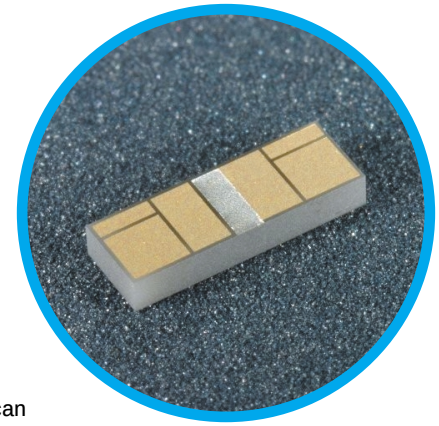
AlN Laser Diode Carriers

Thin Film metallised Aluminium Nitride (AlN) submounts/carriers for mounting of laser diodes and associated components and devices for optical sub-assemblies.



Ceramic material:

The ceramic substrate material is Aluminium Nitride (AlN). Standard grade is 170W/m·K. 200W/m·K is also available. Typical properties are:

TC (W/m·K)	~170
CTE (ppm/°C)	~4.6
Dielectric constant	~8.8 @ 1MHz

Thickness, Flatness and Surface Finish:

The AlN substrate material is available with as-fired, lapped or polished surface finishes. Standard substrate thicknesses are 0.63mm and 1.0mm with as-fired finish. Non-standard thickness material can also be fabricated. Substrates can be lapped and polished from 0.25mm thick up to 1.5mm thick.

The flatness and surface finish of the substrate material affects conductor definition and adhesion and also the quality of the laser die attachment. Typical substrate properties are:

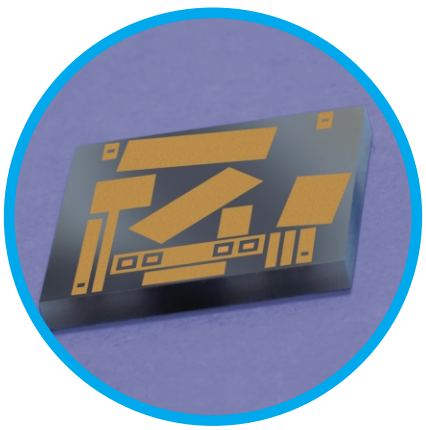
Surface	Thickness	Flatness	Surface Finish	Notes
As-fired	±15%	50µm/25mm	~1.6µm Ra	Lowest cost
Lapped	±0.02mm	5µm/25mm	~1.0µm Ra	Better thickness and flatness control but poor surface integrity
Near polish	"	"	~0.15µm Ra	Best for conductor and AuSn adhesion
Polished	"	"	<0.05µm Ra	Best for conductor definition and minimising epoxy bleedout

Mechanical Dimensions:

Small mounts are commonly used for individual chip-on-carrier assemblies, and large substrates with complex patterning for optical sub-assemblies. General size limits are:

Min. length and width	0.5mm x 0.5mm
Max. length and width	75mm x 75mm

Parts can be machined using diamond saws for the highest edge quality and dimensional control. Laser profiling/scribing are used for complex shapes, holes, etc. Typical tolerances available:



Diamond sawing:	Typical	High
Length and width	±0.05mm	±0.02mm
Edge chipping	<0.05mm	<0.01mm
Pattern to edge	±0.05mm	±0.01mm
Laser profiling:		
Holes	±0.05mm	±0.025mm
Pattern to edge/feature	±0.05mm	±0.025mm

Images are not to scale

Metallisations:

Various metallisation schemes can be applied to form conductors, integral resistors, solder barriers, solder dams etc. Typical schemes include:

Conductors	Notes
Ti/Pt/Au	Best overall conductor scheme but highest cost
TiW/Pd/Au (+ Au)	Pd barrier layer (plus electroplated Au) for standard low cost scheme
TiW/Au (+ Ni/Au)	Ni barrier layer for extra protection when soldering with Sn and Pb based solders
TiW/Au (+ Au)	For high temperature soldering. Suitable for Au bearing solders only

Resistors

Ta_2N or NiCr	Typical sheet resistivity of 50 ohms per sq, with a standard tolerance of 20% or 0.2% if laser trimmed

Dielectrics

Polyimide	For conductor cross overs, solder dams and passivation protection

The Au and barrier layer thicknesses depend on the application. Generally for Au wire bonding 1µm minimum of Au is required. For Pt or Pd barrier layers a minimum of 0.5µm is usually specified.

Plated thru-holes (substrate vias)

Front and back faces of the component can be electrically interconnected using pre-drilled metallised thru-holes. Typical hole diameter = substrate thickness.

Wrap around metallisation

Plain submounts can also be fabricated with metallisation that wraps around one or multiple sides walls to connect the top and bottom faces. Wrap around connections can also be accomplished on patterned mounts, with due consideration to process limitations and cost.

Patterning:

Circuit features are realised using wet or dry film resists and chemical or plasma etching. Typical capabilities:

Minimum line width	25µm
Minimum gap width	25µm
Line tolerance	±50µm
Line to feature (e.g. hole)	±50µm

Alignment guides/fiducials can be incorporated into the design for subsequent automated assembly.

Pre-deposited AuSn:

For laser mounting a thin layer of vacuum-deposited AuSn can be selectively applied over conductor areas. The standard alloy ratio is nominally 72Au/28Sn, normally at ~4-5 microns thick. On reflowing, the Au in the underlying conductor and on the underside of the laser chip, combine with the pre-deposited solder to form an alloy approximating to the eutectic ratio of 80Au/20Sn. The resulting alloy flows and wets very well to both the laser and the carrier, resulting in excellent low-void joints minimising thermal resistance and hotspots. The alloy ratio can also be tailored for specific applications. Typical AuSn features:

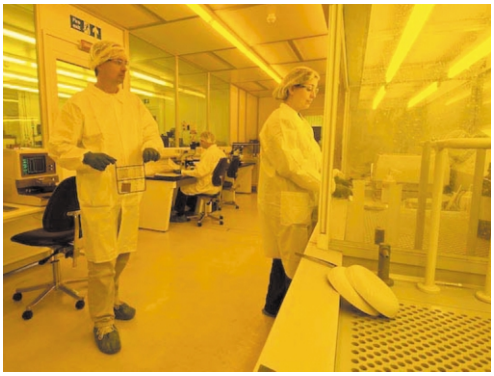
Min. length or width	100µm
Thickness	3-5µm
Alignment to conductors	±10µm

Manufacturing:

LEW Techniques specialises in the manufacture of miniature components for the mounting of semiconductor devices. Our in-house capabilities include thin film, thick film and refractory metallising of ceramics and metals, electroplating, precision dicing, atmosphere/vacuum brazing and solder assembly.

To ensure end user compatibility comprehensive in-house testing includes eutectic die bonding, Au wire bonding, strength testing, coating thickness and surface finish measurement, heat testing and He leak detection.

The information supplied in this document is for guidance only. Please contact our technical sales team to clarify any specific requirements.



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