Quick Reference – Die Attach

***Note:** This guide presents a Die Attach procedure for a single die. If two die are being placed side-by-side, the same procedure can be used, but a larger diameter hot air gun nozzle centered over both die must be used.*

1 EQUIPMENT/SUPPLIES

Equipment:

- Anti-Static Mat
- ESD Wrist Strap
- ESD Lab Coat
- IR PCB Pre-Heater
- Hot Air Gun
- Microscope
- Anti-Static Tweezers
- Anti-Static Micro-Spatula

Consumables:

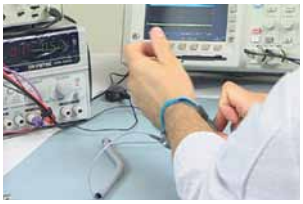
- Tacky Flux
- Lint Free Wipes
- Isopropyl Alcohol

2 HANDLING DIE PRECAUTIONS

- ESD precautions are REQUIRED.
- Prevent overheating the work piece and die.
- Check die orientation prior to placement on PCB.
- DO NOT use excessive force to place the die nor to clean the work area.
- Use a hot air gun nozzle with diameter slightly larger than the largest die dimension.
- Soldering temperatures are critical and deviations in excess of ±10ºC can cause problems.
- Prevent blowing the die away with hot air gun.
- Always cure the flux (prevents dendrites).
- DO NOT over-voltage the die during testing.

3 ANTI-STATIC MEASURES

- Procedure must be done on an anti-static mat or bench that is connected to ground.
- Connect all test equipment to ground.
- ESD wrist strap and ESD lab coat MUST be worn.



4 PREPARE PCB FOR HEATING

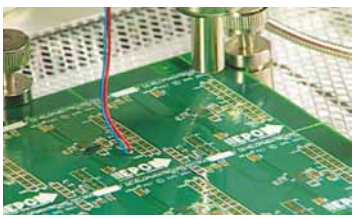
- Place the board on the heat plate.

5 CLEANING PAD AREA

- Clean die pad area with isopropyl alcohol and wipe with a lint free wipe.
- Allow the board to dry.
- Do not touch pad area with bare hands.

6 PRE-HEATING THE PCB

- Install and align the center of the hot air gun nozzle over the die pad area.
- Raise the hot air gun and turn it away from the work area.
- Do not to touch the work areas of the PCB.
- Place the temperature sensor of the heat plate onto the board.
- Turn on the heat plate and set to 150°C.
- Turn on the hot air gun. Set it to 150°C and near minimum airflow to prevent the die from being blown away.

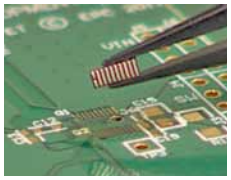


7 APPLYING FLUX

- Once the PCB reaches 150°C, apply a small amount of flux to the pads of the die area using an anti-static micro-spatula.
- Ensure that the flux flows in the required area and that there are NO flux-free areas around the pads.

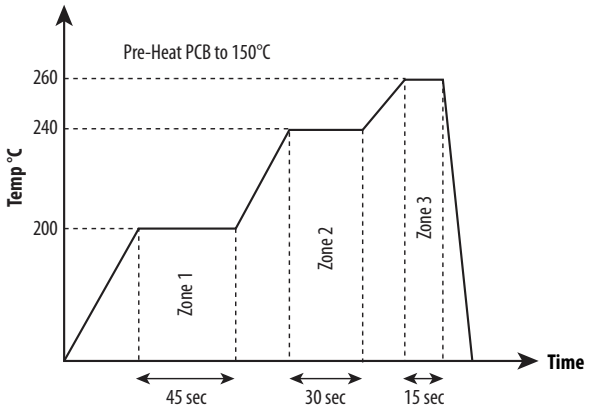
8 DIE ORIENTATION

- Check the orientation of the die to ensure correct connections.
- Place the die onto the pad area.
- Nudge the die to align with the pads and solder mask markings (where applicable).
- Move the microscope out of the way prior to soldering.



9 SOLDERING THE DIE

- Rotate air gun back to centrally align with the center of the die.
- Lower the hot air gun to approximately 1/16" (1.5mm) from the surface of the die.
- Set the temperature of the gun to 200°C and near minimum airflow for 45 seconds.
- ⚠ Warning: excessive airflow will move the die.
- Check the alignment of the die for shifting throughout this operation.
- Raise the gun temperature to 240°C. When it reaches temperature, hold for 30 seconds.
- Increase the gun temperature to 260°C. When it reaches temperature, hold for a minimum of 12 seconds and a maximum of 15 seconds.



10 REMOVE HOT AIR GUN

- After 12 seconds at 260°C slowly raise the air gun.
- Remove the air gun from the heat plate fixture (DO NOT turn it off, as most air guns will increase airflow to maximum to cool down, which will blow the die off the board.)
- Turn off air gun and return it to the hot air gun station holder. Do not point the air gun toward the die or PCB.
- ⚠ Warning: the work piece will be hot!

11 CURE FLUX/COOL DOWN/BOARD REMOVAL

- Leave the PCB on the heat plate for 30 minutes set at 150°C to cure the flux. Flux is cured when it is no longer sticky.
- ⚠ Warning: exercise caution around work-piece to prevent burning as items will be hot!
- Turn off the heat plate and allow the PCB to cool down to room temperature (about 15 minutes).
- Remove board and inspect.

12 VISUAL INSPECTION

- Check tackiness of flux around die using a clean anti-static micro spatula. Flux should be non-sticky and feel glass-like.
- Check that the die rests flat with respect to PCB using the microscope for magnification– tilted die could indicate bad soldering.
- Check for solder shorts around die – should be free of shorts between pads.
- Check for solder balls. Remove if found. This may indicate bad soldering so further inspection is recommended.
- Check for solder between the pads of die using the microscope – gaps indicate unacceptable die placement.
- Proceed to testing the board.

13 ELECTRICAL TEST: ALL BOARDS

- Using a digital multi-meter measure Drain (red-positive) to Source (black-negative) resistance (MΩ setting) – should be a high value (>1MΩ); a short (<1Ω) indicates either a bad die OR solder short under the die.
- Using a digital multi-meter measure Gate (red-positive) to Source (black-negative) resistance (Ω setting) – should be a high value (>100KΩ); a short (<1Ω) indicates either a bad die OR solder short under the die.

Additional Electrical Test: Fully Populated PCB

- Warning: verify the gate-driver circuit prior to attaching the die to prevent a possible reoccurrence of the failure.
- Connect an oscilloscope to the gate-source and verify the gate signal.
- Connect the probe to the drain source and verify that the FET responds to the gate signal.
- Main power may need to be applied to the board, if so, keep this voltage below 5 volts if possible.