



採購規範書

品名：氮化鎵元件磊晶於碳化矽基板
案號：A512005235

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1. 目的/用途說明：

因應氮化鎵功率晶片開發需求，需於碳化矽基板進行氮化鎵元件磊晶層開發設計與製作，用以開發垂直式氮化鎵功率(GaN-on-SiC)晶片。

2. 規格/功能需求：

廠商應依下表規格之氮化鎵元件磊晶層條件，於半絕緣碳化矽(SI-SiC)基板開發製作垂直式氮化鎵元件磊晶層。共計生產出垂直式氮化鎵元件磊晶片6片。

磊晶層結構：

Epitaxy Structure	Thickness (nm)	Conductivity/ dopant concentration	Comment
SiN	2.0 ± 1.0	NA	
N-GaN	250 ± 10%	N-type ($N_n \sim 5 \times 10^{18} \text{ cm}^{-3}$)	Free-electron concentration
P-GaN	500 ± 10%	P-type ($Mg \sim 2 \times 10^{19} \text{ cm}^{-3}$)	Mg concentration
N-GaN	2500 ± 10%	N-type ($N_n < 5 \times 10^{16} \text{ cm}^{-3}$)	Free-electron concentration
N-GaN	300 ± 10%	N-type ($N_n \sim 5 \times 10^{18} \text{ cm}^{-3}$)	Free-electron concentration
AlN(nucleation)	Strain-adjusted thickness	NA	Bow control
Substrate	4" ; 500 mm; on-axis	Semi-insulating	

磊晶規格及檢驗方式：

Epitaxial Layers Properties	Item (Specification)	Measurement Method	Measurement Frequency
Crystallinity	GaN(002) (<350 arcsec)	HR-XRD	Every wafer
	GaN(102) (<500 arcsec)	HR-XRD	Every wafer
Carrier concentration	N_n (< 5×10^{16} , $\sim 5 \times 10^{18} \text{ cm}^{-3}$)	Hall	On calibration wafer only
	Mg ($\sim 2 \times 10^{19} \text{ cm}^{-3}$)	SIMS	On calibration wafer only
Wafer Bow	Sori (<100 μm)	Optical	Every wafer
Thickness and uniformity	Total thickness (STD <5%)	Optical	Every wafer
	Layer thickness	Optical	Every wafer
Surface roughness	Ra (<2nm)	AFM	One on each batch

磊晶層委託開發實驗規劃(NRE)與檢驗方式：

Layer Calibration	Calibration Objectives	Measurement Technique	Delivery
N-GaN	Free-electron density;	Hall	Report
	Thickness	Optical	
	Crystal quality	XRD	
N+ GaN	Free-electron density;	Hall	Report
	Thickness	Optical	
	Crystal quality	XRD	
P GaN	Mg concentration	SIMS	Report
	Thickness	Optical	



	Crystal quality	XRD	
In-situ SiN	Thickness	Optical	Report
	Surface roughness	AFM	
Nucleation/buffer layer	Wafer bow	Optical	Report
	Crystal quality	XRD	
Full Structure	Layer thickness	Optical	6 wafers with COA
	Total thickness uniformity	Optical	
	Crystal quality	XRD	
	Wafer bow	Optical	
	Surface roughness	AFM	

3. 安裝/測試要求：

本購案無現場安裝及測試需求。

4. 重要規格、功能檢測/驗收標準：

交付GaN-on-SiC 磊晶片6片，磊晶條件如磊晶允收COA規格表：

Epitaxy Structure	Thickness (nm)	Conductivity/ dopant concentration	Comment
SiN	2.0 ± 1.0	NA	
N-GaN	250 ± 10%	N-type (Nn~5e18 cm-3)	Free-electron concentration
P-GaN	500 ± 10%	P-type (Mg ~2e19 cm-3)	Mg concentration
N-GaN	2500 ± 10%	N-type (Nn<5e16 cm-3)	Free-electron concentration
N-GaN	300 ± 10%	N-type (Nn~5e18 cm-3)	Free-electron concentration
AlN(nucleation)	Strain-adjusted thickness	NA	Bow control
Substrate	4" ; 500 mm; on-axis	Semi-insulating	

每片需皆符合磊晶COA規格並出具出貨檢驗報告確認，包含以下測量數據：

Epitaxial Layers Properties	Item (Specification)	Measurement Method	Measurement Frequency
Crystallinity	GaN(002) (<350 arcsec)	HR-XRD	Every wafer
	GaN(102) (<500 arcsec)	HR-XRD	Every wafer
Carrier concentration	Nn(<5e16, ~5e18 cm-3)	Hall	On calibration wafer only
	Mg (~2e19 cm-3)	SIMS	On calibration wafer only
Wafer Bow	Sori (<100 μm)	Optical	Every wafer
Thickness and uniformity	Total thickness (STD <5%)	Optical	Every wafer
	Layer thickness	Optical	Every wafer
Surface roughness	Ra (<2nm)	AFM	One on each batch



磊晶層委託開發實驗NRE項目如下表，並交付相關磊晶層委託開發實驗報告：

Layer Calibration	Calibration Objectives	Measurement Technique	Delivery
N-GaN	Free-electron density;	Hall	Report
	Thickness	Optical	
	Crystal quality	XRD	
N+ GaN	Free-electron density;	Hall	Report
	Thickness	Optical	
	Crystal quality	XRD	
P GaN	Mg concentration	SIMS	Report
	Thickness	Optical	
	Crystal quality	XRD	
In-situ SiN	Thickness	Optical	Report
	Surface roughness	AFM	
Nucleation/buffer layer	Wafer bow	Optical	Report
	Crystal quality	XRD	
Full Structure	Layer thickness	Optical	6 wafers with COA
	Total thickness uniformity	Optical	
	Crystal quality	XRD	
	Wafer bow	Optical	
	Surface roughness	AFM	

5. 交貨期：

交期為115年12月18日前交貨完成。

6. 訓練：

無。

7. 保固：

若因製程問題導致產品無法正常工作，需協助除錯及驗證。

8. 廠商交付文件：

隨貨交付出貨檢驗報告一份、磊晶層委託開發實驗報告一份。

9. 工作環境及安全衛生注意事項：

無。



工業技術研究院

Industrial Technology
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10. 涉及智慧財產權歸屬要求：

無。

11. 其他：

無。