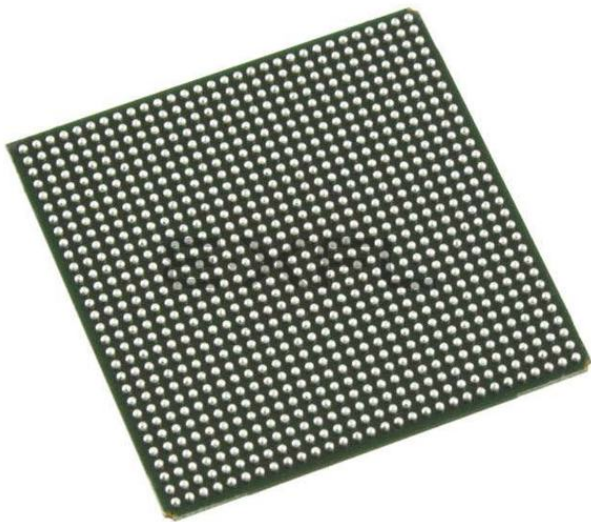




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Understanding [Embedded - FPGAs \(Field Programmable Gate Array\)](#)

Embedded - FPGAs, or Field Programmable Gate Arrays, are advanced integrated circuits that offer unparalleled flexibility and performance for digital systems. Unlike traditional fixed-function logic devices, FPGAs can be programmed and reprogrammed to execute a wide array of logical operations, enabling customized functionality tailored to specific applications. This reprogrammability allows developers to iterate designs quickly and implement complex functions without the need for custom hardware.

Applications of Embedded - FPGAs

The versatility of Embedded - FPGAs makes them indispensable in numerous fields. In telecommunications.

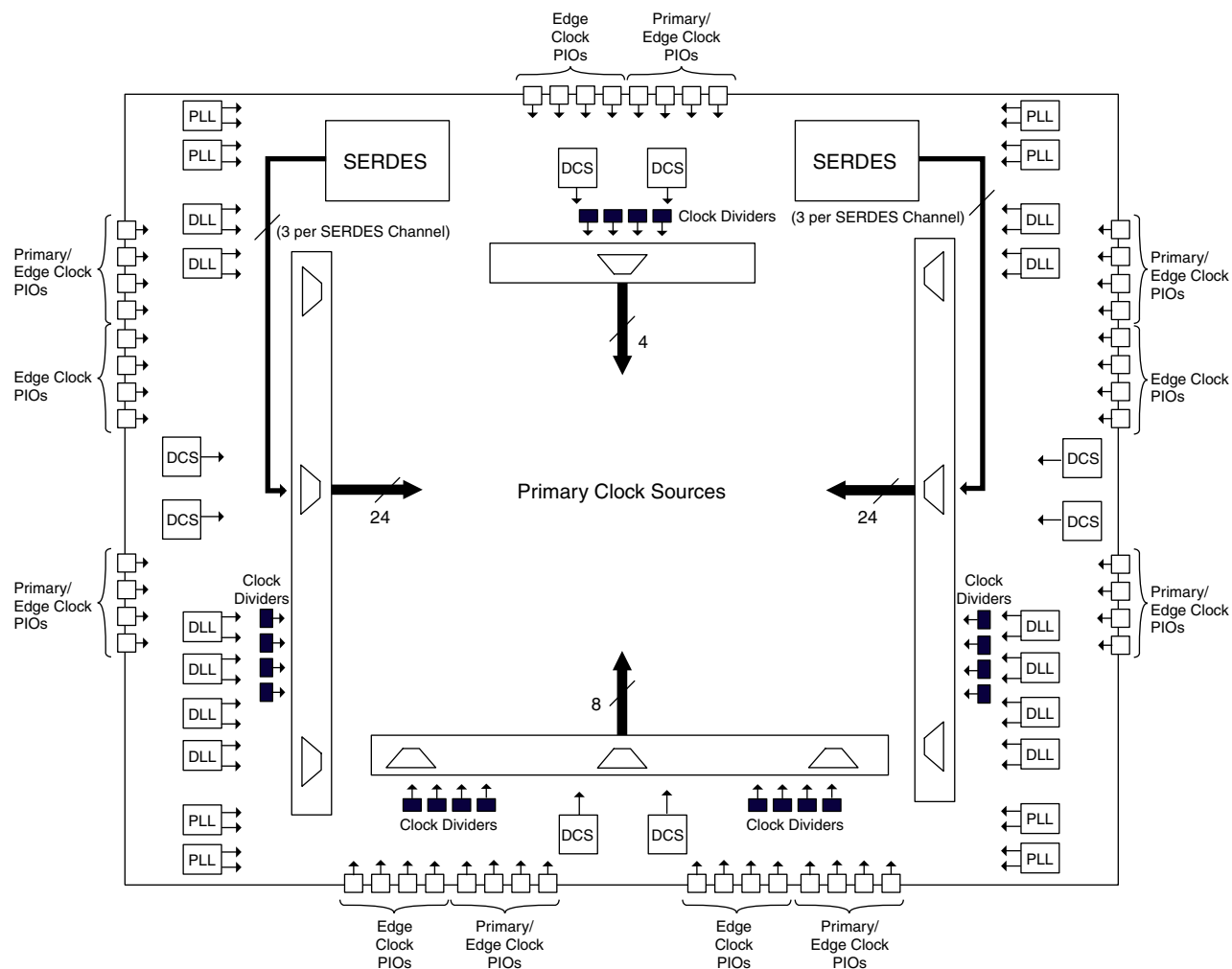
Details

Product Status	Obsolete
Number of LABs/CLBs	6250
Number of Logic Elements/Cells	25000
Total RAM Bits	1966080
Number of I/O	378
Number of Gates	-
Voltage - Supply	0.95V ~ 1.26V
Mounting Type	Surface Mount
Operating Temperature	-40°C ~ 105°C (TJ)
Package / Case	900-BBGA
Supplier Device Package	900-FPBGA (31x31)
Purchase URL	https://www.e-xfl.com/product-detail/lattice-semiconductor/lfsc3ga25e-5f900i

- Two outputs per PLL
- Clock divider outputs
- Digital Clock Select (DCS) block outputs
- Three outputs per SERDES quad

Figure 2-5 shows the arrangement of the primary clock sources.

Figure 2-5. Clock Sources



Primary Clock Routing

The clock routing structure in LatticeSC devices consists of 12 Primary Clock lines per quadrant. The primary clocks are generated from 64:1 MUXs located in each quadrant. Three of the inputs to each 64:1 MUX comes from local routing, one is connected to GND and rest of the 60 inputs are from the primary clock sources. Figure 2-6 shows this clock routing.

toggled. There are eight DCS blocks per device, located in pairs at the center of each side. Figure 2-9 illustrates the DCS Block diagram.

Figure 2-9. DCS Block Diagram

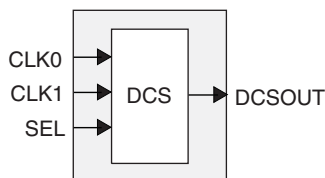
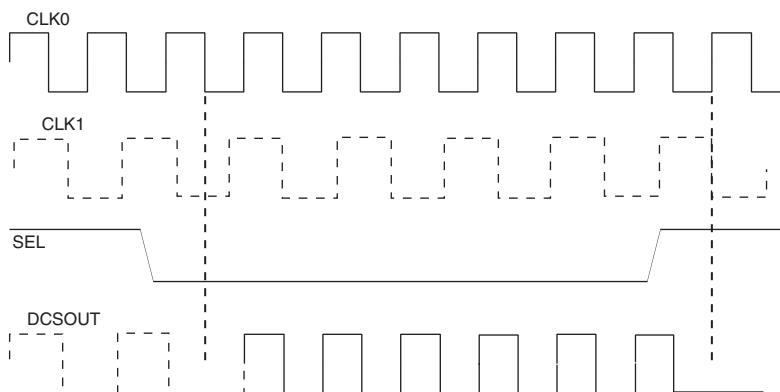


Figure 2-10 shows timing waveforms for one of the DCS operating modes. The DCS block can be programmed to other modes. For more information on the DCS, please see details of additional technical documentation at the end of this data sheet.

Figure 2-10. DCS Waveforms



Clock Boosting

There are programmable delays available in the clock signal paths in the PFU, PIC and EBR blocks. These allow setup and clock-to-output times to be traded to meet critical timing without slowing the system clock. If this feature is enabled then the design tool automatically uses these delays to improve timing performance.

Global Set/Reset

There is a global set/reset (GSR) network on the device that is distributed to all FFs, PLLs, DLLs and other blocks on the device. This GSR network can operate in two modes:

- asynchronous - no clock is required to get into or out of the reset state.
- synchronous - The global GSR net is synchronized to a user selected clock. In this mode it continues to be asynchronous to get into the reset state, but is synchronous to get out of the reset state. This allows all registers on the device to become operational in the same clock period. The synchronous GSR goes out of reset in two cycles from the clock edge where the setup time of the FF was met (not from the GSR being released).

sysCLOCK Phase Locked Loops (PLLs)

The sysCLOCK PLLs provide the ability to synthesize clock frequencies. Each PLL has four dividers associated with it: input clock divider, feedback divider and two clock output dividers. The input divider is used to divide the input clock signal, while the feedback divider is used to multiply the input clock signal.

LFSC/M15 Logic Signal Connections: 256 fpBGA^{1,2} (Cont.)

Ball Number	LFSC/M15		
	Ball Function	VCCIO Bank	Dual Function
C5	A_VDDIB1_L	-	
A5	A_HDINP1_L	-	PCS 360 CH 1 IN P
B5	A_HDINN1_L	-	PCS 360 CH 1 IN N
A4	A_HDOUTP1_L	-	PCS 360 CH 1 OUT P
B4	A_HDOUTN1_L	-	PCS 360 CH 1 OUT N
C4	A_VDDOB1_L	-	
B3	A_HDOUTN0_L	-	PCS 360 CH 0 OUT N
C3	A_VDDOB0_L	-	
A3	A_HDOUTP0_L	-	PCS 360 CH 0 OUT P
B2	A_HDINN0_L	-	PCS 360 CH 0 IN N
A2	A_HDINP0_L	-	PCS 360 CH 0 IN P
C2	A_VDDIB0_L	-	
A1	GND	-	
A16	GND	-	
B10	GND	-	
C13	GND	-	
D15	GND	-	
D3	GND	-	
E11	GND	-	
F13	GND	-	
G14	GND	-	
G2	GND	-	
G8	GND	-	
H10	GND	-	
J7	GND	-	
K15	GND	-	
K3	GND	-	
K9	GND	-	
M6	GND	-	
N11	GND	-	
N14	GND	-	
N2	GND	-	
P10	GND	-	
P4	GND	-	
R13	GND	-	
R7	GND	-	
G10	VCC	-	
G7	VCC	-	
G9	VCC	-	
H7	VCC	-	
H8	VCC	-	
H9	VCC	-	
J10	VCC	-	
J8	VCC	-	

LFSC/M15, LFSC/M25 Logic Signal Connections: 900 fpBGA^{1, 2} (Cont.)

Ball Number	LFSC/M15			LFSC/M25		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
E19	NC	-		NC	-	
G21	NC	-		NC	-	
G20	NC	-		NC	-	
G19	NC	-		NC	-	
F9	NC	-		NC	-	
A11	NC	-		NC	-	
G7	NC	-		NC	-	
AH9	NC	-		NC	-	
H8	VCC12	-		VCC12	-	
T8	VCC12	-		VCC12	-	
AB9	VCC12	-		VCC12	-	
AC8	VCC12	-		VCC12	-	
AB22	VCC12	-		VCC12	-	
AC23	VCC12	-		VCC12	-	
R23	VCC12	-		VCC12	-	
H23	VCC12	-		VCC12	-	
H15	VCC12	-		VCC12	-	
L24	VTT_2	2		VTT_2	2	
T23	VTT_2	2		VTT_2	2	
AC24	VTT_3	3		VTT_3	3	
T25	VTT_3	3		VTT_3	3	
W25	VTT_3	3		VTT_3	3	
AD24	VTT_4	4		VTT_4	4	
AE17	VTT_4	4		VTT_4	4	
AE18	VTT_4	4		VTT_4	4	
AC15	VTT_5	5		VTT_5	5	
AD16	VTT_5	5		VTT_5	5	
AE9	VTT_5	5		VTT_5	5	
AA6	VTT_6	6		VTT_6	6	
T7	VTT_6	6		VTT_6	6	
W6	VTT_6	6		VTT_6	6	
L7	VTT_7	7		VTT_7	7	
P7	VTT_7	7		VTT_7	7	
AA10	VCC	-		VCC	-	
AA11	VCC	-		VCC	-	
AA12	VCC	-		VCC	-	
AA13	VCC	-		VCC	-	
AA14	VCC	-		VCC	-	
AA17	VCC	-		VCC	-	
AA18	VCC	-		VCC	-	
AA19	VCC	-		VCC	-	
AA20	VCC	-		VCC	-	
AA21	VCC	-		VCC	-	
AA22	VCC	-		VCC	-	
AA9	VCC	-		VCC	-	

LFSC/M15, LFSC/M25 Logic Signal Connections: 900 fpBGA^{1, 2} (Cont.)

Ball Number	LFSC/M15			LFSC/M25		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
U18	GND	-		GND	-	
U19	GND	-		GND	-	
U20	GND	-		GND	-	
V11	GND	-		GND	-	
V12	GND	-		GND	-	
V13	GND	-		GND	-	
V14	GND	-		GND	-	
V15	GND	-		GND	-	
V16	GND	-		GND	-	
V17	GND	-		GND	-	
V18	GND	-		GND	-	
V19	GND	-		GND	-	
V20	GND	-		GND	-	
W11	GND	-		GND	-	
W12	GND	-		GND	-	
W13	GND	-		GND	-	
W14	GND	-		GND	-	
W15	GND	-		GND	-	
W16	GND	-		GND	-	
W17	GND	-		GND	-	
W18	GND	-		GND	-	
W19	GND	-		GND	-	
W20	GND	-		GND	-	
Y11	GND	-		GND	-	
Y12	GND	-		GND	-	
Y13	GND	-		GND	-	
Y14	GND	-		GND	-	
Y15	GND	-		GND	-	
Y16	GND	-		GND	-	
Y17	GND	-		GND	-	
Y18	GND	-		GND	-	
Y19	GND	-		GND	-	
Y20	GND	-		GND	-	
H2	VCCIO7	-		VCCIO7	-	
N4	VCCIO7	-		VCCIO7	-	
N6	VCCIO7	-		VCCIO7	-	
J2	VCCIO7	-		VCCIO7	-	
L2	VCCIO7	-		VCCIO7	-	
H4	VCCIO7	-		VCCIO7	-	
AB2	VCCIO6	-		VCCIO6	-	
AD1	VCCIO6	-		VCCIO6	-	
W4	VCCIO6	-		VCCIO6	-	
AA4	VCCIO6	-		VCCIO6	-	
AE7	VCCIO5	-		VCCIO5	-	
AH6	VCCIO5	-		VCCIO5	-	

LFSC/M25, LFSC/M40 Logic Signal Connections: 1020 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M25			LFSC/M40		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
B30	A_HDOUTN0_L	-	PCS 360 CH 0 OUT N	A_HDOUTN0_L	-	PCS 360 CH 0 OUT N
D30	A_VDDOB0_L	-		A_VDDOB0_L	-	
A30	A_HDOUTP0_L	-	PCS 360 CH 0 OUT P	A_HDOUTP0_L	-	PCS 360 CH 0 OUT P
C31	A_HDINN0_L	-	PCS 360 CH 0 IN N	A_HDINN0_L	-	PCS 360 CH 0 IN N
C32	A_HDINP0_L	-	PCS 360 CH 0 IN P	A_HDINP0_L	-	PCS 360 CH 0 IN P
B31	A_VDDIB0_L	-		A_VDDIB0_L	-	
AL25	NC	-		PB26A	5	
AL24	NC	-		PB26B	5	
AG27	NC	-		PB26C	5	
AH27	NC	-		PB26D	5	
AM25	NC	-		PB27A	5	
AM24	NC	-		PB27B	5	
AL9	NC	-		PB62A	4	
AL8	NC	-		PB62B	4	
AK9	NC	-		PB63A	4	
AJ9	NC	-		PB63B	4	
AG10	NC	-		PB63C	4	
AG11	NC	-		PB63D	4	
J30	NC	-		PL26A	7	
H30	NC	-		PL26B	7	
M28	NC	-		PL26C	7	
N28	NC	-		PL26D	7	
J32	NC	-		PL27A	7	
J31	NC	-		PL27B	7	
N26	NC	-		PL27C	7	
N27	NC	-		PL27D	7	
K31	NC	-		PL29A	7	
K32	NC	-		PL29B	7	
P25	NC	-		PL29C	7	
P26	NC	-		PL29D	7	
L27	NC	-		PL22C	7	
L28	NC	-		PL22D	7	
M29	NC	-		PL30A	7	
L29	NC	-		PL30B	7	
M30	NC	-		PL31A	7	
L30	NC	-		PL31B	7	
L31	NC	-		PL34A	7	
M31	NC	-		PL34B	7	
AA29	NC	-		PL56A	6	
AA30	NC	-		PL56B	6	
AB31	NC	-		PL57A	6	
AA31	NC	-		PL57B	6	
AG30	NC	-		PL57C	6	
AG29	NC	-		PL57D	6	
AB29	NC	-		PL58A	6	
AB30	NC	-		PL58B	6	
Y25	NC	-		PL58C	6	
AA25	NC	-		PL58D	6	
AA8	NC	-		PR58D	3	
Y8	NC	-		PR58C	3	

LFSC/M25, LFSC/M40 Logic Signal Connections: 1020 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M25			LFSC/M40		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
P17	VCC	-		VCC	-	
P19	VCC	-		VCC	-	
R13	VCC	-		VCC	-	
R15	VCC	-		VCC	-	
R18	VCC	-		VCC	-	
R20	VCC	-		VCC	-	
T13	VCC	-		VCC	-	
T14	VCC	-		VCC	-	
T16	VCC	-		VCC	-	
T17	VCC	-		VCC	-	
T19	VCC	-		VCC	-	
T20	VCC	-		VCC	-	
U13	VCC	-		VCC	-	
U14	VCC	-		VCC	-	
U16	VCC	-		VCC	-	
U17	VCC	-		VCC	-	
U19	VCC	-		VCC	-	
U20	VCC	-		VCC	-	
V13	VCC	-		VCC	-	
V15	VCC	-		VCC	-	
V18	VCC	-		VCC	-	
V20	VCC	-		VCC	-	
W14	VCC	-		VCC	-	
W16	VCC	-		VCC	-	
W17	VCC	-		VCC	-	
W19	VCC	-		VCC	-	
Y13	VCC	-		VCC	-	
Y15	VCC	-		VCC	-	
Y16	VCC	-		VCC	-	
Y17	VCC	-		VCC	-	
Y18	VCC	-		VCC	-	
Y20	VCC	-		VCC	-	
C17	VCCIO1	-		VCCIO1	-	
D16	VCCIO1	-		VCCIO1	-	
F15	VCCIO1	-		VCCIO1	-	
F24	VCCIO1	-		VCCIO1	-	
G18	VCCIO1	-		VCCIO1	-	
G9	VCCIO1	-		VCCIO1	-	
J11	VCCIO1	-		VCCIO1	-	
J19	VCCIO1	-		VCCIO1	-	
K14	VCCIO1	-		VCCIO1	-	
K22	VCCIO1	-		VCCIO1	-	
G4	VCCIO2	-		VCCIO2	-	
J7	VCCIO2	-		VCCIO2	-	
K3	VCCIO2	-		VCCIO2	-	
L10	VCCIO2	-		VCCIO2	-	
M6	VCCIO2	-		VCCIO2	-	
N4	VCCIO2	-		VCCIO2	-	
P9	VCCIO2	-		VCCIO2	-	
R7	VCCIO2	-		VCCIO2	-	

LFSC/M40, LFSC/M80 Logic Signal Connections: 1152 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M40			LFSC/M80		
	Ball Function	VCCI/O Bank	Dual Function	Ball Function	VCCI/O Bank	Dual Function
AH27	PB5C	5		PB5C	5	
AH26	PB5D	5	VREF1_5	PB5D	5	VREF1_5
AN32	PB7A	5		PB7A	5	
AP32	PB7B	5		PB7B	5	
AF25	PB7C	5		PB7C	5	
AE25	PB7D	5		PB7D	5	
AN31	PB8A	5		PB9A	5	
AN30	PB8B	5		PB9B	5	
AK29	PB8C	5		PB9C	5	
AK28	PB8D	5		PB9D	5	
AP31	PB9A	5		PB11A	5	
AP30	PB9B	5		PB11B	5	
AD24	PB9C	5		PB11C	5	
AE24	PB9D	5		PB11D	5	
AM29	PB11A	5		PB13A	5	
AM28	PB11B	5		PB13B	5	
AJ27	PB11C	5		PB13C	5	
AJ26	PB11D	5		PB13D	5	
AP29	PB13A	5		PB15A	5	
AP28	PB13B	5		PB15B	5	
AK27	PB13C	5		PB15C	5	
AK26	PB13D	5		PB15D	5	
AN29	PB15A	5		PB17A	5	
AN28	PB15B	5		PB17B	5	
AG25	PB15C	5		PB17C	5	
AG24	PB15D	5		PB17D	5	
AL26	PB17A	5		PB19A	5	
AL25	PB17B	5		PB19B	5	
AG23	PB17C	5		PB19C	5	
AG22	PB17D	5		PB19D	5	
AN27	PB19A	5		PB21A	5	
AN26	PB19B	5		PB21B	5	
AF24	PB19C	5		PB21C	5	
AF23	PB19D	5		PB21D	5	
AP27	PB22A	5		PB24A	5	
AP26	PB22B	5		PB24B	5	
AK25	PB22C	5		PB24C	5	
AK24	PB22D	5		PB24D	5	
AN25	PB25A	5		PB27A	5	
AN24	PB25B	5		PB27B	5	
AE22	PB25C	5		PB27C	5	
AE21	PB25D	5		PB27D	5	
AM26	PB26A	5		PB29A	5	
AM25	PB26B	5		PB29B	5	
AF22	PB26C	5		PB29C	5	

LFSC/M40, LFSC/M80 Logic Signal Connections: 1152 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M40			LFSC/M80		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
AG18	PB42C	5		PB61C	5	
AF18	PB42D	5		PB61D	5	
AP19	PB43A	5		PB63A	5	
AP18	PB43B	5		PB63B	5	
AJ18	PB43C	5		PB63C	5	
AH18	PB43D	5		PB63D	5	
AP17	PB45A	4		PB65A	4	
AP16	PB45B	4		PB65B	4	
AJ17	PB45C	4		PB65C	4	
AH17	PB45D	4		PB65D	4	
AN17	PB46A	4		PB66A	4	
AN16	PB46B	4		PB66B	4	
AE17	PB46C	4		PB66C	4	
AD17	PB46D	4		PB66D	4	
AK17	PB47A	4		PB67A	4	
AK16	PB47B	4		PB67B	4	
AG17	PB47C	4		PB67C	4	
AF17	PB47D	4		PB67D	4	
AM16	PB49A	4		PB69A	4	
AM15	PB49B	4		PB69B	4	
AJ15	PB49C	4		PB69C	4	
AJ14	PB49D	4		PB69D	4	
AL16	PB50A	4		PB70A	4	
AL15	PB50B	4		PB70B	4	
AG16	PB50C	4		PB70C	4	
AF16	PB50D	4		PB70D	4	
AP15	PB51A	4		PB71A	4	
AP14	PB51B	4		PB71B	4	
AH15	PB51C	4		PB71C	4	
AH14	PB51D	4		PB71D	4	
AN15	PB53A	4	PCLKT4_2	PB74A	4	PCLKT4_2
AN14	PB53B	4	PCLKC4_2	PB74B	4	PCLKC4_2
AE16	PB53C	4	PCLKT4_7	PB74C	4	PCLKT4_7
AD16	PB53D	4	PCLKC4_7	PB74D	4	PCLKC4_7
AK15	PB54A	4	PCLKT4_1	PB75A	4	PCLKT4_1
AK14	PB54B	4	PCLKC4_1	PB75B	4	PCLKC4_1
AG15	PB54C	4	PCLKT4_6	PB75C	4	PCLKT4_6
AG14	PB54D	4	PCLKC4_6	PB75D	4	PCLKC4_6
AM13	PB55A	4	PCLKT4_0	PB77A	4	PCLKT4_0
AM12	PB55B	4	PCLKC4_0	PB77B	4	PCLKC4_0
AJ12	PB55C	4	VREF2_4	PB77C	4	VREF2_4
AJ11	PB55D	4		PB77D	4	
AL13	PB57A	4	PCLKT4_5	PB79A	4	PCLKT4_5
AL12	PB57B	4	PCLKC4_5	PB79B	4	PCLKC4_5
AH12	PB57C	4		PB79C	4	

LFSC/M40, LFSC/M80 Logic Signal Connections: 1152 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M40			LFSC/M80		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
AJ9	PB78C	4		PB117C	4	
AJ8	PB78D	4		PB117D	4	
AP3	PB79A	4		PB119A	4	
AN3	PB79B	4		PB119B	4	
AF10	PB79C	4		PB119C	4	
AE10	PB79D	4		PB119D	4	
AL7	PB81A	4		PB121A	4	
AL6	PB81B	4		PB121B	4	
AK7	PB81C	4		PB121C	4	
AK6	PB81D	4		PB121D	4	
AN5	PB82A	4		PB123A	4	
AN4	PB82B	4		PB123B	4	
AH9	PB82C	4	VREF1_4	PB123C	4	VREF1_4
AH8	PB82D	4		PB123D	4	
AM3	PB83A	4	LRC_DLLT_IN_C/LRC_DLLT_FB_D	PB124A	4	LRC_DLLT_IN_C/LRC_DLLT_FB_D
AM4	PB83B	4	LRC_DLLC_IN_C/LRC_DLLC_FB_D	PB124B	4	LRC_DLLC_IN_C/LRC_DLLC_FB_D
AG9	PB83C	4		PB124C	4	
AG8	PB83D	4		PB124D	4	
AN2	PB85A	4	LRC_PLLT_IN_A/LRC_PLLT_FB_B	PB125A	4	LRC_PLLT_IN_A/LRC_PLLT_FB_B
AM2	PB85B	4	LRC_PLLC_IN_A/LRC_PLLC_FB_B	PB125B	4	LRC_PLLC_IN_A/LRC_PLLC_FB_B
AJ6	PB85C	4	LRC_DLLT_IN_D/LRC_DLLT_FB_C	PB125C	4	LRC_DLLT_IN_D/LRC_DLLT_FB_C
AH6	PB85D	4	LRC_DLLC_IN_D/LRC_DLLC_FB_C	PB125D	4	LRC_DLLC_IN_D/LRC_DLLC_FB_C
AF7	PROBE_VCC	-		PROBE_VCC	-	
AF8	PROBE_GND	-		PROBE_GND	-	
AG7	PR71D	3	LRC_PLLC_IN_B/LRC_PLLC_FB_A	PR95D	3	LRC_PLLC_IN_B/LRC_PLLC_FB_A
AG6	PR71C	3	LRC_PLLT_IN_B/LRC_PLLT_FB_A	PR95C	3	LRC_PLLT_IN_B/LRC_PLLT_FB_A
AL4	PR71B	3	LRC_DLLC_IN_F/LRC_DLLC_FB_E	PR95B	3	LRC_DLLC_IN_F/LRC_DLLC_FB_E
AL3	PR71A	3	LRC_DLLT_IN_F/LRC_DLLT_FB_E	PR95A	3	LRC_DLLT_IN_F/LRC_DLLT_FB_E
AD10	PR70D	3		PR94D	3	
AD9	PR70C	3		PR94C	3	
AH4	PR70B	3		PR94B	3	
AJ4	PR70A	3		PR94A	3	
AK5	PR69D	3	LRC_DLLC_IN_E/LRC_DLLC_FB_F	PR93D	3	LRC_DLLC_IN_E/LRC_DLLC_FB_F
AJ5	PR69C	3	LRC_DLLT_IN_E/LRC_DLLT_FB_F	PR93C	3	LRC_DLLT_IN_E/LRC_DLLT_FB_F
AM1	PR69B	3		PR93B	3	
AL1	PR69A	3		PR93A	3	
AH5	PR67D	3		PR91D	3	
AG5	PR67C	3		PR91C	3	
AL2	PR67B	3		PR91B	3	
AK2	PR67A	3		PR91A	3	
AB9	PR66D	3		PR90D	3	
AC9	PR66C	3		PR90C	3	
AH1	PR66B	3		PR90B	3	
AG1	PR66A	3		PR90A	3	
AE8	PR65D	3	VREF2_3	PR89D	3	VREF2_3

LFSC/M115 Logic Signal Connections: 1152 fcBGA^{1, 2}

Ball Number	LFSC/M115		
	Ball Function	VCCIO Bank	Dual Function
U22	VCCAUX	-	
V13	VCCAUX	-	
V22	VCCAUX	-	
V23	VCCAUX	-	
W13	VCCAUX	-	
W22	VCCAUX	-	
Y21	GND	-	
Y25	GND	-	
C18	VCCIO1	-	
D17	VCCIO1	-	
F16	VCCIO1	-	
G19	VCCIO1	-	
J20	VCCIO1	-	
K12	VCCIO1	-	
K15	VCCIO1	-	
L23	VCCIO1	-	
Y9	GND	-	
J9	VCCIO1	-	
E3	VCCIO2	-	
G6	VCCIO2	-	
H4	VCCIO2	-	
K7	VCCIO2	-	
L3	VCCIO2	-	
M11	VCCIO2	-	
N6	VCCIO2	-	
P4	VCCIO2	-	
R9	VCCIO2	-	
AA3	VCCIO3	-	
AB7	VCCIO3	-	
AC10	VCCIO3	-	
AD4	VCCIO3	-	
AE6	VCCIO3	-	
AG3	VCCIO3	-	
AK4	VCCIO3	-	
T7	VCCIO3	-	
U3	VCCIO3	-	
V4	VCCIO3	-	
W6	VCCIO3	-	
Y10	VCCIO3	-	
AD12	VCCIO4	-	
AF15	VCCIO4	-	
AF9	VCCIO4	-	
AH10	VCCIO4	-	

LFSC/M80, LFSC/M115 Logic Signal Connections: 1704 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M80			LFSC/M115		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
W33	PL42C	7		PL56C	7	
Y33	PL42D	7		PL56D	7	
W37	PL43A	7		PL57A	7	
Y37	PL43B	7		PL57B	7	
Y32	PL43C	7		PL57C	7	
AA32	PL43D	7		PL57D	7	
U38	PL46A	7		PL60A	7	
V38	PL46B	7		PL60B	7	
W34	PL46C	7		PL60C	7	
Y34	PL46D	7		PL60D	7	
T40	PL47A	7	PCLKT7_1	PL61A	7	PCLKT7_1
U40	PL47B	7	PCLKC7_1	PL61B	7	PCLKC7_1
AA33	PL47C	7	PCLKT7_3	PL61C	7	PCLKT7_3
AB33	PL47D	7	PCLKC7_3	PL61D	7	PCLKC7_3
R42	PL48A	7	PCLKT7_0	PL62A	7	PCLKT7_0
T42	PL48B	7	PCLKC7_0	PL62B	7	PCLKC7_0
AA34	PL48C	7	PCLKT7_2	PL62C	7	PCLKT7_2
AB34	PL48D	7	PCLKC7_2	PL62D	7	PCLKC7_2
U41	PL50A	6	PCLKT6_0	PL64A	6	PCLKT6_0
V41	PL50B	6	PCLKC6_0	PL64B	6	PCLKC6_0
V36	PL50C	6	PCLKT6_1	PL64C	6	PCLKT6_1
W36	PL50D	6	PCLKC6_1	PL64D	6	PCLKC6_1
U42	PL51A	6		PL65A	6	
V42	PL51B	6		PL65B	6	
AB31	PL51C	6	PCLKT6_3	PL65C	6	PCLKT6_3
AC31	PL51D	6	PCLKC6_3	PL65D	6	PCLKC6_3
W38	PL52A	6		PL66A	6	
Y38	PL52B	6		PL66B	6	
AA35	PL52C	6	PCLKT6_2	PL66C	6	PCLKT6_2
AB35	PL52D	6	PCLKC6_2	PL66D	6	PCLKC6_2
W39	PL55A	6		PL69A	6	
Y39	PL55B	6		PL69B	6	
AB32	PL55C	6	VREF1_6	PL69C	6	VREF1_6
AC32	PL55D	6		PL69D	6	
W40	PL56A	6		PL70A	6	
Y40	PL56B	6		PL70B	6	
AA36	PL56C	6		PL70C	6	
AB36	PL56D	6		PL70D	6	
W41	PL57A	6		PL71A	6	
Y41	PL57B	6		PL71B	6	
AA37	PL57C	6		PL71C	6	
AB37	PL57D	6		PL71D	6	
W42	PL59A	6		PL73A	6	
Y42	PL59B	6		PL73B	6	
AC33	PL59C	6		PL73C	6	

LFSC/M80, LFSC/M115 Logic Signal Connections: 1704 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M80			LFSC/M115		
	Ball Function	VCCI/O Bank	Dual Function	Ball Function	VCCI/O Bank	Dual Function
AP1	PR90B	3		PR109B	3	
AN1	PR90A	3		PR109A	3	
AK10	PR89D	3	VREF2_3	PR107D	3	VREF2_3
AJ10	PR89C	3		PR107C	3	
AM5	PR89B	3		PR107B	3	
AL5	PR89A	3		PR107A	3	
AL7	PR86D	3		PR104D	3	
AK7	PR86C	3		PR104C	3	
AM1	PR86B	3		PR104B	3	
AL1	PR86A	3		PR104A	3	
AJ11	PR85D	3		PR103D	3	
AH11	PR85C	3		PR103C	3	
AK5	PR85B	3		PR103B	3	
AJ5	PR85A	3		PR103A	3	
AK9	PR84D	3		PR99D	3	
AJ9	PR84C	3		PR99C	3	
AK3	PR84B	3		PR99B	3	
AJ3	PR84A	3		PR99A	3	
AK6	PR82D	3		PR98D	3	
AJ6	PR82C	3		PR98C	3	
AK2	PR82B	3		PR98B	3	
AJ2	PR82A	3		PR98A	3	
AH10	PR81D	3		PR96D	3	
AG10	PR81C	3		PR96C	3	
AK1	PR81B	3		PR96B	3	
AJ1	PR81A	3		PR96A	3	
AH9	PR80D	3		PR94D	3	
AG9	PR80C	3		PR94C	3	
AH2	PR80B	3		PR94B	3	
AG2	PR80A	3		PR94A	3	
AH8	PR78D	3		PR92D	3	
AG8	PR78C	3		PR92C	3	
AG1	PR78B	3		PR92B	3	
AH1	PR78A	3		PR92A	3	
AG14	PR77D	3		PR91D	3	
AF14	PR77C	3		PR91C	3	
AG4	PR77B	3		PR91B	3	
AF4	PR77A	3		PR91A	3	
AH7	PR76D	3	DIFFR_3	PR90D	3	DIFFR_3
AG7	PR76C	3		PR90C	3	
AG3	PR76B	3		PR90B	3	
AF3	PR76A	3		PR90A	3	
AH6	PR74D	3		PR88D	3	
AG6	PR74C	3		PR88C	3	
AF1	PR74B	3		PR88B	3	

LFSC/M80, LFSC/M115 Logic Signal Connections: 1704 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M80			LFSC/M115		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
AE1	PR74A	3		PR88A	3	
AF12	PR73D	3		PR87D	3	
AE12	PR73C	3		PR87C	3	
AF2	PR73B	3		PR87B	3	
AE2	PR73A	3		PR87A	3	
AF11	PR72D	3		PR86D	3	
AE11	PR72C	3		PR86C	3	
AF5	PR72B	3		PR86B	3	
AE5	PR72A	3		PR86A	3	
AF10	PR69D	3		PR83D	3	
AE10	PR69C	3		PR83C	3	
AD1	PR69B	3		PR83B	3	
AC1	PR69A	3		PR83A	3	
AF9	PR68D	3		PR82D	3	
AE9	PR68C	3		PR82C	3	
AD2	PR68B	3		PR82B	3	
AC2	PR68A	3		PR82A	3	
AF6	PR67D	3		PR81D	3	
AE6	PR67C	3		PR81C	3	
AD3	PR67B	3		PR81B	3	
AC3	PR67A	3		PR81A	3	
AE8	PR65D	3		PR79D	3	
AD8	PR65C	3		PR79C	3	
AD4	PR65B	3		PR79B	3	
AC4	PR65A	3		PR79A	3	
AE7	PR64D	3		PR78D	3	
AD7	PR64C	3		PR78C	3	
AD5	PR64B	3		PR78B	3	
AC5	PR64A	3		PR78A	3	
AD6	PR63D	3		PR77D	3	
AC6	PR63C	3		PR77C	3	
AB1	PR63B	3		PR77B	3	
AA1	PR63A	3		PR77A	3	
AD9	PR61D	3		PR75D	3	
AC9	PR61C	3		PR75C	3	
AB2	PR61B	3		PR75B	3	
AA2	PR61A	3		PR75A	3	
AD14	PR60D	3		PR74D	3	
AC14	PR60C	3		PR74C	3	
AB5	PR60B	3		PR74B	3	
AA5	PR60A	3		PR74A	3	
AD10	PR59D	3		PR73D	3	
AC10	PR59C	3		PR73C	3	
Y1	PR59B	3		PR73B	3	
W1	PR59A	3		PR73A	3	

LFSC/M80, LFSC/M115 Logic Signal Connections: 1704 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M80			LFSC/M115		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
AG38	NC	-		PL95A	6	
AH38	NC	-		PL95B	6	
AJ39	NC	-		PL100A	6	
AK39	NC	-		PL100B	6	
AL41	NC	-		PL105A	6	
AM41	NC	-		PL105B	6	
AN40	NC	-		PL108A	6	
AM40	NC	-		PL108B	6	
AM39	NC	-		PL111A	6	
AN39	NC	-		PL111B	6	
AR42	NC	-		PL113A	6	
AT42	NC	-		PL113B	6	
AT1	NC	-		PR113B	3	
AR1	NC	-		PR113A	3	
AN4	NC	-		PR111B	3	
AM4	NC	-		PR111A	3	
AM3	NC	-		PR108B	3	
AN3	NC	-		PR108A	3	
AM2	NC	-		PR105B	3	
AL2	NC	-		PR105A	3	
AK4	NC	-		PR100B	3	
AJ4	NC	-		PR100A	3	
AH5	NC	-		PR95B	3	
AG5	NC	-		PR95A	3	
P6	NC	-		PR39B	2	
N6	NC	-		PR39A	2	
L3	NC	-		PR36B	2	
K3	NC	-		PR36A	2	
M5	NC	-		PR35A	2	
L4	NC	-		PR32B	2	
K4	NC	-		PR32A	2	
A2	GND	-		GND	-	
A41	GND	-		GND	-	
AA20	GND	-		GND	-	
AA23	GND	-		GND	-	
AA3	GND	-		GND	-	
AA39	GND	-		GND	-	
AB20	GND	-		GND	-	
AB23	GND	-		GND	-	
AB4	GND	-		GND	-	
AB40	GND	-		GND	-	
AC17	GND	-		GND	-	
AC19	GND	-		GND	-	
AC21	GND	-		GND	-	
AC22	GND	-		GND	-	

LFSC/M80, LFSC/M115 Logic Signal Connections: 1704 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M80			LFSC/M115		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
C3	GND	-		GND	-	
C30	GND	-		GND	-	
C33	GND	-		GND	-	
C35	GND	-		GND	-	
C36	GND	-		GND	-	
C39	GND	-		GND	-	
C4	GND	-		GND	-	
C40	GND	-		GND	-	
C7	GND	-		GND	-	
C8	GND	-		GND	-	
D15	GND	-		GND	-	
D21	GND	-		GND	-	
D25	GND	-		GND	-	
D31	GND	-		GND	-	
F4	GND	-		GND	-	
F40	GND	-		GND	-	
G11	GND	-		GND	-	
G17	GND	-		GND	-	
G26	GND	-		GND	-	
G32	GND	-		GND	-	
H14	GND	-		GND	-	
H20	GND	-		GND	-	
H23	GND	-		GND	-	
H29	GND	-		GND	-	
H35	GND	-		GND	-	
H8	GND	-		GND	-	
J3	GND	-		GND	-	
J39	GND	-		GND	-	
L16	GND	-		GND	-	
L27	GND	-		GND	-	
L36	GND	-		GND	-	
L7	GND	-		GND	-	
M19	GND	-		GND	-	
M24	GND	-		GND	-	
M4	GND	-		GND	-	
M40	GND	-		GND	-	
N12	GND	-		GND	-	
N31	GND	-		GND	-	
P35	GND	-		GND	-	
P8	GND	-		GND	-	
R15	GND	-		GND	-	
R28	GND	-		GND	-	
R3	GND	-		GND	-	
R39	GND	-		GND	-	
T11	GND	-		GND	-	

LFSC/M80, LFSC/M115 Logic Signal Connections: 1704 fcBGA^{1, 2} (Cont.)

Ball Number	LFSC/M80			LFSC/M115		
	Ball Function	VCCIO Bank	Dual Function	Ball Function	VCCIO Bank	Dual Function
AB25	VCC	-		VCC	-	
AB26	VCC	-		VCC	-	
AC16	VCC	-		VCC	-	
AC18	VCC	-		VCC	-	
AC20	VCC	-		VCC	-	
AC23	VCC	-		VCC	-	
AC25	VCC	-		VCC	-	
AC27	VCC	-		VCC	-	
AD17	VCC	-		VCC	-	
AD19	VCC	-		VCC	-	
AD21	VCC	-		VCC	-	
AD22	VCC	-		VCC	-	
AD24	VCC	-		VCC	-	
AD26	VCC	-		VCC	-	
AE16	VCC	-		VCC	-	
AE18	VCC	-		VCC	-	
AE20	VCC	-		VCC	-	
AE21	VCC	-		VCC	-	
AE22	VCC	-		VCC	-	
AE23	VCC	-		VCC	-	
AE25	VCC	-		VCC	-	
AE27	VCC	-		VCC	-	
AF17	VCC	-		VCC	-	
AF19	VCC	-		VCC	-	
AF21	VCC	-		VCC	-	
AF22	VCC	-		VCC	-	
AF24	VCC	-		VCC	-	
AF26	VCC	-		VCC	-	
AG18	VCC	-		VCC	-	
AG20	VCC	-		VCC	-	
AG23	VCC	-		VCC	-	
AG25	VCC	-		VCC	-	
T18	VCC	-		VCC	-	
T20	VCC	-		VCC	-	
T23	VCC	-		VCC	-	
T25	VCC	-		VCC	-	
U17	VCC	-		VCC	-	
U19	VCC	-		VCC	-	
U21	VCC	-		VCC	-	
U22	VCC	-		VCC	-	
U24	VCC	-		VCC	-	
U26	VCC	-		VCC	-	
V16	VCC	-		VCC	-	
V18	VCC	-		VCC	-	
V20	VCC	-		VCC	-	

Commercial, Cont.

Part Number	Grade	Package	Balls	Temp.	LUTs (K)
LFSC3GA40E-7FFN1020C ¹	-7	Lead-Free Organic fcBGA	1020	COM	40.4
LFSC3GA40E-6FFN1020C ¹	-6	Lead-Free Organic fcBGA	1020	COM	40.4
LFSC3GA40E-5FFN1020C ¹	-5	Lead-Free Organic fcBGA	1020	COM	40.4
LFSC3GA40E-7FFAN1020C	-7	Lead-Free Organic fcBGA Revision 2	1020	COM	40.4
LFSC3GA40E-6FFAN1020C	-6	Lead-Free Organic fcBGA Revision 2	1020	COM	40.4
LFSC3GA40E-5FFAN1020C	-5	Lead-Free Organic fcBGA Revision 2	1020	COM	40.4
LFSC3GA40E-7FCN1152C ²	-7	Lead-Free Ceramic fcBGA	1152	COM	40.4
LFSC3GA40E-6FCN1152C ²	-6	Lead-Free Ceramic fcBGA	1152	COM	40.4
LFSC3GA40E-5FCN1152C ²	-5	Lead-Free Ceramic fcBGA	1152	COM	40.4
LFSC3GA40E-7FFN1152C	-7	Lead-Free Organic fcBGA	1152	COM	40.4
LFSC3GA40E-6FFN1152C	-6	Lead-Free Organic fcBGA	1152	COM	40.4
LFSC3GA40E-5FFN1152C	-5	Lead-Free Organic fcBGA	1152	COM	40.4

1. Converted to organic flip-chip BGA package revision 2 per [PCN #02A-10](#).

2. Converted to organic flip-chip BGA package per [PCN #01A-10](#).

Part Number	Grade	Package	Balls	Temp.	LUTs (K)
LFSCM3GA40EP1-7FFN1020C ¹	-7	Organic fcBGA	1020	COM	40.4
LFSCM3GA40EP1-6FFN1020C ¹	-6	Organic fcBGA	1020	COM	40.4
LFSCM3GA40EP1-5FFN1020C ¹	-5	Organic fcBGA	1020	COM	40.4
LFSCM3GA40EP1-7FFAN1020C	-7	Organic fcBGA Revision 2	1020	COM	40.4
LFSCM3GA40EP1-6FFAN1020C	-6	Organic fcBGA Revision 2	1020	COM	40.4
LFSCM3GA40EP1-5FFAN1020C	-5	Organic fcBGA Revision 2	1020	COM	40.4
LFSCM3GA40EP1-7FCN1152C ²	-7	Ceramic fcBGA	1152	COM	40.4
LFSCM3GA40EP1-6FCN1152C ²	-6	Ceramic fcBGA	1152	COM	40.4
LFSCM3GA40EP1-5FCN1152C ²	-5	Ceramic fcBGA	1152	COM	40.4
LFSCM3GA40EP1-7FFN1152C	-7	Organic fcBGA	1152	COM	40.4
LFSCM3GA40EP1-6FFN1152C	-6	Organic fcBGA	1152	COM	40.4
LFSCM3GA40EP1-5FFN1152C	-5	Organic fcBGA	1152	COM	40.4

1. Converted to organic flip-chip BGA package revision 2 per [PCN #02A-10](#).

2. Converted to organic flip-chip BGA package per [PCN #01A-10](#).

Commercial, Cont.

Part Number	Grade	Package	Balls	Temp.	LUTs (K)
LFSCM3GA115EP1-6FCN1152C ¹	-6	Lead-Free Ceramic fcBGA	1152	COM	115.2
LFSCM3GA115EP1-5FCN1152C ¹	-5	Lead-Free Ceramic fcBGA	1152	COM	115.2
LFSCM3GA115EP1-6FFN1152C	-6	Lead-Free Organic fcBGA	1152	COM	115.2
LFSCM3GA115EP1-5FFN1152C	-5	Lead-Free Organic fcBGA	1152	COM	115.2
LFSCM3GA115EP1-6FCN1704C ¹	-6	Lead-Free Ceramic fcBGA	1704	COM	115.2
LFSCM3GA115EP1-5FCN1704C ¹	-5	Lead-Free Ceramic fcBGA	1704	COM	115.2
LFSCM3GA115EP1-6FFN1704C	-6	Lead-Free Organic fcBGA	1704	COM	115.2
LFSCM3GA115EP1-5FFN1704C	-5	Lead-Free Organic fcBGA	1704	COM	115.2

1. Converted to organic flip-chip BGA package per [PCN #01A-10](#).

Date	Version	Section	Change Summary
February 2006	01.0	—	Initial release.
March 2006	01.1	Introduction	SC25 1020 I/O count changed to 476.
		Architecture	Changed ROM 16X4 to ROM 16X2.
			Changed “X2 or X4” to “DIV2 or DIV4”.
			Added Global Set/Reset Section.
		DC and Switching Characteristics	Added notes 5 and 6 to Recommended Operating Conditions table.
			Added Power Supply Ramp Rates table.
			Removed -5 and -6 speed grades from Typical Building Block Performance table.
			Added Input Delay Timing table.
			Added Synchronous GSR Timing table.
		Pinout Information	Expanded PROBE_VCC and PROBE_GND description.
			Removed A-RXREFCLKP_[L/R] from Signal Description table.
			Added RESP_[ULC/URC] to Signal Description table.
			Added notes 1 and 2 to Signal Description table.
			Changed number of NCs to 28.
			Changed number of SERDES (signal + power supply) to 74.
			Removed RESP balls from NC list (B2, C2, B29, C29).
			Added note to VTT table.
			Changed RxRefclk (B2 and C2) to NC.
			Added RESP_ULC.
			Added RESP_URC.
			Changed RxRefclk (B29 and C29) to NC.
June 2006	01.2	Introduction	Changed SERDES min bandwidth from 622 Mbps to 600 Mbps.
			Changed max SERDES bandwidth from 3.4 Gbps to 3.8 Gbps.
			Corrected number of package I/Os for the SC80 and SC115 1704 pin packages.
			Updated speed performance for typical functions with ispLEVER 6.0 values.
		Architecture	Changed “When these pins are not used they should be left unconnected.” with “Unused VTT pins should be connected to GND if the internal or external VCMT function is not used in the bank. If the internal or external VCMT function for differential input termination is used, the VTT pins should be unconnected and allowed to float.”
			Added “SERDES Power Supply Sequencing Requirements” section.
			Changed total bandwidth per quad from 13.6 Gbps to 15.2 Gbps.
			Added the accuracy of the temperature-sensing diode to be typically +/- 10 °C. Also referred to a temperature-sensing diode application note for more information.
		DC and Switching Characteristics	Changed “CTAP” to “internal or external VCMT”.
			Changed VCC12 parameter to include VDDP, VDDTX and VDDRFX.
			Changed typical values to match ispLEVER 6.0 Power Calculator.