

### POWER MANAGEMENT

#### Description

SC4625 is a BiCMOS integrated FET, synchronous, 0.5A step-down regulator. It operates at the typical switching frequency of 1.7MHz and enables the user to choose a very small and inexpensive external output inductor and capacitor.

Fully internally compensated current-mode control loop provides a fast transient response and ensures excellent line and load regulation. The SC4625 operates from 2.5V to 5.5V, features internal P-MOS and N-MOS power switches and is implemented as a current-mode pulse-width-modulated (PWM) control scheme.

Multiple modes of operation are available to achieve high performance and efficiency and makes the SC4625 ideally suited for electronic devices where size is at premium. These modes are: PWM fixed frequency, synchronous and asynchronous load dependent, pulse-skipping at very light load, and low-dropout 100% duty cycle mode, by continuously turning on the upper P-MOSFET.

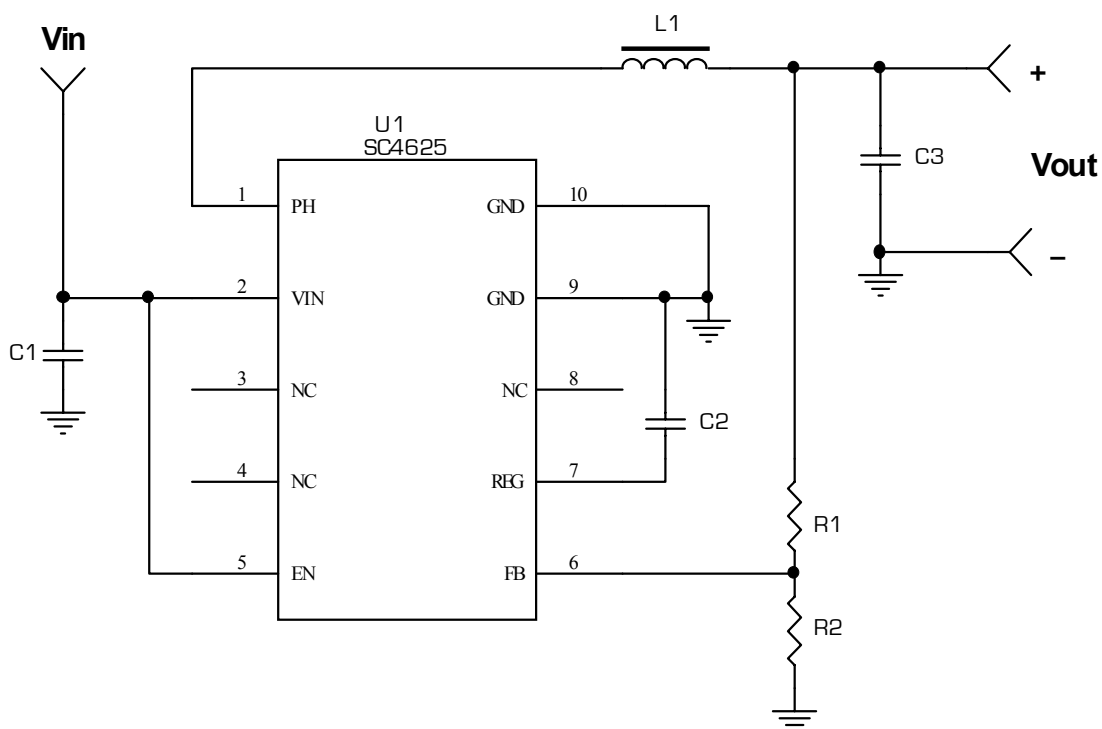
#### Features

- ◆ Fully integrated MOSFET switches and compensation
- ◆ 1.7MHz fixed frequency operation
- ◆ Input voltage range: 2.5V to 5.5V
- ◆ Adjustable output voltage from 0.5V to  $V_{IN}$
- ◆ Pulse-skipping mode operation at light load
- ◆ 100% duty cycle in low-dropout mode
- ◆ Over-temperature shutdown
- ◆ MLP-10 lead free package. This product is fully WEEE and RoHS compliant
- ◆ -40°C to +125°C junction temperature range

#### Applications

- ◆ WLAN and Bluetooth® applications
- ◆ Distributed Power Systems
- ◆ Micro DC-DC converters
- ◆ USB-based DSL modems
- ◆ Point-of-Load Regulation
- ◆ FPGA Core and I/O Supplies
- ◆ Set-top Boxes
- ◆ Battery-powered devices (1 Li-Ion or 3 NiMH/NiCd)

#### Typical Application Circuit



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**Absolute Maximum Ratings**

Exceeding the specifications below may result in permanent damage to the device, or device malfunction. Operation outside of the parameters specified in the Electrical Characteristics section is not implied.

| Parameter                              | Symbol        | Maximum                | Units |
|--|---------------|------------------------|-------|
| Supply Voltage                         | $V_{IN}$      | -0.3 to 6              | V     |
| Output Switch Voltage                  | $V_{PH}$      | -0.3 to 6              | V     |
| Voltage at EN and FB                   |               | -0.3 to $V_{IN} + 0.3$ | V     |
| Continuous Output Current              |               | 1                      | A     |
| Power Dissipation                      | PD            | Internally limited     | A     |
| Thermal Resistance Junction to Ambient | $\theta_{JA}$ | 60                     | °C/W  |
| Operating Junction Temperature Range   | $T_J$         | -40 to +125            | °C    |
| Storage Temperature Range              | $T_{STG}$     | -65 to +150            | °C    |
| IR Reflow Temperature (10 - 40s)       | TPKG          | +260                   | °C    |
| ESD Rating (Human Body Model)          |               | 2                      | kV    |

**Electrical Characteristics**

Unless otherwise specified:

$$V_{IN} = 3.3V, V_O = 1.25V, I_O = 300mA; -40^{\circ}C \leq T_J = T_A \leq +125^{\circ}C.$$

| Parameter                      | Test Conditions   | Min  | Typ | Max  | Units    |
|--------------------------------|---|------|-----|------|----------|
| Supply Voltage Range           |   | 2.5  |     | 5.5  | V        |
| Quiescent Current              | $EN = V_{IN}, V_{FB} = 0.6V$ (not switching)                              |      | 450 |      | $\mu A$  |
|                                | $EN = 0V$   |      | 0.1 |      | $\mu A$  |
| Regulated Feedback Voltage     |   | 487  | 500 | 513  | mV       |
| Output Voltage Line Regulation | $V_{IN} = 3.0V$ to $3.6V, I_{LOAD} = 300mA,$<br>$T_J = T_A = 25^{\circ}C$ |      | 0.2 | 0.5  | %        |
| Output Voltage Load Regulation | $10mA < I_{LOAD} < 500mA, T_J = T_A = 25^{\circ}C$                        |      |     | 0.6  | %        |
| Maximum Duty Cycle             | $V_{FB} = 0.4V$   | 100  |     |      | %        |
| Current Limit                  | $V_{FB} = 0.4V$   | 0.6  | 0.8 | 1.0  | A        |
| Switch ON-Resistance           | $I_{PH} = 300mA, V_{FB} = 0.4V$   |      | 0.6 |      | $\Omega$ |
|                                | $I_{PH} = -300mA, V_{FB} = 0.6V$  |      | 0.6 |      | $\Omega$ |
| Oscillator Frequency           | $T_J = T_A = 25^{\circ}C$   | 1.55 | 1.7 | 1.85 | MHz      |

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**Electrical Characteristics**

Unless otherwise specified:

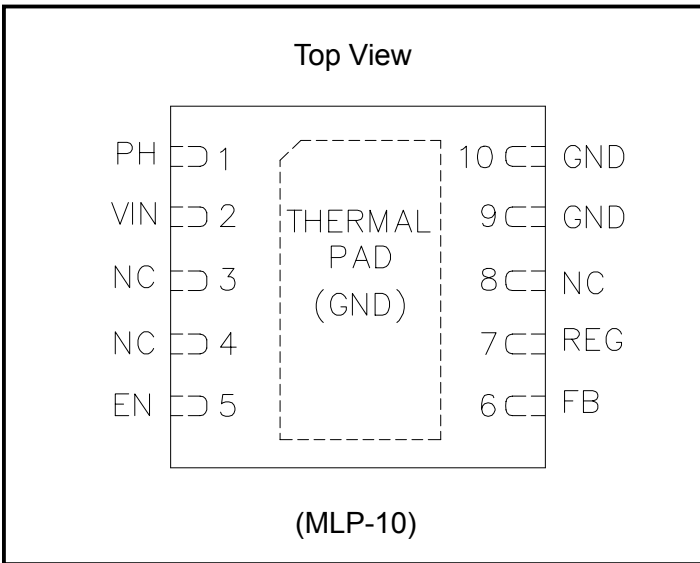
$V_{IN} = 3.3V$ ,  $V_o = 1.25V$ ,  $I_o = 300mA$ ;  $-40^{\circ}C \leq T_j = T_A \leq +125^{\circ}C$ .

| Parameter                            | Test Conditions | Min | Typ | Max | Units       |
|--------------------------------------|-----------------|-----|-----|-----|-------------|
| Enable Input Current                 |                 |     | 0.1 |     | $\mu A$     |
| Enable Threshold, High               |                 | 1.6 |     |     | V           |
| Enable Threshold, Low                |                 |     |     | 0.4 | V           |
| Over-Temperature Shutdown            |                 |     | 160 |     | $^{\circ}C$ |
| Over-Temperature Shutdown Hysteresis |                 |     | 15  |     | $^{\circ}C$ |

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**Pin Configuration**



**Ordering Information**

| Part Number                | Package <sup>(1)</sup> | Temp. Range (T <sub>j</sub> ) |
|----------------------------|------------------------|-------------------------------|
| SC4625MLTRT <sup>(2)</sup> | MLP-10                 | -40°C to +125°C               |

**Notes:**

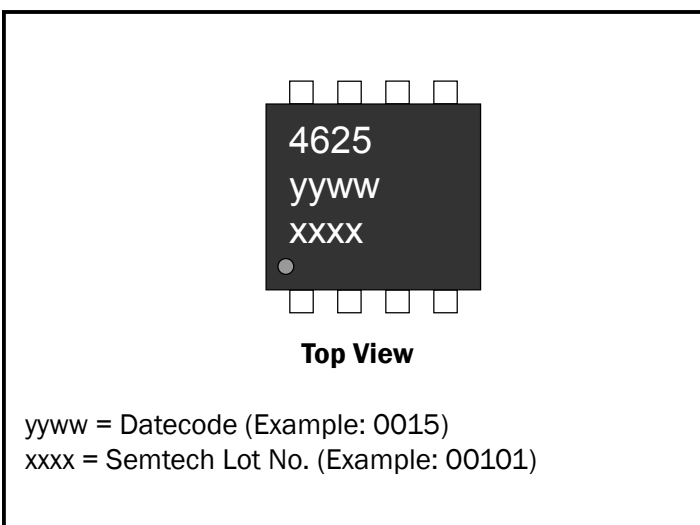
(1) Only available in tape and reel packaging. A reel contains 2500 devices.

(2) Lead free product. This product is fully WEEE and RoHS compliant.

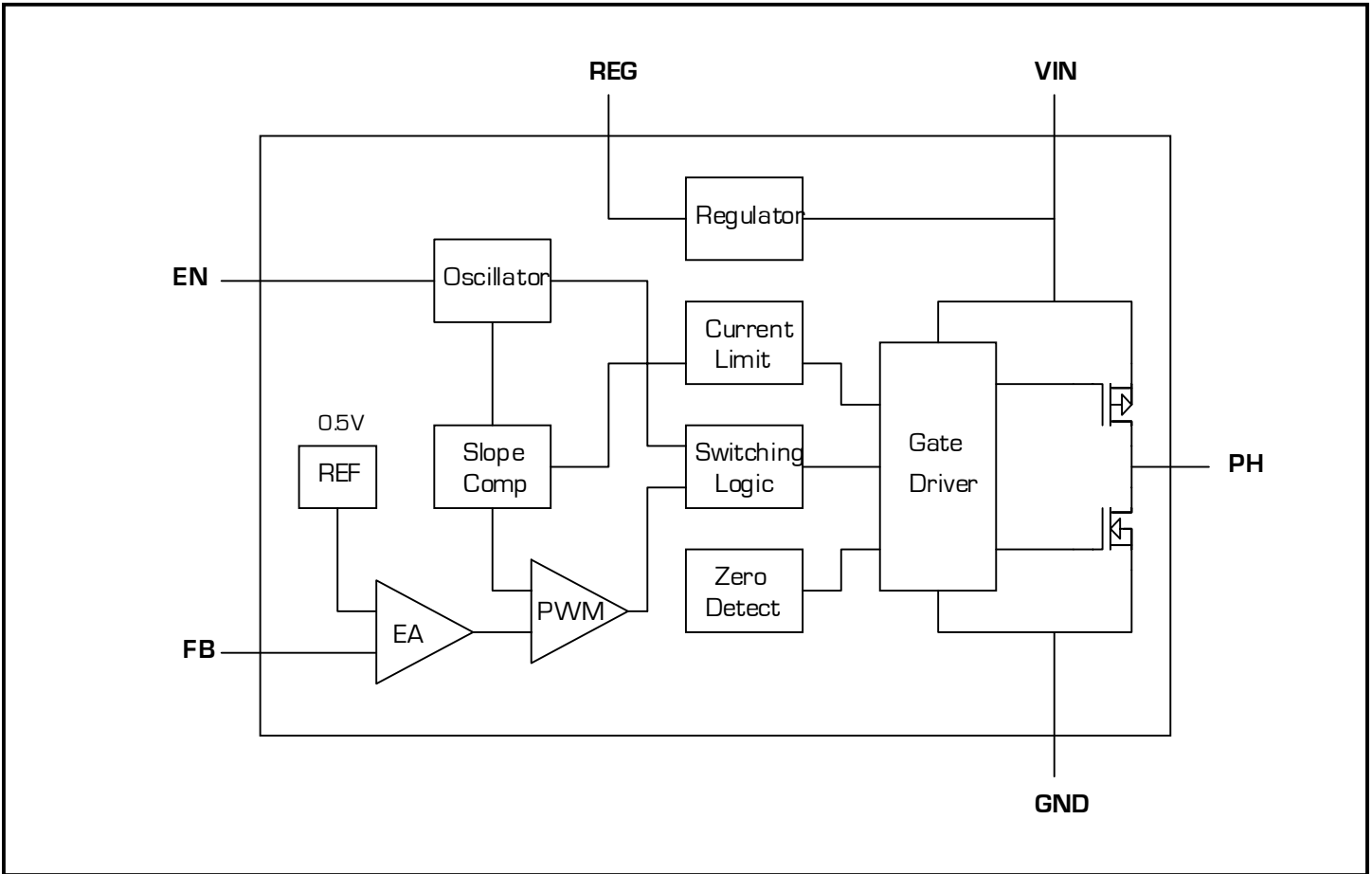
**Pin Descriptions**

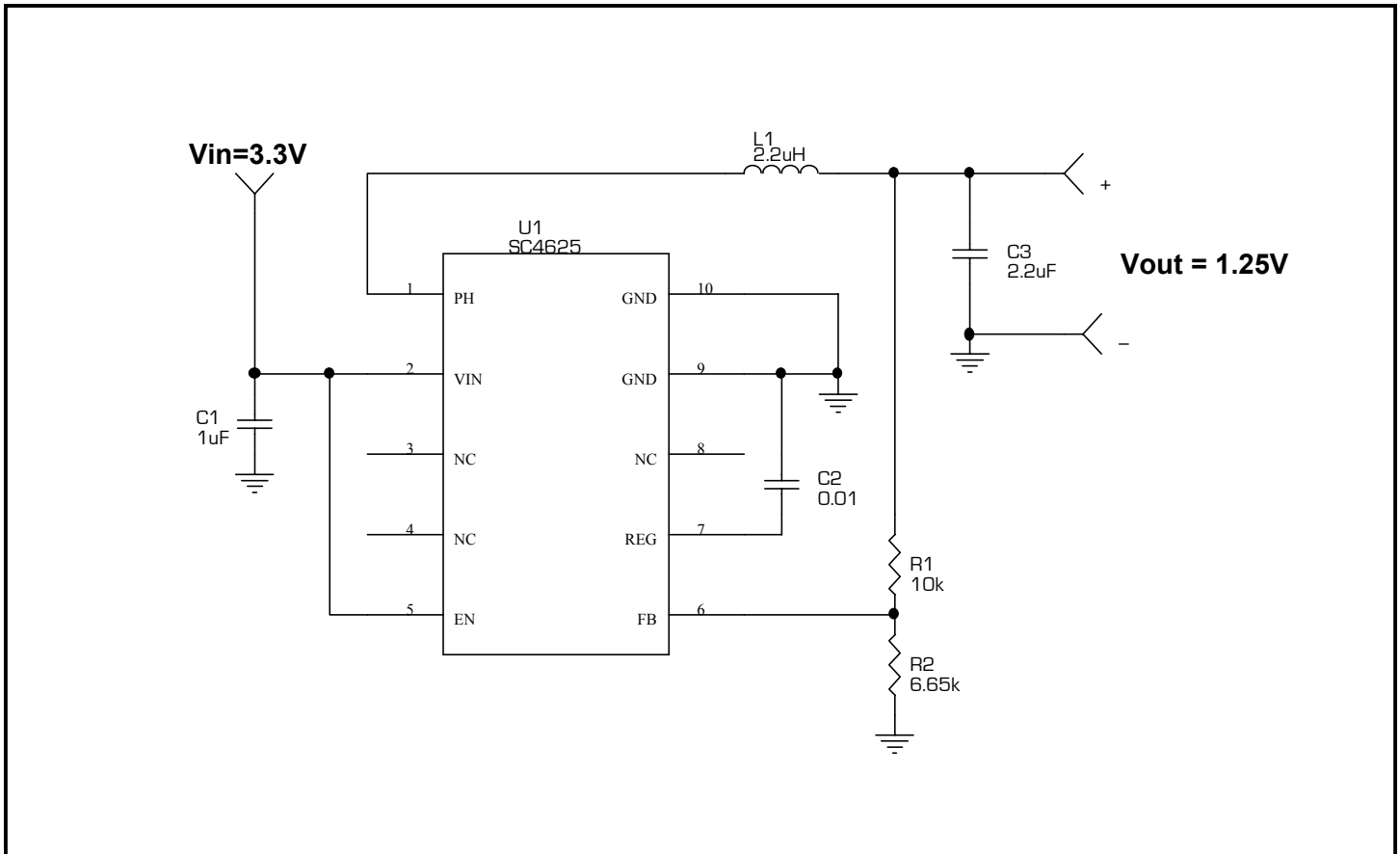
| Pin #       | Pin Name | Pin Function  |
|-------------|----------|---|
| 1           | PH       | Phase Node. Internal power MOSFETs output.  |
| 2           | VIN      | Supply voltage. Requires bypass capacitor to GND.   |
| 3, 4, 8     | NC       | Not connected.  |
| 5           | EN       | A low level EN will power down the device.  |
| 6           | FB       | Input to the error amplifier, connect to the external resistor divider network to set the output voltage. |
| 7           | REG      | Internal regulator. Must be bypassed to GND with a 0.01µF capacitor.                                      |
| 9, 10       | GND      | Ground. Both pins to be tied together.  |
| THERMAL PAD | GND      | Pad for heatsinking purposes. Connect to ground plane using multiple vias.                                |

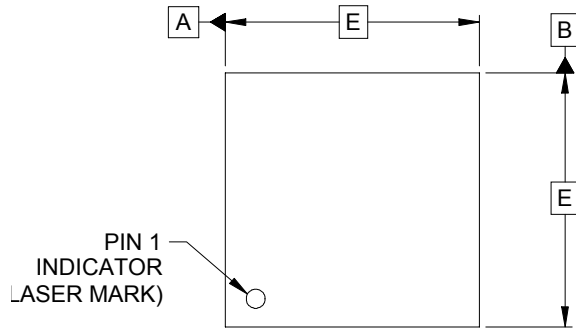
**Marking Information**



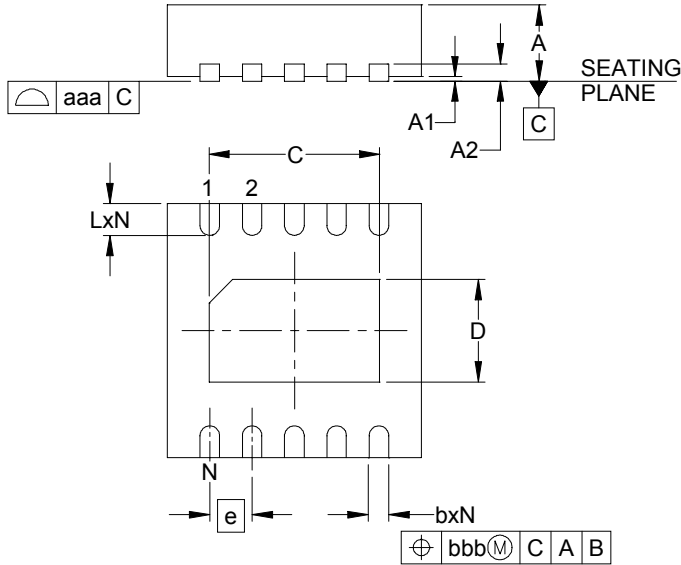
**Block Diagram**







| DIM | DIMENSIONS |        |      |             |        |      |
|-----|------------|--------|------|-------------|--------|------|
|     | INCHES     |        |      | MILLIMETERS |        |      |
|     | MIN        | NOM    | MAX  | MIN         | NOM    | MAX  |
| A   | .031       | -      | .039 | 0.80        | -      | 1.00 |
| A1  | .000       | -      | .002 | 0.00        | -      | 0.05 |
| A2  | -          | (.008) | -    | -           | (0.20) | -    |
| b   | .007       | .009   | .011 | 0.18        | 0.23   | 0.30 |
| C   | .074       | .079   | .083 | 1.87        | 2.02   | 2.12 |
| D   | .042       | .048   | .052 | 1.06        | 1.21   | 1.31 |
| E   | .114       | .118   | .122 | 2.90        | 3.00   | 3.10 |
| e   | .020 BSC   |        |      | 0.50 BSC    |        |      |
| L   | .012       | .016   | .020 | 0.30        | 0.40   | 0.50 |
| N   | 10         |        |      | 10          |        |      |
| aaa | .003       |        |      | 0.08        |        |      |
| bbb | .004       |        |      | 0.10        |        |      |



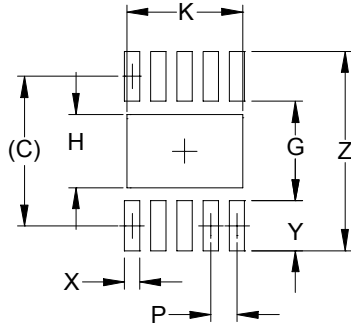
NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS TERMINALS.

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**Land Pattern - MLP-10**



| DIMENSIONS |        |             |
|------------|--------|-------------|
| DIM        | INCHES | MILLIMETERS |
| C          | (.112) | (2.85)      |
| G          | .075   | 1.90        |
| H          | .055   | 1.40        |
| K          | .087   | 2.20        |
| P          | .020   | 0.50        |
| X          | .012   | 0.30        |
| Y          | .037   | 0.95        |
| Z          | .150   | 3.80        |

NOTES:

1. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

**Contact Information**

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