TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74LCX245F,TC74LCX245FW,TC74LCX245FT

Low-Voltage Octal Bus Transceiver with 5-V Tolerant Inputs and Outputs

Note: xxxFW (JEDEC SOP) is not available in Japan.

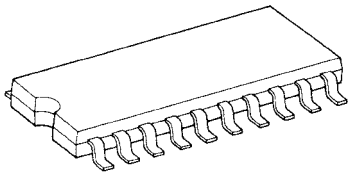
The TC74LCX245F/FW/FT is a high-performance CMOS octal bus transceiver. Designed for use in 3.3-V systems, it achieves high-speed operation while maintaining the CMOS low power dissipation.

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

The direction of data transmission is determined by the level of the DIR input. The enable input ($\overline{OE}$) can be used to disable the device so that the busses are effectively isolated.

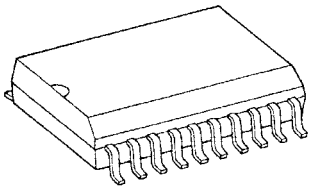
All inputs are equipped with protection circuits against static discharge.

TC74LCX245F



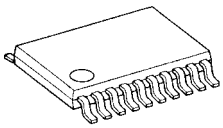
SOP20-P-300-1.27

TC74LCX245FW



SOL20-P-300-1.27

TC74LCX245FT



TSSOP20-P-0044-0.65

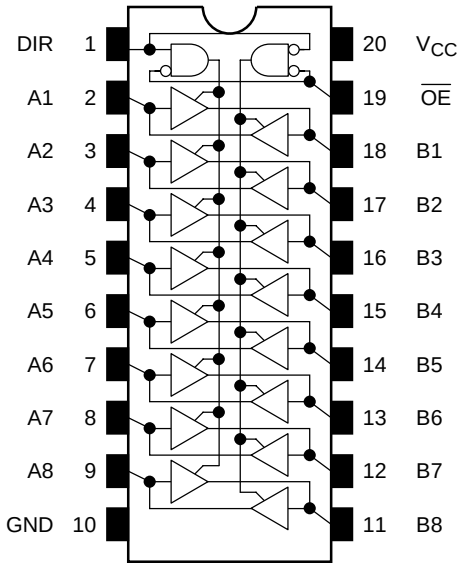
Weight
SOP20-P-300-1.27: 0.22 g (typ.)
SOL20-P-300-1.27: 0.46 g (typ.)
TSSOP20-P-0044-0.65: 0.08 g (typ.)

Features

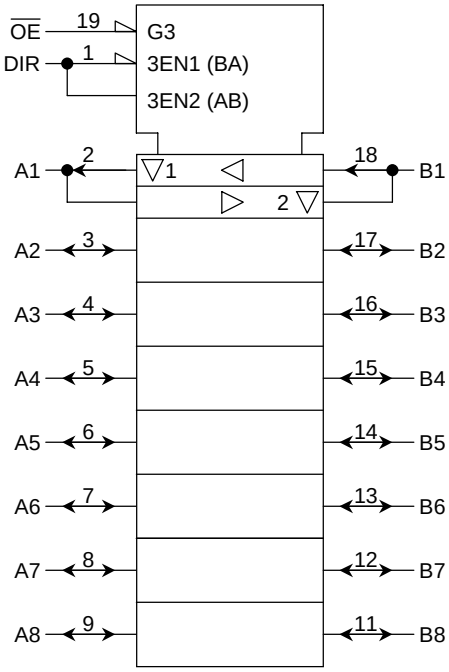
- Low-voltage operation: V_{CC} = 2.0 to 3.6 V
- High-speed operation: t_{pd} = 7.0 ns (max) (V_{CC} = 3.0 to 3.6 V)
- Ouput current: $|I_{OH}|/I_{OL}$ = 24 mA (min) (V_{CC} = 3.0 V)
- Latch-up performance: ±500 mA
- Available in JEDEC SOP, JEITA SOP and TSSOP
- Bidirectional interface between 5.0 V and 3.3 V signals
- Power-down protection provided on all inputs and outputs
- Pin and function compatible with the 74 series (74AC/VHC/HC/F/ALS/LS etc.) 245 type

Note: Do not apply a signal to any bus pins when it is in the output mode. Damage may result.
All floating (high impedance) bus pins must have their input levels fixed by means of pull-up or pull-down resistors.

Pin Assignment (top view)



IEC Logic Symbol



Truth Table

Inputs		Outputs	Function	
$\overline{OE}$	DIR		A-Bus	B-Bus
L	L	A = B	Output	Input
L	H	B = A	Input	Output
H	X	Z	Z	

X: Don’t care

Z: High impedance

Maximum Ratings

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	−0.5 to 7.0	V
DC input voltage (DIR, $\overline{OE}$)	V_{IN}	−0.5 to 7.0	V
DC bus I/O voltage	$V_{I/O}$	−0.5 to 7.0 (Note 1)	V
		−0.5 to 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 to 150	°C

Note 1: Output in OFF state

Note 2: High or low state. I_{OUT} absolute maximum rating must be observed.

Note 3: $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	2.0 to 3.6	V
		1.5 to 3.6 (Note 4)	
Input voltage (DIR, $\overline{OE}$)	V_{IN}	0 to 5.5	V
Bus I/O voltage	$V_{I/O}$	0 to 5.5 (Note 5)	V
		0 to V_{CC} (Note 6)	
Output current	I_{OH}/I_{OL}	±24 (Note 7)	mA
		±12 (Note 8)	
Operating temperature	T_{opr}	−40 to 85	°C
Input rise and fall time	dt/dv	0 to 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_{CC} = 3.0 to 3.6 V

Note 8: V_{CC} = 2.7 to 3.0 V

Note 9: V_{IN} = 0.8 to 2.0 V, V_{CC} = 3.0 V

Electrical Characteristics

DC Characteristics (Ta = –40 to 85°C)

Characteristics		Symbol	Test Condition		V_{CC} (V)	Min	Max	Unit
Input voltage	H-level	V_{IH}	—		2.7 to 3.6	2.0	—	V
	L-level	V_{IL}	—		2.7 to 3.6	—	0.8	
Output voltage	H-level	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = –100 μA	2.7 to 3.6	V_{CC} – 0.2	—	V
				I_{OH} = –12 mA	2.7	2.2	—	
				I_{OH} = –18 mA	3.0	2.4	—	
				I_{OH} = –24 mA	3.0	2.2	—	
	L-level	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 100 μA	2.7 to 3.6	—	0.2	
				I_{OL} = 12 mA	2.7	—	0.4	
				I_{OL} = 16 mA	3.0	—	0.4	
				I_{OL} = 24 mA	3.0	—	0.55	
Input leakage current		I_{IN}	V_{IN} = 0 to 5.5 V		2.7 to 3.6	—	±5.0	μA
3-state output OFF state current		I_{OZ}	V_{IN} = V_{IH} or V_{IL} V_{OUT} = 0 to 5.5 V		2.7 to 3.6	—	±5.0	μA
Power-off leakage current		I_{OFF}	V_{IN}/V_{OUT} = 5.5 V		0	—	10.0	μA
Quiescent supply current		I_{CC}	V_{IN} = V_{CC} or GND		2.7 to 3.6	—	10.0	μA
			V_{IN}/V_{OUT} = 3.6 to 5.5 V		2.7 to 3.6	—	±10.0	
Increase in I_{CC} per input		ΔI_{CC}	V_{IH} = V_{CC} – 0.6 V		2.7 to 3.6	—	500	

AC Characteristics (Ta = –40 to 85°C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
Propagation delay time	t_{pLH} t_{pHL}	Figure 1, Figure 2	2.7	—	8.0	ns
			3.3 ± 0.3	1.5	7.0	
Output enable time	t_{pZL} t_{pZH}	Figure 1, Figure 3	2.7	—	9.5	ns
			3.3 ± 0.3	1.5	8.5	
Output disable time	t_{pLZ} t_{pHZ}	Figure 1, Figure 3	2.7	—	8.5	ns
			3.3 ± 0.3	1.5	7.5	
Output to output skew	t_{osLH} t_{osHL}	(Note 10)	2.7	—	—	ns
			3.3 ± 0.3	—	1.0	

Note 10: Parameter guaranteed by design.
(t_{osLH} = $|t_{pLHm} - t_{pLHn}|$, t_{osHL} = $|t_{pHLm} - t_{pHLn}|$)

Dynamic Switching Characteristics
(Ta = 25°C, input: $t_r = t_f = 2.5$ ns, $C_L = 50$ pF, $R_L = 500\ \Omega$)

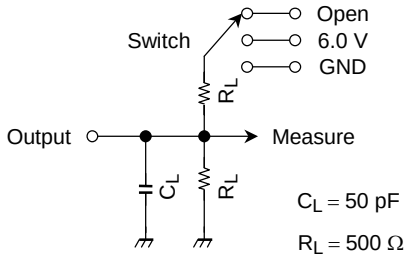
Characteristics	Symbol	Test Condition	V_{CC} (V)	Typ.	Unit
Quiet output maximum dynamic V_{OL}	V_{OLP}	V_{IH} = 3.3 V, V_{IL} = 0 V	3.3	0.8	V
Quiet output minimum dynamic V_{OL}	$\|V_{OLV}\|$	V_{IH} = 3.3 V, V_{IL} = 0 V	3.3	0.8	V

Capacitive Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Typ.	Unit
Input capacitance	C_{IN}	DIR, $\overline{OE}$	3.3	7	pF
Bus input capacitance	$C_{I/O}$	An, Bn	3.3	8	pF
Power dissipation capacitance	C_{PD}	f_{IN} = 10 MHz (Note 11)	3.3	25	pF

Note 11: C_{PD} 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:
$I_{CC\ (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8$ (per bit)

AC Test Circuit



Parameter	Switch
t_{pLH}, t_{pHL}	Open
t_{pLZ}, t_{pZL}	6.0 V
t_{pHZ}, t_{pZH}	GND

Figure 1

AC Waveform

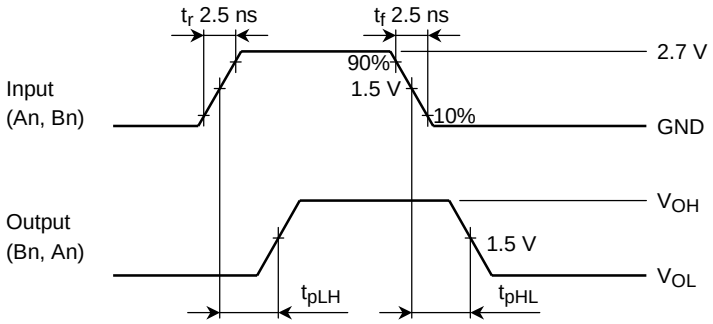


Figure 2 t_{pLH}, t_{pHL}

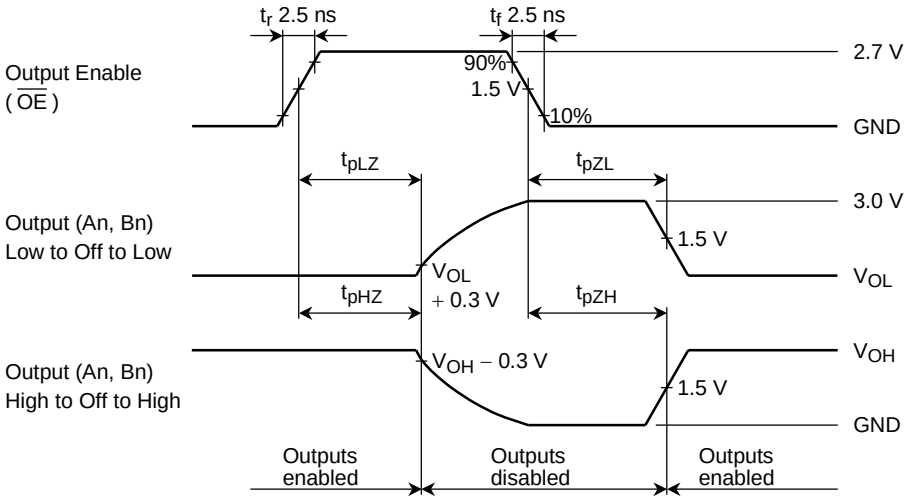
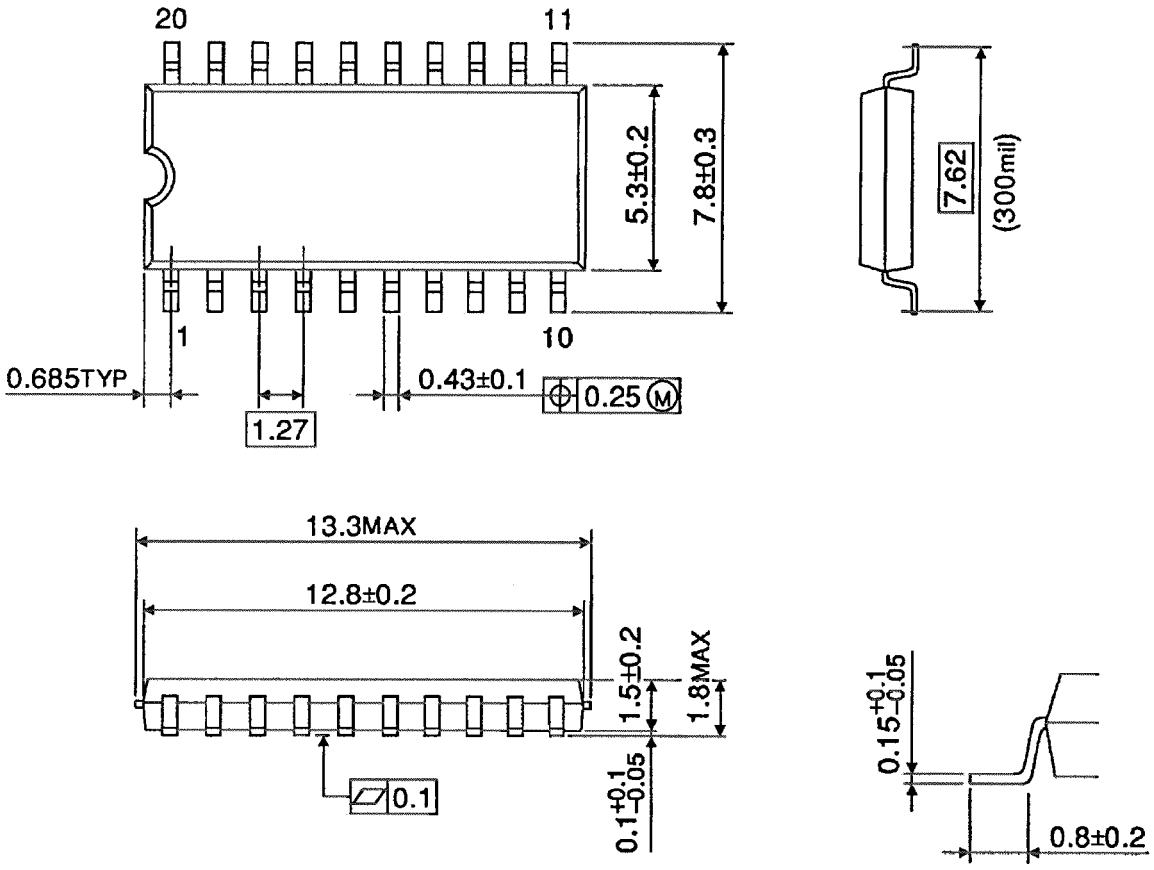


Figure 3 t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}

Package Dimensions

SOP20-P-300-1.27 Unit : mm

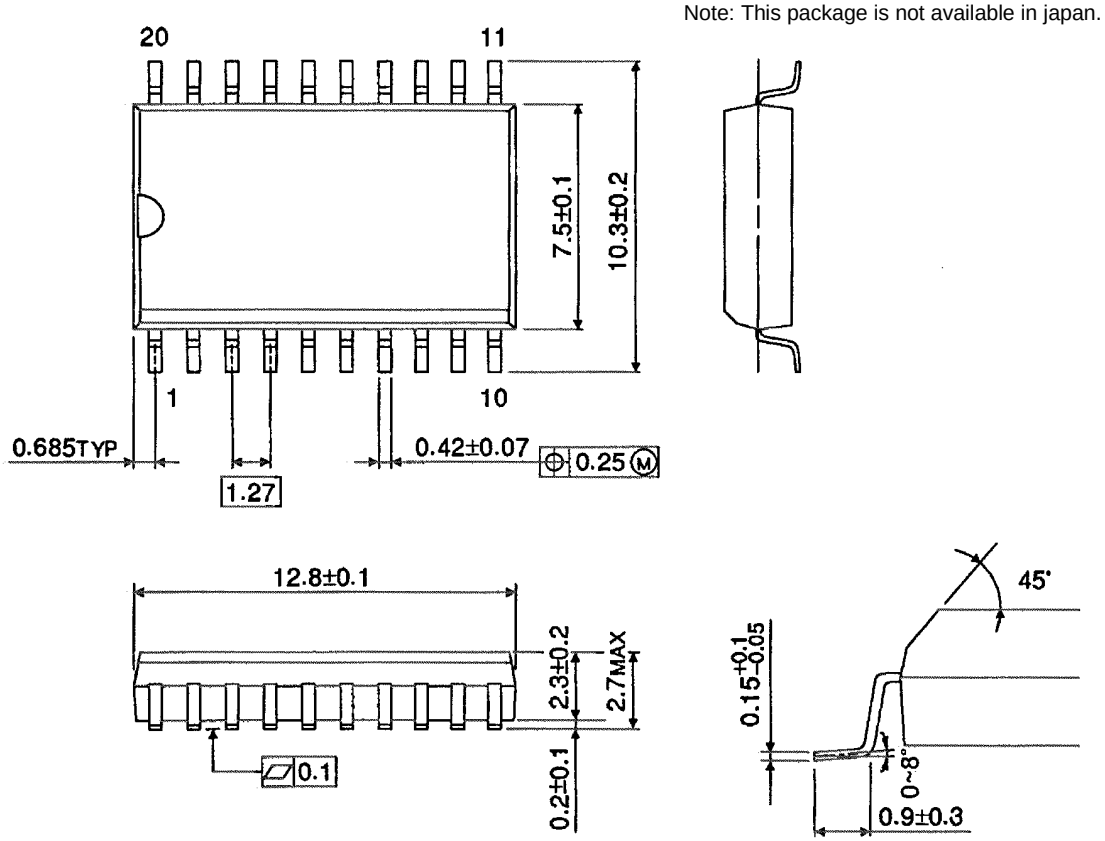


Weight: 0.22 g (typ.)

Package Dimensions

SOL20-P-300-1.27 Unit : mm

Note: This package is not available in japan.

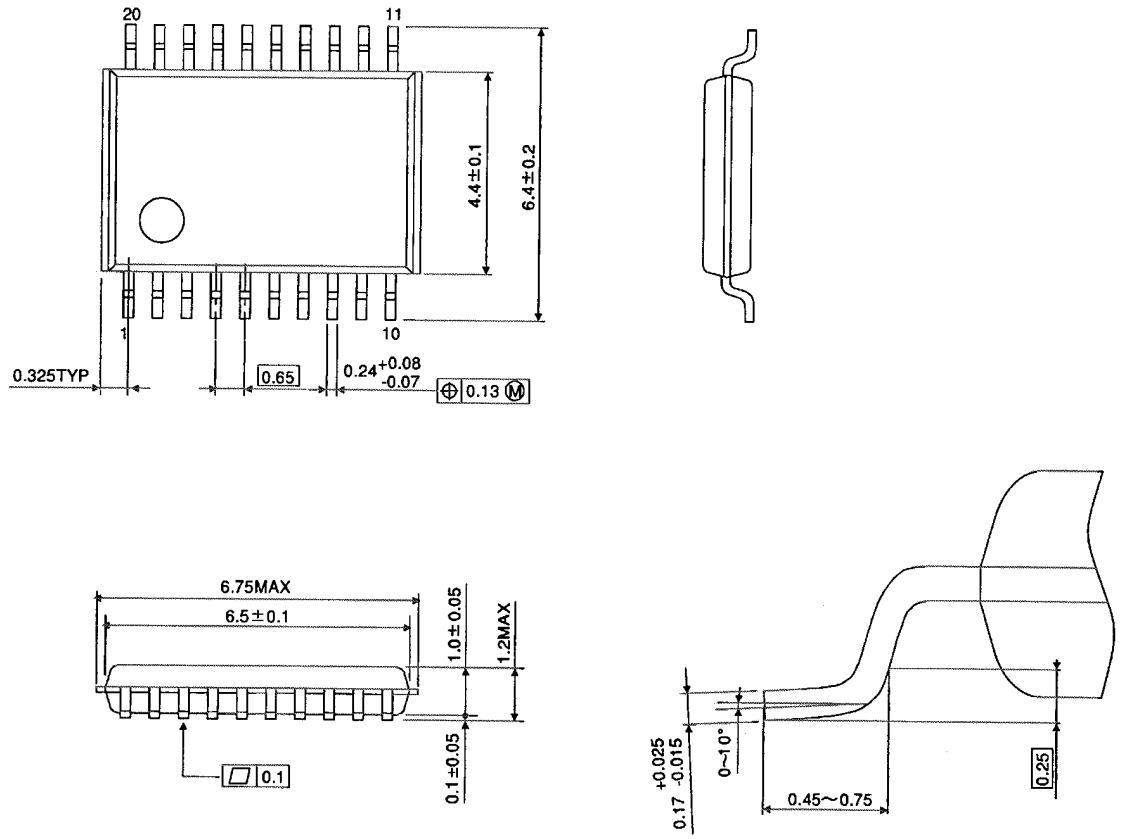


Weight: 0.46 g (typ.)

Package Dimensions

TSSOP20-P-0044-0.65

Unit : mm



Weight: 0.08 g (typ.)

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