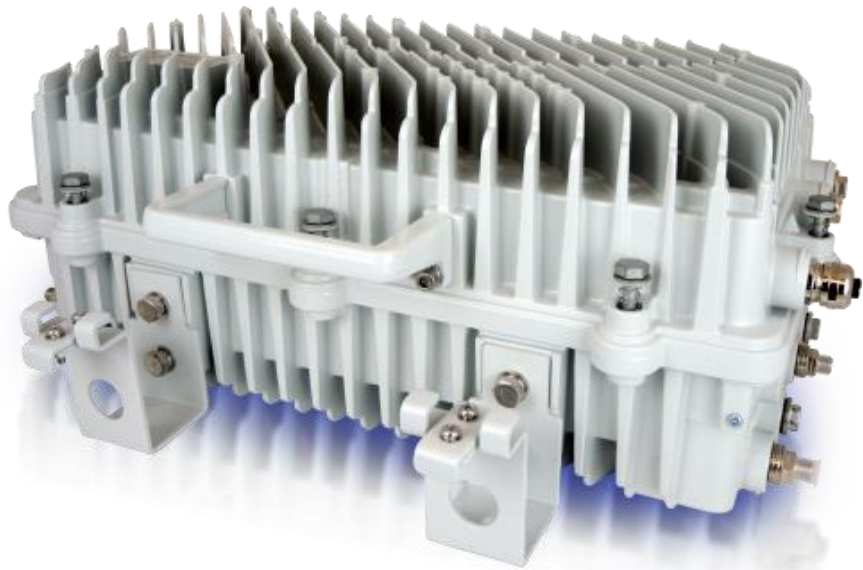


## Distributed CCAP DOCSIS 3.1 Outdoor Node



### Product

**DEV 6871** Distributed CCAP DOCSIS 3.1 Outdoor Node

### Features

- ▀ Compatible with DOCSIS 3.1 / 3.0 / 2.0 / EuroDOCSIS / C-DOCSIS
- ▀ Ready for Distributed Access Architecture (DAA)
- ▀ Support of PacketCable / PacketCable Multimedia (PCMM) / EQAM
- ▀ Support of Analog Optical Receiver
- ▀ Support all common US/DS Frequency Splits
- ▀ Up to 6\* OFDM and 2\*2\* OFDMA
- ▀ 10 Gbps and more per Node
- ▀ Up to 1,000 Cable Modems per Node
- ▀ Outdoor Chassis (IP67)
- ▀ Modular Architecture
- ▀ Various Remote Operation and Management Capabilities

## Technical Data

DEV 6871	Distributed CCAP DOCSIS 3.1 Outdoor Node	
<b>Power Supply</b>		
Supply Voltage	100...240 V AC	(with Option vPS220V, local power supply)
	36...110 V AC	(with Option vPS90V, cable based power supply)
Output Power	max. 140 W	
Power Consumption	115 W	(with Option vRF1)
	120 W	(with Option vRF2)
Surge Protection Level	6 kV	
Overcurrent Protection	≥15 A	(continuous overcurrent)
	≥25 A	(burst overcurrent)
<b>General Specifications</b>		
Size	17.17" (436 mm) Width, 7.28" (185 mm) Height, 9.57" (243 mm) Depth	
Weight	~20.0 kg	
Operating Temperature	-40...+55 °C (-40...+131 °F), startup on -25 °C (-13 °F)	
Operating Humidity	5...95 % (non-condensing)	
Ingress Protection Rating	IP67	
<b>General RF Specifications</b>		
RF Output Ports	4	
Impedance, Connectors	75 Ohm, precision F (f)	
Channel Frequency Range	1003 MHz / 1218 MHz	
Frequency Division	42/54 MHz, 65/87 MHz, 85/108 MHz, 204/258 MHz	

### Option vD30-x DOCSIS 3.0 Mainboard

### Option vD31-x DOCSIS 3.1 Mainboard

Currently, the technical data describes the DOCSIS 3.1 Mainboards, the differences to the technical data of the DOCSIS 3.0 Mainboards will be explained in a future version of this spec sheet

Standards	DOCSIS 3.1 DOCSIS / EuroDOCSIS 3.0 DOCSIS / EuroDOCSIS 2.0 C-DOCSIS	
SNI (Service Node Interface) <sup>1</sup> Management Interface	1 * SFP+ for GE   10GE   EPON   10G EPON   GPON   XG(S)-PON 1 * GE RJ-45 management interface 1 * RJ-45 console interface 1 * RJ-45 monitor Interface (transponder interface)	
Number of Cable Modems	≤300 (DOCSIS 3.1 cable modems) ≤1000 (DOCSIS 3.0 & DOCSIS 2.0 cable modems)	
<b>Working Channels</b>	<b>Downstream (DS)</b>	<b>Upstream (US)</b>
Channel Frequency Range DOCSIS 3.1	54/87/108/258...1003 MHz (with Option vRF1) 54/87/108/258...1218 MHz (with Option vRF2)	5...42/65/85/204 MHz
DOCSIS 3.0	54/87/108...1003 MHz	5...42/65/85 MHz
Working Channels		
DOCSIS 3.1	6	2 * 2
DOCSIS 3.0	96 (64 DOCSIS + 32 NC)	2 * 12 (DOCSIS)
Channel Width		
DOCSIS 3.1	24...192 MHz	6.4...96 MHz
DOCSIS 3.0	6/8 MHz	1.6/3.2/6.4 MHz

## Technical Data (cont.)

Working Channels (cont.)	Downstream (DS)	Upstream (US)
Modulation		
DOCSIS 3.1	OFDM (16...4096 QAM)	OFDMA (BPSK, QPSK, 16...2048 QAM)
DOCSIS 3.0	64...1024 QAM	QPSK, 16...256 QAM
Reception Level Range (US)		
DOCSIS 3.1	N/A	-4...+10 dBmV @ 6.4 MHz -7...+10 dBmV @ 3.2 MHz -10...+10 dBmV @ 1.6 MHz
DOCSIS 3.0	N/A	-7...+23 dBmV @ 6.4 MHz -10...+20 dBmV @ 3.2 MHz -13...+17 dBmV @ 1.6 MHz
MER <sup>2</sup>		
DOCSIS 3.1	<ul style="list-style-type: none"> <li>■ 87...600 MHz ≥48 dB (any single subcarrier) ≥50 dB (average over a whole OFDM channel)</li> <li>■ 600...1002 MHz ≥45 dB (any single subcarrier) ≥47 dB (average over a whole OFDM channel)</li> <li>■ 1002...1218 MHz ≥43 dB (any single subcarrier) ≥45 dB (average over a whole OFDM channel)</li> </ul>	N/A
DOCSIS 3.0	≥35 dB (equalizer off) ≥43 dB (equalizer on)	N/A
<b>System Functions</b>		
IP Version Support	IPv4 and IPv6 dual-stack	
DHCP Support	DHCP relay / snooping; DHCP bundle; DHCP lease query; Insert CMTS capabilities and CM MAC	
DHCPv6 Support	DHCPv6 relay / snooping; DHCPv6 bundle; DHCPv6 lease query; DHCPv6-PD; According to Option 60 to identify equipment type; Insert Remote-ID, Interface-ID, CMTS capabilities, and CM MAC	
VLAN & L2VPN Support	802.1ad / 802.1q subnet VLAN; Service flow-based VLAN addition or deletion; VLAN addition according to device type; L2VPN; VLAN conversion	
MAC Domain Management Support	MDD & MDF enable and disable; MTC & MRC enable and disable; UDC enable and disable; Upstream automatic frequency hopping; Piggyback, shared-secret, channel bonding	
Multicast Support	Multicast authentication; IGMP V2 / V3 snooping; MLD V1 / V2	
Load Balance Support	RLBG / GLBG; Load balance priority	
QoS Support	Static / dynamic service flow; Service class; Best effort, UGS, UGS-AD, RTPS, NRTPS; DOCSIS 3.0 USCB scheduling; PowerBoost	
PacketCable Support	PacketCable 1.5/2.0 & PCMM; DQoS	
<b>Management &amp; Monitoring</b>		
Cable Modem (CM) Management Support	CM status review; CM steer; CM blacklist; CM dispersion degree; Remote query; Flap list; Admission control	
CPE Management Support	CPE query and clear	
Network Management Support	SSH/Telnet; SNMP V1/V2c/V3; SYSLOG; Graphical standalone WEB management; RMD Controller centralized management; NMS integration	
System Diagnostic and Monitoring Support	System information acquisition and monitoring; Optical receiver information monitoring; Debug mode; Show tech-support; Ping, DOCSIS ping, tracer; Spectrum monitor	

## Technical Data (cont.)

### Management & Monitoring (cont.)

IPDR Support	IPDR/SP over TCP; DOCSIS IPDR; IPDR/XDR encoding based on the data; Time interval/event-based/ad hoc data acquisition method
Security Guarantee Support	AAA (TACACS+, RADIUS); RA guard; ACL; BPI+; EAE; Source verify; Message speed; DoS attack prevention; Blacklist, whitelist, firewall
Software Upgrade Support	CLI / WEB GUI / EMS (NM3000) / RMDC upgrade; Remote upgrade, version reversion when upgrade failure

### EQAM Functions

Channel Frequency Range	54/87/108/258...1003 MHz
Channel Width	8/6 MHz
Symbol Rate	6.875/6.900/6.952 MBaud, 5.057/5.361 MBaud
Modulation Mode	64/256 QAM
Working Channel	Maximum 32 NC QAM channels
Phase Noise	<-75 dBc/Hz @ 1 kHz <-85 dBc/Hz @ 10 kHz <-100 dBc/Hz @ >100 kHz
Network Delay Jitter Tolerance	1000 ms
PCR Jitter Tolerance	≤500 ns
Transmission Technology Support	UDP/IP/GE transmission
Control Protocol	Compatible with NGOD specification, D6/R6 standard
Multiplexing Capability Support	PMT PID, and other PSI/SI multiplexing capabilities
TS Multiplexing	<ol style="list-style-type: none"> <li>1) VOD service, single frequency supports 32 programs, with each program supporting 16 PIDs simultaneously by default</li> <li>2) A single program can configure to transmit 50 PIDs</li> <li>3) The whole device supports 256 UDP ports, and 4096 PIDs</li> <li>4) Support DATA stream of a single frequency multiplexing with other frequency</li> </ol>
Stream Parameters	<ol style="list-style-type: none"> <li>1) Support the stream of a variety of signal source formats such as MPEG2, MPEG4, H.264, H.265, HEVC, AVS, DATA (including VBR and CBR formats)</li> <li>2) In a single frequency, support unicast stream, multicast stream and DATA stream simultaneously</li> <li>3) Each frequency supports 4 business UDP port</li> <li>4) The service port (UDP port) can be configured with PMT PID and service flow type information according to different frequencies</li> <li>5) Support stream overflow protection</li> <li>6) In data broadcasting service, support PID value offset in the transport stream (remapping)</li> </ol>
Status Monitoring Support	Real-time traffic statistics; Concurrent traffic statistics
Regular ARP	Report EQAM business IP ARP packet every 2 seconds
Network Management Support	<ol style="list-style-type: none"> <li>1) Web-based graphic management interface, HTTP/ HTTPS</li> <li>2) SSH, Telnet and RS232 serial port management</li> </ol>

Note 1: Industrial-grade SFP+ module has to be used in DOCSIS mainboard

Note 2: The values are obtained from the RF OUT ports on the DOCSIS mainboard based on CableLabs DOCSIS 3.1 test standard. MER test conditions:

- a) Total frequency width 528 MHz, including 2 \* 192 MHz (OFDM channel) + 24 \* 6 MHz (SC-QAM channel)
- b) 528 MHz equal to 88 DOCSIS 3.0 channels (calculated using the U.S. standard 6M channel bandwidth)

## Technical Data (cont.)

Option vRFx	RF Module	
<b>Forward Receiver (Rx) Module</b>		
Wavelength	1290...1600 nm	
Optical Connector Type	SC/APC	
Number of optical Rx Modules	1	(Option vRF1)
	2	(Option vRF2)
Optical AGC Options	-7...+2 dBm	
Passband	47...1003 MHz	
Flatness	±0.75 dB	
Optical Input Test Point	1 V/mW (± 20 %)	
<b>RF Specifications</b> <sup>1</sup>	<b>Forward</b>	<b>Reverse</b>
Return Loss	≥16 dB (258...550 MHz)	≥16 dB
	≥14 dB (550...1003/1218 MHz)	
Internal RF Test Points	-20 dB (±1 dB)	-20 dB (±1 dB)
Port to Port Isolation	50 dB	50 dB
Maximum Output Level	112 dBμV @ 1003 MHz @ 8 dB EQ (Option vRF1)	
	116 dBμV @ 1218 MHz @ 18 dB EQ (Option vRF2)	
Maximum QAM Output Level <sup>2</sup>	48 dBmV @ 160 channels	
	49 dBmV @ 128 channels	
	53 dBmV @ 64channels	
	57 dBmV @ 32 channels	
	60 dBmV @ 16 channels	
	64 dBmV @ 8 channels	
	67 dBmV @ 4 channels	
	71 dBmV @ 2 channels	
	75 dBmV @ 1 channel	
Default Output Tilt	18 dB (87...1002 MHz)	
Tilt Range	20 ±1.0 dB	
Operational Gain <sup>3</sup>		1 * RF_US: 0dB <sup>4</sup>
		2 * RF_US: 3dB <sup>4</sup>
		±0.75 dB
Flatness <sup>5</sup>	±0.75 dB	
Level Stability	±1.5 dB (-40...+55 °C)	
CSO <sup>6</sup>	>60 dBc	
CTB <sup>6</sup>	>65 dBc	
C/N <sup>6</sup>	>51 dBc	

Note 1: All RF specifications are tested under default configuration conditions

Note 2: The channel width of each channel is 6 MHz; the output level of each channel can be reduced based on the maximum output level

Note 3: Operational gain refers to the gain or loss of RF launch amplifier

Note 4: From output port to DOCSIS module US port

Note 5: RF launch amplifier performance

Note 6: Test conditions for C/N, CTB, and CSO: 99 PAL channels (CW)

Option CWDM2	CWDM Module; 1310/1577/1550 nm, SC/APC; 1550 nm, SC/APC, 1310/1577 nm or 1270/1577 nm, SC/UPC
Optical Power	<300 mW (24.77 dBm)
COM Interface	1260...1581 nm, SC/APC
PASS Interface	1530...1565 nm, SC/APC
REF Interface	1260...1360 nm
	1574...1581 nm, SC/UPC

## Technical Data (cont.)

Insertion Loss		
PASS Interface		<0.8 dB
REF Interface		<0.6 dB
Isolation		
PASS Interface		>30 dB
REF Interface		>15 dB
Reflection Loss		>48 dB
Polarization Dependent Loss (PDL)		<0.2 dB
Polarization Mode Dispersion (PMD)		<0.2 dB

## Order Information

<b>Product</b>	
DEV 6871	Distributed CCAP DOCSIS 3.1 Outdoor Node
<b>Options</b>	
Option vD30-1	DOCSIS 3.0 Mainboard; 1*10G EPON SFP+
Option vD30-2	DOCSIS 3.0 Mainboard; 1*10GE SFP+
Option vD30-3	DOCSIS 3.0 Mainboard; 1*10G Combo SFP+
Option vD31-1	DOCSIS 3.1 Mainboard; 1*10G EPON SFP+
Option vD31-2	DOCSIS 3.1 Mainboard; 1*10GE SFP+
Option vD31-3	DOCSIS 3.1 Mainboard; 1*10G Combo SFP+
Option vRF1	RF Module 4*RF out + 1*1 CATV optical Transceiver Module; up to 1 GHz
Option vRF2	RF Module 4*RF out + 2*1 CATV optical Transceiver Module; up to 1.2 GHz
Option vPS220V	Power Supply 110/220 V AC
Option vPS90V	Power Supply 60/90 V AC
Option LD30-DS	DOCSIS 3.0 License 8*DS
Option LD30-US	DOCSIS 3.0 License 4*US
Option LD31-DS	DOCSIS 3.1 License 1*DS OFDM
Option LD31-US	DOCSIS 3.1 License 1*US OFDMA
Option SFP_PON2	SFP+ optical Module Asymmetric 10G EPON ONU; 1.25/10.3125 Gbps; 1310/1577 nm
Option SFP_PON3	SFP+ optical Module Symmetric 10G EPON ONU; 10.3125/10.3125 Gbps; 1270/1578 nm
Option CWDM2	CWDM Module; 1310/1577/1550 nm, SC/APC; 1550 nm, SC/APC, 1310/1577 nm or 1270/1577 nm, SC/UPC
Option OFF1	Optical Fiber Flange; 2 * SC/APC-SC/APC
Option OFF2	Optical Fiber Flange; 2 * FC/APC-SC/APC
Option OFF3	Optical Fiber Flange; 1 * FC/APC-SC/APC, 1 * SC/APC-SC/APC
Option OF1	Optical Fiber; 0.57 m; SC/APC-SC/UPC
Option OF2	Optical Fiber; 0.57 m; SC/APC-LC/UPC
Option OF3	Optical Fiber; 2.0 m; SC/APC-SC/APC
Option OF4	Optical Fiber; 5.0 m; LC/UPC-LC/UPC
Option PDE	European Power Cable
Option PGB	UK Power Cable
Option HPF	Upstream High Pass Filter; 20...100 MHz
Option Acc2	F Type Shell Screw Accessory Package
Option ETH	Gigabit Ethernet Cable; 3.0 m
Option DPX1	Diplexer 5...65 MHz, 87...1218 MHz
Option HPF1	High Pass Filter 87...1218 MHz
Option LPF1	Low Pass Filter 5...65 MHz

## Order Information (cont.)

Option DPX2	Diplexer 5...85 MHz, 108...1218 MHz
Option HPF2	High Pass Filter 108...1218 MHz
Option LPF2	Low Pass Filter 5...85 MHz
Option DPX3	Diplexer 5...204 MHz, 258...1218 MHz
Option HPF3	High Pass Filter 258...1218 MHz
Option LPF3	Low Pass Filter 5...204 MHz

### SFP Module Options

Option SFP_GE1	SFP electrical Module GE; 1000M; 100 m
Option SFP_GE2	SFP optical Module GE; 1.25 Gbps; 850 nm; 550 m
Option SFP_GE3	SFP optical Module GE; 1.25 Gbps; Commercial Grade; 1310 nm; 20 km
Option SFP_10GE1	SFP+ optical Module 10GE; 10.3125 Gbps; 850 nm; 300 m
Option SFP_10GE2	SFP+ optical Module 10GE; 10.3125 Gbps; Commercial Grade; 1310 nm; 20 km
Option SFP_GE4	SFP optical Module GE; 1.25 Gbps; Industrial Grade; 1310 nm; 20 km
Option SFP_GEB1	SFP optical Module GE BIDI; 1.25 Gbps; Tx 1310 nm, Rx 1550 nm; 20 km
Option SFP_GEB2	SFP optical Module GE BIDI; 1.25 Gbps; Tx 1550 nm, Rx 1310 nm; 20 km
Option SFP_10GE3	SFP+ optical Module 10GE; 10.3125 Gbps; Industrial Grade; 1310 nm; 20 km
Option SFP_10GEB1	SFP+ optical Module 10GE BIDI; 10.3125 Gbps; Tx 1270 nm, Rx 1330 nm; 20 km
Option SFP_10GEB2	SFP+ optical Module 10GE BIDI; 10.3125 Gbps; Tx 1330 nm, Rx 1270 nm; 20 km

## Configuration Example

1 *	DEV 6871	Distributed CCAP DOCSIS 3.1 Outdoor Node
1 *	Option vD31-3	DOCSIS 3.1 Mainboard; 1*10G Combo SFP+
1 *	Option vRF2	RF Module 4*RF out + 2*1 CATV optical Transceiver Module; up to 1.2 GHz
1 *	Option vPS220V	Power Supply 110/220 V AC
2 *	Option LD31-DS	DOCSIS 3.1 License 1*DS OFDM
2 *	Option LD31-US	DOCSIS 3.1 License 1*US OFDMA
1 *	Option OFF1	Optical Fiber Flange; 2 * SC/APC-SC/APC
1 *	Option OF2	Optical Fiber; 0.57 m; SC/APC-LC/UPC
1 *	Option PDE	European Power Cable
4 *	Option DPX1	Diplexer 5...65 MHz, 87...1218 MHz
1 *	Option HPF1	High Pass Filter 87...1218 MHz
2 *	Option LPF1	Low Pass Filter 5...65 MHz
2 *	Option SFP_10GE1	SFP+ optical Module 10GE; 10.3125 Gbps; 850 nm; 300 m

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