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

IHLD4032KBERxxxM5A

Generic PPAP

Generic PPAP

8/4/2017

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

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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.

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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 Dual Inductors

FEATURES

- Two inductors in one package
- High temperature, up to 155 °C
- Shielded construction
- Optimal design realizes high quality sound and low distortion
- Low coupling for minimal cross-talk between inductors
- Frequency range up to 1 MHz
- Lowest DCR/µH, in this package size
- Handles high transient current spikes without saturation
- Ultra-low buzz noise, due to composite construction
- AEC-Q200 qualified
- IHLP design. PATENT(S): www.vishay.com/patents
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

DESIGN SUPPORT TOOLS click logo to get started

Design Tools Available

STANDARD ELECTRICAL SPECIFICATIONS

L_0 INDUCTANCE ± 20 % AT 100 kHz, 0.25 V, 0 A (µH)	DCR TYP. 25 °C (mΩ)	DCR MAX. 25 °C (mΩ)	HEAT RATING CURRENT DC TYP. (A) (1)	SATURATION CURRENT DC TYP. (A) (2)	SRF TYP. (MHz)
10	30.5	32.6	5.6	7.4	10.2
15	43.5	45.5	4.6	5.5	9.5
22	67.8	72.5	4.1	4.1	7
33	100	107.0	3.8	3.7	6

Notes

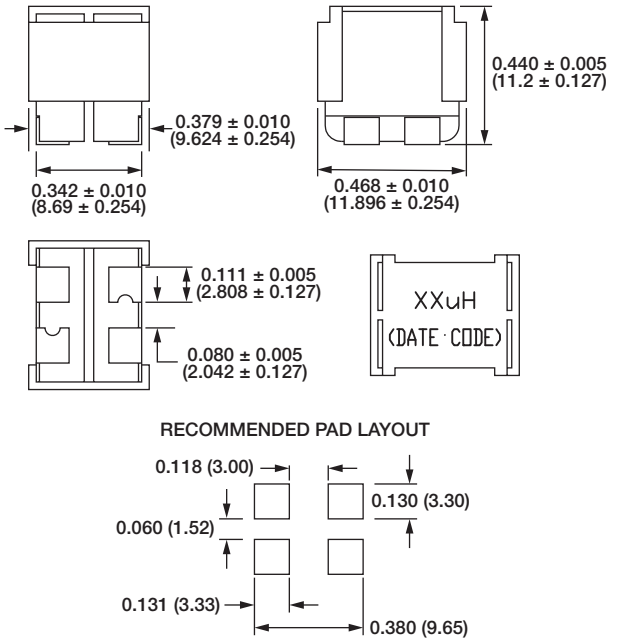
- All test data is referenced to 25 °C ambient
- Operating temperature range -55 °C to +155 °C
- The part temperature (ambient + temp. rise) should not exceed 155 °C under worst case operating conditions. Circuit design, component placement, PWB trace size and thickness, airflow and other cooling provisions all affect the part temperature. Part temperature should be verified in the end application
- Rated operating voltage (across inductor) = 50 V

(1) DC current (A) that will cause an approximate ΔT of 40 °C
(2) DC current (A) that will cause L_0 to drop approximately 20 %

APPLICATIONS

- Class D audio amplifiers

DIMENSIONS in inches [millimeters]



DESCRIPTION

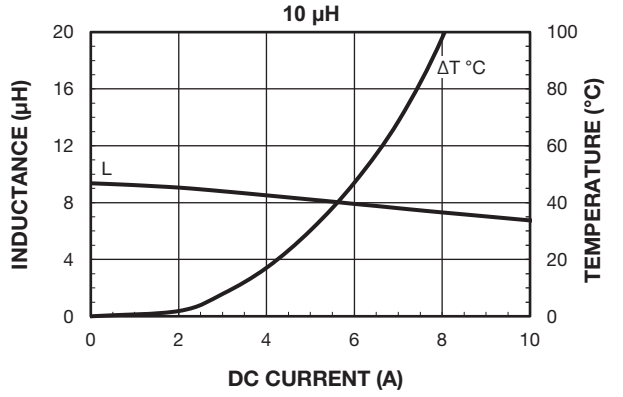
IHLD-4032KB-5A	22 µH	± 20 %	ER	e3
MODEL	INDUCTANCE VALUE	INDUCTANCE TOLERANCE	PACKAGE CODE	JEDEC® LEAD (Pb)-FREE STANDARD

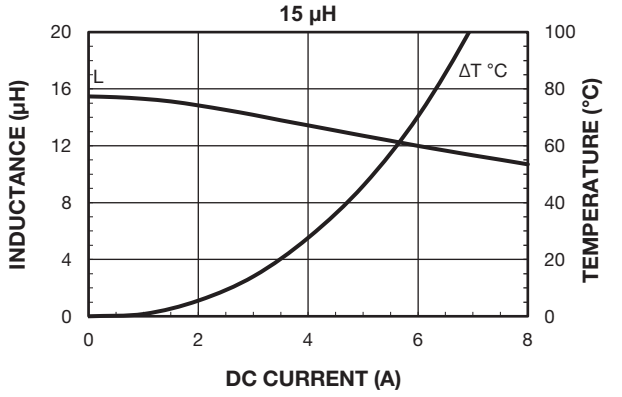
GLOBAL PART NUMBER

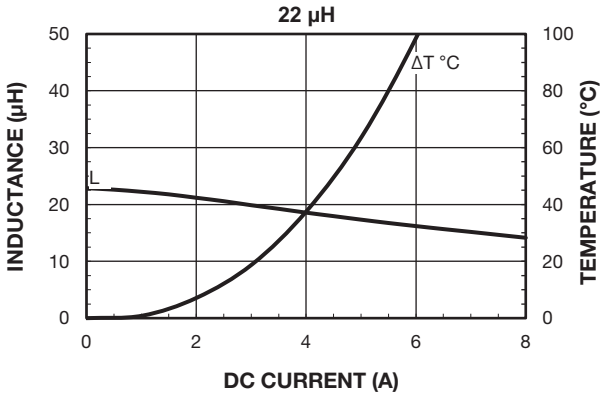
I	H	L	D	4	0	3	2	K	B	E	R	2	2	0	M	5	A
PRODUCT FAMILY				SIZE						PACKAGE CODE		INDUCTANCE VALUE			TOL.	SERIES	

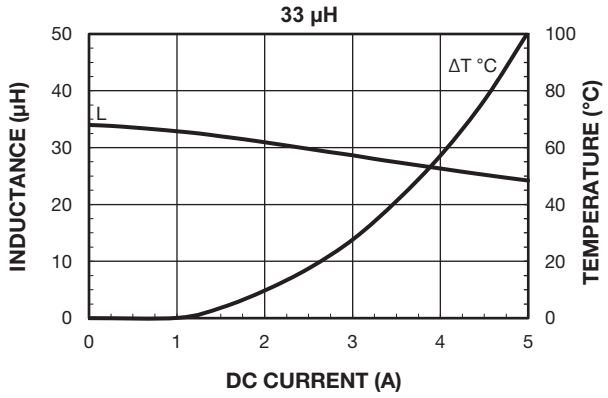
PATENT(S): www.vishay.com/patents
This Vishay product is protected by one or more United States and international patents.

PERFORMANCE GRAPHS

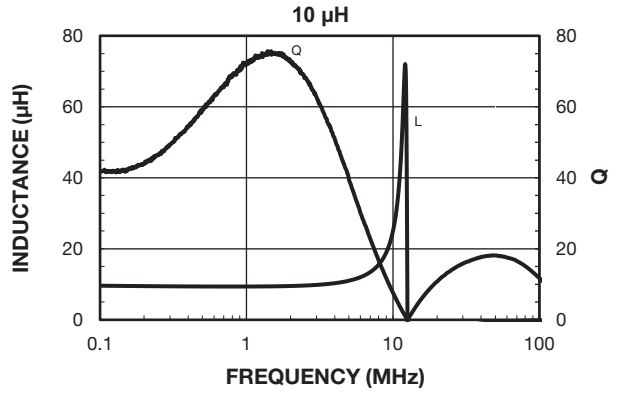


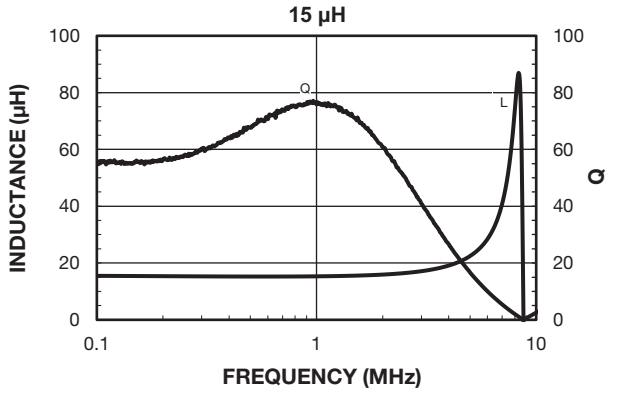


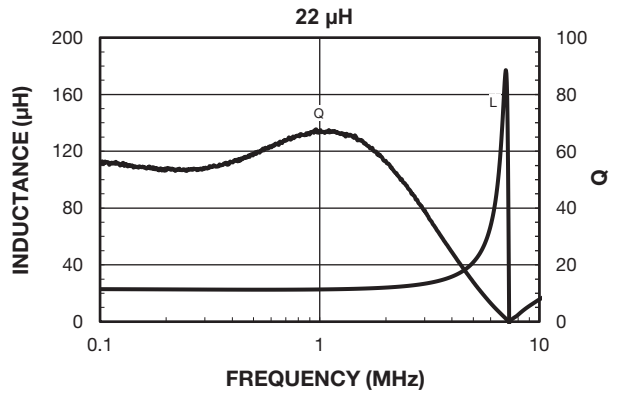


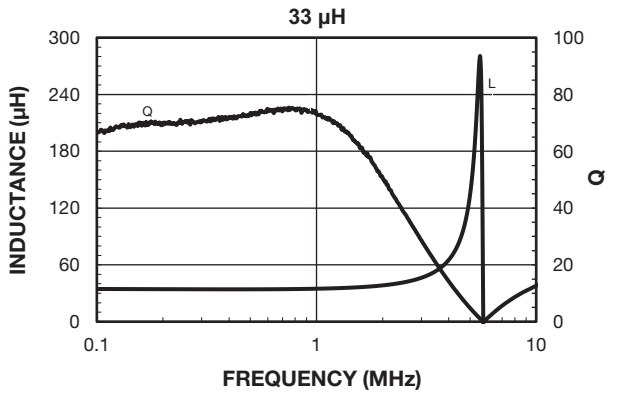


PERFORMANCE GRAPHS: INDUCTANCE AND Q VS. FREQUENCY



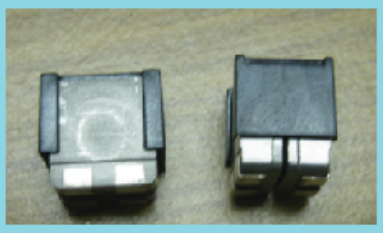




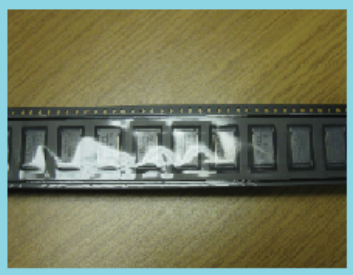


IHLD Packaging

COMPONENT PHOTO



POCKET TAPE PHOTO



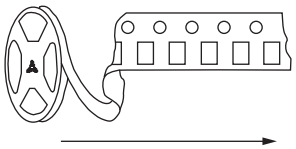
REEL PHOTO

CONTAINER PHOTO

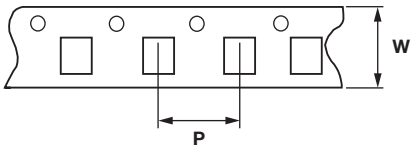
UNIT LOAD PHOTO

SMD Magnetics Packaging Methods

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



User Direction of Feed

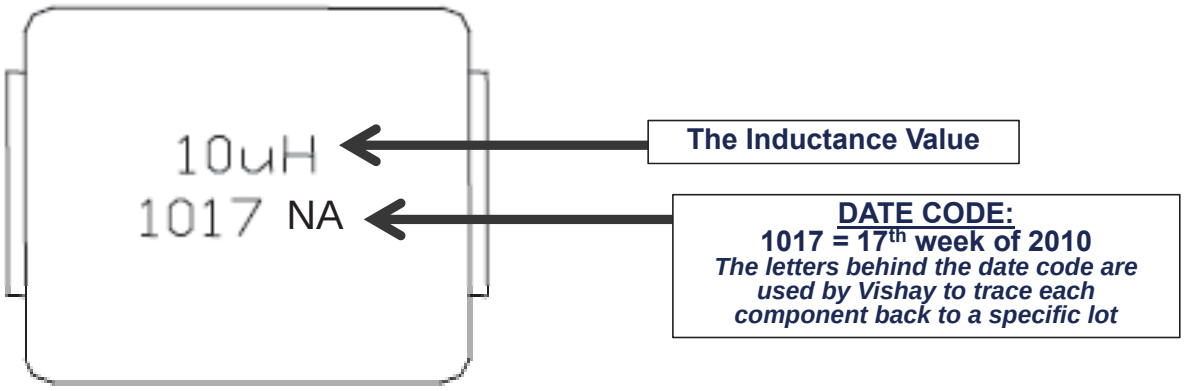


Carrier Dimensions

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	-	-	-	-

COMPONENT PRINT



Production Part Approval Process

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

Terminal Plating Info

Part Number (CUSTOMER)	Part Number (Vishay)	Layer structure with base and coating material used:	Layer thickness and tolerances of the coatings (base material, intermediate layer, final finish)	Kind of Coating or technology (e.g. galvanized, chemically hot tin-plated,..)
Generic PPAP	IHLD4032KBERxxxM5A	Cu - Base Material Ni- Intermediate Later Sn- Finish Layer	CU: .203mm +/- .0254mm Ni: 1.27um to 3.175um Sn: 4.57um to 6.35 um	Electroplated

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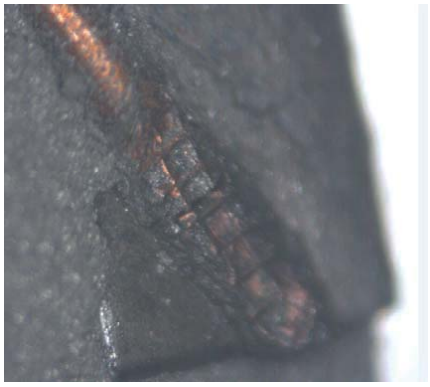
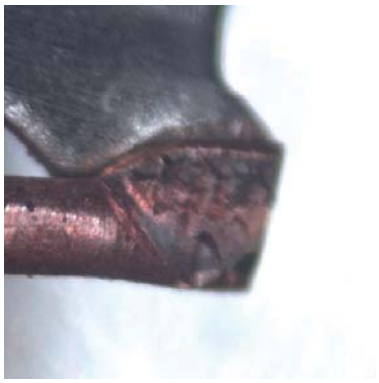
Example Photos of IHLD Welds

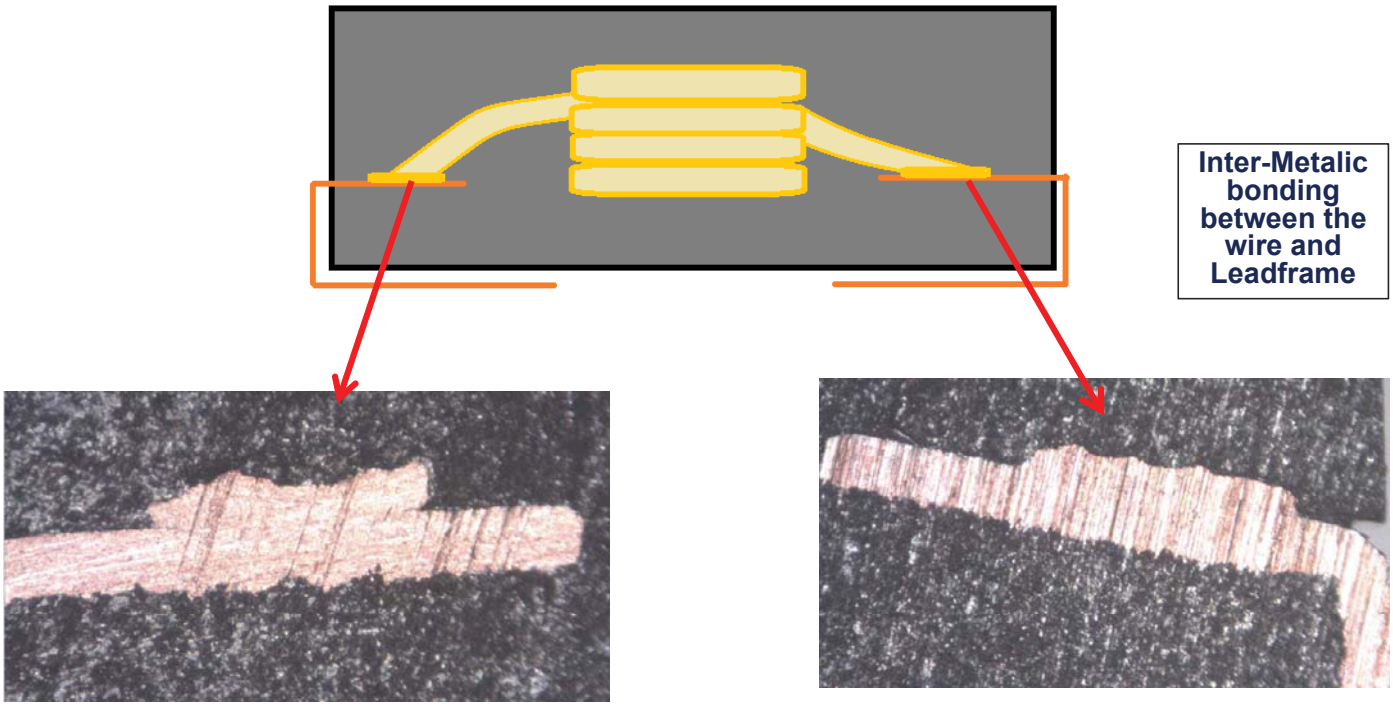




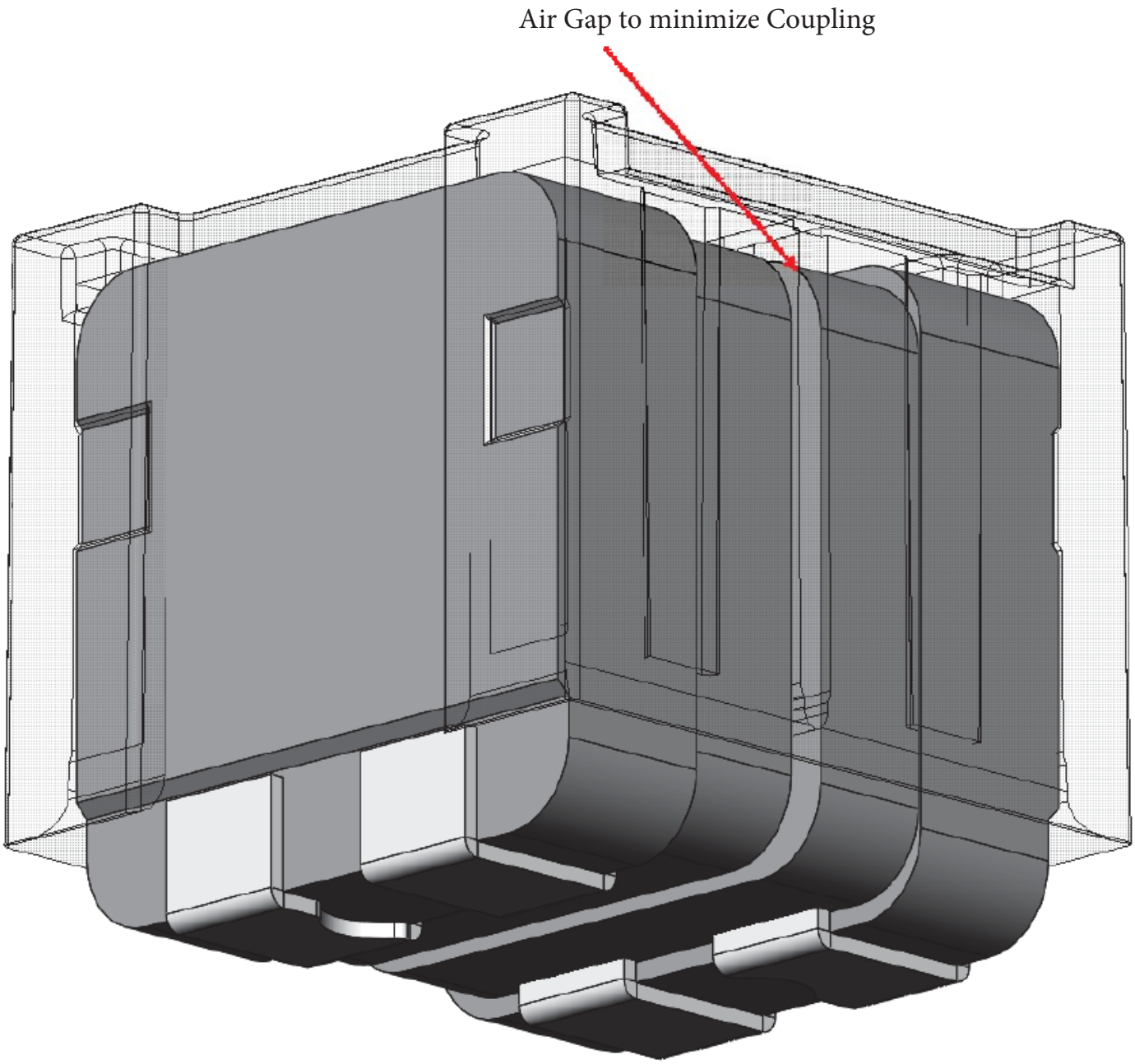
Production Part Approval Process

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

Cross sectional Photos of IHLP/D Welds



IHLD Assembly View



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

Section 3: Customer Engineering Approval

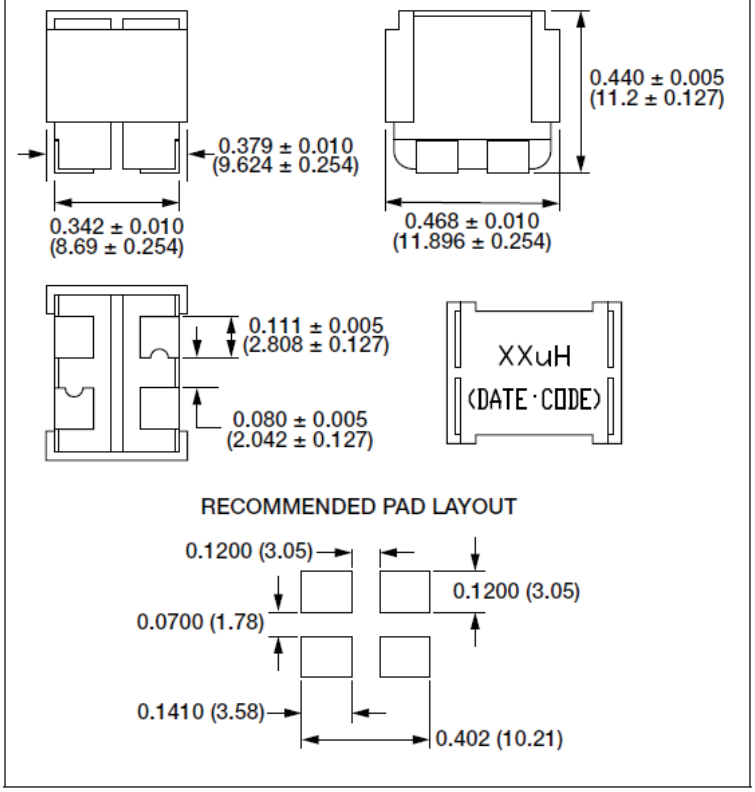
Customer Engineering Approval does not apply for this part number

Production Part Approval Process

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

Dimensional Analysis
IHLD4032KBERXXXM5

DIMENSIONS in inches [millimeters]



Production Part Approval Process

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

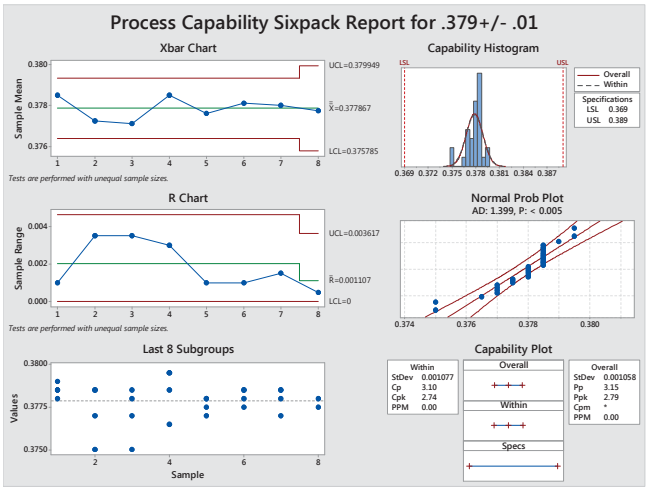
Dimensional Analysis-Danshui China
IHLD-4032 XXuH

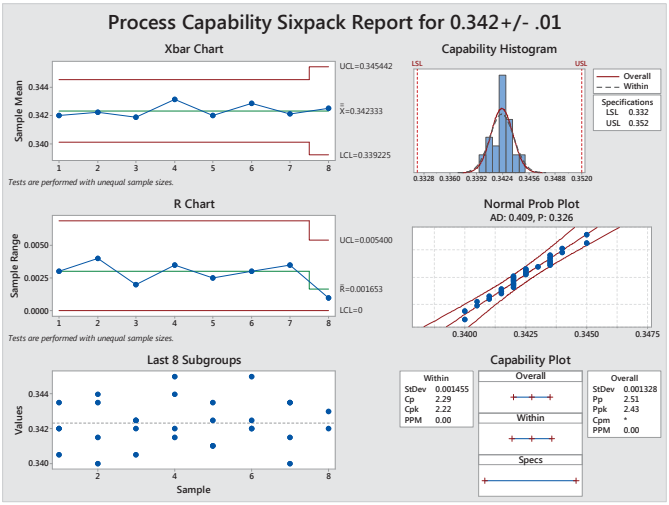
	.379+/- .01	0.342+/- .01	.440+/-.005	.468+/-.010
1	0.3785	0.3405	0.443	0.4675
2	0.3785	0.342	0.4435	0.4675
3	0.378	0.342	0.443	0.47
4	0.379	0.3435	0.441	0.47
5	0.375	0.3415	0.4425	0.47
6	0.3785	0.3435	0.44	0.468
7	0.3785	0.34	0.441	0.4685
8	0.377	0.344	0.438	0.4675
9	0.378	0.3425	0.443	0.4675
10	0.375	0.3405	0.441	0.468
11	0.377	0.3425	0.44	0.4675
12	0.3785	0.342	0.44	0.468
13	0.3785	0.345	0.442	0.468
14	0.3795	0.342	0.4415	0.467
15	0.3765	0.344	0.443	0.468
16	0.3795	0.3415	0.4405	0.47
17	0.3775	0.3435	0.439	0.4675
18	0.378	0.3425	0.441	0.468
19	0.377	0.341	0.441	0.467
20	0.378	0.341	0.4436	0.468
21	0.3775	0.345	0.4405	0.4675
22	0.378	0.3425	0.44	0.469
23	0.3785	0.342	0.44	0.4685
24	0.3785	0.342	0.443	0.468
25	0.378	0.3435	0.4425	0.469
26	0.377	0.3415	0.4375	0.4685
27	0.3785	0.3435	0.4395	0.4685
28	0.3785	0.34	0.4395	0.469
29	0.378	0.343	0.44	0.4675
30	0.3775	0.342	0.4395	0.468

Production Part Approval Process

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

Dimensional Analysis-Danshui China
IHLD-4032 XXuH





Production Part Approval Process

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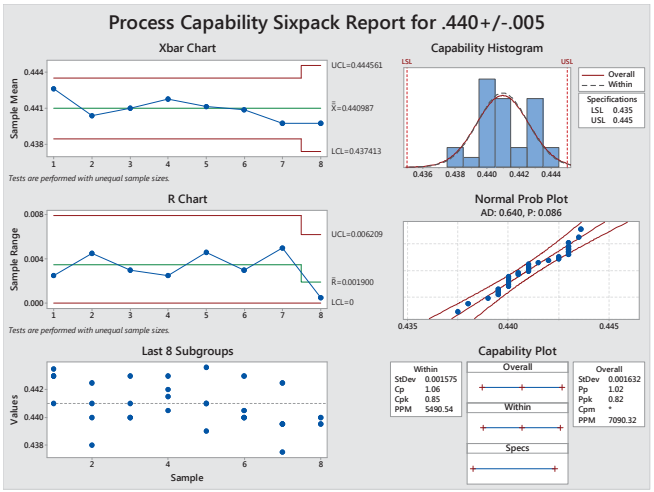
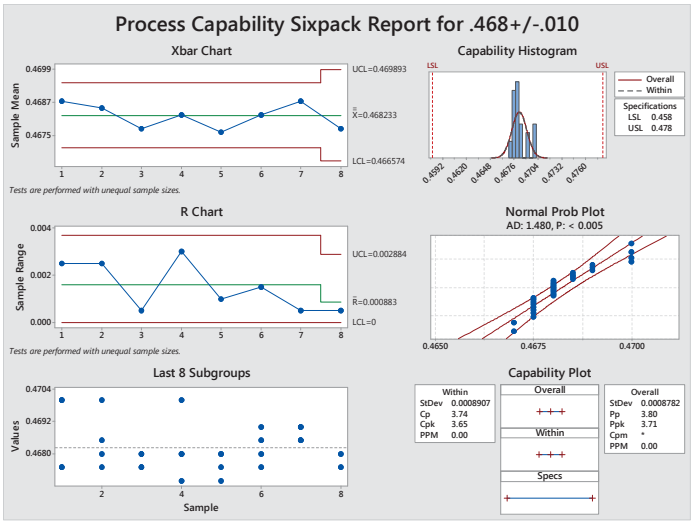
Dimensional Analysis-Danshui China
IHLD-4032 XXuH





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 10: Material/Performance Test Results

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

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AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(1)High Temperatue Exposure			
IEC 60068 Part 2-2 Test Group BA			
Quantity	77	100% passed	
	A L1-2		
	Inductance		
	Initial @ 25°C	Final @ 25°C	%Δ
Maximum =	15.9600	16.3876	4.575
Minimum =	13.7985	13.1956	-15.484
Mean =	14.9430	15.39946	3.0725
Std Dev =	0.4816	0.52872	2.1887
	Initial @ 25°C	Final @ 25°C	%Δ
Maximum =	45.180	44.270	2.336
Minimum =	42.800	43.110	-2.399
Mean =	44.3113	43.9177	-0.8797
Std Dev =	0.5064	.2586	.8931
	Initial @ 25°C	Final @ 25°C	%Δ
Maximum =	16.0180	16.4388	4.913
Minimum =	13.6925	14.2325	2.445
Mean =	14.9031	15.41438	3.4402
Std Dev =	0.4702	.44309	.5052
	Initial @ 25°C	Final @ 25°C	%Δ
Maximum =	45.090	44.320	2.393
Minimum =	43.040	43.030	-2.428
Mean =	44.2899	43.9003	-0.8415
Std Dev =	0.4834	0.2637	0.9105

Production Part Approval Process

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

AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(2)Low Temperatue Exposure									
IEC 60068 Part 2-1 Test Group Aa									
Quantity	77	100% passed							
A L1-2									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.9359	15.9102	0.6144	15.8045	15.8249	0.6403	15.8520	15.8581	0.5525
Minimum =	13.8412	13.8179	-0.3394	13.7284	13.7781	-0.4383	13.7073	13.7241	-0.1990
Mean =	15.0424	15.0444	0.0153	14.9505	14.9639	0.0918	14.9401	14.9581	0.1199
Std Dev =	0.4436	0.4338	0.2435	0.4377	0.4288	0.2445	0.4297	0.4336	0.1569
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.590	44.930	1.629	31.480	31.030	0.463	66.880	66.510	2.050
Minimum =	43.320	43.130	-1.576	30.190	29.540	-2.733	64.160	63.810	-1.634
Mean =	44.0792	44.2118	0.3009	30.7983	30.4696	-1.0641	65.3738	65.4809	0.1681
Std Dev =	0.2336	0.3226	0.5273	0.2758	0.2436	0.6880	0.5797	0.5301	0.8549
B L3-4									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.9382	15.9149	0.8454	15.8180	15.8320	0.7659	15.8039	15.8700	0.5691
Minimum =	13.8841	13.8630	-0.5510	13.7468	13.7615	-0.4485	13.7530	13.7634	-0.4324
Mean =	15.0118	15.0145	0.0200	14.9120	14.9236	0.0794	14.9052	14.9251	0.1339
Std Dev =	0.4767	0.4673	0.2906	0.4710	0.4626	0.2458	0.4617	0.4605	0.1896
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.550	45.040	1.245	31.400	31.140	0.294	66.510	66.900	1.953
Minimum =	42.990	42.950	-1.648	30.040	29.710	-2.857	63.580	63.480	-1.643
Mean =	44.0470	44.1661	0.2701	30.7695	30.4696	-0.9719	65.3727	65.4213	0.0777
Std Dev =	0.2703	0.3872	0.5900	0.2603	0.2372	0.6526	0.6503	0.6649	0.8578

Production Part Approval Process

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

AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(3)Temperature Cycling									
IEC-60068, Part 2.14 test groupNa									
Quantity	77		100% passed						
A L1-2									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.2003	15.5024	2.7402	15.1072	15.4430	2.7156	15.1032	15.7220	5.9302
Minimum =	13.4911	13.7591	1.3096	13.4188	13.7117	1.6332	13.4352	13.9339	3.2650
Mean =	14.2468	14.5342	2.0199	14.1606	14.4759	2.2288	14.1515	14.7292	4.0837
Std Dev =	0.4132	0.4107	0.2719	0.4060	0.4078	0.2285	0.4090	0.4219	0.4288
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.5200	44.1800	1.3303	31.7700	30.8100	3.2539	66.6000	65.8700	3.5068
Minimum =	43.0700	42.0300	-2.8004	28.8900	29.0700	-4.4551	61.3500	62.4900	-3.4296
Mean =	43.7292	43.1100	-1.4154	30.4525	29.9427	-1.6503	64.2270	64.2545	0.0754
Std Dev =	0.4544	0.4739	0.5126	0.5545	0.4031	1.8058	1.3776	0.7433	1.8228
B L3-4									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.2936	15.7771	3.1615	15.1782	15.4898	2.8133	15.1825	15.7869	5.3182
Minimum =	13.0382	13.3507	1.5599	12.9202	13.2647	1.8274	13.0170	13.5814	2.9698
Mean =	14.2462	14.5408	2.0686	14.1490	14.4643	2.2297	14.1537	14.7266	4.0490
Std Dev =	0.3670	0.3724	0.3013	0.3597	0.3630	0.2172	0.3599	0.3698	0.4378
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.5600	44.0400	-0.5814	31.6500	30.8300	3.0465	66.5900	66.0100	3.4461
Minimum =	42.7000	42.0000	-3.5005	29.1800	29.0700	-4.8071	62.0100	62.5700	-4.3250
Mean =	43.7714	43.0796	-1.5794	30.4779	29.9475	-1.7105	64.3708	64.1994	-0.2427
Std Dev =	0.4550	0.4729	0.5806	0.6066	0.3570	1.8703	1.2093	0.8709	1.7589

Production Part Approval Process

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AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(4)Moisture Resistance						
MIL-STD-202G Method 106						
Quantity	77	100% passed				
	A L1-2					
	Inductance			DC Resistance		
	Initial	Final	%Δ	Initial	Final	%Δ
Maximum =	15.9776	15.8349	-0.7465	45.0500	44.8100	0.3907
Minimum =	13.0265	12.9087	-1.1429	43.3200	43.4400	-1.2661
Mean =	14.5037	14.3661	-0.9483	44.2517	44.1808	-0.1581
Std Dev =	0.5880	0.5798	0.0765	0.4443	0.3882	0.4353
	B L3-4					
	Inductance			DC Resistance		
	Initial	Final	%Δ	Initial	Final	%Δ
Maximum =	15.7751	15.6308	-0.7418	45.1400	44.7200	0.4507
Minimum =	13.4783	13.3388	-1.1795	43.5400	43.5000	-1.2863
Mean =	14.5530	14.4151	-0.9474	44.3594	44.2878	-0.1595
Std Dev =	0.6195	0.6121	0.0845	0.4264	0.3789	0.4213

Production Part Approval Process

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

AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(5)Bias Humidity									
IEC-60068, Part 2-67									
Quantity	77	100% passed							
A L1-2									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.9478	15.9274	0.3907	15.8328	15.8432	0.3090	15.9038	15.8729	0.3120
Minimum =	13.8007	13.7889	-0.3595	13.7220	13.7123	-0.6006	13.7640	13.7890	-0.7094
Mean =	15.0446	15.0333	-0.0730	14.9607	14.9473	-0.0880	14.9858	14.9614	-0.1598
Std Dev =	0.4694	0.4595	0.1510	0.4624	0.4554	0.1745	0.4671	0.4530	0.2297
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.6400	44.5600	1.5345	31.3500	31.0500	0.8016	66.4800	66.1900	1.8768
Minimum =	43.0100	42.7400	-2.1072	29.9400	29.6500	-3.2536	63.4400	63.3300	-2.5900
Mean =	44.0081	43.8884	-0.2703	30.6834	30.3977	-0.9265	65.3127	65.1661	-0.2191
Std Dev =	0.2722	0.2944	0.5999	0.2662	0.2262	0.8560	0.6256	0.5544	0.9452
B L3-4									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.7099	15.7184	0.2966	15.6270	15.6124	0.4497	15.7378	15.6538	0.4307
Minimum =	13.8663	13.8971	-0.5318	13.7663	13.7815	-0.6388	13.8384	13.8980	-0.6789
Mean =	15.0499	15.0336	-0.1073	14.9524	14.9402	-0.0803	14.9876	14.9574	-0.1997
Std Dev =	0.3845	0.3792	0.1804	0.3847	0.3756	0.1880	0.3872	0.3742	0.2411
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.7200	44.5500	1.4853	31.3700	31.0300	0.8486	66.4000	66.1400	1.7397
Minimum =	43.0900	43.1600	-2.1876	29.9800	29.8700	-3.1609	63.6100	62.3300	-3.8859
Mean =	44.0283	43.8844	-0.3252	30.6952	30.4095	-0.9262	65.3569	65.0678	-0.4366
Std Dev =	0.2416	0.2435	0.5792	0.2462	0.1897	0.8249	0.6370	0.5921	1.0129

Production Part Approval Process

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

AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(6)Operational Life									
MIL-STD-202G Method 108A									
Quantity	77		100% passed						
A L1-2									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	16.2568	16.7266	4.8795	16.1859	16.4867	4.4874	16.0819	16.9774	6.4027
Minimum =	14.4143	14.9060	2.5448	14.3435	14.7895	1.8584	14.3778	15.0316	3.9514
Mean =	15.2534	15.7931	3.5450	15.1696	15.6092	2.9062	15.1837	15.9597	5.1122
Std Dev =	0.4475	0.4293	0.4706	0.4415	0.4154	0.5412	0.4335	0.4577	0.5778
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.8000	44.1100	-0.2529	31.3100	31.0700	2.4472	66.7400	66.1400	4.2434
Minimum =	43.4800	42.6200	-3.9063	29.2200	29.0100	-4.4373	62.4500	63.7900	-3.2117
Mean =	44.0666	43.3683	-1.5823	30.4599	30.0290	-1.3996	64.6804	64.9974	0.5162
Std Dev =	0.2805	0.2804	0.6921	0.4177	0.3203	1.5124	1.1035	0.4942	1.7168
B L3-4									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	16.4531	16.9275	4.8083	16.3200	16.6995	4.6476	16.3030	17.1525	6.5652
Minimum =	14.6709	15.2490	2.6666	14.5557	15.0570	1.8757	14.6382	15.3339	3.9062
Mean =	15.2296	15.7685	3.5441	15.1215	15.5673	2.9549	15.1595	15.9579	5.2684
Std Dev =	0.4106	0.3939	0.4258	0.4005	0.3814	0.4776	0.3920	0.4129	0.5778
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.7900	44.1400	0.0691	31.2500	30.8900	3.1504	66.6100	66.2800	5.3483
Minimum =	43.4100	42.8300	-2.9898	29.2400	29.4100	-4.0466	62.1300	63.3300	-3.9144
Mean =	44.0399	43.4655	-1.3018	30.4551	30.1027	-1.1427	64.5810	65.0503	0.7579
Std Dev =	0.2994	0.2597	0.6345	0.4112	0.2753	1.3686	1.1848	0.5625	1.9372

(7) External Visual Insp.									
MIL-STD-883, Method 2009									
Quantity	30		100% passed						

Production Part Approval Process

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

AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(9) Resistance to Solvents									
MIL-STD-202, Method 215									
Quantity	5		100% passed						

(10)Mechanical Shock									
IEC 60068 Part 2-27 Test Group Ea									
Quantity	30		100% passed						
A L1-2									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.8050	15.8305	0.7602	15.6981	15.7367	0.7636	15.6727	15.7117	0.3753
Minimum =	13.2724	13.3733	-0.5138	13.2144	13.3111	-0.3254	13.2540	13.2865	0.1805
Mean =	14.6051	14.6244	0.1378	14.5190	14.5530	0.2393	14.4807	14.5195	0.2685
Std Dev =	0.6857	0.6694	0.3513	0.6776	0.6649	0.3143	0.6642	0.6629	0.0476
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.090	44.290	0.940	31.450	30.960	0.391	66.140	66.210	1.314
Minimum =	42.840	43.080	0.137	29.930	29.940	-1.876	63.650	63.970	-0.077
Mean =	43.610	43.820	0.481	30.581	30.531	-0.160	64.977	65.190	0.328
Std Dev =	0.406	0.398	0.178	0.341	0.269	0.513	0.638	0.607	0.310
B L3-4									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.7443	15.7331	0.7898	15.6475	15.6223	0.8925	15.5320	15.5739	0.5001
Minimum =	13.5140	13.5700	-0.4309	13.4441	13.4870	-0.3664	13.4502	13.4859	0.1755
Mean =	14.6570	14.6779	0.1453	14.5594	14.5901	0.2148	14.5331	14.5728	0.2732
Std Dev =	0.6196	0.6103	0.2633	0.6133	0.6023	0.2579	0.6030	0.6030	0.0654
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.140	44.330	1.512	31.480	31.140	0.744	66.150	66.230	1.436
Minimum =	42.780	42.990	0.159	29.960	29.950	-1.828	63.660	63.950	-0.122
Mean =	43.636	43.850	0.492	30.603	30.548	-0.177	65.046	65.242	0.302
Std Dev =	0.408	0.402	0.230	0.329	0.274	0.503	0.654	0.626	0.327

Production Part Approval Process

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

AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(11)Vibration									
IEC 60068 Part 2-6 Test Group Fc									
Quantity	30	100% passed							
A L1-2									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.6187	15.6028	0.5889	15.5113	15.5145	0.5877	15.4738	15.5290	0.5349
Minimum =	13.6124	13.6232	-0.3469	13.5315	13.5357	-0.1630	13.5202	13.5528	0.2411
Mean =	14.7549	14.7617	0.0491	14.6635	14.6830	0.1346	14.6142	14.6699	0.3808
Std Dev =	0.6036	0.5932	0.2057	0.5967	0.5919	0.1539	0.5845	0.5880	0.0794
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	45.020	44.110	-0.532	31.440	30.940	-0.713	66.640	66.080	1.531
Minimum =	43.220	42.860	-2.164	30.160	29.810	-1.914	63.910	63.870	-1.020
Mean =	44.380	43.743	-1.434	30.855	30.514	-1.104	65.188	65.309	0.189
Std Dev =	0.453	0.394	0.430	0.342	0.301	0.278	0.676	0.609	0.672
B L3-4									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.8083	15.7906	0.5470	15.6884	15.6865	0.5484	15.6306	15.6820	0.4876
Minimum =	13.6372	13.7118	-0.1881	13.5523	13.6104	-0.1697	13.5376	13.5990	0.1056
Mean =	14.6646	14.6863	0.1526	14.5675	14.5900	0.1577	14.5343	14.5836	0.3397
Std Dev =	0.6737	0.6593	0.2181	0.6646	0.6551	0.1952	0.6519	0.6530	0.0790
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.990	44.180	-0.543	31.460	31.020	-0.681	66.560	66.080	2.861
Minimum =	43.490	42.990	-2.115	30.250	29.980	-1.762	63.960	63.260	-1.617
Mean =	44.488	43.857	-1.418	30.923	30.596	-1.056	65.301	65.493	0.300
Std Dev =	0.397	0.320	0.426	0.299	0.260	0.231	0.682	0.616	0.859

Production Part Approval Process

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

AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(12)Bump Testing									
IEC-60068 Part 2-29 Test Group Eb									
Quantity	30	100% passed							
A L1-2									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.7478	15.7210	0.4371	15.6550	15.6338	0.5470	15.6102	15.6115	0.4305
Minimum =	13.5214	13.5607	-0.8834	13.4723	13.5041	-0.6303	13.4329	13.4704	-0.3759
Mean =	14.5803	14.5544	-0.1720	14.4924	14.4897	-0.0146	14.4472	14.4611	0.0989
Std Dev =	0.5880	0.5686	0.3127	0.5775	0.5623	0.2668	0.5727	0.5624	0.1347
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.3500	44.3700	0.3201	31.3100	30.6700	0.8311	66.5300	66.3800	0.6655
Minimum =	42.9300	42.8900	-0.8553	29.9000	29.7000	-2.6932	63.4500	63.2900	-1.4472
Mean =	43.7523	43.7193	-0.0753	30.6467	30.3073	-1.1022	65.1047	64.9910	-0.1753
Std Dev =	0.4130	0.4214	0.2575	0.3541	0.2656	0.6899	0.7086	0.7992	0.4219
B L3-4									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	15.7127	15.7219	0.3165	15.6067	15.6352	0.3509	15.5855	15.5900	0.4643
Minimum =	13.0871	13.1218	-0.6878	12.9922	13.0368	-0.5033	13.0521	13.1127	-0.3785
Mean =	14.4832	14.4582	-0.1702	14.3865	14.3754	-0.0745	14.3489	14.3609	0.0854
Std Dev =	0.6283	0.6201	0.2490	0.6220	0.6137	0.2174	0.6154	0.6092	0.1586
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 155°C	Final @ 155°C	%Δ
Maximum =	44.3700	44.3500	0.3419	31.3400	30.7200	0.7256	66.4500	66.0800	0.6463
Minimum =	42.9500	42.9100	-1.2404	30.0100	29.7300	-2.6484	63.7700	62.9800	-1.5014
Mean =	43.7023	43.6600	-0.0964	30.6077	30.2640	-1.1181	65.0463	64.9153	-0.2014
Std Dev =	0.3993	0.3950	0.2952	0.3480	0.2674	0.6912	0.6957	0.7449	0.4203

Production Part Approval Process

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

AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(14)Resistance to Solder Heat						
MIL-STD-202G Method 210						
Quantity	30	100% passed				
	A L1-2					
	Inductance			DC Resistance		
	Initial	Final	%Δ	Initial	Final	%Δ
Maximum =	15.5770	15.4705	-0.2151	44.8600	44.7100	-0.0900
Minimum =	13.1843	13.0805	-2.1566	43.6100	43.4700	-0.7160
Mean =	14.2621	14.1157	-1.0286	44.2373	44.0917	-0.3289
Std Dev =	0.5229	0.5282	0.4258	0.4412	0.4270	0.1355
	B L3-4					
	Inductance			DC Resistance		
	Initial	Final	%Δ	Initial	Final	%Δ
Maximum =	15.6706	15.5468	-0.3966	44.8400	44.6500	-0.1344
Minimum =	13.2069	13.0679	-1.9861	43.5700	43.4200	-0.6249
Mean =	14.2570	14.1087	-1.0387	44.2730	44.1120	-0.3633
Std Dev =	0.5896	0.5838	0.4016	0.4529	0.4390	0.1208

Production Part Approval Process

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

AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(16)ESD						
AEC-Q200-002						
Quantity	15	100% passed				
	A L1-2					
	Inductance			DC Resistance		
	Initial	25kV	%Δ	Initial	25kV	%Δ
Maximum =	16.2520	16.2790	0.5215	44.9100	44.7000	-0.1117
Minimum =	13.3651	13.4170	-0.5904	43.7100	43.6600	-0.6457
Mean =	14.5270	14.5647	0.2632	44.4273	44.2667	-0.3613
Std Dev =	0.7488	0.7416	0.2751	0.4282	0.4168	0.1671
	B L3-4					
	Inductance			DC Resistance		
	Initial	25kV	%Δ	Initial	25kV	%Δ
Maximum =	15.6132	15.5615	0.5988	44.9500	44.7000	-0.1342
Minimum =	13.5095	13.5904	-1.8168	43.7300	43.5800	-0.6452
Mean =	14.4782	14.4484	-0.1916	44.4060	44.2287	-0.3994
Std Dev =	0.5983	0.5500	0.7110	0.4042	0.4087	0.1513

Production Part Approval Process

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

AEC-Q200- Danshui China
IHLD-4032KB-5A 15uH

(18)Board Flex							
AEC-Q200-005							
Quantity	30	100% passed					
A L1-2							
	Inductance			DC Resistance			
	Initial	Final	%Δ	Initial	Flexed	Final	%Δ
Maximum =	15.3115	15.3143	0.2184	44.9200	45.4600	44.9300	0.3870
Minimum =	13.5818	13.5860	-0.0972	43.5900	43.9900	43.6200	-0.2227
Mean =	14.4050	14.4083	0.0227	44.2467	44.6843	44.2933	0.1056
Std Dev =	0.5058	0.5070	0.0606	0.4013	0.4296	0.3979	0.1230
B L3-4							
	Inductance			DC Resistance			
	Initial	Final	%Δ	Initial	Flexed	Final	%Δ
Maximum =	15.1800	15.3143	0.1485	44.9200	45.3800	44.9600	0.2509
Minimum =	13.3629	13.5860	-0.0962	43.7000	44.1500	43.8000	0.0681
Mean =	14.4079	14.4083	0.0384	44.2323	44.6800	44.3043	0.1628
Std Dev =	0.4478	0.5070	0.0755	0.4049	0.4303	0.4048	0.0467

(19)Terminal Strength							
AEC-Q200-006							
Quantity	30	100% passed					
A L1-2							
	Inductance			DC Resistance			
	Initial	Final	%Δ	Initial	Final	%Δ	
Maximum =	15.9052	15.8952	0.0787	44.6600	44.8800	0.9930	
Minimum =	13.6306	13.6276	-0.2228	43.3400	43.6300	0.3177	
Mean =	14.4344	14.4265	-0.0536	44.0973	44.3700	0.6184	
Std Dev =	0.5451	0.5414	0.0668	0.4559	0.4606	0.1746	
B L3-4							
	Inductance			DC Resistance			
	Initial	Final	%Δ	Initial	Final	%Δ	
Maximum =	15.8875	15.8925	0.1850	44.7100	44.8700	0.9917	
Minimum =	13.2823	13.2924	-0.1057	43.3800	43.7300	0.1817	
Mean =	14.5674	14.5717	0.0294	44.1263	44.3947	0.6086	
Std Dev =	0.4454	0.4442	0.0610	0.4215	0.4097	0.2133	

Production Part Approval Process

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

AEC-Q200
IHLD-4032 15uH

03 High Temperature Exposure

Quantity: 77 — 100% Passed

	Inductance A L1-2			DCR A L1-2			Inductance B L3-4			DCR B L3-4		
	Initial	1000 Hrs.	%Δ	Initial	1000 Hrs.	%Δ	Initial	1000 Hrs.	%Δ	Initial	1000 Hrs.	%Δ
Maximum=	16.6134	16.6655	3.2680	44.020	43.630	-0.3977	16.5373	16.6138	3.3665	43.760	43.340	-0.3705
Minimum=	13.0507	13.3663	0.1989	42.690	42.360	-1.1057	13.0490	13.4883	0.4626	42.350	41.920	-1.1034
Mean=	14.8502	15.1147	1.8184	43.358	42.989	-0.8501	14.6116	14.9118	2.0865	43.277	42.915	-0.8356
Std Dev=	0.8924	0.8151	0.7310	0.2309	0.2134	0.1536	0.8397	0.7747	0.6612	0.2866	0.2835	0.1517

04 Temperature Cycling

Quantity: 77 — 100% Passed

	Inductance A L1-2			DCR A L1-2			Inductance B L3-4			DCR B L3-4		
	Initial	1000 Cycle	%Δ	Initial	1000 Cycle	%Δ	Initial	1000 Cycle	%Δ	Initial	1000 Cycle	%Δ
Maximum=	16.8317	16.9322	2.4931	43.900	43.650	-0.3440	16.5342	16.6403	2.2590	43.750	43.490	-0.3209
Minimum=	12.3882	12.6235	0.3580	42.790	42.480	-0.7447	11.8342	11.9718	0.5903	42.310	42.060	-0.7140
Mean=	14.4974	14.7049	1.4516	43.309	43.076	-0.5403	14.6951	14.9048	1.4463	43.335	43.102	-0.5373
Std Dev=	0.9816	0.9502	0.3760	0.2828	0.2979	0.0968	0.9540	0.9240	0.3911	0.2971	0.2969	0.0724

07 Biased Humidity

Quantity: 77 — 100% Passed

	Inductance A L1-2			DCR A L1-2			Inductance B L3-4			DCR B L3-4		
	Initial	Final	%Δ	Initial	Final	%Δ	Initial	Final	%Δ	Initial	Final	%Δ
Maximum=	16.8407	16.6649	-0.5230	43.720	44.050	1.5954	16.4452	16.3269	0.0552	43.740	44.010	1.5331
Minimum=	11.8923	11.8301	-1.5553	42.490	42.580	0.1387	12.6269	12.5550	-1.3666	42.600	42.770	0.0695
Mean=	14.7654	14.6382	-0.8609	43.220	43.479	0.5999	14.7352	14.6505	-0.5709	43.200	43.458	0.5969
Std Dev=	0.9705	0.9614	0.2008	0.2817	0.3058	0.3072	0.9404	0.9261	0.2385	0.2704	0.2898	0.2976

Production Part Approval Process

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

AEC-Q200
IHLD-4032 15uH

08 Operational Life

Quantity: 77 — 100% Passed

	Inductance A L1-2			DCR A L1-2			Inductance B L3-4			DCR B L3-4		
	Initial	1000 Hrs.	%Δ	Initial	1000 Hrs.	%Δ	Initial	1000 Hrs.	%Δ	Initial	1000 Hrs.	%Δ
Maximum=	16.9503	17.3313	6.8180	44.000	43.570	-0.7600	17.0027	17.5145	7.1801	44.100	43.680	-0.7789
Minimum=	12.1426	12.6927	1.6124	40.170	39.720	-1.4696	12.6170	13.4034	1.6278	42.370	41.920	-2.5723
Mean=	14.9394	15.5855	4.3728	43.491	43.012	-1.1019	14.9297	15.5463	4.1926	43.482	42.997	-1.1166
Std Dev=	0.9373	0.8682	1.0192	0.4407	0.4386	0.1318	0.9427	0.8420	1.2599	0.3048	0.3094	0.2187

12 Resistance to Solvents

Quantity: 5 — 100% Passed

	Inductance A L1-2			DCR A L1-2			Inductance B L3-4			DCR B L3-4		
	Initial	Final	%Δ	Initial	Final	%Δ	Initial	Final	%Δ	Initial	Final	%Δ
Maximum=	16.0057	16.0454	0.7367	43.770	43.660	3.6726	16.3740	16.4411	0.7385	43.550	43.650	0.2536
Minimum=	12.8599	12.5290	-2.5731	41.660	43.190	-0.3199	12.5351	12.2204	-2.5106	42.990	42.900	-0.2094
Mean=	14.8842	14.8346	-0.4008	43.108	43.444	0.8044	14.5725	14.5067	-0.5434	43.372	43.414	0.0962
Std Dev=	1.2233	1.3626	1.4217	0.8387	0.2059	1.6250	1.3899	1.5544	1.4697	0.2232	0.2948	0.1930

Production Part Approval Process

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

AEC-Q200
IHLD-4032 15uH

13 Mechanical Shock

Quantity 30 100% Passed

	Inductance A L1-2			DCR A L1-2			Inductance B L3-4			DCR B L3-4		
	Initial	Final	%Δ	Initial	Final	%Δ	Initial	Final	%Δ	Initial	Final	%Δ
Maximum=	16.4427	16.4843	0.2679	43.900	43.830	-0.0920	16.1102	16.1476	0.3637	43.820	43.740	-0.0691
Minimum=	12.9094	12.9272	0.1294	42.840	42.760	-0.4171	13.0420	13.0416	-0.1823	42.820	42.710	-0.4179
Mean=	14.6366	14.6656	0.1965	43.352	43.267	-0.1960	14.7846	14.7976	0.0854	43.359	43.276	-0.1915
Std Dev=	1.0460	1.0518	0.0368	0.3138	0.3134	0.0767	0.7956	0.8021	0.1540	0.2645	0.2724	0.0811

14 Vibration

Quantity 30 100% Passed

	Inductance A L1-2			DCR A L1-2			Inductance B L3-4			DCR B L3-4		
	Initial	Final	%Δ	Initial	Final	%Δ	Initial	Final	%Δ	Initial	Final	%Δ
Maximum=	16.4843	16.4190	-0.3677	43.830	43.720	0.0917	16.1476	16.0839	-0.3372	43.740	43.680	0.0232
Minimum=	12.9272	12.8691	-0.4754	42.760	42.650	-0.3033	13.0416	12.9598	-0.6320	42.710	42.640	-0.3484
Mean=	14.6421	14.5803	-0.4237	43.267	43.189	-0.1796	14.7742	14.7021	-0.4902	43.276	43.196	-0.1864
Std Dev=	1.0423	1.0404	0.0265	0.3134	0.3196	0.0902	0.8059	0.8078	0.0949	0.2724	0.2737	0.0800

15 Resistance to Solder Heat

Quantity 30 100% Passed

	Inductance A L1-2			DCR A L1-2			Inductance B L3-4			DCR B L3-4		
	Initial	Final	%Δ	Initial	Final	%Δ	Initial	Final	%Δ	Initial	Final	%Δ
Maximum=	16.6727	15.4684	-4.1832	43.110	43.880	2.1236	16.5380	15.2944	-3.0649	43.290	43.880	2.1023
Minimum=	13.3582	12.7994	-7.7430	41.920	42.780	0.7221	12.2616	11.8858	-7.7901	42.060	42.910	0.8817
Mean=	15.2343	14.2670	-6.2952	42.662	43.409	1.7524	14.9598	14.0838	-5.7686	42.794	43.463	1.5631
Std Dev=	0.8873	0.6893	1.0118	0.2871	0.2752	0.2815	1.0961	0.8566	1.3057	0.2323	0.2129	0.2569

AEC-Q200 TEST RESULTS

Tests include Operational Life,
Mechanical Shock and Vibration

A WORLD OF SOLUTIONS

Production Part Approval Process

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

IHLD-4032, 10uH

(6)Operational Life									
MIL-STD-202G Method 108A									
Quantity	77		100% passed						
A L1-2									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	9.4582	10.8289	14.7653	9.4078	10.7301	14.3552	9.4781	11.0071	16.2572
Minimum =	8.6070	9.6218	5.8955	8.5497	9.4989	5.3922	8.6498	9.7628	6.8726
Mean =	9.1064	10.1448	11.4082	9.0533	10.0450	10.9600	9.1303	10.3073	12.8949
Std Dev =	0.1711	0.2417	1.9343	0.1728	0.2409	1.9202	0.1672	0.2490	1.9970
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	29.7500	29.1000	-0.2060	20.9700	20.5000	3.7732	43.9700	43.6500	0.6003
Minimum =	28.8400	28.4100	-3.4927	18.9760	19.6200	-3.5088	42.3700	41.8900	-3.4348
Mean =	29.2113	28.7344	-1.6283	20.2144	19.9046	-1.5252	43.2584	42.9304	-0.7566
Std Dev =	0.2201	0.1475	0.7382	0.2321	0.1710	0.9647	0.2896	0.3386	0.7181
B L3-4									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	9.5990	10.7541	14.9939	9.5343	10.6445	14.4221	9.6202	10.9436	16.2857
Minimum =	8.6639	9.6544	6.6519	8.6191	9.5440	6.0129	8.7090	9.8114	8.3396
Mean =	9.1383	10.2037	11.6682	9.0802	10.0944	11.1780	9.1757	10.3710	13.0354
Std Dev =	0.2051	0.2404	1.6515	0.2052	0.2417	1.6642	0.2036	0.2447	1.7176
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	29.8000	29.0900	-0.2752	20.8800	20.5100	0.5938	43.7900	43.4600	0.6019
Minimum =	28.7900	28.0800	-3.6707	19.9110	19.5270	-3.9751	42.0800	41.7300	-3.0107
Mean =	29.1842	28.6830	-1.7125	20.2064	19.8827	-1.5983	43.2209	42.8765	-0.7959
Std Dev =	0.2272	0.1663	0.8287	0.1826	0.1709	0.8524	0.2436	0.3302	0.6843

Production Part Approval Process

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

IHLD-4032, 10uH

(10)Mechanical Shock									
IEC 60068 Part 2-27 Test Group Ea									
Quantity	30	100% Passed							
A L1-2									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	9.1323	9.2864	1.7316	9.0795	9.2456	1.8286	9.2122	9.2621	0.6377
Minimum =	8.4359	8.5516	1.0333	8.3784	8.4969	1.0708	8.4701	8.5165	0.4537
Mean =	8.7381	8.8535	1.3203	8.6865	8.8059	1.3745	8.7724	8.8207	0.5512
Std Dev =	0.1953	0.1973	0.2043	0.1956	0.1995	0.2105	0.1940	0.1962	0.0486
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	29.270	29.280	0.552	20.640	20.390	0.348	43.820	43.930	0.984
Minimum =	28.810	28.800	-0.621	20.007	19.916	-2.659	42.680	42.920	-0.923
Mean =	29.019	29.005	-0.049	20.220	20.105	-0.564	43.252	43.316	0.148
Std Dev =	0.144	0.135	0.242	0.149	0.118	0.655	0.261	0.267	0.436
B L3-4									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	9.1601	9.2560	1.7622	9.1052	9.2075	1.7900	9.1753	9.2230	0.7602
Minimum =	8.4509	8.5451	0.9146	8.3893	8.4914	0.7750	8.4770	8.5211	0.1652
Mean =	8.7333	8.8451	1.2812	8.6752	8.7863	1.2813	8.7643	8.8128	0.5532
Std Dev =	0.1854	0.1850	0.2137	0.1859	0.1858	0.2455	0.1827	0.1833	0.1039
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	29.270	29.250	0.209	20.470	20.310	0.148	43.810	43.950	1.028
Minimum =	28.730	28.670	-0.689	19.948	19.858	-2.428	42.610	42.790	-0.902
Mean =	28.980	28.955	-0.086	20.190	20.077	-0.555	43.191	43.259	0.158
Std Dev =	0.153	0.164	0.204	0.145	0.131	0.593	0.290	0.310	0.444

Production Part Approval Process

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

IHLD-4032, 10uH

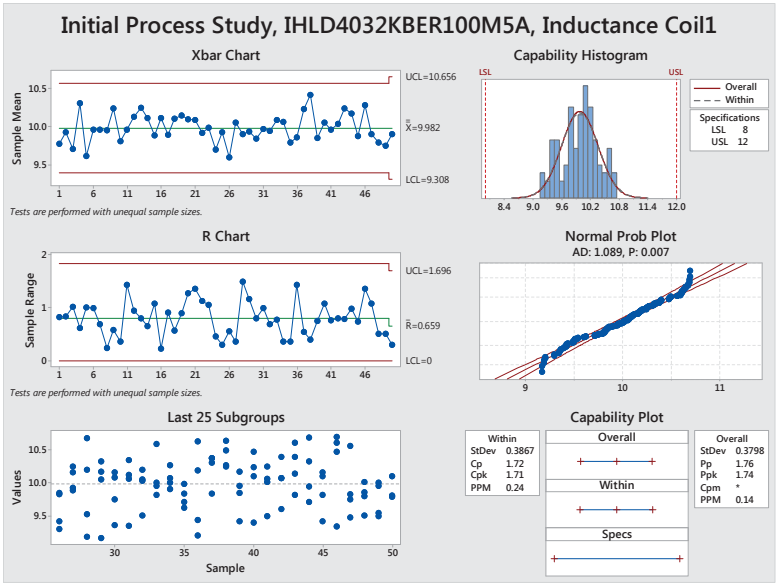
(11)Vibration									
IEC 60068 Part 2-6 Test Group Fc									
Quantity	30	100% Passed							
A L1-2									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	9.2004	9.3417	2.2790	9.1450	9.2965	1.6898	9.2531	9.3005	1.0073
Minimum =	8.4904	8.6053	1.0401	8.4362	8.5606	1.0250	8.5315	8.5760	0.1838
Mean =	8.7747	8.8882	1.2937	8.7202	8.8372	1.3423	8.8082	8.8546	0.5279
Std Dev =	0.1713	0.1719	0.2244	0.1721	0.1760	0.1577	0.1729	0.1709	0.1157
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	29.350	29.790	1.707	20.730	20.700	1.124	43.820	43.720	0.561
Minimum =	28.850	29.010	0.415	20.070	19.995	-2.368	42.400	42.450	-1.003
Mean =	29.098	29.433	1.149	20.361	20.343	-0.087	43.282	43.200	-0.190
Std Dev =	0.143	0.176	0.286	0.164	0.157	0.849	0.348	0.303	0.356
B L3-4									
Inductance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	9.2468	9.3666	1.8591	9.1835	9.3137	1.8022	9.2749	9.3218	0.5993
Minimum =	8.3860	8.4759	0.9058	8.3279	8.4199	0.9404	8.4064	8.4478	0.0495
Mean =	8.7608	8.8713	1.2617	8.6999	8.8137	1.3078	8.7971	8.8371	0.4532
Std Dev =	0.1931	0.1957	0.2064	0.1919	0.1968	0.2134	0.1912	0.1944	0.1247
DC Resistance									
	Initial @ 25°C	Final @ 25°C	%Δ	Initial @ -55°C	Final @ -55°C	%Δ	Initial @ 125°C	Final @ 125°C	%Δ
Maximum =	29.260	29.710	1.726	20.560	20.720	1.271	43.740	43.650	0.747
Minimum =	28.830	29.070	0.310	20.090	20.040	-2.529	42.360	42.480	-1.002
Mean =	29.023	29.349	1.122	20.312	20.288	-0.114	43.171	43.097	-0.170
Std Dev =	0.125	0.164	0.306	0.131	0.155	0.880	0.327	0.284	0.374

Production Part Approval Process

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

Initial Process Study (Danshui)
IHLD-4032 10uH

Inductance (uH) C1							
1	10.11992	26	10.19698	51	10.26675	76	9.715732
2	9.83008	27	10.0351	52	10.24695	77	10.6919
3	9.850483	28	9.504497	53	10.49329	78	9.419587
4	9.295642	29	10.0549	54	10.17626	79	10.16386
5	9.414912	30	9.815791	55	9.953884	80	10.10662
6	10.15931	31	9.953055	56	9.844863	81	9.815539
7	10.24587	32	10.00153	57	9.420495	82	10.69747
8	9.887536	33	10.5929	58	9.393931	83	9.343385
9	9.929513	34	10.00823	59	10.47503	84	10.48015
10	10.20308	35	10.07341	60	10.24158	85	10.61052
11	9.527001	36	10.27242	61	10.10032	86	9.480176
12	9.186543	37	9.905974	62	10.02006	87	9.829315
13	10.67719	38	9.623342	63	10.25265	88	9.749951
14	10.32504	39	9.713855	64	10.06829	89	10.56111
15	10.05892	40	9.988314	65	9.493456	90	9.859995
16	10.1757	41	9.837007	66	10.07613	91	9.50831
17	9.167024	42	10.63116	67	10.3989	92	10.01637
18	10.16718	43	10.18741	68	9.602476	93	9.799633
19	9.363145	44	9.2	69	10.07163	94	9.493151
20	9.749467	45	9.434254	70	9.822746	95	9.541703
21	10.08799	46	10.37469	71	10.39619	96	9.958186
22	10.34511	47	10.31326	72	10.1387	97	10.00584
23	10.06462	48	10.38264	73	10.61099	98	9.792587
24	9.353937	49	9.842065	74	10.32659	99	10.10058
25	10.12145	50	10.646	75	9.944365	100	9.814647

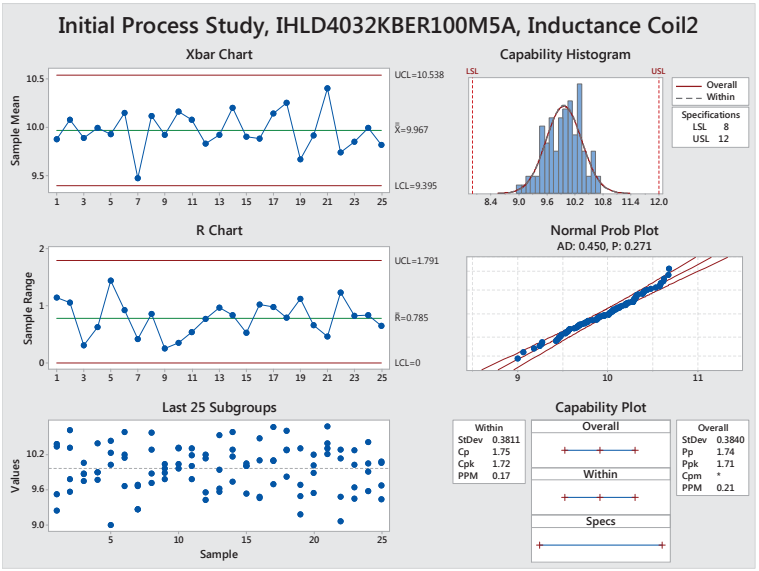


Production Part Approval Process

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

Initial Process Study (Danshui)
IHLD-4032 10uH

Inductance (uH) C2							
1	10.38802	26	9.690147	51	9.567636	76	9.490519
2	9.246849	27	9.664292	52	9.947308	77	9.541611
3	10.33877	28	9.268369	53	9.74528	78	10.20301
4	9.529375	29	9.716785	54	10.58767	79	9.891654
5	9.57001	30	10.57641	55	10.29231	80	10.01558
6	9.780619	31	9.878625	56	10.16682	81	10.40079
7	10.62321	32	10.28618	57	10.05729	82	10.21551
8	10.325	33	9.885867	58	10.01375	83	10.68234
9	9.878042	34	9.784071	59	9.531628	84	10.30839
10	10.06005	35	9.96504	60	10.01241	85	10.13754
11	9.746143	36	10.03796	61	10.11034	86	10.29299
12	9.873535	37	10.04642	62	9.479457	87	9.476838
13	9.906277	38	10.3078	63	10.48065	88	9.062984
14	10.39456	39	9.965184	64	9.458793	89	10.28184
15	9.769333	40	10.31909	65	9.693416	90	9.646752
16	9.903404	41	9.778027	66	10.09439	91	9.454565
17	10.43914	42	10.01178	67	10.67211	92	10.02871
18	10.2361	43	10.31392	68	10.10964	93	9.91326
19	9.002298	44	10.1959	69	9.827787	94	9.579081
20	10.03545	45	10.19745	70	10.61641	95	10.41652
21	10.5894	46	9.42434	71	10.27917	96	10.05525
22	10.14628	47	9.556067	72	10.28641	97	10.08723
23	9.659721	48	10.13293	73	10.3108	98	9.43812
24	10.20175	49	9.624752	74	9.684657	99	10.06681
25	9.269369	50	10.53493	75	9.183279	100	9.680165

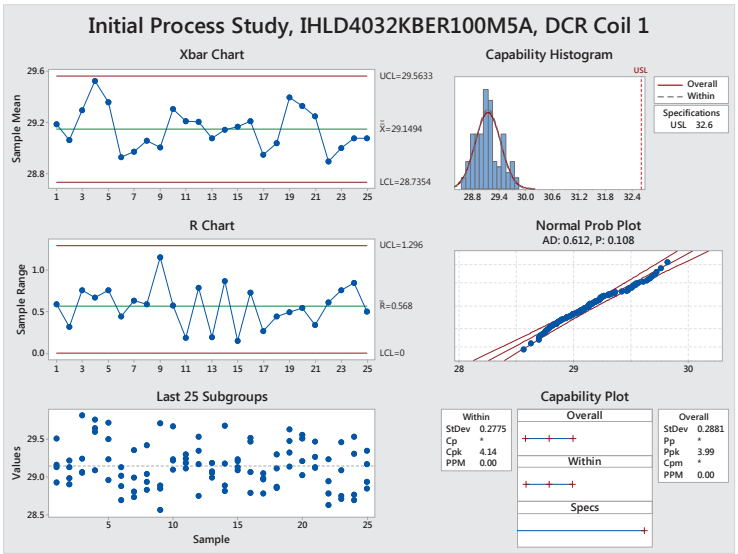


Production Part Approval Process

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

Initial Process Study (Danshui)
IHLD-4032 10uH

DC Resistance (mOhm) C1							
1	29.16316	26	29.36166	51	28.9926	76	29.47997
2	29.13279	27	28.80892	52	29.18955	77	29.56501
3	29.5168	28	28.99087	53	28.89189	78	29.51122
4	28.92763	29	29.42107	54	29.18449	79	29.21557
5	28.98418	30	28.82795	55	29.68431	80	29.0228
6	28.90501	31	29.04024	56	28.81503	81	29.13259
7	29.13484	32	28.93873	57	29.08875	82	29.47105
8	29.22058	33	28.88984	58	29.21301	83	29.12778
9	29.06504	34	28.84776	59	29.13285	84	29.26595
10	29.81894	35	29.71393	60	29.23787	85	28.62508
11	29.24323	36	28.56341	61	29.06486	86	28.94198
12	29.06011	37	29.67185	62	29.5189	87	28.78437
13	29.0913	38	29.23349	63	29.4732	88	29.23389
14	29.65157	39	29.22407	64	28.79273	89	28.70623
15	29.60514	40	29.09761	65	29.04704	90	29.09203
16	29.76269	41	29.24629	66	28.98922	91	28.74682
17	28.96492	42	29.30037	67	28.78219	92	29.46459
18	29.50483	43	29.18784	68	28.97141	93	28.76521
19	29.23339	44	29.11641	69	29.11902	94	29.3078
20	29.72344	45	29.1738	70	28.87047	95	29.54027
21	28.88065	46	29.35415	71	29.30421	96	28.69638
22	29.01896	47	29.53974	72	28.85858	97	29.17024
23	28.69191	48	28.75067	73	29.32899	98	29.3531
24	29.13434	49	29.07381	74	29.14245	99	28.93373
25	28.73109	50	29.05919	75	29.63869	100	28.84893

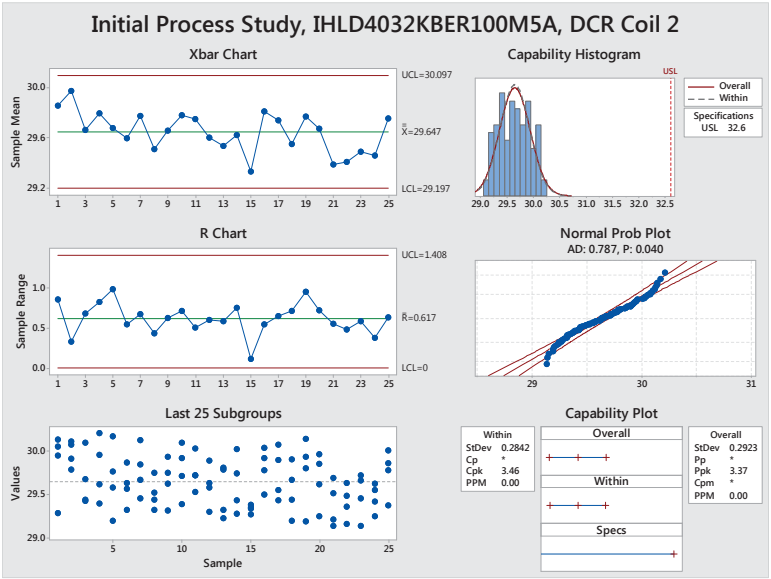


Production Part Approval Process

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

Initial Process Study (Danshui)
IHLD-4032 10uH

DC Resistance (mOhm) C2							
1	30.13934	26	29.66776	51	29.22568	76	29.19001
2	29.949	27	30.12823	52	29.81353	77	29.61931
3	29.28014	28	29.45785	53	30.02882	78	29.96529
4	30.05529	29	29.43788	54	29.43404	79	29.85547
5	30.08121	30	29.7546	55	29.743	80	29.24733
6	29.7871	31	29.32341	56	29.27699	81	29.69144
7	29.91445	32	29.52396	57	29.38041	82	29.51399
8	30.11776	33	29.62458	58	29.35043	83	29.13747
9	29.42493	34	29.93949	59	29.33383	84	29.20759
10	30.10437	35	29.7496	60	29.26712	85	29.48438
11	29.67496	36	29.31482	61	29.78074	86	29.63534
12	29.44119	37	29.92334	62	30.04186	87	29.36024
13	29.95946	38	29.38577	63	29.92607	88	29.15388
14	30.21443	39	30.09935	64	29.49857	89	29.13368
15	29.39119	40	29.71604	65	29.42984	90	29.71862
16	29.61826	41	29.52693	66	29.55196	91	29.45108
17	29.58216	42	29.72006	67	29.90225	92	29.66169
18	29.19148	43	30.03395	68	30.07966	93	29.62384
19	29.76808	44	29.72425	69	29.66612	94	29.5539
20	30.17211	45	29.63452	70	29.19621	95	29.4161
21	29.56374	46	29.58	71	29.90664	96	29.24539
22	29.32019	47	29.89604	72	29.44034	97	30.01035
23	29.63166	48	29.29626	73	29.93425	98	29.86132
24	29.8681	49	29.78725	74	30.14494	99	29.37472
25	29.84756	50	29.31872	75	29.80703	100	29.77911



Production Part Approval Process

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

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

Section 12: Qualified Laboratories

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

Production Part Approval Process

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

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

Section 13: Appearance Approval Report

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

Production Part Approval Process

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

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

Section 14: Sample Product

Sample product from the Vishay Manufacturing Facility is available upon request

Production Part Approval Process

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

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

Section 15: Master Sample

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

Production Part Approval Process

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

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

Section 16: Checking Aids

Checking Aids are not required for this electronic component

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

Production Part Approval Process

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 17: Records of Compliance

Moisture Sensitivity Level: 1

Production Part Approval Process

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

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

Section 19: Bulk Material Requirements

Bulk Material Requirements do not apply to this Electronic Component.

IHLP Standards of Manufacture

IHLP INTRODUCTION SURFACE IRREGULARITIES CRITERIA FOR REJECTION SUMMARY

INTRODUCTION

Scope

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

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

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

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

Product

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

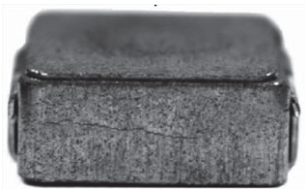
The IHLP inductor provides the best combination of:

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

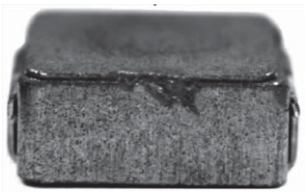
Surface irregularities

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

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



Cracks



Chips

Oxidation

APPLICATION NOTE

IHLP Standards of Manufacture

CRACKS

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

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

Terminal area crack, acceptable

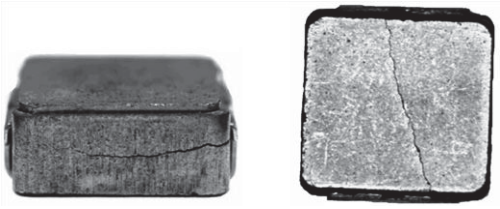
Cracks coming from the top corner of the terminal are a normal occurrence and are caused by terminal expansion during curing operations.

Negligible crack, acceptable

Negligible cracks are those that are nearly invisible without magnification.

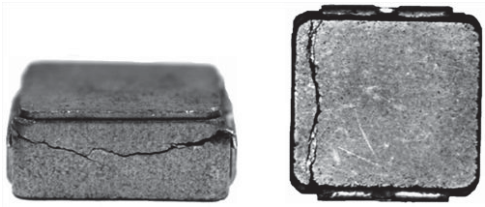
Minor crack, acceptable

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



Moderate crack, rejectable

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



Major crack, rejectable

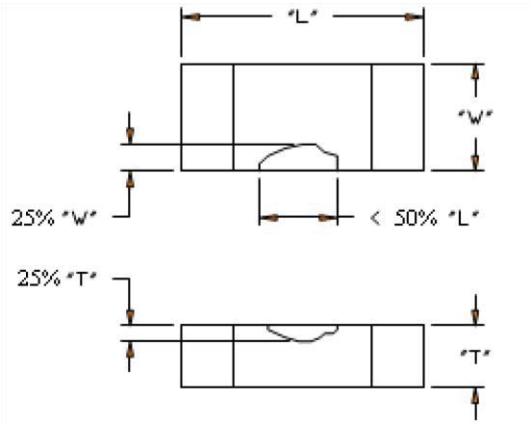
Major cracks are those that are obvious to a customer and would possibly result in large chip-outs that would expose the coil and lead frame.

APPLICATION NOTE

IHLP Standards of Manufacture

CHIPS

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



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

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

Minor chipping, acceptable

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

Major chipping, rejectable

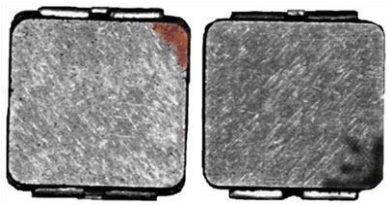
Major chips in the inductor body are those that are very obvious to the customer and may expose the wire coil or lead frame.

OXIDATION

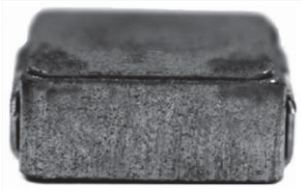
The IHLP inductor is predominately iron and oxidation may occur in a small percentage of the inductors. Resin binders give moderate protection, but some slight oxidation may occur. All components should be stored away from heat, humidity and ionized atmospheres as much as possible before mounting.

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

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



Top view



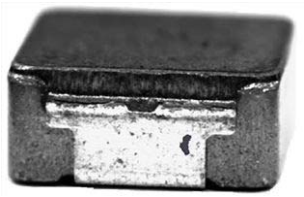
Side view

IHLP Standards of Manufacture

OTHER

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

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



Foreign material: Acceptable

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

Scratch: Acceptable

SUMMARY

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

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

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

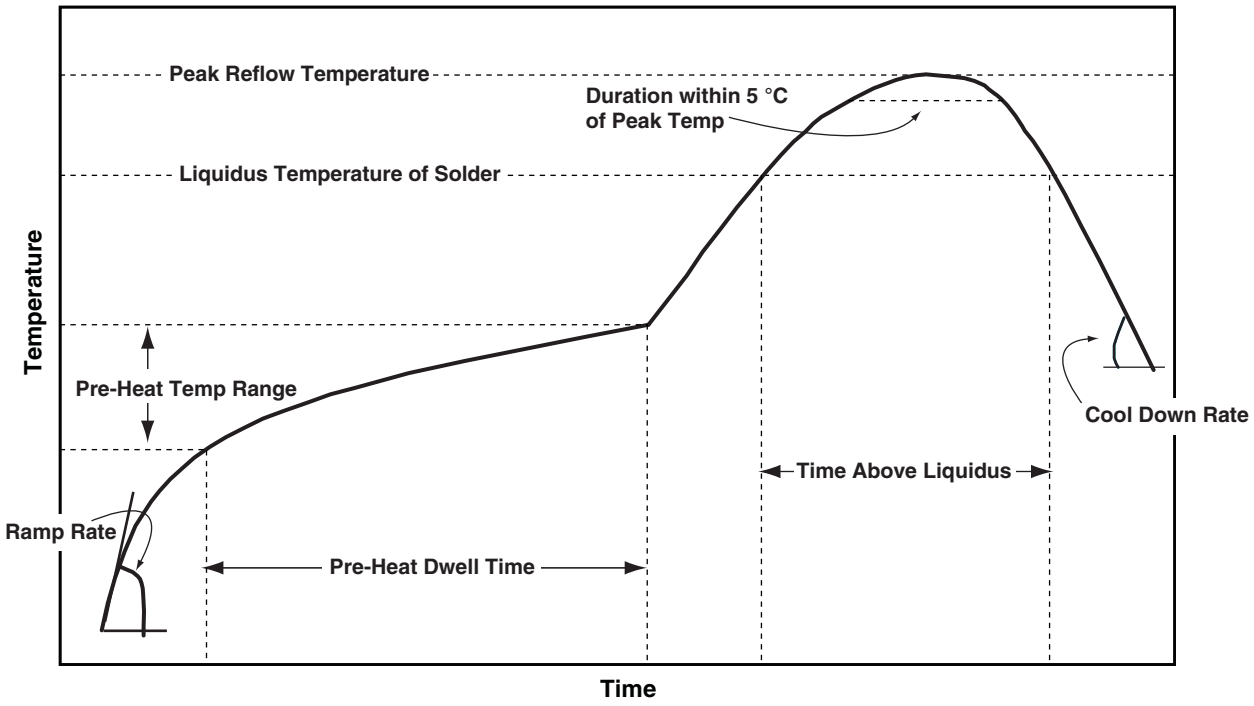


Fig. 1 - Infrared reflow soldering (SMD package)

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.