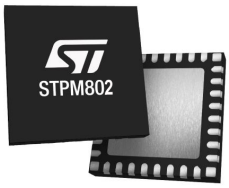
STPM802A

Data brief

Automotive synchronous Buck-Boost controller



VFQFN 32+4L
(5x5x0.9 mm)

Product status link
STPM802A

Product summary		
Order code	Package	Packing
STPM802A-TR	VFQPN32+4L	Tape and reel

Features

- AEC-Q100 qualification ongoing
- 4-switch single inductor architecture
- Synchronous switching
- Input voltage range: 4.2 V to 60 V
- Output voltage range: 3.3 V to 14 V
- Spread-spectrum frequency modulation
- Integrated bootstrap diodes
- Adjustable switching frequency: 177 kHz to 500 kHz
- Peak drive current > 2.8 A
- Standby mode
- Developed according to ISO26262 for use in ASIL–D systems

Description

The STPM802A is a synchronous 4-switch single-phase non-inverting buck-boost DC/DC controller that regulates the output voltage, from an input voltage above, below, or equal to the output voltage. It offers an adjustable fixed-frequency operation and spread-spectrum capability to reduce EMI emissions.

The IC provides an inductor and output current monitor, OV/UV protections and a power-good flag. Fault protection is also provided to detect output short-circuit conditions, during which the IC retries, latches off, or keeps running.

The IC implements a low-power mode function, in which control loop management is adjusted in order to reduce power dissipation.

STPM802A offers a set of features to support applications that must meet functional safety requirements as defined by the Automotive Safety Integrity Level (ASIL) A-B-C-D depending on the application TSR.

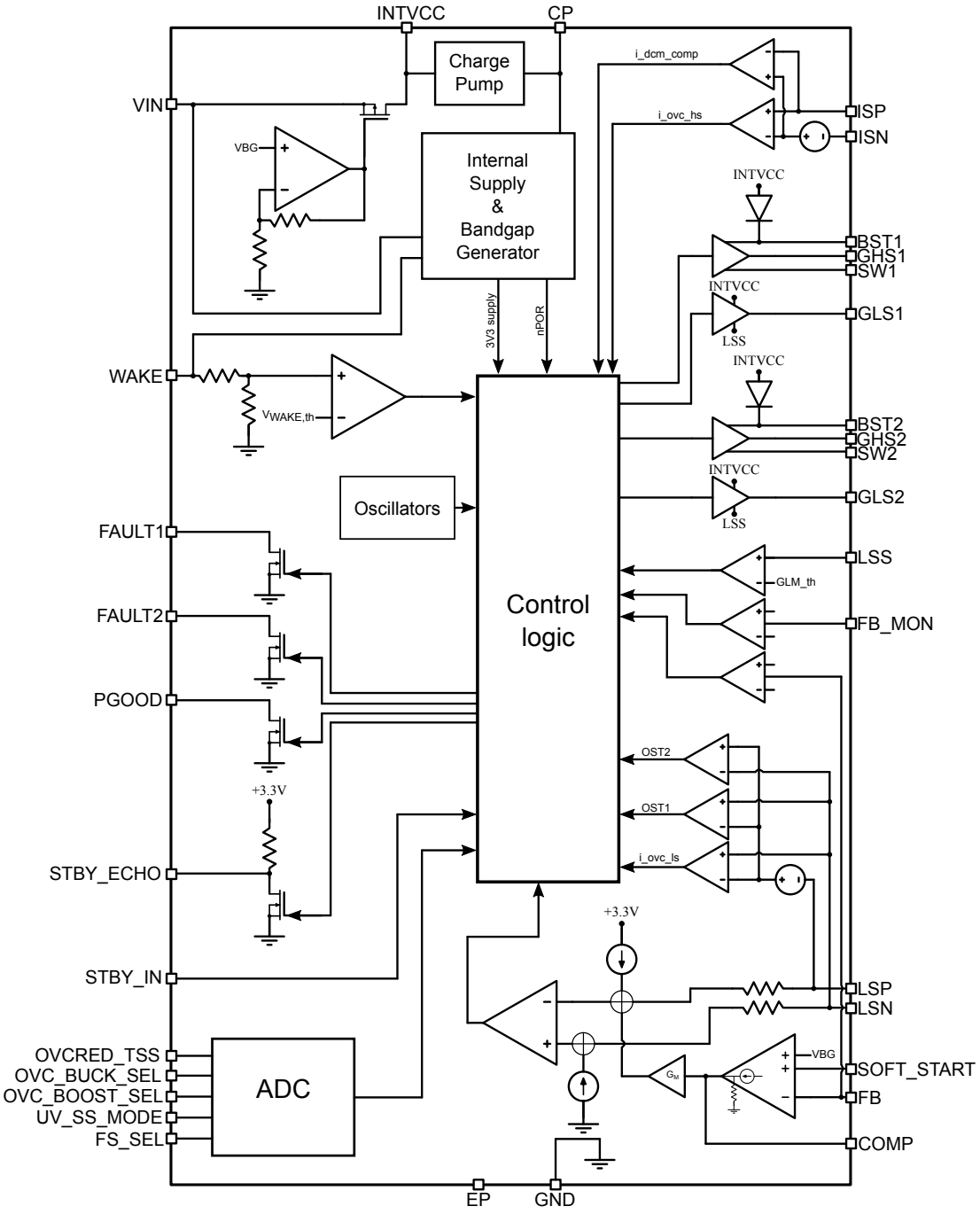
1 Overview

- The IC is a current mode DC/DC controller that can regulate output voltage and output current from an input voltage above, below or equal to the output voltage.
- A key pin (WAKE) is present.
- An internal comparator senses the VIN–ISN voltage drop, thus defining the regulation strategy for thecontrol loop (buck mode, boost mode and transition mode).
- The device works regulating 1.2 V (internal reference voltage) at the FB pin. The regulated voltage is defined by means of an external voltage divider network.
- Shunt resistances (1 mΩ minimum) must be used both on the output high-side load current path (ISN/ISP) and on the low-side buck/boost current path (LSN/LSP). OVC_LS and OVC_HS thresholds can be selected from six different combinations by changing the external resistance on the OVC_BUCK_SEL and OVC_BOOST_SEL pins. The target inductor value with a 1 mΩ LSP/LSN shunt resistor is 3.3 µH.
- Using external resistors of different values at the FS_SEL pin is also used to configure the buck-boost switching frequency. The response in case of an undervoltage event on the VOUT pin (keep running, auto retry function, or turn-off) can be configured via the UV_SS_MODE pin, where spread spectrum can also be enabled.
- The device is equipped with a VOUT Undervoltage/Overvoltage detection, open drain fault pins (two for safety redundancy) and PGOOD diagnosis (output voltage within expected range).
- An internal low drop-out linear regulator (INTVCC) is present in order to drive low-side external MOSFETs, and to recharge the bootstrap capacitors.
- The bootstrap structure is used to drive high-side external MOSFETs.
- The device implements a standby function (using the STBY pin), in which some functions are turned off and the control loop is adjusted to ensure a reduction in power consumption.

2 Block diagram and pin description

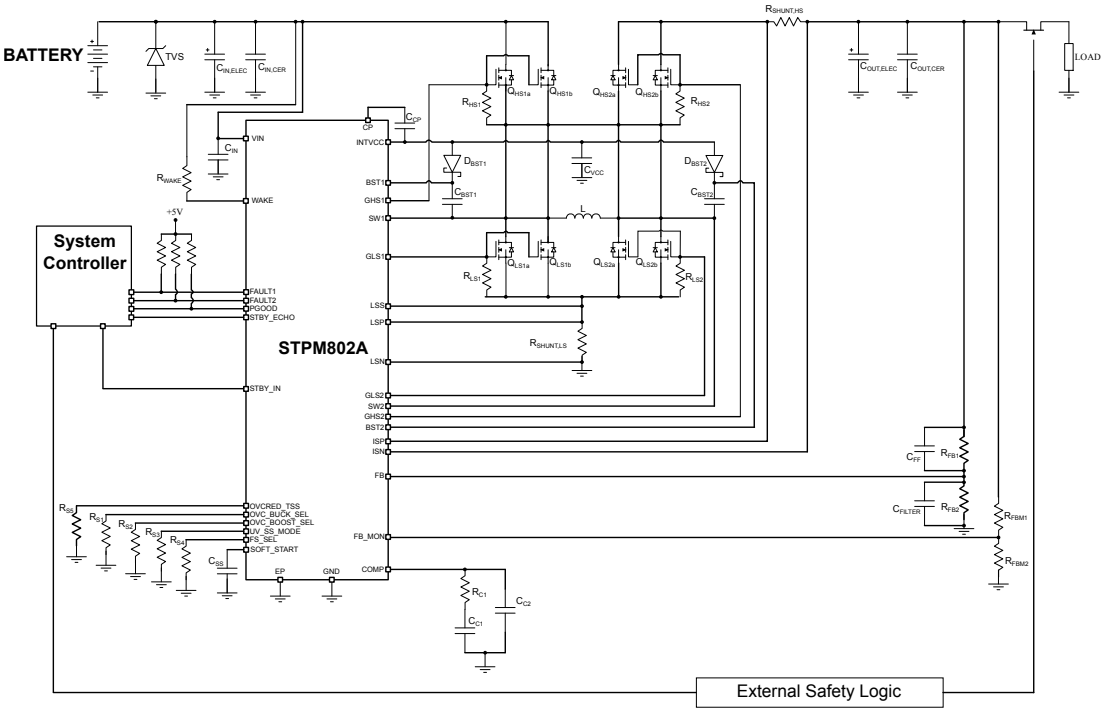
2.1 Block diagram

Figure 1. **Block diagram**



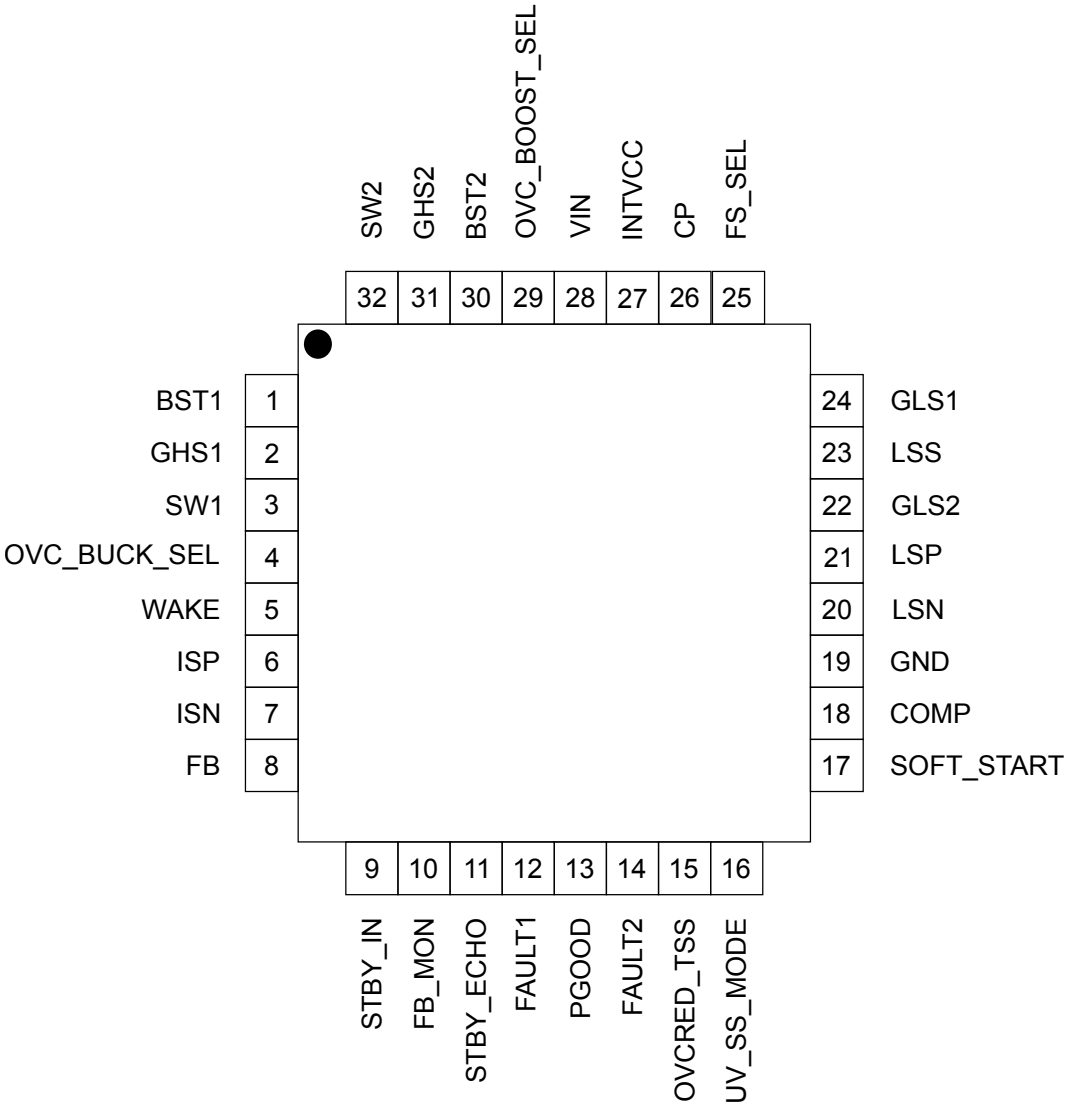
2.2 Applicative circuit

Figure 2. **Applicative circuit**



2.3 Pin description

Figure 3. **Pin out (top view)**



The exposed pad is not electrically connected to the internal substrate. Connecting the exposed pad to the PCB ground plane through thermal vias improves thermal dissipation.

Table 1. Pin functions and description

No.	Name	Type	Description
1	BST1	Local	Bootstrap capacitor/ bootstrap diode 1
2	GHS1	Local	High-side gate 1
3	SW1	Local	Switching node 1
4	OVC_BUCK_SEL	Local	Overcurrent value selection for buck operation and overload detection
5	WAKE	Local	Device wake-up pin
6	ISP	Local	Load peak current detection shunt resistance – upper side
7	ISN	Local	Load peak current detection shunt resistance – lower side
8	FB	Local	Regulation feedback (external voltage divider)
9	STBY_IN	Local	If the defined pattern is applied to this pin, the device enters standby mode. An internal 30 µA pull-up guarantees operation in normal mode if the pin is not driven externally
10	FB_MON	Local	Safety redundancy pin for UV/OV diagnosis. The voltage divider is a copy of the one connected between the VOUT and FB pins. This pin is only a monitor, not used by the control loop
11	STBY_ECHO	Local	Open Drain with internal pull-up, IC provides an indication to the microcontroller whether the device is in normal or standby mode
12	FAULT1	Local	Fault open drain
13	PGOOD	Local	Power-good open drain
14	FAULT2	Local	Fault open drain (safety redundancy)
15	OVCRED_TSS	Local	Selection of reduced overcurrent threshold and of soft short diagnosis filter time
16	UV_SS_MODE	Local	Behavior in case of VOUT undervoltage and selection of spread spectrum function enable
17	SOFT_START	Local	Soft start selection (external capacitor)
18	COMP	Local	Pin for external compensation network
19	GND	Local	Signal ground
20	LSN	Local	Low-side current limitation shunt resistance – lower side
21	LSP	Local	Low-side current limitation shunt resistance – upper side
22	GLS2	Local	Low-side gate 2
23	LSS	Local	Low-side source common point
24	GLS1	Local	Low-side gate 1
25	FS_SEL	Local	Switching frequency selection
26	CP	Local	External capacitor, charge pump tank
27	INTVCC	Local	Pin for LDO external bypass capacitor, bootstrap and low-side drivers supply
28	VIN	Local	Battery voltage
29	OVC_BOOST_SEL	Local	Overcurrent value selection for boost operation
30	BST2	Local	Bootstrap capacitor / bootstrap diode 2
31	GHS2	Local	High-side gate 2
32	SW2	Local	Switching node 2

3 Package information

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.

3.1 VFQFN (5x5x0.9, 32+4L) package information

Figure 4. VFQFN (5x5x0.9, 32+4L) package outline

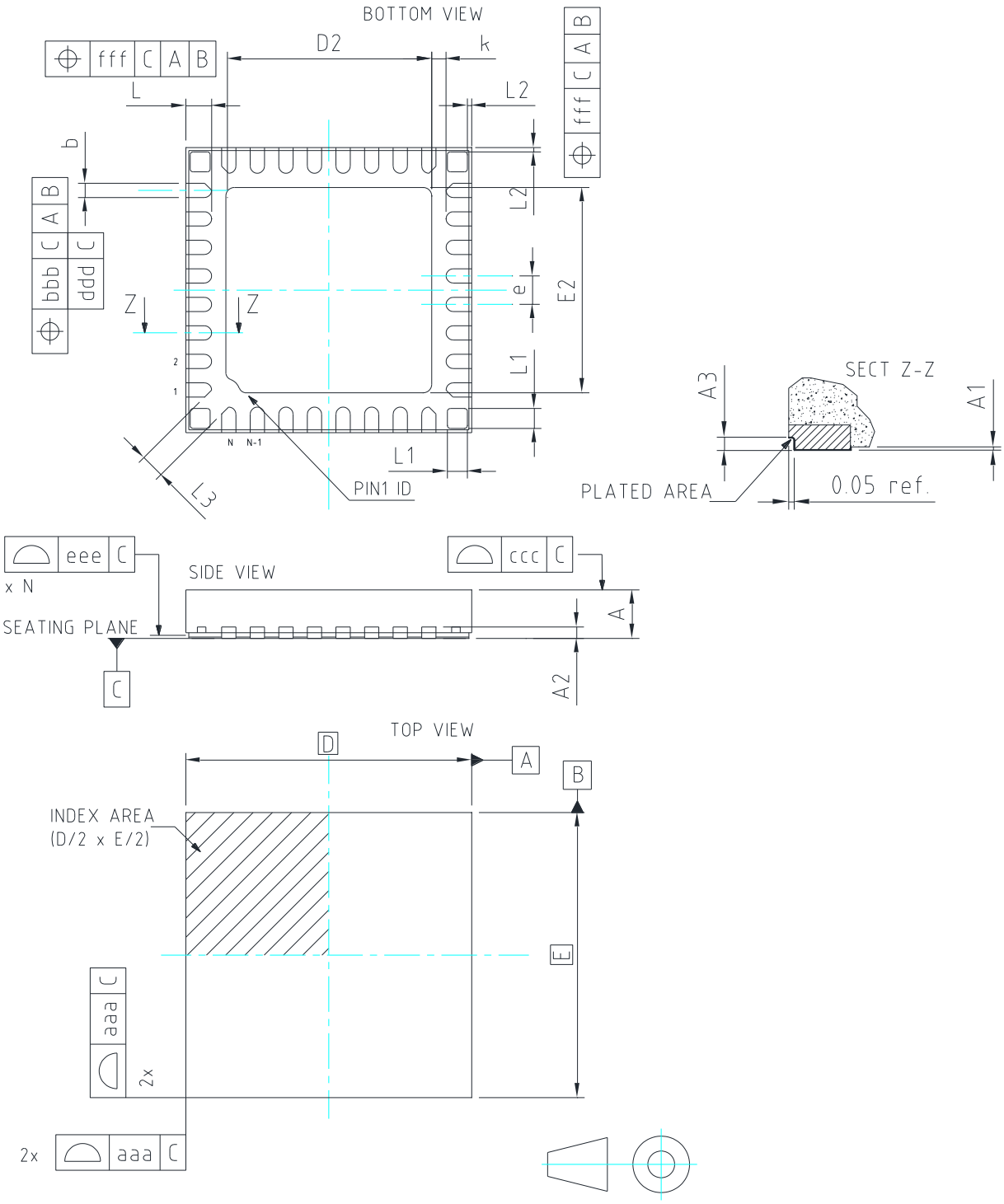


Table 2. VFQFN (5x5x0.9, 32+4L) package mechanical data

Symbol	Dimension in mm		
	Min.	Typ.	Max.
A	0.80	0.90	1.00
A1	0.00	0.02	0.05
A2		0.2 REF	
A3	0.10	-	-
b	0.20	0.25	0.30
D	-	5.00	-
e	-	0.5	-
E	-	5.00	-
L	0.35	0.45	0.55
L1	-	0.35	-
L2	-	0.075	-
L3	-	0.42	-
k	0.20	-	-
N		32+4	
Tolerance of form and position			
aaa		0.15	
bbb		0.10	
ccc		0.10	
ddd		0.05	
eee		0.08	
fff		0.10	
Expose PAD variation			
D2	3.55	3.60	3.65
E2	3.55	3.60	3.65

Note: 4L additional corner pins are electrically floating, but it is recommended to solder them to GND in order to ensure the mechanical integrity of the package.

Revision history

Table 3. **Document revision history**

Date	Version	Changes
07-Jul-2025	1	Initial release.