

Powers3A Power-Supply Board Description.

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1. Main features

The Powers3A switching power supply board can feed +5V regulated (+/-4%, up to 1A or 3A depending on the version), and optionally +/-12V; +/-15V and -5V, for computing, data acquisition or similar equipment from 12, 24 or 48V battery banks. Reliable operation in this environment requires an alarm indication and shut-off circuit in case of low voltage (over-discharge), and logic ON/OFF control.

The circuit is highly efficient (75 to 85%) and uses a *buck* architecture switching at 52kHz (+/-10%). The power ICs used, widely available, feature automatic over-temperature shutdown and cycle-by-cycle current limitation.

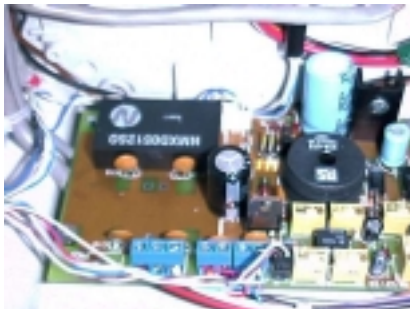


Figure 1: Powers3a 12V-1A+1module

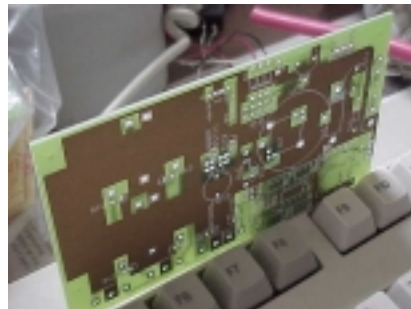


Figure 2 - Powers3a bare board.

Up to two NMX-SO 5W modules from Newport Components can be installed, to obtain split supplies usually used for analog or sensor circuits. These low-profile modules (figure 1, left) can be installed in +/-15V, 0.2A or +/-12V, 0.235A versions with a +/-10% tolerance. The 0V level is nevertheless referenced to the same ground level as +5V. The -5V @ 0.1A auxiliary output is obtained from one of these modules, using a linear 7905 regulator.

In the following diagrams (figures 3, 4) the circuit of the POWERS3A board is shown. The board is manufactured in epoxy, 2-side with plate-through holes, and it can be obtained from L&R as a bare board, board + component kit or as assembled and tested system. Also shown are typical applications (figure 5) and a connection diagram (figure 6).



POWERS3A - VERSION 24V
Fuente para Baterias +12/+24/+48V

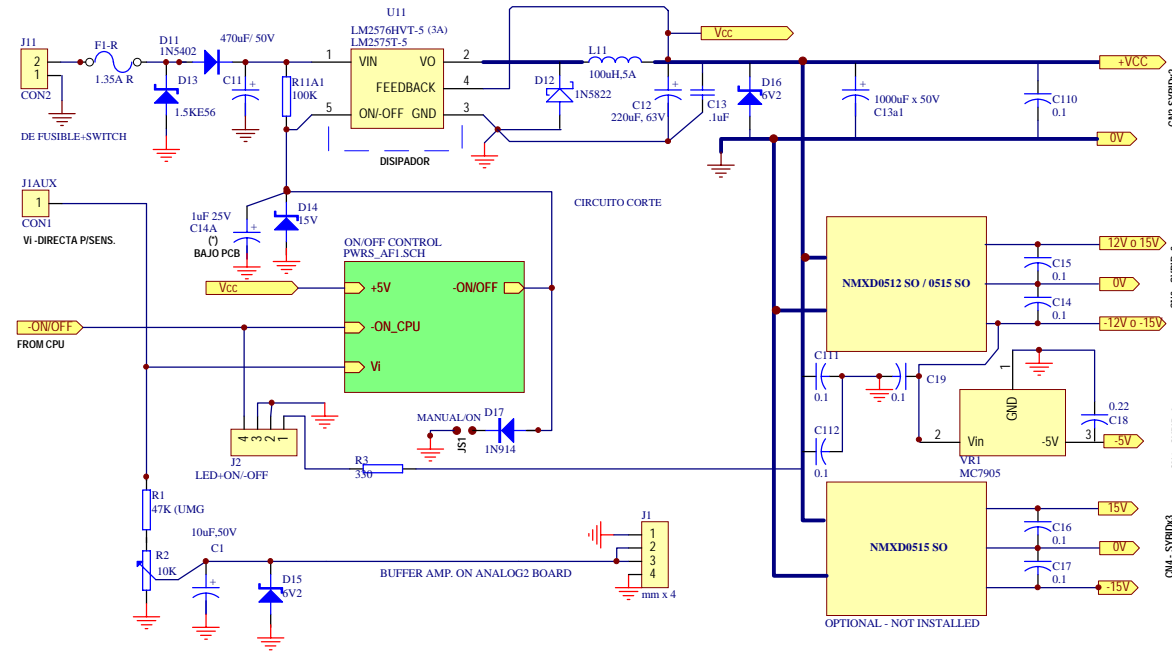
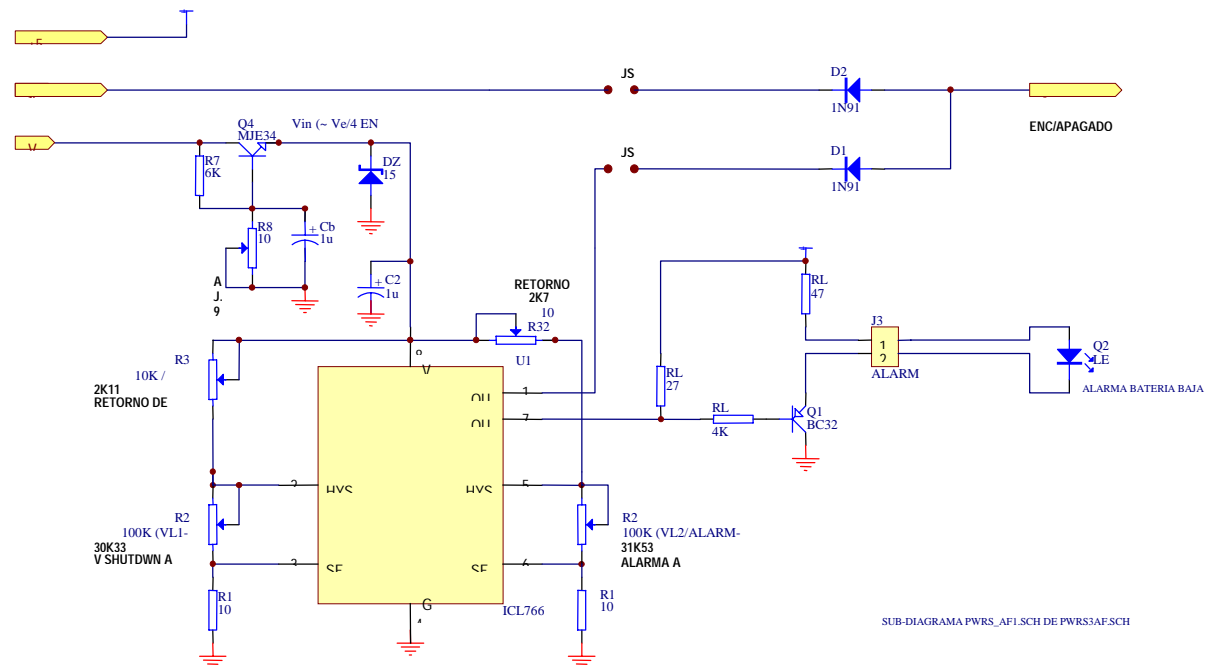


Figure 3 - Main Circuit - Powers3a



SHUT-DOWN CIRCUIT FOR POWERS3A - Leonardo Gonzalez y Rafael Oliva -



SUB-DIAGRAMA PWRS_AFI.SCH DE PWRS3AF.SCH

Figure 4 - Shutdown and Alarm circuit - Powers3a

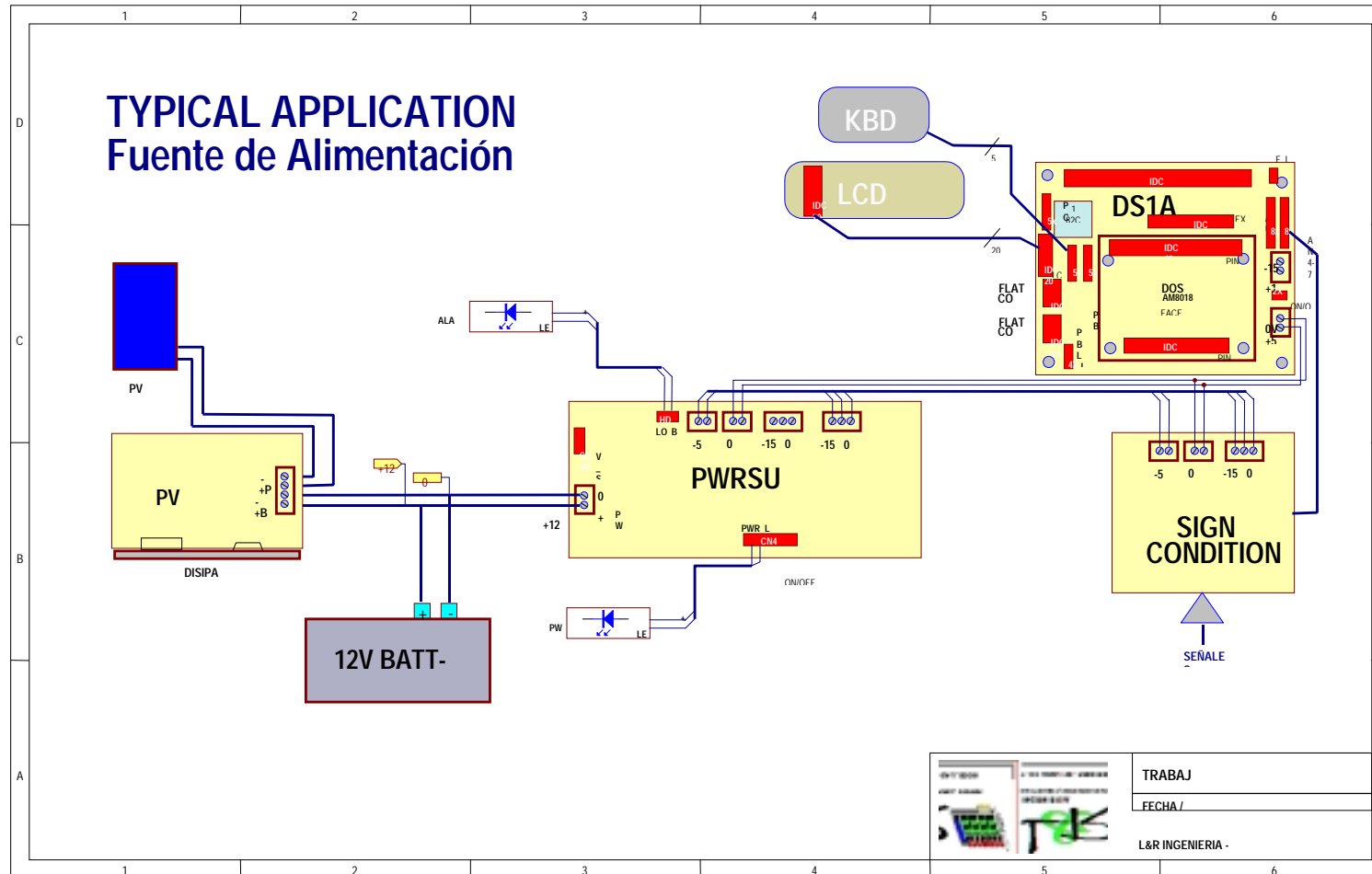


Figure 5 - Typical Application- Powers3a with Data Acquisition and PV powered system.





Powers3a Distribution

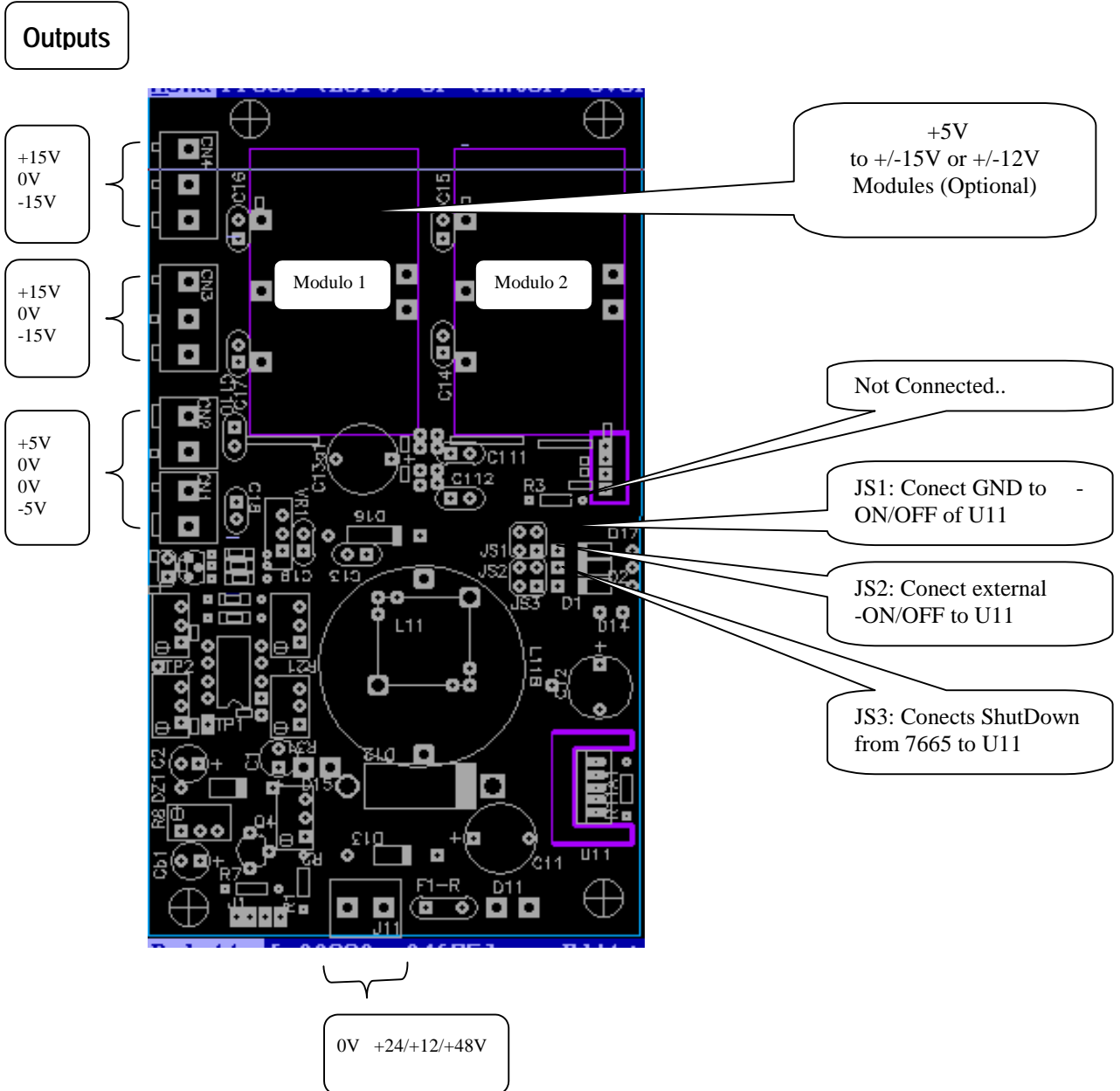


Figura 6 - Diagram of Input / Output Distribution.

2. Possible configurations of the Powers3a board

The POWERS3A board allows for a number of configurations, according to the application. It is possible to use only the +5V output, allowing for the full current (1A or 3A) availability of the LM257x ICs, or use one or both DC/DC modules that draw power from the +5V output.



The cost of these modules (which is not negligible) must be balanced according to the benefits of full protection, tight regulation, reliability and reduced component count compared to other solutions. If the current consumption of the +5V circuits and the analog front end is low (<0.6A), module #1 can be used with the 1A LM2575 version. If more current is necessary, the configurations shown in the following table can be evaluated. Higher battery voltages at higher currents usually make forced ventilation necessary.

Furthermore, cases with a $V_{bat}=48V$ require the installation of a resistive pre-regulator, which avoids that the integrated circuit receives more than specified max. "input" of +60V .

Powers3a Board - Configurations								
Nº	Input Voltage	+5V Rated Output Current	Module #1	Module #2	Available +5V Output Curr.	Forced Ventilation	IC	Pre-Regulator
1	12V	1A	(*)	-	0.7 to 1A	-	LM2575	-
2	24V	1A	(*)	-	0.7 to 1A	-	LM2575	-
3	48V	1A	(*)	-	0.7 to 1A	Recommended	LM2575HV	(**)
4	12V	3A	+/-12 ó +/-15	-	2A	-	LM2576	-
5	24V	3A	+/-12 ó +/-15	-	2A	-	LM2576	-
6	48V	3A	+/-12 ó +/-15	-	2A	Recommended	LM2576HV	(**)
7	12V	3A	+/-12 ó +/-15	+/-12 ó +/-15	1A	-	LM2576	-
8	24V	3A	+/-12 ó +/-15	+/-12 ó +/-15	1A	Necessary	LM2576	-
9	48V	3A	+/-12 ó +/-15	+/-12 ó +/-15	1A	Necessary	LM2576HV	(**)

(*) Not recommended unless current required in +/-12 or +/-15 is less than 0.1A.

(**) Required if V_{bat} can exceed 60V.

figure 7 - Table of possible configurations

References

- [1] Franco, Sergio: *Design with operational amplifiers and analog integrated circuits*, 2nd Edition, WCB McGraw-Hill, US 1998. ISBN 0-07-115280-6
- [2] National Semiconductor: *Power ICs Databook* National Semiconductor Corporation, 1993.