

SEMI D51-0308

SPECIFICATION FOR HANDSHAKE METHOD OF SINGLE SUBSTRATE FOR HANDLING OFF/ON TOOL IN FPD PRODUCTION

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1 Purpose

1.1 Due to the migration to large substrate sizes in FPD production, the demand for single substrate transfer, with the extensive combined use of Automated Material Handling Systems (AMHS), robots and conveyors, is increasing. On the other hand, each FPD fab uses different handshake specifications for single substrate transfer, which creates issues such as increase in cost, as well as delay in delivery and testing. It is imperative to define a handshake method for transferring single substrates to the process equipment in order to solve these issues.

1.2 The purpose of this specification is to standardize the handshake methods for transferring single substrates, which are currently different at each FPD fab. It is expected that this will result in improved efficiency in the design, production and installation of equipment, as well as in cost reduction.

2 Scope

2.1 The scope of this standard is limited to the handshake associated with the transfer operation of single substrates between the single substrate transfer system and the process equipment. Examples are single substrate transfer between the process equipment and the single substrate transfer system, between the single substrate transfer system and the buffers, etc.

2.2 The handshake specification for transferring single substrates includes:

- Signal definition (refer to ¶ 7.1)
- Single substrate transfer sequence definition (refer to ¶ 7.2)
- Guideline for detecting timeout errors (refer to ¶ 7.3 and ¶ 7.4)

2.3 This standard only defines the handshake process and basic handshake signals with their meanings and handling method, for transferring single substrates from single substrate transfer systems to the process equipment.

2.4 The single substrate transfer handshake that is defined in this standard may also be applied to single substrate transfer between different pieces of process equipment.

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 defines the control procedure for each handshake signal while it does not define the relation between the operation of the transfer mechanism and each handshake signal.

3.2 The physical layout or electrical specification of the handshake signals is not defined in this standard.

3.3 The transfer of data such as the single substrate process data that are transferred between the single substrate transfer systems and the process equipment is not defined in this document.

3.4 The handshake signals for single substrate transfer require error recovery procedures. However, these are proprietary procedures specific to the equipment and may need operator assistance. Therefore, error recovery procedures are not defined in this document.

3.5 The signal states defined in this standard are logical states. The logical design for implementation is not defined in this document.

4 Background

4.1 Due to the migration to large glass substrate sizes in FPD production, the demand for a single substrate transfer process is increasing. The mechanism for the transfer of single substrates is assumed to be similar to the process shown in Figure 1 Example of the Control Mechanism between a Single Substrate Transfer System and Equipment; however, the handshake method employed between a single substrate transfer system and the process equipment is not clearly defined. Therefore, this standard defines the handshake method for transferring single substrates between a single substrate transfer system and the process equipment.

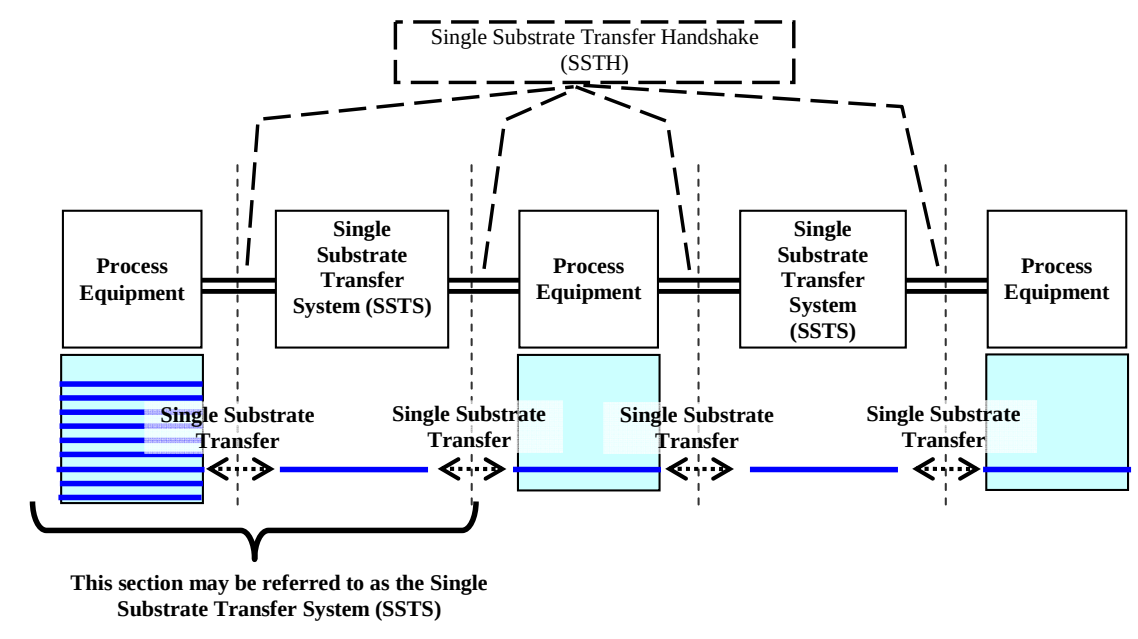


Figure 1
Example of the Control Mechanism between a Single Substrate Transfer System and Equipment

5 Referenced Standards and Document

5.1 SEMI Standard

SEMI D44 — Specification for Reference Position of Single Substrate for Handling Off On Tool

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

6 Terminology

6.1 Definitions

6.1.1 *process equipment* — processing equipment, testing equipment, buffer equipment, etc. that are used for FPD manufacturing.

6.1.2 *receiver* — equipment or device that is basically on the receiving side of single substrates in the single substrate transfer process.

6.1.3 *sender* — equipment or device that is basically on the sending side of single substrates in the single substrate transfer process.

6.1.4 *single substrate* — a glass substrate that is transferred by single units in the fab.

6.1.5 *single substrate transfer* — transfer to handover single substrates between single substrate transfer system and process equipment. Figure 2 shows examples of single substrate transfer.

6.1.6 *single substrate transfer handshake* — an exchange of signals between process equipment and single substrate transfer system to transfer single substrates.

6.1.7 *single substrate transfer system* — equipment or control mechanism having substrate transfer capabilities for transferring single substrates from one piece of process equipment to another piece of process equipment.

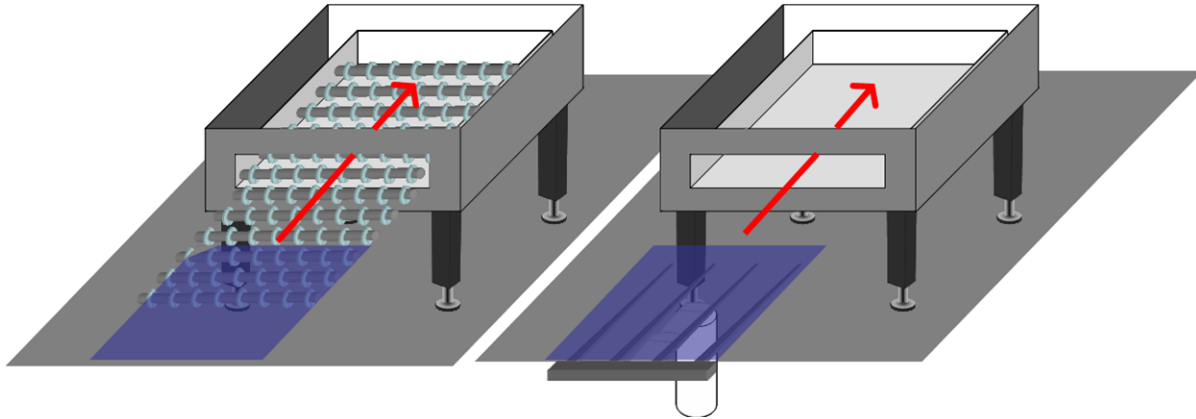


Figure 2
Examples of Single Substrate Transfer

7 Single Substrate Transfer Handshake for Single Substrate Transfer

7.1 *Signal Definitions* — The following signals are used in single substrate transfer handshake. These signals are prepared by both the process equipment and the single substrate transfer system and are used to transfer the single substrates smoothly.

VALID	Handshake Valid Signal (basic signal)
R_REQ (Receive_Request)	Single Substrate Receive Request (basic signal)
S_REQ (Send_Request)	Single Substrate Send Request (basic signal)
BUSY	Transfer Started, Transferring (basic signal)
COMPT (Complete)	Transfer Completed (basic signal)
RESERVE n	Reserved Signal (optional signal)
HS_RST n (Handshake_Reset)	Handshake Reset Signal (optional signal)
PAUSE	Pause Signal (optional signal)

NOTE 1: R_REQ and S_REQ signals can be set by both the receiver and sender so that they can be used as the transfer requests as required.

NOTE 2: Basic signals are mandatory and optional signals can be also used, if necessary.

7.1.1 *Single Substrate Transfer Handshake Assignment Signals* — Table 1 shows the signals required for single substrate transfer handshake when transferring single substrates. Table 1 Signals for Single Substrate Transfer Handshake in Single Substrate Transfer defines the signal name and the description. In the description, the meaning of the signal, the indication of the signal level and comments are included.

Table 1 Signals for Single Substrate Transfer Handshake in Single Substrate Transfer

Signal Name	Description
VALID	Indicates that the Single Substrate Transfer Handshake signals are valid. If this signal is not ON, all the following signals are not valid: ON: Single Substrate Transfer Handshake signals are valid. OFF: Single Substrate Transfer Handshake signals are invalid.