

FPGA Features: Production Devices



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| | | Stratix (1.5 V) High Density, High Performance | | | | | | | Stratix GX (1.5 V) 3.125-Gbps Transceivers | | | | | | | Cyclone (1.5 V) Low Cost, High Volume | | | | |
|---|--|---|----------------|----------------|----------------|------------|------------|------------|--|------------|------------|------------|------------|------------|------------|--|------------|------------|------------|---------|
| | | EP1S10 | EP1S20 | EP1S25 | EP1S30 | EP1S40 | EP1S60 | EP1S80 | EP1SGX10C | EP1SGX10D | EP1SGX25C | EP1SGX25D | EP1SGX25F | EP1SGX40D | EP1SGX40G | EP1C3 | EP1C4 | EP1C6 | EP1C12 | EP1C20 |
| | | Available Now | | | | | | | Available Now | | | | | | | Available Now | | | | |
| Density & Speed | Logic Elements (LEs) | 10,570 | 18,460 | 25,660 | 32,470 | 41,250 | 57,120 | 79,040 | 10,570 | 10,570 | 25,660 | 25,660 | 25,660 | 41,250 | 41,250 | 2,910 | 4,000 | 5,980 | 12,060 | 20,060 |
| | Total RAM Bits (K) ¹ | 920 | 1,669 | 1,944 | 3,317 | 3,423 | 5,215 | 7,427 | 920 | 920 | 1,944 | 1,944 | 1,944 | 3,423 | 3,423 | 60 | 78 | 92 | 240 | 295 |
| | M512 RAM Blocks (512 bits + 64 parity bits) | 94 | 194 | 224 | 295 | 384 | 574 | 767 | 94 | 94 | 224 | 224 | 224 | 384 | 384 | – | – | – | – | – |
| | M4K RAM Blocks (4 Kbits + 512 parity bits) ² | 60 | 82 | 138 | 171 | 183 | 292 | 364 | 60 | 60 | 138 | 138 | 138 | 183 | 183 | 13 | 17 | 20 | 52 | 64 |
| | M-RAM Blocks (512 Kbits + 65,536 parity bits) ² | 1 | 2 | 2 | 4 | 4 | 6 | 9 | 1 | 1 | 2 | 2 | 2 | 4 | 4 | – | – | – | – | – |
| Speed Grades (fastest to slowest) | -5, -6, -7 | -5, -6, -7 | -5, -6, -7, -8 | -5, -6, -7, -8 | -5, -6, -7, -8 | -5, -6, -7 | -5, -6, -7 | -5, -6, -7 | -5, -6, -7 | -5, -6, -7 | -5, -6, -7 | -5, -6, -7 | -5, -6, -7 | -5, -6, -7 | -6, -7, -8 | -6, -7, -8 | -6, -7, -8 | -6, -7, -8 | -6, -7, -8 | |
| Architectural Features & Other | Available Embedded Processor | Nios® II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II | Nios II |
| | DSP Blocks | 6 | 10 | 10 | 12 | 14 | 18 | 22 | 6 | 6 | 10 | 10 | 10 | 14 | 14 | – | – | – | – | – |
| | 18x18-bit / 9x9-bit Embedded Multipliers | 24 / 48 | 40 / 80 | 40 / 80 | 48 / 96 | 56 / 112 | 72 / 144 | 88 / 176 | 24 / 48 | 24 / 48 | 40 / 80 | 40 / 80 | 40 / 80 | 56 / 112 | 56 / 112 | – | – | – | – | – |
| | I/O Registers per I/O Element | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 | 3 | 3 |
| | True Dual-Port RAM | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Global, Regional & Fast Clock Networks | 36 | 36 | 36 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 48 | 48 | 8 | 8 | 8 | 8 | 8 |
| | Phase-Locked Loops (PLLs) / Unique Outputs | 6 / 32 | 6 / 32 | 6 / 32 | 10 / 40 | 12 / 52 | 12 / 52 | 12 / 52 | 4 / 26 | 4 / 26 | 4 / 26 | 4 / 26 | 4 / 26 | 8 / 42 | 8 / 42 | 1 / 3 | 2 / 6 | 2 / 6 | 2 / 6 | 2 / 6 |
| | HardCopy® Device Support | – | – | ✓ | ✓ | ✓ | ✓ | ✓ | – | – | – | – | – | – | – | – | – | – | – | – |
| | Industrial Device Offering | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Lead-Free Device Offering | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Configuration Devices | Configuration File Size (Mbits) | 3.53 | 5.90 | 7.89 | 10.38 | 12.39 | 17.54 | 23.83 | 3.58 | 3.58 | 7.95 | 7.95 | 7.95 | 12.53 | 12.53 | 0.63 | 0.93 | 1.17 | 2.32 | 3.56 |
| | Number of EPCS1 Devices (1 Mbit) | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 1 | 1 | – | – |
| | Number of EPCS4 Devices (4 Mbits) | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 | 1 | 1 | 1 | 1 |
| | Number of EPC2 Devices (1.6 Mbits) | 3 | 4 | 5 | 7 | 8 | 11 | 15 | 3 | 3 | 5 | 5 | 5 | 8 | 8 | 1 | 1 | 1 | 2 | 2 |
| | Number of EPC4 Devices (4 Mbits) | 1 | 1 | – | – | – | – | – | 1 | 1 | – | – | – | – | – | 1 | 1 | 1 | 1 | 1 |
| | Number of EPC8 Devices (8 Mbits) | 1 | 1 | 1 | 1 | 1 | – | – | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Number of EPC16 Devices (16 Mbits) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Core Voltage & I/O Options | I/O Voltage Levels Supported | 1.5V, 1.8V, 2.5V, 3.3V | | | | | | | 1.5V, 1.8V, 2.5V, 3.3V | | | | | | | 1.5V, 1.8V, 2.5V, 3.3V | | | | |
| | I/O Standards Supported | LVDS, LVPECL, HyperTransport™, 3.3-V PCML, Differential SSTL-2, Differential HSTL, SSTL-18 (I & II), SSTL-2 (I & II), SSTL-3 (I & II), 1.5-V HSTL (I & II), 1.8-V HSTL (I & II), PCI, Compact PCI, PCI-X 1.0, AGP (1x & 2x), GTL, GTL+, CTT, LVTTTL, LVCMOS | | | | | | | LVDS, LVPECL, HyperTransport, 3.3-V PCML, 1.5-V PCML, Differential SSTL-2, Differential HSTL, SSTL-18 (I & II), SSTL-2 (I & II), SSTL-3 (I & II), 1.5-V HSTL (I & II), 1.8-V HSTL (I & II), PCI, Compact PCI, PCI-X 1.0, AGP (1x & 2x), GTL, GTL+, CTT, LVTTTL, LVCMOS | | | | | | | LVDS, RSDS, Differential SSTL-2, SSTL-2 (I & II), SSTL-3 (I & II), PCI, LVTTTL, LVCMOS | | | | |
| | External Memory Device Interfaces | QDR II, DDR2, RDRAM II, QDR, ZBT, DDR, SDR | | | | | | | QDR II, DDR2, RDRAM II, QDR, ZBT, DDR, SDR | | | | | | | DDR, SDR | | | | |
| | True-LVDS™ Maximum Data Rate (Mbps) | 840 | 840 | 840 | 840 | 840 | 840 | 840 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | – | – | – | – | – |
| | True-LVDS Channels (Receive / Transmit) | 44 / 44 | 66/66 | 78 / 78 | 80 / 80 | 80 / 80 | 80 / 80 | 80 / 80 | 22 / 22 | 22 / 22 | 39 / 39 | 39 / 39 | 39 / 39 | 45 / 45 | 45 / 45 | – | – | – | – | – |
| | Medium-Speed LVDS Maximum Data Rate (Mbps) | – | – | – | 462 | 462 | 462 | 462 | – | – | – | – | – | – | – | 640 | 640 | 640 | 640 | 640 |
| | Medium-Speed LVDS Channels (Receive / Transmit) | – | – | – | 2 / 2 | 10 / 10 | 36 / 36 | 56 / 72 | – | – | – | – | – | – | – | 34 | 129 | 72 | 103 | 129 |
| | RSDS Maximum Data Rate (Mbps) | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 311 | 311 | 311 | 311 | 311 |
| | Transceiver (SERDES) Maximum Data Rate (Gbps) | – | – | – | – | – | – | – | 3.1875 | 3.1875 | 3.1875 | 3.1875 | 3.1875 | 3.1875 | 3.1875 | – | – | – | – | – |
| | Transceiver (SERDES) Channels | – | – | – | – | – | – | – | 4 | 8 | 4 | 8 | 16 | 8 | 20 | – | – | – | – | – |
| | Embedded Dynamic Phase Alignment (DPA) | – | – | – | – | – | – | – | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | – | – | – | – |
| Series & Differential On-Chip Termination | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | – | – | – | – | |
| Programmable Drive Strength | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |

Notes: ¹K=1,000; ²Kbit=1,024 bits

FPGA Package & I/O Matrix: Production Devices



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■ Device Available Now in Commercial (0 to 85° C) & Industrial (-40 to 100° C) Temperatures.

■ Device Available Now in Commercial Temperature; Contact Altera for Industrial Temperature.

↔ Vertical Migration (Same V_{CC}, GND, ISP & Input)

| | | Stratix® (1.5 V) High Density, High Performance | | | | | | Stratix GX (1.5 V) 3.125-Gbps Transceivers | | | | | | Cyclone™ (1.5 V) Low Cost, High Volume | | | | | | |
|-----------------------------------|-------------------------|--|--------|--------|--------|--------|--------|---|-----------|-----------|-----------|-----------|-----------|---|-----------|-------|-------|-------|--------|--------|
| | | EP1S10 | EP1S20 | EP1S25 | EP1S30 | EP1S40 | EP1S60 | EP1S80 | EP1SGX10C | EP1SGX10D | EP1SGX25C | EP1SGX25D | EP1SGX25F | EP1SGX40D | EP1SGX40G | EP1C3 | EP1C4 | EP1C6 | EP1C12 | EP1C20 |
| | | Available Now | | | | | | Available Now | | | | | | Available Now | | | | | | |
| Thin-Quad Flat Pack (T) | 100-Pin TQFP | | | | | | | | | | | | | | | 65 | | | | |
| | 144-Pin TQFP | | | | | | | | | | | | | | | 104 | | 98 | | |
| Plastic Quad Flat Pack (Q) | 240-Pin PQFP | | | | | | | | | | | | | | | | 185 | 173 | | |
| Ball-Grid Array (B) | 672-Pin BGA | 345 | 426 | 473 | | | | | | | | | | | | | | | | |
| | 956-Pin BGA | | | | 683 | 683 | 683 | 683 | | | | | | | | | | | | |
| FineLine BGA® (F) | 256-Pin FBGA | | | | | | | | | | | | | | | | 185 | 185 | | |
| | 324-Pin FBGA | | | | | | | | | | | | | | | 249 | | 249 | 233 | |
| | 400-Pin FBGA | | | | | | | | | | | | | | | 301 | | | 301 | |
| | 484-Pin FBGA | 335 | 361 | | | | | | | | | | | | | | | | | |
| | 672-Pin FBGA (Wirebond) | 345 | 426 | 473 | | | | | | | | | | | | | | | | |
| | 672-Pin FBGA (FlipChip) | | | | | | | | 330 | 330 | 426 | 426 | | | | | | | | |
| | 780-Pin FBGA | 426 | 586 | 597 | 597 | 615 | | | | | | | | | | | | | | |
| | 1,020-Pin FBGA | | | | 706 | 726 | 773 | 773 | | | 542 | 542 | 548 | 548 | | | | | | |
| | 1,508-Pin FBGA | | | | | | 822 | 1,022 | 1,203 | | | | | | | | | | | |

Note: Lead-free devices are offered in all device/package combinations except for the 672-pin and 956-pin BGA packages.

| Package Statistics | TQFP | | PQFP | BGA | | | FBGA | | | | | | | |
|---|----------|----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Number of Pins | 100 | 144 | 240 | 672 | 956 | 256 | 324 | 400 | 484 | 672 | 672 | 780 | 1,020 | 1,508 |
| Package Technology | Wirebond | Wirebond | Wirebond | Wirebond | FlipChip | Wirebond | Wirebond | Wirebond | FlipChip | Wirebond | FlipChip | FlipChip | FlipChip | FlipChip |
| Nominal Length x Width (mm) | 16x16 | 22x22 | 34.6x34.6 | 35x35 | 40x40 | 17x17 | 19x19 | 21x21 | 23x23 | 27x27 | 27x27 | 29x29 | 33x33 | 40x40 |
| Maximum Surface Area (mm ²) | 262 | 493 | 1,215 | 1,239 | 1,616 | 296 | 369 | 449 | 538 | 740 | 740 | 853 | 1,102 | 1,616 |
| Maximum Height (mm) | 1.20 | 1.60 | 4.10 | 2.60 | 3.50 | 2.60 | 2.60 | 2.60 | 3.50 | 2.60 | 3.50 | 3.50 | 3.50 | 3.50 |
| Nominal Lead Pitch (mm) | 0.50 | 0.50 | 0.50 | 1.27 | 1.27 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Maximum Lead Width (mm) | 0.27 | 0.27 | 0.27 | 0.90 | 0.90 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |

| | Configuration Devices | | | | | |
|------------------|-----------------------|------|------|-------|-------|-------|
| | EPC2 | EPC4 | EPC8 | EPC16 | EPC31 | EPC34 |
| | Available Now | | | | | |
| 8-Pin SOIC | | | | | ✓ | ✓ |
| 20-Pin PLCC | ✓ | | | | | |
| 32-Pin TQFP | ✓ | | | | | |
| 88-Pin UBGA* | | | | ✓ | | |
| 100-Pin PQFP | | ✓ | ✓ | ✓ | | |
| Reprogrammable | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Data Compression | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Page Mode | | ✓ | ✓ | ✓ | | |

* UBGA: Ultra FineLine BGA