DAIDISIKE®
戴迪斯科

B2J0201

Economical Trigger Delay Module

TRM

Ver. R1T1

Constanta · Sand · Calcite(R.II)

B2J0201(Calcite) R1T1

Economical Trigger Delay Module Rev.1 Typ. 1

Technical Reference Manual

Product Highlights

1.Highly Economical

· Ultra low cost implementation of basic time-delay functionality

· Single isolated relay output with 250V AC 10A capacity for both NO & NC

· Multiple power supply voltage versions e.g. 5/9/12/24V with available complementary voltage customization services

2.Good Reliability

· Basic protection against supply polarity inversion, overcurrent, electrostatic discharge, electrical fast transient and voltage surge

· The creepage slots on the PCB isolating the high voltage side strictly follow the safety standards

Contents

List of Tables

List of Figures

Revision History

Version	Date (YYYY-MM-DD)	Notes
R1T1	2020-02-27	Initial Release

Chapter 1 Product Introduction

1.1 Preface

This product is a trigger delay module that can be powered from 5V, 9V, 12V, 18V or 24V. Positive or negative trigger input polarities can be configured to make the module more flexible.

1.2 Structural Description

There are six screw terminals, one button, one potentiometer, one jumper and two LED indicators on the product. The description of each terminal and component are shown in the figure and table below.

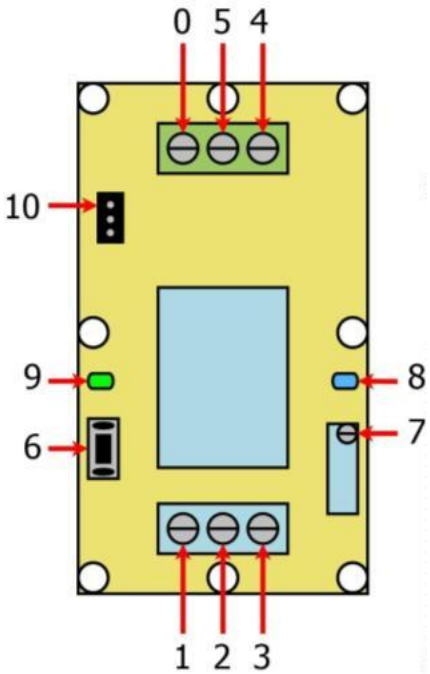

Figure 1-1 Product Front-side Marking Drawing

Table 1-1 Product Front-side Marking

Name	No.	Meaning
Trigger terminal	0	With voltage threshold detection functionality. Green.
Normally open contact	1	The Normally Open (NO) contact of the relay. Blue. When the relay makes, this is connected to the common contact. Blue. For transistor output type products, this serves as the load ground.
Common contact	2	The COMmon (COM) contact of the relay. Blue. For transistor output type products, this serves as the load-side power supply ground.

Name	No.	Meaning
Normally closed contact	3	The Normally Closed (NC) contact of the relay, when the relay breaks, this is connected to the common contact. Blue. For transistor output type, this serves as the common terminal of load and load-side supply.
Positive supply	4	Positive power supply. The typical current consumption when the relay makes is 40 mA. Green.
Negative supply	5	Negative power supply. The typical current consumption when the relay makes is 40 mA. Green.
Trigger button	6	The button for triggering the delay test. Black.
Adjusting knob	7	The knob for adjusting the delay time. Blue.
Action indicator	8	The indicator for the relay status. Blue.
Power indicator	9	The indicator for the power status. Green.
Level selection	10	The pin header for selecting the trigger level. Jump it at the upper position for high-level triggering and the lower position for low-level triggering.

1.3 Wiring Methods

The power supply terminals are directly connected to the DC power input. The normally open and normally closed relay terminals are connected according to the application needs and they are connected in series with the load and load power supply. The trigger terminal is connected to a voltage input to trigger the product according to the voltage change. For the transistor output type, the wiring diagram is described in 3.2.

A typical wiring diagram of the relay output type is shown below.

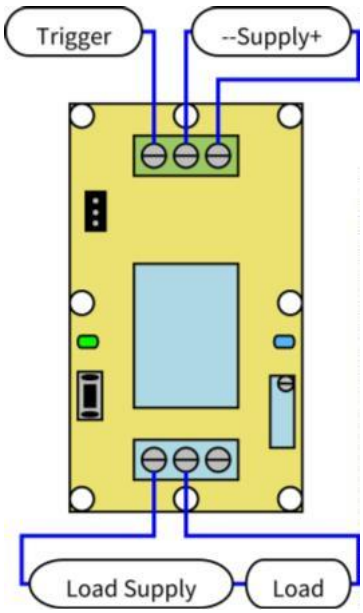

Figure 1-2 Typical Wiring Diagram of a Relay Output Type Product

1.4 Mechanical Dimensions

The mechanical dimensions of the product PCB are shown in the table below. The tolerance of all mechanical dimensions is 5%. All dimensions are in millimeters.

Table 1-2 PCB Mechanical Dimensions

Dimension	Value
PCB length	55
PCB width	30
Distance between upper and lower mounting holes	49
Distance between left and right mounting holes	24.5
Terminal spacing	5.08

This product comes with an optional miniature case. The mechanical dimensions of the case are shown in the figure below. All dimensions are in millimeters.

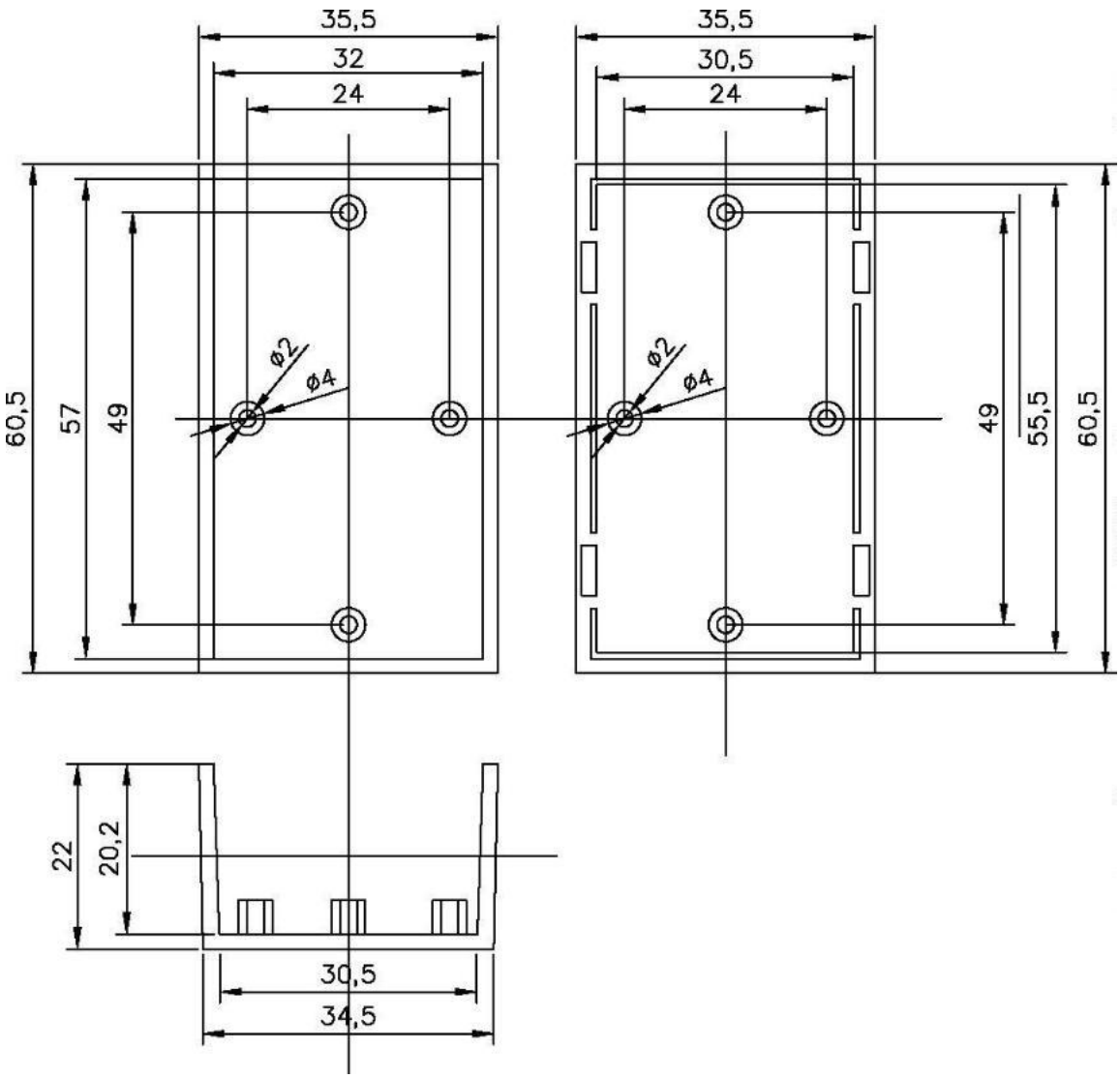

Figure 1-3 Mechanical Drawing of the Small Case

When the product lacks a case, it is only recommended for controlling the safe voltage (0-36V) rather than the AC mains. Special care should be taken to prevent electric shock when a caseless product is used to control the AC mains. Please be gentle when tightening the screws to avoid stressing the product PCB. Long-term reliability of the product may be affected when the screw is too overtightened.

When the product has a case, it can be used to control the AC mains. It can optionally be glued onto a flat surface with double-sided adhesive tape.

Chapter 2 Detailed Function Description

2.1 Delay Time Description

After the product is powered up, the relay is in break state. A high-level or a low-level trigger signal at the input triggers the module and then the relay makes. After an adjustable delay period, the relay will break. The countdown starts right after the trigger signal is applied; if the signal maintains, the relay will remain make until such signal is removed .

This product has a potentiometer knob that is responsible for delay time adjustments. The adjustment range of the delay time is 2-30 seconds. Rotate the knob clockwise to increase the delay time and counterclockwise to decrease it. In addition to the trigger terminal, the trigger button on the product can also be used to trigger the delay sequence.

2.2 Trigger Level Configuration Description

The trigger level of this product is set by three-terminal pin header and a jumper cap. Set the jumper cap between "o" and "+" to use high level trigger. At this time, connect the trigger terminal to a positive voltage higher than 2V, which is the trigger delay. Set the jumper cap between "o" and "-" to use low level trigger. At this time, the trigger terminal is short-circuited to ground to start the delay.

Chapter 3 Modification Description

3.1 Preface

This product has the following modifications whose ordering numbers are in the form of B2J02[aa]R[b]T[c]M[dd]. The [aa] field is fixed as 01, as the module only has a single-channel version; the [b] field and [c] field are the main version number and sub-version number of the module respectively; the [dd] field determines the specific modification of the module. The module modification classes are mutually independent. If no specific requirement is designated when the product is shipped, the default option is the 12V relay output type, that is, M31. The specific meanings of the [dd] field are as follows.

Table 3-1 The Meanings of the [dd] Field

Digit	Description	Meaning	
First	Supply voltage of the module	1	5V supply type
		2	9V supply type
		3	12V supply type
		4	18V supply type
		5	24V supply type
Second	Output modes of the module	1	Relay output type
		2	Transistor output type

3.2 Transistor Output Type Description

This version is connected to the circuit in open-drain mode as shown below. The transistor has a rated working voltage of 12-48V DC and a rated current of 10A. With a 10A freewheeling diode on the transistor, it can directly power an inductive load up to 10A[1].

Certain loads e.g. filament lamps, mercury lamps exhibit a current spike during startup; some other loads e.g. heavy-duty motors, speakers and electromagnets emit extremely strong EMI during operation. Due to size limitations, it is impossible to implement good power line filters on this module; thus when the power of such loads exceed 1W it is recommended to use standalone power sources for the module[2] and to place these loads as far as possible from the module, or the module may repeatedly reset when the load powers on.

[1] Usually heavy-duty electromagnets and motors, etc.

[2] Use one dedicated DC power supply for the module, and one power supply for the load and other devices.

Compared to relays, transistors are far more sensitive. Thus, when the module is being powered off, the internal states of the NE555 may become invalid; even if the delay is untriggered, the transistor may make for a moment[1] and then break. This issue is nonexistant on the relay version, but must be accounted for when using transistor version modules, especially when the devices connected to the output may respond to such momentary pulses. A effective countermeasure is to use power sequencing: make sure that the product is powered on before the output is powered on, and that the output is powered off before the product is powered off.

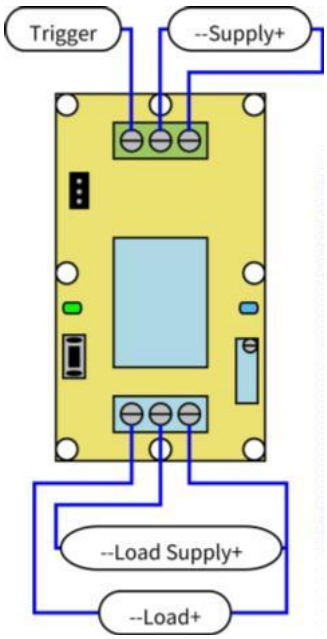

Figure 3-1 Typical Wiring Diagram of a Transistor Output Type Product

[1] Around 100 milliseconds

Chapter 4 Electrical Specification Description

4.1 Normal Working Conditions

The normal working conditions of this module are shown in the table below. Only within this condition can the normal operation be guaranteed.

Table 4-1 Normal Working Conditions

Description	Range	
Supply voltage	5V	DC 4.8 - 5.2V
	9V	DC 8.5 - 11V
	12V	DC 11 - 14V
	18V	DC 16 - 20V
	24V	DC 20 - 28V
Power supply ripple	----	Less than 1Vp-p
Supply current	----	Less than 50mA
Input stress	High-level selected	DC 0 - 30V
	Low-level selected	DC 0 - 5V
Output stress	Relay type	DC 30V or AC 0 - 220V, 8A
	Transistor type	DC 12 - 48V, 8A
Output isolated voltage	Relay type	Less than 250V
	Transistor type	Less than 130V
Operating temperature	----	-20 - 60°C

4.2 Absolute Maximum Ratings

The extreme conditions that this module can withstand are shown in the following table. Stresses at or above those listed here may permanently damage the module.

Table 4-2 Absolute Maximum Ratings

Description	Range	
Supply voltage	5V	DC 5.3V
	9V	DC 11.5V
	12V	DC 15V
	18V	DC 22V
	24V	DC 30V

Self-resettable fuse	----	DC 30V, 500mA
Input stress	High-level selected	DC 50V
	Low-level selected	DC 5.3V
Output stress	Relay type	AC 250V, 10A
	Transistor type	DC 55V, 10A
Output isolating voltage	Relay type	DC 1000V, 60s (Type test only)
	Transistor type	DC 250V, 60s (Type test only)
Relay mechanical life	Relay type	More than 100,000 times (Actual life varies with load, > 10,000 times under heavy load)
Storage temperature	----	-40 - 85°C

4.3 Other Parameters and Certifications

The other parameters and certifications of this module are listed as follows. These parameters and certifications include electrostatic discharge, electrical fast transient and voltage surge tests that comply with the requirements of IEC61000-6-1-2016 (Edition 3.0，2016-08) for light industry purposes. During all of these tests, the modules are powered by a well-grounded 12V supply and in active delay operation.

Table 4-3 Other Parameters and Certifications

Item	Details	Passing Criterion
Electrostatic discharge resistance IEC61000-4-2	1kV, discharge on all terminals.	(A) module functions normally.
Electrostatic discharge resistance IEC61000-4-2	2kV, discharge on all terminals.	(C) module is not permanently damaged.
Electrical fast transient resistance IEC61000-4-4	500V, 5kHz, 2min, applied to all terminals.	(B) module functions normally, the delay time may slightly change.
Electrical fast transient resistance	1kV, 5kHz, 2min, applied to all terminals.	(C) module is not permanently damaged.

IEC61000-4-4		
Surge resistance IEC61000-4-5	1kV voltage surge to ground, applied to power terminals. (Guaranteed by design)	(C) module is not permanently damaged.
Creepage distance IEC60950-2L/2N	Pollution degree 3, material category IIIa and IIIb, basic isolation from relay terminal[1] to logic side[2], creepage distance above 6mm.	The actual distance is above 9.2mm, which meets the requirements.
Electrical clearance IEC60950-2H	Pollution degree 3, basic isolation from relay terminal to logic side, electrical clearance above 2mm.	The actual distance is above 2.2mm, which meets the requirements.

4.4 Notes on Reliability

This module is only qualified[3] for commercial applications due to its miniature size, thus it is not recommended for formal industry situations with strong interference. Additional power filters and / or port filters are required if it must be used in this way. If such additional filters are not desired, a switching power supply[4] with Electrical Fast Transient (EFT) resistance is required to power the module and the power supply cord must be shorter than 3m.

In addition, if the load exhibits current spikes during startup or emit extremely strong EMI during operation, it is recommended to use standalone power sources for the module[5] and to place these loads as far as possible from the module, or the module may repeatedly reset when the load powers on, especially in cases where the power source has poor transient responsiveness or the 5V version is used.

During the test, the negative supply of the module is directly connected to the earth by default. The same connection should be made to obtain the stability index in the table above.

[1] Primary circuit.

[2] Extra low voltage(ELV). Take note that it is not designed according to Safety Extra Low Voltage circuit standards, that is, not SELV.

[3] It complies with the requirement to withstand 500V EFT in IEC61000-6-1, but does not comply with the requirement to withstand 1kV EFT in IEC61000-6-2.

[4] Preferably isolated.

[5] Use one dedicated DC power supply for the module, and one power supply for the load and other devices.

Chapter 5 Appendix

5.1 Typical Applications

The sound control light in a certain stairwell is required to turn on after the sound sensor detects the sound signal and turn off after the sound signal disappears for about 20 seconds. It is known that the sound sensor outputs a 5V high-level when it detects the sound signal.

5.1.1 Requirement Analysis

A relay input and an output are used in this application. The power supply voltage of the module is 12V generated by 220V AC mains power adapter, which can be completed by the B2J0201M31 module.

5.1.2 Circuit Design

According to the above requirements, connect the circuit as shown in the figure:

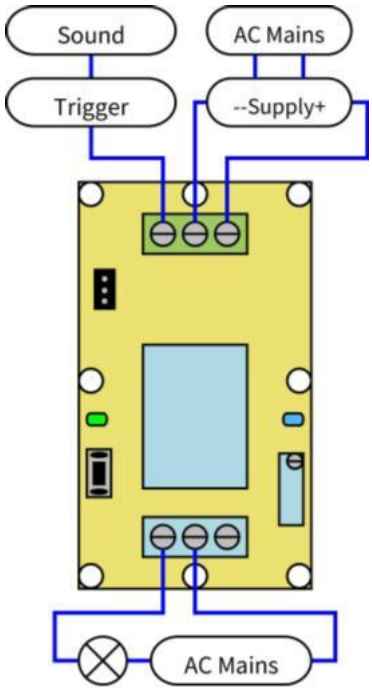

Figure 5-1 Typical Wiring Diagram of Application Cases

The trigger level is set by a three-terminal pin header and a jumper cap. Set the module jumper cap to the upper position and select high-level trigger in this application.

The delay time is set by adjusting the knob on the potentiometer. Rotate the knob clockwise to increase the delay time and counterclockwise to decrease it. The adjustment range of the delay time is 2-30 seconds. In this application, we set it to 20 seconds.

5.2 Legal Statement

The company reserves the right to further modify, upgrade and amend the product and its manuals without notifications. The user should confirm that the information is complete and up-to-grade before placing an order. The company is not responsible for the specific application of the customer and only guarantees that the module functions properly under normal working conditions. This product may be protected by one or more patents or other forms of intellectual properties and may contain third-party intellectual properties; the use of this product does not authorize the user to the patented technologies and intellectual properties contained in this product, nor does it authorize the user to the potentially involved third-party intellectual properties, either expressly or implicitly. Reproduction of this technical manual in part or in whole is allowed only on the premise of maintaining the integrity of the technical data in this technical manual and this legal statement. The company is not responsible for such copies and their uses.

This product is not intended for purposes where failure or faulty operations may cause major injuries or major property damages, such as life support equipment or nuclear industry equipment, even if the company has been explicitly informed or implied that the customer may apply the product to such uses. If the customer applies this product to the above-mentioned uses, the company is not responsible for the associated losses caused by the failure of the product.

The company does not take responsibility for the user configurations of the product and only guarantees the correct operation of the product according to these configuration. Nor does the company guarantee that the specific configuration is suitable for a specific purpose. The company shall not be held liable for any losses in cases where the user configurations do not fit the specific purpose.