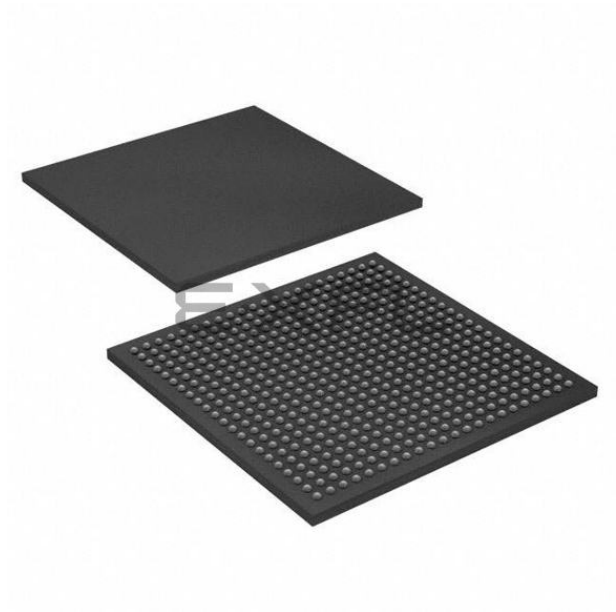

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Embedded - System On Chip (SoC): The Heart of Modern Embedded Systems

Embedded - System On Chip (SoC) refers to an integrated circuit that consolidates all the essential components of a computer system into a single chip. This includes a microprocessor, memory, and other peripherals, all packed into one compact and efficient package. SoCs are designed to provide a complete computing solution, optimizing both space and power consumption, making them ideal for a wide range of embedded applications.

What are Embedded - System On Chip (SoC)?

System On Chip (SoC) integrates multiple functions of a computer or electronic system onto a single chip. Unlike traditional multi-chip solutions, SoCs combine a central

Details	
Product Status	Active
Architecture	MCU, FPGA
Core Processor	Dual ARM® Cortex®-A9 MPCore™ with CoreSight™
Flash Size	-
RAM Size	64KB
Peripherals	DMA, POR, WDT
Connectivity	CANbus, EBI/EMI, Ethernet, I²C, MMC/SD/SDIO, SPI, UART/USART, USB OTG
Speed	700MHz
Primary Attributes	FPGA - 25K Logic Elements
Operating Temperature	-40°C ~ 125°C (TJ)
Package / Case	484-FBGA
Supplier Device Package	484-UBGA (19x19)
Purchase URL	https://www.e-xfl.com/product-detail/intel/5cseba2u19a7n

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Device Ordering Code	Maximum Output Current	Package	Ambient Operating Temperature Range	Junction Temperature Range
EN6310QA	1 A	30-pin QFN	–40°C to 105°C	–40°C to 125°C
EP53A8HQA	1 A	16-pin QFN	–40°C to 105°C	–40°C to 125°C
EP53A8LQA	1 A	16-pin QFN	–40°C to 105°C	–40°C to 125°C
EN6337QA	3 A	38-pin QFN	–40°C to 105°C	–40°C to 125°C
EN6347QA	4 A	38-pin QFN	–40°C to 105°C	–40°C to 125°C
EN6360QA	8 A	68-pin QFN	–40°C to 105°C	–40°C to 125°C
EN63A0QA	12 A	76-pin QFN	–40°C to 105°C	–40°C to 125°C

2.3. Intel MAX 10 Devices

2.3.1. Supported Automotive-Grade Devices

Table 5. Automotive-Grade in Intel MAX 10 Devices

Device Ordering Code	Device	Package	Junction Temperature Range	Speed Grade
10M02SCE144A7G	10M02SC	144-pin EQFP	–40°C to 125°C	–7
10M02SCU169A7G	10M02SC	169-pin UBGA	–40°C to 125°C	–7
10M02DCU324A7G	10M02DC	324-pin UBGA	–40°C to 125°C	–7
10M04SCE144A7G	10M04SC	144-pin EQFP	–40°C to 125°C	–7
10M04SCU169A7G	10M04SC	169-pin UBGA	–40°C to 125°C	–7
10M04DCF256A7G	10M04DC	256-pin FBGA	–40°C to 125°C	–7
10M04DAF256A7G	10M04DA	256-pin FBGA	–40°C to 125°C	–7
10M04DCU324A7G	10M04DC	324-pin UBGA	–40°C to 125°C	–7
10M08SAU169A7G	10M08SA	169-pin UBGA	–40°C to 125°C	–7
10M08SCE144A7G	10M08SC	144-pin EQFP	–40°C to 125°C	–7
10M08SCU169A7G	10M08SC	169-pin UBGA	–40°C to 125°C	–7
10M08DCF256A7G	10M08DC	256-pin FBGA	–40°C to 125°C	–7
10M08DAF256A7G	10M08DA	256-pin FBGA	–40°C to 125°C	–7
10M08DCU324A7G	10M08DC	324-pin UBGA	–40°C to 125°C	–7
10M16SCE144A7G	10M16SC	144-pin EQFP	–40°C to 125°C	–7
10M16SCU169A7G	10M16SC	169-pin UBGA	–40°C to 125°C	–7
10M16DCF256A7G	10M16DC	256-pin FBGA	–40°C to 125°C	–7
10M16DAF256A7G	10M16DA	256-pin FBGA	–40°C to 125°C	–7
10M16DCU324A7G	10M16DC	324-pin UBGA	–40°C to 125°C	–7
10M16DCF484A7G	10M16DC	484-pin FBGA	–40°C to 125°C	–7
10M25SCE144A7G	10M25SC	144-pin EQFP	–40°C to 125°C	–7
10M25DCF256A7G	10M25DC	256-pin FBGA	–40°C to 125°C	–7

continued...

Device Ordering Code	Device	Package	Junction Temperature Range	Speed Grade
10M25DAF256A7G	10M25DA	256-pin FBGA	–40°C to 125°C	–7
10M40SCE144A7G	10M40SC	144-pin EQFP	–40°C to 125°C	–7
10M40DCF256A7G	10M40DC	256-pin FBGA	–40°C to 125°C	–7
10M50SCE144A7G	10M50SC	144-pin EQFP	–40°C to 125°C	–7
10M50DCF256A7G	10M50DC	256-pin FBGA	–40°C to 125°C	–7

2.3.2. Package Options and Maximum User I/Os

Table 6. Package Options and Maximum User I/Os in Intel MAX 10 Single Power Supply Devices

Device	Package		
	Type	U169 169-pin UBGA	E144 144-pin EQFP
	Size	11 mm × 11 mm	22 mm × 22 mm
	Pitch	0.8 mm	0.5 mm
10M02S		130	101
10M04S		130	101
10M08S		130	101
10M16S		130	101
10M25S		—	101
10M40S		—	101
10M50S		—	101

Table 7. Package Options and Maximum User I/Os in Intel MAX 10 Dual Power Supply Devices

Device	Package			
	Type	U324 324-pin UBGA	F256 256-pin FBGA	F484 484-pin FBGA
	Size	15 mm × 15 mm	17 mm × 17 mm	23 mm × 23 mm
	Ball Pitch	0.8 mm	1.0 mm	1.0 mm
10M02D		160	—	—
10M04D		246	178	—
10M08D		246	178	250
10M16D		246	178	320
10M25D		—	178	360
10M40D		—	178	360
10M50D		—	178	360

Device Ordering Code	Device	Package	Junction Temperature Range	Speed Grade
5CSEBA6U19A7N	5CSEBA6	484-pin UBGA	–40°C to 125°C	–7
5CSEBA6U23A7N	5CSEBA6	672-pin UBGA	–40°C to 125°C	–7
5CSEMA6U23A7N	5CSEMA6	672-pin UBGA	–40°C to 125°C	–7
5CSEMA6F31A7N	5CSEMA6	896-pin FBGA	–40°C to 125°C	–7
5CSXFC2C6U23A7N	5CSXFC2	672-pin UBGA	–40°C to 125°C	–7
5CSXFC4C6U23A7N	5CSXFC4	672-pin UBGA	–40°C to 125°C	–7
5CSXFC5C6U23A7N	5CSXFC5	672-pin UBGA	–40°C to 125°C	–7
5CSXFC6C6U23A7N	5CSXFC6	672-pin UBGA	–40°C to 125°C	–7
5CSXFC6D6F31A7N	5CSXFC6	896-pin FBGA	–40°C to 125°C	–7

2.4.2. Package Options and Maximum User I/Os

Table 9. Package Options and Maximum User I/Os in Cyclone V SE Devices

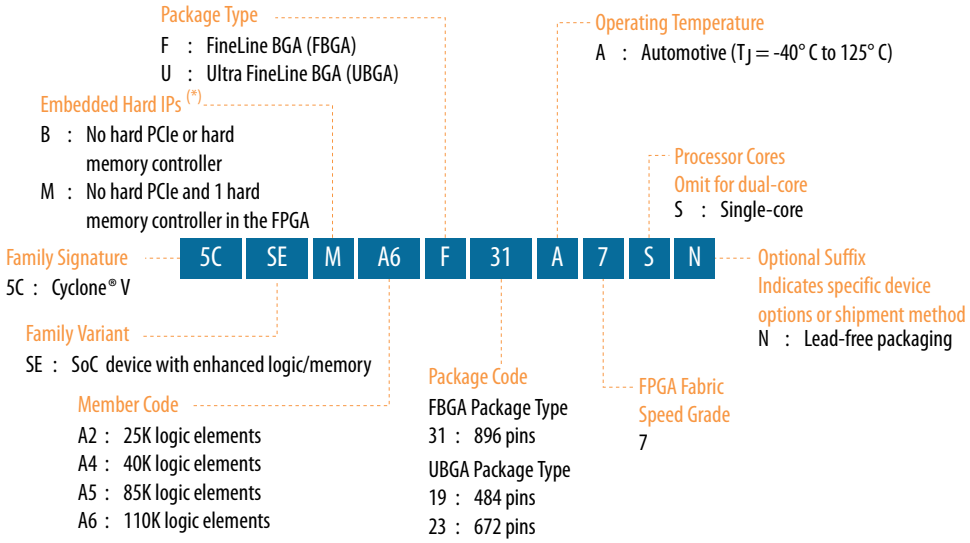
Package Type/ Pin Count	Ball Spacing (mm)	Dimensions (mm)	Product Line			
			5CSEA2	5CSEA4	5CSEA5	5CSEA6
			(25K LEs)	(40K LEs)	(85K LEs)	(110K LEs)
			FPGA I/Os / HPS I/Os			
UBGA-484	0.8	19 x 19	66 / 151	66 / 151	66 / 151	66 / 151
UBGA-672	0.8	23 x 23	145 / 181	145 / 181	145 / 181	145 / 181
FBGA-896	1	31 x 31	—	—	288 / 181	288 / 181

Table 10. Package Options and Maximum User I/Os in Cyclone V SX Devices

Package Type/ Pin Count	Ball Spacing (mm)	Dimensions (mm)	Product Line			
			5CSXC2	5CSXC4	5CSXC5	5CSXC6
			(25K LEs)	(40K LEs)	(85K LEs)	(110K LEs)
			FPGA I/Os / HPS I/Os / XCVRs			
UBGA-672	0.8	23 x 23	145 / 181 / 6	145 / 181 / 6	145 / 181 / 6	145 / 181 / 6
FBGA-896	1	31 x 31	—	—	—	288 / 181 / 9

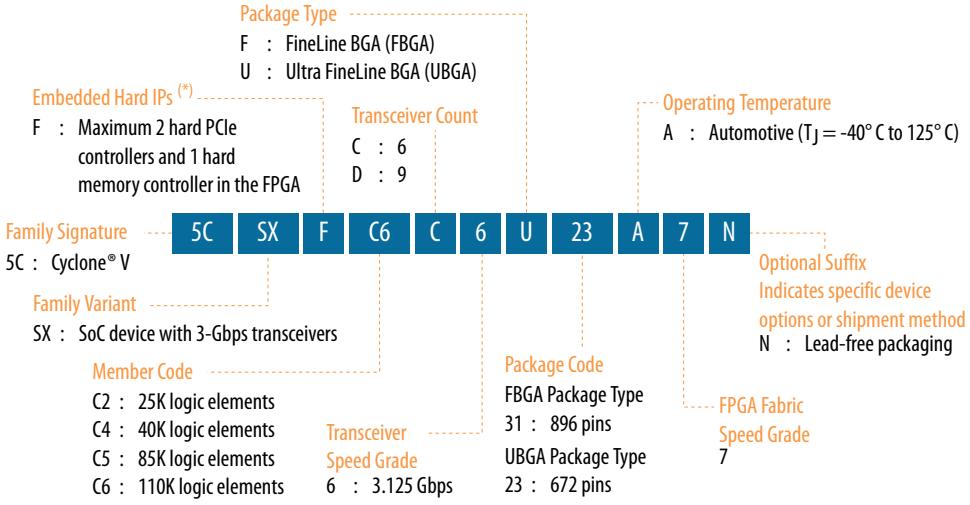
2.4.3. Device Ordering Codes

Figure 3. Automotive-Grade Ordering Information for Cyclone V SE Devices



Note:
* All Cyclone V SoC devices include one hard memory controller dedicated to the processor and which can be shared by the FPGA.

Figure 4. Automotive-Grade Ordering Information for Cyclone V SX Devices



Note:
* All Cyclone V SoC devices include one hard memory controller dedicated to the processor and which can be shared by the FPGA.

2.5. Cyclone V Devices

2.5.1. Supported Automotive-Grade Devices

Table 11. Automotive-Grade in Cyclone V Devices

Other automotive-grade product line/package combinations or ordering codes might be available upon request. Consult your Intel sales representative to submit your request.

Device Ordering Code	Device	Package	Junction Temperature Range	Speed Grade
5CEBA2F17A7N	5CEBA2	256-pin FBGA	–40°C to 125°C	–7
5CEFA2U19A7N	5CEFA2	484-pin UBGA	–40°C to 125°C	–7
5CEBA4F17A7N	5CEBA4	256-pin FBGA	–40°C to 125°C	–7
5CEFA4U19A7N	5CEFA4	484-pin UBGA	–40°C to 125°C	–7
5CEFA5U19A7N	5CEFA5	484-pin UBGA	–40°C to 125°C	–7
5CEFA7U19A7N	5CEFA7	484-pin UBGA	–40°C to 125°C	–7
5CEFA9U19A7N	5CEFA9	484-pin UBGA	–40°C to 125°C	–7
5CGXFC3B6U15A7N	5CGXFC3	324-pin UBGA	–40°C to 125°C	–7
5CGXFC3B6U19A7N	5CGXFC3	484-pin UBGA	–40°C to 125°C	–7
5CGXFC4C6U19A7N	5CGXFC4	484-pin UBGA	–40°C to 125°C	–7
5CGXFC5C6U19A7N	5CGXFC5	484-pin UBGA	–40°C to 125°C	–7
5CGXFC5C6F23A7N	5CGXFC5	484-pin FBGA	–40°C to 125°C	–7
5CGXFC7C6U19A7N	5CGXFC7	484-pin UBGA	–40°C to 125°C	–7
5CGXFC7D6F31A7N	5CGXFC7	896-pin FBGA	–40°C to 125°C	–7
5CGXFC9A6U19A7N	5CGXFC9	484-pin UBGA	–40°C to 125°C	–7

2.5.2. Package Options and Maximum User I/Os

Table 12. Package Options and Maximum User I/Os in Cyclone V E Devices

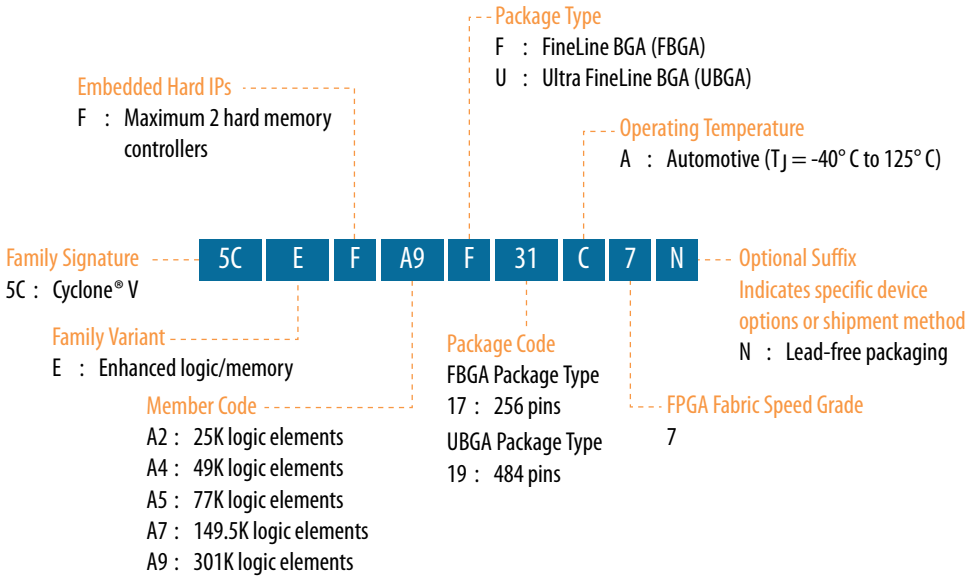
Package Type/ Pin Count	Ball Spacing (mm)	Dimensions (mm)	Product Line				
			5CEA2	5CEA4	5CEA5	5CEA7	5CEA9
			(25K LEs)	(49K LEs)	(77K LEs)	(149.5K LEs)	(301K LEs)
			I/Os				
FBGA-256	1	17 x 17	128	128	—	—	—
UBGA-484	0.8	19 x 19	224	224	224	240	240

Table 13. Package Options and Maximum User I/Os in Cyclone V GX Devices

Package Type/ Pin Count	Ball Spacing (mm)	Dimensions (mm)	Product Line				
			5CGXC3 (36K LEs)	5CGXC4 (50K LEs)	5CGXC5 (77K LEs)	5CGXC7 (149.5K LEs)	5CGXC9 (301K LEs)
			I/Os / XCVRs				
UBGA-324	0.8	15 x 15	144 / 3	—	—	—	—
UBGA-484	0.8	19 x 19	208 / 3	224 / 6	224 / 6	240 / 6	240 / 5
FBGA-484	1	23 x 23	—	—	240 / 6	—	—
FBGA-896	1	31 x 31	—	—	—	480 / 9	—

2.5.3. Device Ordering Codes

Figure 5. Automotive-Grade Ordering Information for Cyclone V E Devices



2.6.3. Device Ordering Codes

Figure 7. Automotive-Grade Ordering Information for Cyclone IV E Devices

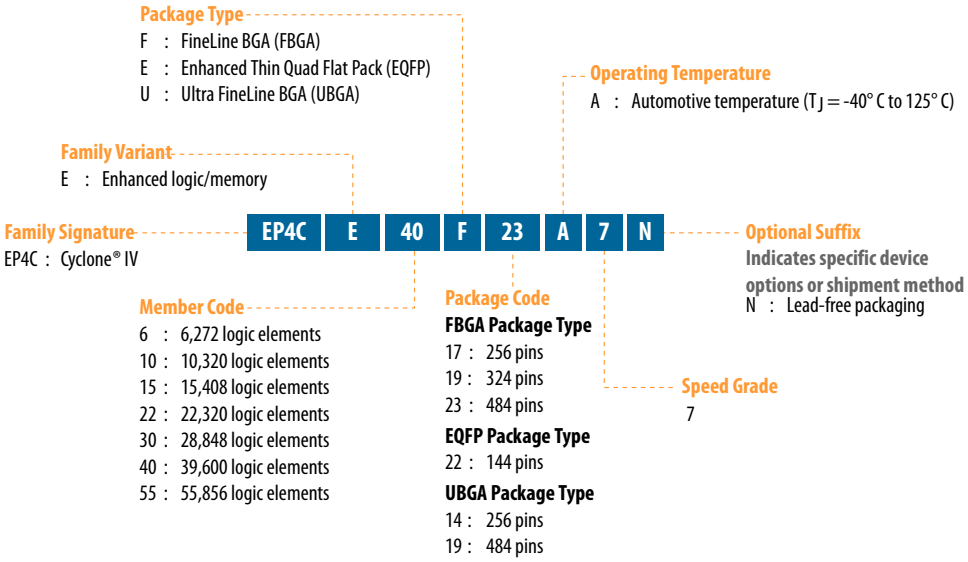
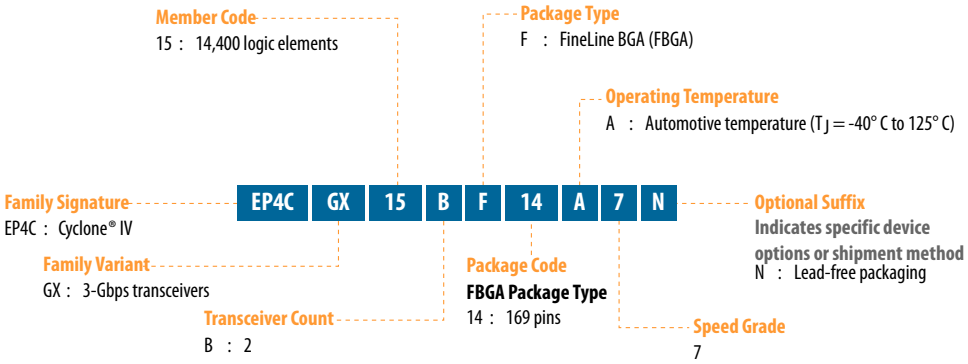


Figure 8. Automotive-Grade Ordering Information for Cyclone IV GX Devices



2.7. MAX V Devices

2.7.1. Supported Automotive-Grade Devices

Table 17. Automotive-Grade in MAX V Devices

Other automotive-grade product line/package combinations or ordering codes might be available upon request. Consult your Intel sales representative to submit your request.

Device Ordering Code	Device	Package	Junction Temperature Range	Speed Grade
5M40ZE64A5N	5M40Z	64-pin EQFP	–40°C to 125°C	–5
5M80ZE64A5N	5M80Z	64-pin EQFP	–40°C to 125°C	–5
5M80ZT100A5N	5M80Z	100-pin TQFP	–40°C to 125°C	–5

continued...

Device Ordering Code	Device	Package	Junction Temperature Range	Speed Grade
5M160ZE64A5N	5M160Z	64-pin EQFP	–40°C to 125°C	–5
5M160ZT100A5N	5M160Z	100-pin TQFP	–40°C to 125°C	–5
5M240ZT100A5N	5M240Z	100-pin TQFP	–40°C to 125°C	–5
5M570ZT100A5N	5M570Z	100-pin TQFP	–40°C to 125°C	–5
5M1270ZF256A5N	5M1270Z	256-pin FBGA	–40°C to 125°C	–5
5M1270ZT144A5N	5M1270Z	144-pin TQFP	–40°C to 125°C	–5

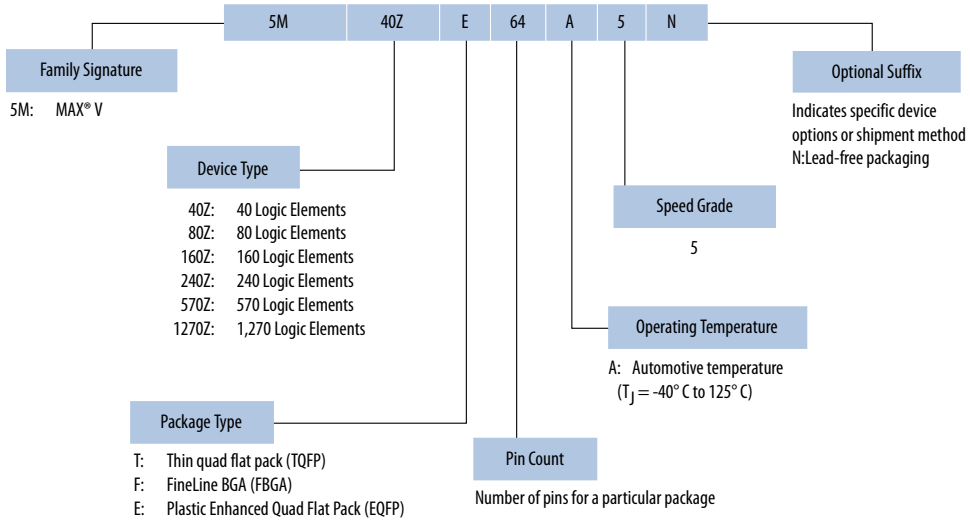
2.7.2. Package Options and Maximum User I/Os

Table 18. Package Options and Maximum User I/Os in MAX V Devices

Package Type/ Pin Count	Ball Spacing (mm)	Dimensions (mm)	Product Line					
			5M40Z (40K LEs)	5M80Z (80K LEs)	5M160Z (160K LEs)	5M240Z (240K LEs)	5M570Z (570K LEs)	5M1270Z (1270K LEs)
			I/Os					
EQFP-64	0.5	7 x 7	54	54	54	—	—	—
TQFP-100	0.5	14 x 14	—	79	79	79	74	—
TQFP-144	0.5	20 x 20	—	—	—	—	—	114
FBGA-256	1	17 x 17	—	—	—	—	—	211

2.7.3. Device Ordering Codes

Figure 9. Automotive-Grade Ordering Information for MAX V Devices



2.8. MAX II Devices

2.8.1. Supported Automotive-Grade Devices

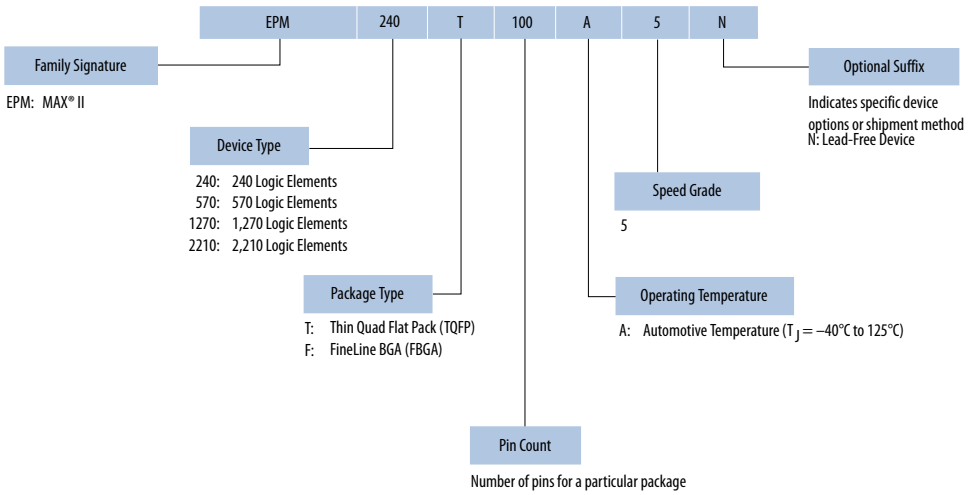
Table 19. Automotive-Grade in MAX II Devices

Other automotive-grade product line/package combinations or ordering codes might be available upon request. Consult your Intel sales representative to submit your request.

Device Ordering Code	Device	Package	Junction Temperature Range	Speed Grade
EPM240T100A5N	EPM240	100-pin TQFP	–40°C to 125°C	–5
EPM570F100A5N	EPM570	100-pin FBGA	–40°C to 125°C	–5
EPM570T100A5N	EPM570	100-pin TQFP	–40°C to 125°C	–5
EPM570T144A5N	EPM570	144-pin TQFP	–40°C to 125°C	–5
EPM1270T144A5N	EPM1270	144-pin TQFP	–40°C to 125°C	–5
EPM1270F256A5N	EPM1270	256-pin FBGA	–40°C to 125°C	–5
EPM2210F256A5N	EPM2210	256-pin FBGA	–40°C to 125°C	–5
EPM2210F324A5N	EPM2210	324-pin FBGA	–40°C to 125°C	–5

2.8.2. Device Ordering Codes

Figure 10. Automotive-Grade Ordering Information for MAX II Devices



2.9. Cyclone III Devices (Legacy Support)

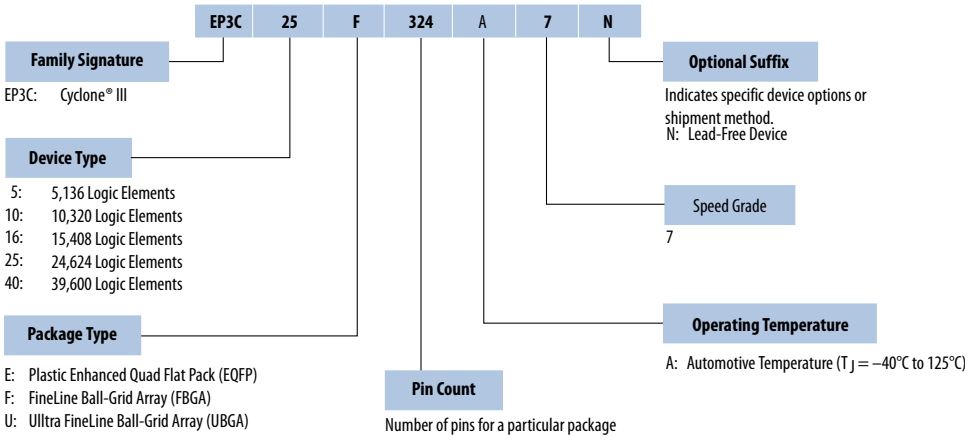
2.9.1. Supported Automotive-Grade Devices

Table 20. Automotive-Grade in Cyclone III Devices

Device Ordering Code	Device	Package	Junction Temperature Range	Speed Grade
EP3C5E144A7N	EP3C5	144-pin EQFP	–40°C to 125°C	–7
EP3C5F256A7N	EP3C5	256-pin FBGA	–40°C to 125°C	–7
EP3C5U256A7N	EP3C5	256-pin UBGA	–40°C to 125°C	–7
EP3C10E144A7N	EP3C10	144-pin EQFP	–40°C to 125°C	–7
EP3C10F256A7N	EP3C10	256-pin FBGA	–40°C to 125°C	–7
EP3C10U256A7N	EP3C10	256-pin UBGA	–40°C to 125°C	–7
EP3C16E144A7N	EP3C16	144-pin EQFP	–40°C to 125°C	–7
EP3C16F256A7N	EP3C16	256-pin FBGA	–40°C to 125°C	–7
EP3C16U256A7N	EP3C16	256-pin UBGA	–40°C to 125°C	–7
EP3C16F484A7N	EP3C16	484-pin FBGA	–40°C to 125°C	–7
EP3C16U484A7N	EP3C16	484-pin UBGA	–40°C to 125°C	–7
EP3C25E144A7N	EP3C25	144-pin EQFP	–40°C to 125°C	–7
EP3C25F256A7N	EP3C25	256-pin FBGA	–40°C to 125°C	–7
EP3C25U256A7N	EP3C25	256-pin UBGA	–40°C to 125°C	–7
EP3C25F324A7N	EP3C25	324-pin FBGA	–40°C to 125°C	–7
EP3C40F324A7N	EP3C40	324-pin FBGA	–40°C to 125°C	–7
EP3C40F484A7N	EP3C40	484-pin FBGA	–40°C to 125°C	–7
EP3C40U484A7N	EP3C40	484-pin UBGA	–40°C to 125°C	–7

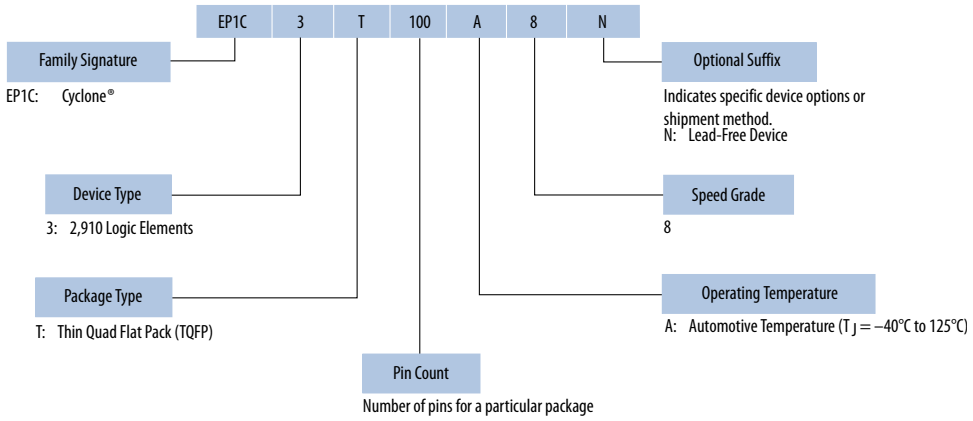
2.9.2. Device Ordering Codes

Figure 11. Automotive-Grade Ordering Information for Cyclone III Devices



2.11.2. Device Ordering Codes

Figure 13. Automotive-Grade Ordering Information for Cyclone Devices



2.12. MAX 7000A Devices (Legacy Support)

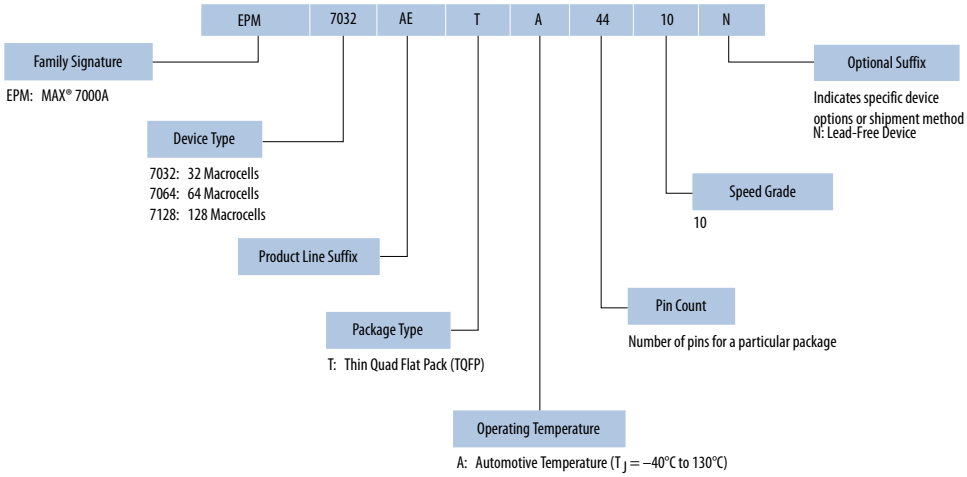
2.12.1. Supported Automotive-Grade Devices

Table 23. Automotive-Grade in MAX 7000A Devices

Device Ordering Code	Device	Package	Junction Temperature Range	Speed Grade
EPM7032AETA44-10N	EPM7032AE	44-pin TQFP	–40°C to 130°C	–10
EPM7064AETA44-10N	EPM7064AE	44-pin TQFP	–40°C to 130°C	–10
EPM7064AETA100-10N	EPM7064AE	100-pin TQFP	–40°C to 130°C	–10
EPM7128AETA100-10N	EPM7128AE	100-pin TQFP	–40°C to 130°C	–10
EPM7128AETA144-10N	EPM7128AE	144-pin TQFP	–40°C to 130°C	–10

2.12.2. Device Ordering Codes

Figure 14. Automotive-Grade Ordering Information for MAX 7000A Devices



4. Power Analysis and Estimation

4.1. Early Power Estimator

The Early Power Estimator (EPE) is a power estimation tool that helps you estimate the power consumption of your design during the system planning phase for proper power supply planning and consideration.

The EPE allows you to enter design information based on architectural features and calculates the power consumed by each architectural feature. Inputs to the EPE are environmental conditions and device resources (such as clock frequency, RAM blocks, and digital signal processing [DSP] blocks) that you expect to use in your design. The EPE then calculates the static and dynamic power, current estimates, and thermal analysis for the design.

You can either enter the design information manually into the spreadsheet or import a power estimator file of a fully or partially completed design from the Intel Quartus Prime software. After importing a file, you can edit some of the input parameters including V_{CCINT}, ambient temperature, airflow, clock frequency, and toggle percentage to suit your system requirements.

The value obtained from the EPE is only an estimation and should not be used as a specification. The accuracy of the EPE results depends on how close your input of the design information into the EPE resembles that of the final design.

For more information about the EPE, and how to generate and import the power estimator file, refer to the respective user guides.

Related Information

Early Power Estimators (EPE) and Power Analyzer, Intel page
Provides the EPE and user guides.

4.2. Power Analyzer

The Power Analyzer tool in the Intel Quartus Prime software is a power analysis tool that helps you calculate your design power consumption accurately to ensure thermal and power supply budgets are not violated after your design is complete. The Power Analyzer tool requires your design to be synthesized and fitted to the target device. Availability of information such as design resources, how the design is placed and routed on the target device, and the I/O standards assigned to each I/O cell allow the Power Analyzer tool to provide accurate power estimation.

The process of using the Power Analyzer tool consists of the following three parts:

- Specifying sources of input data
- Specifying operating conditions
- Running the Power Analyzer tool

The input data consists of the signal activities data (toggle rates and static probabilities) of the compiled design. Signal activity data can be derived from simulation results, user assignment in the Assignment Editor, user-defined default toggle rate, and vectorless estimation.

The operating conditions include device power characteristic, ambient and junction temperature, cooling solution, and board thermal model, all of which can be set in the Intel Quartus Prime software.

The Power Analyzer tool calculates the dynamic, static and I/O thermal power consumption, current consumed from voltage source, a summary of the signal activities used for analysis, and a confidence metric that reflects the overall quality of the data sources for the signal activities.

Related Information

Power Analysis chapter, Intel Quartus Prime Standard Edition Handbook Volume 3: Verification

5. DC and Timing Specifications

The automotive-grade devices have the same values for the following specifications as published in the respective device datasheets :

- Absolute maximum ratings
- Recommended operating conditions
- DC electrical characteristics
- Timing specifications over the automotive temperature range

For the maximum power-up current (I_{CCINT}) required to power up an automotive-grade Cyclone device, use the value specified for the corresponding industrial-grade device.

The on-chip series termination (R_S OCT) specifications for the following automotive-grade devices are as follows:

- Automotive-grade Cyclone III, Cyclone IV, Cyclone V, Cyclone V SoC, Intel Cyclone 10 LP, and Intel MAX 10 devices—same as the corresponding industrial-grade devices
- Automotive-grade Cyclone II devices—same as the corresponding extended-temperature devices

The switching characteristics of the automotive-grade Cyclone III, Cyclone IV, Cyclone V, and Cyclone V SoC devices are the same as the devices with –8 speed grade as published in the respective device datasheets.

Related Information

- Intel Cyclone 10 LP Device Datasheet
- Intel MAX 10 FPGA Device Datasheet
- Cyclone V Device Datasheet
- Cyclone IV Device Datasheet
- DC and Switching Characteristics for MAX V Devices
- DC and Switching Characteristics chapter, MAX II Device Handbook
- Cyclone III Device Datasheet
- DC Characteristics and Timing Specifications chapter, Cyclone II Device Handbook
- DC and Switching Characteristics chapter, Cyclone Device Handbook
- MAX 7000A Programmable Logic Device Data Sheet

6. Pin-Out Information

For more information about the device pin-outs, refer to the respective device pin-out files.

Related Information

Pin-Out Files for Intel FPGA Devices page

7. Package and Board Layout Information

Intel provides information on package and PCB design guidelines.

Related Information

- Package and Thermal Resistance page, Intel website
  Provides more information about the package-related information and Package Information Datasheet for Intel Devices.
- AN 114: Board Design Guidelines for Intel Programmable Device Packages
  Provides more information about the PCB design guidelines.
- Schematic Symbols (Cadence Capture CIS and Allegro DE-HDL (Concept Software)) page
  Provides more information about designing PCBs with the Cadence OrCAD capture component information system and symbols libraries.

Document Version	Changes
	• Updated the *Automotive-Grade Ordering Information for Intel MAX 10 Devices* diagram. — Removed V and M package types. — Removed WLCSP (36 and 81), MBGA (153), and FBGA (672) package types. — Removed DF feature option. • Removed notes from the following tables: — *Package Options and Maximum User I/Os in Cyclone V SE Devices* — *Package Options and Maximum User I/Os in Cyclone V SX Devices* • Removed the resource count for FBGA-896 package in 5CSXC5 device. • Updated the *Automotive-Grade in Cyclone V Devices* table. — Added 5CGXFC7D6F31A7N — Removed Cyclone V GT devices: 5CGTFD5C5U19A7N, 5CGTFD7C5U19A7N, and 5CGTFD9A5U19A7N • Removed resources for packages that are not currently available in automotive-grade for Cyclone V E and GX devices. • Updated the description for embedded hard IPs in the following diagrams: — *Automotive-Grade Ordering Information for Cyclone V E Devices* — *Automotive-Grade Ordering Information for Cyclone V GX Devices* • Removed QFN-148 package in the *Package Options and Maximum User I/Os in Cyclone IV GX Devices* table. • Removed resources for packages that are not currently available in automotive-grade for Cyclone IV E and GX devices. • Updated the *Package Options and Maximum User I/Os in MAX V Devices* table. — Corrected QFP-100 to TQFP-100 and DFP-144 to TQFP-144. — Removed MBGA-64, MBGA-68, MBGA-100, and FBGA-324 packages. — Removed resources for packages that are not currently available in automotive-grade. • Updated the description for the legacy device families in the *Intel Quartus Prime Software Support* section. • Added Intel Cyclone 10 LP and Intel MAX 10 devices in the *DC and Timing Specifications* section.

Date	Version	Changes
December 2017	2017.12.15	• Removed Intel Cyclone 10 GX devices. — Removed Intel Cyclone 10 GX devices from *Automotive-Grade in Intel Cyclone 10 GX Devices* table. — Removed *Package Options and Maximum User I/Os in Intel Cyclone 10 GX Devices* table. — Removed *Automotive-Grade Ordering Information for Intel Cyclone 10 GX Devices* diagram. • Intel rebranding.
July 2017	2017.07.13	Corrected the automotive temperature range in the figure showing the available options for the Intel Arria 10 GX devices from "-40°C to 100°C" to "-40°C to 125°C".
May 2017	2017.05.08	• Updated links. • Rebranded as Intel.
February 2017	2017.02.13	• Added Intel Arria 10, Cyclone 10, and Intel Enpirion devices. • Removed PowerPlay text from tool name.
May 2016	2016.05.03	• Updated the Overview topic to remove ASIC devices. • Updated footnote in Automotive-Grade in MAX 10 Devices table. • Added new automotive-grade devices for the following device families: — MAX 10—10M08SAU169A7G — Cyclone V SoC—5CSXFC6D6F31A7N — Cyclone IV—EP4CE15U14A7N, EP4CE22U14A7N, and EP4CE55F23A7N

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Date	Version	Changes
		• Removed the following devices from Automotive-Grade in MAX 10 Devices table. — 10M04SFE144A7G — 10M04SFU169A7G — 10M04DFF256A7G — 10M04DFU324A7G — 10M08SFE144A7G — 10M08SFU169A7G — 10M08DFF256A7G — 10M08DFU324A7G — 10M08DFF484A7G — 10M16SFE144A7G — 10M16SFU169A7G — 10M16DFF256A7G — 10M16DFU324A7G — 10M16DFF484A7G — 10M25SFE144A7G — 10M25DFF256A7G — 10M25DFF484A7G — 10M25DFF672A7G — 10M40SFE144A7G — 10M40DFF256A7G — 10M40DFF484A7G — 10M40DFF672A7G — 10M50SFE144A7G — 10M50DFF256A7G — 10M50DFF484A7G — 10M50DFF672A7G • Updated the Package Options and Maximum User I/Os in Cyclone V GX Devices table. — Updated the LE count for 5CGXC3 from 31.5K LEs to 36K LEs. — Added I/Os / XCVRs count for UBGA-484 package in 5CGXC9 device. • Updated the Package Options and Maximum User I/Os in Cyclone V GT Devices table. — Added I/Os / XCVRs count for UBGA-484 package in 5CGTD9 device. • Updated the following device ordering codes diagrams: — Automotive-Grade Ordering Information for MAX 10 Devices — Automotive-Grade Ordering Information for Cyclone IV E Devices — Automotive-Grade Ordering Information for Cyclone V SE Devices — Automotive-Grade Ordering Information for Cyclone V SX Devices • Changed instances of *Quartus II* to *Quartus Prime*.
September 2014	2014.09.22	• Added MAX 10 devices. • Removed HardCopy® II devices. • Updated the Quartus II software support versions for the legacy device families. — Cyclone III—Version 8.0 to 13.1 — Cyclone II—Version 7.2 SP1 to 13.0 — Cyclone—Version 7.2 SP1 to 13.0 — MAX 7000AE—Version 7.2 SP1 to 13.0

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