

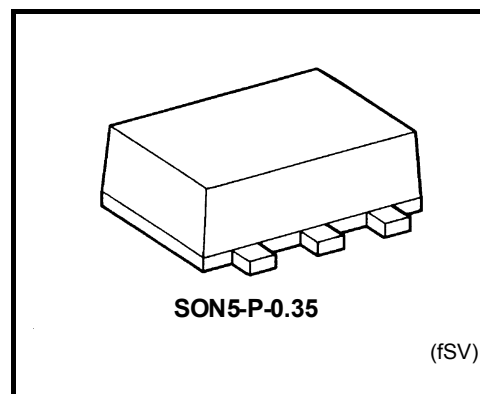
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SZ04AFS

INVERTER

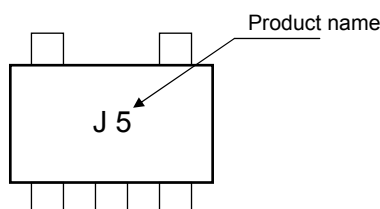
Features

- High output current : $\pm 24\text{mA}$ (min) at $V_{CC} = 3\text{V}$
- Super high speed operation : $t_{pd} = 2.4\text{ns}$ (typ.)
at $V_{CC} = 5\text{V}$, 50pF
- Operation voltage range : V_{CC} (opr.) = 1.65 to 5.5V
- 5.5-V tolerant input



Weight : 0.001 g (typ.)

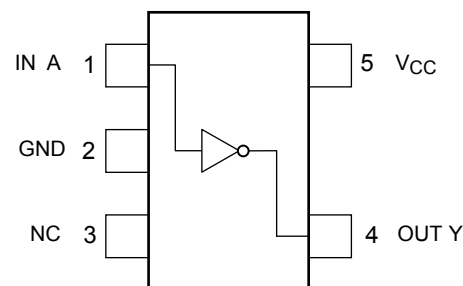
Marking



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

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 6	V
DC input voltage	V_{IN}	-0.5 to 6	V
DC output voltage	V_{OUT}	-0.5 to $V_{CC}+0.5$	V
Input diode current	I_{IK}	-20	mA
Output diode current	I_{OK}	± 20 (Note1)	mA
DC output current	I_{OUT}	± 50	mA
DC V_{CC} /ground current	I_{CC}	± 50	mA
Power dissipation	P_D	50	mW
Storage temperature	T_{stg}	-65 to 150	$^\circ\text{C}$

Pin Assignment (top view)



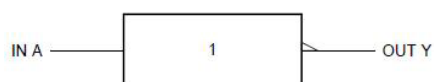
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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: $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

Start of commercial production
2008-03

IEC Logic Symbol



Truth Table

A	Y
L	H
H	L

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	1.65 to 5.5	V
		1.5 to 5.5 (Note 2)	
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to V_{CC}	V
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 2: Data retention only

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit	
				V _{CC} (V)	Min	Typ.	Max	Min		Max
High-level input voltage	V _{IH}	—		1.65 to 1.95	V _{CC} × 0.75	—	—	V _{CC} × 0.75	—	V
				2.3 to 5.5	V _{CC} × 0.7	—	—	V _{CC} × 0.7	—	
Low-level input voltage	V _{IL}	—		1.65 to 1.95	—	—	V _{CC} × 0.25	—	V _{CC} × 0.25	V
				2.3 to 5.5	—	—	V _{CC} × 0.3	—	V _{CC} × 0.3	
High-level output voltage	V _{OH}	V _{IN} = V _{IL}	I _{OH} = −100 μA	1.65	1.55	1.65	—	1.55	—	V
				2.3	2.2	2.3	—	2.2	—	
				3.0	2.9	3.0	—	2.9	—	
				4.5	4.4	4.5	—	4.4	—	
			I _{OH} = −4 mA	1.65	1.29	1.52	—	1.29	—	
			I _{OH} = −8 mA	2.3	1.9	2.15	—	1.9	—	
			I _{OH} = −16 mA	3.0	2.4	2.8	—	2.4	—	
			I _{OH} = −24 mA	3.0	2.3	2.68	—	2.3	—	
I _{OH} = −32 mA	4.5	3.8	4.2	—	3.8	—				
Low-level output voltage	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 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	
			I _{OL} = 4 mA	1.65	—	0.08	0.24	—	0.24	
			I _{OL} = 8 mA	2.3	—	0.1	0.3	—	0.3	
			I _{OL} = 16 mA	3.0	—	0.15	0.4	—	0.4	
			I _{OL} = 24 mA	3.0	—	0.22	0.55	—	0.55	
I _{OL} = 32 mA	4.5	—	0.22	0.55	—	0.55				
Input leakage current	I _{IN}	V _{IN} = 5.5 V or GND		0 to 5.5	—	—	±1	—	±10	μA
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		5.5	—	—	2	—	20	μA

AC Characteristics (unless otherwise specified, Input: $t_r = t_f = 3\text{ ns}$)

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit
			V _{CC} (V)	Min	Typ.	Max	Min	Max
Propagation delay time	t_{pLH} t_{pHL}	$C_L = 15\text{ pF}$, $R_L = 1\text{ M}\Omega$	1.8 ± 0.15	1.1	5.3	9.6	1.1	9.8
			2.5 ± 0.2	1.0	3.2	5.3	1.0	5.7
			3.3 ± 0.3	0.8	2.4	3.7	0.8	4.0
			5.0 ± 0.5	0.5	1.9	2.9	0.5	3.2
		$C_L = 50\text{ pF}$, $R_L = 500\text{ }\Omega$	3.3 ± 0.3	1.0	3.0	4.6	1.0	4.9
			5.0 ± 0.5	0.8	2.4	3.6	0.8	3.9
Input capacitance	C_{IN}	—	0 to 5.5	—	4	—	—	pF
Power dissipation capacitance	C_{PD}	(Note 3)	3.3	—	10	—	—	pF
			5.5	—	15	—	—	

Note3: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

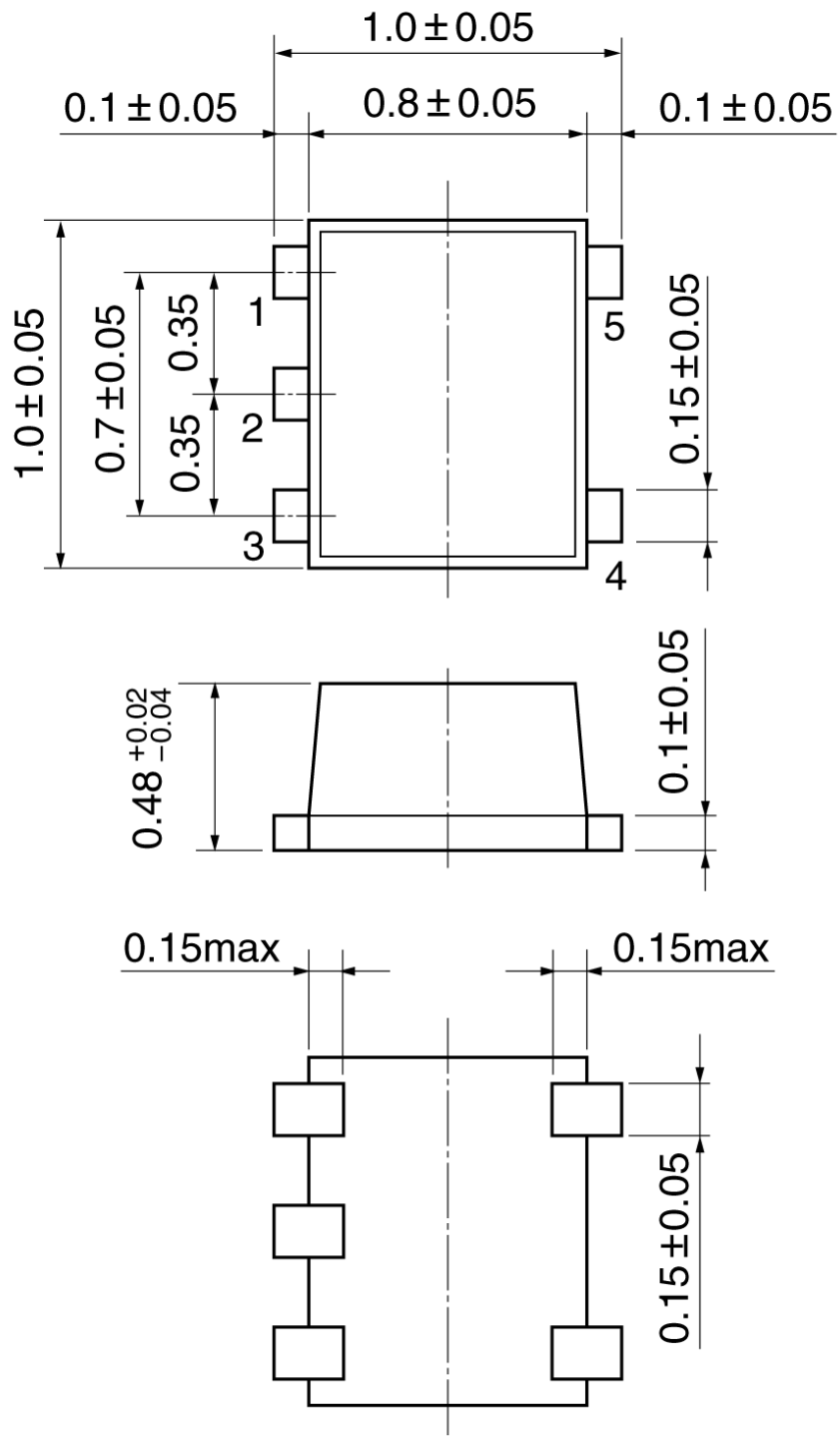
Average operating current can be obtained by the equation.

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

Package Dimensions

SON5-P-0.35

Unit: mm



Weight: 0.001 g (typ.)

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