EtherCAT Slave Controller Overview (1/3)

as of January 2020

EtherCAT®
Technology Group

Name	AX58100	AX58200	fido5200	ET1100	ET1810/ET1811/ET1812	ET1851/ET1816/ET1817	netX90	netX 100	netX 500
Type	ASIC	ARM MPU	ASIC	ASIC	Intel (Altera) FPGA + IP Core	Xilinx FPGA + IP Core	ASIC	ASIC	ASIC
Supplier	ASIX	ASIX	ANALOG DEVICES AHEAD OF WHAT'S POSSIBLE™	BECKHOFF	BECKHOFF	BECKHOFF	hilscher COMPETENCE IN COMMUNICATION	hilscher COMPETENCE IN COMMUNICATION	hilscher COMPETENCE IN COMMUNICATION
Package	80-pin LQFP 0.4 mm pitch	144-pin HSFBGA 0.8 mm pitch	144 FBGA (0.8 mm) 144 LQFP (0.5 mm)	BGA128 0.8 mm pitch	FPGA dependent	FPGA dependent	LFBGA144 0.8 mm pitch	BGA345 1 mm pitch	BGA345 1 mm pitch
Size	12 x 12 mm	10 x 10 mm	10 x 10 mm (FBGA) 20 x 20 mm (LQFP)	10 x 10 mm	FPGA dependent	FPGA dependent	10 x 10 mm	22 x 22 mm	22 x 22 mm
µC Interface	SPI/parallel (8/16-bit, asynchronous)	uC bus (Internal, AHB)	parallel (16/32-bit)	serial/parallel (8/16bit, sync/async)*	serial/parallel (8- /16-bit, async) AVALON®*	serial/parallel (8- /16-bit, async) OPB®* and PLB®*	µC bus (internal, 32bit)	µC bus (internal, 32bit)	µC bus (internal, 32bit)
Digital I/O	32	-	8 (Event Output/Capture)	8-32*	8-32*	8-32*	-	-	-
General Purpose I/O	32	up to 76*	-	0-32*	0-128*	0-128*	16	16	16
DPRAM	9 kByte	160 kByte	10 kByte	8 kByte	0...60 kByte*	0...60 kByte*	6 kByte	256/512 Byte (Mailbox/Process Data)	256/512 Byte (Mailbox/Process Data)
SyncManager Entities	8	8	8	8	0...8*	0...8*	8	4	4
FMMU Entities	8	8	8	8	0...8*	0...8*	8	3	3
Distributed Clock Support	yes (64-bit)	yes (64-bit)	yes	yes	yes*	yes*	yes	yes	yes
No. of Ports	2 (100BaseTX) + Opt. 1 (MII)	2 (100BaseTX) + Opt. 1 (MII)	2 (MII/RMII)	2-4 (MII/E-BUS)*	1-3 (MII/max. 2 RMII)	1-3 (MII/max. 2 RMII)	2 (100BaseTX)	2 (100BaseTX)	2 (100BaseTX)
Specials	100BASE-FX support 2 integrated PHYs 3-ch PWM and S/D I/F ABZ and Hall encoder I/F SPI master I/F	2 integrated Ethernet PHYs, USB 2.0 HS OTG, 10/100Mbps Ethernet MAC with RMII and hardware cryptography accelerator 6xLPUARTs, 3xISO-7816-3, 1xQuad-SPI, 3xI2C, 1xI2S, 2xUSCI, 2xCAN, 1xSPI Flash I/F, 2xSDHC, 1x16-ch/12-bit ADC, 2x12-bit DAC, 2xAnalog Comparators, 2xOperational Amplifiers , 4x32-bit timers, 24x16-bit PWM counters, 2xQEI, 1xECAP, supports Real-Time Clock (RTC) , Built-in Die Temperature Sensor (DTS)	Multi-protocol support, Gigabit Ethernet support, Event Output/Capture I/O	BGA routable with standard PCB	Various license models and OpenCore Plus are available. A wide range of Intel (former: Altera) FPGAs are supported	Various license models and evaluation Version are available. A wide range of Xilinx FPGAs are supported	Multi-protocol support, Integrated PHYs, Integrated µC, OnChip Flash 1,5 Mbytes, OnChip DC-DC Converter, (ARM Cortex M4-100MHz) Additional integrated Application Controller (ARM Cortex M4 - 100 MHz)	Multi-protocol support, Integrated PHYs, Integrated µC (ARM9-200MHz)	Multi-protocol support, Integrated PHYs, Integrated µC (ARM9-200MHz)
Further information	https://www.asix.com.tw/en/product/IndustrialEthernet/EtherCAT/AX58100	https://www.asix.com.tw/en/product/IndustrialEthernet/EtherCAT/AX58200	www.analog.com	https://www.beckhoff.com/ET1100				https://www.hilscher.com/netx	
Data Sheet	https://www.asix.com.tw/en/product/IndustrialEthernet/EtherCAT/AX58100	https://www.asix.com.tw/en/product/IndustrialEthernet/EtherCAT/AX58200	https://www.analog.com/en/products/fido5200.html	https://www.beckhoff.com/en-en/products/i-o/ethercat-development-products/					

*configurable

Name	netX51	netX52	Anybus NP40	XMC4300	XMC4800	LAN9252	EC-1	RZ/T1	R-IN32M3-EC
Type	ASIC	ASIC	ARM MPU	ARM MPU	ARM MPU	ASIC	ARM MPU	ARM MPU	ARM MPU
Supplier	hilscher	hilscher	HMS	Infineon	Infineon	MICROCHIP	RENESAS	RENESAS	RENESAS
Package	PBGA324 1 mm pitch	PBGA244 1 mm pitch	BGA VF400 0.8 mm pitch	100 LQFP (0.5 mm)	100 LQFP (0.5 mm)	64 pin QFN (0.5 mm pitch) 64 pin TQFP-EP (0.5 mm pitch)	196 pin BGA (0.8 mm)	FBGA320 0.8 mm pitch	BGA324 1 mm pitch
Size	19 x 19 mm	15 x 15 mm	17 x 17 mm	16 x 16 mm	20 x 20 mm 16 x 16 mm 12 x 12 mm	9 x 9 mm 12 x 12 mm	12 x 12 mm	17 x 17 mm	19 x 19 mm
µC Interface	µC bus (internal, 32bit)	µC bus (internal, 32bit)	Anybus interface (8- / 16-bit 30 ns parallel, 20 MHz SPI, Shift register, UART)	µC bus (internal, AHB)	µC bus (internal, AHB)	Host Bus/SPI/SQI	USB Host/Function, CAN, SCIFA, I2C RSPI, Flash	16/32-bit parallel and various serial (SPI/I2C/UART)	16/32-bit parallel (master/slave) and serial (SPI/I2C/UART)
Digital I/O	-	-	256 / 256 (Shift register mode)	-	-	0-16*	-	-	-
General Purpose I/O	32	24	-	0 - 46	0 - 123	0-16*	115* GPIOs / 8 Input (port multiplexed, partial 5V-tolerant, open drain, input pull-up)	0-209*	0-96*
DPRAM	6 kByte	6 kByte	12 kByte	8 kByte	8 kByte	4 kByte	512 KB (ATCM) with ECC 32 KB (BTCM) with ECC	8 kByte	8 kByte
SyncManager Entities	8	8	4	8	8	4	8	8	8
FMMU Entities	8	8	4	8	8	3	8	8	8
Distributed Clock Support	yes	yes	yes	yes (64 Bit)	yes (64 Bit)	yes	yes (64 bit)	yes	yes
No. of Ports	2 (100BaseTX)	2 (100BaseTX)	2 (MII)	2 (MII)	2 (MII)	2 (100BaseTX) + opt. 1 (MII)	2 (MII)	2 (RMII/MII)	2 (100BaseTX)
Specials	Multi-protocol support, Integrated PHYs, Integrated µC (ARM9-100MHz)	Multi-protocol support, Integrated PHYs, Integrated µC (ARM9-100MHz)	Multi-protocol support, ESC Frame forwarding delay: 114 ns, MDP, possible to implement several device profiles	EtherCAT® node on an ARM® Cortex®-M4 processor with up to 256kB on-chip flash, 128kB on-chip RAM and analog/mixed signal capabilities. Qualified for up to 125°C ambient temperature.	EtherCAT® node on an ARM® Cortex®-M4 processor with up to 2MB on-chip flash, 352kB on-chip RAM and analog/mixed signal capabilities. Qualified for up to 125°C ambient temperature.	Cable Diagnostics, 100FX support, 2 integrated PHYs, integrated 1.2V regulator	Safety Functions, Multi-Function Pin Controller	Additional Ethernet port (RMII/MII), 2-axis high-speed motion control support, digital encoder interfaces (EnDat, BiSS, others), Multi-protocol support, security option, functional safety support, Cortex-R4F (450/600MHz), Cortex-M3 (150MHz) cores	Multi-protocol support, SPI, I2C, UART, 1.3 Mbyte int. RAM, <1W typical incl. 2 PHYs
Further information	https://www.hilscher.com/netx		www.anybus.com/technologies/network_processors.shtml	www.infineon.com/ethercat	www.infineon.com/ethercat	www.microchip.com/design-centers/ethernet/ethernet-devices/productsethercat	https://www.renesas.com/en-eu/ec-1	www.renesas.eu/products/mpumcu/rz/index.jsp	www.renesas.eu/automation
Data Sheet	https://www.hilscher.com/fileadmin/cms_uploads/hilscher/Images/netX51_Datasheet_11.0014_EN.pdf	https://www.hilscher.com/fileadmin/cms_uploads/hilscher/Images/netX52_Datasheet_11.0014_EN.pdf	www.anybus.com/downloads/NMM-100%20Anybus%20CompactCom%20NP40.pdf	www.infineon.com/ethercat	www.infineon.com/ethercat	www.microchip.com/wwwproducts/en/LAN9252	http://www.renesas.com/en-eu/doc/products/assp/doc/r01ds0288ed1100-ec-1.pdf	www.renesas.eu/products/mpumcu/rz/Documentation.jsp	www.renesas.eu/r-in

*configurable

Name	Sitara AM3357/9	Sitara AM4377/9	Sitara AM571xE	Sitara AM572xE	Sitara AMIC110 SoC	TMC8460	TMC8461	TMC8462	ANTAIOS
Type	ARM MPU	ARM MPU	ARM MPU	ARM MPU	Arm MPU	ASIC	ASIC	ASIC	ARM MPU
Supplier	TEXAS INSTRUMENTS	TEXAS INSTRUMENTS	TEXAS INSTRUMENTS	TEXAS INSTRUMENTS	TEXAS INSTRUMENTS	TRINAMIC MOTION CONTROL	TRINAMIC MOTION CONTROL	TRINAMIC MOTION CONTROL	YASKAWA
Package	324NFBGA 0.8 mm pitch	491 BGA, 0.65mm pitch (0.8 mm effective routing)	760 BGA 0.8 mm pitch	760 BGA 0.8 mm pitch	324NFBGA 0.8mm pitch	VFGG400 Very Fine Pitch BGA 0.8 mm pitch	BGA144 0.8 mm pitch	BGA121 0.75 mm pitch	TFBGA-380 (0.65 mm pitch) TFBGA-385 (0.8 mm pitch)
Size	15 x 15 mm	17 x 17 mm	23 x 23 mm	23 x 23 mm	15x15mm	17 x 17 mm	10x10 mm	9x9 mm	15 mm x 15 mm 19 mm x 19 mm
µC Interface	200 MHz interconnect (internal, 32bit)	200 MHz interconnect (internal, 32bit)	200 MHz interconnect (internal, 32bit)	200 MHz interconnect (internal, 32bit)	200MHz interconnect (internal, 32bit)	SPI or PDI-emulation	serial or standalone	serial or standalone	SPI / QSPI / 16 Bit asynchronous interface
Digital I/O	8	8	8	8	8	0 (see specials)	0..16*	0..16*	-
General Purpose I/O	> 32	> 32	> 32	> 32	>32	0 (see specials)	0..24*	0..24*	up to 32
DPRAM	8 kByte	32 kByte	32 kByte	32 kByte	8 kByte	16 kByte	16 kByte	16 kByte	up to 32 kByte
SyncManager Entities	8	8	8	8	8	6	8	8	8
FMMU Entities	8	8	8	8	8	6	8	8	8
Distributed Clock Support	yes	yes	yes	yes	yes	yes (64 Bit)	yes	yes	yes (64 bit)
No. of Ports	2 (MII)	2 (MII)	4 (MII)	4 (MII)	2 (MII)	2 (MII)	2 (MII)	2 (100BaseTX)	2 (100BaseTX) or 2 (MII)
Specials	Industrial Communications Subsystem (PRU-ICSS) for multi-protocol support, Gigabit Switch, CAN, display, ARM Cortex-A8 (275MHz-1000MHz)	Multi-protocol support, Second PRU-ICSS for Motor control (EnDat, sigma delta filtering etc), Gigabit Switch, CAN, Display subsystem, 2D/3D graphics, Camera I/F, Optional secure boot, ARM Cortex-A9 (upto 1 GHz)	Dual Industrial Communications Subsystem (PRU-ICSS) for multi-protocol support (2 EtherCAT slave instances or EtherCAT slave to protocol gateway), Motor control (EnDat, sigma delta filtering), 2D/3D Graphics, Display subsystem, Video acceleration, PCIe, SATA, Optional secure boot, ARM Cortex-A15 (upto 1.5GHz), 2x M4 cores, 1x C66x DSP core	Dual Industrial Communications Subsystem (PRU-ICSS) for multi-protocol support (2 EtherCAT slave instances or EtherCAT slave to protocol gateway), 2D/3D Graphics, Display subsystem, Video acceleration, PCIe, SATA, Optional secure boot, 2x ARM Cortex-A15 (upto 1.5 GHz), 2x M4 cores, 2x C66x DSP cores	Entire EtherCAT slave controller can be implemented on internal memory (no external DDR needed), Industrial Communications Subsystem (PRU-ICSS) for multi-protocol support, CAN	MFCIO block - additional multi-function and control block in hardware for complex real-time IO (GPIO, Watchdog, SPI Master, ABN interface, S/D output, 3ph PWM), direct MCU control or accessible via DPRAM/SyncManagers	Wide supply range (up to 35V), 2x Integrated DC/DC regulators, 8x Direct High Voltage I/Os, Multi-function I/O block, BGA routable with standard PCB	Wide supply range (up to 35V), 2x Integrated DC/DC regulators, 8x Direct High Voltage I/Os, Multi-function I/O block, Integrated PHYs, BGA routable with standard PCB	Multi fieldbus protocol support, 2 x integrated PHYs, 1 x integrated GBit Ethernet MAC, Integrated ARM® Cortex®-A5 (288MHz), Backplane communication: SliceBus master for profichip's SNAP+ ASIC, Integrated technology module (2xSII / 4xPWM / 4xCounter), QuadSPI interface (e.g. NOR Flash for firmware), DDR2 external memory interface, Other external interfaces: SD/MMC, NAND, USB2 device, SRAM master/slave, SPI master/slave
Further information	www.ti.com/AM335x	www.ti.com/AM437x	www.ti.com/product/AM5718	www.ti.com/product/AM5728	www.ti.com/amic110	www.trinamic.com/products/integrated-circuits/details/tmc8460	https://www.trinamic.com/products/integrated-circuits/details/tmc8461-bw/	https://www.trinamic.com/products/integrated-circuits/details/tmc8462-bw/	www.profichip.com/products/overviewasics/antaios/
Data Sheet	www.ti.com/lit/ds/symlink/am3359.pdf	www.ti.com/lit/ds/symlink/am4379.pdf	www.ti.com/lit/ds/symlink/am5718.pdf	www.ti.com/lit/ds/symlink/am5728.pdf	http://www.ti.com/product/AMIC110/datasheet	https://www.trinamic.com/products/integrated-circuits/details/tmc8460/#document-Technical_Overview	https://www.trinamic.com/products/integrated-circuits/details/tmc8461-bw/	https://www.trinamic.com/products/integrated-circuits/details/tmc8462-bw/	www.profichip.com/products/overviewasics/antaios/

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