

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC74LCX541F, TC74LCX541FW, TC74LCX541FT****LOW VOLTAGE OCTAL BUS BUFFER  
WITH 5V TOLERANT INPUTS AND OUTPUTS**

The TC74LCX541 is a high performance CMOS OCTAL BUS BUFFER. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

The device is designed for low-voltage (3.3V)  $V_{CC}$  applications, but it could be used to interface to 5V supply environment for both inputs and outputs.

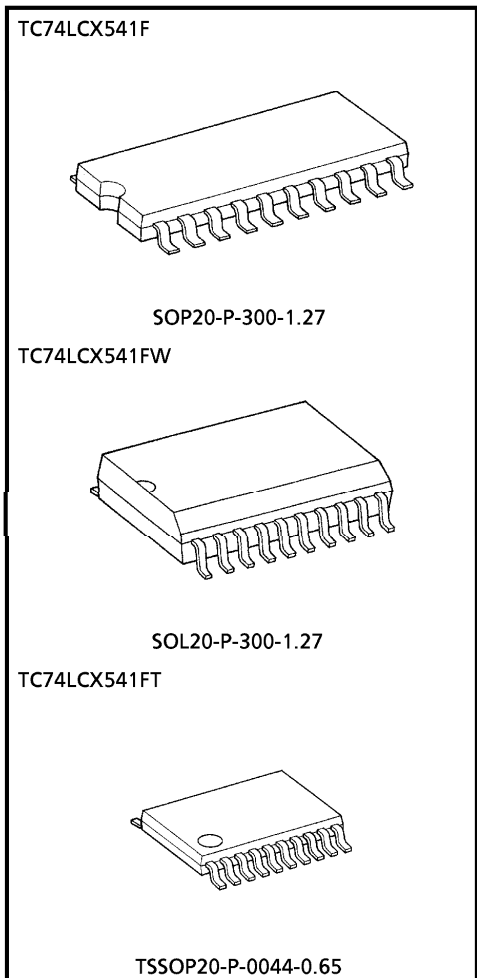
The 74LCX541 is a non-inverting 3-state buffer having two active-low output enables. When either  $\overline{OE1}$  or  $\overline{OE2}$  are high, the terminal outputs are in the high-impedance state. This device is designed to be used with 3-state memory address drivers, etc.

All inputs are equipped with protection circuits against static discharge.

**FEATURES**

- Low voltage operation :  $V_{CC} = 2.0 \sim 3.6V$
- High speed operation :  $t_{pd} = 6.5ns$  (Max.)  
( $V_{CC} = 3.0 \sim 3.6V$ )
- Output current :  $|I_{OH}| / I_{OL} = 24mA$  (Min.)  
( $V_{CC} = 3.0V$ )
- Latch-up performance :  $\pm 500mA$
- Available in JEDEC SOP, EIAJ SOP and TSSOP
- Power down protection is provided on all inputs and outputs.
- Pin and function compatible with the 74 series (74AC/VHC/HC/F/ALS/LS etc.) 541 type.

(Note) The JEDEC SOP (FW) is not available in Japan.

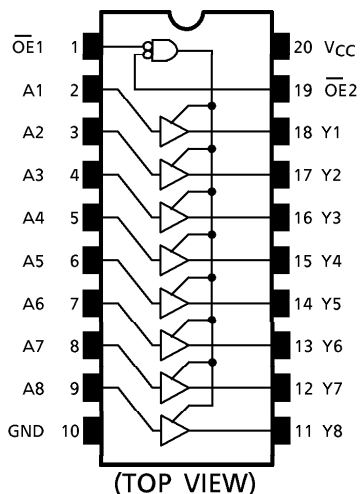
**Weight**

SOP20-P-300-1.27	: 0.22g (Typ.)
SOL20-P-300-1.27	: 0.46g (Typ.)
TSSOP20-P-0044-0.65	: 0.08g (Typ.)

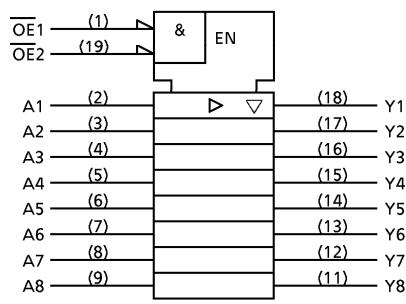
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PIN ASSIGNMENT



IEC LOGIC SYMBOL



TRUTH TABLE

INPUTS			OUTPUTS
OE1	OE2	An	
H	X	X	Z
X	H	X	Z
L	L	H	H
L	L	L	L

X : Don't Care  
Z : High Impedance

MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7.0	V
DC Input Voltage	$V_{IN}$	-0.5~7.0	V
DC Output Voltage	$V_{OUT}$	-0.5~7.0 (Note 1)	V
		-0.5~ $V_{CC} + 0.5$ (Note 2)	
Input Diode Current	$I_{IK}$	-50	mA
Output Diode Current	$I_{OK}$	±50 (Note 3)	mA
DC Output Current	$I_{OUT}$	±50	mA
Power Dissipation	$P_D$	180	mW
DC $V_{CC}$ /Ground Current	$I_{CC}/I_{GND}$	±100	mA
Storage Temperature	$T_{stg}$	-65~150	°C

(Note 1) Output in Off-State  
 (Note 2) High or Low State.  $I_{OUT}$  absolute maximum rating must be observed.  
 (Note 3)  $V_{OUT} < GND, V_{OUT} > V_{CC}$

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- The information contained herein is subject to change without notice.

**RECOMMENDED OPERATING CONDITIONS**

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>CC</sub>	2.0~3.6	V
		1.5~3.6 (Note 4)	
Input Voltage	V <sub>IN</sub>	0~5.5	V
Output Voltage	V <sub>OUT</sub>	0~5.5 (Note 5)	V
		0~V <sub>CC</sub> (Note 6)	
Output Current	I <sub>OH</sub> / I <sub>OL</sub>	±24 (Note 7)	mA
		±12 (Note 8)	
Operating Temperature	T <sub>opr</sub>	-40~85	°C
Input Rise And Fall Time	dt/dv	0~10 (Note 9)	ns/V

(Note 4) Data Retention Only

(Note 5) Output in Off-State

(Note 6) High or Low State

(Note 7) V<sub>CC</sub> = 3.0~3.6V

(Note 8) V<sub>CC</sub> = 2.7~3.0V

(Note 9) V<sub>IN</sub> = 0.8~2.0V, V<sub>CC</sub> = 3.0V

**ELECTRICAL CHARACTERISTICS**

DC characteristics (Ta = -40~85°C)

PARAMETER		SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	MIN.	MAX.	UNIT	
Input Voltage	"H" Level	V <sub>IH</sub>		2.7~3.6	2.0	—	V	
	"L" Level	V <sub>IL</sub>		2.7~3.6	—	0.8		
Output Voltage	"H" Level	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -100μA	2.7~3.6	V <sub>CC</sub> - 0.2	—	V
				I <sub>OH</sub> = -12mA	2.7	2.2	—	
				I <sub>OH</sub> = -18mA	3.0	2.4	—	
				I <sub>OH</sub> = -24mA	3.0	2.2	—	
	"L" Level	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 100μA	2.7~3.6	—	0.2	
				I <sub>OL</sub> = 12mA	2.7	—	0.4	
				I <sub>OL</sub> = 16mA	3.0	—	0.4	
				I <sub>OL</sub> = 24mA	3.0	—	0.55	
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = 0~5.5V	2.7~3.6	—	±5.0	μA		
3-State Output Off-State Current	I <sub>OZ</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> = 0~5.5V	2.7~3.6	—	±5.0	μA		
Power Off Leakage Current	I <sub>OFF</sub>	V <sub>IN</sub> / V <sub>OUT</sub> = 5.5V	0	—	10.0	μA		
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	2.7~3.6	—	10.0	μA		
		V <sub>IN</sub> / V <sub>OUT</sub> = 3.6~5.5V	2.7~3.6	—	±10.0			
Increase In I <sub>CC</sub> Per Input	ΔI <sub>CC</sub>	V <sub>IH</sub> = V <sub>CC</sub> - 0.6V	2.7~3.6	—	500	μA		

AC characteristic (Ta = -40~85°C)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	MIN.	MAX.	UNIT
Propagation Delay Time	t <sub>pLH</sub>	(Fig.1, 2)	2.7	—	7.5	ns
	t <sub>pHL</sub>		3.3 ± 0.3	1.5	6.5	
Output Enable Time	t <sub>pZL</sub>	(Fig.1, 3)	2.7	—	9.5	ns
	t <sub>pZH</sub>		3.3 ± 0.3	1.5	8.5	
Output Disable Time	t <sub>pLZ</sub>	(Fig.1, 3)	2.7	—	8.5	ns
	t <sub>pHZ</sub>		3.3 ± 0.3	1.5	7.5	
Output To Output Skew	t <sub>osLH</sub>	(Note 10)	2.7	—	—	ns
	t <sub>osHL</sub>		3.3 ± 0.3	—	1.0	

(Note 10) Parameter guaranteed by design.  
 (t<sub>osLH</sub> = |t<sub>pLHm</sub> - t<sub>pLHn</sub>|, t<sub>osHL</sub> = |t<sub>pHLm</sub> - t<sub>pHLn</sub>|)

**DYNAMIC SWITCHING CHARACTERISTICS** (Ta = 25°C, Input t<sub>r</sub> = t<sub>f</sub> = 2.5ns, C<sub>L</sub> = 50pF, R<sub>L</sub> = 500Ω)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	TYP.	UNIT
Quiet Output Maximum Dynamic V <sub>OL</sub>	V <sub>OLP</sub>	V <sub>IH</sub> = 3.3V, V <sub>IL</sub> = 0V	3.3	0.8	V
Quiet Output Minimum Dynamic V <sub>OL</sub>	V <sub>OLV</sub>	V <sub>IH</sub> = 3.3V, V <sub>IL</sub> = 0V	3.3	0.8	V

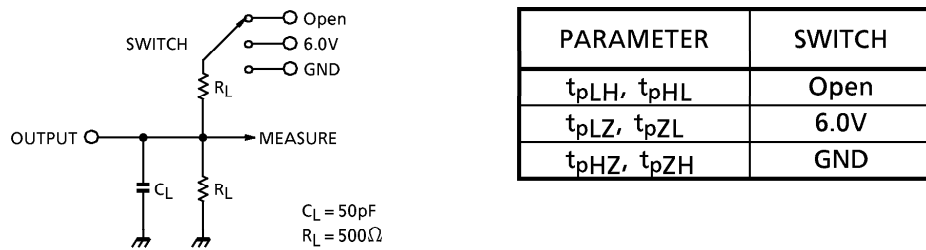
**CAPACITIVE CHARACTERISTICS** (Ta = 25°C)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	TYP.	UNIT
Input Capacitance	C <sub>IN</sub>	—	3.3	7	pF
Output Capacitance	C <sub>OUT</sub>		3.3	8	pF
Power Dissipation Capacitance	C <sub>PD</sub>	f <sub>IN</sub> = 10MHz (Note 11)	3.3	40	pF

(Note 11) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption.  
 Average operating current can be obtained by the equation :  
 I<sub>CC</sub>(opr.) = C<sub>PD</sub> · V<sub>CC</sub> · f<sub>IN</sub> + I<sub>CC</sub> / 8 (per bit)

**TEST CIRCUIT**

Fig.1



**AC WAVEFORM**

Fig.2  $t_{pLH}, t_{pHL}$

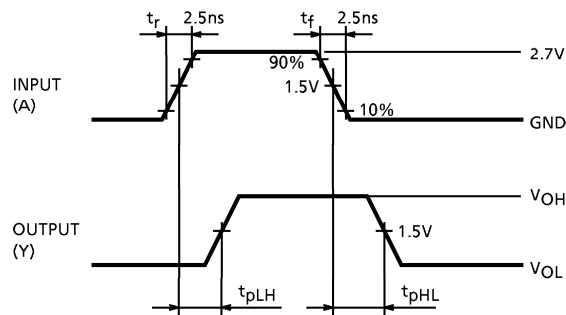
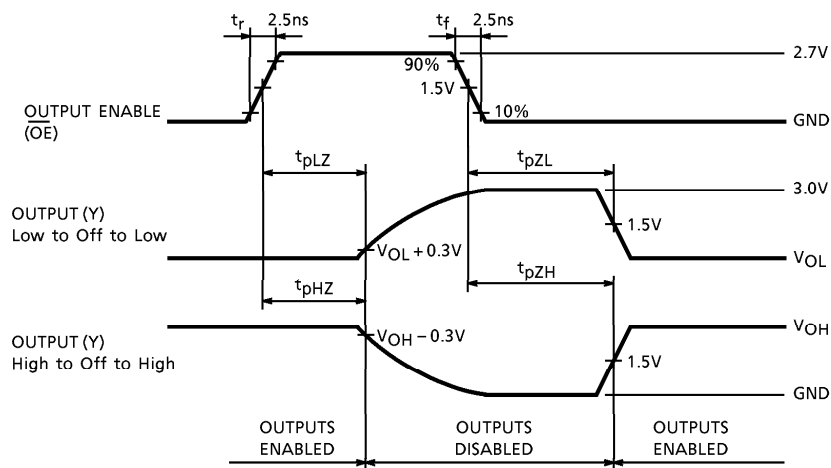
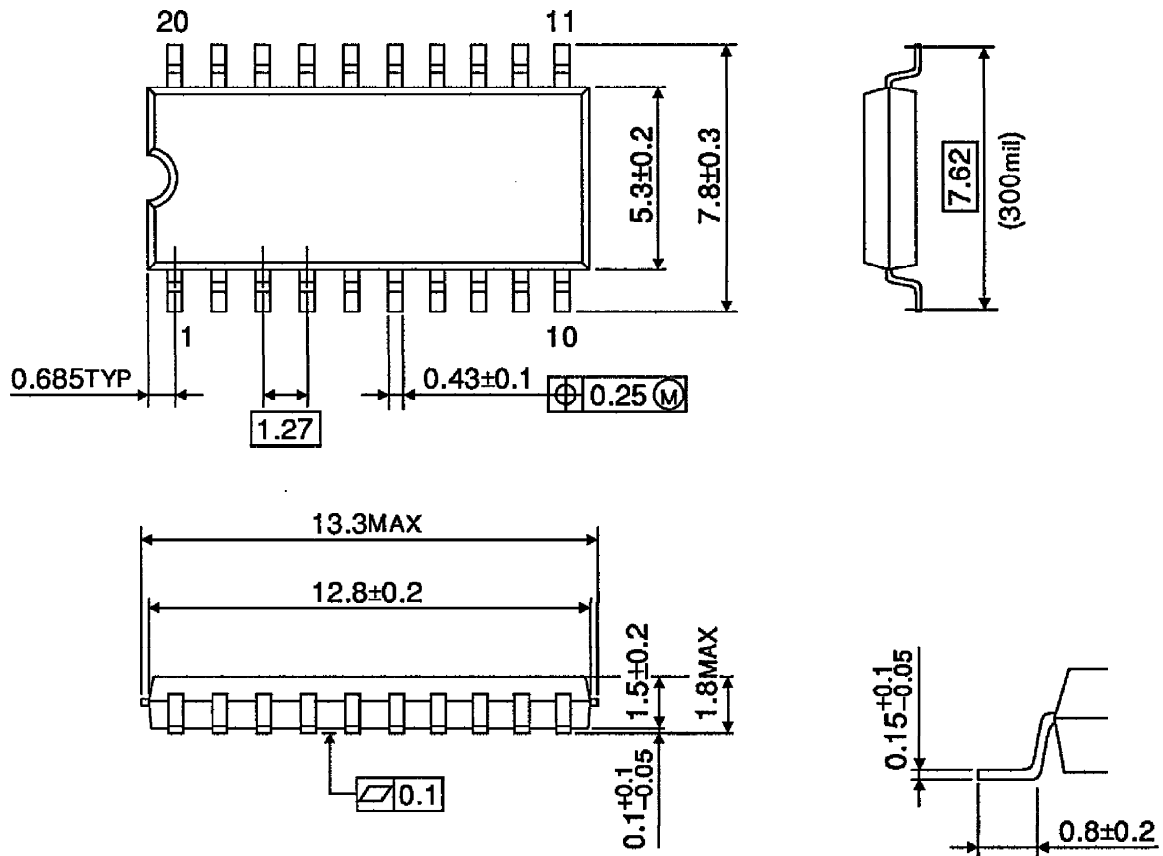


Fig.3  $t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}$



**OUTLINE DRAWING**  
SOP20-P-300-1.27

Unit : mm

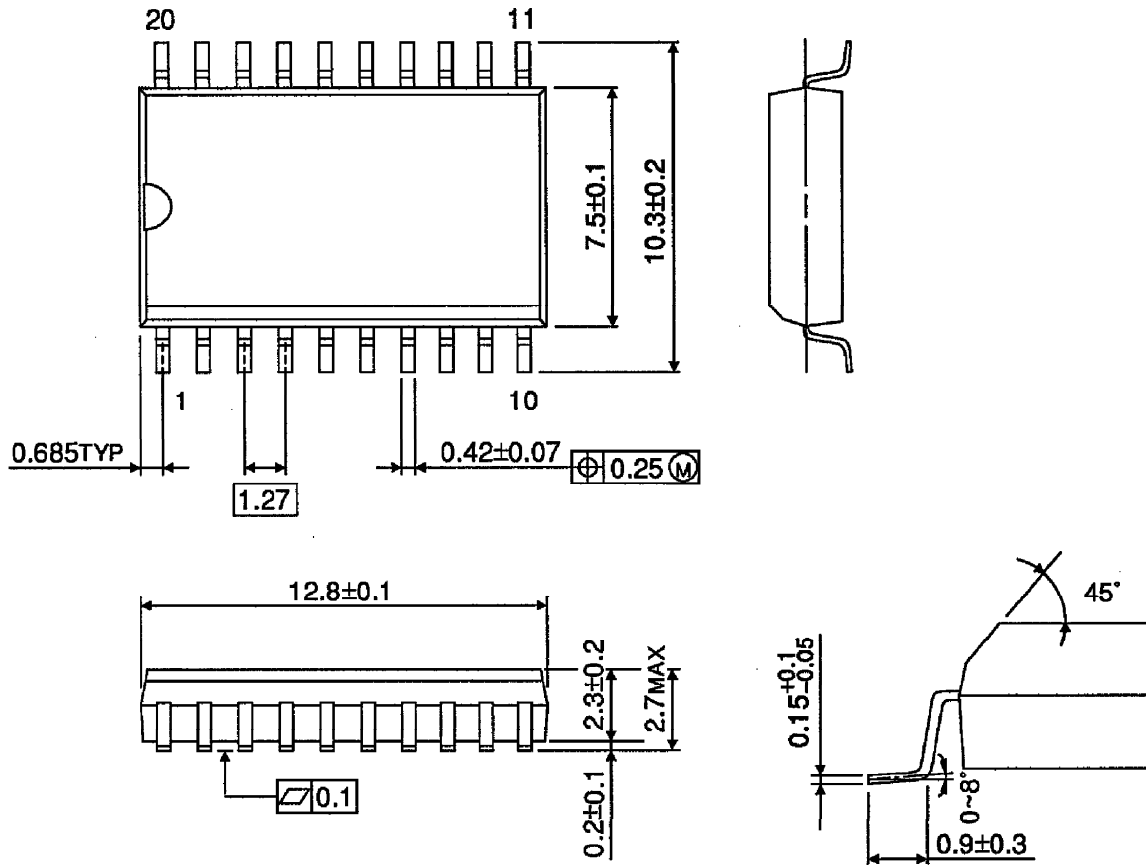


Weight : 0.22g (Typ.)

**OUTLINE DRAWING**  
SOL20-P-300-1.27

Unit : mm

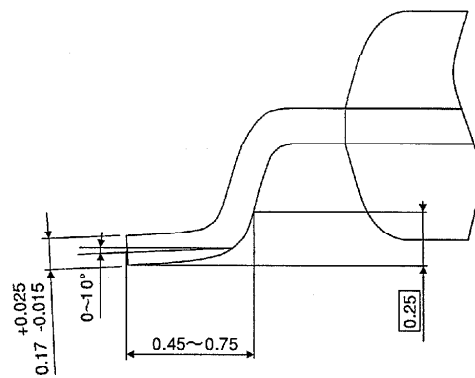
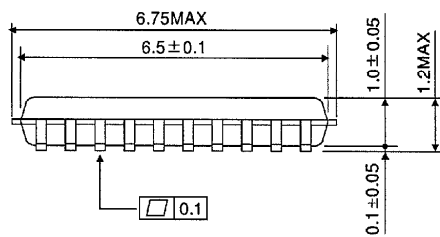
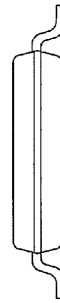
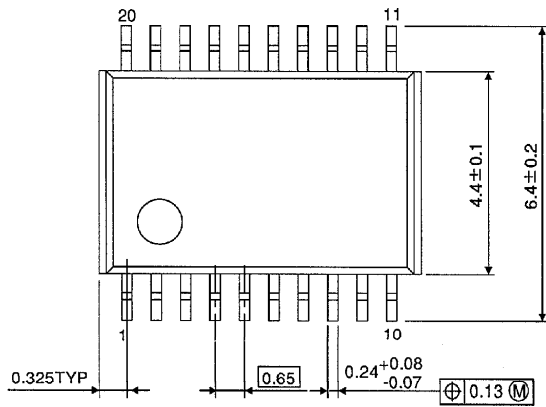
(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)

**OUTLINE DRAWING**  
TSSOP20-P-0044-0.65

Unit : mm



Weight : 0.08g (Typ.)