n型金氧半場效電晶體速度飽和長度受溫度效應影響之研究=study on the length of velocity saturation by temperature effect inf

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摘 要

對金氧半場效電晶體(MOSFET)元件而言，在電性設計時，其「速度飽和長度」及「有效通道長度」皆為必須考量的重要參數之一；且在製程上必須要控制「有效通道長度」是否在設計範圍之內。因此本論文研究的重點在於萃取元件的「速度飽和長度」，並比較當元件在不同溫度與基底偏壓，其速度飽和長度的變化。除此之外，有關臨限電壓隨通道長度異常變化，及熱載子效應等的影響，本文亦有相關的探討。 而當元件在飽和偏壓下，若LDD處的電場過大， 載子受到飽和速度的影響，會使得Rtotel隨汲極電流或閘極偏壓增加而遞增。本論文以簡單的汲極電流的一次方型式，即其隨ID變化的Rtotal值來萃取速度飽和長度與飽和速度。 首先，我們先設計一批不同的通道長度的MOSFET元件，然後利用線性外差法（LE Method）萃取不同溫度與基板偏壓下的臨限電壓， 然後將其值代入萃取出 Lsat。再則我們使用TMA-MEDICI和TMA-TSUPREM4模擬軟體加以驗證，由實驗得知，速度飽和長度變化是隨通道長度、閘極偏壓增加而遞增；隨溫度上升而遞減。

關鍵詞 : 速度飽和長度 ; 飽和速度 ; 有效通道長度

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