

## IC Jedec Shipping Trays

IC trays or JEDEC trays are used in the handling and shipping of Integrated circuits. These trays have to be antistatic to reduce ESD damages. These damages can occur during the IC production, testing and packaging phases as well as during the shipping.

### Requirements

IC trays are made of electrically conductive thermoplastic material and are usually injection moulded. The requirements in term of surface resistivity vary from  $104\Omega/\text{sq}$  to  $1012\Omega/\text{sq}$ . Depending on their final use, IC trays withstand different temperature range.

Tray	Operating Temperature (°C)	Typical Matrix
Low	66-105	ABS, PC
Mid	140-150	mPSU, mPPO/PPE
High	180	PES
Ultra-High	215	TPI

Table 4: IC Tray Characteristics

IC Trays are standardized in length, width, thickness, and numbers of units per tray by JEDEC, the “Joint Electron Device Engineering Council” (<http://www.jedec.org>). The council has set up standards for users to use the same thick trays in assembly, test, and board mounting regardless of who supplied the components.

In the past, IC trays were not subjected to high cleanliness requirements compare to other more sensitive parts from the HDD industry for instance. Specifications have changed over the year and OEMs are increasingly requiring cleaner materials. In addition to that, IC trays should exempt of toxic materials according to RoHS (Restriction of Hazardous Substances Directive). This directive restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment.

After their first use, IC trays can be cleaned or recycled. A whole supply chain is in place to collect, regrind the trays and re-compound them according to the technical specifications.

### An heterogeneous Market

**Carbon black trays** are the cheapest IC trays in the market. These trays are usually reinforced with glass fibers to increase their stiffness. To reach the required conductivity, producers sometimes have to fill their compound with more than 25% of carbon black. This decreases substantially the mechanical properties and the cleanliness performance of the final tray.

**Carbon fibers trays** provide higher performance at lower loading but with certain limits. Because of the relative high concentration of fibers, there is a low retention of the resin basic mechanical properties. Carbon fibers supply is also limited for some producers or compounders.

**Carbon Nanotubes based JEDEC trays** have been integrated by the electronics industry a few years ago for two main reasons:

1. Carbon fibers shortage combined with changing prices and availability
2. Higher performance requirements from OEMs in term of performance homogeneity, cleanliness and temperature resistance.

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## Carbon Nanotubes Advantages

1. Because of CNTs “Nano-size”, the electrical **conductivity can be precisely control**. Moulders can **eliminate the risk of “hot-spots”** on the surface of the tray. This control increases the productivity of OEMs as less microchips are damaged.
2. **Retention of mechanical properties**: Thanks to CNTs high electrical conductivity, the resin is sometimes charged with 10 times less additives than with Carbon black. Carbon Nanotubes trays have better toughness, elongation at break.
3. **Dimensional stability**. Besides other moulding factors, molecular and fibers orientation as well as temperature variations can lead to part warpage. Nanocyl Carbon Nanotubes multi direction dispersion reduces the risk of non homogenous part shrinkage.
4. **High Cleanliness**: High cleanliness tests have been made on Nanocyl Carbon Nanotubes injected parts. The results from the Ultrasonic Liquid Particle Count (LPC) show the presence of fewer particles. Less out gassing, ionic contamination and sloughing in abrasion testing have also been observed.
5. **More efficient in the recycling process**. Carbon Nanotubes also offer a long term benefit to the whole supply chain in term of recyclability. JEDEC trays recyclers have noticed a better retention of electrical conductivity after recycling.

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