

Integrated Quad Half-Bridge and Triple High-Side with Embedded MCU and LIN for High End Mirror

Thermal Addendum

Introduction

This thermal addendum is provided as a supplement to the MM908E621 technical data sheet. The addendum provides thermal performance information that may be critical in the design and development of system applications. All electrical, application and packaging information is provided in the data sheet.

Package and Thermal Considerations

This MM908E621 is a dual die package. There are two heat sources in the package independently heating with P_1 and P_2 . This results in two junction temperatures, T_{J1} and T_{J2} , and a thermal resistance matrix with $R_{\theta JA mn}$.

For $m, n = 1$, $R_{\theta JA 11}$ is the thermal resistance from Junction 1 to the reference temperature while only heat source 1 is heating with P_1 .

For $m = 1, n = 2$, $R_{\theta JA 12}$ is the thermal resistance from Junction 1 to the reference temperature while heat source 2 is heating with P_2 . This applies to $R_{\theta J 21}$ and $R_{\theta J 22}$, respectively.

$$\begin{Bmatrix} T_{J1} \\ T_{J2} \end{Bmatrix} = \begin{bmatrix} R_{\theta JA 11} & R_{\theta JA 12} \\ R_{\theta JA 21} & R_{\theta JA 22} \end{bmatrix} \cdot \begin{Bmatrix} P_1 \\ P_2 \end{Bmatrix}$$

The stated values are solely for a thermal performance comparison of one package to another in a standardized environment. This methodology is not meant to and will not predict the performance of a package in an application-specific environment. Stated values were obtained by measurement and simulation according to the standards listed below.

Standards

Table 1. Thermal Performance Comparison

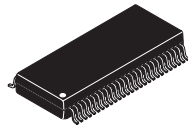
Thermal Resistance	1 = Power Chip, 2 = Logic Chip [$^{\circ}\text{C}/\text{W}$]		
	$m = 1, n = 1$	$m = 1, n = 2$ $m = 2, n = 1$	$m = 2, n = 2$
$R_{\theta JA mn}$ ⁽¹⁾⁽²⁾	23	20	24
$R_{\theta JB mn}$ ⁽²⁾⁽³⁾	9.0	6.0	10
$R_{\theta JA mn}$ ⁽¹⁾⁽⁴⁾	52	47	52
$R_{\theta JC mn}$ ⁽⁵⁾	1.0	0	2.0

Notes:

1. Per JEDEC JESD51-2 at natural convection, still air condition.
2. 2s2p thermal test board per JEDEC JESD51-7 and JESD51-5.
3. Per JEDEC JESD51-8, with the board temperature on the center trace near the power outputs.
4. Single layer thermal test board per JEDEC JESD51-3 and JESD51-5.
5. Thermal resistance between the die junction and the exposed pad, "infinite" heat sink attached to exposed pad.

908E621ACDWB

54-TERMINAL
SOICW-EP



DWB SUFFIX
98ARL105910
54-TERMINAL SOICW-EP

Note For package dimensions, refer to the 908E621 device datasheet.

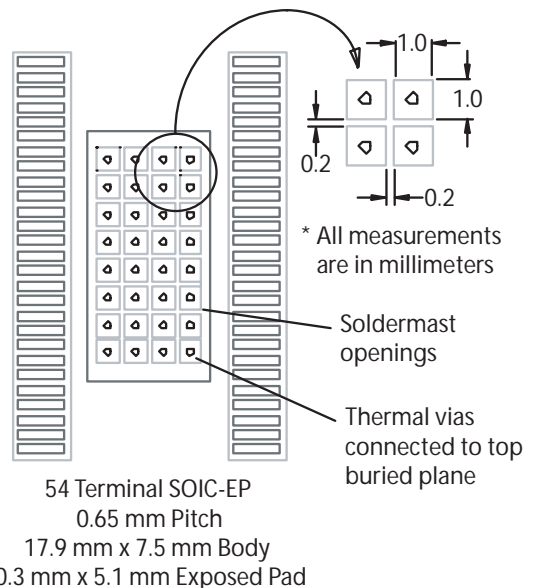


Figure 1. Thermal Land Pattern for Direct Thermal Attachment Per JEDEC JESD51-5

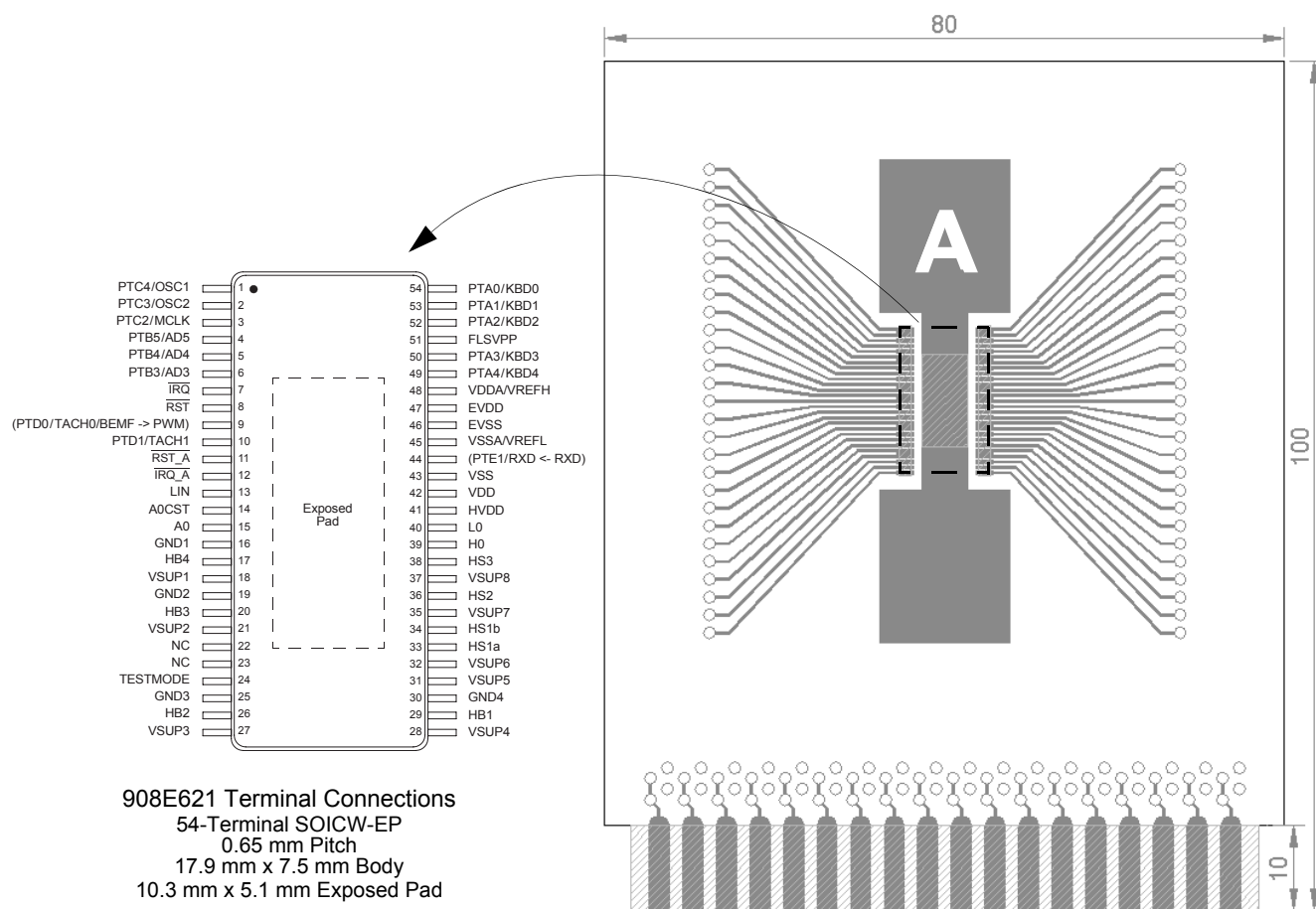


Figure 2. Thermal Test Board

Device on Thermal Test Board

- Material: Single layer printed circuit board
FR4, 1.6 mm thickness
Cu traces, 0.07 mm thickness
- Outline: 80 mm x 100 mm board area,
including edge connector for
thermal testing
- Area A: Cu heat-spreading areas on board
surface
- Ambient Conditions: Natural convection, still air

Table 2. Thermal Resistance Performance

Thermal Resistance	Area A (mm ²)	1 = Power Chip, 2 = Logic Chip (°C/W)		
		m = 1, n = 1	m = 1, n = 2 m = 2, n = 1	m = 2, n = 2
R _{θJA} <i>mn</i>	0	53	48	53
	300	39	34	38
	600	35	30	34
R _{θJS} <i>mn</i>	0	21	16	20
	300	15	11	15
	600	14	9.0	13

R_{θJA} is the thermal resistance between die junction and ambient air.

R_{θJS}*mn* is the thermal resistance between die junction and the reference location on the board surface near a center lead of the package (see Figure 2)

This device is a dual die package. Index *m* indicates the die that is heated. Index *n* refers to the number of the die where the junction temperature is sensed.

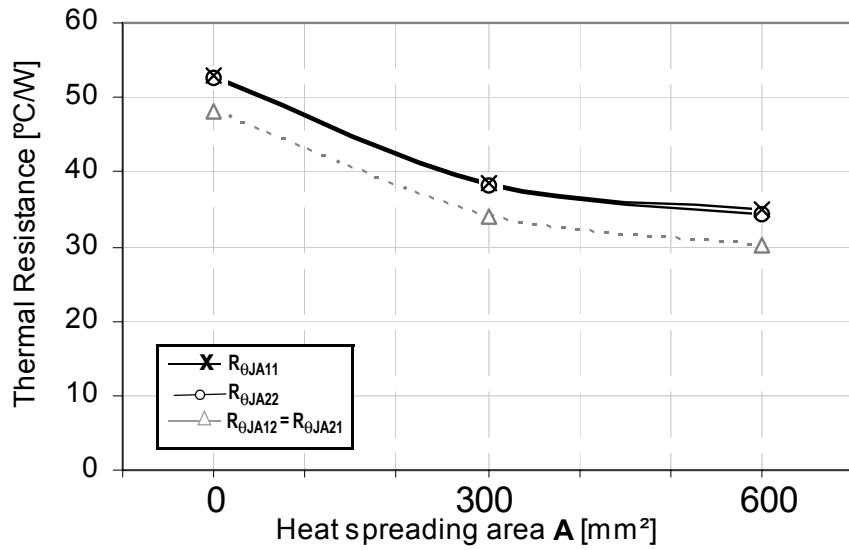


Figure 3. Device on Thermal Test Board R_{θJA}

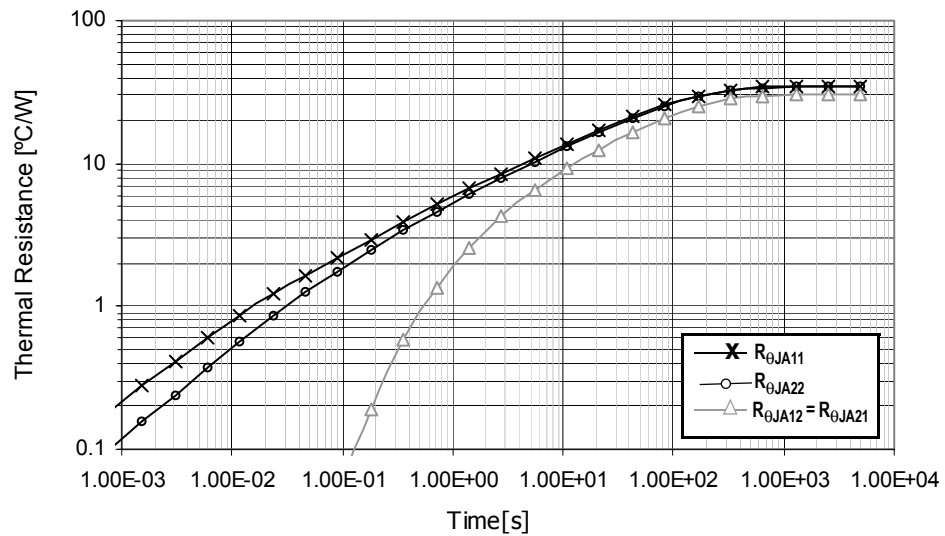


Figure 4. Transient Thermal Resistance R_{θJA} (1.0 W Step Response)
Device on Thermal Test Board Area A = 600 (mm²)

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