

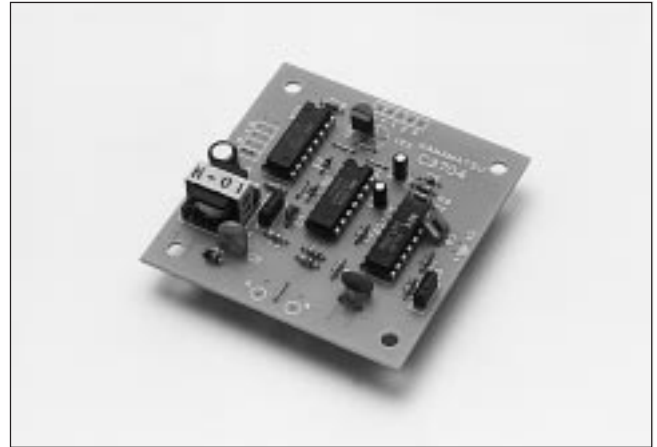
R2868 称为火焰发现者.在火星产生瞬间能够准确地发现, 并且对非可见光的高传输的电晕现象可以完全解除. Hamamatsu R2868 是利用紫外线 TRON 通过金属的光电效果和瓦斯乘法效果来发现火星源. 它可以探测 185 到 260 个不同的狭窄光谱敏感源.它对可见光完全没有感应,也不需要过滤器任何可见光(不像半导体探测器). 它具有很小的体积和很宽敏感角度(择向性),并能快速准确地发现从火焰被发出的弱紫外线.(能够探测 5 m 或在稍远处发现香烟点大小的火焰.)

### Compact, Lightweight, Low Current Consumption, Low Cost Operates as High Sensitivity UV Sensor with UV TRON Suitable for Flame Detectors and Fire Alarms

Hamamatsu C3704 series UV TRON driving circuits are low current consuming, signal processing circuits for the UV TRON, well known as a high sensitivity ultraviolet detecting tube. The C3704 series can be operated as a UV sensor by connecting the UV TRON and applying DC low voltage, as they have both a high-voltage power supply and a signal processing circuit on the same printed circuit board.

Since background discharges of the UV TRON caused by natural excitation lights (such as a cosmic ray, scattered sunlight, etc.) can be cancelled in the signal processing circuit, the output signals from the C3704 series can be used without errors.

When the high sensitivity sensor "UV TRON R2868" (sold separately) is used, the flame from a cigarette lighter (flame length: 25mm) can be detected even from a distance of more than 5m.



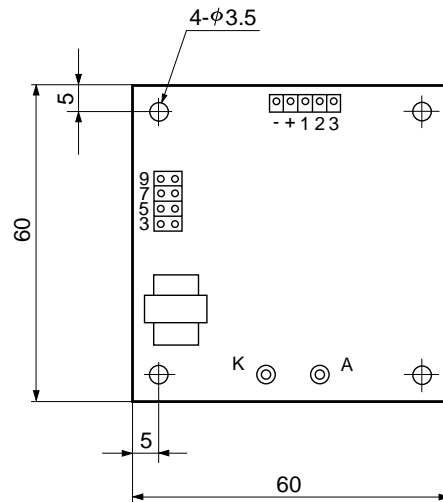
#### APPLICATIONS

- Flame detectors for gas and oil lighters
- Fire alarms
- Combustion monitors for burners
- Electric spark detector
- UV photoelectric counter

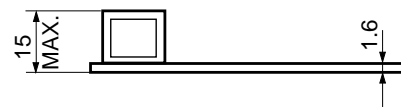
#### SPECIFICATIONS

Dimensional outline ..... Figure 1  
 Weight ..... Approx. 20g  
 Output signal ..... Open collector Output (50 V, 100 mA Max.)  
 10 ms width pulse output (Note : 1)  
 UV TRON supply voltage ..... DC 350 V (Note : 2)  
 Quenching time ..... Approx. 50 ms  
 Operating temperature ..... -10 to +50°C  
 (with no condensation)  
 Suitable UV TRON ..... Low voltage operation UV TRON  
 (such as R2868)

Figure 1: Dimensional Outline (Unit : mm)



<Top View>



<Side View>

TPT A0024EA

	C3704	C3704-02	C3704-03
Input Voltage	10 to 30 Vdc	5Vdc ± 5%	6 to 9 Vdc
Current consumption	3 mA Max.	300µA Max.	300µA Max.

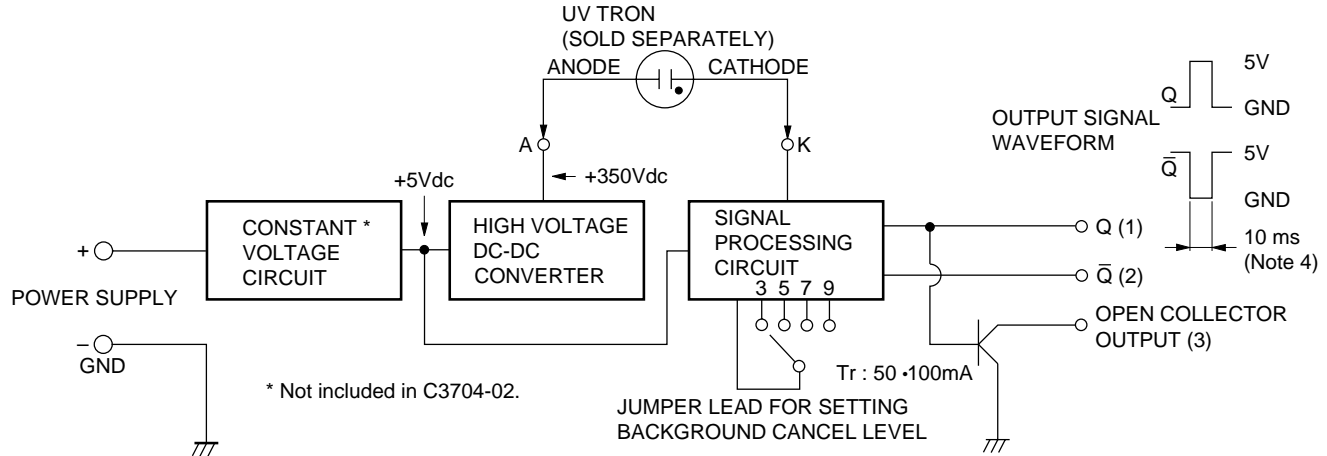
Note 1: The output pulse width can be extended up to about 100s by adding a capacitor to the circuit board.

Note 2: Since the output impedance of this power supply is extremely high, an ordinary voltmeter cannot be used. Use a voltmeter that has an input impedance of more than 10 GΩ.

# UV TRON® DRIVING CIRCUIT C3704 SERIES

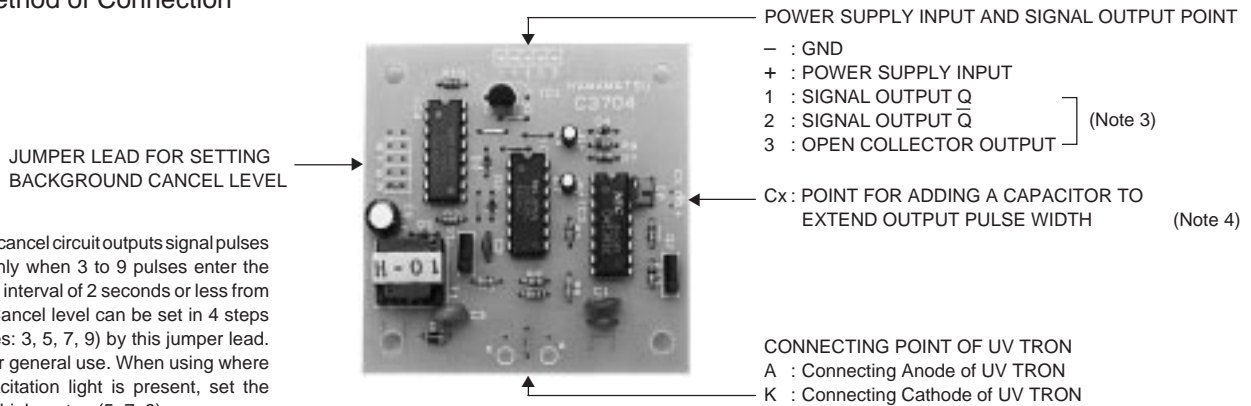
SUNSTAR传感与控制 <http://www.sensor-ic.com/> TEL:0755-83376549 FAX:0755-83376182 E-MAIL:szss20@163.com

Figure 2: Schematic Diagram



TPT C0004EA

Figure 3: Method of Connection



This background cancel circuit outputs signal pulses of 10ms width only when 3 to 9 pulses enter the circuit with a time interval of 2 seconds or less from the UV TRON. Cancel level can be set in 4 steps (number of pulses: 3, 5, 7, 9) by this jumper lead. Connect to "3" for general use. When using where much natural excitation light is present, set the cancel level at a higher step (5, 7, 9).

Note 3: No load can be driven by an output from points "1" and "2" because these signals are output from the only C-MOS IC directly. When a load such as a buzzer and a relay is connected to this circuit, it should be connected to the point open collector output. The transistor ratings of the open collector is 50V, 100mA. Be careful not to exceed the ratings.

Note 4: The output pulse width is set to 10ms at shipping. If the pulse width needs to be extended, add a capacitor to this point. (When using an electrolytic condenser, make sure the polarity is correct.)  
e.g. CX = 1 μF: Pulse Width ≈ 1s, CX=10 μF: Pulse Width ≈ 10s

## PRECAUTIONS FOR USE

- Since the operation impedance is extremely high, the UV TRON should be connected as close as possible to the circuit board within 5 cm.
- Take care to avoid external noise since a C-MOS IC is used in the circuit. It is recommended that the whole PC board be put in the shield box when it is used.
- To reduce current consumption, oscillating frequency is very low (approx. 20 Hz) in this DC-DC converter. Thus, the output impedance of the high voltage power supply is extremely high. If the surrounding humidity is high, electrical leakage on the PC board surface may lead to a drop in the supply voltage to the UV TRON. This voltage drop may result in lowered detection performance, so a moistureproof material (silicone compound, etc.) should be applied at the connecting point of the UV TRON, etc., if using the unit in a humid environment.

- A model equipped with a flame sensor (R2868) is also available.

# HAMAMATSU

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TPT1007E01  
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Created in Japan

## Precautions Concerning Use

- ▶ The C3704 uses a C-MOS IC. Be very careful about external noise. It is recommended that the entire PC board be placed in a metal case.
- ▶ The DC-DC converter-type high-voltage power supply used in the C3704 has an extremely high output impedance. If the surrounding humidity is high, electrical leakage from the PC board surface may lead to a drop in the supply voltage to the UV TRON. This voltage drop may result in lowered detection performance, so a moistureproof material (silicon compound, etc.) should be applied to the UV TRON contact point if the unit is to be used in a humid environment.
- ▶ If there is oil or another substance on the glass surface of the UV TRON, the permeability of the ultraviolet light is decreased, lowering sensitivity. In this case, clean the surface carefully with a piece of gauze dipped in alcohol to remove any residue.
- ▶ The UV TRON is a precision component made of glass. Be careful to protect it with a buffering material against vibration or impact even after it has been assembled.

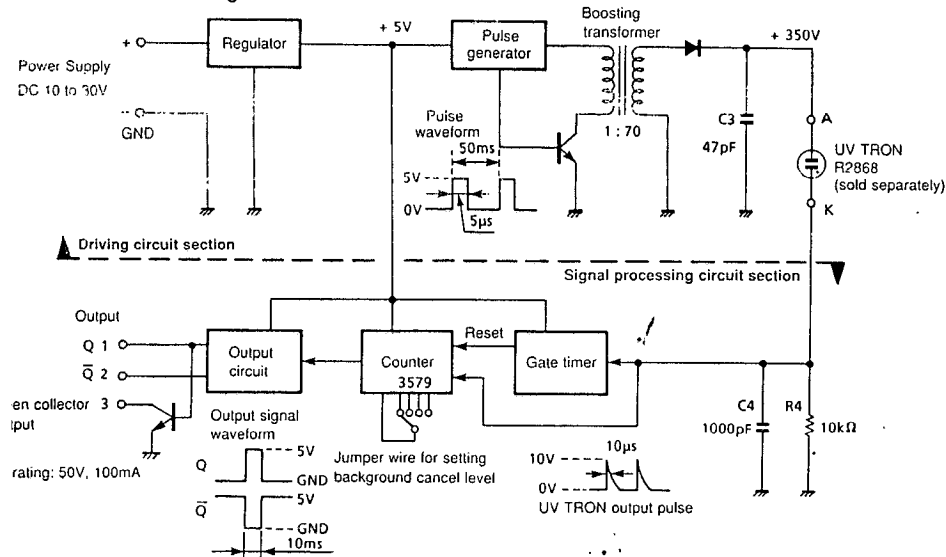
## Warranty

The period of warranty is one year after the date of delivery. During this period, if any damage is judged to be the fault of Hamamatsu, the unit will be repaired or replaced at no charge. Damage occurring because of failure to follow the instructions in this manual, or if any unauthorized additions were made to the unit by the user, or damage resulting from natural disasters, will not be covered by this warranty.

## After-Service

This unit was manufactured and inspected under the strictest quality conditions. In the rare event that damage should occur, please contact Hamamatsu directly (or arrange direct delivery of the unit to us). At that time, please describe the content of the breakdown or damage in as much detail as possible, and include the information with the product label.

### Figure 8: C3704 Circuit Configuration



Information furnished by HAMAMATSU is believed to be reliable. However, no responsibility is assumed for possible inaccuracies or omissions. Specifications are subject to change without notice. No patent rights are granted to any of the circuits described herein.

# HAMAMATSU

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# UV TRON® DRIVING CIRCUIT C3704 User's Manual

Thank you for purchasing the compact UV TRON driving circuit C3704. Before using your unit, please be sure to read this manual carefully to ensure correct operation.

## 1. FEATURES

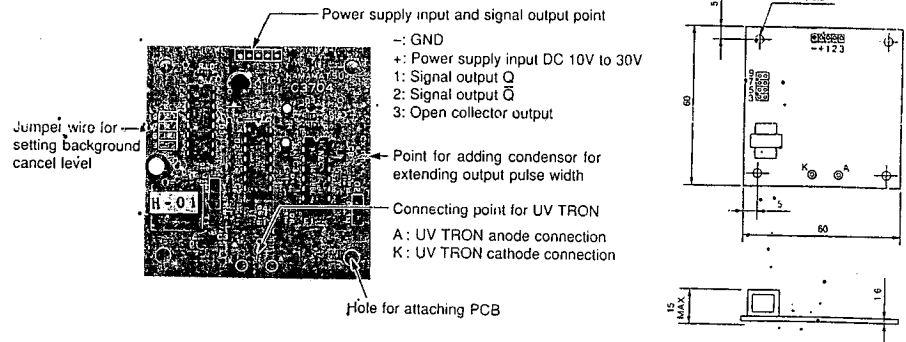
- By connecting the C3704 to a UV TRON (such as the R2868), it can be operated as a high-sensitivity ultraviolet sensor (as a flame detector for lighters, matches, etc. (flame length is about 25mm) at a distance of 5m or more).
- The circuit input stage is supplied with a constant-voltage IC, so that operation is possible over a wide range of power sources, from 10 to 30V.
- Employment of a UV TRON background cancelling circuit ensures error-free operation.

## 2. APPLICATIONS

- Flame detectors for lighters and matches
- Fire alarms
- Combustion monitors for burners
- Electrical discharge detection

## 3. EXTERIOR DIMENSIONS

Figure 1: Diagram of Dimensions (unit: mm)



## 4. SPECIFICATIONS

Dimensions .....	60 (W) x 60 (D) x 15 (H) mm
Weight .....	Approx. 20g
Input voltage .....	DC 10 to 30V
Current consumption .....	3mA typical (with DC 24V power source)
Signal output .....	Open collector output (30V, 100mA max.) 10ms pulse width (Note 1)
UV TRON applied voltage .....	DC 350V (Note 2)
Operating temperature range .....	-10 to +50°C (with no condensation)
Applicable UV TRONS .....	Types with discharge starting voltage of 300V or less (R2868, R1753-01, R259, etc.)

Note 1: By adding a condenser to the PCB, the output pulse width can be extended up to about 100 seconds. Refer to 6..Operation.

Note 2: Since the output impedance of the power source is extremely high, the voltage cannot be measured with an ordinary voltmeter. Use a measuring device with an input impedance of 10GΩ or more.

## CONNECTIONS

### 1) Connecting the UV TRON

As shown in Figure 2, the UV TRON should either be soldered directly to the circuit board, or connected with a short lead wire of 5cm or less.

#### CAUTION

The UV TRON is a precision component made of glass. Be careful not to drop it or subject it to sharp impact, as this may cause a deterioration of its performance. Handle it very carefully.

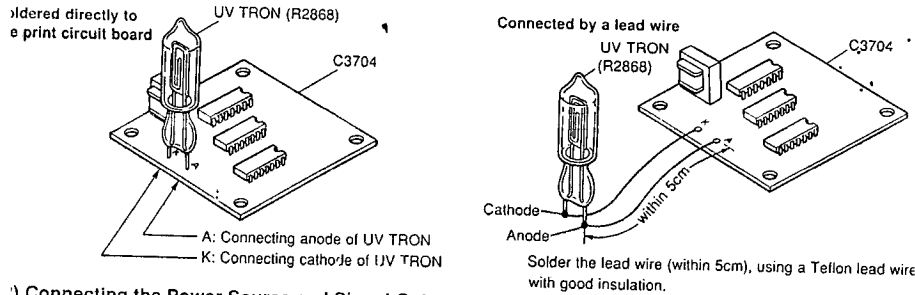
The UV TRON is a bipolar phototube. Be sure to connect it correctly, referring to the data sheet. Incorrect or reversed connections may lead to erroneous operation.

Soldering should be done quickly within 5 seconds, at 300°C or below. If too much heat is applied to the lead wire, the glass may crack, leading to deterioration of performance.

After soldering, excessive flux should be removed with alcohol. If any dirt or flux remains, humidity may cause an electrical leak, resulting in a voltage drop to the UV TRON. This could cause a decrease in sensitivity and a loss of operation.

It should be noted that the glass may be broken if the UV TRON lead wire is installed with too much force. When bending the lead wire, fix the end of the wire on the glass side with pliers to prevent force from being applied onto the glass.

### Figure 2: Connecting the UV TRON



### 2) Connecting the Power Source and Signal Output

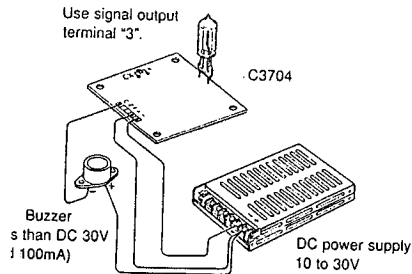
Refer to figure 3, 4 or 5, depending on your purpose, for connecting the power source and signal output.

#### CAUTION

It is very important not to reverse the + and - terminals of the power source. If they are connected in reverse, the IC in the circuit may be damaged, making operation impossible.

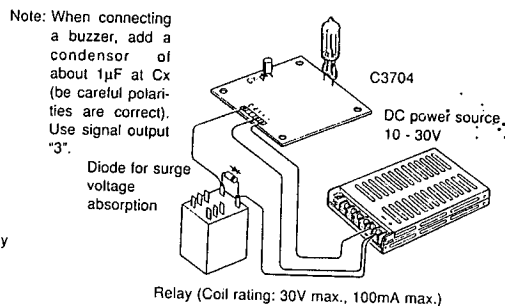
Signal outputs 1 and 2 are output directly by the C-MOS IC. If the GND and power source are accidentally shorted, the IC in the circuit may be damaged, making operation impossible.

### Figure 3: When Connecting a Buzzer



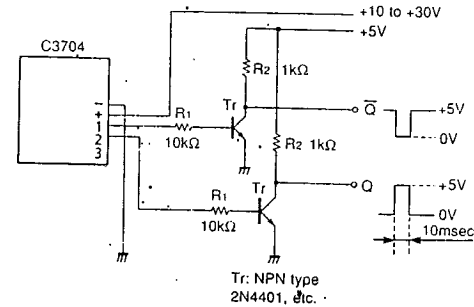
The buzzer sounds when ultraviolet light enters the unit. The length of time for which the buzzer sounds can be extended by adding a condenser at Cx on the PCB. See Figure 6.)

### Figure 4: When Connecting a Relay



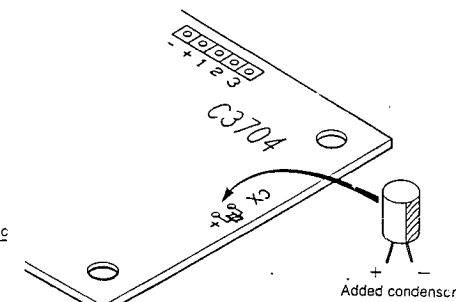
Note: No surge voltage protector circuit is added to the output transistor of the C3704. When connecting an inductive charge such as a relay, connect a surge voltage absorption diode to both ends of the relay coil, as shown in the illustration. (Be careful not to reverse the polarities.)

### Figure 5: Connecting a TTL IC



Note: Q and  $\bar{Q}$  are reversed when the Tr is introduced.

### Figure 6: Adding a Condenser to Extend the Output Pulse Width



Note: Electrolytic condensers are bipolar. When attaching this kind of condenser, connect the + side of the condenser to the + mark on the PCB.

## 6. Operation

Operation of the C3704 will be explained assuming the UV TRON is an R2868. When another UV TRON is used, operation is basically the same, but since the sensitivity level differs depending on the UV TRON used, detection times may vary also. For details, please refer to the data sheet.

Operation is explained in the order shown on the Time Chart in Figure 7.

- ① If ultraviolet light is introduced into the UV TRON, a pulse width of 10μs is output. The generated frequency of this signal pulse varies depending on the amount of incident ultraviolet light.
- ② Also, when no ultraviolet light is present, sporadic pulses ranging from several times to several tens of times per hour are generated by cosmic rays, static electricity, etc. This is called background (BG).
- ③ The pulse waveforms of the signal and the BG are exactly the same, making it impossible to differentiate between them. Because of this, the generated frequency of the pulse is carefully observed to distinguish the signal from the BG, and the BG only is cancelled. (If the signal pulse of the UV TRON is directly output, erroneous operation may result, depending on the BG. It is necessary to have a means of differentiating the BG from the signal of the incident ultraviolet light, to extract only the signal.)

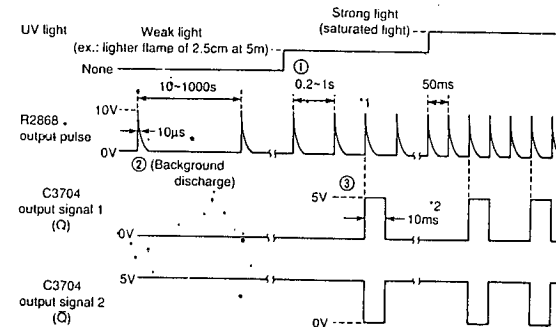
The BG cancel circuit of the C3704 outputs signal pulses of 10ms width only when three consecutive pulses (\*1) enter the circuit with a time interval of 2 seconds or less from the UV TRON.

\*1: The number of pulses can be specified in four stages, 3, 5, 7, and 9, by means of a jumper wire on the circuit board.

This is set to "3" at the time of shipping, but if there is too much background, the cancel background can be set to a higher level (5, 7, 9).

\*2: The pulse width can be extended by adding a condenser to the Cx terminal on the circuit board. See Figure 6. (For example: Cx = 1μF Pulse width = approx. 1 second, Cx = 10μF Pulse width = approx. 10 seconds)

### Figure 7: Operation Time Chart for the C3704 and R2868



For more detailed information regarding the UV TRON, please feel free to request the technical data sheets and catalogs available from Hamamatsu.

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