

**Features**

- Wide 8V to 36V Input Voltage Range
- Output Adjustable from 1.25V to 32V
- Maximum Duty Cycle 100%
- Minimum Drop Out 0.3V
- Fixed 180KHz Switching Frequency
- 5A Constant Output Current Capability
- Internal Optimize Power MOSFET
- High efficiency up to 96%
- Excellent line and load regulation
- Built in thermal shutdown function
- Built in current limit function
- Built in output short protection function
- Available in TO263-5L package

**Applications**

- LCD Monitor and LCD TV
- Portable instrument power supply
- Telecom / Networking Equipment

**General Description**

The HS4015E1 is a 180 KHz fixed PWM buck (step-down) DC/DC converter, capable of driving a 5A load with high efficiency, low ripple and excellent line and load regulation. Requiring a minimum number of external components, the regulator is simple to use and include internal frequency compensation and a fixed-frequency oscillator.

The PWM control circuit is able to adjust the duty ratio linearly from 0 to 100%. An over current protection function is built inside. When short protection function happens, the operation frequency will be reduced from 180KHz to 48KHz. An internal compensation block is built in to minimize external component count.

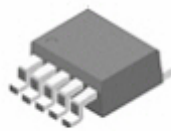
**TO263-5L**

Figure1. Package Type of HS4015E1

## Pin Configurations

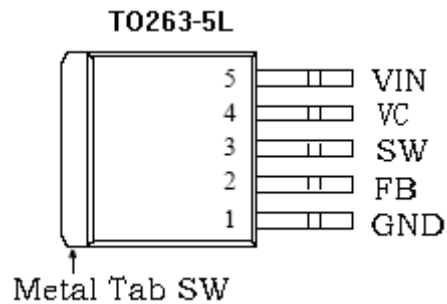


Figure2. Pin Configuration of HS4015E1 (Top View)

Table 1 Pin Description

| Pin Number | Pin Name | Description                                                                                                                                                                                                      |
|------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1          | GND      | Ground Pin. Care must be taken in layout. This pin should be placed outside of the Schottky Diode to output capacitor ground path to prevent switching current spikes from inducing voltage noise into HS4015E1. |
| 2          | FB       | Feedback Pin (FB). Through an external resistor divider network, FB senses the output voltage and regulates it. The feedback threshold voltage is 1.25V.                                                         |
| 3          | SW       | Power Switch Output Pin (SW). SW is the switch node that supplies power to the output.                                                                                                                           |
| 4          | VC       | Internal Voltage Regulator Bypass Capacity. In typical system application, The VC pin connect a 1uf capacity to VIN.                                                                                             |
| 5          | VIN      | Supply Voltage Input Pin. HS4015 operates from a 8V to 36V DC voltage. Bypass Vin to GND with a suitably large capacitor to eliminate noise on the input.                                                        |

## Function Block

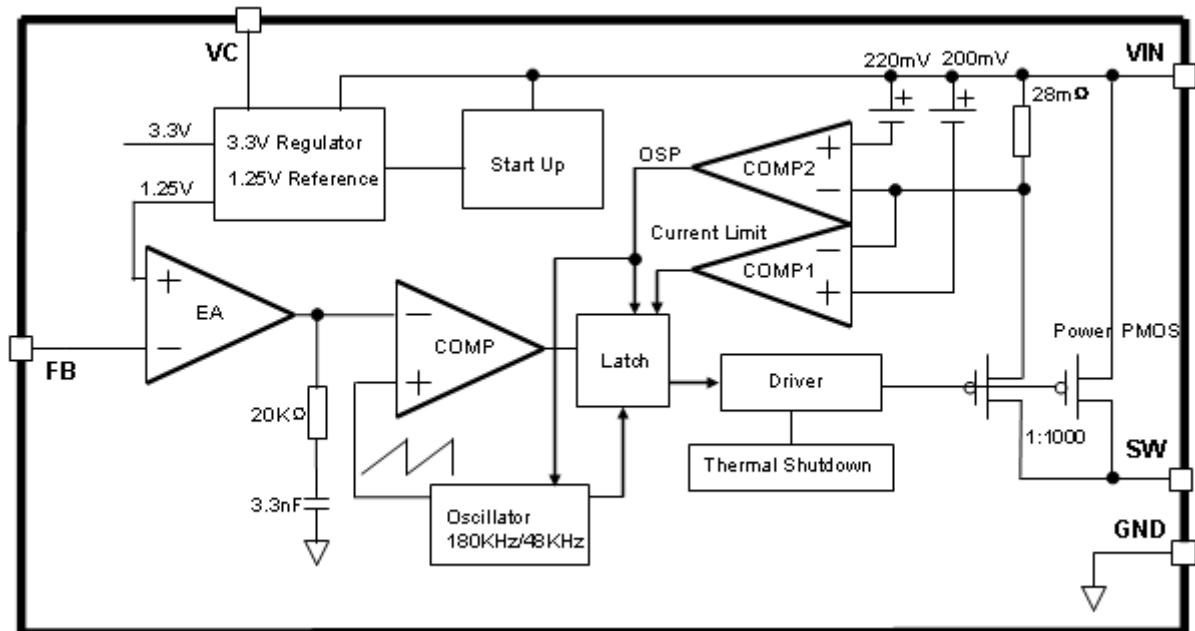


Figure3. Function Block Diagram of

## HS4015E1 Typical Application Circuit

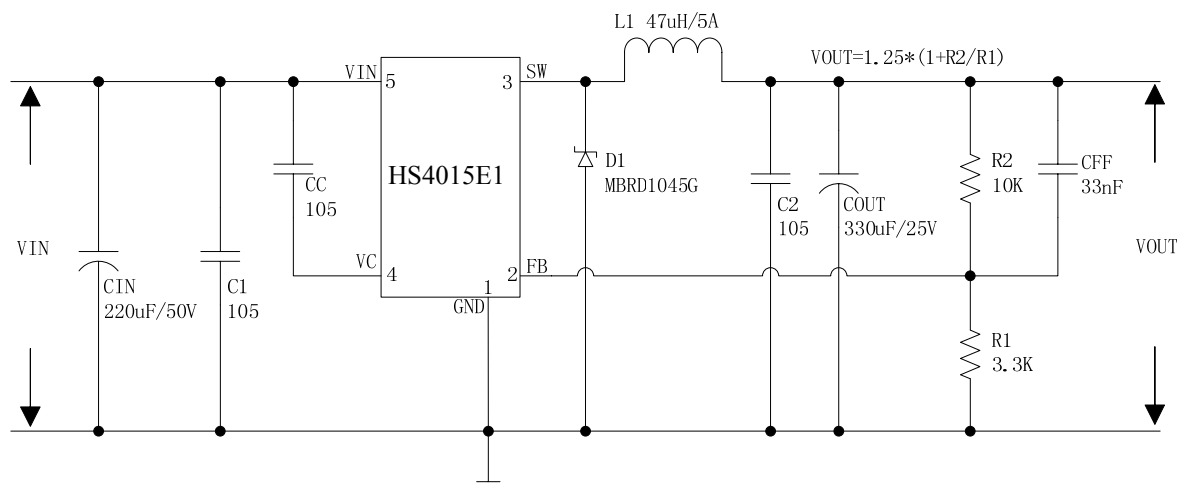


Figure4. HS4015E1 Typical Application Circuit (VIN=8V~36V, VOUT=5V/5A)

**Ordering Information**

| Order Information | Marking ID | Package Type | Packing Type Supplied As |
|-------------------|------------|--------------|--------------------------|
| HS4015E1          | HS4015E1   | TO263-5L     | 800 Units on Tape & Reel |

XLSEMI Pb-free products, as designated with “E1” suffix in the par number, are RoHS compliant.

**Absolute Maximum Ratings (Note1)**

| Parameter                                                                     | Symbol       | Value              | Unit |
|-------------------------------------------------------------------------------|--------------|--------------------|------|
| Input Voltage                                                                 | $V_{in}$     | -0.3 to 40         | V    |
| Feedback Pin Voltage                                                          | $V_{FB}$     | -0.3 to $V_{in}$   | V    |
| Output Switch Pin Voltage                                                     | $V_{Output}$ | -0.3 to $V_{in}$   | V    |
| Power Dissipation                                                             | $P_D$        | Internally limited | mW   |
| Thermal Resistance (TO263-5L)<br>(Junction to Ambient, No Heatsink, Free Air) | $R_{JA}$     | 30                 | °C/W |
| Operating Junction Temperature                                                | $T_J$        | -40 to 125         | °C   |
| Storage Temperature                                                           | $T_{STG}$    | -65 to 150         | °C   |
| Lead Temperature (Soldering, 10 sec)                                          | $T_{LEAD}$   | 260                | °C   |
| ESD (HBM)                                                                     |              | >2000              | V    |

**Note1:** Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

### HS4015 Electrical Characteristics

$T_a = 25^\circ\text{C}$ ; unless otherwise specified.

| Symbol                                        | Parameter        | Test Condition                                                                                 | Min.  | Typ. | Max.  | Unit |
|-----------------------------------------------|------------------|------------------------------------------------------------------------------------------------|-------|------|-------|------|
| <i>System parameters test circuit figure4</i> |                  |                                                                                                |       |      |       |      |
| VFB                                           | Feedback Voltage | $V_{in} = 8\text{V to } 40\text{V}, V_{out}=5\text{V}$<br>$I_{load}=0.5\text{A to } 5\text{A}$ | 1.225 | 1.25 | 1.275 | V    |
| Efficiency                                    | $\eta$           | $V_{in}=12\text{V}, V_{out}=5\text{V}$<br>$I_{out}=5\text{A}$                                  | -     | 87   | -     | %    |
| Efficiency                                    | $\eta$           | $V_{in}=24\text{V}, V_{out}=12\text{V}$<br>$I_{out}=4\text{A}$                                 | -     | 93   | -     | %    |

### Electrical Characteristics (DC Parameters)

$V_{in} = 12\text{V}$ ,  $GND=0\text{V}$ ,  $V_{in}$  &  $GND$  parallel connect a 220uf/50V capacitor;  $I_{out}=500\text{mA}$ ,  $T_a = 25^\circ\text{C}$ ; the others floating unless otherwise specified.

| Parameters               | Symbol     | Test Condition                                               | Min. | Typ. | Max. | Unit |
|--------------------------|------------|--------------------------------------------------------------|------|------|------|------|
| Input operation voltage  | $V_{in}$   |                                                              | 8    |      | 36   | V    |
| Quiescent Supply Current | $I_q$      | $V_{FB} = V_{in}$                                            |      | 2.1  | 5    | mA   |
| Oscillator Frequency     | $F_{osc}$  |                                                              | 144  | 180  | 216  | KHz  |
| Output Short Frequency   | $F_{osp}$  |                                                              |      | 48   |      | KHz  |
| Switch Current Limit     | $I_L$      | $V_{FB} = 0$                                                 |      | 7    |      | A    |
| Max. Duty Cycle          | $D_{MAX}$  | $V_{FB}=0\text{V}$                                           |      | 100  |      | %    |
| Output Power PMOS        | $R_{dson}$ | $V_{FB}=0\text{V}, V_{in}=12\text{V},$<br>$I_{SW}=5\text{A}$ |      | 60   | 80   | mohm |

Efficiency VS Output current

Y-axis: Efficiency(%)

X-axis: Load current(A)

Legend:

- VIN=8V, VOUT=5V, IOUT=0.1A~5A
- VIN=12V, VOUT=5V, IOUT=0.1A~5A
- VIN=24V, VOUT=5V, IOUT=0.1A~5A
- VIN=36V, VOUT=5V, IOUT=0.1A~5A

| Load current (A) | VIN=8V (%) | VIN=12V (%) | VIN=24V (%) | VIN=36V (%) |
|------------------|------------|-------------|-------------|-------------|
| 0.1              | 87         | 81          | 72          | 63          |
| 0.5              | 94         | 91          | 87          | 82          |
| 1.0              | 94         | 91.5        | 88.5        | 85.5        |
| 2.0              | 92         | 90          | 88.5        | 85.5        |
| 3.0              | 90         | 88.5        | 87          | 86          |
| 4.0              | 88.5       | 87.5        | 86.5        | 85          |
| 5.0              | 87         | 86.5        | 86.5        | 82.5        |

page 6 of 9

### Typical System Application (VOUT=12V/4A)

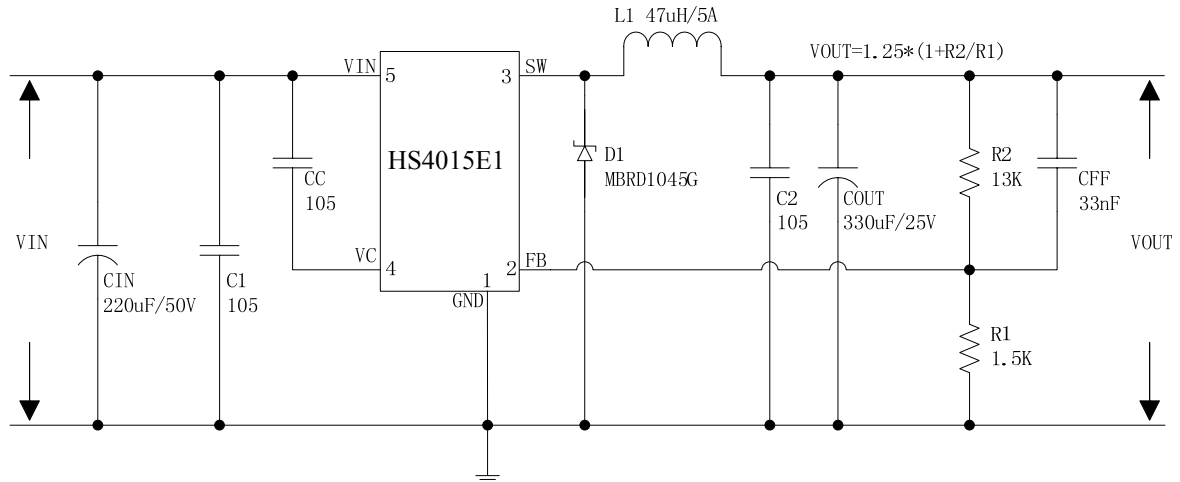


Figure7. HS4015E1 System Parameters Test Circuit (VIN=15V~36V, VOUT=12V/4A)

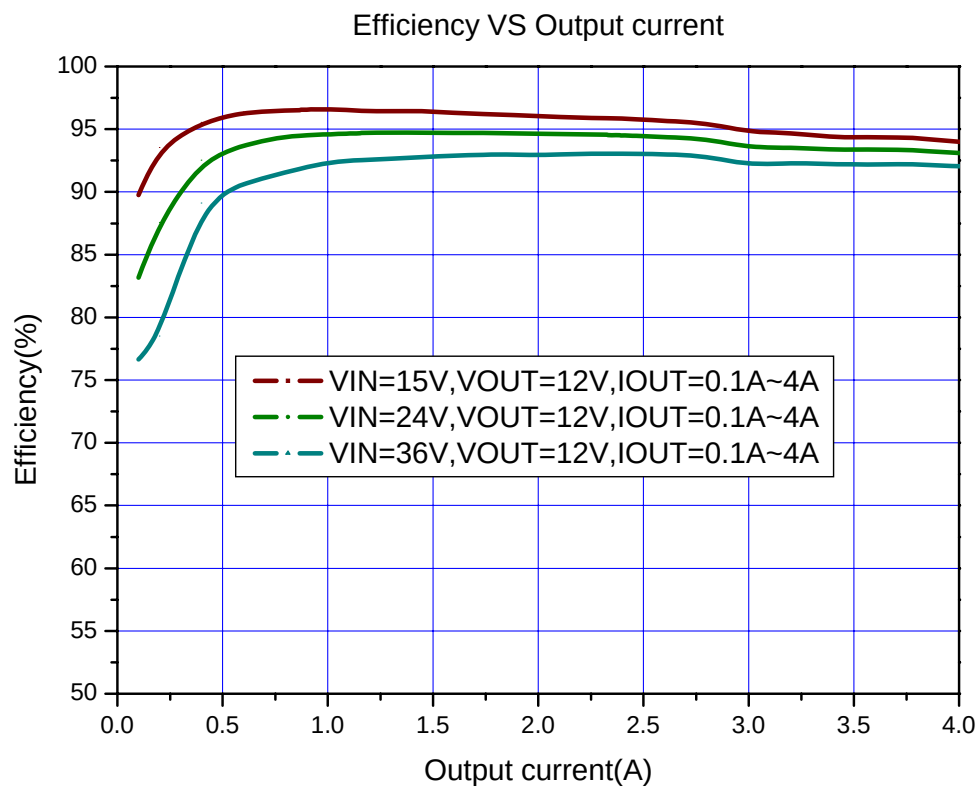


Figure8. HS4015E1 System Efficiency Curve

### Typical System Application (TTL shutdown function)

Logic level signals shutdown function can be used in typical system application with external components. When the TTL high voltage above 3.3V(referenced to ground, lower than VIN), the converter will shutdown, input current less than 5mA; when the TTL Low voltage below 0.8V(referenced to ground), the converter will turn on.

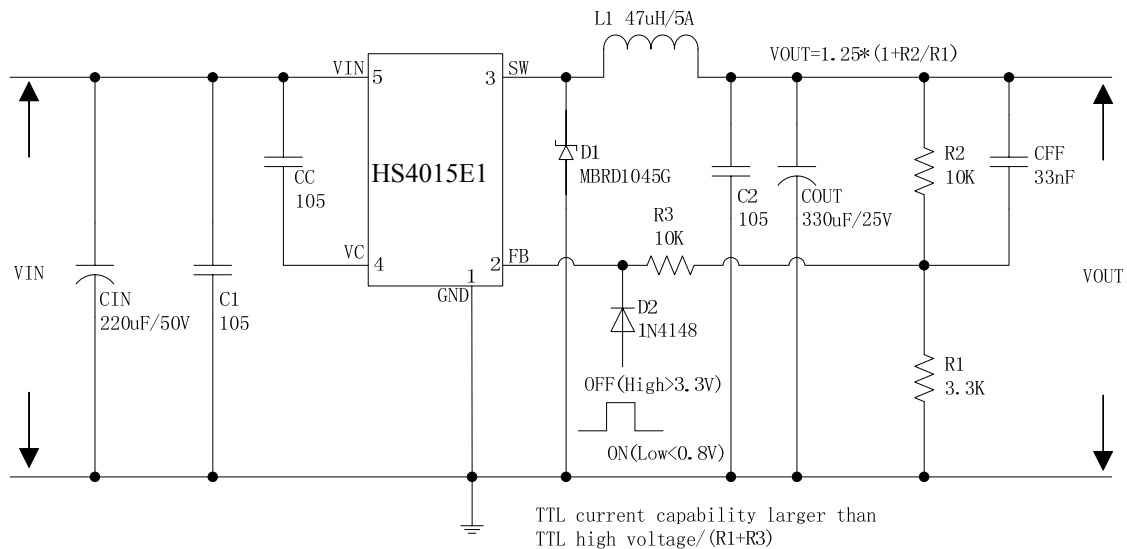
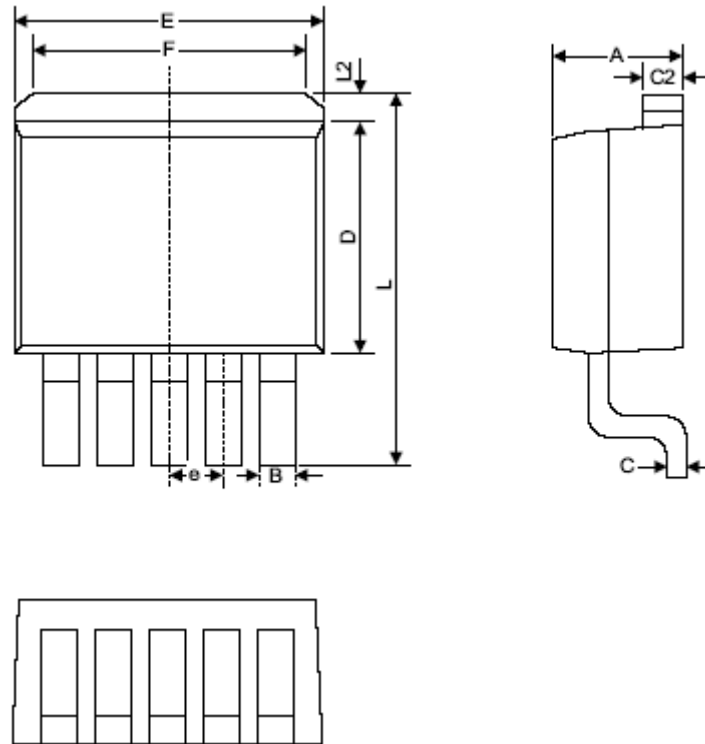


Figure9. HS4015E1 Typical Application Circuit



## Package Information

### TO263-5L



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 4.06                      | 4.83  | 0.160                | 0.190 |
| B      | 0.71                      | 1.02  | 0.030                | 0.040 |
| C      | 0.36                      | 0.64  | 0.014                | 0.025 |
| C2     | 1.14                      | 1.40  | 0.045                | 0.055 |
| D      | 8.39                      | 9.65  | 0.330                | 0.380 |
| E      | 9.78                      | 10.54 | 0.385                | 0.415 |
| e      | 1.55                      | 1.85  | 0.061                | 0.073 |
| F      | 6.36                      | 7.36  | 0.250                | 0.290 |
| L      | 13.95                     | 15.37 | 0.549                | 0.605 |
| L2     | 1.12                      | 1.42  | 0.044                | 0.056 |