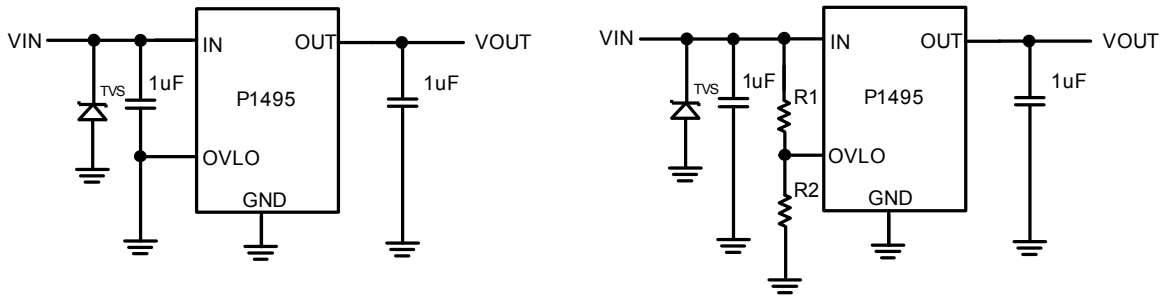
# Over voltage protector

## Description

The P1495 is an Over-Voltage-Protection (OVP) load switch with adjustable 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. P1495(A5) has function to clamp the output voltage at 5.4V if input voltage is higher than 5.4V. When the OVLO input set below the external OVLO select voltage, the P1495 automatically chooses the internal fixed OVLO threshold voltage. The over voltage protection threshold voltage can be adjusted with external resistor divider and the OVLO threshold voltage range is 4.5V~15V. The Over temperature protection (OTP) function monitors chip temperature to protect the device.

The P1495 is available in 9-Ball wafer level Chip-Scale-Package. Standard products are Pb-free and Halogen-free.




Over Voltage Protect with Internal OVLO Threshold Setting

Over Voltage Protect with External OVLO Threshold Setting

Figure 1: Typical Application

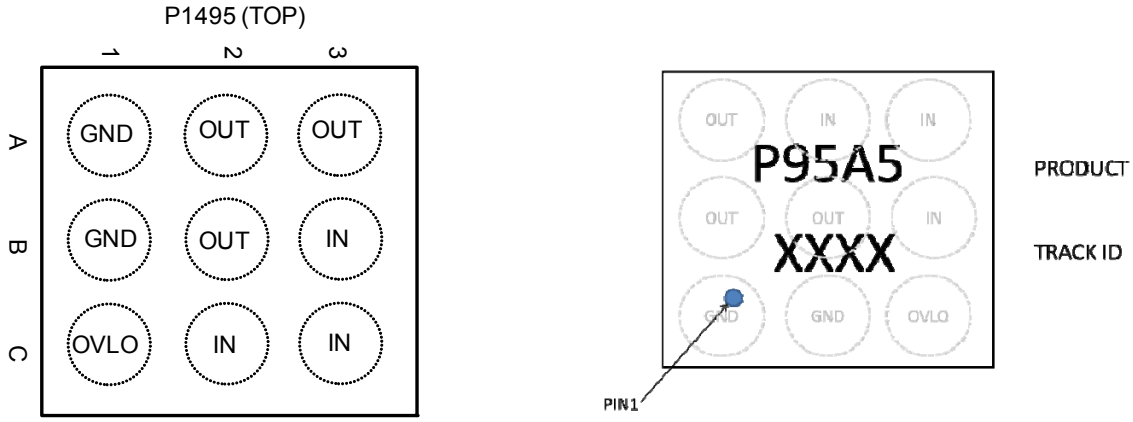



Figure 2: Pin order (Top view) and Marking (Top view)

## Feature

- Maximum input voltage : 29V
- Switch ON resistance : 32mΩTyp.
- Ultra fast OVP response time: 50ns Typ.
- 5.4V fixed over-voltage clamp
- OVLO set threshold

  Reference voltage for adjustable version

  - 1.2V **:** P1495 with ±2% accuracy

## Application

- Mobile Handsets and Tablets
- Portable Media Players
- Peripherals

## Pin Definitions

| Pin No. | Symbol | Descriptions |
|---|---|---|
| B3, C2, C3 | IN | Switch Input and Device Power Supply. |
| A2, A3, B2 | OUT | Switch Output to Load. |
| C1 | OVLO | External OVLO adjustment. Connect a resistor-divider to set different OVLO threshold, $V_{OVLO}$=1.2x(1+R1/R2) as shown typical application diagram. Connect OVLO to GND when using the internal fixed threshold voltage. R2=120kohm is recommended. |
| A1 | GND | Ground |

## Block Diagram

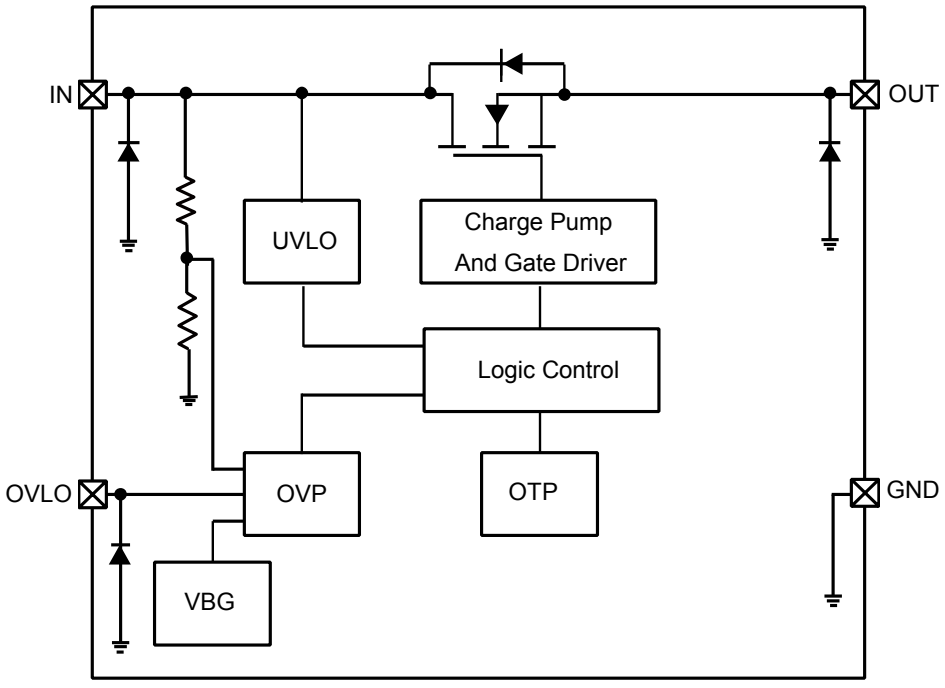



Figure 3: IC Block Diagram

## Absolute maximum rating

| Parameter(Note1) | Symbol | Value | Units |
|---|---|---|---|
| Input voltage (IN pin) | $V_{IN}$ | -0.3 ~ 29 | V |
| Output voltage (OUT pin) | $V_{OUT}$ | -0.3 ~ 15 | V |
| Input voltage (OVLO pin) | $V_{OVLO}$ | -0.3 ~ 15 | V |
| Thermal resistance | $R_{\theta JA}$ | TBD | ℃/W |
| Junction temperature | $T_J$ | 150 | ℃ |
| Lead temperature(10s) | $T_L$ | 260 | ℃ |
| Storage temperature | Tstg | -55~150 | ℃ |
| ESD Ratings | HBM | ±2000 | V |
| | MM | ±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

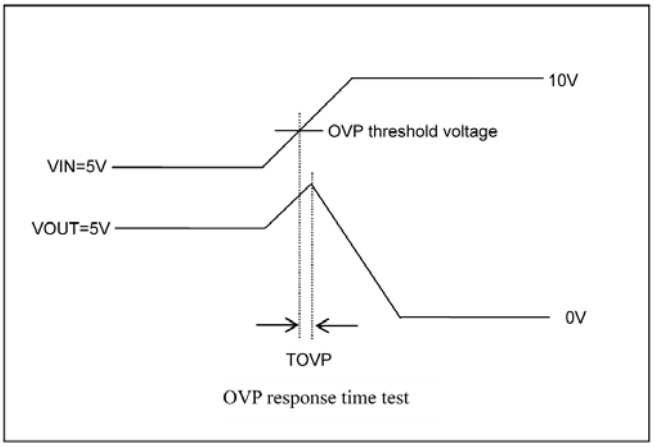
| Parameter | Symbol | Value | Units |
|---|---|---|---|
| Input voltage | $V_{IN}$ | 3.5~28 | V |
| MAX Continuous Output current | $I_{OUT}$ | 3 | A |
| Ambient operating temperature | Topr | -40~85 | ℃ |

## Electrical Characteristics

（$T_A$=25℃，$V_{IN}$=5V，$C_{IN}$=1uF，$C_{OUT}$=4.7uF，unless otherwise specified.）

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Input voltage range | $V_{IN}$ | | 3.5 | | 28 | V |
| Quiescent current | $I_Q$ | NO Load，OVLO=GND<br>$V_{IN}$=25V | | 110 | | uA |
| ON resistance | $R_{ON}$ | $V_{IN}$=5V, $I_{OUT}$=1A | | 32 | 45 | mΩ |
| OVP response time | $t_{OVP}$ | $V_{IN}$ rising, $C_{IN}$=$C_L$=0pF (Note2) | | 50 | | ns |
| OVLO set threshold | $V_{OVLO\_TH}$ | | | 1.2 | | V |
| OVP clamped voltage | $V_{clamp}$ | | | 5.4 | | V |
| Adjust OVP voltage range | VOVP_EXTSEL | VIN rising | 4.5 | | 15 | V |
| | VOVP_INTSEL | | | 7.4 | | V |
| External OVLO select voltage | VOVLO_EXTSEL | | 0.4 | | | V |
| Internal OVLO select voltage | VOVLO_INTSEL | | | | 0.6 | V |
| OVP hysteresis voltage | VOVLO_HYS | VIN falling | | 0.15 | | V |
| UVLO threshold voltage | VUVLO | VIN rising | | | 3.5 | V |
| UVLO hysteresis voltage | VUVLO_HYS | VIN falling | | 0.25 | | V |
| Debounce Time | TDEB | VIN>UVLO to VOUT=VIN*10% | | 60 | | ms |
| Turn On Time | TON | VOUT=VIN*10% to VOUT=VIN*90% | | 300 | | us |
| Output discharge resistance | RDCHG | VIN=5V | | 700 | | Ω |
| OTP threshold temperature | TOTP | VIN=5V | | 140 | | ℃ |
| OTP hysteresis temperature | THYS | VIN=5V | | 20 | | ℃ |

**Note 2:**Guaranteed by design



OVP response time test

## 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.

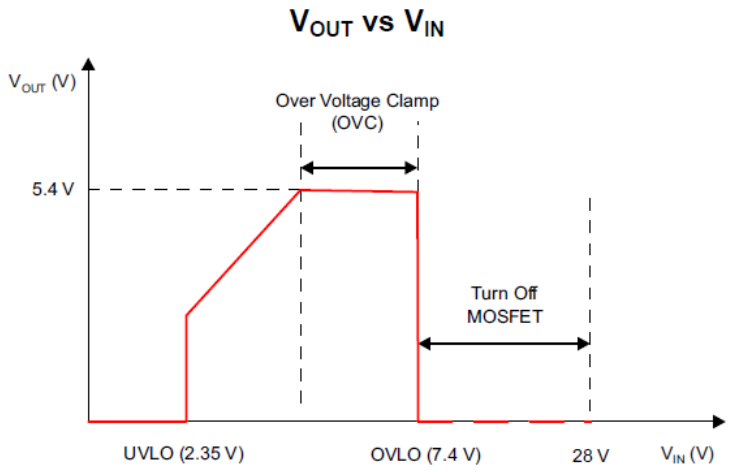
2. Over-voltage Clamp (OVC)

When 5.4 V < VIN < 7.4 V, the over-voltage-clamp (OVC) circuit clamps the output voltage to 5.4 V. Fast transients can exceed the bandwidth of the internal gate control amplifier but such events will not risk damage to the load. In the unlikely event that a transient is fast enough to exceed the amplifier bandwidth but not severe enough to exceed 7.4 V.

3. Over-voltage Lockout (OVLO)

When VIN exceeds 7.6 V, the over-voltage lockout (OVLO) circuit turns off the protected power switch.

The OVP threshold is calculated by the equation: $V_{OVLO}$=1.2x(1+R1/R2).



## Typical Characteristics

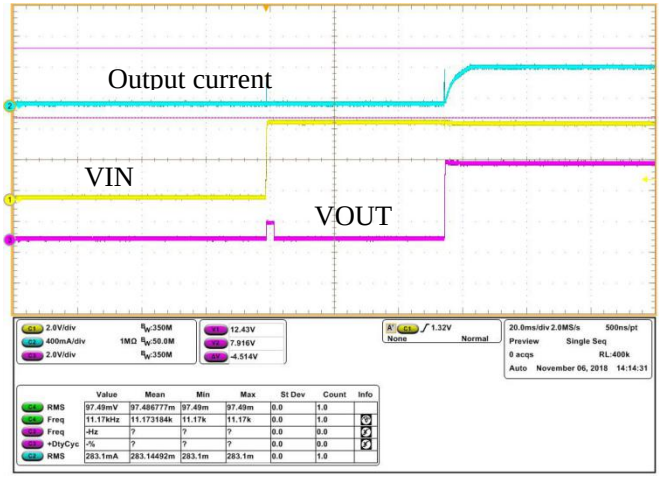



Fig 1. Start-up waveform

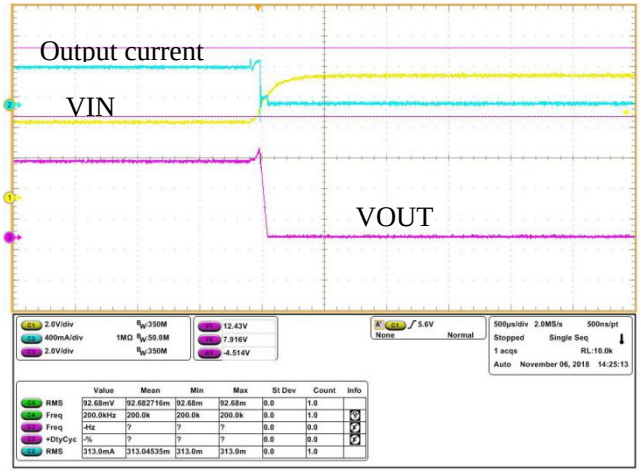



Fig2. OVP response

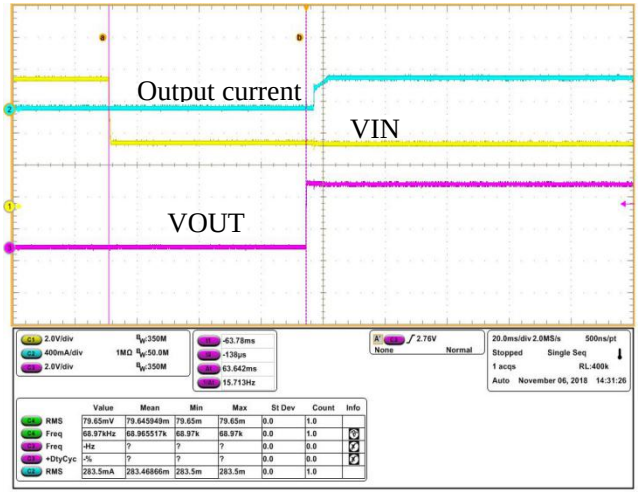



Fig3. OVP recovery waveform

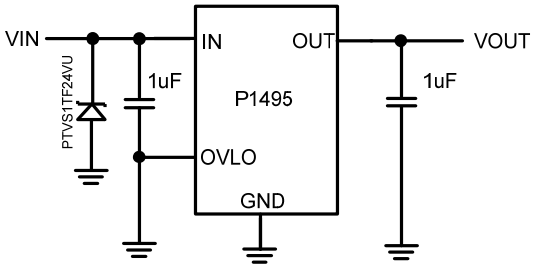



Fig4. Surge test schematic

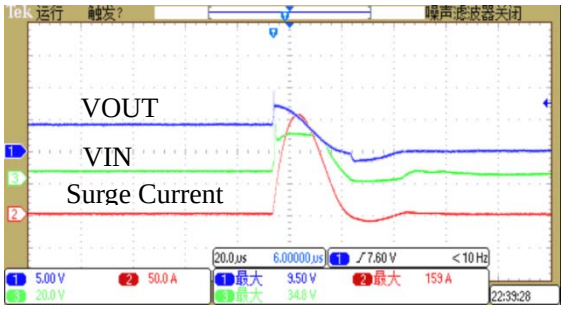
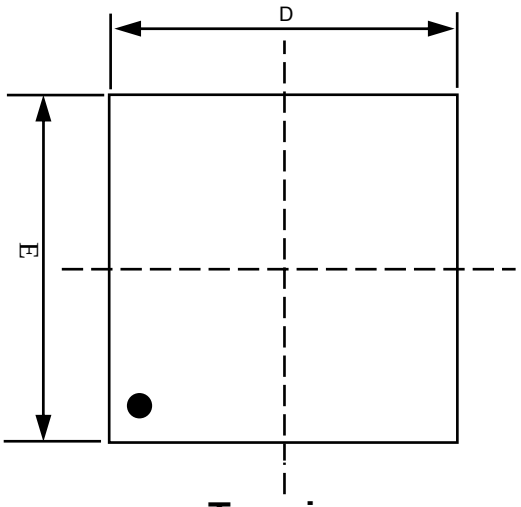
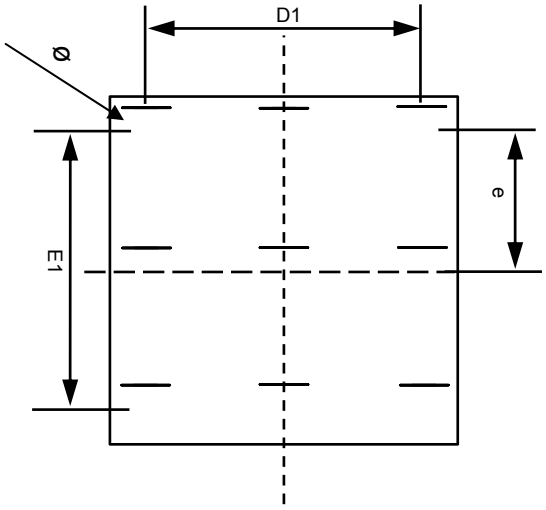



Fig5. 8-20 Surge test waveform (400V)

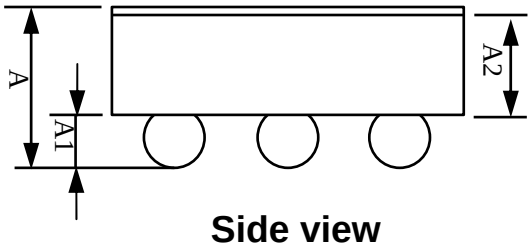
## Product dimension (WLCSP-9L)




Top view




Bottom view




Side view

| Dim | Millimeters | | |
|---|---|---|---|
| | MIN | Typ. | MAX |
| A | 0.475 | 0.505 | 0.535 |
| A1 | 0.125 | 0.140 | 0.155 |
| A2 | 0.325 | 0.340 | 0.355 |
| D | 1.070 | 1.100 | 1.130 |
| E | 1.070 | 1.100 | 1.130 |
| e | 0.400（typ.） | | |
| D1 | 0.800（typ.） | | |
| E1 | 0.800（typ.） | | |
| ø | 0.180（typ.） | | |

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