# Descarga Electrostática

Rev. 1

Curso Electrónica Fundamental

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# Contenido

- Causas, Impacto
- Protecciones

# Origen: "triboelectricidad"

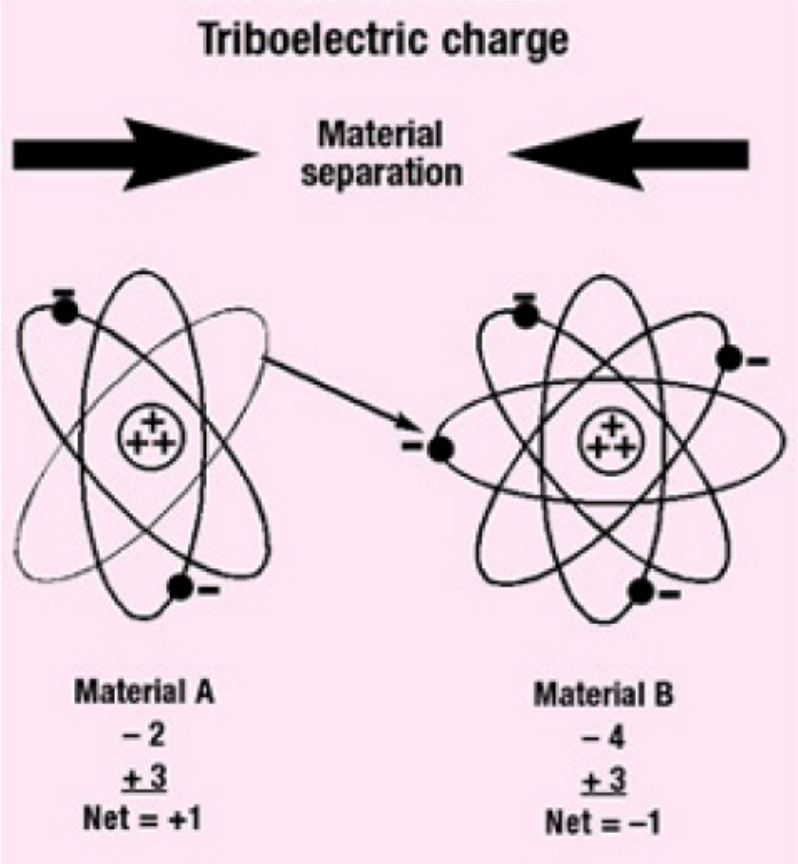



*Figure 2. The triboelectric charge when two materials placed in contact are then separated.*

| | |
|---|---|
| Positive | Acetate |
| | Glass |
| | Nylon |
| | Wool |
| | Lead |
| | Aluminum |
| | Paper |
| | Cotton |
| | Wood |
| | Steel |
| Negative | Nickel |
| | Copper |
| | Rubber |
| | Polyester |
| | PVC |
| | Silicon |
| | Teflon |

*Table III. Typical triboelectric series.*

Fuente: www.esdproducts.eu

# Tensiones resultantes

| Typical Voltage Levels at Different Relative Humidities | | |
|---|---|---|
| **Means of Generation** | **0—25% RH** | **65—90% RH** |
| Walking across carpet | 35,000 V | 1500 V |
| Walking across vinyl tile | 12,000 V | 250 V |
| Worker at bench | 6000 V | 100 V |
| Poly bag picked up from bench | 20,000 V | 1200 V |
| Chair with urethane foam | 18,000 V | 1500 V |

*Table II. Examples of static generation.*

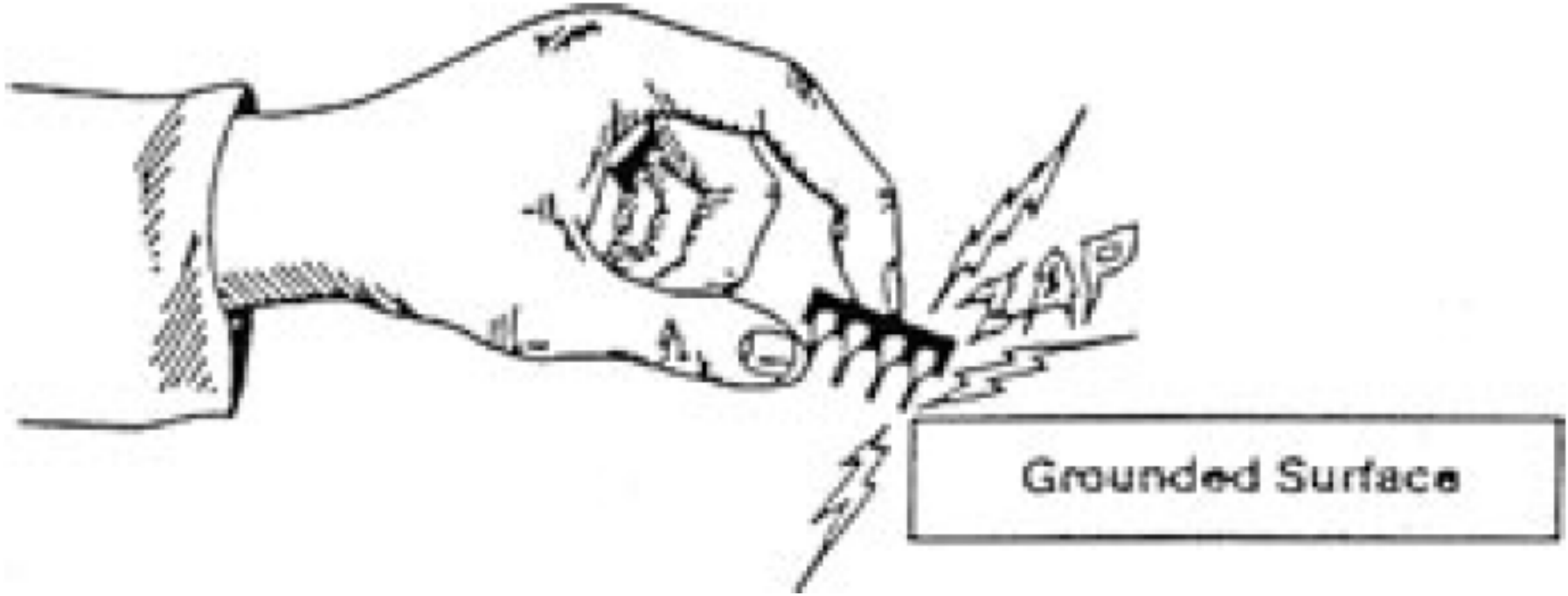
Fuente: www.esdproducts.eu

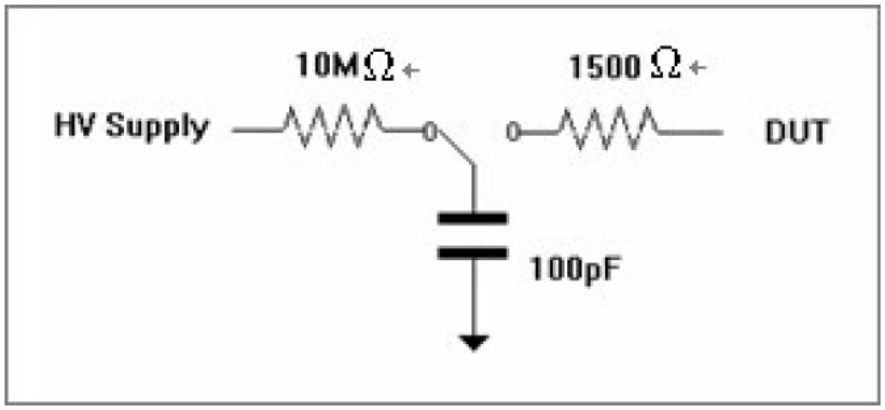
# Modelos de la descarga y niveles de tolerancia de los circuitos

| ESD Model | ESD Classification | Voltage Range |
|---|---|---|
| Human Body Model (HBM) | 0 | 0V – 249V |
| | 1A | 250V – 499V |
| | 1B | 500V – 1999V |
| | 1C | 1000 – 1999V |
| | 2 | 2000 – 3999V |
| | 3A | 4000 – 7999V |
| | 3B | >= 8000V |
| Machine Model (MM) | M1 | 0V – 100V |
| | M2 | 101V – 200V |
| | M3 | 201V – 400V |
| | M4 | 401V – 800V |
| | M5 | >800V |
| Charged Device Model (CDM) | C1 | 0V – 124V |
| | C2 | 125V – 249V |
| | C3 | 250V – 499V |
| | C4 | 500V – 999V |
| | C5 | 1,000V – 1,499V |
| | C6 | 1,500V – 2,999V |
| | C7 | >= 3,000V |

Fuente: MiniCircuits AN40-005

# Ej. Human Body Model

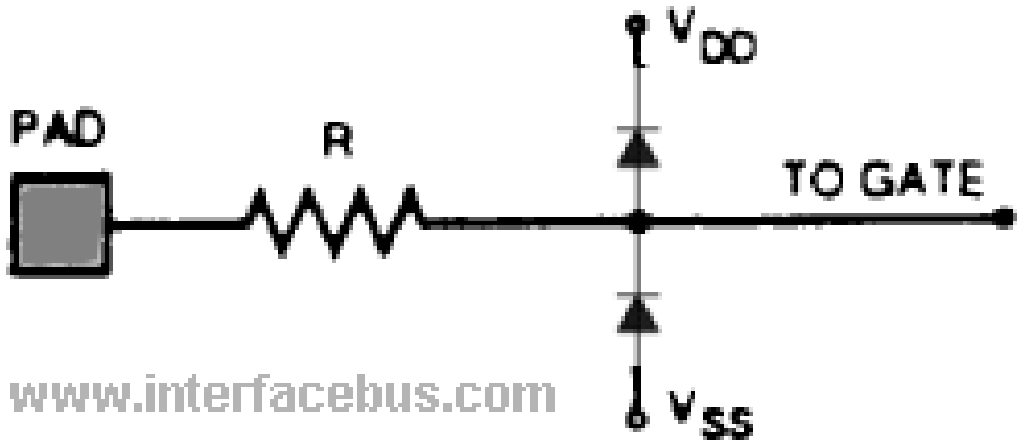


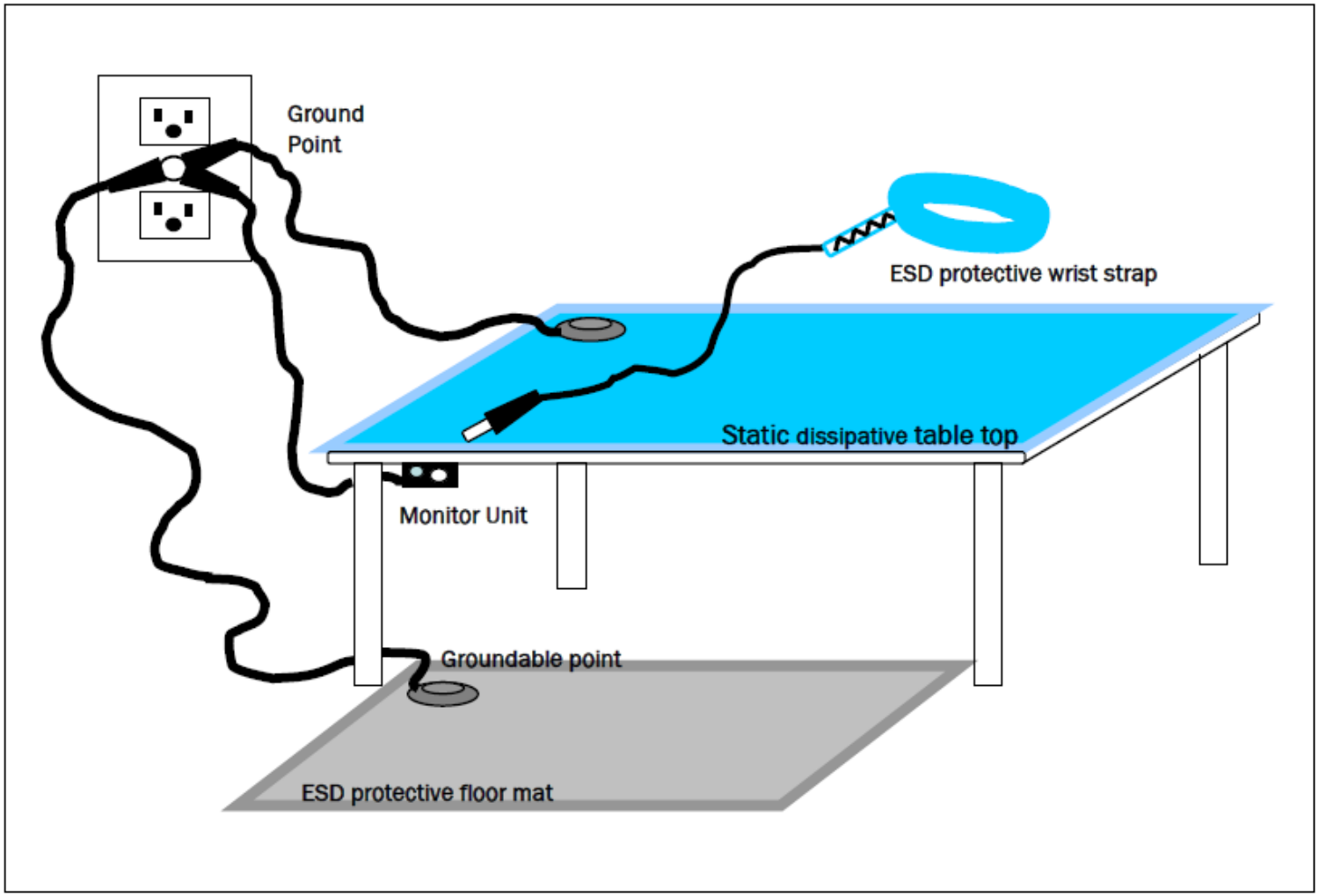

Human Body Model (HBM) test circuit

Fuente: comchiptech.com

# Proteccion básica en el circuito



# Protección en el manejo




Fuente: MiniCircuits AN40-005

# Proteccion en el manejo

Fuente: MiniCircuits AN40-005

# Protección en el manejo

A green test indicator light means the wrist-strap is worn properly and is working as intended. This picture shows the configuration for testing wrist-straps. The test station can also be configured to test antistatic footwear.

Fuente: MiniCircuits AN40-005

# Protección en el manejo

**Labels to identify electrostatic discharge sensitive (ESDS) devices.**

The following labels are commonly used on containers and packaging to alert anyone who handles the ESDS devices on the need to use static-safe procedures before handling the devices. The one on the left is preferred.

The following verbiage should be placed beside the label:

**CAUTION**
**Contains parts and**
**assemblies susceptible to damage by**
**Electrostatic Discharge (ESD)**

Fuente: MiniCircuits AN40-005