



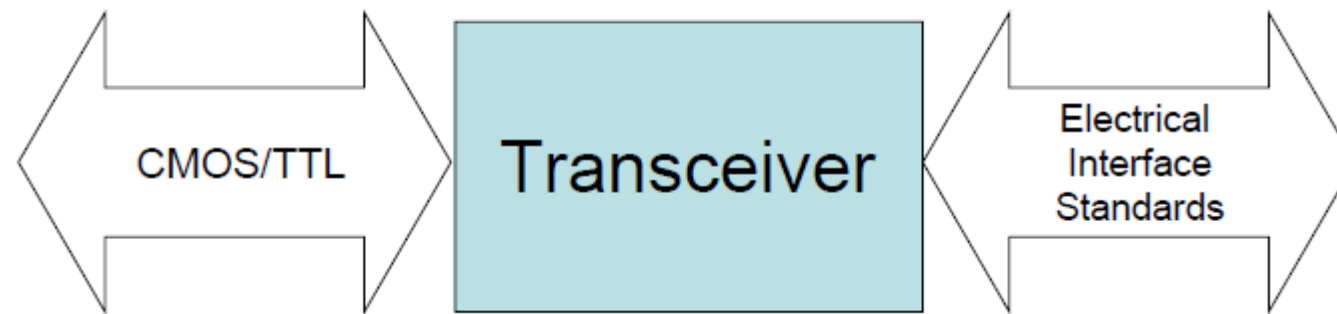
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# Legacy interfaces Solution

STMicroelectronics

# What is a Transceiver

- Transmitter converts CMOS/TTL levels to Electrical Interface Standards
- Receiver converts Electrical Interface Standard levels to CMOS/TTL outputs

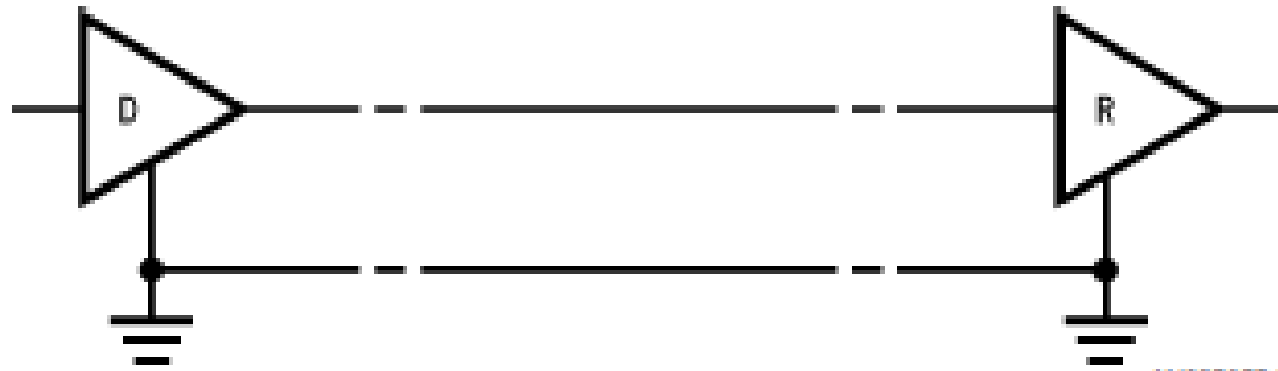


# Electrical Interface Standards

- TIA/EIA (Telecommunications Industry Association/Electronics Industry Association)
  - Unbalanced (single-ended) data transmission:
    - RS-232, RS-423
  - Balanced (differential) data transmission:
    - RS-485, RS-422
- ITU (International Telecommunications Union)

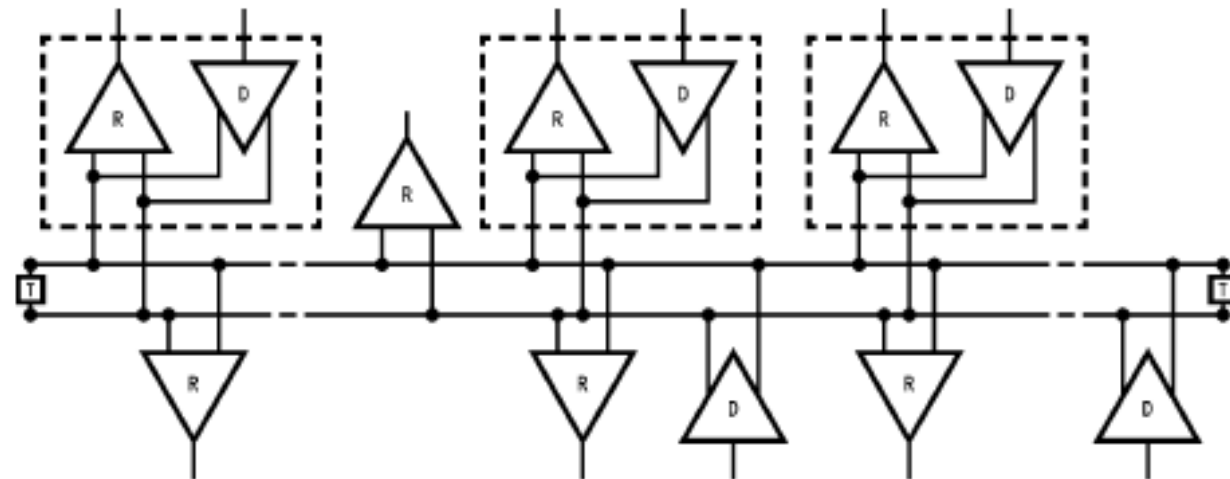
# RS-232 Standard

- Single-ended
- Point to point
- Output driver voltage:  $\pm 7V$  typ with  $5k\Omega$  load
- Receiver input voltage:  $\pm 3V$  min
- Distance up to 15 meters
- 115.2 kbps max data rate



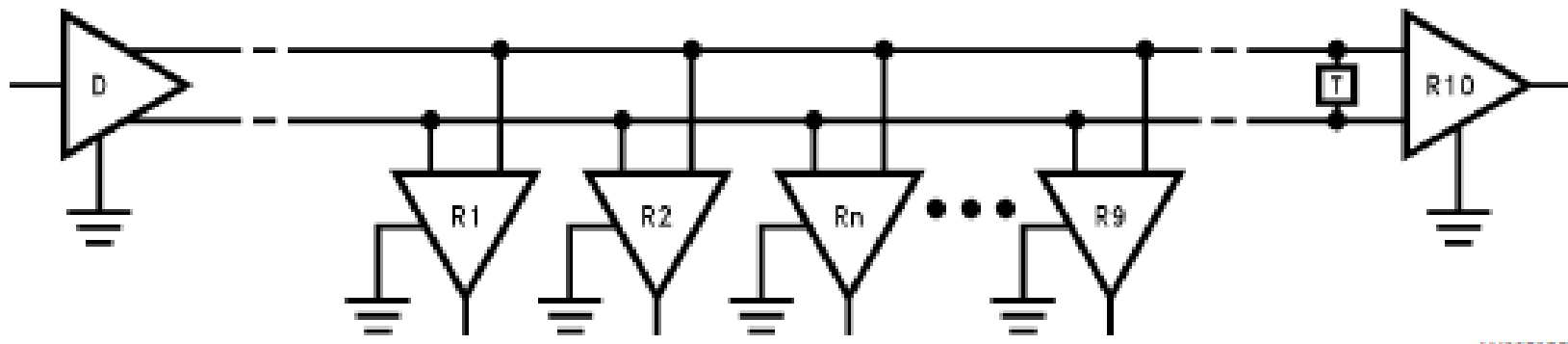
# RS-485 Standard

- Differential
- Point to multipoint
  - Up to 32 drivers and 32 receivers
- 10 Mbps max data rate up to 50 meters
- 200 kbps data rate up to 1200 meters
- -7V to +12V common mode input voltage range



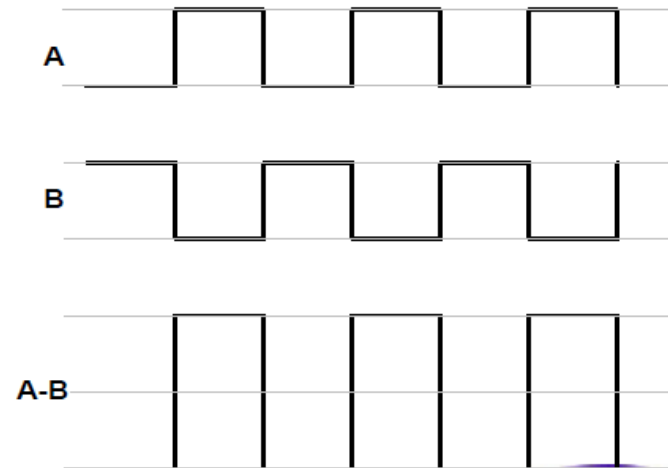
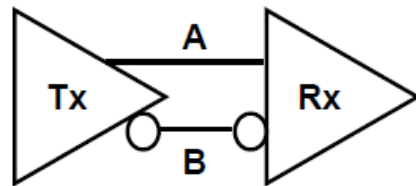
# RS-422 Standard

- Differential
- Point to multidrop
  - 1 driver and up to 32 receivers
- 10 Mbps max data rate up to 50 meters
- 200 kbps data rate up to 1200 meters
- -7V to +7V common mode input voltage range



# Differential signaling

- Signal on B is inverse of A
- Difference between  $V_A$  and  $V_B$  is 2 times the amplitude
  - Improved noise rejection, speed, distance and reliability



# RS standard

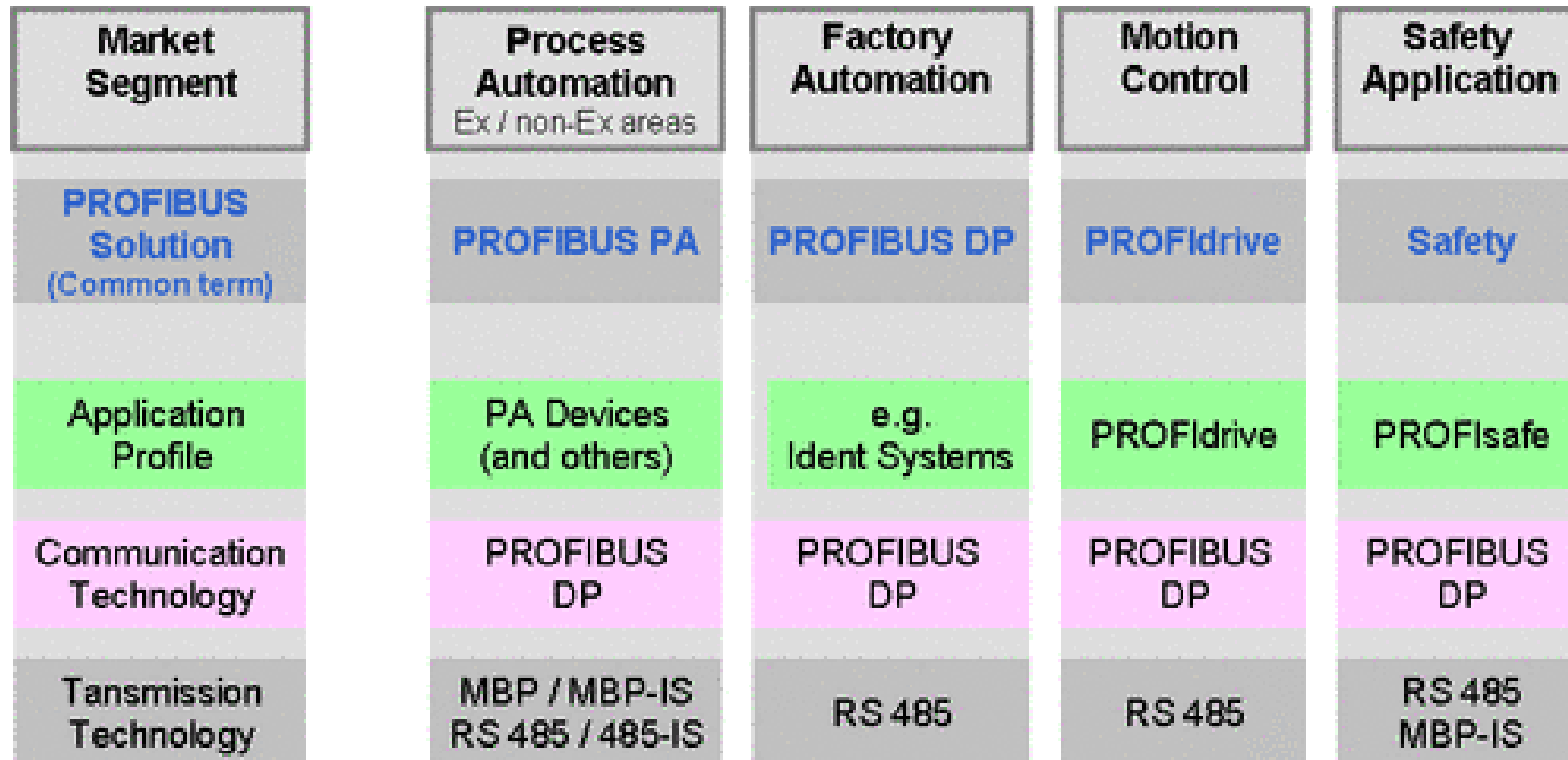
Characteristics of RS232, RS422, RS423 and RS485

	RS232	RS423	RS422	RS485
Transmission type	Single-ended	Single-ended	Differential	differential
Max number of drivers	1	1	1	32 UL
Max number of receivers	1	10	10	32 UL
Modes of operation	half duplex full duplex	half duplex	half duplex	half duplex
Network topology	point-to-point	multidrop	multidrop	multipoint
Max distance (acc. standard)	15 m	1200 m	1200 m	1200 m
Max speed at 12 m	20 kbs	100 kbs	10 Mbs	35 Mbs
Max speed at 1200 m	(1 kbs)	1 kbs	100 kbs	100 kbs
Max slew rate	30 V/ $\mu$ s	adjustable	n/a	n/a
Receiver input resistance min	3.7 k $\Omega$	$\geq 4$ k $\Omega$	$\geq 4$ k $\Omega$	$\geq 12$ k $\Omega$
Driver load impedance	300 $\Omega$	$\geq 450$ $\Omega$	100 $\Omega$	54 $\Omega$
Receiver input sensitivity	$\pm 3$ V	$\pm 200$ mV	$\pm 200$ mV	$\pm 200$ mV
Receiver input voltage range	-15 V to +15 V	$\pm 12$ V	$\pm 10$ V	-7 V to +12 V
Max driver output voltage	-25 V to + 25 V	-6 V to + 6 V	-6 V to + 6 V	-7V to +12 V
Min driver output voltage (with load)	-5 V to + 5 V	-3.6 V to + 3.6 V	-2.0 V to + 2.0 V	-1.5 V to + 1.5 V



# PROFIBUS market & application

- 35 millions nodes installed in 2010
  - 1 node = 2 RS-485 transceivers
  - 5 Mu ASIC/year = 10Mu new installed RS-485



# PROFIBUS: transmission interface

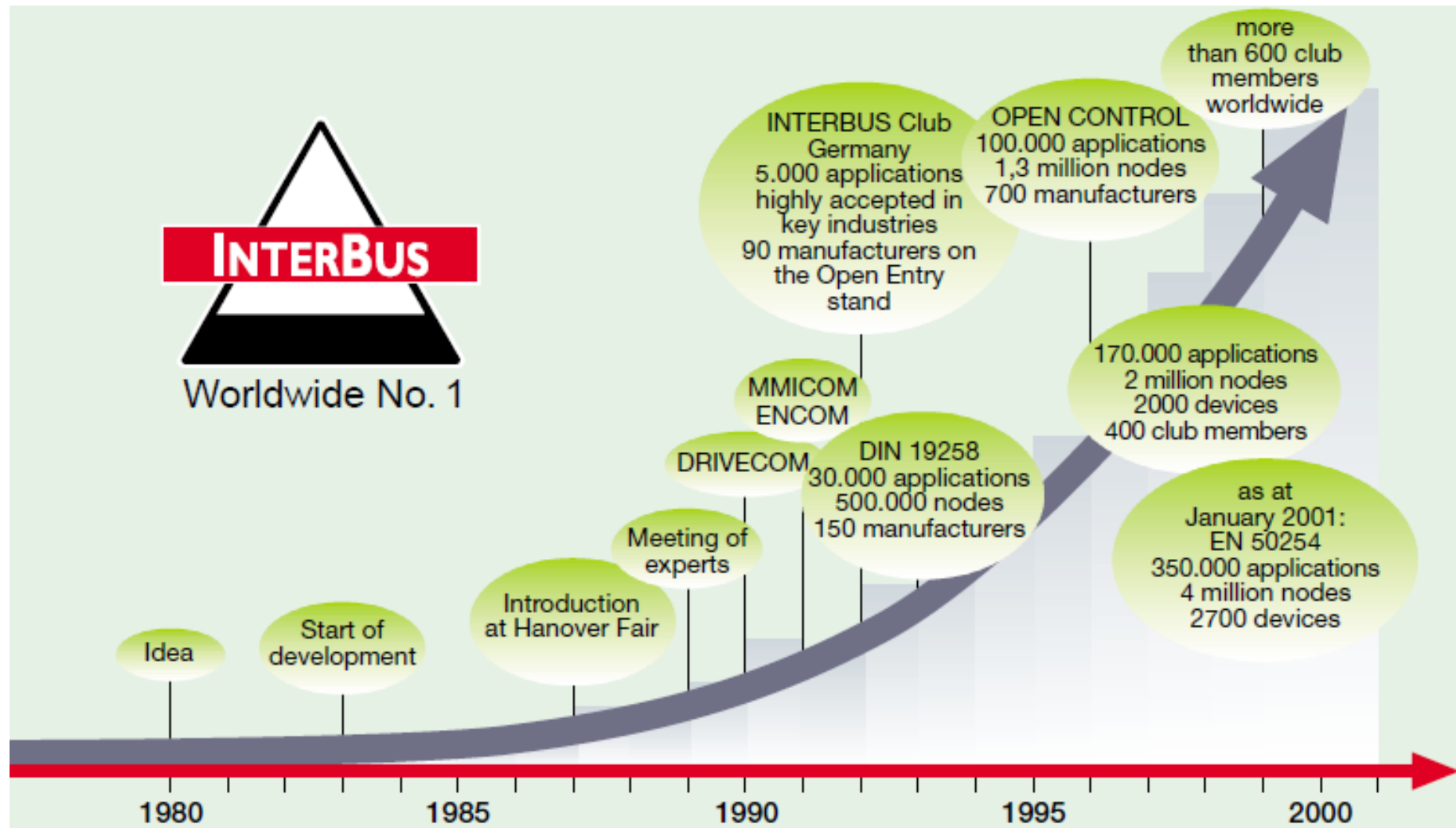
	RS485	RS485-IS	MBP	MBP-IS	Fiber Optic
Data transmission	Digital; differential signals acc. to RS485, NRZ (no return to zero)	Digital; differential signals acc. to RS485, NRZ	Digital, bit-synchronous, Manchester coding	Digital, bit-synchronous, Manchester coding	Optical, digital, NRZ
Transmission rate	9.6 to 12000 Kbit/s	9.6 to 15000 Kbit/s	31.25 Kbit/s	31.25 Kbit/s	9.6 to 12000 Kbit/s
Data security	HD=4; parity bit; start/end delimiter	HD=4; parity bit; start/end delimiter	Preamble; fail-safe start/end delimiter	Preamble; fail-safe start/end delimiter	HD=4; parity bit; start/end delimiter
Cable	Twisted, shielded two-wire cable, cable type A	Twisted, shielded four-wire cable, cable type A	Twisted, shielded two-wire cable, cable type A	Twisted, shielded two-wire cable, cable type A	Multi- and single mode glass fiber, PCF; plastic fiber
Remote power supply	Possible using additional cores	Possible using additional cores	Optional using signal cores	Optional using signal cores	Possible using hybrid cable
Ignition protection types	None	Intrinsic safety Ex ib	None	Intrinsic safety Ex ia/ib	None
Topology	Line topology with termination	Line topology with termination	Line topology with termination	Line and tree topology with termination; also combined	Star and ring topology typical; line topology possible
Number of nodes	Up to 32 nodes per segment. Max. total 126 per network	Up to 32 nodes per segment. Max. total 126 per network	Up to 32 nodes per segment. Max. total 126 per network	Up to 32 nodes per segment. Max. total 126 per network	Up to 126 nodes per network
Number of repeaters	Max. 9 with signal refreshing	Max. 9 with signal refreshing	Max. 4 with signal refreshing	Max. 4 with signal refreshing	Unlimited with signal refreshing; note signal propagation delay

# PROFIBUS interface need

- Transmission interfaces:
  - Without power supply from the bus cable:
    - RS485 interface implemented
      - Data rates from 9.6kbps to 12 Mbps.
    - Intrinsically safe version RS485-IS
      - SN65HVD1176DR
      - SN75LBC176
  - With power supply from the bus cable:
    - MBP 5manchester Coded Bus Powered transmission technology:
      - Supply current of 10-15mA on the bus cable

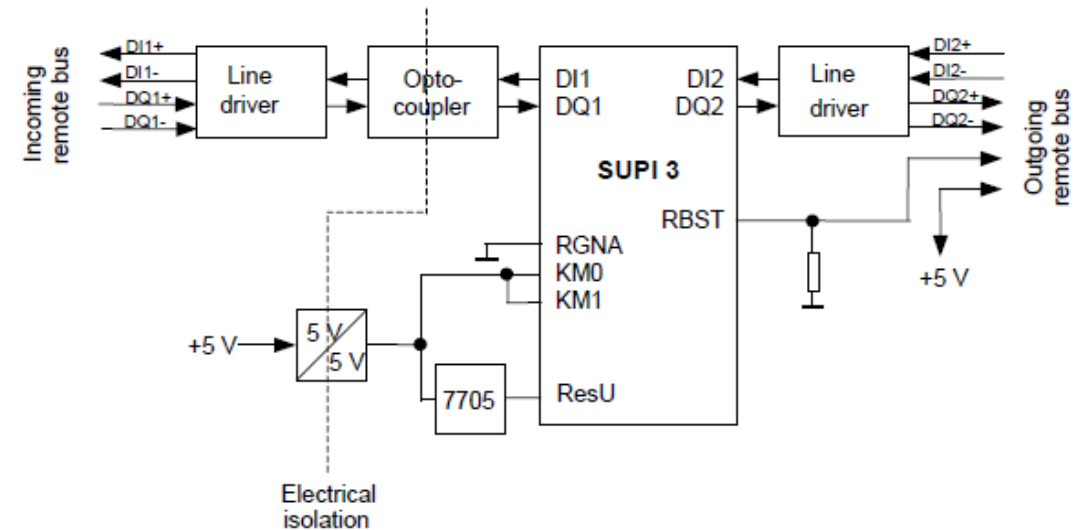
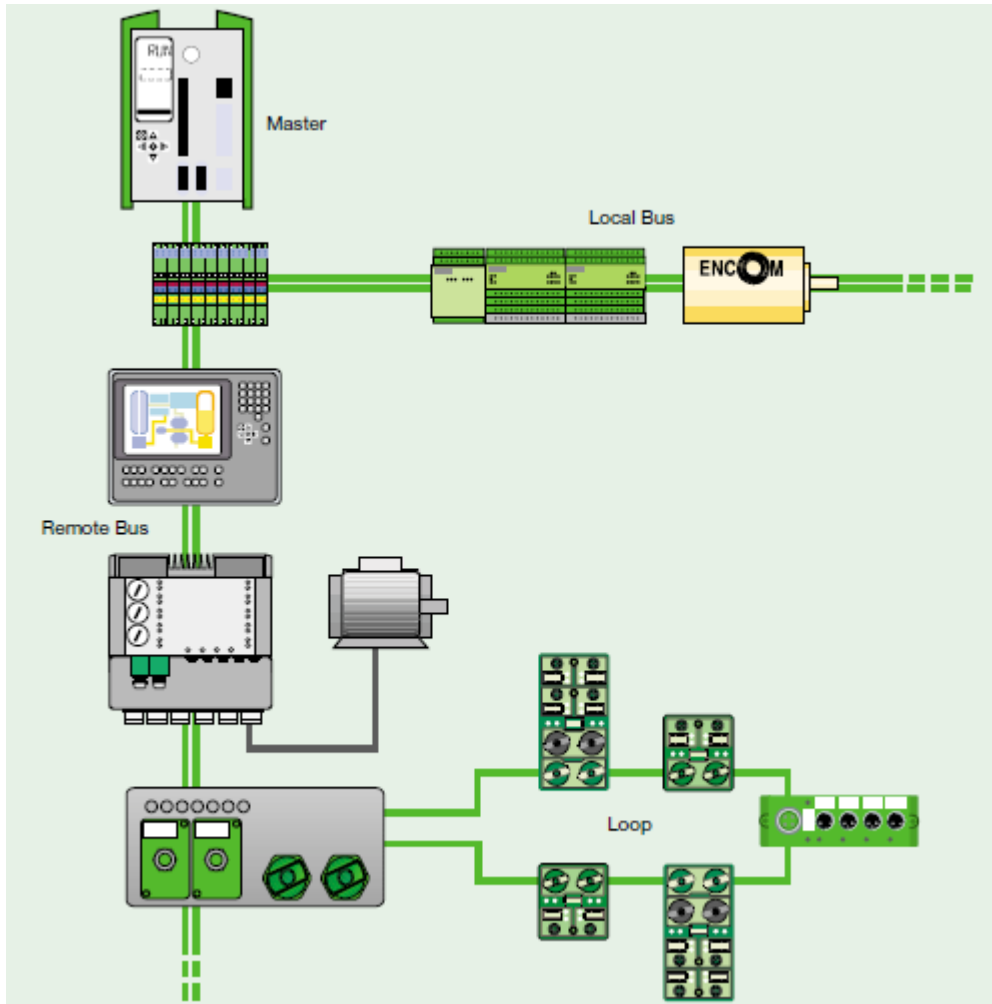
# INTERBUS

- 4 millions nodes in 2001



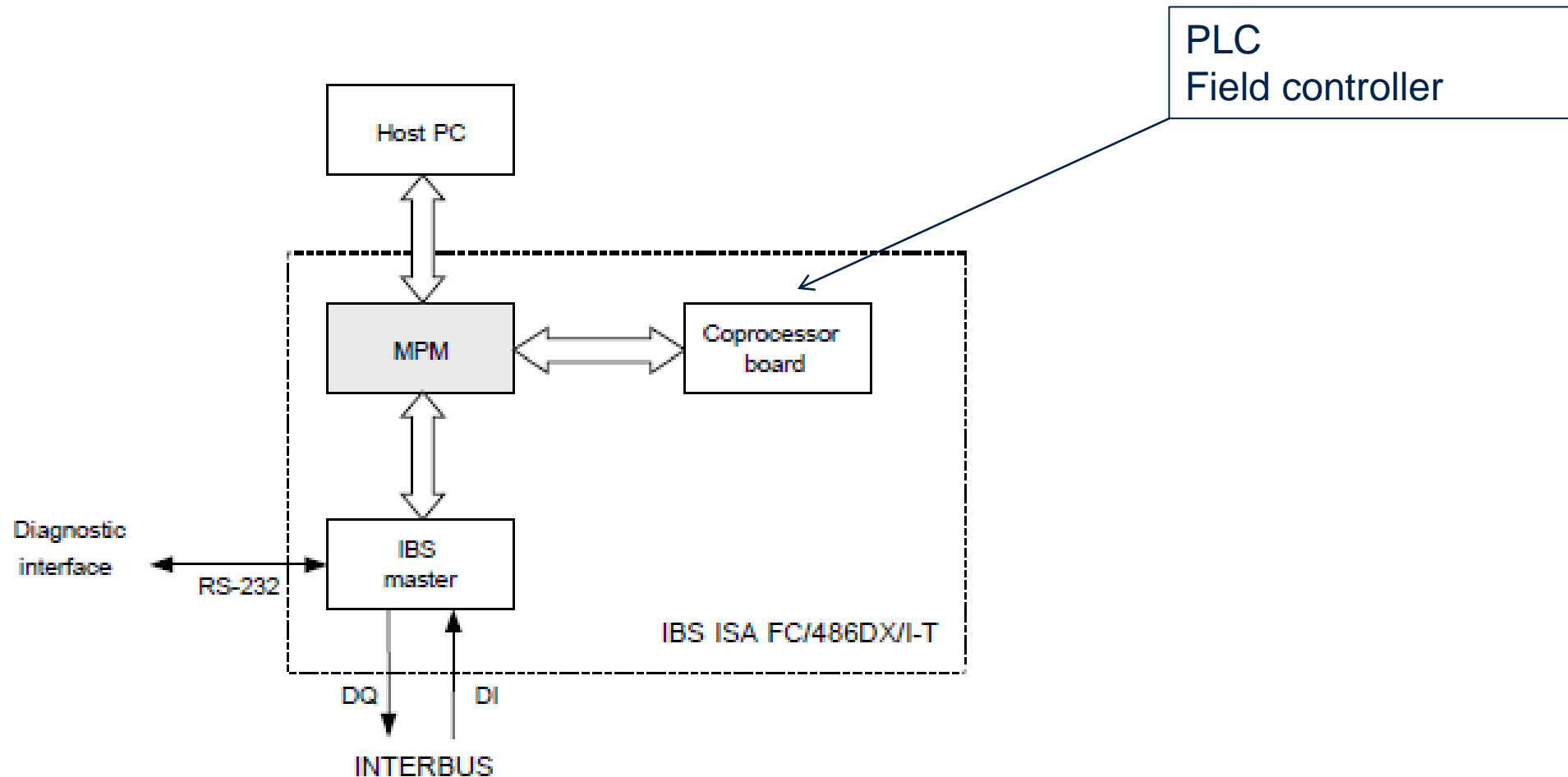
# INTERBUS network

- Remote bus:
  - Local supply voltage
  - Electrically isolated outgoing segment
    - RS-485



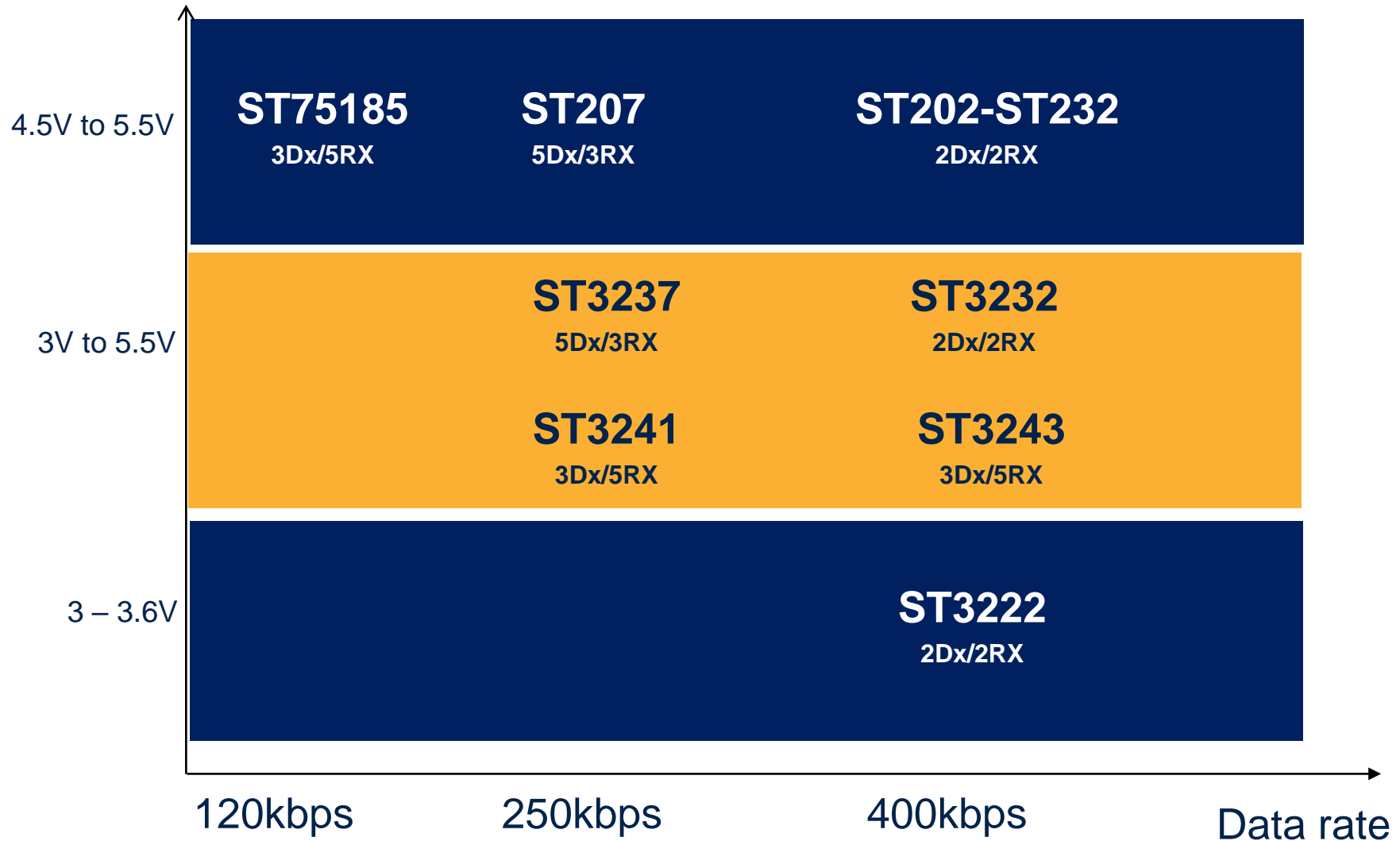
# INTERBUS

- PLC have RS-232 interface



# RS232 interfaces

Supply voltage

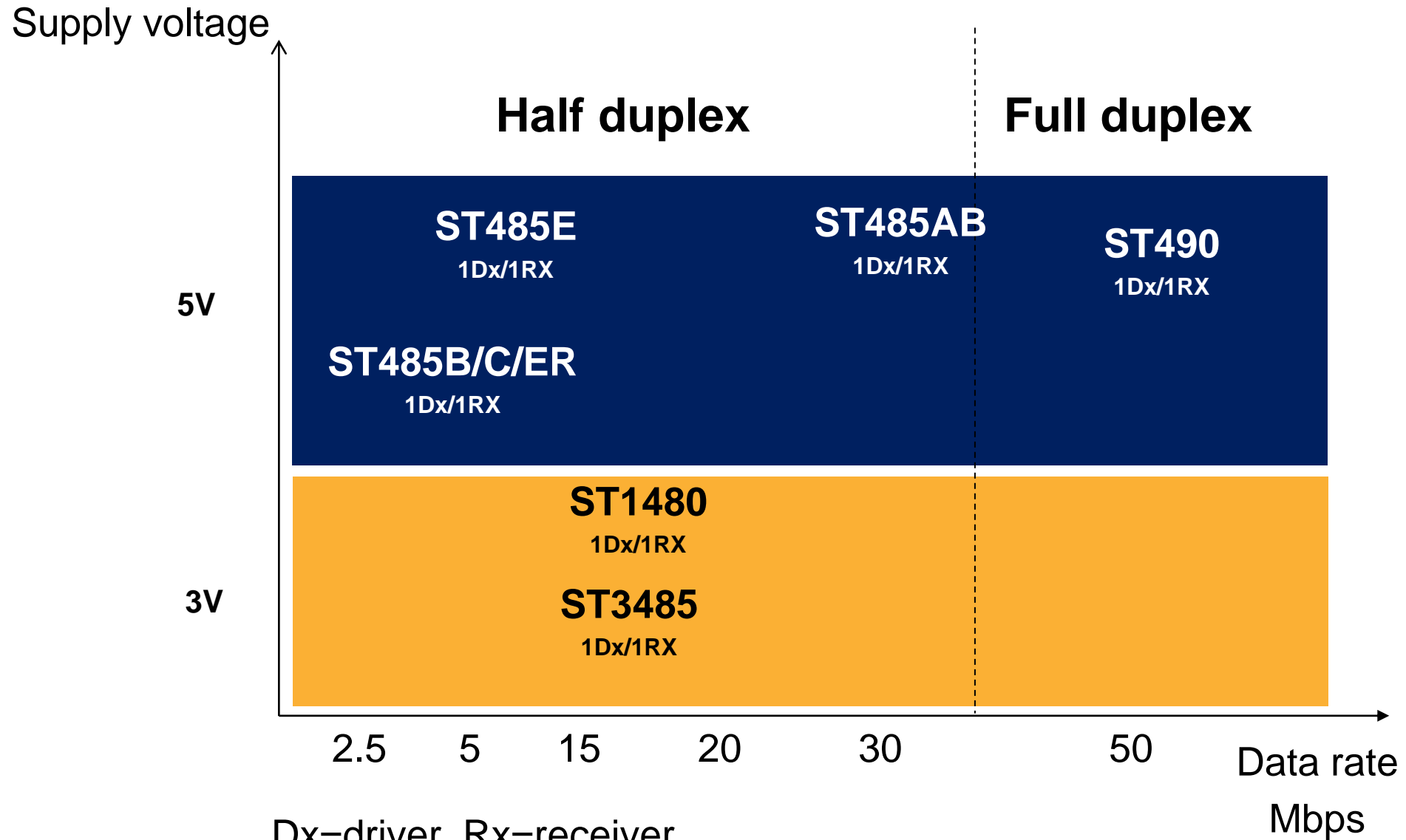


# Interfaces and Transceivers / RS-232

Part Number	5V	3V	Ind. Grade	#TX	#RX	Data Rate (kbps)	HBM (KV)	IEC 61000-4-2 Contact (kV)	Temp (°C) min	Temp(°C) max	Package
ST202B	●	●	●	2	2	400	1.5KV	-	-40	85	SO-16,TSSOP 16
ST202C	●	●		2	2	400	1.5KV	-	0	70	SO-16,SO-16W
ST202EB	●	●	●	2	2	400	15KV	6	-40	85	SO-16,TSSOP 16
ST202EC	●	●		2	2	400	15KV	6	0	70	SO-16,TSSOP 16
ST232AB	●	●	●	2	2	400	1.5KV	-	-40	85	SO-16,TSSOP 16
ST232AC	●	●		2	2	400	1.5KV	-	0	70	SO-16,TSSOP 16
ST232B	●	●	●	2	2	220	1.5KV	-	-40	85	SO-16,TSSOP 16
ST232C	●	●		2	2	220	1.5KV	-	0	70	SO-16,TSSOP 16
ST232EB	●	●	●	2	2	400	15KV	6	-40	85	SO-16,TSSOP 16
ST232EC	●	●		2	2	400	15KV	6	0	70	SO-16
ST3222B		●	●	2	2	400	2KV	-	-40	85	TSSOP 20
ST3222C		●		2	2	400	2KV	-	0	70	TSSOP 20
ST3222EB		●	●	2	2	250	15KV	8	-40	85	SSOP 20 7.2x5.3,TSSOP 20
ST3222EC		●		2	2	250	15KV	8	0	70	SSOP 20 7.2x5.3,TSSOP 20
ST3232B		●	●	2	2	400		-	-40	85	SO-16,TSSOP 16
ST3232C		●		2	2	400		-	0	70	SO-16,TSSOP 16
ST3232EB		●	●	2	2	250	15KV	8	-40	85	SO-16,TSSOP 16
ST3232EC		●		2	2	250	15KV	8	0	70	SO-16,TSSOP 16
ST3237EB		●	●	5	3	1000	15KV	8	-40	85	SSOP 28 10.2x5.3
ST3241EB		●	●	3	5	250	15KV	8	-40	85	SSOP 28 10.2x5.3
ST3241EC		●		3	5	250	15KV	8	0	70	SSOP 28 10.2x5.3
ST3243C		●		3	5	400	15KV	8	0	70	SSOP 28 10.2x5.3
ST3243EB		●	●	3	5	400	15KV	8	-40	85	TSSOP28 9.7 x 4.4
ST3243EC		●		3	5	400	15KV	8	0	70	TSSOP28 9.7 x 4.4
ST75185C				3	5	120	2KV	-	0	70	TSSOP 20

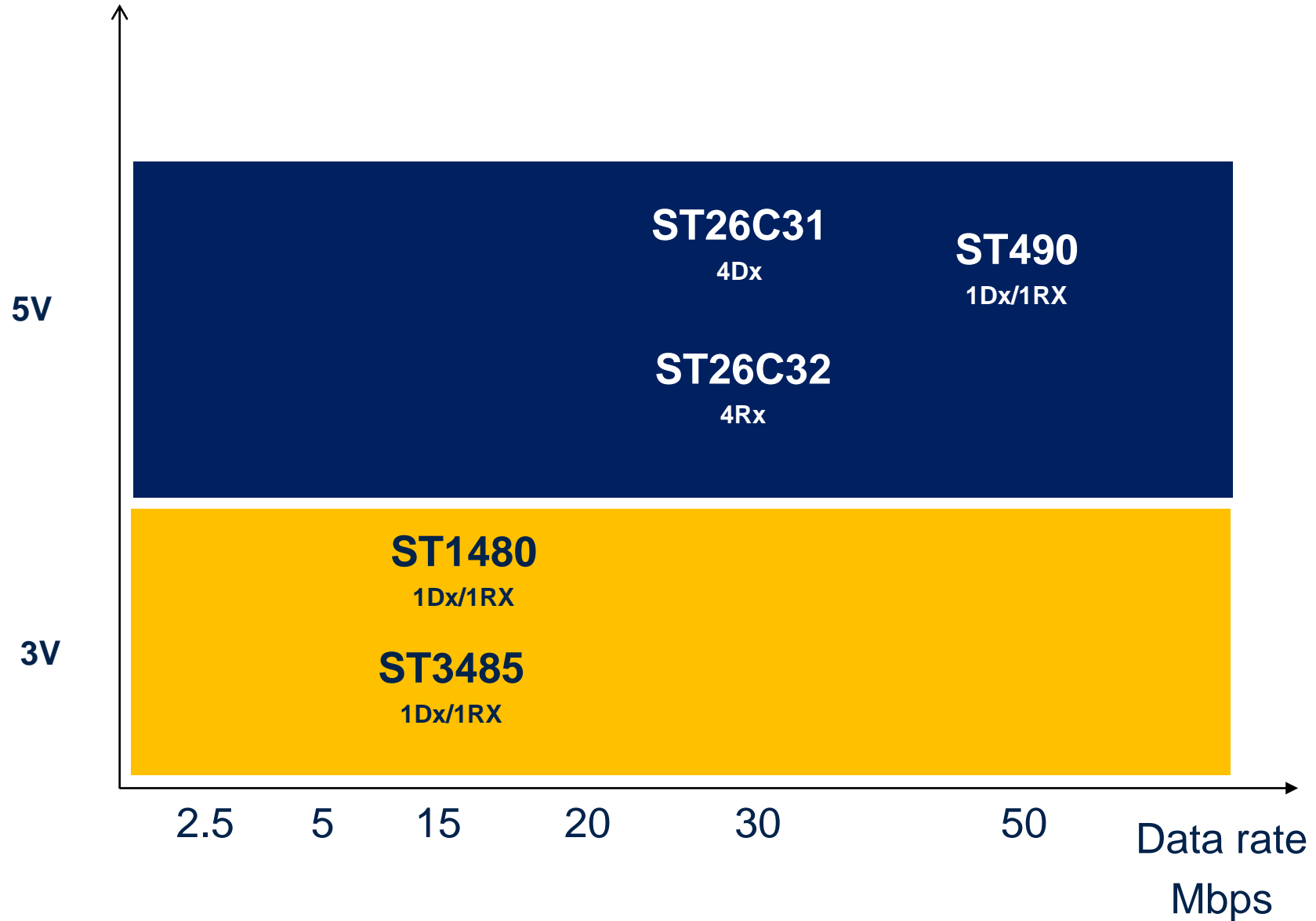


# RS485 interfaces



# RS422/423 interfaces

Supply voltage



# Interfaces and Transceivers / RS-422 RS-423 RS-485

Part Number	Supply Voltage (V) typ	Half-Duplex	Full-Duplex	Contact ESD	RS-422	#TX	#RX	Data Rate (Mb/s)	# nodes	ESD: HBM (v)	IEC 61000-4-2 (kV) Contact	Current Consumption (Icc) (mA) max	Common Mode Input Voltage (V)	Fault protection voltage	Fail safe circuit	Grade	Temperature (°C) min	Package
<a href="#">SERC816</a>	-		●			1	1	16	-	2000	-	-	-	-	-	Industrial	-40 to 85	PQFP 100 14x20x2.7
<a href="#">ST1480AB</a>	3.3	●		●		1	1	12	64	15000	8	2.2	-7 to 12V	-14.0 to 14.0	Open	Industrial	-40 to 85	SO-8
<a href="#">ST1480AC</a>	3.3	●		●		1	1	12	64	15000	8	2.2	-7 to 12V	-14.0 to 14.0	Open		0 to 70	SO-8
<a href="#">ST26C31B</a>	5				●	4	0	10	-	1999,999	-	0.5	-7 to 7V	-	-	Industrial	-40 to 85	SO-16,TSSOP 16
<a href="#">ST26C32AB</a>	5				●	0	4	10	16	1999,999	-	23	-7 to 7V	-	Open	Industrial	-40 to 85	SO-16,TSSOP 16
<a href="#">ST3485EB</a>	3.3	●		●		1	1	12	64	15000	8	2.2	-7 to 12V	-14.0 to 14.0	Open	Industrial	-40 to 85	SO-8
<a href="#">ST3485EC</a>	3.3	●		●		1	1	12	64	15000	8	2.2	-7 to 12V	-14.0 to 14.0	Open		0 to 70	SO-8
<a href="#">ST3485EI</a>	3.3	●		●		1	1	12	64	15000	8	2.2	-7 to 12V	-14.0 to 14.0	Open	Industrial	-40 to 125	SO-8
<a href="#">ST3485EIY</a>	3.3	●		●		1	1	12	64	15000	8	2.2	-7 to 12V	-14.0 to 14.0	Open	Automotive	-40 to 125	SO-8
<a href="#">ST4485EB</a>	3.3	●		●		1	1	20	64	15000	8	2.2	-7 to 12V	-14.0 to 14.0	Open	Industrial	-40 to 105	SO-8
<a href="#">ST485AB</a>	5	●				1	1	30	32	4000	-	2.6	-7 to 12V	-7.5 to 12.0	Open	Industrial	-40 to 85	SO-8
<a href="#">ST485B</a>	5	●				1	1	2.5	64	2000	-	0.4	-7 to 12V	-14.0 to 14.0	Open	Industrial	-40 to 85	SO-8
<a href="#">ST485C</a>	5	●				1	1	2.5	64	2000	-	0.4	-7 to 12V	-14.0 to 14.0	Open		0 to 70	SO-8
<a href="#">ST485EB</a>	5	●		●		1	1	5	256	1500	8	0.4	-7 to 12V	-14.0 to 14.0	Open	Industrial	-40 to 85	SO-8
<a href="#">ST485EC</a>	5	●		●		1	1	5	256	1500	8	0.4	-7 to 12V	-14.0 to 14.0	Open		0 to 70	SO-8
<a href="#">ST485ERB</a>	5	●		●		1	1	2.5	64	1500	8	0.4	-7 to 12V	-14.0 to 14.0	Open	Industrial	-40 to 85	SO-8
<a href="#">ST485EX</a>	5	●		●		1	1	5	256	1500	8	0.4	-7 to 12V	-14.0 to 14.0	Open	Industrial	-55	SO-8
<a href="#">ST490AB</a>	5		●			1	1	25	32	3500	-	5	-7 to 12V	-7.5 to 12.0	Open	Industrial	-40 to 85	SO-8
<a href="#">STR485</a>	3.3	●		●		1	1	20	256	8000	8	0.9	-7 to 12V	-7.5 to 12.0	Open	Industrial	-40 to 105	VDFPN 10 3x3x1.0



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