Cyclone V FPGAs

Lowest system cost. Lowest power 28 nm FPGAs.

Altera's Cyclone® V FPGAs provide an unparalleled combination of high functionality, low system cost, and the lowest power of any 28 nm FPGA. Cyclone V FPGAs, enhanced with integrated transceivers and hard memory controllers, are ideal for differentiating your high-volume applications. Cyclone V FPGAs also come in a SoC variant that embeds an ARM®-based hard processor system (HPS). Cyclone V FPGAs are suitable for your applications in the industrial, wireless, wireline, military, automotive, broadcast, and consumer markets.

Cyclone V FPGAs are ideal in:

- Industrial
- Wireless
- Wireline
- Military
- Automotive
- Broadcast
- Consumer

The Cyclone V device family comes in six targeted variants:

FPGAs
- Cyclone V E FPGA with logic only
- Cyclone V GX FPGA with 3.125 Gbps transceivers
- Cyclone V GT FPGA with 6.144 Gbps transceivers

SoCs
- Cyclone V SE SoC with ARM-based HPS and logic
- Cyclone V SX SoC with ARM-based HPS and 3.125 Gbps transceivers
- Cyclone V ST SoC with ARM-based HPS and 5 Gbps transceivers

The devices are built on TSMC's 28 nm Low Power (28LP) process, which brings down the power and cost, giving you:
- Up to 40 percent lower total power compared to Cyclone IV GX FPGAs
- Lowest power serial transceivers with 88 mW maximum power consumption per channel at 5 Gbps
- Over 4,000 MIPS (Dhrystones 2.1 benchmark) processing performance for under 1.8 W (for SoCs)
- Unparalleled use of hard intellectual property (IP) blocks for lower power and system cost
- Multiple low-cost package options, offering small form-factor, high pin-count, and different ball-pitch variants

Family Plan

All numbers are preliminary and subject to change.

Family	Core Fabric							Interconnect			Hard IP	
	Device	LEs[1]	# of Blocks	Block Memory (Kb)	MLABs (Kb)	DSP Blocks[2]	PLLs	Transceivers	GPIOs	LVDS Pairs	PCIe Blocks	Memory Controllers[3]
Cyclone V E	5CEA2	25K	176	1,760	196	25	4	-	224	56	-	1
	5CEA4	49K	308	3,080	303	66	4	-	224	56	-	1
	5CEA5	77K	446	4,460	424	150	6	-	240	60	-	2
	5CEA7	149.5K	686	6,860	836	156	7	-	480	120	-	2
	5CEA9	301K	1,220	12,200	1,717	342	8	-	480	120	-	2
Cyclone V GX	5CGXC3	31.5K	119	1,190	159	51	4	3	208	52	1	1
	5CGXC4	50K	250	2,500	295	70	6	6	336	84	2	2
	5CGXC5	77K	446	4,460	424	150	6	6	336	84	2	2
	5CGXC7	149.5K	686	6,860	836	156	7	9	480	120	2	2
	5CGXC9	301K	1,220	12,200	1,717	342	8	12	560	140	2	2
Cyclone V GT	5CGTD5	77K	446	4,460	424	150	6	6	336	84	2	2
	5CGTD7	149.5K	686	6,860	836	156	7	9	480	120	2	2
	5CGTD9	301K	1,220	12,200	1,717	342	8	12	560	140	2	2

1 2.65 logic elements (LEs) equivalent per adaptive logic module (ALM).
2 Each DSP block can natively support 3x(9x9), 2x(18x18), or single 27x27 multiplier.
3 Hard memory controllers include ECC support for high reliability. The number of hard memory controllers available in the device (0, 1, or 2) can be chosen in part ordering code.

Cyclone V FPGAs deliver lower power

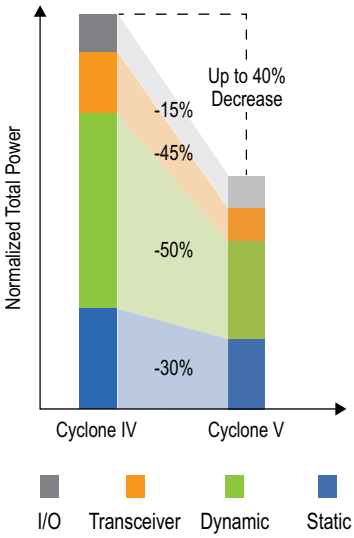

Table 1. Transceiver protocols supported by Cyclone V GT FPGAs

Protocol	Data rate (Gbps)
Basic (proprietary)	0.6 – 5.0
CPRI	6.144
Display Port	2.7
Gigabit Ethernet	1.25
PCIe Gen1 and Gen2	2.5 and 5.0
SATA	3.0
Serial RapidIO®	3.125
SATA Gen1 and Gen2	1.5 and 3.0
V-by-One	3.75
XAUI	3.125
3G SDI	2.97
OBSAI	0.75 – 3.072
HiGig	3.75
JESD204A	3.125

Because Cyclone V FPGAs integrate an abundance of hard IP blocks, you can differentiate and do more with less overall system cost, power, and design time. Key hard IP blocks include the following:

- Hardened memory controllers supporting 400 MHz DDR3 SDRAM, DDR2, and LPDDR2 with optional error correction code (ECC) support
- PCI Express® (PCIe®) Gen1 and Gen2 with multi-function support
- Fractional synthesis phase-locked loops (PLLs) to replace voltage-controlled crystal oscillators (VCXOs)
- Variable-precision digital signal processing (DSP) blocks
- HPSs (for SoCs) include a dual-core ARM Cortex™-A9 MPCore™ processor, embedded peripherals (Ethernet, USB, flash memory, and more), and high-bandwidth (>100 Gbps) HPS-FPGA interconnect

To protect your valuable IP investments, Cyclone V FPGAs also provide comprehensive design protection, with features including 256 bit Advanced Encryption Standard (AES) with volatile and non-volatile keys.

Package Plan

All numbers are preliminary and subject to change.

Family	Device	LEs	M301 11x11	M383 13x13	M484 15x15	U324 15x15	U484 19x19	F256 17x17	F484 23x23	F672 27x27	F896 31x31	F1152 35x35
Cyclone V E	5CEA2	25K	-	223	-	176	224	128	224	-	-	-
	5CEA4	49K	-	223	-	176	224	128	224	-	-	-
	5CEA5	77K	-	175	-	-	224	-	240	-	-	-
	5CEA7	149.5K	-	-	240	-	240	-	240	336	480	-
	5CEA9	301K	-	-	-	-	240	-	224	336	480	-
Cyclone V GX	5CGXC3	31.5K	-	-	-	144/3	208/3	-	208/3	-	-	-
	5CGXC4	50K	129/4	175/6	-	-	224/6	-	240/6	336/6	-	-
	5CGXC5	77K	129/4	175/6	-	-	224/6	-	240/6	336/6	-	-
	5CGXC7	149.5K	-	-	240/3	-	240/6	-	240/6	336/9	480/9	-
	5CGXC9	301K	-	-	-	-	240/5	-	224/6	336/9	480/12	560/12
Cyclone V GT	5CGTD5	77K	129/4	175/6	-	-	224/6	-	240/6	336/6	-	-
	5CGTD7	149.5K	-	-	240/3	-	240/6	-	240/6	336/9	480/9	-
	5CGTD9	301K	-	-	-	-	240/5	-	224/6	336/9	480/12	560/12

Want to dig deeper?

For more technical information about Cyclone V FPGAs, contact your local Altera® sales representative or FAE, or go to www.altera.com/cyclonev. Visit www.altera.com/cvshipping for:

- Download documentation (handbook, white papers, and more)
- Download FREE Quartus® II Web Edition design software
- View webcast: "Reducing Design, Manufacturing, and Debug Costs with Cyclone V FPGAs"

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