SY8003/SY8003A

High Efficiency 5.5V, 3A continuous, 1MHz Synchronous Step Down Regulator

General Description

The SY8003 and SY8003A are high-efficiency, high frequency synchronous step-down DC-DC regulator IC capable of delivering up to 3A output current. The SY8003 and SY8003A operate over a wide input voltage range from 2.7V to 5.5V and integrate main switch and synchronous switch with very low $R_{DS(ON)}$ to minimize the conduction loss.

Low output voltage ripple and small external inductor and capacitor sizes are achieved with 1MHz switching frequency.

SY8003 and SY8003A integrate reliable short circuit and over-voltage protection.

Ordering Information

SY8003 □(□□)□
- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package type	Note①
SY8003DFC	DFN2x2-8	
SY8003ADFC	DFN2x2-8	

Features

- Low $R_{DS(ON)}$ for internal switches (top/bottom):110mΩ/80mΩ
- 3A continuous load current capability
- 2.7-5.5V input voltage range
- High switching frequency minimizes the external components: 1MHz
- Internal softstart limits the inrush current
- Reliable short circuit protection:
  - SY8003: Latch off protection
  - SY8003A: Hic-cup mode protection
- Reliable over-voltage protection:
  - SY8003: Latch off protection
  - SY8003A: No latch off protection
- 100% dropout operation
- RoHS Compliant and Halogen Free
- Compact package: DFN2X2-8.

Applications

- LCD TV
- Set Top Box
- Net PC
- Mini-Notebook PC
- Access Point Router

Typical Applications

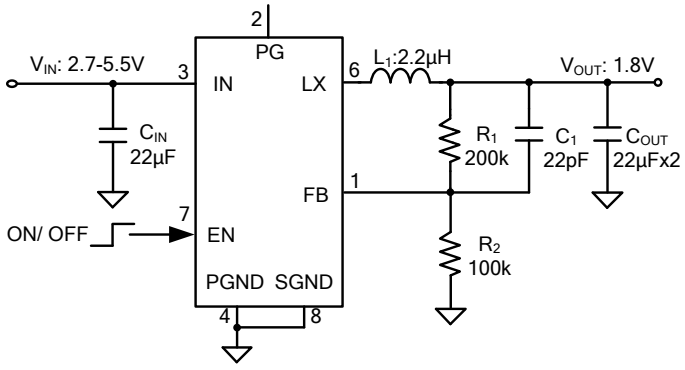


Figure 1.Schematic diagram

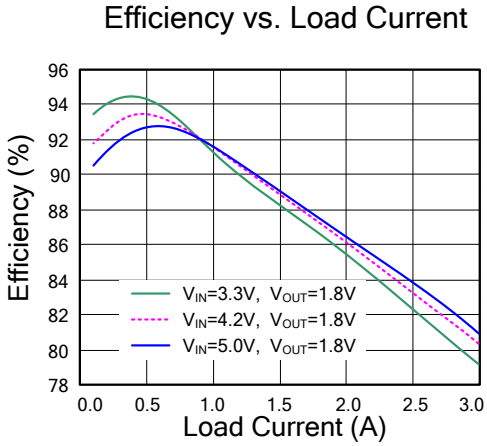
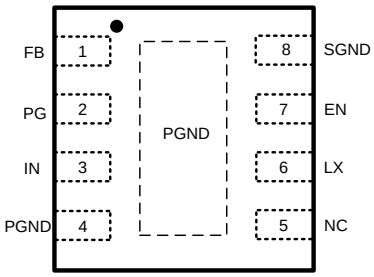


Figure 2. Efficiency vs Load Current

Pinout (top view)



Part Number	Package type	Top Mark①
SY8003DFC	DFN2x2-8	**JD*xyz***
SY8003ADFC	DFN2x2-8	**KW*xyz***

Note①： ***x=year code, y=week code, z= lot number code.***

Pin Name	Pin Number	Pin Description
EN	7	Enable control. Pull high to turn on. Do not float.
PGND	4/Exposed Paddle	Power ground pin.
SGND	8	Signal ground pin.
LX	6	Inductor pin. Connect this pin to the switching node of inductor.
IN	3	Power input pin. Decouple this pin to GND pin with at least 10μF ceramic cap.
PG	2	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	1	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: Vout=0.6*(1+R_1/R_2).
NC	5	No connection.

Absolute Maximum Ratings (Note 1)

Supply Input Voltage ---------- -0.3V to 6.0V
Enable, FB Voltage---------- -0.3V to V_{IN} + 0.6V
LX Voltage---------- -0.3V (*1) to 6V (*2)
Power Dissipation, PD @ TA = 25℃ DFN2x2-8 , ----------1W
Package Thermal Resistance (Note 2)
θ_{JA} ----------120℃/W
θ_{JC} ----------8.2℃/W
Junction Temperature Range ---------- 150℃
Lead Temperature (Soldering, 10 sec.) ---------- 260℃
Storage Temperature Range ---------- 65℃ to 150℃
(*1) LX Voltage tested down to -5V<10ns
(*2) LX Voltage tested up to +7V<50ns

Recommended Operating Conditions (Note 3)

Supply Input Voltage ---------- 2.7V to 5.5V
Junction Temperature Range ---------- -40℃ to 125℃
Ambient Temperature Range ---------- -40℃ to 85℃

Electrical Characteristics

(V_{IN} = 5V, V_{OUT} = 2.5V, L = 2.2μH, C_{OUT} = 22μF, T_A = 25℃, unless otherwise specified)

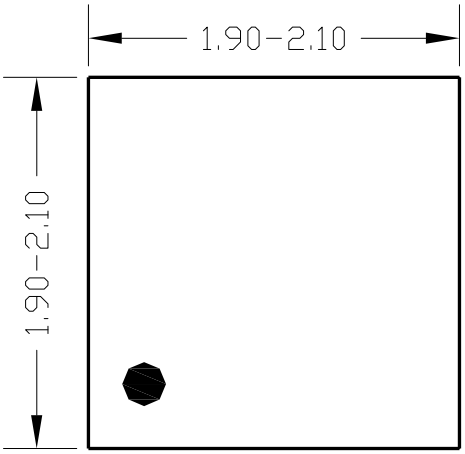
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	V_{IN}		2.7		5.5	V
Quiescent Current	I_Q	I_{OUT}=0, V_{FB}=V_{REF} · 105%		55		μA
Shutdown Current	I_{SHDN}	EN=0		0.1	1	μA
Feedback Reference Voltage	V_{REF}		0.588	0.6	0.612	V
FB Input Current	I_{FB}	V_{FB}=V_{IN}	-50		50	nA
PFET RON	$R_{DS(ON),P}$			110		mΩ
NFET RON	$R_{DS(ON),N}$			80		mΩ
PFET Current Limit	I_{LIM}		3.5			A
EN rising threshold	V_{ENH}		1.5			V
EN falling threshold	V_{ENL}				0.4	V
EN Leakage current	I_{EN}		-1		1	μA
Input UVLO threshold	V_{UVLO}				2.65	V
UVLO hysteresis	V_{HYS}			0.2		V
Oscillator Frequency	F_{OSC}	I_{OUT}=500mA	0.8	1	1.2	MHz
PG High Delay Time				0.1	1	uS
PG Rising Threshold	$V_{FB,HV}$			0.54		V
PG Under-voltage Threshold	$V_{FB,LV}$			0.54		V
PG Under-voltage Delay Time				20		uS
PG Over-voltage Threshold	$V_{FB,OV}$		0.69	0.72	0.75	V
Over-voltage Protection Threshold	V_{OVP}		0.69	0.72	0.75	V
Over-voltage Deglitch Timeout	T_{OV}		10	20	30	μs
Short Circuit Protection Latch Off Threshold	V_{SCP}	SY8003DFC		0.24		V
Short Circuit Protection Delay Time	$T_{DELAY-SC}$			20		μs
Min ON Time				75		ns
Max Duty Cycle			100			%
Soft Start Time	T_{SS}		0.84	1.2	1.56	ms
Output Discharge Switch On Resistance	R_{DISCH}			50		Ω
Thermal Shutdown Temperature	T_{SD}			160		℃

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.

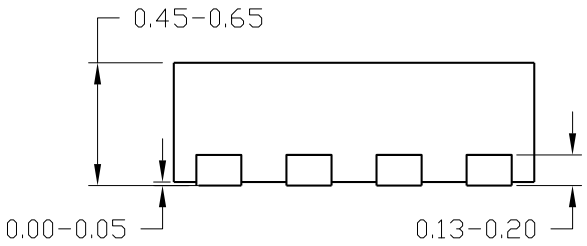
Note 2: Test condition: Device mounted on 2" x 2" FR-4 substrate PCB, 2oz copper, with minimum recommended pad on top layer and thermal vias to bottom layer ground plane.

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

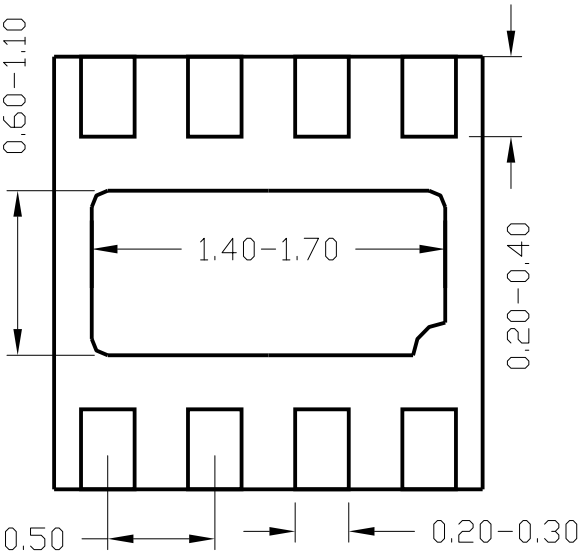
DFN2x2-8 Package Outline



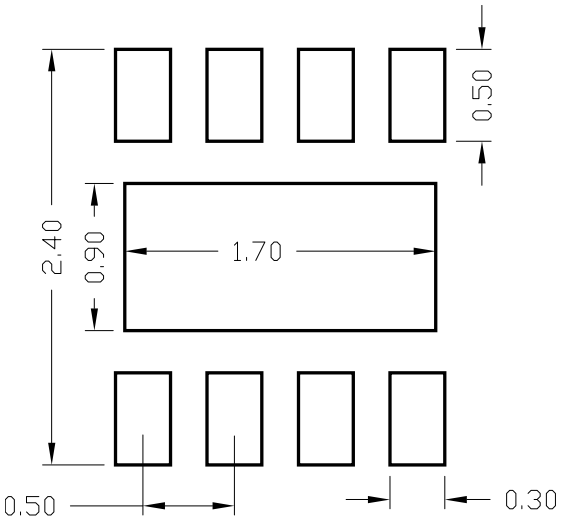
Top View



Side View



Bottom View

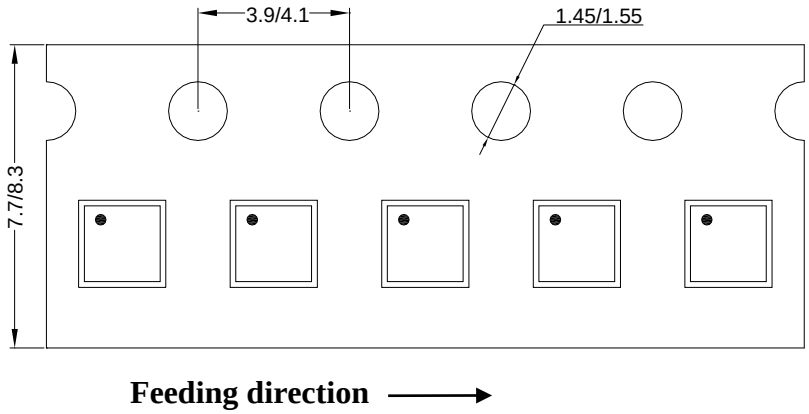


PCB Layout (Reference Only)

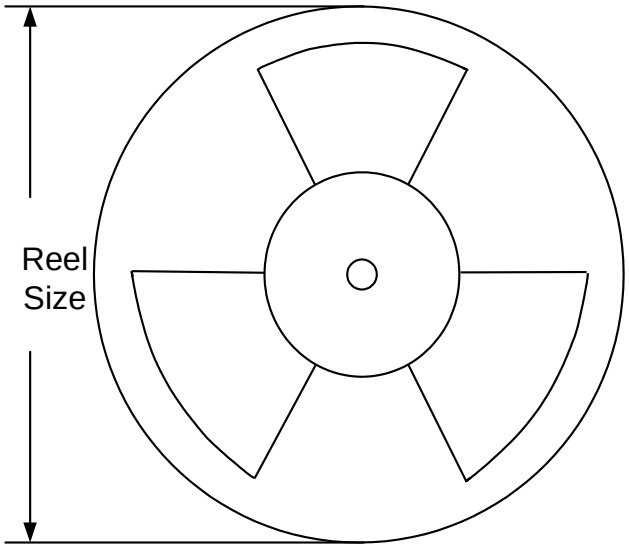
Notes: **All dimension in MM**
All dimension don't include mold flash & metal burr

Taping & Reel Specification

1. DFN2x2



2. Carrier Tape & Reel specification for packages



Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer length(mm)	Leader length (mm)	Qty per reel
DFN2x2	8	4	7"	400	160	3000

3. Others: NA