

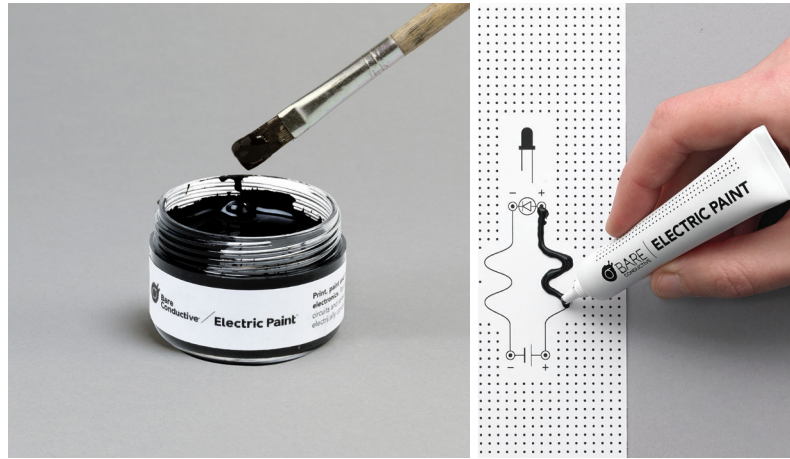
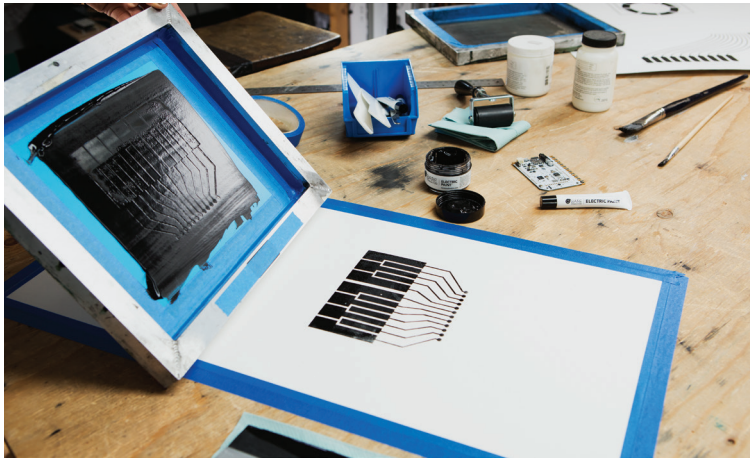


Bare Conductive®

Electric Paint® Application Notes

PRODUCT DESCRIPTION

Electric Paint is available in 10ml tubes and 50ml jars. It is a nontoxic, water based, water soluble, electrically conductive paint, intended for applications with circuits using low DC voltages at low currents. **Electric Paint** adheres to a wide variety of substrates and is easily removed with water. It is black in color and can be painted over with any material compatible with a water-based paint. Please see the **Electric Paint** MSDS for precautionary information.



ADVANTAGES / PRODUCT BENEFITS

- Electrically conductive
- Nontoxic
- Water-soluble
- Works with low voltage DC power sources at low currents (see "Power Sources" p.2) Powers small devices
- Can be used as a potentiometer
- Compatible with many standard printing processes

TYPICAL PROPERTIES

Color /	Black
Viscosity /	Highly viscous and shear sensitive (thixotropic)
Density /	1.16 g/ml
Sheet Resistance /	55Ω/sq at 50 micron film thickness or approximately 32Ω/Sq when applied using a brush (see p.3)
Vehicle /	Water-based
Shelf Life /	6 months after opening
Drying Temperature /	Electric Paint should be allowed to dry at room temperature for 5 – 15 minutes. Drying time can be reduced by placing Electric Paint under a warm lamp or other low intensity heat source.

APPLICATION TIPS

Electric Paint is a unique material that can be applied in many different ways, from a paintbrush to common printing processes like screen-printing. To achieve consistent electrical performance it is best to apply **Electric Paint** in an even layer. If you're interested in screen printing **Electric Paint**, it is best to use a textile-type screen in order to achieve a generous layer thickness. We tend to use a 43T screen. **Electric Paint** is not inkjet printer compatible. For more application tips visit www.bareconductive.com/tutorials

POWER SOURCES

Electric Paint is intended for use with low voltage DC power sources at low currents and has not been tested with sources exceeding 12VDC at 50mA. Higher voltages are not recommended.

SUBSTRATES

Electric Paint is a water-based paint and acts much like other poster paints. **Electric Paint** adheres well to wood, paper products, some plastics, corks, textiles and metal. Hydrophobic materials such as some glass and plastics will exhibit poor adhesion, though this can be improved by roughing the surface with sandpaper or similar.

DRYING TIPS

Electric Paint is fast drying at room temperature. This material dries rather than cures and gives off no fumes during the drying process. Drying time can be moderately reduced by placing the material near a low intensity heat source such as an incandescent lamp. Subjecting **Electric Paint** to a high temperature environment will negatively affect both physical and electrical performance.

FLEXIBILITY

Electric Paint is somewhat flexible, but this flexibility depends on two factors, the layer thickness and choice of substrate. Regardless of substrate, a consistently thin layer of paint creates the most flexible circuitry. Areas of paint with wide variation in thickness tend to produce fracturing. Substrates which are flexible, but not stretchy (such as paper) work better than materials like Lycra which stretch in multiple dimensions.

COLD SOLDERING

Electric Paint works well as a cold solder joint. Whether used to solder a surface mount or through-hole component onto a circuit board, or to adhere a component to a piece of paper, this material is non-permanent and almost infinitely repairable. These unique properties mean that components can be harvested from projects, cleaned and reused.

RESISTANCE SAMPLES

The aim of these application notes is to give you as much information as you need to get your work moving forward. As there are so many ways to apply **Electric Paint**, raw technical data is not always the most useful way to present the product. Presenting sheet resistances at thicknesses not achievable with screen printing are not helpful for someone wanting to experiment in a loose manner, yet still be able to make meaningful calculations.

Page 3 showcases a series of samples which indicate the amount of electrical resistance (measured end to end) that you might expect from a given area of **Electric Paint**. This assumes a reasonably thin layer of material (i.e. carefully painted with a brush or home screen printed). The areas of paint below are shown full size.

See next page for visual.

RESISTANCE SAMPLES VISUAL

39Ω 20mm x 15mm



61Ω 50mm x 20mm



32Ω 30mm x 30mm



473Ω 70mm x 3mm



737Ω 110mm x 3mm



869Ω 130mm x 3mm



526Ω 130mm x 5mm



RESISTANCE GRAPH

Electric Paint presents a wholly unique way of exploring electrical resistance. In general, the resistance of a sample of conductive material is defined by the dimensions of the sample being tested, and resistance is inversely proportional to cross sectional area (i.e. given a set length and depth, a wider sample will have less resistance than a thin one). Thus, the resistance can be defined by the ratio of length/width.

The diagram below plots the proportional ratio of a sample of **Electric Paint** against its approximate resistance. This diagram assumes that **Electric Paint** has been applied with a brush. You can calculate an estimated resistance for any proportion over 1, based on the equation: **Resistance=19.77(Ratio)+12**

Example one is illustrated by a blue point on the diagram. This point is associated with a shape with a ratio of 1 (dimensions of 10mm x 10mm i.e. $10 \times 10 = 1$). The resistance associated with this ratio is 32Ω. The nature of the ratio number means that this shape could have the dimensions of 100mm x 100mm and the resistance would still be 32Ω.

Example two shows a shape of ratio 125. In this example the shape has the dimensions of 1250mm x 10mm ($1250/10=125$). The resistance associated with this shape is 2500Ω.

