To. : DATE : 20 . . .

SPECIFICATION

PRODUCT : STARCAP

MODEL : SM series

WRITTEN	CHECKED	APPROVED

Process / Site	1st. Case	2nd. Case	3rd. Case
Fab	KOREA	KOREA	KOREA
Assembly	KOREA	KOREA	KOREA
Final Test	KOREA	KOREA	KOREA

Taiwan Agent : Component Plus Inc.

Contact Person:Ray Jeng, Email:ray.jeng@seed.net.tw, Mobile:0916-205145

Tel : 886-2-2898-4050

Fax : 886-2-2896-9157

Index

Revision History

No.	Documentation	Check	Description of Revision	Approval	Date
1	Byong-il Lim (R&D)	Byung-Woo Han(Q.A.)	Initial Release for Standard Specifications	Mun-Bae Lee(CTO)	Dec. 1, 2009

Manufacturer Information

Manufacturer : Korchip Corporation

Taiwan Agent : Component Plus Inc.

Office: Tel : 886-2-2898-4050, Fax : 886-2-2896-9157

E mail:ray.jeng@seed.net.tw

Mobile:0916-205145

1. Scope

This specification applies to STARCAP(Electric Double Layer Capacitor), submitted to specified customer in cover page.

2. Part Number System

SM ① 3R3 ② 703 ③ T01 ④ U ⑤ (Example)

① Series Name
② Rated Voltage : 3.3VDC
③ Capacitance : 0.07 F (703 = 70 × 10^{+3} uF)
④ Terminal Type : T01-type
⑤ Suffix Code : Upgraded

3. Product Model Name

1) Product : Electric Double Layer Capacitor
2) Model name : SM3R3703 T01, T02, R01

4. Photo (by terminal type)

T01

T02

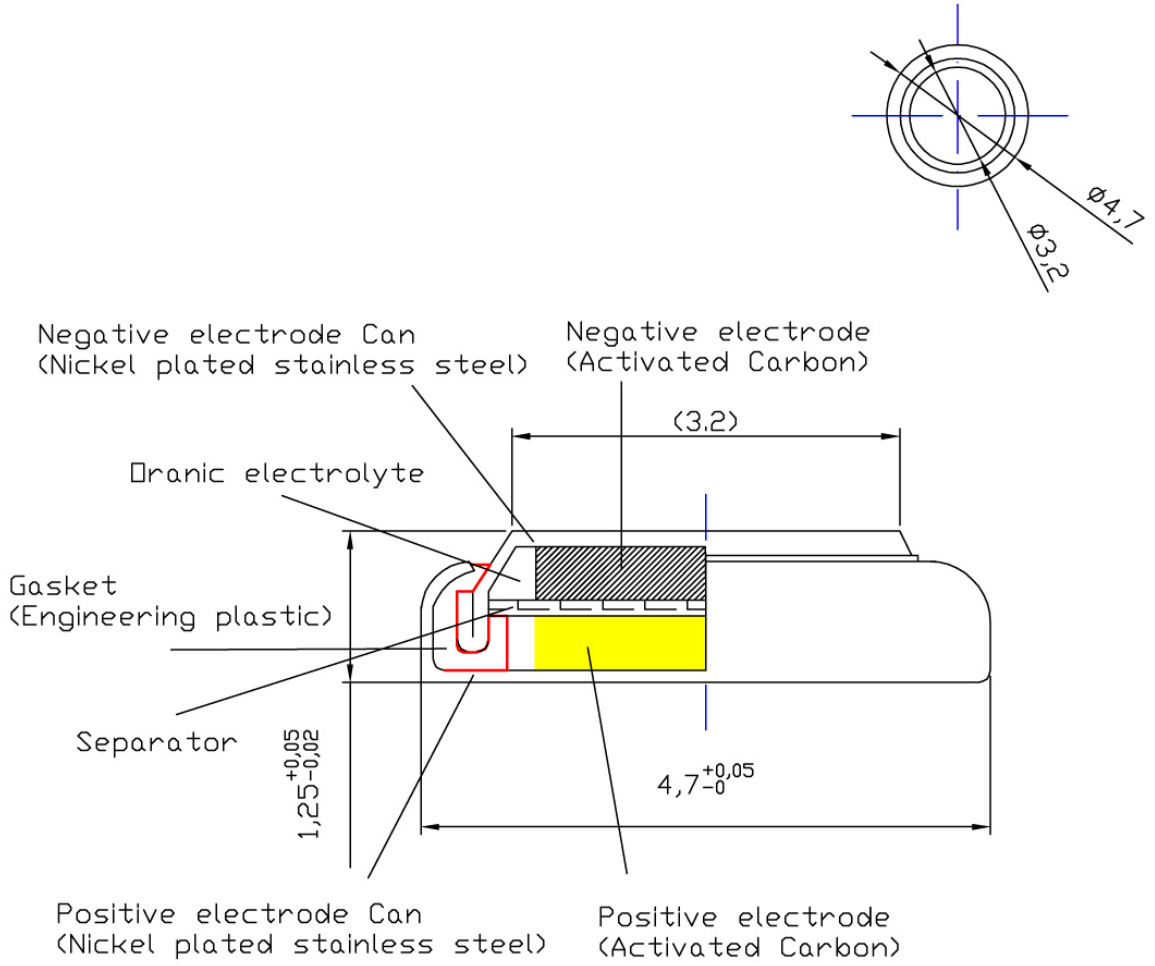
R01

5. Nominal Specifications

Items	SM 3R3 703
Cell Size	Ø4.8 × 1.4mm
OPERATING TEMPERATURE	-25 ~ +60 ℃
RATED VOLTAGE	3.3 VDC
ELECTROSTATIC CAPACITANCE (F)	0.07 F
CAPACITANCE (mAh)	22 uAh (3.3V-2.0V)
CAPACITANCE TOLERANCE	-20 ~ 80 %
EQUIVALENT SERIES RESISTANCE (ESR)	LESS THAN 100Ω
LEAKAGE CURRENT (LC)	LESS THAN 100㎂

6. Cell Structure

년 월 일				
2007-02-12				

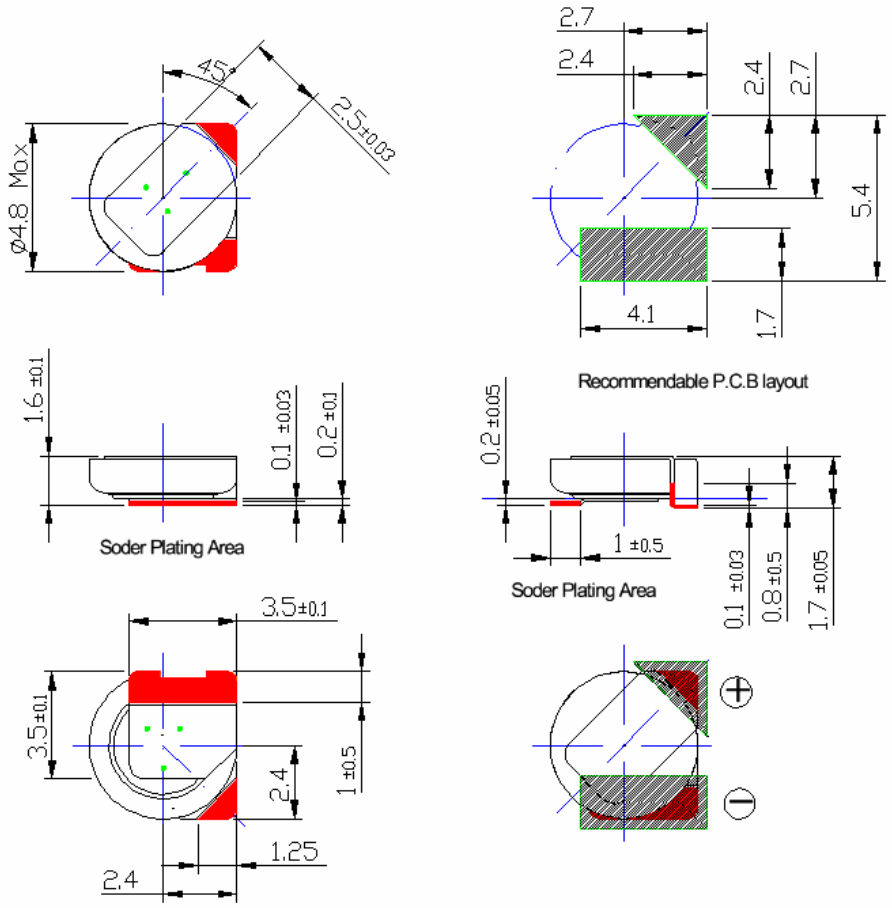


부 호 SYM	개 정 이 유 REVISION	날짜 DATE	담당 SIGN	검도 CHECK	승인 APPR
2					
1					

							도명 NAME	SM Structure	
	척도 SCALE		제도 DRAWN	설계 DESIGN	검도 CHECK	승인 APPR	기계명 TIT.PRJ		CUSTOMER
	단위	mm	hwang.M.J		Lee.S.H	Lee.M.B	도번 DWG.NO		
	날짜 DATE								

7. Product Construction And Dimension (Terminal Type : T01)

년 월 일				
2007-02-12				



Solder Plating
Ni-Substrate : 0.4~0.7㎛
Au Plating : min. 0.05㎛

부 호 SYM	개 정 이 유 REVISION	날짜 DATE	담당 SIGN	검도 CHECK	승인 APPR
②					
①					

						도명 NAME	SM T01 TERMINAL	
	척도 SCALE		제도 DRAWN	설계 DESIGN	검도 CHECK	승인 APPR	기계명 TIT.PRJ	CUSTOMER
	단위	mm	hwang.M.J		Lee.S.H	Lee.M.B	도번 DWG.NO	
	날짜 DATE							

7. Product Construction And Dimension (Terminal Type : T02)

년 월 일				
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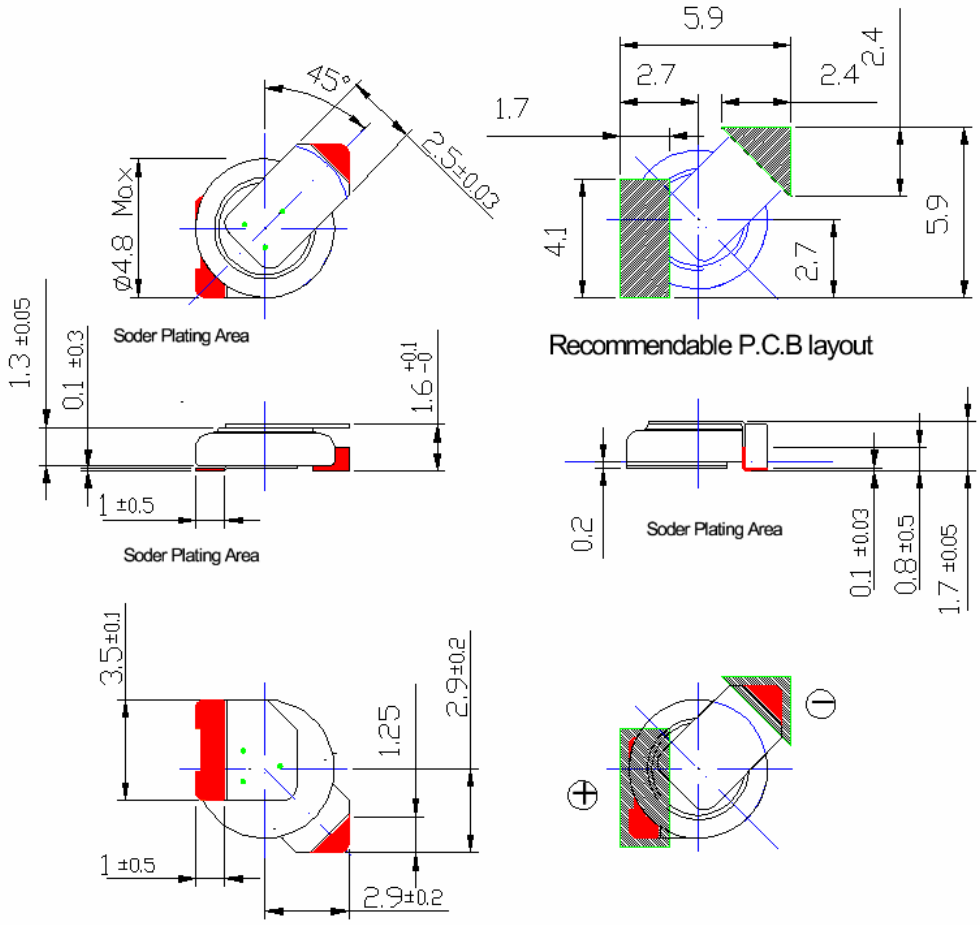


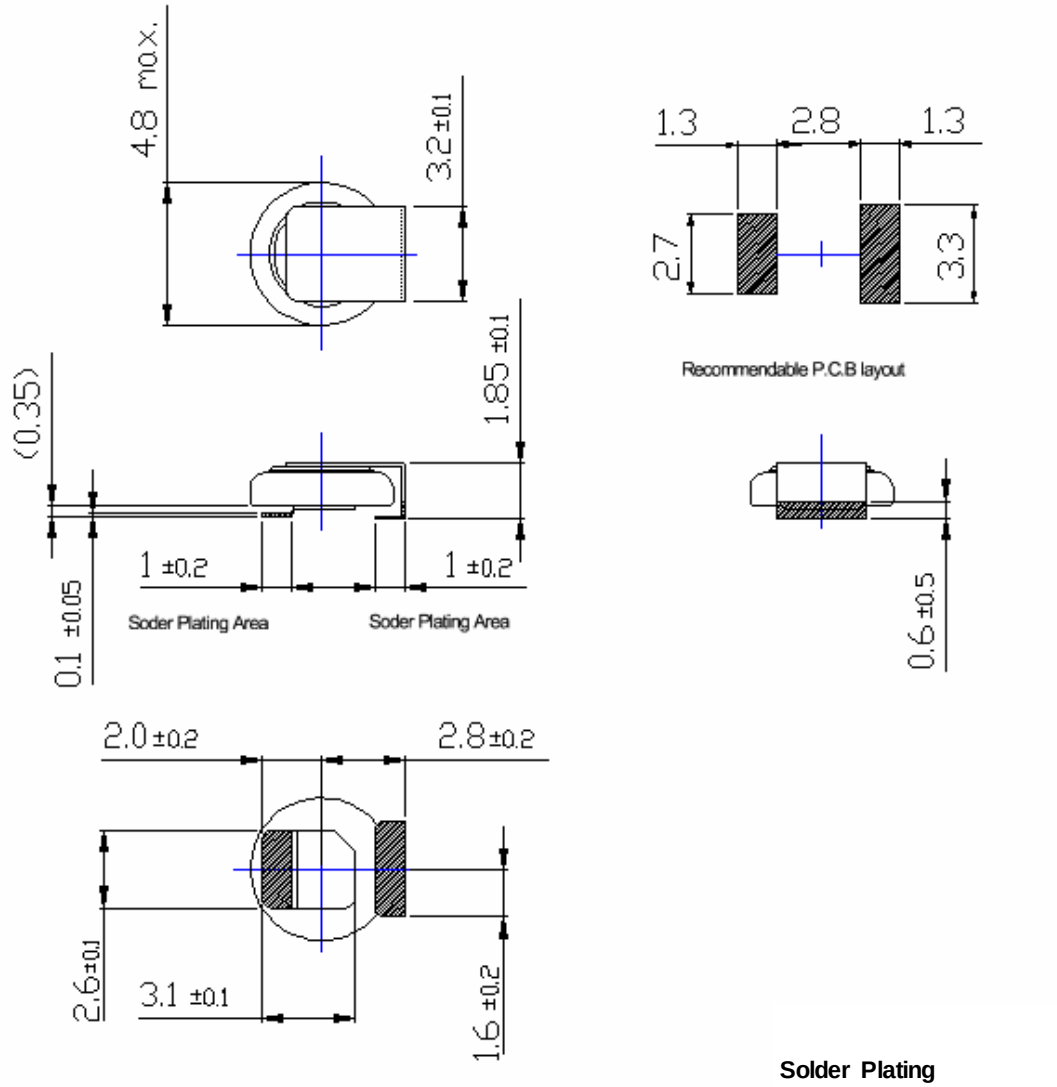
Solder Plating
Ni-Substrate : 0.4~0.7㎛
Au Plating : min. 0.05㎛

부 호 SYM	개 정 이 유 REVISION	날짜 DATE	담당 SIGN	검도 CHECK	승인 APPR
②					
①					

척도 SCALE		제도 DRAWN	설계 DESIGN	검도 CHECK	승인 APPR	도명 NAME	SM T02 TERMINAL	
단위	mm	hwang.M.J		Lee.S.H	Lee.M.B	도번 DWG.NO		CUSTOMER
날짜 DATE								

7. Product Construction And Dimension (Terminal Type : R01)

년월일				
2008-05-02				



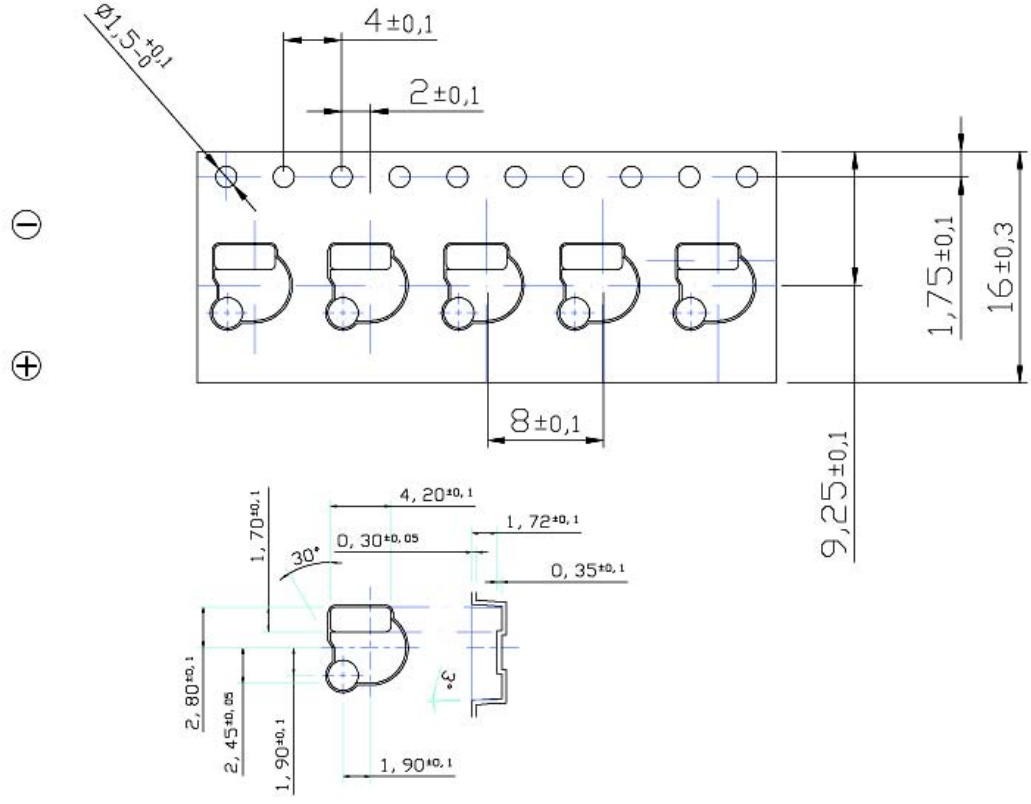
Solder Plating
Ni-Substrate : 0.4~0.7㎛
Au Plating : min. 0.05㎛

부호 SYM	개정이유 REVISION	날짜 DATE	담당 SIGN	검도 CHECK	승인 APPR
△X					
△X					

						도명 NAME	SM R01 TERMINAL	
	척도 SCALE		저도 DRAWN	설계 DESIGN	검도 CHECK	승인 APPR	기계명 TIT.PRJ	CUSTOMER
	단위	mm	hwang.M.J.		Lee.P.K	Lee.M.B.	도번 DWG.NO	
	날짜 DATE							

8. Carrier Tape Construction And Dimension (Terminal Type : T01)

년 월 일				
2007-02-21				



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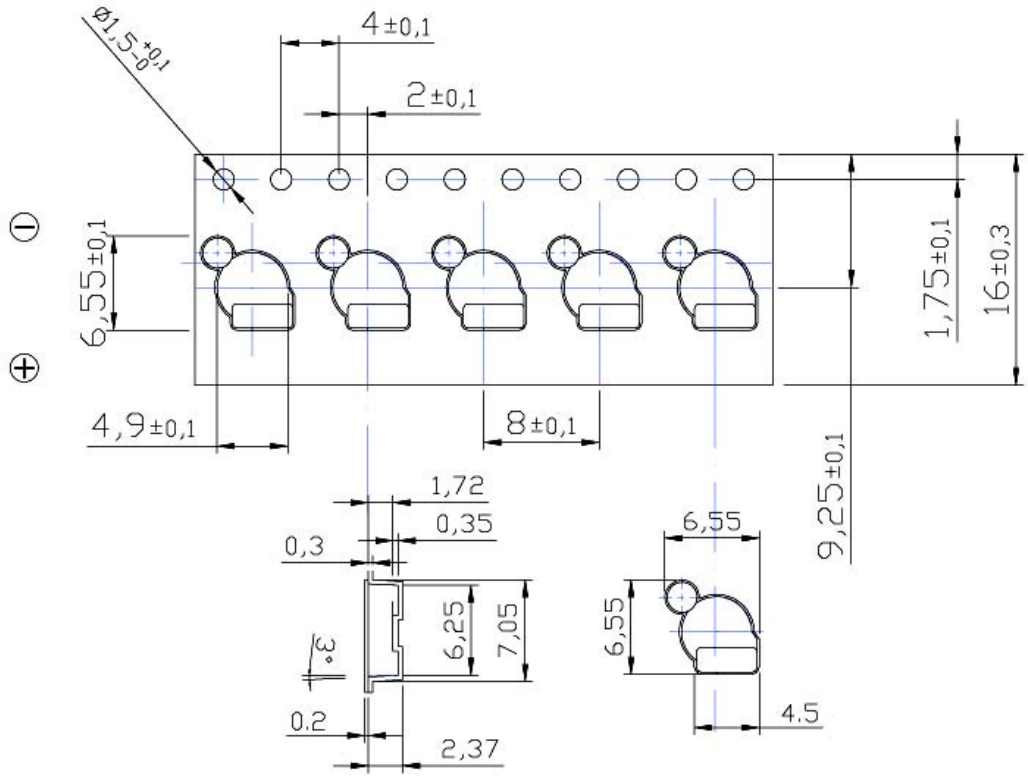
△×					
△×					

							도명 NAME	SM T01 Carrier Tape	
	척도 SCALE		제도 DRAWN	설계 DESIGN	검도 CHECK	승인 APPR	기계명 TIT.PRJ		CUSTOMER
	단위	mm	hwang.M.J		Lee.S.H	Lee.M.B	도번 DWG.NO		
	날짜 DATE								

8. Carrier Tape Construction And Dimension (Terminal Type : T02)

년 월 일				
2007-02-21				



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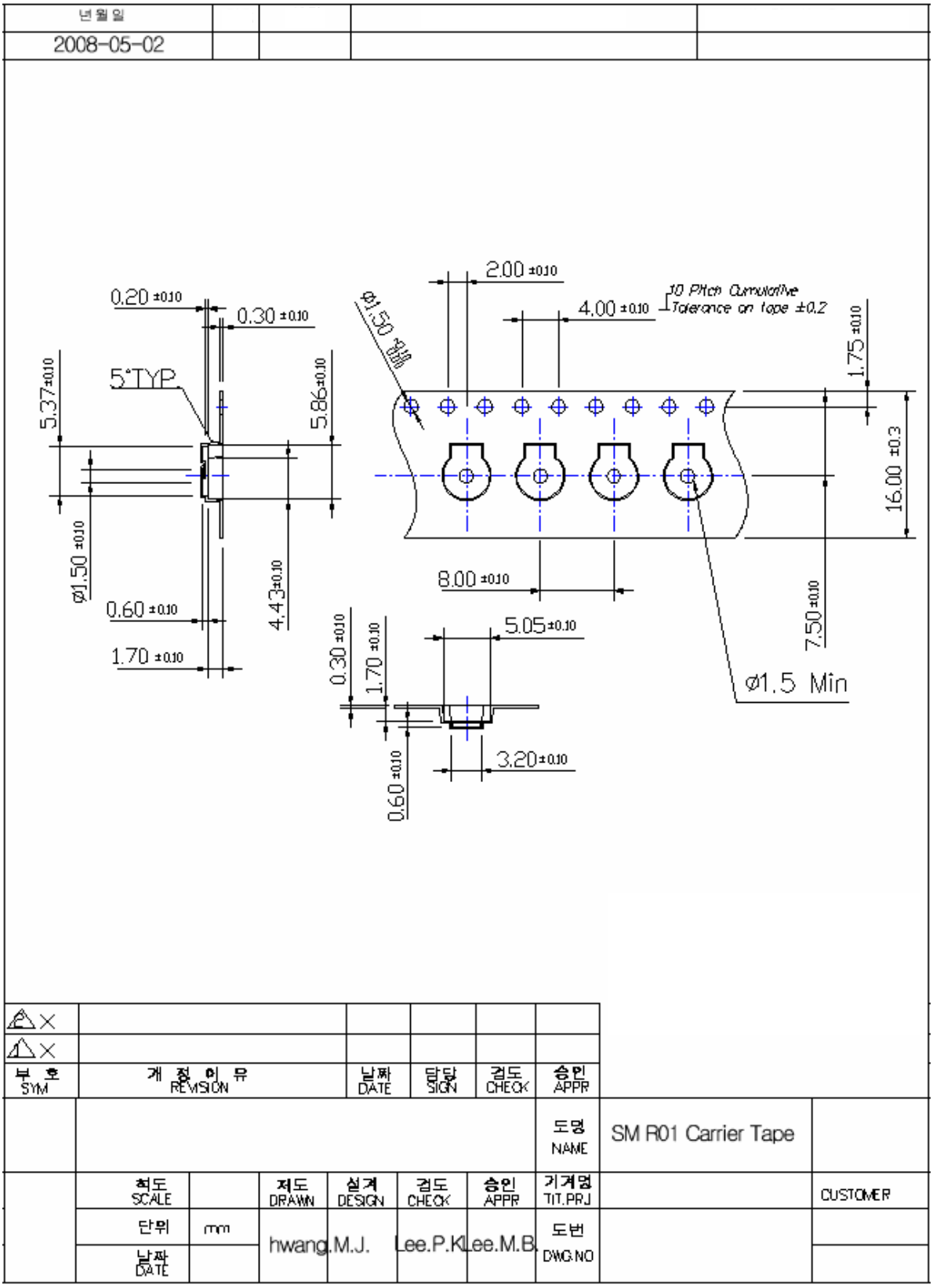
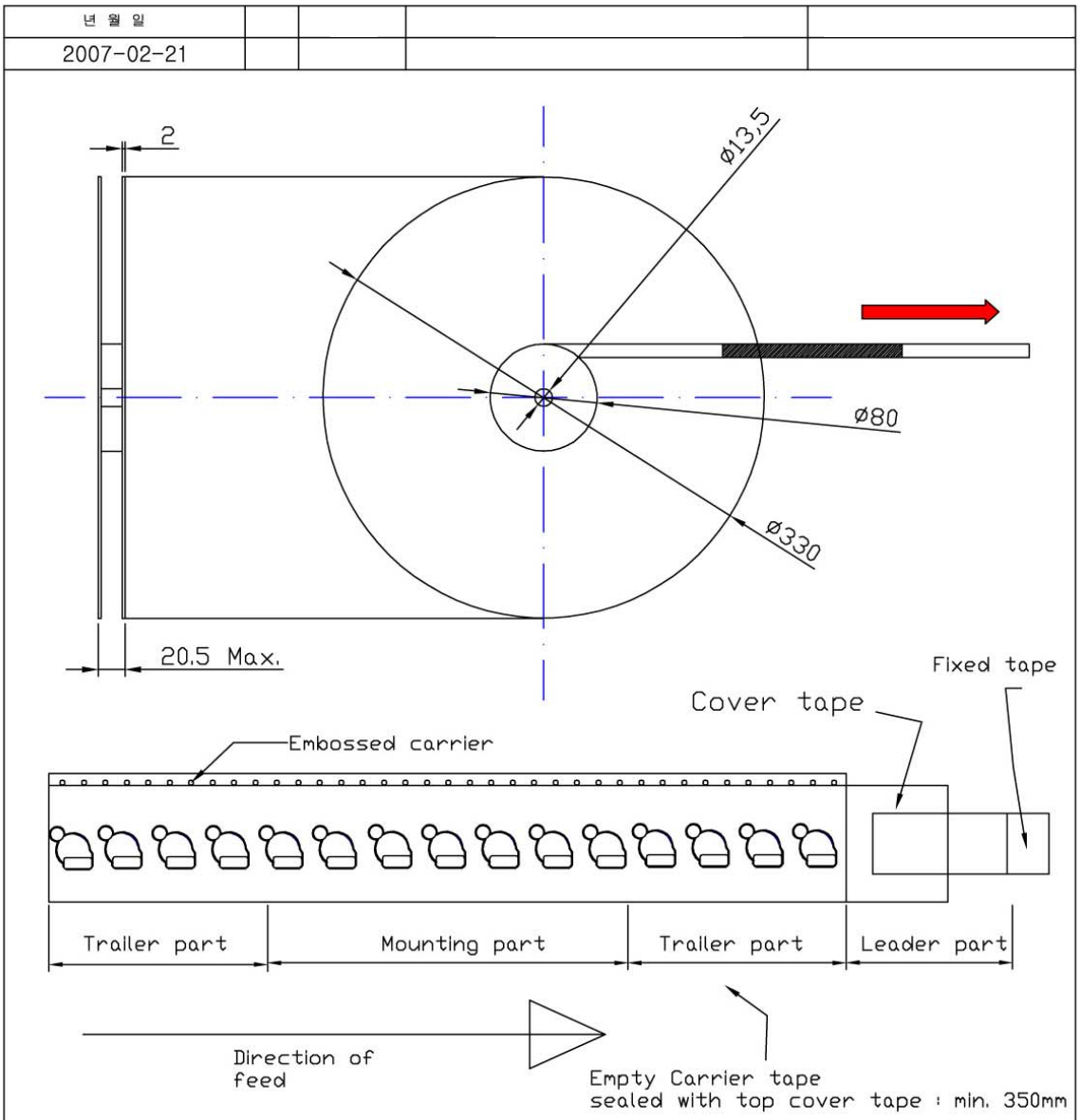
△1					
△2					

						도명 NAME	SM T02 Carrier Tape	
	척도 SCALE		제도 DRAWN	설계 DESIGN	검도 CHECK	승인 APPR	기계명 TIT.PRJ	CUSTOMER
	단위	mm	hwang.M.J		Lee.S.H	Lee.M.B	도번 DWG.NO	
	날짜 DATE							

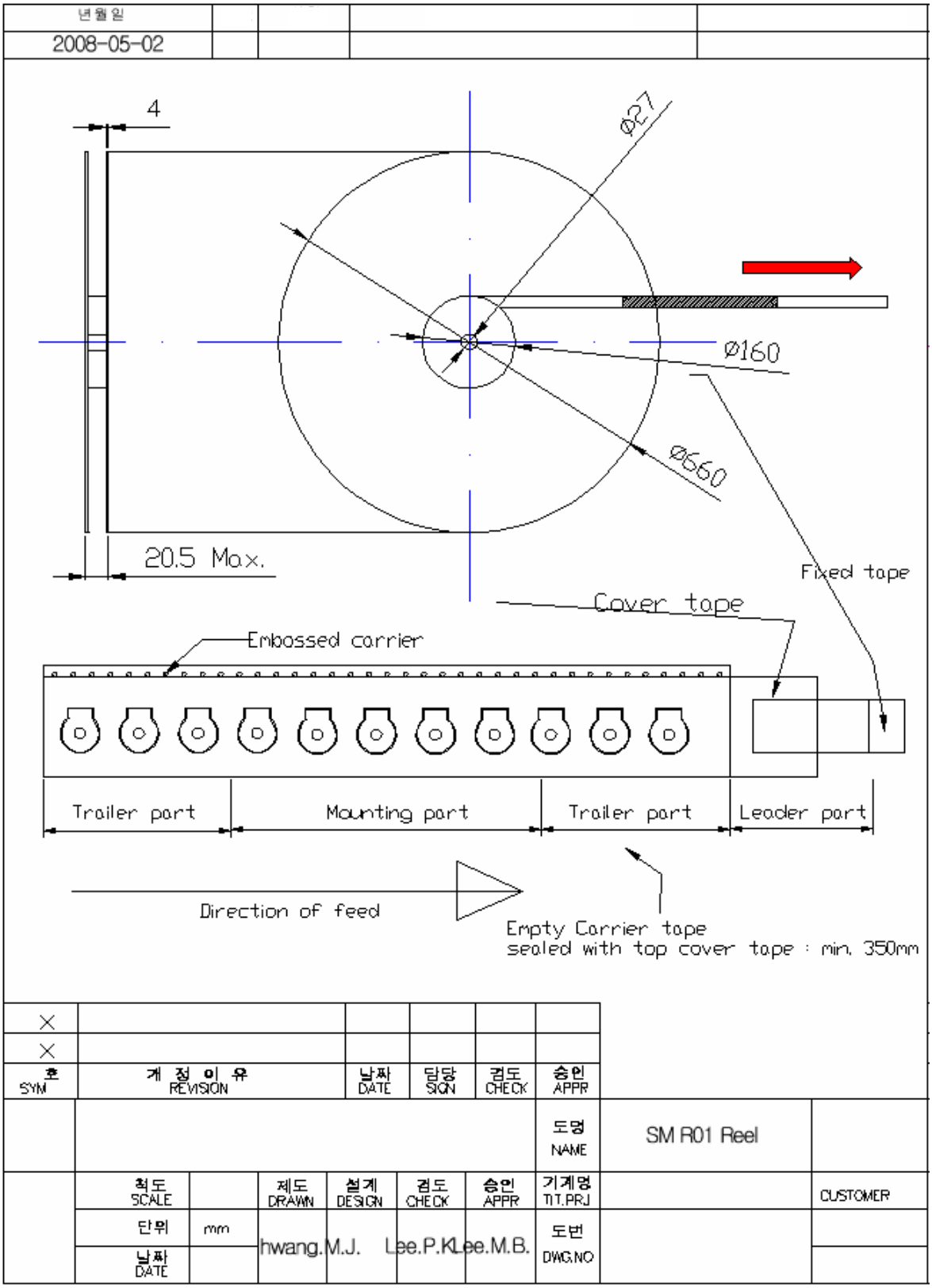
8. Carrier Tape Construction And Dimension (Terminal Type : R01)



9. Taping Construction And Dimension (Terminal Type : T01, T02)

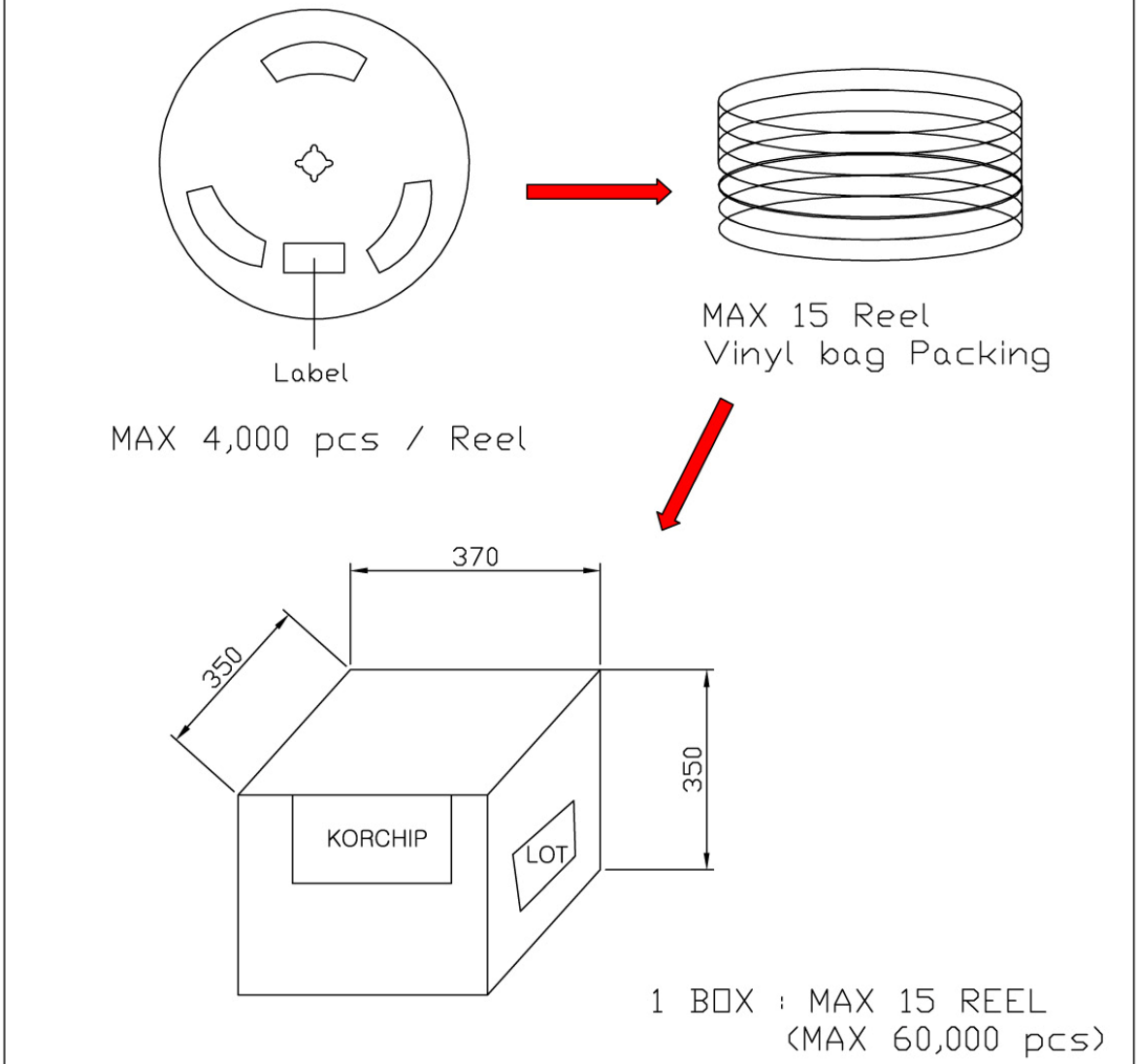


9. Taping Construction And Dimension (Terminal Type : R01)



10. Packing (Terminal Type : T01, T02)

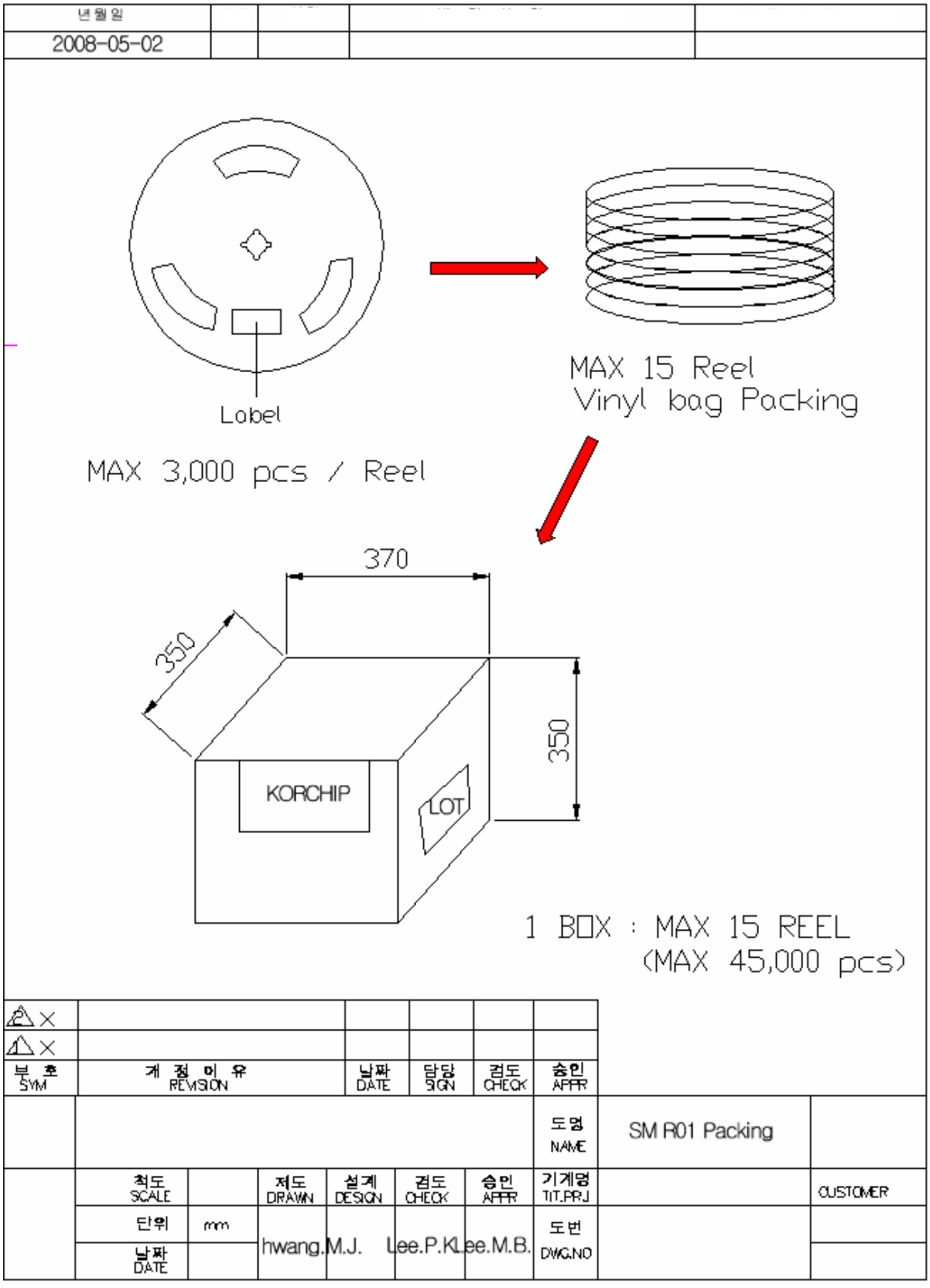
년 월 일				
2007-03-11				



부 호 SYM	개 정 이 유 REVISION	날짜 DATE	담당 SIGN	검도 CHECK	승인 APPR

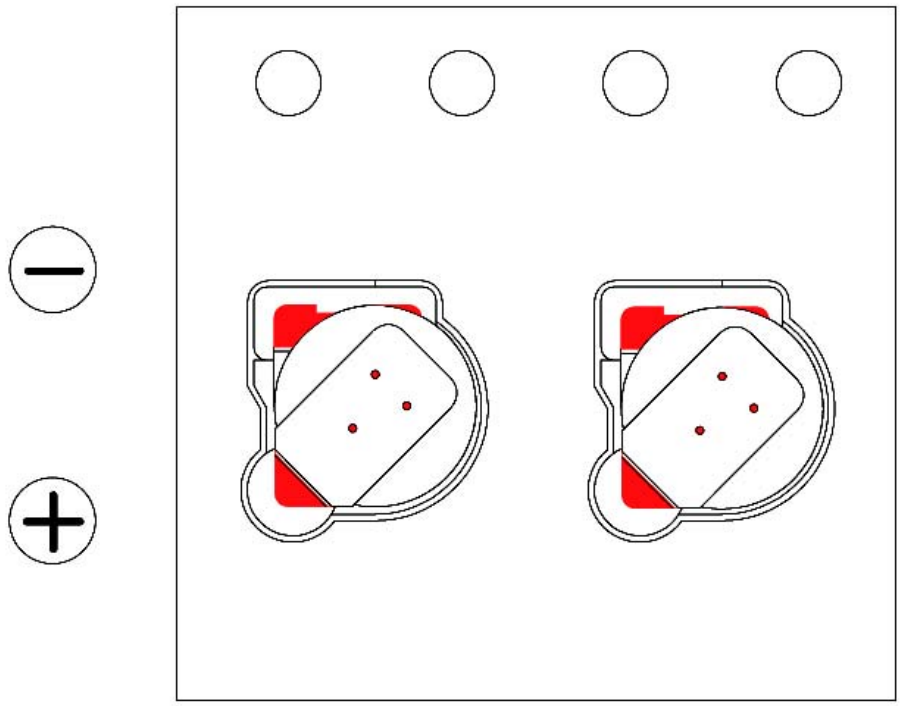
	도명 NAME	SM T02 Packing						
	척도 SCALE		제도 DRAWN	설계 DESIGN	검도 CHECK	승인 APPR	기계명 TIT.PRJ	CUSTOMER
	단위	mm	hwang.M.J		Lee.S.H	Lee.M.B	도번 DWG.NO	
	날짜 DATE							

10. Packing (Terminal Type : R01)



11. Position in Carrier tape (Terminal Type : T01)

년 월 일				
2007-02-21				

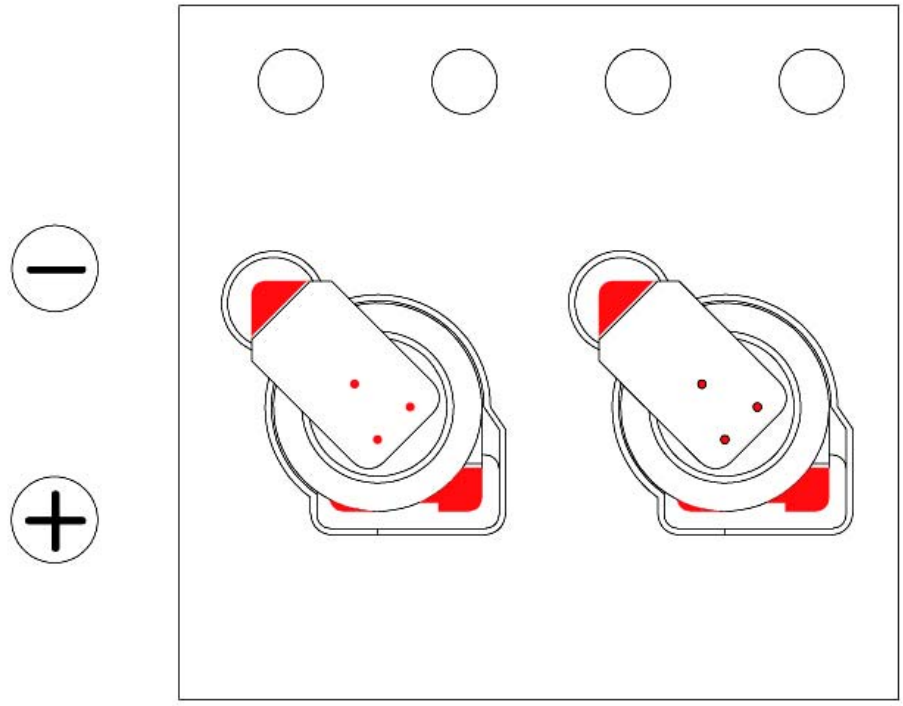


부 호 SYM	개 정 이 유 REVISION	날짜 DATE	담당 SIGN	검도 CHECK	승인 APPR
2					
1					

							도명 NAME	SM T01 Position	
	척도 SCALE		제도 DRAWN	설계 DESIGN	검도 CHECK	승인 APPR	기계명 TIT.PRJ		CUSTOMER
	단위	mm	hwang.M.J		Lee.S.H	Lee.M.B	도번 DWG.NO		
	날짜 DATE								

11. Position in Carrier tape (Terminal Type : T02)

년 월 일				
2007-02-21				

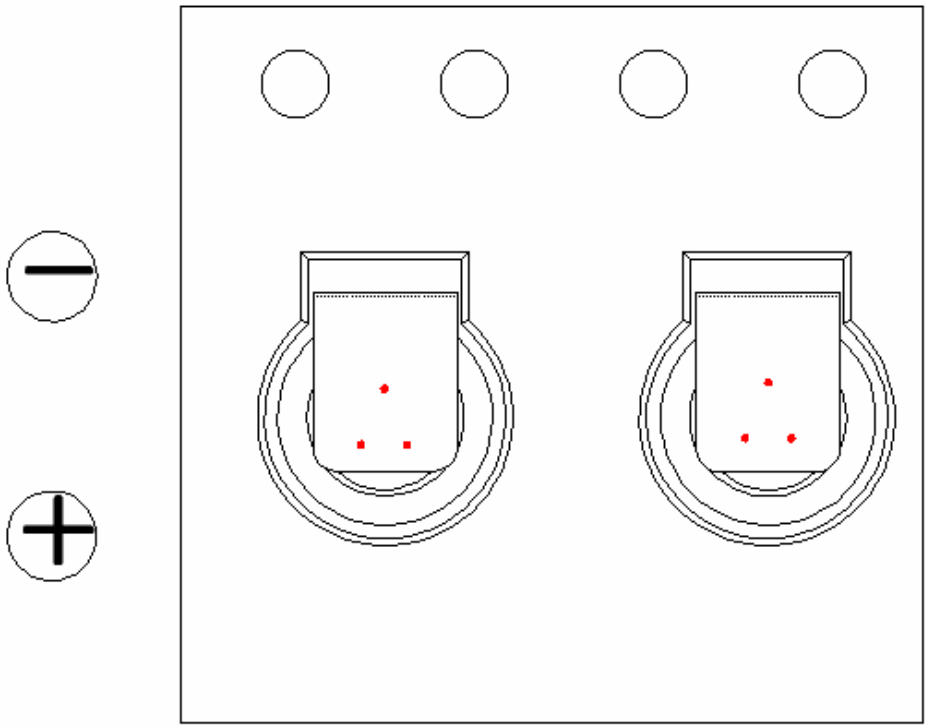


부 호 SYM	개 정 이 유 REVISION	날짜 DATE	담당 SIGN	검도 CHECK	승인 APPR
2					
1					

							도명 NAME	SM T02 Position	
	척도 SCALE		제도 DRAWN	설계 DESIGN	검도 CHECK	승인 APPR	기계명 TIT.PRJ		CUSTOMER
	단위	mm	hwang.M.J		Lee.S.H	Lee.M.B	도번 DWG.NO		
	날짜 DATE								

11. Position in Carrier tape (Terminal Type : R01)

년월일				
2008-05-02				



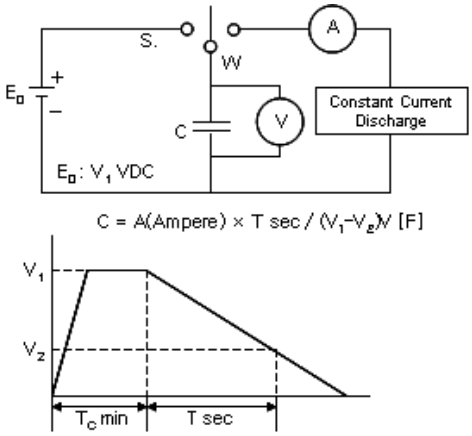
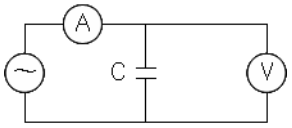
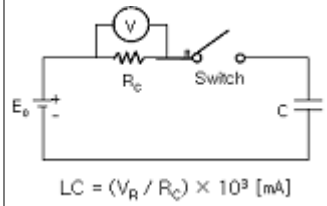
부호 SYM	기 정 이 유 REVISION	날짜 DATE	담당 SIGN	검도 CHECK	승인 APPR

						도명 NAME	SM R01 Position	
	척도 SCALE		제도 DRAWN	설계 DESIGN	검도 CHECK	승인 APPR	기계명 TIT.PRJ	CUSTOMER
	단위	mm	hwang.M.J.		Lee.P.K	Lee.M.B.	도번 DWG.NO	
	날짜 DATE							

12. Specifications And Test Method

<table>
<tr><th colspan="3">ITEMS</th><th>SPECIFICATIONS</th><th>TEST CONDITION</th></tr>
<tr><td colspan="3">OPERATING TEMP. RANGE</td><td>-25℃ ~ +60℃</td><td></td></tr>
<tr><td colspan="3">RATED VOLTAGE</td><td>3.3 Vdc</td><td></td></tr>
<tr><td colspan="3">CAPACITANCE</td><td>0.07F</td><td>See Measuring Method of Characteristics</td></tr>
<tr><td colspan="3">CAPACITANCE TOLERANCE</td><td>+80% , -20%</td><td></td></tr>
<tr><td colspan="3">EQUIV. SERIES. RES. (ESR)</td><td>100Ω OR LESS</td><td>See Measuring Method of Characteristics</td></tr>
<tr><td colspan="3">LEAKAGE CURRENT (30MIN)</td><td>100㎂ OR LESS</td><td>VOLTAGE : 3.3VDC
CHARGING RESISTANCE : 100Ω
See Measuring Method of Characteristics</td></tr>
<tr><td rowspan="9">TEMPERATURE CHARACTERISTICS</td><td rowspan="2">STAGE 2</td><td>CAPACITANCE</td><td>± 50% OF INI. VAL</td><td rowspan="9">Measure electrical characteristics after exposing Double-Layer Capacitor to each temperature atmosphere for 1 hour
<table><tr><th>STAGE</th><th>TEMPERATURE</th></tr><tr><td>1</td><td>20± 2℃</td></tr><tr><td>2</td><td>-25± 2℃</td></tr><tr><td>3</td><td>20± 2℃</td></tr><tr><td>4</td><td>60± 2℃</td></tr><tr><td>5</td><td>20± 2℃</td></tr></table></td></tr>
<tr><td>ESR</td><td>10 TIMES↓ OF INI. VAL</td></tr>
<tr><td rowspan="3">STAGE 4</td><td>CAPACITANCE</td><td>± 50% OF INI. VAL</td></tr>
<tr><td>ESR</td><td>100Ω OR LESS</td></tr>
<tr><td>LC (30MIN)</td><td>SPEC. VALUE</td></tr>
<tr><td rowspan="3">STAGE 5</td><td>CAPACITANCE</td><td>± 10% OF INI. VAL</td></tr>
<tr><td>ESR</td><td>100Ω OR LESS</td></tr>
<tr><td>LC (30MIN)</td><td>SPEC. VALUE</td></tr>
<tr><td rowspan="2">REFLOW SOLDERING</td><td colspan="2">CAPACITANCE</td><td>SPEC. VALUE</td><td rowspan="2">Pb-Free REFLOW SOLDER
PEAK TEMP. : 260± 5℃
PEAK TIME : 5± 0.5sec.</td></tr>
<tr><td colspan="2">APPEARANCE</td><td>NO MARKED DEFECT</td></tr>
<tr><td rowspan="4">HUMIDITY</td><td colspan="2">CAPACITANCE</td><td>90%↑ OF SPEC. VALUE</td><td rowspan="4">TEMP:40± 2℃
HUMIDITY:90 ~ 95%RH
TEST TIME:240± 8HOURS
<u>NO VOLTAGE APPLIED</u></td></tr>
<tr><td colspan="2">ESR</td><td>1.2TIMES ↓ OF SPE. V</td></tr>
<tr><td colspan="2">LC(30MIN)</td><td>1.2TIMES ↓ OF SPE. V</td></tr>
<tr><td colspan="2">APPEARANCE</td><td>NO MARKED DEFECT</td></tr>
<tr><td rowspan="2">CYCLE CHARACTERISTICS</td><td colspan="2">CAPACITANCE</td><td>70%↑ OF SPEC. VALUE</td><td rowspan="2">TEMP. : 25± 2℃
CYCLE NUMBER : 10,000
CHARGE VOLTAGE :3.3V,
RESISTANCE :150Ω, TIME :9min.
DISCHARGE RESISTANCE:150Ω,TIME:1min.</td></tr>
<tr><td colspan="2">APPEARANCE</td><td>NO MARKED DEFECT</td></tr>
<tr><td rowspan="4">VIBRATION RESISTANCE</td><td colspan="2">CAPACITANCE</td><td>± 10% OF INI. VAL</td><td rowspan="4">AMPLITUDE: 1.5㎜
FREQUENCY: 10~55㎐
DIRECTION: X, Y, Z 3DIRECTIONS
TEST TIME: 6HOURS</td></tr>
<tr><td colspan="2">ESR</td><td>100Ω OR LESS</td></tr>
<tr><td colspan="2">LC(30MIN)</td><td>SPEC. VALUE</td></tr>
<tr><td colspan="2">APPEARANCE</td><td>NO MARKED DEFECT</td></tr>
<tr><td>TERMINAL STRENGTH</td><td colspan="2">APPEARANCE</td><td>TERMINALS SHALL NOT BE SEPARATED</td><td>LOAD 1㎏ , 10±1 SEC</td></tr>
<tr><td rowspan="4">ENDURANCE</td><td colspan="2">CAPACITANCE</td><td>± 30% OF SPEC. VAL</td><td rowspan="4">TEMP. :60± 2℃
TEST TIME : 500(+24, -0) HOURS
APPLIED VOLTAGE : 3.3Vdc</td></tr>
<tr><td colspan="2">ESR</td><td>2 KΩ OR LESS</td></tr>
<tr><td colspan="2">LC(30MIN)</td><td>300uA OR LESS</td></tr>
<tr><td colspan="2">APPEARANCE</td><td>NO MARKED DEFECT</td></tr>
</table>

13. Measuring Method Of Characteristics

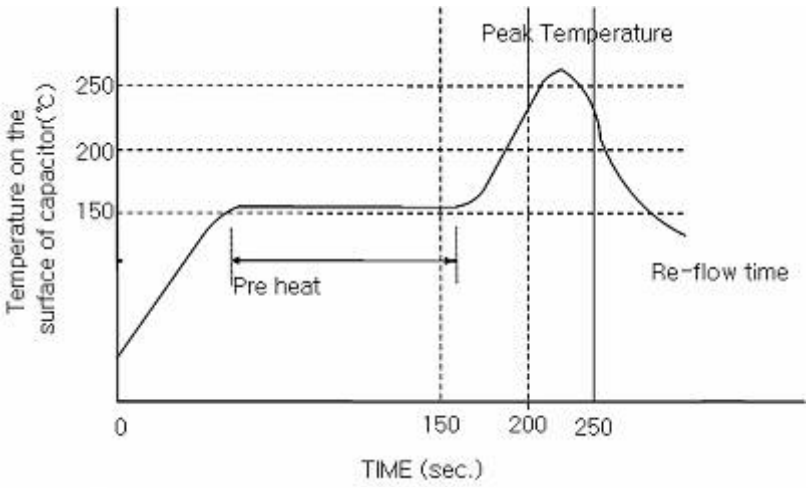
Capacitance	1) CHARGE THE STARCAP WITH 1±0.1㎃ TO OPERATION VOLTAGE(V1) FOR 1 HOUR. 2) DISCHARGE THE STARCAP WITH CONSTANT CURRENT(A) 10±1㎂ TO THE VOLTAGE OF V2(NORMALLY 2V) WHILE MEASURE THE DISCHARGE TIME(T). ※ STANDARD OPERATING CURRENT FOR SM3R3703R01 STARCAP IS 10㎂. 3) CALCULATE CAPACITANCE USING THE FOLLOWING FORMULA.  C = A(Ampere) × T sec / (V_1-V_2)V [F]
Equivalent Series Resistance (ESR @1kHz)	● MEASURE ESR BY THE LCR METER. (Frequency:1㎑, Bias Voltage : $0^{+0.05}$V) or ● CALCULATE ESR USING THE FOLLOWING FORMULA.  ESR[Ω] = V / i **R[Ω] = V[V] / I[A]** * i[㎃] = I[A] x 10^{-3} R : Internal resistance(ESR) [Ω] V : Measured voltage between terminals [V] i : Current 1mA(A.C.)
Leakage Current	1) APPLY 3.3± 0.1V TO THE STARCAP. 2) MEASURE V_R AFTER 30±0.5 MIN. 3) CALCULATE CURRENT USING THE FOLLOWING FORMULA.  E_0 : Vdc R_C : 100Ω LC = $(V_R / R_C) \times 10^3$ [㎃]
☞ THE STARCAP SHOULD BE SHORTED BEFORE EACH MEASUREMENT AS FOLLOWS ; CAPACITANCE : 60 MIN. , ESR : 15 MIN. , LC : 15 MIN.	

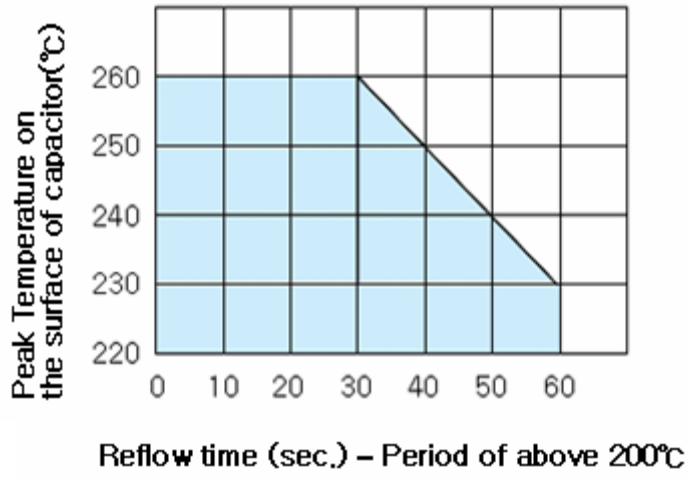
14. Reflow Soldering

Excessive heat stress may result in the deterioration of the electrical characteristics of the capacitor, loss of air tightness, and electrolyte leakage due to the rise in internal pressure.

Use the general reference chart then set soldering temperature and time.

Max. 260℃ (within 5 seconds)





The time of repeated reflow soldering must be two time or less.

Do not use reflow soldering when the cell voltage is above 0.3V.

15. Manual Soldering

For use of a soldering iron, it should not touch the cell body.

Temperature of the soldering iron should be less than 350℃.

Soldering time for terminals should be less than 3 seconds.

16. Cautions For Use

Please be careful for following points when you use STARCAP.

1) Do not apply more than rated voltage.

If you apply more than rated voltage, STARCAP's electrolyte will be electrolyzed and its ESR increase. At the worst, it may be broken.

2) Do not use STARCAP for ripple absorption.

3) Polarity

The STARCAP is non-polar fundamentally, however STARCAP gets polarity through aging process before it is packed. Please mount it in accordance with its polarity to maintain the best condition.

4) Operating temperature and life

Generally, STARCAP has a lower leakage current, longer back-up time and longer life in the low temperature i.e. the room temperature. But it has a higher leakage current, shorter back-up time and shorter life in the high temperature.

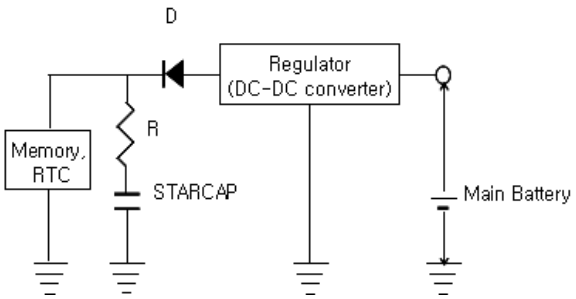
Please design to keep STARCAP away from calorific parts.

5) Cleaning

Some detergent or high temperature drying causes deterioration of STARCAP.

If you wash STARCAP, Consult us.

6) Following figure shows the general back-up circuit.



D : Diode to prevent the reverse current
R : Resistor to control the charging current

7) Short-circuit STARCAP

You can short-circuit between terminals of STARCAP without resistor. However when you short-circuit frequently, please consult us.

8) Storage

In long term storage, please store STARCAP in following condition;

① TEMP. : 15 ~ 35 ℃

② HUMIDITY : 45 ~ 75 %RH

③ NON-DUST ENVIRONMENT

9) Do not disassemble STARCAP. It contains electrolyte.

10) Series connection of STARCAP

Over-rated voltage may be applied to a single STARCAP in series connection due to the deviation of capacitance and ESR of each STARCAP. Please inform us if you are using STARCAP in series connection and please design so as not to apply over-rated voltage to each STARCAP, and use STARCAPs from same lot.

11) The tips of STARCAP terminals are very sharp. Please handle with care.

17. Environmental Management

All STARCAP products are RoHS compliant and environment friendly.

By changing the solder plating from leaded solder to lead-free solder, our new STARCAP has became even more friendly to the environment.

Series	RoHS directive Pb, Cr+6, Hg, Cd, PBB,PBDE	ELV directive Pb, Cr+6, Hg, Cd	PVC	etc.
SM	N.D.	N.D.	N.D.	

* N.D. : Not detected