



QUALITY
SEMICONDUCTOR, INC.

QS74FCT163240

High Speed CMOS 3.3V 16-Bit Buffers/Line Drivers

QS74FCT163240

FEATURES/BENEFITS

- Pin and function compatible with T.I. Widebus™ and IDT Double-Density™ families
- CMOS power levels: $<1 \mu\text{W}$ typical standby
- SSOP (PV) and TSSOP (PA) packages
- Low output skew: $0.5 \text{ ns } t_{\text{SK}(O)}$
- Flow-through pinout for easy layout
- Extended commercial temperature: -40°C to $+85^\circ\text{C}$
- Extended 3.3V supply range 2.7V to 3.6V
- JEDEC compatible LVTTTL output levels for 3.3V
- Input hysteresis for noise immunity
- Multiple power and ground pins for low noise
- 5V tolerant inputs for 5V to 3.3V translation

DESCRIPTION

The FCT163240 is a 16-bit bus interface buffer with three-state output that is ideal for driving address and data buses. Output enables are used to enable or disable A and B ports by placing them in a high impedance condition. Easy board layout is facilitated by the use of flow-through pinouts and byte enable controls provide architectural flexibility for systems designers. All outputs have ground bounce suppression circuitry (See QSI Application Note AN-01). Multiple power and ground pins result in low ground and V_{CC} bounce. This JEDEC LVTTTL compliant 3.3V device is useful for 5V to 3.3V buffering applications, since all inputs will support 5V signals.

Figure 1. Functional Diagram

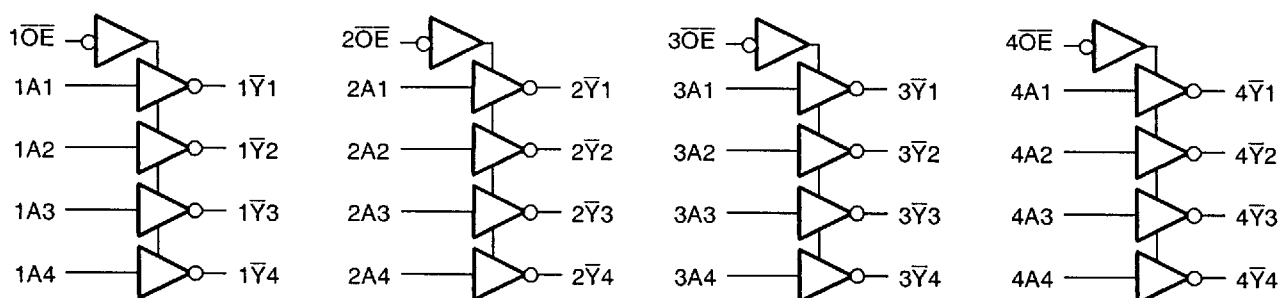


Figure 2. Pin Configuration (All Pins Top View)

SSOP, TSSOP

1 $\overline{OE}$	1	48	2 $\overline{OE}$
1 $\overline{Y}$ 1	2	47	1A1
1 $\overline{Y}$ 2	3	46	1A2
GND	4	45	GND
1 $\overline{Y}$ 3	5	44	1A3
1 $\overline{Y}$ 4	6	43	1A4
V _{CC}	7	42	V _{CC}
2 $\overline{Y}$ 1	8	41	2A1
2 $\overline{Y}$ 2	9	40	2A2
GND	10	39	GND
2 $\overline{Y}$ 3	11	38	2A3
2 $\overline{Y}$ 4	12	37	2A4
3 $\overline{Y}$ 1	13	36	3A1
3 $\overline{Y}$ 2	14	35	3A2
GND	15	34	GND
3 $\overline{Y}$ 3	16	33	3A3
3 $\overline{Y}$ 4	17	32	3A4
V _{CC}	18	31	V _{CC}
4 $\overline{Y}$ 1	19	30	4A1
4 $\overline{Y}$ 2	20	29	4A2
GND	21	28	GND
4 $\overline{Y}$ 3	22	27	4A3
4 $\overline{Y}$ 4	23	26	4A4
4 $\overline{OE}$	24	25	3 $\overline{OE}$

Table 1. Pin Description

Name	Description
x $\overline{OE}$	3-State Output Enable Inputs
xAx	Data Inputs
x $\overline{Y}$ x	3-State Outputs

Table 2. Function Table

Inputs		Outputs
x $\overline{OE}$	xAx	x $\overline{Y}$ x
L	L	H
L	H	L
H	X	Hi-Z

Table 3. Capacitance

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

Symbol	Parameter	Typ	Unit
C_{IN}	Input Capacitance	7.0	pF
C_{OUT}	Output Capacitance	8.0	pF

Note: Capacitance is characterized but not production tested.

Table 4. Absolute Maximum Ratings

Supply Voltage to Ground	-0.5V to +4.6V
DC Output Voltage V_{OUT}	-0.5V to $V_{CC} + 0.5\text{V}$
DC Input Voltage V_{IN}	-0.5V to +7.0V
AC Input Voltage (for a pulse width $\leq 20\text{ ns}$)	-3.0V
DC Input Diode Current with $V_{IN} < 0$	-20 mA
DC Output Diode Current with $V_{OUT} < 0$	-50 mA
DC Output Current Max. Sink Current/Pin	120 mA
T_{STG} 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.

Table 5. Recommended Operating Conditions

Symbol		Min	Max	Unit
V_{CC}	Supply Voltage	2.7	3.6	V
V_{IN}	Input Voltage	-0.5	5.5	V
V_{OUT}	Voltage Applied to Output or I/O	0	V_{CC}	V
$\Delta t/\Delta v$	Input Transition Slew Rate	—	10	ns/V
T_A	Operating Free Air Temperature	-40	+85	°C

Table 6. DC Electrical Characteristics Over Operating Range

Recommended Operating Ranges apply unless otherwise noted.

Symbol	Parameter	Test Conditions ⁽¹⁾	Min	Typ ⁽²⁾	Max	Unit
V_{IH}	Input HIGH Voltage	Logic HIGH for All Inputs	2.0	—	5.5	V
V_{IL}	Input LOW Voltage	Logic LOW for All Inputs	-0.5	—	0.8	V
ΔV_T	Input Hysteresis ⁽⁴⁾	$V_{TLH} - V_{THL}$ for All Inputs	—	150	—	mV
$ I_{IH} $ $ I_{IL} $	Input Current Input HIGH or LOW	$V_{CC} = \text{Max.}, 0 \leq V_{IN} < 5.5V$	—	—	1	μA
$ I_{OZ} $	Off-State Output Current (Hi-Z)	$V_{CC} = \text{Max.}, 0 \leq V_{OUT} \leq V_{CC}$	—	—	1	μA
I_{OS}	Short Circuit Current ^(3,4)	$V_{CC} = \text{Max.}, V_{OUT} = \text{GND}$	-60	-140	-240	mA
V_{OH}	Output HIGH Voltage	$V_{CC} = 2.7V$ $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -0.1 \text{ mA}$ $I_{OH} = -3.0 \text{ mA}$	$V_{CC} - 0.2$ 2.4	— —	— —	V
		$V_{CC} = 3.0V$ $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -8 \text{ mA}$	2.4	—	—	V
V_{OL}	Output LOW Voltage	$V_{CC} = 2.7V$ $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 0.1 \text{ mA}$ $I_{OL} = 16 \text{ mA}$ $I_{OL} = 24 \text{ mA}$	— — —	— — —	0.2 0.4 0.55	V
		$V_{CC} = 3.0V$ $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 24 \text{ mA}$	—	—	0.5	V
V_{IK}	Input Clamp Voltage ⁽⁴⁾	$V_{CC} = \text{Min.}, I_{IN} = -18 \text{ mA}$	—	-0.7	-1.2	V

Notes:

1. For conditions shown as Max or Min use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values indicate $V_{CC} = 3.3V$ and $T_A = 25^\circ C$.
3. Not more than one output should be shorted at one time. Duration of test should not exceed one second.
4. These parameters are guaranteed by design but not production tested.

Table 7. Power Supply Characteristics

Symbol	Parameter	Test Conditions ⁽¹⁾		Typ ⁽²⁾	Max	Unit
I _{CC}	Quiescent Power Supply Current	V _{CC} = Max., Freq = 0 V _{IN} = GND or V _{CC}		0.1	10	μA
ΔI _{CC}	Supply Current per Input @ TTL HIGH	V _{CC} = Max., V _{IN} = V _{CC} - 0.6V ⁽³⁾		2.0	30	μA
I _{CCD}	Supply Current per Input per MHz ⁽⁴⁾	V _{CC} = Max., Outputs Open One Bit Toggling @ 50% Duty Cycle xOE = GND		50	75	μA/ MHz
I _C	Total Power Supply Current ⁽⁶⁾	V _{CC} = Max., Outputs Open One Bit Toggling @ 50% Duty Cycle xOE = GND, f _I = 10 MHz	V _{IN} = V _{CC} - 0.6V V _{IN} = GND	0.5 ⁽⁵⁾	0.8 ⁽⁵⁾	mA
		V _{CC} = Max., Outputs Open Sixteen Bits Toggling @ 50% Duty Cycle xOE = GND, f _I = 2.5 MHz	V _{IN} = V _{CC} - 0.6V V _{IN} = GND			

Notes:

- For conditions shown as Min. or Max., use the appropriate values specified under Recommended Operating Conditions for applicable device type.
- Typical values are at $V_{CC} = 3.3\text{V}$, $+25^\circ\text{C}$ ambient.
- Per TTL driven input. All Other Inputs at V_{CC} or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed by design but not tested.
- $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} = I_{\text{DYNAMIC}}$
 $I_C = I_{CCQ} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP} N_{CP}/2 + f_I N_I)$
 $I_{CCQ} = \text{Quiescent Current } (I_{CCL}, I_{CCH}, \text{ and } I_{CCZ})$
 $\Delta I_{CC} = \text{Power Supply Current for a TTL-High Input } (V_{IN} = V_{CC} - 0.6\text{V})$
 $D_H = \text{Duty Cycle for TTL High Inputs}$
 $N_T = \text{Number of TTL High Inputs}$
 $I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$
 $f_{CP} = \text{Clock Frequency for Register devices (Zero for Non-Register Devices)}$
 $N_{CP} = \text{Number of Clock Inputs at } f_{CP}$
 $f_I = \text{Input Frequency}$
 $N_I = \text{Number of Inputs at } f_I$

Table 8. Switching Characteristics Over Operating Range

Recommended Operating Ranges apply unless otherwise specified.

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

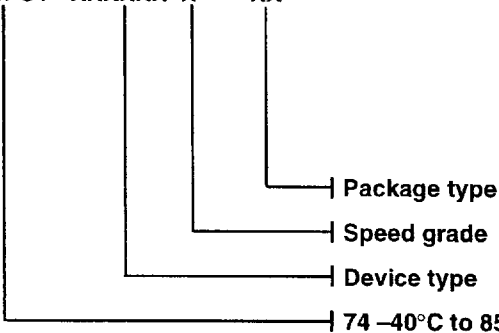
Symbol	Description ^(1,2)	FCT163240A		Unit
		Min	Max	
t_{PHL} t_{PLH}	Propagation Delay xAx to xYx	1.5	4.8	ns
t_{PZH} t_{PZL}	Output Enable Time xOE to xYx	1.5	6.2	ns
t_{PHZ} t_{PLZ}	Output Disable Time ⁽³⁾ xOE to xYx	1.5	5.6	ns
$t_{SK(O)}$	Output Skew ⁽⁴⁾	—	0.5	ns

Notes:

1. Minimums guaranteed but not tested. See Test Circuit and Waveforms.
2. Switching characteristics are with $V_{CC} = 3.3V \pm 0.3V$.
For 2.7 V_{CC} operation, parameters should be degraded by 20%.
3. Guaranteed by design, but not production tested.
4. Skew between any two outputs of the same package switching in the same direction.
This parameter is guaranteed by design but not production tested.

ORDERING INFORMATION

QS74FCT XXXXXX X XX



Package type

Speed grade

Device type

74 -40°C to 85°C

Device Type:

163240

Speed Grades:

A

C

Package Type:

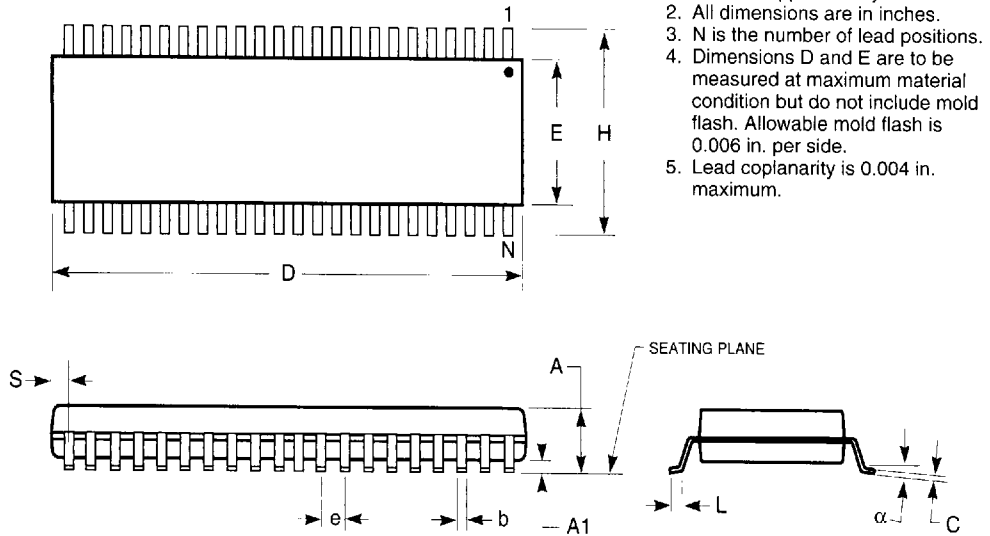
PV – SSOP, 300 mil

PA – TSSOP, 240 mil

PACKAGING INFORMATION

300-MIL SSOP - Package Code PV

Shrink Small Outline Package
Plastic Small Outline Gull-Wing



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 0.006 in. per side.
5. Lead coplanarity is 0.004 in. maximum.

JEDEC#	MO-118AA			MO-118AB		
DWG#	PSS-48B			PSS-56B		
Symbol	Min	Nom	Max	Min	Nom	Max
A	0.095	0.102	0.110	0.095	0.102	0.110
A1	0.008	0.012	0.016	0.008	0.012	0.016
b	0.008	0.010	0.0135	0.008	0.010	0.0135
C	0.005	0.008	0.010	0.005	0.008	0.010
D	0.620	0.625	0.630	0.720	0.725	0.730
E	0.291	0.295	0.299	0.291	0.295	0.299
e	0.025 BSC			0.025 BSC		
H	0.395	0.410	0.420	0.395	0.410	0.420
L	0.020	0.030	0.040	0.020	0.030	0.040
N	48			56		
α	0°	5°	8°	0°	5°	8°
S	0.022	0.025	0.028	0.022	0.025	0.028

7466803 0003418 594