Over Voltage and Over Current Protection IC

General Description

ET9612Y is an Over-Voltage-Protection (OVP) and Over-Current-Protection (OCP) device. It can disconnect IN to OUT to protect load in case wrong input operating conditions are detected. The system is positive over-voltage protected up to 36V. The internal over-voltage thresholds (OVLO) is 6.1V and internal over-current thresholds (OCP) is 1.1A. ET9612Y also has internal over temperature protect(OTP) function and it can monitor chip temperature to protect the device.

The device is packaged in advanced full-Green DFN4 package .

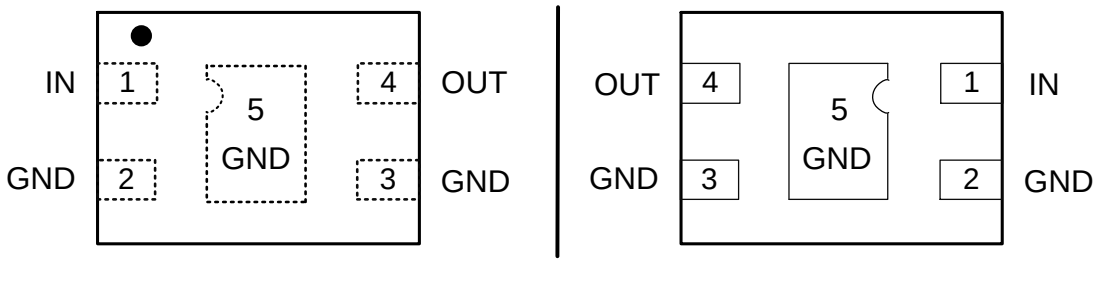
Features

- Typical R_{ON} is100mΩ N-Channel MOSFET @5V/1A
- V_{IN} Operating Range: 2.5V to 36V
- Internal Over-voltage Lockout : 6.1V
- Internal Over-current Lockout : 1.1A (TYP.)
- Over-voltage-Protection Response Time：<300ns
- Startup Debounce Time: 16ms (TYP).
- Typical Output Power on Time: 16.5ms (TYP).
- Internal Thermal-Shutdown Protection
- All pins ESD Protected: Human Body Model (JESD22-A114) ± 2KV Pass
- DFN4 (1.2 × 1.6) package

Application

- GPS and Navigation Equipment
- Portable Media Devices, Laptop & MID
- SLR Digital Cameras
- Industrial Handheld and Enterprise Equipment

Pin Configuration

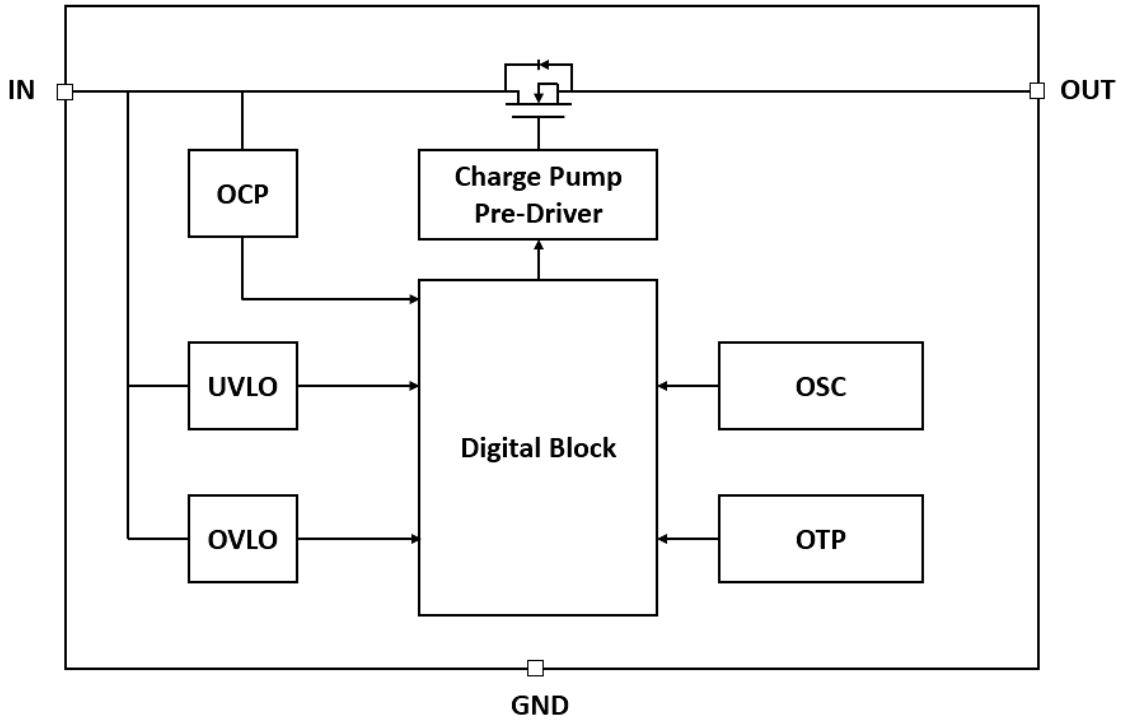


Top View Bottom View

Pin Function

Pin No.	Name	Description
1	IN	Input Voltage.
2、3、5	GND	Ground. Connect GND pins together for proper operation.
4	OUT	Load Output.

Block Diagram



Functional Description

The OVP switch with over-voltage protection feature a low 100mΩ (typical) on-resistance(R_{ON}) internal FET and protect low-voltage systems against voltage faults up to 36V_{DC}. The internal over-voltage thresholds (OVLO) is 6.1V and internal over-current thresholds (OCP) is 1.1A.

The internal FET turns off when the junction temperature exceeds +155 ºC (TYP). The device exits thermal shutdown after the junction temperature cools by 20 ºC (TYP.).

Input Capacitor

To limit the voltage drop on the input supply caused by transient inrush current when the switch turns on into a discharged load capacitor or short-circuit, a capacitor 1uF or lager must be placed between the IN and GND pins.

Output Capacitor

A 1uF or lager capacitor should be placed between the OUT and GND pins.

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameters	Min	Max	Unit
V_{IN}	IN to GND	-0.3	36	V
V_{OUT}	OUT to GND	-0.3	28	V
I_{SW1}	Maximum Continuous Current of switch IN-OUT		1.5	A
I_{SW2}	Maximum Peak Current of switch IN-OUT(10ms)		2.5	A
P_D	Power Dissipation at T_A= +70℃		1.0	W
T_{STG}	Storage Junction Temperature	-65	+150	ºC
T_A	Operating Temperature Range	-40	+85	ºC
T_{SOLD}	Soldering Temperature (reflow).		+260	ºC
T_J	Junction Temperature		+150	ºC

Electrical Characteristics

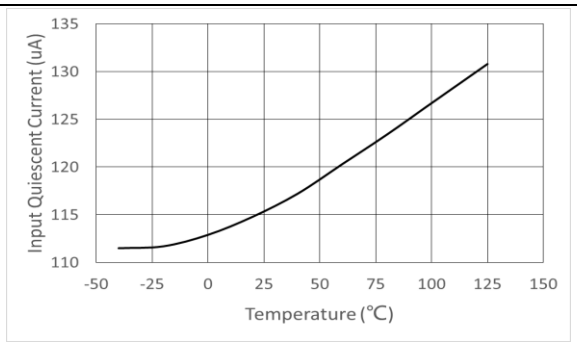
Unless otherwise noted, typical values are at V_{IN}=5V and T_A=25℃.

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
Basic Operation						
V_{IN}	Input Voltage		2.5		36	V
I_{IN}	V_{IN} Quiescent Current	V_{IN}=5V, OUT floating		110		μA
R_{ON}	On-Resistance of Switch IN-OUT	V_{IN}=5.0V, I_{OUT}=1A		100		mΩ
R_{DIS}	Output Discharge Resistance			4.0		KΩ
V_{OVLO}	Over-voltage protect of V_{IN}	V_{IN} rise up	5.9	6.1	6.3	V
V_{OVLO_HYS}	Over-voltage Protect Hysteresis of V_{IN}			0.25		V
V_{UVLO_R}	Under Voltage Lockout Threshold	V_{IN} Rising		2.2		V
Input Over						
t_{DEB}	Debounce Time	Time from 2.1V<V_{IN}< V_{OVLO} to V_{OUT}=10% of V_{IN}		16		ms
t_{ON}	Switch Turn-On Time	R_L=100Ω, C_L=22uF, V_{OUT} from 0.1×V_{IN} to 0.9×V_{IN}		0.5		ms
t_{ON_ALL}	Output power-on Time	Time from 2.1V<V_{IN}< V_{OVLO} to V_{OUT}=90% of V_{IN}		16.5		ms
t_{OFF_RES}(1)	Switch turn-off response time	V_{IN} > V_{OVLO} to V_{OUT} stop rising		150	300	ns
Dynamic Characteristics: see figure						
I_{OCP}	Over current protect		0.75	1.1	1.5	A
I_{SHORT}	Short current protect			180		mA
t_{OCP}	OCP debounce time			30		ms
T_{REC_OCP}	OCP recovery time			1		s
Over Temperature Protection（OTP）						
T_{SHDN}	Thermal Shutdown			155		ºC
T_{HYS}	Thermal-shutdown Hysteresis			20		ºC

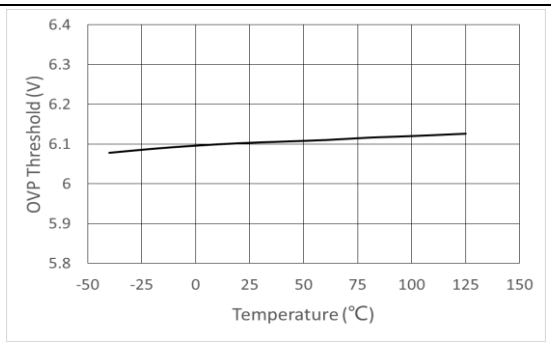
Note：

1、Guaranteed by characterization and design.

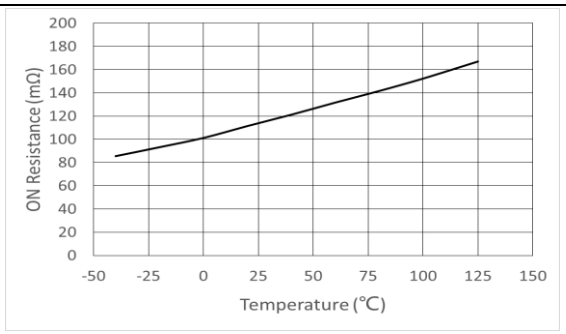
Typical Characteristics



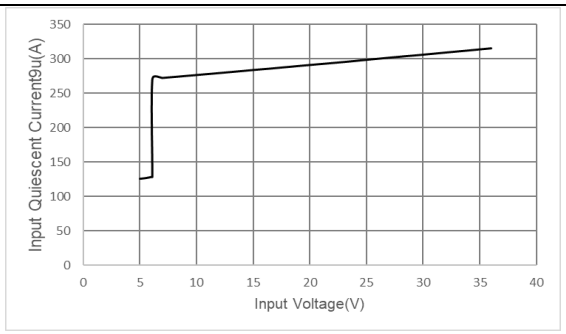
Input Quiescent Current vs.Temperature



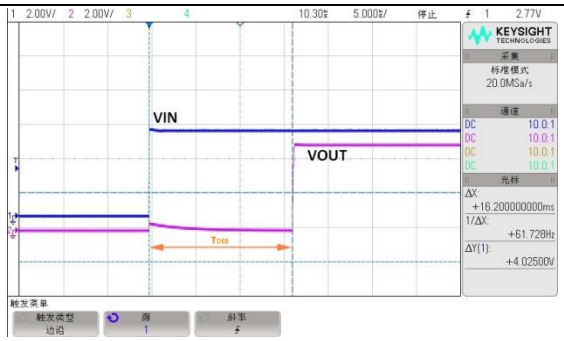
OVP threshold vs. Temperature



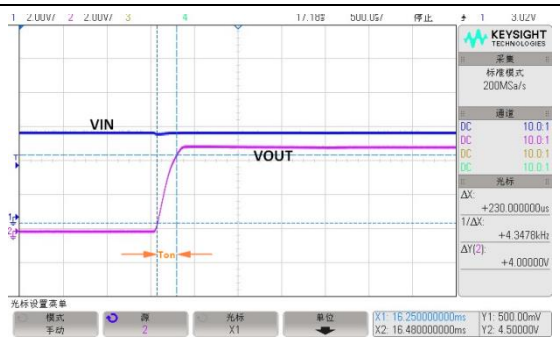
On Resistance vs. Temperature



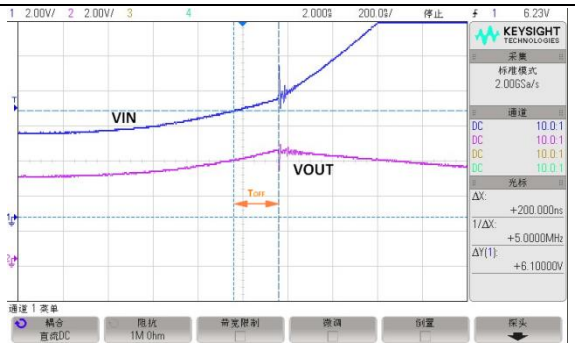
Input Quiescent Current vs. Input Voltage



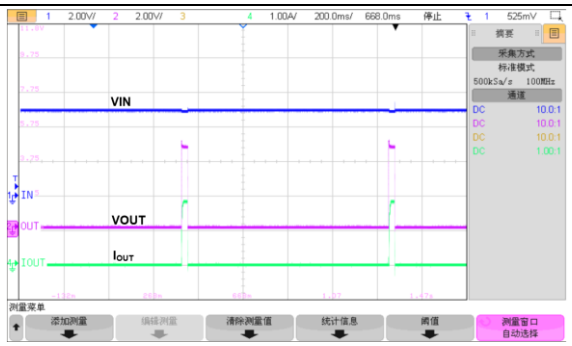
Power ON Debounce Time



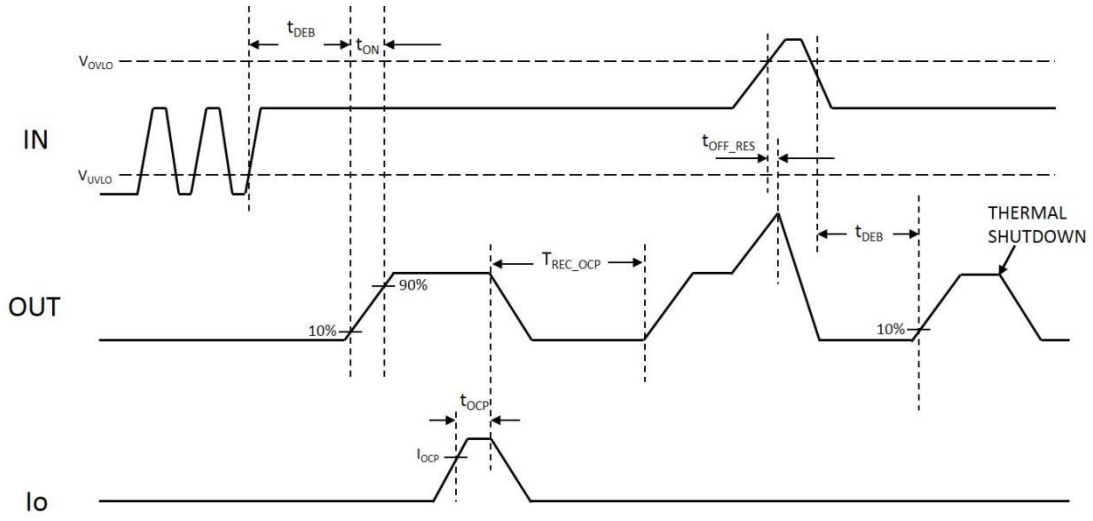
Switch Turn-on Time



OVP Turn-off Response Time

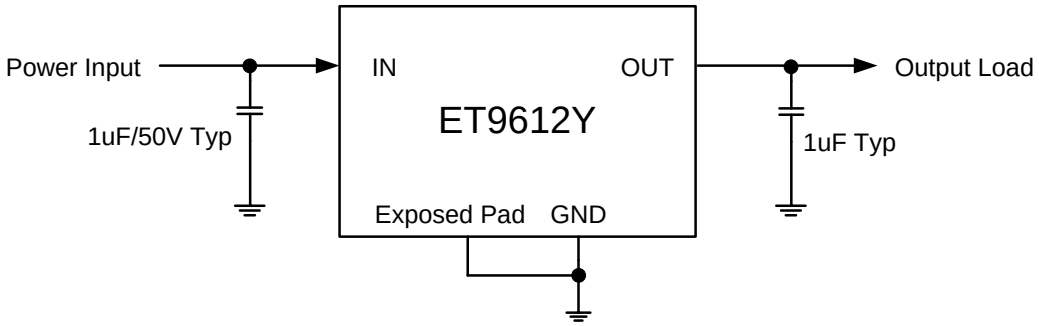


OCP Recovery



Note: Waveform are not to scale

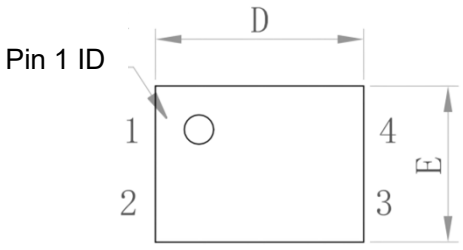
Application Circuits



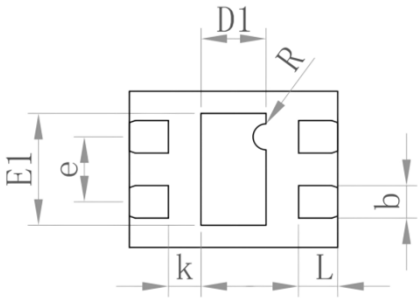
Note: Reference input and output capacitance value is 1uF.

***：** This electric circuit only supplies for reference.

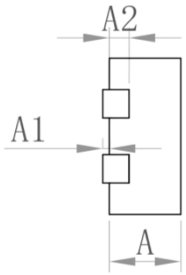
Package Dimension



Top View



Bottom View



Side View

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	0.5	0.55	0.6	D1	0.45	0.5	0.55
A1	0	0.02	0.05	E1	0.81	0.86	0.91
A2	0.152REF				0.25	0.3	0.35
D	1.5	1.6	1.7	b	0.2	0.25	0.3
E	1.10	1.20	1.30	e	0.500BSC		
R	0.05	0.1	0.15	k	0.15	0.25	0.35

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2019-03-19	Original Version	Yang Zhen	Yang Zhen	Zhu Jun Li
1.1	2019-06-14	Update working waveform	Yang Zhen	Yang Zhen	Zhu Jun Li
1.2	2020-8-24	Update Package Dimension	Yang Zhen	Yang Zhen	Zhu Jun Li
1.3	2022-6-29	Update Package Dimension	Shi Bo	Yang Zhen	Zhu Jun Li
1.4	2022-9-29	Update IV curve	Shi Bo	Yang Zhen	Zhu Jun Li