3.3 Volt CMOS 8-Bit Transceivers

QUALITY SEMICONDUCTOR, INC.

FEATURES/BENEFITS

- Pin and function compatible to the 74F245 74LVT245 and 74FCT245T
- Available in SOIC and QSOP
- Undershoot clamp diodes on all inputs
- Ground bounce controlled outputs
- Low power QCMOS: 0.03 μW typ static
- JEDEC spec compatible
- I_{OL} = 24 mA Com.
- TTL-compatible input and output levels
- Extended temperature –40°C to +85°C
- 2.7V to 3.6V Supply Voltage
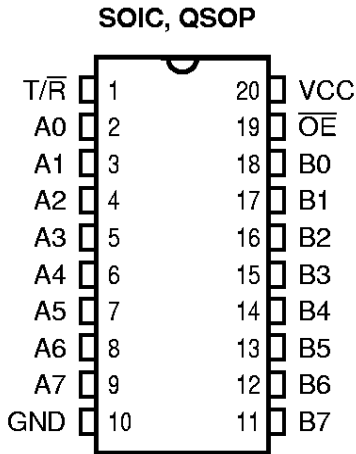- 25Ω series termination option

DESCRIPTION

The QSFCT3245 is an 8-bit non-inverting transceiver that has three-state outputs which are useful for bus-oriented applications. The Transmit/Receive ($T/\overline{R}$) input determines the direction of data flow, either from A to B or B to A, and the Output Enable ($\overline{OE}$) input enables the selected port for output. All inputs have clamp diodes for undershoot noise suppression and all outputs have ground bounce suppression (see QSI Application Note AN-001). Control pins can be driven by 3.3V or 5V components allowing voltage transition in mixed supply systems. Ultra-low power QCMOS technology makes this product ideal for portable computing systems or communications devices.

FUNCTIONAL BLOCK DIAGRAM

FCT32XXX Only

QS74FCT3245, 32245
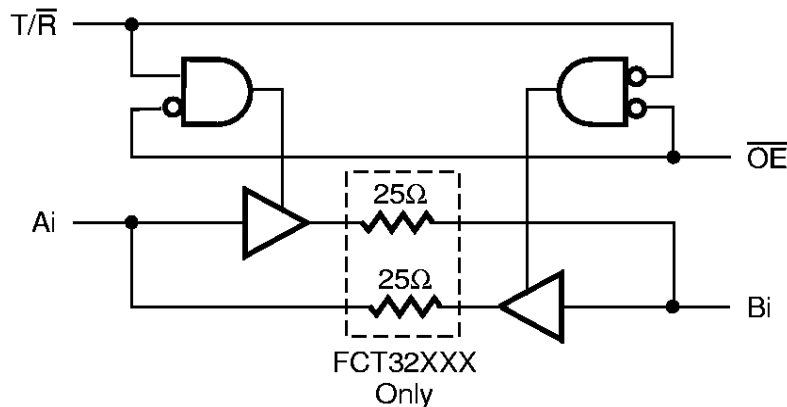
PIN CONFIGURATION
(All Pins Top View)
Note: For QVSOP, see QS74FCT2X3245 Datasheet (MDSL-00062)

SOIC, QSOP

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T/R̄  [ 1      20 ] VCC
A0   [ 2      19 ] OE̅
A1   [ 3      18 ] B0
A2   [ 4      17 ] B1
A3   [ 5      16 ] B2
A4   [ 6      15 ] B3
A5   [ 7      14 ] B4
A6   [ 8      13 ] B5
A7   [ 9      12 ] B6
GND  [ 10     11 ] B7
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PIN DESCRIPTION

Name	I/O	Description
Ai	I/O	Data Bus A
Bi	I/O	Data Bus B
T/R̄	I	Direction
OE̅	I	Output Enable

FUNCTION TABLE

OE̅	T/R̄	A	B	Function
H	X	Hi-Z	Hi-Z	Disable
L	L	Output	Input	Bus B to Bus A
L	H	Input	Output	Bus A to Bus B

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ABSOLUTE MAXIMUM RATINGS[1]

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Supply Voltage to Ground ................................................. −0.5V to +4.6V
DC Output Voltage VOUT (Including I/O Pins) ..... −0.5V to Vcc + 0.5V[2]
DC Input Voltage VIN(Except I/O Pins) ................... −0.5V to Vcc + 0.5V
AC Input Voltage (for a pulse width ≤ 20 ns) ................................ −3.0V
DC Input Diode Current with VIN < 0 ......................................... ±20 mA
DC Output Diode Current with VOUT < 0 .................................... ±50 mA
DC Output Current Max. Sink Current/Pin ................................. ±60 mA
Maximum Power Dissipation .................................................. 0.5 watts
TSTG Storage Temperature ............................................. −65° to +150°C
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Note:
1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to this device resulting in functional or reliability type failures.
2. Not to exceed 4.6V

CAPACITANCE

TA = 25°C, f = 1 MHz, VIN = 0V, VOUT = 0V

Pins	SOIC	QSOP	Unit
1, 19	4	4	pF
2-9, 11-18	8	8	pF

Note: Capacitance is characterized but not tested.

RECOMMENDED OPERATING CONDITIONS

Symbol	Description	Min	Max	Unit
Vcc	Supply Voltage	2.7	3.6	V
VIN	Input Voltage	0	Vcc	V
VOUT	Output Voltage	0	Vcc	V
TA	Ambient Operating Temperature	−40	+85	°C
Δt/ΔV	Input Transition Rise or Fall Rate [1]	0	8	ns/V

Notes:
1. As measured between 0.8V and 2V.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE
Recommended operating conditions apply unless otherwise specified.

| Symbol	Parameter	Test Conditions	Min	Typ[1]	Max	Unit
V_{IH}	Input HIGH Voltage	Input Pins	2.0	—	5.5	V
		I/O Pins	2.0	—	V_{CC}+0.5	V
V_{IL}	Input LOW Voltage	Input Pins	−0.5	—	0.8	V
ΔV_T	Input Hysterisis	$V_{TLH} - V_{THL}$ for All Inputs	—	0.2	—	V
| I_{IH} | | I_{IL} |	Input Current Input HIGH or LOW	V_{CC} = Max., $0 \le V_{IN} < V_{CC}$	—	—	1	μA
| I_{OZ} |	Off-State Output Current (Hi-Z)	V_{CC} = Max., $0 \le V_{IN} \le V_{CC}$	—	—	5	μA
I_{OS}	Short Circuit Current	V_{CC} = Max., V_{OUT} = GND[2,3]	−60	—	−225	mA
V_{IC}	Input Clamp Voltage	V_{CC} = Min., I_{IN} = −18 mA[3]	—	−0.7	—	V
V_{OH}	Output HIGH Voltage	$V_I = V_{IH}$ or V_{IL}, V_{CC} = Min, I_{OH} = −100 μA	V_{CC}−0.2	—	—	V
		$V_I = V_{IH}$ or V_{IL}, V_{CC} = 3V, I_{OH} = −8 mA	2.4	—	—	V
V_{OL}	Output LOW Voltage (FCT3245)	$V_I = V_{IH}$ or V_{IL}, V_{CC} = Min, I_{OL} = 100 μA	—	—	0.2	V
		$V_I = V_{IH}$ or V_{IL}, V_{CC} = 3V, I_{OL} = 16 mA	—	—	0.4	V
		$V_I = V_{IH}$ or V_{IL}, V_{CC} = 3V, I_{OL} = 24 mA	—	—	0.5	V
V_{OL}	Output LOW Voltage (FCT32245−25Ω)	$V_I = V_{IH}$ or V_{IL}, V_{CC} = 3V, I_{OL} = 8 mA	—	—	0.5	V
R_{OUT}	Output Resistance[4] (FCT32245−25Ω)	V_{CC} = 3V, I_{OL} = 8 mA	—	40	—	Ω

Notes:

1. Typical values indicate V_{CC} = 3.3V and T_A = 25°C.
2. Not more than one output should be shorted and the duration is ≤1 second.
3. These parameters are guaranteed by design but not tested.
4. R_{OUT} represents total output impedance and includes added series termination resistance.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]	Min	Typ	Max	Unit
Icc	Quiescent Power Supply Current	V_{CC} = Max., freq = 0 $0V \leq V_{IN} \leq 0.2V$ or V_{CC}-0.2V $\leq V_{IN} \leq V_{CC}$	—	0.01	20	µA
ΔIcc	Supply Current per Input @ TTL HIGH	V_{CC} = Max., freq = 0, V_{IN} = V_{CC} – 0.6V	—	1.0	20	µA
Qccd	Supply Current per Input per MHz	V_{CC} = Max., Outputs Open and Enabled One Bit Toggling @ 50% Duty Cycle Other Inputs at GND or V_{CC}[2,3]	—	40	85	µA/ MHz

Notes:

1. For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
2. For flip-flops, Qccd is measured by switching one of the data input pins so that the output changes every clock cycle. This is a measurement of device power consumption only and does not include power to drive load capacitance or tester capacitance. This parameter is guaranteed by design but not tested.
3. Ic can be computed using the above parameters as explained in the Technical Overview section.
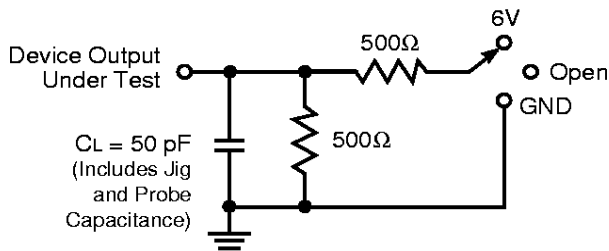
Test	Switch
tPHL/tPLH	Open
tPZL/tPLZ	6V
tPZH/tPHZ	GND

Load Circut for Outputs

Notes

1. Input pulse charateristics: 0V to 2.7V, tr = tf = 2.5 ns (10% to 90%), transition measured at 1.5V, pulse generator Z_{OUT} = 50Ω.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Recommended operating conditions apply unless otherwise specified.

Symbol	Description[1]	3245, 32245 (Vcc = 3.3V ± 0.3V)		3245A, 32245A (Vcc = 3.3V ± 0.3V)		Unit
		Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay Ai to Bi, FCT3245	1.5	7	1.5	4.6	ns
t_{PLH} t_{PHL}	Propagation Delay Ai to Bi, FCT32245	1.5	7	1.5	4.6	ns
t_{PZH} t_{PZL}	Output Enable $\overline{OE}$, T/$\overline{R}$ to A/B, FCT3245	1.5	9.5	1.5	6.2	ns
t_{PZH} t_{PZL}	Output Enable $\overline{OE}$, T/$\overline{R}$ to A/B, FCT32245	1.5	9.5	1.5	6.2	ns
t_{PLZ} t_{PHZ}	Disable Time[2]	1.5	7.5	1.5	5	ns

Notes:
1. Minimums guaranteed but not tested.
2. This parameter is guaranteed by design but not tested.
3. See Test Circuit and Waveforms.

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