27	: 0.12 g (typ.)
TSSOP14-P-0044-0.65A	: 0.06 g (typ.)

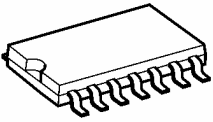
Note: xxxFN (JEDEC SOP) is not available in Japan.

TC4069UBP

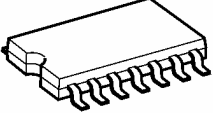


DIP14-P-300-2.54

TC4069UBF

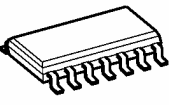


SOP14-P-300-1.27A



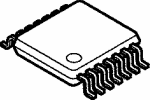
SOP14-P-300-1.27

TC4069UBFN



SOL14-P-150-1.27

TC4069UBFT



TSSOP14-P-0044-0.65A

## 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	$I_{IN}$	$\pm 10$	mA
Power dissipation	$P_D$	300 (DIP)/180 (SOIC)	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.

## Recommended Operating Conditions ( $V_{SS} = 0$ 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 recommended operating conditions are required to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

## Static Electrical Characteristics (V<sub>SS</sub> = 0 V)

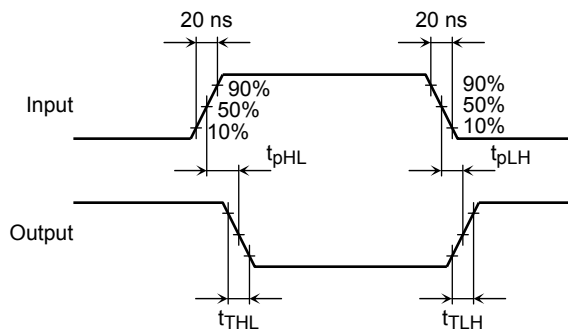
Characteristics	Symbol	Test Condition	V <sub>DD</sub> (V)	-40°C		25°C			85°C		Unit
				Min	Max	Min	Typ.	Max	Min	Max	
High-level output voltage	V <sub>OH</sub>	I <sub>OUT</sub>   < 1 μA V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub>	5	4.95	—	4.95	5.00	—	4.95	—	V
			10	9.95	—	9.95	10.00	—	9.95	—	
			15	14.95	—	14.95	15.00	—	14.95	—	
Low-level output voltage	V <sub>OL</sub>	I <sub>OUT</sub>   < 1 μA V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub>	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 <sub>OH</sub>	V <sub>OH</sub> = 4.6 V	5	-0.61	—	-0.51	-1.0	—	-0.42	—	mA
		V <sub>OH</sub> = 2.5 V	5	-2.50	—	-2.10	-4.0	—	-1.70	—	
		V <sub>OH</sub> = 9.5 V	10	-1.50	—	-1.30	-2.2	—	-1.10	—	
		V <sub>OH</sub> = 13.5 V	15	-4.00	—	-3.40	-9.0	—	-2.80	—	
Output low current	I <sub>OL</sub>	V <sub>OL</sub> = 0.4 V	5	0.61	—	0.51	1.2	—	0.42	—	mA
		V <sub>OL</sub> = 0.5 V	10	1.50	—	1.30	3.2	—	1.10	—	
		V <sub>OL</sub> = 1.5 V	15	4.00	—	3.40	12.0	—	2.80	—	
		V <sub>IN</sub> = V <sub>DD</sub>									
Input high voltage	V <sub>IH</sub>	V <sub>OUT</sub> = 0.5 V, 4.5 V	5	4.0	—	4.0	—	—	4.0	—	mA
		V <sub>OUT</sub> = 1.0 V, 9.0 V	10	8.0	—	8.0	—	—	8.0	—	
		V <sub>OUT</sub> = 1.5 V, 13.5 V	15	12.0	—	12.0	—	—	12.0	—	
		I <sub>OUT</sub>   < 1 μA									
Input low voltage	V <sub>IL</sub>	V <sub>OUT</sub> = 0.5 V, 4.5 V	5	—	1.0	—	—	1.0	—	1.0	mA
		V <sub>OUT</sub> = 1.0 V, 9.0 V	10	—	2.0	—	—	2.0	—	2.0	
		V <sub>OUT</sub> = 1.5 V, 13.5 V	15	—	3.0	—	—	3.0	—	3.0	
		I <sub>OUT</sub>   < 1 μA									
Input current	"H" level	I <sub>IH</sub>	V <sub>IL</sub> = 18 V	18	—	0.1	—	10 <sup>-5</sup>	0.1	—	μA
	"L" level	I <sub>IL</sub>	V <sub>IL</sub> = 0 V	18	—	-0.1	—	-10 <sup>-5</sup>	-0.1	—	
Quiescent supply current	I <sub>DD</sub>	V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub> (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 <sub>TLH</sub>	—	5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Output transition time (high to low)	t <sub>THL</sub>	—	5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Propagation delay time (low to high)	t <sub>pLH</sub>	—	5	—	55	110	ns
			10	—	30	60	
			15	—	25	50	
Propagation delay time (high to low)	t <sub>pHL</sub>	—	5	—	55	110	ns
			10	—	30	60	
			15	—	25	50	
Input capacitance	C <sub>IN</sub>	—	—	7.5	15	pF	

## Waveform for Measurement of Dynamic Characteristics



## Package Dimensions

DIP14-P-300-2.54

Unit : mm

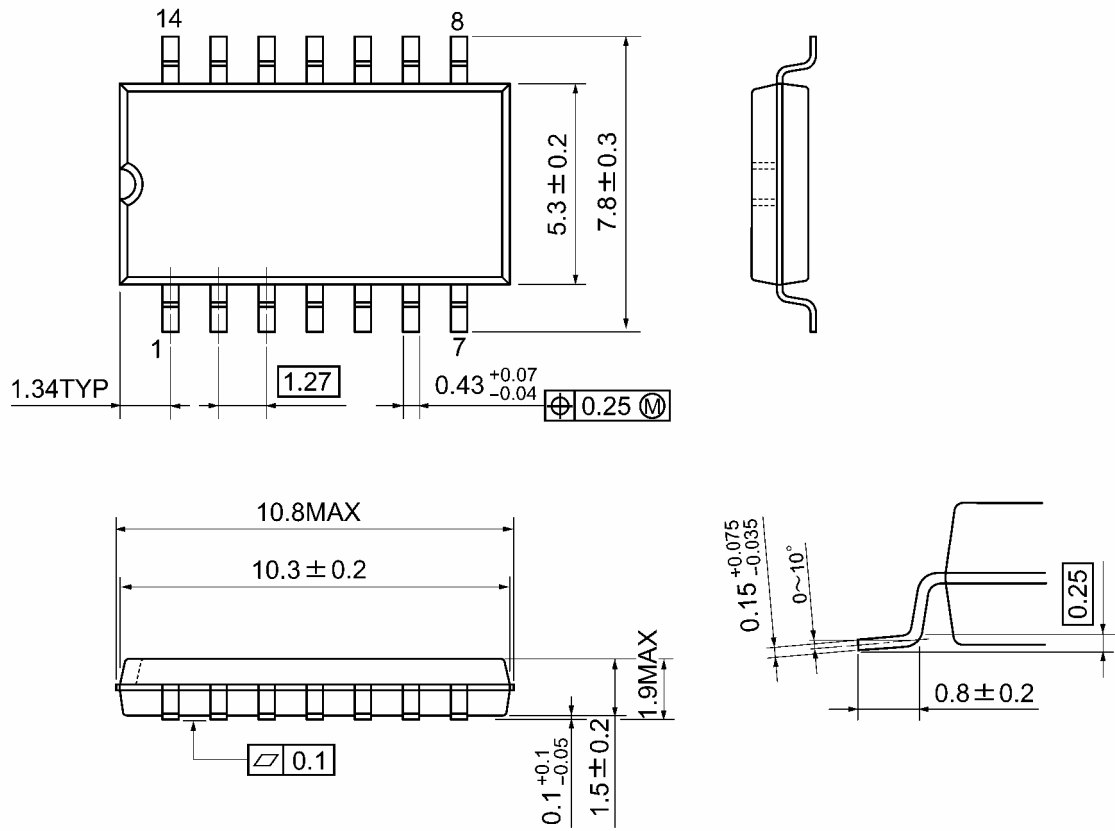


Weight: 0.96 g (typ.)

**Package Dimensions**

SOP14-P-300-1.27A

Unit: mm

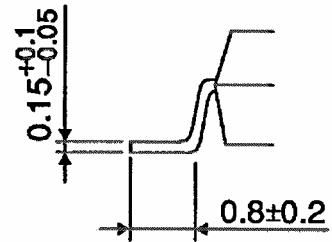
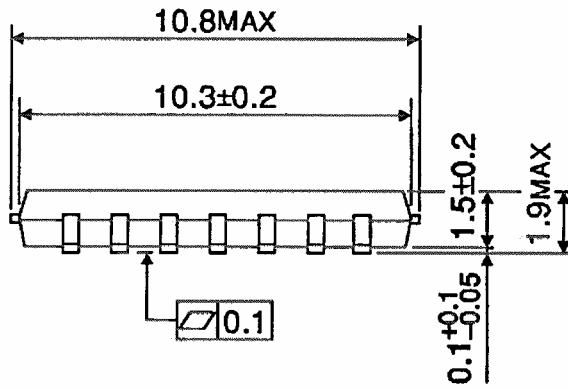
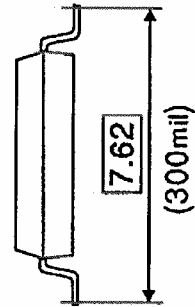
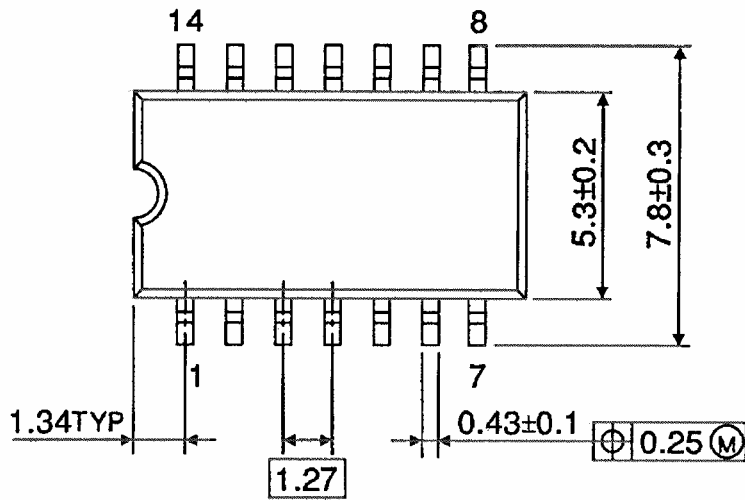


Weight: 0.18 g (typ.)

**Package Dimensions**

SOP14-P-300-1.27

Unit : mm

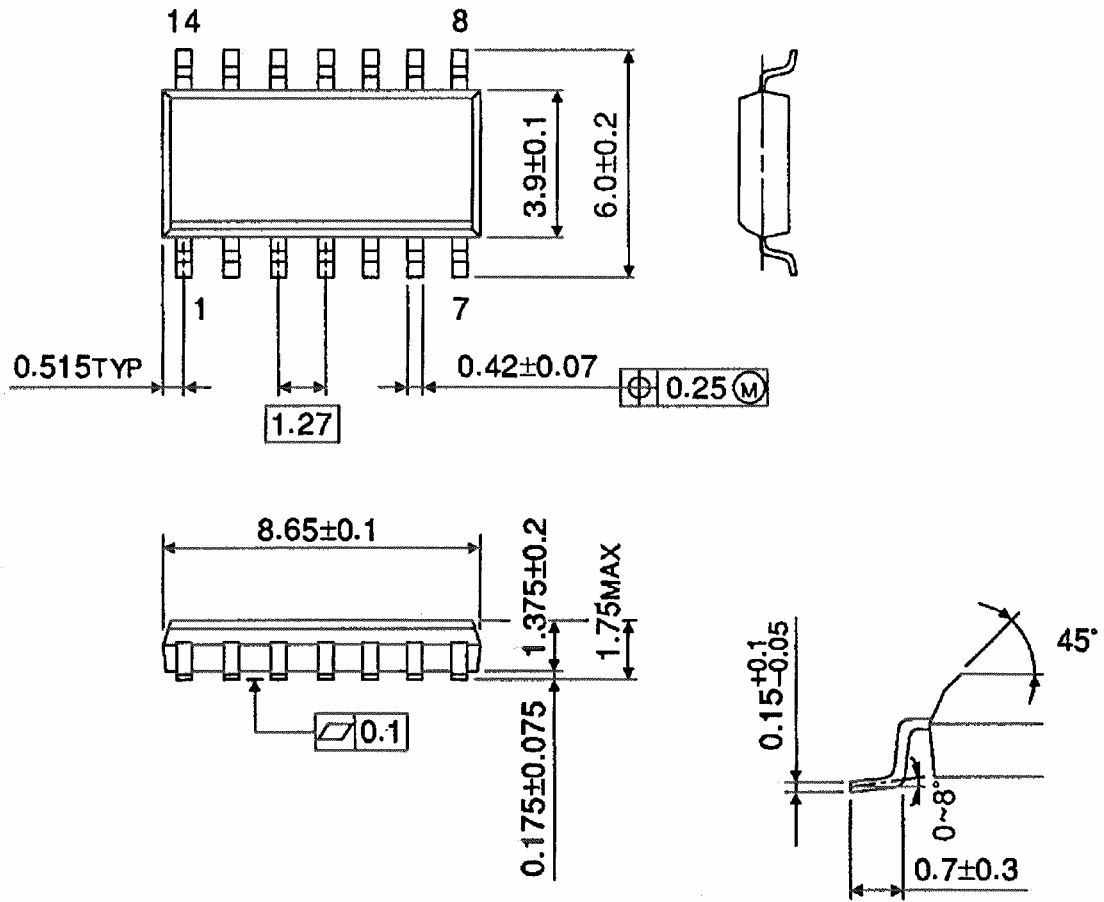


Weight: 0.18 g (typ.)

**Package Dimensions (Note)**

SOL14-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

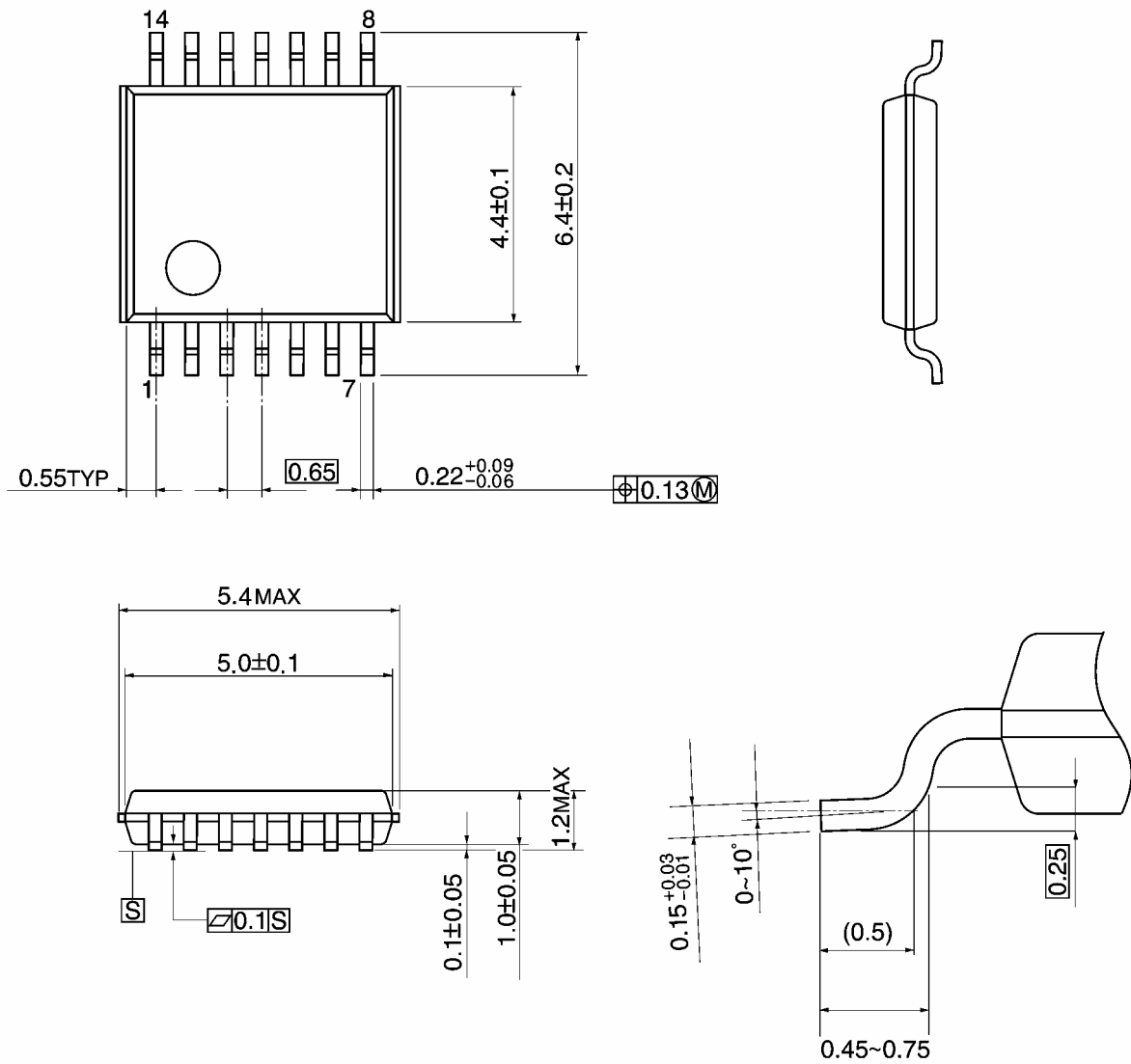
Weight: 0.12 g (typ.)



## Package Dimensions

TSSOP14-P-0044-0.65A

Unit: mm



Weight: 0.06 g (typ.)

**Note: Lead (Pb)-Free Packages****DIP14-P-300-2.54 SOP14-P-300-1.27A SOL14-P-150-1.27 TSSOP14-P-0044-0.65A****RESTRICTIONS ON PRODUCT USE**

20070701-EN

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