

DESCRIPTION

The EV4603-S-00A Evaluation Board is designed to demonstrate the capabilities of MPS' MP4603ES for TV backlighting applications. MP4603 is an integrated Buck-Boost white LED driver which is suitable for TV and big panel backlighting applications with MPS patented pending technology.

With a 12V input V_{IN} and a high voltage source V_{INH} , EV4603-S-00A can deliver a regulated voltage (V_{INH} to $V_{INH}+63V$) to drive a LED string over 350V. The LED current is regulated to about 120mA. The EV4603-S-00A can be synchronized. Several EV4603-S-00As can be used together to drive a TV panel

ELECTRICAL SPECIFICATION

| Parameter | Symbol | Value | Units |
|-------------------------|-----------|---------------|-------|
| Input Voltage | V_{IN} | $12 \pm 10\%$ | V |
| LED Current | I_{LED} | 120 | mA |
| Switching Frequency | f_s | 200 | kHz |
| Over Voltage Protection | V_{OVP} | -63 | V |

FEATURES

- Novel Power Leverage Control Technology
- Unique Step-up/down Operation
- Up to 99.5% Efficiency
- 0.5Ω Internal Power MOSFET Switch
- Switching Frequency Synchronization
- Over 1:1000 Dimming Ratio
- Separated Analog and PWM Dimming
- $\pm 5\%$ 200mV Reference Voltage
- 10 μ A Shutdown Mode
- Cycle-by-Cycle Over Current Protection
- Thermal Shutdown Protection
- LED String Open and Short Protection
- FAULT Output at LED Protection
- Output Short Circuit Protection

APPLICATIONS

- TV Backlighting
- Large LCD Panels Backlighting

All MPS parts are lead-free and adhere to the RoHS directive. For MPS green status, please visit MPS website under Products, Quality Assurance page "MPS" and "The Future of Analog IC Technology", are Registered Trademarks of Monolithic Power Systems, Inc.

EV4603-S-00A EVALUATION BOARD

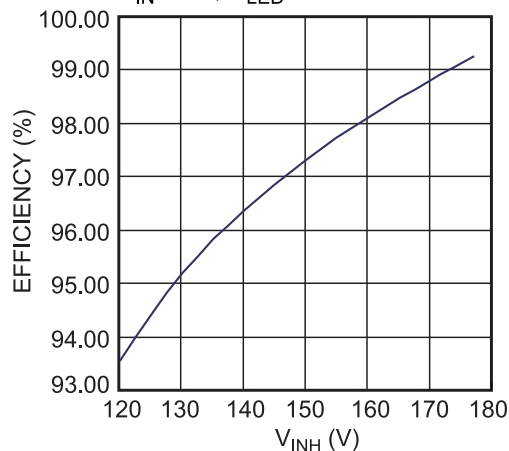


(L x W x H) 5cm x 4.6cm x 4.5mm

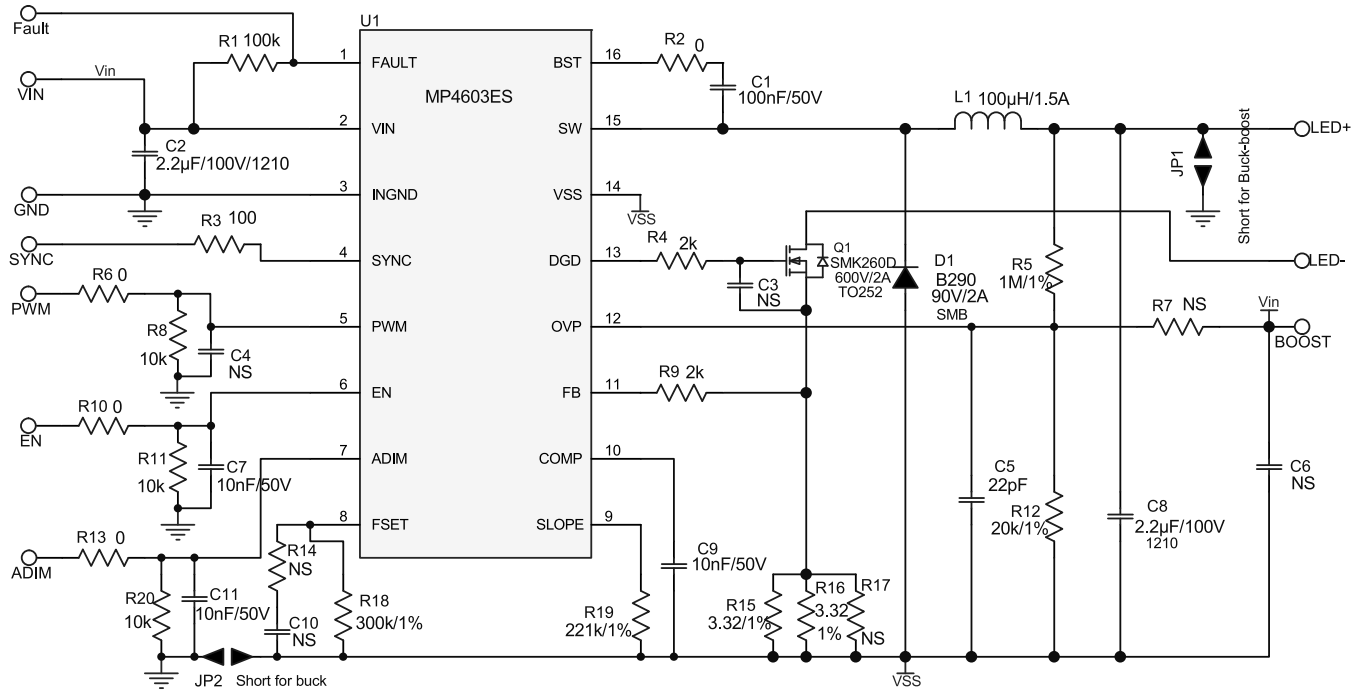
| Board Number | MPS IC Number |
|--------------|---------------|
| EV4603ES-00A | MP4603ES |

Efficiency vs. V_{INH}

$V_{IN}=12V$, $V_{LED}=179V$



EVALUATION BOARD SCHEMATIC



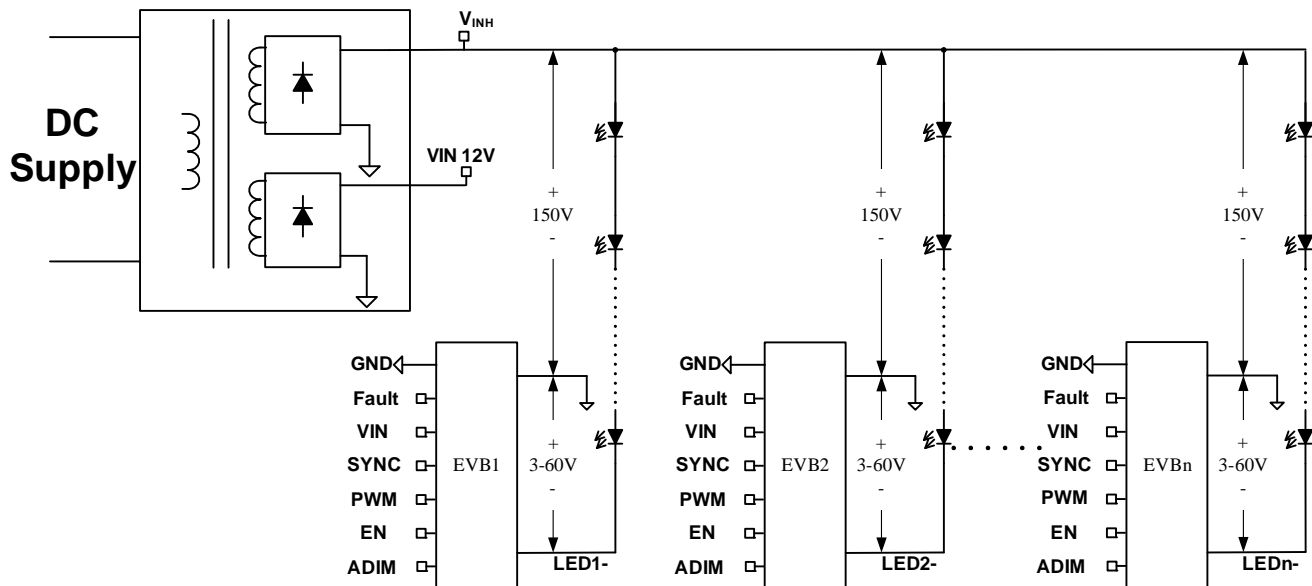
EV4603-S-00A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Part Number |
|-----|------------------|-----------|---------------------------------|---------------|--------------|--------------------|
| 1 | C1 | 100nF | Ceramic Capacitor;50V;X7R;0603 | 0603 | muRata | GRM188R71H103KA01D |
| 2 | C2, C8 | 2.2μF | Ceramic Capacitor;100V;X7R;1210 | 1210 | muRata | GRM32ER72A225KA35L |
| 4 | C3, C4, C6, C10 | NS | | | | |
| 1 | C5 | 22pF | Ceramic Capacitor;50V;COG;0603 | 0603 | muRata | GRM1885C1H220JA01D |
| 3 | C7, C9, C11 | 10nF | Ceramic Capacitor;50V;X7R;0603 | 0603 | muRata | GRM188R71H104KA93D |
| 1 | D1 | B290 | Schottky Diode;90V;2A | SMB | Diodes | B290 |
| 3 | JP3, JP4, JP5 | Jump Wire | Jump Wire | | | Jump Wire |
| 1 | L1 | 100μH | Inductor;100uH;250mOhm ;1.5A | SMD | Wurth | 7447715101 |
| 1 | Q1 | SMK0260D | N-Channel Mosfet;600V, 2A | DPAK(T O-252) | AUK | SMK0260D |
| 1 | R1 | 100k | Film Resistor;1% | 0603 | Yageo | RC0603FR-07100KL |
| 4 | R2, R6, R10, R13 | 0 | Film Resistor;5% | 0603 | Yageo | RC0603JR-070RL |

EV4603ES-00A BILL OF MATERIALS *(continued)*

| Qty | Ref | Value | Description | Package | Manufacturer | Part Number |
|-----|-----------------|----------|------------------|---------|--------------|------------------|
| 1 | R3 | 100 | Film Resistor;1% | 0603 | Yageo | RC0603FR-07100RL |
| 2 | R4, R9 | 2k | Film Resistor;1% | 0603 | Yageo | RC0603FR-072KL |
| 1 | R5 | 1M | Film Resistor;1% | 0603 | Yageo | RC0603FR-071ML |
| 3 | R7, R14, R17 | NS | | | | |
| 4 | R8, R11, R20 | 10k | Film Resistor;1% | 0603 | Yageo | RC0603FR-0710KL |
| 1 | R12 | 20k | Film Resistor;1% | 0603 | Yageo | RC0603FR-0720KL |
| 2 | R15, R16 | 3.32 | Film Resistor;1% | 0603 | Yageo | RC0603FR-073R32L |
| 1 | R18 | 300k | Film Resistor;1% | 0603 | Yageo | RC0603FR-07300KL |
| 1 | R19 | 221k | Film Resistor;1% | 0603 | Yageo | RC0603FR-07221KL |
| 1 | U1 | MP4603ES | MP4603ES | SOIC16 | MPS | MP4603ES |

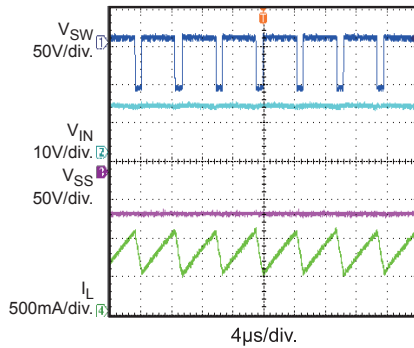
EXAMPLE OF TV BACKLIGHT DRIVE WITH SEVERAL EV4603-S-00A



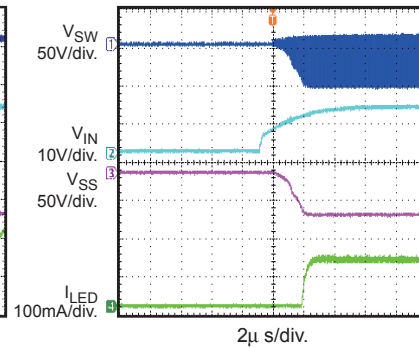
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board (JP1 Short, JP2 Open).
 $V_{IN} = 12V$, $V_{INH}=125V$, $V_{LED}=180V$, $I_{LED} = 120mA$, $T_A = 20^{\circ}C$, unless otherwise noted.

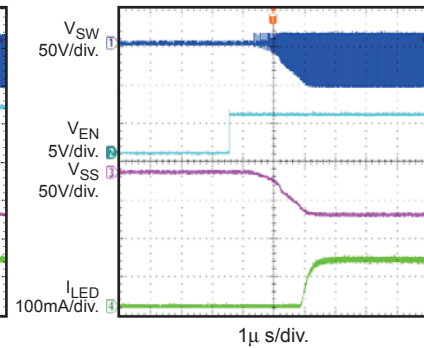
Steady State



VIN Start

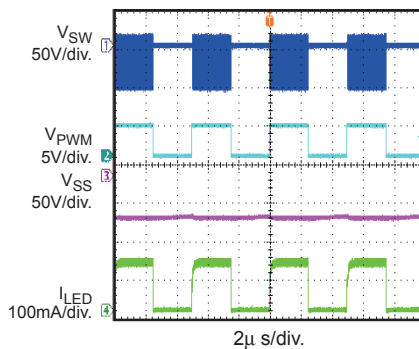


EN Start

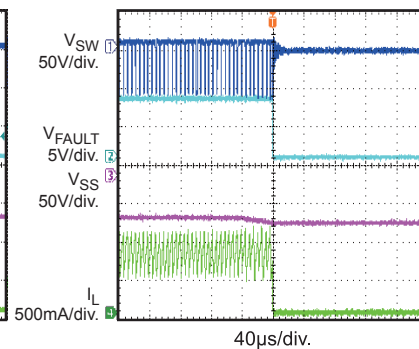


PWM Dimming

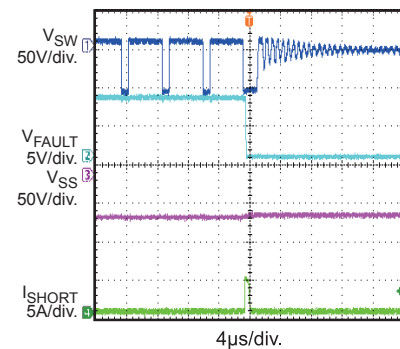
$F_{PWM}=200Hz$, $D_{PWM}=50\%$



Open LED Load @ Working



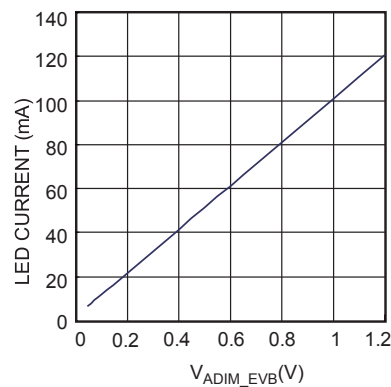
Short LED- to GND @ Working



PWM Dimming Curve



Analog Dimming Curve



Made in China

JP1

JP2

C8

D1

L1

GND

FAULT

VIN

SYNC

PWM

EN

ADIM

R1

C2

C6

U1

R2

C1

R4

C3

R17

R16

R15

R9

C9

R19

R18

C5

R12

R13

R10

R11

R7

C10

LED+

LED-

Q1

Boost

MPS

Monolithic Power Systems
MP4603 Demo Board
EV4603-S-00A
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Figure 1—Top Silk Layer

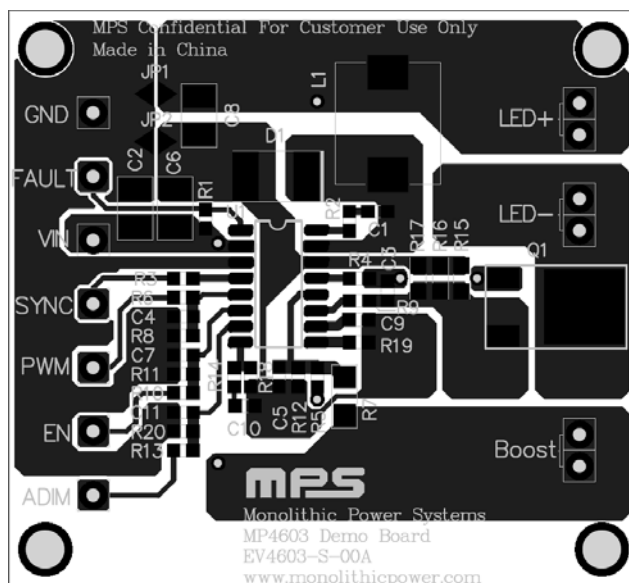


Figure 2—Top Layer

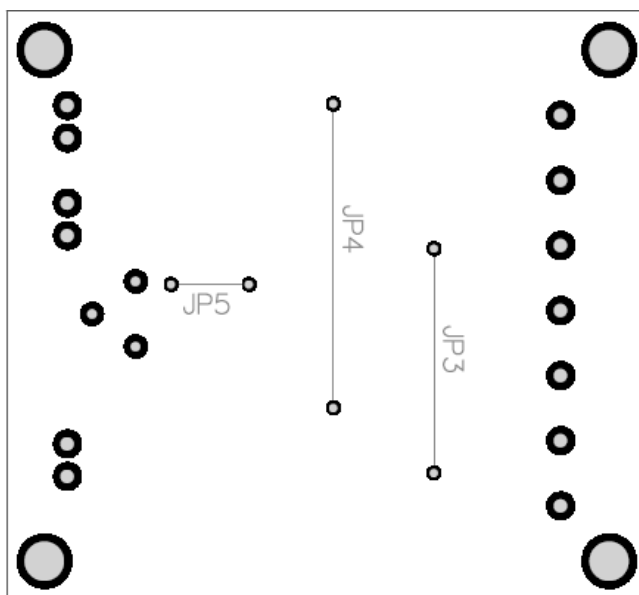


Figure 3—Bottom Layer

QUICK START GUIDE

1. Check the LED string voltage and preset the high voltage power supply's output. For example, 60 LED string needs 180V. Set the high voltage power supply output V_{INH} as 150V.
2. Set a second power supply VIN to 12V as the input of all the EVBs. Set a third power supply to 5V as the EN input to all the EVBs, Set a fourth power supply to 5V as the ADIM input of all EVBs. Set another power supply to 5V as the PWM input of all EVBs.
3. Turn-off all power supplies.
4. Connect the positive terminal of the high voltage power supply to all the anodes of the LED strings, and the negative terminal to all the EVB 'GND' connector.
5. Connect each LED string cathode to the 'LED-' connector on one EVB individually (one EVB for one LED string).
6. Connect VIN (12V) the positive terminal to all the EVB 'VIN' connectors and the negative terminal to all the EVB GND connectors.
7. Connect the 5V PWM power supply positive terminal to all the EVB 'PWM' connectors, and negative terminal to all the EVB 'GND' connectors.
8. Connect the 5V 'ADIM' power supply positive terminal to all the EVB 'ADIM' connectors, and negative terminal to all the EVB 'GND' connectors.
9. Connect the 5V EN power supply positive terminal to all the EVB 'EN' connectors, and negative terminal to all the EVB 'GND' connectors.
10. Connect all 'SYNC' pin of all EVBs together for synchronization if necessary.
11. Turn on the high voltage power supply.
12. Turn on the 12V power supply.
13. Turn on the 5V PWM power supply.
14. Turn on the 5V ADIM power supply.
15. Turn on the 5V EN power supply. All the LED strings should be lighted.
16. To demo the dimming function: replace the 5V PWM power supply with a function generator. Set the PWM signal amplitude from 2.5V to 5V and the frequency within 100Hz to 20kHz range.
17. For analog dimming, adjust the power supply on 'ADIM' connector from 0V to 1.2V
18. To demo the EVB in Boost mode, connect the LED load as follow: Anode to 'BOOST' and Cathode to 'LED-'
19. To demo the EVB in Buck mode, open 'JP1' and short 'JP2'. The anode and cathode of the LED string are connected to "LED+" and "LED-" separately.

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