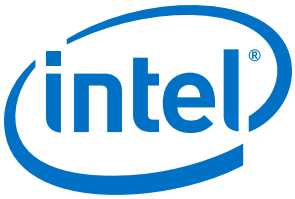

Intel® Arria® 10 Military Temperature Range Support Technical Brief

TB-111 | 2019.11.05
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1. Intel® Arria® 10 Military Temperature Range Support Technical Brief

Intel® offers Intel Arria® 10 FPGAs in the temperature range of –55°C to 125°C including device configuration at both temperature extremes to support platform planning for military applications. This temperature range allows military programs to benefit from the new technology and economies of scale by using commercially available Intel Arria 10 FPGAs.

1.1. Military Temperature Support

The switching characteristic of the military-temperature grade Intel Arria 10 devices is the same as the devices with -I3 FPGA fabric speed grade and transceiver speed grade 4 as indicated in the *Intel Arria 10 Device Datasheet*, with exceptions described below:

- Supported temperature range:
  - Ambient and junction temperature of –55°C during device power-up and configuration.
  - Ambient temperature of –55°C for device functionality support and complies with Intel Arria 10 performance specifications using timing model corresponding to temperature junction range from –40°C to 125°C.
- Transceiver capable of driving backplane up to 13 decibels (dB) only.
- DDR4 maximum performance at 800 MHz.
- For military grade devices, the VCCLSENSE and GNDSENSE to the voltage regulators must be connected and used.
- On-chip termination (OCT) calibration resistance tolerances:

OCT	IO Standard	Tolerances (%)
R_T	POD12	±20
	SSTL and HSTL	-15 to 40
R_S	All supported I/O standard	±20

Note: To understand the impact of termination impedance variation, Intel recommends that you perform signal integrity simulation using the IBIS or HSPICE models.

The military-temperature grade Intel Arria 10 devices support the following serial interface IPs:

- PCI Express* (PCIe*) IP up to Generation 3 x1 and x2 modes
- Triple-Speed Ethernet IP in GXB mode
- Low Latency Ethernet 10G MAC IP in 10G mode

For more information about Ethernet IP or other IP-related support, submit a Service Request at the *My Intel* support page.

Prototyping industrial temperature grade devices may be substituted for military temperature range devices due to the shorter lead time.

Note: You must use and close timing with the Intel Quartus® Prime Pro Edition software with military OPNs. Timing and performance for military OPNs at extended temperatures differ from standard devices. Contact Intel for acceptable mission profiles.

Use the following guidelines to compile your design using the Intel Quartus Prime Pro Edition software for industrial or military devices:

- When using military models with military devices, select an applicable military speed grade 3 (M3) part code and compile or recompile your design.
- When using military models with industrial devices, select an applicable industrial speed grade 3 (I3) part code and update the **Operating Settings and Conditions** dialog box to reflect –55°C (Minimum) and 125°C (Maximum) temperatures before compiling or recompiling your design.

Table 1. Intel Arria 10 Industrial and Military Temperature Device Part Numbers

Item	Device Part Number		Package
	Military Temperature	Industrial Temperature	
1	10AX016C4U19M3SG	10AX016C4U19I3SG	U19
2	10AX016E4F29M3SG	10AX016E4F29I3SG	F29
3	10AX022C4U19M3SG	10AX022C4U19I3SG	U19
4	10AX022E4F29M3SG	10AX022E4F29I3SG	F29
5	10AX115N4F40M3SG	10AX115N4F40I3SG	F40
6	10AX048E4F29M3SG	10AX048E4F29I3SG	F29
7	10AX048K4F35M3SG	10AX048K4F35I3SG	F35
8	10AX057K4F35M3SG	10AX057K4F35I3SG	F35
9	10AX057N4F40M3SG	10AX057N4F40I3SG	F40
10	10AX066K4F35M3SG	10AX066K4F35I3SG	F35
11	10AX066N4F40M3SG	10AX066N4F40I3SG	F40

Related Information

- Intel Arria 10 Device Overview
  Provides more information about the sample ordering code and available options for Intel Arria 10 GX devices.
- Intel Arria 10 Device Datasheet
- My Intel Support

1.2. Software Support

The Intel Arria 10 military temperature grade device models are supported in the Intel Quartus Prime Pro Edition software.

Related Information

- Early Power Estimators (EPE) and Power Analyzer
- Intel Quartus Prime Software Download Center

1.3. Document Revision History for the Intel Arria 10 Military Temperature Range Support Technical Brief

Document Version	Changes
2019.11.05	Initial release.