

MSL: MOISTURE SENSITIVITY LEVEL

anglia

Moisture Sensitivity Level (MSL) defines how sensitive a surface-mount electronic component is to moisture absorption and how long it can be exposed to normal factory conditions before solder reflow without damage.

If a moisture-sensitive device absorbs too much moisture and is then heated during reflow soldering, the trapped moisture can rapidly expand and cause internal cracking or de-lamination, commonly known as 'popcorning'.

Baking

Baking removes absorbed moisture before soldering and requires specialist equipment.

The temperature and duration of the bake depend on the MSL number of the product as well as the thickness of component.

Another consideration when baking should be whether the Reel/Tray is rated for the temperature. However, the settings needed should be present on any MSL sealed package's label, with further information normally moulded into the reel/tray.

MSL Numbers

To simplify industry wide handling measures parts are classified into MSL numbers which describe the care needed to reduce the chance of fault developing due to moisture ingress.

MSL Number	Floor Time*
MSL 1	Unlimited floor life
MSL 2	1 year
MSL 2a	4 weeks
MSL 3	168 hours
MSL 4	72 hours
MSL 5	48 hours
MSL 5a	24 hours
MSL 6	Bake before use

*Before mandatory bake

A part under MSL can exist in two states:

Sealed: In a labelled, sealed moisture barrier bag containing the product, a desiccant bag, and a Humidity Indicator Card (HIC).

Unsealed: referred to as floor time, when a product is open to the atmosphere in an environment at $\leq 30^{\circ}\text{C}$ / $\leq 60\% \text{ RH}$.

Guidance & Rules

Proper Handling Rules

- Keep MSL ≥ 2 components sealed until ready for use.
- Track out-of-bag exposure time.
- Store opened parts in dry cabinets ($\leq 5\text{--}10\% \text{ RH}$) when not in use.
- If floor life is exceeded → bake before reflow.

Good Practice Rules

- Keep all goods sealed until ready for use.
- Have stocks for HIC cards, Moisture barrier bags, and desiccant on hand.
- Have operators trained to identify the MSL status of a part determine the procedure to follow and how to follow this effectively.
- During a rework if a component is removed from a PCB it should be Baked before use.

The conditions and guidance are laid out by two technical standards:

- IPC/JEDEC J-STD-020: Defines MSL classification and reflow testing
 - IPC/JEDEC J-STD-033: Defines handling, packing, storage, and baking rules
- Part specific information can be found in datasheets or on suppliers' websites.

