

48V Input Withstanding Voltage Overvoltage Protection Chip

1 Features

- Input overvoltage protection voltage 6.1V
- Input overvoltage protection shutdown time 100ns
- 48V input withstand voltage
- Integrated short-circuit protection
- Integrated over-temperature protection
- Package: SOT23-3 and SOT23-3M

2 Typical Applications

- Low-power handheld devices
- Portable devices such as cell phones, tablets, etc.

3 Description

The IP2613 is an integrated IC with input overvoltage protection.

The IP2613 has an input withstand voltage of 48V; when an input voltage greater than the OVP protection threshold is detected, it can quickly shut down the internal integrated power tubes, preventing the input high voltage from damaging the devices on the output

The IP2613 has integrated over-temperature protection, which also shuts down the power tube outputs when the internal temperature of the chip is detected to be too high.

The IP2613 has integrated short circuit protection and will hiccup and restart when an output short circuit is detected

4 Simplify the application schematic

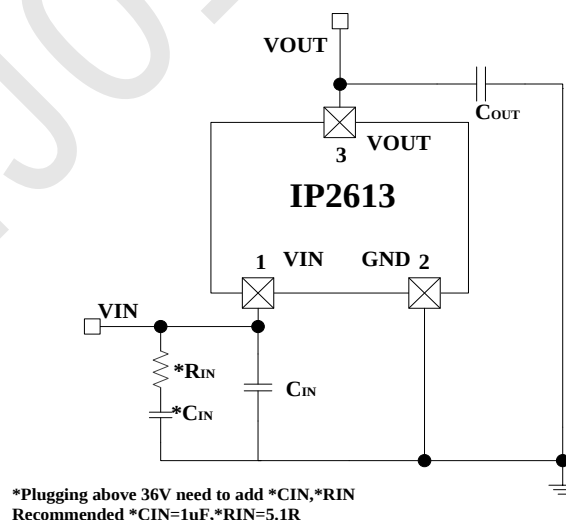


Figure 1 IP2613 Simplify the application schematic

Directory

1	FEATURES	1
2	TYPICAL APPLICATIONS.....	1
3	DESCRIPTION	1
4	SIMPLIFY THE APPLICATION SCHEMATIC.....	1
5	MODIFY RECORDS	3
6	MODEL DESCRIPTION	4
7	PIN DESCRIPTION.....	4
	7.1 PIN Description	4
8	FUNCTIONAL BLOCK DIAGRAM	5
9	LIMIT PARAMETERS	5
10	RECOMMENDED OPERATING CONDITIONS.....	6
11	ELECTRICAL CHARACTERISTICS.....	6
12	FUNCTION DESCRIPTION	7
	12.1 Input overvoltage protection.....	7
	12.2 Output short circuit protection.....	7
	12.3 Over-temperature protection.....	7
	12.4 Application curves	8
	12.5 Temperature Characterization Curve	10
13	TYPICAL APPLICATION SCHEMATIC.....	11
14	BOM.....	11
15	SILKSCREEN	12
16	PACKAGE.....	13
17	IMPORTANT NOTICE	15

5 Modify records

NOTE: The page numbers of the previous version may differ from the page numbers of the current version.

Initial release version V1.00 (2024.3)

Changed Version V1.00 to Version V1.01 (2024.9)

Page

-
- Modify Maximum continuous current6
-

6 Model Description

Model Name	Description
IP2613	Standard model (6.1V overvoltage protection)
IP2613M	Changed to SOT23-3M package

7 PIN Description

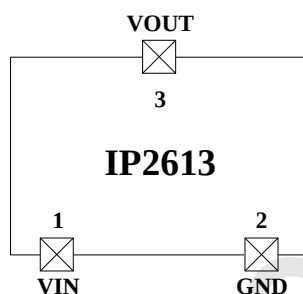


Figure 2 Pin of IP2613

7.1 PIN Description

Pin Num	Pin Name	Pin Description
1	VIN	Input Pins
2	GND	power ground
3	VOUT	output pin

8 Functional Block Diagram

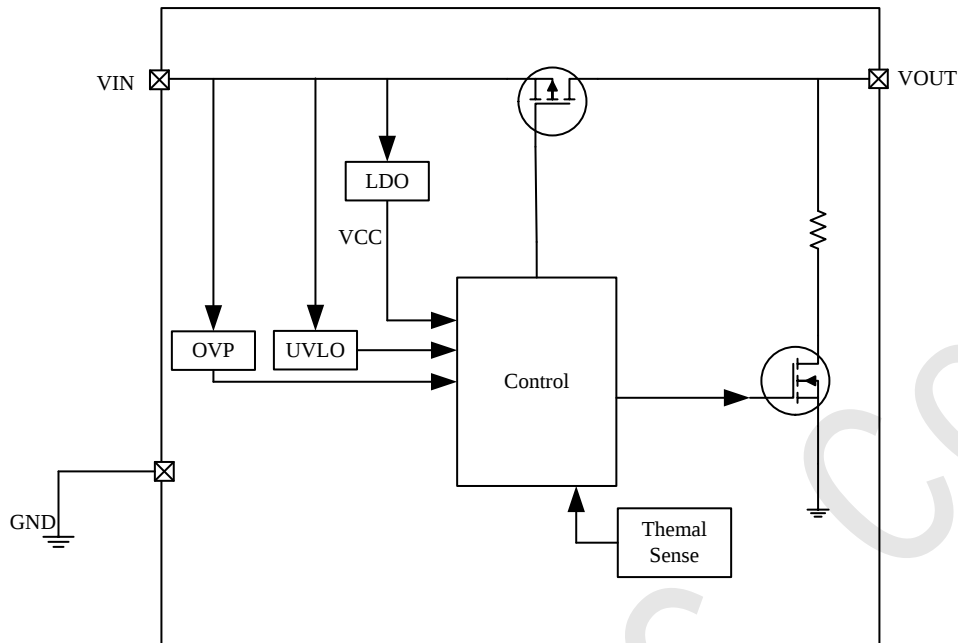


Figure 3 IP2613 Functional Block Diagram

9 Limit parameters

Parameters	Symbol	Value	Unit
VIN Voltage Range	V_{IN}	-0.3 ~ 48	V
VOUT Voltage Range	V_{OUT}	-0.3 ~ 20	V
Junction Temperature Range	T_J	-40 ~ 150	°C
Storage Temperature Range	T_{stg}	-65 ~ 150	°C
Junction Temperature(junction to ambient)	θ_{JA}	220	°C/W
Human Body Model (HBM)	ESD	4	KV

*Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to Absolute Maximum Rated conditions for extended periods may affect device reliability.

10 Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}	3.5	5	48	V
Maximum continuous current	I_{OUT}		1	1.2	A

*Devices' performance cannot be guaranteed when working beyond those Recommended Operating Conditions

11 Electrical Characteristics

Unless otherwise specified, $T_A=25^{\circ}\text{C}$, $V_{IN}=5\text{V}$

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage						
startup time	T_{DE}	VIN rises from 0V to 5V in 1 μs		10		ms
Power-on quiescent current	I_{DD}	VIN=5V, no load on outputs		600		μA
on-resistance	$R_{DS(on)}$	VIN=5V, $I_{OUT}=0.5\text{A}$		350		m Ω
Minimum Operating Voltage	V_{UVLO}	VIN rises from 0V to 4V		3.2		V
Input overvoltage protection						
VIN overvoltage threshold	V_{OVP}	VIN rises from 5V to 7V	5.9	6.1	6.3	V
VIN overvoltage hysteresis	V_{OVP_HYS}	VIN drops from 7V to 5V		150		mV
VIN overvoltage response time	$t_{PD(OVP)}$			100	300	ns
OVP recovery time	$t_{REC(OVP)}$			100		ms
Output short circuit protection						
Short circuit protection threshold	V_{SCP}	VIN-VOUT>1V		1		V
Short circuit protection response time	T_{SC}			400		μs
Short circuit protection recovery time	$T_{REC(SCP)}$			100		ms

Thermal shutdown temperature	T_{OTP}	rising temperature	130	140	150	°C
Thermal shutdown temperature hysteresis	ΔT_{OTP}		30	40	50	°C

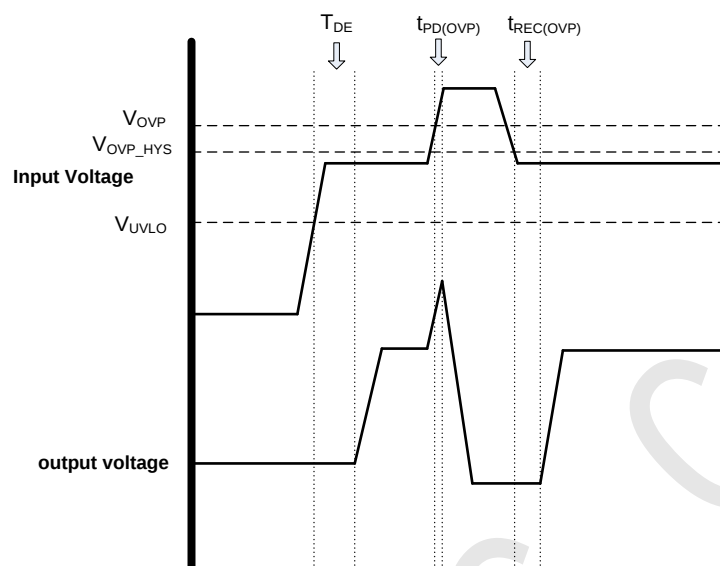


Figure 4 timing chart

12 Function Description

12.1 Input overvoltage protection

When the input voltage exceeds the set V_{OVP} , then the internal power tubes will turn off within 100ns, turning off the output. When the input voltage drops to V_{OVP_HYS} , it will turn the output back on.

12.2 Output short circuit protection

When a short circuit exists in the output, the IP2613 enters a protection state, hiccups and restarts with a restart period of 100ms, turning the output on for 360us each time, until the output short circuit state is undone.

12.3 Over-temperature protection

When the chip junction temperature is detected to be greater than 140 degrees, it will enter the over-temperature protection state, turn off the internal power tubes and stop the output. When the chip junction temperature is less than 100 degrees, it will turn on the output again.

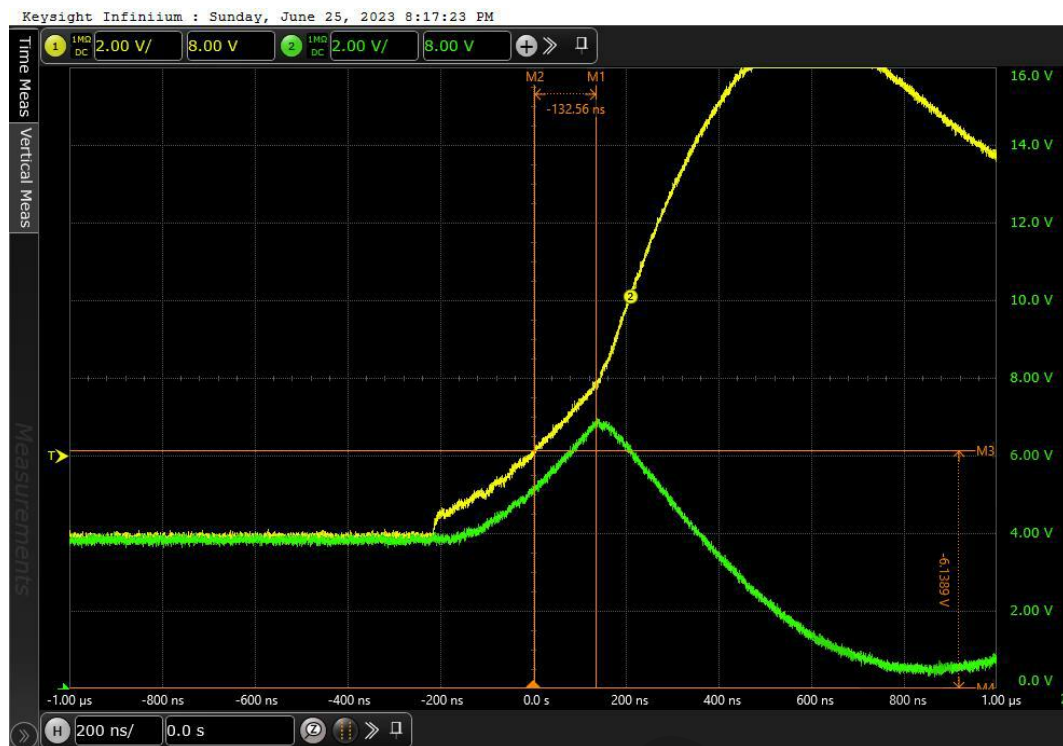


Figure 7 VIN overvoltage recovery (VIN=15V-5V)



Figure 8 Short circuit hiccup reboot

12.5 Temperature Characterization Curve

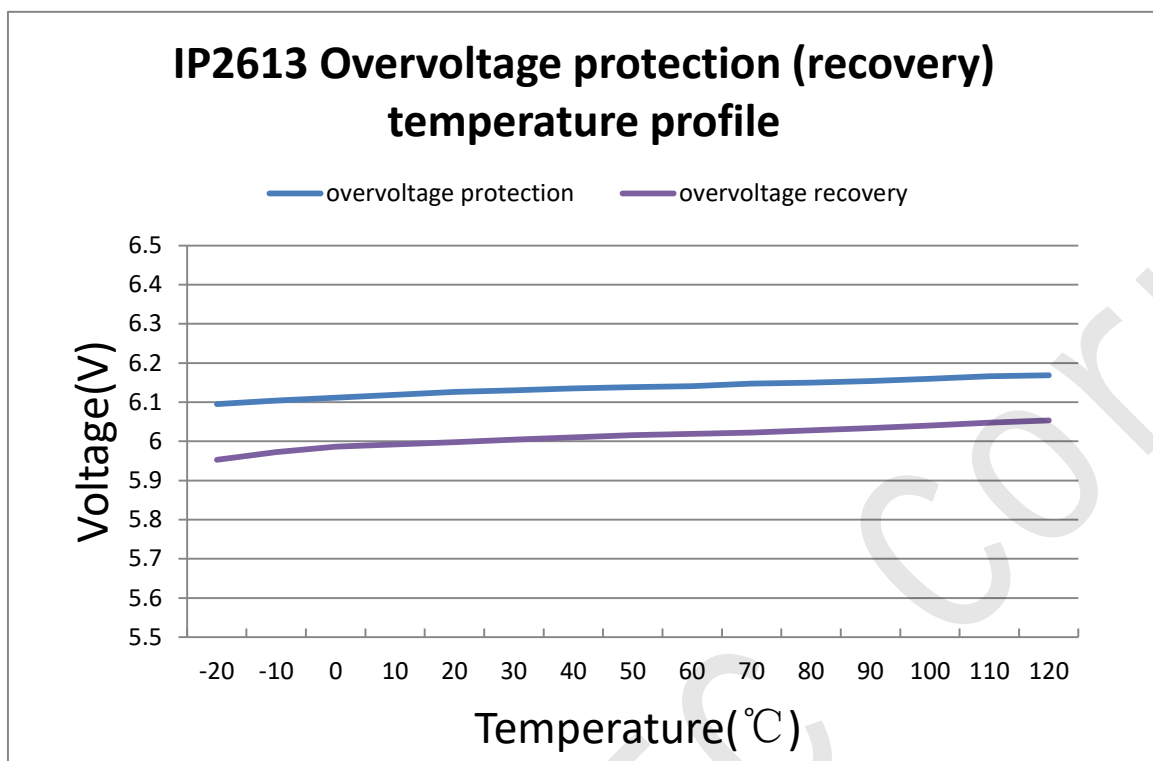


Figure 9 Overvoltage protection (recovery) temperature profile

13 Typical Application Schematic

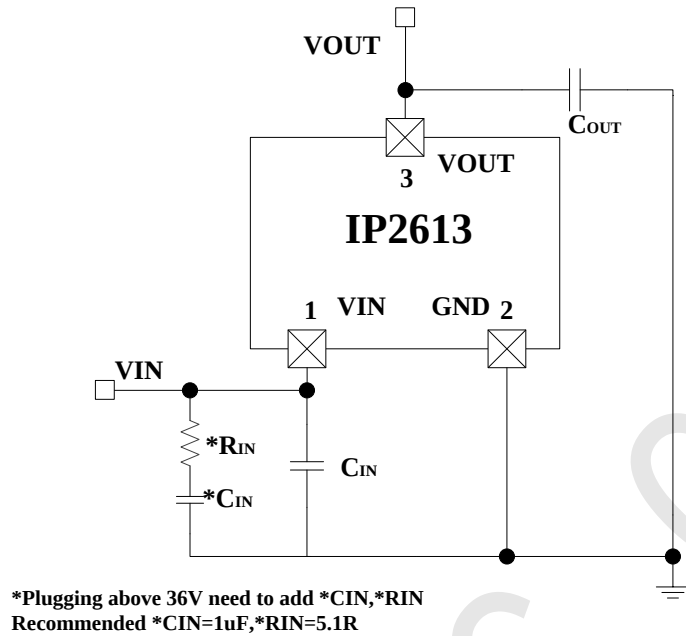


Figure 10 Typical Application Schematic

14 BOM

No.	Part Name	Type & Specification	Units	Quantity	Location	Note
1	IC	IP2613	PCS	1	U1	
2	SMD capacitors	0603 104 50V 10%	PCS	2	C_{IN}, C_{OUT}	
3	SMD capacitors	0603 1uF 50V 10%	PCS	1	$*C_{IN}$	
4	SMD resistors	0603 5.1Ω	PCS	1	$*R_{IN}$	

15 Silkscreen



Instruction:

- 1、2613 --Product name
- 2、XXXX --Product number
- 3、○ --PIN1 Position

Figure 11 IP2613 Chip Silkscreen Description

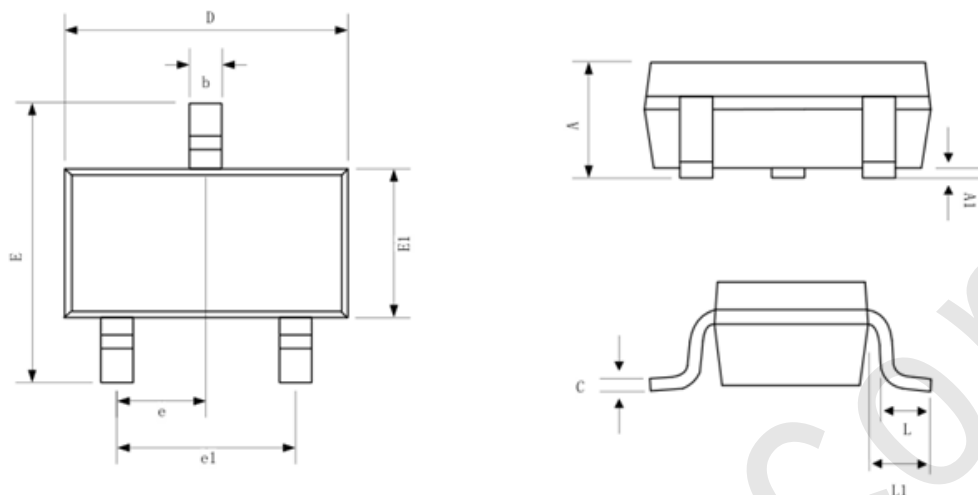


Instruction:

- 1、2613M --Product name
- 2、XL --Product number
- 4、○ --PIN1 Position

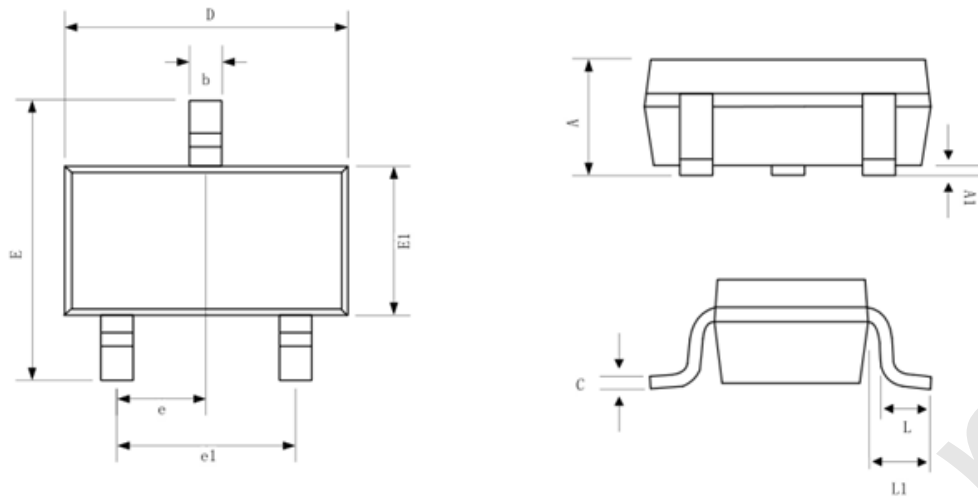
Figure 12 IP2613M Chip Silkscreen Description

16 Package



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.000	--	1.250
A1	0.000	0.050	0.100
b	0.300	0.400	0.500
c	0.100	0.150	0.200
D	2.800	2.900	3.000
E	2.600	2.800	3.000
E1	1.500	1.600	1.700
e	0.950BSC		
e1	1.900BSC		
L	0.400	0.500	0.600
L1	0.600REF		

Figure 13 IP2613 SOT23-3 Package Dimensions



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.890	--	1.120
A1	0.000	0.050	0.100
b	0.300	0.040	0.500
c	0.008	0.012	0.160
D	2.800	2.900	3.000
E	2.370	2.500	2.630
E1	1.200	1.300	1.400
e	0.950BSC		
e1	1.900BSC		
L	0.400	0.500	0.600
L1	0.600REF		

Figure 14 IP2613 SOT23-3M Package Dimensions

17 IMPORTANT NOTICE

INJOINIC TECHNOLOGY and its subsidiaries reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to INJOINIC TECHNOLOGY's terms and conditions of sale supplied at the time of order acknowledgment.

INJOINIC TECHNOLOGY assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using INJOINIC TECHNOLOGY's components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of INJOINIC TECHNOLOGY's components in its applications, notwithstanding any applications-related information or support that may be provided by INJOINIC TECHNOLOGY. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify INJOINIC TECHNOLOGY and its representatives against any damages arising out of the use of any INJOINIC TECHNOLOGY's components in safety-critical applications.

Reproduction of significant portions of INJOINIC TECHNOLOGY's information in INJOINIC TECHNOLOGY's data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. INJOINIC TECHNOLOGY is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

INJOINIC TECHNOLOGY will update this document from time to time. The actual parameters of the product may vary due to different models or other items. This document voids all express and any implied warranties.

Resale of INJOINIC TECHNOLOGY's components or services with statements different from or beyond the parameters stated by INJOINIC TECHNOLOGY for that component or service voids all express and any implied warranties for the associated INJOINIC TECHNOLOGY's component or service and is an unfair and deceptive business practice. INJOINIC TECHNOLOGY is not responsible or liable for any such statements.