

## QSFCT2X3245 PRELIMINARY

Q

## 3.3 Volt CMOS 16-Bit Tranceiver

QS74FCT2X3245

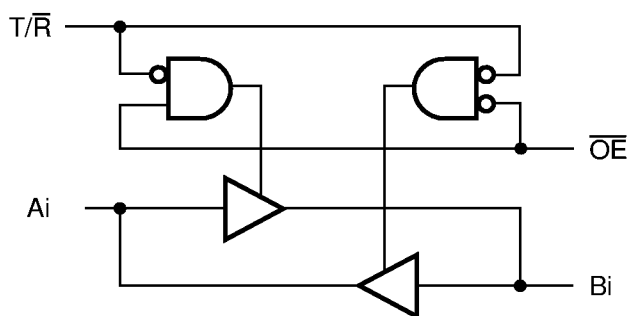
### FEATURES/BENEFITS

- Pin and function compatible to the QSFCT2X245
- Available in 40-pin QVSOP
- Undershoot clamp diodes on all inputs
- Ground bounce controlled outputs
- Low power QCMOS: 0.07  $\mu$ W typ static
- JEDEC low voltage spec compatible
- $I_{OL} = 24$  mA Com.
- TTL-compatible input and output levels
- Extended temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- 2.7V to 3.6V Supply Voltage

### DESCRIPTION

The FCT2X3245 is a 16-bit non-inverting transceiver that has three-state outputs which are useful for bus-oriented applications. The Transmit/Receive ( $T/\bar{R}$ ) input determines the direction of data flow, either from A-to-B or B-to-A, and 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. Ultra-low power QCMOS technology makes this product ideal for portable computing systems or communications devices.

### FUNCTIONAL BLOCK DIAGRAM



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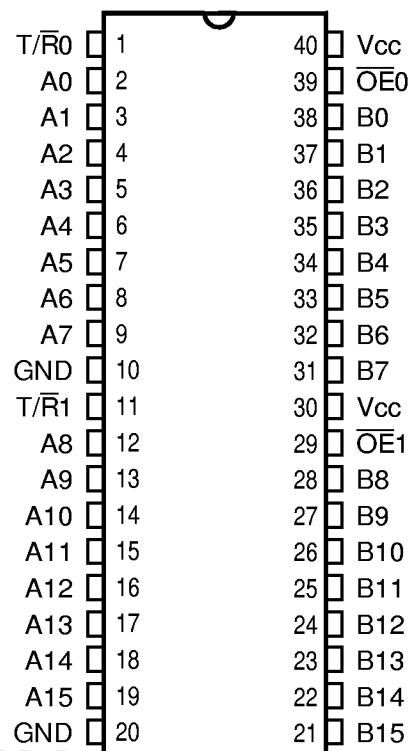
### PIN DISCRIPTION

Name	I/O	Description
Ai	I/O	Data Bus A
Bi	I/O	Data Bus B
T/ $\bar{R}$ 0	I	Direction A7-A0 $\leftrightarrow$ B7-B0
T/ $\bar{R}$ 1	I	Direction A15-A8 $\leftrightarrow$ B15-B8
$\overline{OE}$ 0	I	Output Enable A7-A0 $\leftrightarrow$ B7-B0
$\overline{OE}$ 1	I	Output Enable A15-A8 $\leftrightarrow$ B15-B8

### FUNCTION TABLE

$\overline{OE}$	T/ $\bar{R}$	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

### PIN CONFIGURATION ( All Pins Top View)



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### ABSOLUTE MAXIMUM RATINGS

Supply Voltage to Ground .....	-0.5V to +4.6V
DC Input/Output Voltage .....	-0.5V to V <sub>CC</sub> + 0.5V
DC Control Pin Voltage V <sub>IN</sub> .....	-0.5V to +7.0V
AC Input Voltage (for a pulse width $\leq$ 20 ns) .....	-3.0V
DC Input Diode Current with V <sub>IN</sub> < 0 .....	$\pm$ 20 mA
DC Output Diode Current with V <sub>OUT</sub> < 0 .....	$\pm$ 50 mA
DC Output Current Max. Sink Current/Pin .....	$\pm$ 60 mA
Maximum Power Dissipation .....	0.5 watts
T <sub>STG</sub> Storage Temperature .....	-65° to +150°C

**Note:** Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to this device resulting in functional or reliability type failures.

### CAPACITANCE

T<sub>A</sub> = 25°C, f = 1 MHz, V<sub>IN</sub> = 0V, V<sub>OUT</sub> = 0V

Pins	QVSOP Typ	Unit
1, 11, 29, 39	4	pF
2-9, 12-19, 21-28, 31-38	8	pF

**Note:** Capacitance is characterized but not tested.

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### RECOMMENDED OPERATING CONDITIONS

Symbol	Description	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage	2.7	3.6	V
V <sub>IN</sub>	Input Voltage	0	V <sub>CC</sub>	V
V <sub>OUT</sub>	Output Voltage	0	V <sub>CC</sub>	V
T <sub>A</sub>	Ambient Operating Temperature	-40	+85	°C
Δt/ΔV	Input Transition Rise or Fall Rate <sup>(1)</sup>	0	8	ns/V

**Notes:**

- 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 <sup>(1)</sup>	Max	Unit
V <sub>IH</sub>	Input HIGH Voltage	Input Pins	2.0	—	5.5	V
		I/O Pins	2.0	—	V <sub>CC</sub> +0.5	V
V <sub>IL</sub>	Input LOW Voltage	Input Pins	-0.5	—	0.8	V
ΔV <sub>T</sub>	Input Hysteresis	V <sub>TLH</sub> – V <sub>THL</sub> for All Inputs	—	0.2	—	V
I <sub>IH</sub>     I <sub>IL</sub>	Input Current Input HIGH or LOW	V <sub>CC</sub> = Max., 0 ≤ V <sub>IN</sub> < V <sub>CC</sub>	—	—	1	μA
I <sub>OZ</sub>	Off-State Output Current (Hi-Z)	V <sub>CC</sub> = Max., 0 ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>	—	—	5	μA
I <sub>OS</sub>	Short Circuit Current	V <sub>CC</sub> = Max., V <sub>OUT</sub> = GND <sup>(2,3)</sup>	-60	—	-225	mA
V <sub>IC</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min., I <sub>IN</sub> = -18 mA <sup>(3)</sup>	—	-0.7	—	V
V <sub>OH</sub>	Output HIGH Voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>CC</sub> = Min, I <sub>OH</sub> = -100 μA	V <sub>CC</sub> -0.2	—	—	V
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>CC</sub> = 3V, I <sub>OH</sub> = -8 mA	2.4	—	—	
V <sub>OL</sub>	Output LOW Voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>CC</sub> = Min, I <sub>OL</sub> = 100 μA	—	—	0.2	V
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>CC</sub> = 3V, I <sub>OL</sub> = 16 mA	—	—	0.4	V
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>CC</sub> = 3V, I <sub>OL</sub> = 24 mA	—	—	0.5	V

**Notes:**

- Typical values indicate V<sub>CC</sub> = 3.3V and T<sub>A</sub> = 25°C.
- Not more than one output should be shorted and the duration is ≤1 second.
- These parameters are guaranteed by design but not tested.

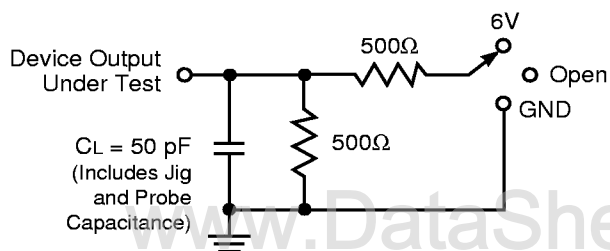
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### POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Min	Typ	Max	Unit
I <sub>cc</sub>	Quiescent Power Supply Current	V <sub>cc</sub> = Max., freq = 0 0V ≤ V <sub>IN</sub> ≤ 0.2V or V <sub>cc</sub> -0.2V ≤ V <sub>IN</sub> ≤ V <sub>cc</sub>	—	0.02	40	μA
ΔI <sub>cc</sub>	Supply Current per Input @ TTL HIGH	V <sub>cc</sub> = Max., freq = 0, V <sub>IN</sub> = V <sub>cc</sub> - 0.6V	—	1.0	20	μA
Q <sub>CCD</sub>	Supply Current per Input per MHz	V <sub>cc</sub> = Max., Outputs Open and Enabled One Bit Toggling @ 50% Duty Cycle Other Inputs at GND or V <sub>cc</sub> <sup>(2,3)</sup>	—	40	85	μA/ MHz

#### Notes:

- For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
- Q<sub>CCD</sub> 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.
- I<sub>c</sub> can be computed using the above parameters as explained in the Technical Overview section.



Test	Switch
t <sub>PHL</sub> /t <sub>PLH</sub>	Open
t <sub>PZL</sub> /t <sub>PLZ</sub>	6V
t <sub>PZH</sub> /t <sub>PHZ</sub>	GND

**Load Circuit for Outputs**

#### Notes

- Input pulse characteristics: 0V to 2.7V, t<sub>r</sub> = t<sub>f</sub> = 2.5 ns (10% to 90%), transition measured at 1.5V, pulse generator Z<sub>OUT</sub> = 50Ω.

### SWITCHING CHARACTERISTICS OVER OPERATING RANGE

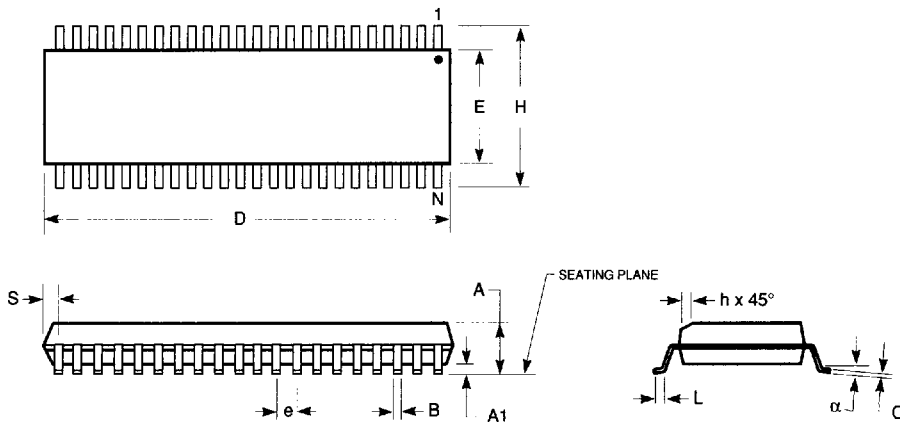
Commercial T<sub>A</sub> = 0°C to 70°C, V<sub>cc</sub> = 3.3V ± 0.3V

C<sub>LOAD</sub> = 50 pF, R<sub>LOAD</sub> = 500Ω unless otherwise noted.

Symbol	Description <sup>(1)</sup>	2X3245		2X3245A		Unit
		Min	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A <sub>i</sub> to B <sub>i</sub>	1.5	7	1.5	4.6	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable $\overline{OE}$ , T/ $\overline{R}$ to A/B	1.5	9.5	1.5	6.2	ns
t <sub>PLZ</sub> t <sub>PHZ</sub>	Disable Time <sup>(2)</sup>	1.5	7.5	1.5	5	ns

#### Notes:

- Minimums are guaranteed but not tested.
- This parameter is guaranteed by design but not tested.
- See Test Circuit and Waveforms.

**150-MIL QVSOP™ - Package Code Q1/Q2  
150-Mil Wide Plastic Small Outline Gull-Wing**


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JEDEC#	MO-154BB			MO-154AB		
DWG#	PSS-40A (Q2)			PSS-48A (Q1)		
Symbol	Min	Nom	Max	Min	Nom	Max
A	0.059	0.065	0.069	0.059	0.065	0.069
A1	0.004	0.006	0.008	0.004	0.006	0.008
B	0.0067	0.008	0.009	0.0051	0.0063	0.008
C	0.0075	0.008	0.0098	0.0075	0.008	0.0098
D	0.386	0.390	0.394	0.386	0.390	0.394
E	0.150	0.154	0.157	0.150	0.154	0.157
e	0.0197 BSC, 0.5mm			0.0157 BSC, 0.4mm		
H	0.228	0.236	0.244	0.228	0.236	0.244
h	0.010	0.013	0.016	0.010	0.013	0.016
L	0.020	0.024	0.030	0.020	0.024	0.030
N	40			48		
α	0°	5°	8°	0°	5°	8°
S	0.006	0.008	0.010	0.012	0.014	0.016

**Notes:**

1. Refer to applicable symbol list.
2. All dimensions are in inches.
3. N is the number of lead positions.
4. Dimensions D and E are to be measured at maximum material condition but do not include mold flash. Allowable mold flash is 0.006in. per side.
5. Lead coplanarity is 0.003in. maximum.

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