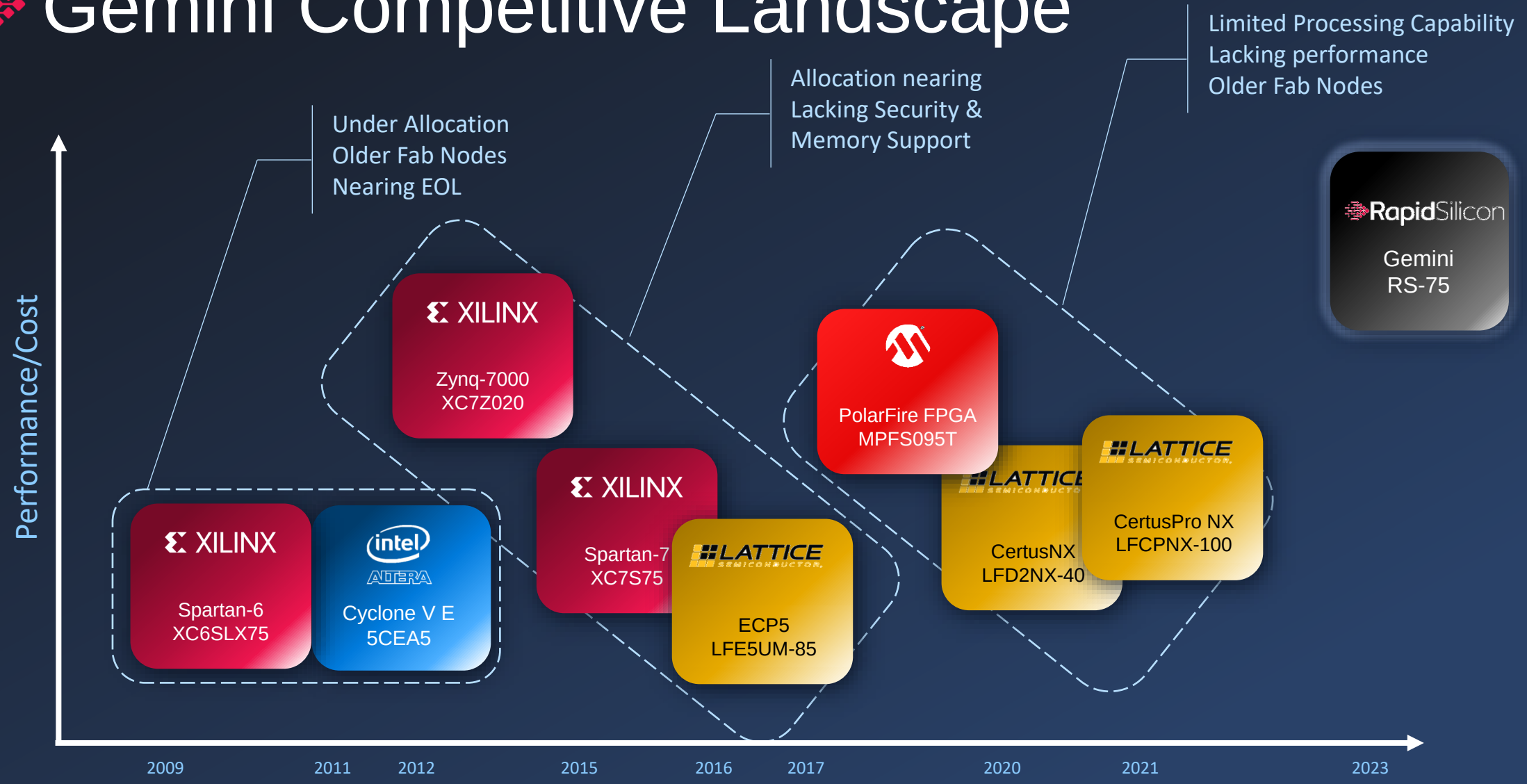
RapidSilicon

Competitive Landscape

GEMINI

Gemini Competitive Landscape



Gemini Family - FPGA Competitive Landscape

	Rapid Silicon	AMD (Xilinx)		Intel (Altera)	Lattice		Microsemi	Efinix
Product	**Gemini**	**Spartan-6**	**Spartan-7**	**Cyclone-V E**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**	**Trion**
Introduction Date	2023	2009	2015	2011	2020	2021	2012	2018
Tech Node (nm)	16	45	28	TSMC 28LP	28	28	65	SMIC 40LL
LUT Structure	LUT-6	LUT-6	LUT-6	ALM-8	LUT-4	LUT-4	LUT-4	LUT-4 + Adder
Embedded Memory	256KB OCM + 36Kb BRAM	18Kb BRAM	36Kb BRAM	10Kb M10K 640b MLAB	18Kb EBR 512KB LRAM	18Kb EBR 512KB LRAM	18Kb LSRAM 1Kb uSRAM 32KB eSRAM	5Kb SRAM
Signal Processing	18x20 MAC	18x18 MAC	25x18 MAC	27x27 MAC	18x36 MAC	18x36 MAC	18x18 MAC	18x18 Multiplier
Processor Core (Soft)	-	Microblaze @ 150MHz	Microblaze @ 200Mhz	NIOS @ 150 Mhz	Mico32 @ 150 MHz	Mico32 @ 150 MHz	MiV @ 150 MHz	VexRiscv Sapphire @ ~250MHz
Processor Core (Hard)	Andes A45 RISC V Hard Core @ 500 MHz	-	-	-	-	-	ARM Cortex M3 @ 166 MHz	-
Hard NOC	Yes	No	No	No	No	No	No	No
Logic Fabric Speed (MHz)	250	150	200	200	150	150	150	150
DDR SDRAM Support	DDR4/LPDDR4	DDR3/LPDDR	DDR3/LPDDR2	DDR3/LPDDR2	DDR4/LPDDR4	DDR4/LPDDR4	DDR3	DDR3/LPDDR3
DDR SDRAM Performance	Upto 1066 Mbps	Upto 800 Mbps	Upto 800 Mbps	Upto 800 Mbps	Upto 1067 Mbps	Upto 1067 Mbps	Upto 667 Mbps	Upto 1066Mbps
Transceivers	No	No	No	No	No	Yes	Yes	No
Max. I/O Count	525	408	400	480	191	191	425	278

Gemini Family - SoC Competitive Landscape

	Rapid Silicon	AMD (Xilinx)			Intel (Altera)		Lattice	Microsemi	
Product	**Gemini**	**Zynq 7000S**	**Zynq-7000**	**Zynq-7000**	**Arria V (SX)**	**Cyclone-V (SX)**		**SmartFusion 2**	**PolarFire SoC**
Introduction Date	2023	2018	2011	2011	2013	2012		2012	(TBF)
Part	**RS-75**	Z-7014S	Z-7015	Z-7020		**5CSXC4**		**M2S090**	**MPFS095T**
Logic Elements (k)	76	65	74	85		40		86	93
Tech Node (nm)	16	28	28	28		28		65	-
Processor Core (Hard)	Andes (A45) RISC V RT Hard Core @ 533 MHz	ARM Cortex A9 Single Core @ 766 MHz	Arm Cortex A9 Dual Core @ 866	Arm Cortex A9 Dual Core @ 866		Arm Cortex A9 Dual core (Freq Not Found)		ARM Cortex M3 @ 166 MHz	RISC-V U54 5 core Application core @ 667
Hard NOC	Yes	No	No	No		No		No	No
Logic Fabric Speed (MHz)	250	**TBF** 628 (Global Clock Freq)	**TBF** 628 (Global Clock Freq)			TBF		150	TBF 500 (Global Clock Freq)
DDR SDRAM Support	DDR4/LPDDR4	DDR3/DDR3L	DDR3/DDR3L	DDR3/DDR3L		DDR3		DDR3	LPDDR3/4
DDR SDRAM Performance	Upto 1066 Mbps	Upto 1066 Mbps	Upto 1066 Mbps	Upto 1066 Mbps		Upto 800 Mbps		Upto 667 Mbps	Upto 1600 Mbps
Transceivers	No	No	Yes	No		Yes		Yes	Yes
Max. I/O Count	365	328	278	328		326		425	412

More than 350k LE Parts

No SoC Device

Gemini – Resource Comparison @ 50K LE

	Rapid Silicon	AMD (Xilinx)			Intel (Altera)	Lattice		Microsemi			Efinix
Product	**Gemini**	**Spartan-6**	**Spartan-7**	**Zynq-7000**	**Cyclone-V E**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**		**PolarFire**	**Trion**
Intro. Date	2023	2009	2015	2012	2011	2020	2021	2012	2012	2017	2018
Part	**RS-50**	**XC6SLX45**	**XC7S50**	**XC7Z014S**	**5CEA4**	**LFD2NX-40**	**LFCPNX-50**	**M2S050**	**M2S060**	**MPF050T**	**T55**
Logic Elements (k)	50.7	44	52	65	49	39	52	56	56	48	54
BRAM Size (Mb)	5.9	2.088	2.700	3.8	2.7	1.512	1.728	1.314	1.314	3.6	2.765
BRAM Block Size	36 Kb	18 Kb	36 Kb	36 Kb	10Kb 0.640 Kb (MLAB)	18 Kb	18 Kb	18 Kb (LSRAM) 1Kb (uSRAM)	18 Kb (LSRAM) 1Kb (uSRAM)	20 Kb (LSRAM) 0.7 Kb (uSRAM)	5 Kb
Additional Embedded Memory	256 KB (On-Chip Memory)	N/A	N/A	256 KB (On-chip Memory)	270 Kb (MLAB)	1024 Kb (LRAM)	2048 Kb (LRAM)	256 KB (eNVM) 64 KB (eSRAM) 80 KB (eSRAM - Non SECDED)	256 KB (eNVM) 64 KB (eSRAM) 80 KB (eSRAM - Non SECDED)	N/A	N/A
DSP	-	58	120	170	72	-	-	-	-	-	-
Multipliers	165	-	-	-	144	56	96	72	72	150	150
Transceiver Count	N/A	N/A	N/A	N/A	N/A	N/A	4	8	4	4	N/A
Transceiver Speed	N/A	N/A	N/A	N/A	N/A	N/A	10.3125 Gbps	5 Gbps	5 Gbps	12.5 Gbps	N/A
Total Transceiver Bandwidth	N/A	N/A	N/A	N/A	N/A	N/A	41.25 Gbps	40 Gbps	20 Gbps	50 Gbps	N/A

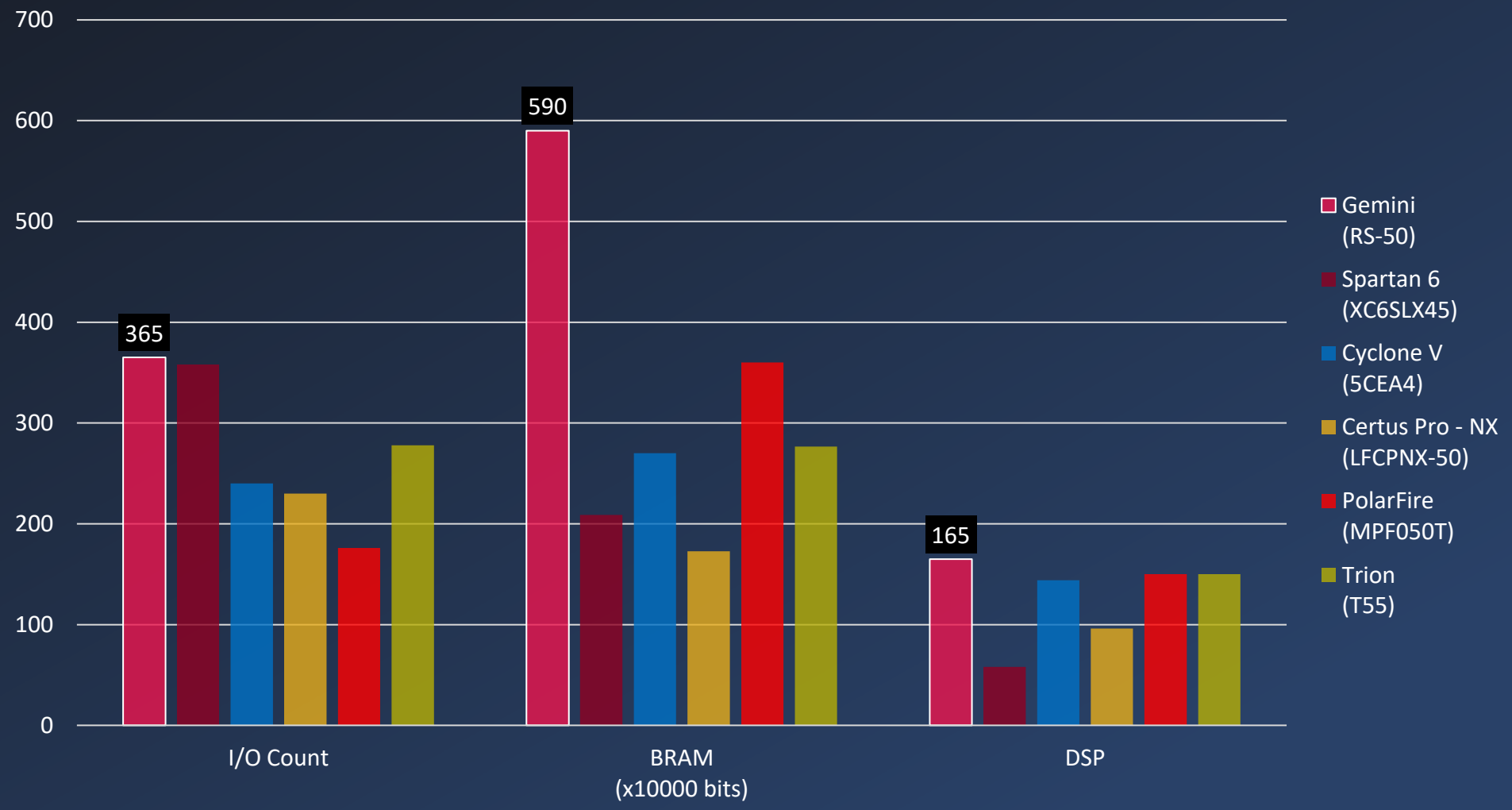
Gemini – I/O Comparison @ 50K LE

	Rapid Silicon	AMD Xilinx			Intel Altera	Lattice		Microsemi			Efinix
Product	**Gemini**	**Spartan-6**	**Spartan-7**	**Zynq-7000**	**Cyclone-V E**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**		**PolarFire**	**Trion**
Intro. Date	2023	2009	2015	2012	2011	2020	2021	2012	2012	2017	2018
Part	**RS-50**	**XC6SLX45**	**XC7S50**	**XC7Z014S**	**5CEA4**	**LFD2NX-40**	**LFCPNX-50**	**M2S050**	**M2S060**	**MPF050T**	**T55**
Logic Elements (k)	50.7	44	52	65	49	39	52	56	56	48	54
Max I/Os	365[1]	358	250	253	240	192	230	377	387	176	278
Max HVIO (3.3V)	140	358	250	253	240	192	230	139	271	92	278
Max HPIO (1.8V)	60	0	0	0	0	0	0	238	116	96	0
I/O per mm²	0.68	0.49	0.47	0.7	0.45	0.97	0.43	0.39	0.53	0.49	1.08
I/O per kLE	7.1	8.1	4.8	3.9	4.9	4.9	4.4	6.7	6.9	3.7	5.1
Max LVDS Rate	2500 Mbps	1080 Mbps	1250 Mbps	1250 Mbps	840 (Tx) – 875 (Rx) Mbps	1250 Mbps	1250 Mbps	700 Mbps	700 Mbps	1600 Mbps	800 Mbps
Smallest Pkg	15x15	15x15	15x15	17x17	13x13	6x6	9x9	11x11	11x11	11x11	12x12
Largest Pkg	23x23	27x27	23x23	19x19	23x23	14x14	23x23	31x31	27x27	19x19	16x16
I/O Voltage	1.2 - 3.3 V	1.2 - 3.3 V (HRIO)	1.2 - 3.3 V (HRIO)	1.2 - 3.3 V (HRIO)	1.2 - 3.3 V	1 – 1.8V (HPIO) 1.2 - 3.3 V (WRIO)	(TBD)	1.2 - 3.3 V	1.2 - 3.3V	1.2 - 3.3V	1.2 - 3.3V

1. Includes dedicated Memory Controller I/O (~81) & 84 DPIO

RapidSilicon

Gemini – Resource Comp. Chart @ 50K LE



Note: BRAM is shown as multiples of 10,000 bits to have bars' height consistent against I/O Count and DSP

Gemini – Resource Comparison @ 75K LE

	Rapid Silicon	AMD (Xilinx)			Intel (Altera)	Lattice		Microsemi		Efinix
Product	**Gemini**	**Spartan-6**	**Spartan-7**	**Zynq-7000**	**Cyclone-V E**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**	**PolarFire**	**Trion**
Intro. Date	2023	2009	2015	2012	2011	2020	2021	2012	2017	2018
Part	**RS-75**	**XC6SLX75**	**XC7S75**	**XC7Z020**	**5CEA5**	**LFD2NX-40**	**LFCPNX-50**	**M2S090**	**MPF050T**	**T85**
Logic Elements (k)	76	74	77	85	77	39	52	86	48	84
BRAM Size (Mb)	8.7	3.096	3.240	4.9	3.8 Mb	1.512	1.728	2.074	3.6	4.055
BRAM Block Size	36 Kb	18 Kb	36 Kb	36 Kb	10Kb 0.640 Kb (MLAB)	18 Kb	18 Kb	18 Kb (LSRAM) 1 Kb (uSRAM)	20 Kb (LSRAM) 0.7 Kb (uSRAM)	5 Kb
Additional Embedded Memory	256 KB	N/A	N/A	256 KB (On-chip Memory)	440 Kb (MLAB)	1024 Kb (LRAM)	2048 Kb (LRAM)	512 KB (eNVM) 64 KB (eSRAM) 80 KB (eSRAM - Non SECDED)	N/A	N/A
DSP		132	140	220	124	-	-	-	-	-
Multipliers	243	-	-	-	248	56	96	84	150	240
Transceiver Count	N/A	N/A	N/A	N/A	N/A	N/A	4	4	4	N/A
Transceiver Speed	N/A	N/A	N/A	N/A	N/A	N/A	10.3125 Gbps	5 Gbps	12.5 Gbps	N/A
Total Transceiver Bandwidth	N/A	N/A	N/A	N/A	N/A	N/A	41.25 Gbps	20 Gbps	50 Gbps	N/A

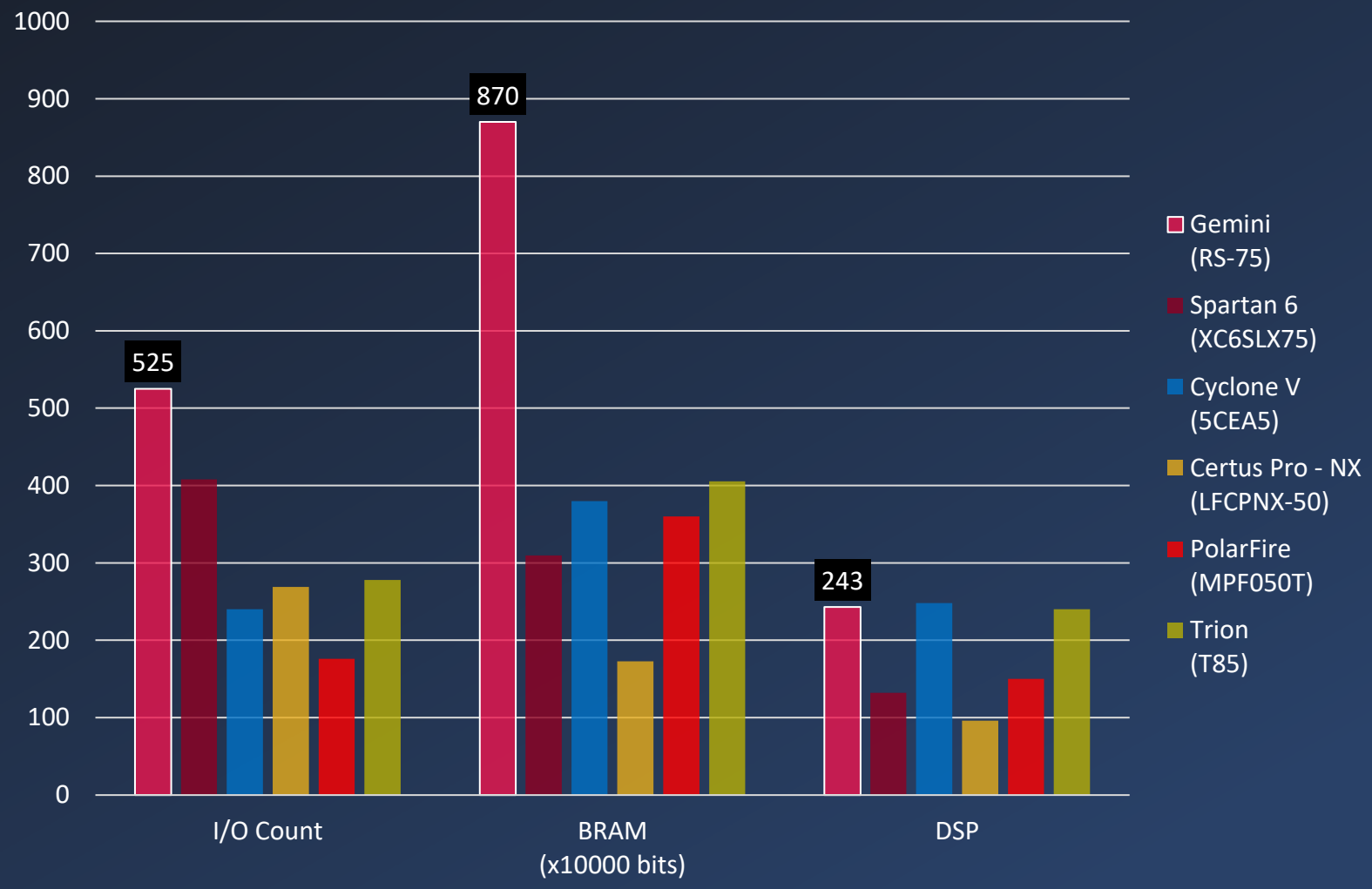
Gemini – I/O Comparison @ 75K LE

	Rapid Silicon	AMD (Xilinx)			Intel (Altera)	Lattice		Microsemi		Efinix
Product	**Gemini**	**Spartan-6**	**Spartan-7**	**Zynq-7000**	**Cyclone-V E**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**	**PolarFire**	**Trion**
Intro. Date	2023	2009	2015	2012	2011	2020	2021	2012	2017	2018
Part	**RS-75**	**XC6SLX75**	**XC7S75**	**XC7Z020**	**5CEA5**	**LFD2NX-40**	**LFCPNX-50**	**M2S090**	**MPF050T**	**T85**
Logic Elements (k)	76	74	77	85	76	39	52	86	48	84
Max I/Os	525	408	400	328	240	192	269	425	176	278
Max. HVIO (3.3V)	240	408	400	328	240	118	167	309	92	278
Max. HPIO (1.8V)	120	0	0	0	0	74	96	116	96	0
I/O per mm²	0.72	0.56	0.55	0.91	0.45	0.97	0.43	0.58	0.49	0.85
I/O per kLE	6.9	5.5	5.19	3.85	3.11	4.92	5.17	4.94	3.7	3.30
Max LVDS Rate	2500 Mbps	1080 Mbps	1250 Mbps	1250 Mbps	840 (Tx) – 875 (Rx) Mbps	1250 Mbps	1250 Mbps	700 Mbps	1600 Mbps	800 Mbps
Smallest Pkg	17x17	19x19	23x23	17x17	13x13	6x6	9x9	11x11	11x11	12x12
Largest Pkg	27x27	27x27	27x27	19x19	23x23	14x14	23x23	27x27	19x19	18x18
Lgst Package Area (mm²)	729	729	729	361	529	196	529	729	361	324
I/O Voltage	1.2 - 3.3 V	1.2 - 3.3 V (HRIO)	1.2 - 3.3 V (HRIO)	1.2 - 3.3 V	1.2 - 3.3 V	1 – 1.8V (HPIO) 1.2 - 3.3 V (WRIO)	(TBD)	1.2 - 3.3 V	1.2 - 3.3V	1.2 - 3.3V

1. Includes dedicated Memory Controller I/O (~81) & 84 DPIO

RapidSilicon

Gemini – Resource Comp. Chart @ 75K LE



Note: BRAM is shown as multiples of 10,000 bits to have bars consistent against I/O Count and DSP

Gemini – Resource Comparison @ 100K LE

	Rapid Silicon	AMD (Xilinx)			Intel (Altera)	Lattice		Microsemi		Efinix
Product	**Gemini**	**Spartan-6**	**Spartan-7**	**Zynq-7000**	**Cyclone-V E**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**	**PolarFire**	**Trion**
Intro. Date	2024	2009	2015	2012	2011	2020	2021	2012	2017	2018
Part	**RS-100**	**XC6SLX100**	**XC7S100**	**XC7Z030**	**5CEA7**	**LFD2NX-40**	**LFCPNX-100**	**M2S090**	**MPF100T**	**T120**
Logic Elements (k)	101.3	100	100	125	156	39	96	86	109	112
BRAM Size (Mb)	11.7	4.824	4.320	9.3	6.5	1.512	3.744	2.074	7.6	5.407
BRAM Block Size	36 Kb	18Kb	36Kb	36Kb	10Kb 0.640 Kb (MLAB)	18 Kb	18 Kb	18 Kb (LSRAM) 1 Kb (uSRAM)	20 Kb (LSRAM) 0.7 Kb (uSRAM)	5 Kb
Additional Embedded Memory	256 KB (On-chip Memory)	N/A	N/A	256 KB (On-chip Memory)	836 Kb (MLAB)	1024 Kb (LRAM)	3584 Kb (LRAM)	512 KB (eNVM) 64 KB (eSRAM) 80 KB (eSRAM - Non SECDED)	N/A	N/A
DSP	-	180	160	400	156	-	-	-	-	-
Multipliers	325	-	-	-	312	56	156	84	336	320
Transceiver Count	N/A	N/A	N/A	4	N/A	N/A	8	4	8	N/A
Transceiver Speed	N/A	N/A	N/A	12.5 Gbps	N/A	N/A	10.3125 Gbps	5 Gbps	12.5 Gbps	N/A
Total Transceiver Bandwidth	N/A	N/A	N/A	50 Gbps	N/A	N/A	82.5 Gbps	20 Gbps	100 Gbps	N/A

Gemini – I/O Comparison @ 100K LE

	Rapid Silicon	AMD (Xilinx)			Intel (Altera)	Lattice		Microsemi		Efinix
Product	**Gemini**	**Spartan-6**	**Spartan-7**	**Zynq-7000**	**Cyclone-V E**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**	**PolarFire**	**Trion**
Intro. Date	2023	2009	2015	2012	2011	2020	2021	2012	2017	2018
Part	**RS-100**	**XC6SLX100**	**XC7S100**	**XC7Z030**	**5CEA7**	**LFD2NX-40**	**LFCPNX-100**	**M2S090**	**MPF100T**	**T120**
Logic Elements (k)	101.3	100	100	125	156	39	96	86	109	112
Max I/Os	525	480	400	250[1]	480	192	305	425	284	278
Max. HVIO (3.3V)	240	480	400	100	480	118	167	309	164	278
Max. HPIO (1.8V)	120	0	0	150	0	74	132	116	120	0
I/O per mm²	0.72	0.65	0.54	0.34	0.49	0.97	0.41	0.58	0.53	0.85
I/O per kLE	5.18	4.8	4	2	3.07	4.92	3.177	4.94	2.60	2.48
Max LVDS Rate	2500 Mbps	1080 Mbps	1250 Mbps	1600 Mbps	840 (Tx) – 875 (Rx) Mbps	1250 Mbps	1250 Mbps	700 Mbps	1600 Mbps	800 Mbps
Smallest Pkg	23x23	19*19	23*23	19x19	19x19	6x6	9x9	11x11	11x11	12x12
Largest Pkg	27x27	27*27	27*27	27x27	31x31	14x14	27x27	27x27	23x23	18x18
Lgst Package Area (mm²)	729	729	729	729	961	196	729	729	529	324
I/O Voltage		1.2 - 3.3V	1.2 - 3.3V	1.2V - 3.3V	1.2V - 3.3V	1 – 3.3V	1 – 3.3V	1.2 - 3.3 V	1.2 - 3.3 V	1.2 - 3.3 V

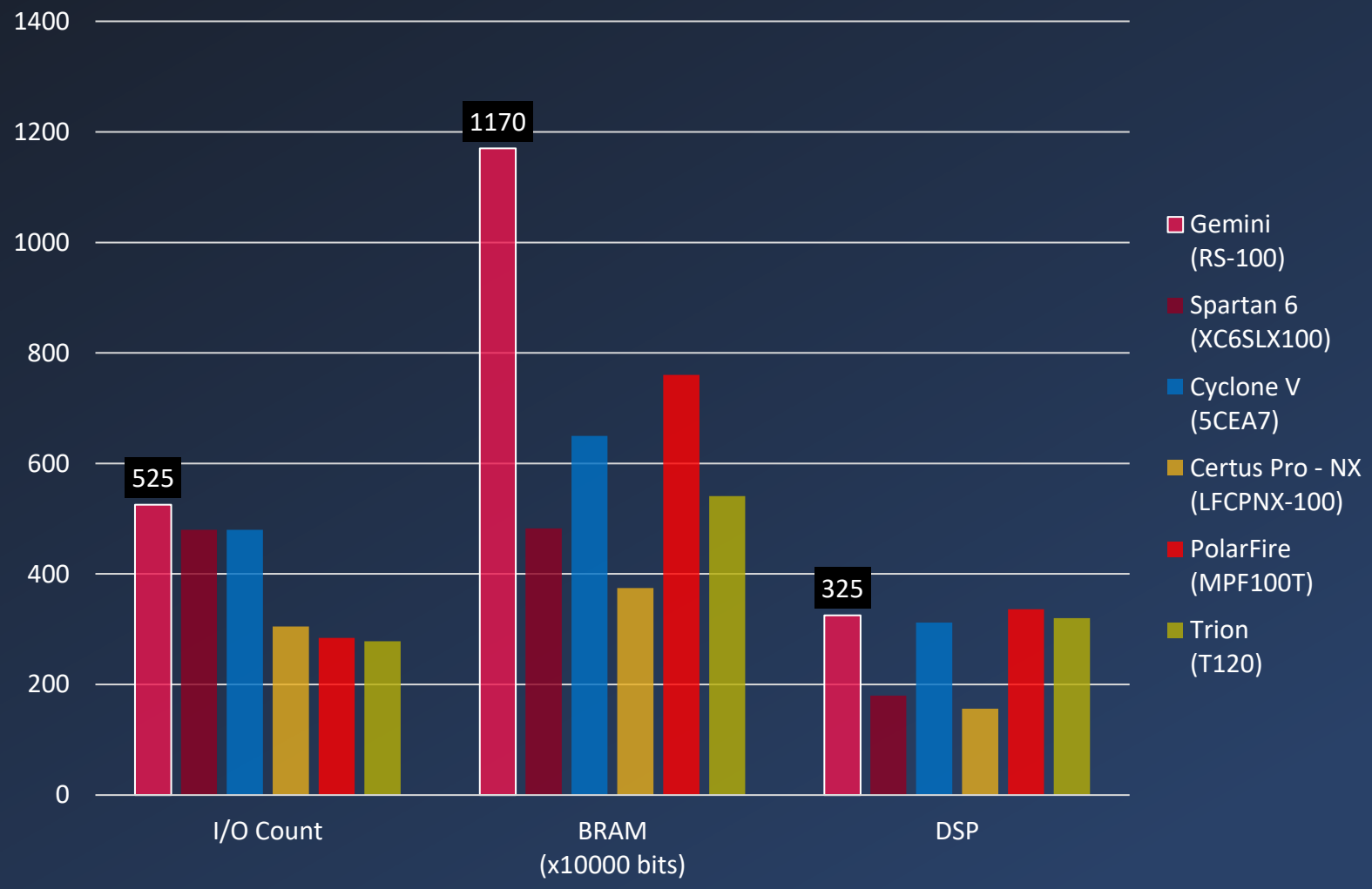
1. Includes dedicated Memory Controller I/O (~81) & 84 DPIO

RapidSilicon

Gemini+ – Resource Comparison @ 100K LE

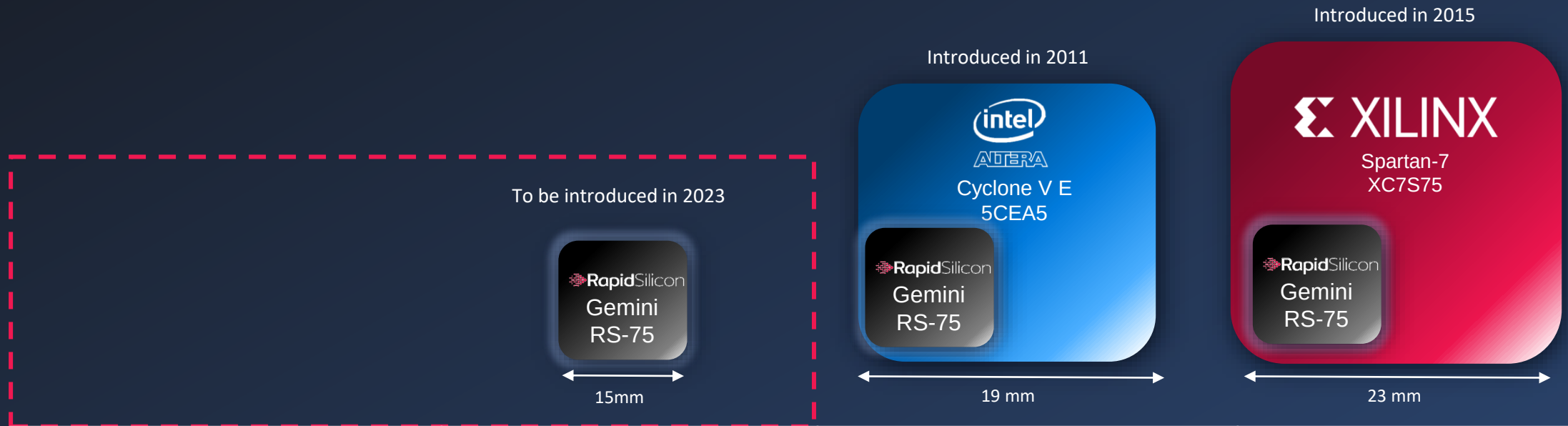
	Rapid Silicon	AMD(Xilinx)				Intel (Altera)	Lattice	Microsemi			Efinix
Product Family	Virgo	Spartan-6	Spartan-6	Spartan-7	Zynq-7000	Cyclone-V E	Certus-NX	Smartfusion 2	IGLOO-2	PolarFire SoC	Trion
Part	28k	XC6SLX25	XC6SLX25T	XC7S25	XC7Z007S	5CEA4	LFD2NX-28	M2S025	M2GL025	MPFS025T	T35
Intro Year	2024	2009	2009	2015	2011	2011	2020	2012	2013	2019	2018
Tech Node (nm)	16	45	45	28	28	28	28	65	65	28	40
Logic Count (k)	27	24	24	23	23	49	28	27	27	23	31
LUT Structure	LUT-6	LUT-6	LUT-6	LUT-6	LUT-6	ALM-8	LUT-4	LUT-4	LUT-4	LUT-4	LUT-4
BRAM Size Each	36Kb	18 kb	18 Kb	36 kb	36 Kb	-	18/512 Kb	-	-	-	5Kb
Cumul Embedded Memory	2 Mb	1.1 Mb	1.1 Mb	1.9 Mb	1.8 Mb	3.38 Mb	2.07 Mb	0.592 Mb	1.1 Mb	1.8 Mb	1.475 Mb
DSP	56	38	38	80	66	66	40	34	32	68	120
Processor Core (Hard)	N/A	N/A	N/A	N/A	ARM Cortex A9 Single @ 766 MHz	N/A	N/A	ARM Cortex M3 @ 166 MHz	N/A	RV E51 Single & U64 Quad @625 MHz	N/A
Global Clock Freq	500 MHz	400 Mhz	400 Mhz	628 MHz	628 Mhz	550 MHz	400 Mhz	-	-	500 MHz	500 MHz
DDR Support	N/A	DDR3/LPDDR	DDR3/LPDDR	DDR4/3L	DDR3/3L	DDR3/LPDDR2	DDR3,3L/LPPDR2, 3	DDR3	DDR3	DDR4/LPDDR4	DDR3/LPDDR3
DDR Perf (Mbps)	N/A	Upto 800	Upto 800	Upto 800	Upto 1066	Upto 800	Upto 1066	Upto 667	Upto 667	Upto 1600	Upto 1066
Transceivers	N/A	N/A	Yes	N/A	N/A	N/A	N/A	Yes	Yes	Yes	N/A
Max IO Count	272	266	250	150	228	224	191	267	267	244	230

Gemini – Resource Comp. Chart @ 100K LE



Note: BRAM is shown as multiples of 10,000 bits to have bars consistent against I/O Count and DSP

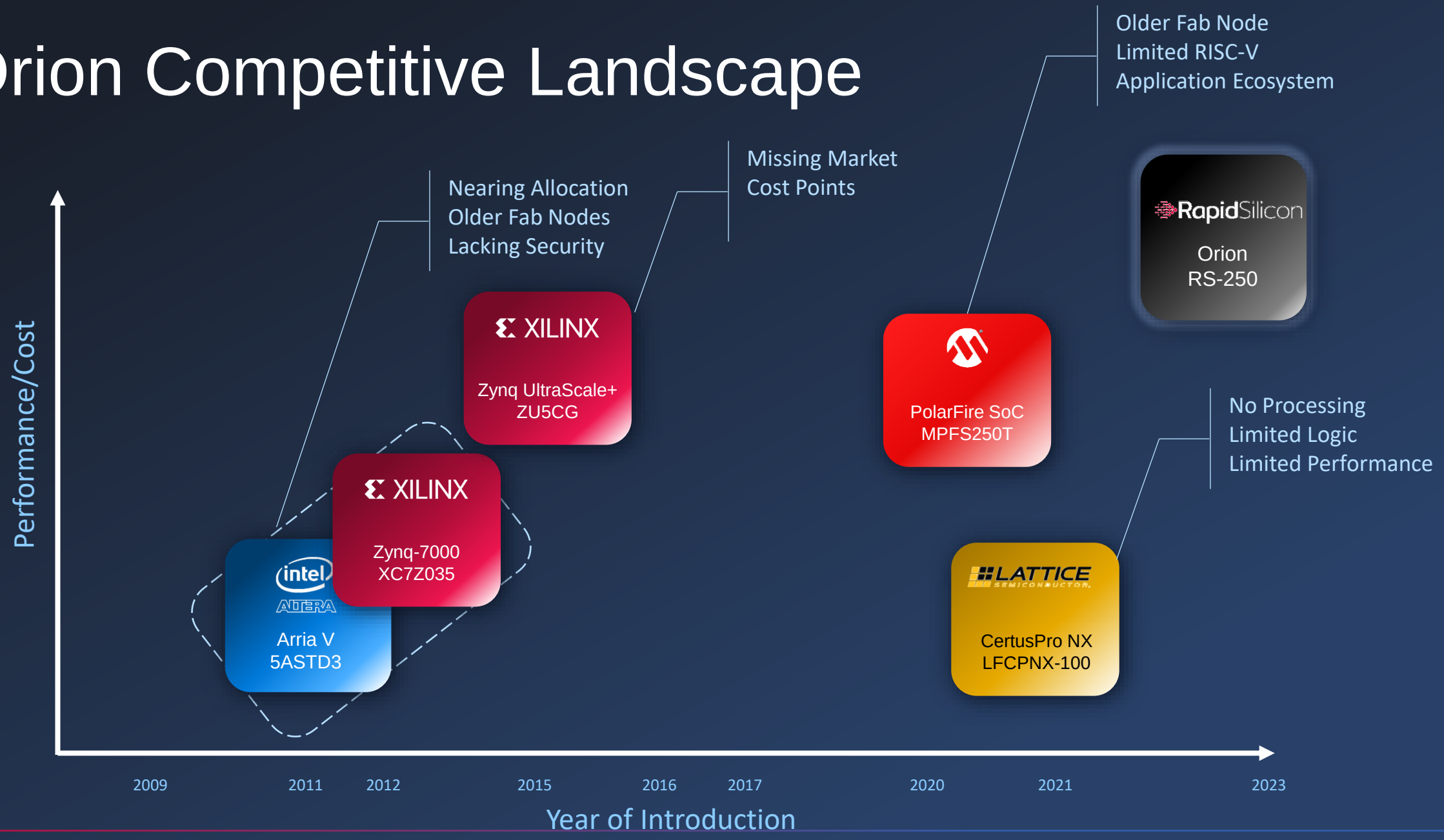
Gemini – Competitive Comparison



	Gemini 75k LE	**Intel Cyclone V (E)** 76k LE	**Spartan 7** 76k LE
1.2x smaller size	15 x 15 mm	19 x 19 mm	23 x 23 mm
2.6x more I/Os	I/O per mm^2 = 1.95	I/O per mm^2 = 0.75	I/O per mm^2 = 0.63
2.85x faster I/Os	Diff I/O Speed = 2500 Mbps	Diff I/O Speed = 840 - 875 Mbps	Diff I/O Speed = 1250 Mbps

ORION

Orion Competitive Landscape



Orion Competitive Landscape

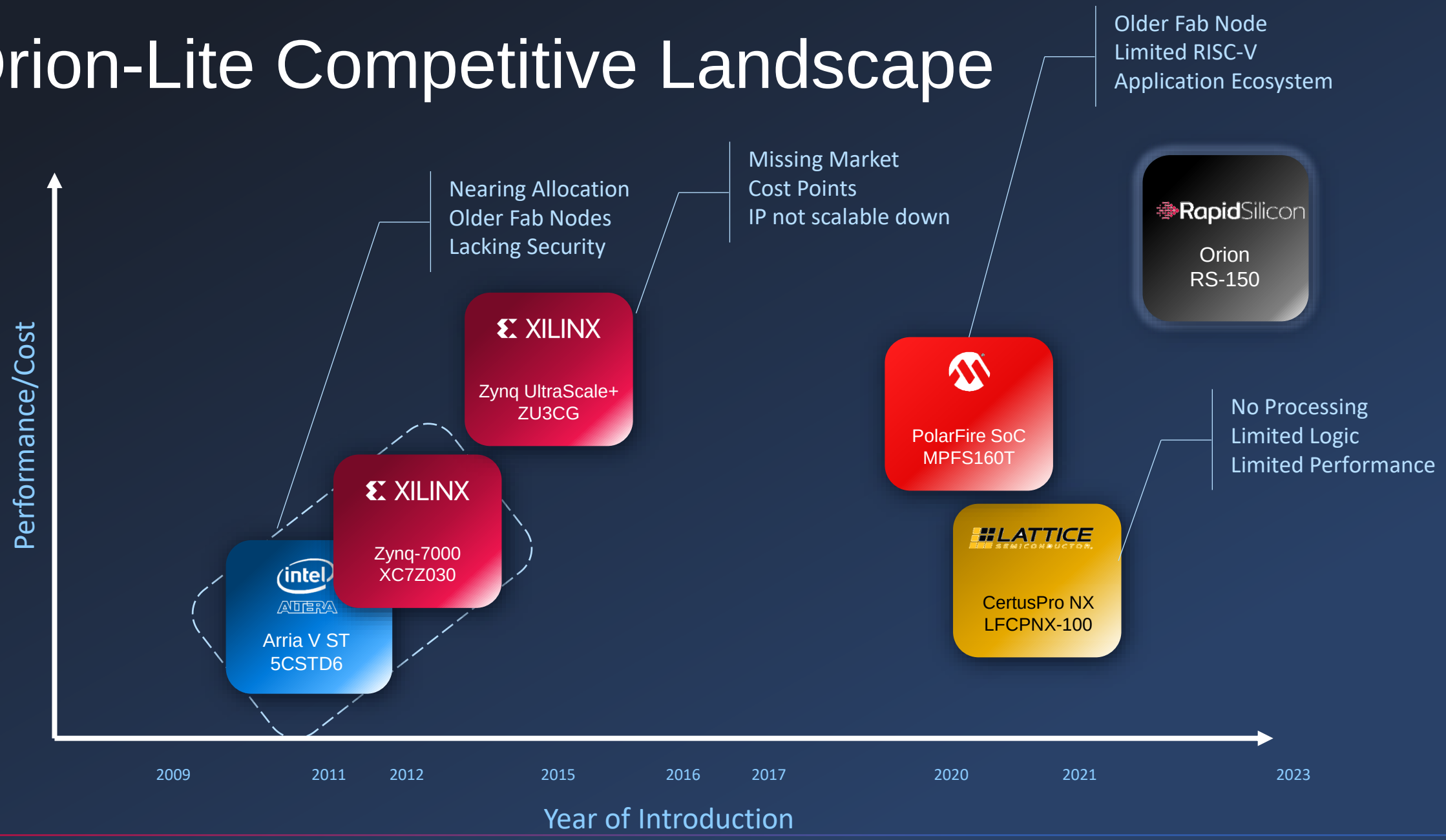
	Rapid Silicon	AMD (Xilinx)		Intel (Altera)			Microchip	Lattice
Product	**Orion**	**Zynq Ultrascale+**	**Zynq-7000**	**Sundance Mesa (Perf. Optimized)**	**Sundance Mesa (Power Optimized)**	Arria V	**PolarFire SoC**	**CertusPro-NX**
Introduction Date	2023	2013	2011			2011	2019	2021
Part	**RS-250**	ZU5CG	**Z-7035**			5ASTD3	MPFS250T	LFCPNX-100
Logic Elements (k)	250	256	275	138 – 656k		350	254	96
Tech Node (nm)	16	16	28	10	10	28	28 Flash	28
Processor Core (Hard)	Dual Core ARM-A53 @ 1 GHz RISC V A45 Real time processor @ 533 MHz	Dual Core ARM-A53 @ 1.3 GHz ARM R5F @ 533 MHz	Dual Core ARM Cortex – A9 @ 866 MHz	Dual A76 @ 1.8 GHz Dual A55 @ 1.5 GHz	Dual A76 @ 1.6 GHz Dual A55 @ 1.33 GHz	Dual Core ARM Cortex-A9 @ 800 MHz	SiFive E51 Control (RISC-V) & SiFive U54 Application Core	None
Hard NOC	Yes	No	No			No	No	No
Logic Fabric Speed (MHz)	350-400 MHz	350-400 MHz	200 MHz???			245 MHz	200 MHz	150 MHz
DDR SDRAM Support	DDR4/LPDDR4	DDR4, LPDDR4	DDR3, DDR3L	DDR5, LPDDR5	DDR4, LPDDR4, DDR5	DDR3	DDR4, LPDDR4	LPDDR4
DDR SDRAM Performance	Upto 2166 Mbps	2666 Mbps	Upto 1333 Mbps	Upto 3733 Mbps	Upto 2666 Mbps	1067 Mbps	Upto 1600 Mbps	Upto 1066 Mbps
Transceivers	16 @ 16.3 Gbps	16 @ 16.3 Gbps 4 @ 6 Gbps	16 @ 6.3 Gbps	24 @ 28.1 Gbps	24 @17.1 Gbps	16 @ 10.3 Gbps 30 @ 6.5 Gbps	16 @ 12.7 Gbps	8 @ 10.3 Gbps
PCIe Hard IP	Gen 4	Gen 3	Gen 2	Gen 4	Gen 3	Gen 2	None	Gen 3
Max. I/O Count	570	252	362			748	508	305

Orion - I/O Comparison

	Rapid Silicon	AMD (Xilinx)		Intel (Altera)	Microchip	Lattice	Efinix
Product	**Orion**	**Zynq Ultrascale+**	**Zynq-7000**	Arria V	**PolarFire SoC**	**CertusPro-NX**	**Trion**
Introduction Date	2023	2013	2011	2011	2019	2021	
Part	**RS-250**	ZU5CG	**Z-7035**	5ASTD3	MPFS250T	LFCPNX-100	T120
Logic Elements (k)	250	256	275	350	254	96	112
Max. IOs		466	490	748	508	305	278
Max. PS IOs (MIO + DDRIO)		214	128	208	136	N/A	N/A
Max. HVIO (3.3V)		96	212	540 (Total FPGA IOs)	228	167	-
Max. HPIO (1.8V)		156	150		144	132	-
I/O per mm2		0.88	0.5	0.46	0.41	0.41	1.08
I/O per kLE		1.82	1.78	2.13	2	3.17	2.48
Max LVDS Rate		1250 Mbps	1600 Mbps	1250 Mbps	1600 Mbps	1250 Mbps	800 Mbps
Total Transceiver Count		20	16	46	16	8	N/A
Total. Transceiver Bandwidth		284.8 Gbps	200 Gbps	361.608 Gbps	200 Gbps	82.5 Gbps	N/A
Smallest Pkg		23 x 23	27 x 27	31 x 31	16 x 16	9x9	12x12
Largest Pkg		31 x 31	31 x 31	40 x 40	35 x 35	27x27	16x16

ORION-LITE

Orion-Lite Competitive Landscape



Orion-Lite Competitive Landscape

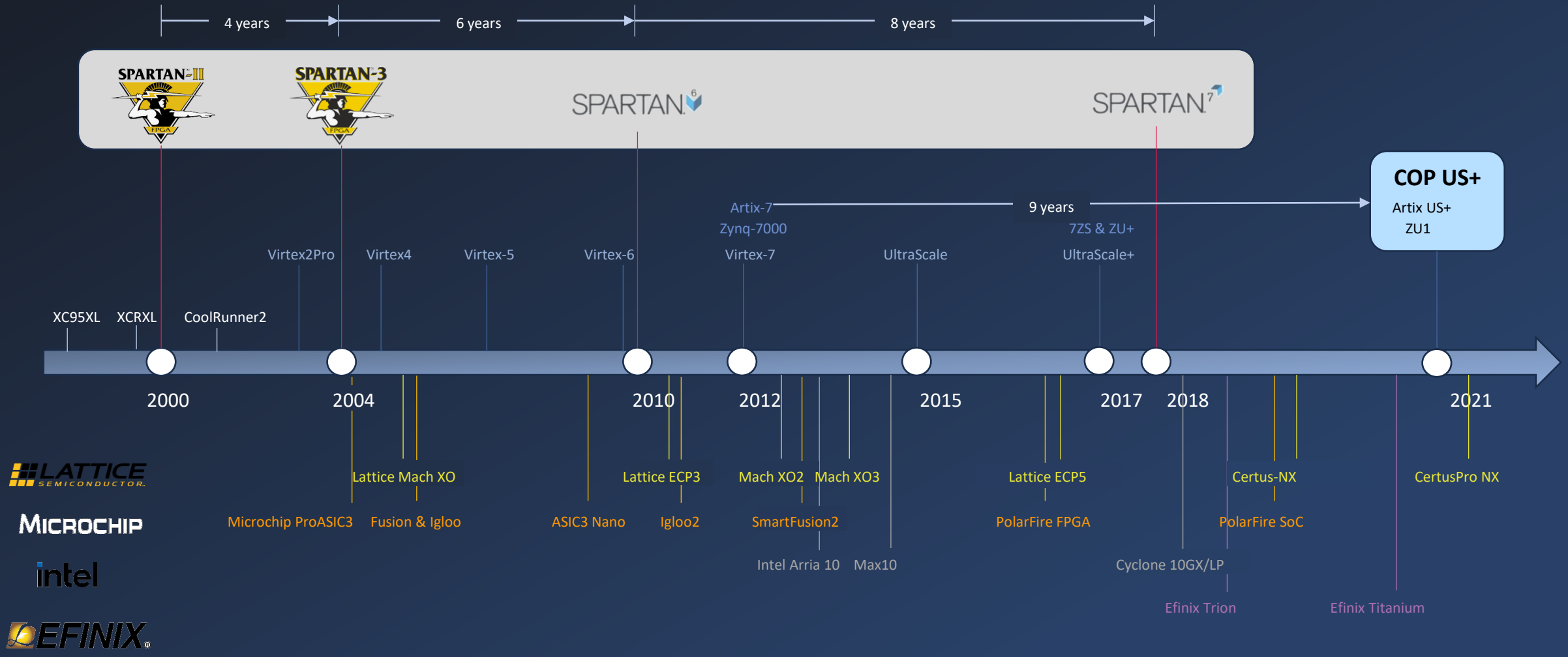
	Rapid Silicon	AMD (Xilinx)			Intel (Altera)	Microchip	Lattice
Product	**Orion-lite**	**Zynq Ultrascale+**		**Zynq-7000**	**Cyclone-V ST**	**PolarFire SoC**	**CertusPro-NX**
Introduction Date	2024	2013	2022	2010	2011	2019	2021
Part	**RS-150**	ZU3CG	**ZU3TCG**	**Z-7030**	**5CSTD6**	MPFS160T	LFCPNX-100
Logic Elements (k)	150	154	157	125	110	161	96
Tech Node (nm)	16	16	16	28	28	28 Flash	28
Processor Core (Hard)	Dual Core ARM-A53 @ 1 GHz RISC V A45 RT processor @ 533 MHz	Dual/Quad Core ARM-A53 @ 1.3 GHz Dual ARM R5F @ 533 MHz	Dual/Quad Core ARM-A53 @ 1.3 GHz Dual ARM R5F @ 533 MHz	Dual Core ARM Cortex – A9 @ 866 MHz	Dual Core ARM Cortex-A9 @ 800 MHz	1. SiFive E51 Control (RISC-V) & SiFive U54 Application Core	None
Hard NOC	YES	No	No	No	No	No	No
Logic Fabric Speed (MHz)	350-400 MHz	350-400 MHz	350-400 MHz	200 MHz???	200 MHz	200 MHz	150 MHz
DDR SDRAM Support	DDR4/LPDDR4	DDR4, LPDDR4	DDR4, LPDDR4	DDR3, DDR3L	DDR3	DDR4, LPDDR4	LPDDR4
DDR SDRAM Performance	Upto 2166 Mbps	2666 Mbps	2666 Mbps	Upto 1333 Mbps	Upto 800 Mbps	Upto 1600 Mbps	Upto 1066 Mbps
Transceivers	8 @ 16.3 Gbps	4 @ 6 Gbps	4 @ 6Gbps 8 @ 16.3Gbps	4 @ 6.25 Gbps	9 @ 6.144 Gbps	4 @ 12.7 Gbps	8 @ 10.3 Gbps
PCIe Hard IP	Gen 4	Gen 3	Gen 3	Gen 2	Gen 2	None	Gen 3
Max. I/O Count	400	466	338	250	288	448	305

Orion-Lite I/O Comparison

	Rapid Silicon	AMD (Xilinx)				Intel (Altera)	Microchip	Lattice	Efinix
Product	**Orion-Lite**	**Zynq Ultrascale+**			**Zynq-7000**	Cyclone-V	**PolarFire SoC**	**CertusPro-NX**	**Trion**
Introduction Date		2013	2022	2013	2010	2011	2019	2021	
Part		ZU3CG	ZUTCG	ZU4CG	Z-7030	5CSTD6	MPFS160T	LFCPNX-100	T120
Logic Elements (k)		154	157	192	125	110	161	96	112
Max. IOs		466	338	466	356	469	460	305	278
Max. PS IOs (MIO + DDRIO)		214	214	214	128	181	136	N/A	N/A
Max. HVIO (3.3V)		96	72	96	100	288 (FPGA I/Os)	180	167	
Max. HPIO (1.8V)		156	52	156	150		144	132	
I/O per mm2		0.88	0.63	0.88	0.48	0.488	0.86	0.41	1.08
I/O per kLE		3.02	2.15	2.42	2.84	4.26	2.85	3.17	2.48
Max LVDS Rate		1250 Mbps	1250 Mbps	1250 Mbps	1600 Mbps	875 Mbps	1600 Mbps	1250 Mbps	800 Mbps
Total Transceiver Count		4	12	20	4	9	8	8	N/A
Total. Transceiver Bandwidth		24 Gbps	154.4 Gbps	284.8 Gbps	50 Gbps	55.296 Gbps	100 Gbps	82.5 Gbps	N/A
Smallest Pkg		19x19	23x23	23x23	19x19	31x31 (Offers one package only)	16x16	9x9	12x12
Largest Pkg		23x23	23x23	31x31	27x27		23x23	27x27	16x16

Aging Competitor Low-End

Competitors abandoning the low-end



GEMINI+

Gemini+ Family FPGA Competitive Landscape

	Rapid Silicon	AMD (Xilinx)			Intel (Altera)	Lattice		Microsemi		Efinix
Product	**Gemini+**	**Spartan-6**	**Spartan-7**	**Zynq 7000**	**Cyclone-V SE**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**	**PolarFire SoC**	**Trion**
Introduction Date	2023	2009	2015	2018	2012	2020	2021	2012	2019	2018
Tech Node (nm)	16	45	28	28	TSMC 28LP	28	28	65	28	SMIC 40LL
LUT Structure	LUT-6	LUT-6	LUT-6	LUT-6	ALM-8	LUT-4	LUT-4	LUT-4	LUT-4	LUT-4 + Adder
Embedded Memory	256KB OCM + 36Kb BRAM	18Kb BRAM	36Kb BRAM	256KB OCM + 36Kb BRAM	10Kb M10K 640b MLAB	18Kb EBR 512KB LRAM	18Kb EBR 512KB LRAM	18Kb LSRAM 1Kb uSRAM 32KB eSRAM	20Kb LSRAM 0.75Kb uSRAM	5Kb SRAM
Signal Processing [# of MAC fractionable modes]	18x20 MAC [1][1]	18x18 MAC	25x18 MAC	18x25 MAC	27x27 MAC [8][2]	18x18 MAC [4][3]	18x18 MAC [4][3]	18x18 MAC	18x18 MAC [6][4]	18x18 MAC
Processor Core (Soft)	VexRISC @ 100 Mhz	Microblaze @ 150MHz	Microblaze @ 200Mhz	Microblaze @ 200 Mhz	NIOS @ 150 Mhz	Mico32 @ 150 MHz	Mico32 @ 150 MHz	MiV RISC-V @ 90 MHz	MiV RISC-V @ 150 MHz	VexRiscv Sapphire @ ~250MHz
Processor Core (Hard)	Andes A45 RISC V @ 533 MHz	-	-	Cortex A9 Sing/Dual @ 1 GHz	Cortex A9 @ 925 Mhz	-	-	ARM Cortex M3 @ 166 MHz	SiFive U54 @ 667 MHz	-
Hard NOC	Yes	No	No	No	No	No	No	No	No	No
Global Clock Perf (MHz)	500	400 MHz	628 MHz	628 MHz	550 Mhz	400 MHz	400 MHz	400 MHz	500 MHz	500 MHz
DDR SDRAM Support	DDR-3/4, LPDDR3/4	DDR3/LPDDR	DDR3/LPDDR2	DDR3/3L	DDR3/LPDDR2	DDR4/LPDDR4	DDR4/LPDDR4	DDR3	LPDDR3/4	DDR3/LPDDR3
DDR SDRAM Performance	Upto 2133 Mbps	Upto 800 Mbps	Upto 800 Mbps	Upto 1066 Mbps	Upto 800 Mbps	Upto 1067 Mbps	Upto 1067 Mbps	Upto 667 Mbps	Upto 1600 Mbps	Upto 1066Mbps
Transceivers[5]	No	No	No	Yes	No	No	Yes	Yes	Yes	No

1. 2 x 8x10
2. 9x9, 18x19, 18x18, 27x27, 18x25, 20x24, 2x 18x19, 18x18 w/ 36-bit I/P
3. 36*36, 18*36, 18x18, 9x9
4. 18x18, 18x18 w/ 48 bit sum, 18x19 w/ pre adder, 2 x 9x9, 9x9 Dot Product, Complex 18x19
5. Part Specific

Gemini + – Resource Comparison @ 50K LE

	Rapid Silicon	AMD (Xilinx)			Intel (Altera)	Lattice		Microsemi			Efinix
Product	**Gemini +**	**Spartan-6**	**Spartan-7**	**Zynq-7000**	**Cyclone-V SE**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**		**PolarFire SoC**	**Trion**
Intro. Date	2023	2009	2015	2012	2012	2020	2021	2012	2012	2019	2018
Part	**RS-50**	**XC6SLX45**	**XC7S50**	**XC7Z012S**	**5CSEA4**	**LFD2NX-40**	**LFCPNX-50**	**M2S050**	**M2S060**	**MPFS025T**	**T55**
Logic Elements (k)	50	44	52	55	40	39	52	56	56	23	54
BRAM Size (Mb)	3.2	2.088	2.700	2.5	2.7	1.512	1.728	1.314	1.314	1.8	2.765
BRAM Block Size	36 Kb	18 Kb	36 Kb	36 Kb	10Kb 0.640 Kb (MLAB)	18 Kb	18 Kb	18 Kb (LSRAM) 1Kb (uSRAM)	18 Kb (LSRAM) 1Kb (uSRAM)	20 Kb (LSRAM) 0.75 Kb (uSRAM)	5 Kb
Additional Embedded Memory	256 KB (On-Chip Memory)	N/A	N/A	256 KB (On-chip Memory)	231 Kb (MLAB)	1024 Kb (LRAM)	2048 Kb (LRAM)	256 KB (eNVM) 64 KB (eSRAM) 80 KB (eSRAM - Non SECDED)	256 KB (eNVM) 64 KB (eSRAM) 80 KB (eSRAM - Non SECDED)	N/A	N/A
DSP	112	58	120	120	84	-	-	-	-	-	-
Multipliers	-	-	-	-	168	56	96	72	72	68	150
Transceiver Count	N/A	N/A	N/A	4	N/A	N/A	4	8	4	4	N/A
Transceiver Speed	N/A	N/A	N/A	6.25 Gbps	N/A	N/A	10.3125 Gbps	5 Gbps	5 Gbps	12.5 Gbps	N/A
Total Transceiver Bandwidth	N/A	N/A	N/A	25	N/A	N/A	41.25 Gbps	40 Gbps	20 Gbps	50 Gbps	N/A

Gemini+ – I/O Comparison @ 50K LE

	Rapid Silicon	AMD Xilinx			Intel Altera	Lattice		Microsemi			Efinix
Product	**Gemini+**	**Spartan-6**	**Spartan-7**	**Zynq-7000**	**Cyclone-V SE**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**		**PolarFire SoC**	**Trion**
Intro. Date	2023	2009	2015	2012	2012	2020	2021	2012	2012	2019	2018
Part	**RS-50**	**XC6SLX45**	**XC7S50**	**XC7Z012S**	**5CSEA4**	**LFD2NX-40**	**LFCPNX-50**	**M2S050**	**M2S060**	**MPFS025T**	**T55**
Logic Elements (k)	50	44	52	55	40	39	52	56	56	23	54
Max I/Os	214[1]	358	250	278	326	192	269	377	395	244	278
Max HRIO	80	358	250	150	181	192	167	139	279	48	278
Max HPIO	40	0	0	0	-	0	96	238	116	60	0
I/O per mm²	0.40	0.49	0.47	0.77	0.61	0.97	0.50	0.39	0.53	0.67	1.08
I/O per kLE	7	8.1	4.8	5.05	8.15	4.9	4.4	6.7	6.9	10.6	5.1
Max LVDS Rate	2500 Mbps	1080 Mbps	1250 Mbps	1250 Mbps	840 (Tx) & 875 (Rx) Mbps	1250 Mbps	1250 Mbps	700 Mbps	700 Mbps	1600 Mbps	800 Mbps
Smallest Pkg	19x19	15x15	15x15	19x19	19x19	6x6	9x9	11x11	11x11	11x11	12x12
Largest Pkg	23x23	27x27	23x23	19x19	23x23	14x14	23x23	31x31	27x27	19x19	16x16
I/O Voltage	1.2 - 1.8 V (HRIO) 1.8 - 3.3 V (HVIO)	1.2 - 3.3 V (HRIO)	1.2 - 3.3 V (HRIO)	1.2 - 3.3 V (HRIO)	1.2 - 3.3 V	1 – 1.8V (HPIO) 1.2 - 3.3 V (WRIO)	1 – 1.8V (HPIO) 1.2 - 3.3 V (WRIO)	X – 2.5V (HPIO) X – 3.3 V (WRIO)	X – 2.5V (HPIO) X – 3.3V (WRIO)		

1. Includes dedicated Memory Controller I/O (54), SoC I/O (40), Configurable I/O (120)

Gemini + – Resource Comparison @ 100K LE

	Rapid Silicon	AMD (Xilinx)			Intel (Altera)	Lattice		Microsemi		Efinix
Product	**Gemini +**	**Spartan-6**	**Spartan-7**	**Zynq-7000**	**Cyclone-V SE**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**	**PolarFire**	**Trion**
Intro. Date	2023	2009	2015	2012	2012	2020	2021	2012	2019	2018
Part	**RS-100**	**XC6SLX100**	**XC7S100**	**XC7Z020**	**5CSEA6**	**LFD2NX-40**	**LFCPNX-100**	**M2S090**	**MPFS095T**	**T120**
Logic Elements (k)	100	100	100	85	110	39	96	86	93	112
BRAM Size (Mb)	6.3	4.824	4.320	4.9	5.570	1.512	3.744	2.074	6.7	5.407
BRAM Block Size	36 Kb	18Kb	36Kb	36Kb	10Kb 0.640 Kb (MLAB)	18 Kb	18 Kb	18 Kb (LSRAM) 1 Kb (uSRAM)	20 Kb (LSRAM) 0.75 Kb (uSRAM)	5 Kb
Additional Embedded Memory	256 KB (On-chip Memory)	N/A	N/A	256 KB (On-chip Memory)	621 Kb (MLAB)	1024 Kb (LRAM)	3584 Kb (LRAM)	512 KB (eNVM) 64 KB (eSRAM) 80 KB (eSRAM - Non SECDED)	N/A	N/A
DSP	176	180	160	220	112	-	-	-	-	-
Multipliers	-	-	-	-	224	56	156	84	292	320
Transceiver Count	N/A	N/A	N/A	N/A	N/A	N/A	8	4	4	N/A
Transceiver Speed	N/A	N/A	N/A	N/A	N/A	N/A	10.3125 Gbps	5 Gbps	12.5 Gbps	N/A
Total Transceiver Bandwidth	N/A	N/A	N/A	N/A	N/A	N/A	82.5 Gbps	20 Gbps	50 Gbps	N/A

Gemini + – I/O Comparison @ 100K LE

	Rapid Silicon	AMD (Xilinx)			Intel (Altera)	Lattice		Microsemi		Efinix
Product	**Gemini +**	**Spartan-6**	**Spartan-7**	**Zynq-7000**	**Cyclone-V SE**	**Certus-NX**	**CertusPro-NX**	**Smartfusion 2**	**PolarFire**	**Trion**
Intro. Date	2023	2009	2015	2012	2012	2020	2021	2012	2019	2018
Part	**RS-100**	**XC6SLX100**	**XC7S100**	**XC7Z020**	**5CSEA6**	**LFD2NX-40**	**LFCPNX-100**	**M2S090**	**MPFS095T**	**T120**
Logic Elements (k)	100	100	100	85	110	39	96	86	93	112
Max I/Os	478	480	400	328	469	192	305	425	412	278
Max. HVIO (3.3V)	240	480	400	150	181	118	167	309	132	278
Max. HPIO (1.8V)	120	0	0	128	-	74	132	116	144	0
I/O per mm²	0.90	0.65	0.54	0.90	0.49	0.97	0.41	0.58	0.77	0.85
I/O per kLE	5.18	4.8	4	3.85	3.07	4.92	3.177	4.94	4.43	2.48
Max LVDS Rate	2500 Mbps	1080 Mbps	1250 Mbps	1600 Mbps	840 (Tx) – 875 (Rx) Mbps	1250 Mbps	1250 Mbps	700 Mbps	1600 Mbps	800 Mbps
Smallest Pkg	19x19	19*19	23*23	17x17	19x19	6x6	9x9	11x11	11x11	12x12
Largest Pkg	23x23	27*27	27*27	19x19	31x31	14x14	27x27	27x27	23x23	18x18
Lgst Package Area (mm²)	529	729	729	361	961	196	729	729	529	324
I/O Voltage	1.2 - 1.8 V (HRIO) 1.8 - 3.3 V (HVIO)	1.2 - 3.3V	1.2 - 3.3V	1.2V - 3.3V	1.2V - 3.3V	1 – 3.3V	1 – 3.3V	1.2 - 3.3 V	1.2 - 3.3 V	1.2 - 3.3 V

Gemini+ - Resource Comparison @ 100k LE

	Rapid Silicon	AMD(Xilinx)			Intel (Altera)	Lattice	Microchip	Efinix
Product Family	Gemini+	Zynq 7000	Zynq US+ MPSoC (CG)	Spartan US+	Cyclone-V SE	CertusPro-NX	PolarFire SoC	Topaz
Part	1GE100	XC7Z030	ZU2CG	SU100P	5CSEA6	LFCPNX-100	MPFS095T	TZ100
Intro Year	TBD	2012	2013	2024	2012	2021	2019	2024
Tech Node (nm)	TBD	28	16	16	28	28	28	16
Logic Count (k)	100	125	103	100	110	96	93	101
LUT Structure	LUT-6	LUT-6	LUT-6	LUT-6	ALM-8	LUT-4	LUT-4	LUT-4
BRAM Size Each	36Kb	36Kb	36Kb	36Kb	10kb M10K/ 640b MLAB	18Kb EBR 512KB LRAM	20Kb LSRAM 0.768Kb uSRAM 387 Kb PROM	-
Cumul Embedded Memory	6.3 Mb	9.3 Mb/256kB	9.3 Mb/256kB	5.1 Mb BRAM + 0.79 Mb Distri RAM	6.191 Mb	7.2 Mb	7.087	6.32 Mb
DSP	176	400	240	144	112	156	292	312
Processor Core (Hard)	RV Core @ 1066MHz	Dual Core ARM @1 GHz	Dual Core APU/RPU @ 1.3GHz/533MHz	N/A	Cortex A9 @ 925 MHz	N/A	SiFive E51 & U54	Quad Core RV
Global Clock Freq	-	628 Mhz	891 MHz	891 MHz	-	400 MHz	-	-
DDR Support	DDR3/4, LPDDR3/4	DDR3/DDR3L	DDR4/LPDDR4	LPDDR4x/LPDDR5	DDR3/LPDDR2	DDR4/LPDDR4	DDR4/LPDDR4	LPDDR4
DDR Perf (Mbps)	Upto 2133	Upto 1066 Mbps	Upto 2666 Mbps	Upto 4266 Mbps	Upto 800 Mbps	Upto 1067 Mbps	Upto 1600Mbps	-
Transceivers	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes
Max IO Count	478	378	466	479	469	305	412	223

Orion VS Latest Comp Product Introductions

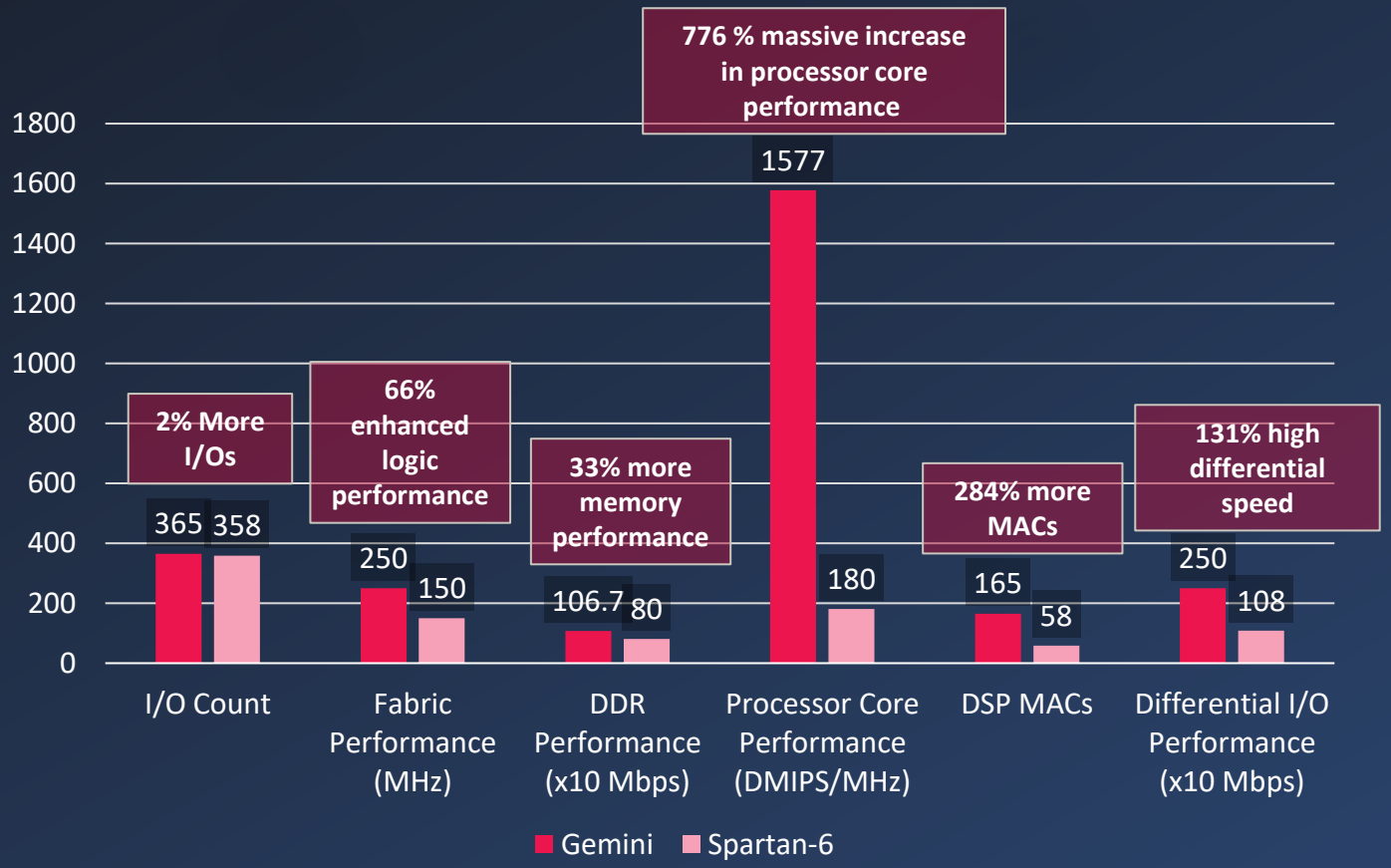
Product	Orion	Intel - Sundance Mesa (Perform Opt)	Intel - Sundance Mesa (Pow Opt)	Zynq US+ CG (AMD)	Artiq US+ (AMD)	Avant (Lattice)	
Process Node	16 nm	Intel 7 (10-nm)	Intel 7 (10-nm)	16	16	16	
Product Class	Low-End	Low-End	Low-End	Low-End	High-End	Mid-Range	
Target Market	Edge, Embedded, Network	Edge, Embedded, Network	Edge, Embedded, Network	Network, Embedded, Medic	Network, Embedded, Compu	Edge, Comms, Indus, Compu, Auto	
Density	120 - 350k LE	138-656k LE		81 – 600k LE	82 - 308	196 - 477k	
Block RAM (Mb)				4.8 - 40.9	1.1 - 4.7	14.4 - 35.6	
BRAM Blocks		358-1611 Blocks	130-1611 Blocks		108 - 300	400 - 990	
DSP Blocks				216 - 2520	216 - 1200	700 – 1800 (18x18) 2800 – 7200 (8x8)	
Multipliers				-	-	-	
Transceivers	16x 16.3 Gbps	24x 28.1 Gbps	24x 17.1 Gbps	4 - 24 @ 6, 16.3, 32.75 Gbps	4 – 12 @ 16.3 Gbps (*1)	4 – 28 Upto 28 Gbps	
PCIe		6x PCIe 4.0 x4	6x PCIe 3.0 x4	Gen3x8, Gen3x16	Gen4	Gen4 x8	
Ethernet				N/A	N/A	10G, 25G	
TSN Controller						N/A	
Processors	Dual A53 @ 1Ghz RV A45 @ 533 MHz	Dual A76 @ 1.8 GHz Dual A55 @ 1.5 GHz	Dual A76 @ 1.6 GHz Dual A55 @ 1.33 GHz	Dual A53 @ 1.3 GHz Dual R5F @ 533 MHz	N/A	N/A	
DDR	DDR4,LPDDR4	DDR4,LPDDR4, DDR5,LPDDR5	DDR4,LPDDR4, LPDDR5	DDR3/3L, LPDDR3, DDR4, LPDDR4	DDR3/3L/LPDDR3/DDR4	DDR4/5, LPDDR4	
DDR Perfom.				Upto 2666 Mbps	Upto 2400 Mbps	Upto 2400 Mbps	
MIPI		D-PHY v2.5 @ 3.5 Gbps/lane	D-PHY v2.5 @2.5Gbps/lane			D-PHY @ 1.8Gbps/lane	
IO	570			252 - 882	128 - 304	208 - 572	
Package Ball Pitch			0.5 mm			0.5 mm	

RapidSilicon

*1: Speed is Package Dependent

Gemini - The Powerful Replacement

Optimized connectivity, high performance at lowest power expense



RapidSilicon

Note: On horizontal axis, x 10 w/ axis' titles mean “Actual Value multiplied by 10 – Actual Value x 10” and shouldn’t be confused as no. of channels. The purpose is to normalize bars across graph