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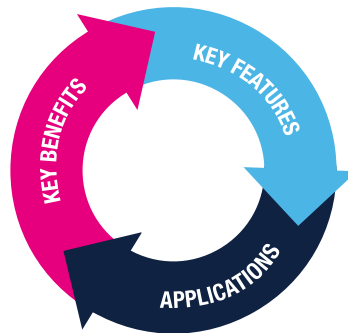
Power management Driving smart power in automotive



Linear voltage regulators

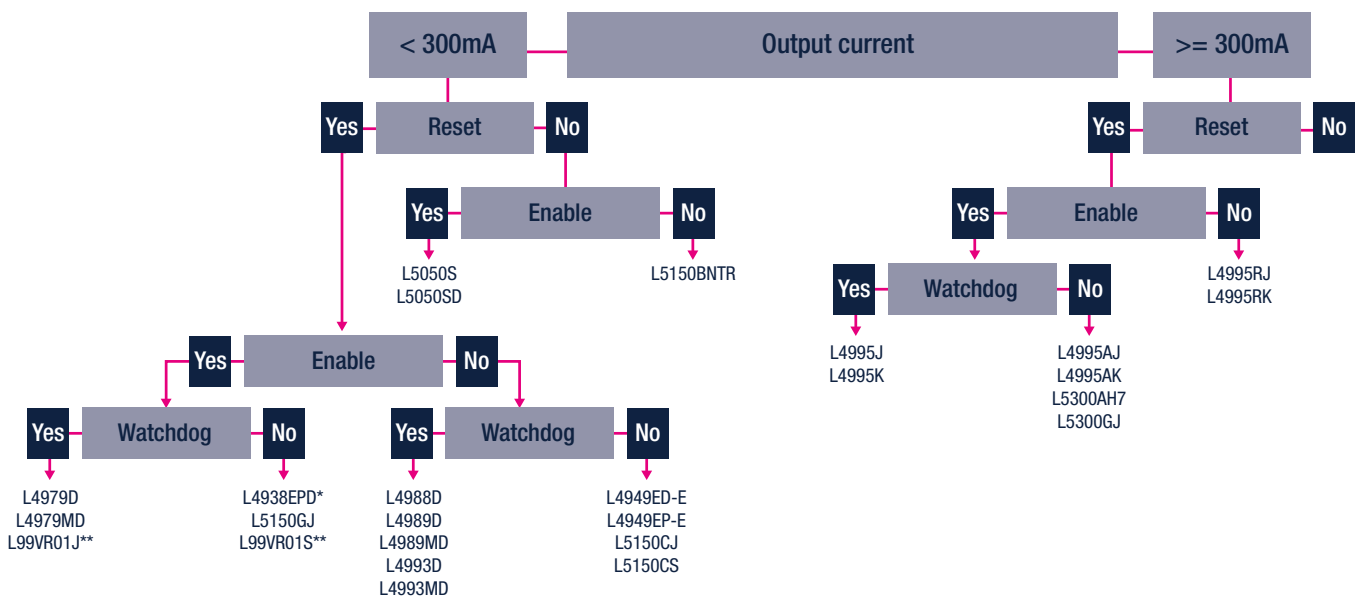
Electronic control units (ECUs), gateways, and body modules represent innovative electronic solutions for automotive applications requiring stable power supplies. ST offers a wide range of linear voltage regulators with extra features to support microprocessor operations such as watchdog, reset, and 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



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

- 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 175°C)
- Fixed and Selectable Output Voltage solutions
- Output Over Voltage Detection
- Fast Output Discharge
- Ishort control
- Advanced Thermal Warning

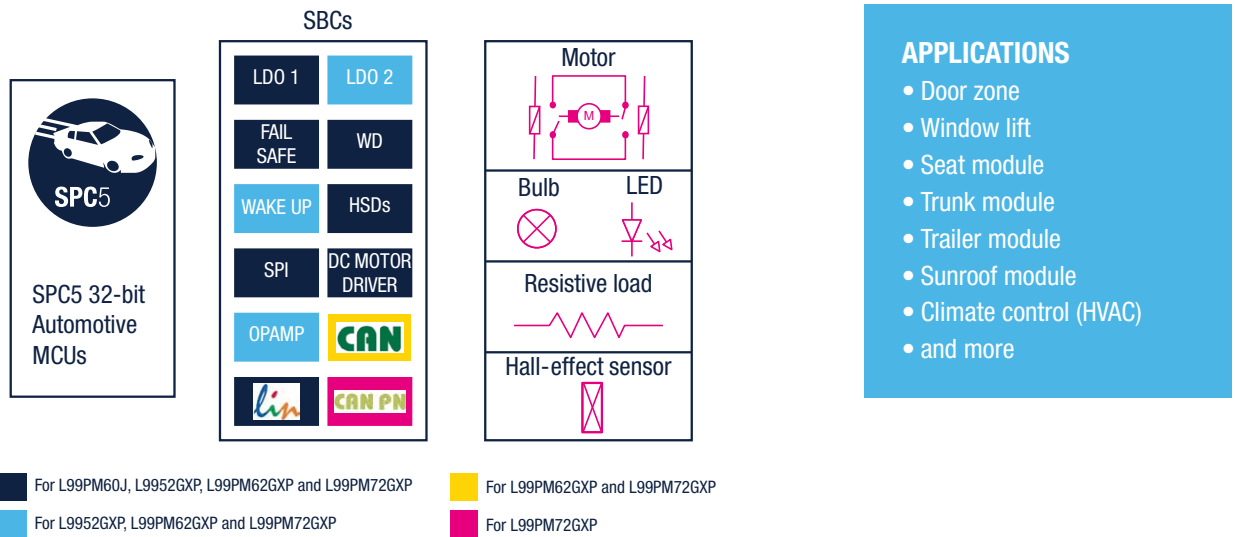


* L4938EPD dual output voltage device (see table on page 6)

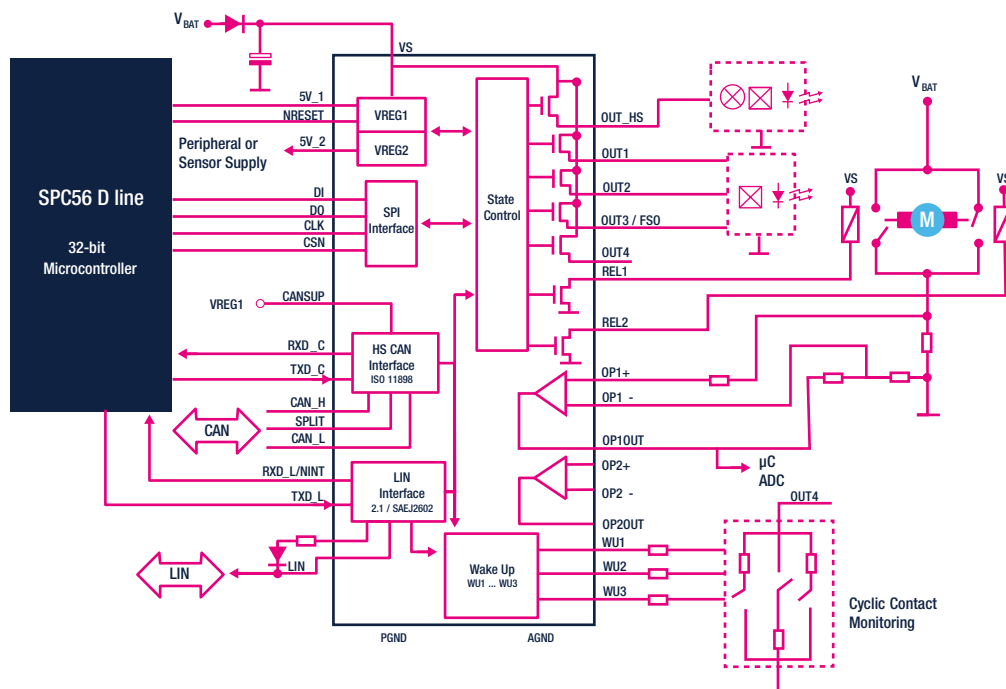
** L99VR01x are configurable LDOs from 0.8 V to 5.0 V (see table on page 6)

Power management System Basis Chip (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.

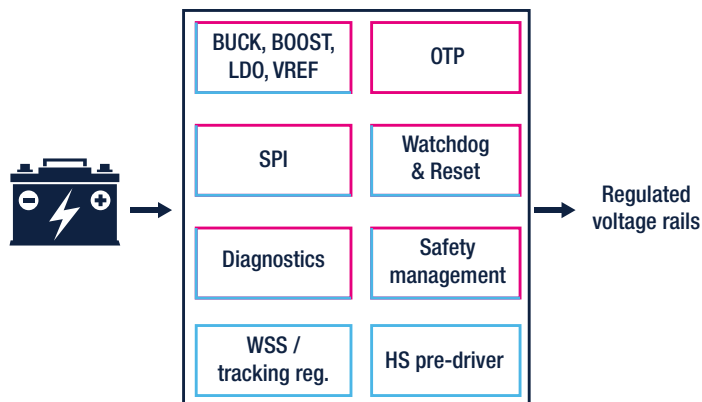


Typical Applications For L99PM62GXP and L99PM72GXP



Multi-channel power management ICs

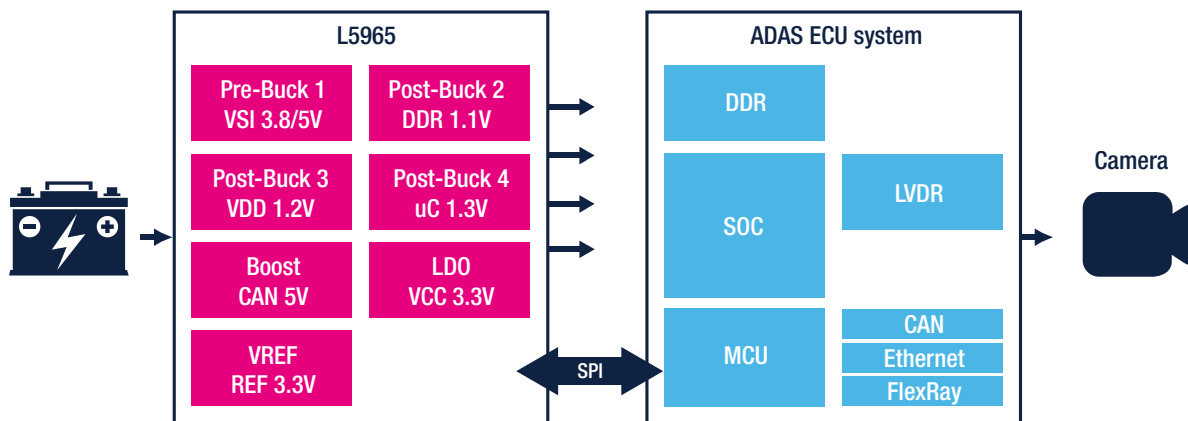
As applications concentrate many functions in small areas and complex processors and surrounding components increase their demand on power rails and current absorption, the demand for voltage regulators with multiple outputs is increasing. Fully integrated solutions are necessary, considering that often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



- APPLICATIONS**
- Camera module (front/rear/surround view)
 - Radar ECU
 - ADAS domain controller
 - Gateway
 - Infotainment (head units, sound systems)
 - Telematics and more

■ L5965S, STPM066S ■ L9396

Example of ADAS domain controller 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



EVAL-L99PM62-72

Dedicated evaluation board with L99PM62GXP-L99PM72GXP daughter boards, drivers & user-friendly GUI.



EVAL-L5963 and EVAL-5963Q

Evaluation boards supporting the L5963 multichannel voltage regulator



EVAL-L5965 and EVAL-STPM066S

Evaluation boards dedicated to L5965 and STPM066S multi-channel voltage regulators. Discovery board SPC582B-DIS completes the kit supporting evaluation boards programming

Order code	Evaluation tool	Components
SAMPLES-AUTOPMIC	Sample kit	L4995K (PowerSSO-24) ; L5150BN (SOT223); L5300GJ (PowerSSO-12); L99PM60J (PowerSSO-16); L99PM62GXP (PowerSSO-36); L5963-L5963Q (VFQFPN48)
EVAL-L99PM62-72	Evaluation board	L99PM62GXP (PowerSSO-36); L99PM72GXP (PowerSSO-36)
EVAL- L5965	Evaluation board	L5965 (VFQFPN-48)
EVAL-STPM066S	Evaluation board	STPM066S (VQFPN-48)
EVAL-L9001	Evaluation board	L9001 (PowerSSO-24)
EVAL- L5963	Evaluation board	L5963 (PowerSSO-36)
EVAL-L5963Q	Evaluation board	L5963 (VQFPN-48)

Linear Voltage Regulators

Part Number	Package	Number of outputs	Regulated output voltage (V)	Output current (I _{OUT}) (mA)	Output tolerance (%)	Dropout voltage		Reset Output	Enable	Early warning	Watchdog	Thermal Warning	Output over Voltage detection	IShort Control	Typ. supply current (standby) (μA)	Quiescent current at low load typ (μA)
						Typ (mV)	Max (mV)									
L4938EPD	PowerSO-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
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	•			•					90
L4995RJ	PowerSSO-12	1	5	500	±2	270	500	•								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	•	•		•				5	50
L5050S	SO-8	1	5	50	±2		500		•						5	50
L5050SD	SO-8	2	Out1: 5 Out2: 5	Out1: 50 Out2: 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
L99VR01S	SO-8	1	0.8,1.2,1.5, 1.8,2.5,2.8, 3.3,5	200	±2		500	•	•						1	75
L99VR01J	PowerSSO-12	1	0.8,1.2,1.5, 1.8,2.5,2.8, 3.3,5	200	±2		500	•	•		•	•	•	•	1	75

(1) Adjustable threshold

Power Management System Basis chip (SBC)

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		
L9952GXP	PowerSS0-36	20 kbit/s	LIN transceiver	5 V @ 250 mA	± 2 %	300 @ I _{LOAD} = 100 mA	•	•	4	HSD 7 Ω @ 120 mA	<ul style="list-style-type: none"> 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 _{LOAD} = 50 mA			1	HSD 1 Ω @ 400 mA		
									2	Relay drivers (2 Ω)		
L99PM62GXP	PowerSS0-36	LIN: 20 kbit/s CAN: 1 Mbit/s	LIN and HS CAN transceivers	5 V @ 250 mA	± 2 %	300 @ I _{LOAD} = 100 mA	•	•	4	HSD 7 Ω @ 120 mA	<ul style="list-style-type: none"> 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 _{LOAD} = 50 mA			1	HSD 1 Ω @ 400 mA		
									2	Relay drivers (2 Ω)		
L99PM60J	PowerSS0-16	20 kbit/s	LIN transceiver	5 V @ 100 mA	± 2 %	300 @ I _{LOAD} = 100 mA	•	•	2	HSD 7 Ω @ 60 mA	<ul style="list-style-type: none"> 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	PowerSS0-36	LIN: 20 kbit/s CAN: 1 Mbit/s	LIN and HS CAN transceivers	5 V @ 250 mA	± 2 %	300 @ I _{LOAD} = 100 mA	•	•	4	HSD 7 Ω @ 120 mA	<ul style="list-style-type: none"> 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 _{LOAD} = 50 mA			1	HSD 1 Ω @ 400 mA		
									2	Relay drivers (2 Ω)		

Multi-channel power management ICs

Part number	Package		Vin (V)	Vout (V)	Iout (A)	Frequency	Topology	Other features	
L5965	VQFPN-48	Buck1 controller	4 to 32	Adjustable via OTP		400kHz	Monolithic synchronous, current mode, internal power switches	OTP programming, SPI interface, diagnostics, voltage supervisors, WD&reset, supporting functional safety	
		Buck2	4 to 32			3/1.5			2.4MHz
		Buck3	3 to 5.5			1.5			2.4MHz
		Buck4	3 to 5.5			1			2.4MHz
		Boost	3 to 5.5			0.3			2.4MHz
		LDO	3 to 5.5			0.6			
		Vref				0.002			
STPM066S	VQFPN-48	Buck	4 to 32	Adjustable via OTP		1.35/2.6	Monolithic synchronous, current mode, internal power switches	OTP programming, SPI interface, diagnostics, voltage supervisors, WD&reset, supporting functional safety	
		Boost	3 to 5.5			0.2/0.3			2.4MHz
		LDO	3 to 5.5			0.3/0.6			
		Vref				0.02			
L9396	TQFP-64	Boost controller	4.5 to 19	8.5	0.3	2MHz	Monolithic, asynchronous	SPI interface, WSS/tracking regulator, designed for ADAS, spread spectrum, diagnostics, compatible to battery, 2xHS pre-driver, WD&reset, supporting functional safety	
		Buck1 controller	6 to 19	6.5/7.2	1	465kHz			
		Buck2 / LDO1	6 to 19	5 to 0.8	1/0.5	465kHz			
		LDO2		5	0.25				
		LDO3		3.3/5	0.1				
L9001	PowerSS0-24	Buck1	5.5 to 18	3.3/5/6	1	465kHz	Monolithic, asynchronous, internal power switches	Voltage supervisors, enables, diagnostics, compatible to battery, WD&reset	
		Buck2 / LDO1	5.5 to 18	5 to 0.8	1/0.3	465kHz			
		LDO	5.5 to 18	3.3/5	0.1				
L9758	PowerS0-36	Boost	5.5 to 26.5	8.5	2	350kHz	Monolithic, asynchronous, internal power switches	Voltage reference, 4x protected tracking regulators	
		Buck	5.5 to 26.5	5.5	2	350kHz			
		LDO1		3.3/5	1				
		LDO2		2.6/3.3	1				
		LDO3		1.5	1				
		ST-BY1	5.5 to 26.5	1/1.5	0.01				
		ST-BY2	5.5 to 26.5	2.6/3.3	0.01				
L5963	PowerSS036 VQFPN-48	Buck1	3.5 to 26	1 to Vin		2.5	Monolithic synchronous, voltage mode, internal power switches	Power goods, high-side driver, enables	
		Buck2	3.5 to 26			3			2MHz
		LDO / ST-BY1	3.5 to 26			0.25			
L5962	PowerS036	Buck	4.1 to 27			2.5	Internal power switches	I2C bus for LDO2, reset, 2 x HSD, enable for buck	
		ST-BY				3.3/5			0.15
		LDO1				5/8.5			0.35
		LDO2				3.3/10			1

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Order code: **BRVRSBC1121**

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