



# High-Speed CMOS 8-Bit Tranceivers

QS54/74FCT245T  
QS54/74FCT2245T

## FEATURES/BENEFITS

- Pin and function compatible to the 74F245, 74FCT245/645 and 74ABT245
- Industrial temperature  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$
- CMOS power levels:  $<7.5\text{mW}$  static
- Available in DIP, SOIC, QSOP, ZIP, HQSOP
- Undershoot clamp diodes on all inputs
- TTL-compatible input and output levels
- Ground bounce controlled outputs
- Reduced output swing of 0-3.5V
- Military product compliant to MIL-STD-883, Class B

### FCT-T 245T

- JEDEC-FCT spec compatible
- Std., A, C, and D speed grades;  $3.8\text{ns}$   $t_{\text{PD}}$  for D
- $I_{\text{OL}} = 64\text{mA}$  Ind.,  $48\text{mA}$  Mil.

### FCT-T 2245T

- Built-in  $25\Omega$  series resistor outputs reduce reflection and other system noise
- Std., A, and C speed grades;  $4.1\text{ns}$   $t_{\text{PD}}$  for C
- $I_{\text{OL}} = 12\text{mA}$  Ind.

## DESCRIPTION

The QSFCT245 and QSFCT2245 are 8-bit non-inverting transceivers that have three-state outputs which are useful for bus-oriented applications. The Transmit/Receive ( $\overline{\text{T/R}}$ ) input determines the direction of data flow, either from A to B or B to A, and the Output Enable ( $\overline{\text{OE}}$ ) input enables the selected port for output. The FCT2245 is a  $25\Omega$  resistor output version useful for driving transmission lines and reducing system noise. The 2245 parts can replace the 245 series to reduce noise in an existing design. All inputs have clamp diode for undershoot noise suppression. All outputs have ground bounce suppression (see QSI Application Note AN-001), and outputs will not load an active bus when  $V_{\text{CC}}$  is removed from the device.

Figure 1. Functional Block Diagram

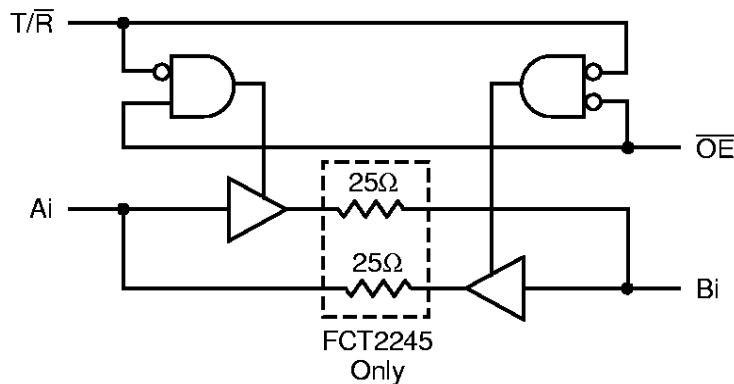


Figure 2. Pin Configurations (All Pins Top View)

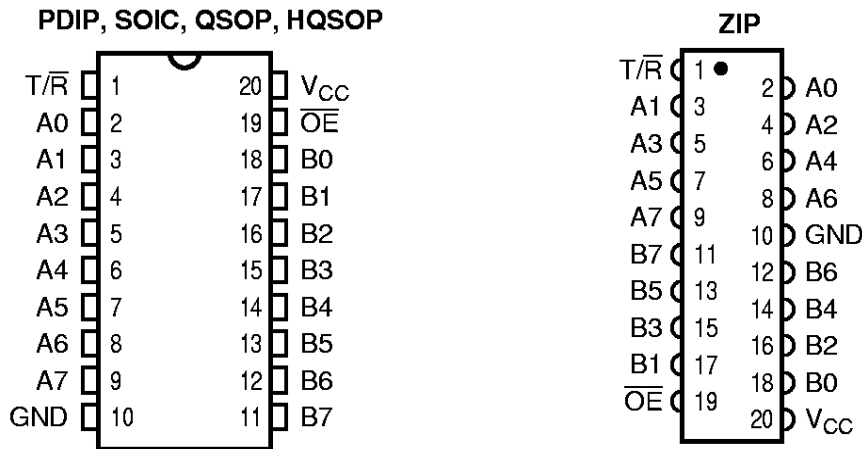


Table 1. Pin Description

Name	I/O	Description
A <sub>i</sub>	I/O	Data Bus A
B <sub>i</sub>	I/O	Data Bus B
T/ $\bar{R}$	I	Direction
$\overline{OE}$	I	Output Enable

Table 2. 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

**Table 3. Absolute Maximum Ratings**

Supply Voltage to Ground.....	-0.5V to 7.0V
DC Output Voltage $V_{OUT}$ .....	-0.5V to 7.0V
DC Input Voltage $V_{IN}$ .....	-0.5V to 7.0V
AC Input Voltage (for a pulse width $\leq 20$ ns).....	-3.0V
DC Input Diode Current with $V_{IN} < 0$ .....	-20mA
DC Output Diode Current with $V_{OUT} < 0$ .....	-50mA
DC Output Current Max. Sink Current/Pin.....	120mA
Maximum Power Dissipation.....	0.5 watts
$T_{STG}$ Storage Temperature.....	-65° to 150°C

**Note:** Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to QSI devices that result in functional or reliability type failures.

**Table 4. Capacitance<sup>(1)</sup>**

$T_A = 25^\circ\text{C}$ ,  $f = 1\text{MHz}$ ,  $V_{IN} = 0\text{V}$ ,  $V_{OUT} = 0\text{V}$

Pins <sup>(2)</sup>	SOIC	QSOP	PDIP	ZIP	Unit
1, 19	4	4	5	7	pF
2-9, 11-18	8	8	9	10	pF

**Notes:**

1. Capacitance is characterized but not tested.
2. Pin reference for 20-pin package.

**Table 5. Power Supply Characteristics**

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Min	Max	Unit
$I_{CC}$	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$ , freq = 0 $0\text{V} \leq V_{IN} \leq 0.2\text{V}$ or $V_{CC}-0.2\text{V} \leq V_{IN} \leq V_{CC}$	—	1.5	mA
$\Delta I_{CC}$	Supply Current per Input @ TTL HIGH	$V_{CC} = \text{Max.}$ , $V_{IN} = 3.4\text{V}$ , freq = 0 <sup>(2)</sup>	—	2.0	mA
$Q_{CCD}$	Supply Current per Input per MHz	$V_{CC} = \text{Max.}$ , Outputs Open and Enabled One Bit Toggling @ 50% Duty Cycle Other Inputs at GND or $V_{CC}$ <sup>(3,4)</sup>	—	0.25	mA/ MHz

**Notes:**

1. For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
2. Per TTL driven input ( $V_{IN} = 3.4\text{V}$ ).
3. For flip-flops,  $Q_{CCD}$  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.
4.  $I_C$  can be computed using the above parameters as explained in the Technical Overview section.

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**Table 6. DC Electrical Characteristics Over Operating Range**

Industrial  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 5\%$

Military  $T_A = -55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

Symbol	Parameter	Test Conditions	Min	Typ <sup>(1)</sup>	Max	Unit
$V_{IH}$	Input HIGH Voltage	Logic HIGH for All Inputs	2.0	—	—	V
$V_{IL}$	Input LOW Voltage	Logic LOW for All Inputs	—	—	0.8	V
$\Delta V_T$	Input Hysteresis	$V_{TLH} - V_{THL}$ for All Inputs	—	0.2	—	V
$ I_{IH} $ $ I_{IL} $	Input Current Input HIGH or LOW	$V_{CC} = \text{Max.}, 0 \leq V_{IN} < V_{CC}$	—	—	5	$\mu\text{A}$
$ I_{OZ} $	Off-State Output Current (Hi-Z)	$V_{CC} = \text{Max.}, 0 \leq V_{IN} \leq V_{CC}$	—	—	5	$\mu\text{A}$
$I_{OS}$	Short Circuit Current (FCT245)	$V_{CC} = \text{Max.}, V_{OUT} = \text{GND}^{(2,3)}$	-60	—	—	mA
$I_{OR}$	Current Drive (FCT2245 – 25 $\Omega$ )	$V_{CC} = \text{Min.}, V_{OUT} = 2.0\text{V}^{(3)}$	50	—	—	mA
$V_{IC}$	Input Clamp Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}, T_A = 25^{\circ}\text{C}^{(3)}$	—	-0.7	-1.2	V
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}$ $I_{OH} = -12\text{mA}$ (MIL) $I_{OH} = -15\text{mA}$ (IND)	2.4 2.4	— —	— —	V
$V_{OL}$	Output LOW Voltage (FCT245)	$V_{CC} = \text{Min.}$ $I_{OL} = 48\text{mA}$ (MIL) $I_{OL} = 64\text{mA}$ (IND)	— —	— —	0.55 0.55	V
$V_{OL}$	Output LOW Voltage (FCT2245 – 25 $\Omega$ )	$V_{CC} = \text{Min.}$ $I_{OL} = 12\text{mA}$ (MIL) $I_{OL} = 12\text{mA}$ (IND)	— —	— —	0.50 0.50	V
$R_{OUT}$	Output Resistance (FCT2245 – 25 $\Omega$ )	$V_{CC} = \text{Min.}$ $I_{OL} = 12\text{mA}$ (MIL) $I_{OL} = 12\text{mA}$ (IND)	— 20	25 28	— 40	$\Omega$

**Notes:**

1. Typical values indicate  $V_{CC} = 5.0\text{V}$  and  $T_A = 25^{\circ}\text{C}$ .
2. Not more than one output should be shorted and the duration is  $\leq 1$  second.
3. These parameters are guaranteed by design but not tested.

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**Table 7. Switching Characteristics Over Operating Range**

Industrial  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 5\%$

Military  $T_A = -55^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

$C_{LOAD} = 50\text{pF}$ ,  $R_{LOAD} = 500\Omega$  unless otherwise noted.

Symbol	Description <sup>(1)</sup>		245 2245		245A 2245A		245C 2245C		245D		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
$t_{PHL}$	Propagation Delay	IND	1.5	7	1.5	4.6	1.5	4.1	1.5	3.8	ns
$t_{PLH}$	Ai to/from Bi (245)	MIL	1.5	7.5	1.5	4.9	1.5	4.5	—	—	
$t_{PHL}$	Propagation Delay	IND	1.5	7	1.5	4.6	1.5	4.1	—	—	ns
$t_{PLH}$	Ai to/from Bi (2245)	MIL	1.5	7.5	1.5	4.9	1.5	4.5	—	—	
$t_{PZH}$	Output Enable Time	IND	1.5	9.5	1.5	6.2	1.5	5.8	1.5	5.6	ns
$t_{PZL}$	$\overline{OE}$ , $T/\overline{R}$ to A/B (245)	MIL	1.5	10	1.5	6.5	1.5	6.2	—	—	
$t_{PZH}$	Output Enable Time	IND	1.5	9.5	1.5	6.2	1.5	5.8	—	—	ns
$t_{PZL}$	$\overline{OE}$ , $T/\overline{R}$ to A/B (2245)	MIL	1.5	10	1.5	6.5	1.5	6.2	—	—	
$t_{PHZ}$	Output Disable Time	IND <sup>(2)</sup>	1.5	7.5	1.5	5	1.5	4.5	1.5	4.5	ns
$t_{PLZ}$	$\overline{OE}$ , $T/\overline{R}$ to A/B	MIL <sup>(2)</sup>	1.5	10	1.5	6	1.5	5.2	—	—	

**Notes:**

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