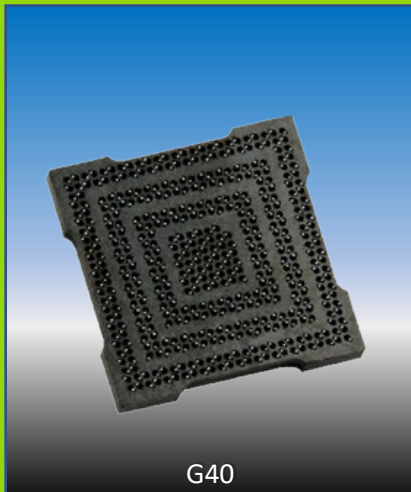
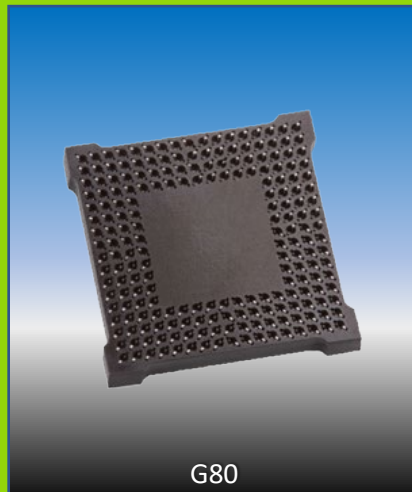
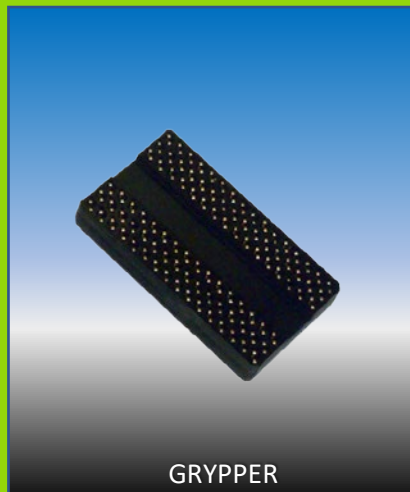




G40



G80



GRYPper

## PRODUCT CATALOG

*True-Zero and Near-Zero  
Footprint Test Sockets -  
Grypper, Grypper Y, & SMT  
Spring Pin*

[WWW.IRONWOODELECTRONICS.COM](http://WWW.IRONWOODELECTRONICS.COM)



# CONTENTS

**3** Introduction**ZERO FOOTPRINT SOCKETS****4** Grypper Test Sockets**5** Grypper Standard Memory Sockets**5** eMMC / UFS Sockets**6** ONFi /NAND Sockets**7** DDR Sockets**8** GDDR Sockets**9** LPDDR Sockets**NEAR-ZERO FOOTPRINT SOCKETS****16** Grypper Y Sockets**17** SMT Spring Pin Sockets**APPLICATIONS****18** Typical Grypper and Grypper Y Applications**19** Typical NZF Spring Pin and SIL Lens Applications

# INTRODUCTION

## Welcome to Ironwood Electronics!

As a premier manufacturer of precision test sockets, adapters, and modules, Ironwood offers more than 6000 standard products. This catalog highlights the Ironwood Grypper line of true Zero-Footprint and Near-Zero-Footprint Socket products. Since 1986, there are very few challenges we have not come across - we welcome your next challenge!

## Mission Statement

We are committed to developing new technologies to provide superior products and services to meet our customer's requirements. We strive to offer the most comprehensive line of high performance test sockets, adapters, and custom modules in the industry, and maintain a deep understanding of the technologies involved. We will provide continuous and open communication with our suppliers and customers to ensure top quality materials and on-time delivery. We are dedicated to quality in the services we provide and the parts we manufacture.

Catalog G1

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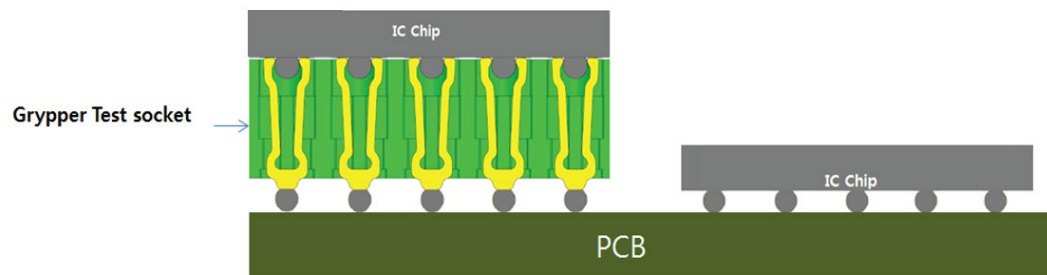


# GRYPPER TEST SOCKETS

Ironwood Electronics Grypper test sockets are like not having a socket at all. With superior electrical performance, Grypper test sockets allow BGA devices to fit into the exact end-use location on actual boards, promoting test, trouble-shooting, failure analysis, and product development, where space is limited to only the IC package itself. The BGA package simply snaps directly into the Grypper socket.

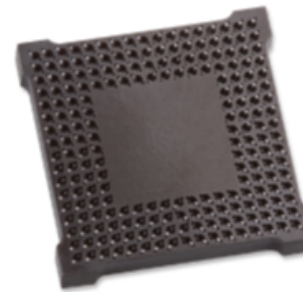
Grypper sockets have 3 series of contact designs that are specific to pitch and I/O count:

- Grypper (standard) is used for 0.65 – 1.0 mm pitch, up to 200 I/O
- Grypper G80 is used for 0.65 to 1.0 mm pitch, 200-300 I/O
- Grypper G80 LIF is used for 0.65 to 1.0 mm pitch, 300+ I/O
- Grypper G35/G40 is used for 0.35 to 0.50 mm pitch

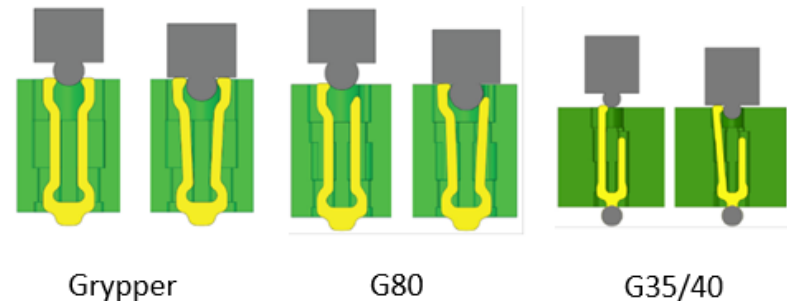


Having the same dimensions as the original device, Grypper sockets mount in the same location, utilize the same footprint, and attach using the same SMT process.

## Grypper Zero Footprint Sockets



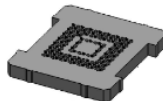
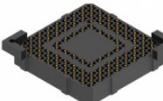
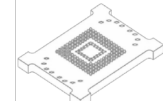
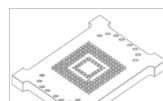
- No lid required
- Socket same size as device
- device simply snaps in for test
- Allows test on platform boards

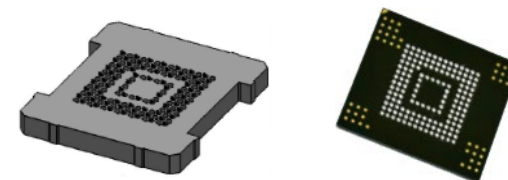


# GRYPPER STANDARD MEMORY SOCKETS - eMMC / UFS

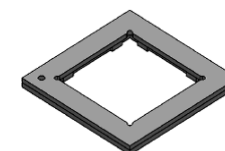
This section includes Zero Footprint Grypper sockets that have been designed for most common industry standard memory devices, including; eMMC / UFS, NAND (ONFi), DDR, GDDR and LPDDR.

## eMMC / UFS Sockets

|                                                                                    | Ball Count-Socket Size- Pitch                | Device Ball Diameter<br>+/- 0.05 mm | SAC 305<br>Solder Balls | SnPb Solder<br>Balls | No Solder<br>Balls<br>(standard) |
|------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------|-------------------------|----------------------|----------------------------------|
|    | <b>153</b> - 11.5 x 13.0 - 0.5               | 0.30                                | <b>107250-0026</b>      | <b>108387-0026</b>   | <b>107248-0026</b>               |
|                                                                                    | Alignment Frame                              |                                     | 108639-0003             |                      |                                  |
|                                                                                    | Device Press - 11.5 x 13.0                   |                                     | 103864-0128             |                      |                                  |
|                                                                                    | Stencil - 153 - 11.5 x 13.0                  |                                     | N/R                     | N/R                  | 104553-0220                      |
|                                                                                    |                                              |                                     |                         |                      |                                  |
|    | <b>153</b> - 11.5 x 13.0 - 0.5               | 0.30                                | <b>107250-0065</b>      | <b>108387-0064</b>   | <b>108519-0064</b>               |
|                                                                                    |                                              |                                     |                         |                      |                                  |
|                                                                                    | <b>153 - with built in alignment feature</b> |                                     |                         |                      |                                  |
| Alignment frame not required - use press and stencil from above                    |                                              |                                     |                         |                      |                                  |
|                                                                                    |                                              |                                     |                         |                      |                                  |
|  | <b>169</b> - 12.0 x 16.0 - 0.5               | 0.30                                | <b>107250-0009</b>      | <b>108387-0009</b>   | <b>107248-0009</b>               |
|                                                                                    | Device Press - 12.0 x 16.0                   |                                     | 103864-0080             |                      |                                  |
|                                                                                    | Stencil – 169 - 12.0 x 16.0                  |                                     | N/R                     | N/R                  | 104553-0166                      |
|  | <b>169</b> - 14.0 x 18.0 - 0.5               | 0.30                                | <b>107250-0012</b>      | <b>108387-0066</b>   | <b>107248-0012</b>               |
|                                                                                    | Alignment Frame                              |                                     | 108639-0026             |                      |                                  |
|                                                                                    | Device Press - 14.0 x 18.0                   |                                     | 103864-0116             |                      |                                  |
|                                                                                    | Stencil - 169 -14.0 x 18.0                   |                                     | N/R                     | N/R                  | 104553-0175                      |

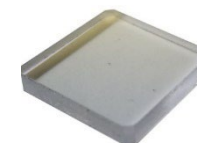


### Accessory Items used with Grypper sockets



#### Alignment Frame

Used for positioning the BGA device into the socket (G35/G40)



#### Device Press

Recommended to ensure even pressure across the top of the device when inserting device into socket



#### Extraction Tool

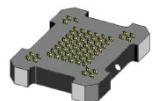
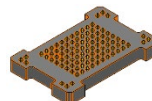
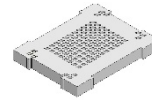
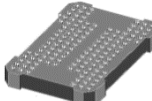
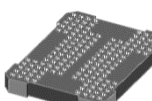
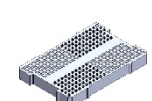
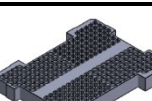
105900-0004 – Used for device removal

Actual device measurements should be reviewed to ensure proper fit with socket contacts

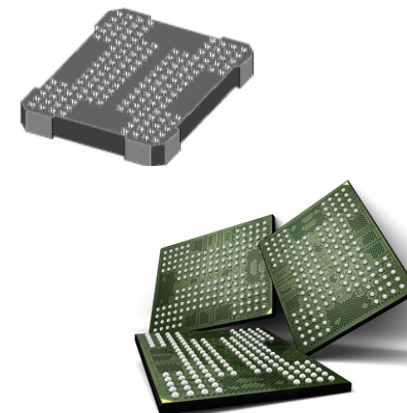
Other configurations / socket outline sizes

# GRYPPER STANDARD MEMORY SOCKETS – ONFi/NAND

## ONFi / NAND Grypper Sockets

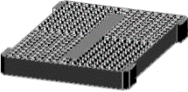
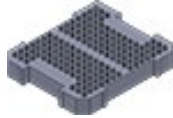
| Typical Applications                                                               | Ball Count - Socket size - Pitch- Product    | Device Ball Diameter +/- 0.05 mm | SAC 305 Solder Balls | SnPb Solder Balls  | No Solder Balls (standard) |
|------------------------------------------------------------------------------------|----------------------------------------------|----------------------------------|----------------------|--------------------|----------------------------|
|    | <b>24</b> - 6.0 x 8.0 - 1.0 – Grypper/G80    | 0.40                             | <b>107282-0011</b>   | <b>107282-0012</b> | <b>107282-0010</b>         |
|                                                                                    | Device Press – 6.0 x 8.0                     |                                  | 103864-0107          |                    |                            |
|                                                                                    | Stencil – 24 – 6.0 x 8.0                     |                                  | N/R                  | N/R                | 104553-0334                |
|    | <b>63</b> - 9.0 x 11.0 - 0.8 - Grypper       | 0.45                             | <b>105526-0097</b>   | <b>105526-0090</b> | <b>105526-0082</b>         |
|                                                                                    | Device Press – 9.0 x 11.0                    |                                  | 103864-0048          |                    |                            |
|                                                                                    | Stencil MOQ (10)                             |                                  | N/R                  | N/R                | 104553-0083                |
|    | <b>100</b> - 12.0 x 18.0 - 1.0 - Grypper     | 0.45                             | <b>105526-0089</b>   | <b>105526-0088</b> | <b>105526-0057</b>         |
|                                                                                    | Device Press - 12.0 x 18.0                   |                                  | 103864-0083          |                    |                            |
|                                                                                    | Stencil – 100 – 12.0 x 18.0                  |                                  | N/R                  | N/R                | 104553-0133                |
|    | <b>100</b> - 14.0 x 18.0 - 1.0 - Grypper     | 0.50                             | <b>111050-0002</b>   | <b>111050-0001</b> | <b>111050-0003</b>         |
|                                                                                    | Device Press- 14.0 x 18.0                    |                                  | 103864-0116          |                    |                            |
|                                                                                    | Stencil - 100 - 14.0 x 18.0                  |                                  | N/R                  | N/R                | 104553-0533                |
|  | <b>132</b> - 12.0 x 18.0 - 1.0 - Grypper     | 0.50                             | <b>104670-0040</b>   | <b>104670-0043</b> | <b>104670-0032</b>         |
|                                                                                    | Device Press- 12.0 x 18.0                    |                                  | 103864-0083          |                    |                            |
|                                                                                    | Stencil - 132 - 12.0 x 18.0                  |                                  | N/R                  | N/R                | 104553-0217                |
|  | <b>152</b> - 14.0 x 18.0 - 1.0 - Grypper     | 0.50                             | <b>104670-0041</b>   | <b>108656-0036</b> | <b>104670-0036</b>         |
|                                                                                    | Device Press - 14.0 x 18.0                   |                                  | 103864-0116          |                    |                            |
|                                                                                    | Stencil - 152 - 14.0 x 18.0                  |                                  | N/R                  | N/R                | 104553-0248                |
|  | <b>252</b> - 12.0 x 18.0 - 0.8 - Grypper/G80 | 0.45                             | <b>111041-0002</b>   | <b>111041-0001</b> | <b>111041-0003</b>         |
|                                                                                    | Device Press - 12.0 x 18.0                   |                                  | 103864-0083          |                    |                            |
|                                                                                    | Stencil - 252 – 12.0 x 18.0                  |                                  | N/R                  | N/R                | 104553-0501                |
|  | <b>272</b> - 14.0 x 18.0 - 0.8 - Grypper/G80 | 0.55                             | <b>107206-0052</b>   | <b>107206-0016</b> | <b>107206-0013</b>         |
|                                                                                    | Device Press - 14.0 x 18.0                   |                                  | 103864-0116          |                    |                            |
|                                                                                    | Stencil - 272 – 14.0 x 18.0                  |                                  | N/R                  | N/R                | 104553-0354                |

**ONFi**  
OPEN NAND  
FLASH INTERFACE

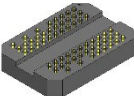
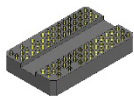
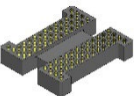
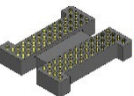
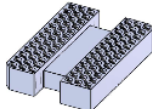


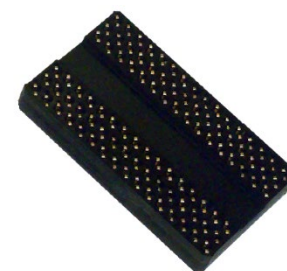


## GRYPPER STANDARD MEMORY SOCKETS – ONFi/NAND

| Typical Applications                                                              | Ball Count - Socket size - Pitch- Product    | Device Ball Diameter +/- 0.05 mm | SAC 305 Solder Balls | SnPb Solder Balls | No Solder Balls (standard) |
|-----------------------------------------------------------------------------------|----------------------------------------------|----------------------------------|----------------------|-------------------|----------------------------|
|  | <b>316</b> - 14.0 x 18.0 - 0.8 - Grypper/G80 | 0.50                             | 107088-0011          | 107088-0012       | 107088-0010                |
|                                                                                   | Device Press - 14.0 x 18.0                   |                                  | 103864-0116          |                   |                            |
|                                                                                   | Stencil - 316 – 14.0 x 18.0                  |                                  |                      |                   | 104553-0289                |
|  | <b>154</b> - 11.5 x 13.5 - 0.80 - Grypper    | 0.50                             | GR1110-0002          | GR1110-0001       | GR1110-0003                |
|                                                                                   | Alignment Frame                              |                                  | 108639-0179          |                   |                            |
|                                                                                   | Device Press - 11.5 x 13.0                   |                                  | 103864-0128          |                   |                            |
|                                                                                   | Stencil - 154 – 11.5 x 13.5                  |                                  |                      |                   | 104553-0605                |

## GRYPPER STANDARD MEMORY SOCKETS – DDR

|                                                                                           | Ball Count - Socket Size - Pitch - Product | Device Ball Diameter +/-0.05mm | SAC 305 Solder Balls | SnPb Solder Balls | No Solder Balls (standard) |
|-------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------|----------------------|-------------------|----------------------------|
| DDR2                                                                                      |                                            |                                |                      |                   |                            |
|          | 60 - 8.0 x 11.4 - 0.8 - Grypper            | 0.45                           | 105526-0099          | 105526-0098       | 105526-0068                |
|                                                                                           | Device Press - 8.0 x 11.4                  |                                | 103864-0108          |                   |                            |
|                                                                                           | Stencil - 60 - 8.0 x 11.4                  |                                | N/R                  | N/R               | 104553-0169                |
|          | 84 - 7.6 x 12.5 - 0.8 - Grypper            | 0.45                           | 105526-0101          | 105526-0100       | 105526-0037                |
|                                                                                           | Device Press - 8.0 x 12.5                  |                                | 103864-0075          |                   |                            |
|                                                                                           | Stencil - 84 - 8.0 x 12.0                  |                                | N/R                  | N/R               | 104553-0108                |
| DDR3                                                                                      |                                            |                                |                      |                   |                            |
|          | 82 - 9.4 x 11.1 - 0.8 - Grypper            | 0.45                           | 105526-0091          | 105526-0092       | 105526-0056                |
|                                                                                           | Device Press - 9.4 x 11.1                  |                                | 103864-0088          |                   |                            |
|                                                                                           | Stencil - 82 - 9.4 x 11.1                  |                                | N/R                  | N/R               | 104553-0129                |
|         | 82 – 10.0 x 11.0 - 0.8 - Grypper           | 0.50                           | GR1113-0002          | GR1113-0001       | GR1113-0003                |
|                                                                                           | Device Press - 10.0 x 11.0                 |                                | 103864-0054          |                   |                            |
|                                                                                           | Stencil - 82 - 10.0 x 11.0                 |                                | N/R                  | N/R               | 104553-0607                |
| DDR3/4                                                                                    |                                            |                                |                      |                   |                            |
|  X4/X8 | 78- 7.5 x 10.6 - 0.8 - Grypper             | 0.45                           | 108493-0009          | 107022-0048       | 107022-0038                |
|                                                                                           | Device Press - 7.5 x 10.6                  |                                | 103864-0119          |                   |                            |
|                                                                                           | Stencil - 78 - 7.5 x 10.6                  |                                | N/R                  | N/R               | 107030-0038                |
|                                                                                           | 78- 7.5 x 10.6 - 0.8 - Grypper             | 0.50                           | 111015-0002          | 111015-0001       | 111015-0003                |
|                                                                                           | Device Press - 7.5 x 10.6                  |                                | 103864-0119          |                   |                            |
|                                                                                           | Stencil - 78 - 7.5 x 10.6                  |                                | N/R                  | N/R               | 104553-0441                |
|  X16   | 96 - 7.5 x 13.1 - 0.8 - Grypper            | 0.45                           | 108493-0014          | 108493-0015       | 105526-0015                |
|                                                                                           | Device Press - 7.5 x 13.1                  |                                | 103864-0060          |                   |                            |
|                                                                                           | Stencil - 96 - 7.5 x 13.1                  |                                | N/R                  | N/R               | 104553-0071                |
|                                                                                           | 96 - 7.5 x 13.1 - 0.8 - Grypper            | 0.50                           | 111017-0002          | 111017-0001       | 111017-0003                |
|                                                                                           | Device Press - 7.5 x 13.1                  |                                | 103864-0060          |                   |                            |
|                                                                                           | Stencil - 96 - 7.5 x 13.1                  |                                | N/R                  | N/R               | 104553-0449                |

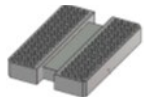
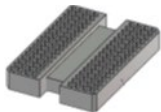
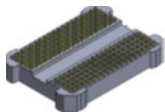
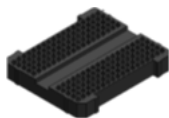


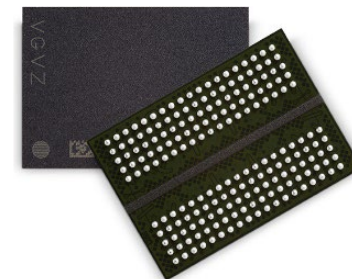
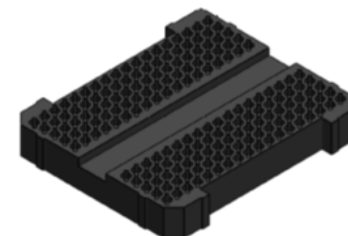


## GRYPPER STANDARD MEMORY SOCKETS – DDR

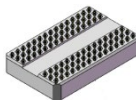
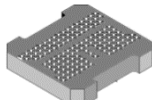
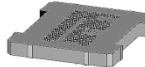
|                                                                                   | Ball Count - Socket Size -<br>Pitch - Product | Device Ball<br>Diameter<br>+/-0.05mm | SAC 305 Solder<br>Balls | SnPb Solder<br>Balls | No Solder Balls<br>(standard) |
|-----------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------|-------------------------|----------------------|-------------------------------|
| DDR5                                                                              |                                               |                                      |                         |                      |                               |
|  | 102 - 9.0 x 14.4 - 0.80 - Grypper             | 0.45                                 | GR1027-0002             | GR 1027-0001         | GR1027-0003                   |
|                                                                                   | Device Press - 9.0 x 14.4                     |                                      | 103864-0133             |                      |                               |
|                                                                                   | Stencil - 102 - 9.0 x 14.4                    |                                      | N/R                     | N/R                  | 104553-0216                   |

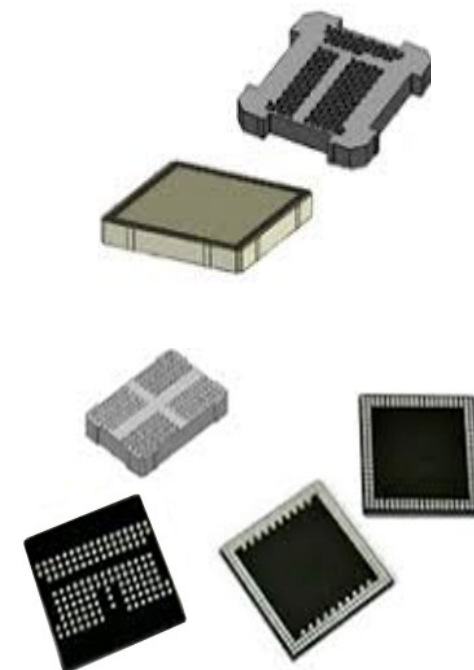
## GRYPPER STANDARD MEMORY SOCKETS – GDDR

|                                                                                     | Ball Count - Socket Size - Pitch - Product | Device Ball Diameter +/-0.05mm | SAC 305 Solder Balls | SnPb Solder Balls  | No Solder Balls (standard) |
|-------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------|----------------------|--------------------|----------------------------|
| <b>GDDR3</b>                                                                        |                                            |                                |                      |                    |                            |
|    | <b>136</b> - 10.0 x 14.0 - 0.8 - Grypper   | 0.45                           | <b>107022-0056</b>   | <b>107022-0055</b> | <b>107022-0026</b>         |
|                                                                                     | Device Press - 10.0 x 14.0                 |                                | 103864-0109          |                    |                            |
|                                                                                     | Stencil - 136 - 10.0 x 14.0                |                                | N/R                  | N/R                | 107030-0026                |
| <b>GDDR5</b>                                                                        |                                            |                                |                      |                    |                            |
|    | <b>170</b> - 12.0 x 14.0 - 0.8 - Grypper   | 0.45                           | <b>105526-0103</b>   | <b>105526-0102</b> | <b>105526-0070</b>         |
|                                                                                     | Device Press - 12.0 x 14.0                 |                                | 103864-0111          |                    |                            |
|                                                                                     | Stencil - 170 - 12.0 x 14.0                |                                | N/R                  | N/R                | 107030-0027                |
| <b>GDDR5 -x</b>                                                                     |                                            |                                |                      |                    |                            |
|   | <b>190</b> - 10.0 x 14.0 - 0.65 - Grypper  | 0.40                           | <b>111008-0002</b>   | <b>111008-0001</b> | <b>111008-0003</b>         |
|                                                                                     | Device Press - 10.0 x 14.0                 |                                | 103864-0109          |                    |                            |
|                                                                                     | Stencil - 190 - 10.0 x 14.0                |                                | N/R                  | N/R                | 104553-0396                |
| <b>GDDR6</b>                                                                        |                                            |                                |                      |                    |                            |
|  | <b>180</b> - 12.0 x 14.0 - 0.75 - Grypper  | 0.45                           | <b>111024-0002</b>   | <b>111024-0001</b> | <b>111024-0003</b>         |
|                                                                                     | Device Press - 12.0 x 14.0                 |                                | 103864-0066          |                    |                            |
|                                                                                     | Stencil - 180 - 12.0 x 14.0                |                                | N/R                  | N/R                | 104553-0455                |
|                                                                                     | <b>180</b> - 12.0 x 14.0 - 0.75 - Grypper  | 0.50                           | <b>111027-0002</b>   | <b>111027-0001</b> | <b>111027-0003</b>         |
|                                                                                     | Device Press - 12.0 x 14.0                 |                                | 103864-0066          |                    |                            |
|                                                                                     | Stencil - 180 - 12.0 x 14.0                |                                | N/R                  | N/R                | 104553-0465                |

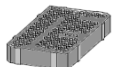
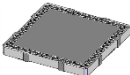
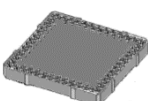


## GRYPPER STANDARD MEMORY SOCKETS – LPDDR

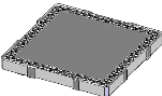
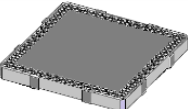
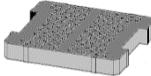
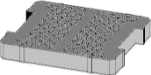
|                                                                                                                                                 | Ball Count - Socket Size - Pitch - Product -                | Device Ball Diameter +/-0.05mm | SAC 305 Solder Balls | SnPb Solder Balls | No Solder Balls (standard) |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------|----------------------|-------------------|----------------------------|
| LPDDR                                                                                                                                           |                                                             |                                |                      |                   |                            |
|                                                                | 60 - 7.5 x 8.5 - 0.8 - Grypper                              | 0.45                           | 111014-0002          | 111014-0001       | 111014-0003                |
|                                                                                                                                                 | Device Press - 7.5 x 7.5                                    |                                | 103864-0132          |                   |                            |
|                                                                                                                                                 | Stencil - 60 - 10.0 x 11.5                                  |                                | N/R                  | N/R               | 104553-0437                |
|                                                                | 90 – 7.5 x 12.3 - 0.8 - Grypper                             | 0.45                           | 104670-0044          | 108493-0018       | 104670-0007                |
|                                                                                                                                                 | Device Press - 8.0 x 12.0                                   |                                | 103864-0038          |                   |                            |
|                                                                                                                                                 | Stencil - 90 - 8.0 x 12.0                                   |                                | N/R                  | N/R               | 104553-0034                |
| LPDDR2                                                                                                                                          |                                                             |                                |                      |                   |                            |
| <br>many other sizes available - contact Ironwood Electronics | 134 - 11.0 x 11.5 - 0.65 - Grypper                          | 0.40                           | 106918-0015          | 106918-0014       | 106918-0012                |
|                                                                                                                                                 | 134 - 11.0 x 11.5 - 0.65 - Grypper                          | 0.35                           | 104946-0015          | 104946-0014       | 104946-0010                |
|                                                                                                                                                 | Device Press - 11.0 x 11.5                                  |                                | 103864-0061          |                   |                            |
|                                                                                                                                                 | Stencil - 134 - 11.0 x 11.5                                 |                                | N/R                  | N/R               | 104553-0196                |
|                                                              | 162 - 11.5 x 13.0 - 0.5 - G40                               | 0.30                           | 107250-0023          | 108387-0080       | 107248-0023                |
|                                                                                                                                                 | Alignment Frame                                             |                                | 108639-0003          |                   |                            |
|                                                                                                                                                 | Device Press - 11.5 x 13.0                                  |                                | 103864-0128          |                   |                            |
|                                                                                                                                                 | Stencil - 134 - 11.5 x 13.0                                 |                                | N/R                  | N/R               | 104553-0206                |
|                                                              | 162 - 11.5 x 13.0 - 0.5 - G40 w/ built in Alignment Feature | 0.30                           | 109023-0002          | 109023-0001       | 109023-0003                |
|                                                                                                                                                 | Device Press - 11.5 x 13.0                                  |                                | 103864-0128          |                   |                            |
|                                                                                                                                                 | Stencil - 134 - 11.5 x 13.0                                 |                                | N/R                  | N/R               | 104553-0206                |



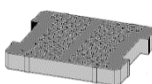
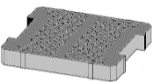
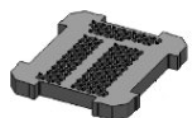
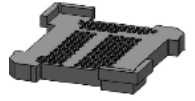
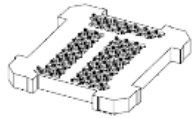
## GRYPHER STANDARD MEMORY SOCKETS – LPDDR

| LPDDR2 Sockets - continued                                                          | Ball Count - Socket Size - Pitch - Product -      | Device Ball Diameter +/-0.05mm | SAC 305 Solder Balls | SnPb Solder Balls  | No Solder Balls (standard) |
|-------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------|----------------------|--------------------|----------------------------|
|    | <b>162</b> - 8.0 x 10.5 - 0.5 - G40               | 0.30                           | <b>109054-0002</b>   | <b>109054-0001</b> | <b>109054-0003</b>         |
|                                                                                     | Alignment Frame                                   |                                | 108639-0065          |                    |                            |
|                                                                                     | Device Press - 5.5 x 10.5                         |                                | 103864-0031          |                    |                            |
|                                                                                     | Stencil - 162 - 5.5 x 10.5                        |                                | N/R                  | N/R                | 104553-0404                |
|    | <b>162</b> - 5.5 x 10.5 - 0.5 - G40               | 0.30                           | <b>107250-0071</b>   | <b>108387-0024</b> | <b>107250-0024</b>         |
|                                                                                     | Alignment Frame                                   |                                | 108639-0013          |                    |                            |
|                                                                                     | Device Press - 5.5 x 10.5                         |                                | 103864-0170          |                    |                            |
|                                                                                     | Stencil - 162 - 5.5 x 10.5                        |                                | N/R                  | N/R                | 104553-0210                |
|    | <b>216</b> - 12.0 x 12.0 - 0.4 (PoP relief) - G40 | 0.25                           | <b>107140-0059</b>   | <b>108388-0004</b> | <b>107022-0043</b>         |
|                                                                                     | <b>216</b> - 12.0 x 12.0 - 0.4 - G40              | 0.25                           | <b>107140-0018</b>   | <b>108388-0018</b> | <b>107620-0004</b>         |
|                                                                                     | Alignment Frame                                   |                                | 108639-0006          |                    |                            |
|                                                                                     | Device Press - 12.0 x 12.0                        |                                | 103864-0002          |                    |                            |
|                                                                                     | Stencil - 216 - 12.0 x 12.0                       |                                | N/R                  | N/R                | 104553-0186                |
|  | <b>240</b> - 14.0 x 14.0 - 0.5 (PoP relief) - G40 | 0.30                           | <b>107250-0013</b>   | <b>108387-0071</b> | <b>107022-0041</b>         |
|                                                                                     | Alignment Frame                                   |                                | 108639-0002          |                    |                            |
|                                                                                     | Device Press - 14.0 x 14.0                        |                                | 103864-0004          |                    |                            |
|                                                                                     | Stencil - 240 - 14.0 x 14.0                       |                                | N/R                  | N/R                | 107030-0041                |

## GRYPPER STANDARD MEMORY SOCKETS – LPDDR

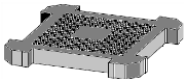
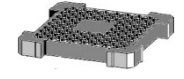
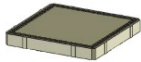
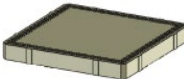
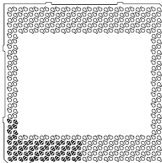
| LPDDR2-3                                                                            |                                                   |      |                    |                    |                    |
|-------------------------------------------------------------------------------------|---------------------------------------------------|------|--------------------|--------------------|--------------------|
|    | <b>168</b> - 12.0 x 12.0 - 0.5                    | 0.30 | <b>107250-0001</b> | <b>108387-0072</b> | <b>107248-0001</b> |
|                                                                                     | <b>168</b> - 12.0 x 12.0 - 0.5 (PoP relief) - G40 | 0.30 | <b>107250-0066</b> | <b>108387-0073</b> | <b>107022-0042</b> |
|                                                                                     | Alignment Frame                                   |      | 108639-0006        |                    |                    |
|                                                                                     | Device Press - 12.0 x 12.0                        |      | 103864-0002        |                    |                    |
|                                                                                     | Stencil - 168 - 12.0 x 12.0                       |      | N/R                | N/R                | 107030-0042        |
|    | <b>216</b> - 15.0 x 15.0 - 0.5 (PoP relief) - G40 | 0.30 | <b>107250-0067</b> | <b>108387-0065</b> | <b>107610-0007</b> |
|                                                                                     | <b>216</b> - 15.0 x 15.0 - 0.5 (PoP relief) - G40 | 0.35 | <b>107268-0010</b> | <b>108387-0074</b> | <b>107269-0010</b> |
|                                                                                     | Alignment Frame                                   |      | 108639-0005        |                    |                    |
|                                                                                     | Device Press - 15.0 x 15.0                        |      | 103864-0005        |                    |                    |
|                                                                                     | Stencil - 216 - 15.0 x 15.0                       |      | N/R                | N/R                | 104553-0245        |
| LPDDR3                                                                              |                                                   |      |                    |                    |                    |
|    | <b>178</b> - 11.0 x 11.5 - 0.65 x 0.8 - Grypper   | 0.30 | <b>104802-0008</b> | <b>104802-0009</b> | <b>104802-0006</b> |
|                                                                                     | Device Press - 11.0 x 11.5                        |      | 103864-0061        |                    |                    |
|                                                                                     | Stencil - 178 - 11.0 x 11.5                       |      | N/R                | N/R                | 104553-0262        |
|                                                                                     | <b>178</b> - 11.5 x 13.0 - 0.65 x 0.8 - Grypper   | 0.40 | <b>107022-0050</b> | <b>107022-0049</b> | <b>107022-0047</b> |
|                                                                                     | Device Press - 11.5 x 13.0                        |      | 103864-0128        |                    |                    |
|                                                                                     | Stencil - 178 - 11.5 x 13.0                       |      | N/R                | N/R                | 104553-0244        |
|  | <b>178</b> - 11.0 x 11.5 - 0.65 x 0.8 - G40       | 0.25 | <b>107140-0035</b> |                    | <b>107140-0037</b> |
|                                                                                     | Alignment Frame                                   |      | 106083-0058        |                    |                    |
|                                                                                     | Device Press - 11.0 x 11.5                        |      | 103864-0061        |                    |                    |
|                                                                                     | Stencil - 178 - 11.0 x 11.5                       |      | N/R                | N/R                | 104553-0260        |
|                                                                                     | <b>178</b> - 11.5 x 13.0 - 0.65 x 0.8 - G40       | 0.30 | <b>107250-0039</b> | <b>108387-0075</b> | <b>107248-0039</b> |
|                                                                                     | Alignment Frame                                   |      | 108639-0003        |                    |                    |
|                                                                                     | Device Press - 11.5 x 13.0                        |      | 103864-0128        |                    |                    |
|                                                                                     | Stencil - 178 - 11.5 x 13.0                       |      | N/R                | N/R                | 104553-0244        |

## GRYPPER STANDARD MEMORY SOCKETS – LPDDR

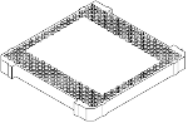
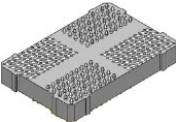
|                                                                                                                                           | Ball Count - Socket Size - Pitch - Product - Contact Type (G40, G80 or Standard Grypper) | Device Ball Diameter +/- 0.05mm | SAC 305 Solder Balls | SnPb Solder Balls  | No Solder Balls (standard) |
|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------|----------------------|--------------------|----------------------------|
|                                                          | <b>178 - 11.0 x 11.5 - 0.65 x 0.8 - G40</b>                                              | 0.30                            | <b>109025-0002</b>   | <b>109025-0001</b> | <b>109025-0003</b>         |
|                                                                                                                                           | Alignment Frame                                                                          |                                 | 108639-0045          |                    |                            |
|                                                                                                                                           | Device Press - 11.0 x 11.5                                                               |                                 | 103864-0061          |                    |                            |
|                                                                                                                                           | Stencil - 178 - 11.0 x 11.5                                                              |                                 | N/R                  | N/R                | 104553-0369                |
| <br>Grypper design that allows use of an alignment frame | <b>178 - 11.0 x 11.5 - 0.65 x 0.8 - Grypper</b>                                          | 0.30                            | <b>111006-0002</b>   | <b>111006-0001</b> | <b>111006-0003</b>         |
|                                                                                                                                           | Alignment Frame                                                                          |                                 | 108639-0052          |                    |                            |
|                                                                                                                                           | Device Press - 11.0 x 11.5                                                               |                                 |                      | 103864-0061        |                            |
|                                                                                                                                           | Stencil - 178 - 11.0 x 11.5                                                              |                                 | N/R                  | N/R                | 104553-0262                |
|                                                         | <b>221 - 11.5 x 13.0 - 0.5 - G40</b>                                                     | 0.30                            | <b>107250-0064</b>   | <b>108387-0076</b> | <b>107248-0061</b>         |
|                                                                                                                                           | Alignment Frame                                                                          |                                 | 108639-0007          |                    |                            |
|                                                                                                                                           | Device Press - 11.5 x 13.0                                                               |                                 | 103864-0128          |                    |                            |
|                                                                                                                                           | Stencil - 221 - 11.5 x 13.0                                                              |                                 | N/R                  | N/R                | 104553-0297                |
|                                                        | <b>221 - 11.5 x 13.0 - 0.5 - G40 w/built in Alignment Feature</b>                        | 0.30                            | <b>107250-0063</b>   | <b>108387-0077</b> | <b>108519-0063</b>         |
|                                                                                                                                           | Device Press - 11.5 x 13.0                                                               |                                 | 103864-0128          |                    |                            |
|                                                                                                                                           | Stencil - 221 - 11.5 x 13.0                                                              |                                 | N/R                  | N/R                | 104553-0297                |
|                                                                                                                                           |                                                                                          |                                 |                      |                    |                            |
|                                                        | <b>221 - 10.0 x 12.0 - 0.5 - G40</b>                                                     | 0.30                            | <b>109001-0002</b>   | <b>109001-0001</b> | <b>109001-0003</b>         |
|                                                                                                                                           | Alignment Frame                                                                          |                                 | 108639-0014          |                    |                            |
|                                                                                                                                           | Device Press - 10.0 x 11.0                                                               |                                 | 103864-0054          |                    |                            |
|                                                                                                                                           | Stencil - 221 - 11.0 x 11.5                                                              |                                 | N/R                  | N/R                | 104553-0338                |



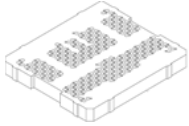
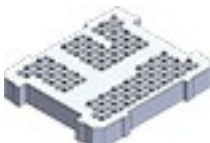
## GRYPHER STANDARD MEMORY SOCKETS – LPDDR

|                                                                                     | Ball Count - Socket Size - Pitch - Product - Contact Type (G40, G80 or Standard Grypper) | Device Ball Diameter +/- 0.05mm | SAC 305 Solder Balls | SnPb Solder Balls  | No Solder Balls (standard) |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------|----------------------|--------------------|----------------------------|
|    | <b>253</b> - 12.5 x 12.5-0.5 - G40                                                       | 0.30                            | <b>107250-0068</b>   | <b>108387-0078</b> | <b>107610-0010</b>         |
|                                                                                     | Alignment Frame                                                                          |                                 | 108639-0012          |                    |                            |
|                                                                                     | <b>253</b> - 12.5 x 12.5-0.5 - G40 w/built in Alignment Feature                          | 0.30                            | <b>107250-0069</b>   | <b>108387-0079</b> | <b>107610-0009</b>         |
|                                                                                     | Device Press - 12.5 x 12.5                                                               |                                 | 103864-0144          |                    |                            |
|                                                                                     | Stencil - 253 - 12.5 x 12.5                                                              |                                 | N/R                  | N/R                | 104553-0243                |
|    | <b>253</b> - 10.5 x 10.5-0.5 - G40                                                       | 0.30                            | <b>107250-0070</b>   | <b>108387-0081</b> | <b>107610-0011</b>         |
|                                                                                     | Alignment Frame                                                                          |                                 | 108639-0011          |                    |                            |
|                                                                                     | Device Press - 10.5 x 10.5                                                               |                                 |                      | 103864-0073        |                            |
|                                                                                     | Stencil - 253 - 10.5 x 10.5                                                              |                                 | N/R                  | N/R                | 104553-0313                |
|    | <b>256</b> - 14.0 x 14.0 - 0.4 (PoP design w/relief) - G40                               | 0.25                            | <b>107140-0060</b>   | <b>108388-0005</b> | <b>107620-0008</b>         |
|                                                                                     | <b>256</b> - 14.0 x 14.0 - 0.4                                                           | 0.25                            | <b>107140-0061</b>   | <b>108388-0006</b> | <b>107620-0012</b>         |
|                                                                                     | Alignment Frame                                                                          |                                 | 108639-0002          |                    |                            |
|                                                                                     | Device Press - 14.0 x 14.0                                                               |                                 | 103864-0004          |                    |                            |
|                                                                                     | Stencil - 256 - 14.0 x 14.0                                                              |                                 | N/R                  | N/R                | 107030-0047                |
| <b>LPDDR4</b>                                                                       |                                                                                          |                                 |                      |                    |                            |
|  | <b>272</b> - 15.0 x 15.0 - 0.4 - G40                                                     | 0.25                            | <b>109000-0002</b>   | <b>109000-0001</b> | <b>109000-0003</b>         |
|                                                                                     | Alignment Frame                                                                          |                                 | 108639-0005          |                    |                            |
|                                                                                     | Device Press - 15.0 x 15.0                                                               |                                 | 103864-0005          |                    |                            |
|                                                                                     | Stencil - 272 - 15.0 x 15.0                                                              |                                 | N/R                  | N/R                | 104553-0336                |
|  | <b>366</b> - 15.0 x 15.0 - 0.5 - G40                                                     | 0.30                            | <b>109002-0002</b>   | <b>109002-0001</b> | <b>109002-0003</b>         |
|                                                                                     | Alignment Frame                                                                          |                                 | 108639-0005          |                    |                            |
|                                                                                     | Device Press - 15.0 x 15.0                                                               |                                 | 103864-0005          |                    |                            |
|                                                                                     | Stencil - 366 - 15.0 x 15.0                                                              |                                 | N/R                  | N/R                | 104553-0339                |

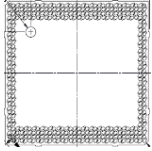
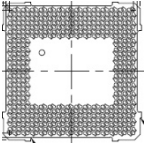
## GRYPPER STANDARD MEMORY SOCKETS – LPDDR

|                                                                                     | Ball Count - Socket Size - Pitch - Product - Contact Type (G40, G80 or Standard Grypper) | Device Ball Diameter +/-0.05mm | SAC 305 Solder Balls | SnPb Solder Balls  | No Solder Balls (standard) |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------|----------------------|--------------------|----------------------------|
|    | <b>366</b> - 12.0 x 12.7 - 0.4 - G40 (PoP)                                               | 0.25                           | <b>109077-0002</b>   | <b>109077-0001</b> | <b>109077-0003</b>         |
|                                                                                     | Alignment Frame                                                                          |                                | 108639-0079          |                    |                            |
|                                                                                     | Device Press - 12.0 x 12.0                                                               |                                | 103864-0002          |                    |                            |
|                                                                                     | Stencil - 366 - 12.0 x 12.7                                                              |                                | N/R                  | N/R                | 104553-0438                |
|  | <b>200</b> - 10.0 x 15.0 - 0.65 x 0.80 - Grypper                                         | 0.30                           | <b>GR1141-0002</b>   | <b>GR1141-0001</b> | <b>GR1141-0003</b>         |
|                                                                                     | Alignment Frame- 10.0 x 15.0                                                             |                                | 108639-0048          |                    |                            |
|                                                                                     | Alignment Frame- 10.0 x 14.5                                                             |                                | 108639-0089          |                    |                            |
|                                                                                     | Device Press - 10.0 x 14.4                                                               |                                | 103864-0059          |                    |                            |
|                                                                                     | Stencil - 200 - 10.0 x 15.0                                                              |                                | N/R                  | N/R                | 104553-0380                |
|                                                                                     | <b>200</b> - 10.0 x 15.0 - 0.65 x 0.80 - Grypper                                         | 0.35                           | <b>111004-0002</b>   | <b>111004-0001</b> | <b>111004-0003</b>         |
|                                                                                     | Alignment Frame- 10.0 x 15.0                                                             |                                | 108639-0048          |                    |                            |
|                                                                                     | Alignment Frame- 10.0 x 14.5                                                             |                                | 108639-0089          |                    |                            |
|                                                                                     | Device Press - 10.0 x 14.4                                                               |                                | 103864-0059          |                    |                            |
|                                                                                     | Stencil - 200 - 10.0 x 15.0                                                              |                                | N/R                  | N/R                | 104553-0380                |
|                                                                                     | <b>200</b> - 10.0 x 15.0 - 0.65 x 0.80 - Grypper                                         | 0.40                           | <b>111020-0002</b>   | <b>111020-0001</b> | <b>111020-0003</b>         |
|                                                                                     | Alignment Frame- 10.0 x 15.0                                                             |                                | 108639-0048          |                    |                            |
|                                                                                     | Alignment Frame- 10.0 x 14.5                                                             |                                | 108639-0089          |                    |                            |
|                                                                                     | Device Press - 10.0 x 14.4                                                               |                                | 103864-0059          |                    |                            |
|                                                                                     | Stencil - 200 - 10.0 x 15.0                                                              |                                | NR                   | N/R                | 104553-0380                |
|                                                                                     | <b>200</b> - 10.0 x 15.0 - 0.65 x 0.80 - Grypper                                         | 0.45                           | <b>GR1002-0002</b>   | <b>GR1002-0001</b> | <b>GR1002-0003</b>         |
|                                                                                     | Alignment Frame- 10.0 x 15.0                                                             |                                | 108639-0048          |                    |                            |
|                                                                                     | Alignment Frame- 10.0 x 14.5                                                             |                                | 108639-0089          |                    |                            |
|                                                                                     | Device Press - 10.0 x 14.4                                                               |                                | 103864-0059          |                    |                            |
|                                                                                     | Stencil - 200 - 10.0 x 15.0                                                              |                                | NR                   | N/R                | 104553-0546                |

## GRYPPER STANDARD MEMORY SOCKETS – LPDDR

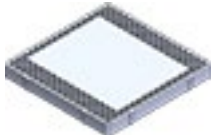
|                                                                                    | Ball Count - Socket Size - Pitch -<br>Product - Contact Type (G40, G80 or<br>Standard Grypper) | Device Ball<br>Diameter<br>+/-0.05mm | SAC 305<br>Solder Balls | SnPb<br>Solder Balls | No Solder<br>Balls<br>(standard) |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------|----------------------|----------------------------------|
|   | <b>432</b> -15.0 x 15.0 – 0.5 - G40                                                            | 0.30                                 | <b>109072-0002</b>      | <b>109072-0001</b>   | <b>109072-0003</b>               |
|                                                                                    | Alignment Frame                                                                                |                                      | 108639-0005             |                      |                                  |
|                                                                                    | Device Press - 15.0 x 15.0                                                                     |                                      | 103864-0005             |                      |                                  |
|                                                                                    | Stencil - 432 - 15.0 x 15.0                                                                    |                                      |                         |                      | 104553-0435                      |
|   | <b>254</b> – 11.5 x 13.0 - 0.5 – G40                                                           | 0.30                                 | <b>109081-0002</b>      | <b>109081-0001</b>   | <b>109081-0003</b>               |
|                                                                                    | Alignment Frame                                                                                |                                      | 108639-0003             |                      |                                  |
|                                                                                    | Device Press – 11.5 x 13.0                                                                     |                                      | 103864-0128             |                      |                                  |
|                                                                                    | Stencil - 254 - 11.5 x 13.0                                                                    |                                      | N/R                     | N/R                  | 104553-0424                      |
|                                                                                    | <b>254</b> - 11.5 x 13.0 - 0.5 – G40                                                           | 0.35                                 | <b>109064-0002</b>      | <b>109064-0001</b>   | <b>109064-0003</b>               |
|                                                                                    | Alignment Frame                                                                                |                                      | 108639-0003             |                      |                                  |
|                                                                                    | Device Press - 11.5 x 13.0                                                                     |                                      | 103864-0128             |                      |                                  |
|                                                                                    | Stencil - 254 - 11.5 x 13.0                                                                    |                                      | NR                      | N/R                  | 104553-0424                      |
|  | <b>149</b> - 8.0 x 9.5 -0.50 - G40                                                             | 0.30                                 | <b>109124-0002</b>      | <b>109124-0001</b>   | <b>109124-0003</b>               |
|                                                                                    | Alignment Frame                                                                                |                                      | 108369-0127             |                      |                                  |
|                                                                                    | Device Press – 8.0 x 9.0                                                                       |                                      | 103864-0074             |                      |                                  |
|                                                                                    | Stencil - 149 – 8.0 x 9.5                                                                      |                                      | NR                      | N/R                  | 104553-0522                      |

## GRYPPE STANDARD MEMORY SOCKETS – LPDDR

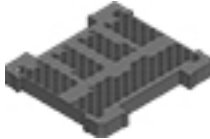
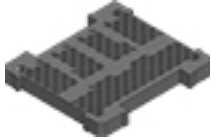
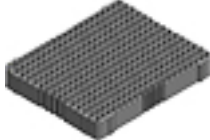
| LPDDR4X                                                                           |                                              |      |                    |                    |                    |
|-----------------------------------------------------------------------------------|----------------------------------------------|------|--------------------|--------------------|--------------------|
|  | <b>376– 14.0 x 14.0 - 0.4 – G40 (PoP)</b>    | 0.25 | <b>109071-0002</b> | <b>109071-0001</b> | <b>109071-0003</b> |
|                                                                                   | Alignment Frame                              |      | 108639-0075        |                    |                    |
|                                                                                   | Device Press – 14.0 x 14.0                   |      | 103864-0004        |                    |                    |
|                                                                                   | Stencil - 376 – 14.0 x 14.0                  |      | NR                 | N/R                | 104553-0432        |
|  | <b>556– 12.4 x 12.4 - 0.4 – G40 (PoP)</b>    | 0.25 | <b>109093-0002</b> | <b>109093-0001</b> | <b>109093-0003</b> |
|                                                                                   | Alignment Frame                              |      | 108639-0093        |                    |                    |
|                                                                                   | Device Press – 12.0 x 12.0                   |      | 103864-0002        |                    |                    |
|                                                                                   | Stencil - 556 – 12.4 x 12.4                  |      | NR                 | N/R                | 104553-0470        |
|  | <b>556-12.4 x 12.4 -0.40 – G40 (PoP) LIF</b> | 0.25 | <b>109116-0002</b> | <b>109116-0001</b> | <b>109116-0003</b> |
|                                                                                   | Alignment Frame                              |      | 108639-0093        |                    |                    |
|                                                                                   | Device Press – 12.0 x 12.0                   |      | 103864-0002        |                    |                    |
|                                                                                   | Stencil - 556 – 12.4 x 12.4                  |      | NR                 | N/R                | 104553-0470        |

Reference LPDDR JEDEC Specifications; JEDEC 209 for LPDDR1, JEDEC 209-2F for LPDDR2, JEDEC 209-3B for LPDDR3 and JEDEC 209-4A for LPDDR4, which list standard device pin configurations.

## GRYPPE STANDARD MEMORY SOCKETS – LPDDR

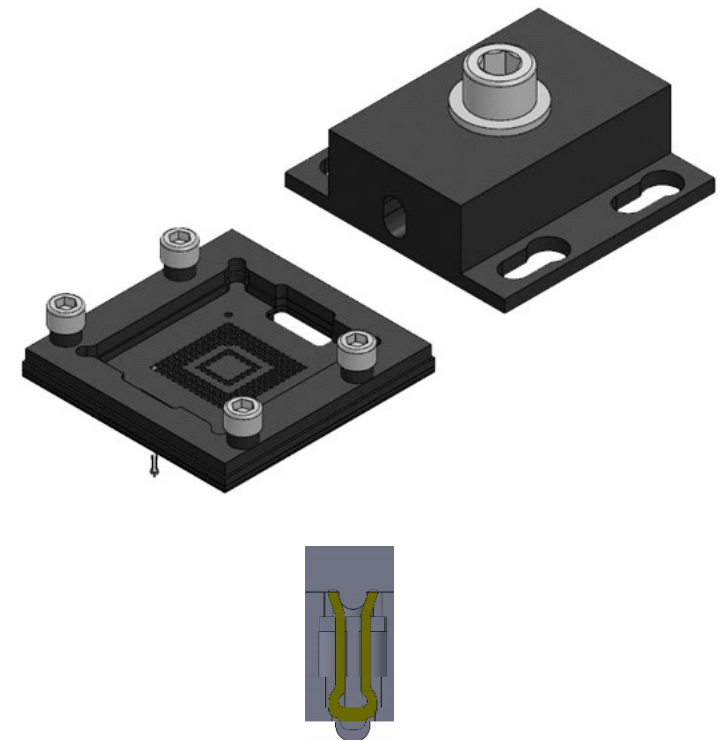
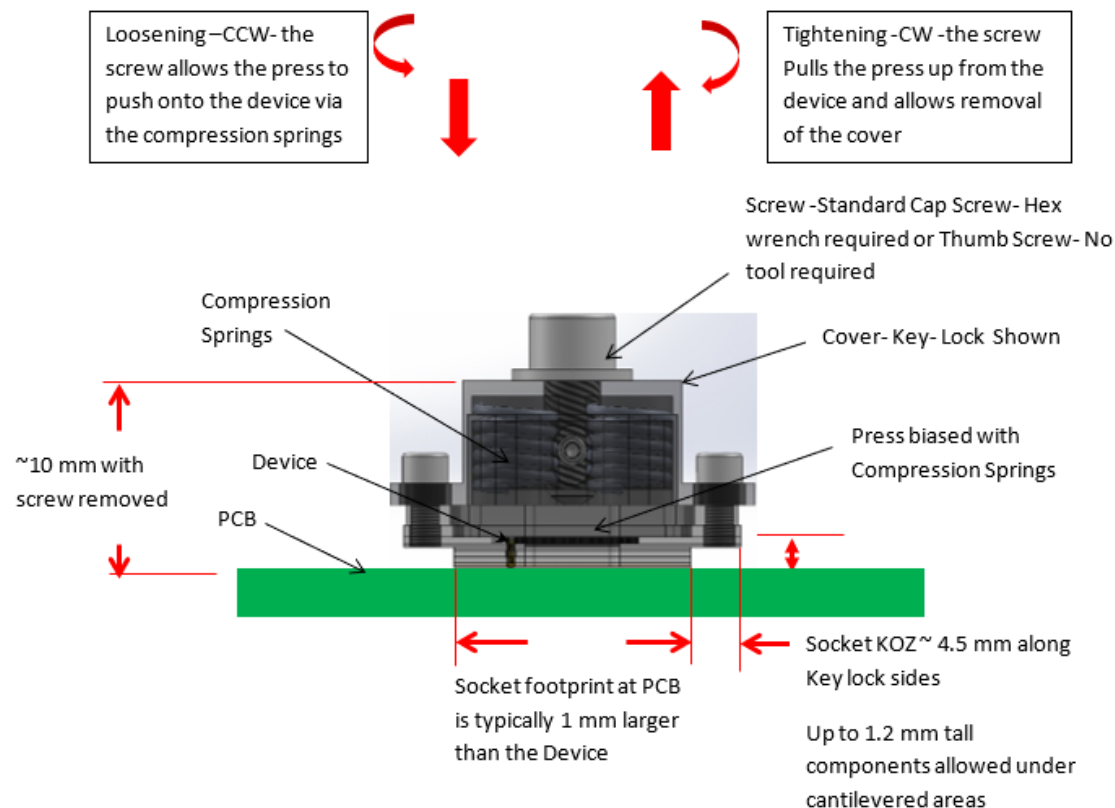
|                                                                                     | Ball Count - Socket Size - Pitch - Product - Contact Type (G40, G80 or Standard Grypper) | Device Ball Diameter +/-0.05mm | SAC 305 Solder Balls | SnPb Solder Balls  | No Solder Balls (standard) |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------|----------------------|--------------------|----------------------------|
| <b>LPDDR5</b>                                                                       |                                                                                          |                                |                      |                    |                            |
|    | <b>496</b> -12.4 x 14.0 -0.40 – G40                                                      | 0.25                           | <b>109111-0002</b>   | <b>109111-0001</b> | <b>109111-0003</b>         |
|                                                                                     | Alignment Frame                                                                          |                                | 108639-0119          |                    |                            |
|                                                                                     | Device Press – 14.0 x 12.0                                                               |                                | 103864-0066          |                    |                            |
|                                                                                     | Stencil - 496 – 12.4 x 14.0                                                              |                                | NR                   | N/R                | 104553-0508                |
|    | <b>496</b> -12.4 x 14.0 -0.40 – G40 -PoP                                                 | 0.25                           | <b>GR1074-0002</b>   | <b>GR1074-0001</b> | <b>GR1074-0003</b>         |
|                                                                                     | Alignment Frame                                                                          |                                | 108639-0119          |                    |                            |
|                                                                                     | Device Press – 14.0 x 12.0                                                               |                                | 103864-0066          |                    |                            |
|                                                                                     | Stencil - 496 – 12.4 x 14.0                                                              |                                | NR                   | N/R                | 104553-0508                |
|    | <b>436</b> -14.0 x 14.0 -0.40 – G40                                                      | 0.25                           | <b>109133-0002</b>   | <b>109133-0001</b> | <b>109133-0003</b>         |
|                                                                                     | Alignment Frame                                                                          |                                | 108639-0138          |                    |                            |
|                                                                                     | Device Press – 14.0 x 14.0                                                               |                                | 103864-0004          |                    |                            |
|                                                                                     | Stencil - 436 – 14.0 x 14.0                                                              |                                | NR                   | N/R                | 104553-0535                |
|   | <b>441</b> -14.0 x 14.0 -0.65 – G40                                                      | 0.30                           | <b>109086-0002</b>   | <b>109086-0001</b> | <b>109086-0003</b>         |
|                                                                                     | Alignment Frame                                                                          |                                | 108639-0002          |                    |                            |
|                                                                                     | Device Press – 14.0 x 14.0                                                               |                                | 103864-0004          |                    |                            |
|                                                                                     | Stencil - 441 – 14.0 x 14.0                                                              |                                | NR                   | N/R                | 104553-0446                |
|  | <b>441</b> -14.0 x 14.0 -0.65 LIF – G40                                                  | 0.30                           | <b>109084-0002</b>   | <b>109084-0001</b> | <b>109084-0003</b>         |
|                                                                                     | Alignment Frame                                                                          |                                | 108639-0002          |                    |                            |
|                                                                                     | Device Press – 14.0 x 43.0                                                               |                                | 103864-0004          |                    |                            |
|                                                                                     | Stencil - 441 – 14.0 x 14.0                                                              |                                | N/R                  | N/R                | 104553-0446                |
|  | <b>441</b> -14.0 x 14.0 -0.65, G80LIF                                                    | 0.435                          | <b>GR1030-0002</b>   | <b>GR1030-0001</b> | <b>GR1030-0003</b>         |
|                                                                                     | Alignment Frame                                                                          |                                | 108639-0002          |                    |                            |
|                                                                                     | Device Press – 14.0 x 43.0                                                               |                                | 103864-0004          |                    |                            |
|                                                                                     | Stencil - 441 – 14.0 x 14.0                                                              |                                | N/R                  | N/R                | 104553-0558                |

## GRYPPE STANDARD MEMORY SOCKETS – LPDDR

|                                                                                   |                                                 |      |                    |                    |                    |
|-----------------------------------------------------------------------------------|-------------------------------------------------|------|--------------------|--------------------|--------------------|
|  | <b>297-11.5 x 13.0 -0.50 – G40</b>              | 0.30 | <b>GR1014-0002</b> | <b>GR1014-0001</b> | <b>GR1014-0003</b> |
|                                                                                   | Alignment Frame                                 |      | 108639-0003        |                    |                    |
|                                                                                   | Device Press – 11.5 x 13.0                      |      | 103864-0128        |                    |                    |
|                                                                                   | Stencil - 297 – 11.5 x 13.0                     |      | NR                 | N/R                | 104553-0549        |
|  | <b>297-11.5 x 13.0 -0.50 – 0.35 solder ball</b> | 0.35 | <b>GR1121-0002</b> | <b>GR1121-0001</b> | <b>GR1121-0003</b> |
|                                                                                   | Alignment Frame                                 |      | 108639-0003        |                    |                    |
|                                                                                   | Device Press – 11.5 x 13.0                      |      | 103864-0128        |                    |                    |
|                                                                                   | Stencil - 297 – 11.5 x 13.0                     |      | NR                 | N/R                | 104553-0549        |
|  | <b>315-12.4 x 15.0 -0.80 x 0.70 - Grypper</b>   | 0.45 | <b>GR1032-0002</b> | <b>GR1032-0001</b> | <b>GR1032-0003</b> |
|                                                                                   | Alignment Frame                                 |      | 108639-0154        |                    |                    |
|                                                                                   | Device Press – 10 x 15.0                        |      | 103864-0025        |                    |                    |
|                                                                                   | Stencil - 315 – 12.4 x 15.0                     |      | NR                 | N/R                | 104553-0554        |

# GRYPPER Y TEST SOCKETS

Near-Zero Footprint Grypper Y sockets work with BGA devices where the solder balls/bumps have either no equator or small exposure, where the standard Grypper cannot reliably hold onto the solder ball. The Y shape, working with the lid, allows reliable contact and ensures device retention in high vibration applications. Lower forces (< 25 grams) make insertion easier and less aggressive contacting allows 20-40 insertions of the same device. The Y contact covers BGA devices from 0.40 mm pitch and larger, while the short electrical length has superior electrical performance. Lids can also be configured to include heat sinking. The Grypper Y uses a Key Lock Lid that presses and holds the device into the socket. Other Lid Options are also available – bolt down clamshell, or No Lid option using the customer's press, which eliminates the cantilevered areas.

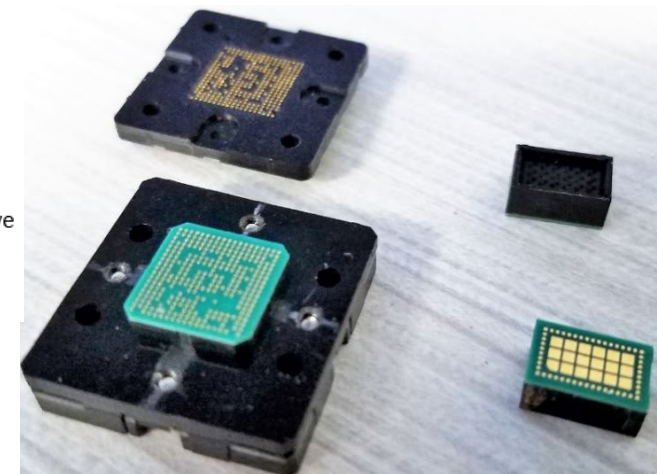
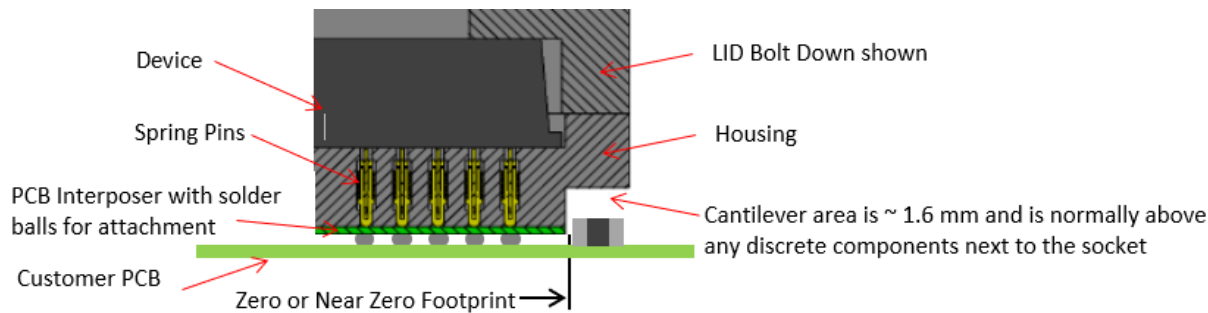




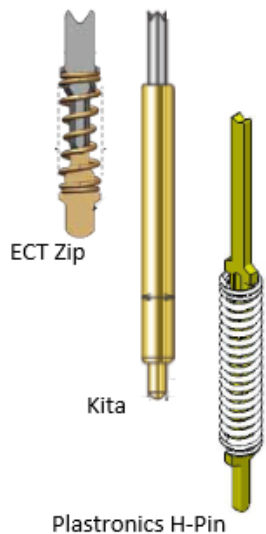
# GRYPPER SMT SPRING PIN TEST SOCKETS

Near-Zero footprint SMT Spring Pin sockets utilize industry standard high-performance spring pins in a surface mount socket which is zero or near-zero footprint, i.e., where the socket is either the same size or just slightly larger than the device itself. Ironwood can design a socket to work with any type of IC packages – BGA, LGA, QFN, DFN -, even leaded devices where you need to fit a socket in place of your device to allow fast, easy testing and development. Depending on the electrical needs, we can design using various spring pins to match to your requirements

The SMT Spring Pin socket will typically use a Key Lock Lid to press and hold the device into the socket. Other lid options are also available, such as bolt down, clamshell, or a no-lid option when used with an external press to eliminate the cantilevered areas.



Key-Lock Lid



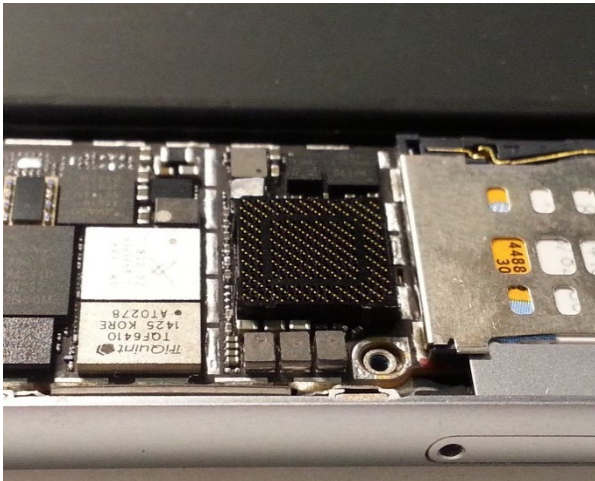
| Manufacture           | Relative Cost | Electrical BW* | Pin Length @ Test Height (mm) |
|-----------------------|---------------|----------------|-------------------------------|
| ECT – Z0 “Zip pin”    | \$\$\$\$      | 40 Ghz         | 1.5                           |
| ECT – Z “Zip Pin”     | \$\$\$        | 30 Ghz         | 2.7                           |
| Kita – Standard Pitch | \$\$          | 20 Ghz         | 2.7-2.8                       |
| Plastronics – “H-Pin” | \$            | 10 Ghz         | 2.5-3.0                       |
| Other                 | S-SSSS        |                |                               |

The above list shows spring pins we have designed into our sockets – any spring pin you are familiar with can also be designed into our compression mount socket. \*Electrical Bandwidth approx. for each type pin.

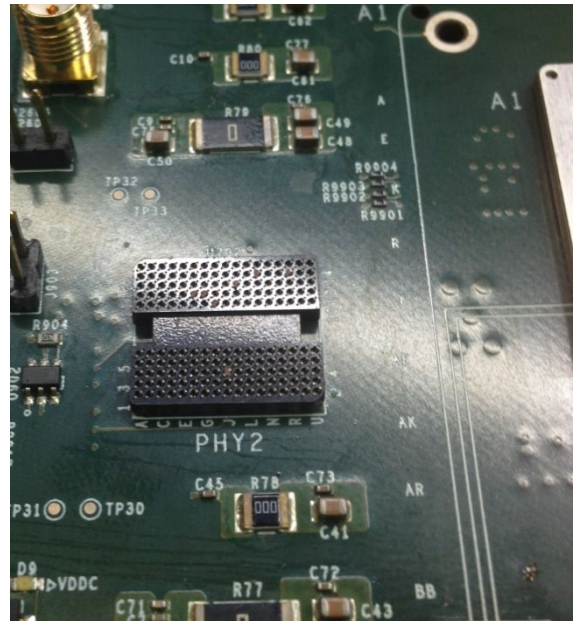
## Typical applications for Grypper and Grypper Y sockets



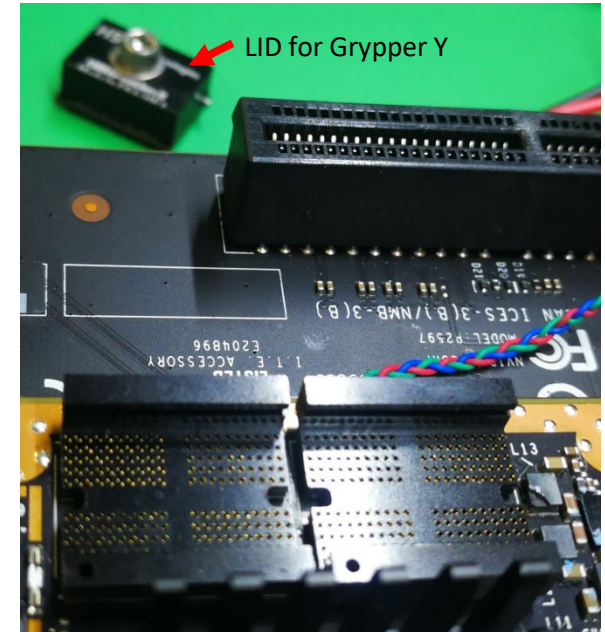
Above Snoop Board application - Grypper used as a Riser for the snoop board



Above Grypper installed into a phone – Grypper socket is the same size as the device so it fits into the exact space as the device



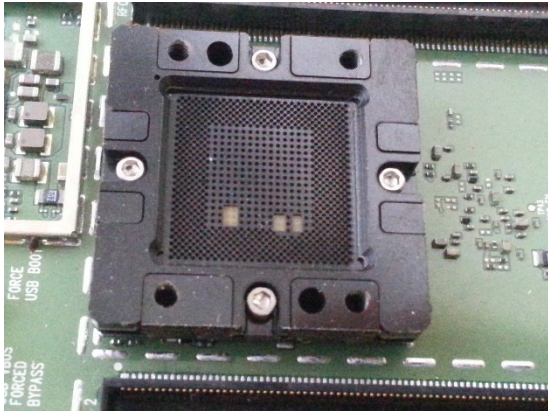
Above Grypper on a validation PCB for GDDR5 Device



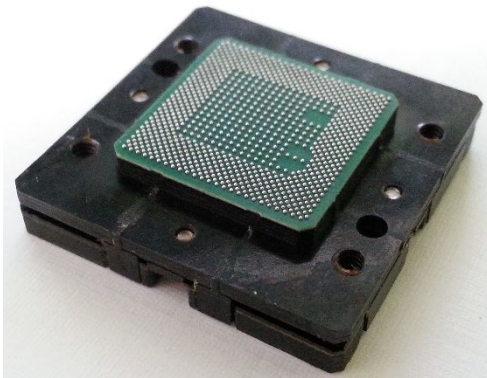
Above Grypper Y on a validation PCB for LPDDR4 – lower insertion and removal force required and 200+ insertions

# NEAR ZERO FOOTPRINT SMT

## NZF SMT Socket Applications



Above Near Zero Footprint Spring Pin Socket mounted to an evaluation board



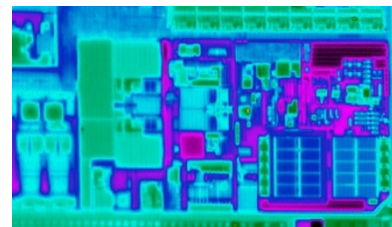
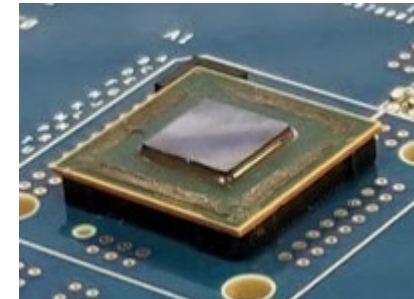
Bottom of the socket is solder balled allowing reflow attachment to the same space as the device. The outer perimeter is cantilevered over any close/ adjacent components next to the device

## SIL LENS Application

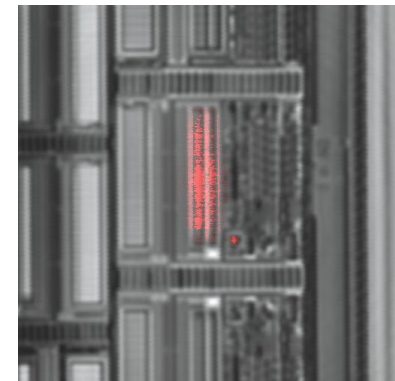
SIL Lens used with a Grypper Test socket allowing the top of the thinned device totally open - NO LID above the device / die allowing the SIL lens to scan across the entire die area



This application has a Grypper as the device carrier working with the lower Spring Pin socket



Thermal Image of Die

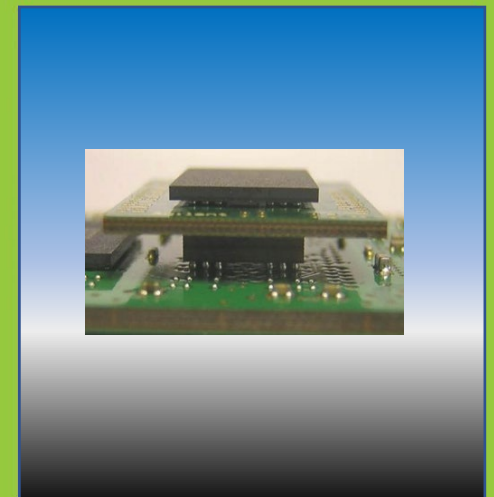
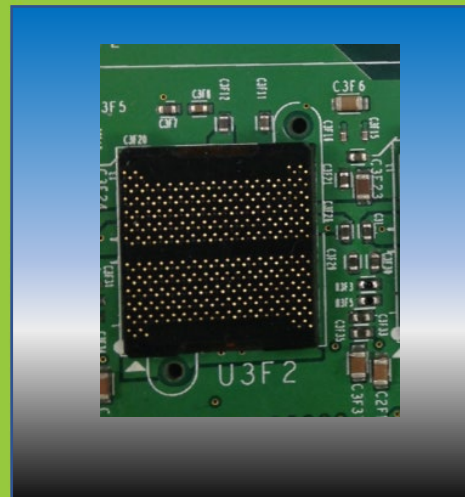
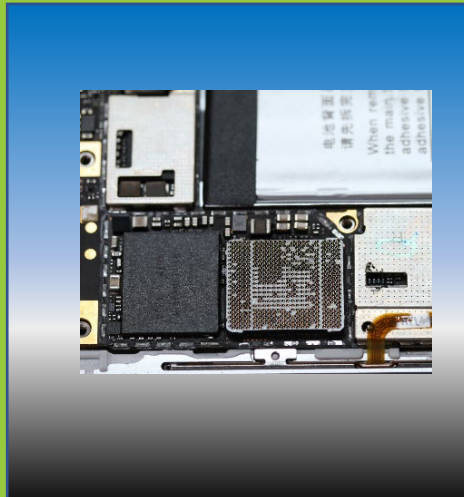
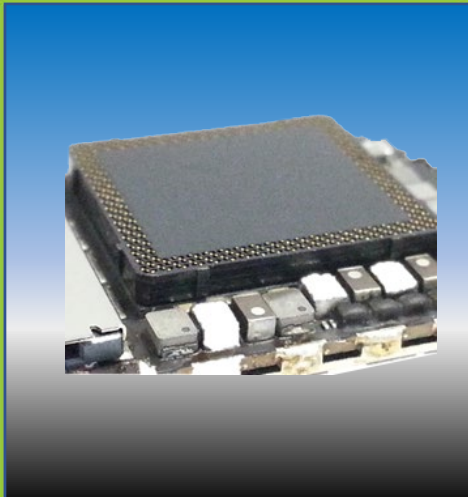


Area showing ESD



## ISO 9001 Certified Design Process

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