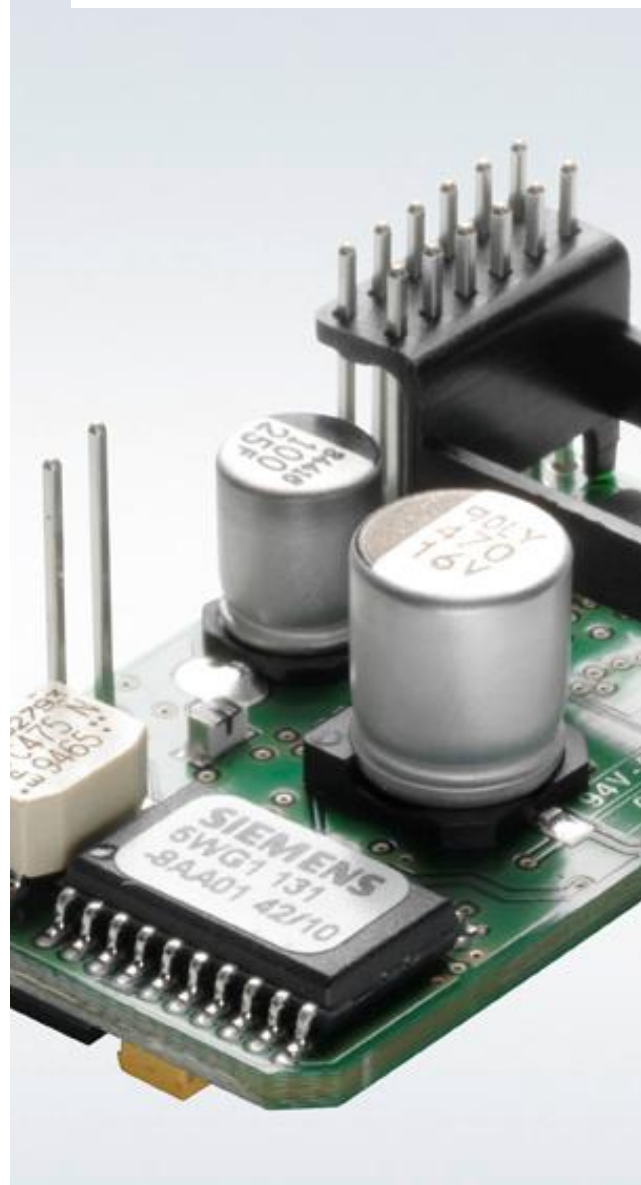


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GAMMA B2B

TPUART 2 Technical Features



Contents

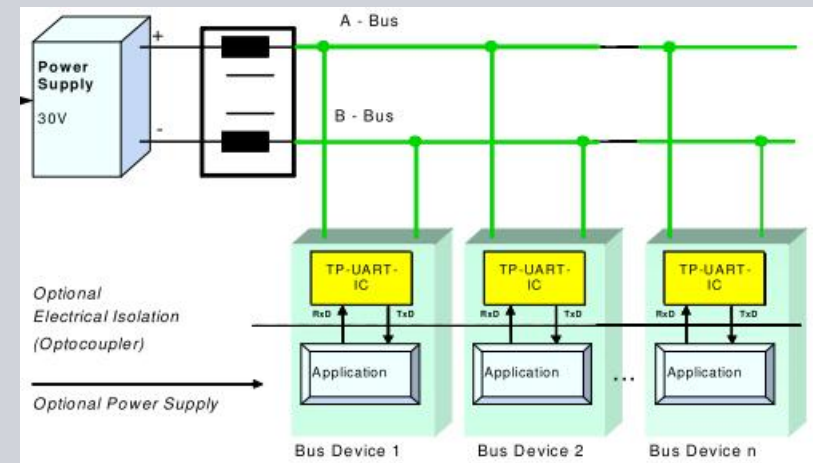
- **Next Generation TP Transceiver**
- Key Features
- Block Diagram
- KNX Bus Connection
- 20V Supply
- 5V / 3.3V Supply
- Clock Generator
- Host Interface
- Power-Up / Power-Down
- Application Circuit (Normal Operation)
- Communication Services
- Test boards

TP-UART 2

Next Generation TP Transceiver

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- More power
- High efficiency
- Proven high quality
- Smaller size
- Easy application design
- Relieve of the host controller
- Software compatible to TP-UART 1
- Multi-patented solution



Contents

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TP-UART 2

Key Features

- **KNX Interface**
 - Certified TP256 KNX transceiver
 - Automatically adjusted current slopes
 - VB+ operation 45 V and absolute maximum rating 50V
 - Maximum input current 66 mA
- **Power supply**
 - V_{CC} switchable between 5 V and 3,3 V
 - High output power at V_{CC} : 250 mW
 - High over all efficiency at V_{CC}
 - 20V linear regulator (based on internal supply)
 - High output power at V_{20} : 500 mW (typical 20V/25mA)
 - V_{20} with adjustable current limit, short-circuit proof (reactionless)
- **Operating Temperature Range -25°C to $+85^{\circ}\text{C}$**
- **Package QFN 36 (6*6 mm) with accessible pins**

TP-UART 2

Key Features (2)

- **Host-Controller Interface**
 - **TP-UART 2**
 - 9.6 / 19.2 kBaud
 - 1 Send buffer
 - **TP-UART 2+**
 - 19.2 / 115.2 kBaud
 - 2 send buffers
- **2-wire protocol with software handshake**
- **TP-UART 1 compatible**
 - based on digital TP-UART 1 designed
 - verified with existing stacks

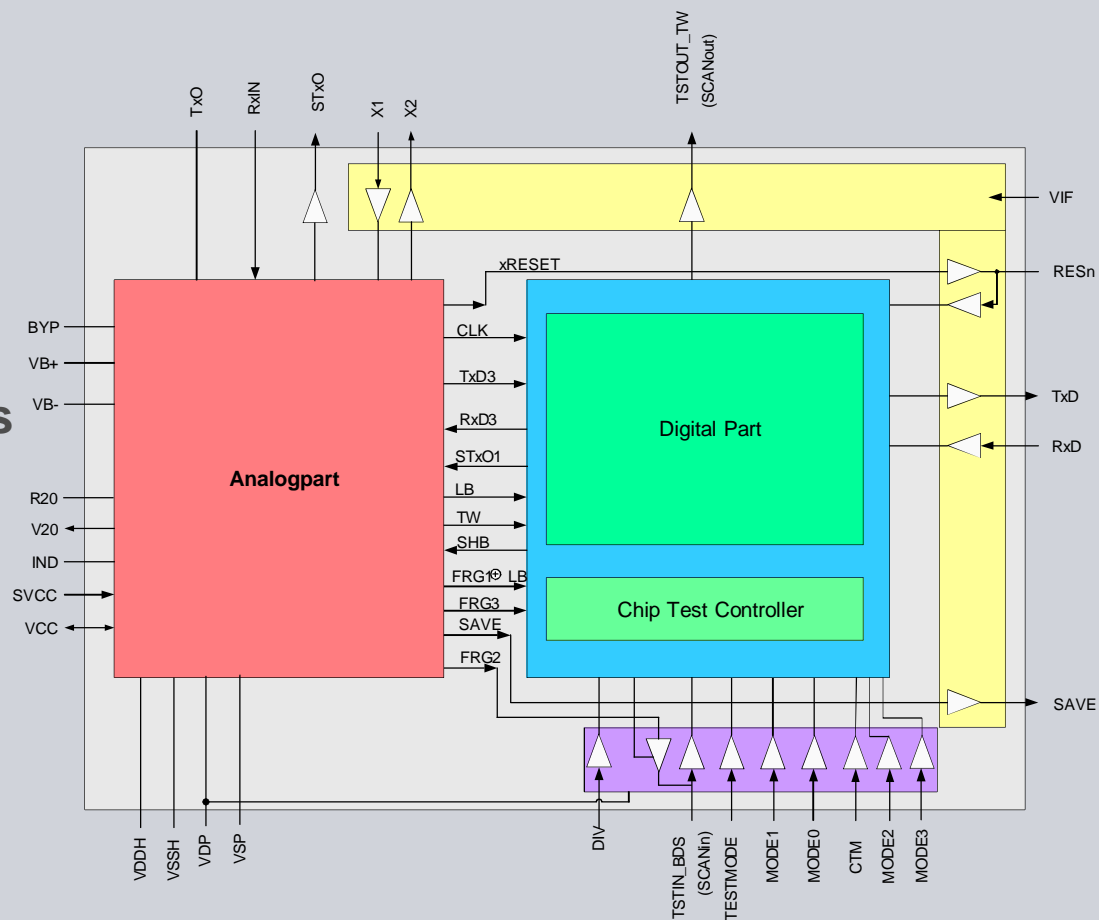
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TP-UART 2

Block Diagram – Hardware View

- **Analog Part**
 - Transceiver like FZE1066
 - Power Supplies
- **Digital Part**
 - TPUART 1 compatible
 - Optional additional services
- **Separate port supply VIF**
 - Keeps IOs defined even under operation voltage
 - Stable reset signal for low power microcontrollers (down to 1 V)



TP-UART 2

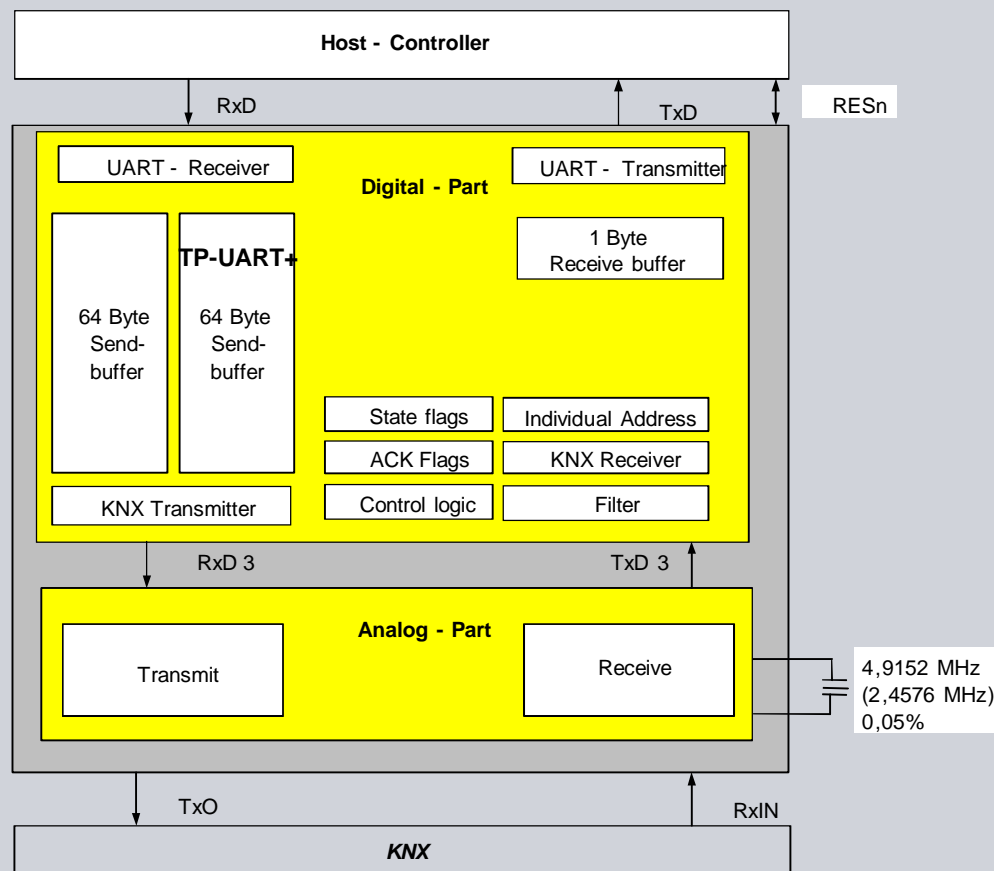
Block Diagram – Communication View

- **Compatibility with TPUART 1**

- No stack change necessary
 - based on TPUART 1 design
- Critical timings
- Checksums, parity
- Immediate acknowledge
- Transmission repetition
- Buffering of send frames

- **Additional features**

- Version information
- Busy Mode
- Individual address filter
- Auto acknowledge
- Optional second send buffer



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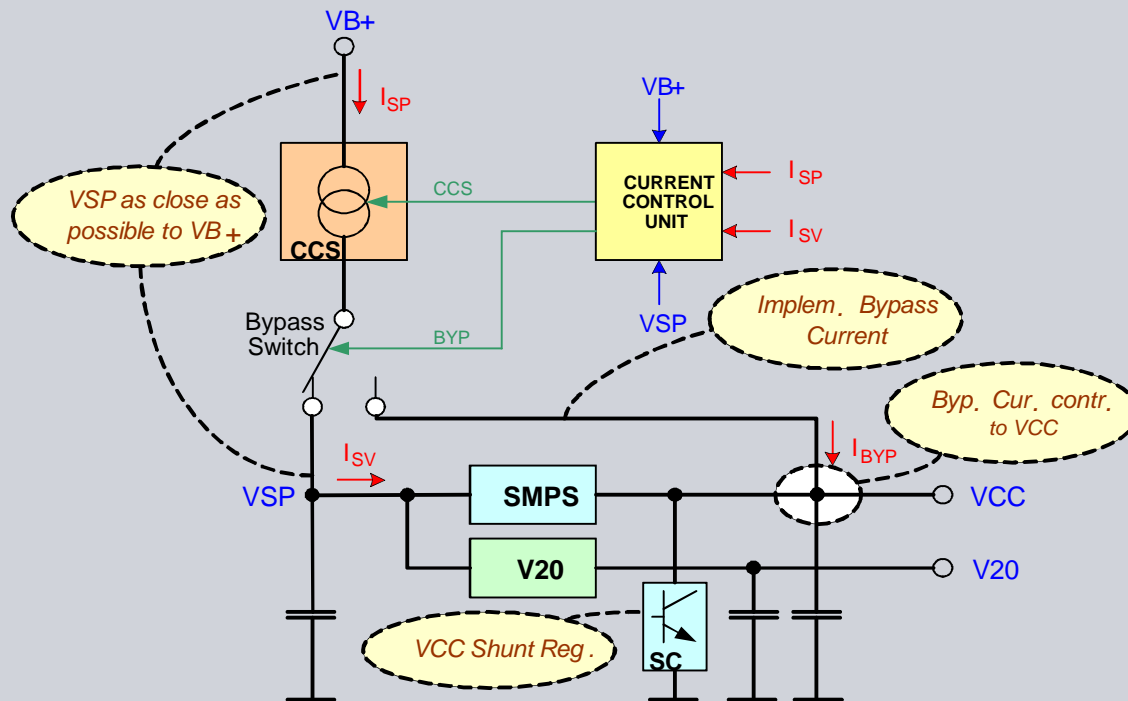
TP-UART 2 KNX Bus Connection

SIEMENS

- **TP256 KNX transceiver**
- **Automatically adjusted current slopes**
 - Maximum input current typ. 60 mA (54 mA – 66 mA)
- **Tested Compatibility and High Quality**
 - Load changes without side effects
 - VB+ operation 45 V and absolute maximum rating 50 V
 - Tested in combination with FZE1065, FZE1066, discrete solution and TP-UART 1
 - Worst case scenarios tested well beyond certification tests, e.g. different positions and number of devices and power supplies in different topologies and different loads
- **Analog Transceiver**
 - Compatible with FZE1066

TP-UART 2 KNX Bus Connection

- **Optimized for high efficiency**
 - High VSP for low losses at current source
 - No energy “lost” to ground → used in VCC
 - Additional efficiency improvement with load on V20

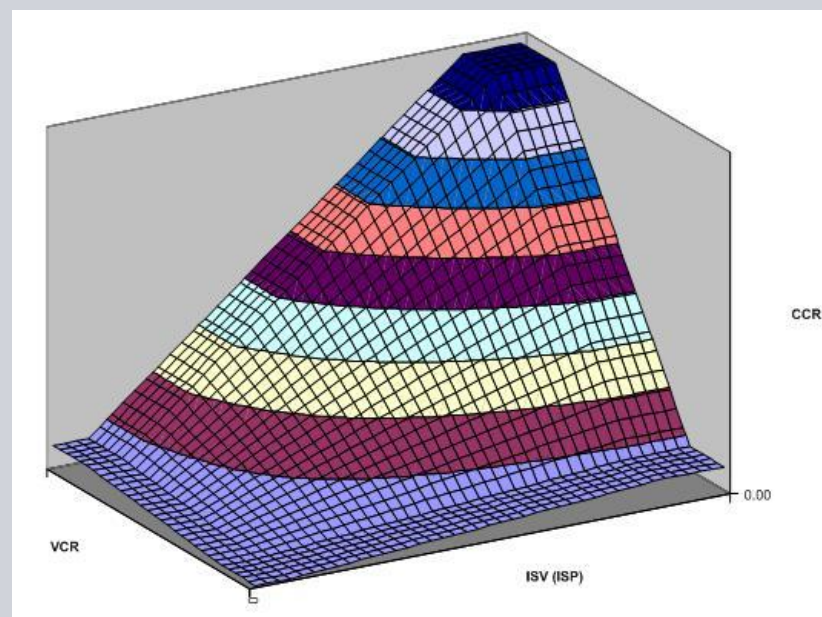


TP-UART 2 KNX Bus Connection

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Automatic current slew rate control for optimum performance under all conditions

- Optimal current slew rate depending on e.g.
 - VB+ (Bus Voltage)
 - VCR (Voltage Change of VSP)
 - VSP (Internal Buffer Voltage)
 - ISP (Bus Current)
 - ISV (Internal Load Current)
- Relieve application designer
- No knowledge of transmission technology necessary
- Fixed slew rates may cause tricky bugs (dynamics of load and communication)
- Fan-In = max. current @24V
e.g. about 45 mA with max. load



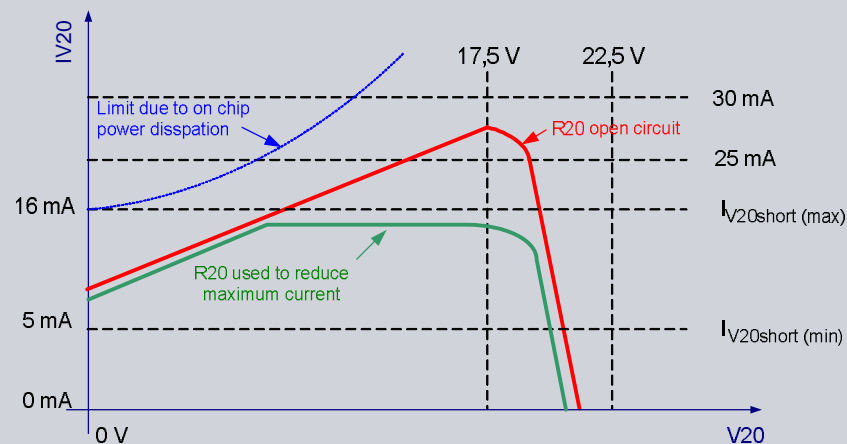
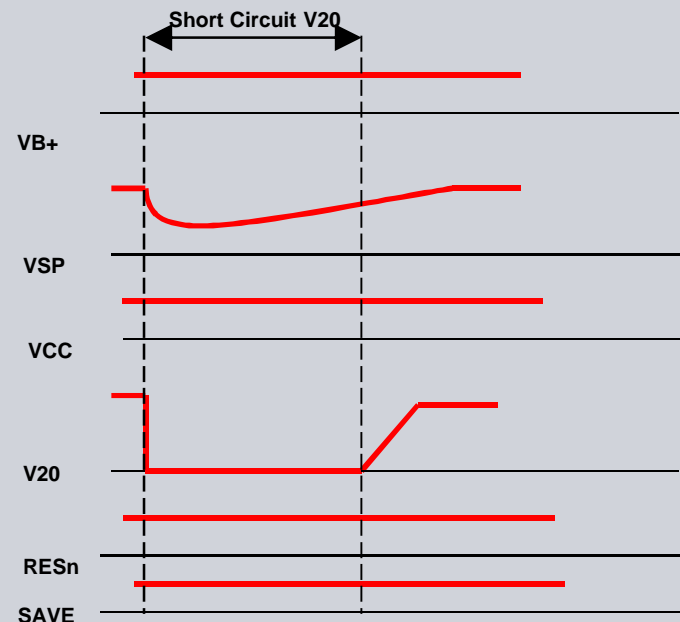
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TP-UART 2 V20 Supply



- Short-circuit proof
- Each operating point (continuously) allowed
- No interference of V20 short-circuit with bus or V_{CC} (no side effects)
- Selectable current limitation
- Power dissipation limited below 500 mW
- V20 automatically switched off during soft start
- Minimum value: 17.5 V



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TP-UART 2

5V / 3.3V Supply

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- **Switchable between 5 V and 3.3 V**
- **High Power**
up to 50mA @ 5 V / 3.3 V
- **High overall efficiency**
- **Supervised voltage**
- **No external flyback diode**
- **Low difference between VSP and 5 V / 3.3 V for long save time**

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TP-UART 2 Clock

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- **Crystal without additional capacitors**
- **Low cost crystal**
- **Same component as TP-UART 1**
- **Optional external clock on X1 (and X2 open)**
 - **No separate crystal**
 - **Supply from host controller
(frequency depends on dividers in host controller)**

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TP-UART 2 Host Interface

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- **Host interface signals supplied by VIF**
→ signals are valid at very low levels during power down
- **Reset, if V_{CC} or V_{SP} too low**
- **Temperature Warning → disables TxO and reduces current**
→ signal and message
Should not happen under normal conditions
- **Save signal on bus power down**
Hold up time (@ I_{VCC} 50mA and I_{V20} 25 mA): typ. 75 ms
- **UART receiver baud rate tolerance of max. 3%**

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TP-UART 2

Power-Up / Power-Down

SIEMENS

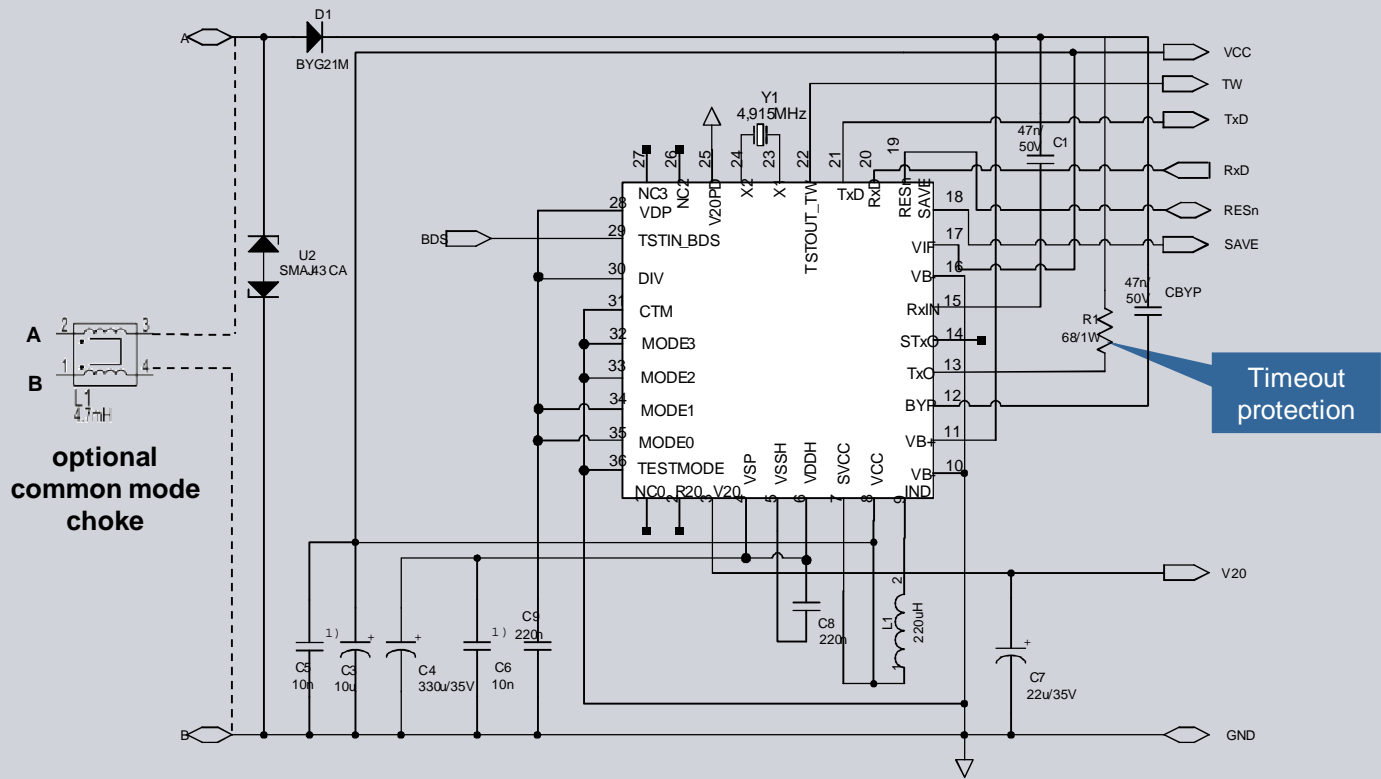
- **Soft Start limits current if devices are connected to an operating system to 10 mA**
→ no power break down
- **V_{CC} and V_{20} are powered up when the buffer capacitor is loaded**
→ stable start condition
- **Save signal depends on bus voltage only**
 - **typical signal on-level 16.25 V with minimum 3 ms duration**
→ interference protection
- **Reset signal depends on V_{CC} and buffer voltage (SMPS input)**
→ stable operation condition for host

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- **Application Circuit (Normal Operation)**
- Communication Services
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TP-UART 2 Application Circuit (normal operation)

- Proven TP-UART1 design
- EMC robust design
- Most components shared with TP-UART 1
- Buffer capacitor C_{VSP} (C4) can be reduced with lower load



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TP-UART 2 Communication Services

TP-UART 2 positioning in the communication stack

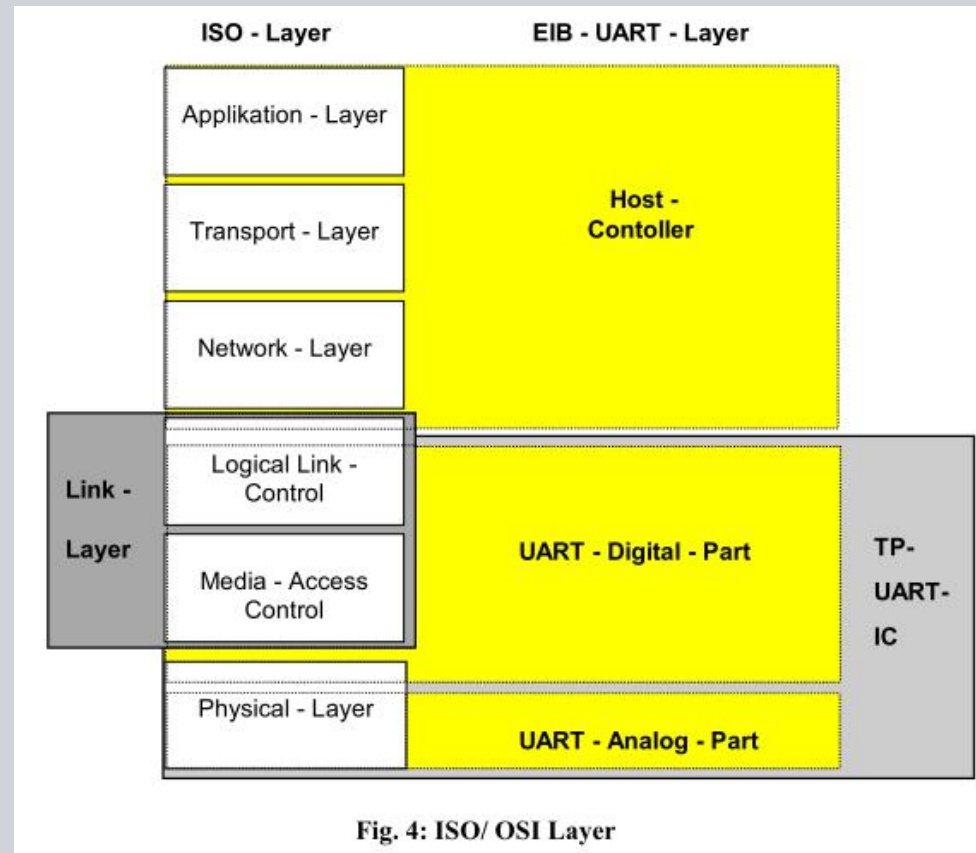


Fig. 4: ISO/ OSI Layer

TP-UART 2 Communication Services

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- **Compatibility with TPUART 1**
 - No stack change necessary
 - Based on TPUART 1 design
 - Critical timings
 - Checksums, parity
 - Immediate acknowledge
 - Transmit repetition
 - Buffering of send frames

- **Additional features**
 - Version information
 - Busy Mode
 - Individual address filter
 - Auto acknowledge
 - Optional second transmit buffer

TP-UART 2

Communication Services – New Features Only



- **Version information**
 - U_ProductID service
 - delivers product ID and revision number
 - allows flexible stack design

- **Busy mode**
 - U_ActivateBusyMode and U_ResetBusyMode services
 - automatically handles bus traffic, if the host is not available (e.g. flash erase)
 - generates BUSY if the transceiver is addressed
 - Timeout after 700ms

- **Adjustable telegram repetitions**
 - U_MaxRstCnt service
 - sets maximum number of repetitions for BUSY and NAK individually.
 - Default after reset: 3 (like TP-UART 1)

- **Automatic address evaluation and acknowledgement**
 - U_SetAddress service
 - automatically handles individual addressed telegrams
 - address filter for telegrams
 - acknowledgement if addressed
 - all group telegrams are acknowledged
 - parity and checksum evaluation
 - deactivated after reset

- **Securing transmission by CRC**
 - U_ActivateCRC service
 - CRC16-CCITT over complete received telegram (including checksum)
 - host detects synchronization errors with TP-UART
 - deactivated after reset

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- **Test boards**

TP-UART 2 Test board

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- **Evaluation board 1
(product quality)**
 - TPUART 2 only (no microcontroller)
 - TPUART 2 in normal mode
 - 5V supply selected
 - V20 available
 - All host interface signals available
- **Evaluation board 2
(development board)**
 - TP-UART 2 and TP-UART 2+ versions
 - Evaluation board with adjustable parameters



TP-UART 2 Take away

SIEMENS



- **More power**
- **High efficiency**
- **Proven high quality**
- **Smaller size**
- **Easy application design**
- **Relieve of the host controller**
- **Software compatible to TP-UART 1**
- **Multi-patented solution**