

## SCM9603CTA High Voltage Start-up IC

### Features

- Wide input voltage range,  $4V_{DC}$  to  $100V_{DC}$  with internal 100V LD PMOS
- Small SOT-23 package, benefits a low-cost design
- Output charge current  $>30mA$  at 9V input voltage 8V output voltage
- Output charge current  $>20mA$  at 4V input voltage 3V output voltage
- Adjustable start-up time set by VDD bypass capacitor
- With  $V_{VDD}$  output voltage  $>10.8V$ , starter IC is off ;With  $V_{VDD}$  output voltage  $<8.8V$ , IC restarts

### Package



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

### Applications

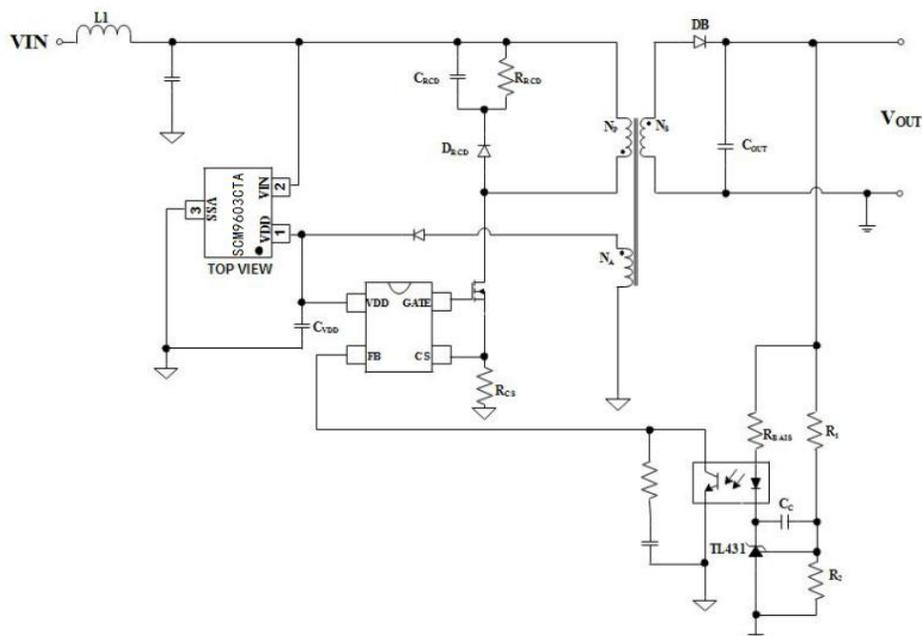
- Wide input range (  $4V_{DC}\sim 100V_{DC}$  ) DC-DC converters

### Functional Description

SCM9603CTA is a high voltage start-up IC, which is suitable for a wide range of voltage input DCDC converter. Chip uses 100V LD PMOS to improve the withstand voltage. In control part, integrated VDD over-voltage protection, VIN over-voltage protection and over-temperature protection functions; When the VDD voltage is greater than 10.8V, chip stops charging the VDD bypass capacitor. At this time, the auxiliary winding supplies power, and the chip working current decreases to 100uA; When the VDD voltage is lower than 8.8V, the start-up chip charges the VDD bypass capacitor again. Under the limiting operating condition ( $V_{IN}=9V$ ,  $V_{DD}=8V$ ), the charging current is still more than 30mA.

SCM9603CTA is packaged in a compact SOT-23-G three-pin package, which reduces the design cost.

### Typical Application Circuit

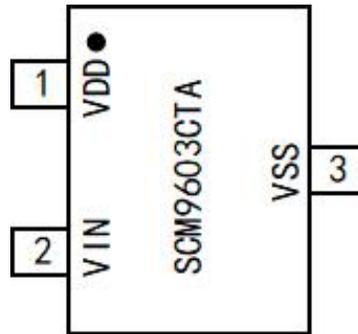


SCM9603CTA typical application circuit

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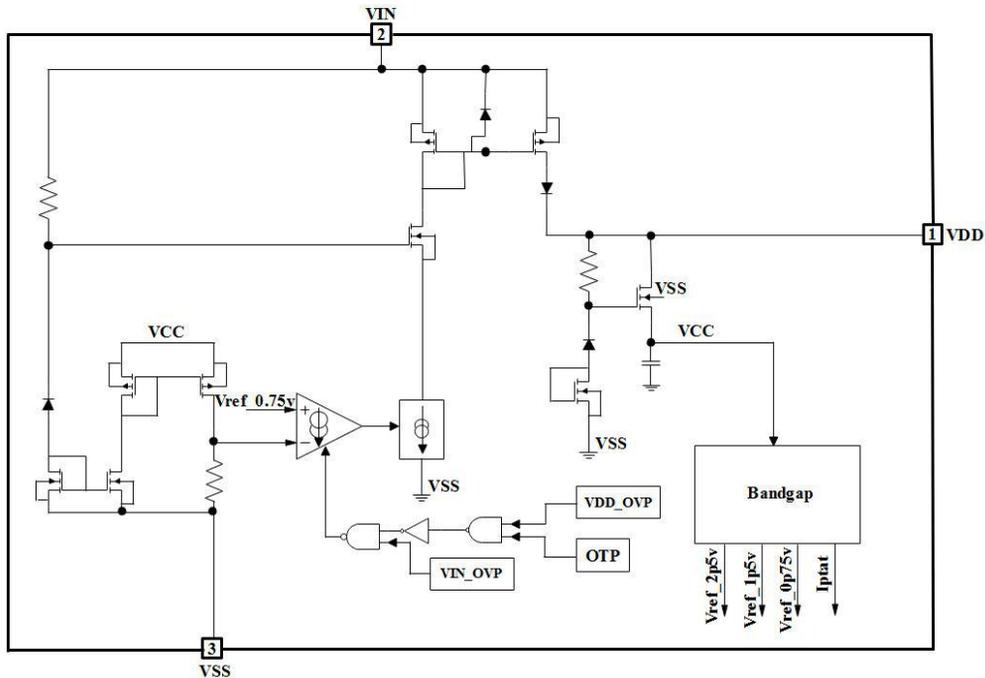
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## Pin Package



SCM9603CTA pin package

## Internal Block Diagram



SCM9603CTA 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	100	V
VIN Pin Voltage	$V_{VDD}$	-0.6	30	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 )		4500	V

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	Typ	Max	Unit
Power Supply Voltage	$V_{VIN}$	4	-	100	V
VDD bypass capacitance	$C_{VDD}$	1	-	20	uF
Operating Junction Temperature	$T_J$	-40	-	125	°C

## Electrical Characteristics

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

Symbol	Parameter	Test condition	Min	Typ	Max	Unit
Chip power supply terminal (VIN PIN)						
VIN	Input Voltage Range		4	-	100	V
$V_{BR}$	Built-in boot Power tube DS voltage value	VDD pin external voltage 13V, Scan VIN=100~125V port voltage : Test VIN pin to ground voltage when current at VIN pin is 500uA	-	100	115	V
$I_{VIN\_STDN}$	Start circuit off , VIN pin leakage current	VDD pin external voltage 13V; Test VIN pin output current			50	μA
$I_{VDD\_STATE}$	Chip working current after start circuit turn-off	VDD pin external voltage 13 V; Test VDD pin output current	80	105	130	μA
$T_{OTP}$	Over temperature protection threshold		-	148	-	°C
$T_{OTPH}$	Over temperature protection hysteresis		-	30	-	°C
Output terminal (VDD PIN)						
$V_{VDD\_ON}$	VDD on threshold		8.0	8.8	9.6	V
$V_{VDD\_OFF}$	VDD off threshold		10.0	10.8	11.6	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	15	23	-	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	25	33	-	mA

## Typical Curves

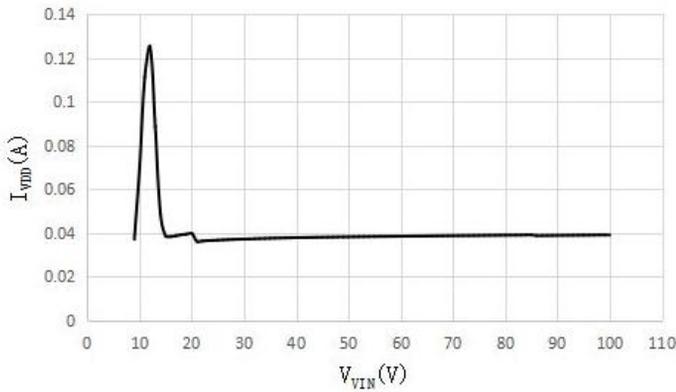


Figure 1 Output Current  $I_{VDD}$  typical curve

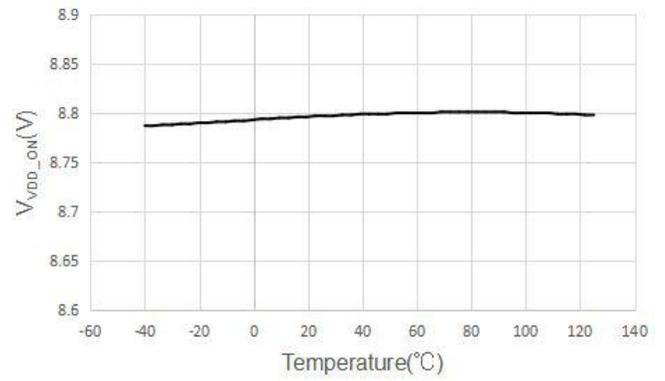


Figure 2 VDD voltage threshold (IC Restart)

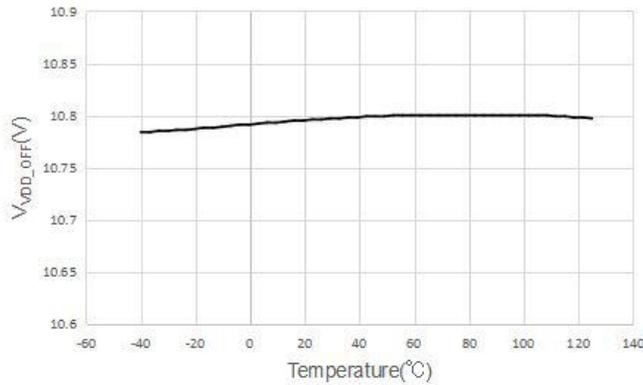


Figure 3 VDD voltage threshold (IC off)

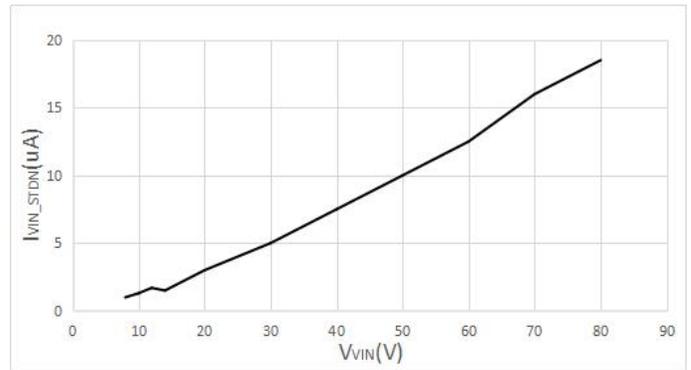


Figure 4 Working current  $I_{VIN}$  versus  $V_{IN}$  voltage (IC off)

## Chip overview

The VIN pin of the SCM9603CTA chip obtains power from the busbar voltage and charges the VDD bypass capacitor  $C_{VDD}$  to start the controller. At the same time, it continuously obtains power from the input voltage for a period of time after the switching power is powered on to maintain the normal operation of the controller and improve the capacitive load capacity of the switching power. When the switching power supply is powered on, when the VIN pin voltage is less than 9V, the starting circuit of SCM9603CTA charges the bypass capacitor  $C_{VDD}$  with current  $I_{VDD1}$ ; When the VIN voltage is greater than or equal to 9V and the VDD pin voltage rises to 8V, SCM9603CTA charges the bypass capacitor  $C_{VDD}$  with  $I_{VDD2}$  current when the input-output pressure difference is 1V. When  $V_{VDD} > 10.8V$ , SCM9603CTA shuts down the start-up circuit and no longer draws power from the input voltage. After SCM9603CTA shuts down, the static working current of the chip is 100uA. The pin voltage of VDD gradually equals the auxiliary winding voltage  $V_A$ .

## Over Temperature Protection

Over-temperature protection: SCM9603CTA supplies the output VDD bypass capacitor  $C_{VDD}$  charging current are dozens of mA when it works, especially in the high voltage input, resulting in a large chip power consumption, the main power device near the heat rise quickly, if do not take any measures, it is easy to overheat caused by power device damage, so the chip internal design over-temperature protection. When the chip detects that the local temperature near the power device exceeds 148 degrees, the chip shuts off the starting part of the circuit and stops charging the VDD bypass capacitor. The working current of the chip decreases to uA level and the heat gradually dissipates. When the chip detects that the temperature near the power device is lower than 118 degrees, the starting part of the chip starts again to charge the VDD bypass capacitor with a high current.

## Power Supply Recommendations

If there is a voltage spike of more than 100V at the input end, the series resistance between the VIN pin of the SCM9603CTA chip and the bus can be used to weaken the voltage peak, and the resistance value can be between 100Ω~2KΩ.

## Ordering Information

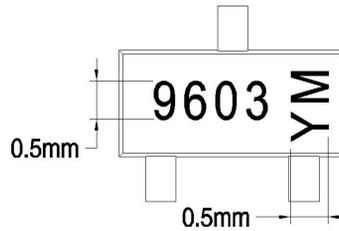
Part number	Package	Number of pins	Product Marking	Tape & Reel
SCM9603CTA	SOT-23-G	3	9603 YM	3K/REEL

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).
- (5) YM: product traceability code; Y production year code, M product production month code.

## Silkscreen information

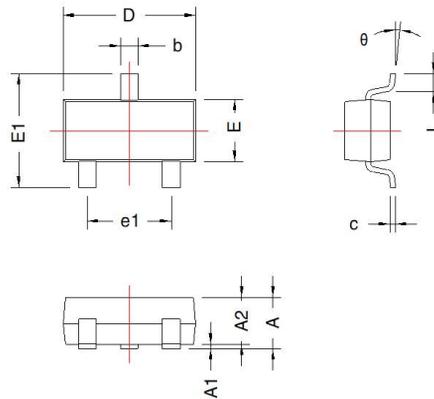


Note:

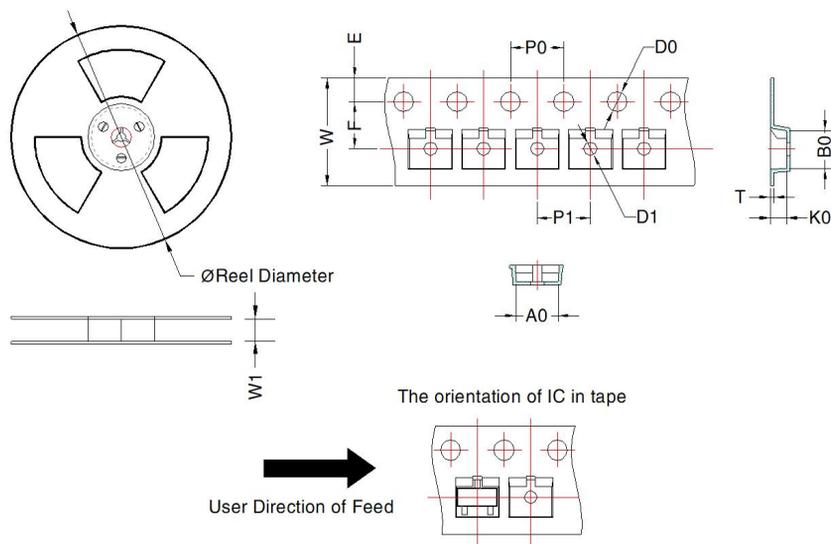
- 1、Typeface: Arial;
- 2、Character size: Height: 0.5mm, Spacing: 0.1mm.

## Package Information (SOT-23-G)

THIRD ANGLE PROJECTION



Mark	Dimension(mm)		Dimension(inch)	
	Min	Max	Min	Max
	A	1.15 Max		0.045 Max
A1	0.00	0.10	0.000	0.004
A2	0.90	1.10	0.035	0.043
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
E1	2.25	2.55	0.089	0.100
L	0.30	0.50	0.012	0.020
b	0.30	0.50	0.012	0.020
e1	1.80	2.00	0.071	0.079
c	0.132	0.202	0.005	0.008
θ	0°	8°	0°	8°



Device	Package Type	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	T (mm)	W (mm)	E (mm)	F (mm)	P1 (mm)	P0 (mm)	D0 (mm)	D1 (mm)
SCM9603CTA	SOT-23-G	3000	180.0	8.5	3.15 ± 0.1	2.77 ± 0.1	1.22 ± 0.1	0.25 ± 0.03	8.0 ± 0.3	1.75 ± 0.1	3.5 ± 0.1	4 ± 0.1	4 ± 0.1	1.5 ± 0.1	1.0 ± 0.1

Note: The minimum order quantity is the minimum packing quantity. The order quantity should be an integer multiple of MPQ.

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