

LITON[®]

DIMMING FACTS FOR LED PRODUCTS



Introduction

Liton offers five dimmable driver options for its product lines: incandescent, electronic low voltage, magnetic low voltage, Hi-Lume and 0-10V. The following pages will help to explain the uses, benefits and limitations of each dimming system. Not all dimming options are available for all products. Please consult our website at: www.liton.com for available options.

LED Dimming Driver Terminology:

| | |
|--------------------------------------|--|
| Efficacy: | The efficacy or efficiency of a lighting fixture is the amount of light (lumens) per unit of energy (watts). Lm/watts = efficacy |
| ELV – type dimmer: | An electronic low voltage dimmer used with electronic low voltage LED drivers. Also known as a trailing-edge dimmer. |
| MLV – type dimmer: | A magnetic low voltage dimmer used with magnetic low voltage drivers |
| Ghosting: | When an LED lighting fixture continues to glow in the off position. This is usually due to mismatched driver and dimmer technology, ex: incandescent dimmer paired with an electronic low voltage driver. |
| Leading-edge Dimmer: | A dimmer that was designed to work with Incandescent lamps. Older dimmers of this type were not designed to work with LED lamps and problems with flicker, pop-on and ghosting due to residual voltage have been observed. Newer designs have been specially designed to eliminate these problems. |
| LED Driver: | An electrical device that converts line voltage power to a power level that low voltage LEDs can use, much like a low voltage transformer converts line voltage power (120VAC) to low voltage (12VDC) so that it can be used with 12V MR16 lamps. |
| LED Dimmable Driver: | An LED driver that provides the correct power to the LEDs so that it can function and also allows the lumen output to be dimmed to create mood, ambience or to save energy. |
| Light Emitting Diode (LED): | A low voltage semiconductor device that emits light when electrical current is passed through it. |
| Pulse Width Modulation (PWM): | A method most LED drivers use to regulate the amount of power to the LED. PWM turns LEDs on and off at high frequency, reducing the total ON time to achieve a desired dimming level without visible flicker. |
| Reverse Phase Dimmers: | Also known as ‘Trailing-edge’ were designed to work with most electronic (ELV) and 3-wire CFL dimmers |
| Trailing-edge Dimmer: | A type of dimmer that was designed for use with most electronic low voltage (ELV) and 3-wire CFL dimmers. |
| Standard Phase Dimmers: | Also known as ‘Leading-edge’ were designed for use with Incandescent products. |

Qualified Partners:



Incandescent Dimming Driver Option

History

Incandescent Dimmers were designed for use with Incandescent (120V) lighting fixtures that use A19 bulbs and PAR type lamps. They are the least expensive and most widely installed dimmers in the marketplace. They are also known as **Leading Edge Dimmers** or **Triac Dimmers**.

Where Used?

LITON offers 2-wire incandescent compatible drivers in many of its 4", 5" and 6" General Purpose Recessed Housings and its 2", 3" and 4" Mini-Arc Recessed Housings and are specified as "-DIN" when ordering. Please see specification sheets for further details.

Synonymous Terms:

Incandescent, Leading Edge, 2-Wire and Triac Dimmers, Forward Phase.

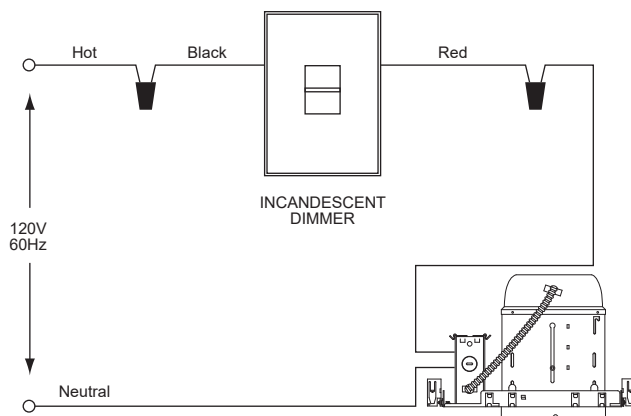
Benefits

- Incandescent LED drivers work with most 2-wire incandescent dimmers making them perfect for many retrofit applications.
- Liton's incandescent drivers are specially designed to eliminate the problems associated with using incandescent dimmers with LED fixtures including flicker and ghost imaging in power off mode.
- Incandescent dimmers are the least expensive and have the most installations in the marketplace.

Limitations

- Incandescent dimmers should not be used with ELV or MLV drivers because doing so could cause any of the following malfunctions: dimmer buzz, lamp flicker, interaction between circuits or radio frequency interference (RFI).

Incandescent Dimmer Wiring Diagram



Partial list of factory tested, compatible incandescent dimmers:

| Manufacturer | Style | Model |
|--------------|------------|--------------|
| Lutron | Skylark | S600PR |
| Lutron | Diva | DVSCCL-153P |
| Lutron | Diva | DV600PR |
| Leviton | Illumatech | IP106 (600W) |
| Hunt | Simplicity | PS-LED-PC |

Electronic Low Voltage (ELV) Dimming

History

Electronic Low Voltage (ELV) Dimmers were originally designed to control Electronic Low Voltage Transformers used in low voltage (12V) MR16 type fixtures. ELV dimmers and transformers are more expensive but offer quieter operation, better control and tend to last longer than Magnetic Low Voltage Transformers (MLV). Also referred to as **Reverse Phase** Dimmers.

Where Used

ELV Dimming Option is used in LITON General Purpose Recessed Housings and is specified as “DLV” when ordering. Please see specification sheets for further details.

Synonymous Terms:

Electronic Low Voltage, ELV, Trailing Edge and Reverse Phase

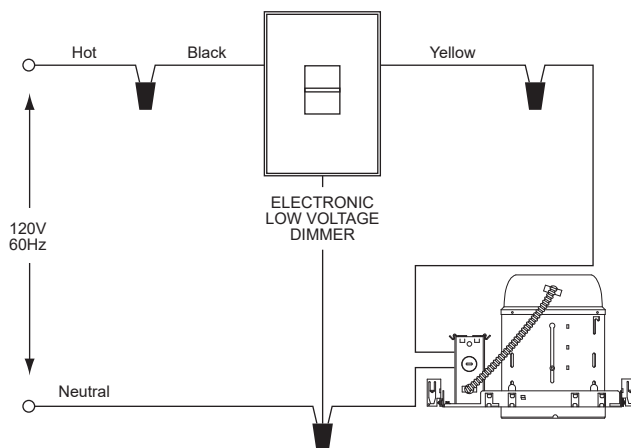
Benefits

- ELV dimming drivers from Liton are the LED driver most widely tested and approved by dimmer manufacturers (see list).
- Works better on LEDs than most magnetic low voltage (MLV) drivers.
- Allows smooth dimming down to 5% depending upon the dimmer’s limitations.

Limitations

- ELV wall dimmers can be more expensive than incandescent or magnetic low voltage dimmers.
- Smaller install base could mean replacing incompatible dimmers on retrofit projects.
- ELV drivers should not be used with incandescent dimmers because doing so could cause any of the following malfunctions: dimmer buzz, lamp flicker, interaction between circuits or radio frequency interference (RFI).
- All ELV drivers and dimmers are 3-wire, requiring a neutral wire. This can result in having to pull additional wire on remodel projects.

Electronic Low Voltage (ELV) Dimmer Wiring Diagram



Examples of ELV dimmers:

(See next page for a more comprehensive list):

| Manufacturer | Style | Model |
|--------------|---------------|------------|
| Lutron | Skylark | SELV-300P |
| Lutron | Diva | DVELV-300P |
| Lutron | Maestro | MAELV-600 |
| Lutron | Nova | NTELV-600 |
| Lutron | Vierti | VTELV-600 |
| Leviton | Surslide | 6615-POW |
| LiteTouch | Inverse Phase | 08-2140-01 |
| LiteTouch | 8-Channel | 6615-POW |

**(ELV) Factory Qualified Dimmers for
Under Cabinet “LULED” Series, Track Lighting “LTD8” Series
and Recessed Lighting “LHLD” 4”, 5” & 6” Series**



| Series | Model | Power | Avg. Price | # Units per Dimmer |
|--|----------------------|-------|---------------|--------------------|
| LUTRON® (Qualified LED Partner) | | | | |
| Lyneo® LX | | | | |
| Single Pole | LXELV-600PL | 600W | SELV-300P | 1 - 13 |
| 3-Way | LXELV-603PL | 600W | | |
| Faedra® | | | | |
| Single Pole | FAELV-500M | 600W | SELV-300P | 1 - 11 |
| Skylark | | | | |
| Single Pole | SELV-300P | 300W | \$45 - \$55 | 1 - 7 |
| 3-Way | SELV-303P | 300W | \$45 - \$55 | 1 - 7 |
| Diva | | | | |
| Single Pole | DVELV-300P | 300W | \$80 - \$100 | 1 - 7 |
| 3-Way | DVELV-303P | 300W | \$80 - \$100 | 1 - 7 |
| Maestro | | | | |
| Single Pole | MAELV-600 | 600W | \$110 - \$150 | 1 - 3 |
| Nova | | | | |
| Single Pole | NELV-450 | 450W | \$80 - \$85 | 1 - 10 |
| Single Pole | NTELV-600 | 600W | \$150 - \$200 | 1 - 14 |
| Vierti™ | | | | |
| Single Pole/Multi Location | VTELV-600 | 600W | \$180 - \$200 | 1 - 14 |
| Lutron Interfaces | | | | |
| Grafik Eye® | ELVI-1000 | | \$130 - \$180 | 2 |
| Grafik Eye® | PHPM-PA Power Module | | | 1 unit min. |
| HomeWorks® | HW-RPM-4A** | | | 1 unit min. |
| RadioRA 2 | RRD-6XA** | | | 4 units min. |
| Commercial Systems | LP-RPM-4A** | | | 1 - 27 |
| **Low end trim adjustment needed | | | | |
| CRESTRON (Certified Partner) | | | | |
| iLux® Universal Dimmer | CLS-EXP-DIMU | 600W | SELV-300P | 1 - 13 |
| Low Voltage Dimmer | CLX-1DELV4 | 600W | | |
| Universal Dimmer | DIN-1DIMU4 | | | |
| VANTAGE | | | | |
| Electronic Dimmer 120V | EDIMMOD | 600W | SELV-300P | 1 unit min. |
| Electronic Load Dimmer 120V | ELDS4-DIN | 600W | | 1 unit min. |
| LEVITON | | | | |
| Surslide | | | | |
| Single Pole | 6615-POW | 600W | \$20 - \$30 | 1 - 14 |
| 3-Way | 6615-POW | 600W | \$20 - \$30 | 1 - 14 |
| Vizia | | | | |
| Single Pole | VZE06-1LZ | 600W | \$90 - \$150 | 1 - 14 |
| 3-Way | VZE06-1LZ | 600W | \$120 - \$180 | 1 - 14 |
| Acenti | | | | |
| Single Pole | ATEO-1LW | 400W | \$75 - \$100 | 1 - 9 |
| 3-Way | ATEO-1LW | 400W | \$75 - \$100 | 1 - 9 |
| Illuminatech | | | | |
| Single Pole | IPE04 | 300W | \$40 - \$70 | 1 - 7 |
| 3-Way | IPE04 | 300W | \$40 - \$70 | 1 - 7 |
| WattStopper | | | | |
| Miro | | | | |
| Single Pole | DCD267* | 600W | \$35 - \$45 | 1 - 13 |
| ETC | | | | |
| Unison Dimmer Module | ELV10 | 0W | | |
| Unison Dimmer Module | D20 | 154W | | |
| LiteTouch | | | | |
| 120V Inverse Phase | 08-2140-01 | 480W | | |

Magnetic Low Voltage (MLV) Dimming

History

Magnetic Low Voltage (MLV) Dimmers were designed to control Magnetic Low Voltage Transformers used in low voltage lighting fixtures.

Where Used?

MLV Dimming can be used in LITON Linkaled products and come standard on all LD522 drivers.

Synonymous Terms:

Magnetic Low Voltage, MLV

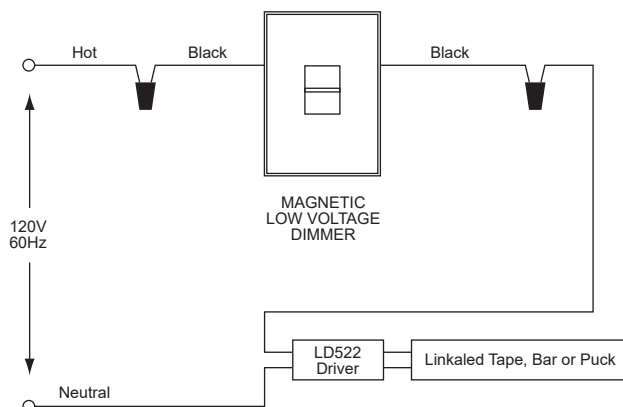
Benefits

- Liton's magnetic low voltage (MLV) drivers are specially designed to function with most magnetic low voltage dimmers.
- Allows smooth dimming down to 10% depending upon the dimmer's limitations.
- All MLV drivers and dimmers are 2-wire and do not require an additional neutral wire.
- MLV dimmers are less expensive than electronic low voltage dimmers or 0-10V dimmers.

Limitations

- MLV wall dimmers can be more expensive than incandescent dimmers
- MLV drivers should not be used with incandescent dimmers because doing so could cause any of the following malfunctions: dimmer buzz, lamp flicker, interaction between circuits or radio frequency interference (RFI).

Magnetic Low Voltage (MLV) Dimmer Wiring Diagram



Examples of MLV dimmers:

(See next page for a more comprehensive list):

| Manufacturer | Style | Model |
|--------------|------------|-----------|
| Lutron | Nova | NTLV-1000 |
| Lutron | Diva | DVLV-103P |
| Lutron | Skylark | SLV-603P |
| Lutron | Illumatech | IPM06-1LZ |



Factory Tested (MLV) Dimmers for Linkaled Products

| Series | Model | | | |
|--|--|---|--|--|
| LUTRON® (Qualified LED Partner) | | | | |
| Ariadni® | Single Pole 3-Way | AYLV-600P AYLV-603P | AYLV-600P-S AYLV-600P-S | AYLV-600P-CSA AYLV-603P-CSA |
| Vareo® | Single Pole/Multi Location | V-600 V-1000-S VETN-1000-S VETS-R VETS-1000-SL | V-600-S VETN-1000 VETS-1000-S VETS-A-SL VETS-1000-SL-S | V-1000 VETS-1000 VETS-1000-CSA VETS-R-S VETS-A-SL-S |
| Nova® | Single Pole Single Pole / 3-Way 3-Way 4-Way | NTLV-600 NTLV-1000 NNTLV-1500 NNTLV-603P NNTLV-1003P NNTLV-1503P NNTLV-2003P NNTLV-603P-CSA NNTLV-1503P-CSA | NNTLV-600-S NNTLV-1000--S NNTLV-1500-S NNTLV-603P-S NNTLV-1003P-S NNTLV-1503P-S NNTLV-2003P-S NNTLV-1003P-CSA | NT1PS NT-1PS-S NT-1PS-CSA NT-3PS NT-3PS-S NT-3PS-CSA NT-4PS- NT-4PS-S NT-4PS-CSA |
| Ceana® | Single Pole 3-Way | CNVL-600P CNVL-603P | | |
| Diva® | 3-Way Single Pole 3-Way 4-Way | DVLV-603P DVLV-603P-S DVLV-103P DVLV-103P-S DVLV-10P DVLV-10P-S DVLV-600P SC-1PS SC-3PSNL | DVSCLV-603P DVLV-603PH-S DVSCLV-103P DVLV-103PH-S DVSCLV-10P DVLV10PH-S DVSCLV-600P SC-1PSNL SC-4PS | DVLV-603P-CSA DVSCLV-603P-L DVLV-103P-CSA DVSCLV-103P-L DVLV-10P-CSA DVSCLV-10P-L SC-3PS SC-4PSNL |
| Glyder® | Single Pole | GLV-600 | GLV-600-CSA | |
| Lyneo® | Single Pole 3-Way | LXLV-600PL LXLV-603PL | LXLV-10PL LXLV-103PL | |
| Nova T® | Single Pole | NNTLV-600 NNTLV-1000 | NNTLV-600-277 NNTLV-1000-277 | NNTLV-1500 |
| Skylark® | Single Pole 3-Way | SLV-600P SLV-603P | SLV-600P-CSA SLV-603P-CSA | SLV-600PH-CSA SLV-603PH-CSA |
| LEVITON | | | | |
| IllumaTech® | Single Pole / 3-Way Single Pole / 3-Way | IPM06-1LZ IPM10-1LZ | IPM06-1LX | |
| Mural™ | Single Pole / 3-Way Single Pole / 3-Way | MDM06-1LI MDM10-1LI | MDM06-1LW MDM10-1LW | MDM06-1LA MDM10-1LA |
| SureSlide® | Single Pole / 3-Way | 6613-PLT | 6613-PLI | 6613-PLW 6613-PLA |
| ToggleTouch™ | Single Pole / 3-Way Single Pole / 3-Way | TGM10-1LI TGM10-1LT | TGM10-1LA | |
| Vizia® | Single Pole / 3-Way | VPM06-1LZ | | |

0-10V Dimming Driver Option

History

0-10V Dimmers have been used in commercial applications for fluorescent lighting and occupancy and daylight sensor systems for years and are now becoming popular with LED products. One reason this standard is widely established is that it is defined in the IEC standard number 60929 Annex E, making it acceptable to most engineers.

Where Used?

LITON offers 0-10V drivers in its 5" and 6" General Purpose Recessed Housings, Architectural Recessed Housings, 24V Linkaled products and are specified as "-D10" when ordering. Please see specification sheets for further details.

Synonymous Terms:

0-10V, Fluorescent Dimming, 5-Wire Dimming.

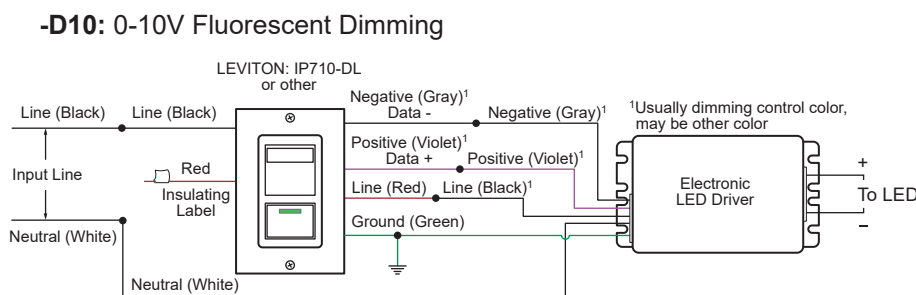
Benefits

- Use existing 0-10V systems in retrofit applications.
- Liton's -D10 LED Driver is compatible with most 0-10V control systems.
- Large 0-10V install base in commercial applications due to IEC standards.
- Allows smooth dimming down to 5% depending upon the dimmer's limitations.
- Compatible with many daylight harvesting controls.

Limitations

- Some manufacturers do not follow the IES standard. This leads to LED drivers and lamps that claim 0-10V compatibility but drop out or pop on, or dim backwards with the lowest output at the top and the highest output at the bottom.
- The control signal is a small analog voltage and long wire runs can cause a signal level drop that can produce different light levels from different drivers on the same control circuit.

0-10V Dimmer Wiring Diagram



Example 1:

| Manufacturer | Style |
|--------------|-----------------------------|
| Leviton | IP710-DLX |
| Lutron | NTFTV-WH* |
| Lightolier | V2000FAMU |
| Synergy | Mark VII ISD 120/277 WH-M10 |

*requires separate power pack, not supplied

More Examples of 0-10V Dimming Systems:

| Manufacturer | Style |
|------------------|--------------------|
| Douglas Lighting | ALC3-BCM |
| Douglas Lighting | WPN-5821/5822/5721 |
| Douglas Lighting | WWS-1301/1302 |

| Manufacturer | Style |
|--------------|-------------------------------------|
| Hunt Dimming | PS-010-120V & PS-010-3W-120V |
| Hunt Dimming | PS-010-277V & PS-0101-3W-277V |
| Hunt Dimming | PS-LED-010-120V, PS-LED-010-3W-120V |
| Hunt Dimming | PS-LED-010-277V, PS-LED-010-3W-277V |

| Manufacturer | Style |
|--------------|------------------------------|
| Leviton | a-2000 |
| Leviton | IP710 |
| Leviton | Renior II (w/ 0-10V Setting) |

| Manufacturer | Style |
|-----------------------------|------------------------------|
| Lehigh Electrical Co., Inc. | Collage Impress Touch Master |
| Lehigh Electrical Co., Inc. | CT500 LCD Touch |
| Lehigh Electrical Co., Inc. | DX2, DX2 277 |
| Lehigh Electrical Co., Inc. | Single Set |

| Manufacturer | Style |
|--------------|--------------|
| Lutron | DVTV, DVSCTV |
| Lutron | NFTV |
| Lutron | NTFTV |

| Manufacturer | Style |
|-------------------|------------|
| Wattstopper, Inc. | ADF-120277 |

Lutron Hi-Lume Dimming Option

History

Lutron originally developed its Hi-Lume 1% Dimming ballast for use with fluorescent and compact fluorescent dimmer controls. It is a 3-wire system that has a separate line voltage wire that carries the phase control signal separate from the power wires. Hi-Lume drivers dim down to 1% of initial lumens, are more precise and more immune to electrical noise.

Where Used?

LITON offers Hi-Lume drivers in many of its General Purpose, Mini-Arc and Architectural LED products and are specified as “-DHL” when ordering.

Synonymous Terms:

Hi-Lume, 3-Wire

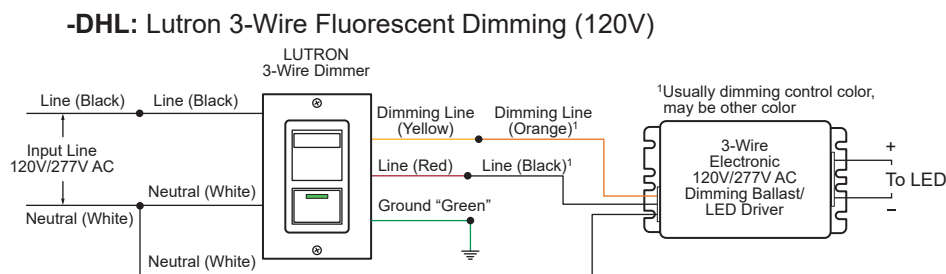
Benefits

- Allows smooth, continuous dimming down to 1% of initial lumens depending on dimming control limitations.
- Lutron’s Hi-Lume LED driver is compatible with more Lutron dimmers than any other brand and also compatible with their EcoSystem control system.
- Backed by Lutron’s 5-year Limited Warranty.

Limitations

- Compatible Lutron wall dimmers can be more expensive than electronic low voltage, incandescent or magnetic low voltage dimmers.
- All Lutron Hi-Lume drivers and compatible dimmers are 3-wire, requiring a neutral wire. This could necessitate pulling additional wire.
- The “-DHL” option should not be used with incandescent dimmers because doing so could cause any of the following malfunctions: dimmer buzz, lamp flicker, interaction between circuits or radio frequency interference (RFI).

-DHL Wiring Diagram



Partial list of factory tested, compatible dimmers:
(See next page for the Lutron Compatibility Report Card)

| Manufacturer | Style | Model |
|--------------|---------|------------|
| Lutron | NovaT | NTF-10-277 |
| Lutron | Skylark | SF-12P-277 |
| Lutron | Vierti | VTF6A |

Qualified Hi-Lume® Dimmers
For fixtures using the Lutron Hi-Lume® A-Series LED Driver



| Product Family | Part Number | | Fixtures per Control* | | Measured light output range |
|---------------------------------------|------------------------|----------------|-----------------------|--------|-----------------------------|
| | 120V | 277V | 120V | 277V | |
| NovaT® | NTF-10 | NTF-10-277 | 1 - 41 | 1 - 44 | 100% - 1% |
| | NTF-103P | NTF-103P-277 | 1 - 20 | 1 - 33 | 100% - 1% |
| Nova® | NF-10 | NF-10-277 | 1 - 41 | 1 - 44 | 100% - 1% |
| | NF103P | NF130P-277 | 1 - 20 | 1 - 33 | 100% - 1% |
| Vareo® | VF10 | | 1 - 20 | - | 100% - 1% |
| Skylark® | SF-10P | SF-12P-277 | 1 - 20 | 1 - 33 | 100% - 1% |
| | SF-103P | SF-12P-277-3 | 1 - 20 | 1 - 33 | 100% - 1% |
| Diva® | DVF-103P | DVF-103P-277 | 1 - 20 | 1 - 33 | 100% - 1% |
| | DVSCF-103P | DVSCF-103P-277 | 1 - 20 | 1 - 33 | 100% - 1% |
| Ariadni® | AYF-103P | AYF-103P-277 | 1 - 20 | 1 - 44 | 100% - 1% |
| Vierti® | VTF-6A | | 1 - 15 | 1 - 33 | 100% - 1% |
| Maestro® | MAF-6AM | MAF-6AM-277 | 1 - 15 | 1 - 33 | 100% - 1% |
| | MSCF-6AM | MSCF-6AM-277 | 1 - 15 | 1 - 33 | 100% - 1% |
| Maestro Wireless® | MRF2-F6AN-DV | | 1 - 15 | 1 - 33 | 100% - 1% |
| RadioTouch® | RTA-RX-F | | 1 - 41 | 1 - 88 | 100% - 1% |
| Spacer System® | SPSF-6A | SPSF-6A-277 | 1 - 15 | 1 - 33 | 100% - 1% |
| | SPSF-6AM | SPSF-6AM-277 | 1 - 15 | 1 - 33 | 100% - 1% |
| Lyneo® Lx | LXF-103PL | LXF-103PL-277 | 1 - 20 | 1 - 33 | 100% - 1% |
| RadioRA® 2 | RRD-F6AN-DV | | 1 - 15 | 1 - 33 | 100% - 1% |
| HomeWorks® QS | HQRD-F6AN-DV | | 1 - 15 | 1 - 33 | 100% - 1% |
| Interfaces** | PHPM-3F | PHPM-3F-DV | 1 - 41 | 1 - 88 | 100% - 1% |
| | GRX-FDBI-16A | | 1 - 41 | 1 - 88 | 100% - 1% |
| PowPak™ dimming module with EcoSystem | RMJ-ECO32-DV-B | | 32 per EcoSystem link | | 100% - 1% |
| PowPak™ dimming module with EcoSystem | QSN-1ECO-S, QSN-2ECO-S | | 63 per EcoSystem link | | 100% - 1% |
| PowPak™ dimming module with EcoSystem | QSG-_P120 | | 64 per EcoSystem link | | 100% - 1% |
| Quantum® | Various | | 64 per EcoSystem link | | 100% - 1% |

* Fixtures per control assumes a 40W fixture. Number of fixtures may be higher if wattages is less than 40W and may be lower if ganged. See control specification submittal sheet for details.

** For use with 3-wire controls or Commercial Systems, RadioRA Systems, or Home Systems applications.

**DIMMING FACTS
FOR LED PRODUCTS**

© 2022 LITON LIGHTING