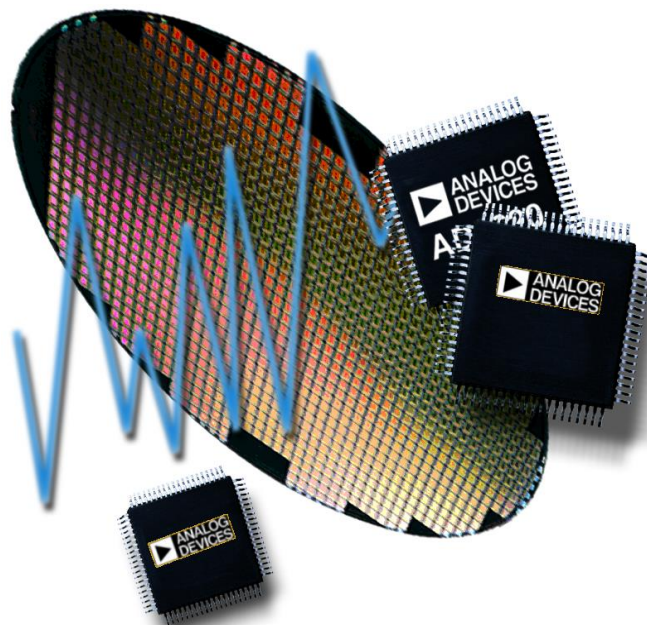




# ***Reliability Report***

|                       |                                                  |
|-----------------------|--------------------------------------------------|
| <b>Report Title:</b>  | <b>LTM4680 Material Set Change Qualification</b> |
| <b>Report Number:</b> | <b>20170</b>                                     |
| <b>Revision:</b>      | <b>A</b>                                         |
| <b>Date:</b>          | <b>09 March 2025</b>                             |

## Summary

This report documents the successful completion of the reliability qualification requirements for the release of the PMU9175 Alpha Omega MOSFET used in LTM4680 product, in a 144-CSP\_BGA package. The LTM4680 is a Dual 30A or Single 60A step-down  $\mu$ Module Regulator.

## Package/Assembly Product Characteristics

**Table 1: Package/Assembly Product Characteristics - 144-CSP\_BGA at ADI Penang**

| Product Characteristics         | Product(s) to be qualified |
|---------------------------------|----------------------------|
| Generic/Root Part #             | LTM4680                    |
| Package                         | 144-CSP_BGA                |
| Body Size (mm)                  | 16.00 x 16.00 x 7.82       |
| Assembly Location               | ADI Penang                 |
| MSL/Peak Reflow Temperature(°C) | 4 / 245                    |
| Mold Compound                   | Sumitomo G311E             |
| Substrate Material              | BT Resin                   |
| Terminal Finish                 | 96.5Sn_3.0Ag_0.5Cu         |
| Solder Ball Size (mm)           | 0.76                       |

## Qualified Components

| ADI P/N     |
|-------------|
| SE006915-01 |

## LTM4680 Test Results

**Table 2: LTM4680 Test Results**

| Test Name                                                                   | Spec        | Conditions                              | Generic/Root Part # | Lot #                          | Fail/SS |
|-----------------------------------------------------------------------------|-------------|-----------------------------------------|---------------------|--------------------------------|---------|
| Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>1</sup> | JESD22-A110 | 110C 85%RH 17.7 psia, Biased, 264 hours | LTM4680             | Q20170.2BHAST2mil <sup>2</sup> | 0/25    |
|                                                                             |             |                                         |                     | Q20170.3.HAST <sup>2</sup>     | 0/25    |
|                                                                             |             | 130C 85%RH 33.3 psia, Biased, 96 Hours  |                     | Q21402.1.3BHAST                | 0/25    |
|                                                                             |             |                                         |                     | EO9056K.RCM                    | 0/25    |
|                                                                             |             |                                         |                     | EO9091K.RCM                    | 0/25    |
| High Temperature Operating Life (HTOL)                                      | JESD22-A108 | Ta=125°C, Biased, 1,000 Hours           | LTM4680             | Q20170.1HTOL <sup>2</sup>      | 0/77    |
|                                                                             |             |                                         |                     | Q20170.3.HTOL <sup>2</sup>     | 0/77    |
|                                                                             |             |                                         |                     | 948472.1                       | 0/77    |
| High Temperature Storage Life (HTSL)                                        | JESD22-A103 | 150°C, 1,000 Hours                      | LTM4680             | Q20170.1HTS <sup>2</sup>       | 0/45    |
|                                                                             |             |                                         |                     | EO9056F.HTS                    | 0/45    |
|                                                                             |             |                                         |                     | EO9091F.HTS                    | 0/45    |
|                                                                             |             |                                         |                     | EO9157F.HTS                    | 0/45    |
| Power Cycle                                                                 | JESD22-A122 | Tj=25°C to 80°C, Biased, 50,000 Cycles. | LTM4680             | Q20170.1PC <sup>2</sup>        | 0/8     |
| Solder Heat Resistance (SHR)                                                | J-STD-020   | MSL-4                                   | LTM4680             | Q20170.2SHR4_2mil <sup>2</sup> | 0/77    |
| Temperature Cycling (TC) <sup>1</sup>                                       | JESD22-A104 | -55°C/+125°C, 1,000 Cycles              | LTM4680             | Q20170.1TC <sup>2</sup>        | 0/77    |
|                                                                             |             |                                         |                     | Q20170.2TC2mil <sup>2</sup>    | 0/77    |
|                                                                             |             |                                         |                     | Q21402.1.TC                    | 0/77    |
| Unbiased HAST (UHST) <sup>1</sup>                                           | JESD22-A118 | 110C 85%RH 17.7 psia, 264 Hours         | LTM4680             | Q20170.1UHAST <sup>2</sup>     | 0/77    |
|                                                                             |             | 130C 85%RH 33.3 psia, 96 Hours          |                     | Q20170.2UHAST2mil <sup>2</sup> | 0/77    |
|                                                                             |             |                                         |                     | EO9056K1.UHAST                 | 0/77    |
|                                                                             |             |                                         |                     | EO9091K1.UHAST                 | 0/77    |
|                                                                             |             |                                         |                     | EO9398K1.UHAST                 | 0/77    |

<sup>1</sup> These samples were subjected to preconditioning (per J-STD-020 Level 4) prior to the start of the stress test. Level 4 preconditioning consists of the following: Bake: 48 hrs @ 125°C, Unbiased Soak: 96 hrs @ 30°C, 60%RH, Reflow: 3 passes through an oven with a peak temperature of 245°C.

<sup>2</sup> Stress test with PMU9175 MOSFET

## ESD and Latch-Up Test Results

**Table 3: ESD Test Result**

| ESD Model | Generic/Root Part #  | Package     | ESD Test Spec | RC Network   | Highest Pass Level | Class |
|-----------|----------------------|-------------|---------------|--------------|--------------------|-------|
| FICDM     | LTM4680 <sup>1</sup> | 144-CSP_BGA | JS-002        | 1Ω, Cpkg     | ±1250V             | C3    |
| HBM       | LTM4680 <sup>1</sup> | 144-CSP_BGA | JS-001        | 1.5kΩ, 100pF | ±4000V             | 3A    |

**Table 4: Latch Up Test Result**

| LU Test Spec | Generic/Root Part #  | Passing Current | Passing Over-Voltage      | Temperature (T <sub>A</sub> ) | Class |
|--------------|----------------------|-----------------|---------------------------|-------------------------------|-------|
| JESD78       | LTM4680 <sup>1</sup> | +100mA, -100mA  | +3.75V/+4.95V/+8.65V/+24V | 25°C                          | I.A   |

<sup>1</sup> Stress test with PMU9175 MOSFET

## Approvals

Reliability Engineer: Lay Yong Ong