

# TC7SET32FU

## 1. Functional Description

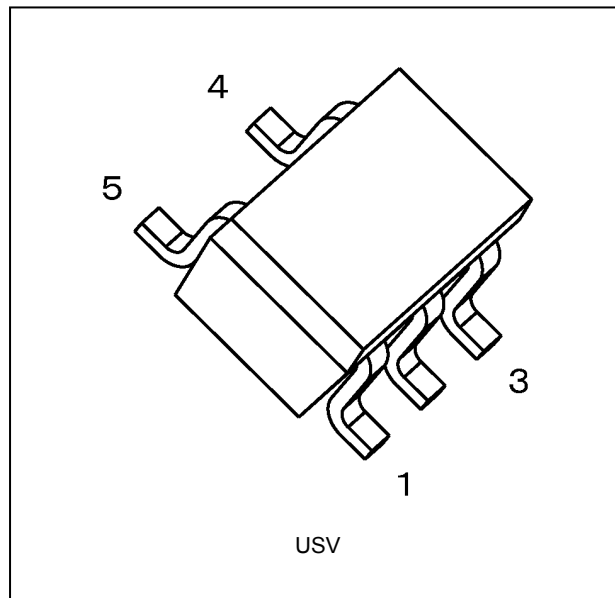
- 2-Input OR Gate

## 2. Features

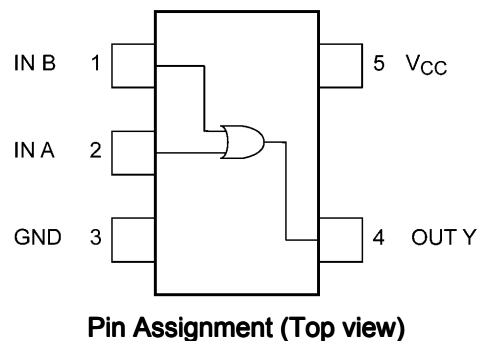
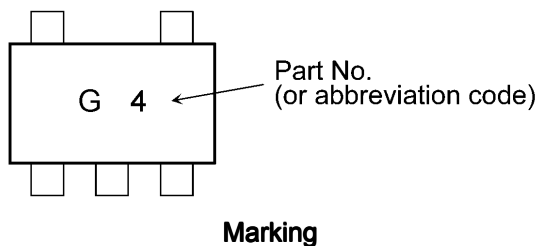
- (1) Wide operating temperature range:  $T_{opr} = -40$  to  $125$  °C (Note 1)
- (2) High speed operation:  $t_{pd} = 4.2$  ns (typ.) ( $V_{CC} = 5$  V,  $C_L = 15$  pF)
- (3) Low power dissipation:  $I_{CC} = 2$   $\mu$ A (max) ( $T_a = 25$  °C)
- (4) Compatible with TTL outputs:  $V_{IL} = 0.8$  V (max)  
 $V_{IH} = 2.0$  V (min)
- (5) 5.5-V tolerant inputs
- (6) Balanced Propagation Delay:  $t_{PLH} \approx t_{PHL}$

Note 1: For devices with the ordering part number TC7SET32FU,LJ(CT).  $T_{opr} = -40$  to  $85$  °C for the other devices.

## 3. Packaging

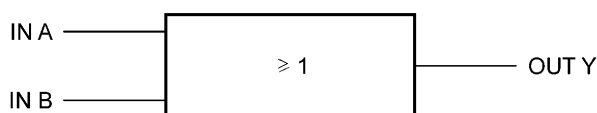


## 4. Marking and Pin Assignment



Start of commercial production  
1996-09

**5. IEC Logic Symbol**



**6. Truth Table**

A	B	Y
L	L	L
L	H	H
H	L	H
H	H	H

**7. Absolute Maximum Ratings (Note) (Unless otherwise specified, T<sub>a</sub> = 25 °C)**

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	V <sub>CC</sub>		-0.5 to 7	V
Input voltage	V <sub>IN</sub>		-0.5 to 7	
DC output voltage	V <sub>OUT</sub>		-0.5 to V <sub>CC</sub> + 0.5	
Input diode current	I <sub>IK</sub>		-20	mA
Output diode current	I <sub>OK</sub>	(Note 1)	±20	
DC output current	I <sub>OUT</sub>		±25	
V <sub>CC</sub> /ground current	I <sub>CC</sub>		±50	
Power dissipation	P <sub>D</sub>		200	mW
Storage temperature	T <sub>stg</sub>		-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).

Note 1: V<sub>OUT</sub> < GND, V<sub>OUT</sub> > V<sub>CC</sub>

**8. Operating Ranges (Note)**

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	V <sub>CC</sub>		4.5 to 5.5	V
Input voltage	V <sub>IN</sub>		0 to 5.5	
Output voltage	V <sub>OUT</sub>		0 to V <sub>CC</sub>	
Operating temperature	T <sub>opr</sub>	(Note 1)	-40 to 125	°C
		(Note 2)	-40 to 85	
Input rise and fall time	dt/dv		0 to 20	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device.

Unused inputs must be tied to either V<sub>CC</sub> or GND.

Note 1: For devices with the ordering part number TC7SET32FU,LJ(CT).

Note 2: For devices except those with the ordering part number TC7SET32FU,LJ(CT).

**9. Electrical Characteristics**

**9.1. DC Characteristics (Unless otherwise specified,  $T_a = 25\text{ }^\circ\text{C}$ )**

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Typ.	Max	Unit	
High-level input voltage	$V_{IH}$	—	4.5 to 5.5	2.0	—	—	V	
Low-level input voltage	$V_{IL}$	—	4.5 to 5.5	—	—	0.8	V	
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -50\text{ }\mu\text{A}$	4.5	4.4	4.5	—	V
			$I_{OH} = -8\text{ mA}$	4.5	3.94	—	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IL}$	$I_{OL} = 50\text{ }\mu\text{A}$	4.5	—	0.0	0.1	V
			$I_{OL} = 8\text{ mA}$	4.5	—	—	0.36	
Input leakage current	$I_{IN}$	$V_{IN} = 5.5\text{ V}$ or GND	0 to 5.5	—	—	$\pm 0.1$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	5.5	—	—	2.0	$\mu\text{A}$	
	$I_{CCT}$	Per input: $V_{IN} = 3.4\text{ V}$ Other input: $V_{CC}$ or GND	5.5	—	—	1.35	mA	

**9.2. DC Characteristics (Unless otherwise specified,  $T_a = -40$  to  $85\text{ }^\circ\text{C}$ )**

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Max	Unit	
High-level input voltage	$V_{IH}$	—	4.5 to 5.5	2.0	—	V	
Low-level input voltage	$V_{IL}$	—	4.5 to 5.5	—	0.8	V	
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -50\text{ }\mu\text{A}$	4.5	4.4	—	V
			$I_{OH} = -8\text{ mA}$	4.5	3.80	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IL}$	$I_{OL} = 50\text{ }\mu\text{A}$	4.5	—	0.1	V
			$I_{OL} = 8\text{ mA}$	4.5	—	0.44	
Input leakage current	$I_{IN}$	$V_{IN} = 5.5\text{ V}$ or GND	0 to 5.5	—	$\pm 1.0$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	5.5	—	20.0	$\mu\text{A}$	
	$I_{CCT}$	Per input: $V_{IN} = 3.4\text{ V}$ Other input: $V_{CC}$ or GND	5.5	—	1.50	mA	

**9.3. DC Characteristics (Note) (Unless otherwise specified,  $T_a = -40$  to  $125\text{ }^\circ\text{C}$ )**

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Max	Unit	
High-level input voltage	$V_{IH}$	—	4.5 to 5.5	2.0	—	V	
Low-level input voltage	$V_{IL}$	—	4.5 to 5.5	—	0.8	V	
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -50\text{ }\mu\text{A}$	4.5	4.4	—	V
			$I_{OH} = -8\text{ mA}$	4.5	3.70	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IL}$	$I_{OL} = 50\text{ }\mu\text{A}$	4.5	—	0.1	V
			$I_{OL} = 8\text{ mA}$	4.5	—	0.55	
Input leakage current	$I_{IN}$	$V_{IN} = 5.5\text{ V}$ or GND	0 to 5.5	—	$\pm 2.0$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	5.5	—	40.0	$\mu\text{A}$	
	$I_{CCT}$	Per input: $V_{IN} = 3.4\text{ V}$ Other input: $V_{CC}$ or GND	5.5	—	1.50	mA	

Note: For devices with the ordering part number TC7SET32FU,LJ(CT).

**9.4. AC Characteristics (Unless otherwise specified,  $T_a = 25\text{ }^\circ\text{C}$ , Input:  $t_r = t_f = 3\text{ ns}$ )**

Characteristics	Symbol	Note	Test Condition	$V_{CC}$ (V)	$C_L$ (pF)	Min	Typ.	Max	Unit
Propagation delay time	$t_{PLH}, t_{PHL}$		—	$5.0 \pm 0.5$	15	—	4.2	6.2	ns
					50	—	6.5	9.0	
Input capacitance	$C_{IN}$		—			—	4	10	pF
Power dissipation capacitance	$C_{PD}$	(Note 1)	—			—	17	—	pF

Note 1:  $C_{PD}$  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.

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

**9.5. AC Characteristics (Unless otherwise specified,  $T_a = -40\text{ to }85\text{ }^\circ\text{C}$ , Input:  $t_r = t_f = 3\text{ ns}$ )**

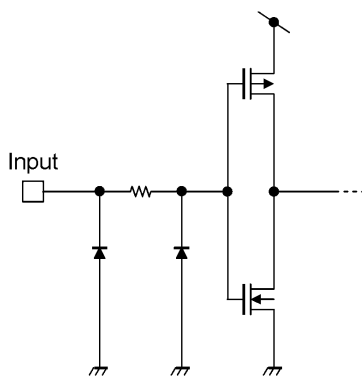
Characteristics	Symbol	Note	Test Condition	$V_{CC}$ (V)	$C_L$ (pF)	Min	Max	Unit
Propagation delay time	$t_{PLH}, t_{PHL}$		—	$5.0 \pm 0.5$	15	1.0	7.1	ns
					50	1.0	10.3	
Input capacitance	$C_{IN}$		—			—	10	pF

**9.6. AC Characteristics (Note) (Unless otherwise specified,  $T_a = -40\text{ to }125\text{ }^\circ\text{C}$ , Input:  $t_r = t_f = 3\text{ ns}$ )**

Characteristics	Symbol	Note	Test Condition	$V_{CC}$ (V)	$C_L$ (pF)	Min	Max	Unit
Propagation delay time	$t_{PLH}, t_{PHL}$		—	$5.0 \pm 0.5$	15	1.0	8.0	ns
					50	1.0	11.5	
Input capacitance	$C_{IN}$		—			—	10	pF

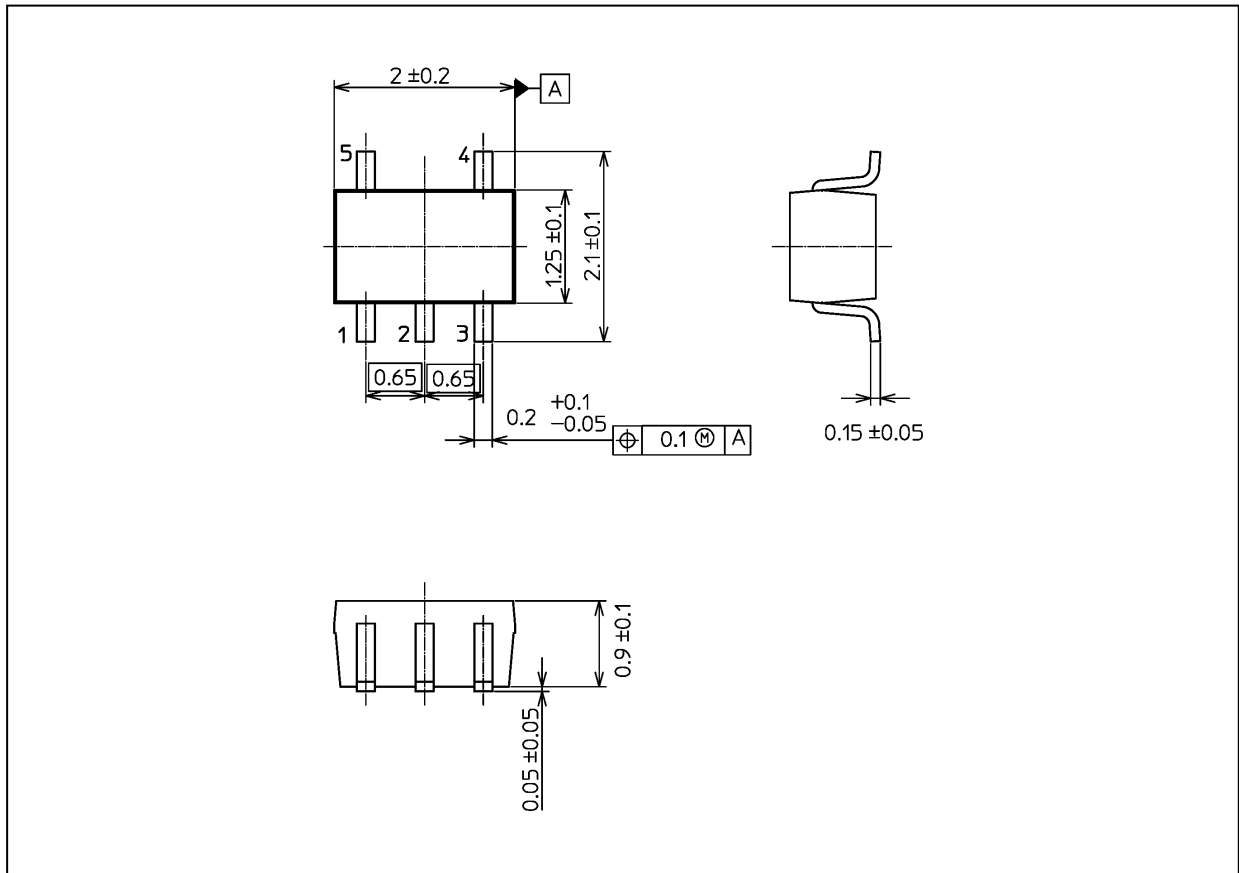
Note: For devices with the ordering part number TC7SET32FU,LJ(CT).

**9.7. Internal Equivalent Circuit**



**Package Dimensions**

Unit: mm



Weight: 0.006 g (typ.)

Package Name(s)
TOSHIBA: SSOP5-P-0.65S
Nickname: USV

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