

## 5V, 8A, 550KHz High Efficiency Low Ripple Synchronous Step-Up Converter

### Description

The HM5172 is a high efficiency, fixed frequency 550KHz, current mode PWM boost DC/DC converter which could operate battery such as input voltage down to 2.5V. The converter output voltage can be adjusted to a maximum of 5.25V by an external resistor divider. Besides the converter includes a 0.05Ω N-channel MOSFET switch and 0.08Ω P-channel synchronous rectifier. So no external Schottky diode is required and could get better efficiency near 90%.

The converter is based on a fixed frequency, current mode, pulse-width-modulation PWM controller that goes automatically into PSM mode at light load.

When converter operation into discontinuous mode, the internal anti-ringing switch will reduce interference and radiated electromagnetic energy.

The HM5172 is available in a space-saving SOP-8 (Exposed Pad) package for portable application.

### Features

- High Efficiency up to 90%
- Low  $R_{DS(ON)}$  Integrated Power MOSFET
- NMOS 50mΩ/PMOS 60mΩ
- Wide Input Voltage Range: 2.5V to 5.25V
- Fixed 550KHz Switching Frequency
- Low-Power Mode for Light Load Conditions
- $\pm 2.0\%$  Voltage Reference Accuracy
- Adjustable Current Limit
- PMOS Current Limit for Short Circuit Protection
- Low Quiescent Current
- Output Ripple under 200mV (Scope Full Bandwidth)
- Input Under Voltage Lockout
- Internal Compensation Function
- Built-In Soft Start Function
- Over-Temperature Protection with Auto Recovery
- Output Overvoltage Protection
- SOP-8 (Exposed Pad) Pb-Free Package

### Applications

- Portable Power Bank
- Wireless Equipment
- Handheld Instrument
- GPS Receiver

### Pin Assignments

SP Package (SOP-8 Exposed Pad)

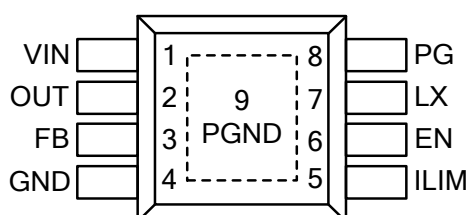
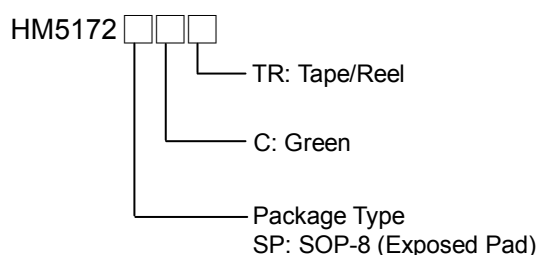
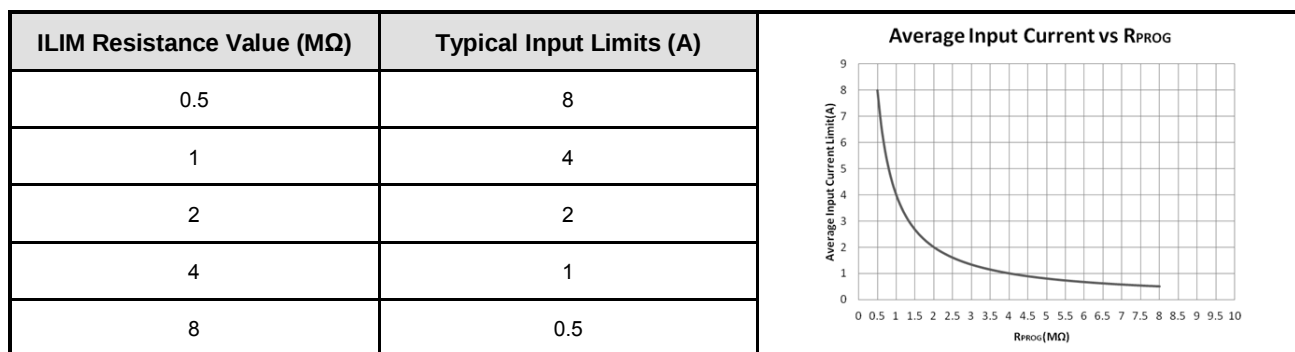
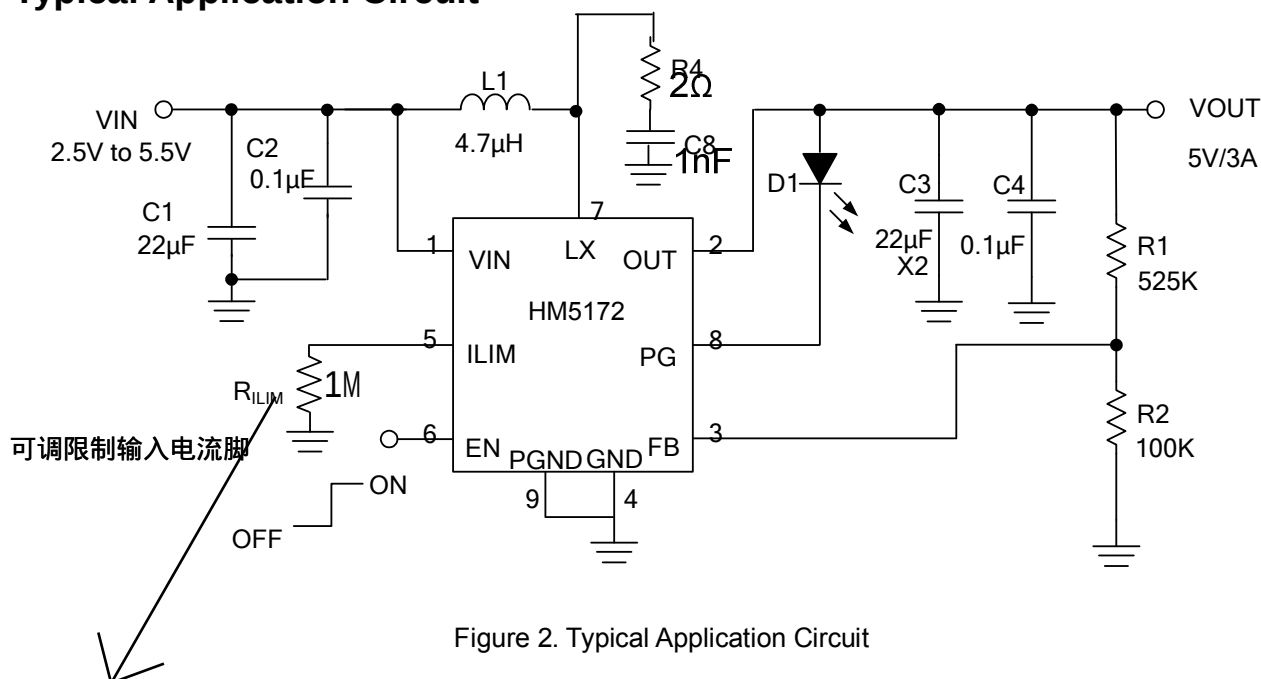


Figure 1. Pin Assignment of HM5172

### Ordering Information



## Typical Application Circuit



## Functional Pin Description

| Pin Name | Pin No. | Pin Function                                                                 |
|----------|---------|------------------------------------------------------------------------------|
| VIN      | 1       | Power Supply Input Pin.                                                      |
| OUT      | 2       | Output of the Synchronous Rectifier.                                         |
| FB       | 3       | Voltage Feedback Input Pin.                                                  |
| GND      | 4       | Ground Pin. Connect GND to exposed pad.                                      |
| ILIM     | 5       | Programming Input for Average Input Current.                                 |
| EN       | 6       | Logic Controlled Shutdown Input.                                             |
| LX       | 7       | Power Switching Connection. Connect LX to the inductor and output rectifier. |
| PG       | 8       | Power Good Indication Open Drain Pin.                                        |
| PGND     | 9       | Power Ground Pin.                                                            |

## Block Diagram

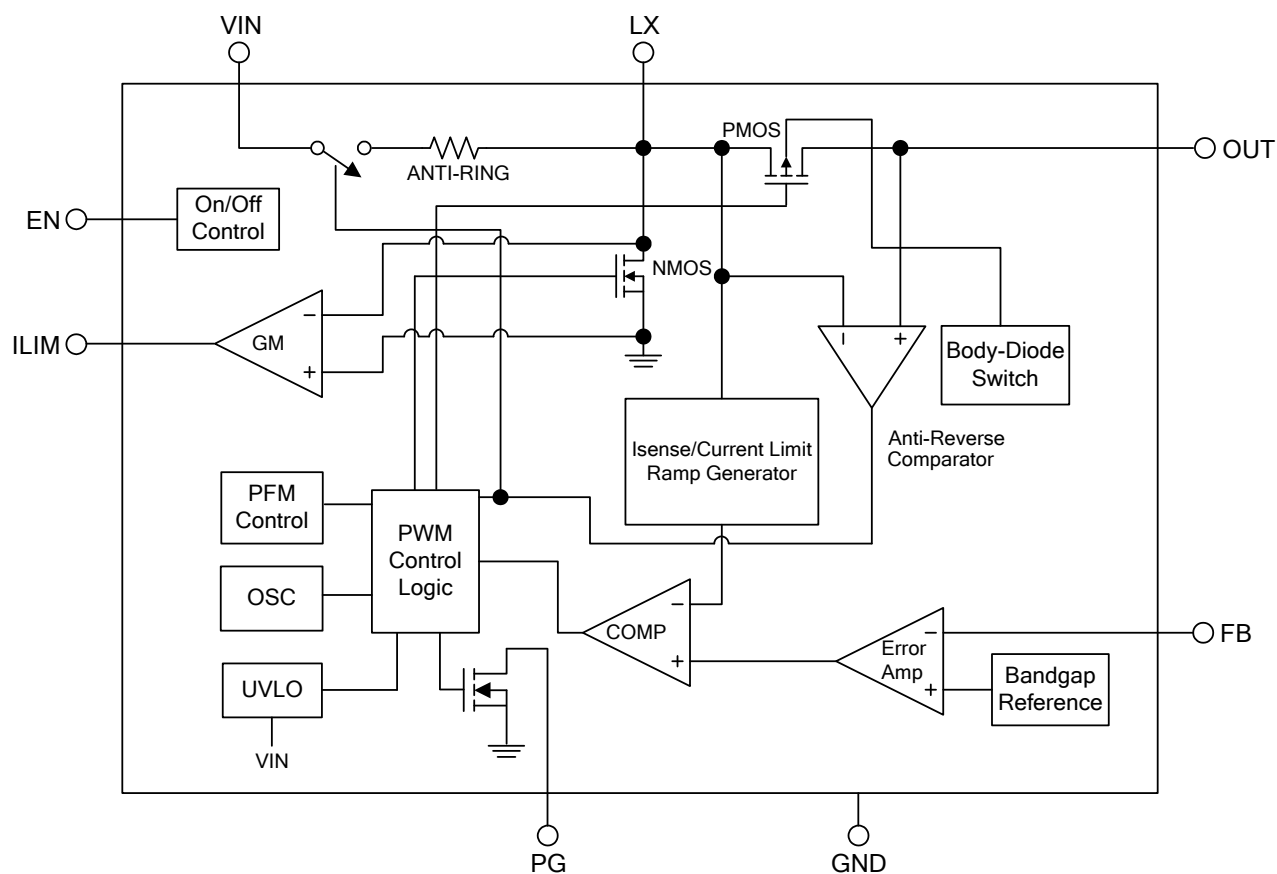


Figure 3. Block Diagram of HM5172

## Absolute Maximum Ratings (Note 1)

- Supply Voltage  $V_{IN}$  ----- -0.3V to +6.5V
- LX Voltage  $V_{LX}$  ----- -0.3V to +6.5V
- All Other Pins Voltage ----- -0.3V to +6.5V
- Maximum Junction Temperature ( $T_J$ ) ----- +150°C
- Storage Temperature ( $T_S$ ) ----- -65°C to +150°C
- Lead Temperature (Soldering, 10sec.) ----- +260°C
- Package Thermal Resistance, ( $\theta_{JA}$ )
  - SOP-8 (Exposed Pad) ----- 60°C/W
- Package Thermal Resistance, ( $\theta_{JC}$ )
  - SOP-8 (Exposed Pad) ----- 15°C/W

Note 1 : Stresses beyond this listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

## Recommended Operating Conditions

- Supply Voltage  $V_{IN}$  ----- +2.5V to +5.25V
- Output Voltage Range ----- up to +5.25V
- Operation Temperature Range ----- -40°C to +85°C

## Electrical Characteristics

( $V_{IN}=3.3V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified.)

| Parameter                                  | Symbol          | Conditions                                        | Min   | Typ | Max   | Unit            |
|--------------------------------------------|-----------------|---------------------------------------------------|-------|-----|-------|-----------------|
| VIN Input Supply Voltage                   | $V_{IN}$        |                                                   | 2.5   |     | 5.25  | V               |
| VIN Supply Current (Switching)             |                 | $V_{IN}=3.3V$ , $V_{FB}=0.7V$<br>Measure $V_{IN}$ |       | 300 | 500   | $\mu A$         |
| VIN Supply Current (No witching)           |                 | $V_{FB}=1V$                                       |       | 30  |       | $\mu A$         |
| Feedback Voltage                           | $V_{FB}$        | $2.5V \leq V_{IN} \leq 5.5V$                      | 0.784 | 0.8 | 0.816 | V               |
| High-Side PMOSFET $R_{DS(ON)}$             |                 |                                                   |       | 60  |       | m $\Omega$      |
| Low-Side NMOSFET $R_{DS(ON)}$              |                 |                                                   |       | 50  |       | m $\Omega$      |
| High-Side MOSFET Leakage Current           | $I_{LX(leak)}$  | $V_{LX}=5.5V$ , $V_{OUT}=0V$                      |       |     | 10    | $\mu A$         |
| Low-Side MOSFET Leakage Current            |                 | $V_{LX}=5.5V$                                     |       |     | 10    | $\mu A$         |
| Oscillation Frequency                      | $F_{OSC}$       |                                                   | 450   | 550 | 650   | KHz             |
| Short Circuit Trip Point                   |                 | Monitored FB voltage                              |       | 0.3 |       | V               |
| Short Circuit Current Limit                |                 | $V_{IN} = 3.3V$                                   |       | 50  |       | mA              |
| Maximum Duty Cycle                         | $D_{MAX}$       | $V_{IN}=3.3V$                                     | 90    |     |       | %               |
| ILIM Current                               |                 |                                                   |       | 8   |       | A               |
|                                            |                 | $R_{LIM}=500K$                                    |       | 8   |       | A               |
| ILIM Current Gain                          |                 | $V_{IN}=3.3V$                                     |       | 8   |       | M $\Omega$ -A/A |
| Line Regulation                            |                 | $V_{IN}=2.5V$ to $5.5V$ ,<br>$I_{OUT}=100mA$      |       |     | 1     | %               |
| Load Regulation                            |                 | $I_{OUT}=0A$ to $1A$                              |       | 0.5 |       | %               |
| Input UVLO Threshold                       | $V_{UVLO(VTH)}$ | $V_{IN}$ Rising                                   |       | 2.3 |       | V               |
| Under Voltage Lockout Threshold Hysteresis | $V_{UVLO(HYS)}$ | $V_{IN}$ Falling                                  |       | 300 |       | mV              |
| OVP Threshold Voltage on OUT Pin           |                 |                                                   |       | 6   |       | V               |
| OVP Threshold Hysteresis                   |                 |                                                   |       | 500 |       | mV              |
| Internal Soft-Start Time                   |                 |                                                   |       | 1   | 3     | ms              |
| Power Good Active                          |                 | Monitored FB,<br>with respect to $V_{FB}$         |       | 90  |       | %               |
| Power Good Hysteresis                      |                 |                                                   |       | 5   |       | %               |
| PG Low Output                              |                 | Sink 20mA                                         |       |     | 0.4   | V               |
| PG Leakage Current                         |                 | $PG=6.0V$                                         |       |     | 1     | $\mu A$         |
| EN Input Low Voltage                       | $V_{EN(L)}$     |                                                   |       |     | 0.4   | V               |
| EN Input High Voltage                      | $V_{EN(H)}$     |                                                   | 1.4   |     |       | V               |
| EN Input Current                           | $I_{EN}$        | $V_{IN}=3.3V$                                     |       | 2   |       | $\mu A$         |

## Electrical Characteristics (Continued)

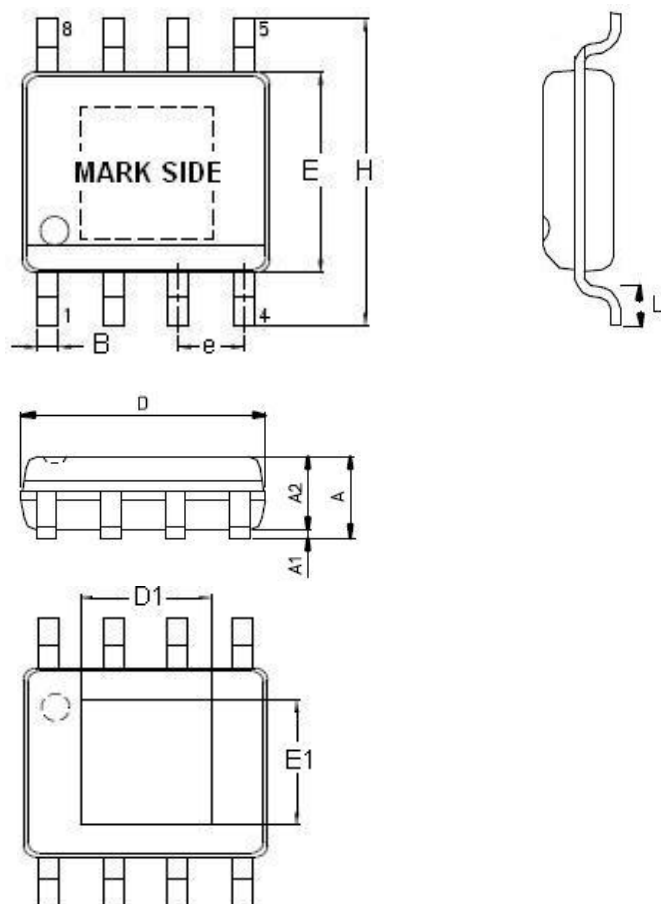
( $V_{IN}=3.3V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified.)

| Parameter                              | Symbol   | Conditions | Min | Typ | Max | Unit        |
|----------------------------------------|----------|------------|-----|-----|-----|-------------|
| Thermal Shutdown Threshold<br>(Note 2) | $T_{SD}$ |            |     | 150 |     | $^{\circ}C$ |
| Thermal Shutdown Hysteresis            |          |            |     | 30  |     | $^{\circ}C$ |

Note 2 : Not production tested.

## Outline Information

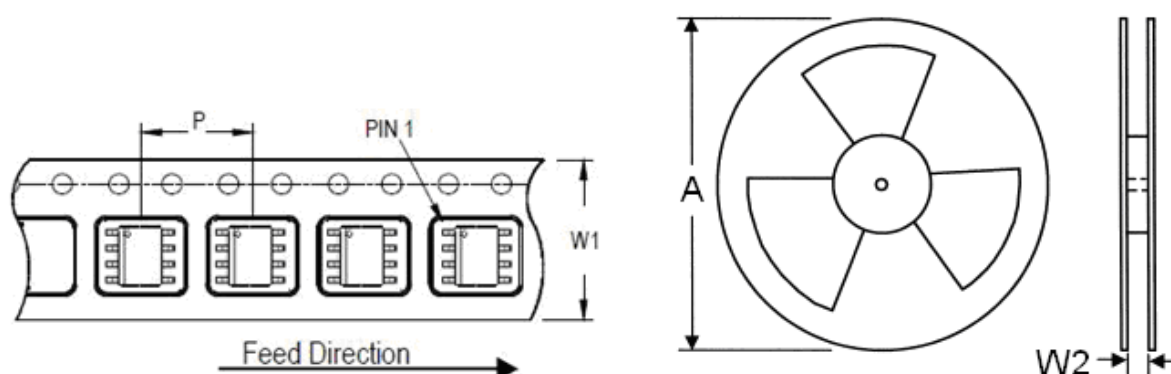
SOP-8 (Exposed Pad) Package (Unit: mm)



| SYMBOLS<br>UNIT | DIMENSION IN MILLIMETER |      |
|-----------------|-------------------------|------|
|                 | MIN                     | MAX  |
| A               | 1.25                    | 1.70 |
| A1              | 0.00                    | 0.15 |
| A2              | 1.25                    | 1.55 |
| B               | 0.31                    | 0.51 |
| D               | 4.80                    | 5.00 |
| D1              | 3.04                    | 3.50 |
| E               | 3.80                    | 4.00 |
| E1              | 2.15                    | 2.41 |
| e               | 1.20                    | 1.34 |
| H               | 5.80                    | 6.20 |
| L               | 0.40                    | 1.27 |

Note : Followed From JEDEC MO-012-E.

## Carrier Dimensions



| Tape Size<br>(W1) mm | Pocket Pitch<br>(P) mm | Reel Size (A) |     | Reel Width<br>(W2) mm | Empty Cavity<br>Length mm | Units per Reel |
|----------------------|------------------------|---------------|-----|-----------------------|---------------------------|----------------|
|                      |                        | in            | mm  |                       |                           |                |
| 12                   | 8                      | 13            | 330 | 12.4                  | 400~1000                  | 2,500          |

### Life Support Policy

H&M Semi's products are not authorized for use as critical components in life support devices or other medical systems.