

# Thermal Measurement Report

DATE: 5/8/96  
revised 11/18/96

Package Description: Package: 240 32 x 32 mm QFP  
Die Down  
Flag: 10.6 mm Square  
Leadframe: SIDN 1234625  
Die Attach: JMI 2500AN  
Mold Compound: Sumitomo 7304LC  
Assembled: ANAM  
Die: PST6 - 10.16 mm Square

Junction to Ambient Thermal Resistance or Theta JA ( $R_{JA}$ ) was measured per SEMI Test Method G38-87 at 1.5 watts in a horizontal configuration. The test board conforms to EIA/JESD 51-3; it is a single layer 115x102 mm board designed to test 0.5 mm pitch QFP packages from 208 to 304 leads. The trace width is 0.24 mm, trace thickness is 0.076 mm. Sample size was 5.

| Convection | Theta JA Average<br>°C/watt | Standard Deviation<br>°C/watt | Theta JA Ave + 3 Std. Dev.<br>°C/watt |
|------------|-----------------------------|-------------------------------|---------------------------------------|
| Natural    | 31.0                        | 0.08                          | 31.3                                  |
| 100 ft/min | 27.7                        | 0.18                          | 28.3                                  |
| 200        | 26.1                        | 0.1                           | 26.4                                  |
| 400        | 23.7                        | 0.34                          | 24.7                                  |
| 800        | 19.9                        | 0.11                          | 20.2                                  |

"Thermal resistance" from junction to a thermocouple on top center of case, previously titled Theta J-Ref ( $R_{JR}$ ), was been renamed by the industry standard committee JEDEC JC15.1 as  $R_{JT}$  and defined in EIA/JESD51-2. It is a useful value to use to estimate junction temperature in steady state customer environments.

| Convection | JT Average<br>°C/watt | Standard Deviation<br>°C/watt |
|------------|-----------------------|-------------------------------|
| Natural    | 1.9                   | 0.09                          |
| 100 ft/min | 2.3                   | 0.06                          |
| 200        | 2.5                   | 0.04                          |
| 400        | 3.1                   | 0.08                          |
| 800        | 3.9                   | 0.1                           |



Junction to case thermal resistance, Theta JC ( $R_{JC}$ ), was measured using the cold plate technique with the cold plate temperature used as the "case" temperature. The reference specifications are MIL-STD 883D, Method 1012.1 and SEMI G30-88. Sample size was 5.

| Theta JC<br>Average<br>°C/watt | Standard<br>Deviation<br>°C/watt | Theta JC<br>Ave + 3 Std. Dev.<br>°C/watt |
|--------------------------------|----------------------------------|--|
| 8.9                            | 0.07                             | 9.1                                      |

Junction to board thermal resistance Theta JB ( $R_{JB}$ ) was measured using a cold plate technique with the cold plate in thermal contact with the bottom of the printed circuit board. The board temperature was measured with a thermocouple soldered to a center lead along one side of the package where the lead was soldered to the board. The measurement was taken using the 4 conductor layer printed circuit board described below. Sample size is 5.

| Theta JB<br>Average<br>°C/watt | Standard<br>Deviation<br>°C/watt | Theta JB<br>Ave + 3 Std. Dev.<br>°C/watt |
|--------------------------------|----------------------------------|--|
| 18.8                           | 0.19                             | 19.4                                     |

Junction to Ambient Thermal Resistance (Theta JA) was also measured on a four layer test board. The test board was a 115x102 mm board designed to test 0.5 mm pitch QFP packages from 208 to 304 leads with two solid internal plane of 1 oz nominal thickness (0.033 mm thick). The trace pattern on the component side had a trace width of 0.231 mm, trace thickness of 0.0715 mm. Sample size was 5.

**Do Not Use this data without special footnote indicating that the results were measured on a board with two solid internal planes.**

| Convection | Theta JA<br>Average<br>°C/watt | Standard<br>Deviation<br>°C/watt | Theta JA<br>Ave + 3 Std. Dev.<br>°C/watt |
|------------|--------------------------------|----------------------------------|--|
| Natural    | 26.1                           | 0.11                             | 26.4                                     |
| 100 ft/min | 23.8                           | 0.13                             | 24.2                                     |
| 200        | 22.8                           | 0.13                             | 23.2                                     |
| 400        | 21.3                           | 0.19                             | 21.9                                     |
| 800        | 18.6                           | 0.16                             | 19.1                                     |

SEMI specifications are available from Semiconductor Equipment and Materials International at (415) 964-5111.

MIL-SPEC and EIA/JESD (JEDEC) specifications are available from Global Engineering Documents at 800-854-7179 or 303-397-7956.



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 480-768-2130

[support@freescale.com](mailto:support@freescale.com)

**Europe, Middle East, and Africa:**

Freescale Halbleiter Deutschland GmbH  
 Technical Information Center  
 Schatzbogen 7  
 81829 Muenchen, Germany  
 +44 1296 380 456 (English)  
 +46 8 52200080 (English)  
 +49 89 92103 559 (German)  
 +33 1 69 35 48 48 (French)  
[support@freescale.com](mailto:support@freescale.com)

**Japan:**

Freescale Semiconductor Japan Ltd.  
 Headquarters  
 ARCO Tower 15F  
 1-8-1, Shimo-Meguro, Meguro-ku  
 Tokyo 153-0064, Japan  
 0120 191014  
 +81 2666 8080  
[support.japan@freescale.com](mailto:support.japan@freescale.com)

**Asia/Pacific:**

Freescale Semiconductor Hong Kong Ltd.  
 Technical Information Center  
 2 Dai King Street  
 Tai Po Industrial Estate,  
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**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.