



# WS4.5P4N3-BW

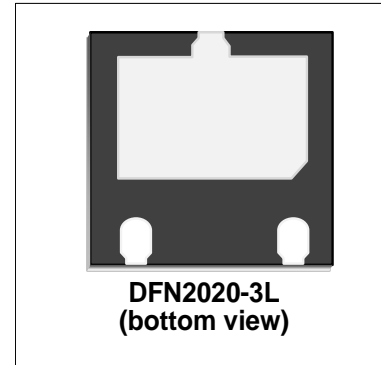
## Transient Voltage Suppressor

### Features

- 4500 Watts Peak Power ( $t_p = 8/20\mu s$ )
- Fast Response time: Typically  $< 1ns$
- Excellent Clamping Capability
- Low Leakage Current
- Working Voltages: 4.5V

### IEC COMPATIBILITY (EN61000-4)

- IEC 61000-4-2 (ESD)  $\pm 30kV$  (air),  $\pm 30kV$  (contact)
- IEC 61000-4-4 (EFT) 40A (5/50ns)
- IEC 61000-4-5 (Lightning) 300A (8/20 $\mu s$ )



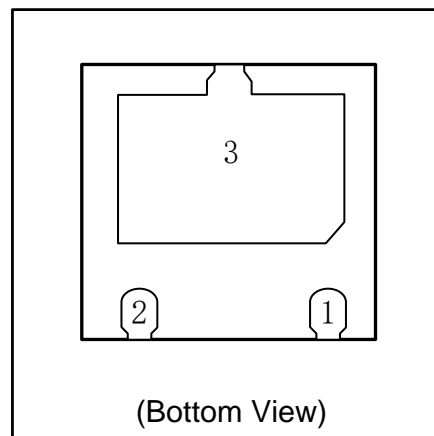
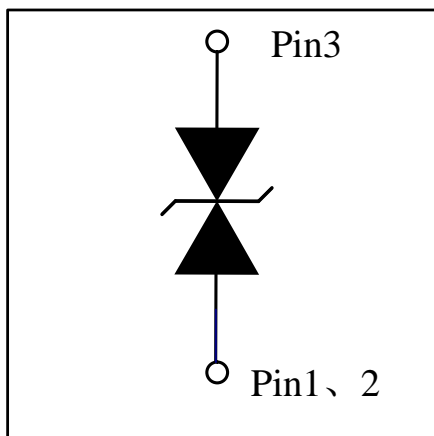
### Mechanical Characteristics

- DFN2020-3L package
- Molding compound flammability rating: UL 94V-0
- Marking : Making Code
- Packaging : Tape and Reel per EIA 481
- RoHS Compliant

### Applications

- I/O Interfaces
- Power lines
- Automotive and Telecommunication
- Computer & Consumer Electronics
- Industrial Electronics
- Microcontroller Input Protection

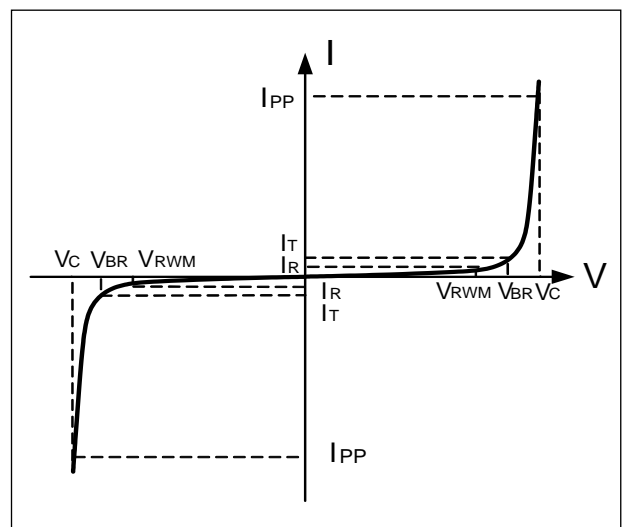
### PIN Configuration



Absolute Maximum Rating			
Rating	Symbol	Value	Units
Peak Pulse Power <sup>1</sup> ( $t_p=8/20\mu s$ )	P <sub>PP</sub>	4500	Watts
Peak Pulse Current <sup>1</sup> ( $t_p=8/20\mu s$ )	I <sub>PP</sub>	300	A
Operating Temperature	T <sub>J</sub>	-55 to + 125	°C
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C

Electrical Parameters (T=25°C)

Symbol	Parameter
I <sub>PP</sub>	Reverse Peak Pulse Current
V <sub>C</sub>	Clamping Voltage @ I <sub>PP</sub>
V <sub>RWM</sub>	Reverse Stand-Off Voltage
I <sub>R</sub>	Reverse Leakage Current @ V <sub>RWM</sub>
V <sub>BR</sub>	Breakdown Voltage @ I <sub>T</sub>
I <sub>T</sub>	Test Current



Electrical Characteristics

WS4.5P4N3-BW						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V <sub>RWM</sub>				4.5	V
Reverse Breakdown Voltage	V <sub>BR</sub>	I <sub>T</sub> =1mA	4.6		7.0	V
Reverse Leakage Current	I <sub>R</sub>	V <sub>RWM</sub> =4.5V, T=25°C			500	nA
Clamping Voltage <sup>1</sup>	V <sub>C</sub>	I <sub>PP</sub> =1A, t <sub>p</sub> =8/20μs		5.5	7.0	V
Clamping Voltage <sup>1</sup>	V <sub>C</sub>	I <sub>PP</sub> =150A, t <sub>p</sub> =8/20μs		7.5	10.0	V
Clamping Voltage <sup>1</sup>	V <sub>C</sub>	I <sub>PP</sub> =300A, t <sub>p</sub> =8/20μs		11.5	15.0	V
Dynamic Resistance <sup>2,3</sup>	R <sub>DYN</sub>	TLP=0.2/100ns		0.03		Ω
Junction Capacitance	C <sub>j</sub>	V <sub>R</sub> = 0V, f = 1MHz		430	600	pF

Note: 1. Measured from pin 1 and pin 2 to pin 3..

2. TLP Setting : t<sub>p</sub>=100ns, t<sub>r</sub>=0.2ns, I<sub>TLP</sub> and V<sub>TLP</sub> sample window:t<sub>1</sub>=70ns to t<sub>2</sub>=90ns.

3. Dynamic resistance calculated from IPP=4A to IPP=16A using “Best Fit”

Typical Characteristics

Figure 1: Peak Pulse Power vs. Pulse Time

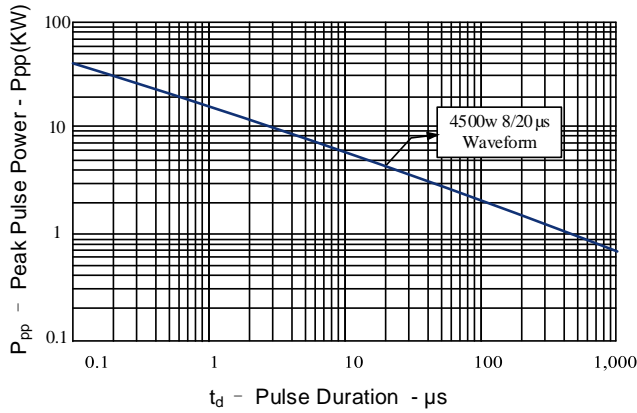


Figure 2: Power Derating Curve

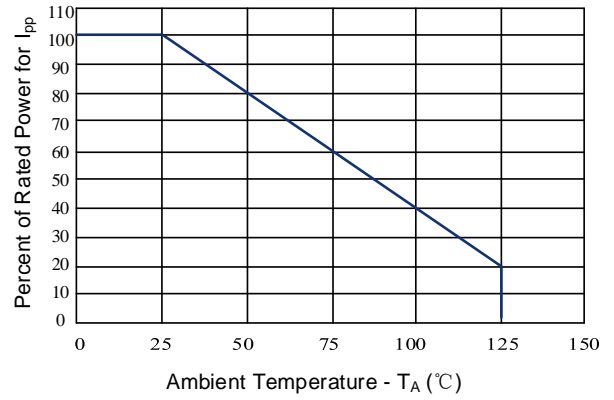


Figure 3: Clamping Voltage vs. Peak Pulse Current

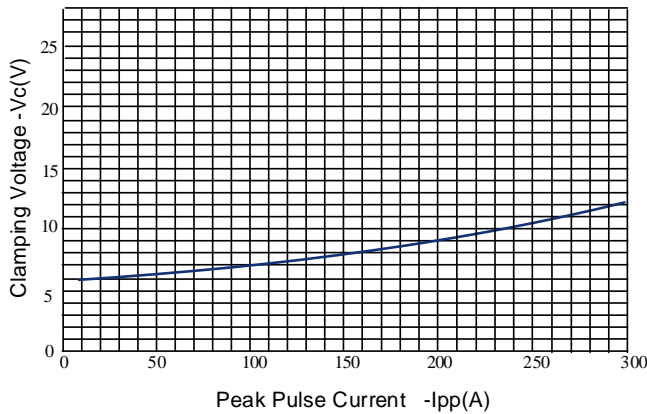


Figure 4: Normalized Junction Capacitance vs. Reverse Voltage

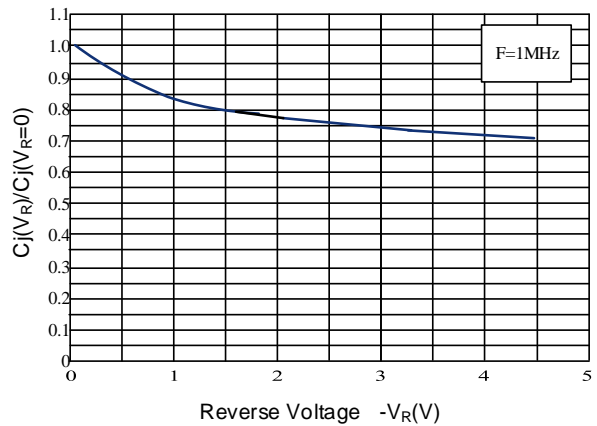


Figure 5: TLP Positive I-V Curve

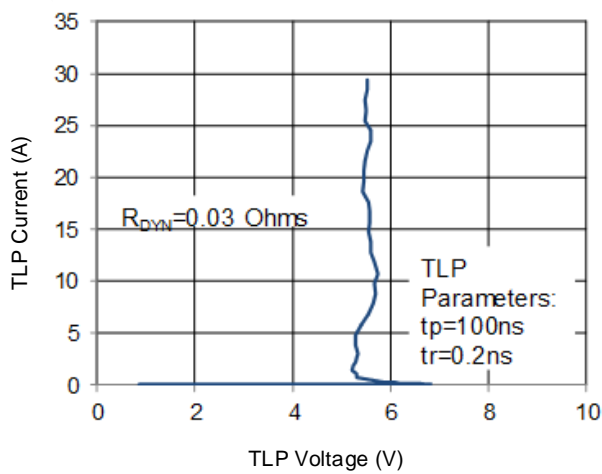
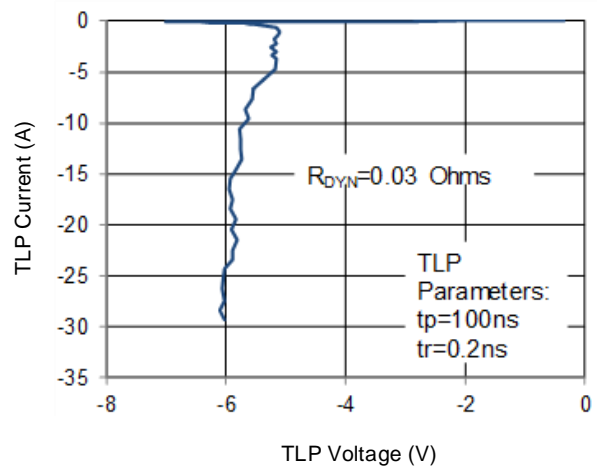
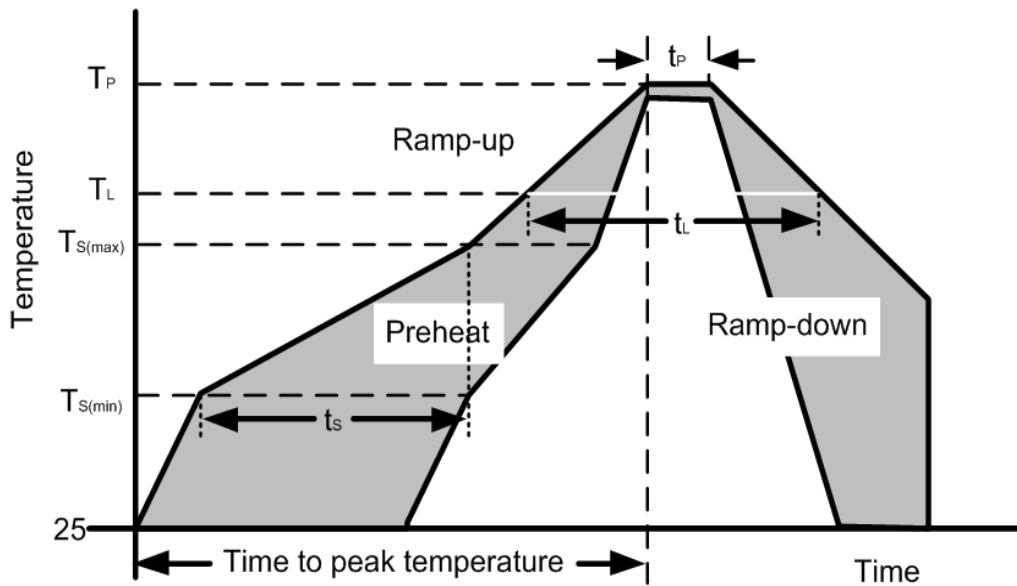


Figure 6: TLP Negative I-V Curve



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



Outline Drawing –DFN2020-3L

### PACKAGE OUTLINE

TOP VIEW

BOTTOM VIEW

SIDE VIEW

**DFN2020-3L**

SYMBOL	MILLIMETERS		
	MIN	NOM	MAX
A	0.5	0.55	0.60
A1	0.00	0.02	0.05
b	0.25	0.30	0.35
b1	0.20REF		
c	0.152REF		
D	1.90	2.00	2.10
D2	1.40	1.50	1.60
e	1.30BSC		
E	1.90	2.00	2.10
E2	0.95	1.05	1.15
E3	0.20	0.30	0.40
L	0.35	0.40	0.45
L1	0.20	0.25	0.30
h	0.20REF		
K	0.20	0.30	0.40

### Land Pattern

### Marking Codes

Part Number	Marking Code	
WS4.5P4N3-BW		M4.5B=Specific Device Code XXXX=Lot Code

### Package Information

Qty: 3k/Reel

### CONTACT INFORMATION

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For additional information, please contact your local Sales Representative.

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*Specifications are subject to change without notice.  
 The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.  
 Users should verify actual device performance in their specific applications.*