Power Management Chipset for HPC and ADAS

ST Approach to Centralized Control Systems

Hot-Swap and Or-ing IC for High Redundancy Power Architectures

Synchronous Buck-Boost Controller

Dual Loop Digital Multiphase Controller

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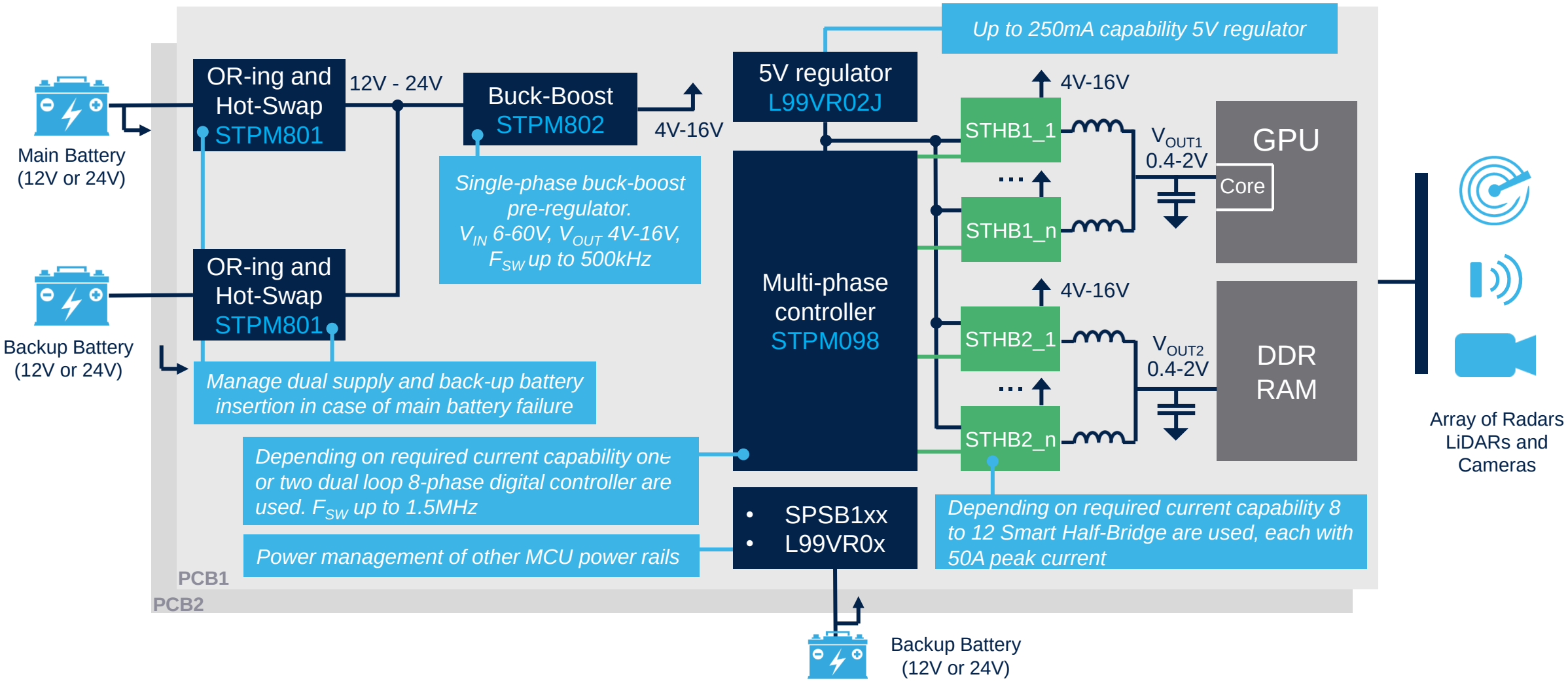
ST approach to centralized control systems



Functional Safety relevant device

Not relevant for Functional Safety

Computing system

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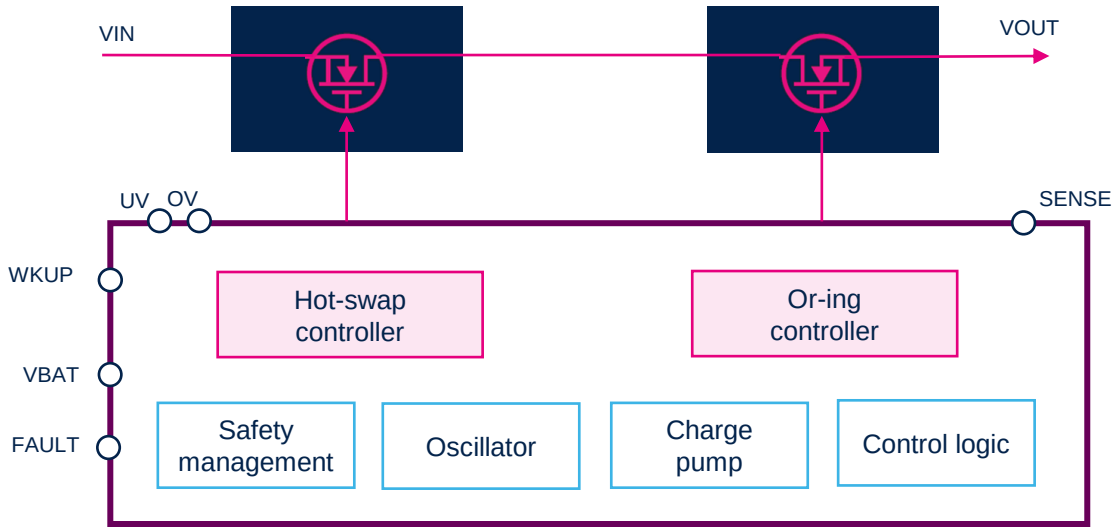
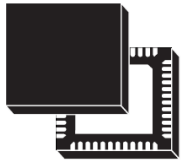
Hot Swap & Oring IC for High Redundancy Power Architectures

STPM801

STPM801 offers integrated Hot-Swap, Soft-Start and Oring and reverse input protections.
It protects load from high voltage transients, OV and UV, and allows the use of the backup battery.



STPM801 supports ASIL-D applications



Package: VFQFPN-32 (5x5mm)

- Wide input voltage, from 4V to 65V, with -65V reverse protection
  - Full function operating input voltage from 4V to 40V
- 2x external N-channel MOSFET pre-drivers: 1x hot-swap + 1x o-ring
- Soft start: control of hot-swap, adjustable by external capacitor
- Input overvoltage and undervoltage protections (threshold with ext divider)
- Fault pin: LOW whenever a fault condition is detected (i.e. OV, UV, OVC). Fault Table in the datasheet
- Stand-by mode with reduced power consumption, disabling accuracy and some diagnostics
- Output overcurrent protection
- Short to GND detection on Vout
- Complies with the 16750 AC ripple test requirements (50-25kHz)

Applications

• ADAS • Automotive Body • Connected & Infotainment • Safety

Description

The two N-channel transistors driven by the device are, respectively, the Hot Swap and the Oring MOSFETs. The first is used as a normal power switch; the Soft Start function helps to limit the inrush current during the device power-up. The Oring MOSFET is mainly used as ideal diode (keeps normally 30 mV between drain and source), but it helps also blocking the current conduction in case of reverse battery detection (FET off if Vout > Vin)

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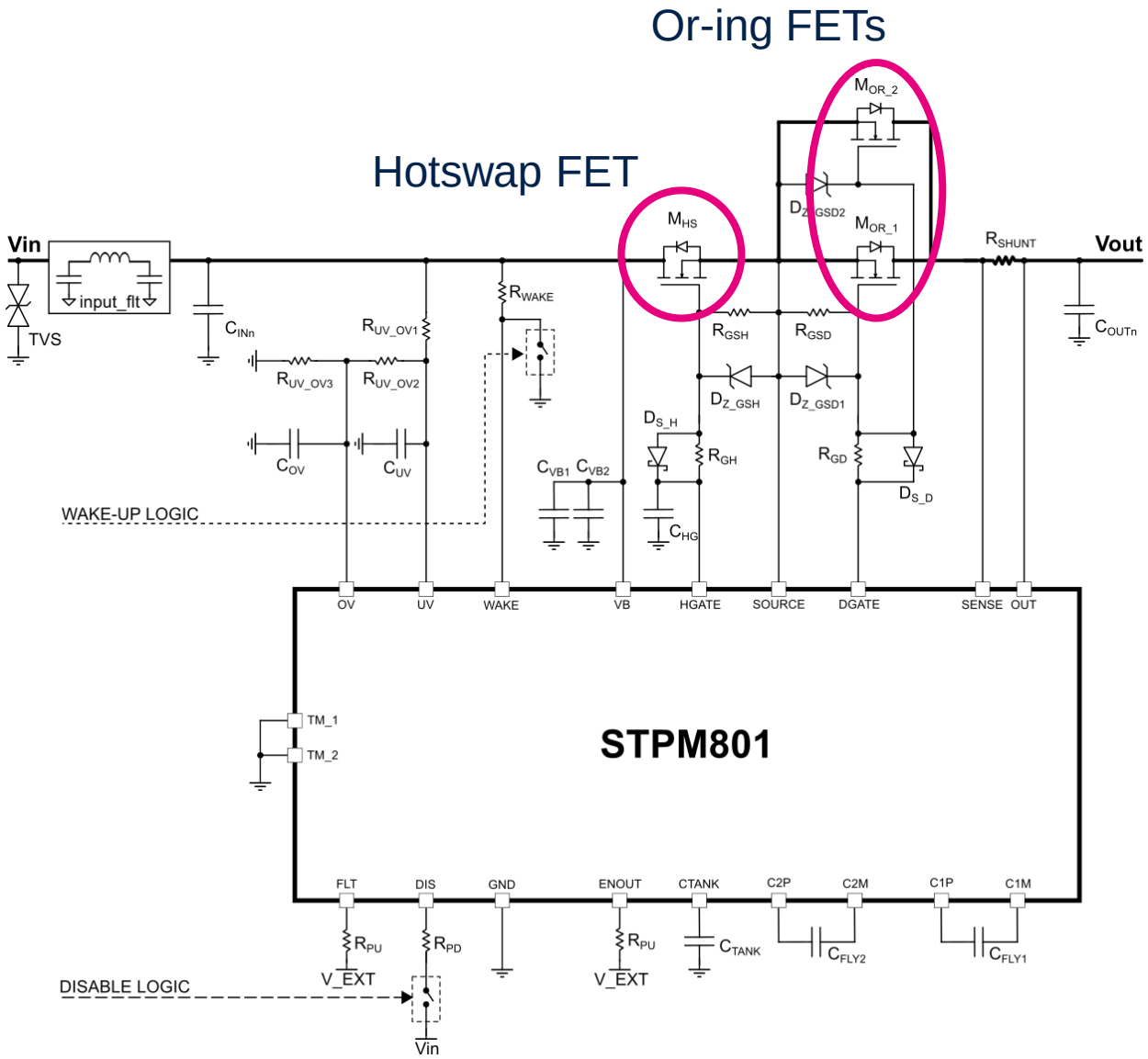
Main functions



Hotswap:

a) Manages inrush current via soft start, enabling fast transition to back up battery input without powering down

OR-ing:

a) **Ideal diode** – device regulates gate driver to keep 30mV between drain and source of FET, minimizing voltage drop across FET

b) **Reverse protection** – OR-ing FETs are switched off whenever Vout > Vin to protect against reverse conduction

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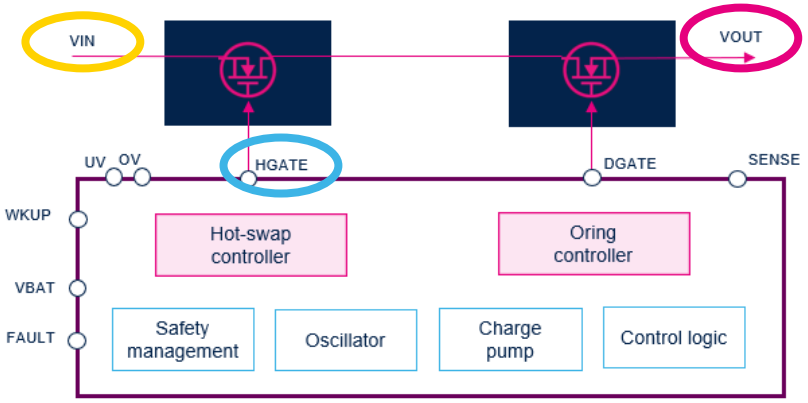
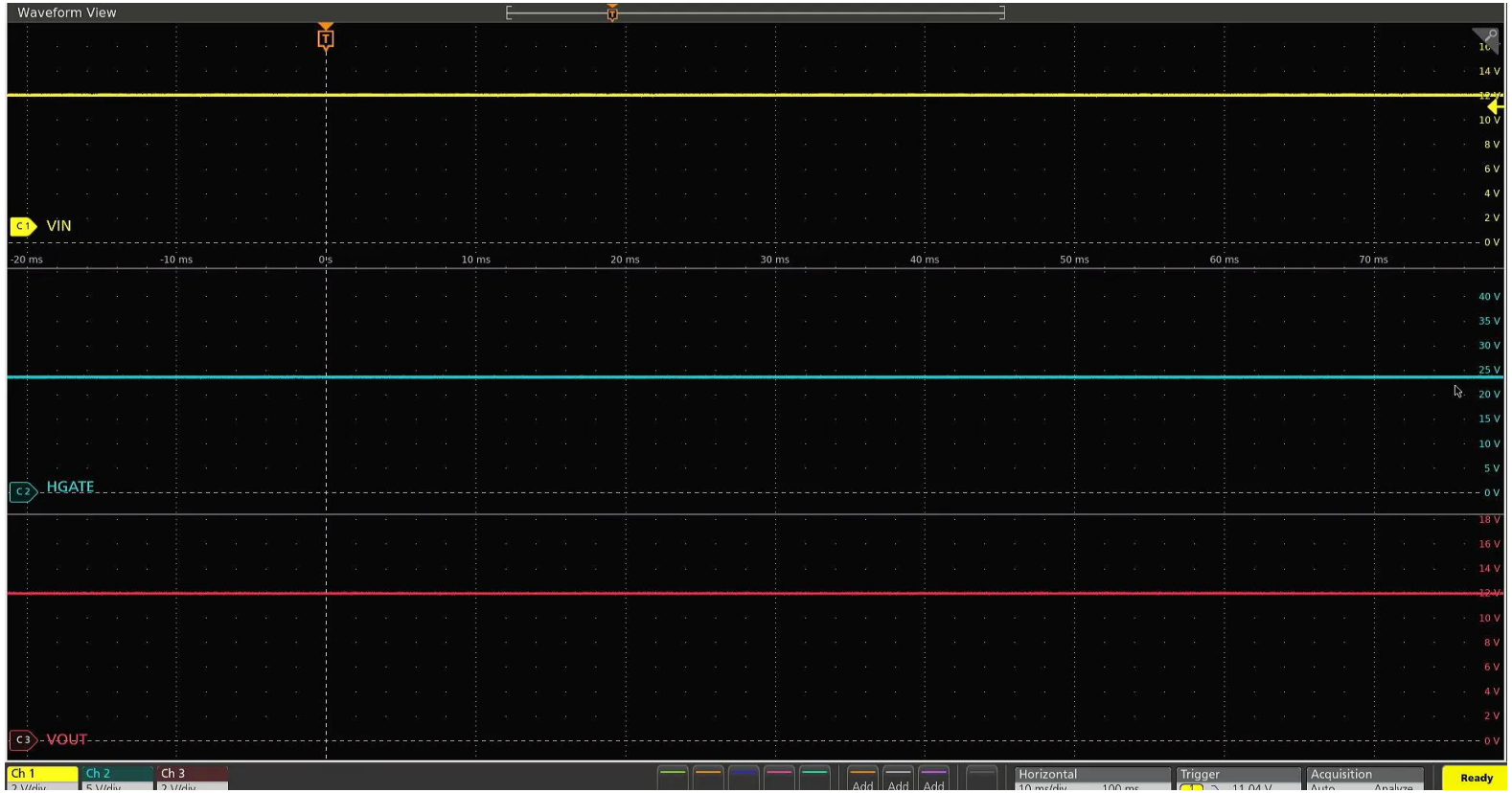
Hot-swap – 12V to 14V





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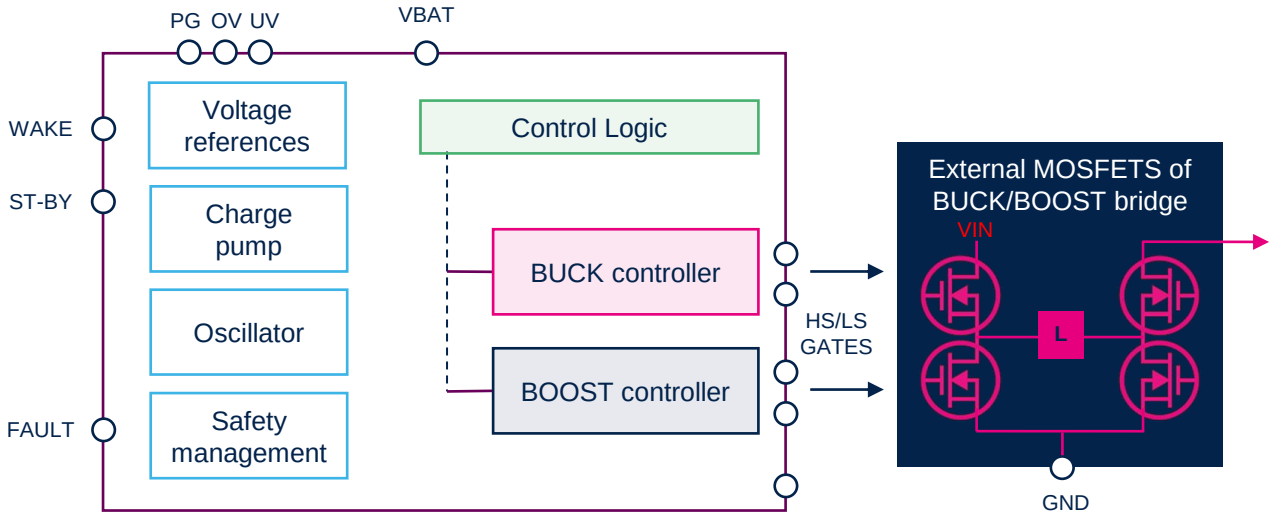
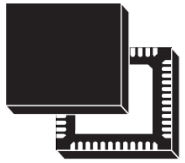
Synchronous Buck-Boost Controller
STPM802

STPM802 is a noninverting synchronous current controlled Buck-Boost, with 4-switch single inductor architecture and integrated bootstrap diodes. Automotive AEC-Q100 qualified and developed according to ISO26262



STPM802 supports ASIL-D applications



Package: VFQFPN-32 (5x5mm)

- Vin from 4.2 (crank) to 60V (12V and 24V systems)
- Spread Spectrum frequency modulation
- Soft start with external capacitor
- 100% duty cycle capable
- Adjustable parameters by external R: fsw from 177 to 500kHz (discrete steps) – OC thresholds, spread spectrum – faults behavior (FAULT1, FAULT2 pins: retry, latch, keep running)
- Peak drive current > 3A (max output power 250W)
- Stand-by function (LPM with lower functionality)
- Monitor of input voltage, output current, OV, UV. PG flag.
- External voltage divider network. Vout 3.3 – 16V. FB at 1.2V
- DCM at light load (discontinuous conduction mode)
- WAKE control input
- Start-up self tests: ABIST, clock self-test, ADC self-test, safety path

Applications

• ADAS • Automotive Body • Connected & Infotainment • Safety

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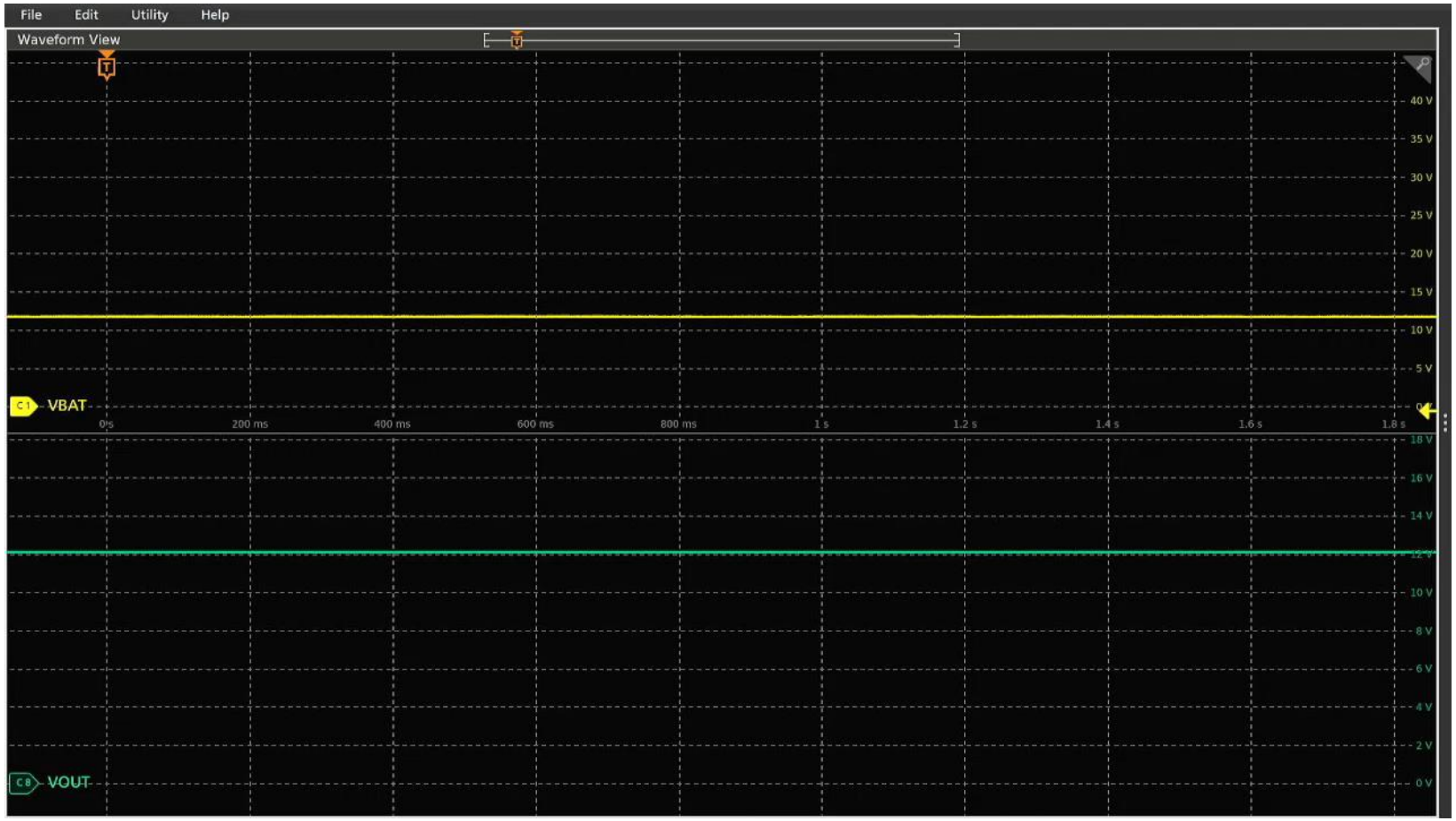
Stable output voltage – 12V to 30V



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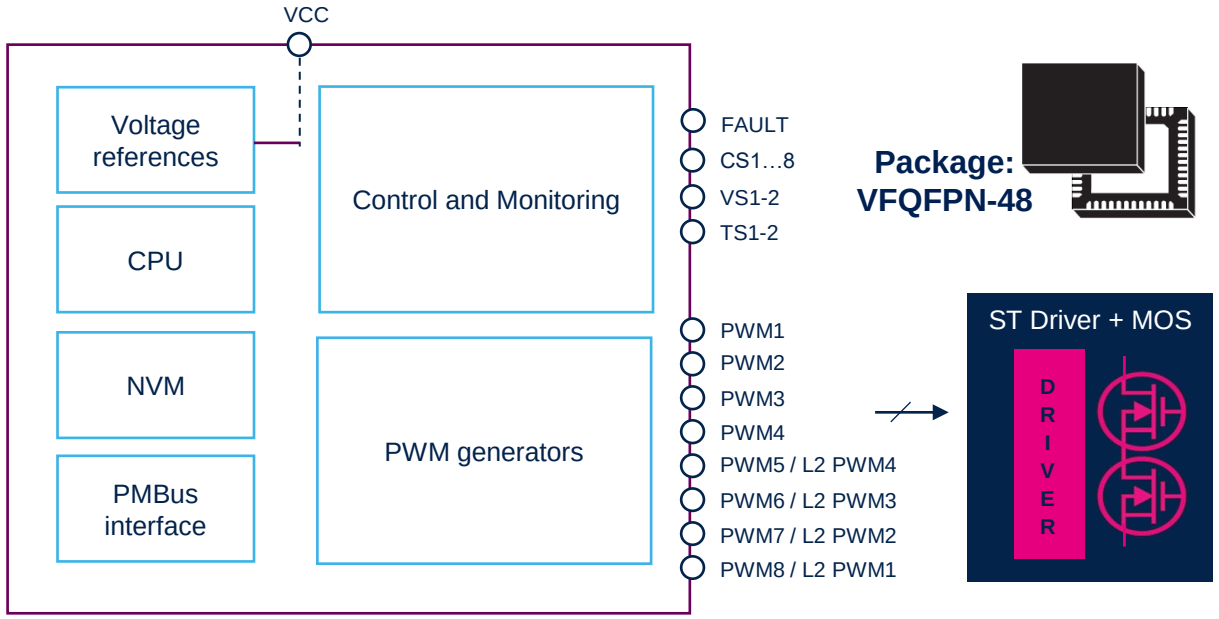
Dual loop, 8 phases digital multiphase controller
STPM098

STPM098 is a dual-loop digital multi-phase buck controller with built-in NVM and PMBus™
An advanced control loop architecture based on COT (Constant On-Time) scheme provides fast transient responses and high efficiency.



Package: VFQFPN-48

STPM098 supports ASIL-C/D applications

Applications

- ADAS
- Automotive Processors
- Safety

- Input voltage 5V (AMR 20V)
- Output voltage range: 0.5V to 2V (0.05V minimum step)
- Switching frequency range: 200kHz to 1.5MHz
- 2x independent voltage loops
- 8x PWM outputs. Phase assignment between two loops: 8+0 to 4+4
- Dynamic phase shedding for light loads managed by embedded CPU ARM Cortex TM M0+ @40MHz for increased efficiency
- Ver.1.2 compliant PMBus for configuration (stored in built-in NVM) and telemetry reporting
- Full input and output telemetry (voltage, current, temperature)
- Full input & output overcurrent, over/undervoltage, thermal diagnostic, and protection against loop disconnection, current unbalancing, etc.
- BIST implemented for analog circuitry and digital core
- Dedicated diagnostic pins
- Ground loss diagnostic

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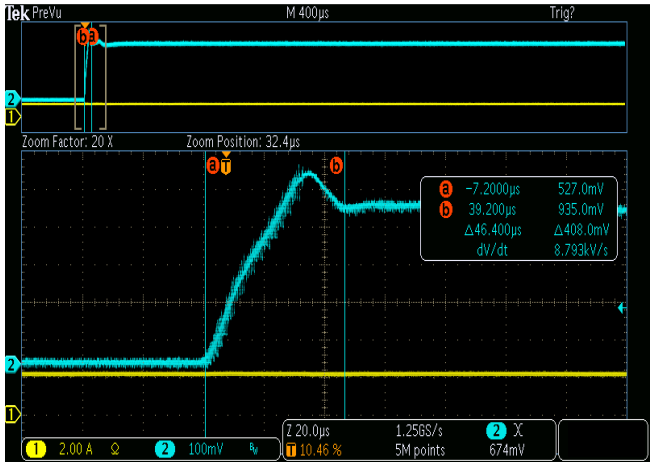
STPM098 dynamic tests

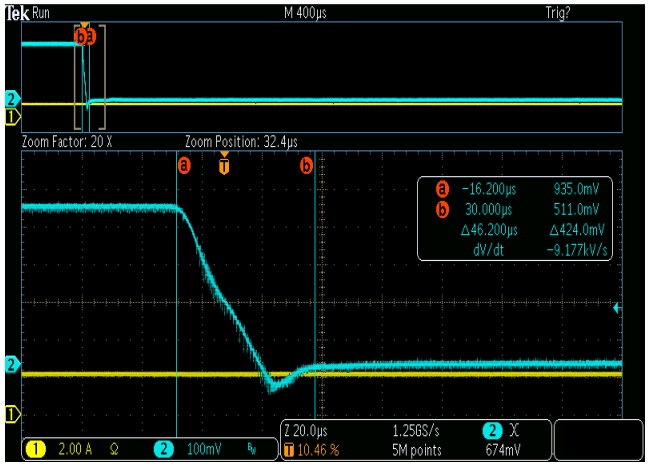
Dynamic V_OUT setpoint change:

Initial setpoint = 500mV → final setpoint = 900 mV

I_{LOAD} (static) = 20A

Expected rise/fall time: 48us → measured: 46us

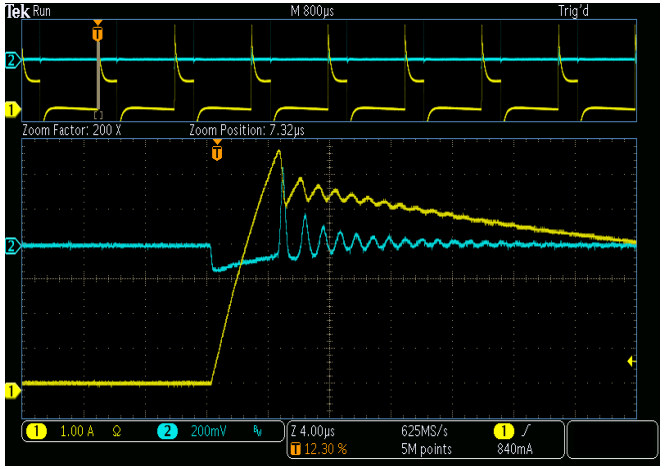




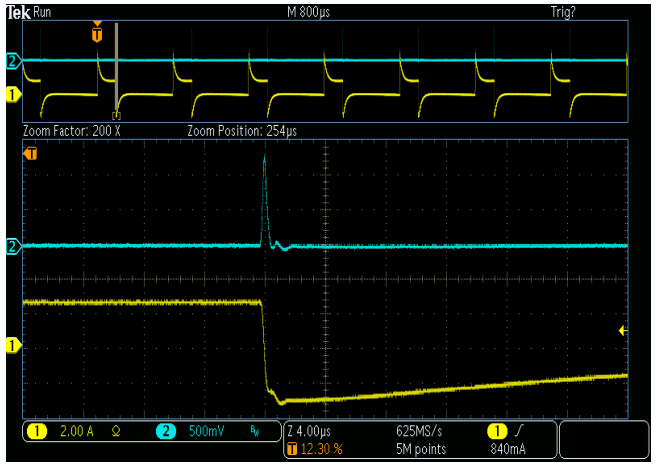
Dynamic load current test:

Vout setting (nominal): 750 mV → blue trace

I_{LOAD} = 30A → yellow trace



current rising edge



current falling edge

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