CAL EEE Parts Qualification and Screening

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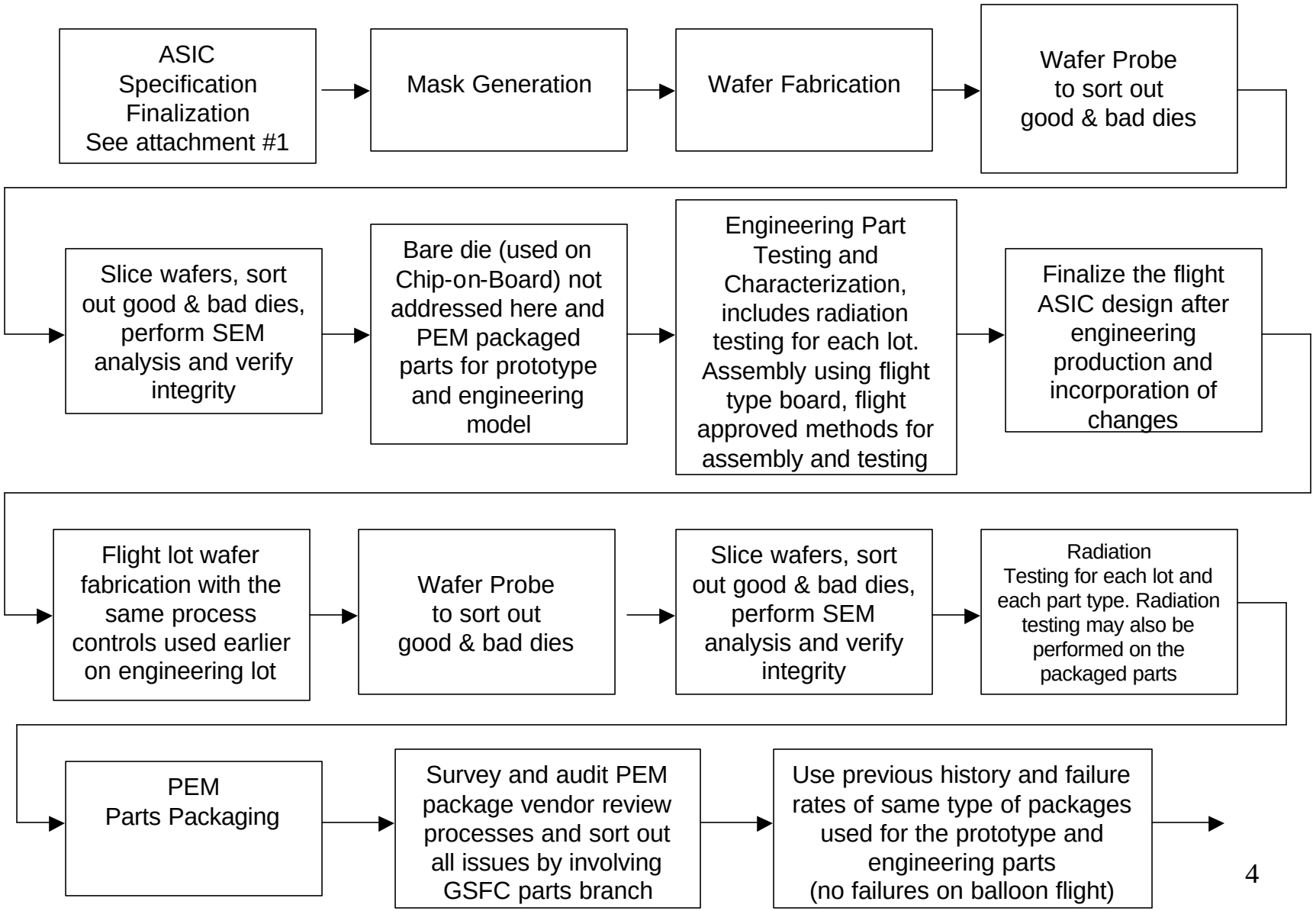
Primary PEM Part Issues for LAT Program

- High quantity of Plastic Encapsulated Microcircuits (PEMs) parts (ADC, ASICs, DAC) from 600 to 6000 each type with fine pitch leads.
- All parts use 3.3 volts and consumes no more than 10 milliwatts of power.
- Thin and small packages, 12x12x1.2mm to 25x25x2.0mm, 44 pin, 80 pin, 160 pin, Thin Quad Flat Package (TQFP).
- Thin Copper Fragile leads
- Fine pitch from 0.015 to 0.020 mils
- Thin encapsulation
- Encapsulation interface at leads is very sensitive and excess handling damage will open cavity for moisture ingress.
- 100% parts testing prior to mounting on board involves multiple handling during functional testing (5x), thermal cycling, burn-in, visual inspection, CSAM, etc. Multiple handling will cause damage to PEMs prior to assembling parts.
- Above processes will create a failure site leading to failure mechanisms.
- Cost of burn-in sockets and individual part testing is very high.
- LAT Instrument/subsystems are exposed to benign environment and –30 degrees C to +60 degrees C temperature.

Risk Mitigation of PEM Parts

- Risk assessment, mitigation and management which involves:
  - Candidate Parts Selection
  - Manufacturer Assessment
  - Part Assessment
  - Determine Environments
  - Performance Assessment
  - Reliability Assessment
  - Assembly Assessment
  - Life Cycle Assessment

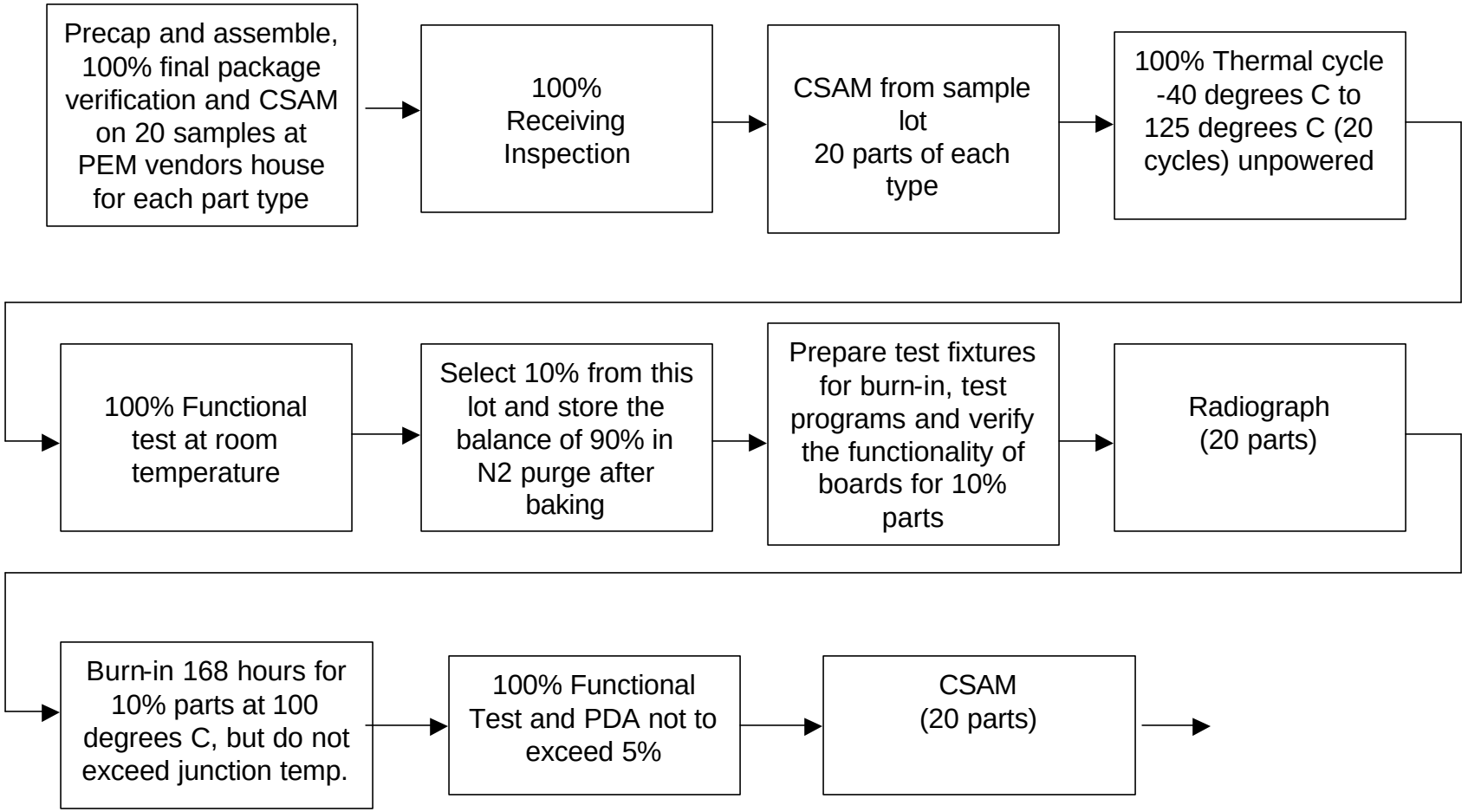
Application Specific Integrated Circuits (ASICs) Major Process Flow



PEM (ASICs, ADC, DAC) Screening Flow

Single Wafer Lot and Single Manufacturing Lot

LAT instrument requirement Qual –30 degrees C to +60 degrees C, acceptance -20 to +40 degrees C, operational +25 degrees C, Radiation testing TID – 2K (5 x 2K), SEU 8 mev/mg/cm2 (8 x 10), Humidity not to exceed 45%, and 100% GSFC Electrical, Parts Branch, GLAST Program Management Involvement



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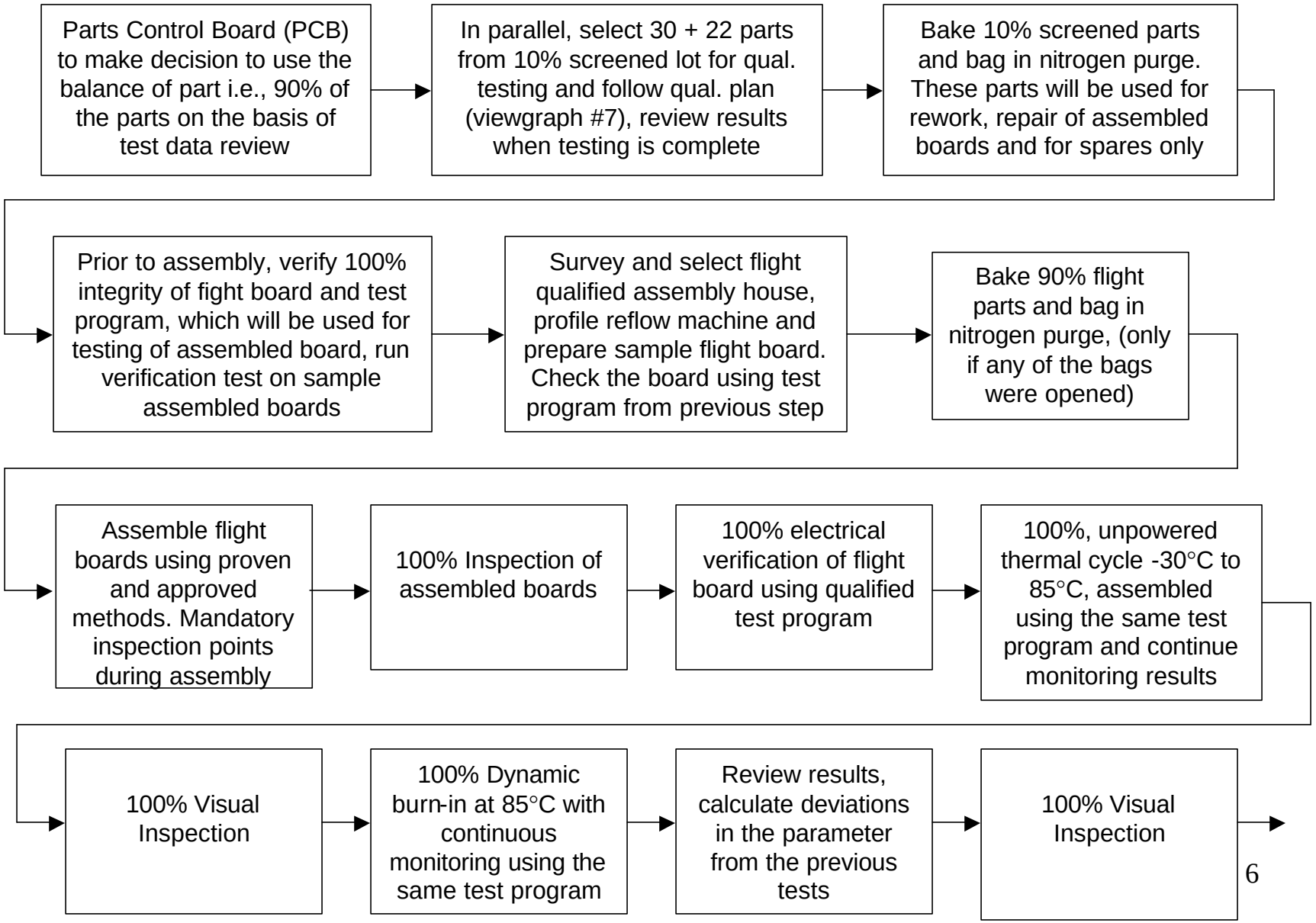

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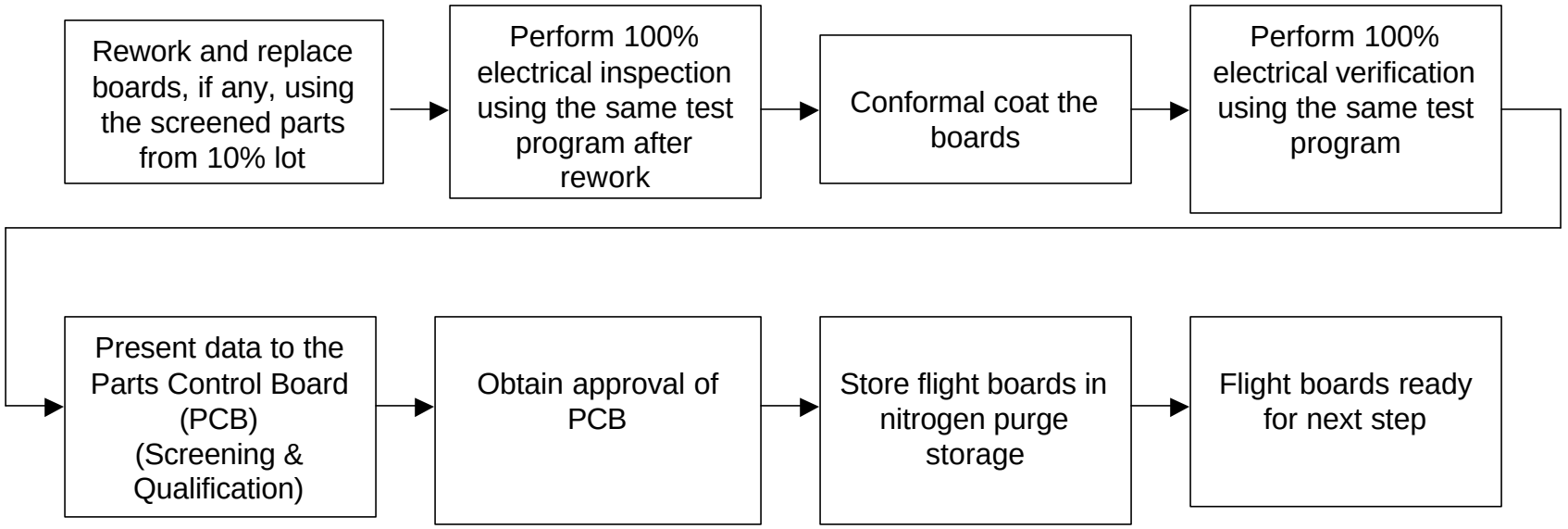

PEM Qualification on 30 + 22 Parts from Screened Lot Includes

- Preconditioning for moisture intake and reflow simulation (30pcs)
- Highly Accelerated Stress Test (HAST) (30pcs)
  - Unbiased HAST – 168 hrs at maximum temperature the part can operate and 85% RH
  - Electrical Testing
- C-Mode Scanning Acoustic Microscope (CSAM) as per IPC/JEDEC, J-035 (15pcs).
- Destructive Physical Analysis (5pcs)
- Operation Life Test
  - As per MIL-STD-883, method 1005, condition D, 1000 hrs 22 pieces from flight screening lot.
- Electrical Testing
- Review data with Parts Control Board