xxxx-TOUCH-LIB

STMTouch library

Data brief

Features

- Complete free C source code library with firmware examples for STM8L, STM8TL5x, STM32F0xx, STM32F3xx and STM32L1xx microcontrollers
- Both surface Charge Transfer (CT) and ProxSense™ (PXS) acquisition principles supported
- Multifunction capability to combine capacitive sensing functions with traditional MCU features
- Modular architecture allowing easy addition of new acquisitions or sensors
- Acquisition, filtering and calibration functions
- Enhanced processing features for optimized sensitivity and immunity
  - Environment Control System (ECS)
  - Detection Time Out (DTO)
  - Detection Exclusion System (DXS)
  - Noise filter
- Flexible touchkey/linear/rotary touch sensors configuration and combination
  - Unlimited number of sensors supported
  - Each sensor can have its own state machine
- Active shield feature
- Compliant with MISRA
- Compliant with Cosmic, IAR, Raisonance, Keil, Altium and Atollic C compilers

Description

STMicroelectronics touch-sensing libraries provide a complete robust free source-code solution to be used on STM8L, STM8TL5x, STM32F0xx, STM32F3xx and STM32L1xx microcontrollers. This solution allows designers familiar with the use of standard microcontrollers to create higher-end human interfaces by replacing conventional electromechanical switches by capacitive sensors.

The xxxx-TOUCH-LIB is part of the application firmware. It allows combining various capacitive sensing touchkeys, linear or rotary touch sensors with traditional MCU features (communications, control of LEDs, beeper or LCD) in the same application.

Two capacitive acquisition principles, surface Charge Transfer (CT) and ProxSense™, are available and can be configured at compiling level. Both acquisition principles offer the same advanced processing algorithms to filter out noise and to compensate environmental parameters such as temperature, humidity, and power supply variation.

Note: ProxSense is a trademark of Azoteq (Pty) Ltd.

Table 1. Device summary

Reference	Part number
xxxx-TOUCH-LIB	STM8L-TOUCH-LIB STM8TL-TOUCH-LIB 32F0-TOUCH-LIB 32F3-TOUCH-LIB 32L1-TOUCH-LIB

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1 ProxSense (PXS) acquisition principle

This peripheral operates in Projected mode which is used to measure the charge transferred by a driven electrode to a second electrode.

This acquisition principle is only available on STM8TL5x devices.

For more information see the STM8TL5x Reference Manual (RM0312).

2 Surface charge transfer (CT) acquisition principle

The surface charge transfer acquisition consists in charging the electrode capacitance (C_X) and transferring part of the accumulated charge into a sampling capacitor (C_S). This sequence is repeated until the voltage across C_S reaches a given threshold. The number of transfers required to reach the threshold depends on the size of the electrode capacitance.

The CT acquisition can be managed in three different ways:

- using the touch sensing controller (TSC) on STM32F0xx and STM32F3xx devices
- using the routing interface (RI) only for STM8L and STM32L1xx devices with software acquisition
- using the routing interface (RI) and two 16-bits timers for STM8L and STM32L1xx devices with hardware acquisition.

Please see the *Table 2* for more details about the peripherals used.

3 STMTouch Library architecture

The STMTouch Library is a “package” composed of different elements:

- the **“STMTouch driver”** directory contains the firmware layer to perform the touch-sensing acquisition and the sensors processing. This driver contains all the acquisitions for all supported microcontrollers. This is the core of the STMTouch Library
- the **“STMTouch examples”** directory contains a set of firmware examples to show how to use the STMTouch driver
- the “**Standard Peripherals driver”** directory contains the firmware layer to access the standard peripherals
- the **“CMSIS driver”** directory contains the Cortex microcontroller software interface standard (STM32 only)
- the **“Utilities drivers”** directory contains the drivers to access for example the LCD on the evaluation boards.

Note: There is one STMTouch Library per microcontroller family (STM8L STMTouch Library, STM8TL5x STMTouch Library, STM32F0xx STMTouch Library, STM32F3xx STMTouch Library, STM32L1xx STMTouch Library...).

Figure 1 and *Figure 2* show the STMTouch driver layers.

Figure 1. STMTouch driver architecture 1

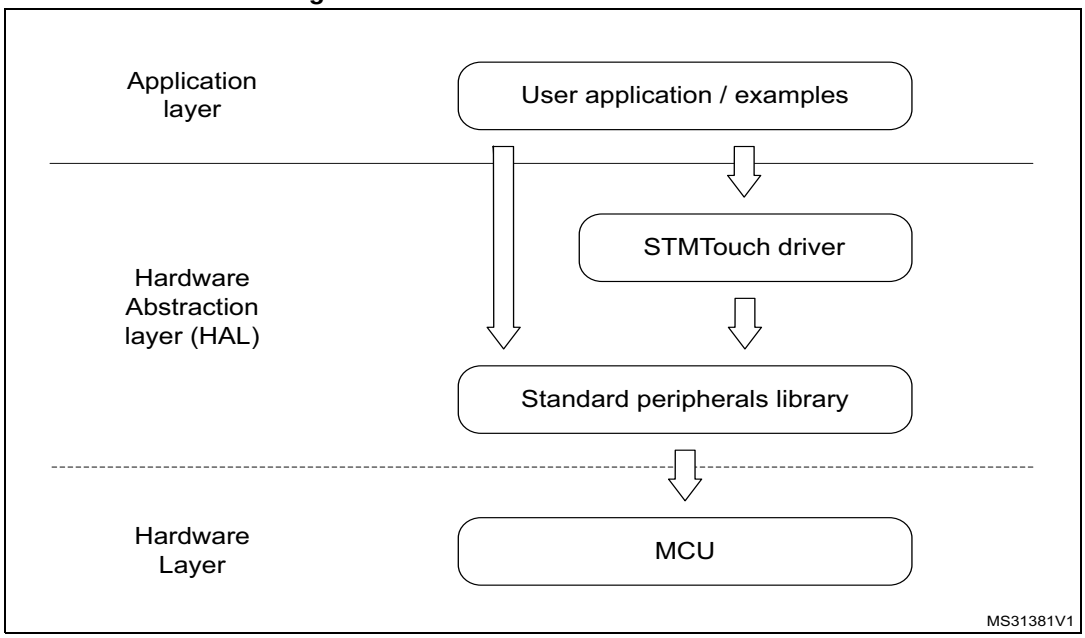
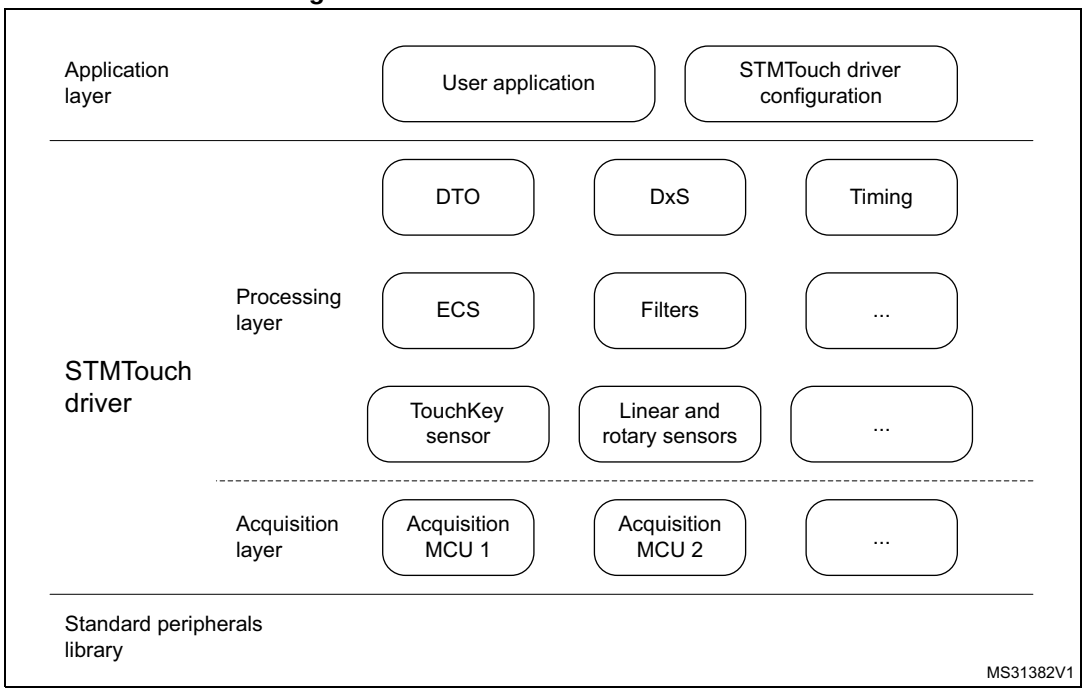


Figure 2. STMTouch driver architecture 2



4 MCU resources

Table 2 shows the peripherals that are used by the STMTouch driver. Care must be taken when using them to avoid any unwanted behavior.

Table 2. List of peripherals used by the STMTouch driver

		Device / Acquisition principle						
Peripheral	**Function**	**STM8L CT software**	**STM8L CT hardware**	**STM8TL5x PXS**	**STM32F0xx CT**	**STM32F3xx CT**	**STM32L1xx CT software**	**STM32L1xx CT hardware**
GPIOs	Acquisition	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8-bit timer (TIM4)	Time base for ECS and DTO	Yes	Yes	Yes	No	No	No	No
Systick	Time base for ECS and DTO	No	No	No	Yes	Yes	Yes	Yes
Routing interface (RI)	Acquisition	Yes	Yes	No	No	No	Yes	Yes
ProxSense (PXS)	Acquisition	No	No	Yes	No	No	No	No
Touch-sensing controller (TSC)	Acquisition	No	No	No	Yes	Yes	No	No
2 x 16-bit timers	Acquisition	No	Yes (TIM2 and TIM3)	No	No	No	No	Yes (TIM9 and TIM11)

5 Touch-sensing channels availability

5.1 STM8L

5.1.1 STM8L features

- Proven and robust surface charge transfer acquisition principle
- Supports up to 20 capacitive sensing channels
- Up to 8 capacitive sensing channels can be acquired in parallel offering a very good response time
- Hardware and software managements of the charge transfer acquisition sequence
- Programmable charge transfer frequency (for hardware management only)
- Programmable sampling capacitor I/O pin
- Programmable channel I/O pin
- Programmable max count value to avoid long acquisition when a channel is faulty
- Dedicated end of acquisition flag with interrupt capability
- One sampling capacitor for up to 4 capacitive sensing channels to reduce the system components
- Compatible with proximity, touchkey, linear and rotary touch sensor implementation

5.1.2 STM8L available touch-sensing channels

The tables below provide an overview of the available touch sensing channels for the STM8L devices.

Pin usage:

- For n available pins in an I/O group, one pin is used as sampling capacitor and n-1 pins are used as channels.
- The I/O group cannot be used if the number of available pins in less or equal to one.

Note1: The following tables are not restrictive in term of part numbers supported by the STMTouch driver. The STMTouch driver can be used on any new device that may become available as part of ST microcontrollers portfolio. Please contact your ST representative for support.

Note2: For n available pins in an I/O group, one pin is used as sampling capacitor and n-1 pins are used as channels.

The I/O group cannot be used if the number of available pins in less or equal to one.

Table 3. Available touch-sensing channels for STM8L101

Subfamily			STM8L101									
Packages			TSSOP20 / UFQFPN20				UFQFPN28			UFQFPN32 / LQFP32		
Part numbers			STM8L101F[23]U				STM8L101G[23]U			STM8L101K3[UT]		
				STM8L101F[23]P								
Analog I/O group	Gx_IOy	GPIO	Pin TSSOP	Pin UFQFPN	Number of available pins	Usage	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group1	G1_IO1	PB0	10	7	3	2 channels with 1 sampling capacitor	12	4	3 channels with 1 sampling capacitor	13	4	3 channels with 1 sampling capacitor
	G1_IO2	PB1	11	8			13			14		
	G1_IO3	PD0	9	6			8			9		
	G1_IO4	PD1	-	-			9			10		
Group2	G2_IO1	PB2	12	9	2	1 channel with 1 sampling capacitor	14	4	3 channels with 1 sampling capacitor	15	4	3 channels with 1 sampling capacitor
	G2_IO2	PB3	13	10			15			16		
	G2_IO3	PD2	-	-			10			11		
	G2_IO4	PD3	-	-			11			12		
Maximum number of channels			3 with 2 sampling capacitors				6 with 2 sampling capacitors			6 with 2 sampling capacitors		

Table 4. Available touch-sensing channels for STM8L15x / STM8L16x (table 1/2)

Subfamily			STM8L151F				STM8L151G				STM8L151K		
Packages			UFQFPN20 / TSSOP20				UFQFPN28 / WLCSP28				UFQFPN32 / LQFP32		
Part numbers			STM8L151F[23]U(1) (UFQFPN)				STM8L151G[346]U(1) (UFQFPN)				STM8L152K[46][UT]		
				STM8L151F[23]P(1) (TSSOP)				STM8L151G[46]Y (WLCSP)					
Analog I/O group	Gx_IOy	GPIO	Pin	Pin	Number of available pins	Usage	Pin	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 1	G1_IO1	PA6	-	-	0	cannot be used for touch sensing	-	-	2	1 channel with 1 sampling capacitor	6	3	2 channels with 1 sampling capacitor
	G1_IO2	PA5	-	-			5	D4			5		
	G1_IO3	PA4	-	-			4	D3			4		
	G1_IO4	PA7	-	-			-	-			-		
Group 2	G2_IO1	PC7	-	-	1	cannot be used for touch sensing	-	-	2	1 channel with 1 sampling capacitor	-	2	1 channel with 1 sampling capacitor
	G2_IO2	PC4	17	20			25	C2			29		
	G2_IO3	PC3	-	-			24	A2			28		
	G2_IO4	PE7	-	-			-	-			-		
Group 3	G3_IO1	PC2	-	-	0	cannot be used for touch sensing	23	B2	1	cannot be used for touch sensing	27	3	2 channels with 1 sampling capacitor
	G3_IO2	PD7	-	-			-	-			24		
	G3_IO3	PD6	-	-			-	-			23		
Group 4	G4_IO1	PD5	-	-	1	cannot be used for touch sensing	-	-	2	1 channel with 1 sampling capacitor	22	3	2 channels with 1 sampling capacitor
	G4_IO2	PD4	-	-			20	C1			21		
	G4_IO3	PB7	14	17			19	E1			20		

Table 4. Available touch-sensing channels for STM8L15x / STM8L16x (table 1/2) (continued)

Subfamily			STM8L151F				STM8L151G				STM8L151K		
Packages			UFQFPN20 / TSSOP20				UFQFPN28 / WLCSP28				UFQFPN32 / LQFP32		
Part numbers			STM8L151F[23]U(1) (UFQFPN)	STM8L151F[23]P(1) (TSSOP)			STM8L151G[346]U(1) (UFQFPN)	STM8L151G[46]Y (WLCSP)			STM8L152K[46][UT]		
Analog I/O group	Gx_IOy	GPIO	Pin	Pin	Number of available pins	Usage	Pin	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 5	G5_IO1	PB6	13	16	3	2 channels with1 sampling capacitor	18	F1	3	2 channels with 1 sampling capacitor	19	3	2 channels with 1 sampling capacitor
	G5_IO2	PB5	12	15			17	D1			18		
	G5_IO3	PB4	11	14			16	D2			17		
Group 6	G6_IO1	PB3	10	13	3	2 channels with 1 sampling capacitor	15	E2	3	2 channels with 1 sampling capacitor	16	3	2 channels with 1 sampling capacitor
	G6_IO2	PB2	9	12			14	F2			15		
	G6_IO3	PB1	8	11			13	G1			14		
Group 7	G7_IO1	PB0	7	10	1	cannot be used for touch sensing	12	E3	3	2 channels with 1 sampling capacitor	13	3	2 channels with 1 sampling capacitor
	G7_IO2	PD3	-	-			11	F3			12		
	G7_IO3	PD2	-	-			10	E4			11		
	G7_IO4	PE3	-	-			-	-			-		
Group 8	G8_IO1	PD1	-	-	1	cannot be used for touch sensing	9	G2	2	1 channel with 1 sampling capacitor	10	1	cannot be used for touch sensing
	G8_IO2	PD0	6	9			8	G3			-		
	G8_IO3	PE5	-	-			-	-			-		
	G8_IO4	PE4	-	-			-	-			-		
Maximum number of channels			4 channels with 2 sampling capacitors				10 channels with 7 sampling capacitors				13 channels with 7 sampling capacitors		

1. The product has an hardware acceleration cell for touch sensing.

Table 5. Available touch-sensing channels for STM8L15x / STM8L16x (table 2/2)

Subfamily			STM8L151K			STM8L151C medium/medium+/high density STM8L151R/M STM8L152C/R/M STM8L162R/M					STM8L151C low density		
Packages			UFQFPN32 / LQFP32			UFQFPN48 / LQFP48 / LQFP64 / LQFP80					LQFP48		
Part numbers			STM8L151K3U(1) STM8L151K[46][UT]			STM8L151C[468][UT] STM8L152C[468][UT] (48 pins)	STM8L151R[68]T STM8L152R[68]T STM8L162R8T (64 pins)	STM8L151M8T STM8L152M8T STM8L162M8T (80 pins)			STM8L151C3T(1)		
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	Pin	Pin	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 1	G1_IO1	PA6	6	3	2 channels with 1 sampling capacitor	7	7	11	3	2 channels with 1 sampling capacitor	7	4	3 channels with 1 sampling capacitor
	G1_IO2	PA5	5			6	6	10			6		
	G1_IO3	PA4	4			5	5	9			5		
	G1_IO4	PA7	-			(2)	(2)	(2)			8		
Group 2	G2_IO1	PC7	-	2	1 channel with 1 sampling capacitor	46	62	74	3	2 channels with 1 sampling capacitor	46	4	3 channels with 1 sampling capacitor
	G2_IO2	PC4	29			43	59	71			43		
	G2_IO3	PC3	28			42	58	70			42		
	G2_IO4	PE7	-			(2)	(2)	(2)			48		

Table 5. Available touch-sensing channels for STM8L15x / STM8L16x (table 2/2) (continued)

Subfamily			STM8L151K			STM8L151C medium/medium+/high density STM8L151R/M STM8L152C/R/M STM8L162R/M					STM8L151C low density		
Packages			UFQFPN32 / LQFP32			UFQFPN48 / LQFP48 / LQFP64 / LQFP80					LQFP48		
Part numbers			STM8L151K3U(1) STM8L151K[46][UT]			STM8L151C[468][UT] STM8L152C[468][UT] (48 pins)	STM8L151R[68]T STM8L152R[68]T STM8L162R8T (64 pins)	STM8L151M8T STM8L152M8T STM8L162M8T (80 pins)			STM8L151C3T(1)		
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	Pin	Pin	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 3	G3_IO1	PC2	27	3	2 channels with 1 sampling capacitor	41	57	69	3	2 channels with 1 sampling capacitor	41	3	1 channel with 1 sampling capacitor
	G3_IO2	PD7	24			36	48	60			36		
	G3_IO3	PD6	23			35	47	59			35		
Group 4	G4_IO1	PD5	22	3	2 channels with 1 sampling capacitor	34	46	58	3	2 channels with 1 sampling capacitor	34	3	2 channels with 1 sampling capacitor
	G4_IO2	PD4	21			33	45	57			33		
	G4_IO3	PB7	20			31	38	46			31		
Group 5	G5_IO1	PB6	19	3	2 channels with 1 sampling capacitor	30	37	45	3	2 channels with 1 sampling capacitor	30	3	2 channels with 1 sampling capacitor
	G5_IO2	PB5	18			29	36	44			29		
	G5_IO3	PB4	17			28	35	43			28		

Table 5. Available touch-sensing channels for STM8L15x / STM8L16x (table 2/2) (continued)

Subfamily			STM8L151K			STM8L151C medium/medium+/high density STM8L151R/M STM8L152C/R/M STM8L162R/M					STM8L151C low density		
Packages			UFQFPN32 / LQFP32			UFQFPN48 / LQFP48 / LQFP64 / LQFP80					LQFP48		
Part numbers			STM8L151K3U(1) STM8L151K[46][UT]			STM8L151C[468][UT] STM8L152C[468][UT] (48 pins)	STM8L151R[68]T STM8L152R[68]T STM8L162R8T (64 pins)	STM8L151M8T STM8L152M8T STM8L162M8T (80 pins)			STM8L151C3T(1)		
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	Pin	Pin	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 6	G6_IO1	PB3	16	3	2 channels with 1 sampling capacitor	27	34	42	3	2 channels with 1 sampling capacitor	27	3	2 channels with 1 sampling capacitor
	G6_IO2	PB2	15			26	33	41			26		
	G6_IO3	PB1	14			25	32	40			25		
Group 7	G7_IO1	PB0	13	3	2 channels with 1 sampling capacitor	24	31	39	3	2 channels with 1 sampling capacitor	24	4	3 channels with 1 sampling capacitor
	G7_IO2	PD3	12			23	28	32			23		
	G7_IO3	PD2	11			22	27	31			22		
	G7_IO4	PE3	-			(2)	(2)	(2)			17		

Table 5. Available touch-sensing channels for STM8L15x / STM8L16x (table 2/2) (continued)

Subfamily			STM8L151K			STM8L151C medium/medium+/high density STM8L151R/M STM8L152C/R/M STM8L162R/M					STM8L151C low density		
Packages			UFQFPN32 / LQFP32			UFQFPN48 / LQFP48 / LQFP64 / LQFP80					LQFP48		
Part numbers			STM8L151K3U(1) STM8L151K[46][UT]			STM8L151C[468][UT] STM8L152C[468][UT] (48 pins)	STM8L151R[68]T STM8L152R[68]T STM8L162R8T (64 pins)	STM8L151M8T STM8L152M8T STM8L162M8T (80 pins)			STM8L151C3T(1)		
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	Pin	Pin	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 8	G8_IO1	PD1	10	2	1 channel with 1 sampling capacitor	21	26	30	3	2 channels with 1 sampling capacitor	21	4	3 channels with 1 sampling capacitor
	G8_IO2	PD0	9			20	25	29			20		
	G8_IO3	PE5	-			19	24	28			19		
	G8_IO4	PE4	-			(2)	(2)	(2)			18		
Maximum number of channels			14 channels with 8 sampling capacitors			16 channels with 8 sampling capacitors					20 channels with 8 sampling capacitors		

1. The product has an hardware acceleration cell for touch sensing.
2. This IO does not belong to the analog IO group.

5.2 STM8TL5x

5.2.1 STM8TL5x features

- Up to 300 capacitive sensing channels composed of 15 transmitters and 20 receivers
- with up to 10 Rx channels acquired in parallel
- Fast acquisition with a typical scan time of 250 µs for 10 Rx channels
- Configurable internal sampling capacitor (CS)
- Electrode Parasitic Capacitance Compensation (EPCC) to ensure the best sensitivity in all user environments
- RF noise detection, allowing to reject corrupted samples
- External trigger to de-synchronize the acquisition from known noise
- Can be configured to return to low power mode between each conversion
- Acquisition possible in Run, Wait and Active-halt modes

5.2.2 STM8TL5x available touch-sensing channels

The table below provides an overview of the available touch sensing channels for the STM8TL5x devices.

Note1: The following table is not restrictive in term of part numbers supported by the STMTouch driver. The STMTouch driver can be used on any new device that may become available as part of ST microcontrollers portfolio. Please contact your ST representative for support.

Note2: For n available pins in an I/O group, one pin is used as sampling capacitor and n-1 pins are used as channels. The I/O group cannot be used if the number of available pins in less or equal to one.

Table 6. Available touch-sensing channels for STM8TL5x

Subfamily			STM8TL5x							
Packages			TSSOP20			UFQFPN28			UFQFPN48	
Part numbers			STM8TL52F4P	STM8TL53F4P		STM8TL52G4U	STM8TL53G4U		STM8TL53C4U	
PXS function		GPIO	Pin	Pin	Usage	Pin	Pin	Usage	Pin	Usage
Receiver A(1)	RX0a	-	11	11	5 Receivers / Transmitters	10	10	8 Receivers / Transmitters	13	10 Receivers / Transmitters
	RX1a	-	12	12		11	11		15	
	RX2a	-	13	13		12	12		17	
	RX3a	-	-	-		13	13		19	
	RX4a	-	-	-		14	14		21	
	RX5a	-	-	-		15	15		23	
	RX6a	-	14	14		16	16		25	
	RX7a	-	15	15		17	17		27	
	RX8a	-	-	-		-	-		29	
	RX9a	-	-	-		-	-		31	
Receiver B(1)	RX0b	-	-	-	0 Receivers / Transmitters	-	-	0 Receivers / Transmitters	14	10 Receivers / Transmitters
	RX1b	-	-	-		-	-		16	
	RX2b	-	-	-		-	-		18	
	RX3b	-	-	-		-	-		20	
	RX4b	-	-	-		-	-		22	
	RX5b	-	-	-		-	-		24	
	RX6b	-	-	-		-	-		26	
	RX7b	-	-	-		-	-		28	
	RX8b	-	-	-		-	-		30	
	RX9b	-	-	-		-	-		32	

Table 6. Available touch-sensing channels for STM8TL5x (continued)

Subfamily			STM8TL5x							
Packages			TSSOP20			UFQFPN28			UFQFPN48	
Part numbers			STM8TL52F4P	STM8TL53F4P		STM8TL52G4U	STM8TL53G4U		STM8TL53C4U	
PXS function		GPIO	Pin	Pin	Usage	Pin	Pin	Usage	Pin	Usage
Transmitter	TX0	PD0	16	16	STM8TL52F4P: 2 Transmitters STM8TL53F4P: 5 Transmitters	18	18	STM8TL52G4U: 2 Transmitters STM8TL53G4U: 9 Transmitters	33	15 Transmitters
	TX1	PD1	17	17		19	19		34	
	TX2	PD2	-	-		20(2)	20		35	
	TX3	PD3	-	-		21(2)	21		36	
	TX4	PD4	18(2)	18		22(2)	22		39	
	TX5	PD5	19(2)	19		23(2)	23		40	
	TX6	PD6	20(2)	20		24(2)	24		41	
	TX7	PD7	-	-		27(2)	27		42	
	TX8	PB0	-	-		28(2)	28		43	
	TX9	PB1	-	-		-	-		44	
	TX10	PB2	-	-		-	-		45	
	TX11	PB3	-	-		-	-		46	
	TX12	PB4	-	-		-	-		47	
	TX13	PB5	-	-		-	-		48	
	TX14	PB6	-	-		-	-		1	
Maximum number of channels			STM8TL52F4P: 12 channels with a 4RX*3TX matrix STM8TL53F4P: 25 channels with a 5RX*5TX matrix			STM8TL52G4U: 25 channels with a 5RX*5TX matrix STM8TL53G4U: 72 channels with a 8RX*9TX matrix			300 channels with a 20RX*15TX matrix	

1. The receivers can also be used as transmitters. This is used to define the square matrix to address the maximum number of channels (please refer to product datasheet for further information).
2. On STM8TL52 devices, this GPIO is present but does not support the PXS alternate function.

5.3 STM32F0xx

5.3.1 STM32F0xx features

- Proven and robust surface charge transfer acquisition principle
- Supports up to 24 capacitive sensing channels
- Up to 8 capacitive sensing channels can be acquired in parallel offering a very good response time
- Spread spectrum feature to improve system robustness in noisy environments
- Full hardware management of the charge transfer acquisition sequence
- Programmable charge transfer frequency
- Programmable sampling capacitor I/O pin
- Programmable channel I/O pin
- Programmable max count value to avoid long acquisition when a channel is faulty
- Dedicated end of acquisition and max count error flags with interrupt capability
- One sampling capacitor for up to 3 capacitive sensing channels to reduce the system components
- Compatible with proximity, touchkey, linear and rotary touch sensor implementation

5.3.2 STM32F0xx available touch-sensing channels

The tables below provide an overview of the available touch sensing channels for the STM32F0xx devices.

Note 1: The following tables are not restrictive in term of part numbers supported by the STMTouch driver. The STMTouch driver can be used on any new device that may become available as part of ST microcontrollers portfolio. Please contact your ST representative for support.

Note2: For n available pins in an I/O group, one pin is used as sampling capacitor and n-1 pins are used as channels.

The I/O group cannot be used if the number of available pins in less or equal to one.

Table 7. Available touch sensing channels for STM32F042

Subfamily			STM32F042															
Packages			TSSOP20			UFQFPN28			LQFP32 / UFQFPN32				WLCSP36			LQFP48 / UFQFPN48		
Flash memory size			4=16K, 6=32K															
Part numbers			STM32F042F[46]			STM32F042G[46]			STM32F042K[46]				STM32F042T[46]			STM32F042C[46]		
Analog I/O group	Gx_IOy	GPIO	Pin	Number of availabl e pins	Usage	Pin	Number of available pins	Usage	Pin LQFP	Pin UFQFP N	Number of available pins	Usage	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 1	G1_IO1	PA0	6	4	3 channels with 1 sampling capacitor	6	4	3 channels with 1 sampling capacitor	6	6	4	3 channels with 1 sampling capacitor	F6	4	3 channels with 1 sampling capacitor	10	4	3 channels with 1 sampling capacitor
	G1_IO2	PA1	7			7			7	7			D4			11		
	G1_IO3	PA2	8			8			8	8			E4			12		
	G1_IO4	PA3	9			9			9	9			F5			13		
Group 2	G2_IO1	PA4(1)	10	4	3 channels with 1 sampling capacitor	10	4	3 channels with 1 sampling capacitor	10	10	4	3 channels with 1 sampling capacitor	C3	4	3 channels with 1 sampling capacitor	14	4	3 channels with 1 sampling capacitor
	G2_IO2	PA5(1)	11			11			11	11			D3			15		
	G2_IO3	PA6	12			12			12	12			E3			16		
	G2_IO4	PA7	13			13			13	13			F4			17		
Group 3	G3_IO1	-	-	1	Cannot be used for touch sensing	-	2	1 channels with 1 sampling capacitor	-	-	2/3	1/2 channels with 1 sampling capacitor	-	3	2channels with 1 sampling capacitor	-	3	2 channels with 1 sampling capacitor
	G3_IO2	PB0	-			14			14	14			F3			18		
	G3_IO3	PB1	14			15			15	15			F2			19		
	G3_IO4	PB2	-			-			-	16			C2			20		
Group 4	G4_IO1	PA9	17(2)	4	3 channels with 1 sampling capacitor	19(2)	4	3 channels with 1 sampling capacitor	19	19	4	3 channels with 1 sampling capacitor	D1	4	3 channels with 1 sampling capacitor	30	4	3 channels with 1 sampling capacitor
	G4_IO2	PA10	18(2)			20(2)			20	20			D2			31		
	G4_IO3	PA11	17(2)			19(2)			21	21			C1			32		
	G4_IO4	PA12	18(2)			20(2)			22	22			A1			33		
Group 5	G5_IO1	PB3	-	0	Cannot be used for touch sensing	24	4	3 channels with 1 sampling capacitor	26	26	4	3 channels with 1 sampling capacitor	B3	4	3 channels with 1 sampling capacitor	39	4	3 channels with 1 sampling capacitor
	G5_IO2	PB4	-			25			27	27			A3			40		
	G5_IO3	PB6	-			27			29	29			C4			42		
	G5_IO4	PB7	-			28			30	30			A4			43		

Table 7. Available touch sensing channels for STM32F042 (continued)

Subfamily			STM32F042															
Packages			TSSOP20			UFQFPN28			LQFP32 / UFQFPN32				WLCSP36			LQFP48 / UFQFPN48		
Flash memory size			4=16K, 6=32K															
Part numbers			STM32F042F[46]			STM32F042G[46]			STM32F042K[46]				STM32F042T[46]			STM32F042C[46]		
Analog I/O group	Gx_IOy	GPIO	Pin	Number of availabl e pins	Usage	Pin	Number of available pins	Usage	Pin LQFP	Pin UFQFP N	Number of available pins	Usage	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 6	not available		-	0	Cannot be used for touch sensing	-	0	Cannot be used for Touch sensing	-	-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing
			-			-			-	-			-			-		
			-			-			-	-			-			-		
			-			-			-	-			-			-		
Group 7			-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing	-	-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing
			-			-			-	-			-			-		
			-			-			-	-			-			-		
			-			-			-	-			-			-		
Group 8			-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing	-	-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing
			-			-			-	-			-			-		
			-			-			-	-			-			-		
			-			-			-	-			-			-		
Maximum number of channels			9 with 3 sampling capacitors			13 with 5 sampling capacitors			13/14 with 5 sampling capacitors				14 with 5 sampling capacitors			14 with 5 sampling capacitors		

1. This GPIO offers a reduced touch sensing sensitivity. It is thus recommended to use it as sampling capacitor I/O.
2. Pin pair PA11/PA12 can be remapped instead of pin pair PA9/PA10 using SYS_CTRL register.

Table 8. Available touch sensing channels for STM32F051 and STM32F072

Subfamily			STM32F051/STM32F072													
Packages			LQFP32/UFQFPN32				LQFP48			LQFP64			LQFP100			
Flash memory size			4=16K, 6=32K, 8=64K, B=128K, C=256K													
Part numbers			STM32F051K[468]				STM32F051C[468B] STM32F072C[8B]			STM32F051R[468B] STM32F072R[8B]			STM32F051VB STM32F052V[8B]			
Analog I/O group	Gx_IOy	GPIO	Pin LQFP	Pin UFQFPN	Number of available pins	Usage	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 1	G1_IO1	PA0	6	6	4	3 channels with 1 sampling capacitor	10	4	3 channels with 1 sampling capacitor	14	4	3 channels with 1 sampling capacitor	23	4	3 channels with 1 sampling capacitor
	G1_IO2	PA1	7	7			11			15			24		
	G1_IO3	PA2	8	8			12			16			25		
	G1_IO4	PA3	9	9			13			17			26		
Group 2	G2_IO1	PA4(1)	10	10	4	3 channels with 1 sampling capacitor	14	4	3 channels with 1 sampling capacitor	20	4	3 channels with 1 sampling capacitor	29	4	3 channels with 1 sampling capacitor
	G2_IO2	PA5(1)	11	11			15			21			30		
	G2_IO3	PA6	12	12			16			22			31		
	G2_IO4	PA7	13	13			17			23			32		
Group 3	G3_IO1	PC5	-	-	2/3	1/2 channels with 1 sampling capacitor	-	3	2 channels with 1 sampling capacitor	25	4	3 channels with 1 sampling capacitor	34	4	3 channels with 1 sampling capacitor
	G3_IO2	PB0	14	14			18			26			35		
	G3_IO3	PB1	15	15			19			27			36		
	G3_IO4	PB2	-	16			20			28			37		
Group 4	G4_IO1	PA9	19	19	4	3 channels with 1 sampling capacitor	30	4	3 channels with 1 sampling capacitor	42	4	3 channels with 1 sampling capacitor	68	4	3 channels with 1 sampling capacitor
	G4_IO2	PA10	20	20			31			43			69		
	G4_IO3	PA11	21	21			32			44			70		
	G4_IO4	PA12	22	22			33			45			71		

Table 8. Available touch sensing channels for STM32F051 and STM32F072 (continued)

Subfamily			STM32F051/STM32F072												
Packages			LQFP32/UFQFPN32				LQFP48			LQFP64			LQFP100		
Flash memory size			4=16K, 6=32K, 8=64K, B=128K, C=256K												
Part numbers			STM32F051K[468]				STM32F051C[468B] STM32F072C[8B]			STM32F051R[468B] STM32F072R[8B]			STM32F051VB STM32F052V[8B]		
Analog I/O group	Gx_IOy	GPIO	Pin LQFP	Pin UFQFPN	Number of available pins	Usage	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 5	G5_IO1	PB3	26	26	4	3 channels with 1 sampling capacitor	39	4	3 channels with 1 sampling capacitor	55	4	3 channels with 1 sampling capacitor	89	4	3 channels with 1 sampling capacitor
	G5_IO2	PB4	27	27			40			56			90		
	G5_IO3	PB6	29	29			42			58			92		
	G5_IO4	PB7	30	30			43			59			93		
Group 6	G6_IO1	PB11	-	-	0	Cannot be used for touch sensing	22	4	3 channels with 1 sampling capacitor	30	4	3 channels with 1 sampling capacitor	48	4	3 channels with 1 sampling capacitor
	G6_IO2	PB12	-	-			25			33			51		
	G6_IO3	PB13	-	-			26			34			52		
	G6_IO4	PB14	-	-			27			35			53		
Group 7	G7_IO1	PE2	-	-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing	1	4	3 channels with 1 sampling capacitor
	G7_IO2	PE3	-	-			-			-			2		
	G7_IO3	PE4	-	-			-			-			3		
	G7_IO4	PE5	-	-			-			-			4		
Group 8	G8_IO1	PD12	-	-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing	-	0	Cannot be used for Touch sensing	59	4	3 channels with 1 sampling capacitor
	G8_IO2	PD13	-	-			-			-			60		
	G8_IO3	PD14	-	-			-			-			61		
	G8_IO4	PD15	-	-			-			-			62		
Maximum number of channels			13/14 with 5 sampling capacitors				17 with 6 sampling capacitors			18 with 6 sampling capacitors			24 with 8 sampling capacitors		

1. This GPIO offers a reduced touch sensing sensitivity. It is thus recommended to use it as sampling capacitor I/O.

5.4 STM32F3xx

5.4.1 STM32F3xx features

- Proven and robust surface charge transfer acquisition principle
- Supports up to 24 capacitive sensing channels
- Up to 8 capacitive sensing channels can be acquired in parallel offering a very good response time
- Spread spectrum feature to improve system robustness in noisy environments
- Full hardware management of the charge transfer acquisition sequence
- Programmable charge transfer frequency
- Programmable sampling capacitor I/O pin
- Programmable channel I/O pin
- Programmable max count value to avoid long acquisition when a channel is faulty
- Dedicated end of acquisition and max count error flags with interrupt capability
- One sampling capacitor for up to 3 capacitive sensing channels to reduce the system components
- Compatible with proximity, touchkey, linear and rotary touch sensor implementation

5.4.2 STM32F3xx available touch-sensing channels

The tables below provide an overview of the available touch sensing channels for the STM32F3xx devices.

Note 1: The following tables are not restrictive in term of part numbers supported by the STMTouch driver. The STMTouch driver can be used on any new device that may become available as part of ST microcontrollers portfolio. Please contact your ST representative for support.

Note2: For n available pins in an I/O group, one pin is used as sampling capacitor and n-1 pins are used as channels.

The I/O group cannot be used if the number of available pins in less or equal to one.

Table 9. Available touch sensing channels for STM32F30x

Subfamily			STM32F30x												
Packages			LQFP32			LQFP48			LQFP64			LQFP100			
Part numbers			STM32F301K[468] STM32F302K[468] STM32F303K[468] STM32F333K[468]			STM32F301C[468] STM32F302C[468BC] STM32F303C[468BC] STM32F333C[468]			STM32F301R[468] STM32F302R[468BC] STM32F303R[468BC] STM32F333R[468]			STM32F302V[BC] STM32F303V[BC]		
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	Pin	Number of availabl e pins	Usage	Pin	Number of available pins	Usage	Pin	Number of availabl e pins	Usage
Group 1	G1_IO1	PA0	7	4	3 channels with 1 sampling capacitor	10	4	3 channels with 1 sampling capacitor	14	4	3 channels with 1 sampling capacitor	23	4	3 channels with 1 sampling capacitor
	G1_IO2	PA1	8			11			15			24		
	G1_IO3	PA2	9			12			16			25		
	G1_IO4	PA3	10			13			17			26		
Group 2	G2_IO1	PA4(1)	11	4	3 channels with 1 sampling capacitor	14	4	3 channels with 1 sampling capacitor	20	4	3 channels with 1 sampling capacitor	29	4	3 channels with 1 sampling capacitor
	G2_IO2	PA5(1)	12			15			21			30		
	G2_IO3	PA6	13			16			22			31		
	G2_IO4	PA7	14			17			23			32		
Group 3	G3_IO1	PC5	-	1	Cannot be used for touch sensing	-	3	2 channels with 1 sampling capacitor	25	4	3 channels with 1 sampling capacitor	34	4	3 channels with 1 sampling capacitor
	G3_IO2	PB0	15			18			26			35		
	G3_IO3	PB1	-			19			27			36		
	G3_IO4	PB2	-			20			28			37		
Group 4	G4_IO1	PA9	19	4	3 channels with 1 sampling capacitor	30	4	3 channels with 1 sampling capacitor	42	4	3 channels with 1 sampling capacitor	68	4	3 channels with 1 sampling capacitor
	G4_IO2	PA10	20			31			43			69		
	G4_IO3	PA13	23			34			46			72		
	G4_IO4	PA14	24			37			49			76		

Table 9. Available touch sensing channels for STM32F30x (continued)

Subfamily			STM32F30x												
Packages			LQFP32			LQFP48			LQFP64			LQFP100			
Part numbers			STM32F301K[468] STM32F302K[468] STM32F303K[468] STM32F333K[468]			STM32F301C[468] STM32F302C[468BC] STM32F303C[468BC] STM32F333C[468]			STM32F301R[468] STM32F302R[468BC] STM32F303R[468BC] STM32F333R[468]			STM32F302V[BC] STM32F303V[BC]		
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage
Group 5	G5_IO1	PB3	26	4	3 channels with 1 sampling capacitor	39	4	3 channels with 1 sampling capacitor	55	4	3 channels with 1 sampling capacitor	89	4	3 channels with 1 sampling capacitor
	G5_IO2	PB4	27			40			56			90		
	G5_IO3	PB6	29			42			58			92		
	G5_IO4	PB7	30			43			59			93		
Group 6	G6_IO1	PB11	-	0	Cannot be used for touch sensing	22	4	3 channels with 1 sampling capacitor	30	4	3 channels with 1 sampling capacitor	48	4	3 channels with 1 sampling capacitor
	G6_IO2	PB12	-			25			33			51		
	G6_IO3	PB13	-			26			34			52		
	G6_IO4	PB14	-			27			35			53		
Group 7	G7_IO1	PE2	-	0	Cannot be used for touch sensing	-	0	Cannot be used for touch sensing	-	0	Cannot be used for touch sensing	1	4	3 channels with 1 sampling capacitor
	G7_IO2	PE3	-			-			-			2		
	G7_IO3	PE4	-			-			-			3		
	G7_IO4	PE5	-			-			-			4		
Group 8	G8_IO1	PD12	-	0	Cannot be used for touch sensing	-	0	Cannot be used for touch sensing	-	0	Cannot be used for touch sensing	59	4	3 channels with 1 sampling capacitor
	G8_IO2	PD13	-			-			-			60		
	G8_IO3	PD14	-			-			-			61		
	G8_IO4	PD15	-			-			-			62		
Maximum number of channels			12 with 4 sampling capacitors			17 with 6 sampling capacitors			18 with 6 sampling capacitors			24 with 8 sampling capacitors		

1. This GPIO offers a reduced touch sensing sensitivity. It is thus recommended to use it as sampling capacitor I/O.

Table 10. Available touch sensing channels for STM32F37x

Subfamily			STM32F37x									
Packages			LQFP48			LQFP64			LQFP100 / UFBGA100			
Flash memory size			8=64K, B=128K, C=256K									
Part numbers			STM32F373C[8BC]			STM32F373R[8BC]			STM32F373V[8BC]			
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage	LQFP Pin	BGA Pin	Number of available pins	Usage
Group 1	G1_IO1	PA0	10	4	3 channels with 1 sampling capacitor	14	4	3 channels with 1 sampling capacitor	23	L2	4	3 channels with 1 sampling capacitor
	G1_IO2	PA1	11			15			24	M2		
	G1_IO3	PA2	12			16			25	K3		
	G1_IO4	PA3	13			18			26	L3		
Group 2	G2_IO1	PA4	14	3	2 channels with 1 sampling capacitor	20	4	3 channels with 1 sampling capacitor	29	M3	4	3 channels with 1 sampling capacitor
	G2_IO2	PA5(1)	15			21			30	K4		
	G2_IO3	PA6(1)	16			22			31	L4		
	G2_IO4	PA7	-			23			32	M4		
Group 3	G3_IO1	PC4	-	2	1 channel with 1 sampling capacitor	24	4	3 channels with 1 sampling capacitor	33	K5	4	3 channels with 1 sampling capacitor
	G3_IO2	PC5	-			25			34	L5		
	G3_IO3	PB0	18			26			35	M5		
	G3_IO4	PB1	19			27			36	M6		

Table 10. Available touch sensing channels for STM32F37x (continued)

Subfamily			STM32F37x									
Packages			LQFP48			LQFP64			LQFP100 / UFBGA100			
Flash memory size			8=64K, B=128K, C=256K									
Part numbers			STM32F373C[8BC]			STM32F373R[8BC]			STM32F373V[8BC]			
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage	LQFP Pin	BGA Pin	Number of available pins	Usage
Group 4	G4_IO1	PA9	30	4	3 channels with 1 sampling capacitor	42	4	3 channels with 1 sampling capacitor	68	D10	4	3 channels with 1 sampling capacitor
	G4_IO2	PA10	31			43			69	C12		
	G4_IO3	PA13	34			46			72	A11		
	G4_IO4	PA14	37			49			76	A10		
Group 5	G5_IO1	PB3	39	4	3 channels with 1 sampling capacitor	55	4	3 channels with 1 sampling capacitor	89	A8	4	3 channels with 1 sampling capacitor
	G5_IO2	PB4	40			56			90	A7		
	G5_IO3	PB6	42			58			92	B5		
	G5_IO4	PB7	43			59			93	B4		
Group 6	G6_IO1	PB14	26	3	2 channels with 1 sampling capacitor	34	3	2 channels with 1 sampling capacitor	53	K11	4	3 channels with 1 sampling capacitor
	G6_IO2	PB15	27			35			54	K10		
	G6_IO3	PD8	28			36			55	K9		
	G6_IO4	PD9	-			-			56	K8		

Table 10. Available touch sensing channels for STM32F37x (continued)

Subfamily			STM32F37x									
Packages			LQFP48			LQFP64			LQFP100 / UFBGA100			
Flash memory size			8=64K, B=128K, C=256K									
Part numbers			STM32F373C[8BC]			STM32F373R[8BC]			STM32F373V[8BC]			
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	Pin	Number of available pins	Usage	LQFP Pin	BGA Pin	Number of available pins	Usage
Group 7	G7_IO1	PE2	-	0	Cannot be used for touch sensing	-	0	Cannot be used for touch sensing	1	B2	4	3 channels with 1 sampling capacitor
	G7_IO2	PE3	-			-			2	A1		
	G7_IO3	PE4	-			-			3	B1		
	G7_IO4	PE5	-			-			4	C2		
Group 8	G8_IO1	PD12	-	0	Cannot be used for touch sensing	-	0	Cannot be used for touch sensing	59	J10	4	3 channels with 1 sampling capacitor
	G8_IO2	PD13	-			-			60	H12		
	G8_IO3	PD14	-			-			61	H11		
	G8_IO4	PD15	-			-			62	H10		
Maximum number of channels			14 with 6 sampling capacitors			17 with 6 sampling capacitors			24 with 8 sampling capacitors			

1. This GPIO offers a reduced touch sensing sensitivity. It is thus recommended to use it as sampling capacitor I/O.

5.5 STM32L1xx

5.5.1 STM32L1xx features

- Proven and robust surface charge transfer acquisition principle
- Supports up to 34 capacitive sensing channels
- Up to 11 capacitive sensing channels can be acquired in parallel offering a very good response time
- Hardware and software managements of the charge transfer acquisition sequence
- Programmable charge transfer frequency (for hardware management only)
- Programmable sampling capacitor I/O pin
- Programmable channel I/O pin
- Programmable max count value to avoid long acquisition when a channel is faulty
- Dedicated end of acquisition flag with interrupt capability
- One sampling capacitor for up to 4 capacitive sensing channels to reduce the system components
- Compatible with proximity, touchkey, linear and rotary touch sensor implementation

5.5.2 STM32L1xx available touch-sensing channels

The tables below provide an overview of the available touch sensing channels for the STM32L1xx devices.

Note1: The following tables are not restrictive in term of part numbers supported by the STMTouch driver. The STMTouch driver can be used on any new device that may become available as part of ST microcontrollers portfolio. Please contact your ST representative for support.

Note2: For n available pins in an I/O group, one pin is used as sampling capacitor and n-1 pins are used as channels. The I/O group cannot be used if the number of available pins in less or equal to one.

Table 11. Available touch sensing channels for *STM32L1xx 512K*

Subfamily			STM32L1xx 512K													
Packages			LQFP64			LQFP100 / WLCSP104				UFBGA132			LQFP144			
Part numbers			STM32L151RE STM32L152RE STM32L162RE			STM32L151VE STM32L152VE STM32L162VE				STM32L151QE STM32L152QE STM32L162QE			STM32L151ZE STM32L152ZE STM32L162ZE			
Analog I/O group	Gx_IOy	GPIO	LQFP pin	Number of available pins	Usage	LQFP Pin	WLCSP ball	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage	
Group 1	G1_IO1	PA0	14	4	3 channels with 1 sampling capacitor	23	K9	4	3 channels with 1 sampling capacitor	L2	4	3 channels with 1 sampling capacitor	34	4	3 channels with 1 sampling capacitor	
	G1_IO2	PA1	15			24	L9			M2			35			
	G1_IO3	PA2	16			25	J8			K3			36			
	G1_IO4	PA3(1)	17			26	H7			L3			37			
Group 2	G2_IO1	PA6	22	2	1 channel with 1 sampling capacitor	31	H6	2	1 channel with 1 sampling capacitor	L4	4(2)	3 channels with 1 sampling capacitor	42	4(2)	3 channels with 1 sampling capacitor	
	G2_IO2	PA7	23			32	K7			J5			43			
	G2_IO3	PF15	-			-	-			J9			55			
	G2_IO4	PG0(3)	-			-	-			H9			56			
	G2_IO5	PG1(3)	-			-	-			G9			57			
Group 3	G3_IO1	PB0(1)	26	3	2 channels with 1 sampling capacitor	35	J6	3	2 channels with 1 sampling capacitor	M5	5	4 channels with 1 sampling capacitor	46	5	4 channels with 1 sampling capacitor	
	G3_IO2	PB1	27			36	K6			M6			47			
	G3_IO3	PB2	28			37	M6			L6			48			
	G3_IO4	PF11	-			-	-			K6			49			
	G3_IO5	PF12	-			-	-			J7			50			

Table 11. Available touch sensing channels for *STM32L1xx 512K* (continued)

Subfamily			STM32L1xx 512K												
Packages			LQFP64			LQFP100 / WLCSP104				UFBGA132			LQFP144		
Part numbers			STM32L151RE STM32L152RE STM32L162RE			STM32L151VE STM32L152VE STM32L162VE				STM32L151QE STM32L152QE STM32L162QE			STM32L151ZE STM32L152ZE STM32L162ZE		
Analog I/O group	Gx_IOy	GPIO	LQFP pin	Number of available pins	Usage	LQFP Pin	WLCSP ball	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage
Group 4	G4_IO1	PA8	41	3	2 channels with 1 sampling capacitor	67	F3	3	2 channels with 1 sampling capacitor	D11	3	2 channels with 1 sampling capacitor	100	3	2 channels with 1 sampling capacitor
	G4_IO2	PA9	42			68	F1			D10			101		
	G4_IO3	PA10	43			69	F2			C12			102		
Group 5	G5_IO1	PA13	46	3	2 channels with 1 sampling capacitor	72	E3	3	2 channels with 1 sampling capacitor	A11	3	2 channels with 1 sampling capacitor	105	3	2 channels with 1 sampling capacitor
	G5_IO2	PA14	49			76	D3			A10			109		
	G5_IO3	PA15	50			77	B1			A9			110		
Group 6	G6_IO1	PB4	56	4	3 channels with 1 sampling capacitor	90	A5	4	3 channels with 1 sampling capacitor	A7	4	3 channels with 1 sampling capacitor	134	4	3 channels with 1 sampling capacitor
	G6_IO2	PB5	57			91	A6			C5			135		
	G6_IO3	PB6	58			92	C5			B5			136		
	G6_IO4	PB7	59			93	C7			B4			137		

Table 11. Available touch sensing channels for *STM32L1xx 512K* (continued)

Subfamily			STM32L1xx 512K													
Packages			LQFP64			LQFP100 / WLCSP104				UFBGA132			LQFP144			
Part numbers			STM32L151RE STM32L152RE STM32L162RE			STM32L151VE STM32L152VE STM32L162VE				STM32L151QE STM32L152QE STM32L162QE			STM32L151ZE STM32L152ZE STM32L162ZE		
Analog I/O group	Gx_IOy	GPIO	LQFP pin	Number of available pins	Usage	LQFP Pin	WLCSP ball	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage
Group 7	G7_IO1	PB12	33	4	3 channels with 1 sampling capacitor	51	J4	4	3 channels with 1 sampling capacitor	L12	5(2)	4 channels with 1 sampling capacitor	73	5(2)	4 channels with 1 sampling capacitor
	G7_IO2	PB13	34			52	J3			K12			74		
	G7_IO3	PB14	35			53	L1			K11			75		
	G7_IO4	PB15	36			54	K2			K10			76		
	G7_IO5	PG2(3)	-			-	-			G10			87		
	G7_IO6	PG3(3)	-			-	-			F9			88		
	G7_IO7	PG4(3)	-			-	-			F10			89		
Group 8	G8_IO1	PC0	8	4	3 channels with 1 sampling capacitor	15	F6	4	3 channels with 1 sampling capacitor	H1	4	3 channels with 1 sampling capacitor	26	4	3 channels with 1 sampling capacitor
	G8_IO2	PC1	9			16	H9			J2			27		
	G8_IO3	PC2	10			17	G9			J3			28		
	G8_IO4	PC3	11			18	G8			K2			29		
Group 9	G9_IO1	PC4	24	2	1 channel with 1 sampling capacitor	33	L7	2	1 channel with 1 sampling capacitor	K5	4	3 channels with 1 sampling capacitor	44	4	3 channels with 1 sampling capacitor
	G9_IO2	PC5	25			34	M7			L5			45		
	G9_IO3	PF13	-			-	-			K7			53		
	G9_IO4	PF14	-			-	-			J8			54		

Table 11. Available touch sensing channels for *STM32L1xx 512K* (continued)

Subfamily			STM32L1xx 512K												
Packages			LQFP64			LQFP100 / WLCSP104				UFBGA132			LQFP144		
Part numbers			STM32L151RE STM32L152RE STM32L162RE			STM32L151VE STM32L152VE STM32L162VE				STM32L151QE STM32L152QE STM32L162QE			STM32L151ZE STM32L152ZE STM32L162ZE		
Analog I/O group	Gx_IOy	GPIO	LQFP pin	Number of available pins	Usage	LQFP Pin	WLCSP ball	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage
Group 10	G10_IO1	PC6	37	4	3 channels with 1 sampling capacitor	63	H1	4	3 channels with 1 sampling capacitor	E12	4	3 channels with 1 sampling capacitor	96	4	3 channels with 1 sampling capacitor
	G10_IO2	PC7	38			64	G1			E11			97		
	G10_IO3	PC8	39			65	G2			E10			98		
	G10_IO4	PC9	40			66	F4			D12			99		
Group 11	G11_IO1	PF6	-	0	Cannot be used for touch sensing	-	-	0	Cannot be used for touch sensing	G3	4	3 channels with 1 sampling capacitor	18	5	4 channels with 1 sampling capacitor
	G11_IO2	PF7	-			-	-			G4			19		
	G11_IO3	PF8	-			-	-			H4			20		
	G11_IO4	PF9	-			-	-			J6			21		
	G11_IO5	PF10	-			-	-			-			22		
Maximum number of channels			23 channels with 10 sampling capacitors			23 channels with 10 sampling capacitors				33 channels with 11 sampling capacitors			34 channels with 11 sampling capacitors		

1. This GPIO offers a reduced touch sensing sensitivity. It is thus recommended to use it as sampling capacitor I/O.
2. Not all the pins are available simultaneously on this group.
3. This GPIO can only be configured as sampling capacitor I/O when using HW acquisition mode and as channel I/O when using SW acquisition mode.

Table 12. Available touch sensing channels for *STM32L1xx 384K*

Subfamily			STM32L1xx 384K												
Packages			LQFP64 / WLCSP64				LQFP100			UFBGA132			LQFP144		
Part numbers			STM32L151RD STM32L152RD STM32L162RD				STM32L151VD STM32L152VD STM32L162VD			STM32L151QD STM32L152QD STM32L162QD			STM32L151ZD STM32L152ZD STM32L162ZD		
Analog I/O group	Gx_IOy	GPIO	LQFP pin	WLCSP ball	Number of available pins	Usage	LQFP Pin	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage
Group 1	G1_IO1	PA0	14	F6	4	3 channels with 1 sampling capacitor	23	4	3 channels with 1 sampling capacitor	L2	4	3 channels with 1 sampling capacitor	34	4	3 channels with 1 sampling capacitor
	G1_IO2	PA1	15	E6			24			M2			35		
	G1_IO3	PA2	16	H8			25			K3			36		
	G1_IO4	PA3(1)	17	G7			26			L3			37		
Group 2	G2_IO1	PA6	22	G5	2	1 channel with 1 sampling capacitor	31	2	1 channel with 1 sampling capacitor	L4	4(2)	3 channels with 1 sampling capacitor	42	4(2)	3 channels with 1 sampling capacitor
	G2_IO2	PA7	23	G4			32			J5			43		
	G2_IO3	PF15	-	-			-			J9			55		
	G2_IO4	PG0(3)	-	-			-			H9			56		
	G2_IO5	PG1(3)	-	-			-			G9			57		
Group 3	G3_IO1	PB0(1)	26	H4	3	2 channels with 1 sampling capacitor	35	3	2 channels with 1 sampling capacitor	M5	5	4 channels with 1 sampling capacitor	46	5	4 channels with 1 sampling capacitor
	G3_IO2	PB1	27	F4			36			M6			47		
	G3_IO3	PB2	28	H3			37			L6			48		
	G3_IO4	PF11	-	-			-			K6			49		
	G3_IO5	PF12	-	-			-			J7			50		

Table 12. Available touch sensing channels for *STM32L1xx 384K* (continued)

Subfamily			STM32L1xx 384K												
Packages			LQFP64 / WLCSP64				LQFP100			UFBGA132			LQFP144		
Part numbers			STM32L151RD STM32L152RD STM32L162RD				STM32L151VD STM32L152VD STM32L162VD			STM32L151QD STM32L152QD STM32L162QD			STM32L151ZD STM32L152ZD STM32L162ZD		
Analog I/O group	Gx_IOy	GPIO	LQFP pin	WLCSP ball	Number of available pins	Usage	LQFP Pin	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage
Group 4	G4_IO1	PA8	41	E4	3	2 channels with 1 sampling capacitor	67	3	2 channels with 1 sampling capacitor	D11	3	2 channels with 1 sampling capacitor	100	3	2 channels with 1 sampling capacitor
	G4_IO2	PA9	42	D2			68			D10			101		
	G4_IO3	PA10	43	D3			69			C12			102		
Group 5	G5_IO1	PA13	46	D4	3	2 channels with 1 sampling capacitor	72	3	2 channels with 1 sampling capacitor	A11	3	2 channels with 1 sampling capacitor	105	3	2 channels with 1 sampling capacitor
	G5_IO2	PA14	49	B2			76			A10			109		
	G5_IO3	PA15	50	C3			77			A9			110		
Group 6	G6_IO1	PB4	56	B4	4	3 channels with 1 sampling capacitor	90	4	3 channels with 1 sampling capacitor	A7	4	3 channels with 1 sampling capacitor	134	4	3 channels with 1 sampling capacitor
	G6_IO2	PB5	57	A5			91			C5			135		
	G6_IO3	PB6	58	B5			92			B5			136		
	G6_IO4	PB7	59	C5			93			B4			137		

Table 12. Available touch sensing channels for *STM32L1xx 384K* (continued)

Subfamily			STM32L1xx 384K												
Packages			LQFP64 / WLCSP64				LQFP100			UFBGA132			LQFP144		
Part numbers			STM32L151RD STM32L152RD STM32L162RD				STM32L151VD STM32L152VD STM32L162VD			STM32L151QD STM32L152QD STM32L162QD			STM32L151ZD STM32L152ZD STM32L162ZD		
Analog I/O group	Gx_IOy	GPIO	LQFP pin	WLCSP ball	Number of available pins	Usage	LQFP Pin	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage
Group 7	G7_IO1	PB12	33	G2	4	3 channels with 1 sampling capacitor	51	4	3 channels with 1 sampling capacitor	L12	5(2)	4 channels with 1 sampling capacitor	73	5(2)	4 channels with 1 sampling capacitor
	G7_IO2	PB13	34	G1			52			K12			74		
	G7_IO3	PB14	35	F2			53			K11			75		
	G7_IO4	PB15	36	F1			54			K10			76		
	G7_IO5	PG2(3)	-	-			-			G10			87		
	G7_IO6	PG3(3)	-	-			-			F9			88		
	G7_IO7	PG4(3)	-	-			-			F10			89		
Group 8	G8_IO1	PC0	8	E8	4	3 channels with 1 sampling capacitor	15	4	3 channels with 1 sampling capacitor	H1	4	3 channels with 1 sampling capacitor	26	4	3 channels with 1 sampling capacitor
	G8_IO2	PC1	9	F8			16			J2			27		
	G8_IO3	PC2	10	D6			17			J3			28		
	G8_IO4	PC3(1)	11	F7			18			K2			29		
Group 9	G9_IO1	PC4	24	H6	2	1 channel with 1 sampling capacitor	33	2	1 channel with 1 sampling capacitor	K5	4	3 channels with 1 sampling capacitor	44	4	3 channels with 1 sampling capacitor
	G9_IO2	PC5	25	H5			34			L5			45		
	G9_IO3	PF13	-	-			-			K7			53		
	G9_IO4	PF14	-	-			-			J8			54		

Table 12. Available touch sensing channels for *STM32L1xx 384K* (continued)

Subfamily			STM32L1xx 384K												
Packages			LQFP64 / WLCSP64				LQFP100			UFBGA132			LQFP144		
Part numbers			STM32L151RD STM32L152RD STM32L162RD				STM32L151VD STM32L152VD STM32L162VD			STM32L151QD STM32L152QD STM32L162QD			STM32L151ZD STM32L152ZD STM32L162ZD		
Analog I/O group	Gx_IOy	GPIO	LQFP pin	WLCSP ball	Number of available pins	Usage	LQFP Pin	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage
Group 10	G10_IO1	PC6	37	E1	4	3 channels with 1 sampling capacitor	63	4	3 channels with 1 sampling capacitor	E12	4	3 channels with 1 sampling capacitor	96	4	3 channels with 1 sampling capacitor
	G10_IO2	PC7	38	E2			64			E11			97		
	G10_IO3	PC8	39	E3			65			E10			98		
	G10_IO4	PC9	40	D1			66			D12			99		
Group 11	G11_IO1	PF6	-	-	0	Cannot be used for touch sensing	-	0	Cannot be used for touch sensing	G3	4	3 channels with 1 sampling capacitor	18	5	4 channels with 1 sampling capacitor
	G11_IO2	PF7	-	-			-			G4			19		
	G11_IO3	PF8	-	-			-			H4			20		
	G11_IO4	PF9	-	-			-			J6			21		
	G11_IO5	PF10	-	-			-			-			22		
Maximum number of channels			23 channels with 10 sampling capacitors				23 channels with 10 sampling capacitors			33 channels with 11 sampling capacitors			34 channels with 11 sampling capacitors		

1. This GPIO offers a reduced touch sensing sensitivity. It is thus recommended to use it as sampling capacitor I/O.
2. Not all the pins are available simultaneously on this group.
3. This GPIO can only be configured as sampling capacitor I/O when using HW acquisition mode and as channel I/O when using SW acquisition mode.

Table 13. Available touch sensing channels for STM32L1xx 256K (table 1/2)

Subfamily			STM32L1xx 256K									
Packages			LQFP48 or UFQFPN48			WLCSP63			LQFP64 / WLCSP64			
Part numbers			STM32L152CC			STM32L151UC			STM32L151RC STM32L152RC STM32L162RC			
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	WLCSP ball	Number of available pins	Usage	LQFP pin	WLCSP ball	Number of available pins	Usage
Group 1	G1_IO1	PA0	10	4	3 channels with 1 sampling capacitor	E4	4	3 channels with 1 sampling capacitor	14	F6	4	3 channels with 1 sampling capacitor
	G1_IO2	PA1	11			G5			15	E6		
	G1_IO3	PA2	12			H6			16	H8		
	G1_IO4	PA3(1)	13			J7			17	G7		
Group 2	G2_IO1	PA6	16	2	1 channel with 1 sampling capacitor	G4	2	1 channel with 1 sampling capacitor	22	G5	2	1 channel with 1 sampling capacitor
	G2_IO2	PA7	17			J5			23	G4		
	G2_IO3	PF15	-			-			-	-		
	G2_IO4	PG0(2)	-			-			-	-		
	G2_IO5	PG1(2)	-			-			-	-		
Group 3	G3_IO1	PB0(1)	18	3	2 channels with 1 sampling capacitor	J3	3	2 channels with 1 sampling capacitor	26	H4	3	2 channels with 1 sampling capacitor
	G3_IO2	PB1	19			H3			27	F4		
	G3_IO3	PB2	20			G3			28	H3		
	G3_IO4	PF11	-			-			-	-		
	G3_IO5	PF12	-			-			-	-		
Group 4	G4_IO1	PA8	29	3	2 channels with 1 sampling capacitor	E3	3	2 channels with 1 sampling capacitor	41	E4	3	2 channels with 1 sampling capacitor
	G4_IO2	PA9	30			C1			42	D2		
	G4_IO3	PA10	31			D2			43	D3		

Table 13. Available touch sensing channels for STM32L1xx 256K (table 1/2) (continued)

Subfamily			STM32L1xx 256K									
Packages			LQFP48 or UFQFPN48			WLCSP63			LQFP64 / WLCSP64			
Part numbers			STM32L152CC			STM32L151UC			STM32L151RC STM32L152RC STM32L162RC			
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	WLCSP ball	Number of available pins	Usage	LQFP pin	WLCSP ball	Number of available pins	Usage
Group 5	G5_IO1	PA13	34	3	2 channels with 1 sampling capacitor	C2	3	2 channels with 1 sampling capacitor	46	D4	3	2 channels with 1 sampling capacitor
	G5_IO2	PA14	37			C3			49	B2		
	G5_IO3	PA15	38			A2			50	C3		
Group 6	G6_IO1	PB4	40	4	3 channels with 1 sampling capacitor	D4	4	3 channels with 1 sampling capacitor	56	B4	4	3 channels with 1 sampling capacitor
	G6_IO2	PB5	41			A5			57	A5		
	G6_IO3	PB6	42			B5			58	B5		
	G6_IO4	PB7	43			C5			59	C5		
Group 7	G7_IO1	PB12	25	4	3 channels with 1 sampling capacitor	G2	4	3 channels with 1 sampling capacitor	33	G2	4	3 channels with 1 sampling capacitor
	G7_IO2	PB13	26			G1			34	G1		
	G7_IO3	PB14	27			F3			35	F2		
	G7_IO4	PB15	28			F2			36	F1		
	G7_IO5	PG2(2)	-			-			-	-		
	G7_IO6	PG3(2)	-			-			-	-		
	G7_IO7	PG4(2)	-			-			-	-		

Table 13. Available touch sensing channels for STM32L1xx 256K (table 1/2) (continued)

Subfamily			STM32L1xx 256K									
Packages			LQFP48 or UFQFPN48			WLCSP63			LQFP64 / WLCSP64			
Part numbers			STM32L152CC			STM32L151UC			STM32L151RC STM32L152RC STM32L162RC			
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	WLCSP ball	Number of available pins	Usage	LQFP pin	WLCSP ball	Number of available pins	Usage
Group 8	G8_IO1	PC0	-	0	Cannot be used for touch sensing	E6	4	3 channels with 1 sampling capacitor	8	E8	4	3 channels with 1 sampling capacitor
	G8_IO2	PC1	-			E5			9	F8		
	G8_IO3	PC2	-			G7			10	D6		
	G8_IO4	PC3	-			G6			11	F7		
Group 9	G9_IO1	PC4	-	0		F4	2	1 channel with 1 sampling capacitor	24	H6	2	1 channel with 1 sampling capacitor
	G9_IO2	PC5	-			J4			25	H5		
	G9_IO3	PF13	-			-			-	-		
	G9_IO4	PF14	-			-			-	-		
Group 10	G10_IO1	PC6	-	0		F1	4	3 channels with 1 sampling capacitor	37	E1	4	3 channels with 1 sampling capacitor
	G10_IO2	PC7	-			E1			38	E2		
	G10_IO3	PC8	-			D1			39	E3		
	G10_IO4	PC9	-			E2			40	D1		
Group11	G11_IO1	PF6	-	0		-	0	Cannot be used for touch sensing	-	-	0	Cannot be used for touch sensing
	G11_IO2	PF7	-			-			-	-		
	G11_IO3	PF8	-			-			-	-		
	G11_IO4	PF9	-			-			-	-		
	G11_IO5	PF10	-			-			-	-		

Table 13. Available touch sensing channels for STM32L1xx 256K (table 1/2) (continued)

Subfamily			STM32L1xx 256K									
Packages			LQFP48 or UFQFPN48			WLCSP63			LQFP64 / WLCSP64			
Part numbers			STM32L152CC			STM32L151UC			STM32L151RC STM32L152RC STM32L162RC			
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	WLCSP ball	Number of available pins	Usage	LQFP pin	WLCSP ball	Number of available pins	Usage
Maximum number of channels			16 channels with 7 sampling capacitors			23 channels with 10 sampling capacitors			23 channels with 10 sampling capacitors			

1. This GPIO offers a reduced touch sensing sensitivity. It is thus recommended to use it as sampling capacitor I/O.
2. This GPIO can only be configured as sampling capacitor I/O when using HW acquisition mode and as channel I/O when using SW acquisition mode.

Table 14. Available touch sensing channels for STM32L1xx 256K (table 2/2)

Subfamily			STM32L1xx 256K									
Packages			LQFP100 / UFBGA100				UFBGA132			LQFP144		
Part numbers			STM32L151VC STM32L152VC STM32L162VC				STM32L151QC STM32L152QC STM32L162QC			STM32L151ZC STM32L152ZC STM32L162ZC		
Analog I/O group	Gx_IOy	GPIO	LQFP pin	BGA ball	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage
Group 1	G1_IO1	PA0	23	L2	4	3 channels with 1 sampling capacitor	L2	4	3 channels with 1 sampling capacitor	34	4	3 channels with 1 sampling capacitor
	G1_IO2	PA1	24	M2			M2			35		
	G1_IO3	PA2	25	K3			K3			36		
	G1_IO4	PA3(1)	26	L3			L3			37		
Group 2	G2_IO1	PA6	31	L4	2	1 channel with 1 sampling capacitor	L4	4(2)	3 channels with 1 sampling capacitor	42	4(2)	3 channels with 1 sampling capacitor
	G2_IO2	PA7	32	M4			J5			43		
	G2_IO3	PF15	-	-			J9			55		
	G2_IO4	PG0(3)	-	-			H9			56		
	G2_IO5	PG1(3)	-	-			G9			57		
Group 3	G3_IO1	PB0(1)	35	M5	3	2 channels with 1 sampling capacitor	M5	5	4 channels with 1 sampling capacitor	46	5	4 channels with 1 sampling capacitor
	G3_IO2	PB1	36	M6			M6			47		
	G3_IO3	PB2	37	L6			L6			48		
	G3_IO4	PF11	-	-			K6			49		
	G3_IO5	PF12	-	-			J7			50		
Group 4	G4_IO1	PA8	67	D11	3	2 channels with 1 sampling capacitor	D11	3	2 channels with 1 sampling capacitor	100	3	2 channels with 1 sampling capacitor
	G4_IO2	PA9	68	D10			D10			101		
	G4_IO3	PA10	69	C12			C12			102		

Table 14. Available touch sensing channels for STM32L1xx 256K (table 2/2) (continued)

Subfamily			STM32L1xx 256K									
Packages			LQFP100 / UFBGA100				UFBGA132			LQFP144		
Part numbers			STM32L151VC STM32L152VC STM32L162VC				STM32L151QC STM32L152QC STM32L162QC			STM32L151ZC STM32L152ZC STM32L162ZC		
Analog I/O group	Gx_IOy	GPIO	LQFP pin	BGA ball	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage
Group 5	G5_IO1	PA13	72	A11	3	2 channels with 1 sampling capacitor	A11	3	2 channels with 1 sampling capacitor	105	3	2 channels with 1 sampling capacitor
	G5_IO2	PA14	76	A10			A10			109		
	G5_IO3	PA15	77	A9			A9			110		
Group 6	G6_IO1	PB4	90	A7	4	3 channels with 1 sampling capacitor	A7	4	3 channels with 1 sampling capacitor	134	4	3 channels with 1 sampling capacitor
	G6_IO2	PB5	91	C5			C5			135		
	G6_IO3	PB6	92	B5			B5			136		
	G6_IO4	PB7	93	B4			B4			137		
Group 7	G7_IO1	PB12	51	L12	4	3 channels with 1 sampling capacitor	L12	5(2)	4 channels with 1 sampling capacitor	73	5(2)	4 channels with 1 sampling capacitor
	G7_IO2	PB13	52	K12			K12			74		
	G7_IO3	PB14	53	K11			K11			75		
	G7_IO4	PB15	54	K10			K10			76		
	G7_IO5	PG2(3)	-	-			G10			87		
	G7_IO6	PG3(3)	-	-			F9			88		
	G7_IO7	PG4(3)	-	-			F10			89		
Group 8	G8_IO1	PC0	15	H1	4	3 channels with 1 sampling capacitor	H1	4	3 channels with 1 sampling capacitor	26	4	3 channels with 1 sampling capacitor
	G8_IO2	PC1	16	J2			J2			27		
	G8_IO3	PC2	17	J3			J3			28		
	G8_IO4	PC3	18	K2			K2(3)			29(3)		

Table 14. Available touch sensing channels for STM32L1xx 256K (table 2/2) (continued)

Subfamily			STM32L1xx 256K									
Packages			LQFP100 / UFBGA100				UFBGA132			LQFP144		
Part numbers			STM32L151VC STM32L152VC STM32L162VC				STM32L151QC STM32L152QC STM32L162QC			STM32L151ZC STM32L152ZC STM32L162ZC		
Analog I/O group	Gx_IOy	GPIO	LQFP pin	BGA ball	Number of available pins	Usage	BGA ball	Number of available pins	Usage	LQFP pin	Number of available pins	Usage
Group 9	G9_IO1	PC4	33	K5	2	1 channel with 1 sampling capacitor	K5	4	3 channels with 1 sampling capacitor	44	4	3 channels with 1 sampling capacitor
	G9_IO2	PC5	34	L5			L5			45		
	G9_IO3	PF13	-	-			K7			53		
	G9_IO4	PF14	-	-			J8			54		
Group 10	G10_IO1	PC6	63	E12	4	3 channels with 1 sampling capacitor	E12	4	3 channels with 1 sampling capacitor	96	4	3 channels with 1 sampling capacitor
	G10_IO2	PC7	64	E11			E11			97		
	G10_IO3	PC8	65	E10			E10			98		
	G10_IO4	PC9	66	D12			D12			99		
Group11	G11_IO1	PF6	-	-	0	Cannot be used for touch sensing	G3	4	3 channels with 1 sampling capacitor	18	5	4 channels with 1 sampling capacitor
	G11_IO2	PF7	-	-			G4			19		
	G11_IO3	PF8	-	-			H4			20		
	G11_IO4	PF9	-	-			J6			21		
	G11_IO5	PF10	-	-			-			22		
Maximum number of channels			23 channels with 10 sampling capacitors				33 channels with 11 sampling capacitors			34 channels with 11 sampling capacitors		

1. This GPIO offers a reduced touch sensing sensitivity. It is thus recommended to use it as sampling capacitor I/O.
2. Not all the pins are available simultaneously on this group.
3. This GPIO can only be configured as sampling capacitor I/O when using HW acquisition mode and as channel I/O when using SW acquisition mode.

Table 15. Available touch sensing channels for STM32L15x 32K to 128K

Subfamily			STM32L15x 32K to 128K										
Packages			LQFP48 / VFQFPN48			LQFP64 / BGA64				LQFP100 / BGA100			
Part numbers			STM32L151C6 STM32L151C8 STM32L151CB STM32L152C6 STM32L152C8 STM32L152CB			STM32L151R6 STM32L151R8 STM32L151RB STM32L152R6 STM32L152R8 STM32L152RB				STM32L151V8 STM32L151VB STM32L152V8 STM32L152VB			
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	LQFP pin	BGA ball	Number of available pins	Usage	LQFP pin	BGA ball	Number of available pins	Usage
Group 1	G1_IO1	PA0	10	4	3 channels with 1 sampling capacitor	14	G2	4	3 channels with 1 sampling capacitor	23	L2	4	3 channels with 1 sampling capacitor
	G1_IO2	PA1	11			15	H2			24	M2		
	G1_IO3	PA2	12			16	F3			25	K3		
	G1_IO4	PA3	13			17	G3			26	L3		
Group 2	G2_IO1	PA6	16	2	1 channel with 1 sampling capacitor	22	G4	2	1 channel with 1 sampling capacitor	31	L4	2	1 channel with 1 sampling capacitor
	G2_IO2	PA7	17			23	H4			32	M4		
Group 3	G3_IO1	PB0	18	2	1 channel with 1 sampling capacitor	26	F5	2	1 channel with 1 sampling capacitor	35	M5	2	1 channel with 1 sampling capacitor
	G3_IO2	PB1	19			27	G5			36	M6		
Group 4	G4_IO1	PA8	29	3	2 channels with 1 sampling capacitor	41	D7	3	2 channels with 1 sampling capacitor	67	D11	3	2 channels with 1 sampling capacitor
	G4_IO2	PA9	30			42	C7			68	D10		
	G4_IO3	PA10	31			43	C6			69	C12		
Group 5	G5_IO1	PA13	34	3	2 channels with 1 sampling capacitor	46	A8	3	2 channels with 1 sampling capacitor	72	A11	3	2 channels with 1 sampling capacitor
	G5_IO2	PA14	37			49	A7			76	A10		
	G5_IO3	PA15	38			50	A6			77	A9		

Table 15. Available touch sensing channels for STM32L15x 32K to 128K (continued)

Subfamily			STM32L15x 32K to 128K										
Packages			LQFP48 / VFQFPN48			LQFP64 / BGA64				LQFP100 / BGA100			
Part numbers			STM32L151C6 STM32L151C8 STM32L151CB STM32L152C6 STM32L152C8 STM32L152CB			STM32L151R6 STM32L151R8 STM32L151RB STM32L152R6 STM32L152R8 STM32L152RB				STM32L151V8 STM32L151VB STM32L152V8 STM32L152VB			
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	LQFP pin	BGA ball	Number of available pins	Usage	LQFP pin	BGA ball	Number of available pins	Usage
Group 6	G6_IO1	PB4	40	2	1 channel with 1 sampling capacitor	56	A4	2	1 channel with 1 sampling capacitor	90	A7	2	1 channel with 1 sampling capacitor
	G6_IO2	PB5	41			57	C4			91	C5		
Group 7	G7_IO1	PB12	25	4	3 channels with 1 sampling capacitor	33	H8	4	3 channels with 1 sampling capacitor	51	L12	4	3 channels with 1 sampling capacitor
	G7_IO2	PB13	26			34	G8			52	K12		
	G7_IO3	PB14	27			35	F8			53	K11		
	G7_IO4	PB15	28			36	F7			54	K10		

Table 15. Available touch sensing channels for STM32L15x 32K to 128K (continued)

Subfamily			STM32L15x 32K to 128K										
Packages			LQFP48 / VFQFPN48			LQFP64 / BGA64				LQFP100 / BGA100			
Part numbers			STM32L151C6 STM32L151C8 STM32L151CB STM32L152C6 STM32L152C8 STM32L152CB			STM32L151R6 STM32L151R8 STM32L151RB STM32L152R6 STM32L152R8 STM32L152RB				STM32L151V8 STM32L151VB STM32L152V8 STM32L152VB			
Analog I/O group	Gx_IOy	GPIO	Pin	Number of available pins	Usage	LQFP pin	BGA ball	Number of available pins	Usage	LQFP pin	BGA ball	Number of available pins	Usage
Group 8	G8_IO1	PC0	-	0	Cannot be used for touch sensing	8	E3	4/3	3/2 channels with 1 sampling capacitor	15	H1	4	3 channels with 1 sampling capacitor
	G8_IO2	PC1	-			9	E2			16	J2		
	G8_IO3	PC2	-			10	F2			17	J3		
	G8_IO4	PC3	-			11	-			18	K2		
Group 9	G9_IO1	PC4	-	0		24	H5	2	1 channel with 1 sampling capacitor	33	K5	2	1 channel with 1 sampling capacitor
	G9_IO2	PC5	-			25	H6			34	L5		
Group 10	G10_IO1	PC6	-	0		37	F6	4	3 channels with 1 sampling capacitor	63	E12	4	3 channels with 1 sampling capacitor
	G10_IO2	PC7	-			38	E7			64	E11		
	G10_IO3	PC8	-			39	E8			65	E10		
	G10_IO4	PC9	-			40	D8			66	D12		
Maximum number of channels			13 channels with 7 sampling capacitors			20/19 channels with 10 sampling capacitors				20 channels with 10 sampling capacitors			

6 Memory footprint

The STMTouch driver memory footprint depends on the following parameters:

- acquisition principle (CT or PXS)
- C compiler and options: memory model, size or speed optimization
- number of capacitive sensing channels, acquisition banks, sensor type (touchkey, linear or rotary).

6.1 STM8L

The Cosmic STM8 C compiler v4.3.6 has been used with the following command line options:

+modsl0 -pxp +compact + split -pp

Table 19 shows the memory footprint taken by the STMTouch driver for different configurations.

Table 16. STM8L101 memory footprint with software acquisition mode(1)

Channels	Banks	Sensors	ROM (Kbytes)	RAM (bytes)
3	2	3 TKeys	~5.3	~160

1. The content of this table is provided for information purposes only

Table 17. STM8L15x memory footprint with hardware acquisition mode(1)

Channels	Banks	Sensors	ROM (Kbytes)	RAM (bytes)
1	1	1 TKey	~5.2	~140
10	2	10 TKeys	~5.4	~300
16	2	10 TKeys + 1 linear + 1 rotary	~7.4	~450

1. The content of this table is provided for information purposes only

Table 18. STM8L15x memory footprint with software acquisition mode(1)

Channels	Banks	Sensors	ROM (Kbytes)	RAM (bytes)
1	1	1 TKey	~4.6	~130
10	2	10 TKeys	~4.8	~280
16	2	10 TKeys + 1 linear + 1 rotary	~6.9	~430

1. The content of this table is provided for information purposes only

6.2 STM8TL5x

The Cosmic STM8 C compiler v4.3.6 has been used with the following command line options:

+modsl0 -pxp +compact + split -pp

Table 19 shows the memory footprint taken by the STMTouch driver for different configurations.

Table 19. STM8TL5x memory footprint(1)

Channels	Banks	Sensors	ROM (Kbytes)	RAM (bytes)
1	1	1 touchkey	~4.3	~70
3	1	3 touchkeys	~4.4	~110
19	4	19 touchkeys	~4.7	~440
26	6	16 linears-1ch 2 linears-5ch	~6.2	~680
26	6	16 touchkeys 2 linears-5ch	~7.8	~570

1. The content of this table is provided for information purposes only

6.3 STM32F0xx

The IAR ANSI C/C++ compiler V6.40.1 for ARM® has been used with the following command line options:

optimization high-balanced

Table 20 shows the memory footprint taken by the STMTouch driver for different configurations.

Table 20. STM32F0xx memory footprint(1)

Channels	Banks	Sensors	ROM (Kbytes)	RAM (bytes)
3	3	3 touchkeys	~3.9	~130
3	3	1 linear-3ch	~4.9	~120
15	6	9 touchkeys 1 linear-3ch 1 rotary-3ch	~7.7	~350

1. The content of this table is provided for information purposes only

6.4 STM32F3xx

The IAR ANSI C/C++ compiler V6.40.1 for ARM® has been used with the following command line options:

optimization high-balanced

Table 21 and *Table 22* show the memory footprint taken by the STMTouch driver for different configurations.

Table 21. STM32F30x memory footprint(1)

Channels	Banks	Sensors	ROM (Kbytes)	RAM (bytes)
2	2	2 TKeys	~3.2	~120

1. The content of this table is provided for information purposes only

Table 22. STM32F37x memory footprint(1)

Channels	Banks	Sensors	ROM (Kbytes)	RAM (bytes)
3	3	3 TKeys	~3.3	~140
3	3	1 Linear-3ch	~4.3	~130

1. The content of this table is provided for information purposes only

6.5 STM32L1xx

The IAR ANSI C/C++ compiler V6.30.1 for ARM® has been used with the following command line options:

optimization high-balanced

Table 23 shows the memory footprint taken by the STMTouch driver using the **hardware acquisition mode** (using Timers) on **STM32L1xx High-density devices**:

Table 23. STM32L1xx memory footprint, example 1(1)

Channels	Banks	Sensors	ROM (Kbytes)	RAM (bytes)
3	3	3 TKeys	~6.2	~370
3	3	1 Linear-3ch	~7.2	~360
16	3	10 TKeys 1 Linear-3ch 1 Rotary-3ch	~9.1	~630

1. The content of this table is provided for information purposes only

Table 24 shows the memory footprint taken by the STMTouch driver using the **software acquisition mode** on **STM32L1xx Medium-density devices**:

Table 24. STM32L1xx memory footprint, example 2(1)

Channels	Banks	Sensors	ROM (Kbytes)	RAM (bytes)
2	2	2 TKeys	~5.2	~400
3	3	1 Linear-3ch	~6.2	~420
16	3	10 TKeys 1 Linear-3ch 1 Rotary-3ch	~8.7	~690

1. The content of this table is provided for information purposes only

7 Revision history

Table 25. Document revision history

Date	Revision	Changes
21-Dec-2012	1	Initial release.
30-Apr-2013	2	Added support for STM32F3xx and STM32L1xx products. Updated *Section 2: Surface charge transfer (CT) acquisition principle*. Replaced everywhere in the document the single ordering code (old ordering code: STMTOUCH-LIB) with multiple ordering codes (new ordering codes: xxxx-TOUCH-LIB). Updated document title. Added *Table 1: Device summary*.
03-Sep-2013	3	Added STM8L in *Section : Description*. Updated *Section 2: Surface charge transfer (CT) acquisition principle*. Updated *Section 3: STMTouch Library architecture*. Updated *Table 2: List of peripherals used by the STMTouch driver*. Added package row in *Table 4: Available touch-sensing channels for STM8L15x / STM8L16x (table 1/2)*. Added package row in *Table 5: Available touch-sensing channels for STM8L15x / STM8L16x (table 2/2)*. Updated *Table 7: Available touch sensing channels for STM32F042*. Added *Section 5.1: STM8L*. Added *Section 6.1: STM8L*. Fixed footnote issues in *Table 9*, *Table 11* and *Table 14*.
13-Feb-2014	4	Updated all channel tables of STM8L, STM32L and STM32F0 products. Added STM32F042 channel table *Table 7: Available touch sensing channels for STM32F042* Added STM32L1xx 512K channel table *Table 11: Available touch sensing channels for STM32L1xx 512K*

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