TEST REPORT

Delivery Date: September 12 2012

1545nm LD Epi-wafer

(#0711281-E1)

Customer：ECE Department,UCSB

Customer：UCSB **Control No.：**0711281-E1

Test data：

1. DXCD

Item	Wafer No.	Spec (Å) (±10%)	test (Å)
1	GLDA1209083- B,C,D	170	170.06~170.98

2. PL

Item	Wafer No.	Spec(nm)	test (nm)
1	GLDA1209083	1545±10	1548.7

3. ECV

Item	Run No.	Layer #7-9(P-InP) (unit:10^{18} cm^{-3})		Layer #15(N-InP) (unit:10^{18} cm^{-3})	
		Spec.(±20%)	Test	Spec.(±20%)	Test
1	GLDA1209083	0.5~1.5	0.49~1.63	1	~1.13

4.Thickness

Item	Run No.	Layer #7-9(P-InP) (unit:um)	
		Spec.(±10%)	test
1	GLDA1209083	1.45	1.46

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 Hsueh Supervisor: Wai Lin

Fringe Thickness Analysis

glda1209083c_0aa1.X01

Intensity (cps)

10^4

10^3

10^2

10^1

-5000 -4000 -3000 -2000 -1000 0 1000 2000 3000 4000 5000

OMEGA-2THETA (arcsec)

Fringe Thickness

Substrate: InP
Epilayer: -
Average Fringe Spacing: 1097.71 arcsec
Thickness: 170.06 Å

ID: glda1209083c_0aa1.X01
h,k,l: (0,0,4)
Number of Fringes: 3

Vtera

ACCENT RPM2000

Date	: September 08, 2012 23:33:11		Operator	:
Wafer ID	: q-qw1		Batch ID	: glda1209083
Material	: InP		Thickness	: 350 µm
Filename	: D:\2012\glda\1209083\q-qw3.spl			
Description	:			
Recipe	:			

Scan parameters

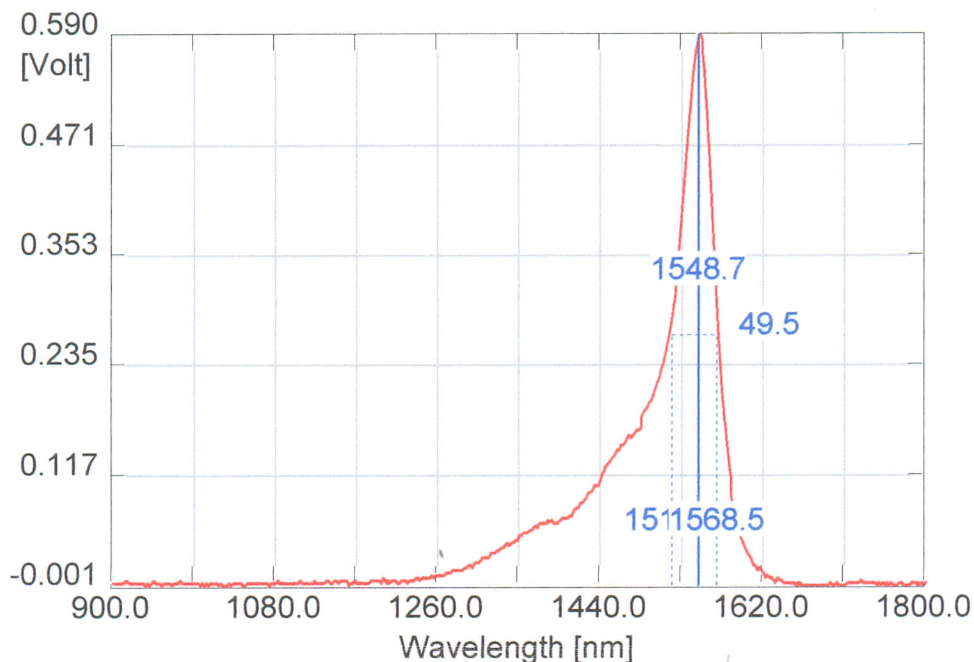
X	: -0.0 mm
Y	: -1.0 mm
Scan rate	: 100 pts/s
Temperature	: 21.9 C

Wavelength settings

Range	: 899.8 to 1799.4 nm
Slit width	: 0.500 mm
Grating	: 150g/mm-1250
Detector	: InGaAs
Gain	: x1 (corr.)
Filter	: 570nm HP
Calibration	: (none)

Laser parameters

Name	: 532nm CW 10mW
Wavelength	: 532.0 nm
Power	: 5.9 mW



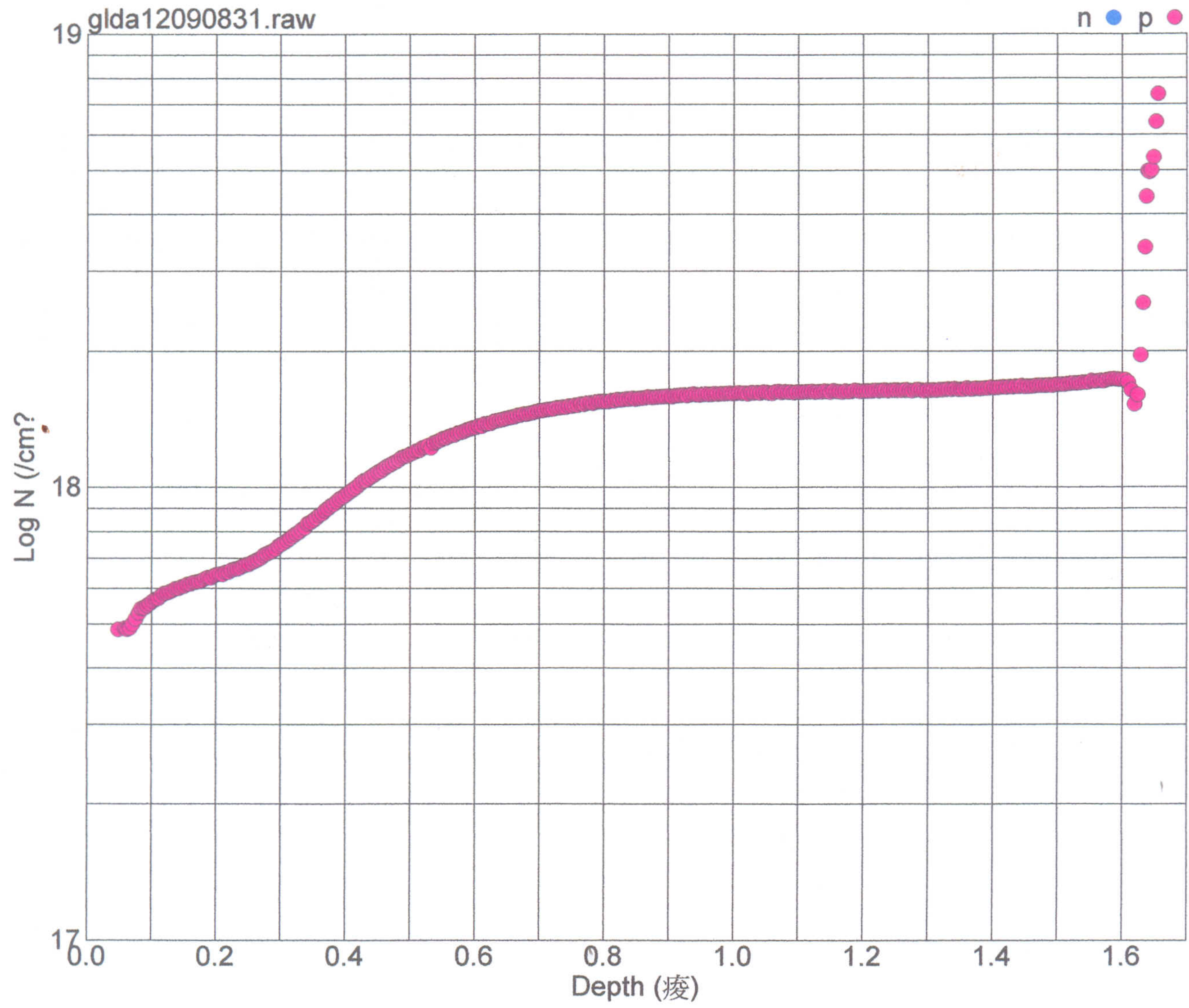
Analysis Parameters

Mode	: Custom 2
Min Limit	: 900.0 nm
Max Limit	: 1800.0 nm
Threshold	: 97.0 %
FWHM	: 50.0 %

Results

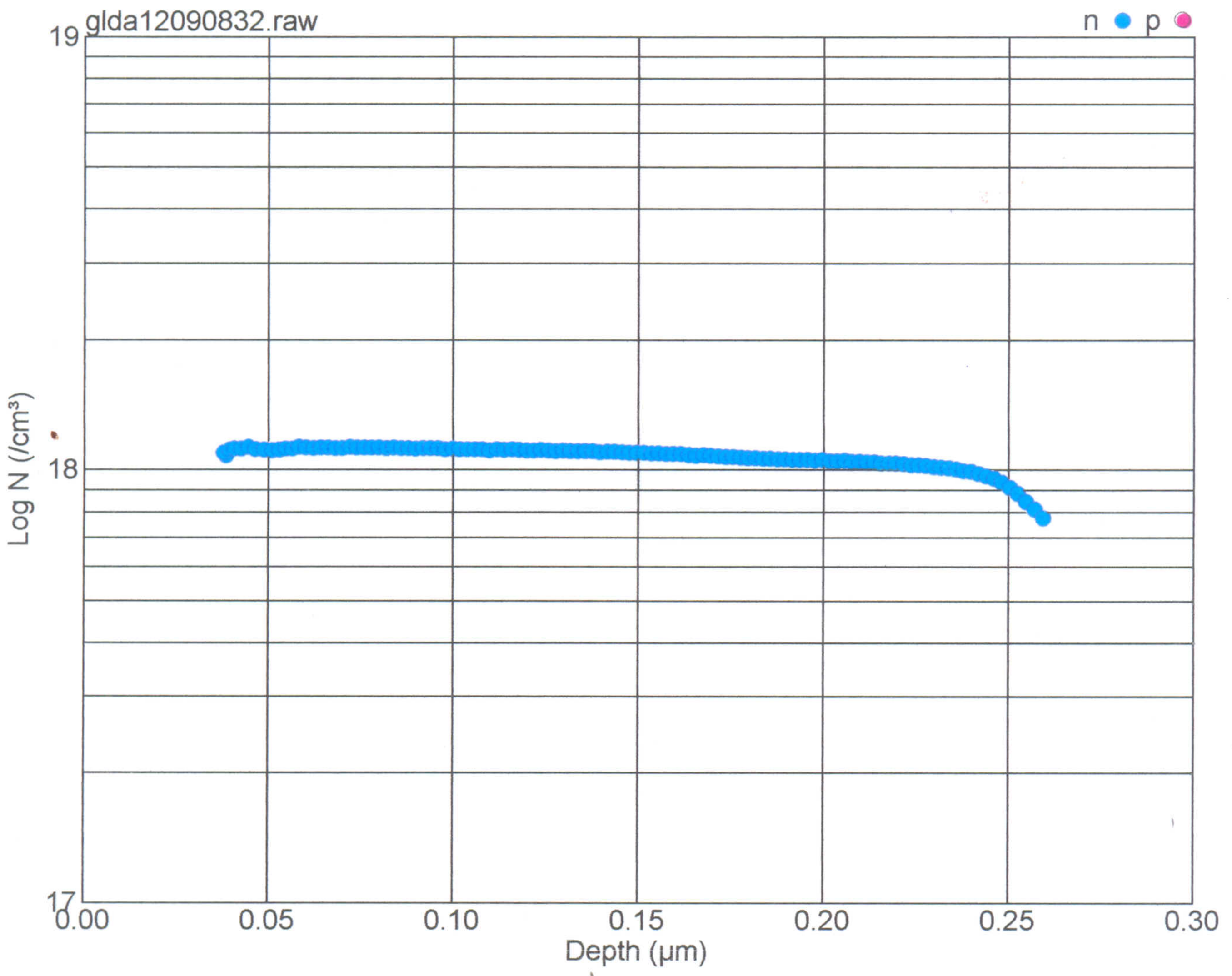
Peak	: 1548.7 nm
Height	: 0.590 Volt
FWHM	: 49.5 nm
Area	: 24 a.u.

Reg End Mat1 +% Mat2 model EAC freq A-wet A-ill
1 350 InP 0 GaAs Parall Off 0.00 0.0095 0.0080



Layer#9-7(P- InP)

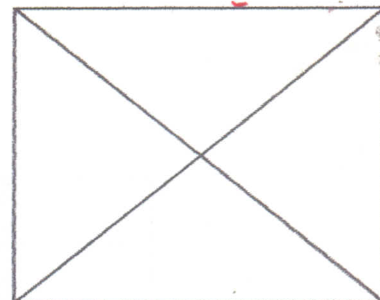
Reg	End	Mat1	+%	Mat2	model	EAC	freq	A-wet	A-ill
1	113	InP	0	GaAs	Parall	Off	0.00	0.0984	0.0940



Layer#15(N- InP)

KLA-Tencor **Alpha-Step IQ**

Document name: glda1209083q1

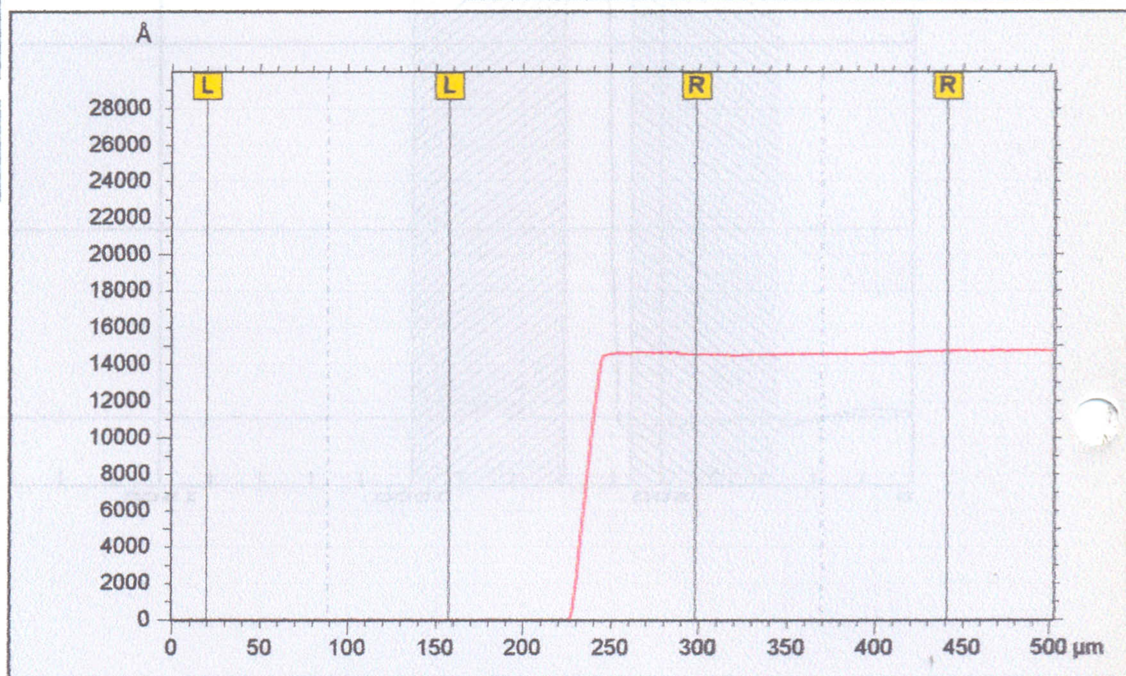


Leveling: 2 zones

Zoom: none

Width	280.98 µm
Height	14605 Å
TIR	14655 Å

Parameters... | 2 bars | 2 zones



聯亞光電工業股份有限公司
Land Mark Optoelectronic Corporation

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-A)

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：2012/08/30 (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, ($2\text{-}8\times10^{18}$)	cm^{-3}	---	---	2" wafer, 350±25μm
1	U-InP Buffer Layer	0.5	μm	±10%	---	
2	P-InGaAs Layer (Concentration)	0.05 ($>1\times10^{19}$)	μm (cm^{-3})	±10% (---)	---	---
3	P-InP Layer (Concentration)	0.02 ($>1\times10^{18}$)	μm (cm^{-3})	±10% (---)	---	---
4	P-InGaAs Layer (Concentration)	0.2 ($>1\times10^{19}$)	μm (cm^{-3})	±10% (---)	---	---
5	P-1.5Q $In_{0.586}Ga_{0.414}As_{0.888}P_{0.112}$ (Concentration)	0.025 ($>3\times10^{18}$)	μm (cm^{-3})	±10% (---)	---	---
6	P-1.3Q $In_{0.729}Ga_{0.271}As_{0.587}P_{0.413}$ (Concentration)	0.025 ($>3\times10^{18}$)	μm (cm^{-3})	±10% (---)		
7	P-InP Layer (Concentration)	1 (1.5×10^{18})	μm (cm^{-3})	±10% (±20%)	C-V measurement	On test wafer
8	P-InP Layer (Concentration)	0.2 (8×10^{17})	μm (cm^{-3})	±10% (±20%)	C-V measurement	On test wafer
9	P-InP Layer (Concentration)	0.25 (5×10^{17})	μm (cm^{-3})	±10% (±20%)	C-V measurement	On test wafer
10	P-1.05Q $In_{0.9029}Ga_{0.0971}As_{0.213}P_{0.787}$ (Concentration)	0.015 (5×10^{17})	μm (cm^{-3})	±10% (±20%)	---	---
11	P-InP Layer (Concentration)	0.015 (5×10^{17})	μm (cm^{-3})	±10% (±20%)	---	---
12	P-$In_{0.528}Al_{0.131}Ga_{0.341}As$ (λg= 1.36μm) SCH (Concentration)	0.125 (1×10^{17})	μm (cm^{-3})	±10% (±20%)	---	---
13	U-6x$In_{0.653}Al_{0.055}Ga_{0.292}As$ Well (+0.85% CS)/ U-7x$In_{0.45}Al_{0.089}Ga_{0.461}As$ Barrier (-0.55% TS) (λ_{PL})	7 / 10 (1545)	nm nm (nm)	±10% ±10% (±10)	DCXD & PL measurement	On epi-wafer On test wafer
14	N-$In_{0.528}Al_{0.131}Ga_{0.341}As$ (λg= 1.36μm) SCH (Concentration)	0.125 (1×10^{17})	μm (cm^{-3})	±10% (±20%)	---	---
15	N-InP Layer (Concentration)	0.25 (1×10^{18})	μm (cm^{-3})	±10% (±20%)	C-V measurement	On test wafer
16	2xN-$In_{0.85}Ga_{0.15}As_{0.327}P_{0.673}$ /2xN-InP (Concentration)	7.5 /7.5 (1×10^{18})	nm nm (cm^{-3})	±10% ±10% (±20%)	---	---
17	N-InP (Concentration)	0.01 (1×10^{18})	μm (cm^{-3})	±10% (±20%)	---	---
18	N-InGaAs (Concentration)	0.2 (1×10^{18})	μm (cm^{-3})	±10% (±20%)	---	---
#	Lattice Mismatch	<±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.製作者：[signature] (R&D Manager)　　8.主管：林蔚 (Supervisor)

9.需求者/客戶簽認：[signature] (Customer Confirmation) (signature)　　公司名稱：UCSB (Customer)

10.管制碼：規需 0711281-E1 (Control No.)

(Please mail back after the confirmation signature by manager who make this order)