



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

IHLP4040DZERxxxM5A

Generic PPAP

Generic PPAP

10/16/2017

Production Part Approval Process

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

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Vishay / Dale Electronics

1505 East Hwy 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

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Production Part Approval Process

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Section 1. Design Records

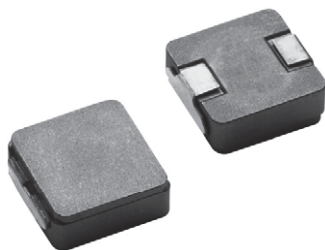
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ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DISCRETE SEMICONDUCTORS AND PASSIVE COMPONENTS



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



DESIGN SUPPORT TOOLS click logo to get started



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)
0.47	1.55	1.66	30.0	28.5	72.1
1.0	2.87	3.07	23.5	24.0	37.2
1.5	4.2	4.5	22.0	17.9	32
2.2	8.15	8.76	15	12	30.1
3.3	11.0	11.81	11.0	12.0	25.5
4.7	14.3	15.32	9.8	9.2	20.1
5.6	16.5	17.60	9.3	9.0	16.3
6.8	20.9	22.36	8.0	9.0	16.3
10	30.9	33.06	6.5	8.5	11.5
15	47.0	50.29	5.1	7.7	10.4
22	70.5	75.44	4.1	6.4	8.30
33	110	117.70	3.7	4.2	5.79
47	167	178	3.1	4.1	5.22
68	240	252	2.4	3.5	4.02

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 L₀ to drop approximately 20 %

FEATURES

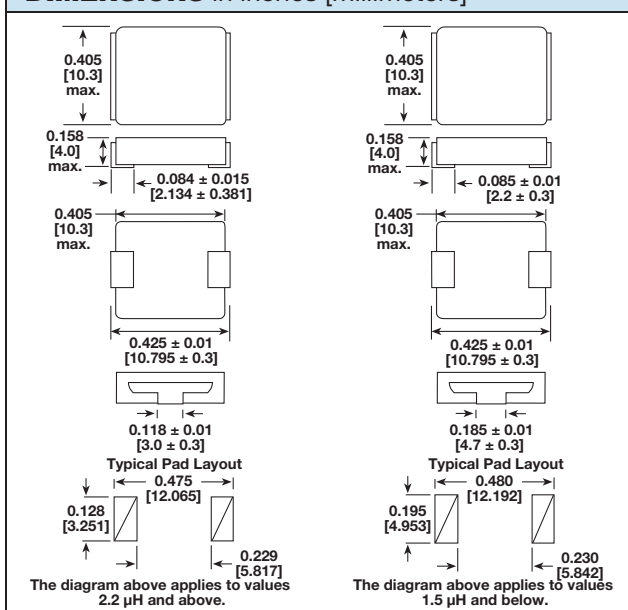
- High temperature, up to 155 °C
- Shielded construction
- Excellent DC/DC energy storage up to 1 MHz to 2 MHz. Filter inductor applications up the SRF (see Standard Electrical Specifications table)
- Lowest DCR/μH, in this package size
- Handles high transient current spikes without saturation
- Ultra 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

RoHS
COMPLIANTHALOGEN
FREEGREEN
(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

DIMENSIONS in inches [millimeters]



DESCRIPTION

IHLP-4040DZ-5A	4.7 μH	± 20 %	ER	e3
MODEL	INDUCTANCE VALUE	INDUCTANCE TOLERANCE	PACKAGE CODE	JEDEC® LEAD (Pb)-FREE STANDARD

GLOBAL PART NUMBER

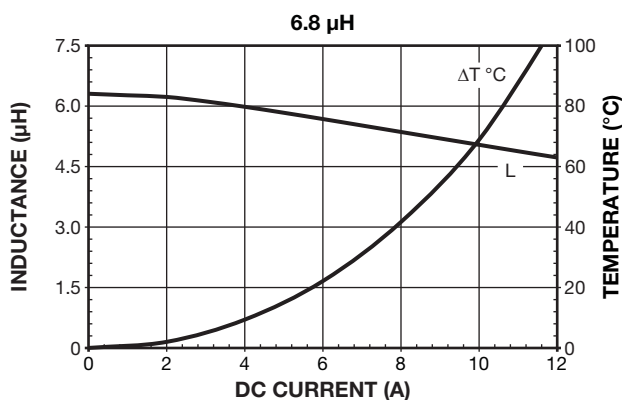
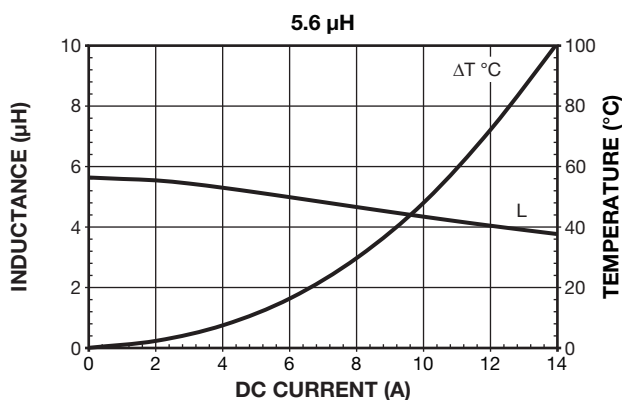
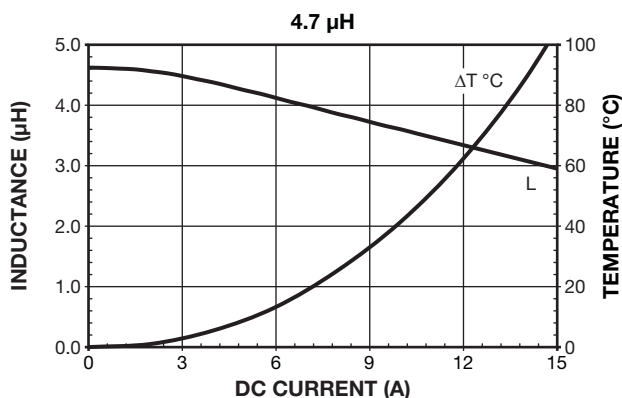
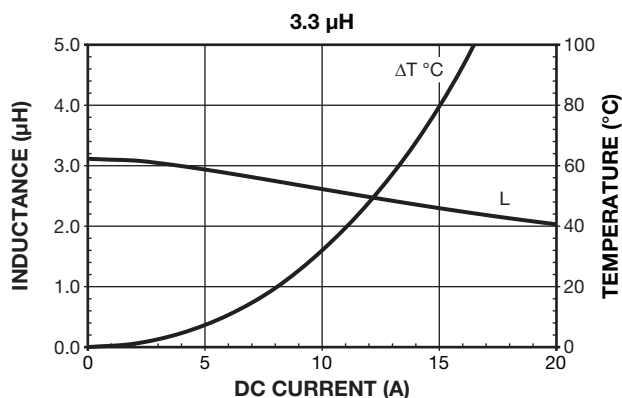
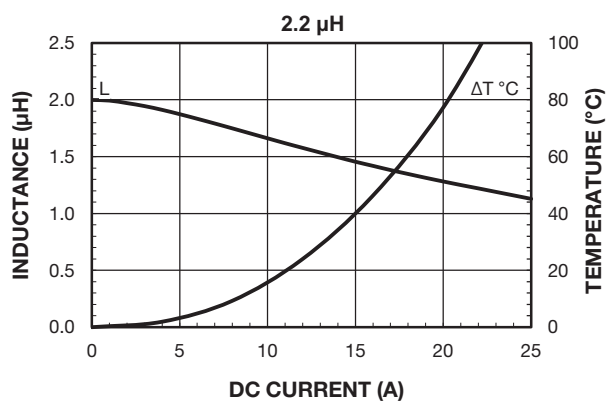
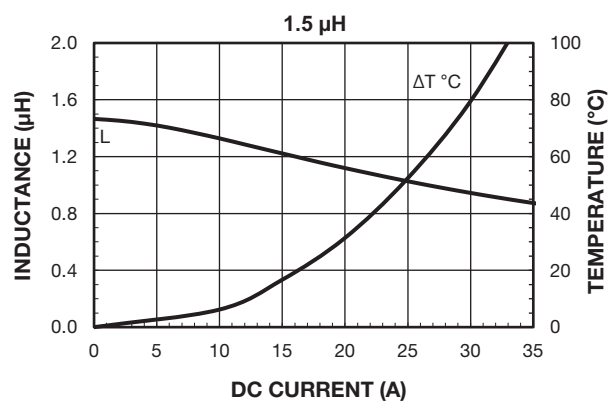
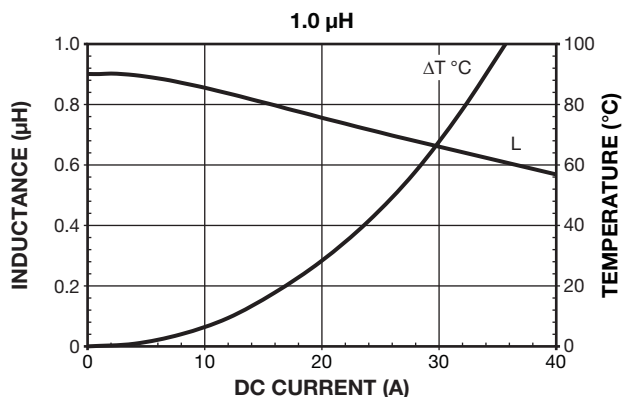
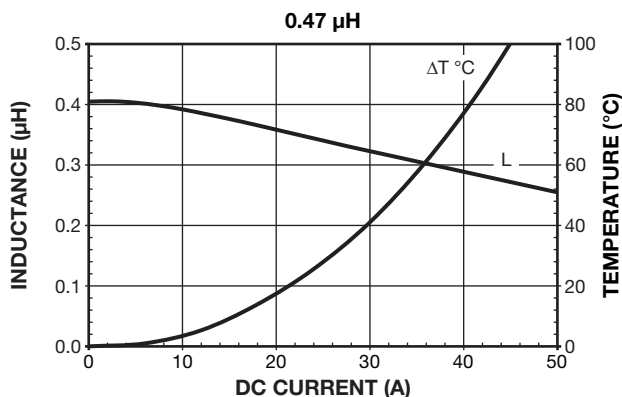
I	H	L	P	4	0	4	0	D	Z	E	R	4	R	7	M	5	A
PRODUCT FAMILY				SIZE						PACKAGE CODE		INDUCTANCE VALUE			TOL.	SERIES	

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

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

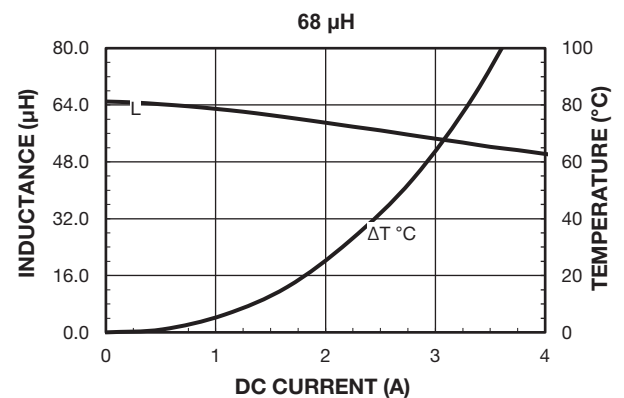
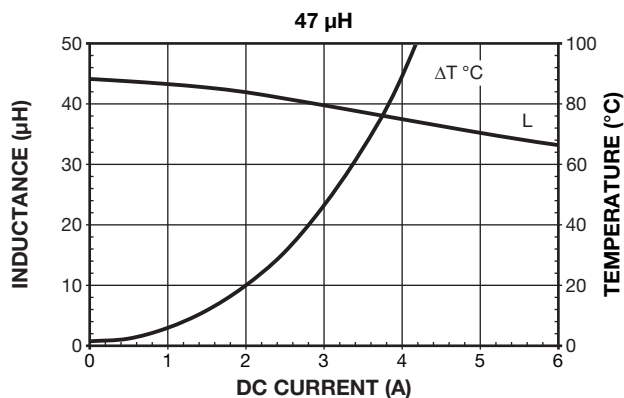
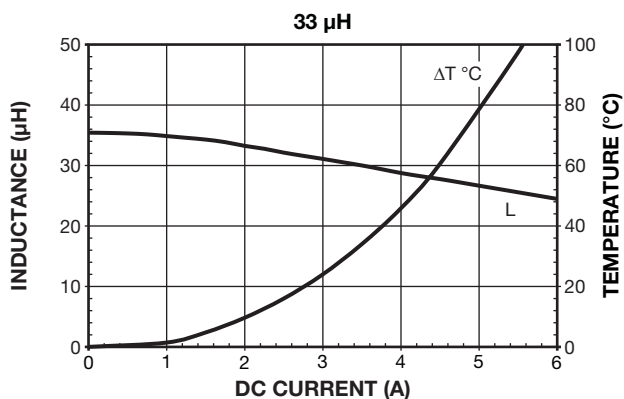
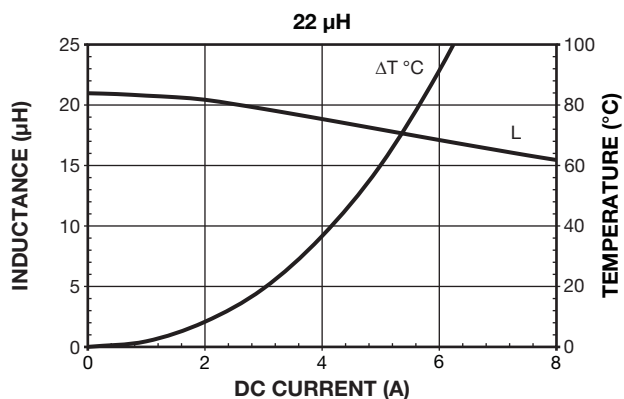
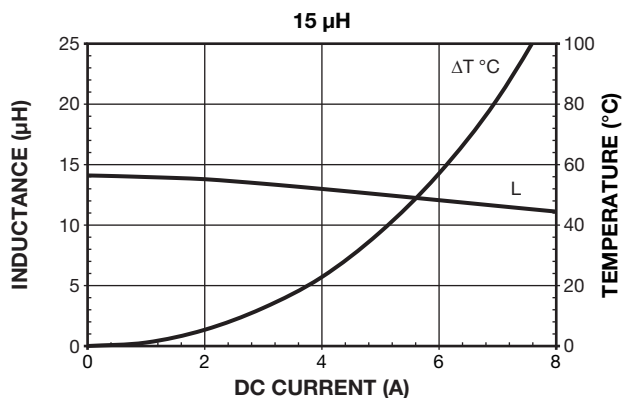
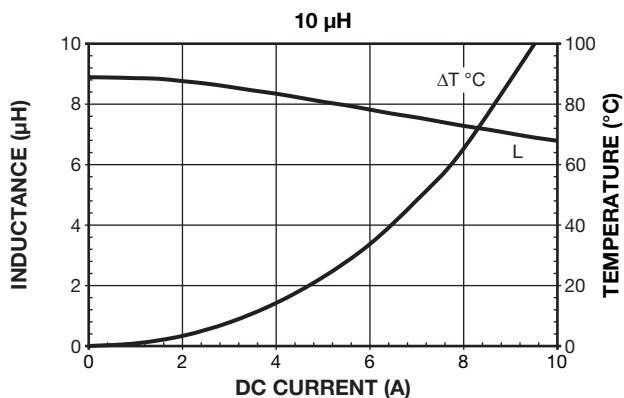


PERFORMANCE GRAPHS



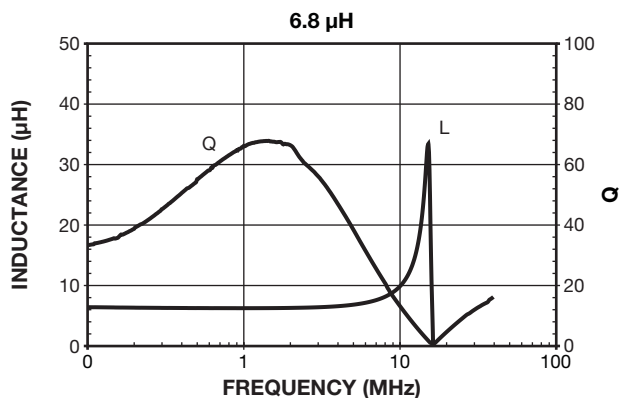
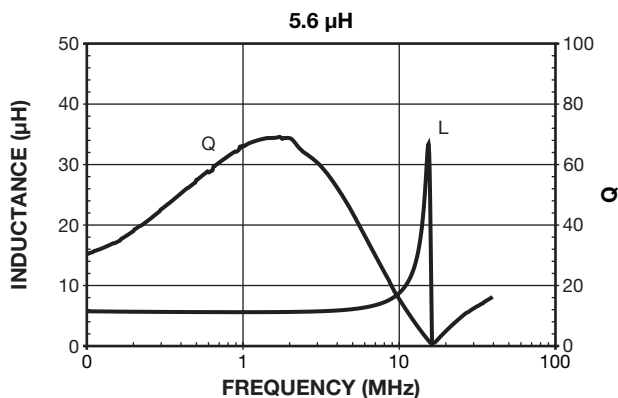
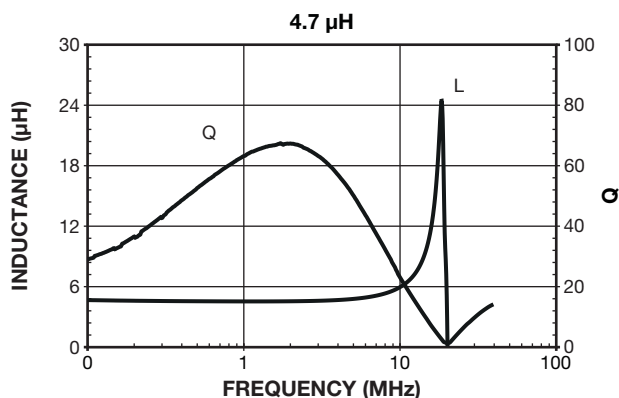
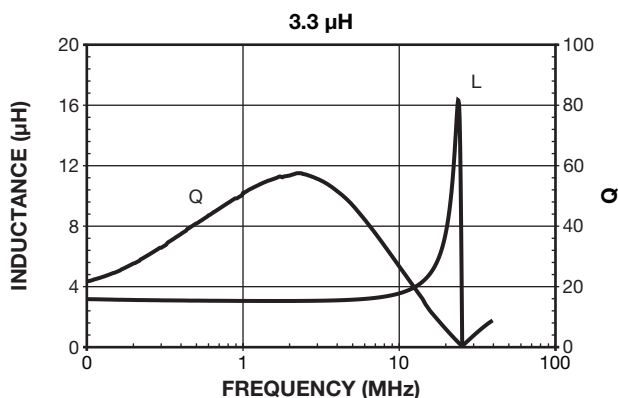
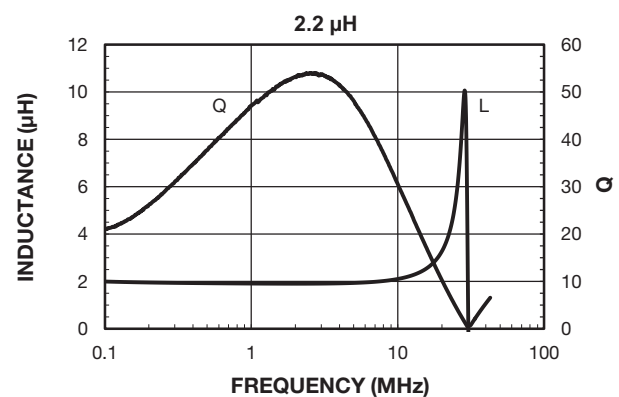
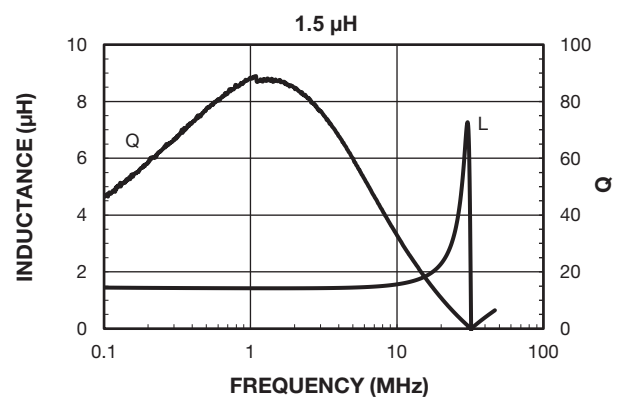
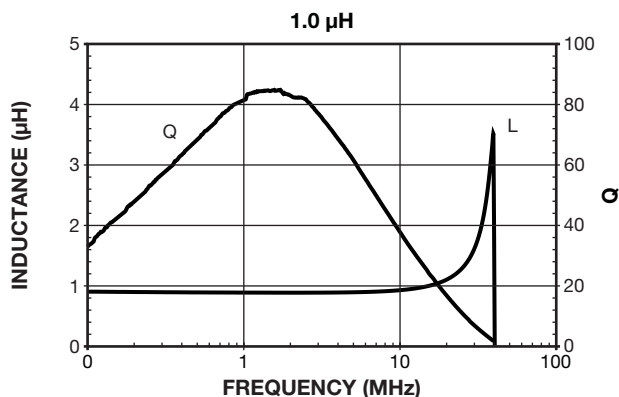
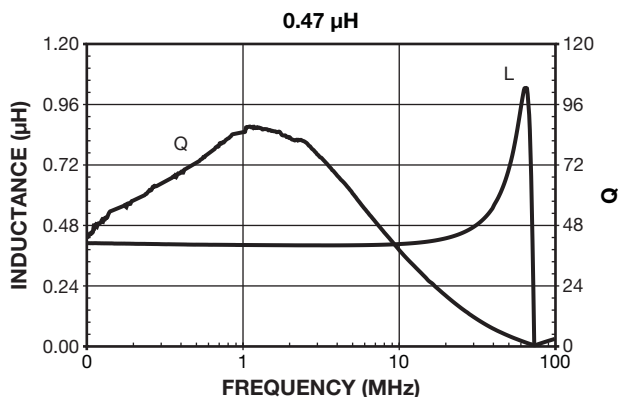


PERFORMANCE GRAPHS



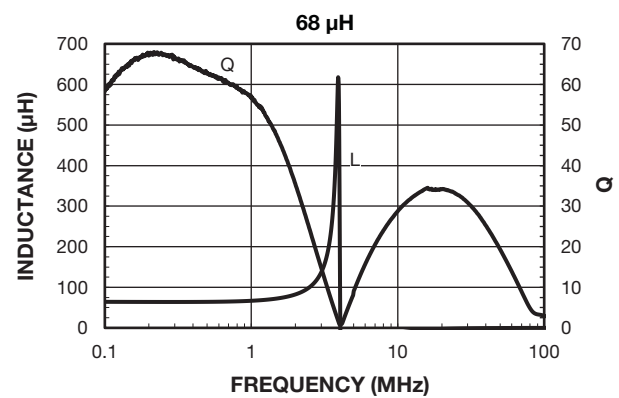
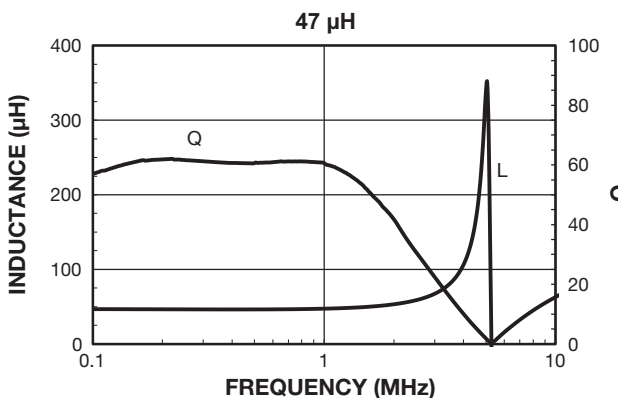
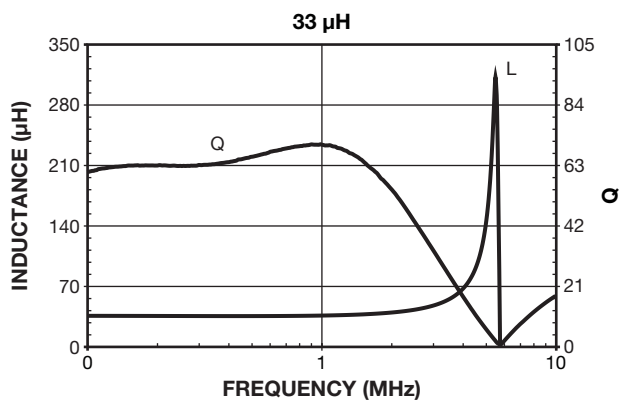
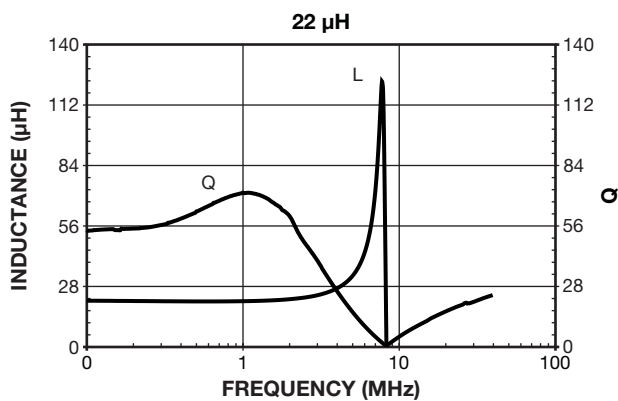
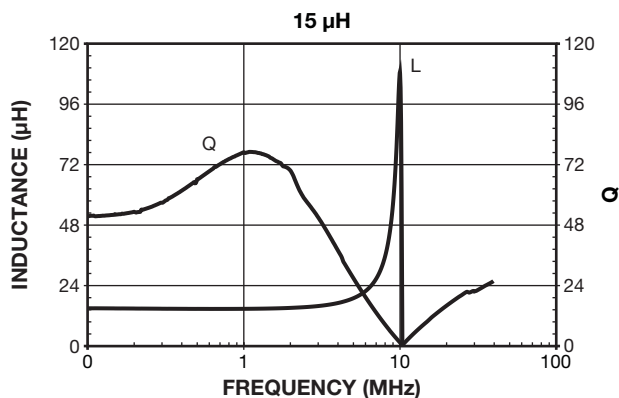
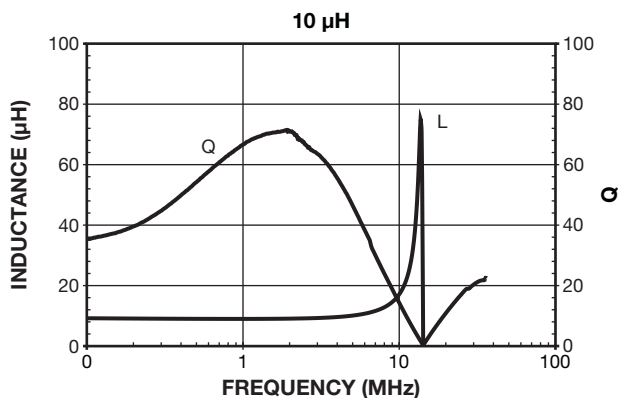


PERFORMANCE GRAPHS: INDUCTANCE AND Q VS. FREQUENCY

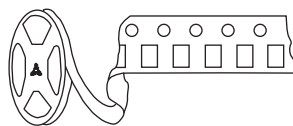




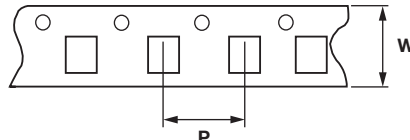
PERFORMANCE GRAPHS: INDUCTANCE AND Q VS. FREQUENCY



SMD Magnetics Packaging Methods

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


User Direction of Feed



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
IHLP-3232CZ	-	-	ER	13	0.630 [16.0]	0.472 [12.0]	1000	-	-	EB	100
IHLP-3232DZ	-	-	ER	13	0.630 [16.0]	0.472 [12.0]	500	-	-	EB	100
IHLP-4040DZ	-	-	ER	13	0.945 [24.0]	0.630 [16.0]	500	-	-	EB	100
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

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	
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 R99/RB4	SY/AN SZ/R9	ER/ET ES/EU	7	0.315 [8.0]	0.157 [4.0]	2000	B13	BN	EB	500
				13	0.315 [8.0]	0.157 [4.0]	7500				
IMC-1210-100	R98/RB3 R99/RB4	SY/AN SZ/R9	ER/ET ES/EU	7	0.315 [8.0]	0.157 [4.0]	2000	B13	BN	EB	500
				13	0.315 [8.0]	0.157 [4.0]	7500				
IMC-1812	R73/R92 R13/R91	RV/RX RQ/RW	ER/ET ES/EU	7	0.472 [12.0]	0.315 [8.0]	500	B13	BN	EB	500
				13	0.472 [12.0]	0.315 [8.0]	2000				
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

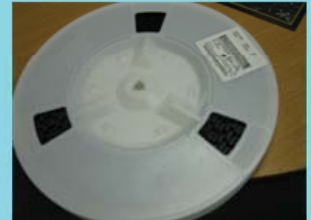
COMPONENT PHOTO



POCKET TAPE PHOTO



REEL PHOTO



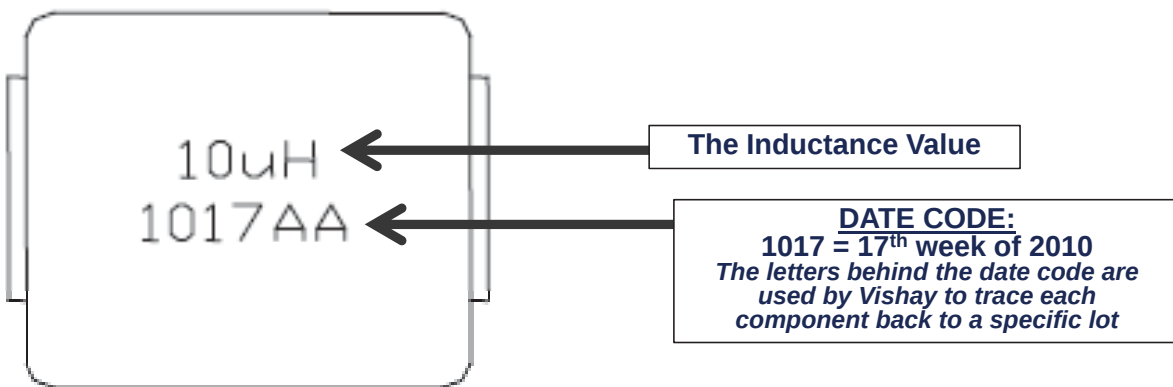
CONTAINER PHOTO



UNIT LOAD PHOTO



IHLP COMPONENT PRINT





Production Part Approval Process

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

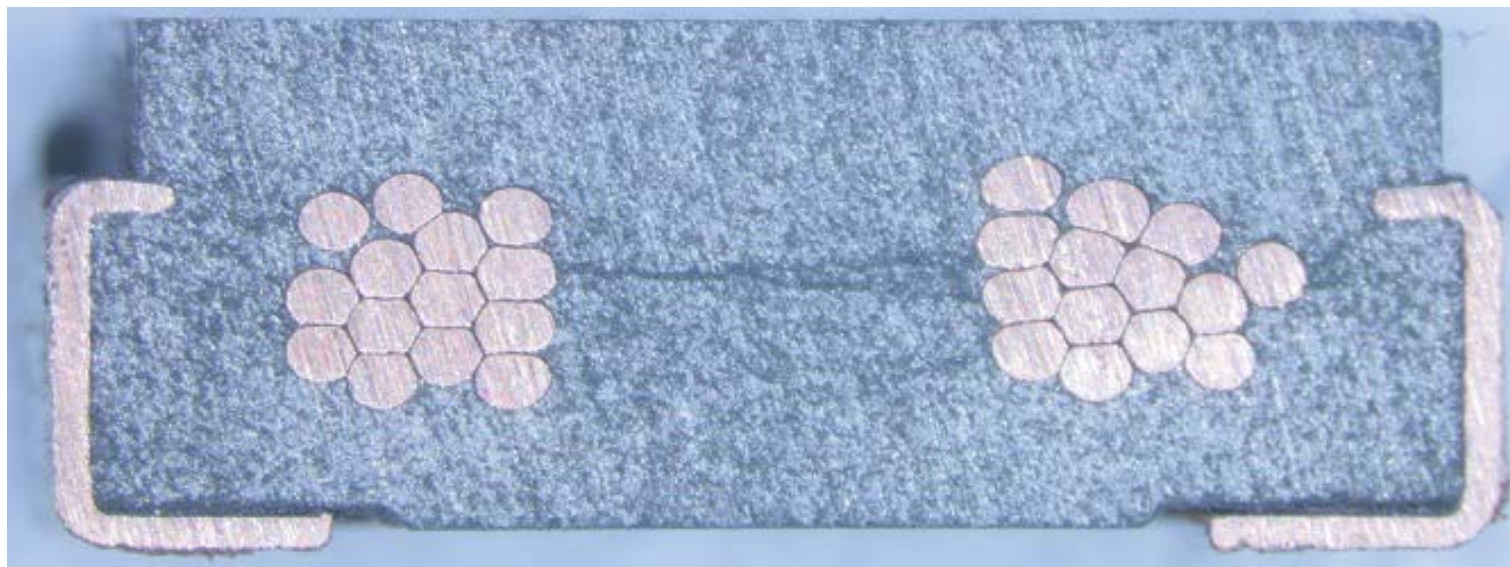
Terminal Plating Info

Part Number (CUSTOMER)	Part Number (Vishay)	Layer structure with base and coating material used:	Layer thickness and tolerances of the coatings (base material, intermediate layer, final finish)	Kind of Coating or technology (e.g. galvanized, chemically hot tin- plated,..)
Generic PPAP	IHLP4040DZERxxxK5A	Cu - Base Material Ni- Intermediate Layer Sn- Finish Layer	Cu: 0.203 +/- .0254mm Ni: 1.27um to 3.175um Sn: 4.57um to 6.35 um	Electroplated

Production Part Approval Process

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

Cross Sectional Picture IHLP4040DZ 10uH



Production Part Approval Process

The following PPAP documentation is assembled according to
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Cross Sectional Picture IHLP4040DZ 47uH



Production Part Approval Process

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

Cross Sectional Picture IHLP4040DZ 90uH





Production Part Approval Process

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Example Photos of IHLP Welds

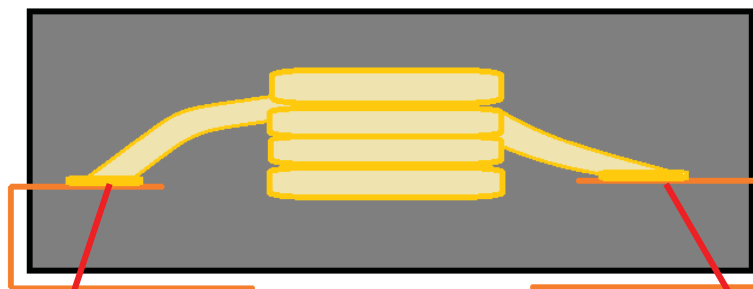




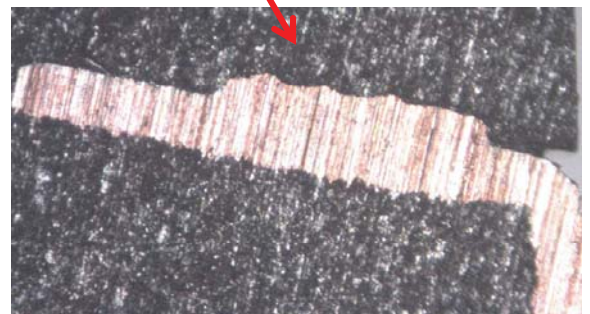
Production Part Approval Process

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Cross sectional Photos of IHLP Welds



Inter-Metallic
bonding
between the
wire and
Leadframe





SECTION 9 DIMENSIONAL ANALYSIS



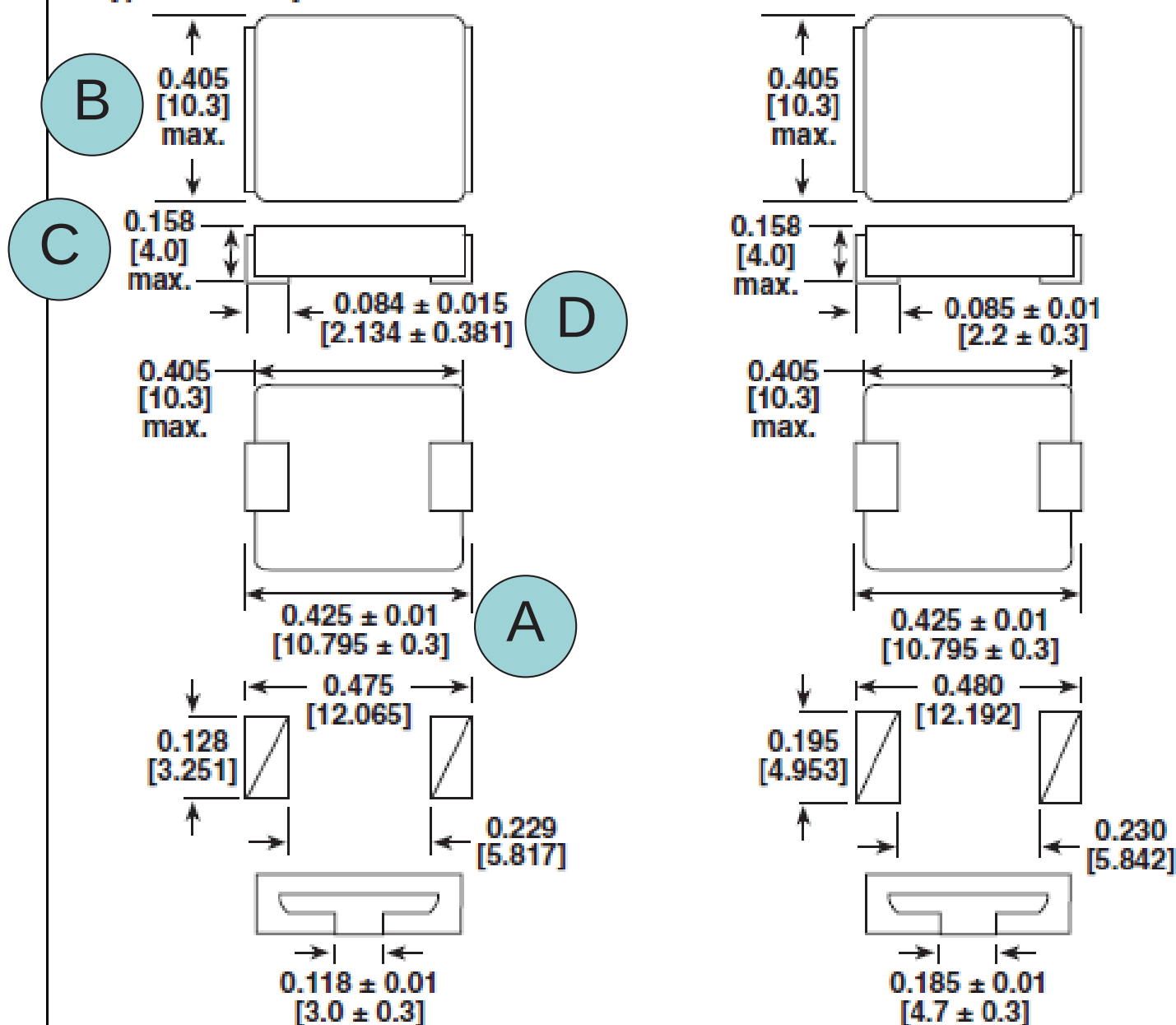
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DIMENSIONS in inches [millimeters]

Typical Pad Layout



The diagram above applies to values
2.2 µH and above.

The diagram above applies to values
1.0 µH and below.



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	A	0.425±.010	B	.405 Max	C	0.058 max.	.084 +/- .015
1		0.4235		0.4025		0.154	0.08
2		0.423		0.4035		0.153	0.08
3		0.4225		0.4025		0.1545	0.081
4		0.4225		0.403		0.1535	0.081
5		0.4225		0.4025		0.152	0.082
6		0.4225		0.4025		0.152	0.081
7		0.423		0.403		0.1535	0.083
8		0.423		0.4025		0.155	0.082
9		0.424		0.4035		0.152	0.079
10		0.4235		0.403		0.1525	0.081
11		0.423		0.4025		0.1555	0.082
12		0.423		0.4025		0.154	0.083
13		0.4235		0.403		0.154	0.083
14		0.4235		0.403		0.153	0.081
15		0.4235		0.4025		0.154	0.081
16		0.4225		0.4025		0.153	0.085
17		0.424		0.4025		0.153	0.079
18		0.423		0.403		0.154	0.083
19		0.4225		0.4025		0.154	0.081
20		0.424		0.4025		0.1525	0.079
21		0.4235		0.403		0.1535	0.082
22		0.4235		0.4025		0.1525	0.082
23		0.423		0.403		0.1535	0.081
24		0.4235		0.403		0.1525	0.082
25		0.423		0.4025		0.1525	0.082
26		0.4225		0.402		0.1525	0.082
27		0.4235		0.403		0.1535	0.079
28		0.4235		0.4035		0.1535	0.081
29		0.4235		0.4025		0.153	0.08
30		0.4235		0.4025		0.153	0.081
31		0.423		0.4025		0.154	0.082
32		0.4235		0.403		0.154	0.083
33		0.4235		0.403		0.153	0.083
34		0.4235		0.4025		0.154	0.081
35		0.4225		0.4025		0.1525	0.081
36		0.424		0.4025		0.1525	0.079
37		0.423		0.403		0.1525	0.082
38		0.4225		0.4025		0.1535	0.082
39		0.424		0.4025		0.1535	0.081
40		0.4235		0.403		0.153	0.082
41		0.4235		0.4025		0.153	0.082
42		0.424		0.4035		0.154	0.082
43		0.423		0.4025		0.1545	0.079
44		0.4225		0.403		0.1535	0.081
45		0.424		0.4025		0.152	0.082
46		0.4235		0.4025		0.152	0.079
47		0.4235		0.403		0.1535	0.081
48		0.423		0.4025		0.155	0.082
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50		0.423		0.403		0.1525	0.083



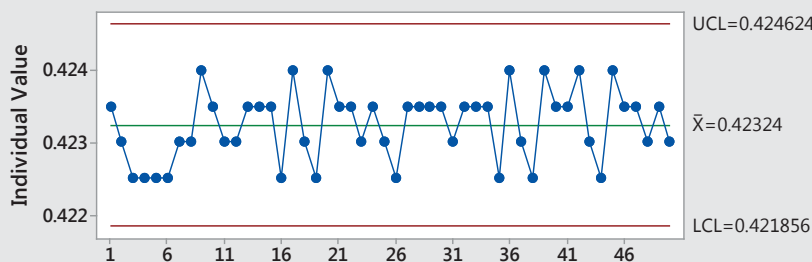
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REQUIREMENTS

IHLP-4040DZ-XX

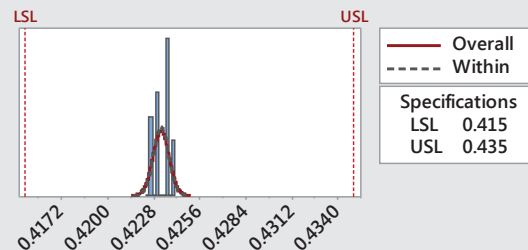
Dimensional Analysis

Dimensional Analysis, IHLP4040DZ-XX, 0.425 +/- .010 Dimension

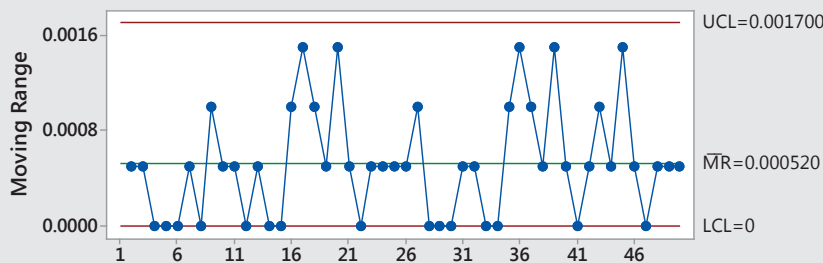
I Chart



Capability Histogram

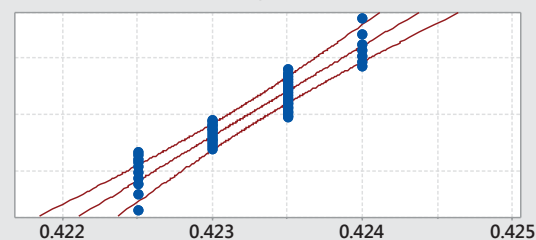


Moving Range Chart

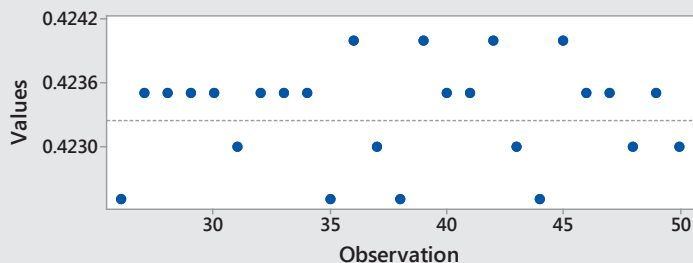


Normal Prob Plot

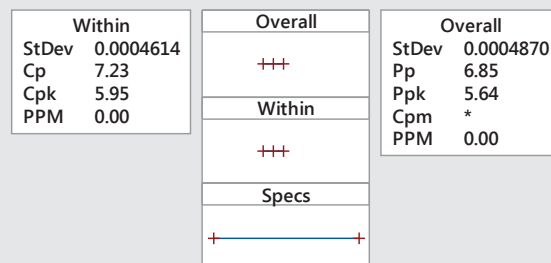
AD: 2.576, P: < 0.005



Last 25 Observations



Capability Plot



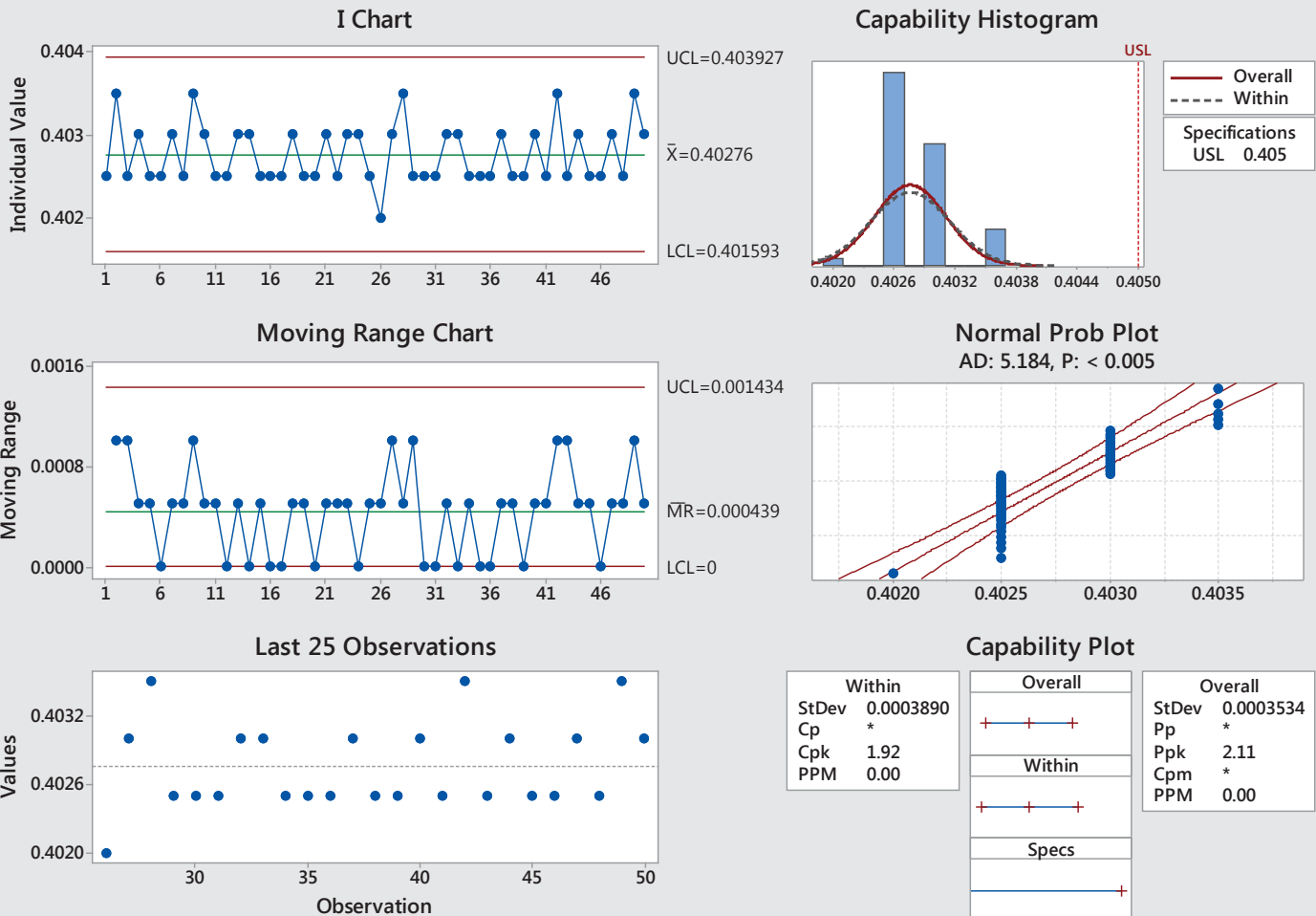


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REQUIREMENTS

IHLP-4040DZ-XX

Dimensional Analysis

Dimensional Analysis, IHLP4040DZ-XX, 0.405 Max Dimension



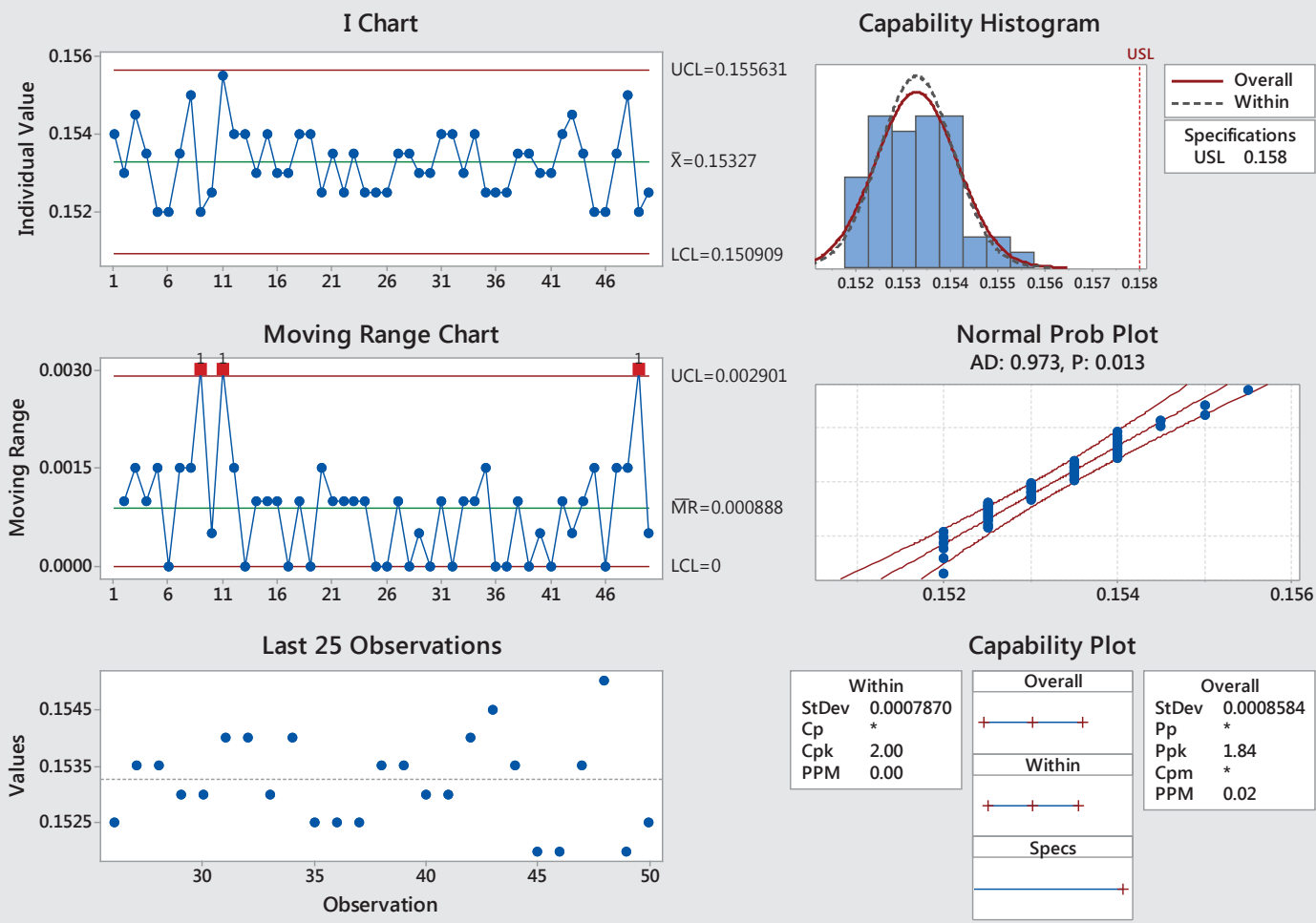


PRODUCTION PART APPROVAL PROCESS
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REQUIREMENTS

IHLP-4040DZ-XX

Dimensional Analysis

Dimensional Analysis, IHLP4040DZ-XX, 0.158 Max Dimension





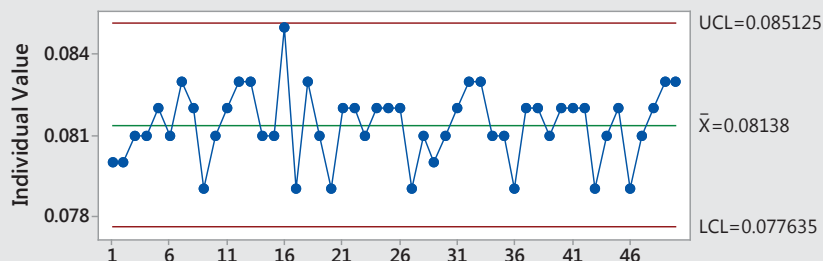
PRODUCTION PART APPROVAL PROCESS
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REQUIREMENTS

IHLP-4040DZ-XX

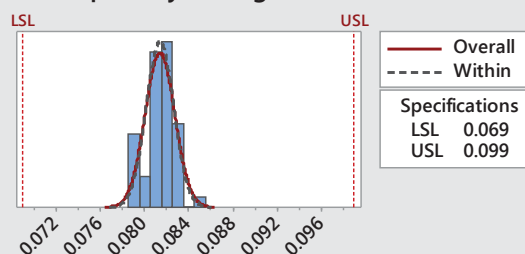
Dimensional Analysis

Dimensional Analysis, IHLP4040DZ-XX, 0.084 +/- .015 Dimension

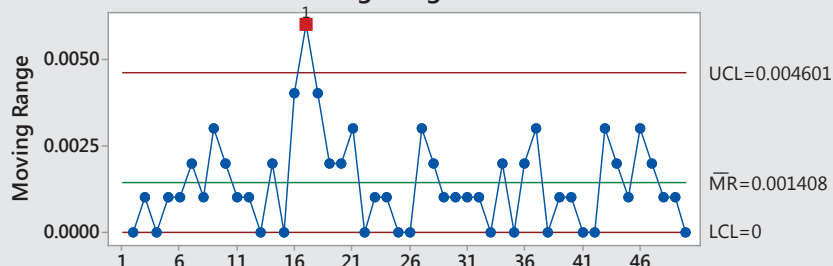
I Chart



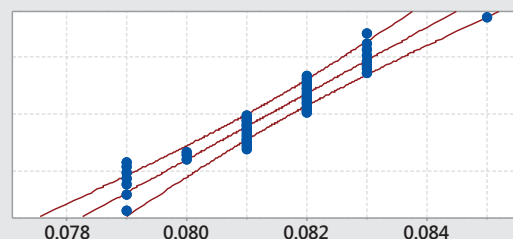
Capability Histogram



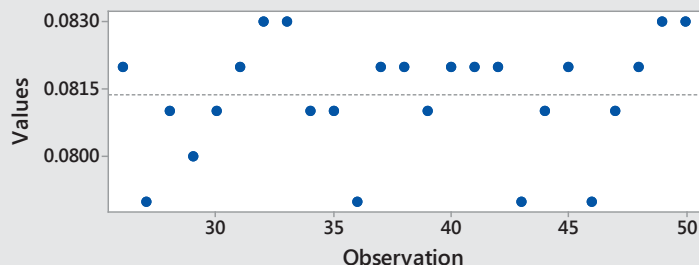
Moving Range Chart



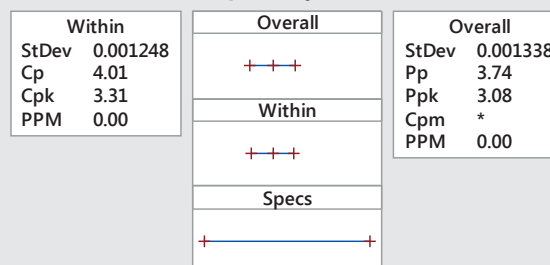
Normal Prob Plot
AD: 1.847, P: < 0.005



Last 25 Observations



Capability Plot





SECTION 10 PERFORMANCE TEST RESULTS

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IHLP4040DZERR47M5A TEST DATA

- Parts were manufactured in the Beer'Sheva, Israel manufacturing location.



IHLP4040DZERR47M5A 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 except Visual per DPS-11,865 10X magnification										
1	Pre- and Post-Stress Electrical Test	IHLP Data Sheet	L (uH) – 100KHz and 250mV DCR – 25°C Ambient	L = $\pm 15\%$ of initial, DCR = $\pm 15\%$ of initial	All tests requiring electrical data								
3	High Temp Exposure	IEC-60068 Part 2-2 test group BA	+155 C 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 = $\pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77			Inductance (μ H)			DC Resistance (m Ω)		
								Initial	Final	% Δ	Initial	Final	% Δ
						-55 deg. C	Maximum	0.460	0.512	14.291	1.050	1.047	2.358
							Minimum	0.423	0.477	9.754	0.984	0.971	-1.905
							Mean	0.441	0.492	11.593	1.014	1.004	-0.970
							Std Dev	0.008	0.007	0.840	0.013	0.015	0.726
						+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	0.465	0.512	14.077	1.497	1.484	-0.560
							Minimum	0.426	0.479	9.346	1.409	1.348	-9.628
							Mean	0.444	0.495	11.389	1.448	1.433	-1.034
							Std Dev	0.008	0.007	0.873	0.018	0.019	1.095
						+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	0.469	0.527	14.836	2.237	2.224	-0.227
							Minimum	0.434	0.493	11.174	2.089	1.981	-7.078
							Mean	0.448	0.508	13.347	2.154	2.139	-0.725
							Std Dev	0.008	0.008	0.839	0.030	0.035	0.801



IHLP4040DZERR47M5A 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	Temperature = -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/HT	L = $\pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77		Inductance (μH)			DC Resistance ($\text{m}\Omega$)			
								Initial	Final	% Δ	Initial	Final	% Δ
						-55 deg. C	Maximum	0.468	0.475	2.943	1.243	1.107	-0.188
							Minimum	0.428	0.435	0.441	0.985	0.979	-11.083
							Mean	0.445	0.451	1.436	1.036	1.009	-2.529
							Std Dev	0.008	0.008	0.366	0.041	0.017	2.770
						+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	0.477	0.502	10.454	1.507	1.500	0.102
							Minimum	0.433	0.439	0.016	1.410	1.404	-0.816
							Mean	0.452	0.457	0.966	1.451	1.444	-0.465
							Std Dev	0.009	0.010	1.152	0.018	0.018	0.114
						+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	0.471	0.477	1.960	2.230	2.227	6.676
							Minimum	0.430	0.435	0.308	1.952	2.069	-0.605
							Mean	0.447	0.452	1.069	2.121	2.139	0.899
							Std Dev	0.009	0.009	0.308	0.052	0.033	1.961



IHLP4040DZERR47M5A 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	Temp = -55°C to +125°C (+155° C for -5A models) dwell time = 30 min. transfer time $\leq$ 10 sec. no. of cycles = 1000 unpowered initial (0 cycles) and final 1000 cycles). Readings at LT/RT/HT	$L = \pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77	-55 deg. C	Inductance (μ H)			DC Resistance (m Ω)			
							Initial	Final	% Δ	Initial	Final	% Δ	
							Maximum	0.465	0.485	7.027	1.067	1.067	1.336
							Minimum	0.423	0.446	3.682	0.992	0.991	-2.076
							Mean	0.450	0.472	4.994	1.023	1.020	-0.305
							Std Dev	0.009	0.008	0.785	0.017	0.017	0.694
						+25 deg. C	Initial	Final	% Δ	Initial	Final	% Δ	
							Maximum	0.466	0.488	7.392	1.520	1.528	1.903
							Minimum	0.423	0.449	4.285	1.418	1.390	-2.477
							Mean	0.451	0.475	5.518	1.453	1.454	0.018
							Std Dev	0.009	0.008	0.768	0.021	0.026	0.921
						+155 deg. C	Initial	Final	% Δ	Initial	Final	% Δ	
							Maximum	0.469	0.498	9.333	2.256	2.233	0.232
							Minimum	0.426	0.457	4.450	2.097	2.046	-4.480
							Mean	0.455	0.484	6.408	2.159	2.127	-1.474
							Std Dev	0.009	0.008	0.939	0.033	0.034	0.958



IHLP4040DZERR47M5A 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
7	Biased Humidity	IEC-60068 Part 2-67	temperature = 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	0.460	0.452	2.577	1.061	1.183	14.138
							Mimimum	0.426	0.408	-5.383	0.985	1.002	-0.165
							Mean	0.445	0.434	-2.496	1.014	1.033	1.889
							Std Dev	0.008	0.009	1.256	0.016	0.032	2.724
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.460	0.454	0.163	1.508	1.508	0.557
							Mimimum	0.426	0.411	-4.854	1.421	1.414	-1.119
							Mean	0.445	0.435	-2.155	1.458	1.452	-0.370
						Std Dev	0.008	0.010	1.050	0.019	0.019	0.327	
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.468	0.459	-0.586	2.226	2.225	1.265
							Mimimum	0.430	0.414	-6.188	2.084	2.074	-0.661
							Mean	0.451	0.439	-2.842	2.153	2.154	0.053
						Std Dev	0.008	0.010	1.051	0.029	0.032	0.310	



IHLP4040DZERR47M5A 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. Power = 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	0.467	0.521	19.622	1.061	1.064	1.228
							Minimum	0.425	0.464	5.410	0.989	0.974	-3.800
							Mean	0.446	0.490	9.936	1.026	1.010	-1.496
							Std Dev	0.008	0.012	2.682	0.013	0.015	0.990
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.468	0.523	18.544	1.502	1.506	0.293
							Minimum	0.426	0.466	5.984	1.414	1.409	-2.180
							Mean	0.447	0.493	10.293	1.460	1.452	-0.556
						+155 deg. C	Std Dev	0.008	0.012	2.716	0.017	0.017	0.450
								Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.475	0.538	19.365	2.073	2.197	7.719
							Minimum	0.432	0.481	6.867	1.928	2.056	3.710
							Mean	0.453	0.505	11.666	2.005	2.131	6.316
							Std Dev	0.008	0.013	2.835	0.025	0.031	0.761



IHLP4040DZERR47M5A 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 $L = \pm 20\%$ of initial, $DCR = \pm 20\%$ of initial	5	na	Pass						



IHLP4040DZERR47M5A TEST RESULTS

Test #	Description	Ref. Spec. Meth / Cond	Test Conditions	End Point Δ requirements	Sample Size	Meas. Temp.							
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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	0.462	0.464	0.915	1.035	1.034	0.452
							Mimimum	0.431	0.434	-0.057	0.987	0.988	-0.871
							Mean	0.446	0.448	0.464	1.014	1.014	-0.037
							Std Dev	0.009	0.009	0.261	0.012	0.011	0.335
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.465	0.468	1.170	1.475	1.483	0.731
							Mimimum	0.432	0.436	0.327	1.410	1.418	0.423
							Mean	0.447	0.451	0.726	1.445	1.453	0.559
							Std Dev	0.009	0.009	0.217	0.015	0.015	0.064
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.470	0.470	0.388	2.202	2.205	0.323
							Mimimum	0.435	0.435	-0.371	2.105	2.105	0.000
							Mean	0.451	0.451	-0.039	2.155	2.158	0.147
							Std Dev	0.010	0.010	0.161	0.023	0.023	0.057



IHLP4040DZERR47M5A TEST RESULTS

Test #	Description	Ref. Spec. Meth / Cond	Test Conditions	End Point Δ requirements	Sample Size	Meas. Temp.							
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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	0.470	0.475	1.645	1.071	1.057	1.184
							Mimimum	0.429	0.434	-0.269	0.998	0.958	-6.984
							Mean	0.448	0.452	0.927	1.026	1.021	-0.429
							Std Dev	0.009	0.009	0.353	0.019	0.021	1.406
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.473	0.478	1.644	1.504	1.504	0.383
							Mimimum	0.431	0.437	0.109	1.421	1.419	-0.400
							Mean	0.450	0.455	1.092	1.460	1.459	-0.049
							Std Dev	0.009	0.009	0.282	0.025	0.025	0.209
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.477	0.481	1.470	2.225	2.071	-5.444
							Mimimum	0.435	0.439	-0.158	2.086	1.941	-8.135
							Mean	0.453	0.457	0.857	2.155	2.006	-6.934
							Std Dev	0.009	0.010	0.282	0.039	0.035	0.729



IHLP4040DZERR47M5A TEST RESULTS

Test #	Description	Ref. Spec. Meth / Cond	Test Conditions	End Point Δ requirements	Sample Size	Meas. Temp.							
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							Inductance (μ H)			DC Resistance ($m\Omega$)		
							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	$L = \pm 20\%$ of initial, $DCR = \pm 20\%$ of initial	30	-55 deg. C	Maximum	0.460	0.462	1.153	1.048	1.051	0.267
						Minimum	0.420	0.423	-0.163	0.992	0.985	-1.283
						Mean	0.443	0.445	0.499	1.019	1.012	-0.604
						Std Dev	0.009	0.009	0.262	0.011	0.012	0.326
					+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
						Maximum	0.462	0.466	1.269	1.480	1.486	0.675
						Minimum	0.420	0.424	0.308	1.409	1.415	0.146
						Mean	0.445	0.448	0.795	1.444	1.450	0.416
						Std Dev	0.010	0.010	0.193	0.015	0.016	0.120
					+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
						Maximum	0.467	0.467	0.329	2.202	2.206	0.370
						Minimum	0.424	0.424	-0.373	2.077	2.077	-0.092
						Mean	0.449	0.449	-0.120	2.140	2.141	0.060
						Std Dev	0.010	0.010	0.183	0.027	0.028	0.088



IHLP4040DZERR47M5A 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 $\pm$ 5°C for 30 $\pm$ 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s	L= $\pm$ 20% of initial, DCR = $\pm$ 20% of initial	30								
						Inductance (μ H)			DC Resistance (m Ω)				
						Initial			Initial				
						Final			Final				
						% Δ			% Δ				
						Maximum	0.470	0.475	3.600	1.438	1.442	0.581	
						Minimum	0.436	0.444	0.924	1.361	1.365	-0.091	
						Mean	0.449	0.456	1.612	1.415	1.420	0.322	
						Std Dev	0.007	0.007	0.651	0.017	0.018	0.159	
17	ESD	AEC-Q200-002	Determine the Classification of the part.	L= $\pm$ 20% of initial, DCR = $\pm$ 20% of initial	15								
						Inductance (μ H)			DC Resistance (m Ω)				
						Initial			Initial				
						25KV			25KV				
						% Δ			% Δ				
						Maximum	0.459	0.467	2.349	1.460	1.468	0.527	
						Minimum	0.424	0.425	-1.687	1.411	1.410	-0.347	
						Mean	0.450	0.454	0.834	1.428	1.428	0.027	
						Std Dev	0.009	0.010	1.231	0.015	0.017	0.234	
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						



IHLP4040DZERR47M5A 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)		
						-55 deg. C	Maximum	0.468		1.2427			
							Mimimum	0.428		0.9852			
							Mean	0.445		1.0360			
							Std Dev	0.008		0.0415			
						+25 deg. C							
							Maximum	0.471	1.5073				
							Mimimum	0.430	1.4101				
							Mean	0.447	1.4508				
						+155 deg. C							
							Maximum	0.477	2.2300				
							Mimimum	0.433	1.9517				
Mean	0.452	2.1205											
Std Dev	0.009	0.0518											
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	0.468	0.471	1.962	1.475	1.471	0.071
							Mimimum	0.436	0.439	-0.309	1.390	1.387	-0.448
							Mean	0.449	0.453	0.883	1.430	1.428	-0.134
							Std Dev	0.007	0.008	0.502	0.020	0.020	0.122
						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		
Initial	Final	%Δ	Initial	Final	%Δ								
+25 deg. C	Maximum	0.467	0.486	4.947	1.447							1.438	-0.014
	Mimimum	0.441	0.449	-0.492	1.387							1.382	-0.974
	Mean	0.457	0.470	2.736	1.419							1.412	-0.476
	Std Dev	0.007	0.011	1.783	0.015							0.015	0.284



IHLP4040DZER900K5A TEST DATA

- Parts were manufactured in the BeerSheva, Israel manufacturing location



IHLP4040DZER900K5A 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 except Visual per DPS-11,865 10X magnification										
1	Pre- and Post-Stress Electrical Test	IHLP Data Sheet	L (uH) – 100KHz and 250mV DCR – 25°C Ambient	L = $\pm 15\%$ of initial, DCR = $\pm 15\%$ of initial	All tests requiring electrical data								
3	High Temp Exposure	IEC-60068 Part 2-2 test group BA	+155 C 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 = $\pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77			Inductance (μ H)			DC Resistance (m Ω)		
								Initial	Final	% Δ	Initial	Final	% Δ
						-55 deg. C	Maximum	88.755	95.066	8.325	0.224	0.231	4.393
							Minimum	79.151	85.000	3.597	0.219	0.218	-0.817
							Mean	84.068	89.911	6.954	0.221	0.220	-0.372
							Std Dev	1.958	1.981	0.601	0.001	0.002	0.933
						+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	89.139	95.724	8.704	0.322	0.321	-0.342
							Minimum	79.275	85.379	4.520	0.319	0.317	-0.718
							Mean	84.319	90.477	7.308	0.321	0.319	-0.476
							Std Dev	2.016	2.013	0.613	0.001	0.001	0.104
						+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	89.081	98.250	11.541	0.486	0.483	-0.063
							Minimum	79.460	86.830	6.849	0.472	0.468	-3.409
							Mean	84.473	92.655	9.690	0.481	0.478	-0.720
							Std Dev	2.014	2.163	0.723	0.004	0.003	0.602



IHLP4040DZER900K5A 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	Temperature = -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/HT	L = $\pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77		Inductance (μH)			DC Resistance ($\text{m}\Omega$)			
								Initial	Final	% Δ	Initial	Final	% Δ
						-55 deg. C	Maximum	88.269	88.705	2.095	0.230	0.228	1.940
							Minimum	78.613	79.098	0.364	0.220	0.220	-2.451
							Mean	83.781	84.241	0.550	0.223	0.223	-0.254
							Std Dev	1.981	1.951	0.196	0.002	0.002	0.789
						+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	88.776	89.159	2.381	0.322	0.322	0.125
							Minimum	78.757	79.217	0.185	0.319	0.319	-0.063
							Mean	84.131	84.523	0.467	0.320	0.320	0.002
							Std Dev	2.028	1.987	0.233	0.001	0.001	0.028
						+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	89.035	89.121	0.319	0.480	0.481	1.462
							Minimum	78.913	79.022	0.031	0.463	0.468	-0.126
							Mean	84.339	84.444	0.125	0.474	0.476	0.436
							Std Dev	2.022	2.021	0.042	0.004	0.003	0.364



IHLP4040DZER900K5A 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	Temp =-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	88.023	90.282	3.452	0.226	0.225	0.136
							Mimimum	79.529	81.936	2.247	0.220	0.219	-2.224
							Mean	84.078	86.325	2.675	0.222	0.221	-0.447
							Std Dev	2.021	1.960	0.213	0.001	0.001	0.436
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	88.295	90.714	4.785	0.323	0.322	-0.062
							Mimimum	79.777	82.235	2.144	0.319	0.318	-0.500
							Mean	84.354	86.716	2.804	0.321	0.320	-0.285
							Std Dev	2.065	1.986	0.320	0.001	0.001	0.081
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	88.330	91.927	4.509	0.484	0.483	0.944
							Mimimum	79.929	83.076	1.379	0.468	0.472	-0.435
							Mean	84.568	87.834	3.865	0.478	0.479	0.180
							Std Dev	2.069	2.067	0.348	0.003	0.002	0.378



IHLP4040DZER900K5A 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 Power = No Power 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	88.527	88.354	0.069	0.231	0.230	2.231
							Mimimum	79.501	79.135	-2.909	0.222	0.221	-1.846
							Mean	83.761	83.173	-0.705	0.225	0.225	-0.066
							Std Dev	1.823	1.965	0.542	0.002	0.002	0.695
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	88.914	88.722	0.144	0.323	0.326	1.059
							Mimimum	79.656	79.378	-2.118	0.318	0.319	0.000
							Mean	84.056	83.510	-0.652	0.321	0.322	0.469
						Std Dev	1.842	1.978	0.485	0.001	0.002	0.293	
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	89.240	88.815	1.575	0.481	0.482	0.695
							Mimimum	79.796	79.237	-3.175	0.468	0.467	-1.546
							Mean	84.348	83.565	-0.929	0.476	0.475	-0.110
						Std Dev	1.877	1.984	0.607	0.004	0.004	0.442	



IHLP4040DZER900K5A 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. Power = As noted on the test request. Readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT	L = $\pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77	-55 deg. C	Inductance (μ H)			DC Resistance ($m\Omega$)			
							Initial	Final	% Δ	Initial	Final	% Δ	
							Maximum	87.134	94.888	14.273	0.234	0.225	0.045
							Minimum	78.277	83.561	5.334	0.221	0.218	-6.381
							Mean	82.618	90.650	9.738	0.223	0.220	-1.469
							Std Dev	1.856	2.375	2.419	0.002	0.001	0.924
						+25 deg. C	Initial	Final	% Δ	Initial	Final	% Δ	
							Maximum	87.589	95.689	15.059	0.323	0.322	-0.094
							Minimum	78.365	84.330	5.810	0.319	0.318	-0.407
							Mean	82.874	91.476	10.399	0.320	0.319	-0.292
							Std Dev	1.893	2.335	2.446	0.001	0.001	0.064
						+155 deg. C	Initial	Final	% Δ	Initial	Final	% Δ	
							Maximum	88.072	97.729	17.112	0.486	0.484	-0.062
							Minimum	78.679	86.091	6.631	0.468	0.465	-1.796
							Mean	83.314	93.474	12.211	0.479	0.477	-0.469
							Std Dev	1.917	2.479	2.462	0.003	0.004	0.206



IHLP4040DZER900K5A 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 $L = \pm 20\%$ of initial, $DCR = \pm 20\%$ of initial	5	na	Pass						



IHLP4040DZER900K5A 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	87.479	87.970	2.337	0.222	0.223	0.544
							Mimimum	80.011	79.781	-2.556	0.220	0.220	-0.586
							Mean	84.319	84.779	0.548	0.221	0.221	0.230
							Std Dev	1.931	1.986	0.814	0.001	0.001	0.228
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	87.933	88.502	0.811	0.323	0.323	0.031
							Mimimum	80.312	80.960	-0.004	0.320	0.320	-0.125
							Mean	84.664	85.254	0.697	0.321	0.321	-0.061
							Std Dev	1.963	1.974	0.143	0.001	0.001	0.031
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	88.186	88.370	0.262	0.485	0.484	-0.083
							Mimimum	80.576	80.754	-0.665	0.481	0.476	-1.225
							Mean	84.877	85.008	0.155	0.482	0.480	-0.591
							Std Dev	1.975	1.957	0.167	0.001	0.002	0.345



IHLP4040DZER900K5A TEST RESULTS

Test #	Description	Ref. Spec. Meth / Cond	Test Conditions	End Point Δ requirements	Sample Size	Meas. Temp.							
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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 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			Inductance (μH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	88.040	88.636	0.785	0.224	0.226	0.986
Mimimum	80.319	80.808	0.298	0.221	0.221		-0.271						
Mean	84.426	84.918	0.583	0.222	0.223		0.209						
Std Dev	2.218	2.187	0.094	0.001	0.002		0.437						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	88.330	88.942	0.748	0.323	0.323	0.000						
	Mimimum	80.603	81.094	0.399	0.320	0.320	-0.094						
	Mean	84.751	85.248	0.587	0.321	0.321	-0.049						
Std Dev	2.221	2.202	0.083	0.001	0.001	0.030							
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	88.565	88.639	0.231	0.482	0.481	-0.021						
	Mimimum	80.845	80.876	0.018	0.474	0.471	-0.860						
	Mean	84.991	85.050	0.069	0.478	0.477	-0.319						
	Std Dev	2.210	2.225	0.040	0.002	0.003	0.289						



IHLP4040DZER900K5A TEST RESULTS

Test #	Description	Ref. Spec. Meth / Cond	Test Conditions	End Point Δ requirements	Sample Size	Meas. Temp.							
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							Inductance (μ H)			DC Resistance ($m\Omega$)		
							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	$L = \pm 20\%$ of initial, $DCR = \pm 20\%$ of initial	30	-55 deg. C	Maximum	87.614	88.114	0.700	0.225	0.226	0.809
						Minimum	80.403	80.946	0.270	0.220	0.220	-0.315
						Mean	84.694	85.151	0.540	0.222	0.223	0.214
						Std Dev	1.810	1.768	0.096	0.001	0.002	0.323
					+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
						Maximum	87.933	88.454	0.759	0.323	0.322	-0.093
						Minimum	80.635	81.247	0.422	0.319	0.319	-0.374
						Mean	85.055	85.548	0.582	0.321	0.320	-0.171
						Std Dev	1.857	1.815	0.094	0.001	0.001	0.074
					+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
						Maximum	88.269	88.321	0.184	0.481	0.481	0.189
						Minimum	80.816	80.961	-0.108	0.472	0.469	-0.782
						Mean	85.270	85.364	0.110	0.477	0.476	-0.209
						Std Dev	1.883	1.880	0.057	0.002	0.003	0.278



IHLP4040DZER900K5A TEST RESULTS

Test #	Description	Ref. Spec. Meth / Cond	Test Conditions	End Point Δ requirements	Sample Size	Meas. Temp.							
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15	Resistance to Solder Heat	MIL-STD-202G Method 210F Condition K	IR/convection reflow. 250 $\pm$ 5°C for 30 $\pm$ 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s	L = $\pm$ 20% of initial, DCR = $\pm$ 20% of initial	30		Inductance (μ H)			DC Resistance (m Ω)		
							Initial	Final	% Δ	Initial	Final	% Δ
+25 deg. C						Maximum	86.589	86.778	0.693	0.323	0.322	-0.094
						Minimum	80.073	80.574	0.044	0.319	0.318	-0.467
						Mean	84.130	84.379	0.298	0.321	0.320	-0.276
						Std Dev	1.738	1.667	0.155	0.001	0.001	0.121
17	ESD	AEC-Q200-002	Determine the Classification of the part.	L = $\pm$ 20% of initial, DCR = $\pm$ 20% of initial	15		Inductance (μ H)			DC Resistance (m Ω)		
							Initial	25KV	% Δ	Initial	25KV	% Δ
+25 deg. C						Maximum	86.126	84.521	-0.867	0.322	0.322	0.000
						Minimum	79.378	74.224	-6.493	0.319	0.319	-0.156
						Mean	84.557	81.126	-4.069	0.320	0.320	-0.065
						Std Dev	1.988	2.677	1.669	0.001	0.001	0.048
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					



IHLP4040DZER900K5A 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)		
						-55 deg. C	Maximum	88.040		0.2244			
							Mimimum	80.319		0.2207			
							Mean	84.426		0.2222			
							Std Dev	2.218		0.0011			
						+25 deg. C							
							Maximum	88.330		0.3230			
							Mimimum	80.603		0.3198			
							Mean	84.751		0.3208			
						+155 deg. C	Std Dev	2.221		0.0008			
Maximum	88.565		0.4820										
Mimimum	80.845		0.4744										
	Mean	84.991		0.4783									
	Std Dev	2.210		0.0019									
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	92.492	87.935	0.146	0.324	0.324	0.343
							Mimimum	80.038	80.101	-6.228	0.317	0.317	-0.312
							Mean	84.240	84.098	-0.148	0.320	0.320	0.017
	Std Dev	2.652	2.191	1.172	0.002	0.002	0.169						
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	88.355	88.372	0.088	0.322	0.323	0.249
							Mimimum	78.302	78.280	-0.057	0.320	0.320	-0.559
							Mean	84.359	84.364	0.005	0.321	0.321	0.051
							Std Dev	2.478	2.479	0.034	0.001	0.001	0.156



SECTION 10

IHLP 4040DZ TEST RESULTS

DANSHUI, CHINA MANUFACTURING SITE

A **WORLD OF**
SOLUTIONS





IHLP4040DZER1R0M5A
IHLP4040DZER220M5A
IHLP4040DZER900K5A

- Parts were produced from the Danshui, China manufacturing site



IHLP4040DZER1R0M5A

Test #	Description	Ref. Spec. Meth / Cond	Test Conditions	End Point Δ requirements	Sample Size	Meas Temp							
0	Preconditioning for lead-free products	AEC-Q200 Rev C - Pb Free Specific Tests Table 4.2	As specified in sections 4.3.1 thru 4.3.3 except Visual per DPS-11,865 10X magnification										
1	Pre- and Post-Stress Electrical Test	IHLP Data Sheet	L (μ H) – 100KHz and 250mV DCR – 25°C Ambient	L = $\pm 15\%$ of initial, DCR = $\pm 15\%$ of initial	All tests requiring electrical data								
3	High Temp Exposure	IEC-60068 Part 2-2 test group BA	155°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/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 = $\pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77			Inductance (μ H)			DC Resistance ($m\Omega$)		
								Initial	Final	% Δ	Initial	Final	% Δ
						-55 deg. C	Maximum	1.025	1.075	9.181	1.950	1.920	0.771
							Minimum	0.912	0.994	4.412	1.880	1.863	-2.318
							Mean	0.965	1.035	7.230	1.906	1.887	-1.034
							Std Dev	0.022	0.017	1.059	0.014	0.013	0.747
						+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	1.038	1.094	10.246	2.769	2.736	-0.847
							Minimum	0.916	1.007	4.960	2.711	2.679	-1.710
							Mean	0.971	1.050	8.119	2.737	2.704	-1.207
							Std Dev	0.023	0.018	1.123	0.013	0.013	0.209
						+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	1.054	1.132	12.481	4.106	4.076	0.847
							Minimum	0.929	1.041	7.207	3.972	3.949	-1.668
							Mean	0.982	1.083	10.299	4.054	4.026	-0.693
							Std Dev	0.025	0.019	1.206	0.025	0.024	0.532



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								Inductance (μH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	1.004	1.010	1.281	1.934	1.944	1.527
Mimimum	0.919	0.930	-0.324	1.882	1.871		-2.007						
Mean	0.956	0.963	0.744	1.901	1.898		-0.172						
Std Dev	0.018	0.017	0.298	0.011	0.014		0.753						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	1.017	1.021	1.107	2.759	2.776	0.996						
	Mimimum	0.931	0.932	-1.401	2.702	2.712	-0.037						
	Mean	0.968	0.970	0.169	2.729	2.739	0.386						
	Std Dev	0.018	0.019	0.516	0.011	0.013	0.266						
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	1.029	1.030	0.733	4.123	4.064	-0.591						
	Mimimum	0.934	0.928	-1.836	4.021	3.922	-3.184						
	Mean	0.976	0.976	-0.027	4.079	4.006	-1.792						
	Std Dev	0.019	0.021	0.527	0.020	0.032	0.623						



IHLP4040DZER1R0M5A

							Inductance (μ H)			DC Resistance (m Ω)		
							Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	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/HT	L = $\pm$ 20% of initial, DCR = $\pm$ 20% of initial	77	-55 deg. C	Maximum	1.004	1.010	1.281	1.934	1.944	1.527
						Minimum	0.919	0.930	-0.324	1.882	1.871	-2.007
						Mean	0.956	0.963	0.744	1.901	1.898	-0.172
						Std Dev	0.018	0.017	0.298	0.011	0.014	0.753
					+25 deg. C	Maximum	1.017	1.021	1.107	2.759	2.776	0.996
						Minimum	0.931	0.932	-1.401	2.702	2.712	-0.037
						Mean	0.968	0.970	0.169	2.729	2.739	0.386
						Std Dev	0.018	0.019	0.516	0.011	0.013	0.266
					+155 deg. C	Maximum	1.029	1.030	0.733	4.123	4.064	-0.591
						Minimum	0.934	0.928	-1.836	4.021	3.922	-3.184
						Mean	0.976	0.976	-0.027	4.079	4.006	-1.792
						Std Dev	0.019	0.021	0.527	0.020	0.032	0.623
4	Temperature Cycling	IEC-60068, Part 2.14 test group Na	-55°C to +125°C (+155°C for -5A models) dwell time $\leq$ 30 min. transfer time $\leq$ 10 sec. no. of cycles = 1000 unpowered initial (0 cycles) and final 1000 cycles). Readings at LT/RT/HT	77	-55 deg. C	Maximum	1.025	1.056	6.932	1.962	1.939	0.954
						Minimum	0.930	0.979	1.508	1.874	1.857	-3.124
						Mean	0.961	1.009	5.027	1.906	1.890	-0.804
						Std Dev	0.017	0.014	1.129	0.021	0.020	0.888
					+25 deg. C	Maximum	1.030	1.065	7.645	2.775	2.749	-0.221
						Minimum	0.933	0.987	2.053	2.691	2.682	-1.441
						Mean	0.963	1.018	5.648	2.727	2.713	-0.498
						Std Dev	0.018	0.014	1.134	0.015	0.016	0.193
					+155 deg. C	Maximum	1.055	1.095	8.723	4.113	4.114	0.719
						Minimum	0.945	1.009	2.946	3.992	3.996	-1.591
						Mean	0.979	1.043	6.516	4.060	4.045	-0.379
						Std Dev	0.019	0.015	1.147	0.025	0.026	0.500



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							Inductance (μ H)			DC Resistance (m Ω)		
							Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	Minimum	Mean	Std Dev	Maximum	Minimum
7	Biased Humidity	IEC-60068 Part 2-67	temperature = 85°C $\pm$ 20°C Humidity = 85% $\pm$ 5% RH Duration = 1000 hours Power = No Power Initial (0hr.) and final (1000hr.) readings at LT/RT/HT	L = $\pm$ 20% of initial, DCR = $\pm$ 20% of initial	77	-55 deg. C	1.006	1.009	2.312	1.935	1.956	3.023
							0.901	0.896	-3.395	1.873	1.861	-2.331
							0.948	0.938	-0.969	1.898	1.895	-0.173
							0.020	0.021	1.236	0.014	0.014	0.839
						+25 deg. C	1.018	1.018	2.127	2.752	2.781	1.794
							0.909	0.900	-3.418	2.691	2.671	-1.868
							0.956	0.945	-1.155	2.722	2.718	-0.131
							0.020	0.022	1.197	0.013	0.017	0.493
						+155 deg. C	1.031	1.030	1.197	4.105	4.132	1.490
							0.915	0.905	-3.906	4.011	3.919	-3.544
							0.966	0.954	-1.269	4.057	4.051	-0.136
							0.021	0.023	1.140	0.023	0.034	0.854
8	Operational Life	MIL-STD-202, Method 108A	Temperature = 85°C for -1A/A1 models. Temperature = 115°C for -5A models. Duration = 2000hrs. Power = As noted on the test request. Readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT	L = $\pm$ 20% of initial, DCR = $\pm$ 20% of initial	77	-55 deg. C	1.002	1.050	7.107	1.956	1.917	1.009
							0.931	0.978	2.829	1.880	1.866	-2.976
							0.963	1.013	5.184	1.906	1.889	-0.871
							0.015	0.016	0.957	0.015	0.012	0.698
						+25 deg. C	1.019	1.061	7.282	2.772	2.786	2.037
							0.945	0.993	3.267	2.700	2.696	-1.672
							0.976	1.030	5.492	2.737	2.732	-0.185
							0.015	0.016	0.864	0.014	0.024	0.809
						+155 deg. C	1.033	1.094	9.545	4.150	4.127	0.913
							0.952	1.018	4.861	4.030	3.988	-2.644
							0.985	1.058	7.376	4.090	4.059	-0.739
							0.016	0.017	1.043	0.026	0.027	0.673



IHLP4040DZER1R0M5A

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

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	0.986	0.993	1.155	1.936	1.930	0.670
Mimimum	0.925	0.933	0.471	1.884	1.895		-0.440						
Mean	0.953	0.961	0.835	1.910	1.910		0.029						
Std Dev	0.014	0.014	0.160	0.013	0.011		0.328						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	0.996	1.003	1.290	2.771	2.759	-0.037						
	Mimimum	0.931	0.941	0.578	2.713	2.703	-0.766						
	Mean	0.960	0.969	0.984	2.739	2.727	-0.458						
	Std Dev	0.015	0.015	0.195	0.016	0.014	0.189						
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	1.012	1.015	0.482	4.131	4.130	0.049						
	Mimimum	0.944	0.947	0.005	4.046	4.046	-0.171						
	Mean	0.971	0.974	0.250	4.081	4.080	-0.020						
	Std Dev	0.016	0.015	0.122	0.021	0.021	0.045						



IHLP4040DZER1R0M5A

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)		
	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	Initial	Final	%Δ	Initial	Final
							Maximum	1.011	1.023	2.882	1.935
							Minimum	0.915	0.934	1.171	1.874
							Mean	0.945	0.962	1.813	1.908
							Std Dev	0.022	0.021	0.387	0.014
						+25 deg. C	Initial	Final	%Δ	Initial	Final
							Maximum	1.026	1.036	2.481	2.748
							Minimum	0.924	0.942	1.005	2.678
							Mean	0.955	0.970	1.597	2.721
							Std Dev	0.023	0.022	0.375	0.016
						+155 deg. C	Initial	Final	%Δ	Initial	Final
							Maximum	1.044	1.052	1.329	4.119
							Minimum	0.939	0.950	0.579	4.015
							Mean	0.969	0.978	0.968	4.070
							Std Dev	0.024	0.024	0.222	0.026



IHLP4040DZER1R0M5A

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	1.014	1.017	1.655	2.759	2.775	0.694
Minimum	0.944	0.956	0.334	2.711	2.708		-0.147						
Mean	0.971	0.982	1.053	2.728	2.736		0.286						
Std Dev	0.016	0.014	0.323	0.011	0.014		0.224						
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	0.984	0.990	0.887	2.754	2.763	0.552
							Minimum	0.932	0.933	0.179	2.692	2.702	-0.073
							Mean	0.962	0.966	0.449	2.728	2.736	0.306
Std Dev	0.018	0.018	0.191	0.017	0.016		0.146						
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						



IHLP4040DZER1R0M5A

								Inductance (μH)			DC Resistance (mΩ)		
								Initial			Initial		
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	-55 deg. C	Maximum	1.001			1.972		
							Mimimum	0.917			1.890		
							Mean	0.947			1.923		
							Std Dev	0.019			0.017		
						+25 deg. C		Initial			Initial		
							Maximum	1.011			2.753		
							Mimimum	0.918			2.649		
							Mean	0.952			2.729		
							Std Dev	0.021			0.021		
							+155 deg. C		Initial			Initial	
								Maximum	1.028			4.100	
								Mimimum	0.934			4.016	
						Mean		0.966			4.051		
						Std Dev	0.021			0.023			
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	1.049	1.046	0.970	2.745	2.746	0.631
							Mimimum	0.923	0.930	-0.398	2.680	2.688	-0.625
							Mean	0.964	0.968	0.451	2.717	2.721	0.155
							Std Dev	0.026	0.025	0.366	0.016	0.015	0.267
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	1.032	1.038	0.898	2.750	2.766	0.847
							Mimimum	0.944	0.949	0.192	2.698	2.684	-0.776
							Mean	0.974	0.979	0.526	2.721	2.734	0.476
							Std Dev	0.025	0.026	0.137	0.013	0.017	0.297



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Test #	Description	Ref. Spec. Meth / Cond	Test Conditions	End Point Δ requirements	Sample Size	Meas Temp							
0	Preconditioning for lead-free products	AEC-Q200 Rev C - Pb Free Specific Tests Table 4.2	As specified in sections 4.3.1 thru 4.3.3 except Visual per DPS-11,865 10X magnification										
1	Pre- and Post-Stress Electrical Test	IHLP Data Sheet	L (μ H) – 100KHz and 250mV DCR – 25°C Ambient	L = $\pm 15\%$ of initial, DCR = $\pm 15\%$ of initial	All tests requiring electrical data								
3	High Temp Exposure	IEC-60068 Part 2-2 test group BA	155°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/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 = $\pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77			Inductance (μ H)			DC Resistance ($m\Omega$)		
								Initial	Final	% Δ	Initial	Final	% Δ
						-55 deg. C	Maximum	21.840	23.467	13.806	48.490	47.150	1.479
							Minimum	19.200	20.761	2.927	45.780	42.560	-8.276
							Mean	20.475	22.044	7.673	46.919	46.067	-1.807
							Std Dev	0.509	0.494	1.208	0.604	0.627	1.464
						+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	22.025	23.604	9.735	68.340	67.740	6.670
							Minimum	19.178	20.878	3.368	62.820	65.330	-2.318
							Mean	20.494	22.178	8.230	66.855	66.346	-0.754
							Std Dev	0.534	0.503	0.842	0.782	0.636	0.945
						+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	22.182	24.052	10.888	101.810	101.900	5.390
							Minimum	19.412	21.181	6.185	94.990	92.850	-5.090
							Mean	20.683	22.578	9.166	99.279	99.217	-0.062
							Std Dev	0.517	0.522	0.596	1.124	1.413	0.978



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									Inductance (μH)			DC Resistance (mΩ)		
									Initial	Final	%Δ	Initial	Final	%Δ
							-55 deg. C	Maximum	21.986	22.105	8.596	50.740	48.280	2.970
Mimimum	19.319	19.534	0.058	44.450	42.810	-9.550								
Mean	20.596	20.784	0.919	47.160	46.321	-1.721								
Std Dev	0.652	0.629	0.938	1.313	0.725	2.557								
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ							
	Maximum	22.088	22.329	2.177	67.960	67.930	0.564							
	Mimimum	19.261	19.525	0.101	65.620	64.380	-2.381							
	Mean	20.596	20.818	1.085	66.511	66.364	-0.222							
	Std Dev	0.662	0.631	0.335	0.531	0.615	0.520							
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ							
	Maximum	22.289	22.312	0.598	99.880	100.750	1.434							
	Mimimum	19.401	19.432	-0.275	95.610	89.380	-8.272							
	Mean	20.669	20.690	0.104	97.918	98.032	0.118							
	Std Dev	0.629	0.630	0.138	0.786	1.407	1.328							

									Inductance (μH)			DC Resistance (mΩ)		
									Initial	Final	%Δ	Initial	Final	%Δ
							-55 deg. C	Maximum	23.081	23.722	4.724	48.380	47.120	1.335
Mimimum	19.129	19.858	-3.961	45.940	44.820	-4.671								
Mean	20.591	21.285	3.383	46.764	45.922	-1.794								
Std Dev	0.705	0.675	0.973	0.505	0.502	1.198								
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ							
	Maximum	23.173	23.838	5.252	69.070	68.290	-0.669							
	Mimimum	19.097	19.341	-6.612	66.680	61.050	-9.929							
	Mean	20.589	21.353	3.724	67.666	66.633	-1.525							
	Std Dev	0.711	0.706	1.281	0.521	0.851	1.072							
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ							
	Maximum	23.381	24.275	5.407	101.040	100.370	0.541							
	Mimimum	19.274	20.077	0.227	97.490	93.980	-5.145							
	Mean	20.650	21.576	4.489	98.902	97.807	-1.109							
	Std Dev	0.688	0.694	0.605	0.815	1.396	1.080							



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7	Biased Humidity	IEC-60068 Part 2-67	temperature = 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			Inductance (μH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	22.606	22.393	-0.179	49.720	48.200	2.860
Minimum	19.359	17.939	-7.337	45.580	41.990		-9.563						
Mean	20.644	20.425	-1.071	46.693	46.511		-0.368						
Std Dev	0.673	0.759	1.056	0.829	0.763		2.004						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	22.674	22.526	2.432	68.350	67.980	4.010						
	Minimum	19.355	18.788	-3.841	64.830	56.670	-15.418						
	Mean	20.668	20.549	-0.579	66.663	66.096	-0.846						
	Std Dev	0.691	0.719	0.712	0.545	1.356	2.029						
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	22.625	23.201	13.682	101.830	101.600	0.916						
	Minimum	19.565	18.885	-4.704	97.760	96.140	-3.206						
	Mean	20.775	20.572	-0.981	99.273	98.642	-0.636						
	Std Dev	0.655	0.769	1.939	0.866	1.109	0.657						

8	Operational Life	MIL-STD-202, Method 108A	Temperature = 85°C for -1A/A1 models. Temperature =115° C for -5A models. Duration = 2000hrs. Power = 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	23.031	23.941	6.610	47.880	48.460	3.150
Minimum	19.495	18.700	-6.484	45.850	43.450		-5.912						
Mean	20.825	21.835	4.854	46.565	46.343		-0.477						
Std Dev	0.583	0.656	1.512	0.522	0.665		0.924						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	23.059	24.249	7.748	68.640	69.600	1.918						
	Minimum	19.438	20.756	4.462	66.030	65.630	-1.533						
	Mean	20.823	22.087	6.078	66.984	66.636	-0.521						
	Std Dev	0.591	0.575	0.700	0.597	0.796	0.592						
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	23.135	24.775	8.326	102.510	101.870	0.239						
	Minimum	19.655	20.929	4.133	97.460	83.030	-17.309						
	Mean	20.951	22.361	6.729	99.886	98.711	-1.177						
	Std Dev	0.577	0.637	0.814	1.009	2.594	2.356						



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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

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	22.192	22.296	1.390	47.520	47.470	1.951
Mimimum	19.354	19.623	0.048	45.990	46.170		-0.667						
Mean	20.827	20.957	0.634	46.467	46.676		0.452						
Std Dev	0.737	0.679	0.366	0.359	0.342		0.577						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	22.413	22.494	1.859	69.380	69.000	0.889						
	Minimum	19.361	19.720	0.361	66.360	66.410	-2.158						
	Mean	20.835	21.054	1.059	67.530	67.058	-0.695						
	Std Dev	0.758	0.695	0.400	0.631	0.554	0.721						
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	22.252	22.409	0.721	101.460	101.730	10.209						
	Mimimum	19.547	19.630	0.254	90.610	96.500	-1.026						
	Mean	20.779	20.896	0.565	98.997	99.680	0.718						
	Std Dev	0.670	0.681	0.123	1.801	0.913	1.865						



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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)		
	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	Initial	Final	%Δ	Initial	Final
							Maximum	22.104	22.166	1.219	47.630
							Minimum	19.286	19.512	-1.970	45.970
							Mean	20.579	20.725	0.712	46.519
							Std Dev	0.554	0.547	0.579	0.427
						+25 deg. C	Initial	Final	%Δ	Initial	Final
							Maximum	22.072	22.286	1.862	67.630
							Minimum	19.239	19.597	0.620	65.640
							Mean	20.582	20.849	1.305	66.441
							Std Dev	0.563	0.523	0.337	0.565
						+155 deg. C	Initial	Final	%Δ	Initial	Final
							Maximum	22.083	22.134	0.516	100.870
							Minimum	19.422	19.448	-0.082	97.910
							Mean	20.657	20.702	0.217	99.135
							Std Dev	0.515	0.518	0.134	0.841



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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	21.750	21.976	2.570	68.340	68.100	-0.120
								Minimum	19.920	20.264	0.857	66.750	66.460	-0.507
								Mean	20.750	21.068	1.538	67.135	66.918	-0.322
								Std Dev	0.435	0.396	0.439	0.425	0.422	0.103
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	22.555	22.643	0.547	68.950	69.070	0.220
								Minimum	20.232	20.290	-0.137	66.990	67.110	0.119
								Mean	21.153	21.213	0.288	67.461	67.571	0.163
								Std Dev	0.645	0.643	0.202	0.534	0.543	0.027
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						



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								Inductance (μH)			DC Resistance (mΩ)		
								Initial				Initial	
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	-55 deg. C	Maximum	22.104			47.630		
							Mimimum	19.286			45.970		
							Mean	20.579			46.519		
							Std Dev	0.554			0.427		
						+25 deg. C		Initial		Initial			
							Maximum	22.072	67.630				
							Mimimum	19.239	65.640				
							Mean	20.582	66.441				
							Std Dev	0.563	0.565				
							+155 deg. C		Initial		Initial		
								Maximum	22.083	100.870			
								Mimimum	19.422	97.910			
						Mean		20.657	99.135				
						Std Dev	0.515	0.841					
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	21.873	22.005	0.779	68.980	69.000	0.579
							Mimimum	20.235	20.375	0.520	67.130	67.240	-0.074
							Mean	20.971	21.106	0.644	67.689	67.809	0.177
							Std Dev	0.440	0.442	0.065	0.493	0.476	0.154
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	22.114	21.943	-0.416	68.450	68.510	0.480
							Mimimum	19.858	19.761	-1.085	66.430	66.470	-0.445
							Mean	21.081	20.950	-0.621	67.244	67.278	0.050
							Std Dev	0.568	0.553	0.197	0.578	0.563	0.178



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Test #	Description	Ref. Spec. Meth / Cond	Test Conditions	End Point Δ requirements	Sample Size	Meas Temp							
0	Preconditioning for lead-free products	AEC-Q200 Rev C - Pb Free Specific Tests Table 4.2	As specified in sections 4.3.1 thru 4.3.3 except Visual per DPS-11,865 10X magnification										
1	Pre- and Post-Stress Electrical Test	IHLP Data Sheet	L (μ H) – 100KHz and 250mV DCR – 25°C Ambient	L = $\pm 15\%$ of initial, DCR = $\pm 15\%$ 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 = $\pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77			Inductance (μ H)			DC Resistance ($m\Omega$)		
								Initial	Final	% Δ	Initial	Final	% Δ
						-55 deg. C	Maximum	84.175	90.136	7.981	0.233	0.231	-0.742
							Minimum	76.774	82.422	6.234	0.227	0.225	-2.190
							Mean	79.643	85.368	7.192	0.230	0.227	-1.220
							Std Dev	1.622	1.650	0.448	0.001	0.001	0.350
						+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	84.813	90.765	8.089	0.336	0.334	-0.481
							Minimum	77.083	82.957	6.267	0.329	0.327	-0.751
							Mean	80.074	85.880	7.255	0.332	0.330	-0.587
							Std Dev	1.650	1.678	0.459	0.002	0.002	0.061
						+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	85.376	93.249	10.349	0.504	0.503	-0.121
							Minimum	77.480	84.815	8.048	0.489	0.488	-0.382
							Mean	80.528	87.973	9.249	0.497	0.496	-0.235
							Std Dev	1.689	1.777	0.521	0.003	0.003	0.052



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										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	85.050	85.517	0.766	0.235	0.236	1.391			
						Minimum	76.644	77.022	0.347	0.227	0.227	-1.074			
						Mean	80.315	80.723	0.508	0.230	0.230	0.033			
						Std Dev	1.858	1.858	0.076	0.002	0.002	0.418			
					+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ			
						Maximum	85.576	85.947	0.606	0.334	0.334	-0.030			
						Minimum	77.050	77.357	0.116	0.328	0.328	-0.331			
						Mean	80.727	81.053	0.404	0.331	0.331	-0.110			
					+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ			
						Maximum	85.864	85.899	0.097	0.500	0.501	1.247			
						Minimum	77.229	77.279	-0.038	0.486	0.484	-2.012			
						Mean	81.040	81.071	0.039	0.494	0.493	-0.168			
					Std Dev	1.886	1.885	0.024	0.003	0.004	0.629				

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	85.971	88.215	4.340	0.233	0.233	0.695			
							Minimum	76.104	79.008	1.942	0.227	0.226	-0.964			
							Mean	79.724	82.406	3.369	0.229	0.229	-0.335			
							Std Dev	2.069	2.015	0.389	0.001	0.002	0.374			
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ			
							Maximum	86.322	88.534	4.267	0.335	0.334	0.210			
							Minimum	76.267	79.315	2.563	0.329	0.328	-0.721			
							Mean	80.124	82.778	3.319	0.332	0.331	-0.350			
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ			
							Maximum	86.712	89.805	5.467	0.503	0.501	0.552			
							Minimum	76.530	80.472	3.421	0.487	0.487	-0.916			
							Mean	80.524	84.031	4.362	0.497	0.496	-0.219			
						Std Dev	2.162	2.085	0.469	0.003	0.003	0.240				



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									Inductance (μH)			DC Resistance (mΩ)		
									Initial	Final	%Δ	Initial	Final	%Δ
							-55 deg. C	Maximum	86.023	86.558	0.940	0.234	0.231	0.653
Mimimum	77.134	77.381	-0.352	0.227	0.225	-2.264								
Mean	80.308	80.747	0.546	0.230	0.228	-1.058								
Std Dev	1.893	1.959	0.239	0.002	0.001	0.686								
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ							
	Maximum	86.442	86.804	0.697	0.336	0.335	-0.151							
	Mimimum	77.539	77.648	-0.631	0.329	0.328	-0.723							
	Mean	80.743	80.979	0.291	0.332	0.331	-0.315							
	Std Dev	1.907	1.957	0.227	0.002	0.002	0.123							
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ							
	Maximum	86.747	87.192	0.765	0.501	0.502	1.863							
	Mimimum	77.950	78.129	-0.686	0.484	0.483	-2.052							
	Mean	81.086	81.379	0.361	0.493	0.494	0.207							
	Std Dev	1.898	1.922	0.225	0.004	0.004	0.896							

									Inductance (μH)			DC Resistance (mΩ)		
									Initial	Final	%Δ	Initial	Final	%Δ
							-55 deg. C	Maximum	82.946	90.125	9.629	0.236	0.235	1.522
Mimimum	74.717	79.844	4.048	0.229	0.225	-2.211								
Mean	78.560	83.984	6.914	0.231	0.229	-1.044								
Std Dev	1.947	2.105	1.494	0.001	0.002	0.836								
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ							
	Maximum	83.209	90.837	10.059	0.335	0.332	-0.484							
	Mimimum	74.948	80.571	4.577	0.329	0.325	-1.545							
	Mean	78.882	84.626	7.291	0.331	0.329	-0.811							
	Std Dev	1.961	2.109	1.477	0.001	0.002	0.216							
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ							
	Maximum	83.937	93.347	11.561	0.502	0.501	1.604							
	Mimimum	75.801	82.229	5.071	0.486	0.483	-2.718							
	Mean	79.858	86.548	8.384	0.496	0.494	-0.391							
	Std Dev	1.926	2.270	1.606	0.003	0.004	0.716							



IHLP4040DZER9000K5A

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

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	84.813	85.316	0.593	0.230	0.229	-0.044
Mimimum	76.803	76.984	0.236	0.226	0.225		-0.656						
Mean	80.201	80.589	0.483	0.228	0.227		-0.432						
Std Dev	1.907	1.931	0.081	0.001	0.001		0.150						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	85.301	85.877	0.732	0.334	0.333	-0.120						
	Mimimum	77.090	77.389	0.387	0.329	0.328	-0.211						
	Mean	80.679	81.171	0.610	0.331	0.331	-0.149						
	Std Dev	1.973	1.999	0.070	0.001	0.001	0.029						
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	85.772	85.931	0.262	0.502	0.499	-0.321						
	Mimimum	77.165	77.256	0.102	0.495	0.492	-0.841						
	Mean	81.157	81.321	0.203	0.499	0.496	-0.515						
	Std Dev	2.027	2.037	0.045	0.002	0.002	0.144						



IHLP4040DZER9000K5A

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)		
	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						



IHLP4040DZER9000K5A

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	81.808	83.074	2.210	0.333	0.331	-0.423
Minimum	75.757	77.369	0.982	0.328	0.327		-0.636						
Mean	78.010	79.292	1.646	0.331	0.329		-0.540						
Std Dev	1.480	1.446	0.306	0.001	0.001		0.063						
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	86.841	84.688	0.914	0.335	0.335	0.060
							Minimum	78.848	66.818	-19.833	0.330	0.330	-0.270
							Mean	81.761	77.025	-5.707	0.332	0.332	-0.076
Std Dev	2.280	5.240	7.054	0.001	0.001		0.111						
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						



IHLP4040DZER9000K5A

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	83.598			0.233		
							Minimum	76.825			0.226		
							Mean	79.637			0.229		
							Std Dev	1.631			0.002		
						+25 deg. C		Initial			Initial		
							Maximum	84.107			0.332		
							Minimum	77.069			0.328		
							Mean	79.914			0.330		
							Std Dev	1.693			0.001		
						+155 deg. C		Initial			Initial		
							Maximum	84.507			0.499		
							Minimum	77.538			0.487		
							Mean	80.309			0.494		
							Std Dev	1.690			0.003		
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	85.495	85.610	0.147	0.333	0.334	0.301
							Minimum	77.483	77.580	0.058	0.329	0.329	-0.181
							Mean	79.920	79.993	0.091	0.331	0.332	0.063
							Std Dev	1.814	1.819	0.025	0.001	0.001	0.138
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	86.100	86.161	0.109	0.335	0.334	-0.121
							Minimum	78.129	78.183	-0.068	0.329	0.328	-0.477
							Mean	80.999	81.042	0.053	0.332	0.331	-0.260
							Std Dev	1.825	1.830	0.042	0.002	0.002	0.095



SECTION 10

IHLP 4040DZ TEST RESULTS

YANKTON, SD MANUFACTURING SITE

A **WORLD OF**
SOLUTIONS





IHLP4040DZERR47M5A IHLP4040DZER330M5A

- Parts were produced from the Yankton, SD manufacturing site



IHLP4040DZERR47M5A

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 except Visual per DPS-11,865 10X magnification										
1	Pre- and Post-Stress Electrical Test	IHLP Data Sheet	L (μ H) – 100KHz and 250mV DCR – 25°C Ambient	L = $\pm 15\%$ of initial, DCR = $\pm 15\%$ of initial	All tests requiring electrical data								
3	High Temp Exposure	IEC-60068 Part 2-2 test group BA	155°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/HT LT=Low Temperature=-55°C, RT=Room Temperature= $\pm 25^\circ$ C, HT=High Temperature= $\pm 125^\circ$ C for -A1/1A models. HT=High Temperature = $\pm 155^\circ$ C for -5A models.	L = $\pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77			Inductance (μ H)			DC Resistance ($m\Omega$)		
								Initial	Final	% Δ	Initial	Final	% Δ
						-55 deg. C	Maximum	0.460	0.512	14.291	1.050	1.047	2.358
							Minimum	0.423	0.477	9.754	0.984	0.971	-1.905
							Mean	0.441	0.492	11.593	1.014	1.004	-0.970
							Std Dev	0.008	0.007	0.840	0.013	0.015	0.726
						+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	0.465	0.512	14.077	1.497	1.484	-0.560
							Minimum	0.426	0.479	9.346	1.409	1.348	-9.628
							Mean	0.444	0.495	11.389	1.448	1.433	-1.034
							Std Dev	0.008	0.007	0.873	0.018	0.019	1.095
						+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	0.469	0.527	14.836	2.237	2.224	-0.227
							Minimum	0.434	0.493	11.174	2.089	1.981	-7.078
							Mean	0.448	0.508	13.347	2.154	2.139	-0.725
							Std Dev	0.008	0.008	0.839	0.030	0.035	0.801



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					77			Inductance (μH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	0.468	0.475	2.943	1.243	1.107	-0.188
Mimimum	0.428	0.435	0.441	0.985	0.979		-11.083						
Mean	0.445	0.451	1.436	1.036	1.009		-2.529						
Std Dev	0.008	0.008	0.366	0.041	0.017		2.770						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	0.471	0.477	1.960	1.507	1.500	0.102						
	Mimimum	0.430	0.435	0.308	1.410	1.404	-0.816						
	Mean	0.447	0.452	1.069	1.451	1.444	-0.465						
	Std Dev	0.009	0.009	0.308	0.018	0.018	0.114						
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	0.477	0.502	10.454	2.230	2.227	6.676						
	Mimimum	0.433	0.439	0.016	1.952	2.069	-0.605						
	Mean	0.452	0.457	0.966	2.121	2.139	0.899						
	Std Dev	0.009	0.010	1.152	0.052	0.033	1.961						



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								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	0.465	0.485	7.027	1.067	1.067	1.336
							Minimum	0.423	0.446	3.682	0.992	0.991	-2.076
							Mean	0.450	0.472	4.994	1.023	1.020	-0.305
							Std Dev	0.009	0.008	0.785	0.017	0.017	0.694
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.466	0.488	7.392	1.520	1.528	1.903
							Minimum	0.423	0.449	4.285	1.418	1.390	-2.477
							Mean	0.451	0.475	5.518	1.453	1.454	0.018
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.469	0.498	9.333	2.256	2.233	0.232
							Minimum	0.426	0.457	4.450	2.097	2.046	-4.480
							Mean	0.455	0.484	6.408	2.159	2.127	-1.474
						Std Dev	0.009	0.008	0.939	0.033	0.034	0.958	

								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	0.460	0.452	2.577	1.061	1.183	14.138
							Minimum	0.426	0.408	-5.383	0.985	1.002	-0.165
							Mean	0.445	0.434	-2.496	1.014	1.033	1.889
							Std Dev	0.008	0.009	1.256	0.016	0.032	2.724
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.460	0.454	0.163	1.508	1.508	0.557
							Minimum	0.426	0.411	-4.854	1.421	1.414	-1.119
							Mean	0.445	0.435	-2.155	1.458	1.452	-0.370
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.468	0.459	-0.586	2.226	2.225	1.265
							Minimum	0.430	0.414	-6.188	2.084	2.074	-0.661
							Mean	0.451	0.439	-2.842	2.153	2.154	0.053
						Std Dev	0.008	0.010	1.051	0.029	0.032	0.310	



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								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	0.467	0.514	14.784	1.061	1.064	1.228
							Mimimum	0.425	0.464	5.410	0.989	0.974	-3.800
							Mean	0.446	0.489	9.694	1.026	1.010	-1.496
							Std Dev	0.008	0.011	2.256	0.013	0.015	0.990
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.468	0.518	15.114	1.502	1.506	0.293
							Mimimum	0.426	0.466	5.984	1.414	1.409	-2.180
							Mean	0.447	0.492	10.050	1.460	1.452	-0.556
						+155 deg. C	Std Dev	0.008	0.011	2.290	0.017	0.017	0.450
								Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.475	0.532	16.503	2.073	2.197	7.719
							Mimimum	0.432	0.481	6.867	1.928	2.056	3.710
							Mean	0.453	0.505	11.408	2.005	2.131	6.316
							Std Dev	0.008	0.012	2.377	0.025	0.031	0.761
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						



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								Inductance (μH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	0.462	0.464	0.915	1.035	1.034	0.452
Mimimum	0.431	0.434	-0.057	0.987	0.988		-0.871						
Mean	0.446	0.448	0.464	1.014	1.014		-0.037						
Std Dev	0.009	0.009	0.261	0.012	0.011		0.335						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	0.465	0.468	1.170	1.475	1.483	0.731						
	Mimimum	0.432	0.436	0.327	1.410	1.418	0.423						
	Mean	0.447	0.451	0.726	1.445	1.453	0.559						
+155 deg. C	Std Dev	0.009	0.009	0.217	0.015	0.015	0.064						
		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	0.470	0.470	0.388	2.202	2.205	0.323						
	Mimimum	0.435	0.435	-0.371	2.105	2.105	0.000						
Mean	0.451	0.451	-0.039	2.155	2.158	0.147							
Std Dev	0.010	0.010	0.161	0.023	0.023	0.057							

								Inductance (μH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	0.470	0.475	1.645	1.071	1.057	1.184
Mimimum	0.429	0.434	-0.269	0.998	0.958		-6.984						
Mean	0.448	0.452	0.927	1.026	1.021		-0.429						
Std Dev	0.009	0.009	0.353	0.019	0.021		1.406						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	0.473	0.478	1.644	1.504	1.504	0.383						
	Mimimum	0.431	0.437	0.109	1.421	1.419	-0.400						
	Mean	0.450	0.455	1.092	1.460	1.459	-0.049						
+155 deg. C	Std Dev	0.009	0.009	0.282	0.025	0.025	0.205						
		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	0.477	0.481	1.470	2.225	2.071	-5.444						
	Mimimum	0.435	0.439	-0.158	2.086	1.941	-8.135						
Mean	0.453	0.457	0.857	2.155	2.006	-6.934							
Std Dev	0.009	0.010	0.282	0.039	0.035	0.729							



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								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	0.460	0.462	1.153	1.048	1.051	0.267	
						Mimimum	0.420	0.423	-0.163	0.992	0.985	-1.283	
						Mean	0.443	0.445	0.499	1.019	1.012	-0.604	
						Std Dev	0.009	0.009	0.262	0.011	0.012	0.326	
					+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ	
						Maximum	0.462	0.466	1.269	1.480	1.486	0.675	
						Mimimum	0.420	0.424	0.308	1.409	1.415	0.146	
						Mean	0.445	0.448	0.795	1.444	1.450	0.416	
					+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ	
						Maximum	0.467	0.467	0.329	2.202	2.206	0.370	
						Mimimum	0.424	0.424	-0.373	2.077	2.077	-0.092	
						Mean	0.449	0.449	-0.120	2.140	2.141	0.060	
					Std Dev	0.010	0.010	0.183	0.027	0.028	0.088		
					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		Inductance (μH)
	Initial	Final	%Δ	Initial								Final	%Δ
Maximum	0.470	0.475	3.600	1.438								1.442	0.581
Mimimum	0.436	0.444	0.924	1.361								1.365	-0.091
Mean	0.449	0.456	1.612	1.415							1.420	0.322	
Std Dev	0.007	0.007	0.651	0.017							0.018	0.159	
17	ESD	AEC-Q200-002	Determine the Classification of the part.	L=±20% of initial, DCR = ±20% of initial	15	+25 deg. C		Inductance (μH)			DC Resistance (mΩ)		
								Initial	25KV	%Δ	Initial	25KV	%Δ
							Maximum	0.459	0.467	2.349	1.460	1.468	0.527
							Mimimum	0.424	0.425	-1.687	1.411	1.410	-0.347
						Mean	0.450	0.454	0.834	1.428	1.428	0.027	
						Std Dev	0.009	0.010	1.231	0.015	0.017	0.234	
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						



IHLP4040DZERR47M5A

								Inductance (μH)			DC Resistance (mΩ)		
								Initial			Initial		
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	-55 deg. C	Maximum	0.460			Initial	1.048	
							Minimum	0.420			0.992		
							Mean	0.443			1.019		
							Std Dev	0.009			0.011		
						+25 deg. C		Initial		Initial			
							Maximum	0.462	1.480				
							Minimum	0.420	1.409				
							Mean	0.445	1.444				
							Std Dev	0.010	0.015				
							+155 deg. C		Initial		Initial		
								Maximum	0.467	2.202			
								Minimum	0.424	2.077			
						Mean		0.449	2.140				
						Std Dev	0.010	0.027					
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	0.468	0.471	1.962	1.475	1.471	0.071
							Minimum	0.436	0.439	-0.309	1.390	1.387	-0.448
							Mean	0.449	0.453	0.883	1.430	1.428	-0.134
							Std Dev	0.007	0.008	0.502	0.020	0.020	0.122
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	0.467	0.486	4.947	1.447	1.438	-0.014
							Minimum	0.441	0.449	-0.492	1.387	1.382	-0.974
							Mean	0.457	0.470	2.736	1.419	1.412	-0.476
							Std Dev	0.007	0.011	1.783	0.015	0.015	0.284



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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 except Visual per DPS-11,865 10X magnification										
1	Pre- and Post-Stress Electrical Test	IHLP Data Sheet	L (μ H) – 100KHz and 250mV DCR – 25°C Ambient	L = $\pm 15\%$ of initial, DCR = $\pm 15\%$ of initial	All tests requiring electrical data								
3	High Temp Exposure	IEC-60068 Part 2-2 test group BA	155°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/HT LT=Low Temperature=-55°C, RT=Room Temperature= $\pm 25^\circ$ C, HT=High Temperature= $\pm 125^\circ$ C for -A1/1A models. HT=High Temperature = $\pm 155^\circ$ C for -5A models.	L = $\pm 20\%$ of initial, DCR = $\pm 20\%$ of initial	77			Inductance (μ H)			DC Resistance ($m\Omega$)		
								Initial	Final	% Δ	Initial	Final	% Δ
						-55 deg. C	Maximum	31.005	33.191	8.908	70.730	70.870	1.971
							Minimum	26.343	28.496	6.443	68.160	68.780	-0.834
							Mean	28.012	30.138	7.599	69.556	69.729	0.252
							Std Dev	0.926	0.907	0.596	0.498	0.457	0.735
						+25 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	31.043	33.351	9.024	101.320	101.110	0.981
							Minimum	26.462	28.663	6.503	98.800	98.910	-0.768
							Mean	28.147	30.322	7.739	100.139	100.226	0.088
							Std Dev	0.932	0.916	0.590	0.568	0.573	0.352
						+155 deg. C		Initial	Final	% Δ	Initial	Final	% Δ
							Maximum	30.871	34.022	11.320	151.750	151.850	1.474
							Minimum	26.544	29.102	8.536	147.360	146.910	-1.358
							Mean	28.116	30.897	9.895	149.537	149.249	-0.192
							Std Dev	0.887	0.973	0.539	0.861	1.107	0.563



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								Inductance (μH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	29.392	29.475	0.606	70.810	71.330	2.457
Mimimum	27.057	27.110	0.065	68.870	69.480		-0.386						
Mean	28.152	28.233	0.287	69.675	70.250		0.828						
Std Dev	0.582	0.577	0.104	0.404	0.384		0.651						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	29.529	29.572	0.527	101.970	102.170	1.717						
	Mimimum	27.157	27.185	0.000	99.430	100.370	-0.631						
	Mean	28.283	28.338	0.196	100.818	101.242	0.423						
	Std Dev	0.590	0.585	0.104	0.620	0.445	0.490						
+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	29.503	29.545	0.263	152.120	152.740	2.752						
	Mimimum	26.944	26.983	0.017	147.390	148.890	-0.873						
	Mean	28.189	28.228	0.138	149.708	151.011	0.874						
	Std Dev	0.592	0.592	0.032	1.134	0.831	0.664						



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								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	29.179	30.020	3.854	70.560	70.890	2.680
							Mimimum	27.025	27.870	2.447	67.540	69.100	-1.313
							Mean	28.098	28.942	3.007	69.566	69.976	0.592
							Std Dev	0.519	0.532	0.315	0.454	0.432	0.585
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	29.374	30.195	3.770	103.650	104.000	2.534
							Mimimum	27.169	27.986	2.295	100.100	100.290	-0.129
							Mean	28.246	29.063	2.892	101.483	102.304	0.810
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	29.235	30.657	5.326	151.290	152.870	1.827
							Mimimum	27.166	28.313	3.714	147.660	148.950	0.027
							Mean	28.210	29.440	4.357	149.610	150.618	0.675
						Std Dev	0.510	0.585	0.358	0.837	0.794	0.395	

								Inductance (μH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
7	Biased Humidity	IEC-60068 Part 2-67	Temperature = 85°C ±20°C Humidity = 85% ±5% RH Duration = 1000 hours Pow er = 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	29.496	29.401	0.058	71.140	71.010	0.911
							Mimimum	26.639	26.619	-0.691	69.180	69.210	-1.082
							Mean	28.155	28.045	-0.391	70.046	70.101	0.079
							Std Dev	0.647	0.639	0.143	0.431	0.419	0.401
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	29.690	30.041	1.183	101.420	101.950	1.172
							Mimimum	26.751	26.730	-0.827	99.580	99.920	-0.407
							Mean	28.300	28.167	-0.469	100.454	100.937	0.481
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	29.619	29.575	0.349	151.860	152.910	1.364
							Mimimum	26.699	26.730	-0.607	148.620	148.990	-0.206
							Mean	28.216	28.166	-0.177	149.873	150.822	0.633
						Std Dev	0.655	0.639	0.208	0.761	0.887	0.339	



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								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	28.894	30.288	6.572	71.250	71.360	2.912
							Mimimum	26.347	27.888	3.256	68.000	69.200	-1.931
							Mean	27.928	29.129	4.301	69.858	70.190	0.482
							Std Dev	0.555	0.550	0.613	0.613	0.497	0.992
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	29.094	30.550	6.922	103.250	102.230	0.899
							Mimimum	26.492	28.125	3.551	100.040	99.880	-1.948
							Mean	28.081	29.385	4.648	101.500	101.010	-0.480
						+155 deg. C	Std Dev	0.574	0.567	0.599	0.738	0.591	0.602
								Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	29.099	31.126	8.184	152.210	152.750	2.277
							Mimimum	26.576	28.477	4.478	146.420	147.350	-1.024
							Mean	28.048	29.768	6.130	149.804	150.494	0.464
							Std Dev	0.554	0.632	0.712	1.096	1.020	0.685
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						



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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	29.598	29.602	0.646	70.660	70.410	3.347
Minimum	26.939	26.989	-0.267	67.720	69.240		-1.401						
Mean	28.074	28.117	0.154	69.063	69.812		1.096						
Std Dev	0.615	0.613	0.184	0.780	0.310		1.170						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	29.721	29.793	0.446	102.040	101.760	0.555						
	Minimum	27.068	27.153	0.006	100.160	99.960	-1.449						
	Mean	28.228	28.293	0.232	101.096	100.859	-0.234						
+155 deg. C	Std Dev	0.631	0.627	0.107	0.525	0.502	0.466						
		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	29.689	29.456	0.159	146.220	151.810	4.756						
	Minimum	27.012	27.047	-0.897	142.970	148.180	2.640						
	Mean	28.145	28.132	-0.047	144.885	150.142	3.630						
	Std Dev	0.633	0.621	0.360	0.826	0.849	0.536						

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 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			Inductance (μH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	29.713	29.704	0.288	70.650	71.410	2.660
Minimum	27.265	27.309	-0.433	68.960	69.090		-1.291						
Mean	28.380	28.418	0.132	69.763	70.096		0.481						
Std Dev	0.571	0.566	0.164	0.425	0.620		1.107						
+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	29.921	29.993	0.384	100.810	101.640	1.306						
	Minimum	27.325	27.430	0.070	99.270	100.230	0.090						
	Mean	28.515	28.580	0.228	100.193	100.968	0.774						
+155 deg. C	Std Dev	0.592	0.590	0.069	0.400	0.487	0.314						
		Initial	Final	%Δ	Initial	Final	%Δ						
	Maximum	29.803	29.862	0.261	150.620	151.500	1.127						
	Minimum	27.265	27.041	-0.833	147.680	147.900	-0.728						
	Mean	28.413	28.413	-0.003	149.197	149.888	0.464						
	Std Dev	0.586	0.623	0.361	0.756	0.879	0.447						



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								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	29.435	29.494	0.693	71.790	70.900	-0.115	
						Minimum	27.302	27.379	0.095	69.680	69.250	-1.758	
						Mean	28.183	28.273	0.318	70.656	70.107	-0.776	
						Std Dev	0.534	0.529	0.112	0.466	0.399	0.511	
					+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ	
						Maximum	29.572	29.607	0.403	103.000	102.040	0.128	
						Minimum	27.443	27.504	-0.529	100.540	99.930	-2.311	
						Mean	28.354	28.416	0.217	101.864	100.933	-0.913	
					+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ	
						Maximum	29.363	29.397	0.188	152.080	152.090	0.828	
						Minimum	27.313	27.364	0.113	148.640	147.330	-1.872	
						Mean	28.244	28.284	0.143	150.506	150.458	-0.031	
					Std Dev	0.533	0.533	0.017	0.946	1.030	0.507		

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	29.561	29.841	3.211	102.930	102.550	0.139						
	Minimum	26.618	27.473	0.947	100.730	100.870	-0.449						
	Mean	27.748	28.317	2.064	101.842	101.654	-0.184						
	Std Dev	0.725	0.627	0.597	0.602	0.505	0.146						

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	28.093	28.370	1.080	102.680	102.900	0.303						
	Minimum	26.406	26.668	-0.057	101.270	101.160	-0.482						
	Mean	27.005	27.231	0.836	101.948	102.045	0.095						
	Std Dev	0.516	0.545	0.324	0.465	0.589	0.273						

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					
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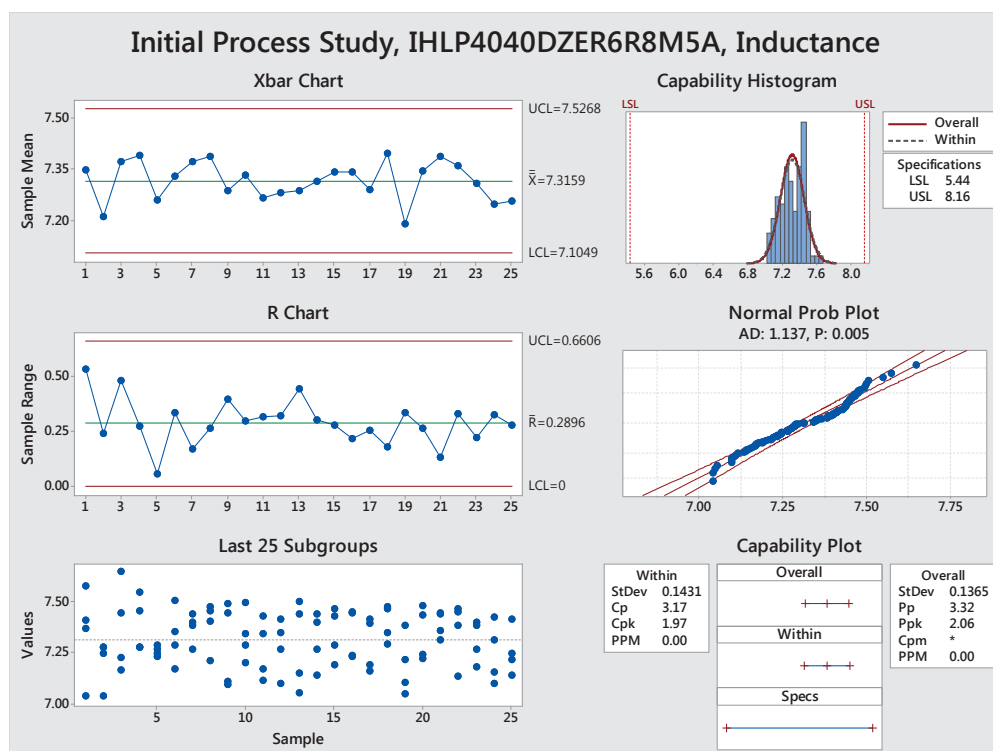
19	Electrical Characterization	User Specification	Min, Max, Mean, and Standard Deviation @ Min (-55C), Room, and Max (+125C) operating temperatures. After mounted, allow +/-5% shift DCR at room temp. -55C/+125C DCR Max calculated using temp conversion for copper: $R_2 = [(T_2 + 234.5) / (234.5 + T_A)] * 1.05R_A$ (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	29.435			71.790		
							Minimum	27.302			69.680		
							Mean	28.183			70.656		
							Std Dev	0.534			0.466		
						+25 deg. C		Initial			Initial		
							Maximum	29.572			103.000		
							Minimum	27.443			100.540		
							Mean	28.354			101.864		
							Std Dev	0.540			0.598		
						+155 deg. C		Initial			Initial		
							Maximum	29.363			152.080		
							Minimum	27.313			148.640		
							Mean	28.244			150.506		
							Std Dev	0.533			0.946		
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	28.857	29.054	0.726	102.860	102.880	0.107
							Minimum	26.572	26.753	0.284	101.110	100.590	-0.764
							Mean	27.575	27.725	0.544	102.147	101.922	-0.221
							Std Dev	0.613	0.626	0.116	0.495	0.686	0.284
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	28.909	29.006	0.901	102.690	102.800	0.561
							Minimum	26.407	26.576	-0.298	100.810	101.040	-0.010
							Mean	27.650	27.676	0.095	101.503	101.857	0.349
							Std Dev	0.742	0.736	0.350	0.438	0.431	0.158

Production Part Approval Process

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

Initial Process Study IHL4040DZER6R8M5A, Inductance

Inductance (uH)							
1	7.368	26	7.268	51	7.438	76	7.107
2	7.576	27	7.438	52	7.15	77	7.221
3	7.409	28	7.401	53	7.401	78	7.483
4	7.04	29	7.406	54	7.27	79	7.242
5	7.246	30	7.458	55	7.442	80	7.435
6	7.279	31	7.476	56	7.14	81	7.44
7	7.04	32	7.21	57	7.428	82	7.314
8	7.276	33	7.443	58	7.286	83	7.358
9	7.648	34	7.109	59	7.467	84	7.443
10	7.226	35	7.097	60	7.189	85	7.45
11	7.167	36	7.493	61	7.234	86	7.465
12	7.447	37	7.286	62	7.445	87	7.134
13	7.28	38	7.2	63	7.451	88	7.386
14	7.549	39	7.343	64	7.236	89	7.179
15	7.277	40	7.497	65	7.161	90	7.266
16	7.456	41	7.115	66	7.396	91	7.387
17	7.234	42	7.432	67	7.191	92	7.398
18	7.246	43	7.169	68	7.415	93	7.312
19	7.289	44	7.343	69	7.348	94	7.157
20	7.266	45	7.098	70	7.295	95	7.098
21	7.508	46	7.348	71	7.467	96	7.425
22	7.286	47	7.266	72	7.475	97	7.417
23	7.356	48	7.417	73	7.049	98	7.246
24	7.172	49	7.499	74	7.216	99	7.14
25	7.384	50	7.055	75	7.384	100	7.217



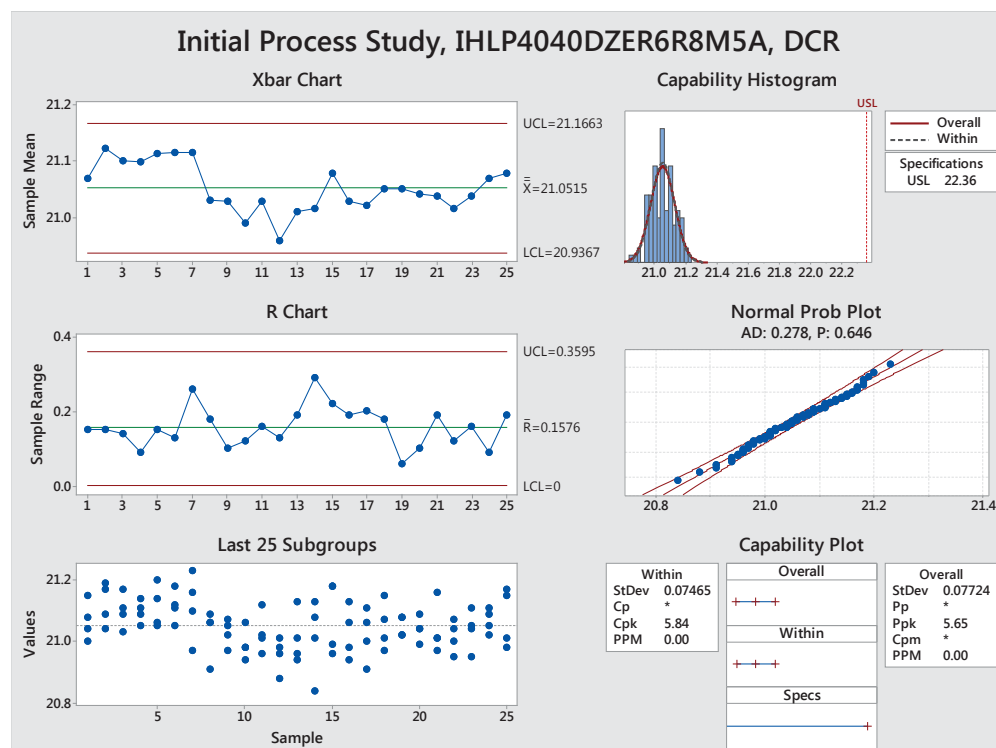


Production Part Approval Process

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

Initial Process Study IHLP4040DZER6R8M5A, DC Resistance

DCR (mOhm)							
1	21	26	21.16	51	20.96	76	21.02
2	21.04	27	21.23	52	21.13	77	20.99
3	21.15	28	20.97	53	21.08	78	21.09
4	21.08	29	21.06	54	21.01	79	21.04
5	21.19	30	20.91	55	20.84	80	21.04
6	21.04	31	21.09	56	21.13	81	21.01
7	21.17	32	21.06	57	20.96	82	21.01
8	21.09	33	20.97	58	21.18	83	21.16
9	21.03	34	21.05	59	20.99	84	20.97
10	21.09	35	21.02	60	21.18	85	20.95
11	21.17	36	21.07	61	21.13	86	21
12	21.11	37	20.98	62	21.06	87	21.07
13	21.05	38	20.94	63	20.98	88	21.04
14	21.09	39	20.98	64	20.94	89	21.04
15	21.14	40	21.06	65	21	90	21.05
16	21.11	41	21.12	66	20.91	91	20.95
17	21.2	42	20.96	67	21.11	92	21.11
18	21.14	43	21.02	68	21.06	93	21.11
19	21.06	44	21.01	69	20.97	94	21.09
20	21.05	45	20.96	70	21.15	95	21.05
21	21.05	46	20.98	71	21.07	96	21.02
22	21.12	47	21.01	72	21.01	97	21.15
23	21.11	48	20.88	73	21.08	98	21.17
24	21.18	49	21.01	74	21.02	99	21.01
25	21.1	50	20.94	75	21.08	100	20.98

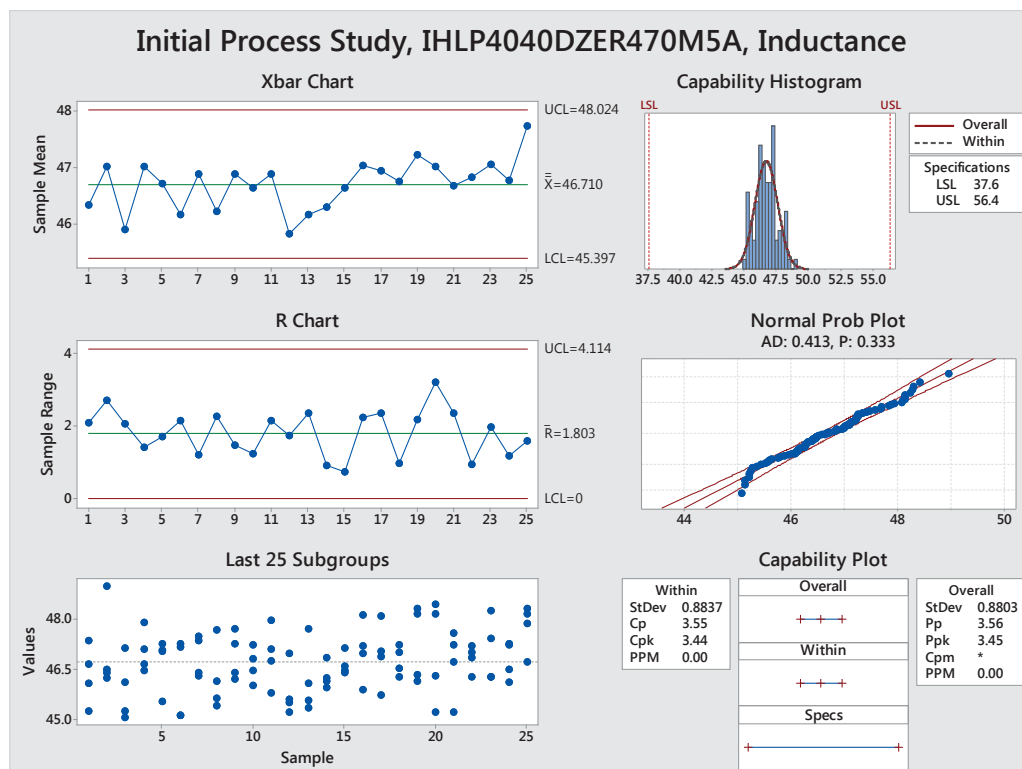


Production Part Approval Process

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

Initial Process Study IHLP4040DZER470M5A, Inductance

Inductance (uH)							
1	45.25	26	47.49	51	45.35	76	48.14
2	46.07	27	46.3	52	46.07	77	46.31
3	46.66	28	47.34	53	46.16	78	48.43
4	47.35	29	45.43	54	46.25	79	45.22
5	46.25	30	46.14	55	45.95	80	48.14
6	48.96	31	45.64	56	46.86	81	47.23
7	46.39	32	47.68	57	46.39	82	47.58
8	46.49	33	47.7	58	46.59	83	46.71
9	45.27	34	46.22	59	46.47	84	45.23
10	47.13	35	47.27	60	47.13	85	46.28
11	46.11	36	46.39	61	47.21	86	47.21
12	45.08	37	46.48	62	45.88	87	46.84
13	46.64	38	46.01	63	46.98	88	47.01
14	47.11	39	46.82	64	48.11	89	46.28
15	47.89	40	47.24	65	48.09	90	47.42
16	46.47	41	45.79	66	46.87	91	46.27
17	45.55	42	46.75	67	47.05	92	48.25
18	47.25	43	47.11	68	45.75	93	47.22
19	47.06	44	47.94	69	46.26	94	46.49
20	47.03	45	45.22	70	46.53	95	46.11
21	45.13	46	45.6	71	47.01	96	47.27
22	45.13	47	46.96	72	47.23	97	48.29
23	47.15	48	45.51	73	48.31	98	48.15
24	47.27	49	45.58	74	46.33	99	47.85
25	46.41	50	47.7	75	46.14	100	46.71

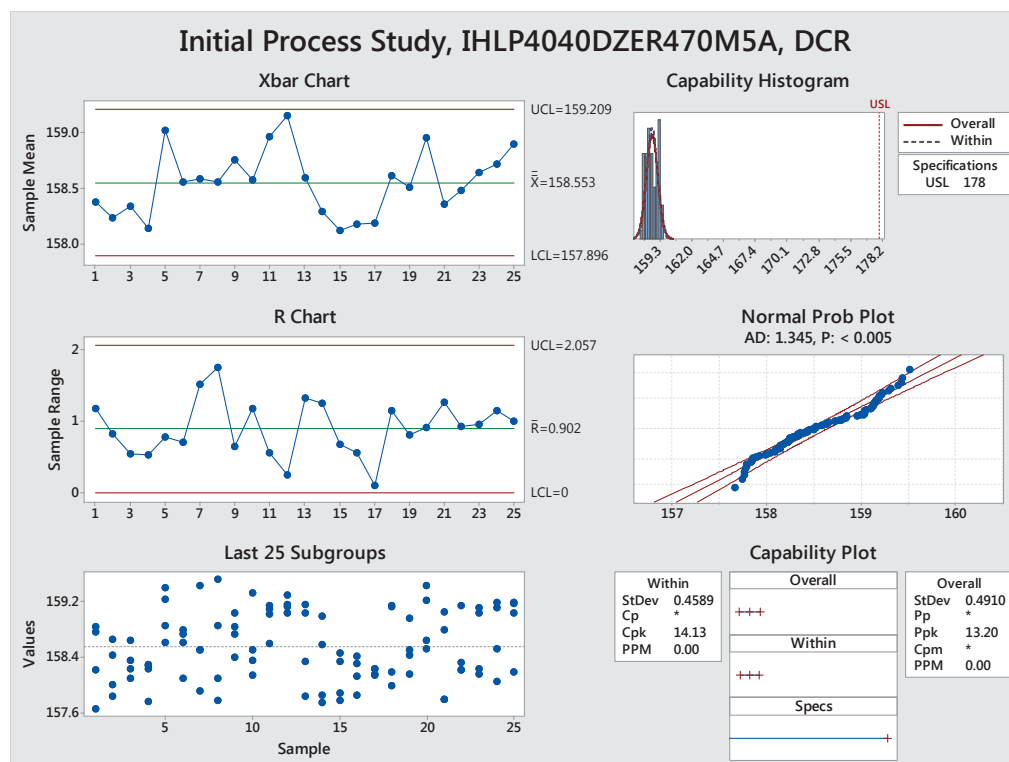


Production Part Approval Process

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

Initial Process Study IHLP4040DZER470M5A, DC Resistance

DCR (mOhm)							
1	158.22	26	158.5	51	158.34	76	158.51
2	157.66	27	159.44	52	157.83	77	159.43
3	158.77	28	158.5	53	157.74	78	158.52
4	158.84	29	159.52	54	158.58	79	159.22
5	158.43	30	158.85	55	158.99	80	158.65
6	157.84	31	157.77	56	157.86	81	157.79
7	158.66	32	158.09	57	158.34	82	159.06
8	158.01	33	158.84	58	157.78	83	157.79
9	158.36	34	158.73	59	157.89	84	158.79
10	158.64	35	158.4	60	158.46	85	158.33
11	158.1	36	159.04	61	158.31	86	159.14
12	158.24	37	158.14	62	158.42	87	158.22
13	157.76	38	158.5	63	157.86	88	158.22
14	158.28	39	159.32	64	158.13	89	159.12
15	158.29	40	158.36	65	158.15	90	158.24
16	158.24	41	158.59	66	158.14	91	158.16
17	158.85	42	159.03	67	158.24	92	159.04
18	158.62	43	159.1	68	158.23	93	159.11
19	159.23	44	159.15	69	159.13	94	158.05
20	159.4	45	159.16	70	159.14	95	159.19
21	158.8	46	159.04	71	158.18	96	158.52
22	158.09	47	159.13	72	157.99	97	159.04
23	158.61	48	159.29	73	158.15	98	159.19
24	158.73	49	159.16	74	158.43	99	158.19
25	157.92	50	159.04	75	158.96	100	159.18

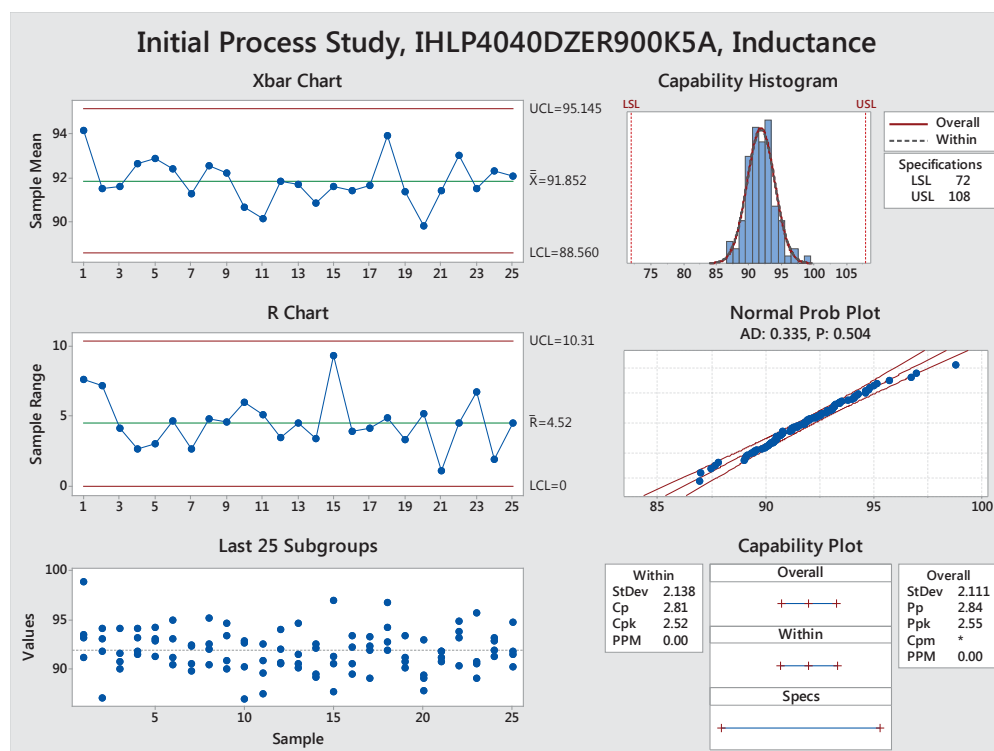


Production Part Approval Process

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

Initial Process Study IHLP4040DZER900K5A, Inductance

Inductance (uH)							
1	91.21	26	92.32	51	90.5	76	91.15
2	93.14	27	89.84	52	90.14	77	89.36
3	93.5	28	90.48	53	92.58	78	89.02
4	98.82	29	90.38	54	89.48	79	92.98
5	91.79	30	95.18	55	92.07	80	87.8
6	94.17	31	92.02	56	89.17	81	91.77
7	93.08	32	92.53	57	96.99	82	91.81
8	87.01	33	93.42	58	87.66	83	91.21
9	90.77	34	90.03	59	90.51	84	90.74
10	89.97	35	94.62	60	91.25	85	93.18
11	91.59	36	90.8	61	89.51	86	93.83
12	94.12	37	92.62	62	92.23	87	94.82
13	93.19	38	92.86	63	93.39	88	90.33
14	94.1	39	86.92	64	90.49	89	95.74
15	91.47	40	90.21	65	91.89	90	89.04
16	91.82	41	87.46	66	93.23	91	90.71
17	94.27	42	89.58	67	92.36	92	90.48
18	92.82	43	92.56	68	89.08	93	92.86
19	93.1	44	90.8	69	96.76	94	93.21
20	91.24	45	90.57	70	92.79	95	91.92
21	93.03	46	90.65	71	94.25	96	91.29
22	94.99	47	93.99	72	91.92	97	91.44
23	90.39	48	92.04	73	90.09	98	91.78
24	91.13	49	94.63	74	90.78	99	90.24
25	92.48	50	91.52	75	93.43	100	94.75

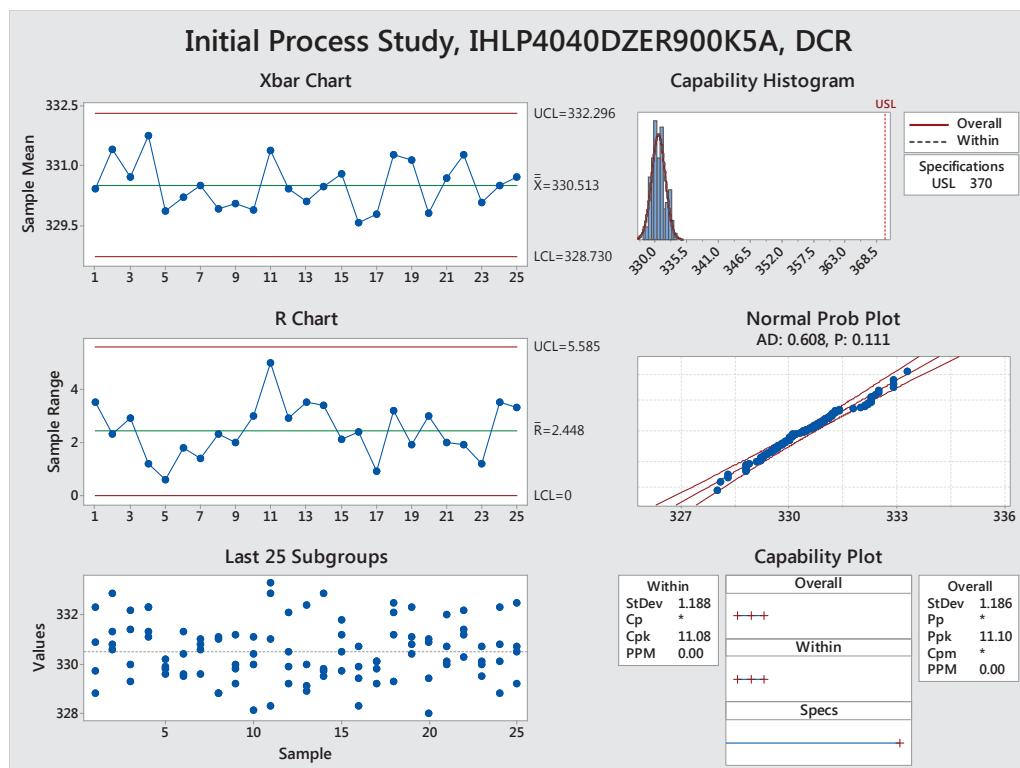


Production Part Approval Process

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

Initial Process Study IHLP4040DZER900K5A, DC Resistance

DCR (mOhm)									
1	328.8	26	331	51	328.9	76	331.1		
2	329.7	27	330.6	52	329.1	77	331		
3	332.3	28	330.8	53	329.7	78	330.9		
4	330.9	29	331	54	329.8	79	329.4		
5	331.3	30	331.1	55	329.5	80	328		
6	330.6	31	328.8	56	332.9	81	330		
7	332.9	32	328.8	57	330.5	82	330.1		
8	330.8	33	330	58	331.8	83	332		
9	332.2	34	329.8	59	329.7	84	330.7		
10	329.3	35	331.2	60	331.2	85	332.2		
11	330	36	329.2	61	328.3	86	331.4		
12	331.4	37	330	62	329.9	87	330.3		
13	332.3	38	330.4	63	330.7	88	331.2		
14	331.1	39	328.1	64	329.4	89	330.7		
15	331.3	40	331.1	65	330.1	90	330.1		
16	332.3	41	328.3	66	329.8	91	329.5		
17	329.9	42	331	67	330.1	92	330		
18	329.8	43	333.3	68	329.2	93	332.3		
19	329.6	44	332.9	69	332.5	94	330.8		
20	330.2	45	330.5	70	331.2	95	328.8		
21	329.6	46	329.9	71	332.1	96	330.1		
22	330.4	47	329.2	72	329.3	97	330.7		
23	331.3	48	332.1	73	330.4	98	330.5		
24	329.5	49	332.4	74	330.8	99	329.2		
25	329.6	50	330	75	332.3	100	332.5		



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 Hwy 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.

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Production Part Approval Process

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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

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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

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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.

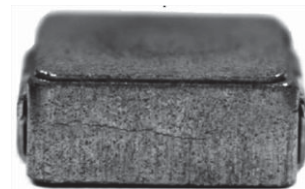
The IHLP inductor provides the best combination of:

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

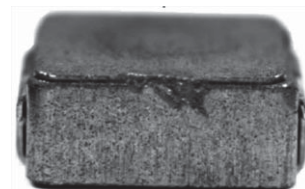
Surface irregularities

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

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.



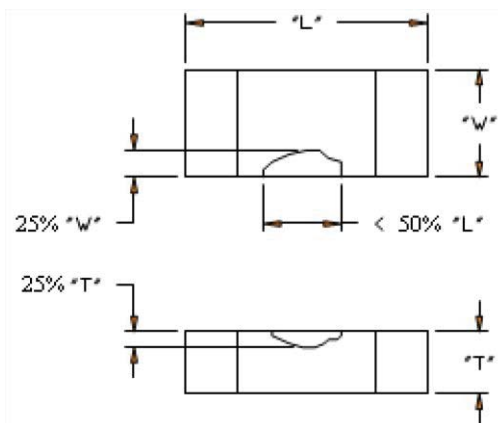
Major crack, rejectable

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.

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.



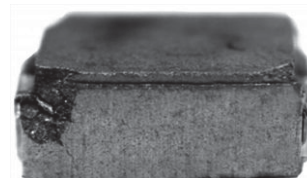
T	25 % of the thickness
W	25 % of the width
L	50 % of the length

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

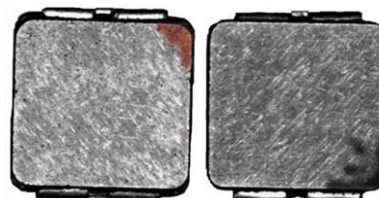
Major chips in the inductor body are those that are very obvious to the customer and may expose the wire coil or lead frame.

OXIDATION

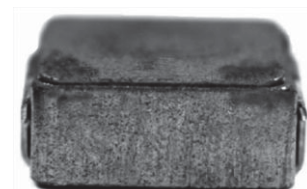
The IHLP inductor is predominately iron and oxidation may occur in a small percentage of the inductors. Resin binders give moderate protection, but some slight oxidation may occur. All components should be stored away from heat, humidity and ionized atmospheres as much as possible before mounting.

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

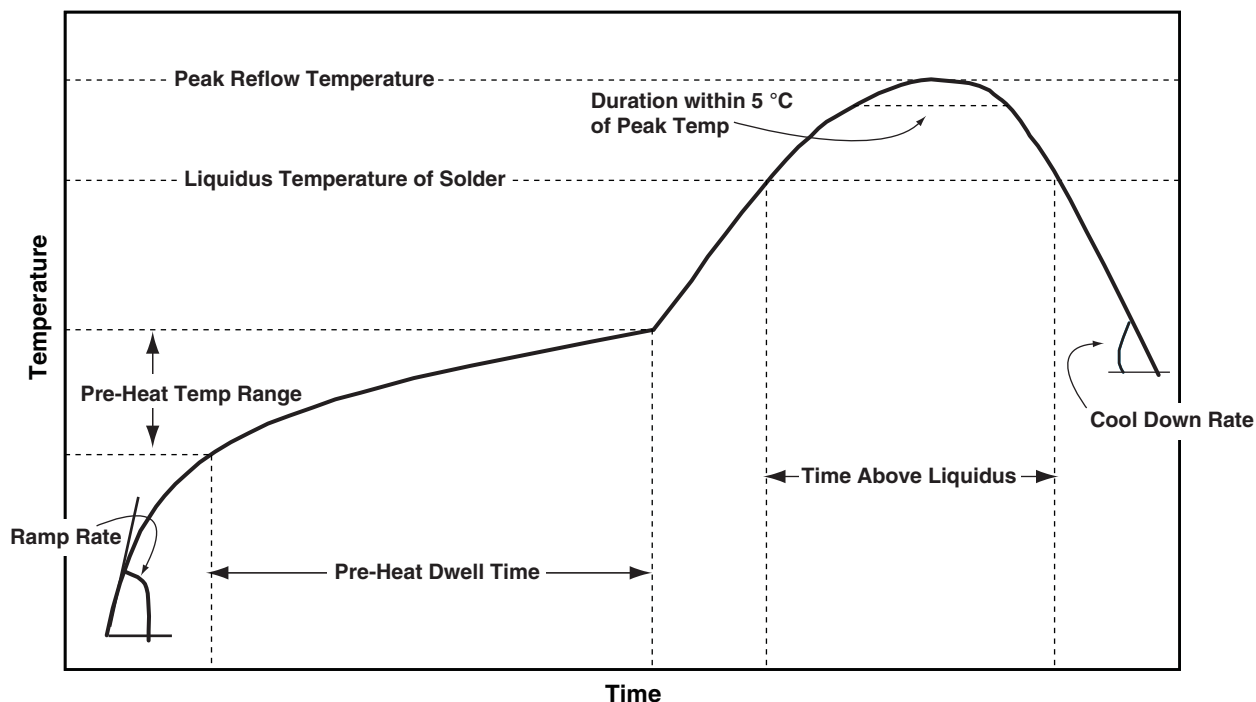


Fig. 1 - Infrared reflow soldering (SMD package)

LEAD (Pb)-FREE SOLDER (SnAgCu) REFLOW PROFILE ATTRIBUTES	
PROFILE ATTRIBUTE	PROFILE ATTRIBUTE
Peak Reflow Temperature	255 (± 5) °C
Time within 5 °C of Peak Temperature	30 s max.
Liquidus Temperature of Solder	~ 217 °C
Cool Down Rate	6 °C/s max.
Time above Liquidus	60 s to 150 s
Pre-heat Temperature Range	150 °C to 200 °C
Pre-heat Dwell Time	60 s to 120 s
Maximum Ramp Rate	3 °C/s max.