# Transient Voltage Suppressor

## Features

- Solid-state silicon-avalanche technology
- Low operating and clamping voltage
- Up to four I/O Lines of Protection
- Ultra low capacitance: 0.3pF typical(I/O to I/O)
- Low Leakage
- Low operating voltage:5V
- Flow-Through design

## IEC COMPATIBILITY (EN61000-4)

- IEC 61000-4-2 (ESD) ±25kV (air), ±22kV (contact)
- IEC 61000-4-4 (EFT) 40A (5/50ns)
- IEC 61000-4-5 (Lightning) 4.5A (8/20μs)

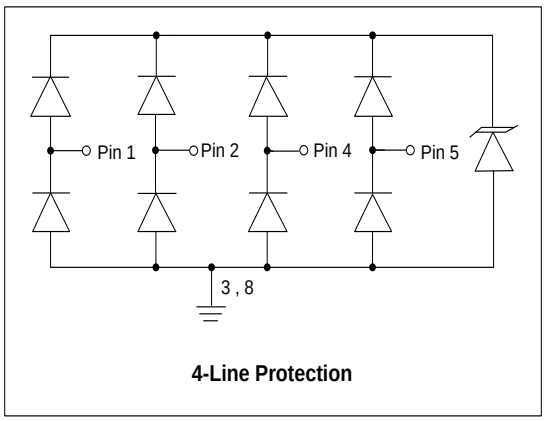
## Mechanical Characteristics

- DFN-10L package (2.5×1.0×0.50mm)
- Marking: Marking Code
- Packaging: Tape and Reel
- RoHS Compliant

## Applications

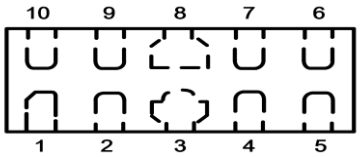
- Digital Visual Interface(DVI)
- MDDI Ports
- DisplayPort TM Interface
- High Definition Multi-Media Interface(HDMI)

## Circuit Diagram




4-Line Protection

## Schematic & PIN Configuration



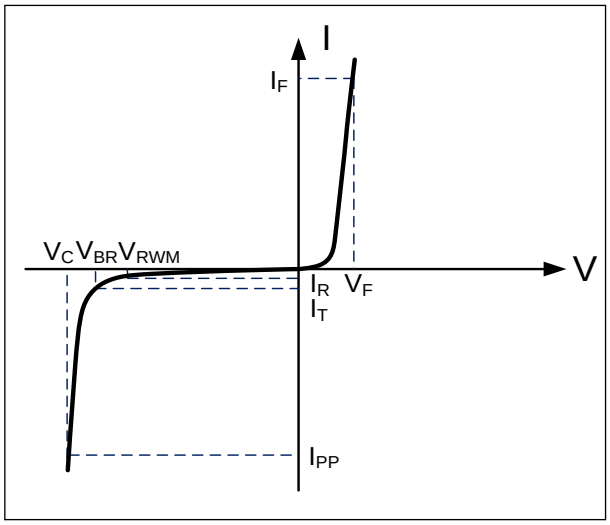

| Pin | Identificaion |
|---|---|
| 1,2,4,5 | Input Lines |
| 6,7,9,10 | Output Lines<br>(No Internal Connection) |
| 3,8 | Ground |

## Absolute Maximum Rating

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Peak Pulse Power ( $t_p$ = 8/20μs ) | $P_{PP}$ | 68 | Watts |
| Peak Pulse Current ( $t_p$ = 8/20μs ) | $I_{PP}$ | 4.5 | A |
| Operating Temperature | $T_J$ | -55 to + 125 | °C |
| Storage Temperature | $T_{STG}$ | -55 to + 150 | °C |

## Electrical Parameters (T=25℃)

| Symbol | Parameter |
|---|---|
| $I_{PP}$ | Reverse Peak Pulse Current |
| $V_C$ | Clamping Voltage @ $I_{PP}$ |
| $V_{RWM}$ | Reverse Stand-Off Voltage |
| $I_R$ | Reverse Leakage Current @ $V_{RWM}$ |
| $V_{BR}$ | Breakdown Voltage @ $I_T$ |
| $I_T$ | Test Current |
| $I_F$ | Forward Current |
| $V_F$ | Forward Voltage @ $I_F$ |



## Electrical Characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Reverse Stand-Off Voltage | $V_{RWM}$ | Any I/O pin to ground | | | 5 | V |
| Reverse Breakdown Voltage | $V_{BR}$ | $I_T$=1mA | 6 | | | V |
| Reverse Leakage Current | $I_R$ | $V_{RWM}$ = 5V, T=25°C<br>Any I/O pin to ground | | | 500 | nA |
| Clamping Voltage | $V_C$ | $I_{pp}$=1A, $t_p$=8/20μs<br>Any I/O pin to groun | | | 9 | V |
| Clamping Voltage | $V_C$ | $I_{pp}$=4.5A, $t_p$=8/20μs<br>Any I/O pin to ground | | | 15 | V |
| Dynamic Resistance (1) (2) | $R_{DYN}$ | TLP=0.2/100ns | | 0.5 | | Ω |
| ESD Clamping Voltage (1) | $V_C$ | $I_{PP}$ = 4A<br>$t_p$ = 0.2/100ns(TLP) | | 10 | | V |
| ESD Clamping Voltage (1) | $V_C$ | $I_{PP}$ = 16A<br>$t_p$ = 0.2/100ns(TLP) | | 16 | | V |
| Junction Capacitance | $C_j$ | $V_R$ = 0V, f = 1MHz<br>I/O pin to GND | | | 0.8 | pF |
| | | $V_{Pin3,8}$=0V $V_R$ = 0V,<br>f = 1MHz<br>Between I/O pins | | 0.3 | 0.4 | pF |

*Note1*. TLP Setting:$t_p$=100ns, $t_r$=0.2ns, $I_{TLP}$ and $V_{TLP}$ sample window:$t_1$=70ns to $t_2$=90ns.

*Note2*. Dynamic resistance calculated from $I_{PP}$=4A to $I_{PP}$=16A using “Best Fit”.

## Typical Characteristics

**Figure 1: Peak Pulse Power vs. Pulse Time**

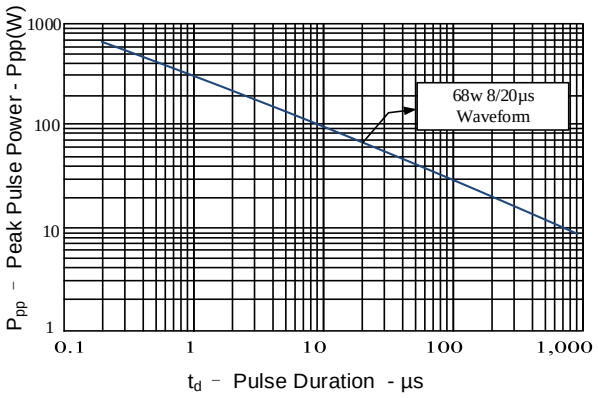



**Figure 2: Power Derating Curve**

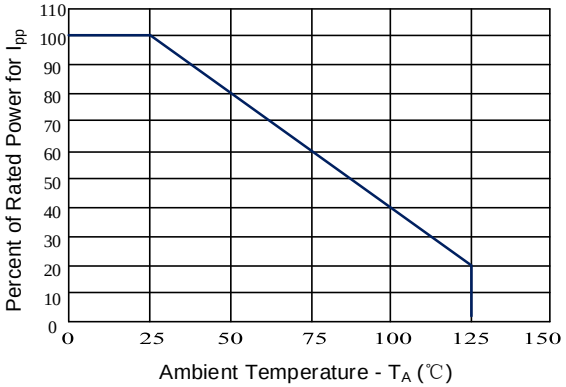



**Figure 3: Clamping Voltage vs. Peak Pulse Current**

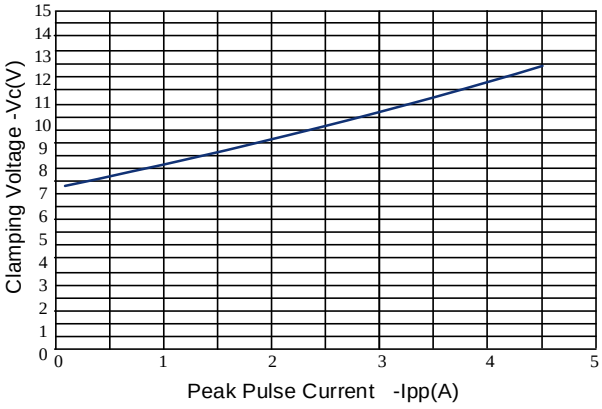



**Figure 4: Normalized Junction Capacitance vs. Reverse Voltage**

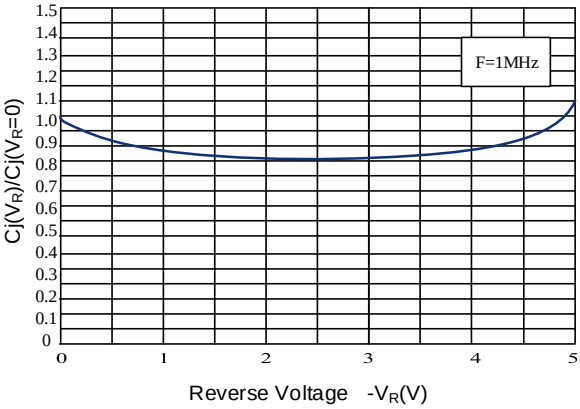



**Figure 5: 8/20µs Pulse Waveform**

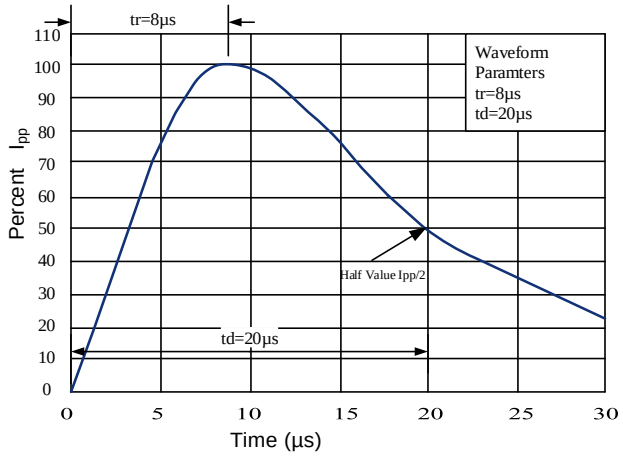
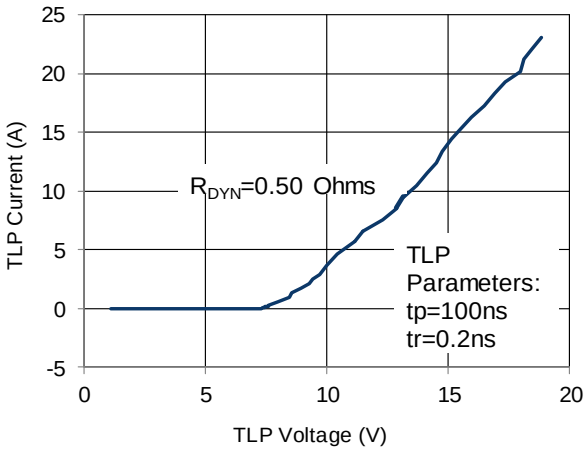
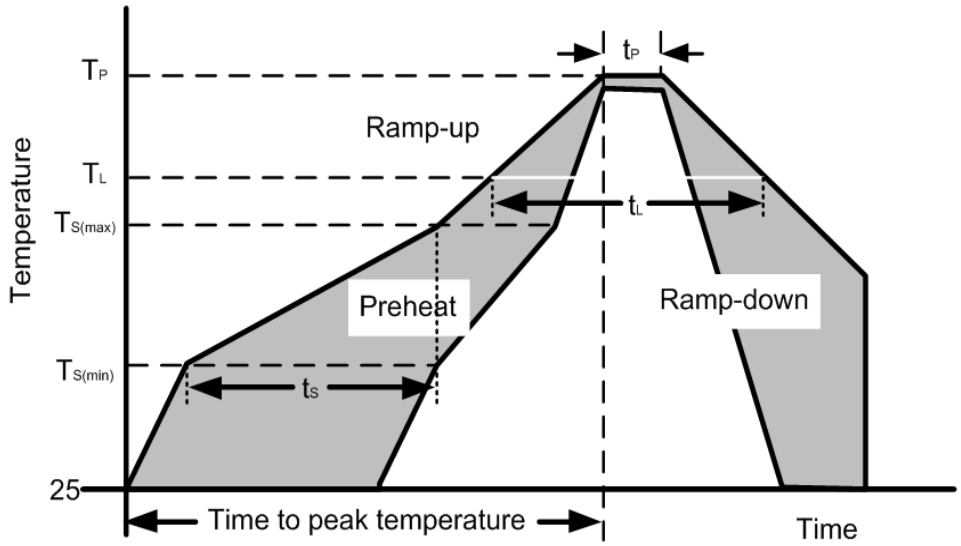



**Figure 6: TLP I-V Curve**



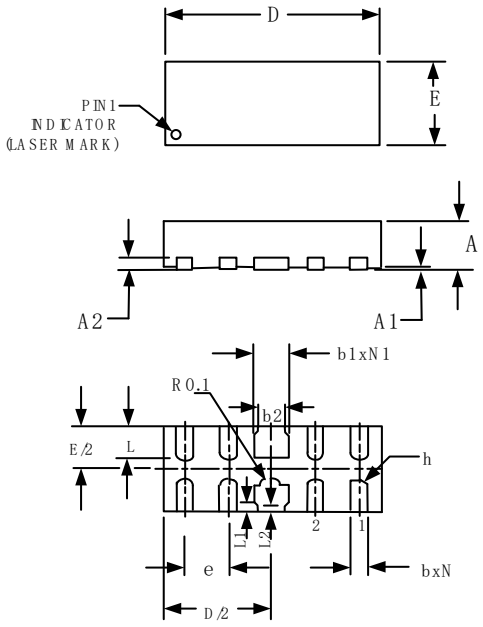
## Soldering Parameters

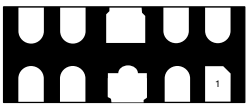
| Reflow Condition | | Pb – Free assembly |
|---|---|---|
| Pre Heat | Temperature Min ($T_{S(min)}$) | 150°C |
| | Temperature Max ($T_{S(max)}$) | 200°C |
| | Time (min to max) ($t_S$ ) | 60 – 190 secs |
| Average ramp up rate (Liquidus Temp) ($T_L$) to peak | | 5°C/second max |
| $T_{S(max)}$ to $T_L$——Ramp-up Rate | | 5°C/second max |
| Reflow | Temperature ($T_L$) (Liquidus) | 217°C |
| | Temperature ($t_L$) | 60 – 150 seconds |
| Peak Temperature ($T_P$) | | 260+0/-5 °C |
| Time within actual peak Temperature ($t_P$ ) | | 20 – 40 seconds |
| Ramp-down Rate | | 5°C/second max |
| Time 25°C to peak Temperature ($T_P$) | | 8 minutes Max. |
| Do not exceed | | 280°C |



## Package Dimension-DFN2510-10L

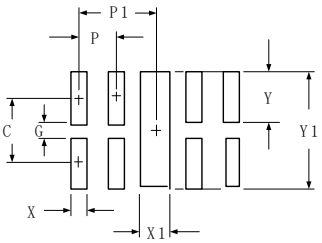
PACKAGE OUTLINE




DFN2.5x1-10L

| SYMBOL | INCHES | | | MILLIMETERS | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.018 | 0.020 | 0.022 | 0.45 | 0.50 | 0.55 |
| A1 | 0.000 | 0.001 | 0.002 | 0.00 | 0.02 | 0.05 |
| A2 | | 0.006 | | | 0.15 | |
| b | 0.006 | 0.008 | 0.010 | 0.15 | 0.20 | 0.25 |
| b1 | 0.014 | 0.016 | 0.018 | 0.35 | 0.40 | 0.45 |
| b2 | 0.008 | 0.010 | 0.018 | 0.20 | 0.25 | 0.45 |
| D | 0.096 | 0.098 | 0.100 | 2.45 | 2.50 | 2.55 |
| E | 0.037 | 0.039 | 0.041 | 0.95 | 1.00 | 1.05 |
| e | | 0.020BSC | | | 0.50BSC | |
| L | 0.014 | 0.016 | 0.018 | 0.35 | 0.40 | 0.45 |
| L1 | 0.000 | 0.003 | 0.004 | 0.00 | 0.075 | 0.10 |
| L2 | 0.000 | 0.002 | 0.003 | 0.00 | 0.05 | 0.08 |
| h | 0.000 | 0.005 | 0.006 | 0.00 | 0.12 | 0.15 |
| N | | 8 | | | 8 | |
| N1 | | 2 | | | 2 | |




| DIMENSIONS | | |
|---|---|---|
| DIM | INCHES | MILLIMETERS |
| C | 0.034 | 0.875 |
| G | 0.008 | 0.20 |
| P | 0.020 | 0.50 |
| P1 | 0.039 | 1.00 |
| X | 0.010 | 0.25 |
| X1 | 0.018 | 0.45 |
| Y | 0.027 | 0.675 |
| Y1 | 0.061 | 1.55 |

Notes:

Controlling Dimension: Millimeter.

## Ordering Information

| Part | Package | Marking | Packing Information |
|---|---|---|---|
| ES054R2P | DFN2510-10L | 5R2P | 3k/Reel |

## Revision History and Checking Table

| No. | Version | Date | Revision Item | Request | Function & Spec Checking | Package Checking | Tape Checking |
|---|---|---|---|---|---|---|---|
| 1 | 1.0 | 2018-03-24 | Released Version | Qi Shu Kun | Li Zi Hao | Liu Jia Ying | Liu Jia Ying |
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