Application Brief

SII

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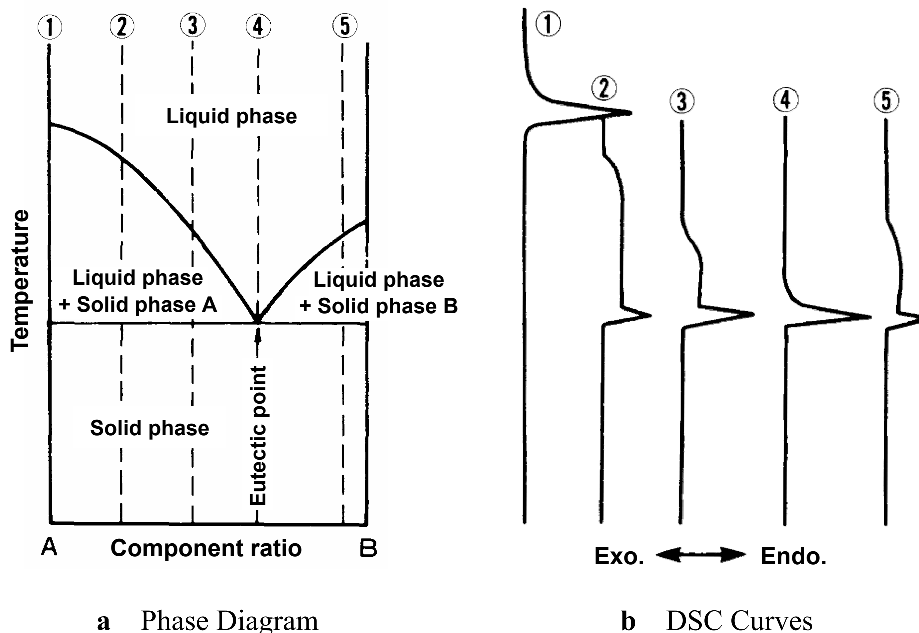
Component Analysis of Minute Amounts of Solder on IC Chip

1. Introduction

Composition ratios of two-component materials can be acquired from DSC measurement results. Recently, a method has been reported for acquiring component ratios from DSC measurements of tin-lead alloy solders. However, the measurement samples in these reports were solders only. There have been few reports about sensitivity issues with DSC instruments in practical applications, such as ultra low volume solder on IC chips.

Solder is placed around IC chips in ROM and other devices to draw out each lead wires and differences in tin/lead composition are said to influence the connection quality of the leads. Chips must be inspected for quality one by one. In this brief, a highly sensitive DSC instrument is used to measure an unmodified IC chip (about 2.5 mm on all sides) and acquire the solder composition ratio.



a Phase Diagram **b** DSC Curves

Figure 1 Phase Diagram and DSC Curves for a Binary System with a Eutectic Point

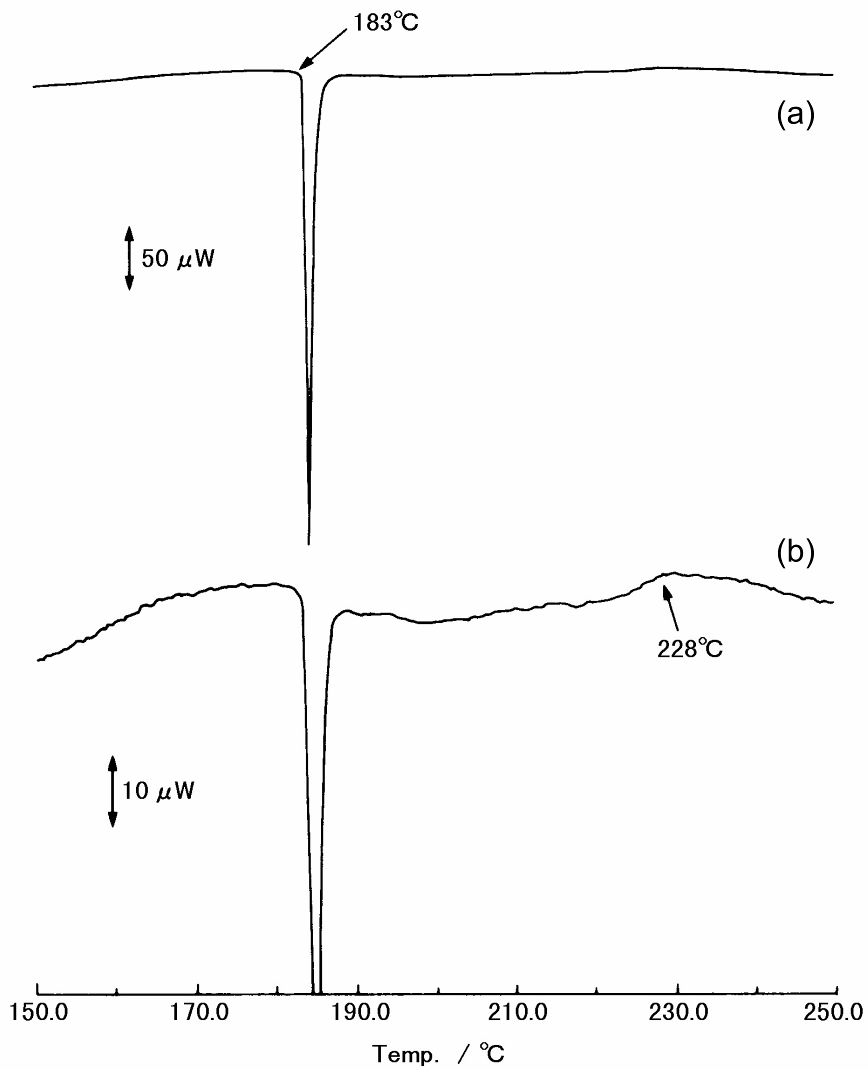


Figure 2　DSC Corves for Minute Amounts of Solder on an IC Chip

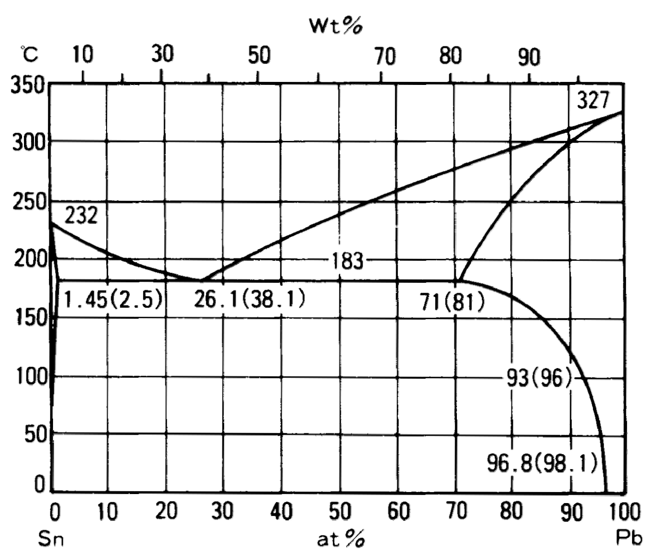


Figure 3　Pb-Sn Phase Diagram

2. Measurements

2-1 Determining Component Ratios

Phase diagrams (see Figure 1-a) can be constructed for not only solders but also other binary systems that have eutectic points. When binary system samples comparable to component ratios are measured using DSC, data such as that in Figure 1-b can be acquired. As can be seen by curves ②, ③ and ⑤, samples with composition ratios between pure material and the eutectic point show sharp endothermic peaks at the eutectic point due to melting of eutectic crystals. After this, a broad endotherm continues. When the sample becomes liquefied, the line returns to the baseline. Conversely, when an unknown binary system sample is measured, its composition ratio can be determined from the phase diagram using the temperature where the broad endotherm returns to baseline.

2-1 Measurement of Solder on IC Chips

An unmodified IC chip was placed in a measurement sample container and measured using DSC. The results are shown in Figure 2 (a). The weight of the solder was about 0.1mg. A sharp melting peak due to eutectic material was observed at 183°C. Figure 2 (b) shows an enlarged view of the same data. The broad endothermic peak clearly returns to the baseline around 228°C.

Considering the composition ratio of standard solder, the composition ratio was acquired from a Pb-Sn phase diagram (Figure 3) using this return point temperature (228°C). The percentage by weight for Sn was 43%.