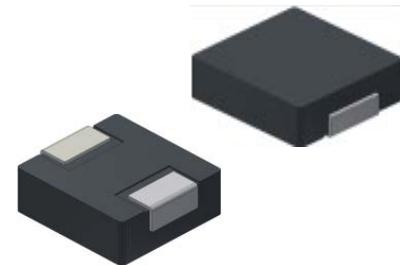


MMPC0402 Series

High Current Molded Power Inductors

FEATURES

- Carbonyl Powder.
- Compact design
- High current, low DCR, high efficiency.
- Frequency range up to 5MHz
- Very low acoustic noise and very low leakage flux noise.
- Operate temperature range $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$ (Including self temp. rise)
- RoHS compliant



APPLICATIONS

Note PC power system,incl. IMVP-6 DC/DC converter .

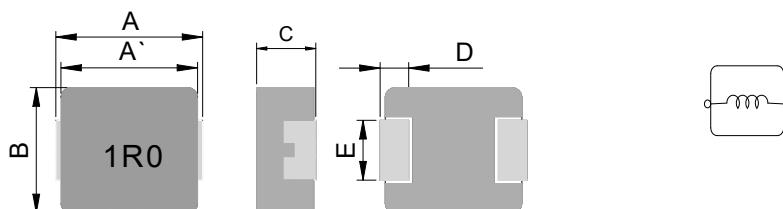
Part Numbering

MMPC 0402 -1R0 M T

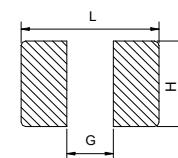
1 2 3 4 5

- 1:Product Series:Carbonyl Molding Power Inductor
- 2:Dimensions:
- 3: Initial inductance value: 1R0 = 1.0uH
- 4:Tolerance of Inductance: K= $\pm 10\%$, L= $\pm 15\%$, M= $\pm 20\%$, N= $\pm 25\%$, Y= $\pm 30\%$
- 5:Packing:Tape Carrier Package

Dimensions (mm)



Recommend PC Board Pattern



Series	A(mm)	A'(mm)	B(mm)	C(mm)	D(mm)	E(mm)
MMPC0402	4.45 ± 0.25	3.95 ± 0.20	4.06 ± 0.25	1.8 ± 0.2	0.76 ± 0.30	2.0 ± 0.20

L(mm)	G(mm)	H(mm)
5.2	2.2	2.3

Note: 1. The above PCB layout reference only.
2. Recommend solder paste thickness at 0.12mm and above.

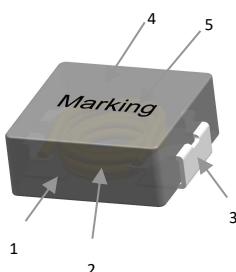
Electrical Properties:

Part Number	Inductance (uH) ± 20%	I rms (A)	I sat (A)	DCR (mΩ)	
		Typ	Typ	Typ	Max
MMPC0402-R10YT	0.10±30%	14.0	35.0	3.20	4.00
MMPC0402-R15YT	0.15±30%	14.0	31.0	4.20	5.00
MMPC0402-R22YT	0.22±30%	13.0	24.0	6.60	7.30
MMPC0402-R33MT	0.33	10.0	18.0	7.80	8.60
MMPC0402-R47MT	0.47	8.00	12.0	11.2	14.0
MMPC0402-R56MT	0.56	7.30	10.0	13.5	16.0
MMPC0402-R68MT	0.68	7.00	10.0	16.0	19.0
MMPC0402-R82MT	0.82	6.00	9.50	19.0	23.0
MMPC0402-1R0MT	1.00	5.00	8.50	22.0	27.0
MMPC0402-1R5MT	1.50	4.50	7.00	34.8	42.0
MMPC0402-2R2MT	2.20	4.00	6.00	51.0	61.0
MMPC0402-3R3MT	3.30	3.50	4.00	69.0	76.0
MMPC0402-4R7MT	4.70	2.60	3.50	95.0	105
MMPC0402-5R6MT	5.60	2.20	3.00	112	125
MMPC0402-6R8MT	6.80	2.10	2.80	150	172
MMPC0402-8R2MT	8.20	2.00	2.50	158	180
MMPC0402-100MT	10.0	1.80	2.30	215	243
MMPC0402-150MT	15.0	1.50	1.90	325	374
MMPC0402-220MT	22.0	1.20	1.40	470	500

Note:

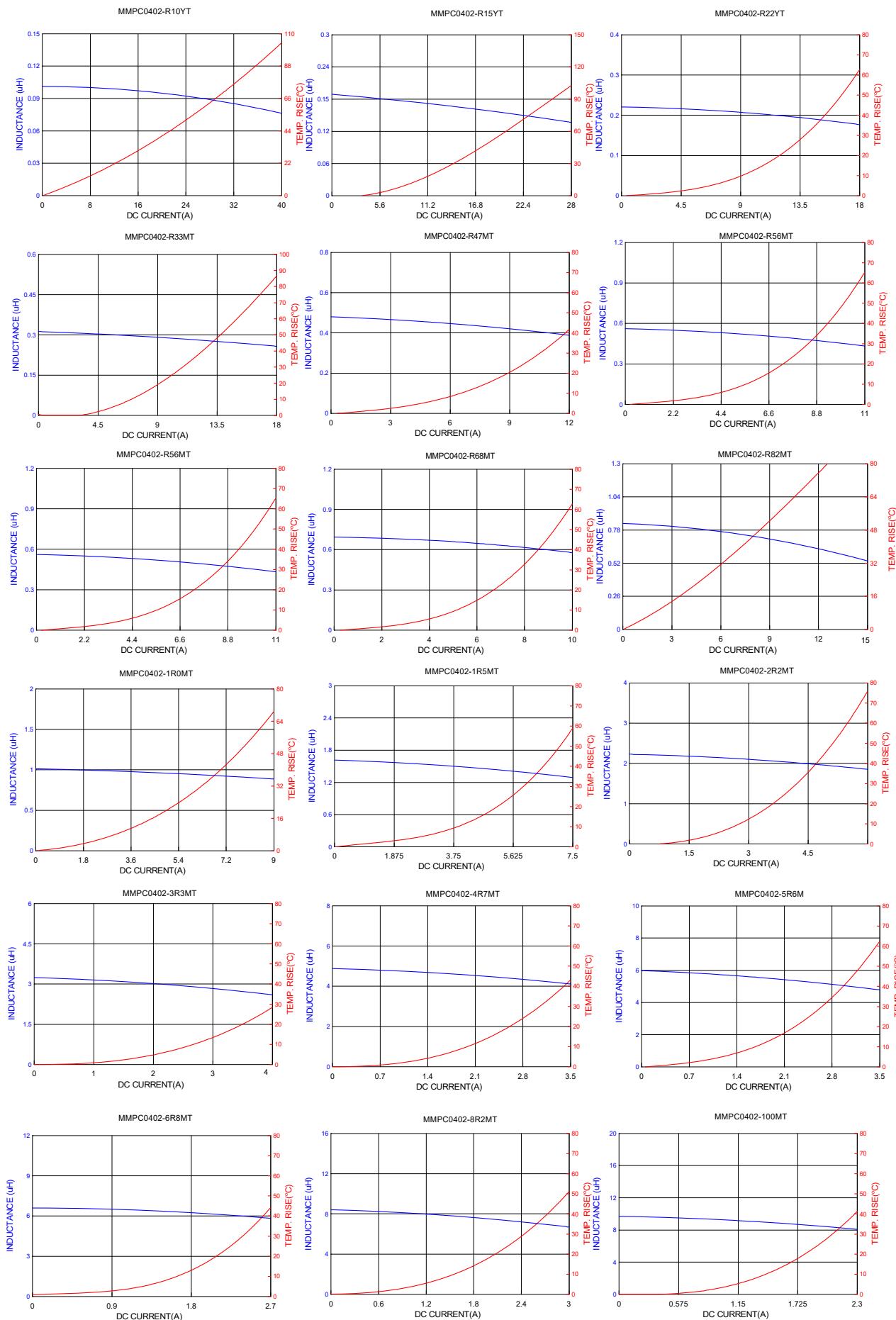
1. Test frequency : L : 100KHz /1.0V.
2. All test data referenced to 25°C ambient.
3. Testing Instrument : L/Q: HP4284A,CH11025,CH3302,CH1320 ,CH1320S LCR METER / Rdc:CH16502,Agilent33420A MICRO OHMMETER.
4. Heat Rated Current (Irms) will cause the coil temperature rise approximately Δt of 40°C (keep 1min.).
5. Saturation Current (Isat) will cause L0 to drop 30% typical. (keep quickly).
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. Special inquiries besides the above common used types can be met on your requirement.

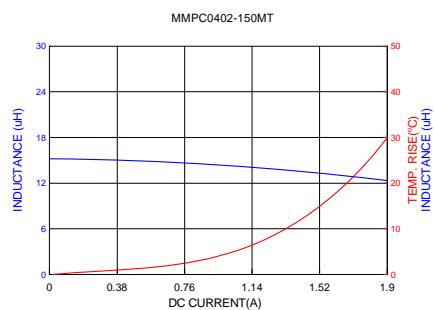
Material List



NO	Items	Materials
1	Core	Carbonyl Powder.
2	Wire	Polyester Wire or equivalent.
3	Clip	100% Pb free solder(Ni+Sn---Plating)
4	paint	Epoxy resin
5	Ink	Halogen-free ketone

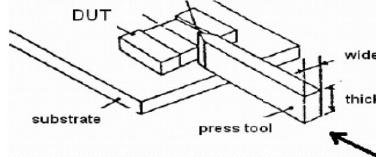
Typical Performance Curves





Reliability and Test Condition

Item	Performance	Test Condition															
Operating temperature	-40~+125°C (Including self - temperature rise)																
Storage temperature	1. -10~+40°C,50~60%RH (Product without taping) 2. -40~+125°C (on board)																
Electrical Performance Test																	
Inductance	Refer to standard electrical characteristics list.	HP4284A,CH11025,CH3302,CH1320,CH1320S LCR Meter.															
DCR		CH16502,Agilent33420A Micro-Ohm Meter.															
Saturation Current (Isat)	Approximately ΔL 30%.	Saturation DC Current (Isat) will cause L0 to drop ΔL (%)															
Heat Rated Current (Irms)	Approximately ΔT 40°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																	
Life Test	Appearance : No damage. Inductance : within \pm 10% of initial value Q : Shall not exceed the specification value. RDC : within \pm 15% of initial value and shall not exceed the specification value	Preconditioning: Run through IR reflow for 3times. (IPC/JEDECJ-STD-020E Classification Reflow Profiles) Temperature : 125 \pm 2°C (Inductor + ambient + temp rise) Applied current : rated current Duration : 1000 \pm 12hrs Measured at room temperature after placing for 24 \pm 2 hrs.															
Load Humidity		Preconditioning: Run through IR reflow for 3times. (IPC/JEDECJ-STD-020E Classification Reflow Profiles) Humidity : 85 \pm 2% R.H. Temperature : 85°C \pm 2°C Duration : 1000hrs Min. Baud:with 100% rated current, Inductance : with 100% rated current Measured at room temperature after placing for 24 \pm 2 hrs.															
Moisture Resistance		Preconditioning: Run through IR reflow for 3 times. (IPC/JEDECJ-STD-020E Classification Reflow Profiles) 1. Baked at 50°C for 25hrs, measured at room temperature after placing for 4 hrs. 2. Raise temperature to 65 \pm 2°C 90-100%RH in 2.5hrs, and keep 3 hours, cool down to 25°C in 2.5hrs. 3. Raise temperature to 65 \pm 2°C 90-100%RH in 2.5hrs, and keep 3 hours, cool down to 25°C in 2.5hrs, keep at 25°C for 2 hrs then keep at -10°C for 3 hrs 4. Keep at 25°C 80-100%RH for 15min and vibrate at the frequency of 10 to 55 Hz to 10 Hz, measure at room temperature after placing for 1~2 hrs.															
Thermal shock		Preconditioning: Run through IR reflow for 3 times. (IPC/JEDECJ-STD-020E Classification Reflow Profiles) Condition for 1 cycle Step1 : -40 \pm 2°C 30 \pm 5min Step2 : 125 \pm 2°C \leq 0.5min Step3 : 125 \pm 2°C 30 \pm 5min Number of cycles : 500 Measured at room temperature after placing for 24 \pm 2 hrs.															
Vibration		Preconditioning: Run through IR reflow for 3 times. (IPC/JEDECJ-STD-020E Classification Reflow Profiles) Oscillation Frequency: 10Hz~2KHz~10Hz for 20 minutes Equipment: Vibration checker Total Amplitude: 10g Testing Time : 12 hours(20 minutes, 12 cycles each of 3 orientations).															
Bending		Shall be mounted on a FR4 substrate of the following dimensions: >=0.0805 inch(20.12mm):40x100x1.2mm <0.0805 inch(20.12mm):40x100x0.8mm Bending depth: >=0.0805 inch(20.12mm):1.2mm <0.0805 inch(20.12mm):0.8mm duration of 10 sec.															
Shock	Appearance : No damage. Inductance : within \pm 10% of initial value Q : Shall not exceed the specification value. RDC : within \pm 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 (Vi)ft/sec</th> </tr> </thead> <tbody> <tr> <td>SMD</td> <td>50</td> <td>11</td> <td>Half-sine</td> <td>11.3</td> </tr> <tr> <td>Lead</td> <td>50</td> <td>11</td> <td>Half-sine</td> <td>11.3</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 (Vi)ft/sec	SMD	50	11	Half-sine	11.3	Lead	50	11	Half-sine	11.3
Type	Peak value (g's)	Normal duration (D) (ms)	Wave form	Velocity change (Vi)ft/sec													
SMD	50	11	Half-sine	11.3													
Lead	50	11	Half-sine	11.3													

Item	Performance	Test Condition								
Solderability	More than 95% of the terminal electrode should be covered with solder.	<p>a. Method B1, 4 hrs @155°C dry heat @255°C±5°C Test time:5 +0/-0.5 seconds.</p> <p>b. Method D category 3. (steam aging 8hours ± 15 min)@260°C±5°C Test time: 30 +0/-0.5 seconds.</p>								
Resistance to Soldering Heat		<p>Depth: completely cover the termination</p> <table border="1"> <thead> <tr> <th>Temperature(°C)</th> <th>Time(s)</th> <th>Temperature ramp/immersion and emersion rate</th> <th>Number of heat cycles</th> </tr> </thead> <tbody> <tr> <td>260 ±5 (solder temp)</td> <td>10 ±1</td> <td>25mm/s ±6 mm/s</td> <td>1</td> </tr> </tbody> </table>	Temperature(°C)	Time(s)	Temperature ramp/immersion and emersion rate	Number of heat cycles	260 ±5 (solder temp)	10 ±1	25mm/s ±6 mm/s	1
Temperature(°C)	Time(s)	Temperature ramp/immersion and emersion rate	Number of heat cycles							
260 ±5 (solder temp)	10 ±1	25mm/s ±6 mm/s	1							
Terminal Strength	<p>Appearance : No damage.</p> <p>Inductance : within±10% of initial value</p> <p>Q : Shall not exceed the specification value.</p> <p>RDC : within ±15% of initial value and shall not exceed the specification value e</p>	<p>Preconditioning: Run through IR reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles</p> <p>With the component mounted on a PCB with the device to be tested, apply a force (>0.805inch(2012mm):1kg, <=0.805inch(2012mm):0.5kg) 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 and Mounting

(1) Soldering

Mildly activated rosin fluxes are preferred. The minimum amount of solder can lead to damage from the stresses caused by the difference in coefficients of expansion between solder, chip and substrate. Metal-lion 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.

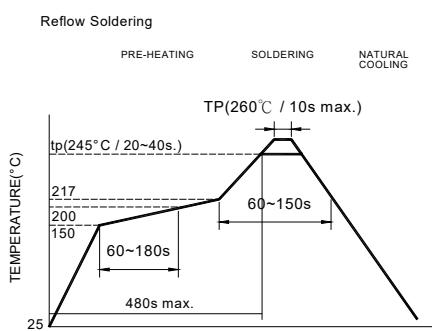
(2) Solder re-flow:

Recommended temperature profiles for re-flow soldering in Figure 1.

(3) Soldering Iron:

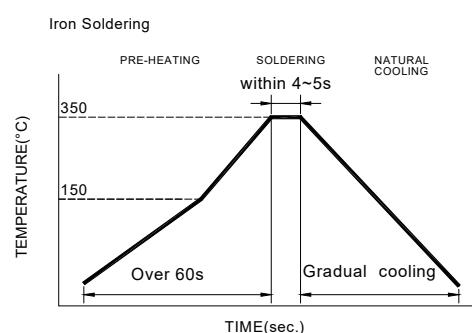
Products attachment with a soldering iron is discouraged due to the inherent process control limitations. In the event that a soldering iron must be employed the following precautions are recommended.

- 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.



Reflow times: 3 times max.

Fig.1

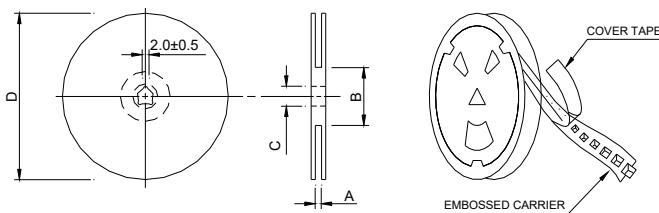


Iron Soldering times: 1 times max.

Fig.2

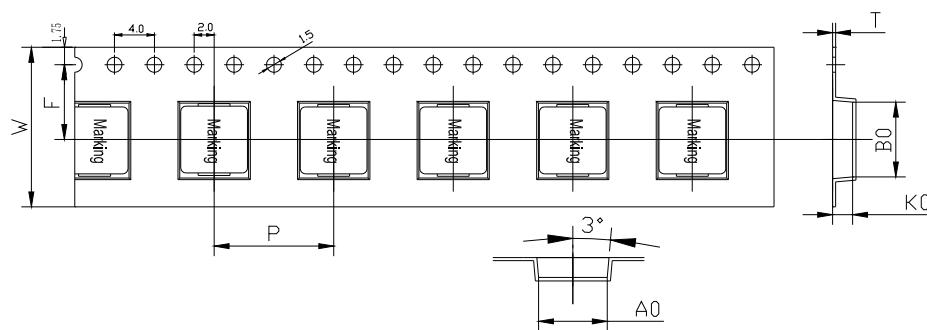
Packaging Information

(1) Reel Dimension



Type	A(mm)	B(mm)	C(mm)	D(mm)
13"x12mm	12.4+2/-0	100±2	13+0.5/-0.2	330

(2) Tape Dimension

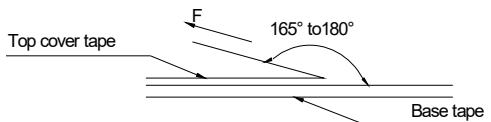


Series	Size	Bo(mm)	Ao(mm)	Ko(mm)	P(mm)	W(mm)	F(mm)	t(mm)
MMPC	0402	5.0±0.1	4.40±0.1	2.3±0.1	8.0±0.1	12±0.3	5.5±0.1	0.35±0.05

(3) Packaging Quantity

MMPC	0402
Chip / Reel	3000
Inner box	6000
Carton	24000

(4) Tearing Off Force



The force for tearing off cover tape is 10 to 130 grams in the arrow direction under the following conditions(referenced ANSI/EIA-481-C-2003 of 4.11 stadnard).

Room Temp. (°C)	Room Humidity (%)	Room atm (hPa)	Tearing Speed mm/min
5~35	45~85	860~1060	300

Application Notice

- Storage Conditions (component level)
 - To maintain the solderability of terminal electrodes:
 - 1. Metal-lions products meet IPC/JEDEC J-STD-020D 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 from 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.