TC74LCX245F/FW/FS

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

The TC74LCX245 is a high performance CMOS OCTAL BUS TRANSCEIVER. 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 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.

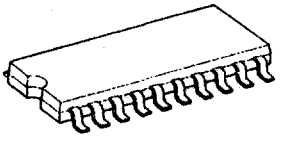
Features

- Low Voltage Operation: V_{CC} = 2.0 ~ 3.6V
- High Speed Operation: t_{pd} = 7.0ns (Max.) (V_{CC} = 3.0 ~ 3.6V)
- Output Current: $|I_{OH}|/I_{OL}$ = 24mA (Min.) (V_{CC} = 3.0V)
- Latch-up Performance: ±500mA
- Available in JEDEC SOP, EIAJ SOP and SSOP
- Bidirectional interface between 5V and 3.3V signals.
- 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.) 245 type.

(Note) Do not apply a signal to any bus terminal when it is in the output mode. Damage may result.

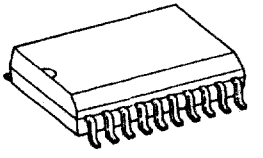
All floating (high impedance) bus terminals must have their input levels fixed by means of pull up or pull down resistors.

TC74LCX245F



SOP20-P-300

TC74LCX245FW

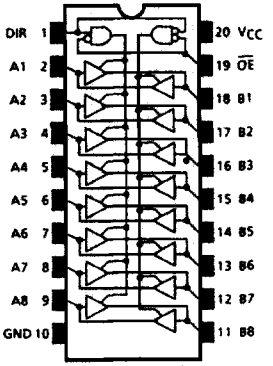


SOL20-P-300

TC74LCX245FS

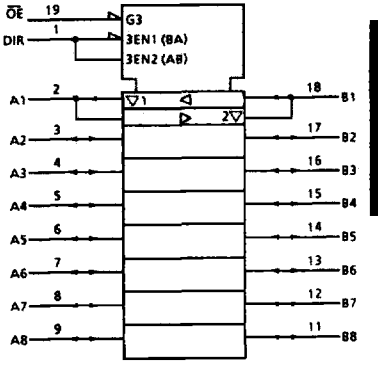
SSOP20-P-225A

Weight SOP20-P-300 : 0.22g (Typ.)
SOL20-P-300 : 0.46g (Typ.)
SSOP20-P-225A : 0.09g (Typ.)



(TOP VIEW)

Pin Assignment



IEC Logic Symbol

Truth Table

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

X: Don't Care
Z: High Impedance

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage Range	V_{CC}	-0.5 ~ 7.0	V
DC Input Voltage (DIR, $\overline{G}$)	V_{IN}	-0.5 ~ 7.0	V
DC Bus I/O Voltage	$V_{I/O}$	-0.5 ~ 7.0 (Note 1) -0.5 ~ V_{CC} + 0.5 (Note 2)	V
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) V_{CC} = 0V
(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

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	2.0 ~ 3.6 1.5 ~ 3.6 (Note 4)	V
Input Voltage (DIR, $\overline{OE}$)	V_{IN}	0 ~ 5.5	V
Bus I/O Voltage	$V_{I/O}$	0 ~ 5.5 (Note 5) 0 ~ V_{CC} (Note 6)	V
Output Current	I_{OH}/I_{OL}	±24 (Note 7) ±12 (Note 8)	mA
Operating Temperature	T_{opr}	-40 ~ 85	°C
Input Rise and Fall Time	dt/dv	0 ~ 10 (Note 9)	ns/V

(Note 4) Data Retension Only
(Note 5) Off-State
(Note 6) High or Low State
(Note 7) V_{CC} = 3.0 ~ 3.6V
(Note 8) V_{CC} = 2.7 ~ 3.0V
(Note 9) V_{IN} = 0.8 ~ 2.0V, V_{CC} = 3.0V

Electrical Characteristics

DC Characteristics (Ta = -40 ~ 85°C)

Parameter		Symbol	Test Condition		V_{CC} (V)	Min.	Max.	Unit
Input Voltage	"H" level	V_{IH}			2.7 ~ 3.6	2.0	–	V
	"L" level	V_{IL}			2.7 ~ 3.6	–	0.8	V
Output Voltage	"H" level	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = -100μA	2.7 ~ 3.6	V_{CC} - 0.2	–	V
				I_{OH} = -12mA	2.7	2.2	–	
				I_{OH} = -18mA	3.0	2.4	–	
				I_{OH} = -24mA	3.0	2.2	–	
	"L" level	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} =100μA	2.7 ~ 3.6	–	0.2	V
				I_{OL} =12mA	2.7	–	0.4	
				I_{OL} =16mA	3.0	–	0.4	
				I_{OL} = 24mA	3.0	–	0.55	
Input Leakage Current		I_{IN}	V_{IN} = 0 ~ 5.5V		2.7 ~ 3.6	–	±5.0	μA
3-State Output Off-State Current		I_{OZ}	V_{IN} = V_{IH} or V_{IL} V_{OUT} = 0 ~ 5.5V		2.7 ~ 3.6	–	±5.0	μA
Power Off Leakage Current		I_{OFF}	V_{IN}/V_{OUT} = 5.5V		0	–	10.0	μA
Quiescent Supply Current		I_{CC}	V_{IN} = V_{CC} or GND		2.7 ~ 3.6	–	10.0	μA
			V_{IN}/V_{OUT} = 3.6~5.5V		2.7 ~ 3.6	–	±10.0	
Increase in I_{CC} per Input		ΔI_{CC}	V_{IH} = V_{CC} - 0.6V		2.7 ~ 3.6	–	500	μA

AC Characteristics (Ta = -40 ~ 85°C)

Parameter	Symbol	Test Condition	V_{CC}(V)	Min.	Max.	Unit
Propagation Delay Time	t_{pLH} t_{pHL}	(Fig. 1, 2)	2.7	–	8.0	ns
			3.3±0.3	1.5	7.0	
Output Enable Time	tpZL tpZH	(Fig. 1, 3)	2.7	–	9.5	ns
			3.3±0.3	1.5	8.5	
Output Disable Time	tpLZ tpHZ	(Fig. 1, 3)	2.7	–	8.5	ns
			3.3±0.3	1.5	7.5	
Output to Output Skew	tosLH tosHL	(Note 10)	2.7	–	1.0	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 $t_r = t_f$ = 2.5ns, C_L = 50pF, R_L = 500Ω)

Parameter	Symbol	Test Condition	V_{CC}(V)	Typical	Unit
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	V_{IH} = 3.3V, V_{IL} = 0V	3.3	0.8	V
Quiet Output Minimum Dynamic V_{OL}	$\|V_{OLV}\|$	V_{IH} = 3.3V, V_{IL} = 0V	3.3	0.8	V

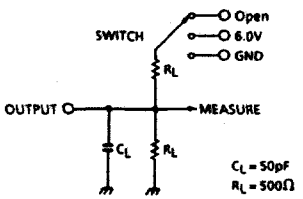
Capacitive Characteristics (Ta = 25°C)

Parameter	Symbol	Test Condition	V_{CC}(V)	Typical	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} = 10MHz (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 without load. Average operating current can be obtained by the equation: $I_{CC}(opr.) = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}/8$ (per bit)

TEST CIRCUIT

Fig.1



Parameter	Switch
tpLH, tpHL	Open
tpLZ, tpZL	6.0V
tpHZ, tpZH	GND

AC WAVEFORM

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

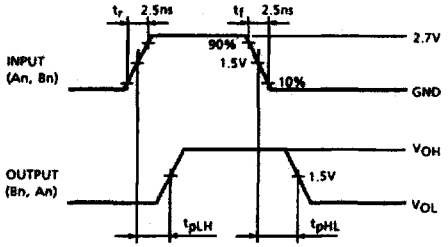
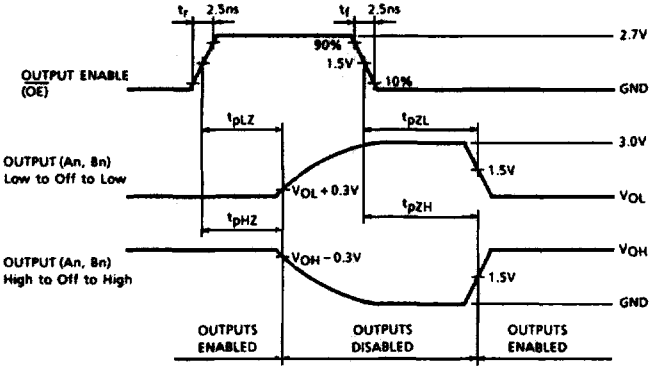


Fig.3 t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}



Notes

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