IC 散熱設計基礎

Reported：台北工程部

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Agenda

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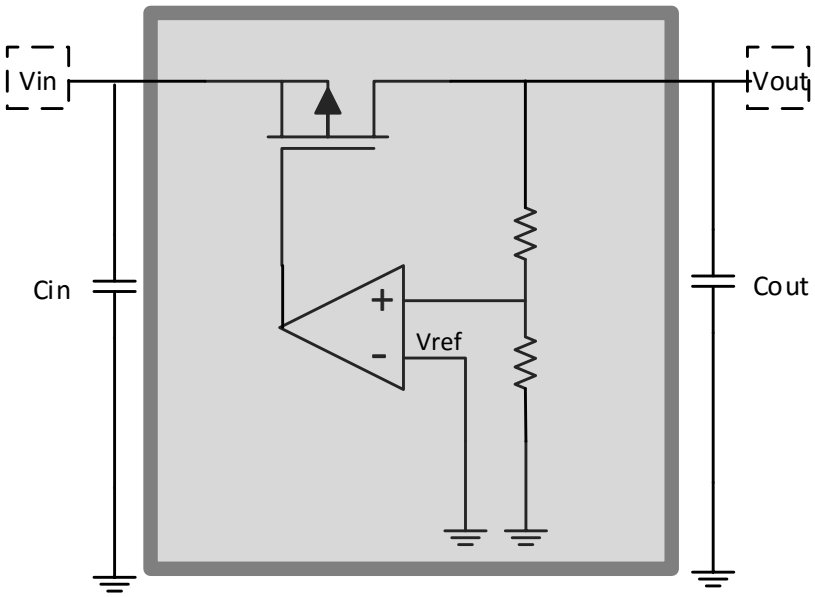
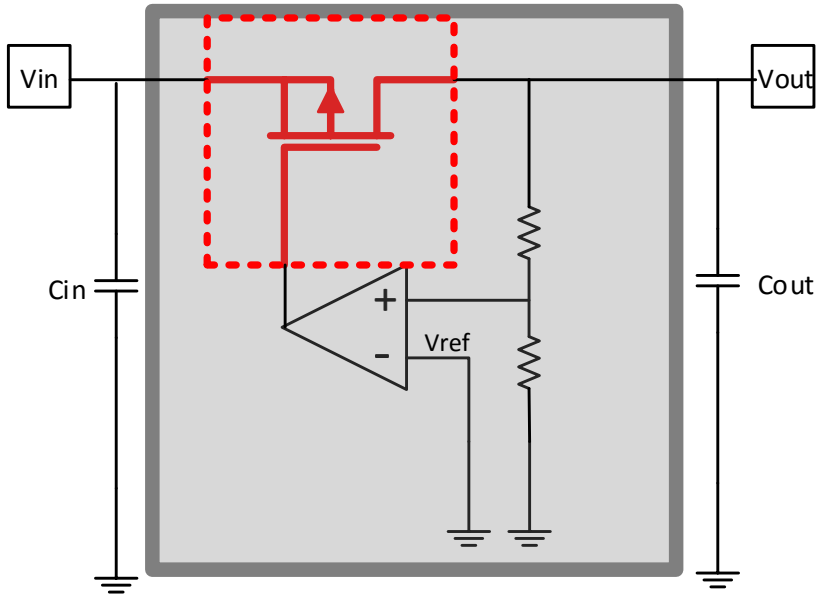
- LDO & Power Dissipation
- 名詞解釋
- 基本公式
- Package
- Layout 重點

Not Working



Working



$$P_D = (V_{IN} - V_{OUT}) \times I_{LOAD}$$

名詞解釋

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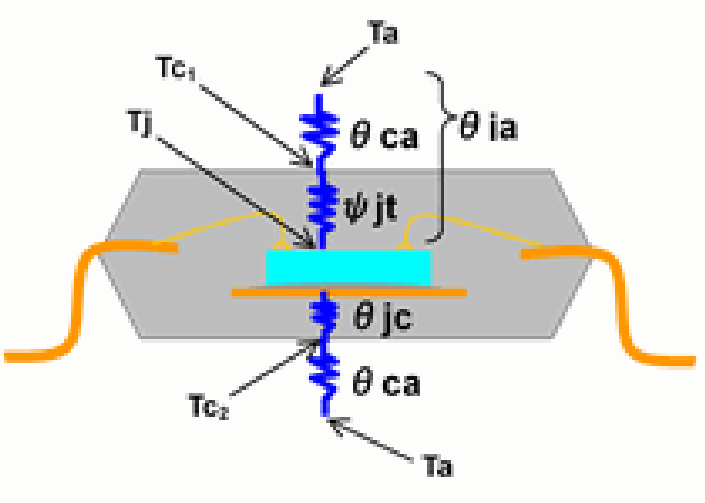

1. T_J (℃) = Junction Temp(≒ Die 溫度)
2. Tc (℃) = Case Temp(IC 表面溫度)
3. T_A (℃) = Ambient Temp(環境溫度)
4. θ_{JC} (℃/W) = Die表面到IC表面的熱阻系數
5. θ_{JA} (℃/W) = Die表面到環境的熱阻系數
6. θ_{CA} (℃/W) = IC表面到環境的熱阻系數
7. P_D(W) = 耗散功率

熱阻係數越低越好

基本公式

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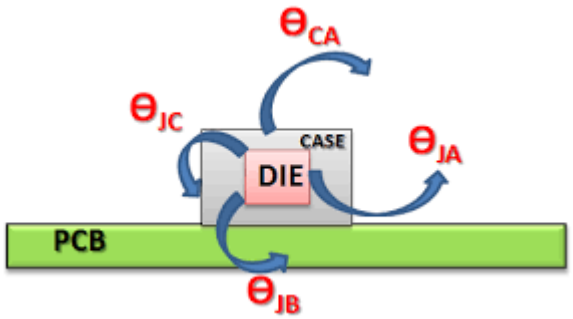
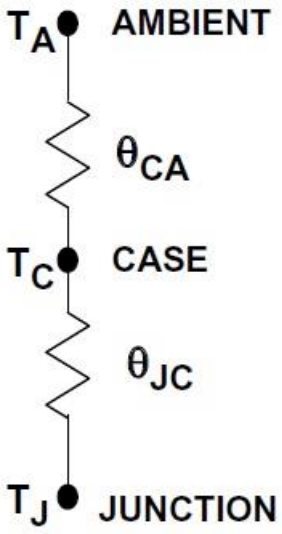
1. $\theta_{JA} = \theta_{JC} + \theta_{CA}$
2. $T_J = T_A + (\theta_{JA} \times P_D)$
3. $T_J = T_C + (\theta_{JC} \times P_D)$



範例參考 : Ricoh RN5T618

$P_{D(MAX)} = 4500\ mW$, $\theta_{JA} = 22.2\ ℃/W$, $\theta_{JC} = 10\ ℃/W$

1. $T_J = 25\ ℃ + (22.5 \times 4.5) = 125\ ℃$
2. $Tc = 125\ ℃ - 45℃ = 80\ ℃$



Package 1

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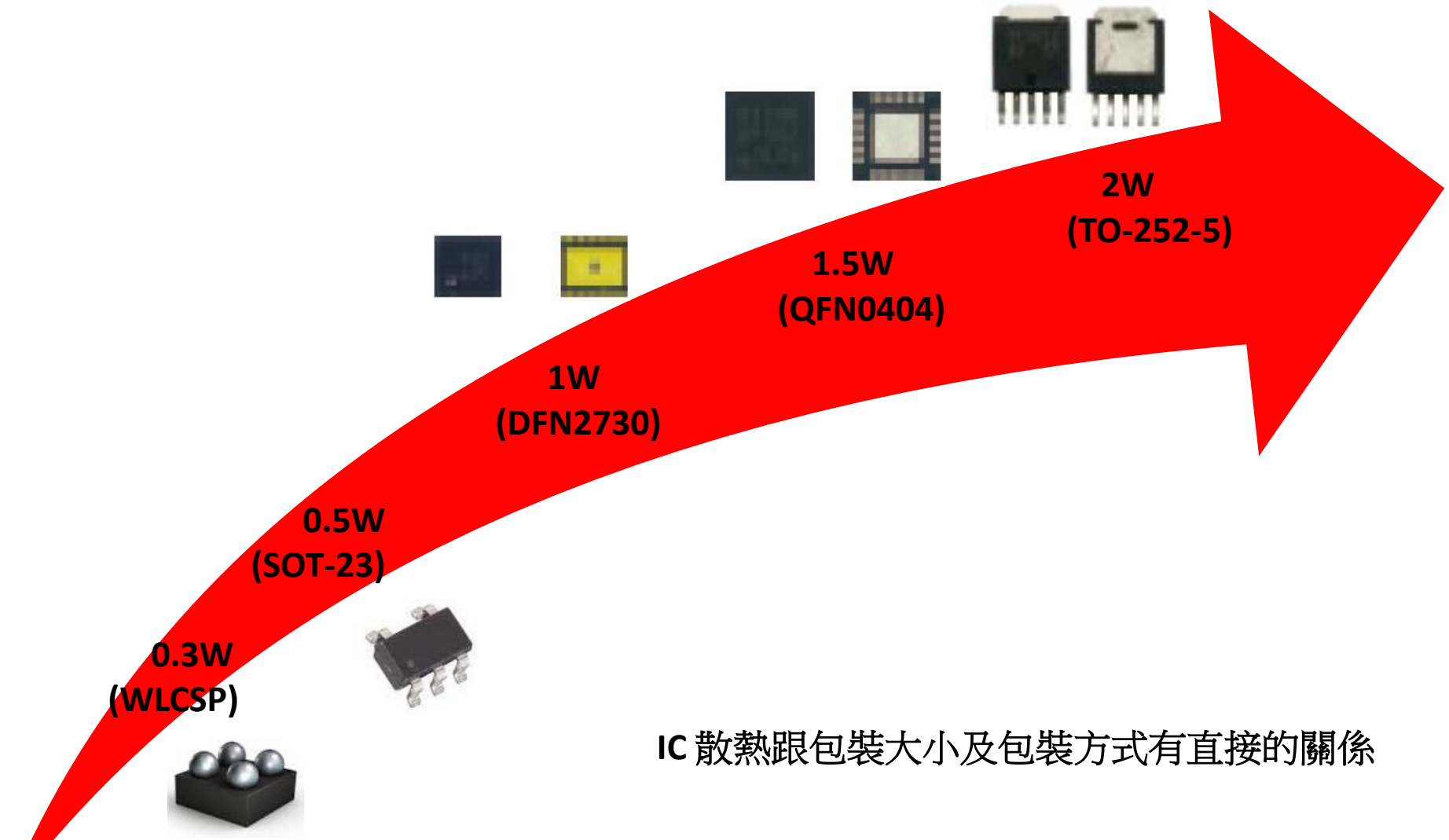

IC 散熱跟包裝大小及包裝方式有直接的關係

Ricoh K包裝範例

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Package	Dimemsions	Power Dissipation Standard Con **High Watt Con**
K(DFN2527)	2.7 x 2.5 (mm)	910(mW) **1400(mW)**

Measurement Conditions

	High Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plastic (4-Layers)	Glass cloth epoxy plastic (Double sided)
Board Dimensions	35mm × 90mm × 0.8mm	40mm × 40mm × 1.6mm
Copper Ratio	Each layers : Approx. 15%	Top side : Approx. 50% , Back side : Approx. 50%
Through-holes	ϕ0.3mm × 9pcs, ϕ0.5mm × 10pcs	ϕ0.54mm × 30pcs

Measurement Results

(Topt=25°C, Tjmax=125°C)

	High Wattage Land Pattern	Standard Land Pattern
Power Dissipation	1400mW	910mW
Thermal Resistance	θja=(125−25°C)/1.4W=71°C/W	θja=(125−25°C)/0.91W=110°C/W
	θjc=14°C/W	θjc=20°C/W

欲知詳情請洽...

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Ricoh官網資訊:

http://www.e-devices.ricoh.co.jp/en/products/product_power/

Thank You

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