



High Speed CMOS 3.3V 16-Bit Registers (3-State)

FEATURES/BENEFITS

- Pin and function compatible with T.I. Widebus™ and IDT Double-Density™ families
- CMOS power levels: <math><1 \mu\text{W}</math> typical standby
- SSOP (PV) and TSSOP (PA) packages
- Low output skew: 0.5 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
- A and C speed grades: 5.2 ns t_{PD} for C
- 5V tolerant inputs for 5V to 3.3V translation

DESCRIPTION

The FCT163374 is a 16-bit buffered register with three-state output that is ideal for driving address and data buses. The output enable ($\overline{\text{xOE}}$) and clock ($\overline{\text{xCLK}}$) controls are organized to operate each device as two 8-bit registers, or one 16-bit register with common clock. 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 applications since all inputs will support 5V signals.

Figure 1. Functional Block Diagram

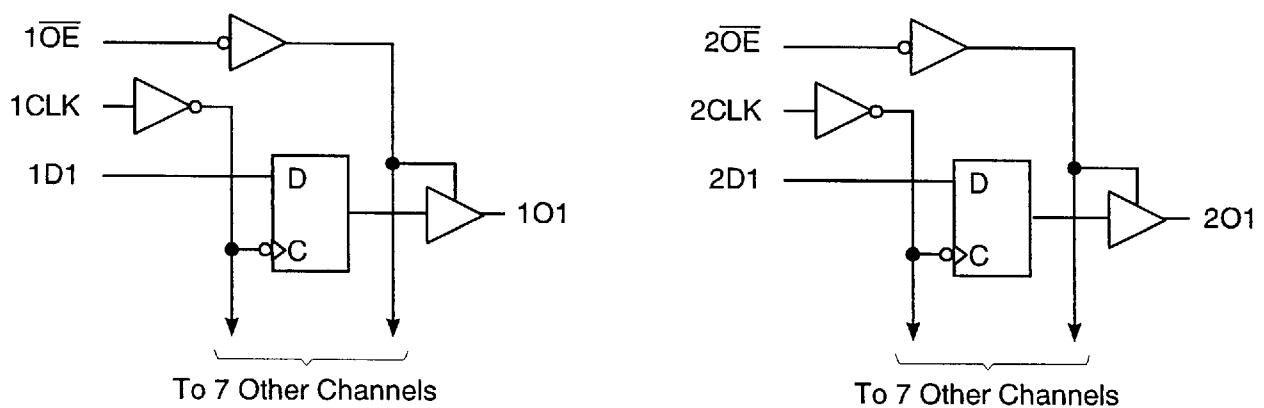


Figure 2. Pin Configuration (All Pins Top View)

SSOP, TSSOP

1 \overline{OE}	1	48	1CLK
1O1	2	47	1D1
1O2	3	46	1D2
GND	4	45	GND
1O3	5	44	1D3
1O4	6	43	1D4
V _{CC}	7	42	V _{CC}
1O5	8	41	1D5
1O6	9	40	1D6
GND	10	39	GND
1O7	11	38	1D7
1O8	12	37	1D8
2O1	13	36	2D1
2O2	14	35	2D2
GND	15	34	GND
2O3	16	33	2D3
2O4	17	32	2D4
V _{CC}	18	31	V _{CC}
2O5	19	30	2D5
2O6	20	29	2D6
GND	21	28	GND
2O7	22	27	2D7
2O8	23	26	2D8
2 \overline{OE}	24	25	2CLK

Table 1. Pin Description

Name	I/O	Description
xDx	I	Data Inputs
xOx	O	Data Outputs
xCLK	I	Clock Input
x	I	Output Enable

Table 2. Function Table

x	Inputs		Internal	Outputs	
	xCLK	xDx	Q Value	xOx	Function
H	X	X	X	Hi-Z	Disable Outputs
L	↑	L	L	L	Load Input Data
L	↑	H	H	H	Enable Outputs
H	↑	L	L	Hi-Z	Load Input Data
H	↑	H	H	Hi-Z	Disable Outputs

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	$V_{CC} = \text{Max.}, \text{Freq} = 0$ $V_{IN} = \text{GND or } V_{CC}$	0.1	10	μA
ΔI_{CC}	Supply Current per Input @ TTL HIGH	$V_{CC} = \text{Max.}, V_{IN} = V_{CC} - 0.6\text{V}^{(3)}$	2.0	30	μA
I_{CCD}	Supply Current per Input per MHz ⁽⁴⁾	$V_{CC} = \text{Max.}, \text{Outputs Open}$ One Bit Toggling @ 50% Duty Cycle $\overline{xOE} = \text{GND}$	50	75	$\mu\text{A}/\text{MHz}$
I_C	Total Power Supply Current ⁽⁶⁾	$V_{CC} = \text{Max.}, \text{Outputs Open}$ One Bit Toggling @ 50% Duty Cycle $\overline{xOE} = \text{GND}, f_I = 5 \text{ MHz}$ $f_{CP} = 10 \text{ MHz}$	$V_{IN} = V_{CC} - 0.6\text{V}$ $V_{IN} = \text{GND}$ 0.5 ⁽⁵⁾	0.8 ⁽⁵⁾	mA
		$V_{CC} = \text{Max.}, \text{Outputs Open}$ Sixteen Bits Toggling @ 50% Duty Cycle $\overline{xOE} = \text{GND}, f_I = 2.5 \text{ MHz}$ $f_{CP} = 10 \text{ MHz}$	$V_{IN} = V_{CC} - 0.6\text{V}$ $V_{IN} = \text{GND}$ 2.5 ⁽⁵⁾	4.0 ⁽⁵⁾	mA

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} = Quiescent Current ($I_{CCL}, I_{CCH},$ and I_{CCZ}).
 ΔI_{CC} = Power Supply Current for a TTL-High Input ($V_{IN} = V_{CC} - 0.6\text{V}$).
 D_H = Duty Cycle for TTL High Inputs.
 N_T = Number of TTL High Inputs.
 I_{CCD} = Dynamic Current Caused by an Input Transition Pair (HLH or LHL).
 f_{CP} = Clock Frequency.
 N_{CP} = Number of Clock Inputs at f_{CP} .
 f_I = Input Frequency.
 N_I = Number of Inputs at f_I .

Table 8. Switching Characteristics Over Operating Range

Recommended Operating Ranges apply unless otherwise specified.

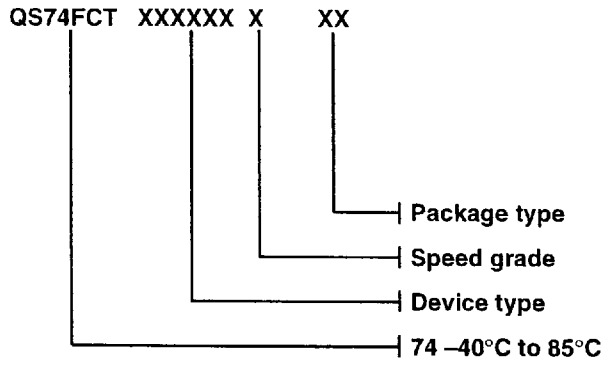
$C_{LOAD} = 50 \text{ pF}$, $R_{LOAD} = 500\Omega$ unless otherwise noted.

Symbol	Description ⁽¹⁾	FCT163374A		FCT163374C		Unit
		Min	Max	Min	Max	
t_{PHL} t_{PLH}	Propagation Delay xCLK to xOx	2.0	6.5	2.0	5.2	ns
t_{PZH} t_{PZL}	Output Enable Time \overline{xOE} to xOx	1.5	6.5	1.5	5.5	ns
t_{PHZ} t_{PLZ}	Output Disable Time ⁽²⁾ \overline{xOE} to xOx	1.5	5.5	1.5	5	ns
t_S	Data Setup Time xDx to xCLK	2.0	—	2.0	—	ns
t_H	Data Hold Time xDx to xCLK	1.5	—	1.5	—	ns
t_W	Clock Pulse Width HIGH or LOW	5.0	—	5.0	—	ns
$t_{SK(o)}$	Output Skew ⁽³⁾	—	0.5	—	0.5	ns

Notes:

1. Minimums guaranteed but not tested on propagation delays. See Test Circuit and Waveforms.
2. Switching Characteristics are with $V_{CC} = 3.3V \pm 0.3V$.
For 2.7V V_{CC} operation, parameters should be degraded by 20%.
3. Guaranteed by design, but not 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



Device Type:

163374

Speed Grades:

A

C

Package Type:

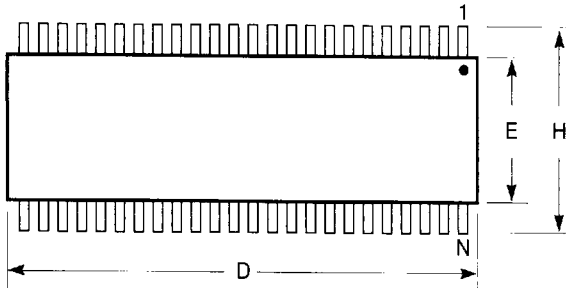
PV – SSOP, 300 mil

PA – TSSOP, 240 mil

PACKAGING INFORMATION

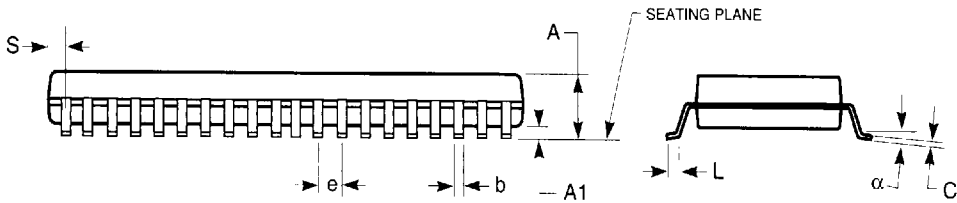
300-MIL SSOP - Package Code PV

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		
	PSS-48B			PSS-56B		
DWG#						
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

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