



TEST REPORT

Delivery Date: March 29 2012

1545nm LD Epi-wafer

(#0711281-F)

Customer : ECE Department, UCSB

Customer : UCSB

Control No. : 0711281-F

Test data :

1. DXCD

Item	Wafer No.	Spec (Å) ($\pm 10\%$)	test (Å)
1	L3LDA1203271-A,B,C	150	150.03~150.77

2. PL

Item	Wafer No.	Spec(nm)	test (nm)
1	L3LDA1203271	1545 \pm 10	1545.8

3. ECV

Item	Run No.	Layer #5-7(P-InP) (unit: 10^{18} cm^{-3})		Layer #13(N-InP) (unit: 10^{18} cm^{-3})	
		Spec.($\pm 20\%$)	Test	Spec.($\pm 20\%$)	Test
1	L3LDA1203271	0.5~1.5	~1.33	1	~1.02

4.Thickness

Item	Run No.	Layer #5-7(P-InP) (unit:um)	
		Spec.($\pm 10\%$)	test
1	L3LDA1203271	1.4	1.39

Comment :

The lattice mismatch and super-lattice period had determined by QC200 Diffractometer. The BIO-RAD RPM Blue PL mode is used to measure the wavelength. The concentrations of P-InP & N-InP layers are measured by Electro-Chemical C-V Profile. The thickness of P-InP layer is measured by Alpha-step.

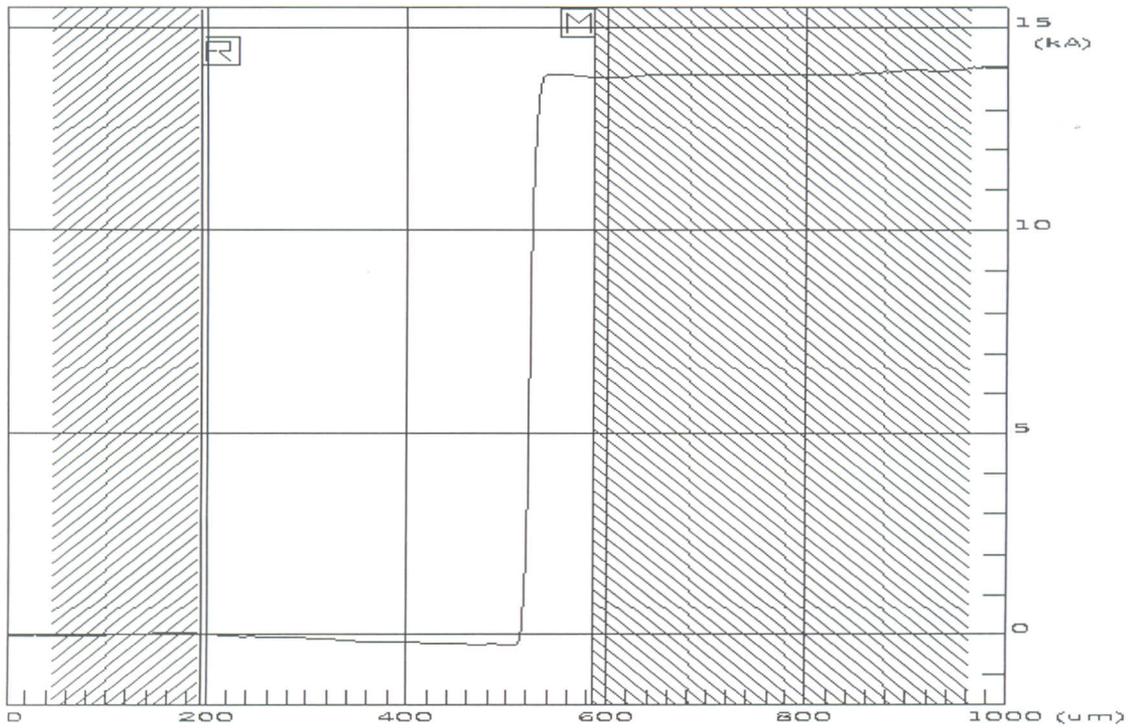
All wafers are tested under the same criteria. The attached graphs are the prototype of the testing results. All test results are in accordance with customer's specifications.

Signature :

Reported By: Jeremy

Manager: Matt Isueh

Supervisor: Wei Lin



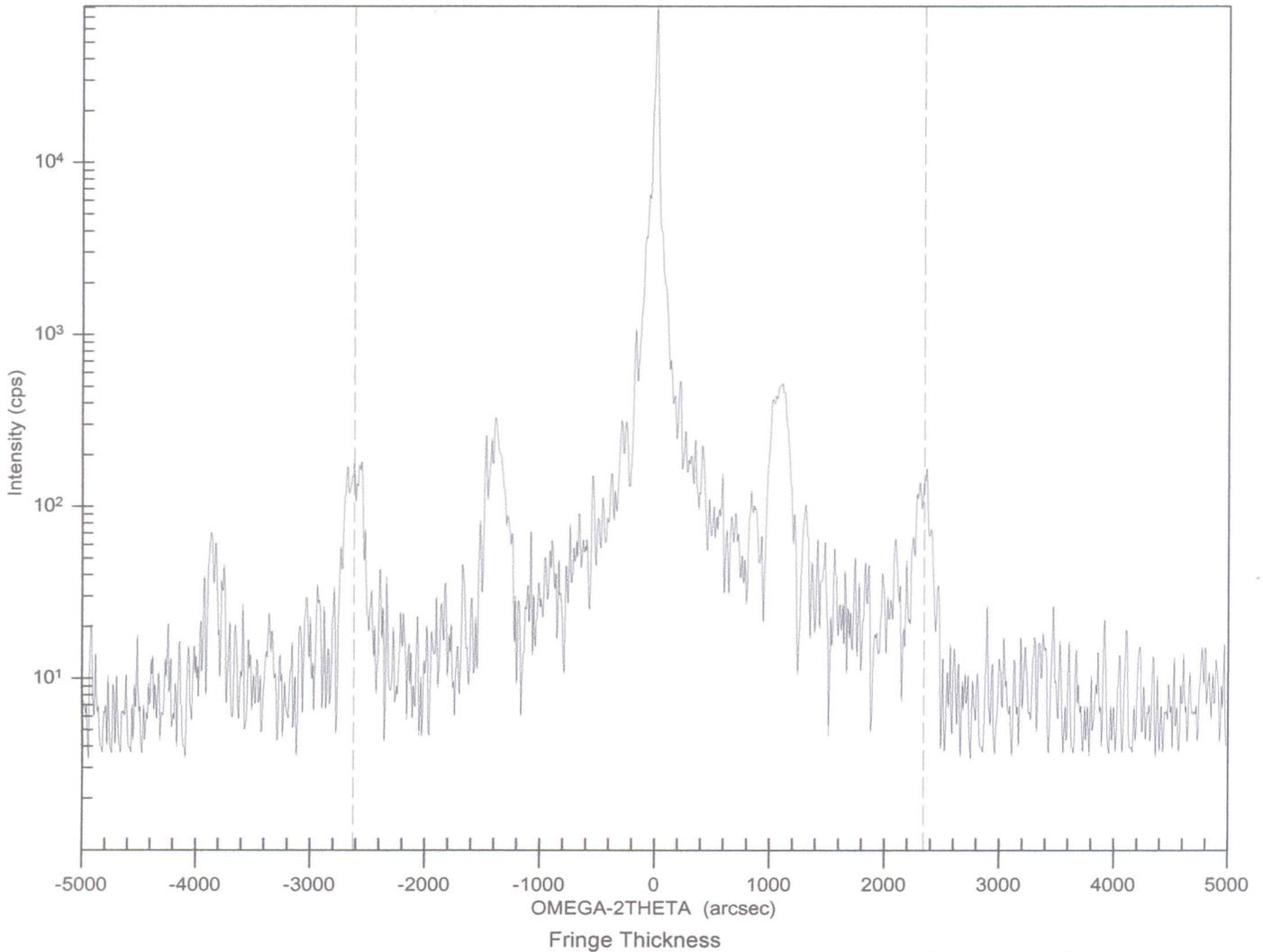
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DEKTAK 3 Version 3.00
PROG FILE NAME: 109092M1.MP
SCAN ROUTINE #: 1
TIME OF SCAN: 14:40:33 Tue Mar 27 2012
DATA FILE NAME: c:\2012\131da\203271Q1.001
Scan ID..... 0
Scan Length.... 1000um
Scan Speed.... Medium (25 sec)
Data Points.... 1000
Resolution.... 1.000 um/sample
Meas. Range.... 655 KA
Profile..... Hills&Valleys
R. Cursor..... 13A @ 192.66um
M. Cursor..... 13811A @ 586.87um
*Vert. Delta... 13798A
Horiz. Delta... 394.21um
ANALYTIC FUNCTIONS:
Ash = 1.39E+4A
R:um M:um
192.66 586.87

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Fringe Thickness Analysis

L3LDA1203271B_0AA1.X01



Substrate: InP
Epilayer: -
Average Fringe Spacing: 1242.13 arcsec
Thickness: 150.29 Å

ID: L3LDA1203271B_0AA1.X01
h,k,l: (0,0,4)
Number of Fringes: 4

Nanometrics RPM

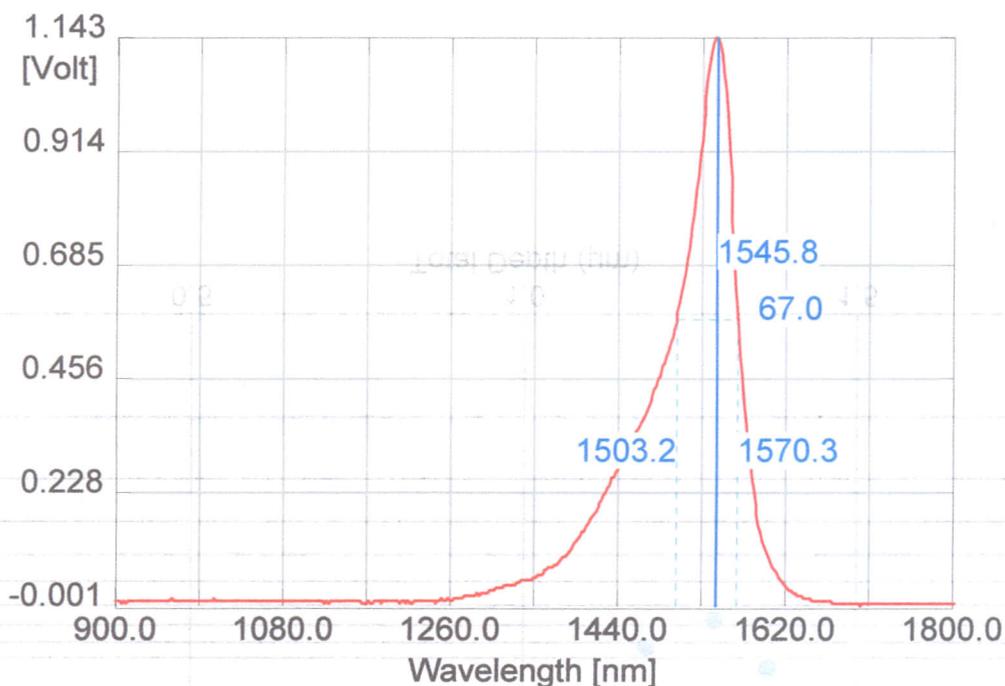
Date : March 27, 2012 11:17:44 Operator :
 Wafer ID : q-qw1 Batch ID : I3lda1203271
 Material : InP Thickness : 350 μ m
 Filename : C:\PL-data\2012\I3lda\1203271\q-qw1.spl
 Description :
 Recipe :
 Calibration : (none)

Scan parameters
 X : -3.0 mm
 Y : 3.0 mm
 Scan rate : 60 pts/s
 Temperature : 31.4 C
 Smoothed : No

Wavelength settings
 Center : N/A
 Range : 898.9 to 1788.8 nm
 Resolution : 2.08 nm/pixel (441)
 Slit width : 0.500 mm
 Grating : 150g/mm-125
 Detector : InGaAs
 Gain : x1 (corr.)
 Filter : 570LP

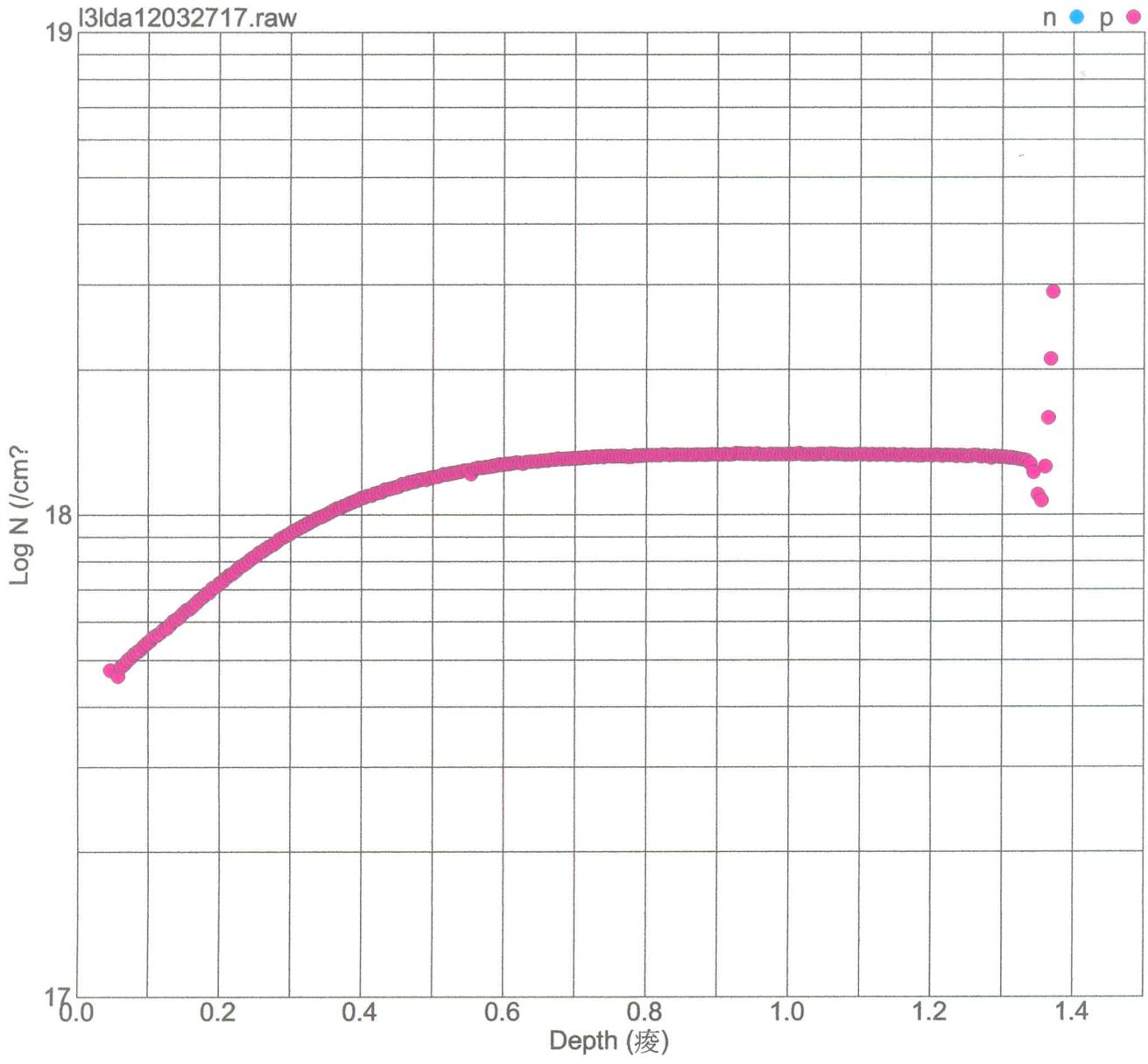
Analysis Parameters
 Mode : Custom 2
 FFT Filter : No
 Min Limit : 800.0 nm
 Max Limit : 1900.0 nm
 Threshold : 97.0 %
 FWHM : 50.0 %

Laser parameters
 Name : 532nm Nd:YAG
 Wavelength : 532.0 nm
 Power : 8.09 mW
 Pow Density : 103.0 W/cm2

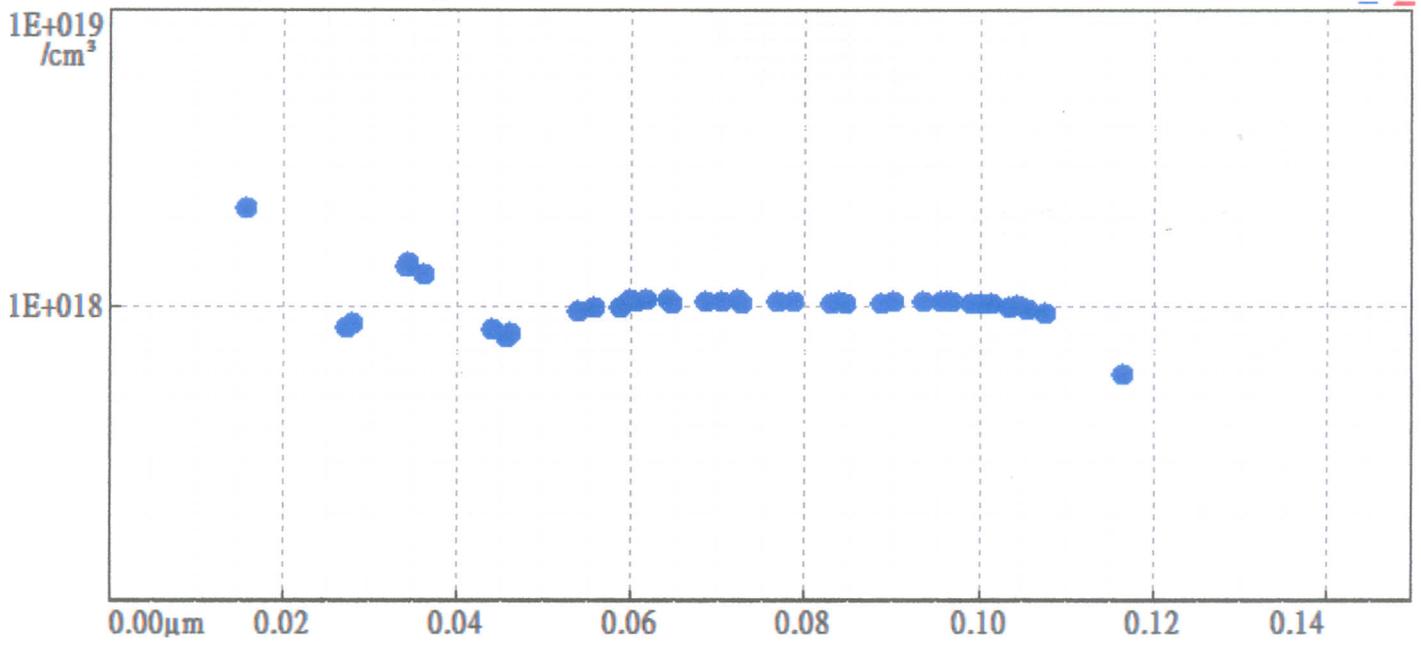


Results
 Peak : 1545.8 nm
 Height : 1.143 Volt
 FWHM : 67.0 nm
 Area : 53 a.u.

Reg End Mat1 +% Mat2 model EAC freq A-wet A-ill
1 274 InP 0 GaAs Parall Off 0.00 0.0081 0.0070



Layer#7-5(P- InP)



Layer#13(N- InP)



規格需求表
(SPECIFICATIONS CONFORMATION)
(LM-WORKP-DC-T1)

1. 功能模式來源: 契約 訂單 年度營運計畫書
(Order Type)

2. 功能簡述: (Function Description) 1545nm LD Epi-wafer (DESIGN-B)

3. 相關法令、規章(附件) (Local Regulations for the Products Specified): 無 (None)

4. 制定者: UCSB
(Specified By)

5. 制定日期: 2012/01/30
(Date of Specification)

6. 規格制定:
(Specifications)

序號 (No.)	規格需求項目 (Item Name)	規格值 (Value for Customer)	單位 (Unit)	誤差 (DP)	工作條件 (Test Condition)	備註 (Note)
0	N-InP Substrate (Material no.:M01022)	S-Doped, ($2-8 \times 10^{18}$)	cm^{-3}	---	---	2" wafer, $350 \pm 25 \mu\text{m}$
1	U-InP Buffer Layer	0.5	μm	$\pm 10\%$	---	
2	P-InGaAs Layer (Concentration)	0.05 ($> 1 \times 10^{19}$)	μm (cm^{-3})	$\pm 10\%$ (---)	---	---
3	P-InP Layer (Concentration)	0.02 ($> 1 \times 10^{18}$)	μm (cm^{-3})	$\pm 10\%$ (---)	---	---
4	P-InGaAs Layer (Concentration)	0.2 ($> 1 \times 10^{19}$)	μm (cm^{-3})	$\pm 10\%$ (---)	---	---
5	P-InP Layer (Concentration)	1 (1.5×10^{18})	μm (cm^{-3})	$\pm 10\%$ ($\pm 20\%$)	C-V measurement	On test wafer
6	P-InP Layer (Concentration)	0.2 (8×10^{17})	μm (cm^{-3})	$\pm 10\%$ ($\pm 20\%$)	C-V measurement	On test wafer
7	P-InP Layer (Concentration)	0.2 (5×10^{17})	μm (cm^{-3})	$\pm 10\%$ ($\pm 20\%$)	C-V measurement	On test wafer
8	P-1.05Q $\text{In}_{0.9029}\text{Ga}_{0.0971}\text{As}_{0.213}\text{P}_{0.787}$ (Concentration)	0.05 (5×10^{17})	μm (cm^{-3})	$\pm 10\%$ ($\pm 20\%$)	---	---
9	P-InP Layer (Concentration)	0.05 (5×10^{17})	μm (cm^{-3})	$\pm 10\%$ ($\pm 20\%$)	---	---
10	U-GRIN- $\text{In}_{0.53}\text{Al}_x\text{Ga}_{0.47-x}\text{As}$ (x:0.34→0.155)	0.1	μm	$\pm 10\%$	---	---
11	U-7x $\text{In}_{0.6753}\text{Al}_{0.06}\text{Ga}_{0.2642}\text{As}$ Well (+1% CS) / U-8x $\text{In}_{0.4411}\text{Al}_{0.085}\text{Ga}_{0.4739}\text{As}$ Barrier (-0.6% TS) (λ_{PL})	6	nm	$\pm 10\%$	DCXD & PL measurement	On epi-wafer
		9	nm	$\pm 10\%$		On test wafer
		(1545)	(nm)	(± 10)		
12	U-GRIN- $\text{In}_{0.53}\text{Al}_x\text{Ga}_{0.47-x}\text{As}$ (x:0.155→0.34)	0.1	μm	$\pm 10\%$	---	---
13	N-InP Layer (Concentration)	0.11 (1×10^{18})	μm (cm^{-3})	$\pm 10\%$ ($\pm 20\%$)	C-V measurement	On test wafer
14	2xN- $\text{In}_{0.85}\text{Ga}_{0.15}\text{As}_{0.327}\text{P}_{0.673}$ / 2xN-InP (Concentration)	7.5 / 7.5 (1×10^{18})	nm / cm^{-3}	$\pm 10\%$ / $\pm 10\%$ ($\pm 20\%$)	---	---
15	N-InP (Concentration)	0.01 (1×10^{18})	μm (cm^{-3})	$\pm 10\%$ ($\pm 20\%$)	---	---
16	N-InGaAs (Concentration)	0.2 (1×10^{18})	μm (cm^{-3})	$\pm 10\%$ ($\pm 20\%$)	C-V measurement	On test wafer
#	Lattice Mismatch	$< \pm 1000$	ppm	---	DCXD measurement	Test on center of epiwafer

Note: The out-diffusion of dopant can't be avoided. The doping profile will not be guaranteed.

7. 研發部主管: Brian Lau
(R&D Manager)

8. 技術部主管: Wei Lin
(Supervisor)

9. 需求者/客戶簽認: Yongbo Tang
(Customer Confirmation) (signature)

公司名稱: UCSB
(Customer)

10. 管制碼: 規需 0711281-F (Control No.)
(Please mail back after the confirmation signature by manager who make this order)