

DAN3 COMPACT REMOTE PHY NODE



DAN3 is a Compact Remote PHY node that is designed to meet the CableLabs Remote PHY specifications. This enables interoperability between different CCAP vendors core solutions without requiring specialized development or back office upgrades.

DAN3 has a single downstream and two upstream segments. The device can be used in 1x1 mode with a 1x2 RPD module installed and later on the 1x2 mode can be enabled. Configuration between 1x1 and 1x2 mode can be done remotely.

DAN3 supports full DOCSIS 3.1 spectrum downstream and upstream directions allowing maximum of 6 OFDM- and 2 OFDMA-channels.

Features

- Full spectrum Downstream capacity up to 1.2 GHz
- Return path supports 2 x 204 MHz bandwidth
- Support DOCSIS 3.1 and DOCSIS 1.1 / 2.0 / 3.0 channels
- 2 x 10 Gbe SFP+, 2nd for redundancy
- Out of Band-systems support using NDF/NDR-channels
- Pilot-tone generation
- Alignment carriers
- 3rd generation GaN amplifier
- Electrical control of return path signal combining
- Electrical level and slope controls
- Efficient surge and ESD protection

Technical specifications

10 Gigabit Ethernet interfaces

Number of ports	2
Connectors	SFP+ module slot
Standard	IEEE 802.3-2008, Section 4 10GBASE-SR, 10GBASE-LR, 10GBASE-ZR
Timing	IEEE-1588

Security

Authentication	802.1x
Secure SW download	as specified in CM-SP-R-PHY
MACSec	Product option. Contact Teleste for details

Local management interface (Gigabit Ethernet)

Connector	RJ45	1)
Standard	1000BASE-T	

Downstream modulator

Downstream SC-QAM

Number of SC-QAM Channels	160/Annex B, 120/AnnexA	2)
Frequency range	108 ...1006 MHz	
Modulation order	QAM64/256	

All SC-QAM channels can be used flexibly for video or DOCSIS. Video dejitter functionality for ASYNC video channels.

Downstream OFDM

Number of OFDM Channels	6
Frequency range	108 ...1218 MHz
Channel width	24 ... 192 MHz
Modulation order	Up to 16k QAM

Upstream demodulator

Frequency range	2 x 5 ...204 MHz
Number of OFDMA Channels	2 per RF interface
Modulation order	Up to 4k QAM
Channel width	up to 96 MHz (per channel)
Number of SC-QAM Channels	12 per RF interface

OOB support

Number of NDF channels	3	
NDF frequency range	50...1000 MHz and 85...1218 MHz	3)
NDF channel width range	Mode 0...7	3)
Number of NDR channels	3 per segment	
NDR channel width range	Mode 0...6	
Pilot tones	4 dedication tone generators. In addition QAM channels can be run in pilot mode.	
Narrowband US FFT	1 per port	
Wideband US FFT	1 shared	
Standard	CM-SP-R-OOB	

Remote PHY standards

CM-SP-R-PHY	Remote PHY Specification
CM-SP-R-DEPI	Remote Downstream External PHY Interface Specification
CM-SP-R-UEPI	Remote Upstream External PHY Interface Specification
CM-SP-R-OOB	Remote Out-of-Band Specification
CM-SP-R-OSSI	Remote PHY OSS Interface Specification
CM-SP-GCP	Generic Control Plane Specification
CM-SP-R-DTI	Remote DOCSIS Timing Interface Specification
CM-SP-PHYv3.1	DOCSIS 3.1 Physical Layer Specification
CM-SP-MULPIv3.1	DOCSIS 3.1 MAC and Upper Layer Protocols Interface Specification

Downstream signal path

Frequency range	85...1218 MHz	
Return loss	19 dB	4)
Gain limited output level	119 dB μ V / 59 dBmV , BW=6MHz	
Level control	- 25...0 dB	5)
Slope control	10...23 dB	6)
Flatness	\pm 0.5 dB	7)
Test points	-20 dB	8)
U _{max} (138 QAM channels)@1.2 GHz	116.0 dB μ V / 56 dBmV	9)
Maximum output level (188 QAM chs)	118 dB μ V / 58 dBmV	10)
MER	See curve	11)
CINR	See curve	11)

Upstream signal path

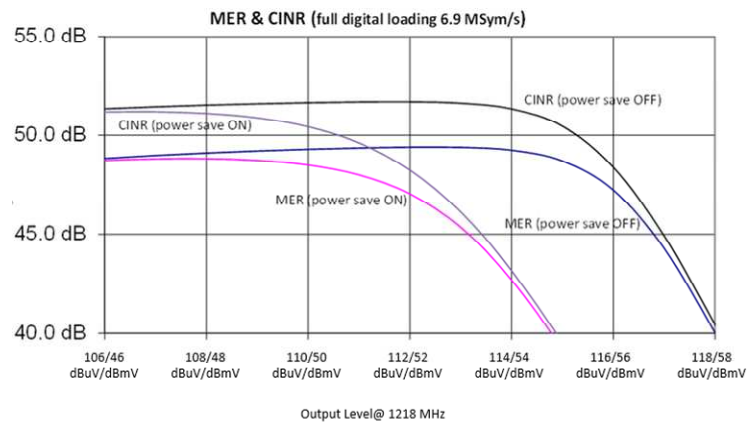
Frequency range	5...204 MHz	
Return loss	18 dB	12)
Flatness	\pm 0.75 dB	12)
MER	42 dB	
Input level	-4...+25 dBmV	12)
Maximum input power (TCP)	39 dBmV	14)
Test point	-20 dB	15)

General

Power consumption		
1x1	58 W	16)
1x2	61 W	16)
Supply voltage	32...65 / 45...90/ 100...253 V _{AC}	
Maximum current feed through	12 A / port	
Hum modulation	70 dB	17)
Output port	PG11	
Test point connectors	F female	
Dimensions	245 x 255 x 159 mm (h x w x d)	18)
Weight	6.0 kg / 13 lbs	
Operating temperature	-40...+60 °C / -40...+140 °F	
Class of enclosure	IP68	19)
EMC	EN50083-2	
ESD	4 kV	20)
Surge	6 kV (EN 60728-3)	
Environmental (Vibration)	ETSI EN 300 019-2-4	

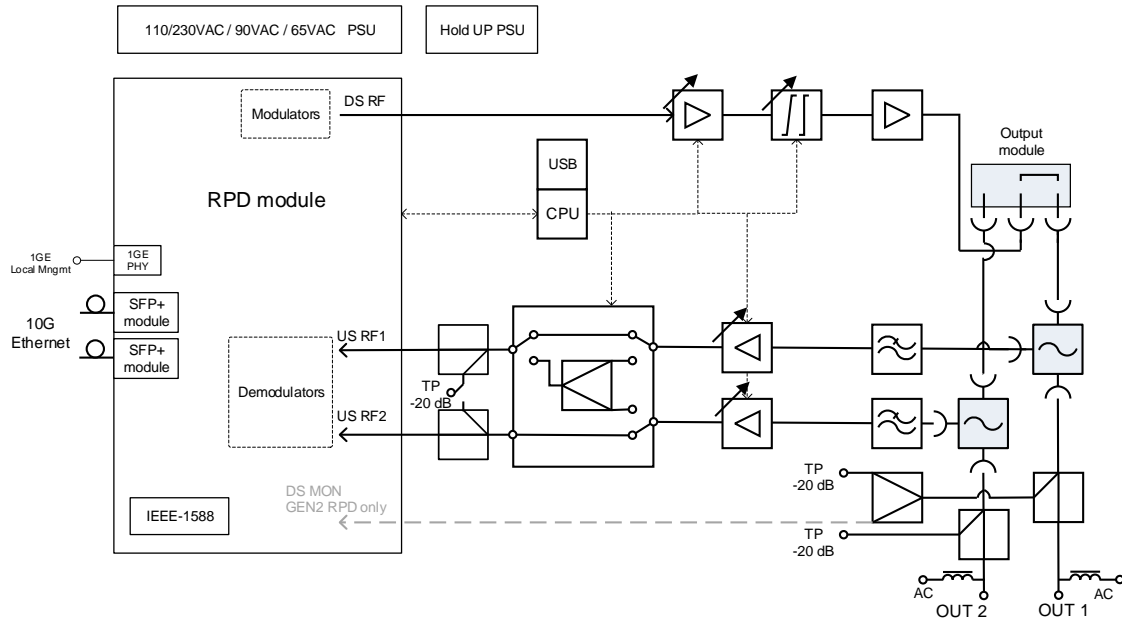
Notes

- 1) The connector is not accessible when the RPD module is installed in a compliant Teleste node. The interface may be removed in future HW versions
- 2) Max 160 pieces of 6 MHz channels in Annex B
- 3) 2 mode 0...6 capable NDF-channels in 50...1000 MHz and 1 mode 0...7 capable NDF-channel in 85...1218 MHz area.
- 4) The limiting curve is defined at 85 MHz -1.5 dB / octave. Return loss is always better than 13 dB.
- 5) Step size is 0.5 dB.
- 6) Step size is 0.5 dB. Linear slope is defined between 85...1218 MHz.
- 7) Typical value in room temperature. Guaranteed value is ± 0.85 dB.
- 8) TPs have ± 0.75 dB tolerance between 85...862 MHz and ± 1.0 dB between 862...1218 MHz. TP for DPD connection is available only when a product is delivered with 2nd gen. RPD.
- 9) Typical value according to IEC60728-3. Full digital loading (J.83 annex A) up to 1218 MHz in use. Channels have 16 dB linear slope. Umax is 112.0 dBuV / 52 dBmV when power save is ON.
- 10) Full 256QAM (J.83 annex B) loading up to 1218 MHz and 22 dB linear slope in use. BER < $1 \cdot 10^{-6}$. This level corresponds power of 73.8 dBmV (TCP).
- 11) Typical MER and CINR



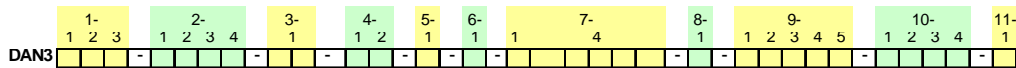
- 12) Valid after $f > 8$ MHz. Return loss is 16 dB after 140 MHz.
- 13) This is a level at port when node gain is set to 0dB
- 14) This equals about -10 dBm RF power. 0 dB gain setting in use.
- 15) -20 dB compared to RPD input. TP has ± 0.75 dB tolerance.
- 16) SFP not included. Power save OFF. When power save is in use, power consumption is 8 W lower.
- 17) 70 dB hum value is valid at any frequency from 10 to 1218 MHz, when the remote current is less than 10 A/ port. Hum modulation is 60 dB, if $I > 10.0$ A
- 18) Including hinges and mounting connectors. Excluding RF connectors.
- 19) Fibre feedthrough solution might have impact to IP classification.
- 20) EN61000-4-2, contact discharge to enclosure and RF-port.

Block Diagram



Ordering information

DAN3 configuration map



1-1: RPD type
A 1 Downstream, 1 Upstream
B 1 Downstream, 2 Upstreams

1-2 Power supply
A 65 VAC
B 110 - 240 VAC
C 65 VAC with UPS
D 110 - 240 VAC with UPS
E 90 VAC
F 90 VAC with UPS

1-3: Output Module
A 0 dB (AC6120)
B Splitter (AC6124)
C Tap 2/8 dB (AC6113)
D Tap 2/12 dB (AC6114)
E Tap 1/16 dB (AC6115)
F Tap 2/10 dB (AC6117)
X None

2-1 Fibre feed-through adapter 1 (left)
E 5/8 Adapter (KDC316)
G 1-4 fibres (KDO900)
X PG11 sealing plug

2-2 Fibre feed-through adapter 2 (right)
E 5/8 Adapter (KDC316)
G 1-4 fibres (KDO900)
X PG11 sealing plug

2-3 Output 1 connection (first from right)
A PG11
B 5/8"
C IEC
D 3.5/12
E F
K Customer specific option

2-4 Output 2 connection
A PG11
B 5/8"
C IEC
D 3.5/12
E F
K Customer specific option
X PG11 sealing plug

3-1 Optical passive
A1 2 x patch fibers SC/APC 8deg - LC/UPC
XX None

4-1: Diplexer filter RF-port 1
A 65/85 MHz (CXF065)
B 85/105 MHz (CXF085)
C 204/258 MHz (CXF204)
G 65/85 MHz (CXF065 19)
I 85/105 MHz (CXF085 19)
K 204/258 MHz (CXF204 19)
N 204/258 MHz (CXF204 10)
X None

4-2: Diplexer filter RF-port 2
A 65/85 MHz (CXF065)
B 85/105 MHz (CXF085)
C 204/258 MHz (CXF204)
G 65/85 MHz (CXF065 19)
I 85/105 MHz (CXF085 19)
K 204/258 MHz (CXF204 19)
N 204/258 MHz (CXF204 10)
X None

5-1: Reserved for future
X None

6-1: Reserved for future
X None

7-1 SFP1
L31 LR, 1310 nm, 10 km, dual LC
XXX None

7-4 SFP2
L31 LR, 1310 nm, 10 km, dual LC
XXX None

8-1 Reserved for future
X None

9-1 Reserved for future
X None

9-2 Reserved for future
X None

9-3 Reserved for future
X None

9-4 Reserved for future
X None

9-5 Reserved for future
X None

10-1 Reserved for future
X None

10-2 Reserved future
X None

10-3 Reserved for future
X None

10-4 Settings
A Customer specified
X Factory default

11-1 Reserved for future
X None

DOC0037077, Rev004