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# Power management

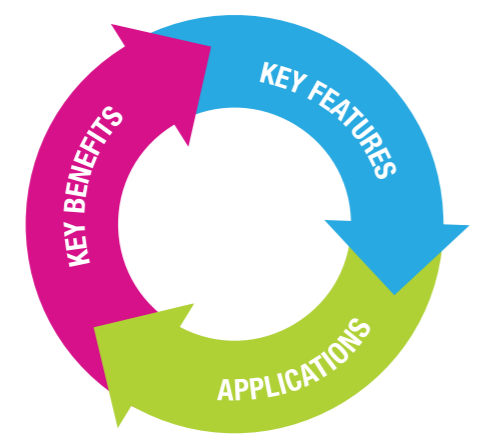
## Driving smart power in automotive



# Voltage regulators

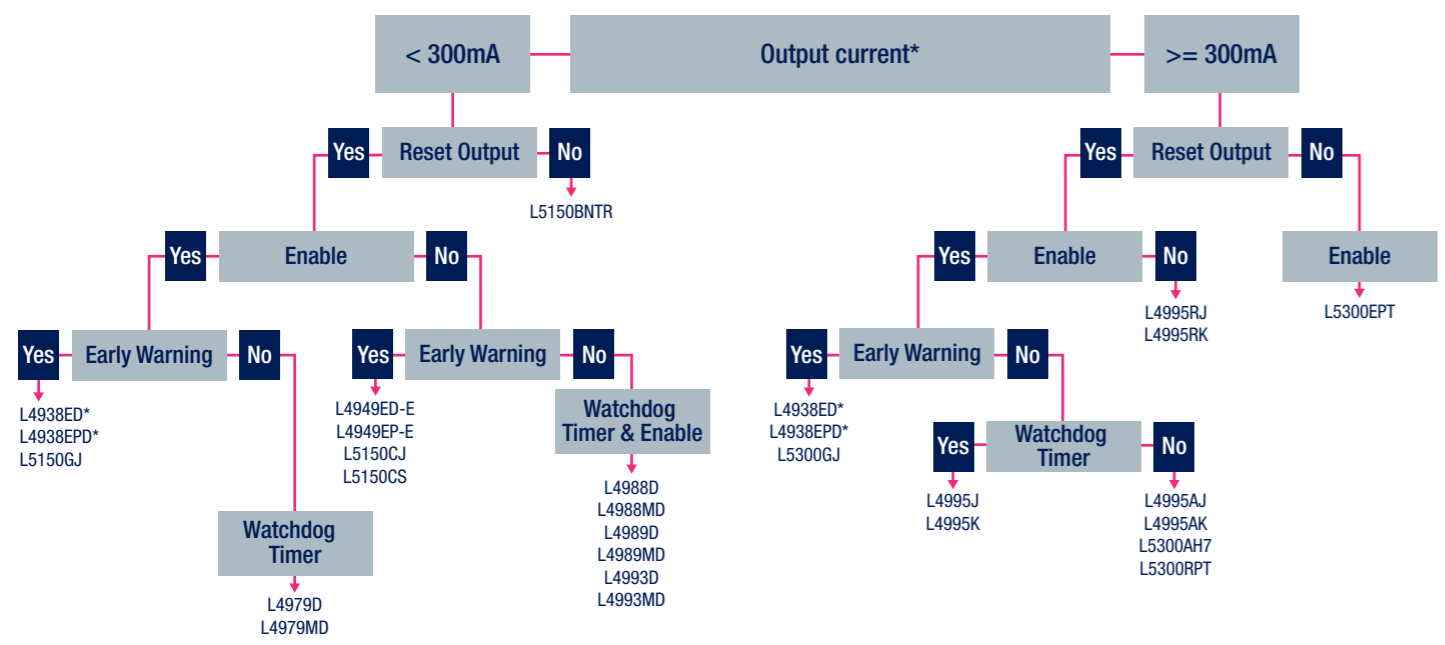
Electronic control units (ECUs), gateways, and body modules represent innovative electronic solutions for automotive applications requiring stable power supplies. ST offers a wide range of linear voltage regulators with extra features to support microprocessor operations such as watchdog, reset, and early warning functions as well as a low quiescent current during module standby that help prevent fast battery discharge when the vehicle is stopped.

- Easy implementation
- High reliability
- Limited number of external components needed
- Low dropout voltage
- Low output voltage tolerance
- Low quiescent current



- Operating DC supply voltage : Up to 40V
- Enable input for enabling/disabling the voltage regulators
- Reset circuit sensing the output voltage down to 1 V
- Programmable reset pulse delay with external capacitor
- Programmable watchdog timer with external capacitor
- Thermal shutdown and short circuit protection
- Wide range of output currents (from 100 to 500 mA)
- Wide temperature range ( $T_j = -40$  to  $150^\circ\text{C}$ )

- Body control module (BCM)
- Powertrain
- HVAC control module
- Door zone
- Seat positioning
- Electric park brake
- Window lift
- LED Light control
- Sunroof module
- Gearbox
- More



\* L4938ED and L4938EPD dual output voltage devices (see table on page 6)

# Power management (SBC)

Smart power management is increasingly pervading the automotive market, finding applications in ECUs, body modules, and gateways. To meet these demands, ST offers highly versatile state-of-the-art power management (System Basis Chips) to supply and drive loads and microcontrollers as well as to establish a reliable interface using dedicated communication protocols. This new power management family offers a broad selection of features and performance characteristics including a very low quiescent current and fail-safe functions.

SPC5 32-bit Automotive MCUs

**SBCs**

LDO 1	LDO 2
FAIL SAFE	WD
WAKE UP	HSDs
SPI	DC MOTOR DRIVER
OPAMP	CAN
Lin	CAN PN

**Motor**

**Bulb**

**LED**

**Resistive load**

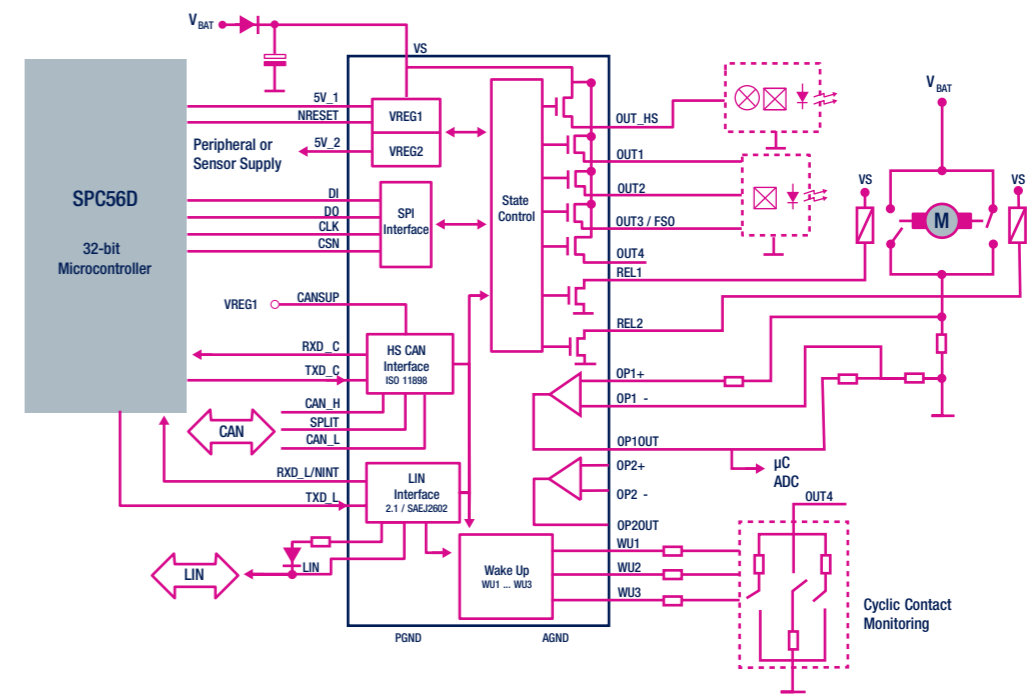
**Hall-effect sensor**

**APPLICATIONS**

- Door zone
- Window lift
- Seat module
- Trunk module
- Trailer module
- Sunroof module
- Climate control (HVAC)
- and more

- For L99PM60J, L9952GXP, L99PM62GXP and L99PM72GXP
- For L9952GXP, L99PM62GXP and L99PM72GXP
- For L99PM62GXP and L99PM72GXP
- For L99PM72GXP

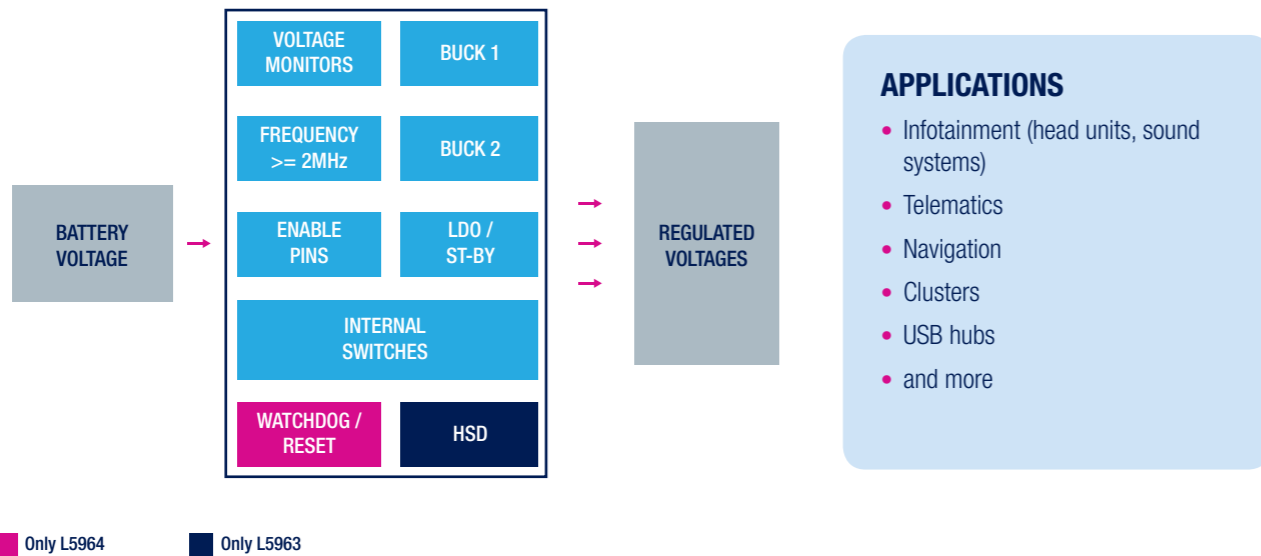
## TYPICAL APPLICATIONS FOR L99PM62GXP AND L99PM72GXP





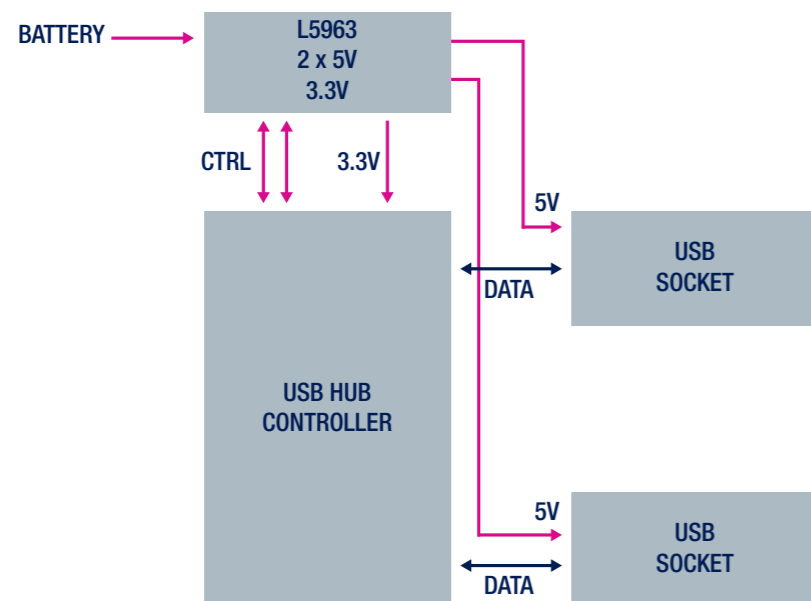
# Multichannel voltage regulators

As applications concentrate many functions in small areas and complex processors and surrounding components increase their demand on power rails and current absorption, the demand for voltage regulators with multiple outputs is increasing. Fully integrated solutions are necessary, considering that often other features like rail sequencing, voltage monitors and basic diagnostics are mandatory. ST's double-voltage regulators can easily support the growing demand for USB power management.



Only L5964    Only L5963

## TYPICAL USB APPLICATION



# Development tools

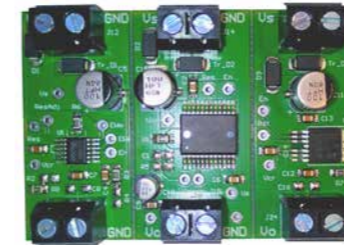
To help developers get the most of our voltage regulators and power management solutions, ST provides a complete set of affordable tools for evaluating the capabilities of our solutions and demonstrating their main characteristics.

## SAMPLE KIT



- SAMPLES-AUTOPMIC : A collection of the most representative products in order to select the best device for a specific application.

## EVALUATION KITS



- EV-AUTO-LDOS : Easy boards with the targeted device mounted on an optimized PCB allowing for simple connection to an external environment to help ensure an effective design-in phase.
- EVAL-L99PM62-72 : Dedicated evaluation board with L99PM62GXP-L99PM72GXP daughter boards, drivers & user-friendly GUI.
- STM8A-DISCOVERY : Discovery kit with STM8AF and STM8AL 8-bit MCU evaluation boards with integrated L99PM62GXP power management IC



- EVAL-L5963 and EVAL-5963Q : Evaluation boards supporting the L5963 multichannel voltage regulator

Order code	Evaluation tool	Components
SAMPLES-AUTOPMIC	Sample kit	L4995K; L5150BN; L5300GJ; L99PM60J; L99PM62GXP; L5963D-L5963Q
EV-AUTO-LDOS	Easy board	L5150GJ; L5300AH7; L4995AK
EVAL-L99PM62-72	Evaluation board	L99PM62GXP; L99PM72GXP
STM8A-DISCOVERY	Discovery kit	L99PM62GXP
EVAL-L5963	Evaluation board	L5963 (PowerSSO-36)
EVAL-L5963Q	Evaluation board	L5963 (VQFPN-48)

## VOLTAGE REGULATORS

Part Number	Package	Number of outputs	Regulated output voltage (V)	Output current (I <sub>OUT</sub> ) (mA)	Output tolerance (%)	Dropout voltage (VDP)		Reset Output	Enable pin	Early warning	Watchdog timer	Watchdog enable	Typ. supply current (standby) (μA)	Quiescent current at low load typ (μA)	
						Typ (mV)	Max (mV)								
L4938ED	SO-20	2	Out1: 5 Out2: Adj	Out1: 100 Out2: 400	Out1: ±1 Out2: ±2	Out1: 200 Out2: 300	Out1: 400 Out2: 600	•	•	•					65
L4938EPD	PowerSSO-20	2	Out1: 5 Out2: Adj	Out1: 100 Out2: 400	Out1: ±1 Out2: ±2	Out1: 200 Out2: 300	Out1: 400 Out2: 600	•	•	•					65
L4949ED-E	SO-8	1	5	100	±1	300	500	•		•					200
L4949EP-E	SO-20	1	5	100	±1	300	500	•		•					200
L4979D	SO-8	1	5	150	±2	200	400	•	•		•		6		100
L4979MD	SO-20	1	5	150	±2	200	400	•	•		•		6		100
L4988D	SO-8	1	5	200	±2	270	500	•			•	•			93
L4988MD	SO-20	1	5	200	±2	270	500	•			•	•			93
L4989D	SO-8	1	5	150	±3	180	400	•			•	•			110
L4989MD	SO-20	1	5	150	±3	180	400	•			•	•			110
L4993D	SO-8	1	5	150	±2	200	400	•			•	•			100
L4993MD	SO-20	1	5	150	±2	200	400	•			•	•			100
L4995RJ	PowerSSO-12	1	5	500	±2	270	500	•					3		90
L4995RK	PowerSSO-24	1	5	500	±2	270	500	•					3		90
L4995AJ	PowerSSO-12	1	5	500	±2	270	500	•	•				3		90
L4995AK	PowerSSO-24	1	5	500	±2	270	500	•	•				3		90
L4995J	PowerSSO-12	1	5	500	±2	270	500	•	•		•		3		90
L4995K	PowerSSO-24	1	5	500	±2	270	500	•	•		•		3		90
L5050S	SO-8	1	5	50	±2		500			•			5		50
L5150BNTR	SOT-223	1	5	150	±2		500								50
L5150CJ	PowerSSO-12	1	5	150	±2		500	•(1)		•					55
L5150CS	SO-8	1	5	150	±2		500	•(1)		•					55
L5150GJ	PowerSSO-12	1	5	150	±2		500	•(1)	•	•			5		55
L5300AH7	HPAK	1	5	300	±2		500	•	•				5		55
L5300GJ	PowerSSO-12	1	5	300	±2		500	•	•	•			5		55
L5300EPT	PPAK	1	5	300	±2		500		•				5		55
L5300RPT	PPAK	1	5	300	±2		500	•	•						55

(1) Adjustable threshold

## POWER MANAGEMENT FOR AUTOMOTIVE SYSTEMS

Part number	Package	Transceiver		Voltage regulators					Driver stages		On-board features	Description
		Transmission rate	Transceiver description	Outputs	Accuracy	Drop voltage VDP (typ) (mV)	Reset	Watchdog	Outputs	Driver description		
L4969URD-E	SO-20	125 kbaud	Fault-tolerant low-speed CAN transceiver	5 V @ 200 mA	± 2 %	250 @ I <sub>LOAD</sub> = 100 mA	•	•			• Wake-up via CAN for voltage regulator	Basic system chip
L9952GXP	PowerSSO-36	20 kbit/s	LIN transceiver	5 V @ 250 mA	± 2 %	300 @ I <sub>LOAD</sub> = 100 mA	•	•	4	HSD 7 Ω @ 120 mA	• 4 wake-up inputs for contact monitoring • Fail-safe output • Two op amps for current sense interfacing • Inhibit input for wake-up from external CAN	Power management IC with LIN
				5 V @ 100 mA	± 4 %	400 @ I <sub>LOAD</sub> = 50 mA			1	HSD 1 Ω @ 400 mA		
									2	Relay drivers (2 Ω)		
L99PM62GXP	PowerSSO-36	LIN: 20 kbit/s CAN: 1 Mbit/s	LIN and HS CAN transceivers	5 V @ 250 mA	± 2 %	300 @ I <sub>LOAD</sub> = 100 mA	•	•	4	HSD 7 Ω @ 120 mA	• Complete 3-channel contact monitoring interface with programmable cyclic sense functionality • 4 internal PWM timers • Two op amps with rail-to-rail outputs (VS) and low-voltage inputs • Programmable periodic system wake-up feature	Power management IC with LIN and high-speed CAN
				5 V @ 100 mA	± 4 % (3% @ 50 mA)	400 @ I <sub>LOAD</sub> = 50 mA			1	HSD 1 Ω @ 400 mA		
									2	Relay drivers (2 Ω)		
L99PM60J	PowerSSO-16	20 kbit/s	LIN transceiver	5 V @ 100 mA	± 2 %	300 @ I <sub>LOAD</sub> = 100 mA	•	•	2	HSD 7 Ω @ 60 mA	• Configurable fail-safe output • ST SPI interface for mode control and diagnostics • Direct drive feature for HSD	Power management IC with LIN
									2	Relay drivers (2 Ω)		
L99PM72GXP	PowerSSO-36	LIN: 20 kbit/s CAN: 1 Mbit/s	LIN and HS CAN transceivers	5 V @ 250 mA	± 2 %	300 @ I <sub>LOAD</sub> = 100 mA	•	•	4	HSD 7 Ω @ 120 mA	• Complete 3-channel contact monitoring interface with programmable cyclic sense functionality • 4 internal PWM timers • Two operational amps with rail-to-rail outputs (VS) and low-voltage inputs • Programmable periodic system wake-up feature	Power management IC with LIN and high-speed CAN supporting selective wake-up functionality according to ISO 11898-6
				5 V @ 100 mA	± 4 % (3% @ 50 mA)	400 @ I <sub>LOAD</sub> = 50 mA			1	HSD 1 Ω @ 400 mA		
									2	Relay drivers (2 Ω)		

## MULTICHANNEL POWER MANAGEMENT

Part Number	Package		V <sub>in</sub> (V)	V <sub>out</sub> (V)	I <sub>out</sub> (A)	Frequency	Topology	Other features
L5963	PowerSSO36 VQFPN-48	Buck1	3.5 to 26	1 to V <sub>in</sub>	2.5	Up to 2MHz	Monolithic, synchronous, voltage mode, internal power switches	• Power goods • High side driver • Independent Enables
		Buck2	3.5 to 26	1 to V <sub>in</sub>	3.0	Up to 2MHz		
		LDO/ST-BY	3.5 to 26	1 to V <sub>in</sub>	0.25	-		
L5964	VQFPN-48 LQFP64	Buck1	3.3 to 26	0.9 to V <sub>in</sub>	3.5	Up to 2.3MHz	Monolithic, synchronous, current mode, internal power switches	• DC-DC parallel mode (7A) • Watchdog / Reset • Voltage supervisors • Independent Enables
		Buck2	3.3 to 26	0.9 to V <sub>in</sub>	3.5	Up to 2.3MHz		
		LDO/ ST-BY	3.3 to 26	1 to 10	0.25	-		

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