# SY7215A

## High Efficiency, 15A Synchronous Step Up Regulator with Accurate Output Current Limit

## General Description

SY7215A develops a high efficiency synchronous Boost regulator with programmable output current limit. The IC adopts adaptive constant OFF time and current mode control. The integrated low $R_{DS(ON)}$ switches minimize the conduction loss.

SY7215A features cycle by cycle peak current limit, output short circuit protection and true shutdown. The IC also provides enable control and power good indicator for system sequence control. Low output voltage ripple and small external inductor and capacitor size are achieved with programmable pseudo-constant frequency.

## Ordering Information

SY7215 □(□□)□
           └── Temperature Code
        └── Package Code
      └── Optional Spec Code
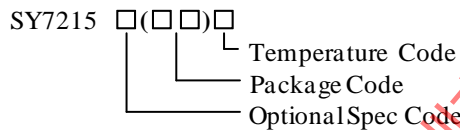
| Ordering Number | Package type | Note |
|---|---|---|
| SY7215ARDC | QFN4×4-18 | ---- |

## Features

- Input Range: 3-16V
- Programmable Pseudo-constant Frequency
- Low $R_{DS(ON)}$ Internal Switch
  Main FET: 9mΩ
  Rectified FET: 12mΩ
  Disconnection FET: 12mΩ
- True Shutdown Function
- Programmable Output Current Limit
- Internal Soft-start Limits the Inrush Current
- Input Voltage UVLO
- Over Temperature Protection
- Over Voltage Protection
- Output Short Circuit Protection
- Minimum ON Time: 100ns typical
- Minimum OFF Time: 120ns typical
- RoHS Compliant and Halogen Free
- Compact Package:QFN4×4-18

## Applications
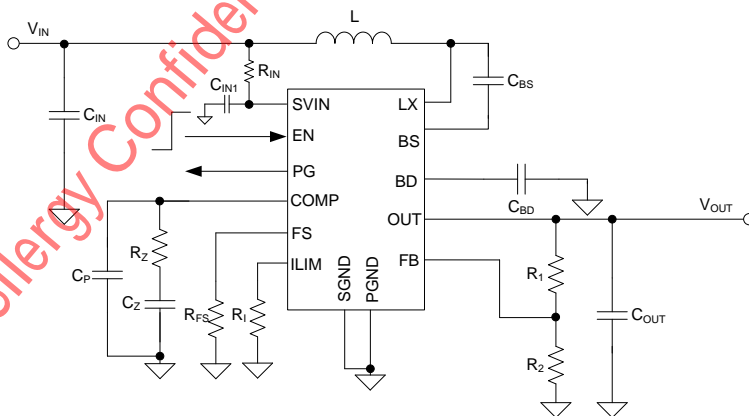
- Power Bank
- High Power AP
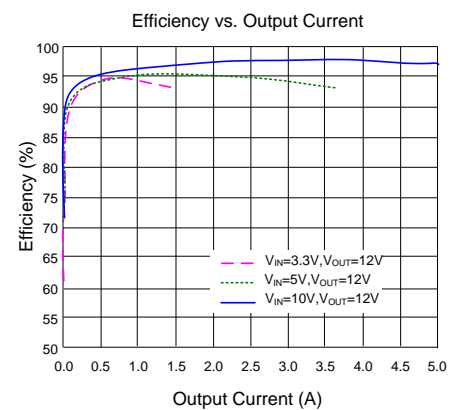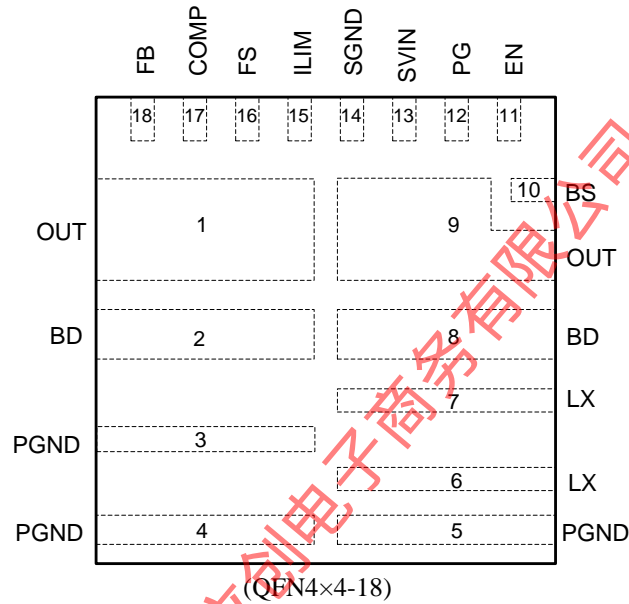
## Typical Applications



**Figure1. Schematic Diagram**



**Figure2. Efficiency vs. Output Current**

## Pinout (top view)



(QFN4×4-18)

Top mark: **BET***xyz* (Device code: BET, *x=year code, y=week code, z= lot number code*)

| Pin Name | QFN4x4-18 | Pin Description |
|---|---|---|
| SVIN | 13 | IC power supply input pin. Decouple this pin to SGND pin with 1μF ceramic cap. |
| SGND | 14 | Signal ground pin. |
| PGND | 3,4,5 | Power ground pin. |
| LX | 6,7 | Inductor node. Connect an inductor from power input to LX pin. |
| FB | 18 | Feedback pin. Connected to the center of resistor voltage divider to program the output voltage: $V_{OUT}=1V\times(R1/R2+1)$ |
| EN | 11 | Enable control. Pull high to turn on the IC. Do not leave it floating. |
| ILIM | 15 | Output current limit program pin. Connect a resistor $R_{LIM}$ from this pin to SGND to program output current limitation threshold. $I_{LIM}(A)=15(V)/ R_{LIM}(k\Omega)$ |
| OUT | 1,9 | Boost converter output pin. |
| BD | 2,8 | Connected to the Drain of internal Disconnect FET. Bypass at least 4.7μF ceramic cap to PGND. |
| BS | 10 | Boot-strap pin. Supply rectified FET's gate driver. Decouple this pin to LX with 0.1μF ceramic cap. |
| FS | 16 | Switching frequency setting pin. Connect a resistor from this pin to ground to program the switching frequency. $F_{SW}(kHz)=1.4\times10^6/R_{FS}(\Omega)^{0.645}$. |
| PG | 12 | Power good indicator. Open drain output, pull low when the output < 90% of regulation voltage, high impendence otherwise. |
| COMP | 17 | Loop compensation pin. Connect a RC network across this pin and ground to stabilize the control loop. |

# Block Diagram
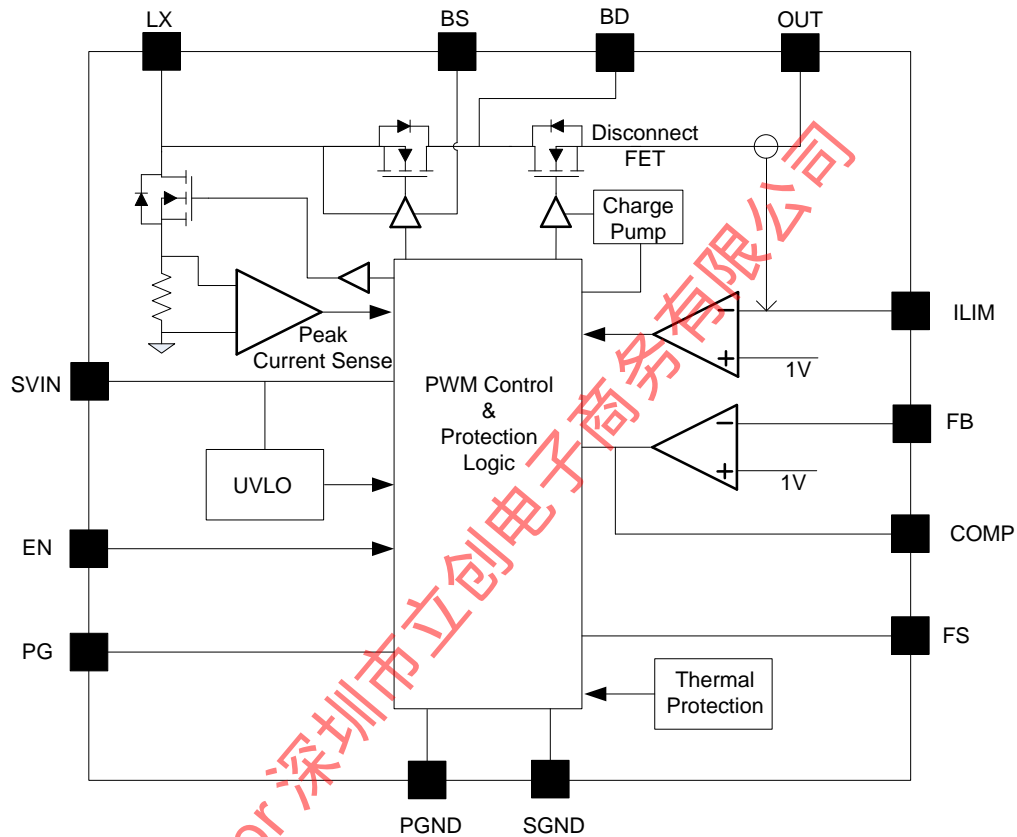


**Figure3. Block Diagram**

## Absolute Maximum Ratings (Note 1)

SVIN, LX, EN, ILIM, OUT, BD, BS, FS, PG, COMP------------------------------------------------------ -0.3V to 18V
FB---------------------------------------------------------------------------------------------------------- 4V
BS-LX ----------------------------------------------------------------------------------------------- 4V
Power Dissipation, $P_D$ @ $T_A$ = 25°C QFN4×4-18-------------------------------------------------------------3.4W
Package Thermal Resistance (Note 2)
   $\theta_{JA}$ ----------------------------------------------------------------------------------------- 30°C/W
   $\theta_{JC}$ ----------------------------------------------------------------------------------------------3.2°C/W
Junction Temperature Range ------------------------------------------------------------------------ -40°C to 125°C
Lead Temperature (Soldering, 10 sec.) ------------------------------------------------------------------ 260°C
Storage Temperature Range ------------------------------------------------------------------ -65°C to 150°C

## Recommended Operating Conditions (Note 3)

SVIN ------------------------------------------------------------------------------------------------------ 3V to 16V
Junction Temperature Range ----------------------------------------------------------------------- - 40°C to 125°C
Ambient Temperature Range ----------------------------------------------------------------------- -40°C to 85°C

## Electrical Characteristics

($V_{IN}$ =5V, $V_{OUT}$=12V, $I_{OUT}$=100mA, $T_A$ = 25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input Voltage Range | $V_{IN}$ | | 3 | | 16 | V |
| Output Voltage Range | $V_{OUT}$ | | $V_{IN}$×1.1 | | 16 | V |
| Output OVP Threshold | $V_{FB\_OVP}$ | $V_{FB}$ Rising | 110% | 115% | 120% | $V_{REF}$ |
| Quiescent Current | $I_Q$ | $V_{OUT}$=13V | | | 230 | µA |
| Shutdown Current | $I_{SHDN}$ | EN=0 | | | 5 | µA |
| FB Leakage Current | $I_{FB}$ | | -50 | | 50 | nA |
| Main N-FET RON | $R_{DS(ON)\_M}$ | | | 9 | | mΩ |
| Rectified N-FET RON | $R_{DS(ON)\_R}$ | | | 12 | | mΩ |
| Disconnect N-FET RON | $R_{DS(ON)\_D}$ | | | 12 | | mΩ |
| Main N-FET Current Limit | $I_{LIM,PEAK}$ | | 15 | | 20 | A |
| Switching Frequency | $F_{SW}$ | $R_{FS}$=390kΩ | | 345 | | kHz |
| Switching Frequency Programmable Range | | | 250 | | 1000 | kHz |
| Feedback Reference Voltage | $V_{REF}$ | | 0.985 | 1 | 1.015 | V |
| IN UVLO Rising Threshold | $V_{IN,UVLO}$ | | | | 2.85 | V |
| UVLO Hysteresis | $V_{HYS,UVLO}$ | | | 0.2 | | V |
| EN Rising Threshold | $V_{ENH}$ | | 1.5 | | | V |
| EN Falling Threshold | $V_{ENL}$ | | | | 0.4 | V |
| Output Current Limit | $I_{LIM}$ | $R_{LIM}$=15kΩ | | 1 | | A |
| Output Current Limit Programmable Range | $I_{LIM,OUT}$ | $V_{OUT}$<=5V | 1 | | 5 | A |
| | | $V_{OUT}$>5V | 1 | | 4 | A |
| Minimum ON Time | $t_{ON,MIN}$ | | | 100 | | ns |
| Minimum OFF Time | $t_{OFF,MIN}$ | | | 120 | | ns |
| Error Amplifier Trans-conductance | $g_m$ | | | 100 | | µS |
| Current Sense Gain | $R_i$ | | | 75 | | mΩ |
| Thermal Shutdown Temperature | $T_{SD}$ | | | 150 | | °C |
| Thermal Shutdown Hysteresis | $T_{HYS}$ | | | 20 | | °C |

**Note 1**: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions may affect device reliability.

**Note 2:** $\theta_{JA}$ is measured in the natural convection at $T_A$ = 25°C on a two-layer Silergy Evaluation Board.

**Note 3:** The device is not guaranteed to function outside its operating conditions.
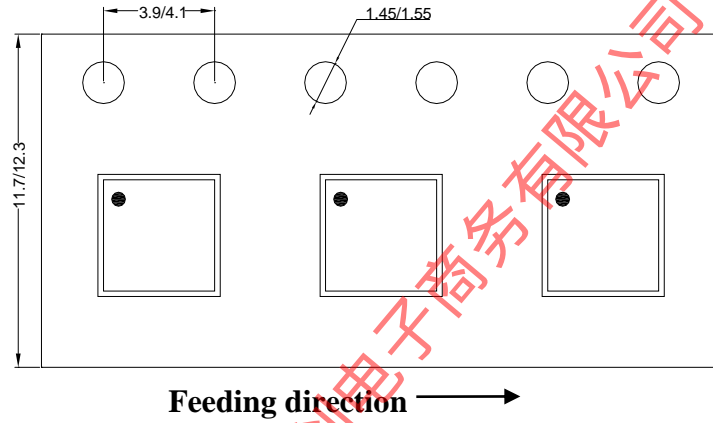
## QFN4×4-18 Package Outline & PCB layout design



**Top View**



**Side View**



**Bottom View**
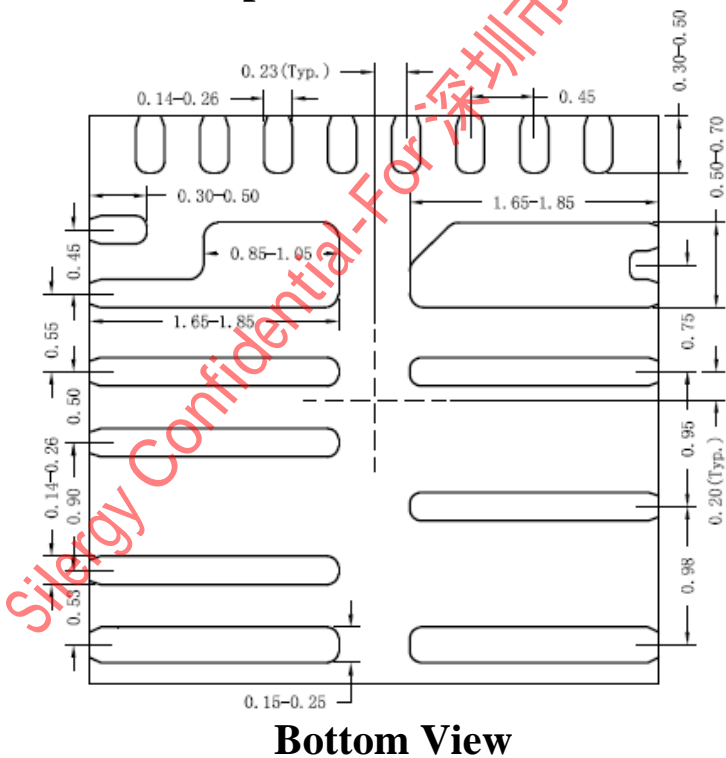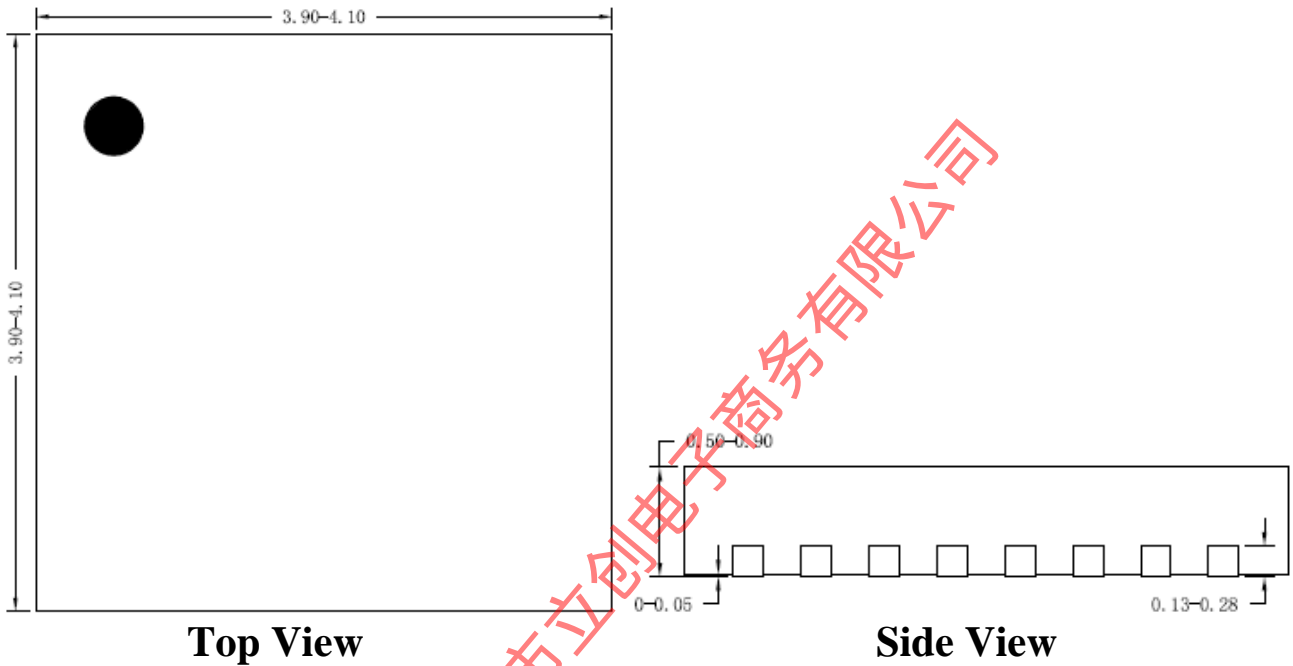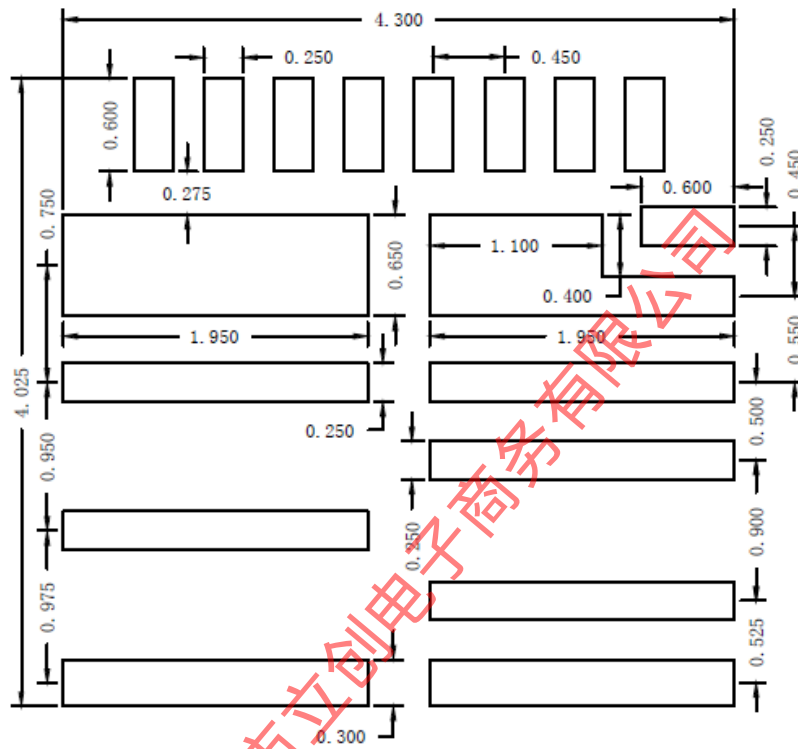
**Recommended PCB layout (Reference only)**

**Notes:** **All dimension in millimeter and exclude mold flash & metal burr**

# Taping & Reel Specification
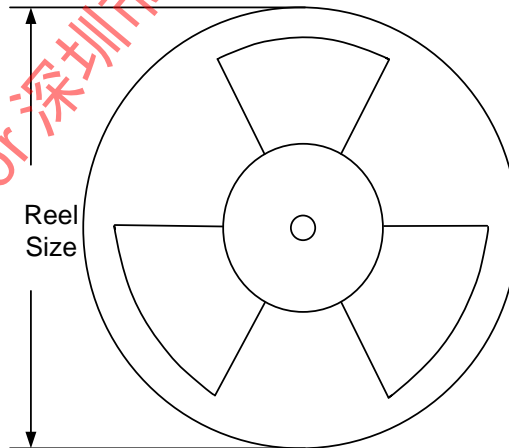
## 1. Taping orientation

**QFN4×4**



**Feeding direction** →

## 2. Carrier Tape & Reel specification for packages



Reel Size

| Package types | Tape width (mm) | Pocket pitch(mm) | Reel size (Inch) | Trailer length(mm) | Leader length (mm) | Qty per reel |
|---|---|---|---|---|---|---|
| QFN4×4 | 12 | 8 | 13" | 400 | 400 | 5000 |

## 3. Others: NA

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