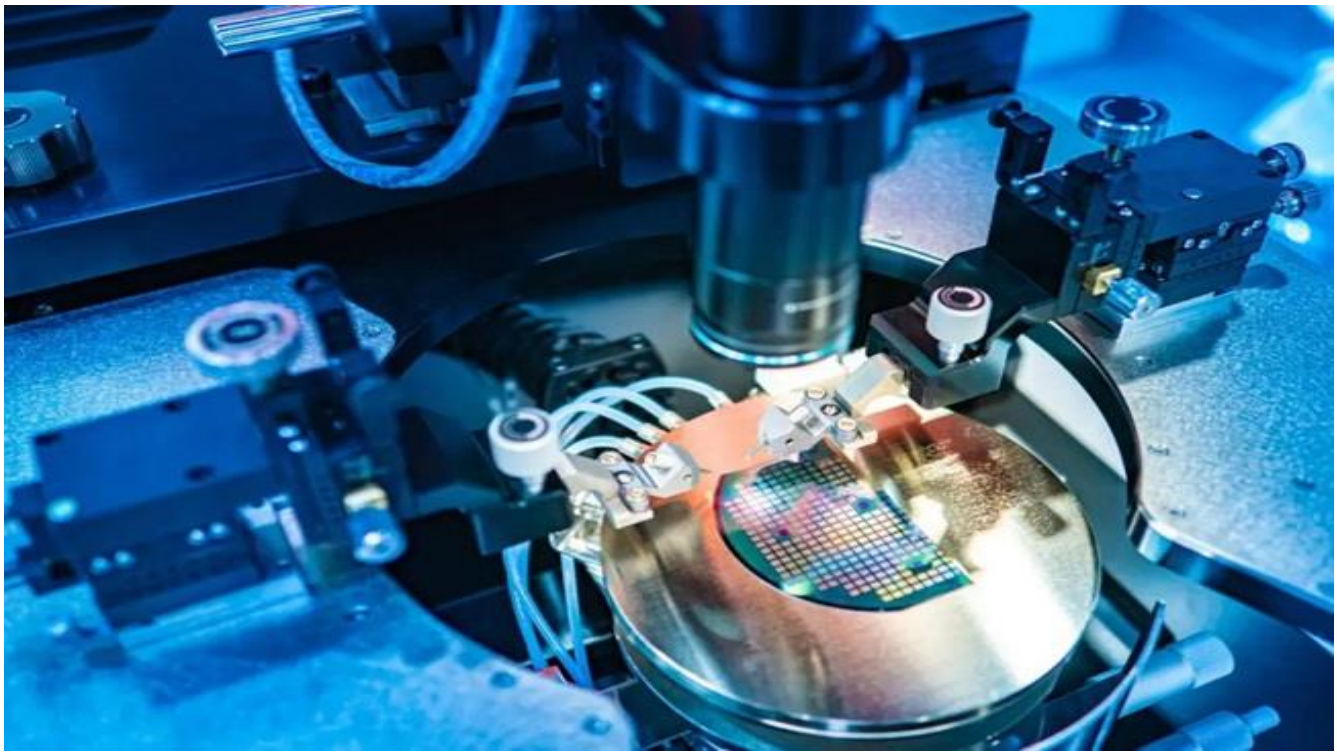

Model Curriculum

QP Name: Solder Ball Attach – Process Supervisor

QP Code: ELE/Q0127

QP Version: 3.0

NSQF Level: 5

Model Curriculum Version: 3.0

Electronics Sector Skills Council of India || 155, 2nd Floor, ESC House, Okhla Industrial Area - Phase 3, New Delhi – 110020

Table of Contents

Training Parameters

Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Production- S&C
Country	India
NSQF Level	5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2144.0101
Minimum Educational Qualification and Experience	Completed 2nd year of UG (UG Diploma) (Physics/ Electronics/ Electrical/Mechanical) with 1.5 years of Relevant Experience OR Completed 3 year diploma after 10th (Electronics/Electrical /Mechanical) with 3 Years of Relevant Experience OR Previous relevant Qualification of NSQF Level (4.5) with 1.5 years of Relevant Experience #Relevant Experience in Semiconductor & Components.
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	01.05.2025
Next Review Date	31.10.2025
NSQC Approval Date	08.05.2025
QP Version	3.0
Model Curriculum Creation Date	01.05.2025
Model Curriculum Valid Up to Date	31.10.2025
Model Curriculum Version	3.0
Minimum Duration of the Course	570 Hours
Maximum Duration of the Course	570 Hours

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills:

- Describe the process of Semiconductor Manufacturing, Assembly, Testing & Packaging evaluating customer requirements and computer issues.
- Demonstrate the evaluation process of customer requirements and semiconductors processing.
- Demonstrate the uses of all standards related to Solder Ball Attach Process
- Demonstrate the process of Implementation of all Solder Ball Attach Machine Handling and Processes
- Demonstrate various practices to be followed to maintain health and safety at work.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
ELE/N0144: Define Recipe & Process Parameters	**66:00**	**54:00**	**30:00**	**00:00**	**150:00**
Module 1: Define Recipe and Process Parameters	66:00	54:00	30:00	00:00	150:00
ELE/N0145: Data Analysis & Yield Improvement	**30:00**	**60:00**	**30:00**	**00:00**	**120:00**
Module 2: Data Analysis and Yield Improvement	30:00	60:00	60:00	00:00	150:00
ELE/N0146: Solder Ball Attachment Design & Verification	**30:00**	**30:00**	**60:00**	**00:00**	**120:00**
Module 3: Solder Ball Attach Design and Verification	30:00	30:00	60:00	00:00	120:00
ELE/N0147: Purchasing of Tools and Consumable Materials	**30:00**	**30:00**	**60:00**	**00:00**	**120:00**
Module 4: Purchasing of Tools & Consumable Material	30:00	30:00	60:00	00:00	120:00

DGT/VSQ/N0102: Employability Skills (60 Hours)	**24:00**	**36:00**	**00:00**	**00:00**	**60:00**
Module 5: Employability Skills (60 Hours)	24:00	36:00	00:00	00:00	60:00
Total Duration	**180:00**	**210:00**	**180:00**	**00:00**	**570:00**

Module Details

Module 1: Define Recipe and Process Parameters

Mapped to ELE/N0144

Terminal Outcomes:

- State the role and responsibilities of a Solder Ball Attach

Duration: 66:00	Duration: 54:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Understand the product dimensions as well the strip dimensions • Understand the package outline drawing and strip drawing, Solder Ball dimension, solder ball pad diameter and pitch • Define solder ball material types, stencil, Pad Wetting coverage, bonding strength etc • Set up all process parameters such as speed, stencil height, reflow temperature range, fiducial marks, orientation, vaccume level, AOI Machine etc • Required Knowledge of AUTO CAD	• Prepare Process flow with clear specifications like solder pad size, solder material, Solder Paste Type, Solder Ball Diameter and Pitch, Reflow Temperature & Humidity etc • Prepare SOP in such a way so that it is more understandable to operators with pictures, visuals, data Charts etc. • Prepare quality flow and procedures for New and existing processes • Regular inspection of lot data such as yield, failure etc
Classroom Aids	
Training Kit - Trainer guide, Presentations, Whiteboard, Marker, projector, laptop	
Tools, Equipment and Other Requirements	
Solder Ball Attach Tools	

Module 2: Data Analysis and Yield Improvement

Mapped to ELE/N0145

Terminal Outcomes:

- Describe the process of standard implementations for Data Analysis and Yield Improvement
- Demonstrate the process of verification all Parameters

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define all package outlines drawings with specifications • Define sample size for each lot to measure all dimensions • After Collecting Data, do statistics analysis if it is within specification release the lot to next step • Production Yield data collection for each Wafer Lot • Any failure at Solder Ball Attach should be passed through failure analysis • Understanding of working principal of machines to improve UPH	• Data Analysis using statistical methods • List down/record all failures along with actions to avoid future failure • Train Operators on SOP Flow • Knowledge of doing some manual testing • Good understanding of Auto CAD generated designs • Any failure at Solder Ball Attach should be passed through failure analysis
Classroom Aids	
Training kit (Trainer guide, Presentations). Whiteboard, Marker, projector, laptop	
Tools, Equipment and Other Requirements	
Data Analysis Standard's and Procedure's	

Module 3: Solder Ball Attach Design and Verification

Mapped to ELE/N0146

Terminal Outcomes:

- Describe the process of Design Creation and Verification.
- Demonstrate the process of Verification
- Demonstrate the process of cost and Productivity Improvement

Duration: 30:00	Duration: 30:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Auto CAD or equivalent design tool knowledge • Knowledge of JEDEC Standard • Knowledge of Semiconductor Material Used in Wafer Fabrication • Knowledge of wafer fabrication process • Understanding of Critical and Normal dimensions Requirements that meet customer's final product specification • Responsibility of Verifying tray drawing • Responsibility of Verifying scrub/street width profile • Responsibility of Verifying package drawing for solder ball	• Participate in substrate drawing activities for Solder ball dimensions • How to read customer POD, SOD, Wafer Mapping etc • Selection of stencil as per Strip outline drawing & Material • Responsibility of Verifying package drawing for solder ball • Support Design team to create an Optimized Product
Classroom Aids	
Training kit (Trainer guide, Presentations). Whiteboard, Marker, projector, laptop	
Tools, Equipment and Other Requirements	
Design Creation and Verification Software's	

Module 4: Purchasing of Tools and Consumable Materials

Mapped to ELE/N0147

Terminal Outcomes:

- Knowledge about all tools and equipment's useful Which are required for The Solder Ball Attach
- Knowledge about all tools and equipment's useful for Solder Ball Attach and to implement Quality Standards

Duration: 30:00	Duration: 30:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List of Machines & Tools required for process of Die Attach & Wire Bond • FAT Report Creation • Awareness on general Machine Specification like Operation, Controller, Panel etc • Knowledge of characterization phase, feasibility phase, customer samples phase and qualification phase is must • Collection of all the quality and realibity data for each characterization, feasibility and qualification build	• Demonstrate the generation of PCN • Process of preparation of Solid Reports Description on All equipment consumables specifications, dimensions and other parameters should be clearly defined by process and equipment engineer General Machine Specification (Operation, Main Controller, Main Panel should function as per requirements given to manufacturer)
Classroom Aids	
Training kit (Trainer guide, Presentations)	
Tools, Equipment and Other Requirements	
Equipment's related to Solder Ball Attach	

Module 5: Employability Skills (60 Hours)

Mapped to DGT/VSQ/N0102

Terminal Outcomes:

- Discuss about Employability Skills in meeting the job requirements
- Describe opportunities as an entrepreneur.
- Describe ways of preparing for apprenticeship & Jobs appropriately.

Duration: *24:00*	**Duration:** *36:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain constitutional values, civic rights, responsibility towards society to become a responsible citizen • Discuss 21st century skills • Explain use of basic English phrases and sentences. • Demonstrate how to communicate in a well-behaved manner • Demonstrate how to work with others • Demonstrate how to operate digital devices • Discuss the significance of Internet and Computer/ Laptops • Discuss the need for identifying business opportunities • Discuss about types of customers. • Discuss on creation of biodata • Discuss about apprenticeship and opportunities related to it.	• List different learning and employability related GOI and private portals and their usage • Show how to practice different environmentally sustainable practices. • Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, etc. • Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone • Demonstrate how to communicate in a well -mannered way with others. • Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette • Utilize virtual collaboration tools to workeffectively • Demonstrate how to maintain hygiene and dressing appropriately. • Perform a mock interview
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Computer, UPS, Scanner, Computer Tables, LCD Projector, Computer Chairs, White Board OR Computer Lab	

Module 6: On-the-Job Training

Mapped to Solder Ball Attach – Process Supervisor

Recommended Duration: 180:00	Mandatory Duration: 00:00
Location: On Site	

Terminal Outcomes

1. Explain the functions of a Saw Singulation in Semiconductors.
2. List the preliminary tasks involved in the repair and maintenance of a Tools and Equipment's
3. Demonstrate how to perform preliminary checks on a computer and its peripherals.
4. Perform steps to inspect the computer and its peripherals to identify defective modules/ components.
5. Perform repair and maintenance activities as per the Service Level Agreement (SLA).
6. Perform steps to test the functioning of Saw Singulation.
7. Communicate product and service-related information to the customer.
8. Employ appropriate practices to interact and coordinate with supervisor and colleagues.
9. Perform assigned work within the turnaround time and as per the defined quality standards.
10. Demonstrate how to maintain a healthy, safe and secure working environment.

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma/ Degree/ ITI/ Certified in relevant CITS Trade	(Electrical/Electronics / Mechanical)	2	Assembly & Packaging	1	Electronics	

Trainer Certification	
Domain Certification	**Platform Certification**
"**Solder Ball Attach – Process Supervisor**, ELE/Q0127, version 3.0". Minimum accepted score is 80%.	Recommended that the Trainer is certified for the **Solder Ball Attach – Process Supervisor** "Trainer (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2601, V2.0", with minimum score of 80%

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma/ Degree/ ITI/ Certified in relevant CITS Trade	(Electrical/Electronics / Mechanical)	3	Assembly & Packaging	1	Electronics	

Assessor Certification	
Domain Certification	**Platform Certification**
"**Solder Ball Attach – Process Supervisor**, ELE/Q0127, version 3.0". Minimum accepted score is 80%.	Recommended that the Assessor is certified for the **Solder Ball Attach – Process Supervisor** "Assessor (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2701, V2.0", with minimum score of 80%

Assessment Strategy

1. Assessment System Overview:
    - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
    - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
    - The assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records
2. Testing Environment

    To ensure a conducive environment for conducting a test, the trainer will:
    - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
    - Check the duration of the training.
    - Check the Assessment Start and End time to be 10 a.m. and 5 p.m. respectively
    - Ensure there are 2 Assessors if the batch size is more than 30.
    - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
    - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
    - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
    - Check the availability of the Lab Equipment for the particular Job Role.
3. Assessment Quality Assurance levels / Framework:
    - Question papers created by the Subject Matter Experts (SME)
    - Question papers created by the SME verified by the other subject Matter Experts
    - Questions are mapped with NOS and PC
    - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
    - The assessor must be ToA certified and the trainer must be ToT Certified
    - The assessment agency must follow the assessment guidelines to conduct the assessment
4. Types of evidence or evidence-gathering protocol:
    - Time-stamped & geotagged reporting of the assessor from assessment location
    - Centre photographs with signboards and scheme-specific branding
    - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
    - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos
5. Method of verification or validation:

    To verify the details submitted by the training centre, the assessor will undertake:
    - A surprise visit to the assessment location
    - A random audit of the batch
    - A random audit of any candidate
6. Method for assessment documentation, archiving, and access

    To protect the assessment papers and information, the assessor will ensure:
    - Hard copies of the documents are stored
    - Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage

- Soft copies of the documents & photographs of the assessment are stored on the Hard drive

References

Glossary

Term	Description
Declarative knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do **upon the completion of the training**.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do **upon the completion of a module.** A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

Term	Description
DC	Direct Current
ISO	International Organization for Standardization
NCO	National Occupational Standards
NOS	National Skills Qualification Committee
NSQF	National Skills Qualification Framework
OJT	On-the-Job Training
OMR	Optical Mark Recognition
PC	Performance Criteria
PwD	Persons with Disabilities
QP	Qualification Pack
SDMS	Skill Development & Management System
SIP	Skill India Portal
SME	Small and Medium Enterprises
SOP	Standard Operating Procedure
SSC	Sector Skill Council
TC	Trainer Certificate
ToA	Training of Assessors
ToT	Training of Trainers
TP	Training Provider