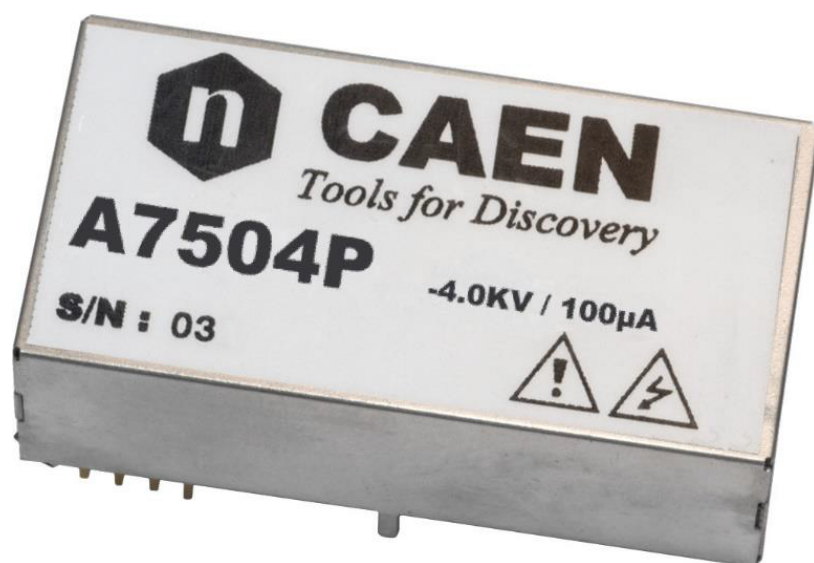
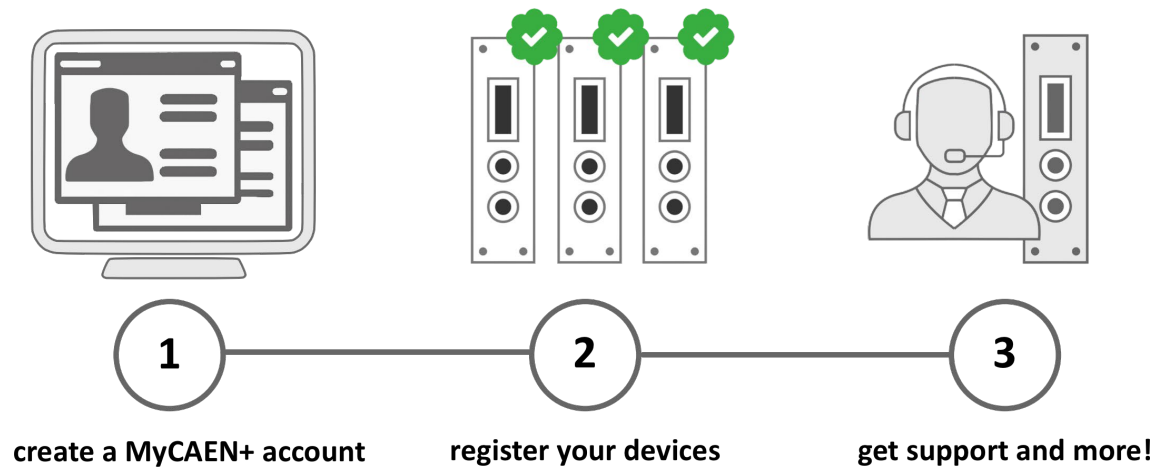




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Purpose of this Manual

This document is the A7504 4kV/100 μ A High Efficiency HV Power Supply user manual; it contains information about the installation, the configuration and the use of the board.

Change Document Record

Date	Revision	Changes
26 September 2016	0	Initial release
29 May 2017	1	Updated § 3 and A7504 images
3 August 2017	2	Updated Technical Specifications table
27 August 2019	3	Updated Vset / Vout and Vmon / Vout Coefficient

Symbols, abbreviated terms and notation

N.A.

Reference Documents

N.A.

Disclaimer

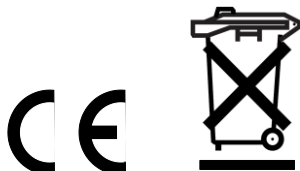
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1. Overview

The CAEN Mod. A7504 is a compact high efficiency power supply providing a programmable and monitorable output voltage ranging from 0 to 4000 V, when supplied with a +12 V input.

It is available with either positive or negative output voltage.

The board is provided with an over-current protection: if a current larger than the lout maximum value is drawn, the module is not being damaged.

The output voltage is regulated by providing a 0 to +2.5 V external voltage (Vset).

The module is engineered on a FR4 PCB, coated and housed in DC01 steel box. CAD Altium library components and 3D step models are available on request.



Fig. 1.1: Mod. A7504

Ordering Option

Board Models	Description	Product Code
A7504N	A7504N -4kV 100µA HV Power Supply Module (12V in)	WA7504XNAAAA
A7504P	A7504P +4kV 100µA HV Power Supply Module (12V in)	WA7504XPAAAA

Tab. 1.1: Table of models and related items

2. Technical Specifications

Packaging	Material: DC01; dimension: W=29 mm; L=54 mm; H=16 mm
Contact pins	Male strip header; 2.54mm step; phosphor bronze; UL94V0 insulator (see Fig. 2.1)
Operating temperature	-20° C ÷ +50° C
Storage temperature	-55° C ÷ +85° C
Voltage Supply (Vin)	+12 V ± 5%
Output Voltage (Vout)	0 ÷ ±4000 V
Output polarity	Available positive or negative
Enable	If Enable > 2.8 V Channel active If Enable < 1 V Channel disabled
Vmon Output (positive analog monitor)	0 ÷ +2.5 V
Vset Input (positive analog command)	0 ÷ +2.5 V Important! Vset must not exceed 2.6 V (Vout is not limited)
Iset Input (positive analog command)	0 ÷ +2.5 V
Imon Output (positive analog monitor) ¹	0 ÷ +2.5 V
Status OVC bit	0÷5 V (low = OVC)
ΔVout/Vout (for ±5% Vin variations)	<1.5 X 10 ⁻³ @ full scale
Maximum Output Current (Iout)	100 μA @ ±4000 V
Power requirement	<1.2 W; @ 4000 V / 100 μA (Rload ≈ 40 MΩ)
Efficiency	>30% @ Vout >2000 V (0° C ÷ +40° C)
Output Ripple (Full Load)	Typical 10mVpp; Maximum 15mVpp
Vout / Temperature coefficient	< 50 ppm / °C (@ Vout > 600 V)
Vset vs. Vout Integral Non Linearity	<±0.2% (-20° C ÷ +50° C)
Vmon vs. Vout Integral Non Linearity	<±0.2% (-20° C ÷ +50° C)
Electromagnetic compatibility	Weak emission of electromagnetic impulse and RF; one-piece metal shielding with several ground connections
Uniformity of a lot	< 1 % see
Protection	Over current short circuit, sparks and humidity

Tab. 2.1: A7504 Technical Specifications

¹ N.B.: In parallel to the load we have a 300 MΩ resistor for the voltage feedback; therefore, the Imon current with load ∞ is Vout/300MΩ.

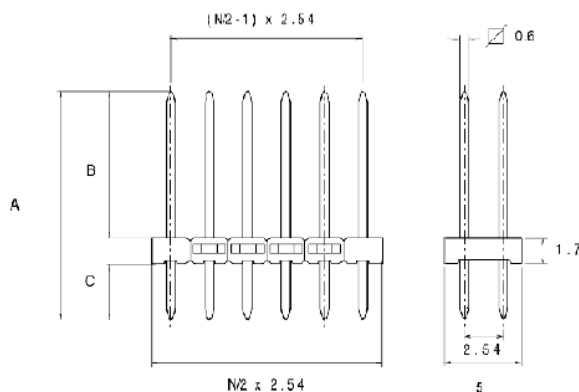


Fig. 2.1: Male strip header of A7504

Vset / Vout and Vmon / Vout Coefficient

Coefficient	A7504N	A7504P	Accuracy
Vout / Vset	1655.0	1640.0	± 1% 500 < Vout < 1000V ± 0.5% Vout > 1000 V
Vout / Vmon	1650.0	1645.0	± 1% 500 < Vout < 1000V ± 0.5% Vout > 1000 V

Tab. 2.2: Table of Vset / Vout and Vmon / Vout coefficient

Example: if Vset = 2 V, then HV Out = 3310 V ± 16 V (A7504N); if Vset = 2 V, then HV Out = 3280 V ± 16 V (A7504P);

Example: if Vmon = 1.5 V, then HV Out = 2475 V ± 12 V (A7504N); if Vmon = 1.5 V, then HV Out = 2467 V ± 12 V (A7504P)

Iset / Iout and Imon / Iout Coefficient

Iset / I _{max out}	45(*)	Accuracy:	± 5% Vout > 1000 V
Imon / Iout	45(*)	Accuracy:	± 5% Vout > 1000 V

Tab. 2.3: Table of Iset / I_{max out} and Imon / Iout coefficient

(*) Iset and Imon expressed in V, I_{max out} and Iout expressed in μA. N.B.: In parallel to the load we have a 300 MΩ resistor for the voltage feedback; therefore, the Imon current with load ∞ is Vout/300MΩ

Example: if Iset = 2 V, then I_{max out} = 90 μA ± 4.5 μA

Example: if Imon = 1 V, then Iout = 45 μA ± 2.25 μA

On / Off Timing

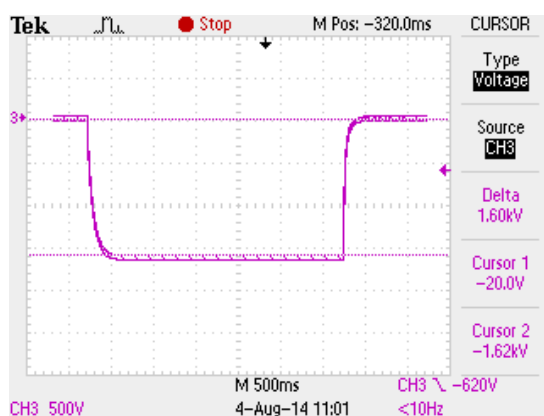


Fig. 2.2: Vout at turning On and Off (Load = 2.6 MΩ)

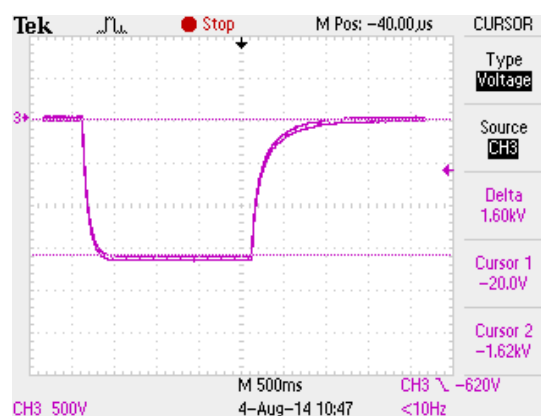


Fig. 2.3: Vout at turning On and Off (Load = 20 MΩ)

3. Packaging

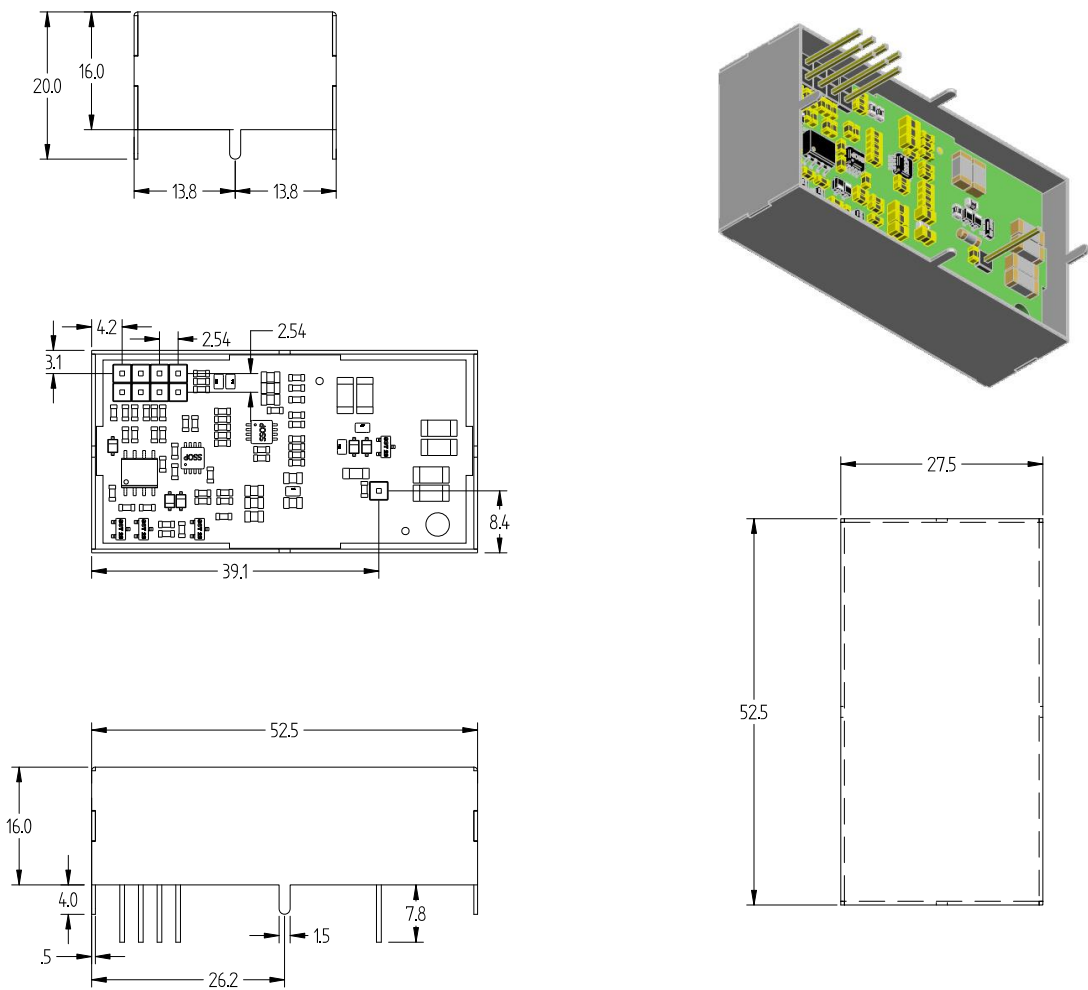


Fig. 3.1: A7504 External packaging (all dimension in mm)

External Connection

The following diagram describes the Pin assignment:

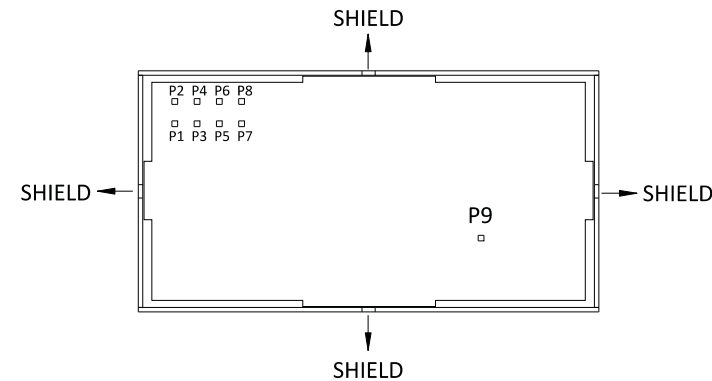


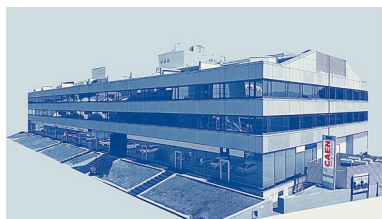
Fig. 3.2: A7504 pins position (bottom view)

Pin #	Description	Direction
P1	Enable (on >+2.8V)	In
P2	OVC Status	Out
P3	Vmon	Out
P4	Vset	In
P5	Iset	In
P6	Imon ²	Out
P7	+12V ($\pm 10\%$) Input	In
P8	RTN ground - shield	
P9	HV Output	Out

² It is necessary to add a regulation current proportional to the operation voltage; the regulation current I equal to $V_{out}/300 \text{ MOhm}$

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