36V Over-Voltage-Protector with 34mohm On Resistance

DESCRIPTION

HM9707 is a low side Over-Voltage-Protection (OVP) IC with only 34mohm switch resistance. It employs a low side protection topology which ensure a very low on resistance together with a high protection voltage.

HM9707 is consist of a voltage comparator, a switch driver and a 34mohm power NMOS.

HM9707 is available in both SOT23-6 and DFN2x2-6 package.

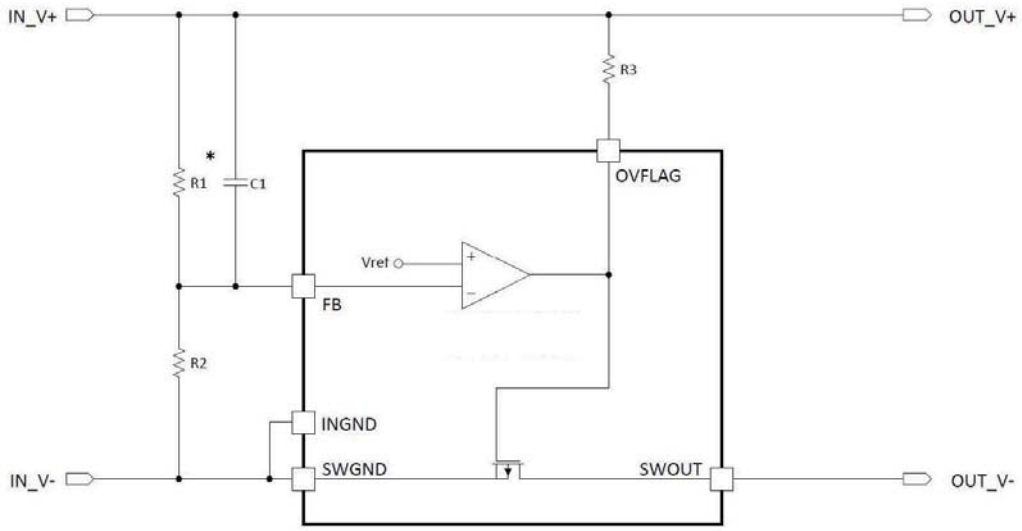
FEATURES

- Over voltage protection up to 36V
- 34mohm switch resistance
- Protection voltage adjustable
- Switch on speed adjustable

APPLICATIONS

- Tablet, MID
- Smart Phone
- Car camera
- Power bank

TYPICAL APPLICATION

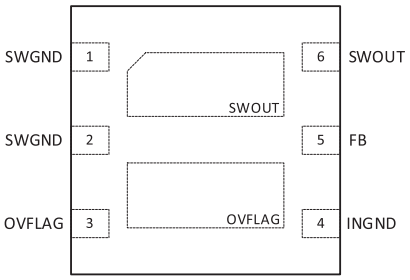


** R1 can be replaced by a Zener Diode*

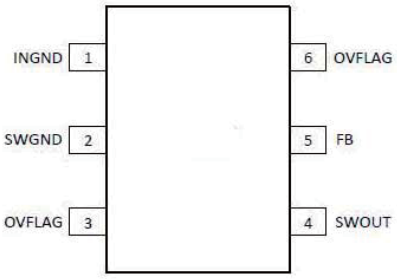
ORDERING INFORMATION

PART No.	PACKAGE	TOP MARK	Pcs/Reel
HM9707	SOT23-6	D5$\overline{YW}$	3000
HM9707	SOT23-6	D3$\overline{YW}$	3000

PIN CONFIGURATION



DFN2x2-6



SOT23-6

ABSOLUTE MAXIMUM RATINGS

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

FB Pin .....–0.3V to 0.7V, internally clamped
OVFLAG Pin 12V
SWOUT Pin 36V
Operating Temperature Range .....–40°C to 85°
Storage Temperature Range .....–55°C to 150°C

Thermal Resistance	θ JC	θ JA	
DFN2x2-6	45	165	°C /W
SOT23-6	65	195	°C /W

Lead Temperature (Soldering, 10sec) .....260°C
ESD HBM (Human Body Mode) 2KV
ESD MM (Machine Mode) 200V

PIN DESCRIPTION

DFN2x2-6 PIN #	SOT23-6 PIN #	NAME	DESCRIPTION
1, 2	2	SWGND	The power ground
3	3, 6	OVFLAG	Connecting a resistor to VIN, turns low when protection triggered
4	1	INGND	The analog ground
5	5	FB	Reference voltage pin for setting OVP trigger voltage
6	4	SWOUT	The output terminal

DC ELECTRICAL CHACRACTERISTICS

(V_{IN} = 5V, unless otherwise specified. Typical values are at TA = 25°C.)

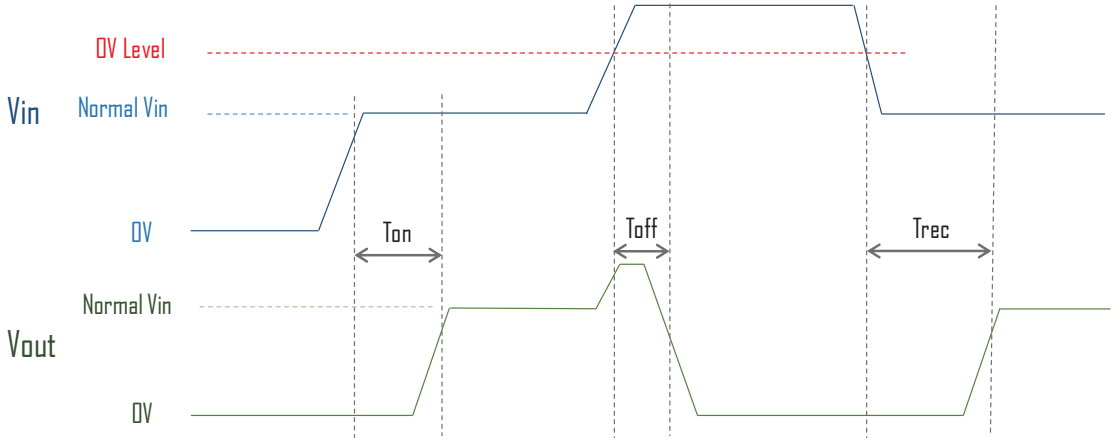
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
FB voltage (Vfb)	R1 =9.1K, R2=820ohm OV level = (R1+R2)/R2 * Vfb	0.45	0.5	0.55	V
Switch Rdson	Vin=5V		34	40	mΩ
Switch Current	Vin=5V, Current from SWOUT to SWGND			4	A
SWOUT Leakage	Vswout = 36V, under OV protection condition		0.1	1	mA

AC ELECTRICAL CHACRACTERISTICS

(V_{IN} = 5V, unless otherwise specified. Typical values are at TA = 25oC.)

It is very crucial for an over-voltage-protection IC to turn off the switch as soon as possible after detecting a input voltage surge that trigger the protection level. C1 is to adjust the dection and protection speed and R3 is to set the turn on speed of the protection switch.

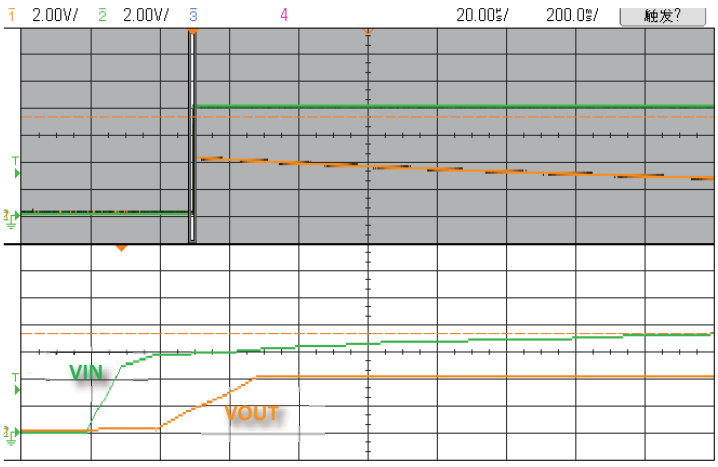
Turn on delay time (Ton), protection delay time (Toff) and output recovery time after voltage drop within Over-Voltage (OV) level (Trec) are defined as followings.



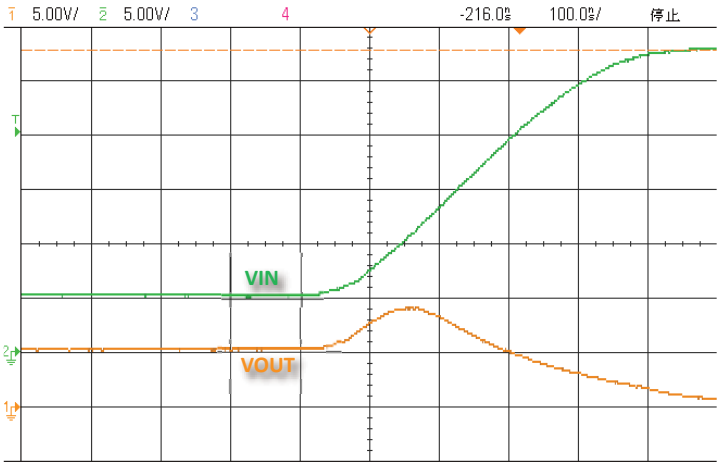
Ton : the time from 90% Vin at VIN termianl to 90% Vin at VOUT terminal
Toff: the time from OV level triggered at VIN terminal to voltage drop to 80% Vin at VOUT terminal
Trec: the time from voltage drop back to OV level at VIN terminal to voltage rise back to 90% Vin at VOUT terminal

By choosing R1=9.1K, R2=680ohm, we can set the over-voltage level at 7.2V. R3 is normally chosen to be 100K. And C1 is 1nF for a good OVP transient response. And followings are the response characteristics.

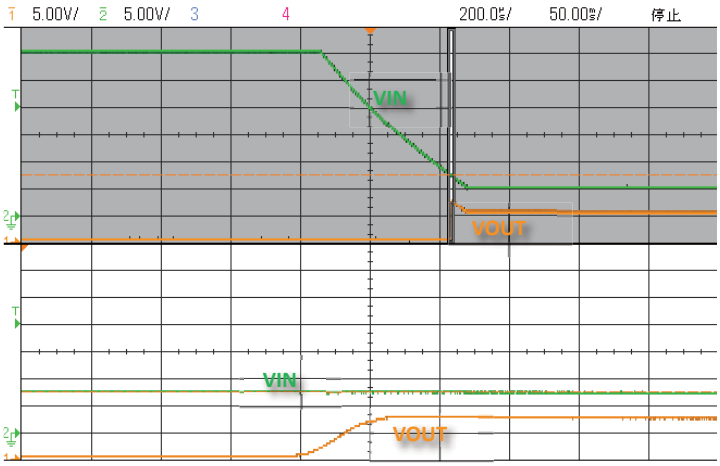
Turn on delay time
Ton = 40us



Turn off (protection) delay time
Vin step from 5V to 27V
Toff = 0.10us



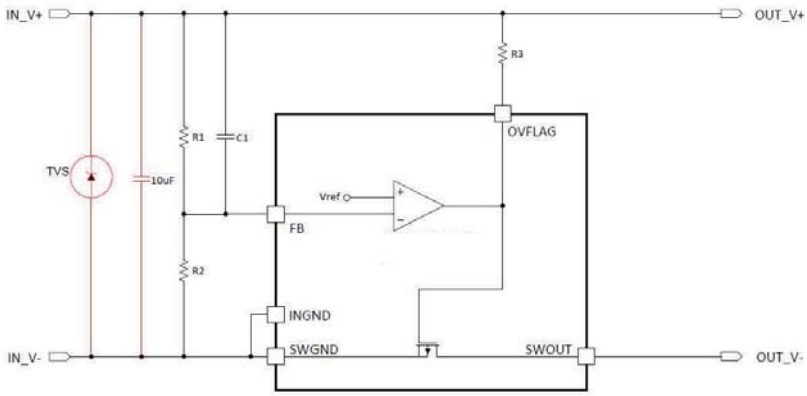
Recovery delay time
Vin drop from 30V to 5V
Trec = 250us



APPLICATION INFORMATION

Typical circuit for cellphone/tablet application

HM9707 is ideal for input surge voltage protection, especially for cellphone and tablet application which is required to pass a 300-500V voltage surge test. With HM9707's high voltage protection ability, one can use a normal low cost TVS and a 10uF to keep input surge voltage with 36V.



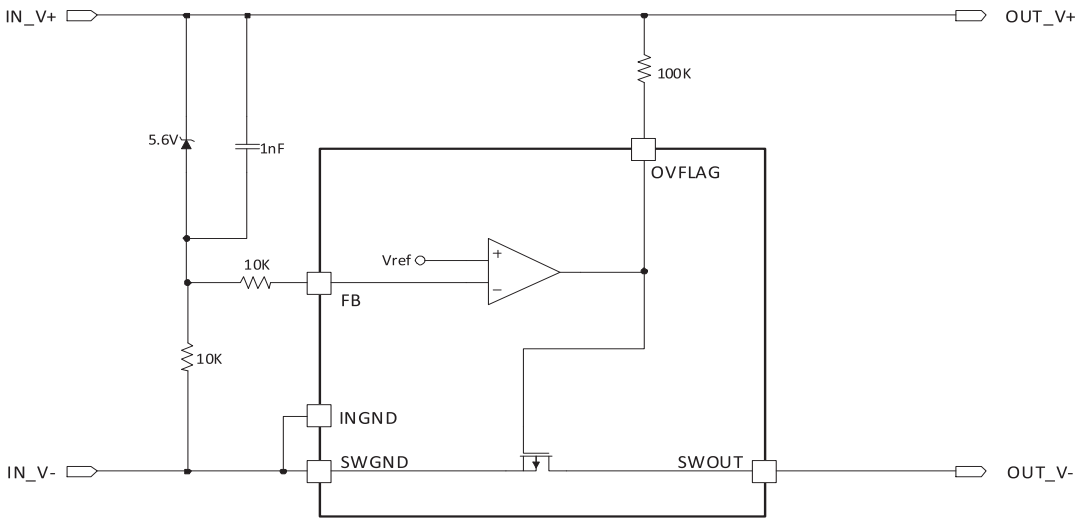
The circuit on the left shows the details

Application with OVP level defined by Zener Diode

When a low and accurate OVP level is needed, for instance, 6.1V OVP for some input voltage sensitive system, a small and cheap zener diode is suggested to replace the R1 in the typical application circuit.

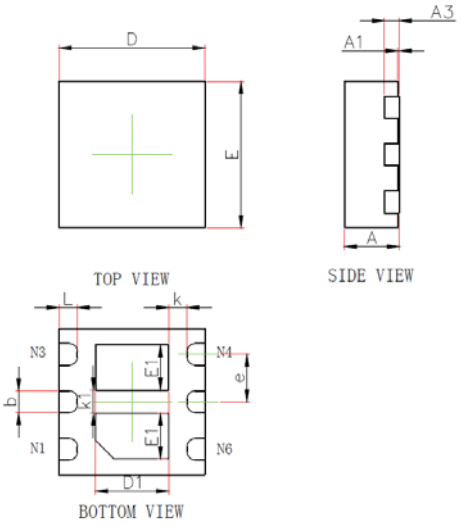
The OVP level then becomes the Vzener + Vfb, and if a 5.6V zener diode is used, then the OVP level is 5.6V+0.5V=6.1V. Such OVP level will have a very good temperature coefficient.

A typical and proven circuit with such zener diode is shown below, and suggested for any system with an OVP slightly above 6V.



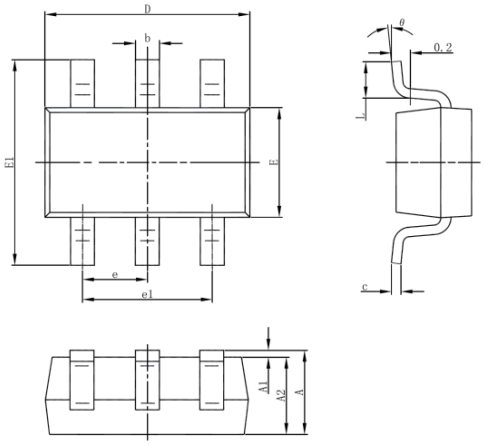
PACKAGE OUTLINE

Package: DFN2x2-6



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN.	MAX.	MIN.	MAX.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	1.900	2.100	0.075	0.083
E	1.900	2.100	0.075	0.083
D1	0.900	1.100	0.035	0.043
E1	0.520	0.720	0.020	0.028
b	0.250	0.350	0.010	0.014
e	0.650TYP.		0.026TYP.	
k	0.200MIN.		0.008MIN.	
k1	0.320REF		0.013REF.	
L	0.200	0.300	0.008	0.012

Package: SOT23-6



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°