ST Car Body Solutions

August- September, 2007

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Manager
APG Application Lab
Automotive Segment
Greater China

ST Components for Automotive Applications

Microelectronics
More Intelligent Solutions

Car Body

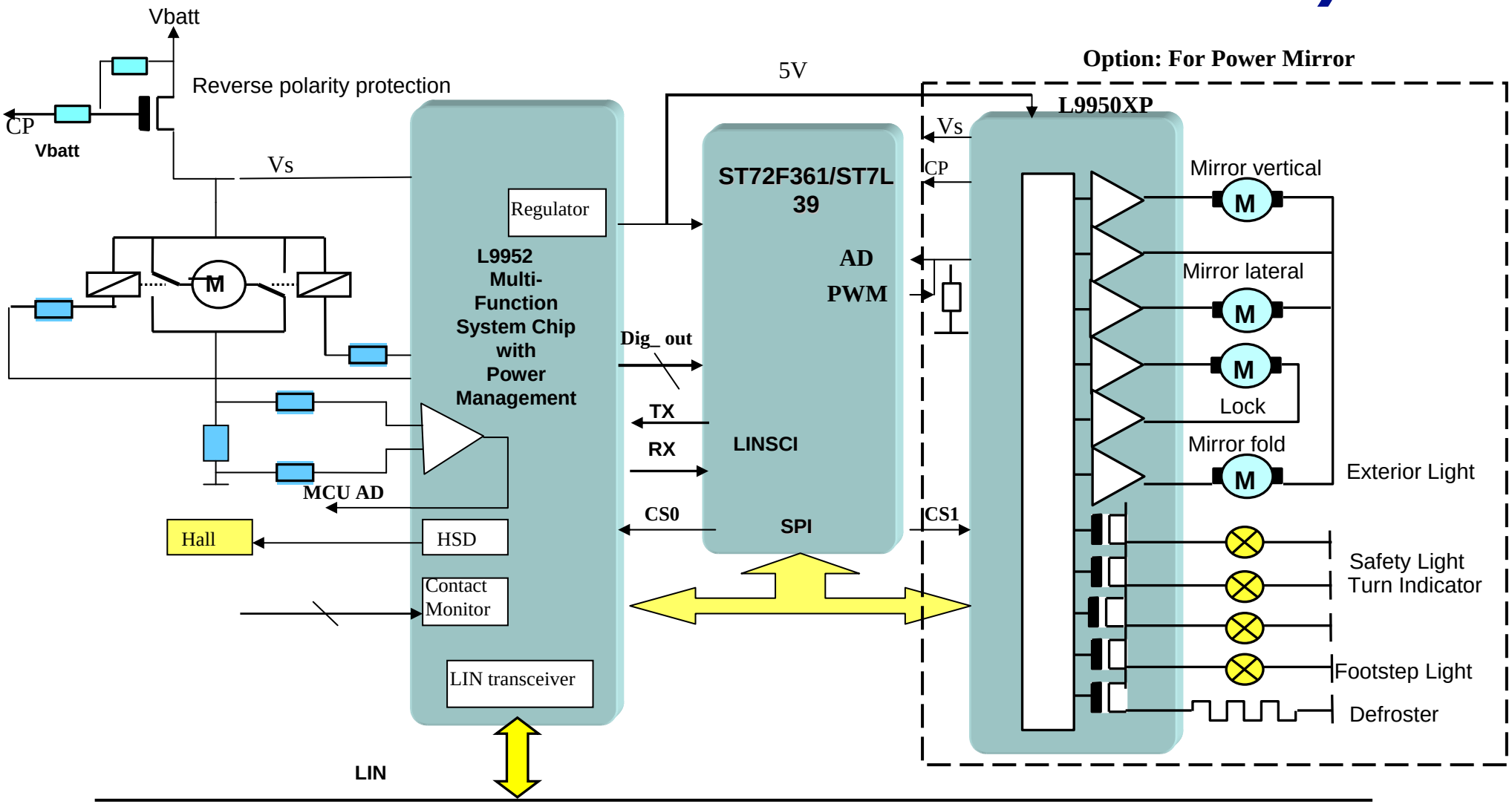
- Systems Solutions

WWW.ST.COM

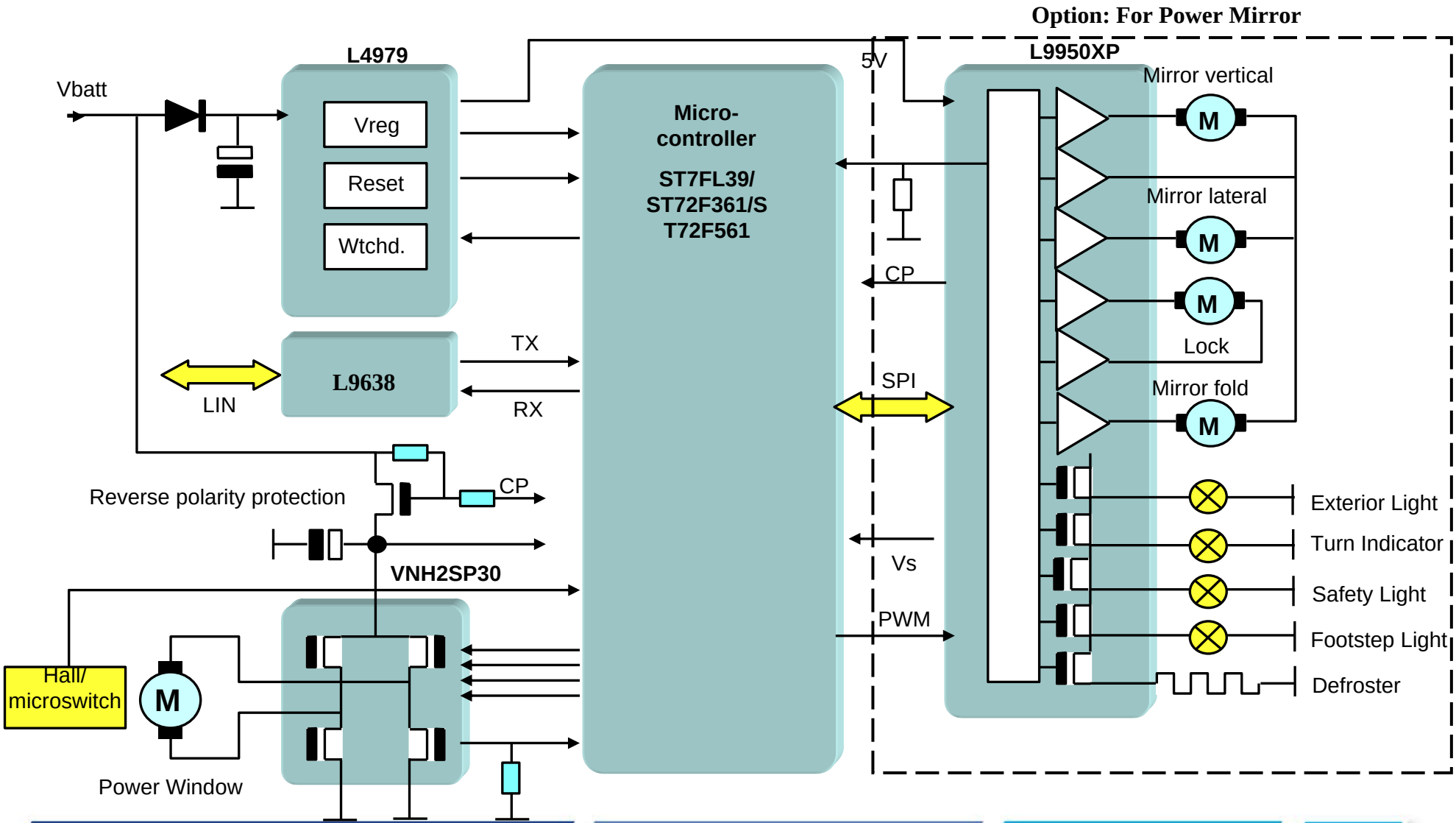
Systems Solutions

- *Door Zone Systems*
- *Junction Box & Lighting Control*
- *Dome Zone Systems*
- *Seat Control*
- *Wiper Systems*
- *Climate Control*
- *Dashboard*
- *Car Siren*

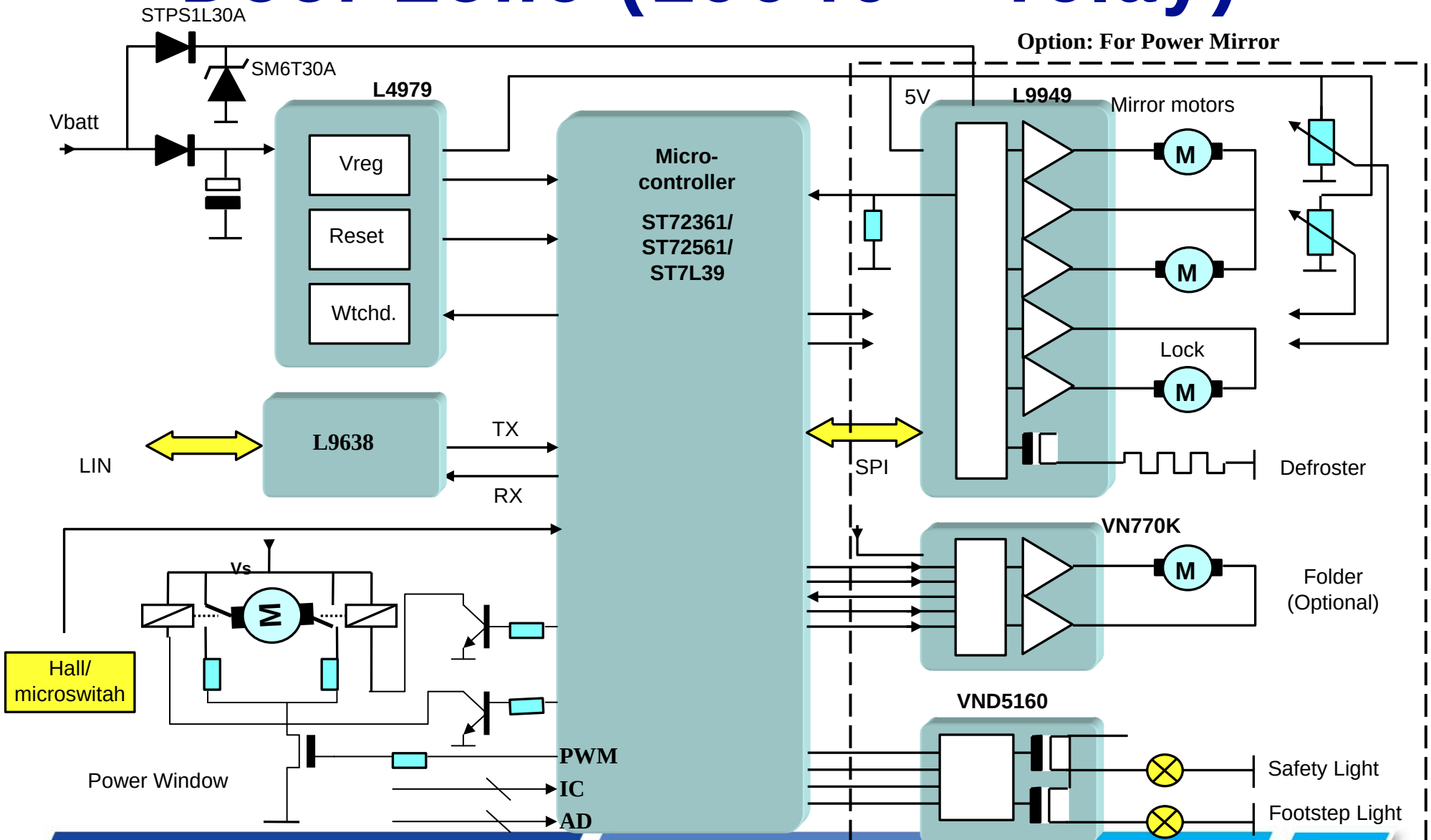
Door Zone（L9952 + L9950）



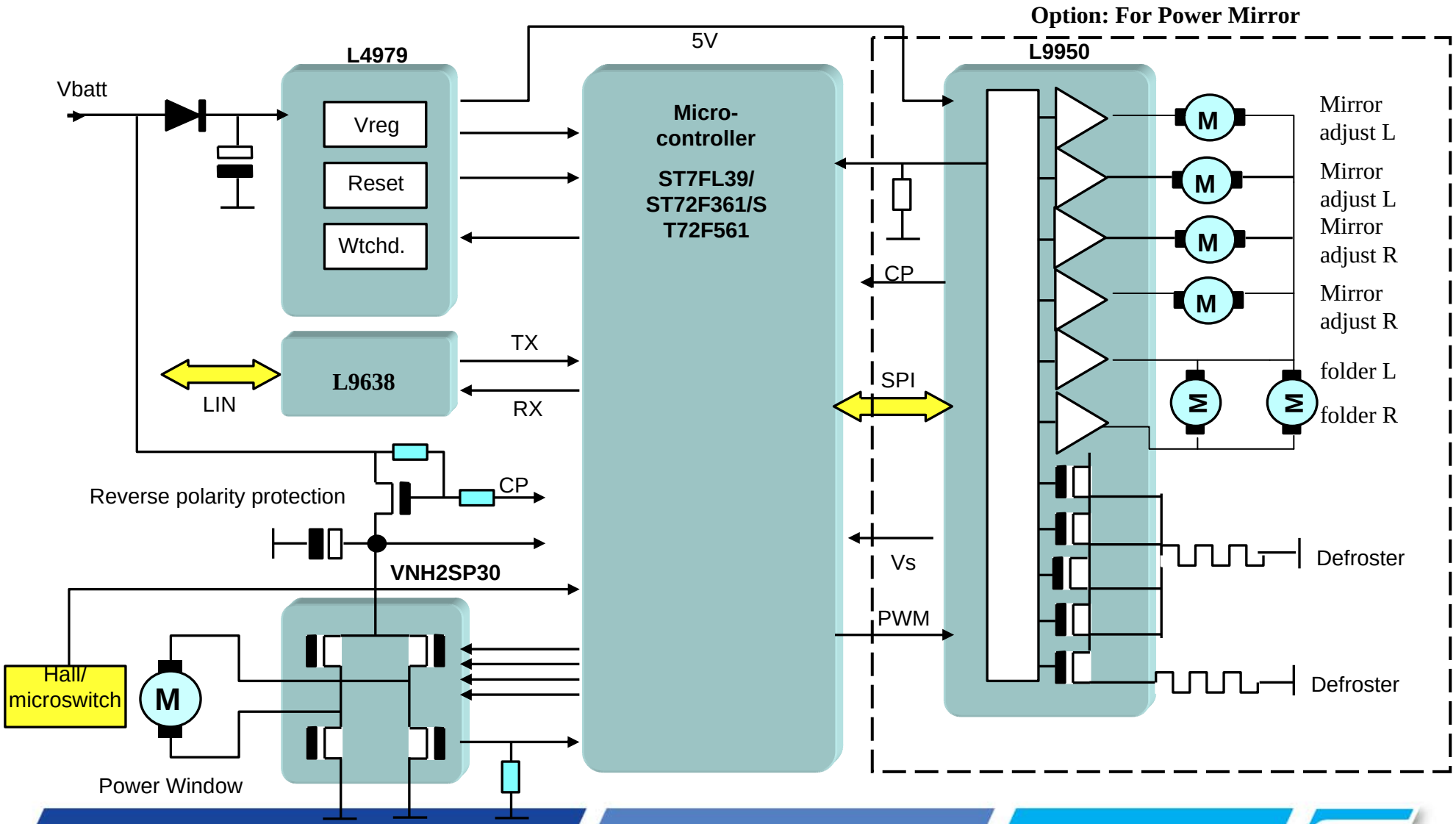
Door Zone (VNH2SP30 + L9950)



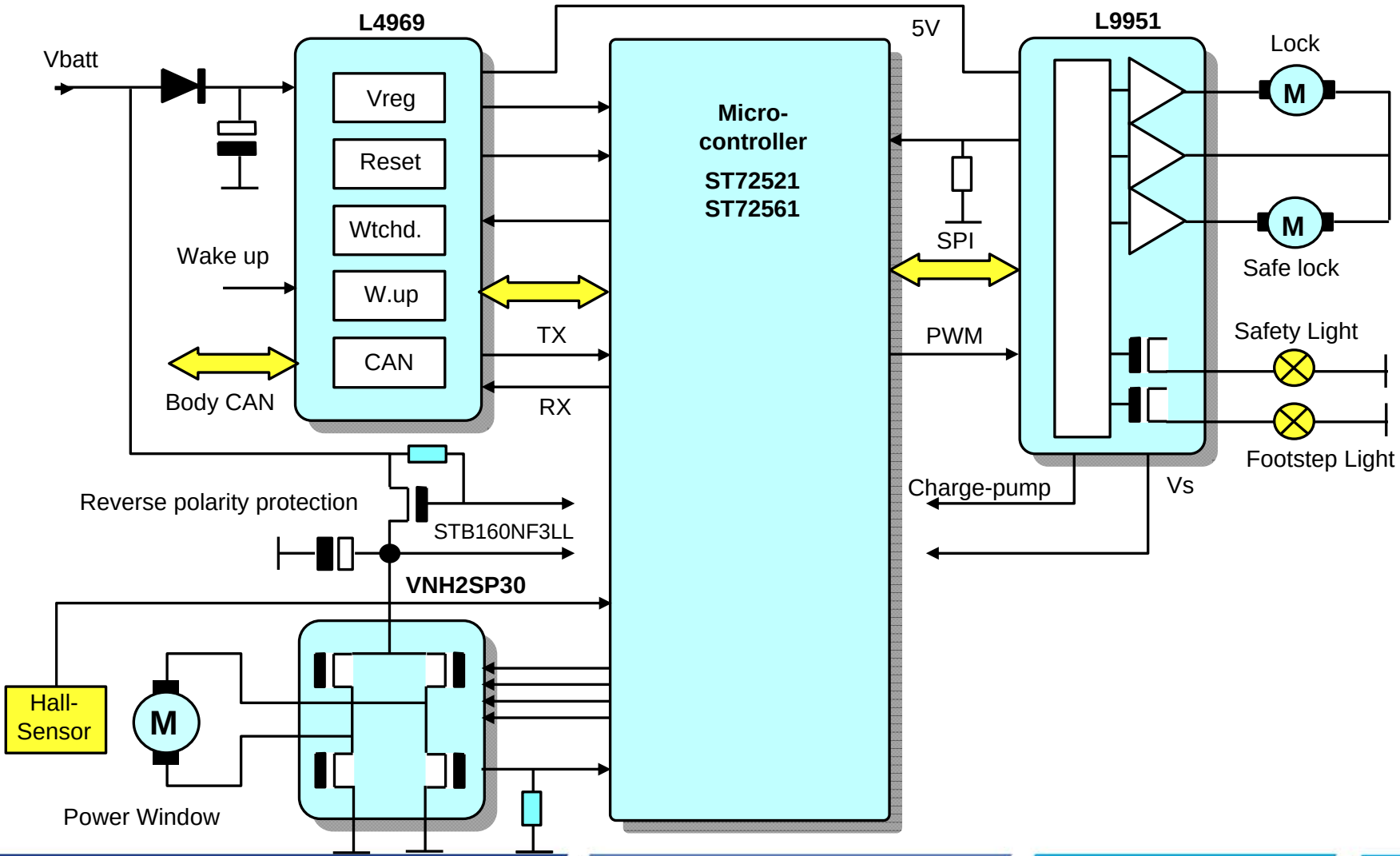
Door Zone (L9949 + relay)



Door Zone (L9950 drive two mirror)



Rear Doors - Dual Motor Lock Drive



L99xx Door Drivers (Family approach)

Customer advantages:

- same PCB for all Variants
- all device PIN compatible
- fallback solution given
- same package: PowerSSO-36

L9949 => L9953XP(*)

Mid End

- Front Door
  - Lock
  - Mirror XY
  - Heater

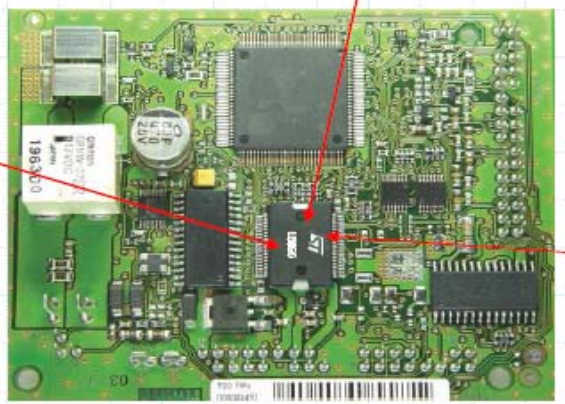
L9953

L9951XP

Low End

- Rear Door
  - Lock
  - Deadlock
  - 2 Bulbs
- Front Door
  - Mirror XY
  - 2 Bulbs

L9951



L9950XP

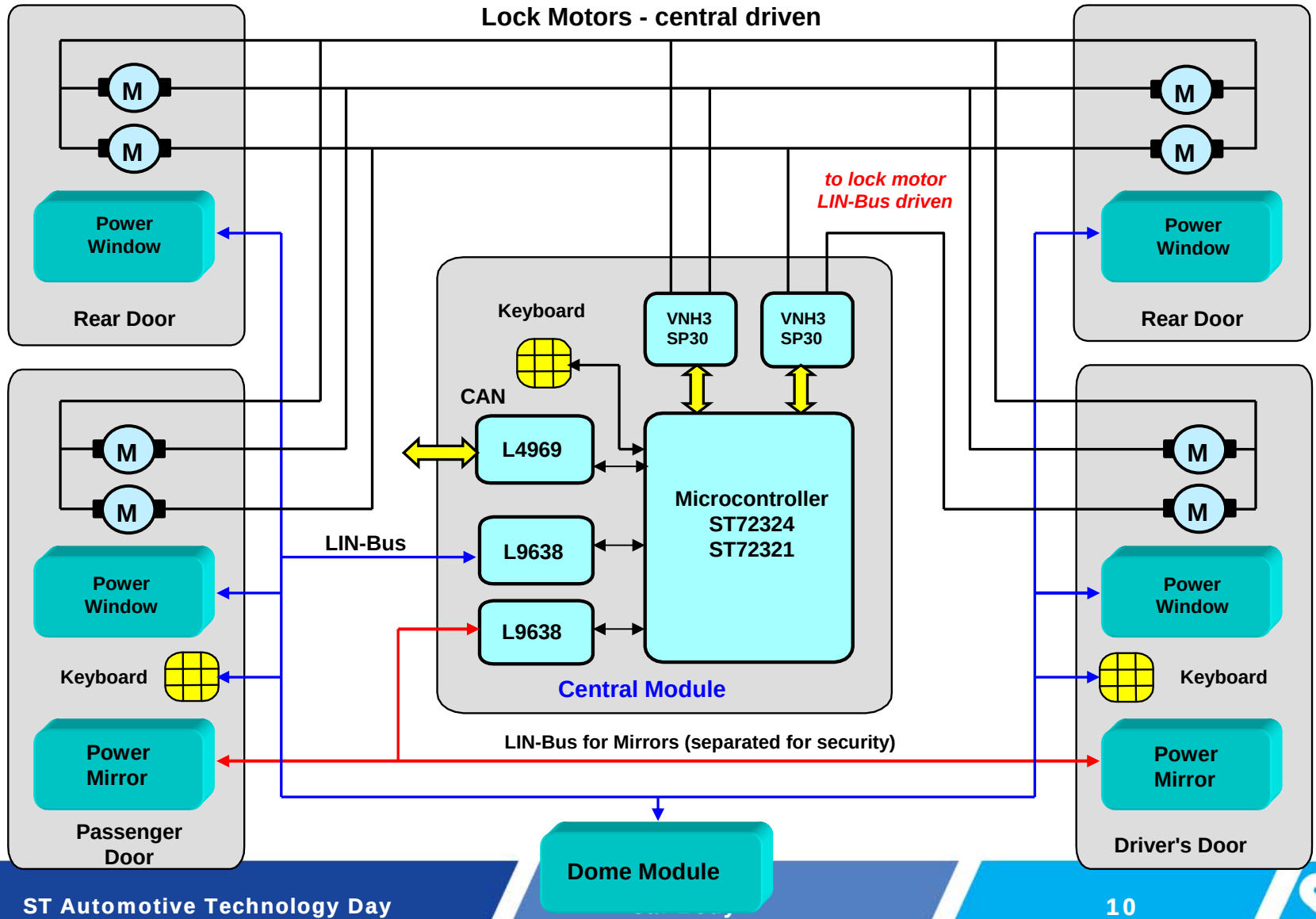
High End

- Front Door
  - Lock
  - Deadlock
  - Mirror XY
  - Folder
  - Heater
  - 4 Bulbs

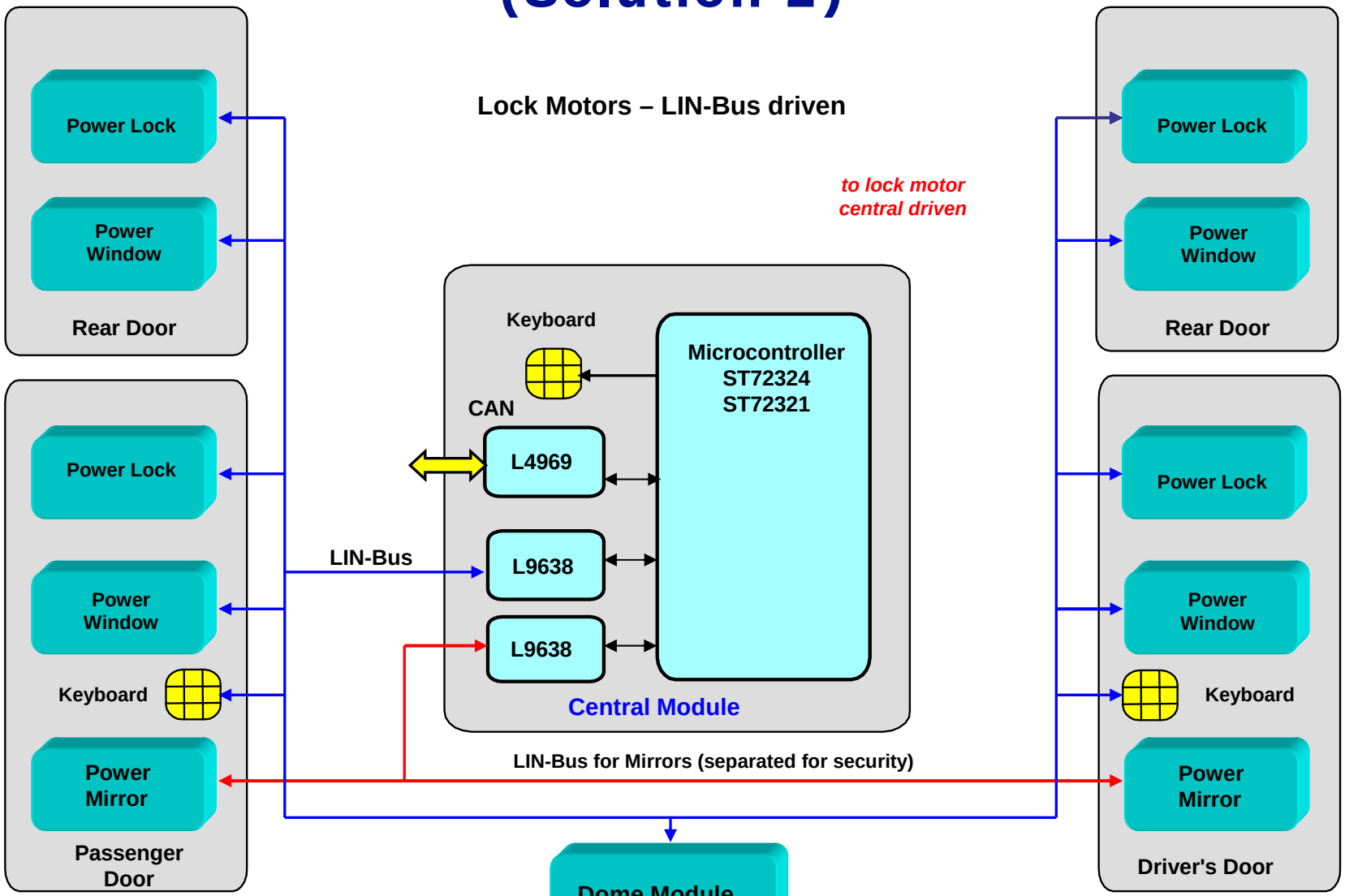
L9950

(*) Under Development

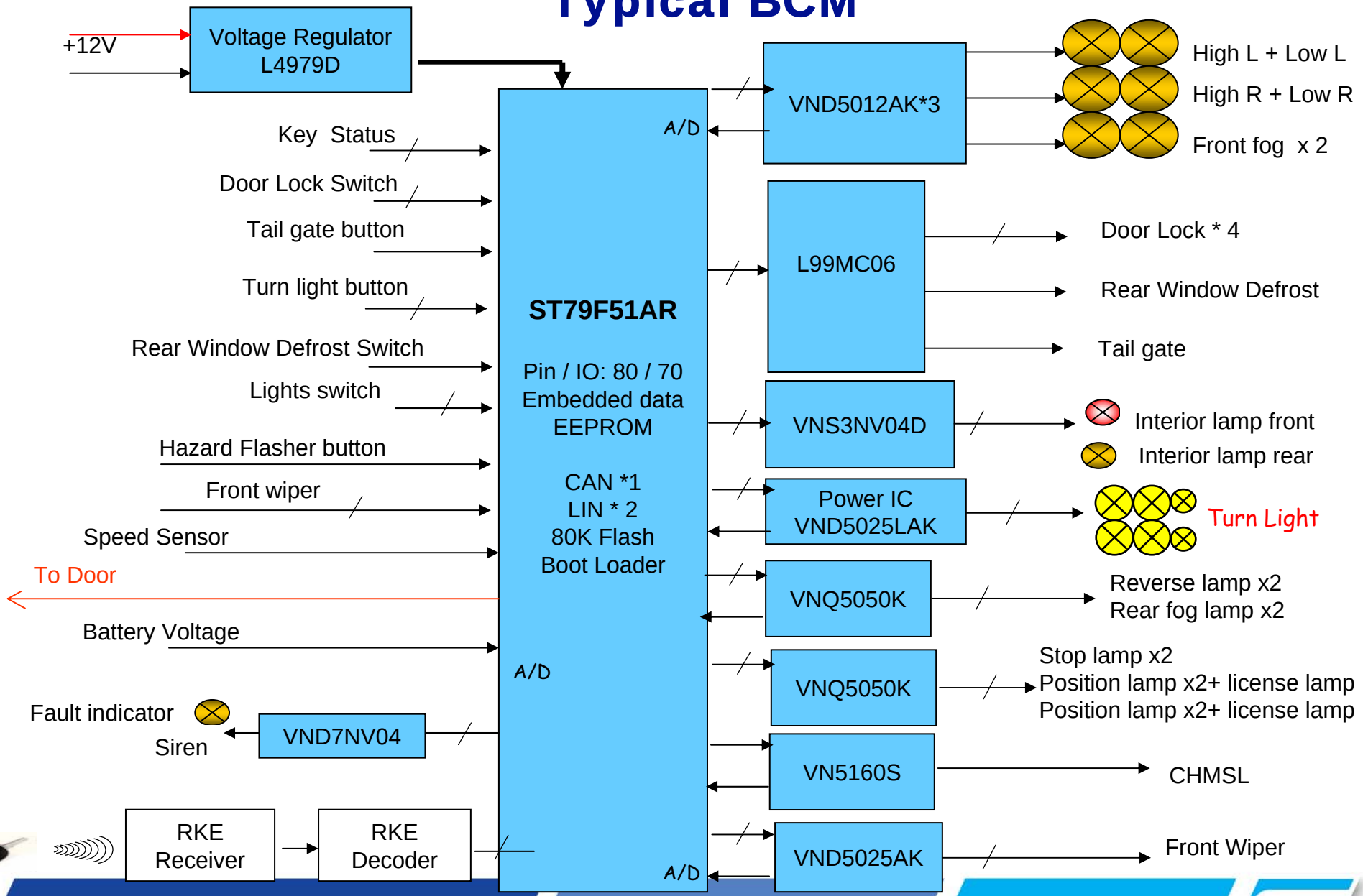
System Overview Mechatronic Door Zone (Solution 1)



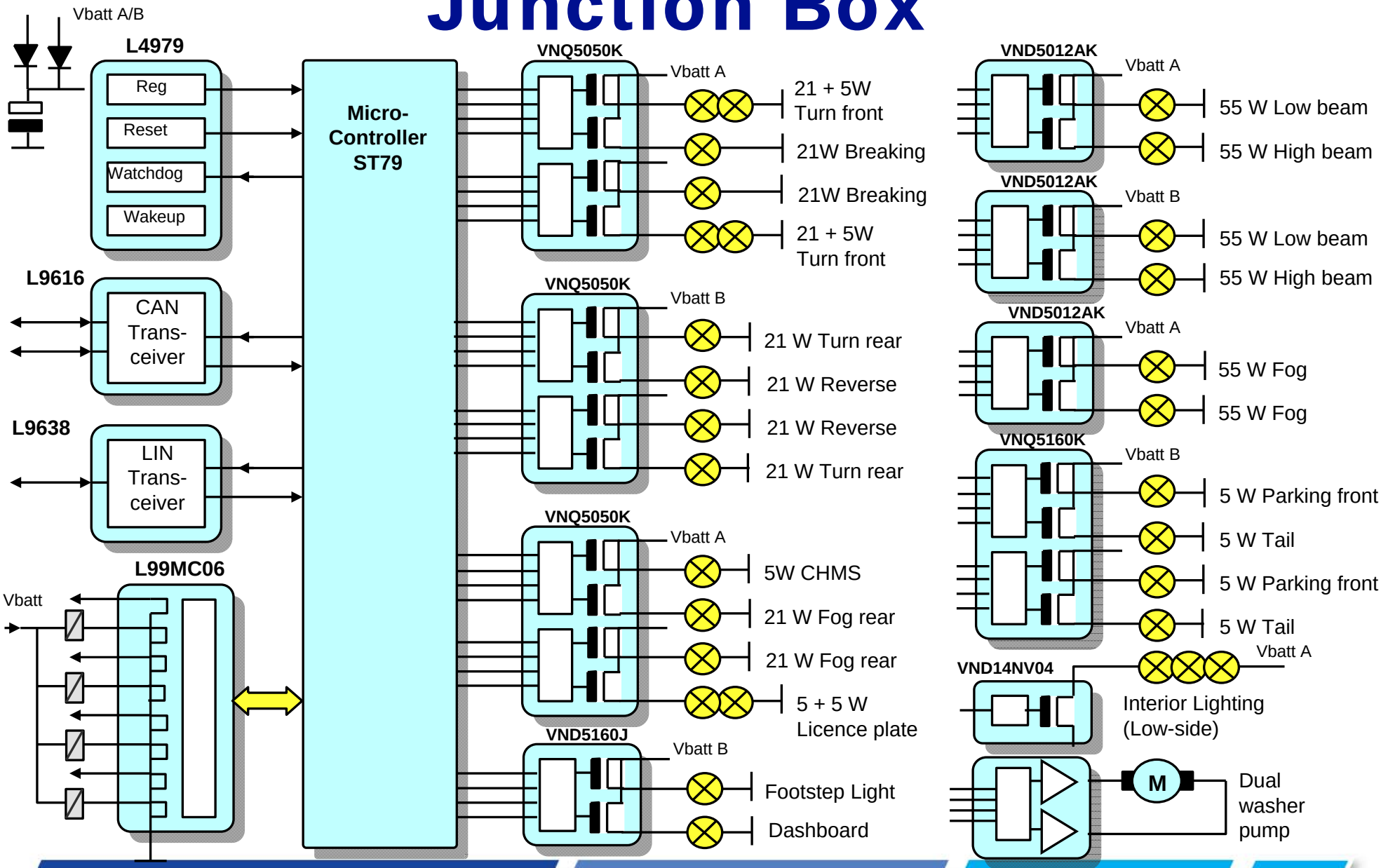
System Overview Mechatronic Door Zone (Solution 2)



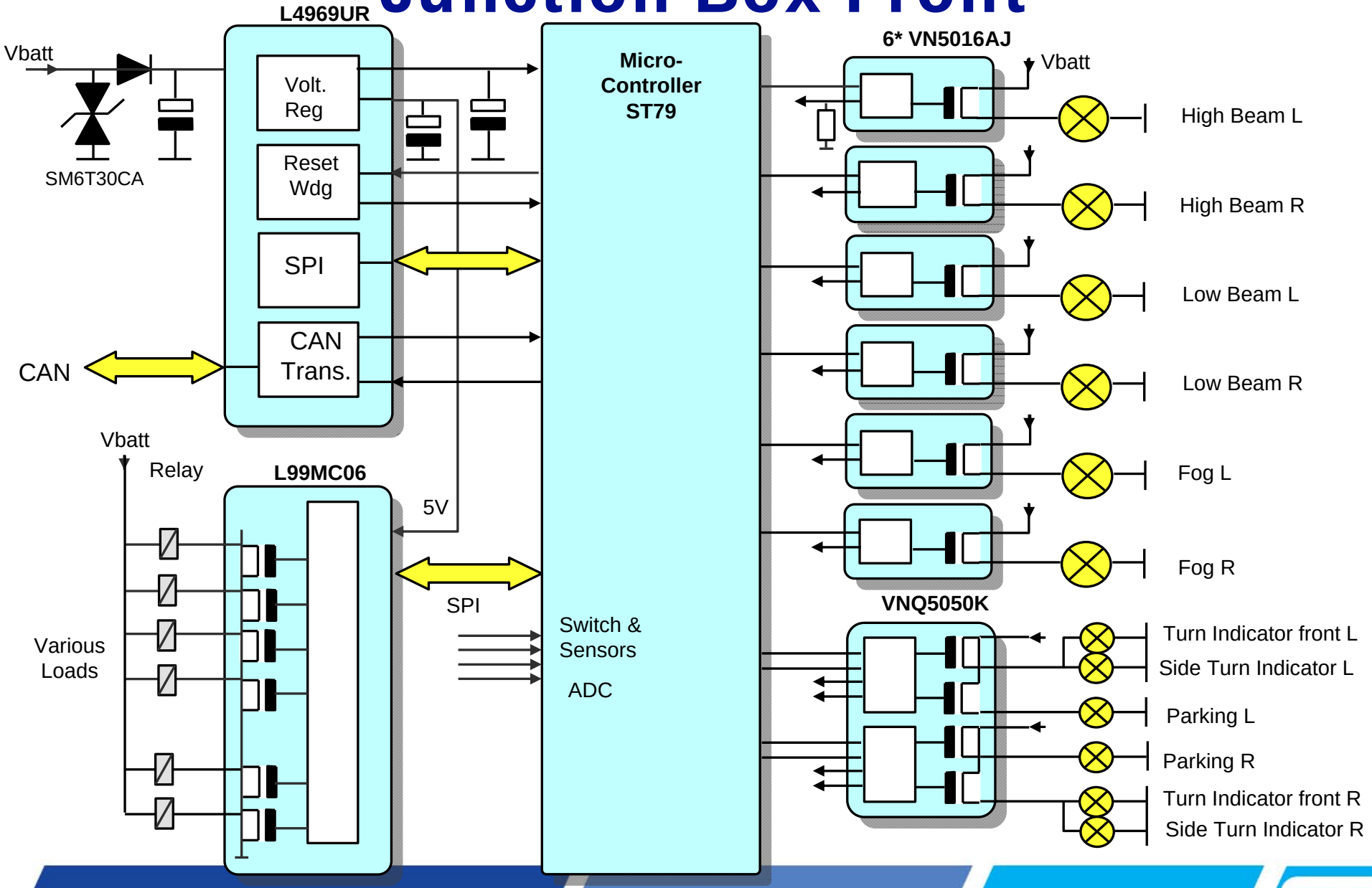
Typical BCM


+12V
Voltage Regulator L4979D
ST79F51AR
Pin / IO: 80 / 70
Embedded data EEPROM
CAN *1
LIN * 2
80K Flash
Boot Loader
A/D
A/D
A/D
Key Status
Door Lock Switch
Tail gate button
Turn light button
Rear Window Defrost Switch
Lights switch
Hazard Flasher button
Front wiper
Speed Sensor
To Door
Battery Voltage
Fault indicator
Siren
VND7NV04
RKE Receiver
RKE Decoder
VND5012AK*3
High L + Low L
High R + Low R
Front fog x 2
L99MC06
Door Lock * 4
Rear Window Defrost
Tail gate
VNS3NV04D
Interior lamp front
Interior lamp rear
Power IC VND5025LAK
Turn Light
VNQ5050K
Reverse lamp x2
Rear fog lamp x2
VNQ5050K
Stop lamp x2
Position lamp x2+ license lamp
Position lamp x2+ license lamp
VN5160S
CHMSL
VND5025AK
Front Wiper

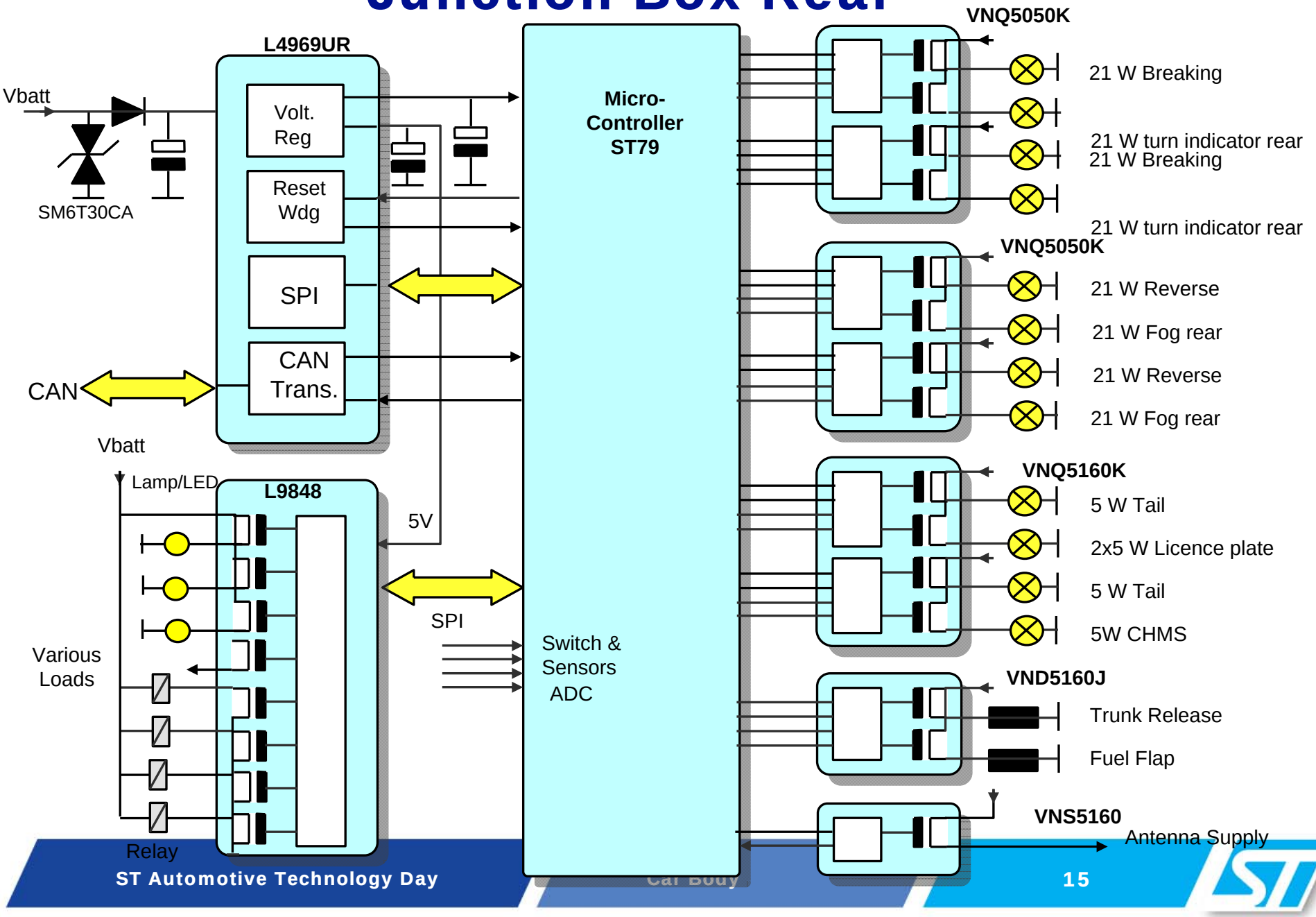
Junction Box



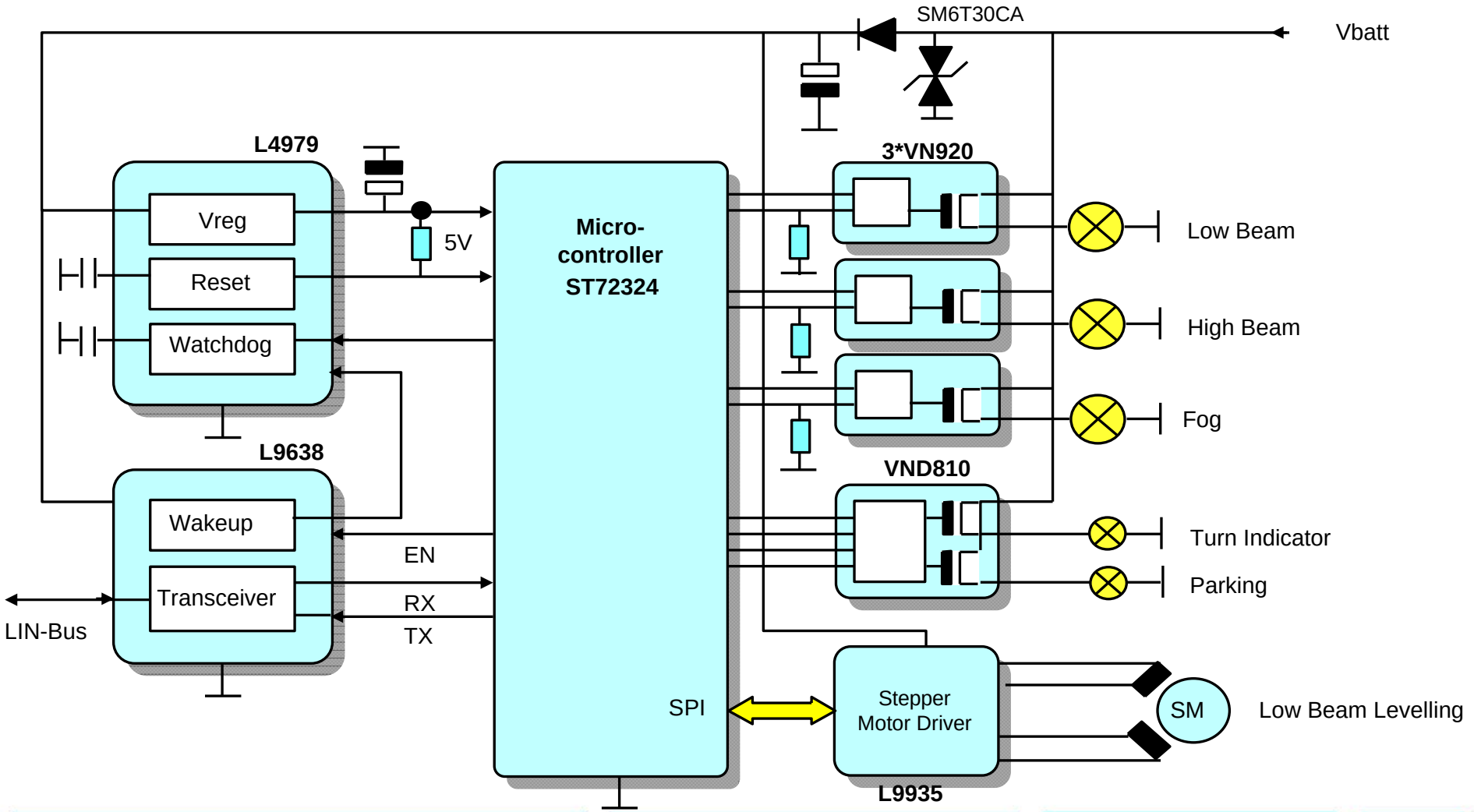
Junction Box Front



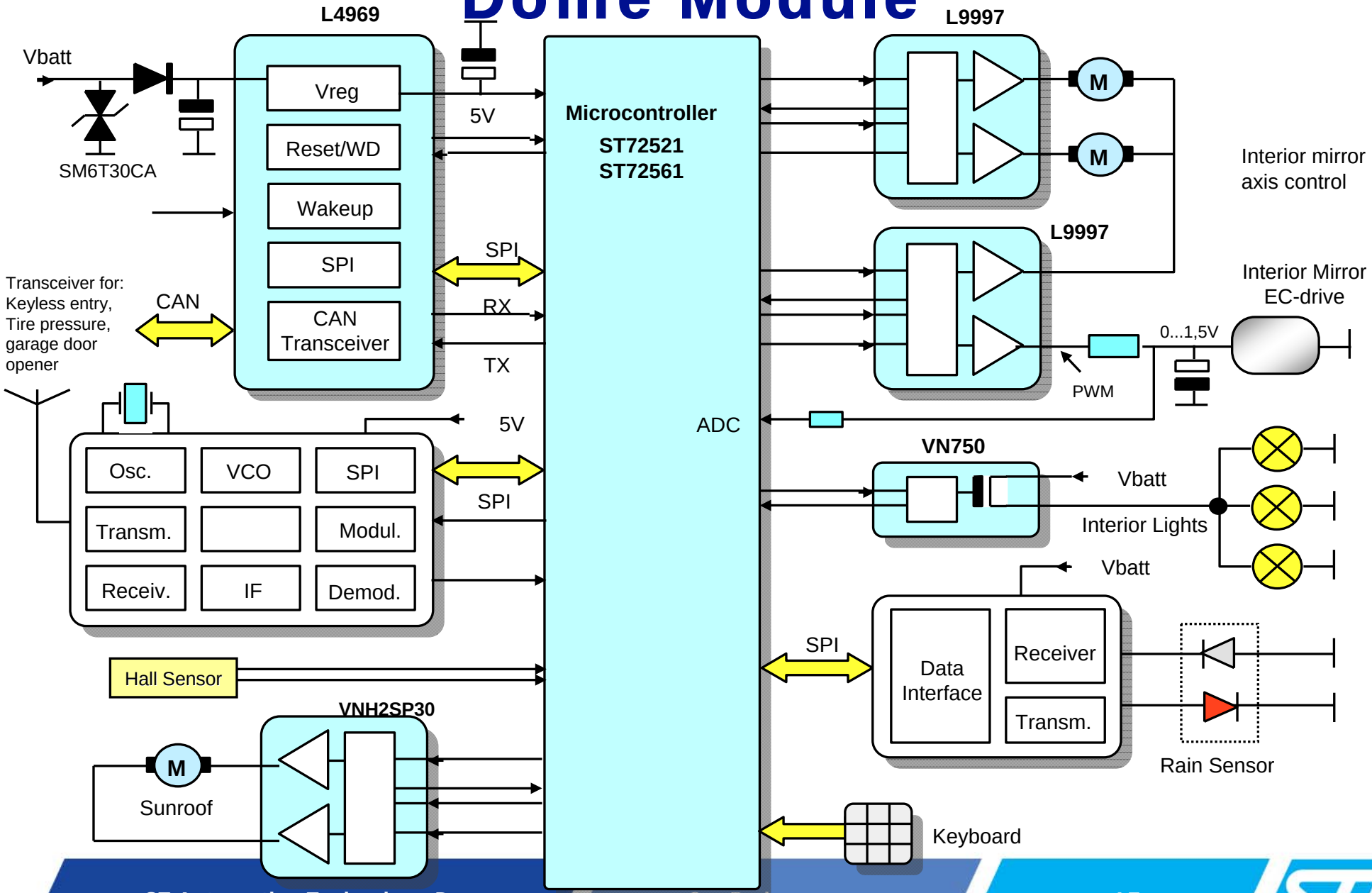
Junction Box Rear



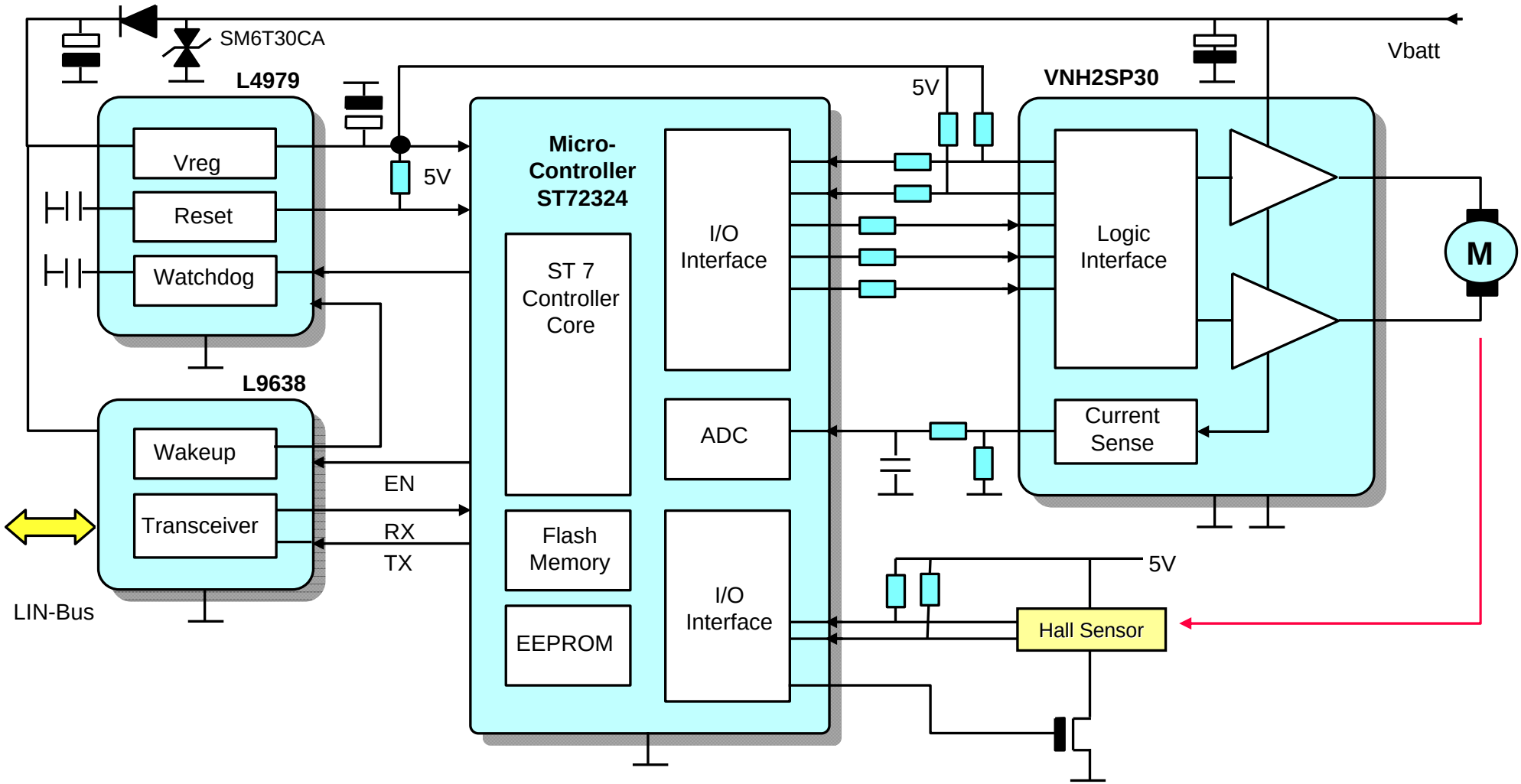
Mechatronic Head-Lamp Driving



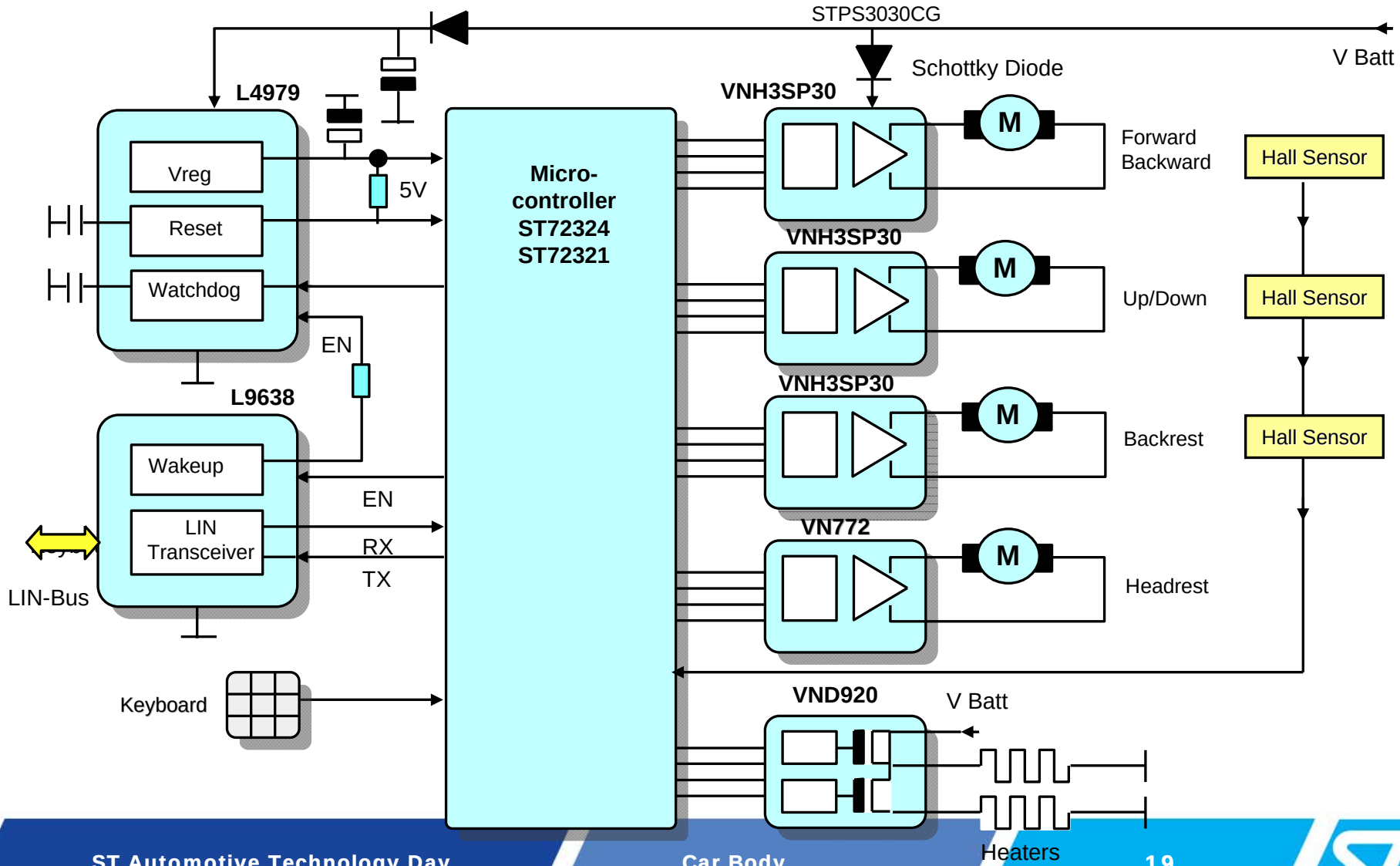
Dome Module


L4969
L9997
Vbatt
SM6T30CA
Vreg
Reset/WD
Wakeup
SPI
CAN Transceiver
5V
Microcontroller
ST72521
ST72561
M
M
Interior mirror axis control
L9997
SPI
RX
TX
CAN
Transceiver for: Keyless entry, Tire pressure, garage door opener
Interior Mirror EC-drive
0...1,5V
PWM
5V
ADC
Osc.
VCO
SPI
Transm.
Modul.
Receiv.
IF
Demod.
SPI
VN750
Vbatt
Interior Lights
Vbatt
SPI
Data Interface
Receiver
Transm.
Rain Sensor
Hall Sensor
VNH2SP30
M
Sunroof
Keyboard

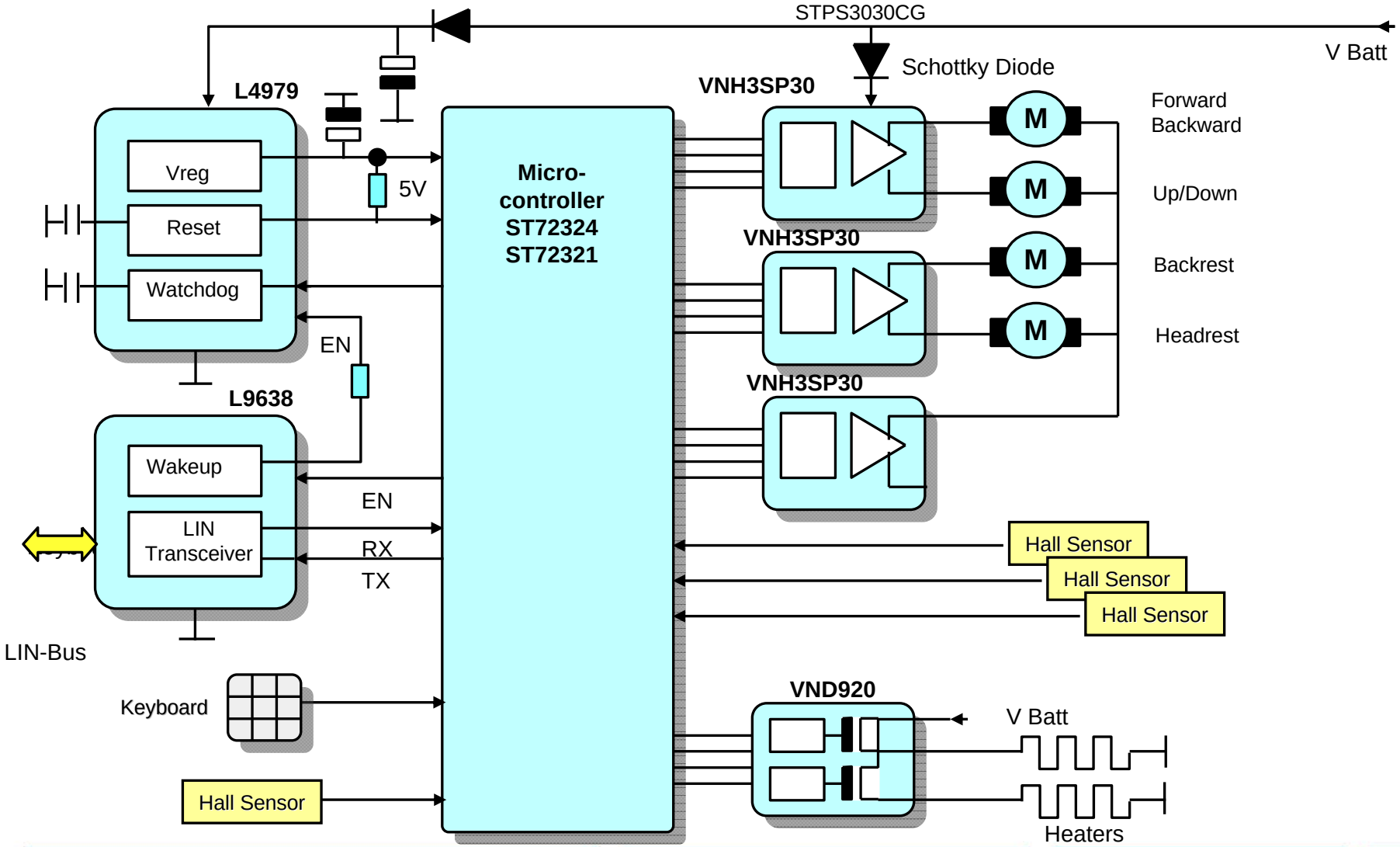
Mechatronic Sunroof



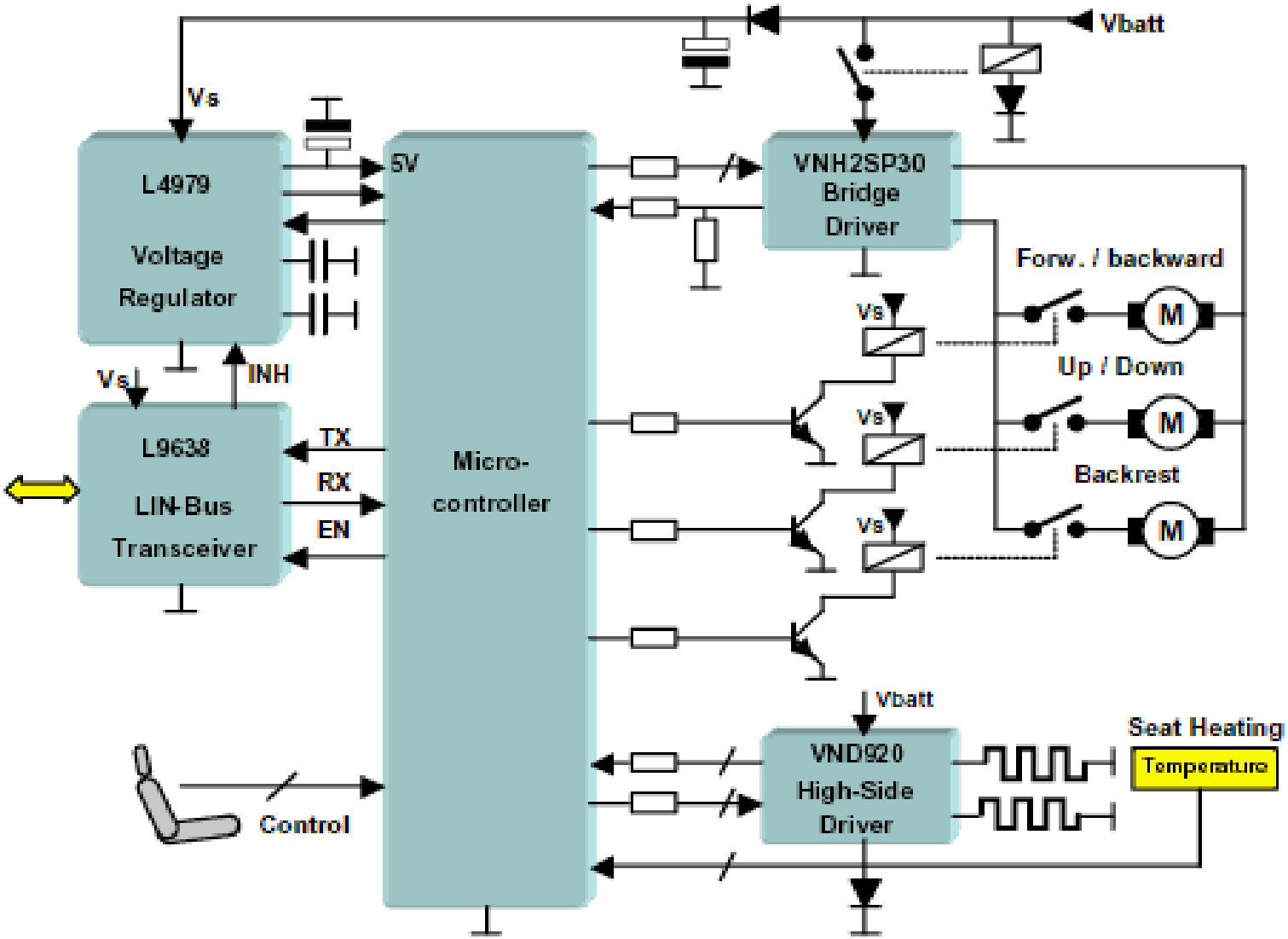
Power Seat – Semiconductor Driven (Simultaneous Mode)



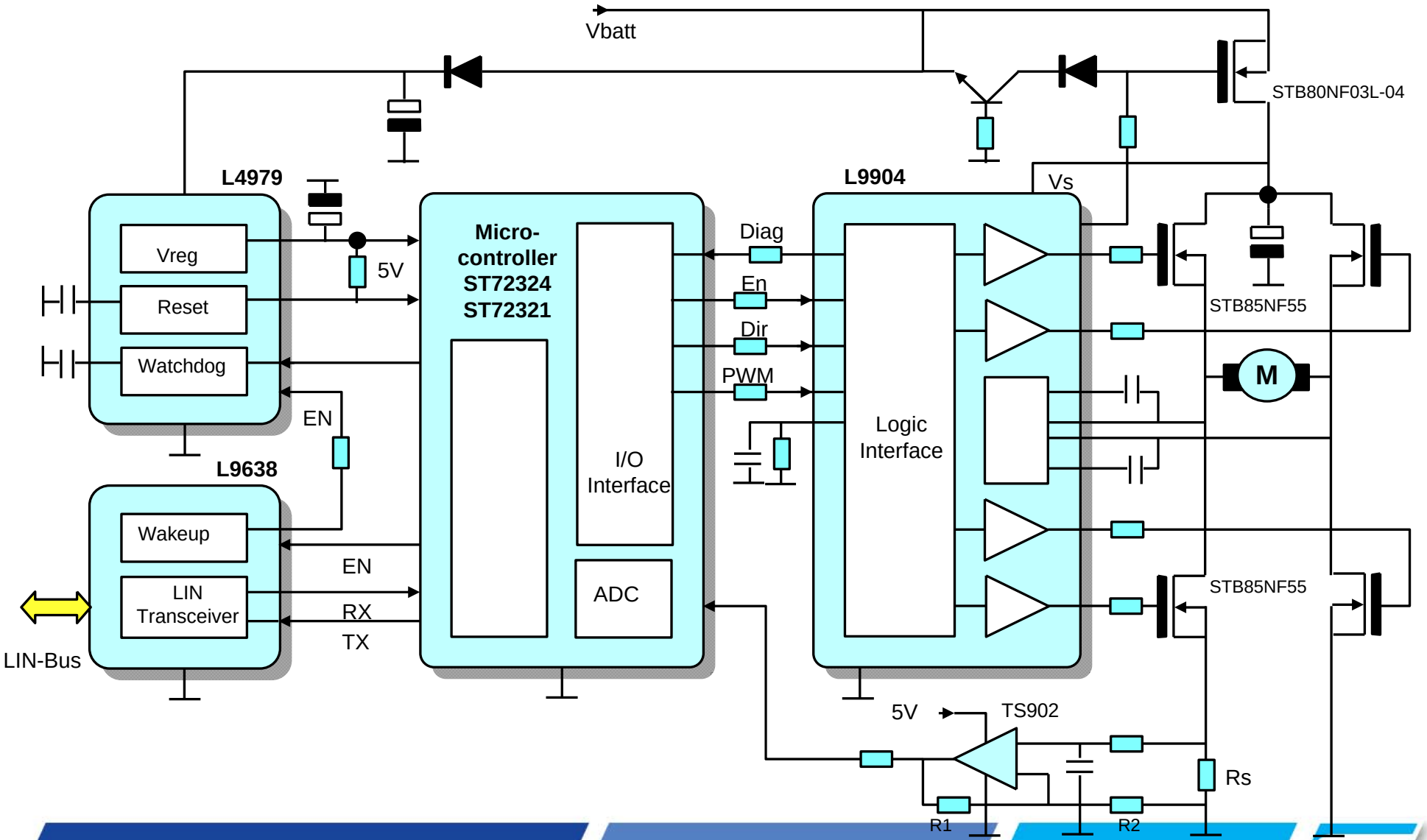
Power Seat - Semiconductor Driven (Sequential Mode)



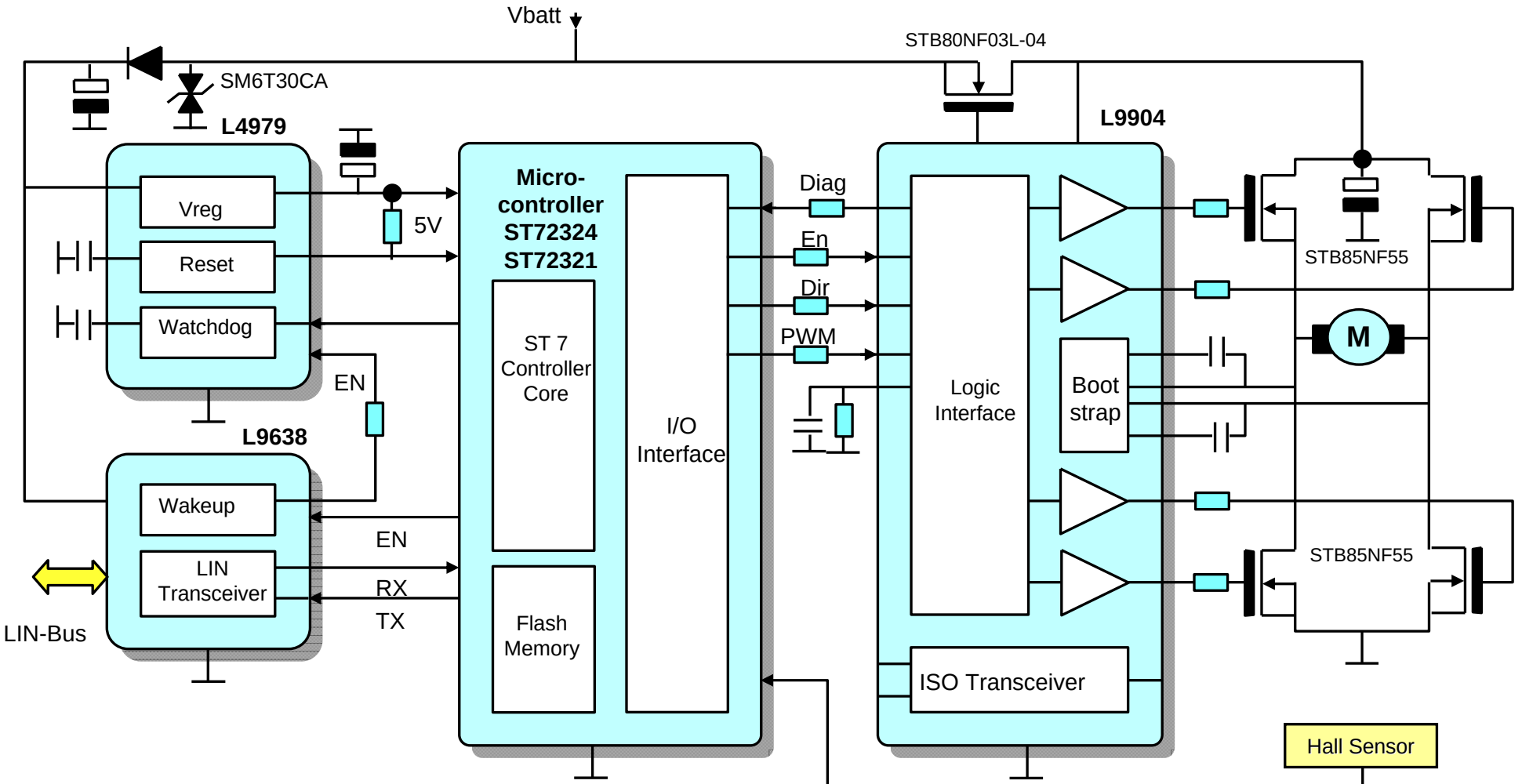
Seat Control - Low End



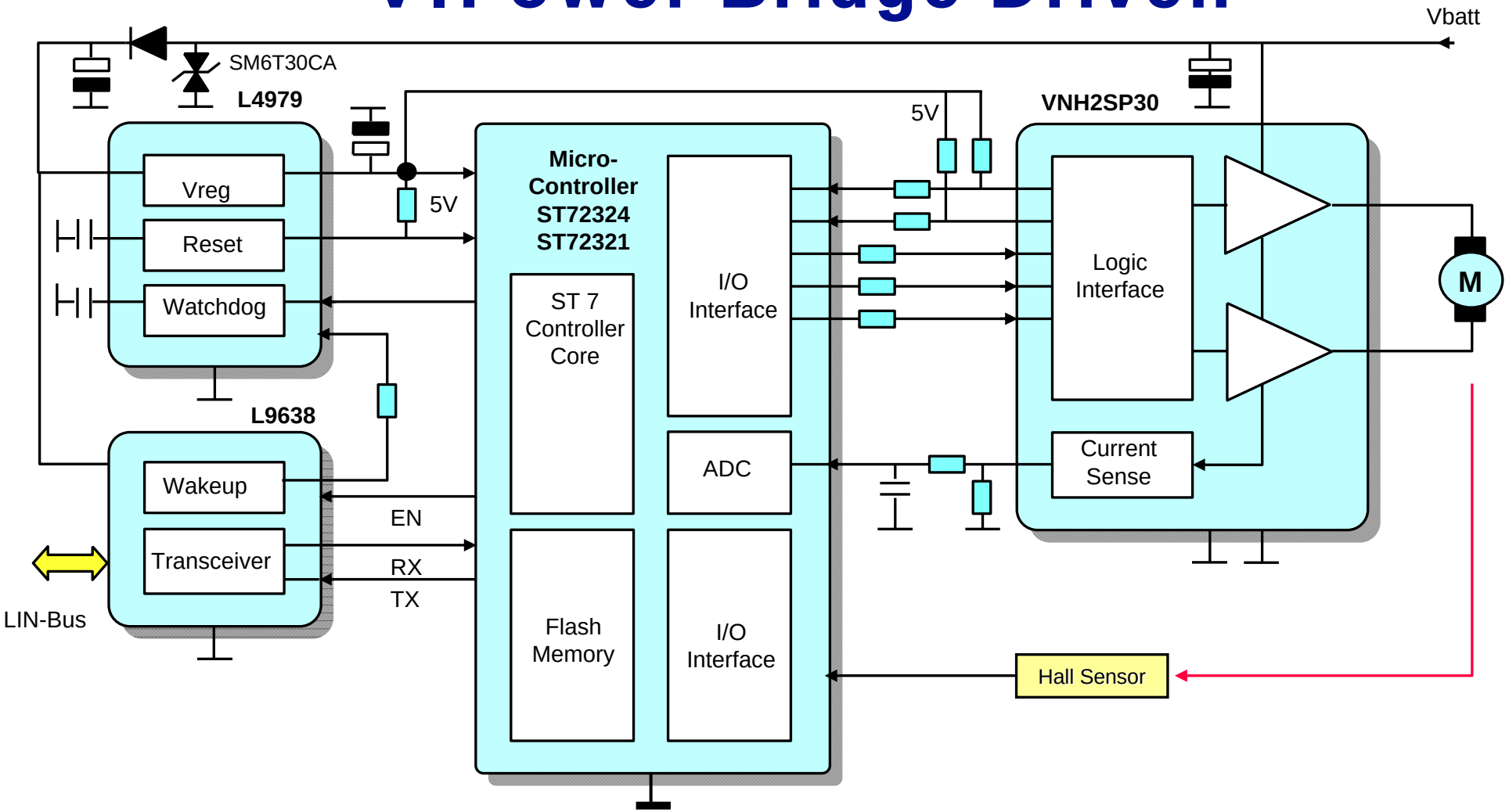
Seat Belt Tensioner



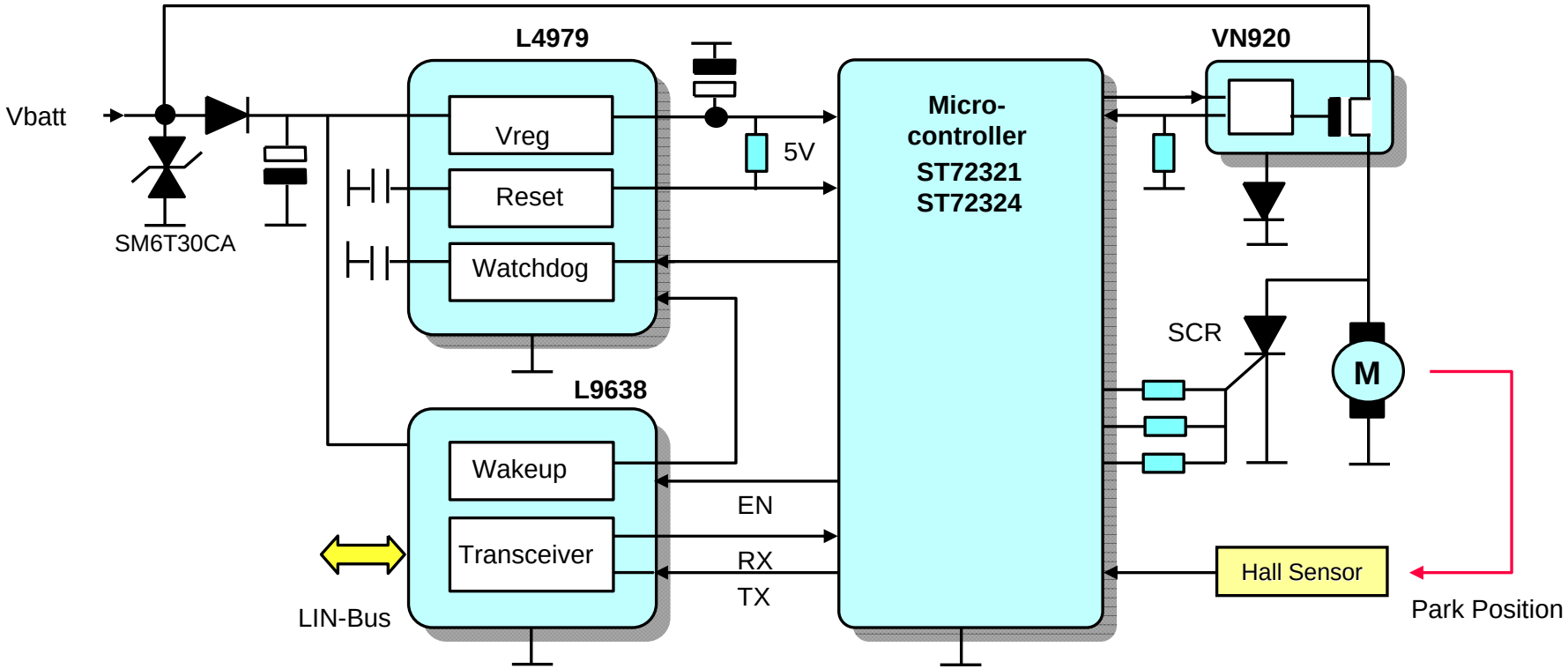
Reversible Front Wiper – PowerMOS Driven



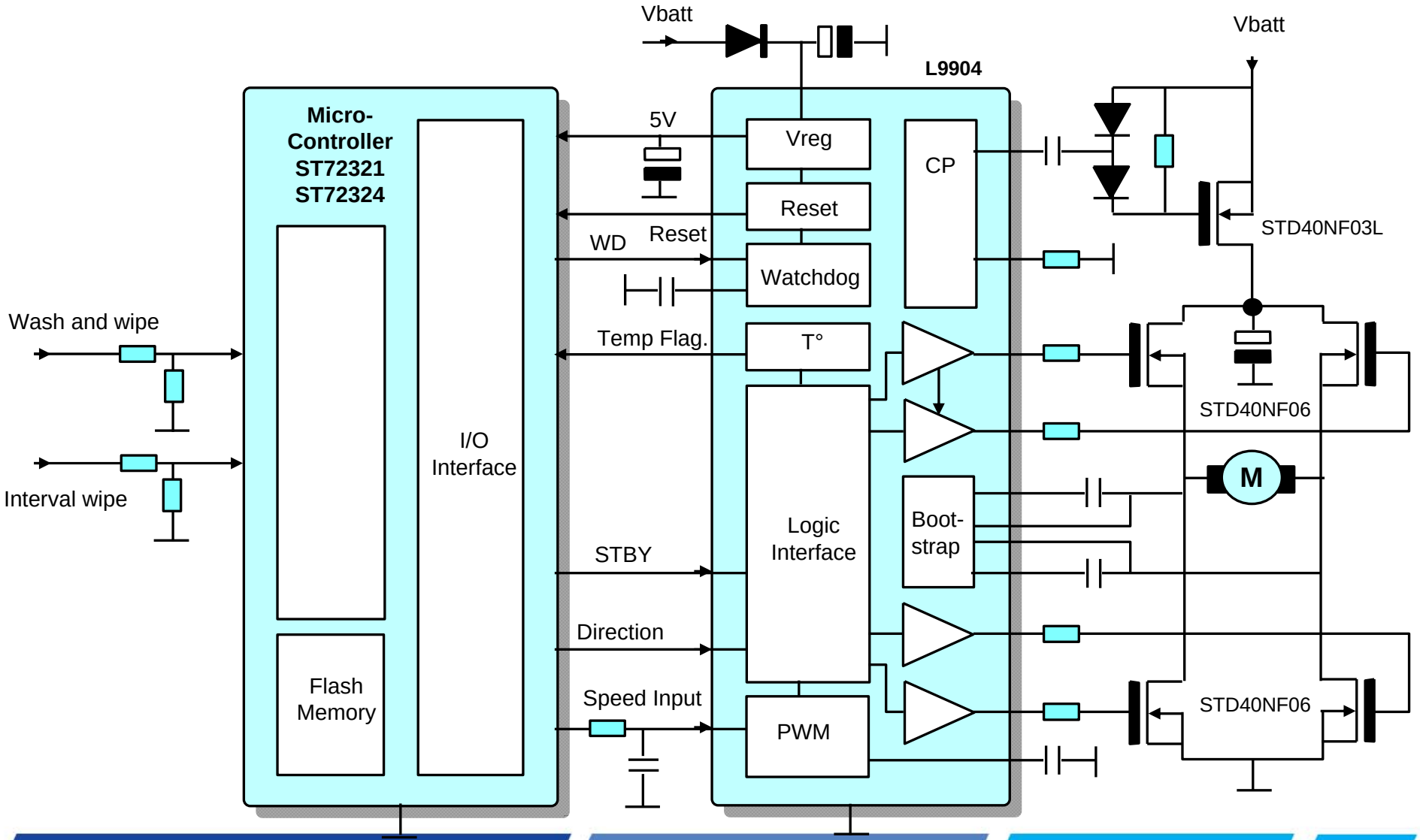
Reversible Front Wiper - VIPower Bridge Driven



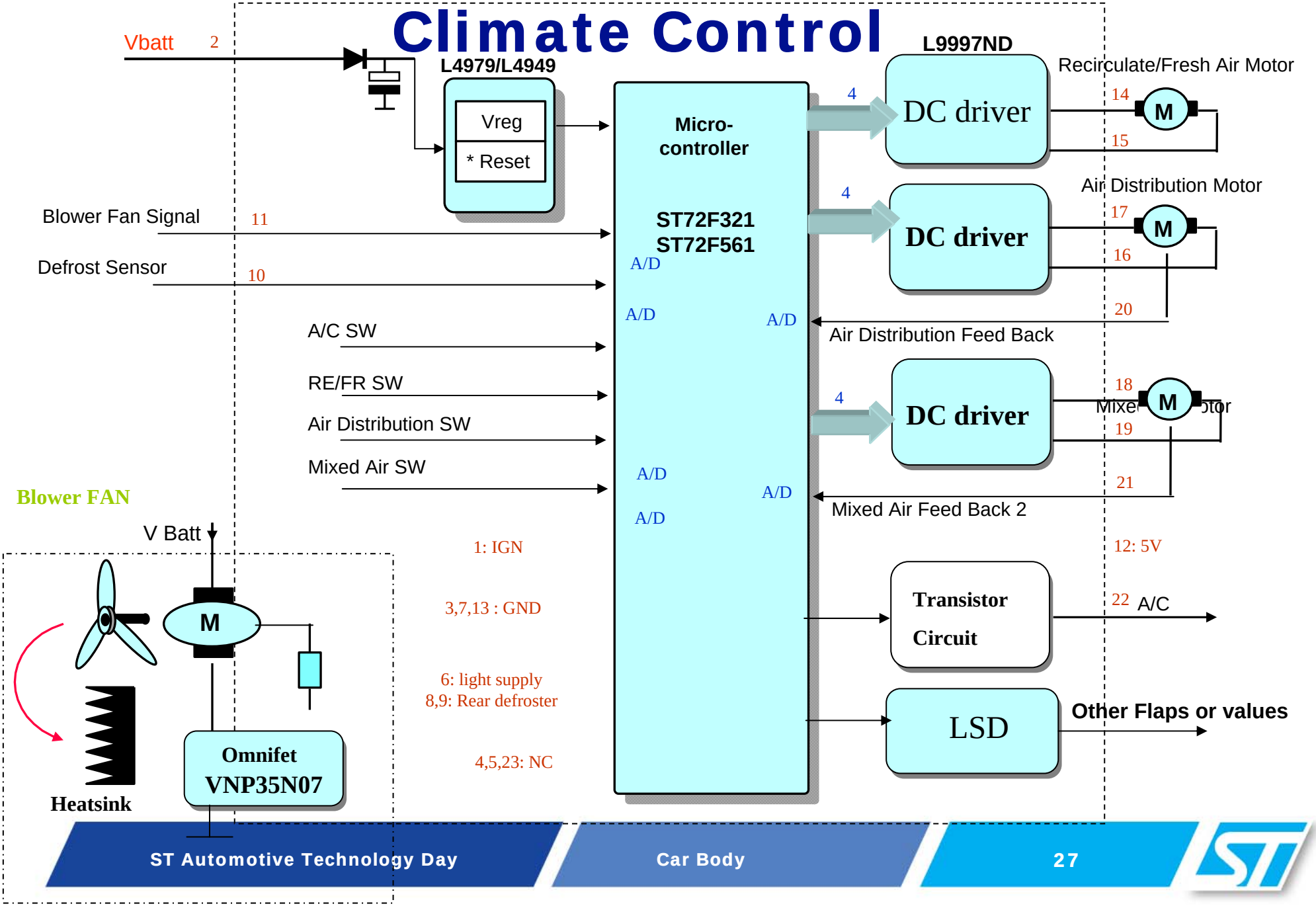
Rear Wiper (Mechatronic)



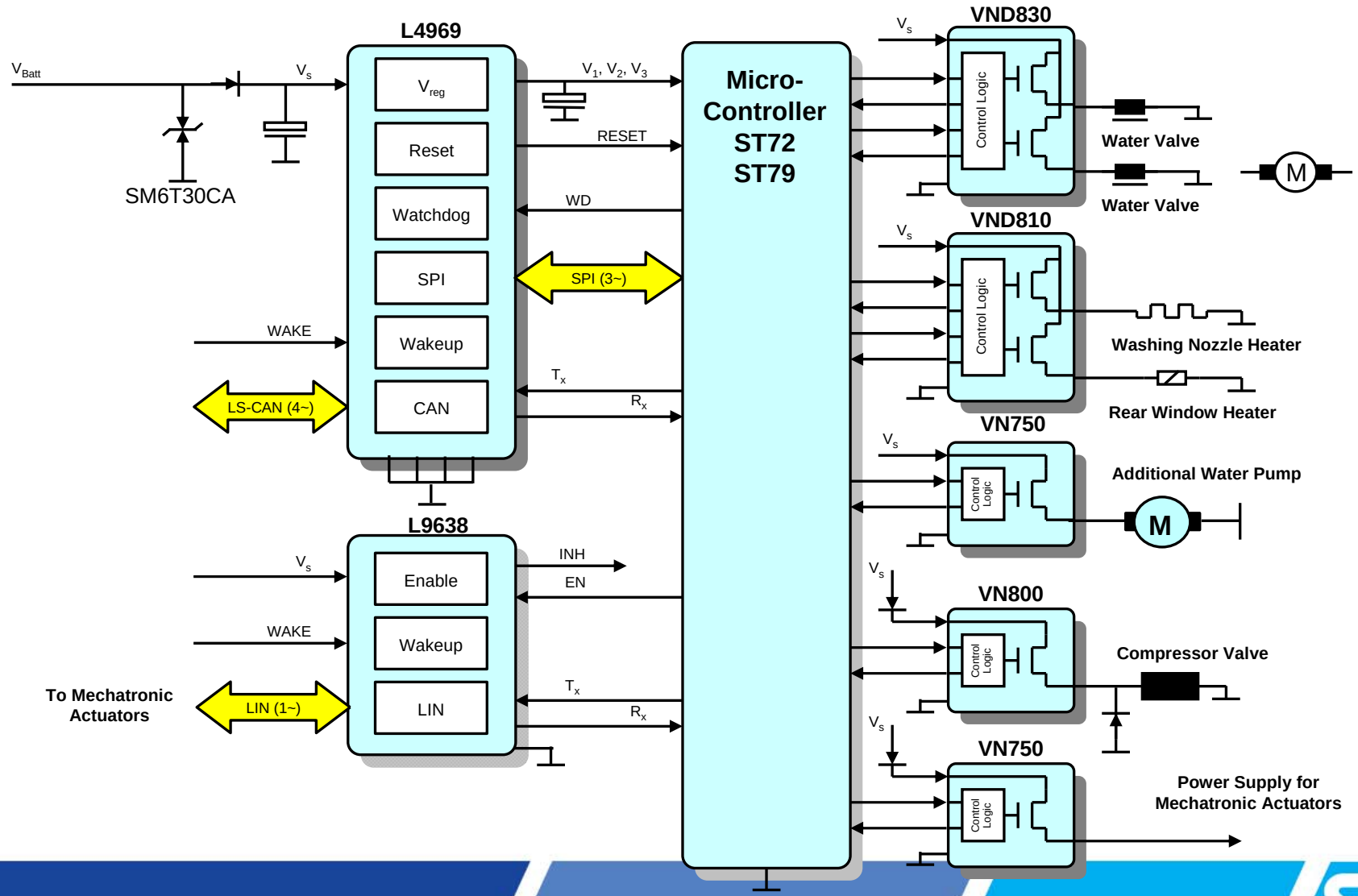
Reversible Rear Wiper (Mechatronic)



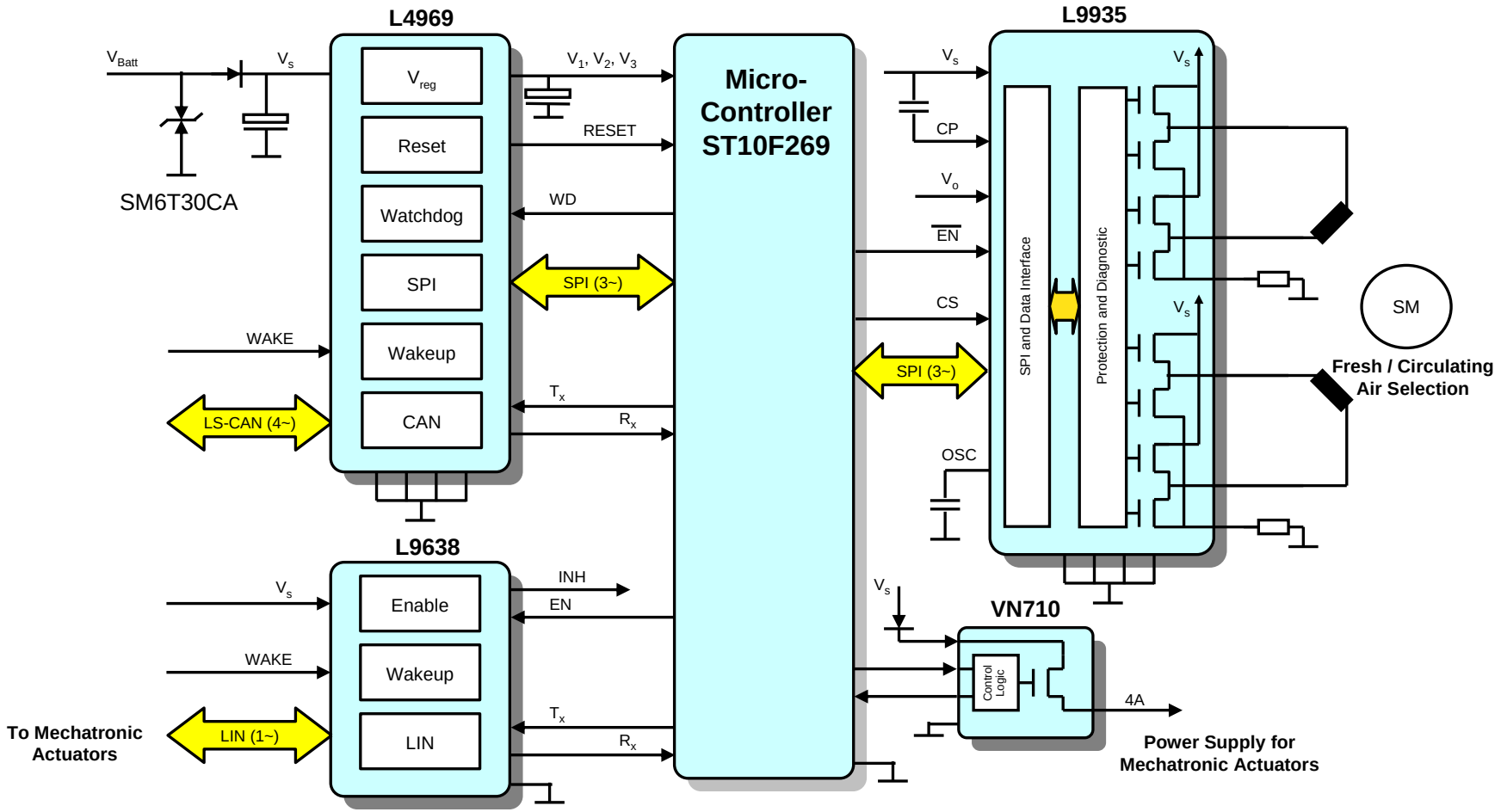
Climate Control



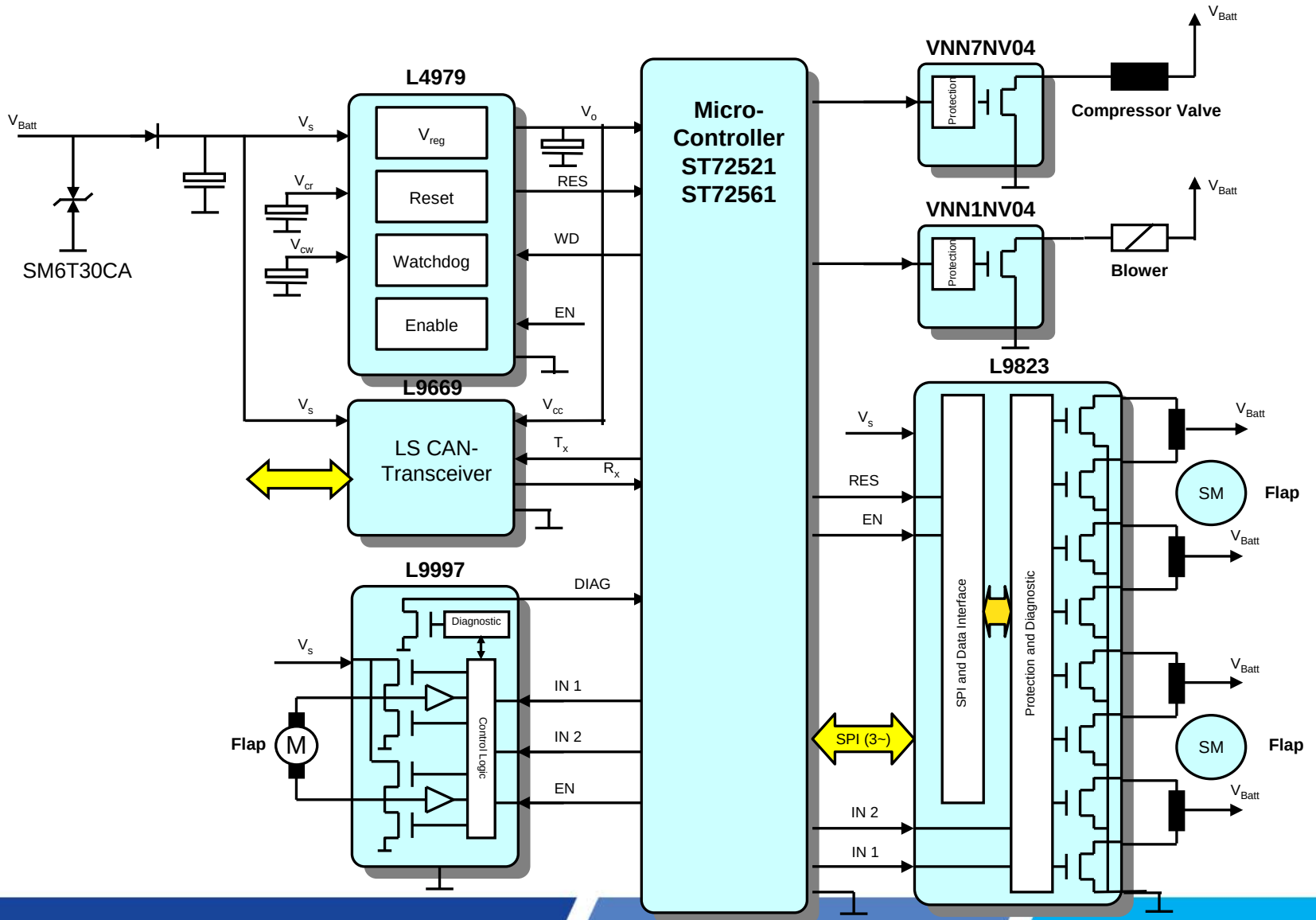
ST Product Fitting for Climate Control



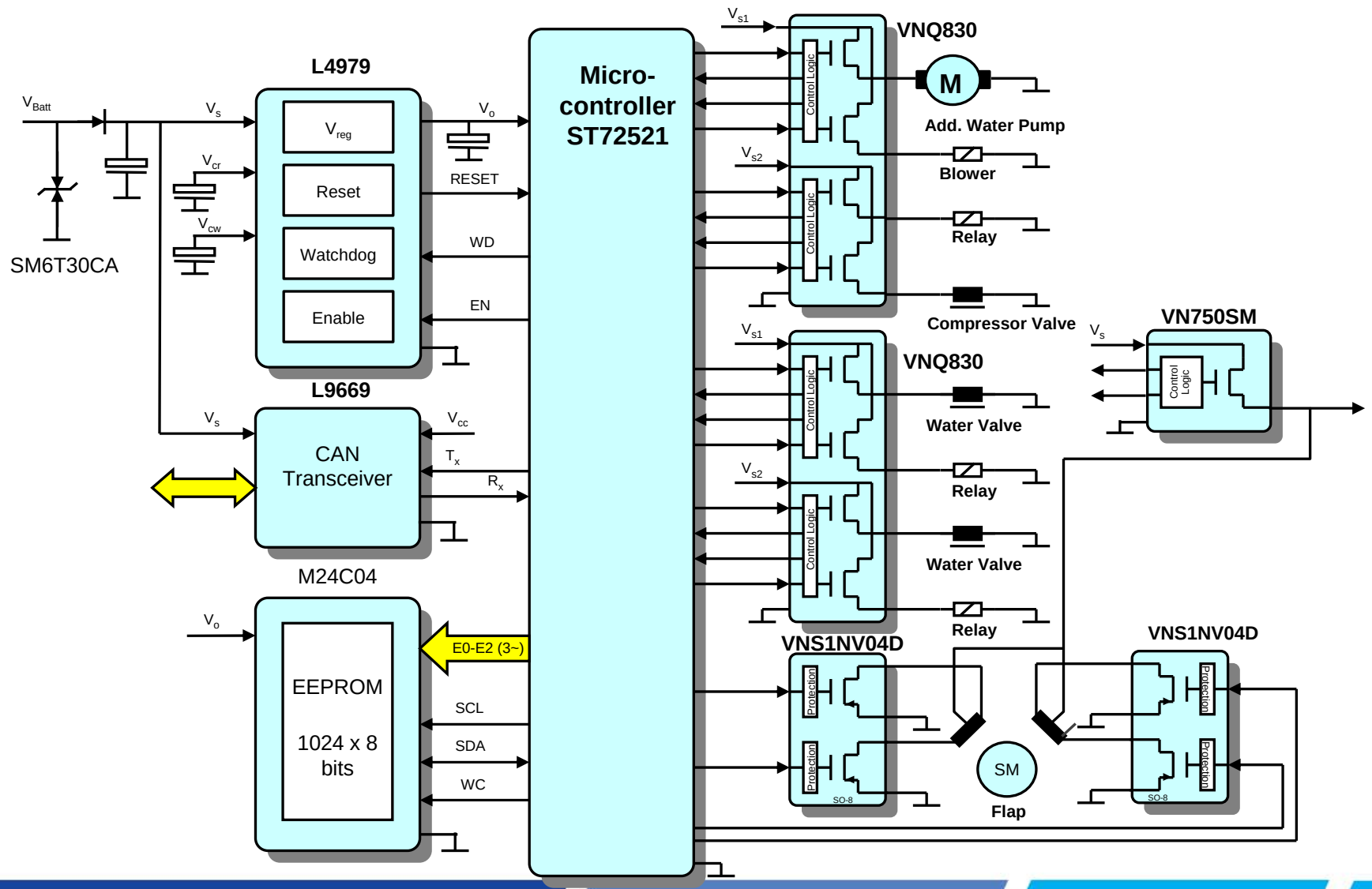
ST Product Fitting for Climate Control



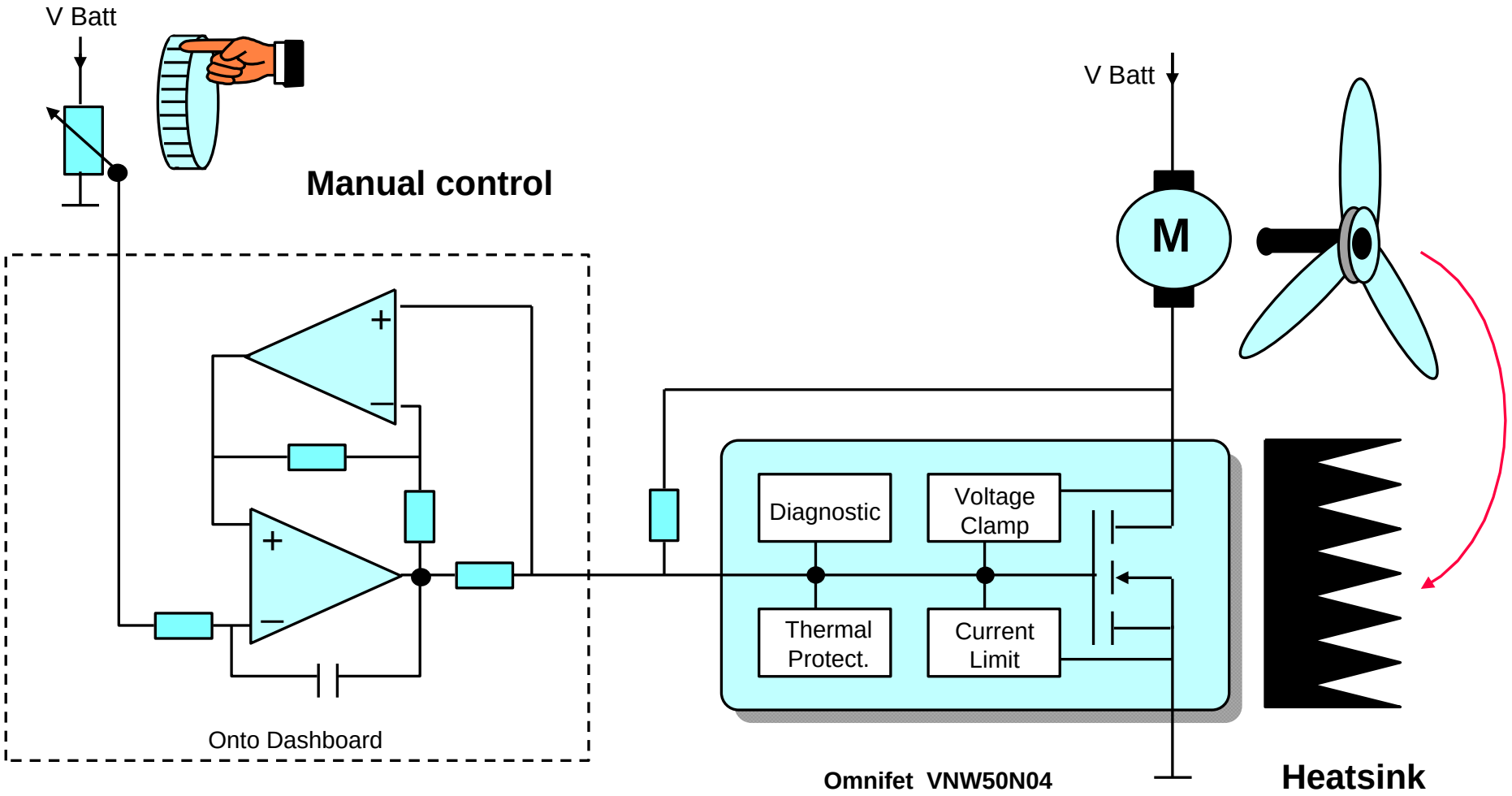
ST Product Fitting for Climate Control



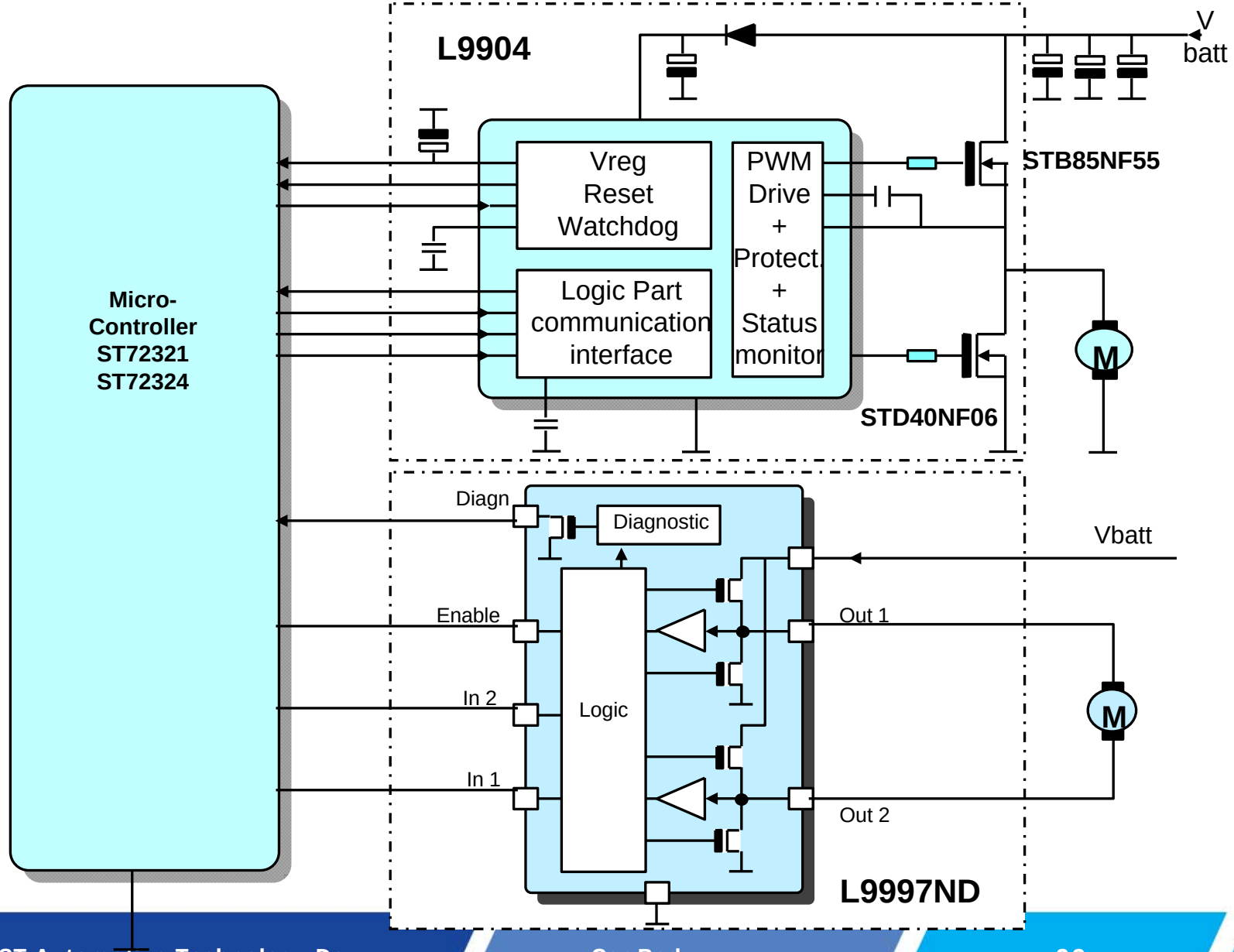
ST Product Fitting for Climate Control



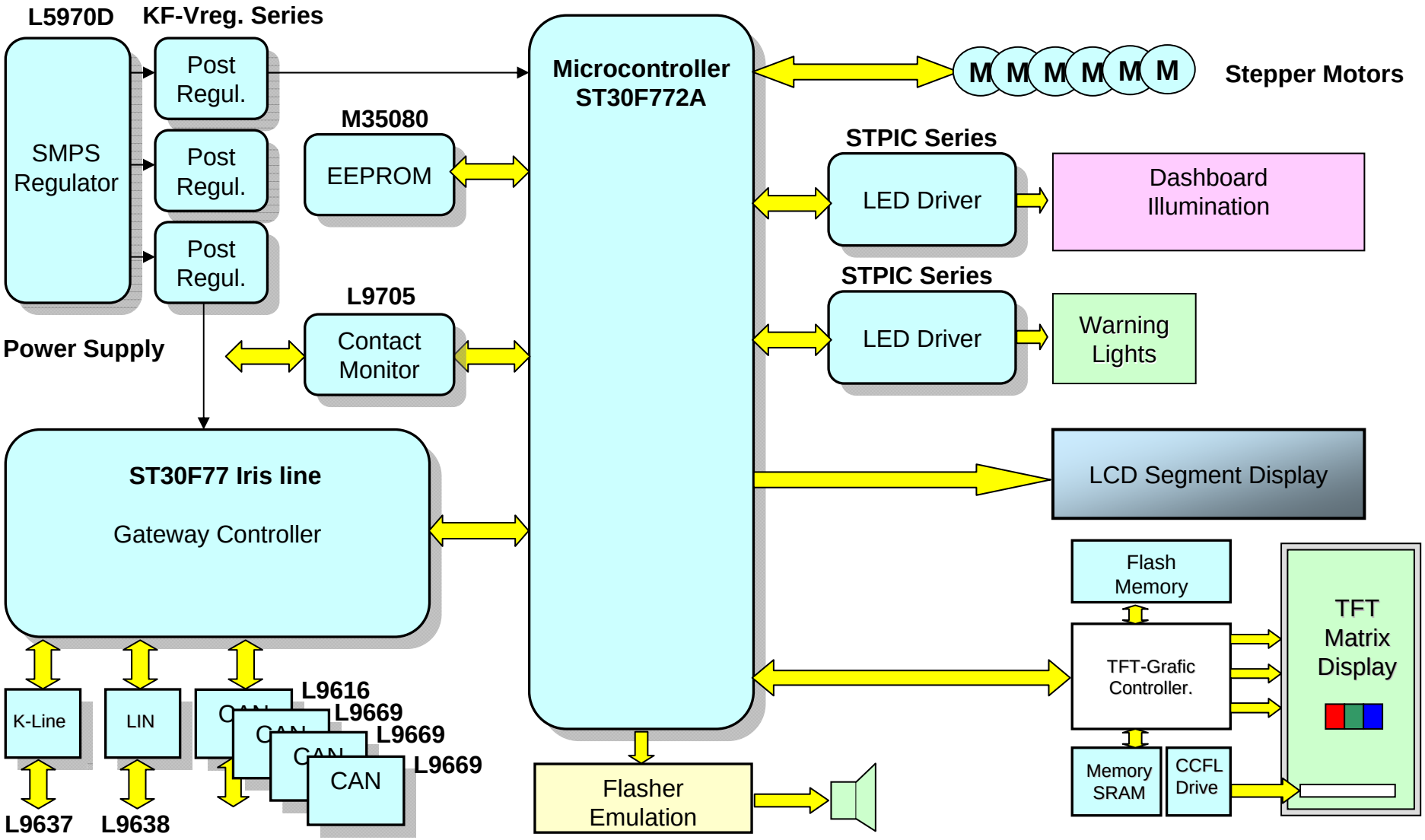
DC-Motor Fan Driving - Linear Mode



DC-Motor Fan Driving – PWM Mode

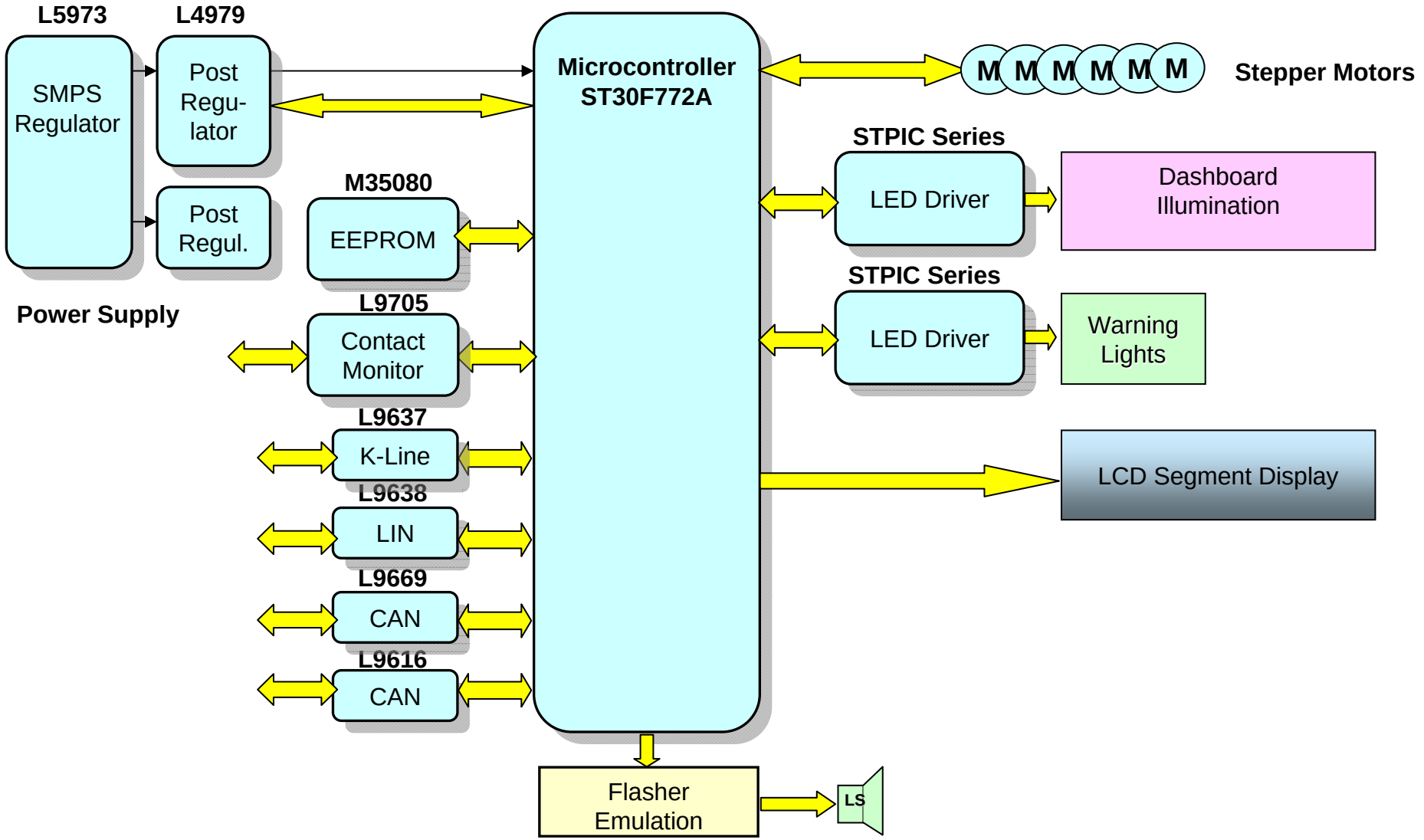


High-End Dashboard



to mid range dashboard

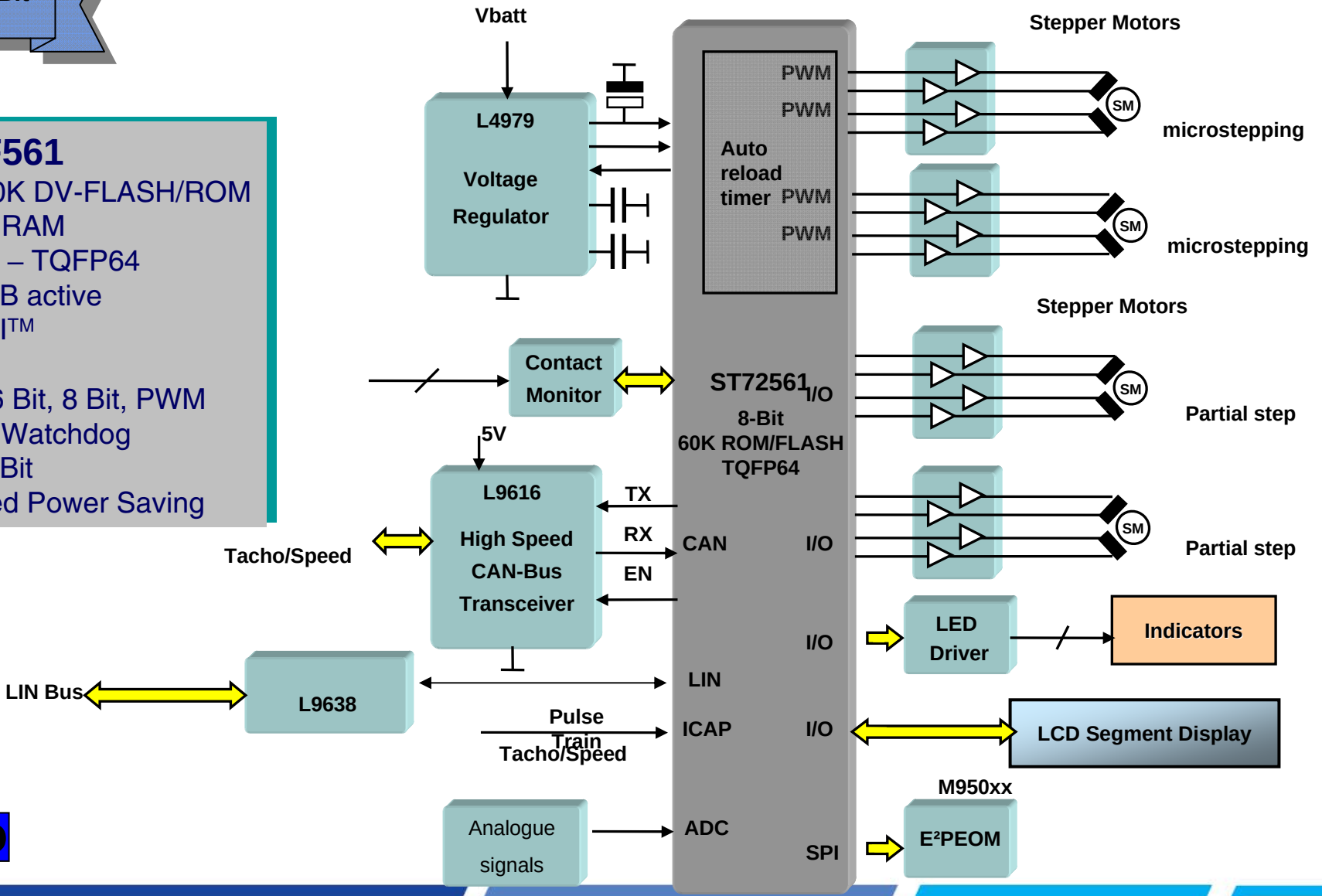
Mid Range Dashboard



Dashboard – ST72F561

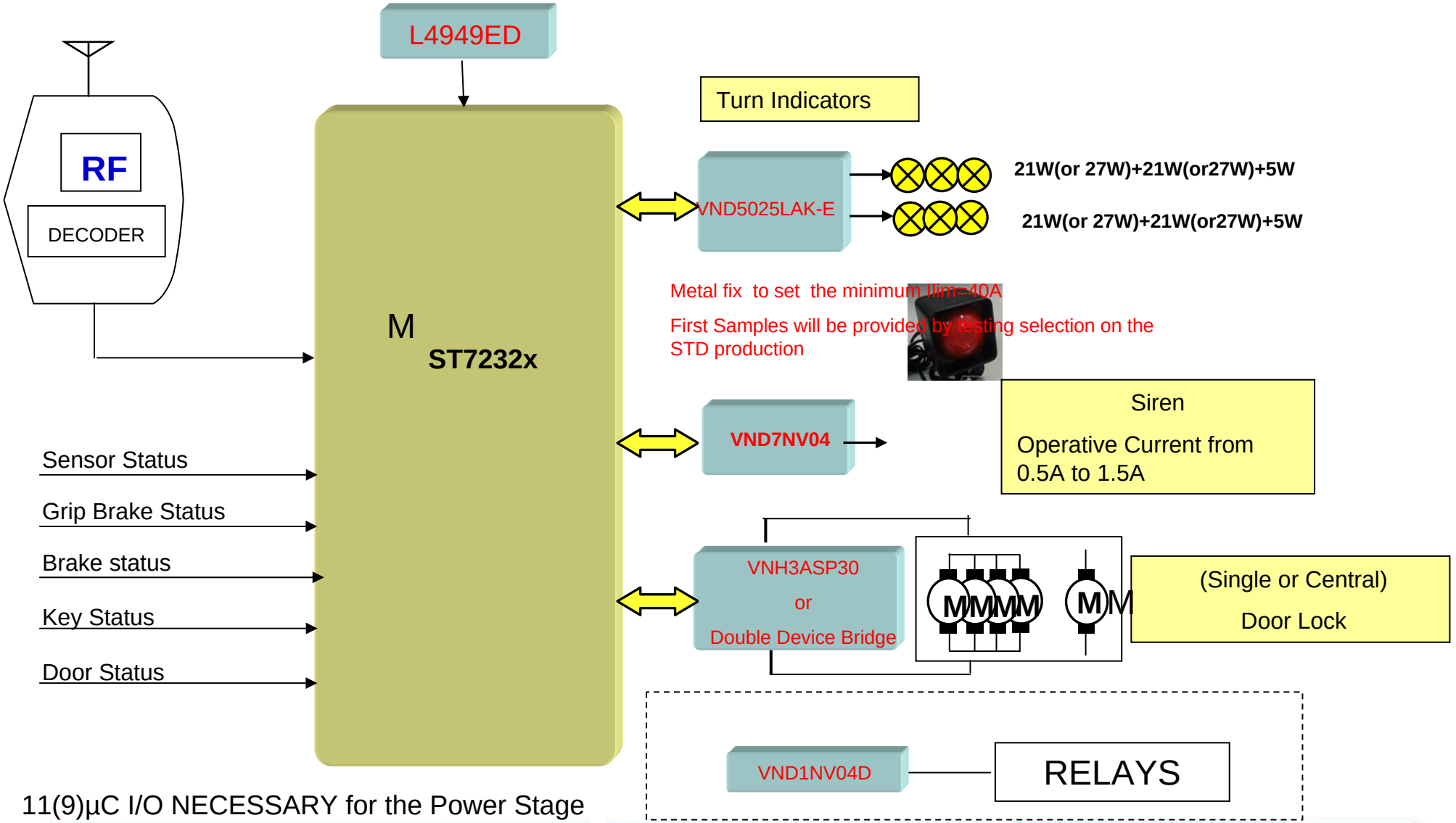
8Bit

ST72F561
32K – 60K DV-FLASH/ROM
1K – 2K RAM
TQFP32 – TQFP64
CAN 2.0B active
2 LINSCI™
SPI
Timer 16 Bit, 8 Bit, PWM
Window Watchdog
ADC 10 Bit
Advanced Power Saving



DEMO

Car Siren General Block & Final Silicon Solution



ST Components for Automotive Applications

Microelectronics
More Intelligent Solutions

Car Body

- **Product Roadmap**

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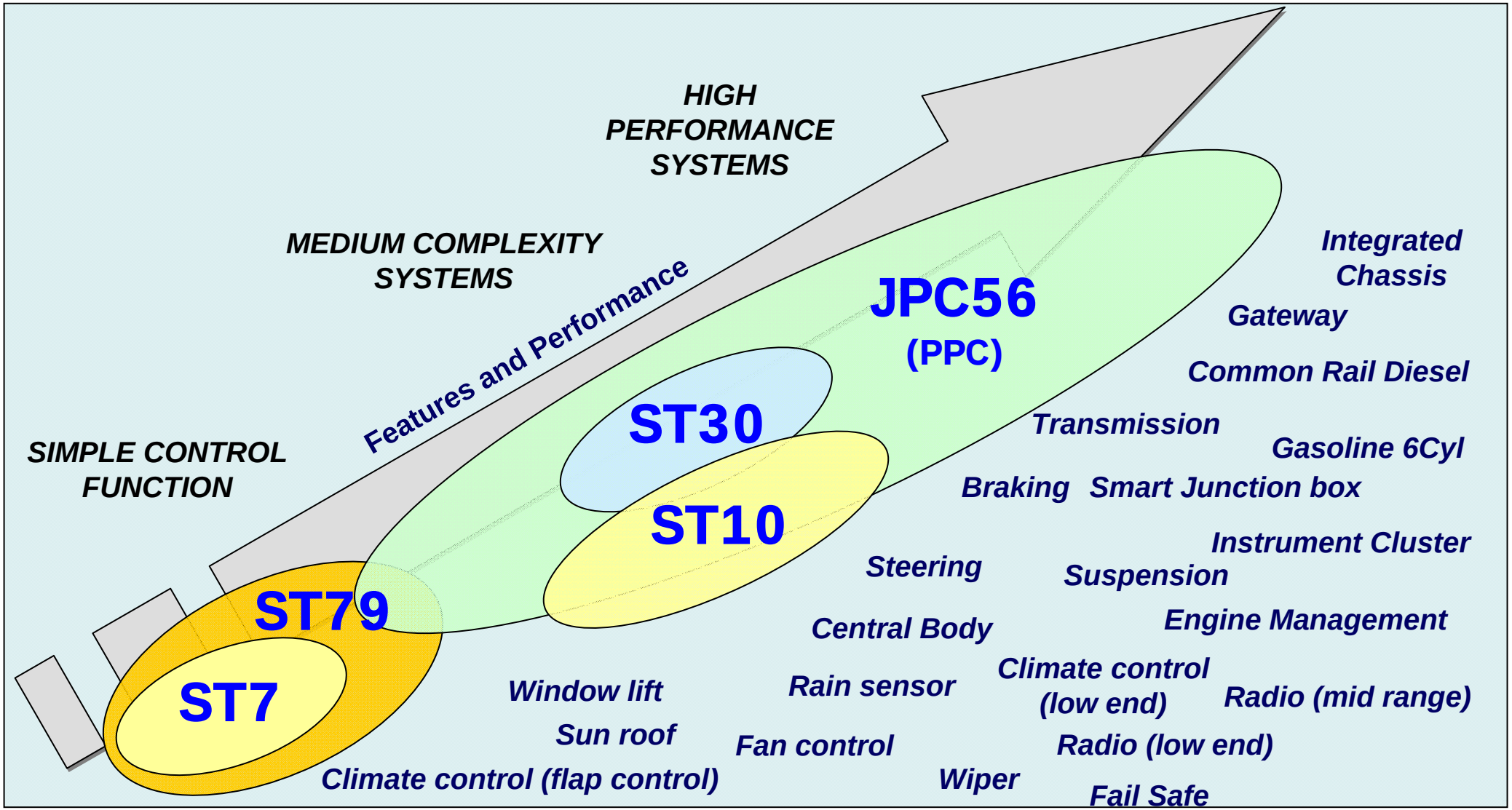
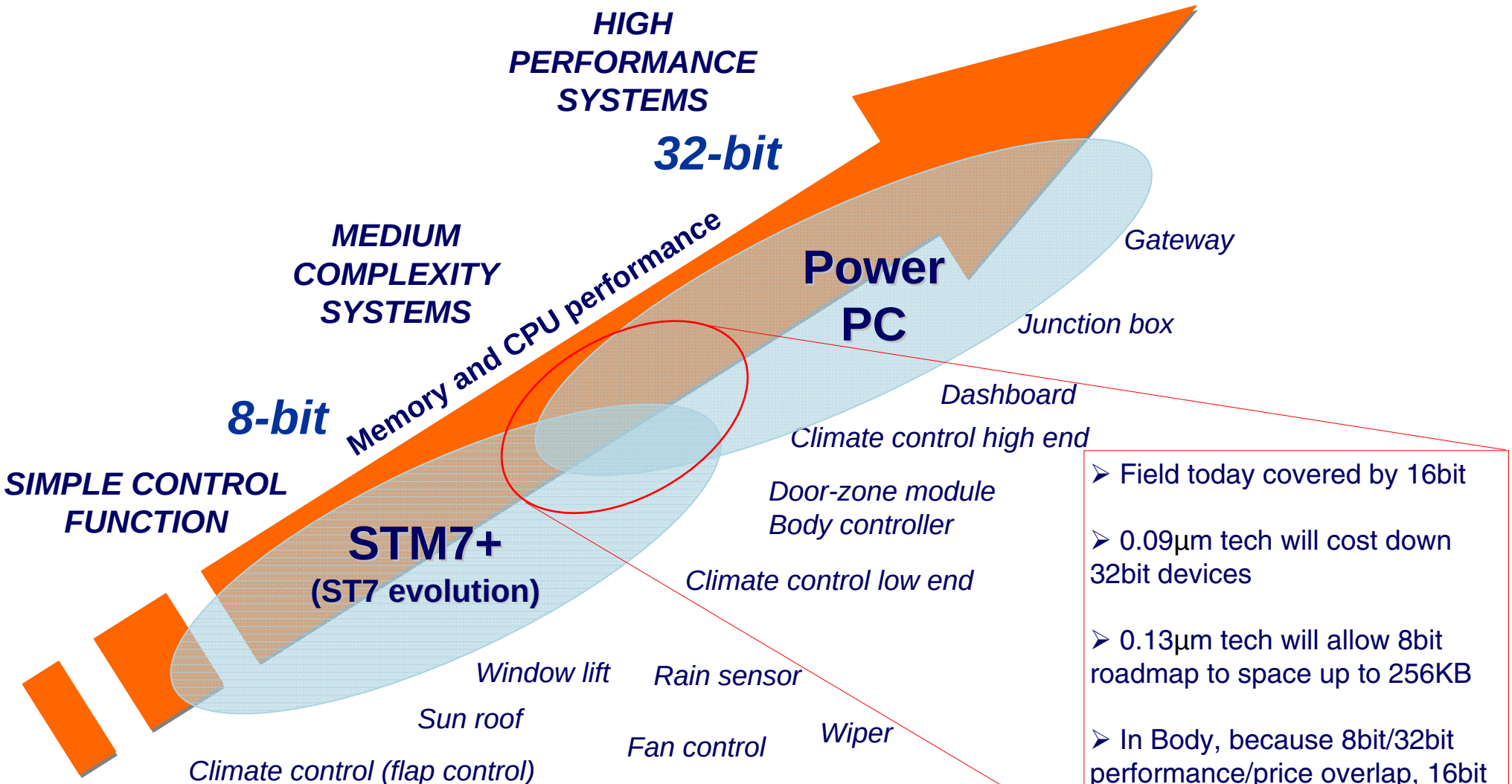
ST APG Microcontroller Families

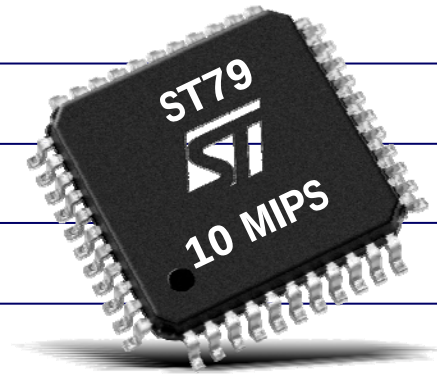


From 8-bit to 32-bit for BODY applications



- Field today covered by 16bit
- 0.09µm tech will cost down 32bit devices
- 0.13µm tech will allow 8bit roadmap to space up to 256KB
- In Body, because 8bit/32bit performance/price overlap, 16bit MCUs are redundant

Body MCU: Technology & Product Roadmap



MEMORY (KB)

2048
1024
768
512
384
256
128
64
32
16
8
2

32-bit

JPC5606B
JPC5606B
JPC5605B
JPC5605B
JPC5604B
JPC5604B
JPC5603B
JPC5603B
ST79F51B
ST79F51B JPC5602B
ST79F51B
JPC5602B
ST79F51A
ST79F51A
ST79F51A
ST79F51A JPC5601B

CMOS–M10 0.09µm

8-bit

ST79F518
ST79F518
ST79F518
ST79F516
ST79F516
ST79F516
ST79F514
ST79F514
ST79F514
ST79F512
ST79F512
ST79F512
ST79F510

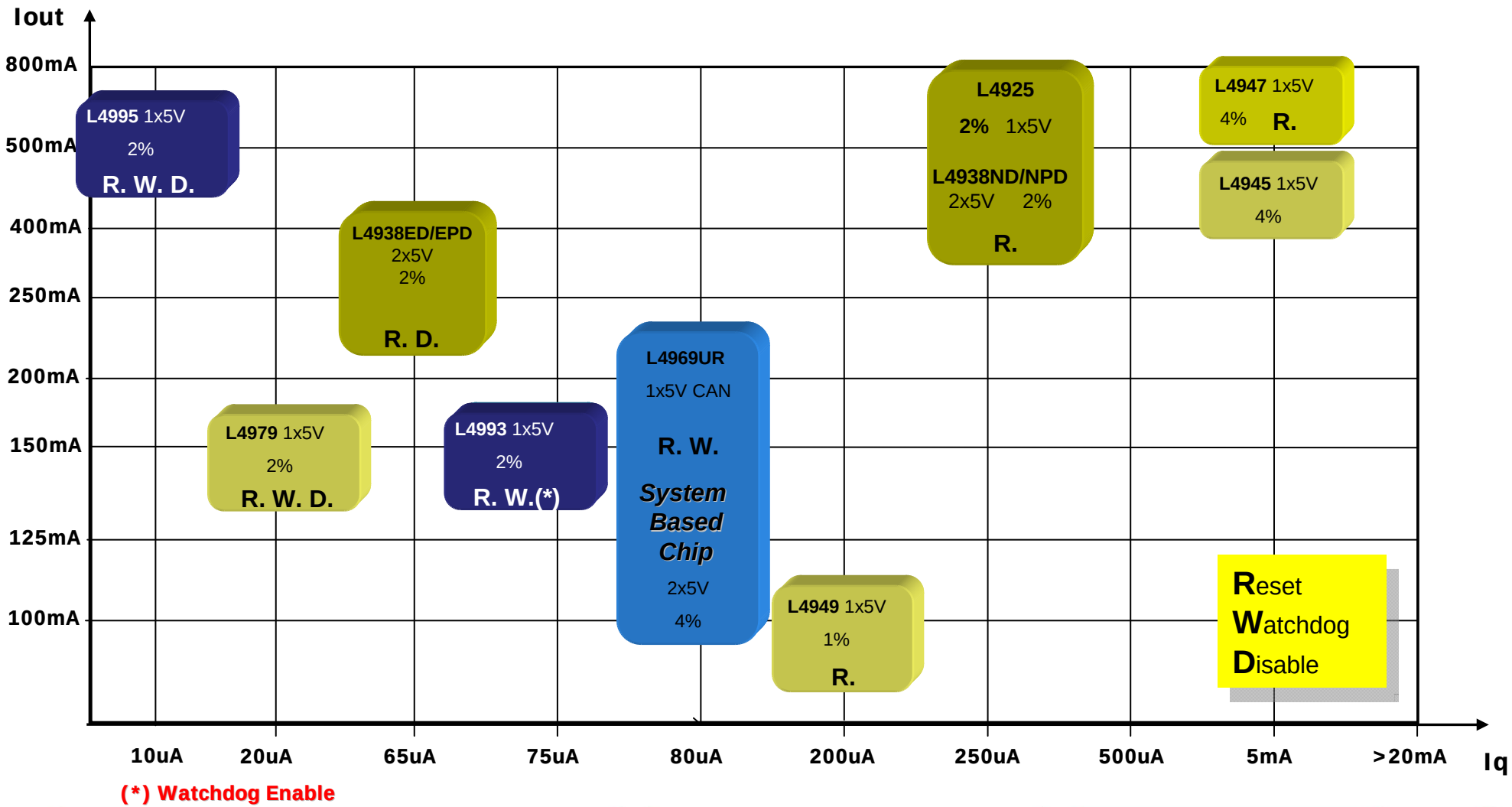
CMOS–F9 0.13µm

BUILT ON Power™

PACKAGE

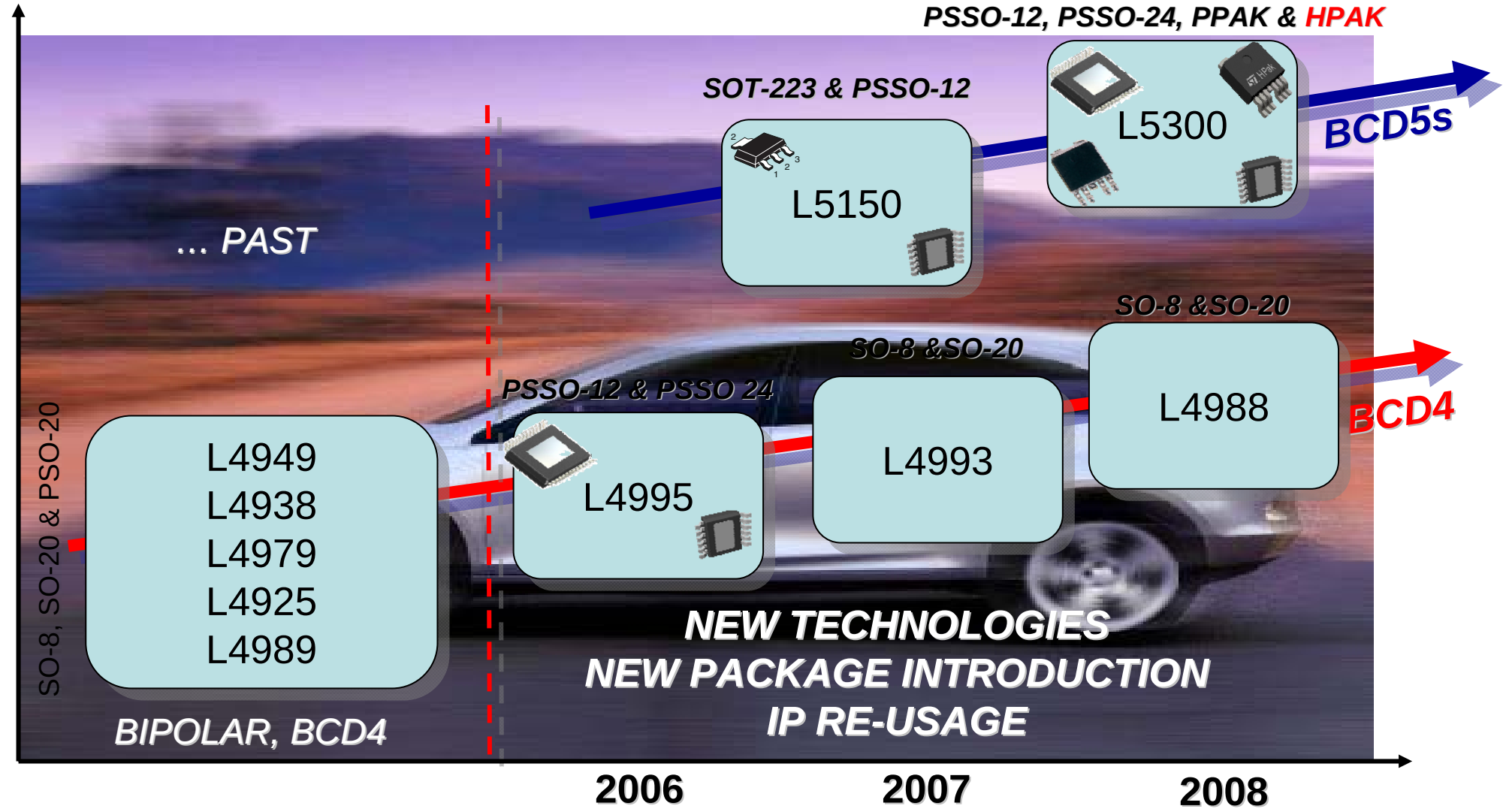
16 PIN | 20 PIN | 32 PIN | 48 PIN | 64 PIN | 80 PIN | 100 PIN | 128 PIN | 144 PIN | 176/208 PIN

Smart Voltage Regulators… where we stand

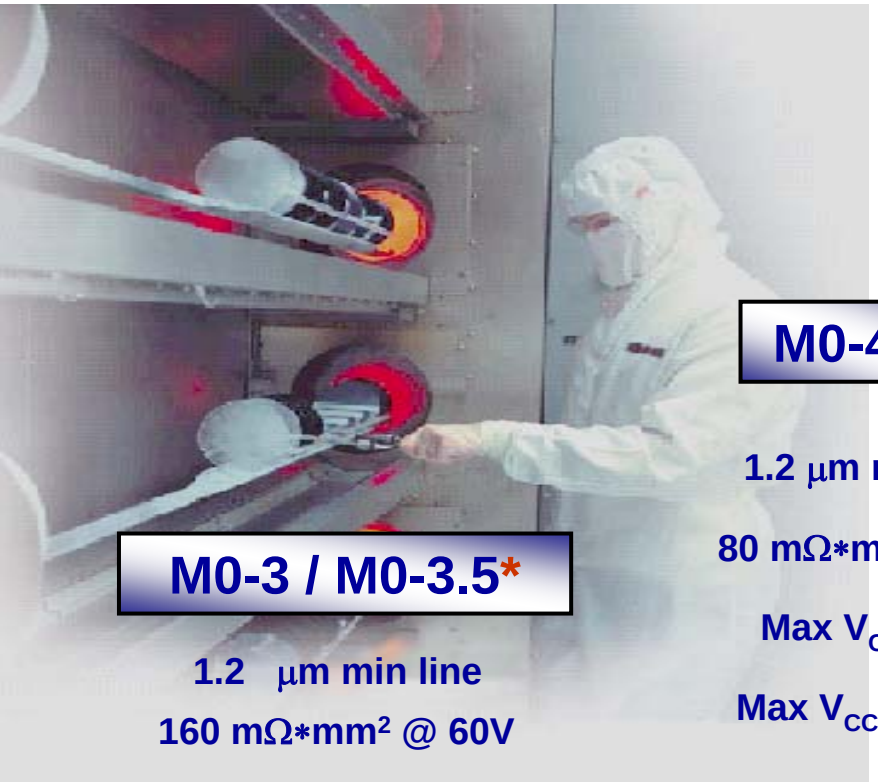


(*) Watchdog Enable

5V LDO VREG's Roadmap



VIPower Technologies Roadmap



M0-3 / M0-3.5*

1.2 µm min line

160 mΩ∗mm² @ 60V

Max V_{CC} = 40V

Max V_{CC-OUT}= 40V

M0-4**

1.2 µm min line

80 mΩ∗mm² @ 60V

Max V_{CC} = 40V

Max V_{CC-OUT}= 24V

M0-5*

0.6 µm min line

110 mΩ∗mm² @ 60V

Max V_{CC} = 40V

Max V_{CC-OUT}= 40V

M0-6*

0.6 µm min line

110 mΩ∗mm² @ 60V

Max V_{CC} = 40V

Max V_{CC-OUT}= 40V

Enhanced with 5V CMOS digital circuits

2002 — 2004 — 2006 — 2007

* *Passive pads for wire bonding*

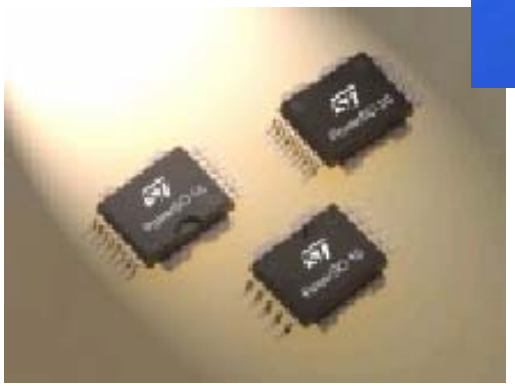
** *For selected applications only*

VIPower PACKAGES Road Map

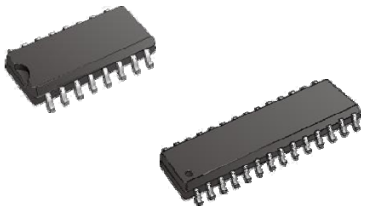
90's

PwSO20/36

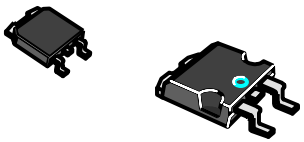
80's



PwSO10/16/20

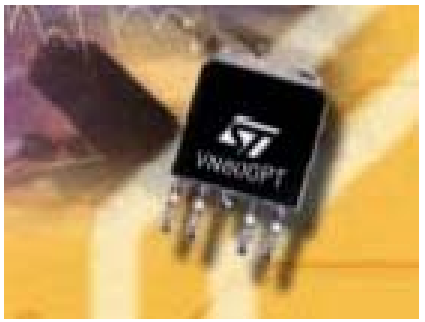


SO16/28

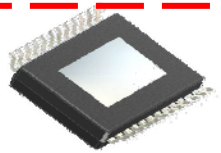


DPAK/D²PAK

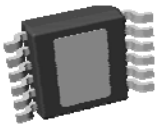
PPAK/P²PAK



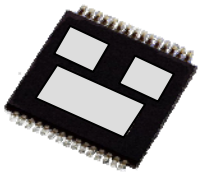
2006



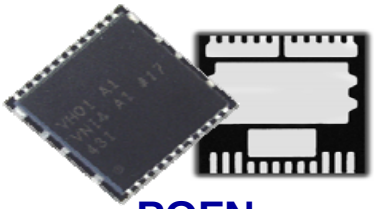
PowerSSO-24



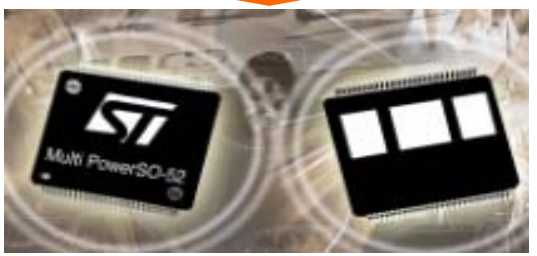
PowerSSO-12



MultiPowerSO-30



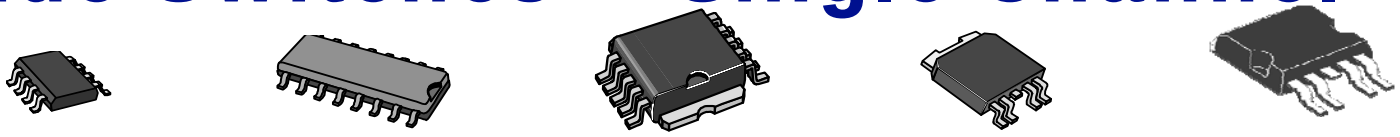
PQFN



MultiPowerSO-52

VIPower M0-3

High Side Switches - Single Channel



	SO-8	SO-16	PSO-10	PPAK	P²PAK
Type suffix:	...S	...SO	...SP	...PT	...-B5
135 mΩ	VN800			VN800	
60/55 mΩ	VN750/M/L*			VN750	VN750
40 mΩ		VN820	VN820	VN820	VN820
20 mΩ			VN710		
18 mΩ		VN920D			VN920D
16 mΩ		VN920	VN920D		VN920
15 mΩ			VN920		
10 mΩ			VN610		

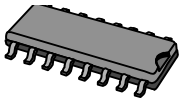
* **SM-Type**: Min. OPEN LOAD: 600mA
  R_{on}: 55mOHM
* **LS-Type**: Higher Current Limit for 27W bulbs

= analog current sense

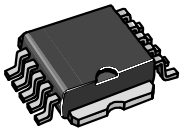
= digital status

VIPower M0-3

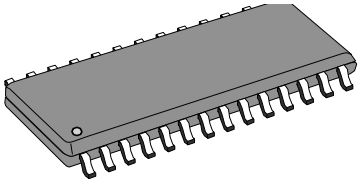
High Side Switches - Dual Channel



SO-16



PSO-10



SO-28

Type suffix:	----	...SP	----
160 mΩ	VND810	VND810 VND810M	
60 mΩ	VND830	VND830 VND830A	VND830M VND830L
35 mΩ	VND600		
30 mΩ		VND600 *VND670**	
16 mΩ			VND920

VND830MSP Type:
Min. OPEN LOAD 600mA

VND830LSP Type:
Min. Current Limit: 18A
Min. OPEN LOAD 600mA

VND810MSP Type:
Min. Current Limit: 0.6A

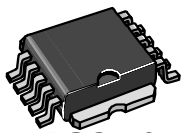
* Dual Highside Switch plus dual PowerMOS gate driver

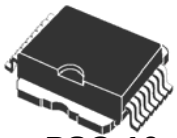
= analog current sense

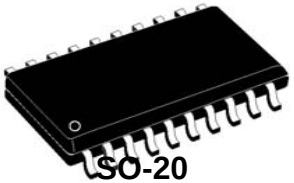
= digital status

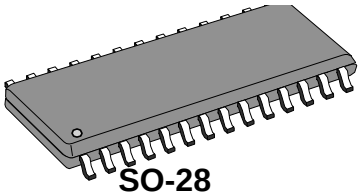
VIPower M0-3

High Side Switches - Quad Channel


PSO-10


PSO-16


SO-20


SO-28

Type suffix:	...SP	...SP16	----	----
270 mΩ	VNQ860		VNQ860	
160 mΩ				VNQ810
150 mΩ				VNQ810M
100 mΩ		VNQ05X		
90 mΩ	VNQ690			
65 mΩ				VNQ830
60 mΩ				VNQ830M / VNQ830A
50 mΩ	VNQ660			
35 mΩ				VNQ600 / VNQ600A

= analog current sense

= digital status

VNQ830M Type:
Min. OPEN LOAD 600mA

VNQ810M Type:
Min. Current Limit: 0.6A

M0-5 Current Product Portfolio

$R_{ds(ON)}$	1 OUTPUT CHANNEL PACKAGE / STATUS	2 OUTPUT CHANNELS PACKAGE / STATUS	4 OUTPUT CHANNELS PACKAGE / STATUS
4 mΩ		*PowerQFN & MultiPowerSO-30* VND5004A-E	
10 mΩ	VN5010AK-E		
12 mΩ	VN5012AK-E	VND5012AK-E	
16 mΩ	VN5016AJ-E		
25 / 30 mΩ	VN5025AJ-E	VND5025AK-E	VNQ5025AK-E
50 mΩ	VN5050(A)J-E	VND5050(A)J/K-E	VNQ5050(A)K-E
160 mΩ	VN5160J-E	VND5160(A)J-E	VNQ5160K-E

Part Numbering: VNX5YYYAJ-E

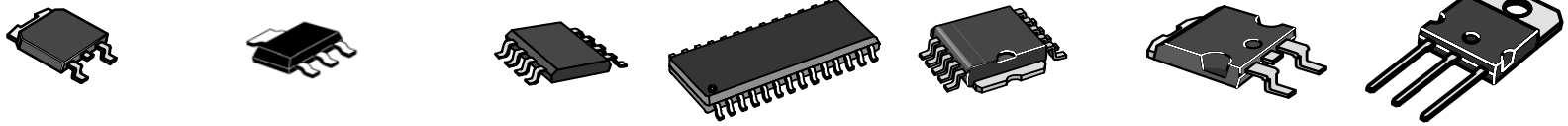
X: D or Q according to # of channels
J is PowerSSO-12; K is PowerSSO-24

YYY : Rds(ON) in mΩ
-E stands for ECOPAK®

A: Analog Diagnostic (no letter if digital)

VIPower

OMNIFET - Single / Dual Channel

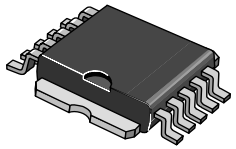


DPAK | SOT-223 | SO-8 | SO-28 | PSO-10 | D2PAK | TO247

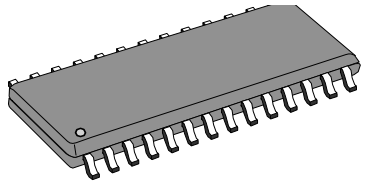
	DPAK	SOT-223	SO-8	SO-28	PSO-10	D2PAK	TO247
250 mΩ	VND1NV04	VNN1NV04	VNS1NV04				
2x 250 mΩ			VNS1NV04D				
120 mΩ	VND3NV04	VNN3NV04	VNS3NV04		VN380 (PWM Valve driver)		
2x 120 mΩ			VNS3NV04D				
60 mΩ	VND7NV04	VNN7NV04	VNS7NV04				
35 mΩ	VND14NV04		VNS14NV04			VNB14NV04	
3x 35 mΩ				VNC14NV04T			
12 mΩ							VNW50N04
10 mΩ					VNV35NV04	VNB35NV04	VNW100N04

VIPower

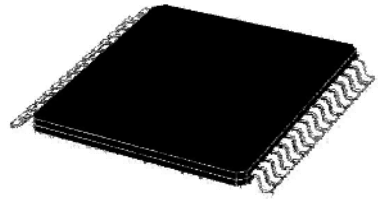
Bridge Driver



PSO-10



SO-28



MultiPowerSO-30

Type Suffix:	...SP	----	...SP30

Path resistance:

220 mΩ		VN770K	
120 mΩ		VN772K	
95 mΩ		VN771K	
45 mΩ			VNH3(A)SP30
30 mΩ	*VND670**		
19 mΩ			VNH2SP30

* Dual Highside Switch plus dual PowerMOS gate driver

= analog current sense

= digital status

ST Electronic Igniter

Controller

- L497D1, L484, L482

VIPower

	V_{al}	I_{cl}
VB025	380V	9 A
VB027	300V	9A
VB029	320V	12A
VB125	340V	11.1A
VB325SP	380V	10A
VB326SP	360V	10A
VB927T	380V	9.5A
VB921ZVSP	340V	7.5A

Coil Driver (IGBT)

	V_{clamp}	I_C@100^{0}C
STGB20NB32LZ	350 ±25	30
STGB10NB37LZ	400 ±25	20
STGB20NB37LZ	400 ±25	30
STGB7NB40LZ	400 ±30	14
STGB10NB40LZ	410 ±30	20
STGB20NB41LZ	412 ±30	30