Eight Discipline Report (8D Report)

To:	8D report No.:
From:：**Chicony Power Technology**	RMA claim No.:
CC：	Chicony Power P/N: ***A20-180P1A***
	Customer P/N:
Submit date: ***9/21***	Product description: ***180W***
Receive date: ***9/21***	Defect D/C or Lot No.:

Subject：試產時發生樣機點膠組裝後，在通電測試時發生異常，使樣機無法正常動作，經檢查發現 CK1 電容已有防爆孔膨脹損壞現象。
(ME 類, 電容)

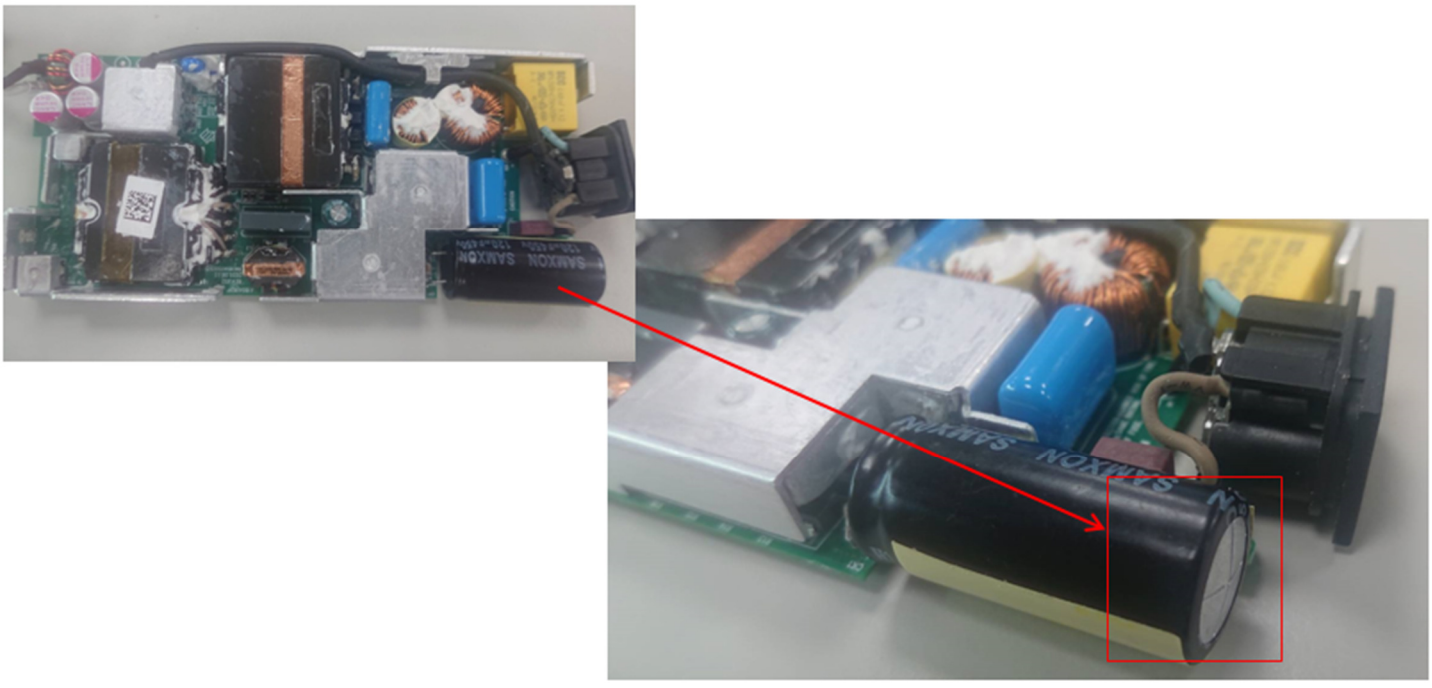
D1.) 問題解決成員:Use Team Approach

主持者 (Team Leader)：
內部成員 (Internal Team Members):
外部成員 (External Team Member):

D2.)問題說明:Problem Description:
(**Note**: Use **who**, **what**, **when**, **where**, **why**, **how**, **how many** to specify the Customer's problem.)

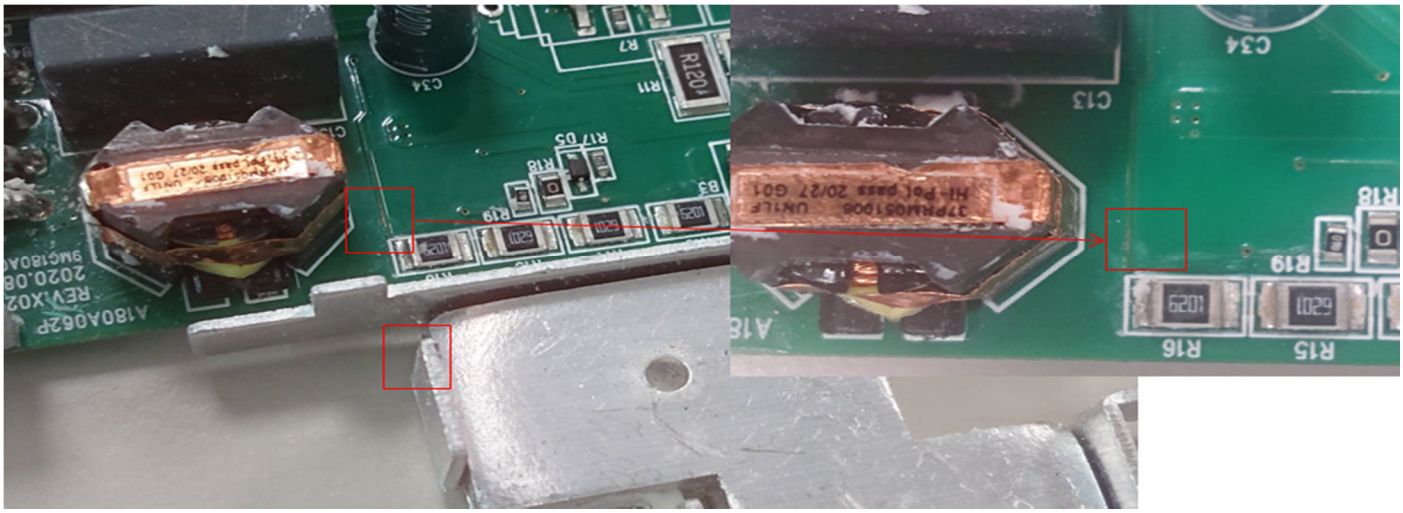
問題說明:

試產時發生樣機點膠組裝後，在通電測試時，發生異常使樣機無法正常動作, 經檢查發現 CK1 電容已有防爆孔膨脹損壞現象。



1. 分析時檢查周邊有無異常

2. 當移除異常樣機 HS2 時，發現 HS2 底部 Trace 有綠漆脫落現象，對應 HS2 有跳火痕跡

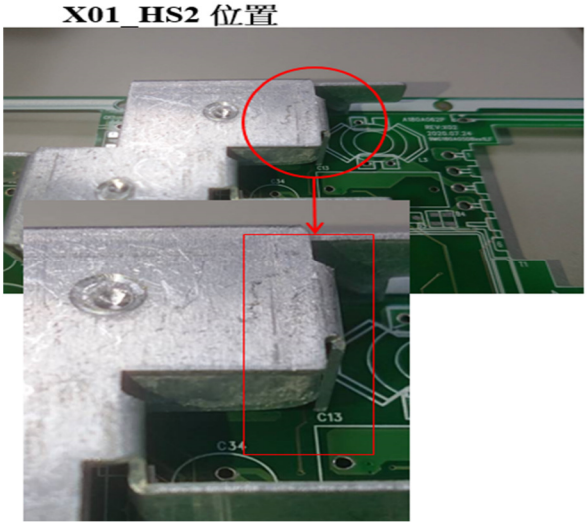


3. 先比對 X01 與 X02 HS2 PCB 組裝位置，因 CNC 製作 HS 的公差問題，發現 X02 HS2 折彎部分較 X01 靠近 SUPHV trace，所以容易碰觸到 SUPHV trace，這是為何 X01 沒有發生問題的原因。

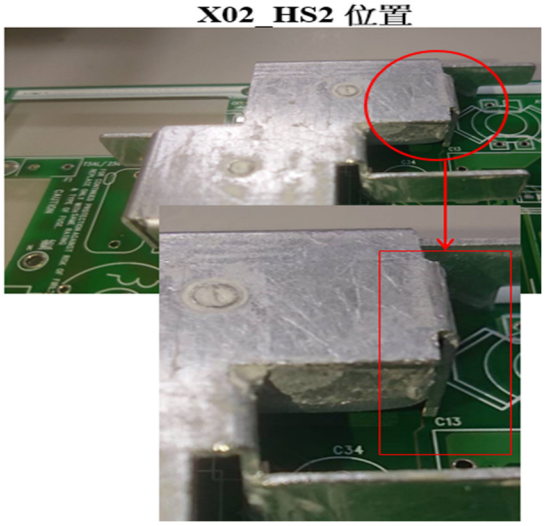
X01 試產數量 320PCS,工廠無反饋不良，不良率 0%

X02 試產數量 155PCS,工廠反饋不良 5PCS，不良率 3.2%.

X01_HS2 位置



X02_HS2 位置



D3.)內部或客戶的暫時解決辦法及實施日期:Implement and Verify Containment Action:

(**Note**: Internal / external containment action effectiveness and date.)

1. 從工廠端取得樣機並做進一步分析

Date:2020/9/15

D4.)不良原因確認: Define and Verify Root Causes:

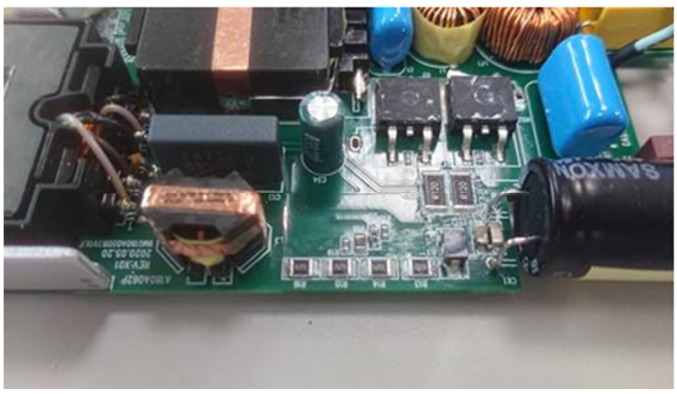
(Note: Identify and verify all suspect causes, which needs explain why the problem occurred.)

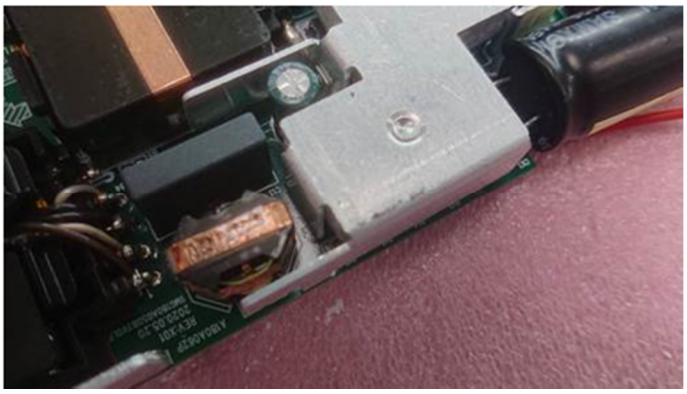
複製異常現象

1.取一樣機複製SUPHV Trace 與 HS2接觸跳火的狀況

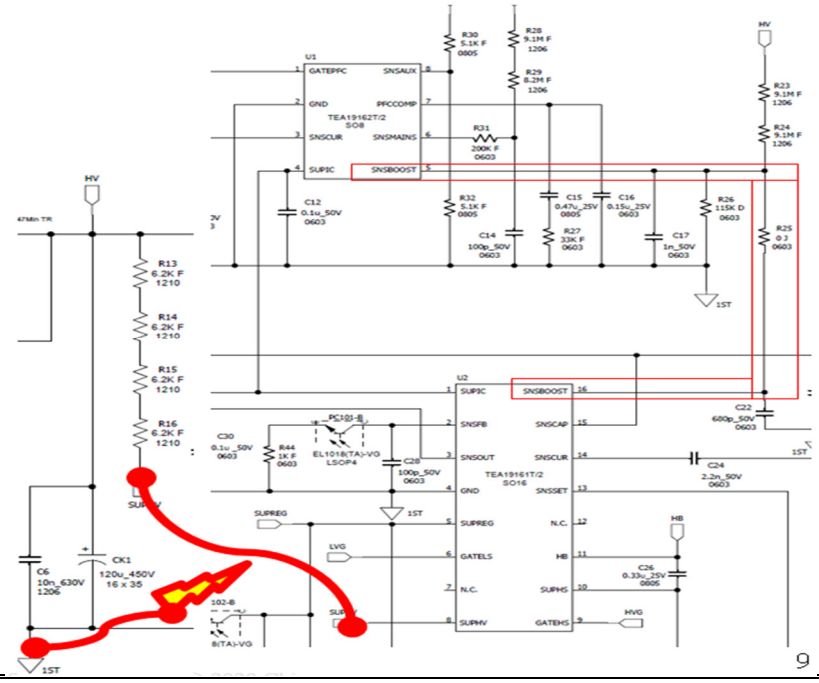
2.刮除Trace 線漆，使裸銅露出

3.只讓HS2接地Pin 焊接，使HS2 先浮高，當開機正常後，將HS2下壓與裸銅Trace輕微接觸產生跳火，觀察有何現象發生?





線路跳火路徑分析，量測TEA19162 PFC IC SNSBOOST 、 PFCCOMP、SUPIV、SNSCUR、GATEPFC 觀察正常及異常時波形



1. 正常開機後，使HS2輕微接觸Trace產生跳火，從波形發現PFC IC的SNSBOOST及PFCCOMP Pin腳有電壓異常且CK1電壓異常升高，從下圖可看到CK1電壓已上升到571V。

2. 正常開機後，使HS2輕微接觸Trace產生跳火，從波形發現PFC IC的GND 有異常電壓

A. 正常開機時

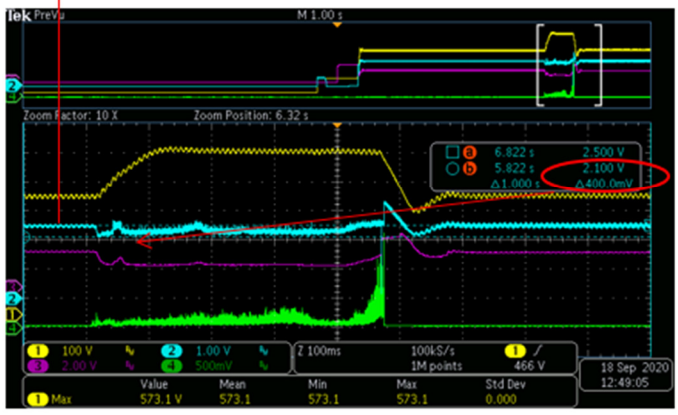
CH1: CK1_Vbulk CH2 : SNSBOOST_V CH3 : PFCCOMP_V CH4 : SUPIC_V

B. 異常時波形

CH1: CK1_Vbulk CH2 : SNSBOOST_V CH3 : PFCCOMP_V CH4 : SUPIC_V

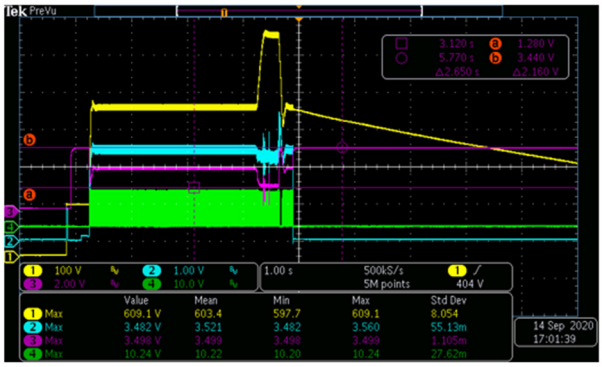
3. 從波形發現PFC IC的SNSBOOST電壓在異常時，電壓2.5V掉下到2.1V左右

SNSBOOST 正常電壓2.5V



CH1: CK1_Vbulk CH2 : SNSBOOST_V CH3 : PFCCOMP_V CH4 : IC GND to HS2 GND_V

4. 從波形發現PFC IC的PFCCOMP電壓在異常時，電壓有掉下到1.28V，將造成PFC on-time 往maximum on-time增加



CH1: CK1_Vbulk CH2 : SNSBOOST_V CH3 : PFCCOMP_V CH4 : GATEPFC

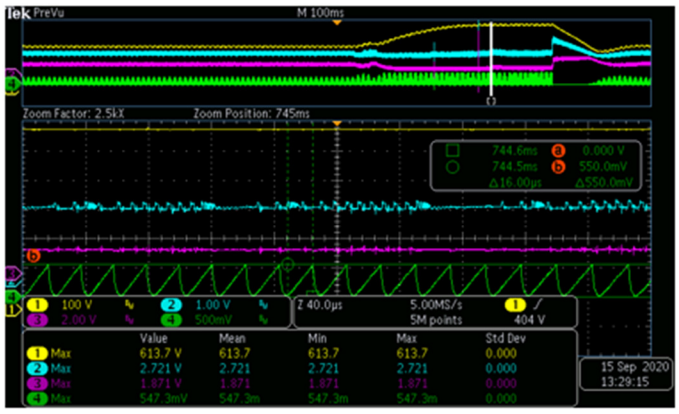
PFC on-timer (PFCCOMP pin)						
$V_{tonzero(PFCCOMP)}$	zero on-time voltage on pin PFCCOMP		3.40	3.50	3.60	V
$V_{tonmax(PFCCOMP)}$	maximum on-time voltage on pin PFCCOMP		1.18	1.23	1.28	V

5. 從波形發現PFC IC的SNSCUR電壓在異常時，電壓會上升到Vreg(oc) 0.5V

CH1: CK1_Vbulk CH2 : SNSBOOST_V CH3 : PFCCOMP_V CH4 : SNSCUR

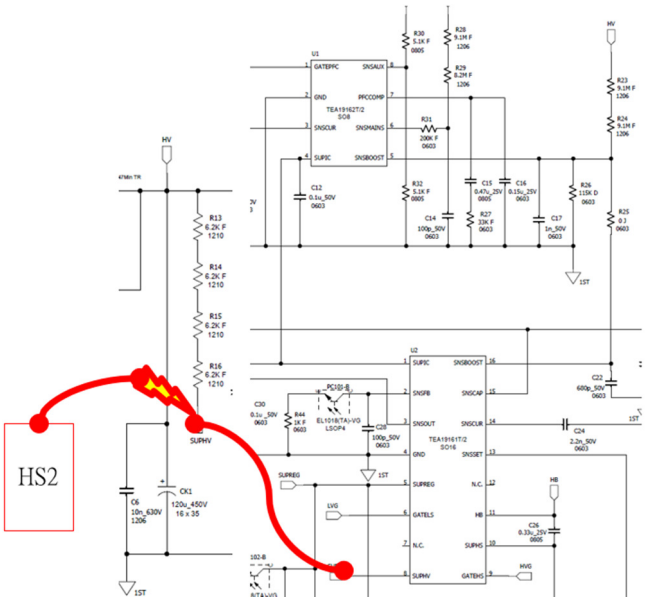
Output current sensing (SNSCUR pin)						
$V_{reg(oc)}$	overcurrent regulation voltage	dV/dt = 0	0.48	0.50	0.52	V

6. 當正常時SNSCUR 電壓較低，PFC on-time 較小，當HS2與Trace 輕微碰觸跳火時，此時PFCCOMP_V 被拉低到1.28V，導致PFC on-time 增加到maximum on-time,直到PFC Current 觸發到SNSCUR 0.5V 後，PFC能量被限制住，使Boost電壓停止上升

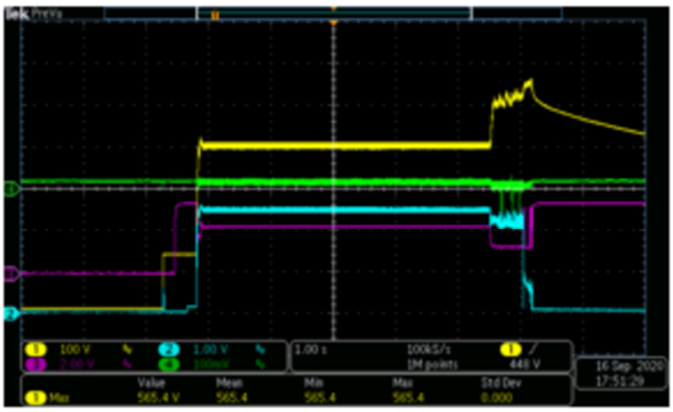


CH1: CK1_Vbulk CH2 : SNSBOOST_V CH3 : PFCCOMP_V CH4 : SNSCUR

實驗一:將HS2 接地及浮接時，碰觸SUPHV Trace，觀察是否為SUPHV 對HS2跳火，而影響 的IC GND電位?

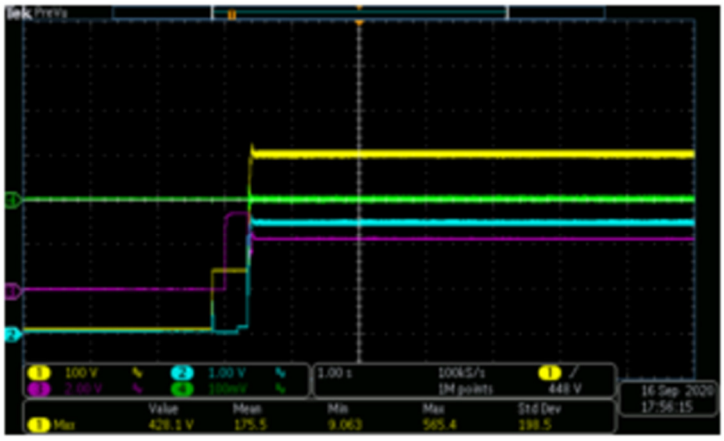


實驗當HS2 有接地時，此時與SUPHV trace 接觸跳火，發現GND有被干擾，使SNSBOOST_V下降，讓PFC以為Bulk電壓變低，為了使SNSBOOST_V回到2.5V，此時PFCCOMP_V將變低到1.28V，使PFC 加大on-time，PFC持續升壓到頂到SNSCUR 限制點才結束升壓。



CH1: CK1_Vbulk CH2 : SNSBOOST_V CH3 : PFCCOMP_V CH4 : IC _GND to HS2 GND

實驗當HS2 不接地時(floating)，此時與SUPHV trace 接觸跳火，並未造成GND被干擾， SNSBOOST電位維持正常，所以沒有發生異常現象。

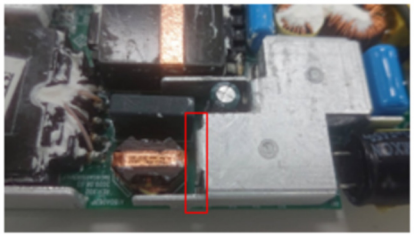
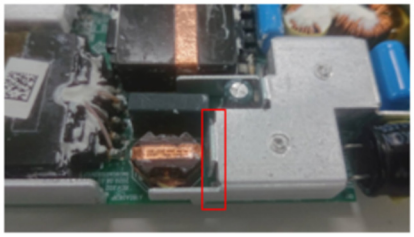
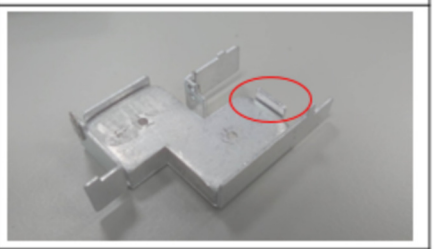


CH1: CK1_Vbulk CH2 : SNSBOOST_V CH3 : PFCCOMP_V CH4 : IC _GND to HS2 GND

改善對策1: 修改HS2切除與PCB trace 接觸的部分

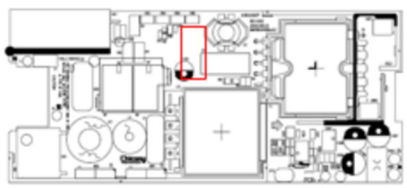
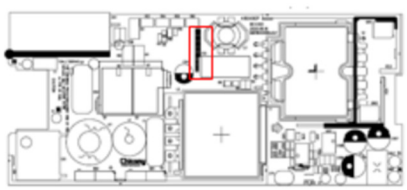
修改HS2，將與SUPHV trace 碰觸部分切除，防止 SUPHV trace 綠漆脫落，

對HS2 發生跳火現象，改善此跳火導致IC偵測異常以致產生高壓損壞CK1的問題。

修改前	修改後
	
	

改善對策2: SUPHV trace 增加白漆絕緣

防止SUPHV trace 綠漆脫落，增加白漆絕緣

修改前	修改後
	

D5.)改善措施:Corrective Action Verification: **(Note**: Be make sure the corrective actions is effective in process as well as able to fix the customer complaint problem**)**
■ **繪製 HS 時需與 ME 確實比對，避開與 PCB trace 碰觸的部分** ■ **修改 HS2 切除與 PCB trace 接觸的部分** ■ **SUPHV trace 增加白漆絕緣** **Date:2020/9/20**
D6.)改善措施實施日期:Implement Permanent Corrective Actions: **(Note**: Be provide the phase-in date or lot# of corrective actions **implementation** in process**)**
Immediately
D7.)預防再發生措施:Prevent Recurrence: **(Note:** Modified the management, operating systems, practices, and procedures to prevent recurrence for the problems as well as lessons learned cases**.)**
Same as D5
D8.)確認並感謝問題解決成員:Check and Congratulate the Team: **(Note:** Recognize the collective efforts of the team.**)**
Thanks to you all！！！

Signature **Team Leader**:	**Arthur Wu**
	Name – Title
Signature by Approver:	**Mark Meng**
	Name-Title