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Keywords: T1, SCT, single chip transceiver, SCTs, transceivers, transciever, T1 SCT

APPLICATION NOTE 349

DS2152L vs. DS2151Q

Mar 29, 2001

Abstract: Application note 349 provides a detailed list of the features included in the DS2152L that are not included in the DS2151Q T1 single chip transceiver (SCT). All of the original features of the DS2151Q have been retained. All software and hardware for the DS2151Q may be used with the DS2152L with minimal effort.

Introduction

This application note highlights the differences between the DS2152L and the DS2151Q T1 Single Chip Transceivers. The DS2152L is a superset of the DS2151Q. All of the original features of the DS2151Q have been retained and software created for the DS2151Q is transferable to the DS2152L with minimal effort.

Additional Functionality

| New Features | Section |
|---|---------|
| Option for non-multiplexed bus operation | 1 & 2 |
| Crystal-less jitter attenuation | 14 |
| Additional hardware signaling capability <ul style="list-style-type: none"> • Receive signaling reinsertion to a backplane multiframe sync • Availability of signaling in a separate PCM data stream • Signaling freezing • Interrupt generated on change of signaling data | 7.2 & 9 |
| Per-channel code insertion in both transmit and receive paths | 8 |
| Full HDLC controller for the FDL with 16-byte buffers in both transmit and receive paths | 11 |
| RCL, RLOS, RRA, and RAIS alarms now interrupt on change of state | 4 |
| 8.192 MHz clock synthesizer | 1 |
| Per-channel loopback capability | 1 |
| Addition of hardware pins to indicate carrier loss and signaling freeze | 1 |
| Line interface function can be completely decoupled from the framer/formatter to allow: <ul style="list-style-type: none"> • Interface to optical, HDSL, and other NRZ interfaces • Be able to tap the transmit and receive bipolar data streams for monitoring purposes • Be able to corrupt data and insert framing errors, CRC errors, etc. | 1 |
| Transmit and receive elastic stores now have independent backplane clocks | 1 |
| Ability to monitor DS0 channel in both the transmit and receive paths | 6 |
| Access to the data stream in between the framer/formatter and the elastic stores | 1 |
| AIS generation in the line interface that is independent of loopbacks | 1 & 3 |
| Ability to calculate and check CRC6 according to the Japanese standard | 3 |
| Ability to pass the F-Bit through the elastic stores in the 2.048 MHz backplane mode | 3 & 15 |
| Programmable in-band loop code generation and detection | 12 |
| Device identification register | 3 |

Changes in Register Definitions

When implementing the new features of the DS2152L, a priority was placed on preserving the DS2151Qs register map to facilitate code migration from existing DS2151Q designs. This section highlights register additions and differences found in the DS2152L.

New Feature Register Usage

Highlights specific registers containing bit locations related to new features. Each item can be found in the data sheet under the listed sections.

Full HDLC & BOC Controller For FDL Support (Section 11.1)

| Register | Description |
|----------|-------------------------------------|
| TCR1 | Transmit Control Register 1 |
| FDLC | FDL Control |
| FDLS | FDL Status |
| FIMR | FDL Interrupt Mask |
| RPRM | Receive Performance Report Message |
| RBOC | Receive Bit Oriented Code |
| RFFR | Receive FDL FIFO |
| TPRM | Transmit Performance Report Message |
| TBOC | Transmit Bit Oriented Code |
| TFFR | Transmit FDL FIFO |

DS0 Monitoring (Section 6.0)

| Register | Description |
|----------|-----------------------------|
| CCR5 | Common Control 5 (bits 4-0) |
| CCR6 | Common Control 6 (bits 4-0) |
| TDS0M | Transmit DS0 Monitor |
| RDS0M | Receive DS0 Monitor |

Hardware Based Signaling (Section 7.2 and 9)

| Register | Description |
|----------|--|
| RCBR1-3 | Receive Channel Block Registers 1-3 |
| TCBR1-3 | Transmit Channel Block Registers 1-3 |
| CCR4 | Common Control 4 (bits 7, 6, 2, and 1) |

Signaling Freeze (Section 3.0 and 7.2)

| Register | Description |
|----------|---------------------------------|
| CCR4 | Common Control 4 (bits 4 and 3) |

Per Channel Loopback (Section 8.0)

| Register | Description |
|-----------|-----------------------------|
| CCR4 | Common Control 4 (bits 0) |
| TIR1-TIR3 | Transmit Idle Registers 1-3 |

Per Channel Code (Idle) Insertion (Section 8.0)

| Register | Description |
|-----------|----------------------------------|
| TCC1-TCC3 | Transmit Channel Control 1-3 |
| TC1-TC24 | Transmit Channels Registers 1-24 |
| RCC1-RCC3 | Receive Channel Control 1-3 |
| RC1-RC24 | Receive Channels Registers 1-24 |

Programmable In-Band Loop Code Generation & Detection (Section 12)

| Register | Description |
|-----------------|----------------------------------|
| TCD | Transmit Code Definition |
| IBCC | In-Band Code Control |
| CCR3 | Common Control 3 (bit 1) |
| RUPCD | Receive Up Code Definition |
| RDNCD | Receive Down Code Definition |
| SR1 | Status Register 1 (bits 7 and 6) |

Device Identification (Section 3.0)

| Register | Description |
|-----------------|-----------------------|
| IDR | Device Identification |

Japanese CRC-6 Mode (Section 3.0)

| Register | Description |
|-----------------|--------------------------|
| CCR5 | Common Control 5 (bit 7) |
| CCR6 | Common Control 6 (bit 7) |

Interrupt On Change of State for RCL, RLOS, RRA, RAIS(Section 4.0)

| Register | Description |
|-----------------|---------------------------|
| SR2 | Status Register 2 |
| IMR2 | Interrupt Mask Register 2 |

Bit Assignment Changes Within Existing Registers

Highlights bit locations in the DS2152L which have changed from the DS2151Q.

| Register | Bit No. | DS2151Q Symbol | DS2151Q Description | DS2152L Symbol | DA2152L Description |
|----------|---------|----------------|-------------------------------|----------------|---|
| TCR1 | 2 | TLINK | TLINK Select | TFDLS | TFDL Select |
| TCR2 | 0 | B7ZS | Bit 7 Zero Suppression Enable | TB7ZS | Transmit Side Bit 7 Zero Suppression Enable |
| CCR1 | 3 | SCLKM | SYSCLOCK Mode Select | RSCLKM | RSYSCLOCK Mode Select |
| CCR1 | 4 | RLB | Remote Loop Back | TSCLKM | TSYSCLOCK Mode Select |
| CCR1 | 6 | LLB | Local Loop Back | ODF | Output Data Format |
| CCR3 | 0 | LIRST | Line Interface Reset | N/A | Not Assigned |
| CCR3 | 1 | TLU | Transmit Loop Up | TLOOP | Transmit Loop Up Enable |
| CCR3 | 2 | TLD | Transmit Loop Down | ECUS | Error Counter Update Select |
| CCR3 | 5 | P16F | Function of Pin 16 | RLOSF | Function of the RLOS/LOTC Output |
| RIR2 | 2 | JALT | Jitter Attenuator Limit Trip | RBLC | Receive Blue Alarm Clear |
| RIR2 | 6 | RL0 | Receive Level Bit 0 | LRCLC | Line Interface Receive Carrier Loss Clear |
| RIR2 | 7 | RL1 | Receive Level Bit 1 | RLOSC | Receive Loss of SYNC Clear |
| SR1 | 1 | RCL | Receive Carrier Loss | LRCL | Line Interface Receive Carrier Loss |
| SR2 | 0 | N/A | Not Assigned | RSC | Receive Signaling Change |
| IMR1 | 1 | RCL | Receive Carrier Loss | LRCL | Line Interface Receive Carrier Loss |
| IMR2 | 0 | N/A | Not Assigned | RSC | Receive Signaling Change |

Register Bit Moves

| Function | DS2151Q Location | DS2152L Location |
|----------|------------------|------------------|
| JALT | RIR2.2 | RIR3.5 |
| LIRST | CCR3.0 | CCR6.7 |
| LLB | CCR1.6 | CCR5.6 |
| RL0 | RIR2.6 | RIR3.6 |
| RL1 | RIR2.7 | RIR3.7 |
| RLB | CCR1.4 | CCR7.6 |

Changes In Device Pin Out

Package Types

The DS2152L is offered in a 100 pin 14 x 14 x 1.4 mm LQFP. The DS2151Q is offered in a 44 pin 16.7 x 16.7 x 4.0 mm PLCC. Values listed are for body dimensions.

Device Pin Differences

Control Port Pins

| DS2152L | DS2151Q | Description |
|---------------------|---------------|--|
| INT | INT1, INT2 | Flags host controller during conditions and change of conditions in the Status Registers 1 and 2, and the FDL Status Register. |
| TEST | N/A | Device pin tri-state enable. |
| MUX | N/A | Multiplexed/non-multiplexed bus operation select. |
| D0:D7 or AD0:AD7 | AD0:AD7 | Multiplexed/non multiplexed bus. |
| A0:A6 | N/A | Address bus. |
| A7 OR ALE | ALE | A7 in non-multiplexed bus operation, ALE in multiplexed bus operation. |

Line Interface Pins

| DS2152L | DS2151Q | Description |
|----------------|-----------------|---|
| MCLK | N/A | A 1.544 MHz TTL clock input used for clock/data recovery and for jitter attenuation. |
| MCLK, XTALD | XTAL1, XTAL2 | 1.544 MHz quartz crystal option instead of a TTL level clock at MCLK. |
| 8XCLK | N/A | An 8 x 1.544 MHz clock that is frequency locked to either the clock/data recovery block or the TCLK1 pin. |
| LIUC | N/A | Line interface circuitry connect enable. |
| RPOSO | N/A | Receive line interface RPOS bipolar data output. |
| RNEGO | N/A | Receive line interface RNEG bipolar data output. |
| RCLKO | N/A | Buffered recovered clock from the T1 line. |
| TPOSI | N/A | Transmit line interface TPOS data input. |
| TNEGI | N/A | Transmit line interface TNEG data input. |
| TCLKI | N/A | Transmit line interface clock input. |

Transmit Side Digital Pins

| DS2152L | DS2151Q | Description |
|---------|---------|---|
| TSYSCLK | N/A | Transmit side elastic store clock. |
| TSSYNC | N/A | Transmit side elastic store frame or multiframe sync input. |
| TSIG | N/A | Outgoing signaling data input. |
| TESO | N/A | Transmit elastic store data output. |
| TDATA | N/A | Transmit formatter data input. |
| TPOSO | N/A | Transmit formatter TPOS data output. |
| TNEGO | N/A | A Transmit formatter TNEG data output. |
| TCLKO | N/A | Buffered clock used to move data through the transmit side formatter. |

Receive Side Digital Pins

| DS2152L | DS2151Q | Description |
|---------|---------|--|
| RFSYNC | N/A | Receive frame sync. |
| RMSYNC | N/A | Receive multiframe sync. |
| RDATA | N/A | Receive side framer data output. |
| RSYSCLK | N/A | Receive side elastic store clock. |
| RSIG | N/A | Receive signaling bits output. |
| RCL | N/A | Receive carrier loss indication. |
| RSIGF | N/A | Receive signaling freeze indication. |
| 8MCLK | N/A | 8.192MHz clock referenced to RCLK. |
| RPOSI | N/A | Receive side framer positive data input. |
| RNEGI | N/A | Receive side framer negative data input. |
| RCLKI | N/A | Receive side framer clock input. |

Related Parts

| | |
|-------------------------|-------------------------------------|
| DS2151Q | T1 Single Chip Transceiver |
| DS2152 | Enhanced T1 Single Chip Transceiver |

More Information

For Technical Support: <http://www.maximintegrated.com/support>

For Samples: <http://www.maximintegrated.com/samples>

Other Questions and Comments: <http://www.maximintegrated.com/contact>

Application Note 349: <http://www.maximintegrated.com/an349>

APPLICATION NOTE 349, AN349, AN 349, APP349, Appnote349, Appnote 349

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