

### P4SMA Series



| Agency Approvals  |                    |
|---|--------------------|
| AGENCY  | AGENCY FILE NUMBER |
|  | E230531            |

### Maximum Ratings and Thermal Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Parameter  | Symbol                            | Value      | Unit |
|--|-----------------------------------|------------|------|
| Peak Pulse Power Dissipation at T <sub>A</sub> =25°C by 10x1000µs Waveform (Fig.2)(Note 1), (Note 2) | P <sub>PPM</sub>                  | 400        | W    |
| Power Dissipation on Infinite Heat Sink at T <sub>A</sub> =50°C                                      | P <sub>M(AV)</sub>                | 3.3        | W    |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)                                     | I <sub>FSM</sub>                  | 40         | A    |
| Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only (Note 4)                        | V <sub>F</sub>                    | 3.5V/6.5   | V    |
| Operating Junction and Storage Temperature Range   | T <sub>J</sub> , T <sub>STG</sub> | -65 to 150 | °C   |
| Typical Thermal Resistance Junction to Lead  | R <sub>θJL</sub>                  | 30         | °C/W |
| Typical Thermal Resistance Junction to Ambient   | R <sub>θJA</sub>                  | 120        | °C/W |

- Notes:**
1. Non-repetitive current pulse, per Fig. 4 and derated above T<sub>A</sub> = 25°C per Fig. 3.
  2. Mounted on 0.2x0.2" (5.0 x 5.0mm) copper pad to each terminal.
  3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.
  4. V<sub>F</sub><3.5V for V<sub>BR</sub> ≤ 200V and V<sub>F</sub><6.5V for V<sub>BR</sub> ≥ 201V.

### Functional Diagram



### Description

The P4SMA series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

### Features

- Excellent clamping capability
- Low incremental surge resistance
- Typical I<sub>R</sub> less than 1µA above 12V
- For surface mounted applications to optimize board space
- Low profile package
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)
- Built-in strain relief capability
- 400W peak pulse power capability at 10x1000µs waveform, repetition rate (duty cycles):0.01 %
- Fast response time: typically less than 1.0ps from 0V to BV min
- Typical maximum temperature coefficient ΔV<sub>BR</sub> = 0.1% × V<sub>BR</sub>@25°C × ΔT
- Glass passivated chip junction
- High Temperature soldering guaranteed: 260°C/40 seconds at terminals
- Plastic package has underwriters laboratory flammability 94V-0
- Matte tin lead-free Plated
- Halogen-free and RoHS compliant

### Applications

TVS devices are ideal for the protection of I/O Interfaces, V<sub>CC</sub> bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

P4SMA Series

### Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | Marking |      | Reverse Stand off Voltage V <sub>R</sub> (Volts) | Breakdown Voltage V <sub>BR</sub> (Volts) @ I <sub>T</sub> |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @ I <sub>pp</sub> (V) | Maximum Peak Pulse Current I <sub>pp</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (µA) | Agency Approval  |
|-------------------|------------------|---------|------|--|--|--------|----------------------------------|---|--|--|---|
|                   |                  | UNI     | BI   |  | MIN  | MAX    |                                  |   |  |  |   |
| P4SMA6.8A         | P4SMA6.8CA       | 6V8A    | 6V8C | 5.80   | 6.45   | 7.14   | 10                               | 10.5  | 39.0   | 1000   | X   |
| P4SMA7.5A         | P4SMA7.5CA       | 7V5A    | 7V5C | 6.40   | 7.13   | 7.88   | 10                               | 11.3  | 36.3   | 500  | X   |
| P4SMA8.2A         | P4SMA8.2CA       | 8V2A    | 8V2C | 7.02   | 7.79   | 8.61   | 10                               | 12.1  | 33.9   | 200  | X   |
| P4SMA9.1A         | P4SMA9.1CA       | 9V1A    | 9V1C | 7.78   | 8.65   | 9.55   | 1                                | 13.4  | 30.6   | 50   | X   |
| P4SMA10A          | P4SMA10CA        | 10A     | 10C  | 8.55   | 9.50   | 10.50  | 1                                | 14.5  | 28.3   | 10   | X   |
| P4SMA11A          | P4SMA11CA        | 11A     | 11C  | 9.40   | 10.50  | 11.60  | 1                                | 15.6  | 26.3   | 5  | X   |
| P4SMA12A          | P4SMA12CA        | 12A     | 12C  | 10.20  | 11.40  | 12.60  | 1                                | 16.7  | 24.6   | 5  | X   |
| P4SMA13A          | P4SMA13CA        | 13A     | 13C  | 11.10  | 12.40  | 13.70  | 1                                | 18.2  | 22.5   | 1  | X   |
| P4SMA15A          | P4SMA15CA        | 15A     | 15C  | 12.80  | 14.30  | 15.80  | 1                                | 21.2  | 19.3   | 1  | X   |
| P4SMA16A          | P4SMA16CA        | 16A     | 16C  | 13.60  | 15.20  | 16.80  | 1                                | 22.5  | 18.2   | 1  | X   |
| P4SMA18A          | P4SMA18CA        | 18A     | 18C  | 15.30  | 17.10  | 18.90  | 1                                | 25.5  | 16.1   | 1  | X   |
| P4SMA20A          | P4SMA20CA        | 20A     | 20C  | 17.10  | 19.00  | 21.00  | 1                                | 27.7  | 14.8   | 1  | X   |
| P4SMA22A          | P4SMA22CA        | 22A     | 22C  | 18.80  | 20.90  | 23.10  | 1                                | 30.6  | 13.4   | 1  | X   |
| P4SMA24A          | P4SMA24CA        | 24A     | 24C  | 20.50  | 22.80  | 25.20  | 1                                | 33.2  | 12.3   | 1  | X   |
| P4SMA27A          | P4SMA27CA        | 27A     | 27C  | 23.10  | 25.70  | 28.40  | 1                                | 37.5  | 10.9   | 1  | X   |
| P4SMA30A          | P4SMA30CA        | 30A     | 30C  | 25.60  | 28.50  | 31.50  | 1                                | 41.4  | 9.9  | 1  | X   |
| P4SMA33A          | P4SMA33CA        | 33A     | 33C  | 28.20  | 31.40  | 34.70  | 1                                | 45.7  | 9.0  | 1  | X   |
| P4SMA36A          | P4SMA36CA        | 36A     | 36C  | 30.80  | 34.20  | 37.80  | 1                                | 49.9  | 8.2  | 1  | X   |
| P4SMA39A          | P4SMA39CA        | 39A     | 39C  | 33.30  | 37.10  | 41.00  | 1                                | 53.9  | 7.6  | 1  | X   |
| P4SMA43A          | P4SMA43CA        | 43A     | 43C  | 36.80  | 40.90  | 45.20  | 1                                | 59.3  | 6.9  | 1  | X   |
| P4SMA47A          | P4SMA47CA        | 47A     | 47C  | 40.20  | 44.70  | 49.40  | 1                                | 64.8  | 6.3  | 1  | X   |
| P4SMA51A          | P4SMA51CA        | 51A     | 51C  | 43.60  | 48.50  | 53.60  | 1                                | 70.1  | 5.8  | 1  | X   |
| P4SMA56A          | P4SMA56CA        | 56A     | 56C  | 47.80  | 53.20  | 58.80  | 1                                | 77.0  | 5.3  | 1  | X   |
| P4SMA62A          | P4SMA62CA        | 62A     | 62C  | 53.00  | 58.90  | 65.10  | 1                                | 85.0  | 4.8  | 1  | X   |
| P4SMA68A          | P4SMA68CA        | 68A     | 68C  | 58.10  | 64.60  | 71.40  | 1                                | 92.0  | 4.5  | 1  | X   |
| P4SMA75A          | P4SMA75CA        | 75A     | 75C  | 64.10  | 71.30  | 78.80  | 1                                | 103.0   | 4.0  | 1  | X   |
| P4SMA82A          | P4SMA82CA        | 82A     | 82C  | 70.10  | 77.90  | 86.10  | 1                                | 113.0   | 3.6  | 1  | X   |
| P4SMA91A          | P4SMA91CA        | 91A     | 91C  | 77.80  | 86.50  | 95.50  | 1                                | 125.0   | 3.3  | 1  | X   |
| P4SMA100A         | P4SMA100CA       | 100A    | 100C | 85.50  | 95.00  | 105.00 | 1                                | 137.0   | 3.0  | 1  | X   |
| P4SMA110A         | P4SMA110CA       | 110A    | 110C | 94.00  | 105.00   | 116.00 | 1                                | 152.0   | 2.7  | 1  | X   |
| P4SMA120A         | P4SMA120CA       | 120A    | 120C | 102.00   | 114.00   | 126.00 | 1                                | 165.0   | 2.5  | 1  | X   |
| P4SMA130A         | P4SMA130CA       | 130A    | 130C | 111.00   | 124.00   | 137.00 | 1                                | 179.0   | 2.3  | 1  | X   |
| P4SMA150A         | P4SMA150CA       | 150A    | 150C | 128.00   | 143.00   | 158.00 | 1                                | 207.0   | 2.0  | 1  | X   |
| P4SMA160A         | P4SMA160CA       | 160A    | 160C | 136.00   | 152.00   | 168.00 | 1                                | 219.0   | 1.9  | 1  | X   |
| P4SMA170A         | P4SMA170CA       | 170A    | 170C | 145.00   | 162.00   | 179.00 | 1                                | 234.0   | 1.8  | 1  | X   |
| P4SMA180A         | P4SMA180CA       | 180A    | 180C | 154.00   | 171.00   | 189.00 | 1                                | 246.0   | 1.7  | 1  | X   |
| P4SMA200A         | P4SMA200CA       | 200A    | 200C | 171.00   | 190.00   | 210.00 | 1                                | 274.0   | 1.5  | 1  | X   |
| P4SMA220A         | P4SMA220CA       | 220A    | 220C | 185.00   | 209.00   | 231.00 | 1                                | 328.0   | 1.3  | 1  | X   |
| P4SMA250A         | P4SMA250CA       | 250A    | 250C | 214.00   | 237.00   | 263.00 | 1                                | 344.0   | 1.2  | 1  | X   |
| P4SMA300A         | P4SMA300CA       | 300A    | 300C | 256.00   | 285.00   | 315.00 | 1                                | 414.0   | 1.0  | 1  | X   |
| P4SMA350A         | P4SMA350CA       | 350A    | 350C | 300.00   | 332.00   | 368.00 | 1                                | 482.0   | 0.9  | 1  | X   |
| P4SMA400A         | P4SMA400CA       | 400A    | 400C | 342.00   | 380.00   | 420.00 | 1                                | 548.0   | 0.8  | 1  | X   |
| P4SMA440A         | P4SMA440CA       | 440A    | 440C | 376.00   | 418.00   | 462.00 | 1                                | 602.0   | 0.7  | 1  | X   |
| P4SMA480A         | P4SMA480CA       | 480A    | 480C | 408.00   | 456.00   | 504.00 | 1                                | 658.0   | 0.6  | 1  | X   |
| P4SMA510A         | P4SMA510CA       | 510A    | 510C | 434.00   | 485.00   | 535.00 | 1                                | 698.0   | 0.6  | 1  | X   |
| P4SMA530A         | P4SMA530CA       | 530A    | 530C | 477.00   | 503.50   | 556.50 | 1                                | 725.0   | 0.6  | 1  | X   |
| P4SMA540A         | P4SMA540CA       | 540A    | 540C | 486.00   | 513.00   | 567.00 | 1                                | 740.0   | 0.5  | 1  | X   |
| P4SMA550A         | P4SMA550CA       | 550A    | 550C | 495.00   | 522.50   | 577.50 | 1                                | 760.0   | 0.5  | 1  | X   |

For bidirectional type having V<sub>R</sub> of 10 volts and less, the I<sub>R</sub> limit is double.

For parts without A, the V<sub>BR</sub> is ± 10% and V<sub>C</sub> is 5% higher than with A parts.

### I-V Curve Characteristics



**$P_{PPM}$  Peak Pulse Power Dissipation** – Max power dissipation

**$V_R$  Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation

**$V_{BR}$  Breakdown Voltage** – Maximum current that flows through the TVS at a specified test current ( $I_T$ )

**$V_C$  Clamping Voltage** – Peak voltage measured across the suppressor at a specified  $I_{ppm}$  (peak impulse current)

**$I_R$  Reverse Leakage Current** – Current measured at  $V_R$

**$V_F$  Forward Voltage Drop for Uni-directional**

### Ratings and Characteristic Curves ( $T_A=25^\circ\text{C}$ unless otherwise noted)

**Figure 1 - TVS Transients Clamping Waveform**



**Figure 2 - Peak Pulse Power Rating Curve**



continues on next page.

**Ratings and Characteristic Curves** ( $T_A=25^\circ\text{C}$  unless otherwise noted) (Continued)

**Figure 3 - Pulse Derating Curve**



**Figure 4 - Pulse Waveform**



**Figure 5 - Typical Junction Capacitance**



**Figure 6 - Steady State Power Dissipation Derating Curve**



**Figure 7 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only**



### Soldering Parameters

|  |                                    |                         |
|--|------------------------------------|-------------------------|
| Reflow Condition                                       |                                    | Lead-free assembly      |
| Pre Heat   | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|  | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|  | - Time (min to max) ( $t_s$ )      | 60 – 180 secs           |
| Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak) |                                    | 3°C/second max          |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                    | 3°C/second max          |
| Reflow   | - Temperature ( $T_L$ ) (Liquidus) | 217°C                   |
|  | - Time (min to max) ( $t_s$ )      | 60 – 150 seconds        |
| Peak Temperature ( $T_p$ )                             |                                    | 260 <sup>+0/-5</sup> °C |
| Time within 5°C of actual peak Temperature ( $t_p$ )   |                                    | 20 – 40 seconds         |
| Ramp-down Rate   |                                    | 6°C/second max          |
| Time 25°C to peak Temperature ( $T_p$ )                |                                    | 8 minutes Max.          |
| Do not exceed  |                                    | 280°C                   |



### Physical Specifications

|                 |  |
|-----------------|--|
| <b>Weight</b>   | 0.002 ounce, 0.061 gram  |
| <b>Case</b>     | JEDEC DO-214AC. Molded plastic body over glass passivated junction |
| <b>Polarity</b> | Color band denotes positive end (cathode) except bidirectional     |
| <b>Terminal</b> | Matte Tin-plated leads, Solderable per JESD22-B102D                |

### Environmental Specifications

|                           |             |
|---------------------------|-------------|
| <b>Temperature Cycle</b>  | JESD22-A104 |
| <b>Pressure Cooker</b>    | JESD22-A102 |
| <b>High Temp. Storage</b> | JESD22-A103 |
| <b>HTRB</b>               | JESD22-A108 |
| <b>Thermal Shock</b>      | JESD22-A106 |

### Dimensions



| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.049  | 0.065 | 1.250       | 1.650 |
| B          | 0.157  | 0.177 | 3.990       | 4.500 |
| C          | 0.100  | 0.110 | 2.540       | 2.790 |
| D          | 0.078  | 0.090 | 1.980       | 2.290 |
| E          | 0.030  | 0.060 | 0.780       | 1.520 |
| F          | -      | 0.008 | -           | 0.203 |
| G          | 0.194  | 0.208 | 4.930       | 5.280 |
| H          | 0.006  | 0.012 | 0.152       | 0.305 |
| I          | 0.070  | -     | 1.800       | -     |
| J          | 0.082  | -     | 2.100       | -     |
| K          | -      | 0.090 | -           | 2.300 |
| L          | 0.082  | -     | 2.100       | -     |

### Part Numbering System



### Part Marking System



### Packaging

| Part number | Component Package | Quantity | Packaging Option            | Packaging Specification |
|-------------|-------------------|----------|-----------------------------|-------------------------|
| P4SMAxxxXX  | DO-214AC          | 5000     | Tape & Reel – 12mm/13" tape | EIA STD RS-481          |

### Tape and Reel Specification



Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А