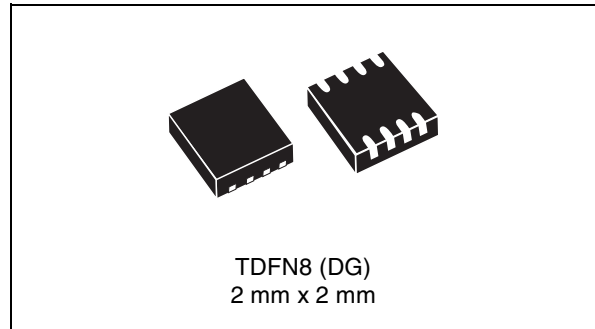


## Dual push-button Smart Reset™ with user-adjustable setup delays

### Features

- Dual Smart Reset push-button inputs with extended reset setup delay
- Adjustable Smart Reset setup delay ( $t_{SRC}$ ): by external capacitor or three-state logic (product options):  $t_{SRC} = 2, 6, 10$  s (min.)
- Power-on reset
- Single  $\overline{RST}$  output, active-low, open-drain
- Factory-programmable thresholds to monitor  $V_{CC}$  in the range of 1.575 to 4.625 V typ.
- Operating voltage 1.0 V (active-low output valid) to 5.5 V
- Low supply current
- Operating temperature: industrial grade  $-40$  °C to  $+85$  °C
- TDFN8 package: 2 mm x 2 mm x 0.75 mm
- RoHS compliant



### Applications

- Mobile phones, smartphones
- e-books
- MP3 players
- Games
- Portable navigation devices
- Any application that requires delayed reset push-button(s) response for improved system stability

**Table 1. Device summary**

Part number	Voltage inputs		Smart Reset inputs			$t_{SRC}$ programming		Reset or Power Good outputs		Package
	$V_{CC}$	$V_{BAT}$	$\overline{SR0}$	$\overline{SR1}$	SRE immediate, independent	Ext. SRC pin	Three-state input TSR	$\overline{RST}$	$\overline{BLD}$	
STM6502 <sup>(1)</sup>	✓		✓	✓		✓		✓		TDFN-8L
STM6503	✓		✓	✓			✓	✓		TDFN-8L
STM6504 <sup>(1)</sup>	✓		✓		✓		✓	✓		TDFN-8L
STM6505	✓	✓	✓	✓		✓		✓	✓	TDFN-8L

1. Contact local ST sales office for availability.

# Contents

<b>1</b>	<b>Description</b> .....	<b>5</b>
1.1	Smart Reset devices .....	5
1.2	Pin descriptions .....	10
1.2.1	Power supply ( $V_{CC}$ ) .....	10
1.2.2	Ground ( $V_{SS}$ ) .....	10
1.2.3	Primary Smart Reset input ( $\overline{SR0}$ ) .....	10
1.2.4	Secondary Smart Reset input ( $\overline{SR1}$ ) .....	10
1.2.5	Edge-triggered Smart Reset input (SRE pin) – STM6504 only .....	11
1.2.6	Adjustable delay of Smart Reset input (SRC pin) – STM6502 and STM6505 only .....	11
1.2.7	Programmable Smart Reset input delay (TSR pin) – STM6503 and STM6504 only .....	12
1.2.8	Reset output ( $\overline{RST}$ ) .....	12
1.2.9	Battery monitoring input ( $V_{BAT}$ ) – STM6505 only .....	12
1.2.10	Battery low detect output ( $\overline{BLD}$ ) – STM6505 only .....	12
<b>2</b>	<b>Typical operating characteristics</b> .....	<b>13</b>
<b>3</b>	<b>Maximum ratings</b> .....	<b>15</b>
<b>4</b>	<b>DC and AC parameters</b> .....	<b>16</b>
<b>5</b>	<b>Package mechanical data</b> .....	<b>20</b>
<b>6</b>	<b>Part numbering</b> .....	<b>26</b>
<b>7</b>	<b>Package marking</b> .....	<b>27</b>
<b>8</b>	<b>Revision history</b> .....	<b>28</b>

## List of tables

Table 1.	Device summary . . . . .	1
Table 2.	Signal names . . . . .	7
Table 3.	$t_{SRC}$ programmed by an ideal external capacitor – STM6502 and STM6505 . . . . .	11
Table 4.	Absolute maximum ratings . . . . .	15
Table 5.	Operating and measurement conditions . . . . .	16
Table 6.	DC and AC characteristics . . . . .	17
Table 7.	$V_{CC}$ voltage thresholds . . . . .	19
Table 8.	TDFN – 8-lead 2 x 2 x 0.75 mm, 0.5 mm pitch package mechanical data . . . . .	21
Table 9.	Parameter for landing pattern - TDFN – 8-lead 2 x 2 mm package . . . . .	22
Table 10.	Carrier tape dimensions . . . . .	23
Table 11.	Reel dimensions . . . . .	24
Table 12.	Ordering information scheme . . . . .	26
Table 13.	Package marking . . . . .	27
Table 14.	Document revision history . . . . .	28

## List of figures

Figure 1.	Logic diagrams . . . . .	6
Figure 2.	Pin connections . . . . .	6
Figure 3.	Block diagram - STM6502, STM6503, STM6504 . . . . .	8
Figure 4.	Block diagram - STM6505 . . . . .	8
Figure 5.	Single-button Smart Reset typical hookup . . . . .	9
Figure 6.	Dual-button Smart Reset typical hookup . . . . .	9
Figure 7.	STM6502, STM6503 timing . . . . .	10
Figure 8.	STM6504 timing . . . . .	11
Figure 9.	STM6505 timing . . . . .	12
Figure 10.	Supply current ( $I_{CC}$ ) vs. temperature (STM6505) . . . . .	13
Figure 11.	Smart Reset delay ( $t_{SRC}$ ) vs. temperature, $C_{SRC} = 0.62 \mu F$ (STM6505) . . . . .	13
Figure 12.	Reset threshold ( $V_{RST}$ ) vs. temperature, "S" threshold option, $V_{CC}$ falling (STM6505) . . . . .	14
Figure 13.	$V_{BAT}$ monitoring threshold ( $V_{BATTH}$ ) vs. temperature, falling (STM6505) . . . . .	14
Figure 14.	AC testing input/output waveforms . . . . .	16
Figure 15.	TDFN – 8-lead 2 x 2 x 0.75 mm, 0.5 mm pitch package outline . . . . .	21
Figure 16.	Landing pattern - TDFN – 8-lead 2 x 2 mm without thermal pad . . . . .	22
Figure 17.	Carrier tape . . . . .	23
Figure 18.	Reel dimensions . . . . .	24
Figure 19.	Tape trailer/leader . . . . .	25
Figure 20.	Pin 1 orientation . . . . .	25
Figure 21.	Package marking, top view . . . . .	27

# 1 Description

**STM6502** has two combined Smart Reset inputs ( $\overline{\text{SR0}}$  and  $\overline{\text{SR1}}$ ) with delayed Smart Reset setup time ( $t_{\text{SRC}}$ ) programmed by an external capacitor on the SRC pin.

**STM6503** is similar to STM6502, has two combined delayed Smart Reset inputs ( $\overline{\text{SR0}}$ ,  $\overline{\text{SR1}}$ ) and three user-selectable delayed Smart Reset setup time ( $t_{\text{SRC}}$ ) options of 2 s, 6 s and 10 s through a three-state TSR input pin: when connected to ground,  $t_{\text{SRC}} = 2$  s; when left open,  $t_{\text{SRC}} = 6$  s; when connected to  $V_{\text{CC}}$ ,  $t_{\text{SRC}} = 10$  s (all the times are minimum).

**STM6504** has two independent Smart Reset inputs.  $\overline{\text{SR0}}$  provides the delayed Smart Reset setup time ( $t_{\text{SRC}}$ ) function with three user-selectable  $t_{\text{SRC}}$  options through a three-state TSR input pin: when connected to ground,  $t_{\text{SRC}} = 2$  s; when left open,  $t_{\text{SRC}} = 6$  s; when connected to  $V_{\text{CC}}$ ,  $t_{\text{SRC}} = 10$  s (all the times are minimum). SRE provides instant reset. SRE is edge-triggered with a special debounce time ( $t_{\text{DEBOUNCE}} = 240$  ms min.) at the falling edge after a valid reset period.

**STM6505** has two combined delayed Smart Reset inputs ( $\overline{\text{SR0}}$ ,  $\overline{\text{SR1}}$ ) and provides an adjustable reset delay setup time via an external capacitor connected to the SRC pin. The  $\overline{\text{RST}}$  output depends also on the  $V_{\text{CC}}$  monitoring threshold. STM6505 also provides independent low battery detect ( $\overline{\text{BLD}}$ ) output controlled by the secondary external input voltage  $V_{\text{BAT}}$ .  $V_{\text{BAT}}$  is monitored for low voltage and provides an indication on the battery low detect output pin ( $\overline{\text{BLD}}$ ).  $V_{\text{BAT}}$  threshold is 1.25 V, fixed, and an external resistor divider is to be used to set the actual battery voltage threshold.  $V_{\text{BAT}}$  threshold hysteresis is 8 mV typ. (16 mV max.).  $V_{\text{BAT}}$  is voltage monitoring input only, the device is powered only from the  $V_{\text{CC}}$  pin;  $V_{\text{CC}}$  must be  $\geq 1.575$  V for proper operation of the  $V_{\text{BAT}}$  comparator.

## 1.1 Smart Reset devices

The Smart Reset device family STM65xx provides a useful feature that ensures inadvertent short reset push-button closures do not cause system resets. This is done by implementing extended Smart Reset input delay ( $t_{\text{SRC}}$ ). Once the valid Smart Reset input levels and setup delay are met, the device generates an output reset pulse with user-programmable timeout period ( $t_{\text{REC}}$ ).

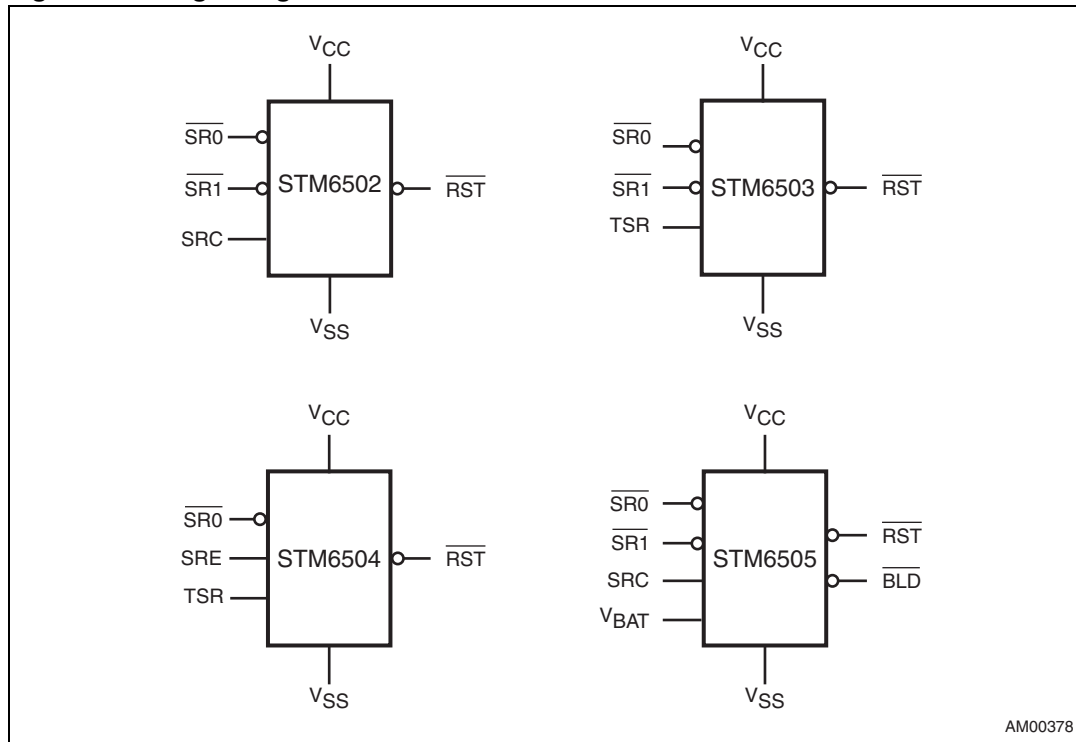
The Smart Reset inputs can be also connected to the applications interrupt to allow the control of both the interrupt pin and the hard reset functions. If the push-buttons are closed for a short time, the processor is only interrupted. If the system still does not respond properly, holding the push-buttons for the extended setup time ( $t_{\text{SRC}}$ ) causes hard reset of the processor through the reset outputs. The Smart Reset feature helps significantly increase system stability.

The STM65xx family of Smart Reset devices consists of low current microprocessor reset circuits targeted at applications such as MP3 players, navigation, smartphones or mobile phones; generally any application that requires delayed reset push-button(s) response for improved system stability. The STM65xx devices feature single or dual Smart Reset inputs (SR). The delayed Smart Reset setup time ( $t_{\text{SRC}}$ ) options of 2 s, 6 s and 10 s (all min.) are adjustable by an external capacitor on the SRC pin or selectable by three-state logic. The delayed setup period ignores switch closures shorter than  $t_{\text{SRC}}$ , thus preventing unwanted resets.

The STM65xx devices have active-low (optionally active-high) open-drain reset ( $\overline{RST}$ ) output(s) with or without internal pull-up resistor or push-pull as output options, with factory-programmed or capacitor-adjustable or push-buttons defined output reset pulse duration, with or without power-on reset function.

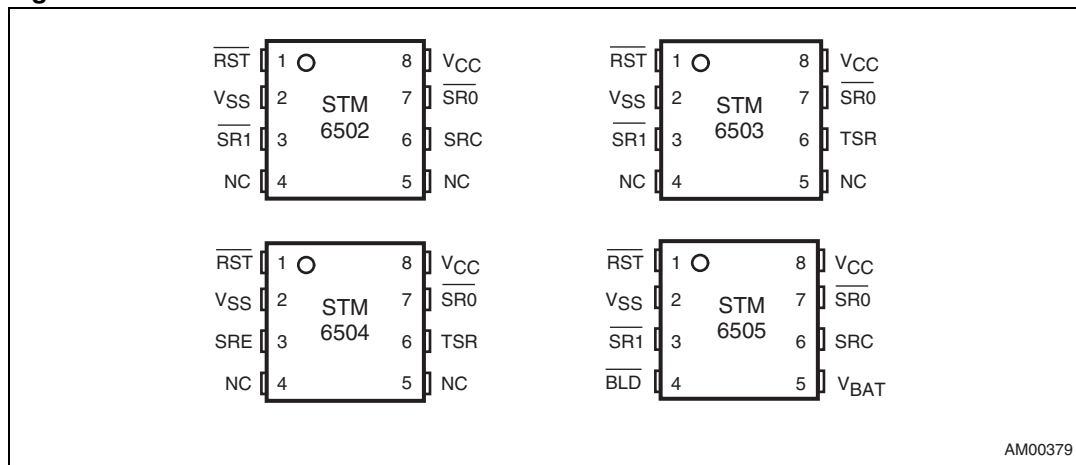
Some devices also have an undervoltage monitoring feature: the reset output is also asserted when the monitored supply voltage  $V_{CC}$  drops below the specified threshold. The reset output remains asserted for the reset timeout period ( $t_{REC}$ ) after the monitored supply voltage goes above the specified threshold.

Figure 1. Logic diagrams



AM00378

Figure 2. Pin connections

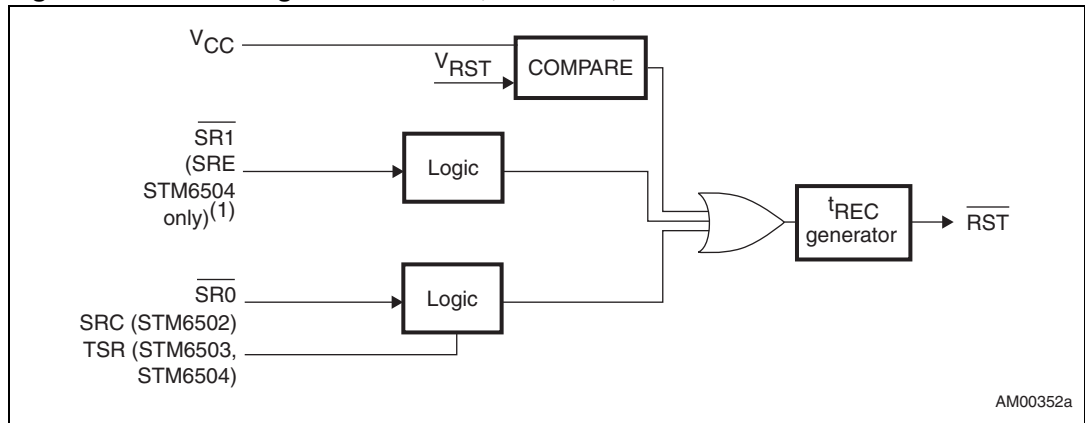


AM00379

Table 2. Signal names

Symbol	Input/output	Description
$\overline{\text{RST}}$	Output	Open-drain reset output, active-low.
$\overline{\text{BLD}}$	Output	Battery low detect output, active-low, open-drain. STM6505 only.
$\overline{\text{SR0}}$	Input	Primary push-button Smart Reset input. Active-low, with or without internal 65 k $\Omega$ pull-up to $V_{\text{CC}}$ (product options).
$\overline{\text{SR1}}$	Input	Secondary push-button Smart Reset input - combines with the primary push-button reset to provide setup delay time before reset. Active-low, with or without internal 65 k $\Omega$ pull-up to $V_{\text{CC}}$ (product options).
SRE	Input	Secondary push-button Smart Reset input - provides instant Smart Reset. SRE is edge-triggered with a special debounce time ( $t_{\text{DEBOUNCE}} = 240 \text{ ms min.}$ ) at the falling edge after a valid reset period. Active-high, no internal pull-up to $V_{\text{CC}}$ . STM6504 only.
SRC	Input	Smart Reset input delay setup control: connect to an external capacitor to adjust the delay setup time ( $t_{\text{SRC}}$ ). STM6502 and STM6505 only.
TSR	Input	A three-state Smart Reset input delay setup control. When connected to ground, $t_{\text{SRC}} = 2 \text{ s}$ ; when left open, $t_{\text{SRC}} = 6 \text{ s}$ ; when connected to $V_{\text{CC}}$ , $t_{\text{SRC}} = 10 \text{ s}$ (all times are minimum). TSR is a DC-type input, intended to be either permanently grounded, permanently connected to $V_{\text{CC}}$ or permanently left open. If left open, for improved system glitch immunity it is strongly recommended to connect a 0.1 $\mu\text{F}$ decoupling ceramic capacitor between the TSR and $V_{\text{SS}}$ pins. STM6503 and STM6504 only.
$V_{\text{CC}}$	Supply	Supply voltage input. Power supply for the device and an input for the monitored supply voltage. A 0.1 $\mu\text{F}$ decoupling ceramic capacitor is recommended to be connected between the $V_{\text{CC}}$ and $V_{\text{SS}}$ pins.
$V_{\text{BAT}}$	Input	Battery voltage monitoring input. STM6505 only.
$V_{\text{SS}}$	Supply	Ground
NC		No connect (not bonded); should be connected to $V_{\text{SS}}$ .

Figure 3. Block diagram - STM6502, STM6503, STM6504



1. STM6504 only:  $\overline{SR0}$  and SRE are working independently. SRE is edge-triggered and has a special debounce time ( $t_{DEBOUNCE} = 240 \text{ ms min.}$ ) at the falling edge after a valid reset period.

Figure 4. Block diagram - STM6505

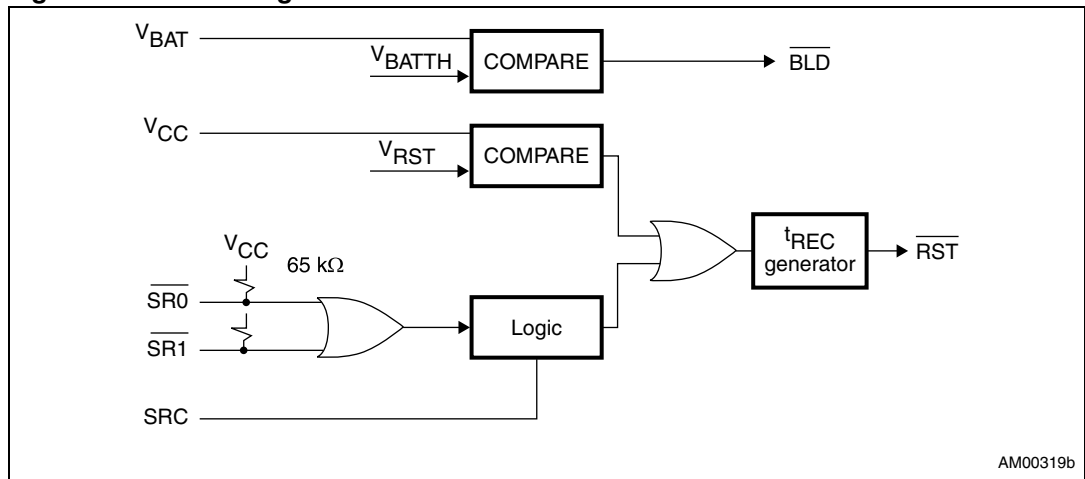




Figure 5. Single-button Smart Reset typical hookup

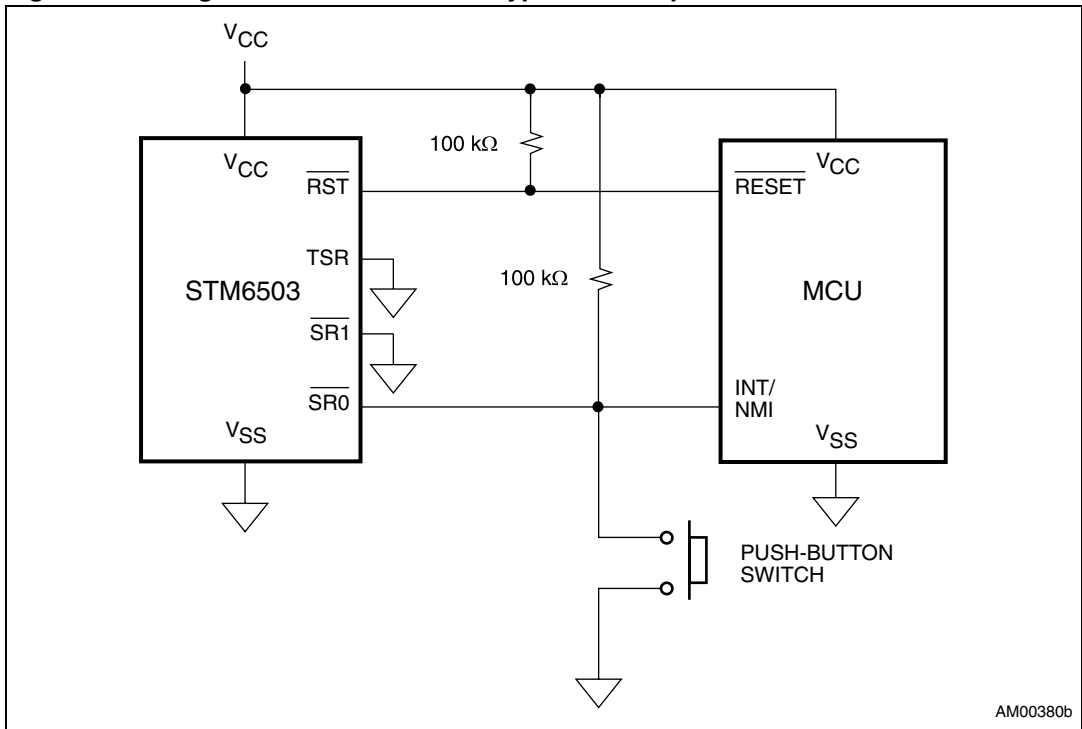
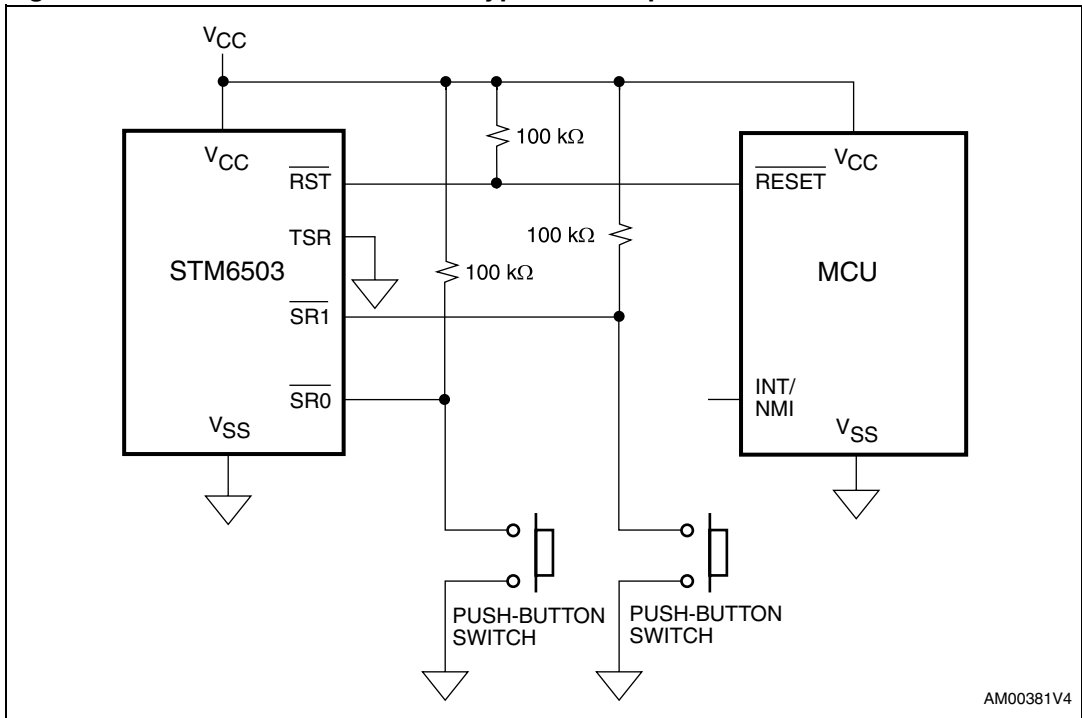


Figure 6. Dual-button Smart Reset typical hookup



## 1.2 Pin descriptions

### 1.2.1 Power supply ( $V_{CC}$ )

This pin is used to provide the power to the device and to monitor the power supply. A 0.1  $\mu\text{F}$  decoupling ceramic capacitor is recommended to be connected between the  $V_{CC}$  and  $V_{SS}$  pins.

### 1.2.2 Ground ( $V_{SS}$ )

This is the supply ground for the device.

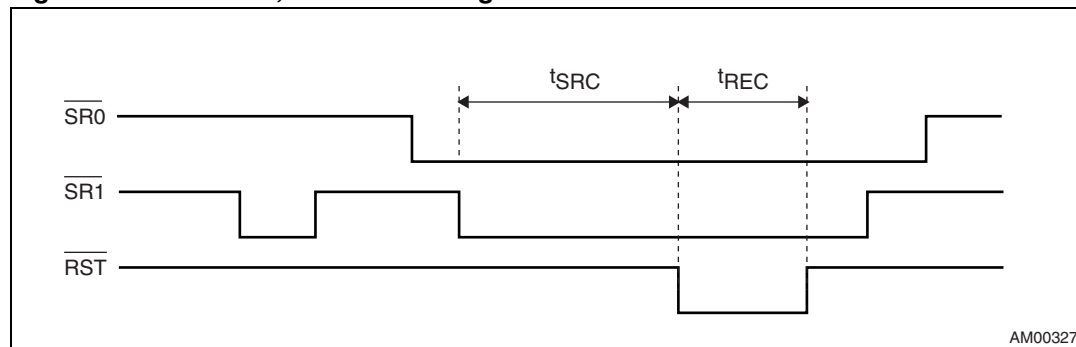
### 1.2.3 Primary Smart Reset input ( $\overline{\text{SR0}}$ )

The primary push-button Smart Reset input, active-low pin is connected to the first push-button switch.

### 1.2.4 Secondary Smart Reset input ( $\overline{\text{SR1}}$ )

The secondary push-button Smart Reset input, active-low pin is connected to the second push-button switch. Keeping both Smart Reset inputs  $\overline{\text{SR0}}$  and  $\overline{\text{SR1}}$  active for longer than  $t_{\text{SRC}}$  activates the reset output pulse.

**Figure 7. STM6502, STM6503 timing**



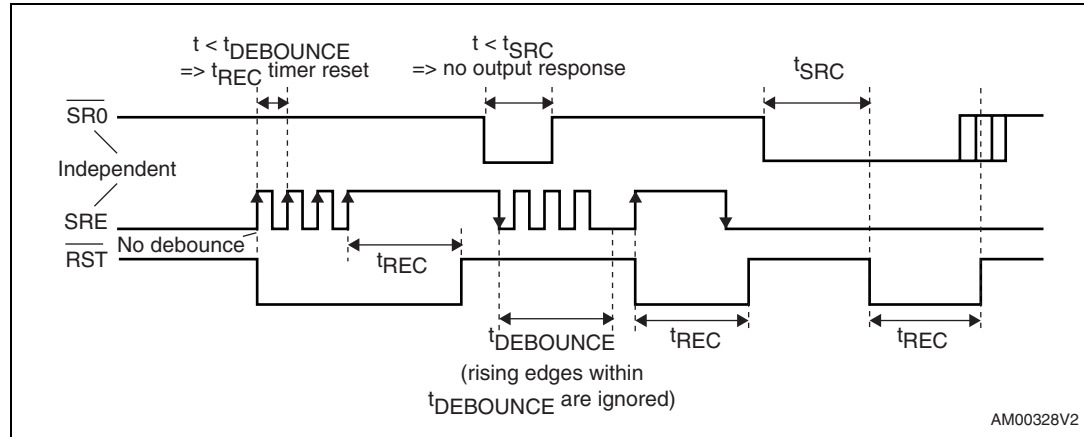
Reset is asserted “low” right after the Smart Reset setup delay ( $t_{\text{SRC}}$ ) has been met and returns to high after the  $t_{\text{REC}}$  period.

### 1.2.5 Edge-triggered Smart Reset input (SRE pin) – STM6504 only

The SRE pin is active-high, immediate and independent reset input that includes an edge trigger with debounce delay  $t_{DEBOUNCE}$  on the falling edge.

*Note:* The triggering edge must be a high-to-low or low-to-high transition with a slew-rate faster than  $1\text{ V}/\mu\text{s}$  typ.

**Figure 8. STM6504 timing**



### 1.2.6 Adjustable delay of Smart Reset input (SRC pin) – STM6502 and STM6505 only

This pin controls the setup time before the push-button action is validated by the reset output. It is connected to an external capacitor ( $C_{SRC}$ ), which is tied to ground to provide the desired value of the setup time ( $t_{SRC}$ ).

Calculated  $t_{SRC}$  and  $C_{SRC}$  examples are given in [Table 3](#). Refer also to [Table 6](#).

**Table 3.  $t_{SRC}$  programmed by an ideal external capacitor – STM6502 and STM6505**

Calculated $C_{SRC}$ value [ $\mu\text{F}$ ]	Setup delay $t_{SRC}$ [s] <sup>(1)(2)</sup>			Closest common $C_{SRC}$ value [ $\mu\text{F}$ ]
	Min.	Typ.	Max.	
0.2	2	2.5	3.0	0.22
0.3	3	3.75	4.5	0.33
0.6	6	7.5	9	0.56
1	10	12.5	15	1

- At 25 °C. Example calculations based on an ideal capacitor. During application design and component selection it should be considered that the current flowing into the external  $t_{SRC}$  programming capacitor ( $C_{SRC}$ ) is on the order of 100 nA, therefore a low-leakage capacitor (ceramic or film capacitor) should be used and placed as close as possible to the SRC pin. Also an adequate low-leakage PCB environment should be ensured to prevent  $t_{SRC}$  accuracy from being affected. A recommended minimum value of  $C_{SRC}$  is 0.01  $\mu\text{F}$ .
- In case of repeated activations of the  $t_{SRC}$  timer, an interval of 10 ms min. is needed between the activations to fully discharge  $C_{SRC}$ , so that the next  $t_{SRC}$  is as specified.

### 1.2.7 Programmable Smart Reset input delay (TSR pin) – STM6503 and STM6504 only

The TSR pin allows the user to program the setup time before the push-button action is validated by the reset output. It is controlled by different voltage levels on the three-state TSR input pin: when connected to ground,  $t_{SRC} = 2$  s; when left open,  $t_{SRC} = 6$  s; when connected to  $V_{CC}$ ,  $t_{SRC} = 10$  s (all times are minimum). TSR is a DC-type input, intended to be either permanently grounded, permanently connected to  $V_{CC}$  or permanently left open. If it is left open, for improved system glitch immunity it is strongly recommended to connect a 0.1  $\mu$ F decoupling ceramic capacitor between the TSR and  $V_{SS}$  pins.

### 1.2.8 Reset output ( $\overline{RST}$ )

$\overline{RST}$  is the active-low, open-drain reset output in the Smart Reset family.

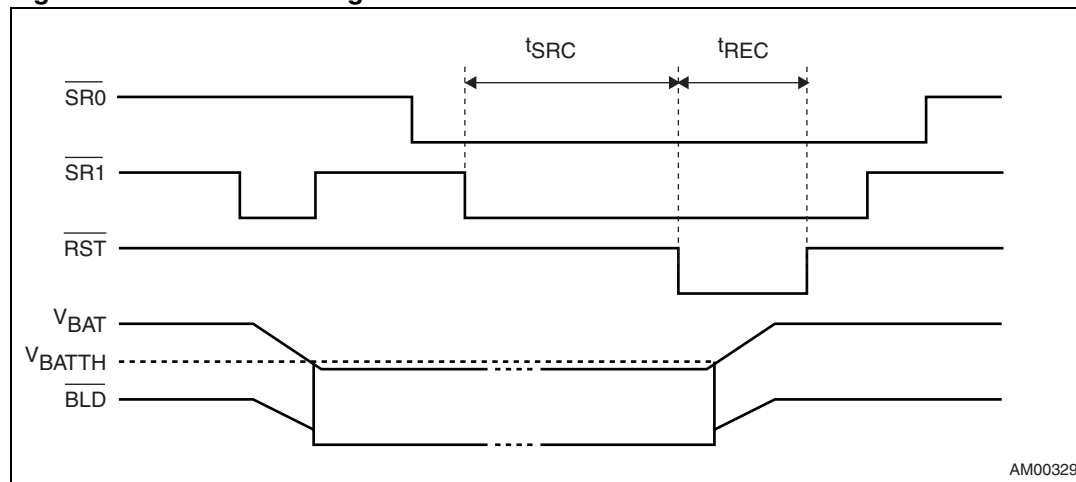
### 1.2.9 Battery monitoring input ( $V_{BAT}$ ) – STM6505 only

$V_{BAT}$  is an input for monitoring the battery voltage.  $V_{BAT}$  threshold is 1.25 V, fixed, and an external resistor divider is to be used to set the actual battery voltage threshold.

### 1.2.10 Battery low detect output ( $\overline{BLD}$ ) – STM6505 only

The battery low detect output is controlled by the  $V_{BAT}$  voltage monitoring input and is active-low, open-drain, with no pull-up.

**Figure 9. STM6505 timing**



AM00329

## 2 Typical operating characteristics

Figure 10. Supply current ( $I_{CC}$ ) vs. temperature (STM6505)

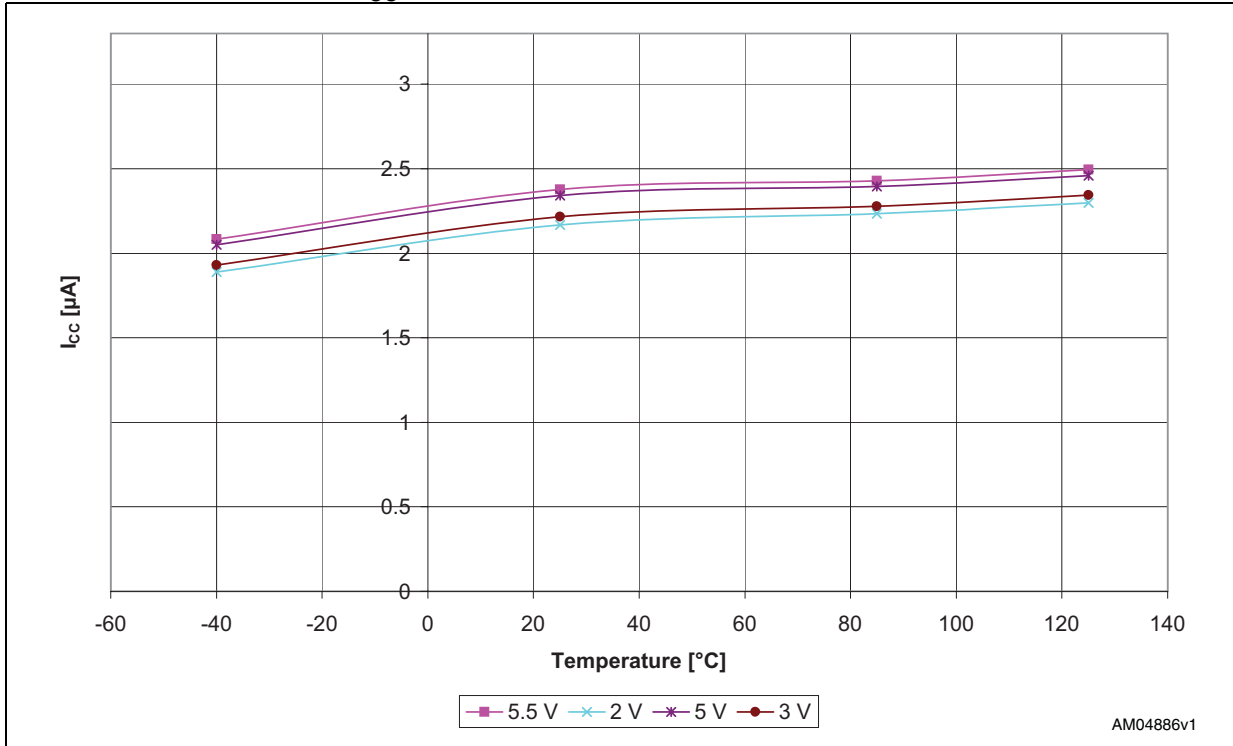


Figure 11. Smart Reset delay ( $t_{SRC}$ ) vs. temperature,  $C_{SRC} = 0.62 \mu F$  (STM6505)

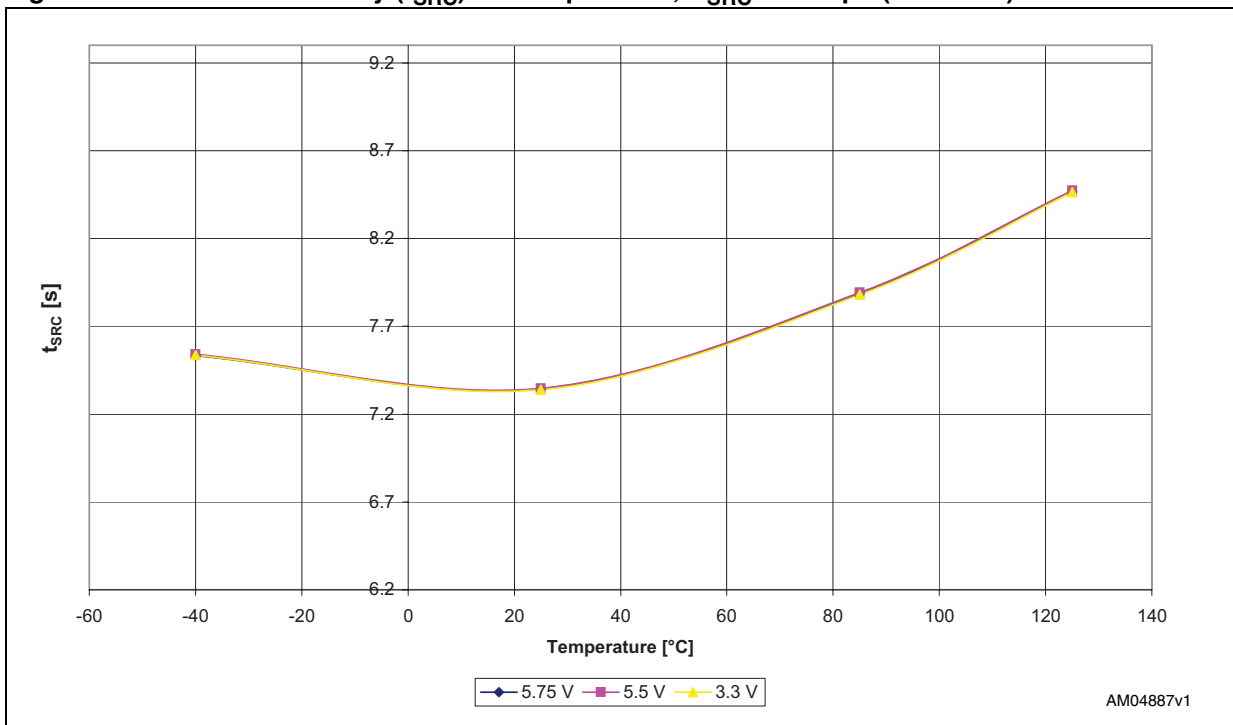


Figure 12. Reset threshold ( $V_{RST}$ ) vs. temperature, “S” threshold option,  $V_{CC}$  falling (STM6505)

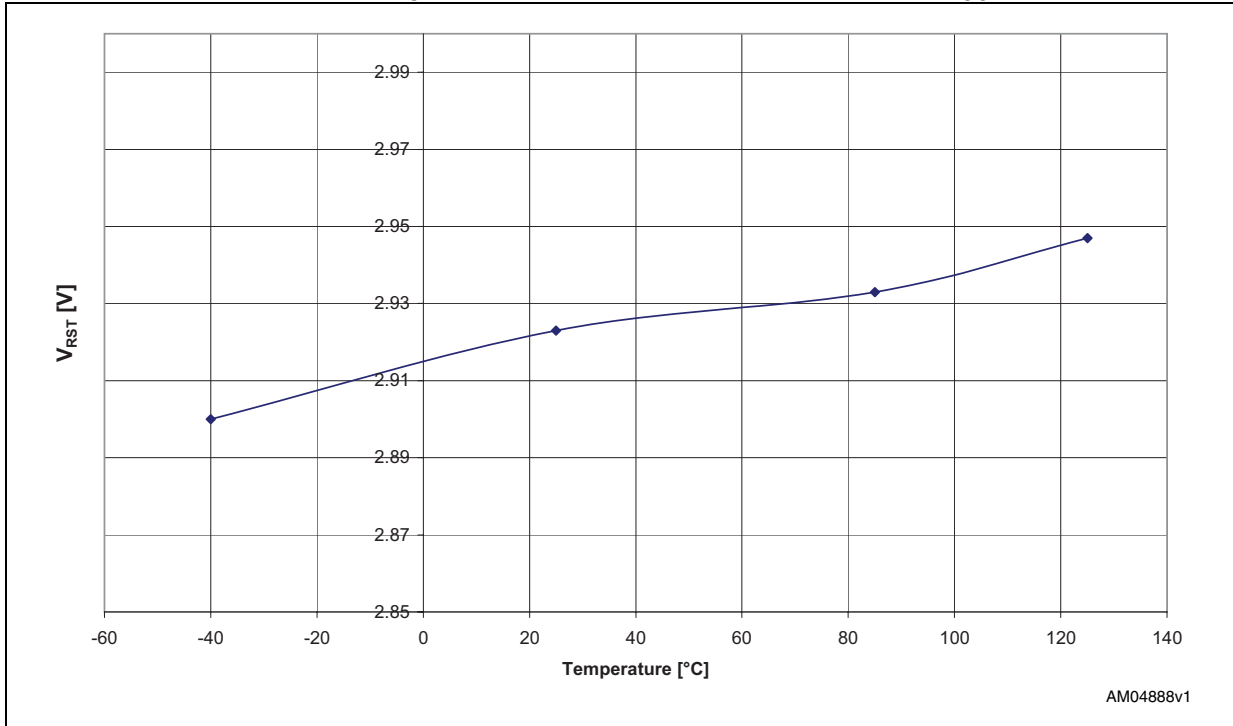
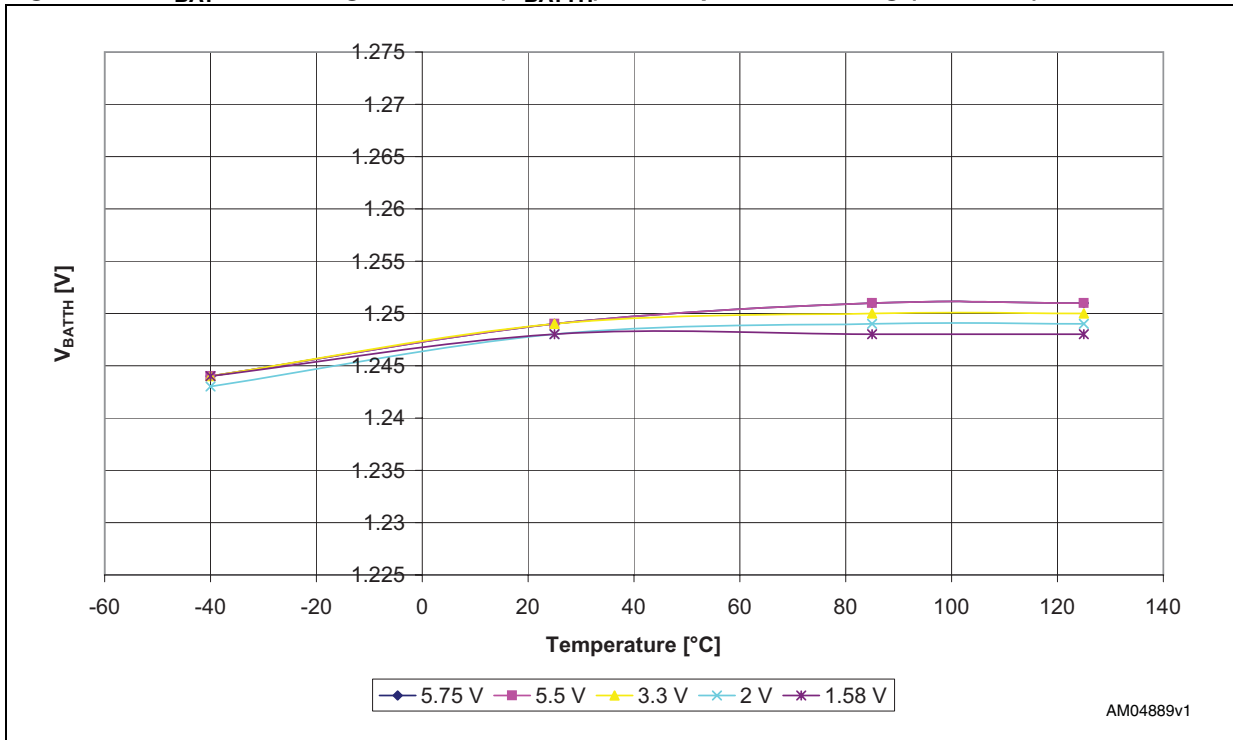


Figure 13.  $V_{BAT}$  monitoring threshold ( $V_{BATTH}$ ) vs. temperature, falling (STM6505)



### 3 Maximum ratings

Stressing the device above the rating listed in [Table 4: Absolute maximum ratings](#) may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Refer also to the STMicroelectronics SURE Program and other relevant quality documents.

**Table 4. Absolute maximum ratings**

Symbol	Parameter		Value	Unit
$T_{STG}$	Storage temperature ( $V_{CC}$ off)		-55 to +150	°C
$T_{SLD}^{(1)}$	Lead solder temperature for 10 seconds		260	°C
$\theta_{JA}$	Thermal resistance (junction to ambient)	TDFN8	149.0	°C/W
$V_{IO}$	Input or output voltage		-0.3 to 5.5 <sup>(2)</sup>	V
$V_{CC}$	Supply voltage		-0.3 to 7	V

1. Reflow at peak temperature of 260 °C. The time above 255 °C must not exceed 30 seconds.
2. For inputs or outputs with internal pull-up resistors and push-pull type outputs -0.3 to  $V_{CC}+0.3$  V only.

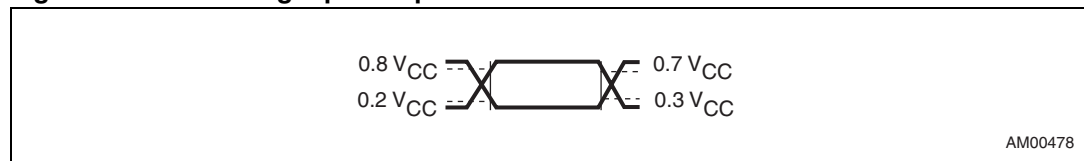
## 4 DC and AC parameters

This section summarizes the operating measurement conditions, and the DC and AC characteristics of the device. The parameters in the DC and AC characteristics tables that follow, are derived from tests performed under the measurement conditions summarized in [Table 5: Operating and measurement conditions](#). Designers should check that the operating conditions in their circuit match the operating conditions when relying on the quoted parameters.

**Table 5. Operating and measurement conditions**

Parameter	Value	Unit
V <sub>CC</sub> supply voltage	1.0 to 5.5	V
Ambient operating temperature (T <sub>A</sub> )	-40 to +85	°C
Input rise and fall times	≤ 5	ns
Input pulse voltages	0.2 to 0.8 V <sub>CC</sub>	V
Input and output timing ref. voltages	0.3 to 0.7 V <sub>CC</sub>	V

**Figure 14. AC testing input/output waveforms**



AM00478



**Table 6. DC and AC characteristics**

Symbol	Parameter	Test conditions <sup>(1)</sup>	Min.	Typ. <sup>(2)</sup>	Max.	Unit	
V <sub>CC</sub>	Supply voltage range	Reset output valid - active-low	1.0		5.5	V	
I <sub>CC</sub>	Supply current (inputs in their inactive state, t <sub>REC</sub> and t <sub>SRC</sub> counter is inactive)	STM6502	V <sub>CC</sub> = 5.0 V		1.2	μA	
			V <sub>CC</sub> = 3.0 V <sup>(3)</sup>		1.1	μA	
		STM6503	V <sub>CC</sub> = 5.0 V, TSR left open		4	5.8	μA
			V <sub>CC</sub> = 3.0 V, TSR left open <sup>(3)</sup>		3		μA
		STM6504	V <sub>CC</sub> = 5.0 V, TSR left open		4	5.8	μA
			V <sub>CC</sub> = 3.0 V, TSR left open <sup>(3)</sup>		3		μA
STM6505	V <sub>CC</sub> = 5.0 V		2.3	3.3	μA		
	V <sub>CC</sub> = 3.0 V <sup>(3)</sup>		2.2		μA		
<b>Output characteristics</b>							
V <sub>OL</sub>	Reset output voltage low (reset asserted: $\overline{\text{RST}}$ , $\overline{\text{BLD}}$ )	V <sub>CC</sub> ≥ 4.5 V, sinking 3.2 mA			0.3	V	
		V <sub>CC</sub> ≥ 3.3 V, sinking 2.5 mA			0.3	V	
		V <sub>CC</sub> ≥ 1.0 V, sinking 0.1 mA			0.3	V	
t <sub>REC</sub>	Reset timeout delay, factory-programmed	Option A	140	210	280	ms	
		Option B	240	360	480	ms	
<b>V<sub>CC</sub> monitoring reset thresholds</b>							
V <sub>RST</sub>	Fixed voltage trip point for V <sub>CC</sub> monitoring (refer to <a href="#">Table 7</a> )	-40 to +85 °C	V <sub>RST</sub> -2.5%	V <sub>RST</sub>	V <sub>RST</sub> +2.5%	V	
		25 °C	V <sub>RST</sub> -2.0%	V <sub>RST</sub>	V <sub>RST</sub> +2.0%	V	
V <sub>HYST</sub>	Hysteresis of V <sub>RST</sub>	L, M		0.5%			
		T, S, R, Z, Y, W, V		1%			
	V <sub>CC</sub> to reset delay	V <sub>CC</sub> falling from (V <sub>RST</sub> + 100 mV) to (V <sub>RST</sub> - 100 mV) at 10 mV/μs <sup>(4)</sup>		20		μs	
<b>V<sub>BAT</sub> monitoring</b>							
V <sub>BATTH</sub>	Fixed V <sub>BAT</sub> monitoring threshold	STM6505 only	1.225	1.25	1.275	V	
V <sub>BATHYST</sub>	V <sub>BATTH</sub> hysteresis	STM6505 only		8	16	mV	
I <sub>LI(VBAT)</sub>	V <sub>BAT</sub> input leakage current	STM6505 only	-100	10	100	nA	

Table 6. DC and AC characteristics (continued)

Symbol	Parameter	Test conditions <sup>(1)</sup>	Min.	Typ. <sup>(2)</sup>	Max.	Unit
<b>Smart Reset inputs</b>						
$V_{IL}$	$\overline{SR0}$ , $\overline{SR1}$ , SRE input voltage low		$V_{SS}$ -0.3		0.3 $V_{CC}$	V
$V_{IH}$	$\overline{SR0}$ , $\overline{SR1}$ , SRE input voltage high		0.7 $V_{CC}$		5.5	V
$I_{LI(SR)}$	Input leakage current, $\overline{SR}$ and SRE inputs	Option without internal pull-up resistor	-1		+1	$\mu A$
$I_{LI(TSR)}$	Input leakage current, TSR input	STM6503 and STM6504 only	-5		+7	$\mu A$
$R_{PUI}$	Internal pull-up resistor, input (optional - refer to <a href="#">Table 12</a> )			65		k $\Omega$
$t_{DEBOUNCE}$	SRE input falling edge debounce time	STM6504 only	240	360	480	ms
<b>Smart Reset delay</b>						
$t_{SRC}^{(5)}$	Capacitor-programmable Smart Reset setup time, STM6502 and STM6505. Refer to <a href="#">Table 3</a> .	$T_A = 25\text{ }^\circ C$	10 x $C_{SRC}$ ( $\mu F$ )	12.5 x $C_{SRC}$ ( $\mu F$ )	15 x $C_{SRC}$ ( $\mu F$ )	s
$t_{SRC}^{(5)}$	TSR pin-programmable Smart Reset setup time, STM6503 and STM6504.	TSR = $V_{SS}$	2	2.5	3	s
		TSR = floating <sup>(6)</sup>	6	7.5	9	s
		TSR = $V_{CC}$	10	12.5	15	s

- Valid for ambient operating temperature:  $T_A = -40$  to  $+85\text{ }^\circ C$ ;  $V_{CC} = 1.0$  to  $5.5$  V (except where noted).
- Typical value is at  $25\text{ }^\circ C$  and  $V_{CC} = 3.3$  V unless otherwise noted.
- For devices with  $V_{RST} < 3.0$  V.
- Guaranteed by design.
- Input glitch immunity is equal to  $t_{SRC}$  (when both  $\overline{SR}$  inputs are low, otherwise infinite). STM6502, STM6503, STM6505 only.
- If left open, for improved system glitch immunity it is strongly recommended to connect a  $0.1\text{ }\mu F$  decoupling ceramic capacitor between the TSR and  $V_{SS}$  pins.

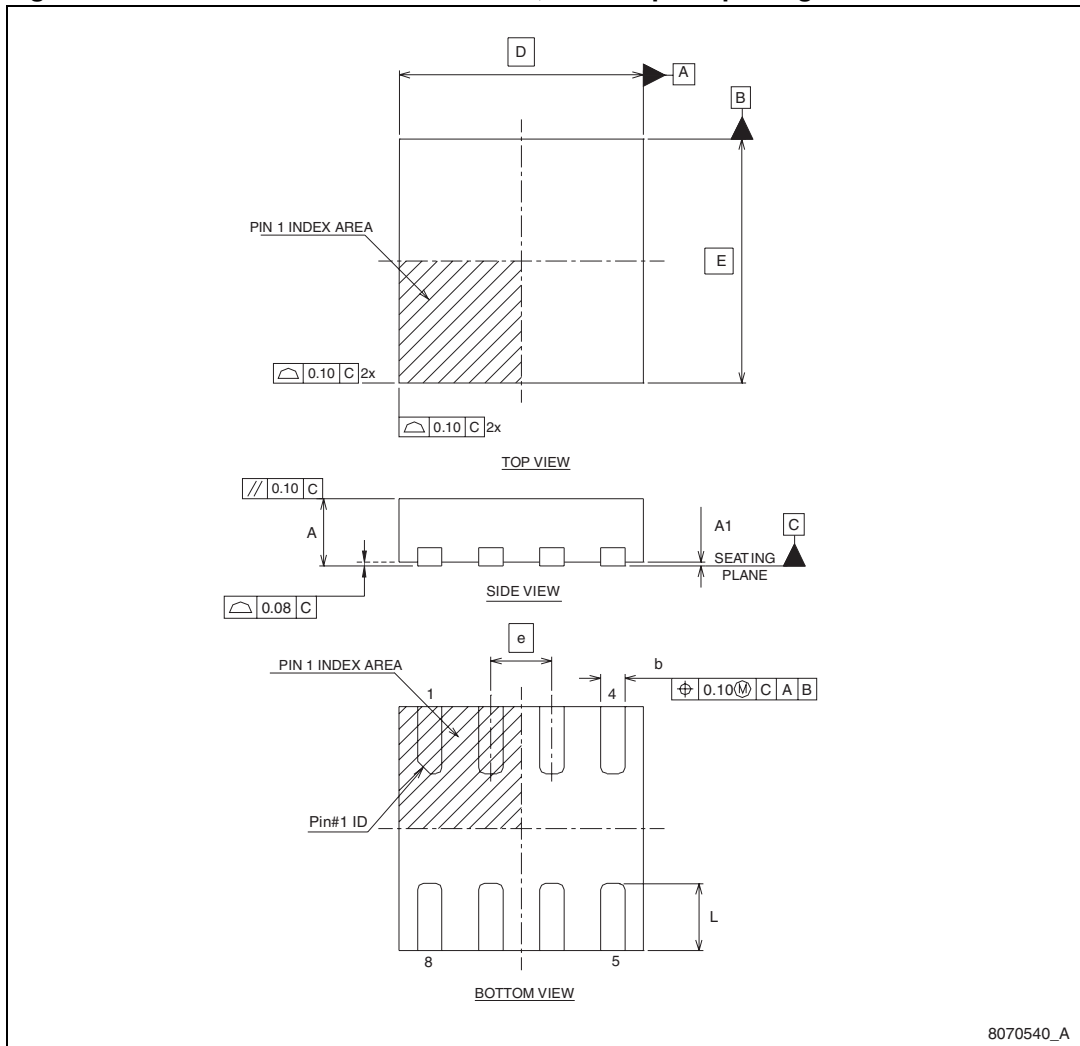
Table 7.  $V_{CC}$  voltage thresholds

$V_{CC}$ monitoring threshold $V_{RST}$	Typ.	$\pm 2.5\%$ ( $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ )		$\pm 2.0\%$ ( $25\text{ }^{\circ}\text{C}$ )		Unit
		Min.	Max.	Min.	Max.	
L (falling)	4.625	4.509	4.741	4.533	4.718	V
M (falling)	4.375	4.266	4.484	4.288	4.463	V
T (falling)	3.075	2.998	3.152	3.014	3.137	V
S (falling)	2.925	2.852	2.998	2.867	2.984	V
R (falling)	2.625	2.559	2.691	2.573	2.678	V
Z (falling)	2.313	2.255	2.371	2.267	2.359	V
Y (falling)	2.188	2.133	2.243	2.144	2.232	V
W (falling)	1.665	1.623	1.707	1.632	1.698	V
V (falling)	1.575	1.536	1.614	1.544	1.607	V

## 5 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 15. TDFN – 8-lead 2 x 2 x 0.75 mm, 0.5 mm pitch package outline



8070540\_A

Table 8. TDFN – 8-lead 2 x 2 x 0.75 mm, 0.5 mm pitch package mechanical data

Symbol	Dimension (mm)			Dimension (inches)		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	0.02	0.05	0.000	0.001	0.002
b	0.15	0.20	0.25	0.006	0.008	0.010
D BSC	1.9	2.00	2.1	0.075	0.079	0.083
E BSC	1.9	2.00	2.1	0.075	0.079	0.083
e		0.50			0.020	
L	0.45	0.55	0.65	0.018	0.022	0.026

Figure 16. Landing pattern - TDFN – 8-lead 2 x 2 mm without thermal pad

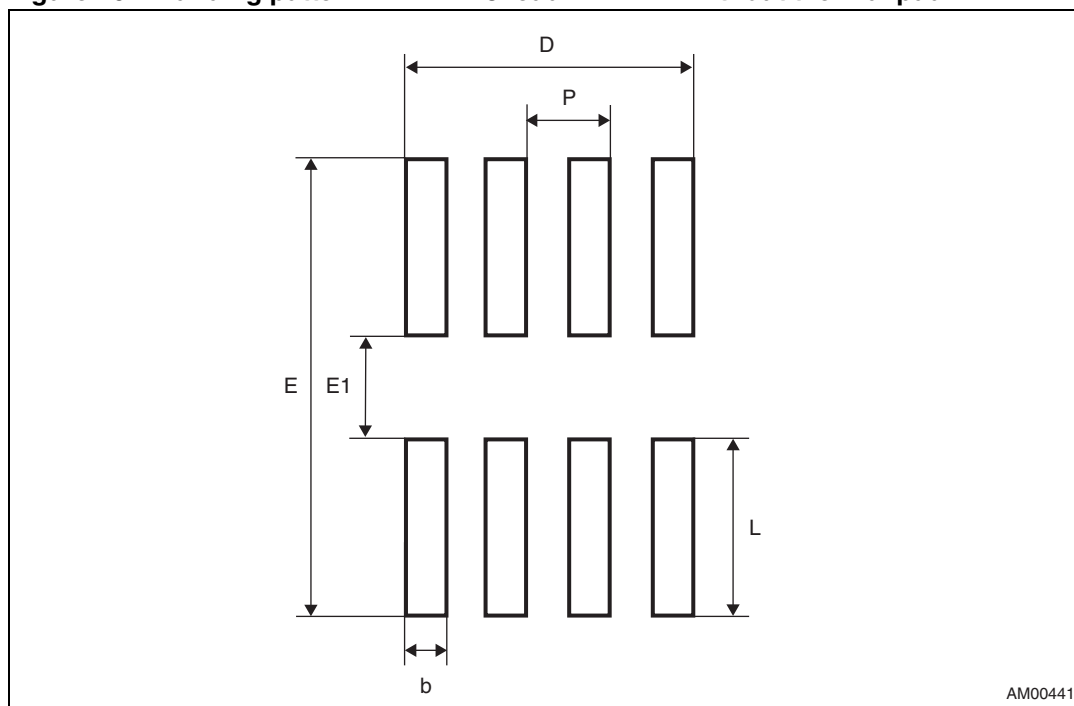
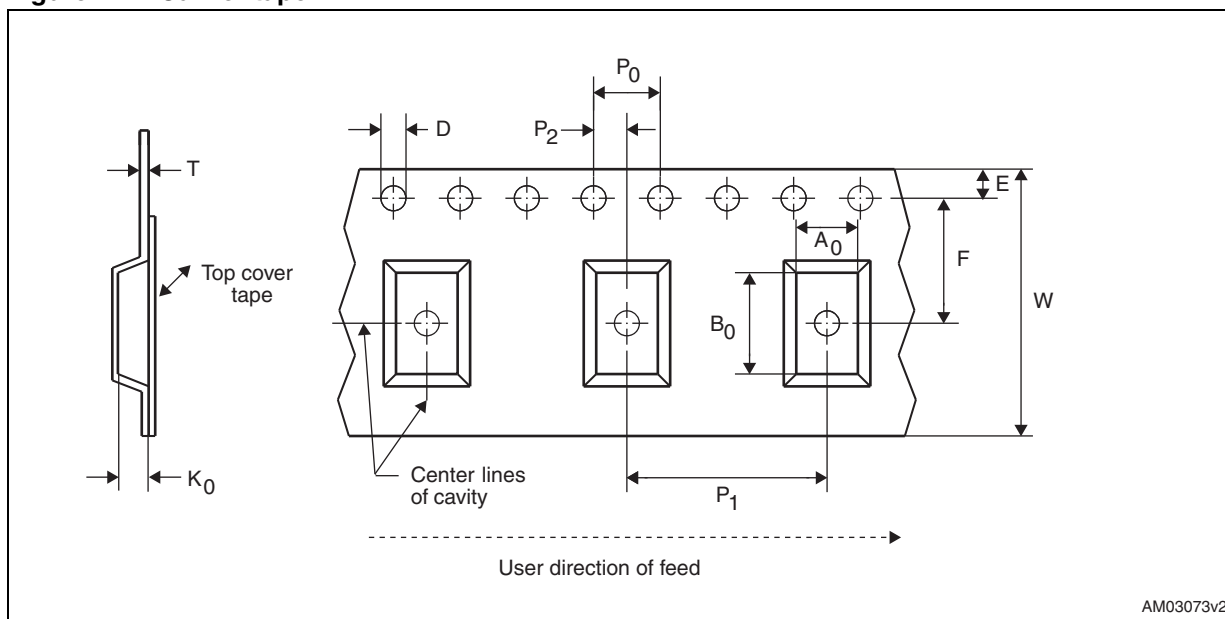


Table 9. Parameter for landing pattern - TDFN – 8-lead 2 x 2 mm package

Parameter	Description	Dimension (mm)		
		Min.	Nom.	Max.
L	Contact length	1.05	—	1.15
b	Contact width	0.25	—	0.30
E	Max. land pattern Y-direction	—	2.85	—
E1	Contact gap spacing	—	0.65	—
D	Max. land pattern X-direction	—	1.75	—
P	Contact pitch	—	0.5	—

Figure 17. Carrier tape



AM03073v2

Table 10. Carrier tape dimensions

Package	W	D	E	P <sub>0</sub>	P <sub>2</sub>	F	A <sub>0</sub>	B <sub>0</sub>	K <sub>0</sub>	P <sub>1</sub>	T	Unit	Bulk qty.
TDFN8	8.00 +0.30 -0.10	1.50 +0.10/ -0.00	1.75 ±0.10	4.00 ±0.10	2.00 ±0.10	3.50 ±0.05	2.30 ±0.05	2.30 ±0.05	1.00 ±0.05	4.00 ±0.10	0.250 ±0.05	mm	3000

Figure 18. Reel dimensions

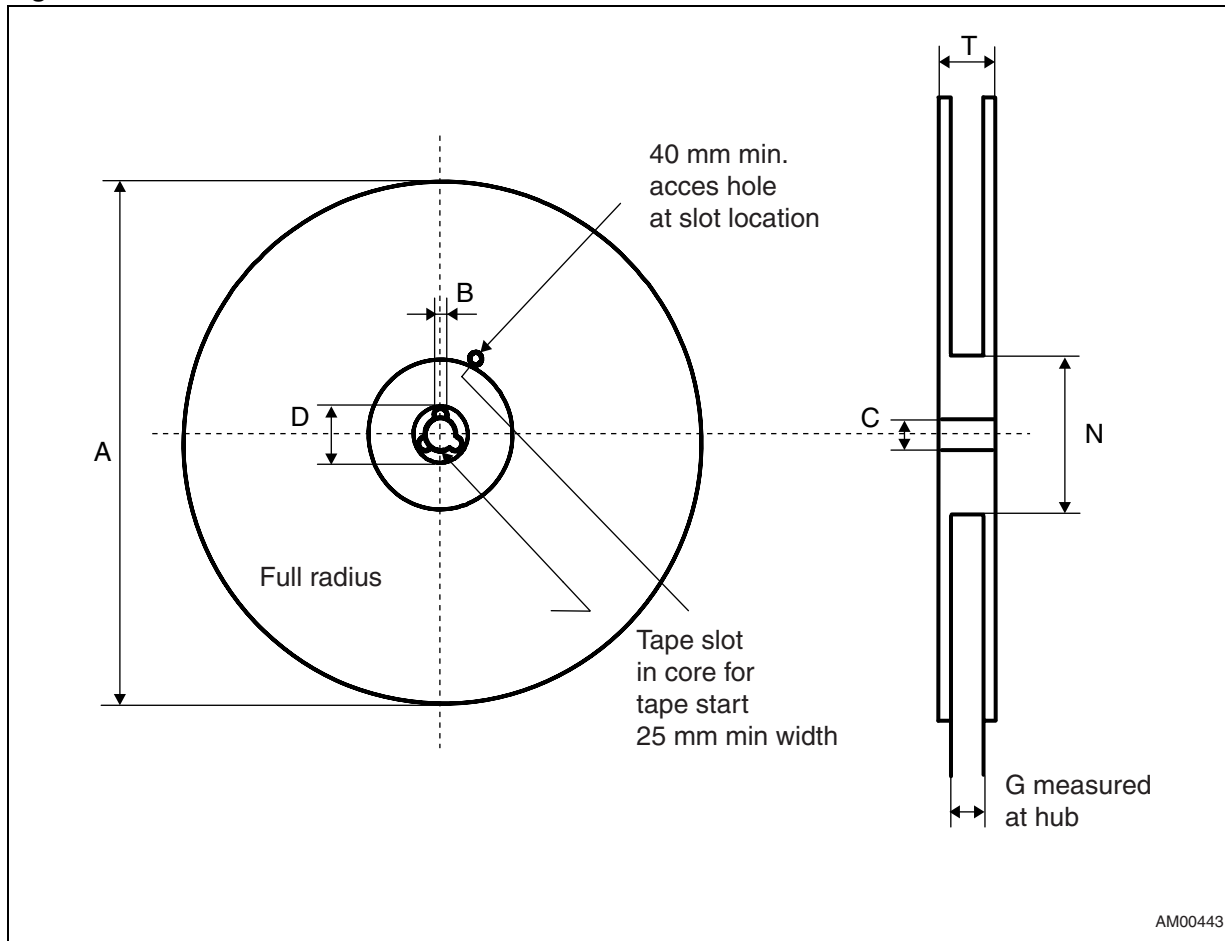


Table 11. Reel dimensions

Tape sizes	A max.	B min.	C	D min.	N min.	G	T max.
8 mm	180 (7 inches)	1.50	13.0 +/- 0.20	20.20	60	8.4 +2/-0	14.40



Figure 19. Tape trailer/leader

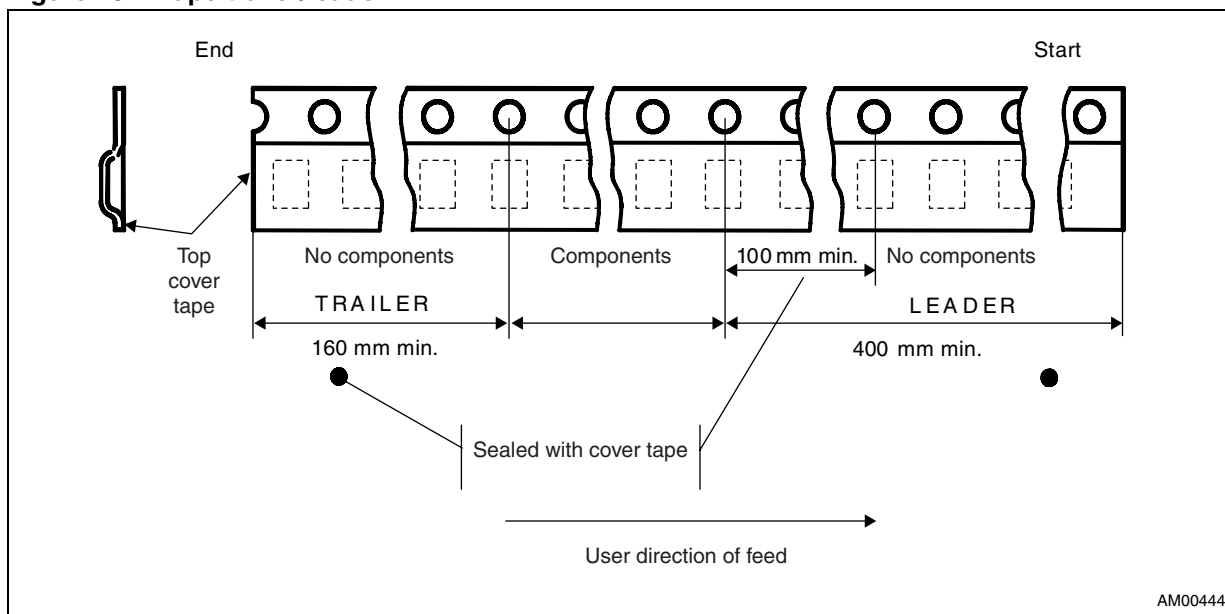
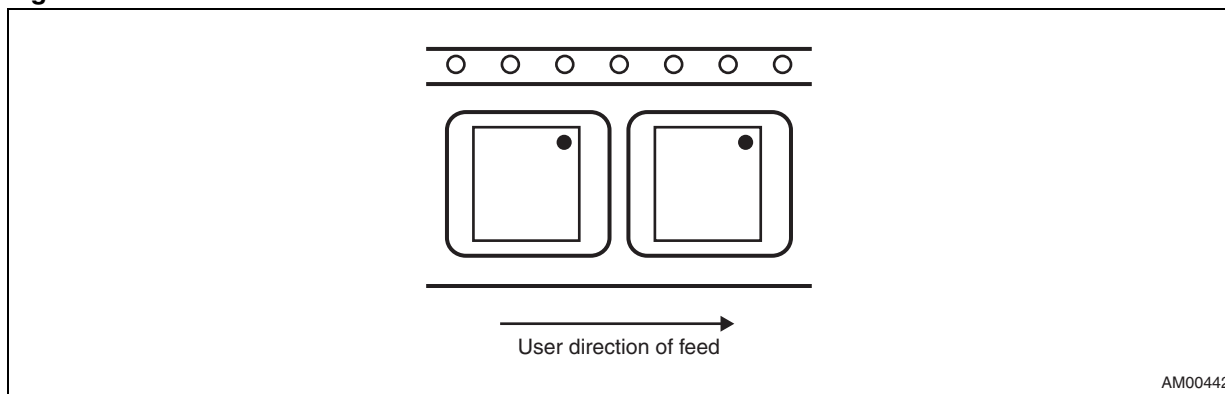


Figure 20. Pin 1 orientation



- Note:
- 1 Drawings are not to scale.
  - 2 All dimensions are in mm, unless otherwise noted.

## 6 Part numbering

**Table 12. Ordering information scheme**

Example:	STM6505	W	C	A	B	DG	6	F
<b>Device type</b>								
STM6502 <sup>(1)</sup>								
STM6503								
STM6504 <sup>(1)</sup>								
STM6505								
<b>Reset (<math>V_{CC}</math> monitoring) threshold voltage (<math>V_{RST}</math>), typ., falling</b>								
L = 4.625 V								
S = 2.925 V								
R = 2.625 V								
Z = 2.313 V								
W = 1.665 V								
V = 1.575 V								
<b>Smart Reset setup delay (<math>t_{SRC}</math>); presence of internal input pull-up on all Smart Reset inputs (<math>SRx</math>, <math>SRE</math>)</b>								
A = user-programmable (external capacitor); no input pull-up								
C = user-programmable (external capacitor); 65 k $\Omega$ input pull-up								
E = 2 or 6 or 10 s min., user-programmable (three-state); no input pull-up								
F = 2 or 6 or 10 s min., user-programmable (three-state); 65 k $\Omega$ input pull-up								
<b>Output type</b>								
A = open-drain, no pull-up, active-low								
<b>Reset timeout period (<math>t_{REC}</math>)</b>								
A = 140 ms min.								
B = 240 ms min.								
<b>Package</b>								
DG = TDFN8 2 x 2 x 0.75 mm, 0.5 mm pitch								
<b>Temperature range</b>								
6 = -40 °C to +85 °C								
<b>Shipping method</b>								
F = ECOPACK <sup>®</sup> package, tape and reel								

1. Contact local ST sales office for availability.

For device options currently available refer to [Table 13](#). For other options, voltage threshold values etc. or for more information on any aspect of this device, please contact the ST sales office nearest you.

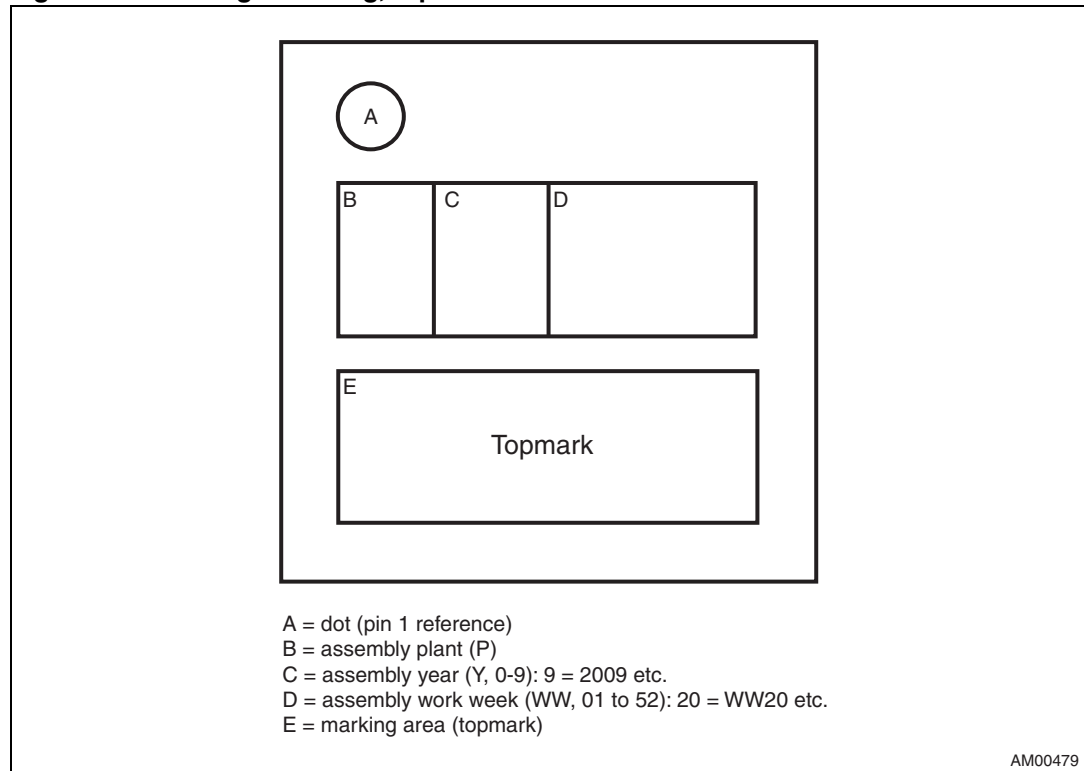
# 7 Package marking

**Table 13. Package marking**

Part number	t <sub>SRC</sub> delay control	Smart Reset inputs <sup>(1)</sup>	V <sub>RST</sub>	RST output <sup>(1)</sup>	t <sub>REC</sub> option	BLD output <sup>(1)</sup>	Topmark
STM6503REAADG6F	TSR	AL	R	AL, OD	A	—	3RG
STM6503SEAADG6F	TSR	AL	S	AL, OD	A	—	3SG
STM6503VEAADG6F	TSR	AL	V	AL, OD	A	—	3VG
STM6504SEABDG6F <sup>(2)</sup>	TSR	AL	S	AL, OD	B	—	4SG
STM6505SCABDG6F	C <sub>SRC</sub>	AL, PU	S	AL, OD	B	AL, OD	5SK
STM6505RCABDG6F	C <sub>SRC</sub>	AL, PU	R	AL, OD	B	AL, OD	5RK
STM6505WCABDG6F	C <sub>SRC</sub>	AL, PU	W	AL, OD	B	AL, OD	5WK

1. AL = active-low, AH = active-high, PU = with internal pull-up resistor, OD = open-drain.
2. Contact local ST sales office for availability.

**Figure 21. Package marking, top view**



## 8 Revision history

**Table 14. Document revision history**

Date	Revision	Changes
31-Aug-2009	1	Initial release.
06-Nov-2009	2	Updated <i>Applications, Section 1, Section , Figure 3</i> to <i>Figure 6</i> updated and moved to <i>Section</i> , updated <i>Table 1, Table 2, Table 3, Table 4, Table 6, Table 12, Section 1.2.3, Section 1.2.7, Section 1.2.9, Section 5</i> , added package footprint, tape and reel information, and <i>Section 7</i> .
15-Jan-2010	3	Updated <i>Features, Section 1, Section 1.2.6, Table 1, Table 2, Figure 5, Figure 6, Table 3, Table 6, Table 12, Table 13</i> , removed Table 4.
01-Mar-2010	4	Updated title of datasheet, <i>Features, Applications, Table 1, 2, 6, 12</i> , footnote 5 of <i>Table 6</i> ; updated <i>Figure 3, 4</i> ; added <i>Section 2: Typical operating characteristics</i> ; minor textual and formatting changes.
21-Jun-2010	5	Updated <i>Features, Section 1, Figure 8</i> , footnote 1 and 2 of <i>Table 3</i> , updated <i>Table 4</i> , added footnote 2 to <i>Table 4, Table 6</i> , added footnote 6 to <i>Table 6</i> , updated <i>Table 6</i> to <i>Table 9</i> , and added footnote 2 of <i>Table 13</i> .
09-Feb-2011	6	Reformatted <i>Table 1</i> , updated <i>Table 6</i> , added STM6503REAADG6F and STM6503SEAADG6F device to <i>Table 13</i> , corrected typo in <i>Table 13</i> .

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2011 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)



# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[STMicroelectronics:](#)

[STM6503VEAADG6F](#) [STM6503REAADG6F](#) [STM6503SEAADG6F](#) [STM6505WCABDG6F](#)