



Infineon Technologies, a leading supplier of ICs for automotive and industrial applications, has developed the MicroSecond Channel (MSC) as the next-generation standard for exchanging data between controllers and power devices.

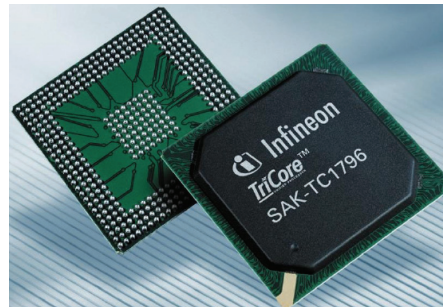
Power devices such as switches for automotive power train management typically require multiple channels of pulse width modulation (PWM) data with one microsecond resolution for real-time control functions. MSC dramatically reduces the pin/wire count of previous generation power device interfaces like parallel/SPI. Using a six-wire interface known as the μ sBus, MSC provides two-way communication:

- ▶ Downstream data transmission from the electronic control unit (ECU) to the power device is through a high-speed (up to 40 MBaud), synchronous, serial interface
- ▶ Upstream data transmission from the power device to the ECU is through a one-wire, low-speed, asynchronous serial interface

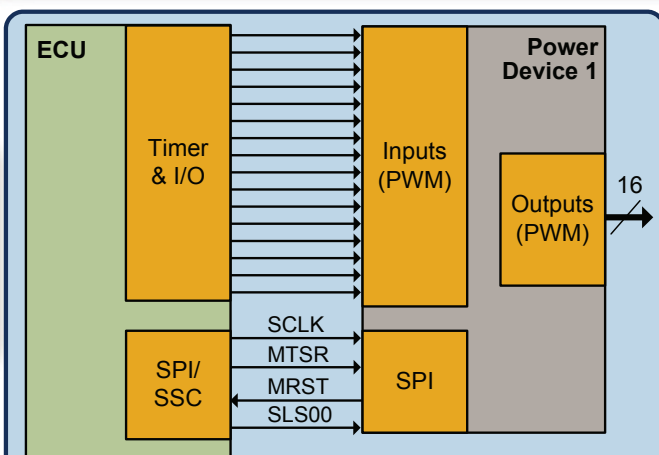
A single MSC master connects up to four MSC-enabled power devices. Overall, MSC is less costly than parallel PWM due to the lower pin count and can operate at higher frequencies than SPI because loopback delay is not an issue in the μ sBus protocol.

Infineon is deploying MSC in its TriCore series ECUs and multichannel smart switch ASSPs. To keep advanced automotive electronics systems affordable, IPextreme is making the MSC specification available and offering production-proven implementation IP. MSC IP from IPextreme is technology-independent and fully synthesizable.

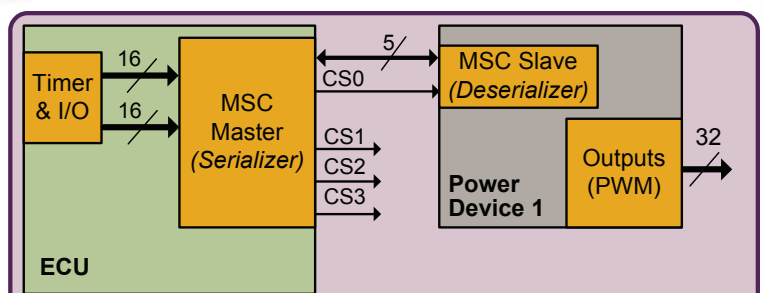
MSC PROVEN IN INFINEON DEVICES



- ▶ TLE6244X
- ▶ TC1166
- ▶ TC1766
- ▶ TC1796



Previous generations use parallel input for PWM; SPI for control/status. One 16-PWM-channel power device requires 20 connections. Each additional power device requires 17 more connections.



MSC/ μ sBus uses just 6 connections for PWM and control/status.

Each MSC port supports 32 PWM channels.

Each additional power device adds only one pin (CS).

MSC means fewer wires between ECUs and power devices.

MSC FEATURES

Controllers and power devices need to exchange various types of data:

- Downstream high-speed, low-latency control data, typically PWM with one- μ sec resolution
- Downstream medium-speed, medium latency configuration data, typically transferred at start-up and as needed for reconfiguration
- Upstream diagnostic data from the power device to the ECU

In addition, the data transmission is often over wires up to one meter in length and in the presence of electromagnetic interference (EMI). MSC meets these challenges with minimum pin count by offering:

- High-speed (up to 40 Mbaud) synchronous serial communication to power devices such as ignition or injection drivers (replaces the high-speed parallel PWM data interface and downstream SPI function)
- Low-speed asynchronous upstream communication channel (replaces upstream SPI function)
- Serializing of PWM channels without additional software load (for example, by receiving parallel PWM data from timer unit)
- EMI rejection through low-voltage differential signals (LVDS)
- Very low pin count, only 6 wires to connect 32 fast PWM channels
- Standard SPI protocol also supported for high-speed downstream channel
- Scalable approach, up to four MSC ports per MSC master
- Choice of host processor interface: Infineon FPI, AMBA AHB-Lite or APB

DOWNSTREAM CHANNEL FEATURES

- High-speed synchronous serial transmission
- Serial output clock frequency: $f_{FCL} = f_{MSC}/2 = 40$ MHz (typical)
- Command, data, and passive frame types

- Start of serial frame: software controlled, timer controlled, or free running
- Transmission with or without selection (SEL) bit
- Flexible chip select generation indicates status during serial frame transmission
- Emergency stop without processor intervention

UPSTREAM CHANNEL FEATURES

- Low-speed asynchronous serial reception
- Baud rate: f_{MSC} divided by 4, 8, 16, 32, 64, 128, or 256
- Standard asynchronous serial frames (compatible to UART)
- Programmable upstream data frame length (16 or 12 bits)
- Parity error checker
- 8-to-1 input multiplexer for SDI line
- Built-in spike filter on SDI

MSC IMPLEMENTATION IP DELIVERABLES

- Synthesizable VHDL source code
- Integration testbench
- Documentation
- IPextreme XPack packaging technology for design configuration, simulation, and synthesis with support for common EDA tools

MSC SPECIFICATION

The MSC specification is also available from IPextreme. For more information, go to www.ip-extreme.com.

IPextreme

IPextreme, Inc.

307 Orchard City Drive
M/S 202
Campbell, CA 95008
800-289-6412 (toll-free)
408-608-0421 (fax)

www.ip-extreme.com

© Copyright 2007, IPextreme. All rights reserved. IPextreme and the IPextreme logo are trademarks of IPextreme, Inc. All other trademarks are the property of their respective owners.