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

IHLE3232xxERxxxM5A

Generic PPAP

Generic PPAP

8/31/2017

Production Part Approval Process

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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.

Production Part Approval Process

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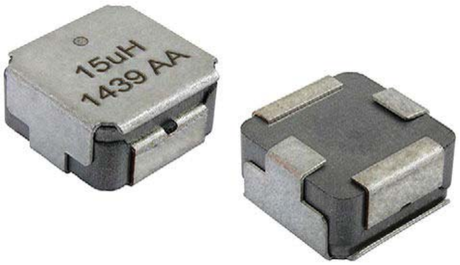
Use the control buttons below to navigate through the PPAP sections.

Section 1. Design Records

Low Profile, High Current Inductors with e-field Shield



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)
0.22	1.68	1.86	36.0	32.0	117
0.47	2.38	2.55	27.0	19.0	77
0.68	3.30	3.53	21.5	16.2	51
1.0	4.58	4.90	19.0	16.2	45
2.2	11.70	12.50	11.5	14.0	32
3.3	15.40	16.48	11.3	11.8	23
4.7	26.60	28.46	7.2	9.1	18
5.6	29.60	31.67	6.9	9.0	18
10	50.00	53.50	5.1	5.2	13
15	62.00	66.34	4.8	3.6	10
22	103.00	110.21	3.7	3.8	9
33	149.00	159.43	3.1	3.2	6.1

Notes
- All test data is referenced to 25 °C ambient
- Operating temperature range -55 °C to +125 °C
- The part temperature (ambient + temp. rise) should not exceed 125 °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 %

FEATURES

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

- High temperature, up to 155 °C
- Integrated E-Shield for maximum EMI reduction (1)
- Excellent DC/DC energy storage up to 1 MHz to 2 MHz. Filter inductor applications up the SRF (see Standard Electrical Specifications table).
- Integrated e-field shield eliminates need for separate shielding
- 20 dB e-field reduction at 1 cm
  - Measured vertically from top center of device
- Lowest DCR/μH, in this package size
- Handles high transient current spikes without saturation
- Coplanarity of the 4 terminals ≤ 100 μm
- AEC-Q200 qualified
- **Patent pending**
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Note

(1) Maximum E-field reduction is realized with the IHLE shield is connected to ground

APPLICATIONS

- Engine and transmission control units
- Diesel injection drivers
- DC/DC converters for entertainment/navigation systems
- Noise suppression for motors
  - Windshield wipers
  - Power seats
  - Power mirrors
  - Heating and ventilation blower
  - HID lighting
- LED drivers

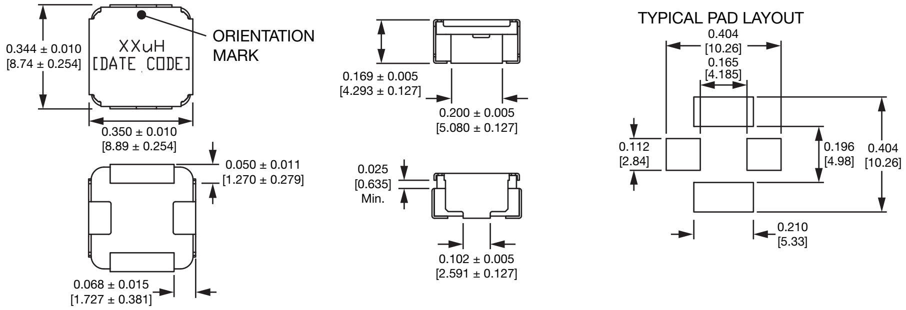
DESCRIPTION

IHLE-3232DD-5A	15 μH	± 20 %	ER	e3
MODEL	INDUCTANCE VALUE	INDUCTANCE TOLERANCE	PACKAGE CODE	JEDEC® LEAD (Pb)-FREE STANDARD

GLOBAL PART NUMBER

I	H	L	E	3	2	3	2	D	D	E	R	1	5	0	M	5	A
PRODUCT FAMILY				SIZE						PACKAGE CODE		INDUCTANCE VALUE			TOL.	SERIES	

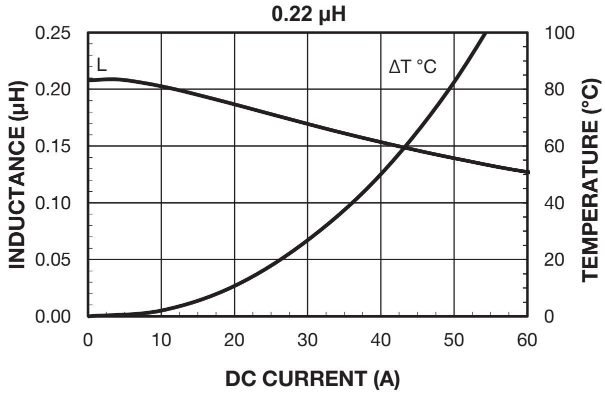
DIMENSIONS in inches [millimeters]

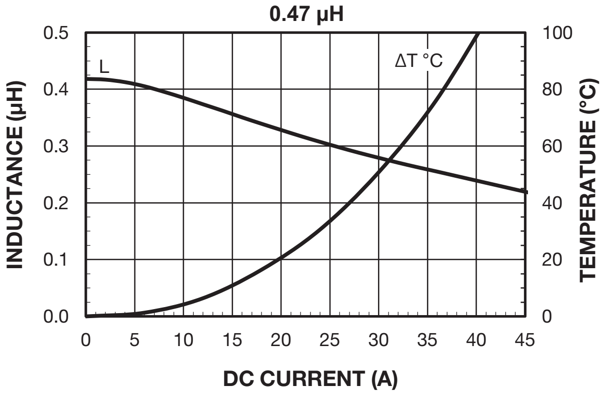


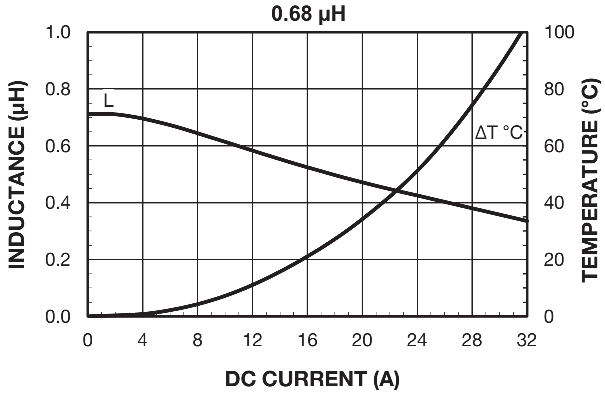
Notes

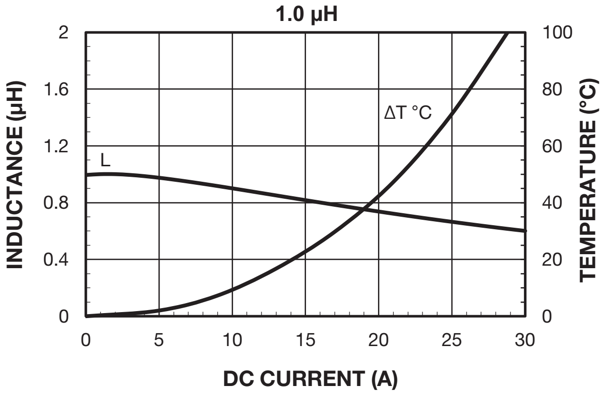
- Dot indicate the coil pin
- Coplanarity of 4 terminals: 0.004” [0.10]

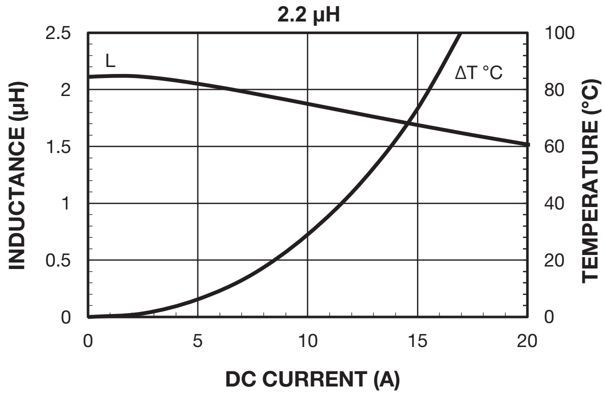
PERFORMANCE GRAPHS

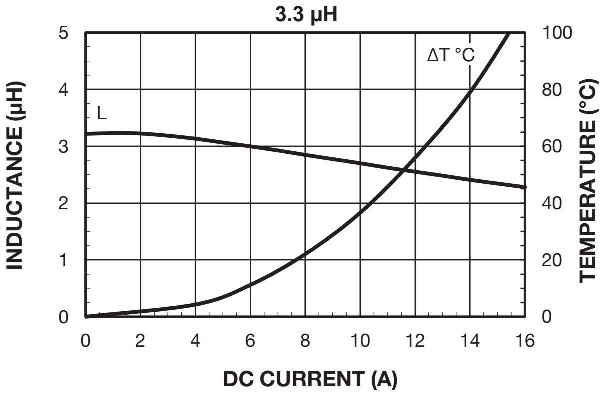




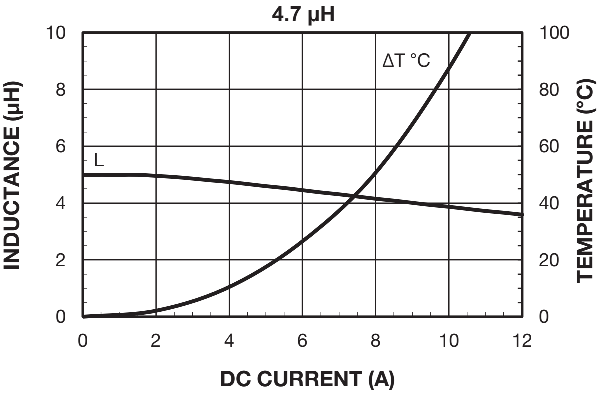


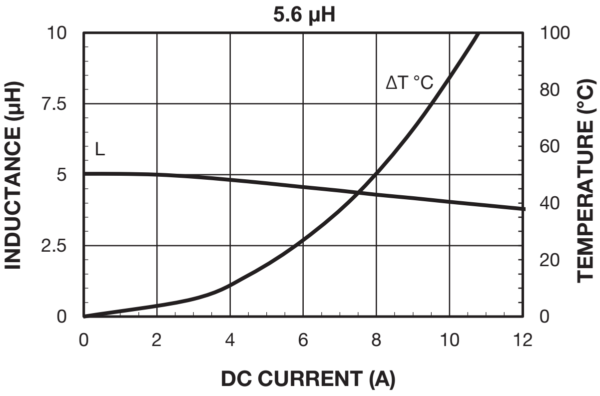


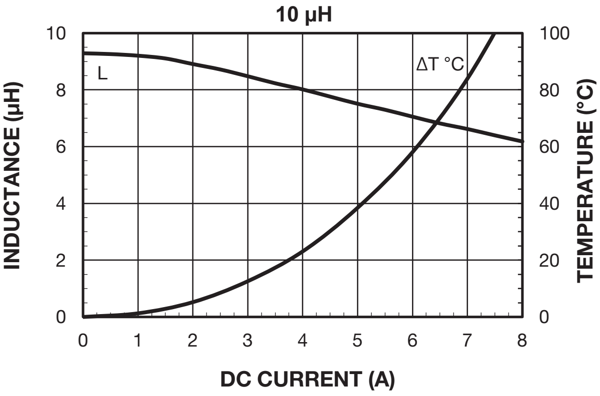


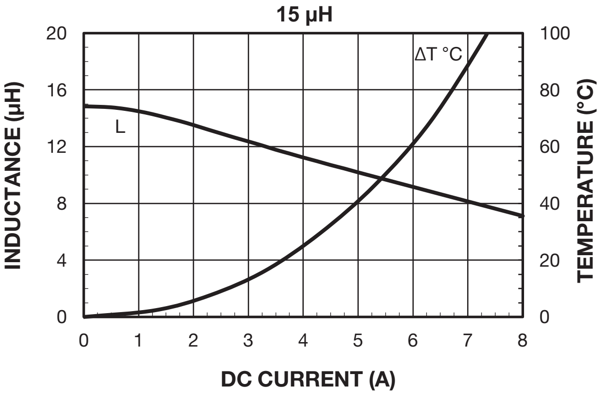


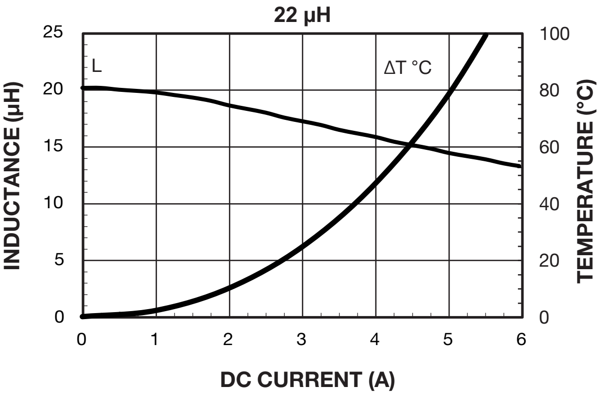
PERFORMANCE GRAPHS

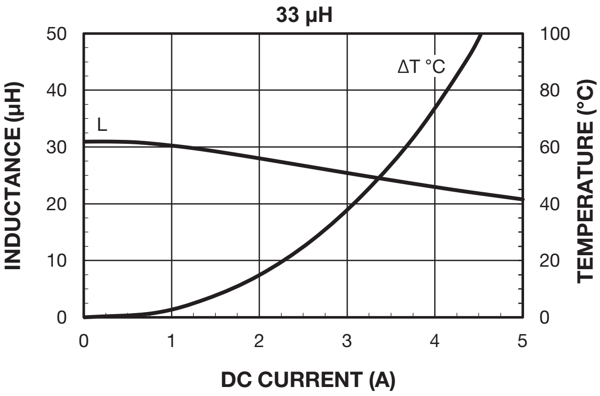




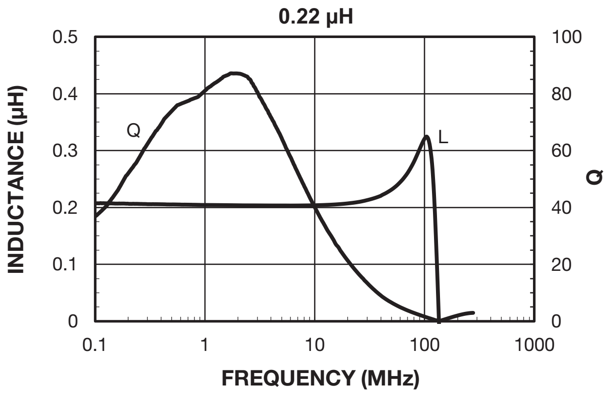


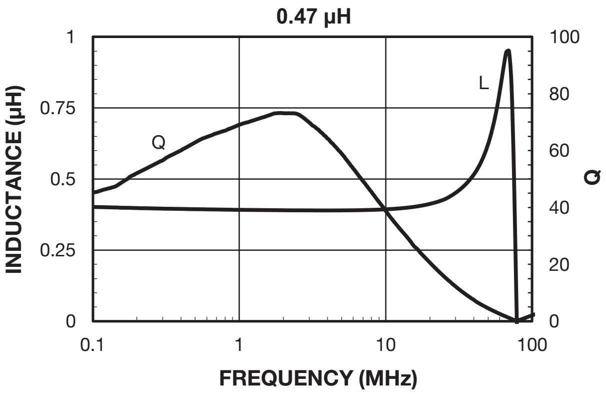






PERFORMANCE GRAPHS: INDUCTANCE AND Q VS. FREQUENCY


0.22 µH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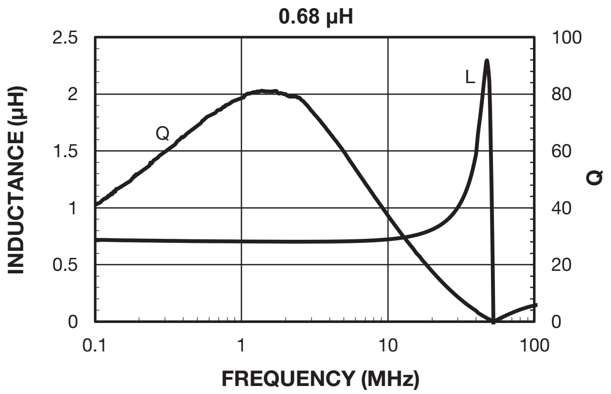
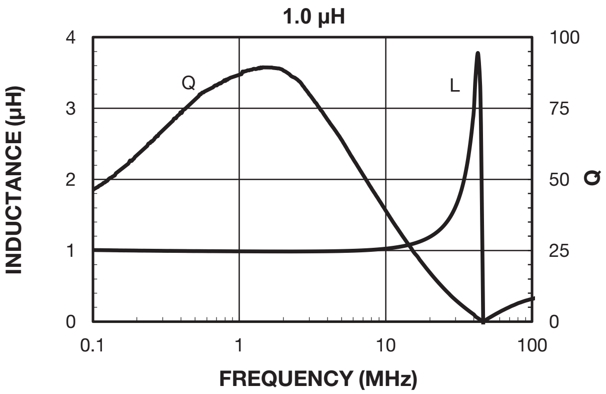
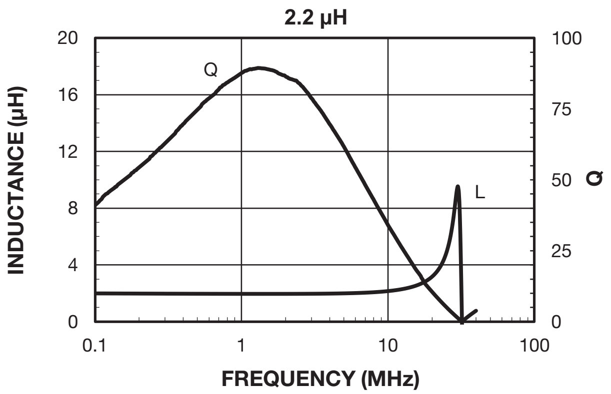
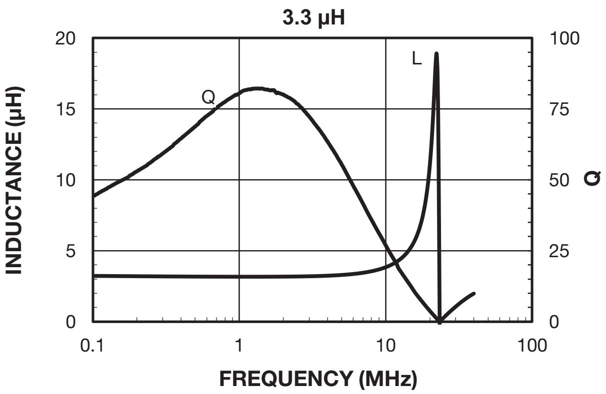
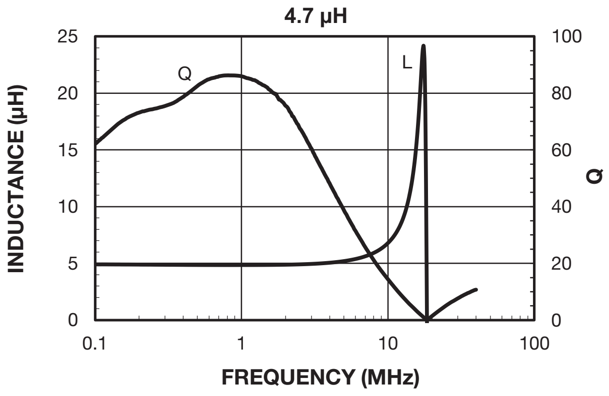

0.68 µH

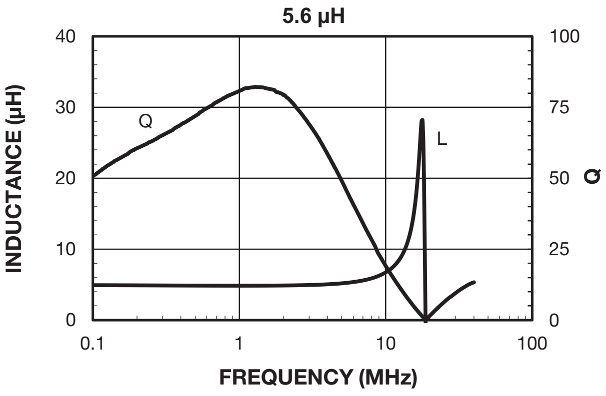

1.0 µH

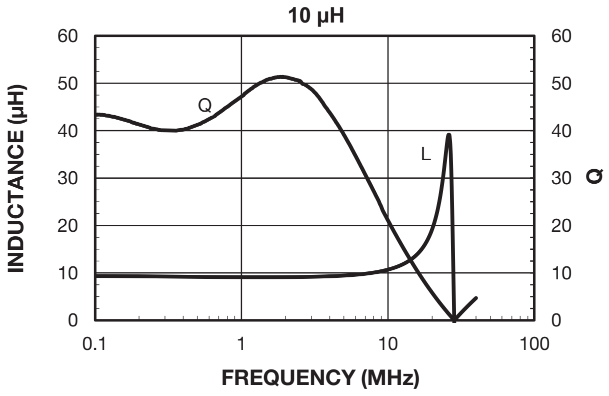

2.2 µH

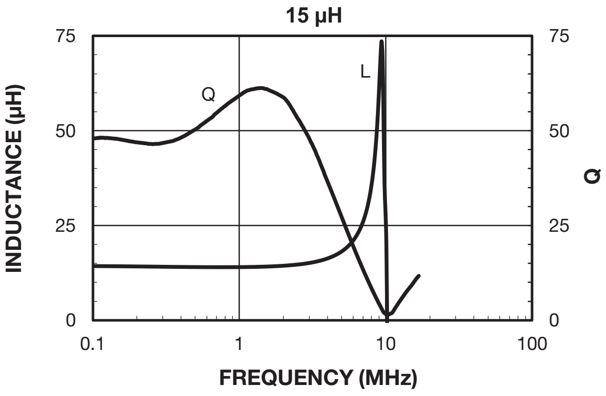

3.3 µH

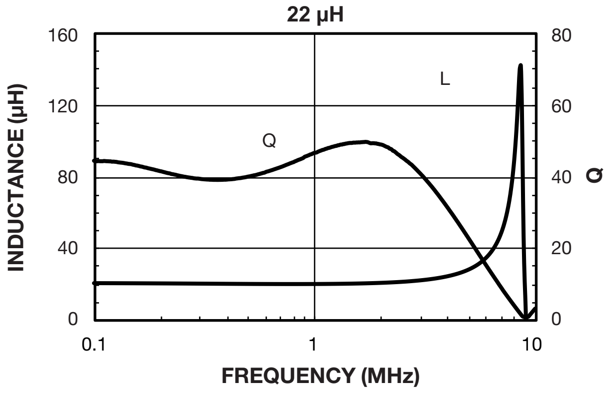
PERFORMANCE GRAPHS: INDUCTANCE AND Q VS. FREQUENCY

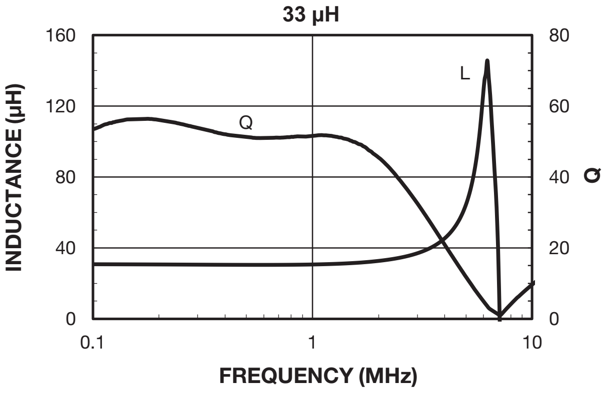






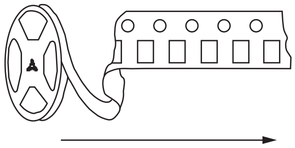




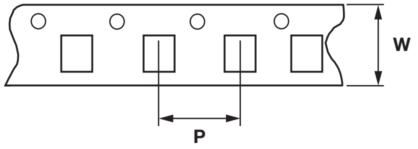


SMD Magnetics Packaging Methods

TAPE AND REEL in inches [millimeters]



User Direction of Feed



Carrier Dimensions

	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
IHLP-1212AB	-	-	ER	13	0.472 [12.0]	0.315 [8.0]	3000	-	-	-	-
IHLP-1212AE	-	-	ER	13	0.472 [12.0]	0.315 [8.0]	3000	-	-	-	-
IHLP-1212BZ	-	-	ER	13	0.472 [12.0]	0.315 [8.0]	3000	-	-	-	-
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
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
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	-	-	-	-
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	-	-	-	-

TAPE AND REEL in inches [millimeters]

	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
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	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	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	-	-	-	-
ISC-1008	-	-	ER	13	0.472 [12.0]	0.157 [4.0]	750	-	-	-	-
ISC-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
ISC-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
ICM-0805	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	2000	-	-	-	-
ICM-1206	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	2000	-	-	-	-
ICM-2824	-	-	ER	13	0.630 [16.0]	0.472 [12.0]	2000	-	-	-	-
ICM-3528	-	-	ER	13	0.945 [24.0]	0.472 [12.0]	900	-	-	-	-
ICM-4743	-	-	ER	13	0.945 [24.0]	0.630 [16.0]	500	-	-	-	-
ILSB-0603	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	4000	-	-	-	-
ILSB-0805 (0.047 µH to 2.2 µH)	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	4000	-	-	-	-
ILSB-0805 (2.7 µH to 33 µH)	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	3000	-	-	-	-
ILSB-1206	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	3000	-	-	-	-
ILBB-0402	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	10 000	-	-	-	-
ILBB-0603	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	4000	-	-	-	-
ILBB-0805	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	4000	-	-	-	-
ILB-1206	- -	- -	ER ES	7 13	0.315 [8.0] 0.315 [8.0]	0.157 [4.0] 0.157 [4.0]	3000 10 000	-	-	-	-
ILBB-1210	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	2000	-	-	-	-
ILBB-1806	-	-	ER	7	0.472 [12.0]	0.157 [4.0]	2000	-	-	-	-
ILBB-1812	-	-	ER	7	0.472 [12.0]	0.157 [4.0]	1000	-	-	-	-
ILHB-0603	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	4000	-	-	-	-
ILHB-0805	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	4000	-	-	-	-
ILHB-1206	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	3000	-	-	-	-
ILHB-1806	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	2000	-	-	-	-
ILHB-1812	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	1000	-	-	-	-
ILAS-1206	-	-	ER	7	0.315 [8.0]	0.157 [4.0]	3000	-	-	-	-
LPE-3325	R94	RY	ER	13	0.945 [24.0]	0.472 [12.0]	1000	S51	SM	EB	10
LPE-4841	R94	RY	ER	13	0.945 [24.0]	0.630 [16.0]	600	S51	SM	EB	10
LPE-5047	R94	RY	ER	13	0.945 [24.0]	0.630 [16.0]	600	S51	SM	EB	10
LPE-6562	R94	RY	ER	13	1.26 [32.0]	0.787 [20.0]	300	S51	SM	EB	10
LPE-6855	R94	RY	ER	13	1.26 [32.0]	0.787 [20.0]	450	S51	SM	EB	10
LPE-3325-CST	-	-	ER	13	0.945 [24.0]	0.472 [12.0]	1000	-	-	EB	10
LPT-3535	RC5	RH	ER	13	0.945 [24.0]	0.630 [16.0]	600	S51	SM	EB	10
LPT-4545	RC5	RH	ER	13	0.945 [24.0]	0.630 [16.0]	600	S51	SM	EB	10

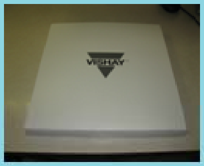
IHLP PACKAGING

COMPONENT PHOTO

POCKET TAPE PHOTO

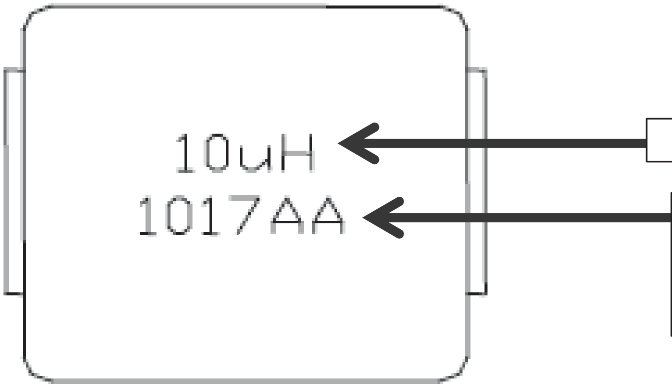
REEL PHOTO

CONTAINER PHOTO



UNIT LOAD PHOTO

IHLP COMPONENT PRINT



The Inductance Value

DATE CODE:
1017 = 17th week of 2010
The letters behind the date code are used by Vishay to trace each component back to a specific lot

Production Part Approval Process

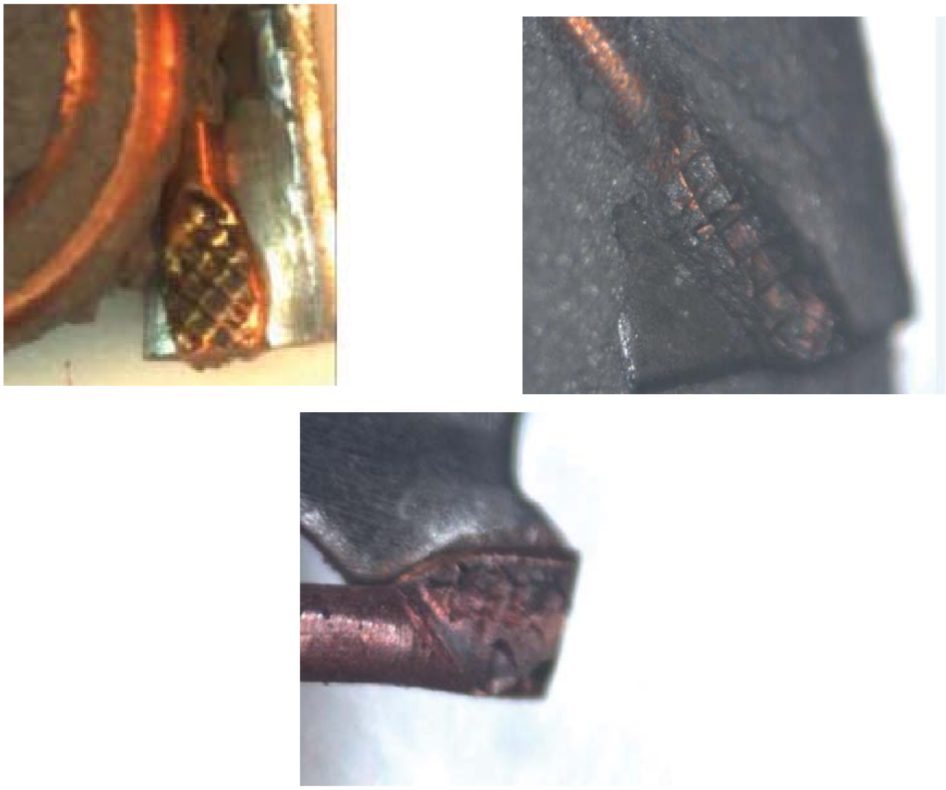
The following PPAP documentation is assembled according to AIAG, 4th Edition PPAP Manual and applicable customer requirements

Terminal Plating Info

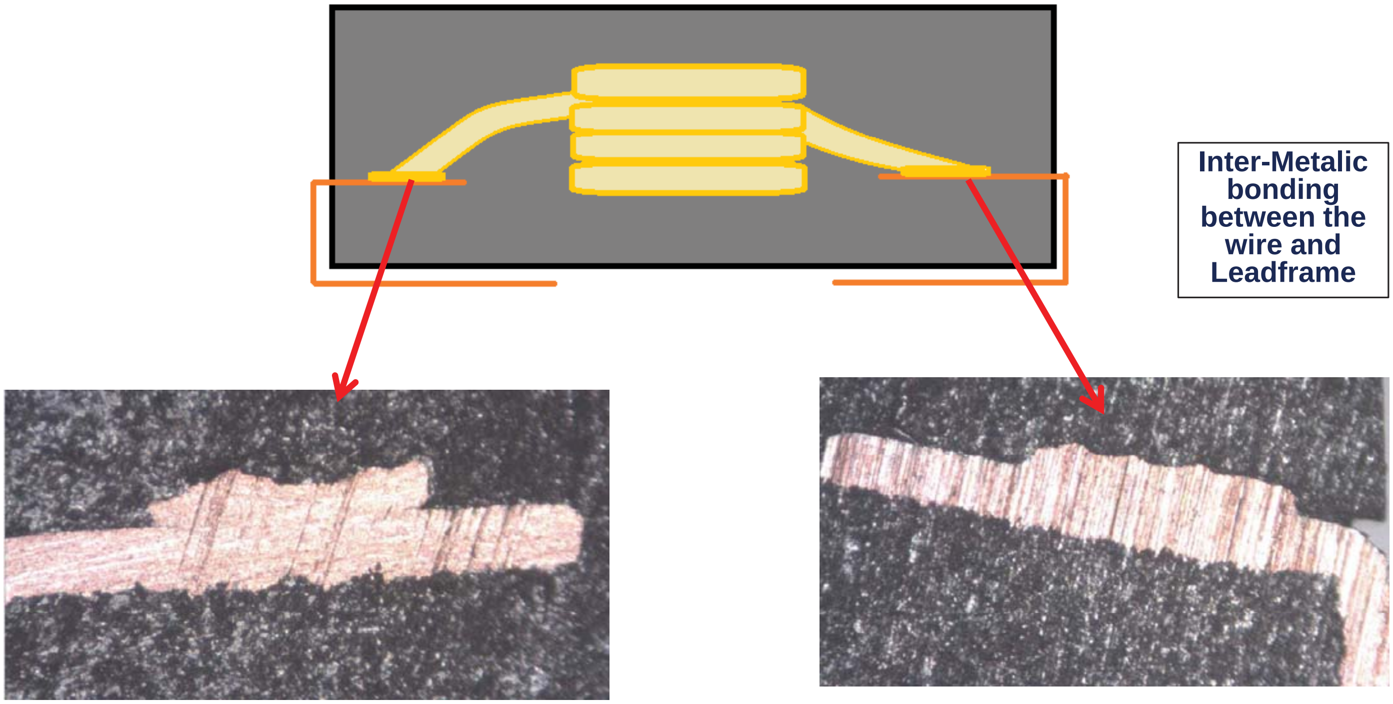
Part Number (CUSTOMER)	Part Number (Vishay)	Layer structure with base and coating material used:	Layer thickness and tolerances of the coatings (base material, intermediate layer, final finish)	Kind of Coating or technology (e.g. galvanized, chemically hot tin-plated,..)
Generic PPAP	IHLE3232xxERxxxM5A	Cu - Base Material Ni- Intermediate Later Sn- Finish Layer	CU: 0.203 +/- .0254mm Ni: 1.27um to 3.175um Sn: 4.57um to 6.35 um	Electroplated

Cross sectional Photos 3232 Cross Section

Example Photos of IHLP Welds



Cross sectional Photos of IHLP Welds



Inter-Metalic bonding between the wire and Leadframe

Production Part Approval Process

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

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

Section 2: Engineering Change Documents

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

Production Part Approval Process

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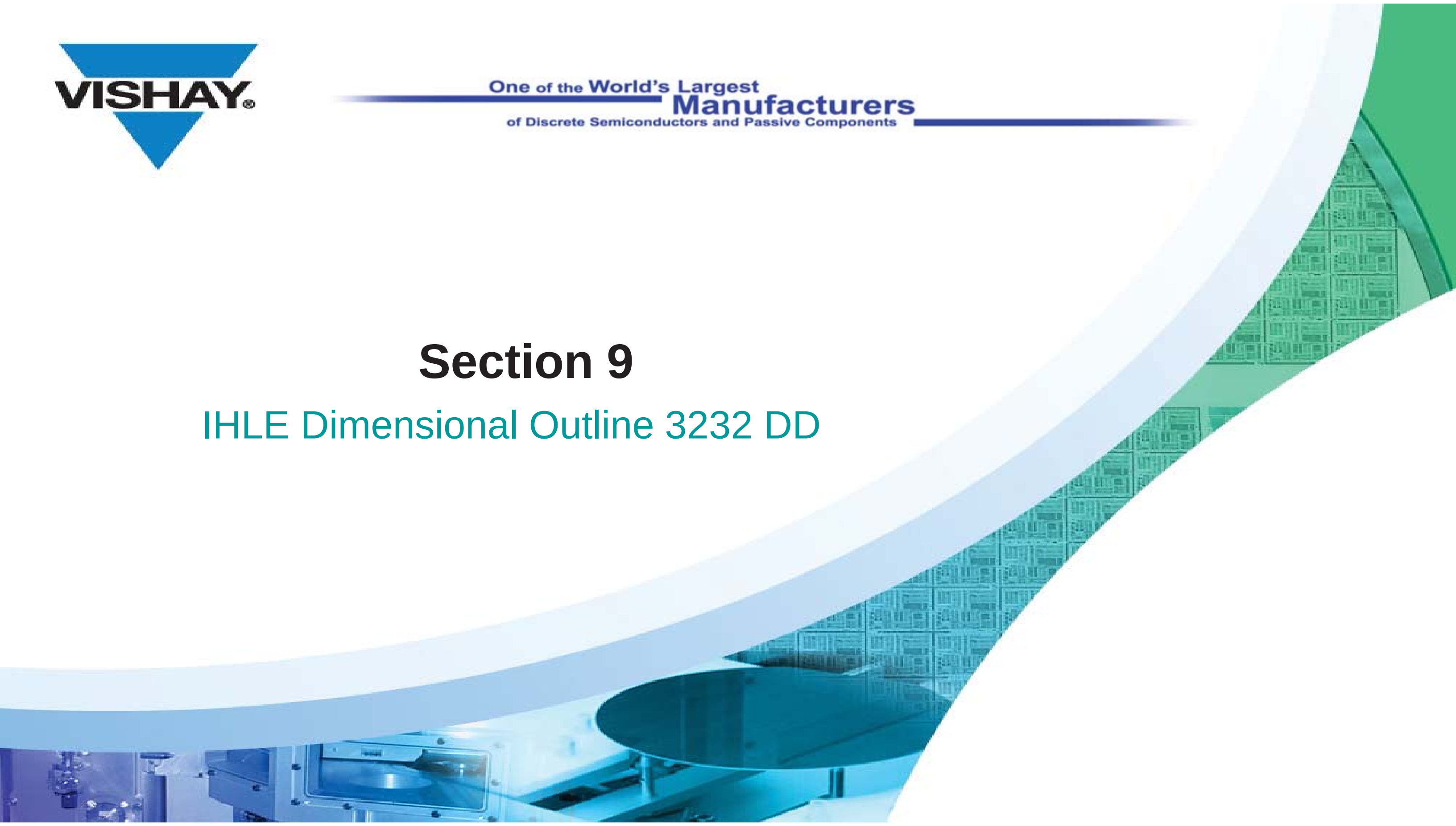
Use the control buttons below to navigate through the PPAP sections.

Section 8: Measurement System Analysis

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

Section 9

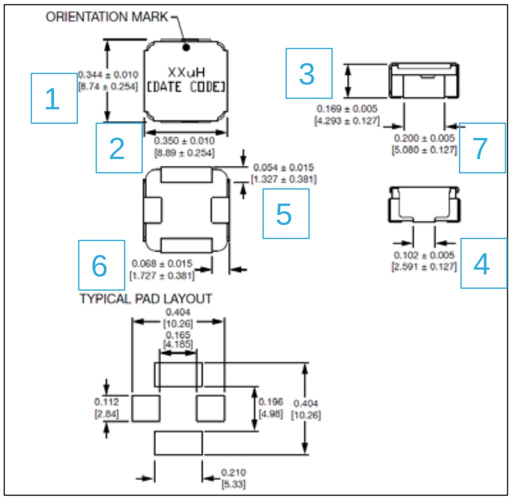
IHLE Dimensional Outline 3232 DD



Production Part Approval Process

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

Dimensional Analysis IHLE3232DD



Production Part Approval Process

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

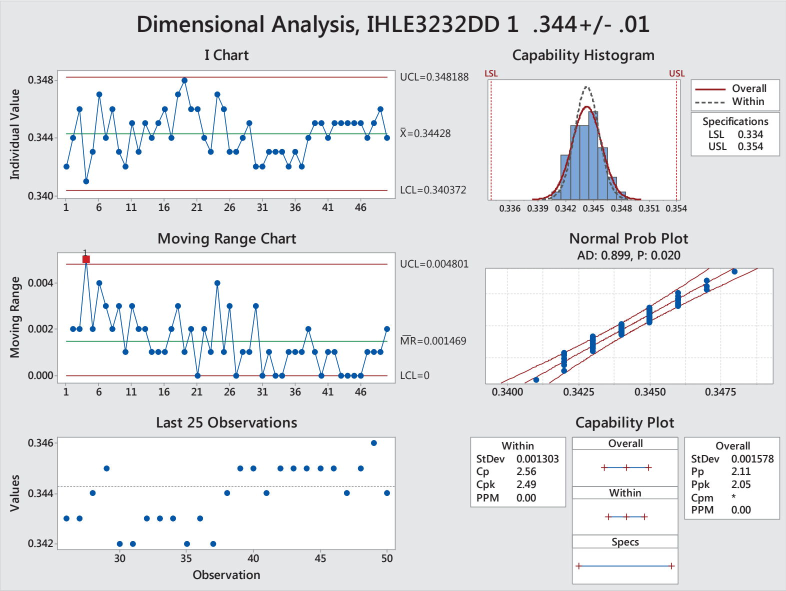
Dimensional Analysis IHLE 3232DD

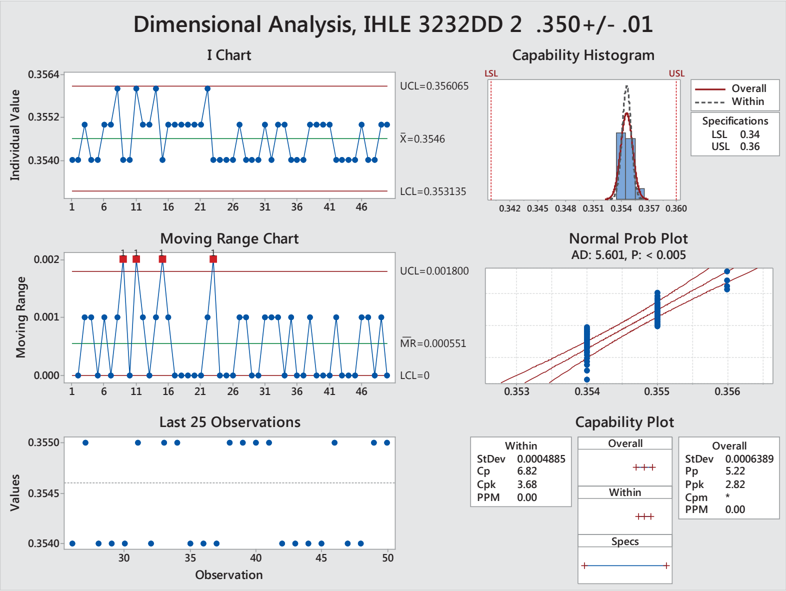
Sample Number	1	2	3	4	5	6	7	8
	.344+-.01	.350+-.01	.169+-.005	.102+-.005	.054+-.015	.068+-.015	.200+-.005	≤ 100µm
1	0.342	0.354	0.169	0.104	0.048	0.065	0.200	58.300
2	0.344	0.354	0.170	0.104	0.048	0.066	0.200	53.500
3	0.346	0.355	0.170	0.104	0.049	0.065	0.201	56.200
4	0.341	0.354	0.169	0.104	0.048	0.065	0.200	58.100
5	0.343	0.354	0.170	0.104	0.049	0.065	0.200	50.800
6	0.347	0.355	0.171	0.104	0.050	0.068	0.200	53.500
7	0.344	0.355	0.171	0.104	0.048	0.066	0.200	50.800
8	0.346	0.356	0.169	0.104	0.047	0.068	0.200	58.100
9	0.343	0.354	0.170	0.104	0.049	0.066	0.200	50.800
10	0.342	0.354	0.170	0.104	0.048	0.063	0.200	56.200
11	0.345	0.356	0.169	0.104	0.049	0.064	0.200	50.800
12	0.343	0.355	0.169	0.104	0.048	0.065	0.200	45.400
13	0.345	0.355	0.171	0.104	0.049	0.069	0.200	58.100
14	0.344	0.356	0.171	0.104	0.050	0.065	0.200	45.400
15	0.345	0.354	0.171	0.104	0.049	0.069	0.200	45.400
16	0.346	0.355	0.170	0.104	0.047	0.065	0.200	50.800
17	0.344	0.355	0.169	0.104	0.048	0.066	0.200	53.500
18	0.347	0.355	0.169	0.104	0.049	0.069	0.200	58.100
19	0.348	0.355	0.169	0.104	0.050	0.063	0.200	63.500
20	0.346	0.355	0.170	0.104	0.048	0.070	0.200	63.500
21	0.346	0.355	0.170	0.105	0.045	0.062	0.200	50.800
22	0.344	0.356	0.171	0.104	0.045	0.066	0.200	45.400
23	0.343	0.354	0.169	0.104	0.050	0.064	0.200	38.100
24	0.347	0.354	0.171	0.104	0.048	0.066	0.200	63.500
25	0.346	0.354	0.170	0.104	0.045	0.063	0.200	63.500
26	0.343	0.354	0.171	0.104	0.050	0.070	0.200	63.500
27	0.343	0.355	0.169	0.104	0.050	0.066	0.200	63.500
28	0.344	0.354	0.169	0.104	0.047	0.063	0.200	50.800
29	0.345	0.354	0.169	0.104	0.047	0.069	0.200	56.200
30	0.342	0.354	0.169	0.104	0.046	0.066	0.200	50.800
31	0.342	0.355	0.170	0.104	0.046	0.066	0.200	63.500
32	0.343	0.354	0.170	0.104	0.047	0.067	0.200	56.200
33	0.343	0.355	0.169	0.104	0.050	0.067	0.200	50.800
34	0.343	0.355	0.169	0.104	0.049	0.065	0.200	63.500
35	0.342	0.354	0.170	0.104	0.049	0.067	0.200	45.400
36	0.343	0.354	0.170	0.105	0.048	0.067	0.201	63.500
37	0.342	0.354	0.171	0.104	0.046	0.068	0.200	63.500
38	0.344	0.355	0.169	0.104	0.048	0.066	0.200	45.400
39	0.345	0.355	0.169	0.104	0.048	0.068	0.200	38.100
40	0.345	0.355	0.169	0.104	0.048	0.069	0.200	38.100
41	0.344	0.355	0.169	0.104	0.049	0.067	0.200	63.500
42	0.345	0.354	0.169	0.104	0.047	0.067	0.200	63.500
43	0.345	0.354	0.169	0.104	0.050	0.066	0.200	63.500
44	0.345	0.354	0.171	0.104	0.048	0.070	0.200	63.500
45	0.345	0.354	0.169	0.104	0.045	0.068	0.200	48.300
46	0.345	0.355	0.169	0.104	0.045	0.068	0.200	63.500
47	0.344	0.354	0.169	0.104	0.049	0.066	0.200	63.500
48	0.345	0.354	0.169	0.104	0.046	0.068	0.200	48.300
49	0.346	0.355	0.170	0.104	0.045	0.067	0.200	50.800
50	0.344	0.355	0.170	0.104	0.045	0.067	0.200	63.500

Production Part Approval Process

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

Dimensional Analysis IHLE 3232DD


Dimensional Analysis, IHLE3232DD 1 .344+/- .01


Dimensional Analysis, IHLE 3232DD 2 .350+/- .01

Production Part Approval Process

The following PPAP documentation is assembled according to
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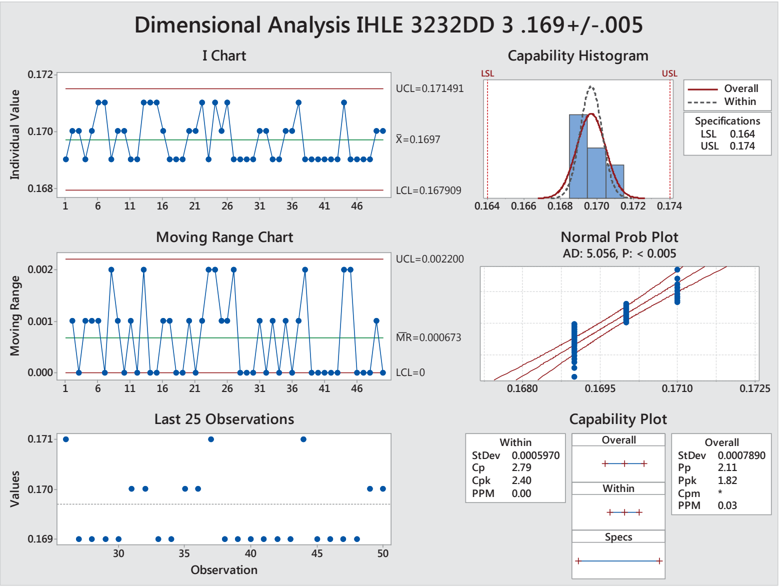
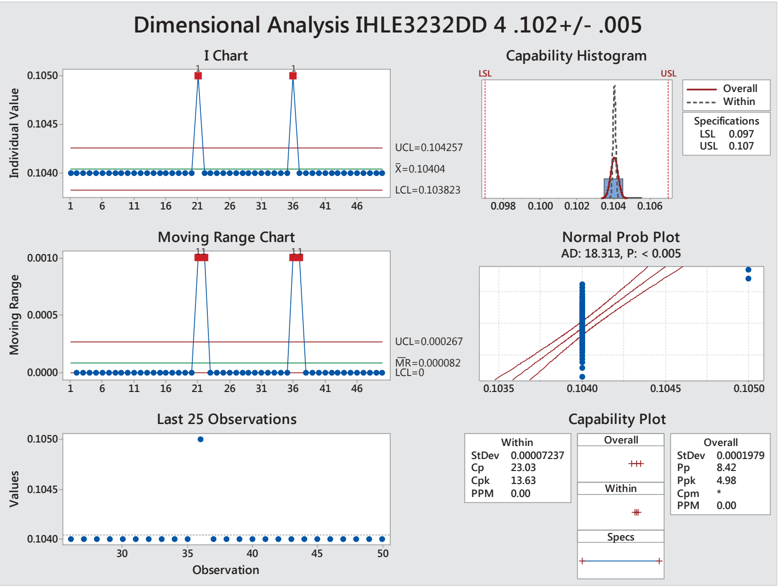
Dimensional Analysis IHLE 3232DD



Dimensional Analysis IHLE 3232DD 3 .169+/-.005

Within
StDev 0.0005970
Cp 2.79
Cpk 2.40
PPM 0.00

Overall
StDev 0.0007890
Pp 2.11
Ppk 1.82
Cpm *
PPM 0.03



Dimensional Analysis IHLE3232DD 4 .102+/- .005

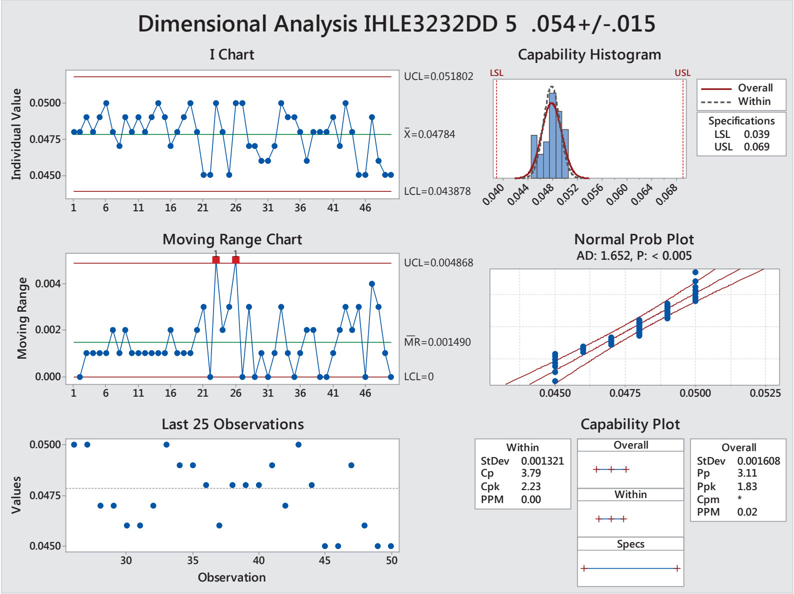
Within
StDev 0.00007237
Cp 23.03
Cpk 13.63
PPM 0.00

Overall
StDev 0.0001979
Pp 8.42
Ppk 4.98
Cpm *
PPM 0.00

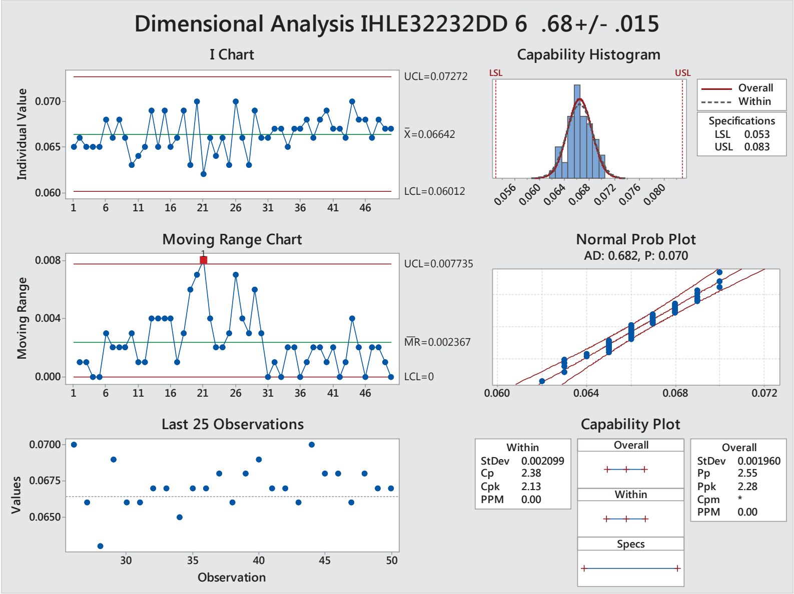
Production Part Approval Process

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

Dimensional Analysis IHLE 3232DD



Dimensional Analysis IHLE3232DD 5 .054+/-.015

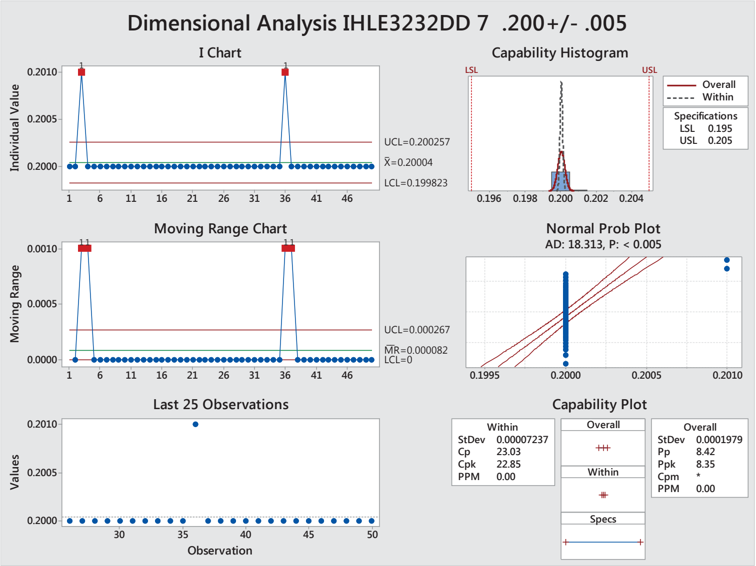


Dimensional Analysis IHLE32232DD 6 .68+/- .015

Production Part Approval Process

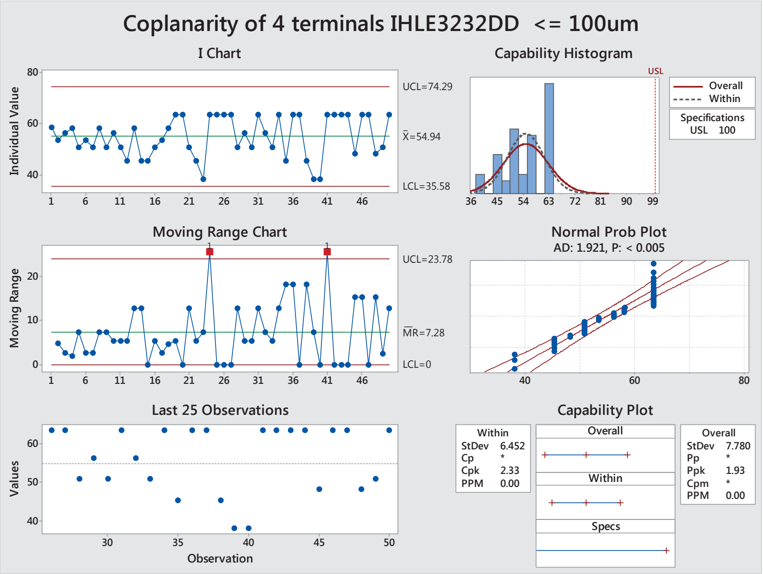
The following PPAP documentation is assembled according to
AIAG, 4th Edition PPAP Manual and applicable customer requirements

Dimensional Analysis IHLE 3232DD



Within	
StDev	0.00007237
Cp	23.03
Cpk	22.85
PPM	0.00

Overall	
StDev	0.0001979
Pp	8.42
Ppk	8.35
Cpm	*
PPM	0.00



Within	
StDev	6.452
Cp	*
Cpk	2.33
PPM	0.00

Overall	
StDev	7.780
Pp	*
Ppk	1.93
Cpm	*
PPM	0.00

VISHAY

IHLE3232DDER150M5A

TEST RESULTS

YANKTON MANUFACTURING LOCATION

A WORLD OF SOLUTIONS

IHLE3232DDER150M5A

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=-55ºC, RT=Room Temperature=+25ºC,HT=High Temperature=+125ºC 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	14.568	15.209	6.808	43.470	42.950	1.561
							Mimimum	12.569	13.397	4.124	42.280	41.110	-3.701
							Mean	13.499	14.257	5.641	42.833	42.207	-1.459
							Std Dev	0.426	0.372	0.702	0.254	0.296	0.870
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.626	15.323	7.332	62.590	63.020	1.110
							Mimimum	12.606	13.493	4.421	61.570	60.580	-2.416
							Mean	13.565	14.378	6.017	62.082	61.833	-0.401
							Std Dev	0.437	0.384	0.710	0.217	0.552	0.807
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.746	15.765	9.275	93.830	92.390	-0.532
							Mimimum	12.721	13.694	6.464	91.300	86.500	-6.213
							Mean	13.664	14.679	7.437	92.518	90.697	-1.968
							Std Dev	0.439	0.429	0.527	0.536	0.995	0.946

IHLE3232DDER150M5A

								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	14.368	14.398	0.878	43.970	43.610	2.016
							Mimimum	12.839	12.926	0.160	42.430	42.110	-1.988
							Mean	13.676	13.745	0.505	42.998	42.870	-0.294
							Std Dev	0.348	0.335	0.157	0.339	0.301	0.875
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.474	14.551	5.691	62.640	62.700	0.794
							Mimimum	12.875	12.995	0.508	61.540	60.100	-3.080
							Mean	13.732	13.845	0.822	62.051	61.735	-0.510
							Std Dev	0.355	0.352	0.578	0.236	0.453	0.736
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.601	14.590	0.137	92.790	92.450	0.452
							Mimimum	13.011	13.004	-0.219	90.520	88.040	-3.823
							Mean	13.839	13.835	-0.032	91.977	90.585	-1.512
							Std Dev	0.364	0.363	0.065	0.507	0.861	0.973

IHLE3232DDER150M5A

								Inductance (µH)			DC Resistance (mΩ)		
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			Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	14.097	14.366	3.317	43.840	43.260	0.589
							Mimimum	12.287	12.693	1.175	42.400	40.210	-5.871
							Mean	13.561	13.851	2.149	42.980	42.237	-1.727
							Std Dev	0.352	0.312	0.489	0.348	0.805	1.763
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.210	14.472	3.491	62.490	62.570	0.758
							Mimimum	12.322	12.752	1.294	61.350	59.640	-3.651
							Mean	13.615	13.921	2.257	61.844	61.149	-1.123
							Std Dev	0.369	0.322	0.525	0.280	0.572	0.927
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.351	14.722	7.211	93.270	92.120	0.779
							Mimimum	12.418	12.869	-1.759	90.930	87.620	-5.507
							Mean	13.722	14.105	2.811	92.170	90.104	-2.240
							Std Dev	0.364	0.337	1.329	0.501	1.251	1.422

								Inductance (µH)			DC Resistance (mΩ)		
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			Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	14.067	14.224	2.323	43.680	43.490	0.828
							Mimimum	12.113	12.106	-0.646	42.270	42.400	-2.385
							Mean	12.787	12.836	0.382	43.149	42.827	-0.744
							Std Dev	0.360	0.377	0.587	0.284	0.253	0.631
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.196	14.332	2.286	62.360	62.320	0.836
							Mimimum	12.180	12.146	-1.651	60.980	61.300	-0.356
							Mean	12.868	12.895	0.207	61.751	61.769	0.030
							Std Dev	0.375	0.384	0.649	0.284	0.280	0.225
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.286	14.258	0.401	93.440	93.620	0.591
							Mimimum	12.183	12.151	-1.097	91.070	90.670	-1.285
							Mean	12.869	12.869	0.003	92.304	92.261	-0.046
							Std Dev	0.381	0.378	0.324	0.546	0.543	0.364

IHLE3232DDER150M5A

								Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
8	Operational Life	MIL-STD-202, Method 108A	Temperature = 85°C for -1A/A1 models. Temperature =115° C for -5A models. Duration = 2000hrs. Pow er = As noted on the test request. Readings a 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	77	-55 deg. C	Maximum	14.401	14.716	5.851	44.320	43.490	0.700
							Mimimum	11.909	12.562	2.190	42.590	42.050	-4.738
							Mean	13.350	13.872	3.934	43.226	42.559	-1.535
							Std Dev	0.446	0.391	0.692	0.395	0.304	1.094
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.589	15.012	6.360	63.140	62.810	1.274
							Mimimum	12.064	12.693	2.747	61.550	60.760	-1.892
							Mean	13.459	14.054	4.438	62.007	61.505	-0.810
							Std Dev	0.458	0.413	0.663	0.280	0.539	0.733
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.662	15.270	6.920	93.690	92.630	1.736
							Mimimum	12.011	12.777	3.954	90.420	89.810	-2.492
							Mean	13.519	14.234	5.300	92.453	91.393	-1.144
							Std Dev	0.459	0.440	0.692	0.680	0.638	0.770
9	External Visual	MIL-STD-883G Method 2009.9	Inspect construction and workmanship.	Pass all criteria as defined in DPS-11,865 VA1	All	na	Pass						
10	Physical Dimensions	JESD22 Method JB-100	Verify physical dimensions per part specification	All parts within dimensional tolerance per data sheet	30	na	Pass						
12	Resistance to Solvents	MIL-STD-202G Method 215K	Add Aqueous wash chemical. OKEM Clean or equivalent. Do not use banned solvents.	Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial	5	na	Pass						

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13	Mechanical Shock	IEC-60068 part 2.27 test group Ea with precondition per 0 above	Pulse Shape-Half Sine Normal Pulse Length 6ms Peak acceleration-100g No. shocks-6 each in both directions of each axis (total of 36) Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	14.334	14.384	0.823	43.270	43.630	2.202
							Mimimum	12.846	12.952	0.001	42.410	42.200	-0.908
							Mean	13.608	13.658	0.372	42.788	42.795	0.018
							Std Dev	0.287	0.277	0.199	0.199	0.378	0.963
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.483	14.546	0.897	62.220	62.000	0.342
							Mimimum	12.926	13.042	0.287	61.170	60.910	-0.759
							Mean	13.721	13.792	0.519	61.629	61.467	-0.263
							Std Dev	0.303	0.292	0.130	0.253	0.267	0.297
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.482	14.524	0.369	93.060	92.800	0.185
							Mimimum	12.943	12.974	0.219	91.410	91.350	-0.447
							Mean	13.710	13.747	0.271	92.099	91.927	-0.187
							Std Dev	0.307	0.308	0.037	0.407	0.384	0.166
14	Vibration	IEC-60068 PART 2-6 TEST GROUP Fc. With precondition per 0 above	Pulse Shape-sine wave range of frequency 1 10-55Hz. Amplitude ±0.75mm Range of frequency 2 55-2000Hz Amplitude; 10G Frequency Sweep: 1 oct./min. Duration: 24 h each of 3 axis. Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	14.280	14.342	1.338	43.620	43.890	0.827
							Mimimum	12.224	12.388	0.294	42.760	42.740	-1.200
							Mean	13.562	13.655	0.695	43.264	43.181	-0.190
							Std Dev	0.537	0.513	0.244	0.231	0.331	0.548
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.448	14.522	1.299	62.620	62.640	0.244
							Mimimum	12.308	12.468	0.350	61.490	61.590	-0.210
							Mean	13.684	13.783	0.737	61.993	62.009	0.026
							Std Dev	0.552	0.532	0.209	0.261	0.265	0.136
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.480	14.507	0.358	93.690	93.070	-0.216
							Mimimum	12.385	12.430	0.164	91.750	91.070	-1.520
							Mean	13.721	13.756	0.254	92.595	91.889	-0.763
							Std Dev	0.532	0.529	0.056	0.428	0.475	0.363

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	Bump	IEC-60068 part 2-29 test group Eb with precondition per 0 above.	Pulse shape: half sine Nominal pulse length: 6 ms Peak Acceleration: 40g No. of shocks: 4000 each mechanical axis.Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	14.408	14.452	1.036	43.600	43.010	-0.047
							Mimimum	12.231	12.320	-0.021	42.580	42.190	-2.676
							Mean	13.472	13.545	0.551	42.982	42.627	-0.824
							Std Dev	0.622	0.605	0.257	0.315	0.216	0.665
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.570	14.628	0.939	62.100	61.870	0.458
							Mimimum	12.279	12.363	0.026	61.000	60.370	-1.469
							Mean	13.576	13.656	0.600	61.523	61.397	-0.205
							Std Dev	0.643	0.628	0.234	0.296	0.314	0.430
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	14.572	14.608	0.308	92.690	91.530	0.099
							Mimimum	12.237	12.259	0.149	90.650	88.600	-3.138
							Mean	13.578	13.609	0.229	91.498	90.209	-1.408
							Std Dev	0.649	0.650	0.045	0.489	0.872	0.818
15	Resistance to Solder Heat	MIL-STD-202G Method 210F Condition K	IR/convection reflow. 250 ± 5°C for 30 ± 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s	L= ±20% of initial, DCR = ±20% of initial	30			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						+25 deg. C	Maximum	14.316	14.276	0.512	62.820	62.900	0.432
							Mimimum	12.943	12.992	-0.753	61.890	61.950	-0.128
							Mean	13.591	13.590	0.001	62.288	62.303	0.025
							Std Dev	0.354	0.319	0.340	0.235	0.243	0.114
17	ESD	AEC-Q200-002	Determine the Classification of the part.	L= ±20% of initial, DCR = ±20% of initial	15			Inductance (µH)			DC Resistance (mΩ)		
								Initial	25KV	%Δ	Initial	25KV	%Δ
						+25 deg. C	Maximum	14.000	14.138	1.054	62.700	62.790	0.531
							Mimimum	12.291	12.401	-0.446	62.020	62.110	-0.416
							Mean	13.107	13.171	0.485	62.389	62.391	0.003
							Std Dev	0.442	0.449	0.465	0.223	0.224	0.347
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	[redacted]	[redacted]	Initial	[redacted]	[redacted]
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	14.408	[redacted]	[redacted]	43.600	[redacted]	[redacted]
							Mimimum	12.231	[redacted]	[redacted]	42.580	[redacted]	[redacted]
							Mean	13.472	[redacted]	[redacted]	42.982	[redacted]	[redacted]
							Std Dev	0.622	[redacted]	[redacted]	0.315	[redacted]	[redacted]
						+25 deg. C		Initial	[redacted]	[redacted]	Initial	[redacted]	[redacted]
							Maximum	14.570	[redacted]	[redacted]	62.100	[redacted]	[redacted]
							Mimimum	12.279	[redacted]	[redacted]	61.000	[redacted]	[redacted]
							Mean	13.576	[redacted]	[redacted]	61.523	[redacted]	[redacted]
							Std Dev	0.643	[redacted]	[redacted]	0.296	[redacted]	[redacted]
						+155 deg. C		Initial	[redacted]	[redacted]	Initial	[redacted]	[redacted]
							Maximum	14.572	[redacted]	[redacted]	92.690	[redacted]	[redacted]
							Mimimum	12.237	[redacted]	[redacted]	90.650	[redacted]	[redacted]
							Mean	13.578	[redacted]	[redacted]	91.498	[redacted]	[redacted]
							Std Dev	0.649	[redacted]	[redacted]	0.489	[redacted]	[redacted]
								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	13.489	13.484	0.770	62.940	62.980	0.417
							Mimimum	12.113	12.115	-0.131	62.200	62.240	-0.095
							Mean	12.736	12.743	0.056	62.558	62.638	0.129
							Std Dev	0.386	0.386	0.166	0.194	0.193	0.110
								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	13.998	14.013	0.292	62.900	62.930	0.224
							Mimimum	12.469	12.494	-0.255	62.310	62.400	-0.287
							Mean	13.205	13.214	0.067	62.592	62.601	0.015
							Std Dev	0.420	0.426	0.133	0.170	0.135	0.126

SECTION 10

PERFORMANCE TEST RESULTS

DANSHUI, CHINA MANUFACTURING LOCATION

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- Parts were manufactured in the Danshui, China manufacturing location.

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Test #	Description	Ref. Spec. Meth / Cond	Test Conditions	End Point Δ requirements	Sample Size	Meas Temp							
0	3x reflow Preconditioning for lead-free products	ICP 10,373	As specified in sections 6.3 thru 6.4 except Visual per DPS-11,865 10X magnification										
1	Pre- and Post-Stress Electrical Test	IHLP Data Sheet	L (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=-55ºC, RT=Room Temperature=+25ºC,HT=High Temperature=+125ºC for –A1/1A models. HT=High Temperature =+155° C for -5A models.	L=±20% of initial, DCR =±20% of initial	77			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	31.643	33.677	9.963	101.800	100.560	-0.772
							Mimimum	28.894	31.664	5.685	100.500	98.680	-2.207
							Mean	30.667	32.780	6.901	101.026	99.309	-1.699
							Std Dev	0.610	0.499	0.744	0.333	0.448	0.286
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	31.878	33.950	8.688	147.240	145.940	-0.749
							Mimimum	29.068	31.593	5.890	146.130	144.640	-1.283
							Mean	30.880	33.073	7.115	146.681	145.305	-0.938
							Std Dev	0.627	0.524	0.698	0.258	0.273	0.102
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	32.103	34.730	9.769	219.700	218.000	-0.275
							Mimimum	29.692	32.506	7.070	214.800	213.100	-1.463
							Mean	31.169	33.737	8.243	217.868	216.523	-0.616
							Std Dev	0.566	0.569	0.498	1.213	1.094	0.268

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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	32.683	32.756	0.779	102.330	102.160	1.219
							Mimimum	29.585	29.815	0.098	99.950	100.590	-0.816
							Mean	31.533	31.673	0.446	100.715	101.212	0.495
							Std Dev	0.615	0.590	0.154	0.465	0.344	0.525
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	33.141	33.167	0.624	147.040	146.790	-0.034
							Mimimum	29.740	29.902	-0.180	145.560	145.340	-0.302
							Mean	31.872	31.952	0.254	146.202	146.016	-0.128
							Std Dev	0.652	0.630	0.150	0.300	0.313	0.060
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	33.218	33.244	0.370	219.900	219.500	1.689
							Mimimum	29.825	29.864	0.050	213.100	214.800	-0.966
							Mean	31.934	31.976	0.132	217.244	217.442	0.095
							Std Dev	0.645	0.646	0.045	1.641	1.087	0.667

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4	Temperature Cycling	IEC-60068, Part 2.14 test group Na	-55°C to +125°C (+155° C for -5A models) dwell time = 30 min. transfer time ≤10 sec. no. of cycles = 1000 unpowered initial (0 cycles) and final 1000 cycles). Readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	77			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	32.513	33.115	5.825	102.270	100.720	-0.959
							Mimimum	28.373	30.025	1.365	100.370	98.850	-2.323
							Mean	30.622	31.726	3.638	101.149	99.455	-1.674
							Std Dev	0.898	0.616	1.198	0.377	0.351	0.276
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	32.870	33.410	6.208	147.340	146.890	-0.266
							Mimimum	28.461	30.228	1.203	145.900	145.180	-0.714
							Mean	30.834	31.963	3.696	146.668	146.007	-0.450
							Std Dev	0.930	0.635	1.252	0.261	0.285	0.098
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	32.791	33.927	4.835	219.400	218.800	0.509
							Mimimum	29.133	30.542	3.071	215.400	215.200	-0.962
							Mean	31.170	32.394	3.931	217.978	217.512	-0.214
							Std Dev	0.730	0.670	0.377	0.959	0.967	0.223

7	Biased Humidity	IEC-60068 Part 2-67	Temperature = 85°C ±20°C Humidity = 85% ±5% RH Duration = 1000 hours Power = No Power Initial (0hr.) and final (1000hr.) readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	77			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	33.256	32.325	0.992	101.950	102.430	1.971
							Mimimum	28.904	28.177	-2.798	99.730	100.550	-0.542
							Mean	30.479	30.449	-0.101	100.406	101.182	0.775
							Std Dev	0.700	0.758	0.804	0.500	0.415	0.584
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	33.565	32.582	1.056	147.690	147.320	0.116
							Mimimum	29.075	28.382	-2.928	145.670	145.590	-0.355
							Mean	30.696	30.635	-0.199	146.309	146.127	-0.124
							Std Dev	0.731	0.770	0.791	0.310	0.305	0.105
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	33.570	32.235	-0.672	219.200	220.100	2.055
							Mimimum	29.699	28.415	-4.324	214.100	214.300	-1.607
							Mean	31.140	30.547	-1.908	216.925	217.475	0.258
							Std Dev	0.654	0.722	0.771	1.321	1.001	0.806

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								Inductance (µH)			DC Resistance (mΩ)		
8	Operational Life	MIL-STD-202, Method 108A	Temperature = 85°C for -1A/A1 models. Temperature =115° C for -5A models. Duration = 2000hrs. Pow er = As noted on the test request. Readings a 0, 250, 500, 1000 and 2000 hour intervals. Initial (0 hr.) and final (2000 hr.) readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	77			Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	32.737	33.641	5.972	102.830	101.540	0.839
							Mimimum	28.265	29.894	1.904	100.100	99.030	-3.491
							Mean	30.899	31.999	3.571	100.878	99.817	-1.049
							Std Dev	0.769	0.691	0.703	0.653	0.572	0.619
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	32.942	34.204	6.212	147.360	146.620	0.082
							Mimimum	28.434	30.201	2.821	145.670	144.890	-0.607
							Mean	31.117	32.415	4.181	146.412	145.791	-0.424
							Std Dev	0.785	0.717	0.668	0.336	0.325	0.103
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	33.217	34.757	7.200	220.700	219.500	1.589
							Mimimum	28.555	30.589	3.835	212.500	213.500	-1.608
							Mean	31.254	32.875	5.191	217.505	217.004	-0.228
							Std Dev	0.774	0.771	0.666	1.689	1.332	0.487
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	32.311	32.401	1.158	101.600	101.880	0.604
							Mimimum	30.527	30.709	0.279	100.240	99.960	-0.685
							Mean	31.393	31.594	0.642	100.754	100.510	-0.243
							Std Dev	0.493	0.462	0.229	0.358	0.583	0.293
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	32.708	32.724	0.313	147.110	146.670	-0.123
							Mimimum	31.005	31.068	-0.019	146.020	145.670	-0.334
							Mean	31.842	31.890	0.151	146.494	146.105	-0.265
							Std Dev	0.492	0.484	0.085	0.289	0.269	0.053
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	32.771	32.804	0.168	219.300	218.100	-0.275
							Mimimum	31.069	31.103	0.016	217.900	214.500	-1.786
							Mean	31.927	31.960	0.102	218.597	216.743	-0.848
							Std Dev	0.491	0.489	0.026	0.339	1.077	0.433

								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	32.597	32.679	0.652	101.620	101.380	0.735
							Mimimum	30.994	31.120	0.252	100.300	99.460	-1.870
							Mean	31.734	31.860	0.397	100.795	100.073	-0.715
							Std Dev	0.401	0.389	0.090	0.394	0.513	0.715
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	32.870	32.812	0.582	146.480	146.190	-0.192
							Mimimum	31.218	31.232	-0.185	145.790	145.380	-0.363
							Mean	32.075	32.144	0.213	146.149	145.726	-0.289
							Std Dev	0.404	0.396	0.216	0.190	0.197	0.048
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	32.917	32.940	0.109	218.400	218.100	1.400
							Mimimum	31.327	31.353	0.028	214.300	213.200	-1.706
							Mean	32.159	32.186	0.083	216.560	216.440	-0.053
							Std Dev	0.407	0.408	0.020	1.044	1.515	0.917

IHLE3232DDER330M5A

	Bump	IEC-60068 part 2-29 test group Eb with precondition per 0 above.	Pulse shape: half sine Nominal pulse length: 6 ms Peak Acceleration: 40g No. of shocks: 4000 each mechanical axis.Initial and final readings at LT/RT/HT	L=±20% of initial, DCR =±20% of initial	30			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						-55 deg. C	Maximum	32.442	32.494	0.485	101.280	101.670	1.721
							Mimimum	30.569	30.712	0.160	99.690	99.640	-1.303
							Mean	31.629	31.720	0.290	100.183	100.268	0.088
							Std Dev	0.477	0.459	0.097	0.466	0.653	0.893
						+25 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	32.825	32.821	0.296	146.350	146.550	0.274
							Mimimum	30.883	30.946	-0.159	145.520	145.650	-0.048
							Mean	31.964	31.984	0.063	145.891	146.111	0.151
							Std Dev	0.493	0.473	0.105	0.229	0.251	0.080
						+155 deg. C		Initial	Final	%Δ	Initial	Final	%Δ
							Maximum	32.781	32.802	0.106	218.100	217.800	2.356
							Mimimum	30.902	30.931	0.027	212.200	213.500	-1.613
							Mean	32.010	32.032	0.068	215.860	216.553	0.329
							Std Dev	0.484	0.485	0.019	1.739	1.372	1.195
15	Resistance to Solder Heat	MIL-STD-202G Method 210F Condition K	IR/convection reflow. 250 ± 5°C for 30 ± 5sec. Ramp rate 1°C/s to 4°C/; Above 183°C for 90s-120s	L=±20% of initial, DCR =±20% of initial	30			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						+25 deg. C	Maximum	32.831	33.319	5.375	146.070	145.620	-0.130
							Mimimum	28.232	29.749	1.487	145.350	144.930	-0.377
							Mean	30.853	31.799	3.079	145.665	145.268	-0.273
							Std Dev	0.826	0.691	0.721	0.216	0.193	0.069
17	ESD	AEC-Q200-002	Determine the Classification of the part.	L=±20% of initial, DCR =±20% of initial	15			Inductance (µH)			DC Resistance (mΩ)		
								Initial	25KV	%Δ	Initial	25KV	%Δ
						+25 deg. C	Maximum	31.851	30.778	1.235	146.550	147.550	0.827
							Mimimum	28.920	25.695	-17.401	145.790	146.410	0.425
							Mean	30.927	29.061	-5.973	146.235	147.180	0.646
							Std Dev	0.781	1.340	5.001	0.207	0.291	0.104
18	Solderability	J-STD-002 Method S1	Dry heat = 16 hrs @ 155°C Solder = SnAgCu (96/3.5/0.5)% T = 230°C	95% or greater coverage	15	NA	Pass						

IHLE3232DDER330M5A

								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	32.442			101.280		
							Mimimum	30.569			99.690		
							Mean	31.629			100.183		
							Std Dev	0.477			0.466		
						+25 deg. C		Initial			Initial		
							Maximum	32.825			146.350		
							Mimimum	30.883			145.520		
							Mean	31.964			145.891		
							Std Dev	0.493			0.229		
						+155 deg. C		Initial			Initial		
							Maximum	32.781			218.100		
							Mimimum	30.902			212.200		
							Mean	32.010			215.860		
							Std Dev	0.484			1.739		
21	Board Flex	AEC-Q200-005 Appendix 2	2mm minimum flex for 60 (+5) sec	Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial	30			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						+25 deg. C	Maximum	32.751	32.998	0.766	147.040	147.490	0.518
							Mimimum	28.690	28.840	0.341	146.110	146.460	0.198
							Mean	31.234	31.421	0.596	146.634	147.096	0.315
							Std Dev	0.926	0.939	0.092	0.232	0.274	0.067
22	Terminal Strength	AEC-Q200-006 Appendix 1	Force of 1.8kg (17.7 N) for 60 seconds	Pass all criteria as defined in DPS-11,865 VA1 L=±20% of initial, DCR =±20% of initial	30			Inductance (µH)			DC Resistance (mΩ)		
								Initial	Final	%Δ	Initial	Final	%Δ
						+25 deg. C	Maximum	32.066	32.005	0.522	146.790	146.950	0.240
							Mimimum	28.707	28.723	-0.190	145.760	145.940	0.055
							Mean	30.580	30.650	0.229	146.121	146.320	0.136
							Std Dev	0.896	0.892	0.172	0.216	0.217	0.037

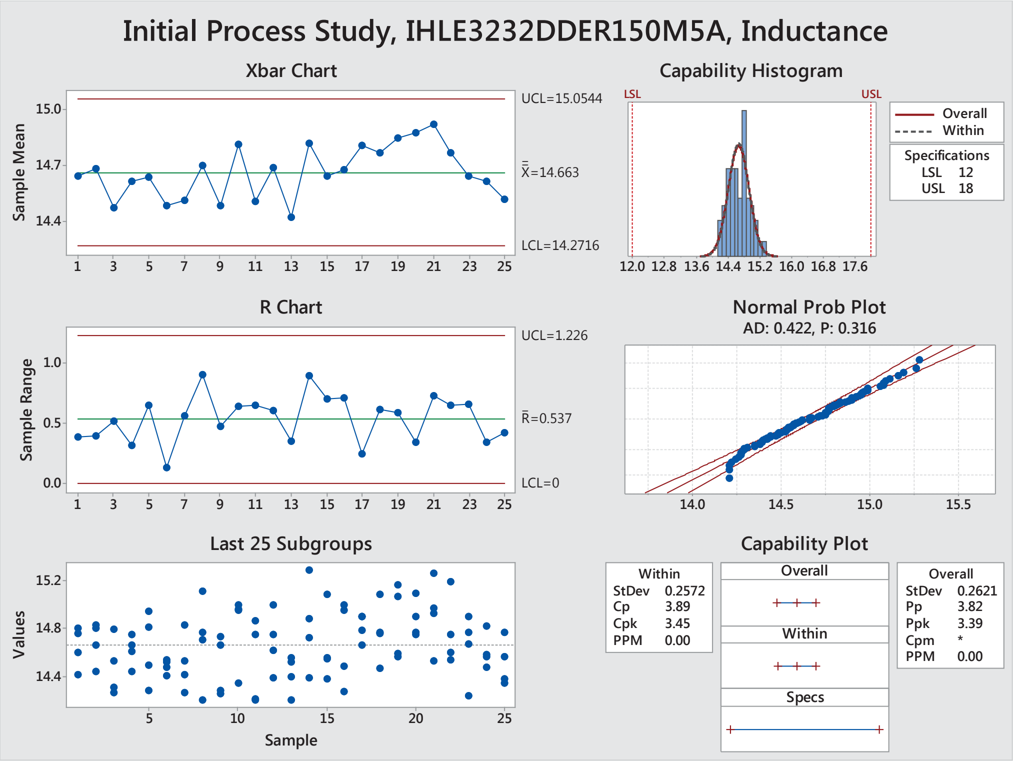
VISHAY.

Production Part Approval Process

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

Initial Process Study
IHLE3232DDER150M5A, Inductance

Inductance (uH)							
1	14.8	26	14.53	51	14.21	76	15.16
2	14.6	27	14.42	52	14.4	77	15.09
3	14.42	28	14.83	53	15.28	78	14.77
4	14.76	29	14.21	54	14.72	79	14.9
5	14.8	30	15.11	55	14.39	80	14.75
6	14.44	31	14.77	56	14.88	81	15.26
7	14.66	32	14.71	57	14.38	82	14.97
8	14.83	33	14.29	58	14.55	83	14.92
9	14.53	34	14.73	59	15.08	84	14.53
10	14.27	35	14.26	60	14.56	85	14.75
11	14.31	36	14.66	61	14.49	86	15.19
12	14.79	37	14.96	62	14.99	87	14.6
13	14.66	38	14.35	63	14.95	88	14.54
14	14.75	39	14.99	64	14.28	89	14.9
15	14.44	40	14.95	65	14.66	90	14.24
16	14.61	41	14.75	66	14.9	91	14.77
17	14.81	42	14.21	67	14.78	92	14.67
18	14.29	43	14.22	68	14.9	93	14.48
19	14.94	44	14.86	69	14.76	94	14.58
20	14.5	45	14.75	70	14.47	95	14.82
21	14.54	46	14.62	71	15.08	96	14.57
22	14.48	47	14.39	72	14.77	97	14.35
23	14.41	48	14.99	73	14.59	98	14.77
24	14.52	49	14.56	74	15.06	99	14.38
25	14.27	50	14.52	75	14.57	100	14.57

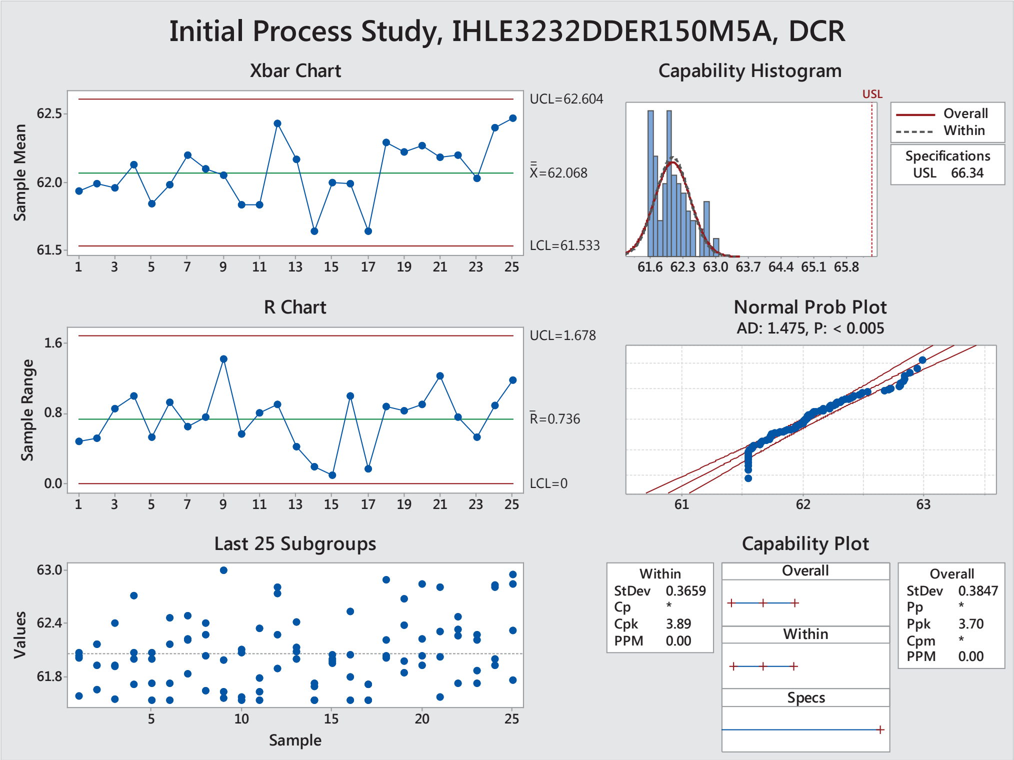


Production Part Approval Process

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

Initial Process Study
IHLE3232DDER150M5A, DC Resistance

DCR (mOhm)							
1	62.07	26	62.23	51	62	76	61.85
2	61.59	27	61.84	52	62.09	77	62.23
3	62.02	28	62.22	53	61.74	78	62.04
4	62.04	29	62.04	54	61.55	79	62.84
5	62.17	30	62.28	55	61.55	80	61.94
6	62.17	31	62.4	56	61.7	81	61.58
7	61.66	32	61.65	57	61.96	82	62.03
8	61.94	33	61.99	58	61.98	83	62.81
9	61.56	34	62.99	59	62.05	84	62.31
10	61.94	35	61.57	60	62	85	62.48
11	61.92	36	61.64	61	62.05	86	62.26
12	62.41	37	61.55	62	62.54	87	62.33
13	62.71	38	62.11	63	61.55	88	61.73
14	62.07	39	61.58	64	61.81	89	61.87
15	62	40	62.08	65	61.55	90	62.22
16	61.72	41	61.55	66	61.72	91	62.27
17	61.73	42	61.79	67	61.55	92	61.74
18	62	43	62.35	68	61.72	93	61.94
19	62.07	44	61.64	69	62.02	94	62.81
20	61.55	45	61.9	70	62.04	95	62.01
21	61.55	46	62.73	71	62.89	96	62.83
22	62.47	47	62.27	72	62.22	97	62.84
23	62.17	48	62.8	73	62.38	98	61.77
24	61.74	49	62.42	74	62.68	99	62.95
25	62.49	50	62.14	75	61.98	100	62.32

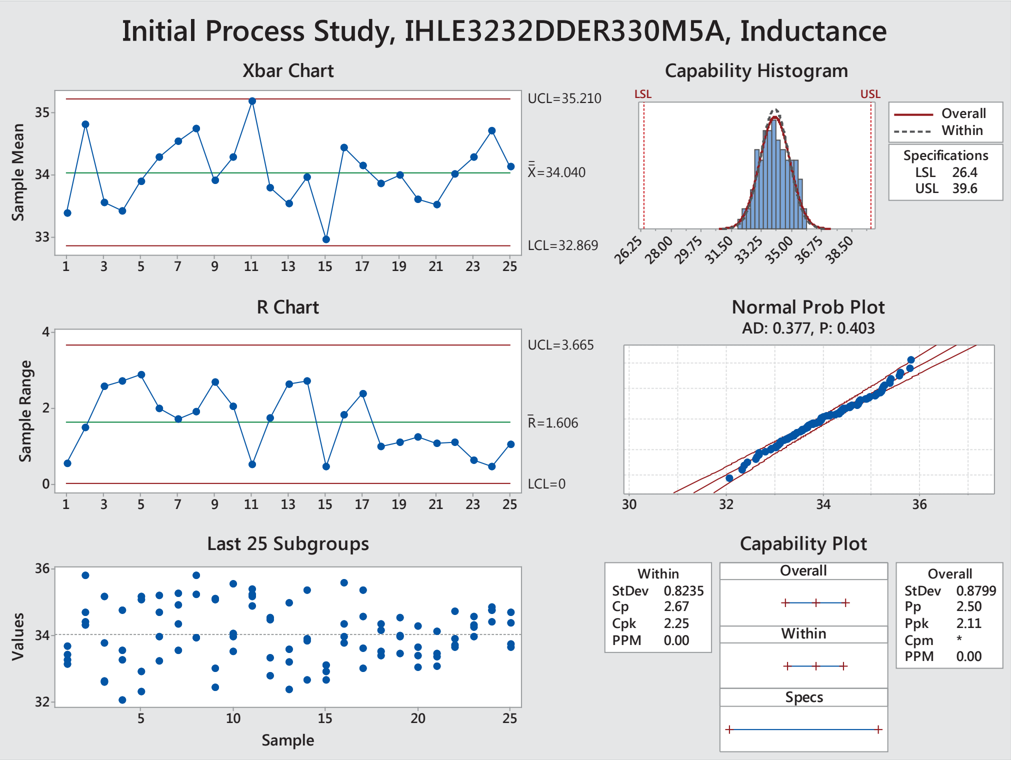


Production Part Approval Process

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

Initial Process Study
IHLE3232DDER330M5A, Inductance

Inductance (uH)							
1	33.27	26	35.27	51	32.37	76	34.55
2	33.14	27	33.56	52	33.2	77	34.29
3	33.68	28	34.36	53	33.86	78	33.06
4	33.44	29	35.26	54	35.39	79	33.39
5	35.81	30	33.94	55	33.9	80	33.67
6	34.33	31	35.83	56	32.68	81	33.47
7	34.72	32	33.95	57	33.12	82	33.37
8	34.41	33	32.44	58	35.7	83	33.09
9	33.8	34	33.02	59	32.78	84	34.14
10	35.18	35	35.12	60	32.94	85	33.67
11	32.61	36	35.08	61	33.99	86	33.92
12	32.64	37	34.08	62	33.8	87	33.71
13	32.07	38	33.97	63	34.37	88	34.75
14	33.56	39	35.58	64	35.61	89	34.59
15	34.77	40	33.53	65	33.03	90	34.25
16	33.29	41	35.24	66	35.39	91	34.34
17	35.1	42	35.4	67	33.63	92	33.97
18	32.92	43	35.2	68	34.57	93	34.76
19	35.2	44	34.9	69	34.16	94	34.88
20	32.33	45	34.47	70	34.37	95	34.43
21	35.23	46	32.81	71	33.4	96	34.76
22	33.96	47	33.34	72	33.52	97	33.75
23	34.72	48	34.55	73	34	98	34.7
24	33.25	49	34.98	74	33.97	99	34.4
25	34.94	50	33.6	75	33.46	100	33.67

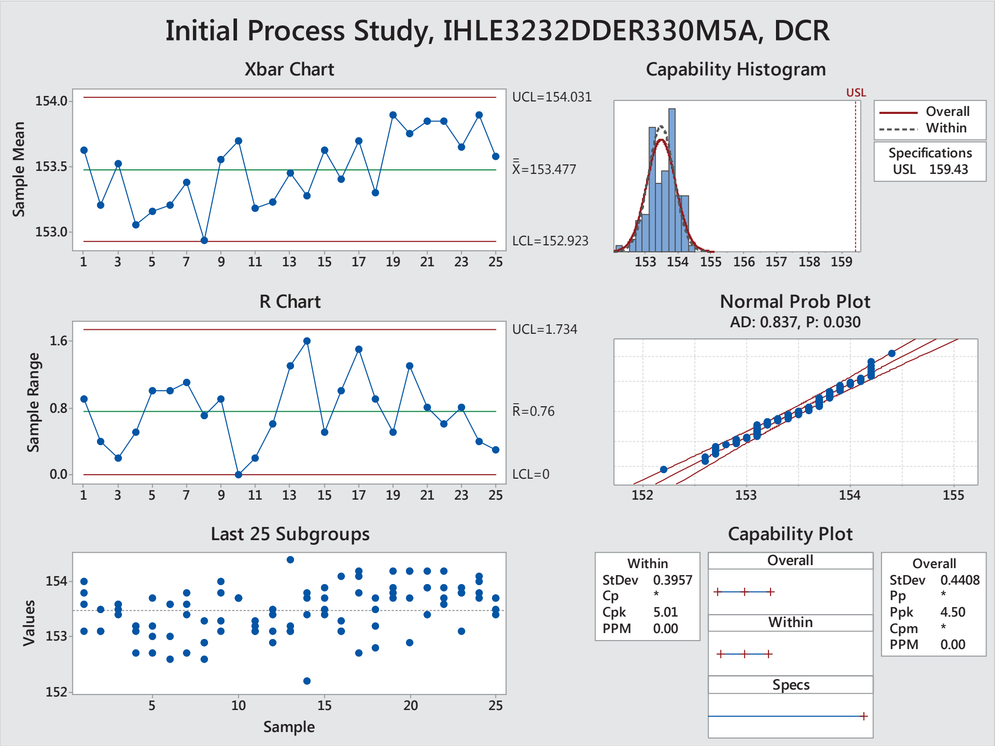


Production Part Approval Process

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

Initial Process Study
IHLE3232DDER330M5A, DC Resistance

DCR (mOhm)							
1	154	26	153.8	51	154.4	76	153.8
2	153.1	27	153.6	52	153.1	77	154.2
3	153.6	28	152.7	53	152.2	78	153.7
4	153.8	29	153.3	54	153.7	79	154.2
5	153.1	30	152.6	55	153.8	80	152.9
6	153.1	31	152.9	56	153.4	81	153.9
7	153.1	32	152.9	57	153.9	82	154.2
8	153.5	33	153.8	58	153.5	83	153.4
9	153.4	34	153.1	59	153.7	84	153.9
10	153.6	35	153.3	60	153.4	85	154.2
11	153.5	36	154	61	153.3	86	153.6
12	153.6	37	153.7	62	154.1	87	153.7
13	153.2	38	153.7	63	153.1	88	153.9
14	152.7	39	153.7	64	153.1	89	153.1
15	153.2	40	153.7	65	152.7	90	153.8
16	153.1	41	153.1	66	154.1	91	153.8
17	153.2	42	153.1	67	154.2	92	153.9
18	153.7	43	153.2	68	153.8	93	154
19	152.7	44	153.3	69	153.5	94	153.8
20	153	45	152.9	70	152.8	95	153.7
21	153.6	46	153.4	71	153.2	96	154.1
22	153.6	47	153.1	72	153.7	97	153.7
23	152.6	48	153.5	73	153.7	98	153.5
24	153	49	153.1	74	153.9	99	153.4
25	153.4	50	153.2	75	154.2	100	153.7



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

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

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.

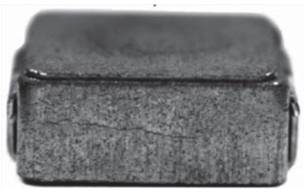
The IHLP inductor provides the best combination of:

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

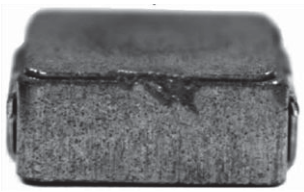
Surface irregularities

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

IHLP Standards of Manufacture

CRACKS

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

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

Terminal area crack, acceptable

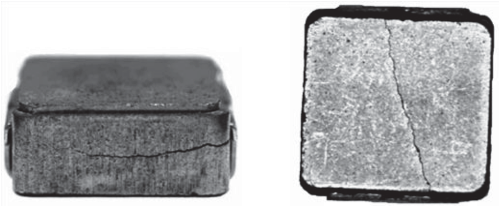
Cracks coming from the top corner of the terminal are a normal occurrence and are caused by terminal expansion during curing operations.

Negligible crack, acceptable

Negligible cracks are those that are nearly invisible without magnification.

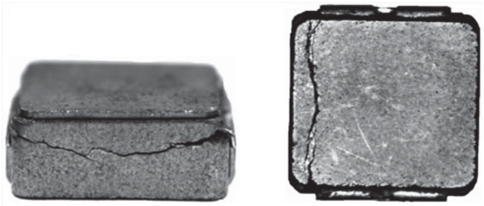
Minor crack, acceptable

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



Moderate crack, rejectable

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



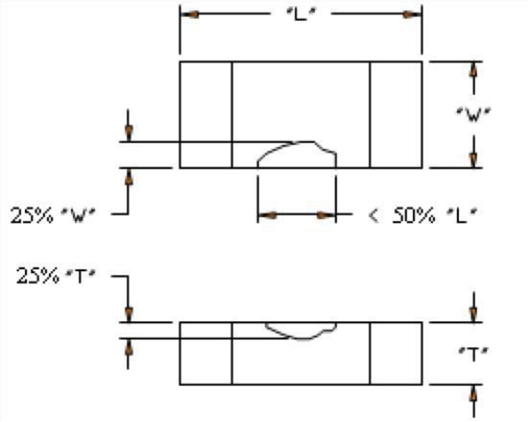
Major crack, rejectable

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

IHLP Standards of Manufacture

CHIPS

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

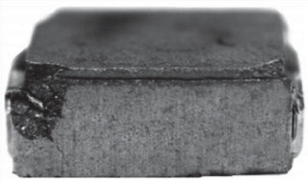


T	25 % of the thickness
W	25 % of the width
L	50 % of the length

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

Minor chipping, acceptable

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



Major chipping, rejectable

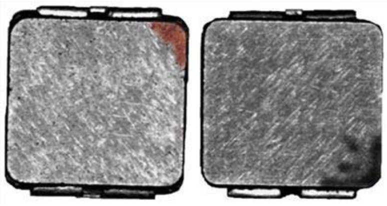
Major chips in the inductor body are those that are very obvious to the customer and may expose the wire coil or lead frame.

OXIDATION

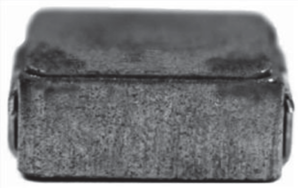
The IHLP inductor is predominately iron and oxidation may occur in a small percentage of the inductors. Resin binders give moderate protection, but some slight oxidation may occur. All components should be stored away from heat, humidity and ionized atmospheres as much as possible before mounting.

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

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



Top view



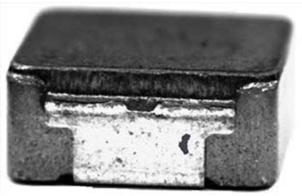
Side view

IHLP Standards of Manufacture

OTHER

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

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



Foreign material: Acceptable

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

Scratch: Acceptable

SUMMARY

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

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

IHLP Solder Profile and Cleaning Guide

Vishay Dale

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

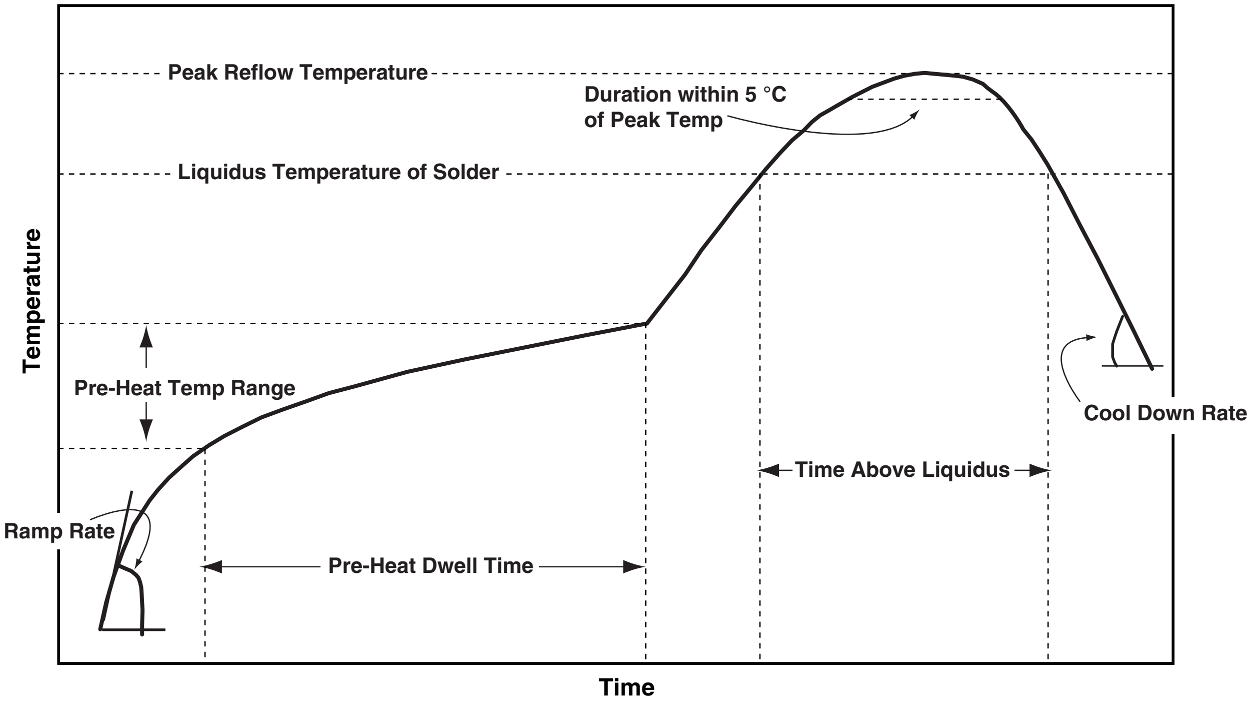


Fig. 1 - Infrared reflow soldering (SMD package)

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.