



Industrial Networking

# PROFIBUS Slave on QorIQ and PowerQUICC Processors

Single-chip solution for better application processing

## Overview

With over 35 million installed nodes, PROFIBUS is the world's most successful fieldbus (communication) technology used in industrial automation systems. Ongoing growth of around 10 percent per year is forecast and this expansion will be aided by the addition of PROFIBUS functionality to Freescale PowerQUICC and QorIQ communication processors. The integration of PROFIBUS layer 2 creates a single-chip solution with a direct connection to an RS485 transceiver. This eliminates the cost and board space associated with an external PROFIBUS ASIC, which is otherwise required.

Building on the versatility and long-term success of QUICC Engine technology, Freescale is now offering PROFIBUS layer 2 firmware for PowerQUICC and QorIQ processors with QUICC Engine technology. This solution not only removes the need for a costly PROFIBUS ASIC, it also leaves the processor core almost entirely free for application processing.

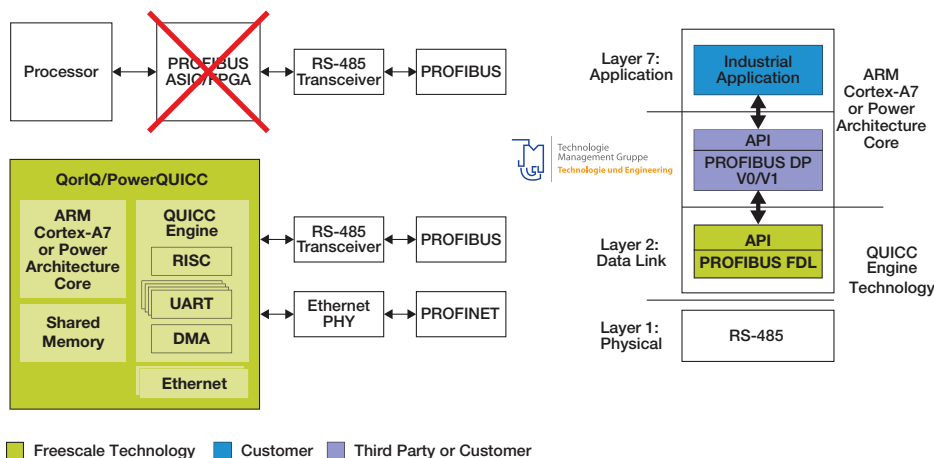
Comprising of multiple flexible communication controllers, programmable RISC engines, DMA and local multi-user RAM (MURAM), QUICC Engine technology is ideal for offloading UART and Ethernet-based communication protocols. In this case, the PROFIBUS layer 2 firmware runs on the QUICC Engine RISC engine while the PROFIBUS stack and customer application (layer 7) run on the processor core. Interaction between layer 7 and layer 2 is via the shared MURAM/SDRAM using the supplied software API.

Combined with a PROFIBUS slave stack from TMG TE GmbH, this PROFIBUS slave solution with a transmission rate of 12 Mb/s has been certified by ComDec, a PROFIBUS certification lab

## Target Applications

- Factory automation
- Industrial control
- Motion control
- Process automation
- Safety-critical applications
- Transportation systems

## PROFIBUS Block Diagram



hosted by Siemens AG. The solution can be deployed on QUICC Engine-enabled QorIQ P1, T1 and LS1 families of processors as well as the MPC8309 PowerQUICC processor.

QorIQ processors can also provide simultaneous support for Industrial Ethernet protocols like PROFINET.

### Try It Out

Customers can try out the Freescale PROFIBUS solution in two different ways. Customers with their own PROFIBUS slave stack can download a PROFIBUS layer 2 API firmware-only package (including layer 2 API) and build on that. Alternatively, customers can license the PROFIBUS slave stack directly from TMG. Those who wish to continue with TMG can license directly from them.

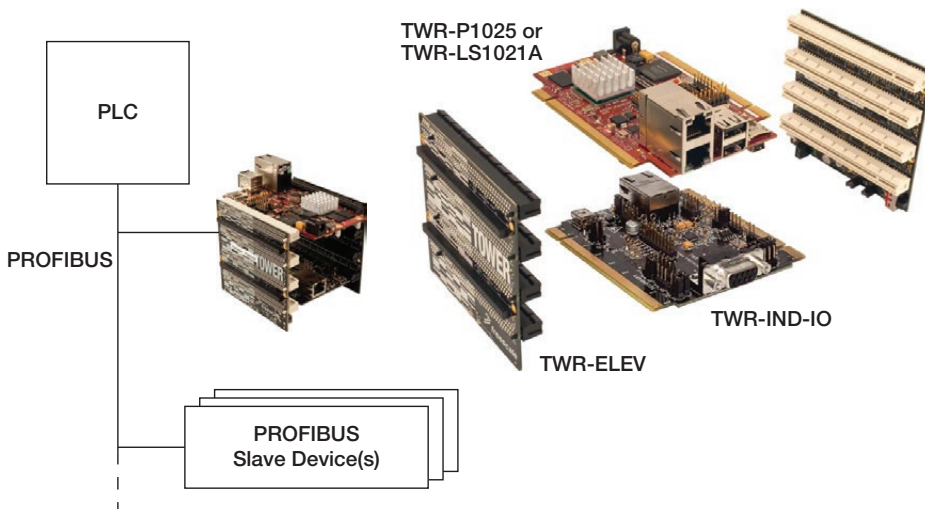
The hardware platform for PROFIBUS evaluation is based on the TWR-P1025 module which is part of the Freescale Tower System portfolio. The evaluation kit (TWRP1025- KIT) comprises the TWR-P1025 processor module and TWR-IND-IO module for RS-485 connectivity. Module interconnect is provided by the TWR-ELEV elevator modules. The TWR-LS1021A provides an ARM-based solution. The Tower System offers open source hardware, with schematic and layout design files provided on request to help speed the customer hardware design cycle.

Customers can use this reference platform to evaluate the QorIQ processor in a PROFIBUS network comprising PLC and other slave devices. Once development is complete, customers can take their product to the PROFIBUS test labs for certification.

### Key PROFIBUS Features

- Data rates (bps or baud) of 12 M, 6 M, 3 M, 1.5 M, 500 K, 187.5 K, 933.75 K, 19.2 K and 9.6 K
- DPv0 and DPv1 support

### PROFIBUS Block Diagram



### Key QorIQ and PowerQUICC Features

Processor Features	PowerQUICC MPC8309	QorIQ P1021/P1012	QorIQ P1025/P1016	QorIQ LS1021A
<b>CPU</b>	e300, 333 MHz	Dual/Single e500, 800 MHz	Dual/Single e500, 533/667 MHz	Dual ARM Cortex-A7 MPCore + NEON Up to 1 GHz
<ul style="list-style-type: none"> <li>• L1 cache (I + D)</li> <li>• L2 cache</li> </ul>	16 KB + 16 KB	32 KB + 32 KB	32 KB + 32 KB	32 KB + 32 KB
<b>External memory (with ECC)</b>	DDR2 16/32-bit, 266 MHz	DDR2/3 32-bit, 400 MHz	DDR2/3 32-bit, 400 MHz	DDR3L/4 16/32-bit 800 MHz
<b>QUICC Engine controller</b>				
<ul style="list-style-type: none"> <li>• Multi-user RAM</li> <li>• Communication controllers*</li> <li>• UART/PROFIBUS</li> <li>• Ethernet</li> </ul>	16 KB	24 KB	24 KB	24 KB
<b>IEEE® 1588</b>	yes	yes	yes	yes
<b>Expansion/networking options</b>				
<ul style="list-style-type: none"> <li>• PCI</li> <li>• PCI Express®</li> <li>• 10/100/1000 Ethernet</li> </ul>	1	-	-	-
<b>GPIO*</b>	72*	63*	63*	88*
<b>Security acceleration</b>	-	yes	yes	yes

Additional I/O options include USB, SPI, I<sup>2</sup>C, SD/MMC, CAN (on MPC8309), and LCD Controller, PWM (on LS1021A). \* indicates multiplexed functionality.

### About TMG TE GmbH

TMG Technologie und Engineering is one of the leading service providers in industrial communication technology focused on PROFINET, EtherNet/IP™, PROFIBUS and IO-Link as well as TCI, FDT and EDD. TMG TE is member of PROFIBUS International, ODVA and the IO-Link consortium and is accredited as a competence center for PROFINET, PROFIBUS and IO-Link. TMG TE possesses its own basic technology and has already realized various master and device integrations based on their own or partners' technology.

### To learn more, visit [freescale.com/profibusQorIQ](http://freescale.com/profibusQorIQ)

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