VISHAY

One of the World's Largest Manufacturers of Discrete Semiconductors and Passive Components

# Production Part Approval Process

**The following PPAP documentation is assembled according to the AIAG, 4th Edition PPAP Manual and applicable customer requirements**

## IHLP5050FDERxxxM5A

## Generic PPAP

Generic PPAP

5/23/2017

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Vishay / Dale Electronics
1505 East Hway 50 Yankton, SD 57078, USA Phone (605) 665-9301 Fax (605) 668-4247

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Use the control buttons below to navigate through the PPAP sections.

Section 1. Design Records

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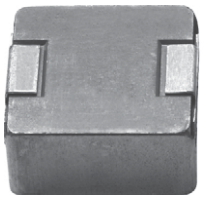
**ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DISCRETE SEMICONDUCTORS AND PASSIVE COMPONENTS**

# IHLP® Automotive Inductors, High Temperature (155 °C) Series




**DESIGN SUPPORT TOOLS** click logo to get started

3D Models Available

Design Tools Available

## FEATURES

- High temperature, up to 155 °C
- Shielded construction
- Excellent DC/DC energy storage up to 1 MHz to 2 MHz. Filter inductor applications up the SRF (see Standard Electrical Specifications table).
- Lowest DCR/µH, in this package size
- Handles high transient current spikes without saturation
- Ultra low buzz noise, due to composite construction
- AEC-Q200 qualified
- IHLP design. PATENT(S): www.vishay.com/patents
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

## APPLICATIONS

- Engine and transmission control units
- Diesel injection drivers
- DC/DC converters for entertainment / navigation systems
- Noise suppression for motors: windshield wipers / power seats / power mirrors / heating and ventilation blower / HID lighting
- LED drivers

## STANDARD ELECTRICAL SPECIFICATIONS

| $L_0$ INDUCTANCE ± 20 % AT 100 kHz, 0.25 V, 0 A (µH) | DCR TYP. 25 °C (mΩ) | DCR MAX. 25 °C (mΩ) | HEAT RATING CURRENT DC TYP. (A) (1) | SATURATION CURRENT DC TYP. (A) (2) | SRF TYP. (MHz) |
|---|---|---|---|---|---|
| 0.22 | 0.73 | 0.81 | 66 | 68 | 113 |
| 0.33 | 0.83 | 0.92 | 62 | 44 | 79.6 |
| 0.47 | 1.05 | 1.16 | 54 | 42 | 65.6 |
| 1.0 | 1.65 | 1.77 | 40 | 26 | 33.4 |
| 1.2 | 1.98 | 2.12 | 29 | 24.5 | 32.0 |
| 1.5 | 2.4 | 2.57 | 27.5 | 23.5 | 29.2 |
| 1.8 | 2.75 | 2.94 | 26 | 22.5 | 25.9 |
| 2.2 | 3.43 | 3.67 | 25.5 | 21.5 | 23.3 |
| 3.3 | 5.08 | 5.44 | 20.2 | 16.7 | 17.8 |
| 4.7 | 7.41 | 7.93 | 17.4 | 18.5 | 15.8 |
| 5.6 | 8.51 | 9.11 | 15.7 | 14.2 | 12.3 |
| 6.8 | 11.3 | 12.09 | 14.2 | 8.7 | 13.4 |
| 7.8 | 12.6 | 13.48 | 13.5 | 8.5 | 13.6 |
| 8.2 | 13.2 | 14.12 | 13.2 | 7.6 | 10.3 |
| 10 | 16.60 | 17.76 | 10.9 | 7.2 | 10.7 |
| 12 | 19.00 | 20.33 | 10.6 | 6.9 | 7.59 |
| 15 | 24.00 | 25.68 | 8.7 | 6.8 | 8.30 |
| 22 | 31.30 | 33.49 | 8.3 | 5.5 | 6.43 |

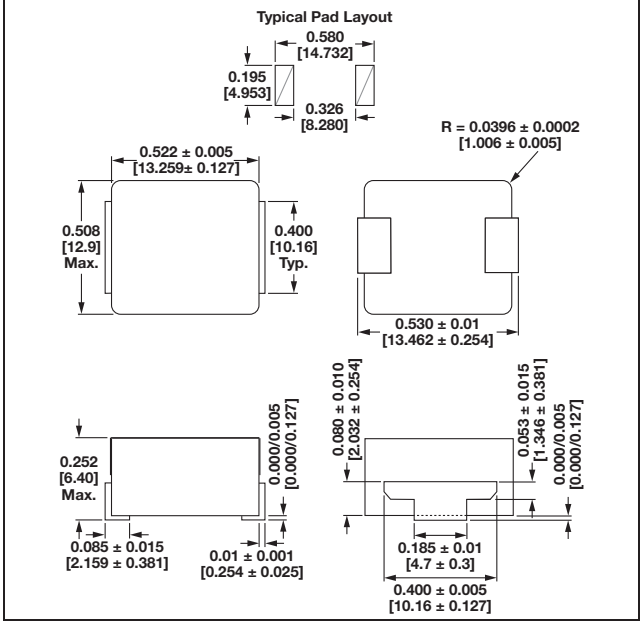
**Notes**

- All test data is referenced to 25 °C ambient
- Operating temperature range -55 °C to +155 °C
- The part temperature (ambient + temp. rise) should not exceed 155 °C under worst case operating conditions. Circuit design, component placement, PWB trace size and thickness, airflow and other cooling provisions all affect the part temperature. Part temperature should be verified in the end application
- Rated operating voltage (across inductor) = 75 V

(1) DC current (A) that will cause an approximate ΔT of 40 °C

(2) DC current (A) that will cause $L_0$ to drop approximately 20 %

## DIMENSIONS in inches [millimeters]




## DESCRIPTION

| IHLP-5050FD-5A | 4.7 µH | ± 20 % | ER | e3 |
|---|---|---|---|---|
| MODEL | INDUCTANCE VALUE | INDUCTANCE TOLERANCE | PACKAGE CODE | JEDEC® LEAD (Pb)-FREE STANDARD |

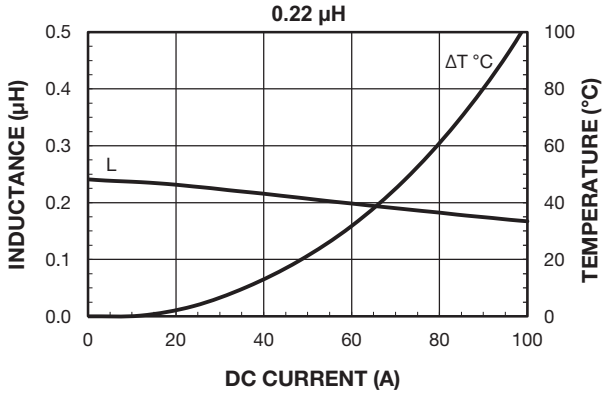
## GLOBAL PART NUMBER

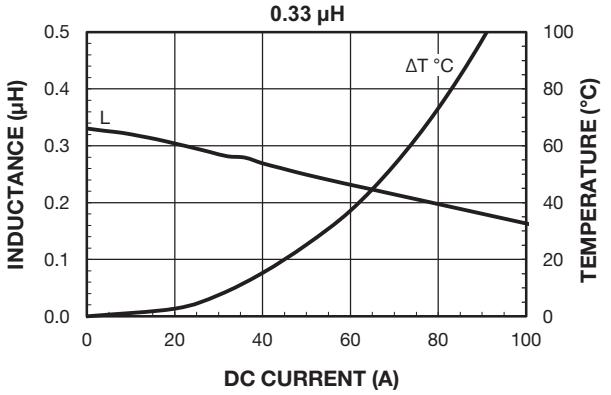
| I | H | L | P | 5 | 0 | 5 | 0 | F | D | E | R | 4 | R | 7 | M | 5 | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | | | | SIZE | | | | | | PACKAGE CODE | | INDUCTANCE VALUE | | | TOL. | SERIES | |

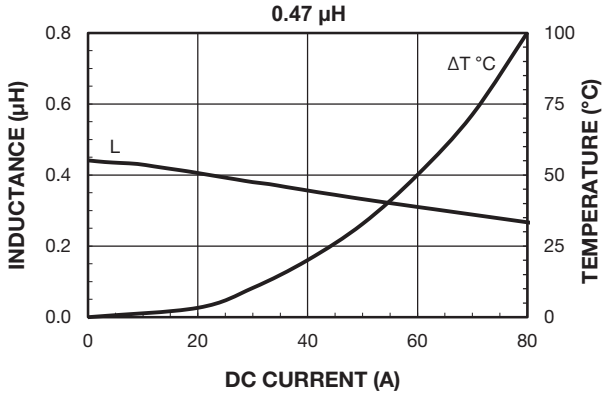
**PATENT(S): www.vishay.com/patents**

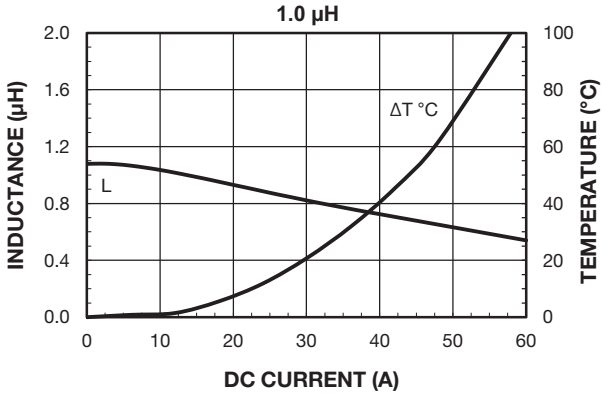
**This Vishay product is protected by one or more United States and international patents.**

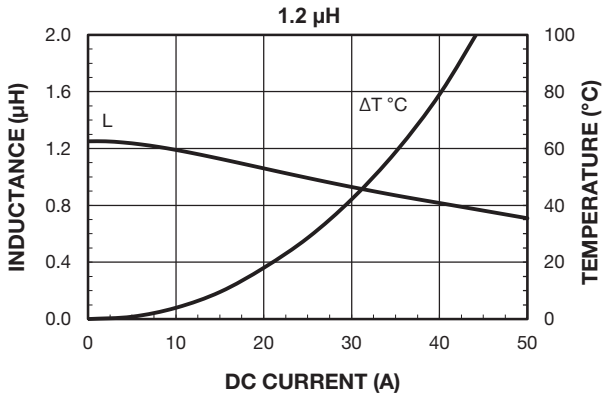
## PERFORMANCE GRAPHS

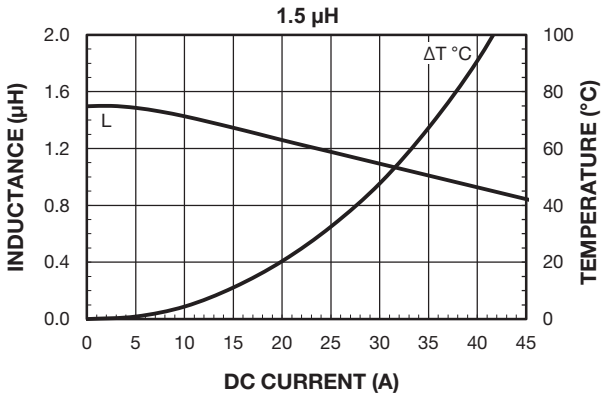


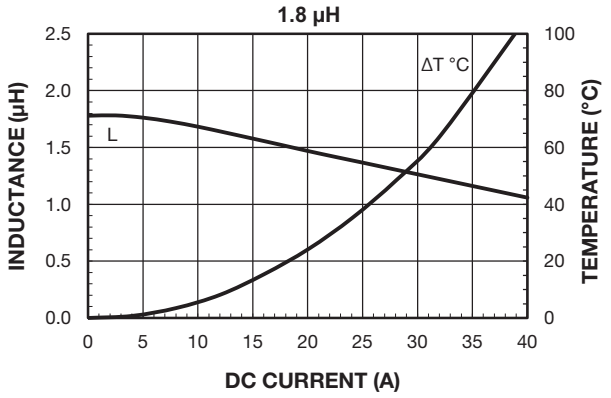



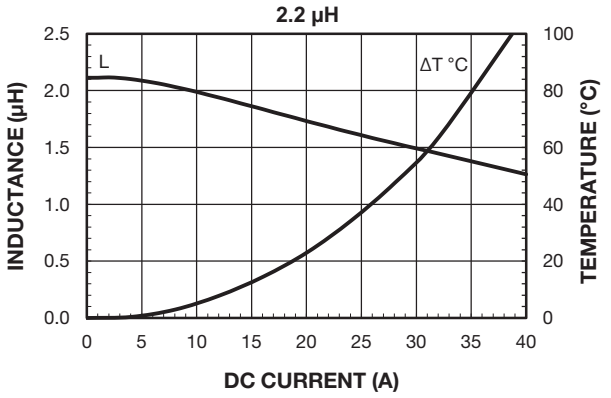



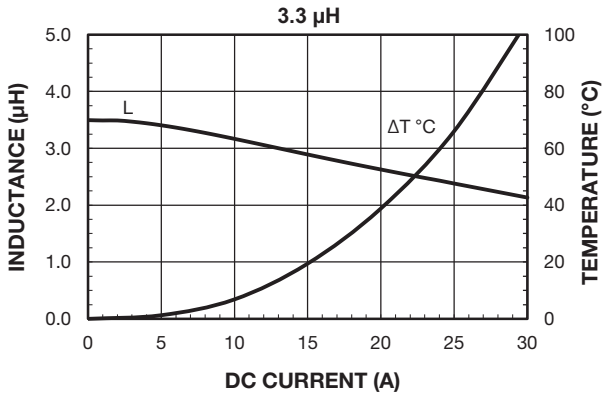



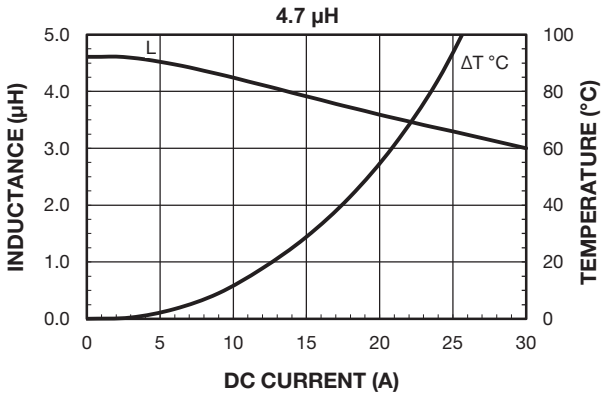



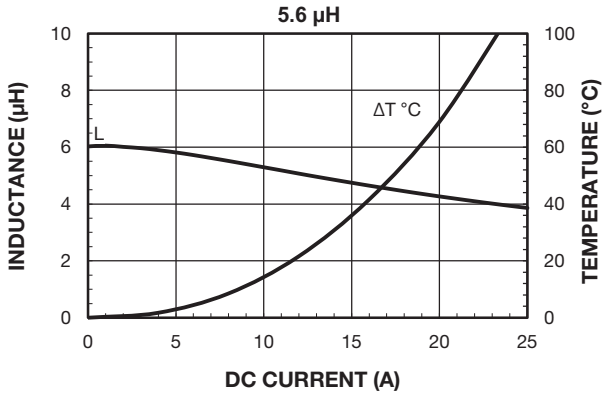
## PERFORMANCE GRAPHS

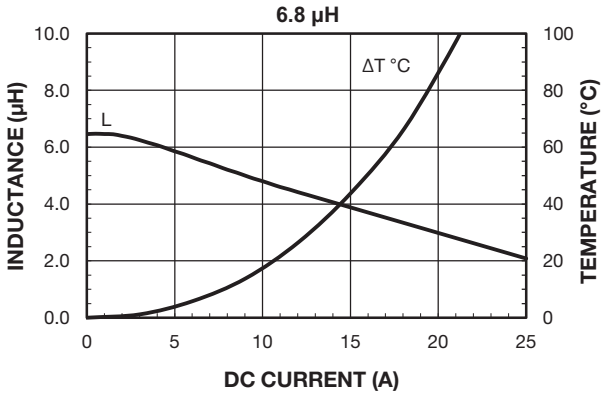


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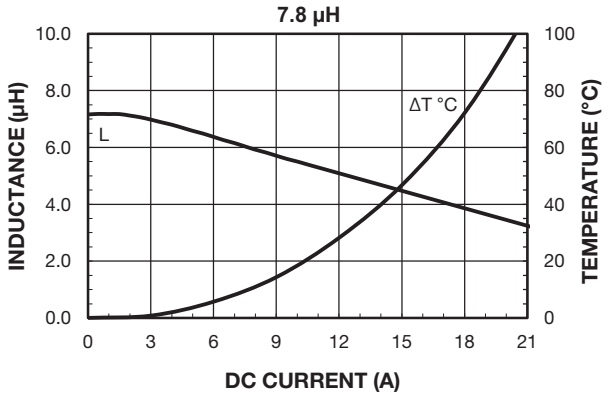
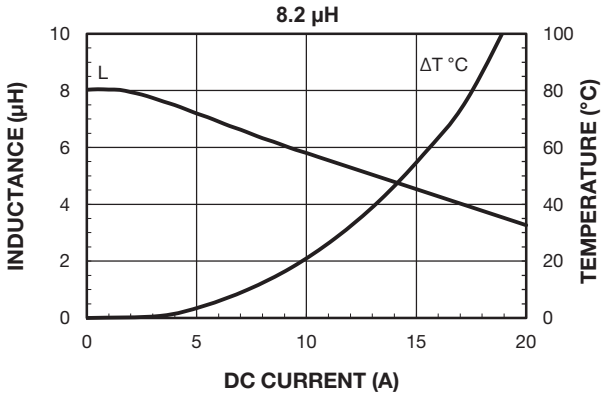
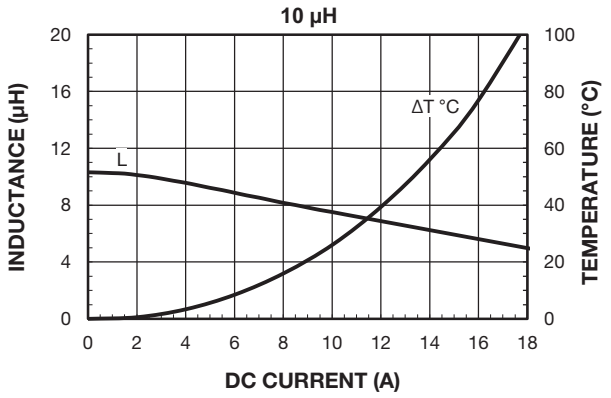
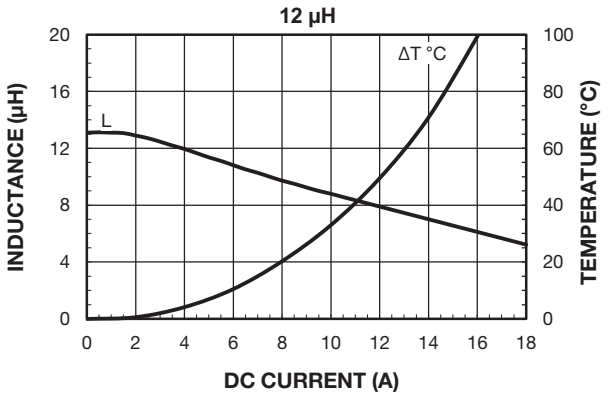
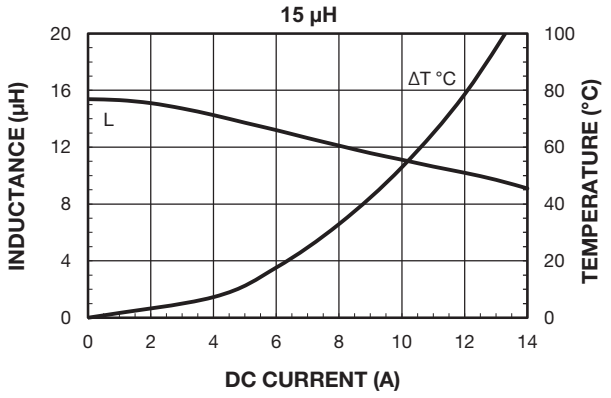
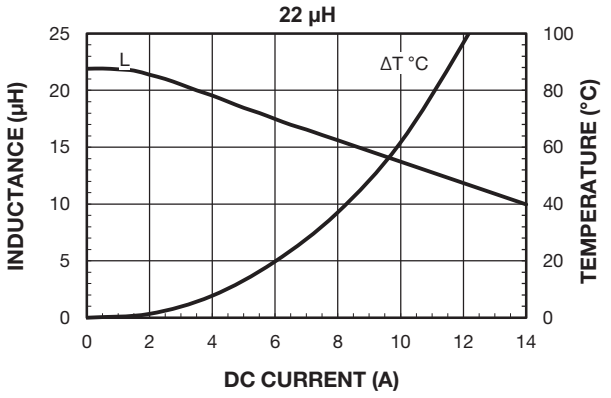


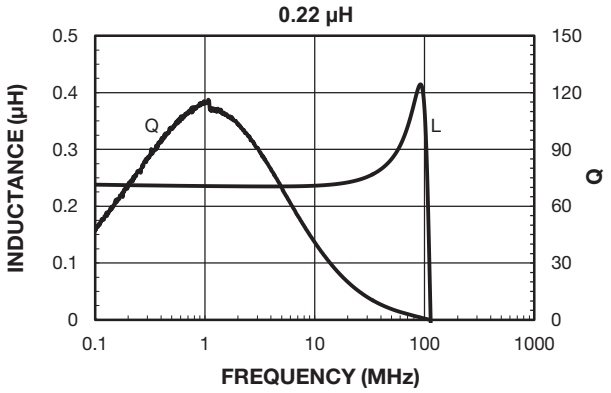



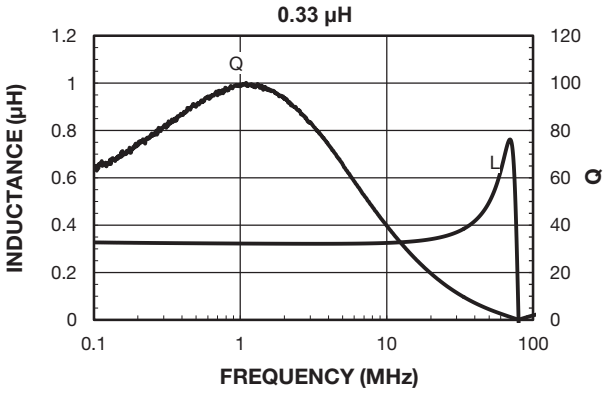



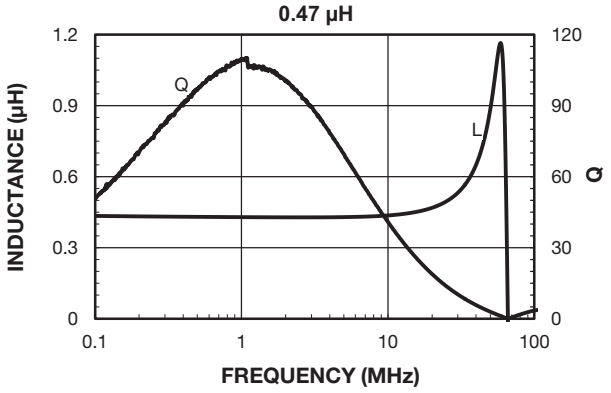



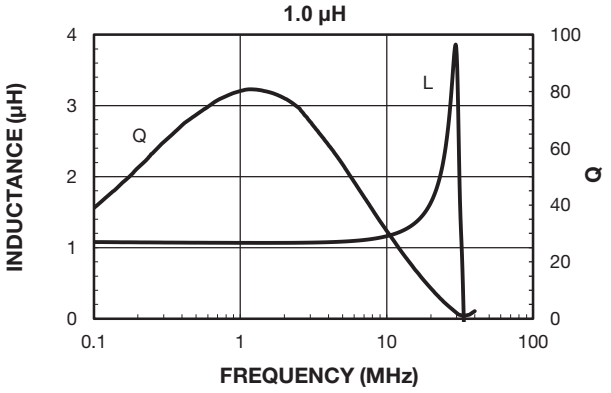



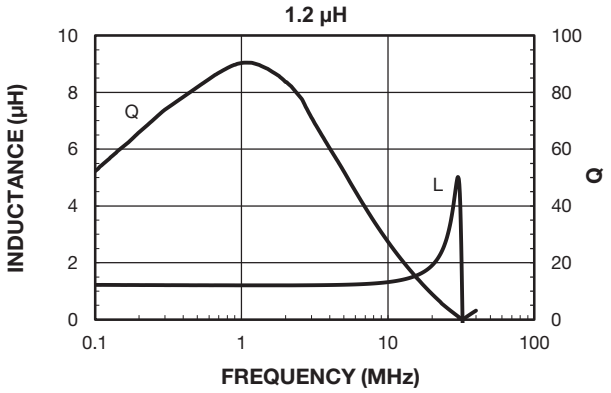
## PERFORMANCE GRAPHS: INDUCTANCE AND Q VS. FREQUENCY

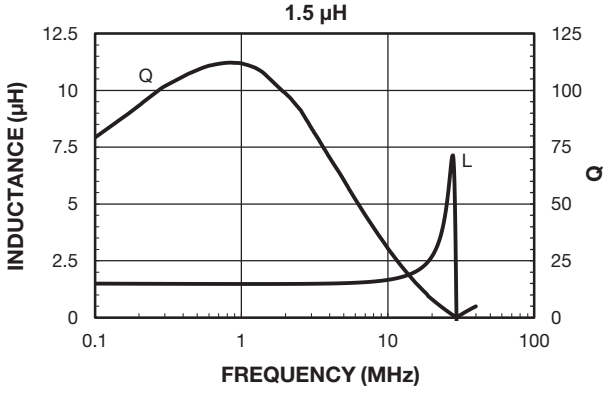


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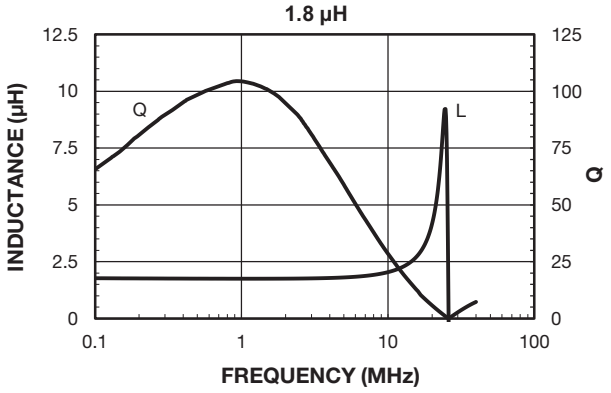


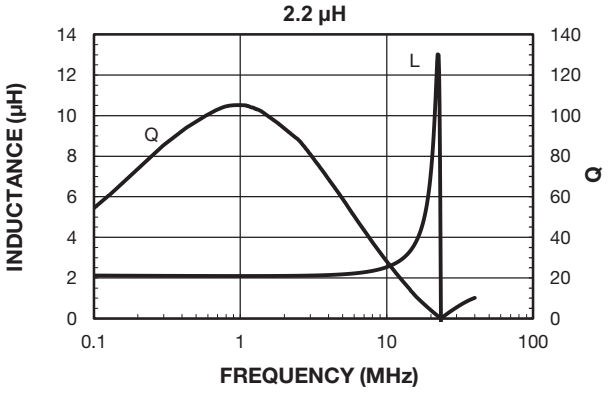


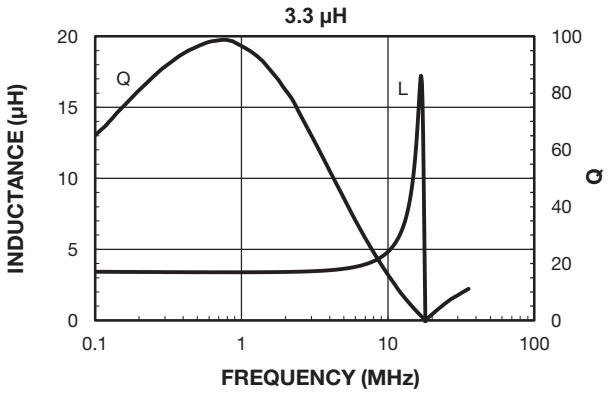


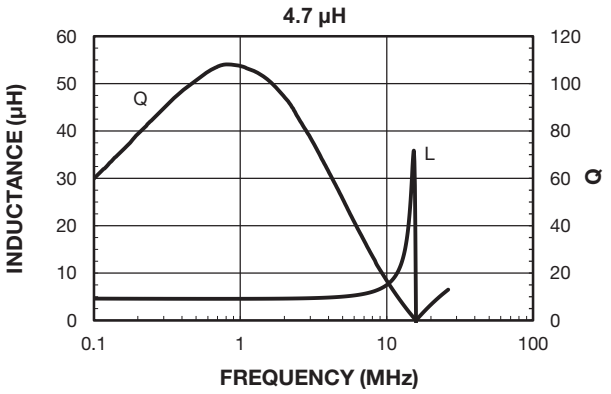


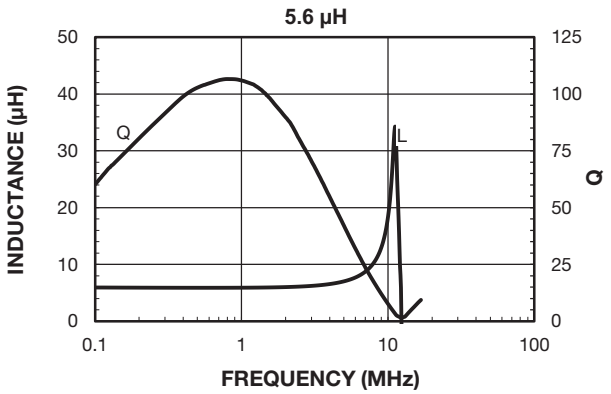


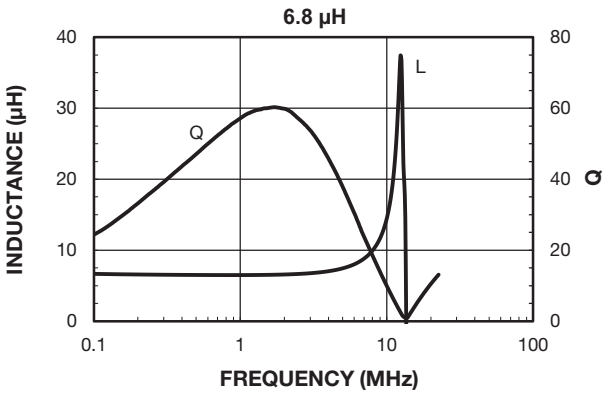

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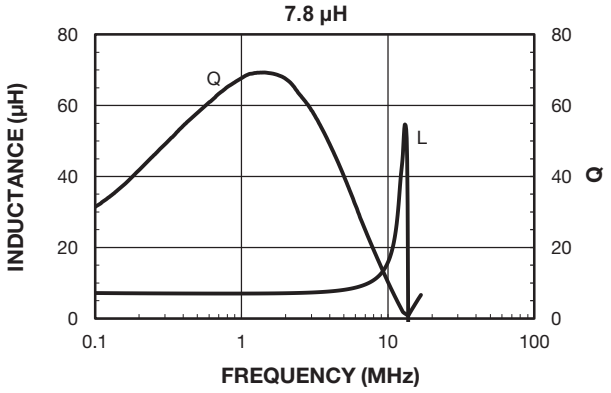
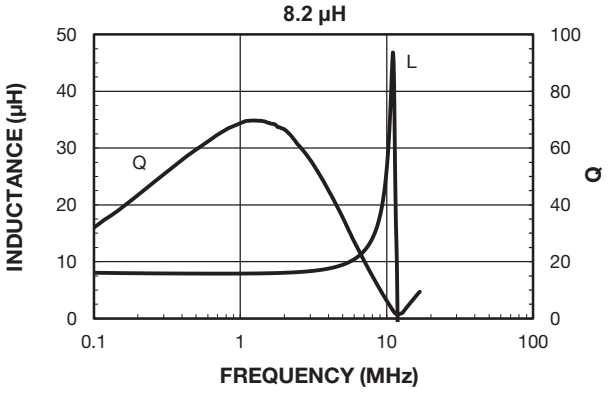
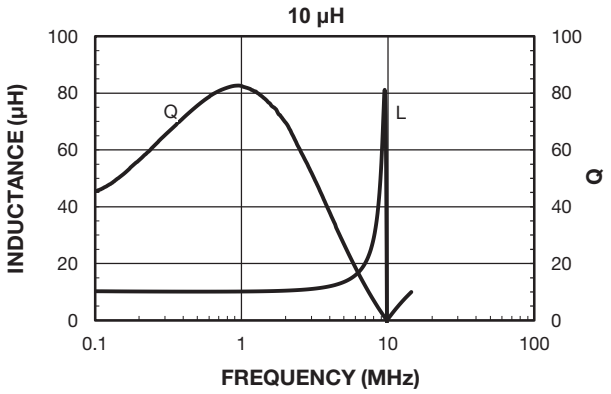
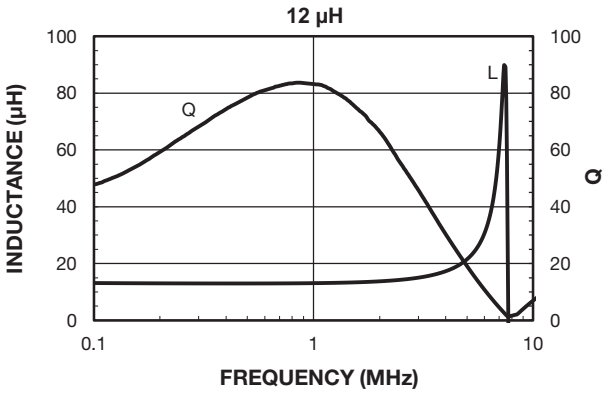
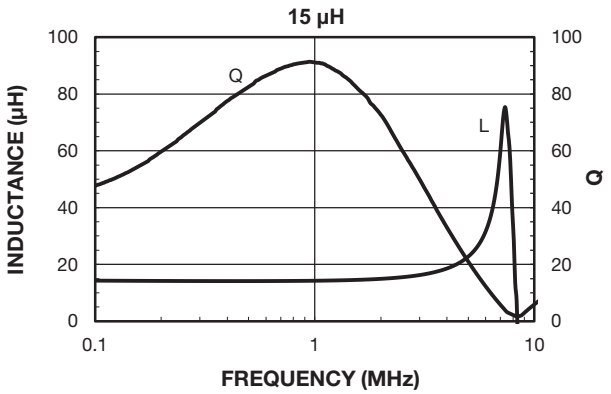
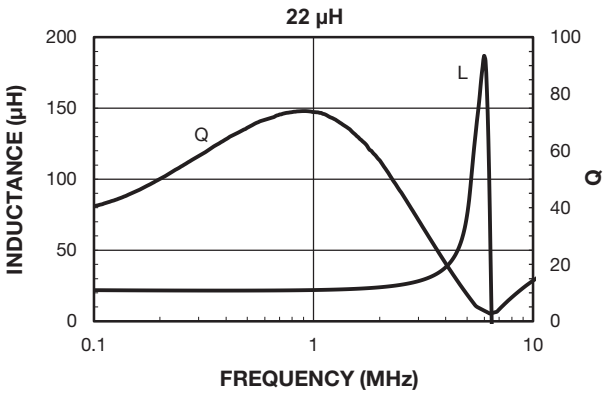


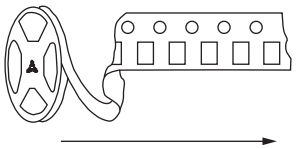



# SMD Magnetics Packaging Methods

**TAPE AND REEL** in inches [millimeters] - Meets EIA RS-481 tape and reel packaging standard



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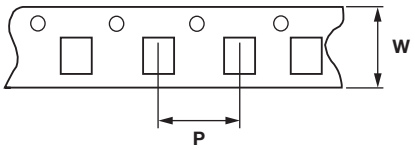


Carrier Dimensions

| MODEL | PACKAGE CODE | | | REEL SIZE | CARRIER TAPE WIDTH (W) | COMPONENT PITCH (P) | UNITS/ REEL | PACKAGE CODE | | | UNITS/ BULK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PREVIOUS CODE | GLOBAL CODE LEAD (Pb)-BEARING | GLOBAL CODE LEAD (Pb)-FREE | | | | | PREVIOUS CODE | GLOBAL CODE LEAD (Pb)-BEARING | GLOBAL CODE LEAD (Pb)-FREE | |
| IHLP-1212ABER | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 3000 | - | - | - | - |
| IHLP-1212ABEV | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 4000 | - | - | - | - |
| IHLP-1212AEER | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 3000 | - | - | - | - |
| IHLP-1212BZER | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 3000 | - | - | - | - |
| IHLP-1212BZEV | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 4000 | - | - | - | - |
| IHLP-1616AB | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 4000 | - | - | EB | 100 |
| IHLP-1616BZ | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 4000 | - | - | EB | 100 |
| IHLP-2020AB | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 4000 | - | - | EB | 100 |
| IHLP-2020BZ | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 2000 | - | - | EB | 100 |
| IHLP-2020CZ | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 2000 | - | - | EB | 100 |
| IHLP-2525AH | - | - | ER | 13 | 0.630 [16.0] | 0.315 [8.0] | 2000 | - | - | EB | 100 |
| IHLP-2525BD | - | - | ER | 13 | 0.630 [16.0] | 0.315 [8.0] | 2000 | - | - | EB | 100 |
| IHLP-2525CZ | - | - | ER | 13 | 0.630 [16.0] | 0.315 [8.0] | 2000 | - | - | EB | 100 |
| IHLP-2525EZ | - | - | ER | 13 | 0.630 [16.0] | 0.472 [12.0] | 500 | - | - | EB | 100 |
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| IHLP-3232DZ | - | - | ER | 13 | 0.630 [16.0] | 0.472 [12.0] | 500 | - | - | EB | 100 |
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| IHLP-5050CE | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 500 | - | - | EB | 100 |
| IHLP-5050EZ | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 250 | - | - | EB | 100 |
| IHLP-5050FD | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 250 | - | - | EB | 100 |
| IHLP-6767DZ | - | - | ER | 13 | 0.945 [24.0] | 0.945 [24.0] | 250 | - | - | EB | 100 |
| IHLP-6767GZ | - | - | ER | 13 | 0.945 [24.0] | 0.945 [24.0] | 200 | - | - | EB | 100 |
| IHLP-8787MZ | - | - | ER | 13 | 1.73 [44.0] | 1.26 [32.0] | 100 | - | - | - | - |
| IHCL-4040DZ | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 500 | - | - | EB | 100 |
| IHLD-4032KB | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 250 | - | - | EB | 100 |
| IHLD-3232HB | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 250 | - | - | EB | 100 |
| IHLE-2525CD | - | - | ER | 13 | 0.630 [16.0] | 0.315 [8.0] | 2000 | - | - | EB | 100 |
| IHLE-3232DD | - | - | ER | 13 | 0.630 [16.0] | 0.472 [12.0] | 500 | - | - | EB | 100 |
| IHLE-4040DD | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 500 | - | - | EB | 100 |
| IHLR-4040DZ | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 500 | - | - | EB | 100 |
| IHLM-2525CZ | - | - | ER | 13 | 0.630 [16.0] | 0.315 [8.0] | 2000 | - | - | EB | 100 |
| IHLW-4040CF | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 500 | - | - | EB | 100 |
| IHLW-5050CE | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 500 | - | - | EB | 100 |
| IFLP-4040DZ | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 500 | - | - | EB | 100 |
| IFLR-2727EZ | - | - | ER | 13 | 0.630 [16.0] | 0.630 [16.0] | 1000 | - | - | - | - |
| IFLR-4027EZ | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 1000 | - | - | - | - |
| IFLR-4031GC | - | - | ER | 13 | 0.945 [24.0] | 0.472 [12.0] | 500 | - | - | EB | 100 |
| IFLR-5151HZ | - | - | ER | 13 | 0.945 [24.0] | 0.630 [16.0] | 450 | - | - | EB | 100 |

| **TAPE AND REEL** in inches [millimeters] - Meets EIA RS-481 tape and reel packaging standard | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PACKAGE CODE | | | | | | | PACKAGE CODE | | | |
| MODEL | PREVIOUS CODE | GLOBAL CODE LEAD (Pb)-BEARING | GLOBAL CODE LEAD (Pb)-FREE | REEL SIZE | CARRIER TAPE WIDTH (W) | COMPONENT PITCH (P) | UNITS/ REEL | PREVIOUS CODE | GLOBAL CODE LEAD (Pb)-BEARING | GLOBAL CODE LEAD (Pb)-FREE | UNITS/ BULK |
| IFSC-0806AZ | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 2000 | - | - | - | - |
| IFSC-1008AB | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 2000 | - | - | - | - |
| IFSC-1111AZ | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 2000 | - | - | - | - |
| IFSC-1111AB | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 2000 | - | - | - | - |
| IFSC-1515AH | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 2000 | - | - | - | - |
| IHHP-0806AZ-01 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 2000 | - | - | - | - |
| IHHP-0806AB-01 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 2000 | - | - | - | - |
| IHHP-1008AZ-01 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 3000 | - | - | - | - |
| IHHP-1008AB-01 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 3000 | - | - | - | - |
| IHHP-1212ZH-01 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 3000 | - | - | - | - |
| IHHP-1212AZ-01 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 3000 | - | - | - | - |
| IHSM-3825 | RC2 | RE | ER | 13 | 0.945 [24.0] | 0.472 [12.0] | 750 | P09 | PJ | EB | 100 |
| IHSM-4825 | RC2 | RE | ER | 13 | 0.945 [24.0] | 0.472 [12.0] | 750 | P09 | PJ | EB | 100 |
| IHSM-5832 | RC3 | RF | ER | 13 | 1.26 [32.0] | 0.472 [12.0] | 500 | P09 | PJ | EB | 100 |
| IHSM-7832 | RC4 | RG | ER | 13 | 1.73 [44.0] | 0.472 [12.0] | 500 | P09 | PJ | EB | 100 |
| IDC-2512 | - | - | ER | 13 | 0.630 [16.0] | 0.315 [8.0] | 2000 | - | - | - | - |
| IDC-5020 | - | - | ER | 13 | 0.630 [16.0] | 0.472 [12.0] | 500 | - | - | - | - |
| IDC-7328 | - | - | ER | 13 | 0.945 [24.0] | 0.945 [24.0] | 250 | - | - | - | - |
| IDCS-2512 | - | - | ER | 13 | 0.630 [16.0] | 0.315 [8.0] | 2000 | - | - | - | - |
| IDCS-5020 | - | - | ER | 13 | 0.630 [16.0] | 0.472 [12.0] | 500 | - | - | - | - |
| IDCS-7328 | - | - | ER | 13 | 0.945 [24.0] | 0.945 [24.0] | 250 | - | - | - | - |
| IDCP-1813 | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 2000 | - | - | - | - |
| IDCP-2218 | - | - | ER | 13 | 0.472 [12.0] | 0.315 [8.0] | 1500 | - | - | - | - |
| IDCP-3114 | - | - | ER | 13 | 0.630 (16.0) | 0.472 [12.0] | 1000 | - | - | - | - |
| IDCP-3020 | - | - | ER | 13 | 0.630 (16.0) | 0.472 [12.0] | 1000 | - | - | - | - |
| IDCP-3722 | - | - | ER | 13 | 0.945 [24.0] | 0.472 [12.0] | 500 | - | - | - | - |
| IDCP-3916 | - | - | ER | 13 | 0.945 [24.0] | 0.472 [12.0] | 500 | - | - | - | - |
| IFCB-0402 | - | - | ER | 7 | 0.315 [8.0] | 0.079 [2.0] | 10 000 | - | - | - | - |
| ILC-0402 | - | - | ER | 7 | 0.315 [8.0] | 0.079 [2.0] | 10 000 | - | - | - | - |
| ILC-0603 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 4000 | - | - | - | - |
| ILC-0805 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 4000 | - | - | - | - |
| IMC-0402 | - | - | ER | 7 | 0.315 [8.0] | 0.079 [2.0] | 10 000 | - | - | - | - |
| IMC-0402-01 | - | - | ER | 7 | 0.315 [8.0] | 0.079 [2.0] | 10 000 | - | - | - | - |
| IMC-0603 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 4000 | - | - | - | - |
| IMC-0603-01 | - | - | ER | 7 | 0.315 [8.0] | 0.079 [2.0] | 3000 | - | - | - | - |
| IMC-0805-01 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 2000 | - | - | - | - |
| IMC-1008 | - | - | ER | 7 | 0.315 [8.0] | 0.157 [4.0] | 2000 | - | - | - | - |
| IMC-1210 | R98/RB3<br>R99/RB4 | SY/AN<br>SZ/R9 | ER/ET<br>ES/EU | 7<br>13 | 0.315 [8.0]<br>0.315 [8.0] | 0.157 [4.0]<br>0.157 [4.0] | 2000<br>7500 | B13 | BN | EB | 500 |
| IMC-1210-100 | R98/RB3<br>R99/RB4 | SY/AN<br>SZ/R9 | ER/ET<br>ES/EU | 7<br>13 | 0.315 [8.0]<br>0.315 [8.0] | 0.157 [4.0]<br>0.157 [4.0] | 2000<br>7500 | B13 | BN | EB | 500 |
| IMC-1812 | R73/R92<br>R13/R91 | RV/RX<br>RQ/RW | ER/ET<br>ES/EU | 7<br>13 | 0.472 [12.0]<br>0.472 [12.0] | 0.315 [8.0]<br>0.315 [8.0] | 500<br>2000 | B13 | BN | EB | 500 |
| IMCH-1812 | - | - | ER | 7 | 0.472 [12.0] | 0.315 [8.0] | 500 | - | - | - | - |
| IMC-2220 | - | - | ER | 13 | 0.630 [16.0] | 0.472 [12.0] | 1000 | - | - | - | - |

# IHLP PACKAGING

COMPONENT PHOTO

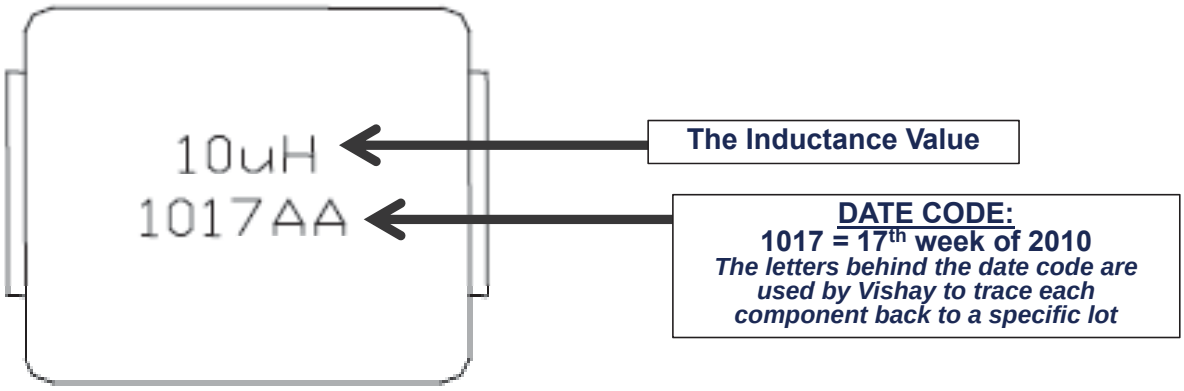
POCKET TAPE PHOTO

REEL PHOTO

CONTAINER PHOTO

UNIT LOAD PHOTO

# IHLP COMPONENT PRINT



**P**roduction **P**art **A**pproval **P**rocess

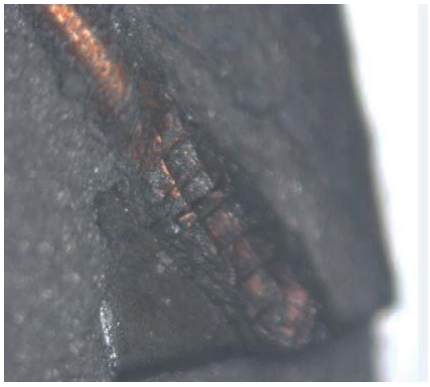
The following PPAP documentation is assembled according to
AIAG, 4th Edition PPAP Manual and applicable customer requirements

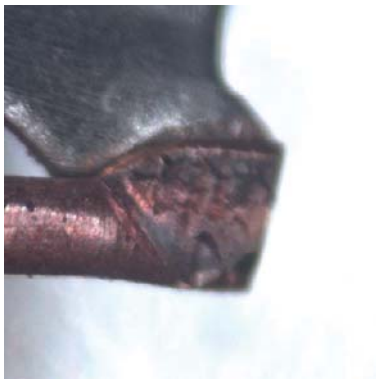
# Cross-Section
# IHLP-5050FD

# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

## Example Photos of IHLP Welds

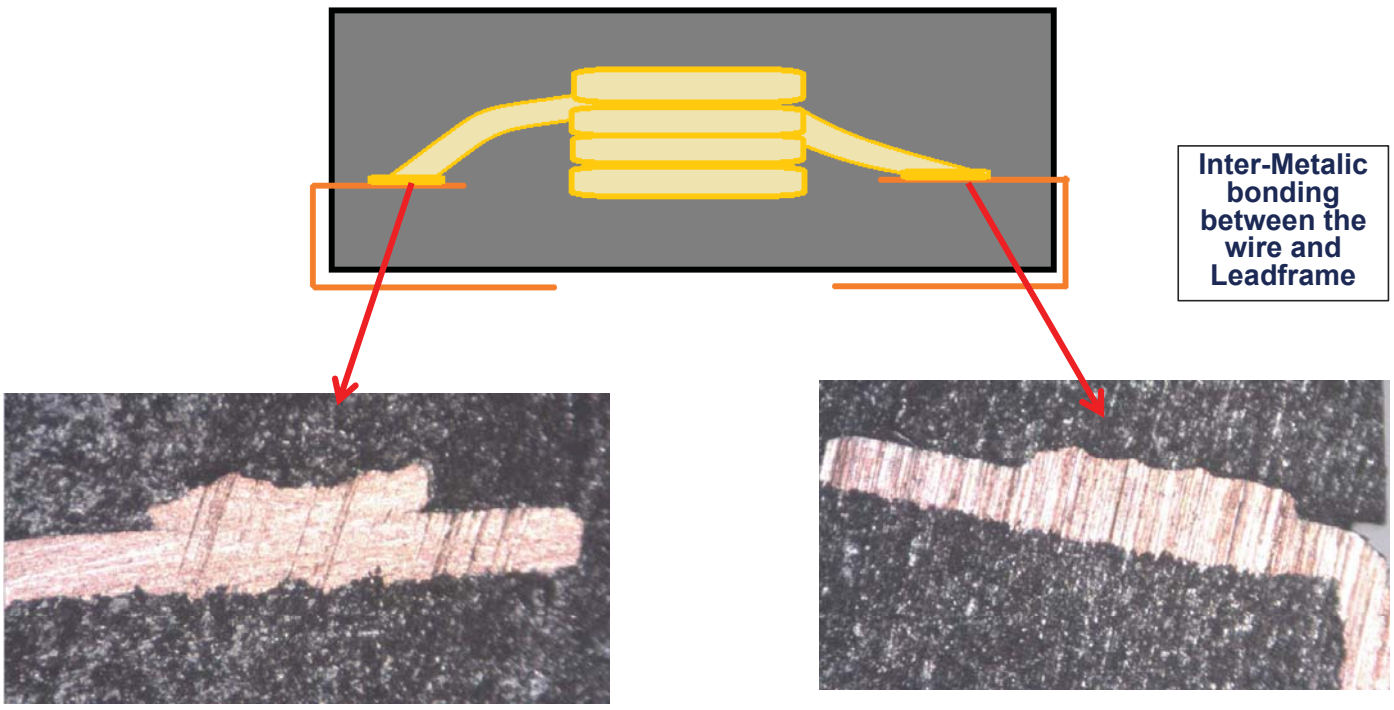




# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

## Cross sectional Photos of IHLP Welds



# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

Use the control buttons below to navigate through the PPAP sections.

## Section 2: Engineering Change Documents

There are no applicable Engineering Change Documents for this part number.

Vishay / Dale Electronics
1505 East Hway 50 Yankton, SD 57078, USA Phone (605) 665-9301 Fax (605) 668-4247

# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

Use the control buttons below to navigate through the PPAP sections.

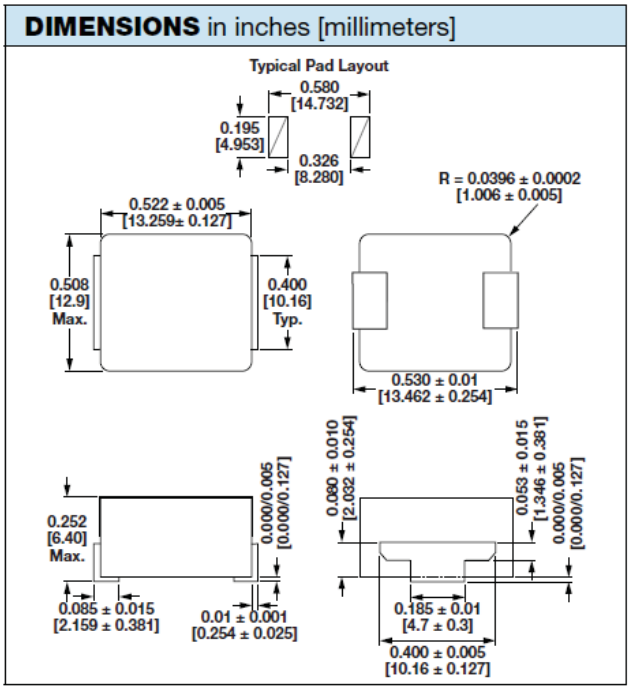
## Section 3: Customer Engineering Approval

Customer Engineering Approval does not apply for this part number

# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

## DIMENSIONAL ANALYSIS
## IHLP5050FD-5A



# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

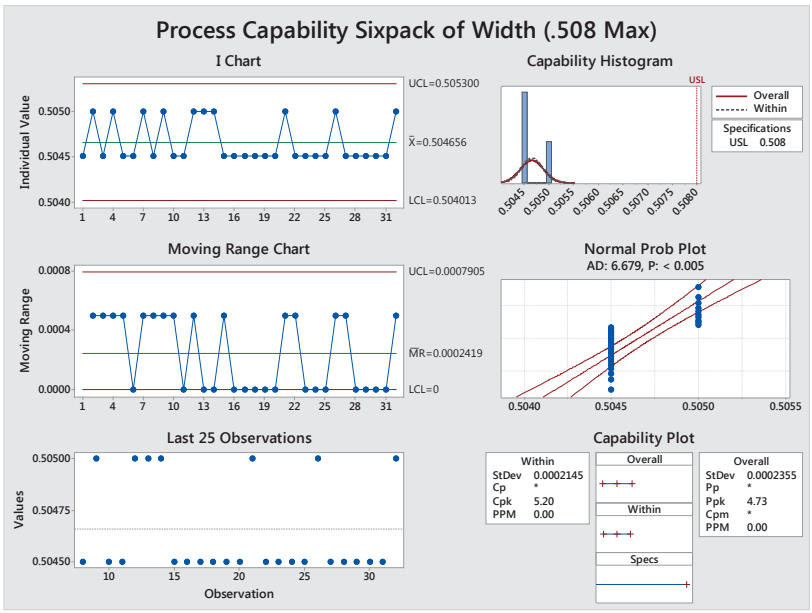
## DIMENSIONAL ANALYSIS
## IHLP5050FD-5A

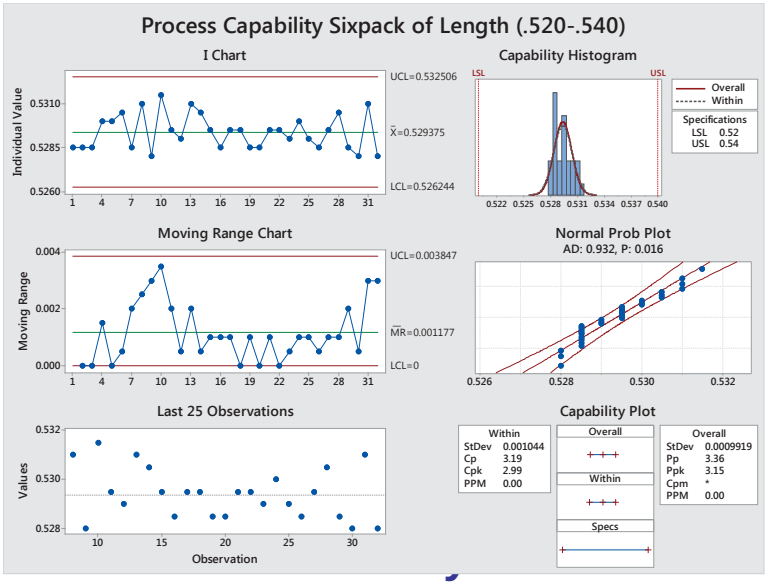
| | Width (.508"Max) | Length (.520-.540") | Height (.252"max) | tab length (.070-.100") | Tab Width (.185+/- .01") |
|---|---|---|---|---|---|
| 1 | 0.5045 | 0.5285 | 0.2465 | 0.083 | 0.185 |
| 2 | 0.505 | 0.5285 | 0.246 | 0.081 | 0.185 |
| 3 | 0.5045 | 0.5285 | 0.247 | 0.086 | 0.185 |
| 4 | 0.505 | 0.53 | 0.2465 | 0.084 | 0.185 |
| 5 | 0.5045 | 0.53 | 0.247 | 0.089 | 0.185 |
| 6 | 0.5045 | 0.5305 | 0.247 | 0.086 | 0.185 |
| 7 | 0.5045 | 0.5285 | 0.2475 | 0.085 | 0.185 |
| 8 | 0.505 | 0.531 | 0.247 | 0.084 | 0.185 |
| 9 | 0.5045 | 0.528 | 0.246 | 0.087 | 0.185 |
| 10 | 0.505 | 0.5315 | 0.2465 | 0.086 | 0.185 |
| 11 | 0.5045 | 0.5295 | 0.247 | 0.082 | 0.185 |
| 12 | 0.5045 | 0.529 | 0.247 | 0.084 | 0.185 |
| 13 | 0.505 | 0.531 | 0.2475 | 0.083 | 0.185 |
| 14 | 0.505 | 0.5305 | 0.247 | 0.086 | 0.185 |
| 15 | 0.505 | 0.5295 | 0.247 | 0.084 | 0.185 |
| 16 | 0.5045 | 0.5285 | 0.247 | 0.089 | 0.185 |
| 17 | 0.5045 | 0.5295 | 0.2455 | 0.084 | 0.185 |
| 18 | 0.5045 | 0.5295 | 0.2475 | 0.083 | 0.185 |
| 19 | 0.5045 | 0.5285 | 0.2465 | 0.085 | 0.185 |
| 20 | 0.5045 | 0.5285 | 0.2465 | 0.086 | 0.185 |
| 21 | 0.505 | 0.5295 | 0.2475 | 0.089 | 0.185 |
| 22 | 0.5045 | 0.5295 | 0.2465 | 0.089 | 0.185 |
| 23 | 0.5045 | 0.529 | 0.246 | 0.084 | 0.185 |
| 24 | 0.5045 | 0.53 | 0.246 | 0.082 | 0.185 |
| 25 | 0.5045 | 0.529 | 0.247 | 0.081 | 0.185 |
| 26 | 0.505 | 0.5285 | 0.2475 | 0.081 | 0.185 |
| 27 | 0.5045 | 0.5295 | 0.247 | 0.086 | 0.185 |
| 28 | 0.5045 | 0.5305 | 0.2475 | 0.086 | 0.185 |
| 29 | 0.5045 | 0.5285 | 0.2465 | 0.085 | 0.185 |
| 30 | 0.5045 | 0.528 | 0.2475 | 0.084 | 0.185 |
| 31 | 0.5045 | 0.531 | 0.247 | 0.083 | 0.185 |
| 32 | 0.505 | 0.528 | 0.2465 | 0.089 | 0.185 |

# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

## DIMENSIONAL ANALYSIS
## IHLP5050FD-5A

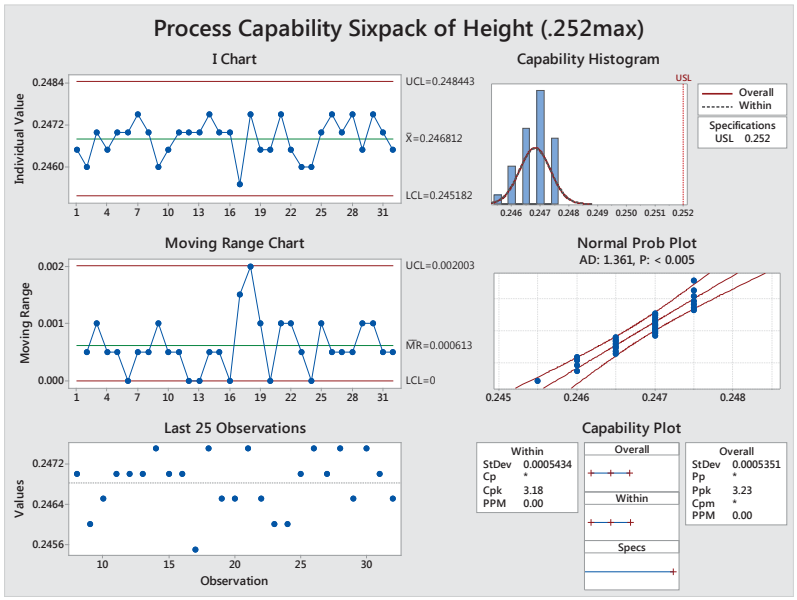


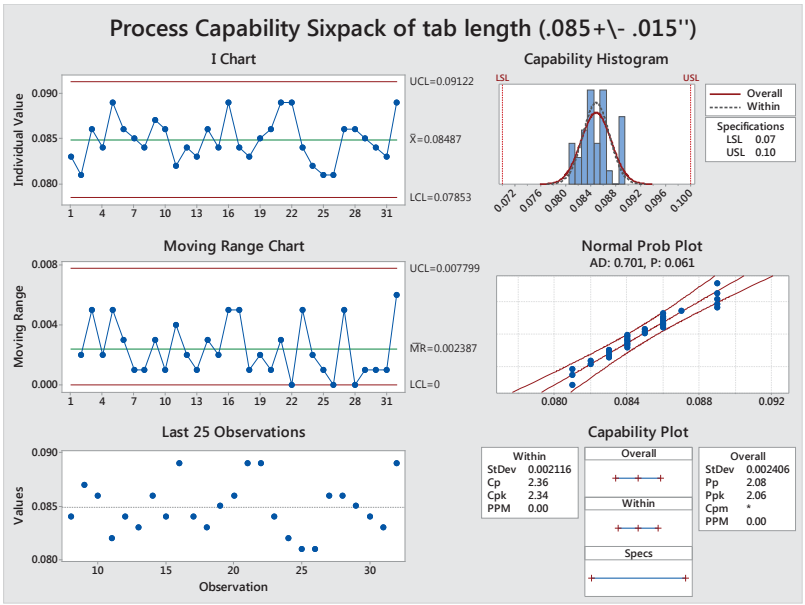



# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

## DIMENSIONAL ANALYSIS
## IHLP5050FD-5A



# TEST RESULTS FOR IHLP5050FD-5A FROM DANSHUI CHINA

A WORLD OF SOLUTIONS

# IHLP5050FDER330M5A TEST DATA

- This data represents parts manufactured in the Danshui,China manufacturing facility.

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 3X Reflow Preconditioning for lead-free products | ICP-10,373 | As specified in sections 6.3 thru 6.4 in ICP-10,373 | | | | | | | | | | |
| 1 | Pre- and Post-Stress Electrical Test | IHLP Data Sheet | L (uH) – 100KHz and 250mV DCR – 25°C Ambient | L=±15% of initial, DCR =±15% of initial | All tests requiring electrical data | | | | | | | | |
| 3 | High Temp Exposure | IEC-60068 Part 2-2 test group BA | 155C for 2000 hours, unpow ered readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT LT=Low Temperature=-55°C, RT=Room Temperature=+25°C,HT=High Temperature=+125°C for –A1/1A models. HT=High Temperature =+155° C for -5A models. | L=±20% of initial, DCR =±20% of initial | 77 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 31.961 | 33.624 | 7.082 | 33.490 | 33.670 | 1.934 |
| | | | | | | | Mimimum | 26.746 | 28.320 | 5.077 | 32.190 | 32.620 | -0.390 |
| | | | | | | | Mean | 28.591 | 30.162 | 5.497 | 32.787 | 33.093 | 0.937 |
| | | | | | | | Std Dev | 1.059 | 1.097 | 0.293 | 0.267 | 0.223 | 0.489 |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 32.186 | 33.849 | 7.150 | 48.730 | 48.320 | 0.864 |
| | | | | | | | Mimimum | 26.925 | 28.515 | 5.021 | 47.040 | 47.010 | -1.195 |
| | | | | | | | Mean | 28.788 | 30.367 | 5.488 | 47.759 | 47.584 | -0.365 |
| | | | | | | | Std Dev | 1.070 | 1.100 | 0.313 | 0.320 | 0.286 | 0.438 |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +155 deg. C | Maximum | 32.384 | 34.574 | 7.835 | 72.310 | 72.520 | 1.765 |
| | | | | | | | Mimimum | 27.119 | 28.985 | 6.239 | 69.630 | 69.980 | -1.525 |
| | | | | | | | Mean | 28.963 | 30.906 | 6.708 | 70.745 | 71.035 | 0.413 |
| | | | | | | | Std Dev | 1.079 | 1.152 | 0.293 | 0.534 | 0.513 | 0.662 |

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low Temperature Storage | EC-60068 Part 2-1 test group Aa | -55°C for 2000 hours unpowered readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/H | L=±20% of initial, DCR =±20% of initial | 77 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 30.933 | 31.119 | 1.265 | 33.530 | 33.720 | 4.116 |
| | | | | | | | Mimimum | 26.425 | 26.641 | 0.240 | 32.020 | 32.610 | -0.484 |
| | | | | | | | Mean | 28.372 | 28.616 | 0.863 | 32.595 | 33.145 | 1.695 |
| | | | | | | | Std Dev | 1.040 | 1.026 | 0.153 | 0.337 | 0.289 | 0.940 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 31.141 | 31.292 | 1.136 | 48.290 | 48.460 | 1.431 |
| | | | | | | | Mimimum | 26.623 | 26.807 | 0.462 | 46.720 | 46.990 | -0.127 |
| | | | | | | | Mean | 28.582 | 28.795 | 0.746 | 47.322 | 47.636 | 0.664 |
| | | | | | | | Std Dev | 1.051 | 1.040 | 0.129 | 0.353 | 0.345 | 0.350 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 31.362 | 31.398 | 0.367 | 71.400 | 71.760 | 2.349 |
| | | | | | | | Mimimum | 26.897 | 26.853 | -0.206 | 68.890 | 69.270 | -1.919 |
| | | | | | | | Mean | 28.819 | 28.853 | 0.117 | 70.015 | 70.511 | 0.713 |
| | | | | | | | Std Dev | 1.041 | 1.045 | 0.122 | 0.564 | 0.579 | 0.810 |

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Temperature Cycling | IEC-60068, Part 2.14 test group Na | -55°C to +125°C (+155° C for -5A models) dw ell time = 30 min. transfer time ≤10 sec. no. of cycles = 1000 unpow ered initial (0 cycles) and final 1000 cycles). Readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 77 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 30.546 | 31.126 | 2.645 | 34.090 | 33.430 | 4.607 |
| | | | | | | | Mimimum | 26.623 | 27.223 | 1.666 | 31.690 | 32.290 | -3.403 |
| | | | | | | | Mean | 28.437 | 29.039 | 2.117 | 33.175 | 32.789 | -1.157 |
| | | | | | | | Std Dev | 0.996 | 0.998 | 0.205 | 0.344 | 0.253 | 0.993 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 30.764 | 31.311 | 2.534 | 48.780 | 48.490 | 0.667 |
| | | | | | | | Mimimum | 26.805 | 27.394 | 1.460 | 46.910 | 46.980 | -1.497 |
| | | | | | | | Mean | 28.623 | 29.200 | 2.016 | 47.717 | 47.670 | -0.098 |
| | | | | | | | Std Dev | 1.007 | 1.003 | 0.226 | 0.369 | 0.362 | 0.421 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 30.943 | 31.631 | 2.874 | 72.500 | 72.770 | 0.977 |
| | | | | | | | Mimimum | 27.032 | 27.645 | 1.956 | 70.030 | 69.850 | -1.139 |
| | | | | | | | Mean | 28.829 | 29.511 | 2.366 | 71.107 | 71.181 | 0.103 |
| | | | | | | | Std Dev | 0.994 | 1.032 | 0.182 | 0.586 | 0.662 | 0.372 |

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | Biased Humidity | IEC-60068 Part 2-67 | emperature = 85°C ±20°C Humidity = 85% ±5% RH Duration = 1000 hours Pow er = No Pow er Initial (0hr.) and final (1000hr.) readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 77 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 31.971 | 32.208 | 1.021 | 33.860 | 34.010 | 1.704 |
| | | | | | | | Mimimum | 26.189 | 26.248 | -0.578 | 32.410 | 32.690 | -0.091 |
| | | | | | | | Mean | 28.613 | 28.734 | 0.422 | 32.972 | 33.260 | 0.874 |
| | | | | | | | Std Dev | 1.168 | 1.193 | 0.285 | 0.334 | 0.338 | 0.498 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 32.226 | 32.373 | 1.054 | 49.560 | 48.630 | -0.273 |
| | | | | | | | Mimimum | 26.406 | 26.426 | -0.774 | 47.630 | 47.020 | -2.431 |
| | | | | | | | Mean | 28.834 | 28.920 | 0.298 | 48.403 | 47.773 | -1.301 |
| | | | | | | | Std Dev | 1.191 | 1.200 | 0.310 | 0.419 | 0.401 | 0.394 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 32.456 | 32.579 | 0.598 | 72.380 | 72.760 | 0.971 |
| | | | | | | | Mimimum | 26.588 | 26.607 | -0.949 | 69.930 | 69.890 | -0.399 |
| | | | | | | | Mean | 28.999 | 29.061 | 0.209 | 71.021 | 71.182 | 0.226 |
| | | | | | | | Std Dev | 1.190 | 1.207 | 0.232 | 0.610 | 0.667 | 0.249 |

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| 8 | Operational Life | MIL-STD-202, Method 108A | Temperature = 85°C for -1A/A1 models. Temperature =115° C for -5A models. Duration = 2000hrs. Pow er = As noted on the test request. Readings a 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 77 | -55 deg. C | Maximum | 30.558 | 33.216 | 11.273 | 34.340 | 33.930 | 1.133 |
| | | | | | | | Mimimum | 26.515 | 28.445 | 4.495 | 32.570 | 32.250 | -3.441 |
| | | | | | | | Mean | 28.442 | 30.847 | 8.466 | 33.229 | 32.946 | -0.848 |
| | | | | | | | Std Dev | 0.993 | 1.062 | 1.334 | 0.332 | 0.371 | 0.927 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 30.773 | 33.548 | 11.587 | 48.700 | 49.060 | 1.162 |
| | | | | | | | Mimimum | 26.664 | 29.070 | 5.520 | 47.090 | 46.710 | -0.976 |
| | | | | | | | Mean | 28.639 | 31.158 | 8.806 | 47.885 | 47.923 | 0.079 |
| | | | | | | | Std Dev | 0.997 | 1.055 | 1.275 | 0.367 | 0.485 | 0.595 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 30.984 | 34.239 | 12.436 | 73.100 | 72.700 | 1.907 |
| | | | | | | | Mimimum | 26.948 | 29.609 | 6.353 | 69.630 | 69.770 | -1.649 |
| | | | | | | | Mean | 28.871 | 31.685 | 9.756 | 71.276 | 71.199 | -0.103 |
| | | | | | | | Std Dev | 0.991 | 1.084 | 1.298 | 0.741 | 0.633 | 0.742 |

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | External Visual | MIL-STD-883G Method 2009.9 | Inspect construction and workmanship. | Pass all criteria as defined in DPS-11,865 VA1 | All | na | Pass | | | | | | |
| 10 | Physical Dimensions | JESD22 Method JB-100 | Verify physical dimensions per part specification | All parts within dimensional tolerance per data sheet | 30 | na | Pass | | | | | | |
| 12 | Resistance to Solvents | MIL-STD-202G Method 215K | Add Aqueous wash chemical. OKEM Clean or equivalent. Do not use banned solvents. | Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial | 5 | na | Pass | | | | | | |

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Mechanical Shock | IEC-60068 part 2.27 test group Ea with precondition per 0 above | Pulse Shape-Half Sine Normal Pulse Length 6ms Peak acceleration-100g No. shocks-6 each in both directions of each axis (total of 36) Initial and final readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 31.352 | 31.562 | 0.980 | 33.680 | 33.890 | 1.369 |
| | | | | | | | Mimimum | 27.374 | 27.519 | 0.435 | 32.880 | 32.920 | -0.448 |
| | | | | | | | Mean | 28.658 | 28.866 | 0.726 | 33.255 | 33.355 | 0.301 |
| | | | | | | | Std Dev | 1.014 | 1.015 | 0.124 | 0.203 | 0.223 | 0.441 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 31.547 | 31.785 | 1.021 | 49.240 | 47.990 | -1.501 |
| | | | | | | | Mimimum | 27.547 | 27.696 | 0.511 | 47.980 | 47.010 | -2.558 |
| | | | | | | | Mean | 28.861 | 29.076 | 0.747 | 48.475 | 47.457 | -2.099 |
| | | | | | | | Std Dev | 1.032 | 1.036 | 0.113 | 0.291 | 0.229 | 0.292 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 31.683 | 31.757 | 0.257 | 72.220 | 71.840 | -0.085 |
| | | | | | | | Mimimum | 27.562 | 27.622 | 0.146 | 70.470 | 70.410 | -1.193 |
| | | | | | | | Mean | 28.977 | 29.039 | 0.212 | 71.414 | 71.119 | -0.413 |
| | | | | | | | Std Dev | 1.036 | 1.040 | 0.030 | 0.436 | 0.399 | 0.220 |

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Vibration | IEC-60068 PART 2-6 TEST GROUP Fc. With precondition per 0 above | Pulse Shape-sine wave range of frequency 1 10-55Hz. Amplitude ±0.75mm Range of frequency 2 55-2000Hz Amplitude; 10G Frequency Sweep: 1 oct./min. Duration: 24 h each of 3 axis. Initial and final readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 30.104 | 30.303 | 1.501 | 33.980 | 33.950 | 0.451 |
| | | | | | | | Mimimum | 26.861 | 27.092 | 0.662 | 32.800 | 32.580 | -1.107 |
| | | | | | | | Mean | 28.246 | 28.521 | 0.975 | 33.342 | 33.213 | -0.390 |
| | | | | | | | Std Dev | 0.922 | 0.919 | 0.152 | 0.309 | 0.401 | 0.491 |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 30.343 | 30.583 | 1.286 | 48.960 | 48.860 | 0.248 |
| | | | | | | | Mimimum | 27.028 | 27.326 | 0.792 | 47.600 | 47.460 | -1.070 |
| | | | | | | | Mean | 28.449 | 28.725 | 0.973 | 48.297 | 48.094 | -0.419 |
| | | | | | | | Std Dev | 0.925 | 0.921 | 0.119 | 0.375 | 0.354 | 0.323 |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +155 deg. C | Maximum | 30.521 | 30.556 | 0.301 | 72.050 | 71.630 | -0.209 |
| | | | | | | | Mimimum | 27.212 | 27.258 | -0.117 | 70.350 | 69.590 | -1.292 |
| | | | | | | | Mean | 28.635 | 28.682 | 0.164 | 71.074 | 70.567 | -0.712 |
| | | | | | | | Std Dev | 0.910 | 0.915 | 0.069 | 0.470 | 0.522 | 0.332 |

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | Bump | IEC-60068 part 2-29 test group Eb with precondition per 0 above. | Pulse shape: half sine Nominal pulse length: 6 ms Peak Acceleration: 40g No. of shocks: 4000 each mechanical axis.Initial and final readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 30 | -55 deg. C | Maximum | 30.228 | 30.394 | 1.059 | 33.540 | 33.610 | 0.934 |
| | | | | | | | Mimimum | 26.811 | 27.095 | 0.549 | 32.990 | 33.030 | -1.073 |
| | | | | | | | Mean | 28.297 | 28.527 | 0.810 | 33.223 | 33.297 | 0.223 |
| | | | | | | | Std Dev | 0.727 | 0.725 | 0.107 | 0.169 | 0.171 | 0.531 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 30.502 | 30.718 | 1.078 | 47.860 | 48.710 | 2.062 |
| | | | | | | | Mimimum | 26.959 | 27.249 | 0.709 | 47.050 | 47.920 | 1.482 |
| | | | | | | | Mean | 28.489 | 28.733 | 0.859 | 47.414 | 48.248 | 1.758 |
| | | | | | | | Std Dev | 0.742 | 0.742 | 0.099 | 0.213 | 0.218 | 0.142 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 30.703 | 30.724 | 0.136 | 71.590 | 72.090 | 2.413 |
| | | | | | | | Mimimum | 27.185 | 27.208 | 0.054 | 69.610 | 70.850 | 0.056 |
| | | | | | | | Mean | 28.666 | 28.690 | 0.085 | 70.589 | 71.374 | 1.114 |
| | | | | | | | Std Dev | 0.735 | 0.736 | 0.022 | 0.418 | 0.305 | 0.515 |

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | Resistance to Solder Heat | MIL-STD-202G Method 210F Condition K | IR/convection reflow. 250 ± 5°C for 30 ± 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s | L=±20% of initial, DCR =±20% of initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 29.770 | 30.208 | 1.913 | 48.580 | 48.510 | 0.042 |
| | | | | | | | Mimimum | 27.154 | 27.563 | 0.889 | 47.840 | 47.790 | -0.270 |
| | | | | | | | Mean | 28.138 | 28.529 | 1.394 | 48.121 | 48.043 | -0.163 |
| | | | | | | | Std Dev | 0.673 | 0.668 | 0.219 | 0.179 | 0.174 | 0.061 |
| 17 | ESD | AEC-Q200-002 | Determine the Classification of the part. | L=±20% of initial, DCR =±20% of initial | 15 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | 25KV | %Δ | Initial | 25KV | %Δ |
| | | | | | | +25 deg. C | Maximum | 32.782 | 30.501 | -6.587 | 48.410 | 48.400 | 0.166 |
| | | | | | | | Mimimum | 29.777 | 27.637 | -7.739 | 47.800 | 47.810 | -0.208 |
| | | | | | | | Mean | 31.123 | 28.934 | -7.034 | 48.073 | 48.097 | 0.050 |
| | | | | | | | Std Dev | 0.845 | 0.826 | 0.310 | 0.188 | 0.183 | 0.103 |
| 18 | Solderability | J-STD-002C Method B1 | 4 hours @ 155°C dry heat @ 255°C. 90° dipping angle. | 95% or greater coverage on "A" (seating plane) per J-STD-002C | 15 | NA | Pass | | | | | | |

# IHLP5050FDER330M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | Electrical Characterization | User Specification | Min, Max, Mean, and Standard Deviation @ Min (-55C), Room, and Max (+125C) operating temperatures. After mounted, allow +/-5% shift DCR at room temp. -55C/+125C DCR Max calculated using temp conversion for copper: $R_2 = [(T_2 + 234.5) / (234.5 + T_A)] * 1.05R_A$ (A = Ambient, 2 = new con) | Final Test: L=±20% of initial, DCR per calculated limits described in test conditions. L test for -55C & +125C = ±20% initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | | | Initial | | |
| | | | | | | -55 deg. C | Maximum | 30.933 | | | 33.530 | | |
| | | | | | | | Mimimum | 26.425 | | | 32.020 | | |
| | | | | | | | Mean | 28.372 | | | 32.595 | | |
| | | | | | | | Std Dev | 1.040 | | | 0.337 | | |
| | | | | | | | | Initial | | | Initial | | |
| | | | | | | +25 deg. C | Maximum | 31.141 | | | 48.290 | | |
| | | | | | | | Mimimum | 26.623 | | | 46.720 | | |
| | | | | | | | Mean | 28.582 | | | 47.322 | | |
| | | | | | | | Std Dev | 1.051 | | | 0.353 | | |
| | | | | | | | | Initial | | | Initial | | |
| | | | | | | +155 deg. C | Maximum | 31.362 | | | 71.400 | | |
| | | | | | | | Mimimum | 26.897 | | | 68.890 | | |
| | | | | | | | Mean | 28.819 | | | 70.015 | | |
| | | | | | | | Std Dev | 1.041 | | | 0.564 | | |
| 21 | Board Flex | AEC-Q200-005 Appendix 2 | 2mm minimum flex for 60 (+5) sec | Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 30.787 | 30.985 | 0.642 | 48.740 | 48.740 | 0.145 |
| | | | | | | | Mimimum | 26.407 | 26.540 | 0.319 | 48.050 | 48.060 | -0.228 |
| | | | | | | | Mean | 28.288 | 28.425 | 0.482 | 48.337 | 48.326 | -0.023 |
| | | | | | | | Std Dev | 0.968 | 0.981 | 0.089 | 0.194 | 0.190 | 0.084 |
| 22 | Terminal Strength | AEC-Q200-006 Appendix 1 | Force of 1.8kg (17.7 N) for 60 seconds | Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 30.686 | 30.834 | 0.635 | 48.540 | 48.500 | 0.692 |
| | | | | | | | Mimimum | 26.928 | 27.033 | -0.259 | 47.680 | 47.840 | -0.536 |
| | | | | | | | Mean | 28.717 | 28.799 | 0.288 | 48.087 | 48.122 | 0.073 |
| | | | | | | | Std Dev | 1.041 | 1.042 | 0.240 | 0.243 | 0.200 | 0.233 |

# SECTION 10
# PERFORMANCE TEST RESULTS

**BeerSheva, Israel manufacturing facility**

# IHLP5050FDER560M5A TEST RESULTS

- This data represents parts manufactured in the Beer'Sheva, Israel manufacturing facility.

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 3X Reflow Preconditioning for lead-free products | ICP-10,373 | As specified in sections 6.3 thru 6.4 in ICP-10,373 | | | | | | | | | | |
| 1 | Pre- and Post-Stress Electrical Test | IHLP Data Sheet | L (uH) – 100KHz and 250mV DCR – 25°C Ambient | L=±15% of initial, DCR =±15% of initial | All tests requiring electrical data | | | | | | | | |
| 3 | High Temp Exposure | IEC-60068 Part 2-2 test group BA | 155C for 2000 hours, unpow ered readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT LT=Low Temperature=-55°C, RT=Room Temperature=+25°C,HT=High Temperature=+125°C for –A1/1A models. HT=High Temperature =+155° C for -5A models. | L=±20% of initial, DCR =±20% of initial | 77 | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 56.739 | 59.227 | 6.151 | 64.720 | 64.290 | -0.315 |
| | | | | | | | Mimimum | 46.574 | 49.342 | 3.272 | 63.090 | 62.330 | -1.288 |
| | | | | | | | Mean | 50.679 | 53.179 | 4.945 | 63.790 | 63.234 | -0.871 |
| | | | | | | | Std Dev | 2.194 | 2.160 | 0.553 | 0.379 | 0.402 | 0.232 |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 56.856 | 59.675 | 7.059 | 93.000 | 92.690 | -0.033 |
| | | | | | | | Mimimum | 46.559 | 49.656 | 3.776 | 91.480 | 86.840 | -6.230 |
| | | | | | | | Mean | 50.710 | 53.567 | 5.649 | 92.086 | 91.673 | -0.448 |
| | | | | | | | Std Dev | 2.241 | 2.208 | 0.600 | 0.335 | 0.666 | 0.687 |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +155 deg. C | Maximum | 57.451 | 60.835 | 9.928 | 129.680 | 128.770 | -0.563 |
| | | | | | | | Mimimum | 46.949 | 50.116 | 4.759 | 126.150 | 124.990 | -2.607 |
| | | | | | | | Mean | 51.103 | 54.245 | 6.157 | 128.138 | 127.113 | -0.800 |
| | | | | | | | Std Dev | 2.287 | 2.348 | 0.610 | 0.580 | 0.701 | 0.246 |

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas. Temp. | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | Low Temperature Storage | EC-60068 Part 2-1 test group Aa | -55°C for 2000 hours unpowered readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/H | L=±20% of initial, DCR =±20% of initial | 77 | -55 deg. C | Maximum | 54.166 | 54.278 | 0.578 | 64.840 | 64.320 | 0.390 |
| | | | | | | | Mimimum | 45.169 | 45.313 | -1.964 | 62.960 | 62.410 | -1.670 |
| | | | | | | | Mean | 50.288 | 50.425 | 0.274 | 63.605 | 63.323 | -0.442 |
| | | | | | | | Std Dev | 1.968 | 1.949 | 0.284 | 0.372 | 0.351 | 0.351 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 54.253 | 54.674 | 1.135 | 92.710 | 93.280 | 0.857 |
| | | | | | | | Mimimum | 45.102 | 45.489 | -2.595 | 91.000 | 91.290 | -0.879 |
| | | | | | | | Mean | 50.315 | 50.699 | 0.764 | 91.975 | 92.339 | 0.396 |
| | | | | | | | Std Dev | 2.021 | 2.028 | 0.409 | 0.369 | 0.410 | 0.290 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 54.717 | 54.736 | 0.340 | 129.440 | 129.410 | 0.616 |
| | | | | | | | Mimimum | 45.523 | 45.542 | -2.585 | 126.440 | 124.830 | -2.301 |
| | | | | | | | Mean | 50.733 | 50.745 | 0.024 | 127.986 | 127.713 | -0.213 |
| | | | | | | | Std Dev | 2.060 | 2.057 | 0.315 | 0.697 | 0.831 | 0.367 |

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas. Temp. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Temperature Cycling | IEC-60068, Part 2.14 test group Na | -55°C to +125°C (+155° C for -5A models) dwell time = 30 min. transfer time ≤10 sec. no. of cycles = 1000 unpowered initial (0 cycles) and final 1000 cycles). Readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 77 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 55.959 | 56.775 | 2.329 | 64.100 | 65.080 | 2.468 |
| | | | | | | | Mimimum | 46.788 | 47.853 | 1.123 | 62.770 | 63.350 | 0.651 |
| | | | | | | | Mean | 50.411 | 51.311 | 1.711 | 63.391 | 64.224 | 1.316 |
| | | | | | | | Std Dev | 2.148 | 2.078 | 0.239 | 0.341 | 0.468 | 0.507 |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 56.176 | 57.124 | 2.771 | 92.840 | 92.860 | 2.422 |
| | | | | | | | Mimimum | 46.723 | 48.017 | 1.279 | 91.310 | 91.410 | -0.293 |
| | | | | | | | Mean | 50.424 | 51.526 | 2.116 | 92.160 | 92.216 | 1.061 |
| | | | | | | | Std Dev | 2.197 | 2.122 | 0.295 | 0.344 | 0.336 | 0.175 |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +155 deg. C | Maximum | 56.691 | 57.979 | 2.641 | 139.140 | 139.840 | 2.415 |
| | | | | | | | Mimimum | 47.105 | 48.327 | 1.832 | 135.240 | 137.630 | 0.072 |
| | | | | | | | Mean | 50.842 | 52.035 | 2.266 | 137.370 | 138.878 | 1.100 |
| | | | | | | | Std Dev | 2.241 | 2.260 | 0.197 | 0.890 | 0.623 | 0.582 |

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas. Temp. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | Biased Humidity | IEC-60068 Part 2-67 | emperature = 85°C ±20°C Humidity = 85% ±5% RH Duration = 1000 hours Pow er = No Pow er Initial (0hr.) and final (1000hr.) readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 77 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 55.612 | 55.708 | 0.636 | 64.940 | 64.460 | -0.331 |
| | | | | | | | Mimimum | 46.839 | 46.846 | 0.016 | 63.030 | 62.370 | -1.983 |
| | | | | | | | Mean | 50.531 | 50.680 | 0.294 | 63.770 | 63.183 | -0.918 |
| | | | | | | | Std Dev | 2.108 | 2.133 | 0.117 | 0.449 | 0.414 | 0.326 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 55.609 | 56.068 | 1.236 | 93.130 | 92.570 | 0.196 |
| | | | | | | | Mimimum | 46.893 | 47.128 | 0.461 | 91.520 | 90.490 | -1.958 |
| | | | | | | | Mean | 50.557 | 50.979 | 0.834 | 92.258 | 91.666 | -0.642 |
| | | | | | | | Std Dev | 2.159 | 2.170 | 0.142 | 0.333 | 0.522 | 0.514 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 56.101 | 56.416 | 0.962 | 129.870 | 128.080 | -0.300 |
| | | | | | | | Mimimum | 47.106 | 47.324 | 0.018 | 126.390 | 123.500 | -3.754 |
| | | | | | | | Mean | 50.957 | 51.234 | 0.544 | 128.133 | 126.369 | -1.376 |
| | | | | | | | Std Dev | 2.201 | 2.214 | 0.128 | 0.733 | 1.016 | 0.657 |

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas. Temp. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | Operational Life | MIL-STD-202, Method 108A | Temperature = 85°C for -1A/A1 models. Temperature =115° C for -5A models. Duration = 2000hrs. Pow er = As noted on the test request. Readings a 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 77 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 55.334 | 59.851 | 11.861 | 65.130 | 64.390 | -0.473 |
| | | | | | | | Mimimum | 45.909 | 49.447 | 4.378 | 63.140 | 62.370 | -1.487 |
| | | | | | | | Mean | 50.014 | 53.619 | 7.242 | 63.760 | 63.124 | -0.996 |
| | | | | | | | Std Dev | 2.248 | 2.178 | 1.816 | 0.483 | 0.484 | 0.245 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 55.551 | 60.470 | 12.641 | 93.080 | 92.840 | 0.033 |
| | | | | | | | Mimimum | 45.942 | 49.840 | 5.286 | 91.730 | 91.030 | -0.925 |
| | | | | | | | Mean | 50.053 | 54.139 | 8.199 | 92.252 | 91.884 | -0.399 |
| | | | | | | | Std Dev | 2.294 | 2.228 | 1.694 | 0.308 | 0.371 | 0.229 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 56.071 | 61.388 | 12.584 | 129.780 | 128.780 | -0.204 |
| | | | | | | | Mimimum | 46.340 | 50.131 | 5.519 | 125.720 | 124.880 | -1.017 |
| | | | | | | | Mean | 50.436 | 54.623 | 8.332 | 127.824 | 127.154 | -0.523 |
| | | | | | | | Std Dev | 2.323 | 2.318 | 1.719 | 0.791 | 0.741 | 0.181 |

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas. Temp. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | External Visual | MIL-STD-883G Method 2009.9 | Inspect construction and workmanship. | Pass all criteria as defined in DPS-11,865 VA1 | All | na | Pass | | | | | | |
| 10 | Physical Dimensions | JESD22 Method JB-100 | Verify physical dimensions per part specification | All parts within dimensional tolerance per data sheet | 30 | na | Pass | | | | | | |
| 12 | Resistance to Solvents | MIL-STD-202G Method 215K | Add Aqueous wash chemical. OKEM Clean or equivalent. Do not use banned solvents. | Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial | 5 | na | Pass | | | | | | |

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas. Temp. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Mechanical Shock | IEC-60068 part 2.27 test group Ea with precondition per 0 above | Pulse Shape-Half Sine Normal Pulse Length 6ms Peak acceleration-100g No. shocks-6 each in both directions of each axis (total of 36) Initial and final readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 55.291 | 55.305 | 1.014 | 64.100 | 65.080 | 2.472 |
| | | | | | | | Mimimum | 46.013 | 46.349 | 0.025 | 62.770 | 63.350 | 0.671 |
| | | | | | | | Mean | 50.241 | 50.544 | 0.610 | 63.391 | 64.224 | 1.313 |
| | | | | | | | Std Dev | 2.323 | 2.253 | 0.212 | 0.341 | 0.468 | 0.507 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 55.349 | 56.062 | 1.747 | 92.860 | 92.910 | 0.564 |
| | | | | | | | Mimimum | 46.011 | 46.603 | 1.052 | 91.500 | 91.790 | -0.140 |
| | | | | | | | Mean | 50.238 | 50.904 | 1.331 | 92.176 | 92.431 | 0.277 |
| | | | | | | | Std Dev | 2.355 | 2.345 | 0.149 | 0.316 | 0.265 | 0.161 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 56.039 | 56.090 | 0.463 | 137.840 | 138.820 | 2.878 |
| | | | | | | | Mimimum | 46.414 | 46.546 | -0.140 | 134.760 | 136.220 | 0.007 |
| | | | | | | | Mean | 50.733 | 50.810 | 0.153 | 135.883 | 137.524 | 1.210 |
| | | | | | | | Std Dev | 2.403 | 2.394 | 0.101 | 0.751 | 0.711 | 0.720 |

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas. Temp. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Vibration | IEC-60068 PART 2-6 TEST GROUP Fc. With precondition per 0 above | Pulse Shape-sine w ave range of frequency 1 10-55Hz. Amplitude ±0.75mm Range of frequency 2 55-2000Hz Amplitude; 10G Frequency Sw eep: 1 oct./min. Duration: 24 h each of 3 axis. Initial and final readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 30 | -55 deg. C | Maximum | 56.043 | 56.206 | 0.888 | 64.670 | 65.020 | 1.690 |
| | | | | | | | Mimimum | 47.019 | 47.436 | 0.164 | 62.650 | 63.430 | 0.062 |
| | | | | | | | Mean | 51.719 | 51.995 | 0.536 | 63.612 | 64.260 | 1.022 |
| | | | | | | | Std Dev | 2.437 | 2.405 | 0.143 | 0.593 | 0.409 | 0.534 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 56.153 | 56.770 | 1.459 | 92.970 | 93.700 | 1.346 |
| | | | | | | | Mimimum | 47.075 | 47.669 | 0.344 | 91.440 | 92.190 | 0.260 |
| | | | | | | | Mean | 51.829 | 52.401 | 1.104 | 92.155 | 93.023 | 0.941 |
| | | | | | | | Std Dev | 2.475 | 2.514 | 0.307 | 0.350 | 0.444 | 0.296 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 56.780 | 56.712 | 0.196 | 139.140 | 139.840 | 2.415 |
| | | | | | | | Mimimum | 48.078 | 48.066 | -0.505 | 135.240 | 137.630 | 0.072 |
| | | | | | | | Mean | 52.342 | 52.292 | -0.093 | 137.370 | 138.878 | 1.100 |
| | | | | | | | Std Dev | 2.520 | 2.507 | 0.104 | 0.890 | 0.623 | 0.582 |

Inductance (µH) | DC Resistance (mΩ)

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas. Temp. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bump | IEC-60068 part 2-29 test group Eb with precondition per 0 above. | Pulse shape: half sine Nominal pulse length: 6 ms Peak Acceleration: 40g No. of shocks: 4000 each mechanical axis.Initial and final readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 55.671 | 56.221 | 1.291 | 63.500 | 64.090 | 1.417 |
| | | | | | | | Mimimum | 46.725 | 47.266 | 0.477 | 62.670 | 63.020 | 0.270 |
| | | | | | | | Mean | 50.363 | 50.820 | 0.911 | 63.040 | 63.523 | 0.766 |
| | | | | | | | Std Dev | 2.055 | 2.036 | 0.189 | 0.233 | 0.317 | 0.247 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 55.815 | 56.642 | 1.760 | 92.670 | 93.470 | 0.863 |
| | | | | | | | Mimimum | 46.782 | 47.532 | 1.059 | 91.760 | 92.000 | -0.065 |
| | | | | | | | Mean | 50.480 | 51.206 | 1.442 | 92.216 | 92.616 | 0.433 |
| | | | | | | | Std Dev | 2.125 | 2.119 | 0.166 | 0.274 | 0.386 | 0.217 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 56.547 | 56.582 | 0.698 | 139.140 | 139.790 | 1.835 |
| | | | | | | | Mimimum | 47.256 | 47.484 | -0.161 | 135.180 | 137.050 | 0.065 |
| | | | | | | | Mean | 51.041 | 51.137 | 0.190 | 136.836 | 138.013 | 0.863 |
| | | | | | | | Std Dev | 2.186 | 2.171 | 0.159 | 1.095 | 0.644 | 0.492 |

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas. Temp. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | Resistance to Solder Heat | MIL-STD-202G Method 210F Condition K | IR/convection reflow. 250 ± 5°C for 30 ± 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s | L=±20% of initial, DCR =±20% of initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 56.43 | 55.89 | 0.26 | 93.39 | 93.07 | 0.63 |
| | | | | | | | Mimimum | 47.63 | 47.65 | -1.14 | 91.87 | 91.83 | -0.72 |
| | | | | | | | Mean | 50.41 | 50.24 | -0.32 | 92.53 | 92.35 | -0.19 |
| | | | | | | | Std Dev | 2.21 | 2.07 | 0.35 | 0.35 | 0.33 | 0.40 |
| 17 | ESD | AEC-Q200-002 | Determine the Classification of the part. | L=±20% of initial, DCR =±20% of initial | 15 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | 4KV | %Δ | Initial | 4KV | %Δ |
| | | | | | | +25 deg. C | Maximum | 55.83 | 56.18 | 0.88 | 92.47 | 92.44 | 0.25 |
| | | | | | | | Mimimum | 49.24 | 46.74 | -12.47 | 91.52 | 91.43 | -0.27 |
| | | | | | | | Mean | 52.13 | 51.46 | -1.28 | 91.95 | 91.96 | 0.02 |
| | | | | | | | Std Dev | 2.21 | 2.85 | 3.57 | 0.33 | 0.30 | 0.14 |
| 18 | Solderability | J-STD-002C Method B1 | 4 hours @ 155°C dry heat @ 255°C. 90° dipping angle. | 95% or greater coverage on "A" (seating plane) per J-STD-002C | 15 | NA | Pass | | | | | | |

# IHLP5050FDER560M5A TEST RESULTS

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas. Temp. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | Electrical Characterization | User Specification | Min, Max, Mean, and Standard Deviation @ Min (-55C), Room, and Max (+125C) operating temperatures. After mounted, allow +/-5% shift DCR at room temp. -55C/+125C DCR Max calculated using temp conversion for copper: $R_2 = [(T_2 + 234.5) / (234.5 + T_A)] * 1.05R_A$ (A = Ambient, 2 = new con) | Final Test: L=±20% of initial, DCR per calculated limits described in test conditions. L test for -55C & +125C = ±20% initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | | | Initial | | |
| | | | | | | -55 deg. C | Maximum | 54.166 | | | 64.840 | | |
| | | | | | | | Mimimum | 45.169 | | | 62.960 | | |
| | | | | | | | Mean | 50.288 | | | 63.605 | | |
| | | | | | | | Std Dev | 1.968 | | | 0.372 | | |
| | | | | | | +25 deg. C | | Initial | | | Initial | | |
| | | | | | | | Maximum | 54.253 | | | 92.710 | | |
| | | | | | | | Mimimum | 45.102 | | | 91.000 | | |
| | | | | | | | Mean | 50.315 | | | 91.975 | | |
| | | | | | | | Std Dev | 2.021 | | | 0.369 | | |
| | | | | | | +155 deg. C | | Initial | | | Initial | | |
| | | | | | | | Maximum | 54.717 | | | 129.440 | | |
| | | | | | | | Mimimum | 45.523 | | | 126.440 | | |
| | | | | | | | Mean | 50.733 | | | 127.986 | | |
| | | | | | | | Std Dev | 2.060 | | | 0.697 | | |
| 21 | Board Flex | AEC-Q200-005 Appendix 2 | 2mm minimum flex for 60 (+5) sec | Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 57.059 | 56.960 | 1.554 | 93.330 | 93.390 | 1.031 |
| | | | | | | | Mimimum | 47.918 | 48.259 | -0.497 | 92.120 | 92.130 | -1.106 |
| | | | | | | | Mean | 51.137 | 51.425 | 0.565 | 92.730 | 92.787 | 0.062 |
| | | | | | | | Std Dev | 2.305 | 2.299 | 0.390 | 0.347 | 0.343 | 0.311 |
| 22 | Terminal Strength | AEC-Q200-006 Appendix 1 | Force of 1.8kg (17.7 N) for 60 seconds | Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial | 30 | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 55.859 | 55.863 | 0.584 | 93.330 | 93.470 | 0.465 |
| | | | | | | | Mimimum | 48.458 | 48.464 | -0.829 | 91.630 | 91.570 | -0.325 |
| | | | | | | | Mean | 52.285 | 52.282 | -0.005 | 92.366 | 92.343 | -0.026 |
| | | | | | | | Std Dev | 2.017 | 2.018 | 0.198 | 0.388 | 0.494 | 0.190 |

# IHLP5050FDER100M5A TEST RESULTS

- This data represents parts manufactured in the BeerSheva, Israel manufacturing facility.

# IHLP5050FDER100M5A

| Test # | Description | Ref. Spec. Meth / Cond | Test Conditions | End Point Δ requirements | Sample Size | Meas Temp | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 3X Reflow Preconditioning for lead-free products | ICP-10,373 | As specified in sections 6.3 thru 6.4 in ICP-10,373 | | | | | | | | | | |
| 1 | Pre- and Post-Stress Electrical Test | IHLP Data Sheet | L (uH) – 100KHz and 250mV DCR – 25°C Ambient | L=±15% of initial, DCR =±15% of initial | All tests requiring electrical data | | | | | | | | |
| 3 | High Temp Exposure | IEC-60068 Part 2-2 test group BA | 155C for 2000 hours, unpowered readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT LT=Low Temperature=-55°C, RT=Room Temperature=+25°C,HT= High Temperature=+125°C for –A1/1A models. HT=High Temperature =+155° C for -5A models. | L=±20% of initial, DCR =±20% of initial | 77 | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | -55 deg. C | Maximum | 9.496 | 10.101 | 9.308 | 10.996 | 10.984 | 16.071 |
| | | | | | | | Mimimum | 8.172 | 8.912 | 6.055 | 9.178 | 10.476 | -2.737 |
| | | | | | | | Mean | 8.784 | 9.463 | 7.741 | 10.781 | 10.708 | -0.649 |
| | | | | | | | Std Dev | 0.231 | 0.211 | 0.638 | 0.198 | 0.097 | 2.125 |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +25 deg. C | Maximum | 9.552 | 10.188 | 9.416 | 15.782 | 15.684 | 1.799 |
| | | | | | | | Mimimum | 8.213 | 8.980 | 6.042 | 15.171 | 15.101 | -1.897 |
| | | | | | | | Mean | 8.838 | 9.534 | 7.890 | 15.532 | 15.427 | -0.674 |
| | | | | | | | Std Dev | 0.234 | 0.213 | 0.649 | 0.088 | 0.099 | 0.520 |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | +155 deg. C | Maximum | 9.553 | 10.430 | 11.889 | 23.570 | 23.170 | 0.703 |
| | | | | | | | Mimimum | 8.214 | 9.170 | 8.674 | 22.290 | 22.240 | -3.559 |
| | | | | | | | Mean | 8.834 | 9.747 | 10.350 | 23.123 | 22.799 | -1.398 |
| | | | | | | | Std Dev | 0.232 | 0.222 | 0.688 | 0.220 | 0.202 | 0.806 |

# IHLP5050FDER100M5A

| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | Low Temperature Storage | EC-60068 Part 2-1 test group Aa | -55°C for 2000 hours unpowered readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/H | L=±20% of initial, DCR =±20% of initial | 77 | -55 deg. C | Maximum | 9.409 | 9.413 | 0.230 | 10.992 | 11.109 | 3.120 |
| | | | | | | | Mimimum | 8.086 | 8.082 | -0.111 | 10.520 | 10.554 | -1.805 |
| | | | | | | | Mean | 8.728 | 8.734 | 0.077 | 10.790 | 10.818 | 0.264 |
| | | | | | | | Std Dev | 0.247 | 0.247 | 0.080 | 0.095 | 0.097 | 1.011 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.478 | 9.471 | 0.129 | 15.654 | 15.868 | 1.975 |
| | | | | | | | Mimimum | 8.125 | 8.115 | -0.370 | 15.313 | 15.208 | -1.215 |
| | | | | | | | Mean | 8.784 | 8.781 | -0.037 | 15.465 | 15.576 | 0.716 |
| | | | | | | | Std Dev | 0.250 | 0.248 | 0.081 | 0.069 | 0.118 | 0.630 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.457 | 9.465 | 0.182 | 23.280 | 23.340 | 1.867 |
| | | | | | | | Mimimum | 8.108 | 8.108 | -0.042 | 22.370 | 22.370 | -1.454 |
| | | | | | | | Mean | 8.771 | 8.777 | 0.079 | 22.845 | 22.954 | 0.478 |
| | | | | | | | Std Dev | 0.248 | 0.248 | 0.039 | 0.170 | 0.179 | 0.666 |

# IHLP5050FDER100M5A

| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| 4 | Temperature Cycling | IEC-60068, Part 2.14 test group Na | -55°C to +125°C (+155° C for -5A models) dwell time = 30 min. transfer time ≤10 sec. no. of cycles = 1000 unpowered initial (0 cycles) and final 1000 cycles). Readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 77 | -55 deg. C | Maximum | 9.319 | 9.467 | 2.590 | 10.996 | 10.885 | 0.859 |
| | | | | | | | Mimimum | 8.276 | 8.466 | 1.585 | 10.561 | 10.548 | -2.901 |
| | | | | | | | Mean | 8.721 | 8.902 | 2.079 | 10.756 | 10.669 | -0.806 |
| | | | | | | | Std Dev | 0.227 | 0.219 | 0.230 | 0.072 | 0.064 | 0.602 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.388 | 9.531 | 2.562 | 15.763 | 15.591 | 0.003 |
| | | | | | | | Mimimum | 8.338 | 8.532 | 1.525 | 15.311 | 15.266 | -1.675 |
| | | | | | | | Mean | 8.779 | 8.960 | 2.059 | 15.530 | 15.417 | -0.728 |
| | | | | | | | Std Dev | 0.229 | 0.218 | 0.247 | 0.090 | 0.076 | 0.335 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.347 | 9.699 | 4.581 | 23.520 | 23.380 | 3.373 |
| | | | | | | | Mimimum | 8.339 | 8.676 | 3.557 | 21.940 | 22.620 | -1.334 |
| | | | | | | | Mean | 8.758 | 9.109 | 4.011 | 22.967 | 23.014 | 0.215 |
| | | | | | | | Std Dev | 0.222 | 0.224 | 0.225 | 0.294 | 0.179 | 0.875 |

| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| 7 | Biased Humidity | IEC-60068 Part 2-67 | emperature = 85°C ±20°C Humidity = 85% ±5% RH Duration = 1000 hours Power = No Power Initial (0hr.) and final (1000hr.) readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 77 | -55 deg. C | Maximum | 9.190 | 9.169 | 0.354 | 10.974 | 10.969 | 2.395 |
| | | | | | | | Mimimum | 8.070 | 8.088 | -0.406 | 10.496 | 10.565 | -2.681 |
| | | | | | | | Mean | 8.727 | 8.723 | -0.046 | 10.762 | 10.779 | 0.167 |
| | | | | | | | Std Dev | 0.233 | 0.229 | 0.151 | 0.098 | 0.077 | 0.986 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.241 | 9.207 | 0.245 | 15.760 | 15.722 | 3.083 |
| | | | | | | | Mimimum | 8.129 | 8.140 | -0.503 | 14.986 | 15.142 | -2.180 |
| | | | | | | | Mean | 8.784 | 8.773 | -0.125 | 15.411 | 15.494 | 0.552 |
| | | | | | | | Std Dev | 0.234 | 0.227 | 0.138 | 0.164 | 0.105 | 1.173 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.237 | 9.241 | 0.666 | 23.310 | 23.410 | 3.244 |
| | | | | | | | Mimimum | 8.154 | 8.208 | -0.125 | 22.180 | 21.880 | -3.697 |
| | | | | | | | Mean | 8.782 | 8.805 | 0.263 | 22.793 | 23.009 | 0.952 |
| | | | | | | | Std Dev | 0.230 | 0.222 | 0.146 | 0.199 | 0.218 | 1.051 |

# IHLP5050FDER100M5A

| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| 8 | Operational Life | MIL-STD-202, Method 108A | Temperature = 85°C for -1A/A1 models. Temperature =115° C for -5A models. Duration = 2000hrs. Pow er = As noted on the test request. Readings a 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 77 | -55 deg. C | Maximum | 9.423 | 9.607 | 2.745 | 10.994 | 11.045 | 1.880 |
| | | | | | | | Mimimum | 8.163 | 8.336 | 1.661 | 10.676 | 10.700 | -1.690 |
| | | | | | | | Mean | 8.727 | 8.927 | 2.292 | 10.786 | 10.816 | 0.277 |
| | | | | | | | Std Dev | 0.242 | 0.243 | 0.245 | 0.068 | 0.072 | 0.714 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.512 | 9.733 | 3.359 | 15.969 | 15.857 | 1.460 |
| | | | | | | | Mimimum | 8.221 | 8.427 | 1.989 | 15.408 | 15.402 | -0.939 |
| | | | | | | | Mean | 8.783 | 9.025 | 2.757 | 15.604 | 15.592 | -0.072 |
| | | | | | | | Std Dev | 0.246 | 0.248 | 0.290 | 0.129 | 0.113 | 0.595 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.502 | 9.749 | 4.206 | 23.470 | 23.560 | 1.626 |
| | | | | | | | Mimimum | 8.235 | 8.504 | 2.349 | 22.750 | 22.400 | -1.582 |
| | | | | | | | Mean | 8.788 | 9.080 | 3.329 | 23.144 | 23.177 | 0.148 |
| | | | | | | | Std Dev | 0.240 | 0.251 | 0.404 | 0.176 | 0.179 | 0.629 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9 | External Visual | MIL-STD-883G Method 2009.9 | Inspect construction and workmanship. | Pass all criteria as defined in DPS-11,865 VA1 | All | na | Pass |
| 10 | Physical Dimensions | JESD22 Method JB-100 | Verify physical dimensions per part specification | All parts within dimensional tolerance per data sheet | 30 | na | Pass |
| 12 | Resistance to Solvents | MIL-STD-202G Method 215K | Add Aqueous wash chemical. OKEM Clean or equivalent. Do not use banned solvents. | Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial | 5 | na | Pass |

# IHLP5050FDER100M5A

| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| 13 | Mechanical Shock | IEC-60068 part 2.27 test group Ea with precondition per 0 above | Pulse Shape-Half Sine Normal Pulse Length 6ms Peak acceleration-100g No. shocks-6 each in both directions of each axis (total of 36) Initial and final readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 30 | -55 deg. C | Maximum | 9.314 | 9.320 | 0.221 | 10.929 | 10.980 | 0.851 |
| | | | | | | | Mimimum | 8.361 | 8.364 | -0.093 | 10.640 | 10.638 | -0.215 |
| | | | | | | | Mean | 8.801 | 8.809 | 0.088 | 10.744 | 10.777 | 0.312 |
| | | | | | | | Std Dev | 0.232 | 0.230 | 0.077 | 0.077 | 0.091 | 0.264 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.383 | 9.379 | 0.166 | 15.629 | 15.626 | 0.330 |
| | | | | | | | Mimimum | 8.422 | 8.421 | -0.100 | 15.369 | 15.278 | -1.123 |
| | | | | | | | Mean | 8.859 | 8.862 | 0.041 | 15.473 | 15.452 | -0.132 |
| | | | | | | | Std Dev | 0.236 | 0.232 | 0.069 | 0.061 | 0.073 | 0.378 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.340 | 9.352 | 0.203 | 23.250 | 23.210 | 3.135 |
| | | | | | | | Mimimum | 8.409 | 8.420 | -0.041 | 22.290 | 22.530 | -0.879 |
| | | | | | | | Mean | 8.843 | 8.853 | 0.116 | 22.791 | 22.921 | 0.576 |
| | | | | | | | Std Dev | 0.229 | 0.230 | 0.039 | 0.253 | 0.167 | 0.878 |

| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| 14 | Vibration | IEC-60068 PART 2-6 TEST GROUP Fc. With precondition per 0 above | Pulse Shape-sine wave range of frequency 1 10-55Hz. Amplitude ±0.75mm Range of frequency 2 55-2000Hz Amplitude; 10G Frequency Sweep: 1 oct./min. Duration: 24 h each of 3 axis. Initial and final readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 30 | -55 deg. C | Maximum | 9.427 | 9.423 | 0.264 | 11.047 | 10.808 | 0.288 |
| | | | | | | | Mimimum | 8.293 | 8.309 | -0.195 | 10.663 | 10.626 | -2.462 |
| | | | | | | | Mean | 8.708 | 8.718 | 0.116 | 10.786 | 10.724 | -0.571 |
| | | | | | | | Std Dev | 0.248 | 0.244 | 0.099 | 0.079 | 0.050 | 0.778 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.482 | 9.472 | 0.244 | 15.694 | 15.608 | 0.367 |
| | | | | | | | Mimimum | 8.349 | 8.363 | -0.105 | 15.383 | 15.239 | -1.706 |
| | | | | | | | Mean | 8.763 | 8.771 | 0.095 | 15.495 | 15.422 | -0.475 |
| | | | | | | | Std Dev | 0.249 | 0.244 | 0.084 | 0.066 | 0.089 | 0.546 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.454 | 9.448 | 0.326 | 23.240 | 23.040 | -0.087 |
| | | | | | | | Mimimum | 8.342 | 8.353 | -0.065 | 22.670 | 22.280 | -3.966 |
| | | | | | | | Mean | 8.754 | 8.765 | 0.132 | 23.055 | 22.743 | -1.352 |
| | | | | | | | Std Dev | 0.244 | 0.241 | 0.079 | 0.127 | 0.209 | 0.883 |

# IHLP5050FDER100M5A

| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| | Bump | IEC-60068 part 2-29 test group Eb with precondition per 0 above. | Pulse shape: half sine Nominal pulse length: 6 ms Peak Acceleration: 40g No. of shocks: 4000 each mechanical axis.Initial and final readings at LT/RT/HT | L=±20% of initial, DCR =±20% of initial | 30 | -55 deg. C | Maximum | 9.025 | 9.023 | 0.285 | 11.086 | 10.961 | -0.456 |
| | | | | | | | Mimimum | 8.438 | 8.462 | -0.024 | 10.739 | 10.663 | -1.128 |
| | | | | | | | Mean | 8.703 | 8.717 | 0.157 | 10.858 | 10.776 | -0.753 |
| | | | | | | | Std Dev | 0.165 | 0.161 | 0.077 | 0.100 | 0.085 | 0.179 |
| | | | | | | +25 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.087 | 9.082 | 0.214 | 15.642 | 15.633 | 0.000 |
| | | | | | | | Mimimum | 8.502 | 8.520 | -0.067 | 15.410 | 15.392 | -0.408 |
| | | | | | | | Mean | 8.762 | 8.767 | 0.048 | 15.514 | 15.502 | -0.075 |
| | | | | | | | Std Dev | 0.167 | 0.163 | 0.074 | 0.063 | 0.067 | 0.077 |
| | | | | | | +155 deg. C | | Initial | Final | %Δ | Initial | Final | %Δ |
| | | | | | | | Maximum | 9.067 | 9.077 | 0.217 | 23.280 | 23.210 | 0.087 |
| | | | | | | | Mimimum | 8.507 | 8.521 | -0.041 | 22.870 | 22.760 | -0.558 |
| | | | | | | | Mean | 8.753 | 8.764 | 0.126 | 23.074 | 23.032 | -0.181 |
| | | | | | | | Std Dev | 0.165 | 0.164 | 0.051 | 0.103 | 0.111 | 0.176 |

# IHLP5050FDER100M5A

| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| 15 | Resistance to Solder Heat | MIL-STD-202G Method 210F Condition K | IR/convection reflow. 250 ± 5°C for 30 ± 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s | L=±20% of initial, DCR =±20% of initial | 30 | +25 deg. C | Maximum | 9.122 | 9.135 | 1.619 | 15.872 | 15.817 | -0.044 |
| | | | | | | | Mimimum | 8.250 | 8.350 | -0.348 | 15.584 | 15.556 | -0.599 |
| | | | | | | | Mean | 8.722 | 8.775 | 0.624 | 15.731 | 15.692 | -0.251 |
| | | | | | | | Std Dev | 0.250 | 0.223 | 0.552 | 0.062 | 0.060 | 0.103 |
| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | 25KV | %Δ | Initial | 25KV | %Δ |
| 17 | ESD | AEC-Q200-002 | Determine the Classification of the part. | L=±20% of initial, DCR =±20% of initial | 15 | +25 deg. C | Maximum | 9.196 | 9.229 | 1.096 | 15.811 | 15.826 | 0.599 |
| | | | | | | | Mimimum | 8.438 | 8.513 | 0.003 | 15.576 | 15.601 | -0.753 |
| | | | | | | | Mean | 8.934 | 8.987 | 0.601 | 15.678 | 15.693 | 0.096 |
| | | | | | | | Std Dev | 0.176 | 0.170 | 0.245 | 0.076 | 0.065 | 0.334 |
| 18 | Solderability | J-STD-002C Method B1 | 4 hours @ 155°C dry heat @ 255°C. 90° dipping angle. | 95% or greater coverage on "A" (seating plane) per J-STD-002C | 15 | NA | Pass | | | | | | |

# IHLP5050FDER100M5A

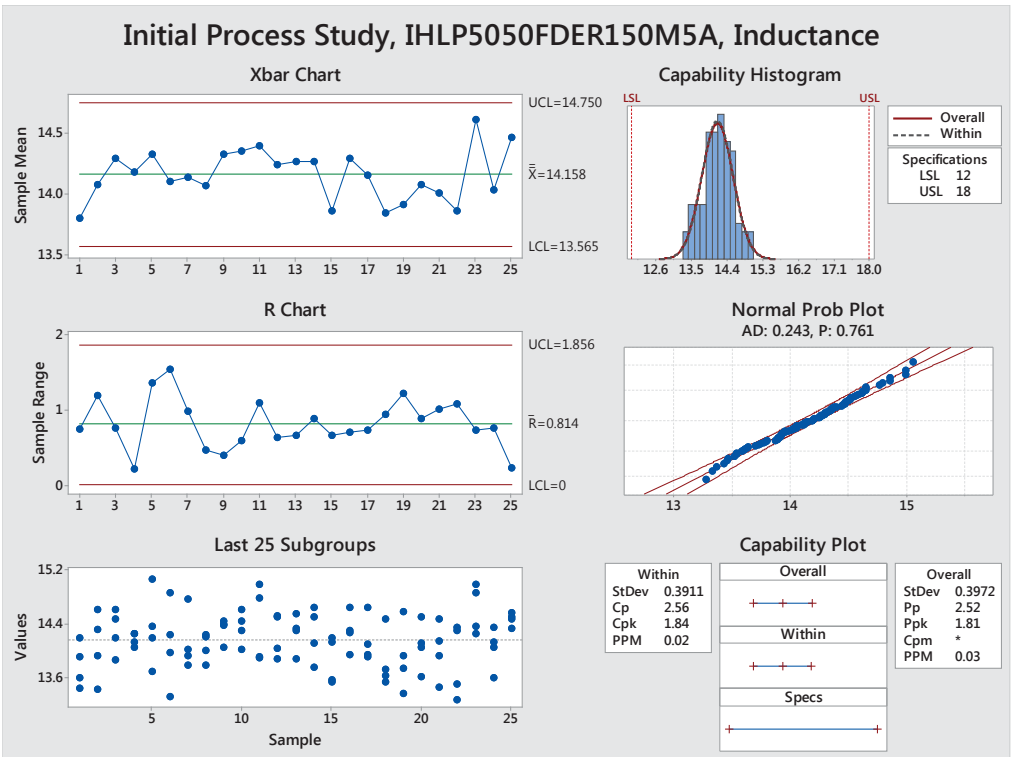
| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | Electrical Characterization | User Specification | Min, Max, Mean, and Standard Deviation @ Min (-55C), Room, and Max (+125C) operating temperatures. After mounted, allow +/-5% shift DCR at room temp. -55C/+125C DCR Max calculated using temp conversion for copper: $R_2 = [(T_2 + 234.5) / (234.5 + T_A)] * 1.05R_A$ (A = Ambient, 2 = new con) | Final Test: L=±20% of initial, DCR per calculated limits described in test conditions. L test for -55C & +125C = ±20% initial | 30 | | | May | [redacted] | | Initial | [redacted] | |
| | | | | | -55 deg. C | Maximum | 9.427 | | | 11.047 | | |
| | | | | | | Mimimum | 8.293 | | | 10.663 | | |
| | | | | | | Mean | 8.708 | | | 10.786 | | |
| | | | | | | Std Dev | 0.248 | | | 0.079 | | |
| | | | | | +25 deg. C | | Initial | | | Initial | | |
| | | | | | | Maximum | 9.482 | | | 15.694 | | |
| | | | | | | Mimimum | 8.349 | | | 15.383 | | |
| | | | | | | Mean | 8.763 | | | 15.495 | | |
| | | | | | | Std Dev | 0.249 | | | 0.066 | | |
| | | | | | +155 deg. C | | Initial | | | Initial | | |
| | | | | | | Maximum | 9.454 | | | 23.240 | | |
| | | | | | | Mimimum | 8.342 | | | 22.670 | | |
| | | | | | | Mean | 8.754 | | | 23.055 | | |
| | | | | | | Std Dev | 0.244 | | | 0.127 | | |
| | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| 21 | Board Flex | AEC-Q200-005 Appendix 2 | 2mm minimum flex for 60 (+5) sec | Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial | 30 | +25 deg. C | Maximum | 9.516 | 9.558 | 0.444 | 15.784 | 15.818 | 0.249 |
| | | | | | | | Mimimum | 8.355 | 8.374 | 0.169 | 15.600 | 15.635 | -0.025 |
| | | | | | | | Mean | 8.824 | 8.851 | 0.312 | 15.711 | 15.730 | 0.123 |
| | | | | | | | Std Dev | 0.299 | 0.301 | 0.057 | 0.052 | 0.048 | 0.084 |
| | | | | | | | | Inductance (µH) | | | DC Resistance (mΩ) | | |
| | | | | | | | | Initial | Final | %Δ | Initial | Final | %Δ |
| 22 | Terminal Strength | AEC-Q200-006 Appendix 1 | Force of 1.8kg (17.7 N) for 60 seconds | Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial | 30 | +25 deg. C | Maximum | 9.480 | 9.475 | 0.294 | 15.834 | 15.885 | 0.414 |
| | | | | | | | Mimimum | 8.342 | 8.355 | -0.240 | 15.540 | 15.535 | -0.184 |
| | | | | | | | Mean | 8.919 | 8.938 | 0.114 | 15.674 | 15.698 | 0.182 |
| | | | | | | | Std Dev | 0.272 | 0.270 | 0.138 | 0.077 | 0.078 | 0.137 |

# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

## Initial Process Study
## IHLP5050FDER150M5A, Inductance

| Inductance (uH) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 14.2 | 26 | 14.77 | 51 | 13.89 | 76 | 14.59 |
| 2 | 13.91 | 27 | 13.8 | 52 | 14.3 | 77 | 13.63 |
| 3 | 13.46 | 28 | 13.93 | 53 | 13.77 | 78 | 14.51 |
| 4 | 13.61 | 29 | 14.21 | 54 | 14.51 | 79 | 14.05 |
| 5 | 14.32 | 30 | 14.25 | 55 | 14.65 | 80 | 14.12 |
| 6 | 14.61 | 31 | 13.79 | 56 | 14.12 | 81 | 13.94 |
| 7 | 13.93 | 32 | 14.01 | 57 | 13.54 | 82 | 14.15 |
| 8 | 13.43 | 33 | 14.06 | 58 | 14.13 | 83 | 13.47 |
| 9 | 14.2 | 34 | 14.38 | 59 | 13.58 | 84 | 14.48 |
| 10 | 14.62 | 35 | 14.45 | 60 | 14.19 | 85 | 14.3 |
| 11 | 13.87 | 36 | 14.4 | 61 | 14.3 | 86 | 14.35 |
| 12 | 14.47 | 37 | 14.03 | 62 | 13.95 | 87 | 13.52 |
| 13 | 14.26 | 38 | 14.44 | 63 | 14.28 | 88 | 13.28 |
| 14 | 14.13 | 39 | 14.31 | 64 | 14.65 | 89 | 14.26 |
| 15 | 14.26 | 40 | 14.62 | 65 | 14.1 | 90 | 14.86 |
| 16 | 14.05 | 41 | 14.99 | 66 | 14.65 | 91 | 14.36 |
| 17 | 15.06 | 42 | 13.9 | 67 | 13.95 | 92 | 14.99 |
| 18 | 13.7 | 43 | 13.92 | 68 | 13.92 | 93 | 13.6 |
| 19 | 14.19 | 44 | 14.79 | 69 | 13.54 | 94 | 14.05 |
| 20 | 14.37 | 45 | 14.52 | 70 | 14.47 | 95 | 14.14 |
| 21 | 14.86 | 46 | 14.04 | 71 | 13.64 | 96 | 14.35 |
| 22 | 13.98 | 47 | 14.5 | 72 | 13.73 | 97 | 14.5 |
| 23 | 13.33 | 48 | 13.89 | 73 | 13.37 | 98 | 14.34 |
| 24 | 14.24 | 49 | 14.33 | 74 | 13.75 | 99 | 14.57 |
| 25 | 14.03 | 50 | 14.55 | 75 | 13.94 | 100 | 14.47 |

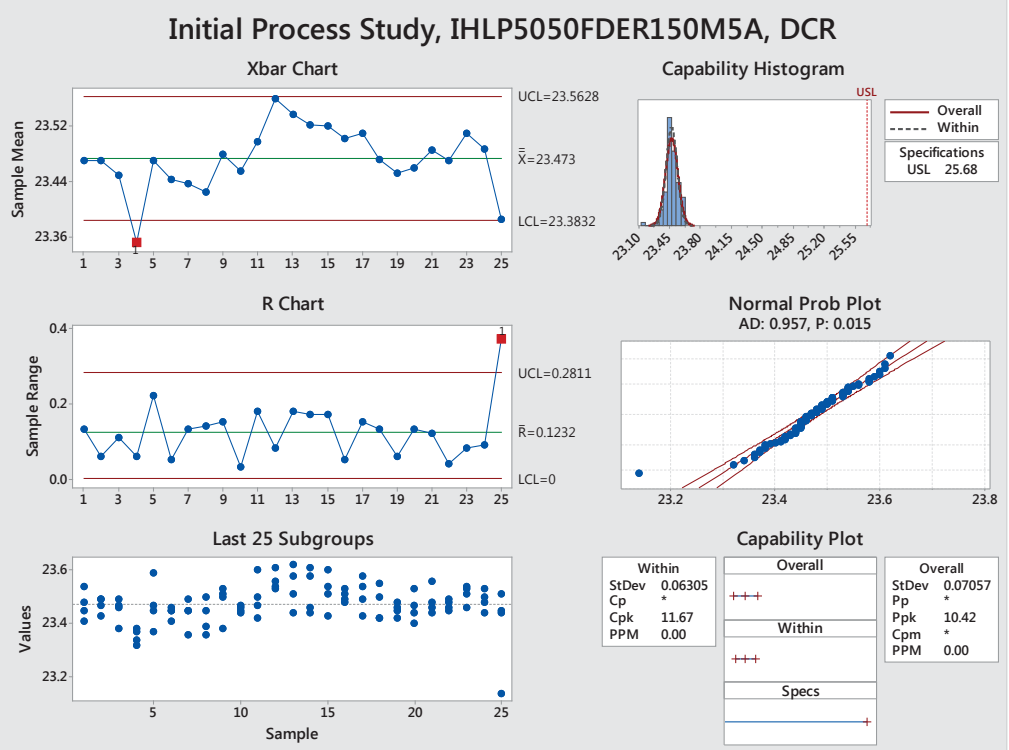


# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

## Initial Process Study
## IHLP5050FDER150M5A, DC Resistance

| DCR (mOhm) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 23.54 | 26 | 23.45 | 51 | 23.51 | 76 | 23.48 |
| 2 | 23.48 | 27 | 23.45 | 52 | 23.44 | 77 | 23.47 |
| 3 | 23.45 | 28 | 23.36 | 53 | 23.44 | 78 | 23.4 |
| 4 | 23.41 | 29 | 23.5 | 54 | 23.61 | 79 | 23.53 |
| 5 | 23.49 | 30 | 23.45 | 55 | 23.46 | 80 | 23.44 |
| 6 | 23.47 | 31 | 23.39 | 56 | 23.58 | 81 | 23.48 |
| 7 | 23.49 | 32 | 23.36 | 57 | 23.43 | 82 | 23.46 |
| 8 | 23.43 | 33 | 23.51 | 58 | 23.6 | 83 | 23.56 |
| 9 | 23.49 | 34 | 23.38 | 59 | 23.51 | 84 | 23.44 |
| 10 | 23.46 | 35 | 23.53 | 60 | 23.54 | 85 | 23.49 |
| 11 | 23.47 | 36 | 23.5 | 61 | 23.49 | 86 | 23.45 |
| 12 | 23.38 | 37 | 23.47 | 62 | 23.53 | 87 | 23.48 |
| 13 | 23.38 | 38 | 23.46 | 63 | 23.51 | 88 | 23.46 |
| 14 | 23.37 | 39 | 23.44 | 64 | 23.48 | 89 | 23.51 |
| 15 | 23.34 | 40 | 23.45 | 65 | 23.43 | 90 | 23.46 |
| 16 | 23.32 | 41 | 23.42 | 66 | 23.54 | 91 | 23.54 |
| 17 | 23.59 | 42 | 23.5 | 67 | 23.49 | 92 | 23.53 |
| 18 | 23.47 | 43 | 23.47 | 68 | 23.58 | 93 | 23.53 |
| 19 | 23.45 | 44 | 23.6 | 69 | 23.42 | 94 | 23.44 |
| 20 | 23.37 | 45 | 23.54 | 70 | 23.55 | 95 | 23.5 |
| 21 | 23.45 | 46 | 23.56 | 71 | 23.42 | 96 | 23.48 |
| 22 | 23.45 | 47 | 23.53 | 72 | 23.5 | 97 | 23.51 |
| 23 | 23.46 | 48 | 23.61 | 73 | 23.46 | 98 | 23.14 |
| 24 | 23.41 | 49 | 23.58 | 74 | 23.45 | 99 | 23.45 |
| 25 | 23.49 | 50 | 23.62 | 75 | 23.42 | 100 | 23.44 |

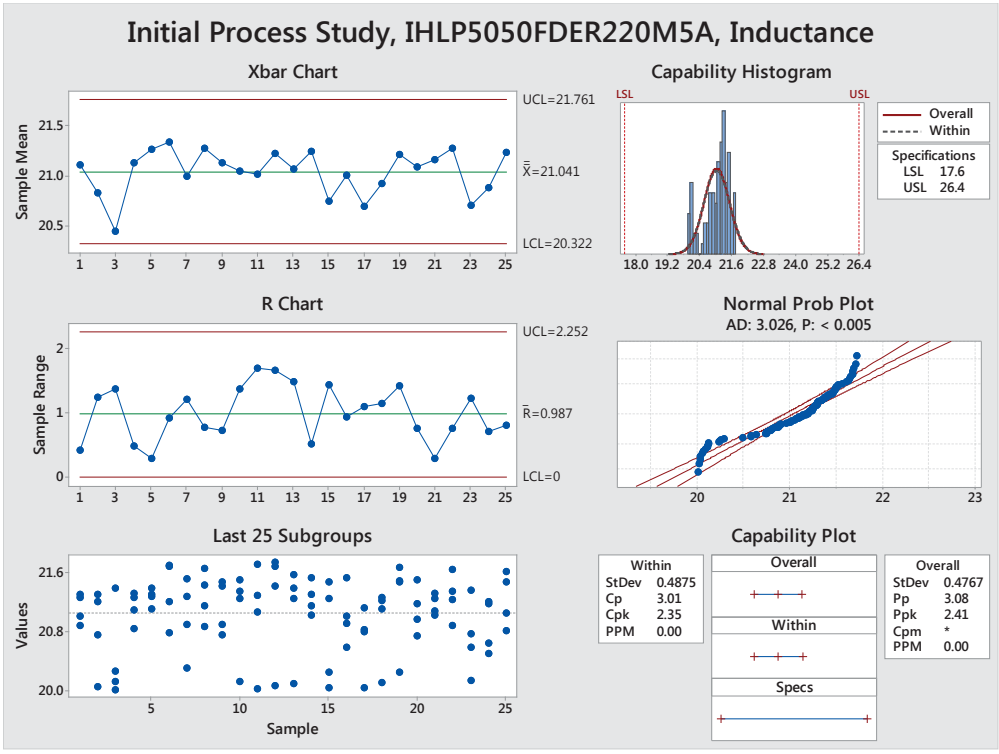


# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

## Initial Process Study
## IHLP5050FDER220M5A, Inductance

| Inductance (uH) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 21.2993 | 26 | 20.8877 | 51 | 21.5691 | 76 | 21.4855 |
| 2 | 21.0088 | 27 | 21.2753 | 52 | 21.2484 | 77 | 21.1725 |
| 3 | 20.8839 | 28 | 21.5063 | 53 | 21.0146 | 78 | 21.4968 |
| 4 | 21.2631 | 29 | 21.6493 | 54 | 21.3035 | 79 | 20.7373 |
| 5 | 21.2953 | 30 | 21.1476 | 55 | 21.1449 | 80 | 20.965 |
| 6 | 20.054 | 31 | 20.871 | 56 | 21.5271 | 81 | 21.068 |
| 7 | 20.7485 | 32 | 21.4309 | 57 | 21.4614 | 82 | 21.0158 |
| 8 | 21.2014 | 33 | 20.7492 | 58 | 20.0304 | 83 | 21.3086 |
| 9 | 20.0126 | 34 | 20.8974 | 59 | 20.2415 | 84 | 21.2418 |
| 10 | 20.1174 | 35 | 21.4734 | 60 | 21.2463 | 85 | 21.226 |
| 11 | 20.2585 | 36 | 21.4163 | 61 | 20.9104 | 86 | 21.6348 |
| 12 | 21.3873 | 37 | 21.2416 | 62 | 20.5877 | 87 | 20.8786 |
| 13 | 21.3146 | 38 | 20.1251 | 63 | 21.5244 | 88 | 21.3424 |
| 14 | 20.8408 | 39 | 21.4899 | 64 | 21.0005 | 89 | 20.7612 |
| 15 | 21.0949 | 40 | 21.3396 | 65 | 20.8008 | 90 | 20.1272 |
| 16 | 21.2552 | 41 | 20.0194 | 66 | 20.0319 | 91 | 20.5845 |
| 17 | 21.38 | 42 | 21.2837 | 67 | 20.8196 | 92 | 21.3515 |
| 18 | 21.2985 | 43 | 21.7132 | 68 | 21.1187 | 93 | 20.4936 |
| 19 | 21.2706 | 44 | 21.0645 | 69 | 21.2596 | 94 | 20.6414 |
| 20 | 21.1028 | 45 | 21.6791 | 70 | 21.2113 | 95 | 21.1732 |
| 21 | 21.1945 | 46 | 21.4134 | 71 | 20.1113 | 96 | 21.1967 |
| 22 | 21.6954 | 47 | 20.0677 | 72 | 21.0978 | 97 | 21.4697 |
| 23 | 21.6772 | 48 | 21.7301 | 73 | 21.6584 | 98 | 21.0505 |
| 24 | 20.7833 | 49 | 21.3804 | 74 | 21.4719 | 99 | 21.6083 |
| 25 | 20.2962 | 50 | 20.0862 | 75 | 20.2449 | 100 | 20.8067 |

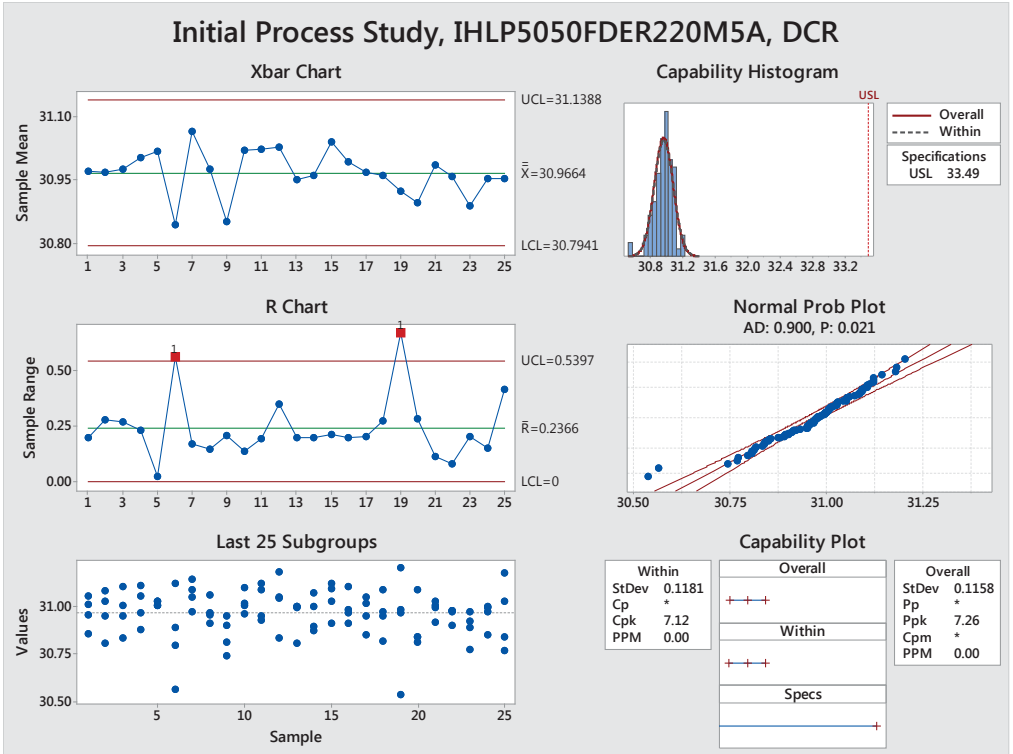


# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

## Initial Process Study
## IHLP5050FDER220M5A, DC Resistance

| | DCR (mOhm) | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 31.055 | 26 | 31.145 | 51 | 30.808 | 76 | 30.537 |
| 2 | 30.857 | 27 | 31.052 | 52 | 30.996 | 77 | 30.839 |
| 3 | 30.955 | 28 | 30.975 | 53 | 31.073 | 78 | 31.091 |
| 4 | 31.01 | 29 | 30.956 | 54 | 30.893 | 79 | 30.812 |
| 5 | 31.082 | 30 | 30.914 | 55 | 30.875 | 80 | 30.84 |
| 6 | 30.951 | 31 | 31.06 | 56 | 31 | 81 | 30.993 |
| 7 | 31.029 | 32 | 30.968 | 57 | 30.914 | 82 | 31.005 |
| 8 | 30.807 | 33 | 30.949 | 58 | 31.026 | 83 | 31.027 |
| 9 | 30.837 | 34 | 30.901 | 59 | 31.093 | 84 | 30.915 |
| 10 | 31.106 | 35 | 30.743 | 60 | 31.122 | 85 | 30.979 |
| 11 | 30.95 | 36 | 30.814 | 61 | 31.106 | 86 | 30.973 |
| 12 | 31.007 | 37 | 31.097 | 62 | 30.986 | 87 | 30.901 |
| 13 | 30.881 | 38 | 31.007 | 63 | 30.966 | 88 | 30.978 |
| 14 | 31.111 | 39 | 30.96 | 64 | 30.91 | 89 | 30.921 |
| 15 | 30.968 | 40 | 31.019 | 65 | 30.952 | 90 | 30.771 |
| 16 | 31.054 | 41 | 30.931 | 66 | 31.052 | 91 | 30.891 |
| 17 | 31.006 | 42 | 31.088 | 67 | 31.014 | 92 | 30.97 |
| 18 | 31.028 | 43 | 30.95 | 68 | 30.85 | 93 | 30.998 |
| 19 | 31.005 | 44 | 31.123 | 69 | 31.091 | 94 | 30.85 |
| 20 | 31.027 | 45 | 31.182 | 70 | 30.975 | 95 | 30.971 |
| 21 | 30.564 | 46 | 30.835 | 71 | 30.953 | 96 | 30.994 |
| 22 | 30.796 | 47 | 31.043 | 72 | 30.819 | 97 | 31.025 |
| 23 | 30.891 | 48 | 31.052 | 73 | 31.203 | 98 | 31.179 |
| 24 | 31.122 | 49 | 31.002 | 74 | 30.983 | 99 | 30.841 |
| 25 | 31.086 | 50 | 30.998 | 75 | 30.966 | 100 | 30.768 |



# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

Use the control buttons below to navigate through the PPAP sections.

Section 12:  Qualified Laboratories

Vishay / Dale Electronics
1505 East Hway 50 Yankton, SD 57078, USA Phone (605) 665-9301 Fax (605) 668-4247
ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DISCRETE SEMICONDUCTORS AND PASSIVE COMPONENTS

# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

Use the control buttons below to navigate through the PPAP sections.

## Section 13: Appearance Approval Report

Inductors, like many other electronic components are specified for their electrical properties. There are no specific requirements stated for the physical appearance of inductors, e.g. color of inductors. Therefore, the Appearance Approval Report does not apply in this case.

# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

Use the control buttons below to navigate through the PPAP sections.

## Section 14: Sample Product

Sample product from the Vishay Manufacturing Facility is available upon request

# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

Use the control buttons below to navigate through the PPAP sections.

## Section 15: Master Sample

Master Sample(s) will be retained at the Vishay Manufacturing Facility with a copy of the PPAP

# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

Use the control buttons below to navigate through the PPAP sections.

## Section 16: Checking Aids

Checking Aids are not required for this electronic component

Vishay / Dale Electronics
1505 East Hway 50 Yankton, SD 57078, USA Phone (605) 665-9301 Fax (605) 668-4247

# Production Part Approval Process

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Use the control buttons below to navigate through the PPAP sections.

Section 17:  Records of Compliance

**Moisture Sensitivity Level: 1**

# Production Part Approval Process

**The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements**

Use the control buttons below to navigate through the PPAP sections.

## Section 19: Bulk Material Requirements

Bulk Material Requirements do not apply to this Electronic Component.

# IHLP Standards of Manufacture

## IHLP INTRODUCTION SURFACE IRREGULARITIES CRITERIA FOR REJECTION SUMMARY

## INTRODUCTION

### Scope

This document was written for the purpose of helping customers better understand the product they are purchasing. It will give the customer an idea as to the type of cosmetic irregularities that may occur from time to time during the manufacture of the component itself or during customer use of the component.

This document also discusses the criteria that have been developed for rejection of irregularities that are determined to be excessive.

While it would be desirable to have cosmetically perfect IHLP inductors, the powdered iron manufacturing technique has cosmetic limitations.

Certified test labs have performed extensive environmental testing on IHLP's with and without cosmetic imperfections according to AEC-Q200 standards for such tests as thermal shock, mechanical shock, vibration, humidity and others. This testing has shown that the cosmetic imperfections listed in this document do not affect the performance or reliability of the IHLP inductor. Test results are available upon request.

### Product

The IHLP inductor is unique from most inductors. The inductor body is a soft magnetic composite (SMC), not a ferrite. It is made from an iron powder mixture and cemented together using a resin binder. This powder mixture, when pressed around the inductor coil, greatly enhances the electrical properties of the inductor and gives protection from environmental forces. After pressing, the component is cured in an oven to increase the bonding strength of the resin binders with the iron powder, yielding excellent electrical and physical properties.

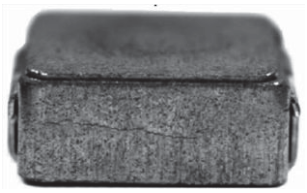
**The IHLP inductor provides the best combination of:**

- Inductance
- Low Core Loss
- Saturation
- Temperature Stability
- Smallest Footprint
- Lowest Profile

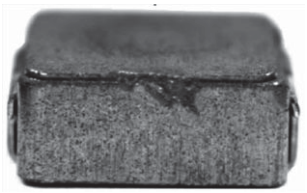
### Surface irregularities

The following pages include descriptions of the most common irregularities seen on IHLP inductors. Common causes are described along with variations in their magnitude. Customers may at some time see one or all of these irregularities.

Those that are determined to adversely affect the customer's use of the component are rejected, but minor (acceptable) irregularities will occasionally be present. With the use of this guide, a customer will better understand the effect of each irregularity.



Cracks



Chips

Oxidation

APPLICATION NOTE

# IHLP Standards of Manufacture

## CRACKS

Cracks within the inductor body are unavoidable during the manufacturing process. Small cracks are caused by die wall friction when the parts are ejected during the pressing process and by expansion of the coil during the process of curing the resin binder in the powdered iron body. Unlike ferrite material, cracks on the IHLP body do not affect the electrical performance of the component.

Reliability testing has shown that even cracks in excess of 0.005" will not cause the component to fail electrically or physically in field application. Acceptance widths are adopted based on the ability to detect cracks both at the component and circuit level.

Terminal area crack, acceptable

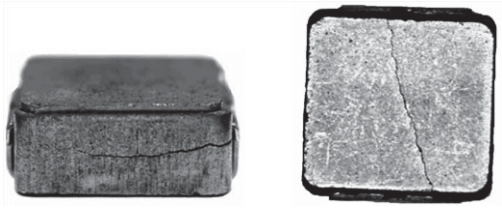
Cracks coming from the top corner of the terminal are a normal occurrence and are caused by terminal expansion during curing operations.

Negligible crack, acceptable

Negligible cracks are those that are nearly invisible without magnification.

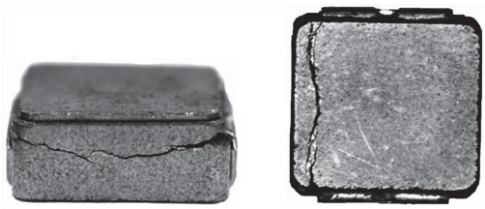
Minor crack, acceptable

Minor cracks are those that are visible without magnification but are not apparent without close inspection.



Moderate crack, rejectable

Moderate cracks are those that are obvious upon examination and continue across most of the component.



Major crack, rejectable

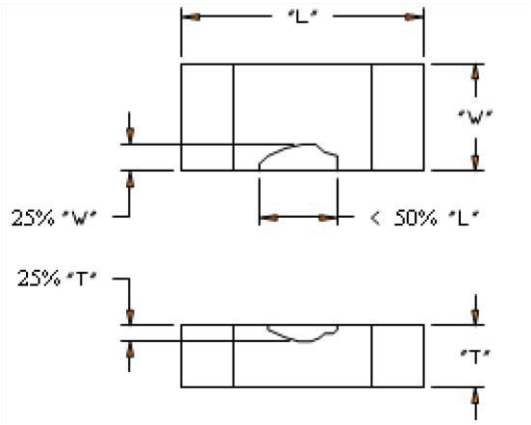
Major cracks are those that are obvious to a customer and would possibly result in large chip-outs that would expose the coil and lead frame.

APPLICATION NOTE

# IHLP Standards of Manufacture

## CHIPS

Chipping of the inductor body can occur during normal processing and testing of the inductor. The acceptance criteria for chipping vary with the size of the component, but current acceptance standards are based on IPCA-610. The effect of chipping is negligible as long as the inductor coil is not showing. See IPC standard for class 1 and 2 components below.




| | |
|---|---|
| **T** | 25 % of the thickness |
| **W** | 25 % of the width |
| **L** | 50 % of the length |

Chips typically occur on the edges and corners of the inductor body. They are slightly darker in color and rougher in appearance than the surrounding material.

Minor chipping, acceptable

Minor chips in the inductor body are those that are typically shallow imperfections that occur on the corners and edge of components. No coil wire or lead frame is showing and the chip does not affect the performance or reliability of the component.

Major chipping, rejectable

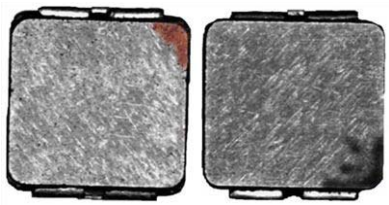
Major chips in the inductor body are those that are very obvious to the customer and may expose the wire coil or lead frame.

## OXIDATION

The IHLP inductor is predominately iron and oxidation may occur in a small percentage of the inductors. Resin binders give moderate protection, but some slight oxidation may occur. All components should be stored away from heat, humidity and ionized atmospheres as much as possible before mounting.

Basic steps should be taken in order to limit surface oxidation, including keeping the IHLP inductors sealed in their packaging until PCB mounting.

In the case that oxidation does occur, the effects are contained to the surface of the component and do not penetrate into the core material. No electrical effects have ever been documented due to oxidation of the IHLP product. Oxidation should never be considered a reliability risk.



Top view

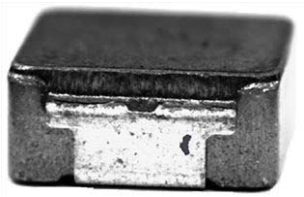
Side view

# IHLP Standards of Manufacture

## OTHER

A very small number of other irregularities have been reported. These occur at an exceedingly low rate and typically do not affect the components electrically. These include:

Foreign material may be seen pressed into the upper terminals. This material is of the same material as the inductor body and should not be a reason for rejection unless solderability is affected.



Foreign material: Acceptable

Scratches may be seen on the surface of the inductor body. Scratches are an acceptable surface irregularity.

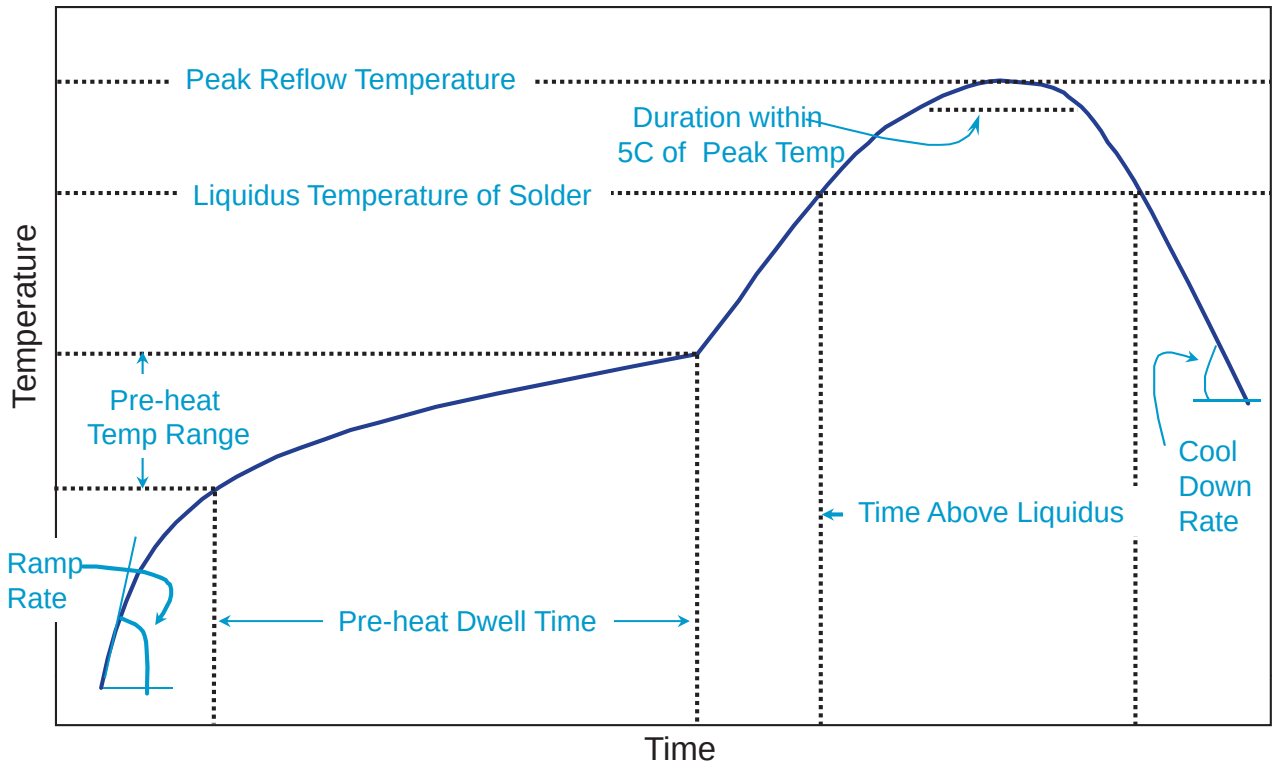
Scratch: Acceptable

## SUMMARY

The IHLP inductor is comprised of an iron powder body compressed around a coil. Due to the fact that this iron powder body is not solid like ferrite material, irregularities such as cracks and chips do not affect the electrical properties, or the reliability of the component. Criteria have been determined for the acceptability of the components that allow for a robust manufacturing process as well as an acceptable degree of cosmetic irregularity.

Reliability testing has been done on the effects of cracking of the iron powder body and on the oxidation of the iron particles that are present on the surface. Testing has shown no reliability issues from either of these cosmetic differences.

# Typical Reflow Soldering Profile



# Lead Free Solder (SnAgCu) Reflow Profile Attributes

| Profile Attribute | Value |
|---|---|
| Peak Reflow Temperature | 255(+/-5)C |
| Time within 5C of Peak Temperature | 20 seconds max |
| Liquidus Temperature of Solder | ~217C |
| Cool Down Rate | 3.5C/sec max |
| Time Above Liquidus | 30 to 90 seconds |
| Pre-heat Temperature Range | 145 to 170C |
| Pre-heat Dwell Time | 20-1200s |
| Maximum Ramp Rate | 2C/sec max |