



U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

MAY 04 2017

Mr. Richard Laudano
Commodity Engineer
Broadcom Limited
4165 Shackleford Road
Norcross, GA 30093

Reference No. 16-0093

Dear Mr. Laudano:

This letter is in response to your May 24, 2016, email requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to proper shipping names. Specifically, you ask for the appropriate proper shipping name for a Broadcom Cache Backup Unit (CBU) that contains a lithium ion cell electrically connected to a Printed Circuit Board Assembly (PCBA). You further state that the CBU provides power to RAID controller memory in the event of a power loss.

As specified in § 173.22 of the HMR, it is the shipper's responsibility to properly class and package a hazardous material. While this Office does not normally perform this function, we are able to provide guidance. Based on the information you provide in your emails and the requirements of the HMR, it is the opinion of this Office that the CBU in your scenario is most appropriately described as "UN3480, Lithium ion batteries." The introductory paragraph to § 173.185 of the HMR defines *equipment* as "...the device or apparatus for which the lithium cells or batteries will provide electrical power for its operation." According to your description, the CBU provides power to the RAID controller memory. As such, when shipped separate from the RAID controller memory, the CBU does not meet the definition for "UN3481, Lithium ion batteries contained in equipment."

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,

Duane A. Pfund
International Standards Coordinator
Standards and Rulemaking Division

Dodd, Alice (PHMSA)

Kevin Leary
Batteries
\$173.185
16-0093

From: Leary, Kevin (PHMSA)
Sent: Tuesday, May 24, 2016 2:29 PM
To: Goodall, Shante CTR (PHMSA); Dodd, Alice (PHMSA)
Cc: Pfund, Duane (PHMSA)
Subject: FW: Broadcom Review Request for Packed With or In Equipment
Attachments: Broadcom BBU Shipping Review 24 May 16.pdf; Intel Li-Ion Shipping Review Request to Broadcom.pdf

Please log this request for a letter of interp.

Kevin

From: Richard Laudano [<mailto:richard.laudano@broadcom.com>]
Sent: Tuesday, May 24, 2016 2:18 PM
To: Leary, Kevin (PHMSA)
Cc: Like Xie; Ismat Jahan; Tyson Crist
Subject: Broadcom Review Request for Packed With or In Equipment

Mr. Leary,

Your name was passed along to me from Like Xie of Inventus (formally Palladium) as a potential source to assist in getting a review of our question whether our use of Lithium-Ion cell can be considered UN3481 or Packed With or In Equipment. Our feedback so far has resulted in an agreement from my contacts at IATA and a no decision (stating that the definition of equipment is too vague) from Shanghai Chemical Research Institute.

I am hoping that you can guide me in getting a review of my equipment to determine if it does meet the standard of UN3481.

Can you review or forward to someone who can review the attached documents from Broadcom and Intel (a Broadcom customer who reships the equipment) to determine how we can classify the equipment?

I appreciate any assistance you can provide in this effort. Please contact me if you have any questions or need any additional information.

Thanks,
Richard Laudano
Commodity Engineer
Broadcom Limited
Phone: 678-728-1338
Mobile: 678-294-3572
richard.laudano@broadcom.com
www.broadcom.com



Lithium-Ion Shipping Review

Richard Laudano

24 May 2016



Broadcom Position

- Broadcom has continued working with IATA and suppliers to monitor the changes and impact to shipping methods.
- Recently Broadcom focused its efforts to understand the interface of the battery cell in our application.
- Since the battery cell in the pack has no external interface Broadcom's position has changed from a lithium battery shipment (UN3480) to a lithium battery shipment with or in equipment (UN3481), Packing Instruction 966, Section II.
- In order to more accurately describe the function the assembly, for this discussion, it is more appropriate to call it a cache memory back-up unit (CBU) instead of the battery backup unit (BBU)
- The volumetric energy density of the CBU is relatively low between 120 – 200 Wh/l.

Broadcom CBU Function Details

Broadcom's Cache Backup Unit (CBU) is designed to provide backup power to the RAID controller memory in the event of power loss.

If a power failure is detected, the cache memory power source is switched from primary to backup system power using controls resident on the RAID controller board and CBU.

During power failure, the battery cell in the CBU supplies power to the voltage regulation circuit contain in or attached to the module. The CBU's regulation circuit creates all necessary voltage rails in order to provide the required power to maintain data in the cache long enough until system power is restored.

Justification for Changing to Packed With or In Equipment (UN3481)

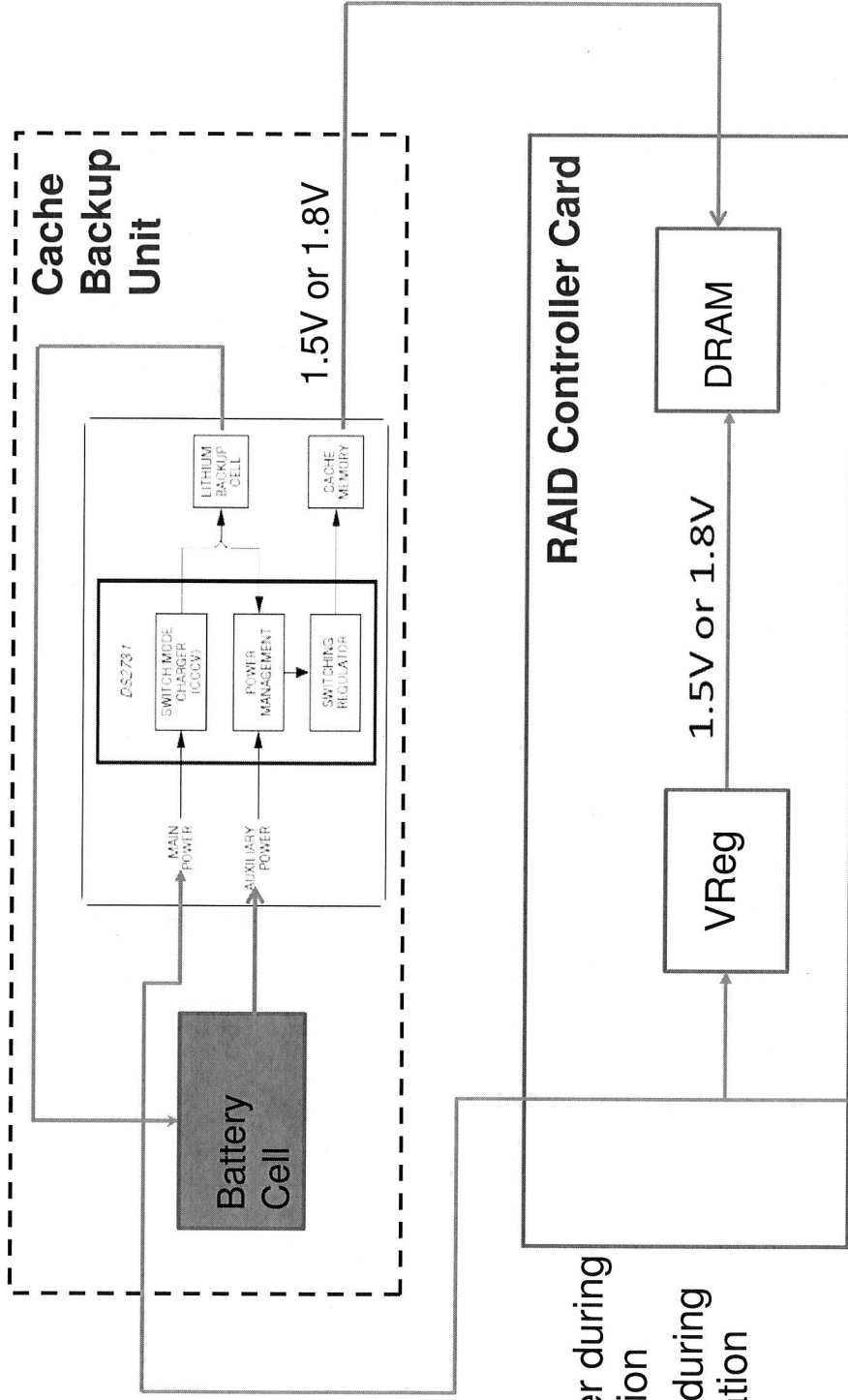
For the purposes of this packing instruction, IATA defines “equipment” as the device or apparatus for which the lithium cells or batteries will provide electrical power for its operation.

From the SP188(i) document: As used in this special provision “equipment” means apparatus for which the lithium cells or batteries will provide electrical power for its operation.

The Li-Ion cell in the equipment only provides power to the apparatus (PCBA which contains the charger chip) and the cell’s interface (input or output) does not exit the PCBA. It looks like this does meet the current definition

For Broadcom’s application the lithium cell only provides electrical power to the apparatus (PCBA which contains the charger chip) that is either integrated in the pack or connected via a short wire harness and has no direct external interface.

Broadcom CBU Block Diagram



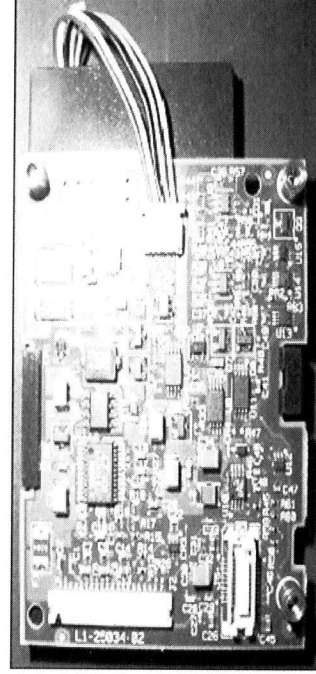
Green – Power during normal operation
Blue – Power during back up operation

12V from PCIe Bus

Broadcom Single Cell CBU Types



TOP SIDE



BOTTOM SIDE

Broadcom single cell CBU connected to charger card



Broadcom single cell CBU with integrated charger card



*Circuit board Contains
health monitor sCell
convert voltage to
the D-RAM,
Safety Circuits*



IATA Agreement of Broadcom Position

From: YMQ Dangerous Goods
To: Richard Laudano
Cc:
Subject: RE: Packed With or In Equipment?
Signed By: dangood@iata.org

Sent: Mon 5/16/2016 5:18

From: YMQ Dangerous Goods [mailto:dangood@iata.org]
Sent: Tuesday, May 10, 2016 7:45 AM
To: Richard Laudano; YMQ Dangerous Goods
Subject: RE: Packed With or In Equipment?

Richard,

From what you say, it sounds like the battery is an integral part of the equipment. It would therefore be considered as contained in equipment. If it is separate from the equipment, it should be shipped as packed with equipment.

I hope this helps.

Regards

Paul Horner

Manager, Dangerous Goods Standards

Tel: +41 22 770 2045

Fax: +41 22 770 2686

Email: phornerp@iata.org

International Air Transport Association

33, Route de l'Aéroport, 1215 Geneva 15 Airport, Switzerland

www.iata.org/dangerousgoods

Richard,

From the description of what you have this appears to be lithium ion batteries contained in equipment. As such it is UN 3481, and must meet the applicable parts of Section II of packing instruction 967.

Regards,

David BRENNAN

Asst. Director Cargo Safety & Standards

Tel: +41 22 770 2047

Mob: +41 79 505 9495

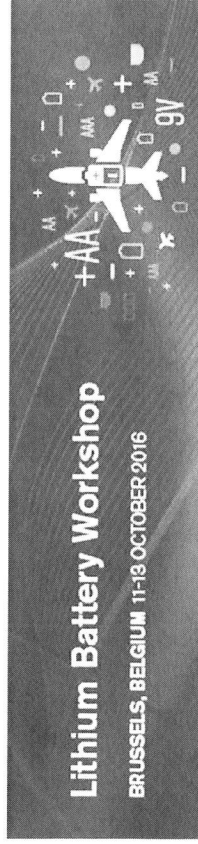
Fax: +41-22-770-2686

email: brennand@iata.org

International Air Transport Association

33, Route de l'Aéroport, 1215 Geneva 15 Airport, Switzerland

www.iata.org/dangerousgoods



Please consider the environment before printing this email

From: Richard Laudano [mailto:richard.laudano@broadcom.com]

Sent: 10 May, 2016 11:21 AM

To: YMQ Dangerous Goods <dangood@iata.org>

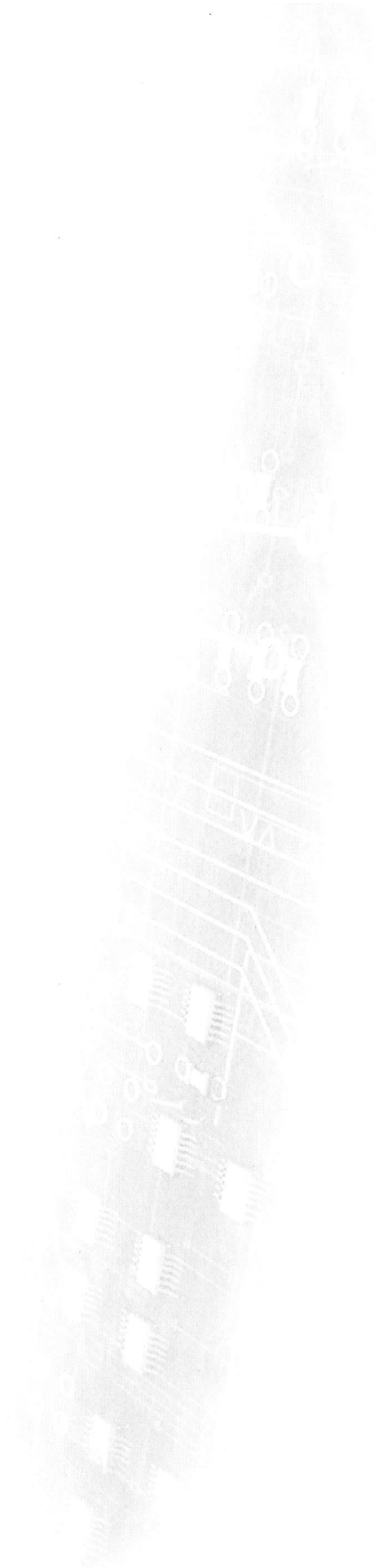
Subject: Re: Packed With or In Equipment?

Paul

Thanks for your feedback. Given the information I provided will this application give me clear guidance on whether my application where the battery cell has no interface outside of the pack can be considered "equipment"? I need to get guidance and hoped your group could look at my unusual application and provide feedback. I can buy the application but need to know if it will provide more information than the PI 965-967 that I currently have.

Thanks

Richard



Thank You





Lithium Ion Batteries - Shipping By Air

Date: WW17 '16

Owner: Liliana Alonso

Reg execution & operations
Datacenter Engineering Group

Problem Statement

The International Air Transport Association (IATA) has recently made (relatively) sudden changes in the regulation for transportation of Lithium-Ion (Li-Ion) batteries that may impact Intel's ability to deliver shipping products to our customers

As of April 1st, 2016, the new IATA regulations for air transportation pertaining to Li-Ion batteries are summarized as follows:

- Standalone batteries not permitted to be shipped in cargo area of passenger planes
- Standalone batteries are permitted to be shipped in cargo area of air freight planes, but must be discharged to $\leq 30\%$
- Batteries when contained/installed in equipment are not subject to these restrictions
 - The definition of what 'equipment' means is not 100% clear
- Batteries packed with the equipment they power are not subject to these restrictions
 - The definition of what 'equipment' means is not 100% clear

Impact to Commercial Business as of April 1, 2016

- Current Intel inventory of batteries is at 45%-50% of charge. This charge comes from factory when they are built by a third party and then provided to Intel
- Our battery units are physically installed to a PCB with the charging and monitoring circuits in all cases, and are shipped to/from Intel with these connected
- Batteries in warehouse, disti's, etc. are on ship hold and cannot be shipped by air to many customers

Products Impacted:

PCSD RAID Battery Backup Units
AXXRSBBU3
AXXRSBBU3S
AXXRSBBU4
AXXRSBBU6
AXXRSBBU7
AXXRSBBU7D10
AXXRSBBU7S
AXXRSBBU8
AXXRSBBU9

Position Recommendation:

After analysis by Tiger Team and approval from Hazardous Material Intel Leader Matt Riffey and Regulatory representative Jeff Pasternak, current battery inventory in Intel warehouses at 45%-50% of charge should be enabled to be shipped as "Li-Ion batteries contained in/with equipment." Team believes this adheres to the both the spirit and letter of the IATA restriction. This is still regulated and restricted, but this designation can be shipped on passenger aircraft, the SOC is not a factor, and this will enable shipping of all current inventory to customers currently backlogged for units.

Benefits to position:

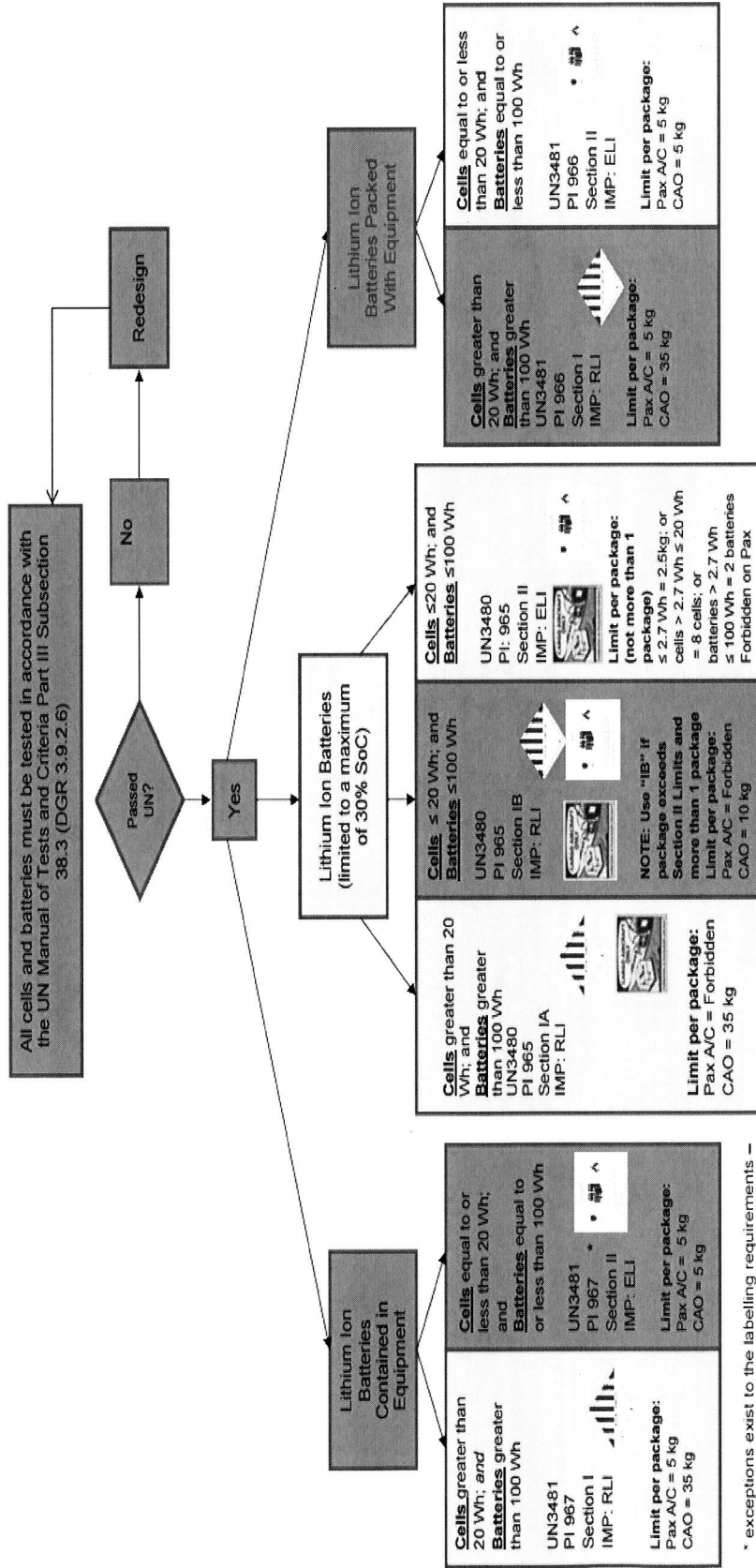
- Immediately resolves the impact on LDT for end customer
- Avoids rework for current inventory
- Enables urgent shipments for NCR that are still held in Intel warehouses to ship directly and immediately
- Avoids scrambling to rework (no defined solution yet), and other transportation modes do not meet needs

Risk to position: Interpretation of 'equipment' is ambiguous. When these BBU's are installed and activated in a full system and power loss occurs, the batteries power/use the PCB and cable, but also supply power to the RAID card memory it is attached to (which is not included in the shipping equipment). The memory is on the RAID card, not on the local PCB. Because of the ambiguous equipment definition, there is potential for whether Intel is adhering to the letter of the restriction (no doubt about the spirit based on tiger team assessments).

Action Requested: Inform Intel Legal of the situation and the recommendation above, and get approval from Intel Legal to move forward with shipping Li-Ion BBU's as 'shipping with equipment.'

Follow Up Action Required: RAID team will implement <30% SKU's over coming 2 months, and update all SKU's to new charge values, in case IATA decides to further restrict ALL batteries to this level. Broadcom has now committed to <30% for all batteries, and they have already started needed actions for implementation as planned.

BackUp



* exceptions exist to the labelling requirements – see PI 967 Section II

APCS/Cargo

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09/03/2016