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Self-Powered Digital Input with CLT03-2Q3

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Agenda

1 Key applications

2 Function & characteristics

3 Integrated vs. discrete solution

4 ST portfolio for digital inputs

5 CLT03-2Q3 introduction

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Key applications

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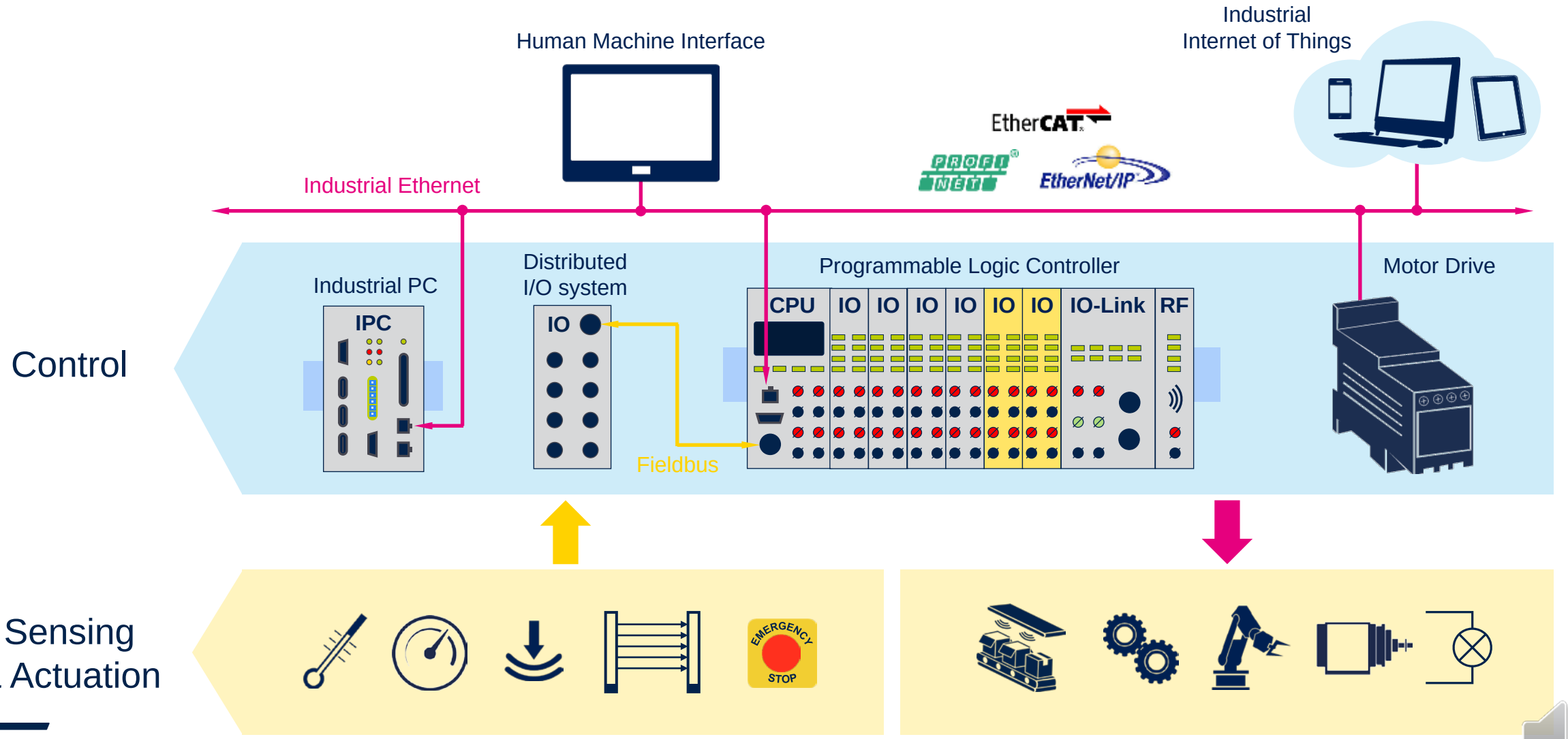
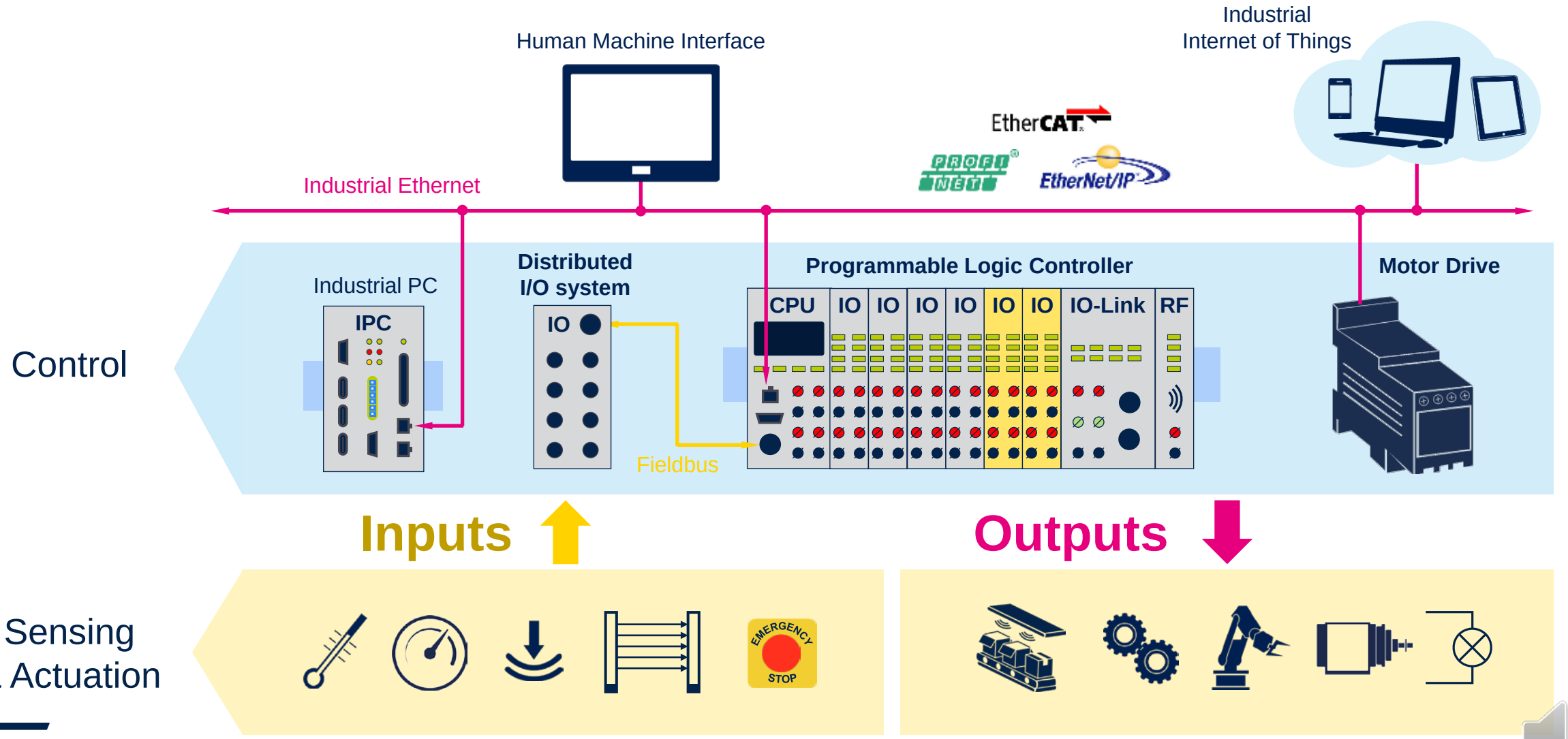
Automation system architecture



Automation system architecture



Digital Input function

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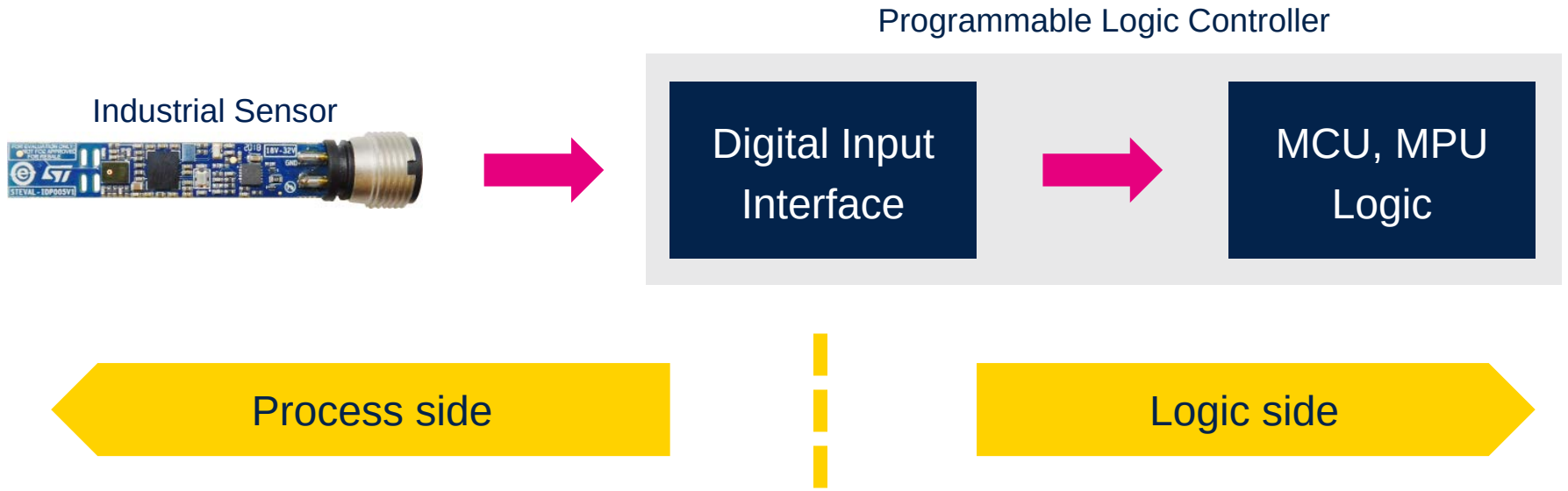
Digital Input function

- Convert binary signal coming from process side to a logic level signal suitable for further processing



- Most systems use 24V DC signals
- Key international standard for technical requirements IEC61131-2

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IEC 61131-2: input characteristics

Digital Input Type 1

Type 1

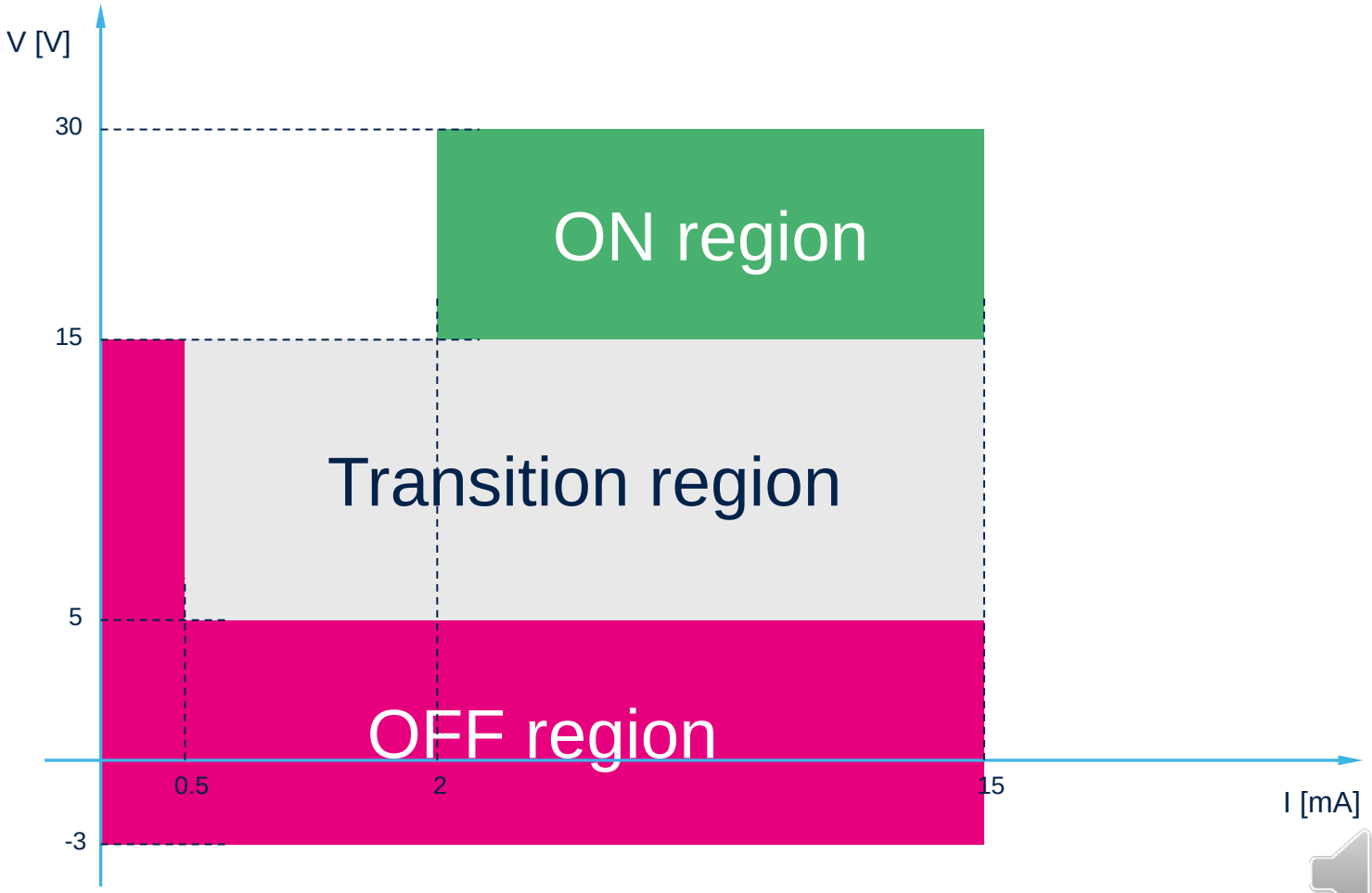
- Sensing electromechanical switching devices such as relays, pushbuttons, switches etc.
- Not suitable for two-wire solid state sensors due to low OFF-state current and high ON-state voltage

Type 2

- Early solid state two-wire sensors with increased consumption (proximity switches).
- Standard two-wire proximity switches, IEC 61947-5-2

Type 3

- Electromechanical switching devices as well as nowadays solid state sensors with low consumption



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IEC 61131-2: input characteristics

Digital Input Type 2

Type 1

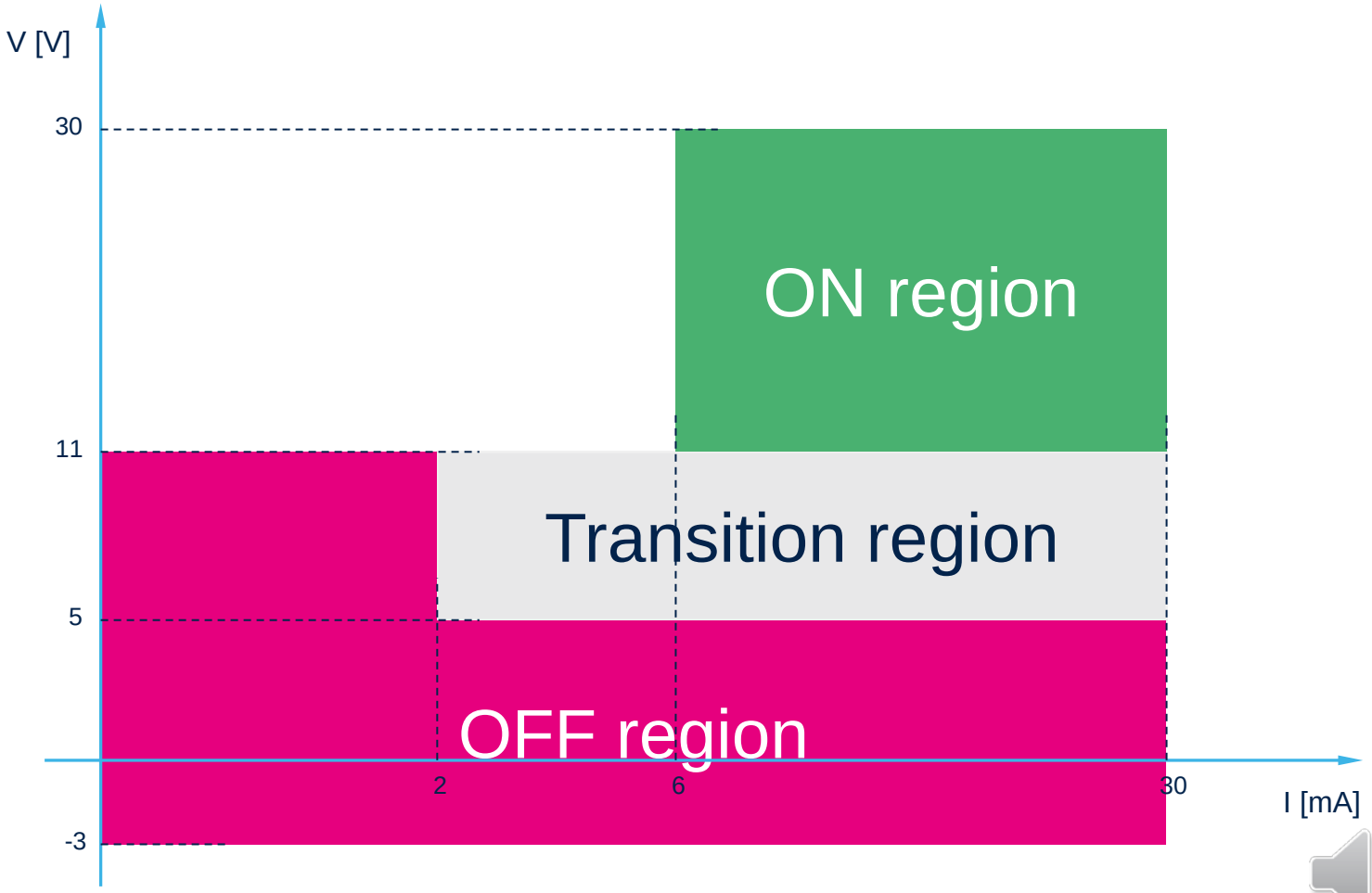
- Sensing electromechanical switching devices such as relays, pushbuttons, switches etc.
- Not suitable for two-wire solid state sensors due to low OFF-state current

Type 2

- Early solid state two-wire sensors with increased consumption (proximity switches).
- Standard two-wire proximity switches, IEC 61947-5-2

Type 3

- Electromechanical switching devices as well as nowadays solid state sensors with low consumption



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IEC 61131-2: input characteristics

Digital Input Type 3

Type 1

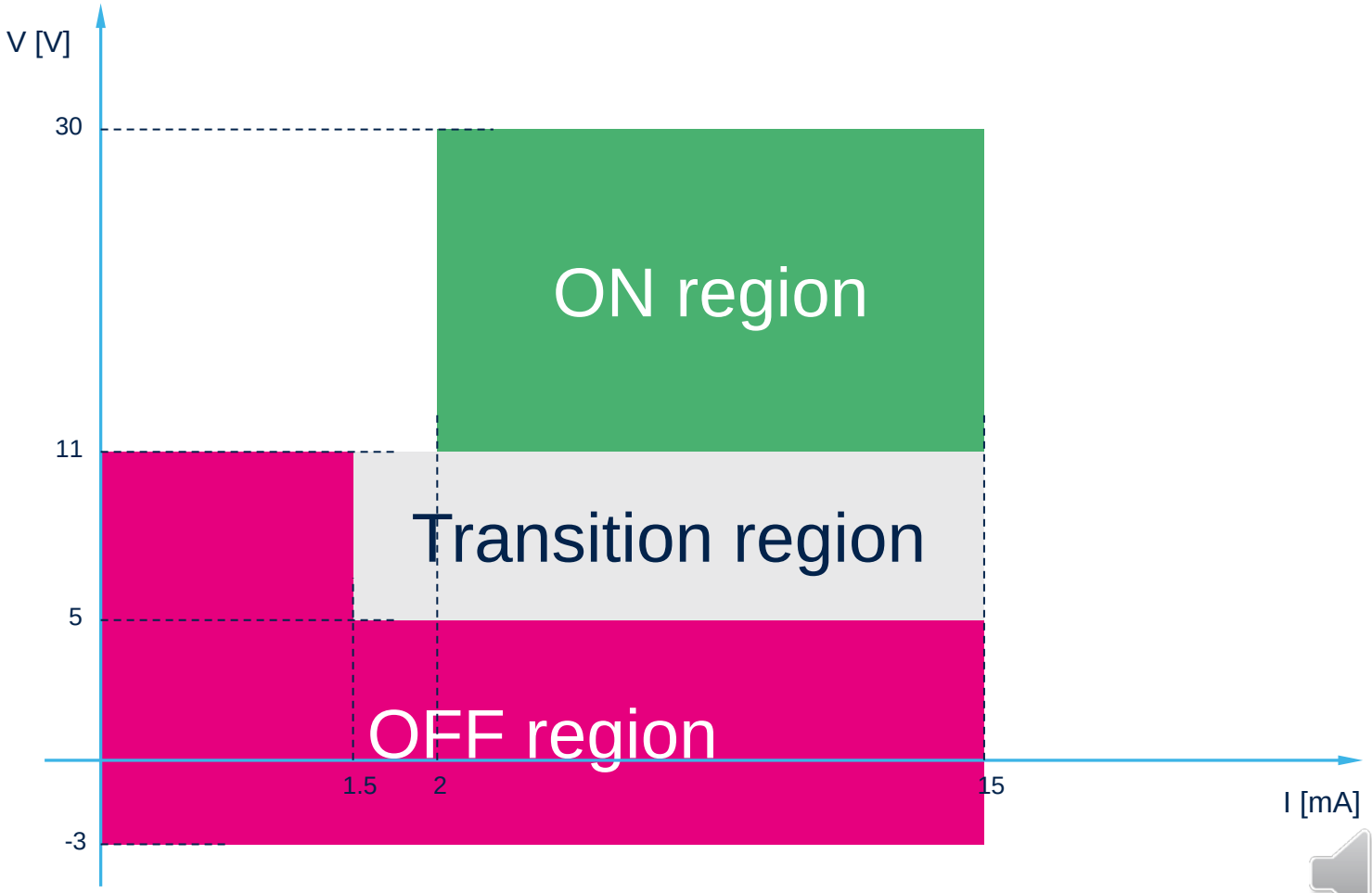
- Sensing electromechanical switching devices such as relays, pushbuttons, switches etc.
- Not suitable for two-wire solid state sensors due to low OFF-state current

Type 2

- Early solid state two-wire sensors with increased consumption (proximity switches).
- Standard two-wire proximity switches, IEC 61947-5-2

Type 3

- Electromechanical switching devices as well as nowadays solid state sensors with low consumption



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Integrated vs. Discrete solution

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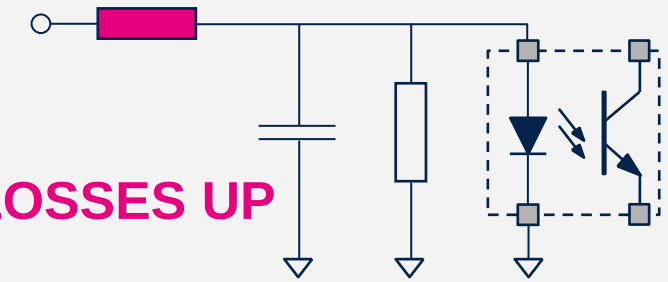
CLT product family

PASSIVE SOLUTION

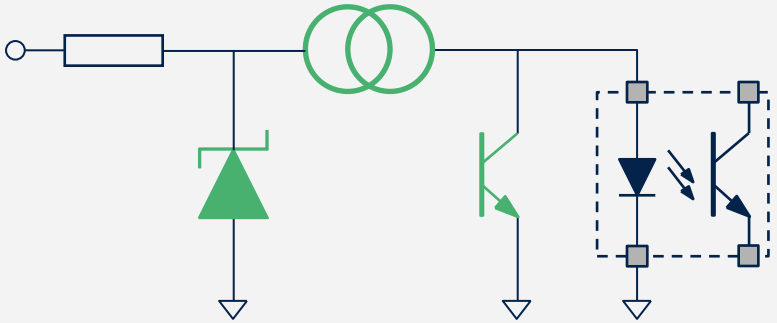
IMMUNITY DOWN



LOSSES UP

xCLT SOLUTION

LOSSES DOWN



IMMUNITY UP

- Power dissipation reduction
- EMC immunity improvement

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IEC 61131-2: input characteristics

Power dissipation reduction with integrated input

Type 1

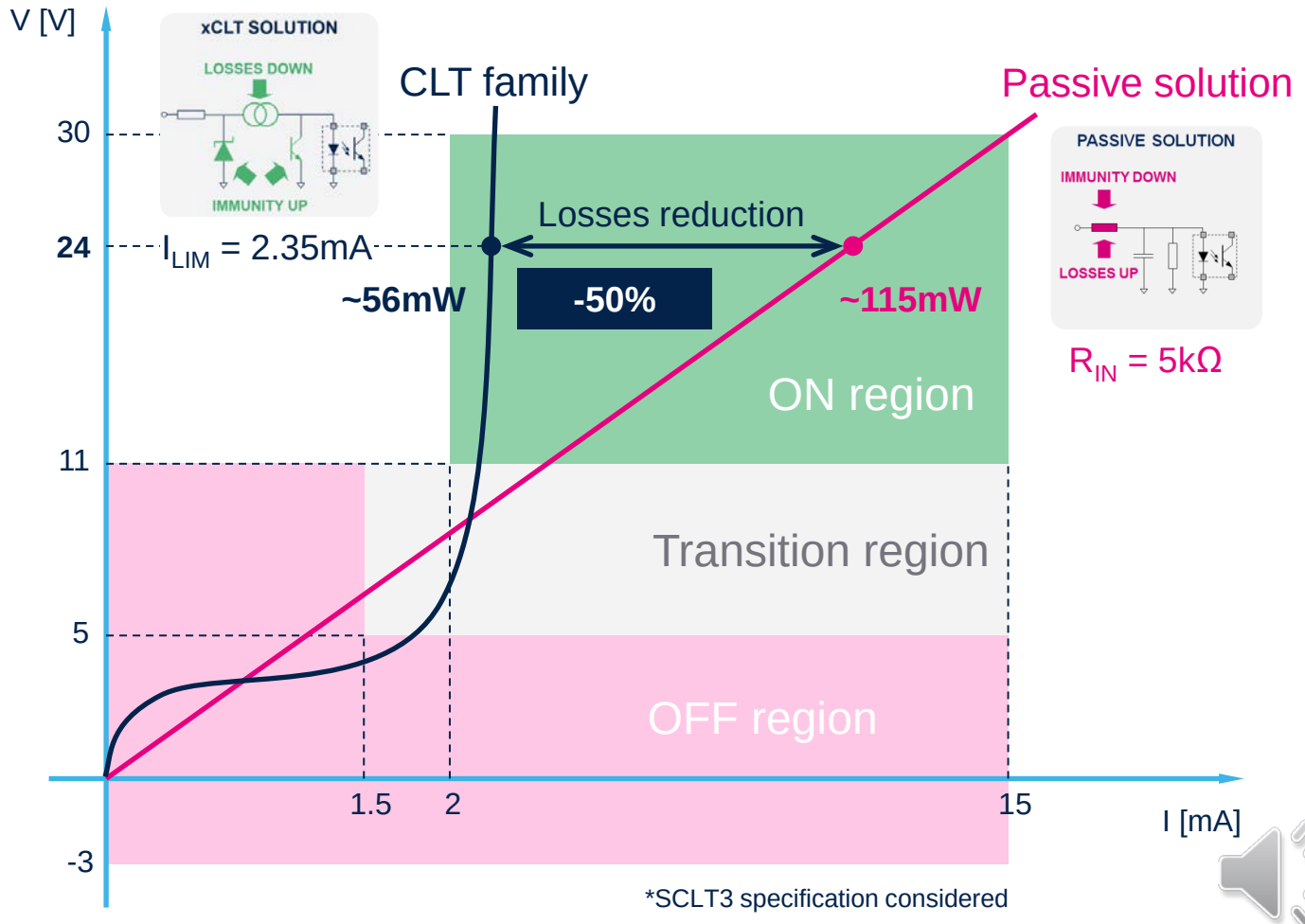
- Sensing electromechanical switching devices such as relays, pushbuttons, switches etc.
- Not suitable for two-wire solid state sensors due to low OFF-state current

Type 2

- Early solid state two-wire sensors with increased quiescent current consumption (proximity switches).
- Standard two-wire proximity switches, IEC 61947-5-2

Type 3

- Nowadays solid state sensors with low current consumption



ST portfolio for Digital Inputs

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Digital input interfaces

Safety & Flexibility
- 60V rated inputs
- Self powered
- HS/LS compatible
- Test pulse embedded

- Input data rate @ 400kbps

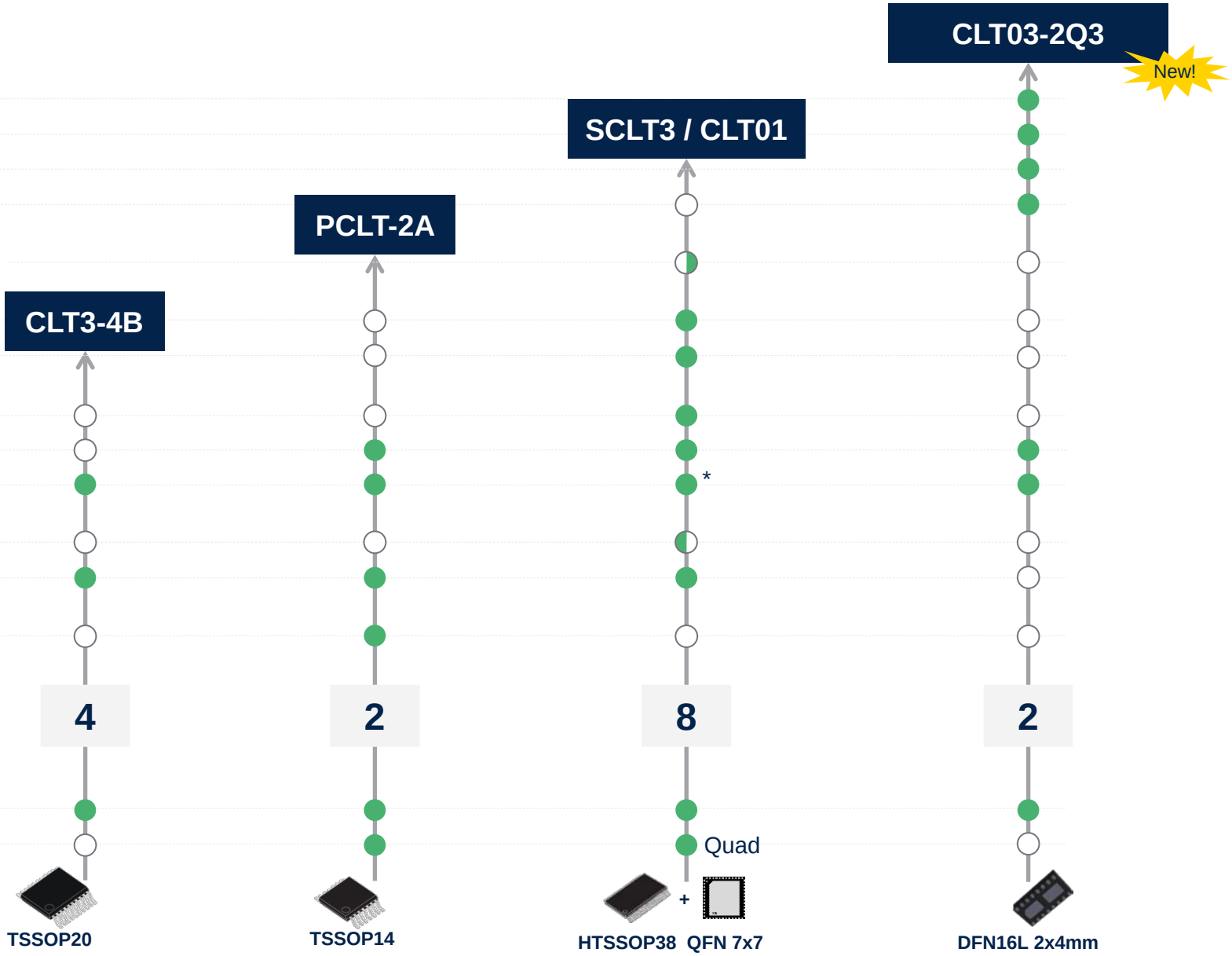
Diag
- Thermal Alarm
- Over / under Voltage

Output
- SPI interface
- CMOS interface
- Opto-coupler interface

Immunity
- Digital filter
- Surge protection

- Programmable current

- Number of channels
- Characteristic, IEC61131-2
  - Type 1 & 3
  - Type 2



* Through LEDx outputs

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CLT03-2Q3
most flexible digital input

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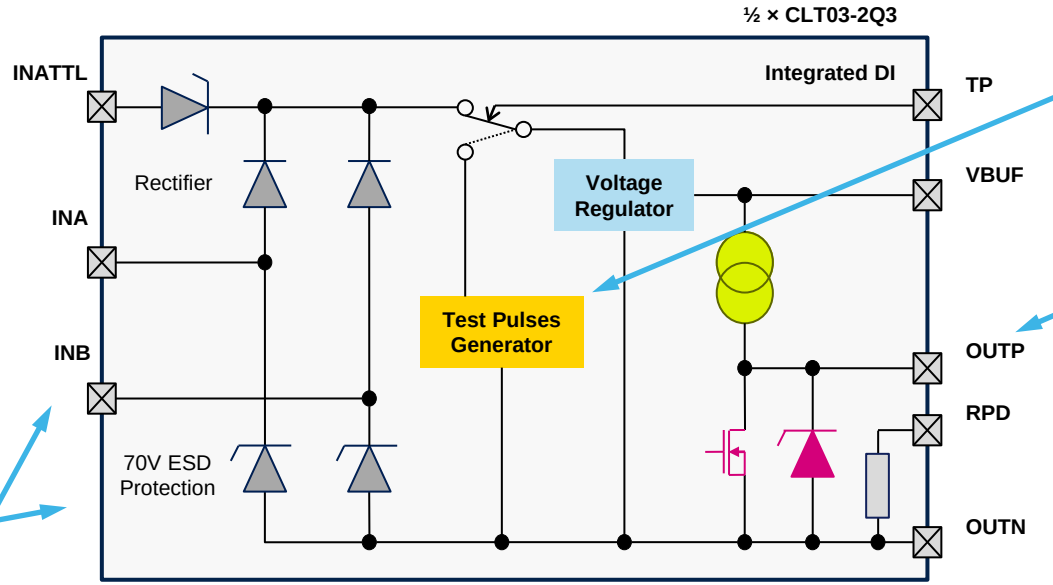
CLT03-2Q3: Dual-channel digital input IC

Perfect fit for safe digital inputs in compact DFN package

No supply voltage needed!

Wide input voltage range up to 60V

Capable to interface HS & LS sensors



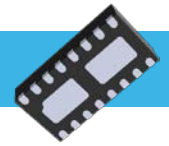
Configurable test pulse generator (for safety)

Optocoupler & CMOS compatible interfaces

Type 1 & 3 interface with minimum dissipation

Isolated channels up to 230V

Compact package DFN 16L 2 × 4 mm



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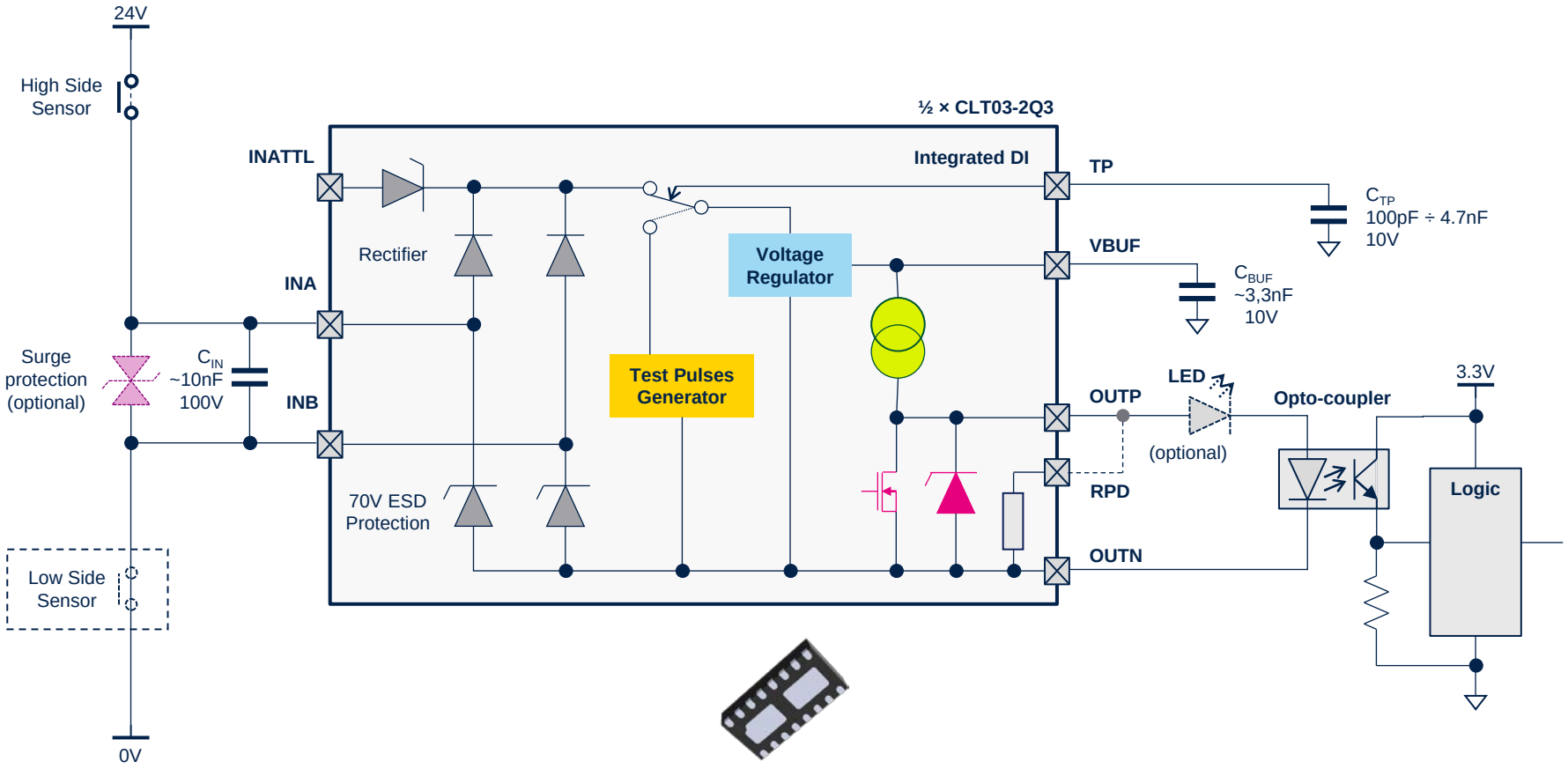
CLT03-2Q3: Dual-channel digital input IC

Application Example



DFN16L 2x4mm

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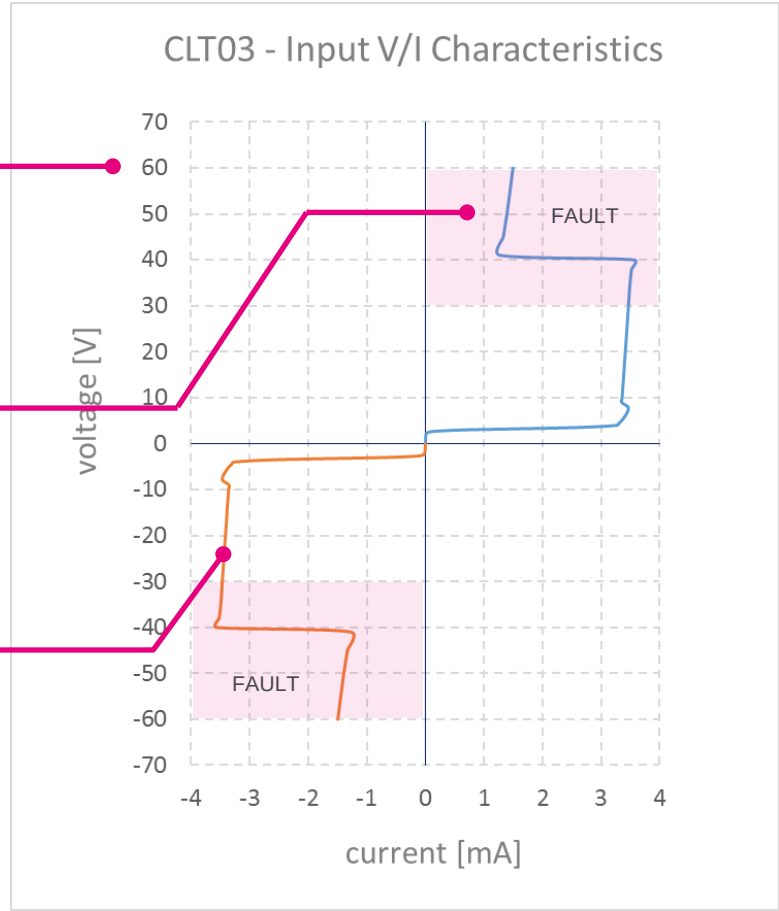
CLT03-2Q3: Dual-channel safe digital input IC

Safe-by-design: Leading-edge flexibility & robustness

- Operation up to 60V simplifies SIL certification
- Smart limitation saves power during overvoltage
- Symmetric input prevents installation failures in the field



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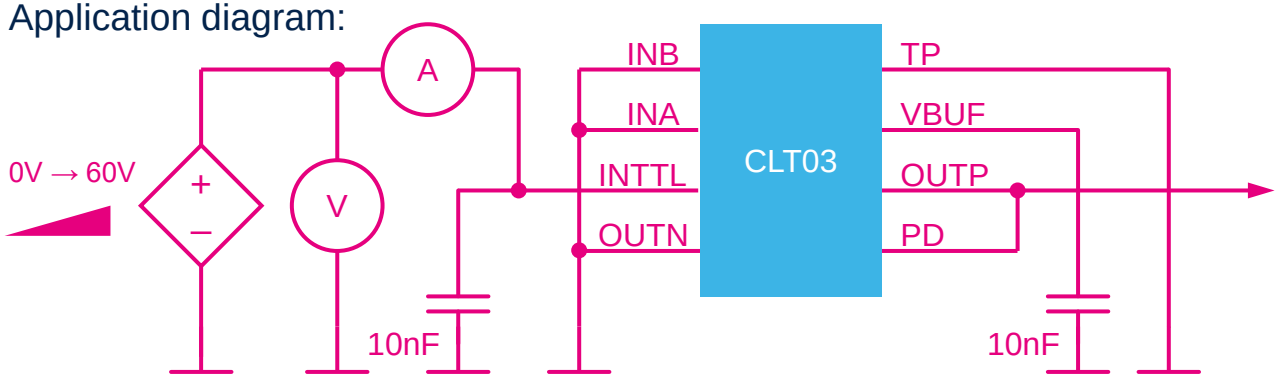
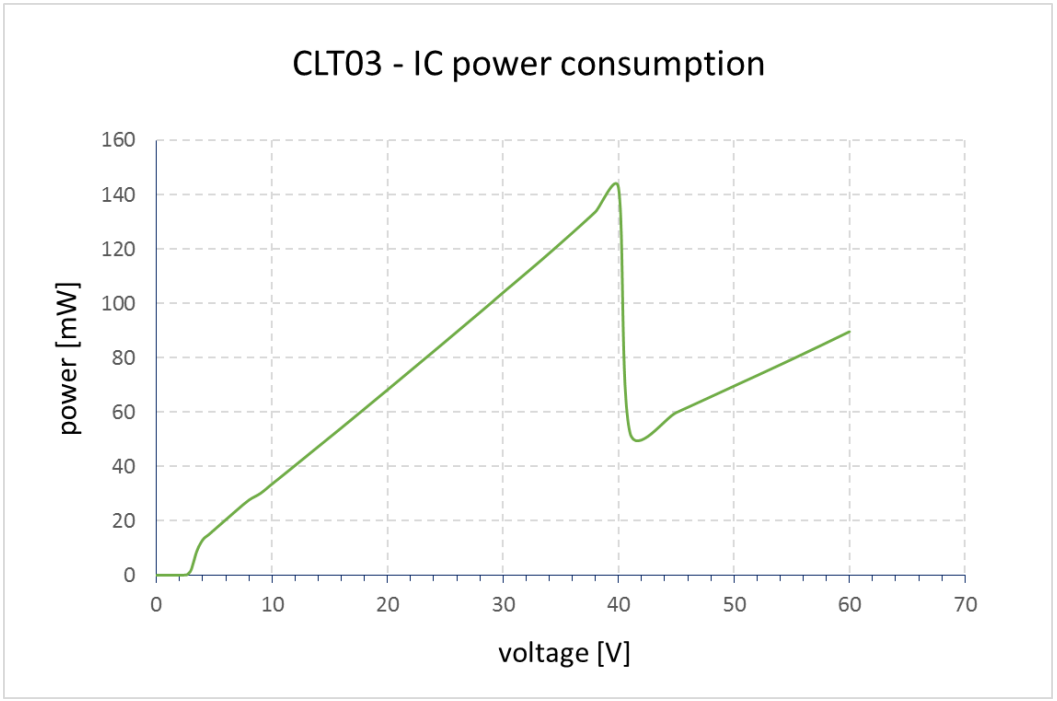
CLT03: IC power consumption

V_{IN1} = 0 → 60V, V_{IN2} = 0V, PD connected, TP inactive, T_{AMB} = 24°C

Application diagram:





Related datasheet parameters:

Table 2: Absolute maximum ratings

Symbol	Parameter name	Value	Unit
V_{IN}	Maximum input voltage	-60 to 60	V

Table 3: Electrical characteristics (values)

Symbol	Description	Name	Min.	Typ.	Max.	Unit
		Input				
I_{LIM}	Input current – On state		2.5		4	mA
V_{TLH}	High to Low state input voltage			9.4	11	V
V_{THL}	Low to High state input voltage		5	7.5		V
V_{HYST}	Input triggering voltage hysteresis		1.2		2.6	V
V_{FAULT}	Fault mode threshold voltage		30	40		V
I_{FAULT}	Input current in fault region $V_{IN} > V_{FAULT}$		1		3	mA

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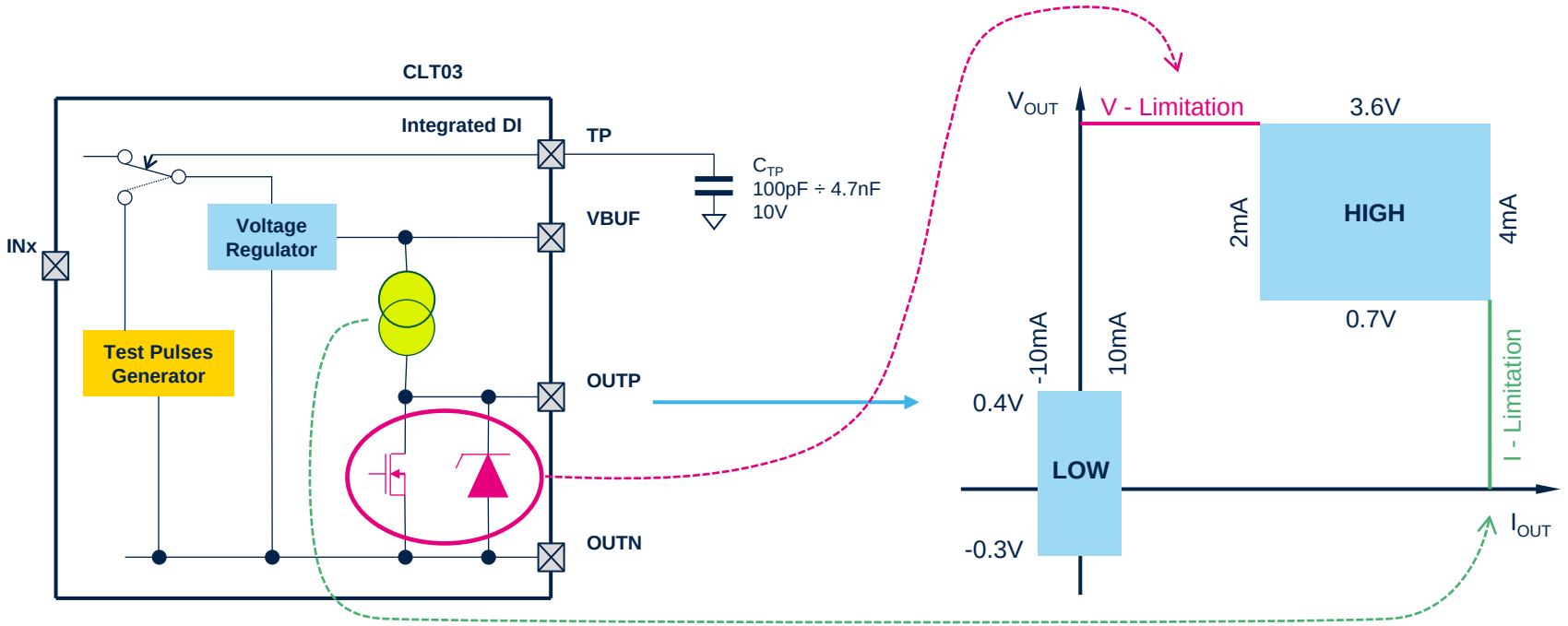
CLT03: flexible integrated digital input

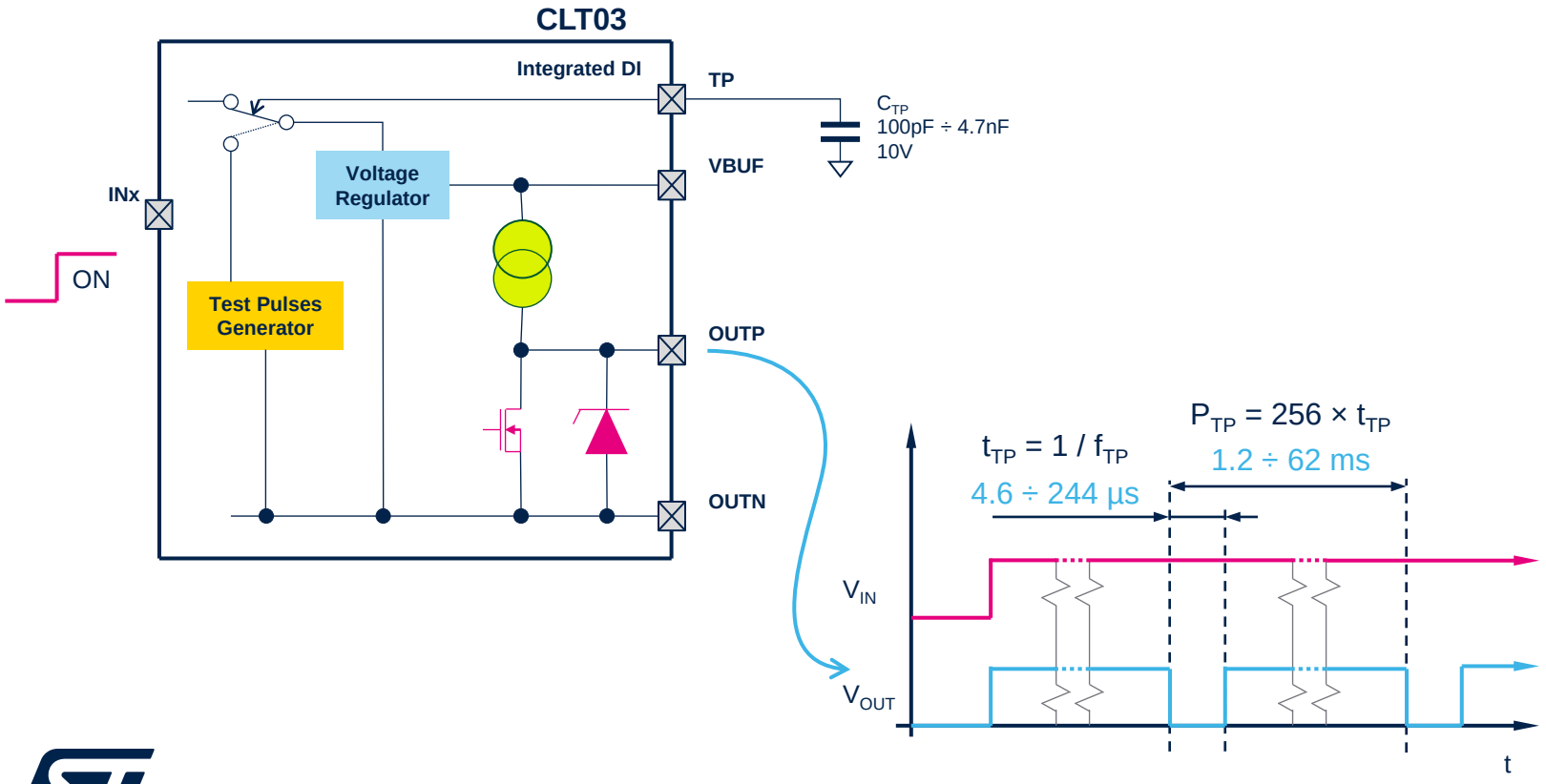
Output stage

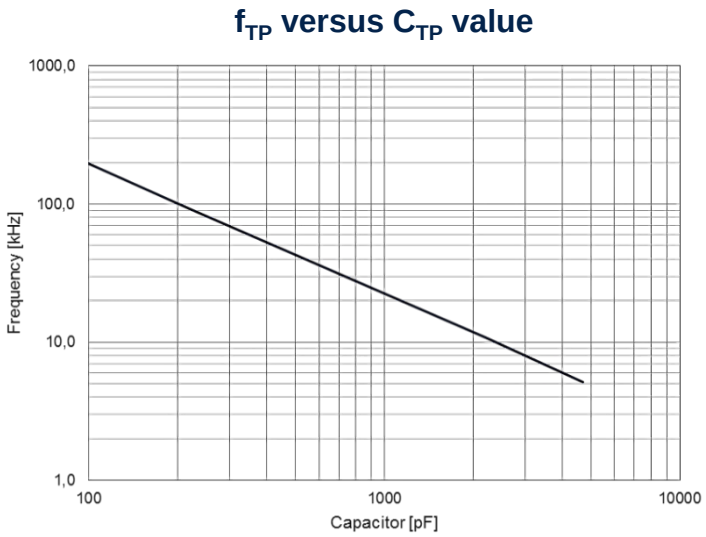
- Enabling to drive opto-coupler or to interface logic circuits
- No external components, no resistors
- Supports multiple opto-couplers or opto + LED in series



CLT03: test pulses

Enabling hardware connection test to the MCU





Why to chose CLT03?

Key advantages

Flexibility	❯	No need of external supply!
Compatibility	❯	HS + LS sensors, Opto-coupler + CMOS output
Safety	❯	60V tolerant, Embedded test pulses, Channels isolation
Form Factor	❯	Tiny package DFN 4×2 mm (dual channel)

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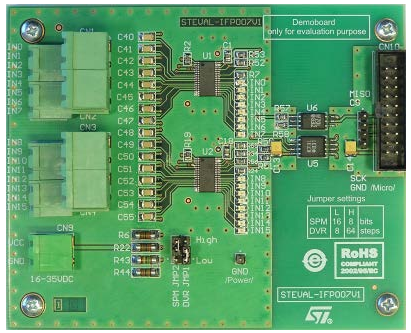
Evaluation boards

Product	# Channels	Input type	Documentation	Evalboard order code
CLT3-4BT6	4	1 & 3	AN1608	STEVAL-IFP008V1
PCLT-2A	2	1, 2 & 3	AN2482	STEVAL-IFP004V1
SCLT3-8BT8	8	1, 2 & 3	AN2846 AN3031	STEVAL-IFP007V1
SCLT3-8BQ7	8	1, 2 & 3	DB2782	STEVAL-IFP030V1
CLT01-38S4	8	1, 2 & 3	AN4625	STEVAL-IFP023V1
CLT01-38SQ7	8	1, 2 & 3	DB2777	STEVAL-IFP031V1
CLT01 & VNI8200XP	8	1, 2 & 3	DB2622 UM1918	X-NUCLEO-PLC01A1
CLT03-2Q3	**2**	**1 & 3**	**DB3936**	**STEVAL-IFP035V1**



Thank you

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