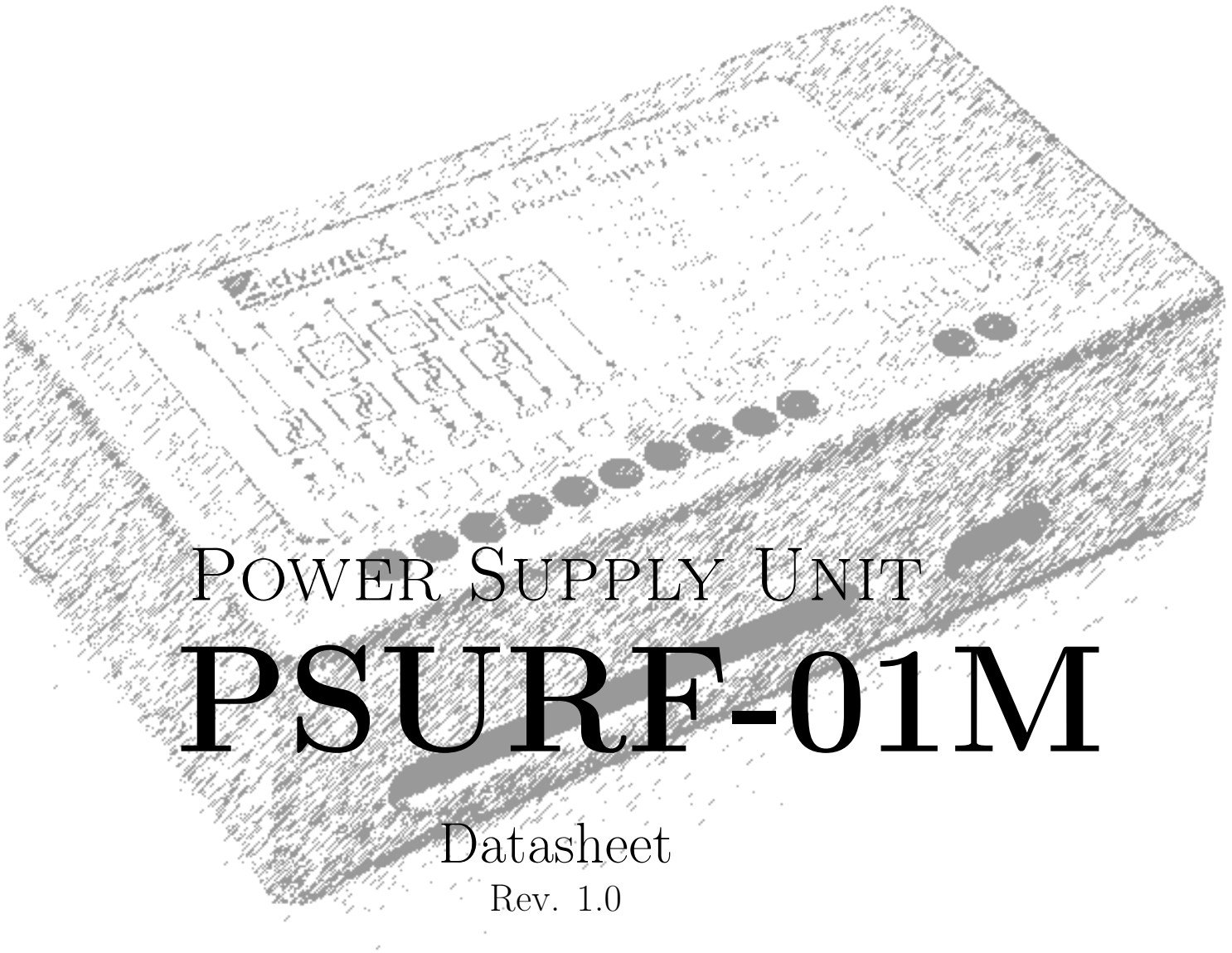

Power Supply Unit

PSURF-01M

Datasheet

Rev. 1.0

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July 31, 2009

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Document Revisions

Rev.	Date	Description
1.0	July 31, 2009.	Based on the real tests

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1 Overview

1.1 Applications

- Ideal for RF-blocks and control PCB power supply
- Secondary power supply unit for equipment which require multiple supply voltages
- Power supply for evaluation boards

1.2 Key Features

- Output voltages
  - analog supply channels: **+5, +9, -12 V**;
  - digital supply channels: **+3,3 V**;
- Total output power: **55 W**;
- Rated input voltage: **+12 V**;
- Low ripple and noise level;
- Zinc-coated aluminum case provides low EMI and high thermal conductance;
- Operating temperature range: **−30..+55°C**;
- Dimensions: H x W x D: **30 x 111 x 60 mm**.

1.3 Ordering Information

Full power supply unit part number consists of the following parts (fig. 1):

1. Equipment series (project name)
2. Modification number
3. Assembly variant
4. Case type (mechanical)

Table 1 contains detailed description of the marking parts.

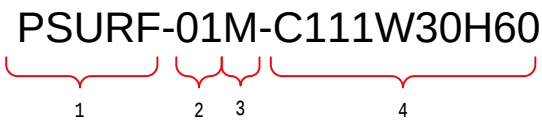


Figure 1: Power supply block part numbering

Table 1: Marking parts used in part number

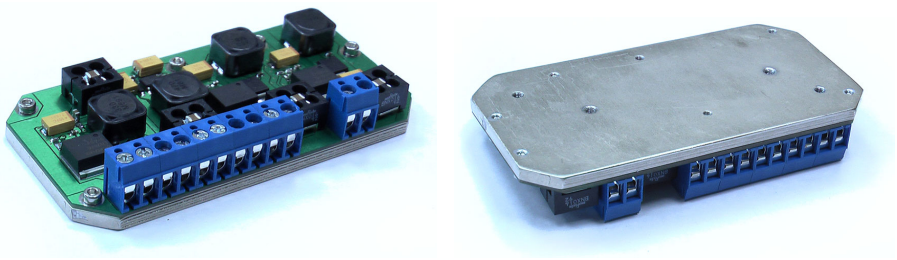
Marking	Description
Position 1. Equipment series	
PSURF	**P**ower **S**upply **U**nit for **RF**-blocks
Position 2. Modification number	
01	Device modification number①
Position 3. Assembly variants②	
M	Variant by default
Position 4. Case type	
C111W30H60	Case (“C”), height 30 mm, width 111 mm, depth 60 mm
CHS	Chassis/heat sink (“CHS”), in form of aluminum plate 4 mm thick, with milled slots and mounting holes

① Modification number is being increased by one after next revision of PCBs or other blocks of the device

② Assembly variant of the PCB

(a) Top view (b) Bottom view

Figure 2: External view of “C111W30H60” variant



(a) Top view (b) Bottom view

Figure 3: External view of “CHS” variant

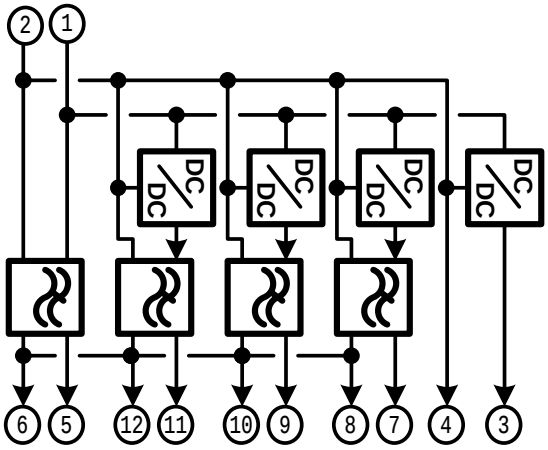


Figure 4: PSURF-01M internal structure

Table 2: Nominal voltages and currents

Outputs	**+3.3VD**	**+5VA**	**+9VA**	**-12VA**	**+12VA**
Voltages, V	+3.3	+5.0	+9.0	-12	+12*
Current, A	3	3	3	0.25	10**

* Corresponds to input voltage as 1:1 ratio
** Pin terminal limitation

1.4 Functional Description

PSURF-01M power supply exists in two mechanical variants: PSURF-01M-C111W30H60 – in aluminum case (fig. 2); PSURF-01M-CHS – PCB with chassis (aluminum plate for heat sink and PCB mounting), fig. 3. Power supply functional diagram is shown in fig. 4. Input voltage Vin (terminal "1") is supplied on DC/DC converters which form +3.3, +5, +9, -12 V. Voltages from +5, +9, -12 V converters, as well as from the Vin input, are fed to low-pass filters, thus forming "analog" power supply channels. Voltage from +3.3 V converter is supplied directly to the block output, forming "digital" power supply channels. It should be mentioned that filters in use have separate input and output ground circuits, providing AC decoupling of grounds for "analog" and "digital" channels. Nevertheless these grounds are coupled by DC. Power supply block case is connected to the input ground (terminal "2").

2 Specification

Rated voltages and currents are listed in table 2. Table 3 contains static characteristics – deviations and tolerances under various conditions. Table 4 contains converters switching frequency ranges. These values define general spectral components of output ripple, and can be used to find the most effective method for output ripple and noise suppression. Table 5 presents typical values of ripple and noise at idle run and nominal load.[1] Figures 5, 6, 7, 8, 9, 10, 11 contain ripple diagrams presented in time domain. Table 6 presents power supply block pinout and pin descriptions.

3 Typical Applications

Power supply block PSURF-01M was generally designed for use as the secondary power supply unit for RF-blocks and control PCBs. Its typical application is shown in figure 12, where designated the following:

1. DC/DC-converter, PSURF-01M – secondary power supply block;

[1] Measurements were made directly from the block output while net resistive load connected via cable 10-20 cm length.

Table 3: Static characteristics at Vin=+12 V, Ta=+25°C

Parameter	Conditions	min.	typ.	max.	Unit
Voltage accuracy (Iout=0)	+3.3 V	0	+0.3	+2	%
	+5 V	0	+0.4	+2	%
	+9 V	0	+0.1	+2	%
	-12 V	0	+1.3	+2	%
Load regulation (from 0 to 100% load)	+3.3 V		-1		%
	+5 V		-0.5		%
	+9 V		-0.3		%
	-12 V		-0.3		%
Efficiency (at nominal load)	+3.3 V		74		%
	+5 V		86		%
	+9 V		91		%
	-12 V		72		%
Input current (Icc @ Iout=0)	Vin=+12 V	30		40	mA
Input voltage (Vin)		+11.5	+12	+14.5	V
Operating temperature		-30		+55	°C
Dimensions (WxHxD)	C111W30H60	111 x 30 x 60			mm
	CHS	102.5 x 17.5 x 52			mm

Table 4: Switching Frequency, kHz

Output	min.	typ.	max.
+3.3VD	225	260	280
+5VA	225	260	280
+9VA	225	260	280
-12VA	170	200	240

Table 5: Ripple and noise, typical values

Output	Conditions	Peak-to-peak	RMS	Unit
+3.3VD	idle run	8	0.9	mV
	nominal load	26	7	mV
+5VA	idle run	5	0.9	mV
	nominal load	24	7	mV
+9VA	idle run	2	0.3	mV
	nominal load	20	5	mV
-12VA	idle run	4	0.6	mV
	nominal load	31	10	mV

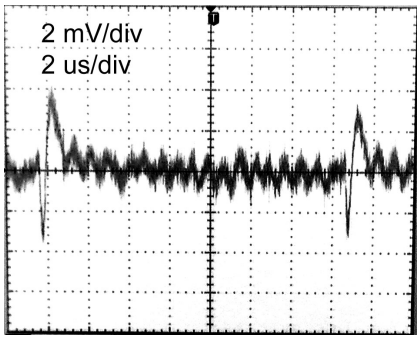


Figure 5: Ripple @ +3.3 V, idle run

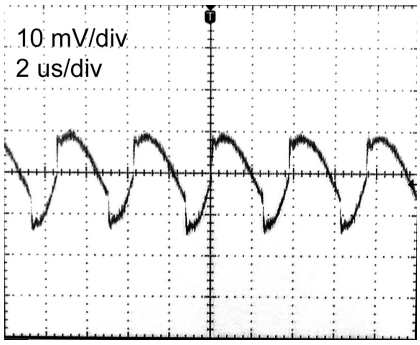


Figure 6: Ripple @ +3.3 V, nominal load

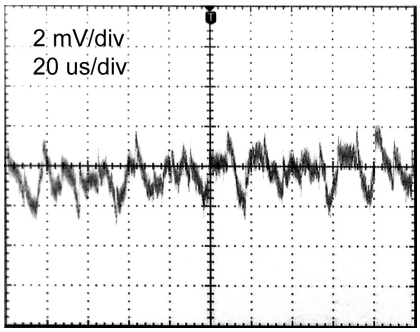


Figure 7: Ripple @ +5 V, idle run

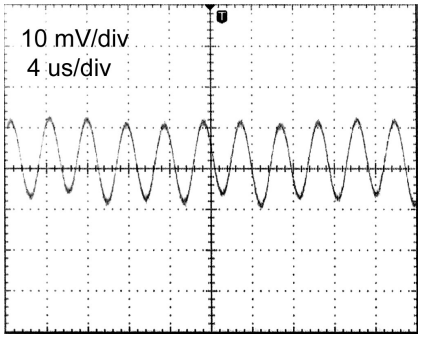


Figure 8: Ripple @ +5 V, nominal load

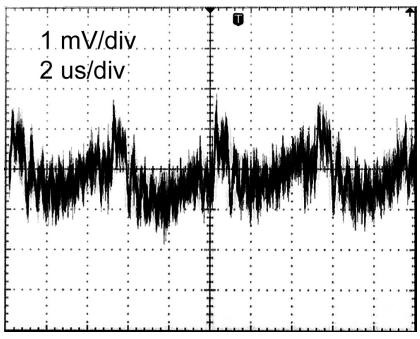


Figure 9: Ripple @ -12 V, idle run

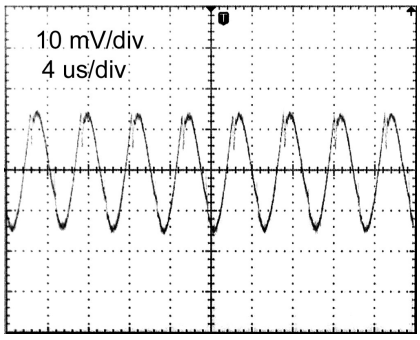


Figure 10: Ripple @ -12 V, nominal load

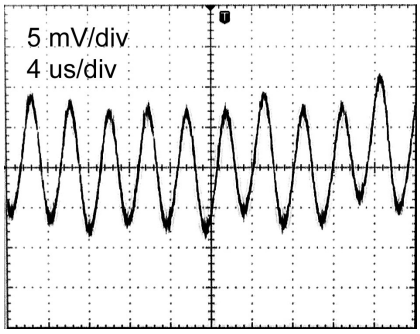


Figure 11: Ripple @ +9 V, nominal load

Table 6: Pinout

Pin Number	Pin Name	Description
1	+12Vin	+12 V Input
2	GND	“Digital” ground*
3	+3.3VD	+3.3 V Output (“digital” supply)
4	GND	“Digital” ground*
5	+12VA	+12 V Output (“analog” supply)**
6	GNDA	“Analog” ground
7	-12VA	-12 V Output (“analog” supply)
8	GNDA	“Analog” ground
9	+5VA	+5 V Output (“analog” supply)
10	GNDA	“Analog” ground
11	+9VA	+9 V Output (“analog” supply)
12	GNDA	“Analog” ground

* GND circuit is internally connected to chassis/case of the power supply block
** +12VA output is connected to +12Vin input directly via low-pass filter

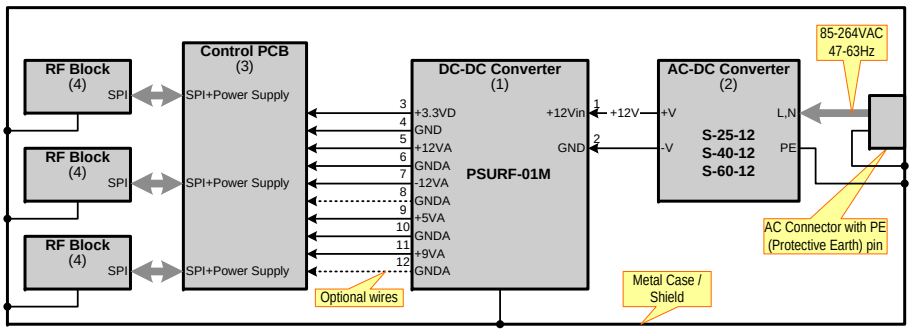


Figure 12: Typical application of the PSURF-01M block

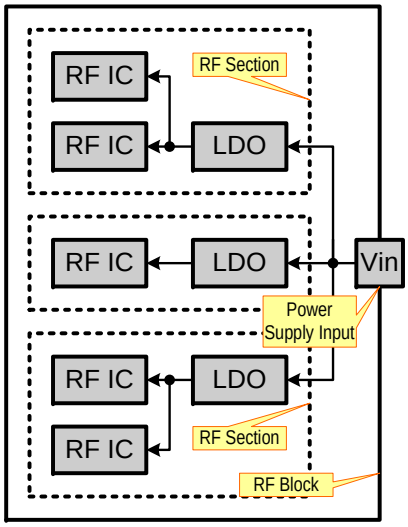


Figure 13: Recommended power supply distribution inside RF-block under development

2. AC/DC-converter, primary power supply block, for example, the following Meanwell models with power 25, 40 and 60 W accordingly: S-25-12, S-40-12, S-60-12;

3. Control PCB which manages multiple RF-blocks, data processing, conversion and displaying processed data;

4. RF-blocks which require multiple power supply voltages, such as LNO, AVM, AVD and so on.

Figure 13 shows recommended power supply circuit distribution inside RF-block, which consists of several RF-sections Each section provides certain function, for example, frequency synthesis, gain path, frequency conversion, etc. For appropriate isolation between sections, and eliminating induction effects via supply circuits, power supply of each section should be implemented via LDO (Low Drop-Out) regulator designed to produce low voltage drop (0.2-0.3 V) from input power supply voltage. This allows to suppress the ripple to 40-60 dB, and to provide significant decoupling of the sections between each other. Due to small voltage drop on the linear regulator, efficiency loss is negligible (at 0.3 V dropout on +5 V channel efficiency loss is about 6%), thus enabling the use of regulator ICs in small package. Another benefit of this approach is the ability of power supply control for each section. As for the most linear regulators have control pin, one can turn off the ICs which are not used in the current mode of the operation.

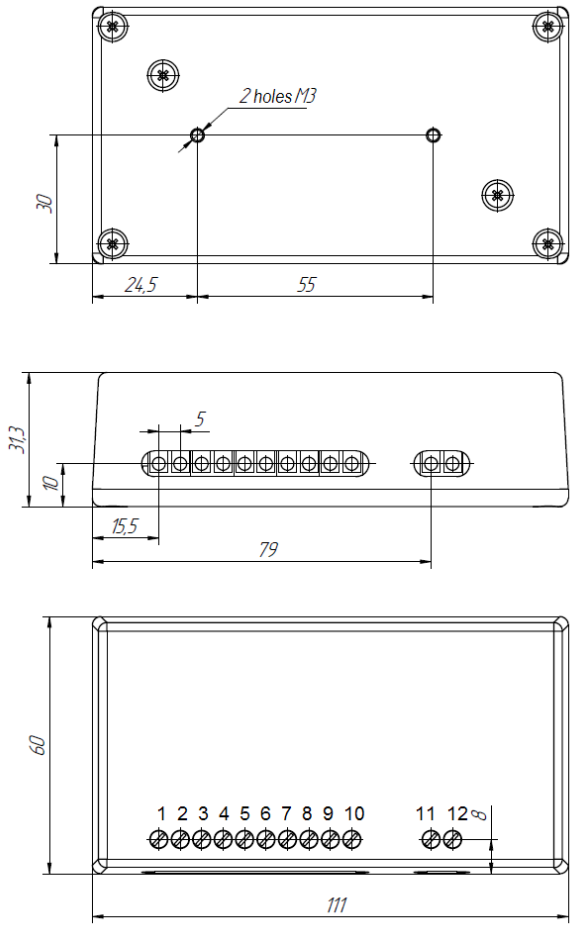


Figure 14: Mechanical drawing and pin locations

4 Mechanical Drawings

Dimensions and pin location of the power supply block are shown in figure 14. Terminal blocks with screw clamps are used for input and output wire connections.