

手机键盘设计资料



Products (产品种类)

General Silicone Rubber 普通硅胶

Key-Film (IMD) 薄膜注塑键

Key-Film (IMD) + Rubber (KEY-Film+硅胶)

Plastic + Rubber (P + R) (塑料+硅胶)

TPE or General Rubber 特别塑料或橡胶

*Various Options (其它选项):

Metalic Spray (材料喷涂)

2nd Surface Printing (底面印刷)

Coating (保护层)

Chrome Plated (电镀)

Laser Etching (激光雕刻)

工艺说明:

- 目前市场流行IMD及P+R两大类按键，
- 其中IMD类技术按键一般都会在1.20到1.50美元，
P+R类技术按键一般都会在1.50到3.00美元。
- 按键设计与制作中常见的名词：

- 1、镭雕 (Laser Etching)
- 2、丝印与移印
- 3、双色注塑
- 4、电镀 (Plating)
- 5、IMD (In Mould Decortion)
- 6、P+R (Plastic+Rubber)

电镀 (Plating)

在结构设计时有几点也要关注外形要适合于电镀处理:

1. 表面凸起最好控制在0.1~0.15mm/cm, 尽量没有尖锐的边缘。
2. 如果有盲孔的设计, 盲孔的深度最好不超过孔径的一半, 负责不要对孔的底部的色泽作要求。
3. 要采用适合的壁厚防止变形, **最好在1.5mm以上4mm以下**, 如果需要作的很薄的话, 要在相应的位置作加强的结构来保证电镀的变形在可控的范围内。
4. 在设计中要考虑到电镀工艺的需要, 由于电镀的工作条件一般在60度到70度的温度范围下, 在吊挂的条件下, 结构不合理, 变形的产生难以避免, 所以在塑件的设计中对水口的位置要作关注, 同时要有合适的吊挂的位置, 防止在吊挂时对有要求的表面带来伤害。另外最好不要在塑件中有金属嵌件存在, 由于两者的膨胀系数不同, 在温度升高时, 电镀液体会渗到缝隙中, 对塑件结构造成一定的影响。
5. 要避免采用大面的平面。
塑料件在电镀之后反光率提高, 平面上的凹坑、局部的轻微凹凸不平都变得很敏感, 最终影响产品效果。
这种零件可采用略带弧形的造型。
6. 要避免直角和尖角。
初做造型和结构的设计人员往往设计出棱角的造型。但是, 这样的棱角部位很容易产生应力集中而影响镀层的结合力。而且, 这样的部位会造成结瘤现象。因此, 方形的轮廓尽量改为曲线形轮廓, 或用圆角过渡。
造型上一定要要求方的地方, 也要在一切角和棱的地方倒圆角 $R=0.2\sim0.3\text{ mm}$ 。
7. 不要有过深的凹部, 不要有小孔和盲孔, 这些部位不仅电镀困难, 而且容易残存溶液污染下道工序的溶液。像旋钮和按钮不可避免的盲孔, 应从中间留缝。
8. 要考虑留有时装挂的结点部位, 结点部位要放在不显眼的位置。可以用挂钩、槽、缝和凸台等位置作接点。
对于容易变形的零件, 可以专门设计一个小圆环状的装挂部位, 等电镀后再除去。
9. 厚度不应太薄, 也不要突变。
太薄的零件在电镀过程中受热或首镀层应力的影响容易变形, 大的片形零件的厚度一般不应小于3毫米; 厚度的突变容易造成应力集中, 一般来说厚度差不应超过两倍。
10. 标记和符号要采用流畅的字体, 如: 圆体、琥珀、彩云等。因多棱多角不适于电镀。流畅的字体容易成形、电镀后外观好。文字凸起的高度以0.3-0.5为宜, 斜度65度。
11. 如果能够采用皮纹、滚花等装饰效果要尽量采用, 因为降低电镀件的反光率有助于掩盖可能产生的外观缺陷。
12. 尽量不要采用螺纹和金属嵌件, 以免电镀时为保护螺纹、嵌件而增加工序。
13. 小件或中空零件, 在模具上要尽量设计成一模多件, 以节省加工时间和电镀时间, 同时也便于电镀时装挂。

IMD (In Mould Decortion)

IMD-FI (PC Film + PC Resin)

- 就是将一个已经有丝印图案的FILM放在塑胶模具里进行注塑，此FILM一般可分为三层：基材（一般是PET）、INK（油墨）、耐磨材料（多为一种特殊的胶）。当注塑完成后，FILM和塑胶融为一体，耐磨材料在最外层，其中注塑材料多为PC、PMMA、PBT等等，有耐磨和耐刮伤的作用，还有一种叫IML（In-Mould-Lable）技术，和IMD大致相同，只是在注塑后，FILM就象冲压的料带一样拉出，只是将印刷图案转印到塑胶件上，又称模内转印。

1. 优点:

- Light weight / Thinner 轻薄/短小
- Compact in Design 结构精细
- Smaller packaging size 装配简易
- Surpassing Abrasion Resistance 永不磨损
- Allows decoration on 3D geometry and quick change over in Color / Graphic 允许三维设计及变化多样的颜色和图案
- With Polydome or Metaldome Array, Key Film, EL assembly reduces production assembly time and cost
该按键可以和聚脂薄膜（或金属）开关、冷光片组装以减少装配时间和成本
- Eliminate abrasion test as images is printed and protected inside the PC film
消除字体印刷过程中的表面磨损并能保护内部的PC Film
- Can apply possibly many different colors on keypad可以应用于很多不同颜色的按键上
- Can adapt to many different decortion requirements,by simply changing IMD film
可以轻易地改变IMD Film，这样就能够满足许多不同的装饰需要
- Continuous image transfers with high positioning tolerance(up to 0.20mm)字体成型后的公差为0.2mm
- Reduce production cost as it eliminates the separate decorating steps of single-or multi-colors images.
IMD-FI消除了制作过程中为了印刷一种或多种颜色而必须分开进行的步骤，降低了制作成本
- 可以在小片零件上集成很多种效果，例如电镀，透明，丝网印等，如果用真实的工艺会很困难。

2. 缺点:

- Maximun key height 4.0mm按键的最大高度为4.0mm
- Hard PC plunger might shorten life span of polydome,Can be overcome by replacing injected PC resin with silicone rubber material.
较硬的PC触点力可能缩短Polydome的使用寿命。可以用PC树脂和硅胶材料来取代（只有YouEal做得到）
- Delamination(detachment of PC mold base with top film) might surface.在特殊情况下（如高温等）PC Film 和硅胶底可能会脱落

P+R (Plastic+Rubber)

P+R(Clear Silicone base + Spray painted, Laser etched Acrylic/PC keycap)

- 包括一个压缩模，一个硅胶底和一个注塑的键帽。这些特殊的组件能够用粘合剂或胶水粘合在一起。键帽则根据图纸要求进行喷印和镭射雕刻。此后按键表面再涂上一层U.V.保护层。
- Components shall involve compression molded silicone rubber base, injection molded keycaps. The individual components are then assembled together by the use of adhesive tape / glue. Keycaps are sprayed painted and laser etched with the desired graphic. Thereafter key surface are protected with a layer of UV coat.

1. 优点:

- High keypad flexibility with silicone rubber base. 使用硅胶作为基底使得按键具有较高的柔韧性
- Able to obtain hard keytop with complex, appealing designs. 能够在较复杂和具有吸引力的设计上获得较坚固的Keytop
- Able to produce keypad with wide combination of keycaps (spray painted/chromed/medalized/and laser etched, clear with second surface printing) 能够适用于不同类型的键帽（如喷印，镭雕，底部丝印等）
- No limitation on key height. 键的高度没有范围
- Able to meet abrasion requirement of at least 80RCA cycles for painted top surface
印刷表面至少可以达到80 RCA Cycles的表面磨损需求

2. 缺点:

- More operation processes when compared with IMD processes keypads
相比于IMD按键的制作过程, P + R的步骤比较繁琐
- More control required in printing, laser marking, and assembling positioning.
对印刷，镭射雕刻和装配过程会有比较多的监控要求
- Flange dimensions / allowance to be considered during overall assembly of keypads, front housing and PCB.
在装配键盘，外壳和PCB板时，必须考虑到边缘的尺寸

General Silicone Rubber 通用硅胶

- Platform for most applications 一般用途

Examples : Laser-etched, P + R, Key-Film + R, Polydome Assembly, Metaldome Assembly, Spray painted keymat (例如: 镭雕, 塑料+硅胶, IMD+硅胶, 组装弹性导电薄膜和金属导电薄膜, 键面喷涂)

- Various colors, material durometer, printing options to meet aesthetic requirements 根据美工要求可选择多种颜色,

- 材料硬度, 印刷工艺。

Examples : Color Keycap, Durometer Keycap, Positive Printing, Negative Printing

例如: 彩色键帽, 硬键帽, 正面印刷, 反面印刷等。

- Provides Sealing Capabilities 特殊组装需要

- Built-in features: sealing ring/rib, boss, undercut, "holeless" keymat

防水, 倒钩角, 固定角等

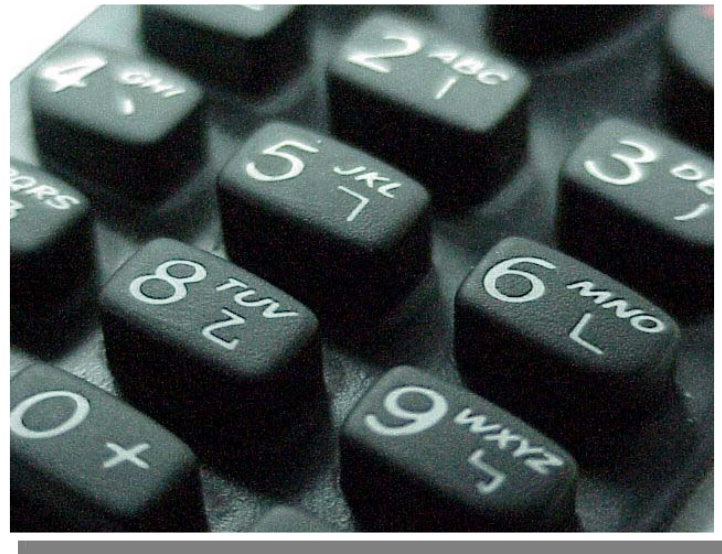
- Economy 经济实惠

Creative designed key mat can be cost effective and meeting aesthetic requirements (按键有创意的设计能有效的节约成本和符合美工要求)



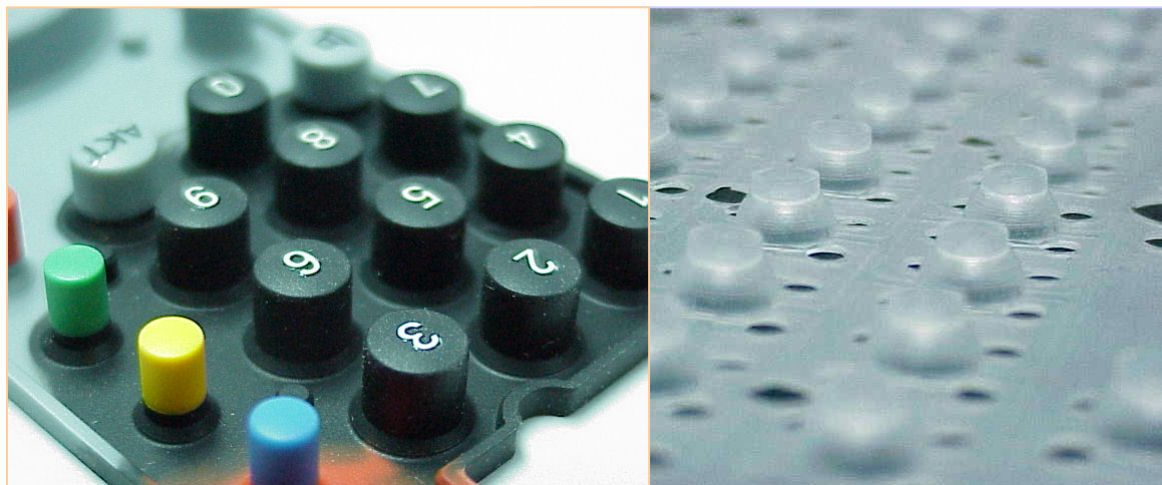
Laser-Etched / Night Vision 镭射雕刻/透光效果

- Enhance Product Value 提高产品价值
- Control Light Emitting Passage 字体透光

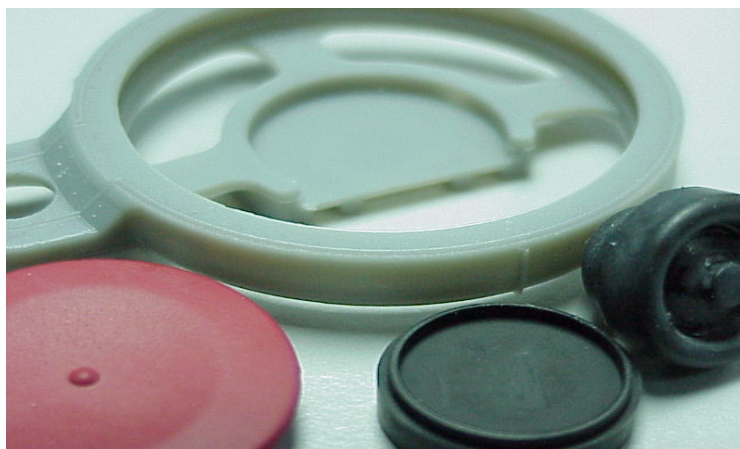




透光/镭射雕刻



硅胶制品



精密橡胶制品



IMD 成型

Key-Film (IMD)



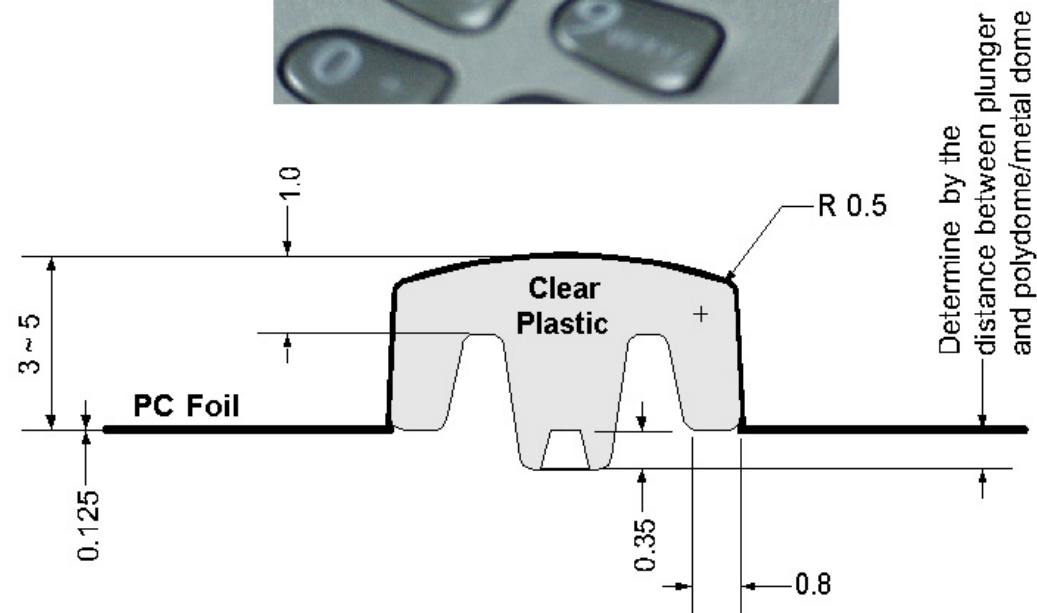
- Light weight / Thinner 轻薄/短小
- Compact in Design 结构精细
- Smaller packaging size 装配简易
- Surpassing Abrasion Resistance 永不磨损
- Allows decoration on 3D geometry and quick change over in Color / Graphic 允许三维设计及变化多样的颜色和图案
- With Polydome or Metaldome Array, Key Film, EL assembly reduces production assembly time and cost

该按键可以和聚脂薄膜（或金属）开关、冷光片组装以减少
装配时间和成本

IMD, In Mold Decoration

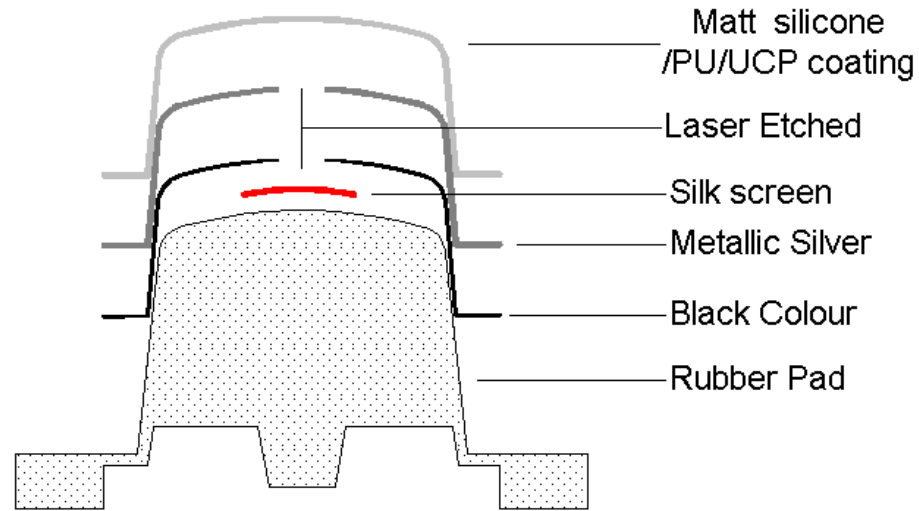
In Mold Decoration

- * Best suitable for product that requires light weight and compact in design.
- * It has good abrasion resistance as the graphics are protected by the foil.
- * As the name implies, aesthetic decoration can be greatly enhanced.



CURRENT TECHNOLOGY / Silicone Keypads

Laser Etched Keypads

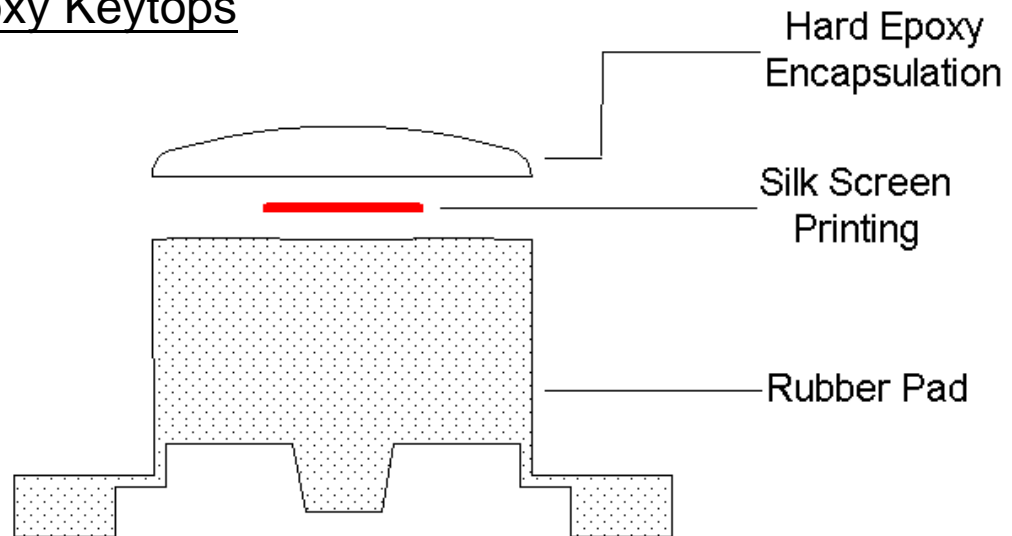


- ❖ Sharp and clear illumination of keytop legends
- ❖ Contrast enhancement
- ❖ Excellent backlighting
- ❖ Broad range of metallic colours

CURRENT TECHNOLOGY / Silicone Keypads



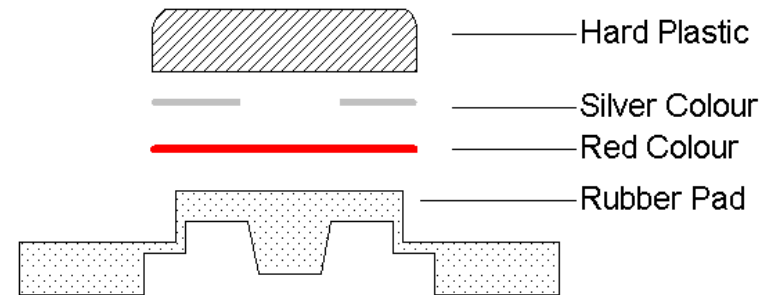
Epoxy Keytops



- ❖ Hard key feeling
- ❖ High abrasion resistance
- ❖ Natural drop shape
- ❖ Glossy and semi-glossy finishes

CURRENT TECHNOLOGY / Plastic + Rubber

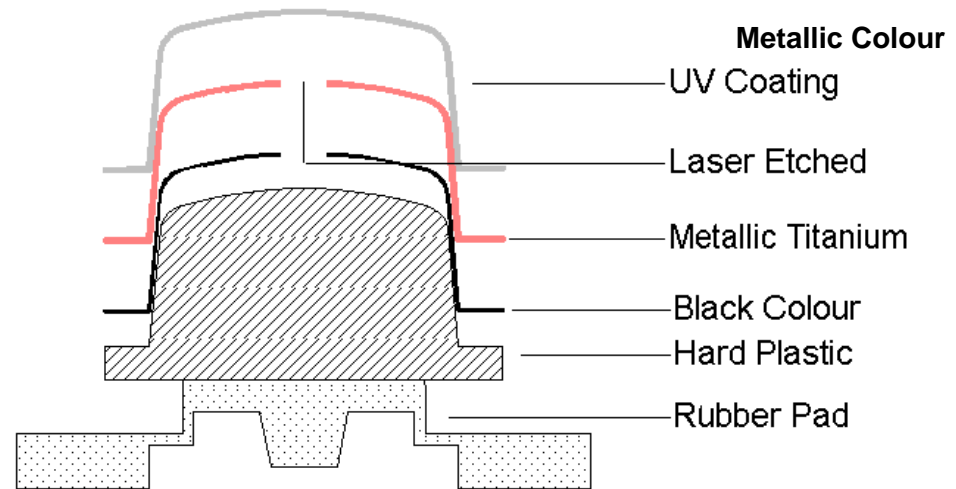
Back Printing



- ❖ Lifetime abrasion resistance
- ❖ Hard key feeling
- ❖ Magnification effect
- ❖ Low noise solution
- ❖ Waterproof and dustproof solution

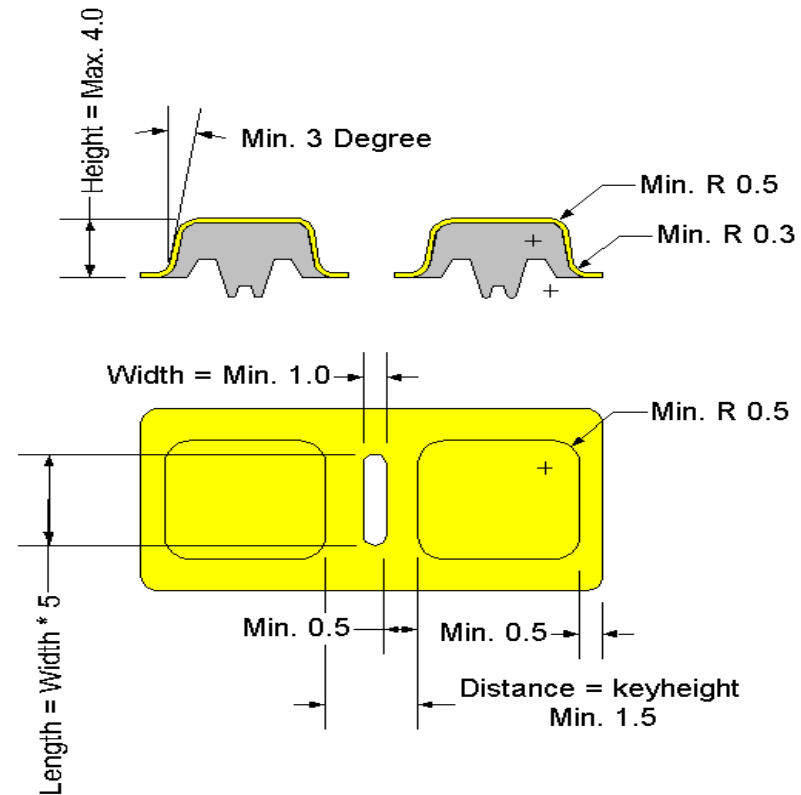
CURRENT TECHNOLOGY / Plastic + Rubber

Spray and Laser Etched



- ❖ Sharp corner radius
- ❖ Bridgeless solution
- ❖ Case colour matching
- ❖ Backlighting solution

CURRENT TECHNOLOGY / I.M.D. Keypads



- ❖ Thinnest and lightest keypad solution
- ❖ 3D profile expertise
- ❖ Tall key expertise
- ❖ Life time abrasion resistance (Second surface printing)

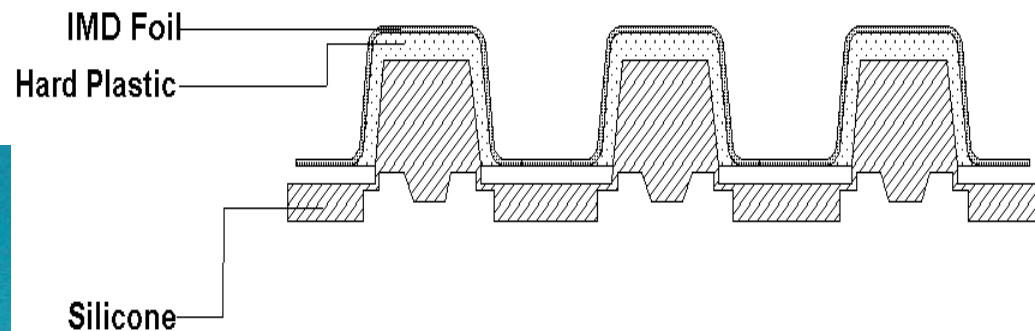
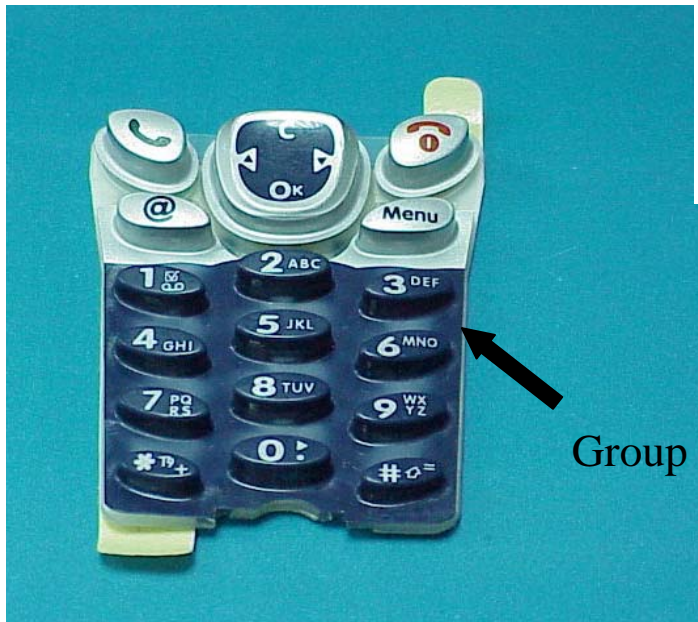
Key Film + Rubber (IMD & P+R)

- The benefits of Key Film, decoration capabilities and abrasion resistance, have been the main consideration for Key Film + R product
- 塑料与硅胶结合可达到柔和的手感及耐磨效果
- Rubber provides the base platform to received plastic caps or sealing features required



CURRENT TECHNOLOGY / I.M.D + Rubber

I.M.D. + Rubber / I.M.D. with Shoulder & Group Keys

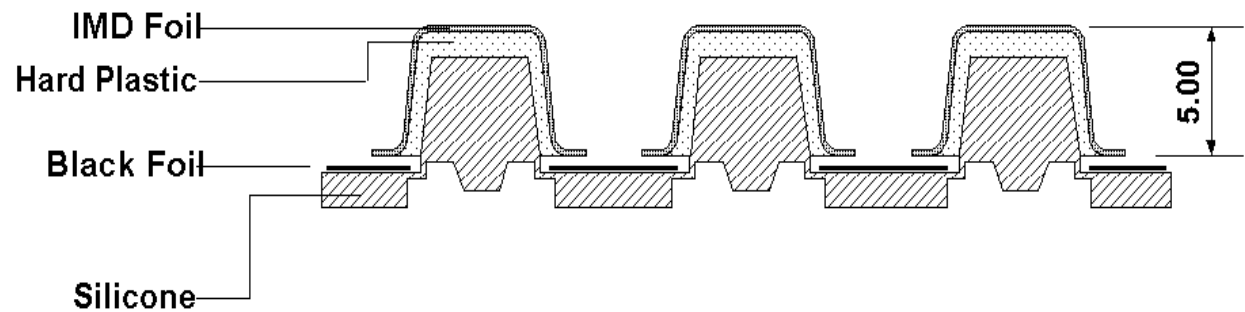


- ❖ Life time abrasion resistance
- ❖ Hard key feeling
- ❖ Excellent backlighting (No light leakage)
- ❖ Waterproof and dustproof solution

CURRENT TECHNOLOGY / I.M.D + Rubber



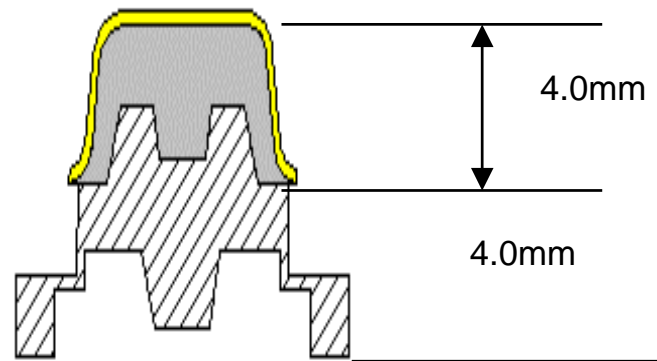
Tall Keys



- ❖ Tall key expertise (>5.0mm)
- ❖ Individual keys linked with flexible bridge
- ❖ Black foil to avoid light leakage

CURRENT TECHNOLOGY / I.M.D + Rubber

Tall Key Solution with I.M.D



- ❖ Rubber key height increased to achieve overall dimension greater than 4.00mm
- ❖ I.M.D. shoulder-less solution

CURRENT TECHNOLOGY / I.M.D. + Rubber

Alternative to Plastic + Rubber



I.M.D + RUBBER

PLASTIC + RUBBER

- ❖ I.M.D. provides a better abrasion and chemical resistance performance
- ❖ I.M.D. provides a cost effective solution

Plastic + Rubber (P + R)

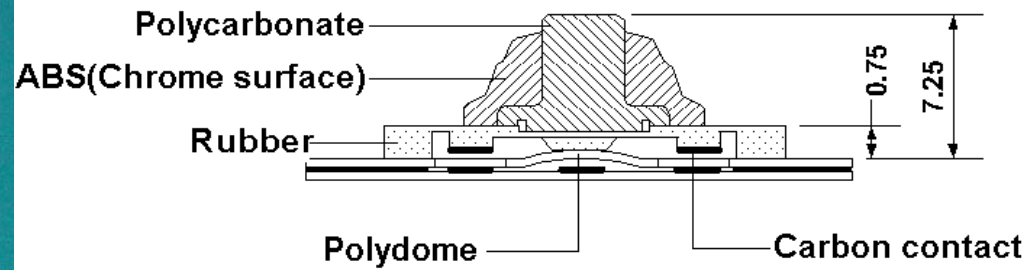
- **Metallised plastic caps, Spray-painted plastic caps, Injected plastic caps or Electroplated plastic caps assembled with Silicone rubber offers a unique application in switch technology**
- **特殊表面喷涂或电镀工艺具优质金属感的注塑键帽和硅胶组装产品。**
- **Creatively used P + R to enhance the value and aesthetic appearance of products**



CURRENT TECHNOLOGY / Metalization



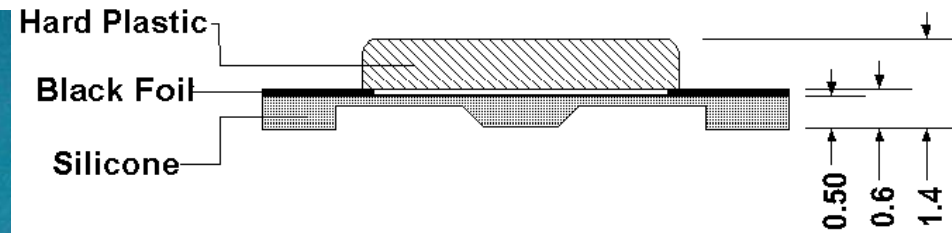
Double Injection



- ❖ Excellent abrasion resistance
- ❖ Double cosmetic effect
- ❖ Large backlighting area

APPLICATION / Low Profile Solution

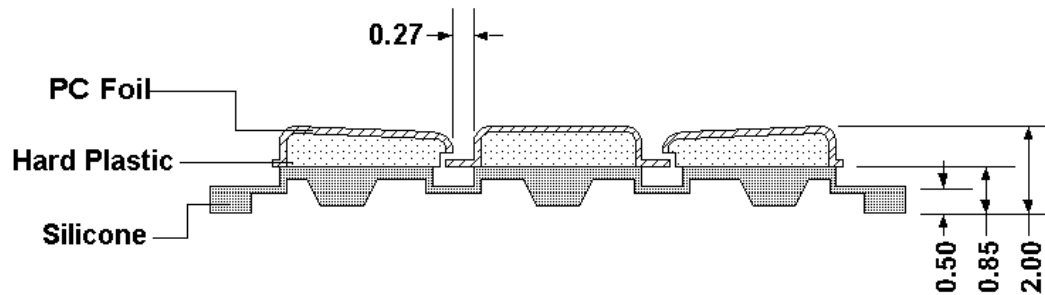
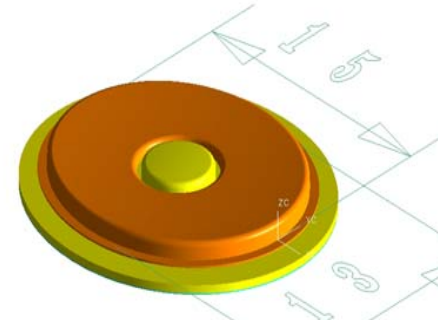
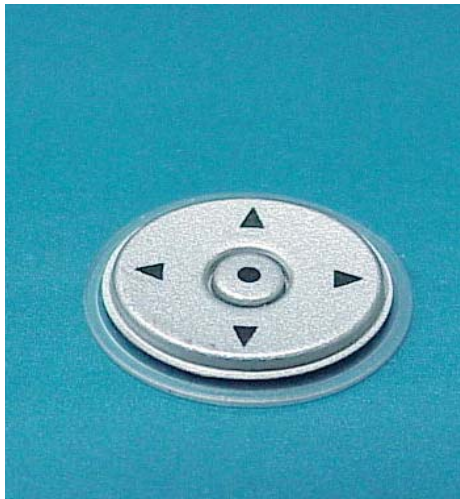
Low Profile Solution



- ❖ Ultra low profile: (1.4mm)
- ❖ Prevent light leakage
- ❖ Hard key feeling

APPLICATION / Navigator Solution

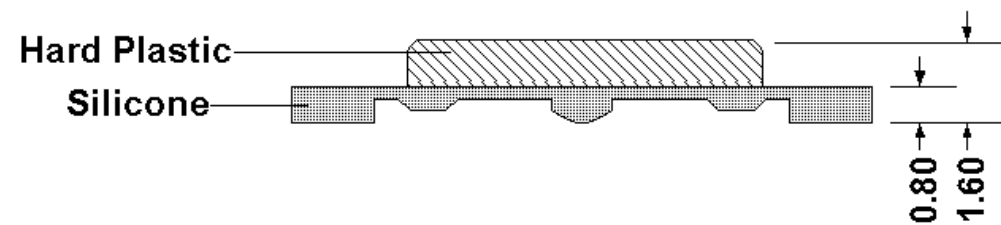
I.M.D + Rubber navi-keys (5 ways)



- ❖ 4 directional actuations + center actuation
- ❖ Low profile solution: 2.00mm
- ❖ Excellent abrasion resistance
- ❖ Finger nail mark resistance

APPLICATION / Navigator Solution

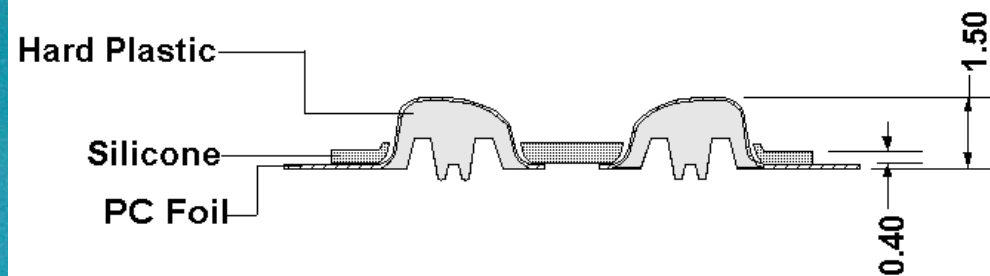
Plastic + Rubber + Chrome Plated (4 ways)



- ❖ Low profile 4 ways navigator: 1.60mm
- ❖ Metalization options
- ❖ Back printing options

APPLICATION / Navigator Solution

I.M.D + Rubber Ring (4 ways)

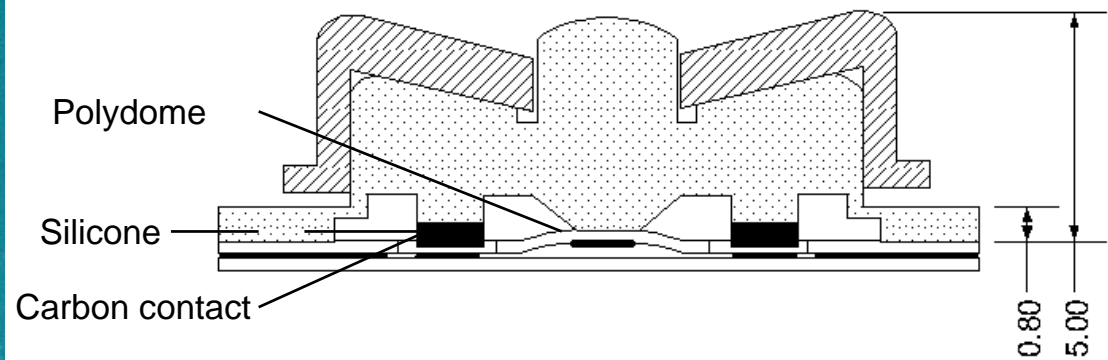


- ❖ Low profile 4 ways navigator: 1.50mm
- ❖ Individual key actuation
- ❖ Cosmetic rubber ring

APPLICATION / Navigator Solution



Plastic + Rubber (5 ways)

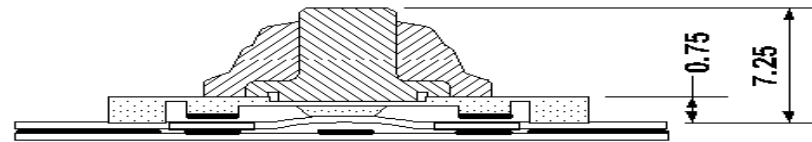


- ❖ 4 directional actuations with soft touch
- ❖ Center actuation with click feeling
- ❖ Independent center key

APPLICATION / Navigator Solution



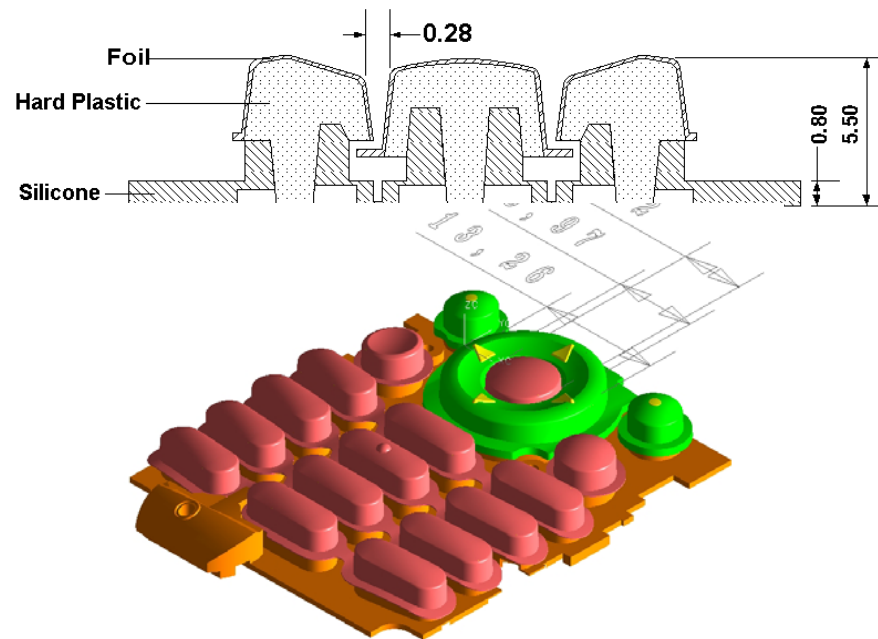
Plastic + Rubber (5 ways Toggle)



- ❖ Joystick design
- ❖ 5 directional actuations
- ❖ Center actuation with click feeling
- ❖ 4 directional actuations with soft touch

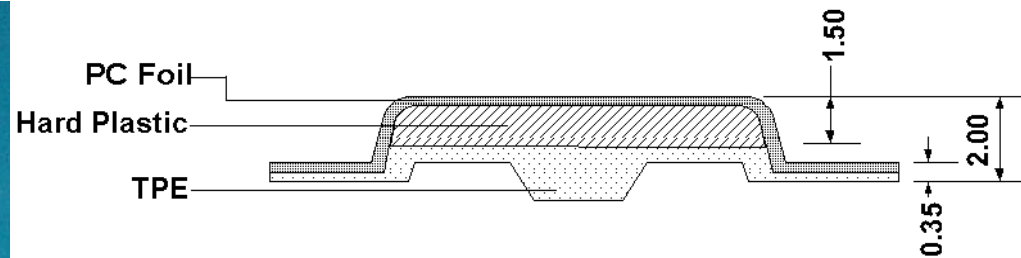
APPLICATION / Navigator Solution

I.M.D. + Rubber (5 ways Tall)



- ❖ 5 ways actuation navigator
- ❖ Independent center key
- ❖ Excellent abrasion resistance

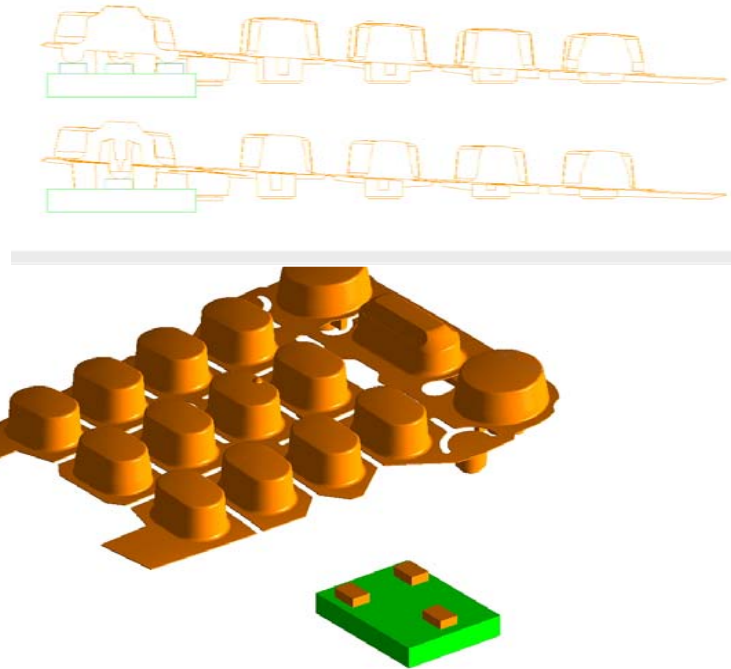
APPLICATION / Low Profile Solution



- ❖ Low profile: 2.00mm
- ❖ Enhances life of poly domes
- ❖ Finger nail mark resistance

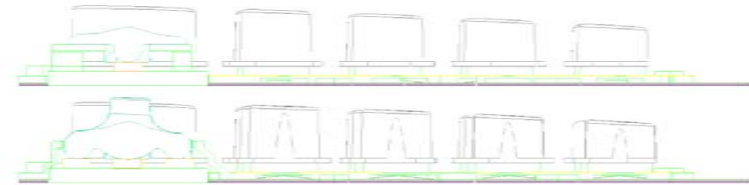
APPLICATION / Navigator Solution

I.M.D: 3 way Navi-keys with tact switches

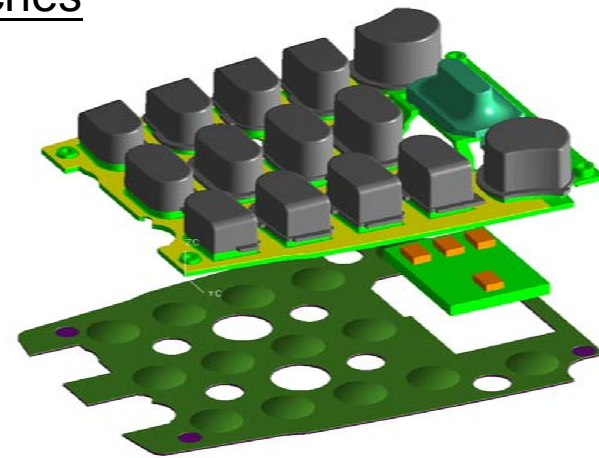
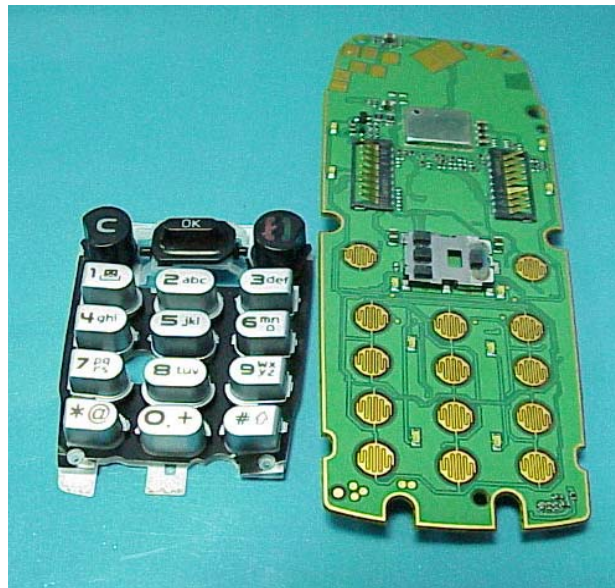


- ❖ Integrated I.M.D. navigator key
- ❖ 3 ways actuation: up / down / center actuation
- ❖ Excellent abrasion resistance

APPLICATION / Navigator Solution



Plastic + Rubber: 3 ways Navi-key with tact switches

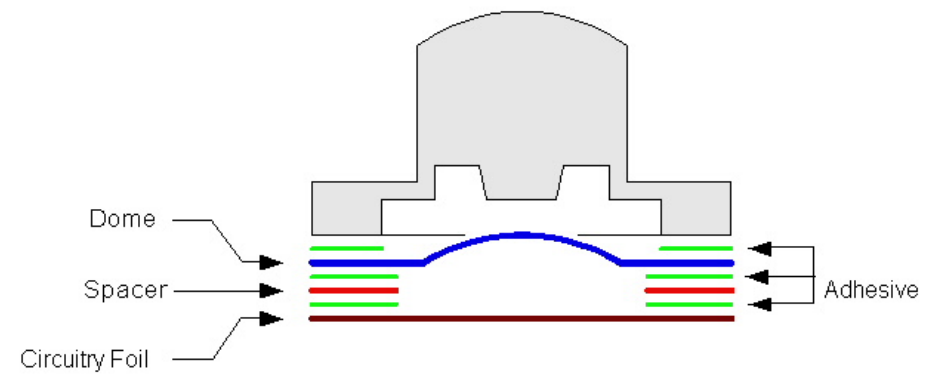
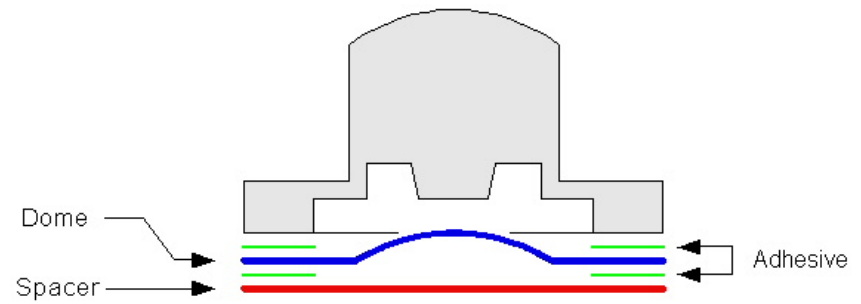


❖ Floating plastic cap on rubber

PolyDome

Polydome

- * Allow high actuation force at low travel, 0.3+/- 0.1mm
- * Overall size of product can be more compact
- * Together with foil circuitry, a complete set of assembly can be achieved.
Reduce assembly time and packaging size and weight.
- * Add on layers of EL (Electroluminescent Lamps) and LEDs are possible.



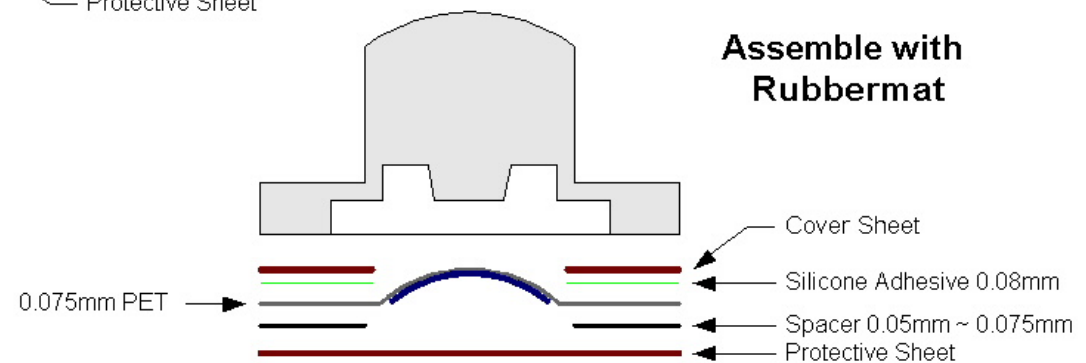
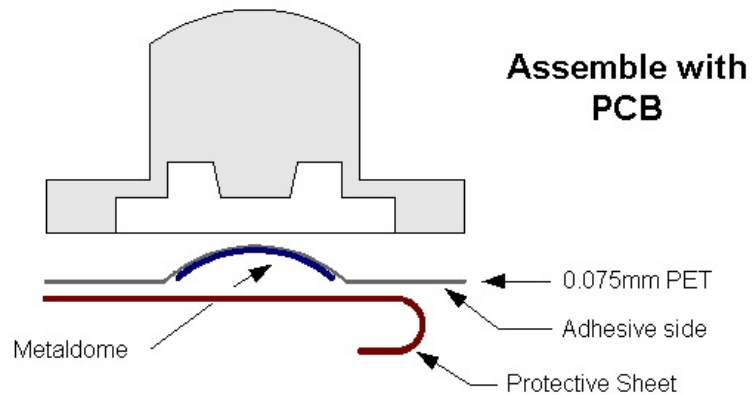
MetalDome

MetalDome

- * Has lower travel than Polydome, 0.2 +/- 0.05mm
- * Has lower contact resistance than Polydome, <10 Ohms
- * Reduce packaging size
- * Higher Operating Temperature than Polydome

Type	Operating Temperature
Polydome	-10C ~ +55C
MetalDome	-45C ~ +85C

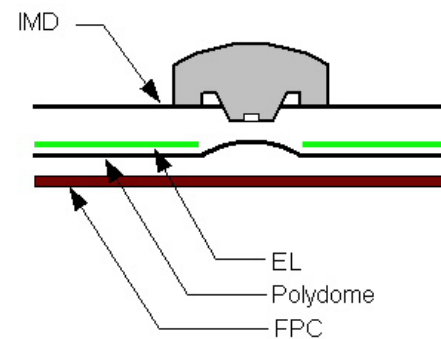
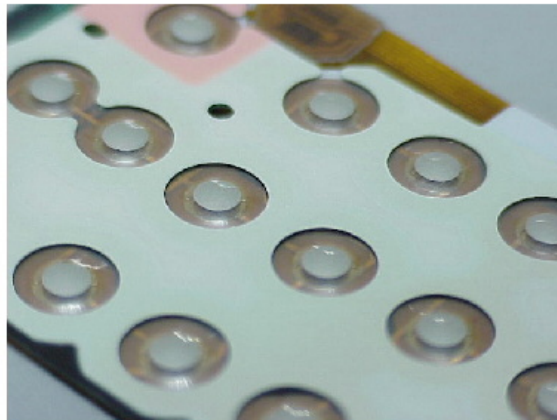
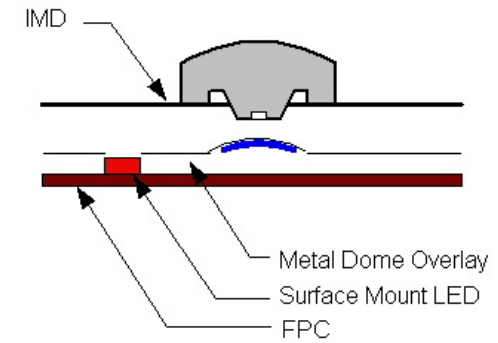
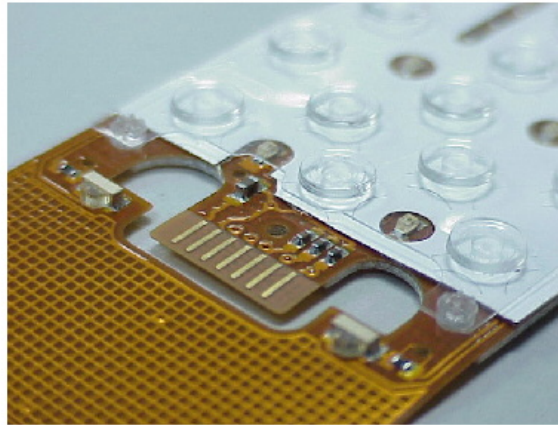
- * Can be assembled to both PCB or Rubbermat



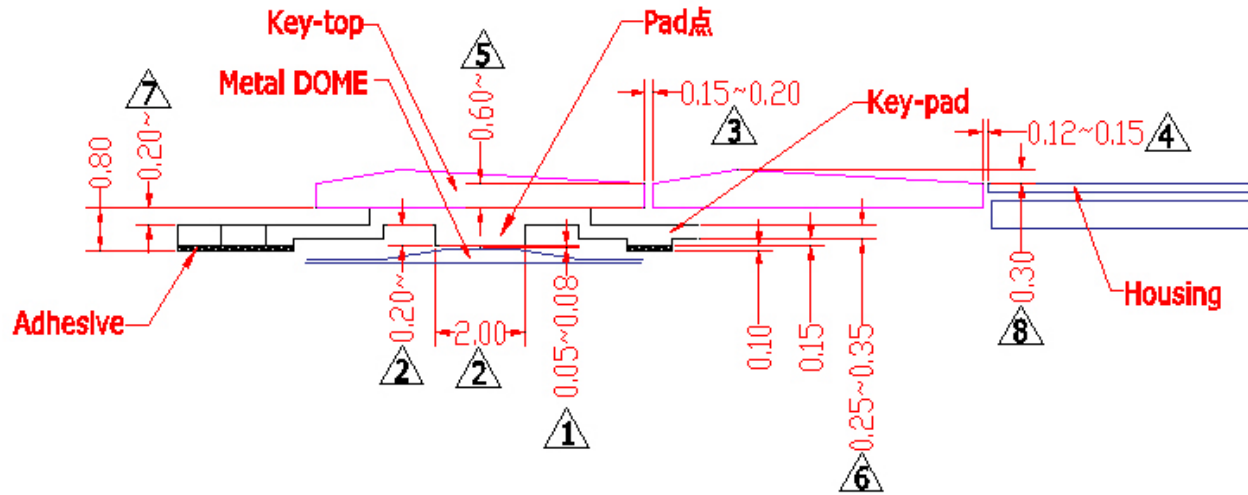
FPC, Flexible Printed Circuit

Flexible Printed Circuit

- * Reduce product size and weight.
- * Depending on application, assembly cost can be reduced.
- * 3 Dimensional packaging sought.
- * Dynamic flexure of circuitry.
- * Compliant substrate for surface mount.



参考范例（GSM2560 Keypad）



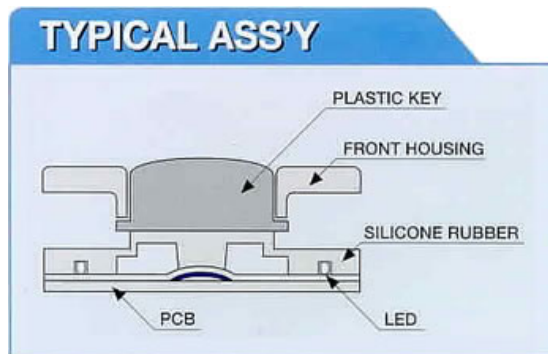
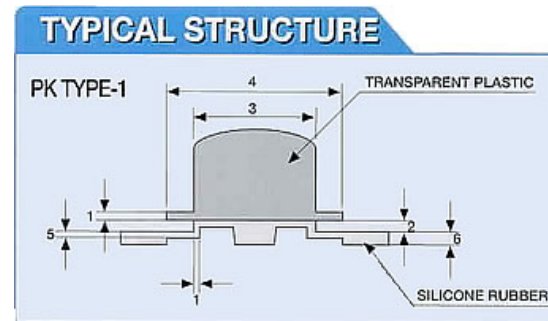
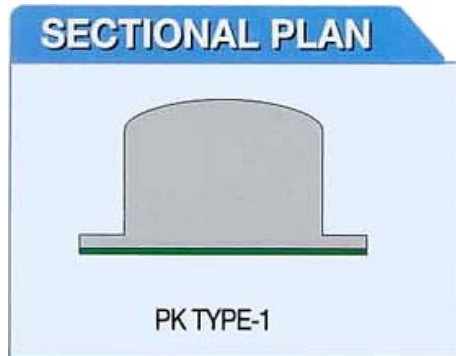
- 设计参考：
- 1. Pad点与Dome点的距离应在0.05mm到0.08mm之间。
- 2. Pad点的高度应在0.20mm以上，直径应在2.00mm以上。
- 3. Gsm2560类按键的单键之间的间隙可在0.15mm以上。
- 4. 按键与Housing之间的间隙可在0.12mm以上。
- 5. Key-top的高度可在0.60mm以上。
- 6. TPU可实现0.25mm的结构。
- 7. Key-top与Key-pad之间的间隙应在0.20mm（行程）以上。
- 8. Key-top与Housing的段差视状况而定，一般高出0.05mm到0.10mm之间。
- 9. 定位于Housing的位置不应离Pad点太近，或者与Pad点不在一条垂直或水平线上。

问题点的发现及其可能产生原因：

- 1. 手感不良
 - A/PAD点的高度？有无压伤或缺料？
 - B/TPU的品质？过硬？
 - C/Dome是否良品？
 - D/单键产品的分模线及其帽沿的剪切效果？
 - E/料头太大？
 - F/与Housing配合的间隙？键之间的间隙？
- 2. 外观不良
 - A/电镀线不平整？
 - B/各键之间的间隙不一以及上下不平齐？
 - C/盲点效果？
 - D/色差？
 - E/镭雕效果？
 - F/印刷的品质？
 - G/注塑件缩水？
 - H/印刷与喷涂的附着力？表面杂质？
- 3. 透光不良
 - A/背面印刷品质？
 - B/Led灯的位置设计？
 - C/热压粘胶不均，不成形状！

PK-Plastic Key Top Type 1 (塑料套按键 1)

- 结合Acrylic (原料) 按键和硅胶基底
- 底部丝印 (表面完全不会擦伤)
- 适用于棒型的移动电话

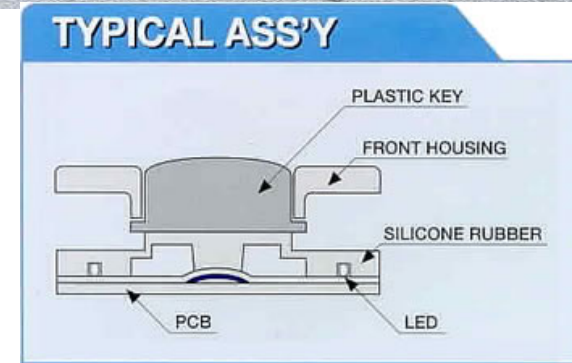
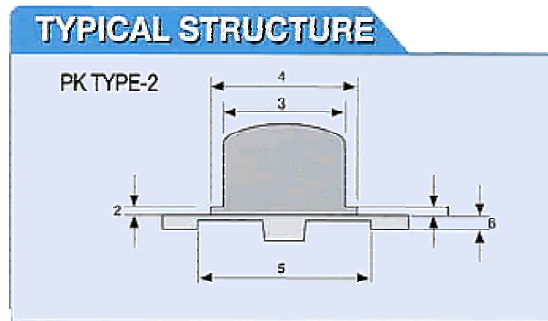
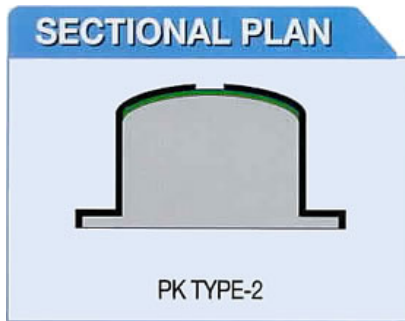


常用的技术	
普通	底部丝印 (底部和顶部)
特殊	半镜面 热冲压 真空电镀

N	尺寸
0	
1	0.5~1.0mm
2	Polydome: 0.7mm Metaldome: 0.4mm
3	D1
4	D1 +0.6~1.0mm
5	0.25~0.3mm
6	0.7~1.2mm

PK-2 – Plastic Key Top Type 2 (塑料套按键 2)

- 结合Acrylic（原料）按键和硅胶基底
- 喷漆和镭射雕刻
- 适用于外观吸引人的移动电话

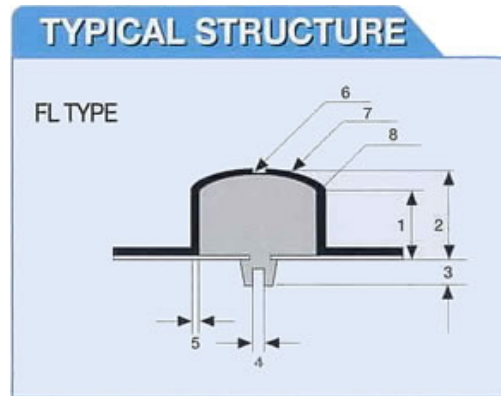
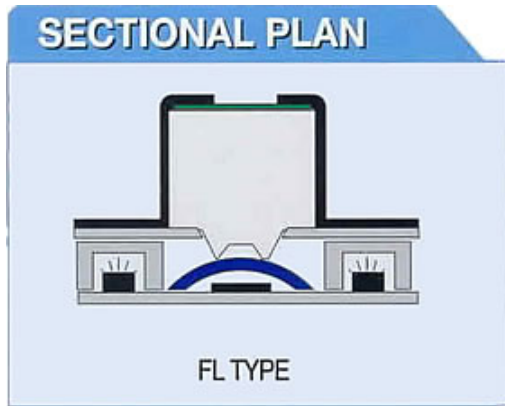


常用的技术	
普通	Metallic spray 镭射雕刻和上保护层
特殊	Metallic Plating 真空电镀 嵌入Film和切割 半透明喷漆

NO	尺寸
1	0.5~1.0mm
2	Polydome: 0.7mm Metaldome: 0.4mm
3	D1
4	D1 +0.6~1.0mm
5	0.25~0.3mm
6	0.7~1.2mm

Film Insert Laser Type

- 适用于小的，轻的，品质较高的移动电话
- 新技术的开发是为了使按键更亮，表面不易擦伤，保证高品质和耐用性
- 相似于LM (Laser Marking Type) 的加工过程，除了原料的选用（塑料或者是嵌入Film的硅胶）
- 外观比FI (Film Insert) 更为美观和吸引人



NO	种类	尺寸
1	常有高度	0.6~8.0mm
2	总高度	0.9~8.3mm
3	接触到Boss的高度	0.4~2.0mm
4	内部直径	最小 1.8mm

NO	种类	尺寸
5	保护层的厚度	App. 0.05mm
6	U.V.保护层	10~15祬
7	黑漆	0.02mm
8	Film的塑料树脂厚度	0.125mm

SA – Special Assembly Type

- 完全自动化的专业装配
- 有吸引力的豪华外表
- 为理想的高品质的移动电话而设计



NO	Description	Dimension
1	按键的空隙	0.15~0.5mm
2	中风的间隙	0.4~0.5mm
3	Film 的厚度	0.15~0.20mm
4	Silicone Dual Coated Tape	0.1~0.15mm
5		1.0~2.0mm

