AVR® Microcontrollers Peripheral Integration

Quick Reference Guide

Peripheral Function Focus							Intelligent Analog									Waveform Control		Timing and Measurements				Logic and Math		Safety and Monitoring					Communications						User Interface					System Flexibility			
Product Family	Pin Count	Program Flash Memory (KB)	SRAM (KB)	EEPROM (B)	Supply Voltage	Speed (MHz) Single Cycle Instruction: MHz = MIPS	ADC (# of bits)	ADC (# of channels)	ADC Gain Stage	Comparators	DAC (# of bits)	Op-amp	Temperature Sensor	Internal Voltage Reference	Zero Cross Detector (ZCD)	8-bit PWM	16-bit PWM	Real-Time Counter	8-bit Timer/Counters	12-bit Timer Counter	16-bit Timer/Counter	CCL	MULT	CRC/SCAN	POR	BOD	WDT	Funcional Safety Support	USART	USB	I²C	SPI	IRCOM	Serial Number	QTouch® Technology	QTouch Technology with PTC (2)	LCD	Event System	Multi-Voltage I/O	Event System	Multi-Voltage I/O	Sleep Modes	picoPower® Technology
ATtiny102/104	8/14	1	0.032		1.8–5.5	12	10	5/8		✓				✓			2				2				✓		✓		1													4	
ATtiny20x/40x/80x/160x	8–24	2–16	Up to 1	128-256	1.8–5.5	20	10	12		✓			✓	✓			2	✓			1	✓	✓	✓	✓	✓	✓	✓	1(1)		1	1		✓				✓		✓		3	✓
ATtiny21x/41x/81x/161x /321x	8–24	2–32	Up to 2	128-256	1.8–5.5	20	10	12		✓	8		✓	✓			2	✓		1	1	✓	✓	✓	✓	✓	✓	✓	1(1)		1	1		✓		✓(3)		✓		✓		3	✓
ATtiny42x/82x/162x/322x	14-24	4-32	0.5-3	128-266	1.8-5.5	20	12	15	✓	✓			✓	✓		12	8	✓			6	✓	✓	✓	✓	✓	✓	✓	2		1	1	✓	✓				✓		✓		3	✓
ATmega80x/160x/320x /480x	28–48	8–48	1–6	256	1.8–5.5	20	10	16		✓			✓	✓		4	3	✓			5	✓	✓	✓	✓	✓	✓	✓	4		1	1		✓				✓		✓		3	✓
ATmega48PB/88PB/168PB /328PB	32	4–32	0.5–2	256-1024	1.8–5.5	20	10	8		✓			✓	✓		4	2/6(4)	✓	2		1/3(4)		✓		✓	✓	✓		1/2(4)		1/2(4)	1/2(4)			✓	✓(3)						6	✓
ATmega324PB	44	32	2	1024	1.8–5.5	20	10	8	✓	✓				✓		2	2	✓	2		1		✓		✓	✓	✓		1		1	1			✓	✓						5	✓
AVR-DA Family	28-64	32-128	4–16	512	1.8–5.5	24	12	22		✓	10		✓	✓	1-3	16	16	✓		1	5	✓	✓	✓	✓	✓	✓	✓	3–6		1–2	2	✓	✓		✓		✓		✓		3	✓
AVR-DB Family	28-64	32-128	4–16	512	1.8–5.5	24	12	22		✓	10	2-3	✓	✓	1-3	9–18	3–7	✓		1	1–5	✓	✓	✓	✓	✓	✓	✓	3–6		1–2	2	✓	✓				✓	✓	✓	✓	3	✓
AVR-DD Family	14-32	16-64	2-8	256	1.8-5.5	24	12	23		✓	10		✓	✓	1	16	9	✓		1	3	✓	✓	✓	✓	✓	✓	✓	2		1	1	✓	✓				✓	✓	✓	✓	3	✓
AVR-EA Family	28-48	16-64	2-6	512	1.8-5.5	20	12	28	✓	✓	10	✓	✓	✓		12	10	✓			6	✓	✓	✓	✓	✓	✓	✓	3		1	1	✓	✓				✓		✓		3	✓
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ATmega8U2/16U2/32U2	32	8–32	0.5–1	512-1024	2.7–5.5	16	–	–		✓			✓	✓		4	6	✓	2		3		✓		✓	✓	✓		2	✓	2	2										6	
ATmega16U4/32U4	32	16/32	1.25-2.5	512-1024	2.7–5.5	16	10	12		✓			✓	✓		5			1		1		✓		✓	✓	✓		1	✓		1										6	
ATmega3290PA/6490P	100	32-64	2–4	1024	1.8–5.5	20	10	8	✓	✓				✓		2	2	✓	2		1		✓		✓	✓	✓		1		1	1			✓		✓					5	✓

1: LIN port also 2: Peripheral Touch Controller 3: Not on the ATtiny212/214/412/414/416 4: Only on the ATmega328PB

INTELLIGENT ANALOG: Sensor Interfacing and Signal Conditioning	
ADC: Analog-to-Digital Converter	General purpose 10-/12-bit ADC
ADC Gain Stage: Analog-to-Digital Converter Gain Stage	Programmable gain stage, providing amplification steps on the differential input voltage
Comp: Comparator	General purpose rail-to-rail comparator
DAC: Digital-to-Analog Converter	Programmable voltage reference with multiple internal and external connections
VREF: Voltage Reference	Stable fixed voltage reference for use with integrated analog peripherals
ZCD: Zero Cross Detect	AC high-voltage zero-crossing detection for simplifying TRIAC control, synchronised switching control and timing
WAVEFORM CONTROL: PWM Drive and Waveform Generation	
PWM: Pulse Width Modulation	General purpose 10-bit PWM control
16-bit PWM: Standalone 16-bit PWM and 16-bit Timer/Counter	1. High-resolution 16-bit PWM with edge- and center- aligned modes 2. General purpose 16-bit timer/counter
WeX: Waveform Extension	1. Module for more customised and advanced waveform generation 2. Optimised for various types of motor, ballast and power stage control
TIMING AND MEASUREMENTS: Signal Measurement with Timing and Counter Control	
8-/12-/16-bit Timer	General purpose 8-/12-/16-bit timer/counter
LOGIC, CRYPTO AND MATH: Customizable Logic and Math Functions	
CCL: Configurable Custom Logic	1. Integrated combinational and sequential logic 2. Customer interconnection and re-routing of digital peripherals
MULT: Hardware Multiplier	MULTIPLY function of two 8-bit values with 16-bit result
Crypto (AES/DES)	Data encryption and decryption can be easily performed for both internally stored data or for small external data packets
SAFETY AND MONITORING: Hardware Monitoring and Fault Detection	
CRC/SCAN: Cyclical Redundancy Check with Memory Scan	Automatically calculates CRC checksum of Program/ DataEE memory for NVM integrity
POR: Power-On Reset	Keeps the device in reset until the voltage is high enough. Ensures a safe start-up of logic and memories
BOD: Brownout Detector	Prevents code execution if voltage drops below a set threshold
WDT: Watchdog Timer	Monitors correct program operation. Constantly running timer with a configurable time-out period

COMMUNICATIONS: General, Industrial, Lighting and Automotive	
UART: Universal Asynchronous Receiver Transmitter	1. General purpose serial communications 2. Support for LIN
USB: Universal Serial Bus	Support for Full-Speed USB 2.0 device profiles
I2C: Inter-Integrated Circuit	General purpose 2-wire serial communications
SPI: Serial Peripheral Interface	General purpose 4-wire serial communications
IRCOM: Infrared Communication Module	Encodes and decodes data according to the IrDA communication protocol
Serial Number	Factory programmed unique ID useful in wired and wireless communications
USER INTERFACE: Capacitive Touch Sensing and LCD Control	
LCD: Liquid Crystal Display	Highly integrated segmented LCD controller
QTouch®: Microchip Proprietary Touch Technology	Provides a simple-to-use solution to realize touch- sensitive interfaces
QTouch with PTC: QTouch with Peripheral Touch Controller	Provides a simple-to-use solution to realize touch- sensitive interfaces with a Peripheral Touch Controller
LOW POWER AND SYSTEM FLEXIBILITY: Low-Power Technology, Peripheral and Interconnects	
DMA: Direct Memory Access	Moves data between memories and peripherals without CPU overhead, improving overall system performance and efficiency
Event System	Flexible routing of peripheral events, ability to control peripheral independent from the CPU
External Bus Interface	Highly flexible module for interfacing external memories and memory- addressable peripherals
picoPower® Technology	Low-power technology
Sleep Modes	Low-power saving modes, IDLE, power-down, power- save, standby and extended standby
SleepWalking	Ability to put the CPU core to sleep until a relevant event occurs

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