



## DEVICE HANDLING RECOMMENDATIONS

GaAs FETs and MMICs are “Class 1” devices in terms of Electrostatic Discharge (ESD) sensitivity, by DOD-STD-1886 definition. **Handling these devices must at all times be done with ESD precautions.** It is very important that the work surface, assembly equipment and operator are properly grounded to prevent ESD damage to these devices.

GaAs chip devices are also brittle and easily damaged. Excelics recommends manual handling of die using clean and sharp tweezers (such as type 5SA) with excellent tip alignment. Automatic “pick and place” equipment or vacuum collect for pick up may also be used, but soft, conductive and grounded collects should be used. Shipping package opening as well as die assembly must only be performed in a work area with clean room environment. A work area of class 10,000 or lower is recommended to prevent contamination of exposed devices. Chip devices should be stored in clean dry Nitrogen gas environment at room temperature until required for assembly.

Excelics’ standard shipping containers are designed to provide a reasonable measure of protection from mechanical and ESD damages. For chip devices, our standard shipping packages are anti-static “Gel-Paks” in metallized bags. Packaged devices are shipped in either conductive tape and reel or conductive plastic boxes in metallized bags.

### Die Attach:

- 1.) Low thermal resistance and good mechanical/electrical integrity critically depends on a good die attach operation.
- 2.) For die attach on GaAs chip devices, Excelics recommends the “eutectic” die attach using Au/Sn (80/20) pre-forms. The die attach station must have accurate temperature control, and the operation should be performed with parts **no hotter than 300°C**. An inert forming gas (90% N<sub>2</sub>/10% H<sub>2</sub>) or clean/dry N<sub>2</sub> should be used.
- 3.) Place a package or carrier on the heated stage, pre-set at 290+/- 10°C. Then, place and melt a pre-form on it at the position where the chip device will be attached. Pick up the chip device by slightly grasping edges along its longer side using clean and sharp tweezers. Scrub the chip several times down onto the Au/Sn pre-form. The assembly with die should be removed from the heated stage immediately after the chip is positioned. (All circuit components, such as resistors and capacitors if required, should be die-attached prior to starting die attach for the chip devices.) No GaAs chip devices should be left at the eutectic temperature for over 2 minutes. For large devices with the chip dimension longer than 1000 um (40 mils), intermediate heating at 150°C on the chip or the assembly with the chip, before and after die attachment should be also implemented to prevent chip cracking caused by thermal shock.
- 4.) Use of conductive epoxy (gold or silver filled) may also be acceptable for die-attaching low power devices. Please consult the manufacturer’s directions for assembly and curing.

### Wire Bonding:

- 1.) The bonding equipment must be properly grounded, particularly for bonding tools.
- 2.) Excelics recommends thermo-compression wedge bonding by using 0.7 to 1 mil diameter gold wires. Our standard set-up is a West-bond Model 7400 with a wedge tool manufactured by Gaiser Tool Company (P/N 2M45-1505-L-TIC, W=0.002 or equivalent) and a tip force of 15 to 20 grams for 0.7 mil (or 20-25 grams for 1 mil) wire with 0.5 to 2% elongation. We generally uses a heater stage temperature of 220°C and a heated tip (wedge) temperature of 150°C. Ultrasonic bonding is not recommended. Please follow wire bonding diagrams recommended by Excelics on each device for optimum device performance.

### Solder Attach:

- 1.) The method described below should be used for soldering to all Excelics devices with surface-mount packages.
- 2.) Excelics recommends using a lowest possible temperature to flow a solder paste and form properly wetting fillets. To minimize thermal shock, the solder melt temperature should be maintained at surface-mount devices for the minimum practical time. Preheat at 5°C/second maximum rate and allow at least 2 minutes cool-down time. To prevent ESD damage, all fixtures and tools, particularly soldering-iron tips, should be properly grounded.
- 3.) For automatic solder re-flow process, Excelics recommends maximum peak temperature of 235°C and maximum duration of 30 seconds for temperature over 215°C.
- 4.) For manual soldering process, Excelics recommends maximum tip temperature for soldering-iron of 350°C and **maximum exposure duration of 3 seconds.**