

1310 nm FP-LD Epiwafer



EPWAFERS FOR PHOTODETECTOR (PD) EPWAFERS FOR VISIBLE-LIGHT LASER DIODE (LD) and RCLED EPWAFERS FOR LASER DIODE

Descriptions

Two-inch epiwafers grown by MOVPE are available for 1310 nm FP-LD fabrication. The standard structure comes with an InGaAsP etch-stop layer in the P-InP cladding layer for the wet-etch ridge process or optionally without an etch-stop layer for the RIE-etch ridge process. The active region is normally fabricated with strained InAlGaAs-based material multiple quantum wells (MQW) to enhance the high temperature performance. An epiwafer layer structure is shown in **Figure 1**. The ridge wave-guide (RWG) lasers from these epiwafers can work without the TE cooler within -20° C to +85° C temperature range. The typical laser characteristic temperature is around 85° K. **Figure 2** shows the schematic drawing of a typical LD chip. The 1310 nm FP-LD is widely used in transmitters for the short reach fiber optic communications with Gigabit transfer rate.

P ⁺ - InGaAs
P ⁺ - InGaAsP
P - InP Clad
P - InGaAsP Etch Stop
P - InP Spacer
MQW Active Region
N - InP Buffer
N-InP Substrate

FIG. 1



FIG. 2

Wafer Characterization

Epiwafers are characterized by PL, DCXD and E-CV tests. The PL test results of a typical epiwafer are shown in **Figure 3 & 4**. A standard deviation of 2 nm is achieved in a PL wavelength mapping at the inner 44 mm of a 2" wafer.

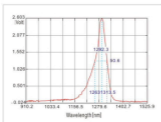


FIG. 3

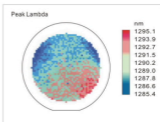


FIG. 4

1310 nm FP- LD Epiwafer

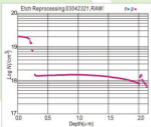
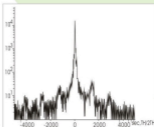
(LD) AND LIGHT-EMITTING DIODE (LED)

EPWAFERS FOR VERTICAL CAVITY SURFACE EMITTING LASER DIODE (VCSEL)

SOLAR CELL EPWAFERS

Wafer Characterization

Figure 5 shows a typical DCXD rocking curve measured at the center of a 1310nm FP-LD epiwafer. Clear satellite peaks show the MQW/Barrier active region with good quality. E-CV test measures doping profile. Figure 6 shows the carrier concentration depth profile of P-type materials.



Typical Epitaxial Parameters

Parameters	Values
Thickness control	Better than $\pm 5\%$
Thickness uniformity	Better than $\pm 2.5\%$ at the inner 40mm
PL Wavelength uniformity	± 6.5 nm at inner 40mm
Doping control	$\pm 20\%$
P-InP doping (cm^{-3})	Zn doped: $1\text{E}17$ to $2\text{E}18$
N-InP doping (cm^{-3})	Si doped: $1\text{E}16$ to $5\text{E}18$
InAlGaAs doping (cm^{-3})	$1\text{E}17$ to $2\text{E}18$
InGaAsP doping (cm^{-3})	$1\text{E}17$ to $5\text{E}18$
P ⁺⁺ - InGaAs doping (cm^{-3})	Zn doped, $>1\text{E}19$, Max. $2.5\text{E}19$
Defect density control (Diameter)	<50 cm^{-2} ($D > 10\mu\text{m}$)

Typical Device Performance

Parameter	Symbol	Typical Values
Threshold current @ 25°C	I_{th}	$<14\text{mA}$
Wavelength	λ	1310 nm
Slope efficiency	η	>0.25 W/A
Characteristic temperature	T_c	$>85\text{K}$ ($20^\circ\text{C} - 80^\circ\text{C}$)
Serial resistance	R_s	<10 Ω
Operating temperature	--	$-25^\circ\text{C} - 85^\circ\text{C}$
Ridge waveguide		$2\mu\text{m} \times 300\mu\text{m}$, as cleaved

*Characteristic temperature is measured on TO packaged lasers