

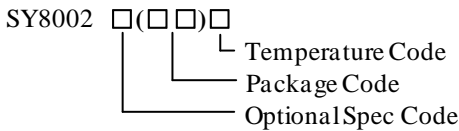
General Description

The SY8002I is a high efficiency 1.5MHz synchronous step down DC/DC regulator, which is capable of delivering up to 2A output current. It can operate over a wide input voltage range from 2.5V to 5.5V and integrate main switch and synchronous switch with very low $R_{DS(ON)}$ to minimize the conduction loss.

The SY8002I integrates reliable latch off function when output over voltage, output short or thermal shutdown happens.

The low output voltage ripple, the small external inductor and the capacitor sizes are achieved with 1.5MHz switching frequency.

Ordering Information



| Ordering Number | Package type | Note |
|-----------------|--------------|------|
| SY8002IABC | SOT23-6 | -- |

Features

- 2.5V to 5.5V Input Voltage Range
- 50 μ A Low Quiescent Current
- Low $R_{DS(ON)}$ for Internal Switches (Top/Bottom) 130m Ω /85m Ω
- High Switching Frequency 1.5MHz Minimizes the External Components
- Internal Soft-start Limits the Inrush Current
- 100% Dropout Operation
- Power Good Indicator
- Reliable Latch off Function When:
 - Output Short
 - Thermal Shutdown
 - Output Voltage >120% of Regulated Voltage
- Output Auto Discharge Function
- RoHS Compliant and Halogen Free
- Compact Package: SOT23-6

Applications

- Set Top Box
- USB Dongle
- Media Player
- Smart phone

Typical Applications

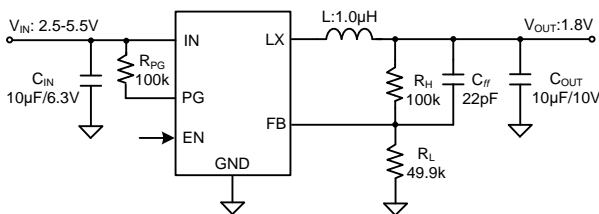


Figure1. Schematic Diagram

| V _{OUT} [V] | L [μ H] | C _{OUT} [μ F] | | | |
|----------------------|--------------|-----------------------------|----|----|---------------|
| | | 4.7 | 10 | 22 | 2 \times 22 |
| 1.2/ 1.8 /3.3 | 0.47 | | ✓ | ✓ | ✓ |
| | 1.0 | | ☆ | ✓ | ✓ |
| | 2.2 | | | ✓ | ✓ |

Note: '☆' means recommended for most applications.

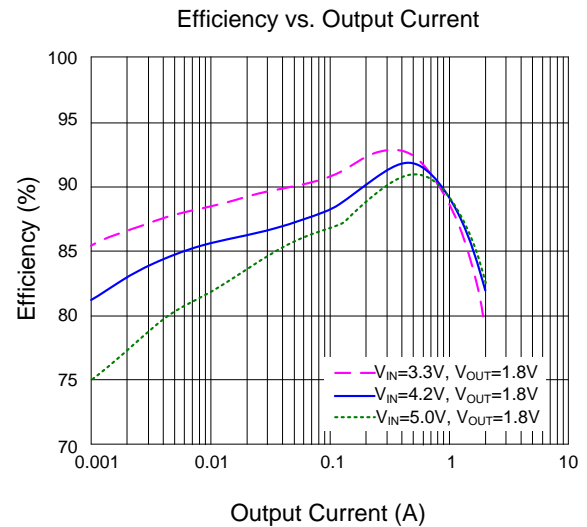
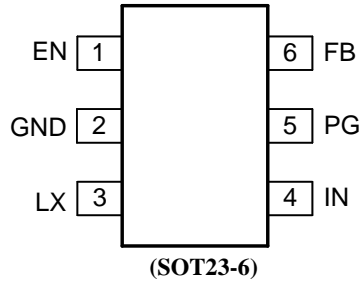


Figure2. Efficiency vs. Output Current

Pinout (Top View)



Top Mark: qTxyz (device code: qT, *x=year code*, *y=week code*, *z=lot number code*)

| Pin Name | Pin Number | Pin Description |
|----------|------------|---|
| EN | 1 | Enable control. Pull high to turn on. Do not leave it floating. |
| GND | 2 | Ground pin. |
| LX | 3 | Inductor pin. Connect this pin to the switching node of the inductor. |
| IN | 4 | Input pin. Decouple this pin to the GND pin with at least a 10μF ceramic capacitor. |
| PG | 5 | Power good indicator (Open drain output). Low if the output < 90% of regulation voltage or >120% regulation voltage; High otherwise. Connect a pull-up resistor to the input. |
| FB | 6 | Output feedback pin. Connect this pin to the center point of the output resistor divider (as shown in Figure 1) to program the output voltage: $V_{OUT}=0.6 \times (1+R_H/R_L)$. |

Block Diagram

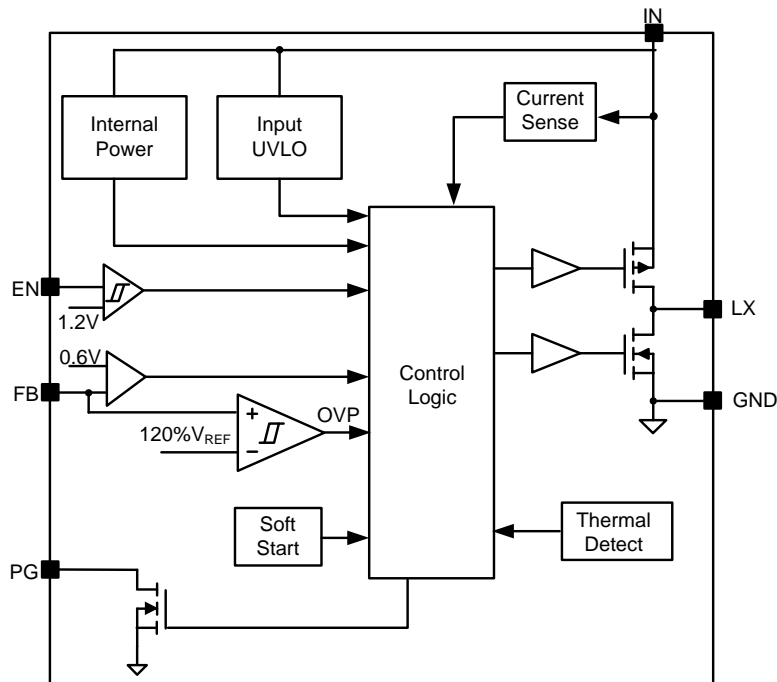


Figure3. Block Diagram



Absolute Maximum Ratings (Note 1)

| | |
|---|---|
| Supply Input Voltage | -0.3V to 6.0V |
| PG, FB, EN Voltage | -0.3V to $V_{IN}+0.6V$ |
| LX Voltage | -0.3V ^(*1) to 6.0V ^(*2) |
| Power Dissipation, P_D @ $T_A = 25^\circ C$ | 0.83W |
| Package Thermal Resistance (Note 2) | |
| θ_{JA} | 120°C/W |
| θ_{JC} | 20°C/W |
| Junction Temperature Range | -40°C to 150°C |
| Lead Temperature (Soldering, 10 sec.) | 260°C |
| Storage Temperature Range | -65°C to 150°C |

(*1) LX Voltage Tested Down to -3V<40ns
(*2) LX Voltage Tested Up to +7V<40ns

Recommended Operating Conditions (Note 3)

| | |
|----------------------------|----------------|
| Supply Input Voltage | 2.5V to 5.5V |
| Junction Temperature Range | -40°C to 125°C |
| Ambient Temperature Range | -40°C to 85°C |

Electrical Characteristics

($V_{IN} = 5V$, $V_{OUT} = 1.8V$, $L = 1.0\mu H$, $C_{OUT} = 10\mu F$, $T_A = 25^\circ C$, unless otherwise specified)

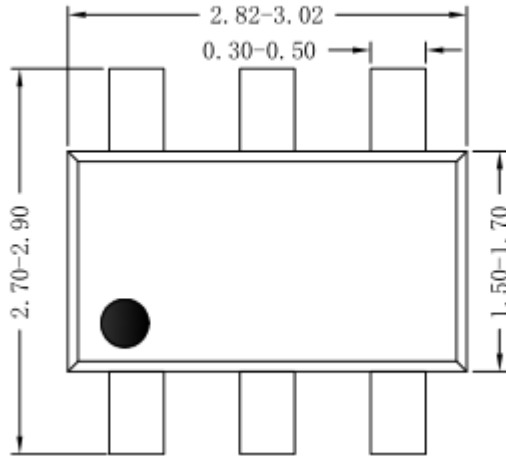
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|----------------|------------------------------------|-----|-----|-----|-------------|
| Input Voltage Range | V_{IN} | | 2.5 | | 5.5 | V |
| Input UVLO Threshold | V_{UVLO} | | | | 2.5 | V |
| Input UVLO Hysteresis | V_{HYS} | | | 150 | | mV |
| Quiescent Current | I_Q | $V_{FB} = V_{REF} \times 105\%$ | | 50 | 70 | μA |
| Shutdown Current | I_{SHDN} | $V_{EN} = 0V$ | | 0.1 | 1 | μA |
| Feedback Reference Voltage | V_{REF} | $I_{OUT} = 0.5A$, CCM | 591 | 600 | 609 | mV |
| LX Node Discharge Resistance | R_{DIS} | | | 50 | | Ω |
| Top FET R_{ON} | $R_{DS(ON)1}$ | | | 130 | | m Ω |
| Bottom FET R_{ON} | $R_{DS(ON)2}$ | | | 85 | | m Ω |
| EN Input Voltage High | $V_{EN,H}$ | | 1.2 | | | V |
| EN Input Voltage Low | $V_{EN,L}$ | | | | 0.4 | V |
| PG Threshold for Under Voltage Detection | $V_{PG,UVP}$ | | | 90 | | % V_{REF} |
| PG Low Delay Time for Under Voltage Detection | $t_{UVP,DLY}$ | | | 20 | | μs |
| PG Threshold for Over Voltage Detection | $V_{PG,OVP}$ | | | 120 | | % V_{REF} |
| PG Low Delay Time for Over Voltage Detection | $t_{OVP,DLY}$ | | | 20 | | μs |
| Min ON Time | $t_{ON,MIN}$ | | | 60 | | ns |
| Maximum Duty Cycle | D_{MAX} | | 100 | | | % |
| Turn On Delay | $t_{ON,DLY}$ | from EN high to LX start switching | | 0.5 | | ms |
| Soft-start Time | t_{SS} | V_{OUT} from 0% to 100% | | 1 | | ms |
| Switching Frequency | f_{SW} | $I_{OUT} = 0.5A$, CCM | | 1.5 | | MHz |
| Top FET Current Limit | $I_{LMT, TOP}$ | | 3.5 | | | A |
| Thermal Shutdown Temperature | T_{SD} | | | 160 | | $^\circ C$ |

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 for extended periods may affect device reliability.

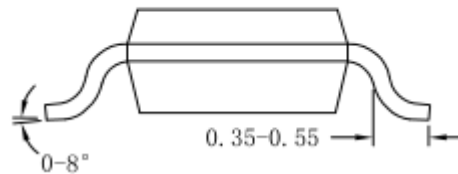
Note 2: θ_{JA} of SY8002I is measured in the natural convection at $T_A = 25^\circ C$ on a 2OZ two-layer Silergy evaluation board. Pin 3 is the case position for θ_{JC} measurement.

Note 3: The device is not guaranteed to function outside its operating conditions.

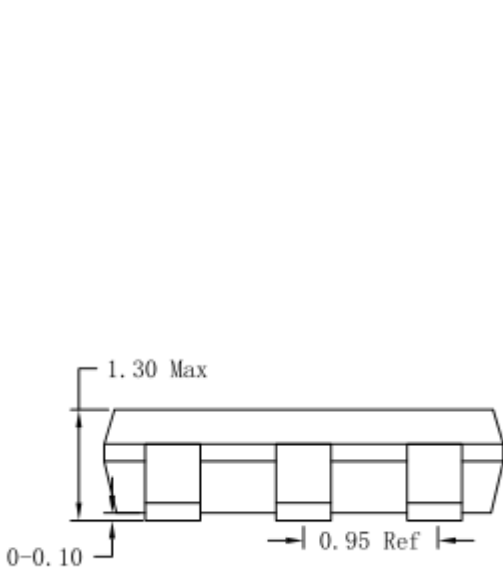
SOT23-6 Package Outline & PCB Layout Design



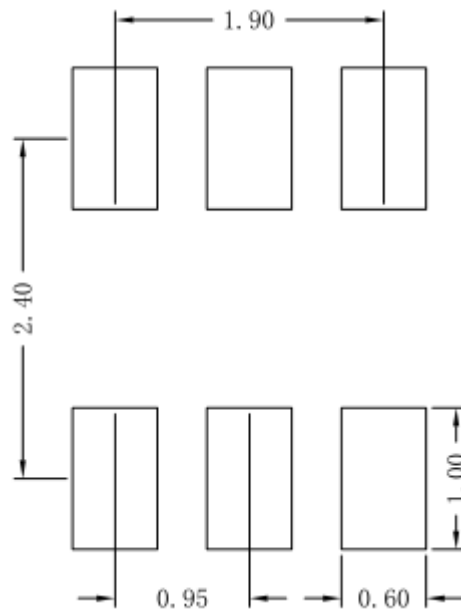
Top View



Side View



Side View

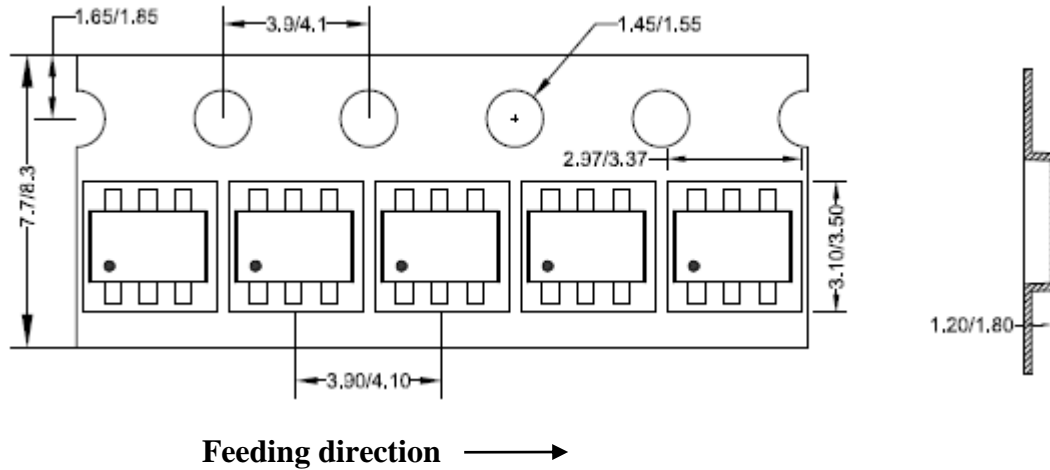


Recommended Pad Layout

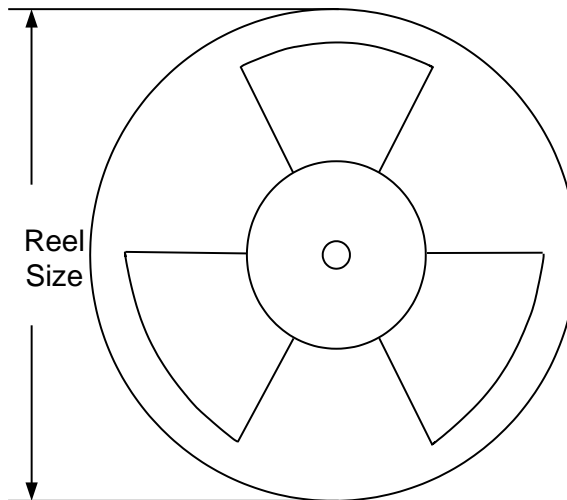
Notes: All dimensions in millimeter and exclude mold flash & metal burr.

Taping & Reel Specification

1. Taping orientation for package



2. Carrier Tape & Reel specification for packages



| Package type | Tape width (mm) | Pocket pitch(mm) | Reel size (Inch) | Trailer length(mm) | Leader length (mm) | Qty per reel |
|--------------|-----------------|------------------|------------------|--------------------|--------------------|--------------|
| SOT23-6 | 8 | 4 | 7" | 280 | 160 | 3000 |

3. Others: NA

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