High-Current Over-voltage Protector with Adjustable OVLO

General Description

ET9523C series can disconnect the systems from its output pin(OUT) in case wrong input operating conditions are detected. The system is positive over-voltage protected up to 28V. The internal over-voltage thresholds(OVLO) is fixed, and external OVLO setting also available. ET9523C has internal thermal shutdown Protection and Input Voltage detection.

The device is packaged in advanced full-Green compliant Wafer Level Chip Scale Packaging (WLCSP6).

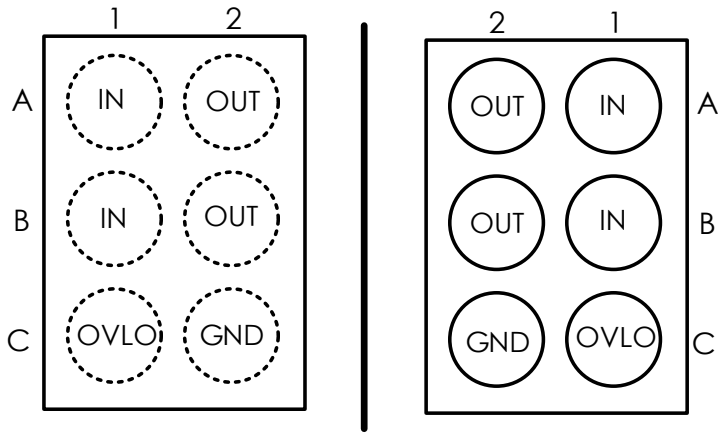
Features

- 4A Continuous Current Capability
- Typical R_{ON}: 29mΩ N-Channel MOSFET
- V_{IN} Operating Range: 2.5V to 28V
- Internal Over-voltage Lockout :
  - -- 14.0V(ET9523C)
  - -- 10.8V(ET9523CM1)
  - -- 10V(ET9523CM)
  - -- 6.8V(ET9523CL)
  - -- 6.0V(ET9523CL1)
- Over-voltage Protection Response Time：50ns(TYP)
- Startup Debounce Time: 15ms(TYP).
- Internal Thermal-Shutdown Protection
- ESD Protected: Human Body Model (JESD22-A114) All pins ±2KV Pass
- WLCSP6 Package (ball pitch=0.4mm)

Application

- Smartphones, Tablet PC
- HDD, Storage and Solid State Memory Devices
- Portable Media Devices, Laptop & MID
- SLR Digital Cameras
- GPS and Navigation Equipment
- Industrial Handheld and Enterprise Equipment

Pin Configuration

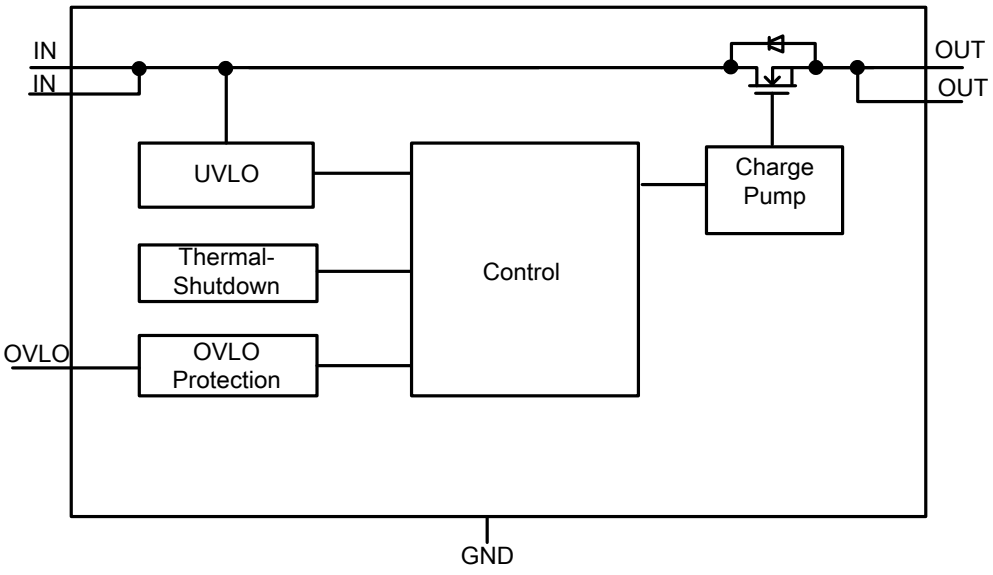


TOP VIEW BOTTOM VIEW

Pin Function

Pin No.	Name	Description
A1、B1	IN	Voltage Input. Connect IN pins together for proper operation.
A2、B2	OUT	Output Voltage. Output of internal switch. Connect OUT pins together for proper operation.
C1	OVLO	External OVLO Adjustment. Connect OVLO to GND when using the internal threshold. Connect a resistor-divider to OVLO to set a different OVLO threshold; this external resistor-divider is completely independent of the internal threshold.
C2	GND	Ground. Connect GND pins together for proper operation.

Block Diagram



Functional Description

The OVP switch with over-voltage protection feature a low 29mΩ (TYP.) on-resistance(R_{ON}) internal FET and protect low-voltage systems against voltage faults up to $28V_{DC}$. If the input voltage(V_{IN}) exceeds 14V(ET9523C)/10.8V(ET9523CM1)/10V(ET9523CM)/6.8V(ET9523CL)/6.0V(ET9523CL1), the internal FET is quickly turned off to prevent damage to the protected downstream components.

OVLO Setting

When input (OVLO) is set lower than 0.2V. The over-voltage protection threshold is 14V(ET9523C) or 10.8V(ET9523CM1) or 10V(ET9523CM) or 6.8V(ET9523CL) /6.0V(ET9523CL1).

The over-voltage protection threshold can also be adjusted by external resistors when input (OVLO) is set higher than 0.3V.

$$\mathbf{V_{IN\_OVLO} = V_{OVLO\_TH} \times (1+R1/R2)}$$

Note : V_{OVLO_TH} = 1.2V (TYP.)

The internal FET turns off when the junction temperature exceeds +155ºC (TYP.). The device exits thermal shutdown after the junction temperature cools by 20ºC (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 1μF or lager must be placed between the IN and GND pins.

Output Capacitor

A 1μF 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
V_{OVLO}	OVLO to GND	-0.3	7	V
I_{SW1}	Maximum Continuous Current of switch IN-OUT		4	A
I_{SW2}	Maximum Peak Current of switch IN-OUT(10ms)		6	A
P_D	Power Dissipation at T_A= +70ºC		1000	mW
T_{STG}	Storage Junction Temperature	-65	+150	ºC
T_A	Operating Temperature Range	-40	+85	ºC
T_L	Soldering Temperature (reflow).		+260	ºC
T_{JMAX}	Max Junction Temperature		+150	ºC

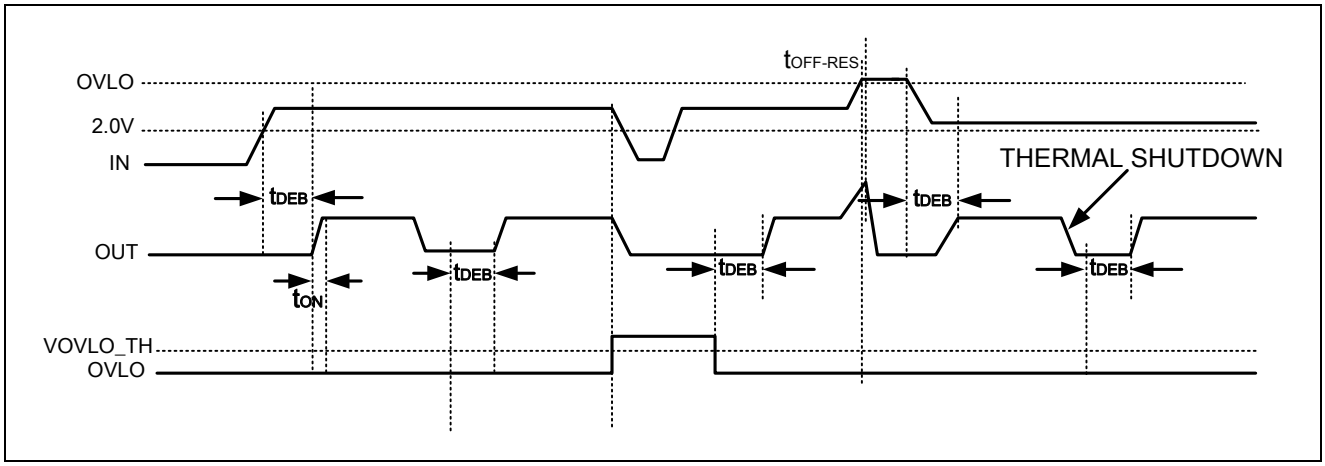
Electrical Characteristics

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

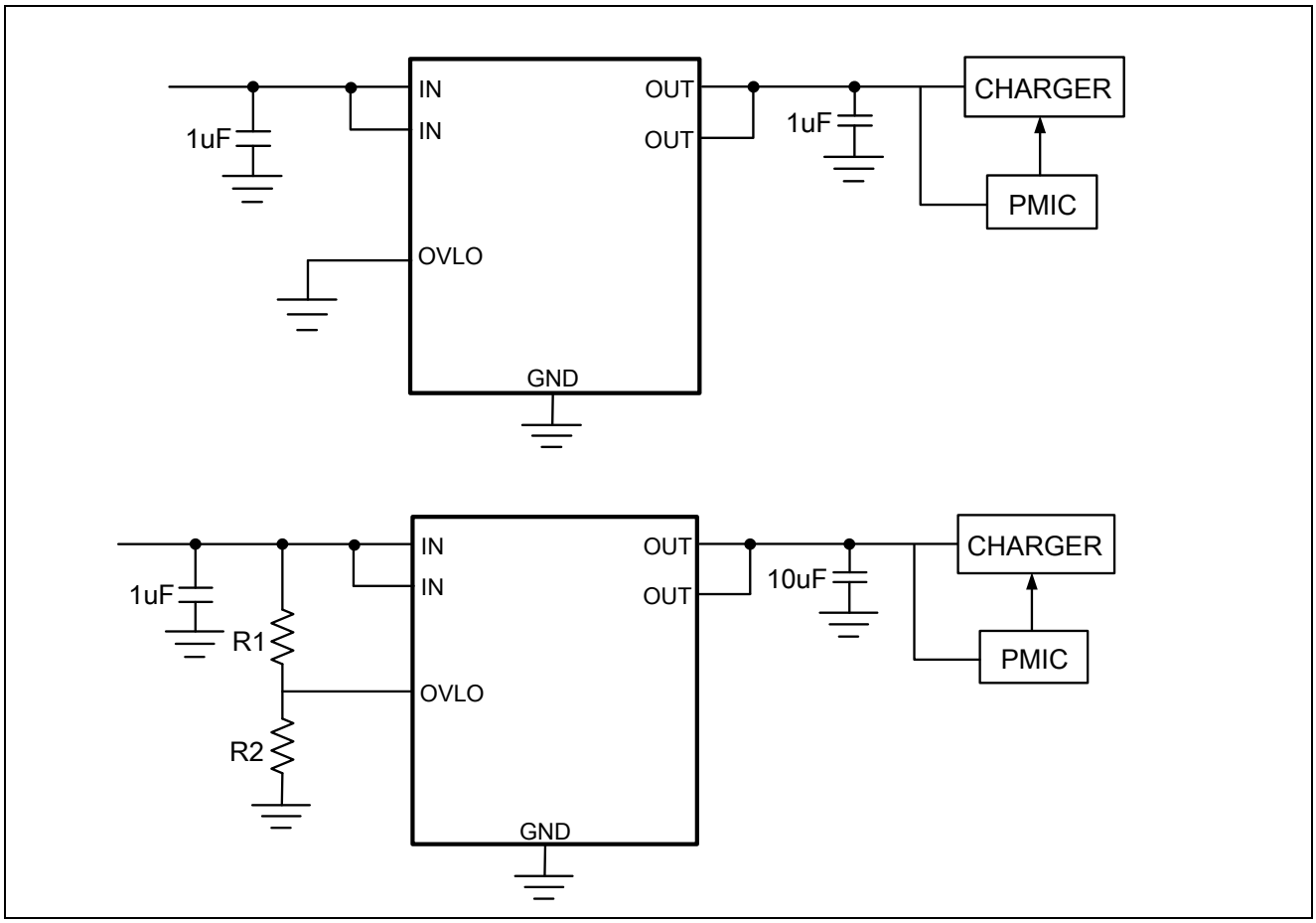
Symbol	Parameters	Conditions		Min	Typ	Max	Unit
Basic Operation							
V_{IN}	Input Voltage			2.5		28	V
I_{IN}	V_{IN} Quiescent Current	V_{IN}=5V, OUT floating			95		μA
R_{ON}	On-Resistance of Switch IN-OUT	V_{IN}=5V, I_{OUT}=1A			29	39	mΩ
V_{OVLO}	Over-voltage Protect of V_{IN}	V_{IN} rise up	ET9523C	13.6	14.0	14.4	V
			ET9523CM1	10.6	10.8	11.0	
			ET9523CM	9.8	10.0	10.2	
			ET9523CL	6.6	6.8	7.0	
			ET9523CL1	5.9	6.0	6.1	
V_{OVLO_HYS}	Over-voltage Protect Hysteresis of V_{IN}				0.2		V
V_{OVLO_RG}	Adjustable OVLO Threshold Range			4		20	V
V_{OVLO_TH}	OVLO Set Threshold			1.18	1.2	1.22	V
V_{OVLO_SEL}	External OVLO Select Threshold			0.2		0.3	V
V_{UVLO_R}	Under Voltage Lockout Threshold	V_{IN} Rising			2.0		
T_{SD}(1)	Thermal Shutdown				155		ºC
T_{SD_HYS}(1)	Thermal-shutdown Hysteresis				20		ºC
Dynamic Characteristics: see figure							
t_{DEB}	Debounce Time	Time from V_{UVLO_R}<V_{IN}< V_{OVLO} to V_{OUT}=10% of V_{IN}			15		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}			2		ms
t_{OFF_RES}(1)	Switch Turn-off Response Time	V_{IN} > V_{OVLO} to V_{OUT} stop rising			50	80	ns

Note1： Guaranteed by characterization and design.

Timing Waveform



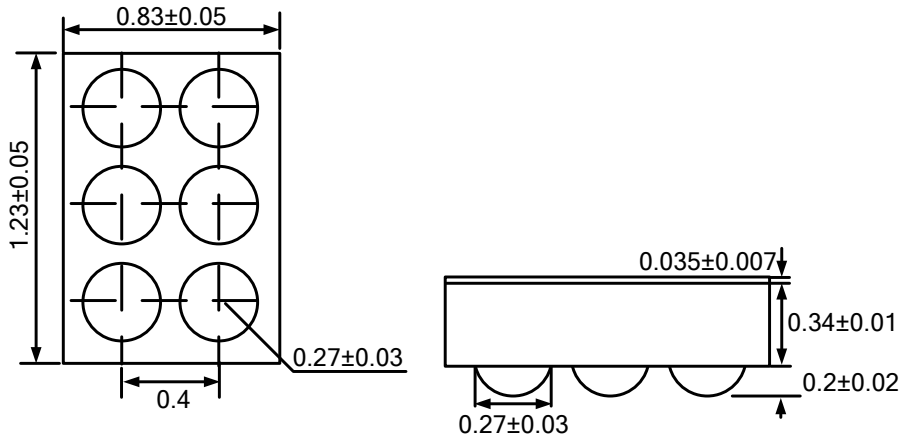
Application Circuits



***Notes*:**

- This electric circuit only supplies for reference.
- R1 and R2 are only required for adjustable OVLO; otherwise connect OVLO to GND.
- Recommend 30K ≤ R2 ≤ 51K

Package Dimension



Unit:mm

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2017-10-18	Preliminary Version	Wum	Wum	Zhujl
1.1	2023-1-31	Update Typeset	Shibo	Wum	Liujy