Highly integrated automotive radar MCU for advanced driver assistance systems

**Overview**

The Qorivva MPC577xK 32-bit embedded MCU family is specially designed for automotive radar systems, providing high levels of digital and analog integration and performance within a single chip for next-generation radar-based ADAS systems. The MPC577xK family removes the need for additional external components to the MCU that are typically used in existing radar systems, such as an FPGA, ADC, DAC and SRAM, thus reducing the overall number of components within the system, the size of the PCB and the complexity of software. The MPC577xK MCU family, when combined with the MRD2001 77 GHz packaged radar front-end chipset, offers a complete system-level radar solution for ADAS applications.

**Radar MCU Chipset Evolution**

Traditional System Configuration
- RF Rx Mixer
- BB Filter, Amplifier
- RF Tx Amplifier
- VCO
- FPGA
- Signal Processing
- Timing Controller
- Chirp Generation
- SRAM
- CAN, FlexRay™, Ethernet

Future System Configuration with Freescale Radar Chipset
- MRD2001 Rx
- MRD2001 Tx
- MRD2001 VCO
- Qorivva MPC577xK MCU
- 2x Z7 (266 MHz)
- 1x Z4 LS (133 MHz)
- 8x SD ADC, 4 SAR ADC, DAC
- SPT (FFT Accelerator, DMA)
- 4 MB Flash
- 1.5 MB SRAM
- Ethernet
- Integrated Safety
- CAN, FlexRay™, Ethernet

**Target Applications**
- Adaptive cruise control
- Emergency brake system
- Blind spot detection
- Park assist
- Cross traffic assist
- Side impact assist
- Radar fusion center
Software and Development Tools

A comprehensive suite of hardware and software development tools is available to help simplify and speed system design. Development support is available from world-class tool vendors, providing compilers, debuggers and simulation development environments.

Compilers
- Wind River Diab
- Green Hills Software

Debuggers
- P&E Micro
- Lauterbach

Runtime Software
- SPT assembler/disassembler
- RAAppID
- Flash and EEPROM drivers
- AUTOSAR MCAL 4.0

Operating Systems
- AUTOSAR OS 4.0 provided by third-party vendors

SafeAssure Program

Functional Safety. Simplified.

Our SafeAssure functional safety program is designed to help system manufacturers more easily achieve system compliance with International Standards Organization (ISO) 26262 and IEC 61508 functional safety standards. The program highlights Freescale solutions—hardware and software—that are optimally designed to support functional safety implementations and come with a rich set of enablement collateral. For more information, visit freescale.com/SafeAssure.

Qorivva MPC577xK MCU Key Features

In addition to the two 266 MHz e200z7 processing cores and the e200Z4 lockstep cores for functional safety, the MPC577xK MCU also features a state-of-the-art Signal Processing Toolbox (SPT). The SPT contains all the hardware modules required for processing sampled signals from short-, medium- and long-range radar applications.

Qorivva MPC577xK MCU Block Diagram

All devices in the MPC577xK family are part of the SafeAssure program, designed to help system manufacturers more easily achieve compliance with functional safety standards. The family is built around a safety concept targeting an ISO 26262 ASIL D integrity level. The MPC577xK family has an integrated safety architecture that helps minimize additional software and module-level features to reach this target.

MPC577xK Features for Radar

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radar Processing Platform</td>
<td>Signal Processing Toolbox (SPT): FFT accelerator, DMA</td>
</tr>
<tr>
<td>ADC input</td>
<td>8x SD – 10 MHz, 4x 12-bit SAR - 1 MHz</td>
</tr>
<tr>
<td>DAC</td>
<td>2 Ms/s 8-bit DAC</td>
</tr>
<tr>
<td>CPU Platform</td>
<td>Processing cores: 2x e200z7 (266 MHz)</td>
</tr>
<tr>
<td>Functional safety core 2</td>
<td>e200Z4 in lockstep (133 MHz)</td>
</tr>
<tr>
<td>Vehicle and ECU Network</td>
<td>Ethernet, FlexRay, LFAST</td>
</tr>
<tr>
<td>Memory</td>
<td>NVM: 4 MB with ECC</td>
</tr>
<tr>
<td>External Memory U/F</td>
<td>16-bit PDI</td>
</tr>
<tr>
<td>Safe Memory</td>
<td>3x eTimers: 6-ch. each</td>
</tr>
<tr>
<td>Safety and Support</td>
<td>PMU, OSC and PLL, T sensor, FCCU and CRC, safe DMA, Nexus 3+</td>
</tr>
<tr>
<td>Package</td>
<td>356 PBGA</td>
</tr>
<tr>
<td>Temperature</td>
<td>–40 °C to +125 °C, 150 °C Ta, AEC-Q100 grade 1</td>
</tr>
<tr>
<td>Supply</td>
<td>3.3 V I/O (5 V SAR) and 1.2 V core (ext. or PMU)</td>
</tr>
</tbody>
</table>

For more information, visit freescale.com/MPC577xK

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