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# Smart control solutions for multiple motor applications

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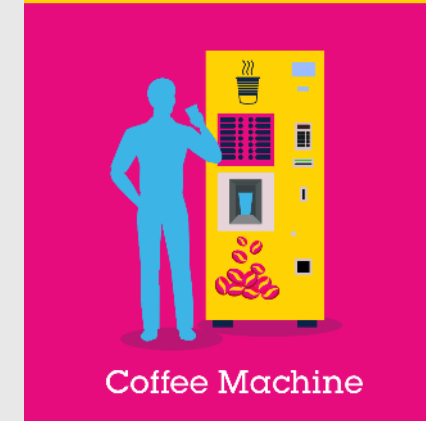
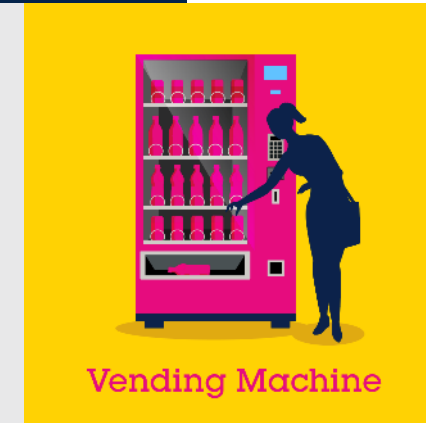
# L99UDL01 for vending machines

## Multiple motor smart control

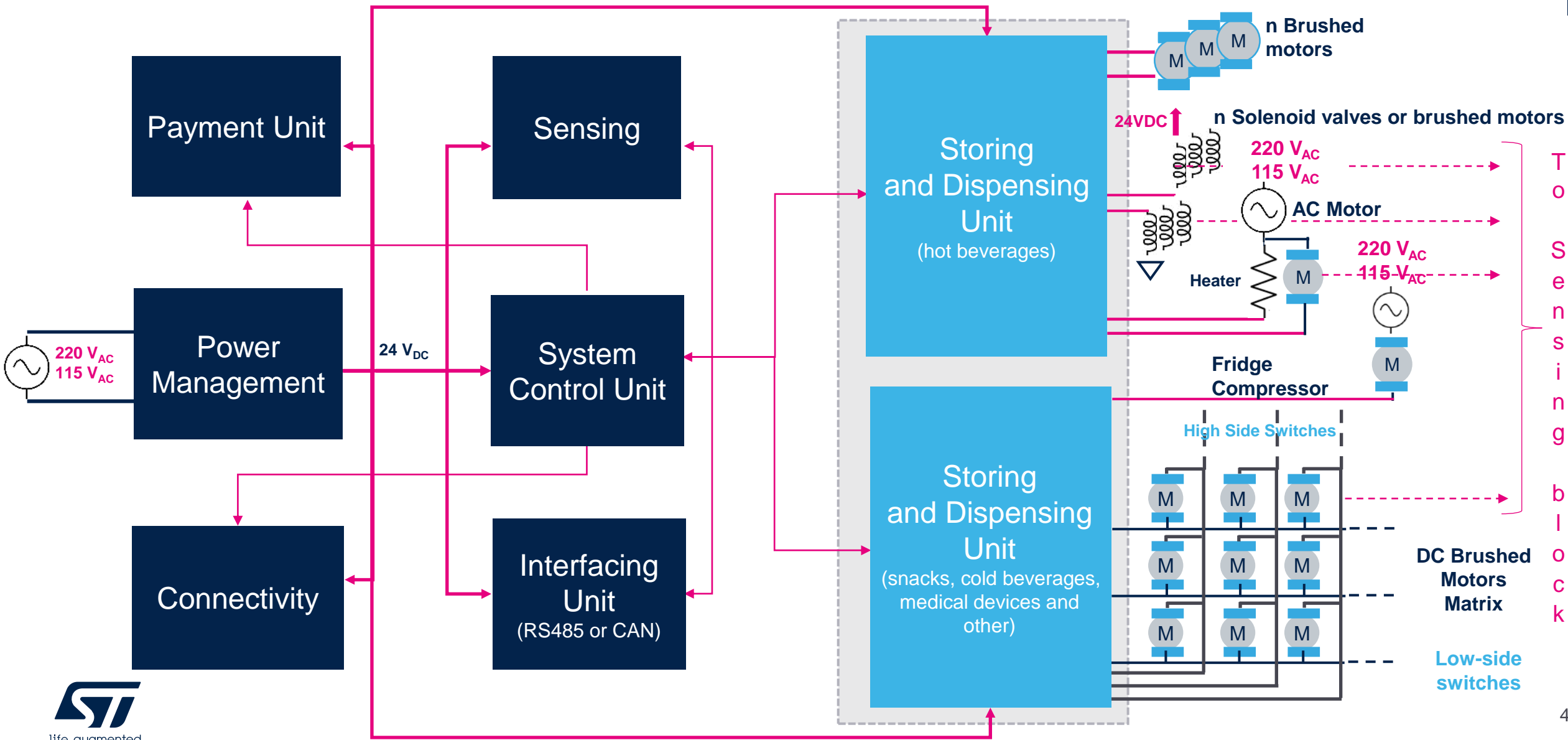
What electronics are inside a vending machine?



Vending machines are complex electro-mechanical equipment used to store and dispense various items such as foods, beverages, medical products, tickets, etc.



# Vending machine architecture

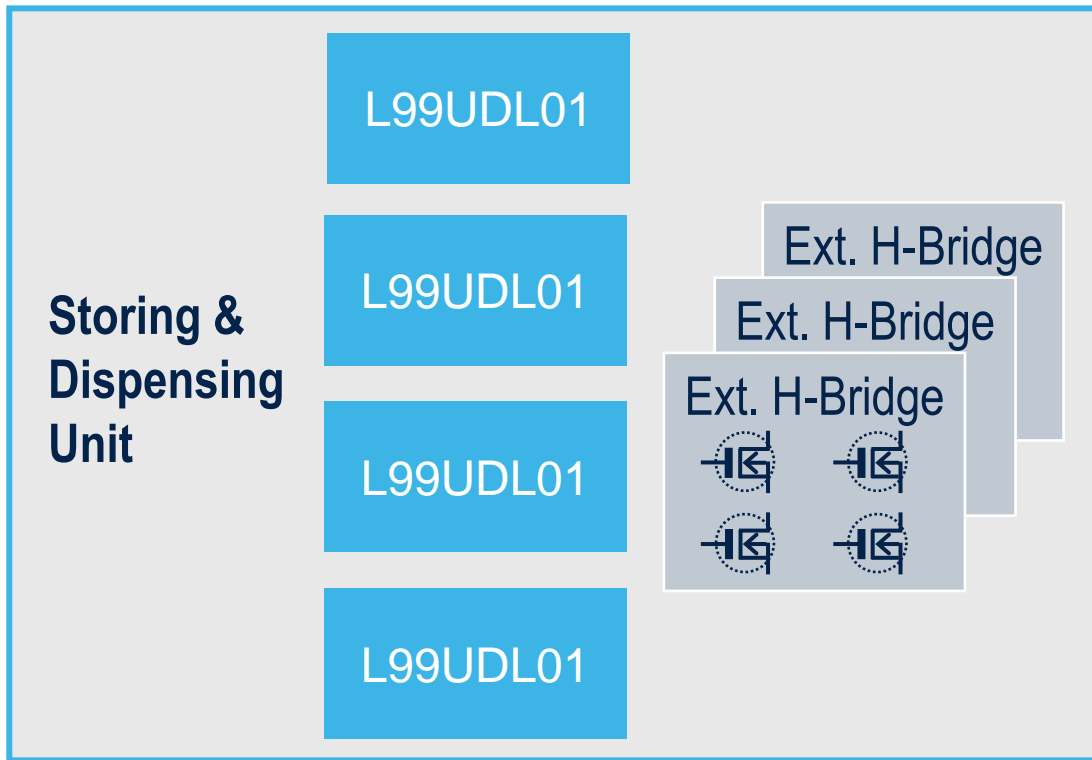




# L99UDL01 for vending machines

## Multiple motor control

L99UDL01 can control multiple motors thanks to its 6 integrated half-bridges ( $R_{DS(ON)} = 90 \text{ m}\Omega$ ) and its 2 half-bridge drivers



The Storing and Dispensing Unit incorporates refrigerating and heating systems that are integrated with a complex matrix of electrical motors and valves used to move items, mix substances and control the position of dispensing arms or materials presence.

**Several DC brushed motors can be driven thanks to the L99UDL01**

Its 2 integrated half-bridge drivers and the capability to group up to 3 integrated half-bridges allow the L99UDL01 to control DC motors with high current requirements.



# Multiple motor smart control Solution benefits

ST offers a comprehensive evaluation solution including evaluation boards and software with an intuitive GUI



Try out various configurations, develop prototypes and quickly find **the best design for your application**

## Main features:

- Smart way to control multiple DC motors in applications with short duty cycles
- Flexible and low-cost solution that allows several different configurations
- Advanced diagnostics for increased motor reliability and longevity



# L99UDL01 evaluation kit

The EVAL-L99UDL01 evaluation board is designed to demonstrate the centralized control of all the locks available in a car



**The L99UDL01 evaluation kit (EVAL-L99UDL01) includes**

- A motherboard based on the SPC560B54 MCU which provides the logic section for monitoring and driving the L99UDL01
- A daughterboard with the L99UDL01 device

Both boards embed electronic control modules with enhanced power management functionalities including a standby mode.



# Graphical User Interface for L99UDL01 evaluation kit

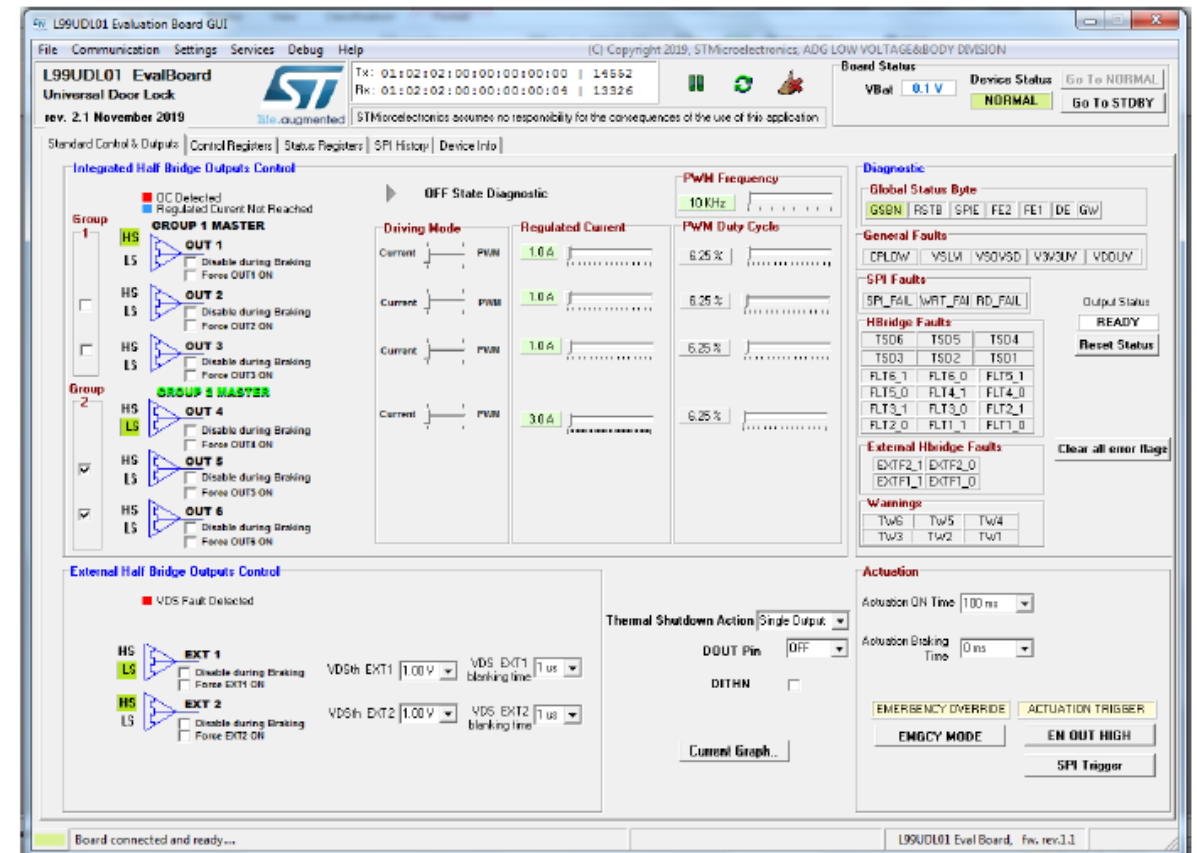
The STSW-L99UDL01 user-friendly Graphic User Interface (GUI) facilitate the use and configuration of the evaluation board

This GUI enables the user to:

- Set the L99UDL01 control parameters
- Shows real time diagnostics information such as current output and battery voltage monitoring

The STSW-L99UDL01 is developed using C++ and it works with the motherboard based on SPC560B MCU

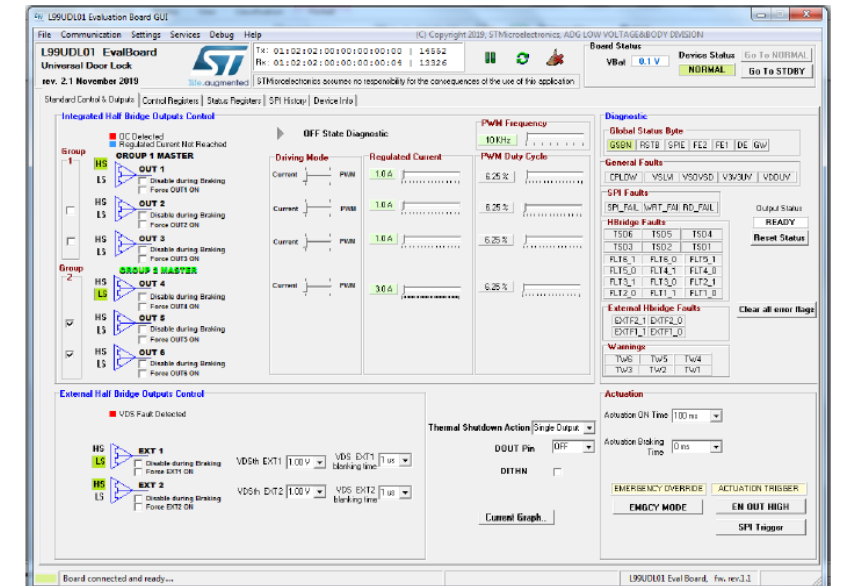
For developers looking to use an alternative SPC5 32-bit automotive microcontroller for their design, an online smart selector is available to help you find the best fit for your application.





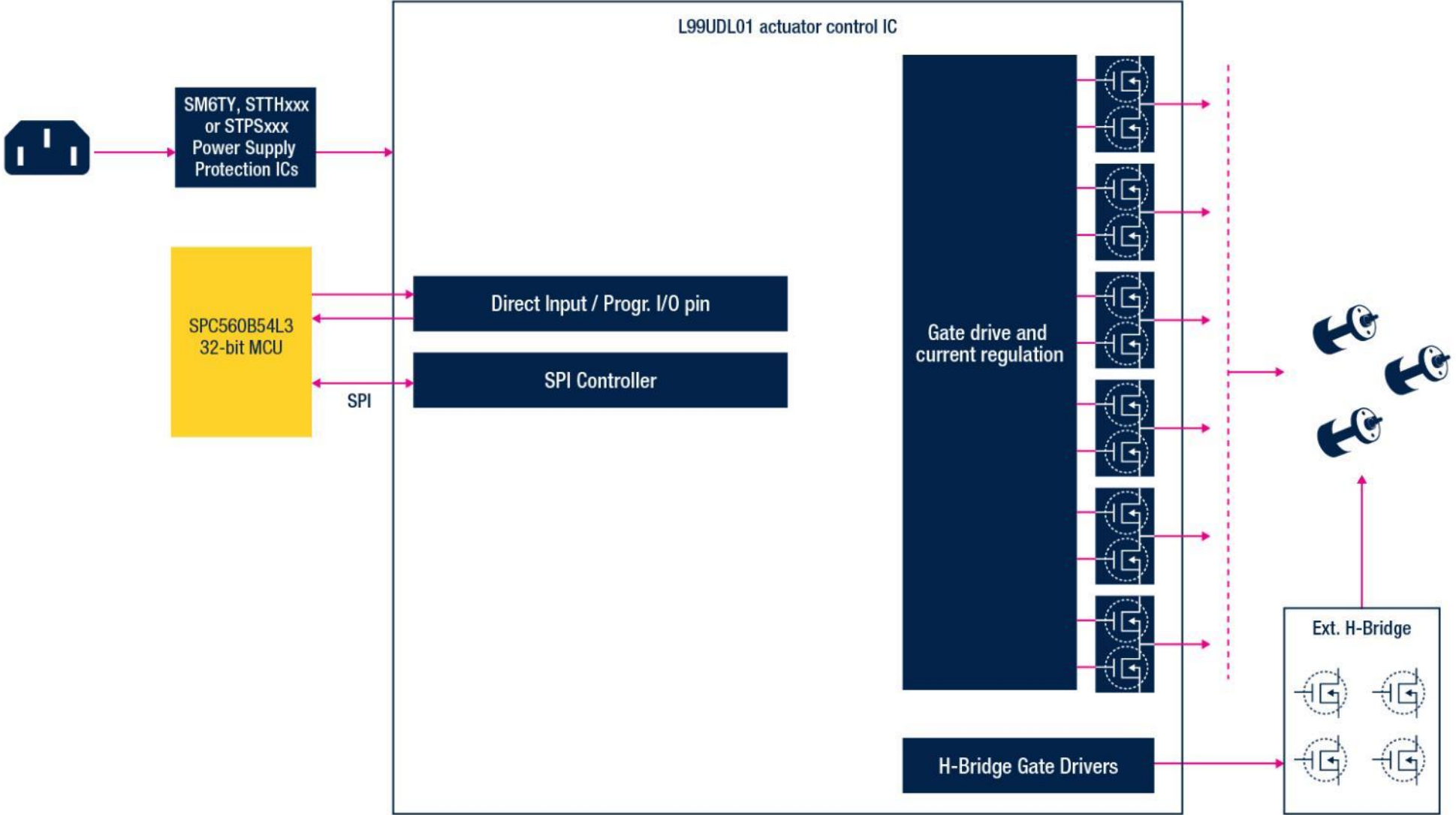
# L99UDL01 for vending machines

Find on [ST.COM](https://www.st.com) the complete solution to evaluate the L99UDL01 for vending machines



Evaluation Tools	Description
EVAL-L99UDL01	L99UDL01 Evaluation board
STSW-L99UDL01	EVAL-L99UDL01 Graphical User Interface
User Manual STSW-L99UDL01	STSW-L99UDL01 Graphical User Interface Manual

# Multiple motor smart control Evaluation kit block diagram





# Advantages of L99UDL01 in vending machines?



Reduced bill of material

Control of multiple motors using a single device

High current motors support thanks to grouping and external half-bridge drivers

24V system support

Independent control of the motors





# L99UDL01 main features

## Multiple motor smart control with a single IC embedding current regulation IP



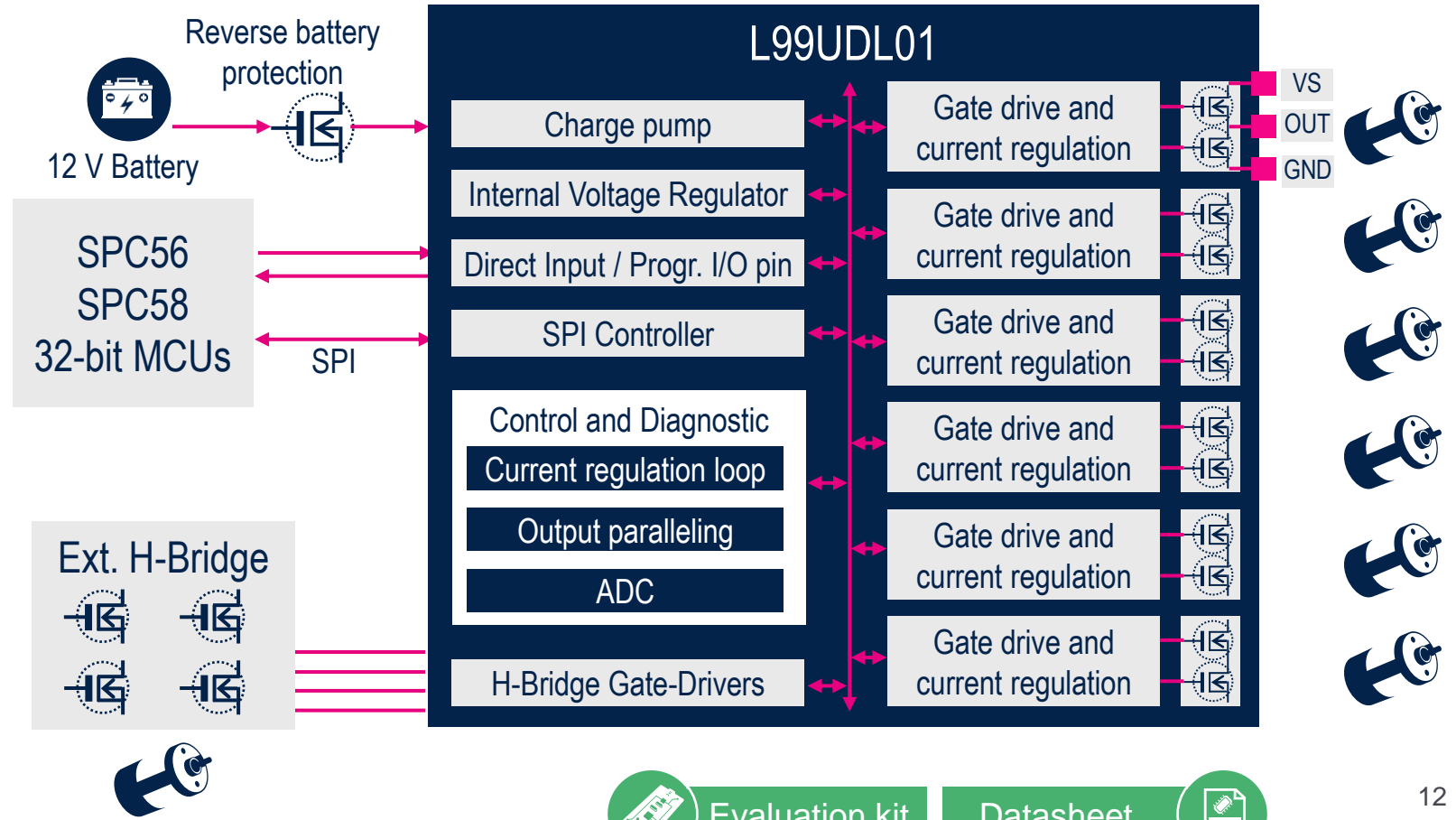
Power-TQFP64L 10x10

### Main features

- Extended Operating Range: 5 V to 26 V
- Fully programmable control logic
- Serial communication: ST-SPI 24-bit with 17 registers
- Power Stage: six half-bridges with 90mΩ per FET
- Current regulation loops for each High-Side and each Low-Side Switch
- Mechanism for paralleling up to 2x3 outputs
- Two-stage charge pump

### Protection and diagnostics

- Digital Current Monitor 10-bit resolution, through SPI
- Thermal warning and thermal shutdown
- Shorted and open load detection, also in off state
- Drain-Source voltage monitoring for external FETs
- Emergency mode overriding built-in protections
- Junction Temperature: From -40 to 150 °C
- Minimum thermal protection: 150 °C





# L99UDL01 for vending machines

## Grouping 2 or 3 outputs

The 6x integrated half bridges of the L99UDL01 can be paralleled in groups of 2 or 3 channels

The possibility to group channels makes the L99UDL01 able to manage motors that can require load currents regulated up to 12 A

Table 41. Current bit description (continued)

One output		Two outputs		Three outputs			
Sum of 1 only	Current	Sum of 1+2	Current	Sum of 1+2+3	Current		
Three outputs						31	9.2 A
						32	9.4 A
						33	9.6 A
						34	9.8 A
						35	10 A
						36	10.2 A
						37	10.4 A
						38	10.6 A
						39	10.8 A
						40	11 A
						41	11.2 A
						42	11.4 A
						43	11.6 A
						44	11.8 A
						45	12 A

Table 41. Current bit description

One output		Two outputs		Three outputs			
Sum of 1 only	Current	Sum of 1+2	Current	Sum of 1+2+3	Current		
One output						0	1 A
						1	1.2 A
						2	1.4 A
						3	1.6 A
						4	1.8 A
						5	2 A
						6	2.2 A
						7	2.4 A
						8	2.6 A
						9	2.8 A
						10	3 A
						11	3.2 A
						12	3.4 A
						13	3.6 A
						14	3.8 A
15	4 A						
Two outputs						16	5.2 A
						17	5.4 A
						18	5.6 A
						19	5.8 A
						20	6 A
						21	6.2 A
						22	6.4 A
						23	6.6 A
						24	6.8 A
						25	7 A
						26	7.2 A
						27	7.4 A
						28	7.6 A
						29	7.8 A
						30	8 A



# L99UDL01 for vending machines 24 V system support

L99UDL01 can be supplied with 24 V, the typical value for vending machine applications

Req ID	Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
A.001	$VS_{OPER}$	Vs Operating Supply Voltage		6		18	V
A.002	$VS_{OPER\_EXT}$	Extended Vs Operating Supply Voltage		5		26	V
D.033	$VS_{OVSD}$	Overvoltage shutdown, rising edge	Above this threshold the integrated drivers are tri-stated and the external high side pre-drivers are turned OFF	26		28	V

**The overvoltage threshold is not exceeded using the L99UDL01 in 24 V supplied systems !**

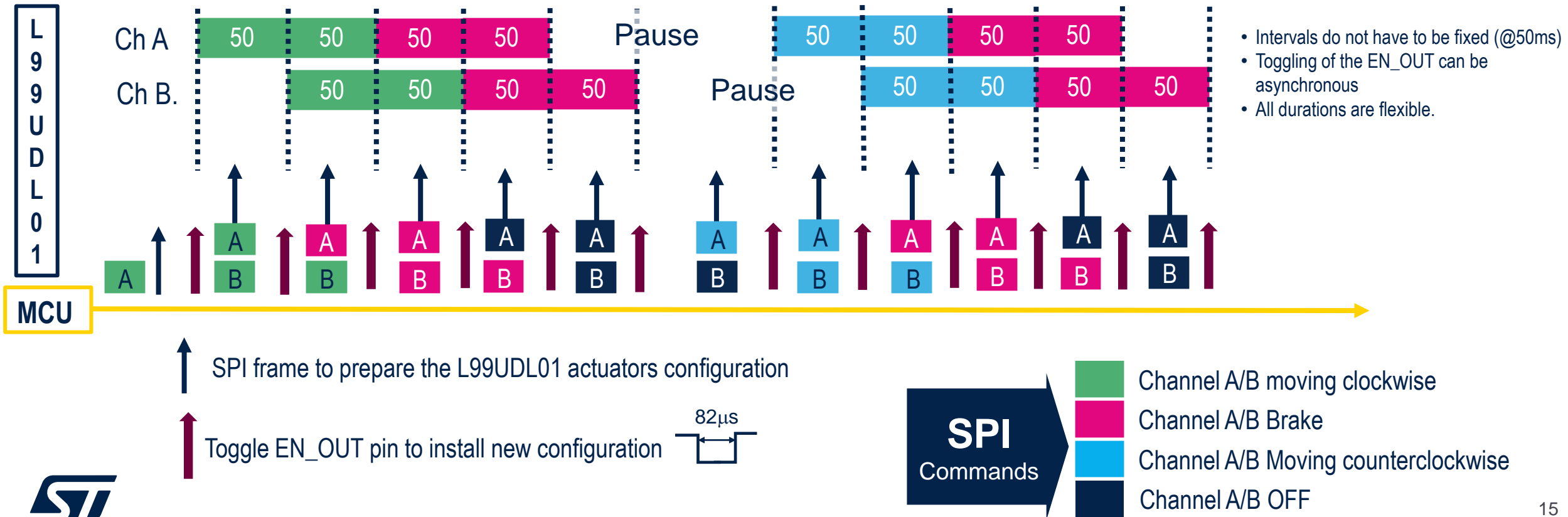


# L99UDL01 for vending machines

## Multiple motors independent actuations

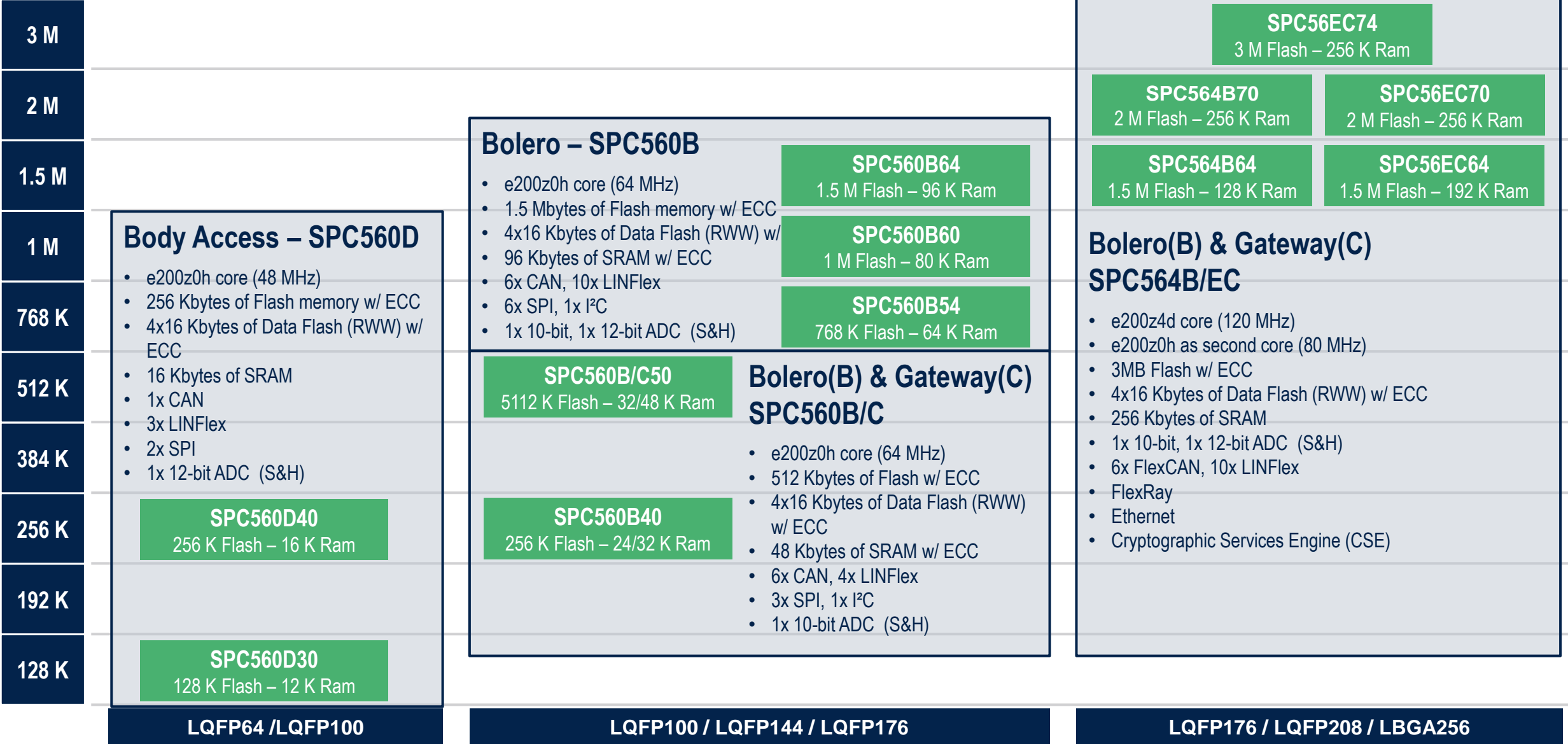
The brushed DC motors can be independently actuated by the L99UDL01 driver

### Example of 2 channel independent actuation





# SPC56 32-bit power architecture MCUs for general-purpose automotive applications





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