WORLD PRODUCTS INC.

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Spark Gap Protectors

CELEBRATING
FIFTY YEARS
OF EXCELLENCE

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Table of Contents

WPSPG Spark Gap Protectors – L Series

Part Numbering System

Example part number:

WPSPG	-	**20**	**L**	**200**	___
(1)		(2)	(3)	(4)	(5)

(1) World Products Spark Gap Protector

(2) DC Spark-Over Voltage Tolerance (Example: 20 = 20% tolerance)

(3) Series Type L = Low Current

(4) DC Spark-Over Voltage (Example: 200 = 200V)

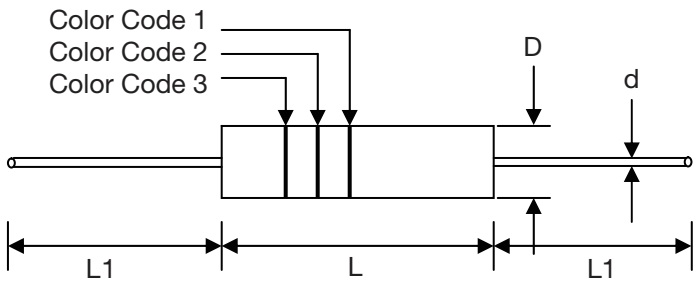
(5) Nil = Standard Packaging (Taped/Ammo Box), **S** = Bulk Packaging

FEATURES:

1. RoHS Compliant and Halogen Free
2. UL497B - PENDING
3. Fast Responding
4. Low Capacitance and High Isolation
5. Zero leakage current
6. Stable electrical characteristics over time
7. Can withstand repeated surges
8. Bilateral Symmetrical
9. Less decay at on/off state
10. Temperature, humidity and lightness insensitive
11. Operating temperature: -40ºC - + 85ºC
12. Storage temperature: -40ºC - +125ºC
13. Meets MSL level 1, per J-STD-020

WPSPG Spark Gap Protectors – L Series

DIMENSIONS in mm



Item	Dimension
L	4.0 ± 0.5
L1	28.0 ± 3.0
D	2.0 ± 0.5
d	0.5 ± 0.05

Electrical Characteristics

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20µs) (A)	Surge Life Test (8/20µs) (A)
		Test Voltage (V)	IR OHM (MΩ)			
WPSPG-XXL 140	140	50	100	0.8	500	100 150 times
WPSPG-XXL 200	200	100	100	0.8		
WPSPG-XXL 220	220	100	100	0.8		
WPSPG-XXL 300	300	100	100	0.8		
WPSPG-XXL 400	400	250	100	0.8		
WPSPG-XXL 500	500	250	100	0.8		
WPSPG-XXL 600	600	250	100	0.8		
WPSPG-XXL 700	700	250	100	0.8		
WPSPG-XXL 1000	1000	500	100	0.8		
WPSPG-XXL 1500	1500	500	100	0.8		

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%), 140V device is only available in 30% tolerance.

WPSPG Spark Gap Protectors – L Series

Color Code

Part Number	Color Code 1	Color Code 2	Color Code 3
WPSPG-XXL 140	Black	Yellow	---
WPSPG-XXL 200	Red	---	---
WPSPG-XXL 220	Red	Red	---
WPSPG-XXL 300	Orange	Orange	---
WPSPG-XXL 400	Yellow	---	---
WPSPG-XXL 500	Green	---	---
WPSPG-XXL 600	Blue	---	---
WPSPG-XXL 700	White	Brown	---
WPSPG-XXL 1000	Black	---	---
WPSPG-XXL 1500	Brown	Green	Red

Test Methods and Results

<table>
<tr><th>Item</th><th>Test Method</th><th>Standard</th></tr>
<tr><td>DC Spark-Over Voltage (Vs)</td><td>Measure starting discharge voltage (Vs) by gradually increasing applied DC voltage. Test current is 0.5mA max. And the DC voltage ascends up within as follow condition.<table><tr><td>Vs <1000V</td><td>100V/second</td></tr><tr><td>Vs >1000V</td><td>500V/second</td></tr></table></td><td rowspan="3">Meet specific value.</td></tr>
<tr><td>Insulation Resistance (IR)</td><td>Measure the insulation resistance across the terminal at regular voltage. But the test voltage doesn't go beyond the DC spark-over voltage.</td></tr>
<tr><td>Capacitance</td><td>Measure the electrostatic capacitance by applying a voltage less than 6V (at 1KHZ) between terminals.</td></tr>
<tr><td>Static Life</td><td>10KV with 1500pf condenser is discharged through 0Ω resistor. 200 times at an interval of 10 seconds.</td><td>Rate of change ≤30%. Characteristics of other items must meet specified value.</td></tr>
<tr><td>Surge Current Capacity</td><td>The following impulse current for specified current applied ± 5 times at 60 second intervals. Thereafter, outer appearance shall be visually examined.<table><tr><th>Type</th><th>Impulse Current</th></tr><tr><td>Vs <400V</td><td>1.25μs & 8/20μs, 500A</td></tr><tr><td>Vs >400V</td><td>1.25μs & 8/20μs, 500A, electrically connected with a resistor (1~2Ω).</td></tr></table></td><td>No crack and no failures</td></tr>
<tr><td>Cold Resistance</td><td>Measurement after -40°C/1000 HRS and normal temperature/ 2 HRS.</td><td rowspan="4">Features are conformed to rated spec.</td></tr>
<tr><td>Heat Resistance</td><td>Measurement after 125°C/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Humidity Resistance</td><td>Measurement after humidity 90~95% (45°C)/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Temperature Cycle</td><td>10 times repetition of cycle -40°C/30 min normal, temp/2 min 125°C/30 min, measurement after normal temp/2 HRS.</td></tr>
<tr><td>Solder Ability</td><td>Apply flux and immerse in molten solder 230 ± 5°C for 3 sec up to the point of 1.5mm from body. Check for solder adhesion.</td><td>Lead wire is evenly covered by solder.</td></tr>
<tr><td>Solder Heat</td><td>Measurement after lead wire is dipped up to the point of 1.5mm from body into 260 ± 5°C solder for 10 sec.</td><td>Conformed to rated spec.</td></tr>
<tr><td>Pull Strength</td><td>Apply 0.5kg load for 10 sec.</td><td rowspan="2">Lead shall not pull out or snap.</td></tr>
<tr><td>Flexural Strength</td><td>Bend lead wire at the point of 2mm from body upder 0.25 load and back to its original point. Repeat 1 time.</td></tr>
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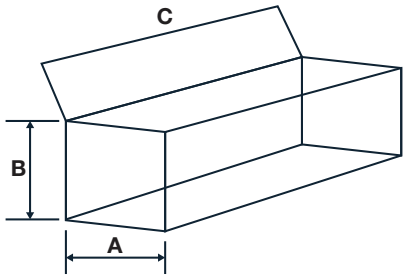
WPSPG Spark Gap Protectors – L Series

Inner Box Dimensions

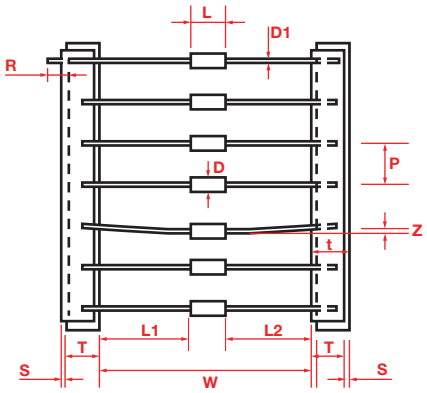


unit: mm

Item	Dimensions
A	78
B	78
C	255

Series	Minimum Package Quantity
L	5000 pcs
M	2500 pcs
H	1500 pcs

Axial Taping Packaging



Lead Taping

Item	Dimensions (mm)
W	52 ± 1.5
P	5.0 ± 0.5
T	6.0 ± 1.0
Z	1.2 max.
R	Leads cannot extend beyond tape.
t	3.2 max.
S	0.8 max.
D	2.5 max.
D1	0.5 ± .05
L	4.5 max
L1 & L2	1 max

WPSPG Spark Gap Protectors – M Series

Part Numbering System

Example part number:

WPSPG	-	**20**	**M**	**200**	___
(1)		(2)	(3)	(4)	(5)

(1) World Products Spark Gap Protector

(2) DC Spark-Over Voltage Tolerance (Example: 20 = 20% tolerance)

(3) Series Type: M = Medium Current

(4) DC Spark-Over Voltage (Example: 200 = 200V)

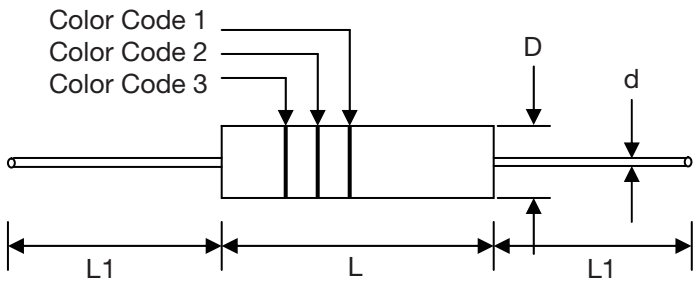
(5) Nil = Standard Packaging (Taped/Ammo Box), **S** = Bulk Packaging

FEATURES:

1. RoHS Compliant and Halogen Free
2. UL497B - File #E135015
3. Fast Responding
4. Low Capacitance and High Isolation
5. Zero leakage current
6. Stable electrical characteristics over time
7. Can withstand repeated surges
8. Bilateral Symmetrical
9. Less decay at on/off state
10. Temperature, humidity and lightness insensitive
11. Operating temperature: -40ºC - + 85ºC
12. Storage temperature: -40ºC - +125ºC
13. Meets MSL level 1, per J-STD-020

WPSPG Spark Gap Protectors – M Series

DIMENSIONS in mm



Item	Dimension
L	4.3 ± 0.5
L1	28.0 ± 3.0
D	φ 2.6 ± 0.5
d	φ 0.5 ± 0.05

Electrical Characteristics

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20μs) (A)	Surge Life Test (8/20μs) (A)
		Test Voltage (V)	IR OHM (MΩ)			
WPSPG-XXM 140*	140	50	100	0.8	1000	100 200 times
WPSPG-XXM 200*	200	100	100	0.8		
WPSPG-XXM 220	220	100	100	0.8		
WPSPG-XXM 300*	300	100	100	0.8		
WPSPG-XXM 400*	400	250	100	0.8		
WPSPG-XXM 500*	500	250	100	0.8		
WPSPG-XXM 600	600	250	100	0.8		
WPSPG-XXM 700	700	250	100	0.8		
WPSPG-XXM 1000	1000	500	100	0.8		
WPSPG-XXM 1500	1500	500	100	0.8		

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%), 140V device is only available in 30% tolerance.

*UL 497B recognized (30% tolerance only).

WPSPG Spark Gap Protectors – M Series

Color Code

Part Number	Color Code 1	Color Code 2	Color Code 3
WPSPG-XXM 140	Black	Yellow	---
WPSPG-XXM 200	Red	---	---
WPSPG-XXM 220	Red	Red	---
WPSPG-XXM 300	Orange	---	---
WPSPG-XXM 400	Yellow	---	---
WPSPG-XXM 500	Green	Green	---
WPSPG-XXM 600	Blue	---	---
WPSPG-XXM 700	Purple	---	---
WPSPG-XXM 1000	Black	---	---
WPSPG-XXM 1500	Brown	Green	Red

Test Methods and Results

<table>
<tr><th>Item</th><th>Test Method</th><th>Standard</th></tr>
<tr><td>DC Spark-Over Voltage (Vs)</td><td>Measure starting discharge voltage (Vs) by gradually increasing applied DC voltage. Test current is 0.5mA max. And the DC voltage ascends up within as follow condition.<table><tr><td>Vs <1000V</td><td>100V/second</td></tr><tr><td>Vs >1000V</td><td>500V/second</td></tr></table></td><td rowspan="3">Meet specific value.</td></tr>
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<tr><td>Static Life</td><td>10KV with 1500pf condenser is discharged through 0Ω resistor. 200 times at an interval of 10 seconds.</td><td>Rate of change ≤30%. Characteristics of other items must meet specified value.</td></tr>
<tr><td>Surge Current Capacity</td><td>The following impulse current for specified current applied ± 5 times at 60 second intervals. Thereafter, outer appearance shall be visually examined.<table><tr><th>Type</th><th>Impulse Current</th></tr><tr><td>Vs <400V</td><td>1.25μs & 8/20μs, 1000A</td></tr><tr><td>Vs >400V</td><td>1.25μs & 8/20μs, 1000A, electrically connected with a resistor (1~2Ω).</td></tr></table></td><td>No crack and no failures</td></tr>
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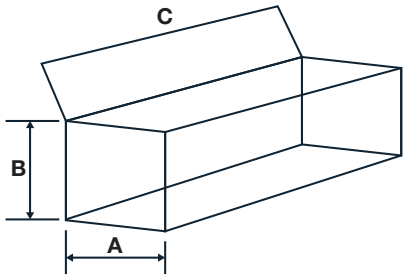
<tr><td>Heat Resistance</td><td>Measurement after 125ºC/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Humidity Resistance</td><td>Measurement after humidity 90~95% (45ºC)/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Temperature Cycle</td><td>10 times repetition of cycle -40ºC/30 min normal, temp/2 min 125ºC/30 min, measurement after normal temp/2 HRS.</td></tr>
<tr><td>Solder Ability</td><td>Apply flux and immerse in molten solder 230 ± 5ºC for 3 sec up to the point of 1.5mm from body. Check for solder adhesion.</td><td>Lead wire is evenly covered by solder.</td></tr>
<tr><td>Solder Heat</td><td>Measurement after lead wire is dipped up to the point of 1.5mm from body into 260 ± 5ºC solder for 10 sec.</td><td>Conformed to rated spec.</td></tr>
<tr><td>Pull Strength</td><td>Apply 0.5kg load for 10 sec.</td><td rowspan="2">Lead shall not pull out or snap.</td></tr>
<tr><td>Flexural Strength</td><td>Bend lead wire at the point of 2mm from body upder 0.25 load and back to its original point. Repeat 1 time.</td></tr>
</table>

WPSPG Spark Gap Protectors – M Series

Inner Box Dimensions

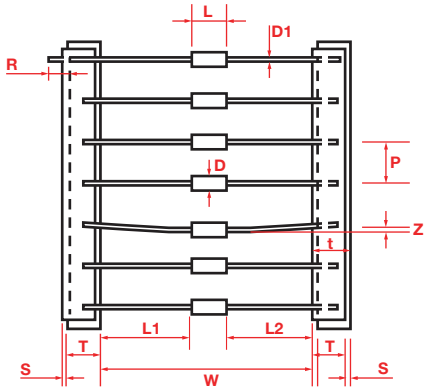


unit: mm

Item	Dimensions
A	78
B	78
C	255

Series	Minimum Package Quantity
L	5000 pcs
M	2500 pcs
H	1500 pcs

Axial Taping Packaging



Lead Taping

Item	Dimensions (mm)
W	52 ± 1.5
P	5.0 ± 0.5
T	6.0 ± 1.0
Z	1.2 max.
R	Leads cannot extend beyond tape.
t	3.2 max.
S	0.8 max.
D	3.1 max.
D1	0.5 ± .05
L	4.8 max
L1 & L2	1 max

WPSPG Spark Gap Protectors – H Series

Part Numbering System

Example part number:

WPSPG	-	20	H	200	___
(1)		(2)	(3)	(4)	(5)

(1) **World Products Spark Gap Protector**

(2) **DC Spark-Over Voltage Tolerance** (Example: 20 = 20% tolerance)

(3) **Series Type:** H = High Current

(4) **DC Spark-Over Voltage** (Example: 200 = 200V)

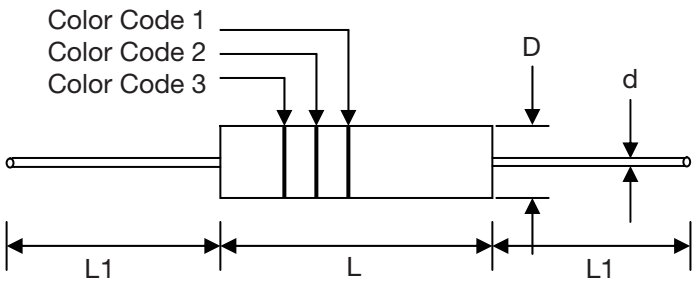
(5) **Nil** = Standard Packaging (Taped/Ammo Box), **S** = Bulk Packaging

FEATURES:

1. RoHS Compliant and Halogen Free
2. UL497B - File #E135015 and UL1449/CUL File #E321567 (see specific voltage values)
3. Fast Responding
4. Low Capacitance and High Isolation
5. Zero leakage current
6. Stable electrical characteristics over time
7. Can withstand repeated surges
8. Bilateral Symmetrical
9. Less decay at on/off state
10. Temperature, humidity and lightness insensitive
11. Operating temperature: -40ºC - + 85ºC
12. Storage temperature: -40ºC - +125ºC
13. Meets MSL level 1, per J-STD-020

WPSPG Spark Gap Protectors – H Series

DIMENSIONS in mm



Item	Dimension	DC Spark-Over Voltage
L	4.0 ± 0.5	140V – 700V
L1	28.0 ± 3.0	
D	3.1 ± 0.5	
d	0.5 ± 0.05	
L	5.3 ± .05	1000V – 5000V

Electrical Characteristics

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20µs) (A)	Surge Life Test (8/20µs) (A)
		Test Voltage (V)	IR OHM (MΩ)			
WPSPG-XXH 140*	140	50	100	0.8	3000	100 250 times
WPSPG-XXH 200*	200	100				
WPSPG-XXH 300*	300	100				
WPSPG-XXH 400*	400	250				
WPSPG-XXH 500*	500					
WPSPG-XXH 600**	600					
WPSPG-XXH 700**	700					
WPSPG-XXH 1000	1000	500				
WPSPG-XXH 1500	1500					
WPSPG-XXH 1800	1800					
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WPSPG-XXH 4500	4500					
WPSPG-XXH 5000	5000					

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%), 140V device is only available in 30% tolerance.

*UL 497B recognized (30% tolerance only).

**UL1449/CUL recognized (20% tolerance only).

WPSPG Spark Gap Protectors – H Series

Color Code

Part Number	Color Code 1	Color Code 2	Color Code 3
WPSPG-XXH 140	Black	Yellow	---
WPSPG-XXH 200	Red	---	---
WPSPG-XXH 300	Orange	---	---
WPSPG-XXH 400	Yellow	---	---
WPSPG-XXH 500	Green	---	---
WPSPG-XXH 600	Blue	---	---
WPSPG-XXH 700	Purple	---	---

Part Number	Color Code 1	Color Code 2	Color Code 3
WPSPG-XXH 1000	Brown	Black	Red
WPSPG-XXH 1500	Brown	Green	Red
WPSPG-XXH 1800	Brown	Grey	---
WPSPG-XXH 2000	Red	Black	---
WPSPG-XXH 2400	Red	Yellow	---
WPSPG-XXH 2700	Red	Purple	---
WPSPG-XXH 3000	Orange	Black	---
WPSPG-XXH 3600	Orange	Blue	---
WPSPG-XXH 4000	Yellow	Black	---
WPSPG-XXH 4500	Yellow	Green	---
WPSPG-XXH 5000	Green	Black	---

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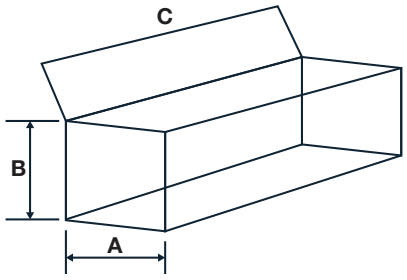
WPSPG Spark Gap Protectors – H Series

Inner Box Dimensions

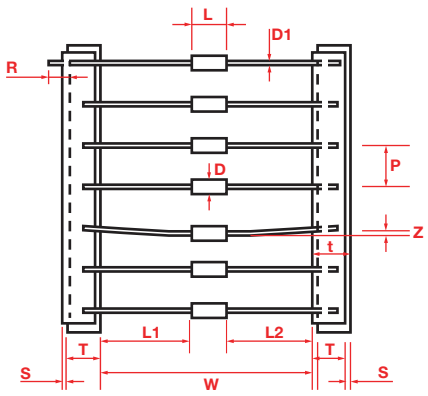


unit: mm

Item	Dimensions
A	78
B	78
C	255

Series	Minimum Package Quantity
L	5000 pcs
M	2500 pcs
H	1500 pcs

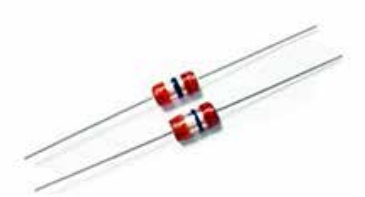
Axial Taping Packaging



Lead Taping

Item	Dimensions (mm)
W	52 ± 1.5
P	5.0 ± 0.5
T	6.0 ± 1.0
Z	1.2 max.
R	Leads cannot extend beyond tape.
t	3.2 max.
S	0.8 max.
D	3.6 max.
D1	0.5 ± .05
L	4.5 max
L1 & L2	1 max

WPSPG Spark Gap Protectors – HX Series



Part Numbering System

Example part number:

WPSPG	-	**20**	**HX**	**1000**	__
(1)		(2)	(3)	(4)	(5)

(1) **World Products Spark Gap Protector**

(2) **DC Spark-Over Voltage Tolerance** (Example: 20 = 20% tolerance)

(3) **Series Type:** HX = Super High Current/High Voltage

(4) **DC Spark-Over Voltage** (Example: 1000 = 1000V)

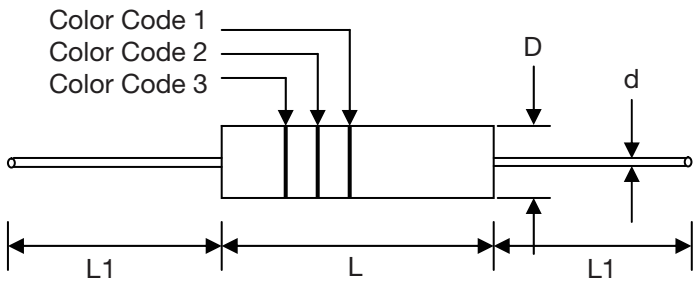
(5) **Nil** = Standard Packaging (Taped/Ammo Box), **S** = Bulk Packaging

FEATURES:

1. RoHS Compliant and Halogen Free
2. UL1449/CUL File #E321567 (see specific voltage values)
3. Fast Responding
4. Low Capacitance and High Isolation
5. Zero leakage current
6. Stable electrical characteristics over time
7. Can withstand repeated surges
8. Bilateral Symmetrical
9. Micro-gap design and low clamping
10. Temperature, humidity and lightness insensitive
11. Less decay at on/off state
12. No dark effect
13. Operating Temperature: -40ºC - + 85ºC
14. Storage Temperature: -40ºC - +125ºC
15. Meets MSL level 1, per J-STD-020

WPSPG Spark Gap Protectors – HX Series

DIMENSIONS in mm



Item	Dimension
L	9.0 ± 1.5
L1	28.0 ± 3.0
D	4.1 ± 0.5
d	0.5 ± 0.05

Electrical Characteristics

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20µs) (A)	AC Withstanding Voltage (V)
		Test Voltage (V)	IR OHM (MΩ)			
WPSPG-XXHX 1000	1000	500	100	1.0		---
WPSPG-XXHX 1500	1500	500	100	1.0		---
WPSPG-XXHX 1800	1800	500	100	1.0		---
WPSPG-XXHX 2000	2000	500	100	1.0		---
WPSPG-XXHX 2400	2400	500	100	1.0		1200 (3 sec)
WPSPG-XXHX 2700	2700	500	100	1.0	3000	1200 (3 sec)
WPSPG-XXHX 3000	3000	500	100	1.0		1500 (3 sec)
WPSPG-XXHX 3600	3600	500	100	1.0		1800 (3 sec)
WPSPG-XXHX 4000	4000	500	100	1.0		1800 (3 sec)
WPSPG-XXHX 4500	4500	500	100	1.0		2000 (1 min)
WPSPG-XXHX 5000	5000	500	100	1.0		2000 (1 min)

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%).

UL1449/CUL File #E321567 (20% tolerance only)

DC Spark-Over Voltage	Measure starting discharge voltage (Vs) by` gradually increasing applied DC voltage. Test Current is 1.0Ma max. And the DC voltage ascends up withing 500V/second.
Insulation Resistance	Measure the insulation resistance across the terminal at regualr voltage. Test voltage may not exceed the DC spark-over voltage.
Capacitance	Measure the electrostatic capacitance by applying a voltage of less than 6V (at 1KHz) between terminals.

WPSPG Spark Gap Protectors – HX Series

Color Code

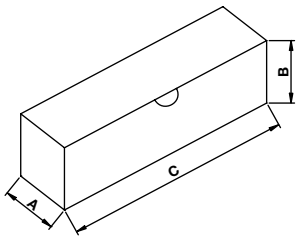
Part Number	Color Code 1	Color Code 2	Color Code 3
WPSPG-XXHX 1000	Brown	Black	Red
WPSPG-XXHX 1500	Brown	Green	Red
WPSPG-XXHX 1800	Brown	Gray	Red
WPSPG-XXHX 2000	Red	Black	Red
WPSPG-XXHX 2400	Red	Yellow	Red
WPSPG-XXHX 2700	Red	Purple	Red
WPSPG-XXHX 3000	Orange	Black	Red
WPSPG-XXHX 3600	Orange	Blue	Red
WPSPG-XXHX 4000	Yellow	Black	Red
WPSPG-XXHX 4500	Yellow	Green	Red
WPSPG-XXHX 5000	Green	Black	Red

Test Methods and Results

Item	Test Method	Standard
Cold Resistance	Measurement after -40ºC/1000 HRS and normal temperature/ 2 HRS.	Features are conformed to rated spec.
Heat Resistance	Measurement after 85ºC/1000 HRS and normal temperature/ 2 HRS.	
Humidity Resistance	Measurement after humidity 90~95% (45ºC)/48 HRS and normal temperature/ 2 HRS.	
Temperature Cycle	10 times repetition of cycle -40ºC/30 min normal, temp/2 min 125ºC/30 min, measurement after normal temp/2 HRS.	
Solder Ability	Apply flux and immerse in molten solder 230 ± 5ºC for 3 sec up to the point of 1.5mm from body. Check for solder adhesion.	Lead wire is evenly covered by solder.
Solder Heat	Measurement after lead wire is dipped up to the point of 1.5mm from body into 260 ± 5ºC solder for 10 sec.	Conformed to rated spec.
Pull Strength	Apply 0.5kg load for 10 sec.	Lead shall not pull out or snap.
Flexural Strength	Bend lead wire at the point of 2mm from body upder 0.25 load and back to its original point. Repeat 1 time.	
Surge Life	Apply standard impulse current (8/20μs of 100A) for 300 times at 60 seconds intervals.	
Surge Current Capacity	Charge a 1.2/50μs, 2000A, and apply it to the sample. Do this 10 times. Or 3000, 1 time.	No crack and no failures

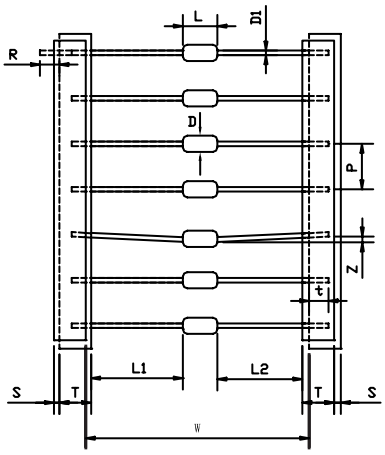
WPSPG Spark Gap Protectors – HX Series

Inner Box Dimensions



Item	Dimension	Quantity
A	75.0	1000 pcs.
B	114.0	
C	250.0	

Axial Taping Packaging



Item	Dimension(mm)
W	52.0±1.5
P	10.0±0.5
L1-L2	1.0max.
T	6.0±1.0
Z	1.2max.
R	Terminals must not project from tape.
t	3.2max.
S	0.8max.
D	Φ4.6max.
D1	Φ0.5±0.05
L	10.5max.

WPSPG Spark Gap Protectors – LLS Series

Part Numbering System

Example part number:

WPSPG	-	**20**	**LLS**	**1000**	___
(1)		(2)	(3)	(4)	(5)

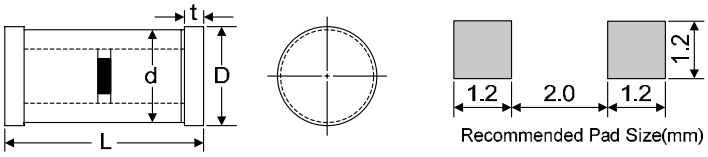
(1) **World Products Spark Gap Protector**
(2) **DC Spark-Over Voltage Tolerance** (Example: 20 = 20% tolerance)
(3) **Series Type:** LLS = Super Low Current SMD Type
(4) **DC Spark-Over Voltage** (Example: 1000 = 1000V)
(5) **Nil** = Standard Packaging (Taped/Ammo Box), **S** = Bulk Packaging

FEATURES:

1. RoHS Compliant and Halogen Free
2. UL497B – PENDING
3. Fast Responding
4. Low Capacitance
5. Zero leakage current
6. Stable electrical characteristics over time
7. Can withstand repeated surges
8. Bilateral Symmetrical
9. Operating Temperature: -40ºC - + 85ºC
10. Storage Temperature: -40ºC - +125ºC
11. Meets MSL level 1, per J-STD-020

WPSPG Spark Gap Protectors – LLS Series

DIMENSIONS in mm



Item	Mini Melf
L	3.4 ± 0.5
D	1.4 ± 0.5
d	1.3 ± 0.5
t	0.4 ± 0.1

Electrical Characteristics
Standard Series

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20μs) (A)
		Test Voltage (V)	IR OHM (MΩ)		
WPSPG-XXLLS 140	140	50	100	0.8	300
WPSPG-XXLLS 200	200	100	100	0.8	300
WPSPG-XXLLS 300	300	100	100	0.8	300

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%).

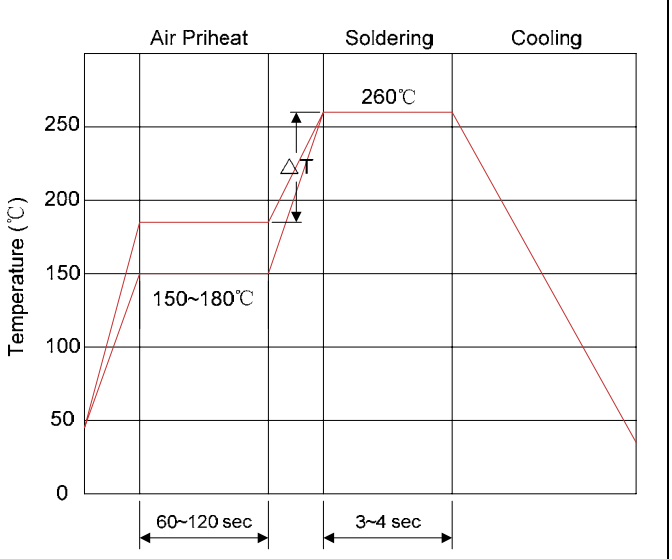
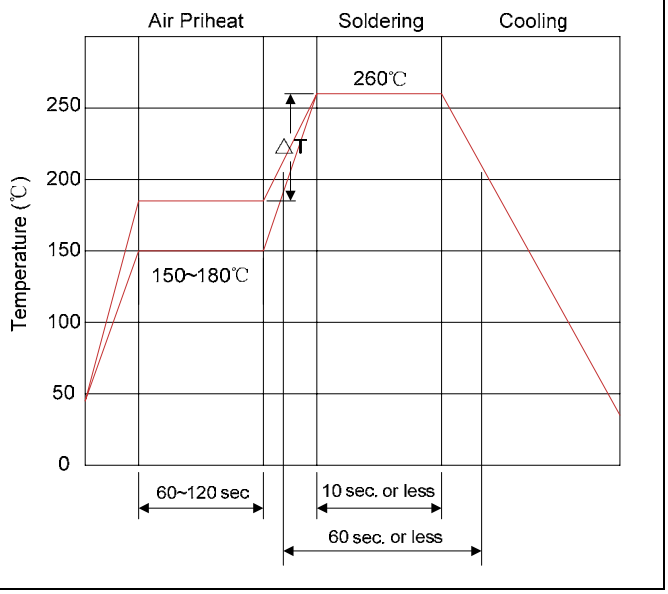
WPSPG Spark Gap Protectors – LLS Series

Test Methods and Results

<table>
<tr><th>Item</th><th>Test Method</th><th>Standard</th></tr>
<tr><td>DC Spark-Over Voltage (Vs)</td><td>Measure starting discharge voltage (Vs) by gradually increasing applied DC voltage. Test current is 0.5mA max. And the DC voltage ascends up within as follow condition.</td><td rowspan="3">Meet specific value.</td></tr>
<tr><td>Insulation Resistance (IR)</td><td>Measure the insulation resistance across the terminal at regular voltage. But the test voltage doesn’t go beyond the DC spark-over voltage.</td></tr>
<tr><td>Capacitance</td><td>Measure the electrostatic capacitance by applying a voltage less than 6V (at 1KHZ) between terminals.</td></tr>
<tr><td>Static Life</td><td>10KV with 1500pf condenser is discharged through 0Ω resistor. 200 times at an interval of 10 seconds.</td><td>Rate of change ±30%. Characteristics of other items must meet specified value.</td></tr>
<tr><td>Surge Current Capacity</td><td>The following impulse current for specified current applied ± 5 times at 60 second intervals. Thereafter, outer appearance shall be visually examined.
<table>
<tr><th>Type</th><th>Impulse Current</th></tr>
<tr><td>Mini Melf</td><td>1.25µs & 8/20µs, 300A</td></tr>
</table></td><td>No crack and no failures</td></tr>
<tr><td>Cold Resistance</td><td>Measurement after -40ºC/1000 HRS and normal temperature/ 2 HRS.</td><td rowspan="4">Features are conformed to rated spec.</td></tr>
<tr><td>Heat Resistance</td><td>Measurement after 125ºC/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Humidity Resistance</td><td>Measurement after humidity 90~95% (45ºC)/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Temperature Cycle</td><td>10 times repetition of cycle -40ºC/30 min normal, temp/2 min 125ºC/30 min, measurement after normal temp/2 HRS.</td></tr>
<tr><td>Solder Ability</td><td>Apply flux and immerse in molten solder 230 ± 5ºC for 3 sec up to the point of 1.5mm from body. Check for solder adhesion.</td><td>The end surface is evenly covered by solder</td></tr>
<tr><td>Solder Heat</td><td>Measurement after end surface of the electrodes is dipped up into 260 ± 5ºC solder for 10 sec.</td><td>Conformed to rated spec.</td></tr>
</table>

WPSPG Spark Gap Protectors – LLS Series

Recommended Soldering Conditions

Flow Soldering Conditions	Reflow Soldering Conditions
	

1) Time shown in the above figures is measured from the point when chip surface reaches temperature.
2) Temperature difference in high temperature part should be within 110ºC
3) After soldering, do not force cool, allow the parts to cool gradually.

Hand Soldering

Solder iron temperature: 350±5ºC
Heating time: 3 seconds max.

General attention to soldering

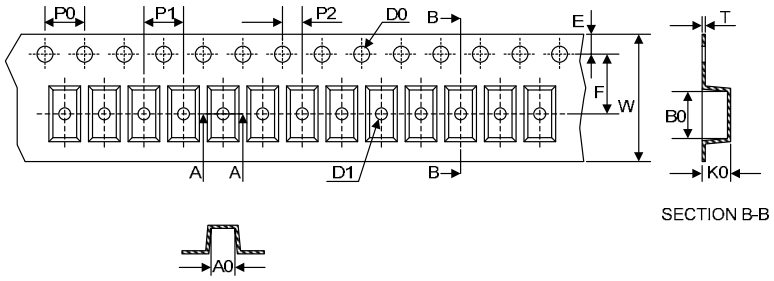
- High soldering temperatures and long soldering times can cause leaching of the termination, decrease in adherence strength, and the change of characteristic may occur.
- For soldering, please refer to the soldering curves above. However, please keep exposures to temperatures exceeding 200ºC to fewer than 50 seconds.
- Please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

Cleaning

When using ultrasonic cleaning, the board may resonate if the output power is too high. Since this vibration can cause cracking or a decrease in the adherence of the termination, we recommend that you use the conditions below.
Frequency: 40kHz max.
Output power: 20W/liter
Cleaning time: 5 minutes max.

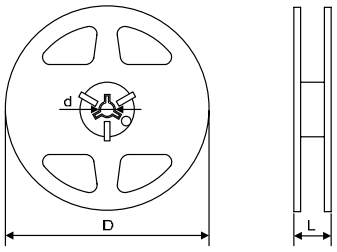
WPSPG Spark Gap Protectors – LLS Series

Taping Specifications



SECTION A-A

SECTION B-B



Symbol	Dimension (mm)
W	8.00±0.30
P0	4.00±0.10
P1	4.00±0.10
P2	2.00±0.10
D0	Φ1.5±0.10
D1	Φ1.0±0.10
E	1.50±0.10
F	3.40±0.10
A0	1.60±0.10
B0	4.00±0.10
K0	1.60±0.10
T	0.20±0.10
D	178.0
d	13.0
L	11.0
Quantity: 3000PCS	

WPSPG Spark Gap Protectors – LS Series

Part Numbering System

Example part number:

WPSPG	-	20	LS	200	M	__
(1)		(2)	(3)	(4)	(5)	(6)

(1) World Products Spark Gap Protector

(2) DC Spark-Over Voltage Tolerance (Example: 20 = 20% tolerance)

(3) Series Type: LS = Low Current Surface Mount Series

(4) DC Spark-Over Voltage (Example: 200 = 200V)

(5) Package Type

Nil = Standard Package

M = Mini Melf Package

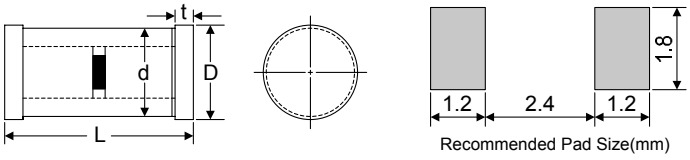
(6) Nil = Standard Packaging (Taped/Ammo Box), **S** = Bulk Packaging

FEATURES:

1. RoHS Compliant and Halogen Free
2. UL497B - PENDING
3. Fast Responding
4. Low Capacitance
5. Zero leakage current
6. Stable electrical characteristics over time
7. Can withstand repeated surges
8. Bilateral Symmetrical
9. Operating Temperature: -40ºC – +85ºC
10. Storage Temperature: -40ºC – +125ºC
11. Meets MSL Level 1, per J-STD-020

WPSPG Spark Gap Protectors – LS Series

DIMENSIONS in mm



Item	Dimension	Mini Melf
L	4.0 ± 1.5	3.4 ± 0.5
D	2.1 ± 0.5	1.4 ± 0.5
d	2.0 ± 0.5	1.3 ± 0.5
t	0.4 ± 0.1	0.4 ± 0.1

Electrical Characteristics
Standard Series

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20μs) (A)	Surge Voltage Capacity (10/700μs)
		Test Voltage (V)	IR OHM (MΩ)			
WPSPG-XXLS 140	140	50	100	0.8	500	4KV
WPSPG-XXLS 200	200	100	100	0.8	500	4KV
WPSPG-XXLS 220	220	100	100	0.8	500	4KV
WPSPG-XXLS 300	300	100	100	0.8	500	4KV
WPSPG-XXLS 400	400	250	100	0.8	500	4KV
WPSPG-XXLS 500	500	250	100	0.8	500	4KV
WPSPG-XXLS 600	600	250	100	0.8	500	4KV
WPSPG-XXLS 700	700	250	100	0.8	500	4KV
WPSPG-XXLS 1000	1000	500	100	0.8	500	4KV

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%), 140V device is only available in 30% tolerance.

Electrical Characteristics
Mini Melf Series

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20μs) (A)
		Test Voltage (V)	IR OHM (MΩ)		
WPSPG-XXLS 140M	140	50	100	0.8	300
WPSPG-XXLS 200M	200	100	100	0.8	300

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%), 140V device is only available in 30% tolerance.

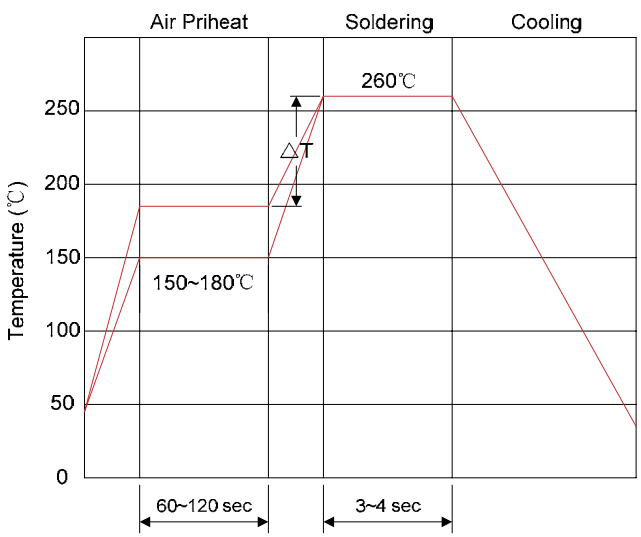
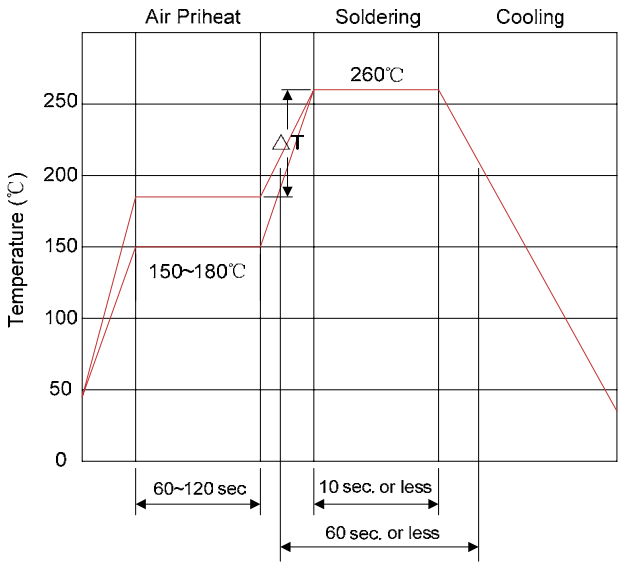
WPSPG Spark Gap Protectors – LS Series

Test Methods and Results

<table>
<tr><th>Item</th><th>Test Method</th><th>Standard</th></tr>
<tr><td>DC Spark-Over Voltage (Vs)</td><td>Measure starting discharge voltage (Vs) by gradually increasing applied DC voltage. Test current is 0.5mA max. And the DC voltage ascends up within as follow condition.<table><tr><td>Vs <1000V</td><td>100V/second</td></tr><tr><td>Vs <1000V</td><td>500V/second</td></tr></table></td><td rowspan="3">Meet specific value.</td></tr>
<tr><td>Insulation Resistance (IR)</td><td>Measure the insulation resistance across the terminal at regular voltage. But the test voltage doesn’t go beyond the DC spark-over voltage.</td></tr>
<tr><td>Capacitance</td><td>Measure the electrostatic capacitance by applying a voltage less than 6V (at 1KHZ) between terminals.</td></tr>
<tr><td>Static Life</td><td>10KV with 1500pf condenser is discharged through 0Ω resistor. 200 times at an interval of 10 seconds.</td><td>Rate of change ±30%. Characteristics of other items must meet specified value.</td></tr>
<tr><td>Surge Current Capacity</td><td>The following impulse current for specified current applied ± 5 times at 60 second intervals. Thereafter, outer appearance shall be visually examined.<table><tr><th>Type</th><th>Impulse Current</th></tr><tr><td>Mini Melf</td><td>1.25µs & 8/20µs, 300A</td></tr><tr><td>Standard</td><td>1.25µs & 8/20µs, 500A</td></tr></table></td><td>No crack and no failures</td></tr>
<tr><td>Cold Resistance</td><td>Measurement after -40ºC/1000 HRS and normal temperature/ 2 HRS.</td><td rowspan="4">Features are conformed to rated spec.</td></tr>
<tr><td>Heat Resistance</td><td>Measurement after 125ºC/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Humidity Resistance</td><td>Measurement after humidity 90~95% (45ºC)/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Temperature Cycle</td><td>10 times repetition of cycle -40ºC/30 min normal, temp/2 min 125ºC/30 min, measurement after normal temp/2 HRS.</td></tr>
<tr><td>Solder Ability</td><td>Apply flux and immerse in molten solder 230 ± 5ºC for 3 sec up to the point of 1.5mm from body. Check for solder adhesion.</td><td>The end surface is evenly covered by solder</td></tr>
<tr><td>Solder Heat</td><td>Measurement after end surface of the electrodes is dipped up into 260 ± 5ºC solder for 10 sec.</td><td>Conformed to rated spec.</td></tr>
</table>

WPSPG Spark Gap Protectors – LS Series

Recommended Soldering Conditions

Flow Soldering Conditions	Reflow Soldering Conditions
	

1) Time shown in the above figures is measured from the point when chip surface reaches temperature.
2) Temperature difference in high temperature part should be within 110ºC
3) After soldering, do not force cool, allow the parts to cool gradually.

Hand Soldering

Solder iron temperature: 350±5ºC
Heating time: 3 seconds max.

General attention to soldering

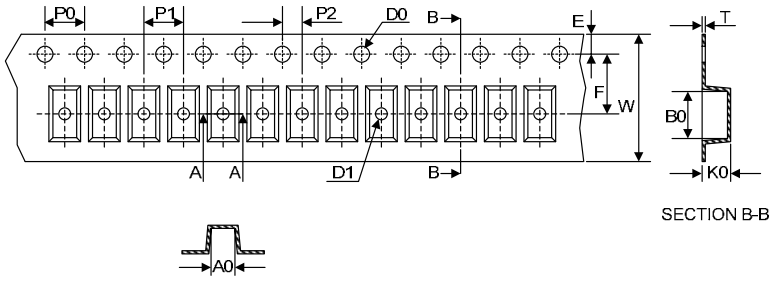
- High soldering temperatures and long soldering times can cause leaching of the termination, decrease in adherence strength, and the change of characteristic may occur.
- For soldering, please refer to the soldering curves above. However, please keep exposures to temperatures exceeding 200ºC to fewer than 50 seconds.
- Please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

Cleaning

When using ultrasonic cleaning, the board may resonate if the output power is too high. Since this vibration can cause cracking or a decrease in the adherence of the termination, we recommend that you use the conditions below.
Frequency: 40kHz max.
Output power: 20W/liter
Cleaning time: 5 minutes max.

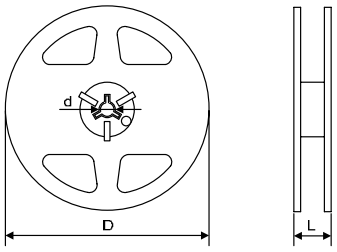
WPSPG Spark Gap Protectors – LS Series

Taping Specifications



SECTION B-B

SECTION A-A



Symbol	Dimension (mm)
W	12.00±0.20
P0	4.00±0.10
P1	4.00±0.10
P2	2.00±0.05
D0	Φ1.5±0.05
D1	Φ1.0±0.10
E	1.75±0.10
F	5.50±0.05
A0	2.40±0.10
B0	4.50±0.10
K0	2.50±0.10
T	0.25±0.05
D	178.0
d	13.0
L	15.0
Quantity: 2000PCS	

WPSPG Spark Gap Protectors – MS Series

Part Numbering System

Example part number:

WPSPG	-	**20**	**MS**	**200**	___
(1)		(2)	(3)	(4)	(5)

(1) **World Products Spark Gap Protector**

(2) **DC Spark-Over Voltage Tolerance** (Example: 20 = 20% tolerance)

(3) **Series Type:** MS = Medium Current Surface Mount Series

(4) **DC Spark-Over Voltage** (Example: 200 = 200V)

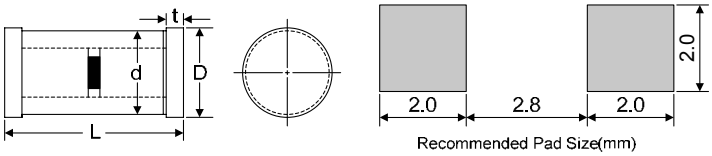
(5) **Nil** = Standard Packaging (Taped/Ammo Box), **S** = Bulk Packaging

FEATURES:

1. RoHS Compliant and Halogen Free
2. UL497B - File #E135015 (see specific voltage values)
3. Fast Responding
4. Low Capacitance
5. Zero leakage current
6. Stable electrical characteristics over time
7. Can withstand repeated surges
8. Bilateral Symmetrical
9. Operating Temperature: -40ºC – +85ºC
10. Storageorage Temperature: -40ºC – +125ºC
11. Meets MSL Level 1, per J-STD-020

WPSPG Spark Gap Protectors – MS Series

DIMENSIONS in mm



Item	Dimension
L	5.0 ± 0.5
D	2.8 ± 0.5
d	2.6 ± 0.5
t	0.4 ± 0.1

Electrical Characteristics
Standard Series

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20µs) (A)
		Test Voltage (V)	IR OHM (MΩ)		
WPSPG-XXMS 140*	140	50	100	0.8	1000
WPSPG-XXMS 200*	200	100	100	0.8	1000
WPSPG-XXMS 220	220	100	100	0.8	1000
WPSPG-XXMS 300*	300	100	100	0.8	1000
WPSPG-XXMS 400*	400	250	100	0.8	1000
WPSPG-XXMS 500*	500	250	100	0.8	1000
WPSPG-XXMS 600	600	250	100	0.8	1000
WPSPG-XXMS 700	700	250	100	0.8	1000
WPSPG-XXMS 1000	1000	500	100	0.8	1000

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%), 140V device is only available in 30% tolerance.

*UL 497B recognized (30% tolerance only).

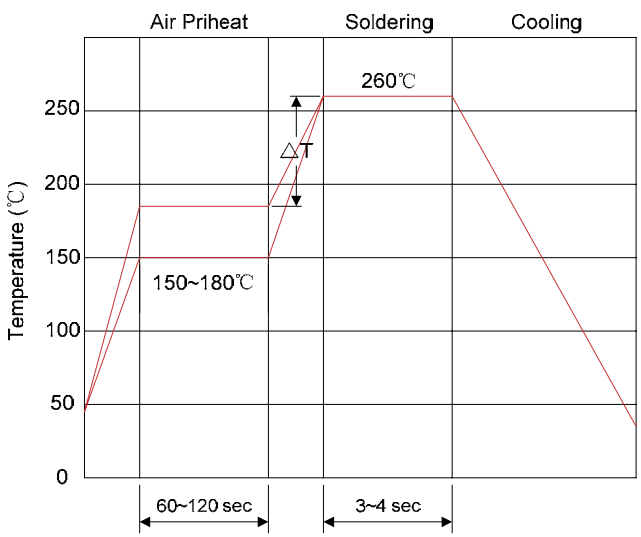
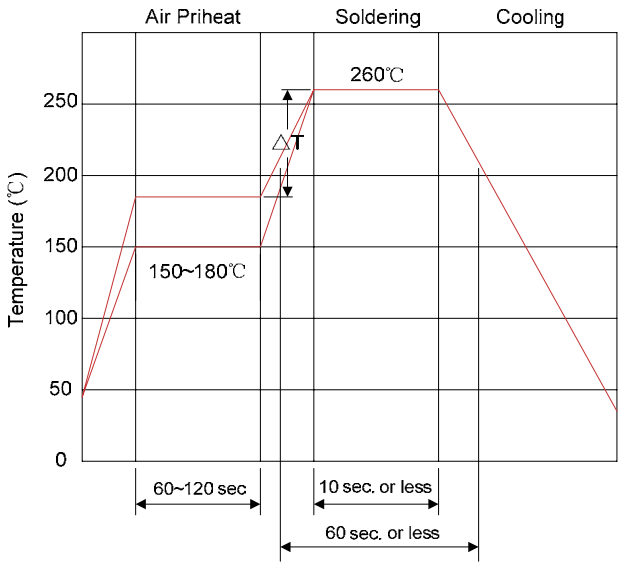
WPSPG Spark Gap Protectors – MS Series

Test Methods and Results

<table>
<tr><th>Item</th><th>Test Method</th><th>Standard</th></tr>
<tr><td>DC Spark-Over Voltage (Vs)</td><td>Measure starting discharge voltage (Vs) by gradually increasing applied DC voltage. Test current is 0.5mA max. And the DC voltage ascends up within as follow condition.<table><tr><td>Vs <1000V</td><td>100V/second</td></tr><tr><td>Vs <1000V</td><td>500V/second</td></tr></table></td><td rowspan="3">Meet specific value.</td></tr>
<tr><td>Insulation Resistance (IR)</td><td>Measure the insulation resistance across the terminal at regular voltage. But the test voltage doesn’t go beyond the DC spark-over voltage.</td></tr>
<tr><td>Capacitance</td><td>Measure the electrostatic capacitance by applying a voltage less than 6V (at 1KHZ) between terminals.</td></tr>
<tr><td>Static Life</td><td>10KV with 1500pf condenser is discharged through 0Ω resistor. 200 times at an interval of 10 seconds.</td><td>Rate of change 30%. Characteristics of other items must meet specified value.</td></tr>
<tr><td>Surge Current Capacity</td><td>The following impulse current for specified current applied ± 5 times at 60 second intervals. Thereafter, outer appearance shall be visually examined.<table><tr><th>Impulse Current</th></tr><tr><td>1.25μs & 8/20μs, 1000A, electrically connected with a resistor (1~2Ω)</td></tr></table></td><td>No crack and no failures</td></tr>
<tr><td>Cold Resistance</td><td>Measurement after -40ºC/1000 HRS and normal temperature/ 2 HRS.</td><td rowspan="4">Features are conformed to rated spec.</td></tr>
<tr><td>Heat Resistance</td><td>Measurement after 125ºC/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Humidity Resistance</td><td>Measurement after humidity 90~95% (45ºC)/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Temperature Cycle</td><td>10 times repetition of cycle -40ºC/30 min normal, temp/2 min 125ºC/30 min, measurement after normal temp/2 HRS.</td></tr>
<tr><td>Solder Ability</td><td>Apply flux and immerse in molten solder 230 ± 5ºC for 3 sec up to the point of 1.5mm from body. Check for solder adhesion.</td><td>The end surface is evenly covered by solder</td></tr>
<tr><td>Solder Heat</td><td>Measurement after end surface of the electrodes is dipped up into 260 ± 5ºC solder for 10 sec.</td><td>Conformed to rated spec.</td></tr>
</table>

WPSPG Spark Gap Protectors – MS Series

Recommended Soldering Conditions

Flow Soldering Conditions	Reflow Soldering Conditions
	

1) Time shown in the above figures is measured from the point when chip surface reaches temperature.
2) Temperature difference in high temperature part should be within 110ºC
3) After soldering, do not force cool, allow the parts to cool gradually.

Hand Soldering

Solder iron temperature: 350±5ºC
Heating time: 3 seconds max.

General attention to soldering

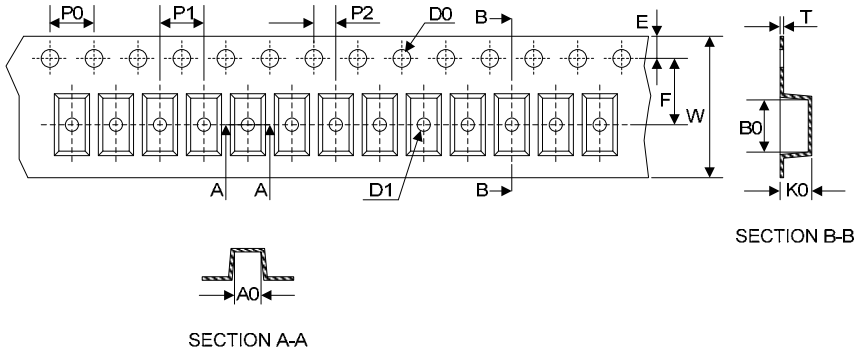
- High soldering temperatures and long soldering times can cause leaching of the termination, decrease in adherence strength, and the change of characteristic may occur.
- For soldering, please refer to the soldering curves above. However, please keep exposures to temperatures exceeding 200ºC to fewer than 50 seconds.
- Please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

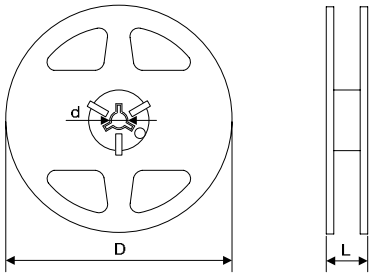
Cleaning

When using ultrasonic cleaning, the board may resonate if the output power is too high. Since this vibration can cause cracking or a decrease in the adherence of the termination, we recommend that you use the conditions below.
Frequency: 40kHz max.
Output power: 20W/liter
Cleaning time: 5 minutes max.

WPSPG Spark Gap Protectors – MS Series

Taping Specifications





Symbol	Dimension (mm)
W	12.00±0.20
P0	4.00±0.10
P1	4.00±0.10
P2	2.00±0.10
D0	Φ1.5±0.10
D1	Φ1.5±0.10
E	1.75±0.10
F	5.50±0.05
A0	3.00±0.10
B0	6.00±0.10
K0	3.00±0.10
T	0.30±0.05
D	178.0
d	13.0
L	15.0
Quantity: 1500PCS	

WPSPG Spark Gap Protectors – HS Series

Part Numbering System

Example part number:

WPSPG	-	**20**	**HS**	**200**	___
(1)		(2)	(3)	(4)	(5)

(1) **World Products Spark Gap Protector**

(2) **DC Spark-Over Voltage Tolerance** (Example: 20 = 20% tolerance)

(3) **Series Type:** HS = High Current Surface Mount Series

(4) **DC Spark-Over Voltage** (Example: 200 = 200V)

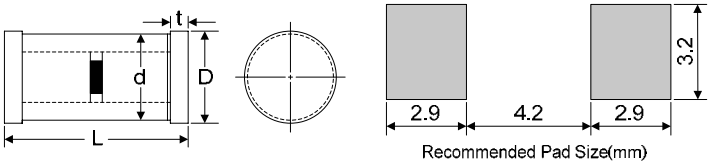
(5) **Nil** = Standard Packaging (Taped/Ammo Box), **S** = Bulk Packaging

FEATURES:

1. RoHS Compliant and Halogen Free
2. UL497B - File #E135015 (see specific voltage values)
3. Fast Responding
4. Low Capacitance
5. Zero leakage current
6. Stable electrical characteristics over time
7. Can withstand repeated surges
8. Bilateral Symmetrical
9. Operating Temperature: -40ºC – +85ºC
10. Storageorage Temperature: -40ºC – +125ºC
11. Meets MSL Level 1, per J-STD-020

WPSPG Spark Gap Protectors – HS Series

DIMENSIONS in mm



Item	Dimension
L	6.0 ± 0.5
D	3.3 ± 0.5
d	3.1 ± 0.5
t	0.4 ± 0.1

Electrical Characteristics

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20µs) (A)
		Test Voltage (V)	IR OHM (MΩ)		
WPSPG-XXHS 140*	140	50	100	0.8	3000
WPSPG-XXHS 200*	200	100	100	0.8	3000
WPSPG-XXHS 300*	300	100	100	0.8	3000
WPSPG-XXHS 400*	400	250	100	0.8	3000
WPSPG-XXHS 500*	500	250	100	0.8	3000
WPSPG-XXHS 700**	700	250	100	0.8	3000
WPSPG-XXHS 1000**	1000	500	100	0.8	3000

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%), 140V device is only available in 30% tolerance.

*UL 497B recognized (30% tolerance only).

**UL1449/CUL File #E321567 (20% tolerance only)

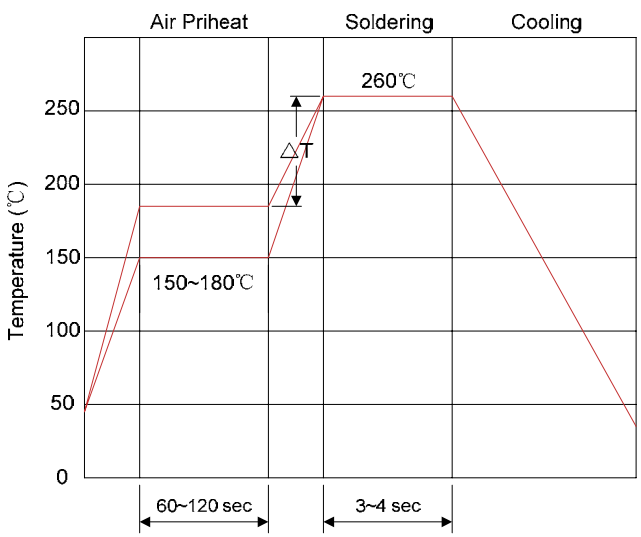
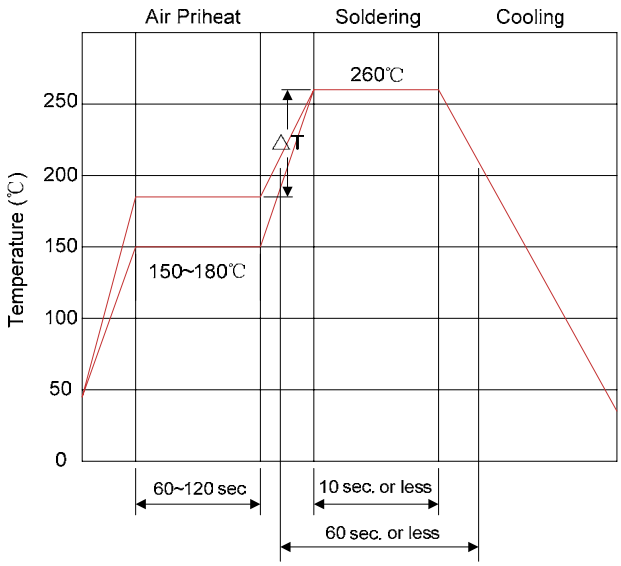
WPSPG Spark Gap Protectors – HS Series

Test Methods and Results

<table>
<tr><th>Item</th><th>Test Method</th><th>Standard</th></tr>
<tr><td>DC Spark-Over Voltage (Vs)</td><td>Measure starting discharge voltage (Vs) by gradually increasing applied DC voltage. Test current is 0.5mA max. And the DC voltage ascends up within as follow condition.<table><tr><td>Vs <1000V</td><td>100V/second</td></tr><tr><td>Vs <1000V</td><td>500V/second</td></tr></table></td><td rowspan="3">Meet specific value.</td></tr>
<tr><td>Insulation Resistance (IR)</td><td>Measure the insulation resistance across the terminal at regular voltage. But the test voltage doesn’t go beyond the DC spark-over voltage.</td></tr>
<tr><td>Capacitance</td><td>Measure the electrostatic capacitance by applying a voltage less than 6V (at 1KHZ) between terminals.</td></tr>
<tr><td>Static Life</td><td>10KV with 1500pf condenser is discharged through 0Ω resistor. 200 times at an interval of 10 seconds.</td><td>Rate of change 30%. Characteristics of other items must meet specified value.</td></tr>
<tr><td>Surge Current Capacity</td><td>The following impulse current for specified current applied ± 5 times at 60 second intervals. Thereafter, outer appearance shall be visually examined.<table><tr><th>Impulse Current</th></tr><tr><td>1.25μs & 8/20μs, 1000A, electrically connected with a resistor (2~4Ω)</td></tr></table></td><td>No crack and no failures</td></tr>
<tr><td>Cold Resistance</td><td>Measurement after -40ºC/1000 HRS and normal temperature/ 2 HRS.</td><td rowspan="4">Features are conformed to rated spec.</td></tr>
<tr><td>Heat Resistance</td><td>Measurement after 125ºC/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Humidity Resistance</td><td>Measurement after humidity 90~95% (45ºC)/1000 HRS and normal temperature/ 2 HRS.</td></tr>
<tr><td>Temperature Cycle</td><td>10 times repetition of cycle -40ºC/30 min normal, temp/2 min 125ºC/30 min, measurement after normal temp/2 HRS.</td></tr>
<tr><td>Solder Ability</td><td>Apply flux and immerse in molten solder 230 ± 5ºC for 3 sec up to the point of 1.5mm from body. Check for solder adhesion.</td><td>The end surface is evenly covered by solder</td></tr>
<tr><td>Solder Heat</td><td>Measurement after end surface of the electrodes is dipped up into 260 ± 5ºC solder for 10 sec.</td><td>Conformed to rated spec.</td></tr>
</table>

WPSPG Spark Gap Protectors – HS Series

Recommended Soldering Conditions

Flow Soldering Conditions	Reflow Soldering Conditions
	

1) Time shown in the above figures is measured from the point when chip surface reaches temperature.
2) Temperature difference in high temperature part should be within 110ºC
3) After soldering, do not force cool, allow the parts to cool gradually.

Hand Soldering

Solder iron temperature: 350±5ºC
Heating time: 3 seconds max.

General attention to soldering

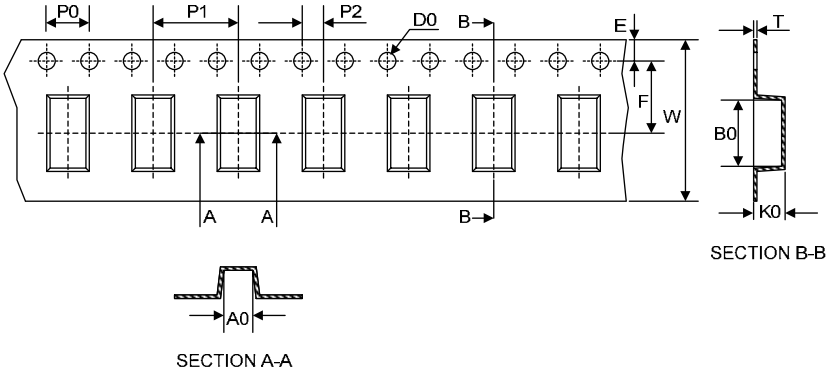
- High soldering temperatures and long soldering times can cause leaching of the termination, decrease in adherence strength, and the change of characteristic may occur.
- For soldering, please refer to the soldering curves above. However, please keep exposures to temperatures exceeding 200ºC to fewer than 50 seconds.
- Please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

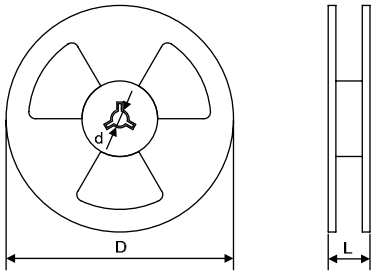
Cleaning

When using ultrasonic cleaning, the board may resonate if the output power is too high. Since this vibration can cause cracking or a decrease in the adherence of the termination, we recommend that you use the conditions below.
Frequency: 40kHz max.
Output power: 20W/liter
Cleaning time: 5 minutes max.

WPSPG Spark Gap Protectors – HS Series

Taping Specifications





Symbol	Dimension (mm)
W	16.00±0.20
P0	4.00±0.10
P1	8.00±0.10
P2	2.00±0.10
D0	Φ1.5±0.10
E	1.75±0.10
F	7.50±0.05
A0	3.50±0.10
B0	6.50±0.10
K0	3.50±0.10
T	0.50Max.
D	330.0
d	13.0
L	20.0
Quantity: 2000PCS	

WPSPG Spark Gap Protectors – HSS Series

Part Numbering System

Example part number:

WPSPG - **20** **HSS** **200** ___
(1) (2) (3) (4) (5)

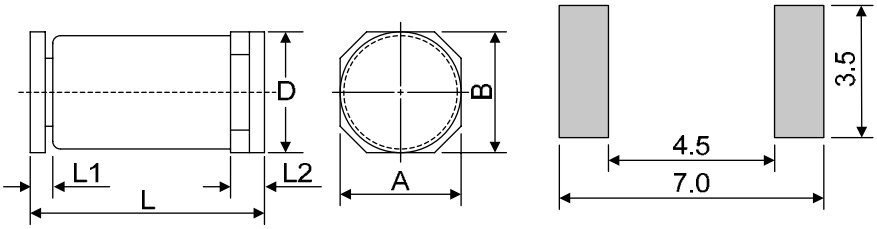
(1) **World Products Spark Gap Protector**
(2) **DC Spark-Over Voltage Tolerance** (Example: 20 = 20% tolerance)
(3) **Series Type:** HSS = High Current Surface Mount Series
(4) **DC Spark-Over Voltage** (Example: 200 = 200V)
(5) **Nil** = Standard Packaging (Taped/Ammo Box), **S** = Bulk Packaging

FEATURES:

1. RoHS Compliant and Halogen Free
2. UL497B - File #E135015 (see specific voltage values) and UL1449/CUL File #E321567
3. Fast Responding
4. Low Capacitance
5. Zero leakage current
6. Stable electrical characteristics over time
7. Can withstand repeated surges
8. Bilateral Symmetrical
9. Operating Temperature: -40ºC – +85ºC
10. Storageorage Temperature: -40ºC – +125ºC
11. Meets MSL Level 1, per J-STD-020
12. Square electrode (no rolling)

WPSPG Spark Gap Protectors – HSS Series

DIMENSIONS in mm



Item	Dimension
L	6.0 ± 0.5
L1	0.8 ± 0.3
L2	0.6 ± 0.3
D	Φ 3.2 ± 0.2
A	3.2 ± 0.2
B	3.2 ± 0.2

Electrical Characteristics

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20μs) (A)
		Test Voltage (V)	IR OHM (MΩ)		
WPSPG-XXHSS 140*	140	50	100	0.8	3000
WPSPG-XXHSS 200*	200	100	100	0.8	3000
WPSPG-XXHSS 300*	300	100	100	0.8	3000
WPSPG-XXHSS 400*	400	250	100	0.8	3000
WPSPG-XXHSS 500*	500	250	100	0.8	3000
WPSPG-XXHSS 700**	700	250	100	0.8	3000
WPSPG-XXHSS 1000**	1000	500	100	0.8	3000

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%).

*UL497B recognized (30% tolerance only).

**UL1449/CUL recognized (20% tolerance only).

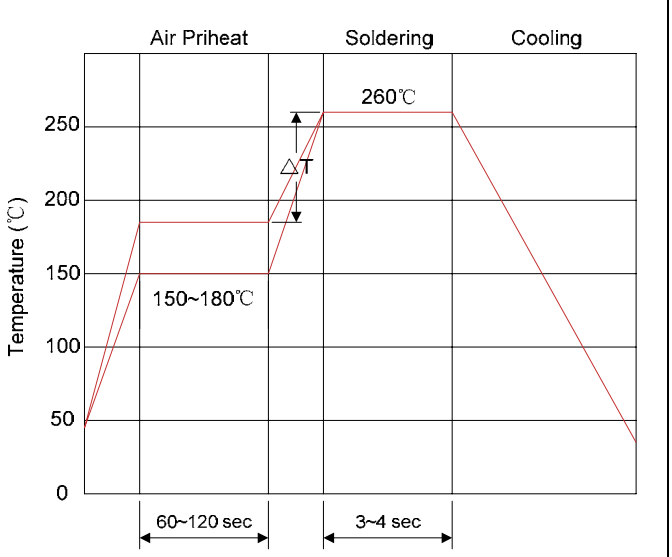
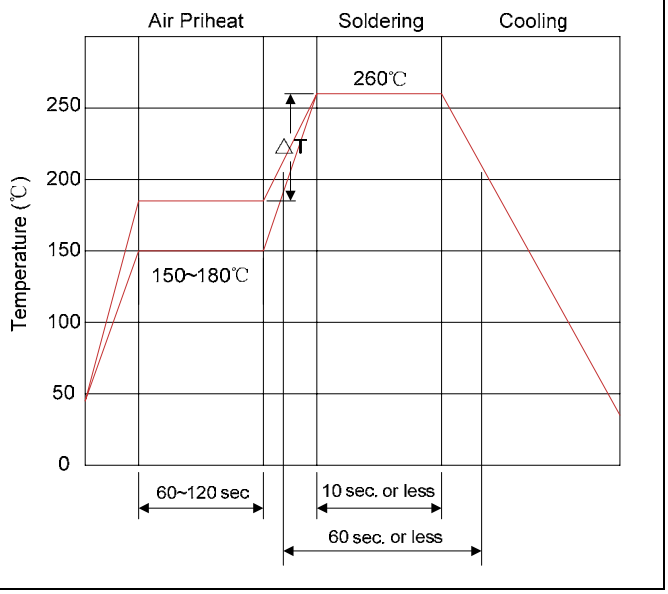
WPSPG Spark Gap Protectors – HSS Series

Test Methods and Results

Item	Test Method	Standard
DC Spark-Over Voltage (Vs)	Measure starting discharge voltage (Vs) by gradually increasing applied DC voltage. Test current is 0.5mA max. And the DC voltage ascends up within 100V/s (Vs<1000V) or 500V/s (Vs≥1000V).	Meet specific value.
Insulation Resistance	Measure the insulation resistance across the terminal at regular voltage. But the test voltage doesn't go over the DC spark-over voltage.	
Capacitance	Measure the electrostatic capacitance by applying a voltage less than 6V (at 1KHZ) between terminals.	
Static Life	10KV with 1500pf condenser is discharged through 0Ω resistor. 200 times at an interval of 10 seconds.	Rate of change 30%. Characteristics of other items must meet specified value.
Surge Current Capacity	1.2/5μ & 8/20μs, 3000A, electrically connected with a resistor (2~40Ω), ± 5 times at 60 second intervals. Thereafter, outer appearance shall be visually examined.	No crack and no failures
Cold Resistance	Measurement after -40ºC/1000 HRS and normal temperature/ 2 HRS.	Features are conformed to rated spec.
Heat Resistance	Measurement after 125ºC/1000 HRS and normal temperature/ 2 HRS.	
Humidity Resistance	Measurement after humidity 90~95% (45ºC)/1000 HRS and normal temperature/ 2 HRS.	
Temperature Cycle	10 times repetition of cycle -40ºC/30 min normal, temp/2 min 125ºC/30 min, measurement after normal temp/2 HRS.	
Solder Ability	Apply flux and immerse in molten solder 230 ± 5ºC for 3 sec up to the point of 1.5mm from body. Check for solder adhesion.	The end surface is evenly covered by solder
Solder Heat	Measurement after end surface of the electrodes is dipped up into 260 ± 5ºC solder for 10 sec.	Conformed to rated spec.

WPSPG Spark Gap Protectors – HSS Series

Recommended Soldering Conditions

Flow Soldering Conditions	Reflow Soldering Conditions
	

1) Time shown in the above figures is measured from the point when chip surface reaches temperature.
2) Temperature difference in high temperature part should be within 110ºC
3) After soldering, do not force cool, allow the parts to cool gradually.

Hand Soldering

Solder iron temperature: 350±5ºC
Heating time: 3 seconds max.

General attention to soldering

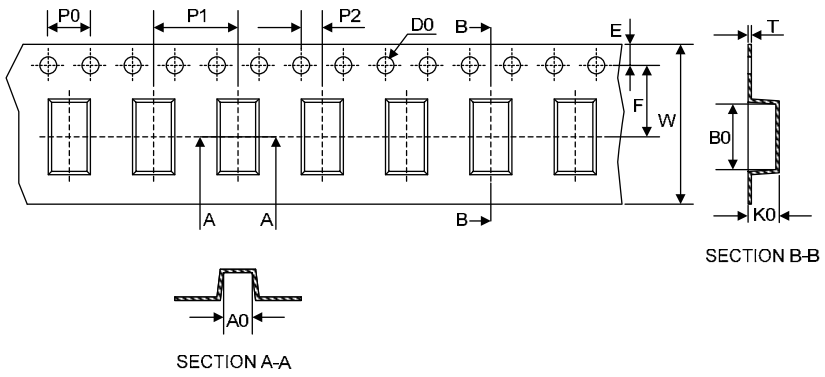
- High soldering temperatures and long soldering times can cause leaching of the termination, decrease in adherence strength, and the change of characteristic may occur.
- For soldering, please refer to the soldering curves above. However, please keep exposures to temperatures exceeding 200ºC to fewer than 50 seconds.
- Please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

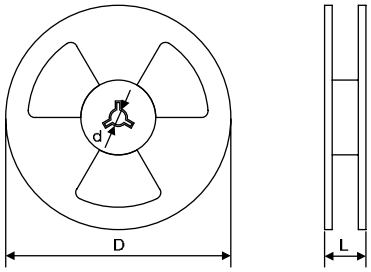
Cleaning

When using ultrasonic cleaning, the board may resonate if the output power is too high. Since this vibration can cause cracking or a decrease in the adherence of the termination, we recommend that you use the conditions below.
Frequency: 40kHz max.
Output power: 20W/liter
Cleaning time: 5 minutes max.

WPSPG Spark Gap Protectors – HSS Series

Taping Specifications





Symbol	Dimension (mm)
W	16.00±0.20
P0	4.00±0.10
P1	8.00±0.10
P2	2.00±0.10
D0	Φ1.5±0.10
E	1.75±0.10
F	7.50±0.05
A0	3.50±0.10
B0	6.50±0.10
K0	3.50±0.10
T	0.50Max.
D	330.0
d	13.0
L	20.0
Quantity: 2000PCS	

WPSPG Spark Gap Protectors – HG Series

Part Numbering System

Example part number:

WPSPG	-	**20**	**HG**	**1000**	___
(1)		(2)	(3)	(4)	(5)

(1) **World Products Spark Gap Protector**

(2) **DC Spark-Over Voltage Tolerance** (Example: 20 = 20% tolerance)

(3) **Series Type:** HG = High Current/High Voltage SMD Series

(4) **DC Spark-Over Voltage** (Example: 200 = 200V)

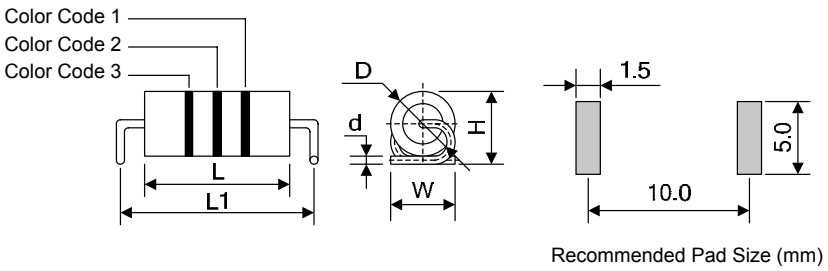
(5) **Nil** = Standard Packaging (Taped/Ammo Box), **S** = Bulk Packaging

FEATURES:

1. RoHS Compliant and Halogen Free
2. UL497B - Pending
3. Fast Responding
4. Low Capacitance
5. Zero leakage current
6. Stable electrical characteristics over time
7. Can withstand repeated surges
8. Bilateral Symmetrical
9. Operating Temperature: -40ºC – +85ºC
10. Storageorage Temperature: -40ºC – +125ºC
11. Meets MSL Level 1, per J-STD-020

WPSPG Spark Gap Protectors – HG Series

DIMENSIONS in mm



Recommended Pad Size (mm)

Item	Dimension
L	9.0 ± 1.5
L1	10.5 ± 1.0
D	Φ4.1 ± 0.5
d	Φ0.5 ± 0.05
H	4.6 ± 0.5
W	4.1 ± 0.5

Electrical Characteristics

Part Number	DC Spark-Over Voltage Vs (V)	Minimum Insulation Resistance		Maximum Capacitance (1KHz-6V$_{MAX}$) C (pf)	Surge Current Capacity (8/20μs) (A)	AC Withstanding Voltage
		Test Voltage (V)	IR OHM (MΩ)			
WPSPG-XXHG 1000	1000	500	100	1.0	3000A	---
WPSPG-XXHG 1500	1500	500	100	1.0	3000A	---
WPSPG-XXHG 1800	1800	500	100	1.0	3000A	---
WPSPG-XXHG 2000	2000	500	100	1.0	3000A	---
WPSPG-XXHG 2400	2400	500	100	1.0	3000A	AC1200V, 3 sec.
WPSPG-XXHG 2700	2700	500	100	1.0	3000A	AC1200V, 3 sec.
WPSPG-XXHG 3000	3000	500	100	1.0	3000A	AC1500V, 3 min.
WPSPG-XXHG 3600	3600	500	100	1.0	3000A	AC1800V, 3 sec.
WPSPG-XXHG 4000	4000	500	100	1.0	3000A	AC1800V, 3 sec.
WPSPG-XXHG 4500	4500	500	100	1.0	3000A	AC2000V, 1 min.
WPSPG-XXHG 5000	5000	500	100	1.0	3000A	AC2000V, 1 min.

Note: Vs ± XX% (DC Spark-Over Voltage Tolerance 30% and 20%).

Color Code

Part Number	Color Code 1	Color Code 2	Color Code 3
WPSPG-XXHG 1000	Brown	Black	Red
WPSPG-XXHG 1500	Brown	Green	Red
WPSPG-XXHG 1800	Brown	Gray	Red
WPSPG-XXHG 2000	Red	Black	Red
WPSPG-XXHG 2400	Red	Yellow	Red
WPSPG-XXHG 2700	Red	Purple	Red
WPSPG-XXHG 3000	Orange	Black	Red
WPSPG-XXHG 3600	Orange	Blue	Red
WPSPG-XXHG 4000	Yellow	Black	Red
WPSPG-XXHG 4500	Yellow	Green	Red
WPSPG-XXHG 5000	Green	Black	Red

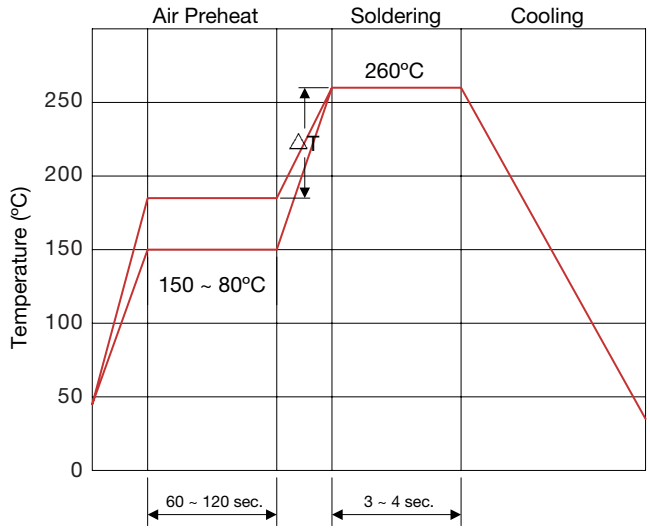
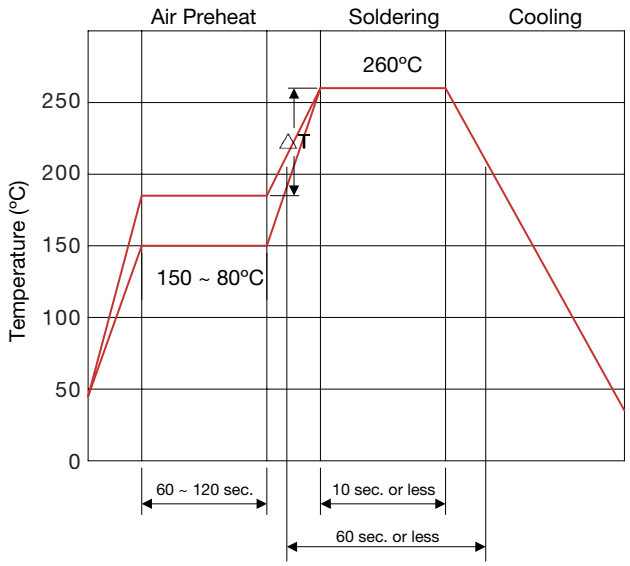
WPSPG Spark Gap Protectors – HG Series

Test Methods and Results

Item	Test Method	Standard
DC Spark-Over Voltage (Vs)	Measure starting discharge voltage (Vs) by gradually increasing applied DC voltage. Test current is 0.5mA max. And the DC voltage ascends up within 500V/second.	Meet specified value.
Insulation Resistance	Measure the insulation terminal at regular voltage. But the test voltage doesn't over the DC spark-over voltage.	
Capacitance	Measure the electrosapplying a voltage of less than 6V (at 1KHz) between terminals.	
Surge Current Capacity	Charge a 1.2/50μs & 8/20μs, 2000A, and apply it to the sample. Do this 10 time. Or 3000A, 1 time.	No crack and no failures
Surge Life	Apply a standard impulse current (8/20μs of 100A) for 300 times at 60 seconds intervals.	
Cold Resistance	Measurement after -40ºC/1000 HRS and normal temperature/ 2 HRS.	Features are conformed to rated spec.
Heat Resistance	Measurement after 125ºC/1000 HRS and normal temperature/ 2 HRS.	
Humidity Resistance	Measurement after humidity 90~95% (45ºC)/1000 HRS and normal temperature/ 2 HRS.	
Temperature Cycle	10 times repetition of cycle -40ºC/30 min normal, temp/2 min 125ºC/30 min, measurement after normal temp/2 HRS.	
Solder Ability	Apply flux and immerse in molten solder 230 ± 5ºC for 3 sec up to the point of 1.5mm from body. Check for solder adhesion.	Lead wire is evenly covered by solder
Solder Heat	Measurement after lead wire is dipped up to the point of 1.5mm from body into 260±5ºC solder for 10sec.	Conformed to rated spec.
Pull Strength	Apply 0.5kg load for 10sec.	Lead shall not pull out to snap.
Flexural Strength	Bend lead wire at the point of 2mm from body under 0.25 load and back to its original point. Repeat 1 time.	

WPSPG Spark Gap Protectors – HG Series

Recommended Soldering Conditions

Flow Soldering Conditions	Reflow Soldering Conditions
	

1) Time shown in the above figures is measured from the point when chip surface reached temperature.

2) Temperature difference in high remperature part should be within 110°C.

3) After soldering, do not force cool, allow parts to cool gradually.

Hand Soldering

Solder iron temperature: 350 ± 5°.

Heating time: 3 seconds max.

General Attention to Soldering

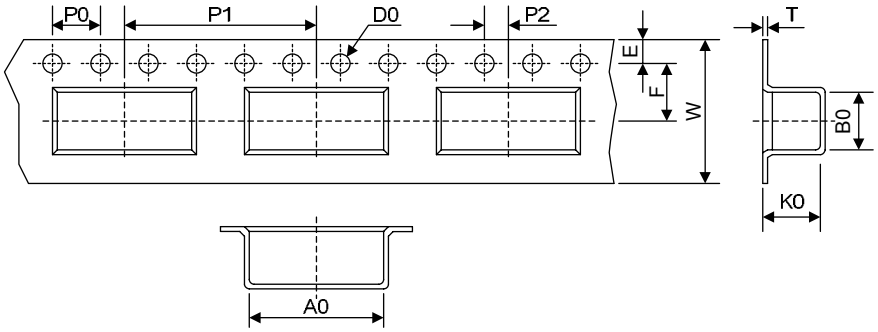
- High soldering temperatures and long soldering times can cause leaching of the termination, decrease in adherence strength, and the change of characteristic may occur.
- For soldering, please refer to the soldering curves above. However, please keep exposures to temperatures exceeding 200°C to fewer than 50 seconds.
- Please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluable, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

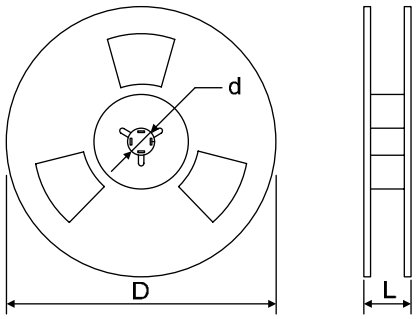
Cleaning

When using ultrasonic cleaning, the board may resonate if the output power is too high. Since this vibration can cause cracking or a decreasse in the adherence of the termination, we recommend that you use the folowing conditiions: **Frequency** - 40kHz max., **Output Power** - 20W/liter, **Cleaning Time** - 5 minutes max.

WPSPG Spark Gap Protectors – HG Series

Taping Specifications





Symbol	Dimension (mm)
W	12.00±0.20
P0	4.00±0.10
P1	16.00±0.20
P2	2.00±0.10
D0	Φ1.55±0.05
E	1.75±0.10
F	4.70±0.10
A0	11.00±0.10
B0	4.80±0.10
K0	4.70±0.10
T	0.40±0.10
D	330.0
d	13.0
L	16.0
Quantity: 800PCS	

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