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

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： 2009/07/08
(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	S-Doped, >2x10^{18}	cm^{-3}	---	---	2" wafer, 350±25μm
1	U- InP Buffer Layer	0.2	μm	±10%	---	
2	P- InGaAs (Concentration)	0.1 (>1x10^{19})	μm (cm^{-3})	±10% (---)	---	---
3	P-InP Layer (Concentration)	1.5 (1x10^{18})	μm (cm^{-3})	±10% (±20%)	C-V Test	On test wafer
4	P-InAlGaAs (λg= 1.3μm) SCH (Concentration)	200 (1x10^{17})	nm (cm^{-3})	±10% (±20%)	---	---
5	U-8X InAlGaAs Well (+0.85% CS)/ U- 9X InAlGaAs Barrier (-0.55% TS, λg= 1.3μm) (λ_{PL})	7 / 10 (1545)	nm nm (nm)	±10% ±10% (±10)	DCXD & PL measurement	On epi-wafer
6	N-InAlGaAs (λg= 1.3μm) SCH (Concentration)	200 (1x10^{17})	nm (cm^{-3})	±10% (±20%)	---	---
7	N-InP Layer (Concentration)	110 (1x10^{18})	nm (cm^{-3})	±10% (±20%)	---	---
8	2xN-InGaAsP (λ_g=1.1μm) /2xN-InP (Concentration)	7.5 /7.5 (1x10^{18})	nm nm (cm^{-3})	±10% ±10% (±20%)	---	---
9	N-InP (Concentration)	10 (1x10^{18})	nm (cm^{-3})	±10% (±20%)	---	---
10	N-InGaAs (Concentration)	0.2 (1x10^{18})	μm (cm^{-3})	±10% (±20%)	C-V Test	On test wafer
#	Lattice Mismatch	<±1000	ppm	---	DCXD measurement	Test on center of epiwafer

7.研發部經理：
(R&D Manager)

8.主管：
(Supervisor)

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

公司名稱： UCSB
(Customer)

10.管制碼：規需 0711281-9 (Control No.)
(Please mail back after the confirmation signature by manager who make this order)

保存年限： 叁 年

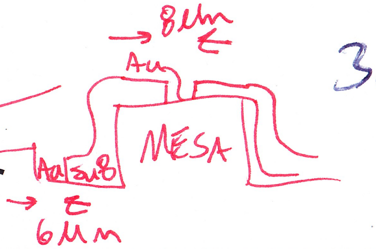
密等：密

h ≈ 7.5·10⁴ W/m²K

Pipet Ram

Vias 50%

Epitaxial layer



3.746

~~center~~ Au: 13 μm → 33 μm from center

1.2 μm

3·10⁻⁷

	Layer	Material and Composition	Doping	Thickness	Index	W	
						Au: top	
0	Substrate	InP	(S-doped)			SU-8: 5 μm tall	
1	Buffer	InP	Undoped	0.2 μm		Au: 4 μm 100 nm	
2	Contact	$In_{0.53}Ga_{0.47}As$	P – 1e19	0.1 μm		14 μm	
3	Cladding	InP	P – 1e18	1.5 μm	3.1673	14 μm	InP
4	SCH	InAlGaAs, 1.3 μm	P – 1e17	0.125 μm	3.5616	14 μm	Tens. 271 nm
5	QW (λ_{PL}=1.545 μm)	InAlGaAs (well), +0.85%, 1.3 μm (8x)	n.i.d.	7 nm	3.8051	14 μm	
		InAlGaAs (barrier), -0.55%, 1.3 μm (9x)	n.i.d.	10 nm	3.5746	14 μm	
6	SCH	InAlGaAs, 1.3 μm	N – 1e17	0.125 μm	3.5616	16 μm	Tesn 125 nm
7	Contact	InP	N – 1e18	0.11 μm	3.1673	68 μm	InP, 40 nm
8	Super lattice	$In_{0.85}Ga_{0.15}As_{0.327}P_{0.673}$ (2x)	N – 1e18	7.5 nm	3.2777	68 μm	
		InP (2x)	N – 1e18	7.5 nm	3.1673	68 μm	
9	Bonding	InP	N – 1e18	10 nm	3.1673	68 μm	
~~10~~	~~Cap~~	~~$In_{0.53}Ga_{0.47}As$~~	~~N – 1e18~~	~~0.2 μm~~			

Si 0.7 μm tall, 0.4 μm etch, 1 μm wide WG

SiO₂ 1 μm thick

Si substrate

150 μm wide SOA spacing

Rsoft Beamprop were 74% and 5.5%, respectively. The laser's facets were diced and polished resulting in a total cavity length of ~780 μm. Other waveguide widths of 1 μm, 1.5 μm, 2.5 μm, 3 μm, and 3.5 μm were also fabricated and tested, but are not presented in detail here since the 2 μm width devices showed the best overall performance. The variation of device performance due to facet polishing created scatter in the laser thresholds and differential efficiencies such that relationships between width and device performance could not be established.

III-V Epitaxial growth layer structure

Name	Composition	Doping Concentration	Thickness
P contact layer	P-type $In_{0.53}Ga_{0.47}As$ - 3.2923	1×10^{19} cm^{-3}	0.1 μm
Cladding	P-type InP	1×10^{18} cm^{-3}	1.5 μm
Separate Confinement Heterostructure	P-type $Al_{0.131}Ga_{0.34}In_{0.528}As$, 1.3 μm	1×10^{17} cm^{-3}	0.25 μm
Quantum Wells	$Al_{0.089}Ga_{0.461}In_{0.45}As$, 1.3 μm (9x)	undoped	10 nm
	$Al_{0.055}Ga_{0.292}In_{0.653}As$, 1.7 μm (8x)	undoped	7 nm
N layer	N-type InP	1×10^{18} cm^{-3}	110 nm
Super Lattice	N-type $In_{0.85}Ga_{0.15}As_{0.327}P_{0.673}$ (2x) 3.27	1×10^{18} cm^{-3}	7.5 nm
	N-type InP (2x)	1×10^{18} cm^{-3}	7.5 nm
N bonding layer	N-type InP	1×10^{18} cm^{-3}	10 nm

Table 3.1 – Electrically pumped III-V epitaxial layer structure transferred to silicon.

The epitaxial layer structure used in the electrically pumped devices is shown in Table 3.1. It is similar to the optically pumped devices except for a few modifications. First, N layers (S dopant) and P layers (Zn dopant) were added to the structure such that current could be injected into the quantum well region. The region below the quantum wells (closer to the silicon waveguide after bonding) was doped N type since N type InP has lower optical loss and electrical resistance than P type for a given doping level [2]. This is important because this layer goes through the optical mode, and needs to be as low loss as possible to minimize threshold

$Al_{1-x-y}Ga_yIn_xAs_1$