VISHAY

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

Production Part Approval Process

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

IHLP1616xxERxxxM5A

Generic PPAP

Generic PPAPs

4/26/2016

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

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Note: Generic PPAPs do not include all sections shown in the Table of Contents.
Sections 4,5,6,7,8,12,&18 are only available upon request of a full Automotive PPAP.

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

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

Section 1. Design Records

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

Low Profile, High Current IHLP® Inductors

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).
- Handles high transient current spikes without saturation
- Ultra low buzz noise, due to composite construction
- AEC-Q200 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

APPLICATIONS

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

STANDARD ELECTRICAL SPECIFICATIONS

L_0 INDUCTANCE ± 20 % AT 100 kHz, 0.25 V, 0 A (µH)	DCR TYP. 25 °C (mΩ)	DCR MAX. 25 °C (mΩ)	HEAT RATING CURRENT DC TYP. (A) (3)	SATURATION CURRENT DC TYP. (A) (4)	SRF TYP. (MHz)
0.10	4.0	4.2	17.3	19.0	320
0.22	7.0	7.5	12.6	12.0	171
0.47	12.2	13.1	9.3	6.9	103
0.68	17.5	18.8	7.6	6.8	100
1.0	25.6	27.4	6.2	4.8	63
2.2	63.7	65.0	3.8	4.0	37
3.3	77.7	83.1	3.5	3.0	30
4.7	102.0	110.0	3.2	1.8	28

Notes

(1) All test data is referenced to 25 °C ambient.

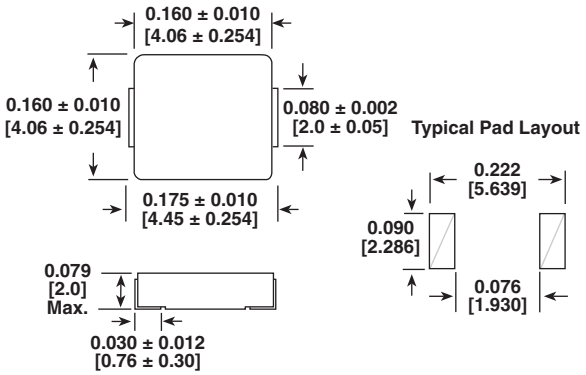
(2) Operating temperature range -55 °C to +155 °C.

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

(4) DC current (A) that will cause L_0 to drop approximately 20 %.

(5) 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.

DIMENSIONS in inches [millimeters]



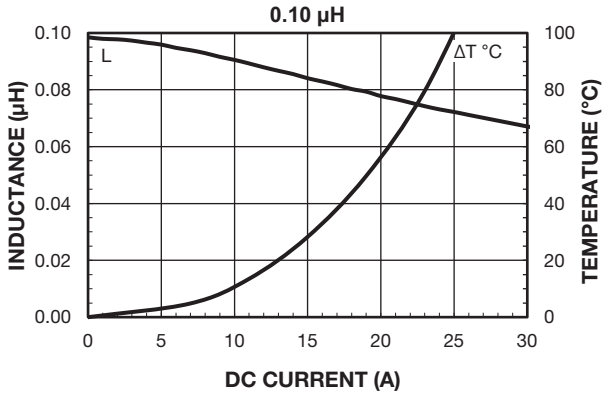
DESCRIPTION

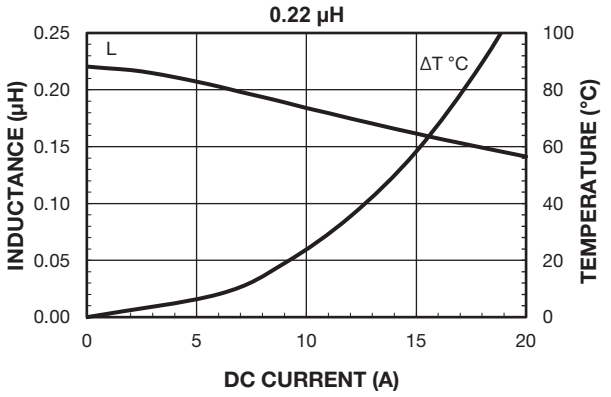
IHLP-1616BZ-5A	3.3 µH	± 20 %	ER	e3
MODEL	INDUCTANCE VALUE	INDUCTANCE TOLERANCE	PACKAGE CODE	JEDEC® LEAD (Pb)-FREE STANDARD

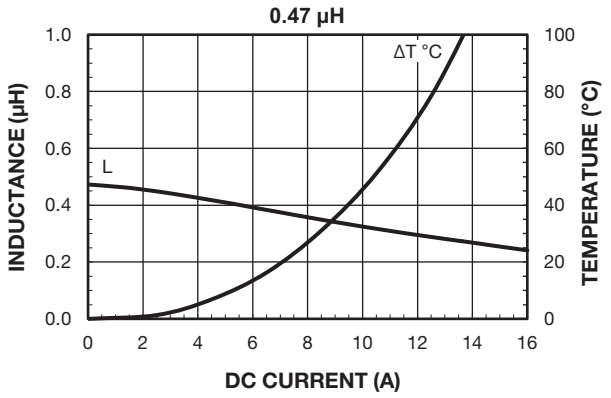
GLOBAL PART NUMBER

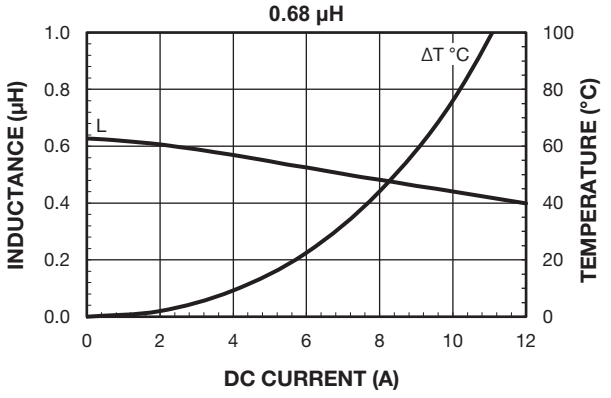
I	H	L	P	1	6	1	6	B	Z	E	R	3	R	3	M	5	A
PRODUCT FAMILY				SIZE						PACKAGE CODE		INDUCTANCE VALUE			TOL.	SERIES	

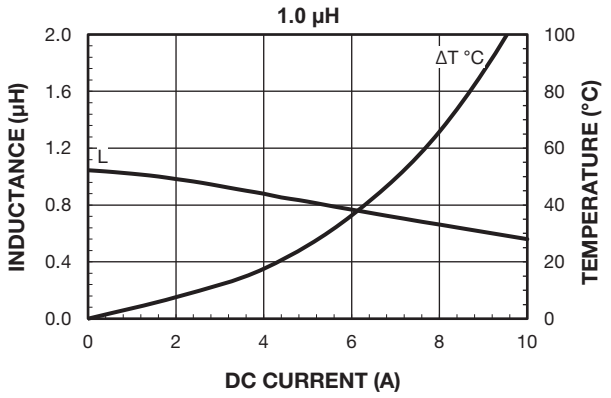
PERFORMANCE GRAPHS

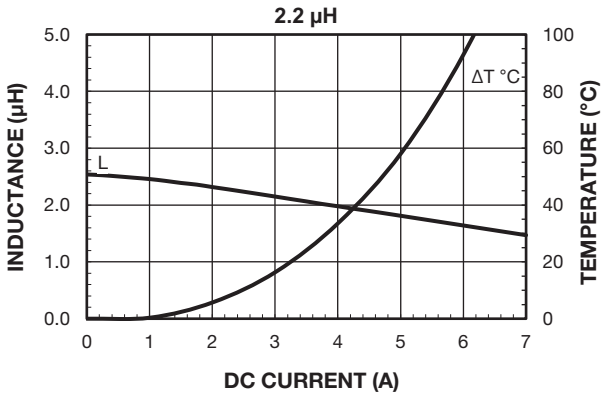


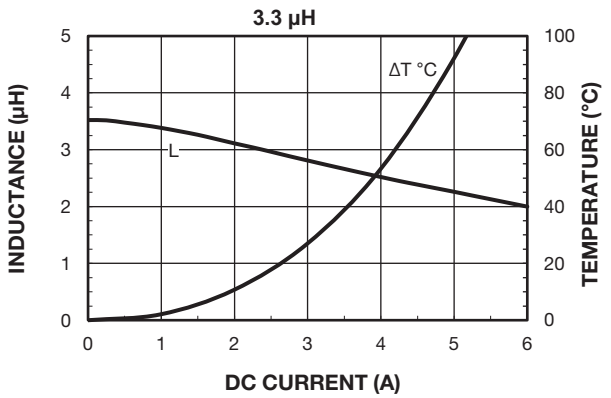


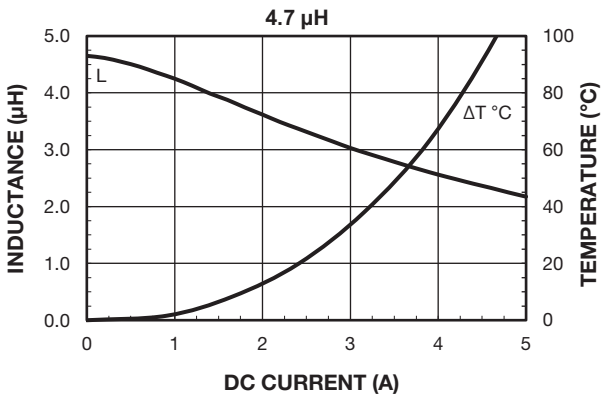




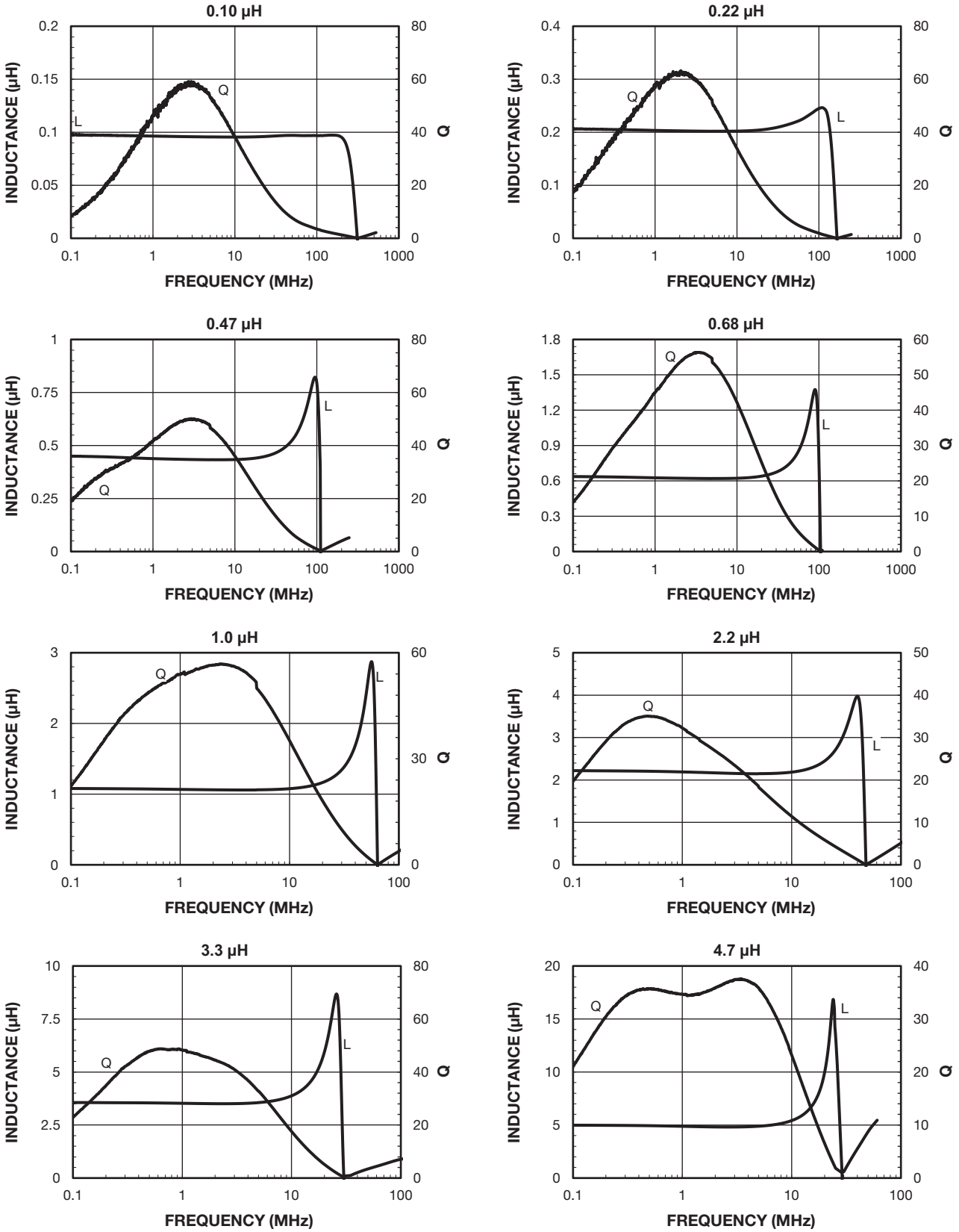






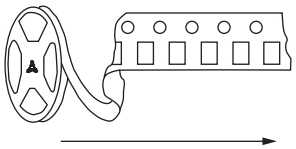


PERFORMANCE GRAPHS: INDUCTANCE AND Q VS. FREQUENCY

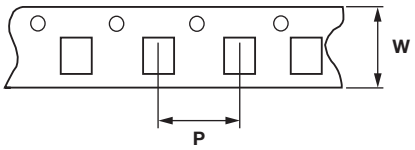


SMD Magnetics Packaging Methods

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

IHLP PACKAGING

COMPONENT PHOTO

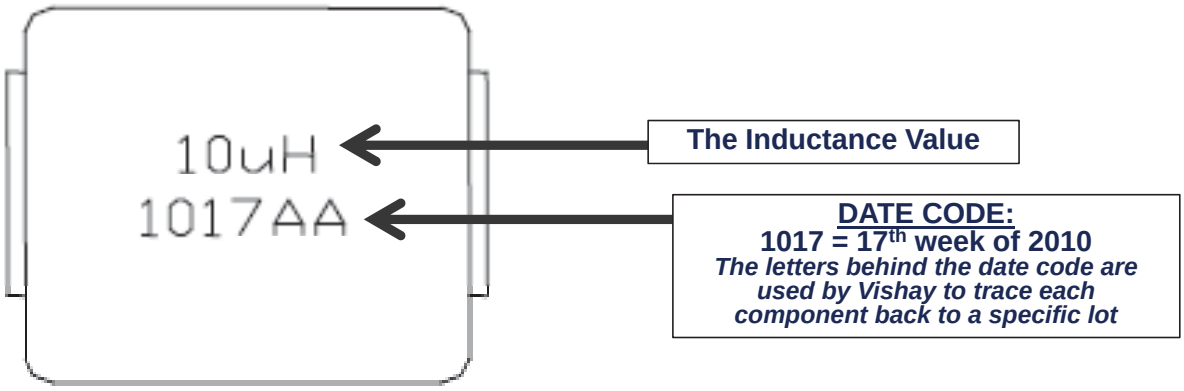
POCKET TAPE PHOTO

REEL PHOTO

CONTAINER PHOTO

UNIT LOAD PHOTO

IHLP COMPONENT PRINT



Production Part Approval Process

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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 PPAPs	IHLP1616xxERxxxM5A	Cu - Base Material Ni- Intermediate Later Sn- Finish Layer	CU: 0.152 +/- .0254mm Ni: 1.27um to 3.175um Sn: 4.57um to 6.35 um	Electroplated

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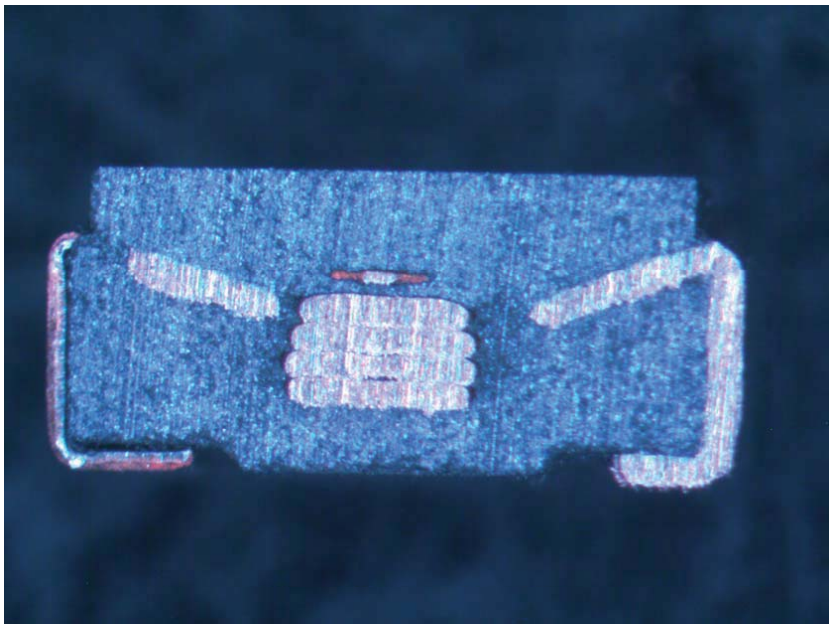
Cross-Section
IHLP1616BZ



Production Part Approval Process

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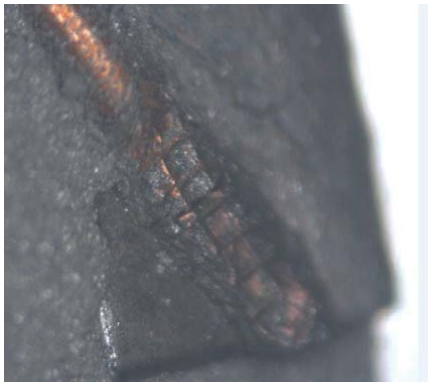
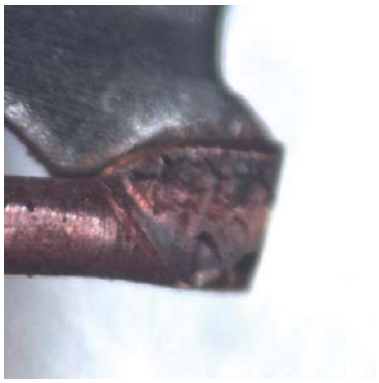
Example Photos of IHLP Welds





Production Part Approval Process

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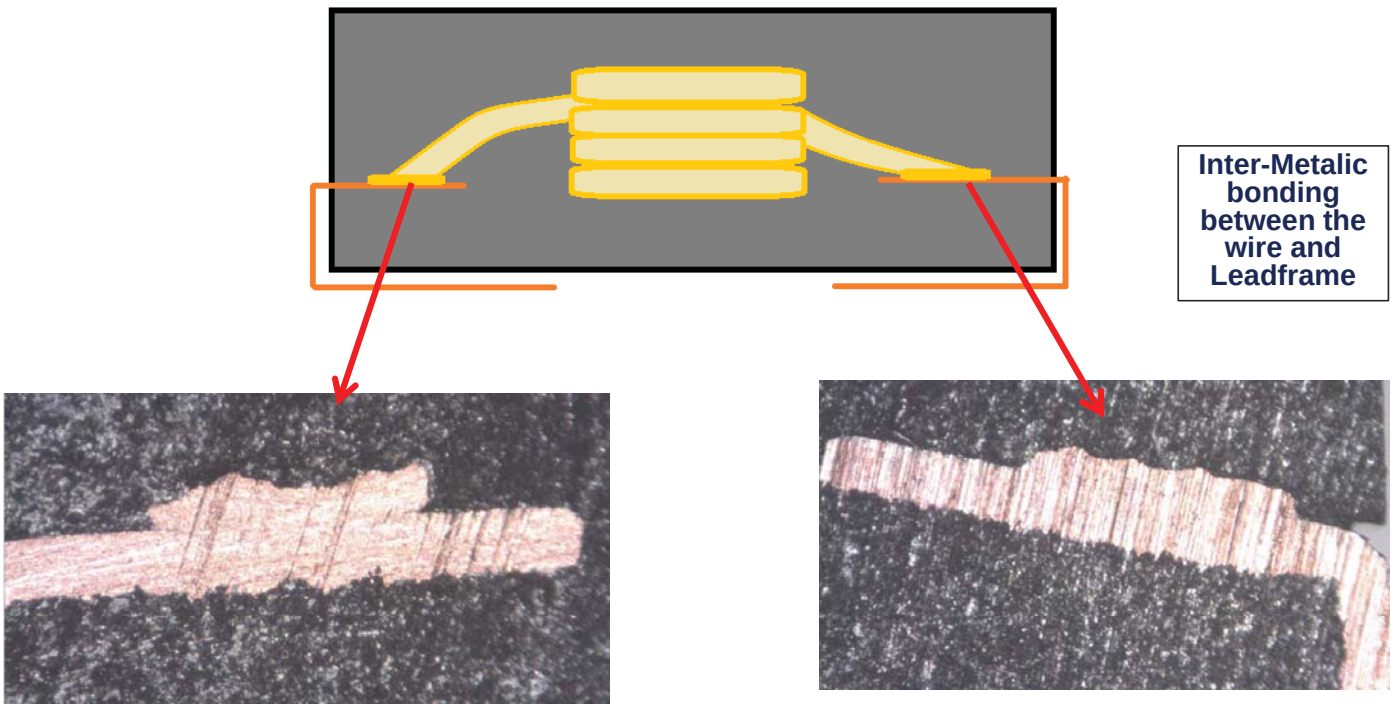
Cross sectional Photos of IHLP Welds



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

Section 2: Engineering Change Documents

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

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Production Part Approval Process

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

Section 3: Customer Engineering Approval

Customer Engineering Approval does not apply for this part number

Production Part Approval Process

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

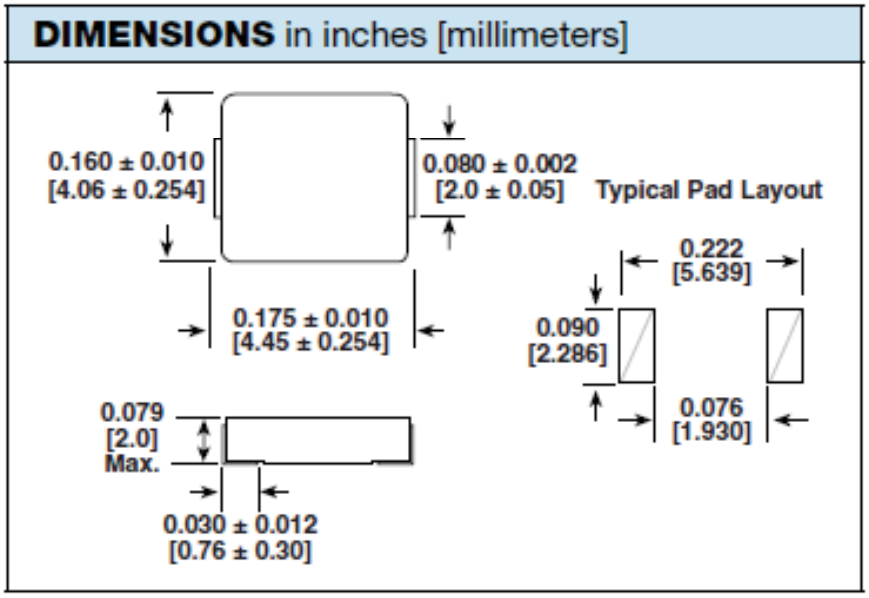
Section 8: Measurement System Analysis

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

Production Part Approval Process

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

DIMENSIONAL ANALYSIS
IHLP1616BZ



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Production Part Approval Process

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

DIMENSIONAL ANALYSIS
IHLP1616BZ

	Width	Length	Height	Terminal Length
1	0.162	0.174	0.078	0.039
2	0.162	0.174	0.078	0.039
3	0.161	0.175	0.078	0.039
4	0.162	0.174	0.078	0.04
5	0.162	0.174	0.077	0.04
6	0.162	0.174	0.077	0.038
7	0.162	0.174	0.078	0.04
8	0.162	0.174	0.077	0.041
9	0.163	0.174	0.0775	0.041
10	0.161	0.173	0.078	0.041
11	0.161	0.174	0.078	0.041
12	0.162	0.174	0.078	0.04
13	0.162	0.173	0.078	0.039
14	0.162	0.174	0.077	0.041
15	0.161	0.173	0.0775	0.039
16	0.162	0.174	0.078	0.039
17	0.162	0.174	0.078	0.038
18	0.162	0.174	0.0775	0.039
19	0.162	0.174	0.078	0.039
20	0.162	0.174	0.077	0.036
21	0.1615	0.1735	0.077	0.035
22	0.1615	0.174	0.0775	0.035
23	0.1615	0.1745	0.0775	0.035
24	0.161	0.174	0.077	0.034
25	0.161	0.1745	0.077	0.0345
26	0.1615	0.174	0.077	0.0345
27	0.161	0.175	0.077	0.0365
28	0.161	0.174	0.0775	0.035
29	0.161	0.174	0.0775	0.0345
30	0.161	0.1745	0.077	0.032
31	0.161	0.175	0.077	0.0345
32	0.1615	0.1745	0.077	0.035
33	0.1615	0.1745	0.077	0.034
34	0.1615	0.1745	0.077	0.035
35	0.1615	0.174	0.077	0.0355
36	0.161	0.1735	0.0775	0.035
37	0.1615	0.175	0.0775	0.035
38	0.161	0.174	0.078	0.035
39	0.1615	0.176	0.0775	0.035
40	0.161	0.177	0.077	0.035
41	0.1615	0.1735	0.077	0.035
42	0.1615	0.174	0.0775	0.035
43	0.1615	0.1745	0.0775	0.035
44	0.161	0.175	0.078	0.039
45	0.162	0.175	0.078	0.04
46	0.1615	0.175	0.078	0.04
47	0.1615	0.174	0.077	0.039
48	0.161	0.173	0.0775	0.039
49	0.162	0.175	0.078	0.038
50	0.162	0.174	0.078	0.038

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Production Part Approval Process

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DIMENSIONAL ANALYSIS
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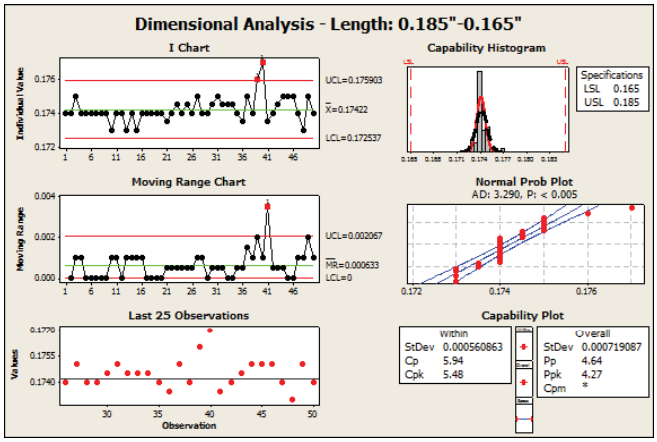

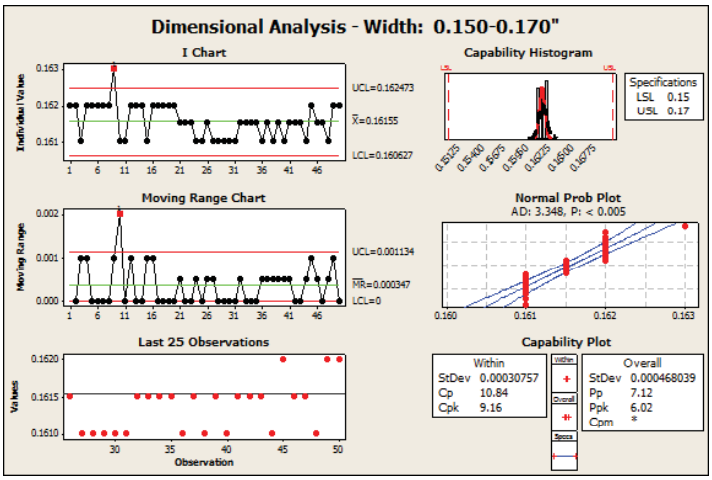

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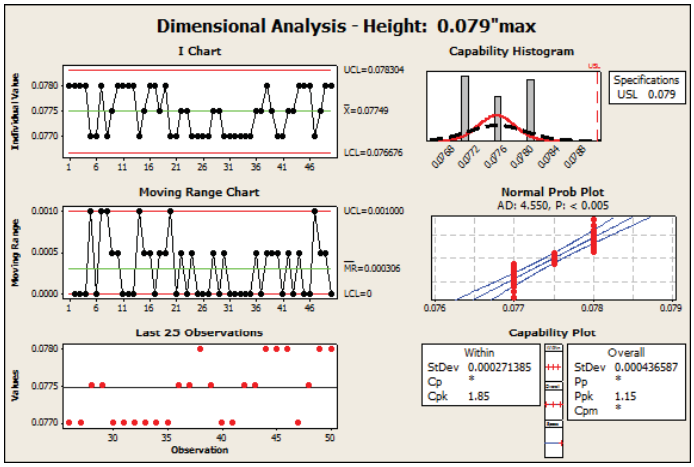

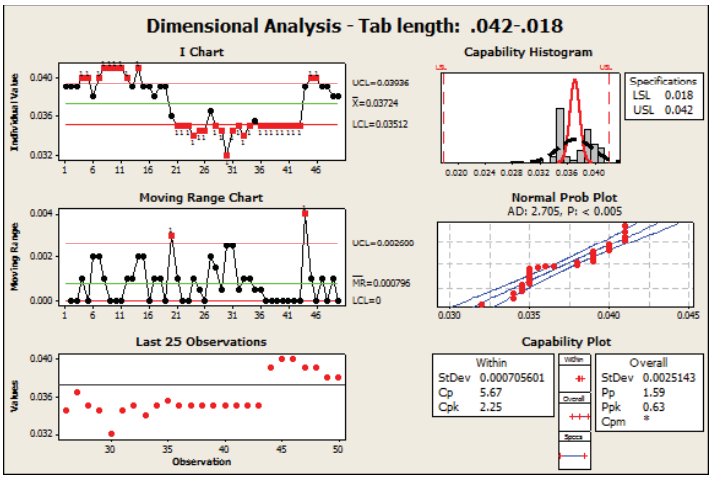

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SECTION 10

IHLP1616-5A TEST RESULTS

DANSHUI MANUFACTURING LOCATION

IHLP1616BZER1R0M5A
IHLP1616BZER4R7M5A

- Parts were manufactured in the Danshui, China location

IHLP1616BZER1R0M5A

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=±15% of initial, DCR =±15% of initial	All tests requiring electrical data								
3	High Temp Exposure	IEC-60068 Part 2-2 test group BA	155C for 2000 hours, unpowered readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT LT=Low Temperature=-55°C, RT=Room Temperature=+25°C,HT=High Temperature=+125°C for –A1/1A models. HT=High Temperature =+155° C for -5A models.	L=±20% of initial, DCR =±20% of initial	77			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	1.009	1.073	14.358	16.154	15.940	0.006
							Mimimum	0.804	0.907	5.933	15.532	15.281	-3.508
							Mean	0.902	0.992	10.010	15.884	15.627	-1.618
							Std Dev	0.053	0.045	1.910	0.139	0.136	0.663
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.019	1.088	15.034	22.960	23.030	0.799
							Mimimum	0.808	0.914	6.251	22.130	22.060	-2.212
							Mean	0.907	1.003	10.732	22.615	22.525	-0.398
							Std Dev	0.054	0.047	1.926	0.165	0.178	0.486
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.014	1.124	19.606	34.350	34.280	0.604
							Mimimum	0.811	0.936	8.842	33.010	32.750	-1.628
							Mean	0.907	1.032	13.850	33.688	33.541	-0.434
							Std Dev	0.053	0.050	2.055	0.286	0.273	0.416

IHLP1616BZER1R0M5A

								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	1.016	1.012	2.097	16.153	15.901	-0.083
							Mimimum	0.806	0.807	-1.513	15.646	15.435	-3.150
							Mean	0.897	0.898	0.105	15.876	15.641	-1.475
							Std Dev	0.048	0.048	0.769	0.112	0.113	0.799
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.022	1.021	2.359	22.920	23.000	0.804
							Mimimum	0.808	0.809	-0.913	22.280	22.280	-1.503
							Mean	0.900	0.903	0.303	22.589	22.596	0.032
							Std Dev	0.050	0.049	0.749	0.137	0.153	0.480
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.020	1.019	0.765	34.320	34.200	1.535
							Mimimum	0.812	0.810	-0.479	33.010	32.880	-1.919
							Mean	0.904	0.904	0.023	33.659	33.614	-0.129
							Std Dev	0.050	0.050	0.269	0.298	0.263	0.666

IHLP1616BZER1R0M5A

								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	1.049	1.069	12.579	16.194	16.106	1.364
							Mimimum	0.795	0.846	1.950	15.545	15.414	-1.719
							Mean	0.904	0.953	5.454	15.867	15.765	-0.643
							Std Dev	0.058	0.050	2.399	0.119	0.127	0.499
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.061	1.077	13.244	23.180	23.090	0.745
							Mimimum	0.801	0.852	1.571	22.400	22.220	-1.354
							Mean	0.909	0.959	5.599	22.831	22.694	-0.599
							Std Dev	0.060	0.050	2.506	0.144	0.152	0.324
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.070	1.108	16.322	34.670	34.460	0.149
							Mimimum	0.803	0.869	3.596	33.420	33.150	-1.758
							Mean	0.913	0.981	7.503	34.039	33.798	-0.707
							Std Dev	0.059	0.053	2.269	0.245	0.246	0.288

								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	1.047	1.053	3.703	16.069	15.959	0.783
							Mimimum	0.805	0.793	-2.814	15.571	15.464	-1.581
							Mean	0.889	0.894	0.531	15.811	15.750	-0.381
							Std Dev	0.051	0.054	1.235	0.114	0.108	0.645
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.060	1.067	4.100	22.990	23.050	0.629
							Mimimum	0.809	0.798	-2.627	22.250	22.300	-0.874
							Mean	0.894	0.901	0.707	22.675	22.662	-0.052
							Std Dev	0.052	0.055	1.288	0.166	0.147	0.468
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.070	1.085	3.073	34.010	34.470	4.784
							Mimimum	0.807	0.810	-1.024	32.100	33.180	-1.006
							Mean	0.902	0.911	1.005	33.198	33.779	1.762
							Std Dev	0.051	0.052	0.857	0.449	0.240	1.228

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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. 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	-55 deg. C	Maximum	0.999	1.022	6.780	16.243	15.892	-0.191
							Mimimum	0.800	0.837	1.882	15.544	15.262	-3.417
							Mean	0.906	0.941	3.889	15.851	15.574	-1.745
							Std Dev	0.048	0.046	0.872	0.134	0.117	0.692
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.009	1.036	7.396	23.020	23.260	1.900
							Mimimum	0.804	0.842	2.186	22.290	22.140	-1.279
							Mean	0.912	0.950	4.147	22.707	22.663	-0.196
							Std Dev	0.049	0.048	0.935	0.117	0.223	0.846
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.016	1.061	9.524	34.240	34.070	1.083
							Mimimum	0.811	0.855	3.120	33.140	33.070	-1.828
							Mean	0.918	0.967	5.418	33.786	33.627	-0.468
							Std Dev	0.049	0.050	1.061	0.248	0.254	0.535

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
13	Mechanical Shock	IEC-60068 part 2.27 test group Ea with precondition per 0 above	Pulse Shape-Half Sine Normal Pulse Length 6ms Peak acceleration-100g No. shocks-6 each in both directions of each axis (total of 36) Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30	-55 deg. C	Maximum	1.013	1.014	1.460	16.178	16.191	0.966
							Mimimum	0.818	0.818	-0.083	15.674	15.722	-0.202
							Mean	0.919	0.924	0.470	15.863	15.918	0.348
							Std Dev	0.047	0.047	0.360	0.136	0.120	0.301
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.024	1.024	1.255	23.000	23.040	0.487
							Mimimum	0.817	0.821	-0.270	22.520	22.570	0.044
							Mean	0.926	0.930	0.520	22.725	22.774	0.219
							Std Dev	0.049	0.048	0.374	0.114	0.111	0.110
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.026	1.029	1.002	34.220	34.350	0.652
							Mimimum	0.819	0.825	-0.397	33.350	33.510	-0.415
							Mean	0.928	0.931	0.346	33.803	33.947	0.425
							Std Dev	0.048	0.049	0.345	0.219	0.213	0.191
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
14	Vibration	IEC-60068 PART 2-6 TEST GROUP Fc. With precondition per 0 above	Pulse Shape-sine wave range of frequency 1 10-55Hz. Amplitude ±0.75mm Range of frequency 2 55-2000Hz Amplitude; 10G Frequency Sweep: 1 oct./min. Duration: 24 h each of 3 axis. Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30	-55 deg. C	Maximum	0.976	0.973	0.188	16.164	16.097	2.024
							Mimimum	0.808	0.805	-1.036	15.578	15.684	-1.602
							Mean	0.895	0.892	-0.323	15.861	15.872	0.080
							Std Dev	0.045	0.044	0.331	0.167	0.120	1.333
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.986	0.982	0.184	23.060	23.080	0.658
							Mimimum	0.814	0.811	-0.931	22.480	22.580	-0.527
							Mean	0.903	0.899	-0.367	22.776	22.774	-0.009
							Std Dev	0.046	0.045	0.290	0.122	0.117	0.388
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	0.994	0.993	0.292	34.280	34.510	1.593
							Mimimum	0.820	0.819	-1.035	33.270	33.640	-0.441
							Mean	0.909	0.907	-0.211	33.803	34.004	0.597
							Std Dev	0.045	0.045	0.285	0.217	0.204	0.588

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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	1.001	0.999	0.181	16.011	16.127	1.805
							Mimimum	0.809	0.806	-1.030	15.533	15.550	-0.347
							Mean	0.901	0.899	-0.320	15.801	15.857	0.356
							Std Dev	0.059	0.059	0.285	0.101	0.131	0.683
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.011	1.006	-0.170	23.020	23.050	0.702
							Mimimum	0.813	0.808	-1.057	22.320	22.360	-0.394
							Mean	0.908	0.903	-0.516	22.721	22.762	0.182
							Std Dev	0.060	0.060	0.234	0.145	0.141	0.272
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.018	1.015	0.062	34.250	34.470	0.708
							Mimimum	0.818	0.816	-0.761	33.190	33.400	-0.207
							Mean	0.912	0.910	-0.230	33.865	33.977	0.331
							Std Dev	0.059	0.059	0.192	0.224	0.216	0.238
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
15	Resistance to Solder Heat	MIL-STD-202G Method 210F Condition K	IR/convection reflow. 250 ± 5°C for 30 ± 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s	L=±20% of initial, DCR =±20% of initial	30	+25 deg. C	Maximum	1.001	0.995	5.634	23.160	23.130	0.088
							Mimimum	0.802	0.845	-1.021	22.490	22.450	-0.307
							Mean	0.894	0.918	2.733	22.854	22.822	-0.141
							Std Dev	0.053	0.044	1.650	0.154	0.152	0.083
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	25KV	%Δ	Initial	25KV	%Δ
17	ESD	AEC-Q200-002	Determine the Classification of the part.	L=±20% of initial, DCR =±20% of initial	15	+25 deg. C	Maximum	1.003	0.999	0.789	23.430	23.210	-0.694
							Mimimum	0.854	0.849	-0.800	22.890	22.720	-0.939
							Mean	0.938	0.935	-0.392	23.215	23.035	-0.778
							Std Dev	0.046	0.047	0.355	0.157	0.147	0.062
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)		
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			Initial			Initial		
						-55 deg. C	Maximum	1.001			16.011		
							Mimimum	0.809			15.533		
							Mean	0.901			15.801		
							Std Dev	0.059			0.101		
						+25 deg. C		Initial			Initial		
							Maximum	1.011			23.020		
							Mimimum	0.813			22.320		
							Mean	0.908			22.721		
							Std Dev	0.060			0.145		
						+155 deg. C		Initial			Initial		
							Maximum	1.018			34.250		
							Mimimum	0.818			33.190		
							Mean	0.912			33.865		
							Std Dev	0.059			0.224		

							Inductance (µH)			DC Resistance (mΩ)		
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		Initial	Final	%Δ	Initial	Final	%Δ
						+25 deg. C	Maximum	1.017	1.027	1.040	23.090	23.090	0.484
							Mimimum	0.800	0.802	0.004	22.420	22.430	-0.088
							Mean	0.914	0.920	0.677	22.815	22.836	0.092
							Std Dev	0.061	0.063	0.211	0.154	0.155	0.142

							Inductance (µH)			DC Resistance (mΩ)		
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	1.018	1.009	1.346	23.160	23.120	0.175
							Mimimum	0.803	0.796	-1.422	22.480	22.340	-0.623
							Mean	0.904	0.900	-0.444	22.920	22.858	-0.272
							Std Dev	0.066	0.065	0.966	0.157	0.161	0.168

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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
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=±15% of initial, DCR =±15% of initial	All tests requiring electrical data								
3	High Temp Exposure	IEC-60068 Part 2-2 test group BA	155C for 2000 hours, unpowered readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT LT=Low Temperature=-55°C, RT=Room Temperature=+25°C,HT=High Temperature=+125°C for –A1/1A models. HT=High Temperature =+155° C for -5A models.	L=±20% of initial, DCR =±20% of initial	77	-55 deg. C	Maximum	4.706	4.975	7.401	69.680	72.700	8.201
							Mimimum	3.783	4.056	3.668	66.100	68.060	-0.274
							Mean	4.334	4.573	5.521	67.907	70.106	3.248
							Std Dev	0.211	0.210	0.750	0.726	1.162	1.930
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.736	4.997	7.644	101.280	101.670	1.076
							Mimimum	3.792	4.074	3.620	97.910	97.660	-0.534
							Mean	4.352	4.601	5.752	99.616	99.732	0.117
							Std Dev	0.219	0.216	0.790	0.694	0.752	0.426
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.716	5.084	10.511	154.180	150.650	-0.740
							Mimimum	3.742	4.122	5.599	147.660	141.430	-5.480
							Mean	4.317	4.685	8.538	150.844	147.198	-2.415
							Std Dev	0.217	0.231	0.890	1.278	1.756	1.061

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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	4.662	4.673	1.075	68.820	74.120	10.177
							Mimimum	3.753	3.764	0.013	65.620	69.190	2.261
							Mean	4.293	4.301	0.193	67.631	71.469	5.703
							Std Dev	0.223	0.223	0.127	0.783	1.213	2.065
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.701	4.703	0.584	101.580	102.000	0.656
							Mimimum	3.782	3.792	-0.237	98.100	98.180	-0.020
							Mean	4.309	4.315	0.135	99.660	99.890	0.231
							Std Dev	0.230	0.230	0.164	0.688	0.702	0.164
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.686	4.686	0.948	154.870	150.430	-0.989
							Mimimum	3.786	3.794	-0.077	147.670	142.790	-5.281
							Mean	4.283	4.290	0.152	151.160	147.090	-2.685
							Std Dev	0.234	0.232	0.139	1.303	1.624	1.049

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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) dw ell time = 30 min. transfer time ≤10 sec. no. of cycles = 1000 unpow ered initial (0 cycles) and final 1000 cycles). Readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	77	-55 deg. C	Maximum	4.660	4.762	2.841	69.510	72.420	6.011
							Mimimum	3.728	3.830	1.023	65.770	67.770	0.264
							Mean	4.293	4.381	2.049	67.706	69.846	3.168
							Std Dev	0.208	0.207	0.317	0.808	1.003	1.506
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.713	4.770	3.099	101.930	101.570	0.959
							Mimimum	3.742	3.840	0.749	98.030	97.830	-0.949
							Mean	4.311	4.396	1.972	99.733	99.792	0.060
							Std Dev	0.214	0.209	0.429	0.797	0.913	0.524
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.687	4.850	5.430	153.820	151.280	-1.299
							Mimimum	3.691	3.881	2.668	147.490	143.460	-4.621
							Mean	4.276	4.456	4.214	150.916	146.891	-2.665
							Std Dev	0.216	0.220	0.541	1.381	1.367	0.705

								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 Pow er Initial (0hr.) and final (1000hr.) readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	77	-55 deg. C	Maximum	4.702	4.706	0.522	71.160	72.830	4.641
							Mimimum	3.800	3.797	-0.460	66.510	68.830	0.141
							Mean	4.293	4.298	0.116	69.213	70.902	2.450
							Std Dev	0.216	0.217	0.207	0.970	0.880	1.276
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.727	4.710	0.123	101.720	101.730	0.350
							Mimimum	3.800	3.789	-0.788	97.810	97.900	-0.100
							Mean	4.305	4.294	-0.265	99.794	99.926	0.132
							Std Dev	0.221	0.950	0.184	0.752	0.744	0.103
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.723	4.720	0.660	153.080	152.080	0.951
							Mimimum	3.787	3.792	-0.546	145.760	144.720	-2.448
							Mean	4.293	4.296	0.088	148.995	147.836	-0.775
							Std Dev	0.222	0.220	0.235	1.404	1.579	0.877

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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. 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	-55 deg. C	Maximum	4.819	4.994	9.502	69.470	67.820	-0.370
							Mimimum	3.928	4.176	3.068	66.170	65.010	-3.667
							Mean	4.388	4.612	5.141	68.108	66.452	-2.429
							Std Dev	0.212	0.199	1.483	0.691	0.680	0.832
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.879	5.065	10.004	101.200	100.530	-0.030
							Mimimum	3.926	4.213	3.603	97.760	97.040	-0.784
							Mean	4.413	4.663	5.705	99.611	99.135	-0.478
							Std Dev	0.222	0.208	1.450	0.706	0.759	0.184
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.856	5.222	12.816	153.430	155.280	1.676
							Mimimum	3.877	4.301	6.793	148.410	149.380	-0.730
							Mean	4.390	4.774	8.767	150.800	152.011	0.804
							Std Dev	0.226	0.231	1.266	1.117	1.185	0.556

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
13	Mechanical Shock	IEC-60068 part 2.27 test group Ea with precondition per 0 above	Pulse Shape-Half Sine Normal Pulse Length 6ms Peak acceleration-100g No. shocks-6 each in both directions of each axis (total of 36) Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30	-55 deg. C	Maximum	4.694	4.683	0.119	68.990	68.630	0.525
							Mimimum	3.938	3.937	-0.290	65.080	65.240	-1.348
							Mean	4.280	4.274	-0.132	67.626	67.475	-0.222
							Std Dev	0.202	0.200	0.102	0.872	0.856	0.572
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.717	4.716	0.994	100.800	100.890	0.994
							Mimimum	3.935	3.938	-0.172	97.640	97.740	-0.172
							Mean	4.286	4.292	0.130	99.571	99.670	0.130
							Std Dev	0.208	0.208	0.256	0.790	0.788	0.256
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.708	4.708	0.193	153.700	153.590	0.520
							Mimimum	3.898	3.906	-0.054	148.020	148.790	-0.271
							Mean	4.273	4.276	0.075	151.203	151.364	0.107
							Std Dev	0.212	0.210	0.067	1.371	1.363	0.227
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
14	Vibration	IEC-60068 PART 2-6 TEST GROUP Fc. With precondition per 0 above	Pulse Shape-sine wave range of frequency 1 10-55Hz. Amplitude ±0.75mm Range of frequency 2 55-2000Hz Amplitude; 10G Frequency Sweep: 1 oct./min. Duration: 24 h each of 3 axis. Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30	-55 deg. C	Maximum	4.613	4.617	0.204	68.940	68.820	0.149
							Mimimum	3.916	3.922	0.060	65.990	65.910	-0.356
							Mean	4.316	4.322	0.136	67.631	67.566	-0.095
							Std Dev	0.203	0.203	0.032	0.673	0.680	0.125
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.635	4.643	0.251	101.310	101.240	0.010
							Mimimum	3.922	3.923	0.005	98.700	98.660	-0.149
							Mean	4.333	4.338	0.111	99.698	99.640	-0.055
							Std Dev	0.210	0.212	0.060	0.597	0.589	0.041
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.639	4.634	0.058	153.530	153.500	0.007
							Mimimum	3.900	3.900	-0.157	149.020	148.770	-0.309
							Mean	4.318	4.315	-0.061	151.111	150.961	-0.099
							Std Dev	0.216	0.215	0.054	1.184	1.179	0.085

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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	4.683	4.670	0.099	68.960	69.180	0.728
							Mimimum	3.817	3.816	-0.281	65.990	65.740	-1.433
							Mean	4.252	4.248	-0.098	67.506	67.319	-0.278
							Std Dev	0.226	0.224	0.094	0.891	1.027	0.617
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.722	4.716	0.629	101.210	101.020	-0.141
							Mimimum	3.824	3.818	-0.226	97.860	97.370	-0.588
							Mean	4.260	4.265	0.119	99.701	99.365	-0.337
							Std Dev	0.234	0.235	0.243	0.799	0.851	0.125
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	4.692	4.696	0.258	153.140	153.200	0.600
							Mimimum	3.776	3.784	0.031	147.770	148.030	-0.286
							Mean	4.236	4.241	0.123	150.943	151.170	0.151
							Std Dev	0.242	0.831	0.051	1.283	1.240	0.257
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
15	Resistance to Solder Heat	MIL-STD-202G Method 210F Condition K	IR/convection reflow. 250 ± 5°C for 30 ± 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s	L=±20% of initial, DCR =±20% of initial	30	+25 deg. C	Maximum	4.800	4.756	-0.649	101.430	101.450	0.170
							Mimimum	3.813	3.766	-1.432	97.530	97.550	-0.141
							Mean	4.317	4.272	-1.053	99.671	99.663	-0.008
							Std Dev	0.218	0.215	0.159	0.714	0.711	0.063
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	25KV	%Δ	Initial	25KV	%Δ
17	ESD	AEC-Q200-002	Determine the Classification of the part.	L=±20% of initial, DCR =±20% of initial	15	+25 deg. C	Maximum	4.618	4.642	0.890	100.480	101.070	0.680
							Mimimum	3.788	3.821	0.036	98.340	98.900	0.504
							Mean	4.237	4.257	0.482	99.219	99.804	0.589
							Std Dev	0.215	0.214	0.227	0.684	0.697	0.043
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)		
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			Initial			Initial		
						-55 deg. C	Maximum	4.683			68.960		
							Mimimum	3.817			65.990		
							Mean	4.252			67.506		
							Std Dev	0.226			0.891		
								Initial			Initial		
						+25 deg. C	Maximum	4.722			101.210		
							Mimimum	3.824			97.860		
							Mean	4.260			99.701		
							Std Dev	0.234			0.799		
								Initial			Initial		
						+155 deg. C	Maximum	4.692			153.140		
							Mimimum	3.776			147.770		
							Mean	4.236			150.943		
							Std Dev	0.242			1.283		
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
21	Board Flex	AEC-Q200-005 Appendix 2	2mm minimum flex for 60 (+5) sec	Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial	30	+25 deg. C	Maximum	4.600	4.612	0.464	101.040	100.740	0.141
							Mimimum	3.961	3.977	-0.140	98.960	98.870	-1.474
							Mean	4.247	4.260	0.306	100.047	99.886	-0.160
							Std Dev	0.178	0.179	0.111	0.510	0.492	0.277
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
22	Terminal Strength	AEC-Q200-006 Appendix 1	Force of 1.8kg (17.7 N) for 60 seconds	Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial	30	+25 deg. C	Maximum	4.685	4.685	0.061	101.720	101.450	0.080
							Mimimum	3.905	3.907	-0.108	97.690	97.470	-0.540
							Mean	4.396	4.396	-0.014	99.863	99.651	-0.212
							Std Dev	0.205	0.204	0.046	0.826	0.852	0.166

SECTION 10

IHLP 1616-5A TEST RESULTS

BEER'SHEVA, ISRAEL MANUFACTURING LOCATION

IHLP1616BZER1R0M5A
IHLP1616BZER4R7M5A

- Parts were produced from the Beer'Sheva, Israel Location

IHLP1616BZER1R0M5A

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=±15% of initial, DCR =±15% of initial	All tests requiring electrical data								
3	High Temp Exposure	IEC-60068 Part 2-2 test group BA	155C for 2000 hours, unpowered readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT LT=Low Temperature=-55°C, RT=Room Temperature=+25°C,HT=High Temperature=+125°C for –A1/1A models. HT=High Temperature =+155° C for -5A models.	L=±20% of initial, DCR =±20% of initial	77			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	1.045	1.124	9.929	16.190	17.440	9.410
							Mimimum	0.900	0.977	6.384	15.340	15.780	1.314
							Mean	0.971	1.050	8.212	15.784	16.581	5.058
							Std Dev	0.033	0.033	0.737	0.178	0.320	2.185
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.060	1.135	7.753	23.670	23.790	1.299
							Mimimum	0.909	0.984	9.324	22.730	22.880	0.129
							Mean	0.982	1.058	5.788	23.248	23.395	0.635
							Std Dev	0.035	0.034	0.793	0.176	0.188	0.294
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.045	1.166	13.445	35.930	35.440	-0.697
							Mimimum	0.900	1.004	9.861	34.420	33.560	-4.887
							Mean	0.970	1.082	11.619	35.216	34.386	-2.353
							Std Dev	0.034	0.036	0.818	0.309	0.373	1.066

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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	1.038	1.041	5.774	16.180	17.350	9.707
							Mimimum	0.877	0.885	0.201	15.350	16.120	1.569
							Mean	0.969	0.974	0.545	15.816	16.637	5.203
							Std Dev	0.035	0.033	0.848	0.188	0.292	2.091
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.048	1.045	0.625	23.710	23.720	0.298
							Mimimum	0.889	0.888	-0.764	22.920	22.800	-0.949
							Mean	0.978	0.977	-0.224	23.323	23.270	-0.224
							Std Dev	0.035	0.034	0.289	0.184	0.207	0.344
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.041	1.044	7.971	36.270	35.420	-0.629
							Mimimum	0.862	0.889	0.134	34.650	33.380	-4.981
							Mean	0.971	0.976	0.586	35.368	34.512	-2.418
							Std Dev	0.036	0.034	1.108	0.311	0.404	1.048

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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	1.036	1.055	11.086	16.130	17.030	7.798
							Mimimum	0.884	0.905	1.360	15.260	16.150	1.806
							Mean	0.974	1.002	2.825	15.775	16.540	4.864
							Std Dev	0.035	0.030	1.200	0.200	0.200	1.378
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.060	1.059	5.556	23.780	24.030	1.766
							Mimimum	0.913	0.910	-2.211	22.710	23.010	0.301
							Mean	0.991	1.005	1.509	23.284	23.542	1.106
							Std Dev	0.037	0.031	1.401	0.163	0.176	0.358
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.041	1.076	8.203	36.190	35.640	0.288
							Mimimum	0.891	0.926	2.638	34.430	34.040	-3.580
							Mean	0.980	1.020	4.060	35.322	34.856	-1.318
							Std Dev	0.034	0.032	0.883	0.290	0.318	0.852

								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	1.050	1.056	0.915	16.210	17.090	8.397
							Mimimum	0.913	0.917	-0.061	15.340	16.140	1.985
							Mean	0.981	0.986	0.450	15.799	16.561	4.833
							Std Dev	0.033	0.034	0.160	0.181	0.175	1.498
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.065	1.056	-0.425	23.580	23.650	0.384
							Mimimum	0.920	0.915	-1.454	22.950	23.000	-0.043
							Mean	0.993	0.985	-0.842	23.281	23.330	0.213
							Std Dev	0.035	0.034	0.206	0.139	0.141	0.083
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.053	1.060	1.005	35.990	35.190	-0.677
							Mimimum	0.911	0.919	0.051	34.550	33.640	-3.834
							Mean	0.985	0.989	0.470	35.325	34.528	-2.252
							Std Dev	0.034	0.035	0.179	0.266	0.333	0.846

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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. 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	-55 deg. C	Maximum	1.039	1.097	9.363	16.250	17.850	11.077
							Mimimum	0.912	0.965	4.416	15.420	16.400	3.748
							Mean	0.966	1.031	6.754	15.889	16.998	7.000
							Std Dev	0.029	0.029	1.190	0.161	0.327	2.027
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.053	1.109	9.892	23.760	23.760	1.171
							Mimimum	0.916	0.973	3.848	22.900	22.690	-1.448
							Mean	0.975	1.040	6.604	23.296	23.174	-0.522
							Std Dev	0.031	0.029	1.441	0.173	0.223	0.685
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.034	1.134	12.857	35.930	35.070	-2.066
							Mimimum	0.908	0.994	7.527	34.730	32.910	-5.891
							Mean	0.962	1.062	10.400	35.317	33.987	-3.766
							Std Dev	0.030	0.031	1.463	0.262	0.426	0.925

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
13	Mechanical Shock	IEC-60068 part 2.27 test group Ea with precondition per 0 above	Pulse Shape-Half Sine Normal Pulse Length 6ms Peak acceleration-100g No. shocks-6 each in both directions of each axis (total of 36) Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30	-55 deg. C	Maximum	1.027	1.026	-0.068	16.100	16.030	0.443
							Mimimum	0.862	0.861	-0.242	15.390	15.360	-0.756
							Mean	0.970	0.968	-0.139	15.788	15.767	-0.130
							Std Dev	0.041	0.041	0.040	0.162	0.160	0.345
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.045	1.034	-0.567	23.520	23.600	0.475
							Mimimum	0.871	0.863	-1.181	22.860	22.910	-0.384
							Mean	0.981	0.973	-0.879	23.163	23.231	0.295
							Std Dev	0.042	0.041	0.160	0.160	0.156	0.160
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.031	1.032	0.133	36.120	36.130	0.337
							Mimimum	0.856	0.856	-0.125	34.820	34.830	-0.167
							Mean	0.968	0.968	0.004	35.293	35.314	0.061
							Std Dev	0.041	0.041	0.049	0.299	0.299	0.129
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
14	Vibration	IEC-60068 PART 2-6 TEST GROUP Fc. With precondition per 0 above	Pulse Shape-sine wave range of frequency 1 10-55Hz. Amplitude ±0.75mm Range of frequency 2 55-2000Hz Amplitude; 10G Frequency Sweep: 1 oct./min. Duration: 24 h each of 3 axis. Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30	-55 deg. C	Maximum	1.029	1.027	0.268	16.180	16.030	1.097
							Mimimum	0.915	0.914	-0.214	15.380	15.370	-1.179
							Mean	0.969	0.969	-0.060	15.758	15.757	-0.005
							Std Dev	0.038	0.038	0.107	0.179	0.165	0.067
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.043	1.033	-0.237	24.300	23.720	0.261
							Mimimum	0.925	0.918	-1.021	22.930	22.930	-3.827
							Mean	0.980	0.973	-0.710	23.271	23.255	-0.063
							Std Dev	0.039	0.039	0.156	0.278	0.200	0.714
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.029	1.028	0.408	36.070	36.360	0.925
							Mimimum	0.909	0.909	-0.079	34.670	34.700	-0.169
							Mean	0.966	0.966	0.014	35.236	35.347	0.315
							Std Dev	0.039	0.039	0.086	0.352	0.404	0.328

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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	1.043	1.041	0.650	16.120	16.150	1.381
							Mimimum	0.922	0.921	-0.218	15.370	15.460	-1.070
							Mean	0.989	0.987	-0.118	15.796	15.814	0.116
							Std Dev	0.029	0.029	0.148	0.166	0.166	0.657
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.058	1.047	-0.096	23.740	23.700	0.173
							Mimimum	0.929	0.924	-1.036	23.060	23.070	-0.385
							Mean	1.000	0.992	-0.776	23.362	23.337	-0.107
							Std Dev	0.031	0.030	0.173	0.174	0.165	0.142
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	1.045	1.045	0.775	36.040	35.980	0.561
							Mimimum	0.921	0.922	0.008	34.960	34.780	-0.685
							Mean	0.990	0.991	0.091	35.478	35.448	-0.085
							Std Dev	0.029	0.029	0.134	0.299	0.340	0.310
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
15	Resistance to Solder Heat	MIL-STD-202G Method 210F Condition K	IR/convection reflow. 250 ± 5°C for 30 ± 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s	L=±20% of initial, DCR =±20% of initial	30	+25 deg. C	Maximum	1.060	1.046	0.514	23.650	23.660	0.260
							Mimimum	0.891	0.892	-1.461	22.970	22.980	-0.128
							Mean	0.988	0.981	-0.736	23.272	23.286	0.059
							Std Dev	0.046	0.041	0.590	0.175	0.168	0.114
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	25KV	%Δ	Initial	25KV	%Δ
17	ESD	AEC-Q200-002	Determine the Classification of the part.	L=±20% of initial, DCR =±20% of initial	15	+25 deg. C	Maximum	1.057	1.039	9.297	23.660	24.020	3.179
							Mimimum	0.896	0.950	-9.501	23.040	23.370	-0.085
							Mean	0.967	0.999	3.414	23.341	23.592	1.081
							Std Dev	0.039	0.029	5.018	0.178	0.158	0.879
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	1.043			16.120		
						Mimimum	0.922			15.370		
						Mean	0.989			15.796		
						Std Dev	0.029			0.166		
					+25 deg. C		Initial			Initial		
						Maximum	1.058			23.740		
						Mimimum	0.929			23.060		
						Mean	1.000			23.362		
						Std Dev	0.031			0.174		
					+155 deg. C		Initial			Initial		
						Maximum	1.045			36.040		
						Mimimum	0.921			34.960		
						Mean	0.990			35.478		
						Std Dev	0.029			0.299		
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
21	Board Flex	AEC-Q200-005 Appendix 2	2mm minimum flex for 60 (+5) sec	Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial	30	+25 deg. C	Maximum	1.071	1.072	0.217	23.840	23.700	-0.426
							Mimimum	0.908	0.910	-0.250	23.090	22.950	-0.765
							Mean	0.996	0.996	0.080	23.384	23.253	-0.560
							Std Dev	0.043	0.043	0.116	0.189	0.191	0.079
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
22	Terminal Strength	AEC-Q200-006 Appendix 1	Force of 1.8kg (17.7 N) for 60 seconds	Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial	30	+25 deg. C	Maximum	1.067	1.055	-0.603	23.710	23.680	0.086
							Mimimum	0.925	0.918	-1.215	23.140	23.130	-0.129
							Mean	0.988	0.979	0.895	23.320	23.303	-0.071
							Std Dev	0.032	0.031	0.171	0.139	0.136	0.058

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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
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=±15% of initial, DCR =±15% of initial	All tests requiring electrical data								
3	High Temp Exposure	IEC-60068 Part 2-2 test group BA	155C for 2000 hours, unpowered readings at 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT LT=Low Temperature=-55°C, RT=Room Temperature=+25°C,HT=High Temperature=+125°C for –A1/1A models. HT=High Temperature =+155° C for -5A models.	L=±20% of initial, DCR =±20% of initial	77	-55 deg. C	Maximum	5.225	5.455	6.551	69.610	69.060	0.176
							Mimimum	3.770	4.003	3.741	66.380	65.730	-2.399
							Mean	4.631	4.856	4.916	68.007	67.351	-0.964
							Std Dev	0.357	0.347	0.735	0.745	0.726	0.508
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.264	5.507	7.406	101.210	100.740	-0.230
							Mimimum	3.768	4.022	4.084	97.270	96.840	-0.729
							Mean	4.645	4.894	5.425	99.544	99.051	-0.495
							Std Dev	0.370	0.357	0.876	0.843	0.865	0.108
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.262	5.702	10.170	154.350	154.310	-0.136
							Mimimum	3.750	4.094	7.284	148.510	147.910	0.619
							Mean	4.635	5.029	8.539	151.945	151.738	-0.593
							Std Dev	0.378	0.395	0.660	1.413	1.448	0.228

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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	5.247	5.262	0.779	69.660	69.760	0.699
							Mimimum	3.855	3.853	-0.186	66.460	66.820	-1.723
							Mean	4.716	4.718	0.040	68.175	68.212	0.056
							Std Dev	0.371	0.373	0.150	0.670	0.665	0.487
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.297	5.308	0.836	101.770	101.780	0.159
							Mimimum	3.842	3.856	0.067	97.630	97.720	-0.080
							Mean	4.732	4.745	0.287	99.844	99.850	0.006
							Std Dev	0.386	0.386	0.149	0.802	0.799	0.067
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.298	5.295	0.372	155.210	156.180	1.113
							Mimimum	3.825	3.827	-0.112	147.810	147.960	-0.013
							Mean	4.723	4.724	0.033	152.015	152.825	0.533
							Std Dev	0.393	0.393	0.092	1.378	1.467	0.281

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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	5.224	5.267	19.156	69.450	69.420	0.130
							Mimimum	3.931	4.036	0.239	66.470	65.760	-1.962
							Mean	4.635	4.711	1.703	68.132	67.580	-0.809
							Std Dev	0.362	0.346	2.124	0.720	0.751	0.480
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.258	5.306	16.704	101.260	101.020	0.768
							Mimimum	3.938	4.045	0.120	97.310	97.080	-0.519
							Mean	4.659	4.739	1.766	99.789	99.560	-0.229
							Std Dev	0.371	0.355	1.861	0.795	0.786	0.150
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.261	5.429	10.556	154.920	155.310	1.507
							Mimimum	3.891	4.076	2.315	148.690	149.460	-0.243
							Mean	4.646	4.819	3.742	152.164	152.561	0.261
							Std Dev	0.386	0.383	1.028	1.310	1.237	0.276

								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	5.237	5.266	0.768	69.530	69.430	0.289
							Mimimum	3.840	3.825	-0.406	66.410	66.120	-1.356
							Mean	4.707	4.716	0.191	68.033	67.694	-0.498
							Std Dev	0.349	0.356	0.271	0.698	0.704	0.361
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.268	5.260	0.052	101.500	101.480	0.181
							Mimimum	3.824	3.807	-0.926	97.950	97.990	-0.051
							Mean	4.730	4.711	-0.398	99.698	99.779	0.081
							Std Dev	0.365	0.364	0.173	0.808	0.807	0.059
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.230	5.229	0.270	155.140	155.820	0.948
							Mimimum	3.787	3.773	-0.693	148.450	149.200	0.174
							Mean	4.715	4.706	-0.174	152.147	152.854	0.465
							Std Dev	0.375	0.372	0.212	1.399	1.434	0.178

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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. 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	-55 deg. C	Maximum	5.196	5.515	12.535	69.190	68.210	0.617
							Mimimum	3.805	4.279	3.876	65.750	64.840	-2.905
							Mean	4.689	4.995	6.717	67.477	66.852	-0.924
							Std Dev	0.390	0.319	2.645	0.777	0.773	0.744
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.251	5.591	13.976	101.360	101.310	0.776
							Mimimum	3.794	4.321	4.565	97.020	96.520	-0.567
							Mean	4.728	5.069	7.425	99.582	99.442	-0.140
							Std Dev	0.411	0.332	2.873	0.872	0.918	0.336
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.239	5.745	17.927	155.300	155.200	0.561
							Mimimum	3.758	4.428	8.131	147.510	146.940	-0.613
							Mean	4.707	5.232	11.375	152.531	152.398	-0.088
							Std Dev	0.422	0.362	2.794	1.313	1.393	0.204

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
13	Mechanical Shock	IEC-60068 part 2.27 test group Ea with precondition per 0 above	Pulse Shape-Half Sine Normal Pulse Length 6ms Peak acceleration-100g No. shocks-6 each in both directions of each axis (total of 36) Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30	-55 deg. C	Maximum	5.139	5.139	0.137	70.870	73.340	6.303
							Mimimum	3.872	3.869	-0.077	67.810	70.090	1.436
							Mean	4.640	4.642	0.027	69.203	71.949	3.981
							Std Dev	0.350	0.350	0.061	0.937	0.864	1.554
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.190	5.177	0.414	101.810	102.690	1.308
							Mimimum	3.868	3.867	-0.485	98.600	99.260	-0.445
							Mean	4.674	4.665	-0.182	100.214	100.751	0.537
							Std Dev	0.369	0.364	0.198	0.721	0.870	0.526
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.179	5.173	0.173	152.870	150.250	0.536
							Mimimum	3.816	3.821	-0.203	146.150	146.010	-2.240
							Mean	4.643	4.642	-0.017	149.627	148.024	-1.065
							Std Dev	0.380	0.376	0.108	1.579	1.120	0.810

								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
14	Vibration	IEC-60068 PART 2-6 TEST GROUP Fc. With precondition per 0 above	Pulse Shape-sine wave range of frequency 1 10-55Hz. Amplitude ±0.75mm Range of frequency 2 55-2000Hz Amplitude; 10G Frequency Sweep: 1 oct./min. Duration: 24 h each of 3 axis. Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30	-55 deg. C	Maximum	5.085	5.093	0.165	71.240	71.350	4.344
							Mimimum	4.032	4.030	-0.214	67.030	66.570	-1.929
							Mean	4.665	4.663	-0.052	68.654	69.468	1.204
							Std Dev	0.320	0.319	0.101	1.006	1.136	2.119
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.147	5.137	0.262	101.870	102.250	0.525
							Mimimum	4.038	4.041	-0.403	97.220	97.470	0.231
							Mean	4.706	4.699	-0.134	100.052	100.406	0.354
							Std Dev	0.340	0.334	0.160	1.046	1.061	0.077
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	5.126	5.126	0.148	154.120	154.220	1.856
							Mimimum	3.993	3.998	-0.264	145.570	147.300	-1.862
							Mean	4.677	4.674	-0.056	150.518	150.436	-0.044
							Std Dev	0.345	0.342	0.119	2.026	1.673	1.247

IHLP1616BZER4R7M5A

								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	5.128	5.134	0.338	71.770	71.280	2.758
							Mimimum	4.061	4.063	-0.103	68.200	67.700	-5.473
							Mean	4.623	4.627	0.074	69.822	69.221	-0.835
							Std Dev	0.337	0.337	0.096	0.981	0.994	2.303
								Initial	Final	%Δ	Initial	Final	%Δ
						+25 deg. C	Maximum	5.190	5.175	0.288	101.400	101.270	-0.050
							Mimimum	4.063	4.066	-0.471	98.700	98.450	-0.289
							Mean	4.661	4.652	-0.177	100.278	100.143	-0.135
							Std Dev	0.357	0.352	0.180	0.643	0.656	0.071
								Initial	Final	%Δ	Initial	Final	%Δ
						+155 deg. C	Maximum	5.167	5.161	0.143	151.710	153.520	3.581
							Mimimum	4.002	4.005	-0.273	146.530	147.930	-0.617
							Mean	4.629	4.626	-0.046	149.048	151.194	1.448
							Std Dev	0.365	0.362	0.093	1.458	1.317	1.213
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
15	Resistance to Solder Heat	MIL-STD-202G Method 210F Condition K	IR/convection reflow. 250 ± 5°C for 30 ± 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s	L=±20% of initial, DCR =±20% of initial	30	+25 deg. C	Maximum	5.289	5.265	0.562	101.820	101.590	0.768
							Mimimum	4.042	4.051	-2.200	98.760	97.830	-1.223
							Mean	4.701	4.662	-0.777	100.513	100.176	-0.333
							Std Dev	0.398	0.373	0.740	0.957	0.833	0.543
								Inductance (µH)			DC Resistance (mΩ)		
								Initial	25KV	%Δ	Initial	25KV	%Δ
17	ESD	AEC-Q200-002	Determine the Classification of the part.	L=±20% of initial, DCR =±20% of initial	15	+25 deg. C	Maximum	5.207	5.200	0.406	101.530	102.270	0.864
							Mimimum	3.926	3.941	-0.542	98.740	99.150	0.268
							Mean	4.719	4.724	0.123	100.370	100.905	0.533
							Std Dev	0.468	0.460	0.269	0.749	0.793	0.169
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						

IHLP1616BZER4R7M5A

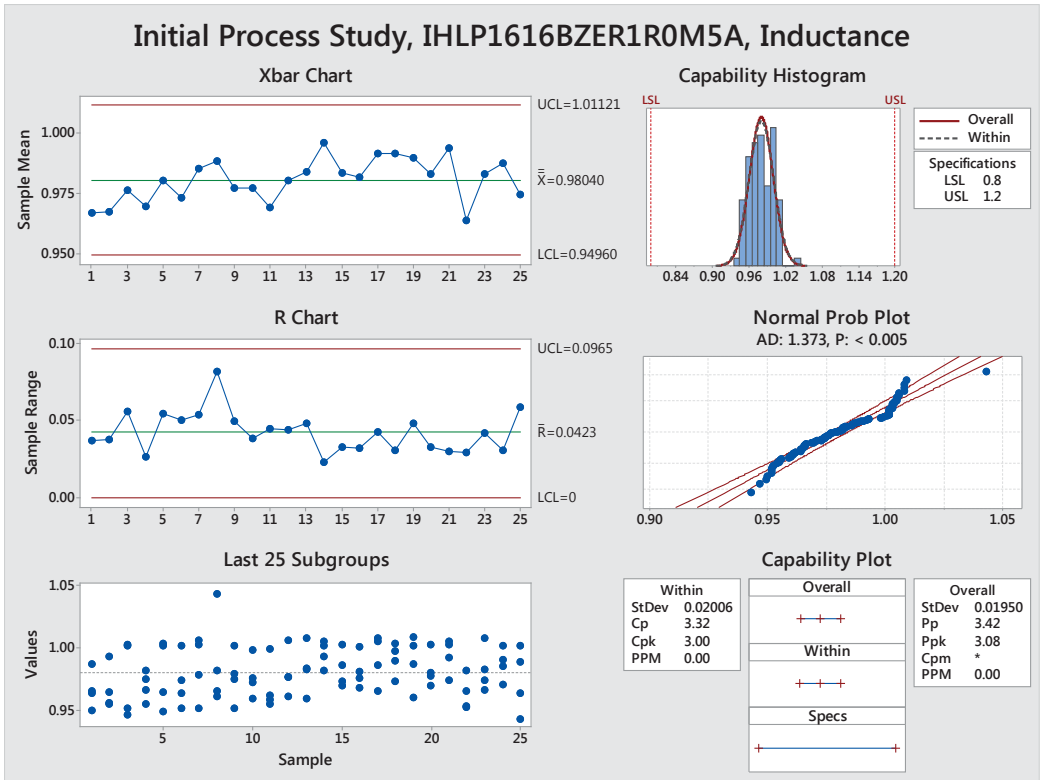
								Inductance (µH)			DC Resistance (mΩ)		
19	Electrical Characterization	User Specification	Min, Max, Mean, and Standard Deviation @ Min (-55C), Room, and Max (+125C) operating temperatures. After mounted, allow +/-5% shift DCR at room temp. -55C/+125C DCR Max calculated using temp conversion for copper: $R_2 = [(T_2 + 234.5) / (234.5 + T_A)] * 1.05R_A$ (A = Ambient, 2 = new con)	Final Test: L=±20% of initial, DCR per calculated limits described in test conditions. L test for -55C & +125C = ±20% initial	30			Initial	[redacted]		Initial	[redacted]	
					-55 deg. C	Maximum	5.128			71.770		
						Mimimum	4.061			68.200		
						Mean	4.623			69.822		
						Std Dev	0.337			0.981		
					+25 deg. C		Initial			Initial		
						Maximum	5.190			101.400		
						Mimimum	4.063			98.700		
						Mean	4.661			100.278		
						Std Dev	0.357			0.643		
					+155 deg. C		Initial			Initial		
						Maximum	5.167			151.710		
						Mimimum	4.002			146.530		
						Mean	4.629			149.048		
						Std Dev	0.365			1.458		
							Inductance (µH)			DC Resistance (mΩ)		
							Initial	Final	%Δ	Initial	Final	%Δ
21	Board Flex	AEC-Q200-005 Appendix 2	2mm minimum flex for 60 (+5) sec	Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial	30							
					+25 deg. C	Maximum	5.210	5.243	0.871	101.640	101.720	1.153
						Mimimum	3.767	3.640	-6.047	97.760	97.980	-1.002
						Mean	4.583	4.487	-2.140	100.053	100.174	0.123
						Std Dev	0.417	0.439	1.870	1.054	0.998	0.438
							Inductance (µH)			DC Resistance (mΩ)		
							Initial	Final	%Δ	Initial	Final	%Δ
22	Terminal Strength	AEC-Q200-006 Appendix 1	Force of 1.8kg (17.7 N) for 60 seconds	Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial	30							
					+25 deg. C	Maximum	5.246	5.257	0.264	103.260	101.580	0.474
						Mimimum	4.087	4.093	0.090	98.890	97.760	-2.340
						Mean	4.738	4.746	0.163	101.012	99.990	-1.007
						Std Dev	0.338	0.340	0.049	1.111	0.858	0.682

Production Part Approval Process

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

Initial Process Study
IHLP1616BZER1R0M5A, Inductance

Inductance (uH)							
1	0.966	26	1.003	51	1.008	76	0.961
2	0.987	27	0.979	52	0.96	77	0.978
3	0.95	28	0.952	53	1.002	78	0.97
4	0.964	29	1.043	54	0.982	79	1.003
5	0.965	30	0.982	55	0.993	80	0.981
6	0.955	31	0.966	56	1.005	81	0.992
7	0.993	32	0.961	57	1.003	82	1.005
8	0.956	33	0.952	58	0.973	83	0.975
9	0.952	34	1.002	59	0.97	84	1.003
10	0.947	35	0.98	60	0.986	85	0.953
11	1.002	36	0.975	61	0.976	86	0.965
12	1.003	37	0.96	62	1.001	87	0.982
13	0.956	38	0.976	63	0.981	88	0.954
14	0.975	39	0.999	64	0.969	89	0.983
15	0.966	40	0.973	65	1.005	90	1.008
16	0.982	41	0.955	66	1.008	91	0.966
17	1.002	42	0.999	67	0.986	92	0.974
18	0.965	43	0.959	68	0.965	93	1.002
19	1.004	44	0.962	69	0.998	94	0.986
20	0.95	45	1.006	70	0.973	95	0.991
21	0.964	46	0.962	71	1.004	96	0.971
22	1.002	47	0.977	72	0.99	97	0.964
23	0.974	48	0.977	73	1.002	98	0.989
24	0.952	49	0.983	74	0.987	99	0.943
25	1.006	50	0.984	75	1.009	100	1.002

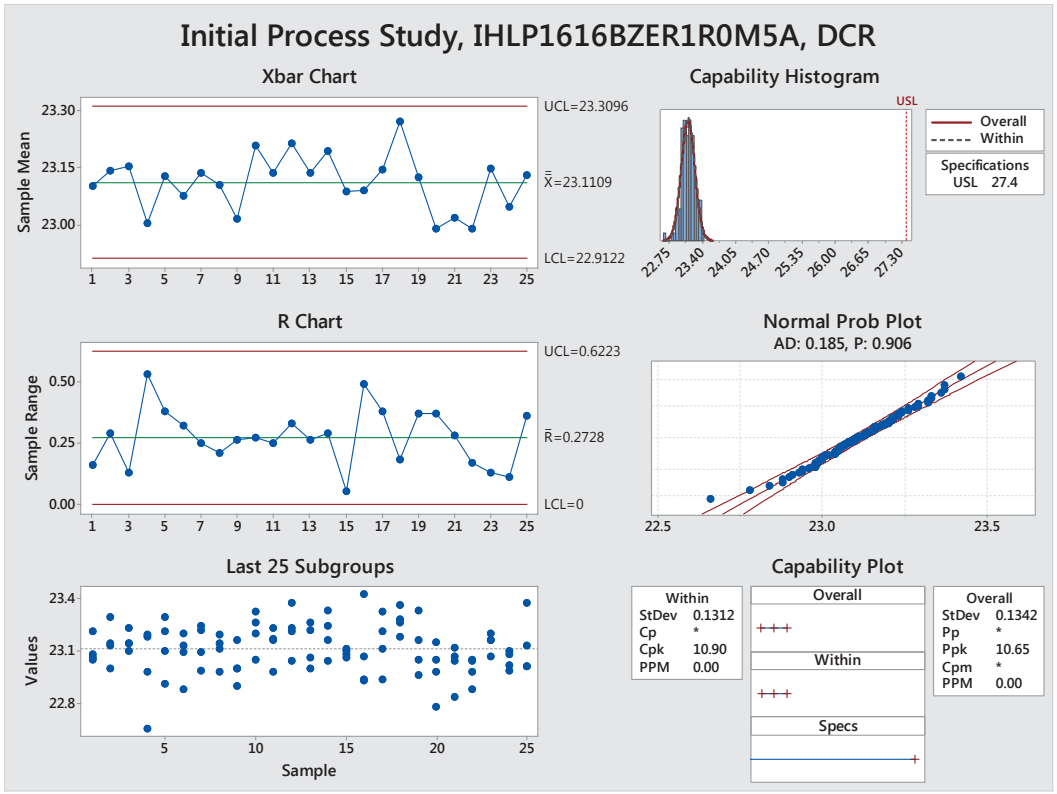


Production Part Approval Process

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

Initial Process Study
IHLP1616BZER1R0M5A, DC Resistance

DCR (mOhm)							
1	23.06	26	23.24	51	23.06	76	23.16
2	23.21	27	22.99	52	23.26	77	22.98
3	23.08	28	23.09	53	23.33	78	22.78
4	23.05	29	23.19	54	23.16	79	23.05
5	23.29	30	22.98	55	23.04	80	23.15
6	23	31	23.11	56	23.24	81	23.07
7	23.13	32	23.14	57	23.1	82	23.12
8	23.14	33	23.16	58	23.08	83	22.84
9	23.14	34	23	59	23.06	84	23.04
10	23.23	35	22.9	60	23.11	85	22.88
11	23.14	36	23	61	23.42	86	23.05
12	23.1	37	23.05	62	22.94	87	23.04
13	23.18	38	23.26	63	22.93	88	22.98
14	22.66	39	23.2	64	23.07	89	23.2
15	22.98	40	23.32	65	22.94	90	23.16
16	23.19	41	22.98	66	23.32	91	23.16
17	23.21	42	23.16	67	23.11	92	23.07
18	22.91	43	23.17	68	23.21	93	23.1
19	23.29	44	23.23	69	23.28	94	22.99
20	23.1	45	23.21	70	23.36	95	23.08
21	23.09	46	23.04	71	23.26	96	23.02
22	23.13	47	23.37	72	23.18	97	23.13
23	23.2	48	23.23	73	23.33	98	23.01
24	22.88	49	23.22	74	22.96	99	23.37
25	23.22	50	23	75	23.05	100	23.01

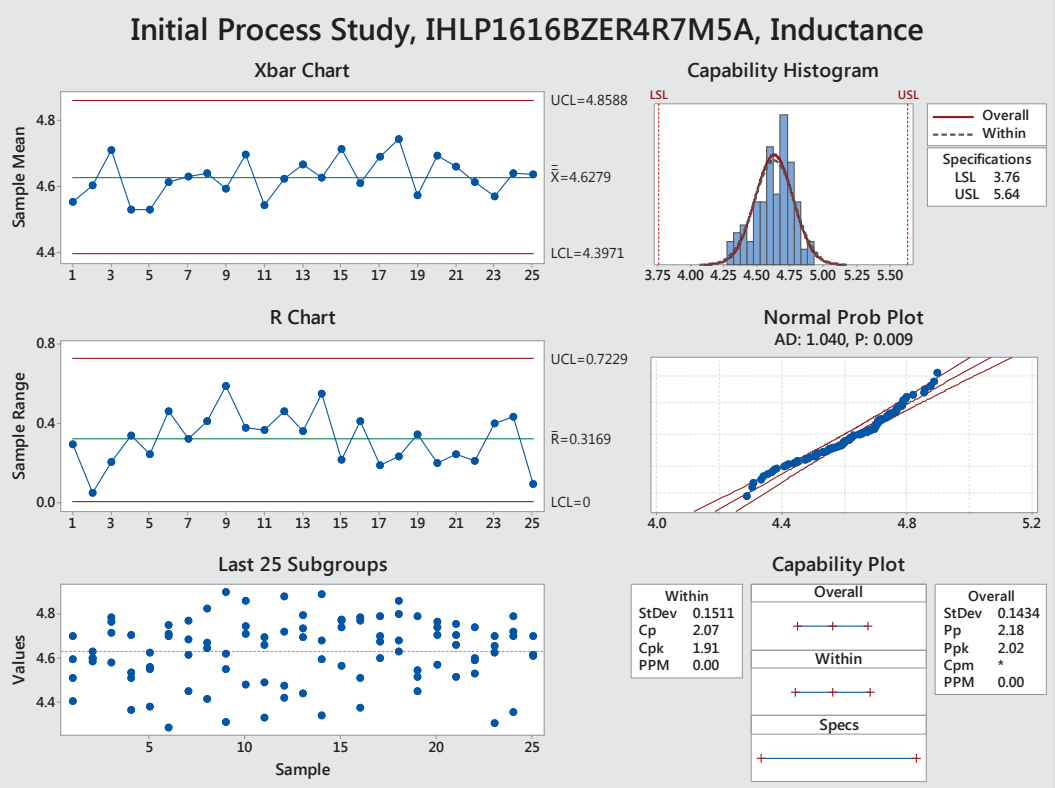


Production Part Approval Process

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

Initial Process Study
IHLP1616BZER4R7M5A, Inductance

Inductance (uH)							
1	4.597	26	4.685	51	4.695	76	4.449
2	4.698	27	4.45	52	4.796	77	4.737
3	4.406	28	4.617	53	4.594	78	4.763
4	4.509	29	4.414	54	4.887	79	4.569
5	4.586	30	4.822	55	4.682	80	4.707
6	4.599	31	4.672	56	4.341	81	4.659
7	4.601	32	4.647	57	4.563	82	4.707
8	4.63	33	4.62	58	4.74	83	4.752
9	4.713	34	4.309	59	4.769	84	4.514
10	4.762	35	4.552	60	4.774	85	4.598
11	4.582	36	4.897	61	4.375	86	4.59
12	4.784	37	4.709	62	4.769	87	4.532
13	4.704	38	4.742	63	4.508	88	4.738
14	4.368	39	4.858	64	4.784	89	4.305
15	4.508	40	4.481	65	4.602	90	4.627
16	4.536	41	4.333	66	4.788	91	4.653
17	4.55	42	4.658	67	4.673	92	4.699
18	4.382	43	4.697	68	4.702	93	4.698
19	4.624	44	4.489	69	4.859	94	4.717
20	4.56	45	4.475	70	4.799	95	4.787
21	4.748	46	4.72	71	4.629	96	4.356
22	4.288	47	4.42	72	4.681	97	4.7
23	4.71	48	4.879	73	4.513	98	4.615
24	4.7	49	4.439	74	4.788	99	4.612
25	4.771	50	4.732	75	4.546	100	4.617



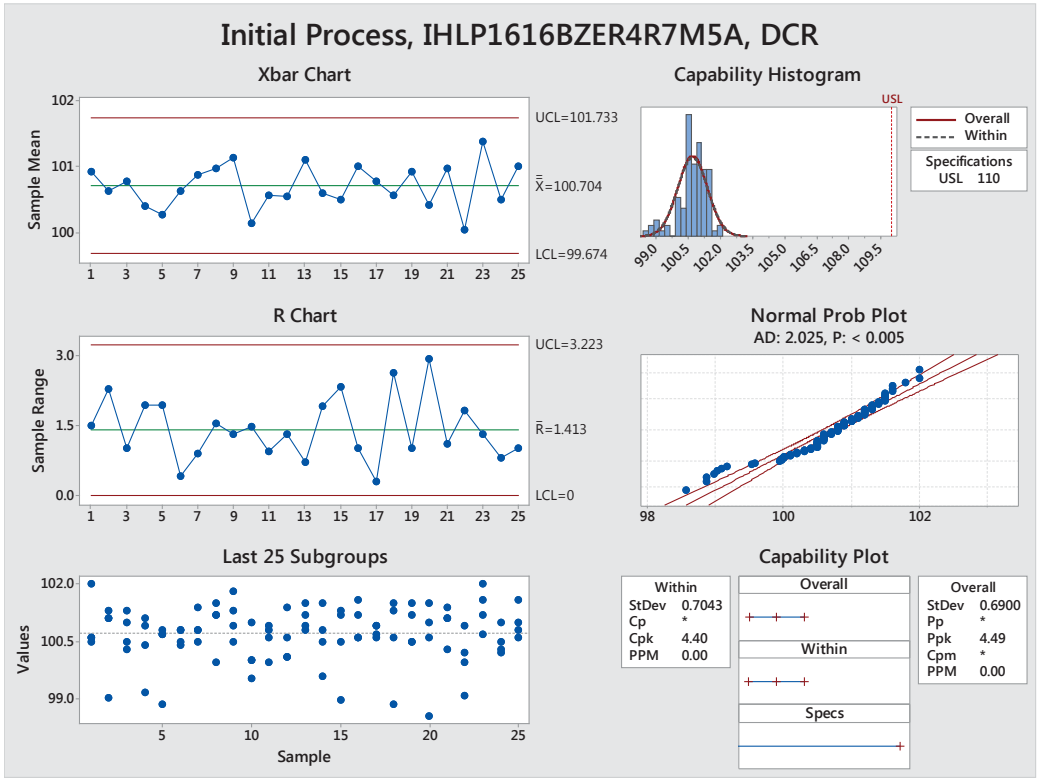
Vishay-Danshui

Production Part Approval Process

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

Initial Process Study
IHLP1616BZER4R7M5A, DC Resistance

	DCR (mOhm)						
1	100.5	26	101.4	51	101.2	76	100.5
2	102	27	100.5	52	100.9	77	100.6
3	100.6	28	100.8	53	101.5	78	98.56
4	100.6	29	101.2	54	100.8	79	101.5
5	101.3	30	101.2	55	99.58	80	101
6	101.1	31	101.5	56	100.5	81	101.4
7	99.02	32	99.95	57	101.3	82	100.3
8	101.1	33	101.3	58	100.5	83	101.1
9	101.3	34	100.5	59	98.98	84	101.1
10	101	35	100.9	60	101.2	85	99.97
11	100.3	36	101.8	61	101.6	86	99.09
12	100.5	37	101	62	101.2	87	100.9
13	100.9	38	100	63	100.6	88	100.2
14	101.1	39	99.53	64	100.6	89	102
15	100.4	40	100	65	100.9	90	100.7
16	99.17	41	100.9	66	100.7	91	101.6
17	100.7	42	99.97	67	100.6	92	101.2
18	100.7	43	100.6	68	100.9	93	100.3
19	100.8	44	100.8	69	101.5	94	101
20	98.87	45	100.1	70	100.6	95	100.5
21	100.5	46	101.4	71	98.86	96	100.2
22	100.8	47	100.1	72	101.3	97	101.6
23	100.4	48	100.6	73	101.2	98	101
24	100.8	49	101.5	74	100.5	99	100.8
25	100.8	50	100.8	75	101.5	100	100.6



Vishay-Danshui

Production Part Approval Process

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

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

Section 12: Qualified Laboratories

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

Production Part Approval Process

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

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

Section 13: Appearance Approval Report

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

IHLP Standards of Manufacture

IHLP INTRODUCTION SURFACE IRREGULARITIES CRITERIA FOR REJECTION SUMMARY

INTRODUCTION

Scope

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

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

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

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

Product

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

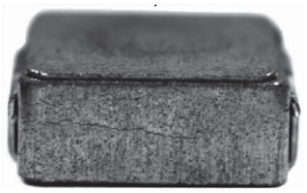
The IHLP inductor provides the best combination of:

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

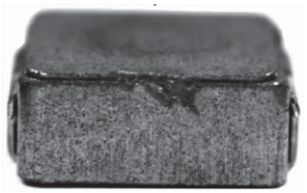
Surface irregularities

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

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



Cracks



Chips

Oxidation

APPLICATION NOTE

IHLP Standards of Manufacture

CRACKS

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

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

Terminal area crack, acceptable

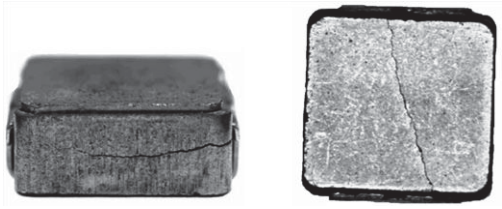
Cracks coming from the top corner of the terminal are a normal occurrence and are caused by terminal expansion during curing operations.

Negligible crack, acceptable

Negligible cracks are those that are nearly invisible without magnification.

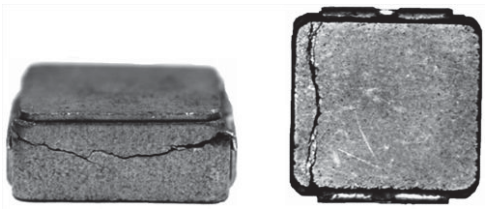
Minor crack, acceptable

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



Moderate crack, rejectable

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



Major crack, rejectable

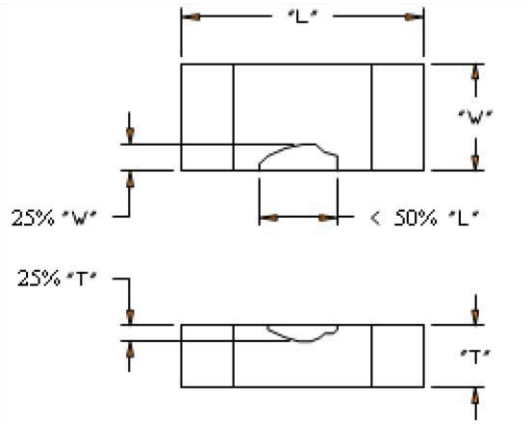
Major cracks are those that are obvious to a customer and would possibly result in large chip-outs that would expose the coil and lead frame.

APPLICATION NOTE

IHLP Standards of Manufacture

CHIPS

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



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

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

Minor chipping, acceptable

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

Major chipping, rejectable

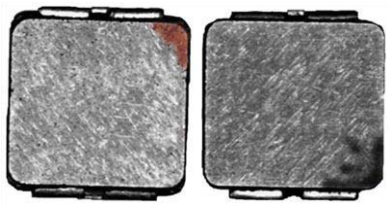
Major chips in the inductor body are those that are very obvious to the customer and may expose the wire coil or lead frame.

OXIDATION

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

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

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



Top view

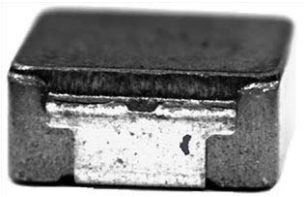
Side view

IHLP Standards of Manufacture

OTHER

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

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



Foreign material: Acceptable

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

Scratch: Acceptable

SUMMARY

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

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

Instructions

ASSEMBLY INSTRUCTIONS

General

This document provides instructions on mounting for the different types of packages, specifically on the different methods of soldering.

If the device is to be mounted near heat-generating components, consideration must be given to the resultant increase in ambient temperature.

Soldering Instructions

Protection against overheating is essential when a device is being soldered. Therefore, the PCB traces should be left as long as possible. The maximum permissible soldering temperature is governed by the maximum permissible heat that may be applied to the package.

The maximum soldering iron (or solder bath) temperatures are given in the individual Datasheets. During soldering, no forces must be transmitted from the pins to the case (e.g., by spreading the pins).

Soldering Methods

There are several methods for soldering devices onto the substrate. The following list is not complete.

a. Soldering in the Vapor Phase
   Soldering in saturated vapor is also known as condensation soldering. This soldering process is used as a batch system (dual vapor system) or as a continuous single vapor system. Both systems may also include a pre-heating of the assemblies to prevent high temperature shock and other undesired effects.

b. Infrared Soldering
   By using infrared (IR) reflow soldering, the heating is contact-free and the energy for heating the assembly is derived from direct infrared radiation and from convection.

   The heating rate in an IR furnace depends on the absorption coefficients of the material surfaces and on the ratio of component's mass to an As-irradiated surface.

   The temperature of parts in an IR furnace, with a mixture of radiation and convection, cannot be determined in advance. Temperature measurement may be performed by measuring the temperature of a certain component while it is being transported through the furnace.

   The temperatures of small components, soldered together with larger ones, may rise up to 280 °C.

   Influencing parameters on the internal temperature of the component are as follows:

   - Time and power
   - Mass of the component
   - Size of the component
   - Size of the printed circuit board
   - Absorption coefficient of the surfaces
   - Packing density
   - Wavelength spectrum of the radiation source
   - Ratio of radiated and convected energy

   As a general rule of thumb, maximum temperature should be reached within 360 s and time above solder liquids temperature should be reached in less than 180 s.

   Temperature/time profiles of the entire process and the influencing parameters are given. The IR reflow profile is shown in Figure 1.

c. Wave Soldering
   In wave soldering one or more continuously replenished waves of molten solder are generated, while the substrates to be soldered are moved in one direction across the crest of the wave. Maximum soldering temperature should not exceed 260 °C for 20 s.

d. Iron Soldering
   This process cannot be carried out in a controlled situation. It should therefore not be used in applications where reliability is important. There is no SMD classification for this process.

CLEANING INSTRUCTIONS

A no clean solder system is recommended for IHLP's.
If cleaning must be performed, an Isopropyl alcohol is recommended. If de-ionized Water Wash is used insure it is followed by a thorough warm air dry cycle to avoid oxidation.

Some cleaning solutions, especially those containing non-linear alcohol will attack the IHLP and should be avoided. It is recommended that any chemical cleaning solution be thoroughly rinsed with clean water. The IHLP should be tested for compatibility with any cleaning solution before production assembly.

TYPICAL REFLOW SOLDERING PROFILE

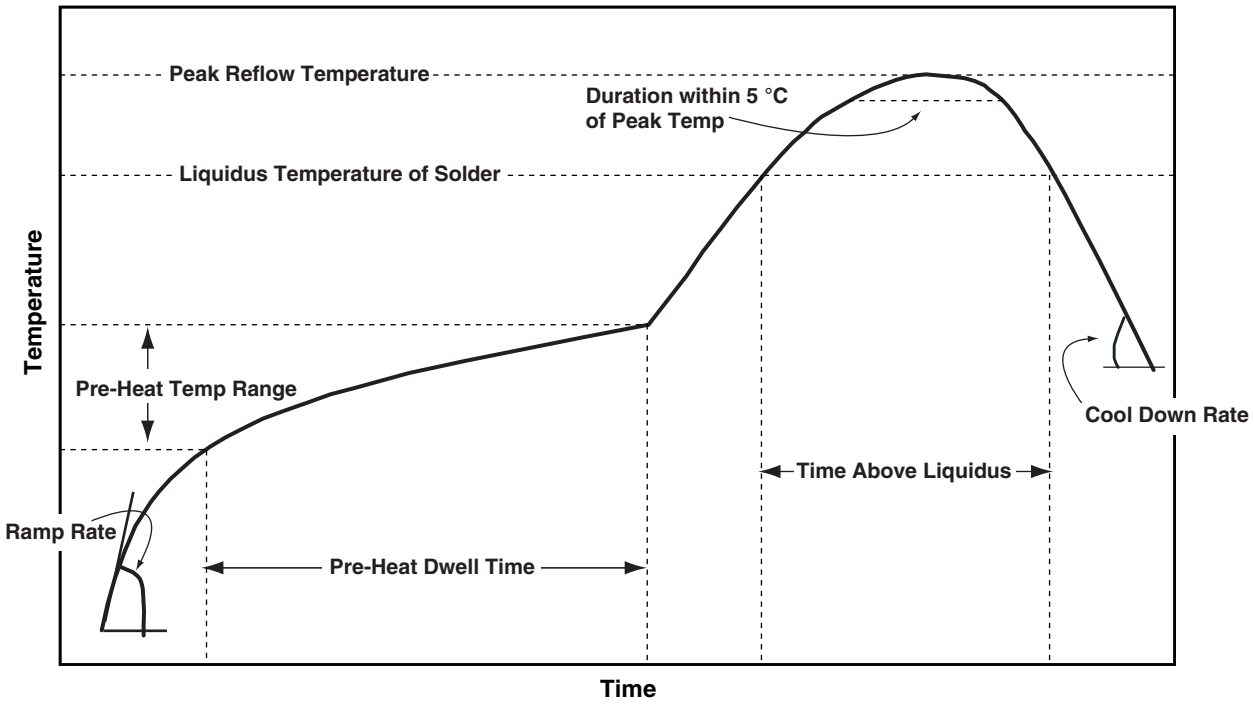


Fig. 1 - Infrared reflow soldering (SMD package)

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.