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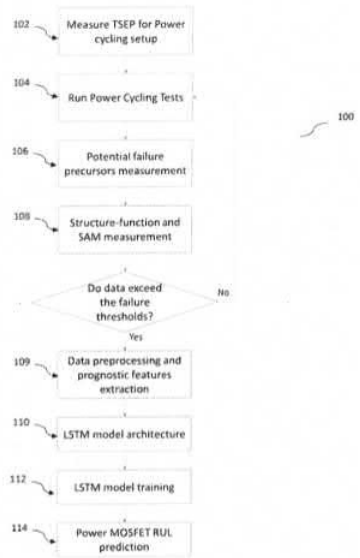
[54] A SYSTEM AND METHOD OF POWER MOSFET DIAGNOSTIC AND LIFETIME ESTIMATION USING AI ALGORITHM
一種使用 AI 演算法的功率 MOSFET 診斷及壽命估計的系統及方法

[57] The present invention discloses a power metal-oxide-semiconductor field-effect transistor (MOSFET) diagnostic and lifetime estimation system and method, comprising the steps of: acquiring degradation data by conducting a degradation test; measuring potential failure precursors to provide early warning of failure 106; inspecting and diagnosing health condition of internal structure of the power MOSFET device using thermal transient measurement and scanning acoustic microscopy (SAM) images 108; repeating power cycling test 104 and the measurements of potential failure precursors until the precursors reach a corresponding failure threshold; and estimating remaining lifetime of the power MOSFET device using an artificial intelligence (AI) algorithm.

本發明揭露了一種功率金屬氧化物半導體場效電晶體（MOSFET）診斷和壽命估計的系統及方法，包括以下步驟：透過進行退化測試取得退化資料；測量潛在的故障前兆以提供早期故障預警 106；使用熱瞬態測量和掃描聲學顯微鏡（SAM）影像 108 以檢查及診斷功率 MOSFET 元件的內部結構的健康狀況；重複功率循環測試 104 及潛在故障前兆的測量，直到前兆達到對應的故障閾值；及使用人工智慧（AI）演算法估計功率 MOSFET 元件的剩餘壽命。


100
102
Measure TSEP for Power cycling setup
104
Run Power Cycling Tests
106
Potential failure precursors measurement
108
Structure-function and SAM measurement
Do data exceed the failure thresholds?
No
Yes
109
Data preprocessing and prognostic features extraction
110
LSTM model architecture
112
LSTM model training
114
Power MOSFET RUL prediction