Optical Modules for DSA8300*[1] Sampling Oscilloscope

80C07B, 80C08D, 80C10C, 80C11B, 80C12B, 80C14 Datasheet

Features & Benefits

- 10 Gb/s Telecom and Datacom
  - Highly Accurate ER Calibrated (Extinction Ratio) Measurement Option for Increased Repeatability and Transferability of the Measurement
  - 80C14 – Low-noise, High Optical Sensitivity, Broad Wavelength Conformance Testing for 10GbE, 40GbE (R4), 100GbE (X10) LAN, WAN, FEC, 10G Fibre Channel, 16G Fibre Channel (14.025 Gb/s), 14G Infiniband FDR (14.06250 Gb/s)
  - 80C08D and 80C12B (w/ Option 10G or 10GP) – Low-noise, High Optical Sensitivity, and Broad Wavelength Conformance Testing for 10 GbE, 40 GbE (R4), 100 GbE (X10) LAN, WAN, FEC, 10G Fibre Channel, and 10 Gb/s Telecom Standards and FEC Rates
  - 80C11B 30 GHz Optical Bandwidth Conformance Testing and Characterization for 10 Gb/s Telecom and Datacom Standards and FEC Rates
  - 80C14 Clock Recovery for Rates ≥10 Gb/s is Supported by CR175A (Sold Separately)
  - 80C08D and 80C11B Integrated Clock Recovery supports All Current 10 Gb/s Standards or User-defined Rates from 9.8 Gb/s to 12.6 Gb/s (CR4)
  - 80C12B Clock Recovery for 10 Gb/s Rate is supported by the 80A05 Module or CR125A Clock Recovery Instrument (Sold Separately)
- 100 Gb/s and 40 Gb/s Telecom and Datacom
  - 80C10C 80 GHz Optical Bandwidth and Lowest Noise Capability for Performance Testing and Signal Characterization of 40 Gb/s NRZ, RZ, or Optical Duobinary Data Formats
  - 80C10C Option F1 provides 70 GHz full bandwidth and fully integrated selectable reference receiver filtering, enabling conformance testing at either 1310 nm or 1550 nm for 25.781 Gb/s (100GBASE-ER4 and 100GBASE-LR4), 27.952 Gb/s (OTU-4), 39.813 Gb/s (OC-768/STM-256, VSR-2000 G.693, 40G NRZ G.959.1), 41.25 Gb/s (40GBASE-FR), and 43.018 Gb/s (OTU3, VSR-2000 w/ FEC, 4x10G LAN PHY OTU3) in a single module
  - 80C10C Option F2 provides 55 GHz full bandwidth and fully integrated selectable reference receiver filtering, enabling conformance testing at either 1310 nm or 1550 nm for 27.952 Gb/s (OTU-4) and 25.781 Gb/s (100GBASE-LR4 and 100GBASE-ER4)
  - 80C10C Option F3 provides 80 GHz full bandwidth and fully integrated selectable reference receiver filtering, enabling conformance testing of 39.813 Gb/s (OC-768/STM-256, VSR-2000 G.693, 40G NRZ G.959.1), 41.25 Gb/s (40GBASE-FR), and 43.018 Gb/s (OTU3, VSR-2000 w/ FEC, 4x10G LAN PHY OTU3)
  - 80C10C Clock Recovery for 25-44.5 Gb/s Rates is Supported by the CR286A-HS or Similar*[2] (Sold Separately) and Option CRTP (Electrical Signal Outputs to 44.5 Gb/s)
- Tributary Telecom and Datacom
  - 80C07B and 80C12B provide Excellent Optical Sensitivity and Broad Wavelength Test Capability
  - 80C07B, 80C12B Multirate Telecom Conformance Testing Solutions from 125*[3] Mb/s (OC-3/STM-4) through 11.317 Gb/s (10GFC w/ FEC) and Multirate Datacom Conformance Testing Solutions for Fibre Channel, Gigabit Ethernet, and Infiniband Standards

*[1] Also compatible with DSA8200, TDS/CSA8200, TDS/CSA8000B, and TDS/CSA8000 sampling oscilloscopes.

*[2] Contact Tektronix for details.

*[3] 125 Mb/s is supported by selecting 155 Mb/s rate.

Tektronix®

Applications

- High-speed Optical Communications Testing
- Extinction Ratio and Q-factor Measurements
- Eye-pattern and Pulse Shape Analysis
- Relaxation Oscillation Testing
- Optical Signal Analysis
- Compliance Testing
- NRZ, RZ, and Optical Duobinary Signal Characterization

DSA8300*1 Series Sampling Oscilloscope Optical Modules

The DSA8300 Series Sampling Oscilloscope, when configured with one or more optical sampling modules, provides complete optical test solutions for Telecom (125 Mb/s to 44.50 Gb/s) or Datacom (Gigabit Ethernet, 10 GbE, 40 GbE, 100 GbE, Fibre Channel to 16 GFC, and InfiniBand) applications, as well as general-purpose optical component testing.

Each optical module includes all the elements necessary for optical testing:

- Optical-to-Electrical Converter
- Average Power Monitor
- One or More Reference Receiver Filters
- A Full Bandwidth Optical Path
- Optional Integrated Clock Recovery (80C07B, 80C08D, and 80C11B)
- 80C10C, when equipped with Opt. CRTP and 80C12B and 80C14, provide electrical clock recovery signal pickoff
- Universal Optical Input Connector

ER Calibrated (Extinction Ratio)

To increase the level of transferability of the ER measurement, ER Calibrated reduces the uncertainty of ER results through Tektronix calibration of the module against a calibrated, known, high ER source. This optional feature is available on all 10G modules (see Ordering Information).

Performance You Can Count On

Depend on Tektronix to provide you with performance you can count on. In addition to industry-leading service and support, this product comes backed by a one-year warranty as standard.

*1 Also compatible with DSA8200, CSA/TDS8200, CSA/TDS8000B, and CSA/TDS8000 sampling oscilloscopes.

Optical Sampling Modules

Module	Description
80C07B Multirate, Datacom and Telecom	The 80C07B module is a broad wavelength (700 to 1650 nm) multirate optical sampling module optimized for testing datacom/telecom signals from 125 to 2500 Mb/s. With its amplified O/E converter design, this module provides excellent signal-to-noise performance, allowing users to examine low-power optical signals. The 80C07B can be optionally configured with clock recovery that supports 125, 155, 622, 1063, 1250, 2125, 2488, 2500, and 2666 Mb/s rates.
80C08D Multirate, Broad Wavelength, High Sensitivity 10 Gb/s	The 80C08D module is a broad wavelength (700 to 1650 nm) multirate optical sampling module providing datacom rate testing for 10GbE, 40GbE-R4, 100GbE-SR10 applications at 9.953, 10.3125, 11.0957 Gb/s and 10G Fibre Channel applications at 10.51875 Gb/s and 11.317 Gb/s. The 80C08D also provides telecom rate testing at 9.953, 10.664, and 10.709 Gb/s. With its amplified O/E converter design, this module provides excellent signal-to-noise performance and high optical sensitivity, allowing users to examine low power level optical signals. The 80C08D can be optionally configured with clock recovery options that can support any standard or user-defined rate in the continuous range from 9.8 to 12.6 Gb/s.
80C10C Multirate Datacom and Telecom 25 Gb/s, 40 Gb/s, and 100 Gb/s	The 80C10C module provides integrated and selectable reference receiver filtering, enabling conformance testing at either 1310 nm or 1550 nm of all standard 25, 40 and 100 (4 x 25) Gb/s standard rates. The 80C10C has the following configurations: **Option F1**: Provides standard compliant optical reference receivers for the following rates (standards): 25.781 Gb/s (100GBase-LR4 and 100GBase-ER4) 27.952 Gb/s (OTU4) 39.813 Gb/s (OC-768/STM-256, VSR2000 G.693, 40G NRZ G.959.1) 41.25 Gb/s (40GBase-FR) 43.018 Gb/s (G.709 FEC, OTU3 4×10G LAN PHY) **Option F2**: Provides standard compliant optical reference receivers for the following rates (standards): 25.781 Gb/s (100GBase-LR4 and 100GBase-ER4) 27.952 Gb/s (OTU4) **Option F3**: Provides standard compliant optical reference receivers for the following rates (standards): 39.813 Gb/s (OC-768/STM-256, VSR2000 G.693, 40G NRZ G.959.1) 41.25 Gb/s (40GBase-FR) 43.018 Gb/s (G.709 FEC, OTU3 4×10G LAN PHY) In addition to the filter rates, the user may also select bandwidths for the 80C10C for optimal noise versus bandwidth performance for accurate signal characterization. When equipped with Option CRTP an electrical signal pickoff is provided for clock recovery. Clock recovery, to 28.6 Gb/s, for the 80C10C is provided using the CR286A clock recovery instrument (sold separately). When equipped with Option HSPR, a separate high-sensitivity photo receiver is provided with independent electrical outputs that can be used with external equipment (such as a Tektronix BERTScope) for high accuracy optical measurements. The 80C10C is also optionally available in a bundled ordering configuration which includes a 70+ GHz electrical sampling channel.
80C11B Multirate, 10 Gb/s Datacom and Telecom	The 80C11B module is a long wavelength (1100 to 1650 nm) multirate optical sampling module optimized for testing 10 Gb/s datacom and telecom standard rates at 9.953, 10.3125, 10.51875, 10.664, 10.709, 11.0957, 11.317, 12.50, and 14.025 Gb/s. With its high optical bandwidth of up to 30 GHz (typical) it is well suited for general-purpose high-performance 10 Gb/s optical component testing. The 80C11B can be optionally configured with clock recovery options that can support any standard or user-defined rate in the continuous range from 9.8 to 12.6 Gb/s.
80C12B Multirate Datacom and Telecom	The 80C12B module is a broad wavelength (700 to 1650 nm) multirate optical sampling module providing telecom and datacom testing for standards from 155 Mb/s to 11.4 Gb/s. This highly flexible module can be configured to support a wide variety of 10 Gb/s applications, lower data rate applications (155 Mb/s to 7.4 Gb/s), or a combination of 10G and lower data rate standards. The low data rate applications include: Telecom applications from 155 to 2666 Mb/s, 1G, 2G, and 4G Fibre Channel, multilane standards such as 10GBASE-X4 and 4-Lane 10 Gb/s Fibre Channel, and Infiniband SDR and DDR rates. The supported 10 Gb/s application includes both datacom and telecom standards. The supported 10 Gb/s datacom applications include 10GbE, 40GbE-R4, 100GbE-SR10 applications at 9.953, 10.3125, 11.0957 Gb/s and 10G Fibre Channel applications at 10.51875 Gb/s and 11.317 Gb/s. The 80C12B also provides telecom rate testing at 9.953, 10.664, and 10.709 Gb/s. With its amplified O/E converter design, this module provides excellent signal-to-noise performance and high optical sensitivity, allowing users to examine low-power optical signals. Clock recovery for the 80C12B is provided using the 80A05 module or CR125A clock recovery instrument (sold separately).
80C14 Multirate Datacom and Telecom	The 80C14 module is a broad wavelength (700 to 1650 nm) multirate optical sampling module providing 8G, 10G, and 16G telecom and datacom testing. The supported 10 Gb/s datacom applications include: 10GbE, 40GbE-R4, 100GbE-SR10 applications at 9.953, 10.3125, and 11.0957 Gb/s. Fibre Channel applications include: 8.500, 10.51875, 11.317, and 14.025 Gb/s. The 80C14 also provides telecom rate testing at 9.953, 10.664, 10.709, and 12.5 Gb/s. With its amplified O/E converter design, this module provides excellent signal-to-noise performance and high optical sensitivity, allowing users to examine low power level optical signals. Clock recovery for the 80C14 is provided by the CR175A or CR286A (sold separately).

Optical Modules: 80C07B

Module	80C07B										
Opt.	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**	**CR1**
Bandwidth (GHz)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Wavelength Range (nm)	700-1650	700-1650	700-1650	700-1650	700-1650	700-1650	700-1650	700-1650	700-1650	700-1650	700-1650
Fibre Input (µm)	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5
Mask Test Sensitivity (dBm)	–22	–22	–22	–22	–22	–22	–22	–22	–22	–22	–22
Number of Channels	1	1	1	1	1	1	1	1	1	1	1
Rates Supported: ■=Filter, ♦=Optical Clock Recovery, ⊕=Electrical Clock Recovery											
125 Mb/s*3	■	■	■	■							♦
155 Mb/s	■	■	■	■							♦
622 Mb/s	■				■	■	■				♦
1063 Mb/s		■			■			■	■		♦
1250 Mb/s			■			■		■		■	♦
2125 Mb/s				■			■		■	■	♦
2488 Mb/s	■	■	■	■	■	■	■	■	■	■	♦
2500 Mb/s	■	■	■	■	■	■	■	■	■	■	♦
3.125 Gb/s											
3.188 Gb/s											
3.32 Gb/s											
4.25 Gb/s											
9.95 Gb/s											

*3 125 Mb/s is supported by selecting 155 Mb/s rate.

Optical Modules: 80C08D, 80C10C, and 80C11B

Module	80C08D				80C10C*4, *6				80C11B				
Opt.		**CR1**	**CR2**	**CR4**	**F1**	**F2**	**F3**	**CRTP**		**CR1**	**CR2**	**CR3**	**CR4**
Bandwidth (GHz)	10	10	10	10	70	55	80		30	30	30	30	30
Wavelength Range (nm)	700-1650	700-1650	700-1650	700-1650	1290-1330 1520-1620	1290-1330 1520-1620	1290-1330 1520-1620	1290-1330 1520-1620	1100-1650	1100-1650	1100-1650	1100-1650	1100-1650
Fibre Input (µm)	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5	9 or 50 or 62.5	9	9	9	9	9	9	9	9	9
Mask Test Sensitivity (dBm)*7	–16	–15	–15	–15	–8	–8	–8	–7*4	–10	–9	–9	–9	–9
Number of Channels	1	1	1	1	1	1	1	1	1	1	1	1	1
Rates Supported: ■=Filter, ♦=Optical Clock Recovery, ⊕=Electrical Clock Recovery													
9.95 Gb/s	■	♦		♦					■	♦	♦	♦	♦
10.31 Gb/s	■	♦	♦	♦					■				♦
10.52 Gb/s	■		♦	♦					■				♦
10.66 Gb/s	■			♦					■		♦		♦
10.71 Gb/s	■			♦					■			♦	♦
11.1 Gb/s	■			♦					■				♦
11.3 Gb/s	■			♦					■				♦
12.5 Gb/s	■								■				♦
25.78 Gb/s					■	■		♦*5					
27.74 Gb/s					■	■		♦*5					
39.81 Gb/s					■		■	♦*2					
41.25 Gb/s					■		■	♦*2					
43.02 Gb/s					■		■	♦*2					

*2 Contact Tektronix for details.

*4 Option CRTP reduces sensitivity by 0.6 dB (max) and increases noise by 15% (max).

*5 Clock recovery with CR286A-HS (sold separately).

*6 User must specify one (and only one) of options F1, F2, F3.

*7 Typical mask test sensitivity shown for most common data rate and wavelength.

Optical Modules: 80C12B and 80C14

Select from one of the following three 80C12B Optical Reference Receiver (ORR) configuration strategies:
1. To configure with 10G (8.5 Gb/s to 11.3 Gb/s) Optical Reference Receivers only: Order **Option 10G** only.
2. To configure with tributary rate (155 Mb/s to 7.373 Gb/s) Optical Reference Receivers only: Order from any four from Option **F0 through F12** (this provides four tributary rate Optical Reference Receivers).
3. To configure with tributary rate Optical Reference Receivers plus 10G Optical Reference Receivers: Order any three from Option **F1 through F12 + Option 10GP** (this provides three tributary rate + the 10G Optical Reference Receivers).

Note: Both Option 10G and Option 10GP include a non-filtered signal path that provides 12 GHz full optical bandwidth. Do not order Option F0 with either Option 10G or 10GP.

	80C12B																80C14	
	F0	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**	**10G**	**10GP**	**CR**		**CR**
Full Bandwidth	>12 GHz	(for non-10G/10GP modules bandwidth is constrained to the highest bandwidth filter)												>12 GHz		—	>13 GHz	—
Wavelength Range	—	700 - 1650 nm														—	700 - 1650 nm	—
Fiber Input	—	9, 50, or 62.5 µm														—	9, 50, or 62.5 µm	—
Mask Sensitivity	—	–22 dBm			–19 dBm									–15 dBm		—	–15 dBm	—
Rates Supported: ■=Filter, ♦=Optical Clock Recovery, ⊕=Electrical Clock Recovery																		
155 Mb/s		■														♦*6		
622 Mb/s			■													♦*6		
1.063 Gb/s				■												♦*6		
1.250 Gb/s					■											♦*6		
2.125 Gb/s						■										♦*6		
2.488 Gb/s							■									♦*6		
2.500 Gb/s							■									♦*6		
2.66 Gb/s								■								♦*6		
3.125 Gb/s									■							♦*6		
3.188 Gb/s									■							♦*6		
4.250 Gb/s										■						♦*6		
5.000 Gb/s											■					♦*6		
6.144 Gb/s												■				♦*6		
7.373 Gb/s													■			♦*6		
8.500 Gb/s*8	■													■	■	♦*6	■	♦*6
9.953 Gb/s														■	■	♦*6	■	♦*6
10.31 Gb/s														■	■	♦*6	■	♦*6
10.51 Gb/s														■	■	♦*6	■	♦*6
10.66 Gb/s														■	■	♦*6	■	♦*6
10.71 Gb/s														■	■	♦*6	■	♦*6
11.1 Gb/s														■	■	♦*6	■	♦*6
11.3 Gb/s														■	■	♦*6	■	♦*6
12.5 Gb/s																♦*6	■	♦*6
14.025 Gb/s																	■	♦*7
14.063 Gb/s																	■	♦*7

*6 With CR125A or CR175A.

*7 With CR175A.

*8 Draft version of the 8.5GFC filter. T11 committee redefined this filter at the April 2008 meeting. New 8.5GFC filter, as defined by T11 committee in April 2009, is identical to the 10GBASE-R 10.313G filter and is available for 80C12B Option F0/10G/10GP modules and 80C14 modules; and is identified as 10BASE-R.

80A05, CR125A, CR175A, and CR286A Electrical Clock Recovery

Product Feature		80A05		CR125A	CR175A	CR286A
		Standard	Option 10G			
Supported Specifications						
Enumerated Standards						
OC3/STM1	155.52 Mb/s	■	■	♦*9	♦*9	♦*9
OC12/STM4	622.08 Mb/s	■	■	■	■	■
Fibre Channel	1.063 Gb/s	■	■	■	■	■
Gigabit Ethernet	1.25 Gb/s	■	■	■	■	■
SAS Gen I	1.50 Gb/s	♦*10	♦*10	■	■	■
2 GB Fibre Channel	2.125 Gb/s	■	■	■	■	■
OC48/STM16	2.488 Gb/s	■	■	■	■	■
2 GB Ethernet	2.50 Gb/s	■	■	■	■	■
PCI Express I	2.50 Gb/s	♦*10	♦*10	■	■	■
Infiniband®	2.50 Gb/s	■	■	♦*9	♦*9	♦*9
2.5G G.709 FEC	2.666 Gb/s	■	■	♦*9	♦*9	♦*9
SAS Gen II	3.0 Gb/s	♦*10	♦*10	■	■	■
XAUI, 10GBASE-X	3.125 Gb/s	■	■	♦*9	♦*9	♦*9
10GB Fibre Channel x4	3.188 Gb/s	■	■	♦*9	♦*9	♦*9
4 GB Fibre Channel	4.25 Gb/s	■	■	■	■	■
FB-DIMM1	3.2, 4.0, 4.8 Gb/s		♦*9, 10	■	■	■
PCI Express II	5.0 Gb/s		♦*9, 10	■	■	■
FB-DIMM2	4.8, 6.4, 8.0, 9.6 Gb/s		♦*9, 10	■	■	■
OIF CEI	6+ Gb/s		♦*9	■	■	■
2x XAUI	6.25 Gb/s		■	♦*9	♦*9	♦*9
8 GB Fibre Channel*[8]	8.50 Gb/s			■	■	■
OC192/STM64	9.953 Gb/s		■	■	■	■
XFP/XFI	9.95-11.2		♦*9	■	■	■
10GBASE-W	9.953 Gb/s		■	♦*9	♦*9	♦*9
10GBASE-R*[8]	10.31 Gb/s		■	■	■	■
10GB Fibre Channel	10.51 Gb/s		■	♦*9	♦*9	♦*9
G.975 FEC	10.66 Gb/s		■	♦*9	♦*9	♦*9
G.709 FEC	10.71 Gb/s		■	♦*9	♦*9	♦*9
OIF CEI	11+ Gb/s		♦*9	■	■	■
10 GbE w/ FEC	11.10 Gb/s		■	♦*9	♦*9	♦*9
Super FEC	12.50 Gb/s		■	♦*9	♦*9	♦*9
16GFC	14.025 Gb/s			♦*9	♦*9	♦*9
14G Infiniband FDR	14.063 Gb/s				♦*9	♦*9
100GbE-LR4/ER4	25.7 Gb/s					♦*9
100GbE-LR4/ER4 FEC	28.8 Gb/s					♦*9
Additional enumerated standard rates are supported with 8000 Series Firmware Releases higher than 2.4.x						
Clock Recovery Ranges for Custom (User-specified) Rates (in addition to enumerated lists above)		50 Mb/s to 3.188 Gb/s 4.25 Gb/s	50 Mb/s to 3.188 Gb/s 3.267 to 4.25 Gb/s 4.900 to 6.375 Gb/s 9.800 to 12.60 Gb/s	150 Mb/s to 12.5 Gb/s continuous	150 Mb/s to 17.5 Gb/s continuous	150 Mb/s to 28.6 Gb/s continuous
Sensitivity (Clock recovery will lock, differential data is given for each input)						
Lowest Supported Rate to 2.70 Gb/s		Differential ≤8 mV_{p-p} Single Ended 10 mV_{p-p}		Differential 15 mV (typ) Single Ended 30 mV (typ)		
2.70 to 11.19 Gb/s			Differential ≤12 mV_{p-p} Single Ended 15 mV_{p-p}			
11.19 to 12.60 Gb/s			Differential ≤15 mV_{p-p} Single Ended 20 mV_{p-p}			

*[8] Draft version of the 8.5GFC filter. T11 committee redefined this filter at the April 2008 meeting. New 8.5GFC filter, as defined by T11 committee in April 2009, is identical to the 10GBASE-R 10.313G filter and is available for 80C12B Option F0/10G/10GP modules and 80C14 modules; and is identified as 10BASE-R.

*[9] The standard is not enumerated but is supported as a custom rate.

*[10] No spread spectrum clocking support.

Characteristics

Optical Sampling Module Characteristics

Module	Application Type	Standards and Supported Filtering Rates*[11]	Number of Input Channels	Effective Wavelength Range	Calibrated Wavelengths
80C07B	Tributary Datacom/Telecom	Standard Included: OC-48/STM-16 (2.488 Gb/s), Infiniband SDR, 2 GbE (2.500 Gb/s); Optional (choose any two): OC-3/STM-1 (155 Mb/s), OC-12/STM-4 (622 Mb/s), Fibre Channel (1.063 Gb/s), GbE (1.250 Gb/s), 2G Fibre Channel (2.125 Gb/s)	1	700 nm to 1650 nm	780 nm, 850 nm, 1310 nm, and 1550 nm (±20 nm)
80C08D	10 Gb/s Datacom/Telecom	OC-192/STM-64 (9.953 Gb/s), 10GBASE-W (9.953 Gb/s), 10GBASE-R, 40GBASE-R4, 100GBASE-SR10 (10.31 Gb/s), 10G Fibre Channel (10.52 Gb/s), ITU-T G.975 FEC (10.664 Gb/s), ITU-T G.709 (10.709 Gb/s), 10 GbE FEC (11.1 Gb/s), 10 GFC FEC (11.3 Gb/s), 10GBASE-LRM, 40GBASE-SR4, 100GBASE-SR10, 40GBASE-LR4, 12.5 Gb/s	1	700 nm to 1650 nm	780 nm, 850 nm, 1310 nm, and 1550 nm (±20 nm)
80C10C	100 Gb/s and 40 Gb/s Telecom and Datacom	OC-768/STM-256 (39.813 Gb/s), OTU3, VSR-2000 G.693, 40G NRZ G.959.1, FEC (43.018 Gb/s), OTU3 (44.5 Gb/s), 40GBASE-FR (41.25 Gb/s), 100GBASE-LR4, 100GBASE-ER4 (25.781 Gb/s), OTU-4 (27.952 Gb/s)	1	1310 nm and 1550 nm	1310 nm and 1550 nm (±20 nm)
80C11B	10 Gb/s Datacom/Telecom	OC-192/STM-64 (9.953 Gb/s), 10GBASE-W (9.953 Gb/s), 10GBASE-R, 40GBASE-LR4 (10.31 Gb/s), 10G Fibre Channel (10.52 Gb/s), ITU-T G.975 FEC (10.664 Gb/s), ITU-T G.709 (10.709 Gb/s), 10 GbE FEC (11.1 Gb/s), 10 GFC FEC (11.3 Gb/s), 40GBASE-LR4, 12.5 Gb/s, 16GFC (14.025 Gb/s)	1	1100 nm to 1650 nm	1310 nm and 1550 nm (±20 nm)
80C12B	155 Mb/s to 11.3 Gb/s Datacom/Telecom	OC-3/STM-1 (155.52 Mb/s), OC-12/STM-4 (622 Mb/s), FC1063 (1.0625 Gb/s), ENET1250 Gigabit Ethernet (1.250 Gb/s), FC2125 (2.125 Gb/s), OC-48/STM-16 (2.488 Gb/s), GBE (2.500 Gb/s), INF2500 (2.500 Gb/s), FEC2.666 (2.666 Gb/s), 10GBASE-X4 (3.125 Gb/s), FC-3188 (3.188 Gb/s), FC4250 (4.250 Gb/s), INF5000 (5.000 Gb/s), OBSAI6144 (6.144 Gb/s), CPRI7373 (7.373 Gb/s), FC8500*[8] (8.500 Gb/s), OC-192/STM-64 (9.95 Gb/s), 8GFC (8.500 Gb/s), 10GBASE-W (9.95 Gb/s), 10GBASE-R (10.31 Gb/s), 40GBASE-R4 (10.31 Gb/s), 100GBASE-R10 (10.31 Gb/s), 10GFC (10.51 Gb/s), FEC10.66 (10.66 Gb/s), FEC10.71 (10.71 Gb/s), FEC11.10 (11.1 Gb/s), FC11317 (11.3 Gb/s)	1	700 nm to 1650 nm	850 nm, 1310 nm, and 1550 nm (±20 nm)
80C14	8.5 to 14 Gb/s Datacom/Telecom	8GFC*[8] (8.500 Gb/s), OC-192/STM-64 (9.953 Gb/s), 10GBASE-W (9.953 Gb/s), 10GBASE-R, 40GBASE-R4, 100GBASE-SR10 (10.31 Gb/s), 10G Fibre Channel (10.52 Gb/s), ITU-T G.975 FEC (10.664 Gb/s), ITU-T G.709 (10.709 Gb/s), 12.5 G+FEC, 10 GbE FEC (11.1 Gb/s), 10 GFC FEC (11.3 Gb/s), 16GFC (14.025 Gb/s),14G Infiniband FDR (14.0625 Gb/s)	1	700 nm to 1650 nm	850 nm, 1310 nm, and 1550 nm (±20 nm)

*[8] Draft version of the 8.5GFC filter. T11 committee redefined this filter at the April 2008 meeting. New 8.5GFC filter, as defined in ANSI FC-PI-4 (Rev 8), is identical to the 10GBASE-R 10.313G filter and is available for 80C12B Option F0, 10G and 10GP modules and 80C14 modules; and is identified as 10GBASE-R.

*[11] Bandwidths shown are warranted unless printed in an italic typeface which represents a typical value. 80C08D, 80C12B, 80C14: Bandwidths and optical filters valid for OMA ≤500 uW (1550/1310 nm), OMA ≤860 uW (850 nm), OMA ≤1020 uW (780 nm).

Note: Refer to Optical Sampling Modules User Manual for more detailed information.

Optical Sampling Module Characteristics (Cont.)

Module	Clock Recovery (Optional)	Clock Recovery Outputs	Unfiltered Optical Bandwidth*11	Absolute Maximum Nondestructive Optical Input	Internal Fibre Diameter
80C07B	Option CR1: 155 Mb/s, 622 Mb/s, 1.063 Gb/s, 1.250 Gb/s, 2.125 Gb/s, 2.488 Gb/s, 2.500 Gb/s, 2.666 Gb/s	±Clock, ±Data	*2.5 GHz*	5 mW average; 10 mW peak power at wavelength of highest responsivity	62.5/125 µm Multi Mode
80C08D*13	Option CR1: 9.953 Gb/s, 10.31 Gb/s; Option CR2: 10.31 Gb/s, 10.52 Gb/s; Option CR4: Continuous from 9.8 Gb/s to 12.6 Gb/s	Clock, Clock/16	*12.5 GHz*	1 mW average; 10 mW peak power at wavelength of highest responsivity	62.5/125 µm Multi Mode
80C10C	Provided by CR286A or other compatible external CR units*2	ELECTRICAL SIGNAL OUT (to 44.5 Gb/s, 50 Ω, AC coupled, differential 2.92 mm female connectors, max. 1 ps diff. skew)*12	*80 GHz*	20 mW average; 60 mW peak power at wavelength of highest relative responsivity	9/125 µm Single Mode
80C11B	Option CR1: 9.953 Gb/s; Option CR2: 9.953 Gb/s, 10.664 Gb/s; Option CR3: 9.953 Gb/s, 10.709 Gb/s; Option CR4: Continuous between 9.8 Gb/s to 12.6 Gb/s	CR1: Clock, Clock/16, Data; CR2, CR3, CR4: Clock, Clock/16	*30 GHz*	5 mW average; 10 mW peak power at wavelength of highest responsivity	9/125 µm Single Mode
80C12B	Provided by 80A05 or CR125A (sold separately)	ELECTRICAL SIGNAL OUT (to 12 Gb/s, AC coupled, differential)	*12 GHz* (Option F0, 10G, and 10GP only)	2 mW average (1310/1550 nm); 4 mW average (850 nm); 10 mW peak power at wavelength of highest responsivity	62.5/125 µm Multi Mode
80C14	Provided by CR175A or CR286A (sold separately)	ELECTRICAL SIGNAL OUT (to 14.2 Gb/s, AC coupled, differential)	*14 GHz*	2 mW average (1310/1550 nm); 4 mW average (850 nm); 10 mW peak power at wavelength of highest responsivity	62.5/125 µm Multi Mode

*2 Contact Tektronix for details.

*11 Bandwidths shown are warranted unless printed in an italic typeface which represents a typical value. 80C08D, 80C12B, 80C14: Bandwidths and optical filters valid for OMA ≤500 uW (1550/1310 nm), OMA ≤860 uW (850 nm), OMA ≤1020 uW (780 nm).

*12 With Option CRTP.

*13 Frequency characteristic and ORR guaranteed for signals up to 500 μW_{p-p} (80C08D, 80C12B), respectively 200 µW (80C07B) at 1550 nm; pro-rated (higher power) for other wavelengths.

Optical Sampling Module Characteristics (Cont.)

Module	Optical Return Loss	Fibre Input Accepted	RMS Optical Noise (Typical)		RMS Optical Noise (Maximum)		Independent Channel Deskew
80C07B	>14 dB (Multi Mode) >24 dB (Single Mode)	Single or Multi Mode	0.50 µW at 155 Mb/s, 622 Mb/s, 1063 Mb/s, 1250 Mb/s; 0.70 µW at 2.488/2.500 Gb/s		1.0 µW at 155 Mb/s, 622 Mb/s, 1063 Mb/s, 1250 Mb/s; 1.5 µW at 2.488/2.500 Gb/s		Standard
80C08D	>14 dB (Multi Mode) >24 dB (Single Mode)	Single or Multi Mode	1.7 µW at all filter rates (1550/1310 nm, no CR)		3.0 µW at all filter rates (1550/1310 nm)		Standard
80C10C*[4]	>30 dB	Single Mode	1310 nm	1550 nm	1310 nm	1550 nm	Standard
			16 µW (25.78 Gb/s) 17 µW (27.95, 28.05 Gb/s) 18 µW (32 GHz) 24 µW (39.81 Gb/s - 43.02 Gb/s) 30 µW (55 GHz) 46 µW (70 GHz) 75 µW (80 GHz)	12 µW (25.78 Gb/s) 13 µW (27.95, 28.05 Gb/s) 14 µW (32 GHz) 18 µW (39.81 Gb/s - 43.02 Gb/s) 23 µW (55 GHz) 36 µW (70 GHz) 55 µW (80 GHz)	23 µW (25.78 Gb/s) 25 µW (27.95, 28.05 Gb/s) 29 µW (32 GHz) 38 µW (39.81 Gb/s - 43.02 Gb/s) 52 µW (55 GHz) 85 µW (70 GHz) 140 µW (80 GHz)	18 µW (25.78 Gb/s) 20 µW (27.95, 28.05 Gb/s) 22 µW (32 GHz) 29 µW (39.81 Gb/s - 43.02 Gb/s) 40 µW (55 GHz) 65 µW (70 GHz) 100 µW (80 GHz)	
80C11B	>30 dB	Single Mode	5.5 µW filters <14 Gb/s; 7.0 µW at 14.025 Gb/s filter 10.0 µW at 20 GHz 20.0 µW at 30 GHz		8.0 µW filters <14 Gb/s; 10.0 µW at 14.025 Gb/s filter 14.0 µW at 20 GHz 30.0 µW at 30 GHz		Standard
80C12B	>14 dB (Multi Mode) >24 dB (Single Mode)	Single or Multi Mode	(1310/1550 nm) 0.7 µW (all filters <2 Gb/s) 0.9 µW (filters between 2 and 4.5 Gb/s) 1.2 µW (filters between 5 and 7.4 Gb/s) 1.7 µW (filters between 8.5 and 11.4 Gb/s) 2.0 µW ('Full BW' and Option 10G/10GP filters)		(1310/1550 nm) 1.3 µW (all filters <2 Gb/s) 1.5 µW (filters between 2 and 4.5 Gb/s) 2.2 µW (filters between 5 and 7.4 Gb/s) 2.7 µW (filters between 8.5 and 11.4 Gb/s) 3.6 µW ('Full BW' and Option 10G/10GP filters)		Standard
80C14	>14 dB (Multi Mode) >24 dB (Single Mode)	Single or Multi Mode	850 nm	1310/1550 nm	850 nm	1310/1550 nm	Standard
			2.5 µW (10G filters) 3.7 µW (14G filters)	1.3 µW (10G filters) 1.9 µW (14G filters)	5 µW (10G filters) 7 µW (14G filters)	2.5 µW (10G filters) 3.5 µW (14G filters)	

*[4] Option CRTP reduces sensitivity by 0.6 dB (max) and increases noise by 15% (max).

Optical Sampling Module Characteristics (Cont.)

Module	Offset Capability	Power Meter	Power Meter Range	Power Meter Accuracy	Mask Test Optical Sensitivity*[14]
80C07B	Standard	Standard	+4 dBm to –30 dBm	5% of reading	–22 dBm at 155 Mb/s, 622 Mb/s; –20 dBm at 2488/2500 Mb/s
80C08D	Standard	Standard	0 dBm to –30 dBm	5% of reading	–16 dBm at all filter rates
80C10C*[4]	Standard	Standard	+13 dBm to –21 dBm	5% of reading	25.8 and 27.7 Gb/s: –8 dBm (1550 nm) and –7 dBm (1310 nm); 39.813 to 43.018 Gb/s: –7 dBm (1550 nm) and –6 dBm (1310 nm)
80C11B	Standard	Standard	+4 dBm to –30 dBm	5% of reading	<14G: –10/–9 dBm (no CR / with CR) 14G: –8/–7 dBm (no CR / with CR)
80C12B	Standard	Standard	0 dBm to –30 dBm	5% of reading	–19 dBm (for all filter options except Option 10G and 10GP) –14 dBm (for Option 10G and 10GP)
80C14	Standard	Standard	0 dBm to –30 dBm	5% of reading	–15 dBm

*[4] Option CRTP reduces sensitivity by 0.6 dB (max) and increases noise by 15% (max).

*[14] Smallest power level for mask test. Values represent theoretical typical sensitivity of NRZ eyes for comparison purposes. Assumes instrument peak-peak noise consumes most of the mask margin.

Optical Sampling Module Characteristics (Cont.)

Module	Extinction Ratio Calibrated Accuracy (Opt. 01 ER Calibrated)*15		
	Reference Filter in Range (Gb/s)	Repeatability (Typical) (to itself and to other 80Cxx-Opt. 01)	Accuracy
80C07B	—	Option not available	
80C08D	9.9…12.5	±0.6% (–0.39 dB / +0.42 dB at 12 dB)	±1.2% (–0.76 dB / +0.92 dB at 12 dB)
80C10C	—	Option not available	
80C11B	9.9…12.5	±0.6% (–0.39 dB / +0.42 dB at 12 dB)	±1.2% (–0.76 dB / +0.92 dB at 12 dB)
80C12B	0.155...11.3	±0.6% (–0.39 dB / +0.42 dB at 12 dB)	±1.2% (–0.76 dB / +0.92 dB at 12 dB)
80C14	—	Option not available	

*15 Low ER signals (ER ≤ 6 dB): signal passes 802.3ae-like mask (scaled horizontally for bit rate); 10^5 samples in mask. High ER signals (ER > 6 dB): signal passes OC-192-like mask (scaled horizontally for bit rate); 10^5 samples in mask.

Physical Characteristics

Module	Dimensions (mm/in.)			Weight (kg/lb.)
	Width	Height	Depth	Net
80C07B	165/6.5	25/1.0	305/12.0	<1.36/<3.0
80C08D	165/6.5	25/1.0	305/12.0	<1.22/<2.7
80C10C	165/6.5	25/1.0	305/12.0	<2.61/<5.75
80C11B	165/6.5	25/1.0	305/12.0	<1.22/<2.7
80C12B	165/6.5	25/1.0	305/12.0	<2.61/<5.75
80C14	165/6.5	25/1.0	305/12.0	<2.61/<5.75

Ordering Information

80C07B
Multirate Datacom and Telecom Optical Sampling Module.
Includes: User manual, FC/PC optical connector, one-year warranty.

80C08D
Multirate Datacom and Telecom Optical Sampling Module.
Includes: User manual, FC/PC optical connector, one-year warranty.

80C10C
Multirate Optical Sampling Module – 80 GHz.
Includes: User manual, FC/PC optical connector, one-year warranty. Clock recovery is available using the CR286A (sold separately).

80C11B
Multirate Datacom and Telecom Optical Sampling Module.
Includes: User manual, FC/PC optical connector, one-year warranty.

80C12B
Multirate Datacom and Telecom Optical Sampling Module.
Includes: User manual, FC/PC optical connector, one-year warranty. Clock recovery is available using the 80A05 or CR125A. The 80C12B Multirate Telecom and Datacom Optical Sampling Module is available with a wide variety of factory-configured signal conditioning options. These options provide a variety of reference receiver filtering and unfiltered signal acquisition bandwidths. See the Options table listed next for more details.

80C14
Multirate Datacom and Telecom Optical Sampling Module.
Includes: User manual, FC/PC optical connector, one-year warranty. Clock recovery is available using the CR175A (sold separately).

Options

Module/Option	Description
80C07B	
Opt. CR1	155/622/1063/1250/2125/2488/2500/2666 Mb/s clock/data recovery. User must select any one (1) of the following filter options:
Opt. F1	155, 622, 2488, 2500 Mb/s
Opt. F2	155, 1063 Mb/s
Opt. F3	155, 1250 Mb/s
Opt. F4	155, 2125 Mb/s
Opt. F5	622, 1063 Mb/s
Opt. F6	622, 1250 Mb/s
Opt. F7	622, 2125 Mb/s
Opt. F8	1063, 1250 Mb/s
Opt. F9	1063, 2125 Mb/s
Opt. F10	1250, 2125 Mb/s
80C08D	
Opt. CR1	9.953, 10.31 Gb/s clock recovery
Opt. CR2	10.31, 10.52 Gb/s clock recovery
Opt. CR4	Continuous rate clock recovery supporting any standard or user-definable rate in the range from 9.8 to 12.6 Gb/s
Opt. 01	ER Calibrated (when ordered with new module); module will only work on mainframe with Windows XP or Windows 7 and oscilloscope FW V 5.0 and higher. ER Calibrated can be ordered as an upgrade to an existing module; order Opt. 01 + Opt. IFC (factory installation); factory installation is required; module will only work on mainframe with Windows XP and oscilloscope FW V 5.0 and higher.
80C10C The 80C10C has three configurations (Option F1, F2, or F3). User must order one of these options with the module	
Opt. F1	25.781, 27.952, 39.813, 41.25, 43.018 Gb/s filters, 70 GHz full bandwidth
Opt. F2	25.781, 27.952 Gb/s filters, 55 GHz full bandwidth
Opt. F3	39.813, 41.25, 43.018 Gb/s filters, 80 GHz full bandwidth
Opt. HSPR	Option HSPR (High Sensitivity Photo Receiver) provides a second, more sensitive single-mode optical input that supports typical power levels for the 40 Gb/s and 100 (4 x 25) Gb/s standards. The option also provides differential electrical outputs (50 Ω, AC coupled, differential 2.92 mm female connectors) on the module front panel, to 44.5 Gb/s, with a maximum 1 ps differential skew. A typical use for Option HSPR is to provide optical BER testing when using a Tektronix BERTScope. This option is compatible with options F1–F3, but is mutually exclusive from Opt. CRTP
Opt. CRTP	The option provides differential clock recovery trigger pick-off (CRTP) electrical outputs (50 Ω, AC coupled, differential 2.92 mm female connectors) on the module front panel, to 44.5 Gb/s, with a maximum 1 ps differential skew. This option is compatible with options F1–F3, but is mutually exclusive from Opt. HSPR
80C10CE2 Bundled ordering configuration includes 80C10C plus one 80E11X1 single-channel 70+ GHz electrical module (This bundle has the same ordering options as the 80C10C).	

Module/Option	Description
80C11B	
Opt. CR1	9.953 Gb/s clock recovery
Opt. CR2	9.953, 10.66 Gb/s clock recovery
Opt. CR3	9.953, 10.71 Gb/s clock recovery
Opt. CR4	Continuous rate clock recovery supporting any standard or user-definable rate in the range from 9.8 to 12.6 Gb/s
Opt. 01	ER Calibrated (when ordered with new module); module will only work on mainframe with Windows XP or Windows 7 and oscilloscope FW V 5.0 and higher. ER Calibrated can be ordered as an upgrade to an existing module; order Opt. 01 + Opt. IFC (factory installation); factory installation is required; module will only work on mainframe with Windows XP and oscilloscope FW V 5.0 and higher.

80C12B

The 80C12B module provides user-selected filter options for measuring specified sets of standards. There are three module configurations available which must be specified when ordering:
- Option 10G provides Optical Reference Receiver (ORR) filters for all standard rates between 8.5 and 11.4 Gb/s.
- Options F0-F12 provide four "tributary" filters for standards at data rates from 155 Mb/s to 7.373 Gb/s. Select the four filter options when ordering the module.
- Option 10GP plus any three F1-F12 filters provides Optical Reference Receiver (ORR) filters for all standard rates between 8.5 and 11.3 Gb/s plus the three selected tributary standard rates.

Note: Option 10GP and F0 are mutually exclusive, as Option 10GP already includes Option F0.

Opt. F0	Unfiltered 12 GHz bandwidth and 8.5 Gb/s
Opt. F1	155.52 Mb/s
Opt. F2	622 Mb/s
Opt. F3	1.0625 Gb/s
Opt. F4	1.250 Gb/s
Opt. F5	2.125 Gb/s
Opt. F6	2.488, 2.500 Gb/s
Opt. F7	2.666 Gb/s
Opt. F8	3.125, 3.188 Gb/s
Opt. F9	4.250 Gb/s
Opt. F10	5.000 Gb/s
Opt. F11	6.144 Gb/s
Opt. F12	7.373 Gb/s
Opt. 10G/10GP	8.500, 9.95, 10.31, 10.51, 10.66, 10.71, 11.1, 11.3 Gb/s, Unfiltered 12 GHz bandwidth
Opt. 01	ER Calibrated (when ordered with new module); module will only work on mainframes with Windows XP or Windows 7 and oscilloscope FW V 5.0 and higher. ER Calibrated can be ordered as an upgrade to an existing module; order Opt. 01 and Opt. IFC (factory installation)

Service Options For All Optical Sampling Modules

Option	Description
Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D1	Calibration Data Report (includes frequency response curves for all included reference receiver filters)
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. R3	Repair Service 3 Years
Opt. R5	Repair Service 5 Years

Optical Connector Accessories

While the FC/PC connector is standard with the 8000 Series optical sampling modules, the input connector type can be interchanged with any of the following standard adapters:

Adapters

Adapter	Order
ST/PC	119-4513-xx
D4/PC	119-4514-xx
Biconic	119-4515-xx
FC/PC	119-5115-xx
SMA 2.5	119-4517-xx
SC/PC	119-5116-xx
DIN/PC 47256	119-4546-xx
HP/PC	119-4556-xx
SMA	119-4557-xx
DIAMOND 3.5	119-4558-xx

Note: For LC connector please use LC to FC/PC patch cable and connect to the default FC/PC.

CE

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

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