

SEMI D40-0704

TERMINOLOGY FOR FPD SUBSTRATE DEFLECTION

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1 Purpose

1.1 This document provides the terms and definitions of a physical transformation when flat panel display (FPD) substrates are maintained statically.

2 Scope

2.1 These terms and definitions are applicable to both front and back substrates used in FPD fabrication.

NOTICE: This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard to establish appropriate safety and health practices and determine the applicability of regulatory or other limitations prior to use.

3 Limitations

3.1 This standard is not applicable to sag at transportation between substrate vendors and FPD manufacturers.

4 Referenced Standards

4.1 SEMI Standards

SEMI D9 — Terminology For FPD Substrates

SEMI D25 — Specification For Flat Panel Display Substrate Shipping Case

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

5 Terminology

5.1 Definitions

5.1.1 *Displacement Terminology* — The displacement is generated by sag and lift caused by the supporting positions and/or locations of the FPD substrate. The displacement is defined by the values of two-dimensional sag and lift. Two dimensional maximum displacement is also defined by values of two-dimensional maximum sag and lift, and the thickness of the FPD substrate.

5.1.1.1 *support plain* — a support plain is defined as a horizontally ideal flat plain which is enhanced from a horizontally straight line defined from the top position of the support members, as shown in Figure 1.

5.1.1.2 *support member* — support member is a support device such as a support pin to support FPD substrates, as shown in Figure 1.

5.1.1.3 *support span* — support span is defined as at least the distance between two support members, as shown in Figure 1.

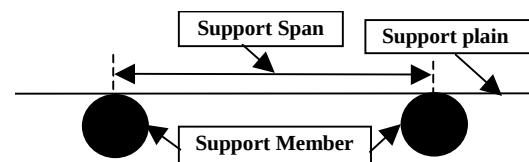


Figure 1
Definitions of Support Span, Support Member and Support Plain

5.1.1.4 *lift* — lift is defined as the displacement to the bottom surface of substrate from the support plain. It is located above position from the support plain, as shown in Figure 2.

5.1.1.5 *sag* — sag is defined as the generated distance between the bottom surface of the substrate and the support plain caused by gravity, as shown in Figure 2.

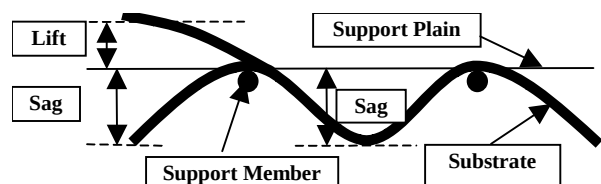


Figure 2
Definitions of Lift and Sag

NOTE 1: In case there is sag at the edge of a substrate, sag is defined by the distance to position "A" from the support plain. The position "A" is determined by the intersection point of between the edge of the bottom surface of the substrate and the edge of the beveled region, as shown in Figure 3.

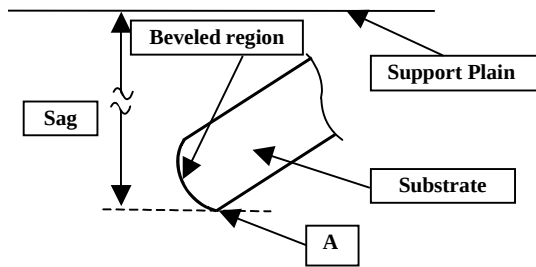


Figure 3
Definition of Sag at Edge

NOTE 2: In case there is lift at the edge of a substrate, lift is defined by the distance to position “B” from the support plain. The position “B” is determined by the intersection point of between the edge of the bottom surface of the substrate and the edge of the beveled region, as shown in Figure 4.

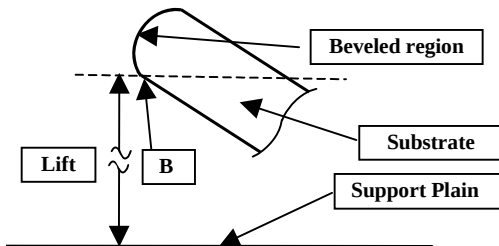


Figure 4
Definition of Lift at Edge

5.1.1.6 *maximum displacement* — two-dimensional maximum displacement (Max. Displacement) is defined by maximum lift (Max. Lift) + maximum sag (Max. Sag) + substrate thickness. Maximum displacement can have the same value at several different locations, as shown in Figure 5.

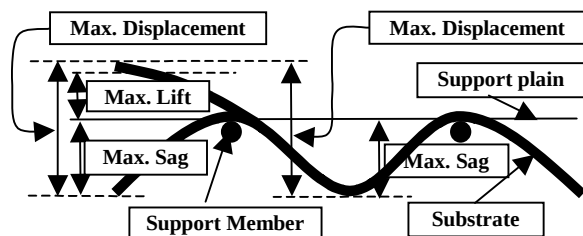


Figure 5
Maximum Displacement

5.1.2 *Displacement Mode Terminology* — displacement modes are classified into five types caused by supporting conditions, which are number of

supporting positions, distance of each supporting position and location of supporting positions.

5.1.2.1 *A Type* — substrates of this type have a convex shape. The substrate shape is named “A type”. A type mode consists of lift at center location and two sags at the left and right edges, as shown in Figure 6.

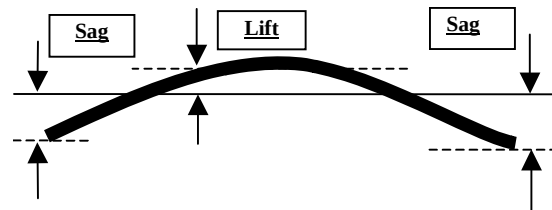


Figure 6
A Type Substrate Shape

5.1.2.2 *U Type* — the type is the concave shape of substrate. The substrate shape is named as “U type”. U type mode consists of Sag at center location and two lifts which consist of the Lift at left and at right edge locations, as shown in Figure 7.

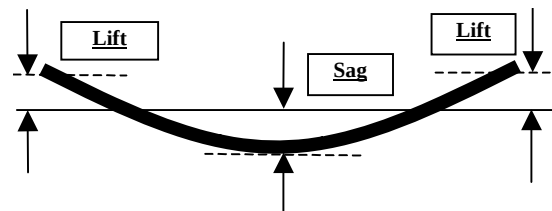


Figure 7
U Type Substrate Shape

NOTE 3: Depending on conditions, support span length may change slightly due to the substrate slipping on its support members, as shown in Figure 8. The support span is shorter when sag is relatively larger, as shown in Figure 9. On the other hand, the support span is longer when sag is relatively smaller, as shown in Figure 10. Since the change of support span is predicted to be significantly smaller than the support span, the change of support span is ignored.

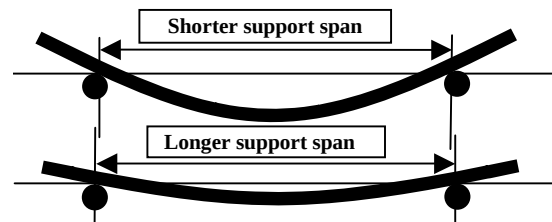


Figure 8
Change of Support Span Due to Sag Magnitude