Pre-Qualification Testing Description

TSMC-GEL01B

This document details a GE-internal testing procedure for validation of the “blind-package” test ICs sent from OSE. After pre-qualification, a similar testing procedure (in addition to the standard tests for bonding/package contacts, ESD devices, and shorts to VDD or GND) will be developed with OSE for production testing. The first lot of parts could then be packaged & tested by OSE with statistical results sent to GEL prior to final production plans.

Note: Pins S1, S2, REF, GND, FB, DIM, DET, VDD = pins 1-8, respectively, per data sheet description

Key Parameters for Testing:

- Supply Current: \((I_{VDD})_{\text{MAX}} = 920\mu A \pm 20\%\)
- Pre-heat Time: \(t_{PH} = 950\text{ms} \pm 20\%\) (or 7.42ms with \(V_{FB}=5\text{V}\))
- Lamp Detection: \(I_{DET} = 500\mu A \pm 15\%\)
- 3-Way Input Detection: \(I_{3\text{way}} = 1\text{mA} \pm 20\%\)
- 3-Way Reference Settings: \(\{100\%, 41.5\%, 19\%\} \pm 15\%\)

Note: By testing the above parameters via the procedure below, functional operation of all internal blocks is also verified.

Test Setup:

A simple test board schematic is shown below and referenced in the testing procedure. The required equipment is also given below:

- 3 Voltage sources
  - 5V Supply (connect to Vdd1 & Vdd2)
  - Variable 0V-5V input
  - Fine-scale current input (100µA to mA range): V-source w/ fine-tune current limit or variable 0.5V with multimeter for fine current sensing
- Scope: monitor \(V_{DIM}\) (0-5V, 10ms time scale)
- Function generator (used for 80% duty cycle 5V square wave, ~65Hz)
- Multimeters
  - Sense supply current \(I_{Vdd1}\) (100µA to mA range), and \(V_{DIM}\)
Testing Procedure:

All: Vdd1=Vdd2=5V; Record V_REF

1. Supply Current:
   • Setup: J1-J4 closed; J5: open
   • Record: I_Vdd1
   • Spec: (I_VDD)_MAX = 920uA +/-20%

2. Pre-Heat Time:
   • Setup: J5 closed; J1-J4: open
   • Setup: Connect function generator to R3 at J3 (input current into DET), setup for 0-5V square wave, 65Hz, 80% duty cycle; connect scope to pin 6 (DIM), ~1V/div; ~5ms/div
   • Single trigger V_DIM ~ 0.5V, measure & record time interval with V_DIM ~ 0V
   • Spec: t_PH = 7.4ms +/-20%

3. Lamp Detection:
   • Setup: J5 closed; J1-J4: open
   • Setup: Connect variable current limit source to R3 at J3 (input current into DET), or voltage source & sense output current, 100uA to mA range
   • Increase current into pin 7 (I_7) to detect threshold current when V_DIM transitions 0V to >1V (from preheat to normal modes)
   • Record threshold: I_DET
   • Spec: I_DET = 500uA +/-15%

4. 3-Way Reference:
   • Setup: J3 closed; J1, J2, J4, J5: open
   • Setup: Connect variable voltage supply to V_FB (pin 5), start at 5V (Vdd)
   • Setup: Connect variable current supply (or V-supply w/ current sense) to R2 at J2 (input current into S2), start at 0uA.
   • Decrease V_FB while monitoring V_DIM for transition from ~1.2V to 5V
   • Record: V_HIGH at threshold
   • Spec: V_HIGH = V_REF +/-15%
   • Set V_FB such that V_DIM = 5V (i.e. V_FB = 0.8V)
   • Increase variable current into S2 while monitoring V_DIM for transition from 5V to ~1.2V
   • Record: I_3way at threshold
   • Spec: I_3way = 1mA +/-20%
   • Set current source into S2 such that V_DIM = ~1.2V (i.e. 1.5mA)
   • Decrease V_FB while monitoring V_DIM for transition from ~1.2V to 5V
   • Record: V_LOW at threshold
   • Spec: V_LOW = 0.19*V_REF +/-15%

Notes:
   • Operating mode can be determined at the DIM pin:
     o V_DIM < 1V → Pre-Heat Mode
     o V_DIM > 1V → Normal Mode
   • TEMPERATURE:
     o Above tests to be performed in 10 deg increments from –25 deg C to 120 deg C