

## High Efficiency Self Contained Amplifier Module



### Highlights

- High efficiency
- Universal input voltage range
- Extremely small form factor
- Low EMI
- 10W standby SMPS

### Features

- Advanced over current protection
- Remote controlled operation
- Low weight:  
UcD32MP=0,2kg/UcD34MP=0,25kg/  
UCD36MP=0,3kg
- Compact:143/165/187 x 70x 31,6mm
- Fitted with 1, 2 or 3 UcD<sup>®</sup>32 modules

### Applications

- Stereo or multichannel audio systems based on our UcD<sup>®</sup>32 module
- Active loudspeakers

## Description

The UcD3xMP is a high efficiency Safety Class 2 multichannel mains powered UcD module. Key features are high efficiency over the entire load range, extremely small form factor, low weight and very low radiated and conducted EMI. The UcD3xMP also features an advanced over current protection which in case of temporary overload simply reduces the output voltage, only when the overload condition remains for a longer time the supply will enter hiccup mode until the overload condition disappears. This feature combined with large electrolytic buffer capacitors leads to the capability of delivering high dynamic headroom power to the connected amplifier. The UcD3xMP also includes a low power standby power. The main power supply is triggered for normal operation or latched off in case of a critical fault via in built-in actuators. The UcD3xMP is optimized from the first phase of design to final implementation to realize the low EMI signature required of the most demanding audio applications.

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## 1 General Information

### 1.1 Functional description

The UcD3xMP integrates a low power (Max. 10W) standby SMPS, providing the internal household voltages for the SMPS itself and also to the external application, a high power SMPS capable of delivering 70W (according to FTC requirement) of output power to the connected amplifiers, an auxiliary supply which is required by the amplifiers. An onboard automatic input voltage selector is also integrated. This provides quasi universal mains capability. The UcD3xMP has no on-board input buffers, please see the UcD32 datasheet for more information.

### 1.2 Standby SMPS

The onboard standby SMPS will accept universal mains inputs (90 – 264Vac) and will be operating continuously as soon power is applied. No-load standby power is lower than 300mW including the power consumption of the internal household circuitry of the main SMPS in its none-active state. From this supply a single isolated 5.1V output will be available to the external application with a maximum continuous power capability of 10W. This output is short-circuit proof and includes (thermal) overload protection.

### 1.3 Main SMPS

The power converter is an unregulated Half Bridge. This converter can be remotely turned on and off through the enable input. The nominal main output voltage will be + and - 18V (@115/230V mains input). The rated power is 70W/5min (according to FTC requirements). The main output is both short and long term over current and short circuit protected. In case of a short term over current condition (like a short circuit) the SMPS will enter a hiccup mode until the fault has disappeared. Long term over current will be the responsibility of the external control logic. When an over temperature condition is detected, the main SMPS should be put in standby mode. Once the temperature drops below a safe level it may continue normal operation. The main SMPS will also provide regulated auxiliary output voltages used by the amplifier board. These outputs are not protected against over current nor are they short-circuit proof.

### 1.4 Automatic input voltage doubler

The threshold for switching from low to high voltage input range will be 190Vpk. (as the sense circuitry will sense the unfiltered rectified sine wave and the maximum bus voltage should stay under all circumstances below 400V). The threshold for switching from high to low voltage input range will be the same without hysteresis, but there will be a time delay (only when going from high to low) of at least 1 second. The actual input range will be (90 – 132VAC ... 180 – 264VAC).

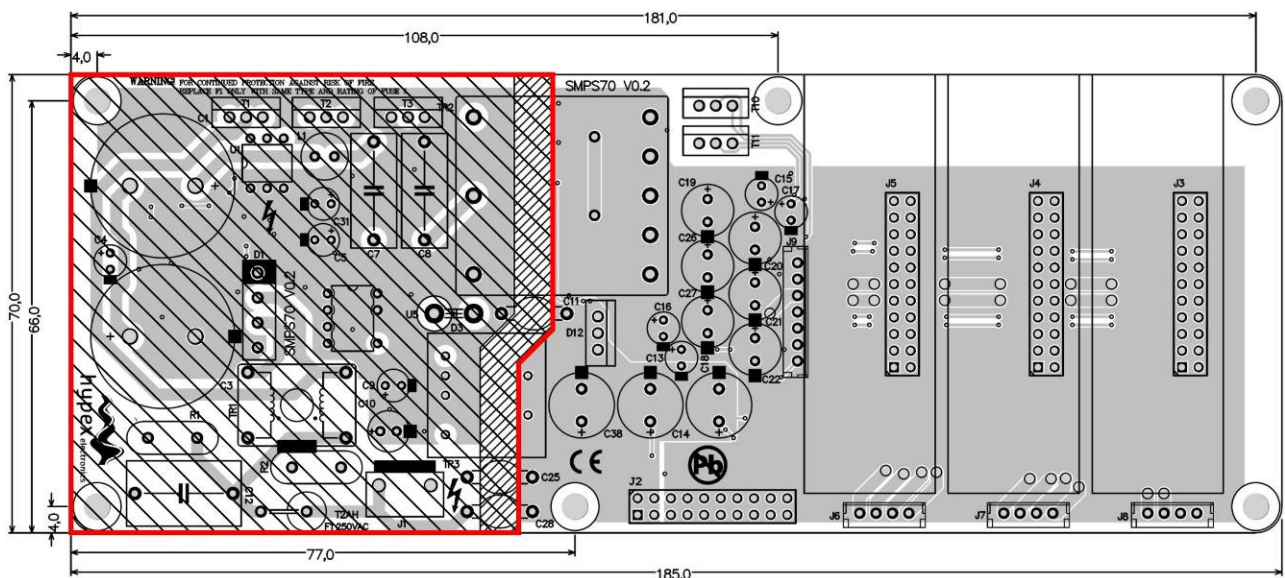
## 2 Safety precautions



The UcD3xMP operates at mains voltage and carries hazardous voltages at accessible parts. These parts may never be exposed to inadvertent touch. Observe extreme care during installation and never touch any part of the unit while it is connected to the mains. Disconnect the unit from the mains and allow all capacitors to discharge for **10** minutes before handling it.

This product has no serviceable parts.

This is a Safety Class 2 device. It is very important to maintain a 6mm clearance with all possible conducting parts (housing etc.) and cables. All parts enclosed by the RED thick line below carry hazardous voltages. This includes parts on the top and the bottom of the board. When the UcD3xMP is mounted in a tight space there needs to be at least 6mm clearance or a layer of insulation with a minimum thickness of 0.5mm between the top of the transformer and the housing. Only use insulated spacers in the hatched area.



## 3 Instructions For Installation

**Warning:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

**Warning:** Disconnect the unit from the mains and allow all capacitors to discharge for 10 minutes before handling it.



This symbol indicates the presence of hazardous voltages at accessible conductive terminals on the board. Parts that are not highlighted in red (picture above) may carry voltages in excess of 45VDC!

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. This apparatus shall not be exposed to dripping or splashing water and no object filled with liquid such as a vase shall be placed on the apparatus.
6. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the application.
7. Only use attachments/accessories specified or approved by the manufacturer.
8. Unplug this apparatus during lightning storms or when unused for long periods of time.
9. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally or has been dropped.
10. This product is to be used with Hypex amplifier modules only.
11. Only the ready-made cable sets provided by Hypex may be used for external wiring of the UcD3xMP.
12. Don't run any cables across the top or the bottom of the UcD3xMP. Apply fixtures to cables to ensure that this is not compromised.
13. Observe a minimum distance of 6mm maintain clearance with all possible conducting parts (housing etc.). All parts enclosed by the dotted line below carry hazardous voltages. This includes parts on the top and the bottom of the board. When the UcD3xMP is mounted in a tight space there needs to be at least 6mm clearance or a layer of insulation with a minimum thickness of 0.5mm between the top of the transformer and the housing.
14. Natural convection should not be impeded by covering the UcD3xMP (apart from the end applications housing).

## 4 Absolute maximum ratings

**Correct operation at these limits is not guaranteed. Operation beyond these limits may result in irreversible damage**

Item	Symbol	Rating	Unit	Notes
Input voltage	$V_{LINE}$	270	Vac	
Ambient Air Temperature	$T_{AMB}$	50	°C	

## 5 Recommended Operating Conditions

Item	Symbol	Nominal	Unit	Notes
High Line Input Voltage	$V_B$	230	Vac	1), 2)
Low Line Input Voltage	$V_{B,FP}$	115	Vac	1), 2)
Line Input Frequency	$f$	47 - 63	Hz	

**Note 1:** Mains AC input range switches automatically.

**Note 2:** Minimum startup voltage is 90V/180V.

## 6 General Performance Data Standby SMPS

Item	Symbol	Min	Typ	Max	Unit	Notes
Output Voltage	$V_{OUT}$	-	5.1	-	V	
Max. Continuous output current	$I_{OUTMAX}$	2	-	-	A	
Efficiency	$\eta$	75	-	-	%	full power
Standby power	$P_{STANDBY}$	-	-	300m	W	
Output voltage Ripple	$V_{RIPPLE}$	-	-	100m	V	

## 7 General Performance Data Main SMPS

Item	Symbol	Min	Typ	Max	Unit	Notes
Max Output Power	$P_R$	100	-	-	W	<sup>1)</sup>
Max Audio Output Power @ 20Hz into amplifier load	$P_{RALF}$	70	-	-	W	<sup>2)</sup>
Efficiency	$\eta$	90			%	full power
Idle Losses	$P_0$		3		W	
Switching frequency	$F_{SW}$	80	100	120	kHz	
Maximum power consumption	$P_{max}$			200	W	<sup>4)</sup>
Output Voltage	$V_{OUT}$	2 x 13.64	2 x 17.6	2 x 20.29	Vdc	<sup>3)</sup>
Max Output Short Circuit Current (Rail to rail)	$I_{OUT,MAX}$	-	6	-	Adc	<sup>4)</sup>
Regulated Output Voltage Vaux	$V_{OUT,AUX}$	-	2 x 6,2	-	Vdc	<sup>3)</sup>
Max Output Current Vaux	$I_{OUT,AUX}$	200m	-	-	A	per rail

**Note 1:** Output Power delivered to a resistive dummy load (generally the only specification supplied by other SMPS manufacturers).

**Note 2:** An audio amplifier actually draws twice the RMS power from the power supply. At high frequencies the secondary storage output caps are capable to provide this power. At very low frequencies however the SMPS is responsible for delivering this peak power to the amplifier.

**Note 3:** Output voltage is proportional to the mains line voltage (Min@180Vac, Typical@230Vac, Max@264Vac).

**Note 4:** Limited by over current protection.

## 8 Electrical Specifications

### 8.1.1 Switch-On time of standby SMPS

The standby SMPS switches on in less than 3 seconds at maximum load and 115VAC (60Hz) input. The measurement starts the moment the input voltage is applied and stops the moment the standby output voltage reaches its specified output voltage.

### 8.1.2 Hold-Up time of standby SMPS

Minimum 10ms with 90% of full output load connected @115 VAC 60Hz input.

### 8.1.3 ON/OFF control main SMPS

- Turn ON: The time delay counting from the moment the enable control signal reaches 2V until the main SMPS output voltage reaches 50% of its nominal value is less than 100ms (measured @ no-load condition)
- Turn OFF: The time delay counting from the moment the enable control signal drops below 0.5V until the main SMPS output voltage drops below 50% is less than 100ms (measured @ full load condition).

## 8.2 Protection Circuits

### 8.2.1 Input circuit protection

At the input of the primary circuit of the SMPS, a protection fuse is inserted. Only an internal fault of the SMPS can cause this fuse to blow.

### 8.2.2 Output Short Circuit protection

Both the main output and the standby output are short circuit proof. In case of such occurrence, the SMPS will shut down and auto-recover once the fault is removed. The -/+ VDR lines are not short circuit proof, a low ohmic value resistor in series with the transformer winding will blow in case of a severe overload or short circuit.

### 8.2.3 Control Loop Failure protection

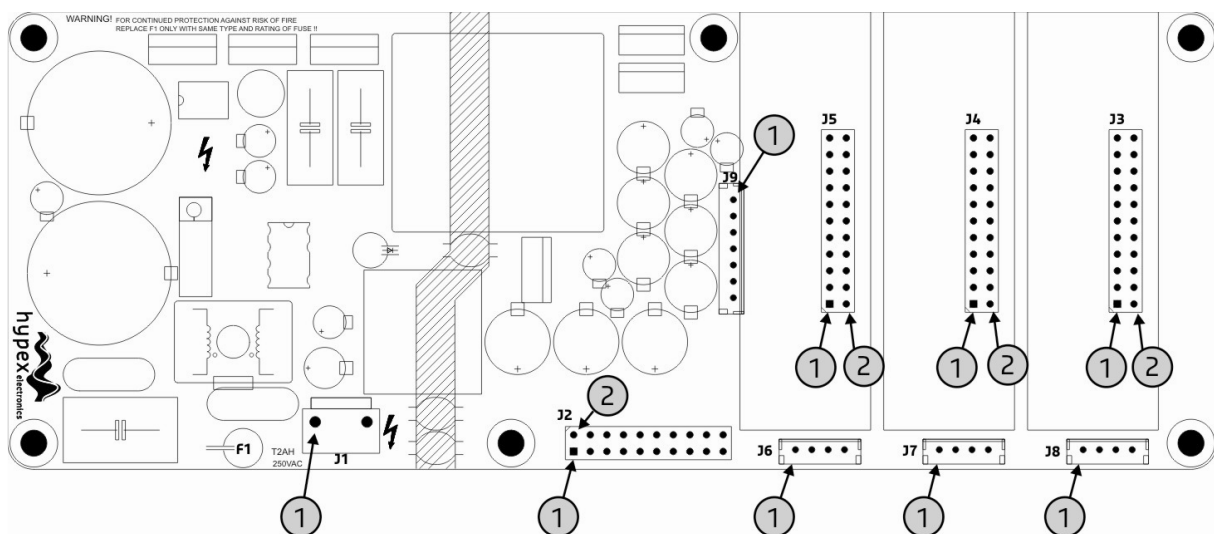
If the feedback control loop of the standby SMPS fails, the whole device will enter a latched-off state. The SMPS will only try to restart if the primary circuit is fully discharged (i.e. disconnect the mains for at least 5 min)

## 8.3 Safety

### 8.3.1 Over temperature protection

The main power supply is not self-protected against long term overload conditions. J2 pin 3 connects to an NTC located near the main secondary rectifiers. This sensor must be monitored by the external application which should reduce the required output power as soon as a resistance of less than 1k ohms +/-5% is measured. Furthermore the external circuit must monitor the NTC for proper operation (not open or shorted).

## 9 Connector Pinout



### 9.1 MAINS Input (J1)

Connector type: JST B2P3-VH  
Crimp pin type: SVH-x1T-P1.1

PIN	Description
1	AC1
2	AC2

### 9.2 User Application Connector (J2)

Connector type: 2 x 10P 2.54mm BoxHeader

PIN	Description
1	+5V Standby (use J9:2 when more than 200mA is required)
2	GND Standby
3	NTC connection
4	Enable input
5	-VAMP
6	+VAMP
7	AMP_EN (Active Low)
8	GND Amplifiers
9	Inverting audio input CH1
10	Non-inverting audio input CH1
11	Inverting audio input CH2
12	Non-inverting audio input CH2
13	Inverting audio input CH3
14	Non-inverting audio input CH3
15	Inverting audio input CH4
16	Non-inverting audio input CH4
17	Inverting audio input CH5
18	Non-inverting audio input CH5
19	Inverting audio input CH6
20	Non-inverting audio input CH6

### 9.3 Amplifier position (J3, J4 & J5)

PIN	Description
1	Loudspeaker connection Channel A (HOT)
2	Loudspeaker connection Channel A (COLD)
3	Non-inverting audio input Channel A
4	Inverting audio input Channel A
5	NC
7	ON/OFF control (Active Low)
8	DC-fault detection (Active Low)
9,10	Positive power supply connection (+VAMP)
11,12	Negative power supply connection (-VAMP)
13,14	Power supply ground connection (GND)
15	Positive driver voltage (+VDR)
16	Negative driver voltage (-VDR)
17,18	NC
19	Non-inverting audio input Channel B
20	Inverting audio input Channel B
21	Loudspeaker connection Channel B (HOT)
22	Loudspeaker connection Channel B (COLD)

## 9.4 Loudspeaker outputs (J6, J7 & J8)

Connector type: JST B4B-EH  
Crimp pin type: SEH-00xT-P0.6L

PIN	J6	J7	J8
1	CH2-	CH4-	CH6-
2	CH2+	CH4+	CH6+
3	CH1-	CH3-	CH5-
4	CH1+	CH3+	CH5+

## 9.5 Supply output (J9)

Connector type: JST B4B-EH  
Crimp pin type: SEH-00xT-P0.6L

Pin	Type	Function
1	N.C.	-
2	Out	+5V Standby (only from V3 and up)
3	Out	-Vamp
4	GND	GND
5	Out	+Vamp
6	Out	AMP_EN (Active Low). Same as J2:7
7	In	DCERR, from amplifiers

## 9.6 SMPS Enable Characteristics

Connect this pin to +5V Standby to enable the SMPS. All amplifiers are running but muted.

Item	I/O	Min	Typ	Max	Unit	Notes
Voltage on pin J2:4	In	-0,6		5	V	

## 9.7 Amplifier Enable

Connect this pin to GND to unmute all amplifiers.

Item	I/O	Min	Typ	Max	Unit	Notes
Voltage on pin J2:7 (J9:6)	In	0			V	

## 9.8 DC Error Characteristics

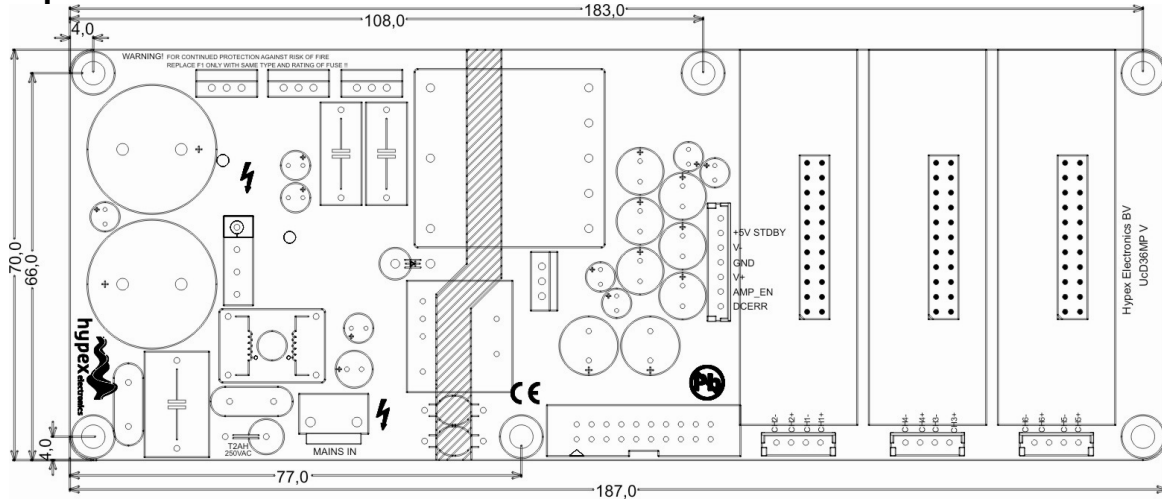
In case of a fatal error in one of the amplifiers this pin is driven low and the module will power down except for the standby voltage. The module resets after the +5V standby is fully drained. This will take a couple of minutes.

Item	I/O	Min	Typ	Max	Unit	Notes
Voltage on pin J9:7, Error	Out	200m			V	

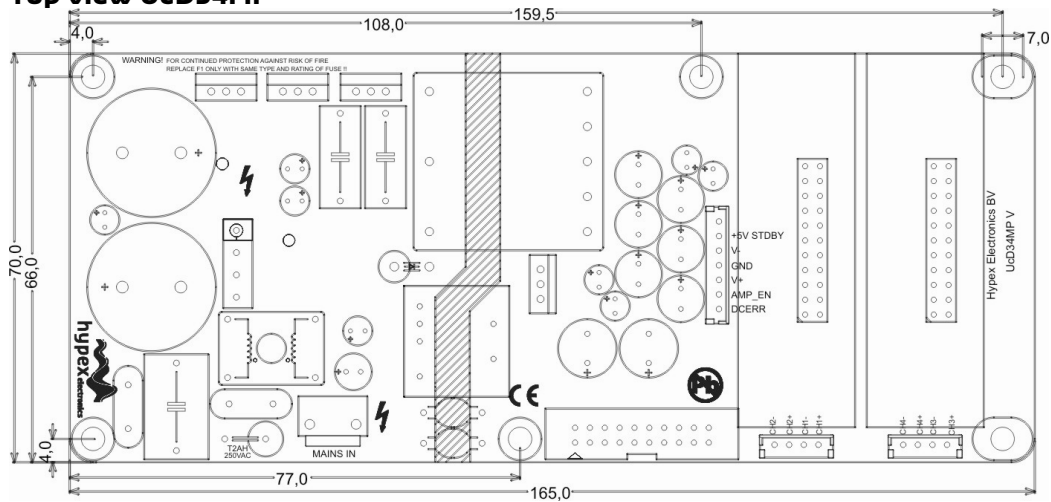


## 10 Dimensions

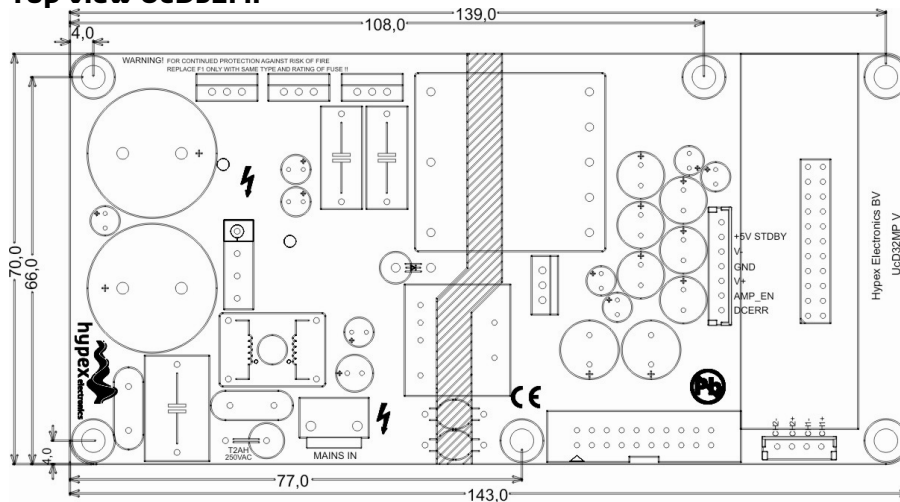
Top view UcD36MP



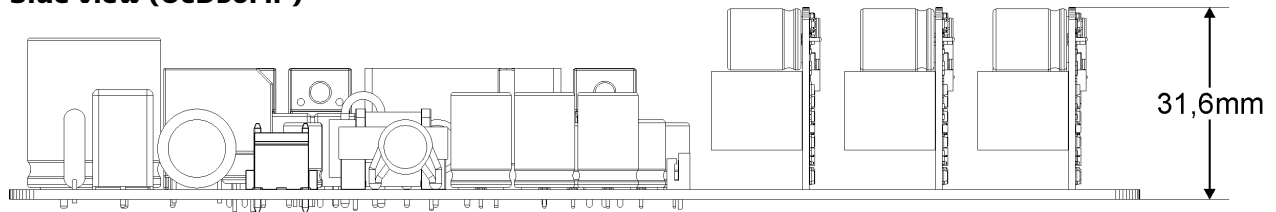
Top view UcD34MP



Top view UcD32MP



Side view (UcD36MP)



**DISCLAIMER:** This product is designed for use in sound reproduction equipment in conjunction with Hypex amplifier modules. No representations are made as to fitness for use in other applications. Except where noted otherwise any specifications given pertain to this subassembly only. Responsibility for verifying the performance, safety, reliability and compliance with legal standards of end products using this subassembly falls to the manufacturer of said end product.

**LIFE SUPPORT POLICY:** Use of Hypex products in life support equipment or equipment whose failure can reasonably be expected to result in injury or death is not permitted except by explicit written consent from Hypex Electronics BV.

Document Revision	PCB Version	Description	Date
R1	V1	First version	24.08.2012
R2	V2	Adjusted standby power capability	24.01.2013
R3	V2		20.03.2013
R4	V3		24.09.2013