Fortec US

Application Note

LED Stage Lighting Power Solution

Summary

LED stage lighting systems demand high power density, excellent thermal performance, and compact mechanical integration. These systems often operate in thermally constrained environments where forced-air cooling is undesirable due to noise and reliability concerns.

Target Application

LED Stage Lighting Systems

Typical deployment environments include:
• Concert and live event lighting
• Theater and studio lighting systems
• Architectural and entertainment lighting
• Touring and mobile lighting rigs
• High-output LED fixtures

These systems require compact, efficient, and quiet power solutions capable of reliable operation under varying environmental and load conditions.

System Design Challenges

1. Thermal Constraints & Silent Operation

Stage lighting environments impose strict thermal and acoustic requirements:
• Limited airflow within compact fixtures
• Requirement for silent operation (no fans)
• High ambient temperatures near lighting elements

Key concerns:
• Efficient heat dissipation using convection cooling
• Avoidance of thermal hotspots
• Maintaining performance without active cooling

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2. High Power Density Requirements

Modern LED fixtures demand increasing output power within smaller form factors:
• Compact mechanical envelopes
• Integration into densely packed lighting assemblies

Power solutions must:
• Maximize output power per unit volume
• Maintain efficiency under full load
• Fit within standard or legacy footprints

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3. Mechanical Integration Constraints

Lighting OEMs often require:
• Compatibility with standard footprints (e.g., 3×5 form factor)
• Flexible mounting and connector configurations
• Easy integration into existing fixture designs

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4. Customization & Time-to-Market

Lighting manufacturers operate on tight development cycles:
• Rapid prototyping and iteration
• Application-specific electrical and mechanical adaptations
• Minimal redesign risk

Fast response and proven platforms are critical to success.

Key Benefits for Stage Lighting Designers

Best-in-Class Power Density

• Maximized output within compact 3×5 form factor
• Supports high-performance LED fixtures
• Reduces overall system size and weight

Improved Thermal Performance

• Designed for convection cooling operation
• Optimized layout minimizes heat concentration

• Maintains performance within standard footprint
• Eliminates need for forced-air cooling

Platform-Based Design Advantage

• Built on proven platform architecture
• Reduced development risk
• Faster design cycles through reuse of validated building blocks

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Cost-Effective Customization

• Adaptation of standard platforms reduces engineering effort
• Lower total cost compared to full custom designs
• Flexible to meet application-specific needs

Quiet and Reliable Operation

• Fanless design improves system reliability
• Eliminates acoustic noise for live performance environments
• Reduced maintenance requirements

System-Level Integration Support from Fortec US

Fortec US provides comprehensive engineering support for LED stage lighting applications:

Engineering Support

• Thermal optimization for convection-cooled designs
• Efficiency tuning to minimize heat generation
• Electrical performance validation under dynamic loads
• Design-in support and documentation

Mechanical Integration Guidance

Recommended implementation:
• Ensure adequate spacing for natural convection airflow
• Use thermally conductive mounting surfaces where possible
• Avoid obstruction of airflow paths
• Validate performance under worst-case ambient conditions

Direct collaboration during the design-in phase ensures optimal system performance and faster issue resolution.

Conclusion

For LED stage lighting applications requiring:
✔ High power density in compact form factors
✔ Superior thermal performance with passive cooling
✔ Silent, fanless operation
✔ Fast customization and reduced time-to-market
✔ Reliable, cost-effective design

Fortec US delivers a solution based on a **modified DDP400 platform**, incorporating proven design elements from a DDP520 3×5 custom implementation developed specifically for stage lighting applications.

Solution Highlights

• High power density in compact 3×5 footprint
• Optimized for convection cooling
• Enhanced thermal performance within a standard form factor
• Platform-based design enabling targeted customization
• High efficiency to minimize thermal load

This approach enables rapid adaptation to customer-specific requirements while maintaining proven performance and reducing development risk.

Why Partner with Fortec US?

• Proven expertise in high-performance power platforms
• Strong platform-based customization approach
• Fast response and development cycles
• Close customer collaboration and support
• Reliable, well-documented solutions

For technical evaluation support or design consultation, call us at (631) 648-6400 or visit:
https://fortec.us/