Project Summary:

Failure Analysis of LEDs

When a major cell phone manufacturer was trying to discover the cause of elevated leakage current in backlight LEDs, it asked DfR Solutions to perform failure analysis testing. After testing by using electrical characterization, SQUID microscopy, and optical microscopy, the failure site was indicated to be on the LED die on the edge of the mesa structure. This suggested that threading dislocations and/or insufficient passivation caused this type of LED failure. DfR Solutions recommended further testing to identify which exact mechanism was causing the failures so that the cell phone manufacturer could correct the design flaws that were causing this elevated leakage current.

Keywords: LED, mobile phone, cell, cellular, failure analysis, threading dislocation density, insufficient SiO_2 passivation layer, failure mode, discoloration, elevated leakage current, construction analysis, light emitting diode, temperature humidity bias qualification testing, voltage-current behavior, electrical characterization, P-metal metallization, mesa structure, micropipes, nanopipes, glass passivation, microcrack, deposition, wire bonding, prepared surface, GMR, giant magnetoresistance, AFM, atomic force microscopy, SCM, scanning capacitance microscopy, TEM, transmission electron microscopy, x-ray diffraction