

General Description

SY20855C is a current limit switch with input voltage range selection and output voltage clamping. Extremely low $R_{DS(ON)}$ of the integrated protection N-channel FET helps to reduce power loss during the normal operation. Programmable soft-start time controls the slew rate of the output voltage during start-up. Independent enable control allows the complicated system sequencing control. It integrates the over-temperature protection shutdown and auto-recovery with hysteresis. This IC along with small DFN3X3-10 footprint provides small PCB area application.

Features

- Wide Input Voltage Range from 2.5V to 6.5V with surge up to 12V
- Ultra Low Bias Current: 50uA typical
- Extremely Low $R_{DS(ON)}$ for the Integrated Protection Switch: 40 mΩ
- Programmable Soft-Start Time
- 5A Fixed Current Limit
- Short-circuit Protection
- Selectable Input and Clamping Voltage Range
- Enable Interface Pin
- Thermal Shutdown Protection & Auto Recovery
- RoHS Compliant and Halogen Free
- Compact package: DFN3X3-10

Ordering Information

SY20855 □(□□)□
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 Temperature Code
 Package Code
 Optional Spec Code

Ordering Number	Package type	Note
SY20855CDBC	DFN3x3-10	----

Applications

- Notebook PC
- I-pad Mini
- Server
- Service PC

Typical Applications

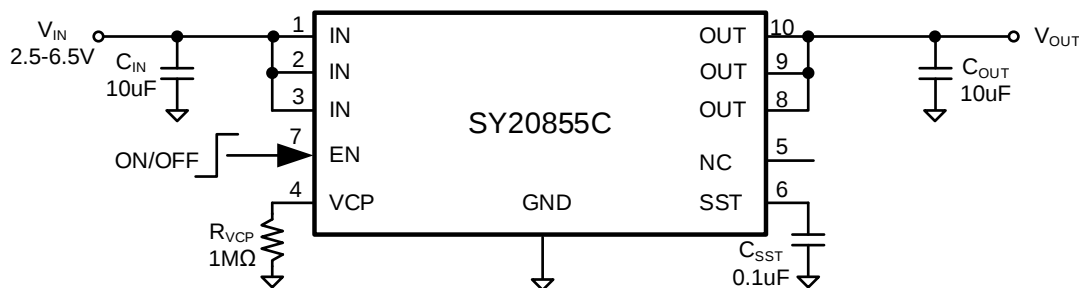
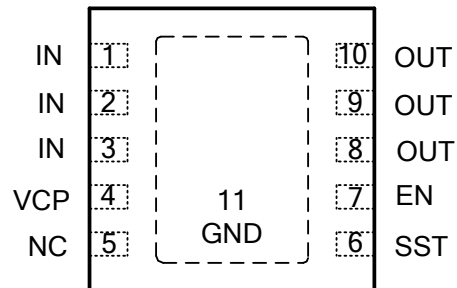


Figure 1. Schematic Diagram

Pinout (top view)

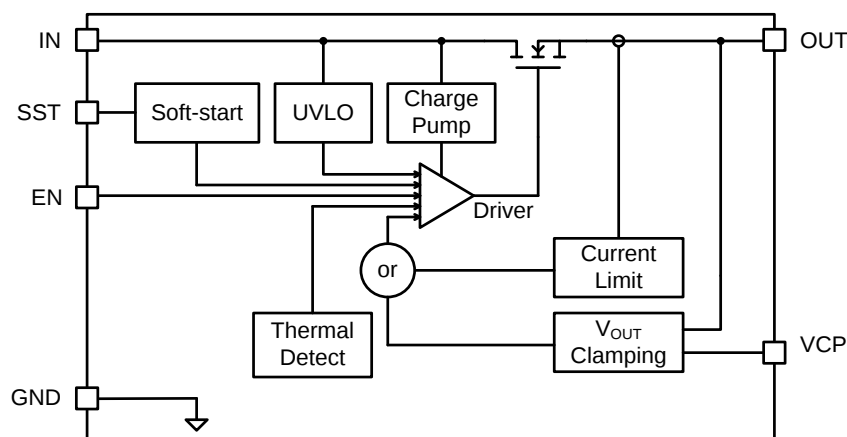


(DFN3x3-10)

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

Pin Name	Pin Number	Pin Description															
IN	1,2,3	Power input pin. Decouple high frequency noise by connecting at least 0.1uF MLCC to ground.															
VCP	4	Output clamp voltage selection based on the input voltage. Pull VCP pin to High by connecting a resistor to IN, or pull VCP pin to Low by connecting a resistor to ground. Recommend to decoupling this pin with 0.1uF capacitor. <table><tr><td rowspan="2">VCP</td><td colspan="3">Clamping Threshold</td></tr><tr><td>Min</td><td>Typ</td><td>Max</td></tr><tr><td>Low</td><td>3.6V</td><td>3.8V</td><td>4.0V</td></tr><tr><td>High</td><td>5.4V</td><td>5.7V</td><td>6.0V</td></tr></table>	VCP	Clamping Threshold			Min	Typ	Max	Low	3.6V	3.8V	4.0V	High	5.4V	5.7V	6.0V
VCP	Clamping Threshold																
	Min	Typ	Max														
Low	3.6V	3.8V	4.0V														
High	5.4V	5.7V	6.0V														
NC	5	No connection.															
SST	6	Soft-start time program pin. Connect a capacitor to ground to program the soft start time.															
EN	7	Enable control input. Pull it High to enable the IC.															
OUT	8,9,10	Power output pin.															
GND	11(exposed paddle)	Ground pin.															

Block Diagram



**Absolute Maximum Ratings** (Note 1)

Supply Input Voltage	12V
EN pin, VCP pin,	12V
Power Dissipation, P_D @ $T_A = 25^\circ\text{C}$ DFN3X3-10,	2.6W
Package Thermal Resistance (Note 2)	
θ_{JA}	38°C/W
θ_{JC}	8°C/W
Junction Temperature Range	125°C
Lead Temperature (Soldering, 10 sec.)	260°C
Storage Temperature Range	-65°C to 150°C

Recommended Operating Conditions (Note 3)

Supply Input Voltage	2.5V to 6.5V
Junction Temperature Range	-40°C to 125°C
Ambient Temperature Range	-40°C to 85°C

Electrical Characteristics(V_{IN} = 5V, C_{SST}=100nF, C_{IN} = 10uF, C_{OUT} = 10uF, T_A = 25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	V _{IN}		2.5		6.5	V
Input UVLO Threshold	V _{UVLO}		2.2		2.4	V
UVLO hysteresis	V _{HYS}			0.085		V
Bias Current	I _{BIAS}			50	65	μA
Shutdown Current	I _{SHDN}	EN=0		10		μA
Protection FET RON	R _{DS(ON)}			40	60	mΩ
Current Limit Threshold	I _{LIM}		3.5	5	6.5	A
Clamping Output Voltage	V _{CLP}	VCP=LOW	3.6	3.8	4.0	V
		VCP=HIGH	5.4	5.7	6.0	V
Soft-start Time	T _{SST}	C _{SST} =100nF(Note 4)		27.8		ms
Soft-start Time Accuracy			-30%		+30%	T _{SST}
EN Turn-on Threshold	V _{EN_ON}		2			V
EN Turn-off Threshold	V _{EN_OFF}				0.4	V
Thermal Shutdown Temperature	T _{SD}			140		°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 single layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard. Paddle of DFN3x3-10 packages is the case position for θ_{JC} measurement.

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

Note4. Recommended Soft-start Time Program Table



SST cap (nF)	None	10	47	100
Rise time (ms)	0.6	2.3	10.8	23

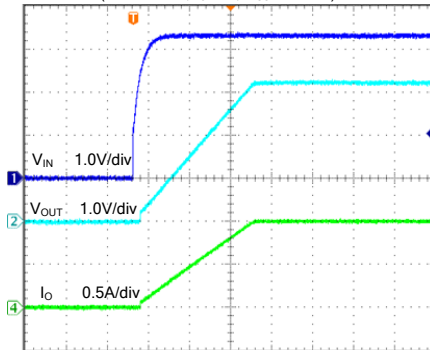
Recommended Formula for C_{SST} & Soft-start Time Calculation

$$T_{SS} = \begin{cases} T_{SS_DLT}, & \text{No external } C_{SST} \\ \frac{0.85 \times C_{SST}}{I_{INT}}, & T_{SS} > T_{SS_DLT} \end{cases},$$

Where, T_{SS_DLT} is the internally fixed default soft-start time, about 0.6ms, which means there's no any external C_{SST}; I_{INT} is the internal current source, about 3.7uA.

Typical Performance Characteristics

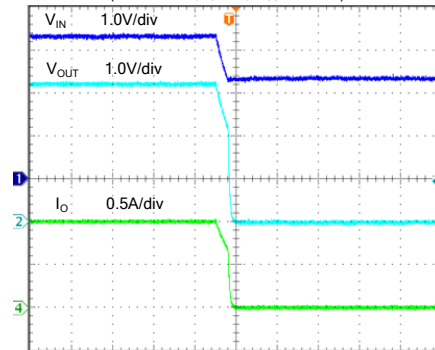
Programmable Soft-start Time
(3.3V Mode, $I_O=1A$, $C_{SST}=100nF$)



Time (10ms/div)

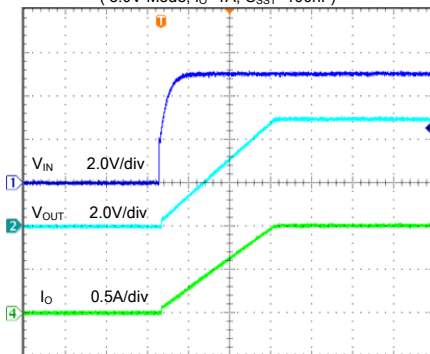
Shutdown

(3.3V Mode, $I_O=1A$, $C_{SST}=100nF$)



Time (1ms/div)

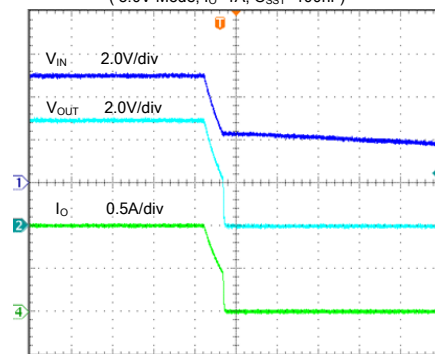
Programmable Soft-start Time
(5.0V Mode, $I_O=1A$, $C_{SST}=100nF$)



Time (10ms/div)

Shutdown

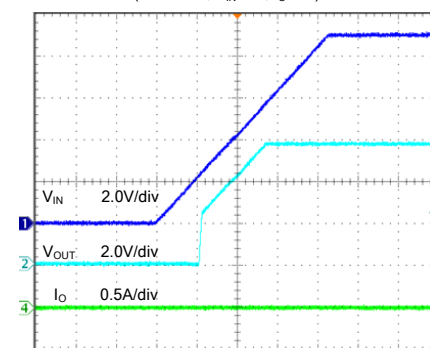
(5.0V Mode, $I_O=1A$, $C_{SST}=100nF$)



Time (4ms/div)

Over Voltage Protection

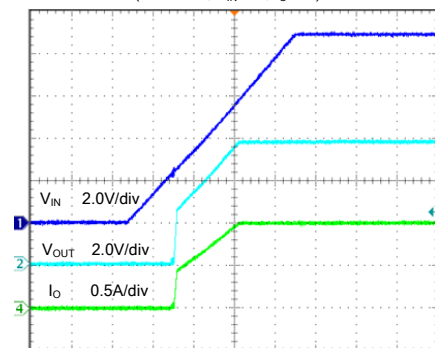
(5V Mode, $V_{IN}=9V$, $I_O=0A$)



Time (200ms/div)

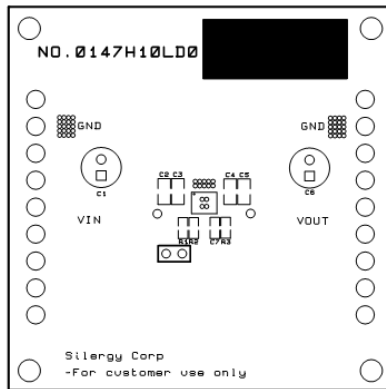
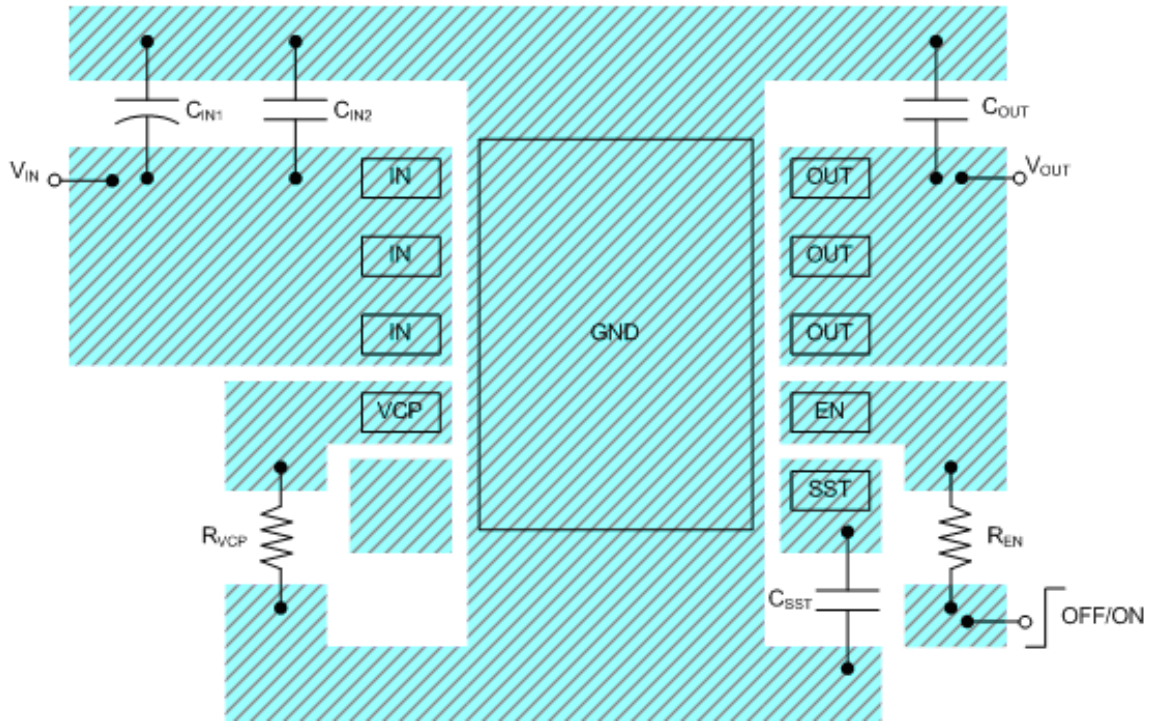
Over Voltage Protection

(5V Mode, $V_{IN}=9V$, $I_O=1A$)

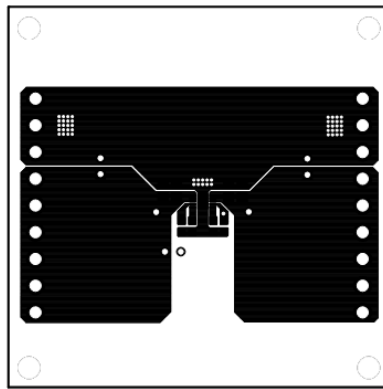


Time (200ms/div)

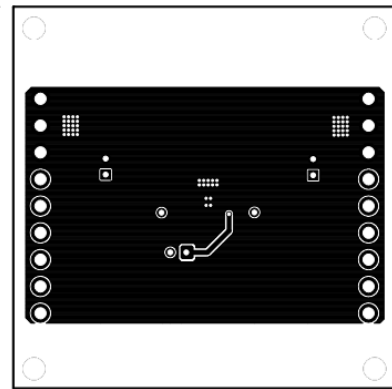
PCB Layout Guideline



Top Silkscreen

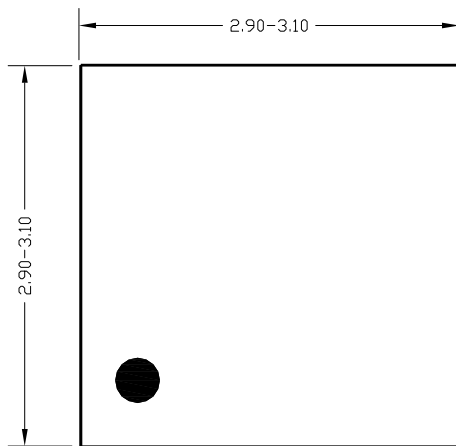


Top Layer

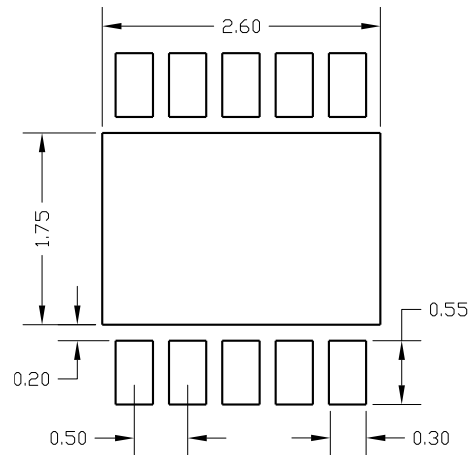


Bottom Layer

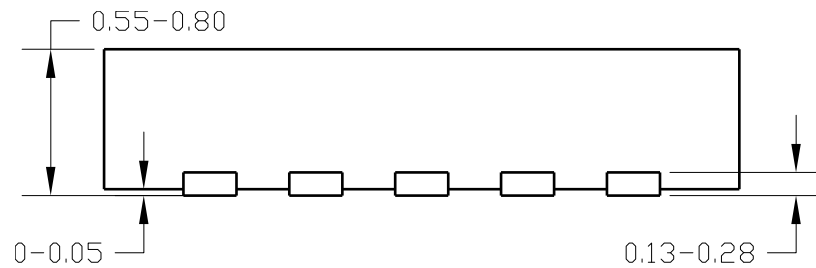
DFN3x3-10 Package outline



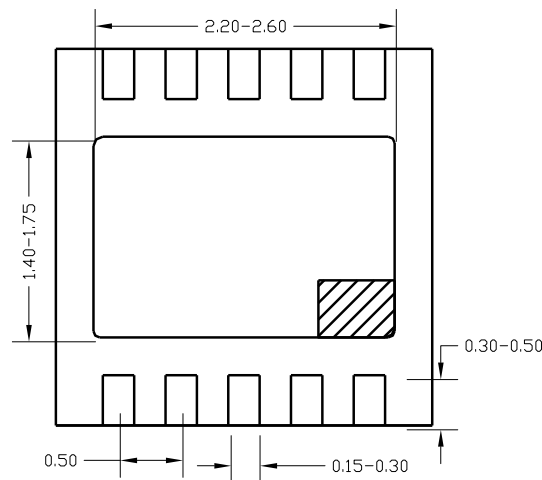
Top View



PCB layout (recommended)



Side View



Bottom View

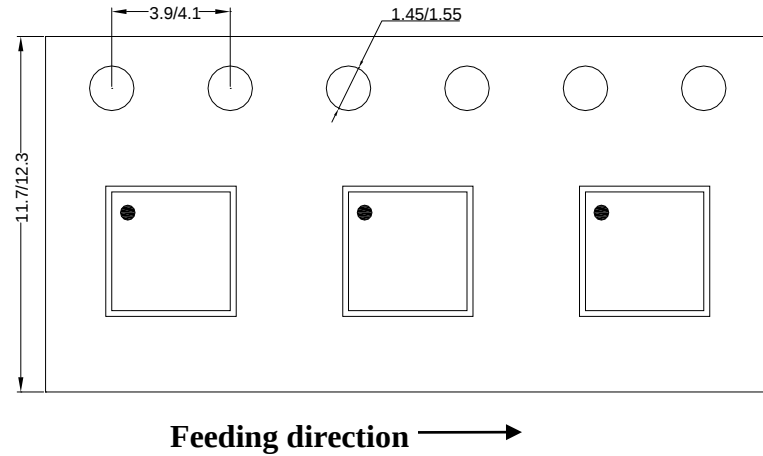


Detail A
Pin1 identifier: two options

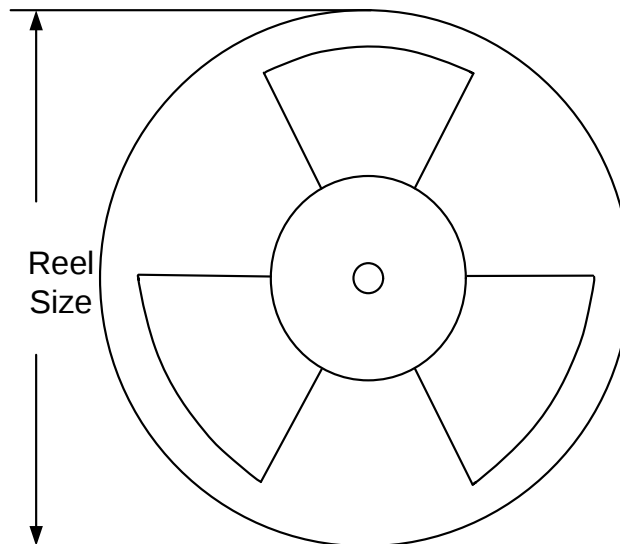
Notes: All dimensions are in millimeters and exclude mold flash & metal burr.

Taping & Reel Specification

1. DFN3x3-10 taping orientation



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
DFN3x3	10	8	13"	400	400	5000

3. Others: NA



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