

POWER INDUCTOR

- CHC SERIES -

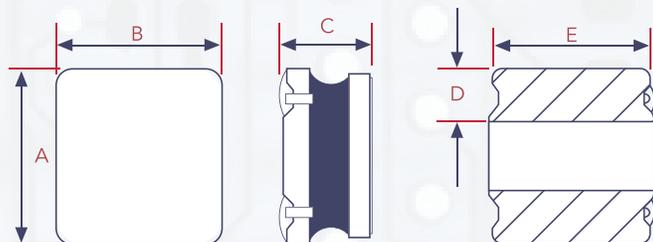
FEATURES

- This specification applies Low Profile Power Inductors.
- 100% Lead (Pb) & Halogen-Free and RoHS compliant.
- High reliability -Reliability tests comply to AEC-Q200.

APPLICATIONS

- Automotive applications.

DIMENSION



*A	*B	*C	D	E
3.2 ± 0.2	2.5 ± 0.2	1.0 ± 0.2	1.0 ± 0.3	2.5 ± 0.2

UNIT : MM

*Dimensions are not including the termination. For maximum overall dimensions with termination, add 0.1mm

PART NUMBERING



SPECIFICATION

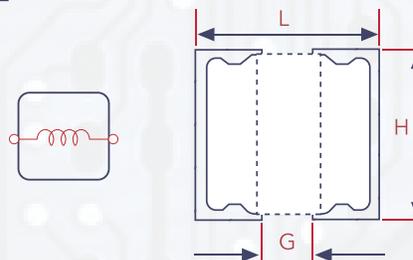
PART NUMBER	INDUCTANCE (μH) ± 20% @ 0 A DC	I rms (A)		I sat (A)		DCR (mΩ)	
		TYP	MAX	TYP	MAX	TYP	MAX
CHC322512BMV-R33M	0.33	5.00	4.50	4.50	4.20	19	22.8
CHC322512BMV-R47M	0.47	4.50	4.10	4.00	3.80	25	30
CHC322512BMV-R68M	0.68	4.10	3.60	3.70	3.40	32	38
CHC322512BMV-1R0M	1.00	3.50	3.20	3.00	2.80	39	47
CHC322512BMV-1R5M	1.50	3.20	3.00	2.40	2.20	48	58
CHC322512BMV-2R2M	2.20	2.90	2.70	2.10	1.90	72	86
CHC322512BMV-3R3M	3.30	2.50	2.20	1.80	1.60	105	126
CHC322512BMV-4R7M	4.70	2.20	2.00	1.50	1.30	148	177
CHC322512BMV-5R6M	5.60	1.90	1.70	1.25	1.15	170	204
CHC322512BMV-6R8M	6.80	1.70	1.40	1.15	1.05	200	240
CHC322512BMV-8R2M	8.20	1.50	1.30	1.00	0.90	260	312
CHC322512BMV-100M	10.0	1.30	1.10	0.92	0.82	350	420
CHC322512BMV-150M	15.0	1.00	0.90	0.70	0.65	460	552
CHC322512BMV-220M	22.0	0.80	0.70	0.60	0.55	660	792

NOTE:

1. Test frequency : Ls : 100KHz /1.0V.
2. All test data referenced to 25°C ambient.
3. Testing Instrument(or equ) : Agilent 4284A, E4991A, 4339B, KEYSIGHT E4980A/AL, chroma3302, 3250, 16502.
4. Heat Rated Current (Irms) will cause the coil temperature rise approximately ΔT of 40°C
5. Saturation Current (Isat) will cause L0 to drop approximately 30%.
6. The part temperature (ambient + temp rise) should not exceed 125°C under worst case operating conditions. Circuit design, component, PCB trace size and thickness, airflow and other cooling provisions all affect the part temperature. Part temperature should be verified in the end application.
7. I rms Testing : Temperature rise is highly dependent on many factors including pcb land pattern, trace size, and proximity to other components. Therefore temperature rise should be verified in application conditions.
8. Rated DC current: The lower value of I rms and Isat



RECOMMENDED LAND PATTERN

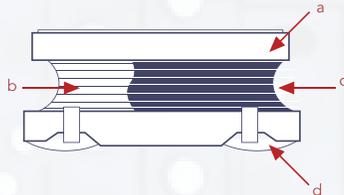


L	G	H
3.5	1.0	3.0

Note:

1. PCB layout is referred to standard IPC-7351B
2. The above PCB layout reference only.
3. Recommend solder paste thickness at 0.15mm and above.

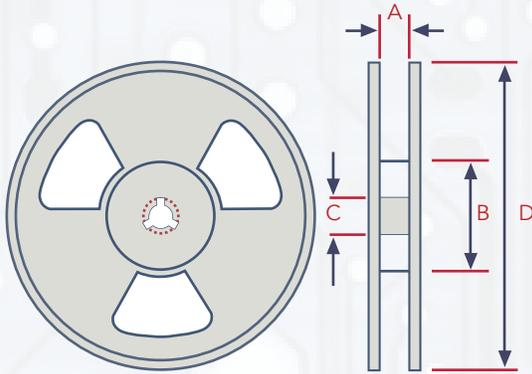
MATERIAL LIST



NO.	ITEMS	MATERIALS
a	Core	Ferrite Core
b	Wire	Enameled Copper Wire
c	Glue	Epoxy with Magnetic Powder
d	Terminal	Ag / Ni / Sn+ Sn Solder

PACKAGING INFORMATION

REEL DIMENSION

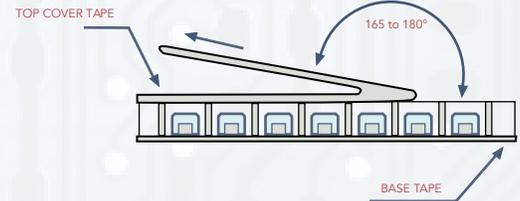


TYPE	A (MM)	B (MM)	C (MM)	D (MM)
7" x 8mm	8.4 + 1.5 / -0	60 ± 1.0	13 + 0.5 / -0.2	178 ± 2.0

PACKAGING QUANTITY

CHC	322512
Reel	3000

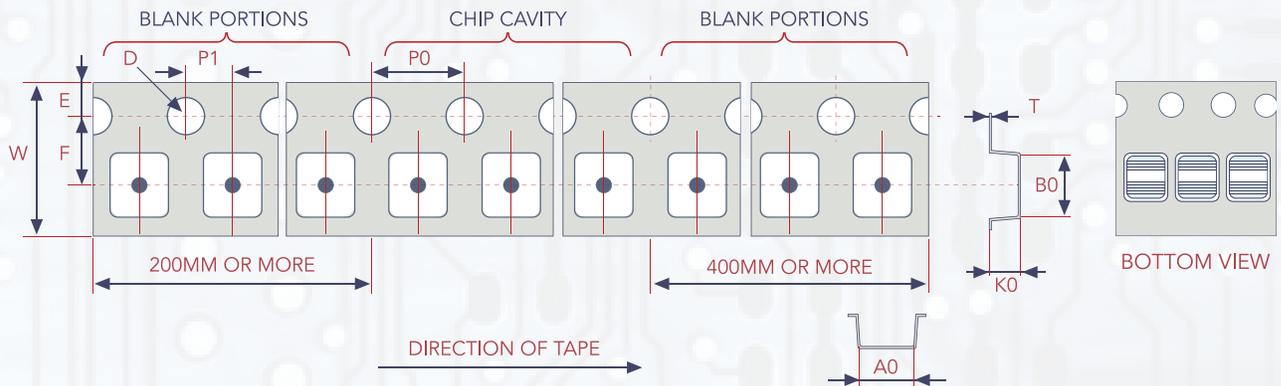
TEARING OFF FORCE



- The force for tearing off cover tape is 10 to 100 grams in the arrow direction under the following conditions (referenced ANSI/EIA-481-D-2008 of 4.11 standard).

TEARING SPEED (MM)	ROOM TEMP (°C)	ROOM HUMIDITY (%)	ROOM ATM (hPa)
300 ± 10%	5 ~ 35	45 ~ 85	860 ~ 1060

TAPE DIMENSION



UNIT : MM

B0	A0	K0	P	W	T	E	F	D	P0	P2
3.6 ± 0.1	2.9 ± 0.1	1.4 ± 0.1	4.0 ± 0.1	8.0 ± 0.3	0.23 ± 0.1	1.75 ± 0.1	3.50 ± 0.1	1.50 ± 0.1	4.0 ± 0.1	2.0 ± 0.1





RELIABILITY AND TEST CONDITION

ITEM	PERFORMANCE	TEST CONDITIONS
Operating Temperature	-55~+125°C (Including self - temperature rise)	
Storage Temperature and Humidity Range	1. -10~+40°C, 50~60%RH (Product with taping) 2. -55~+125°C (on board)	

ELECTRICAL PERFORMANCE TEST

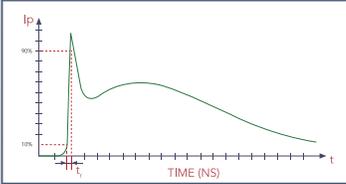
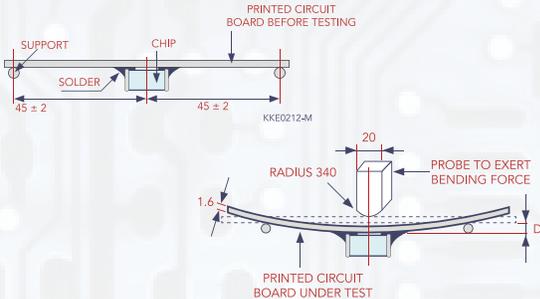
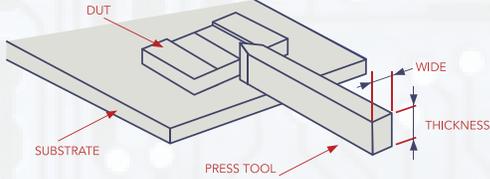
Inductance	Refer to standard electrical characteristics list	HP4284A, CH11025, CH3302, CH1320, CH1320S LCR Meter.
DCR		CH16502, Agilent 33420A Micro-Ohm Meter.
Saturation Current (Isat)	Approximately ΔL30%	Saturation DC Current (Isat) will cause L0 to drop ΔL(%)
Heat Rated Current (Irms)	Approximately ΔT40°C	Heat Rated Current (Irms) will cause the coil temperature rise ΔT(°C). 1. Applied the allowed DC current 2. Temperature measured by digital surface thermometer

RELIABILITY TEST

High Temperature Exposure(Storage) AEC-Q200	Appearance: No damage. Inductance: with in ±10% of initial value Q: Shall not exceed the specification value. RDC: within ±15% of initial value and shall not exceed the specification value	Preconditioning: Run through IR reflow for 3 times. (IPC/JEDEC J-STD-020E Classification Reflow Profiles Temperature: 125 ± 2°C (Inductor) Duration: 1000hrs Min. Measured at room temperature after placing for 24 ± 2 hrs															
Temperature Cycling AEC-Q200		Preconditioning: Run through IR reflow for 3 times. (IPC/JEDEC J-STD-020E Classification Reflow Profiles Condition for 1 cycle Step1 : -55 ± 2°C 30min Min. (Inductor) Step2 : 125 ± 2°C transition time 1min MAX. Step3 : 125 ± 2°C 30min Min. Step4 : Low temp. transition time 1min MAX. Number of cycles: 1000 Measured at room temperature after placing for 24 ± 2 hrs															
Biased Humidity (AEC-Q200)		Preconditioning: Run through IR reflow for 3 times. (IPC/JEDEC J-STD-020E Classification Reflow Profiles Humidity: 85 ± 3% R.H, Temperature: 85°C ± 2°C Duration: 1000hrs Min Measured at room temperature after placing for 24 ± 2hrs															
High Temperature Operational Life (AEC-Q200)		Preconditioning: Run through IR reflow for 3 times. (IPC/JEDEC J-STD-020E Classification Reflow Profiles Temperature: 125 ± 2°C (Inductor) Duration: 1000hrs Min. with 100% rated current. Measured at room temperature after placing for 24 ± 2hrs															
External Visual		Inspect device construction, marking and workmanship. ElectricalTest not required.															
Physical Dimension	According to the product specification size measurement	According to the product specification size measurement															
Resistance to Solvents	Appearance: No damage.	Add aqueous wash chemical - OKEM clean or equivalent.															
Mechanical Shock	Appearance: No damage. Inductance: with in ± 10% of initial value Q: Shall not exceed the specification value. RDC: within ± 15% of initial value and shall not exceed the specification value	<table border="1"> <thead> <tr> <th>TYPE</th> <th>PEAK VALUE (G'S)</th> <th>NORMAL DURATION (D) (MS)</th> <th>WAVE FORM</th> <th>VELOCITY CHANGE (V) Ft / Sec.</th> </tr> </thead> <tbody> <tr> <td>SMD</td> <td>100</td> <td>6</td> <td>Half-Sine</td> <td>12.3</td> </tr> <tr> <td>LEAD</td> <td>100</td> <td>6</td> <td>Half-Sine</td> <td>12.3</td> </tr> </tbody> </table> 3 shocks in each direction along 3 perpendicular axes (18 shocks)	TYPE	PEAK VALUE (G'S)	NORMAL DURATION (D) (MS)	WAVE FORM	VELOCITY CHANGE (V) Ft / Sec.	SMD	100	6	Half-Sine	12.3	LEAD	100	6	Half-Sine	12.3
TYPE	PEAK VALUE (G'S)	NORMAL DURATION (D) (MS)	WAVE FORM	VELOCITY CHANGE (V) Ft / Sec.													
SMD	100	6	Half-Sine	12.3													
LEAD	100	6	Half-Sine	12.3													
Vibration	Appearance: No damage. Inductance: within ± 10% of initial value Q: Shall not exceed the specification value. RDC: within ± 15% of initial value and shall not exceed the specification value Resistance to Soldering Heat	IPC/JEDEC J-STD-020D Classification Reflow Profiles Oscillation Frequency: 10~2K~10Hz for 20 minute Equipment: Vibration checker Total Amplitude: 1.52mm ± 10% Testing Time: 12 hours (20 minutes, 12 cycles each of 3 orientations).															
Resistance to Soldering Heat		Test condition:(MIL-STD-202 Condition B) Number of heat cycles: 1 <table border="1"> <thead> <tr> <th>TEMPERATURE (°C)</th> <th>TIME (S)</th> <th>TEMPERATURE RAMP/IMMERSION AND EMERSION RATE</th> </tr> </thead> <tbody> <tr> <td>260 ± 5 (solder temp)</td> <td>10 ± 1</td> <td>25 mm/s ± 6 mm/s</td> </tr> </tbody> </table> Depth: completely cover the termination	TEMPERATURE (°C)	TIME (S)	TEMPERATURE RAMP/IMMERSION AND EMERSION RATE	260 ± 5 (solder temp)	10 ± 1	25 mm/s ± 6 mm/s									
TEMPERATURE (°C)		TIME (S)	TEMPERATURE RAMP/IMMERSION AND EMERSION RATE														
260 ± 5 (solder temp)	10 ± 1	25 mm/s ± 6 mm/s															
Thermal shock (AEC-Q200)	Preconditioning: Run through IR reflow for 3 times. (IPC/JEDEC J-STD-020E Classification Reflow Profiles Condition for 1 cycle Step1: -55 ± 2°C 15 ± 1min (Inductor) Step2: 125 ± 2°C within 20Sec. Step3: 125 ± 2°C 15 ± 1min Number of cycles: 300 Measured at room fempraturc after placing fo24±2hrs																



RELIABILITY AND TEST CONDITION

ITEM	PERFORMANCE	TEST CONDITIONS
RELIABILITY TEST		
ESD	Appearance: No damage.	 <p>Direct Contact and Air Discharge PASSIVE COMPONENT HBM ESD Discharge Waveform to a Coaxial Target Test method: AEC-Q200-002 Test mode: Contact Discharge Discharge level: 4 KV (Level: 2)</p>
Solderability	More than 95% of the terminal electrode should be covered with solder.	a. Method B1, 4 hrs @155°C dry heat @255°C±5°C Test time: 5 +0/-0.5 seconds. b. Method D category 3. (steam aging 8hours ± 15 min) @ 260°C ± 5°C Test time: 30 +0/-0.5 seconds.
Electrical Characterization	Refer Specification for Approval	Summary to show Min, Max, Mean and Standard deviation
Flammability	Electrical Test not required.	V-0 or V-1 are acceptable.
Board Flex	Appearance: No damage.	<p>Preconditioning: Run through IR reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles Place the 100mm X 40mm board into a fixture similar to the one shown in below Figure with the component facing down. The apparatus shall consist of mechanical means to apply a force which will bend the board (D) x = 2 mm minimum. The duration of the applied forces shall be 60 (+ 5) sec. The force is to be applied only once to the board.</p> 
Terminal Strength (SMD)	Appearance: No damage.	<p>Preconditioning: Run through IR reflow for 3 times. (IPC/JEDEC J-STD-020E Classification Reflow Profiles With the component mounted on a PCB with the device to be tested, apply a 17.7 N (1.8 Kg) force to the side of a device being tested. This force shall be applied for 60 +1 seconds. Also the force shall be applied gradually as not to apply a shock to the component being tested.</p> 

Note: When there are questions concerning measurement result: measurement shall be made after 48 ± 2 hours of recovery under the standard condition.



SOLDERING SPECIFICATIONS

SOLDERING

Mildly activated rosin fluxes are preferred. Cal-Chip Electronics terminations are suitable for re-flow soldering systems. If hand soldering cannot be avoided, the preferred technique is the utilization of hot air soldering tools.

SOLDERING REFLOW

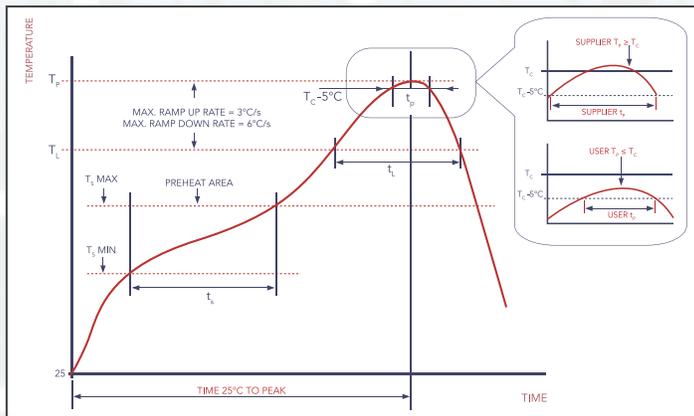
Recommended temperature profiles for lead free re-flow soldering in Figure 1. Table 1.1 & 1.2 (J-STD-020E)

IRON REFLOW

Products attachment with a soldering iron is discouraged due to the inherent process control limitations. In the event that a soldering iron must be employed the following precautions are recommended. (Fig. 2)

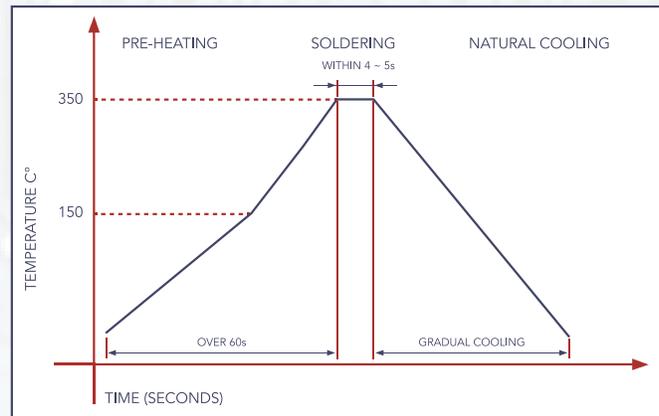
- Preheat circuit and products to 150°C
- 355°C tip temperature (max)
- Never contact the ceramic with the iron tip
- 1.0mm tip diameter (max)
- Use a 20 watt soldering iron with tip diameter of 1.0mm
- Limit soldering time to 4~5sec

SOLDERING REFLOW (FIGURE 1)



Reflow times: 3 times max

IRON SOLDERING TEMPERATURE PROFILES (FIGURE 2)



Iron Soldering Times: 1 times max.
Soldering Iron Method: 350 ± 5°C max

REFLOW PROFILES

PROFILE TYPE	PB-FREE ASSEMBLY
Preheat Temperature Min (T_{smin}) Temperature Max (T_{smax}) Time (t_p) from (T_{smin} to T_{smax})	150°C 200°C 60-120 seconds
Ramp-up rate (T_L to T_p)	3°C / second max.
Liquidus temperature (T_L) Time (t_L) maintained above T_L	217°C 60 - 150 seconds
Classification temperature (T_c)	See Table (1.2)
Time(t_p) at $T_c - 5^\circ\text{C}$ (T_p should be equal to or less than T_c .)	* < 30 seconds
Ramp-down rate (T_p to T_L)	6°C / second max.
Time 25°C to peak temperature	8 minutes max.

T_p : maximum peak package body temperature, T_c : the classification temperature.
For user (customer) T_p should be equal to or less than T_c .
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.

PACKAGE THICKNESS/VOLUME AND CLASSIFICATION TEMPERATURE (T_c)

	PACKAGE THICKNESS	VOLUME MM ³ <350	VOLUME MM ³ 350 - 2000	VOLUME MM ³ >2000
PB - Free Assembly	<1.6 mm	260°C	260°C	260°C
	1.6 - 2.5 mm	260°C	250°C	245°C
	≥2.5 mm	250°C	245°C	245°C

Reflow is referred to standard IPC/JEDEC J-STD-020E.

NOTES

- When there are questions concerning measurement result : measurement shall be made after 48 ± 2 hours of recovery under the standard condition
- This power choke coil itself does not have any protective function in abnormal condition such as overload, short-circuit and open-circuit conditions, etc. Therefore, it shall be confirmed as the end product that there is no risk of smoking, fire, dielectric withstand voltage, insulation resistance, etc. in abnormal conditions to provide protective devices and/or protection circuit in the end product.
- When this power choke coil was used in a similar or new product to the original one, sometimes it might not be able to satisfy the specifications due to different condition of use.
- Dielectric withstanding test with higher voltage than specific value will damage insulating material and shorten its life.
- This power choke coil must not be used in wet condition by water, coffee or any liquid because insulation strength becomes very low in this condition.
- Please consult our company to confirm the reliability of the process required to wash or use or exposure to a chemical solvent used in this product. PCB washing tested to MIL-STD-202 Method, and dry it off immediately.
- The rated current as listed is either the saturation current or the heating current depending on which value is lower.
- If this power choke is dipped in the cleaning agent, such as toluene, xylene, ketone, and ether system, there is a possibility that the performance decreases greatly, and marking disappearance.
- The high power ultrasonic washing may damage the choke body.
- Before use, the user should determine whether this product is suitable for their own design, Our company only guarantees that the product meets the requirements of this specification.

APPLICATION NOTICE

- Storage Conditions

To maintain the solderability of terminal electrodes:

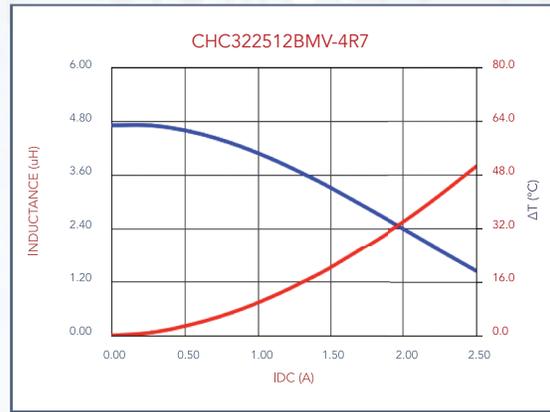
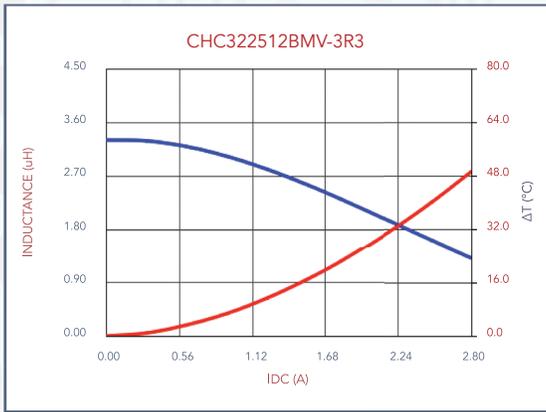
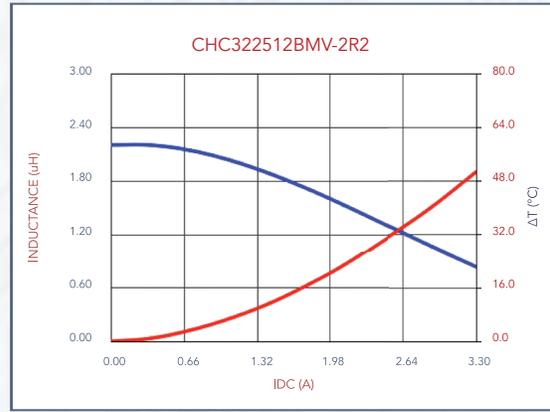
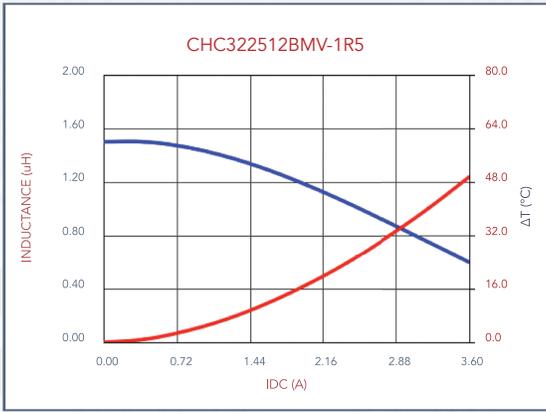
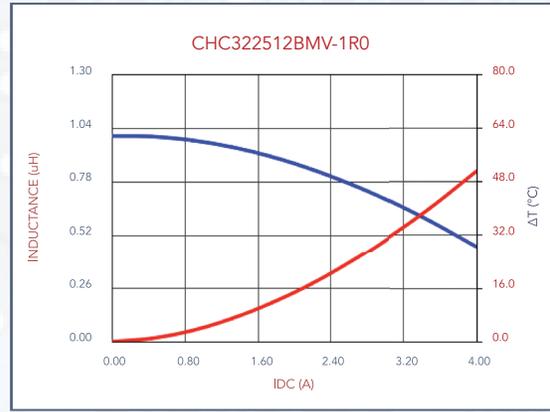
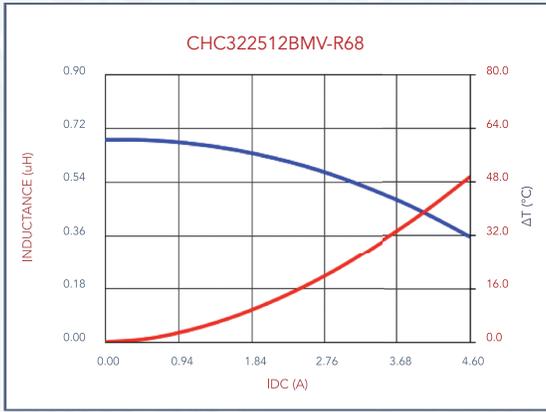
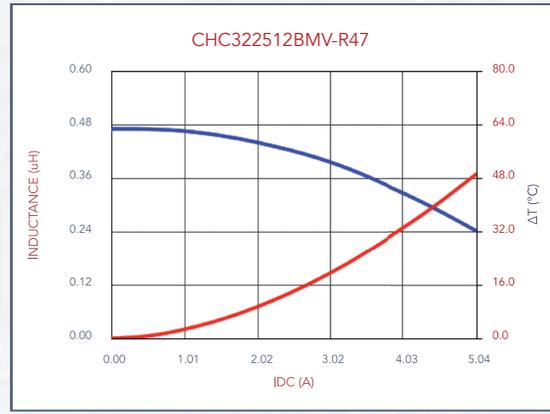
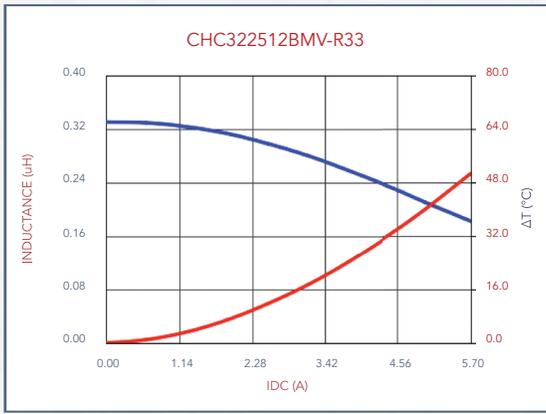
1. Cal-Chip Electronics' products meet IPC/JEDEC J-STD-020E standard-MSL, level 1.
2. Temperature and humidity conditions: Less than 40°C and 60% RH.
3. Recommended products should be used within 12 months form the time of delivery.
4. The packaging material should be kept where no chlorine or sulfur exists in the air.

TRANSPORTATION

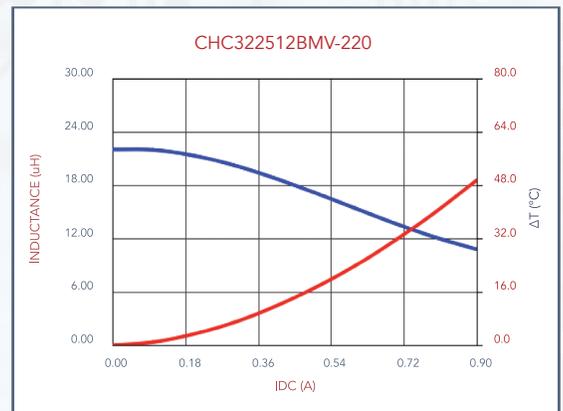
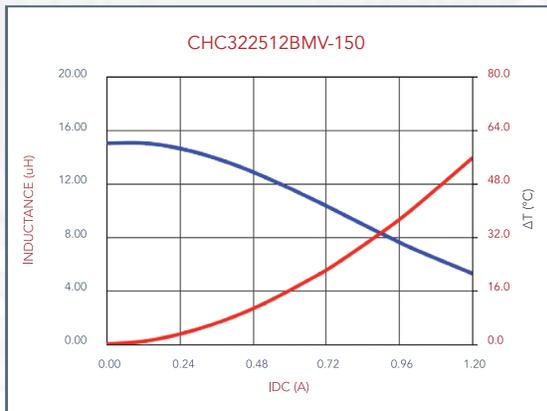
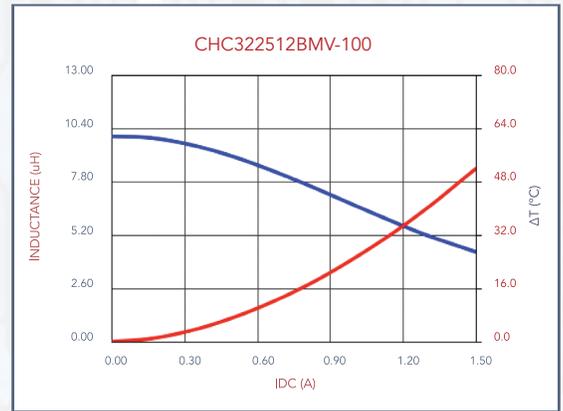
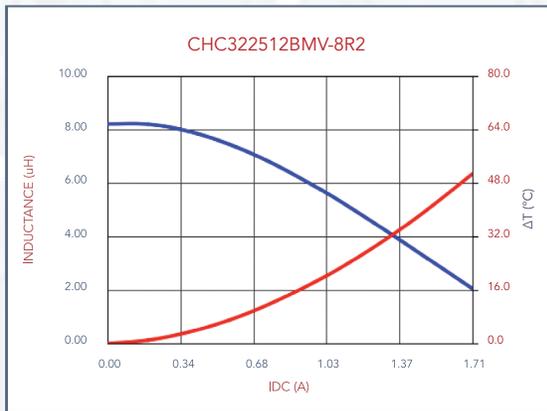
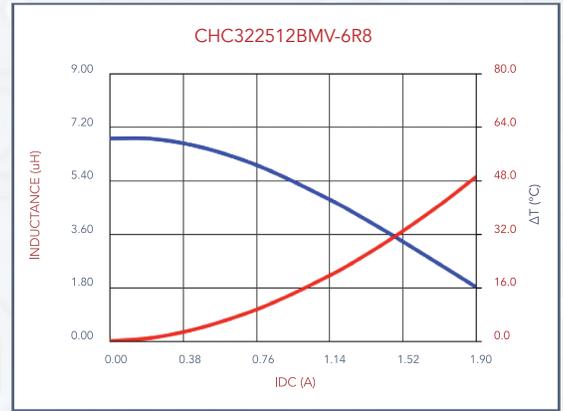
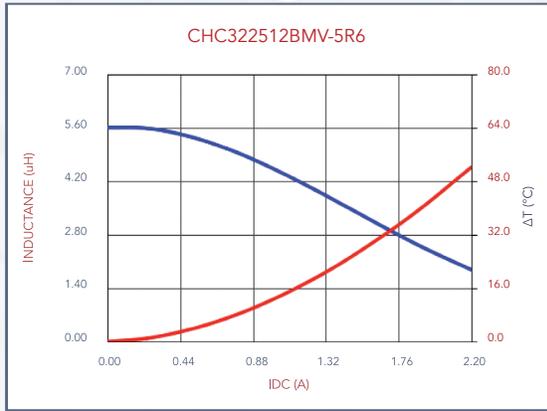
1. Products should be handled with care to avoid damage or contamination from perspiration and skin oils.
2. The use of tweezers or vacuum pick up is strongly recommended for individual components.
3. Bulk handling should ensure that abrasion and mechanical shock are minimized



TYPICAL PERFORMANCE CURVES



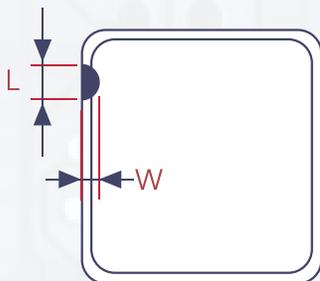
TYPICAL PERFORMANCE CURVES



APPERANCE CRITERION

CORE CHIPPING

- The appearance standard of the chipping size on top side, and bottom side ferrite core is listed below.
- Chip off is generated during molding and manufacturing process.
- Chip off acceptance limits subjected to the product size.
- Our current Defect limit is based on the IPC-A-610.
- Some chip off does not impact the product function, see the IPC standard 1 & 2.



L	≤50 % of the length
W	≤25 % of the width

- Defects usually occur at the corners and edges of the product, There will be a slight defect black and rough, but not exposed copper, and does not affect the product performance and reliability.

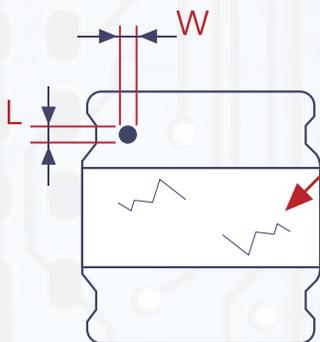
EXTERNAL APPEARANCE CRITERION FOR EXPOSED WIRE

- Exposed winding wire at the secondary side is regarded as qualified product.



ELECTRODE APPEARANCE CRITERION FOR EXPOSED WIRE

- Foreign materials on the product body is inevitable and accepted.
- Electrodes with foreign body (dirt) appearance standards
- Foreign materials (dirt) will not affect the coplanarity of PAD, below the example of foreign materials (dirt) quantity ≤2PCS on single PAD.
- Dimensions range as shown in the table.

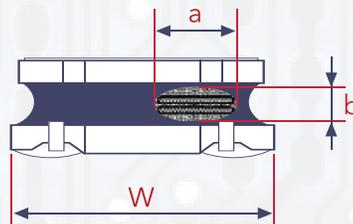


visual check on core surface with no crack means pass.

VOID APPEARANCE TOLERANCE LIMIT

- Size of voids occurring to coating resin is specified below.
- Exposed wire tolerance limit of coating resin part on product side.
- Size of exposed wire occurring to coating resin is specified below.

1. Width direction (dimension a):
Acceptable when $a \leq w/2$.
2. Length direction (dimension b)
Dimension b is not specified.
3. The total area of exposed wire occurring to each sides is not greater than 50% of coating resin area, and is acceptable.



CONFORMING

- Only top side of wire is exposed (regardless of whole top side of wire exposed)



LESS THAN 1/2 OF JOINT SIDE LENGTH

- More than 1/2 is selected as defect
- Wire is soldered insufficiently and less than half of outer diameter is covered with solder

