E-Ray FlexRay™ Protocol Controller

**Highlights**

- E-Ray module performs communication according to the FlexRay™ protocol specification v2.1
- E-Ray module supports data rates of up to 10 Mbit/s on each channel.

**Key Features**

- Configuration of up to 128 message buffers
- Filtering based on slot, cycle, and channel value

**Customer Benefits**

- Allows greater flexibility with definition of a network
- Simplifies definition of acceptance or transmit criteria for each message
E-Ray
Configuration of up to 128 message buffers

8 Kbyte of Message RAM for storage of e.g. 128 Message Buffers with max. 48 byte data field or up to 30 Message Buffers with 254 byte Data Sections

Configuration of Message Buffers with different payload lengths possible

Each Message Buffer can be configured as receive buffer, as transmit buffer or as part of the receive FIFO

Host access to Message Buffers via Input and Output Buffer
- Input Buffer: Holds message to be transferred to the Message RAM
- Output Buffer: Holds message read from the Message RAM

<table>
<thead>
<tr>
<th>RAM Word</th>
<th>Message Buffer 0</th>
<th>Static Buffers</th>
<th>Start of Header Partition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0..3</td>
<td></td>
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</tr>
<tr>
<td>4..7</td>
<td>Message Buffer 1</td>
<td>Static + Dynamic Buffers</td>
<td>End of Header Partition</td>
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<tr>
<td></td>
<td>...</td>
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</tr>
<tr>
<td></td>
<td>Message Buffer N-1</td>
<td>FIFO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Message Buffer N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4*(N+1)</td>
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<td></td>
<td>Start of Data Partition</td>
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<td></td>
<td>...</td>
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<td>End of Data Partition</td>
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<tr>
<td>2047</td>
<td></td>
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</tbody>
</table>
E-Ray
Filtering based on slot, cycle, and channel value

› Acceptance filtering ➔ checking specific fields in a received Frame against the corresponding configuration values of the valid Message Buffers

› Transmit filtering ➔ comparing the configuration constants of the valid Message Buffers against the actual slot and cycle counter values

› Filtering is done on the following fields:
  – Channel ID
  – Frame ID
  – Cycle counter

› The following filter combinations for acceptance / transmit filtering are allowed:
  – Frame ID + Channel ID
  – Frame ID + Channel ID + Cycle Counter
E-Ray System integration

E-RAY module is connected to several external modules:

- **Clock Control:** generates all the necessary clocks for the E-RAY module
- **Interrupt Router:** schedules service requests coming from various E-Ray interrupt sources
- **Port Control:** connects the E-RAY module pins to the external GPIO pins
- **External Clock Output Unit (SCU module):** distribution of Macro Tick as time base for distributed system control
- **External Request Unit (SCU module):** possibility of triggering stop watch events and providing global time e.g. to the on-chip timers
Overview

› Used in the adaptive suspension control systems that act simultaneously as an active anti-roll stabilizer and an electronic shock absorber

› “X-by-Wire” system; mechanical or hydraulic control systems are replaced by fully electrical or electronic solutions

Advantages

› CAN lacks deterministic and fault-tolerant aspects that are mandatory for “X-by-Wire” systems

› Due to its higher bandwidth (10 Mbps) in comparison with CAN overall system complexity will be reduced, which offers a path for more cost-effective solutions
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