

5 Handling

5.1 MSL level

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Several procedures have to be followed when packaging, storing and processing (assembling) SMD technology DC/DC voltage regulators. The J-STD-020 standard from the US JEDEC organization is referred to and applied for this purpose.

5.1 MSL level

The moisture sensitivity level (MSL) is a specification related to the moisture sensitivity of non-hermetically sealed SMD components, which tend to absorb moisture due to their construction. The components are classified (Tab. 5.1), whereby it is apparent in which period e.g. a voltage regulator has to be processed without any problems in the soldering process. The specified time and the conditions apply for permissible storage without the relevant protective measures against ambient humidity.

MSL value	Time	Condition
1	unlimited	30 °C/85% RH
2	1 year	30 °C/60% RH
2a	4 weeks	30 °C/60% RH
3	168 hours	30 °C/60% RH
4	72 hours	30 °C/60% RH
5	48 hours	30 °C/60% RH
5a	24 hours	30 °C/60% RH
6	TOL (time on label)	30 °C/60% RH

Tab. 5.1: MSL classification and processing time for opened bag (J-STD-033C)

The background to classification and labeling of the components with the MSL level is the fact that moisture can penetrate encapsulated components. This is caused by the hygroscopicity of the plastic and the enclosed moisture can suddenly vaporize during reflow-soldering of the regulator at soldering temperature >210 °C. This can lead to cracks arising or the components bursting – the popcorn effect!

The relevant tests, e.g. multiple soldering, functional testing, ultrasound or CT investigations, are performed by the manufacturer in order to correctly classify the component with a MSL. These tests are defined in the JEDEC standard. The MSL determined (e.g. MSL-3) is specified by the manufacturer in the datasheet and on the bag and has to be considered in processing.

5.2 Packing/treatment

Mag³C power modules from Würth Elektronik eiSos GmbH & Co.KG are stored/shipped in a Dry Pack (specially antistatic, water vapor-impermeable, flexible, ESD-resistant bag) and are provided with an MSL level information sticker (see Fig. 5.1).

Moisture sensitivity level

Popcorn effect

Dry packing

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5.2 Packing/treatment



Fig. 5.1: Example: bag label for power module article no.: 171 012 401

If the complete unit quantity of the opened bag cannot be processed within the timeframe specified in the MSL level, e.g. 168 hours for MSL-3, there is the option of resealing the components in a Dry Pack bag. As soon as the component is repacked air-tight, the remaining period for the MSL time specification not expired is available for another production period.

Moreover, there is the possibility, through drying/tempering the product (Caution: Observe the manufacturer's information on the duration and temperature) and subsequent vacuuming, of again attaining the starting level.

To check the momentary moisture value, the moisture barrier bag contains a humidity indicator card, HIC (see Fig. 5.2).

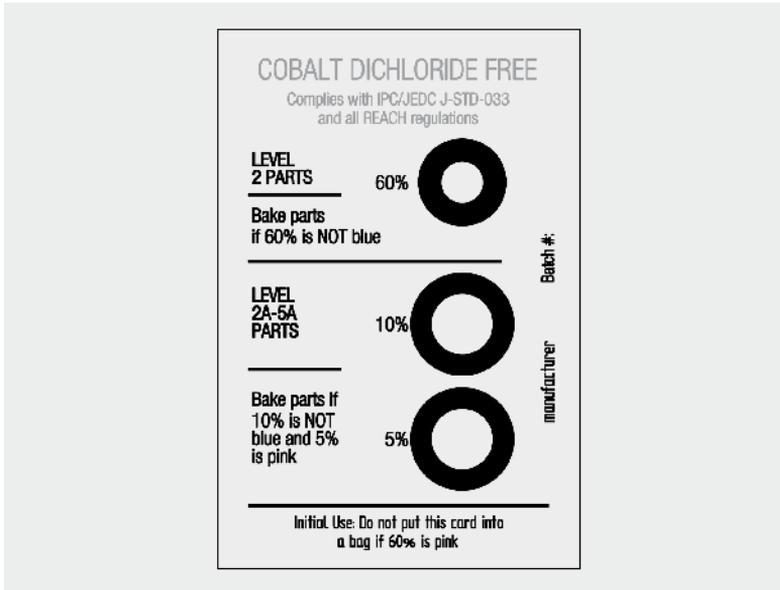


Fig. 5.2: Humidity indicator card

In addition, to avoid moisture, a desiccant is included, which may consist of silica gel (Fig. 5.3), siliceous earth or a molecular sieve.

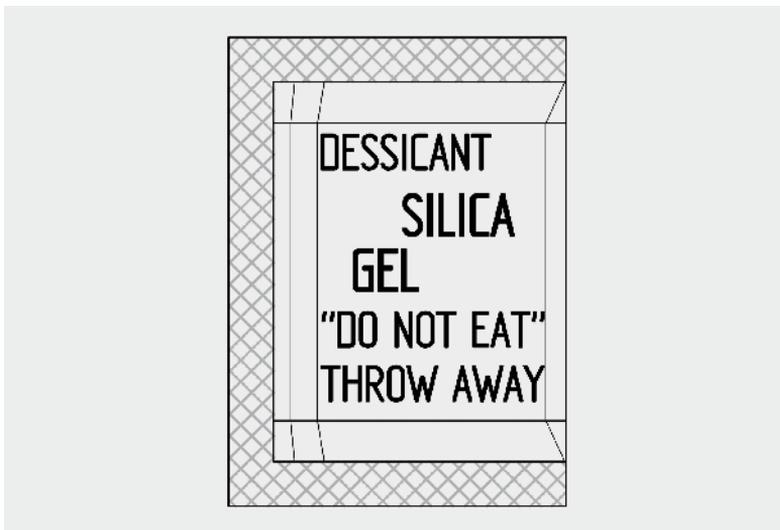


Fig. 5.3: Bag with desiccant

As a result of the ongoing miniaturization of the components necessary for a DC voltage regulator (inductor, choke, IC, capacitors) and the corresponding leadframe and packing technology, power modules can be housed in the familiar standard SMD pack-