

LumiFree™ Electrically Tunable Light Shaping Panels

LumiFree™ panels from GRE Alpha enable digital light distribution control for LED lighting by dynamically modifying beam angle and shape using liquid crystal (LC) technology. Both models feature a $\Phi 105\text{mm}$ active area, 8-bit precision beam tuning on X and Y axes (0–255 steps), and are designed for seamless integration with LED modules using GRE Alpha’s proprietary driving board.

Features

- Digital Light Beam Shaping: Independent X/Y-axis control for beam spread and directionality
- Precise Control Resolution: 8-bit (256-level) modulation per axis for smooth transitions
- No Mechanical Parts: Silent, compact, and maintenance-free operation
- LC Technology: Liquid Crystal Optical Modulator optimized for lighting applications
- RoHS & UL Compliant: Environmentally certified and safe for integration

LumiFree™ Electrically Tunable Light Shaping Panels



Model	Display Area	External Dimensions (Panel Only)	External Dimensions (I/O Interface)	Control Granularity	External Dimensions (Driving Board --M972A)
LAM041	$\Phi 105\text{mm}$ (105.0 x 105.0 mm)	116.2 x 116.2 x 4.45 (mm)	186.6 x 116.2 x 6.7 (mm)	8-bit (0 – 255 steps/axis)	45.0 x 45.0 x 6.7 (mm)

Optical Characteristics (Ta = 25°C)

Parameter	Min	Typical	Max	Notes
Transmittance (OFF: T0 @ 0°)	75.0%	80.0%	85.0%	Clear state (no voltage applied)
Transmittance (ON: T255 @ 0°)	8.0%	9.0%	10.0%	Maximum dispersion (full voltage)
Chromaticity Wx0	0.447	0.452	0.457	X-axis center chromaticity
Chromaticity Wy0	0.406	0.411	0.416	Y-axis center chromaticity

Electrical Interface*

Control Channels	4 channels (LC Ch1 ~ Ch4)
Connector Type	J.S.T. S4B-PH-SM4-TB(LF)(SN)
Driving Board	M972A(supplied separately by GRE Alpha)
Control Resolution	8-bit (256 levels) per axis

*Operating Humidity, 60±15% RH, Standard inspection conditions

Environmental Specification

	Operating Temperature	Storage Temperature
LC Panel	-20 to 80°C*	-20 to 80°C*
Driving Board	-20 to 70°C*	-20 to 80°C*

*No condensation or freezing

System Architecture

Complete LumiFree System Components

1. LumiFree LC Panel (LAM041)
2. LumiFree Driving Board (M972A)
3. Customer-Supplied Components (**Note: GRE Alpha can also provide all these items for customer)
 - o AC/DC Converter/Power Supply
 - o LED/COB Driver and Control board
 - o LED Module/COB
 - o Operation Control Terminal and or Mobile/PC App

Connection Overview

Dual Connectors	CN1 and CN1' with identical pin assignments
FPC Connection	Flexible printed circuit connection to relay board
Harness Connection	Customer harness to driving board
Cross-Connection Safe	CN1 and CN1' wires can be crossed without operational issues

Compliance & Quality

Environmental Compliance	
RoHS Compliant	Meets 10-substance restriction requirements
UL Certification	All major components UL certified <ul style="list-style-type: none"> • PWB: UL94V-0 flame retardant • Connectors: UL certified materials • FPC: UL94 flame retardant V0 equivalent

Quality Standards	
Inspection Standards	Visual inspection at 30cm distance Min
Environmental Testing	Room temperature (20-25°C), 60±15% humidity
Defect Classification	Comprehensive standards for foreign substances, scratches, and linear defects
Warranty	2 year from delivery date

Application Guidelines

Design Considerations	
Mounting	Avoid warping, twisting, or excessive pressure on panel surface
Protection	Use protective cover for outdoor or harsh environment applications
UV Protection	UV cut filter recommended for direct sunlight exposure (cutting 390nm and below)
Static Control	Handle with anti-static precautions (ESD sensitive)

Power Supply Requirements	
Noise Specification	Power supply voltage ripple within 50mVp-p
Power Sequence	Follow proper ON/OFF sequence for reliable operation
Driving Board	Input Voltage: 2.97V to 5.5V

Light Source Compatibility	
Optimization Required	Optical characteristics depend on light source properties
Pre-Evaluation	Test optical performance with intended light source before final implementation
Temperature Compensation	Consider temperature effects on optical response

Technical Support

Documentation Package (Upon Request)

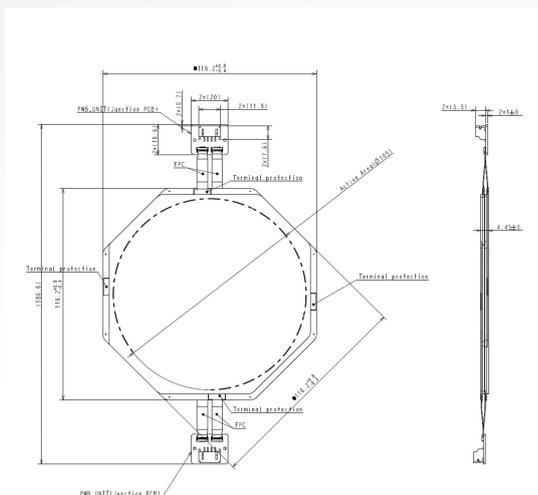
- Complete engineering specifications
- Connection diagrams and pinout details
- Optical characterization data
- Handling and installation guidelines

System Integration Support (Upon Request)

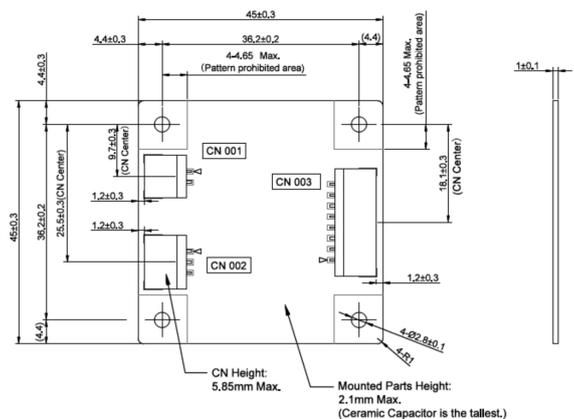
- Driving board specifications and compatibility
- Light source optimization guidance
- Custom application consulting available
- Power and User Control Integration Solutions

For technical inquiries and ordering information, please contact GRE Alpha

Mechanical Drawing



LC Panel Packing Information:
 397mm(W) × 597mm(L) × 227mm(H)
 50pcs/Carton; 10.0kg/Carton



Driving Board Packing Information:
 495mm(W) × 395mm(L) × 285mm(H)
 700pcs/Carton;

Handling Precautions

- ESD Protection: Handle with anti-static measures
- Glass Care: Panel contains precision glass components
- Moisture Control: Avoid condensation during storage and handling
- Temperature Stability: Minimize temperature fluctuations during transport