# ATTACHMENT 2.
# ASSEMBLY FLOWCHART

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|---|---|
| **Vendor:** | Linear Technology Corporation |
| **Product:** | Bipolar or CMOS Process |
| **Package:** | MSOP Package |
| **Location of Wafer Fab:** | Linear Technology Corp., Milpitas, CA. / Camas, WA. |
| **Assembly:** | Penang-Malaysia, |
| **Final Test:** | Linear Technology Corp., Milpitas, CA., Singapore |
| **Q.C. Test** | Linear Technology Corp., Milpitas, CA., Singapore |
| **Source Accept Test:** | Linear Technology Corp., Milpitas, CA., Singapore |
| **Quality Contact:** | Dwight Somersett, LTC, Milpitas, CA.<br>(408) 432-1900 Ext. 2427 |

▽ INCOMING

⊡ QUALITY INSPECTION AND GATE

○ MANUFACTURING PROCESS

⯃ QUALITY MONITOR / SURVEILLANCE

□ REWORK

| FLOW CHART INCOMING ASSY REWORK | PROCESS STEP | DESCRIPTION | INSPECTION/ TEST CRITERIA | METHOD & EQUIPMENT | SAMPLING PLAN | SPC TECHNIQUE |
|---|---|---|---|---|---|---|
| ▽ ○ | WAFER SORT | 100% DIE LEVEL ELECTRICAL TEST REJECTS ARE INKED | | WAFER PROBER | | |
| ○ ⯃ | WAFER SORT MONITOR | MONITOR PROBING AND 2ND OPTICAL QUALITY | PROBE DEFECTS 2ND OPTICAL DEFECTS | 75X MICROSCOPE | MINIMUM OF 1 TIME PER SHIFT.<br>S/S = 1, ACC = 0 | LOG |
| ○ | KIT FOR OVERSEAS ASSEMBLY (N/A FOR PENANG) | WAFERS ARE KITTED WITH LTC BONDING DIAGRAM AND LTC ASSEMBLY TRAVELER | | | | |
| ○ | WAFER MOUNT | PREPARATION FOR DIE SEPERATION | VISUAL INSPECTION | UNAIDED EYE | 3 WAFERS/SHIFT<br>0 PPM TARGET | GO/NO GO INSPECTION |
| ○ ⯃ | WAFER MOUNT MONITOR | | | | | |
| ○ | WAFER SAW | DIE SEPERATION | ALIGNMENT ACCURACY | TV ALIGNMENT MICRO AUTOMATION OR DISCO SAW<br>10X TO 30X MICROSCOPE | EVERY WAFER LOT / MACHINE,<br>0 PPM TARGET | LOG |
| ○ | BACTERIA COUNT | BACTERIA CULTURE | 10 COL / 100 CC | BACTERIA CULTURE | 1X PER WEEK | LOG |
| ○ | SET-UP CHECK | INSPECTION | PER SPEC | VISUAL | EA WAFER LOT | LOG |
| | | BLADE LIFE | 45K IN SAW LINE | COUNT USAGE | N/A | LOG |
| | | SAW KERF | 1.0 TO 2.2 MILS | TM MICROSCOPE OR EQUIVALENT | ONCE PER SHIFT<br>4 CUTS PER MACHINE | nP CHART |
| ○ | PARAMETERS | PRESSURE, SPEED, CUT COUNT | PER SPEC | VISUAL | 1X PER SHIFT | LOG |
| ○ ⯃ | PARAMETERS | PRESSURE, SPEED, CUT COUNT | PER SPEC | VISUAL | 1X PER WEEK | LOG |
| ○ ⯃ | DI WATER QUALITY | RESISTIVITY | 12 M OHM MIN | RESISTIVITY METER | 1X PER WEEK | LOG |

| FLOW CHART INCOMING ASSY REWORK | PROCESS STEP | DESCRIPTION | INSPECTION/ TEST CRITERIA | METHOD & EQUIPMENT | SAMPLING PLAN | SPC TECHNIQUE |
|---|---|---|---|---|---|---|
| ○ | DIE SORT 2ND OPT | VISUAL INSPECTION | PER SPEC | 75X MICROSCOPE | YIELD TRIGGER 93.0% | LOG |
| ○—⯃ | DIE SORT BUY OFF | VISUAL INSPECTION | PER SPEC | 75X MICROSCOPE | 32 / LOT<br>ACC =Ø, REJ = 1 | LOG |
| ○ | DIE ATTACH | DIE BONDED WITH EPOXY | PER SPEC | AUTO DIE ATTACHER<br>20X MICROSCOPE | 1 STRIP/MAG<br>ACC = Ø, REJ = 1 | LOG |
| ○—⯃ | DIE PLACEMENT | VISUAL | PER SPEC | 20X TO 40X MICROSCOPE | 1 STRIP/WAFER LOT<br>ACC = Ø, REJ = 1 | LOG |
| ○—⯃ | DIE BACK CRACK | VISUAL | PER SPEC | 75X TO 200X MICROSCOPE | 4 UNITS/WAFER LOT<br>CHIPS, CRACKS | LOG |
| ○—⯃ | DIE ATTACH MONITOR | VISUAL QUALITY | DIE SHEAR TESTER | 30X TO 60X MICROSCOPE | 3 UNITS PER OVEN LOAD | nP CHART |
| ○—⯃ | RESIN BLEED | VISUAL | | 20X TO 40X MICROSCOPE | 2 STRIPS/OVEN/DAY<br>ZERO BLEED | LOG |
| ○—⯃ | EPOXY CURE | CURE TEMP | EPOXY CURE<br>+175°C +/-5°C | PYROMETER / TC | 1X/DAY | LOG |
| ○ | WIRE BOND | BALL BONDS | GOLD WIRE | AUTO THERMOSONIC BALL BONDER<br>20X TO 40X | 10 UNITS/LOT<br>ACC = Ø, REJ = 1 | LOG |
| ○ | SURVEILLANCE | VISUAL | PER SPEC | 20X TO 40X MICROSCOPE | 10 UNITS/MAG<br>ACC = Ø, REJ = 1 | LOG |
| ○ | PARAMETERS | VISUAL | PER SPEC | | 1X PER LOT | LOG |
| ○—⯃ | CAPILLARY LIFE | VISUAL | COUNT USAGE | | EVERY 6 SHIFTS (<800K BONDS) | |
| ○—⯃ | SET-UP | VISUAL | | 20X TO 40X MICROSCOPE | 10 UNITS / LOT<br>ACC = Ø, REJ = 1 | LOG |
| ○—⯃ | WIRE BOND MONITOR | WIRE PULL | 5GM(1MIL), 7GM (1.3MIL), 8GM(1.5 MIL), 12GM(2MIL), 15GM(3MIL) | BOND PULL TESTER | EACH LOT / CAP CHANGE (ALL WIRES) | X BAR R CHART |
| ○—⯃ | BALL SHEAR | VISUAL | 35GM(1MIL), 40GM (OTHER SIZES)GND BOND 60GM(1MIL) 80GM(1.3MIL), 120GM(1.5MIL) | BALL SHEAR TESTER | EACH LOT / CAP CHANGE (5 WIRES INCLUDING GND BONDS) | X BAR R CHART |
| ○—⯃ | PARAMETERS | VISUAL | (POWER, FORCE TIME, TEMP) | | 1X / DAY | LOG |
| ○—⯃ | BOND PEEL TEST | VISUAL | >25% AU REMAINING | 75X MICROSCOPE | 1 WIRE/MACH/DAY | LOG |
| ○—⯃ | BOND CRATER | VISUAL | NO CRATERING | 75X MICROSCOPE | 1X/MACH/DAY (10 UNITS) | LOG |
| ○ | 3RD OPTICAL INSPECTION | VISUAL INSPECTION | PER SPEC | 20X TO 40X MICROSCOPE | YIELD TRIGGER 95% | LOG |
| ⧇ | QA 3RD OPTICAL INSPECTION | CHECK FOR WORKMANSHIP QUALITY | PER SPEC | MIN 30X MICROSCOPE | 125 PER LOT<br>ACC = Ø, REJ = 1<br>(MRB>10%, 3X REJ) | LOG |

| FLOW CHART | | PROCESS STEP | DESCRIPTION | INSPECTION/ TEST CRITERIA | METHOD & EQUIPMENT | SAMPLING PLAN | SPC TECHNIQUE |
|---|---|---|---|---|---|---|---|
| INCOMING ASSY | REWORK | | | | | | |
| ○ | | MOLD - EPOXY NOVOLAC | ENCAPSULATION PARAMETERS | PER SPEC | VISUAL | 1X / SHIFT | CHECKLIST |
| ○ | | SURVEILANCE | VISUAL | PER SPEC | MIN 3X | 1 SHOT / LOT<br>ACC = 0, REJ = 1 | CHECKLIST |
| ○ | | TEMPERATURE | MOLD TEMP | +175°C +/- 5°C | PYROMETER | 1X/SHIFT/MACH/ MOLD CHANGE | X BAR R CHART |
| ○ | ⯃ | SURVEILLANCE | VISUAL | PER SPEC | 30X TO 40X MICROSCOPE | 6 STRIPS/MACH/ SHIFT/CONVERSION | |
| ○ | ⯃ | COMPOUND AGEING CHECK | VISUAL | AGE LIFE | VISUAL | 1X / SHIFT | |
| ○ | ⯃ | MISMATCH | OFFSET | <2.5MIL(SSOP) | TOOLMAKER'S | 1X/DAY/MC<br>4 UNITS/SHOT | LOG |
| ○ | ⯃ | PARAMETERS | PRESS, SPEED | PER SPEC | VISUAL | 1X / MACH / DAY<br>1X/DAY | LOG |
| ○ | ⯃ | MOLD QUALITY | XRAY VISUAL | SWEEP,VOIDS WIRE DEFECTS | SOFT XRAY | EVERY LOT 20 UNITS<br>ACC = 0, REJ = 1 | LOG |
| ○ | | POST MOLD CURE | TEMPERATURE | +175°C +/- 5°C<br>6 HOURS | PYROMETER | CONTINUOUS | |
| ○ | ⯃ | POST MOLD CURE MONITOR | TEMPERATURE | +175°C +/- 5°C<br>6 HOURS | PYROMETER | 1X/OVEN/DAY | |
| ○ | | SLURRY DEFLASH VISUAL | REMOVE MOLD FLASH FROM PACKAGE | PER SPEC | UNAIDED EYE | 2X/SHIFT/PKG CHANGE - 5 STRIPS<br>ACC = 0, REJ = 1 | LOG |
| ○ | ⯃ | DEFLASH MONITOR | PRESSURE | PER SPEC | PRESSURE GAGE | 2X/SHIFT/MACH | LOG |
| ○ | | MARKING | VISUAL INSPECTION | PER SPEC | UNAIDED EYE | 2 STRIPS/3X/SHIFT<br>ACC = 0, REJ = 1 | LOG |
| ○ | ⯃ | SET-UP CHECK | VISUAL | PER SPEC | | 1X / SHIFT | CHECKLIST |
| ○ | ⯃ | PERMANENCY | MARK PERMANENCY | 1 SOLUTION | UNAIDED EYE | 1 LOT/MACH/SHIFT<br>11 UNITS<br>ACC = 0, REJ = 1 | LOG |
| | | | | 3 SOLUTIONS | UNAIDED EYE | 1X/WEEK(11 UNITS/ SOLUTION<br>ACC = 0, REJ = 1 | |
| ○ | ⯃ | IR, VISCOSITY | VISUAL | PER SPEC | | 1X / SHIFT | nP CHART |
| ○ | | SOLDER PLATE INSPECTION | PARAMETERS | PER SPEC | UNAIDED EYE | 1X/PKG/SHIFT | LOG |
| ○ | ⯃ | | THICKNESS AND COMPOSITION | 300 - 800 u INCH<br>85% ±10% | XRF | 1X/SHIFT/MACH/ CHANGE OF SOLDER BATH - MIN OF 10 READINGS | nP CHART |
| ○ | ⯃ | | SOLDERABILITY (W&WO AGING) | 95% COVERAGE | 20X TO 40X MICROSCOPE | 1X / SHIFT<br>10 UNITS | LOG |
| ○ | ⯃ | | PACKAGE CLEANLINESS | 1.7 μG/INCH SQUARED | IONOGRAPH | 3 LOTS / SHIFT<br>3 TESTS / LOT | LOG |

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|---|---|---|---|---|---|---|
| ⧇ | SOLDER PLATE BUYOFF | VISUAL | SOLDER QUALITY ETC | 3X TO 10X MICROSCOPE | S/S = 125<br>ACC = 0, REJ = 1 | LOG |
| ○ | TRIM & FORM SINGULATION | SET-UP CHECK | PER SPEC | UNAIDED EYE | 5 UNITS / SHIFT<br>2 UNITS / LOT<br>ACC = 0, REJ = 1 | CHECKLIST |
| ○—⯃ | | COPLANARITY<br>LEAD SPREAD<br>STANDOFF | PER SPEC | COMPARATOR | 1X / DAY / MACH<br>5 UNITS | nP CHART |
| ○—⯃ | | LEAD FATIGUE | PER SPEC | LEAD TESTER | 1X / WK / MACH<br>2 LEADS | LOG |
| ⧇ | CRACK / GAP BUYOFF | VISUAL | PER SPEC | 30X TO 45X MICROSCOPE (SINGULATED) | 45 / LOT / CONVERSION 200/1ST LOT OF SHIFT<br>ACC = 0, REJ = 1 | LOG |
| ⧇ | DELAMINATION/ CRACK | VISUAL | PER SPEC | SCANNING ACOUSTIC MICROSCOPE (STRIP FORM) | MIN 2 LOTS/SHIFT/ MACHINE<br>ACC = 0, REJ = 1 | LOG |
| ○ | DEJUNK | SET-UP CHECK | PER SPEC | UNAIDED EYE | 5 UNITS / SHIFT<br>2 UNITS / LOT<br>ACC = 0, REJ = 1 | LOG |
| ○—⯃ | | VISUAL | PER SPEC | 30X TO 40X MICROSCOPE | 45 UNITS HOURLY/ CONVERSION 100 UNITS/1ST LOT OF SHIFT<br>ACC = 0, REJ = 1 | LOG |
| ○ | FINAL VISUAL INSPECTION | VISUAL QUALITY | PER SPEC | UNAIDED EYE | 100% - YIELD TRIGGER 95.0% | LOG |
| ○—⯃ | QA FINAL VISUAL INSPECTION | CORRECT MARK, MARKING PERMANENCY TEST (IF INK MARKED)<br>VISUAL:<br>BENT LEADS<br>MOLD FLASH, SOLDER QUALITY ETC | PER SPEC | UNAIDED EYE | S/S = 125<br>ACC = 0, REJ = 1 | LOG |
| ○—⯃ | QA PACK & DOCUMENTATION CHECK | PACKING & PREPERATION FOR DELIVERY | PER SPEC | UNAIDED EYE | 5 TUBES<br>ACC = 0, REJ = 1 | LOG |
| ○ | SHIP TO LTC | ANTISTATIC TUBES | | | EVERY LOT<br>100% BASIS | |