

Over voltage and over current protector

Description

The P14C3M is an Over-Voltage-Protection (OVP) load switch with programmable over current Threshold. The device will switch off internal MOSFET to disconnect IN to OUT to protect load when any of input voltage over the threshold. The current limit is adjustable by external resistor between ILIM and GND. The Over temperature protection (OTP) function monitors chip temperature to protect the device.

The P14C3M is available in DFN1.2x1.6 package.

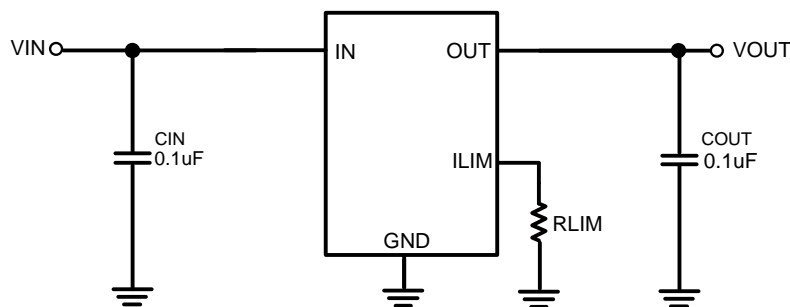


Figure 1: Typical Application

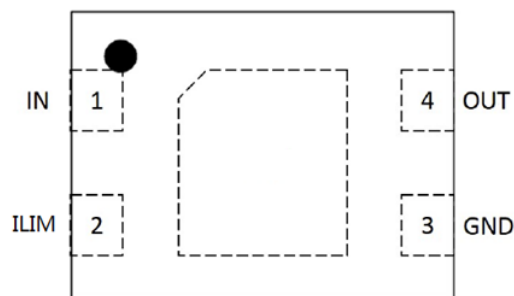


Figure 2: Pin order (Top view)

Feature

- Maximum input voltage: 40V
- Switch ON resistance: 105mΩ Typ.
- Ultra fast OVP response time: 50ns Typ.
- Programmed over-current protection: 200mA-3A
- Fixed internal OVLO threshold voltage: 6.0V, ±3%
- Over temperature protection

Application

- Mobile Handsets and Tablets
- Portable Media Players
- Peripherals

Pin Definitions

Pin No.	Symbol	Descriptions
1	IN	Switch Input and Device Power Supply.
2	ILIM	Current limit adjustment. Connect a resistor to GND to set over current threshold. $I_{Lim} = 5.6 \div R3$ (current in A, resistance in k Ω). For example, $I_{Lim} = 1.0A$ if $R3=5.6k\Omega$. Short ILIM to GND will disable current limitation. An optional capacitor to GND for OCP response time setting.
3	GND	Ground.
4	OUT	Switch Output to Load.

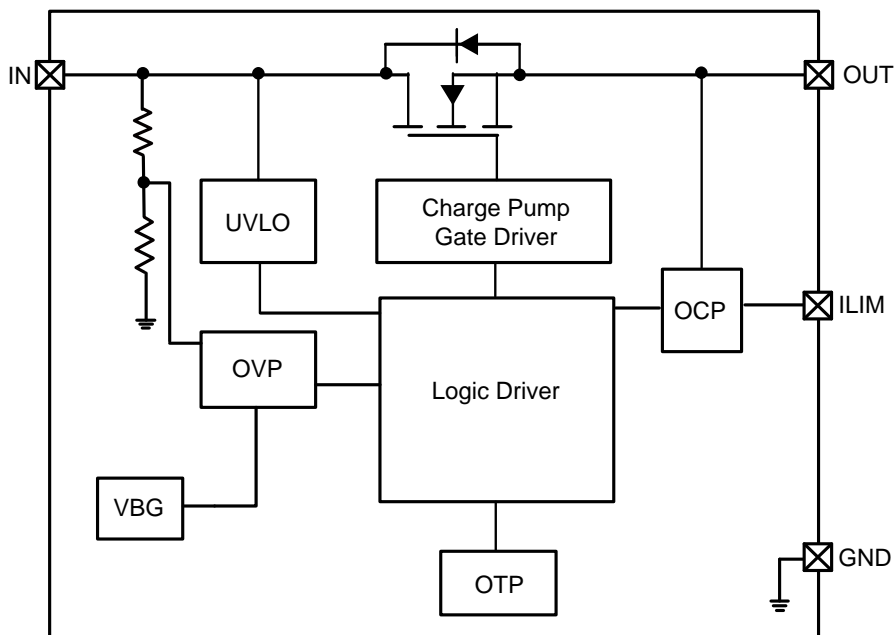


Figure 3: IC Block Diagram

Over voltage and over current protector
Absolute Maximum Rating

Parameter(Note1)	Symbol	Value	Units
Input voltage (IN pin)	V_{IN}	-0.3 ~ 40	V
Output voltage (OUT pin)	V_{OUT}	-0.3 ~ 20	V
Input voltage (OVLO, ILIM pin)	V_{OVLO}, V_{ILIM}	-0.3 ~ 6.0	V
Junction temperature	T_J	150	°C
Lead temperature(10s)	T_L	260	°C
Storage temperature	T_{stg}	-55~150	°C

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}	3.5~40	V
MAX Continuous Output current	I_{OUT}	2	A
Ambient operating temperature	T_{opr}	-40~85	°C

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Electrical Characteristic

($T_A=25^{\circ}\text{C}$, $V_{IN}=5\text{V}$, $C_{IN}=0.1\mu\text{F}$, $C_{OUT}=0.1\mu\text{F}$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
General Function						
Input voltage range	V_{IN}		3.5		40	V
Quiescent current	I_Q	No Load, $OVLO=GND$, $V_{IN}=5\text{V}$		93		μA
Over voltage quiescent current	I_{Q_OVP}	No Load, $OVLO=GND$, $V_{IN}=30\text{V}$		114		μA
ON resistance	$R_{DS(ON)}$	$V_{IN}=5\text{V}$, $I_{OUT}=1\text{A}$		105		$\text{m}\Omega$
Power on delay time	T_{ON_DELAY}	$V_{IN}=0\text{V}$ to 5V		10		ms
Turn On Time	T_{ON}	$V_{OUT}=V_{IN}*10\%$ to $V_{OUT}=V_{IN}*90\%$		180		μs
OVP Function						
OVP response time	T_{OVP}	V_{IN} Rising, $C_{IN}=C_L=0\text{pF}$		50		ns
OVP voltage	V_{OVP}		5.82	6.0	6.18	V
OVP hysteresis voltage	V_{OVP_HYS}			0.2		V
Output discharge resistance	R_{DCHG}	$V_{IN}=5\text{V}$		230		Ω
OCP Function						
OCP current	I_{OCP}	Current Rising	200		3000	mA
OCP accuracy	$ACCURACY_I_{OCP}$	$I_{OCP}<1\text{A}$	- 15		+ 15	%
		$I_{OCP}\geq 1\text{A}$	- 10		+ 10	%
OCP deglitch time	$T_{DEGLITCH_OCP}$			3		ms
OCP detect delay time at start-up	T_{OCP}	$V_{IN}=0\text{V}$ to 5V		20		ms
Over current recover delay time	T_{OCR}			18		s
SCP Function						
Current Limit at SCP	I_{SHORT_LIMIT}			0.7		A
SCP deglitch time	T_{DELAY_SHORT}			3		ms
Short recover delay time	T_{SCR}			18		s
OTP Function						
OTP threshold temperature	T_{OTP}	$V_{IN}=5\text{V}$		150		$^{\circ}\text{C}$
OTP hysteresis temperature	T_{HYS}	$V_{IN}=5\text{V}$		20		$^{\circ}\text{C}$

Typical Operating Performance

($T_A=25^{\circ}\text{C}$, $V_{IN}=5\text{V}$, $V_{CTRL}=5\text{V}$, unless otherwise specified.)

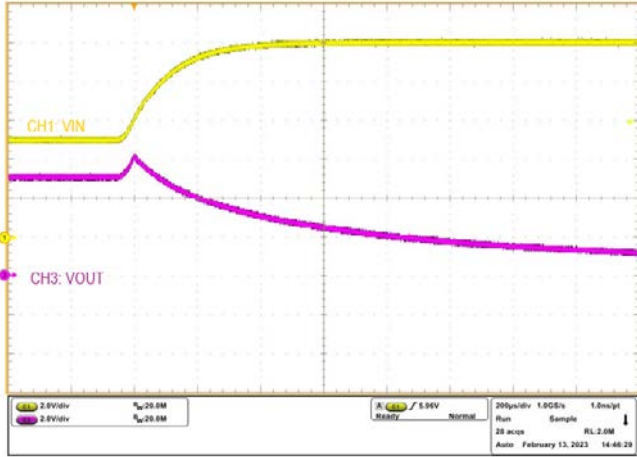


Figure 6. OVP Response

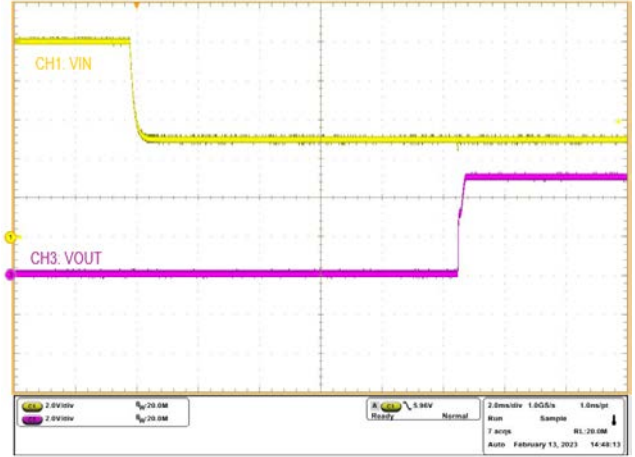


Figure 7. OVP Recovery Response

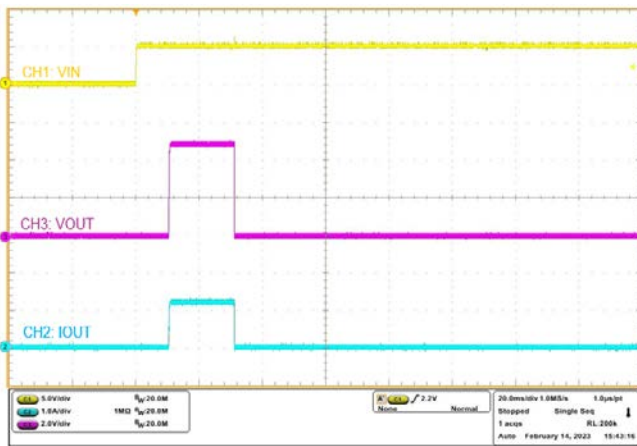


Figure 8. OCP Response at Start-up
($R_{load}=4\Omega$, $R_{lim}=5.6k\Omega$)

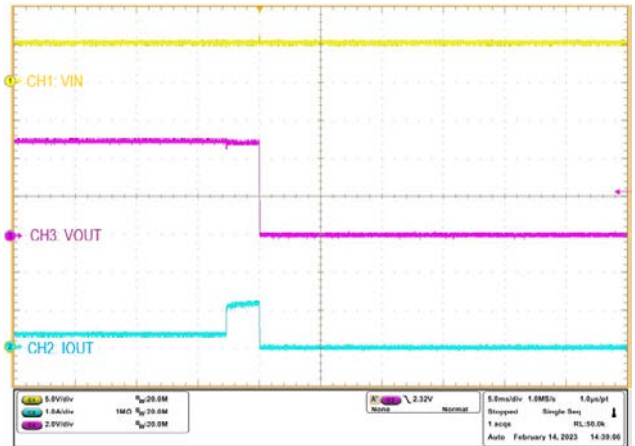


Figure 9. OCP Response after Start-up
($R_{load}=14\Omega$ to 4Ω , $R_{lim}=5.6k\Omega$)

Function Descriptions**Over Current Protection (OCP)**

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

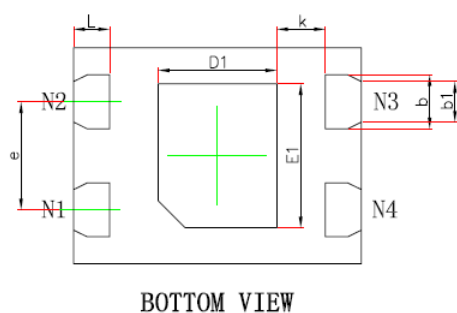
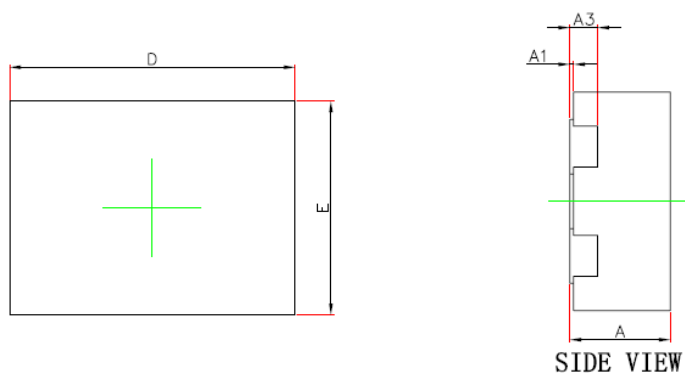
$$I_{OCP} = 5.6 \div R3 \text{ (current in A, resistance in k}\Omega\text{)}$$

If the output current exceed 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 turned off, and the Fault pin is go low. The switch will re-soft start again after T_{OCR} .

Over Temperature Protection (OTP)


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

Product Dimension (DFN1.2X1.6)



Dim	Millimeters	
	MIN	MAX
A	0.500	0.600
A1	0.000	0.050
A3	0.152REF	
D	1.500	1.700
E	1.100	1.300
D1	0.560	0.760
E1	0.700	0.900
b	0.250	0.350
b1	0.175	0.275
e	0.600TYP	
L	0.150	0.250
k	0.200MIN	

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