

# 16-Output Switch with SPI Control

## Thermal Addendum

### Introduction

This thermal addendum is provided as a supplement to the MC33996 technical datasheet. 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 datasheet.

### Packaging and Thermal Considerations

The MC33996 is offered in a 32 pin SOICW exposed pad, single die package. There is a single heat source (P), a single junction temperature (T<sub>J</sub>), and thermal resistance (R<sub>θJA</sub>).

$$\{ T_J \} = [ R_{\theta JA} ] \cdot \{ P \}$$

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 Comparisons

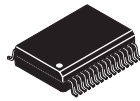
Thermal Resistance	[°C/W]
R <sub>θJA</sub> (1), (2)	29
R <sub>θJB</sub> (2), (3)	9.0
R <sub>θJA</sub> (1), (4)	69
R <sub>θJC</sub> (5)	2.0

Notes:

- Per JEDEC JESD51-2 at natural convection, still air condition.
- 2s2p thermal test board per JEDEC JESD51-5 and JESD51-7.
- Per JEDEC JESD51-8, with the board temperature on the center trace near the center lead.
- Single layer thermal test board per JEDEC JESD51-3 and JESD51-5.
- Thermal resistance between the die junction and the exposed pad surface; cold plate attached to the package bottom side, remaining surfaces insulated.

**33996EK**

**32-PIN  
 SOICW-EP**



**EK (PB-FREE) SUFFIX  
 98ARL10543D  
 32-PIN SOICW-EP**

**Note** For package dimensions, refer to the 33996 data sheet.

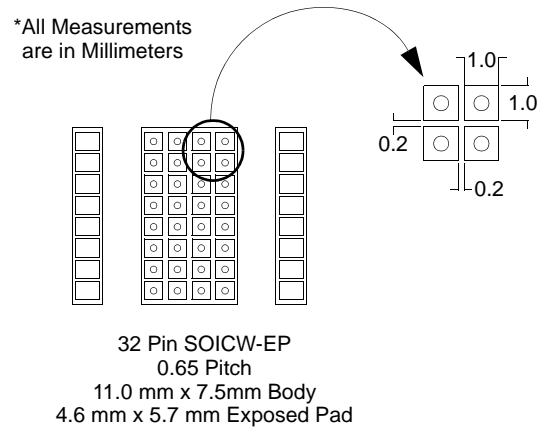
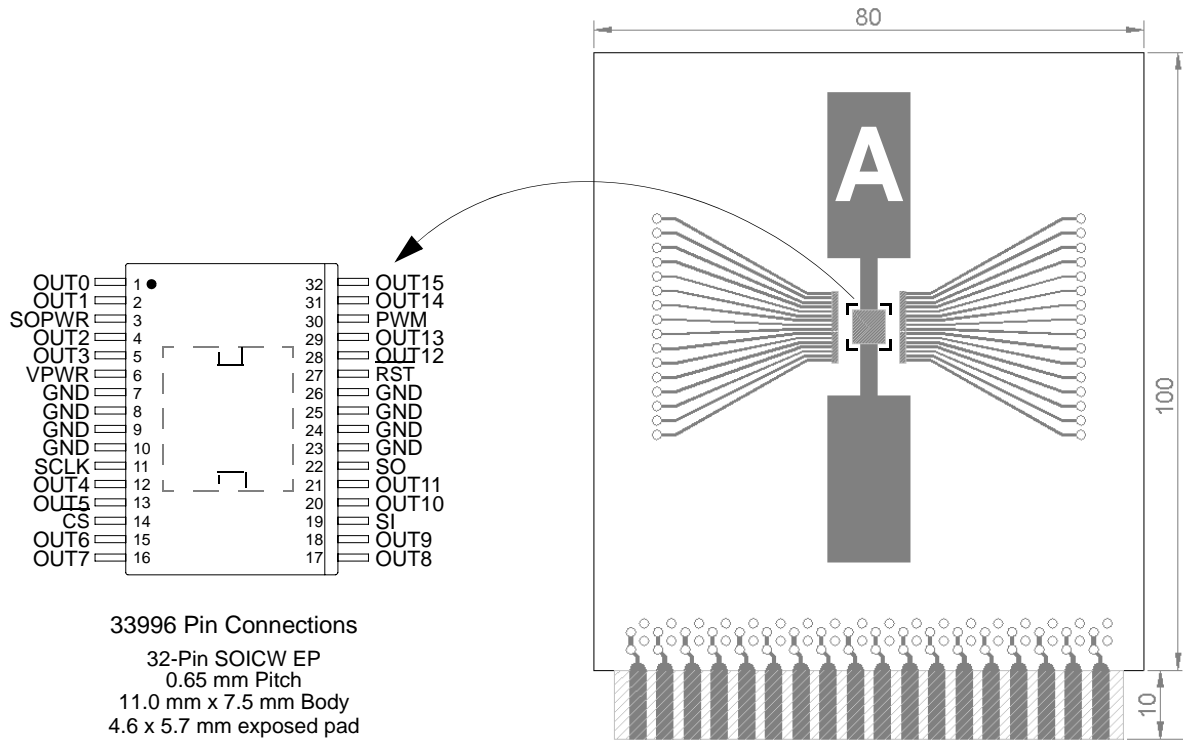


Figure 1. Surface Mount for SOICW Exposed Pad



**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**

A [mm <sup>2</sup> ]	R <sub>θJA</sub> [°C/W]
0	70
300	49
600	47

R<sub>θJA</sub> is the thermal resistance between die junction and ambient air.

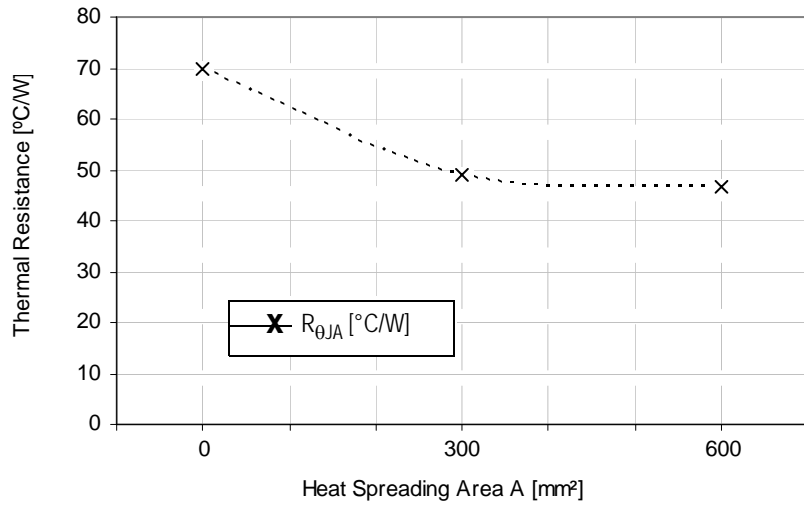


Figure 3. Device on Thermal Test Board  $R_{\theta JA}$

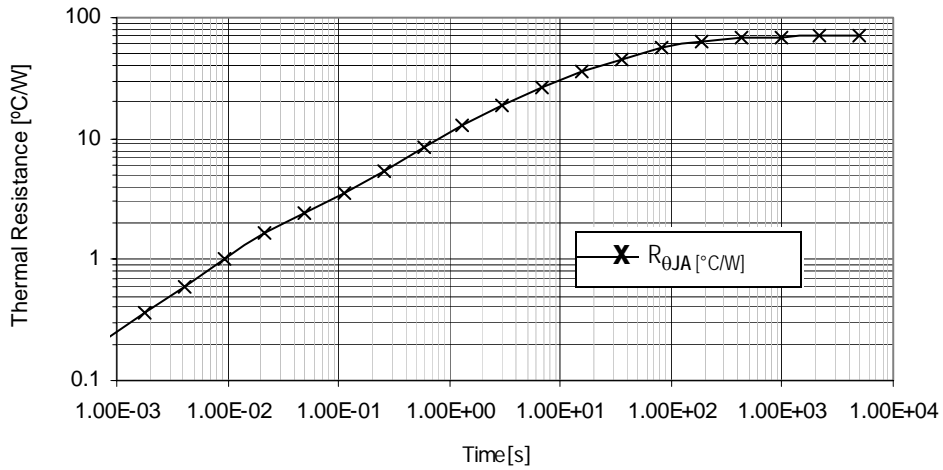


Figure 4. Transient Thermal Resistance  $R_{\theta JA}$ ,  
 1 W Step response, Device on Thermal Test Board Area A = 600 (mm<sup>2</sup>)

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