Over voltage protector

Description

The P14C8NE is an Over-Voltage-Protection (OVP) load switch with fixed 6.1V 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 the load current is below the limit threshold over 3.3s(typ).

The P14C8NE is available in DFN2x2-8L package. Standard products are Pb-free and Halogen-free.

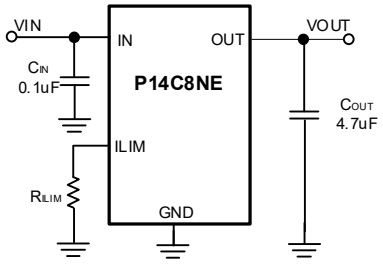


Figure 1. Typical Application

Feature

- Maximum input voltage: 30V
- Switch ON resistance: 115mΩ Typ.
- Ultra fast OVP response time: 50ns Typ.
- Programmed over-current protection
- Fixed internal OVLO threshold voltage: 6.1V, ±3%
- Over temperature protection
- Input reverse protection to -10V

Application

- Mobile Handsets and Tablets
- Portable Media Players
- Peripherals

Package

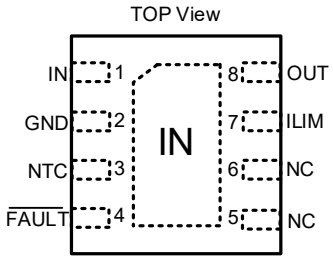


Figure 2: Pin order (Top view)

Pin Definitions

Pin No.	Symbol	Descriptions
1	IN	Switch Input and Device Power Supply.
2	GND	Ground Terminal. Connect to the thermal pad and to the ground rail of the circuit.
3	NTC	NTC control pin. Float to disable NTC function.
4	$\overline{\text{FAULT}}$	Fault indication, Open drain output, active-low at OVP, OTP, OCP, NTC, UVP, SCP, Chip disable and short status.
5	NC	NO Connect.
6	NC	NO Connect.
7	ILIM	Current limit adjustment. Connect a resistor to GND to set over current threshold. $I_{LIM} = 25/R_{ILIM}$. (current in A, resistance in kΩ) Short ILIM to GND will disable current limitation.
8	OUT	Switch output Terminal to the Charging System.

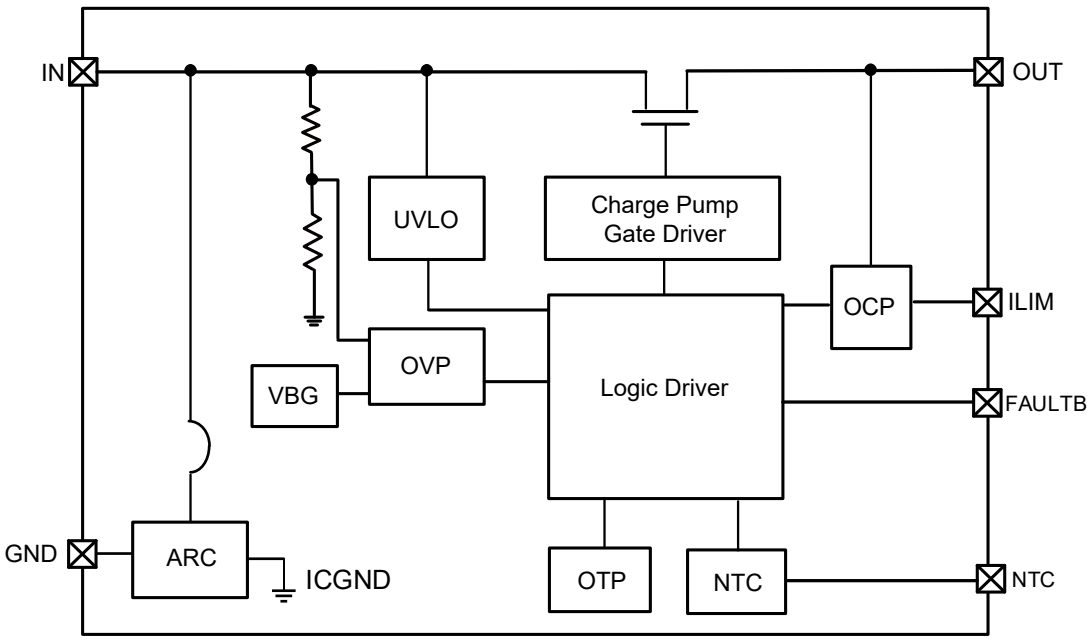


Figure 3. IC Block Diagram

Absolute maximum rating

Parameter(Note1)	Symbol	Value	Units
Input voltage (IN pin), CE Float or R_{CE}>10kΩ	V_{IN}	-10 ~ 30	V
Output voltage (OUT pin)	V_{OUT}	-0.3 ~ 6.0	V
Input voltage (CTRL, OVLO pin)	V_{CTRL}, V_{OVLO}	-0.3 ~ 6.0	V
Junction temperature	T_J	150	℃
Lead temperature(10s)	T_L	260	℃
Storage temperature	Tstg	-55~150	℃

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}	3.5~30	V
MAX Continuous Output current	I_{OUT}	2	A
Ambient operating temperature	Topr	-40~85	℃

Electrical Characteristics

（T_A=25℃，V_{IN}=5V，C_{IN}=0.1uF，C_{OUT}=4.7uF，unless otherwise specified.）

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Output Characteristics						
Input voltage range	V_{IN}		3.5		30	V
UVLO threshold voltage	V_{UVLO}	V_{IN} rising		2.6	3.0	V
UVLO hysteresis voltage	V_{UVLO_HYS}	V_{IN} falling		20		mV
Quiescent current	I_Q	NO Load, CTRL=GND, OVLO=GND V_{IN}=5V		90		uA
Over voltage quiescent current	I_{Q_OVP}	NO Load, CTRL=GND, OVLO=GND V_{IN}=30V		180		uA
Disable OVP quiescent current	I_{Q_DIS}	NO Load, CTRL=1.8V, OVLO=GND V_{IN}=5V			15	uA
CE leakage current	I_{IEAKAE_CE}	V_{IN}=5V, V_{CE}=5V		27		uA
ON resistance	R_{ON}	V_{IN}=5V, I_{OUT}=1A		115		mΩ
Power on delay time	t_{ON_DELAY}	V_{IN}=0V to 5V		25		ms
Turn On Time	t_{ON}	V_{OUT}=V_{IN}*10% to V_{OUT}=V_{IN}*90%		150		us
CTRL high threshold voltage	V_{CTRL_H}	V_{CTRL} Rising	1.4			V
CTRL low threshold voltage	V_{CTRL_L}	V_{CTRL} Falling			0.4	V
Over Voltage Protection						
OVP response time	t_{OVP}	V_{IN} rising, C_{IN}=C_L=0pF		50		ns
OVP voltage range	V_{OVP}		5.92	6.1	6.28	V
OVP hysteresis voltage	V_{OVP_HYS}			0.1		V
Output discharge resistance	R_{DCHG}	V_{IN}=5V		550		Ω
Over Current Protection						
OCP current	I_{OCP}	Current rising	100		2300	mA
OCP accuracy	Accuracy_Iocp	I_{OCP}=1A	-10		10	%
OCP active time	T_{OCP}	I_{LOAD}=1A		1		ms
OCP recovery time	T_{OCR}			3.3		s
NTC function						
NTC COLD	Cold Temperature Threshold, NTC pin Voltage Rising Threshold	As Percentage to V_{IN} (Approx. 0°C w/ 103AT), T_J = –20°C - 125°C		66%		VIN
NTC HOT	Hot Temperature Threshold, NTC pin Voltage Rising Threshold	As Percentage to V_{IN} (Approx. 60°C w/ 103AT), T_J = –20°C - 125°C		14%		VIN
Over Temperature Protection						
OTP threshold temperature	T_{OTP}	V_{IN}=5V		150		℃
OTP hysteresis temperature	T_{OTP_HYS}	V_{IN}=5V		20		℃

Typical Operating Performance

（T_A=25℃，V_{IN}=5V，V_{CTRL}=5V，unless otherwise specified.）

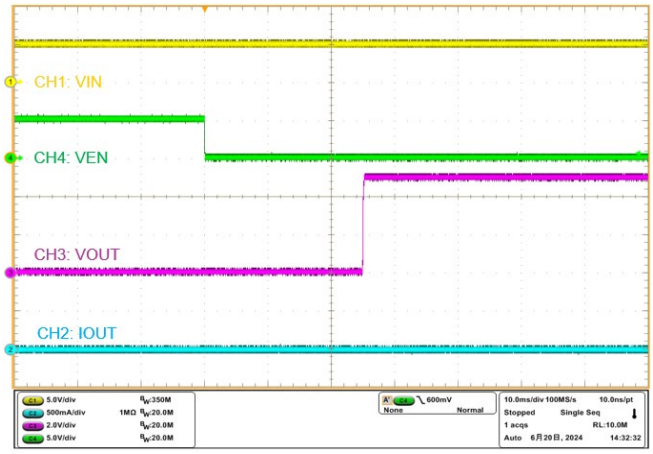


Figure 4. Enable，No Load

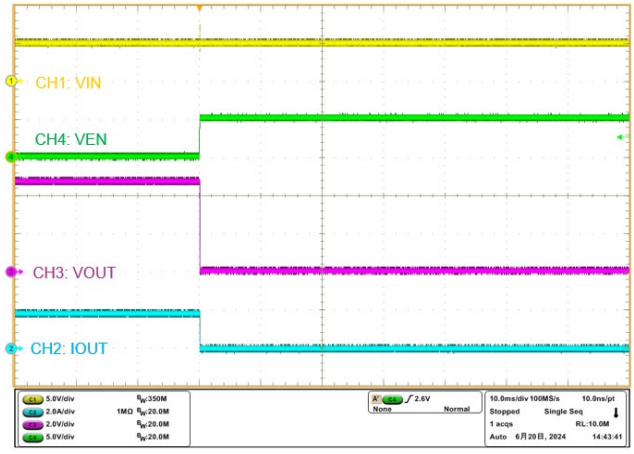


Figure 5. Disable，No Load

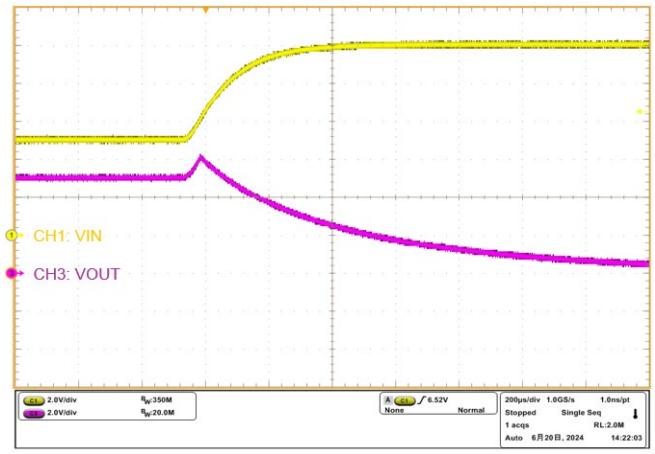


Figure 6. OVP Response

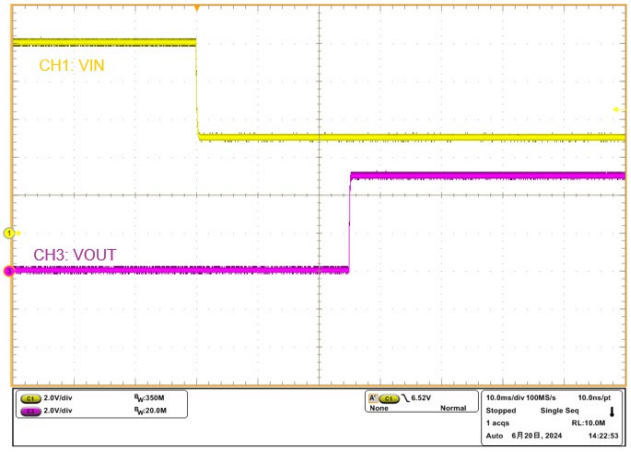


Figure 7. OVP Recovery Response

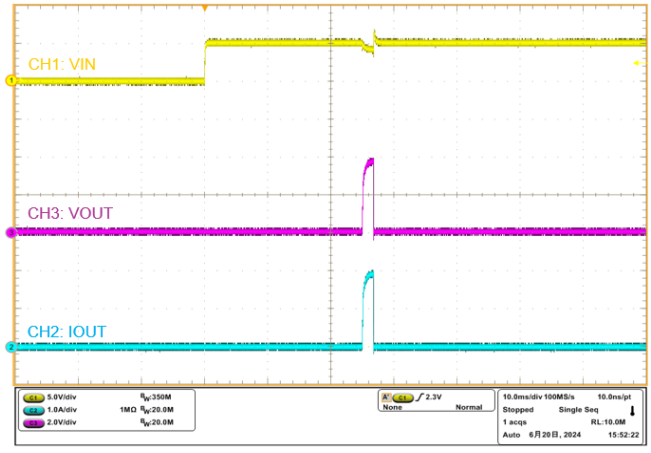


Figure 8. OCP Response at Start-up

（Rload=3Ω, Rlim=22kΩ）

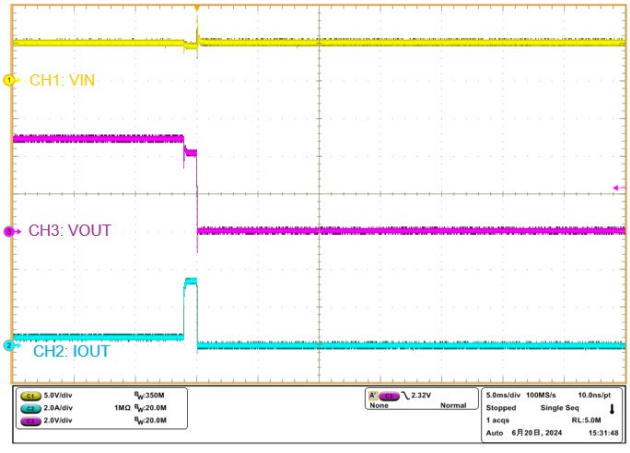


Figure 9. OCP Response after Start-up

（Rload=13Ω to 3Ω, Rlim=22kΩ）

Typical Operating Performance (continued)

（T_A=25℃，V_{IN}=5V，V_{CTRL}=5V，unless otherwise specified.）

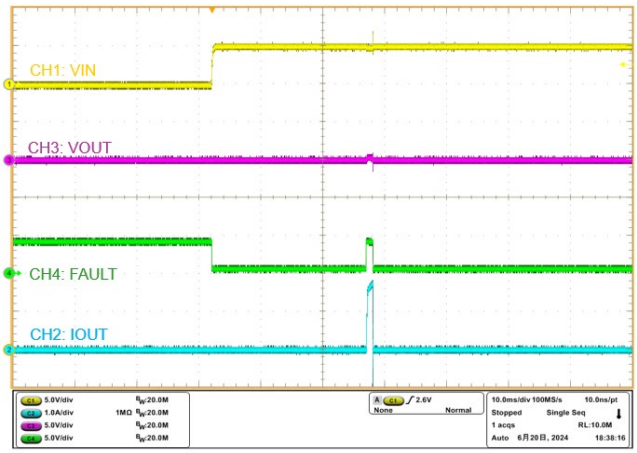


Figure 10. Fault Indication at SCP

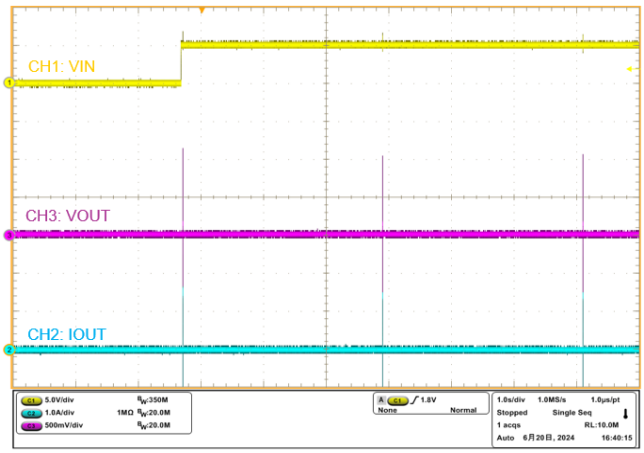


Figure 11. Short recover delay time

Function Descriptions

Over Current Protection (OCP)

The Over Current threshold can adjustable by a external resistor connected from the ILIM pin to GND. The OCP threshold is calculated by the following formula:

$$I_{OCP}=25\div R_{LIM}\ \text{(current in A, resistance in k}\Omega\text{)}$$

If the output current exceeds the I_{OCP} threshold, the device limits the current for a blanking duration of T_{OCP}. If the over current situation exceeds the T_{OCP}, the switch will be turned off, and the Fault pin is goes to low. The switch will re-soft start again after T_{OCR}.

Input Over Voltage Protection (OVP)

The P14C8NE Input has an over voltage protection to protect system. When the V_{IN} voltage rises above V_{OVP_INTSEL} (fix 6.1V), the system will turn the switch off.

Under Voltage Lockout (UVLO)

The P14C8NE had an UVLO internal circuit that enable the device once the V_{IN} voltage exceeds the UVLO threshold voltage.

Input reverse protection

The V_{IN} PIN is protected against reverse input voltage of up to -10V.

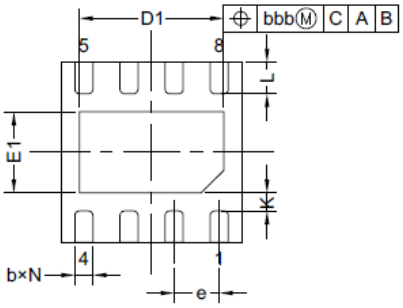
Thermistor Monitor

For battery protection, the device monitors the battery temperature to be within the thresholds. When temperature is outside of the temperature thresholds, the system will turn the switch off.

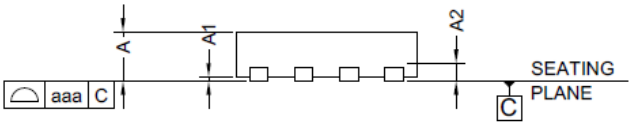
Over Temperature Protection (OTP)

The device monitors the internal junction temperature to provide thermal shutdown. When IC junction temperature exceeds T_{OTP} (150 ºC), the switch is turned off. The output will restart when IC junction temperature is below T_{OTP} (150ºC) - T_{HYS} (20ºC).

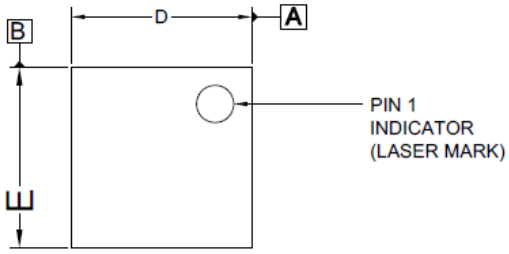
Product dimension (DFN2X2-8L)



BOTTOM VIEW



SIDE VIEW



TOP VIEW

COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	TYP	MAX
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
A2		0.203	
b	0.15	0.20	0.25
D	1.95	2.00	2.05
D1	1.50	1.60	1.70
E	1.95	2.00	2.05
E1	0.80	0.90	1.00
e		0.50BSC	
L	0.30	0.35	0.40
K		0.20MIN	
N		8	
aaa		0.08	
bbb		0.10	

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