Δ0:3 Data Sheet

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1 Description

The Δ0:3 is a third generation delayed relay device designed to send a desired current through an output when the timer runs out. Primarily designed to set off charge fuses, the wide variety of features make the device very useful in testing equipment, charging batteries, or any other application requiring a small, portable, high power output unit.

The name Δ0:3 stems from the fact that the momentum of an explosive does not change, hence the *Δ0*; *3* denotes the generation of the device.

2 Model
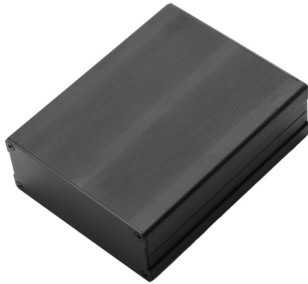
3 Feature Overview

Δ0:3 is packed with features such as:

- 5 to 120 second timer, with minimum of 0 seconds and a maximum of 24 hours.

- *Atmega2560* microprocessor.

- Internal 20A max output *18650* battery.

- 200W output.

- LCD display.

- Bluetooth remote controll.

- Constant voltage mode.

- Constant current mode.

- Resistance checking.

- In depth parameter monitoring.

- Audio cues.

A comprehensive list of features can be found below.

4 Specs

Default Operating Conditions

Parameter	Symbol	Nominal	Min	Max	Unit
Activation timer	T_1	60	5	120	s
Pulse timer[1]	T_p	0	0	1	s
Output shutdown timer[1]	T_s	—	1	120	s
Input voltage	V_{in}	12 or 3.6	3	35	V
Output voltage	V_o	—	—	40	V
Output current	I_o	—	—	5	A
Output power	P_o	—		200	W
Buzzer frequency	F_b	880	—	—	Hz
Bluetooth range	R_{bt}	—	—	10	m

<div align="center">**Absolute Maximum Operating Conditions**</div>

Parameter	Symbol	Nominal	Min	Max	Unit
Activation timer[2]	T_1	0	–	24	s, h
Pulse timer[12]	T_p	0	0	1	s
Output shutdown timer[12]	T_s	–	1	120	s

5 Firmware Features

- Bluetooth remote control.

  Set the *Activation* switch to *Armed* position for the unit to be activated remotely via bluetooth.

- Programmable output wattage.

- Programmable output voltage.

- Timed activation.

- Automatic fuse resistance check.

- Calibrator for output cable resistance.

  The user would have to manually enter the resistance of the output wires leading to and back from the fuse in order to have accurate power regulation.

- Password protected access, activation, and or deactivation.

  Passwords are stored on the Atmega EEPROM.

- Timed pulse setting for outputting current for a selected time.

- Timer post-countdown for measuring when the fuse blows out.

- Fuse current, voltage potential, resistance, and output power display.

- Stealth mode, shuts screen and any LEDs down during operation.

- Battery voltage display.

- Pong.

6 Hardware Features

- *Atmega2560* microprocessor.

- OLED or LCD display.

  Size debatable.

- Bluetooth module allowing for remote controll of the unit.

- External power connection.

- Internal *18650* battery.

  Independant internal power allowing for a fully integrated operation of the unit. A switch allows you to select either internal or external battery mode.

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[1]Minimum is applicable only if the option is enabled.
[2]Some values denoted with [1] can be accessed by changing the settings or entering specific secret activation codes.

- Boost converter to step up input voltage.

- PWM late stage MOSFET voltage regulator to step down output voltage and controll the output power.

- *ACS712* or *ACS758* hall effect current sensor for measuring output current.

- Internal battery charging protection.

- Buck converters for powering internal devices.

- Rotary encoder for navigating menus.

- External USB connector allowing for easy interface for reflashing firmware without disassembling the unit.

- Three pole DPDT

- Buzzer.

- Reverse polarity protection.

- GX16 connectors.

- Extruded aluminium case.

7 Settings

Δ0-3 contains a number of useful settings in order to provide more controll of the unit to the user.

- Bluetooth options.

- Speaker options.

8 Considered Features

- SMT components

  Pros:

  - Smaller form factor.

  Cons:

  - Requiring ordering of new parts and additional costs.
  - Questionable ability to solder them.

- Pong considerations

There are two options for pong support. Either one player against ai and controlled via the rotary encoder, or two player, controlled by two potentiometers.

Alternatively, it could be controlled via the keypad, with 7-1 for player 1, and 9-3 for player 2.

9 Circuit Diagram

10 Internal Specifications

Internal Component Operating Conditions

Parameter	Symbol	Nominal	Min	Max	Unit
PWM frequency	f_{pwm}	16	–	–	kHz
PWM duty cycle	D_{pwm}	100	0	–	%

11   Bill of Materials

Already acquired:

- Extruded aluminium enclosure, 120x97x40.

- PCB.

- 1.8" LCD.

- 12 button keypad.

- DPDT switch, optional protextive cover.

- Buck converters.

- Boost converter/s.

- 18650 battery (x2).

- 18650 battery charging protection.

- 18650 battery holder.

- Bluetooth module.

- USB female connector.

- Hall current sensor.

- Voltage sensors (x2).

- MOSFETs.

- Rotary encoder.

- XH-25 pin headers.

- Atmega2560 arduino compatible board.

- Necessary caps and resistors.

- DPDT mini switches.

- Relays.

- LEDs.

- Buzzer.