Application Note: AN_ SY6882A/B
Over Voltage Protection Switch

General Description

SY6882A/B integrates an extremely low $R_{DS(ON)}$ N-channel MOSFET with precise over-voltage protection to against high-voltage faults up to 25V. Linear mode is active to maintain the output voltage at 5.5V with the input voltage up to the input over-voltage threshold. SY6882A is available with internal fixed over-voltage protection point at 7.1V and SY6882B has the programmable over-voltage threshold by two external resistors. The internal NFET will be turned off to disconnect input and output when the V_{IN} is higher than the over-voltage threshold. Low $R_{DS(ON)}$ of the integrated switch helps to reduce power loss during the normal operation.

Control the /EN pin to enable or disable the device and /FLB indicates OVP and OTP.

Features

- Low $R_{DS(ON)}$ for the N-channel MOSFET Switch: 100 mΩ typical
- 2.0A Maximum Continuous Current
- Over-Voltage Protection up to 25V
- **SY6882A:**
  Internal Fixed Over-Voltage Protection Threshold at 7.1V
  SY6882B:
  External Programmable Over-Voltage Protection Threshold
- Thermal Shutdown Protection& Auto Recovery
- OVP and OTP Fault Flag
- 300μA MAX Quiescent Current
- 20μA MAX in shutdown mode
- RoHS Compliant and Halogen Free
- Compact package: DFN2x2-8

Ordering Information

SY6882 □(□□)□
- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package type	Note
SY6882ADFC	DFN2x2-8	---
SY6882BDFC	DFN2x2-8	----

Applications

- Cell Phones
- Digital Still cameras
- GPS
- MP3 Players
- Personal Data Assistants(PDAs)
- USB Hot Swap/Live Insertion Device

Typical Applications

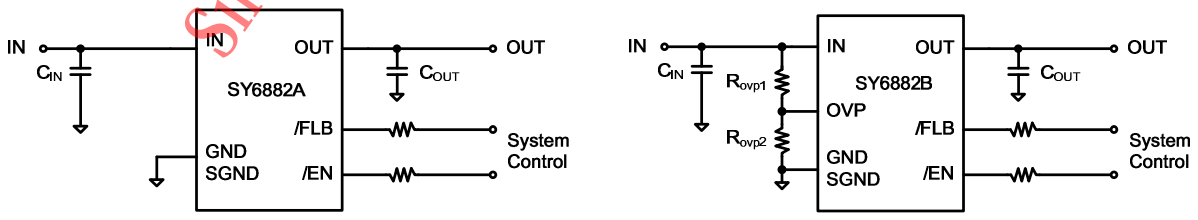
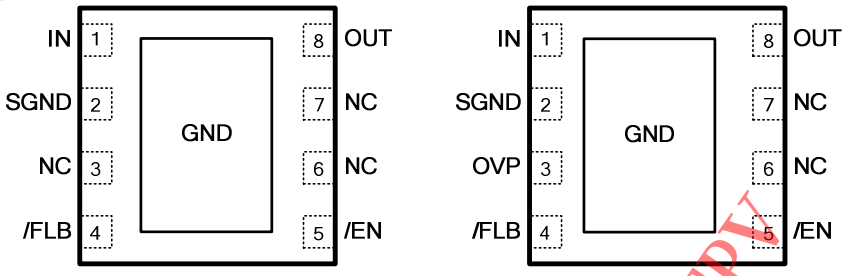


Figure 1. SY6882A/B Schematic Diagram

Pinout (top view)



SY6882A SY6882B

(DFN2x2-8)

Top mark: **HZ*xyz*** for SY6882A (Device code: HZ, ***x=year code, y=week code, z= lot number code***)
JA*xyz* for SY6882B (Device code: JA, ***x=year code, y=week code, z= lot number code***)

Pin Name	Pin Number	Pin Description
IN	1	Power input pin. Decouple high frequency noise by connecting at least 1uF MLCC to ground.
SGND	2	Signal ground pin.
NC(SY6882A)	3	Not connect.
OVP(SY6882B)		Over voltage protection program pin. Using external divider to program OVP threshold.
/FLB	4	Open drain device. Fault flag pin for OVP and OTP.
/EN	5	Active-low enable interface pin. It can be used to enable the output of the device by pulling the pin to ground, or disable the IC by pulling high.
NC	6	Not connect.
NC	7	Not connect.
OUT	8	Power output pin. Decouple high frequency noise by connecting at least 1uF MLCC to ground.
GND	Exposed pad	Ground pin.

Absolute Maximum Ratings (Note 1)

Input Voltage (V_{IN}) ---------- -0.3 to 25V
Output Voltage (V_{OUT}) ---------- $0.3+V_{IN}$
All other pins---------- -0.3 to 6.5V
Maximum Continuous Switch Current----------2.0A
Power Dissipation, PD @ TA = 25°C DFN2x2-8 FC, ---------- 2W
Package Thermal Resistance (Note 2)
θ_{JA} ---------- 62.5°C/W
θ_{JC} ----------10°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

Recommended Operating Conditions (Note 3)

Input Voltage (V_{IN}) ---------- -0.3 to 23V
Junction Temperature Range ---------- -40°C to 125°C
Ambient Temperature Range ---------- -40°C to 85°C

Electrical Characteristics

(V_{IN} = 5V, C_{IN} = 10uF, C_{OUT} = 10uF, T_A = 25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
INPUT						
Input Voltage Range	V_{IN}		3		23	V
Input UVLO Threshold	V_{UVLO}	Rising edge			3	V
UVLO hysteresis	$V_{UVLOHYS}$			0.1		V
Quiescent Current	I_Q	I_{OUT}=0A, /EN=0V			300	μA
Shutdown Current	I_{SHDN}	/EN=5V, V_{OUT}=0V			20	μA
Protection FET						
Protection NFET R_{ON}	$R_{DS(ON)}$	I_{OUT}=100mA		100		mΩ
Off Leakage Current	I_{LK}	/EN=High, V_{IN}=5V			1	μA
Output Over Current Protection			2.5			A
Over-voltage Protection						
Output Voltage Regulation	$V_{O(REG)}$	/EN=LOW, V_{IN}=6, OVP not active	5.23	5.50	5.78	V
OVP recovery time	T_{OVPREC}	/EN=LOW, Vin falling slew rate 2V/μs		8		ms
(SY6882A)						
Internal OVP Threshold	V_{OVP}	Fixed, Rising edge	6.75	7.1	7.46	V
OVP Threshold Hysteresis	V_{OVPHYS}			100		mV
(SY6882B)						
OVP Threshold	V_{OVP}	Rising edge	1.14	1.2	1.26	V
OVP Threshold Hysteresis	V_{OVPHYS}			20		mV
Enable and Fault Indicator Logic						
/EN Low Threshold	V_{EN_ON}				0.4	V
/EN High Threshold	V_{EN_OFF}		1.6			V
/FLB Output voltage low	V_{FLB_L}				0.4	V
Thermal Protection						
Thermal Shutdown Temperature	T_{SD}			150		°C
Thermal Shutdown Hysteresis	T_{HYS}			20		°C

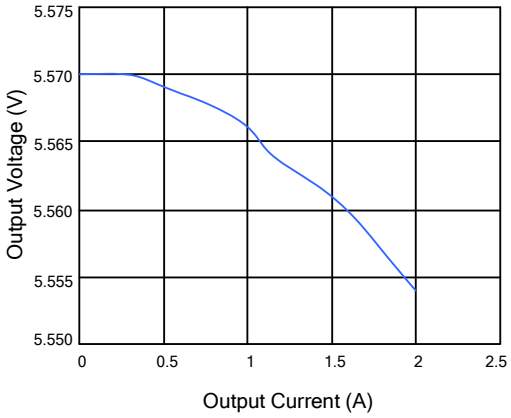
Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute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

Note 2: θ_{JA} is measured in the natural convection at T_A = 25°C on a low effective four-layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

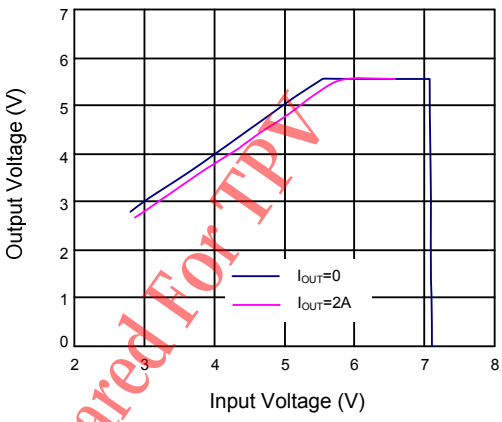
Note 3: The device is not guaranteed to function outside its operating conditions

Typical Performance Characteristics

Clamp Voltage vs. Output Current

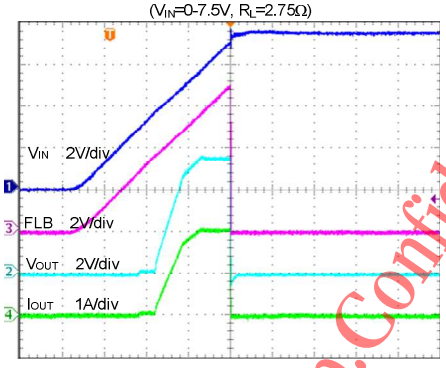


Line Regulation



Over Voltage Protection

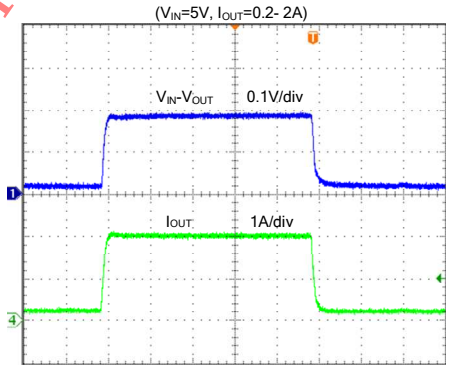
(V_{IN}=0-7.5V, R_L=2.75Ω)



Time (1ms/div)

Load Transient

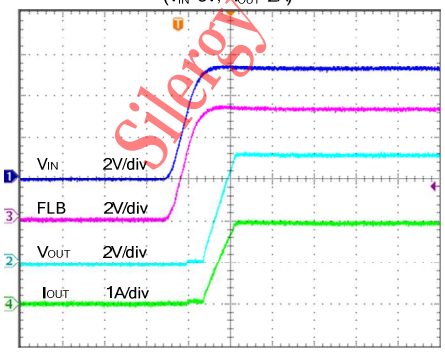
(V_{IN}=5V, I_{OUT}=0.2- 2A)



Time (100μs/div)

Startup from V_{IN}

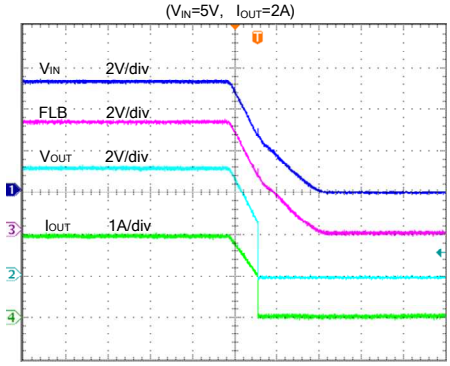
(V_{IN}=5V, I_{OUT}=2A)



Time (1ms/div)

Shutdown from V_{IN}

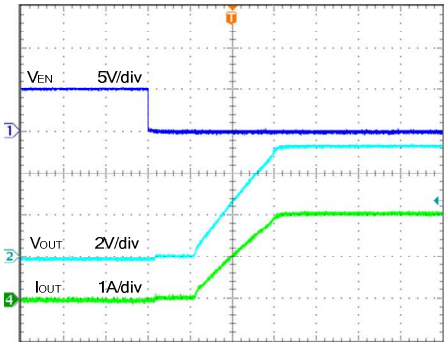
(V_{IN}=5V, I_{OUT}=2A)



Time (4ms/div)

Startup from ENable

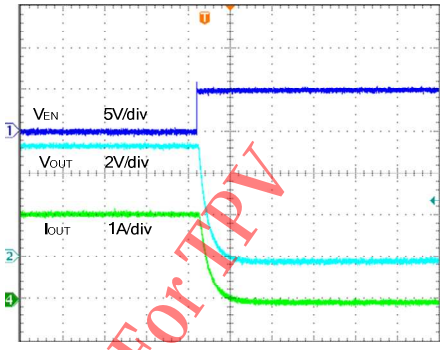
(V_{IN}=5V, I_{OUT}=2A)



Time (400μs/div)

Shutdown from ENable

(V_{IN}=5V, I_{OUT}=2A)



Time (10μs/div)

Detail Function Description

SY6882A/B integrates an extremely low $R_{DS(ON)}$ N-channel MOSFET with precise over-voltage protection to against high-voltage faults up to 25V. Linear mode is active to maintain the output voltage at 5.5V with the input voltage up to the input over-voltage threshold.

SY6882A is available with internal fixed over-voltage protection point at 7.1V and SY6882B has the programmable over-voltage threshold by two external resistors. The internal NFET will be turned off to disconnect input and output when the V_{IN} is higher than the over-voltage threshold. Low $R_{DS(ON)}$ of the integrated switch helps to reduce power loss during the normal operation. Thermal protection is active to turn the NFET off if the die temperature exceeds 150℃.

Input Under/Over-voltage Protection

The SY6882A/B starts work when the input voltage exceeds the UVLO threshold. The integrated NFET's gate is charged by an internal current source to control the output voltage's ramp up slewrate without any overshoot. While the input voltage is less than the output voltage regulation threshold $V_{O(REG)}$ and above the UVLO threshold, the output voltage tracks the input voltage. When the input voltage is higher than the $V_{O(REG)}$ and less than the over voltage protection threshold V_{OVP}, the integrated NFET is operated in LDO mode and regulates the output voltage at 5.5V. If the input voltage is higher than V_{OVP}, the overvoltage protection is active to turn the NFET off. The NFET is turned on when the input voltage falls back below (V_{OVP}-V_{OVPHYS}) after a deglitch time of $t_{REC(OVP)}$. SY6882A is available with the internal fixed over-voltage protection point at 7.1V and SY6882B has the programmable over-voltage threshold by two external resistors. The /FLB output is asserted when the overvoltage protection is active.

Thermal Protection

If the die temperature of the device exceeds the thermal protection threshold which is typically 150℃, the NFET is turned off and the /FLB output is asserted low. The NFET is turned on when the die temperature falls to the recovery point.

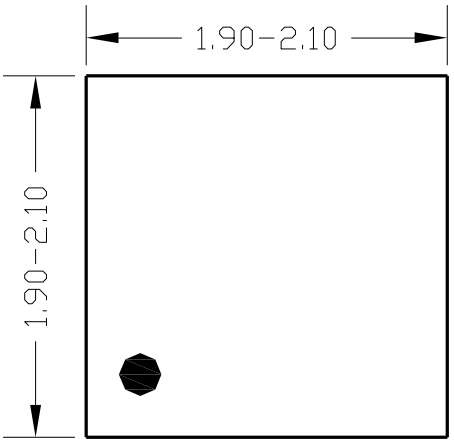
Enable Function

SY6882A/B has the enable pin /EN that can be used to enable or disable the device. Pull down the /EN pin to enable the device and turn on the NFET if there's no any protection occurring. Pull up the /EN pin to disable the device and the NFET is turned off.

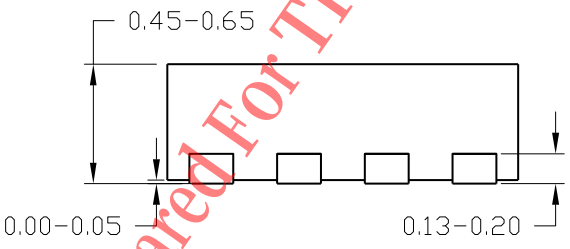
Fault Indication

The /FLB pin is an active-low, open drain output. It is high impedance when there's no protection occurring or the device is disable by pulling up the /EN pin. When /EN low, the /FLB pin goes low whenever overvoltage protection or thermal protection occurs.

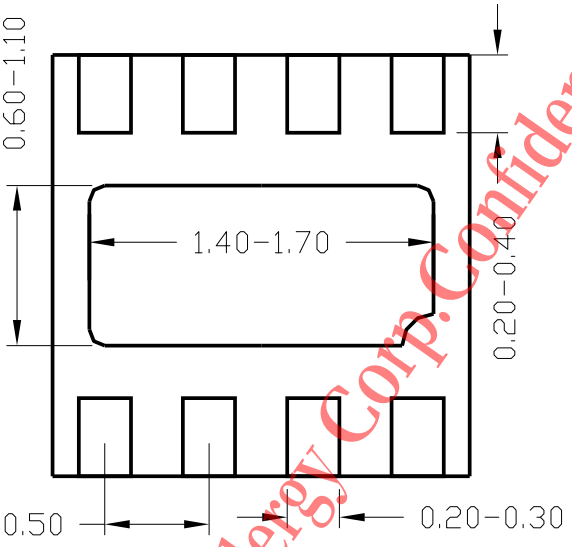
DFN2x2-8 Package Outline



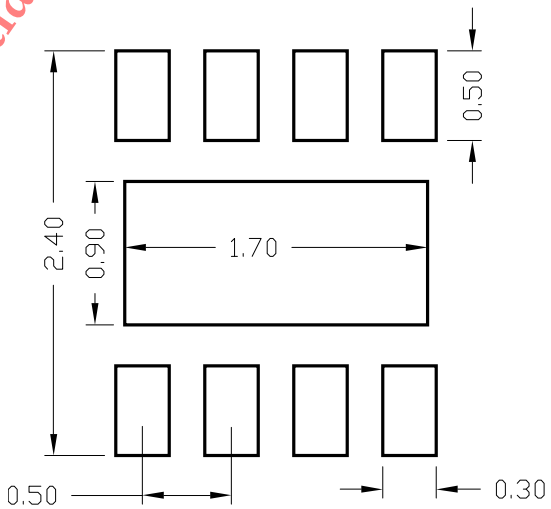
Top View



Side View



Bottom View

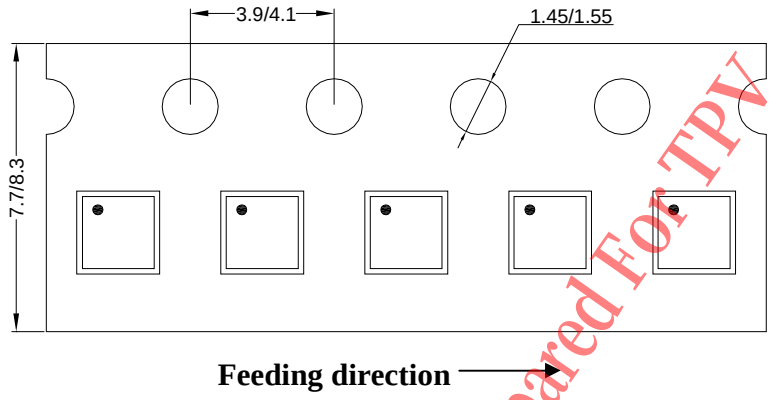


PCB Layout (Reference Only)

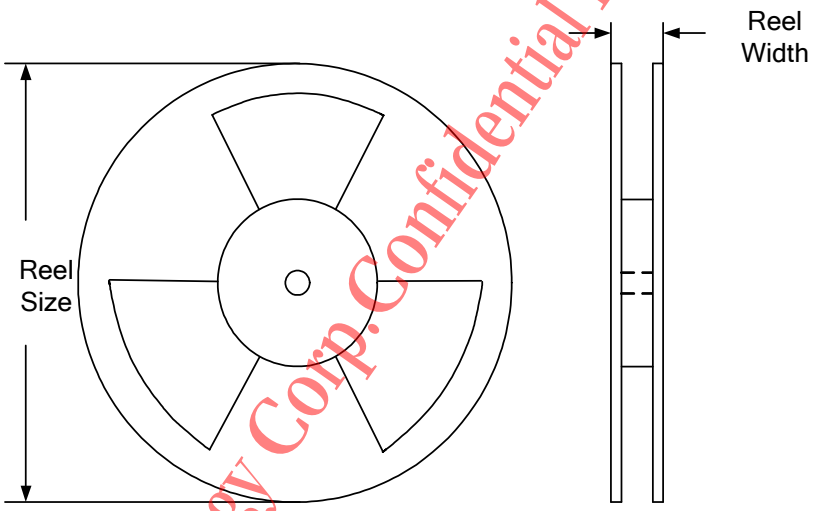
Notes: **All dimension in MM**
All dimension don't not include mold flash & metal burr

Taping & Reel Specification

1. DFN2x2-8(FC) taping orientation



2. Carrier Tape & Reel specification for packages



Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Reel width(mm)	Trailer length(mm)	Leader length (mm)	Qty per reel
DFN2x2	8	4	7"	8.4	400	160	3000

3. Others: NA