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1. GENERAL DESCRIPTION AND SCOPE

This is the specification of Model TC-2U50PD8; AC-line powered switching power supply with active PFC (Power Factor Correction) circuit, meet EN61000-3-2 and with Full Range Input features. Designed and manufactured by FSP GROUP.

The specification below is intended to describe as detail as possible the functions and performance of the subject power supply. Any comment or additional requirements to this specification from our customers will be highly appreciated and treated as a new target for us to approach.

2. REFERENCE DOCUMENTS

The subject power supply will meet the EMI requirements and obtain main safety approvals as following:

2.1. EMI regulatory

- FCC Part 15 Subpart J, Class ‘B’ 115 Vac operation.
- CISPR 22 Class ‘B’ 230 Vac operation.

2.2. Safety

- TUV EN60950
- CSA 22.2 NO. 60950
- IEC 60950
- UL 60950
- CUL 60950
- CCC
- CE

EN 55022:1998+A1: 2000, Class B	EN 55024: 1998+A1: 2001
EN 61000-3-2: 2000	IEC 61000-4-2: 2001
EN 61000-3-3: 1995+A1: 2001	IEC 61000-4-3: 2002
CISPR22: 1997+A1: 2000, Class B	IEC 61000-4-4:1995
AS/NZS CISPR 22: 2002, Class B	+A1:2000+A2: 2001
	IEC 61000-4-5: 2001
	IEC 61000-4-6: 2001
	IEC 61000-4-8: 2001

3. PHYSICAL REQUIREMENTS

3.1. Mechanical specifications

The mechanical drawing of the subject power supply, which indicate the form factor, location of the mounting holes, location, the length of the connectors, and other physical specifications of the subject power supply. Please refer to the attachment drawing.

3.2. Connector specifications

The power supply connectors are:

- AC Inlet : Standard inlet socket 10A/250V, UL/CSA/VDE approved.
- P1 : The equivalent of MOLEX 39-01-2240, 24 pin connector
- PA,PB,PC, : The equivalent of AMP 1-480424-0, 4 pin connector
- PD : The equivalent of AMP 171822-4, 4 pin connector
- P2 : The equivalent of Molex 39-01-2080, 8pin connector

4. ELECTRICAL REQUIREMENTS

4.1. Output electrical requirements

The subject power supply will meet all electrical specifications below, over the full operation temperature range and dynamic load regulation.

4.1.1. Output rating

Output	Nominal	Regulation	Ripple/Noise	Min	Max	peak
1	+3.3V	±5%	50mV	0.5A	24.0 A	
2	+5V	±5%	50mV	0.5A	20.0 A	
3	+12V1	±5%	120mV	1.0A	15.0 A	
4	+12V2	±5%	120mV	1.0A	15.0 A	
5	+12V3	±5%	120mV	1.0A	15.0 A	
6	-5V	±10%	100mV	0 A	0.3 A	
7	-12V	±10%	120mV	0 A	0.5 A	
8	+5VSB	±5%	50mV	0 A	2.5A	

- (1) The +3.3V and +5V total output shall not exceed 150watts.
- (2) total output for this subject power supply is 500 watts.
- (3) Max continuous load combined 12V should not exceed 35A.
- (4) Ripple and noise measurements shall be made under all specified load conditions through a single pole low pass filter with 20MHz cutoff frequency. Outputs shall bypassed at the connector with a 0.1uF ceramic disk capacitor and a 10uF electrolytic capacitor to simulate system loading.
- (5) -5V is option.

4.1.2. Load capacity specifications

The cross regulation defined as follows, the voltage regulation limits DC include DC Output ripple & noise.

LOAD	STM.	+3.3V	+5V	+12V1	+12V2	+12V3	-5V	-12V	5VSB
ALL MAX	HHHHH HH	14.18A	11.81A	10.59A	10.59A	10.59A	0.25A	0.35A	1.50A
+5V MAX other MIN	LHLLLL L	0.5A	20.0 A	1.0A	1.0A	1.0A	0A	0A	2.5A
+3.3V MAX other MIN	HLLLLL L	24.0 A	0.5 A	1.0A	1.0A	1.0A	0A	0A	2.0A
+12V1 MAX other MIN	LLHLLL L	0.5 A	0.5 A	15.0A	1.0A	1.0A	0A	0A	1.5A
+12V2 MAX other MIN	LLLHLL L	0.5 A	0.5 A	1.0A	15.0A	1.0A	0A	0A	1.0A
+12V3 MAX other MIN	LLLHL L	0.5 A	0.5 A	1.0A	1.0A	15.0A	0A	0A	0.5A
ALL MIN	LLLLLL	0.5 A	0.5 A	1.0A	1.0A	1.0A	0A	0A	0A

4.1.3. Hold-up time (@full load)

115V / 60Hz : 16 mSec. Minimum.

230V / 50Hz : 16 mSec. Minimum.

4.1.4. Output rise time

(10% TO 90% OF FINAL OUTPUT VALUE, @FULL LOAD)

115V-rms or 230V-rms + 5Vdc : 20ms Maximum

4.1.5. Over voltage protection

Voltage Source	Protection Point
+ 3.3 V _{dc}	3.5V-4.5V
+5V _{dc}	5.5V-6.82V
12V ₁ & 12V ₂ & 12V ₃	13.4V-15.6V

4.1.6. Short circuit protection

Output short circuit is defined to be a short circuit load of less than 0.1 ohm.

In the event of an output short circuit condition on +3.3V, +5V or +12V output, the power supply will shutdown and latch off without damage to the power supply. The power supply shall return to normal operation after the short circuit has been removed and the power switch has been turned off for no more than 2 seconds.

In the event of an output short circuit condition on -12V output, the power supply will not be damaged. The power supply shall return to normal operation as soon as the short circuit has been removed. and the power switch has been turned off for no more than 2 seconds.

4.1.7. Over current protection

3.3V	25A-40A
5V	25A-40A
12V1	16A-20A
12V2	16A-20A
12V3	16A-20A

4.1.8. Power good signal

The power good signal is a TTL compatible signal for the purpose of initiating an orderly start-up procedure under normal input operating conditions. This signal is asserted (low) until +5Vdc has reached 4.75 volts during power up. Characteristics:

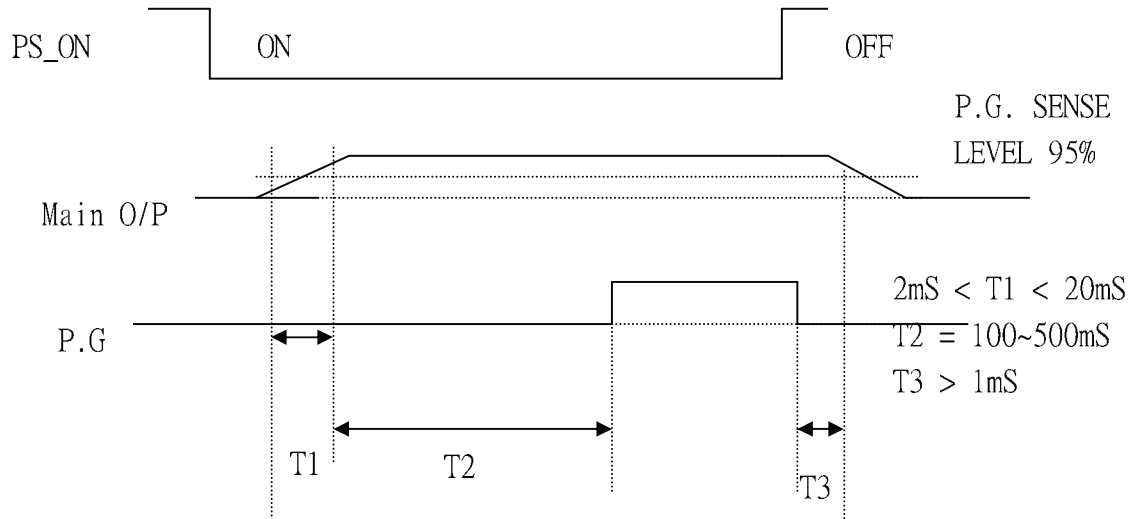
TTL signal asserted (low state) : less than 0.5V while sinking 10mA.

TTL signal asserted (high state): greater than 4.75V while sourcing 500uA.

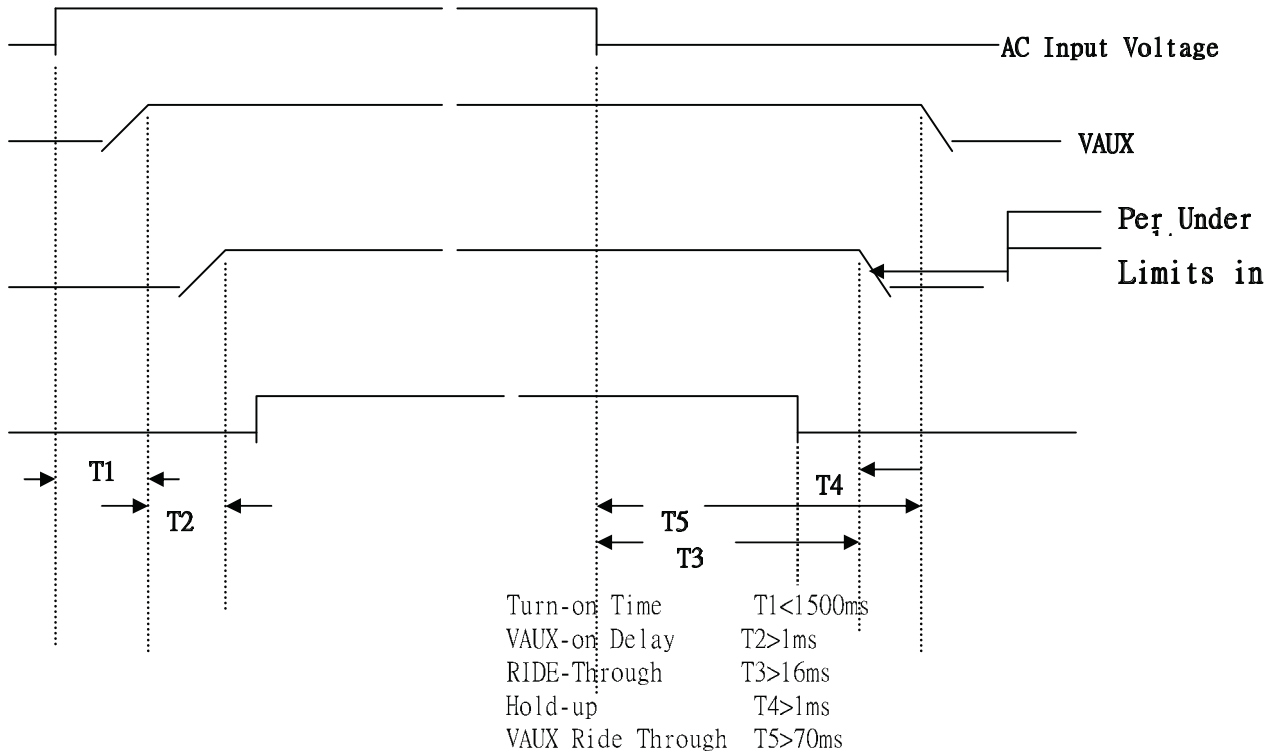
High state output impedance: less or equal to 1Kohm from output to common.

POWER GOOD @ 115/230V, FULL LOAD	100 –500mSec.
POWER FAIL @115/230V, FULL LOAD	1 mSec. minimum

(A) Remote ON-OFF Timing:



(B) AC ON / OFF Timing :



4.2. Output transient load response

The output voltages shall remain within the limits specified in 4.1.1 output rating table in page 6 for the step loading and within the limits specified in Table 1 for the capacitive loading. The load transient repetition rate shall be tested between 50Hz and 5 kHz at duty cycles ranging from 10%-90%. The load transient repetition rate is only a test specification. The step load may occur anywhere within the MIN load to the MAX load shown in Table 1.

Table 1: Transient Load Requirements

Output	Step Load Size	Load Slew Rate	Capacitive Load
+3.3V	30% of max load	0.5A/us	1000uF
+5V	30% of max load	0.5A/us	1000uF
12V1+12V2+12V3	65% of max load	1.0A/us	2200uF
+5Vsb	25% of max load	0.5A/us	1uF

4.3. Input electrical specifications

4.3.1. Voltage range

PARAMETER		UNITS
V-in Range	90 - 264	V-rms

4.3.2. Input frequency

INPUT FREQUENCY	47–63Hz
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4.3.3. Inrush current

(Cold start – 25 deg. C)

115V	NO damage
230V	NO damage

(No damage)

4.3.4. Input line current

115V	10.0 Amps – rms maximum
230V	5.0 Amps – rms maximum

4.4. Efficiency

	Full load (100%)	Typical load (50%)	Light load (20%)
115VAC	82%	85%	82%
230VAC	82%	85%	82%

4.5. (loading shown in Amps)

Loading	+12V1	+12V2	+12V3	+5V	+3.3V	-5V	-12V	+5Vsb
Full (100%)	10.59	10.59	10.59	11.56	14.18	0.25	0.35	1.76
Typical (50%)	5.29	5.29	5.29	5.76	7.09	0.15	0.18	0.88
Light (20%)	2.12	2.12	2.12	2.31	2.84	0.05	0.07	0.35

4.6. PS_ON#

PS_ON# is an active-low, TTL-compatible signal that allows a motherboard to remotely control the power supply in conjunction with features such as soft on/off, Wake on LAN+, or wake-on-modem. When PS_ON# is pulled to TTL low, the power supply should turn on the five main DC output rails: +12VDC,+5VDC,+3.3VDC,-5VDC,and –12VDC. When PS_ON# is pulled to TTL high or open-circuited, the DC output rails should not deliver current and should be held at zero potential with respect to ground. PS_ON# has no effect on the +5VSB output, which is always enabled whenever the AC power is present. Table 15 lists PS_ON# signal characteristics.

The power supply shall provide an internal pull-up to TTL high. The power supply shall also provide debouche circuitry on PS_ON# to prevent it from oscillating on/off at startup when activated by a mechanical switch. The DC output enable circuitry must be SELV-compliant.

Table 15. PS_ON# Signal Characteristics

	Min.	Max.
VIL, Input Low Voltage	0.0V	0.8V
IIL, Input Low Current (Vin = 0.4V)		-1.6mA
VIH, Input High Voltage (Iin = -200 A)	2.0V	
VIH OPEN circuit, Iin = 0		5.25V

5. ENVIRONMENTAL REQUIREMENTS

The power supply will be compliant with each item in this specification for the following environmental conditions.

5.1. Temperature range

Operating	0 to +50 deg. C
Storage	-20 to +80 deg. C

5.2. Humidity

Operating	85% RH, Non-condensing
Storage	95% RH, Non-condensing

5.3. Vibration

The subject power supply will withstand the following imposed conditions without experiencing non-recoverable failure or deviation from specified output characteristics.

Vibration Operating – Sine wave excited, 0.25 G maximum acceleration, 10-250 Hz swept at one octave / min. Fifteen minute dwell at all resonant points, where resonance is defined as those exciting frequencies at which the device under test experiences excursions two times larger than non-resonant excursions.

Plane of vibration to be along three mutually perpendicular axes.

5.4. Shock

The subject power supply will withstand the following imposed conditions without experiencing non-recoverable failure or deviation from specified output characteristics.

Storage –40G, 11 mSec. half-sine wave pulse in both directions on three mutually perpendicular axes.

Operating -10G, 11mSec. half-sine wave pulse in both directions on three mutually Perpendicular axes.

6. SAFETY

6.1. Leakage current

The leakage current from AC to safety ground will not exceed 3.5 mA-rms at 264Vac, 50 Hz.

7. ELECTROMAGNETIC COMPATIBILITY

7.1. Line conducted emi

The subject power supply in system case will meet FCC and VFG class B requirements under full load conditions.

7.2. Radiated EMI

The subject power supply in system case will meet FCC and CISPR 22 requirements under normal load conditions.

8. LABELLING

Label marking will be permanent, legible and complied with all agency requirements.

8.1. Model number label

Labels will be affixed to the sides of the power supply showing the following:

- Manufacturer's name and logo.
- Model no., serial no., revision level, location of manufacturer.
- The total power output and the maximum load for each output.
- AC input rating.

8.2. DC output identification

Each output connector will be labeled.

9. RELIABILITY

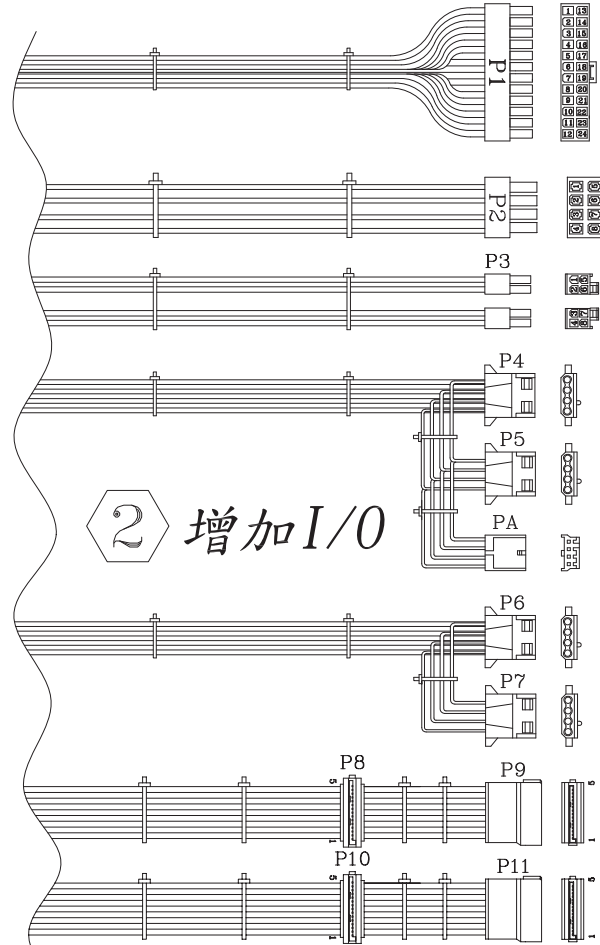
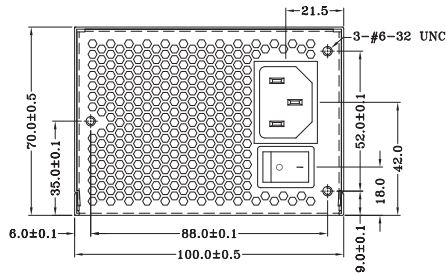
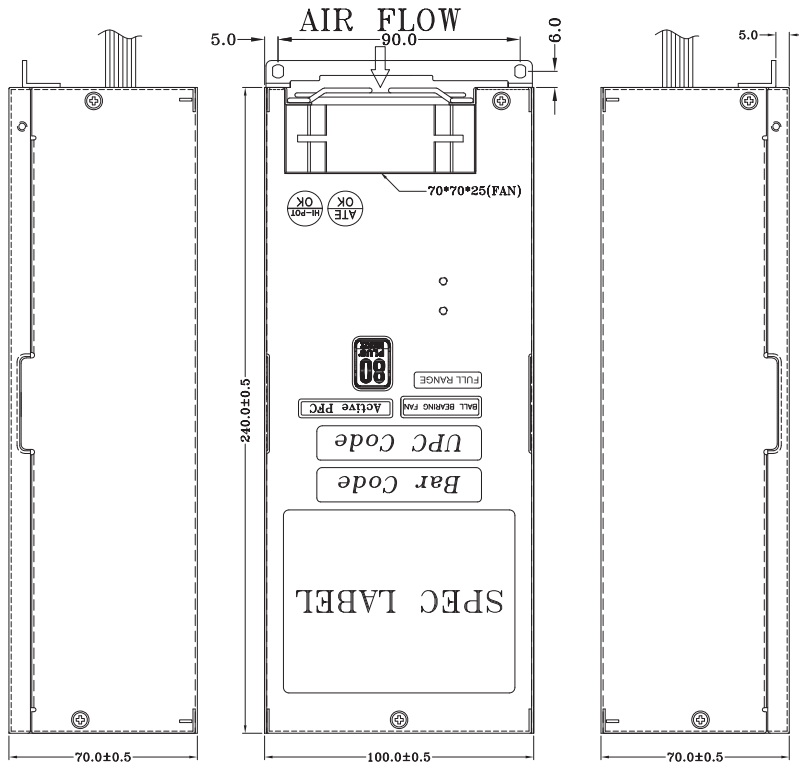
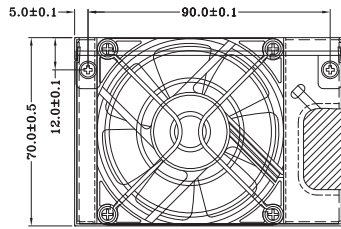
9.1. MTBF

The power supply have a minimum predicted MTBF(MIL-HDBK-217) of 100,000 hours of continuous operation at 25°C, maximum-output load, and nominal AC input voltage.

10. MECHANICAL

10.1. Outside dimension

The power supply outline dimension is L240 x W100 x H70 (mm)



REF. ID.	PIN NO.	SIGNAL	WIRE COLOR	GAUGE	CONNECTOR TYPE	CABLE LENGTH
P1	1	+3.3VDC	ORANGE	18	MOLEX 39-01-2240 or EQUIV.	500±15mm
	2	+3.3VDC	ORANGE	18		
	3	COM	BLACK	18		
	4	+5VDC	RED	18		
	5	COM	BLACK	18		
	6	+5VDC	RED	18		
	7	COM	BLACK	18		
	8	PW-OK	GRAY	18		
	9	+5Vsb	PURPLE	18		
	10	+12V3	YEL/WHITE	18		
	11	+12V3	YEL/WHITE	18		
	12	+3.3VDC	ORANGE	18		
	13	+3.3VDC	ORANGE	18		
	13	+3.3V sense	BROWN	22		
	14	-12VDC	BLUE	18		
	15	COM	BLACK	18		
	16	PS-ON	GREEN	18		
	17	COM	BLACK	18		
	18	COM	BLACK	18		
	19	COM	BLACK	18		
20	-5V	WHITE	18			
21	+5VDC	RED	18			
22	+5VDC	RED	18			
23	+5VDC	RED	18			
24	COM	BLACK	18			
P2	1	COM	BLACK	18	MOLEX 39-01-2080 or EQUIV.	500±15mm
	2	COM	BLACK	18		
	3	COM	BLACK	18		
	4	COM	BLACK	18		
	5	+12V1	YEL/BLACK	18		
	6	+12V1	YEL/BLACK	18		
	7	+12V1	YEL/BLACK	18		
	8	+12V1	YEL/BLACK	18		
P3	1	COM	BLACK	18	WST P4-142002 K3B+ P4-142002 K4B OR EQUIV	500±15mm
	2	COM	BLACK	18		
	3	COM	BLACK	18		
	4	COM	BLACK	18		
	5	+12V2	YEL/BLUE	18		
	6	+12V2	YEL/BLUE	18		
	7	+12V2	YEL/BLUE	18		
	8	+12V2	YEL/BLUE	18		
P4	1	+12V3	YEL/WHITE	18	AMP 1-480424-0 or EQUIV.	450±15mm
	2	COM	BLACK	18		
	3	COM	BLACK	18		
	4	+5V	RED	18		
P5	1	+12V1	YEL/WHITE	18	AMP 1-480424-0 or EQUIV.	200±10mm
	2	COM	BLACK	18		
P7	3	COM	BLACK	18	AMP 171822-4 or EQUIV.	150±10mm
	4	+5V	RED	18		
PA	1	+5V	RED	22	AMP 171822-4 or EQUIV.	150±10mm
	2	COM	BLACK	22		
	3	COM	BLACK	22		
P8	4	+12V3	YEL/WHITE	22	CL1271HSO-15P or EQUIV.	450±15mm
	1	+3.3VDC	ORANGE	18		
P10	2	COM	BLACK	18	CL1270H00-15P or EQUIV.	450±10mm
	3	+5V	RED	18		
	4	COM	BLACK	18		
P9	5	+12V3	YEL/WHITE	18	CL1270H00-15P or EQUIV.	450±10mm
	1	+3.3VDC	ORANGE	18		
	2	COM	BLACK	18		
	3	+5V	RED	18		
P11	4	COM	BLACK	18	CL1270H00-15P or EQUIV.	450±10mm
	5	+12V3	YEL/WHITE	18		

NOTE:

1. ALL THE LENGTH OF OUTPUT WIRES EXCLUDE HOUSING.
2. 產地標籤依業務指示加貼.

MODEL NO. : TC-2U50PD8		TITLE: ASSY		SHEET: 1 OF 1 REV:02	
R&D(2)	PE	DRAWN	DATE		
		樂家龍	Sep.03.2009		
INTERIOR COUNTERSIGN:					

UNIT:mm