SPECIFICATIONS

Customer	
Product Name	Wire Wound Molded SMD Power Inductors
Sunlord Part Number	MWSA0604S-Series
Customer Part Number	

[☒New Released, ☐Revised] SPEC No.: MWSA02230000

【This SPEC is total 10 pages.】

【ROHS Compliant Parts】

Approved By	Checked By	Issued By
	-	

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【For Customer approval Only】 Date:_____

Qualification Status: ☐ Full ☐ Restricted ☐ Rejected

Approved By	Verified By	Re-checked By	Checked By

Comments:

_____

Rev.	Effective Date	Changed Contents	Change Reasons	Approved By
01	/	New release	/	Simei Yu

Caution：

All products listed in this specification are developed, designed and intended for use in general electronics equipment. The products are not designed or warranted to meet the requirements of the applications listed below, whose performance and/or quality require especially high reliability, or whose failure, malfunction or trouble might directly cause damage to society, person, or property. Please understand that we are not responsible for any damage or liability caused by use of the products in any of the applications below. Please contact us for more details if you intend to use our products in the following applications.

1. Aircraft equipment
2. Aerospace equipment
3. Undersea equipment
4. Nuclear control equipment
5. Military equipment
6. Power plant equipment
7. Medical equipment
8. Transportation equipment (automobiles, trains, ships,etc.)
9. Traffic signal equipment
10. Disaster prevention / crime prevention equipment
11. Applications of similar complexity or with reliability requirements comparable to the applications listed in the above

1. Scope

This specification applies to MWSA0604S-Series of wire wound molded SMD power Inductors

2. Product Description and Identification (Part Number)

1) Description

Wire Wound Molded SMD Type Power Inductor,

Product Identification (Part Number)

MWSA ① 0604S ② -XXX ③ □ ④ T ⑤

①	Type
MWSA	Wire wound molded SMD power Inductors

②	External Dimensions (mm)
0604S	

③	Nominal Inductance
Example	Nominal Value
1R0	1.0μH
100	10μH
101	100μH

④	Inductance Tolerance
M	±20%

⑤	Packing
T	Tape Carrier Package

3. Electrical Characteristics

1) Operating temperature range (Including self-heating): -55℃~+125℃.

2) Storage temperature and humidity range (product with tapping): -10℃~+40℃, RH 70% Max.

4. Shape and Dimensions

1) Dimensions and recommended PCB pattern for reflow soldering: See **Fig.4-1** 、**Fig.4-2 and Table 4-1**

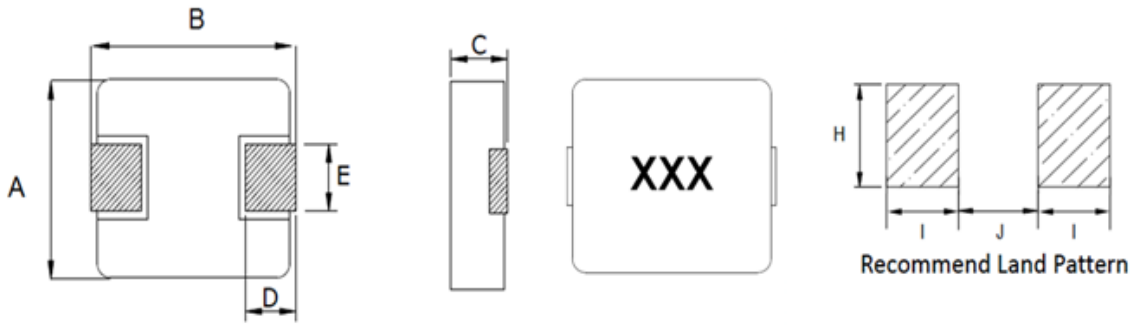


Fig.4-1

Table 4-1

Unit: mm

Series	A	B	C	D	E	I Typ.	J Typ.	H Typ.
MWSA0604S	6.6±0.2	7.1±0.3 (L≦0.22μH)	3.8±0.2	1.6±0.3	3.0±0.3	2.35	3.7	3.5
		7.0±0.3 (L≧0.33μH)						

Structure and Components: See **Table 4-2**

Table 4-2

Components	Material
INK	Ink(black)
CORE	Alloy Sponge Powder
WIRE	Polyurethane copper wire A/W 220℃
BASE	Copper plated with Ni+Sn

Thickness of BASE coating：See **Table 4-3**

Table 4-3

Coating material	Thickness (μm)
Nickel bottom	0.125~0.625
Tin layer	5~7

5. Test and Measurement Procedures

5.1 Test Conditions

5.1.1 Unless otherwise specified, the standard atmospheric conditions for measurement/test as:

a. Ambient Temperature: 20±15℃
b. Relative Humidity: 65±20%
c. Air Pressure: 86 KPa to 106 KPa

5.1.2 If any doubt on the results, measurements/tests should be made within the following limits:

a. Ambient Temperature: 20±2℃
b. Relative Humidity: 65±5%
c. Air Pressure: 86KPa to 106 KPa

5.2 Visual Examination

a. Inspection Equipment: 10 X magnifier

5.3 Electrical Test

5.3.1 DC Resistance (DCR)

a. Refer to **Appendix A**.
b. Test equipment (Analyzer): HIOKI3540 or equivalent.

5.3.2 Inductance (L)

a. Refer to **Appendix A**.
b. Test equipment: Wayne kerr3260+3265B or equivalent.

5.3.3 Rated Current

a. Refer to **Appendix A**.
b. Test equipment: Wayne kerr3260+3265B, Agilent E3633A, R2M-2H3 or equivalent.
c. Definition of Rated Current (Ir): With the condition of the DC current pass, the inductance decrease approximate 30% of the standard value, compare to the temperature rise approximate 40℃, the smaller is Rated Current.(reference environment temperature:20℃)

5.4 Reliability Test

Mechanical Reliability		
Item	Specification and Requirement	Test Method
Solderability	The surface of terminal immersed shall be minimum of 95% covered with a new coating of solder	Solder heat proof: 1. Preheating: 160 ± 10 ℃ 2. Retention time: 245 ± 5 ℃ for 2 ± 0.5 seconds
Vibration	Inductance change: Within ± 10% Without mechanical damage such as break	1. Vibration frequency: (10 Hz to 55 Hz to 10Hz) in 60 seconds as a period 2. Vibration time: Period cycled for 2 hours in each of 3 mutual perpendicular directions. 3. Amplitude: 1.5 mm max.
Shock	Inductance change: Within ± 10% Without mechanical damage such as break	1. Peak value: 100 G 2. Duration of pulse: 11ms 3. 3 times in each positive and negative direction of 3 mutual perpendicular directions
Insulating Resistance	Over 100MΩ	4. Over 100MΩ at 100V D.C. between coil and core
Endurance Reliability		
Item	Specification and Requirement	Test Method
Thermal Shock	Inductance change: Within ± 10% Without distinct damage in appearance	1. Repeat 100 cycles as follow: (-55 ± 2 ℃; 30 ± 3 min) →(Room temp., 5 min) → (+125 ± 2 ℃, 30 ± 3 min) → (Room temp., 5 min) 2. Recovery: 48 + 4 / -0 hours of recovery under the standard condition after the test.

High Temperature Resistance	Inductance change: Within ± 10% Without distinct damage in appearance	1. Environment condition: 85 ± 2 ℃ Applied Current: Rated current 2. Duration: 1000 + 4 / -0 hours
Humidity Resistance	Inductance change: Within ±10% Without distinct damage in appearance	1. Environment condition: 60 ± 2 ℃ Humidity: 90–95% Applied Current: Rated current 2. Duration: 1000 + 4 / -0 hours
Low Temperature Store	Inductance change: Within ± 10% Without distinct damage in appearance	Store temperature: -55 ± 2 ℃,1000 + 4 / -0 hours
High Temperature Store	Inductance change: Within ± 10% Without distinct damage in appearance	Store temperature: +125 ± 2 ℃,1000 + 4 / -0 hours

6. Packaging, Storage and Transportation

6.1 Tape Carrier Packaging:

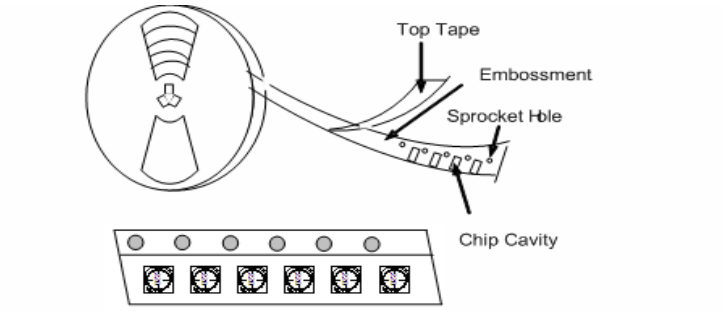
Packaging code: T

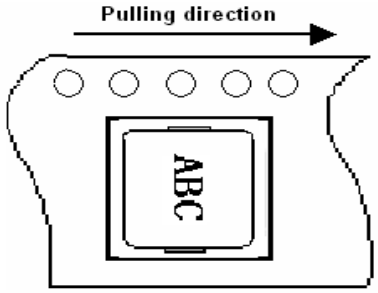
(1) Tape carrier packaging are specified in attached figure **Fig.6.1-1~2**

(2) Tape carrier packaging quantity:

Type	Standard Quantity (pcs/reel)
MWSA0604S	1000

a. Taping Drawings (Unit: mm)

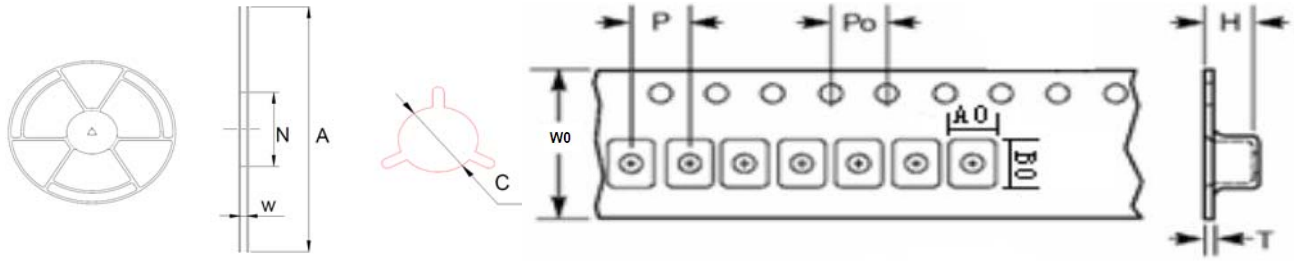




Remark: The sprocket holes are to the right as the tape is pulled toward the user.

Fig.6.1-1

c. Reel and Taping Dimensions (Unit: mm)



Type	Reel dimensions (mm)				Tape dimensions (mm)						
	A	N	C	W	W0	P	P0	H	T	A0	B0
MWSA0604S	330±2.0	97±0.5	13.2±0.2	16.8±2.0	16±0.3	12±0.1	4±0.1	4.2±0.10	0.35±0.05	6.9±0.1	7.5±0.1

c.Peeling off force: 10gf to 130gf in the direction show below.

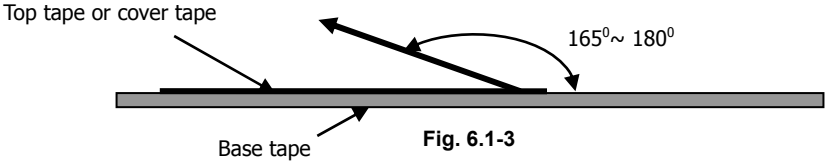


Fig. 6.1-3

6.2 Storage

(1) The solderability of the external electrodes may deteriorate if packages are stored in high humidity. Besides, to ensure packing material's good state, packages must be stored at -10℃ to 40℃ and 70% RH Max.

(2) The solderability of the external electrodes may deteriorate if packages are exposed to dust of harmful gas (e.g. HCl, sulfurous gas of H_2S).

(3) Packaging materials may deform if packages are exposed directly to sunlight.

(4) Minimum packages, such as polyvinyl heat-seal packages shall not be opened until they are used. If opened, use the reels as soon as possible.

(5) Solderability shall be guaranteed for a period of time from the date of delivery on condition that they are stored at the specified environment. For those parts, which passed more than the time shall be checked solderability before using.

(6) For magnetic products, keep clear of anything that may generate magnetic fields to avoid change of products performance.

(7) To avoid any damage to products, do not load mechanic force on products or place heavy goods on products, and exclude strong vibration or drop.

(8)In case of storage over 12 months, solderability shall be checked before actual usage.

7. Warning and Attentions

7.1 Precautions on Use

(1) Always wear static control bands to protect against ESD.

(2) Any devices used with the products (soldering irons, measuring instruments) should be properly grounded.

(3) Keep bare hands and metal conductors (i.e., metal desk) away from electrodes or conductive areas that lead to electrodes.

(4) Preheat when soldering.

(5) Don't apply current in excess of the rated current value. It may reduce the impedance or inductance, or cause damage to components due to over-current.

(6) For magnetic products, keep clear of anything that may generate magnetic fields such as speakers and coils. Use non-magnetic tweezers when handing the chips.

(7) When soldering, the electrical characteristics may be varied due to hot energy and mechanical stress.

(8) When coating products with resin, the relatively high resin curing stress may change the electrical characteristics. For exterior coating, select resin carefully so that electrical and mechanical performance of the product is not affected. Before using, please evaluate reliability with the product mounted in your application set.

(9) When mount chips with adhesive in preliminary assembly, do appropriate check before the soldering stage, i.e., the size of land pattern, type of adhesive, amount applied, hardening of the adhesive on proper usage and amounts of adhesive to use.

(10) Mounting density: Add special attention to radiating heat of products when mounting other components nearby. The excessive heat by other products may cause deterioration at joint of this product with substrate.

(11) Since some products are constructed like an open magnetic circuit, narrow spacing between components may cause magnetic coupling.

(12) Please do not give the product any excessive mechanical shocks in transportation.

(13) Please do not touch wires by sharp terminals such as tweezers to avoid causing any damage to wires.

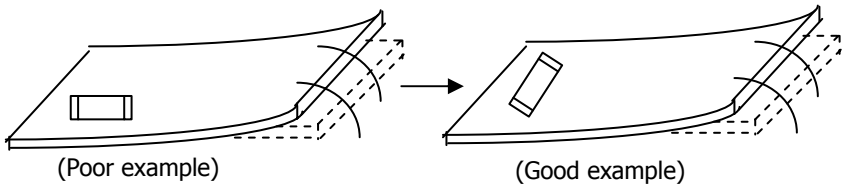
(14) Please do not add any shock and power to the soldered product to avoid causing any damage to chip body.

(15) Please do not touch the electrodes by naked hand as the solderability of the external electrodes may deteriorate by grease or oil on the skin.

7.2 PCB Bending Design

The following shall be considered when designing and laying out PCB's.

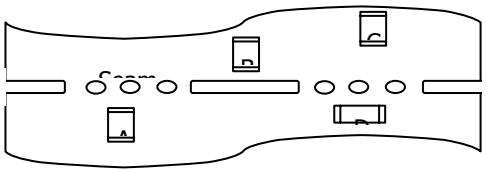
(1) PCB shall be designed so that products are not subjected to the mechanical stress from board warp or deflection.



(Poor example) (Good example)

Products shall be located in the sideways direction to the mechanical stress

(2) Products location on PCB separation.



Product shall be located carefully because they may be subjected to the mechanical stress in order of A>C=B>D.

(3) When splitting the PCB board, or insert (remove) connector, or fasten thread after mounting components, care is required so as not to give any stress of deflection or twisting to the board. Because mechanical force may cause deterioration of the bonding strength of electrode and solder, even crack of product body. Board separation should not be done manually, but by using appropriate devices.

7.3 Recommended PCB Design for SMT Land-Patterns

When chips are mounted on a PCB, the amount of solder used (size of fillet) can directly affect chip performance. Therefore, the following items must be carefully considered in the design of solder land patterns:

(1) The amount of solder applied can affect the ability of chips to withstand mechanical stresses which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets.

(2) When more than one part is jointly soldered onto the same land or pad, the pad must be designed that each component's soldering point is separated by solder-resist.

Recommended land dimensions please refer to product specification.

8 Recommended Soldering Technologies

8.1Re-flowing Profile:

△ Preheat condition: 150 ~200℃/60~120sec.
△ Allowed time above 217℃: 60~90sec.
△ Max temp: 260℃
△ Max time at max temp: 10sec.
△ Solder paste: Sn/3.0Ag/0.5Cu
△ Allowed Reflow time: 2x max
Please refer to **Fig. 8.1**

[Note: The reflow profile in the above table is only for qualification and is not meant to specify board assembly profiles. Actual board assembly profiles must be based on the customer's specific board design, solder paste and process, and should not exceed the parameters as the Reflow profile shows.]

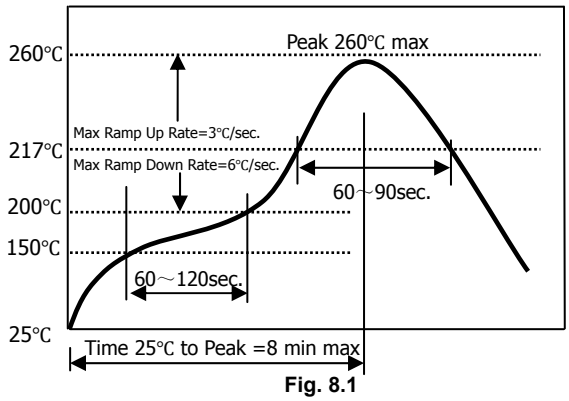


Fig. 8.1

8.2 Iron Soldering Profile

△ Iron soldering power: Max. 30W
△ Pre-heating: 150℃/60sec.
△ Soldering Tip temperature: 350℃ Max.
△ Soldering time: 3sec. Max.
△ Solder paste: Sn/3.0Ag/0.5Cu
△ Max.1 times for iron soldering
Please refer to **Fig. 8.2**.

[Note: Take care not to apply the tip of the soldering iron to the terminal electrodes.]

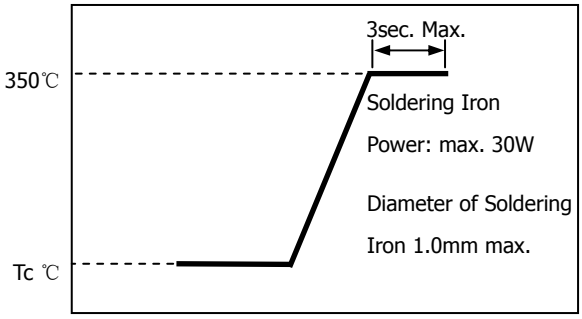


Fig. 8.2

8.3 Recommended Soldering Technologies

Heat Gun Profile

Soldering tip temperature: 350℃ Max.

△ Hot air time: <5sec (over 5sec may cause wiring inductor short)
△ When repairing or reworking the component near inductors, take over-heat protection for Inductors

9. Solder Volume

Solder shall be used not to exceed as shown below. Exceeding solder volume may cause the failure of mechanical or electrical performance.

0 ≤L≤T

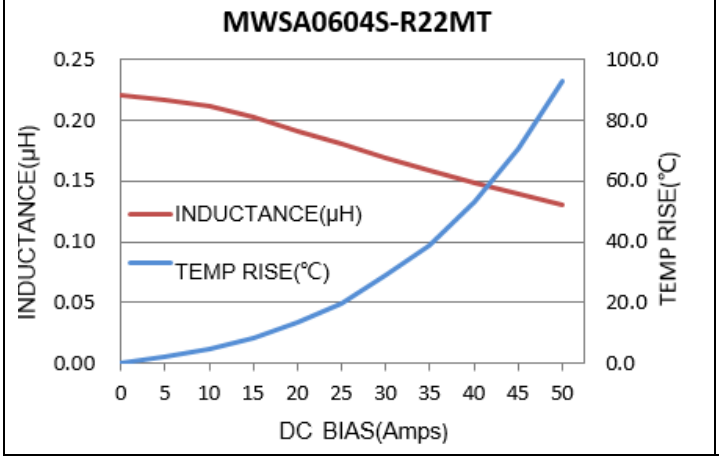
(T: height of electrode)

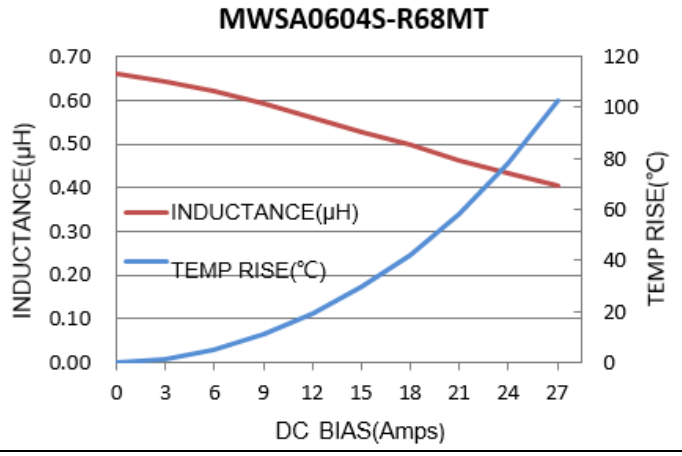
Appendix A: Electrical Characteristics

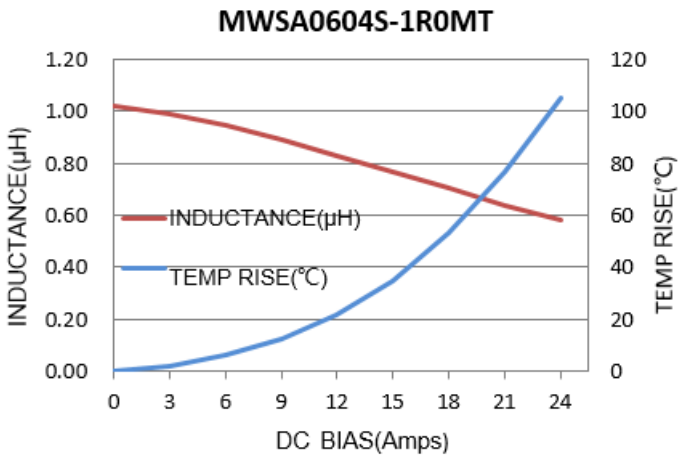
Part Number	Inductance	DC Resistance	Saturation Current		Heat Rating Current		Voltage
	100KHZ,1V	Max.	Max.	Typ.	Max.	Typ.	Max.
Units	μH	mΩ	A		A		VDC
Symbol	L	DCR	Isat		Irms		
MWSA0604S-R15MT	0.15±20%	0.66±7%	45	50	36	40	30
MWSA0604S-R22MT	0.22±20%	0.98±7%	28	35	32	35	30
MWSA0604S-R68MT	0.68±20%	4.8	17	19	16	17	30
MWSA0604S-1R0MT	1.0±20%	6.6	15	16	12.5	13.5	30
MWSA0604S-1R5MT	1.5±20%	10	12	12.5	11	12.4	30
MWSA0604S-2R2MT	2.2±20%	14	10	11.0	8.5	10	30
MWSA0604S-3R3MT	3.3±20%	20	8.7	9.5	7.8	8.5	30
MWSA0604S-4R7MT	4.7±20%	30	8.0	9.0	6.0	6.5	30
MWSA0604S-6R8MT	6.8±20%	45	6.0	6.5	5.0	5.5	30
MWSA0604S-100MT	10±20%	65	5.0	6.0	4.0	4.8	30
MWSA0604S-100MTB01	10±20%	63	5.5	6.5	4.1	5.0	30
MWSA0604S-150MT	15±20%	95	4.0	4.5	3.2	3.7	30
MWSA0604S-220MT	22±20%	125	3.5	4.0	3.0	3.3	30
MWSA0604S-330MT	33±20%	240	2.5	3.0	2.0	2.2	30
MWSA0604S-470MT	47±20%	320	2.0	2.5	1.6	1.8	30

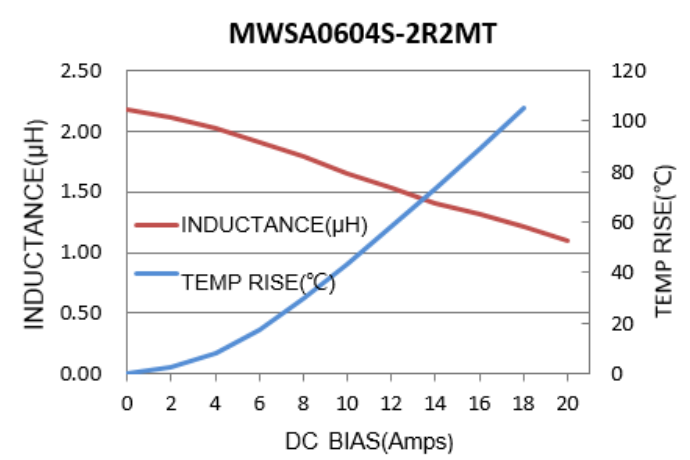
※1: All test data is referenced to 20°C ambient;
※2: Rated current: Isat or Irms, whichever is smaller;
※3: Isat(Typ): DC current at which the inductance drops approximate 30% from its value without current;
※4: Isat(Max): DC current at which the inductance drops less than 30% from its value without current;
※5: Irms(Typ): DC current that causes the temperature rise (△T =40°C) from 20°C ambient.
※6: Irms(Max): DC current that causes the temperature rise (△T =20°C) from 20°C ambient.

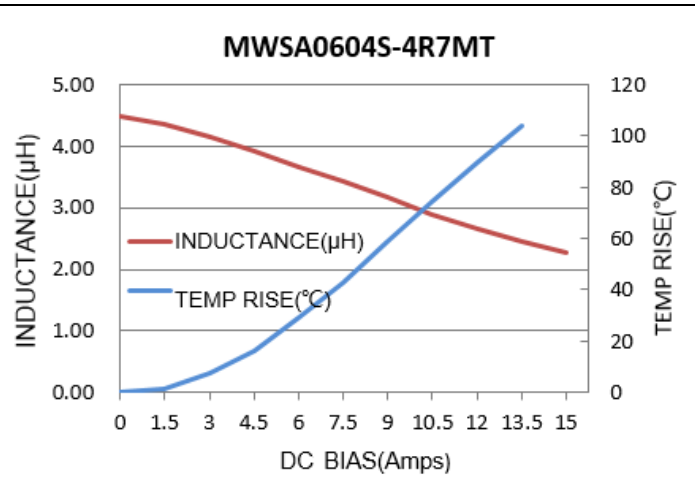
Test Instruments	Test Condition
Wayne kerr 3260B/G LCR Meter Wayne kerr 3265B Bias Current Source	Temperature: 26 ± 3℃ Humidity: < 70% RH Frequency: 100 KHz, 1.0V

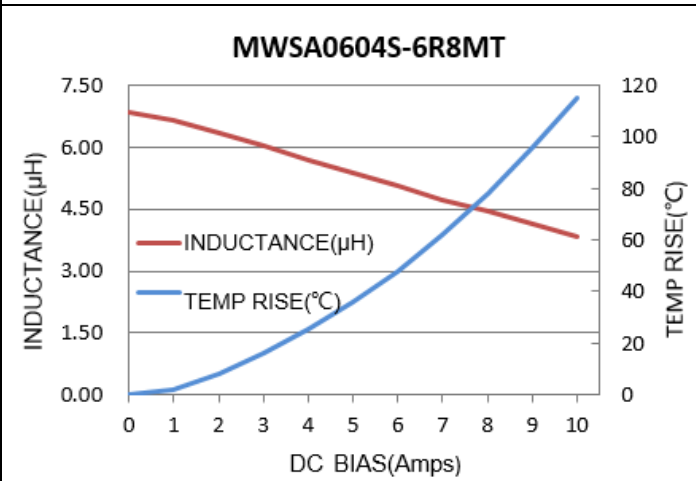


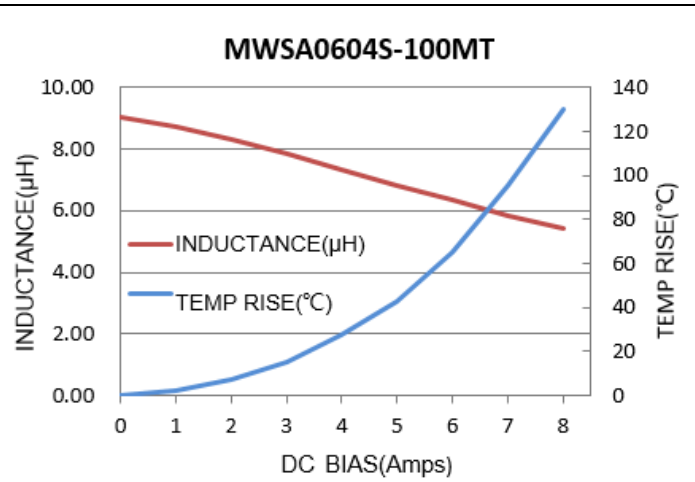


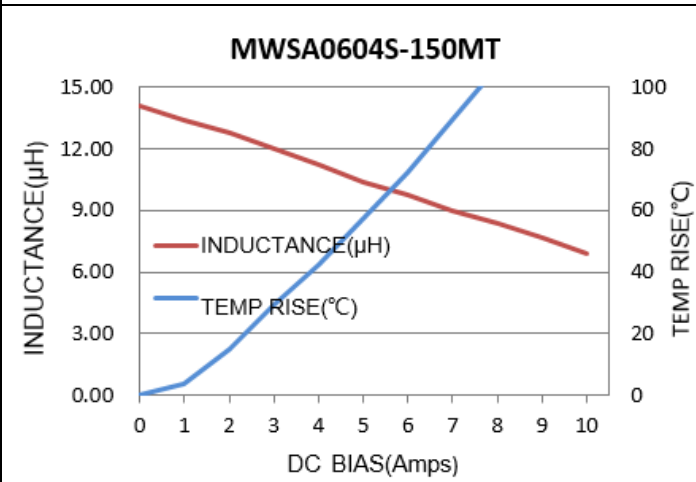

MWSA0604S-1R0MT
INDUCTANCE(μH)
TEMP RISE(℃)
DC BIAS(Amps)
TEMP RISE(℃)


MWSA0604S-2R2MT
INDUCTANCE(μH)
TEMP RISE(℃)
DC BIAS(Amps)
TEMP RISE(℃)


MWSA0604S-4R7MT
INDUCTANCE(μH)
TEMP RISE(℃)
DC BIAS(Amps)
TEMP RISE(℃)


MWSA0604S-6R8MT
INDUCTANCE(μH)
TEMP RISE(℃)
DC BIAS(Amps)
TEMP RISE(℃)


MWSA0604S-100MT
INDUCTANCE(μH)
TEMP RISE(℃)
DC BIAS(Amps)
TEMP RISE(℃)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TEMP RISE(℃)
DC BIAS(Amps)
TEMP RISE(℃)