To：BMZ

Product Specifications

1. Date of 1st Issue: 2011-6-16

2. Date of Revision (1st):

3. Customer’s Part Name:

4. Customer’s Part Number:

5. AEenergy’s Part Name: AE754364P8H-4S

6. AEenergy’s Part Number:AE776-02-A

7. Customer’s Approval

8. Supplier

Advanced Electronics Energy Limited
Unit 7,12F,Chevalier Commercial Center,
No.8 Wang Hoi Road, Kowloon Bay,
Hong Kong

Product Specifications – AE754364P8H-4S

Revision History

Date	Description	Checked By	Approved By
2011-6-16	First Issue		

Product Specifications – AE754364P8H-4S

Contents

Product Specifications– AE754364P8H-4S

1. Scope

This specification shall be applied to Lithium ion polymer battery- model number AE754364P8H-4S manufactured by Advanced Electronics Energy Ltd. Hong Kong.

2. System: Rechargeable Lithium-ion Polymer Battery

3. Cell Model : AE754364P

4. Cell Model Number : AE754364P8H-4S

5. Ratings

5.1. Nominal Capacity [at 0.2C (420mA)]:	2100mAh (min); 2250mAh (typical)
5.2. Nominal Voltage	14.8V (average voltage at 0.2C discharge)
5.3. Charging Voltage :	16.8 ±0.05V
5.4. Max. Charging Current :	2000mA
5.5. Charging Method: constant current constant voltage	
Standard Charge:	500mA (constant current) charge to 16.8V, then 16.8V (constant voltage) for 5-6hr or 42mA(0.02C) cut off
Quick Charge:	2000mA (constant current) charge to 16.8V, then 16.8V (constant voltage) for 3.0hr or 42mA(0.02C) cut off
5.6. Max. Continuous Discharge Current:	2000mA
5.7. Discharge Cut-off Voltage :	11V
5.19. Battery Dimensions (Refer to the attached drawing)	
5.9. Battery Weight :	170±9g

Product Specifications – AE754364P8H-4S

5.10. Operating Temperature

Discharge : -20°C - +60°C

Charging : -0°C - +45°C

Storage in a 50% charged state(CELL)

Temperature range	Duration	Typ. Capacity recovery
-20°C - +80°C	10 days	50%(expected)
-20°C - +60°C	1month	75%(expected)
-20°C - +45°C	3months	70%(expected)
-20°C - +25°C	1year	80%(expected)

Do not storage at fully charged state (4.2V) for a long period of time

6. Battery Performance

6.1. Visual Inspection

There shall be no such defects as remarkable scratches, cracks, leakage or deformations.

6.2. Test Condition

6.2.1.Standard Test Condition

Test new cells within one month after shipment from our factory and the cells shall not be cycled over five times before the tests.

All the tests in this specification shall be conducted in an ambient temperature of 25°C ±5°C under a humidity of 25% to 85%, unless otherwise specified.

6.2.2.Measuring Instrument or Apparatus

6.2.2.1. The dimension measurement shall be implemented by instruments with equal or more precision seal of 0.01mm.

6.2.2.2.Standard class specified in the national standard or more sensitive class having inner impedance more than 10k Ω/v.

6.2.2.3 Impedance shall be measured by a sinusoidal alternating current method(1kHz LCR meter).

6.2.4.6.The current measurement shall be implemented by instrument with equal to more precision scale of ± 0.1% and the constant voltage precision should be implemented with ± 0.5%, and the timing precision should be not below ±0.1%.

6.2.2.5.The temperature measurement shall be implemented by instrument with equal or more precision seal of ± 0.5℃.

6.3. Electrical Characteristics

6.3.1. Standard Charge

The cell shall be charged at a constant current of 500mA to 16.8Vand then at constant voltage of 16.8Vwith a charging time of 5-6 hours or 42mA(0.02C) cut off .

Product Specifications– AE754364P8H-4S

6.3.2. Rated Capacity (0.2C): 2100mAh (minimum)
The capacity shall be measured at a discharge current of 420mA (0.2C) and a cut-off voltage of 11V after the standard charge (Section 6.3.1.)

6.3.3. High Rate Discharge Capacity : 85% (minimum) of Rated Capacity
The capacity shall be measured at a discharge current of 2000mA and a cut-off voltage of 11V after the standard charge (Section 6.3.1.)

6.3.4. Low Temperature Discharge Capacity (0°C): 80% (minimum) of Rated Capacity
The capacity shall be measured at a discharge current of 420mA (0.2C) in an ambient temperature of 0°C ±2°C and a cut-off voltage of 11V after the standard charge (Section 6.3.1.)

6.3.5. Low Temperature Discharge Capacity (-10°C): 70% (minimum) of Rated Capacity
The capacity shall be measured at a discharge current of 420mA (0.2C) in an ambient temperature of -10°C ±2°C and a cut-off voltage of 11V after the standard charge (Section 6.3.1.)

6.3.6. High Temperature Discharge Capacity (60°C): 100% (minimum) of Rated Capacity
The capacity shall be measured at a discharge current of 420mA (0.2C) in an ambient temperature of 60°C ±2°C and a cut-off voltage of 11V after the standard charge (Section 6.3.1.)

6.3.7. Storage Characteristics (25°C)
Capacity Retention: 85% (minimum) of Rated Capacity
Capacity Recovery: 90% (minimum) of Rated Capacity
The capacity retention shall be measured at a discharge current of 420mA (0.2C) and a cut-off voltage of 11V after standard charge (Section 6.3.1.) and being stored for 4.6 days at 25°C ±5°C . Then, the capacity recovery shall be measured at a discharge current of 420mA (0.2C) and a cut-off voltage of 11V after standard charge (Section 6.3.1.).

6.3.8. Storage Characteristics (45°C)
Capacity Retention : 60% (minimum) of Rated Capacity
Capacity Recovery: 70% (minimum) of Rated Capacity
The capacity retention shall be measured at a discharge current of 420mA (0.2C) and a cut-off voltage of 11V after standard charge (Section 6.3.1.) and being stored for 4.6 days at 45°C ±5°C .Then, the capacity recovery shall be measured at a discharge current of 420mA (0.2C) and a cut-off voltage of 11V after standard charge (Section 6.3.1.).

6.3.9. Internal Impedance: 360mΩ(type) ; 500mΩ(max)
The internal impedance shall be measured at a since wave alternative current process of 1kHz after the standard charge.

Product Specifications– AE754364P8H-4S

6.3.10. Cycle Life :

The cycle life shall be conducted as the following procedures：

Step 1 charge the cell with the standard charge (as of section 6.3.1);

Step 2 discharge the cell at 1050mA (0.5C) to 11V;

Step 3 repeat Step 1 and Step 2 for 500 times.

The capacity after 300 cycles is expected to be equal to or more than 80% of the rated capacity. The capacity after 500 cycles is expected to be equal to or more than 60% of the rated capacity.

6.3.11. Open Circuit Voltage: 14.4V – 16.4V as of shipment.

6.4. Mechanical Performance

6.4.1. Vibration Test 95% (min) of Rated Capacity, No Leakage

After standard charge (Section 6.3.1.), the battery is vibrated with an amplitude of 0.8mm (1.6mm total maximum excursion) for 60 minutes in three mutually perpendicular directions. The vibration is performed between 10Hz and 55Hz at a rate of 1Hz per minute.

After the completion of the vibration, the capacity shall be measured at a discharge current of 420mA (0.2C) and a cut-off voltage of 11V

6.5. Environmental Performance

6.5.1. Thermal Shock Test No Leakage, No Fire, No Explosion

The battery is stored at 75°C ±5°C for 48 hours, moved to a temperature of -20°C ±5°C within 5 minutes and stored for 6 hours after standard charge (Section 6.3.1.).

6.6. Safety Performance

6.6.1. Short Circuit Test No Fire, No Explosion

After standard charge (Section 6.3.1.), the battery shall be subjected to a short-circuit condition with a wire of resistance less than 100mΩ for 1 hour.

6.6.2. Overcharge Test (with a PCM) No Fire, No Explosion

After standard charge (Section 6.3.1.), the battery shall be charged at (2000mA)/20V for 7 hrs.

6.6.3. Thermal Exposure Test No Fire, No Explosion

After standard charge (Section 6.3.1.), the battery is placed in an oven and is heated up at a rate of 5°C until the temperature reaches 130°C. The oven shall be maintained at 130°C for 30 minutes.

7. Delivery Condition: about 50% charged.

Product Specifications– AE754364P8H-4S

8. ***AEenergy*** **Lithium Ion Polymer Battery Handling Guideline**

8.1 In case of contacting the materials from a damaged or ruptured cell or battery:

Eye contact: Washing immediately with plenty of water and soap or for at least 15 minutes. Get medical attention.

Skin Contact: Washing immediately with water and soap.

Inhalation of Vented Gas: Remove to fresh air. Get medical attention.

Ingestion: Get medical attention immediately.

8.2 Keep away batteries from children.

8.3 The cells/ batteries are requested to be stored within a proper temperature range specified in this specifications.

8.4 Do not store batteries in a manner that allow s terminals to short circuit.

8.5 Do not place batteries near heating sources, nor exposed to direct sunlight for long periods. Elevated temperatures can result in reduced battery service life.

8.6 Charging Battery

Use only approved chargers and procedures. Improperly charging a cell or battery may cause the cell or battery to flame or damage.

Charge the battery using the “CCCV” or constant current /constant voltage method.

Do not charge the battery with a current or voltage higher than the specified maximum value in this specifications. The absolute maximum charging voltage is 4.25V per cell.

Prohibit reverse charging of the battery. The battery must be connected correctly.

No trickle charging shall be applied for lithium battery charging.

8.7 Discharging Battery

Discharge battery at the max current specified in this specification. If you plan to discharge battery at a higher current than the max current, please consult AEenergy.

Avoid discharge the battery below 27.5V for each cell.

Do not over-discharge the battery. Over-discharging can damage the performance of the battery. It should be noted that the cell/battery would be at an over-discharged state by its self-discharge characteristics in case the cell is not used for long time. In order to prevent over-discharging, the cell/battery shall be charged periodically to maintain between 14.4V and 16.4V.

Product Specifications– AE754364P8H-4S

8.8 Operation Temperature

The battery shall be operated (stored, charged and discharged) in the temperature specified in this specifications.

8.9 Cell/Battery Protection Circuit Module (PCM)

The cell/battery must be equipped with a PCM that protects the cell/battery from overcharging, over-discharging and over-current. The cell/battery should be inspected every 90 days periodically and those voltage below 3.6V cell /battery should be charged timely.

8.10 Battery Short Circuit

Do not short-circuit a battery. A short circuit can result in over-heating of the terminals and provide an ignition source.More than a momentary short circuit will generally reduce the cell or battery service life and can lead to ignition of surrounding materials or materials within the cell or battery if the seal integrity is damaged.Extended short-circuiting creates high temperature in the cell and at the terminals. Physical contact to high temperatures can cause skin burns. In addition, extended short-circuit may cause the cell or battery to flame.

8.11 Prohibit reversing cell polarity within a battery assembly.

8.12 The cell edge of the heat seal zone is electrically conductive. Avoid the edge cross battery terminals, PCB, or conductive surfaces

8.13 Do not bend, fold or fall the battery or part of the battery. It may cause the battery be damaged and result in the battery swelling, leaking, explosion or ignition

8.14 Do not open or manipulate the folded cell edge.

8.15 Do not bend or fold the sealing edge. And do not tear off the sealing film.

8.16 Battery Pack Design

The battery housing should have sufficient mechanical strength.

No sharp edge components shall be inside the battery housing. The sharp edge may destroy the cell packaging.

No cell movement is allowed in the battery housing.

The ultrasonic head shall not directly/ or indirectly pressed the cell if you need to enclose the battery housing by ultrasonic method. Please consult AEenergy for designing the ultrasonic head.Avoid designing airtight battery housing.

8.17 Battery Assembly

We recommend ultrasonic welding or spot welding to connect battery with PCM or other parts.

If you employ manual solder method to connect tab with PCM, please pay attention to the followings:

Use a solder with temperature controlled and ESD

Soldering temperature should not exceed 300° C

Soldering time should not be longer than 3s

Soldering times should not exceed 5 times

Keep battery tab cold down before next time soldering.

Do not directly heat cell body. It may cause the battery be damaged by heat above 90° C

Product Specifications– AE754364P8H-4S

8.18 Battery Disassembly

Never disassemble a battery.

Should a battery unintentionally be crushed, thus releasing its contents, rubber gloves must be used to handle all battery components. Avoid inhalation of any vapors that may be emitted.

8.19 Do not mixed Batteries and Types. Avoid to use old and new cells or cells of different sizes, different chemistry or types in the same battery assembly.

8.20 Other Warnings

Do not heat or dispose the battery into fire, water or other liquids.

Do not put the battery into microwave, washing machine or drying machine.

Do not use a damaged battery.

8.21 Others

AEenergy shall make no liability for problems that occur when the above specifications are not followed.

9. Remarks

If any matters with this specification arises, it shall be revised by mutual agreements.

Appendix 1 Battery Drawing

以下物料均需使用环保材料

序号	部件名称	型号	数量
01	电芯/Cell	AE754364P8H	4
02	保护板/PCM	465 Mos 2.5V 截止电压/Cut-off (A08810Mos)	4
03	红线/Red Wire(Ba4/P+)	UL1007#22	1
04	黑线/Black Wire(Ba1/P-)	UL1007#22	1
05	热缩管/Heatshrink tube		1
06	绝缘胶布/Insulating Tape	橙色/Orange	1
07	绝缘胶布/Insulating Tape	橙色/Orange	2
08	绝缘胶布/Insulating Tape	无色透明	1
09	贴纸/Label	AE00-716(透明底黑色图案15*15)	1

技术要求:

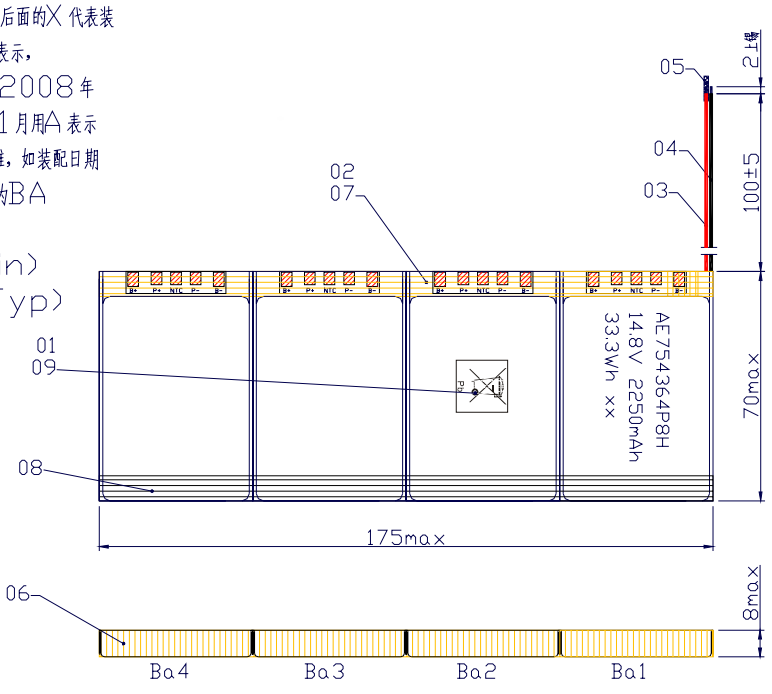
1. 电池正面要求打码, 打码内容为:

AE754364P8H
14.8V 2250mAh
33.3Wh xx

注：前面X 代表装配的年，后面的X 代表装配的月份，年及月均用字母表示，如2007 年用A 表示，2008 年用B 表示，以此类推，同样1 月用A 表示，2 月用B 表示，以此类推，如装配日期为2008 年1 月则表示为BA

2. 此款电池的容量为:

2100mAh(Min)
2250mAh(Typ)



标记	处数	更改前内容
⚠	1	增加保护板方案

设计		样板确认		
复核		审核		
审批				
版本	A1	日期	11/07/18	

四串电池图

文件编号: RD-DWG-

锂聚合物电池/AE754364P8H

精进能源有限公司

客户	数量	重量	比例
BMZ			1:1
共 张	第 张		

AE776-02-A

To:

Product Specifications

1. Date of 1st Issue: 2008-07-08

2. Date of Revision (1st):

3. Customer's Part Name:

4. Customer's Part Number:

5. AEenergy's Part Name: AE_PCM 465 2.5V
6. AEenergy's Part Number:

7. Customer's Approval

8. Supplier

Advanced Electronics Energy Limited
Unit 7, 12/F., Chevalier Commercial Centre
No.8 Wang Hoi Road Kowloon
Hong Kong

Product Specifications – AE_PCM 465 2.5V -Spec1

Revision History

Date	Description	Checked By	Approved By
2008-07-08	First Issue		

Product Specifications - AE_PCM 465 2.5V -Spec1

Contents

Product Specifications - AE_PCM 465 2.5V -Spec1

1. Scope

This specification shall be applied to Lithium ion polymer battery protection circuit module- model number AE_PCM 465 2.5Vetc. manufactured by Advanced Electronics Energy Ltd. Hong Kong.

2. Type and Model

2.1 Type: Protection Module for Li Ion/Li-Polymer Battery Pack
2.2. Model: AE_PCM 465 2.5Vetc.

3-A. Absolute Maximum Ratings (for Ricoh R5402N101KD or Sanyo LV51140T)

3-A.1 Supply Voltage: -0.3V to 12 V
3-A.2. Operating Temperature: -40ºC to 85ºC
3-A.3. Storage Temperature: -55ºC to 125ºC

4-A. Electrical Characteristics (for Ricoh R5402N101KD or Sanyo LV51140T)(T=25ºC)

The followings is referring to the specs of R5402N101KD of Ricoh or Sanyo LV51140T(for details, see R5402N101KD or Sanyo LV51140T specs). These specs are guaranteed by design not by production tests.

4-A.1 Input Voltage:	1.5V (min)		5.0V(max)	
4-A.2 Overcharge Detection :	4.225V (min)	4.250V(Typ)	4.275V(max)	
4-A.3 Output Delay of Overcharge:	0.7s (min)	1.0s(Typ.)	1.3s (max)	
4-A.4 Overcharge Release :	4.000V (min)	4.05V(Typ)	4.10V(max)	
4-A.4 Over-discharge Detection :	2.437V (min)	2.500V(Typ)	2.563V(max)	
4-A.5 Output Delay of Over-discharge:	14ms (min)	20ms(Typ.)	26ms (max)	for R5402N101KD
	21ms (min）	31ms(Typ.)	40ms (max)	for LV51140T
4-A.6 Over-discharge Release :	2.950V (min)	3.000V(Typ)	3. 050V(max)	
	2.650V (min)	2.700V(Typ)	2. 750V(max)	

Product Specifications - AE_PCM 465 2.5V-Spec1

4-A.7 Over Discharge-Current Detection : 0.180V (min) 0.20V(Typ) 0.22V(max)

4-A.8 Over charge-Current Detection : -0.13V (min) -0.10V(Typ) -0.07V(max) for R5402N101KD

-1.0V (min) -0.7V(Typ) -0.4V(max) for LV51140T

4-A.9 Over Discharge-Current Value: 3.0A(min) 4.0-6.0A(Typ) 9.0A (max)

4-A.10 Over charge-Current Value: -3.5A(min) -2.0A(Typ) -1.2A (max) for R5402N101KD

-28A(min) -14A(Typ) -7A (max) for LV51140T

4-A.8 Output Delay of Over-Discharge-Current: 8ms (min) 12ms(Typ.) 16ms (max) for R5402N101KD

5..6ms (min) 8ms(Typ.) 10.4ms (max) for LV51140T

4-A.10 Short Protection Voltage: 0.55V (min) 0.8 V (Typ) 1.0V (max) for R5402N101KD

- 1.7V (min) -1.3V (Typ.) -1.0V (max) for LV51140T

4-A.11 Output Delay of Short Protection: 230(Min) 300 µs(Typ.) 500 µs(max) for R5402N101KD

190µs (min) 370 µs(Typ.) 550µs (max) for LV51140T

4-A.12 Supply Current (active status): 4.0µA (Typ) 8.0µA (max) for R5402N101KD

3.0µA (Typ) 6.0µA (max) for LV51140T

4-A.13 Supply Current (Standby): 1.2µA (Typ) 2.00µA (max) for R5402N101KD

-µA (Typ) 0.1µA (max) for LV51141T

4-A.14 PCM Resistance : 25- 35mΩ (min) 35-50mΩ (Typ) 60mΩ (max)

4-A.15 Cell Balancing Function

When one of the cell reaches >=4.2V during charge, a discharge current of 90-180mA will be by-pass the cell through resistor(s) till the cell voltage is below 4.2V.

5. Remarks

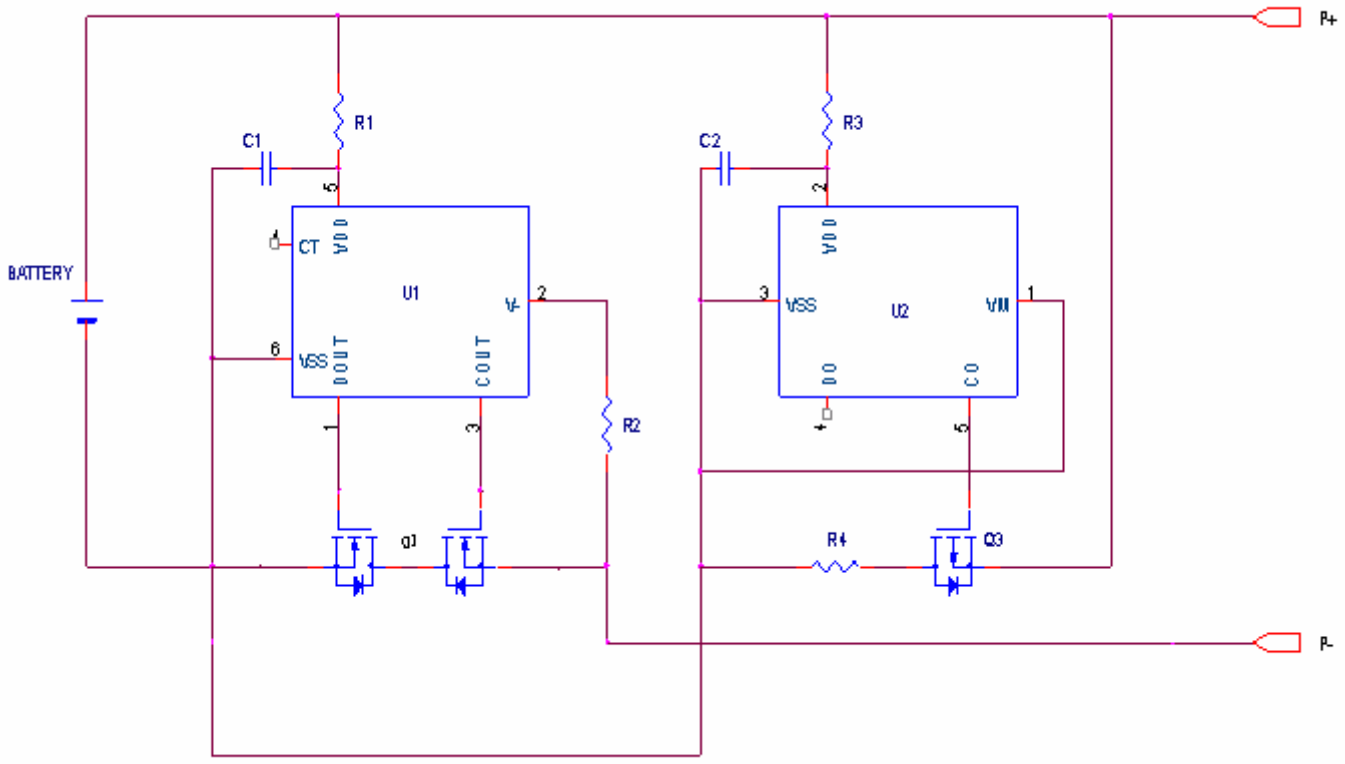
Any other items which are not covered in this specification shall be agreed by both parties

Product Specifications - AE_PCM 465 2.5V -Spec1

6-A. Part List (for 5402N101KD or Equivalent)

Part Number	Part Name	Qty	Remark
Ricoh R5402N101KD or Sanyo LV51140T or Equivalent	Control IC	1	U1
SME8205 or SME2017 or AO8820 or AO8810 or FTD2017 or Equivalent	MOSFET	1	Q1
Seiko S-8241GCL or Equivalent	Control IC	1	U2
AO3401or Equivalent	MOSFET	1	Q3
330Ω(0603)	Resister	1	R1
1kΩ(0603)	Resister	1	R2
470Ω(0603)	Resister	1	R3
47Ω(2010)	Resister	1	R4
0.1uF(0603)	Capacitor	2	C1 C2

7-A. PCM Circuit Diagram (R5402N101KD or LV51140T or Equivalent)



7-B. PCB layout (R5402N101KD or LV51140T or Equivalent) PCM465