

【1. 適用範囲 SCOPE】

本仕様書は、0.5mmピッチ FFC対基板用コネクタ について規定する。

This product specification covers the performance requirements for 0.5mm pitch FFC to Board connector series.

【2. 製品名称及び型番 PRODUCT NAME AND PART NUMBER】

| 製品名称 Product Name | | 製品型番 Material Number |
|-------------------------|--|----------------------------|
| コネクタ側 Connector Side | ハウジングアッセンブリ グランド端子付き Housing Assembly with Ground (ST Type) | 501786-**31 501786-**61 |
| | 501786-**31, -**61 テーピング梱包 Embossed Tape Package for 501786-**31, -**61 | 501786-**91 |
| | ハウジングアッセンブリ Housing Assembly (ST Type) | 501786-**41 |
| | 501786-**41 テーピング梱包 Embossed Tape Package for 501786-**41 | 501786-**92 |
| プラグ側 Plug Side | プラグジャケット(小ラッチ) Plug Jacket (Small Latch) | 501783-**09 |
| | プラグジャケットカバー(小ラッチ) Plug Jacket Cover (Small Latch) | 501784-**08 501784-**09 |
| | プラグジャケット(大ラッチ) Plug Jacket (Large Latch) | 503150-**09 |
| | プラグジャケットカバー(大ラッチ) Plug Jacket Cover (Large Latch) | 503151-**09 |

** : 極数 (図面参照)

CIRCUITS(Refer to the drawing)

・ジャケット、ジャケットカバー対応表 CORRESPONDENCE TABLE

| 製品名称(テーピング梱包) Product Name(Embossed Tape Package) | プラグジャケット Plug Jacket | プラグジャケットカバー Plug Jacket Cover |
|--|-------------------------|----------------------------------|
| 501786-3091 | 501783-3009 | 501784-3008 |
| 501786-3092 | | 501784-3009 |
| 501786-4091 | 501783-4009 | 501784-4008 |
| 501786-5091 | 503150-5009 | 503151-5009 |

| | | | | | | | | | | | | | | | | | | | | |
|---------------------|--|---|---|---|---|---|---|---|----------------------------------|-------------------------|---------------------|----------------------------|----|----|----|----|----|----|------------------|----|
| REV. | A | A | A | A | A | A | A | F | A | F | F | A | A | A | A | A | A | A | F | |
| SHEET | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| REVISE ON PC ONLY | | | | | | | | TITLE: 0.5mm PITCH FFC TO BOARD CONNECTOR WITH GROUND TERMINAL | | | | | | | | | | | | |
| F | 変更 REVISED EC NO. 628512 2020/1/31 S.KITAZAWA | | | | | | | THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX ELECTRONIC TECHNOLOGIES, LLC AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION | | | | | | | | | | | | |
| REV. | DESCRIPTION | | | | | | | WRITTEN BY: MTAKASAKI | CHECKED BY: KMORIKAWA | APPROVED BY: HHIRATA | DATE: 2009/02/04 | | | | | | | | | |
| DESIGN CONTROL J | | | | | | | | STATUS | DOCUMENT NUMBER PS-501786-004 | DOC. TYPE PS | DOC. PART 001 | CUSTOMER GENERAL MARKET | | | | | | | SHEET 1 OF 20 | |

【3. 定 格 RATINGS】

| 項 目 Item | 規 格 Standard | |
|---------------------------------------|----------------------|------------------|
| 最大許容電圧 Rated Voltage(MAXIMUM) | 50V | [AC(実効値 rms)/DC] |
| 最大許容電流 Rated Current (MAXIMUM) | 0.5A | |
| 使用温度範囲*1 Ambient Temperature Range | -40°C ~+105°C *2*3*4 | |

*1: 基板実装後の無通電状態は、使用温度範囲が適用されます。
Non-operating connectors after reflow must follow the operating temperature range condition.

*2: 通電による温度上昇分を含む。
This includes the terminal temperature rise generated by conducting electricity.

*3: 適合FFC(電線、ケーブル等)も本使用温度範囲を満足すること。
Applicable FFC (wires and cables) must also meet the specified temperature range.

*4: 8-4を参照のこと。
See for details 8-4

| | | | | |
|----------------------------------|-------------------|---|------------------|----------------------------|
| REVISE ON PC ONLY | | TITLE: 0.5mm PITCH FFC TO BOARD CONNECTOR WITH GROUND TERMINAL | | |
| F | SEE SHEET 1 OF 20 | THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX ELECTRONIC TECHNOLOGIES, LLC AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION | | |
| REV. | DESCRIPTION | | | |
| DOCUMENT NUMBER PS-501786-004 | | DOC. TYPE PS | DOC. PART 001 | CUSTOMER GENERAL MARKET |
| | | | | SHEET 2 OF 20 |
| EN-127(2015-12) | | | | |

【4. 性能 PERFORMANCE】

4-1. 電気的性能 Electrical Performance

| 項目 Item | | 条件 Test Condition | 規格 Requirement |
|------------|-------------------------------|---|---|
| 4-1-1 | 接触抵抗 Contact Resistance | 適合FFCを嵌合させ、開放電圧20mV 以下、短絡電流10mA 以下にて測定する。 (JIS C5402-2-1) Mate applicable FFC, measured at the open circuit voltage 20mV MAXIMUM and short circuit 10mA MAXIMUM.(JIS C5402-2-1) | 40 milliohm MAXIMUM |
| 4-1-2 | 絶縁抵抗 Insulation Resistance | 適合FFCを嵌合させ、隣接するターミナル間及びターミナル、アース間に、DC 500Vを印加し測定する。 (JIS C5402-3-1/MIL-STD-202 試験法 302) Mate applicable FFC, measured by applying DC 500V between adjacent terminal or terminal and ground. (JIS C5402-3-1/MIL-STD-202 Method 302) | 50 megaohm MINIMUM |
| 4-1-3 | 耐電圧 Dielectric Strength | 適合FFCを嵌合させ、隣接するターミナル間及びターミナル、アース間に、AC 250V(実効値)を1分間印加する。 (JIS C5402-4-1/MIL-STD-202 試験法 301) Mate applicable FFC, applying AC 250V(effective value) between adjacent terminal or terminal and ground for 1 minutes. (JIS C5402-4-1/MIL-STD-202 Method 301) | 製品機能を損なう異状なきこと No damage on function |

REVISE ON PC ONLY

F

SEE SHEET 1 OF 20

TITLE:

0.5mm PITCH FFC TO BOARD CONNECTOR
WITH GROUND TERMINAL

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REV.

DESCRIPTION

DOCUMENT NUMBER
PS-501786-004

DOC. TYPE
PS

DOC. PART
001

CUSTOMER
GENERAL MARKET

SHEET
3 OF 20

4-2. 機械的性能 Mechanical Performance

| 項目 Item | | 条件 Test Condition | 規格 Requirement |
|------------|--|---|---|
| 4-2-1 | 挿入／抜去力 Insertion Force / Withdrawal Force | 適合FFCをロック解除した状態にて毎分25±3 mmの速さで挿入／抜去を行う。 Unlock, and insert / withdraw the applicable FFC at the speed rate of 25+ /-3 mm per minute. | 第7項参照 (参考値) Refer to paragraph 7 (Reference value) |
| 4-2-2 | 端子保持力 Terminal / Housing Retention Force | ハウジングに装着された各端子を引き抜く。 Pull out the each terminal assembled in the housing. | 0.5N MINIMUM |
| 4-2-3 | 金具保持力 Fitting Nail /Housing Retention Force | ハウジングに装着された各金具を引き抜く。 Pull out the each fitting nail assembled in the housing. | 1.0N MINIMUM |
| 4-2-4 | 強制抜去力 Compulsion Unmate Force | 適合FFCを挿入し、ロックした状態にてFFCを毎分25±3 mmの速さで嵌合軸方向に対して真っ直ぐ引き抜く。 Mate applicable FFC, stay lock, and mate axial pull out the FPC at the speed rate of 25+ /-3 mm per minute. | 9.8N MINIMUM |

REVISE ON PC ONLY

F

SEE SHEET 1 OF 20

TITLE:

0.5mm PITCH FFC TO BOARD CONNECTOR
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DESCRIPTION

DOCUMENT NUMBER
PS-501786-004

DOC. TYPE
PS

DOC. PART
001

CUSTOMER
GENERAL MARKET

SHEET
4 OF 20

4-3. その他 Environmental Performance and Others

| 項目 Item | | 条件 Test Condition | 規格 Requirement | |
|------------|---------------------------------------|--|-------------------------------|--|
| 4-3-1 | 繰返し挿抜 Repeated Mate / Unmate | 無通電状態にて1分間に10回以下の速さで、FFCの挿入、抜去を20回繰り返す。 Mate/unmate FFC to 20 cycles at the speed rate of less than 10 cycles per minute in the power-off state. | 接触抵抗 Contact Resistance | 60 milliohm MAXIMUM |
| 4-3-2 | 温度上昇 Temperature Rise | 適合するFFCを嵌合させ、最大許容電流を通電し、コネクタの温度上昇分を測定する。(UL 498) Mate applicable FFC, measure the temperature rise of contact when the maximum AC rated current is passed.(UL 498) | 温度上昇 Temperature Rise | 30 °C MAXIMUM |
| 4-3-3 | 耐振動性 Vibration | 適合するFFCを嵌合させ、DC1mA通電状態にて、嵌合軸を含む互いに垂直な3方向に掃引割合10~55~10 Hz/分、全振幅1.5mmの振動を各2時間加える。 (JIS C 60068-2-6 /MIL-STD-202 試験法201) Mate applicable FFC, add to each 2 hours with ratio sweep 10-55-10 Hz per minute and total amplitude 1.5 mm vibration at 3 directions mutually vertical including fitting axis in DC 1 mA electricity state. (JIS C 60068-2-6 /MIL-STD-202, Method 201) | 外観 Appearance | 製品機能を損なう 異状なきこと No damage on function |
| | | | 接触抵抗 Contact Resistance | 60 milliohm MAXIMUM |
| | | | 瞬断 Discontinuity | 1.0 microsecond MAXIMUM |
| 4-3-4 | 耐衝撃性 Mechanical Shock | 適合するFFCを嵌合させ、DC1mA通電状態にて、嵌合軸を含む互いに垂直な6方向に、490m/s ² {50G}の衝撃を作用時間11ミリ秒で各3回加える。 (JIS C60068-2-27 / MIL-STD-202試験法 213) Mate applicable FFC, add to each 3 times with impact of 490m/s ² {50G} on action time 11 milliseconds at 6 directions mutually vertical including fitting axis in DC 1 mA electricity state. (JIS C60068-2-27 / MIL-STD-202Method 213) | 外観 Appearance | 製品機能を損なう 異状なきこと No damage on function |
| | | | 接触抵抗 Contact Resistance | 60 milliohm MAXIMUM |
| | | | 瞬断 Discontinuity | 1.0 microsecond MAXIMUM |

REVISE ON PC ONLY

F

SEE SHEET 1 OF 20

TITLE:

0.5mm PITCH FFC TO BOARD CONNECTOR
WITH GROUND TERMINAL

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REV.

DESCRIPTION

DOCUMENT NUMBER
PS-501786-004

DOC. TYPE
PS

DOC. PART
001

CUSTOMER
GENERAL MARKET

SHEET
5 OF 20

| 項目 Item | | 条件 Test Condition | 規格 Requirement | |
|------------|------------------------|---|-------------------------------|---|
| 4-3-5 | 耐熱性 Heat Resistance | 適合するFFCを嵌合させ、105±2°Cの雰囲気中に96時間放置する。 試験後、1～2時間室温に放置する。 (JIS C60068-2-2/MIL-STD-202 試験法 108) Mate applicable FFC, exposing for 96 hours in the atmosphere of 105+/-2 degree C. After the test, allowed to stand at room temperature for 1 to 2 hours. (JIS C60068-2-2/MIL-STD-202 Method 108) | 外観 Appearance | 製品機能を損なう異状なきこと No damage on function |
| | | | 接触抵抗 Contact Resistance | 60 milliohm MAXIMUM |
| 4-3-6 | 耐寒性 Cold Resistance | 適合するFFCを嵌合させ、-40±3°Cの雰囲気中に96時間放置する。試験後、1～2時間室温に放置する。(JIS C60068-2-1) Mate applicable FFC and expose to -40+/-3 degree C for 96 hours. Upon completion of the exposure period, the test specimens shall be conditioned at ambient room conditions for 1 to 2 hours. (JIS C60068-2-1) | 外観 Appearance | 製品機能を損なう異状なきこと No damage on function |
| | | | 接触抵抗 Contact Resistance | 60 milliohm MAXIMUM |
| 4-3-7 | 耐湿性 Humidity | 適合FFCを嵌合させ、60±2°C 相対湿度 90～95% の雰囲気中に 96時間放置する。 試験後、1～2時間室温に放置する。 (JIS C60068-2-78/MIL-STD-202 試験方法103) Mate applicable FFC, exposing for 96 hours in an atmosphere of 60+/-2 degree C, relative humidity 90 to 95%. After the test, allowed to stand at room temperature for 1 to 2 hours. (JIS C60068-2-78/MIL-STD-202 Method 103) | 外観 Appearance | 製品機能を損なう異状なきこと No damage on function |
| | | | 接触抵抗 Contact Resistance | 60 milliohm MAXIMUM |
| | | | 耐電圧 Dielectric Strength | 4-1-3項 満足のこと Must meet 4-1-3 |
| | | | 絶縁抵抗 Insulation Resistance | 20 megaohm MINIMUM |

REVISE ON PC ONLY

F

SEE SHEET 1 OF 20

TITLE:

0.5mm PITCH FFC TO BOARD CONNECTOR
WITH GROUND TERMINAL

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REV.

DESCRIPTION

DOCUMENT NUMBER
PS-501786-004

DOC. TYPE
PS

DOC. PART
001

CUSTOMER
GENERAL MARKET

SHEET
6 OF 20

| 項目 Item | | 条件 Test Condition | 規格 Requirement | |
|------------|------------------------------------|--|-------------------------------|--|
| 4-3-8 | 温度サイクル Temperature Cycling | 適合するFFCを嵌合させ、-40±3°Cに30分、105±2°Cに30分、これを1サイクルとし、5サイクル繰り返す。但し、温度移行時間は、5分以内とする。試験後1~2時間室温に放置する。 (JIS C60068-2-14) Mate applicable FFC, exposing to 105+/-2 degree C and -40+/-3 degree C temperature extremes for 30 minutes each including a 0-5 minutes transition time. The above-mentioned condition is repeated 5 cycles. After the test, allowed to stand at the room temperature for 1 to 2 hours before checking functionality. (JIS C60068-2-14) | 外観 Appearance | 製品機能を損なう 異状なきこと No damage on function |
| | | | 接触抵抗 Contact Resistance | 60 milliohm MAXIMUM |
| 4-3-9 | 亜硫酸ガス SO ₂ Gas | 適合するFFCを嵌合させ、40±2°C、50±5ppmの亜硫酸ガス中に24時間放置する。 Mate applicable FFC, exposing to the atmosphere is written below. Gas Concentration : SO ₂ =50+/-5ppm Temperature : 40+/-2 degree C Duration : 24h | 外観 Appearance | 製品機能を損なう 異状なきこと No damage on function |
| | | | 接触抵抗 Contact Resistance | 60 milliohm MAXIMUM |
| 4-3-10 | 耐アンモニア 性 NH ₃ Gas | 適合するFPCを嵌合させ、濃度28%のアンモニア水から発生させたアンモニアガス中に40分間放置する。(1ℓに対して25mℓの割合) Mate applicable FPC, allow to stand for 40 minutes in a container filled with NH ₃ gas (from density 28% ammonia water). (It is a rate of 25 mℓ to 1ℓ) | 外観 Appearance | 製品機能を損なう 異状なきこと No damage on function |
| | | | 接触抵抗 Contact Resistance | 60 milliohm MAXIMUM |

REVISE ON PC ONLY

F

SEE SHEET 1 OF 20

TITLE:

0.5mm PITCH FFC TO BOARD CONNECTOR
WITH GROUND TERMINAL

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REV.

DESCRIPTION

DOCUMENT NUMBER
PS-501786-004

DOC. TYPE
PS

DOC. PART
001

CUSTOMER
GENERAL MARKET

SHEET
7 OF 20

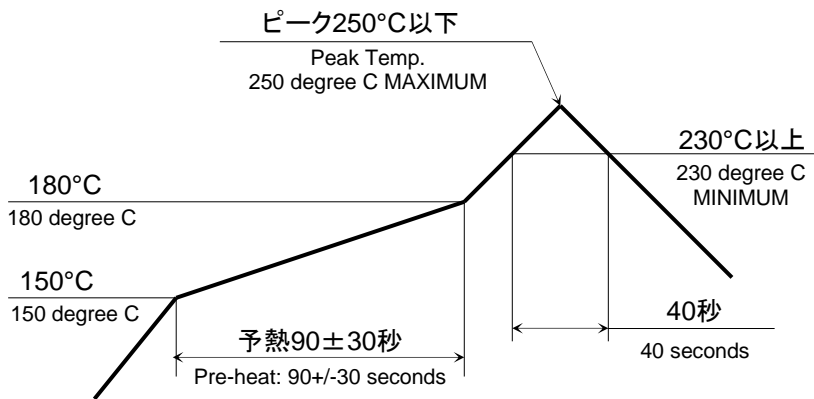
| 項 目 Item | | 条 件 Test Condition | 規 格 Requirement | |
|-------------|--|---|-----------------------|--|
| 4-3-11 | はんだ付け性 Solderability | 端子先端より0.3mm、金具先端より0.3mmの位置まで、245±5℃のはんだに3±0.5秒浸す。 Dip the position of 0.3mm from terminal tip and 0.3mm from fitting nail tip into 245 +/-5 degree C solder for 3+/-0.5 seconds. | 濡れ性 Solder Wetting | 浸漬面積の75%以上 75% of immersed area must show no voids, pin holes |
| 4-3-12 | はんだ耐熱性 Resistance to Soldering-Heat | 赤外線リフロー時 Infrared Reflow Method 第5項参照 2回リフロー実施 Refer to the paragraph 5 2 times reflow enforcement | 外 観 Appearance | 製品機能を損なう異状なきこと No damage on function |
| | | 手はんだ時 Soldering iron method 端子先端より0.3mm、金具先端より0.3mmの位置まで350±10℃のはんだゴテにて3秒加熱する。 但し、異常な加圧のないこと。 Heat the position of 0.3mm from terminal tip and 0.3mm from fitting nail tip for 3 seconds with 350+/-10 degree C soldering iron. However, without too much pressure to the terminal pin and fitting nail. | | |

() : 参考規格
Reference Standard

各項目の評価サンプルは、第5項のリフロー条件にて実装しております。
また、はんだペーストは、無鉛はんだ(Sn-3Ag-0.5Cu)を使用しています。
The board samples of the specification test were reflowed under the reflow profile of paragraph 5.
Cream soldering paste : Sn-3Ag-0.5Cu

| | | | | | | |
|-------------------|-------------|-------------------|--|-----------|----------------|---------|
| REVISE ON PC ONLY | F | SEE SHEET 1 OF 20 | TITLE: 0.5mm PITCH FFC TO BOARD CONNECTOR WITH GROUND TERMINAL | | | |
| | | | THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX ELECTRONIC TECHNOLOGIES, LLC AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION | | | |
| REV. | DESCRIPTION | | DOC. TYPE | DOC. PART | CUSTOMER | SHEET |
| | | | PS | 001 | GENERAL MARKET | 8 OF 20 |

【5. 推奨温度プロファイル REFLOW CONDITION】



温度条件グラフ
TEMPERATURE CONDITION GRAPH
はんだ接合部の基板表面にて測定

(Temperature is measured at the soldering area on the surface of the print circuit board)

注記: 本リフロー条件に関しては、温度プロファイル、はんだペースト、大気、N₂リフロー、基板などにより条件が異なりますので事前に実装評価(リフロー評価)を必ず実施願います。実装条件によっては、製品性能に影響を及ぼす場合があります。

NOTE: Please investigate the mounting condition (reflow soldering condition) on your own devices beforehand. The mounting conditions may change due to the soldering temperature, soldering paste, air reflow machine, Nitrogen reflow machine, and the type of printed circuit board. The different mounting conditions may have an influence on the product's performance.

【6. 外観形状、寸法及び材質 PRODUCT SHAPE, DIMENSIONS AND MATERIALS】

図面参照 Refer to the drawing.

| | | | | |
|----------------------------------|-------------------|--|------------------|----------------------------|
| REVISE ON PC ONLY | | TITLE: 0.5mm PITCH FFC TO BOARD CONNECTOR WITH GROUND TERMINAL | | |
| F | SEE SHEET 1 OF 20 | THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX ELECTRONIC TECHNOLOGIES, LLC AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION | | |
| REV. | DESCRIPTION | | | |
| DOCUMENT NUMBER PS-501786-004 | | DOC. TYPE PS | DOC. PART 001 | CUSTOMER GENERAL MARKET |
| | | | | SHEET 9 OF 20 |

【7. 挿入／抜去力 INSERTION FORCE / WITHDRAWAL FORCE】

下記のFFCを使用した場合のテストデータです。(参考)

This test data in case of used the following FFC (Reference)

FFC : 住友電気工業株式会社 製

FFC : SUMITOMO ELECTRIC INDUSTRIES, LTD.

厚さ(導体部) : 0.305mm ~ 0.310mm

Thickness (CONDUCTOR AREA) : 0.305mm ~ 0.310mm

Shield 材質 : アルミテープ

Shield material : Aluminum tape

<501786-**91>

(N=5)

| 極数 Circuits | 回数 Times | 単位 UNIT | 挿入力 Insertion Force | | | 抜去力 Withdrawal Force | | |
|----------------|--------------|------------|------------------------|-------------|-------------|-------------------------|-------------|-------------|
| | | | 平均値 AVE. | 最大値 MAX. | 最小値 MIN. | 平均値 AVG. | 最大値 MAX. | 最小値 MIN. |
| 30 | 初回 1st | N | 14.02 | 15.3 | 11.3 | 7.26 | 7.6 | 6.7 |
| | 10回目 10th | N | 13.46 | 15.4 | 11.1 | 6.72 | 7.4 | 6.2 |
| | 20回目 20th | N | 13.48 | 14.5 | 10.9 | 7.08 | 8.0 | 6.5 |
| 40 | 初回 1st | N | 19.90 | 21.6 | 18.2 | 10.38 | 10.9 | 10.0 |
| | 10回目 10th | N | 18.82 | 21.7 | 16.7 | 10.06 | 10.9 | 9.5 |
| | 20回目 20th | N | 18.76 | 20.4 | 17.6 | 9.96 | 10.4 | 9.5 |
| 50 | 初回 1st | N | 24.26 | 25.5 | 22.8 | 11.54 | 12.4 | 10.7 |
| | 10回目 10th | N | 23.18 | 24.4 | 21.3 | 10.98 | 11.9 | 9.7 |
| | 20回目 20th | N | 23.82 | 25.3 | 22.5 | 10.98 | 11.9 | 9.7 |

REVISE ON PC ONLY

F

SEE SHEET 1 OF 20

TITLE:

0.5mm PITCH FFC TO BOARD CONNECTOR
WITH GROUND TERMINAL

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REV.

DESCRIPTION

DOCUMENT NUMBER
PS-501786-004

DOC. TYPE
PS

DOC. PART
001

CUSTOMER
GENERAL MARKET

SHEET
10 OF 20

<501786-**92>

(N=5)

| 極数 Circuits | 回数 Times | 単位 UNIT | 挿入力 Insertion Force | | | 抜去力 Withdrawal Force | | |
|----------------|--------------|------------|------------------------|-------------|-------------|-------------------------|-------------|-------------|
| | | | 平均値 AVE. | 最大値 MAX. | 最小値 MIN. | 平均値 AVG. | 最大値 MAX. | 最小値 MIN. |
| 30 | 初回 1st | N | 9.86 | 10.7 | 9.0 | 6.30 | 6.6 | 5.8 |
| | 10回目 10th | N | 8.40 | 8.7 | 8.2 | 5.04 | 5.3 | 4.4 |
| | 20回目 20th | N | 8.54 | 8.7 | 8.4 | 5.10 | 5.6 | 4.5 |

REVISE ON PC ONLY

F

SEE SHEET 1 OF 20

TITLE:

0.5mm PITCH FFC TO BOARD CONNECTOR
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DOCUMENT NUMBER
PS-501786-004

DOC. TYPE
PS

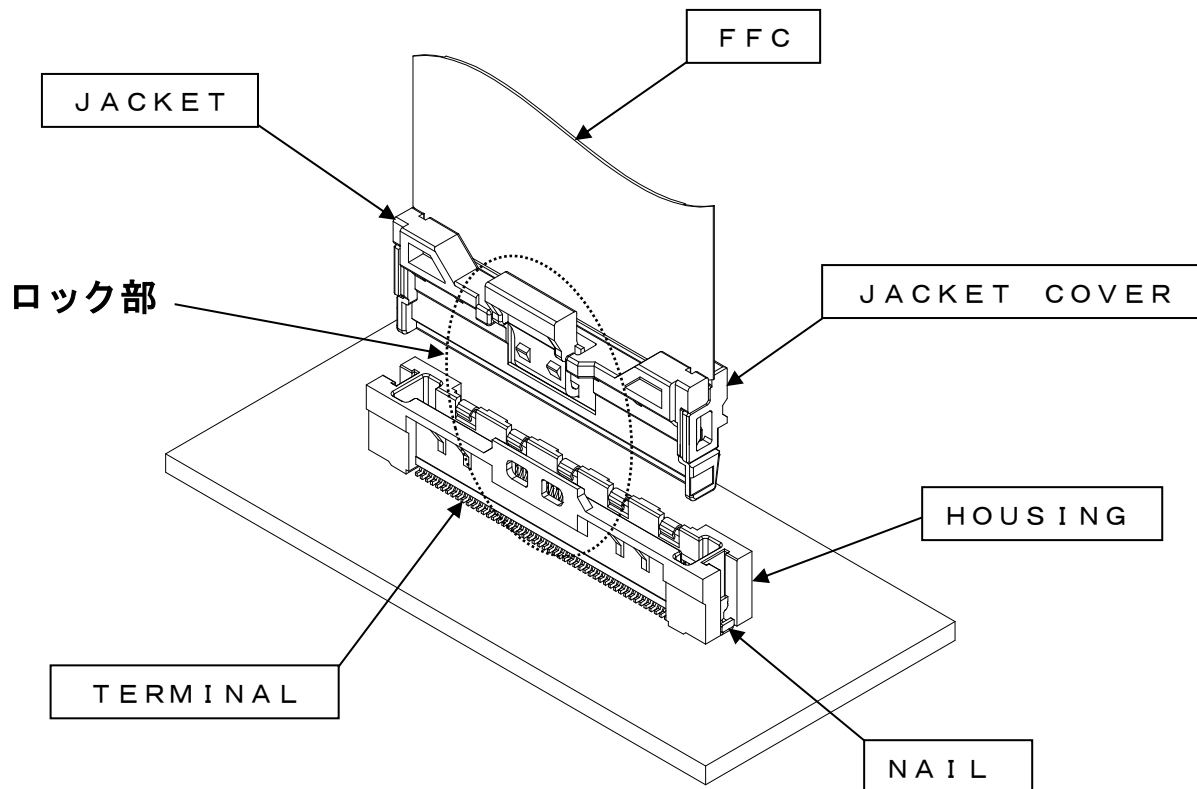
DOC. PART
001

CUSTOMER
GENERAL MARKET

SHEET
11 OF 20

【8. 取り扱い説明書 INSTRUCTION FOR THE HANDLING OF THE CONNECTOR】

8-1 各部の名称 DESCRIPTION OF EACH PART



8-2 基板への実装に関して MOUNTING ON THE PC BOARD

基板への実装は実装機にて実施願います。

もし、手半田する場合は、TERMINAL及びNAIL等に触れない様に願います。

(半田付け不良等の原因となる可能性があります。)

The mounting of the PC board is handled by the mounter.

If to manually solder, please be cautious to not touch the Terminal and Fitting Nail.

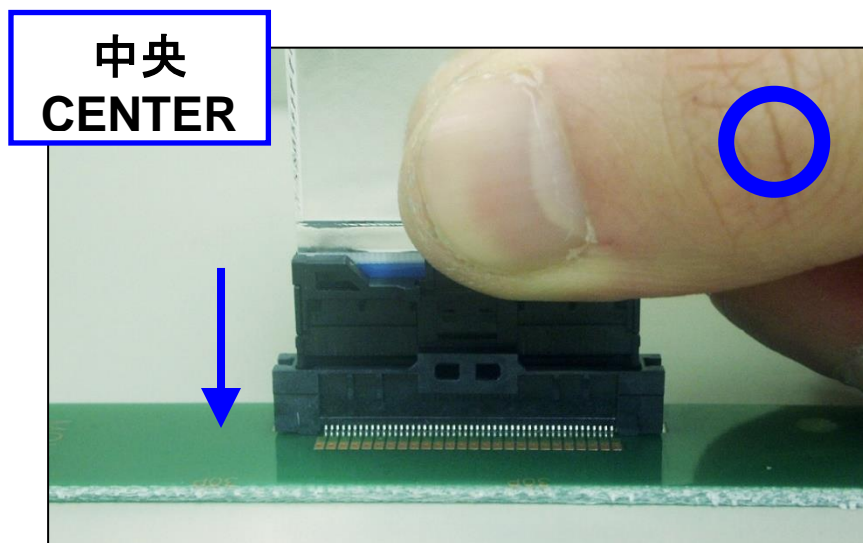
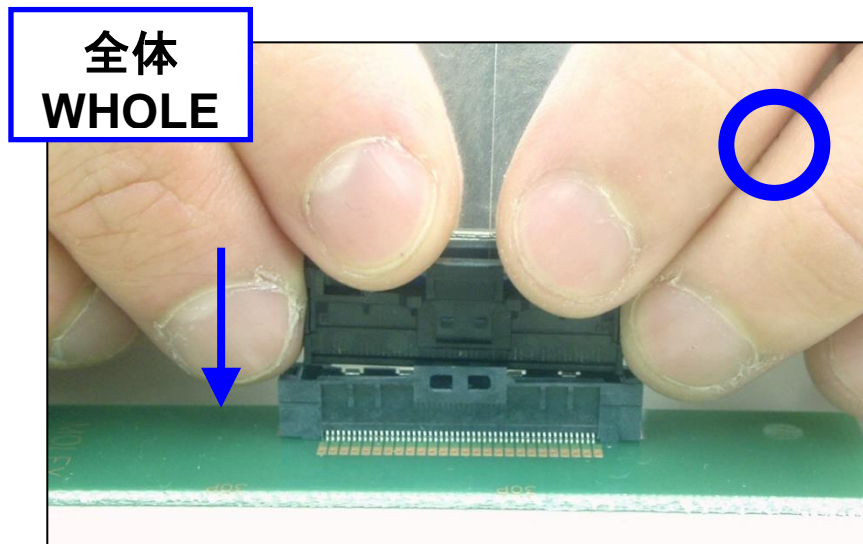
(It will create the possibility to cause solderability failure.)

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|----------------------------------|-------------------|--|---|----------------------------|-------------------|
| REVISE ON PC ONLY | | TITLE: | | | |
| F | SEE SHEET 1 OF 20 | 0.5mm PITCH FFC TO BOARD CONNECTOR WITH GROUND TERMINAL | | | |
| | REV. | DESCRIPTION | THIS DOCUMENT CONTAINS INFORMATION THAT IS PROPRIETARY TO MOLEX ELECTRONIC TECHNOLOGIES, LLC AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION | | |
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| EN-127(2015-12) | | | | | |

8-3 コネクタ嵌合に関して MATING THE CONNECTOR

コネクタを嵌合する際は、JACKETとJACKET COVERの全体もしくは中央を掴んで挿入を実施ください。

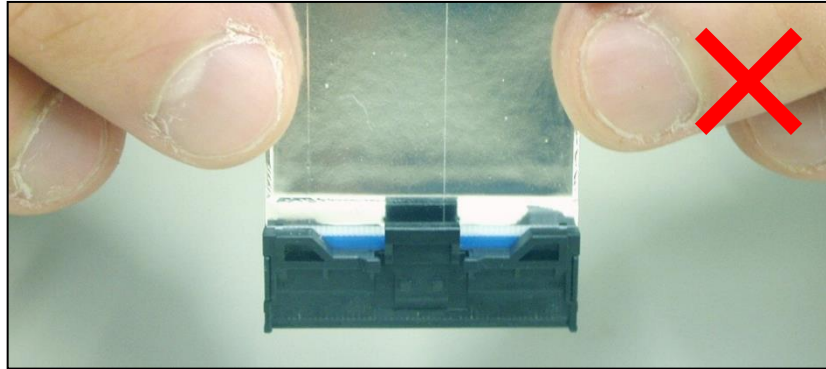
When mating the connector, hold the JACKET and JACKET COVER together at either a whole or the center portion of them to insert.



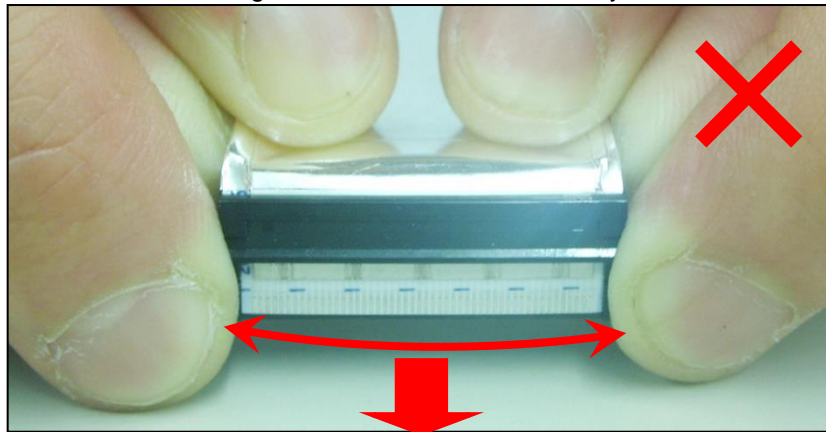
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| DOCUMENT NUMBER PS-501786-004 | | DOC. TYPE PS | DOC. PART 001 | CUSTOMER GENERAL MARKET |
| | | | | SHEET 13 OF 20 |
| EN-127(2015-12) | | | | |

以下のような嵌合は回復不可能な機能不全や製品破壊につながりますので実施しないで下さい。
The following method of mating will cause either irreversable functionality failure or product breaking, so please do not mate this way.

- ・FFC のみを掴まないでください。
Please do not hold the FFC part only

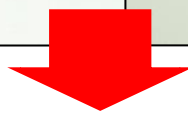
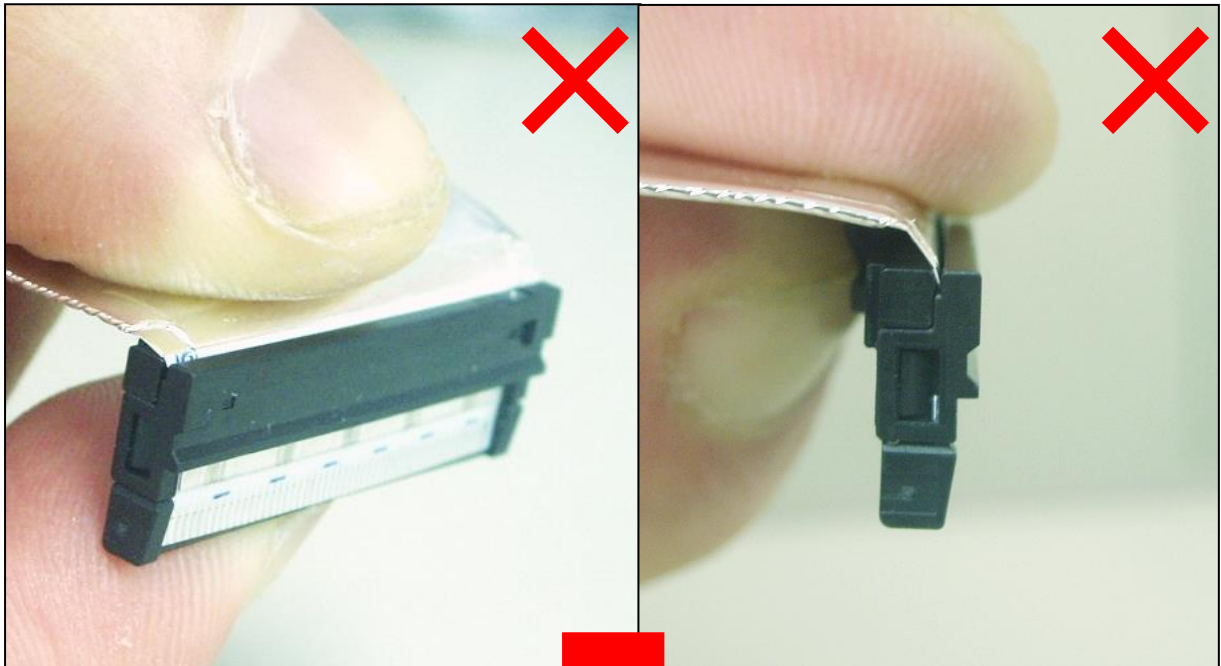


- ・JACKET と JACKET COVER の端部のみを掴まないでください。
Please do not hold the JACKET AND edge of the JACKET COVER only



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| EN-127(2015-12) | | | | | |

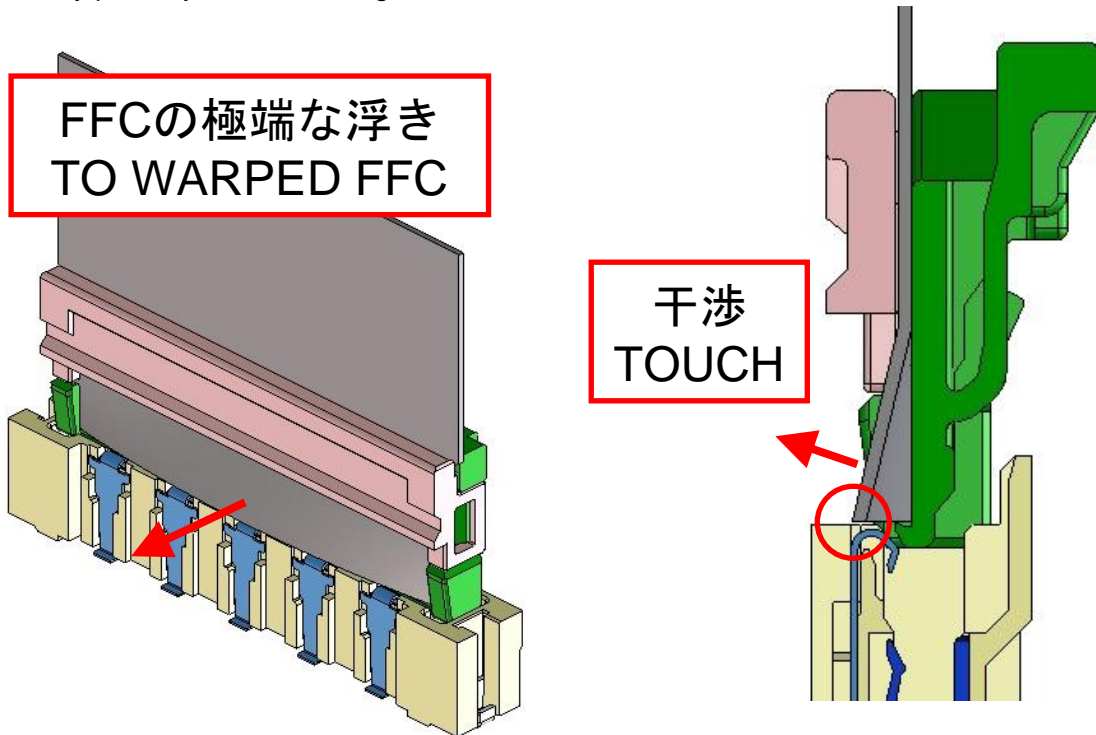
・FFCを折り曲げるように掴まないでください。
Please do not hold the FFC like bending it.



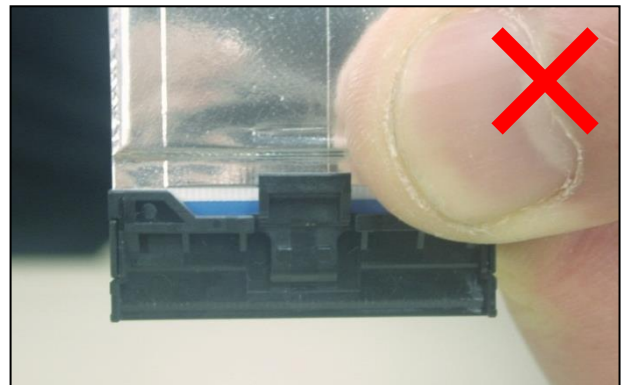
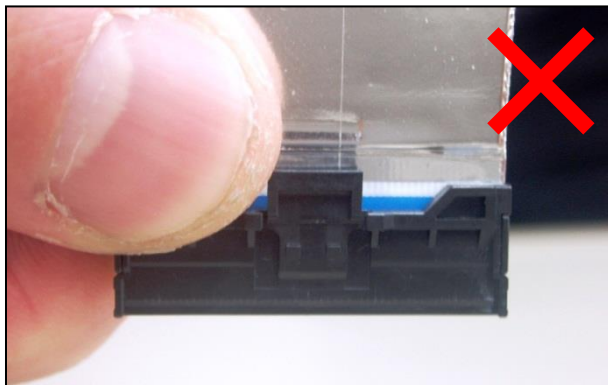
FFCの浮き発生
WARPED FFC

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| DOCUMENT NUMBER PS-501786-004 | | DOC. TYPE PS | DOC. PART 001 |
| | | CUSTOMER GENERAL MARKET | SHEET 15 OF 20 |
| EN-127(2015-12) | | | |

※FFCが極端に浮くと、嵌合時にHOUSINGと干渉し座屈する可能性があります。
 ※If FFC warps too much, it will touch with the Header housing when mated,
 And may possibly cause buckling.

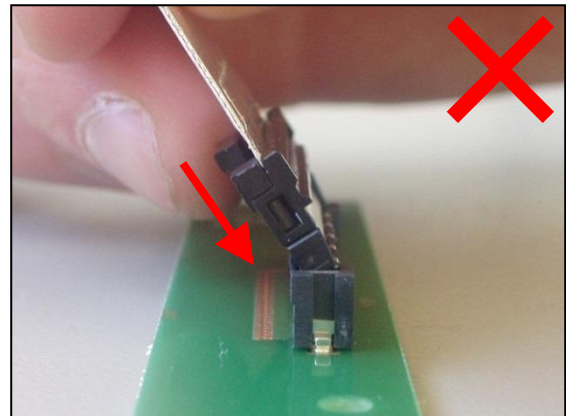
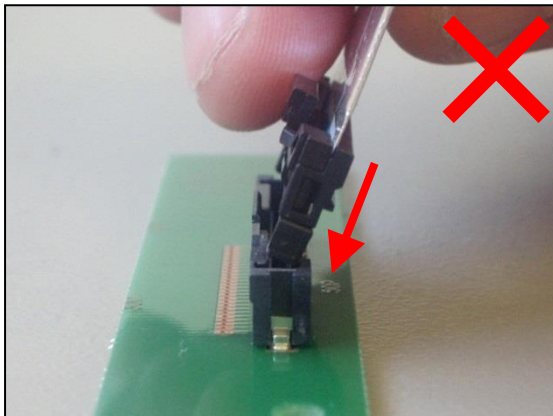
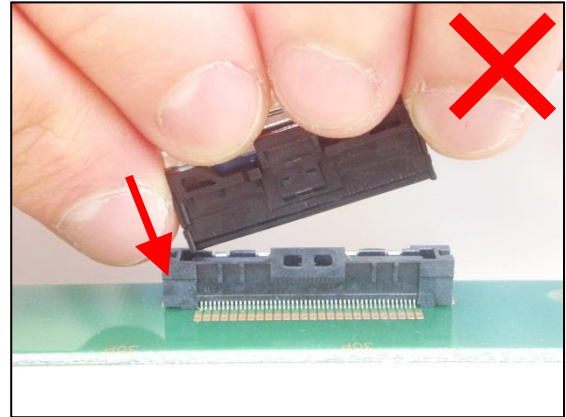
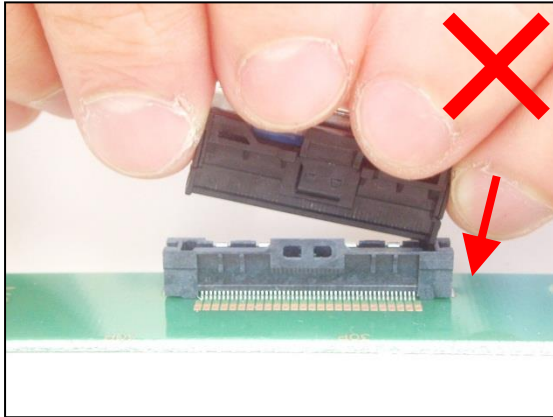


・JACKETとJACKET COVERの片端のみを掴まないでください。
 斜め嵌合となり、不良につながります。
 Please do not hold one side of the JACKET and the JACKET COVER only as shown below.
 It will be mated in the slant direction and will cause failure



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| REVISE ON PC ONLY | | TITLE: | | | |
| F | SEE SHEET 1 OF 20 | 0.5mm PITCH FFC TO BOARD CONNECTOR WITH GROUND TERMINAL | | | |
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| DOCUMENT NUMBER PS-501786-004 | | DOC. TYPE PS | DOC. PART 001 | CUSTOMER GENERAL MARKET | SHEET 16 OF 20 |

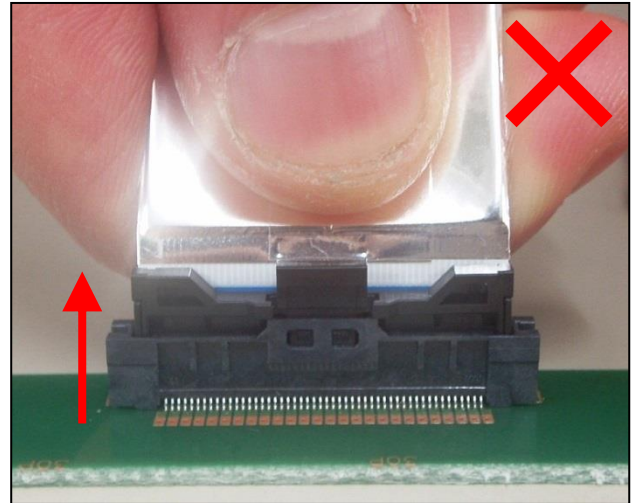
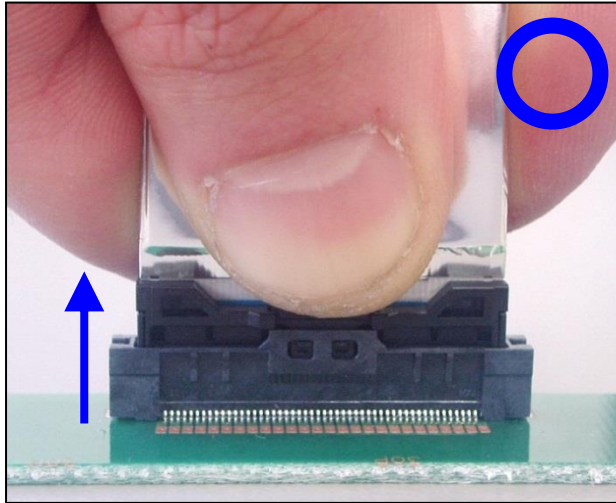
・斜め嵌合は不良につながりますので実施しないでください。
Mating inconsistently will cause failure, so please do not do this.



・嵌合状態 及び 嵌合時のFFC引き回し作業においてロック部に無理な負荷が掛かるような使用は避けてください。
Please be cautious not to put excess load at the lock part after mating and when FFC is pulled and extracted.

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| F | SEE SHEET 1 OF 20 | | | | |
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| DOCUMENT NUMBER PS-501786-004 | | DOC. TYPE PS | DOC. PART 001 | CUSTOMER GENERAL MARKET | SHEET 17 OF 20 |

・コネクタの嵌合を取り外す際は、必ずロック解除して実施ください。
Please be sure to release the lock when unmating the connector.



8-4. ご使用のFFCに関して

御社でのFFC選定時には以下を必ずご確認ください、実機での評価/可否判断をお願いします。

高温環境での不具合回避にはFPCの使用をご検討ください。

When actually using it with connector, please do the evaluation and the confirmation with an actual equipment to evade the following case where reliability cannot be filled.

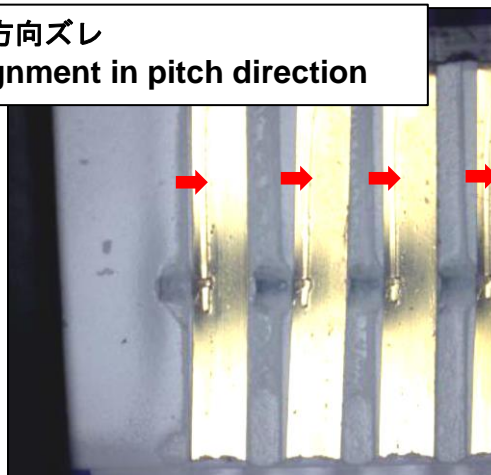
Because an FPC resists heat than FFC; in some cases use the FPC.(high-temperature environment case etc)

FFCに規定された定格温度がFFC単体前提の場合が御座います。

この場合、コネクタと組み合わせての実使用において、高温環境でFFC基材と導体間の接着層が劣化し接着力が低下、その後の温度変動によるコネクタ/FFCの収縮により、導体自体のピッチ方向ズレが発生し、長期的には接点脱落、不導通に至る事例が確認されております。

The adhesive line of FFC is deteriorated by high temperature heat.
Then contact conductor of FFC may move.

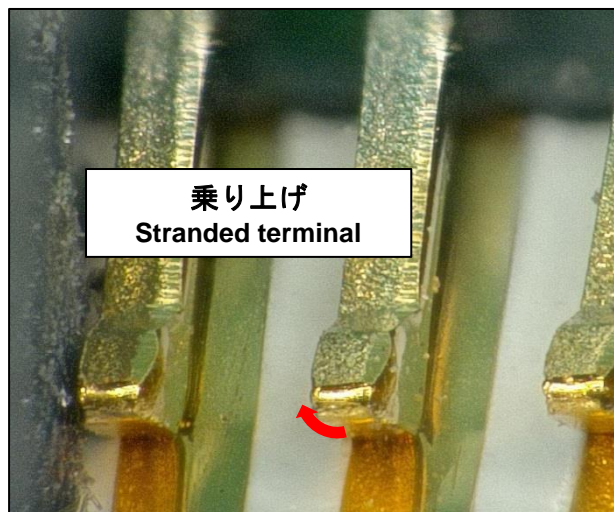
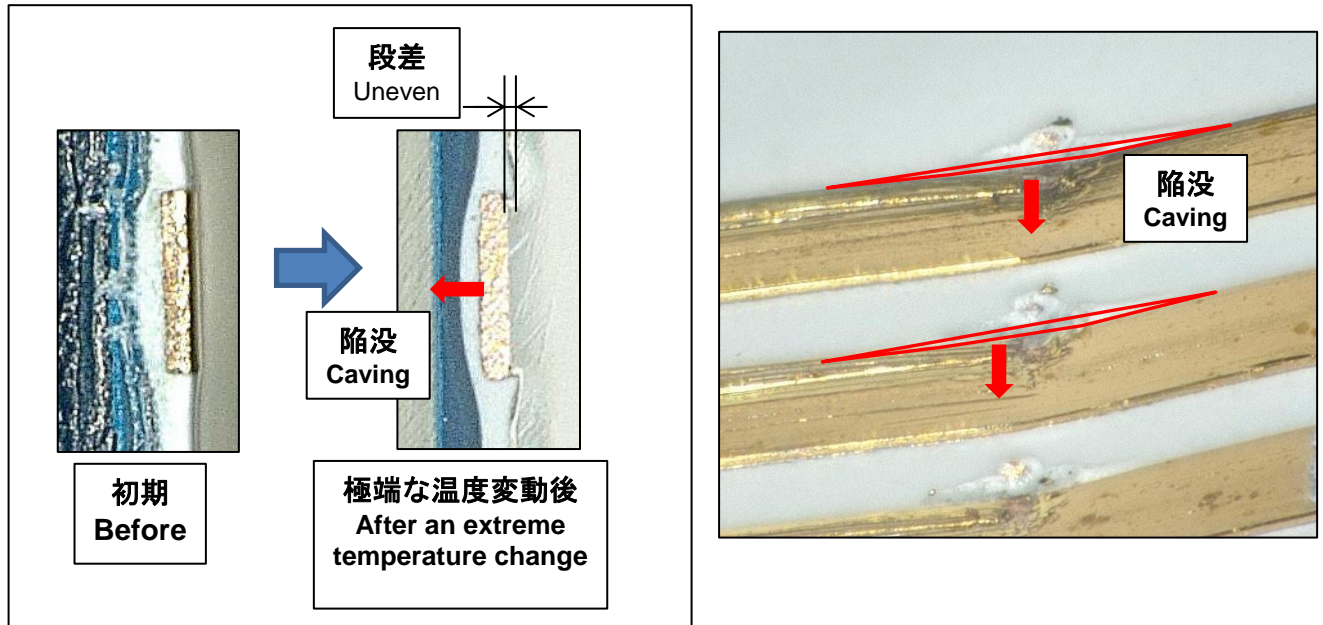
**ピッチ方向ズレ
Misalignment in pitch direction**



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| REV. | DESCRIPTION | | | | |
| DOCUMENT NUMBER PS-501786-004 | | DOC. TYPE PS | DOC. PART 001 | CUSTOMER GENERAL MARKET | SHEET 18 OF 20 |

また、同様に高温環境で接着層/基材/補強板が軟化してつぶれ、導体部が陥没、基材と導体の境目に段差が発生し、熱サイクルなど温度変動が極端な場合に、初期段階でコネクタ接点が乗り上げて不導通に至る事例も確認されております。

In addition, a pad of FFC is crushed and may become instantaneous interruption and the non-conduction.



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| DOCUMENT NUMBER PS-501786-004 | | DOC. TYPE PS | DOC. PART 001 |
| | | CUSTOMER GENERAL MARKET | SHEET 19 OF 20 |

