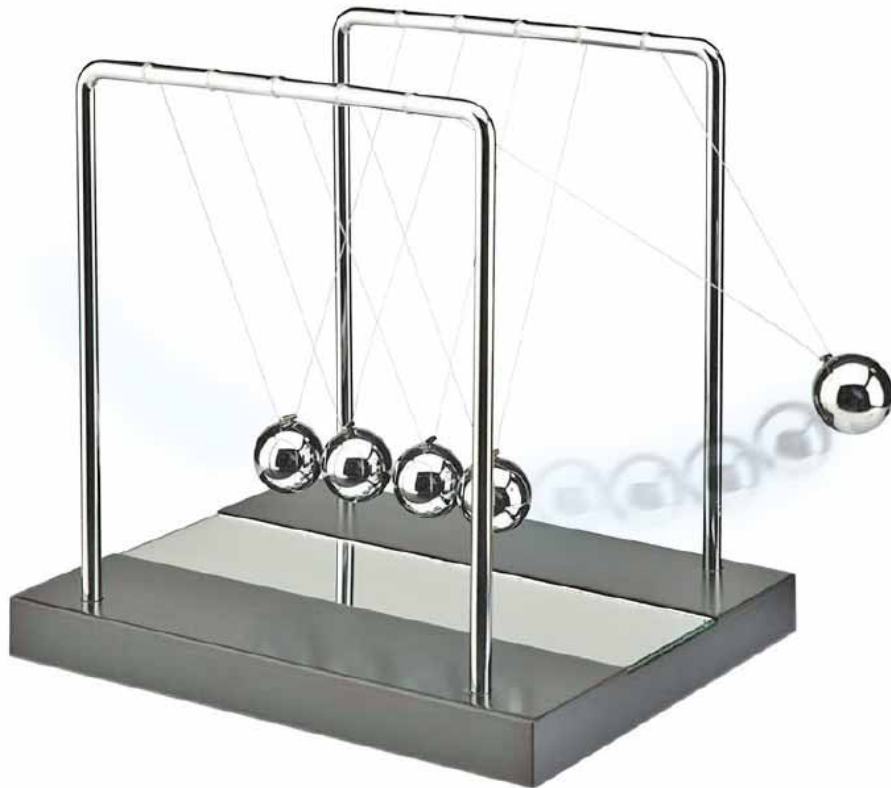


Vibration Damping PID Product Guide

2017-A

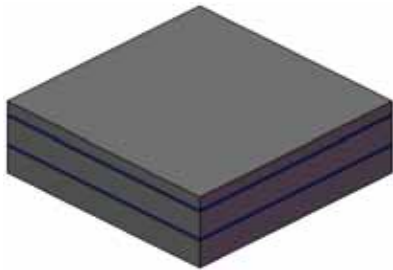


Inspired by Gravity™

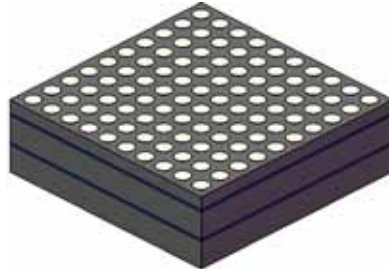
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www.Vibration.Engineering

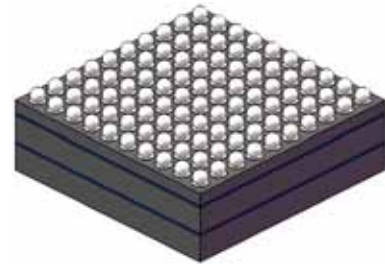
PID Find it Fast



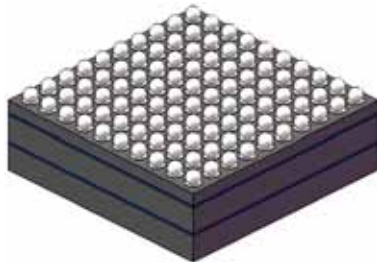
FA Series
Adhesive Mounting
[Page 4-5](#)



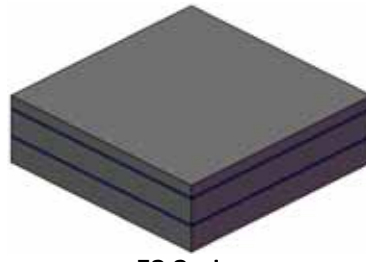
FL Series
LGA Bottom Terminal
[Page 6-7](#)



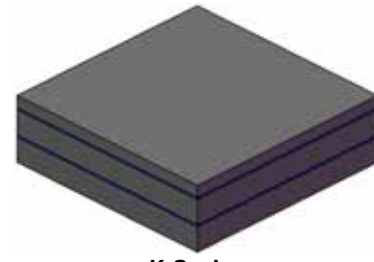
FB Series
BGA SAC305
[Page 8-9](#)



FP Series
BGA Sn63/Pb37



FS Series
Screw Mount



K Series
Engineering Development Kit



Where to Buy
[Page 10](#)



Contact: info@TopLine.tv

What is PID? Quick Answers

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About TopLine

TopLine manufactures PID Particle Impact Dampers for PCB printed circuit board assemblies under an exclusive technology transfer license from NASA.

What is PID

The **PID** Particle Impact Damper is a sealed container that is filled to 90% with tungsten (W) balls. The impact of tungsten balls colliding in the **PID** dampens fundamental frequency f_0 mode vibrations in the PCB assembly. This maximizes energy transfer to the **PID** to dampen vibration. The weight of the **PID** is approximately 10% the mass of the PCB assembly. The motion of the tungsten balls in the sealed PID housing removes vibratory energy from non-linear vibroacoustic environments such as PCB card assemblies. The PID straightens the PCB at the central lobe and attenuates vibration by pushing and pulling the PCB in the opposite direction after the tungsten balls overcome gravity. The **PID** is functional at any temperatures without derating.

About Tungsten

Tungsten (W) is environmentally friendly. Tungsten's properties include high density and tensile strength.

- Atomic Number 74
- Density 19.3g/cc (@20°C)
- Linear CTE 4.3 ppm/deg;C
- Poisson's Ratio 0.284
- Melting Point 3400°C
- Tensile Strength 700–3400 MPa @25°C

No Electrical Power Required

PID technology works without batteries or electrical power.

Technical Support:

Contact TopLine for technical support and questions for applications involving special needs. We look forward to assisting you. Email info@TopLine.tv
Or call 1-800-776-9888

Patent

Issued US 9521753 B1. Others pending. NASA invented **PID** technology to reduce vibration and increase reliability in circuit board assemblies.

Where to Mount on PCB

Vibration is attenuated by mounting a **PID** near the geometric center (anti-node) of the PCB. The damping effect increases reliability in the PCB. The **PID** may be located on either side of the board. **PID** may also be attached to an optional interposer bridge to avoid interference with existing components on the board.

Vibration Frequency

Vibration at the fundamental frequency f_0 causes bending, fatigue and cracks in the PCB assembly. Excessive vibration from external excitations lead to catastrophic failure. Typical fundamental vibration frequency ranges from 100Hz to 2000Hz.

How to Select the Right PID

Step 1. Select PID that is 10% of the mass (Weight) of your PCB assembly (Including Components)

Step 2. Place the PID near the geometric center of the board or the place where the board is oscillating the most.

Step 3. Select mounting style. For most heritage boards, it is best to epoxy the PID to the board with strong adhesive glue.

Step 4. Contact TopLine for assistance with interposer bridge to lift the PID over other components on your board. The PID can be mounted on the bridge.

Contact:

TopLine Corporation

95 Highway 22 W.
Milledgeville, GA 31061 USA

Tel: +1-800-776-9888
Email: info@TopLine.tv

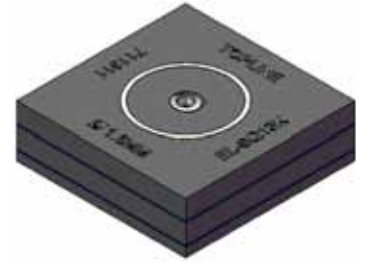
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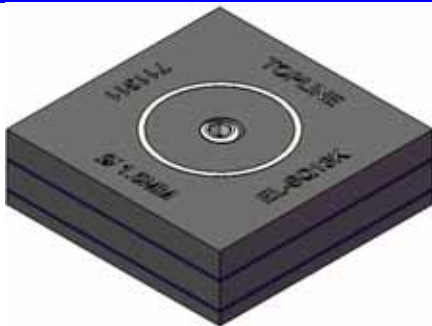
Ready to assist you.

FA Series Adhesive Mount Particle Impact Damper

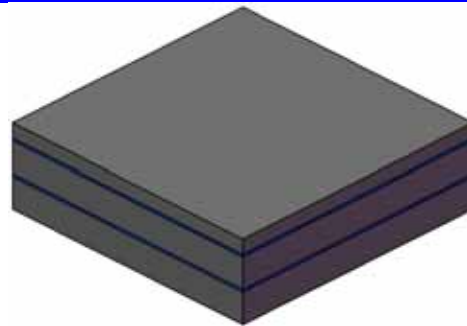


PCB Mass Grams	Tungsten Weight Min.	Total Weight Max.	Body Size X / Y	Height Max.	Tungsten Ball Size	Nbr Balls	Part Number	Order Nr
3 g	0.3 g	1.5 g	11 x 11mm	4.0mm	Ø1.5mm	17	FA 0.3 SQ11x4.0 A	139301
5 g	0.5 g	1.7 g	12 x 12mm	4.0mm	Ø1.5mm	20	FA 0.5 SQ12x4.0 A	139501
8 g	0.8 g	2.0 g	13 x 13mm	4.0mm	Ø1.5mm	25	FA 0.8 SQ13x4.0 A	139801
10 g	1.0 g	2.4 g	14 x 14mm	4.0mm	Ø1.5mm	32	FA 1.0 SQ14x4.0 A	131901
14 g	1.4 g	3.2g	15 x 15mm	4.5mm	Ø2.0mm	19	FA 1.4 SQ15x4.5 A	131941
18 g	1.8 g	4.0 g	17 x 17mm	4.5mm	Ø2.0mm	25	FA 1.8 SQ17x4.5 A	131981
20 g	2.0 g	4.5 g	18 x 18mm	4.5mm	Ø2.0mm	29	FA 2.0 SQ18x4.5 A	132901
25 g	2.5 g	5.1 g	19 x 19mm	4.5mm	Ø2.0mm	34	FA 2.5 SQ19x4.5 A	132951
28 g	2.8 g	6.2 g	21 x 21mm	4.5mm	Ø2.0mm	39	FA 2.8 SQ21x4.5 A	132981
40 g	4.0 g	8.0 g	23 x 23mm	5.0mm	Ø2.3mm	39	FA 4.0 SQ23x5.0 A	134901
50 g	5.0 g	10 g	25 x 25mm	5.0mm	Ø2.3mm	50	FA 5.0 SQ25x5.0 A	135901
60 g	6.0 g	12 g	27 x 27mm	5.0mm	Ø2.3mm	60	FA 6.0 SQ27x5.0 A	136901
75 g	7.5 g	14 g	29 x 29mm	5.0mm	Ø2.3mm	75	FA 7.5 SQ29x5.0 A	137951
90 g	9.0 g	16 g	31 x 31mm	5.0mm	Ø2.3mm	88	FA 9.0 SQ31x5.0 A	139901
100 g	10 g	18 g	33 x 33mm	5.0mm	Ø2.3mm	103	FA 10 SQ33x5.0 A	131001
120 g	12 g	21 g	35 x 35mm	5.0mm	Ø2.3mm	119	FA 12 SQ-35x5.0 A	131201
150 g	15 g	32 g	37.5 x 37.5mm	7.5mm	Ø2.5mm	105	FA 15 SQ37.5x7.5 A	131501
170 g	17 g	36 g	40 x 40mm	7.5mm	Ø2.5mm	119	FA 17 SQ40x7.5 A	131701
190 g	19 g	41 g	42.5 x 42.5mm	7.5mm	Ø2.5mm	133	FA 19 SQ42.5x7.5 A	131901
210 g	21 g	42 g	45 x 45mm	7.5mm	Ø2.5mm	146	FA 21 SQ45x7.5 A	132101
240 g	24 g	46 g	47.5 x 47.5mm	7.5mm	Ø2.5mm	168	FA 24 SQ47.5x7.5 A	132401
270 g	27 g	57 g	50 x 50mm	7.5mm	Ø2.5mm	189	FA 27 SQ50x7.5 A	132701
300 g	30 g	63 g	52.5 x 52.5mm	7.5mm	Ø2.5mm	210	FA 30 SQ52.5x7.5 A	133001

TOP



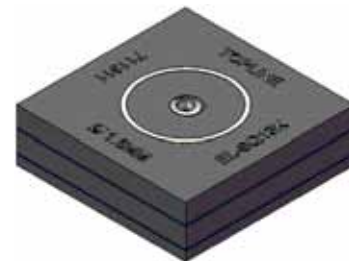
BOTTOM VIEW



INFO

- Note 1: Mount to PCB using epoxy adhesive.
- Note 2: Bottom is insulated to avoid shorting to board surface.
- Note 3: PCB assembly mass includes the weight of all components.
- Note 4: Custom sizes available.

FA Series Adhesive Mount Part Number System

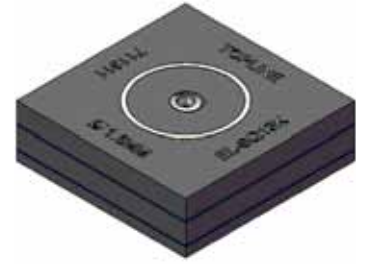


Part Number System					
<u>F</u>	<u>A</u>	<u>25</u>	<u>SQ</u>	<u>21x4.5</u>	<u>A</u>
Series	Mounting To PCB	Tungsten Mass Grams (Min.)	Shape	Body Dimensions Outside (mm)	Version/Option
Filled Case F = FR4 Case A = AI Case	Mounting Style A = Adhesive L = LGA NiAu Solderable Bottom Terminal B = BGA SAC305 Ball P = BGA Sn/Pb Solder Ball S = Screw Fastener	Code Grams 0.03 ~ 0.03 ~ 500 500 g Other Mass Available	Code Shape SQ Square R Rectangle C Cylindrical Z Custom	Width Height 3~ 4.0~ 100mm 25mm Custom Dimensions Available	Code Version A • 01 B • 02 C • 03 Z • 26 - - - - BA • 27 BB • 28 BC • 29 BZ • 52

Order Number			
<u>1</u>	<u>3</u>	<u>591</u>	<u>1</u>
Alloy	Mounting to PCB	Mass (gram) 9 = Decimal	Option Code
Code • Description 1 = Filled PID	Code Description 1 = LGA 2 = Screw 3 = Adhesive 4 = BGA SAC305 5 = BGA Sn63/Pb37 9 = Custom	Code Weight 905 = 0.05 g 951 = 0.51 g 297 = 2.7 g 590 = 5.0 g 010 = 10 g 051 = 51 g 123 = 123 g 254 = 254 g Other Mass Available 9 = Decimal	Code Mil 1 Version A 2 Version B 3 Version C ... 9 Version J

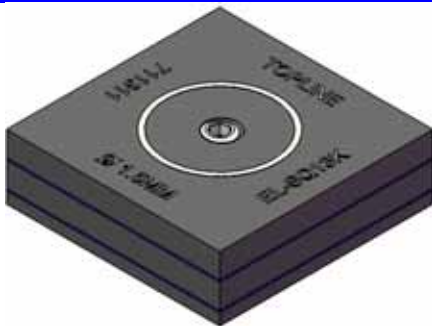
Type	Diameter	Diameter	Weight Per Ball	Balls Per Kg	Part Nbr	DWG
	Ø1.5mm	0.059-in	0.031gm	32,000	TB1.5	720059
	Ø2.0mm	0.079-in	0.073gm	13,700	TB2.0	720079
	Ø2.3mm	0.090-in	0.102gm	5,300	TB2.29	720090
	Ø2.5mm	0.100-in	0.143gm	3,200	TB2.5	720100
	Ø4.0mm	0.157-in	0.587gm	1,700	TB2.5	720100

FL Series LGA SMT Mount Particle Impact Damper

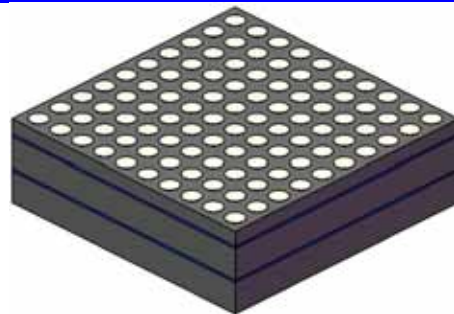


PCB Mass Grams	Tungsten Weight Min.	Total Weight Max.	Body Size X / Y	Height Max.	Tungsten Ball Size	Nbr Balls	Part Number	Order Nr
3 g	0.3 g	1.5 g	11 x 11mm	4.0mm	Ø1.5mm	17	FL 0.3 SQ11x4.0 A	119301
5 g	0.5 g	1.7 g	12 x 12mm	4.0mm	Ø1.5mm	20	FL 0.5 SQ12x4.0 A	119501
8 g	0.8 g	2.0 g	13 x 13mm	4.0mm	Ø1.5mm	25	FL 0.8 SQ13x4.0 A	119801
10 g	1.0 g	2.4 g	14 x 14mm	4.0mm	Ø1.5mm	32	FL 1.0 SQ14x4.0 A	111901
14 g	1.4 g	3.2g	15 x 15mm	4.5mm	Ø2.0mm	19	FL 1.4 SQ15x4.5 A	111941
18 g	1.8 g	4.0 g	17 x 17mm	4.5mm	Ø2.0mm	25	FL 1.8 SQ17x4.5 A	111981
20 g	2.0 g	4.5 g	18 x 18mm	4.5mm	Ø2.0mm	29	FL 2.0 SQ18x4.5 A	112901
25 g	2.5 g	5.1 g	19 x 19mm	4.5mm	Ø2.0mm	34	FL 2.5 SQ19x4.5 A	112951
28 g	2.8 g	6.2 g	21 x 21mm	4.5mm	Ø2.0mm	39	FL 2.8 SQ21x4.5 A	112981
40 g	4.0 g	8.0 g	23 x 23mm	5.0mm	Ø2.3mm	39	FL 4.0 SQ23x5.0 A	114901
50 g	5.0 g	10 g	25 x 25mm	5.0mm	Ø2.3mm	50	FL 5.0 SQ25x5.0 A	115901
60 g	6.0 g	12 g	27 x 27mm	5.0mm	Ø2.3mm	60	FL 6.0 SQ27x5.0 A	116901
75 g	7.5 g	14 g	29 x 29mm	5.0mm	Ø2.3mm	75	FL 7.5 SQ29x5.0 A	117951
90 g	9.0 g	16 g	31 x 31mm	5.0mm	Ø2.3mm	88	FL 9.0 SQ31x5.0 A	119901
100 g	10 g	18 g	33 x 33mm	5.0mm	Ø2.3mm	103	FL 10 SQ33x5.0 A	111001
120 g	12 g	21 g	35 x 35mm	5.0mm	Ø2.3mm	119	FL 12 SQ-35x5.0 A	111201
150 g	15 g	32 g	37.5 x 37.5mm	7.5mm	Ø2.5mm	105	FL 15 SQ37.5x7.5 A	111501
170 g	17 g	36 g	40 x 40mm	7.5mm	Ø2.5mm	119	FL 17 SQ40x7.5 A	111701
190 g	19 g	41 g	42.5 x 42.5mm	7.5mm	Ø2.5mm	133	FL 19 SQ42.5x7.5 A	111901
210 g	21 g	42 g	45 x 45mm	7.5mm	Ø2.5mm	146	FL 21 SQ45x7.5 A	112101
240 g	24 g	46 g	47.5 x 47.5mm	7.5mm	Ø2.5mm	168	FL 24 SQ47.5x7.5 A	112401
270 g	27 g	57 g	50 x 50mm	7.5mm	Ø2.5mm	189	FL 27 SQ50x7.5 A	112701
300 g	30 g	63 g	52.5 x 52.5mm	7.5mm	Ø2.5mm	210	FL 30 SQ52.5x7.5 A	113001

TOP



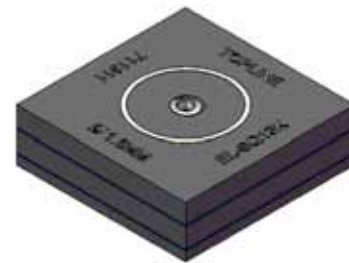
BOTTOM VIEW



INFO

- Note 1: Mount to PCB using SAC305 Lead Free or Tin/Lead Solder Paste.
- Note 2: Bottom is insulated to avoid shorting to board surface.
- Note 3: PCB assembly mass includes the weight of all components.
- Note 4: Custom sizes available.

FL Series LGA SMT Mount Part Number System

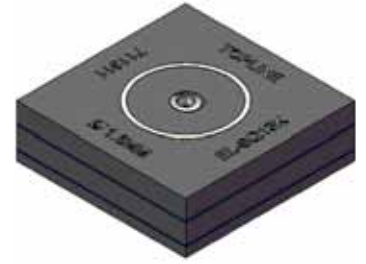


Part Number System					
<u>F</u>	<u>L</u>	<u>25</u>	<u>SQ</u>	<u>21x4.5</u>	<u>A</u>
Series	Mounting To PCB	Tungsten Mass Grams (Min.)	Shape	Body Dimensions Outside (mm)	Version/Option
Filled Case F = FR4 Case A = Al Case	Mounting Style A = Adhesive L = LGA NiAu Solderable Bottom Terminal B = BGA SAC305 Ball P = BGA Sn/Pb Solder Ball S = Screw Fastener	Code Grams 0.03 ~ 0.03~ 500 500 g Other Mass Available	Code Shape SQ Square R Rectangle C Cylindrical Z Custom	Width Height 3~ 4.0~ 100mm 25mm Custom Dimensions Available	Code Version A • 01 B • 02 C • 03 Z • 26 - - - - BA • 27 BB • 28 BC • 29 BZ • 52

Order Number			
<u>1</u>	<u>1</u>	<u>591</u>	<u>1</u>
Alloy	Mounting to PCB	Mass (gram) 9 = Decimal	Option Code
Code • Description 1 = Filled PID	Code Description 1 = LGA 2 = Screw 3 = Adhesive 4 = BGA SAC305 5 = BGA Sn63/Pb37 9 = Custom	Code Weight 905 = 0.05 g 951 = 0.51 g 297 = 2.7 g 590 = 5.0 g 010 = 10 g 051 = 51 g 123 = 123 g 254 = 254 g Other Mass Available 9 = Decimal	Code Mil 1 Version A 2 Version B 3 Version C ... 9 Version J

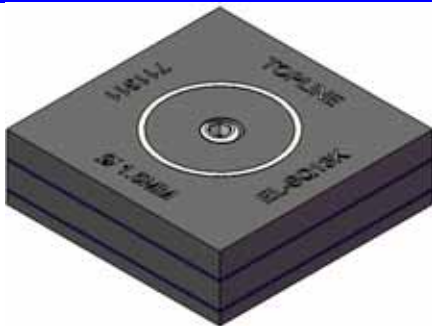
Type	Diameter	Diameter	Weight Per Ball	Balls Per Kg	Part Nbr	DWG
	∅1.5mm	0.059-in	0.031gm	32,000	TB1.5	720059
	∅2.0mm	0.079-in	0.073gm	13,700	TB2.0	720079
	∅2.3mm	0.090-in	0.102gm	5,300	TB2.29	720090
	∅2.5mm	0.100-in	0.143gm	3,200	TB2.5	720100
	∅4.0mm	0.157-in	0.587gm	1,700	TB2.5	720100

FB Series BGA Lead Free Particle Impact Damper

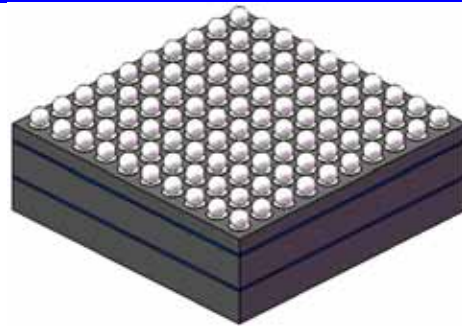


PCB Mass Grams	Tungsten Weight Min.	Total Weight Max.	Body Size X / Y	Height Max.	Tungsten Ball Size	Nbr Balls	Part Number	Order Nr
3 g	0.3 g	1.5 g	11 x 11mm	4.0mm	Ø1.5mm	17	FB 0.3 SQ11x4.0 A	149301
5 g	0.5 g	1.7 g	12 x 12mm	4.0mm	Ø1.5mm	20	FB 0.5 SQ12x4.0 A	149501
8 g	0.8 g	2.0 g	13 x 13mm	4.0mm	Ø1.5mm	25	FB 0.8 SQ13x4.0 A	149801
10 g	1.0 g	2.4 g	14 x 14mm	4.0mm	Ø1.5mm	32	FB 1.0 SQ14x4.0 A	141901
14 g	1.4 g	3.2g	15 x 15mm	4.5mm	Ø2.0mm	19	FB 1.4 SQ15x4.5 A	141941
18 g	1.8 g	4.0 g	17 x 17mm	4.5mm	Ø2.0mm	25	FB 1.8 SQ17x4.5 A	141981
20 g	2.0 g	4.5 g	18 x 18mm	4.5mm	Ø2.0mm	29	FB 2.0 SQ18x4.5 A	142901
25 g	2.5 g	5.1 g	19 x 19mm	4.5mm	Ø2.0mm	34	FB 2.5 SQ19x4.5 A	142951
28 g	2.8 g	6.2 g	21 x 21mm	4.5mm	Ø2.0mm	39	FB 2.8 SQ21x4.5 A	142981
40 g	4.0 g	8.0 g	23 x 23mm	5.0mm	Ø2.3mm	39	FB 4.0 SQ23x5.0 A	144901
50 g	5.0 g	10 g	25 x 25mm	5.0mm	Ø2.3mm	50	FB 5.0 SQ25x5.0 A	145901
60 g	6.0 g	12 g	27 x 27mm	5.0mm	Ø2.3mm	60	FB 6.0 SQ27x5.0 A	146901
75 g	7.5 g	14 g	29 x 29mm	5.0mm	Ø2.3mm	75	FB 7.5 SQ29x5.0 A	147951
90 g	9.0 g	16 g	31 x 31mm	5.0mm	Ø2.3mm	88	FB 9.0 SQ31x5.0 A	149901
100 g	10 g	18 g	33 x 33mm	5.0mm	Ø2.3mm	103	FB 10 SQ33x5.0 A	141001
120 g	12 g	21 g	35 x 35mm	5.0mm	Ø2.3mm	119	FB 12 SQ-35x5.0 A	141201
150 g	15 g	32 g	37.5 x 37.5mm	7.5mm	Ø2.5mm	105	FB 15 SQ37.5x7.5 A	141501
170 g	17 g	36 g	40 x 40mm	7.5mm	Ø2.5mm	119	FB 17 SQ40x7.5 A	141701
190 g	19 g	41 g	42.5 x 42.5mm	7.5mm	Ø2.5mm	133	FB 19 SQ42.5x7.5 A	141901
210 g	21 g	42 g	45 x 45mm	7.5mm	Ø2.5mm	146	FB 21 SQ45x7.5 A	142101
240 g	24 g	46 g	47.5 x 47.5mm	7.5mm	Ø2.5mm	168	FB 24 SQ47.5x7.5 A	142401
270 g	27 g	57 g	50 x 50mm	7.5mm	Ø2.5mm	189	FB 27 SQ50x7.5 A	142701
300 g	30 g	63 g	52.5 x 52.5mm	7.5mm	Ø2.5mm	210	FB 30 SQ52.5x7.5 A	143001

TOP



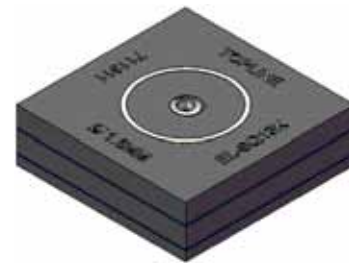
BOTTOM VIEW



INFO

- Note 1: Mount to PCB using SAC305 Lead Free or Tin/Lead Solder Paste.
- Note 2: Bottom is insulated to avoid shorting to board surface.
- Note 3: PCB assembly mass includes the weight of all components.
- Note 4: Custom sizes available.

FB Series BGA Lead Free Part Number System



Part Number System					
<u>F</u>	<u>B</u>	<u>25</u>	<u>SQ</u>	<u>21x4.5</u>	<u>A</u>
Series	Mounting To PCB	Tungsten Mass Grams (Min.)	Shape	Body Dimensions Outside (mm)	Version/Option
Filled Case F = FR4 Case A = Al Case	Mounting Style A = Adhesive L = LGA NiAu Solderable Bottom Terminal B = BGA SAC305 Ball P = BGA Sn/Pb Solder Ball S = Screw Fastener	Code Grams 0.03 ~ 0.03~ 500 500 g Other Mass Available	Code Shape SQ Square R Rectangle C Cylindrical Z Custom	Width Height 3~ 4.0~ 100mm 25mm Custom Dimensions Available	Code Version A • 01 B • 02 C • 03 Z • 26 - - - - BA • 27 BB • 28 BC • 29 BZ • 52

Order Number			
<u>1</u>	<u>4</u>	<u>591</u>	<u>1</u>
Alloy	Mounting to PCB	Mass (gram) 9 = Decimal	Option Code
Code • Description 1 = Filled PID	Code Description 1 = LGA 2 = Screw 3 = Adhesive 4 = BGA SAC305 5 = BGA Sn63/Pb37 9 = Custom	Code Weight 905 = 0.05 g 951 = 0.51 g 297 = 2.7 g 590 = 5.0 g 010 = 10 g 051 = 51 g 123 = 123 g 254 = 254 g Other Mass Available 9 = Decimal	Code Mil 1 Version A 2 Version B 3 Version C ... 9 Version J

Type	Diameter	Diameter	Weight Per Ball	Balls Per Kg	Part Nbr	DWG
	Ø1.5mm	0.059-in	0.031gm	32,000	TB1.5	720059
	Ø2.0mm	0.079-in	0.073gm	13,700	TB2.0	720079
	Ø2.3mm	0.090-in	0.102gm	5,300	TB2.29	720090
	Ø2.5mm	0.100-in	0.143gm	3,200	TB2.5	720100
	Ø4.0mm	0.157-in	0.587gm	1,700	TB2.5	720100



TopLine Distributors

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