CONFIDENTIAL

ENGINEERING SPECIFICATION FOR

AUTO Nd-YAG LASER MARKING SYSTEM PROCUREMENT

Equipmemt Title	: Auto Nd-YAG LASER MARKING SYSTEM
Equipment User	: Signetics
Package Families	: All PKG
Date	: May. 17 '05
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Contents

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1. General Information

   1.1 This specification apply to auto Nd-YAG laser marking system.

   1.2 This specification consists of general and specific requirements.

   1.3 The general requirement describes general system requirement and equipment buyoff requirement , while the specific requirement describes design and quality requirements and product performance, etc.

2. Scope

   2.1 This specification defines the technical and buyoff requirement for the marking system listed in section 6. and is a supplement to purchase order for a Nd-YAG marking system.

3. Strip Type / Size

Package	Pin Count (ea)	Mold compound	Package Matrix	Strip size LxWxT(mm)
FBGA	48	SMT-B-1LV	2 x 4 x 6	187.5 x 40 x 0.95
FBGA	144	EME-S730L	4 x 4 x 4	230 x 63 x 0.96

Note : Refer to attached PCB drawing for detailed information.

4. Package Configuration

Package	Body Size (mm)	Pin Count (ea)	PCB Thickness (mm)	body thickness (mm)
FBGA	5 x 13.8	48	0.27±0.03	0.95±0.10
FBGA	12 x 12	144	0.26±0.03	0.96±0.10

Note : Refer to attached PKG outline drawing for detailed information.

5. General System Requirement

   The supplier shall provide a certificate of warranty for the following equipment requirements.

   5.1 Equipment shall contain an internal chassis ground which is connected to power ground to protect operator , equipment and products in progress from electric shock , also to eliminate electrostatic charge which can cause product's damage during equipment operation and / or , handling the parts of material handling and loading station on equipment as well as the painted body shall be made of Electro Static Discharge(ESD) protective materials ; dissipative and / or conductive ones except aluminum , and conductive plastic if need clear window.
   Above substance shall be qualified by buyoff people of Signetics in attendance of supplier personnel at pre-buyoff and final buyoff.

   5.2 Prior to equipment manufacturing , all items of P.O Spec shall be reviewed with Signetics buyoff team and supplier shall get approval for design concept of all parts and constructions from Signetics.

   5.3 The equipment control shall be protected against volatile memory loss as result of power loss.
   Protection shall be accomplished through the use of a rechargeable battery or the equivalent of sufficient capacity to provide a minimum of 168hrs protection.
   The system shall provide automatic battery recharging when power is supplied to the equipment.

   5.4 The equipment shall be protected against any damage due to electrical power momentary fluctuations and failures. The device in process at the time of the power failure shall be protected from damage.

5.5

- Red : error
- Yellow : warning
- Green : production

5.6 Noise level shall be less than 70db , it will be checked at the location of 1 meter from equipment and 1 meter from floor.

5.7 The equipment shall be built to provide a safe working environment for operator and maintenance personnel including safety interlocking doors and minimum 3 emergency stop switches.

5.8 Facilities & Environmental requirement :

As an acceptance requirement , the equipment shall be capable of meeting all requirements of this specification when the utilities or environmental conditions supplied by Signetics within the specified ranges.

5.8.1 Power supply : AC 208V ± 10% / 60Hz / 3phase

5.8.2 Air supply : 5-6 kg/㎠

5.8.3 Vacuum : 19-23 inch-Hg

5.8.4 Room temperature : 20-27 ℃

5.8.5 Relative humidity : 43-55 %

5.8.6 Supplier shall provide Signetics with required facility data (dimension ,weight,voltage,ampere,watt, phase, air supply, vacuum, exhaust,etc) for installation of machine no later 1 month of shipment.

5.9 The equipment shall be designed to be transferable in case plant re-layout.

5.10 The equipment shall run with MTBA (Mean Time between Assists) must be greater than or equal 1hr and MTBF(Mean Time Between Failure) of more than 60 hrs and MTTR (Mean Time To Repair) must be less than or equal to 90 minutes.

5.11 After system delivery, a specific failure or trouble should not be happened during 4wks(500 hrs) of products running.

6. Specific Requirement

6.1 Equipment description : Full auto dual head pen type laser marking system for all molding PKG.

6.2 The equipment shall consist of the following features.

6.2.1 This system should have a dual pen type Nd-YAG laser head.(HKOPTO)
- The PO condition of laser head is conditional PO to decide final purchasing by condition during 3 month after buy-off.
When fail, the laser head shall be changed to EO tech laser.

6.2.2 Auto cassette loading system.

6.2.3 Automatic device converting function for different types of packages.

6.2.4 Pre/Post cleaning station for dust removal with brushing , ionized air blower and vacuum suction.

6.2.5 Jamming detection system for all area.

6.2.6 Mis-loading detection function and alarm lamp/buzzer.

6.2.7 Laser beam path and area should be housed to protect possible serious damages when directly exposed human eye or skin to the laser beam.

6.2.8 At marking zone, strip positioning system shall consist of pin inserting type and encoder type.

6.2.9 Automatic strip feeding system.

6.2.10 Mis-feed, jam detection sensor system.

6.2.11 Safety covers and interlocks for all moving parts.

6.2.12 Ionization system for prevention of contamination.

6.2.13 S/W for SPC and system error tracking shall be stored in system controller. (micro-processor or PLC)

6.2.14 Automatic package counter for production out put check.

6.2.15 Applicable strip size : 180 x 40mm ~ 250 x 80mm

6.2.16 This system should have two vision system, one is to check strip orientation and inspect reject mark on PCB, the other is to inspect quality.(HIMS vision)

6.3 System design requirement

The supplier shall provide a certificate of warranty for the following system / equipment requirement.

6.3.1 The equipment shall meet all of the requirement of this specification while processing.

6.3.2 This m/c should perform selective marking by vision inspection of reject marking on PCB reject windov

6.3.3

6.3.4 The processing of operation shall be :
Auto strip loading --> Strip orientation check & Inspection for reject mark --> Index feeding -->

6.3.5 The feeding direction of strip shall be from right to left.

6.3.6 One strip escape system for marking quality check.

6.3.7 All products shall be protected from ESD damage.

6.3.8 It shall be designed to do continuous machine running without stop while operator is replacing cassette

6.3.9 The one time marking area shall be over 300 x 170 mm.

6.3.10 All wiring of machine shall be placed to be protected from foreign material and to be maintained easily.

6.3.11 Operation mode system shall have four mode, such as manual, single, auto mode and device change.

6.3.12 Marking position shall be controlled within ± 4mils (0.1 mm) tolerance.

6.3.13 The reject mark inspection vision system should be designed to edit position and sequence of reject mark window.

6.3.14 Marking letter shall be changed automatically through net-working with Signetics server by bar-code scanning.

6.3.15 Machine shall display the cause and location of an error detected during running.
Two LCD monitor shall be attached at the front of system.
One LCD monitor shall be on laser head controller tower.
(All message shall be displayed in Korean.)

6.3.16 Scratch is not allowed on the package.

6.3.17 This system should have min. 64ea of device to be set-up.

6.3.18 Minimum loading quantity
Cassette : 6 ea(each on/off loader)

6.3.19 Equipment color : Semisys's standard

6.3.20 Back-up hard disk driver for each computer

6.3.21 This system should be designed to be assembled with on/off loader module of stack magazine in the future.

7. Production Performance Requirement

This equipment shall be evaluated in a production mode as described in section 4. to assure that the following performance requirement are met ;

7.1 Productivity : Min. 12 strips per minute(FBGA12x12 144ball wide PCB(230x63mm))

7.2 Up time : Min. 98%

7.3 First pass yield : 100%

7.4 Material handling system jams

7.4.1 The frequency of jams of the material handling system from all causes shall be less than 1 jam per 60 min.

7.4.2 The mean to clear a jam shall be less than or equal to 1minute.

7.4.3 For purpose of this specification a material handling system jam is defined as any failure of the material handling system to properly load, unload or index material according to the intended system function and which failure requires operator interaction to restore operation.

8. Product Quality Requirements (Production Criteria)

The following criteria shall be used to judge acceptable and rejectable units for the yield requirements of section 7.3

8.1 Key chrateristics capability

No.	Check items	Criteria	Remark
1	Marking location	+/- 0.1mm	All Packages
2	Broken marking	Any Evidence	On 30cm distance with naked eyes
3	Illegible marking	Any Evidence	On 30cm distance with naked eyes
4	Solder Mask Damage	Any Evidence	All Packages
5	Strip Damage	Any Evidence	All Packages
6	Scratch	Any Evidence	All Packages
7	Foreign Material	Any Evidence	All Packages

Supplier must supply both product data and quality data , in accordance with their check sheet to Signetics engineer before the equipment or the tool delivery. (including trouble shooting report at supplier site.)

9. Related Document

The following document are a part of this specification.
In the event of conflict between this specification and document including dwg. listed in this section , this specification shall control.

9.1 Signetics Korea drawings

Description	Dwg. No	Rev.

10. Equipment Buyoff Requirement

10.1 Preliminary buyoff at supplier site (pre-buyoff)

3 persons for 2 days at supplier site.
At system supplier factory before 5 days of system delivery.

10.1.1 It is the supplier's responsibility to understand the requirements for buyoff and to assure that equipment is ready for buyoff prior to arrival of Signetics buyoff team.
Signetics buyoff team shall arrive at the time agree to by Signetics and the supplier , find that the equipment is not in a state of readiness for buyoff and that a period exceeding 24hrs from the time of arrival at the supplier's factory is required to prepare the equipment for buyoff,Signetics reserves the right to cancel the buyoff.
In the event of cancellation , the supplier shall be liable to charge transporting cost for buyoff team to and from the pre-buyoff.
Also , if the machine is failed on first buyoff at supplier , the supplier shall charge the additional cost for next pre-buyoff.

10.1.2 The equipment shall be inspected for conformance to section 6.2 .

10.1.3 Supplier shall present for verification and the certificate of warranty for the general equipment requirement of section 5. & 6.3 .
Should Signetics personnel determine that there is a question as to whether the requirements are met , Signetics reserves the right to request the supplier to demonstrate conformance to the buyoff team.

10.1.4 The equipment shall be evaluated for conformance to the requirement of section 7.

10.1.4.1 Prior to the start of an actual buyoff attempt,any number of evaluation runs may be made for purpose of equipment set-up or adjustment.
However, this is subject to the limitation of section 10.1.1.

10.1.4.2 The maximum number of buyoff attempt's shall be three times.

10.1.4.3 The buyoff shall consist of 2hrs continuous production following 4hrs dry run.

10.1.4.4 Prior to start of each buyoff attempt, supplier and Signetics buyoff team both shall approve the material and equipment conditions.

10.1.4.5 Supplier personnel shall perform all set-up , maintenance and equipment operation for the buyoff.

10.1.4.6 Once a buyoff attempt is commenced , it shall continue for the entire of section 10.1.4.4.

10.1.4.7 If the equipment is unable to complete buyoff attempt, the supplier personnel who have full responsibility may elect to abort the attempt.
However, data will be collected and reported regarding the buyoff attempt, and the aborted buyoff attempt shall be counted into three allowed buyoff chances.

10.1.4.8 When buyoff attempt meets or exceeds the requirements of section 7 , the equipment shall be acceptable to the requirements of section 7.
No further production evaluations are required.

10.1.4.9 Should three buyoff attempts be completed with failure for the requirements of section 7. or 8. , the buyoff shall be terminated and wrap-up meeting should hold with the supplier to date-rmine a mutual agreeable course of corrective action.
This corrective action plan shall be communicated to appropriate Signetics management personnel and approved prior to acceptance.
The approved corrective action plan shall be documented, dated and signed by the supplier and Signetics buyoff team.

The result will be reviewed and agreed to in writing by the supplier an Signetics buyoff team both.

10.1.4.11 In the event of a dispute that cannot be mutually resolved , the views of both the supplier and Signetics shall be documented and signed mutually by both parties.

10.1.5 The buyoff of each tool shall be independent.

10.1.6 Sigentics buyoff team has the authority to designate the equipment described in section 6. acceptable to this specification.

10.1.7 Signetics buyoff team does not have the authority to do any of the following without prior approval of appropriate Signetics management.

10.1.7.1 Add requirements to this specification :

10.1.7.2 Make financial commitments.

10.1.7.3 Request changes to the equipment purchases to this specification other than changes to this specification.
All such changes are the financial responsibility of the supplier.

10.1.7.4 Authorize the shipment of equipment or any part thereof.

10.1.8 An acceptance of equipment to this specification by Signetics buyoff team neither grant nor implies authority to ship the equipment to Signetics.

10.1.9 Training at supplier factory : 1 or 2 days.
Training shall include hardware , software , set-up and maintenance.

10.2 Final buyoff at Signetics site

Final buyoff will be proceeded according to the procedure listed in Signetics spec as equipment acceptance.

10.2.1 In case of pre-buy off is skipped ,supplier shall provide Signetics engineer equipment pre-run check / test results including the following items before equipment shipping.

10.2.1.1 The certificate of warranty for the design requirement of section 5. And 6.3.

10.2.1.2 Equipment performance requirements of section 7.

10.2.2 The following paragraphs of section 10.1. Shall be applied to the final buyoff in Signetics :
10.1.2 , 10.1.4 , 10.1.5 , and 10.1.6.
In case pre-buyoff at supplier facility is skipped, the section 10.1.3 shall be applied to the final buyoff in Signetics.

10.2.3 Training and education at Signetics site : Min. 1week

10.2.3.1 Supplier must provide training for Signetics persons regarding operator, maintenance and technical detail before work completion for 7 days minimum.

10.2.3.2 Actual training time shall be determined , based upon demonstrated capability of Signetics personnel.

10.2.4 The equipment set-up and final buyoff should be completed within one month after the equipment was arrived at relevant Signetics factory.

10.3 Sample and materials for buyoff

Signetics will provide supplier with samples and material for the 1'st pre and final buyoff.
But, if 1'st buyoff is failed, supplier shall prepare those samples and material for the 2'nd 3'rd buyoff.

10.4 Cancellation

If this system fail at the third pre or final buyoff attempt, Signetics reserve the right to cancel the purchasing order.

11. Attendant Requirement

11.1 Recommended spare part (List)

Unless previously supplied to Signetics purchasing ,the supplier shall supply a list of recommended spare parts no later 1 month of completion of design approval.
Spare parts shall not be made obsolete with a period of 5-years upon machine delivery.

11.2 Technical support and service.

Supplier shall provide technical support and service within 24-hrs.

11.3 Equipment installation assistance

Upon notification of equipment arrival in Signetics, the supplier shall send qualified personnel to Signetics to set-up the equipment and participate in final buyoff.

11.4 Guarantee

The supplier assume full responsibility for tool engineering, design , construction , checkout and production performance.
Minimum 12 months guarantee for material and workman--ship is required from the date of final buyoff completion.

11.5 Packing for shipment

Packing for shipment shall be such that there is no damage to the equipment from the environment , storage or shipping.
This shall include customs storage,environmental conditions and normal handling of shipment.

11.6 Used material return

This article will be applied when there is no specific statements in other items in this specification.
All the materials such as leadframes,magazines,etc which are used for machine test, qualification or pre-buyoff having Signetics representative present or waiving must be returned to Signetics regardless of

Supplier shall inform Signetics for shipping information.

12. Others

12.1 The following items should be supplied with the equipment.(3 volumes per each)

12.1.1 Spare part drawing : (all insert part)

12.1.2 Manual book for operation, maintenance and reference.

12.1.3 Preventive maintenance specification and procedure.

12.1.4 System manual book for electrical circuits diagram and pneumatic diagrams.

12.1.5 Trouble shooting guide manual.

12.1.6 Recommended spare part list : including estimated part life time

12.2 Supplier to furnish time schedule chart including following items a term of 1wk.

12.2.1 Design concept approval

12.2.2 Design complete

12.2.3 Design review and approval by Signetics

12.2.4 Manufacturing system progress

12.2.5 Initial check by supplier

12.2.6 Preliminary buyoff at supplier site by Signetics

12.2.7 Shipping

12.2.8 Final buyoff at Signetics

12.3 After P.O released supplier must provide development plan to Signetics engineer in order to monitor the progress.

12.4 Any other issues may affect the system performance must be noticed to Signetics and have the agreement before design fix.