

Low Voltage (12V_{AC}) Dual-Mode Digital Control Dimmable LED Driver

1 Description

The iW3662 advanced digital LED driver, designed for low voltage AC and DC input voltages, combines support for both low voltage LEDs and high voltage Chip-On-Board (COB) LED modules at power levels up to 8W.

The iW3662 features two selectable operating modes to accommodate both low voltage LEDs and high voltage COB LEDs in one part. The Boost-Buck mode provides a boost converter to step-up the input voltage to an intermediate voltage, which a second buck regulator stage steps down to create a highly efficient, constant current LED controller. The Boost-Linear mode, designed to work with high voltage COB LEDs, steps up the input voltage to a higher voltage than in the Boost-Buck mode, then, with the buck converter now disabled and reconfigured into a linear current regulator, provides a highly accurate constant current sink to drive the LEDs.

The highly configurable digital control circuitry allows the end user to specify one part for multiple applications, covering the bulk of low voltage LED replacement bulb applications. Using Dialog's Flickerless™ technology allows the iW3662 to operate without visible flicker and operate with a broad range of input dimmer types (leading edge, trailing edge and digital) while effectively detecting and managing both electronic and magnetic transformers automatically. When the iW3662 detects a magnetic transformer, an additional output drives an external switch that can add extra input capacitance needed to ensure proper operation, easing the design of replacement bulbs compatible with both transformer types.

The iW3662 also integrates an internal bleeder FET to add a dynamic load to the input to optimize electronic transformer performance during low dimming ranges. Also, full protection features include over-temperature protection derating, which lowers the output current drive to the LEDs when an over-temperature event occurs to maintain light output even during a fault condition. These protection features provide robust and functional solutions for low voltage LED replacement lighting.

2 Features

- 10 to 24V_{DC} input voltage or 12V_{AC} input voltage
- Output power up to 8W
- Supports magnetic or electronic transformers
- Two operational modes
 - » Boost-Buck - low voltage LED arrays
 - » Boost-Linear - high voltage COB LEDs
- Integrated boost controller and buck/linear current regulator controller
- **Flickerless™** technology for flicker-free LED dimming
- Wide dimmer compatibility (leading edge, trailing edge, and digital)
- Deep dimming to 5% (depends on dimmers)
- Power factor > 0.7
- Tight LED current regulation (±5%) in both modes
- Optimized dimming curve for maximizing dimmer and electronic transformer compatibility
- Over-temperature protection derating
- OVP, OCP, and open load protection
- 16-lead QFN (4x4mm) or 16-lead TSSOP

3 Applications

- V_{AC} or V_{DC} input dimmable LED lighting
- Optimized for use with all transformers, including electronic and magnetic
- MR16 bulbs, AR111 fixtures/bulbs



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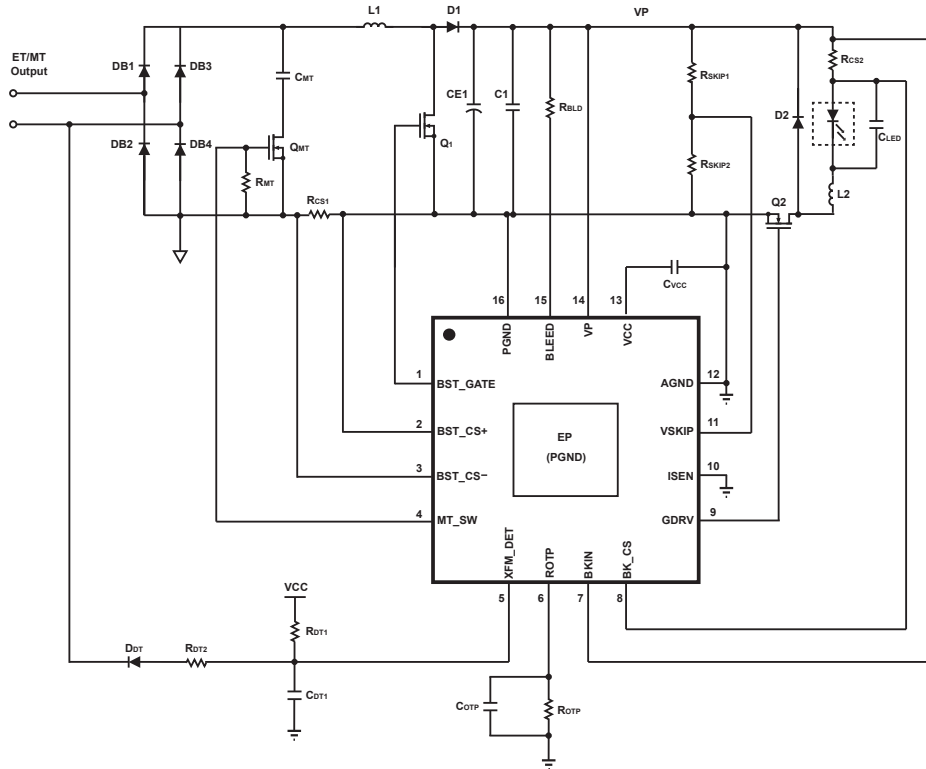


Figure 3.1 : Typical Schematic for 12V/350mA (4W) Boost-Buck Configuration

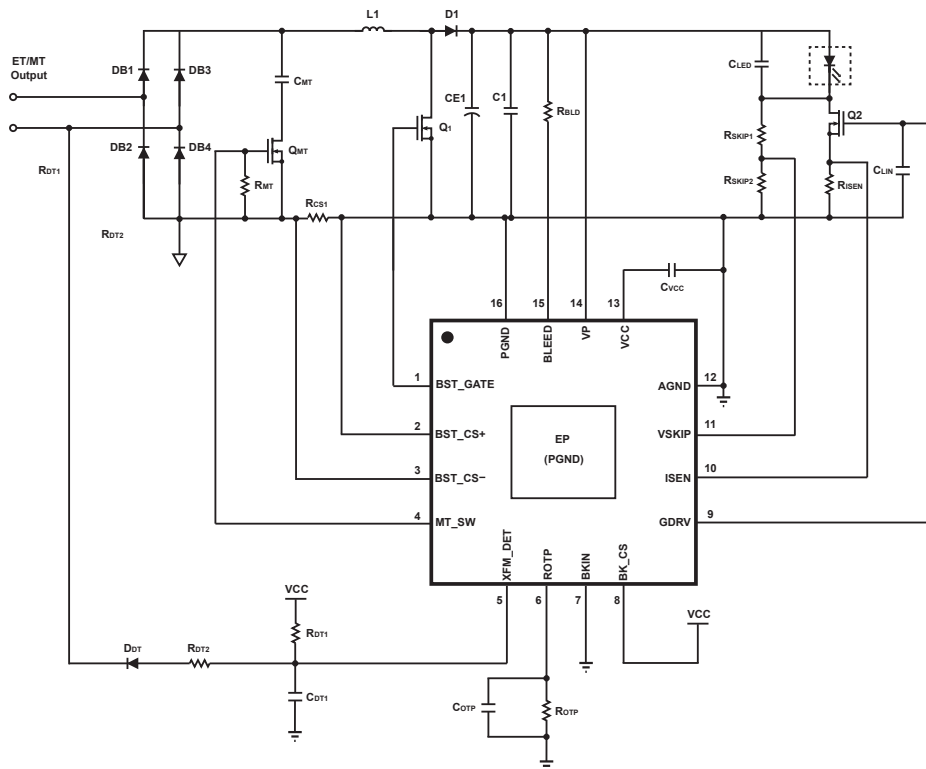


Figure 3.2 : Typical Schematic for 38V/105mA (4W) Boost-Linear Configuration

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4 Pinout Description

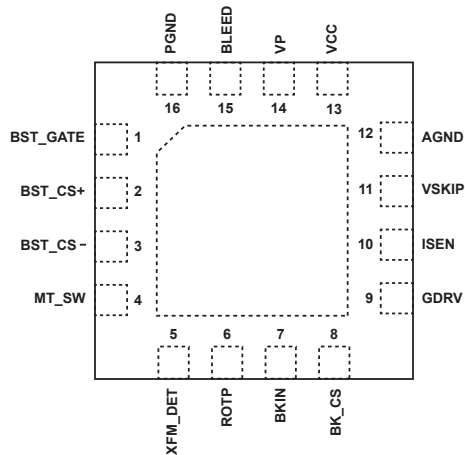


Figure 4.1 : 16-Lead QFN Package

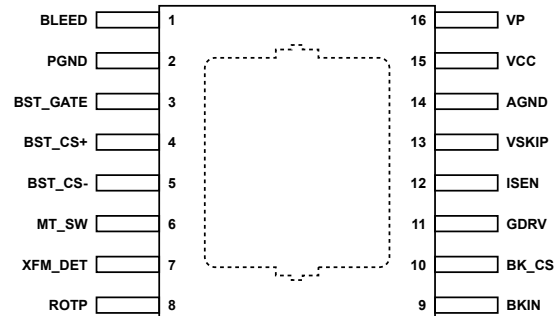


Figure 4.2 : 16-Lead TSSOP Package

| Pin Number | | Pin Name | Type | Pin Description |
|------------|-------|----------|--------|---|
| QFN | TSSOP | | | |
| 1 | 3 | BST_GATE | Output | Gate driver for boost converter. |
| 2 | 4 | BST_CS+ | Input | Boost current sense positive input. |
| 3 | 5 | BST_CS- | Input | Boost current sense negative input. |
| 4 | 6 | MT_SW | Output | Indicator of MT/ET detection with PMOS open drain output. MT: MT_SW = V _{CC} ; ET: MT_SW = open drain, connect pull-down resistor to Ground. |
| 5 | 7 | XFM_DET | Input | MT/ET detection input. Internal 1MΩ pull-down to AGND |
| 6 | 8 | ROTP | Input | OTP threshold program pin. Used to set the power derating temperature that is determined by an external resistor tied to AGND. |
| 7 | 9 | BKIN | Input | Buck power supply input. It is also used to configure the operation mode. V _{BKIN} > 2V: Boost-Buck mode; V _{BKIN} < 2V: Boost-Linear mode |
| 8 | 10 | BK_CS | Input | Buck current sense input. Connect resistor RCS2 from this pin to BKIN to define nominal average output current. It is also used to configure the skip function when in Boost-Linear mode. V _{BK_CS} < 2V: Disable skip function in Boost-Linear mode. V _{BK_CS} > 2V: Enable skip function in Boost-Linear mode. |
| 9 | 11 | GDRV | Output | Dual function: Boost-Buck mode: Gate driver for Buck FET. Boost-Linear mode: Gate driver for linear current regulator. |

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| Pin Number | | Pin Name | Type | Pin Description |
|------------|-------|----------|--------|---|
| QFN | TSSOP | | | |
| 10 | 12 | ISEN | Input | Current sense input for the linear current regulator in Boost-Linear mode. In Boost-Buck mode, used to enable/disable DCM operation. VISEN > 2V: Disable DCM function in Boost-Buck mode. VISEN < 2V: Enable DCM function in Boost-Buck mode. |
| 11 | 13 | VSKIP | Input | Skip voltage threshold set pin. |
| 12 | 14 | AGND | Ground | Chip ground. |
| 13 | 15 | VCC | Output | LDO 5V output. Connect a 4.7μF capacitor typically to AGND. |
| 14 | 16 | VP | Power | Chip power supply input. |
| 15 | 1 | BLEED | Output | Input for the internal bleeder FET. Internal 1MΩ resistor to VP. See Section 9.5 for more details. |
| 16 | 2 | PGND | Ground | Power ground for bleeder FET. |
| | | EP | Ground | Exposed PAD. It is internally tied to PGND. |

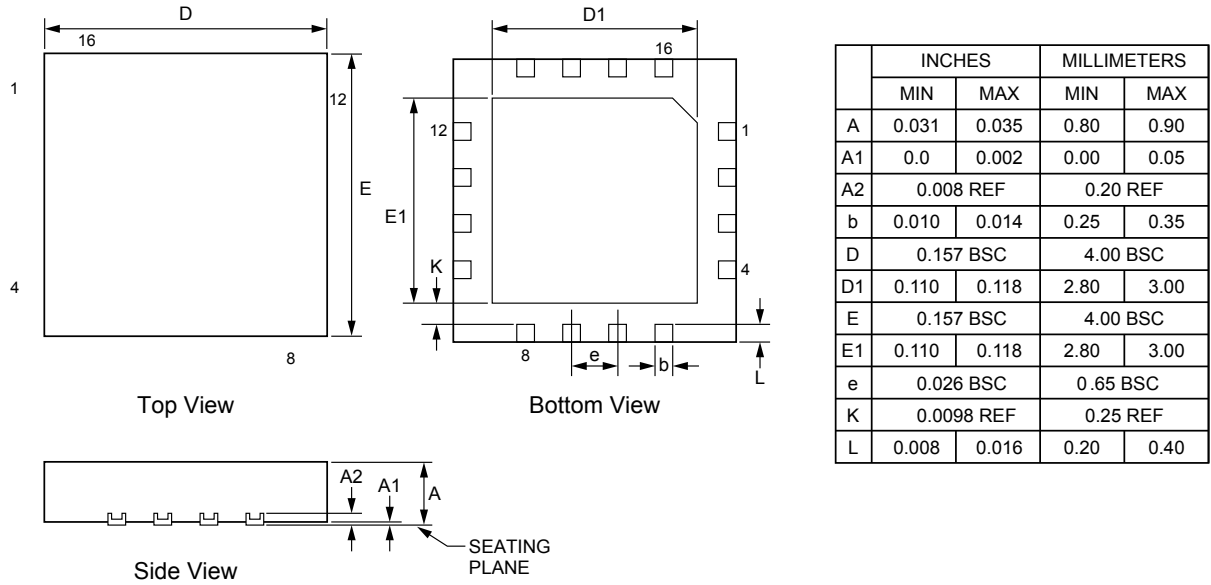
5 Absolute Maximum Ratings

Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded.

| Parameter | Symbol | Value | Units | |
|--|-------------------|------------------------|-------|------|
| VP to AGND | | -0.3 to 60 | V | |
| BLEED, VSKIP to AGND | | -0.3 to V _P | V | |
| BKIN, BK_CS to AGND | | -0.3 to V _P | V | |
| BST_CS- to AGND | | -5 to 0.3 | V | |
| XFM_DET, MT_SW to AGND | | -0.3 to 6.5 | V | |
| Other pins to AGND | | -0.3 to 6.5 | V | |
| Voltage difference between BKIN and BK_CS | | -6.5 to 6.5 | V | |
| Maximum junction temperature | T _{JMAX} | 150 | °C | |
| Operating junction temperature | T _{JOPT} | -40 to 150 | °C | |
| Storage temperature | T _{STG} | -65 to 150 | °C | |
| Thermal Resistance Junction-to-Ambient [Still Air] | θ _{JA} | QFN4x4 | 98 | °C/W |
| | | TSSOP16 | 148 | |
| ESD rating per JEDEC JESD22-A114 | | ±2,000 | V | |

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6 Physical Dimensions



Compliant to JEDEC Standard MS12F

Controlling dimensions are in millimeters; inch dimensions are for reference only

This product is RoHS compliant and Halide free.

Soldering Temperature Resistance:

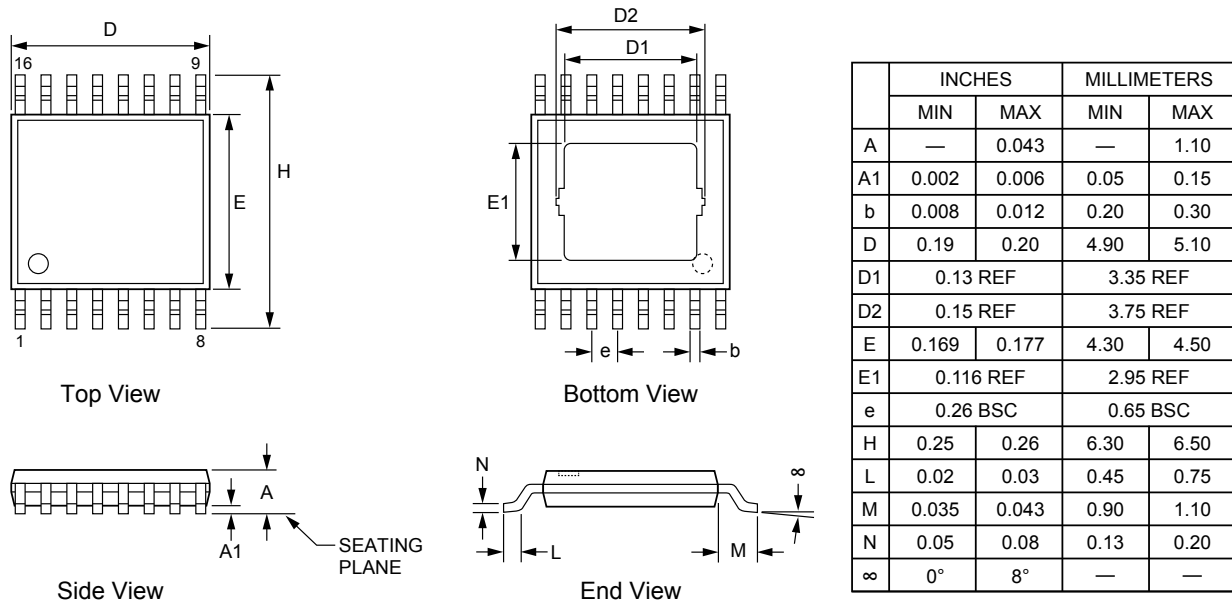
[a] Package is IPC/JEDEC Std 020D Moisture Sensitivity Level 1

[b] Package exceeds JEDEC Std No. 22-A111 for Solder Immersion Resistance; package can withstand 10 s immersion < 260 °C

Figure 6.1 : 16-Lead QFN 4x4mm Package

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Physical Dimensions (continued)



Compliant to JEDEC Standard MS12F

Controlling dimensions are in inches; millimeter dimensions are for reference only

This product is RoHS compliant and Halide free.

Soldering Temperature Resistance:

[a] Package is IPC/JEDEC Std 020D Moisture Sensitivity Level 1

[b] Package exceeds JEDEC Std No. 22-A111 for Solder Immersion Resistance; package can withstand immersion < 260°C

The package top may be smaller than the package bottom. Dimensions D and E are determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.

Figure 6.2 : 16-Lead TSSOP Package

7 Ordering Information

| Part no. | Options | Package | Description |
|-----------------|--|------------|--------------------------|
| iW3662-00-QFN5 | Low voltage SSL controller (12V _{AC} or 10-24V _{DC}) in QFN 16-lead, 4x4mm package optimized for boost buck | QFN16, 4x4 | Tape & Reel ¹ |
| iW3662-01-QFN5 | Low voltage SSL controller (12V _{AC} or 10-24V _{DC}) in QFN 16-lead, 4x4mm package optimized for boost linear | QFN16, 4x4 | Tape & Reel ¹ |
| iW3662-00-TSE16 | Low voltage SSL controller (12V _{AC} or 10-24V _{DC}) in TSSOP 16-lead package. See Note 2. | TSSOP16 | Tape & Reel ¹ |

Note 1: 7-inch Tape & Reel packing quantity is 1,500/reel. Minimum ordering quantity is 1,500.

Note 2: Please call Dialog for availability.

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