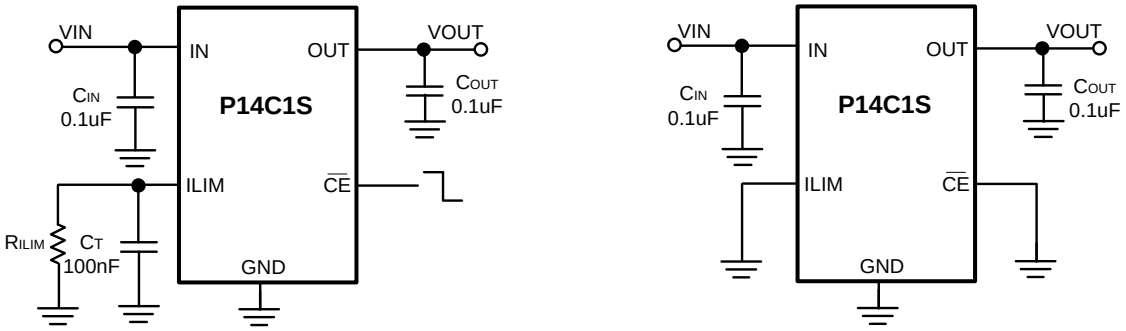
Over voltage protector

Description

The P14C1S is an Over-Voltage-Protection (OVP) load switch with fixed 6.0V OVLO threshold voltage. The device will switch off internal MOSFET to disconnect IN to OUT to protect load when any of input voltage over the threshold. The Over temperature protection (OTP) function monitors chip temperature to protect the device. The OCP function turns off OUTPUT if the load current is over the threshold and recovers when VIN re-plug or CE reactive. The OCP current limit threshold is adjustable by an external R_{ILIM}. When the ILIM pin short to GND, the current limitation will be disable, the IC cut off the output voltage in heavy load conditions to protect IC from damage by OTP.

The P14C1S is available in SOT23-6L. Standard products are Pb-free and Halogen-free.



C_T=100nF is recommended for ILIM<1A; C_T is optional for ILIM>=1A

Figure 1: Typical Application

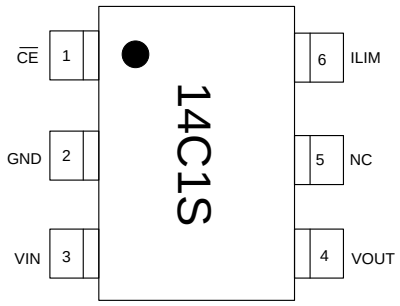


Figure 2: Pin order and Marking (Top view)

Feature

- Maximum input voltage : 32V
- Ultra fast OVP response time: 50ns (Typ.)
- Fixed OVLO threshold voltage: 6.0V, ±3%
- Adjustable over-current protection:
  100mA-1.2A, ±10%
- Supports up to 1.2 A Load Current
- Thermal Shutdown
- Enable Function
- Available in Green SOT23-6L Package

Application

- Mobile Handsets and Tablets
- Portable Media Players
- Low-Power Handheld Devices

Pin Definitions

Pin No.	Symbol	Descriptions
1	$\overline{CE}$	Active-Low Chip Enable Input. Connect $\overline{CE}$ = "HIGH" to turn the input pass FET off. Connect $\overline{CE}$ = "LOW" to turn the internal pass FET on, connecting the input to the charging circuitry. CE is internally pulled down.
2	GND	Ground Terminal. Connect to the thermal pad and to the ground rail of the circuit.
3	IN	Switch Input and Device Power Supply.
4	OUT	Switch output Terminal to the Charging System.
5	NC	No Connect.
6	ILIM	Current limit adjustment. Connect a resistor to GND to set over current threshold. I_{Lim} = 600/R_{ILIM}. (current in A, resistance in Ω) Short ILIM to GND will disable current limitation.

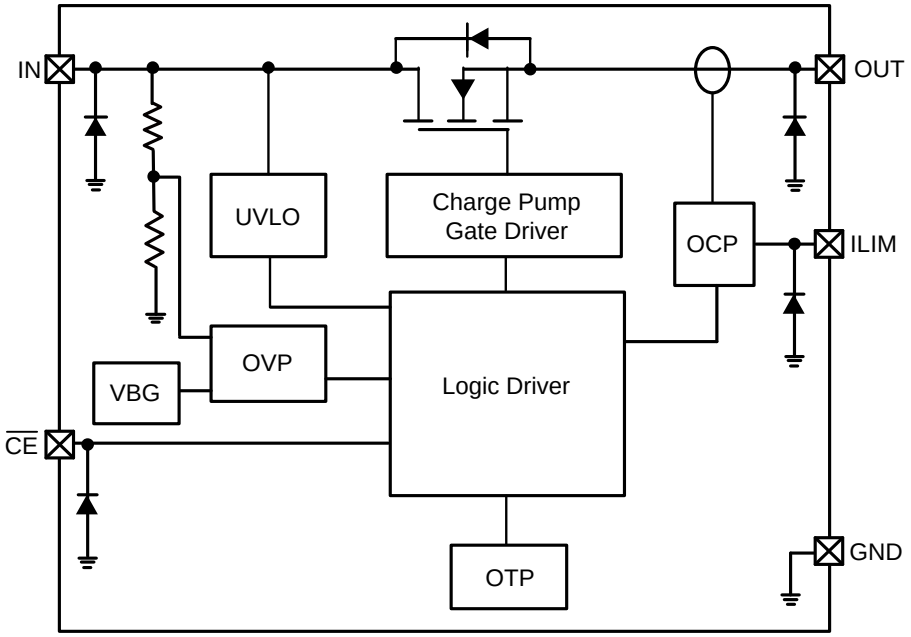


Figure 3: IC Block Diagram

Absolute maximum rating

Parameter(Note1)	Symbol	Value	Units
Input voltage (IN pin)	V_{IN}	-0.3 ~ 32	V
Output voltage (OUT pin)	V_{OUT}	-0.3 ~ 6.0	V
Junction temperature	T_J	150	℃
Lead temperature(10s)	T_L	260	℃
Storage temperature	Tstg	-55~150	℃
ESD Ratings	HBM	±2000	V
	CDM	±500	V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

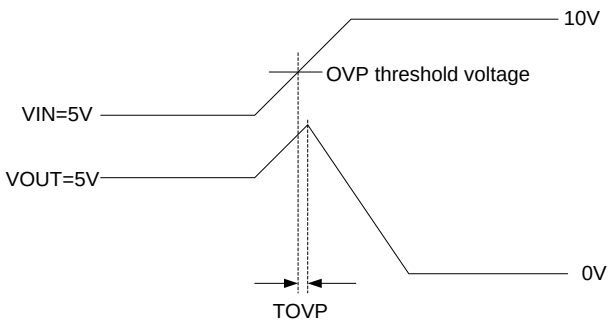
Parameter	Symbol	Value	Units
Input voltage	V_{IN}	3.5~32	V
MAX Continuous Output current	I_{OUT}	1.2	A
Ambient operating temperature	Topr	-40~85	℃

Electrical Characteristics

（T_A=25℃，V_{IN}=5V，C_{IN}=0.1uF，C_{OUT}=0.1uF，unless otherwise specified.）

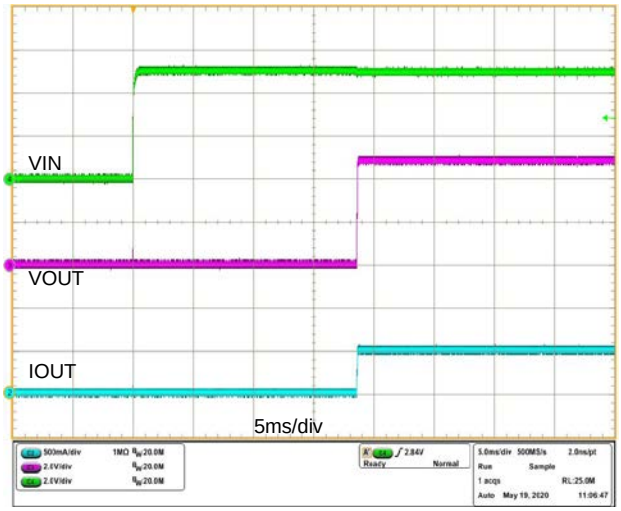
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input voltage range	V_{IN}		3.5		32	V
Quiescent current	I_Q	NO Load, /CE=GND, V_{IN}=5V		120	200	uA
Over voltage quiescent current	I_{Q_OVP}	NO Load, /CE=GND, V_{IN}=30V		200		uA
Disable OVP quiescent current	I_{Q_DIS}	NO Load, /CE=5.5V, V_{IN}=5.5V		50	100	uA
On resistance	R_{on}	V_{IN}=5V, I_{OUT}=1.0A		200	280	mΩ
OVP response time	t_{OVP}	V_{IN} rising, C_{IN}=C_L=0pF (Note2)		50		ns
OVP voltage	V_{OVLO}	VIN rising	5.82	6.0	6.18	V
/CE high threshold voltage	V_{CE_H}	V_{CE} Rising	1.4			V
/CE low threshold voltage	V_{CE_L}	V_{CE} Falling			0.4	V
UVLO threshold voltage	VUVLO	VIN rising		2.5		V
UVLO hysteresis voltage	VUVLO_HYS	VIN falling		25		mV
OCP setting range	IOCP_RANG		100		1200	mA
OCP accuracy	IOCP_AC	R_{ILIM}=560Ω	0.96	1.07	1.18	A
OCP Debounce Time @Start up	TDEB	Start up from VIN or /CE	10	18	30	ms
Turn On Time	TON	VOUT=VIN*10% to VOUT=VIN*90%		40		us
Output discharge resistance	R_{DCHG}	VIN=5V		400		Ω
OTP threshold temperature	TOTP	VIN=5V		150		℃
OTP hysteresis temperature	THYS	VIN=5V		20		℃

Note 2: Guaranteed by design

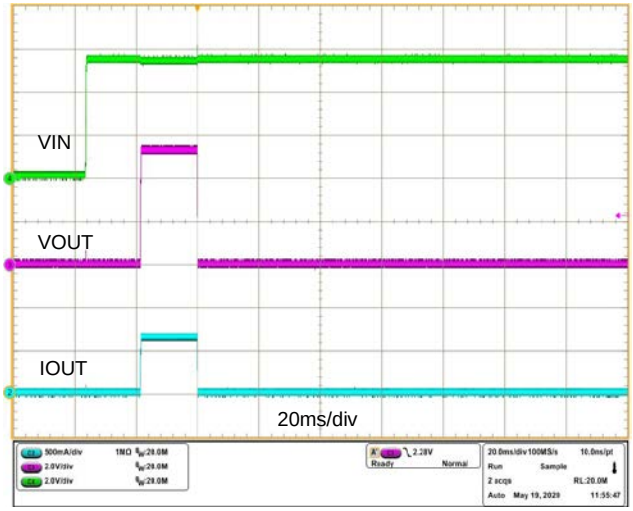


OVP response time test

Typical Operating Performance



Power on Response(Rout=10Ω,R_{ILIM}=1kΩ)



Power on OCP Response(Rout=8Ω,R_{ILIM}=1kΩ)

Function Descriptions

1. Under-voltage Lockout (UVLO)

The under-voltage lockout (UVLO) circuit disables the power switch until the input voltage reaches the UVLO turn on threshold. Built-in hysteresis prevents unwanted on and off cycling because of input voltage droop during turn on.

2. Over Current Protection (OCP)

If the load current rises to the OCP threshold, the device will cut off the output voltage. It takes 18ms after power on for OCP begins to detect. After Power Good, the OCP active time is dozens to hundreds microseconds. A recommended 100-220nF capacitor(C_T) connect on ILIM pin can increase the OCP active time for longer blanking time applications.

The OCP threshold is calculated by the equation: $I_{LIM} = 600/R_{ILIM}$ (current in A, resistance in Ω).

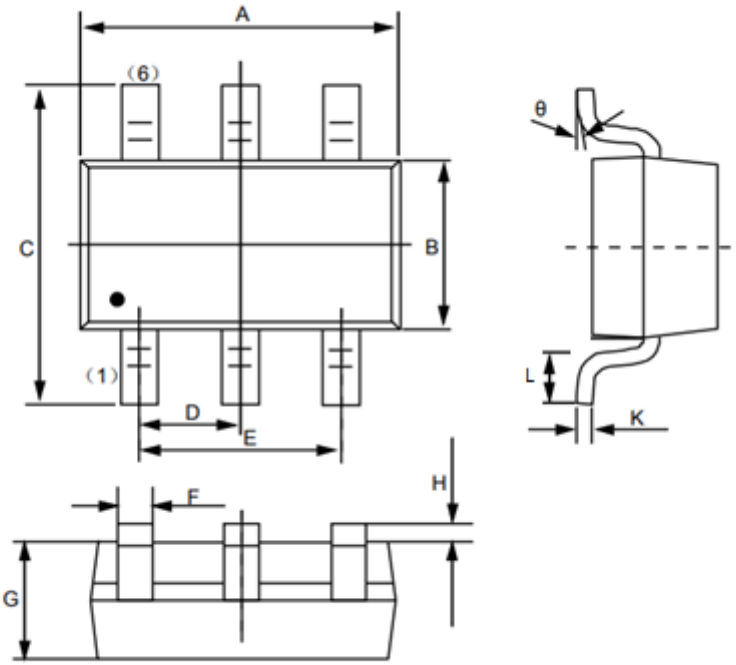
3. Over-voltage Lockout (OVLO)

When VIN exceeds the OVP threshold voltage, the over-voltage lockout (OVLO) circuit turns off the protected power switch.

4. Over Temperature Protection (OTP)

The P14C1S monitors its own internal temperature to prevent thermal failures. The chip turns off the power MOSFET when the internal temperature reaches 150°C, and will resume after the internal temperature is cooled down below 20°C. When the ILIM pin short to GND, the current limitation will be disable, but the IC still cut off the output voltage in heavy load conditions (about 1.7A to 2.0A load current, depend on the thermal diffusion) to protect IC from damage by OTP.

Product dimension (SOT23-6L)



Dim	Millimeters		
	MIN	NOM	MAX
A	2.72	2.92	3.12
B	1.40	1.60	1.80
C	2.60	2.80	3.00
D	0.95BSC		
E	1.80	1.90	2.00
F	0.30	0.40	0.50
G	0.90	1.10	1.30
H	0.01	--	0.15
L	0.30	--	0.60
K	0.08	--	0.21
θ	0^o	---	8^o

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