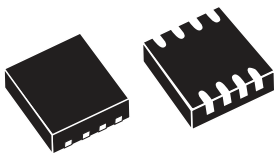
STM6522

Dual push-button Smart Reset™ with capacitor-adjustable setup delay

Features

- Dual Smart Reset™ push-button inputs with capacitor-adjustable extended reset setup delay (t_{SRC})
- No power-on reset
- Dual $\overline{RST}$ output, active-low, open-drain
- Fixed Smart Reset™ input logic voltage levels
- Broad operating voltage range 1.65 V to 5.5 V, inactive reset output levels valid down to 1.0 V
- Low supply current (1.5 µA)
- Operating temperature: industrial grade –40 °C to +85 °C
- TDFN8 package: 2 mm x 2 mm x 0.75 mm
- RoHS compliant



TDFN8 (DG)
2 mm x 2 mm

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

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1 Description

The Smart Reset™ devices provide a useful feature that ensures that inadvertent short reset push-button closures do not cause system resets as the extended Smart Reset™ delay setup periods are implemented. Once the valid Smart Reset™ input levels and setup delay are met, the device generates an output reset pulse for a fixed timeout period (t_{REC}).

The typical application hookup shows that either a single Smart Reset™ input, or both reset inputs can be connected to the applications interrupt and control both the interrupt pin and the hard reset functions. If the push-button is closed for a short time, the processor is only interrupted. If the system still does not respond properly, holding the push-button(s) for the extended setup time (t_{SRC}) causes a hard reset of the processor. The Smart Reset™ feature helps significantly increase system stability and eliminates the need for a dedicated reset button.

The STM65xx family of Smart Reset™ devices consists of low-current microprocessor reset circuits targeted at applications such as MP3 players, portable navigation or mobile phones, generally any application that requires delayed reset push-button(s) response for improved system stability. The devices in the STM65xx Smart Reset™ family include various combinations of useful features for the targeted applications.

The STM6522 has two combined Smart Reset™ inputs ($\overline{SR0}$ and $\overline{SR1}$) with delayed reset setup time (t_{SRC}) programmed by an external capacitor on the SRC pin.

Figure 1. Logic diagram

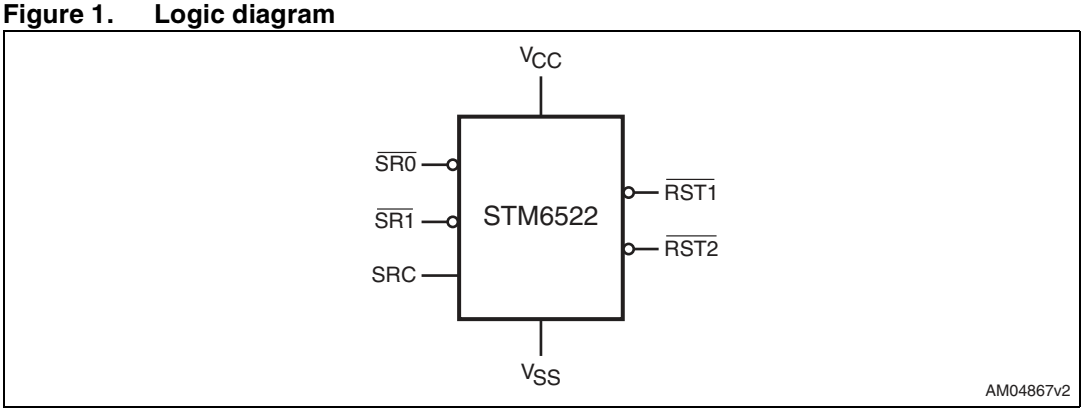

Table 1. Signal names

Symbol	Input/ output	Description
$\overline{RST1}$	Output	Open-drain reset output, active-low, no internal pull-up resistor.
$\overline{RST2}$	Output	Open-drain reset output, active-low, no internal pull-up resistor.
$\overline{SR0}$	Input	Primary push-button Smart Reset™ input, active-low, fixed voltage input logic levels, no internal pull-up.
$\overline{SR1}$	Input	Secondary push-button Smart Reset™ input - combines with the primary push-button reset to provide setup delay time, active-low, fixed voltage input logic levels, no internal pull-up.
SRC	Input	Smart Reset™ input delay setup control: connect to an external capacitor to adjust the delay setup time (t_{SRC}).
V_{CC}	Supply	Supply voltage input. Power supply for the device. A 0.1 µF decoupling ceramic capacitor is recommended to be connected between V_{CC} and V_{SS} pins.
V_{SS}	Supply	Supply ground.
NC		No connect (not bonded); should be connected to V_{SS}.

Figure 2. Pin connections

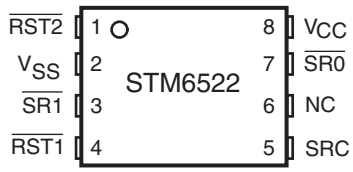

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Figure 3. Block diagram

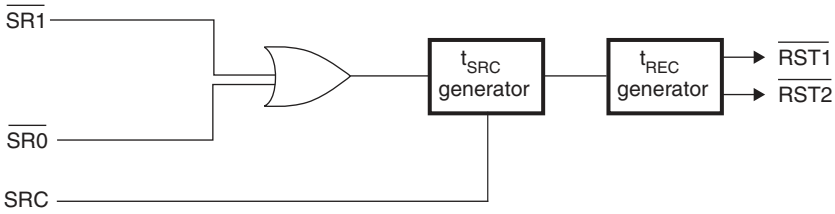

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Figure 4. Single-button Smart Reset™ typical hookup

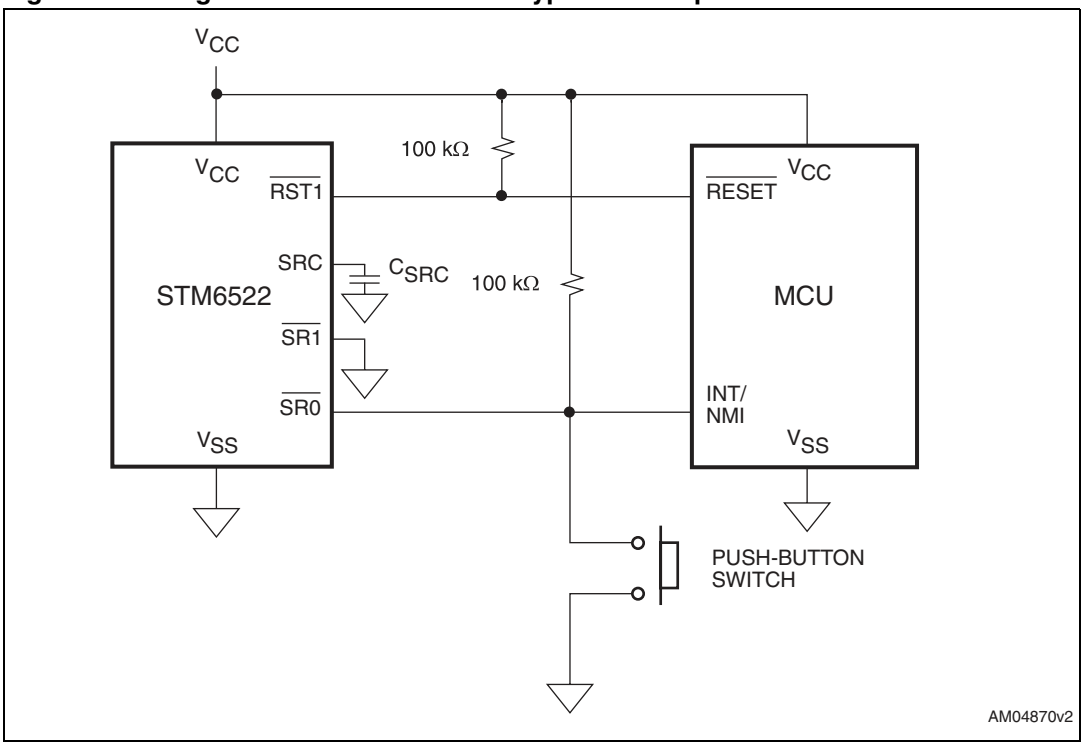


Figure 5. Dual-button Smart Reset™ typical hookup

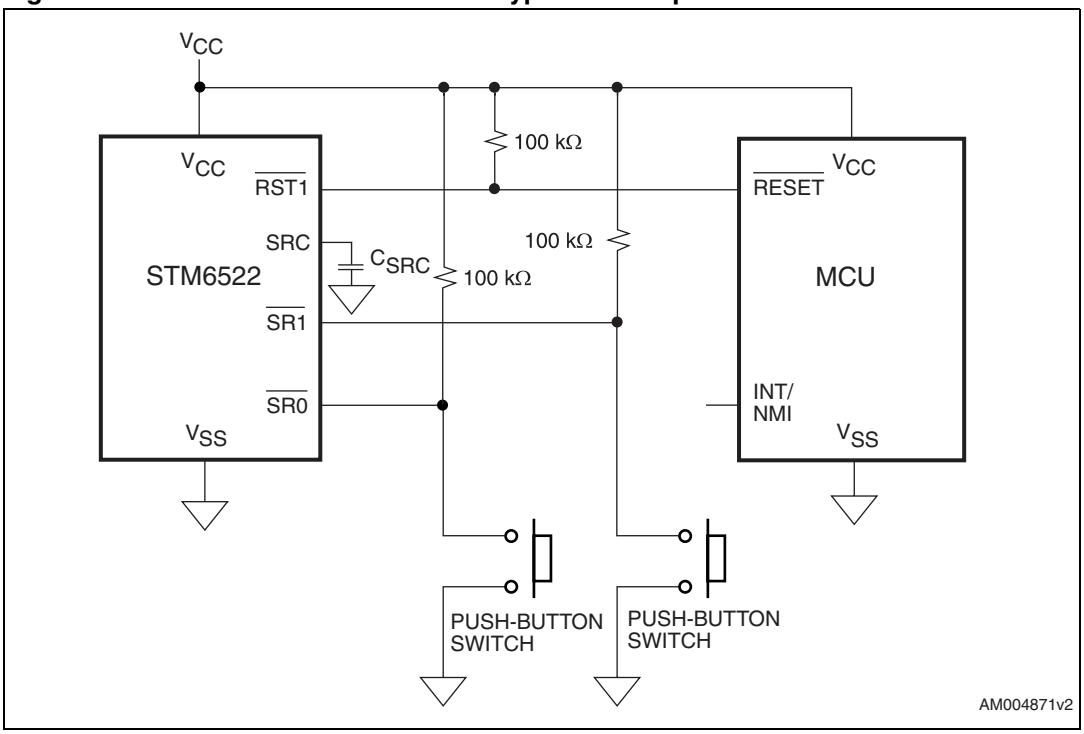
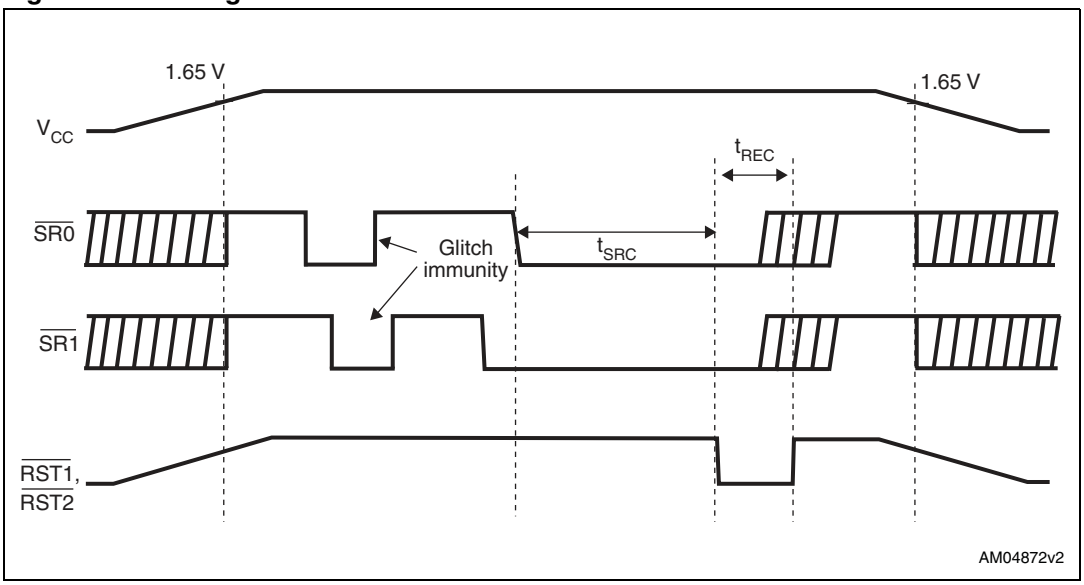


Figure 6. Timing waveforms



2 Pin descriptions

2.1 Power supply (V_{CC})

This pin is used to provide the power to the device. A 0.1 µF decoupling ceramic capacitor is recommended to be connected between V_{CC} and V_{SS} pins.

2.2 Ground (V_{SS})

This is the supply ground for the device.

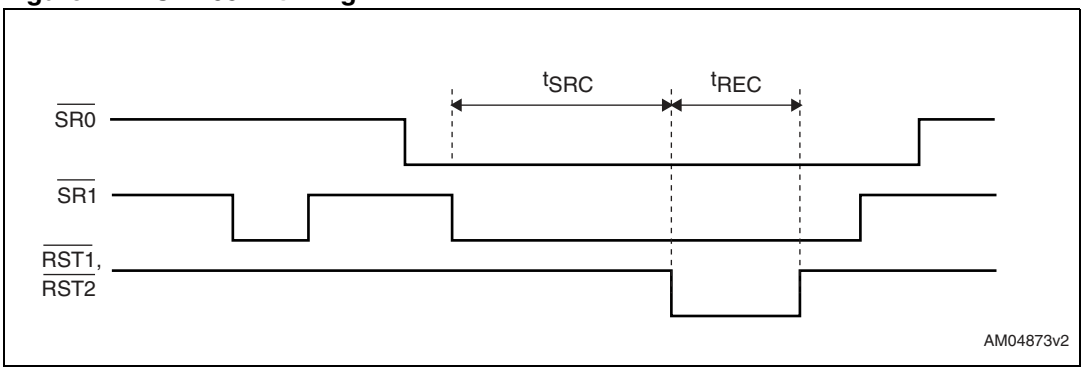
2.3 Primary Smart Reset™ input ($\overline{SR0}$)

The primary push-button Smart Reset™ input, active-low pin is connected to the push-button switch. The input logic voltage levels are set to a fixed voltage level and have no internal pull-up resistor.

2.4 Secondary Smart Reset™ input ($\overline{SR1}$)

The secondary push-button Smart Reset™ input, active-low pin is connected to the second push-button switch. The input logic voltage levels are set to a fixed voltage level and have no internal pull-up resistor. Keeping both Smart Reset™ inputs $\overline{SR0}$ and $\overline{SR1}$ active for longer than t_{SRC} activates the reset output pulse.

Figure 7. STM6522 timing



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

2.5 Adjustable delay of Smart Reset™ (SRC pin)

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 setup time (t_{SRC}).

Selected calculated t_{SRC} and C_{SRC} examples are given in *Table 2*. Refer also to *Table 5*.

Table 2. t_{SRC} programmed by an ideal external capacitor

Calculated C_{SRC} value [µF]	Setup delay t_{SRC} [s](1)(2)			Closest common C_{SRC} value [µF]
	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

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 0.1 µF.
2. In case of quickly repeated activations of t_{SRC} counter, 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.

2.6 Reset output ($\overline{RST1}$)

This output is active-low, open-drain with no internal pull-up resistor.

2.7 Reset output ($\overline{RST2}$)

This output is active-low, open-drain with no internal pull-up resistor.

3 Typical operating characteristics

Figure 8. Supply current (I_{CC}) vs. temperature

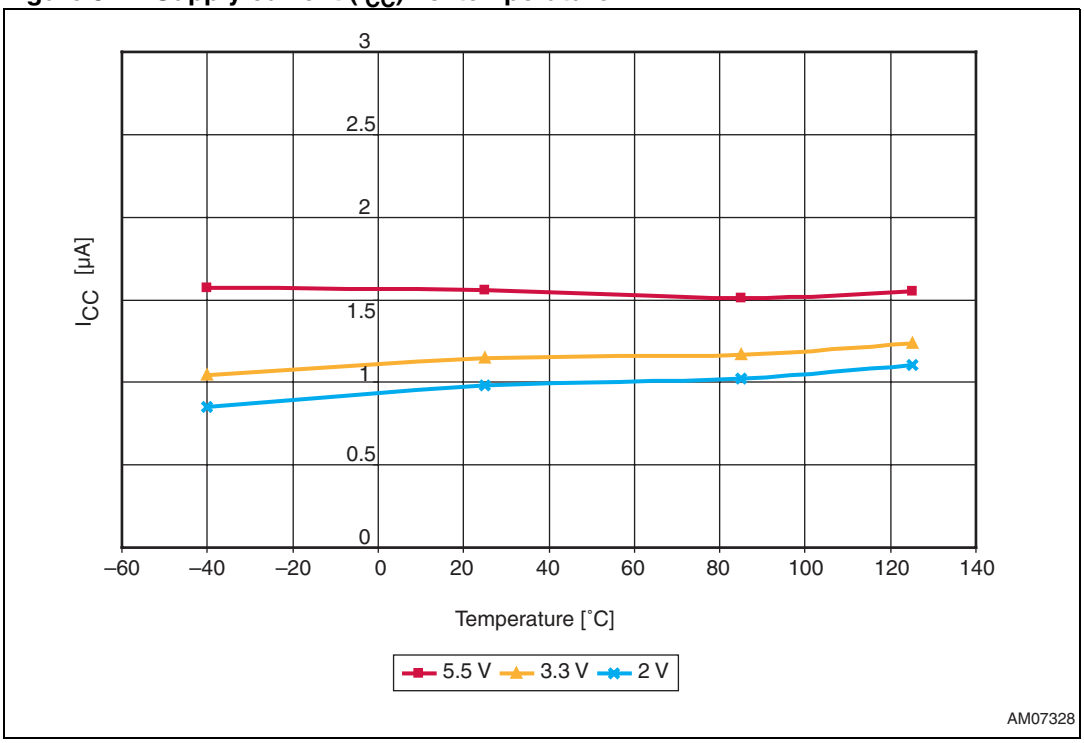


Figure 9. Smart Reset™ delay (t_{SRC}) vs. temperature, C_{SRC} = 0.6 µF

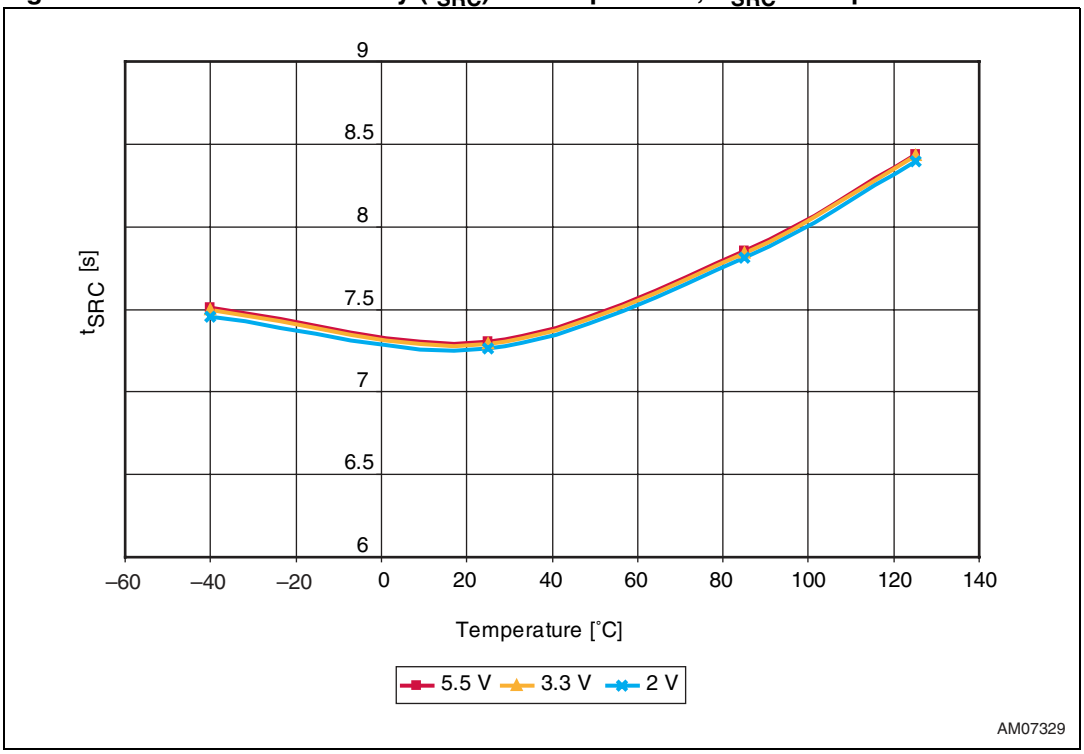


Figure 10. Reset timeout period (t_{REC}) vs. temperature

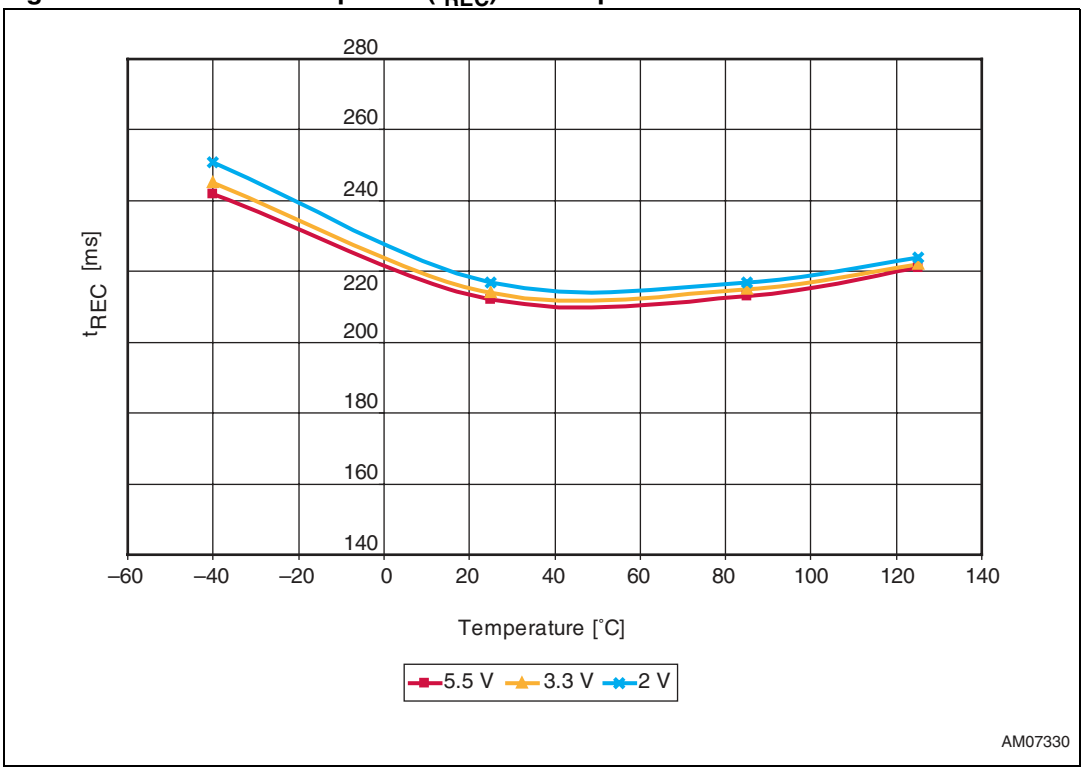
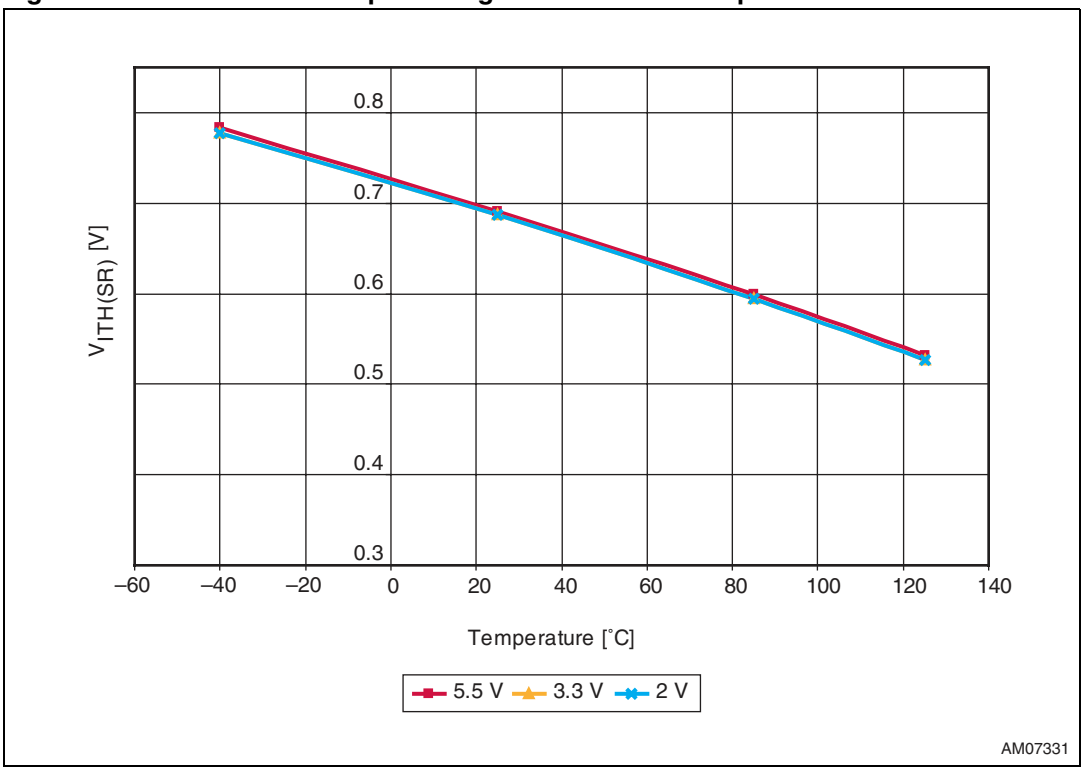


Figure 11. Smart Reset™ input voltage threshold vs. temperature



4 Maximum ratings

Stressing the device above the ratings listed in *Table 3: 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 *Table 4: Operating and measurement conditions* 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 3. 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
θ_{JA}	Thermal resistance (junction to ambient)	TDFN8	149.0	°C/W
V_{IO}	Input or output voltage		–0.3 to 5.5	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.

5 DC and AC parameters

This section summarizes the operating measurement conditions, and the DC and AC characteristics of the device. The parameters in *Table 5: DC and AC characteristics* that follows, are derived from tests performed under the measurement conditions summarized in *Table 4: 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 4. Operating and measurement conditions

Parameter	Value	Unit
V_{CC} supply voltage	1.65 to 5.5	V
Ambient operating temperature (T_A)	–40 to +85	°C
Input rise and fall times	≤ 5	ns
Input pulse voltages	0.2 to 0.8 V_{CC}	V
Input and output timing ref. voltages	0.3 to 0.7 V_{CC}	V

Figure 12. AC testing input/output waveforms

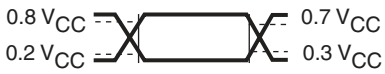


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Table 5. DC and AC characteristics

Symbol	Parameter	Test conditions[1]	Min.	Typ.[2]	Max.	Unit
V_{CC}	Supply voltage range		1.65		5.5	V
I_{CC}	Supply current (inputs in their inactive state, neither t_{REC} nor t_{SRC} in progress)	V_{CC} = 5.0 V		2	3	µA
		V_{CC} = 3.0 V		1.5		µA
V_{OL}	Reset output voltage low (active-low reset asserted)	$V_{CC} \geq$ 4.5 V, sinking 3.2 mA			0.3	V
		$V_{CC} \geq$ 3.3 V, sinking 2.5 mA			0.3	V
		$V_{CC} \geq$ 1.65 V, sinking 1 mA			0.3	V
t_{REC}	Reset timeout delay, factory programmed		140	210	280	ms
Smart Reset™ inputs						
V_{IL}	$\overline{SR0}$, $\overline{SR1}$ input voltage low		V_{SS} – 0.3		0.3	V
V_{IH}	$\overline{SR0}$, $\overline{SR1}$ input voltage high		0.85		5.5	V
$I_{LI(SR)}$	Input leakage current, $\overline{SRx}$ input		–1		+1	µA
Smart Reset™ delay						
t_{SRC}[3]	Delayed Smart Reset™ setup time. Refer to *Table 2*.	T_A = 25 °C	10 x C_{SRC} (µF)	12.5 x C_{SRC} (µF)	15 x C_{SRC} (µF)	s

1. Valid for ambient operating temperature: T_A = –40 to +85 °C; V_{CC} = 1.65 to 5.5 V (except where noted).
2. Typical value is at 25 °C and V_{CC} = 3.3 V unless otherwise noted.
3. Input glitch immunity is equal to t_{SRC} (when both $\overline{SR}$ inputs are low, otherwise infinite).

6 Package mechanical data

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

Figure 13. TDFN – 8-lead 2 x 2 x 0.75 mm, 0.5 mm pitch package outline

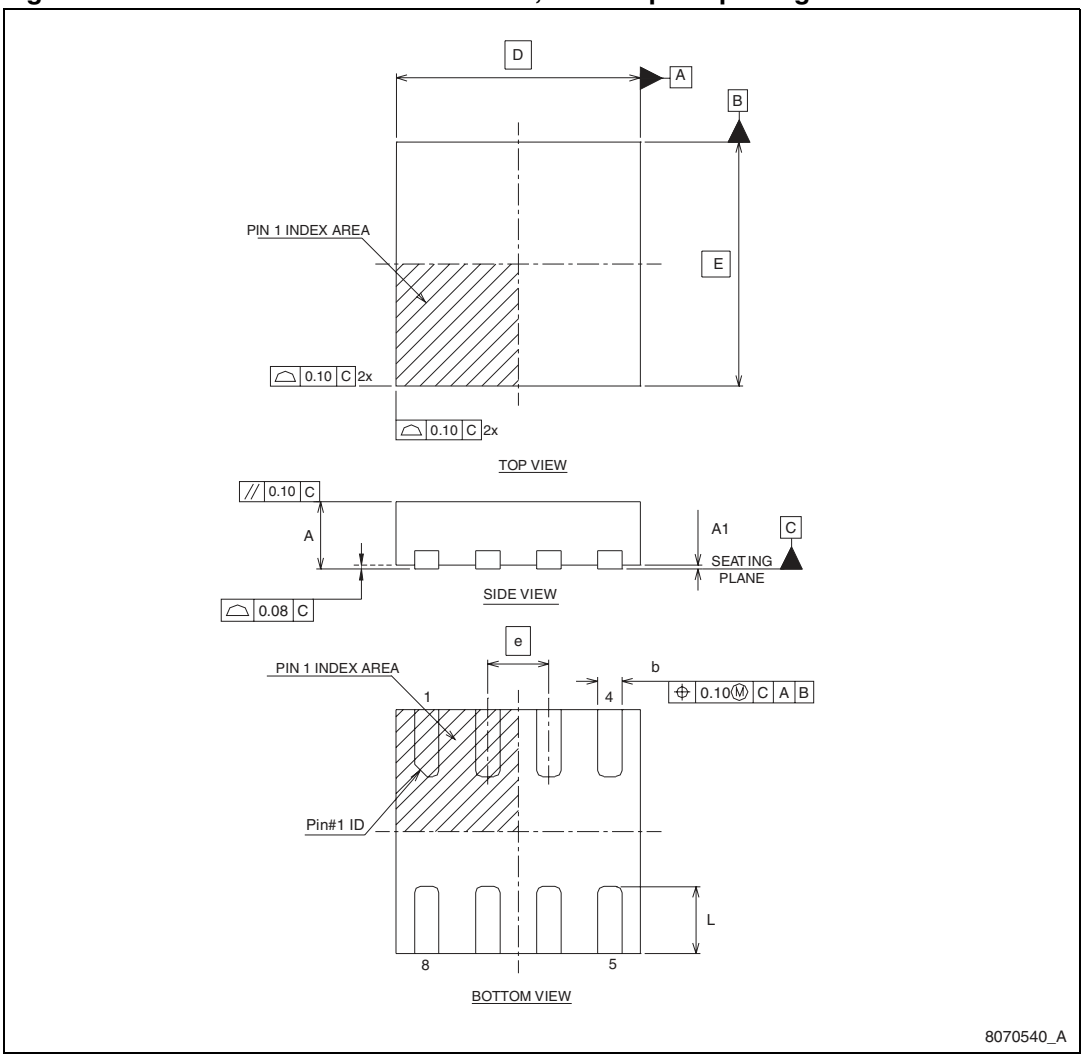


Table 6. TDFN – 8-lead 2 x 2 x 0.75 mm, 0.5 mm pitch package mechanical data

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

7 Package footprint

Figure 14. Landing pattern - TDFN – 8-lead 2 x 2 mm without thermal pad

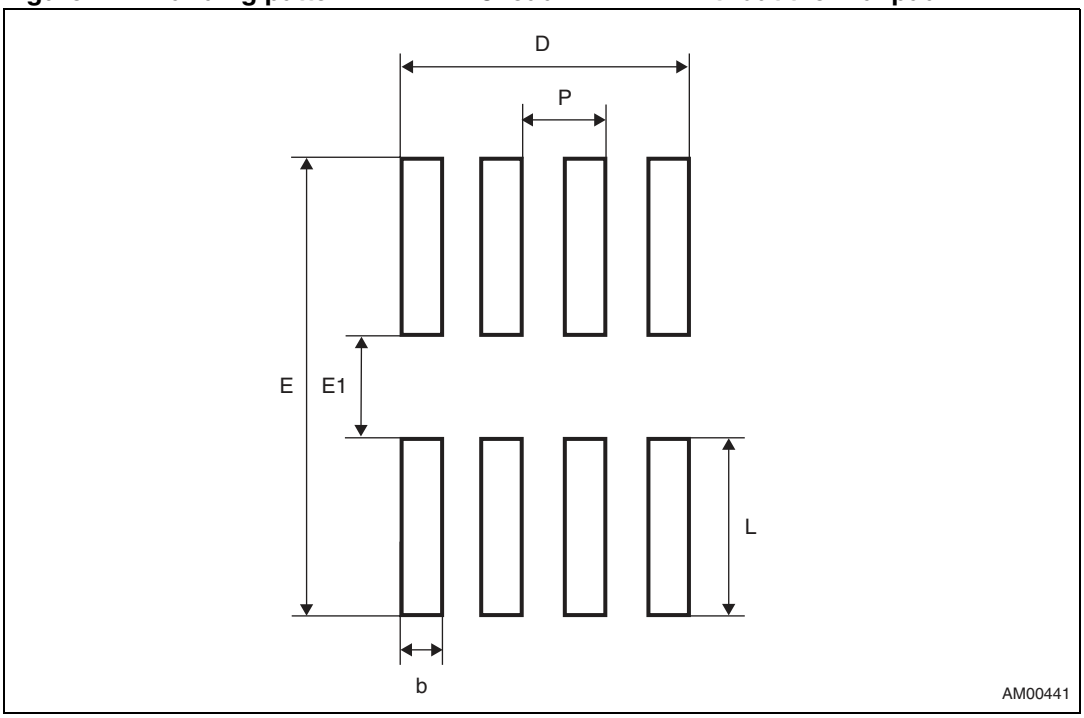


Table 7. Parameters for landing pattern - TDFN – 8-lead 2 x 2 mm package

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	—

8 Tape and reel information

Figure 15. Carrier tape

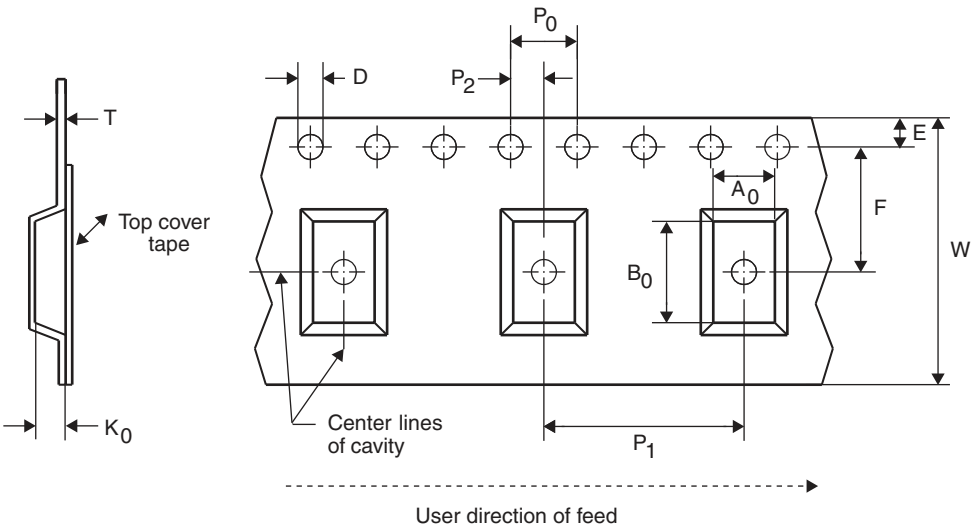


Table 8. Carrier tape dimensions

Package	W	D	E	P_0	P_2	F	A_0	B_0	K_0	P_1	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 16. Reel dimensions

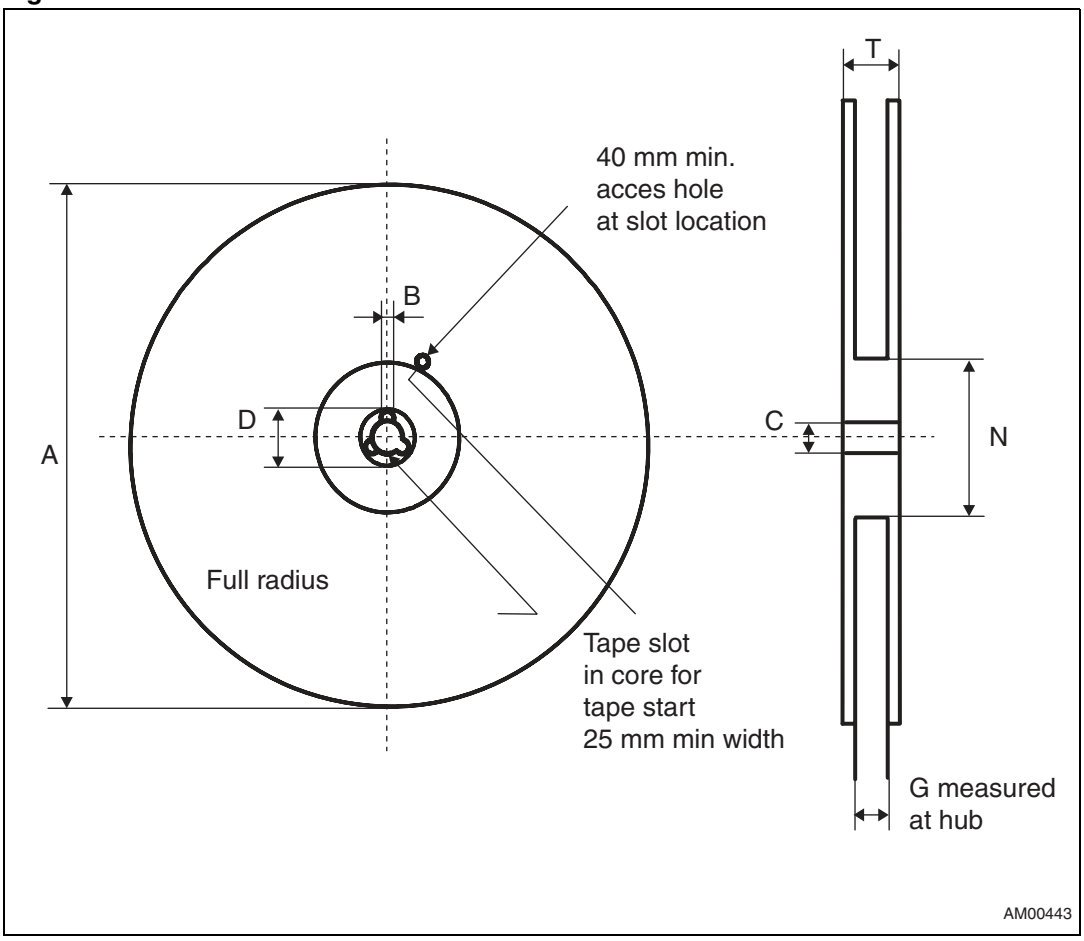


Table 9. Reel dimensions

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 17. Tape trailer/leader

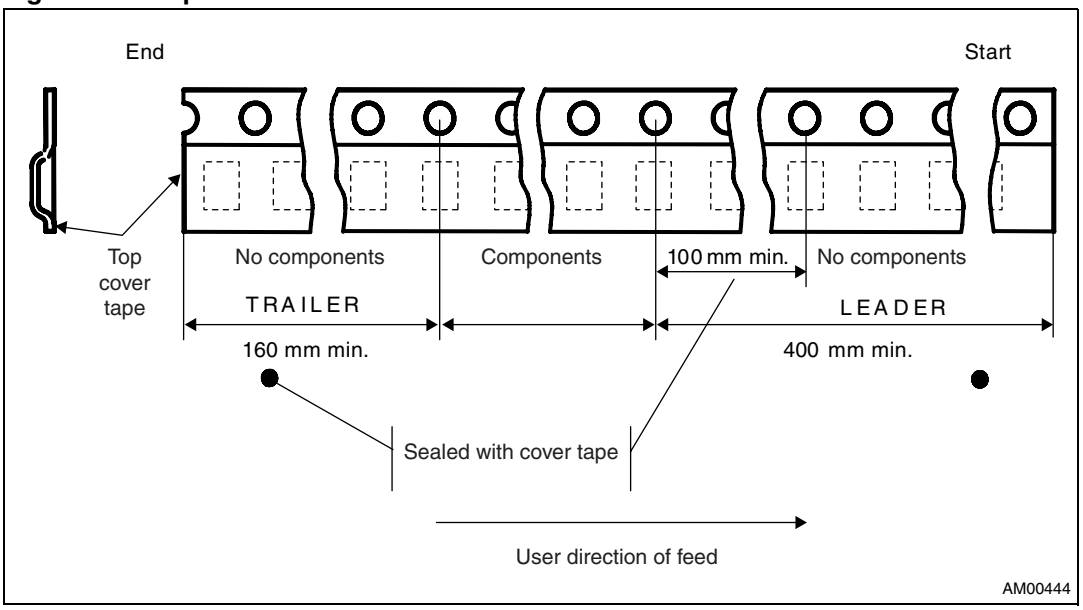
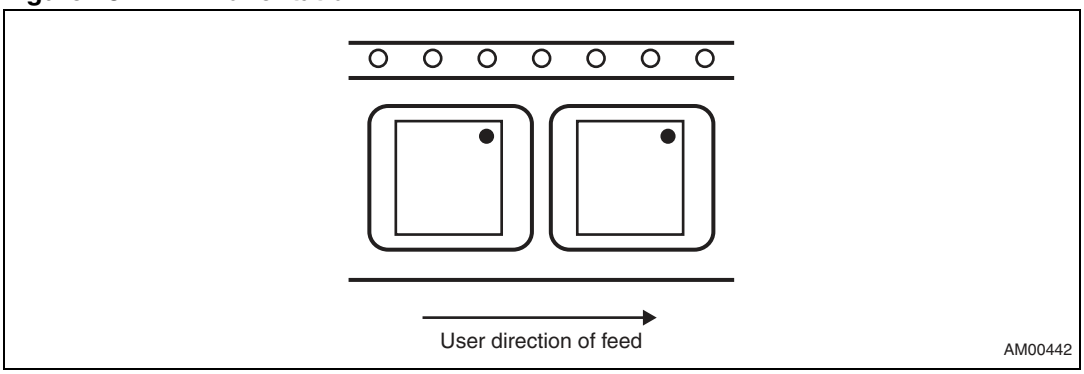


Figure 18. Pin 1 orientation



Note: 1 Drawings are not to scale.

2 All dimensions are in mm, unless otherwise noted.

9 Part numbering

Table 10. Ordering information scheme

Example: STM6522 A A A A DG 6 F

Device type

STM6522

V_{CC} monitoring, power-on reset

A = no V_{CC} monitoring, no power-on reset

Smart Reset™ setup delay (t_{SRC}); presence of internal input pull-up on all Smart Reset™ inputs ($\overline{SRx}$)

A = user-programmed (external capacitor); no input pull-up

Output type

A = both $\overline{RST1}$ and $\overline{RST2}$ open-drain, no pull-up, active-low

Reset timeout period (t_{REC})

A = 140 ms min.

Package

DG = TDFN8 2 x 2 x 0.75 mm, 0.5 mm pitch

Temperature range

6 = –40 °C to +85 °C

Shipping method

F = ECOPACK® package, tape and reel

For device options currently available refer to *Table 11*. For other options, or for more information on any aspect of this device, please contact the ST sales office nearest you.

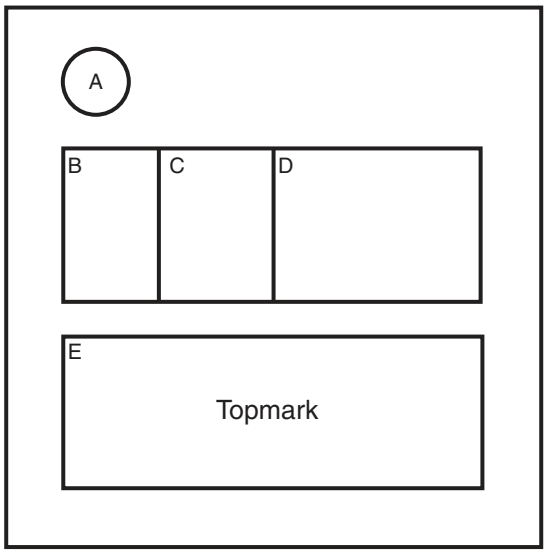
10 Package marking

Table 11. Package marking

Part number	t_{SRC} delay control	Smart Reset™ inputs(1)	Power-on reset, V_{CC} monitoring	$\overline{RST1}$ output(1)	$\overline{RST2}$ output(1)	t_{REC} option	Topmark
STM6522AAAADG6F	C_{SRC}	AL	—	AL, OD	AL, OD	A	CAL, AAL

1. AL = active-low, AH = active-high, PU = with internal pull-up resistor, OD = open-drain.

Figure 19. Package marking, top view



A = dot (pin 1 reference)
B = assembly plant (P)
C = assembly year (Y, 0-9): 9 = 2009 etc.
D = assembly work week (WW, 01 to 52): 20 = WW20 etc.
E = marking area (topmark)

AM00479

11 Revision history

Table 12. Document revision history

Date	Revision	Changes
03-Feb-2010	1	Initial release.
10-May-2010	2	Updated title, *Features*, *Applications*, *Section 1*, *Figure 1*, *Table 1*, *Figure 2*, *Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Section 2.4*, *Figure 7*, note 1 below *Table 2*, *Section 2.6*, added *Section 2.7*, *Section 3*, *Table 5*, *Table 6*, *Table 7*, *Table 10*, *Section 8*, *Table 11*.
09-Jan-2012	3	Updated *Table 3*, *Table 5*, *Table 11* and Disclaimer, minor text corrections throughout document.

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