Alfa-MOS Technology

# AF1860

## 60V 1.5A 52KHZ PWM Step Down DC-DC LED Driver

### General Description

AF1860 is the monolithic IC designed for a step-down DC/DC converter capable of driving 1.5A load without an additional transistor. The input voltage range is up to 60V. Its feedback voltage, $V_{FB}$, is 200mV. The AF1860 operates at a switching frequency of 52kHz. The external shutdown function is controlled by a logic level on the ON/OFF pin and then the circuit comes into the standby mode with $I_{STBY}$ ~ 50μA (typ.). The ON/OFF pin may be used for the analog dimming. As the voltage on the ON/OFF pin is increased from 0.07V to 0.67V, the voltage on the FB pin falls from 200mV to 0V.

The self-protection features include a cycle-by-cycle current limit and a thermal protection.

The AF1860 is available in standard SOP-8EP package.

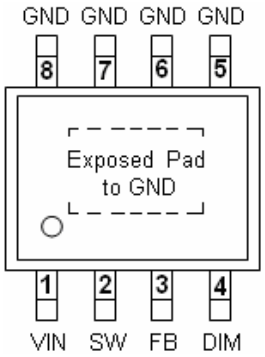
### Features

- $V_{IN\ Max}$ = 60V
- $V_{FB}$ = 200mV
- Frequency 52kHz
- $I_{LED\ Max}$ 1.5A ( SOP-8EP )
- On/Off input may be used for the Analog Dimming
- Thermal protection
- Cycle-by-cycle current limit

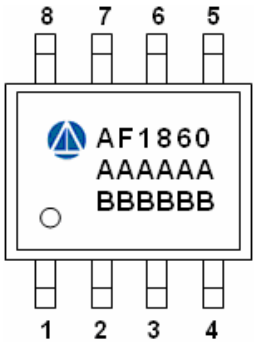
### Application

- DC-DC or AC-DC LED driver applications
- Back lighting of flat panel displays
- General purpose constant current source
- Automotive
- Chargers

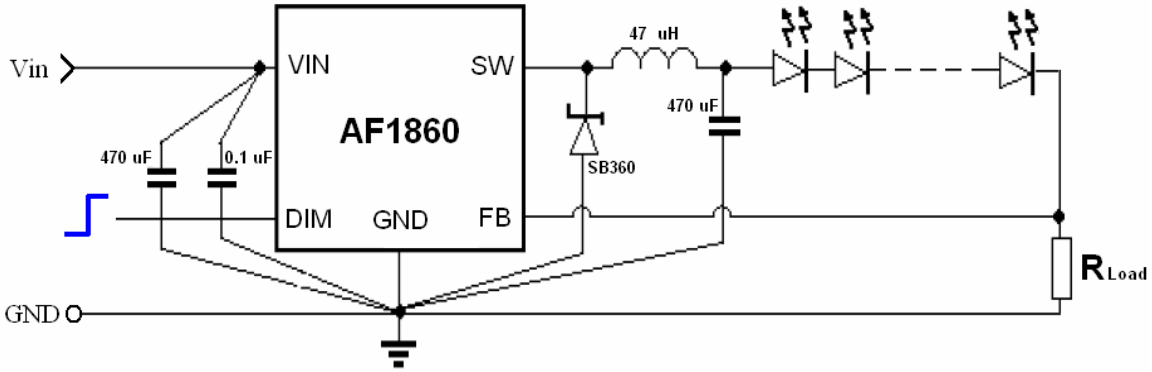
### Pin Define (SOP-8EP)




### Marking Information (SOP-8EP)



## Typical Application Circuit




## SOP-8EP Pin Description

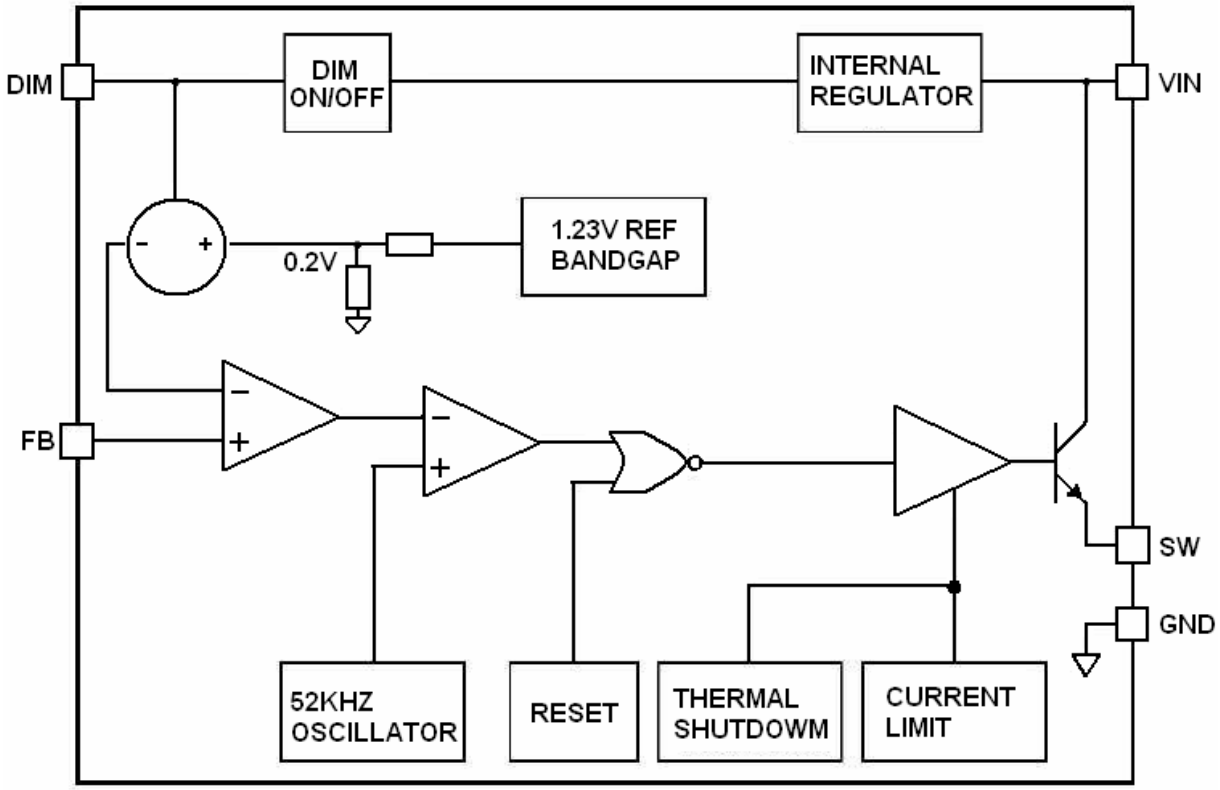
| Pin | Symbol | Description |
|---|---|---|
| 1 | VIN | Supply Voltage Input |
| 2 | SW | Switching |
| 3 | FB | Feedback |
| 4 | DIM | On/Off & Dimming |
| 5 | GND | Ground |
| 6 | GND | Ground |
| 7 | GND | Ground |
| 8 | GND | Ground |

## Ordering Information

| Part Ordering No. | Part Marking | Package | Unit | Quantity |
|---|---|---|---|---|
| AF1860S8EPRG | AF1860 | SOP-8EP ( Exposed Pad ) | Tape & Reel | 2500 EA |

※ A Lot Code
※ B Date Code
※ AF1860S8EPRG : 13” Tape & Reel ; Pb- Free ; Halogen- Free

## Block Diagram




## Absolute Maximum Ratings ($T_A$=25℃ Unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| DC Supply Voltage | $V_{IN}$ | 63 | V |
| ON/OFF and Dimming Voltage | DIM | -0.3~$V_{IN}$ | V |
| SW Voltage | SW | -0.8 | V |
| FB Voltage | FB | -0.3~$V_{IN}$ | V |
| Operating Temperature | $T_{OPR}$ | -40～125 | ℃ |
| Maximum Junction Temperature | $T_{J(Max)}$ | 150 | ℃ |
| Storage Temperature | $T_S$ | -65～150 | ℃ |

The IC has a protection circuit against static electricity ( > 2KV). Do not apply high static electricity or high voltage that exceeds the performance of the protection circuit to the IC.

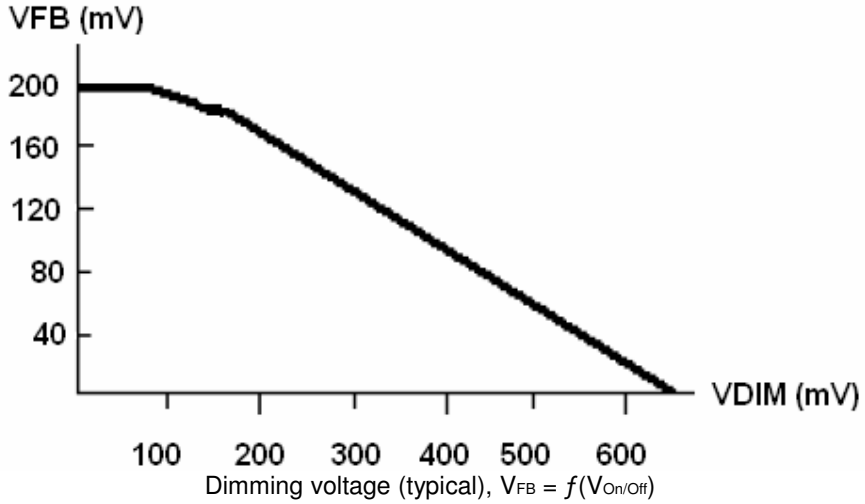
## Electrical Characteristics

($T_j$=25℃, $V_{IN}$=12V, $I_{LOAD}$=350mA Unless otherwise specified)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{IN}$ | Operating Voltage | | 5.5 | | 60 | V |
| $V_{FB}$ | Feedback Voltage | $V_{IN}$ = 12V, $I_{LOAD}$ = 350mA, DIM = 0V | 190 | 200 | 210 | mV |
| | | $V_{IN}$ = 5.5V~60V, $I_{LOAD}$ = 350mA, $V_{DIM}$ = 0V | 180 | | 220 | mV |
| $I_{FB}$ | Feedback Current | $V_{FB}$ = 250mV, DIM= 0V | -150 | -50 | 150 | nA |
| $F_{OSC}$ | Oscillator Frequency | | 47 | 52 | 58 | KHz |
| $V_{SAT}$ | Saturation Current | $I_{SW}$=1.5A | | 1.35 | 1.5 | V |
| $D_{MAX}$ | Max Duty | | | | 100 | % |
| $I_{LO}$ | SW Leakage Current | $V_{IN}$=50V, $V_{FB}$ = 1.5V, $V_{SW}$ = 0V | -0.3 | -0.07 | | mA |
| $C_L$ | Current Limit | | 1.5 | | 4.0 | A |
| $V_{TH}$ | DIM Threshold Voltage | | 1.0 | 1.4 | 2.0 | V |
| $I_{IH}$ | Input Current On/Off | $V_{On/Off}$ = 2.5V | -1.0 | 0.01 | 1.0 | uA |
| $I_{IL}$ | Input Current On/Off | $V_{On/Off}$ = 0 V | -1.0 | -0.3 | 1.0 | uA |
| $I_Q$ | Quiescent Current | $V_{FB}$ = 1.5V | | 5.3 | 10 | mA |
| $I_{STBY}$ | Standby Current | $V_{IN}$=50V, $V_{DIM}$ = 5V | | 50 | 200 | uA |
| $V_{DIM}$ | Dimming Voltage | $V_{IN}$ = 12V, $I_{LOAD}$ = 0 | 600 | 670 | 750 | mV |

**Note :**

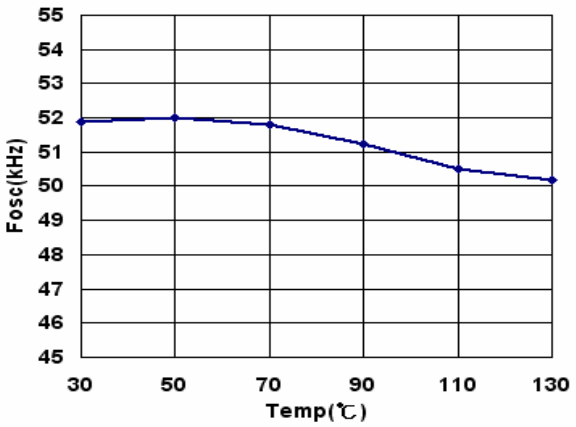
LED must be ensured with load current ($I_{LOAD}$) at $V_{IN\ Min.}$



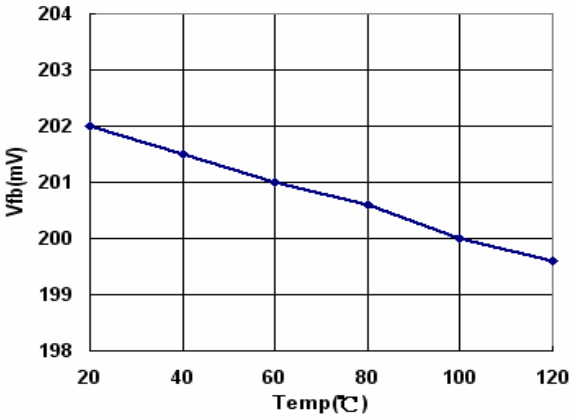

Dimming voltage (typical), $V_{FB} = f(V_{On/Off})$

## Typical Performance Characteristics

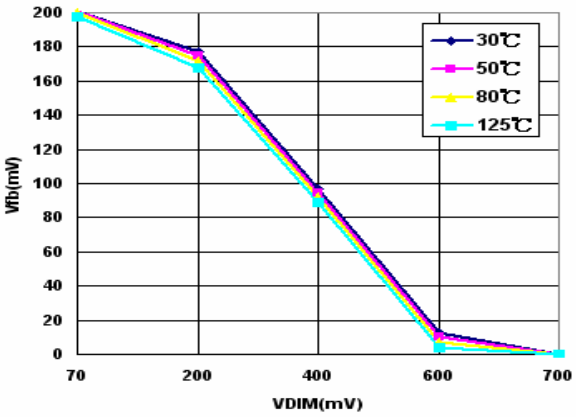
Oscillator Frequency



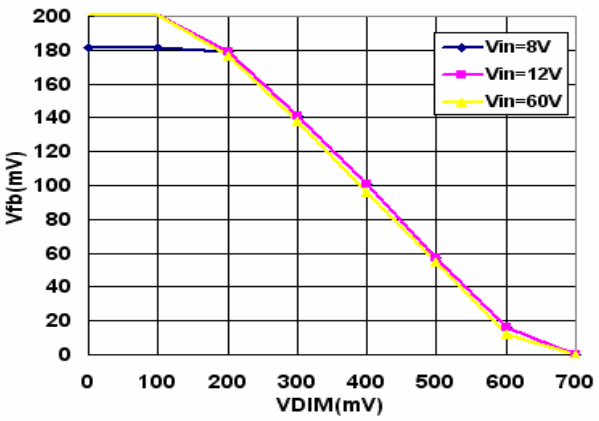

Normalized Feedback Voltage



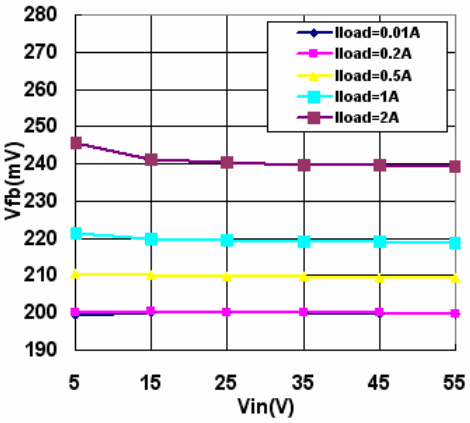

Normalized Dimming Voltage



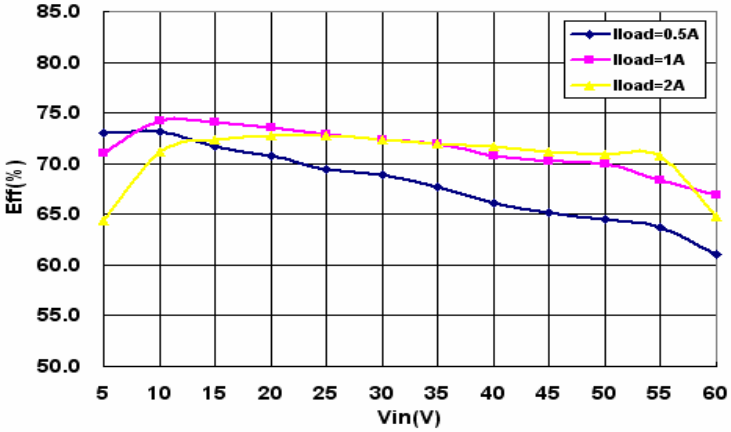

Dimming Voltage



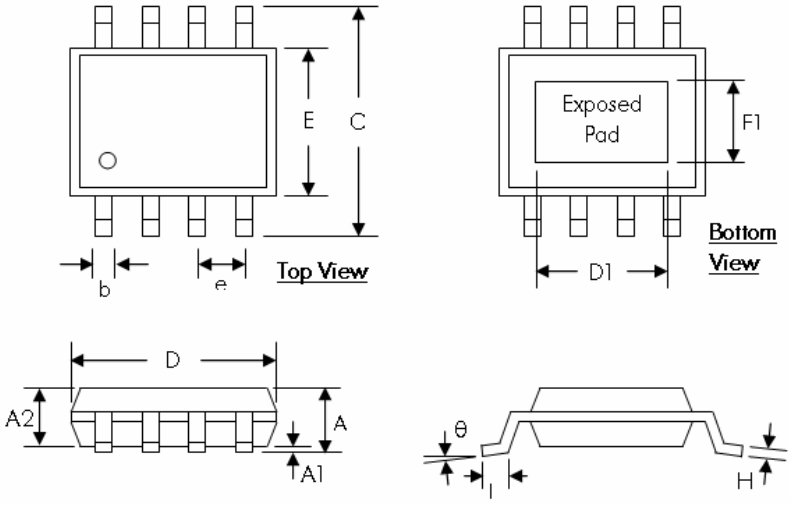

Feedback Voltage




Operating Efficiency



## Package Information ( SOP-8EP )




| SYMBOLS | DIMENSION (MM) | | DIMENSION (INCH) | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 1.30 | 1.70 | 0.051 | 0.067 |
| A1 | 0.00 | 0.15 | 0.000 | 0.006 |
| A2 | 1.25 | 1.52 | 0.049 | 0.060 |
| b | 0.33 | 0.51 | 0.013 | 0.020 |
| C | 5.80 | 6.20 | 0.228 | 0.244 |
| D | 4.80 | 5.11 | 0.189 | 0.201 |
| D1 | 3.15 | 3.45 | 0.124 | 0.136 |
| E | 3.80 | 4.00 | 0.150 | 0.157 |
| E1 | 2.26 | 2.56 | 0.089 | 0.101 |
| e | 1.27 BSC | | 0.050 BSC | |
| H | 0.19 | 0.25 | 0.0075 | 0.0098 |
| L | 0.41 | 1.27 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

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