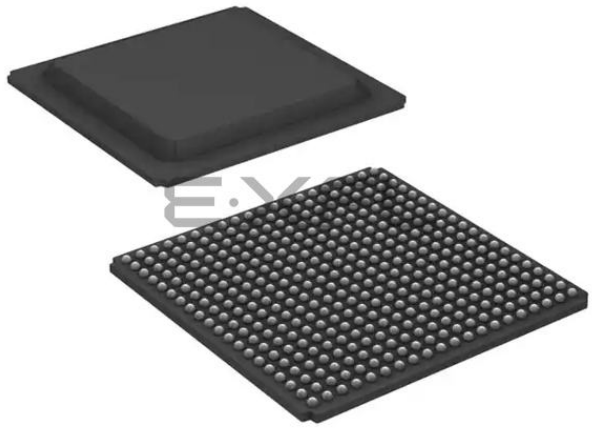

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Details	
Product Status	Active
Number of LABs/CLBs	896
Number of Logic Elements/Cells	8064
Total RAM Bits	368640
Number of I/O	311
Number of Gates	400000
Voltage - Supply	1.14V ~ 1.26V
Mounting Type	Surface Mount
Operating Temperature	0°C ~ 85°C (TJ)
Package / Case	400-BGA
Supplier Device Package	400-FBGA (21x21)
Purchase URL	https://www.e-xfl.com/product-detail/xilinx/xc3s400a-4fgg400c

Differential Output Pairs

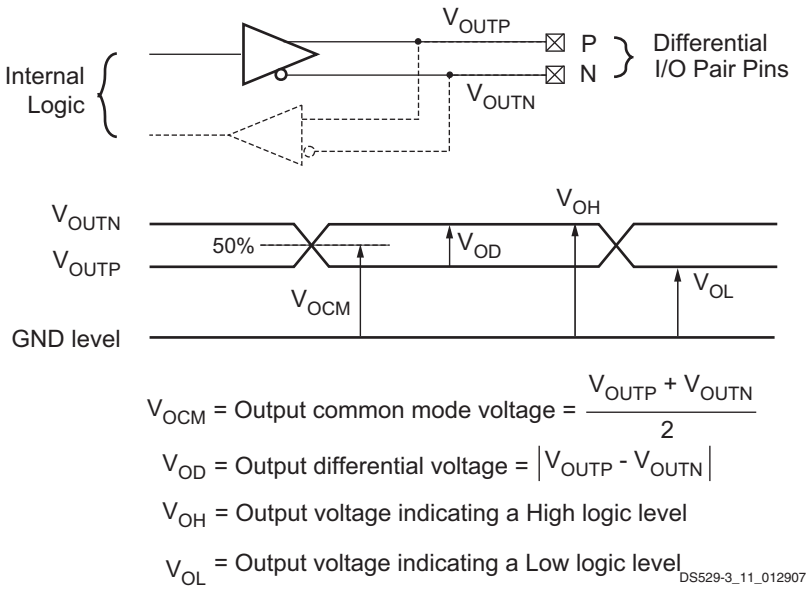

Figure 5: **Differential Output Voltages**

Table 14: **DC Characteristics of User I/Os Using Differential Signal Standards**

IOSTANDARD Attribute	V_{OD}			V_{OCM}			V_{OH}	V_{OL}
	Min (mV)	Typ (mV)	Max (mV)	Min (V)	Typ (V)	Max (V)	Min (V)	Max (V)
LVDS_25	247	350	454	1.125	–	1.375	–	–
LVDS_33	247	350	454	1.125	–	1.375	–	–
BLVDS_25	240	350	460	–	1.30	–	–	–
MINI_LVDS_25	300	–	600	1.0	–	1.4	–	–
MINI_LVDS_33	300	–	600	1.0	–	1.4	–	–
RSDS_25	100	–	400	1.0	–	1.4	–	–
RSDS_33	100	–	400	1.0	–	1.4	–	–
TMDS_33	400	–	800	V_{CCO} – 0.405	–	V_{CCO} – 0.190	–	–
PPDS_25	100	–	400	0.5	0.8	1.4	–	–
PPDS_33	100	–	400	0.5	0.8	1.4	–	–
DIFF_HSTL_I_18	–	–	–	–	–	–	V_{CCO} – 0.4	0.4
DIFF_HSTL_II_18	–	–	–	–	–	–	V_{CCO} – 0.4	0.4
DIFF_HSTL_III_18	–	–	–	–	–	–	V_{CCO} – 0.4	0.4
DIFF_HSTL_I	–	–	–	–	–	–	V_{CCO} – 0.4	0.4
DIFF_HSTL_III	–	–	–	–	–	–	V_{CCO} – 0.4	0.4
DIFF_SSTL18_I	–	–	–	–	–	–	V_{TT} + 0.475	V_{TT} – 0.475
DIFF_SSTL18_II	–	–	–	–	–	–	V_{TT} + 0.603	V_{TT} – 0.603
DIFF_SSTL2_I	–	–	–	–	–	–	V_{TT} + 0.61	V_{TT} – 0.61
DIFF_SSTL2_II	–	–	–	–	–	–	V_{TT} + 0.81	V_{TT} – 0.81
DIFF_SSTL3_I	–	–	–	–	–	–	V_{TT} + 0.6	V_{TT} – 0.6
DIFF_SSTL3_II	–	–	–	–	–	–	V_{TT} + 0.8	V_{TT} – 0.8

Notes:

1. The numbers in this table are based on the conditions set forth in Table 8 and Table 13.
2. See "External Termination Requirements for Differential I/O," page 20.
3. Output voltage measurements for all differential standards are made with a termination resistor (R_T) of 100Ω across the N and P pins of the differential signal pair.
4. At any given time, no more than two of the following differential output standards can be assigned to an I/O bank: LVDS_25, RSDS_25, MINI_LVDS_25, PPDS_25 when V_{CCO}=2.5V, or LVDS_33, RSDS_33, MINI_LVDS_33, TMDS_33, PPDS_33 when V_{CCO} = 3.3V

Input Propagation Times

Table 22: **Propagation Times for the IOB Input Path**

Symbol	Description	Conditions	DELAY_VALUE	Device	Speed Grade		Units
					-5	-4	
					Max	Max	
Propagation Times							
T_{IOPI}	The time it takes for data to travel from the Input pin to the I output with no input delay programmed	LVCMOS25(2)	IBUF_DELAY_VALUE=0	XC3S50A	1.04	1.12	ns
				XC3S200A	0.87	0.87	ns
				XC3S400A	0.65	0.72	ns
				XC3S700A	0.92	0.92	ns
				XC3S1400A	0.96	1.21	ns
T_{IOPID}	The time it takes for data to travel from the Input pin to the I output with the input delay programmed	LVCMOS25(2)	1	XC3S50A	1.79	2.07	ns
			2		2.13	2.46	ns
			3		2.36	2.71	ns
			4		2.88	3.21	ns
			5		3.11	3.46	ns
			6		3.45	3.84	ns
			7		3.75	4.19	ns
			8		4.00	4.47	ns
			9		3.61	4.11	ns
			10		3.95	4.50	ns
			11		4.18	4.67	ns
			12		4.75	5.20	ns
			13		4.98	5.44	ns
			14		5.31	5.95	ns
			15		5.62	6.28	ns
			16		5.86	6.57	ns
			1	XC3S200A	1.57	1.65	ns
			2		1.87	1.97	ns
			3		2.16	2.33	ns
			4		2.68	2.96	ns
			5		2.87	3.19	ns
			6		3.20	3.60	ns
			7		3.57	4.02	ns
			8		3.79	4.26	ns
			9		3.42	3.86	ns
			10		3.79	4.25	ns
			11		4.02	4.55	ns
			12		4.62	5.24	ns
			13		4.86	5.53	ns
			14		5.18	5.94	ns

Input Timing Adjustments

Table 23: **Input Timing Adjustments by IOSTANDARD**

Convert Input Time from LVCMOS25 to the Following Signal Standard (IOSTANDARD)	Add the Adjustment Below		Units
	Speed Grade		
	-5	-4	
Single-Ended Standards			
LVTTL	0.62	0.62	ns
LVCMOS33	0.54	0.54	ns
LVCMOS25	0	0	ns
LVCMOS18	0.83	0.83	ns
LVCMOS15	0.60	0.60	ns
LVCMOS12	0.31	0.31	ns
PCI33_3	0.41	0.41	ns
PCI66_3	0.41	0.41	ns
HSTL_I	0.72	0.72	ns
HSTL_III	0.77	0.77	ns
HSTL_I_18	0.69	0.69	ns
HSTL_II_18	0.69	0.69	ns
HSTL_III_18	0.79	0.79	ns
SSTL18_I	0.71	0.71	ns
SSTL18_II	0.71	0.71	ns
SSTL2_I	0.68	0.68	ns
SSTL2_II	0.68	0.68	ns
SSTL3_I	0.78	0.78	ns
SSTL3_II	0.78	0.78	ns

Table 23: **Input Timing Adjustments by IOSTANDARD*(Continued)***

Convert Input Time from LVCMOS25 to the Following Signal Standard (IOSTANDARD)	Add the Adjustment Below		Units
	Speed Grade		
	-5	-4	
Differential Standards			
LVDS_25	0.76	0.76	ns
LVDS_33	0.79	0.79	ns
BLVDS_25	0.79	0.79	ns
MINI_LVDS_25	0.78	0.78	ns
MINI_LVDS_33	0.79	0.79	ns
LVPECL_25	0.78	0.78	ns
LVPECL_33	0.79	0.79	ns
RSDS_25	0.79	0.79	ns
RSDS_33	0.77	0.77	ns
TMDS_33	0.79	0.79	ns
PPDS_25	0.79	0.79	ns
PPDS_33	0.79	0.79	ns
DIFF_HSTL_I_18	0.74	0.74	ns
DIFF_HSTL_II_18	0.72	0.72	ns
DIFF_HSTL_III_18	1.05	1.05	ns
DIFF_HSTL_I	0.72	0.72	ns
DIFF_HSTL_III	1.05	1.05	ns
DIFF_SSTL18_I	0.71	0.71	ns
DIFF_SSTL18_II	0.71	0.71	ns
DIFF_SSTL2_I	0.74	0.74	ns
DIFF_SSTL2_II	0.75	0.75	ns
DIFF_SSTL3_I	1.06	1.06	ns
DIFF_SSTL3_II	1.06	1.06	ns

Notes:

1. The numbers in this table are tested using the methodology presented in Table 27 and are based on the operating conditions set forth in Table 8, Table 11, and Table 13.
2. These adjustments are used to convert input path times originally specified for the LVCMOS25 standard to times that correspond to other signal standards.

Table 28: **Equivalent V_{CCO}/GND Pairs per Bank**

Device	Package Style *(including Pb-free)*						
	VQ100	TQ144	FT256	FG320	FG400	FG484	FG676
XC3S50A	1	2	3	–	–	–	–
XC3S200A	1	–	4	4	–	–	–
XC3S400A	–	–	4	4	5	–	–
XC3S700A	–	–	4	–	5	5	–
XC3S1400A	–	–	4	–	–	6	9

Table 29: **Recommended Number of Simultaneously Switching Outputs per VCCO-GND Pair (V_{CCAUX}=3.3V)**

Signal Standard (IOSTANDARD)			Package Type			
			VQ100, TQ144		FT256, FG320, FG400, FG484, FG676	
			Top, Bottom (Banks 0,2)	Left, Right (Banks 1,3)	Top, Bottom (Banks 0,2)	Left, Right (Banks 1,3)
Single-Ended Standards						
LVTTL	Slow	2	20	20	60	60
		4	10	10	41	41
		6	10	10	29	29
		8	6	6	22	22
		12	6	6	13	13
		16	5	5	11	11
		24	4	4	9	9
	Fast	2	10	10	10	10
		4	6	6	6	6
		6	5	5	5	5
		8	3	3	3	3
		12	3	3	3	3
		16	3	3	3	3
		24	2	2	2	2
	QuietIO	2	40	40	80	80
		4	24	24	48	48
		6	20	20	36	36
		8	16	16	27	27
		12	12	12	16	16
		16	9	9	13	13
		24	9	9	12	12

Table 29: **Recommended Number of Simultaneously Switching Outputs per VCCO-GND Pair (V_{CCAUX}=3.3V)*(Continued)***

Signal Standard (IOSTANDARD)			Package Type			
			VQ100, TQ144		FT256, FG320, FG400, FG484, FG676	
			Top, Bottom (Banks 0,2)	Left, Right (Banks 1,3)	Top, Bottom (Banks 0,2)	Left, Right (Banks 1,3)
LVCMOS33	Slow	2	24	24	76	76
		4	14	14	46	46
		6	11	11	27	27
		8	10	10	20	20
		12	9	9	13	13
		16	8	8	10	10
		24	–	8	–	9
	Fast	2	10	10	10	10
		4	8	8	8	8
		6	5	5	5	5
		8	4	4	4	4
		12	4	4	4	4
		16	2	2	2	2
		24	–	2	–	2
	QuietIO	2	36	36	76	76
		4	32	32	46	46
		6	24	24	32	32
		8	16	16	26	26
		12	16	16	18	18
		16	12	12	14	14
		24	–	10	–	10

Configurable Logic Block (CLB) Timing

Table 30: **CLB (SLICEM) Timing**

Symbol	Description	Speed Grade				Units
		-5		-4		
		Min	Max	Min	Max	
Clock-to-Output Times						
T_{CKO}	When reading from the FFX (FFY) Flip-Flop, the time from the active transition at the CLK input to data appearing at the XQ (YQ) output	–	0.60	–	0.68	ns
Setup Times						
T_{AS}	Time from the setup of data at the F or G input to the active transition at the CLK input of the CLB	0.18	–	0.36	–	ns
T_{DICK}	Time from the setup of data at the BX or BY input to the active transition at the CLK input of the CLB	1.58	–	1.88	–	ns
Hold Times						
T_{AH}	Time from the active transition at the CLK input to the point where data is last held at the F or G input	0	–	0	–	ns
T_{CKDI}	Time from the active transition at the CLK input to the point where data is last held at the BX or BY input	0	–	0	–	ns
Clock Timing						
T_{CH}	The High pulse width of the CLB's CLK signal	0.63	–	0.75	–	ns
T_{CL}	The Low pulse width of the CLK signal	0.63	–	0.75	–	ns
F_{TOG}	Toggle frequency (for export control)	0	770	0	667	MHz
Propagation Times						
T_{ILO}	The time it takes for data to travel from the CLB's F (G) input to the X (Y) output	–	0.62	–	0.71	ns
Set/Reset Pulse Width						
T_{RPW_CLB}	The minimum allowable pulse width, High or Low, to the CLB's SR input	1.33	–	1.61	–	ns

Notes:

1. The numbers in this table are based on the operating conditions set forth in Table 8.

Block RAM Timing

Table 35: **Block RAM Timing**

Symbol	Description	Speed Grade				Units
		-5		-4		
		Min	Max	Min	Max	
Clock-to-Output Times						
T_{RCKO}	When reading from block RAM, the delay from the active transition at the CLK input to data appearing at the DOUT output	–	2.06	–	2.49	ns
Setup Times						
T_{RCCK_ADDR}	Setup time for the ADDR inputs before the active transition at the CLK input of the block RAM	0.32	–	0.36	–	ns
T_{RDCK_DIB}	Setup time for data at the DIN inputs before the active transition at the CLK input of the block RAM	0.28	–	0.31	–	ns
T_{RCCK_ENB}	Setup time for the EN input before the active transition at the CLK input of the block RAM	0.69	–	0.77	–	ns
T_{RCCK_WEB}	Setup time for the WE input before the active transition at the CLK input of the block RAM	1.12	–	1.26	–	ns
Hold Times						
T_{RCKC_ADDR}	Hold time on the ADDR inputs after the active transition at the CLK input	0	–	0	–	ns
T_{RCKD_DIB}	Hold time on the DIN inputs after the active transition at the CLK input	0	–	0	–	ns
T_{RCKC_ENB}	Hold time on the EN input after the active transition at the CLK input	0	–	0	–	ns
T_{RCKC_WEB}	Hold time on the WE input after the active transition at the CLK input	0	–	0	–	ns
Clock Timing						
T_{BPWH}	High pulse width of the CLK signal	1.56	–	1.79	–	ns
T_{BPWL}	Low pulse width of the CLK signal	1.56	–	1.79	–	ns
Clock Frequency						
F_{BRAM}	Block RAM clock frequency	0	320	0	280	MHz

Notes:

1. The numbers in this table are based on the operating conditions set forth in Table 8.

Table 37: **Switching Characteristics for the DLL**

Symbol	Description		Device	Speed Grade				Units
				-5		-4		
				Min	Max	Min	Max	
Output Frequency Ranges								
CLKOUT_FREQ_CLK0	Frequency for the CLK0 and CLK180 outputs		All	5	280	5	250	MHz
CLKOUT_FREQ_CLK90	Frequency for the CLK90 and CLK270 outputs			5	200	5	200	MHz
CLKOUT_FREQ_2X	Frequency for the CLK2X and CLK2X180 outputs			10	334	10	334	MHz
CLKOUT_FREQ_DV	Frequency for the CLKDV output			0.3125	186	0.3125	166	MHz
Output Clock Jitter(2,3,4)								
CLKOUT_PER_JITT_0	Period jitter at the CLK0 output		All	–	±100	–	±100	ps
CLKOUT_PER_JITT_90	Period jitter at the CLK90 output			–	±150	–	±150	ps
CLKOUT_PER_JITT_180	Period jitter at the CLK180 output			–	±150	–	±150	ps
CLKOUT_PER_JITT_270	Period jitter at the CLK270 output			–	±150	–	±150	ps
CLKOUT_PER_JITT_2X	Period jitter at the CLK2X and CLK2X180 outputs			–	±[0.5% of CLKIN period + 100]	–	±[0.5% of CLKIN period + 100]	ps
CLKOUT_PER_JITT_DV1	Period jitter at the CLKDV output when performing integer division			–	±150	–	±150	ps
CLKOUT_PER_JITT_DV2	Period jitter at the CLKDV output when performing non-integer division			–	±[0.5% of CLKIN period + 100]	–	±[0.5% of CLKIN period + 100]	ps
Duty Cycle(4)								
CLKOUT_DUTY_CYCLE_DLL	Duty cycle variation for the CLK0, CLK90, CLK180, CLK270, CLK2X, CLK2X180, and CLKDV outputs, including the BUFGMUX and clock tree duty-cycle distortion		All	–	±[1% of CLKIN period + 350]	–	±[1% of CLKIN period + 350]	ps
Phase Alignment(4)								
CLKIN_CLKFB_PHASE	Phase offset between the CLKIN and CLKFB inputs		All	–	±150	–	±150	ps
CLKOUT_PHASE_DLL	Phase offset between DLL outputs	CLK0 to CLK2X (not CLK2X180)		–	±[1% of CLKIN period + 100]	–	±[1% of CLKIN period + 100]	ps
		All others		–	±[1% of CLKIN period + 150]	–	±[1% of CLKIN period + 150]	ps
Lock Time								
LOCK_DLL(3)	When using the DLL alone: The time from deassertion at the DCM's Reset input to the rising transition at its LOCKED output. When the DCM is locked, the CLKIN and CLKFB signals are in phase	5 MHz ≤ F_{CLKIN} ≤ 15 MHz	All	–	5	–	5	ms
		F_{CLKIN} > 15 MHz		–	600	–	600	µs
Delay Lines								
DCM_DELAY_STEP(5)	Finest delay resolution, averaged over all steps		All	15	35	15	35	ps

Notes:

1. The numbers in this table are based on the operating conditions set forth in Table 8 and Table 36.
2. Indicates the maximum amount of output jitter that the DCM adds to the jitter on the CLKIN input.
3. For optimal jitter tolerance and faster lock time, use the CLKIN_PERIOD attribute.
4. Some jitter and duty-cycle specifications include 1% of input clock period or 0.01 UI. For example, the data sheet specifies a maximum jitter of "±[1% of CLKIN period + 150]". Assume the CLKIN frequency is 100 MHz. The equivalent CLKIN period is 10 ns and 1% of 10 ns is 0.1 ns or 100 ps. According to the data sheet, the maximum jitter is ±[100 ps + 150 ps] = ±250ps.
5. The typical delay step size is 23 ps.

Suspend Mode Timing

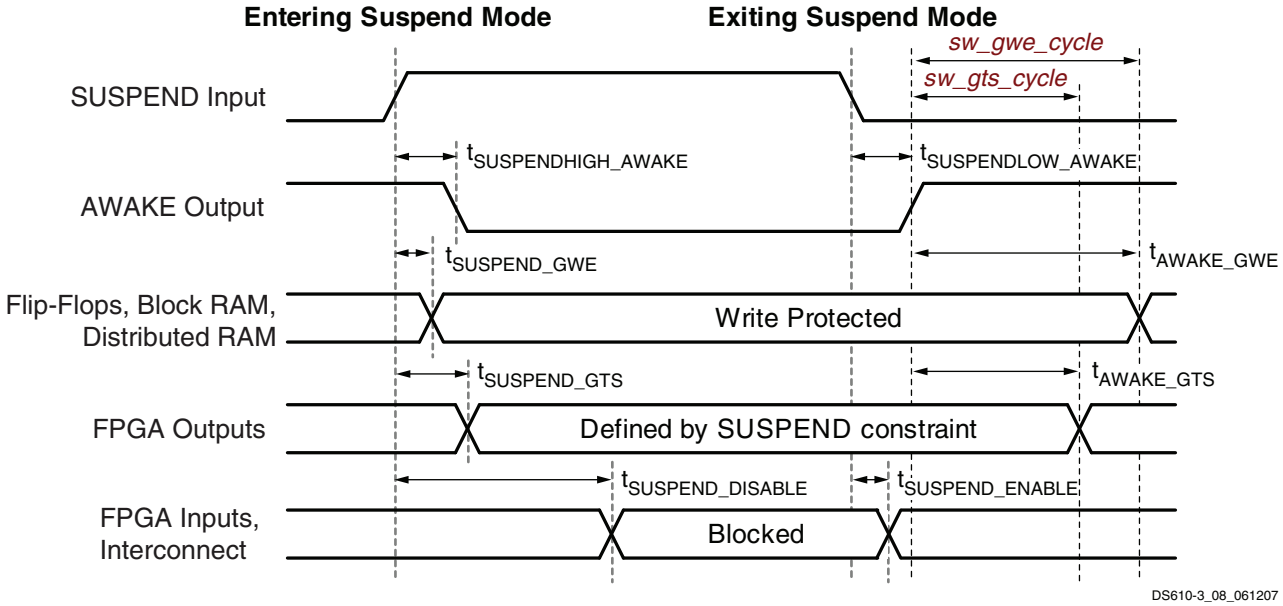

Figure 10: **Suspend Mode Timing**

Table 44: **Suspend Mode Timing Parameters**

Symbol	Description	Min	Typ	Max	Units
Entering Suspend Mode					
$T_{SUSPENDHIGH\_AWAKE}$	Rising edge of SUSPEND pin to falling edge of AWAKE pin without glitch filter (***suspend_filter:No***)	–	7	–	ns
$T_{SUSPENDFILTER}$	Adjustment to SUSPEND pin rising edge parameters when glitch filter enabled (***suspend_filter:Yes***)	+160	+300	+600	ns
$T_{SUSPEND\_GTS}$	Rising edge of SUSPEND pin until FPGA output pins drive their defined SUSPEND constraint behavior	–	10	–	ns
$T_{SUSPEND\_GWE}$	Rising edge of SUSPEND pin to write-protect lock on all writable clocked elements	–	<5	–	ns
$T_{SUSPEND\_DISABLE}$	Rising edge of the SUSPEND pin to FPGA input pins and interconnect disabled	–	340	–	ns
Exiting Suspend Mode					
$T_{SUSPENDLOW\_AWAKE}$	Falling edge of the SUSPEND pin to rising edge of the AWAKE pin. Does not include DCM lock time.	–	4 to 108	–	µs
$T_{SUSPEND\_ENABLE}$	Falling edge of the SUSPEND pin to FPGA input pins and interconnect re-enabled	–	3.7 to 109	–	µs
T_{AWAKE_GWE1}	Rising edge of the AWAKE pin until write-protect lock released on all writable clocked elements, using ***sw_clk:InternalClock*** and ***sw_gwe_cycle:1***.	–	67	–	ns
T_{AWAKE_GWE512}	Rising edge of the AWAKE pin until write-protect lock released on all writable clocked elements, using ***sw_clk:InternalClock*** and ***sw_gwe_cycle:512***.	–	14	–	µs
T_{AWAKE_GTS1}	Rising edge of the AWAKE pin until outputs return to the behavior described in the FPGA application, using ***sw_clk:InternalClock*** and ***sw_gts_cycle:1***.	–	57	–	ns
T_{AWAKE_GTS512}	Rising edge of the AWAKE pin until outputs return to the behavior described in the FPGA application, using ***sw_clk:InternalClock*** and ***sw_gts_cycle:512***.	–	14	–	µs

Notes:

1. These parameters based on characterization.
2. For information on using the Spartan-3A Suspend feature, see XAPP480: *Using Suspend Mode in Spartan-3 Generation FPGAs*.

Configuration Clock (CCLK) Characteristics

Table 46: **Master Mode CCLK Output Period by *ConfigRate* Opti0on Setting**

Symbol	Description	*ConfigRate* Setting	Temperature Range	Minimum	Maximum	Units
T_{CCLK1}	CCLK clock period by ***ConfigRate*** setting	1 *(power-on value)*	Commercial	1,254	2,500	ns
			Industrial	1,180		ns
T_{CCLK3}		3	Commercial	413	833	ns
			Industrial	390		ns
T_{CCLK6}		6 (default)	Commercial	207	417	ns
			Industrial	195		ns
T_{CCLK7}		7	Commercial	178	357	ns
			Industrial	168		ns
T_{CCLK8}		8	Commercial	156	313	ns
			Industrial	147		ns
T_{CCLK10}		10	Commercial	123	250	ns
			Industrial	116		ns
T_{CCLK12}		12	Commercial	103	208	ns
			Industrial	97		ns
T_{CCLK13}		13	Commercial	93	192	ns
			Industrial	88		ns
T_{CCLK17}		17	Commercial	72	147	ns
			Industrial	68		ns
T_{CCLK22}		22	Commercial	54	114	ns
			Industrial	51		ns
T_{CCLK25}		25	Commercial	47	100	ns
			Industrial	45		ns
T_{CCLK27}		27	Commercial	44	93	ns
			Industrial	42		ns
T_{CCLK33}		33	Commercial	36	76	ns
			Industrial	34		ns
T_{CCLK44}		44	Commercial	26	57	ns
			Industrial	25		ns
T_{CCLK50}		50	Commercial	22	50	ns
			Industrial	21		ns
$T_{CCLK100}$		100	Commercial	11.2	25	ns
			Industrial	10.6		ns

Notes:

1. Set the ***ConfigRate*** option value when generating a configuration bitstream.

Revision History

The following table shows the revision history for this document.

Date	Version	Revision
12/05/06	1.0	Initial release.
02/02/07	1.1	Promoted to Preliminary status. Moved Table 15 to under "DC Electrical Characteristics" section. Updated all timing specifications for the v1.32 speed files. Added recommended Simultaneous Switching Output (SSO) limits in Table 29. Set a 10 µs maximum pulse width for the DNA_PORT READ signal and the JTAG clock input during the ISC_DNA command, affecting both Table 43 and Table 56. Described "External Termination Requirements for Differential I/O." Added separate DIN hold time for Slave mode in Table 50. Corrected wording in Table 52 and Table 54; no specifications affected.
03/16/07	1.2	Updated all AC timing specifications to the v1.34 speeds file. Promoted the XC3S700A and XC3S1400A FPGAs offered in the -4 speed grade to Production status, as shown in Table 16. Added Note 2 to Table 39 regarding the extra logic (one LUT) automatically added by ISE 9.1i and later software revisions for any DCM application that leverages the Digital Frequency Synthesizer (DFS). Separated some JTAG specifications by array size or function, as shown in Table 56. Updated quiescent current limits in Table 10.
04/23/07	1.3	Updated all AC timing specifications to the v1.35 speeds file. Promoted all devices except the XC3S400A to Production status, as shown in Table 16.
05/08/07	1.4	Updated XC3S400A to Production and v1.36 speeds file. Added banking rules and other explanatory footnotes to Table 12 and Table 13. Corrected DIFF_SSTL3_II V_{OL} Max in Table 14. Improved XC3S400A Pin-to-Pin Clock-to-Output times in Table 18. Updated XC3S400A Pin-to-Pin Setup Times in Table 19. Updated TIOICKPD for -5 in Table 20. Added SSO numbers to Table 28 and Table 29. Removed invalid Embedded Multiplier Hold Times in Table 34. Improved CLKOUT_FREQ_CLK90 in Table 37. Improved T_{TDITCK} and F_{TCK} performance for XC3S400A in Table 56.
07/10/07	1.5	Added DIFF_HSTL_I and DIFF_HSTL_III to Table 13, Table 14, Table 27, and Table 29. Updated TMDS DC characteristics in Table 14. Updated for speed file v1.37 in ISE 9.2.01i as shown in Table 17. Updated pin-to-pin setup and hold times in Table 19. Updated TMDS output adjustment in Table 26. Updated I/O Test Method values in Table 27. Added BLVDS SSO numbers inTable 29. For Multiplier block, updated setup times and added hold times to Table 34. Updated block RAM clock width in Table 35. Updated CLKOUT_PER_JITT_2X and CLKOUT_PER_JITT_DV2 in Table 37. Added CCLK specifications for Commercial in Table 46 through Table 48.
04/15/08	1.6	Added V_{IN} to Recommended Operating Conditions in Table 8 and added reference to XAPP459, "Eliminating I/O Coupling Effects when Interfacing Large-Swing Single-Ended Signals to User I/O Pins." Reduced typical I_{CCINTQ} and I_{CCAUXQ} quiescent current values by 12%-58% in Table 10. Increased V_{IL} max to 0.4V for LVCMOS12/15/18 and improved V_{IH} min to 0.7V for LVCMOS12 in Table 11. Changed V_{OL} max to 0.4V and V_{OH} min to V_{CCO}-0.4V for LVCMOS15/18 in Table 12. Noted latest speed file v1.39 in ISE 10.1 software in Table 16. Added new packages to SSO limits in Table 28 and Table 29. Improved SSTL18_II SSO limit for FG packages in Table 29. Improved F_{BUFG} for -4 to 334 MHz in Table 33. Added references to 375 MHz performance via SCD 4103 in Table 33,Table 38, Table 39, and Table 40. Restored Units column to Table 44. Updated CCLK output maximum period in Table 46 to match minimum frequency in Table 47. Corrected BPI active clock edge in Figure 15 and Table 54.
05/28/08	1.7	Improved V_{CCAUXT} and V_{CCO2T} POR minimum in Table 5 and updated V_{CCO} POR levels in Figure 11. Clarified recommended V_{IN} in Table 8. Added reference to V_{CCAUX} in "Simultaneously Switching Output Guidelines". Added reference to Sample Window in Table 21. Removed DNA_RETENTION limit of 10 years in Table 15 since number of Read cycles is the only unique limit. Added references to UG332.
03/06/09	1.8	Changed typical quiescent current temperature from ambient to junction. Updated BPI configuration waveforms in Figure 15 and updated Table 55. Updated selected I/O standard DC characteristics. Added TIOPI and TIOPID in Table 22. Removed references to SCD 4103.
08/19/10	2.0	Added I_{IK} to Table 4. Updated V_{IN} in Table 8 and footnoted I_L in Table 9 to note potential leakage between pins of a differential pair. Clarified LVPECL notes to Table 13. Corrected symbols for TSUSPEND_GTS and TSUSPEND_GWE in Table 44.

Package Thermal Characteristics

The power dissipated by an FPGA application has implications on package selection and system design. The power consumed by a Spartan-3A FPGA is reported using either the XPower Power Estimator or the XPower Analyzer calculator integrated in the Xilinx® ISE® development software. Table 62 provides the thermal characteristics for the various Spartan-3A FPGA package offerings. This information is also available using the Thermal Query tool on xilinx.com (www.xilinx.com/cgi-bin/thermal/thermal.pl).

The junction-to-case thermal resistance (θ_{JC}) indicates the difference between the temperature measured on the package body (case) and the die junction temperature per watt of power consumption. The junction-to-board (θ_{JB}) value similarly reports the difference between the board and junction temperature. The junction-to-ambient (θ_{JA}) value reports the temperature difference between the ambient environment and the junction temperature. The θ_{JA} value is reported at different air velocities, measured in linear feet per minute (LFM). The “Still Air (0 LFM)” column shows the θ_{JA} value in a system without a fan. The thermal resistance drops with increasing air flow.

Table 62: **Spartan-3A Package Thermal Characteristics**

Package	Device	Junction-to-Case (θ_{JC})	Junction-to-Board (θ_{JB})	Junction-to-Ambient (θ_{JA}) at Different Air Flows				Units
				Still Air (0 LFM)	250 LFM	500 LFM	750 LFM	
VQ100 VQG100	XC3S50A	12.9	30.1	48.5	40.4	37.6	36.6	°C/Watt
	XC3S200A	10.9	25.7	42.9	35.7	33.2	32.4	°C/Watt
TQ144 TQG144	XC3S50A	16.5	32.0	42.4	36.3	35.8	34.9	°C/Watt
FT256 FTG256	XC3S50A	16.0	33.5	42.3	35.6	35.5	34.5	°C/Watt
	XC3S200A	10.3	23.8	32.7	26.6	26.1	25.2	°C/Watt
	XC3S400A	8.4	19.3	29.9	24.9	23.0	22.3	°C/Watt
	XC3S700A	7.8	18.6	28.1	22.3	21.2	20.7	°C/Watt
	XC3S1400A	5.4	14.1	24.2	18.7	17.5	17.0	°C/Watt
FG320 FGG320	XC3S200A	11.7	18.5	27.8	22.3	21.1	20.3	°C/Watt
	XC3S400A	9.9	15.4	25.2	19.8	18.6	17.8	°C/Watt
FG400 FGG400	XC3S400A	9.8	15.5	25.6	19.2	18.0	17.3	°C/Watt
	XC3S700A	8.2	13.0	23.1	17.9	16.7	16.0	°C/Watt
FG484 FGG484	XC3S700A	7.9	12.8	22.3	17.4	16.2	15.5	°C/Watt
	XC3S1400A	6.0	9.9	19.5	14.7	13.5	12.8	°C/Watt
FG676 FGG676	XC3S1400A	5.8	9.4	17.8	13.5	12.4	11.8	°C/Watt

Table 69: **Spartan-3A FT256 Pinout (XC3S700A,**

Bank	XC3S700A XC3S1400A	FT256 Ball	Type
3	IO_L16N_3	L2	I/O
3	IO_L16P_3/VREF_3	L1	VREF
3	IO_L18N_3	L3	I/O
3	IO_L18P_3	K4	I/O
3	IO_L19N_3	L4	I/O
3	IO_L19P_3	M3	I/O
3	IO_L20N_3	N1	I/O
3	IO_L20P_3	M1	I/O
3	IO_L22N_3	P1	I/O
3	IO_L22P_3/VREF_3	N2	VREF
3	IO_L23N_3	P2	I/O
3	IO_L23P_3	R1	I/O
3	IO_L24N_3	M4	I/O
3	IO_L24P_3	N3	I/O
3	IP_3	J4	INPUT
3	IP_3/VREF_3	G4	VREF
3	IP_3/VREF_3	J5	VREF
3	VCCO_3	D2	VCCO
3	VCCO_3	H2	VCCO
3	VCCO_3	M2	VCCO
GND	GND	A1	GND
GND	GND	A16	GND
GND	GND	B11	GND
GND	GND	B7	GND
GND	GND	C14	GND
GND	GND	C3	GND
GND	GND	E10	GND
GND	GND	E12	GND
GND	GND	E5	GND
GND	GND	F11	GND
GND	GND	F2	GND
GND	GND	F6	GND
GND	GND	F7	GND
GND	GND	F8	GND
GND	GND	F9	GND
GND	GND	G10	GND
GND	GND	G12	GND
GND	GND	G15	GND
GND	GND	G5	GND
GND	GND	G6	GND

Table 69: **Spartan-3A FT256 Pinout (XC3S700A,**

Bank	XC3S700A XC3S1400A	FT256 Ball	Type
GND	GND	G8	GND
GND	GND	H11	GND
GND	GND	H5	GND
GND	GND	H7	GND
GND	GND	H9	GND
GND	GND	J10	GND
GND	GND	J6	GND
GND	GND	J8	GND
GND	GND	K11	GND
GND	GND	K12	GND
GND	GND	K2	GND
GND	GND	K5	GND
GND	GND	K7	GND
GND	GND	K9	GND
GND	GND	L10	GND
GND	GND	L11	GND
GND	GND	L15	GND
GND	GND	L6	GND
GND	GND	L8	GND
GND	GND	M12	GND
GND	GND	M5	GND
GND	GND	M8	GND
GND	GND	N10	GND
GND	GND	N7	GND
GND	GND	P14	GND
GND	GND	P3	GND
GND	GND	R10	GND
GND	GND	R6	GND
GND	GND	T1	GND
GND	GND	T16	GND
VCCAUX	SUSPEND	R16	PWRMGT
VCCAUX	DONE	T15	CONFIG
VCCAUX	PROG_B	A2	CONFIG
VCCAUX	TCK	A15	JTAG
VCCAUX	TDI	B1	JTAG
VCCAUX	TDO	B16	JTAG
VCCAUX	TMS	B2	JTAG
VCCAUX	VCCAUX	D6	VCCAUX
VCCAUX	VCCAUX	E11	VCCAUX
VCCAUX	VCCAUX	F12	VCCAUX

Differences Between XC3S200A/XC3S400A and XC3S700A/XC3S1400A

The XC3S700A and XC3S1400A FPGAs have several additional power and ground pins as compared to the XC3S200A and XC3S400A. Table 76 summarizes all the differences. All dedicated and dual-purpose configuration pins are in the same location.

Table 76: **Differences Between XC3S200A/XC3S400A and XC3S700A/XC3S1400A**

FT256 Ball	Bank	XC3S200A XC3S400A		XC3S700A XC3S1400A	
		Pin Name	Type	Pin Name	Type
F8	0	IO_L14P_0	I/O	GND	GND
D11	0	IO_L03N_0	I/O	IO_L06P_0	I/O
D10	0	IO_L06P_0	I/O	IO_L06N_0/ VREF_0	VREF
F7	0	IP_0	INPUT	GND	GND
F9	0	IP_0	INPUT	GND	GND
D12	0	IP_0	INPUT	IO_L03N_0	I/O
E9	0	IP_0/ VREF_0	INPUT	IO_L14P_0	I/O
D6	0	IP_0	INPUT	VCCAUX	VCCAUX
F10	0	IP_0	INPUT	VCCINT	VCCINT
E10	0	IO_L06N_0/ VREF_0	VREF	GND	GND
M13	1	IO_L05P_1	I/O	IP_1/ VREF_1	VREF
F11	1	IP_L25N_1	INPUT	GND	GND
H11	1	IP_L13N_1	INPUT	GND	GND
K11	1	IP_L04P_1	INPUT	GND	GND
G11	1	IP_L21N_1	INPUT	VCCINT	VCCINT
H10	1	IP_L13P_1	INPUT	VCCINT	VCCINT
J11	1	IP_L09N_1	INPUT	VCCINT	VCCINT
H14	1	IO_L14N_1/ RHCLK5	RHCLK	VCCAUX	VCCAUX
J14	1	IO_L14P_1/ RHCLK4	RHCLK	IP_1/ VREF_1	VREF
H12	1	VCCO_1	VCCO	IP_1/ VREF_1	VREF
G12	1	IP_L21P_1/ VREF_1	VREF	GND	GND
J10	1	IP_L09P_1/ VREF_1	VREF	GND	GND
K12	1	IP_L04N_1/ VREF_1	VREF	GND	GND
F12	1	IP_L25P_1/ VREF_1	VREF	VCCAUX	VCCAUX
M14	1	IO_L05N_1/ VREF_1	VREF	IP_1/ VREF_1	VREF
N7	2	IO_L07P_2	I/O	GND	GND
N10	2	IO_L13P_2	I/O	GND	GND
M10	2	IO_L13N_2	I/O	VCCAUX	VCCAUX
P6	2	IO_L07N_2	I/O	IP_2/ VREF_2	VREF
L8	2	IP_2	INPUT	GND	GND
L7	2	IP_2	INPUT	VCCINT	VCCINT
M9	2	VCCO_2	VCCO	IP_2/ VREF_2	VREF
L10	2	IP_2/ VREF_2	VREF	GND	GND
M8	2	IP_2/ VREF_2	VREF	GND	GND
L9	2	IP_2/ VREF_2	VREF	VCCINT	VCCINT
H5	3	IO_L10N_3	I/O	GND	GND
J6	3	IO_L17N_3	I/O	GND	GND
G3	3	IO_L09P_3	I/O	IO_L07N_3	I/O
J4	3	IO_L17P_3	I/O	IP_3	IP
H4	3	IO_L09N_3	I/O	VCCAUX	VCCAUX
H6	3	IO_L10P_3	I/O	VCCINT	VCCINT
N2	3	IO_L22P_3	I/O	IO_L22P_3/ VREF_3	VREF
G4	3	IO_L07N_3	I/O	IP_3/ VREF_3	VREF
G6	3	IP_L06P_3	INPUT	GND	GND
H7	3	IP_L13P_3	INPUT	GND	GND
K5	3	IP_L21P_3	INPUT	GND	GND
E4	3	IP_L04P_3	INPUT	IO_L04P_3	I/O
L5	3	IP_L25P_3	INPUT	VCCAUX	VCCAUX
J7	3	IP_L13N_3	INPUT	VCCINT	VCCINT
K6	3	IP_L21N_3	INPUT	VCCINT	VCCINT
J5	3	VCCO_3	VCCO	IP_3/ VREF_3	VREF
G5	3	IP_L06N_3/ VREF_3	VREF	GND	GND
L6	3	IP_L25N_3/ VREF_3	VREF	GND	GND
F4	3	IP_L04N_3/ VREF_3	VREF	IO_L04N_3	I/O

FG320 Footprint

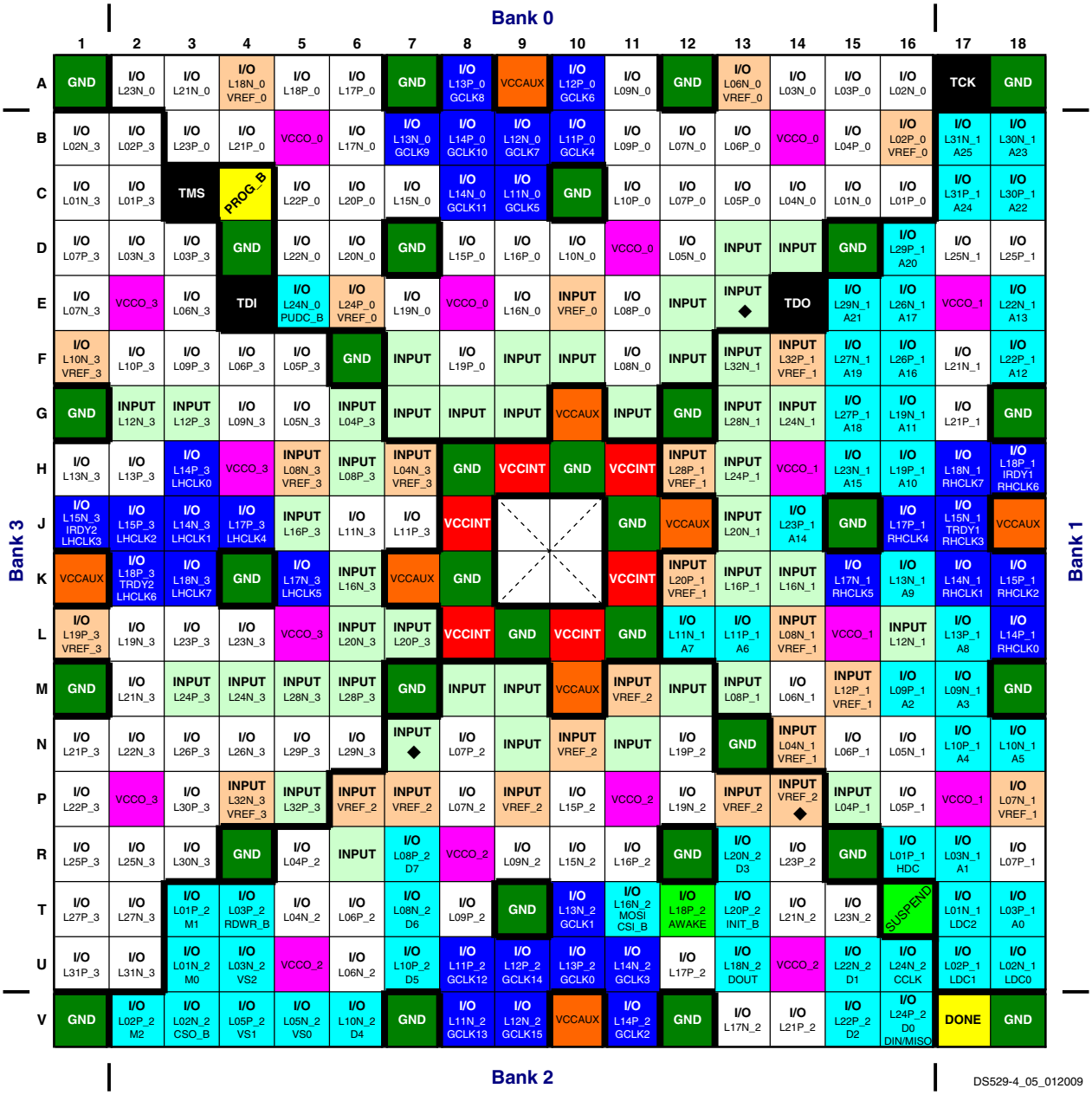

Figure 23: **FG320 Package Footprint (Top View)**

101	**I/O:** Unrestricted, general-purpose user I/O	51	**DUAL:** Configuration pins, then possible user-I/O	23 - 24	**VREF:** User I/O or input voltage reference for bank	2	**SUSPEND:** Dedicated SUSPEND and dual-purpose AWAKE Power Management pins
40 - 42	**INPUT:** Unrestricted, general-purpose input pin	32	**CLK:** User I/O, input, or global buffer input	16	**VCCO:** Output voltage supply for bank		
2	**CONFIG:** Dedicated configuration pins	4	**JTAG:** Dedicated JTAG port pins	6	**VCCINT:** Internal core supply voltage (+1.2V)		
3	**N.C.:** Not connected. Only the XC3S200A has these pins (◆).	32	**GND:** Ground	8	**VCCAUX:** Auxiliary supply voltage		

FG400: 400-ball Fine-pitch Ball Grid Array

The 400-ball fine-pitch ball grid array, FG400, supports two different Spartan-3A FPGAs, the XC3S400A and the XC3S700A. Both devices share a common footprint for this package as shown in Table 81 and Figure 24.

Table 81 lists all the FG400 package pins. They are sorted by bank number and then by pin name. Pairs of pins that form a differential I/O pair appear together in the table. The table also shows the pin number for each pin and the pin type, as defined earlier.

An electronic version of this package pinout table and footprint diagram is available for download from the Xilinx website at

www.xilinx.com/support/documentation/data_sheets/s3a_pin.zip.

Pinout Table

Table 81: **Spartan-3A FG400 Pinout**

Bank	Pin Name	FG400 Ball	Type
0	IO_L01N_0	A18	I/O
0	IO_L01P_0	B18	I/O
0	IO_L02N_0	C17	I/O
0	IO_L02P_0/VREF_0	D17	VREF
0	IO_L03N_0	E15	I/O
0	IO_L03P_0	D16	I/O
0	IO_L04N_0	A17	I/O
0	IO_L04P_0/VREF_0	B17	VREF
0	IO_L05N_0	A16	I/O
0	IO_L05P_0	C16	I/O
0	IO_L06N_0	C15	I/O
0	IO_L06P_0	D15	I/O
0	IO_L07N_0	A14	I/O
0	IO_L07P_0	C14	I/O
0	IO_L08N_0	A15	I/O
0	IO_L08P_0	B15	I/O
0	IO_L09N_0	F13	I/O
0	IO_L09P_0	E13	I/O
0	IO_L10N_0/VREF_0	C13	VREF
0	IO_L10P_0	D14	I/O
0	IO_L11N_0	C12	I/O
0	IO_L11P_0	B13	I/O
0	IO_L12N_0	F12	I/O
0	IO_L12P_0	D12	I/O
0	IO_L13N_0	A12	I/O

Table 81: **Spartan-3A FG400 Pinout *(Continued)***

Bank	Pin Name	FG400 Ball	Type
0	IO_L13P_0	B12	I/O
0	IO_L14N_0	C11	I/O
0	IO_L14P_0	B11	I/O
0	IO_L15N_0/GCLK5	E11	GCLK
0	IO_L15P_0/GCLK4	D11	GCLK
0	IO_L16N_0/GCLK7	C10	GCLK
0	IO_L16P_0/GCLK6	A10	GCLK
0	IO_L17N_0/GCLK9	E10	GCLK
0	IO_L17P_0/GCLK8	D10	GCLK
0	IO_L18N_0/GCLK11	A8	GCLK
0	IO_L18P_0/GCLK10	A9	GCLK
0	IO_L19N_0	C9	I/O
0	IO_L19P_0	B9	I/O
0	IO_L20N_0	C8	I/O
0	IO_L20P_0	B8	I/O
0	IO_L21N_0	D8	I/O
0	IO_L21P_0	C7	I/O
0	IO_L22N_0/VREF_0	F9	VREF
0	IO_L22P_0	E9	I/O
0	IO_L23N_0	F8	I/O
0	IO_L23P_0	E8	I/O
0	IO_L24N_0	A7	I/O
0	IO_L24P_0	B7	I/O
0	IO_L25N_0	C6	I/O
0	IO_L25P_0	A6	I/O
0	IO_L26N_0	B5	I/O
0	IO_L26P_0	A5	I/O
0	IO_L27N_0	F7	I/O
0	IO_L27P_0	E7	I/O
0	IO_L28N_0	D6	I/O
0	IO_L28P_0	C5	I/O
0	IO_L29N_0	C4	I/O
0	IO_L29P_0	A4	I/O
0	IO_L30N_0	B3	I/O
0	IO_L30P_0	A3	I/O
0	IO_L31N_0	F6	I/O
0	IO_L31P_0	E6	I/O
0	IO_L32N_0/PUDC_B	B2	DUAL

Table 83: **Spartan-3A FG484 Pinout*(Continued)***

Bank	Pin Name	FG484 Ball	Type
2	IO_L10P_2	Y7	I/O
2	IO_L11N_2/VS0	Y8	DUAL
2	IO_L11P_2/VS1	W8	DUAL
2	IO_L12N_2	AB8	I/O
2	IO_L12P_2	AA8	I/O
2	IO_L13N_2	Y10	I/O
2	IO_L13P_2	V10	I/O
2	IO_L14N_2/D6	AB9	DUAL
2	IO_L14P_2/D7	Y9	DUAL
2	IO_L15N_2	AB10	I/O
2	IO_L15P_2	AA10	I/O
2	IO_L16N_2/D4	AB11	DUAL
2	IO_L16P_2/D5	Y11	DUAL
2	IO_L17N_2/GCLK13	V11	GCLK
2	IO_L17P_2/GCLK12	U11	GCLK
2	IO_L18N_2/GCLK15	Y12	GCLK
2	IO_L18P_2/GCLK14	W12	GCLK
2	IO_L19N_2/GCLK1	AB12	GCLK
2	IO_L19P_2/GCLK0	AA12	GCLK
2	IO_L20N_2/GCLK3	U12	GCLK
2	IO_L20P_2/GCLK2	V12	GCLK
2	IO_L21N_2	Y13	I/O
2	IO_L21P_2	AB13	I/O
2	IO_L22N_2/MOSI/CSI_B	AB14	DUAL
2	IO_L22P_2	AA14	I/O
2	IO_L23N_2	Y14	I/O
2	IO_L23P_2	W13	I/O
2	IO_L24N_2/ DOUT	AA15	DUAL
2	IO_L24P_2/AWAKE	AB15	PWR MGMT
2	IO_L25N_2	Y15	I/O
2	IO_L25P_2	W15	I/O
2	IO_L26N_2/D3	U13	DUAL
2	IO_L26P_2/INIT_B	V13	DUAL
2	IO_L27N_2	Y16	I/O
2	IO_L27P_2	AB16	I/O
2	IO_L28N_2/D1	Y17	DUAL
2	IO_L28P_2/D2	AA17	DUAL
2	IO_L29N_2	AB18	I/O
2	IO_L29P_2	AB17	I/O

Table 83: **Spartan-3A FG484 Pinout*(Continued)***

Bank	Pin Name	FG484 Ball	Type
2	IO_L30N_2	V15	I/O
2	IO_L30P_2	V14	I/O
2	IO_L31N_2	V16	I/O
2	IO_L31P_2	W16	I/O
2	IO_L32N_2	AA19	I/O
2	IO_L32P_2	AB19	I/O
2	IO_L33N_2	V17	I/O
2	IO_L33P_2	W18	I/O
2	IO_L34N_2	W17	I/O
2	IO_L34P_2	Y18	I/O
2	IO_L35N_2	AA21	I/O
2	IO_L35P_2	AB21	I/O
2	IO_L36N_2/CCLK	AA20	DUAL
2	IO_L36P_2/D0/DIN/MISO	AB20	DUAL
2	IP_2	P12	INPUT
2	IP_2	R10	INPUT
2	IP_2	R11	INPUT
2	IP_2	R9	INPUT
2	IP_2	T13	INPUT
2	IP_2	T14	INPUT
2	IP_2	T9	INPUT
2	IP_2	U10	INPUT
2	IP_2	U15	INPUT
2	***XC3S1400A:*** IP_2 ***XC3S700A:*** N.C. (◆)	U16	INPUT
2	***XC3S1400A:*** IP_2 ***XC3S700A:*** N.C. (◆)	U7	INPUT
2	IP_2	U8	INPUT
2	IP_2	V7	INPUT
2	IP_2/VREF_2	R12	VREF
2	IP_2/VREF_2	R13	VREF
2	IP_2/VREF_2	R14	VREF
2	IP_2/VREF_2	T10	VREF
2	IP_2/VREF_2	T11	VREF
2	IP_2/VREF_2	T15	VREF
2	IP_2/VREF_2	T16	VREF
2	IP_2/VREF_2	T7	VREF
2	***XC3S1400A:*** IP_2/VREF_2 ***XC3S700A:*** N.C. (◆)	T8	VREF
2	IP_2/VREF_2	V8	VREF
2	VCCO_2	AA13	VCCO

FG484 Footprint

Left Half of FG484 Package (Top View)

195 **I/O:** Unrestricted, general-purpose user I/O

60-62 **INPUT:** Unrestricted, general-purpose input pin

51 **DUAL:** Configuration pins, then possible user I/O

33-34 **VREF:** User I/O or input voltage reference for bank

32 **CLK:** User I/O, input, or clock buffer input

2 **SUSPEND:** Dedicated SUSPEND and dual-purpose AWAKE Power Management pins

2 **CONFIG:** Dedicated configuration pins

4 **JTAG:** Dedicated JTAG port pins

53 **GND:** Ground

24 **VCCO:** Output voltage supply for bank

15 **VCCINT:** Internal core supply voltage (+1.2V)

10 **VCCAUX:** Auxiliary supply voltage

3 ◆ **N.C.:** Not connected (XC3S700A only)

Bank 0

	1	2	3	4	5	6	7	8	9	10	11
A	GND	I/O L36N_0 PUDC_B	I/O L33P_0	I/O L31P_0	I/O L28N_0	I/O L26N_0	I/O L26P_0	I/O L22N_0	I/O L22P_0	I/O L21P_0	I/O L18N_0 GCLK7
B	I/O L02P_3	I/O L36P_0 VREF_0	I/O L33N_0	I/O L31N_0	VCCO_0	I/O L28P_0	GND	I/O L25P_0	I/O L24P_0	VCCO_0	I/O L19P_0 GCLK8
C	I/O L01P_3	I/O L02N_3	GND	PROG_B	I/O L32P_0	I/O L29P_0	I/O L27N_0	I/O L25N_0	I/O L24N_0 VREF_0	I/O L21N_0	I/O L19N_0 GCLK9
D	I/O L06P_3	I/O L01N_3	I/O L03P_3	TMS	I/O L32N_0	I/O L29N_0	I/O L27P_0	I/O L30N_0	GND	I/O L23P_0	I/O L20P_0 GCLK10
E	I/O L06N_3	VCCO_3	I/O L07N_3	I/O L03N_3	VCCAUX	I/O L35N_0	I/O L34P_0	INPUT	I/O L30P_0	I/O L23N_0	I/O L20N_0 GCLK11
F	I/O L12N_3	I/O L12P_3	I/O L08P_3	I/O L07P_3	TDI	GND	I/O L35P_0	I/O L34N_0	VCCO_0	INPUT	GND
G	I/O L13N_3	GND	I/O L13P_3	I/O L08N_3	I/O L05N_3	I/O L05P_3	INPUT	INPUT VREF_0	INPUT	INPUT	INPUT
H	I/O L16N_3	I/O L16P_3	I/O L14N_3	I/O L14P_3	I/O L09P_3	I/O L09N_3	INPUT L04N_3 VREF_3	INPUT L04P_3	INPUT VREF_0	INPUT	VCCAUX
J	I/O L17N_3 VREF_3	VCCO_3	I/O L17P_3	GND	I/O L10N_3	VCCO_3	INPUT L11P_3	INPUT VREF_3	GND	VCCINT	GND
K	I/O L22P_3 LHCLK2	I/O L20N_3	I/O L20P_3	I/O L18N_3	I/O L18P_3	I/O L10P_3	INPUT L15P_3	INPUT L11N_3	VCCINT	GND	VCCINT
L	I/O L22N_3 IRDY2 LHCLK3	GND	I/O L21N_3 LHCLK1	VCCAUX	I/O L21P_3 LHCLK0	GND	INPUT L19P_3	INPUT L15N_3 VREF_3	GND	VCCINT	GND
M	I/O L24P_3 LHCLK4	I/O L24N_3 LHCLK5	I/O L25P_3 TRDY2 LHCLK6	I/O L25N_3 LHCLK7	I/O L30P_3	INPUT L23N_3	INPUT L23P_3	INPUT L19N_3	VCCINT	GND	VCCINT
N	I/O L26P_3 VREF_3	VCCO_3	I/O L26N_3	I/O L30N_3	INPUT L31N_3	INPUT L31P_3	INPUT L35P_3	INPUT L27P_3	INPUT L27N_3	VCCINT	GND
P	I/O L28P_3	I/O L28N_3	I/O L29P_3	GND	I/O L29N_3	VCCO_3	INPUT L39P_3	INPUT L35N_3	GND	GND	VCCAUX
R	I/O L32P_3	I/O L32N_3	I/O L33P_3	I/O L33N_3	I/O L34P_3	INPUT VREF_3	INPUT L46P_3	INPUT L39N_3	INPUT	INPUT	INPUT
T	I/O L36P_3 VREF_3	GND	I/O L36N_3	I/O L34N_3	I/O L40P_3	INPUT L46N_3 VREF_3	INPUT VREF_2	INPUT VREF_2 ◆	INPUT	INPUT VREF_2	INPUT VREF_2
U	I/O L37P_3	I/O L37N_3	I/O L41P_3	I/O L41N_3	I/O L40N_3	GND	INPUT ◆	INPUT	VCCO_2	INPUT	I/O L17P_2 GCLK12
V	I/O L38P_3	VCCO_3	I/O L38N_3	I/O L43P_3	VCCAUX	I/O L01P_2 M1	INPUT	INPUT VREF_2	I/O L09P_2 RDWR_B	I/O L13P_2	I/O L17N_2 GCLK13
W	I/O L42P_3	I/O L42N_3	I/O L43N_3	I/O L02P_2 M2	I/O L01N_2 M0	I/O L05P_2	I/O L07P_2	I/O L11P_2 VS1	I/O L09N_2 VS2	GND	VCCAUX
Y	I/O L44P_3	I/O L44N_3	GND	I/O L02N_2 CSO_B	I/O L05N_2	I/O L07N_2	I/O L10P_2	I/O L11N_2 VS0	I/O L14P_2 D7	I/O L13N_2	I/O L16P_2 D5
AA	I/O L45P_3	I/O L45N_3	I/O L03N_2	I/O L04N_2	VCCO_2	I/O L08P_2	GND	I/O L12P_2	VCCO_2	I/O L15P_2	GND
AB	GND	I/O L03P_2	I/O L04P_2	I/O L06P_2	I/O L06N_2	I/O L08N_2	I/O L10N_2	I/O L12N_2	I/O L14N_2 D6	I/O L15N_2	I/O L16N_2 D4

Bank 3 (rows A–AB)

Bank 2

DS529-4_01_101106

Figure 25: **FG484 Package Footprint (Top View)**

FG676: 676-ball Fine-pitch Ball Grid Array

The 676-ball fine-pitch ball grid array, FG676, supports the XC3S1400A FPGA.

Table 87 lists all the FG676 package pins. They are sorted by bank number and then by pin name. Pairs of pins that form a differential I/O pair appear together in the table. The table also shows the pin number for each pin and the pin type, as defined earlier.

The XC3S1400A has 17 unconnected balls, indicated as N.C. (No Connection) in Table 87 and with the black diamond character (◆) in Table 87 and Figure 27.

An electronic version of this package pinout table and footprint diagram is available for download from the Xilinx website at:

www.xilinx.com/support/documentation/data_sheets/s3a_pin.zip.

Pinout Table

Table 87: **Spartan-3A FG676 Pinout**

Bank	Pin Name	FG676 Ball	Type
0	IO_L01N_0	F20	I/O
0	IO_L01P_0	G20	I/O
0	IO_L02N_0	F19	I/O
0	IO_L02P_0/VREF_0	G19	VREF
0	IO_L05N_0	C22	I/O
0	IO_L05P_0	D22	I/O
0	IO_L06N_0	C23	I/O
0	IO_L06P_0	D23	I/O
0	IO_L07N_0	A22	I/O
0	IO_L07P_0	B23	I/O
0	IO_L08N_0	G17	I/O
0	IO_L08P_0	H17	I/O
0	IO_L09N_0	B21	I/O
0	IO_L09P_0	C21	I/O
0	IO_L10N_0	D21	I/O
0	IO_L10P_0	E21	I/O
0	IO_L11N_0	C20	I/O
0	IO_L11P_0	D20	I/O
0	IO_L12N_0	K16	I/O
0	IO_L12P_0	J16	I/O
0	IO_L13N_0	E17	I/O
0	IO_L13P_0	F17	I/O
0	IO_L14N_0	A20	I/O
0	IO_L14P_0/VREF_0	B20	VREF

Table 87: **Spartan-3A FG676 Pinout *(Continued)***

Bank	Pin Name	FG676 Ball	Type
0	IO_L15N_0	A19	I/O
0	IO_L15P_0	B19	I/O
0	IO_L16N_0	H15	I/O
0	IO_L16P_0	G15	I/O
0	IO_L17N_0	C18	I/O
0	IO_L17P_0	D18	I/O
0	IO_L18N_0	A18	I/O
0	IO_L18P_0	B18	I/O
0	IO_L19N_0	B17	I/O
0	IO_L19P_0	C17	I/O
0	IO_L20N_0/VREF_0	E15	VREF
0	IO_L20P_0	F15	I/O
0	IO_L21N_0	C16	I/O
0	IO_L21P_0	D17	I/O
0	IO_L22N_0	C15	I/O
0	IO_L22P_0	D16	I/O
0	IO_L23N_0	A15	I/O
0	IO_L23P_0	B15	I/O
0	IO_L24N_0	F14	I/O
0	IO_L24P_0	E14	I/O
0	IO_L25N_0/GCLK5	J14	GCLK
0	IO_L25P_0/GCLK4	K14	GCLK
0	IO_L26N_0/GCLK7	A14	GCLK
0	IO_L26P_0/GCLK6	B14	GCLK
0	IO_L27N_0/GCLK9	G13	GCLK
0	IO_L27P_0/GCLK8	F13	GCLK
0	IO_L28N_0/GCLK11	C13	GCLK
0	IO_L28P_0/GCLK10	B13	GCLK
0	IO_L29N_0	B12	I/O
0	IO_L29P_0	A12	I/O
0	IO_L30N_0	C12	I/O
0	IO_L30P_0	D13	I/O
0	IO_L31N_0	F12	I/O
0	IO_L31P_0	E12	I/O
0	IO_L32N_0/VREF_0	D11	VREF
0	IO_L32P_0	C11	I/O
0	IO_L33N_0	B10	I/O
0	IO_L33P_0	A10	I/O

Table 87: **Spartan-3A FG676 Pinout*(Continued)***

Bank	Pin Name	FG676 Ball	Type
1	IO_L03P_1/A0	AC23	DUAL
1	IO_L04N_1	W21	I/O
1	IO_L04P_1	W20	I/O
1	IO_L05N_1	AC25	I/O
1	IO_L05P_1	AD26	I/O
1	IO_L06N_1	AB26	I/O
1	IO_L06P_1	AC26	I/O
1	IO_L07N_1/VREF_1	AB24	VREF
1	IO_L07P_1	AB23	I/O
1	IO_L08N_1	V19	I/O
1	IO_L08P_1	V18	I/O
1	IO_L09N_1	AA23	I/O
1	IO_L09P_1	AA22	I/O
1	IO_L10N_1	U20	I/O
1	IO_L10P_1	V21	I/O
1	IO_L11N_1	AA25	I/O
1	IO_L11P_1	AA24	I/O
1	IO_L12N_1	U18	I/O
1	IO_L12P_1	U19	I/O
1	IO_L13N_1	Y23	I/O
1	IO_L13P_1	Y22	I/O
1	IO_L14N_1	T20	I/O
1	IO_L14P_1	U21	I/O
1	IO_L15N_1	Y25	I/O
1	IO_L15P_1	Y24	I/O
1	IO_L17N_1	T17	I/O
1	IO_L17P_1	T18	I/O
1	IO_L18N_1	V22	I/O
1	IO_L18P_1	W23	I/O
1	IO_L19N_1	V25	I/O
1	IO_L19P_1	V24	I/O
1	IO_L21N_1	U22	I/O
1	IO_L21P_1	V23	I/O
1	IO_L22N_1	R20	I/O
1	IO_L22P_1	R19	I/O
1	IO_L23N_1/VREF_1	U24	VREF
1	IO_L23P_1	U23	I/O
1	IO_L25N_1/A3	R22	DUAL
1	IO_L25P_1/A2	R21	DUAL
1	IO_L26N_1/A5	T24	DUAL

Table 87: **Spartan-3A FG676 Pinout*(Continued)***

Bank	Pin Name	FG676 Ball	Type
1	IO_L26P_1/A4	T23	DUAL
1	IO_L27N_1/A7	R17	DUAL
1	IO_L27P_1/A6	R18	DUAL
1	IO_L29N_1/A9	R26	DUAL
1	IO_L29P_1/A8	R25	DUAL
1	IO_L30N_1/RHCLK1	P20	RHCLK
1	IO_L30P_1/RHCLK0	P21	RHCLK
1	IO_L31N_1/TRDY1/RHCLK3	P25	RHCLK
1	IO_L31P_1/RHCLK2	P26	RHCLK
1	IO_L33N_1/RHCLK5	N24	RHCLK
1	IO_L33P_1/RHCLK4	P23	RHCLK
1	IO_L34N_1/RHCLK7	N19	RHCLK
1	IO_L34P_1/IRDY1/RHCLK6	P18	RHCLK
1	IO_L35N_1/A11	M25	DUAL
1	IO_L35P_1/A10	M26	DUAL
1	IO_L37N_1	N21	I/O
1	IO_L37P_1	P22	I/O
1	IO_L38N_1/A13	M23	DUAL
1	IO_L38P_1/A12	L24	DUAL
1	IO_L39N_1/A15	N17	DUAL
1	IO_L39P_1/A14	N18	DUAL
1	IO_L41N_1	K26	I/O
1	IO_L41P_1	K25	I/O
1	IO_L42N_1/A17	M20	DUAL
1	IO_L42P_1/A16	N20	DUAL
1	IO_L43N_1/A19	J25	DUAL
1	IO_L43P_1/A18	J26	DUAL
1	IO_L45N_1	M22	I/O
1	IO_L45P_1	M21	I/O
1	IO_L46N_1	K22	I/O
1	IO_L46P_1	K23	I/O
1	IO_L47N_1	M18	I/O
1	IO_L47P_1	M19	I/O
1	IO_L49N_1	J22	I/O
1	IO_L49P_1	J23	I/O
1	IO_L50N_1	K21	I/O
1	IO_L50P_1	L22	I/O
1	IO_L51N_1	G24	I/O
1	IO_L51P_1	G23	I/O
1	IO_L53N_1	K20	I/O

Table 87: **Spartan-3A FG676 Pinout*(Continued)***

Bank	Pin Name	FG676 Ball	Type
3	IO_L30P_3	N5	I/O
3	IO_L31N_3	N2	I/O
3	IO_L31P_3	N1	I/O
3	IO_L32N_3/LHCLK1	N7	LHCLK
3	IO_L32P_3/LHCLK0	N6	LHCLK
3	IO_L33N_3/IRDY2/LHCLK3	P2	LHCLK
3	IO_L33P_3/LHCLK2	P1	LHCLK
3	IO_L34N_3/LHCLK5	P3	LHCLK
3	IO_L34P_3/LHCLK4	P4	LHCLK
3	IO_L35N_3/LHCLK7	P10	LHCLK
3	IO_L35P_3/TRDY2/LHCLK6	N9	LHCLK
3	IO_L36N_3	R2	I/O
3	IO_L36P_3/VREF_3	R1	VREF
3	IO_L37N_3	R4	I/O
3	IO_L37P_3	R3	I/O
3	IO_L38N_3	T4	I/O
3	IO_L38P_3	T3	I/O
3	IO_L39N_3	P6	I/O
3	IO_L39P_3	P7	I/O
3	IO_L40N_3	R6	I/O
3	IO_L40P_3	R5	I/O
3	IO_L41N_3	P9	I/O
3	IO_L41P_3	P8	I/O
3	IO_L42N_3	U4	I/O
3	IO_L42P_3	T5	I/O
3	IO_L43N_3	R9	I/O
3	IO_L43P_3/VREF_3	R10	VREF
3	IO_L44N_3	U2	I/O
3	IO_L44P_3	U1	I/O
3	IO_L45N_3	R7	I/O
3	IO_L45P_3	R8	I/O
3	IO_L47N_3	V2	I/O
3	IO_L47P_3	V1	I/O
3	IO_L48N_3	T9	I/O
3	IO_L48P_3	T10	I/O
3	IO_L49N_3	V5	I/O
3	IO_L49P_3	U5	I/O
3	IO_L51N_3	U6	I/O
3	IO_L51P_3	T7	I/O
3	IO_L52N_3	W4	I/O

Table 87: **Spartan-3A FG676 Pinout*(Continued)***

Bank	Pin Name	FG676 Ball	Type
3	IO_L52P_3	W3	I/O
3	IO_L53N_3	Y2	I/O
3	IO_L53P_3	Y1	I/O
3	IO_L55N_3	AA3	I/O
3	IO_L55P_3	AA2	I/O
3	IO_L56N_3	U8	I/O
3	IO_L56P_3	U7	I/O
3	IO_L57N_3	Y6	I/O
3	IO_L57P_3	Y5	I/O
3	IO_L59N_3	V6	I/O
3	IO_L59P_3	V7	I/O
3	IO_L60N_3	AC1	I/O
3	IO_L60P_3	AB1	I/O
3	IO_L61N_3	V8	I/O
3	IO_L61P_3	U9	I/O
3	IO_L63N_3	W6	I/O
3	IO_L63P_3	W7	I/O
3	IO_L64N_3	AC3	I/O
3	IO_L64P_3	AC2	I/O
3	IO_L65N_3	AD2	I/O
3	IO_L65P_3	AD1	I/O
3	IP_L04N_3/VREF_3	C1	VREF
3	IP_L04P_3	C2	INPUT
3	IP_L08N_3	D1	INPUT
3	IP_L08P_3	D2	INPUT
3	IP_L12N_3/VREF_3	H4	VREF
3	IP_L12P_3	G5	INPUT
3	IP_L16N_3	G1	INPUT
3	IP_L16P_3	G2	INPUT
3	IP_L20N_3/VREF_3	J2	VREF
3	IP_L20P_3	J3	INPUT
3	IP_L24N_3	K1	INPUT
3	IP_L24P_3	J1	INPUT
3	IP_L46N_3	V4	INPUT
3	IP_L46P_3	U3	INPUT
3	IP_L50N_3/VREF_3	W2	VREF
3	IP_L50P_3	W1	INPUT
3	IP_L54N_3	Y4	INPUT
3	IP_L54P_3	Y3	INPUT
3	IP_L58N_3/VREF_3	AA5	VREF