

# Special Pattern Design Based on Printed Electronics

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## Abstract

With the development of technologies in printed electronics, the products more personalized, irregular and customized application are more and more welcome. Nowadays, technologies have solved many technology problems such as circuit conductivity, functional inks, printing method, substrate, etc. In this paper, the aim is to achieve different LED display by same background circuits. We designed the common circuit that suited personalized various appearance with low cost. Then we tried irregular circuit to achieve different effect. This study attempts to show the important ways on design and art, to help optimize ways to special pattern application.

**Keywords:** printed- electronics, irregular, circuit -conductivity pattern

## Introduction

Nowadays, the whole printed electronic products include designed image, circuit line, printing output, cell or paper battery and OLED, etc. As we all know, lots of cards can attract eyes in the business low-end market. But most intelligent or special cards such as birthday cards, festival cards and other usage cards are expensive. In this paper, the purpose is to try many way for shining cards with low price substrate.

Circuit design has been used by screen printing technology which is the most efficient way to produce personalized products. The inkjet printing is usually another common methods for output of circuit, too. Ink-jet printing technology can output the fine lines and low viscosity. But it is impossible to produce flexible electronic circuits at low cost by using this technology. According to LED cards type, we should choose the screen printing which can produce volume products. The printing substrate could be lots kind of coated paper additionally.

## Background and Preparation

### Theory Basements

In this study, the same bottom layer has been designed, the upper layer pattern is various from each other. According to the experimental before, the parameters match between design and output is very essential. Special pattern circuit line with design is connected with the conductive ink viscosity, which will influence the LED light current and its illuminate efficiently. The conductive ink we chose is according to Screen printing technology. Thinking of LEDs, power supply is considered to use button battery or paper battery.

### Experimental Design

Business cards showed personalize and customize from different country festival to various cultures. Based design is in Adobe Illustrate by common width 1mm and normal paper battery in Figure 1. Here the line width is at least 1mm [3] to ensure the normal lighting. All the parameters are below in Table 1.

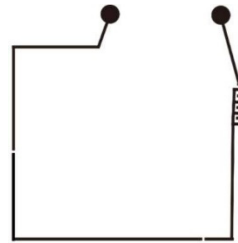


Figure 1. Based design

Table. 1

Line Width	1mm
LED SPACE	0.9mm
Button Battery Diameter	15-20mm
Paper Battery Diameter	10mm*15mm

## Experimental

### Output

We use the screen printing to print the circuit separately. Firstly, all output process take silver inks (DuPont) with Automatic screen machine to coated paper with weight 120g. Then the papers with silver inks were heating 15min 1500. Next, LEDs were put on the empty void. Last, the top pictures should be printed out to coated paper to match the bottom circuit layers and punch holes on the top pictures.

### Test and Analysis

During the test, we used the paper battery (ENFUCELL) to make sure luminous efficiently in common design. The traditional Chinese frame pictures are covered on the top. As we can see, the first test result is very succeeded. Secondly, the different two cover pictures were printed, The test process is showed in Figure 2. In order to compare the difference and make cards special, the cover pictures design changed to irregular pattern in Figure 3. These cards are very economic and look very special with a creative idea.

The other personalized design used the large area or Chinese characters so as to achieve the special application cards effect of spark your eyes in Figure 4. Here the Chinese character “相” is a more creative design with switch. We tried to use Chinese culture to display something special. Here some part of the Chinese character is one segment of circuit line. Another lover design includes large area which is big part of circuit on common film. The bigger LEDs can be arranged between two lovers, and the battery set in two hearts.

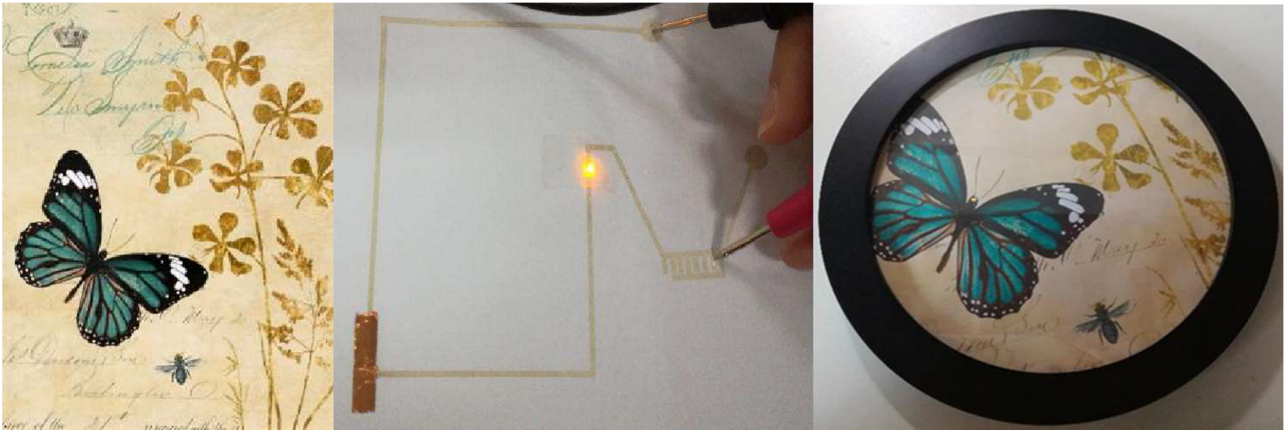


Figure 2. The covering picture on the top



Figure 3. The covering picture on the top

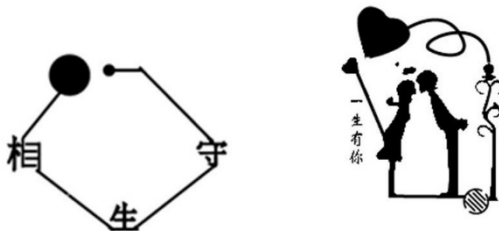


Figure 4. Irregular design

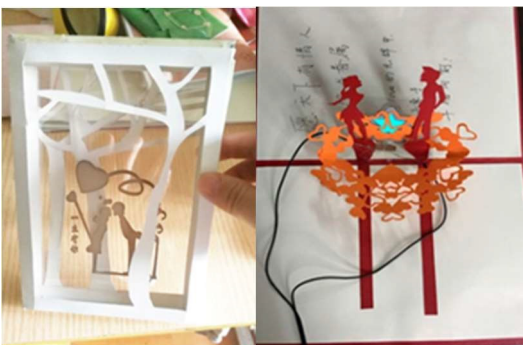


Figure 5. Special Pattern cards

All the steps and testing process we use multimeter to make sure the accurate of data. The decoration in Figure 5 is another try .These designs refer to arts, culture and characters. Creation and technology combining the art works can meet the common requirements of low-end markets

## Conclusion

In this study, we designed a new type of personalized way to produce business cards with printed electronics. The whole process included design bottom circuits, top covered pictures, output products, test and decoration. The result showed that personalized idea will very be suitable for future business market because of its creative. With irregular pattern test, printed electronics application will become lower cost and common for general people's requirement. Hope the creative idea in this paper be more and more popular and advanced in the future.

## Acknowledgement

The paper is supported by Key Laboratory of National Press and Publication Administration: Green Platemaking and Standardization for Flexographic Printing. (Project: ZBKT201706)

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