

Keywords: BSDL, JTAG, scan chain, boundary scan, chain mapping

APPLICATION NOTE 3894

# DS26522 JTAG Scan Chain Mapping

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*Abstract: This application note describes the JTAG hardware boundary scan chain for the DS26522 dual-port, single-chip transceiver. The DS26522 is composed of two dice, and the JTAG functionality is the same as two separate devices daisy chained together. This application note contains a complete breakdown of the JTAG scan chain and explains how to access all of the scan cells in the boundary.*

## Overview

This application note describes the JTAG hardware boundary scan chain for the DS26522 dual-port T1/E1/J1 single-chip transceiver (SCT). It is a dual-die module with two separate JTAG controllers in the same package (see **Figure 1**). Notice the internal JTAG connections. The JTDI pin is connected to the JTDI input of the first die (port 1), while the JTDO pin is connected to the JTDO output of the second die (port 2). JTRST, JTCLK, and JTMS are wired together in parallel to both ports. This causes the DS26522 to appear as two separate devices in any JTAG software application. To solve this issue, two BSDL files have been created: one for port 1 and one for port 2.

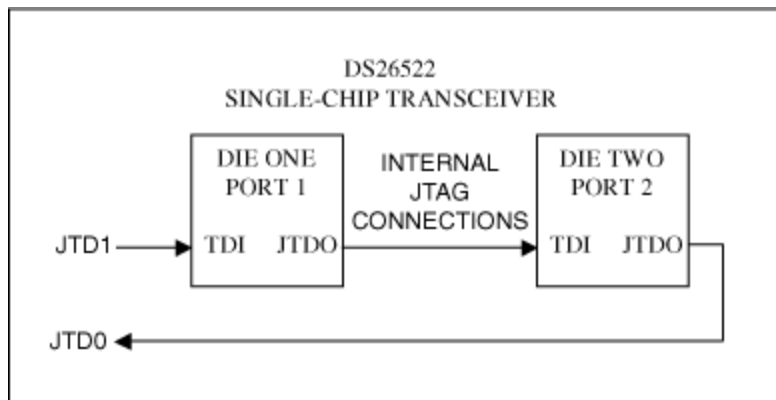


Figure 1. DS26522 JTAG Scan Chain

If the user would like to do any type of JTAG testing that requires a board netlist, the netlist will need to be modified to ensure that there are two unique instances of the DS26522 that correspond to the two BSDL files. **Table 1** contains the port location (SCT port), the pin names, BSDL cell scan position, BSDL cell name and other useful information that correspond to the pins in each BSDL file. The table has been sorted by port location (SCT number) and then BSDL cell scan position. This should allow easy access to the necessary information about which BSDL cell scan position maps to which port location and BGA pin number. Incomplete or incorrect JTAG testing can be caused by the failure to modify the netlist accordingly.

**Table 1. DS26522 JTAG scan chain: BGA pin to BSDL cell mapping**

SCT Port	BGA Pin	BSDL Scan Position	BSDL Scan Name	BSDL Scan Function	Data Sheet Symbol	Data Sheet Description
1	F8	0	TSER	Observe_only	TSER1	Transmit NRZ Serial Data
1	G8	1	TCLK	Observe_only	TCLK1	Transmit Clock
1	H8	2	TSYSCLK	Observe_only	TSYSCLK1	Transmit System Clock
1	--	3	--	Control	--	--
1	J7	4	TSYNC	Output3	TSYNC1	Transmit Synchronization
1	--	5	TSYNC	Observe_only	--	--
1	--	6	--	Control	--	--
1	G7	7	TSSYNCIO	Output3	TSSYNCIO1	Transmit System Synchronization In or Out
1	--	8	TSSYNCIO	Observe_only	--	--
1	--	9	--	Control	--	--
1	H7	10	TSIG	Output3	TSIG1	Transmit Signaling
1	--	11	TSIG	Observe_only	--	--
1	--	12	--	Control	--	--
1	F7	13	TCHBLK_CLK	Output3	TCHBLK/CLK1	Transmit Channel Block or Transmit Channel Block Clock
1	--	14	TCHBLK_CLK	Observe_only	--	--
1	--	15	--	Control	--	--
1	K5	16	RSER	Output3	RSER1	Received Serial Data
1	--	17	--	Control	--	--
1	L8	18	RCLK	Output3	RCLK1	Receive Clock
1	--	19	RCLK	Observe_only	--	--
1	J8	20	RSYSCLK	Observe_only	RSYSCLK1	Receive System Clock
1	--	21	--	Control	--	--
1	K7	22	RYSNC	Output3	RSYNC1	Receive Synchronization
1	--	23	RYSNC	Observe_only	--	--
1	--	24	--	Control	--	--
1	G6	25	RM_RFSYNC	Output3	RM/RFSYNC1	Receive Multiframe or Frame Synchronization
1	--	26	RM_RFSYNC	Observe_only	--	--
1	--	27	--	Control	--	--
1	H6	28	RSIG	Output3	RSIG1	Receive Signaling
1	--	29	RSIG	Observe_only	--	--
1	--	30	--	Control	--	--

1	F6	31	AL_RSIGF_FLOS	Output3	AL/RSIGF/FLOS1	Analog Loss or Receive Signaling Freeze or Framers LOS
1	--	32	--	Control	--	--
1	J5	33	RLF_LTC	Output3	RLF/LTC1	Receive Loss of Frame or Loss of Transmit Clock
1	--	34	--	Control	--	--
1	J6	35	RCHBLK_CLK	Output3	RCHBLK/CLK1	Receive Channel Block or Receive Channel Block Clock
1	--	36	RCHBLK_CLK	Observe_only	--	--
1	--	37	--	Control	--	--
1	K6	38	BPCLK	Output3	BPCLK1	Backplane Clock
1	--	39	--	Control	--	--
1	K8	40	REFCLKIO	Output3	REFCLKIO1	Reference Clock Input or Output
1	--	41	REFCLKIO	Observe_only	--	--
1	M9	42	MCLK	Observe_only	MCLK	Master Clock
1	K3	43	RESETB	Observe_only	RESETB	Reset Bar
1	--	44	--	Control	--	--
1	K4	45	INTB	Output3	INTB	Interrupt Bar
1	J3	46	WRB_RWB	Observe_only	WRB/RWB	Write Bar or Read-Write Bar
1	H3	47	RDB_DSB	Observe_only	RDB/DSB	Read Data Bar or Strobe Bar
1	L4	48	CSB	Observe_only	CSB1	Chip Select Bar
1	--	49	--	Control	--	--
1	M3	50	D0	Output3	D0/SPI_MISO	Data[0] or SPI Serial Interface Data Master-In Slave-Out
1	--	51	D0	Observe_only	--	--
1	--	52	--	Control	--	--
1	L3	53	D1	Output3	D1/SPI_MOSI	Data[1] or SPI Serial Interface Data Master-Out Slave-In
1	--	54	D1	Observe_only	--	--
1	--	55	--	Control	--	--
1	M2	56	D2	Output3	D[2]/SPI_SCLK	Data[2] or SPI Serial Interface Clock
1	--	57	D2	Observe_only	--	--
1	--	58	--	Control	--	--
1	M1	59	D3	Output3	D[3]	Data[3]

1	--	60	D3	Observe_only	--	--
1	--	61	--	Control	--	--
1	L2	62	D4	Output3	D[4]	Data[4]
1	--	63	D4	Observe_only	--	--
1	--	64	--	Control	--	--
1	L1	65	D5	Output3	D[5]/SPI_SWAP	Data[5] or SPI Bit Order Swap
1	--	66	D5	Observe_only	--	--
1	--	67	--	Control	--	--
1	K2	68	D6	Output3	D[6]/SPI_CPHA	Data[6] or SPI Interface Clock Phase
1	--	69	D6	Observe_only	--	--
1	--	70	--	Control	--	--
1	K1	71	D7	Output3	D[7]/SPI_CPOL	Data[7] or SPI Interface Clock Polarity
1	--	72	D7	Observe_only	--	--
1	J2	73	A0	Observe_only	A0	Address[0]
1	J1	74	A1	Observe_only	A1	Address[1]
1	H2	75	A2	Observe_only	A2	Address[2]
1	H1	76	A3	Observe_only	A3	Address[3]
1	G2	77	A4	Observe_only	A4	Address[4]
1	G1	78	A5	Observe_only	A5	Address[5]
1	F2	79	A6	Observe_only	A6	Address[6]
1	F1	80	A7	Observe_only	A7	Address[7]
1	E2	81	A8	Observe_only	A8	Address[8]
1	E1	82	A12	Observe_only	A12	Address[12]
1	E6	83	TXEN_B	Observe_only	TXENABLE1	Transmit Enable
1	E5	84	BTS	Observe_only	BTS	Bus Type Select
1	D7	85	SPI_SEL	Observe_only	SPI_SEL	SPI Serial Bus Mode Select
2	E12	0	TSER	Observe_only	TSER2	Transmit NRZ Serial Data
2	G11	1	TCLK	Observe_only	TCLK2	Transmit Clock
2	H11	2	TSYSCLK	Observe_only	TSYSCLK2	Transmit System Clock
2	--	3	--	Control	--	--
2	F11	4	TSYNC	Output3	TSYNC2	Transmit Synchronization
2	--	5	TSYNC	Observe_only	--	--
2	--	6	--	Control	--	--
2	F12	7	TSSYNCIO	Output3	TSSYNCIO2	Transmit System Synchronization In/Out

2	--	8	TSSYNCIO	Observe_only	--	--
2	--	9	--	Control	--	--
2	E11	10	TSIG	Output3	TSIG2	Transmit Signaling
2	--	11	TSIG	Observe_only	--	--
2	--	12	--	Control	--	--
2	G12	13	TCHBLK_CLK	Output3	TCHBLK/CLK2	Transmit Channel Block or Transmit Channel Block Clock
2	--	14	TCHBLK_CLK	Observe_only	--	--
2	--	15	--	Control	--	--
2	H12	16	RSER	Output3	RSER2	Received Serial Data
2	--	17	--	Control	--	--
2	L9	18	RCLK	Output3	RCLK2	Receive Clock
2	--	19	RCLK	Observe_only	--	--
2	J11	20	RSYSCLK	Observe_only	RSYSCLK2	Receive System Clock
2	--	21	--	Control	--	--
2	K12	22	RYSNC	Output3	RSYNC2	Receive Synchronization
2	--	23	RYSNC	Observe_only	--	--
2	--	24	--	Control	--	--
2	L12	25	RM_RFSYNC	Output3	RM/RFSYNC2	Receive Multiframe or Frame Synchronization
2	--	26	RM_RFSYNC	Observe_only	--	--
2	--	27	--	Control	--	--
2	L11	28	RSIG	Output3	RSIG2	Receive Signaling
2	--	29	RSIG	Observe_only	--	--
2	--	30	--	Control	--	--
2	J12	31	AL_RSIGF_FLOS	Output3	AL/RSIGF/FLOS2	Analog Loss or Receive Signaling Freeze or Framers LOS
2	--	32	--	Control	--	--
2	M12	33	RLF_LTC	Output3	RLF/LTC2	Receive Loss of Frame or Loss of Transmit Clock
2	--	34	--	Control	--	--
2	M11	35	RCHBLK_CLK	Output3	RCHBLK/CLK2	Receive Channel Block or Receive Channel Block Clock
2	--	36	RCHBLK_CLK	Observe_only	--	--
2	--	37	--	Control	--	--
2	M10	38	BPCLK	Output3	BPCLK2	Backplane Clock
2	--	39	--	Control	--	--
2	L10	40	REFCLKIO	Output3	REFCLKIO2	Reference Clock Input or

						Output
2	--	41	REFCLKIO	Observe_only	--	--
2	M9	42	MCLK	Observe_only	MCLK	Master Clock
2	K3	43	RESETB	Observe_only	RESETB	Reset Bar
2	--	44	--	Control	--	--
2	K4	45	INTB	Output3	INTB	Interrupt Bar
2	J3	46	WRB_RWB	Observe_only	WRB/RWB	Write Bar or Read-Write Bar
2	H3	47	RDB_DSB	Observe_only	RDB/DSB	Read Data Bar or Strobe Bar
2	M4	48	CSB	Observe_only	CSB2	Chip Select Bar
2	--	49	--	Control	--	--
2	M3	50	D0	Output3	D[0]/SPI_MISO	Data[0] or SPI Serial Interface Data Master-In Slave-Out
2	--	51	D0	Observe_only	--	--
2	--	52	--	Control	--	--
2	L3	53	D1	Output3	D[1]/SPI_MOSI	Data[1] or SPI Serial Interface Data Master-Out Slave-In
2	--	54	D1	Observe_only	--	--
2	--	55	--	Control	--	--
2	M2	56	D2	Output3	D[2]/SPI_SCLK	Data[2] or SPI Serial Interface Clock
2	--	57	D2	Observe_only	--	--
2	--	58	--	Control	--	--
2	M1	59	D3	Output3	D[3]	Data[3]
2	--	60	D3	Observe_only	--	--
2	--	61	--	Control	--	--
2	L2	62	D4	Output3	D[4]	Data[4]
2	--	63	D4	Observe_only	--	--
2	--	64	--	Control	--	--
2	L1	65	D5	Output3	D[5]/SPI_SWAP	Data[5] or SPI Bit Order Swap
2	--	66	D5	Observe_only	--	--
2	--	67	--	Control	--	--
2	K2	68	D6	Output3	D[6]/SPI_CPHA	Data[6] or SPI Interface Clock Phase
2	--	69	D6	Observe_only	--	--
2	--	70	--	Control	--	--
2	K1	71	D7	Output3	D[7]/SPI_CPOL	Data[7] or SPI Interface Clock Polarity

2	--	72	D7	Observe_only	--	--
2	J2	73	A0	Observe_only	A0	Address[0]
2	J1	74	A1	Observe_only	A1	Address[2]
2	H2	75	A2	Observe_only	A2	Address[2]
2	H1	76	A3	Observe_only	A3	Address[3]
2	G2	77	A4	Observe_only	A4	Address[4]
2	G1	78	A5	Observe_only	A5	Address[5]
2	F2	79	A6	Observe_only	A6	Address[6]
2	F1	80	A7	Observe_only	A7	Address[7]
2	E2	81	A8	Observe_only	A8	Address[8]
2	E1	82	A12	Observe_only	A12	Address[12]
2	E7	83	TXEN_B	Observe_only	TXENABLE2	Transmit Enable
2	E5	84	BTS	Observe_only	BTS	Bus Type Select
2	D7	85	SPI_SEL	Observe_only	SPI_SEL	SPI Serial Bus Mode Select

## Conclusion

This application note explains in detail about the JTAG hardware boundary scan chain for the DS26522 (SCT). The DS26522 is composed of two die and the JTAG functionality is the same as two separate devices daisy chained together. The application note also contains a complete breakdown of the JTAG scan chain and explains how to access all of the boundary scan cells in the device.

If you have further questions about the DS26522 or our Telecom products at Maxim, please contact the Telecommunication Applications support team through email at [Telecom.Support@maximintegrated.com](mailto:Telecom.Support@maximintegrated.com) or call 972-371-6555.

### Related Parts

<a href="#">DS26521</a>	Single T1/E1/J1 Transceiver	<a href="#">Free Samples</a>
<a href="#">DS26522</a>	Dual T1/E1/J1 Transceiver	<a href="#">Free Samples</a>

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