TEST REPORT

Delivery Date: March 29 2012

1545nm LD Epi-wafer

(#0711281-E)

Customer：ECE Department, UCSB

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

Test data：

1. DXCD

Item	Wafer No.	Spec (Å) (±10%)	test (Å)
1	L3LDA1203272- A,B,C	170	170.54~170.72

2. PL

Item	Wafer No.	Spec(nm)	test (nm)
1	L3LDA1203272	1545±10	1547.6

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	L3LDA1203272	0.5~1.5	~1.35	1	~1.09

4.Thickness

Item	Run No.	Layer #7-9(P-InP) (unit:um)	
		Spec.(±10%)	test
1	L3LDA1203272	1.45	1.45

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.

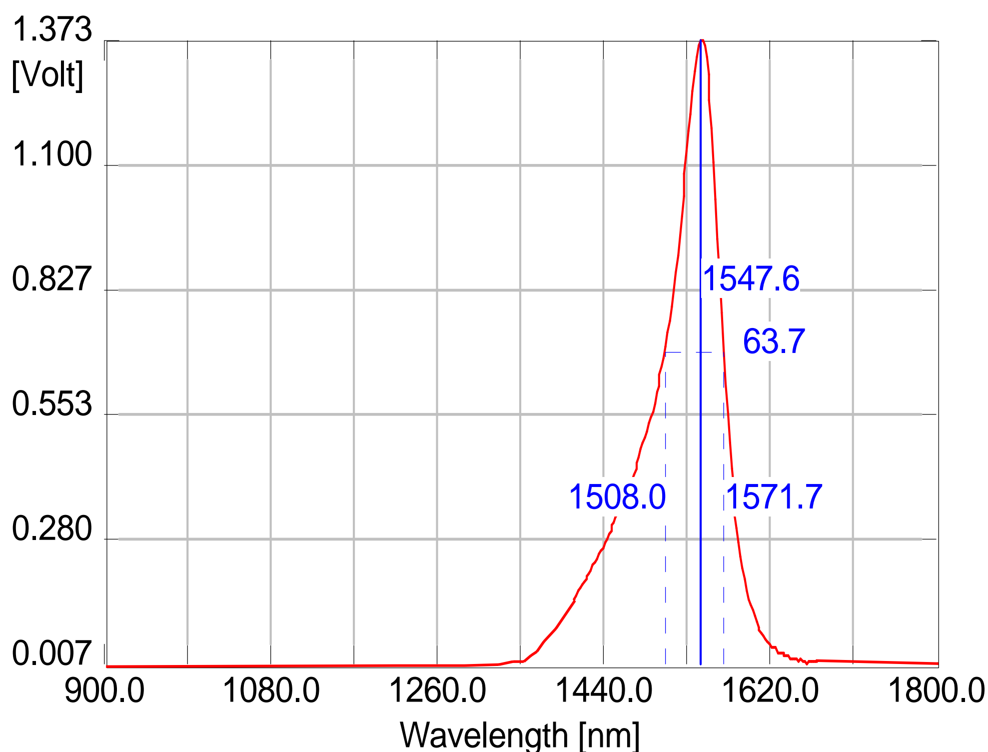
Signature：

Reported By: Jeremy Manager: Matt Hsueh Supervisor: Wei Lin

Nanometrics RPM

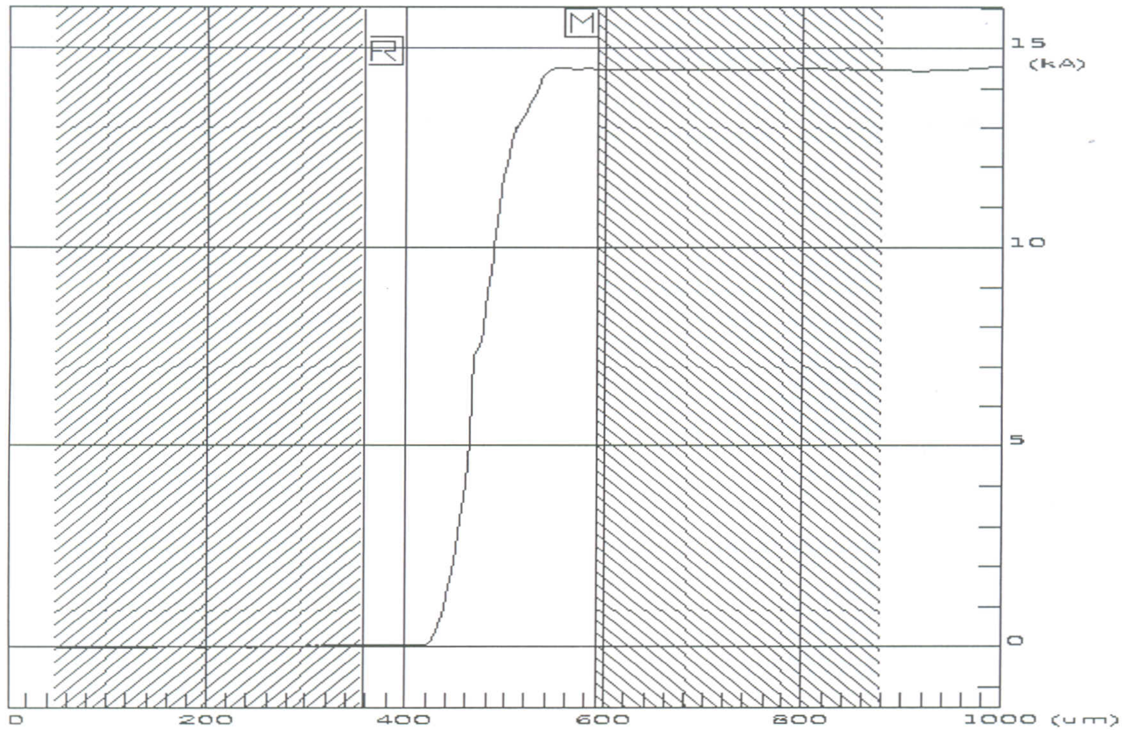
Date	: March 27, 2012 05:16:41	Operator	:
Wafer ID	: a-qw	Batch ID	: I3lda1203262
Material	: InP	Thickness	: 350 µm
Filename	: C:\PL-data\2012\I3lda\1203272\q-qw2.spl		
Description	:		
Recipe	:		
Calibration	: (none)		

Scan parameters		Wavelength settings		Analysis Parameters		Laser parameters	
X	: 9.0 mm	Center	: 1540.4 nm	Mode	: Custom 2	Name	: 532nm Nd:YAG
Y	: -1.0 mm	Range	: 1409.6 to 1673.3 nm	FFT Filter	: No	Wavelength	: 532.0 nm
Scan rate	: 60 pts/s	Resolution	: 2.08 nm/pixel (128)	Min Limit	: 900.0 nm	Power	: 8.25 mW
Temperature	: 30.6 C	Slit width	: 0.500 mm	Max Limit	: 1800.0 nm	Pow Density	: 105.1 W/cm2
Smoothed	: No	Grating	: 150g/mm-125	Threshold	: 97.0 %		
		Detector	: InGaAs	FWHM	: 50.0 %		
		Gain	: x1 (corr.)				
		Filter	: 570LP				



Results

Peak	: 1547.6 nm
Height	: 1.373 Volt
FWHM	: 63.7 nm
Area	: 56 a.u.

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DEKTAK 3  Version 3.00
PROG FILE NAME: 109092M1.MP
SCAN ROUTINE #: 1
TIME  OF  SCAN: 19:24:10 Tue Mar 27 2012
DATA FILE NAME: c:\2012\131da\203272Q1.001
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...... 30A @ 357.14um
M. Cursor...... 14475A @ 592.66um
*Vert. Delta... 14445A
Horiz. Delta... 235.52um
ANALYTIC FUNCTIONS:              R:um    M:um
Ash     = 1.45E+4A               357.14   592.66
```

Fringe Thickness Analysis

l3lda1203272a_0aa1.X01

Intensity (cps)

10^4

10^3

10^2

10^1

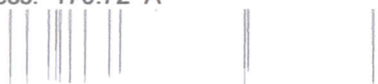
-5000 -4000 -3000 -2000 -1000 0 1000 2000 3000 4000 5000

OMEGA-2THETA (arcsec)

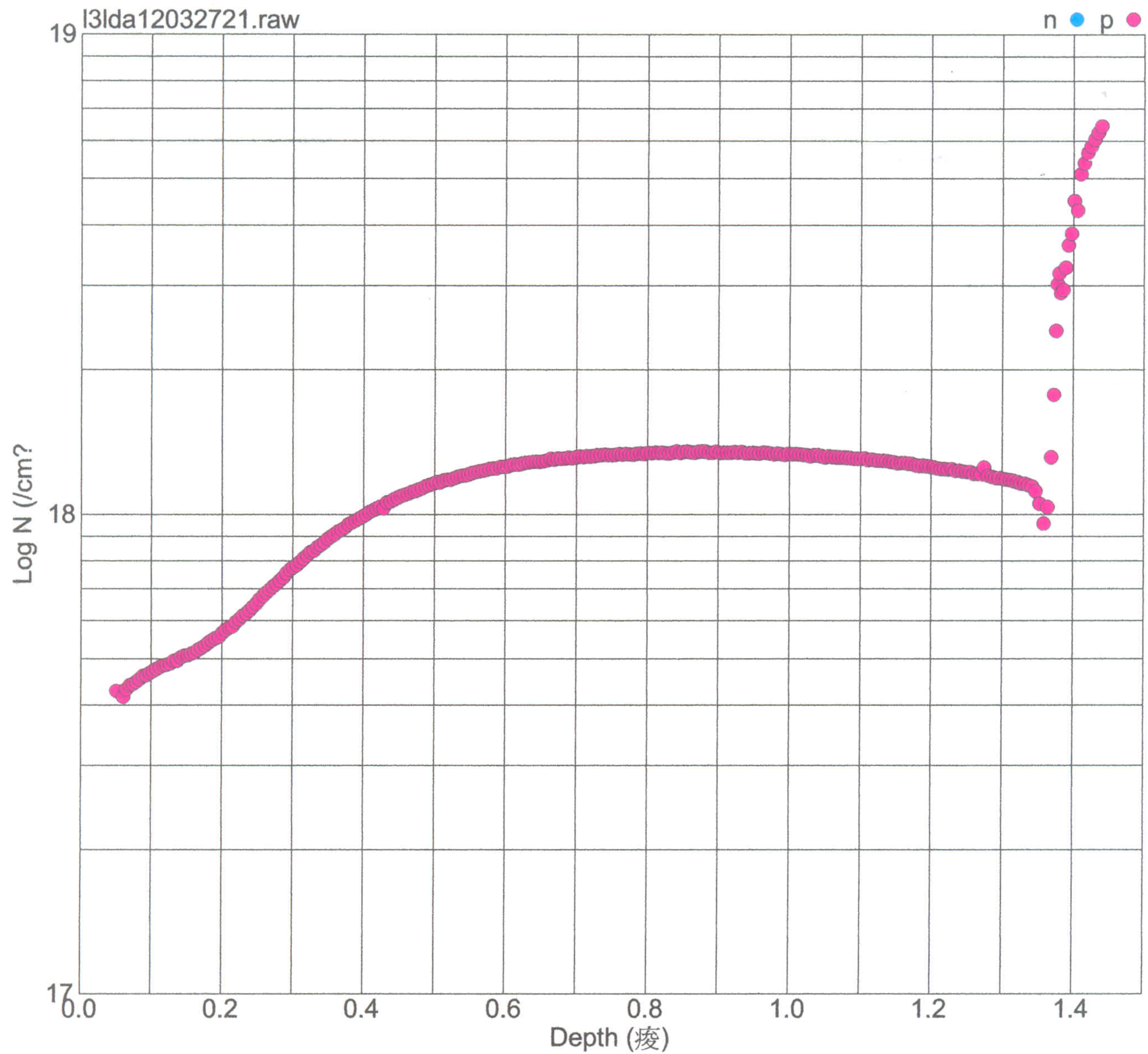
Fringe Thickness

Substrate: InP
Epilayer: -
Average Fringe Spacing: 1093.50 arcsec
Thickness: 170.72 Å

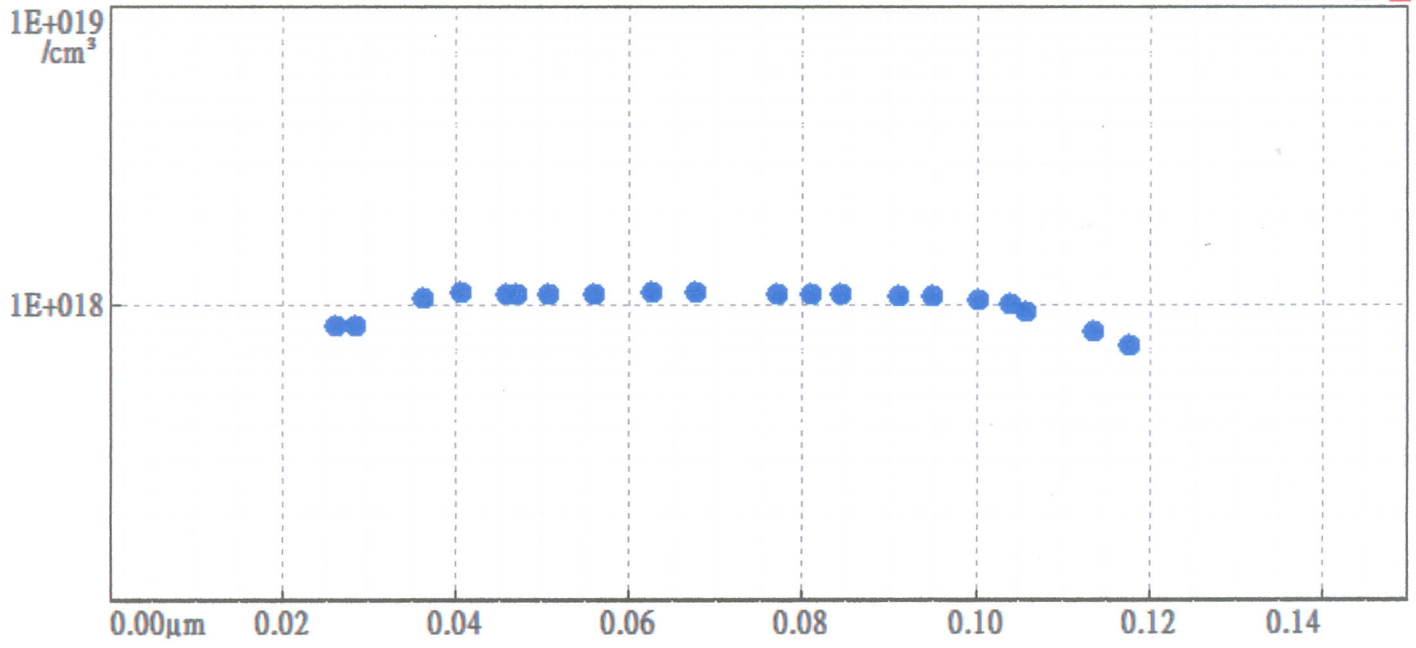
ID: l3lda1203272a_0aa1.X01
h,k,l: (0,0,4)
Number of Fringes: 5



Reg	End	Mat1	+%	Mat2	model	EAC	freq	A-wet	A-ill
1	281	InP	0	GaAs	Parall	Off	0.00	0.0078	0.0070



Layer#9-7(P- InP)



Layer#15(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-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： 2012/01/30
(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, $(2\text{-}8\times10^{18})$	cm^{-3}	---	---	2" wafer, $350\pm25\mu m$
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-8x$In_{0.653}Al_{0.055}Ga_{0.292}As$ Well (+0.85% CS)/ U-9x$In_{0.45}Al_{0.089}Ga_{0.461}As$ 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)	0.11 (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%)	~~C-V measurement~~	~~On test wafer~~
#	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.研發部主管：[signature]
(R&D Manager)

8.技術部主管：[signature]
(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-B (Control No.)
(Please mail back after the confirmation signature by manager who make this order)