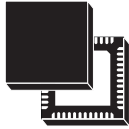



## 4 rail power management for automotive vision and radar systems



VFQFPN-48 (7x7 mm)

### Features

- AEC-Q100 qualified 
- Pre SMPS BUCK regulator, adjustable via OTP to 1.0 V, 1.1 V, 1.2 V, 1.35 V, 1.5 V, 3.3 V, 3.6 V, 5.0 V @ 1.35/2.6 A min peak current limit, 0.4/2.4 MHz
- Post SMPS BOOST regulator, adjustable via OTP to 5.0 V @ 0.3 A max load current, 7.0 V @ 0.2 A max load current, 2.4 MHz
- Post Linear regulator LDO, adjustable via OTP to 1.2 V, 1.25 V, 1.3 V, 1.8 V, 2.5 V, 2.8 V, 3.3 V, 5.0 V @ 300/600 mA max load current
- Precise Voltage reference, adjustable via OTP to 1.8 V, 2.5 V, 3.3 V, 4.1 V @ 20 mA max load current
- SPI interface with CRC
- Programmable slew rate/soft start
- Voltage supervisors
- Spread frequency spectrum
- Reset and reset sensitivity list
- Adjustable window watchdog supervisors
- Programmed power up phase via OTP
- Short circuit protected outputs and Fault detection pin to Microcontroller
- Low external components number
- Thermal shutdown junction temperature 175 °C

Product status link	
STPM066S	
Product summary	
Order code	STPM066S-V0Y
Package	VQFPN-48
Packing	Tray
Order code	STPM066S-V0T
Package	VQFPN-48
Packing	Tape and reel

### Description

STPM066S is a multiple voltage regulator composed by one battery compatible BUCK pre-regulator, one BOOST, one LDO and a precise voltage reference regulator. All the regulators have internal power switches.

OTP (One Time Programmable) cells are used for the main device parameters programming (output voltages and currents, switching frequencies) and to configure power up sequence.

An SPI interface can be used to enable or disable the single voltage regulators, for diagnostic information and to program internal blocks parameters (monitor and Power Good thresholds, slew rate, etc.).

The device offers a set of features to support applications that need to fulfill functional safety requirements as defined by Automotive Safety Integrity Level (ASIL) A-B-C-D.

# 1 Overview

STPM066S is a multichannel voltage regulator able to offer flexibility and easy to use, together with a set of features that make it compliant to car passenger applications that require functional safety. The product includes input and output monitors, independent band-gaps, ground loss monitors, internal compensation networks, that also help to reduce the BOM, digital and analog BIST, fault pin.

STPM066S provides 4 different power rails. A battery-compatible regulator with integrated MOS that can be used as a pre-regulator for currents up to about 2.6 A. One boost that can be used to supply, for example, a CAN bus, one linear regulator and 1% accurate reference voltage for the microcontroller.

All output voltages can be selected via memory cells (OTP) that can be programmed before using the PMIC. This guarantees precision and safety, since output voltages are not susceptible to variations due to the external environment. It also contributes to reduce the number of external components. Through the OTP it is also possible to decide the switching frequency of some regulators, the current limitation and the system power-on sequence.

Programming can also be done at customer's production line.

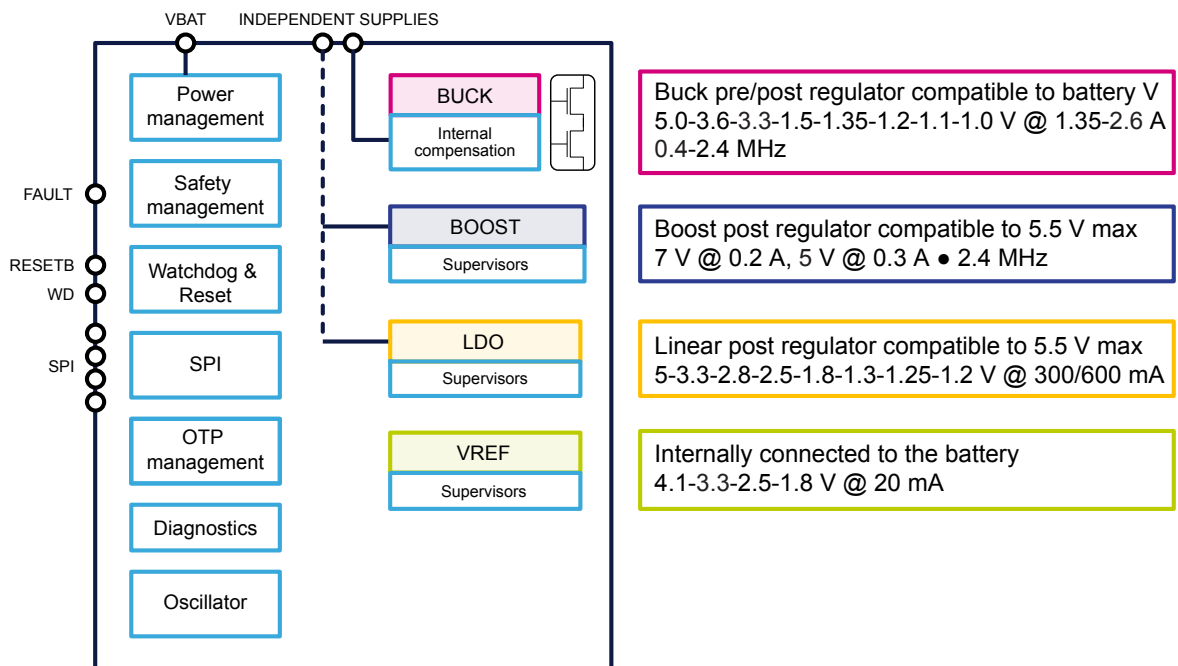
There is also an SPI bus, used to program the PMIC and to communicate with the microcontroller. Through this bus it is possible to set overvoltage and undervoltage thresholds, enable the spread spectrum, select the soft start time, switch on/off some regulators when required and many other things. The SPI is also used to communicate the status of the regulators in case of fault, over-temperature or other events.

The maximum free run switching frequency of the bucks is 2.4 MHz, modifiable through external synchronization signals.

The PMIC can manage watchdog and reset signals.

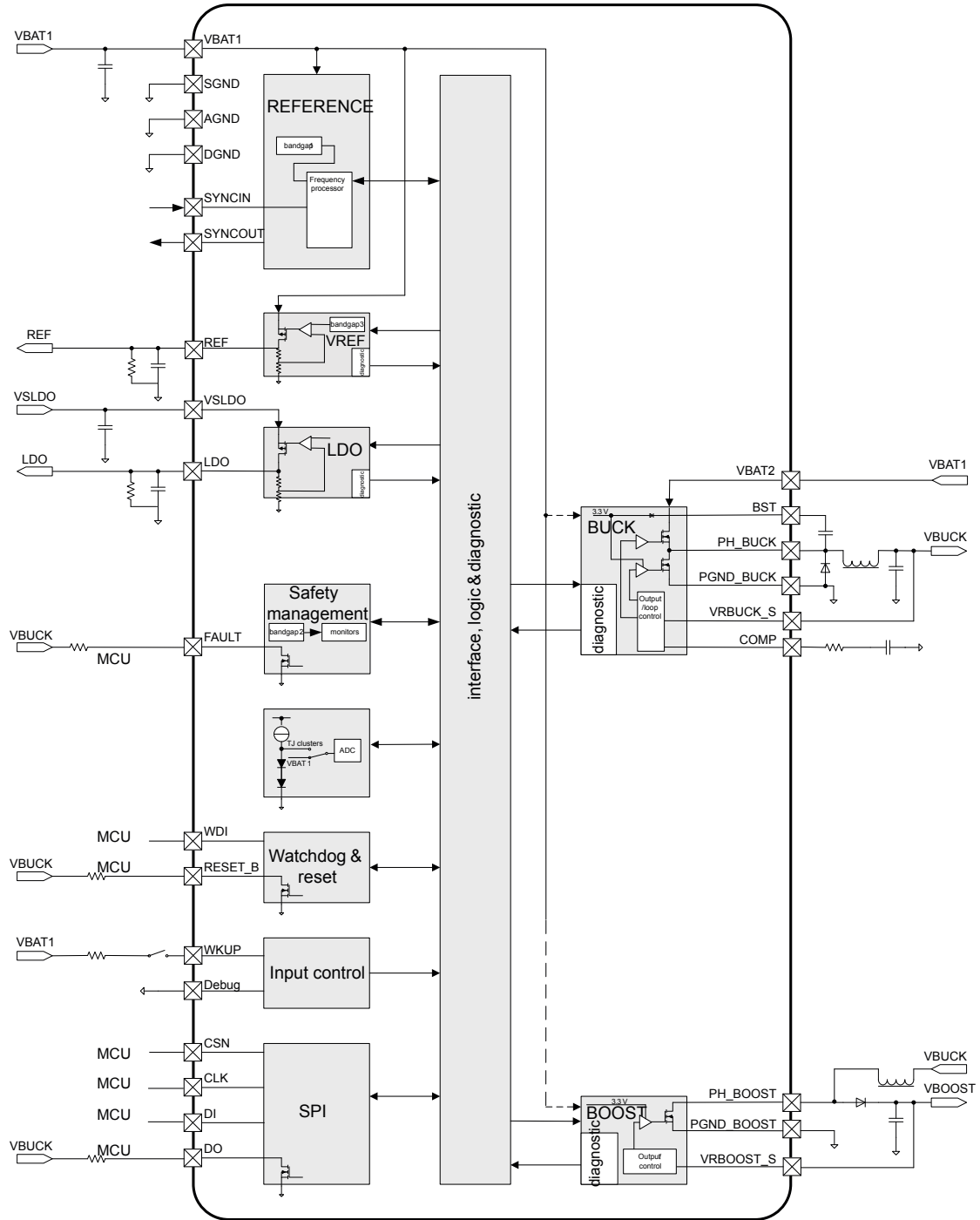
## 1.1 Simplified block diagram

Figure 1. Simplified block diagram

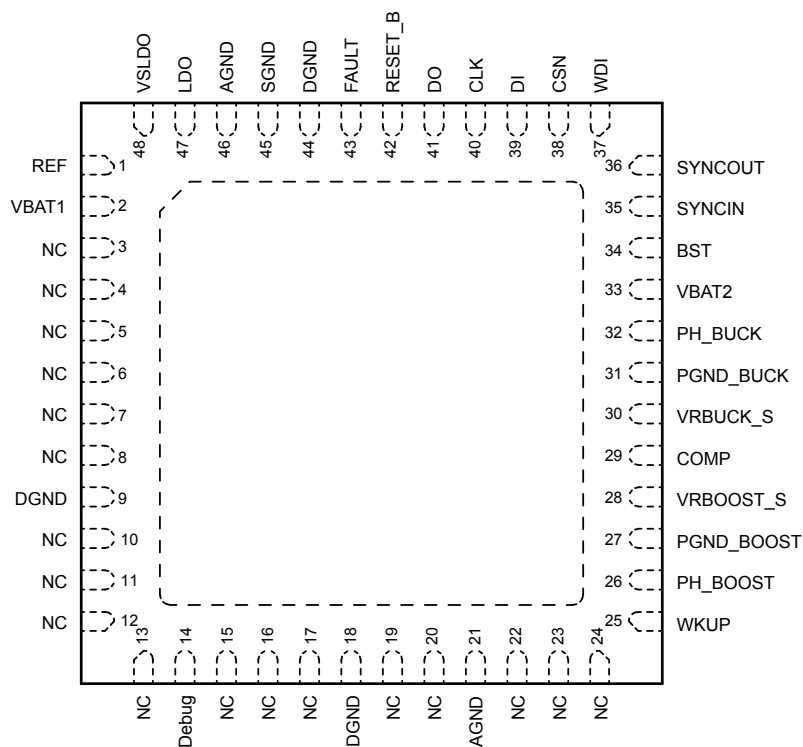


## 1.2 Functional block diagram

Figure 2. Functional block diagram



## 2 Pins description

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

**Table 1. Pin description and functions**

No.	Pin name	Pin type	Description
1	REF	O	Accurate reference voltage output
2	VBAT1	S	Battery voltage for inner reference
3	N.C.	-	-
4	N.C.	-	-
5	N.C.	-	-
6	N.C.	-	-
7	N.C.	-	-
8	N.C.	-	-
9	DGND	G	Digital GND
10	N.C.	-	-
11	N.C.	-	-
12	N.C.	-	-
13	N.C.	-	-
14	Debug	I	Device debug. Keep floating or connect to ground when not used

No.	Pin name	Pin type	Description
15	N.C.	-	-
16	N.C.	-	-
17	N.C.	-	-
18	DGND	G	Digital GND
19	N.C.	-	-
20	N.C.	-	-
21	AGND	G	Analog GND
22	N.C.	-	-
23	N.C.	-	-
24	N.C.	-	-
25	WKUP	I	Wake up input. Internal 200 kΩ pull-down
26	PH_BOOST	O	BOOST switching node
27	PGND_BOOST	G	BOOST power ground
28	VRBOOST_S	I	BOOST regulated voltage output (to internal voltage monitors)
29	COMP	I/O	BUCK Error Amplifier compensation network
30	VRBUCK_S	I	BUCK regulated voltage output (to internal voltage monitors)
31	PGND_BUCK	G	BUCK Power ground
32	PH_BUCK	O	Switching node BUCK
33	VBAT2	S	Input voltage supply for BUCK
34	BST	I/O	Boot-strap capacitor to supply BUCK high-side MOS gate-driver circuitry
35	SYNCIN	I	PWM input frequency for synchronization purpose. Internal current pull-down
36	SYNCOUT	O	PWM output frequency of inner 2.4M oscillator, or SYNCIN if used
37	WDI	I	Watchdog input. WDI is trigger input from MCU. Internal current pull-down
38	CSN	I	SPI: chip select (not) input. Internal current pull-up
39	DI	I	SPI: serial data input. Internal current pull-down
40	CLK	I	SPI: serial clock input. Internal current pull-down
41	DO	OD	SPI: serial data output
42	RESET_B	OD	Reset
43	FAULT	OD	Fault pin detection to MCU
44	DGND	G	Digital GND
45	SGND	G	Signal ground for low noise circuitry
46	AGND	G	Analog GND
47	LDO	O	Linear regulated output
48	VSLDO	S	Input voltage supply for LDO

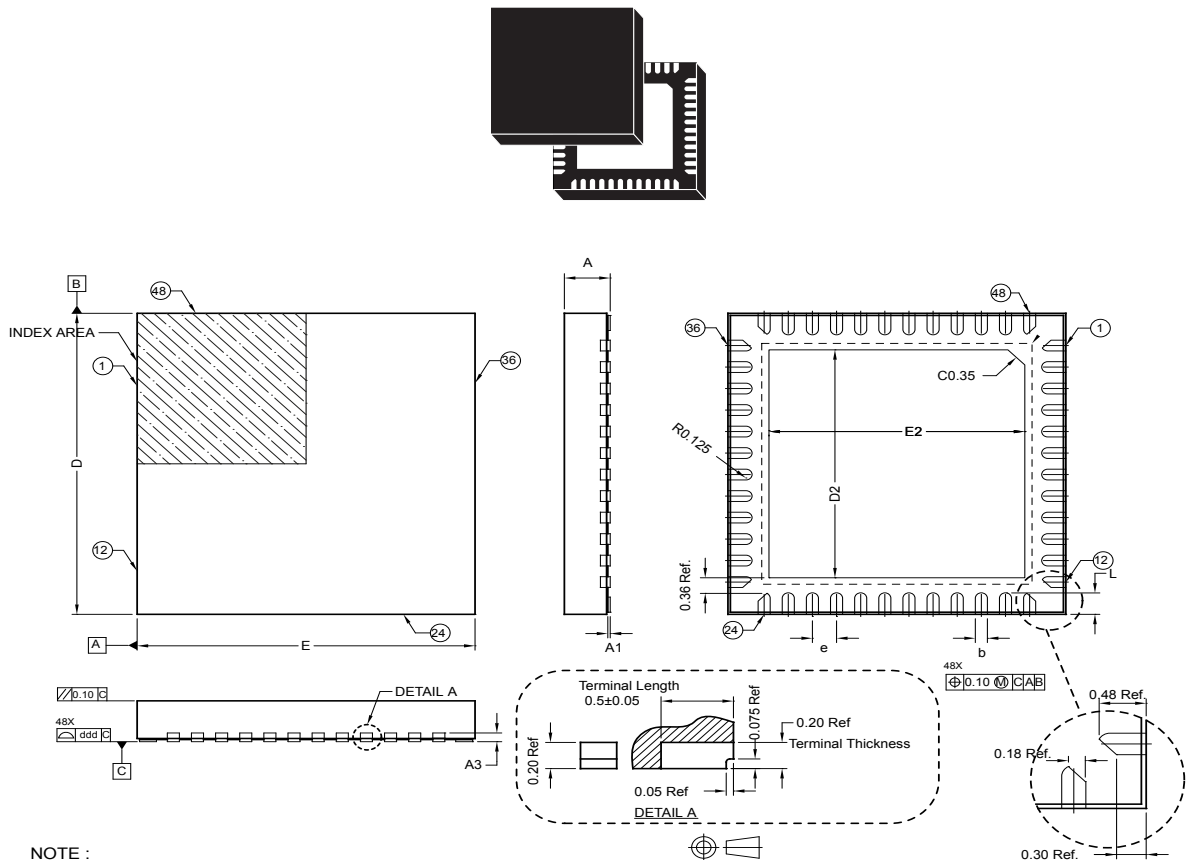
*Note: N.C. means the pins are not internally bonded.*

### 3 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.

#### 3.1 VFQFPN-48 (7x7x1.0 mm - opt. D) package information

Figure 4. VFQFPN-48 (7x7x1.0 mm - opt. D) package outline



- NOTE :
1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES.
  2. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS. COPLANARITY SHALL NOT EXCEED 0.08 mm.
  3. WARPAGE SHALL NOT EXCEED 0.10 mm.
  4. REFER JEDEC MO-220.

7446345\_G\_V0 (Opt. C)

GAPGPS03449

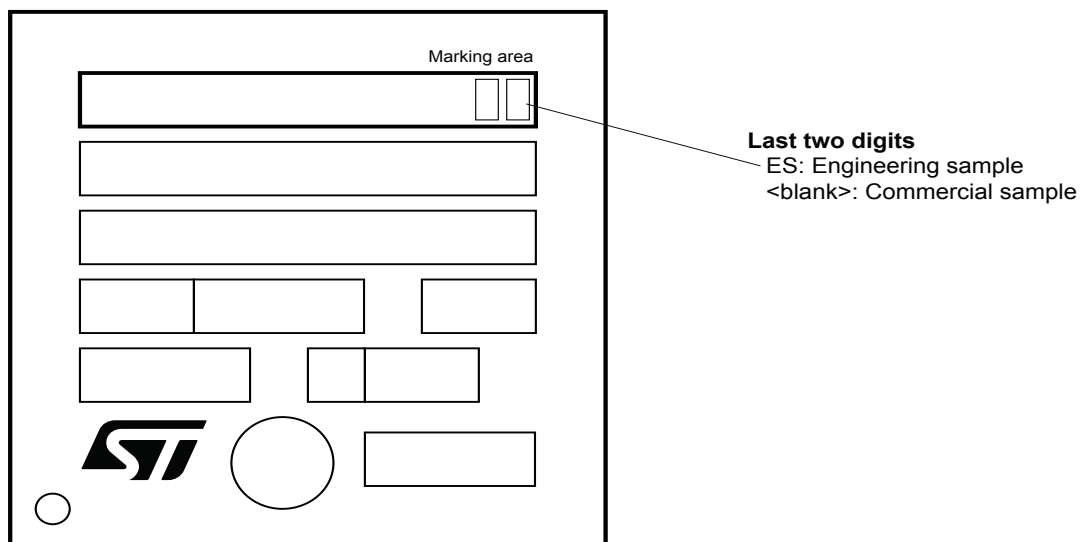
Table 2. VFQFPN-48 (7x7x1.0 - opt. D) package mechanical data

Ref	Dimensions (mm)		
	Min.	Typ.	Max.
A	0.85	0.95	1.05
A1	-	-	0.05
A2	-	0.75	-
A3	-	0.200	-

Ref	Dimensions (mm)		
	Min.	Typ.	Max.
b	0.15	0.25	0.35
D	6.80	7.00	7.15
D2	5.15	5.30	5.45
E	6.85	7.00	7.15
E2	5.15	5.30	5.45
e	0.45	0.50	0.55
L	0.45	0.50	0.55
ddd	-	-	0.08

### 3.2 VFQFPN-48 (7x7x1.0) marking information

Figure 5. VFQFPN-48 (7x7x1.0) marking information



GAPG2203161040PS

Parts marked as 'ES' are not yet qualified and therefore not approved for use in production. ST is not responsible for any consequences resulting from such use. In no event will ST be liable for the customer using any of these engineering samples in production. ST's Quality department must be contacted to run a qualification activity prior to any decision to use these engineering samples.

## Revision history

**Table 3. Document revision history**

Date	Version	Changes
11-Nov-2020	1	Initial release.



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