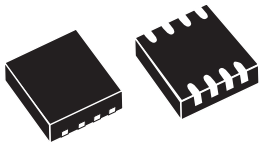
STM6522

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

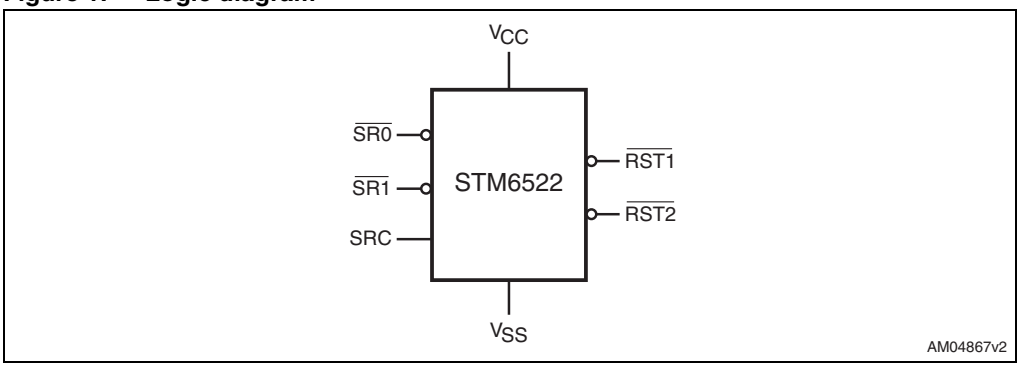


Table 1. Signal names

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

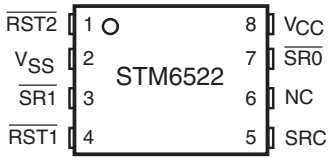


Figure 3. Block diagram

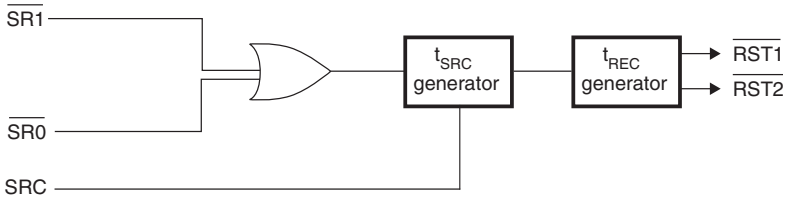


Figure 4. Single-button Smart Reset™ typical hookup

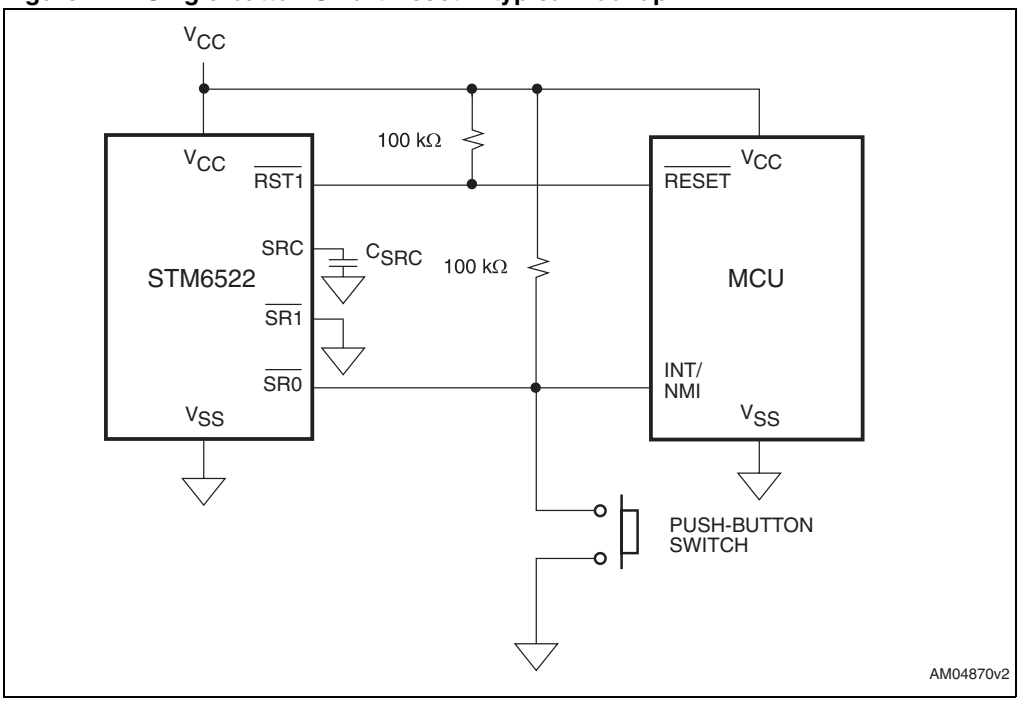


Figure 5. Dual-button Smart Reset™ typical hookup

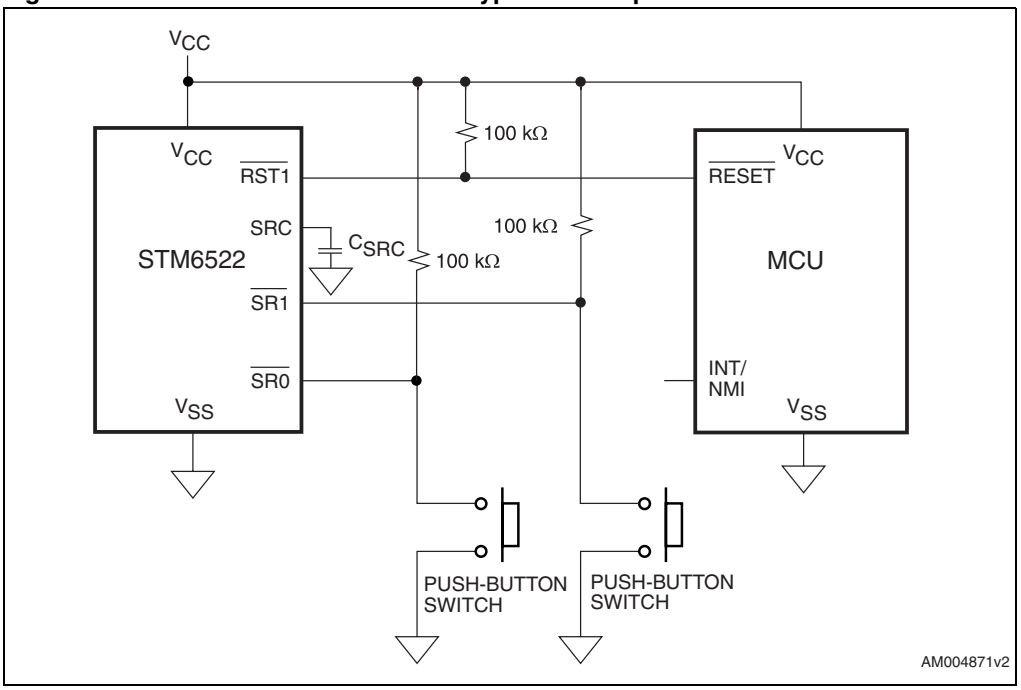
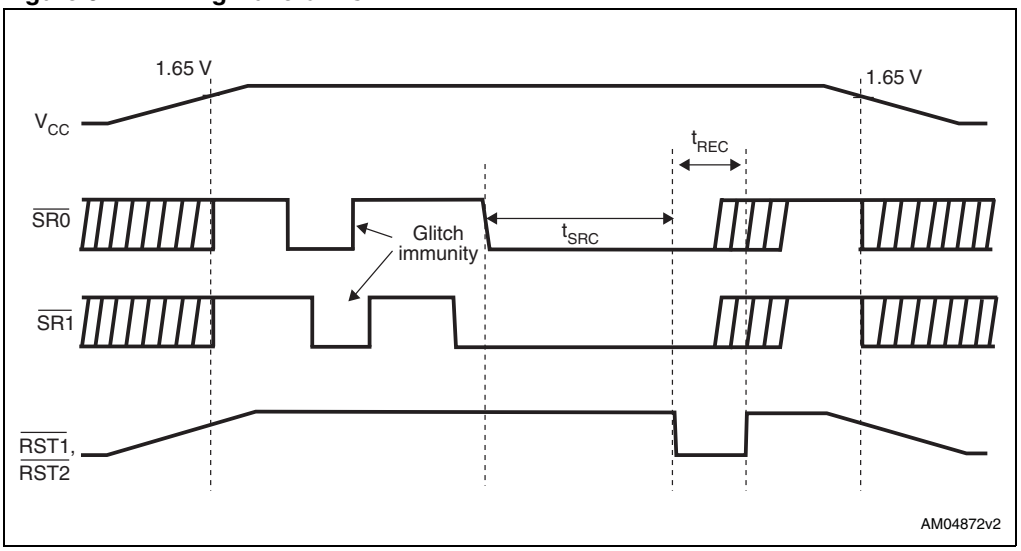


Figure 6. Timing waveforms



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.

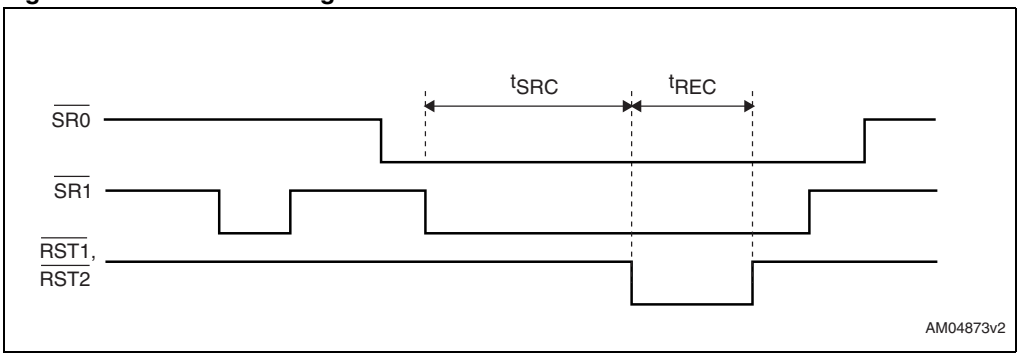
2.3 Primary Smart Reset™ input ($\overline{SR0}$)

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

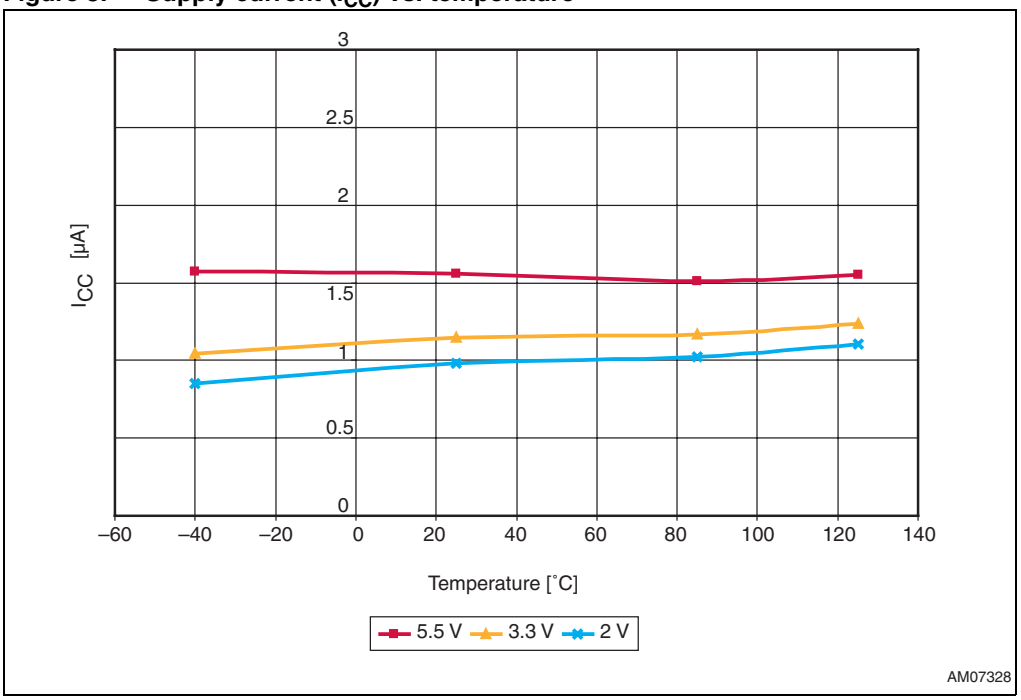


Figure 9. Smart Reset delay (t_{SRC}) vs. temperature, C_{SRC} = 0.6 µF

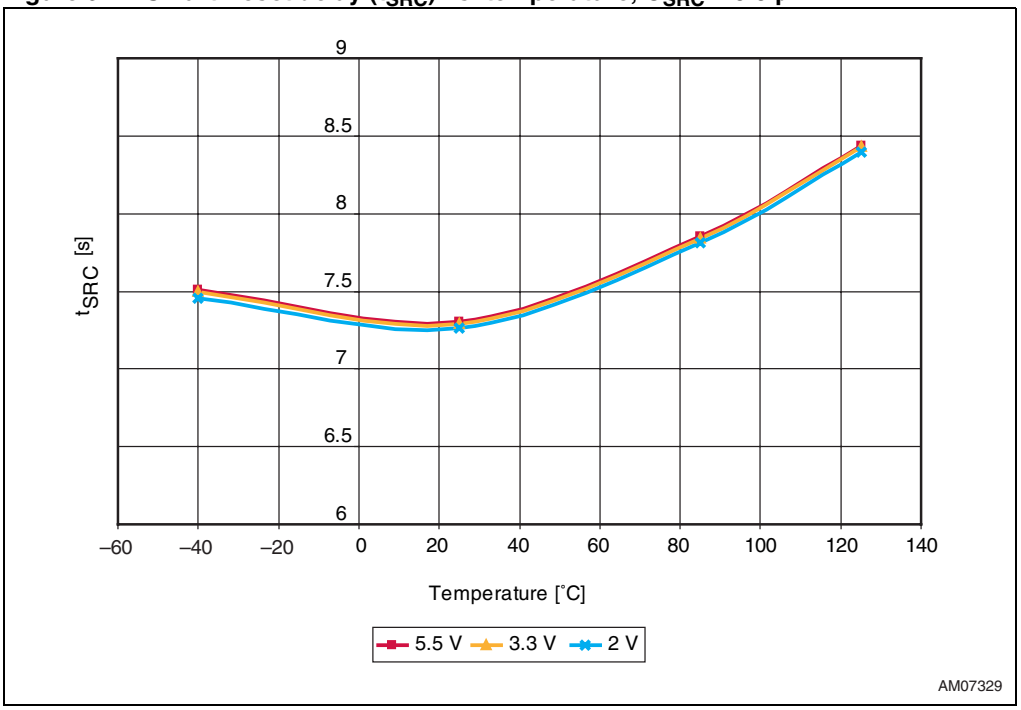


Figure 10. Reset timeout period (t_{REC}) vs. temperature

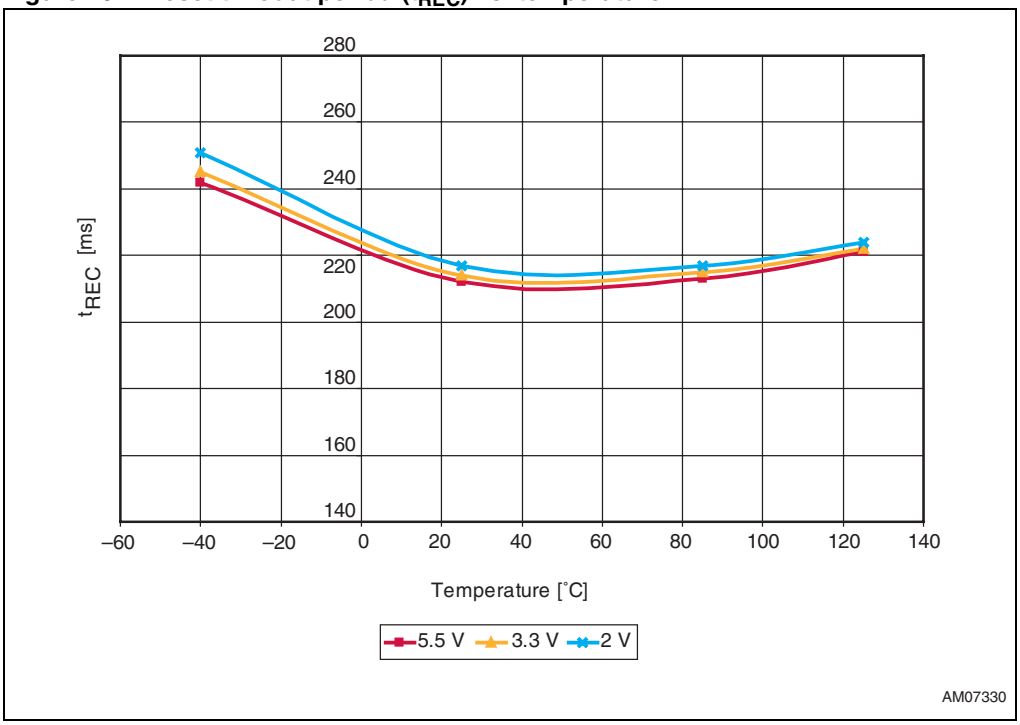
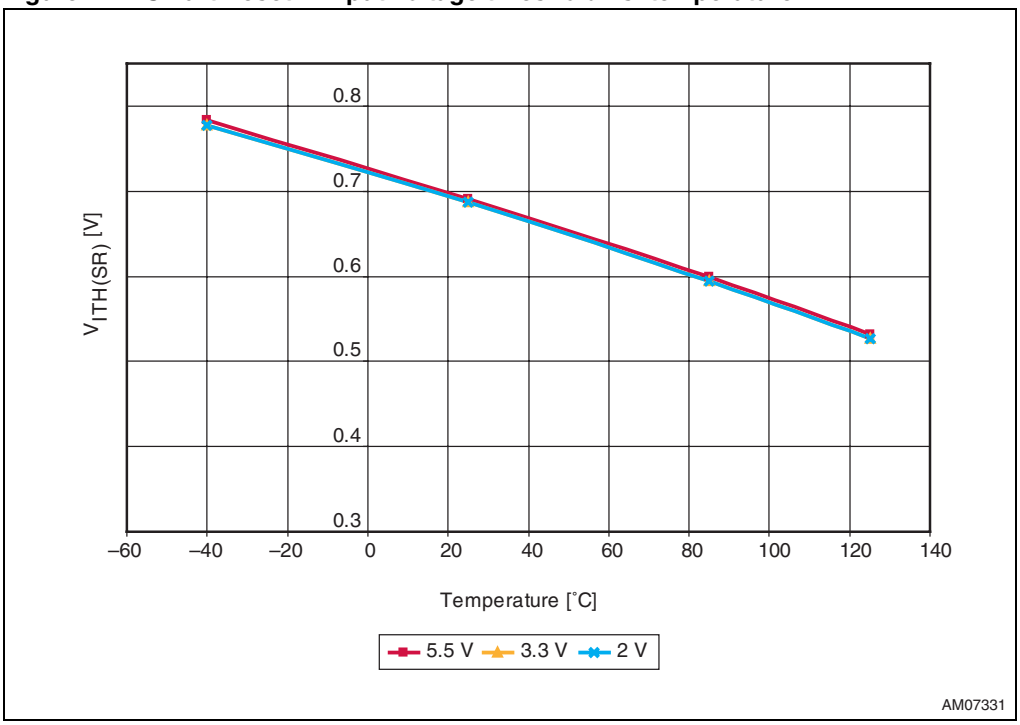


Figure 11. Smart Reset™ input voltage threshold vs. temperature



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 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 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 V_{CC} +0.3	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 the DC and AC characteristics tables that follow, 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

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	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

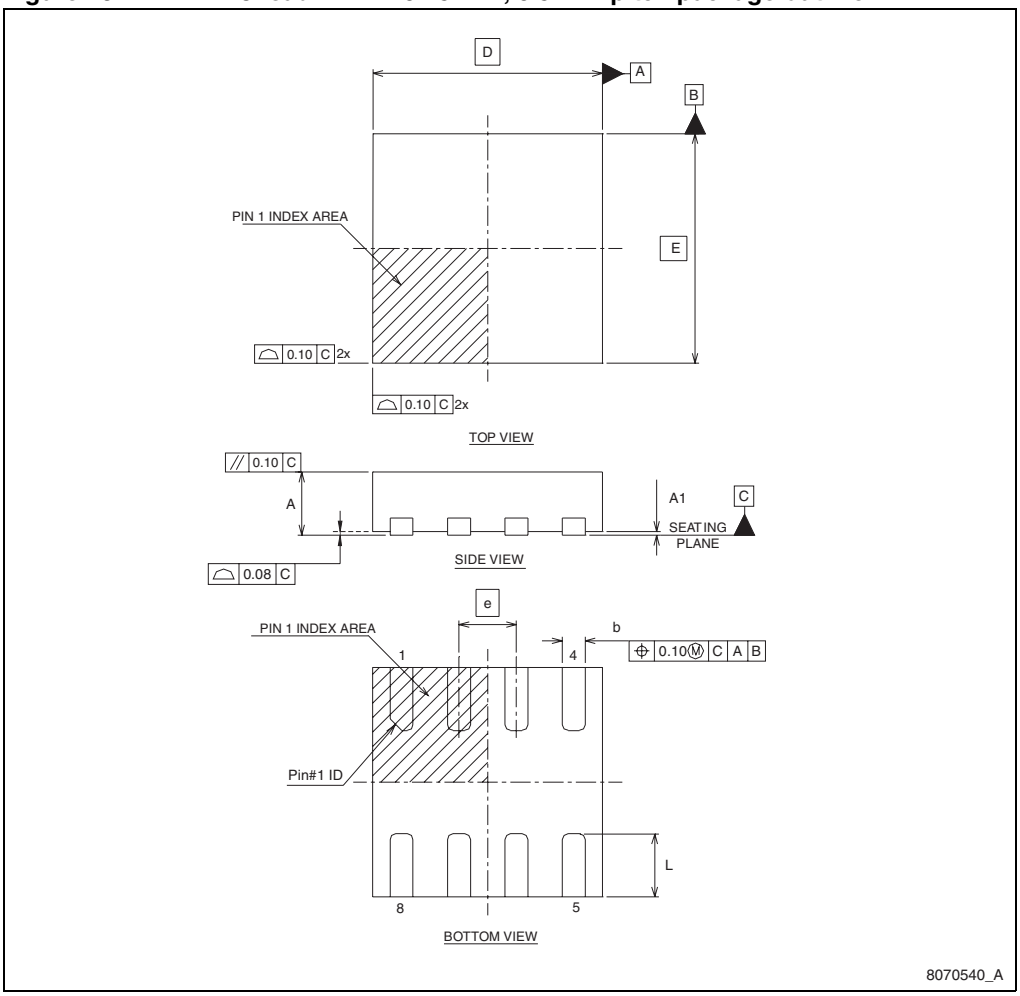


Table 6. TDFN – 8-lead 2 x 2 x 0.75 mm, 0.5 mm pitch package mechanical data

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

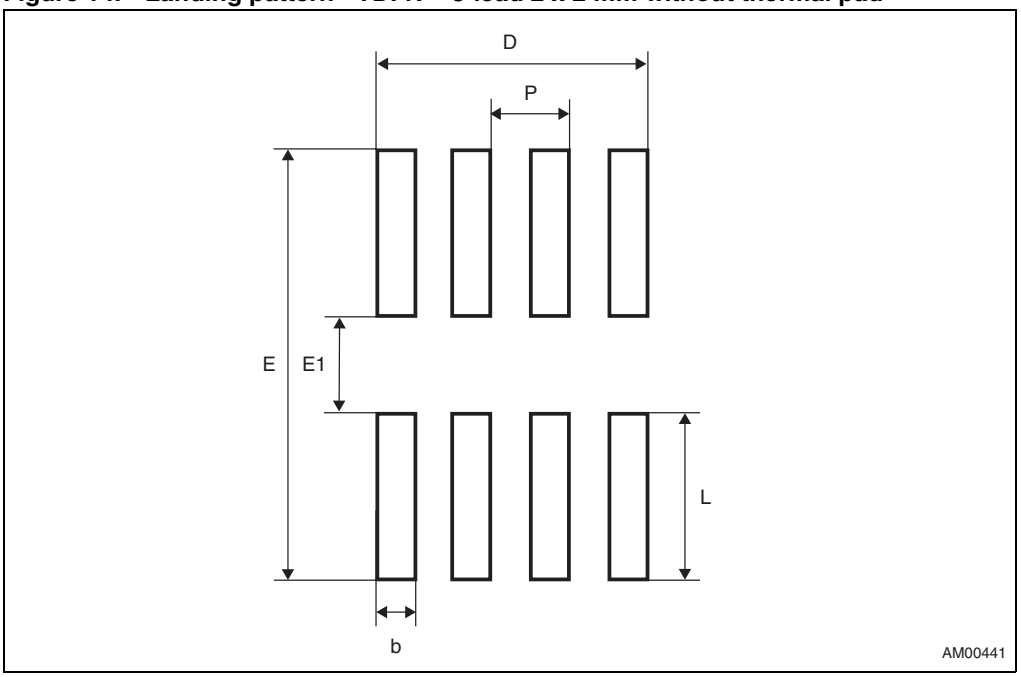


Table 7. Parameters for landing pattern - TDFN – 8-lead 2 x 2 mm package

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

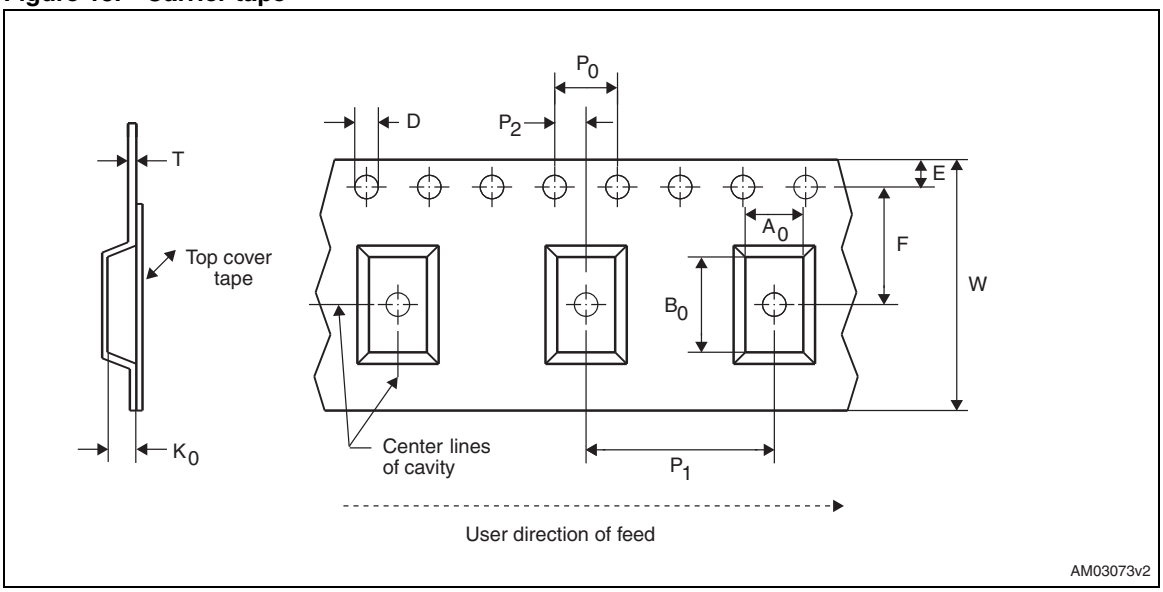


Table 8. Carrier tape dimensions

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

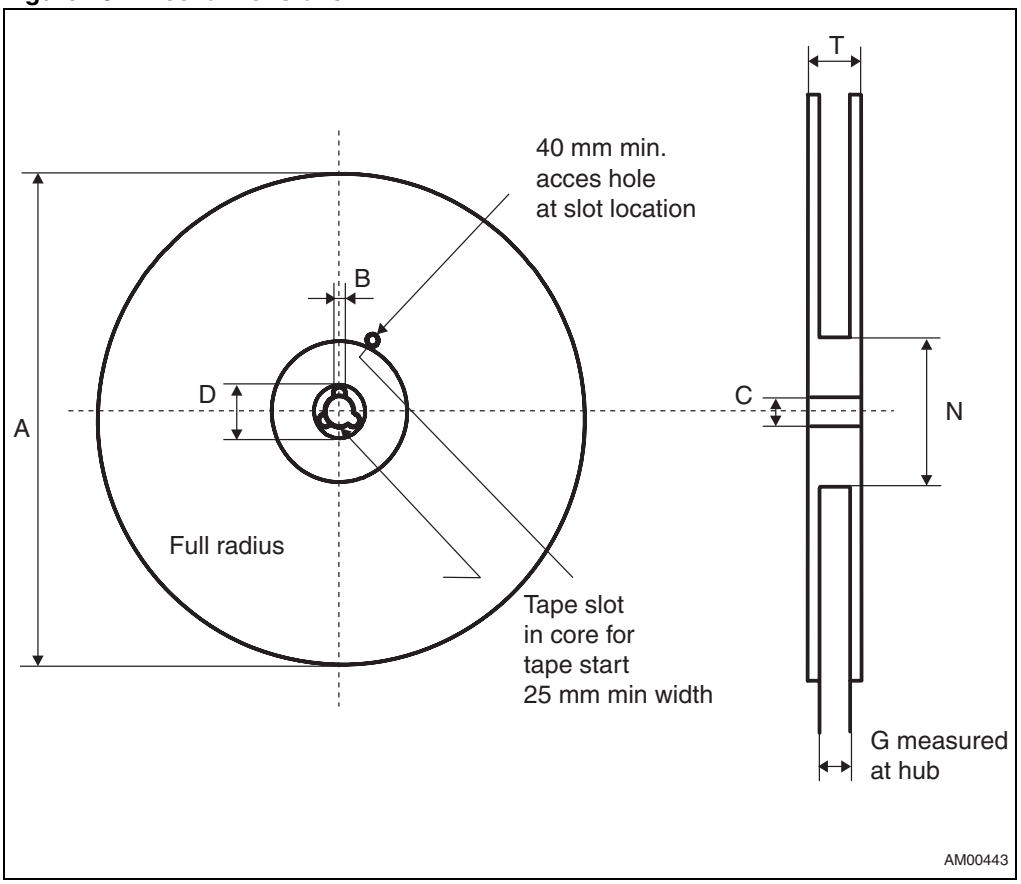


Table 9. Reel dimensions

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

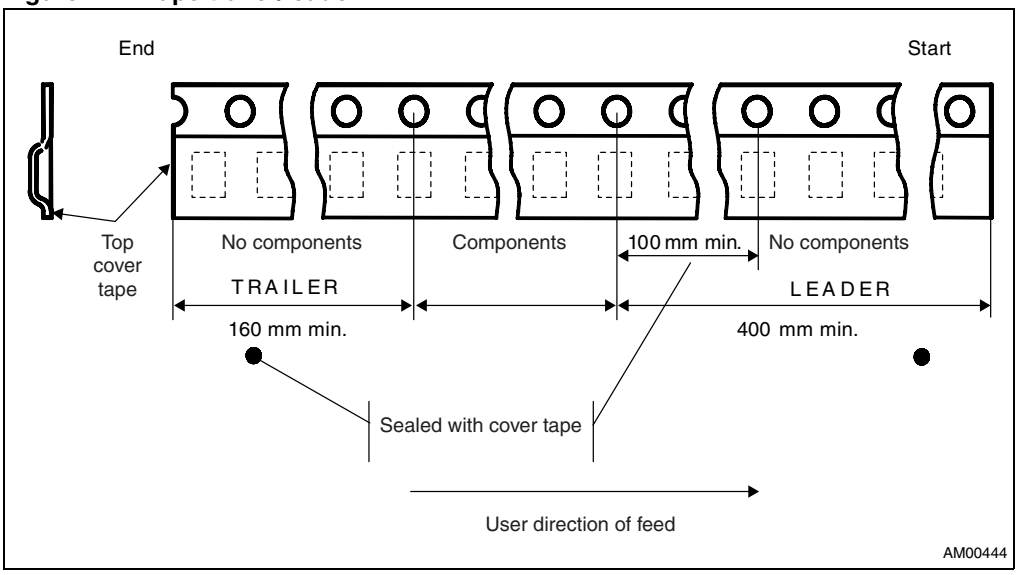
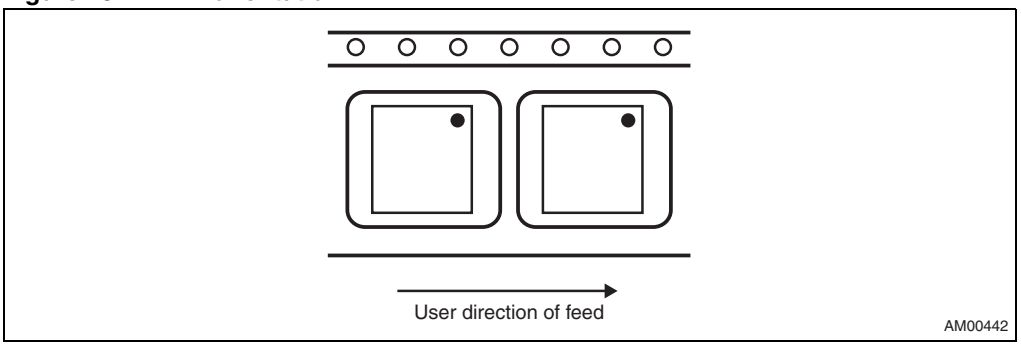


Figure 18. Pin 1 orientation



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.

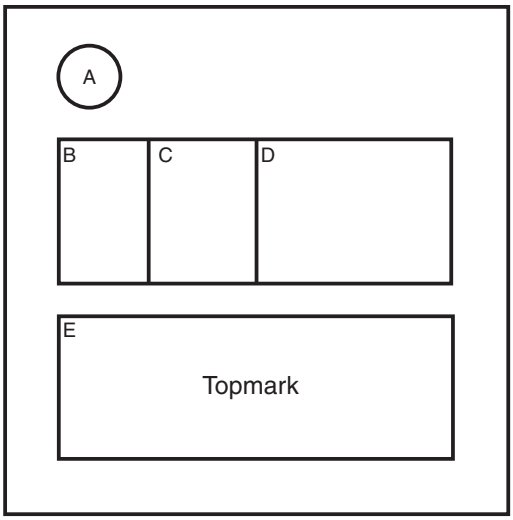
10 Package marking

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	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*.

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