

## SCM9603B Low voltage start-up controller

### Features

- Wide input voltage range,  $4V_{DC}$  to  $85V_{DC}$
- Small SOT-23 package, benefits a low-cost design
- Large bypass capacitor charge current, up to 20mA (input/output voltage delta 1V)
- Output charge current  $>2mA$  at low input voltage (4V)
- Adjustable start-up time set by VDD bypass capacitor
- With  $V_{VDD}$  output voltage  $>10V$ , starter IC is off
- With  $V_{VDD}$  output voltage  $<8V$ , IC restarts.
- Built-in Over-temperature protection

### Package



Mechanical package: SOT-23  
(see "Ordering information" for details).

### Applications

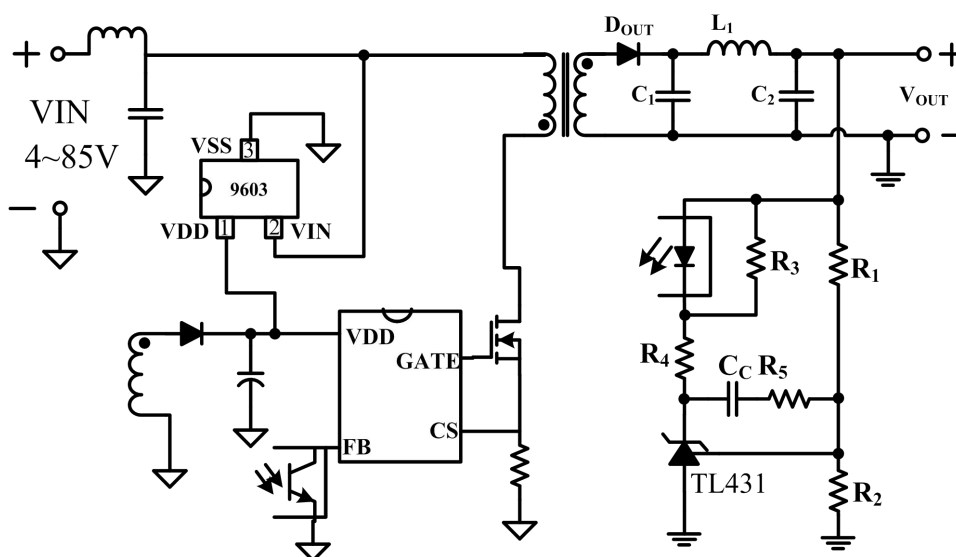
- Wide input range (  $4V_{DC} \sim 85V_{DC}$  ) DC-DC converters

### Functional Description

The SCM9603B's built-in 85V high voltage transistor works over a wide input voltage range from 4VDC to 85VDC, A constant current output charges the bypass capacitor for starting-up the controller. After the controller start-up, the SCM9603B will continue to work for a certain period of time, which is beneficial to improve the capacitive ability of the power supply.

To avoid the damage to the controller and the entire system, the SCM9603B can sense the appropriate protection mode if the VDD bypass capacitor is too small or when the power supply output is in short-circuit.

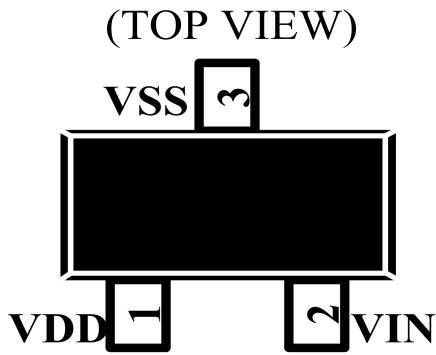
### Typical Application Circuit



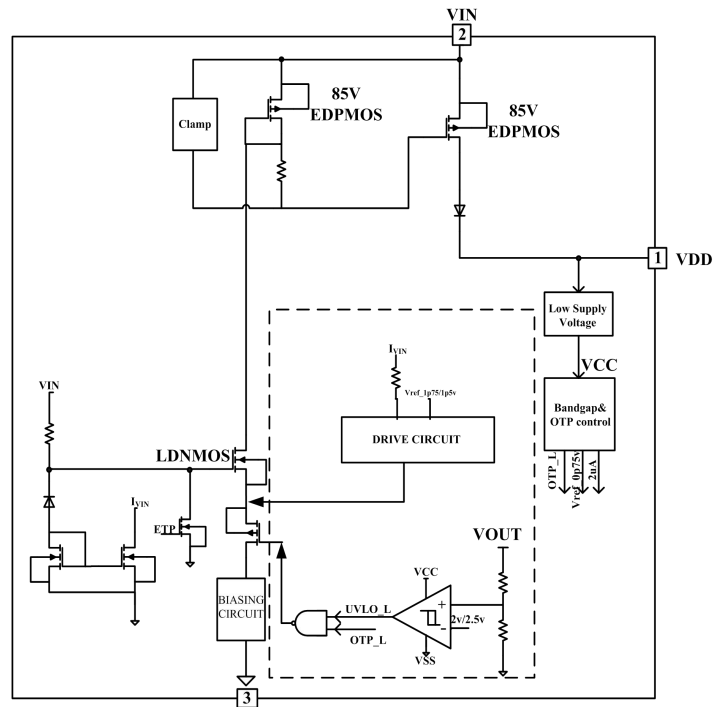
## Contents

Features.....	1	Absolute Maximum Ratings.....	2
Package.....	1	Recommended Operating Conditions.....	3
Application.....	1	Electrical Characteristics.....	3
Functional Description.....	1	Typical Curve.....	3
Typical Application Circuit.....	1	Chip Description.....	4
Pins.....	2	Application Circuit.....	4
Internal Block Diagram.....	2	Power Supply Recommendations.....	5
Pin Description.....	2	Ordering Information.....	5

### Pins



### Internal Block Diagram



### Pin Descriptions

Pin No.	Pin Name	I/O	Description
1	VDD	O	This pin requires a bypass capacitor to GND.
2	VIN	I	This pin is connected to the input source voltage and supplies power to the controller.
3	VSS	P	IC Ground connection

### Absolute Maximum Ratings

General test conditions: Free-air, normal operating temperature range (unless otherwise specified).

Parameter	Symbol	Min	Max	Unit
Power Supply Voltage	$V_{VIN}$	4	85	V
VIN Pin Voltage	$V_{VDD}$	-0.4	85	V
Operating Junction Temperature	$T_J$	-40	150	°C
Storage Temperature Range	$T_{STG}$	-55	150	
Lead temperature for soldering (0.6 mm from case for 10 seconds)			260	
Moisture Sensitivity Level	MSL	MSL3		
ESD rating	Human Body Model ( HBM )		1000	V
	Charged Device Module ( CDM )		1000	

Important: Exposure to Absolute Maximum Rated conditions for an extended period may severely affect the device reliability, and stress levels exceeding the "Absolute Maximum Ratings" may result in permanent damage.

## Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Power Supply Voltage	$V_{VIN}$	4	85	V
VDD bypass capacitance	$C_{VDD}$	0.047	20	$\mu\text{F}$
Operating Junction Temperature	$T_J$	-40	125	$^{\circ}\text{C}$

## Electrical Characteristics

General test conditions: Free-air, normal operating temperature range,  $V_{SS}=0\text{V}$  (unless otherwise specified).

Symbol	Parameter	Test condition	Min	Typ	Max	Unit
<b>VIN PIN</b>						
VIN	Input Voltage Range		4		85	V
$V_{BR}$	Built-in boot Power tube DS voltage value	VDD pin external voltage 11V; Test VIN pin to ground voltage when current at VIN pin is 100 $\mu\text{A}$	85			V
$I_{VIN\_STDN}$	Start circuit off, VIN pin leakage current	VDD pin external voltage 11V; Test VIN pin output current		20	40	$\mu\text{A}$
$I_{VDD\_STATE}$	Chip working current after start circuit turn-off	VDD pin external voltage 11V; Test VDD pin output current		150		$\mu\text{A}$
$T_{OTP}$	Over temperature protection threshold		150	155	160	$^{\circ}\text{C}$
$T_{OTPH}$	Over temperature protection hysteresis			30		$^{\circ}\text{C}$
<b>VDD PIN</b>						
$V_{VDD\_ON}$	VDD on threshold		7.52	8	8.48	V
$V_{VDD\_OFF}$	VDD off threshold		9.4	10	10.6	V
$I_{VDD1}$	Low input voltage, VDD pin current to bypass capacitance	VIN pin external voltage 4V; Test VDD pin output current with external voltage of 3V at VDD pin	1.85	2.3		mA
$I_{VDD2}$	High input voltage, VDD pin current to bypass capacitance.	VIN pin external voltage 9V; Test VDD pin output current with external voltage of 8V at VDD pin	16	20		mA

## Typical Curves

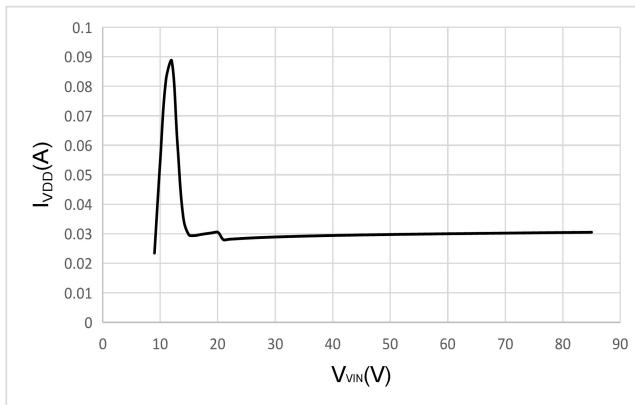


Figure 1 Output Current versus Vin Pin Temperature

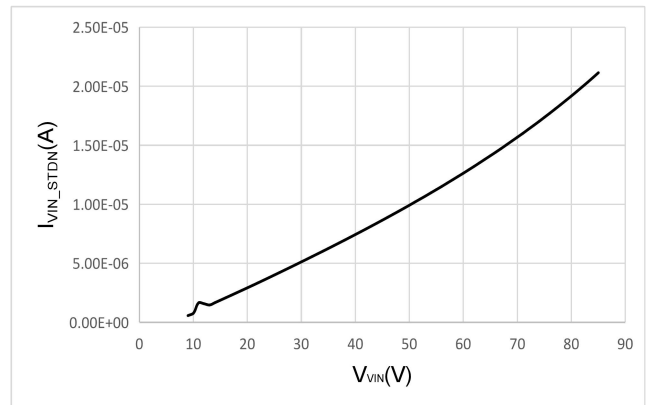


Figure 2 IC Off Current versus Vin Pin Voltage

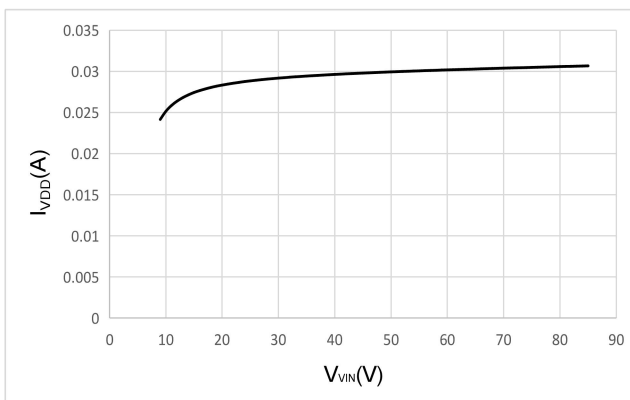


Figure 3 Input current versus Input voltage with VDD = 5V

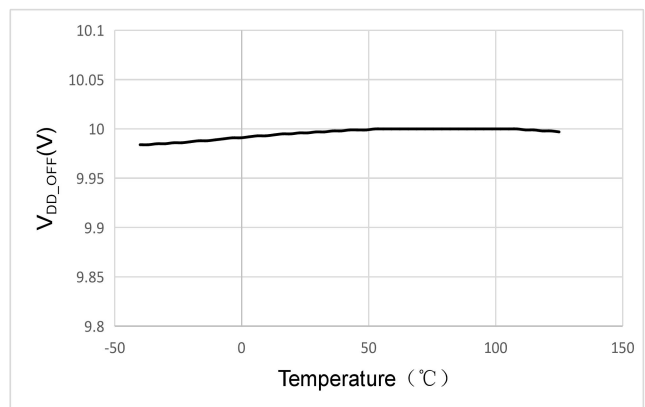


Figure 4 VDD voltage threshold (IC off)

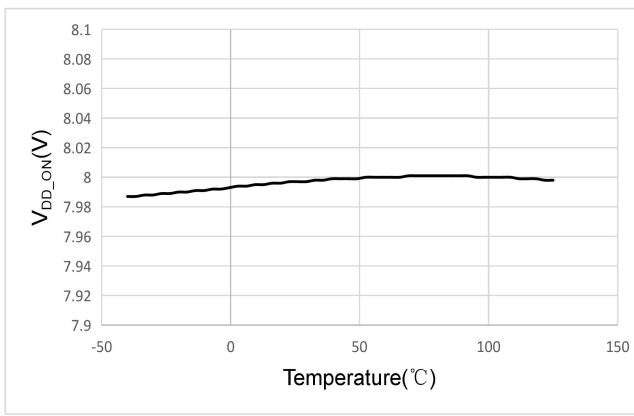


Figure 5 VDD voltage threshold (IC Restart)

## Start-up Sequence

The SCM9603B is powered by the input voltage and charging the start-up bypass capacitor  $C_{VDD}$ . The chip charges the bypass capacitor  $C_{VDD}$  with a low current  $I_{VDD1}$  when  $V_{IN}$  is less than 9V. When the  $V_{IN}$  voltage level gets up to 9V,  $V_{DD}$  reaches 8V and the different voltage between input and output is 1V, it charges the bypass capacitor  $C_{VDD}$  with a high limit current  $I_{VDD1}$ . When  $V_{VDD}$  is greater than 10V, the internal start-up circuit is turned off, the SCM9603B stop being powered, the operating current is less than 150uA. The VDD voltage is equal to the auxiliary voltage  $V_A$ .

## Over Temperature Protection

When the chip detects that the power transistor ambient temperature exceeds 155°C, the chip turns off, disables the start function, stops charging the VDD bypass capacitor, and the chips working current is reduced to a few uA, causing the heat to be gradually dissipated and cooling off the system. Once the chip detects that the power transistor is below the threshold of 125°C, the start-up function of the chip is re-enabled and starts to charge the VDD bypass capacitor with a large charging current.

## Application Circuit

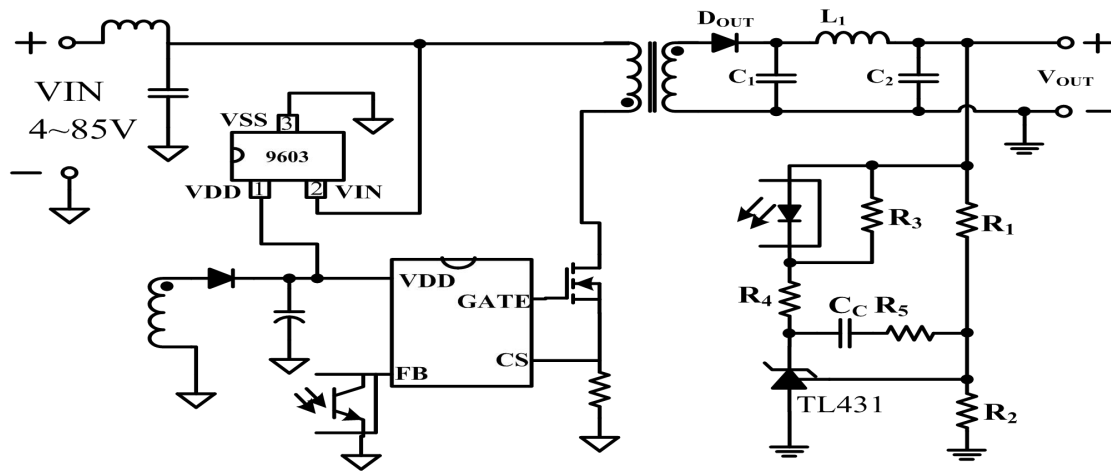


Fig.8 Application Circuit

## Power Supply Recommendations

If there is a voltage spike of more than 85v at the input end, the series resistance between the VIN pin of the 9603B chip and the bus can be used to weaken the voltage peak, and the resistance value can be between 100Ω~2KΩ.

## Ordering Information

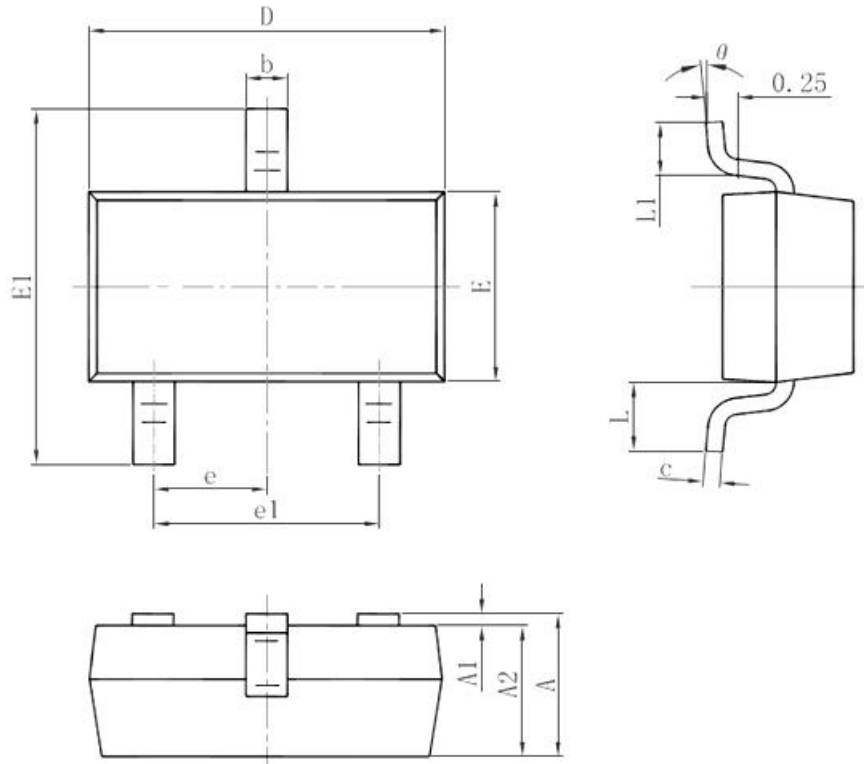
Part number	Package	Number of pins	Product Marking	Tape & Reel
SCM9603BTA	SOT-23	3	9603	3K/REEL

Product marking and date code

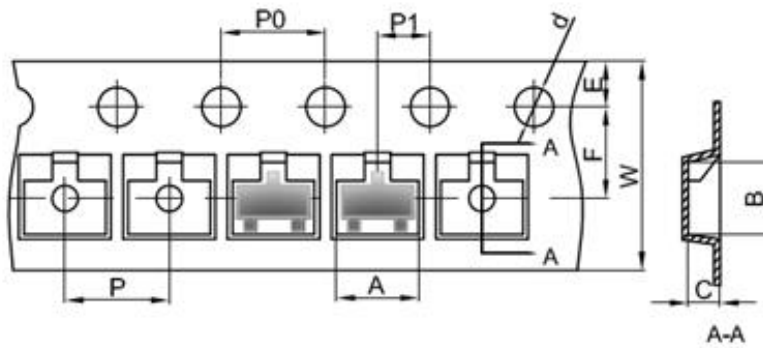
SCM9603XYZ:

- (1) SCM9603 = Product designation.
- (2) X = Version code information (A-Z).
- (3) Y = Packaging definition code; T for SOT package.
- (4) Z = Operating temperature range (C = 0°C to +70°C, I = -40°C to +85°C, A = -40°C to +125°C, M = -55°C to +125°C).

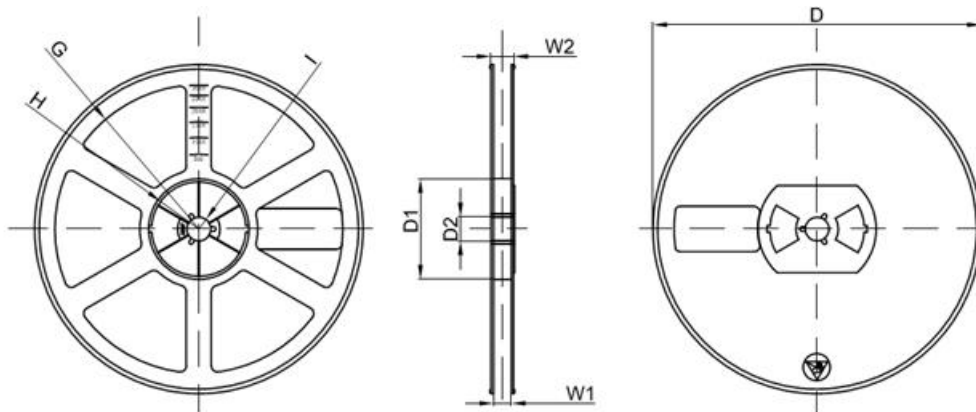
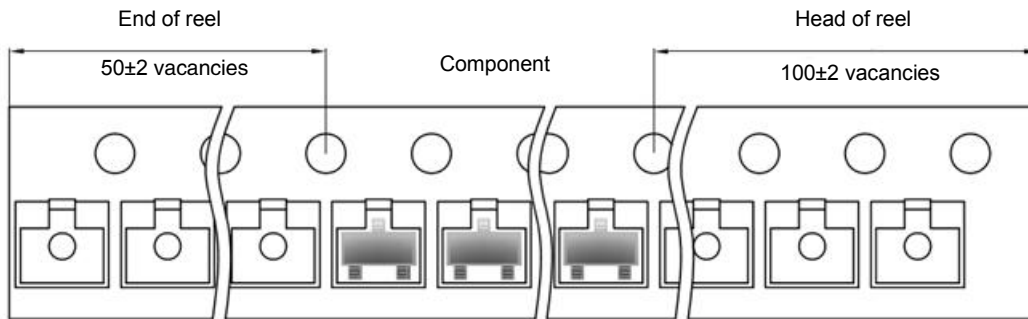
## Package Information (SOT-23)



Mark	SOT-23			
	Dimensions (mm)		Dimensions (inches)	
	Minimum	Maximum	Minimum	Maximum
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.1
e	0.950 Typical value		0.037 Typical value	
e1	1.800	2.000	0.071	0.079
L	0.550 reference value		0.022 reference value	
L1	0.300	0.500	0.012	0.020
$\theta$	0°	8°	0°	8°



Dimensions (mm)									
Mark	A	B	C	d	E	F	P0	P1	W
SOT-23	3.15	2.77	1.22	Φ1.50	1.75	3.50	4.00	2.00	8.00
Tolerance	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+0.3/-0.1



Dimensions (mm)								
Mark	D	D1	D2	G	H	I	W1	W2
7" reel	Φ178.00	54.40	13.00	78.00 (radius)	25.60 (radius)	6.50 (radius)	9.50	12.30
Tolerance	+/-2	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1

On reel	Reel dimensions	In carton	Carton dimensions (mm)	In plate box	Plate box dimensions (mm)
3000PCS	7"	45,000PCS	203*203*195	180,000PCS	438*438*220

## Mornsun Guangzhou Science & Technology Co., Ltd.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Luogang District, Guangzhou, P. R. China

Tel: 86-20-38601850

Fax: 86-20-38601272

E-mail: sales@mornsun.cn