

Contents

Datasheet

• Functional overview	15
– ARM® Cortex®-M4 with FPU core with embedded Flash and SRAM	15
– Adaptive real-time memory accelerator (ART Accelerator™)	15
– Memory protection unit	15
– Embedded Flash memory	16
– CRC (cyclic redundancy check) calculation unit	16
– Embedded SRAM	16
– Multi-AHB bus matrix	16
– DMA controller (DMA)	17
– Nested vectored interrupt controller (NVIC)	18
– External interrupt/event controller (EXTI)	18
– Clocks and startup	18
– Boot modes	19
– Power supply schemes	19
– Power supply supervisor	20
– Internal reset ON	20
– Internal reset OFF	20
– Voltage regulator	21
– Regulator ON	21
– Regulator OFF	22
– Regulator ON/OFF and internal power supply supervisor availability 25	
– Real-time clock (RTC) and backup registers	25
– Low-power modes	26
– VBAT operation	26
– Timers and watchdogs	27
– Advanced-control timers (TIM1)	27
– General-purpose timers (TIMx)	28
– Independent watchdog	28
– Window watchdog	28
– SysTick timer	29

– Inter-integrated circuit interface (I2C)	29
– Universal synchronous/asynchronous receiver transmitters (USART) 29	
– Serial peripheral interface (SPI)	30
– Inter-integrated sound (I2S)	30
– Audio PLL (PLLI2S)	30
– Secure digital input/output interface (SDIO)	31
– Universal serial bus on-the-go full-speed (OTG_FS)	31
– General-purpose input/outputs (GPIOs)	31
– Analog-to-digital converter (ADC)	31
– Temperature sensor	32
– Serial wire JTAG debug port (SWJ-DP)	32
– Embedded Trace Macrocell™	32
• Pinouts and pin description	33
• Memory mapping	51
• Electrical characteristics	55
– Parameter conditions	55
– Minimum and maximum values	55
– Typical values	55
– Typical curves	55
– Loading capacitor	55
– Pin input voltage	56
– Power supply scheme	57
– Current consumption measurement	58
– Absolute maximum ratings	58
– Operating conditions	60
– General operating conditions	60
– VCAP1/VCAP2 external capacitors	62
– Operating conditions at power-up/power-down (regulator ON) ..	63
– Operating conditions at power-up / power-down (regulator OFF) ..	63
– Embedded reset and power control block characteristics	64
– Supply current characteristics	65
– Wakeup time from low-power modes	75
– External clock source characteristics	76

– Internal clock source characteristics	80
– PLL characteristics	82
– PLL spread spectrum clock generation (SSCG) characteristics ..	84
– Memory characteristics	85
– EMC characteristics	87
– Absolute maximum ratings (electrical sensitivity)	89
– I/O current injection characteristics	90
– I/O port characteristics	91
– NRST pin characteristics	96
– TIM timer characteristics	97
– Communications interfaces	98
– 12-bit ADC characteristics	106
– Temperature sensor characteristics	112
– VBAT monitoring characteristics	112
– Embedded reference voltage	112
– SD/SDIO MMC card host interface (SDIO) characteristics	113
– RTC characteristics	114
• Package characteristics	115
– Package mechanical data	115
– WLCSP49, 3.06 x 3.06 mm, 0.4 mm pitch wafer level chip size pack- age	116
– UFQFPN48, 7 x 7 mm, 0.5 mm pitch package	119
– LQFP64, 10 x 10 mm, 64-pin low-profile quad flat package	122
– LQFP100, 14 x 14 mm, 100-pin low-profile quad flat package ..	125
– UFBGA100, 7 x 7 mm, 0.5 mm pitch package	128
– Thermal characteristics	131
– Reference document	131
• Part numbering	132
• Revision history	134