

I4

Inline Current Source, 4th Generation Specification & Manual

Document Version 1

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General Information

The **I4 (ICS-4)** is a buck mode, DC-DC **LED driver**, mounted in-line with the power cable and LED light. This driver facilitates continuous and pulsed overdrive strobe capability in a compact and simple to use package.

Designed to work with standard 24V DC power, the driver is simple to install and operate and provides optimal and steady current for a wide range of LED illumination.

Note: The **I4** is exclusively used with a pre-configured Ai illuminators and should not be considered a standalone device.

Safety

Do not modify the cables or housing without explicit instruction from Advanced Illumination.

Caution: Hot surface. Under normal operation, the driver housing may operate at temperatures that are uncomfortable to touch without protective gear. If handling during operation, handle carefully with protective gear.

Not suitable for direct mounting in or onto flammable surfaces.

Not suitable for covering with thermally insulated materials.

Regulatory Compliance



Environmental Conditions for operation

Ambient temperature Range 0-50[°C]

Relative humidity Range 20-90[%]

Mounting and Maintenance

The I4 does not require specific mounting or heatsinking – it may be operated in “free space”, or if additional heatsinking is allowed, it can be mounted to a metal surface. The chassis has no electrical connection.

Cleaning

Wipe housing and cable with a mild soap or detergent and lukewarm water solution. Use only a damp, clean, soft cloth or sponge. Wipe detergent residue with clean water.

Avoid using alcohol, alkali or other solvent-based cleaners as they may damage or corrode the cable.

Key Specifications

PARAMETER	SPECIFICATIONS	DETAILS
POWER INPUT		
Input Voltage (range)	22-28VDC, 24V nominal	Tolerant to 28V, reverse polarity protected.
Maximum Current Input	2.15A	
Recommended Power Supply	4A	For pulsed operation
LED OUTPUT		
LED String Voltage (range)	Typical LED string voltages are between 12-22VDC	
Maximum Current Output (continuous)	2.1A** Continuous Maximum current ripple 20% (500KHz-1Mhz typical)	
Maximum Current Output (pulsed)	8A	Duty-cycle and LED Vf. limited, Limited by Adaptive Overdrive
Maximum Output Power	50W Continuous, 250W Peak	
Pulse Width	30us - 5ms with overdrive, >5ms to infinity without overdrive	
Pulse Rise- and Fall-time	10us per 1A of drive current; 30us typical	
Maximum Duty Cycle	5% during overdrive; no maximum while in gated ON/OFF mode	
Pulse Frequency	Up to 2kHz; internally limited	
TRIGGER INTERFACE		
Trigger Input	Active HIGH (connect to PNP output) Active LOW (connect to NPN output)	
Trigger Input Delay	3μs, excluding LED rise-time	
Trigger Input Voltage	TTL-Compatible L: 0-0.8V; H: 2-5V Max 30 VDC (clamped)	
MODES OF OPERATION		
Adaptive Continuous/Pulsed	LED peak current varies based on ON-time; combination continuous and pulsed mode. Output may be operated in either continuous or pulsed via the same control input.	
GENERAL		
Mechanical Dimensions	3.94 x 0.89 x 0.73 inches	
Weight	xx	
Cable	PVC jacketed, x, 22 Awg x5 cond (7 strand) with drain wire	

General Operation

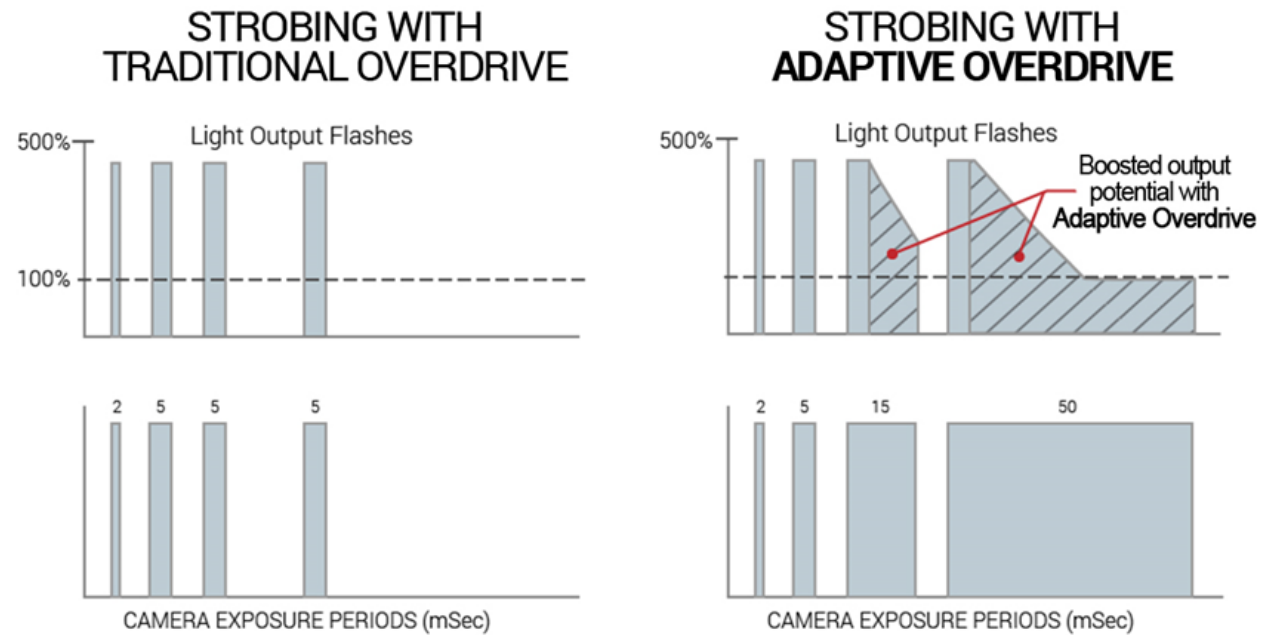
The **I4** can operate in multiple ways.

Continuous Mode: Activate either trigger to enable the output. The light will operate at 100% intensity as long as the trigger line is enabled.

Adaptive Overdrive: Activating the trigger for short durations (<5ms) will activate overdrive. Between 0-1ms the output of the driver will reach up to 500% output current, then decay to 100% over the next 5ms. Pulses shorter than 1ms will not experience any output decay, and pulses longer than 5ms will appear as continuous mode.

Analog dimming affects both modes simultaneously. In continuous mode 0-10V correlates to 0-100% intensity. While overdriving, a 0-10V signal will correspond to a 0-500% intensity.

Adaptive Overdrive



Duty Cycle Limitations

During pulsed mode operation, the following duty cycle limit table is a guideline to prevent excessive overdrive or potentially high temperature situations.

LED Pulse Time (ms)	Duty Cycle, Max (%)	Cycle time (s)	Frequency (Hz)
0.25	5	0.005	200
0.5	5	0.010	100
1	5	0.020	50
2	5	0.040	25
5	5	0.10	10
7.5	10	0.075	13
10	10	0.1	10
25	~99.9 (no max)	~	~

Pinout

Wire Color	Function	Note	M12/M8 Pin (option)
Brown	+24V DC		1
Blue	DC GND		3
White	Trigger	Active Low, TTL	2
Black	Trigger	Active High, TTL	4
Gray	Dim	0-10V DC	5
Bare Wire	Shield/Drain	No electrical connection	N/A

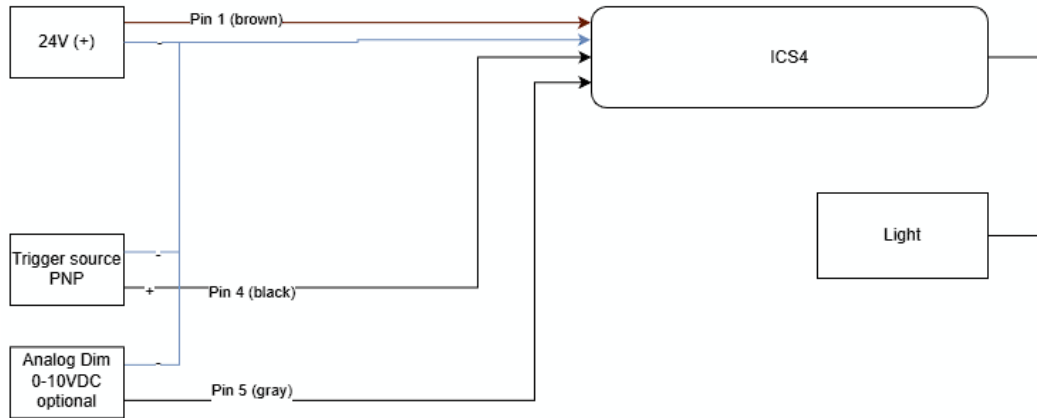
Output Characteristics

The **I4** is a buck, current-mode controller. The output current will have some high-frequency switching component, but the speed and amplitude will vary depending on the light and power level. Shown is a typical example output ripple.

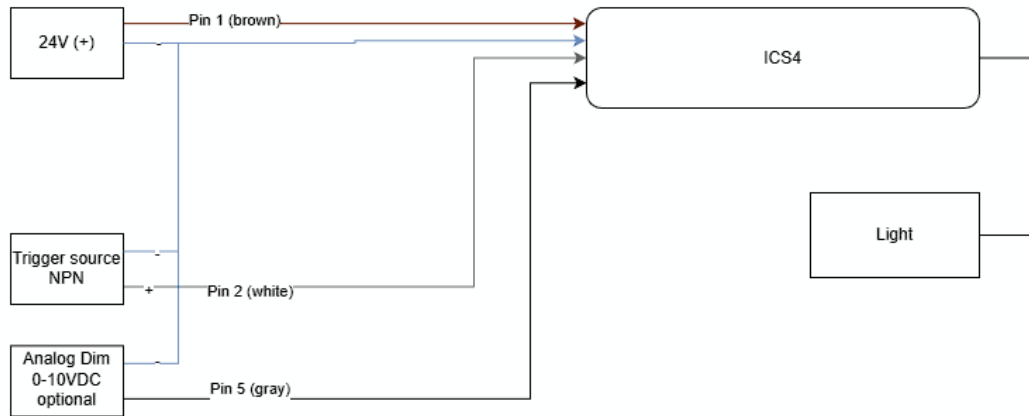
General Wiring Diagrams

Basic Connection

Connecting trigger to a **PNP** (sourcing) output:



Connecting trigger to a **NPN** (sinking) output:

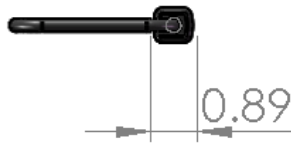
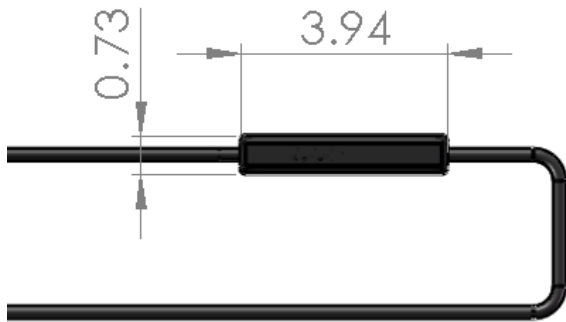


Analog input is pulled HIGH internally and can float if unused or tied to +24VDC. A trigger is required to enable the output. If using continuous, the trigger may be tied directly to +24VDC.

Mechanical Specifications

The **I4** is housed in an extruded aluminum tube. The driver electronics within are completely encapsulated with a thermally conductive compound. There is an internal thermal interface to the tube to allow for efficient heat transfer to the external environment.

The driver is potted with a thermally conductive compound and is not user serviceable.



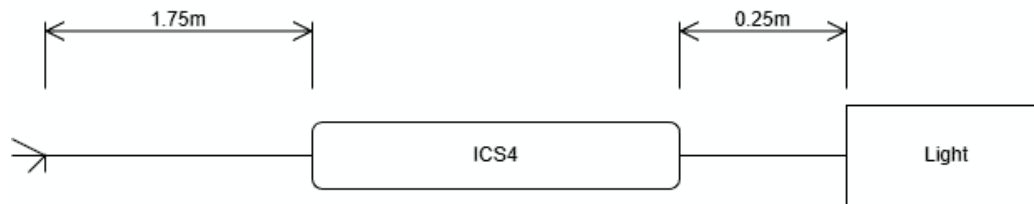
Cable Specifications

The I4 is designed for a light source that is typically positioned 10" (0.25m) from the output of the drive circuit.

Input power cable is typically up to 60" (1.52m) long (from DC power supply to driver input).

Default cable lengths and flying leads shown. Cable lengths and connector type may be specified as an option.

Basic Cable Diagram



Company Contact

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