

## 热设计

# HTSOP-J8 封装热阻情报 (A)

不适用产品编号：BD4xxM2EFJ-C 系列、BD4xxM2WEFJ-C 系列、BD4xxU2EFJ-C 系列、BD4xxU2WEFJ-C 系列、BD7xxL2EFJ-C 系列、BD7xxU2EFJ-C 系列、BD42530EFJ-C、BD42530UEFJ-C、BD820F50EFJ-C、BD820F50UEFJ-C

本应用笔记记载了使用 HTSOP-J8 封装进行热设计所需的热阻信息。请作为设计初期进行温度评估时的参考值使用。

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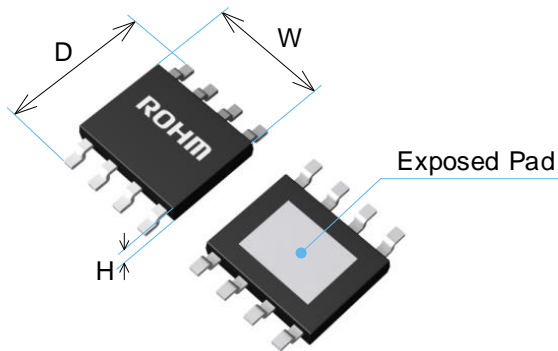
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## 1. 封装概要

封装名：HTSOP-J8

封装组别：SOP

外形尺寸：W (typ) D (typ) H (max)  
4.9mm × 6.0mm × 1.0mm



## 2. 基于 JEDEC STANDARD 环境下的热阻以及热特性参数

### 2-1. 测量环境

内容	标准
测量环境	JEDEC STANDARD JESD51-2A (Still Air)
测量基板标准	JEDEC STANDARD JESD51-3 JESD51-5 JESD51-7

### 2-2. 数值

状态	$\theta_{JA}$ (°C/W)	$\Psi_{JT}$ (°C/W)
1 层 (1s)	139.0	17
4 层 (2s2p)	35.6	7

$\theta_{JA}$ ：结温  $T_J$  与环境温度  $T_A$  之间的热阻

$\Psi_{JT}$ ：结温  $T_J$  与封装表面中央温度  $T_T$  之间的热特性参数

注意：本应用笔记中的热阻和热特性参数是在符合 JEDEC STANDARD 的测量环境中的值，因此不一定与实机一致。有必要考虑由于 PCB 特性、PCB 布局、器件配置、壳体形状、周围环境等的影响值发生变化。

2-3. PCB 规格 1 层 (1s)

JEDEC 标准 JESD51 准则

项目	值	
基板厚度	1.57mm	
基板外形尺寸	76.2mm × 114.3mm	
基板材质	FR-4	
铜箔厚度 (完成厚度)	Top	70μm (2 oz)
导线宽度	0.254mm	
铜箔范围	Top	15.7mm <sup>2</sup> (Footprint)

Table 2-3-1. 1 层 PCB 规格



Figure 2-3-1. 1 层基板截面图

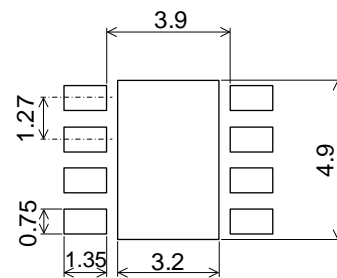


Figure 2-3-2. Footprint 尺寸

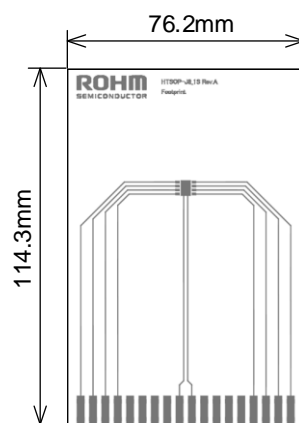


Figure 2-3-3. Top layer

2-4. PCB 规格 4 层 (2s2p)

JEDEC 标准 JESD51 准则

项目	值
基板厚度	1.60mm
基板外形尺寸	76.2mm × 114.3mm
基板材质	FR-4
铜箔厚度 (完成厚度)	Top 70μm (2 oz) Middle 1 35μm (1 oz) Middle 2 35μm (1 oz) Bottom 70μm (2 oz)
导线宽度	0.254mm
铜箔范围	Top 15.7mm <sup>2</sup> (Footprint) Middle 1 5505mm <sup>2</sup> (74.2mm×74.2mm) Middle 2 5505mm <sup>2</sup> (74.2mm×74.2mm) Bottom 5505mm <sup>2</sup> (74.2mm×74.2mm)

Table 2-4-1. 4 层 PCB 规格

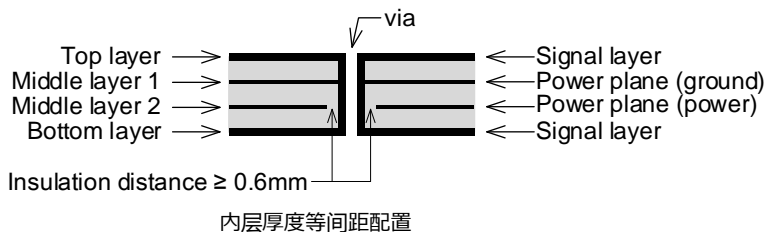


Figure 2-4-2. 4 层基板截面图

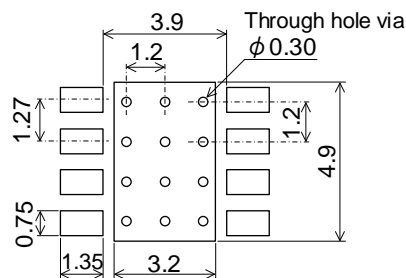


Figure 2-4-3. Footprint 尺寸

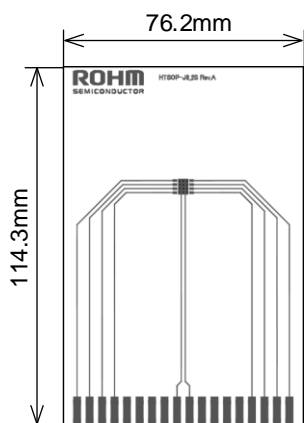


Figure 2-4-4.  
Top layer

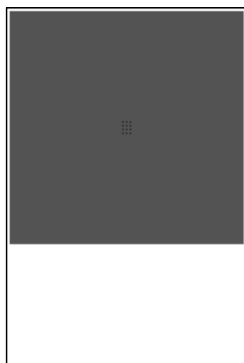


Figure 2-4-5.  
Middle 1 layer

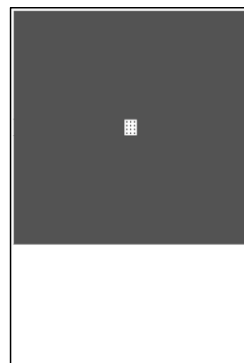


Figure 2-4-6.  
Middle 2 layer

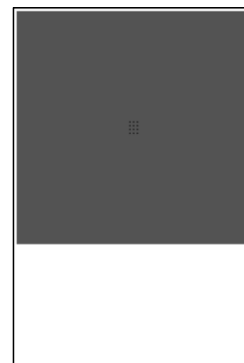


Figure 2-4-7.  
Bottom layer

### 3. 各参数变化时的热阻及热 000 特性参数

#### 3-1. 铜箔面积的变化

##### 3-1-1. 1 层

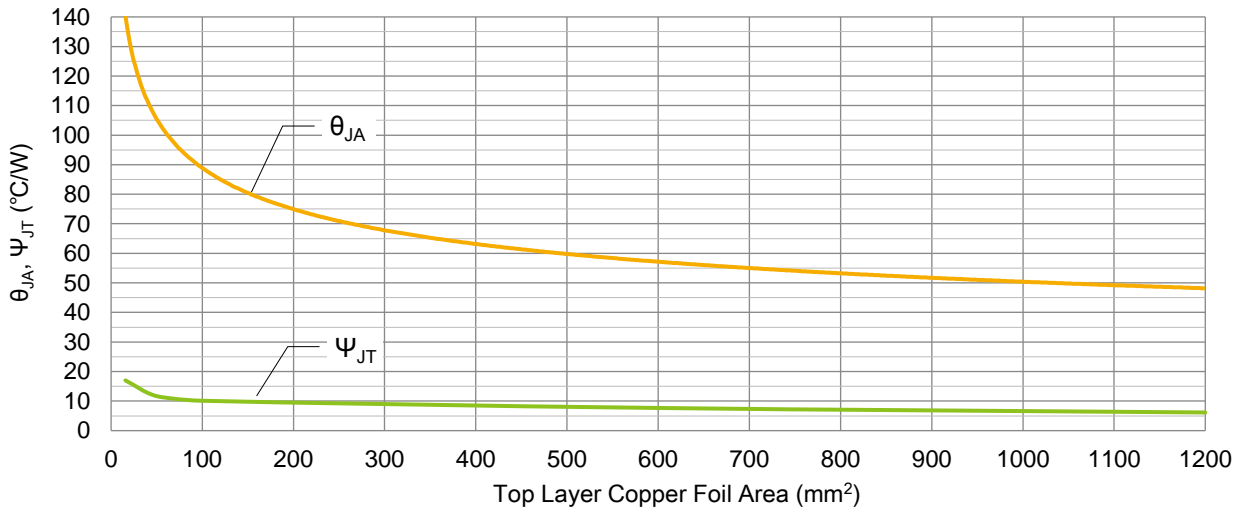


Figure 3-1-1-1.  $\theta_{JA}$ ,  $\psi_{JT}$  vs 铜箔面积



Figure 3-1-1-2. 1 层基板截面图

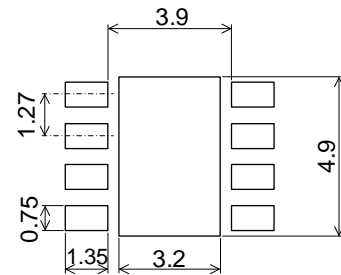


Figure 3-1-1-3. Footprint 尺寸

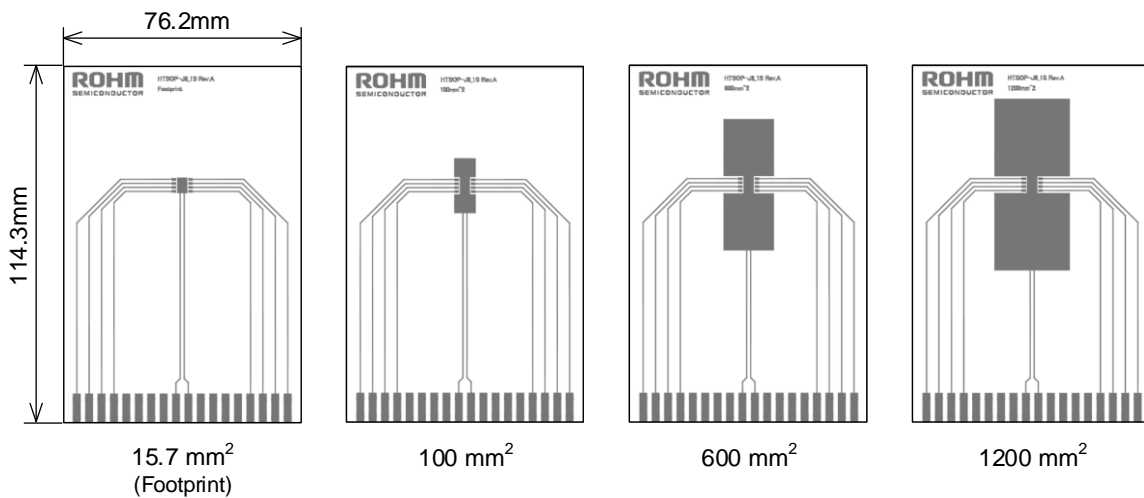


Figure 3-1-1-4. Top layer

3-1. 铜箔面积的变化 (继续)

3-1-2. 2 层

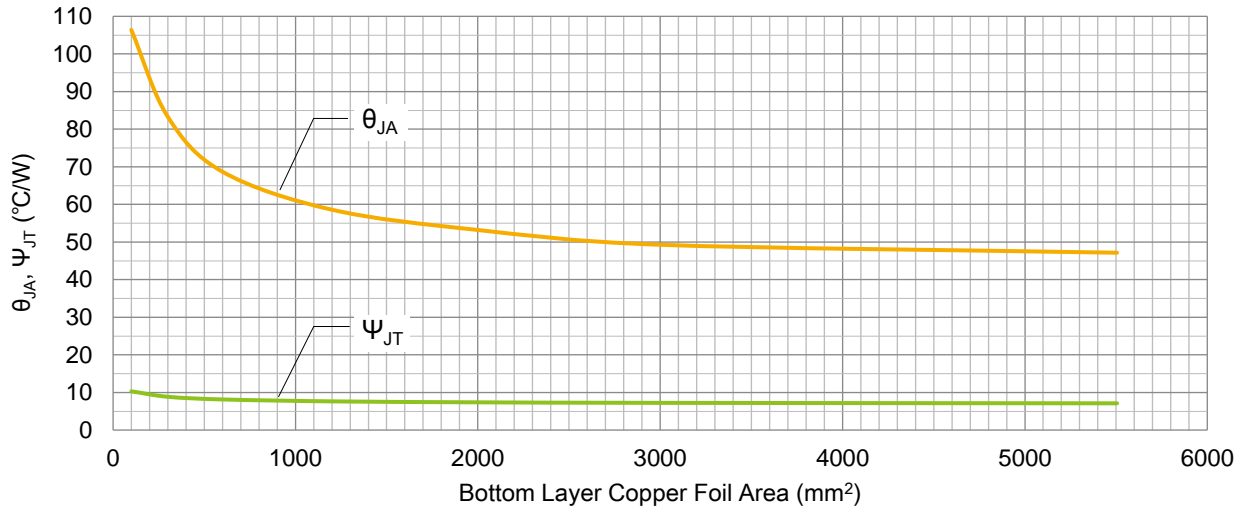


Figure 3-1-2-1.  $\theta_{JA}$ ,  $\psi_{JT}$  vs 铜箔面积

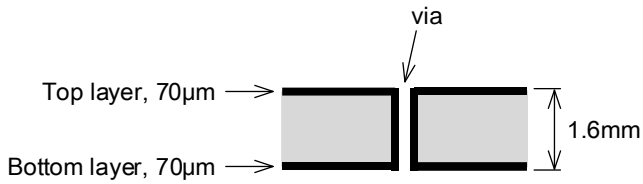


Figure 3-1-2-2. 2 层基板截面图

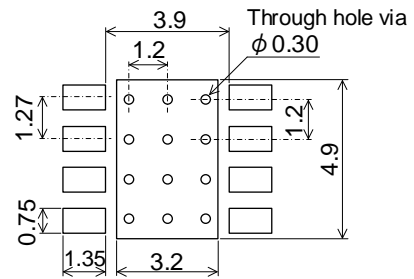


Figure 3-1-2-3. Footprint 尺寸

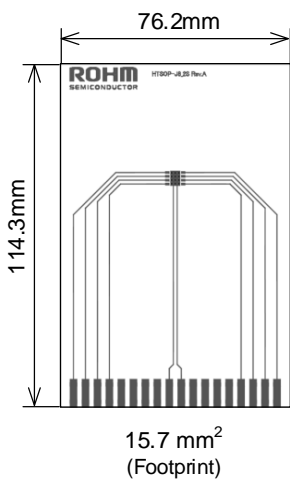


Figure 3-1-2-4. Top layer

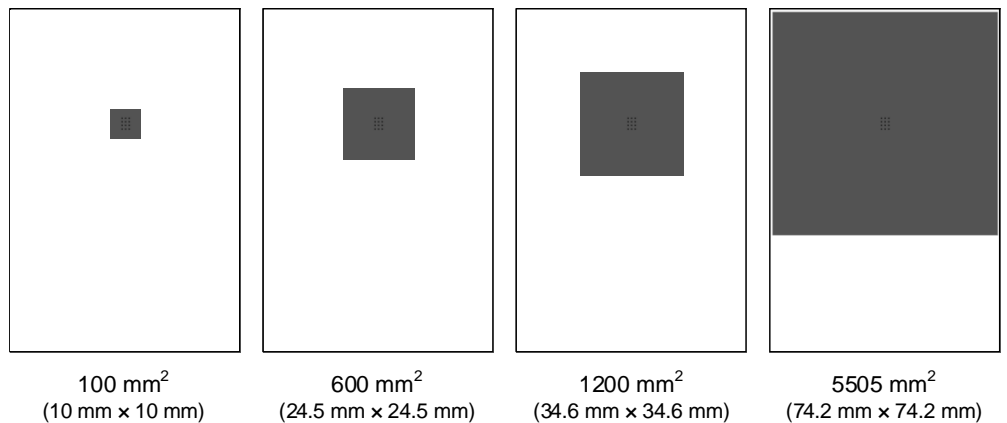


Figure 3-1-2-5. Bottom layer

3-1. 铜箔面积的变化 (继续)

3-1-3. 4层、多层的铜箔面积变化的情况

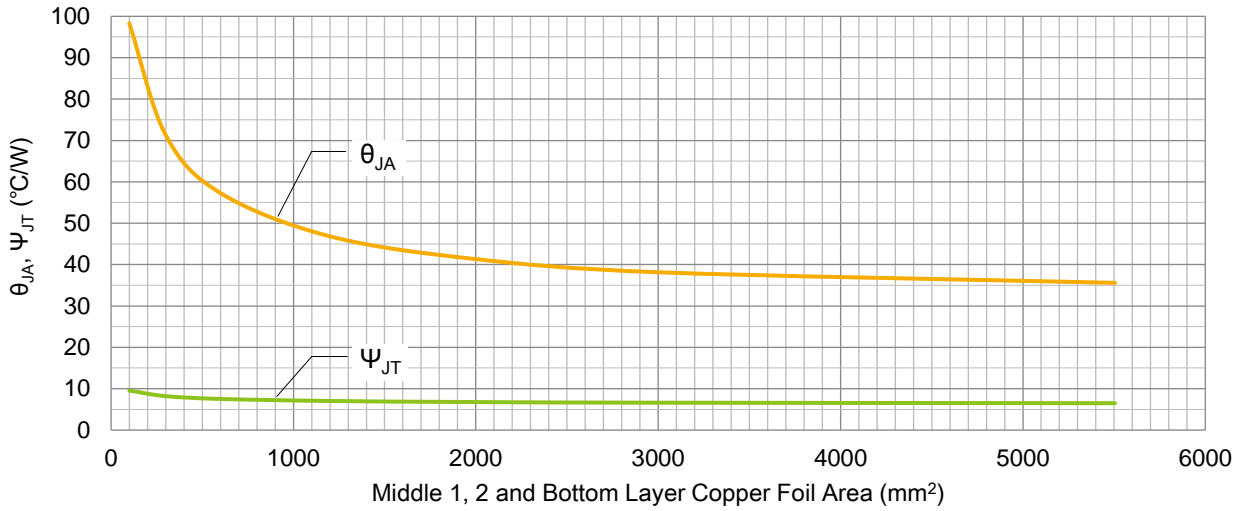


Figure 3-1-3-1.  $\theta_{JA}$ ,  $\psi_{JT}$  vs 铜箔面积

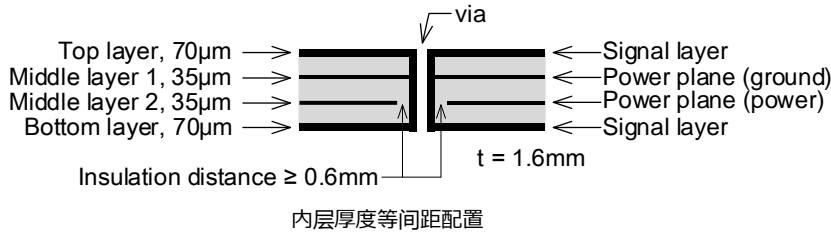


Figure 3-1-3-2. 4层基板截面图

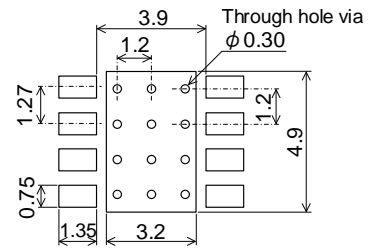


Figure 3-1-3-3. Footprint 尺寸

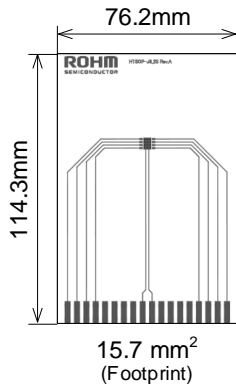


Figure 3-1-3-4. Top layer

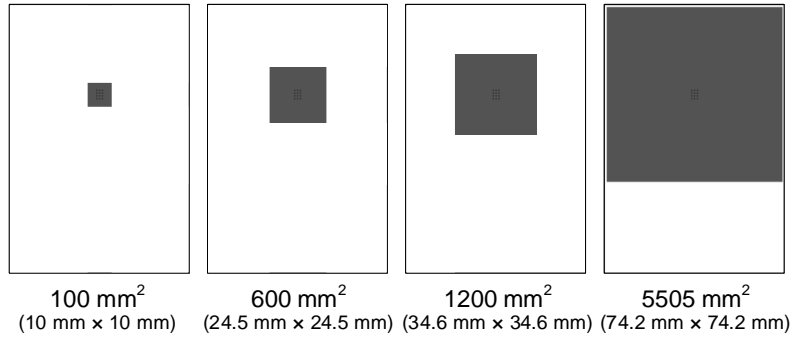


Figure 3-1-3-5. Middle layer 1, Bottom layer

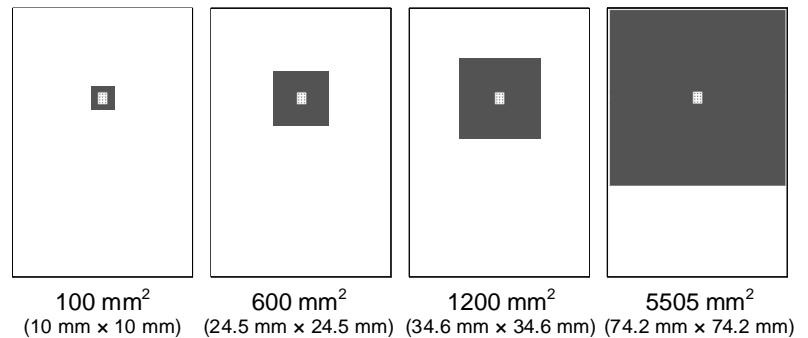


Figure 3-1-3-6. Middle layer 2

3-1. 铜箔面积的变化 (继续)

3-1-4. 4层、仅 Bottom 层的铜箔面积变化的情况

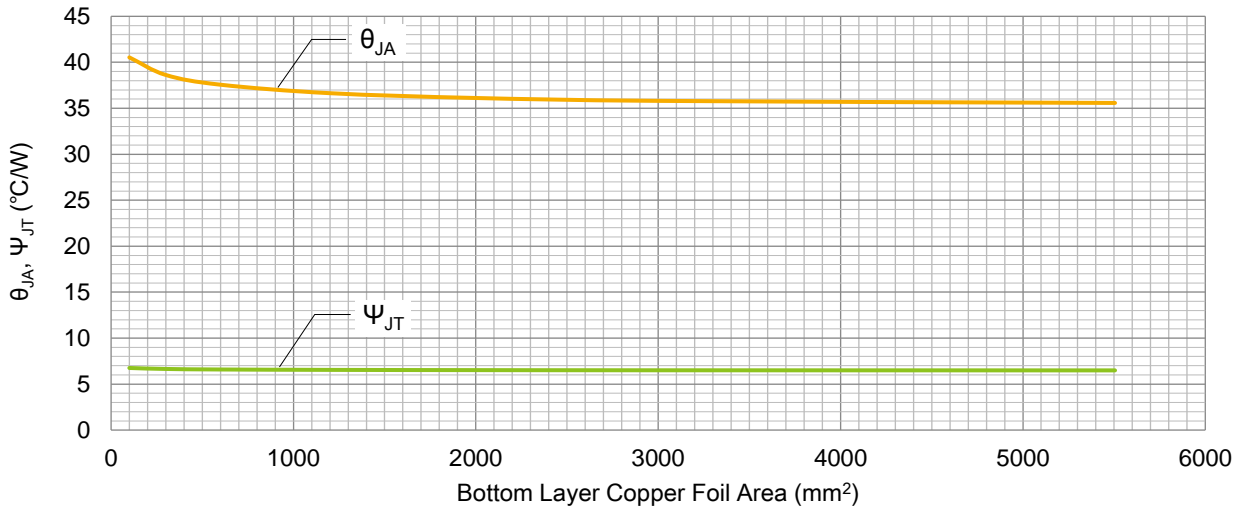


Figure 3-1-4-1.  $\theta_{JA}$ ,  $\psi_{JT}$  vs 铜箔面积

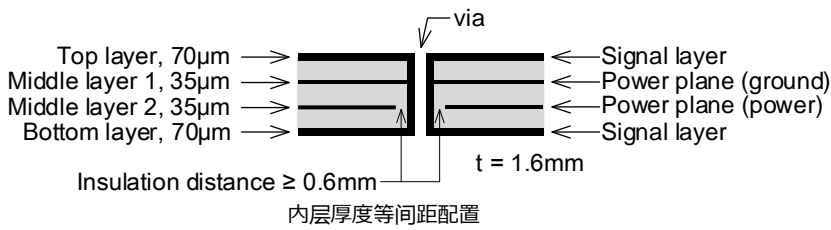


Figure 3-1-4-2. 4层基板截面图

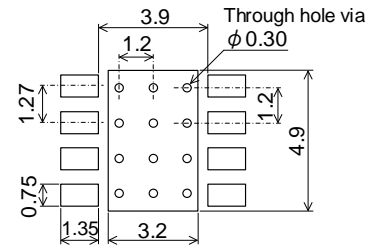


Figure 3-1-4-3. Footprint 尺寸

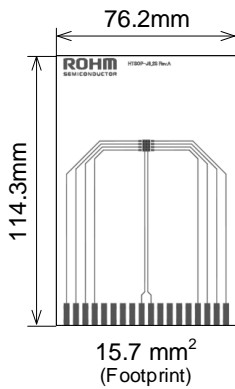


Figure 3-1-4-4. Top layer

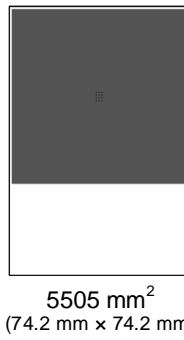


Figure 3-1-4-5. Middle layer 1

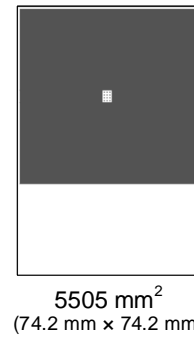


Figure 3-1-4-6. Middle layer 2

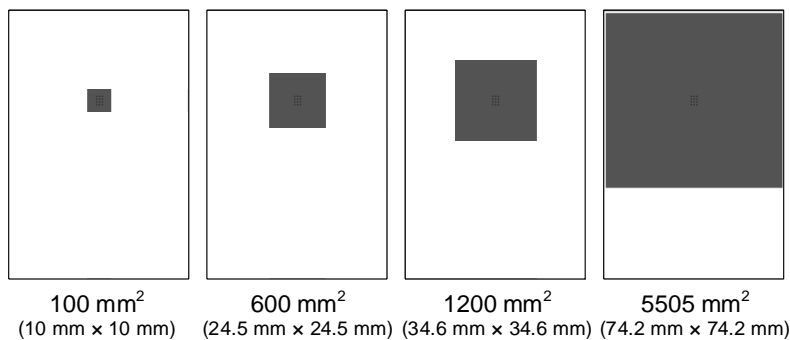


Figure 3-1-4-7. Bottom layer



3-1. 铜箔面积的变化 (继续)

3-1-5. 6层、多层的铜箔面积变化的情况

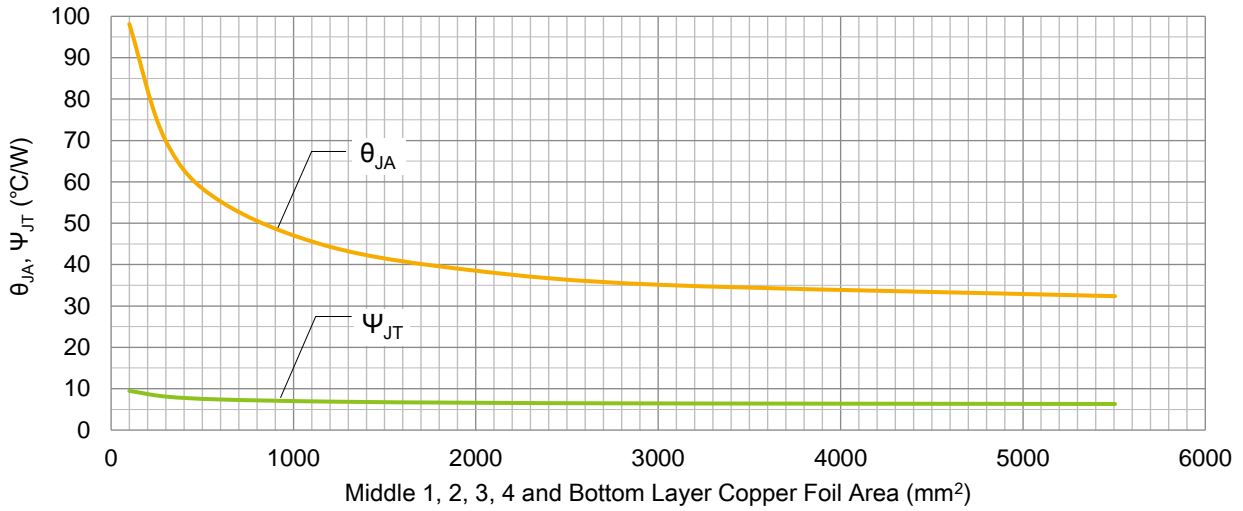


Figure 3-1-5-1.  $\theta_{JA}$ ,  $\psi_{JT}$  vs 铜箔面积

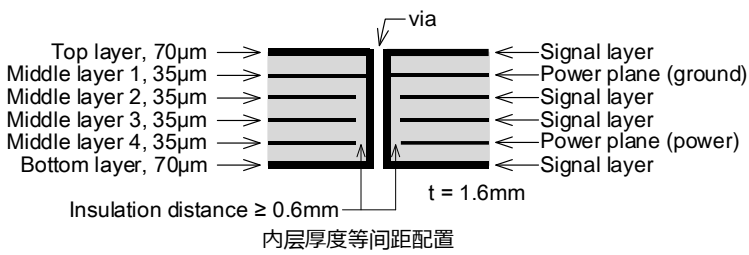


Figure 3-1-5-2. 6层基板截面图

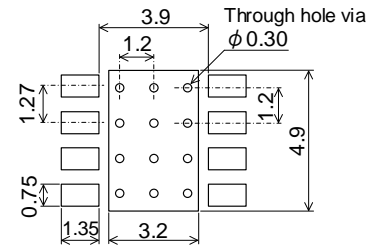


Figure 3-1-5-3. Footprint 尺寸

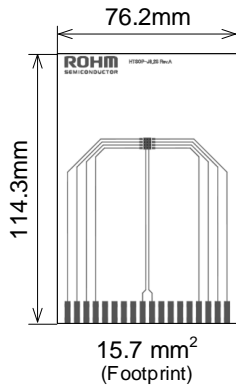


Figure 3-1-5-4. Top layer

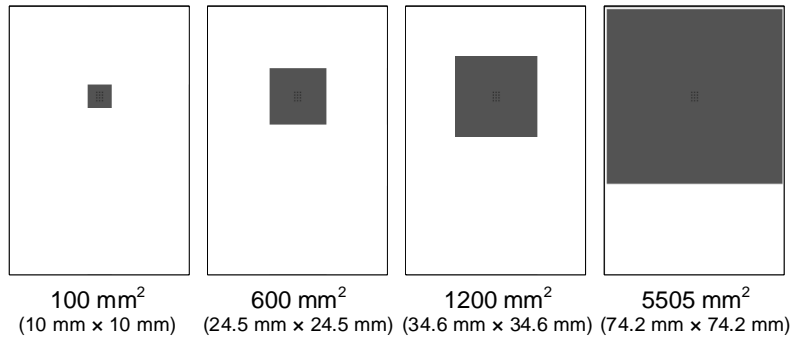


Figure 3-1-5-5. Middle layer 1, Bottom layer

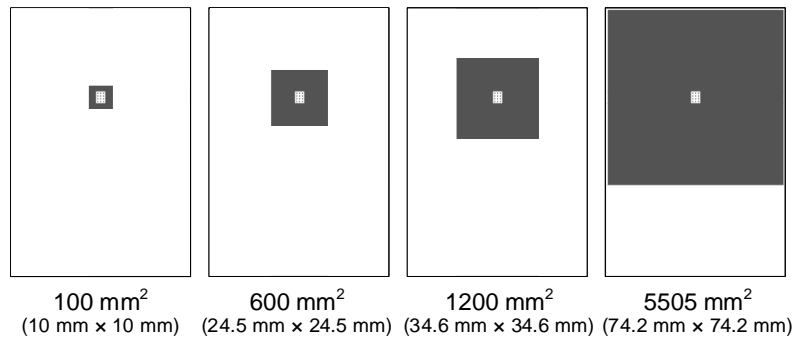


Figure 3-1-5-6. Middle layer 2, 3, 4

3-1. 铜箔面积的变化 (继续)

3-1-6. 6层、仅 Bottom 层的铜箔面积变化的情况

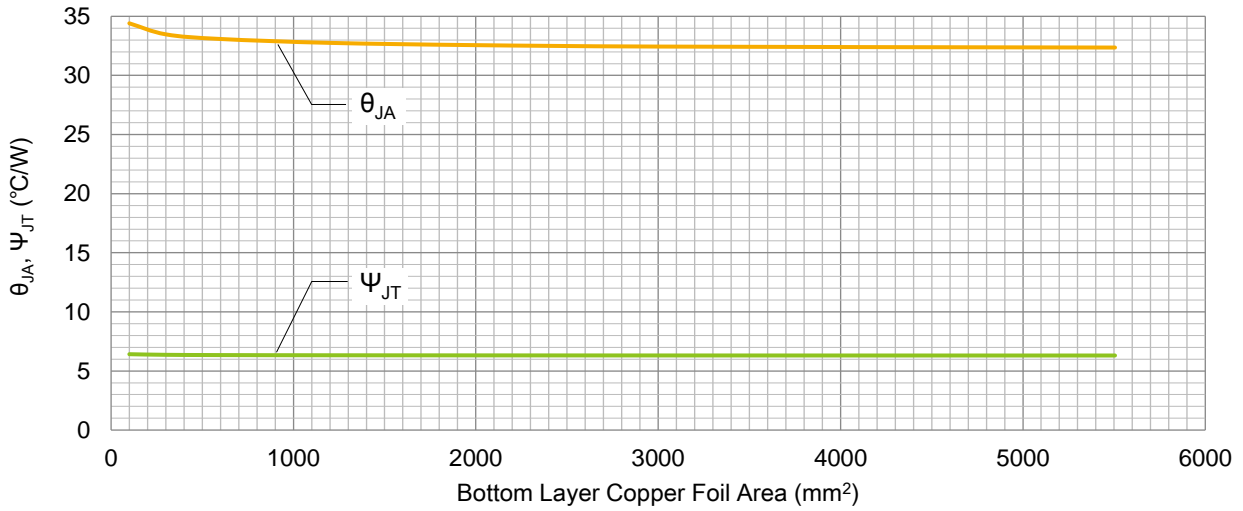


Figure 3-1-6-1.  $\theta_{JA}$ ,  $\psi_{JT}$  vs 铜箔面积

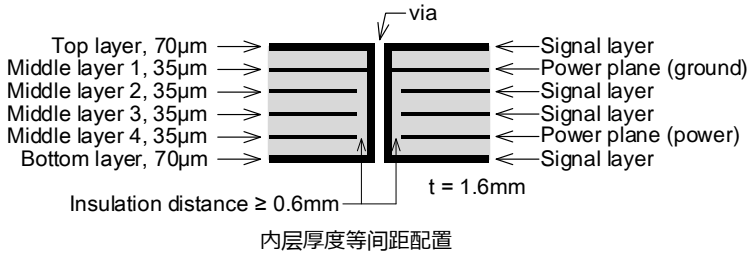


Figure 3-1-6-2. 6层基板截面图

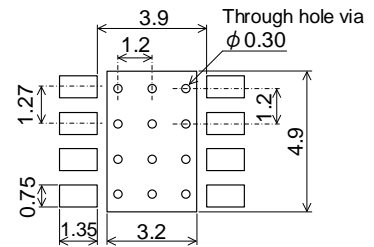


Figure 3-1-6-3. Footprint 尺寸

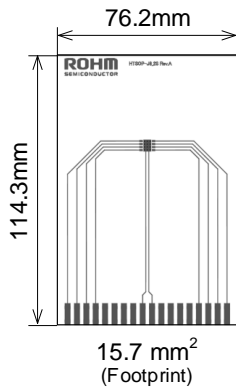


Figure 3-1-6-4. Top layer

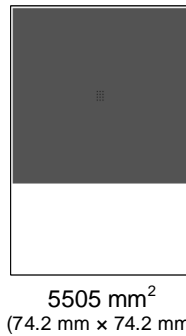


Figure 3-1-6-5. Middle layer 1

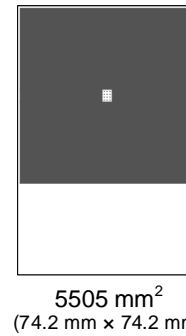


Figure 3-1-6-6. Middle layer 2, 3, 4

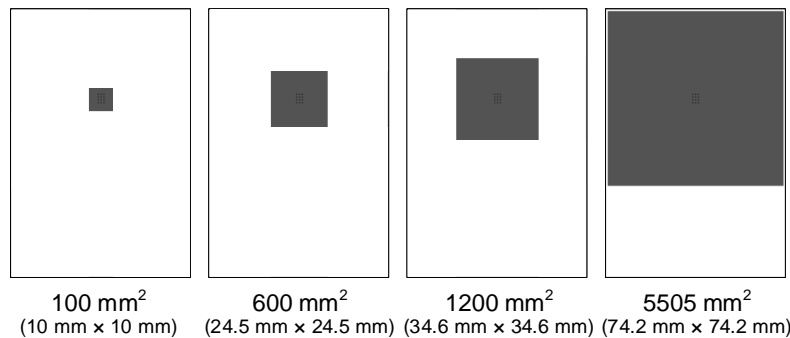


Figure 3-1-4-7. Bottom layer

3-1. 铜箔面积的变化 (继续)

3-1-7. 8层、多层的铜箔面积变化的情况

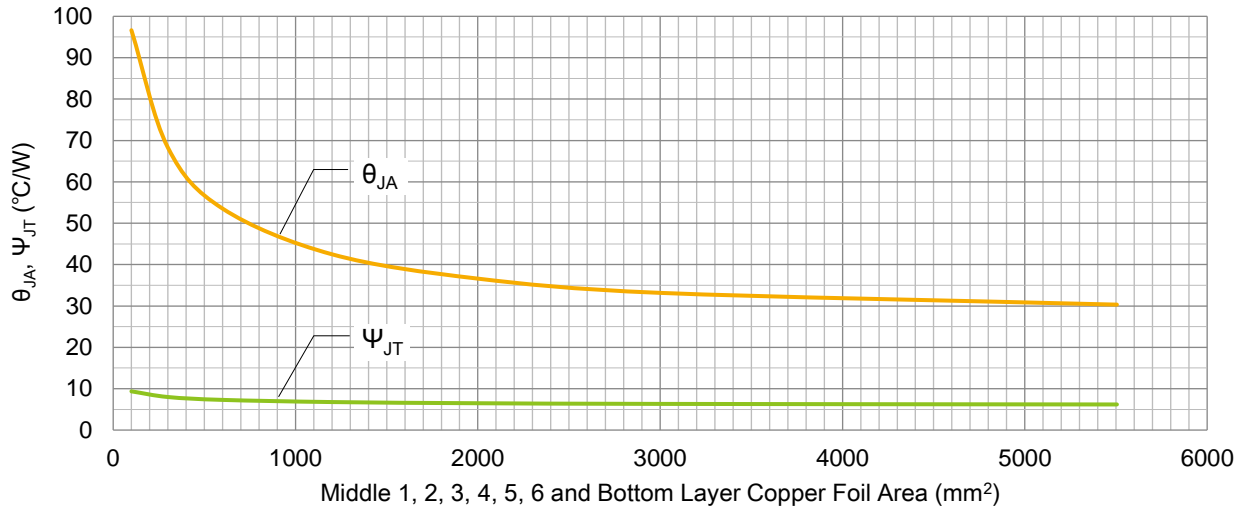


Figure 3-1-7-1.  $\theta_{JA}$ ,  $\psi_{JT}$  vs 铜箔面积

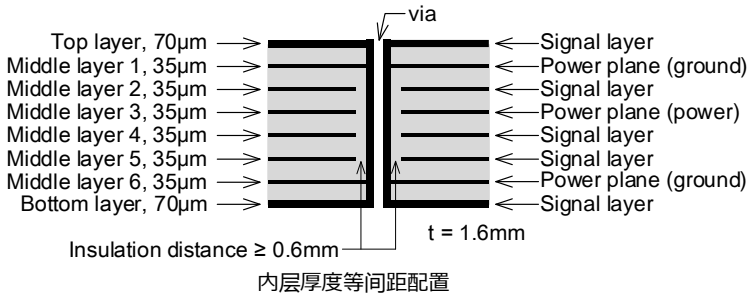


Figure 3-1-7-2. 8层基板截面图

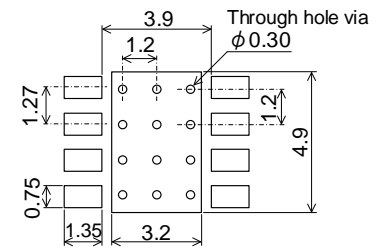


Figure 3-1-7-3. Footprint 尺寸

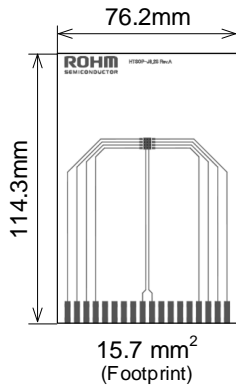


Figure 3-1-7-4. Top layer

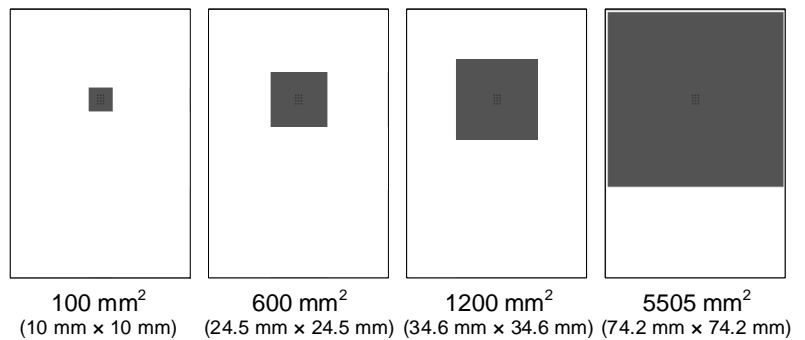


Figure 3-1-7-5. Middle layer 1, 6, Bottom layer

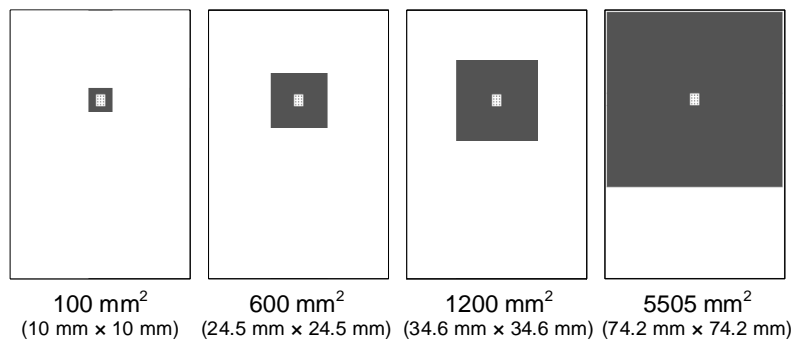


Figure 3-1-7-6. Middle layer 2, 3, 4, 5

3-1. 铜箔面积的变化 (继续)

3-1-8. 8层、仅 Bottom 层的铜箔面积变化的情况

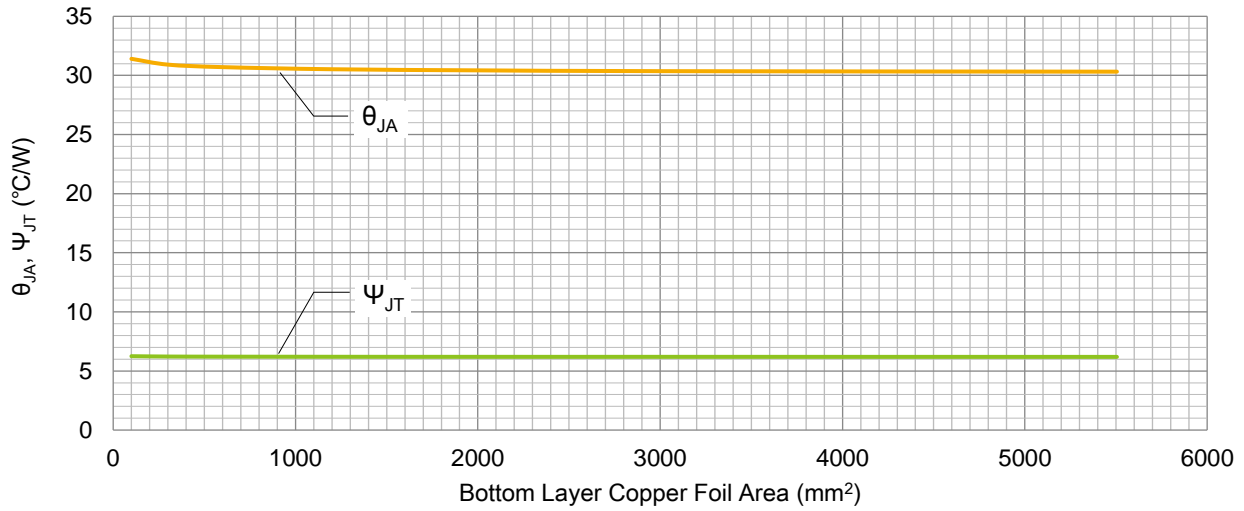


Figure 3-1-8-1.  $\theta_{JA}$ ,  $\psi_{JT}$  vs 铜箔面积

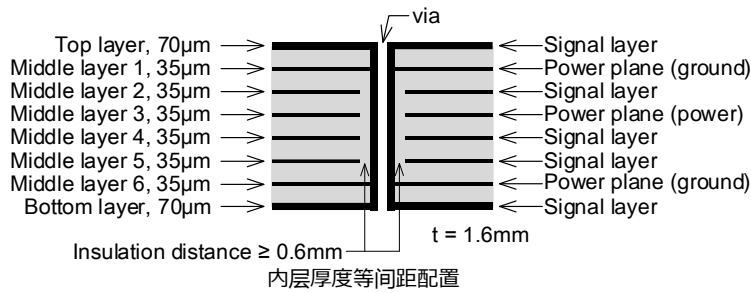


Figure 3-1-8-2. 8层基板截面图

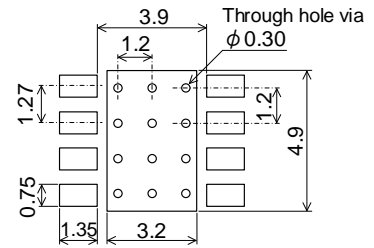


Figure 3-1-8-3. Footprint 尺寸

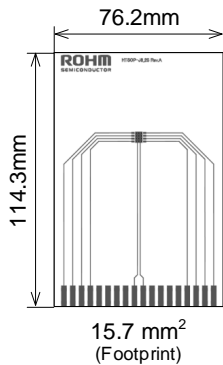


Figure 3-1-8-4. Top layer

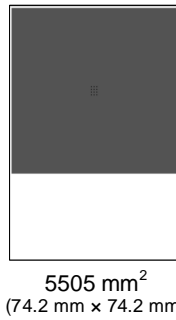


Figure 3-1-8-5. Middle layer 1, 6

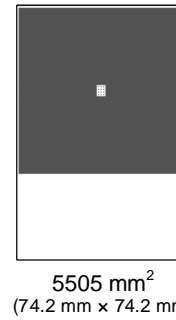


Figure 3-1-8-6. Middle layer 2, 3, 4, 5

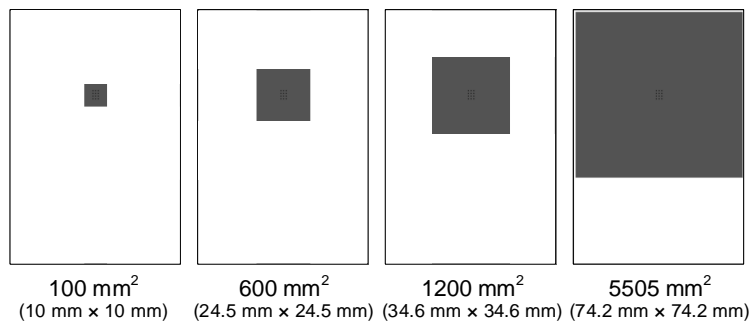


Figure 3-1-8-7. Bottom layer

3-2. 铜箔厚度的变化

3-2-1. 1 层

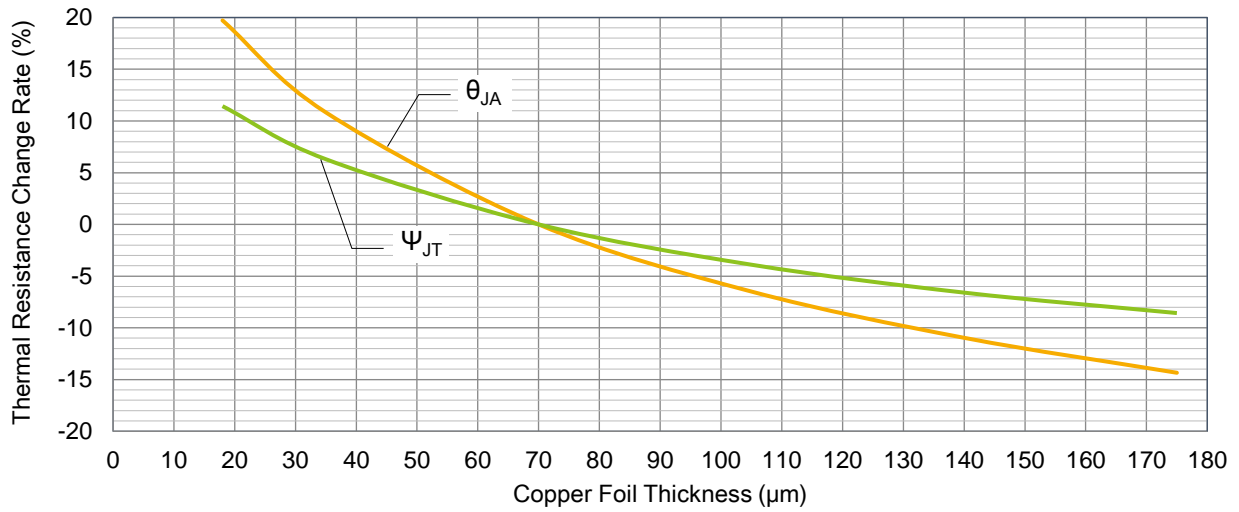


Figure 3-2-1-1.  $\theta_{JA}$ ,  $\psi_{JT}$  变化率 vs 铜箔厚度

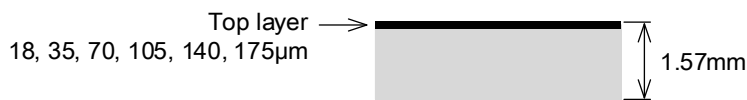


Figure 3-2-1-2. 1 层基板截面图

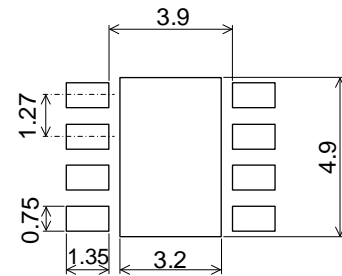


Figure 3-2-1-3. Footprint 尺寸

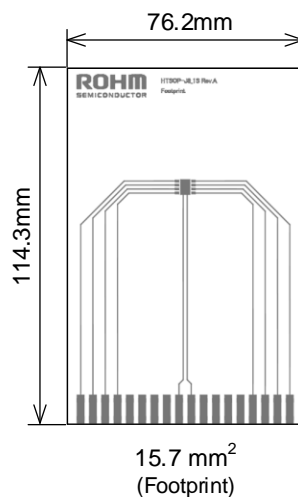


Figure 3-2-1-4. Top layer

3-2. 铜箔厚度的变化 (继续)

3-2-2. 2 层

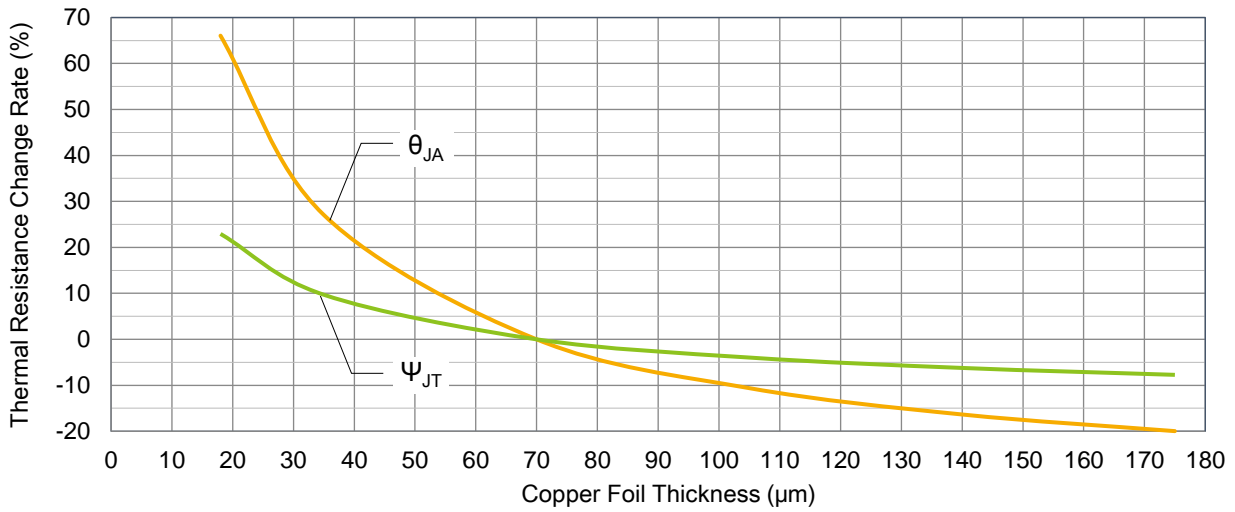


Figure 3-2-2-1.  $\theta_{JA}$ ,  $\Psi_{JT}$  变化率 vs 铜箔厚度

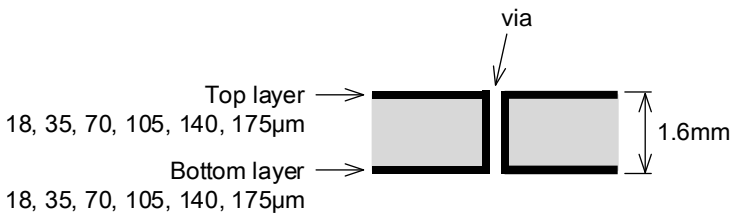


Figure 3-2-2-2. 2层基板截面图

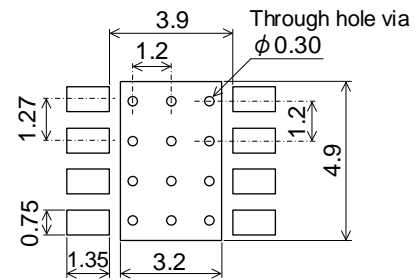


Figure 3-2-2-3. Footprint 尺寸

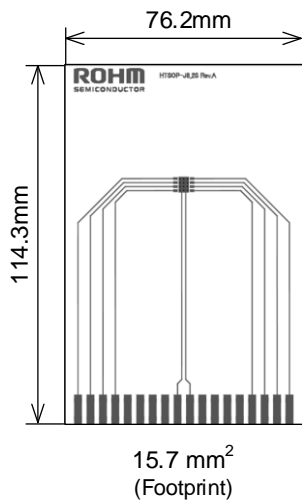


Figure 3-2-2-4. Top layer

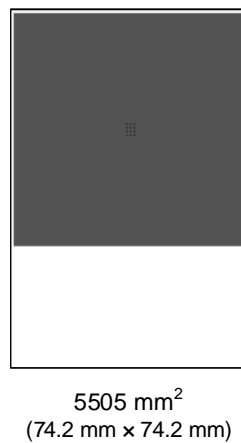


Figure 3-2-2-5. Bottom layer

3-2. 铜箔厚度的变化 (继续)

3-2-3. 4 层

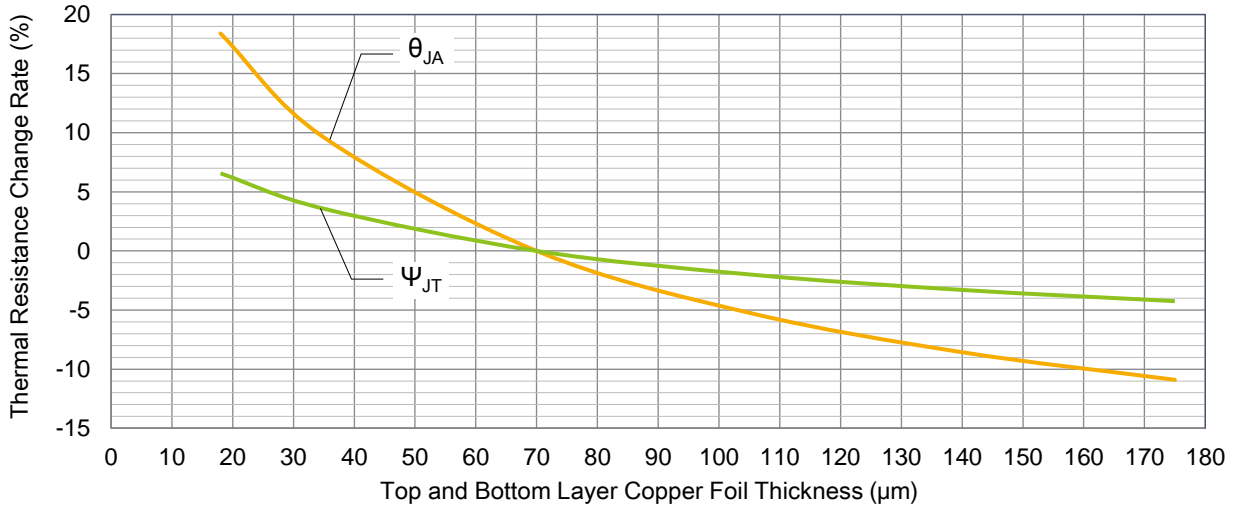


Figure 3-2-3-1.  $\theta_{JA}$ ,  $\psi_{JT}$  变化率 vs 铜箔厚度

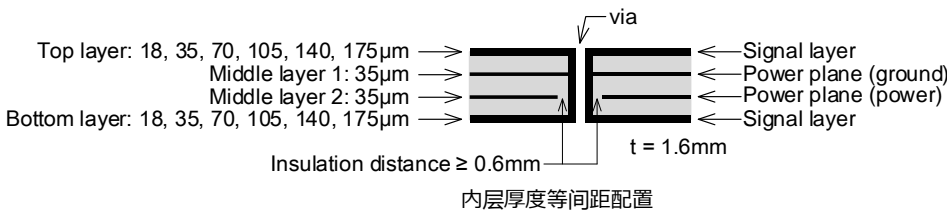


Figure 3-2-3-2. 4 层基板截面图

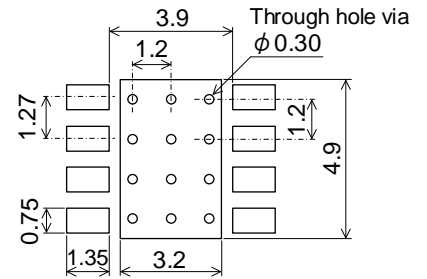


Figure 3-2-3-3. Footprint 尺寸

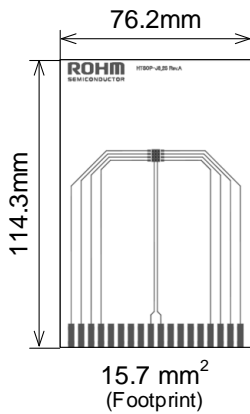


Figure 3-2-3-4. Top layer

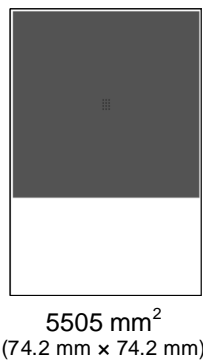


Figure 3-2-3-5. Middle layer 1

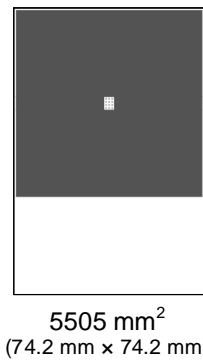


Figure 3-2-3-6. Middle layer 2

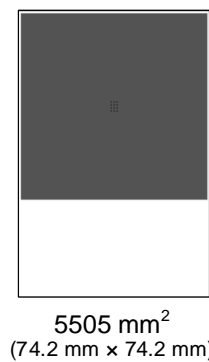


Figure 3-2-3-7. Bottom layer

3-3. 热通孔配置

3-3-1. 2层

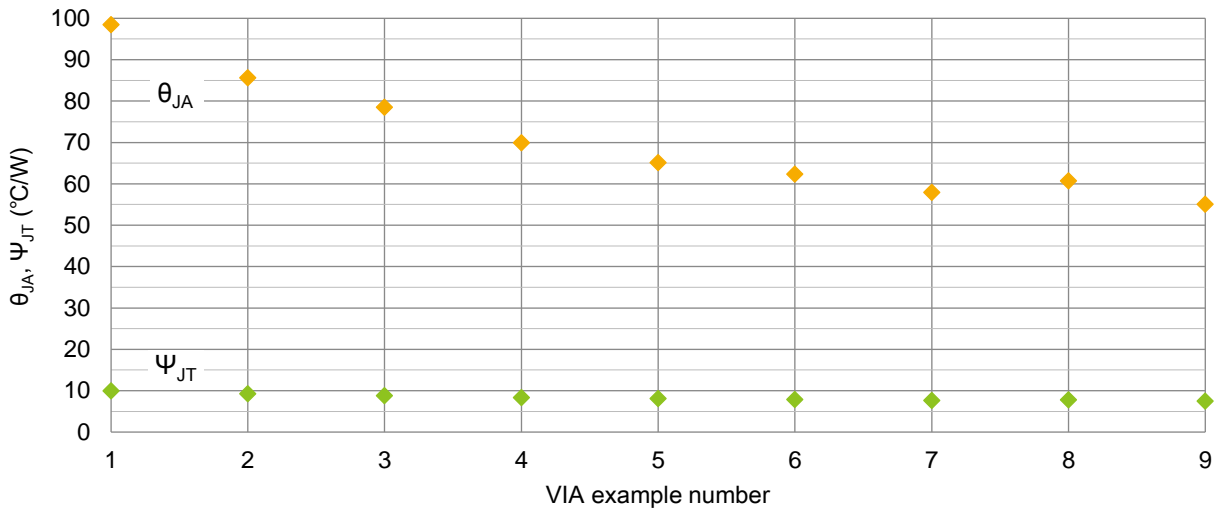


Figure 3-3-1-1.  $\theta_{JA}$ ,  $\psi_{JT}$  vs 热通孔配置

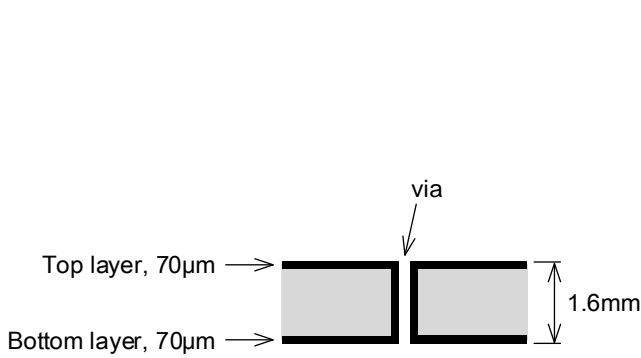


Figure 3-3-1-2. 2层基板截面图

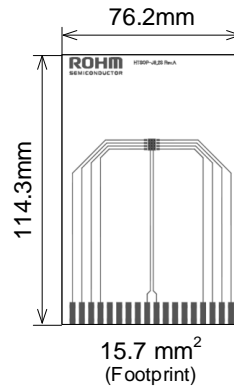


Figure 3-3-1-3. Top layer

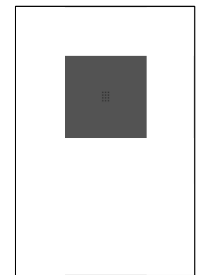
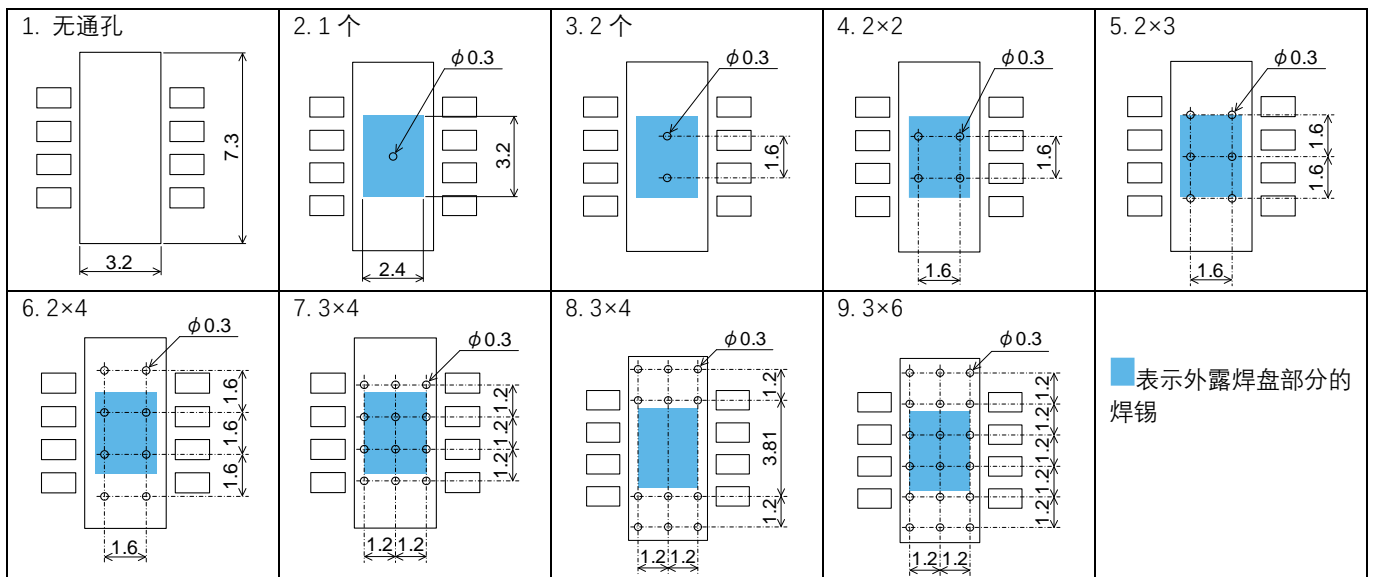


Figure 3-3-1-4. Bottom layer

通孔示例的编号





3-3. 热通孔配置 (继续)

3-3-2. 4 层

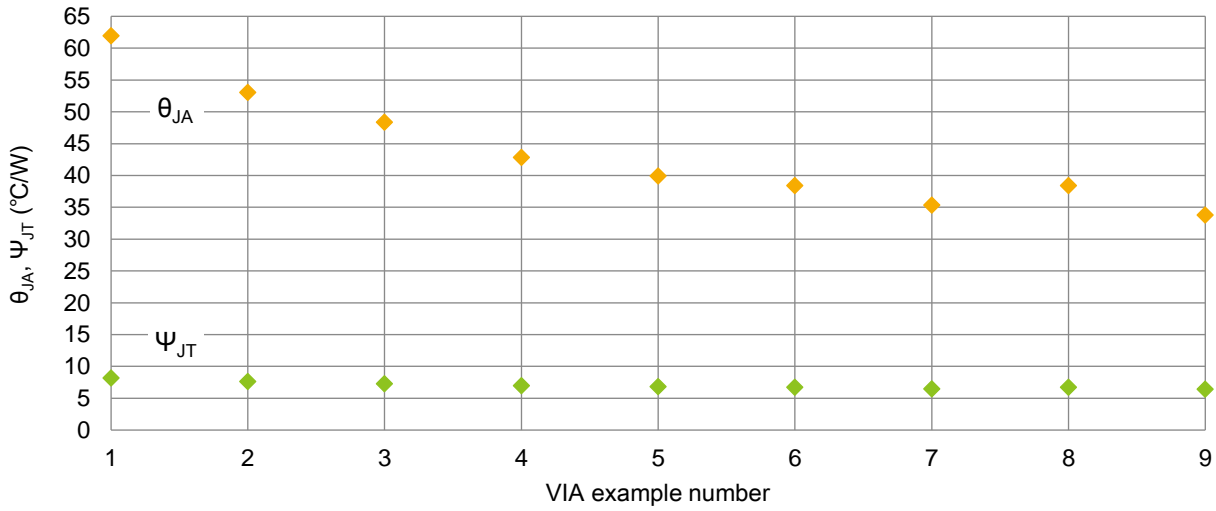


Figure 3-3-2-1.  $\theta_{JA}$ ,  $\psi_{JT}$  vs 热通孔配置

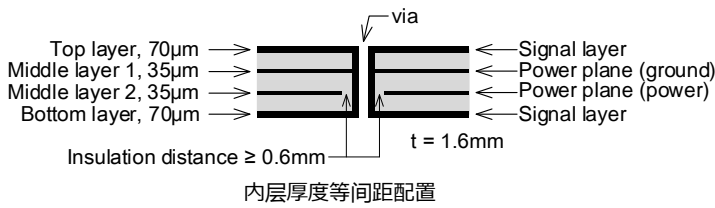


Figure 3-3-2-2. 4 层基板截面图

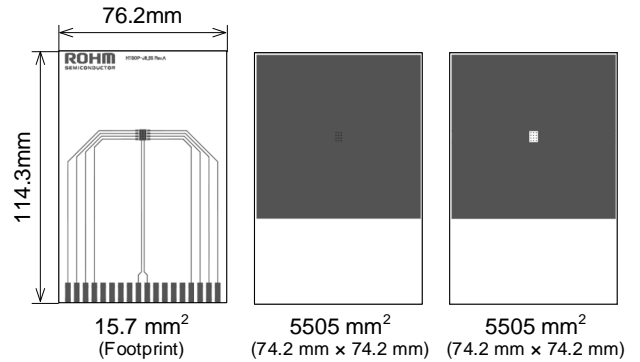
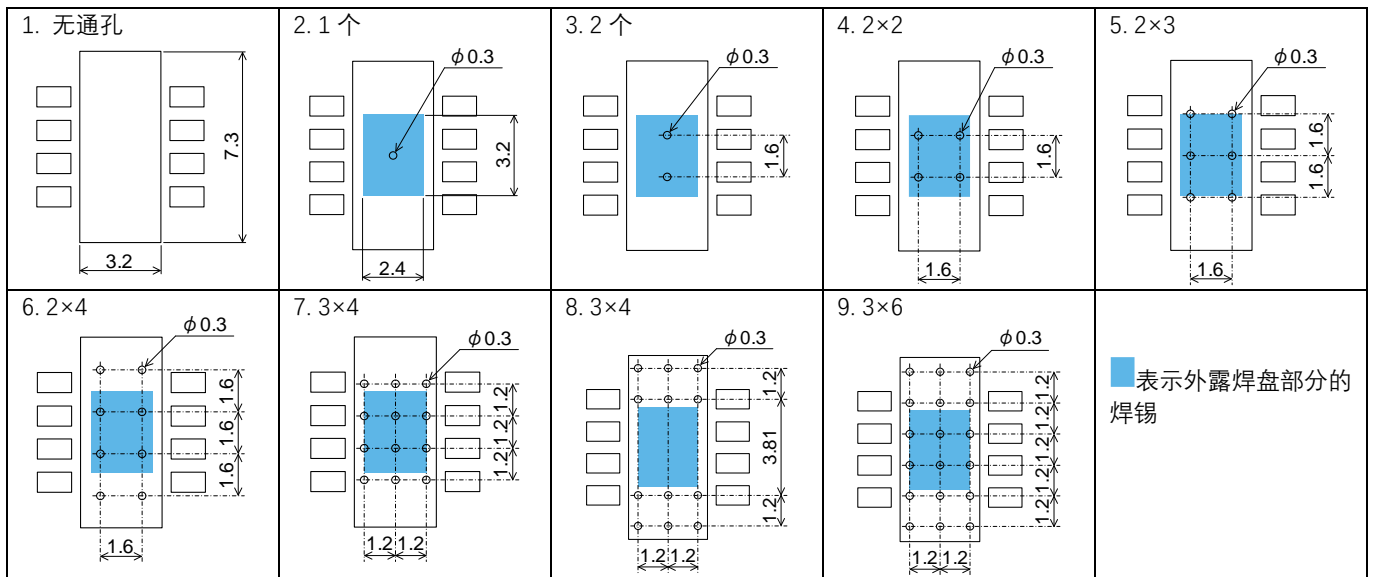


Figure 3-3-2-3. Top layer  
Figure 3-3-2-4. Middle layer 1, Bottom layer  
Figure 3-3-2-5. Middle layer 2

通孔示例的编号



3-4. 基板厚度的变化

3-4-1. 1层

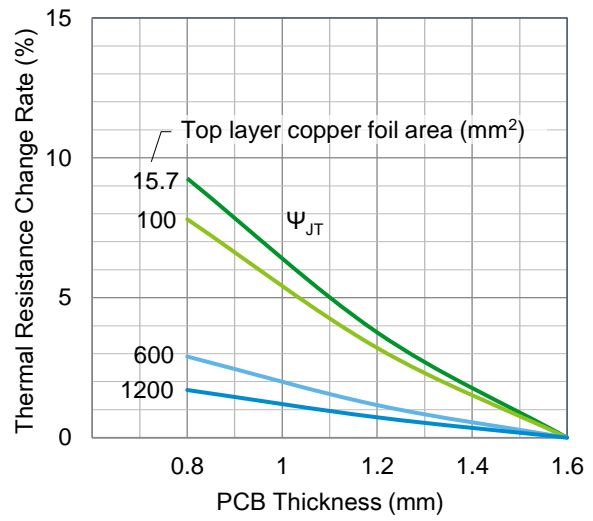
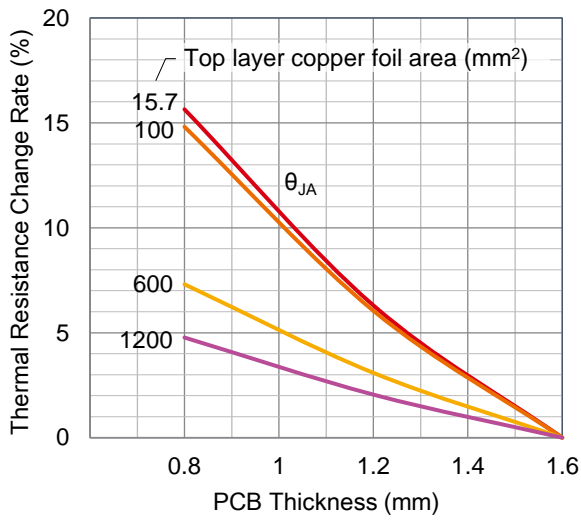


Figure 3-4-1-1.  $\theta_{JA}$ ,  $\psi_{JT}$  变化率 vs 基板厚度



Figure 3-4-1-2. 1层基板截面图

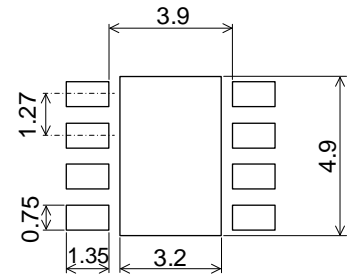


Figure 3-4-1-3. Footprint 尺寸

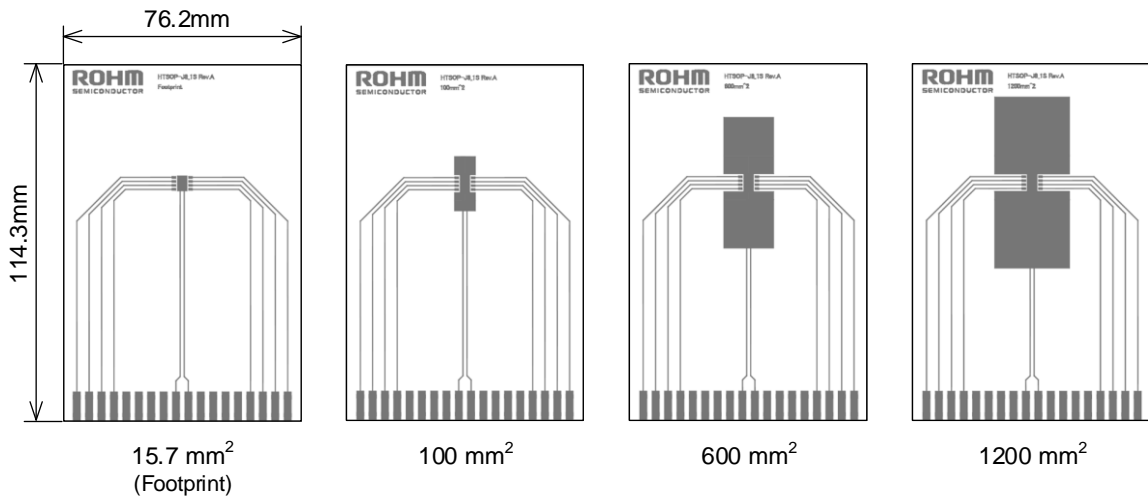


Figure 3-4-1-4. Top layer

3-4. 基板厚度的变化 (继续)

3-4-2. 2 层

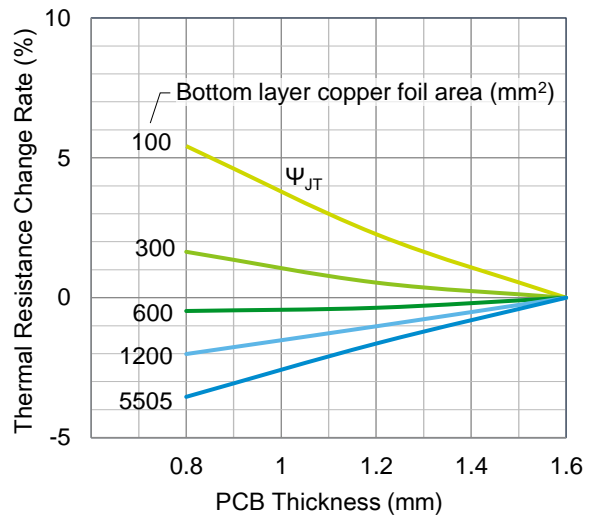
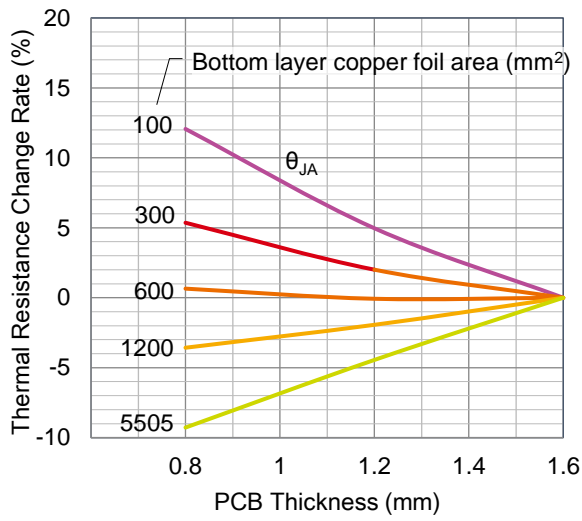


Figure 3-4-2-1.  $\theta_{JA}$ ,  $\psi_{JT}$  变化率 vs 基板厚度

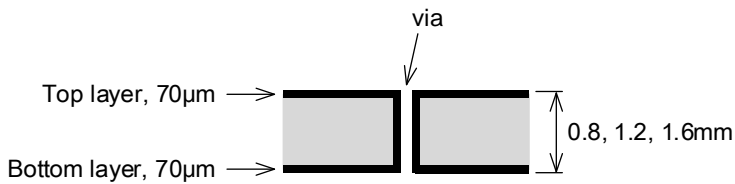


Figure 3-4-2-2. 2 层基板截面图

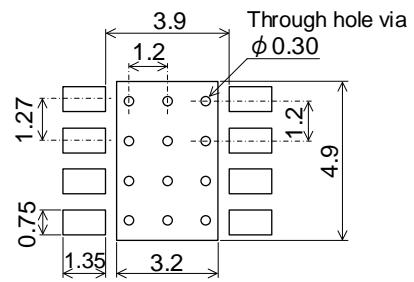


Figure 3-4-2-3. Footprint 尺寸

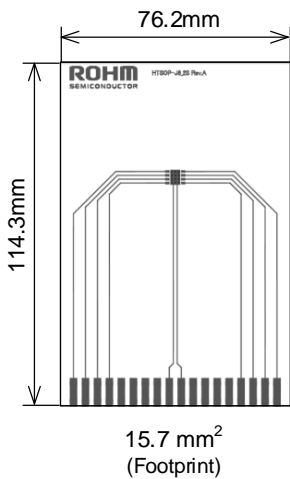


Figure 3-4-2-4. Top layer

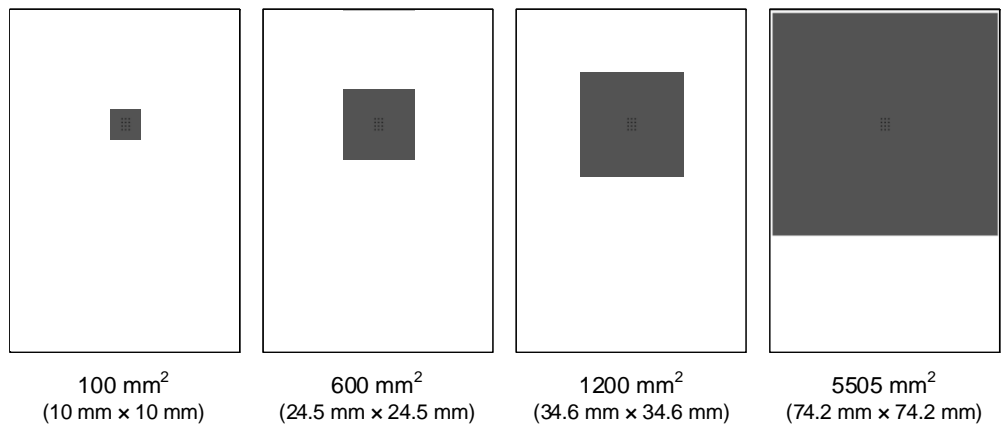


Figure 3-4-2-5. Bottom layer

3-4. 基板厚度的变化 (继续)

3-4-3. 4 层

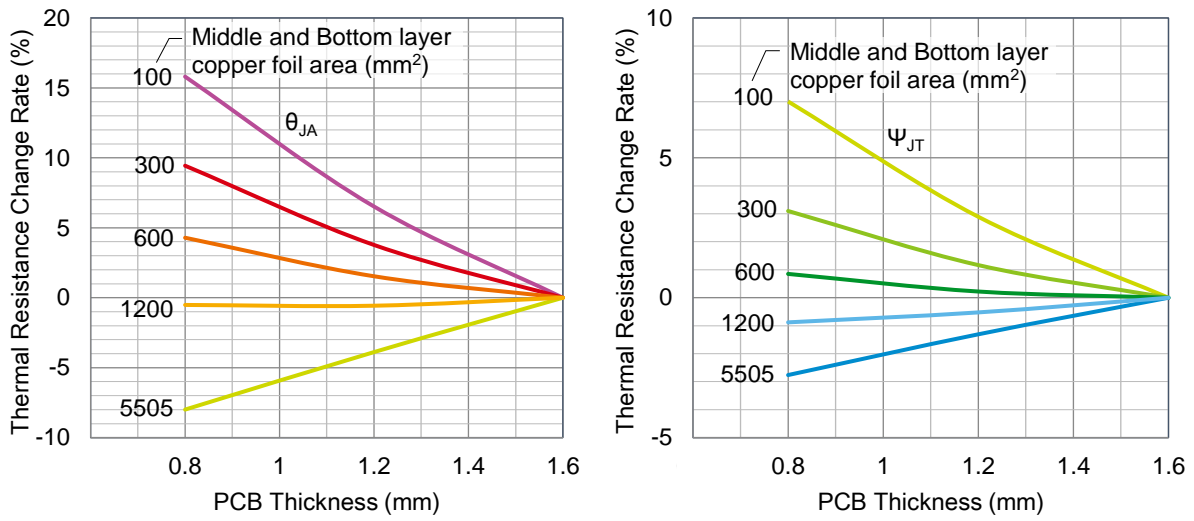


Figure 3-4-3-1.  $\theta_{JA}$ ,  $\psi_{JT}$  变化率 vs 基板厚度

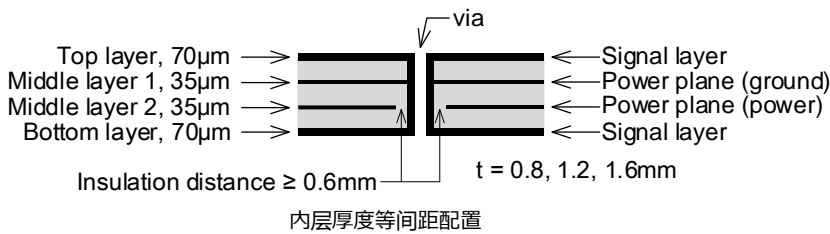


Figure 3-4-3-2. 4 层基板截面图

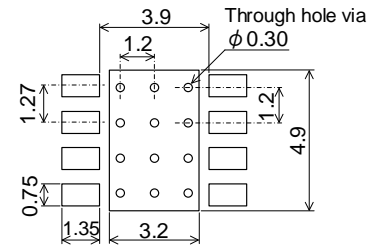


Figure 3-4-3-3. Footprint 尺寸

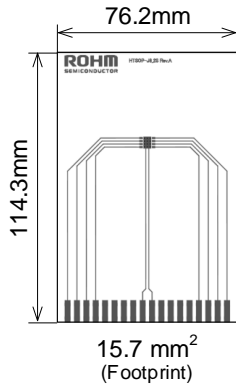


Figure 3-4-3-4. Top layer

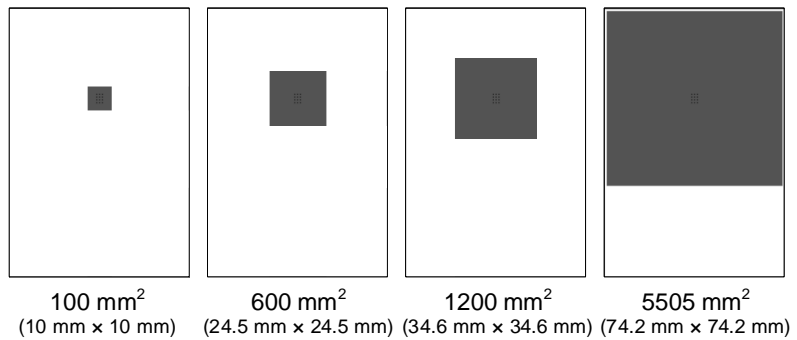


Figure 3-4-3-5. Middle layer 1, Bottom layer

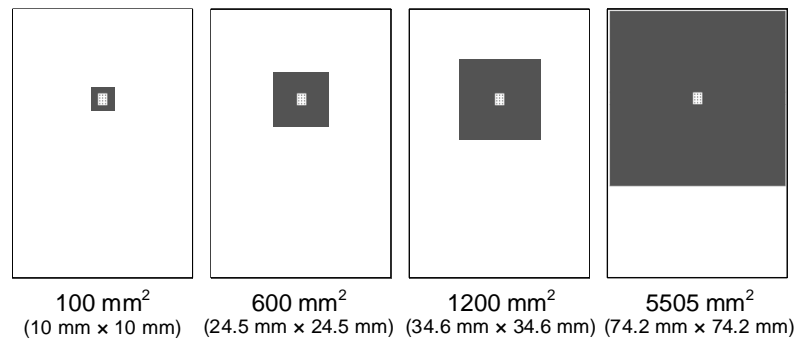
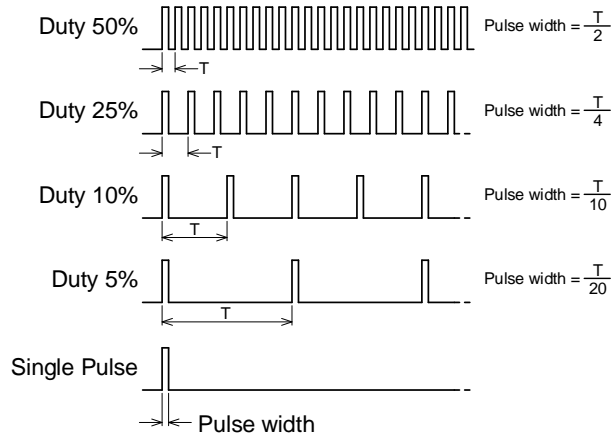


Figure 3-4-3-6. Middle layer 2

### 4. 瞬态热阻

坐标轴的说明

X 轴：Pulse width 是给系统供电的时间



Y 轴：瞬态热阻

#### 4-1. 瞬态热阻 1 层



Figure 4-1-1. 1 层基板截面图

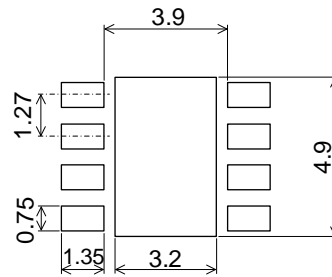


Figure 4-1-2. Footprint 尺寸

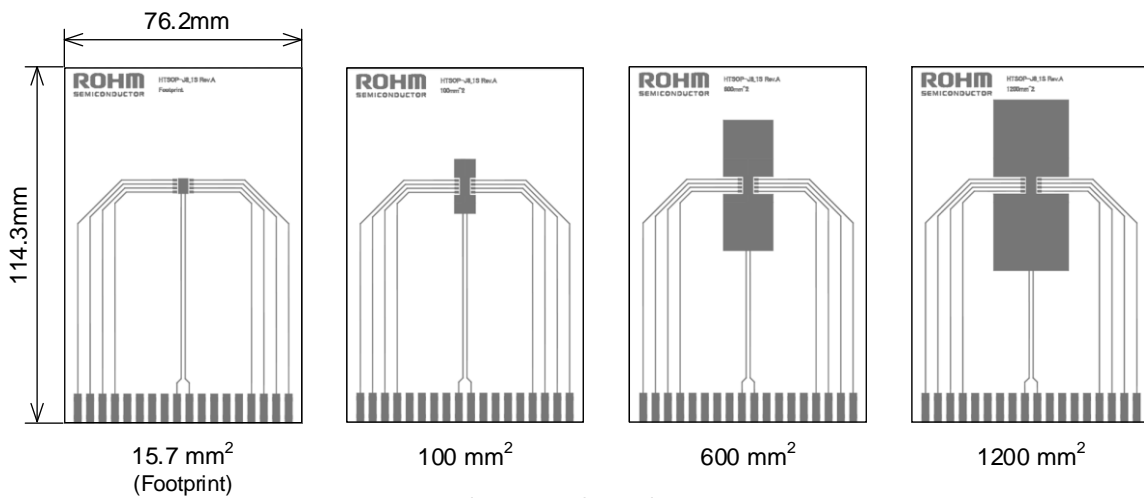


Figure 4-1-3. Top layer

4-1. 瞬态热阻 1 层 (继续)

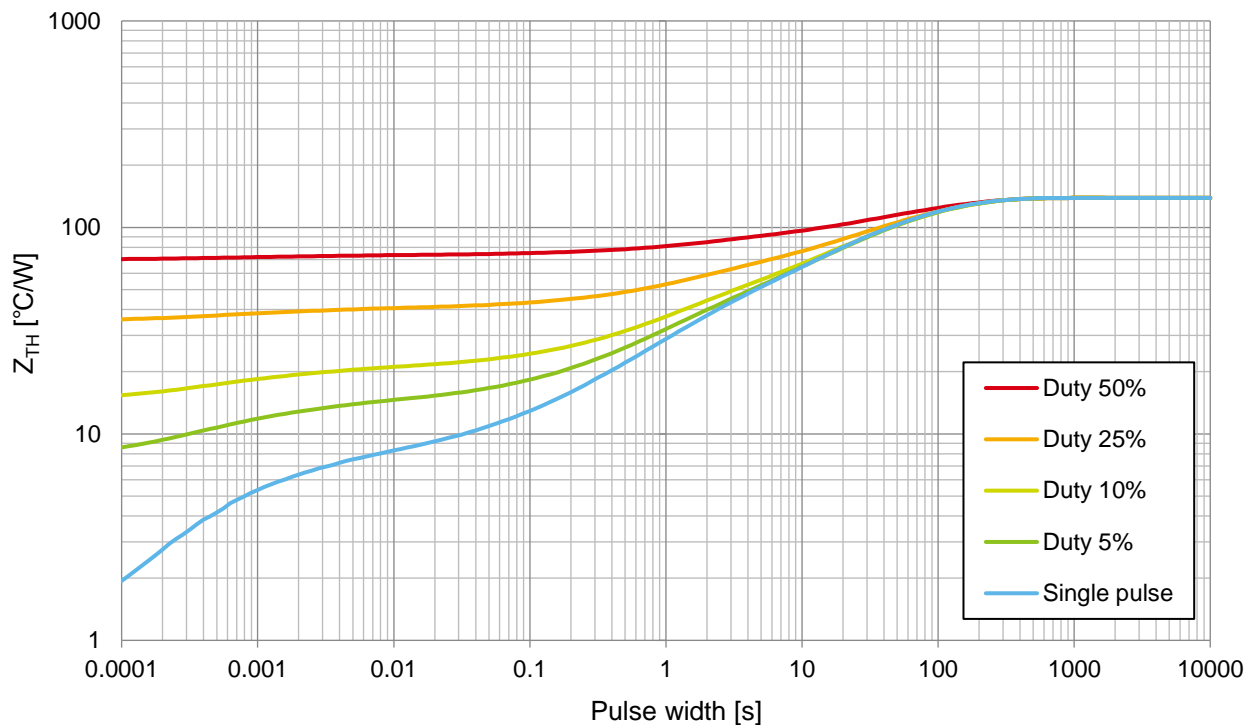


Figure 4-1-4. 瞬态热阻 1 层  
铜箔面积 15.7mm<sup>2</sup> (Footprint)

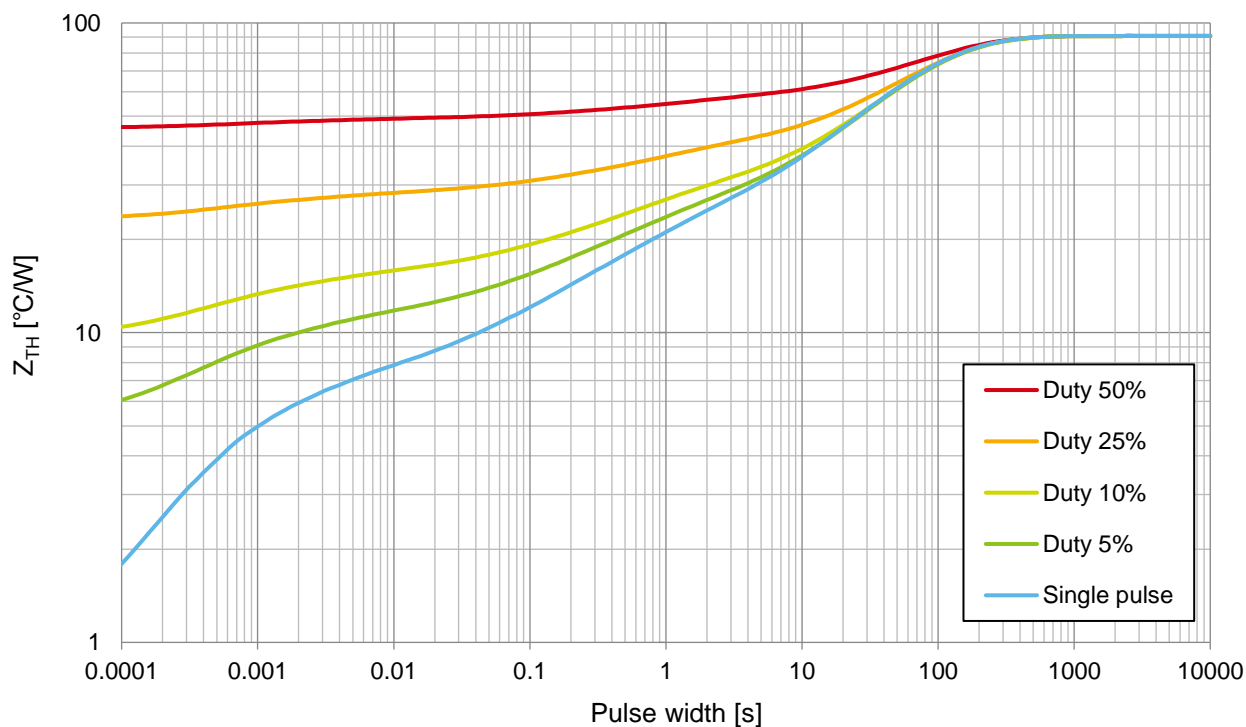


Figure 4-1-5. 瞬态热阻 1 层  
铜箔面积 100mm<sup>2</sup>

4-1. 瞬态热阻 1 层 (继续)

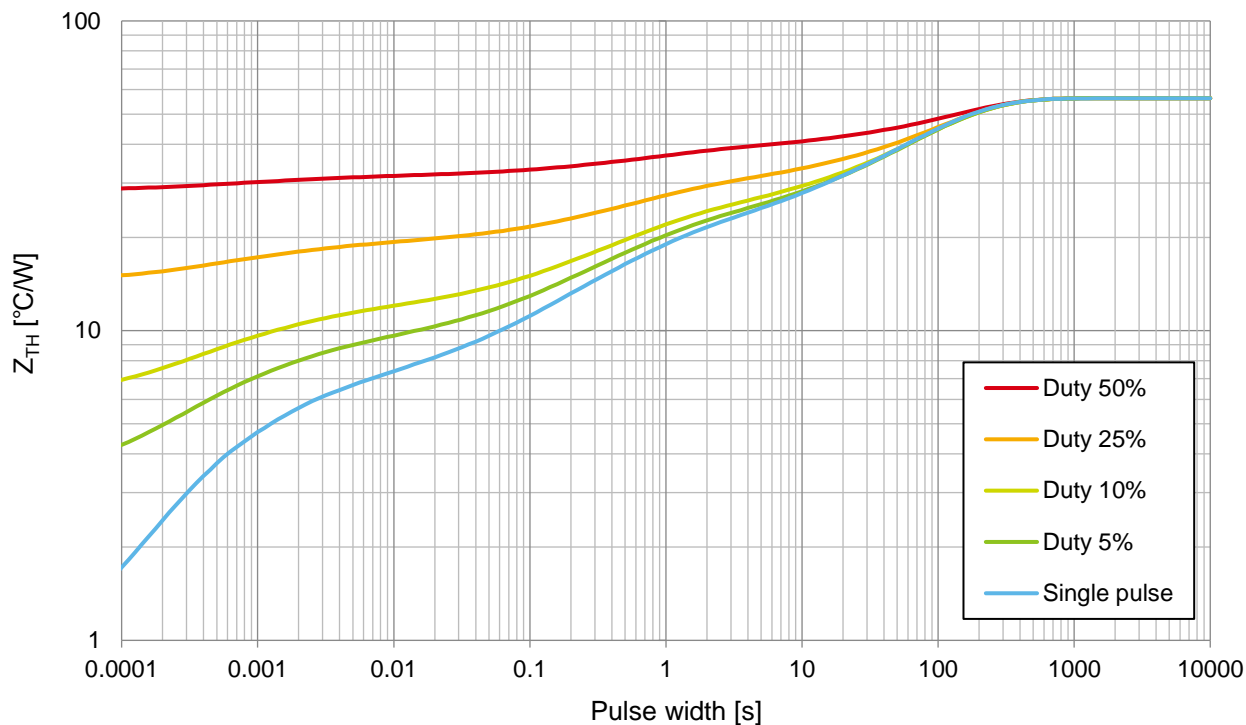


Figure 18. 瞬态热阻 1 层  
铜箔面积 600mm<sup>2</sup>

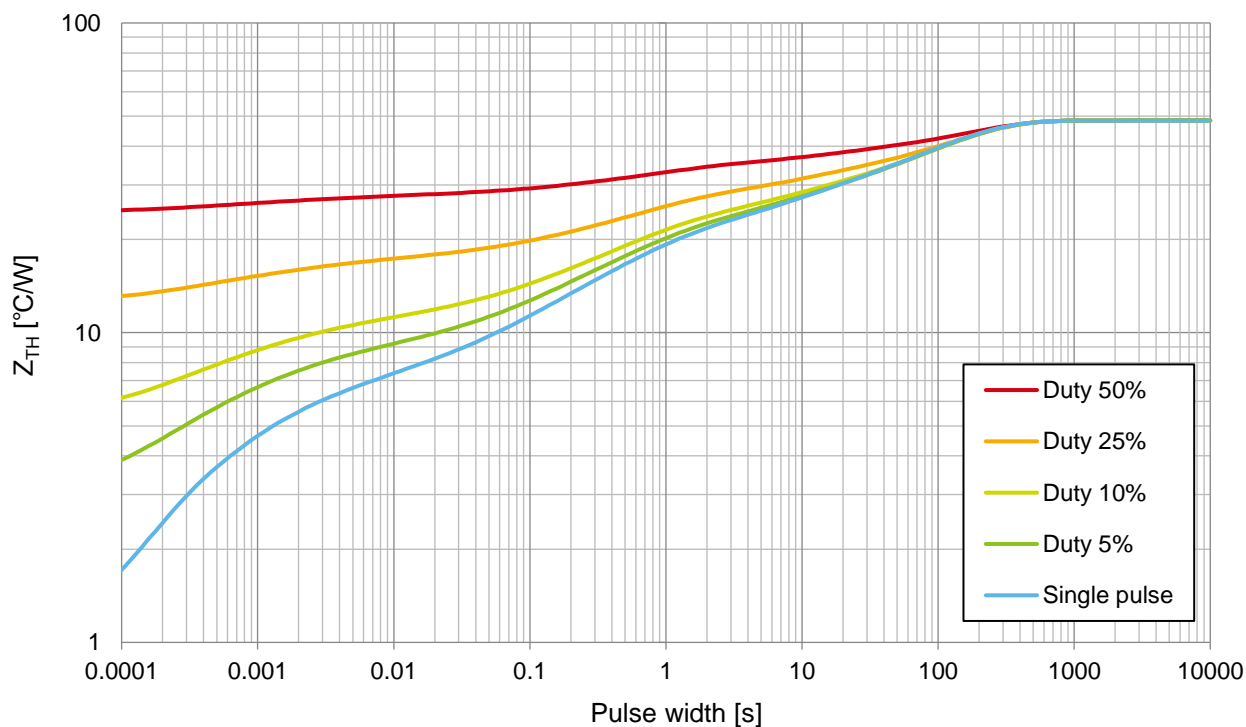


Figure 19. 瞬态热阻 1 层  
铜箔面积 1200mm<sup>2</sup>

4-2. 瞬态热阻 2层

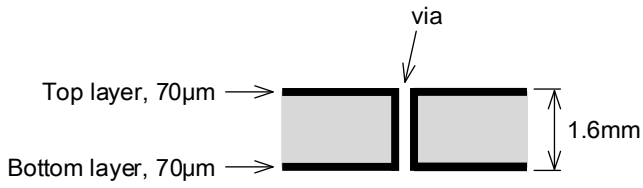


Figure 4-2-1. 2层基板截面图

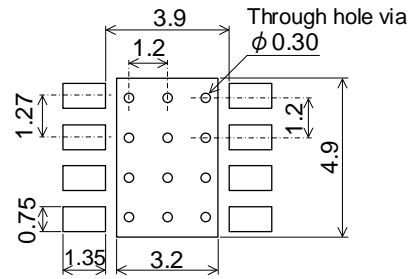


Figure 4-2-2. Footprint 尺寸

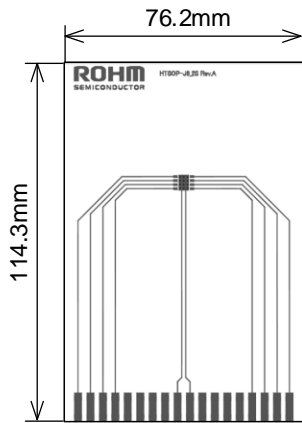


Figure 4-2-3. Top layer

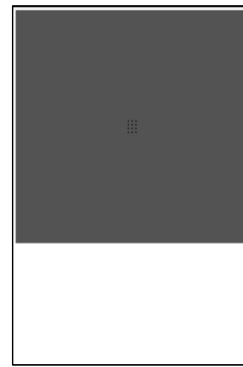


Figure 4-2-4. Bottom layer

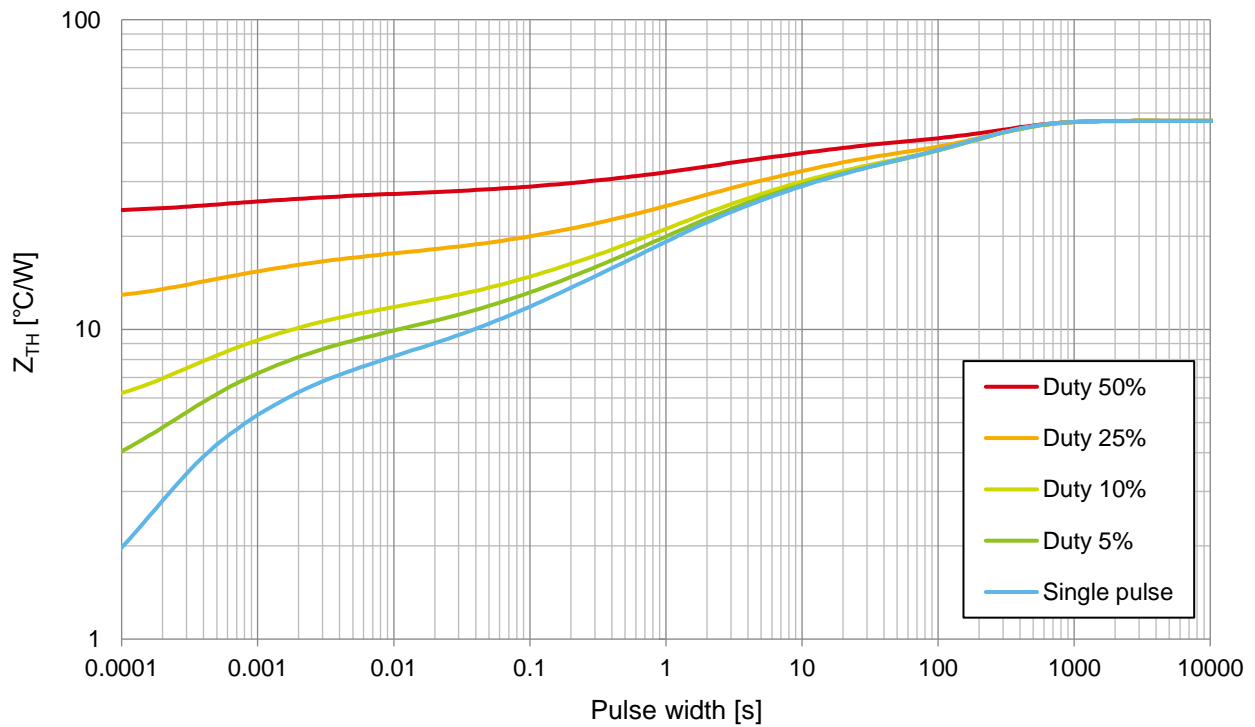


Figure 4-2-5. 瞬态热阻 2层



4-3. 瞬态热阻 4层

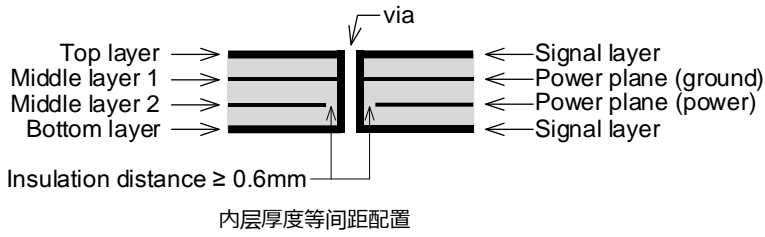


Figure 4-3-1. 4层基板截面图

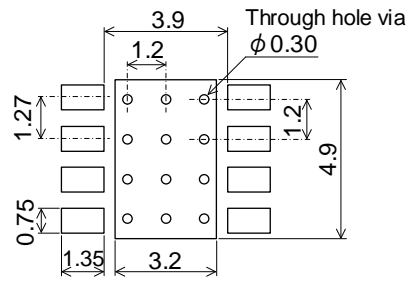


Figure 4-3-2. Footprint 尺寸

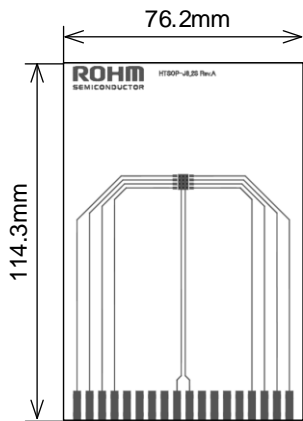


Figure 4-3-3. Top layer

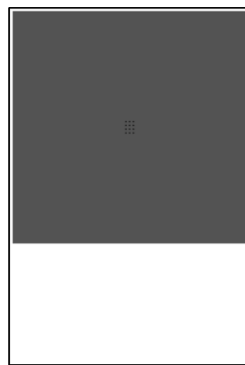


Figure 4-3-4. Middle 1 layer

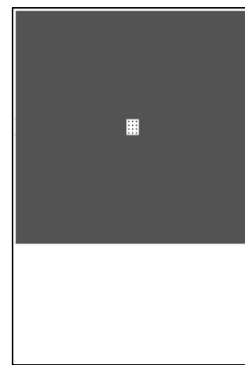


Figure 4-3-5. Middle 2 layer

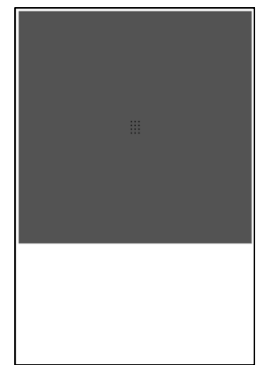


Figure 4-3-6. Bottom layer

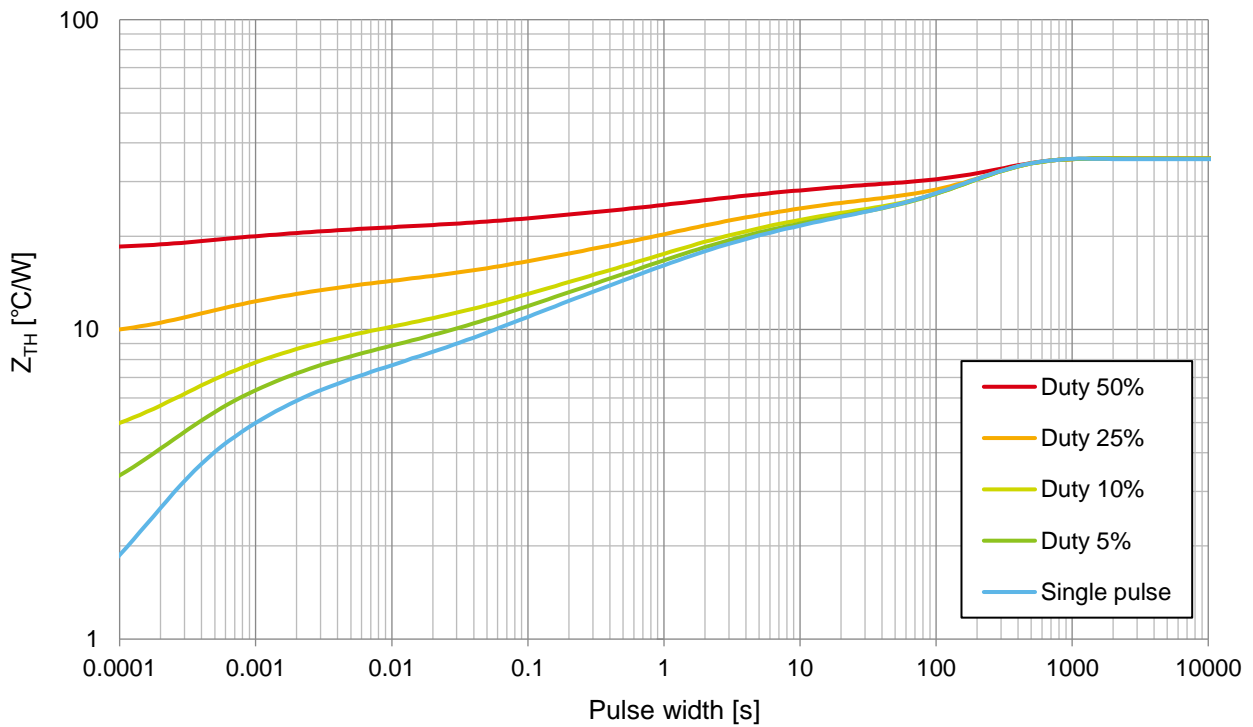


Figure 4-3-7. 瞬态热阻 4层

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