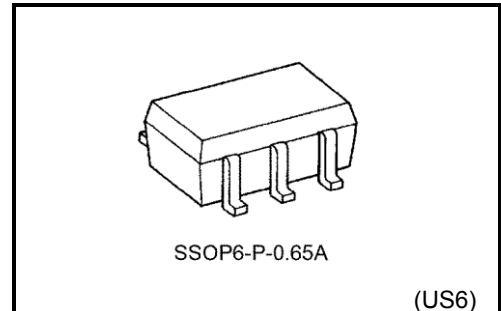


# TC7PZ05FU

## Dual Inverter (Open-Drain)

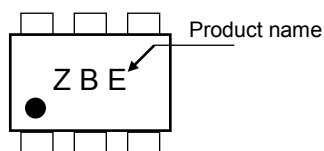
### Features

- High output current : 24 mA (min) at  $V_{CC} = 3\text{ V}$
- Super high speed operation :  $t_{pZL} = 2.3\text{ ns}$  (typ.)  
at  $V_{CC} = 5\text{ V}$ , 50 pF
- Operation voltage range :  $V_{CC} = 1.65\text{ to }5.5\text{ V}$
- 5.5-V tolerant inputs
- 5.5-V power down protection outputs

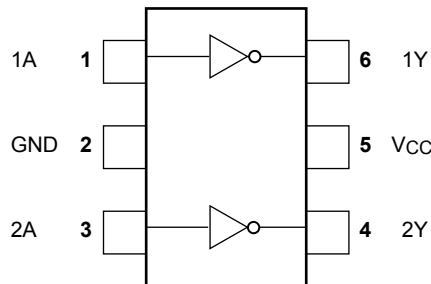


Weight: 0.0068g (typ.)

### Marking



### Pin Assignment (top view)



### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	-0.5 to 6.0	V
DC input voltage	$V_{IN}$	-0.5 to 6.0	V
DC output voltage	$V_{OUT}$	-0.5 to 6.0 (Note 1)	V
Input diode current	$I_{IK}$	-20	mA
Output diode current	$I_{OK}$	-20 (Note 2)	mA
DC output current	$I_{OUT}$	50	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 100$	mA
Power dissipation	$P_D$	200	mW
Storage temperature	$T_{stg}$	-65 to 150	$^\circ\text{C}$

Note: 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.

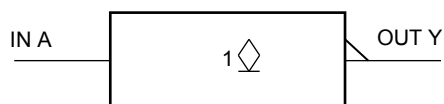
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Do not exceed  $I_{OUT}$  of absolute maximum ratings.

Note 2:  $V_{OUT} < GND$

Start of commercial production  
2015-09

## IEC Logic Symbol



## Truth Table

A	Y
L	Z
H	L

Z: High-impedance

## Operating Ranges

Characteristic	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	1.65 to 5.5	V
		1.5 to 5.5 (Note 1)	
Input voltage	$V_{IN}$	0 to 5.5	V
Output voltage	$V_{OUT}$	0 to 5.5 (Note 2)	V
		0 to $V_{CC}$ (Note 3)	
Operating temperature	$T_{opr}$	-40 to 85	°C
Input rise and fall time	dt/dv	0 to 20 ( $V_{CC} = 1.80\text{ V} \pm 0.15\text{ V}$ , $2.5\text{ V} \pm 0.2\text{ V}$ )	ns/V
		0 to 10 ( $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ )	
		0 to 5 ( $V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$ )	

Note 1: Data retention only

Note 2:  $V_{CC} = 0\text{ V}$  or high impedance condition.

Note 3: Low state

## Electrical Characteristics

### DC Characteristics

Characteristic		Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit		
					VCC (V)	Min	Typ.	Max	Min		Max	
Input voltage	High level	VIH	—	—	1.65 to 1.95	VCC × 0.75	—	—	VCC × 0.75	—	V	
					2.3 to 5.5	VCC × 0.7	—	—	VCC × 0.7	—		
	Low level	VIL			1.65 to 1.95	—	—	VCC × 0.25	—	VCC × 0.25		
					2.3 to 5.5	—	—	VCC × 0.3	—	VCC × 0.3		
Output voltage	Low level	VOL	VIN = VIH	IOL = 100 μA	1.65	—	0	0.1	—	0.1	V	
					2.3	—	0	0.1	—	0.1		
					3.0	—	0	0.1	—	0.1		
					4.5	—	0	0.1	—	0.1		
					IOL = 4 mA	1.65	—	0.08	0.24	—		0.24
					IOL = 8 mA	2.3	—	0.1	0.3	—		0.3
					IOL = 16 mA	3.0	—	0.15	0.4	—		0.4
					IOL = 24 mA	3.0	—	0.22	0.55	—		0.55
					IOL = 32 mA	4.5	—	0.22	0.55	—		0.55
Input leakage current		IIN	VIN = 5.5 V or GND	0 to 5.5	—	—	±1	—	±10	μA		
Off-state current		IOZ	VIN = VIL, VOUT = VCC or GND	5.5	—	—	±5	—	±10	μA		
Power off leakage current		IOFF	VIN or VOUT = 5.5 V	0.0	—	—	1	—	10	μA		
Quiescent supply current		ICC	VIN = 5.5 V or GND	1.65 to 5.5	—	—	1	—	10	μA		

## AC Characteristics (unless otherwise specified, Input: $t_r = t_f = 3$ ns)

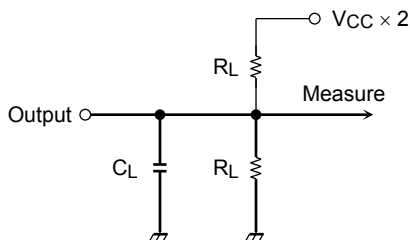
Characteristic	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit	
			VCC (V)	Min	Typ.	Max	Min		Max
Propagation delay time	t <sub>pZL</sub>	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω	1.8 ± 0.15	1.8	5.5	9.5	1.8	10.5	ns
			2.5 ± 0.2	1.2	3.7	5.8	1.2	6.4	
			3.3 ± 0.3	0.8	2.9	4.4	0.8	4.8	
			5.0 ± 0.5	0.5	2.3	3.5	0.5	3.9	
	t <sub>pLZ</sub>	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω	1.8 ± 0.15	1.8	4.3	9.5	1.8	10.5	
			2.5 ± 0.2	1.2	2.8	5.8	1.2	6.4	
			3.3 ± 0.3	0.8	2.1	4.4	0.8	4.8	
			5.0 ± 0.5	0.5	1.4	3.5	0.5	3.9	
Input capacitance	C <sub>IN</sub>	—	0 to 5.5	—	4	—	—	—	pF
Output capacitance	C <sub>OUT</sub>	—	0 to 5.5	—	3	—	—	—	pF
Power dissipation capacitance	C <sub>PD</sub>	(Note)	3.3	—	4	—	—	—	pF
			5.5	—	8	—	—	—	

Note : CPD is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

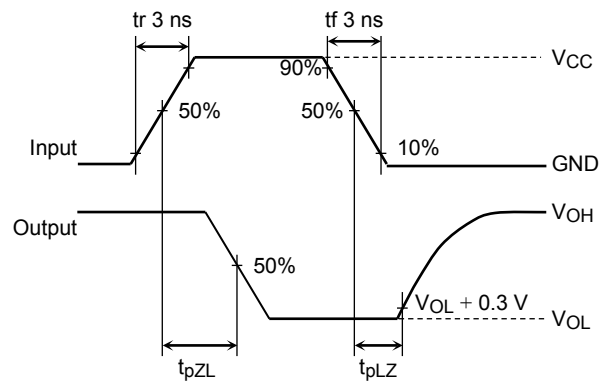
Average operating current can be obtained by the equation:

$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2$$

### Test Circuit



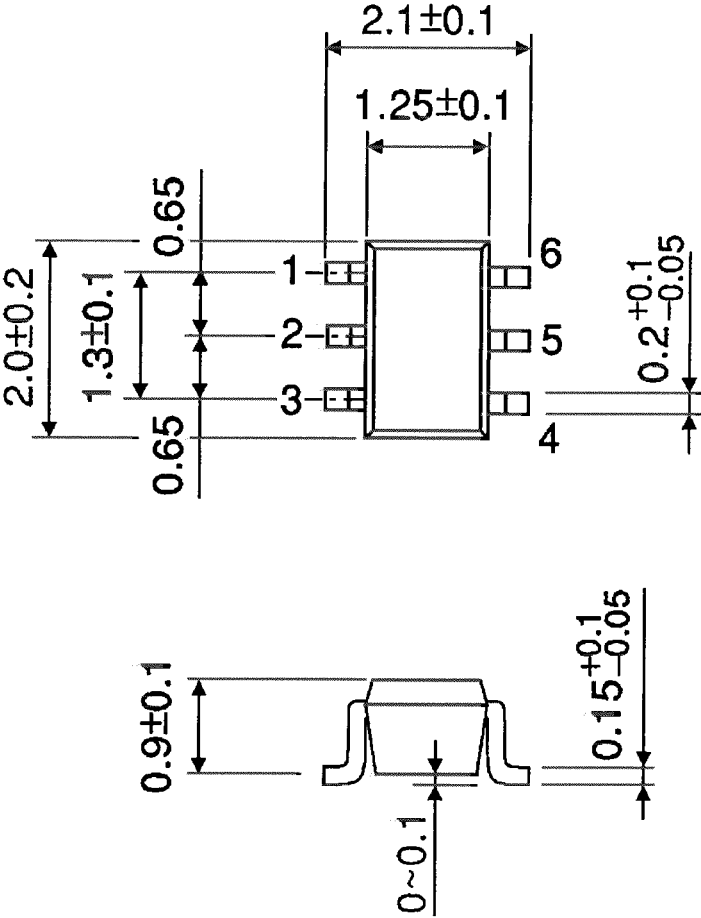
### AC Waveform



**Package Dimensions**

SSOP6-P-0.65A

Unit: mm



Weight: 0.0068 g (typ.)

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