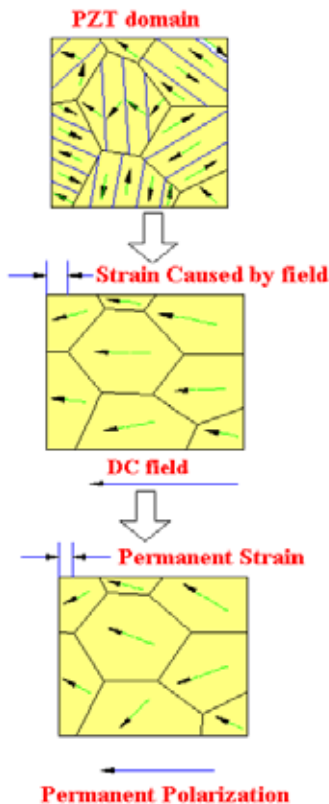


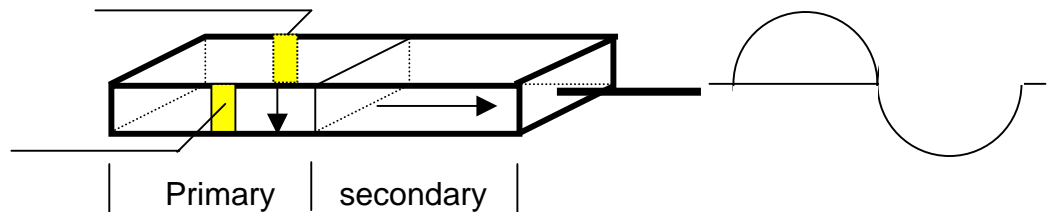
## 1、 General:

Piezoelectric ceramics is characterized as a smart material and has been used widely in the actuators and sensors field. Piezoelectric transformer combines actuators and sensors so that energy can be transformed from electrical form to mechanical energy and back to electrical form. Piezoelectric transformer can generate a high voltage by a low voltage input through the utilization of the resonance phenomenon of the piezoelectric transducer.



### 1.1 Piezo Transformer Principle:

The piezoelectric transformer has primary and secondary electrodes on the piezoelectric ceramics. The primary electrode is polarized in the thickness direction and secondary electrode is polarized in the length direction. When a voltage with a resonance frequency is applied on the primary electrode, a strong mechanical vibration is generated by **“inverse piezoelectric effect”** of the ceramics, and a high voltage is the output from the secondary side, matching its vibration by **“direct piezoelectric effect”**.

**DC-AC PIEZO INVERTER For CCFL Application**

The Piezo Transformer has a unique character to output variable voltage based on the load.

## 1.2 Piezo Inverter

The LCD application is used CCFL as a backlight to stable light source. The CCFL inverter driver circuit will directly affect the quality of LCD display. The Piezoelectric transformer is suitable for CCFL driver circuit because piezo transformer has characteristics which it will drop in proportion when the drop of load resistance just fit with the CCFL characteristics, as the resistance of CCFL will reduces after ignition. The CCFL requires a strike voltage over 1000V and after ignition its voltage drops to about half to one-third of its striking voltage.

After ignition, the output voltage of the traditional electromagnetic transformer is uncontrollable and it will still maintain at high striking voltage. Electromagnetic

## 1.3 Piezo Transformer and Inverter Features:

We have started the mass production of multi-layer Piezo Transformer to match with high performance patent CCFL (Cold Cathode Fluorescent Lamp) driver circuit since year 2000. We already applied 32 unique application patents for different countries and started to deliver our products to market from Dec.2001.

Compared with traditional electromagnetic transformer and inverter, the Piezo have:

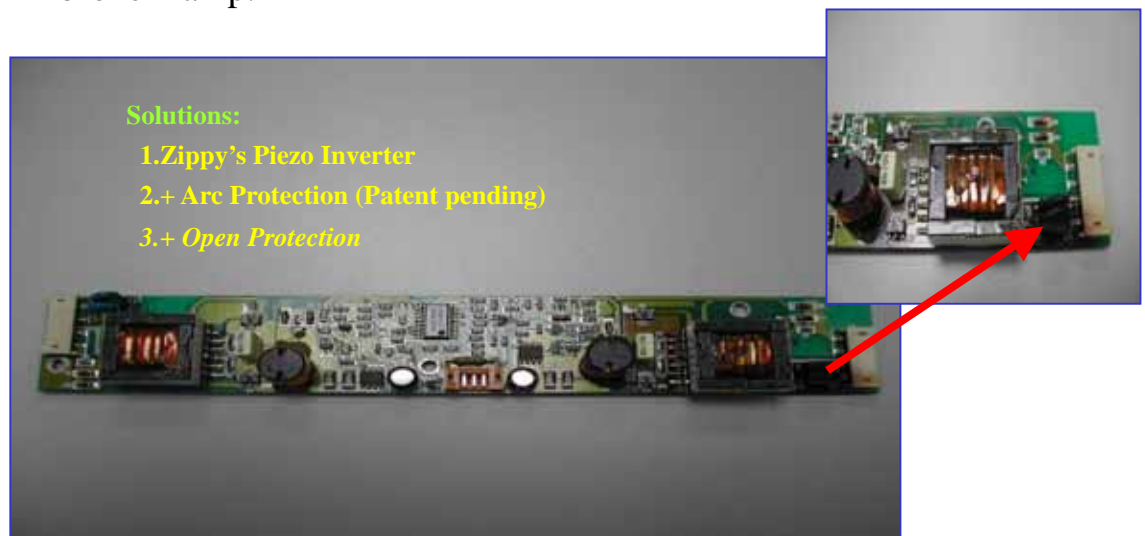
## DC-AC PIEZO INVERTER For CCFL Application

**High efficiency:** 1. Low Power Consumption.

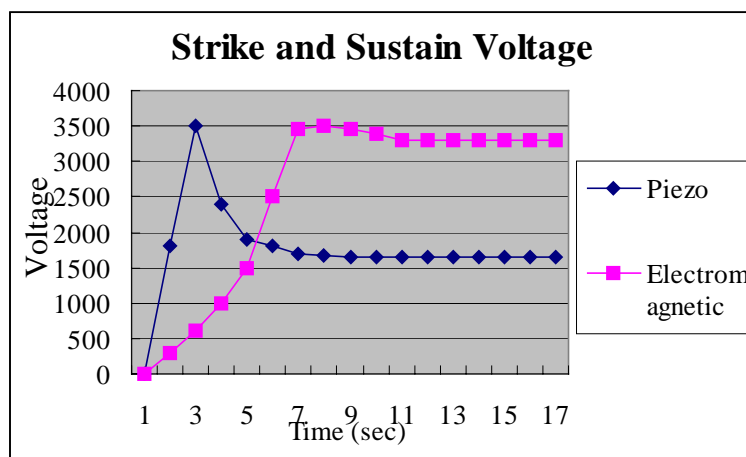
2. Perfect Sine wave output are good for CCFL lifetime and brightness.

3. Over 93% high-energy transformation efficiency with Piezo Transformer and over 85% efficiency of Inverter.

**Safer:** Non-flammable Ceramics Transformer embedded, self-control function of output current, Open and patent Arc protection on board to shut down input power and to reduce the risk of fire in case of broken lamp.



The Piezo inverter will provide high strike voltage to ignite the lamp within short light-up time and will drop to low lighting sustaining voltage around one third of striking voltage to secure system safety, prolong the lifetime of lamp.



**No flux leakage, Electromagnetic Interference free, Low harmonic current noise:** Ceramics Transformer embedded (16 lamps 650mm length)

CCFL for 30"LCD-TV), Save the cost for EMI shielding.

**ZIPPY** TECHNOLOGY CORP.

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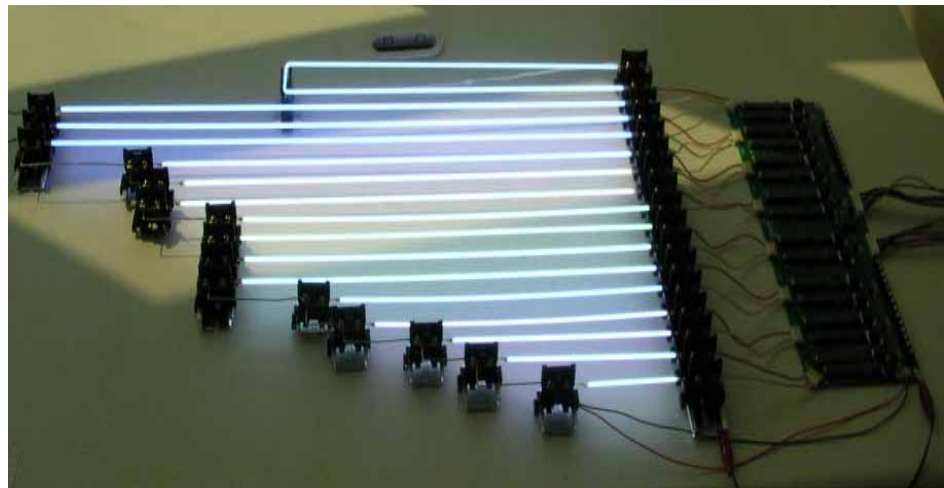
E-mail: [anna@zippy.com.tw](mailto:anna@zippy.com.tw)

**DC-AC PIEZO INVERTER For CCFL Application**



**Compact size:** 7.6mm height on new developed Inverter for 49" LCD-TV with 28 x 1200mm length CCFL.

**Low thermal induction** to the system, especially in multi-lamps direct-side backlights application of LCD-TV.



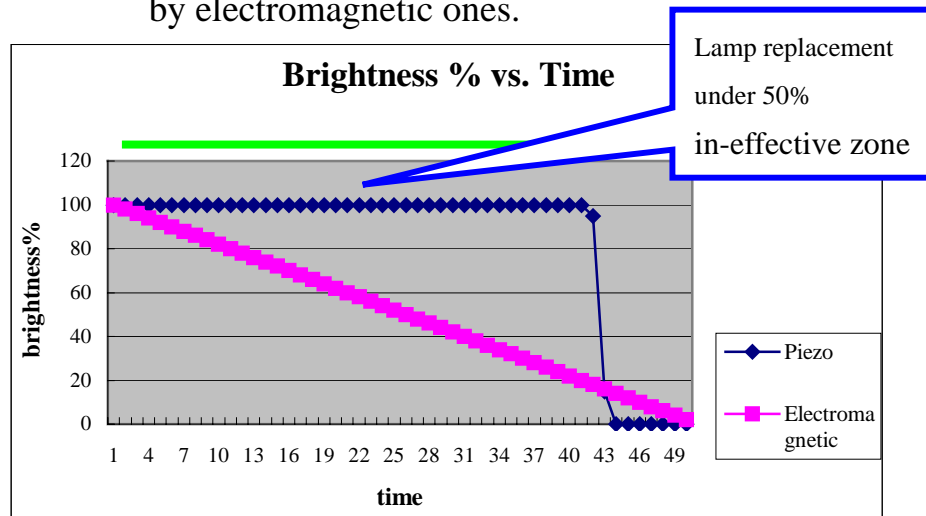
**Uniform luminosity:** Perfect Sine Wave output and high performance driving circuit is good to direct-side backlight. **Panel and Lamps Compatibility:** Suitable for all kind of panels/lamps. The Piezo Transformer's voltage output is based on the variable of the load. Only a single type of Piezo inverter can ignite many different lengths of lamps to simplify the inverter stock, to secure the personnel safety in case of wrong inverter adoption and to short the developing time for inverter .

## DC-AC PIEZO INVERTER For CCFL Application

**High Voltage gain and High Output density**

**High reliability & Wide operating range:** -30 to 70

**Long Lamp's Life:** The lamp's internal resistance increase when lamp is aging, the Piezo inverter will output more voltage to maintain the same brightness for CCFL compared with the fix voltage by electromagnetic ones.



**Dimming Range :** 20~100%

**Brightness Uniformity:** Uniform luminance density, especially use in multi-lamps direct- side backlight application of LCD-TV.



### 1.4 Protection: (option)

Input : Over voltage Protection

Output: open protection and Arc protection (Patent Pending)

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**DC-AC PIEZO INVERTER For CCFL Application**

**2. Application:**

<b>PRODUCTS</b>							
<b>SPEC</b>	<b>PDA</b>	<b>WebPad</b>	<b>Tablet PC</b>	<b>Car-PC</b>	<b>Notebook PC</b>	<b>DT-ITM Monitor</b>	<b>LCD-TV</b>
<b>TYPE</b>							
<b>Model No.</b>	INV-PZI01-PDA	INV-PZI03-WEB	INV-PZI03-TB	INV-PZI05-DVD	INV-PZI04-NB	INV-PZI05-DT	INV-PZI05-TV
<b>Efficiency</b>	90%±5%	90%±5%	90%±5%	90%±5%	90%±5%	90%±5%	90%±5%
<b>W</b>	1±5%	2.5±5%	3.5±5%	4.6±5%	4±5%	5±5%	5±5%
<b>Input V</b>	5V±10%	12V±10%	12V±10%	8.5V~16V	9V~20V	12V±10%	12V±10%
<b>Output Current</b>	4mA±10%	4.5mA±10%	4.5mA±10%	6.5mA±10%	6mA±10%	8mA±10%	6mA±10%
<b>Frequency</b>	74KHz±1K	74KHz±1K	74KHz±1K	74KHz±1K	74KHz±1K	74KHz±1K	74KHz±1K
<b>L*W*H</b>	40*20*6mm	60*10*6mm	45*30*6mm	116*15*7mm	163*9*5mm	116*15*7mm	185*19*8mm
<b>Advantages</b>	Low Power Consumption	Low Power Consumption	Low Power Consumption	20%~100% Brightness	Low Power Consumption	Compatibility	Safety

We are already available for following items for LCD market.

LCD TV with 8~16 lamps, 650 mm CCFL with striking voltage over 1700V

LCD TV with 8 U-type lamps, 1100mm CCFL with striking voltage over 2200V

LCD TV with 32 lamps, 1200mm CCFL with striking voltage over 3500V

LCD TV with 8 lamps, 520 mm CCFL with striking voltage over 1200V

POS with 2~4 lamps

POS touch panel with 2~4 lamps

e-Book with 1~2 lamps

DVD portable device with 1~2 lamps

Desktop monitor with 1~4 lamps

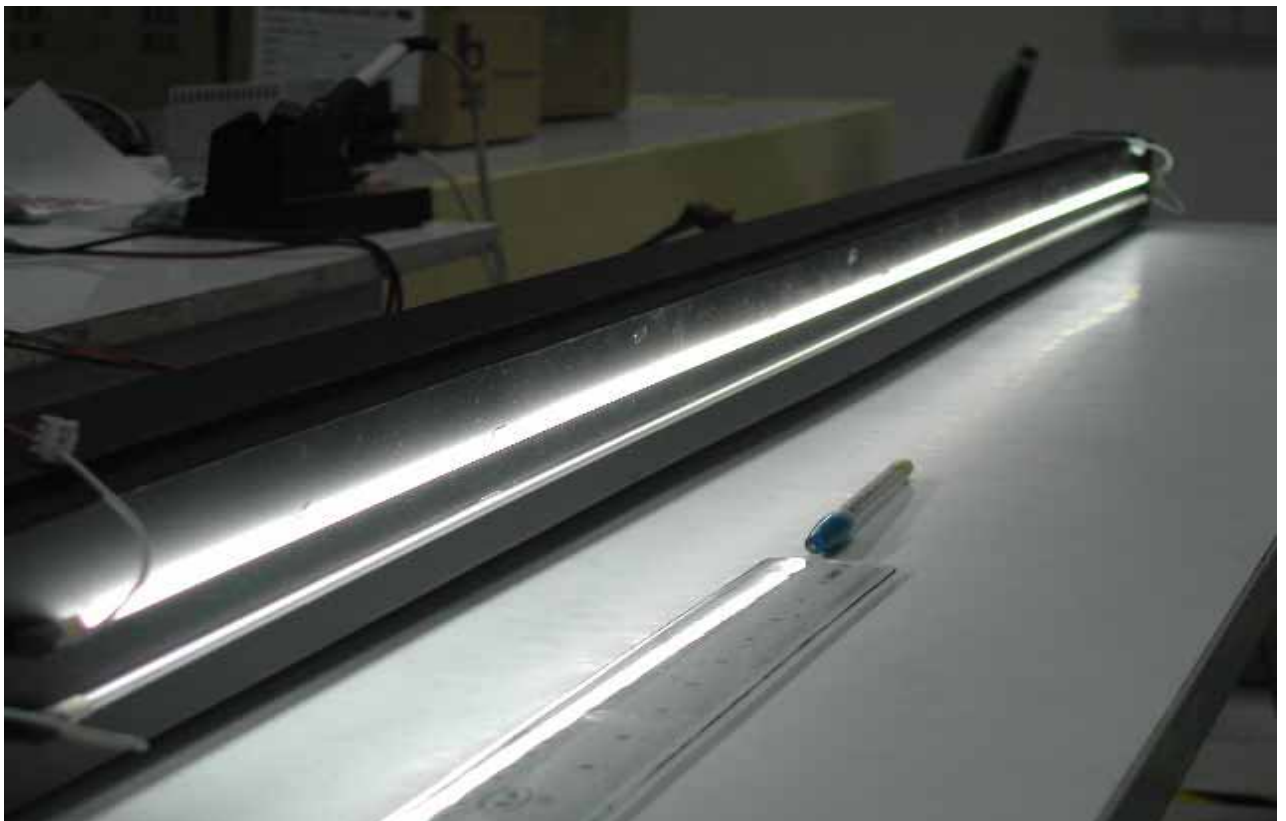
Car PC with 1~2 lamps

DC-AC PIEZO INVERTER For CCFL Application

Inverter for 325mm/490mm CCFL



1500mm CCFL



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**DC-AC PIEZO INVERTER For CCFL Application**

650mm 16 lamps for LCD-TV 30"



1200 mm 12 lamps for LCD-TV 49"

