

## Description

The P1405A over-voltage protection device features an ultra-low 30mΩ (typical) on-resistance high current integrated N-MOSFET which actively protects low-voltage systems from voltage supply faults up to +32VDC. An input voltage exceeding the over-voltage threshold will cause the internal MOSFET to turn off, preventing excessive voltage from damaging downstream devices. P1405A has thermal protection at 140°C

The P1405A is available in a RoHS and Green compliant DFN2x2-6L package.

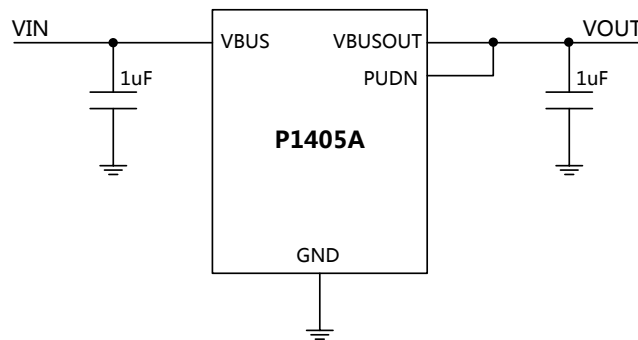


Figure 1. Typical Application

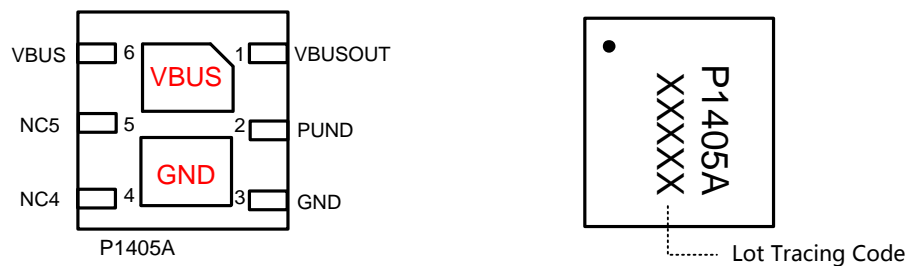


Figure 2. Pin order (Bottom view) and Marking (Top view)

### Feature

- Wide Input voltage range: 3.0-32V
- Ultra-low 30mohm On-resistance.
- Fixed OVP Threshold: 6.0V
- Fast turn-off response time: 50ns
- Soft-start function to avoid in-rush current
- -40-85°C operation temperature
- DFN2x2-6L

### Application

- Cellular Phones, Smart Phones, PDAs
- Tablet, Portable Media Players
- Gaming Device, Digital Cameras

**Pin Definitions**

Pin#	PIN Name	Description
1	VBUSOUT	Output voltage.
2	PUND	Pull down output voltage to ground when input voltage is higher than OVP threshold voltage.
3	GND	Ground.
4	NC4	Not connected.
5	NC5	Not connected.
6	VBUS	Input voltage.

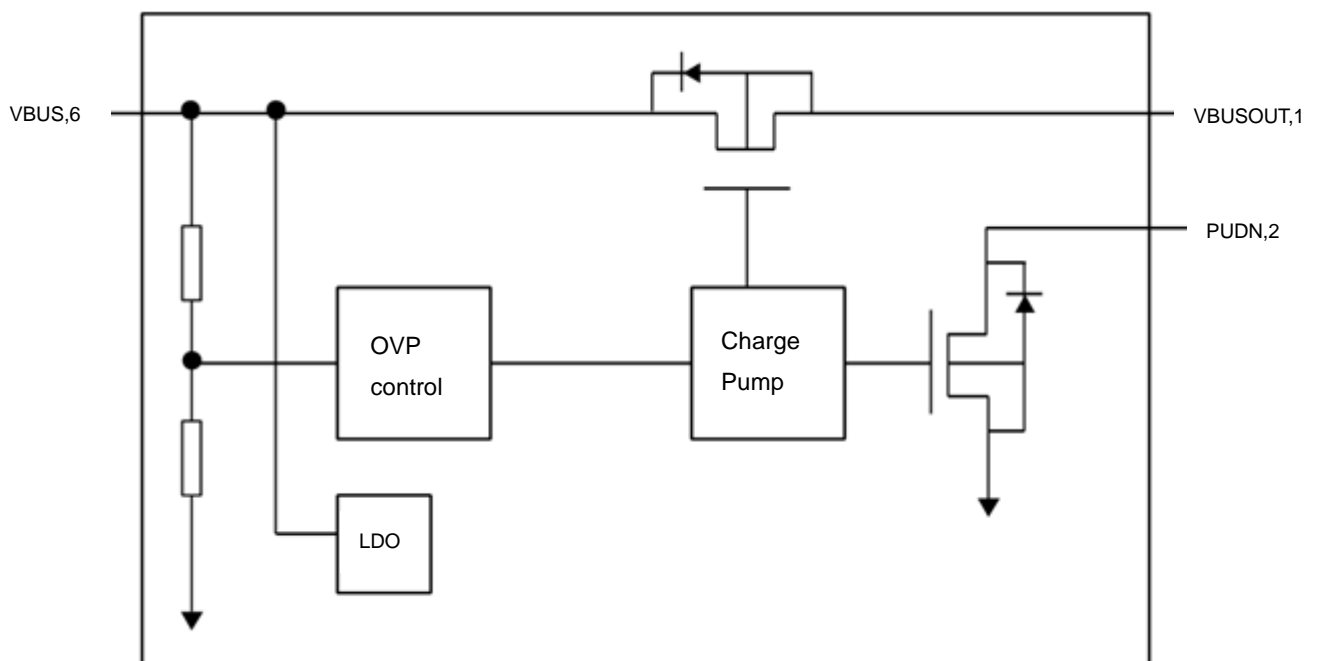
**Block Diagram**


Figure 3. IC Block Diagram

**Absolute maximum rating**

Parameter(Note1)	Symbol	Value	Units
VBUS voltage range	$V_{BUS}$	-0.3 to 32	V
VBUSOUT voltage range	$V_{BUSOUT}$	-0.3 to 7	V
PUDN voltage range	$V_{PUDN}$	-0.3 to 7	V
AVDD voltage range	$V_{AVDD}$	-0.3 to 7	V
Switch I/O Continuous Current	$I_{IN}$	3	A
Junction temperature	$T_J$	150	°C
Lead temperature(Soldering,10s)	$T_L$	260	°C
Storage temperature	$T_{STG}$	-55 to 150	°C
ESD Ratings	HBM (Except VBUSOUT PIN)	3000	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
VBUS input voltage range	$V_{BUS}$	3.0 to 32, typical=5	V
Operating ambient temperature	$T_A$	-40 to 85	°C
Thermal Resistance	$R_{\theta JA}$	67.5	°C/W

**Note 2:** Junction to Ambient thermal resistance is highly dependent on PCB layout. Values are based on thermal properties of the device when soldered to an EV board.

**Over voltage protector**
**Electrical Characteristics**

( $T_A=25^{\circ}\text{C}$ ,  $V_{\text{BUS}}=5\text{V}$ ,  $C_{\text{IN}}=1\mu\text{F}$ ,  $C_{\text{OUT}}=1\mu\text{F}$ , for 5V application, unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
<b>Basic Operation</b>						
Quiescent Supply Current	$I_{\text{DDQ1}}$	$V_{\text{BUS}}=5\text{V}$ , No load		120		$\mu\text{A}$
	$I_{\text{DDQ2}}$	$V_{\text{BUS}}=30\text{V}$ , No load		190		$\mu\text{A}$
UVLO Threshold Voltage	$V_{\text{UVLO}}$	$V_{\text{BUS}}$ Rising		2.4	3.2	V
Start-up Delay Time	$T_{\text{START\_DLY}}$	$V_{\text{BUS}}=0 \rightarrow 5\text{V}$ to Output ON		18		ms
Main Switch ON-Resistance	$R_{\text{ON}}$	$V_{\text{BUS}}=5\text{V}$ , $I_{\text{OUT}}=1\text{A}$		30	40	$\text{m}\Omega$
<b>Over-Voltage Protection</b>						
VBUS OVP Threshold	$V_{\text{OVP}}$	$V_{\text{BUS}}$ Rising	5.85	6.0	6.15	V
OVP Response Time	$t_{\text{OVP}}$	$V_{\text{IN}} > V_{\text{OVP}}$ to VOUT stop rising		50		ns
OVP Recovery Time	$t_{\text{R\_OVP}}$	$V_{\text{IN}} < V_{\text{OVP}}$ to VOUT start rising		18		ms
Output discharge resistance	$R_{\text{DCHG}}$	$V_{\text{IN}} > V_{\text{OVP}}$		400		$\Omega$
<b>Thermal Protection</b>						
Over-Temperature Protection Threshold	$T_{\text{SD}}$			140		$^{\circ}\text{C}$
Over-Temperature Protection Hysteresis	$T_{\text{HYS}}$			20		$^{\circ}\text{C}$

## Typical Characteristics

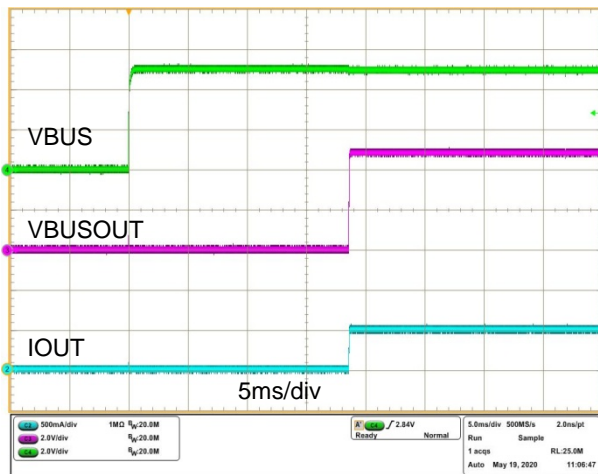


Figure 4. Start-up waveform(Rload=10Ω)

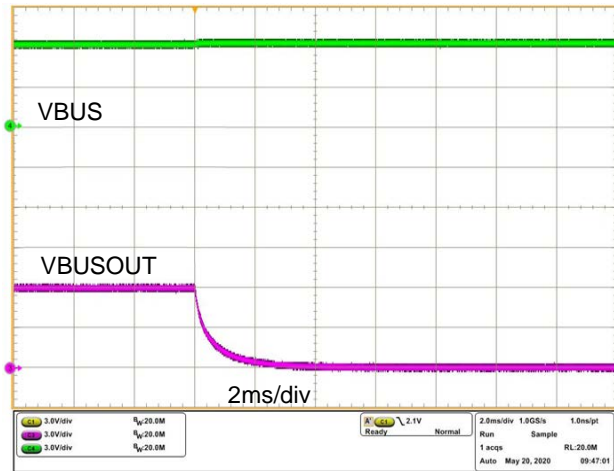


Figure 5. OVP response

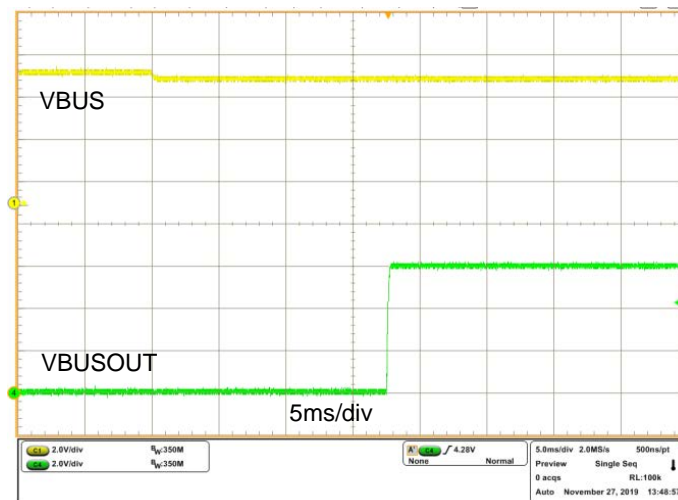
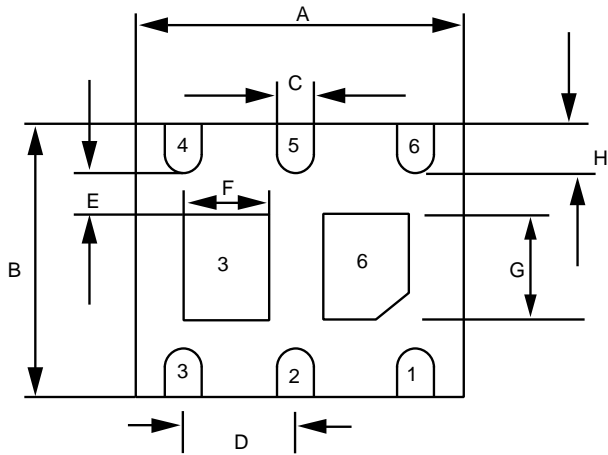
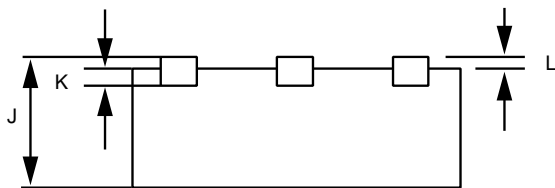


Figure 6. OVP recovery waveform

**Product dimension (DFN2x2-6L)**

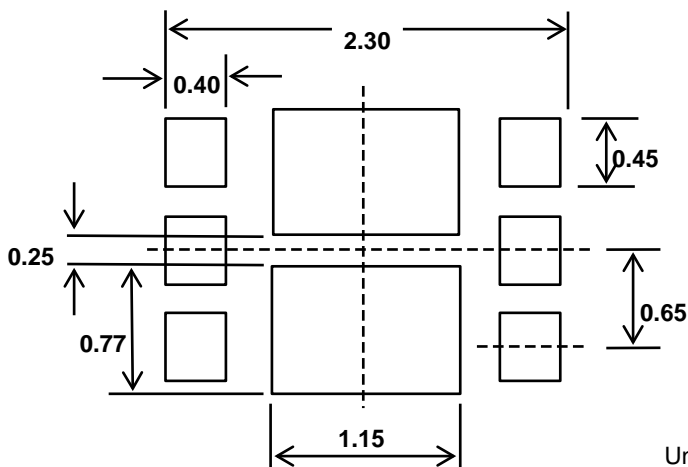


**Bottom view**



**Side view**


Dim	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.924	2.076	0.076	0.082
B	1.924	2.076	0.076	0.082
C	0.250	0.400	0.010	0.016
D	0.650 (typ.)		0.026 (typ.)	
E	0.200 MIN.		0.008 MIN.	
F	0.520	0.720	0.020	0.028
G	0.750	1.100	0.030	0.043
H	0.174	0.380	0.007	0.015
J	0.550	0.800	0.022	0.031
L	0	0.050	0	0.002
K	0.180	0.200	0.007	0.008



Unit:mm

**PCB Layout Guide**

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