The Balloon Open Hardware License (BOHL)

Version 0.2 For Discussion

Preamble

This license agreement covers hardware designed, manufactured and distributed on an open basis. The license outlines the Terms and Conditions placed on the use of the design. When licensing Open Hardware it is important to note that there is a significant distinction between Open Hardware and Open Software particularly with respect to both the design process and the replication process.

Firstly the design and replication of hardware is different because there are intermediate steps in the processes that are valuable in their own right. Secondly the process of replication can involve considerable time, cost and expertise. For these reasons it is not appropriate to simply transfer licenses that have validity in the software domain (such as the GPL) to the hardware domain.

This license is intended to establish an Open Design approach in the hardware domain while building in practical safeguards, which are necessary for the design and manufacture of hardware, where manufacturers take a financial and legal risk when replicating Open Hardware and where the physical product must conform to approvals if its sale is to be legal. It is also important to protect designers from issues of liability particularly as many designers may be working as individuals and therefore not protected by an employer.

The license is written to apply to any type of hardware produced using an Open Hardware design process. It has originated from the Balloon Project (www.balloonboard.org) but the license can be freely applied to any Open Hardware.

In order to augment the text of the license it is accompanied by Notes and Appendices. The notes help to provide interpretation and guidance within the text of the license and the appendices contain more detailed discussions about the operation of the license and detail the types of Manufacturing Information and Design Documentation that might be provided as a part of any Open Hardware Design. The notes do not form part of the License but are intended to clarify the intention of the license. The Appendices are intended to provide uniformity to the way that hardware designs are released and managed when using this license.

{Notes occur in the text of the License between curly brackets and in italics}

Purpose

The purpose of this license is to protect the designers of the hardware from any form of litigation resulting from its design, manufacture, distribution or use.

It is also the purpose of this license to ensure that the design remains Open in the sense detailed in the license and that manufacturers, distributors, and users are obliged to adhere to the Open principles of the design and to protect their rights to access the design as specified in the license.

Terms and Conditions

Definitions

You Your

You or Your refers to the licensee who may be any individual or organisation.

Hardware

Hardware is defined as a physical device or component that can be manufactured.

The Hardware

The Hardware is defined as the specific Hardware that is generated from a Release of The Design modified or unmodified.

Software

Software is defined as the arrangement of data forming executable programs and information about or for that software.

Hardware Design Files

Hardware Design Files are files which can be used in conjunction with Design Software to allow a Designer to modify and change The Design of The Hardware in such a way that a new version of The Hardware can be manufactured. The Hardware Manufacturing Information is derived from the Hardware Design Files, and parts of the Hardware Design Documentation are also derived from the Hardware Design Files.

Current Hardware Design Files

The Current Hardware Design Files are the Hardware Design Files that were used to create the last Release of The Hardware by the Design Group or versions of those files modified by the Design Group in the process of creating the next Release.

Hardware Manufacturing Information

Hardware Manufacturing Information is defined as the information required to manufacture a PCB together with the information required to populate a PCB with components in accordance with The Design. By definition it must not be possible to automatically turn Hardware Manufacturing Information into Hardware Design Files that would allow a new manufacturable version of the hardware to be produced without the use of the original Hardware Design Files.

{Note: The term "automatically" is included because it may be possible to manually recreate a design from the Hardware Manufacturing Information}

Hardware Design Documentation

Hardware Design Documentation is defined as documents that can be consulted by a User, Manufacturer or Distributor of The Hardware in order to understand its operation. This consists of printable schematics, printable PCB layout drawings,

descriptions of circuit operation, descriptions of hardware interfaces or any other document produced as a part of the Hardware Design Documentation. By definition it must not be possible to automatically turn Hardware Design Documents into Hardware Manufacturing Information or into Hardware Design Files that would allow a manufacturable version of the hardware to be produced without access to the Hardware Design Files.

The Design Files

The collection of individual Files that constitute information about The Design or The Hardware that is covered by this License.

Design, The Design

The collection of components and interconnections, and their physical arrangement on a PCB as described by the Hardware Design Files.

The boundary of the design is defined by the physical boundary of the Manufactured item as defined in the Hardware Design Files and the influence of the BOHL does not propagate beyond that boundary when The Hardware is connected to other hardware as a part of a manufacturing or assembly process.

{Note: In some circumstances components may not be fully defined in the design as described by the Hardware Design Files this does not invalidate the concept of a Design within the Licence.}

{Note: The Design may relate to a single PCB or to a system of flexi-rigid boards. If The Design is built from a single set of Hardware Design Files then it is a single design under the BOHL. There are a number of potential manufacturing methods that are capable of connecting BOHL and non BOHL designs together:

Different PCB's can be connected together during assembly even if that connection is placed by machine or soldered.

A panel of PCB's could be manufactured with BOHL designs next to non-BOHL designs where the Assembly process automatically connects them with a connecting cable. Panels surrounding PCBs are not considered to be Designs as they carry no significant electrical function.

This does raise an issue with complex flexi-rigid systems. In this version of the BOHL a flexi rigid combination of BOHL and non-BOHL parts cannot be created on a single flexi-rigid design. If the design is unified (i.e. it has a common flexi layers) and there is one set of schematics for the whole design, then the propagation of the BOHL is unavoidable. Even if the BOHL part can be manufactured independently then although there would be no propagation of the license, the license would be infringed when the design is inserted into the larger flexi-rigid design as it has then been embedded in a larger design without propagating the BOHL.. While the BOHL is clear on how to treat this issue it may be unduly restrictive}

Design Marks

Design Marks are readable identifications that include a revision identifier, copyright notice and the BOHL Logo to indicate that the hardware is covered by the BOHL. Design Marks must be human readable once The Hardware has been Manufactured. Usually this will be text as copper on the outer layers of the PCB.

User

Any organisation or individual that either knowingly or unknowingly applies sufficient electrical power to the Hardware to cause it to operate.

Printable

Any data is defined as printable if it can be converted, by means of Software, to a legible form that is useful to a Manufacturer, Distributor or User.

{Note: Although "printable" normally means that it could be transferred to paper this might exclude hypertext documents on the basis that the paper version is of no use. So the definition refers to "legible"}.

Firmware

Firmware is the pattern of data that is used to program a function into a programmable hardware device; this may be fixed or variable or associated with analogue or digital hardware. This is typically generated from either schematics or a hardware description language via a compilation process.

PCB

Printed Circuit Board the physical board that carries the components of The Hardware.

Designer

A designer is an individual or organisation who has access to the Hardware Design Files and who modifies these to create new versions of the design.

The Designers

The Designers of a Design are all of the Designers who have worked on the design since its inception. The Designers includes the Design Group.

Release, Design Release

A design is said to be Released when the Hardware Manufacturing Files generated from the Hardware Design Files are used to Manufacture The Hardware.

Release Lifetime

The time between one Release and the next of The Hardware, or a period of 3 calendar years whichever is shorter.

Design Group

The collection of individuals or organisations that construct, edit, manage, publish, release, alter, or distribute the Hardware Design Files.

Manufacture

The act of using a Manufacturing Process.

Manufacturing Process

The means by which the Hardware Manufacturing Information is turned into The Hardware.

Document Date 11/01/2007 18:46:00

Manufacturer

An organisation, or individual that uses the Hardware Manufacturing Information to produce a physical instantiation of The Hardware.

Distributor

An organisation or individual who distributes The Hardware to another party whether or not they charge for this. The means of distribution is undefined and may include distribution of a system where The Hardware is an embedded component in that system.

The License

This license is offered for use "as is" and without any guarantee or promise that will be legally enforceable or effective. It is for you to establish its effectiveness and applicability in fulfilling your expectations for it. The copyright holder of the license text is not liable for its content in any way.

Statement

This license is between The Designers and copyright holders of The Design and any User, Manufacturer or Distributor of The Design or The Hardware.

Propagation

When the BHOL is assigned to a Design or when a Design contains a sub-part that is assigned to the BOHL this automatically causes the BOHL to be assigned to all of the other parts of The Design.

The License does not propagate to other hardware when The Hardware is connected to it.

{Note: The Design is defined as the collection of components and interconnections and so the BOHL does not propagate to firmware or software installed on The Hardware even if these are required to use the hardware. These parts of the design can therefore be covered by License agreements other than this License.}

General Permissions

The general permissions apply to all Users, Manufacturers and Designers of The Design without exception. Everyone who is affected by this license is either a Designer, Manufacturer, Distributor or User.

You are permitted to make minor modifications to the Hardware Manufacturing Information to improve the efficiency of a manufacturing process, or to correct errors in the information.

{For example it would be acceptable to change the size of the via holes, or the annular ring size of pads to fit a particular manufacturing process, but it would not be acceptable to move the positions of mounting holes or components as these would invalidate the common design parameters of the PCB.}

You are required to make available on request, at the time the design is released for Manufacture, details of any changes you make to the Hardware Manufacturing Information or Hardware Design Documentation.

You are required to provide valid contact details with any design Release which you expect to be valid during the Release Lifetime.

You are permitted to change the selection of components that are fitted onto the PCB during Manufacture by changing the Hardware Manufacturing Information.

You are permitted to change the specification of any component provided you do not infringe the terms and conditions in this license.

You are permitted to printout, copy or redistribute by any suitable means the Hardware Documentation provided that the copyright notices, the references to this licence agreement, and any Design Marks applied to the documentation remain intact.

You are permitted to use the Hardware Manufacturing Information to manufacture the hardware as specified by the manufacturing information. You may do this freely but by doing so you automatically agree to abide by the conditions in this licence.

You are permitted to install firmware or software onto the device provided that doing so does not infringe or invalidate the terms and conditions of this license. Doing so does not cause this License to propagate to these components.

You are permitted to incorporate The Hardware as a Manufactured component into a larger system provided that doing so does not infringe or invalidate the terms and conditions of this license. Doing so does not cause this License to propagate to the larger system.

General Restrictions

The general restrictions apply to all Designers, Manufacturers, Distributors and Users of the design without exclusion.

You are not permitted to remove copyright notices or other marks that identify the source of the design from The Design Files or from The Hardware.

You are not permitted to present The Design as your own work, or claim ownership of the design, or claim any rights to The Design.

You are not permitted to apply for Patent Protection or any similar type of protection for The Design or for any part of The Design.

You are not permitted to alter the Hardware Documentation other than to; correct errors and mistakes, or make additions to the information.

You are not permitted to use any significant part of The Design in another Design that is not covered by the BOHL.

> *{Note: Here "significant part" refers to sub-circuits, typically schematic sheets, which represent a collection of components with an arrangement specific to The Design. For example it is permissible to copy connectors and associated signal labels to non-BOHL designs and it is permissible to copy individual components to non-BOHL designs for example via a parts library.}*

You are not permitted to insert the arrangement of interconnections as defined by the Hardware Manufacturing Information into a larger design.

> *{Note: You are not permitted to use the Gerber data to insert the design of the PCB into a larger PCB design which connects further circuits to The Design. You are permitted to insert the PCB design into a panel for manufacturing purposes because the panel is not a "larger design".}*

You are not permitted to prevent others from manufacturing, selling and distributing the Hardware or The Design Files provided they are doing so within the terms and conditions of this License.

You are not permitted to restrict access to the Hardware Documentation and the Hardware Manufacturing Information of Released Designs.

You must abide by any underlying conditions placed on the usage of the individual parts used in the manufacture of the product. Such conditions may concern, but are not limited to, the use of the hardware in Medical equipment, Safety Critical equipment, Aviation equipment, Military equipment, the export of The Hardware to countries where there are trade restrictions, or limitations on the export of certain technologies.

You are responsible for your own use of The Hardware. You are responsible for assessing its fitness for your purpose, and for assessing its compliance with all relevant legislation concerning its Manufacture, distribution and use. The Designers are not responsible.

Manufacturer

If you are a Manufacturer of The Hardware then you must adhere to the terms and conditions of this license. If you do so then:

You are permitted to Manufacture The Hardware without paying a fee to The Designers and without the need for further permission from The Designers over and above that granted in this License.

You are permitted to add identifying marks and compliance marks to The Hardware provided they do not obscure the Design Marks.

You must ensure that the Hardware that you Manufacture complies with all relevant legislation.

You must comply with all reasonable requests for information about the compliance with relevant legislation of The Hardware you Manufacture.

You must provide to any users who request information about the Hardware, The Hardware Documentation and the Hardware Manufacturing Information that you used to Manufacture The Hardware, and identify the source where you obtained this information. You are only allowed to charge a nominal fee for this if a physical representation of the information is provided.

You may, at entirely your own risk, provide a warranty for your manufactured hardware provided it does not infringe or nullify any part of this License.

If you fail to adhere to the terms and conditions in this license then all your rights and permissions granted under this license will terminate but your obligations will remain in force.

Distributor

If you are a Distributor of The Hardware then you must adhere to the terms and conditions in this license. If you do so then:

You are permitted to market and Distribute the hardware within the limitations set out in this license without paying a fee to The Designers and without the need for further permission from The Designers over and above that granted in this License.

You must ensure that The Hardware that you Distribute complies with all relevant legislation.

You are permitted to add identifying marks and compliance marks to The Hardware provided they do not obscure the Design Marks or any identifying and compliance marks added by the Manufacturer.

It is your responsibility to ensure that any conditions placed on the end use of any of the component parts used in The Hardware are communicated to Users.

It is your responsibility to ensure that the fact that The Hardware is covered by the BOHL is communicated to Users.

You may, at entirely your own risk, provide a warranty for The hardware, or for a system in which The Hardware is a component part, provided it does not infringe or nullify any part of this License.

If you fail to adhere to the terms and conditions in this license then all rights and permissions granted under this license will terminate but your obligations will remain in force.

Designers

Each design is created by a Design Group and the membership of that group is defined as being those people who have access to the Current Hardware Design Files. {*Appendix A provides a discussion of how Design Groups operate.*}

If you are a member of the Design Group then you must abide by the Terms and Conditions in this license. If you do so then:

You are permitted to access the Current Hardware Design Files and are permitted to modify these in order to create new designs as agreed by the Design Group.

You are required to indicate all schematic modifications in the Hardware Design Files made to the design each time the design is Released.

> {*Note: Here "indicate" may mean a note or marker that is visible in the Hardware Design Documentation or a specific document that details the changes. In each case it must be clear either from context or by annotation what has changed at each revision. It is intended that this indication of modifications is only applied to functionally significant modifications and fixes, graphical tidying up of the schematic or the addition of notes would not normally be indicated.*}

You must ensure that the Hardware Manufacturing Information contains Design Marks that can be made visible on The Hardware once it is Manufactured.

You must include a release identification in the name of each file, or collection of files {for example in the name of an archive file}, that is Released and this must correspond to details in the Hardware Design Documentation that document any modifications to the design.

You may start a new design based on an existing Hardware Design only on the condition that the BOHL is assigned to the new Design. In this case a new Design Group is appointed.

You may not claim ownership or rights over any part of The Design or The Hardware.

You must always pass Hardware Design Files to other members of the Design Group when requested to do so.

The right of access to the Hardware Design Files granted to you by this license does not imply any transfer of ownership or rights in the design to you.

If you add a new sub-circuit to the design then that new sub-circuit is automatically covered by the BOHL and its use is therefore governed by this licence.

If you add a new sub-circuit to The Design then it is your responsibility to ensure that that sub-circuit does not infringe any rights owned by a third party and that it can be freely used in The

Design under the BOHL without hindrance of any kind and without the need to pay a fee or apply for permission from a third party.

{*For example the sub-circuit design may be protected by a Patent, or your employer may own all of you intellectual output even if you are working at home in the evening or at the weekend*}

If you significantly modify a sub-circuit of a design protected by the BOHL such that the design is altered to a point where it might not be recognised as a derivative of the original work in terms of its copyright this does not remove the effect of the BOHL from The Design.

You must provide information about The Design in response to any reasonable request for information about the operation or configuration of the Hardware during the Release Lifetime.

{*Note: You are expected to provide useful documentation with each release. For example if the design is based on a micro-processor then the assignment of IO maps or Address maps and interrupt structures, the signal specifications of non-standard IO interfaces etc should be provided. If they are not provided then Manufacturers, Distributors and Users have the right under the BOHL to make reasonable requests for thisor equivalent information.*}

You must not prevent or hinder the onward distribution of information about the design.

You are permitted to use the Hardware Design Files to carry out design simulations in order to verify The Design, for example to test its operation, design integrity or maufacturability.

You may not allow the Hardware Design Files to pass to anyone other than a member of the Design Group unless the Design Group has agreed that the Hardware Design Files may be placed in the Public Domain. Placing the Design Files in the Public Domain does not alter the functioning of the Design Group within the context and operation of the License.

If you discover that you have unknowlingly or though a change in circumstances compromised the integrity of the BOHL with respect to The Design you are obliged to take reasonable measures to ensure that the members of The Design Group for The Design are informed so that they can take appropriate corrective action.

You may choose at any time to leave a particular Design Group, if you do so you must inform the other members of the Design Group. At that point you cease to be a member of the Design Group and your rights of access to the Hardware Design Files under the Terms and Condiitons of this license cease.

{*Note: If you leave a Design Group in order to start a new project and that new project is based on the Design Files of a current project then is is courteous to inform the Design Group of what you are doing, the new project is obviously still covered by the BOHL*}

If none of the design files you have modified as a part of the preparation for a new release are used in that release then unless you are explicitly sent updated copies of the Current Hardware Design Files you no longer belong to the Design Group and your rights granted under this license to access the Hardware Design Files terminate.

Warranty

There is no warranty for The Design or The Hardware produced from The Design whether modified or unmodified, to the extent permitted by applicable laws. The copyright holders and The Designers offer the design "as is" without warranty of any kind, either expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. The entire risk as to the quality, performance and compliance with applicable law governing the manufacture, distribution and sale of The Hardware and The Design rests with the

Manufacturer and or the Distributor not The Designers. All costs, direct, indirect and consequential, associated with any defect caused by a failure in The Design, rest entirely with you. The copyright holder and The Designers are not liable for any consequential damage or costs caused by your use of The Design or The Hardware either modified or unmodified.

In particular The Designers are not liable for any damage to connected equipment caused by use of The Hardware, or caused by use of The Hardware in combination with any firmware or software.

It is the responsibility of the User to ensure that any connected devices are compatible with The Hardware in all aspects of the connection, electrical, mechanical etc.

The Designers provide no assurance that any standard interfaces that are used or referred to in The Design comply with any relevant standards or specifications. It is your responsibility to ensure that these standard interfaces operate within the parameters and specifications that you require for your end use of The Hardware.

Appendix A: The operation of Design Groups

The purpose of this Appendix is to provide a brief discussion of Design Groups under the BOHL and to provide some simple guidelines on the formation and management of a design group.

For a hardware design to be released it must be manufactured, this will cost money and time and someone will have to be convinced that the expenditure, of time effort and money, is worthwhile. For this reason it does not matter if there are many different designs within a project as they have no direct value unless they are Released as Hardware. This might simply be an individual making a double sided PCB at home and soldering the parts down by hand, or it might be the automatic manufacture of a complex multi-layer surface mount fine pitch BGA design in mass production, like the Balloon board. Thus the releasing of a design for Manufacture is a key event.

The Design Group is at the core of making a release. Typically there will be one person who coordinates the final assembly of Schematic files to create a netlist for routing a PCB, and one person who takes the PCB design and component information and generates The Manufacturing Files and the other files that are produced when the design is released.

The membership of The Design Group may change between releases of The Hardware and it is important that the Design Group is well defined as they have particular responsibilities with respect to the Design. However it is not the job of the BOHL to dictate how the Design Group is managed or structured or persuaded to produce a particular design. The License therefore defines the group in terms of access to the Current Design Files.

Each design is started by an individual who chooses the initial Design Group. At first release the Design Group is defined as those people who contributed to The Design, at subsequent releases it is defined as the group of people who provided modified Design Files for the new Release plus the people who are sent a full set of Design Files at Release. This allows both a top down pyramidal structure of management with a project leader coordinating the collection and distribution of Design Files both pre and post release, and a heterarchical structure where individuals simply e-mail each other with everything or check it in and out of a repository.

It is important to identify the Design Group for a release so that knowledge about the design can be tapped by manufacturers, distributors and users, however it is not appropriate for the license to force any particular method of information distribution on the design process. So the license simply requires Designers to respond to requests for information. It is in the best interests of the design that they provide this information so that it can be propagated and exploited.

It is important that the Design Group can evolve over time and divide to create new projects without too much formalism, the fact that, to be useful, designs must be turned into hardware and that this costs money will provide a survival filter that allows successful designs to succeed.

Appendix B: The use of firmware and software on BOHL hardware

This version of the BOHL has been deliberately confined to covering the hardware components of the system. It has not been extended to cover firmware, and it would make no sense to extend it to cover software. However as part of the function of the License is to protect The Designers it is important to protect them against failures that might occur when someone loads inappropriate firmware, or runs software capable of damaging The Hardware or the systems it is connected to.

One of the key points of the License is that at each stage of the process of turning a Design into working hardware and onwards to a product the onus is on the actors at each stage in the process to verify that what they are doing does not infringe the BOHL.

The firmware in the design will need to be covered by a different type of license as it is more akin to software than hardware.

Appendix C: Design Documentation

Any design Released under this License will consist of Hardware Manufacturing Information and Hardware Design Documentation. There are a variety of ways of publishing this information but it helps if there is a degree of consistency between different BOHL projects so that there is some chance of design reuse.

Version Numbers

Design versioning should work in a consistent way. Because of the different stages in the hardware manufacturing process and inevitable variations in the build and assembly process a simple decimal number denoting a board at a particular design revision is insufficient. The proposed numbering scheme uses the fact that the Release of the design for manufacture is the key event that needs to be captured. The version number is divided as follows:

Digits to the left of the decimal point refer to major design releases.

> A change in this number probably indicates a lack of easy backward compatibility, (e.g. connectors and pin-outs have changed, or the size of the board and the position of mounting holes have changed) and a corresponding increase or decrease in functions.

The first decimal digit (tenths) indicates successive PCB revisions (major) and the second decimal digit (hundredths) indicates a minor revision increment.

> As a rough guide a major revision might well change IC's (though probably not function) or add new functions, or change the position of connectors. While a minor revision might represent the shifting of components to aid manufacturability or the fixing of bugs by adding or removing tracks or re-specifying component sizes (e.g. different power rating giving larger resistor sizes). A major revision will almost certainly require a new paste mask, a minor revision might not.

These digits are sufficient to specify the PCB and the revision of the schematic that generated that PCB but not sufficient to label a particular build of the hardware.

In most designs there are options about which components are fitted, there may be components that are not always needed or mutually exclusive alternatives, these will all appear on the schematic and there will be space on the PCB for them, but a particular sub set of the possible components will need to be established for each manufacturing run. This is indicated by a letter following the two PCB revision digits.

Therefore a revision number 3.21 refers to a PCB and its schematic and 3.21B refers to a PCB full of components that are specified by fit option B.

Hardware Manufacturing Information

The collection of files that make up the Hardware Manufacturing Information for a particular project should be released as a pair of archives (zip, tar, gzip etc) the name of the project and the version number should be in the name of each archive.

The first archive contains PCB manufacturing information, and should have the letters PCB in the archive name. This should contain the following information:

a) A set of gerbers defining the PCB, or an ODB++ tree (or both).

b) Drilling information.

c) A panel drawing if this is appropriate.

d) A document detailing the specification of the PCB such as thickness, colour, insulation layer material, copper weight, layer stack order etc. and any PCB manufacturing notes. There may also be an information file generated during the PCB design process that specifies the parameters of the PCB such as total track length and number of each hole size.

e) A printable document clearly showing the location of each component and its designator so that discussion about problems with the board can make reference to board location. For some boards the silk screen layer will suffice but densely packed boards usually don't label anything other than the larger connectors and IC's.

f) Pick and Place data, if this is relevant, (it is important to generate this at the same time as the PCB data since they must match).

The second archive contains the manufacturing information to allow a manufacturer to place components onto the PCB the archive should have the letters "MFG" in its name. This archive should contain the following information:

a) The exact specification of each component to a sufficient level of detail to allow the board manufacturer to purchase the component.

b) A Parts list that shows what each part is, referenced by its designator.

c) A bill of materials that shows how many of each type of part is required.

d) A fit list showing which parts are to be fitted.

e) A no fit list showing which parts are not to be fitted.

f) A document detailing the manufacture of the board and detailing any variants and detailing any mods that need to be made to the board either before or after assembly. Photos based on prototypes are particularly useful.

g) Details of how the board has changed since the last revision.

The first archive is used to make the PCB and the second to assemble it. The first archive can be made in advance of the second as very often the PCB design if frozen before exact specifications for the parts have been finalised. Both archives are needed for board assembly but only the first for PCB manufacture.