National Semiconductor

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SCAN12100
1228.8 and 614.4 Mbps CPRI SerDes with Auto RE Sync and Precision Delay Calibration Measurement

General Description

The SCAN12100 is a 1228.8 and 614.4 Mbps serializer/deserializer (SerDes) for high-speed bidirectional serial data transmission over FR-4 printed circuit board backplanes, balanced cables, and optical fiber. The SCAN12100 integrates precision delay calibration measurement (DCM) circuitry that measures link delay components to better than ± 800 ps accuracy.

The SCAN12100 features independent transmit and receive PLLs, on-chip oscillator, and intelligent clock management circuitry to automatically perform remote radio head synchronization and reduce the cost and complexity of external clock networks.

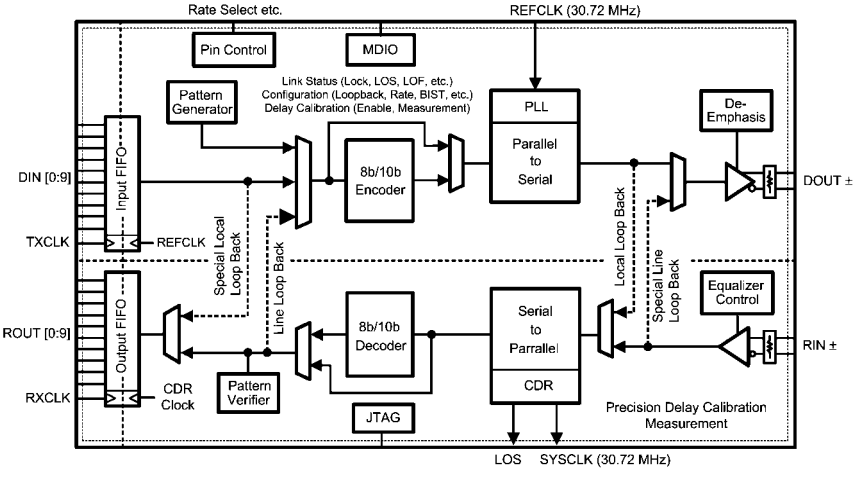
The SCAN12100 is programmable though an MDIO interface as well as through pins, featuring configurable transmitter de-emphasis, receiver equalization, speed rate selection, internal pattern generation/verification, and loop back modes. In addition to at-speed BIST, the SCAN12100 includes IEEE 1149.1 and 1149.6 testability.

Note: For a full SCAN12100 datasheet please contact your local National Semiconductor representitive

Features

- Exceeds LV and HV CPRI voltage and jitter requirements
- 1228.8, and 614.4 Mbps operation
- Pin and package compatibility with the SCAN25100
- Integrated delay calibration measurement (DCM) directly measures T14 and Toffset delays to ≤ ± 800 ps
- DCM also measures chip and other delays to ≤ ± 1200 ps accuracy
- Deterministic chip latency
- Automatic receiver lock and RE synchronization without reference clock or external crystal
- Independent transmit and receive PLLs for seamless RE synchronization
- Low noise recovered clock output
- Requires no jitter cleaning in single-hop applications
- >8 kV ESD on the CML IO, >7 kV on all other pins, >2 kV CDM
- Hot plug protection
- LOS, LOF, 8b/10b line code violation, comma, and receiver PLL lock reporting
- Programmable hyperframe length and start of hyperframe character
- Programmable transmit de-emphasis and receive equalization with on-chip termination
- Advanced testability features
  - IEEE 1149.1 and 1149.6
  - At-speed BIST pattern generator/verifier
  - Multiple loopback modes
- 1.8V or 3.3V compatible parallel bus interface
- 100-pin TQFP package with exposed dap
- Industrial –40 to +85° C temperature range

Block Diagram



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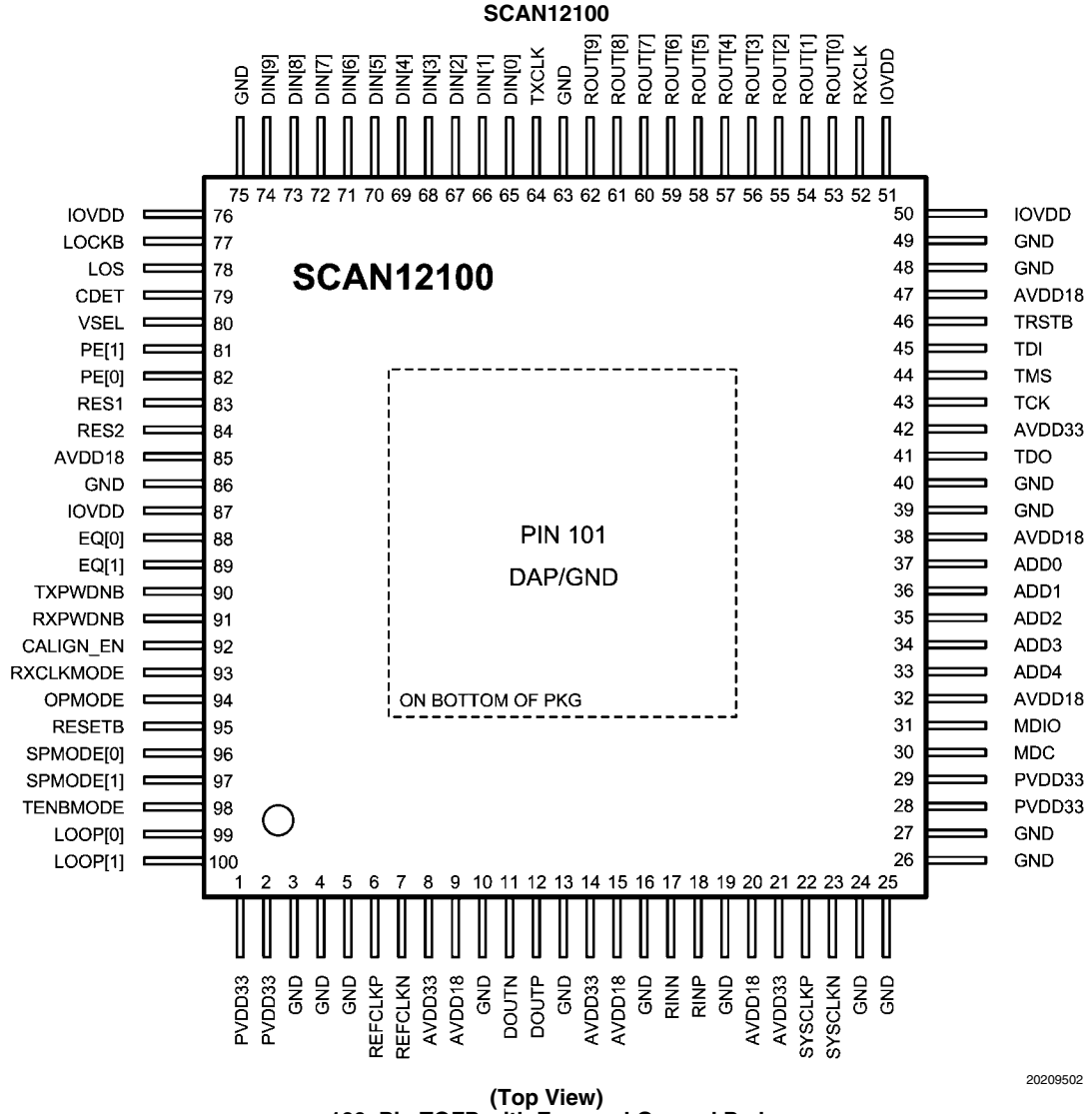
Pin Diagram



(Top View)
100–Pin TQFP with Exposed Ground Pad
Order Number SCAN12100TYA
See NS Number VXF100B

Pin Descriptions

Pin #	Pin Name	I/O, Type	Description
HIGH SPEED DIFFERENTIAL I/O			
12 11	DOUTP DOUTN	O, CML	Inverting and non-inverting high speed CML differential outputs of the serializer. On-chip termination resistors connect from DO+ and DO– to an internal reference
18 17	RINP RINN	I, CML	Inverting and non-inverting high speed differential inputs of the deseralizer. On-chip termination resistors connect from RI+ and RI– to an internal reference. On-chip termination resistors are configured for AC-coupled applications.
PARALLEL DATA BUS			
65 66 67 68 69 70 71 72 73 74	DIN [0] DIN [1] DIN [2] DIN [3] DIN [4] DIN [5] DIN [6] DIN [7] DIN [8] DIN [9]	I, LVTTL or 1.8V LVCMOS Internal pull down	Transmit data word. In 10-bit mode, the 10-bit code-group at DIN [0–9] is serialized with the internal 8b/10b encoder disabled. Bit 9 is the msb. The 8B/10B specification is defined in IEEE 802.3-2000 section 36.2.2
53 54 55 56 57 58 59 60 61 62	ROUT [0] ROUT [1] ROUT [2] ROUT [3] ROUT [4] ROUT [5] ROUT [6] ROUT [7] ROUT [8] ROUT [9]	O, LVTTL or 1.8V LVCMOS Internal pull down	Deserialized receive data word. In 10-bit mode, ROUT [0-9] is the deserialized received data word in 10-bit code group. Bit 9 is the msb. The 8B/10B specification is defined in IEEE 802.3-2000 section 36.2.2
CLOCK SIGNALS			
6 7	REFCLKP REFCLKN	I, LVDS or LVPECL	Inverting and non-inverting differential serializer reference clock. A low jitter clock source should be connected to REFCLKP & REFCLKN.
64	TXCLK	I, LVTTL or 1.8V LVCMOS Internal pull down	Transmit clock. TXCLK must be synchronous to REFCLK to avoid FIFO under/overflow though it may differ in phase.
52	RXCLK	I/O, LVTTL or 1.8V LVCMOS	Write mode: RXCLK is recovered clock output pin. Read mode: RXCLK is an input pin. ROUT [9:0] are latched out on RXCLK rising and falling edges. RXCLK must be synchronous to the incoming serial data to avoid FIFO over/underflow, though it may differ in phase. See RXCLKMODE pin description for more details.
22 23	SYSCLKP SYSCLKN	O, LVDS	30.72 MHz output clock. (OPMODE must be low.)
LINE STATUS			
78	LOS	O, LVTTL or 1.8V LVCMOS	Receiver CPRI loss of signal (LOS) status (8-bit mode only). 0 = signal detected (per CPRI standard) 1 = signal lost (per CPRI standard)
77	LOCKB	O, LVTTL or 1.8V LVCMOS	Receiver PLL lock status 0 = Receiver PLL locked 1 = Receiver PLL not locked

Pin #	Pin Name	I/O, Type	Description
79	CDET	O, LVTTL or 1.8V LVCMOS	Comma Detect. 0 = no comma yet detected in the incoming serial stream or receiver PLL not locked. 1 = the receiver PLL is locked and a positive or negative comma bit sequence detected in the incoming bit stream. The serial to parallel converter is aligned to the proper 10-bit word boundary when comma alignment is enabled (CALIGN_EN = 1).
CONTROL PINS			
82 81	PE [0] PE [1]	I, LVTTL or 1.8V LVCMOS Internal pull down	Transmitter de-emphasis configuration. Pulling both pins low enables MDIO control, default is no de-emphasis.
			PE1 / **PE0** /
			0 / 0 / No de-emphasis
			0 / 1 / Low de-emphasis
			1 / 0 / Medium de-emphasis
			1 / 1 / Maximum de-emphasis
88 89	EQ [0] EQ [1]	I, LVTTL or 1.8V LVCMOS Internal pull down	Receive input equalization configuration. Pulling both pins low enables MDIO control, default is no receive equalization.
			EQ1 / **EQ0** /
			0 / 0 / No receive equalization
			0 / 1 / Low receive equalization
			1 / 0 / Medium receive equalization
			1 / 1 / Maximum receive equalization
90 91	TXPWDNB RXPWDNB	I, LVTTL or 1.8V LVCMOS Internal pull down	Power down control signals. **TXPWDNB** 0 = Transmitter is powered down and DOUT± pins are high impedance. 1 = Transmitter is powered up. **RXPWDNB** 0 = Receiver is powered down and ROUT [9:0] as well as LOS, LOCKB, CDET, RXCLK, and SYSCLK are high impedance. 1 = Receiver is powered up.
92	CALIGN_EN	I, LVTTL or 1.8V LVCMOS Internal pull down	Comma alignment enable. 0 = comma alignment circuitry disabled. Receiver will not realign 10-bit data based on incoming comma characters. CDET pin still flags comma detection. 1 = comma detect and alignment circuitry enabled. Receiver aligns 10-bit data to incoming comma character and flags comma detect through CDET pin.
93	RXCLKMODE	I, LVTTL or 1.8V LVCMOS Internal pull down	Receiver recovered clock mode 0 = Write mode. RXCLK pin is a recovered clock output. (RXCLK = output pin) 1 = Read mode. RXCLK pin is ROUT [9:0] bus read input strobe. (RXCLK = input pin)
80	VSEL	I, LVTTL or 1.8V LVCMOS Internal pull down	Selects whether single-ended data and control pins are 3.3V LVTTL or 1.8V LVCMOS. 0 = 1.8V LVCMOS. Tie VSEL to ground and power IOVDD at 1.8 V. 1 = 3.3V LVTTL. Tie VSEL to IOVDD supply and power IOVDD at 3.3 V.
94	OPMODE	I, LVTTL or 1.8V LVCMOS Internal pull down	Selects SerDes mode. 0 = Base station mode 1 = Reserved for future use
95	RESETB	I, LVTTL or 1.8V LVCMOS Internal pull down	Hardware SerDes reset. Resets PLLs and MDIO registers. 0 = Hardware SerDes reset 1 = Normal operation

<table>
<tr><th>Pin #</th><th>Pin Name</th><th>I/O, Type</th><th colspan="3">Description</th></tr>
<tr><td>96
97</td><td>SPMODE [0]
SPMODE [1]</td><td>I, LVTTL or 1.8V LVCMOS Internal pull down</td><td colspan="3">Speed mode configuration. (OPMODE must be low)
Pulling both pins low enables MDIO control.</td></tr>
<tr><td></td><td></td><td></td><td>SPMODE [1]</td><td>SPMODE [0]</td><td></td></tr>
<tr><td></td><td></td><td></td><td>0</td><td>0</td><td>Rate selected via MDIO</td></tr>
<tr><td></td><td></td><td></td><td>0</td><td>1</td><td>614.4 Mbps rate mode</td></tr>
<tr><td></td><td></td><td></td><td>1</td><td>0</td><td>1228.8 Mbps rate mode</td></tr>
<tr><td></td><td></td><td></td><td>1</td><td>1</td><td>Reserved</td></tr>
<tr><td>98</td><td>TENBMODE</td><td>I, LVTTL or 1.8V LVCMOS, Internal pull down</td><td colspan="3">Enable 10-bit mode
The 8B/10B specification is defined in IEEE 802.3-2000 section 36.2.2
0 = Selects 8-bit mode. Enables the internal 8b/10b encoder and decoder.
1 = Selects 10-bit mode. Bypasses internal 8b/10b encoder and decoder.</td></tr>
<tr><td>99
100</td><td>LOOP [0]
LOOP [1]</td><td>I, LVTTL or 1.8V LVCMOS, Internal pull down</td><td colspan="3">Loop back configuration.
Pulling both pins low enables MDIO control.
Note: During Special line (remote) loop back mode, the output de-emphasis control is disabled.</td></tr>
<tr><td></td><td></td><td></td><td>LOOP [1]</td><td>LOOP [0]</td><td></td></tr>
<tr><td></td><td></td><td></td><td>0</td><td>0</td><td>Normal mode—no loop back</td></tr>
<tr><td></td><td></td><td></td><td>0</td><td>1</td><td>Line (remote) loop back mode</td></tr>
<tr><td></td><td></td><td></td><td>1</td><td>0</td><td>Local loop back mode</td></tr>
<tr><td></td><td></td><td></td><td>1</td><td>1</td><td>Special line (remote) loop back mode</td></tr>
<tr><td colspan="6">MDC/MDIO</td></tr>
<tr><td>30
31
37
36
35
34
33</td><td>MDC
MDIO
ADD0
ADD1
ADD2
ADD3
ADD4</td><td>3.3V LVTTL Internal pull up on ADDR pins</td><td colspan="3">MDC/MDIO configuration bus.
Protocol per IEEE 802.2ae-2002 MDC/MDIO Clause 45. These pins are 3.3V LVTTL compatible, not 1.2V signal compatible.</td></tr>
<tr><td colspan="6">IEEE 1149.1 (JTAG)</td></tr>
<tr><td>45
41
44
43
46</td><td>TDI
TDO
TMS
TCK
TRSTB</td><td>3.3V LVTTL Internal pull up on TDI, TMS, and TRSTB</td><td colspan="3">JTAG test bus for IEEE 1149.1 and 1149.6 support.</td></tr>
<tr><td colspan="6">RESERVED PINS</td></tr>
<tr><td>83
84</td><td>RES1
RES2</td><td>I</td><td colspan="3">Reserved.
Tie with 5 KΩ resistor to ground.</td></tr>
<tr><td colspan="6">POWER</td></tr>
<tr><td>9, 15, 20, 32, 38, 47, 85</td><td>AVDD18</td><td>I, Power</td><td colspan="3">1.8V analog supply.</td></tr>
<tr><td>8, 14, 21, 42</td><td>AVDD33</td><td>I, Power</td><td colspan="3">3.3V analog supply.</td></tr>
<tr><td>1, 2, 28, 29</td><td>PVDD33</td><td>I, Power</td><td colspan="3">3.3V PLL supply (minimize supply noise to < 100 mV peak-to-peak).</td></tr>
<tr><td>50, 51, 76, 87</td><td>IOVDD</td><td>I, Power</td><td colspan="3">1.8V or 3.3V parallel I/O bus and control pin supply.
See VSEL pin description for additional information.</td></tr>
<tr><td colspan="6">GROUND</td></tr>
<tr><td>3, 4, 5, 10, 13, 16, 19, 24, 25, 26, 27, 39, 40, 48, 49, 63, 75, 86</td><td>GND</td><td>I, Ground</td><td colspan="3">Device ground.</td></tr>
</table>

Pin #	Pin Name	I/O, Type	Description
GROUND DAP			
101	GND	I, Ground	Device ground. Pad must be soldered and contected to GND plane with a minimum of 8 thermal vias to achieve specified thermal performance.

Note: I= input O = output Internal pull down = input pin is pulled low by an internal resistor Internal pull up = input pin is pulled high by an internal resistor

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Supply Voltage (AV_{DD18})	−0.3V to +2.0V
Supply Voltage (PV_{DD}, IOV_{DD})	−0.3V to +3.6V
Supply Voltage (AV_{DD33})	−0.3V to +3.6V
LVCMOS Input Voltage	−0.3V to (IOV_{DD} + 0.5V)
LVCMOS Output Voltage	−0.3V to (IOV_{DD} + 0.5V)
MDC/MDIO/ADD[0:4],VSEL Input Voltage	−0.3V to (AV_{DD33} + 0.5V)
MDIO Output Voltage	−0.3V to (AV_{DD33} + 0.5V)
CML Receiver Input Voltage	−0.3V to (AV_{DD} + 0.3V)
CML Receiver Output Voltage	−0.3V to (AV_{DD} + 0.3V)
Junction Temperature	+125°C
Storage Temperature	−65°C to +150°C
Lead Temperature	
Soldering, 10–20 sec	235 °C
Lead-free +260°C flow is available	
Maximum Package Power Dissipation at 25°C	
100-pin TQFP with Exposed Pad	4.16 W
Derating above 25°C	41.6 mW/°C
Thermal Resistance , θ_{JA} (0 airflow)	24.0°C/W
ESD Rating	
CML RIN/DOUT Pins	
HBM, 1.5 kΩ, 100 pF	>8 kV
EIAJ, 0Ω, 200 pF	>250V
CDM	>2 kV
All Other Pins	
HBM, 1.5 kΩ, 100 pF	>7 kV
EIAJ, 0Ω, 200 pF	>250V
CDM	>2 kV

Note: This is the maximum TQFP-100 package power dissipation capability. For SCAN12100 power dissipation, see the information in the Electrical Characteristics section.

Recommended Operating Conditions

	Min	Typ	Max	Unit
Supply Voltage				
AV_{DD18}	1.7	1.8	1.9	V
AV_{DD33}, PV_{DD33}	3.135	3.3	3.465	V
IOV_{DD} (1.8V Mode)	1.7	1.8	1.9	V
IOV_{DD} (3.3V Mode)	3.135	3.3	3.465	V
Temperature	-40	25	85	°C
Junction temperature			125	°C
Supply Noise (Peak-to-Peak)			<100	mV

Electrical Characteristics

Over recommended operating supply and temperature ranges unless other specified.

Symbol	Parameter	Condition	Min	Typ (Note 2)	Max	Units
LVCMOS DC SPECIFICATIONS (1.8V I/O)						
V_{IH}	High level input voltage		$0.65V_{DD}$			V
V_{IL}	Low level input voltage				$0.35V_{DD}$	V
I_{IN}	Input Current	V_{IN} = 0V or 1.9V	−10		+50	µA
V_{OH}	High level output voltage	I_{OH} = −2 mA	1.2			V
V_{OL}	Low level output voltage	I_{OL} = 2 mA			0.45	V
I_{OZ}	Power Down Output Current	Power down	−20		+20	µA
C_{IO}	Input/Output Capacitance	Typical		2.8		pF
LVCMOS DC SPECIFICATIONS (3.3V I/O)						
V_{IH}	High level input voltage		2			V
V_{IL}	Low level input voltage				0.8	V
I_{IN}	Input Current	V_{IN} = 0V or 3.465V	−10		+50	µA
V_{OH}	High level output voltage	I_{OH} = −2 mA	2.4			V
V_{OL}	Low level output voltage	I_{OL} = 2 mA			0.4	V
I_{OZ}	Power Down Output Current	Power down	−20		+20	µA
C_{IO}	Input/Output Capacitance	Typical		2.8		pF
JTAG DC SPECIFICATIONS (3.3V I/O)						
V_{IH}	High level input voltage		2			V
V_{IL}	Low level input voltage				0.8	V
I_{IN}	Input Current	V_{IN} = 0V or 3.465V	−35		+50	µA
V_{OH}	High level output voltage	I_{OH} = −2 mA	2.4			V

Symbol	Parameter	Condition	Min	Typ (Note 2)	Max	Units
V_{OL}	Low level output voltage	I_{OL} = 2 mA			0.4	V
C_{IO}	Input/Output Capacitance	Typical		2.8		pF
MDIO/MDC/ADD0-4 DC SPECIFICATIONS						
V_{IH}	High level input voltage		2.0		3.465	V
V_{IL}	Low level input voltage		GND		0.8	V
I_{IN}	Input Current	V_{IN} = 0 or 3.465V	-150		150	µA
V_{OH}	High level output voltage	I_{OH} = –2 mA	2.4			V
V_{OL}	Low level output voltage	I_{OL} = 2 mA			0.4	V
I_{OZ}	Power Down Output Current	Power down	–100		+100	µA
C_{IO}	Input/Output Capacitance	Typical		2.8		pF
POWER CONSUMPTION (Powerdown)						
P_{PDN}	Powerdown Mode	Rx and Tx Powerdown		25	40	mW
RECOMMENDED REFCLK INPUT SPECIFICATIONS						
$V_{IDSREFCLK}$	Differential input voltage		± 100			mV_{P-P}
V_{ICM}	Common mode voltage		0.05V		2.4V	V
f_{REF}	REFCLK frequency	OPMODE = 0 (BTS SerDes Mode)	30	30.72	31.5	MHz
df_{REF}	REFCLK frequency variation	Variation from nominal frequency	–100		100	ppm
t_{REF-DC}	REFCLK duty cycle	Between 50% of the differential voltage across REFCLKP and REFCLKN	45		55	%
t_{REF-X}	REFCLK transition time	Transition time between 20% and 80% of the differential voltage across REFCLKP and REFCLKN		300		pS
SYSCLK DC OUTPUT SPECIFICATIONS						
V_{OD}	Differential Output Voltage	R_L = 100Ω	± 250	± 330	± 450	mV
V_{OS}	Offset Voltage		1.125	1.20	1.375	V
I_{OS}	Output Short Circuit Current	Output pair shorted together and tied to GND			35	mA
I_{OZ}	Power Down Output Current	Power down	–30		+30	µA
TRANSMITTER SERIAL TIMING SPECIFICATIONS						
V_{OD}	Output differential voltage swing	PE[1]=0, PE[0]=0	± 550	± 700	± 800	mVp-p
		PE[1]=0, PE[0]=1		± 630		mVp-p
		PE[1]=1, PE[0]=0		± 500		mVp-p
		PE[1]=1, PE[0]=1	± 200	± 360	± 450	mVp-p
R_{DO}	Output differential resistance		80	100	120	Ω
R_O	Output Return Loss	Frequency = 1.229 GHz		-13.4		dB
t_R, t_F	Serial data output transition time (Notes 10, 14)	Measured between 20% and 80%	80	100	130	ps
JIT_{T-DJ}	Serial data output deterministic jitter (Notes 3, 10)	Output CJPAT with BER of 10^{-12} (Note 4)			0.14	UIp-p
JIT_{T-TJ}	Serial data output total jitter (Notes 3, 10)	Output CJPAT pattern with BER of 10^{-12} (Note 4)			0.279	UIp-p
t_{LAT-T}	Transmit latency (Note 7)	614.4 Mbps		310		ns
		1.228 Gbps		155		
$t_{DO-LOCK}$	Maximum lock time	K28.5 pattern at 1228.8 Mbps		110	130	us
RECEIVER SERIAL TIMING SPECIFICATIONS						
V_{ID}	Input voltage	RINP - RINN	± 100		± 1100	mVp-p
V_{CMR}	Receiver common mode voltage			0.9		V
R_R	Differential Input Terminations		80	100	120	Ω

Symbol	Parameter	Condition	Min	Typ (Note 2)	Max	Units
RLR_I	Input Return Loss (Note 10)	Frequency = 1.229 GHz		-20	-15	dB
t_{LAT-R}	Receive latency (Note 8)	614.4 Mbps		280		ns
		1.228 Gbps		140		ns
JIT_{R-TOL}	Total input jitter tolerance (Note 10)	Input CJPAT with BER of 10^{-12} (Note 4)			0.66	UIp-p
F_{R-LOCK}	Receiver lock range	Input data rate reference to local transmit data rate.	–200		+200	ppm
t_{R-LOCK}	Maximum lock time	K28.5 pattern at 1228.8 Mbps			1	ms
TRANSMITTER INPUT TIMING SPECIFICATIONS						
t_{S-T}	Setup Time	DIN [9:0] valid to TXCLK rising or falling edge	0.5			ns
t_{H-T}	Hold Time	TXCLK rising or falling edge to DIN [9:0] valid	0.5			ns
t_{DC}	Duty cycle	TXCLK duty cycle	45		55	%
f_{TXCLK}	TXCLK frequency		30		62.5	MHz
RECEIVER OUTPUT TIMING SPECIFICATIONS (Read Mode RXCLKMODE=1)						
t_{PDRX}	RXCLK Propagation Delay	RXCLK rising or falling edge to ROUT [9:0] valid	2	4	6	ns
t_{DC}	Duty cycle	RXCLK input duty cycle	45		55	%
f_{RXCLKR}	RXCLK input frequency	RXCLK input frequency	30		62.5	MHz
t_R, t_F	Output data transition time	For ROUT [0-9], LOCK, etc. pins. Measured between 20% and 80% levels		0.35		ns
RECEIVER OUTPUT TIMING SPECIFICATIONS (Write Mode RXCLKMODE=0)						
t_{S-R}	Setup Time	ROUT [9:0] valid to RXCLK rising or falling edge (Note 9)	2.2			ns
t_{H-R}	Hold Time	RXCLK rising or falling edge to ROUT [9:0] valid (Note 9)	2.4			ns
t_{DC}	Duty cycle	RXCLK duty cycle	45		55	%
f_{RXCLK}	RXCLK frequency		30		62.5	MHz
t_R, t_F	Output data transition time	For ROUT [0-9], LOCK, etc. pins. Measured between 20% and 80% levels		0.35		ns
CDET OUTPUT TIMING SPECIFICATIONS (Read Mode RXCLKMODE=1)						
t_{PDCD}	CDET Propagation Delay	RXCLK rising or falling edge to CDET	2	4	6	ns
CDET OUTPUT TIMING SPECIFICATIONS (Write Mode RXCLKMODE=0) (Note 5)						
t_{S-C}	Setup Time	CDET valid to RXCLK rising or falling edge	2.6			ns
t_{H-C}	Hold Time	RXCLK rising or falling edge to CDET valid	2.6			ns
SYSCLK LVDS OUTPUT TIMING SPECIFICATIONS						
$t_{SYSCLKNDC}$	Duty cycle		40		60	%
JIT_{SYSCLK}	Cycle to cycle jitter	(Note 10)		40	65	ps p-p
t_R, t_F	Output transition time	Between 20% and 80% levels (Note 10)	0.1		0.3	ns
MDC/MDIO TIMING SPECIFICATIONS (Clause 45)						
f_{MDC}	MDC Frequency		0		2.5	MHz
t_{S-MDIO}	Setup Time	MDIO (input) valid to MDC rising clock	10			ns

Symbol	Parameter	Condition	Min	Typ (Note 2)	Max	Units
$t_{H\text{-}MDIO}$	Hold Time	MDC rising edge to MDIO (input) invalid	10			ns
$t_{D\text{-}MDIO}$	Delay Time	MDIO (output) delay from MDC rising edge	0		300	ns
$t_{X\text{-}MDIO}$	Transition Time	Measured at MDIO when used as output, CL = 470 pF		1		ns
MINIMUM PULSE WIDTH, Hardware Reset (Note 11)						
$t_{TX\text{-}RST}$	Transmiter Reset	TXPWDNB = 0		1		us
$t_{RX\text{-}RST}$	Receiver Reset	RXPWDNB = 0		1		us
t_{RST}	SerDes Reset	RESETB = 0		1		us
JTAG TIMING SPECIFICATIONS						
f_{JTAG}	JTAG TCK Frequency	R_L= 1000Ω, C_L = 15 pF	25			MHz
$t_{R\text{-}J}$ $t_{F\text{-}J}$	TDO data transition time (20% to 80%)			2		ns
$t_{S\text{-}TDI}$	Setup Time TDI to TCK High or Low		2			ns
$t_{H\text{-}TDI}$	Hold Time TDI to TCK High or Low		2			ns
$t_{S\text{-}TMS}$	Setup Time TMS to TCK High or Low		2			ns
$t_{H\text{-}TMS}$	Hold Time TMS to TCK High or Low		2			ns
$t_{W\text{-}TCK}$	TCK Pulse Width		10			ns
$t_{W\text{-}TRST}$	TRSTB Pulse Width		2.5			ns
t_{REC}	Recovery Time TRSTB to TCK		14			ns
DELAY CALIBRATION MEASUREMENT (DCM) (Notes 10, 12, 13)						
T_{14}	T_{14} Delay Accuracy	Receive and Transmit PLLs locked to valid hyperframe data.			± 800	ps
T_{offset}	T_{offset} Delay Accuracy				± 800	ps
T_{ser}	Serializer Delay Accuracy				± 1200	ps
T_{des}	Deserializer Delay Accuracy				± 1200	ps
$T_{in\text{-}out}$	$T_{in\text{-}out}$ Delay Accuracy				± 1200	ps
$T_{out\text{-}in}$	$T_{out\text{-}in}$ Delay Accuracy				± 1200	ps

Note 1: “Absolute Maximum Ratings” are the ratings beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the device should be operated at these limits.

Note 2: Typical parameters are measured at nominal supply levels and T_A = 25°C. They are for reference purposes and are not production-tested.

Note 3: Transmit Jitter testing methodology is defined in Appendix 48B of IEEE 802.2ae-2002. The SCAN12100 transmit output jitter is constant for all valid CPRI datarates. The transmit jitter is significantly less than the specified limits in terms of UI.

Note 4: CJPAT is a stress pattern defined in IEEE 802.2ae-2002 Appendix 48A

Note 5: CDET nominal valid duration is determined by the CPRI data rate. CDET timing is similar to the ROUT[0:9] timing.

Note 6: Transmit or Receive K28.5 pattern. Assumes TXCLK is stable and toggles only after all SerDes clocks become synchronous.

Note 7: Transmit latency is fixed once the link is established and is guaranteed by the Tser specification.

Note 8: Receive latency is fixed once the link is established and is guaranteed by the Tdes specification.

Note 9: Receiver output timing specifications for TS-R and TH-R are tested at the CPRI rate of 1.2288 Gbps.

Note 10: Limits are guaranteed by design and characterization over process, supply voltage, and temperature variations.

Note 11: Limits are guaranteed by design.

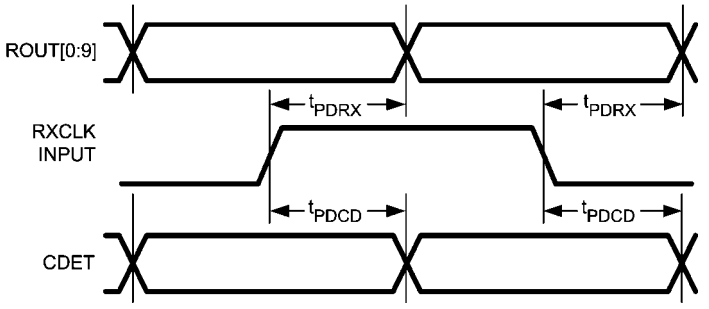
Note 12: Serial side DCM readings are referenced to the first bit of the K28.5 pattern {110000 0101 001111 1010}. Parallel side DCM readings are referenced to the TXCLK or RXCLK edge (not the data edge) that registers the K character as an input or output.

Note 13: DCM readings are valid when the RXCLK pin on the SCAN12100 is used as an output in "WRITE" mode (RXCLKMODE = 0) and IOVDD = 3.3V.

Note 14: Edge rate characterization includes the loading effects of 1.0 uF AC-coupling capacitors and 4 inches of 100 ohm differential microstrip.

AC Timing Diagrams

READ MODE



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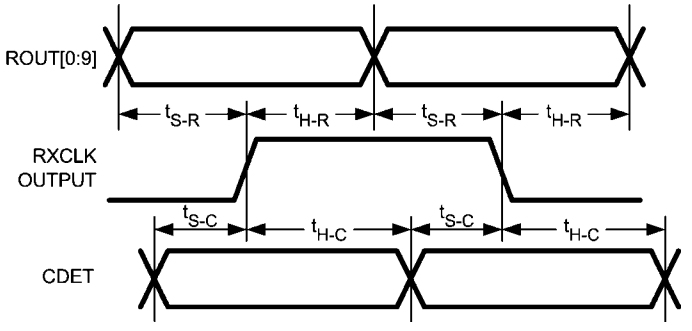
WRITE MODE



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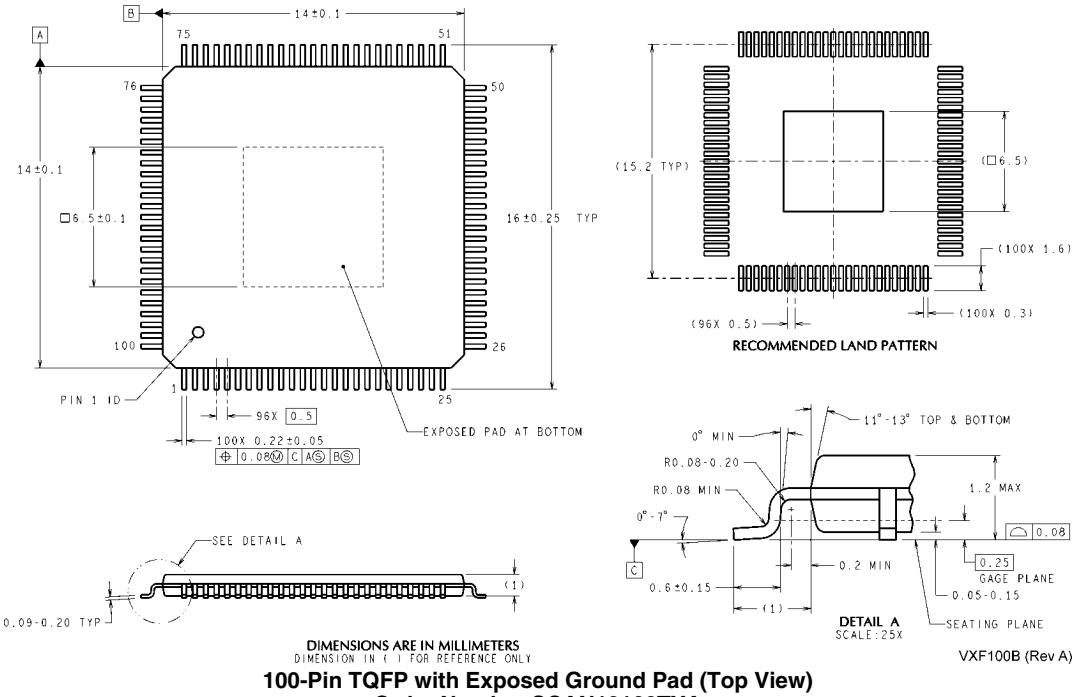
Register Description

The SCAN12100 implements the device ID of 61 (0x3D.) Other registers defined by 802.3ae-2002 are not implemented in SCAN12100. The SCAN12100 has a rich MDIO register set to allow the chip to be controlled and monitored through software. Certain functions such as BIST and delay calibration are only accessible through MDIO.

The type of registers used in SCAN12100 are RW, RC, RO, and WC. RW is a read and write register. RC is a read and clear register. Upon reading the value of the RC register through MDIO, the register will reset its value. WC is a write and clear register. Write and clear registers are used for reset operations. A re-read of the WC register is necessary to verify the register has been cleared.

Address (hex)	Name	Access	Description
0	RESERVED	RW	Reserved.
1	POWERDOWN	RW	Transmiter and Receiver POWERDOWN control.
2	OUI	RO	OUI.
3	OUI Revision	RO	OUI, Device Product and Revision information.
4	RESET	RC	Transmiter and Receiver RESET control.
5	Rx Equalization	RW	CPRI LOF (Loss of Frame) bypass and Receiver EQ control.
6	Tx De-Emphasis	RW	Hyperframe size and Transmitter De-Emphasis control.
7	LOOPBACK	RW	Selects Normal, Line and Local Loopback.
8	MDIO	RO	Required by MDIO.
9	BIST	RW	Pattern and Enable control for Trasmit and Receive BIST.
A	Speed Mode	RW/Pin OW	Selects CPRI speed mode.
B	BIST Status	RC	BIST status information.
C	RESERVED	RO	Reserved.
D	DCM Start	RC	Initiates or restarts Delay Calibration Measurement.
E	OUI Duplicate	RO	Duplicate of Register Address 2.
F	OUI Rev. Duplicate	RO	Duplicate of Register Address 3.
10	LOF	RC	CPRI Loss of Frame (LOF) counter.
11	LOS	RC	CPRI Loss of Sync (LOS) counter.
12	Rx Lock	RC	Receiver Loss of Lock (LOCKB) counter.
13	Loss of Clock	RO	Loss of Transmit and/or Receive clock.
14	PLL Status	RO	Tx and Rx PLL status.
15	Hyperframe Length	RW	Programmable Hyperframe Length control.
16-17	DCM Trigger	RW	Delay Calibration Trigger pattern.
18	Reserved	RW	Reserved.
19	Hyperframe Tuning	RW	Programmable Hyperframe size and DCM enable
1A-1D	Reserved	RO	Reserved.
1E	T14 Lower	RO	T14 Measurement.
1F	T14 Upper	RO	T14 Measurement.
20	Toffset Lower	RO	Toffset Measurement.
21	Toffset Upper	RO	Toffset Measurement.
22	Tser Lower	RO	Tser Measurement.
23	Tser Upper	RO	Tser Measurement.
24	Tdes Lower	RO	Tdes Measurement.
25	Tdes Upper	RO	Tdes Measurement.
26	Tin-out Lower	RO	Tin-out Measurement.
27	Tin-out Upper	RO	Tin-out Measurement.
28	Tout-in Lower	RO	Tout-in Measurement.
29	Tout-in Upper	RO	Tout-in Measurement.

Physical Dimensions inches (millimeters) unless otherwise noted



100-Pin TQFP with Exposed Ground Pad (Top View)
Order Number SCAN12100TYA
NS Package Number VXF100B
See www.national.com/quality/marking_conventions.html for additional part marking information

Notes

National Semiconductor Americas Customer Support Center
Email: new.feedback@nsc.com
Tel: 1-800-272-9959

National Semiconductor Europe Customer Support Center
Fax: +49 (0) 180-530-85-86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 69 9508 6208
English Tel: +49 (0) 870 24 0 2171
Français Tel: +33 (0) 1 41 91 8790

National Semiconductor Asia Pacific Customer Support Center
Email: ap.support@nsc.com

National Semiconductor Japan Customer Support Center
Fax: 81-3-5639-7507
Email: jpn.feedback@nsc.com
Tel: 81-3-5639-7560