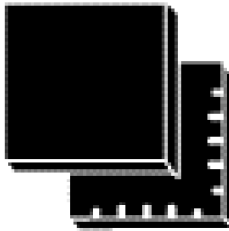


## Ultra-low power and wide input dynamic buck-boost converter



**VFQFPN 3 x 3 x 1 mm 20L**

### Features

- Seamless transition from Buck-Boost to Boost and vice versa working mode
- Up to 70 mA output current
- Four fully integrated MOSFETs
- Enable pin
- 2.6 V to 5.3 V trimmable overvoltage level ( $\pm 1\%$  accuracy)
- 2.2 V to 3.6 V trimmable undervoltage level ( $\pm 1\%$  accuracy)
- Two fully independent LDOs (1.8 V and 3.3 V output)
- Enable/disable LDO control pins
- Load disconnect function at first switch-on
- Embedded pass transistor status and DC-DC status open drain indication pins

### Application

- WSN, HVAC, building and home automation, industrial control, remote metering, lighting, security, surveillance
- Wearable and biomedical sensors, fitness
- Battery charging

### Description

The STBLW35 is an ultra-low power and high-efficiency buck-boost DC-DC converter which can work as boost or buck-boost according to the selected hardware configuration. When in buck-boost the DC-DC can seamlessly switch between the two working modes depending on operating conditions.

The IC shows very low power losses either in active or disable mode and provides an average output current between 33mA to 70mA, suitable to guarantee load minimum current constraints or to faster charge a battery. The device also allows the charge of any battery by tightly monitoring the end-of-charge and the minimum battery voltage in order to avoid overdischarge and to preserve battery life.

The power manager covers the input voltage range from 75 mV up to 18 V and guarantees high efficiency in both buck-boost and boost configuration.

Furthermore the STBLW35 device shows very high flexibility thanks also to the trimming capability of the overvoltage and the undervoltage protection voltages.

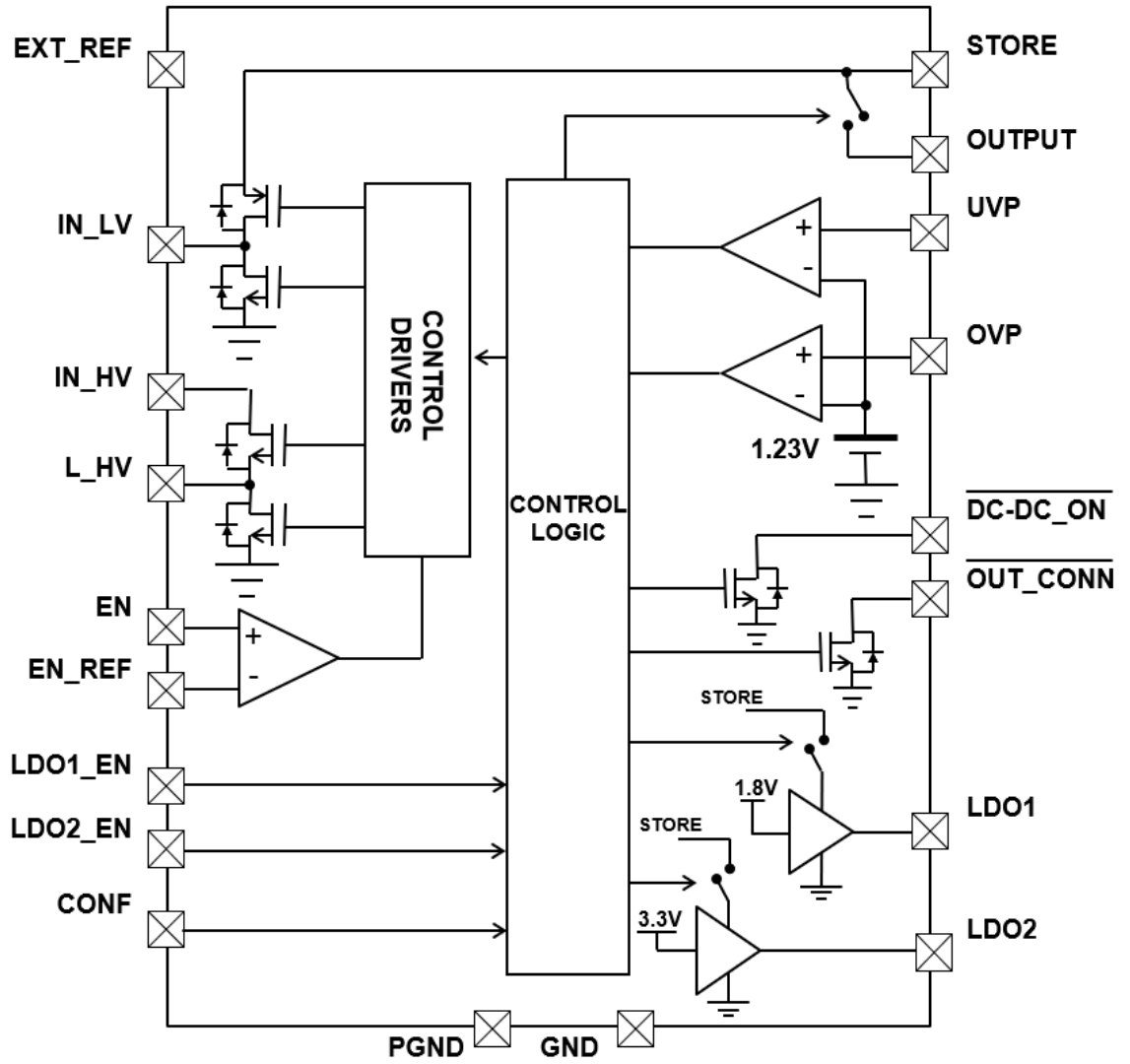
In order to optimize the power consumption during system operation, the device can be driven in standby mode thanks to the high impedance open-drain Enable pin.

An unregulated voltage output is available (to supply a transceiver for instance), while two fully independent LDOs are embedded for powering sensors and other companion chips. Both LDOs (1.8 V and 3.3 V) can be independently enabled through dedicated pins.

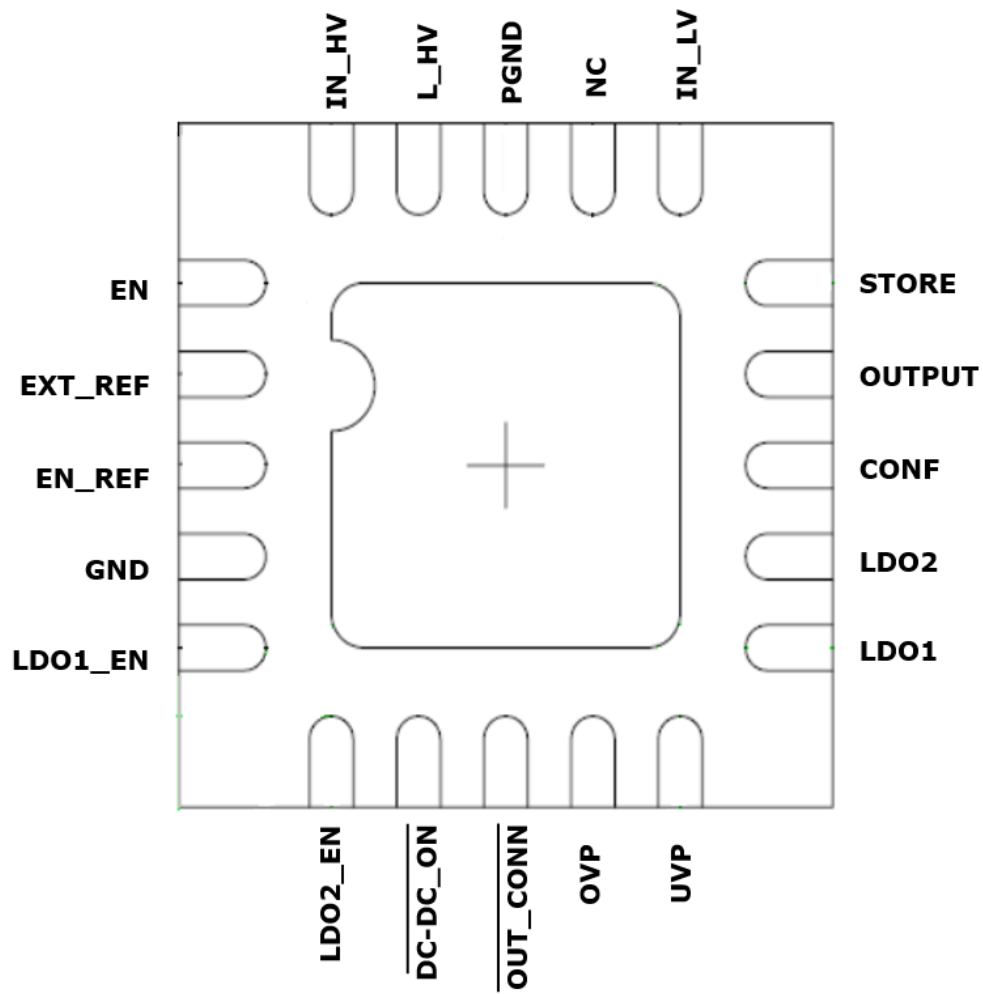
Product status link
<a href="#">STBLW35</a>
Product label


# 1 Block Diagram

Figure 1. Block diagram



## 2 Pin configuration



### 3 Pin description

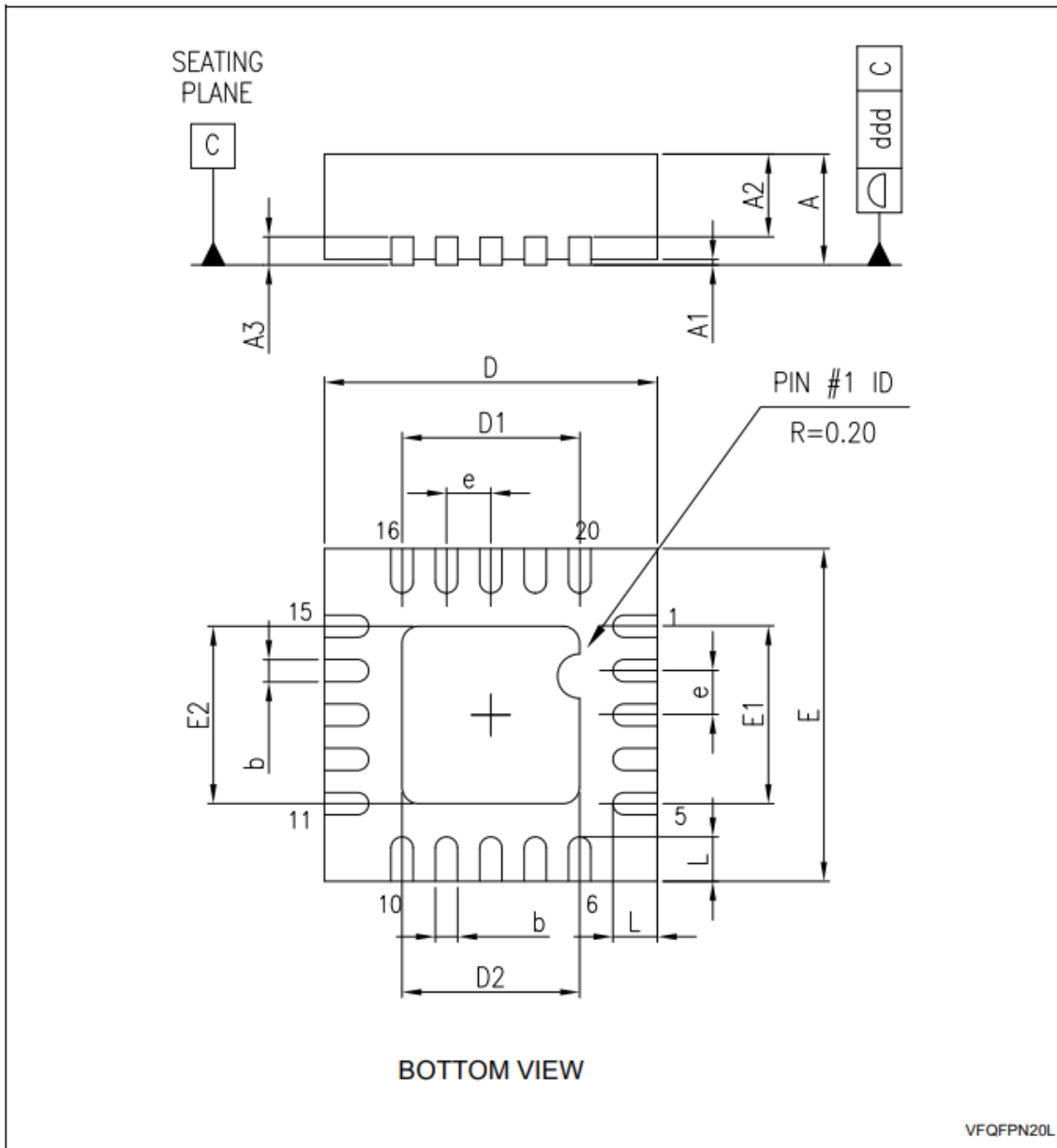
Pin no.	Name	Type	Description
1	EN	I	Enable/disable switching pin. Connected to the voltage source by a resistor (e.g 1kΩ).
2	EXT-REF	I	Connect this to STORE pin (by a short or by a 1kΩ resistor)
3	EN-REF	I	Connect this pin to an external voltage reference: the DC-DC switches when $V_{EN} > V_{EN-REF}$ and stops switching when $V_{EN} \leq V_{EN-REF}$ . Connecting this pin to ground enables continuous switching of the DC-DC converter provided that enough power is available at the source and other protections are not active.
4	GND	GND	Signal ground pin.
5	LDO1_EN	I	If high, enables LDO1.
6	LDO2_EN	I	If high, enables LDO2.
7	$\overline{DC-DC\_ON}$	O	DC-DC ON output flag pin (open drain). If low, it indicates that the DC-DC is switching. If high, it indicates that the DC-DC is not switching.
8	$\overline{OUT\_CONN}$	O	Embedded pass transistor connection status pin (open drain). If high, it indicates that the pass transistor between the STORE and OUTPUT pins is open (load disconnected). If low, it indicates that the pass transistor between the STORE and OUTPUT pins is closed (load connected).
9	OVP	I	Output overvoltage protection pin. To be connected to the STORE pin through a resistor divider. Internal DC-DC stops/restarts switching when the voltage at OVP pin is higher/lower than the internal bandgap voltage. Also, at startup (internal pass transistor between STORE and OUTPUT is still open) and while $V_{STORE}$ is increasing, the triggering of the internal bandgap voltage makes the internal pass transistor close.
10	UVP	I	Output undervoltage protection pin. To be connected to the STORE pin through a resistor divider. Internal pass transistor between STORE and OUTPUT pins opens when the voltage at UVP pin goes below the internal bandgap voltage.
11	LDO1	O	1.8 V regulated output voltage pin.
12	LOD2	O	3.3 V regulated output voltage pin.
13	CONF	I	DC-DC converter configuration pin. Boost configuration: CONF pin connected to the voltage supply source. Buck-boost configuration: CONF pin connected to ground.
14	OUTPUT	I/O	Load connection pin.
15	STORE	I/O	Tank capacitor connection pin.
16	IN_LV	I	Low voltage input source. It has to be connected to the inductor for both boost and buck-boost configuration.
17	NC	I	Not connected.
18	PGND	PGND	Power ground pin.
19	L_HV	I	Input pin for buck-boost configuration. Boost configuration: to be connected to ground. Buck-boost configuration: to be connected to the inductor.
20	IN_HV	I	High voltage input source. Boost configuration: to be connected to ground. Buck-boost configuration: to be connected to the voltage supply source.

## 4 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

### 4.1 Package and packing information

**Figure 2.** VFQFPN20 3 x 3 x 1 mm - 20-lead pitch 0.4 package outline



**Table 1. VFQFPN20 3 x 3 x 1 mm - 20-lead pitch 0.4 package mechanical data**

Symbol	Dimensions [mm] <sup>(1)</sup>		
	Min.	Typ.	Max.
A	0.80	0.90	1.0
A1	-	0.02	0.05
A2	-	0.65	1.00
A3	-	0.20	-
b	0.15	0.20	0.25
D	2.85	3.00	3.15
D1	-	1.60	-
D2	1.50	1.60	1.70
E	2.85	3.00	3.15
E1	-	1.60	-
E2	1.50	1.60	1.70
e	0.35	0.40	0.45
L	0.30	0.40	0.50
ddd	-	-	0.07

1. "VFQFPN" stands for "Thermally Enhanced Very thin Fine pitch Quad Packages No lead". Very thin:  $0.80 < A \leq 1.00$  mm / fine pitch:  $e < 1.00$  mm.

**Figure 3. Recommended footprint of VFQFPN20 3 x 3 x 1 mm - 20-lead pitch 0.4**

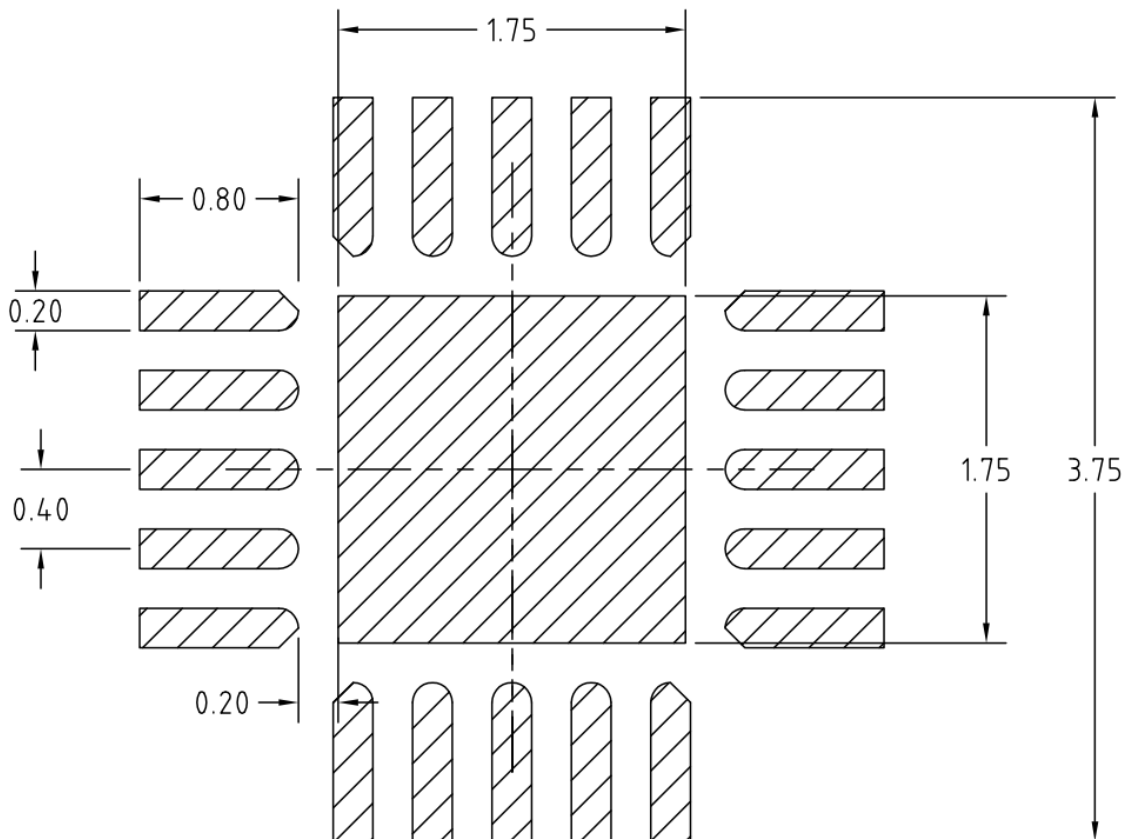
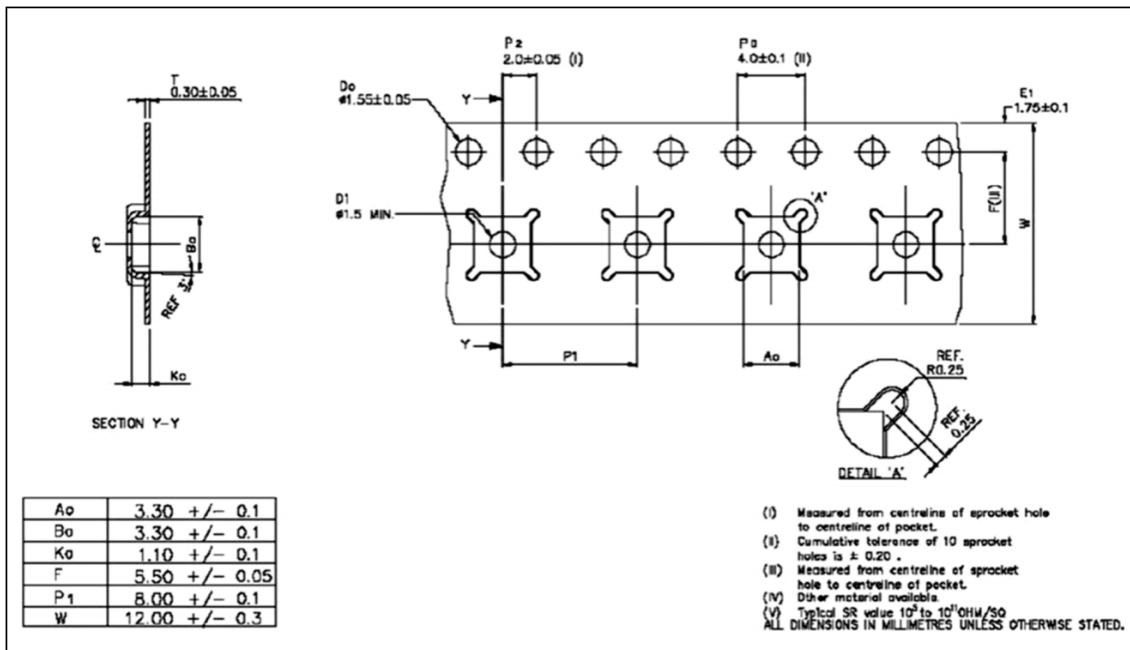


Figure 4. Tape and reel design



## 5 Ordering information

Order code	Op. temp. range [°C]	Package	Packing
STBLW35TTR	-40 to 85	VFQFPN 3 x 3 x 1 20L	Tape and reel



## Revision history

**Table 2. Document revision history**

Date	Version	Changes
26-Jan-2021	1	Initial release.
27-Jan-2021	2	Removed "Tube" option from ordering table.
17-Feb-2021	3	Changed minimum output current.

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