TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7W14F,TC7W14FU,TC7W14FK

Schmitt Inverter

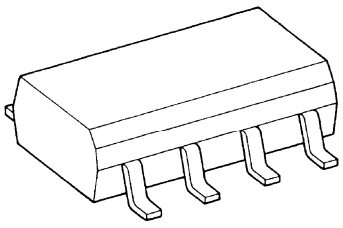
The TC7W14 is high speed C²MOS Schmitt Inverter fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the C²MOS low power dissipation.

Pin configuration and function are the same as the TC7WU04 but the inputs have 25% VCC hysteresis and with its schmitt trigger function, the TC7W14 can be used as a line receivers which will receive slow input signals.

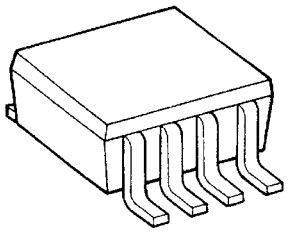
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

TC7W14F



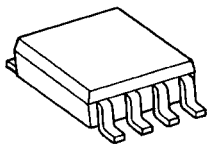
SOP8-P-1.27

TC7W14FU



SSOP8-P-0.65

TC7W14FK



SSOP8-P-0.50A

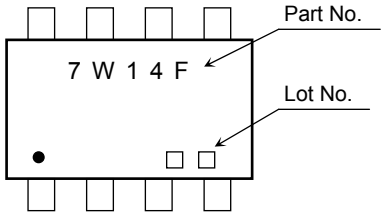
Weight
SOP8-P-1.27: 0.05 g (typ.)
SSOP8-P-0.65: 0.02 g (typ.)
SSOP8-P-0.50A: 0.01 g (typ.)

Features

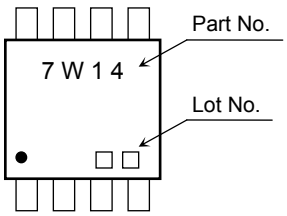
- High speed: t_{pd} = 11 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 1μA (max) at Ta = 25°C
- High noise immunity: V_H = 1.1 V at V_{CC} = 5V
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL}$ = 4mA (min)
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: V_{CC} (opr) = 2 to 6V

Marking

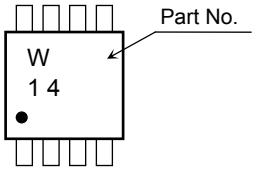
TC7W14F



TC7W14FU



TC7W14FK

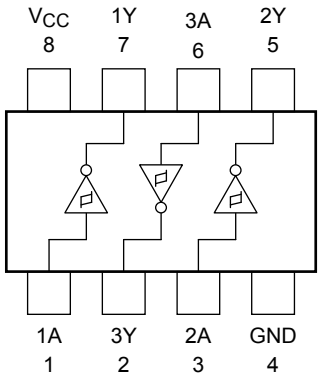


Absolute Maximum Ratings (Ta = 25°C)

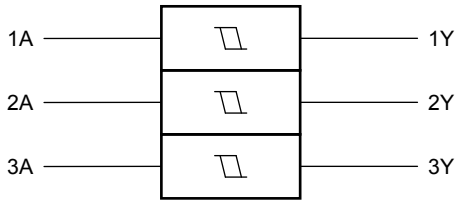
Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5 to 7	V
DC input voltage	V_{IN}	−0.5 to V_{CC} + 0.5	V
DC output voltage	V_{OUT}	−0.5 to V_{CC} + 0.5	V
Input diode current	I_{IK}	±20	mA
Output diode current	I_{OK}	±20	mA
DC output current	I_{OUT}	±25	mA
DC V_{CC}/ground current	I_{CC}	±25	mA
Power dissipation	P_D	300 (FM8, SM8)	mW
		200 (US8)	
Storage temperature range	T_{stg}	−65 to 150	°C
Lead temperature (10 s)	T_L	260	°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).

Pin Configuration (top view)



Logic Diagram



Truth Table

A	Y
L	H
H	L

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2 to 6	V
Input voltage	V_{IN}	0 to V_{CC}	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature range	T_{opr}	−40 to 85	°C

Electrical Characteristics

DC Electrical Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C				Ta = −40 to 85°C		Unit
					V_{CC} (V)	Min	Typ.	Max	Min	Max	
Threshold voltage	High level	V_P	—		2.0	1.0	1.25	1.5	1.0	1.5	V
					4.5	2.3	2.7	3.15	2.3	3.15	
					6.0	3.0	3.5	4.2	3.0	4.2	
	Low level	V_N	—		2.0	0.3	0.65	0.9	0.3	0.9	
					4.5	1.13	1.6	2.0	1.13	2.0	
					6.0	1.5	2.3	2.6	1.5	2.6	
Hysteresis voltage		V_H	—		2.0	0.3	0.6	1.0	0.3	1.0	V
					4.5	0.6	1.1	1.4	0.6	1.4	
					6.0	0.8	1.2	1.7	0.8	1.7	
Output voltage	High level	V_{OH}	$V_{IN} = V_{IL}$	I_{OH} = −20 μA	2.0	1.9	2.0	—	1.9	—	V
					4.5	4.4	4.5	—	4.4	—	
					6.0	5.9	6.0	—	5.9	—	
				I_{OH} = −4 mA	4.5	4.18	4.31	—	4.13	—	
				I_{OH} = −5.2 mA	6.0	5.68	5.80	—	5.63	—	
	Low level	V_{OL}	$V_{IN} = V_{IH}$	I_{OL} = 20 μA	2.0	—	0	0.1	—	0.1	
					4.5	—	0	0.1	—	0.1	
					6.0	—	0	0.1	—	0.1	
				I_{OL} = 4 mA	4.5	—	0.17	0.26	—	0.33	
				I_{OL} = 5.2 mA	6.0	—	0.18	0.26	—	0.33	
Input leakage current		I_{IN}	$V_{IN} = V_{CC}$ or GND		6.0	—	—	±0.1	—	±1.0	μA
Quiescent supply current		I_{CC}	$V_{IN} = V_{CC}$ or GND		6.0	—	—	1.0	—	10.0	μA

AC Electrical Characteristics (C_L = 15 pF, V_{CC} = 5 V, Ta = 25°C)

Characteristics	Symbol	Test Condition	Ta = 25°C			Unit
			Min	Typ.	Max	
Output transition time	t_{TLH} t_{THL}	—	—	4	8	ns
Propagation delay time	t_{pLH} t_{pHL}	—	—	11	21	ns

AC Electrical Characteristics (C_L = 50 pF, input $t_r = t_f$ = 6 ns)

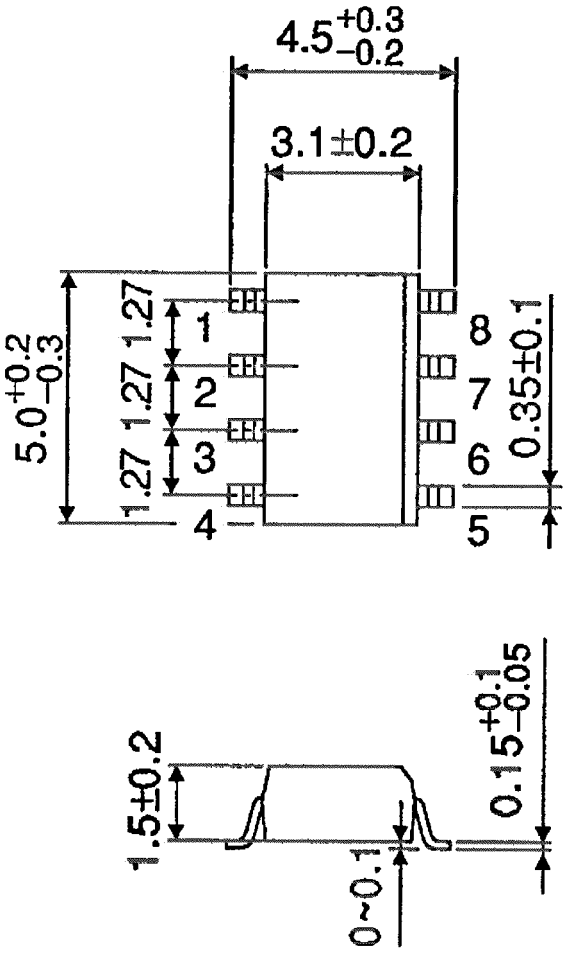
Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Output transition time	t_{TLH} t_{THL}	—	2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation delay time	t_{pLH} t_{pHL}	—	2.0	—	42	125	—	155	ns
			4.5	—	14	25	—	31	
			6.0	—	12	21	—	26	
Input capacitance	C_{IN}	—		—	5	10	—	10	pF
Power dissipation capacitance	C_{PD}	(Note)		—	28	—	—	—	pF

Note: C_{PD} is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to test circuit).
Average operating current can be obtained by the equation hereunder.

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

Package Dimensions

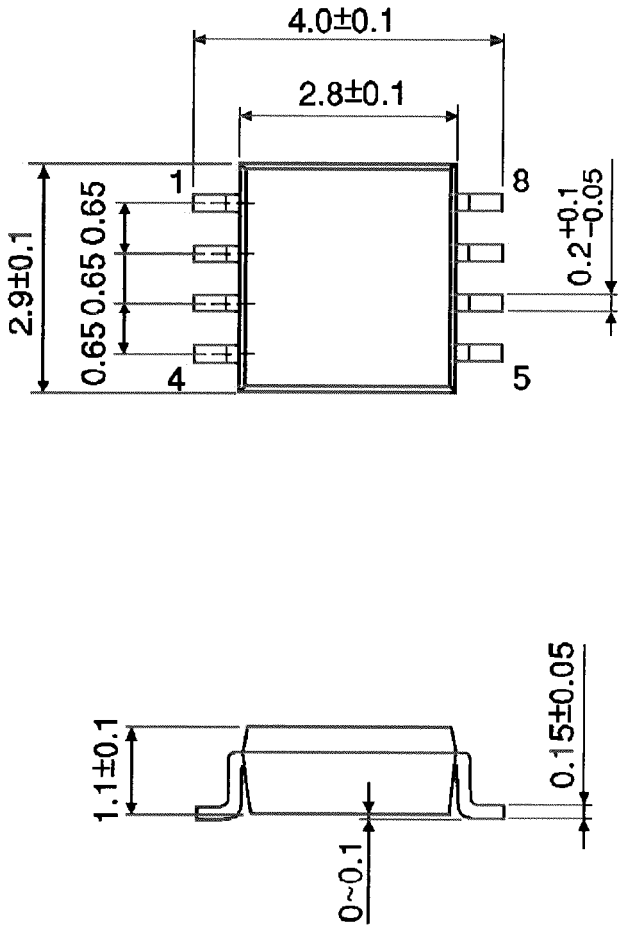
SOP8-P-1.27 Unit : mm



Weight: 0.05 g (typ.)

Package Dimensions

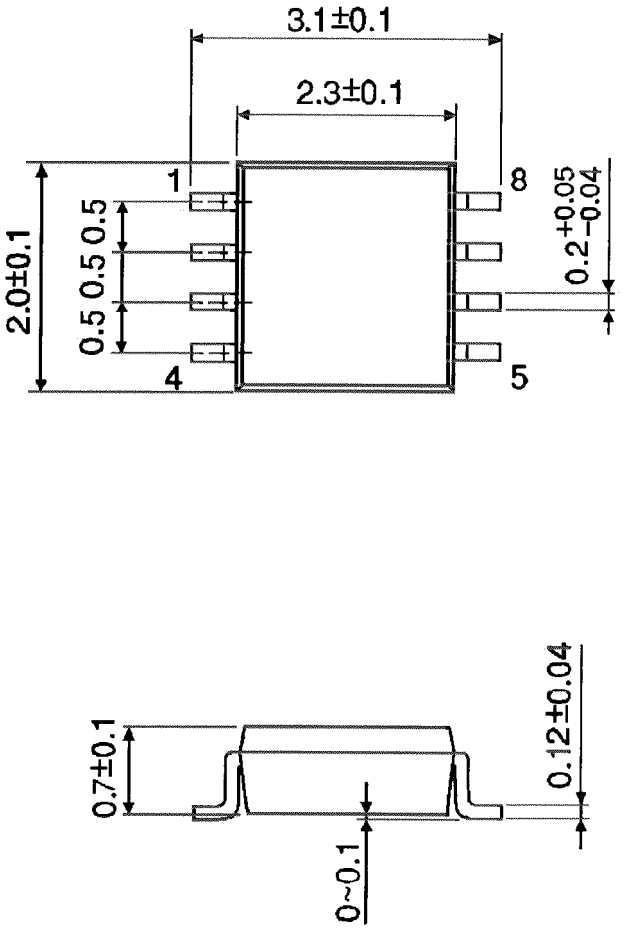
SSOP8-P-0.65 Unit : mm



Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A Unit : mm



Weight: 0.01 g (typ.)

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