

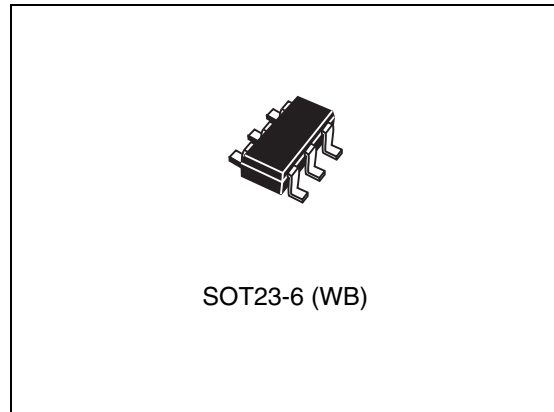


# STM6700 STM6710

## Low-voltage, high-accuracy, triple/quad voltage microprocessor supervisory circuit in SOT package

### Features

- Accurate monitoring of up to four supply voltages
- Precision factory-set reset threshold options for 1.8 V, 2.5 V, 3.0 V, 3.3 V and 5.0 V
- Adjustable input threshold voltage = 0.62 V with 1.5% accuracy
- Low power consumption (<35  $\mu$ A)
- Reset timeout period 200 ms (typ) - STM6710
- 5  $\mu$ s propagation delay ( STM6700)
- Open-drain  $\overline{\text{RESET}}$  output with a weak pull-up (10  $\mu$ A)
- $\overline{\text{RESET}}$  - active low - valid to  $V1IN = 1$  V or  $V2IN = 1$  V
- Immune to power supply transients
- Guaranteed from  $-40$  °C to  $+85$  °C
- Small 6-pin SOT23 package
- ROHS compliant



### Applications

- Telecommunications
- Set-top boxes
- Networking equipment
- Server/workstations
- Desktop and notebook computers
- Data storage equipment

Table 1. Device summary

Part number	V1IN (V)	V2IN (V)	V3IN (V)	V4IN (V)	Power supply tolerance	Temperature range	Package
STM6710DWB6F	5	3.3	1.8	Adj	5%	$-40$ °C to $+85$ °C	SOT23-6
STM6710FWB6F	Adj	3.3	2.5	1.8	5%	$-40$ °C to $+85$ °C	SOT23-6
STM6710KWB6F	Adj	3.3	1.8	Adj	10%	$-40$ °C to $+85$ °C	SOT23-6
STM6710LWB6F	Adj	3.3	1.8	Adj	5%	$-40$ °C to $+85$ °C	SOT23-6

## Contents

<b>1</b>	<b>Description</b> .....	<b>5</b>
1.1	Pin descriptions .....	7
<b>2</b>	<b>Operation</b> .....	<b>9</b>
2.1	$\overline{\text{RESET}}$ output configuration .....	9
2.2	Adjustable thresholds (input configurations) .....	11
2.3	Unused inputs .....	12
2.4	Adding manual reset capability .....	12
<b>3</b>	<b>Maximum ratings</b> .....	<b>13</b>
<b>4</b>	<b>DC and AC parameters</b> .....	<b>14</b>
<b>5</b>	<b>Package mechanical data</b> .....	<b>16</b>
<b>6</b>	<b>Part numbering</b> .....	<b>19</b>
<b>7</b>	<b>STM6700 / STM6710 device selector guide</b> .....	<b>20</b>
<b>8</b>	<b>Revision history</b> .....	<b>21</b>

## List of tables

Table 1.	Device summary . . . . .	1
Table 2.	Signal names . . . . .	6
Table 3.	Absolute maximum ratings . . . . .	13
Table 4.	DC and AC characteristics . . . . .	14
Table 5.	SOT23-6L – 6-lead small outline transistor package mechanical data. . . . .	17
Table 6.	Carrier tape dimensions for SOT23-6L. . . . .	18
Table 7.	Ordering information scheme . . . . .	19
Table 8.	STM6700/STM6710 device selector summary . . . . .	20
Table 9.	Document revision history . . . . .	21

## List of figures

Figure 1.	Logic diagram . . . . .	6
Figure 2.	Pinout SOT23-6 . . . . .	6
Figure 3.	Functional block diagram . . . . .	8
Figure 4.	Hardware hookup (typical application diagram) . . . . .	9
Figure 5.	Interface to external pull-up using a different supply voltage . . . . .	9
Figure 6.	$\overline{\text{RESET}}$ output diagram . . . . .	10
Figure 7.	Adjustable thresholds monitoring . . . . .	11
Figure 8.	Adding manual reset capability for STM6710 input . . . . .	12
Figure 9.	SOT23-6L – 6-lead small outline transistor package mechanical drawing . . . . .	17
Figure 10.	SOT23-6L landing pattern . . . . .	18
Figure 11.	Carrier tape for SOT23-6L . . . . .	18

# 1 Description

The STM6710 is a precision voltage-monitoring supervisor with the capability to monitor triple/quad voltages and combines competitive reset threshold accuracy with low-power consumption.

Factory-trimmed reset threshold options for monitoring 5.0 V, 3.3 V, 2.5 V and 1.8 V supplies with  $-5\%$  and  $-10\%$  tolerances as shown in [Table 1 on page 1](#) are available. [Table 8 on page 20](#) provides the complete selector guide for this device.

If a monitored supply voltage input falls below the minimum voltage threshold, a single active low output is asserted, triggering a system reset.

This device can be configured to support an external manual reset input using minimal external components.

Monitoring up to four different voltages in a small 6-lead SOT-23 package, the STM6710 devices can help to lower system cost, reduce board space requirements, and increase the reliability of multi-voltage systems.

Low  $V_{CC}$  detection circuitry protects the user's system from low voltage conditions, resetting the system when  $V_{CC}$  or any of the other monitored power supply voltages fall below their respective minimum voltage thresholds. The reset signal remains asserted until all of these voltages return to proper operating levels and stabilize.

STM6710 includes internally fixed monitoring voltages for 5.0 V, 3.3 V, 3.0 V, 2.5 V and 1.8 V supplies with  $-5\%$  and  $-10\%$  tolerances

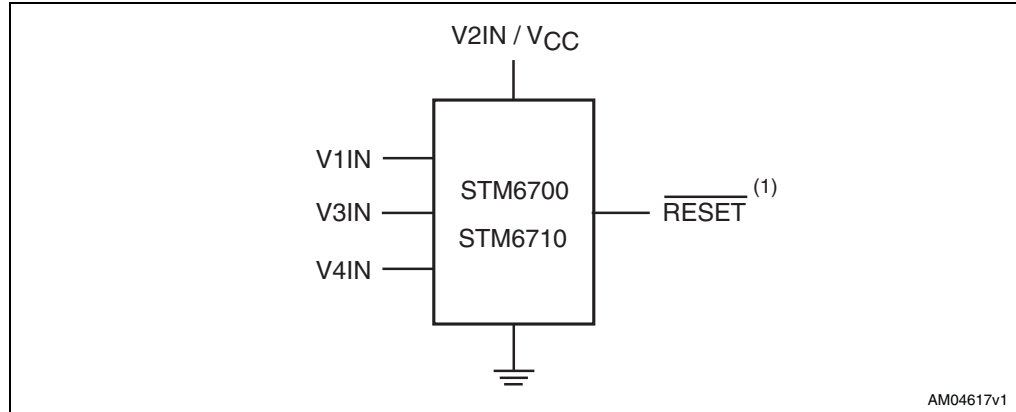
This device will function as a triple monitoring voltage supervisor (STM6700) when V2IN is used as  $V_{CC}$ .

The output is open drain with a weak internal pull-up to the monitored V2IN supply (or  $V_{CC}$  in the case of STM6710Q) of typically  $10\ \mu\text{A}$ . Once all voltages rise above the selected threshold level, the STM6710 reset signal remains low for the reset timeout period of 200 ms (typical). The STM6700 acts as a voltage detector with a propagation delay of  $5\ \mu\text{s}$  after all monitored voltages exceed their thresholds.

The STM6710 output remains valid as long as V1IN or V2IN exceeds 1 V. For the STM6700 and STM6710 the condition is to have  $V_{CC}$  above 2 V.

The STM6700/STM6710 are available in a 6-pin small SOT23 package and operate over the temperature range of  $-40\ ^\circ\text{C}$  to  $+85\ ^\circ\text{C}$  (refer to [Table 8 on page 20](#) for the selector guide).

Figure 1. Logic diagram

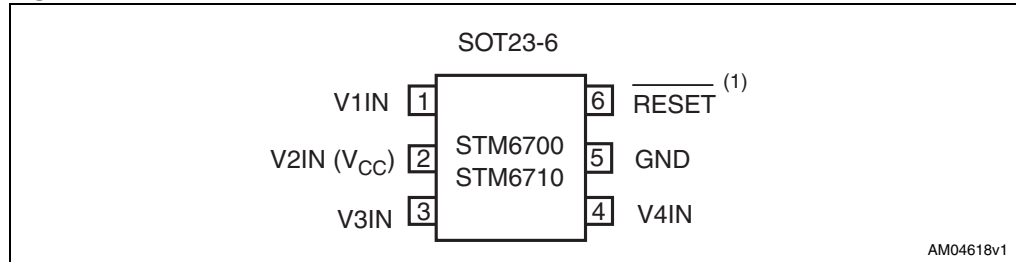


1. Open drain

Table 2. Signal names

Pin	Name	Type	Function (STM6710 / STM6700)
1	V1IN	Input	Input voltage 1
2	V2IN	Input/supply	Input voltage 2 and device power supply pin
	V <sub>CC</sub>		For the triple monitor voltage STM6700 and for STM6710Q, this pin is the V <sub>CC</sub> supply pin and is not monitored
3	V3IN	Input	Input voltage 3
4	V4IN	Input	Input voltage 4
5	GND	Supply	Ground
6	$\overline{\text{RESET}}$	Output	Active-low, open-drain $\overline{\text{RESET}}$ output. Output goes low when any input drops below the specified threshold. Once all inputs rise above their threshold voltages, $\overline{\text{RESET}}$ remains low for typical 200 ms (STM6710) before going high. For the triple monitor (STM6700) it remains low for 5 $\mu\text{s}$ (propagation delay - no $t_{\text{REC}}$ ). The open-drain $\overline{\text{RESET}}$ has a weak (10 $\mu\text{A}$ ) internal pull-up to V2IN (STM6710) or V <sub>CC</sub> (STM6700/STM6710Q).

Figure 2. Pinout SOT23-6



1. Open drain

**Note:** For the STM6700 and STM6710Q, pin 2 is a fixed V<sub>CC</sub>, thereby making it a triple voltage reset, while the STM6710 is a quad voltage reset.

## 1.1 Pin descriptions

### V1IN, V3IN, V4IN (VxIN)

The VxIN pins are used for nominal input voltages for 1.8 V, 2.5 V and 5.0 V supplies. The voltage at this pin is compared against an internal factory-programmed voltage trip point, Vrst.

$\overline{\text{RESET}}$  is first asserted low when the device is initially powered and  $V_{xIN} < 1 \text{ V}$  and then at any time thereafter when  $V_{xIN}$  falls below Vrst. The device is designed with typical hysteresis of 0.3% with respect to its threshold to help prevent oscillation due to noise and is immune to brief power-supply transients.

### V2IN

The V2IN is used to power the STM6710 device. In normal operations V2IN is also monitored. For STM6710Q and STM6700 variations this pin is the  $V_{CC}$  power supply but is not monitored.

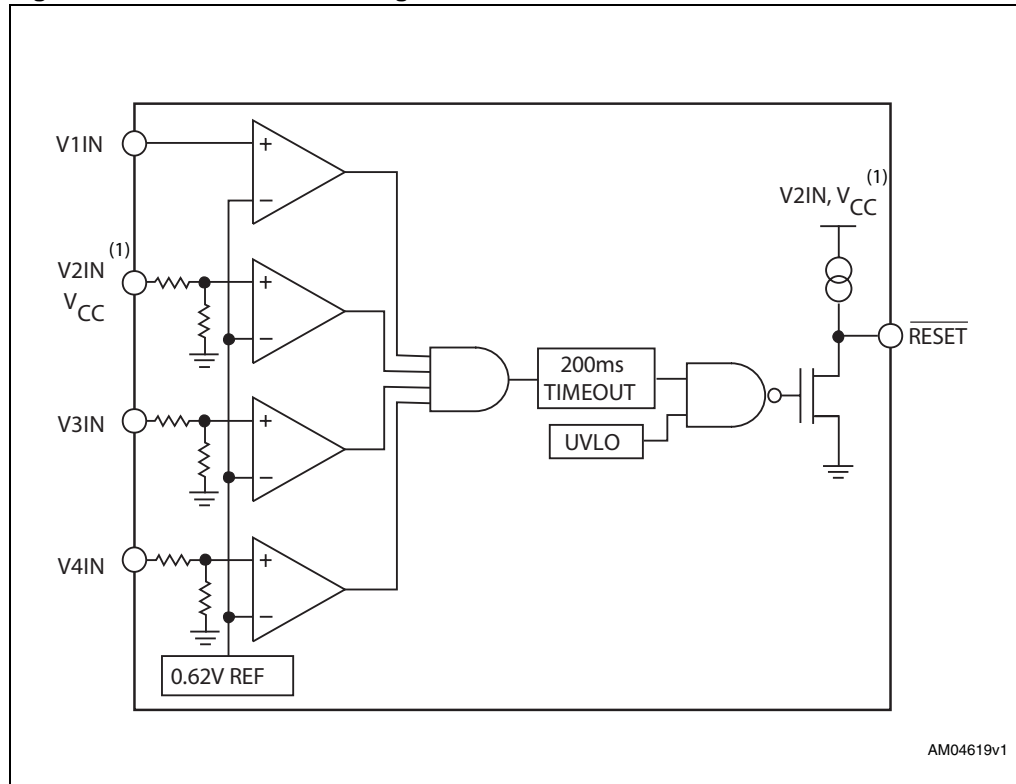
### Ground (V<sub>SS</sub>)

This pin (GND) is the ground pin for the power supply and is tied to  $V_{SS}$ .

### $\overline{\text{RESET}}$

The  $\overline{\text{RESET}}$  output is an open-drain output that asserts low whenever a monitored supply falls below the minimum threshold. STM6710 provides an extended reset timeout period of typically 200 ms.

Figure 3. Functional block diagram



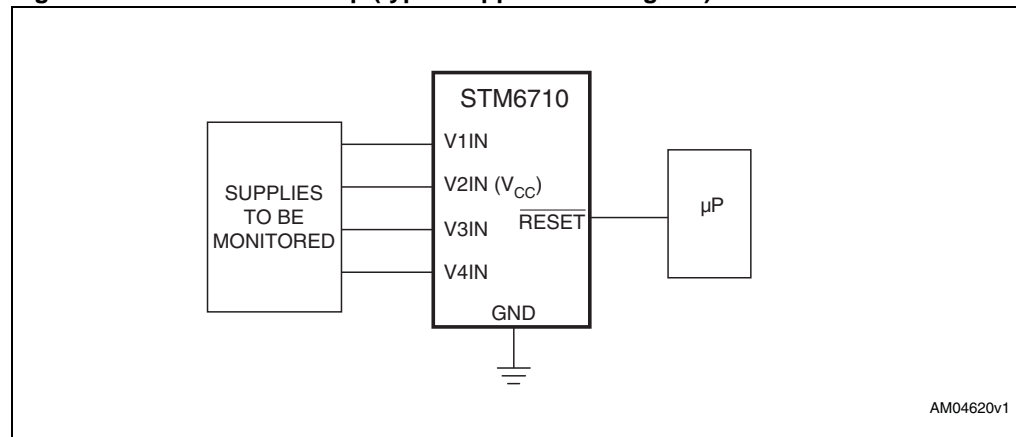
1. The STM6700 and STM6710Q are powered via the V2IN input which is the supply voltage. When this pin is  $V_{CC}$ , the input is not monitored.



## 2 Operation

The STM6710 is capable of monitoring up to 4 voltages in a multi-supply application. The device is available in several pre-set voltage thresholds for power supplies of 1.8 V, 2.5 V, 3.0 V, 3.3 V and 5.0 V. The STM6710 is powered by the V2IN pin which is also a monitored voltage, thus making this a quad voltage monitor. The STM6710Q and STM6700 use this pin as  $V_{CC}$  which is not monitored and thereby limits these devices to three adjustable voltage inputs. If any of the monitored input voltage falls below its associated threshold, the active-low reset output is asserted and remains low as long as V1IN or V2IN remains above 1.0 V.

**Figure 4. Hardware hookup (typical application diagram)**



### 2.1 RESET output configuration

The  $\overline{\text{RESET}}$  output asserts low if a monitored input voltage drops below its threshold. This is an open-drain with a weak internal pull-up to V2IN or the  $V_{CC}$  supply, and is typically 10  $\mu\text{A}$ . However, many applications may not require an external pull-up resistor. In case a pull-up resistor is required and is connected to a voltage ranging from 0 V to 5.5 V (as shown in [Figure 5](#) below), it can overdrive the weak internal pull-up. The STM6710 has built-in circuitry to prevent this reverse current flow to V2IN under this condition.

**Figure 5. Interface to external pull-up using a different supply voltage**

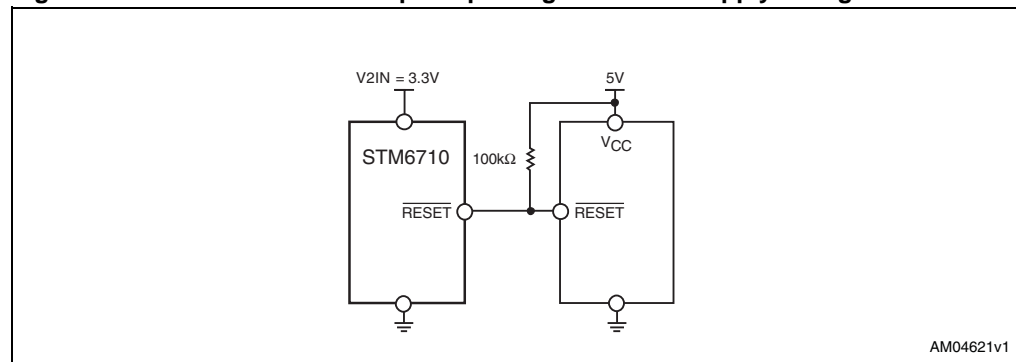
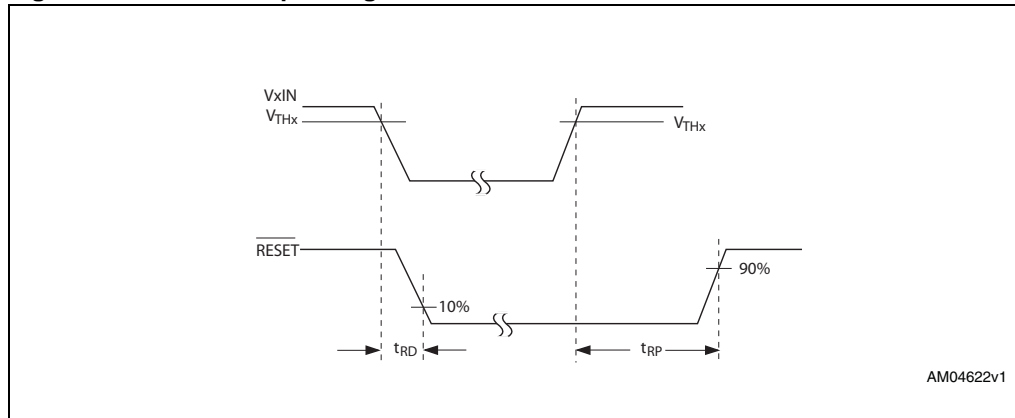


Figure 6.  $\overline{\text{RESET}}$  output diagram



## 2.2 Adjustable thresholds (input configurations)

The STM6700/STM6710 may be configured to monitor several options with adjustable reset thresholds. The threshold voltages at each adjustable input VxIN is typically 0.62 V. Thus to monitor a voltage > 0.62 V, a resistor divider network as shown in [Figure 7](#) below can be used.

The STM6710 allows users to customize the minimum voltage sense level with adjustable reset thresholds. The threshold voltage at each adjustable input VxIN is typically 0.62 V. For example, the user can adjust the voltage input threshold (VTHx) for V1IN, V3IN and V4IN inputs. To do this, connect an external resistor divider network to the VxIN pin in order to set the trip point to some other voltage above 620 mV according to the following formula which is also shown in [Figure 7](#).

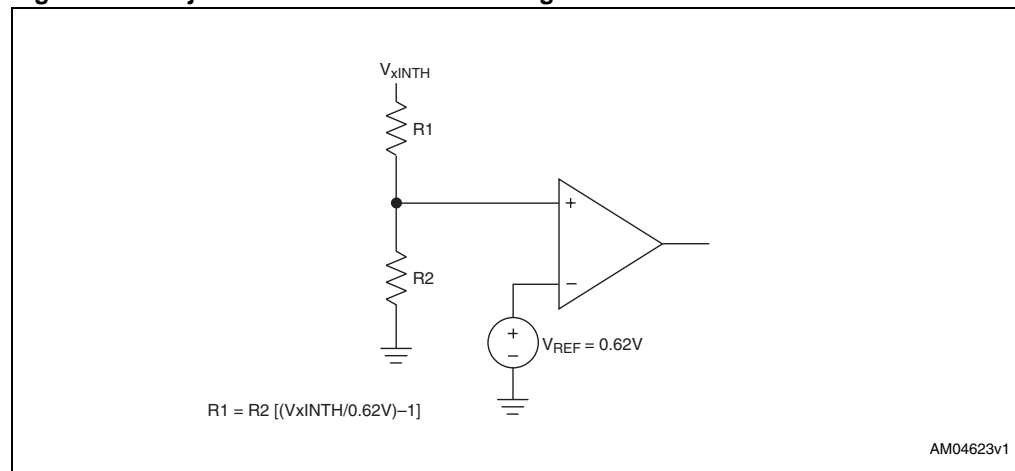
$$V_{THx} = 0.62 \text{ V} \times \frac{(R1 + R2)}{R2}$$

or solved in terms of R1:

$$R1 = R2 \left( \frac{V_{THx}}{0.62\text{V}} - 1 \right)$$

The STM6700/STM6710 have an input current of less than  $\pm 0.2 \mu\text{A}$  ( $\pm 0.4 \mu\text{A}$  for VIN1) on their adjustable inputs, therefore resistor values of up to 100 k $\Omega$  can be used for R2 with <1% error.

**Figure 7. Adjustable thresholds monitoring**



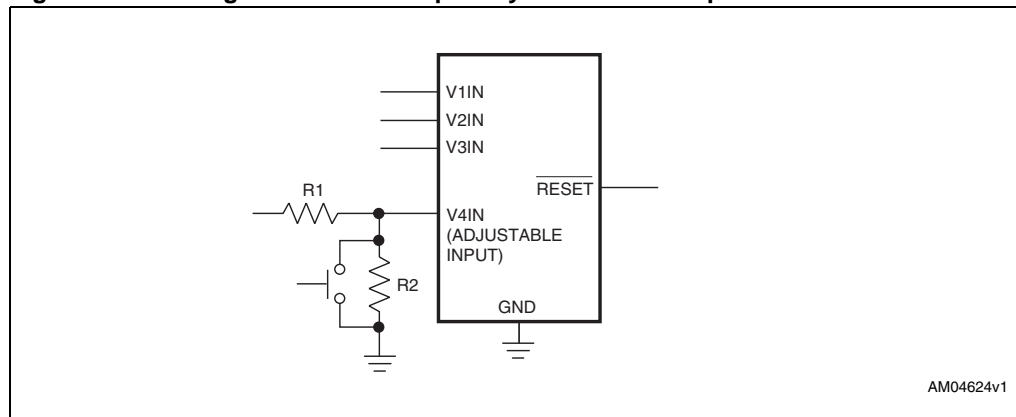
## 2.3 Unused inputs

Connect unused monitor inputs to a supply voltage greater in magnitude than their specified threshold voltages. For unused VxIN adjustable inputs connect a 1 M ohm resistor between unused input and V2IN or ( $V_{CC}$ ) to limit the bias current. Use V2IN for normal operation (device power supply pin). Do not connect unused monitor inputs to ground or allow them to float.

## 2.4 Adding manual reset capability

*Figure 8* shows a circuit which can be used to add manual reset capability for the STM6710. Depressing the push button switch short circuits the analog input to ground and initiates a  $\overline{\text{RESET}}$  pulse. The switch must be open for at least 140 ms in order to de-assert the  $\overline{\text{RESET}}$  output. No external switch debounce is required. A small capacitor may be used to improve noise immunity. *Figure 8* below shows the addition of the manual reset capability.

**Figure 8. Adding manual reset capability for STM6710 input**



### 3 Maximum ratings

Stressing the device above the rating listed in the absolute maximum ratings table 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
$V_{IO}$	Input or output voltage	-0.3 to $V_{CC} + 0.3$	V
$V_{CC}$	Supply voltage	-0.3 to +7.0 V	V
$I_O$	Output current	20	mA
$\theta_{JA}$	Thermal resistance (junction to ambient)	N/A	°C/W

1. Reflow at peak temperature of 260 °C. The time above 255 °C must not exceed 30 seconds.

## 4 DC and AC parameters

This section summarizes the DC and AC characteristics of the device. The parameters in the DC and AC characteristics table that follows are derived from tests performed under the test conditions. Designers should check that the operating conditions in their circuit match the operating conditions when relying on the quoted parameters.

**Table 4. DC and AC characteristics**

Alt.	Symbol	Parameter	Test conditions	Min	Typ <sup>(1)</sup>	Max	Unit
V <sub>CC</sub>	V2IN	Operating voltage	T <sub>A</sub> = 0 °C to +85 °C	1.0		5.5	V
			T <sub>A</sub> = -40 °C to +85 °C	1.2		5.5	
	V <sub>CC</sub>	STM6700 and STM6710Q		2.0		5.5	
	I <sub>XIN</sub>	Input current	V <sub>XIN</sub> nominal input voltage (1.8 V, 2.5 V, 5.0 V supplies)		25	40	μA
			V2IN = nominal input voltage for 3.0 V and 3.3 V supplies		55	115	
			V1IN = 0 to 0.85 V (for adjustable thresholds)			0.4	
			V3IN, V4IN = 0 to 0.85 V (for adjustable thresholds)			0.2	
I <sub>CC</sub>	I2N	I2N input current	STM6700 and STM6710Q only V <sub>CC</sub> = 5.5 V		35	50	μA
<b>Voltage thresholds</b>							
V <sub>rst</sub>	V <sub>TH</sub>	V <sub>XIN</sub> falling	5 V (-5%)	4.500	4.630	4.750	V
			5 V (-10%)	4.250	4.380	4.450	
			3.3 V (-5%)	3.000	3.080	3.150	
			3.3 V (-10%)	2.850	2.930	3.000	
			3.0 V (-5%)	2.700	2.780	2.850	
			3.0 V (-10%)	2.550	2.630	2.70	
			2.5 V (-5%)	2.250	2.320	2.380	
			2.5 V (-10%)	2.130	2.190	2.250	
			1.8 V (-5%)	1.620	1.670	1.710	
1.8 V (-10%)	1.530	1.580	1.620				
V <sub>rstxin</sub>	V <sub>REF</sub>	V1IN, V2IN, V3IN, V4IN adj. reset threshold voltage	V <sub>XIN</sub> decreasing	0.611	0.620	0.629	V
V <sub>HYST</sub>		Hysteresis of V <sub>TH</sub>			0.3		%V <sub>TH</sub>
	TCVTH	Reset threshold temperature coefficient			60		ppm/°C

Table 4. DC and AC characteristics (continued)

Alt.	Symbol	Parameter	Test conditions	Min	Typ <sup>(1)</sup>	Max	Unit
<b>Reset</b>							
t <sub>RD</sub>	t <sub>RPD</sub>	V <sub>TH</sub> to reset asserted delay	VxIN falling at 10 mV/μs from V <sub>TH</sub> to (V <sub>TH</sub> - 50 mV)		30		μs
t <sub>RP</sub>	t <sub>REC</sub>	Reset timeout delay	STM6710	140	200	280	ms
t <sub>PD</sub>		Propagation delay	STM6700 only		5		μs
	V <sub>OL</sub>	$\overline{\text{RESET}}$ output low	V2IN, V <sub>CC</sub> = 5 V, I <sub>SINK</sub> = 2 mA			0.3	V
			V2IN, V <sub>CC</sub> = 2.5 V, I <sub>SINK</sub> = 1.2 mA			0.4	
			V2IN = 1.0 V, I <sub>SINK</sub> = 50 μA, T <sub>A</sub> = 0 °C to +85 °C			0.3	
	V <sub>OH</sub>	$\overline{\text{RESET}}$ output high	V <sub>CC</sub> ≥ 2.0 V, I <sub>SOURCE</sub> = 6 μA, $\overline{\text{RESET}}$ deasserted (STM6700)	0.8 x V <sub>CC</sub>			
			V <sub>CC</sub> ≥ V <sub>TH</sub> , I <sub>SOURCE</sub> = -6 μA, $\overline{\text{RESET}}$ deasserted	0.8 x V2IN			
	I <sub>OH</sub>	$\overline{\text{RESET}}$ output high source current	V2IN ≥ 2.0 V, $\overline{\text{RESET}}$ deasserted		10		μA

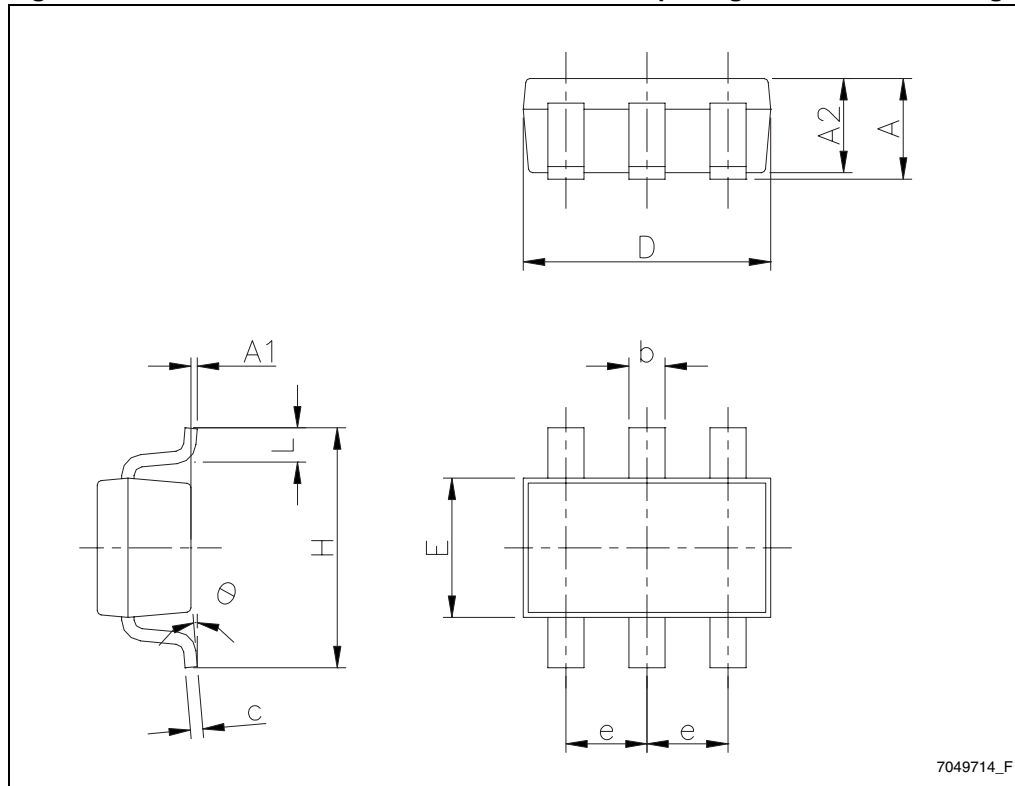
1. V2IN = 1 V to 5.5 V, T<sub>A</sub> = -40 °C to +85 °C, unless otherwise stated. Typical values are at V2IN = 3.0 V to 3.3 V, T<sub>A</sub> = +25 °C.

## 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 9. SOT23-6L – 6-lead small outline transistor package mechanical drawing



7049714\_F

Table 5. SOT23-6L – 6-lead small outline transistor package mechanical data

Sym	mm			inches		
	Min	Typ	Max	Min	Typ	Max
A	0.9		1.45	0.035		0.057
A1	0		0.10	0		0.0039
A2	0.9		1.3	0.035		0.0512
b	0.35		0.5	0.014		0.02
c	0.09		0.2	0.004		0.008
D	2.8		3.05	0.11		0.120
E	1.5		1.75	0.059		0.0689
e		0.95			0.037	
H	2.6		3	0.102		0.118
L	0.1		0.6	0.004		0.024
θ	0°		10°	0°		10°

Figure 10. SOT23-6L landing pattern

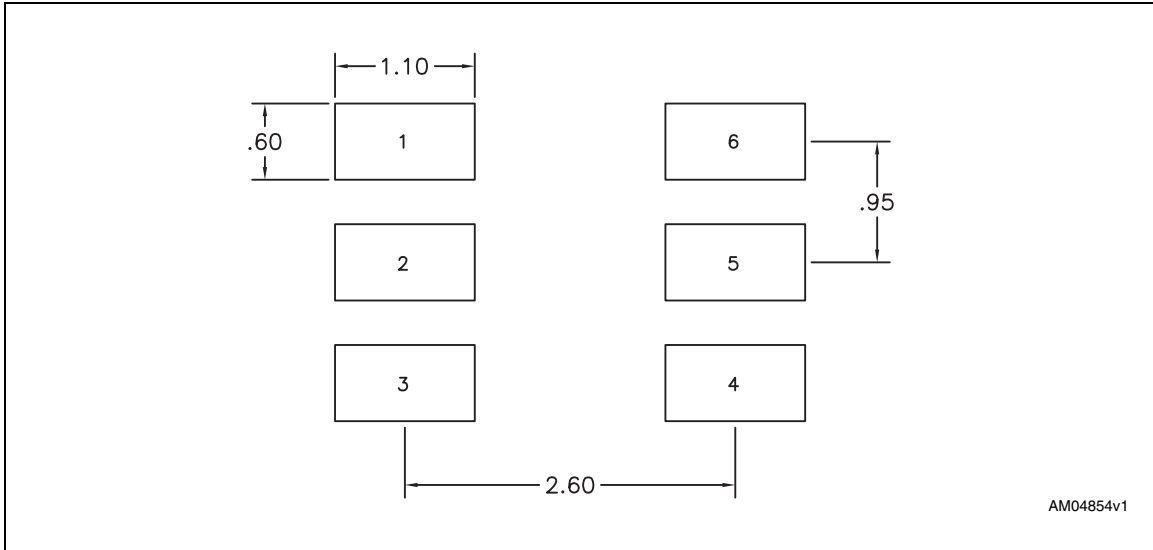


Figure 11. Carrier tape for SOT23-6L

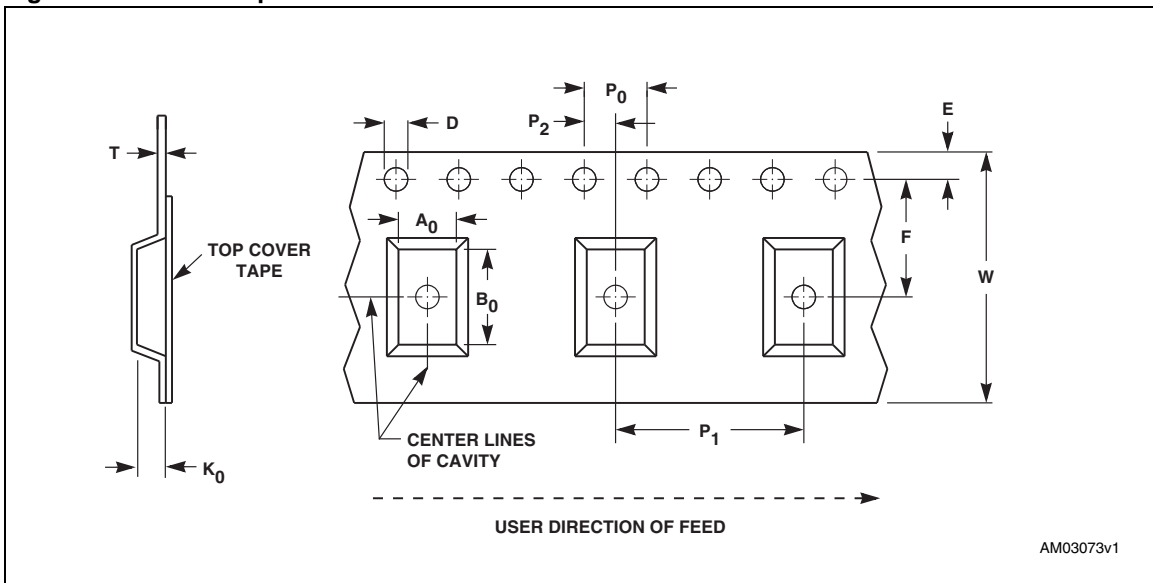


Table 6. Carrier tape dimensions for SOT23-6L

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
SOT23-6	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	3.23 ±0.10	3.17 ±0.10	1.37 ±0.10	4.00 ±0.10	0.254 ±0.013	mm	3000

## 6 Part numbering

**Table 7. Ordering information scheme**

Example:	STM6710	F	WB	6	F
<b>Device type</b>	STM6700 <sup>(1)</sup> STM6710				
<b>Threshold combination</b>	Refer to <a href="#">Table 8: STM6700/STM6710 device selector summary</a>				
<b>Package</b>	WB = SOT23-6				
<b>Temperature range</b>	6 = -40 °C to +85 °C				
<b>Shipping method</b>	F = ECOPACK <sup>®</sup> package, tape & reel packing				

1. Contact local ST sales office for availability

For other options, or for more information on any aspect of this device, please contact the ST sales office nearest you.

## 7 STM6700 / STM6710 device selector guide

The STM6700/STM6710 are designed for various voltage thresholds and configurations, however not all variations are shown in [Table 8](#). Please contact local ST sales office for availability.

**Table 8. STM6700/STM6710 device selector summary**

Part name	Monitored pins				Supply pin	t <sub>REC</sub> (ms)	Supply tolerance (%)	Top marking	Comments
	V1IN (V)	V2IN (V)	V3IN (V)	V4IN (V)					
STM6710AWB6F	5	3.3	2.5	Adj	V2IN	200	10	D6BA	Contact ST sales office
STM6710BWB6F	5	3.3	2.5	Adj	V2IN	200	5	D6BB	Contact ST sales office
STM6710CWB6F	5	3.3	1.8	Adj	V2IN	200	10	D6BC	Contact ST sales office
<b>STM6710DWB6F</b>	<b>5</b>	<b>3.3</b>	<b>1.8</b>	<b>Adj</b>	<b>V2IN</b>	<b>200</b>	<b>5</b>	<b>D6BD</b>	<b>Available</b>
STM6710EWB6F	Adj	3.3	2.5	1.8	V2IN	200	10	D6BE	Contact ST sales office
<b>STM6710FWB6F</b>	<b>Adj</b>	<b>3.3</b>	<b>2.5</b>	<b>1.8</b>	<b>V2IN</b>	<b>200</b>	<b>5</b>	<b>D6BF</b>	<b>Available</b>
STM6710GWB6F	5	3.3	Adj	Adj	V2IN	200	10	D6BG	Contact ST sales office
STM6710HWB6F	5	3.3	Adj	Adj	V2IN	200	5	D6BH	Contact ST sales office
STM6710IWB6F	Adj	3.3	2.5	Adj	V2IN	200	10	D6BI	Contact ST sales office
STM6710JWB6F	Adj	3.3	2.5	Adj	V2IN	200	5	D6BJ	Contact ST sales office
<b>STM6710KWB6F</b>	<b>Adj</b>	<b>3.3</b>	<b>1.8</b>	<b>Adj</b>	<b>V2IN</b>	<b>200</b>	<b>10</b>	<b>D6BK</b>	<b>Available</b>
<b>STM6710LWB6F</b>	<b>Adj</b>	<b>3.3</b>	<b>1.8</b>	<b>Adj</b>	<b>V2IN</b>	<b>200</b>	<b>5</b>	<b>D6BL</b>	<b>Available</b>
STM6710MWB6F	Adj	3	2.5	Adj	V2IN	200	10	D6BM	Contact ST sales office
STM6710NWB6F	Adj	3	2.5	Adj	V2IN	200	5	D6BN	Contact ST sales office
STM6710OWB6F	Adj	3	1.8	Adj	V2IN	200	10	D6BO	Contact ST sales office
STM6710PWB6F	Adj	3	1.8	Adj	V2IN	200	5	D6BP	Contact ST sales office
STM6710QWB6F	Adj	V <sub>CC</sub>	Adj	Adj	V <sub>CC</sub>	N/A	N/A	D6BQ	Contact ST sales office
STM6700WB6F	Adj	V <sub>CC</sub>	Adj	Adj	V <sub>CC</sub>	N/A	N/A	D6BZ	Contact ST sales office

## 8 Revision history

Table 9. Document revision history

Date	Revision	Changes
09-Dec-2009	1	Initial release.

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