

Specification for a 30W non standard Power over Ethernet Gigabit DC injector used on Cambium Network's Subscriber Module (SM) / Access Point (AP) product lines

Cambium Networks part numbers are: N000000L034A

56V Gigabit N000000L034A This model would use pin pairs 4,5 for +56V and 7,8 as DC return.

30V Gigabit xxxxxx on hold This model would use pin pairs 7,8 for +30V and 4,5 as DC return.

- Rev. A Date: 09/15/2014, Eliminated third model option 30V 100BaseT
- Rev. B Date: 09/23/2014, Took out references to 100BaseT (sec. 1.2, 1.3, 2.33, 3.5). In sec. 2.8 added PxP 455 model
In sec. 2.22 under comments added the 30V SMB consideration
In sec. 2.33 added Fold back current mode 56V model not to over dissipate a 30V SMB Transorb at 25C
In sec. 2.6, 2.7, 2.17, 2.31 changed Energy level 5 to 6 which takes affect 2/2016
- Rev. C Date 10/20/2014, changed 55V to 56V and the 56V pin assignments were changed to default mode B
The reason for this change is for not damaging the protection device on the data lines of the PMP100 and ePMP SM
In sec. 2.37 the spark gap changed from 10mil to 20mil
Sec. 3.5, 3.6, 3.7 was added, the case is black and the locations of the labeling are discussed, plus vibration test
Sec 4.0 was added "Reliability"
- Rev. D Date: 08/05/2015,
2.31 on the 56V model the LED changed color from Green to Blue, but stays Green for the 30V model
2.28 Changed the primary to secondary Ycap leakage current from 250 uA to 390 uA to reduce conducted EMI emissions
2.1 For better survivability in the India market, the upper AC line limit changed from 264 VAC to 300 VAC continuous
Added Section 6 and 2.37 Fping Test for 1000BaseT confirmation
3.4 Added white pad printing for top labeling of RJ45 connectors and power LED, no laser etching for the top side
3.7 Added if laser etched safety labeling is used the background must have a gloss finish
- Rev. E Date 8/15/2015 Added Cambium Part Number and changed 55V to 56V and adjusted current in Section 2.21 and 2.22
- Rev. F Date 09/09/2015 Updated Mechanical Section 3.1, 3.3, and 3.6. Added 3.8 Recessed LED
Added 3.9 RJ45 contact plating
- Rev. G Date 10/19/2015 Updated Section 2.2 input current and 2.14 over voltage protection
added sec. 3.10 packaging/shipping carton and label

Objectives:

- a Universal AC line input on one side and two shielded RJ45 connectors on the opposite side.
- b One shielded RJ45 would have data and 30V or 56V DC output, the other RJ45 would have data only.
- c This power supply injector would take the shape of a brick determined by its component layout.
- d It is desired to have this power supply be compatible to all 30V Canopy models built under 15W.
- e Two models are proposed using the same PCB but with different jumper/component options.
- f It is desired to have the 56V model fold back fast enough in time and extend the auto recovery rate long enough so to not over dissipate a 30V SMB Transorb SMBJ30CA.
- g Higher AC line input voltage option for addressing India's power grid voltage fluctuations

Specification Parameter	Description	Comments
1.0 General Specifications		
1.1 Input/Output	3-wire AC line socket using the IEC320 C6 with its protective earth (PE) connected to the shield of the two RJ45 connectors using an 18 AWG drain wire	This allows the option of having a shielded CAT5 cable's drain wire be directly connected to protective earth

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1.2	Black plastic housing	Desktop, rectangular brick shape, suggested approximate size 1.5" tall, 2" wide, 5.5" long, all dimensions +/- 20%	One Suggested size is LxWxH of 5.5"x 2.55"x1.42"
1.3	Printed Circuit Board (PCB) options	Objective is to use the same PCB for the two models to help minimize the safety approval costs. Jumper options would be utilized.	This would allow one PCB for both models
1.4	AC input connector	IEC320 C6	Three prong
2.0	Electrical Specifications		
2.1	AC Input Voltage Range	90-264 VAC, the Indian 300 VAC upper limit option has been selected	CE label will say 100 to 240 VAC, but upper limit is really designed for 300 VAC for the India market
2.2	AC Input Current	0.6A rms at 115VAC; 0.4A rms at 230VAC	Worse case
2.3	AC input frequency	47 to 63 Hz	
2.4	In-Rush current	30A at 120Vac; 60A at 240Vac	
2.5	DC Output Power at 0C to 40C	30W max.	at 30VDC 5%, or 56VDC 5%
2.6	Efficiency	Must meet Energy Level 6	Energy Level 6 takes affect 2/11/2016
2.7	No Load Power Consumption	Must use Energy Level 6 limits	Energy Level 6 takes affect 2/11/2016
2.8	EMI	FCC Class B, EN55022 Class B	Shielded and unshielded LISN test EN 55022 for the Ethernet cable with our radio loads is required in addition to the AC line LISN test. Cambium Networks would supply the four radio types: ePMP, PMP 450 AP and SM, and PxP 455. Tested as a system (this power supply, CAT5 cable 20-50 ft, and our radio types) we must have at least 6 dB margin on all conducted and radiated tests.
2.9	Isolation (Hi-pot)	3000VAC for 1 minute, 10mA	primary to secondary side
2.10	Insulation resistance	50Mohm min, at 500VDC	Input to output
2.11	Over current Protection	Short circuit, with auto recovery	Should restart between every 0.5 to 2 sec.
2.12	DC Output voltage/current transient when AC line is applied while radio load is connected, the radio platforms are defined in 2.80 under comments	Must start up with all radio platforms specified over temperature from 0C to 40C and using a 3 foot and 328 foot CAT5 cable	The voltage start up ramp from 0V to 30V should take aprox. 20ms +/-30% with no overshoot exceeding 33V. Around 4V to 7V into the ramp our radios can demand up to a 1.25A peak for 2 ms. The 56V version 40ms ramp and with no overshoot exceeding 60V.
2.13	Start up time	within 3 seconds after AC line main is applied 0C to 40C	
2.14	Over Voltage protection	Zener clamping	Clamping range 38V to 45V for 30V, Clamping range 64V-92V for 56V
2.15			
2.16	RoHS and WEEE	Meets current directives	
2.17	Energy Star and MEPS	Meets Energy Star 2.0, Aussie and Korea MEPS, and must meet Energy Level 6 limits	Energy Level 6 takes affect 02/11/2016

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2.18	Safety approvals	UL (UL60950-1 2nd Edition), cUL, Aussie RCM, C-Tick and MEPS, CB, NOM, CE, LPS, Argentina, Singapore, Taiwan, Korea KC and MEPS, Brazil, China	This list of countries could change depending on our international marketing strategy, this will be quoted separately on a as needed bases.
2.19	Output Voltage	56.0 VDC +/-5%, other model 30.0 VDC +/-5%	
2.20	Minimum Output Load Current	0A	
2.21	Max. Continuous Load Current	1.0A at 30V, 536mA at 56V	30W
2.22	Peak load current	1.2A at 30V, 0.643mA at 56V	Should not fold back under those
2.23			
	Ambient Operating Temperature	0C to 40C	Storage temp. -40 to 70C
2.24	ESD	EN61000-4-2, Level 3	6kV contact, 8kV air discharge
2.25	AC line surge	EN61000-4-5, Level 3	L-N 1kV, L-PE and N-PE 2kV
2.26	Immunity	EN61000-4-2, level 3; EN61000-4-3, level 2; EN61000-4-4, level 2; EN61000-4-5, level 3; EN61000-4-6, level 2; EN61000-4-11	
2.27	Hold up time	10mS min at max load, 120Vac	
2.28	Leakage current through Y cap	390 uA max	at all line conditions
2.29	Humidity	20%-90% R. H.	over temperature range 0 to 40C
2.30	Altitude	Standard (up to 6562 feet min.) 2 km	and meets all specifications, 10k ft is preferred
2.31	LED Blue for 56V, LED Green for 30V	LED location determined by supplier	LED intensity determined by Level 6 efficiency
2.32	Ripple	Max. 300mV p-p at 30V, Max. 500mV p-p at 56V	at rated maximum load and temperature range. Supplier can define additional capacitance for the measurement.
2.33	Fold back current mode 56V model	The 56V model needs to be fast enough in time and have an auto recovery rate long enough so to not over dissipate a 30V SMB Transorb SMBJ30CA (Vishay, Diodes Inc.) at 25C ambient.	The reason being is that if an installer plugs a 56V model into a 30V radio, which has a SMBJ30CA across the DC input of the radio, so that its 30V SMB Transorb survives.
2.34	30 VDC Output/1000BaseT Gigabit model	Two shielded RJ45s: To radio (Gigabit Data+Power): balanced 100 ohm data lines paired pins 1,2 and 3,6 and 4,5 and 7,8 with pins 7,8 +30VDC; and pins 4,5 DC return.	Two DC injection min. 350uH center tapped toroids are populated with DC blocking caps min. 100V toward (Data) data only side of balanced lines pins 7,8 and 4,5. The criteria being able to pass the 300 MBit Fping test.

2.35	56 VDC Output/1000BaseT Gigabit model	Two shielded RJ45s: To radio (Gigabit Data+Power): balanced 100 ohm data lines paired pins 1,2 and 3,6 and 4,5 and 7,8 with pins 4,5 at +56VDC; and pins 7,8 are DC return.	Two min. 350uH center tapped toroids are populated with DC blocking caps min. 100V toward (Data) data only side of balanced lines pins 7,8 and 4,5. The criteria being able to pass the 300 MBit Fping test.
2.36	DC Current Imbalance (1GBit model only)	18mA max. current imbalance through toroid and pass 1000BaseT data throughput using Fping test at around 300 Mbit	Two min. 350uH center tapped toroids are populated with DC blocking caps min. 100V toward (Data) data only side of balanced lines pins 7,8 and 4,5.
2.37	Fping Test Definition	Use 65500 bytes in a packet, run for 1 sec, need to have ping time less	One needs a second 350uH toroid DC injector set to extract out the DC current
2.38	AC line PE grounding (3rd prong), all Ethernet data lines have 20 mil spark gaps to PE (ground)	3 pin AC input; 18AWG green with yellow strips (UL, CE requirement) drain wire must be connected from PE 3rd AC pin to RJ45 shield	Between the eight data lines and PE (ground), there would be on the printed foil eight 20mil spark gaps, the spark gaps would be triangular in shape and have the LPI removed between them. The triangle shape should be covered with solder.
2.39	Between DC secondary to AC line primary, ESD protection request for controller IC	Suggest to add a zener diode from feed back input pin to controller IC's DC return. This adds ESD protection for the controller IC from DC secondary side to AC line side	Suggest to use a MM3Z6V2 SOD-323 6.8V zener at Feed Back pin input on controller IC. This topic is up for discussion with the power supply design team. With careful layout of Feed Back pin foil trace (not exposed to secondary side), the zener might not be needed.

3.0 Mechanical Specification

3.1	Drop Test	Dropped 30" (76 cm) onto 1 corner, 3 edges, and all 6 sides one time onto a concrete floor (with no cables attached and not placed into a gift box)	There should be no visible cracking of the enclosure nor any internal parts coming loose, the power supply is expected to be fully functional after the drop test and meeting all above electrical specifications
3.2	Pull Test AC line cord from power supply	It is desired that the AC line cord should meet min. 10 lb pull test	Load tested for 1 min. This test is dependent on the AC line power cord vendor that we select and the power supply can not be held responsible
3.3	RJ45 connector Retention Strength and Mating Force	Both RJ45 must meet 10 lb min. pull test and less than 6.7 lb mating/unmating force	Pull test of 10 lb for 1 min., continuous electrical contact must be made between RJ45 pins and the CAT5 plug when sliding the plug between retention tab and furthest insertion.

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3.4	Text placement located on top of the two RJ45 connectors and power LED	Text should say: Gigabit Data+ Power, Gigabit Data	Printed text to be seen from top cover, perpendicular to RJ45 opening. Text shall be printed in white and resist finger nail scratching. The contrast level and font size would need to be approved by Cambium Networks.
3.5	Supplier S/N and Date Code	This is required, supplier can use a printed label or laser etched label.	The location would need to be approved by Cambium Networks. Supplier also needs to forward us the date code decoding definition.
3.6	Vibration	Frequency range: 10 to 55 back to 10 Hz, amplitude 2G or 0.2 inches over entire freq. range. Sweep rate 0.5 octave/minute, one sweep all 3 x, y, z axis, total duration 60 minutes. Supplier can suggest their standard vibration test,	The purpose of this test is to simulate shipping vibrations, for example, from a truck. The power supply is not operating, and no cables connected. Fasten the power supply to the vibration table with a fixture.
3.7	The case color is black, the regulatory/safety label should be made as large as possible.	The regulatory/safety label can be laser etched or be a printed label. If laser etched the background must have a gloss finish.	Printed text to be clearly seen from bottom of case, with reasonable contrast. The resolution and aspect ratios must meet Safety Organization standards.
3.8	Power LED to be recessed	The top of the LED should be	The LED should be recessed enough such that a
3.9	RJ45 connector Plating specification	Contact Material = Phosphor Bronze 0.46mm, Contact Plating = Gold plating over Nickel 0.6u inches,	Durability 750 cycles min.
3.10	Packaging specification	The Supplier can determine if the product ships in a gift box or plastic bag but either must have a sticker label that has our part number with bar code. Label should be around 2 inches by 1 inch	The shipping carton can be proposed by the supplier and must be agreed upon by Cambium Networks

4.00

Reliability

4.1	Mean Time Between Failures	Minimum 50k hours (MIL-STD-217F)	At full load and at 25C ambient
4.2	One year warranty	Warranty starts on the day leaving the FOB location	
4.3	Electrolytic Capacitor Life Time	The life time of the electrolytic should be greater than 5 years operating from 100-240Vrms input voltage at 25C ambient condition with 80% load.	The electrolytic capacitor life is calculated based on actual temperature measurement and shall take into account all factors which affect life based on each capacitor vendor's electrolytic life formula, for example capacitor temperature and ripple current.
4.4	Burn-In	The power supply shall undergo a minimum of 4 hour Burn-In test at 40C +/- 5C.	MFR can propose their typical burn-in sampling rate and this could be considered/agreed upon by Cambium Networks

5 Cambium Networks part numbers for AC line cords:

N000900L007A - US
N000900L008A - EU
N000900L009A - UK

This is only informational for Cambium Networks, nothing for the supplier to do.

6 Fping Test Description must be under 2.5ms (typ. 1.7ms) at 0% packet error, at around 300 MBit

PoE Supply Ethernet Traffic Test Setup

