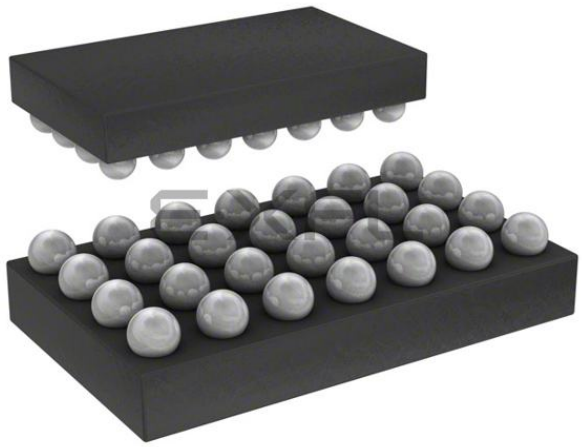

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Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	STM8
Core Size	8-Bit
Speed	16MHz
Connectivity	I²C, IrDA, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, DMA, IR, POR, PWM, WDT
Number of I/O	26
Program Memory Size	32KB (32K x 8)
Program Memory Type	FLASH
EEPROM Size	1K x 8
RAM Size	2K x 8
Voltage - Supply (Vcc/Vdd)	1.8V ~ 3.6V
Data Converters	A/D 18x12b; D/A 1x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	28-UFBGA, WLCSP
Supplier Device Package	28-WLCSP (1.7x2.84)
Purchase URL	https://www.e-xfl.com/product-detail/stmicroelectronics/stm8l151g6y6tr

1 Introduction

This document describes the features, pinout, mechanical data and ordering information of the medium-density STM8L151x4/6 and STM8L152x4/6 devices (STM8L151Cx/Kx/Gx, STM8L152Cx/Kx microcontrollers with a 16-Kbyte or 32-Kbyte Flash memory density). These devices are referred to as medium-density devices in the STM8L15x and STM8L16x reference manual (RM0031) and in the STM8L Flash programming manual (PM0054).

For more details on the whole STMicroelectronics ultra-low-power family please refer to *Section 2.2: Ultra-low-power continuum on page 13*.

For information on the debug module and SWIM (single wire interface module), refer to the STM8 SWIM communication protocol and debug module user manual (UM0470).For information on the STM8 core, please refer to the STM8 CPU programming manual (PM0044).

The medium-density devices provide the following benefits:

- Integrated system
  - Up to 32 Kbyte of medium-density embedded Flash program memory
  - 1 Kbyte of data EEPROM
  - Internal high speed and low-power low speed RC
  - Embedded reset
- Ultra-low power consumption
  - 195 µA/MHz + 440 µA (consumption)
  - 0.9 µA with LSI in Active-halt mode
  - Clock gated system and optimized power management
  - Capability to execute from RAM for Low power wait mode and Low power run mode
- Advanced features
  - Up to 16 MIPS at 16 MHz CPU clock frequency
  - Direct memory access (DMA) for memory-to-memory or peripheral-to-memory access
- Short development cycles
  - Application scalability across a common family product architecture with compatible pinout, memory map and modular peripherals
  - Wide choice of development tools

All devices offer 12-bit ADC, DAC, two comparators, Real-time clock three 16-bit timers, one 8-bit timer as well as standard communication interface such as SPI, I2C and USART. A 4x28-segment LCD is available on the medium-density STM8L152xx line. *Table 2: Medium-density STM8L151x4/6 and STM8L152x4/6 low-power device features and peripheral counts* and *Section 3: Functional overview* give an overview of the complete range of peripherals proposed in this family.

Figure 1 on page 14 shows the general block diagram of the device family.

Table 5. Medium-density STM8L151x4/6, STM8L152x4/6 pin description (continued)

Pin number				Pin name	Type	I/O level	Input			Output			Main function (after reset)	Default alternate function
LQFP48/UFQFPN48	LQFP32/UFQFPN32	UFQFPN28	WLCSP28				floating	wpu	Ext. interrupt	High sink/source	OD	PP		
-	5	5	D4	PA5/TIM3_BKIN/ *[TIM3_ETR]*(4)/ LCD_COM1(2)/ADC1_IN1/ COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port A5**	Timer 3 - break input / *[Timer 3 - external trigger]* / LCD_COM 1 / ADC1 input 1 / Comparator 1 positive input
7	6	-	-	PA6/*[ADC1_TRIG]*(4)/ LCD_COM2(2)/ADC1_IN0/ COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port A6**	*[ADC1 - trigger]* / LCD_COM2 / ADC1 input 0 / Comparator 1 positive input
8	-	-	-	PA7/LCD_SEG0(2)(5)	I/O	FT	**X**	X	X	HS	X	X	**Port A7**	LCD segment 0
24	13	12	E3	PB0(6)/TIM2_CH1/ LCD_SEG10(2)/ ADC1_IN18/COMP1_INP	I/O	TT (3)	**X**(6)	X(6)	X	HS	X	X	**Port B0**	Timer 2 - channel 1 / LCD segment 10 / ADC1_IN18 / Comparator 1 positive input
25	14	13	G1	PB1/TIM3_CH1/ LCD_SEG11(2)/ ADC1_IN17/COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port B1**	Timer 3 - channel 1 / LCD segment 11 / ADC1_IN17 / Comparator 1 positive input
26	15	14	F2	PB2/ TIM2_CH2/ LCD_SEG12(2)/ ADC1_IN16/COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port B2**	Timer 2 - channel 2 / LCD segment 12 / ADC1_IN16/ Comparator 1 positive input
27	-	-	-	PB3/TIM2_ETR/ LCD_SEG13(2)/ ADC1_IN15/COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port B3**	Timer 2 - external trigger / LCD segment 13 /ADC1_IN15 / Comparator 1 positive input

Table 5. Medium-density STM8L151x4/6, STM8L152x4/6 pin description (continued)

Pin number				Pin name	Type	I/O level	Input			Output			Main function (after reset)	Default alternate function
LQFP48/UFQFPN48	LQFP32/UFQFPN32	UFQFPN28	WLCSP28				floating	wpu	Ext. interrupt	High sink/source	OD	PP		
-	-	9	G2	PD1/TIM1_CH3/[*TIM3_ETR*](4)/LCD_COM3(2)/ ADC1_IN21/COMP2_INP/ COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port D1**	Timer 1 channel 3 / *[Timer 3 - external trigger]* / LCD_COM3/ ADC1_IN21 / Comparator 2 positive input / Comparator 1 positive input
22	11	10	E4	PD2/TIM1_CH1 /LCD_SEG8(2)/ ADC1_IN20/COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port D2**	Timer 1 - channel 1 / LCD segment 8 / ADC1_IN20 / Comparator 1 positive input
23	12	-	-	PD3/ TIM1_ETR/ LCD_SEG9(2)/ADC1_IN19/COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port D3**	Timer 1 - external trigger / LCD segment 9 / ADC1_IN19 / Comparator 1 positive input
-	-	11	F3	PD3/ TIM1_ETR/ LCD_SEG9(2)/ ADC1_IN19/TIM1_BKIN/ COMP1_INP/ RTC_CALIB	I/O	TT (3)	**X**	X	X	HS	X	X	**Port D3**	Timer 1 - external trigger / LCD segment 9 / ADC1_IN19 / Timer 1 break input / RTC calibration / Comparator 1 positive input
33	21	20	C1	PD4/TIM1_CH2 /LCD_SEG18(2)/ ADC1_IN10/COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port D4**	Timer 1 - channel 2 / LCD segment 18 / ADC1_IN10/ Comparator 1 positive input
34	22	-	-	PD5/TIM1_CH3 /LCD_SEG19(2)/ ADC1_IN9/COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port D5**	Timer 1 - channel 3 / LCD segment 19 / ADC1_IN9/ Comparator 1 positive input
35	23	-	-	PD6/TIM1_BKIN /LCD_SEG20(2)/ ADC1_IN8/RTC_CALIB/ /VREFINT/ COMP1_INP	I/O	TT (3)	**X**	X	X	HS	X	X	**Port D6**	Timer 1 - break input / LCD segment 20 / ADC1_IN8 / RTC calibration / Internal voltage reference output / Comparator 1 positive input

Table 5. Medium-density STM8L151x4/6, STM8L152x4/6 pin description (continued)

Pin number				Pin name	Type	I/O level	Input			Output			Main function (after reset)	Default alternate function
LQFP48/UFQFPN48	LQFP32/UFQFPN32	UFQFPN28	WLCSP28				floating	wpu	Ext. interrupt	High sink/source	OD	PP		
-	8	7	G4	$V_{DD1}/V_{DDA}/V_{REF+}$	S	-	-	-	-	-	-	-	Digital power supply / Analog supply voltage / ADC1 positive voltage reference	
9	7	6	F4	$V_{SS1}/V_{SSA}/V_{REF-}$	S	-	-	-	-	-	-	-	I/O ground / Analog ground voltage / ADC1 negative voltage reference	
39	-	-	-	V_{DD2}	S	-	-	-	-	-	-	-	IOs supply voltage	
40	-	-	-	V_{SS2}	S	-	-	-	-	-	-	-	IOs ground voltage	
1	32	28	A4	PA0(9)/*[USART1_CK]*(4)/ SWIM/BEEP/IR_TIM (10)	I/O		X	**X**(9)	X	HS (10)	X	X	**Port A0**	*[USART1 synchronous clock]*(4) / SWIM input and output / Beep output / Infrared Timer output

1. At power-up, the PA1/NRST pin is a reset input pin with pull-up. To be used as a general purpose pin (PA1), it can be configured only as output open-drain or push-pull, not as a general purpose input. Refer to Section *Configuring NRST/PA1 pin as general purpose output* in the STM8L15x and STM8L16x reference manual (RM0031).
2. Available on STM8L152xx devices only.
3. In the 3.6 V tolerant I/Os, protection diode to V_{DD} is not implemented.
4. [ ] Alternate function remapping option (if the same alternate function is shown twice, it indicates an exclusive choice not a duplication of the function).
5. In the 5 V tolerant I/Os, protection diode to V_{DD} is not implemented.
6. A pull-up is applied to PB0 and PB4 during the reset phase. These two pins are input floating after reset release.
7. In the open-drain output column, 'T' defines a true open-drain I/O (P-buffer, weak pull-up and protection diode to V_{DD} are not implemented).
8. Available on STM8L151xx devices only.
9. The PA0 pin is in input pull-up during the reset phase and after reset release.
10. High Sink LED driver capability available on PA0.

Note: The slope control of all GPIO pins, except true open drain pins, can be programmed. By default, the slope control is limited to 2 MHz.

Table 9. General hardware register map (continued)

Address	Block	Register label	Register name	Reset status
0x00 5055 to 0x00 506F	Reserved area (27 bytes)			
0x00 5070	DMA1	DMA1_GCSR	DMA1 global configuration & status register	0xFC
0x00 5071		DMA1_GIR1	DMA1 global interrupt register 1	0x00
0x00 5072 to 0x00 5074		Reserved area (3 bytes)		
0x00 5075		DMA1_C0CR	DMA1 channel 0 configuration register	0x00
0x00 5076		DMA1_C0SPR	DMA1 channel 0 status & priority register	0x00
0x00 5077		DMA1_C0NDTR	DMA1 number of data to transfer register (channel 0)	0x00
0x00 5078		DMA1_C0PARH	DMA1 peripheral address high register (channel 0)	0x52
0x00 5079		DMA1_C0PARL	DMA1 peripheral address low register (channel 0)	0x00
0x00 507A		Reserved area (1 byte)		
0x00 507B		DMA1_C0M0ARH	DMA1 memory 0 address high register (channel 0)	0x00
0x00 507C		DMA1_C0M0ARL	DMA1 memory 0 address low register (channel 0)	0x00
0x00 507D to 0x00 507E		Reserved area (2 bytes)		
0x00 507F		DMA1_C1CR	DMA1 channel 1 configuration register	0x00
0x00 5080		DMA1_C1SPR	DMA1 channel 1 status & priority register	0x00
0x00 5081		DMA1_C1NDTR	DMA1 number of data to transfer register (channel 1)	0x00
0x00 5082		DMA1_C1PARH	DMA1 peripheral address high register (channel 1)	0x52
0x00 5083		DMA1_C1PARL	DMA1 peripheral address low register (channel 1)	0x00

Table 9. General hardware register map (continued)

Address	Block	Register label	Register name	Reset status
0x00 5084	DMA1	Reserved area (1 byte)		
0x00 5085		DMA1_C1M0ARH	DMA1 memory 0 address high register (channel 1)	0x00
0x00 5086		DMA1_C1M0ARL	DMA1 memory 0 address low register (channel 1)	0x00
0x00 5087 0x00 5088		Reserved area (2 bytes)		
0x00 5089		DMA1_C2CR	DMA1 channel 2 configuration register	0x00
0x00 508A		DMA1_C2SPR	DMA1 channel 2 status & priority register	0x00
0x00 508B		DMA1_C2NDTR	DMA1 number of data to transfer register (channel 2)	0x00
0x00 508C		DMA1_C2PARH	DMA1 peripheral address high register (channel 2)	0x52
0x00 508D		DMA1_C2PARL	DMA1 peripheral address low register (channel 2)	0x00
0x00 508E		Reserved area (1 byte)		
0x00 508F		DMA1_C2M0ARH	DMA1 memory 0 address high register (channel 2)	0x00
0x00 5090		DMA1_C2M0ARL	DMA1 memory 0 address low register (channel 2)	0x00
0x00 5091 0x00 5092		Reserved area (2 bytes)		
0x00 5093		DMA1_C3CR	DMA1 channel 3 configuration register	0x00
0x00 5094		DMA1_C3SPR	DMA1 channel 3 status & priority register	0x00
0x00 5095		DMA1_C3NDTR	DMA1 number of data to transfer register (channel 3)	0x00
0x00 5096		DMA1_C3PARH_ C3M1ARH	DMA1 peripheral address high register (channel 3)	0x40
0x00 5097		DMA1_C3PARL_ C3M1ARL	DMA1 peripheral address low register (channel 3)	0x00
0x00 5098		Reserved area (1 byte)		
0x00 5099		DMA1_C3M0ARH	DMA1 memory 0 address high register (channel 3)	0x00
0x00 509A		DMA1_C3M0ARL	DMA1 memory 0 address low register (channel 3)	0x00
0x00 509B to 0x00 509D		Reserved area (3 bytes)		
0x00 509E	SYSCFG	SYSCFG_RMPCR1	Remapping register 1	0x00
0x00 509F		SYSCFG_RMPCR2	Remapping register 2	0x00

Table 9. General hardware register map (continued)

Address	Block	Register label	Register name	Reset status
0x00 5140	RTC	RTC_TR1	Time register 1	0x00
0x00 5141		RTC_TR2	Time register 2	0x00
0x00 5142		RTC_TR3	Time register 3	0x00
0x00 5143		Reserved area (1 byte)		
0x00 5144		RTC_DR1	Date register 1	0x01
0x00 5145		RTC_DR2	Date register 2	0x21
0x00 5146		RTC_DR3	Date register 3	0x00
0x00 5147		Reserved area (1 byte)		
0x00 5148		RTC_CR1	Control register 1	0x00
0x00 5149		RTC_CR2	Control register 2	0x00
0x00 514A		RTC_CR3	Control register 3	0x00
0x00 514B		Reserved area (1 byte)		
0x00 514C		RTC_ISR1	Initialization and status register 1	0x00
0x00 514D		RTC_ISR2	Initialization and Status register 2	0x00
0x00 514E 0x00 514F		Reserved area (2 bytes)		
0x00 5150		RTC_SPRERH(1)	Synchronous prescaler register high	0x00(1)
0x00 5151		RTC_SPRERL(1)	Synchronous prescaler register low	0xFF(1)
0x00 5152		RTC_APRER(1)	Asynchronous prescaler register	0x7F(1)
0x00 5153		Reserved area (1 byte)		
0x00 5154		RTC_WUTRH(1)	Wakeup timer register high	0xFF(1)
0x00 5155		RTC_WUTRL(1)	Wakeup timer register low	0xFF(1)
0x00 5156 to 0x00 5158		Reserved area (3 bytes)		
0x00 5159		RTC_WPR	Write protection register	0x00
0x00 515A 0x00 515B		Reserved area (2 bytes)		
0x00 515C		RTC_ALRMAR1	Alarm A register 1	0x00
0x00 515D		RTC_ALRMAR2	Alarm A register 2	0x00
0x00 515E		RTC_ALRMAR3	Alarm A register 3	0x00
0x00 515F		RTC_ALRMAR4	Alarm A register 4	0x00
0x00 5160 to 0x00 51FF	Reserved area (160 bytes)			

Table 9. General hardware register map (continued)

Address	Block	Register label	Register name	Reset status
0x00 5200	SPI1	SPI1_CR1	SPI1 control register 1	0x00
0x00 5201		SPI1_CR2	SPI1 control register 2	0x00
0x00 5202		SPI1_ICR	SPI1 interrupt control register	0x00
0x00 5203		SPI1_SR	SPI1 status register	0x02
0x00 5204		SPI1_DR	SPI1 data register	0x00
0x00 5205		SPI1_CRCPR	SPI1 CRC polynomial register	0x07
0x00 5206		SPI1_RXCRCR	SPI1 Rx CRC register	0x00
0x00 5207		SPI1_TXCRCR	SPI1 Tx CRC register	0x00
0x00 5208 to 0x00 520F	Reserved area (8 bytes)			
0x00 5210	I2C1	I2C1_CR1	I2C1 control register 1	0x00
0x00 5211		I2C1_CR2	I2C1 control register 2	0x00
0x00 5212		I2C1_FREQR	I2C1 frequency register	0x00
0x00 5213		I2C1_OARL	I2C1 own address register low	0x00
0x00 5214		I2C1_OARH	I2C1 own address register high	0x00
0x00 5215		Reserved (1 byte)		
0x00 5216		I2C1_DR	I2C1 data register	0x00
0x00 5217		I2C1_SR1	I2C1 status register 1	0x00
0x00 5218		I2C1_SR2	I2C1 status register 2	0x00
0x00 5219		I2C1_SR3	I2C1 status register 3	0x0x
0x00 521A		I2C1_ITR	I2C1 interrupt control register	0x00
0x00 521B		I2C1_CCRL	I2C1 clock control register low	0x00
0x00 521C		I2C1_CCRH	I2C1 clock control register high	0x00
0x00 521D		I2C1_TRISER	I2C1 TRISE register	0x02
0x00 521E		I2C1_PECR	I2C1 packet error checking register	0x00
0x00 521F to 0x00 522F	Reserved area (17 bytes)			

Table 9. General hardware register map (continued)

Address	Block	Register label	Register name	Reset status
0x00 534E	ADC1	ADC1_TRIGR1	ADC1 trigger disable 1	0x00
0x00 534F		ADC1_TRIGR2	ADC1 trigger disable 2	0x00
0x00 5350		ADC1_TRIGR3	ADC1 trigger disable 3	0x00
0x00 5351		ADC1_TRIGR4	ADC1 trigger disable 4	0x00
0x00 5352 to 0x00 537F	Reserved area (46 bytes)			
0x00 5380	DAC	DAC_CR1	DAC control register 1	0x00
0x00 5381		DAC_CR2	DAC control register 2	0x00
0x00 5382 to 0x00 5383		Reserved area (2 bytes)		
0x00 5384		DAC_SWTRIGR	DAC software trigger register	0x00
0x00 5385		DAC_SR	DAC status register	0x00
0x00 5386 to 0x00 5387		Reserved area (2 bytes)		
0x00 5388		DAC_RDHRH	DAC right aligned data holding register high	0x00
0x00 5389		DAC_RDHRL	DAC right aligned data holding register low	0x00
0x00 538A to 0x00 538B		Reserved area (2 bytes)		
0x00 538C		DAC_LDHRH	DAC left aligned data holding register high	0x00
0x00 538D		DAC_LDHRL	DAC left aligned data holding register low	0x00
0x00 538E to 0x00 538F		Reserved area (2 bytes)		
0x00 5390		DAC_DHR8	DAC 8-bit data holding register	0x00
0x00 5391 to 0x00 53AB		Reserved area (27 bytes)		
0x00 53AC		DAC_DORH	DAC data output register high	0x00
0x00 53AD		DAC_DORL	DAC data output register low	0x00
0x00 53AE to 0x00 53FF	Reserved area (82 bytes)			

Table 13. Option byte description (continued)

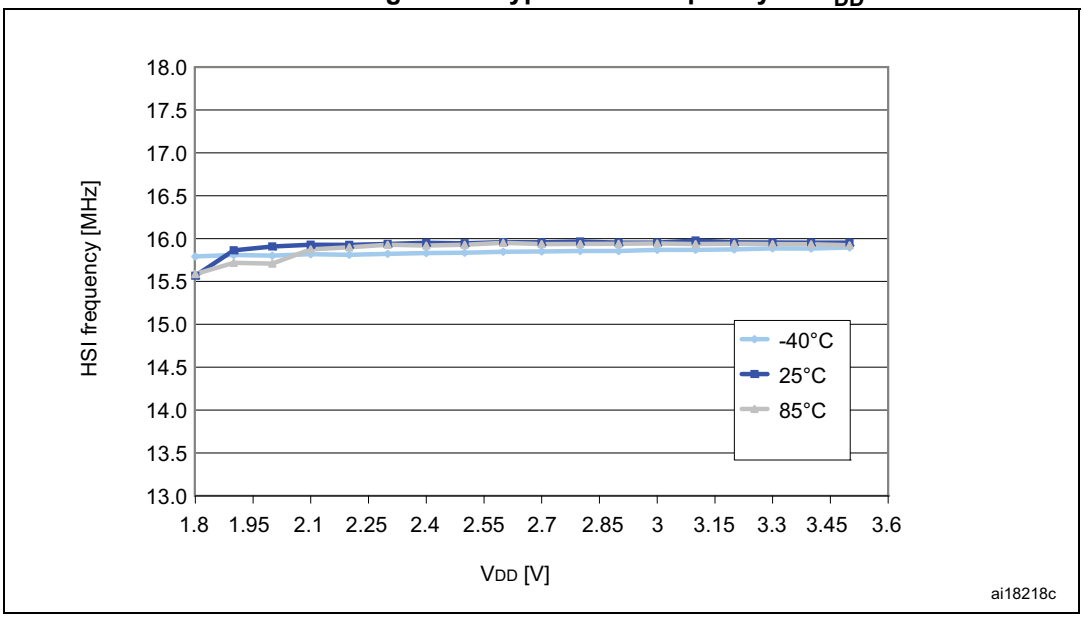
Option byte No.	Option description
OPT5	**BOR_ON**: 0: Brownout reset off 1: Brownout reset on
	BOR_TH[3:1]: Brownout reset thresholds. Refer to *Table 23* for details on the thresholds according to the value of BOR_TH bits.
OPTBL	**OPTBL[15:0]**: This option is checked by the boot ROM code after reset. Depending on content of addresses 00 480B, 00 480C and 0x8000 (reset vector) the CPU jumps to the bootloader or to the reset vector. Refer to the UM0560 bootloader user manual for more details.

Table 21. Total current consumption in Wait mode (continued)

Symbol	Parameter	Conditions[1]			Typ	Max				Unit
						55°C	85 °C[2]	105 °C (3)	125 °C (4)	
$I_{DD(Wait)}$	Supply current in Wait mode	CPU not clocked, all peripherals OFF, code executed from Flash, V_{DD} from 1.65 V to 3.6 V	HSI	f_{CPU} = 125 kHz	0.38	0.48	0.49	0.50	0.56	mA
				f_{CPU} = 1 MHz	0.41	0.49	0.51	0.53	0.59	
				f_{CPU} = 4 MHz	0.50	0.57	0.58	0.62	0.66	
				f_{CPU} = 8 MHz	0.60	0.66	0.68	0.72	0.74	
				f_{CPU} = 16 MHz	0.79	0.84	0.86	0.87	0.90	
			HSE[6] external clock (f_{CPU}=HSE)	f_{CPU} = 125 kHz	0.06	0.08	0.09	0.10	0.12	
				f_{CPU} = 1 MHz	0.10	0.17	0.18	0.19	0.22	
				f_{CPU} = 4 MHz	0.24	0.36	0.39	0.41	0.44	
				f_{CPU} = 8 MHz	0.50	0.58	0.61	0.62	0.64	
				f_{CPU} = 16 MHz	1.00	1.08	1.14	1.16	1.18	
			LSI	$f_{CPU} = f_{LSI}$	0.055	0.058	0.065	0.073	0.080	
			LSE[8] external clock (32.768 kHz)	$f_{CPU} = f_{LSE}$	0.051	0.056	0.060	0.065	0.073	

1. All peripherals OFF, V_{DD} from 1.65 V to 3.6 V, HSI internal RC osc., $f_{CPU} = f_{SYSCLK}$
2. For temperature range 6.
3. For temperature range 7.
4. For temperature range 3.
5. Flash is configured in I_{DDQ} mode in Wait mode by setting the EPM or WAITM bit in the Flash_CR1 register.
6. Oscillator bypassed (HSEBYP = 1 in CLK_ECKCR). When configured for external crystal, the HSE consumption ($I_{DD\ HSE}$) must be added. Refer to *Table 31*.
7. Tested in production.
8. Oscillator bypassed (LSEBYP = 1 in CLK_ECKCR). When configured for external crystal, the LSE consumption ($I_{DD\ HSE}$) must be added. Refer to *Table 32*.

Figure 19. Typical HSI frequency vs V_{DD}



Low speed internal RC oscillator (LSI)

In the following table, data is based on characterization results, not tested in production.

Table 34. LSI oscillator characteristics

Symbol	Parameter (1)	Conditions(1)	Min	Typ	Max	Unit
f_{LSI}	Frequency	-	26	38	56	kHz
$t_{su(LSI)}$	LSI oscillator wakeup time	-	-	-	200(2)	µs
$I_{DD(LSI)}$	LSI oscillator frequency drift(3)	0 °C ≤T_A ≤85 °C	-12	-	11	%

1. V_{DD} = 1.65 V to 3.6 V, T_A = -40 to 125 °C unless otherwise specified.
2. Guaranteed by design.
3. This is a deviation for an individual part, once the initial frequency has been measured.

6. R_{PU} pull-up equivalent resistor based on a resistive transistor (corresponding I_{PU} current characteristics described in *Figure 24*).

Figure 21. Typical V_{IL} and V_{IH} vs V_{DD} (high sink I/Os)

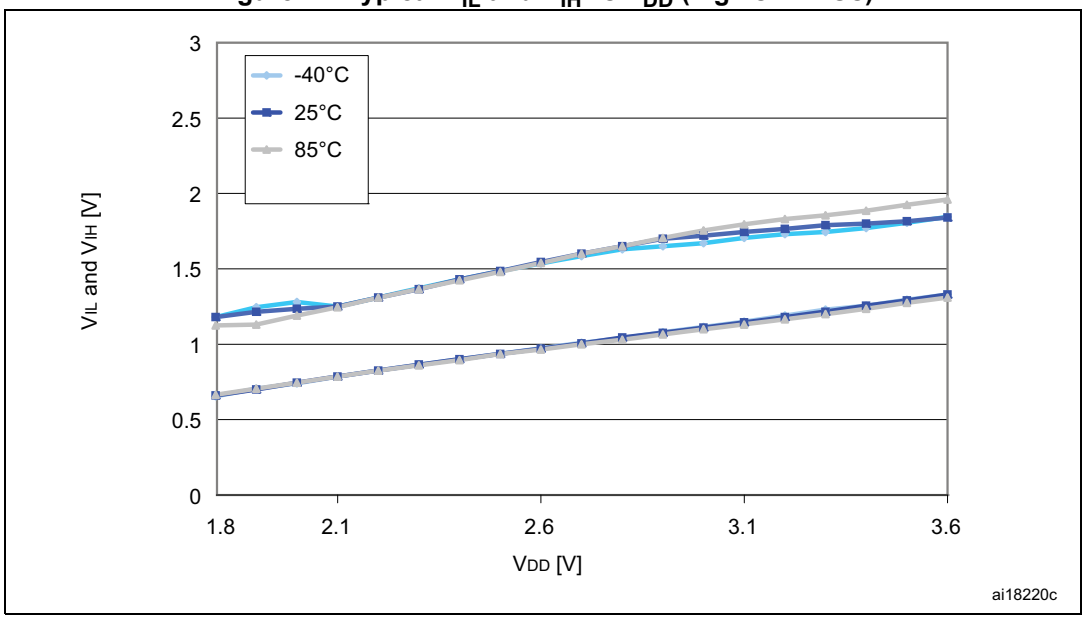


Figure 22. Typical V_{IL} and V_{IH} vs V_{DD} (true open drain I/Os)

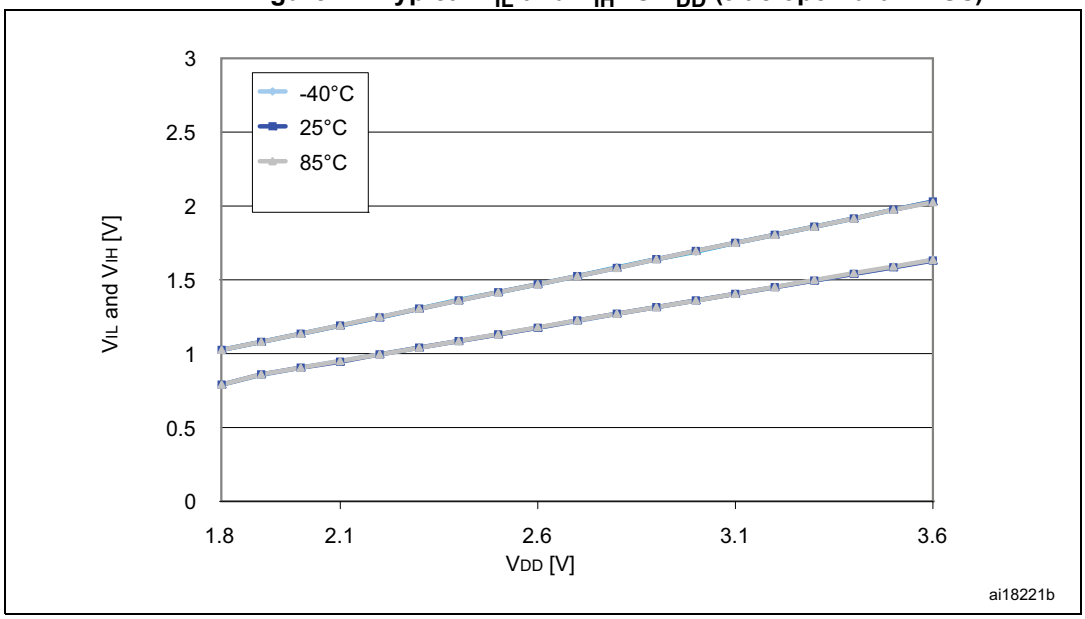


Figure 34. SPI1 timing diagram - slave mode and CPHA=0

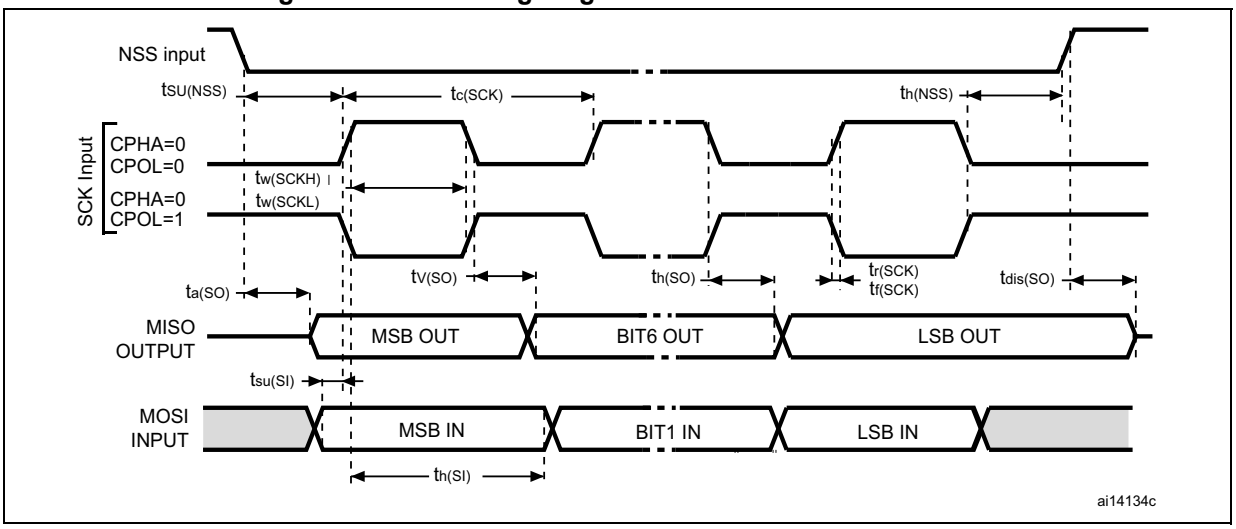
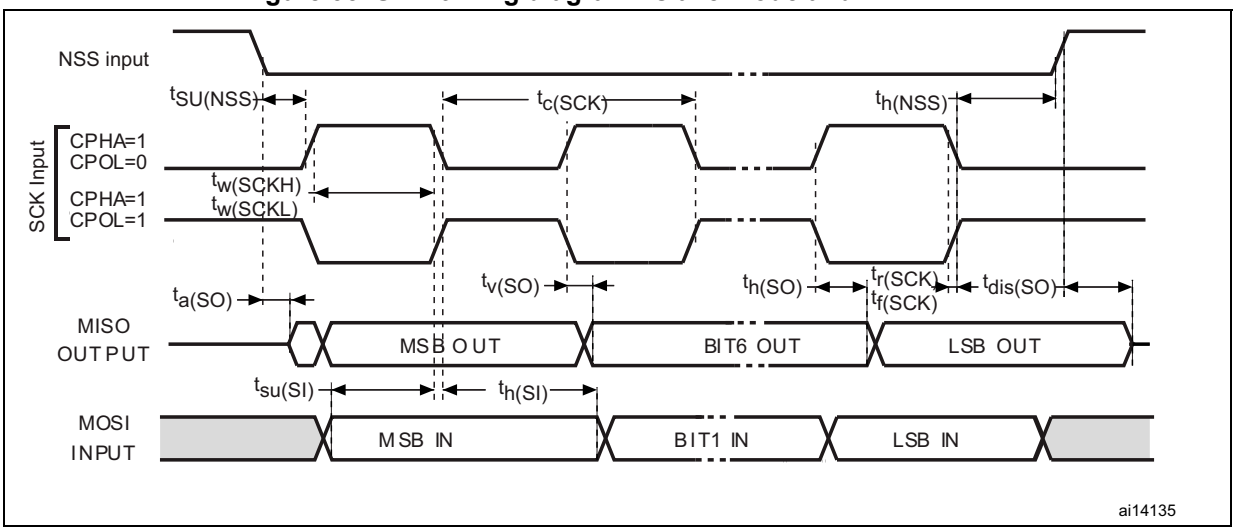


Figure 35. SPI1 timing diagram - slave mode and CPHA=1(1)



1. Measurement points are done at CMOS levels: $0.3V_{DD}$ and $0.7V_{DD}$.

9.3.9 LCD controller (STM8L152xx only)

In the following table, data is guaranteed by design. Not tested in production.

Table 45. LCD characteristics

Symbol	Parameter	Min	Typ	Max.	Unit
V_{LCD}	LCD external voltage	-	-	3.6	V
V_{LCD0}	LCD internal reference voltage 0	-	2.6	-	V
V_{LCD1}	LCD internal reference voltage 1	-	2.7	-	V
V_{LCD2}	LCD internal reference voltage 2	-	2.8	-	V
V_{LCD3}	LCD internal reference voltage 3	-	2.9	-	V
V_{LCD4}	LCD internal reference voltage 4	-	3.0	-	V
V_{LCD5}	LCD internal reference voltage 5	-	3.1	-	V
V_{LCD6}	LCD internal reference voltage 6	-	3.2	-	V
V_{LCD7}	LCD internal reference voltage 7	-	3.3	-	V
C_{EXT}	V_{LCD} external capacitance	0.1	-	2	µF
I_{DD}	Supply current(1) at V_{DD} = 1.8 V	-	3	-	µA
	Supply current(1) at V_{DD} = 3 V	-	3	-	µA
R_{HN} (2)	High value resistive network (low drive)	-	6.6	-	MΩ
R_{LN} (3)	Low value resistive network (high drive)	-	360	-	kΩ
V_{33}	Segment/Common higher level voltage	-	-	V_{LCDx}	V
V_{23}	Segment/Common 2/3 level voltage	-	$2/3V_{LCDx}$	-	V
V_{12}	Segment/Common 1/2 level voltage	-	$1/2V_{LCDx}$	-	V
V_{13}	Segment/Common 1/3 level voltage	-	$1/3V_{LCDx}$	-	V
V_0	Segment/Common lowest level voltage	0	-	-	V

1. LCD enabled with 3 V internal booster (LCD_CR1 = 0x08), 1/4 duty, 1/3 bias, division ratio= 64, all pixels active, no LCD connected.
2. R_{HN} is the total high value resistive network.
3. R_{LN} is the total low value resistive network.

VLCD external capacitor (STM8L152xx only)

The application can achieve a stabilized LCD reference voltage by connecting an external capacitor C_{EXT} to the V_{LCD} pin. C_{EXT} is specified in *Table 45*.

9.3.13 12-bit DAC characteristics

In the following table, data is guaranteed by design, not tested in production.

Table 50. DAC characteristics

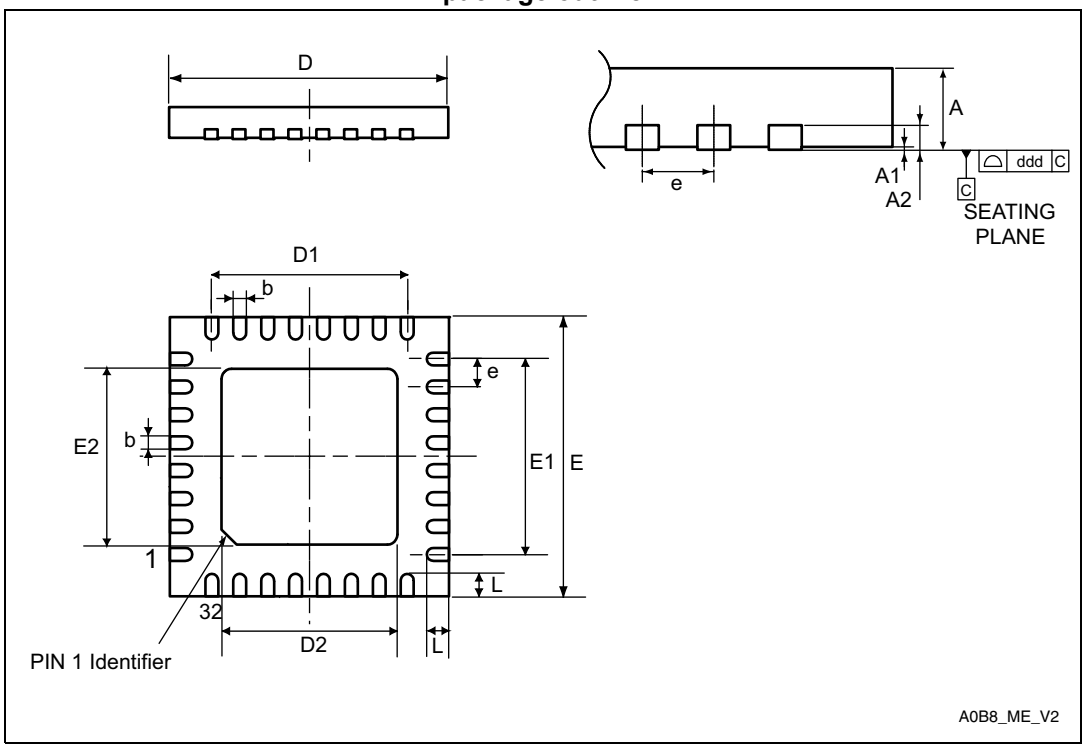
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DDA}	Analog supply voltage	-	1.8	-	3.6	V
V_{REF+}	Reference supply voltage	-	1.8	-	V_{DDA}	
I_{VREF}	Current consumption on V_{REF+} supply	V_{REF+} = 3.3 V, no load, middle code (0x800)	-	130	220	µA
		V_{REF+} = 3.3 V, no load, worst code (0x000)	-	220	350	
I_{VDDA}	Current consumption on V_{DDA} supply	V_{DDA} = 3.3 V, no load, middle code (0x800)	-	210	320	
		V_{DDA} = 3.3 V, no load, worst code (0x000)	-	320	520	
T_A	Temperature range	-	-40	-	125	°C
R_L	Resistive load(1) (2)	DACOUT buffer ON	5	-	-	kΩ
R_O	Output impedance	DACOUT buffer OFF	-	8	10	kΩ
C_L	Capacitive load(3)	-	-	-	50	pF
DAC_OUT	DAC_OUT voltage(4)	DACOUT buffer ON	0.2	-	V_{DDA}-0.2	V
		DACOUT buffer OFF	0	-	V_{REF+} -1 LSB	V
$t_{settling}$	Settling time (full scale: for a 12-bit input code transition between the lowest and the highest input codes when DAC_OUT reaches the final value ±1LSB)	R_L ≥5 kΩ, C_L≤ 50 pF	-	7	12	µs
Update rate	Max frequency for a correct DAC_OUT (@95%) change when small variation of the input code (from code i to i+1LSB).	R_L ≥ 5 kΩ, C_L ≤50 pF	-		1	Msps
t_{WAKEUP}	Wakeup time from OFF state. Input code between lowest and highest possible codes.	R_L ≥5 kΩ, C_L≤50 pF	-	9	15	µs
PSRR+	Power supply rejection ratio (to V_{DDA}) (static DC measurement)	R_L≥ 5 kΩ, C_L≤50 pF	-	-60	-35	dB

1. Resistive load between DACOUT and GNDA.
2. Output on PF0 (48-pin package only).
3. Capacitive load at DACOUT pin.
4. It gives the output excursion of the DAC.

Samples to run qualification activity.

10.5 UFQFPN32 package information

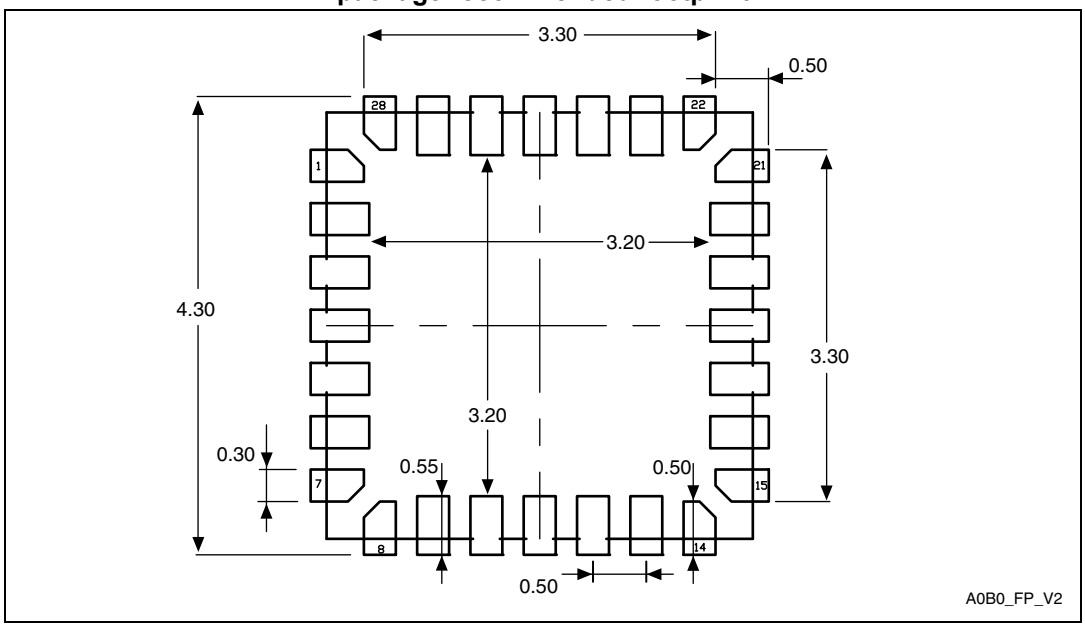
Figure 52. UFQFPN32 - 32-pin, 5 x 5 mm, 0.5 mm pitch ultra thin fine pitch quad flat package outline



1. Drawing is not to scale.

1. Values in inches are converted from mm and rounded to 4 decimal digits.

Figure 56. UFQFPN28 - 28-lead, 4 x 4 mm, 0.5 mm pitch, ultra thin fine pitch quad flat package recommended footprint



1. Dimensions are expressed in millimeters.

Table 69. Document revision history (continued)

Date	Revision	Changes
11-Mar-2011	6 cont'd	Modified OPT1 and OPT4 description in *Table: Option byte description.* Updated *Section: Electrical parameters* "standard I/Os" replaced with "high sink I//Os". Updated $R_{HN\ and}$ R_{HN} descriptions in *Table: LCD characteristics.* Added Tape & Reel option to *Figure: Medium density STM8L15x ordering information scheme*.
06-Sep-2011	7	*Features:* updated bullet point concerning capacitive sensing channels. *Section: Low power modes:* updated Wait mode and Halt mode definitions. *Section: Clock management:* added 'kHz' to 32.768 in the 'System clock sources bullet point'. *Section: System configuration controller and routing interface:* replaced last sentence concerning management of charge transfer acquisition sequence. Added *Section: Touchsensing* *Section Development support:* updated the *Bootloader.* *Table: Medium density STM8L15x pin description:* added LQFP32 to second column (same pinout as UFQFPN32); "Timer X - trigger" replaced by "Timer X - external trigger"; added note at the end of this table concerning the slope control of all GPIO pins. *Table: Interrupt mapping:* merged footnotes 1 and 2; updated some of the source blocks and descriptions. *Section: Option bytes*: replaced PM0051 by PM0054 and UM0320 by UM0470. *Table: Option byte description:* replaced the factory default setting (0xAA) for OPT0. *NRST pin:* updated text above the *Figure*; updated *Figure: Recommended NRST pin configuration*. *Table: TS characteristics:* removed typ and max values for the parameter T_{S_TEMP}; added min value for same. *Table: Comparator 1 characteristics:* added typ value for 'Comparator offset error'; added footnote *1.* *Table: Comparator 2 characteristics:* updated t_{START}, t_{dslow}, t_{dfast}, V_{offset}, I_{COMP2}; added footnotes *1.* and *3.* *Table: DAC characteristics:* updated max value for DAC_OUT voltage (DACOUT buffer ON). *Section: 12-bit ADC1 characteristics:* updated. Replaced *Figure: UFQFPN48 7 x 7 mm, 0.5 mm pitch, package outline* and *Figure: UFQFPN48 7 x 7 mm recommended footprint (dimensions in mm)*. *Figure: Medium density STM8L15x ordering information scheme*: removed 'TR = Tape & Reel".