

# PIEZOELECTRIC TRANSFORMER

**MODEL : ELS-60**

Approval	Check	Written

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### 1. Application Range

This specification covers piezoelectric transformer model ELS-60 ( $\lambda$  mode)

### 2. Structure

Structural drawing	As drawing no. DW-PT-4807-1
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### 3. Electrical Characteristics

Item	Typical value	Note
Resonant frequency <sup>*1,2</sup>	70KHz $\pm$ 3%	Input AC 1V into primary side, fixed in standard fixture, tested by HP4194A.
Resonant impedance <sup>*1,2</sup>	75 $\Omega$ (max)	Input AC 1V into primary side, fixed in standard fixture, tested by HP4194A.
Electromechanical coupling coefficient $K_{31}$ <sup>*1</sup>	25%(min)	Input AC 1V into primary side, fixed in standard fixture, tested by HP4194A.
Input static capacitance <sup>*1</sup>	780pF $\pm$ 10%	Input AC 1V into primary side at 1KHz, secondary side open, tested by HP4194A.
Maximum rated input voltage	130V <sub>rms</sub>	$\lambda$ sine wave resonant frequency drive with load 75K $\Omega$ ~300K $\Omega$ , output power 8W, test circuit as Fig 1.
Maximum rated output voltage	6000V <sub>pp</sub>	At moment, with load : 100M $\Omega$ , 3pF, test circuit as Fig 1.
Maximum rated output power	8W	$\lambda$ sine wave resonant frequency drive with load 75K $\Omega$ ~300K $\Omega$ , test circuit as Fig 1.
Voltage step up ratio <sup>*3</sup>	8	$\lambda$ sine wave resonant frequency drive with load 200K $\Omega$ , output power 6W, test circuit as Fig. 1.

\*1 : At 25  $\pm$  3 $^{\circ}$ C , 40% to 70%RH humidity.

\*2 : The resonant frequency and impedance of the piezoelectric transformer will depend on the loading, input voltage, output power, and temperature.

\*3 : The voltage step up ratio is dependent on the load resistance. Higher load resistance will have higher voltage step up ratio.

#### 4. Testing circuit

As illustrated in Fig. 1.

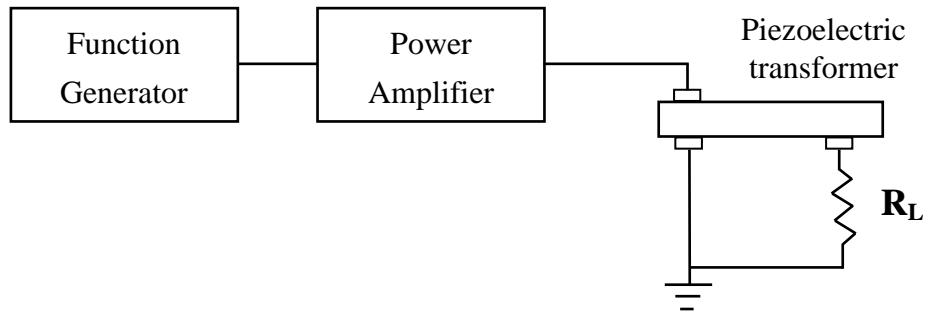


Fig. 1

Function generator : HP3324A or equivalent

High speed power amplifier : NF4020 or equivalent

#### 5. Electrical connections

As illustrated in drawing no. DW-PT-4807-1, terminal A is common ground, terminal B is input power, and terminal C is output power.

#### 6. Precaution for assembly

6.1. The piezoelectric transformer is made by thin substrate of ceramic sintered body. Excessive mechanical stress such as vibration and shock etc. may cause breakage or crack of the ceramics. Handle the transformer with care in assembly, and dropped on the floor shall not be used.

6.2. The recommended soldering condition:  $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$  within 3 seconds

6.3. Soldering method of flow soldering and reflow soldering shall not be applied to this transformer.

6.4. The piezoelectric transformer is a vibrating device that the resin molding and coating is not allowed for this transformer.

#### 7. Operating environment

7.1 The operating environmental temperature is  $-10^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

7.2 The humidity should be no more than 85%RH. The piezoelectric transformers shall not be operated under dew formation.

7.3 The piezoelectric transformers neither shall nor be operated under corrosive atmospheres such as hydrogen chloride, sulfuric oxide, and/or hydrogen sulfide etc. These corrosive

substances may destroy the function of the transformer.

7.4 The piezoelectric transformer, due to high voltage generation in operation, shall be free from electrically conductive dusts and combustible dusts.

## 8. Storage

8.1 The piezoelectric transformer shall be stored in their factory sealed package.

8.2 The piezoelectric transformer shall not be stored in corrosive atmospheres such as hydrogen chloride, sulfuric oxide, and/or hydrogen sulfide etc.

8.3 The piezoelectric transformer shall not be stored beyond the specified storage temperature range of  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

8.4 The piezoelectric transformer shall not be stored beyond the specified maximum humidity of 85%RH.

## 9. Cleaning method

Any solvent cleaning shall not be applied to piezoelectric transformer for preventing electric and/or mechanical damages of transformer.

## 10. Handling

10.1 The piezoelectric transformer consists of thin substrate of ceramic sintered body. Excessive mechanical stress such as vibration and shock etc. may cause breakage or crack of the ceramic. Handle the transformer with care in assembly and dropped components on the floor shall not be used.

10.2 Due to its pyro-electric effect, an electric charge is produced when subjected to rapid temperature difference.

## 11. Circuit design consideration

11.1 Any DC or bias voltage shall not be applied to piezoelectric transformers. It will deteriorate the electrical properties of the piezoelectric transformer by depolarization.

11.2 The specifications of the piezoelectric transformers are based on measurements at the specified frequency of sinusoidal wave. A driving voltage of higher harmonic frequency may cause overheating of the transformer and/or may damage the transformer.

11.3 The output voltage of the piezoelectric transformer depends on the load impedance to be connected. Operation with relative higher resistance load or with open circuit may cause abnormal overheating or deterioration of the transformer. The input voltage should be lowered at relative high impedance load.

## 12. Materials list

No.	Item	Description
①	Piezoelectric ceramics	Lead zirconate titanate (PZT), Exempt application of RoHS
②	Silver electrode	Ag, RoHS
③	Solder	Sn/Ag/Cu, RoHS
④	Plastic case	LCP, RoHS
⑤	Terminal	Phosphor bronze, RoHS
⑥	Electrical wire	Tinsel copper wire coated with Ag, RoHS
⑦	Silicone adhesive	Silicone, UL94V-0, RoHS

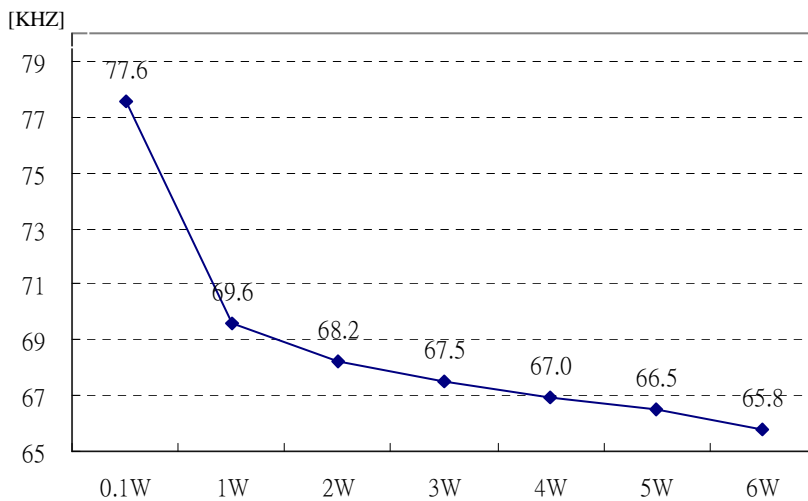
## Appendix :

### Frequency and output power relationship of ELS-60

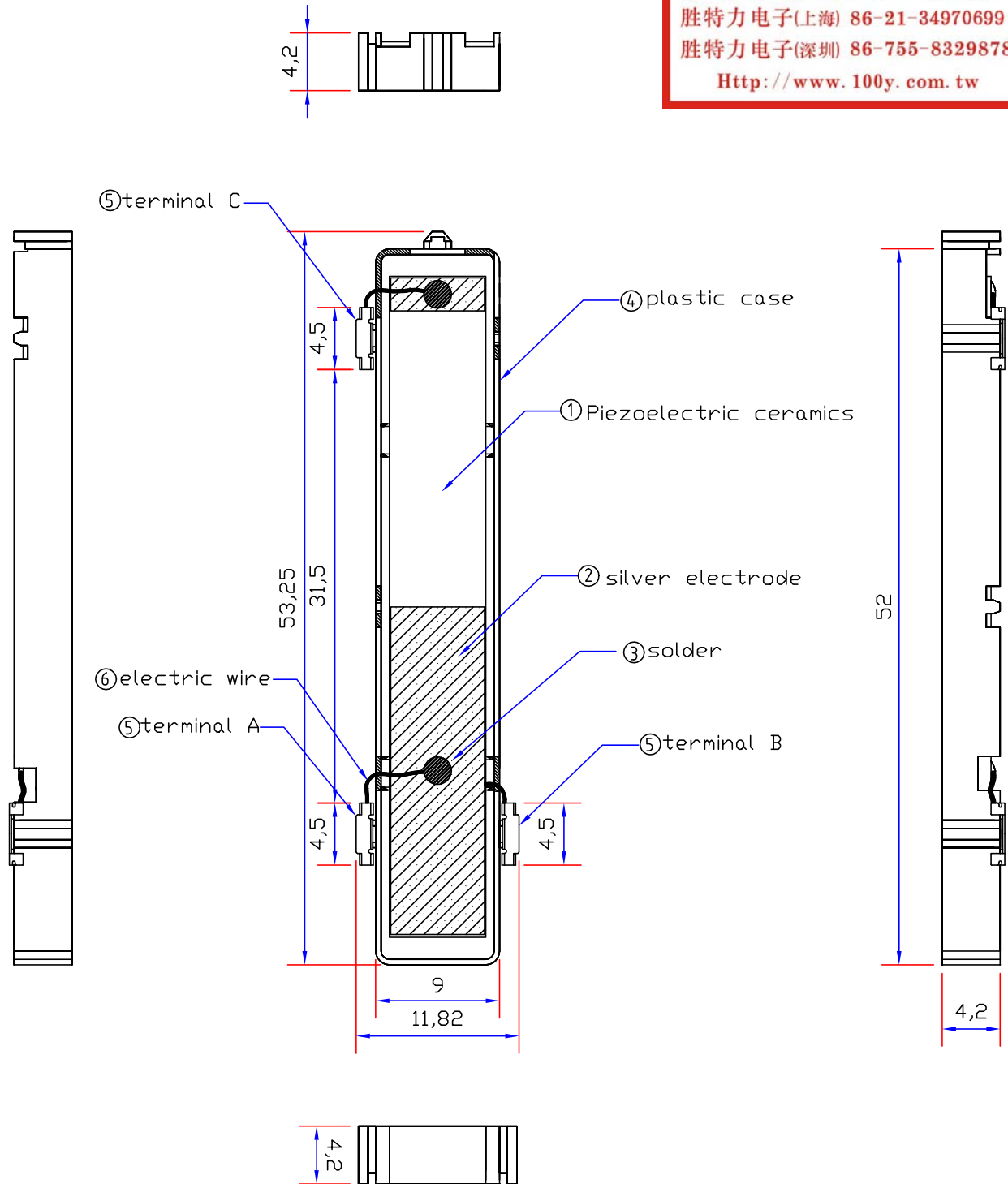
#### 1. Testing condition

Item	Typical value
Test time	5min
Test voltage	118V±2V
Output power	0.1W~6W
Load	75KΩ
Test temperature	25℃
Instruments	HAS 4052 INSTEK SFG-830 LeCroy LT342 FLUKE 87IV TRUE RMS MULTIMETER

#### 2. Output power and frequency curve



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Design:	Check:	Approval:	Model:
			ELS-60
Title:			Drawing No.:
Piezoelectric transformer			DW-PT-4807-1
			Version:
			2.4
			Issue Date:
			2006-07-05