



May 31, 2018

Certification

TransPerfect

QUALITY MANAGER'S DECLARATION:

I, Denise Marie Cochrane, hereby declare:

That I possess advanced knowledge of the Japanese and English languages. The attached Japanese into English translation has been translated by TransPerfect and reviewed by me and, to the best of my knowledge and belief, it is a true and accurate translation.

In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the patent which is under review in this proceeding.

A handwritten signature in cursive script that reads 'Denise Marie Cochrane'.

Denise Marie Cochrane

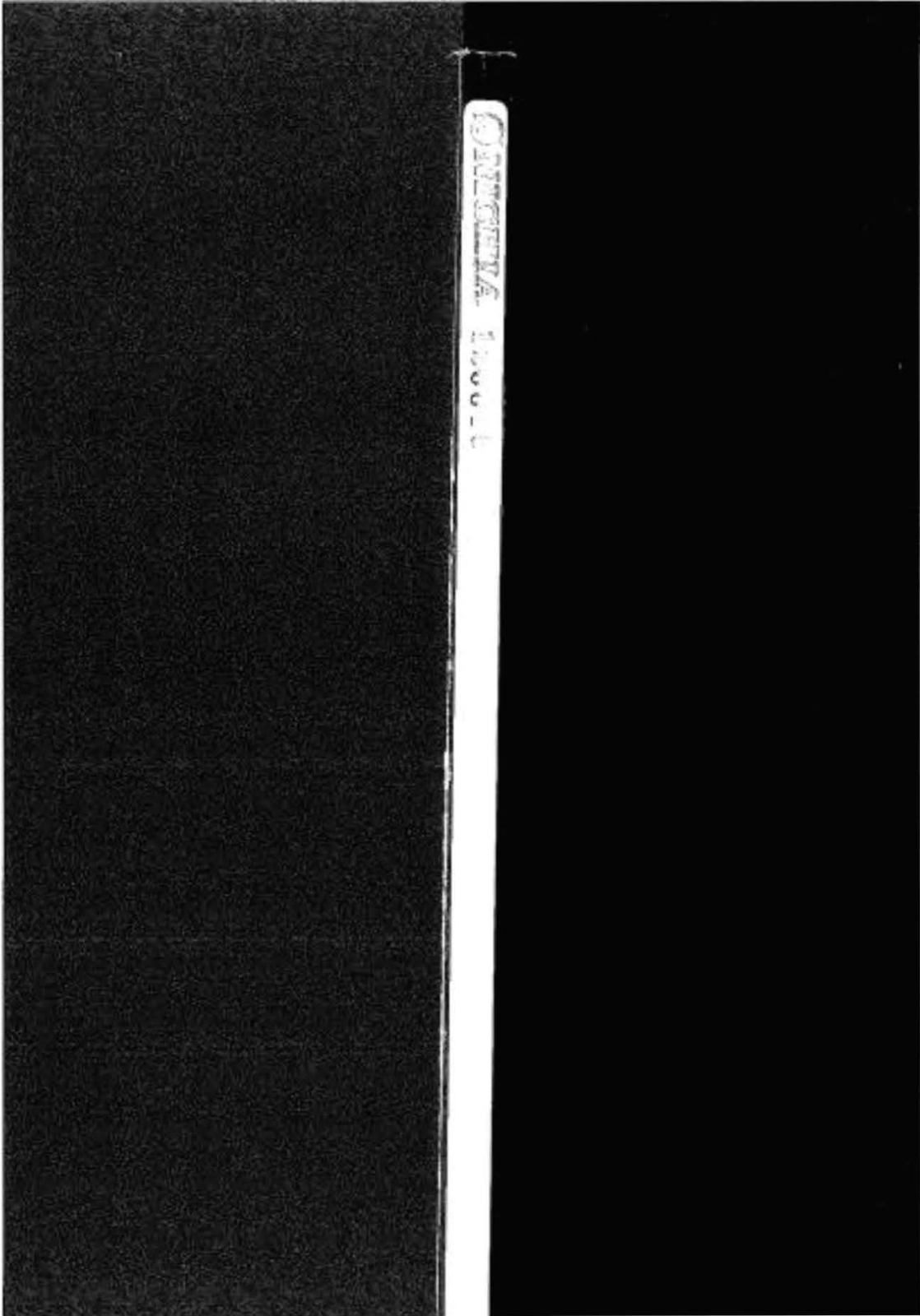
NICHIA EXHIBIT 2350

Vizio, Inc. v. Nichia Corp.
Case IPR2017-01623

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LABORATORY NOTEBOOK

Notebook No.
Department Name
Name
Remarks



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Nic20032517
NicCONSOL0006347

LABORATORY NOTEBOOK

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DEPARTMENT

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Guideline for LABORATORY NOTEBOOK Entry and Management

-- Introduction --

This LABORATORY NOTEBOOK is for recording research and development activities of researchers and inventors by themselves. This LABORATORY NOTEBOOK is a valuable asset of the company, and at the same time, it can be used as a proof material necessary for proof of the date of the invention. Therefore, at the time of recording, it is necessary to be recorded to a degree where a person skilled in the art can easily understand the idea of the technical concept as an invention (Conception), the background leading to the idea and continuous research activities (Diligence), and its practicality (Reduction to Practice), that is, means and methods for realizing the conceived technique and concept.

- Notes-

1. Issuance (Management Department)

When issuing LABORATORY NOTEBOOK to researchers and inventors, fill out the necessary items (issue date, LABORATORY NOTEBOOK number, issuer name, names of researchers and inventors, and the like) in the management ledger.

2. Record (Recorder)

- a. Use a pen or ballpoint pen (black or blue ink) for recording. Pencils are not allowed.
- b. Researchers and inventors fill out necessary items such as name, LABORATORY NOTEBOOK lending date, and date of first entry.
- c. In the table of contents, fill out the necessary items such as record date, subject of the research and experiment, and recording page.
- d. Even if engaging in a plurality of projects or subjects at the same time, use in the order of the pages, and fill in the necessary items such as projects and subjects at the top of each page.
- e. When the entry continues on the next page or another page, fill in the connection on each of the page.
- f. Fill in so that the empty space will not be produced between the entries, and when the empty space is produced, cross out that part with a hatched line.
- g. When correcting or deleting, erase it with a double line without using an eraser, correction liquid, correction tape, or the like, and add an initial or signature and correction date in small letters to the corresponding part.
- h. When additions, corrections or deletions have occurred at a later date in the contents filled previously, add an initial or signature and the date of addition, correction, and deletion to the corresponding part, and have the witness fill in the signature and the signature date.

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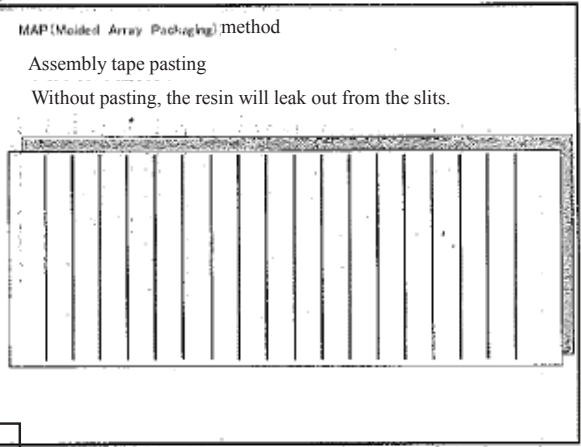
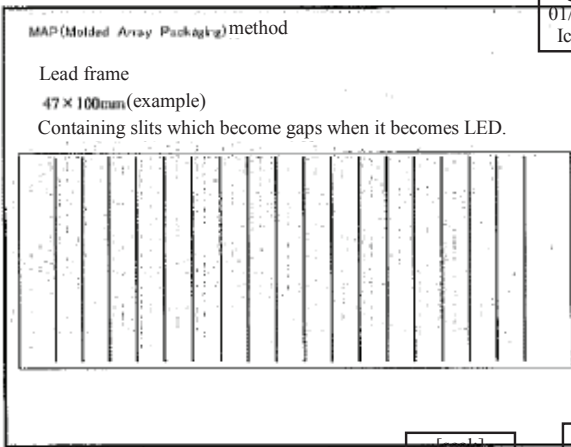
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NicCONSOL0006350

Project	Subject
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From Page No:
 [handwritten:] 01/29/2008
 Weekly report meeting
 Made a monthly report

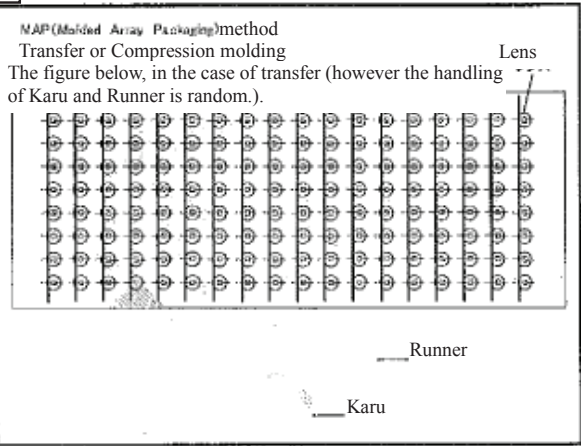
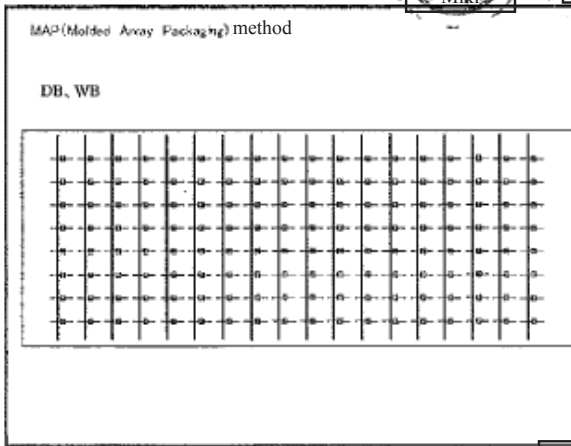
01/30/2008
 Thorough cleaning
 Correcting the monthly report
 Prepared the material for explaining MAP method to STP



[seal:]
 Engineering
 01/30/2008
 Ichikawa

[seal:]
 Engineering
 02/04/2008
 Miki

[seal:]
 Engineering
 01/30/2008
 Ichikawa



[seal:]
 Engineering
 01/30/2008
 Ichikawa

Date
 Invented by [signature:] Hiroshi Ichikawa [hw:] 01/30/2008
 Recorded by [signature:] Miki [hw:] 02/04/2008 MM/DD/YYYY

To Page No:
 Understood and Witnessed by Date
 Signed [signature:] Junji Takechi [hw:] 02/15/2008
 Signed _____ MM/DD/YYYY

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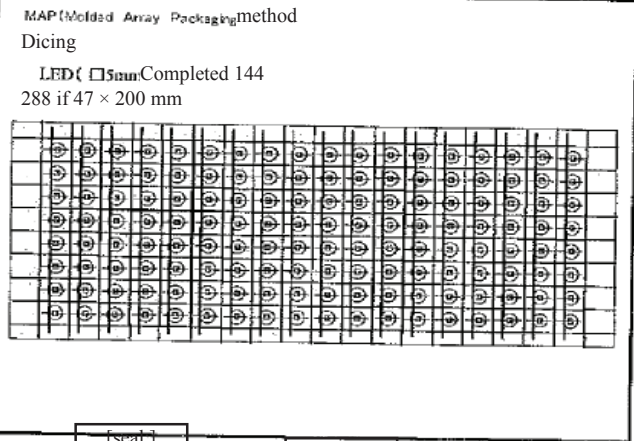
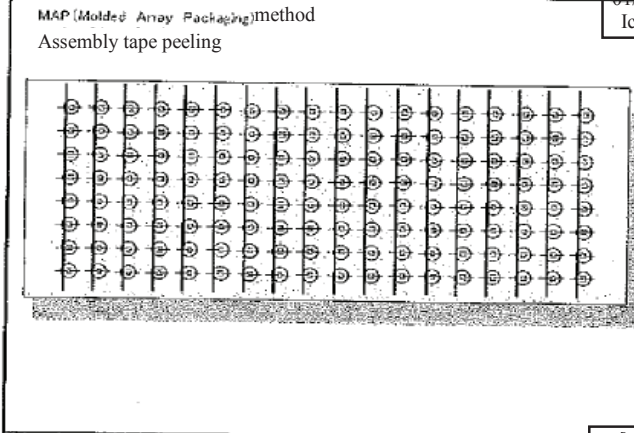
Notebook No: **12001637**

Date MM/DD/YYYY

Project _____ Subject _____

From Page No:-

[seal:]
Engineering
01/30/2008
Ichikawa



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[handwritten:] 01/31/2008

[seal:]
Engineering
01/30/2008
Ichikawa

[seal:]
Engineering
01/30/2008
Ichikawa

[seal:]
Engineering
02/04/2008
Miki

Dealing with UL (SCR1012)
Prototyping (Reproduction confirmation of effect of lens and cavi depth on light extraction of 083)
Frame type lens formation
Improving light extraction efficiency of 083
Confirming the effect of the shallow cavi and lens by color comparison.
Prototype condition
Prototype LED: NS6W083B
Cavi depth:

20
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- ① Design value of current product 0.625 mm
- ② Targeting roughly 0.4 mm by hand polishing
- ③ Targeting roughly 0.2 mm by hand polishing

Inner blend ratio

NP-206-12	OE-6340A	OE-6340B
40	50	50
50	50	50
60	50	50
70	50	50
80	50	50

30

Inner blend amount (g)

NP-206-12	OE-6340A	OE-6340B
8	10	10
10	10	10
12	10	10
14	10	10
16	10	10

35

NP-206-12 lot: 206-12-008
OE-6340 lot: 0005016751
Rentaro: Stir for two minutes
Vacuum de-foaming
Needle: 22 G
Dispenser One in the TS2 building clean room
Press Data: 400

40

dispense time

YAG (nhr)	40	50	60	70	80	
Cavi depth	0.625mm	0.970	0.970	0.970	0.990	1.230
Cavi depth	0.4mm	0.65~0.68	0.640	0.650	0.790	0.800
Cavi depth	0.2mm	0.370	0.400	0.400	0.480(0.500)	

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Curing condition: Wait at room temperature for 6 hr + (50 → 70) °C × 1 hr + 70°C × 3 hr + (70 → 100) °C × 2 hr + 100°C × 3 hr + (100 → 150) °C × 1 hr + 150 °C × 3 hr (setting) The Yamato oven in the TS2 building

[seal:]
Engineering
01/31/2008
Ichikawa

To Page No:

Date _____ Understood and Witnessed by _____ Date _____

Invented by [signature:] Hiroshi Ichikawa [hw:] 01/31/2008

Signed [signature:] Junji Takechi [hw:] 02/15/2008

ay Recorded by [signature:] _____ [hw:] MM/DD/YYYY

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[seal:]
Engineering
02/04/2008
Miki

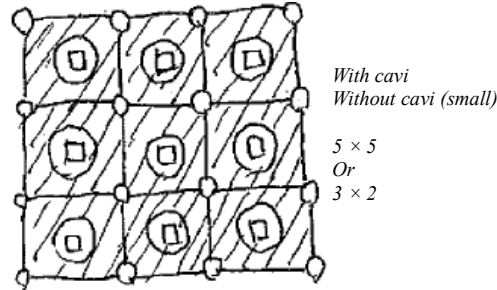
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Nic20032558
NicCONSOL0006388

Project	Subject
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From Page No :
 [handwritten:] 02/ 12/ 2008

- Weekly report meeting
 - Summarizing the direct mold patent
- 02/ 13/ 2008
- Summarizing the direct mold patent
 - Meeting for the direct mold PKG shape (with STP)=



It has been decided that we will try making prototypes of a substrate with 183 with its L/F and EMC gathered together in an array like this. Have the schedule of design be issued by 2/16 from STP.

- UL test specimen size adjustment and sending to UL SCR-1012

02/ 14/ 2008

- ① Mold a lead frame to create an assembled substrate. LED manufactured by assembling and then dicing at least one side and the manufacturing method thereof
 - ② Lead frame LED with castellation structure
- Prepare a material for investigating prior art of the patent of the application idea described above
 Next page

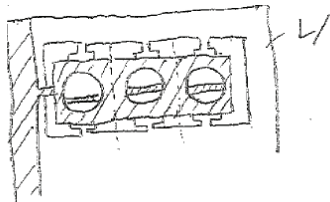
[stamp:]
 Tamaki

To Page No :

Date	Understood and Witnessed by Date
Invented by <u>[signature] Hiroshi Ichikawa 02/ 14/ 2008</u>	Signed <u>[signature] Hideyuki Nagai 02/ 15/ 2008</u>
Recorded by <u>[stamp:] Technology 02/ 16/ 2008 Miki</u> <u>MM/ DD/ YYYY</u>	Signed _____ <u>MM/ DD/ YYYY</u>

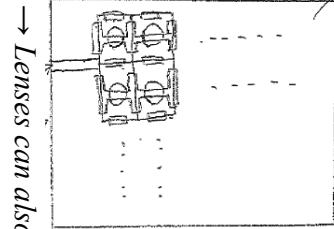
Project

[handwritten:]
dicing at least one side

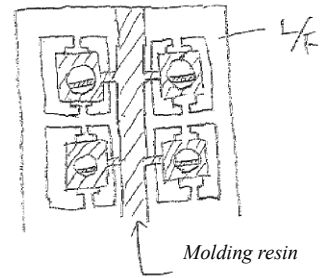


Molding resin

Assembled substrate



Singulation



Molding resin

[stamp:]
Technology
02/ 14/ 2008
Ichikawa

Lenses can also be attached to this type by compression molding.

Edge (No caster → Solder fillet cannot be made)
Since it is the cut copper, it is easily oxidized, whereby solder wetting is bad and the joining is not reliable

① Mold a lead frame to make a (assembled) substrate. LED made by assembling and dicing at least one side and the manufacturing method thereof

[stamp:]
Technology
02/ 15/ 2008
Ichikawa

[stamp:]
Technology
02/ 16/ 2008
Miki

[stamp:]
Tamaki

Date

To Page No :

Invented by [signature] Hiroshi Ichikawa 02/ 14/ 2008

Understood and Witnessed by Date

Signed [signature] Hideyuki Nagai 02/ 15/ 2008

Recorded by [stamp:] Technology 02/ 16/ 2008 Miki MM/ DD/ YYYY

Signed MM/ DD/ YYYY

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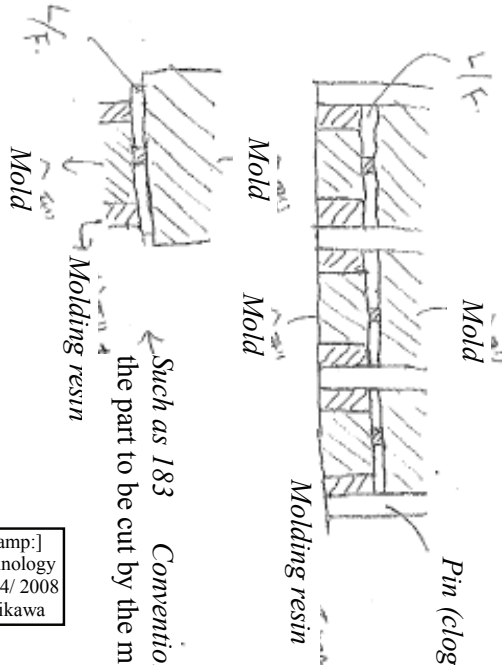
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NicCONSOL0006398

Project
From P.

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Such as 183 Conventionally → It is necessary to put out the edge because the part to be cut by the mold becomes small. → needless space is needed

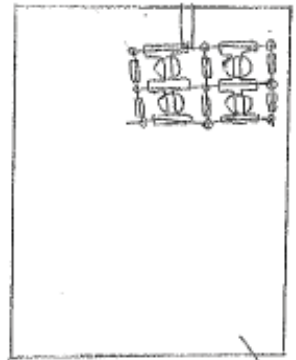
[stamp:]
Technology
02/ 14/ 2008
Ichikawa

[stamp:]
Technology
02/ 16/ 2008
Miki

② LED of a lead frame with a castellation structure

There is a hole which will become a caster at L/F

However, lenses ~~cannot~~ be attached to this type by compression molding. cannot the substrate of



Singulation



Edge (there is a caster → Solder filler can be made)

[stamp:]
Tamaki

[stamp:]
Tamaki

Date MM/ DD/ YYYY

Signed [signature] Hideyuki Nagai 02/ 15/ 2008

Nic20032569

NicCONSOL0006399

Invented by [signature] Hiroshi Ichikawa 02/ 14/ 2008

Recorded by [signature] Miki MM/ DD/ YYYY

Signed _____ Date MM/ DD/ YYYY

Signed [signature] Hideyuki Nagai 02/ 15/ 2008

Project	Subject
From Page No : [handwritten:] • <i>Visitor</i> <i>Rohm and Haas</i> <i>There was introduction in the past via Nichia America.</i> <i>Once again, there was a presentation of sealing resin.</i> <i>Famous for acrylics. There are also polymers and monomers.</i> <i>Sales of 8.3 billion US dollars in 2006.</i> <i>Of the unusual thing, salt alone has sales of 100 billion yen.</i> <i>There are introductions of silicone resins with high refractive indexes of 1.60 and 1.57.</i> <i>From Nichia</i> ① <i>Method of degeneration of silicon</i> ② <i>At what stage will silicon raw materials be obtained?</i> ③ <i>Features</i> ④ <i>Comparison data with Dow JCR. Water vapor transmission, low molecular weight siloxane content,</i> <i>[Illegible] and the like were requested.</i> [stamp:] Ichikawa <i>There is no track record of the material.</i> <i>Asked NDA (draft) and Japanese translation thereof.</i> <i>Make a ref. for light (heat) resistance test of Hitachi Chemical's molding material</i> <i>NS 104-2. (Lot S1482E - 0314)</i> <i>100°C × 3 hr + 150°C × 4 hr</i> <i>OE-6340 (Lot 0005016751)</i> <i>Under cure conditions of 083</i>	
To Page No :	
Date Invented by <u>[signature] Hiroshi Ichikawa 02/ 14/ 2008</u> Recorded by <u>[stamp:] Technology 02/ 16/ 2008 Miki</u> <u>MM/ DD/ YYYY</u>	Understood and Witnessed by Date Signed <u>[signature] Hideyuki Nagai 02/ 15/ 2008</u> Signed _____ <u>MM/ DD/ YYYY</u>

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Nic20032570

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NicCONSOL0006400

Project	Subject
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From Page No :

[handwritten:] 02/15/2008

• Made a ref. for heat resistance and light resistance test of Hitachi Chemical's molding material

9ZR

FSX 0510

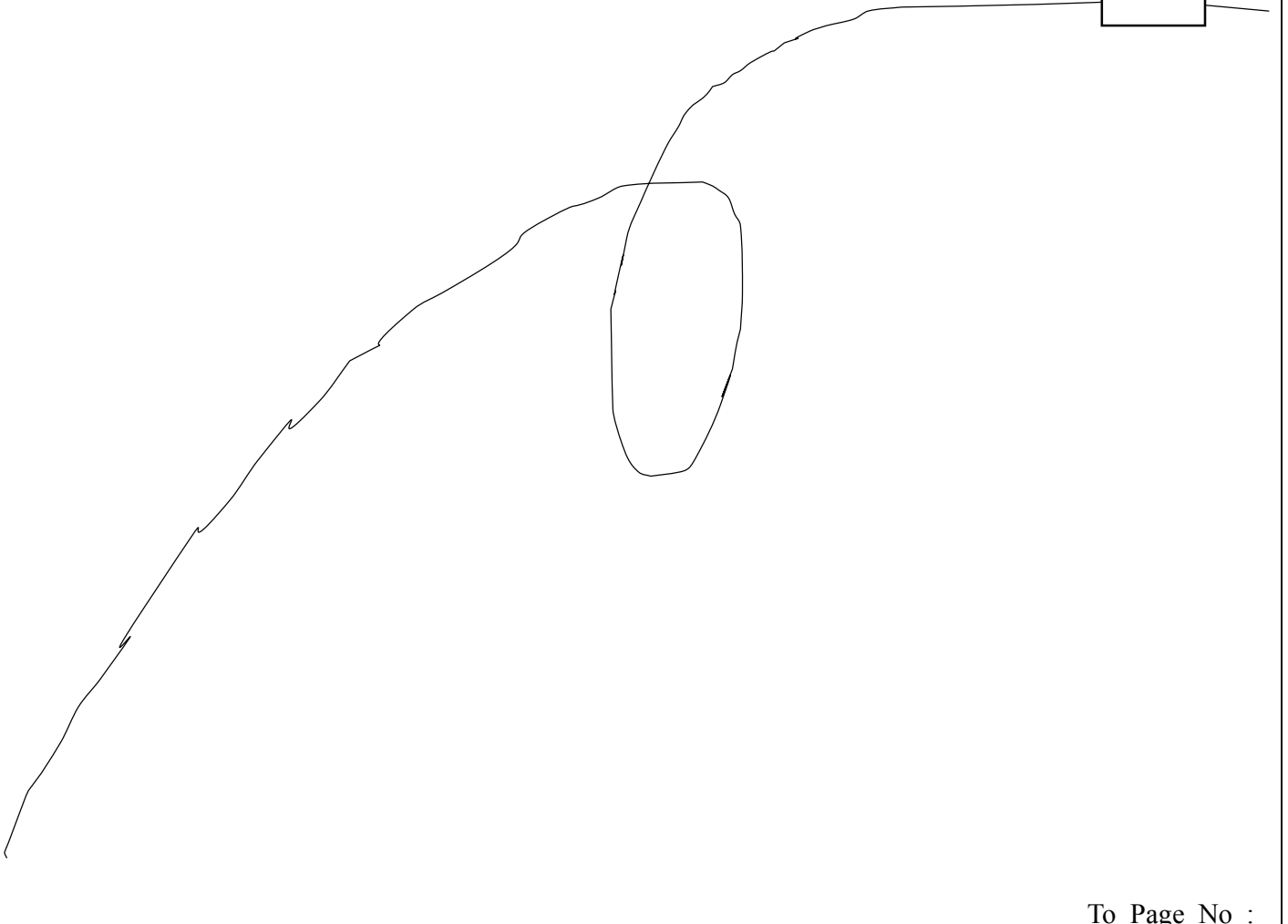
• Dealing with the apparatus for Instron high temperature tensile test

(especially for the company K)

• Going to IP to ask for the prior art investigation of the patent idea of the previous day.

[stamp:] [Illegible]

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To Page No :

Date	Understood and Witnessed by Date	
Invented by <u>[signature] Hiroshi Ichikawa 02/15/2008</u>	Signed <u>[signature] Hideyuki Nagai 02/15/2008</u>	
Recorded by <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>[stamp:] Technology 02/16/2008 Miki</td></tr></table> <u>MM/DD/YYYY</u>	[stamp:] Technology 02/16/2008 Miki	Signed _____ <u>MM/DD/YYYY</u>
[stamp:] Technology 02/16/2008 Miki		

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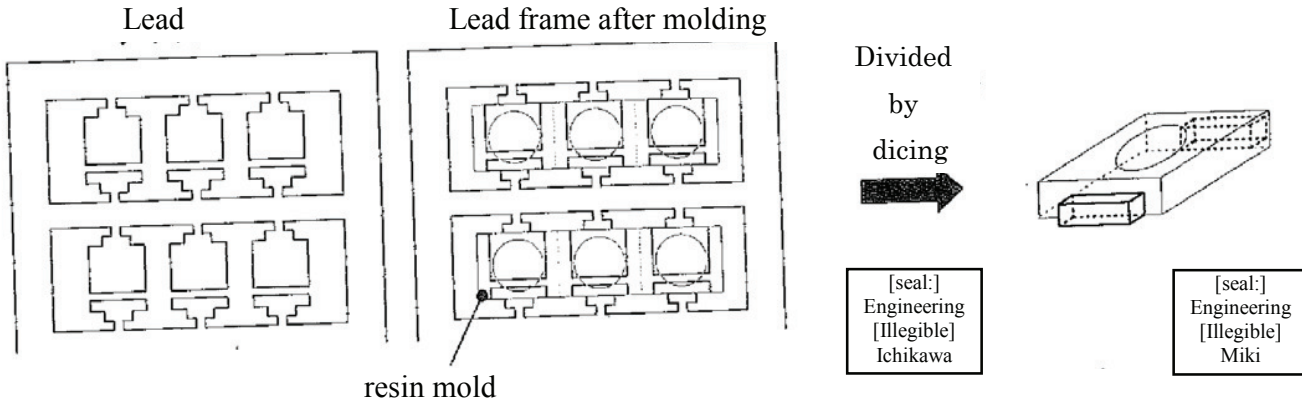
Project	Subject
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From Page No: [Handwritten:] *Summary of EMC collective substrate patents*

Characteristics:

[seal:]
Engineering
2/09/2008
Ichikawa

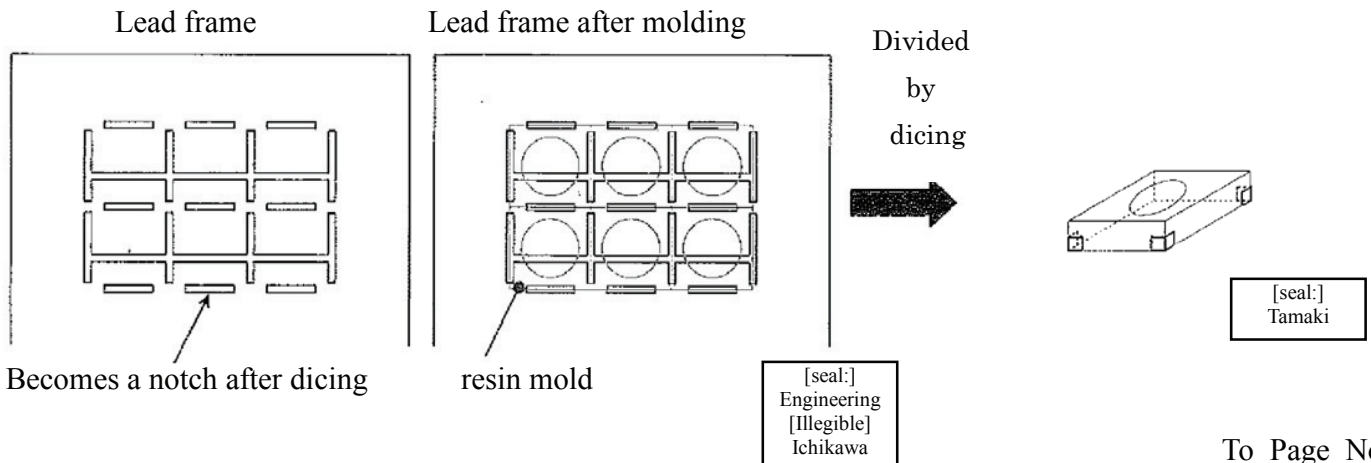
(1) LED and its manufacture method characterized by production through dicing at least one side of housing to increase number of units, wherein dye-bonding, wire bonding, and resin sealing are performed to the collective housing body with resin mold in lead frames.



[seal:]
Engineering
[Illegible]
Ichikawa

[seal:]
Engineering
[Illegible]
Miki

(2) LED and its manufacturing method characterized by production through dicing into individual units in order to further increase the number of finished units in (1), wherein die bonding, wire bonding, and resin sealing are performed on substrate with two-dimensional housing collection. Lead frames contain notches to increase adhesion with resin mold.



[seal:]
Engineering
[Illegible]
Ichikawa

[seal:]
Tamaki

Date	Understood and Witnessed by	Date
Invented by [signature:] <u>Hiroshi Ichikawa</u> [hw:] <u>03/09/2008</u>	Signed _____	<u>MM/DD/YYYY</u>
Stamp: 3/10/2008	Signed _____	<u>MM/DD/YYYY</u>
Recorded by _____	[seal:] Engineering 3/10/2008 Miki	<u>MM/DD/YYYY</u>

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NicCONSOL0006420

Project	Subject
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From Page No:

(3) Side part of lead from (2) are not entirely metal plated and are susceptible to oxidation due to cut section composed with Cu material becoming exposed. To improve, when lead frame with hole treated with metal-plating that becomes castellated after dicing is used, the castellated part is a metal-plated surface, which is not readily oxidized, improving the reliability of solder.

[seal:]
Engineering
3/9/2008
Ichikawa

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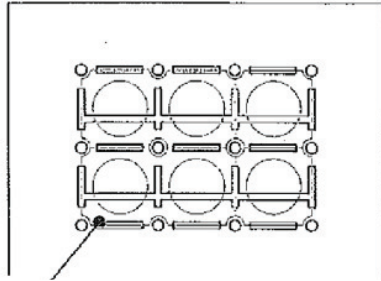
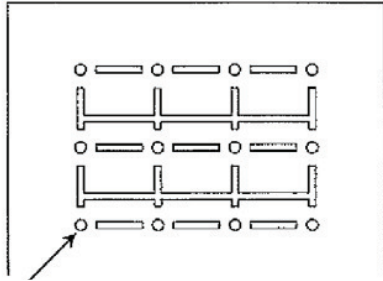
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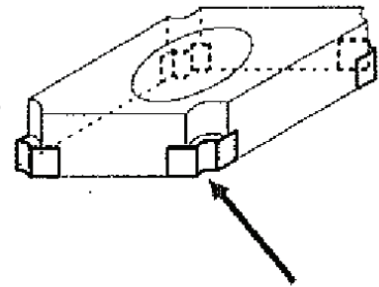
25

Lead frame

Lead frame after molding



Divided by dicing



castellation

Hole for casting

resin mold

[seal:]
Engineering
3/10/2008
Ichikawa

[seal:]
Engineering
3/10/2008
Miki

[seal:]
Engineering
[Illegible]
Ichikawa

[seal:]
Engineering
[Illegible]

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(4) After dicing into units, the same effect as (3) may be obtained when lead frame having groove on its back side, treated with metal plating that becomes castellated, is used.

Lead frame

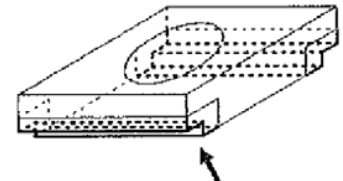
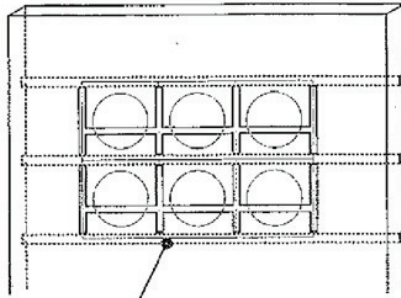
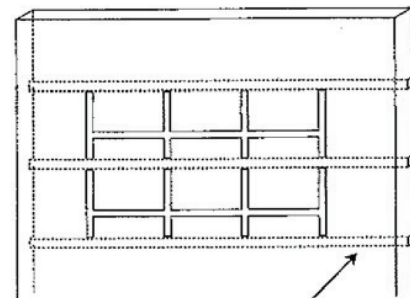
Lead frame after molding

Divided by dicing

[seal:]
Tamaki

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castellation

Groove on back side

resin mold

[seal:]
Engineering
[Illegible]
Ichikawa

To Page No:

45

Date

Understood and Witnessed by Date

Invented by [signature:] Hiroshi Ichikawa [hw:] 03/09/2008

Signed _____ MM/DD/YYYY

Recorded by _____ MM/DD/YYYY

[seal:]
Engineering
3/10/2008
Miki

Signed _____ MM/DD/YYYY

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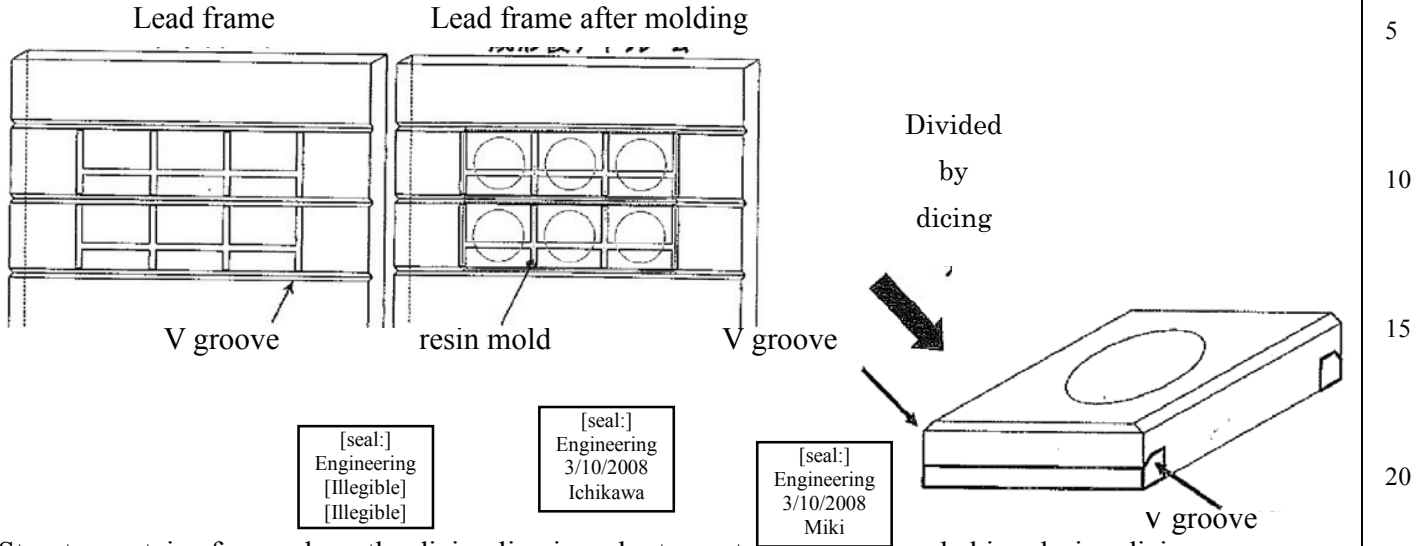
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NicCONSOL0006421

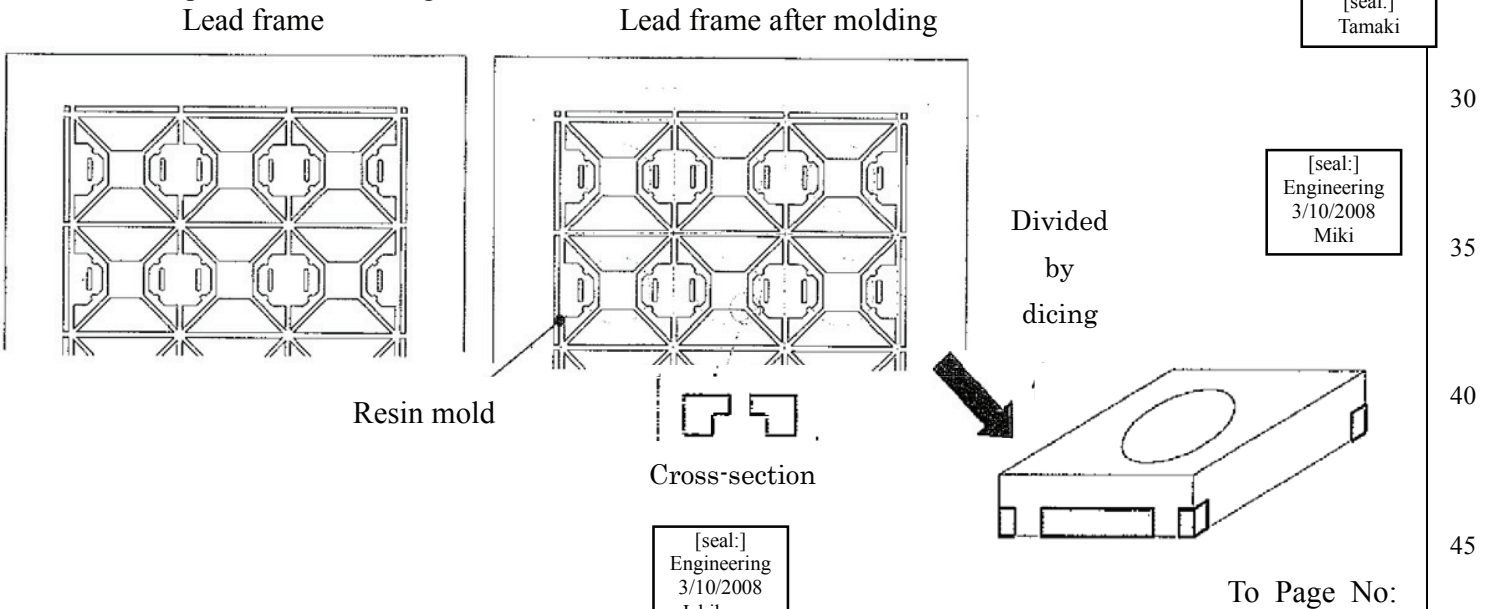
Project	Subject
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From Page No:

(5). (1), (2), (3), & (4) may have grooves inserted in lead frame and resin mold to thin thickness for dicing (for example, a V groove).



(6). Structure retains frame along the dicing line in order to control blade from shaking during dicing. Furthermore, to increase adhesion with resin mold, the frame is formed with steps, hole, and notch. Frame along dicing line serves as a cutting board during dicing, and is eliminated after dicing into units. After units are diced, diced LED requires two or more glass.



Date	Understood and Witnessed by	Date
Invented by [signature:] <u>Hiroshi Ichikawa</u> [hw:] <u>03/09/2008</u>	Signed _____	<u>MM/DD/YYYY</u>
Recorded by [seal:] Engineering 3/10/2008 Miki	Signed _____	<u>MM/DD/YYYY</u>

Confidential - Outside Attorneys Eyes Only Nic20032592
Confidential - Outside Attorneys' Eyes Only **NicCONSOL0006422**

Project	Subject
<p>From Page No : [Handwritten:] Meeting for EMC collective substrate figures</p> <p>Meeting for patents (Hayashi KK, Tamura IP, Sasaoka)</p> <p>Aim to file a patent for LED having a caster structure with hole and a groove on backside.</p> <p>In such case, it is necessary to clarify the difference between ceramic type.</p> <p>Since the ceramic has cracking problem during soldering, we will aim to file an application by using a metallic L.F resembling a similar linear expansion coefficient as the substrate in use (glass epoxy, alumni). [seal:] Ichikawa</p> <p>As for the need for a caster, we can justify that since the metal material becomes exposed while diced in order to increase productivity, the caster with Ag remaining is used to increase adhesiveness.</p> <ul style="list-style-type: none"> • Begin test for Hitachi Chemical's anti-transparency resin and heat-resistant, phosphor-resistant resin. <div style="text-align: right; margin-top: 20px;">[seal:] Tamaki</div>	
<p>Date</p> <p>Invented by <u>[signature:]Hiroshi Ichikawa [hw:] 3/14/2008</u></p> <p>Recorded by [seal:] Miki <u> </u>/YYYY</p>	<p>Understood and Witnessed by Date</p> <p>Signed _____ <u>MM/DD/YYYY</u></p> <p>Signed _____ <u>MM/DD/YYYY</u></p>

Project	Subject	
<p>From Page No : [Handwritten:] 3/14/2008 Meeting for EMC collective substrate figures</p> <p>Meeting for patents (Hayashi KK, Tamura IP, Sasaoka)</p> <p>Aim to file a patent for LED having a caster structure with hole and a groove on backside.</p> <p>In such case, it is necessary to clarify the difference between ceramic type.</p> <p>Since the ceramic has cracking problem during soldering, we will aim to file an application by using a metallic L.F resembling a similar linear expansion coefficient as the substrate in use (glass epoxy, alumni).</p> <p>As for the need for a caster, we can justify that since the metal base material becomes exposed while diced in order to increase productivity, the caster with Ag remaining is used to increase joining reliability adhesiveness.</p> <ul style="list-style-type: none"> Begin test for Hitachi Chemical's anti-transparency resin and heat-resistant, phosphor-resistant resin. 		
<div style="text-align: right;"> <table border="1"> <tr> <td>[seal:] Tamaki</td> </tr> </table> </div>		[seal:] Tamaki
[seal:] Tamaki		
<p>Date</p> <p>Invented by [signature:] <u>Hiroshi Ichikawa</u> [hw:] <u>3/14/2008</u></p> <p>Recorded by _____ <u>MM/DD/YYYY</u></p>	<p>Understood and Witnessed by Date</p> <p>Signed _____ <u>MM/DD/YYYY</u></p> <p>Signed _____ <u>MM/DD/YYYY</u></p>	

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Project

Subject

[seal:]
Ichikawa

From Page No :

PKG

- (1). Usually, ceramic PKG includes a dented part for fillet molding called castellation on its outer side to improve the strength of solder joint of semiconductor.
- (2). However, (1)'s method is insufficient because the linear expansion coefficient is great for PKG and mounted substrate (resin, metal, etc.)
- *Especially, the conditions above is usual when ceramic PKG size is greater than 3.5mm.
- (3). To solve the problems presented in (2), we provided resin-type PKG having lead frame made with metal (ex. copper, alloy, 42 alloy, steel, aluminum) that has small linear expansion coefficient when used with mounted substrate and further having castellation for improved strength on solder joint.
- (4). PKG resin material is resin with hardening property and resin with heat resistance property. Furthermore, it is desirable that they are resin with heat curing properties with expansion rate similar to metal.
- (5). Sealing material include epoxy and silicone, and silicone with superior heat resistance is more favorable.

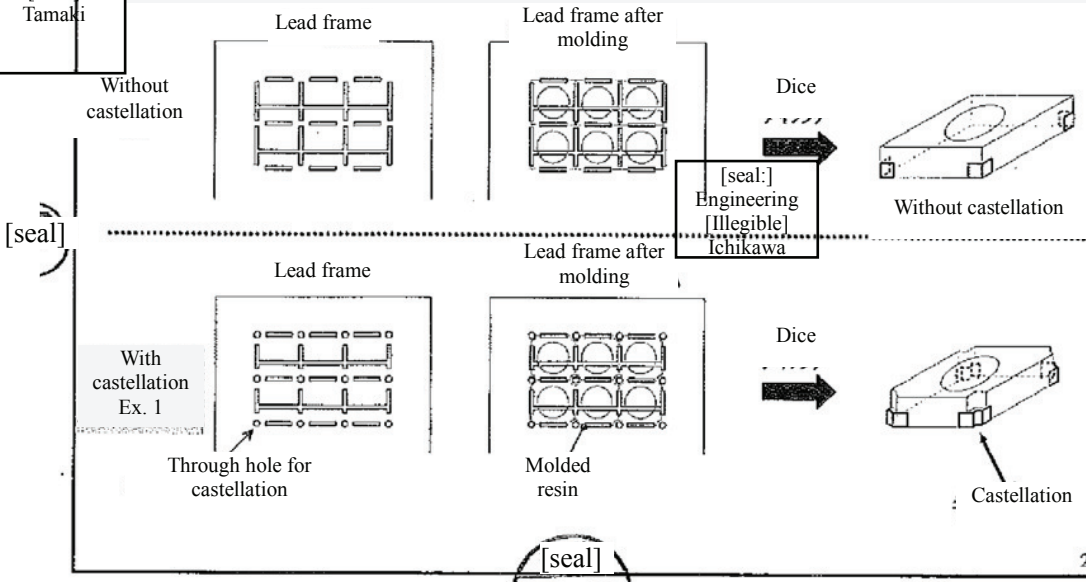
Summary

- (1). PKG described above is diced into individual units instead of forming by cuts to improve the number of produced units within lead frames (improved production and cost reduction).
- (2.) After dicing metallic lead frame, the diced surface becomes exposed and susceptible to oxidation. Therefore, solder wettability becomes low, and solder adhesion reliability becomes low after using substrate.
- (3) To solve the problem of (2) by placing a through-hole, spot facing or groove by pressing, half-etching, dicing or the like on the back side of the lead frame, and then plating, even when it is diced, it is possible to provide a castellation without exposing the base material of the lead frame.
- (4). Also, is possible to include castellation to PKG with resin mold/lead frame on dicing line.

[seal:]
Miki

LED lead side parts are not completely metal plated and Cu material cross section becomes exposed, becoming susceptible to oxidation. Therefore, reliability for adhesion is low due to low solder wettability. This may be improved by using lead frame having metal-plated through hole which becomes castellated after dicing into units because castellated part has metal facing and is resistant to oxidation, increasing adhesion reliability.

[seal:]
Tamaki



[seal]


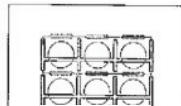

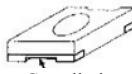

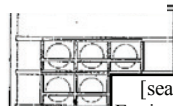

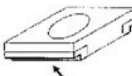
[seal:]
Engineering
[Illegible]
Ichikawa

[seal]

Date _____
 Invented by [signature:] Hiroshi Ichikawa [hw:] 3/14/2008
 Recorded by _____

[seal:]
Miki

Understood and Witnessed by _____ Date _____
 Signed _____ MM/DD/YYYY
 Signed _____ MM/DD/YYYY

Project	Subject
From Page No :	
<div style="border: 1px solid black; display: inline-block; padding: 2px;">[seal:] Engineering 3/10/2008</div>	
<p>Ex. 2. For the PKG in the previous page, rather than a through hole, you can provide a spot facing made by half-etching with plating on the back face.</p>	
5	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Lead frame</p>  <p>Backside spot facing by half etching</p> </div> <div style="text-align: center;"> <p>Lead frame after molding</p>  <p>Resin mold</p> </div> <div style="text-align: center;"> <p>Dice</p>  </div> <div style="text-align: center;">  <p>Castellation</p> </div> </div>
10	<div style="border: 1px solid black; display: inline-block; padding: 2px; margin-bottom: 10px;">[seal:] Miki</div>
<p>Ex. 3. PKG from prior page may have metal-plated groove on backside instead of face spotting.</p>	
15	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Lead frame</p>  <p>Surface groove</p> </div> <div style="text-align: center;"> <p>Lead frame after molding</p>  <p>Resin mold</p> </div> <div style="text-align: center;"> <p>Dice with blade thinner than surface groove</p>  </div> <div style="text-align: center;">  <p>Castellation</p> </div> </div>
20	<div style="border: 1px solid black; display: inline-block; padding: 2px; margin-right: 10px;">[seal:] Tamaki</div>
25	<div style="border: 1px solid black; display: inline-block; padding: 2px; margin-bottom: 10px;">[seal:] Engineering 3/10/2008 Ichikawa</div>
30	<div style="border: 1px solid black; display: inline-block; padding: 2px; margin-bottom: 10px;">[seal:]</div>
To Page No :	
Date	Understood and Witnessed by Date
Invented by [signature:] <i>Hiroshi Ichikawa</i> [hw:] <i>3/21/2008</i>	Signed _____ MM/DD/YYYY
Recorded by _____ [seal:] Miki /YYYY	Signed _____ MM/DD/YYYY

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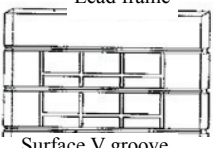
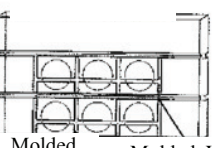


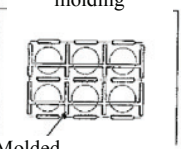
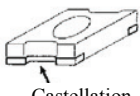
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Project	Subject
From Page No :	<div style="border: 1px solid black; padding: 2px; display: inline-block;">[seal:] Engineering 3/21/2008 Ichikawa</div>
<p style="text-align: center;">Ex. 3 PKG from prior page may include V groove on resin mold and surface of lead frame to improve dicing and to improve resin mold adhesion</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Lead frame</p> <p>Surface V groove</p> </div> <div style="text-align: center;">  <p>Lead frame after molding</p> <p>Molded resin</p> </div> <div style="text-align: center;">  <p>Molded V groove resin</p> </div> </div> <p style="text-align: center;">Dice with blade thinner than surface groove → Castellation</p> <div style="text-align: right; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">[seal:] Miki</div> </div>	
<p style="text-align: center;">Ex. 4 PKG from page 2 may include through hole with metal plating on PKG sides instead of PKG 4 corners.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Lead frame</p> <p>Through hole for castellation</p> </div> <div style="text-align: center;">  <p>Lead frame after molding</p> <p>Molded resin</p> </div> <div style="text-align: center;">  <p>Castellation</p> </div> </div> <p style="text-align: center;">Dice → Castellation</p> <div style="text-align: right; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">[seal:] Tamaki</div> </div>	
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Date</p> <p>Invented by [signature:] <u>Hiroshi Ichikawa</u> [hw:] <u>3/21/2008</u></p> <p>Recorded by _____ <div style="border: 1px solid black; padding: 2px; display: inline-block;">[seal:] Miki</div> YYYY</p> </div> <div style="width: 45%;"> <p>Understood and Witnessed by _____ Date _____</p> <p>Signed _____ MM/DD/YYYY</p> <p>Signed _____ MM/DD/YYYY</p> </div> </div>	

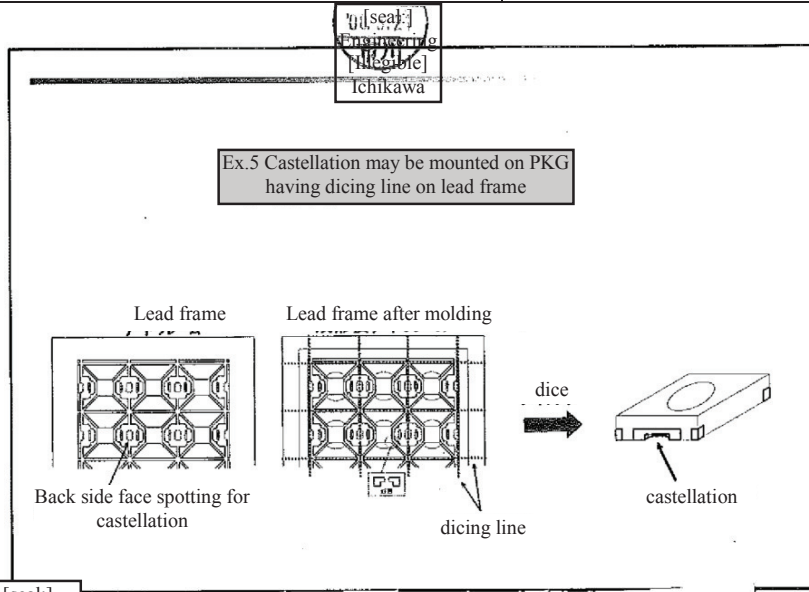
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To Page No :

Project

Subject

From Page No



Date _____

Invented by [signature:] Hiroshi Ichikawa
3/21/2008

Recorded by [seal:] Miki MM/DD/YYYY

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Signed _____ MM/DD/YYYY

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氏 名

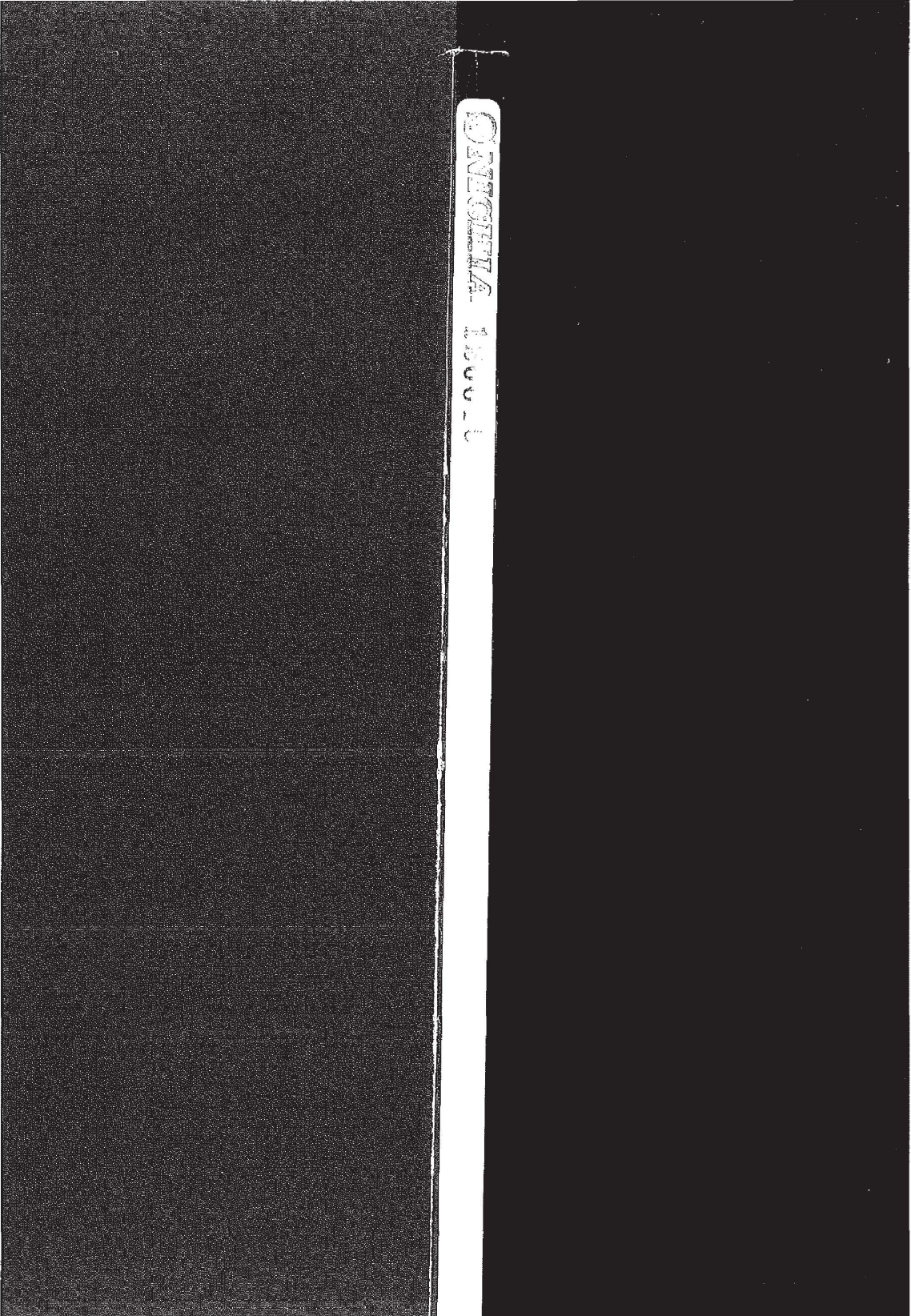
備 考

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DATE OF LAST ENTRY
記録終了日

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返却確認者

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保管日

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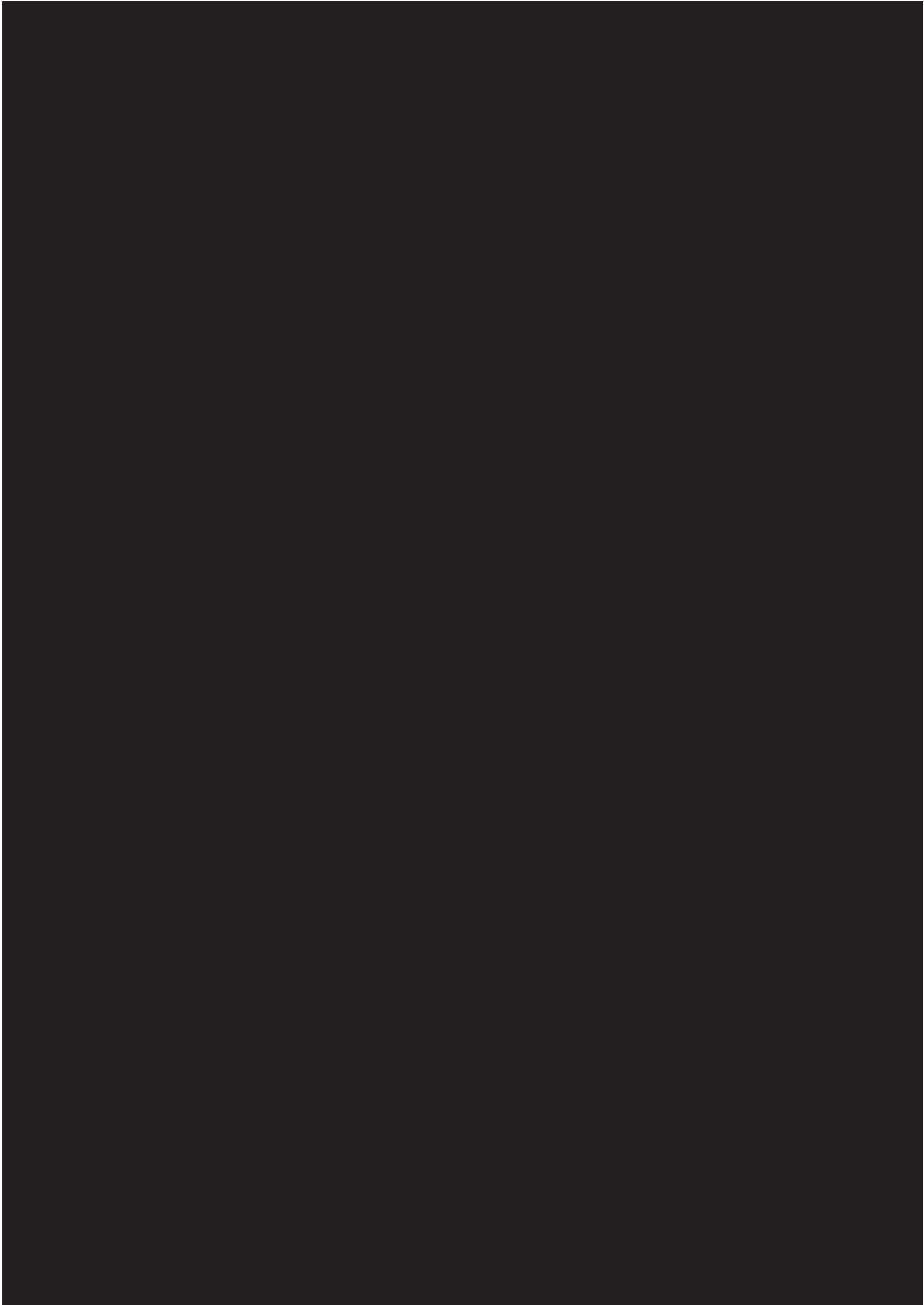
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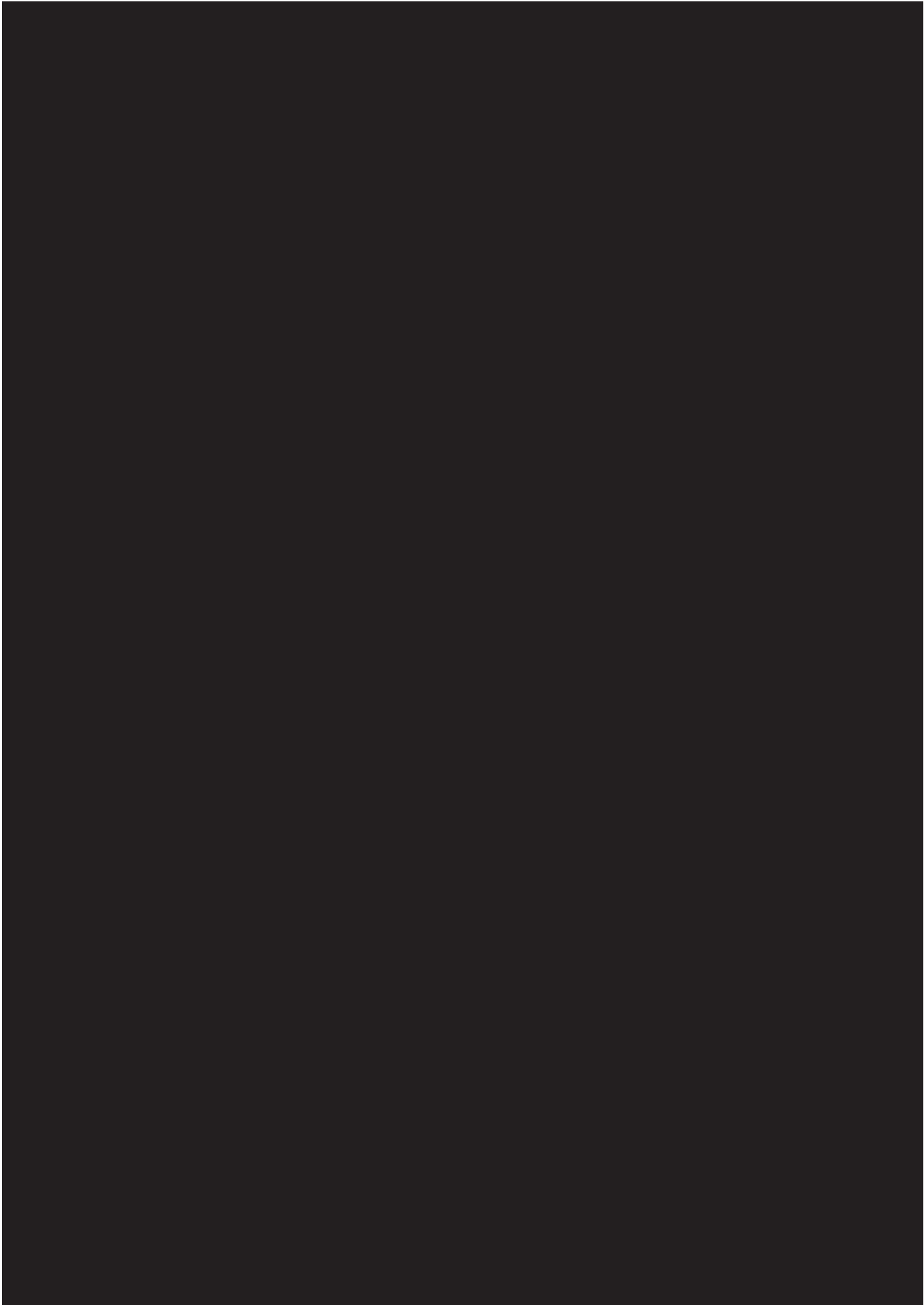






















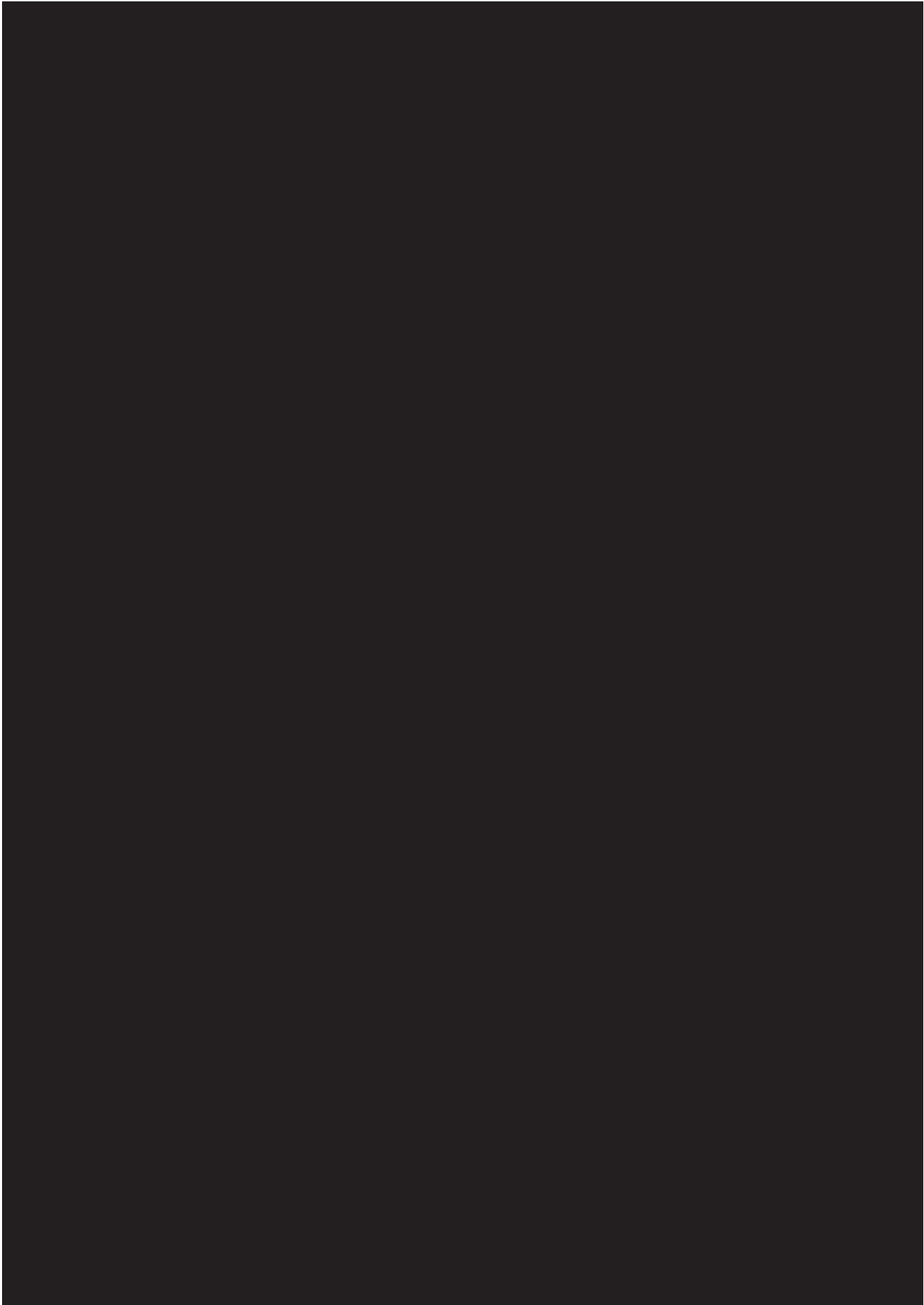














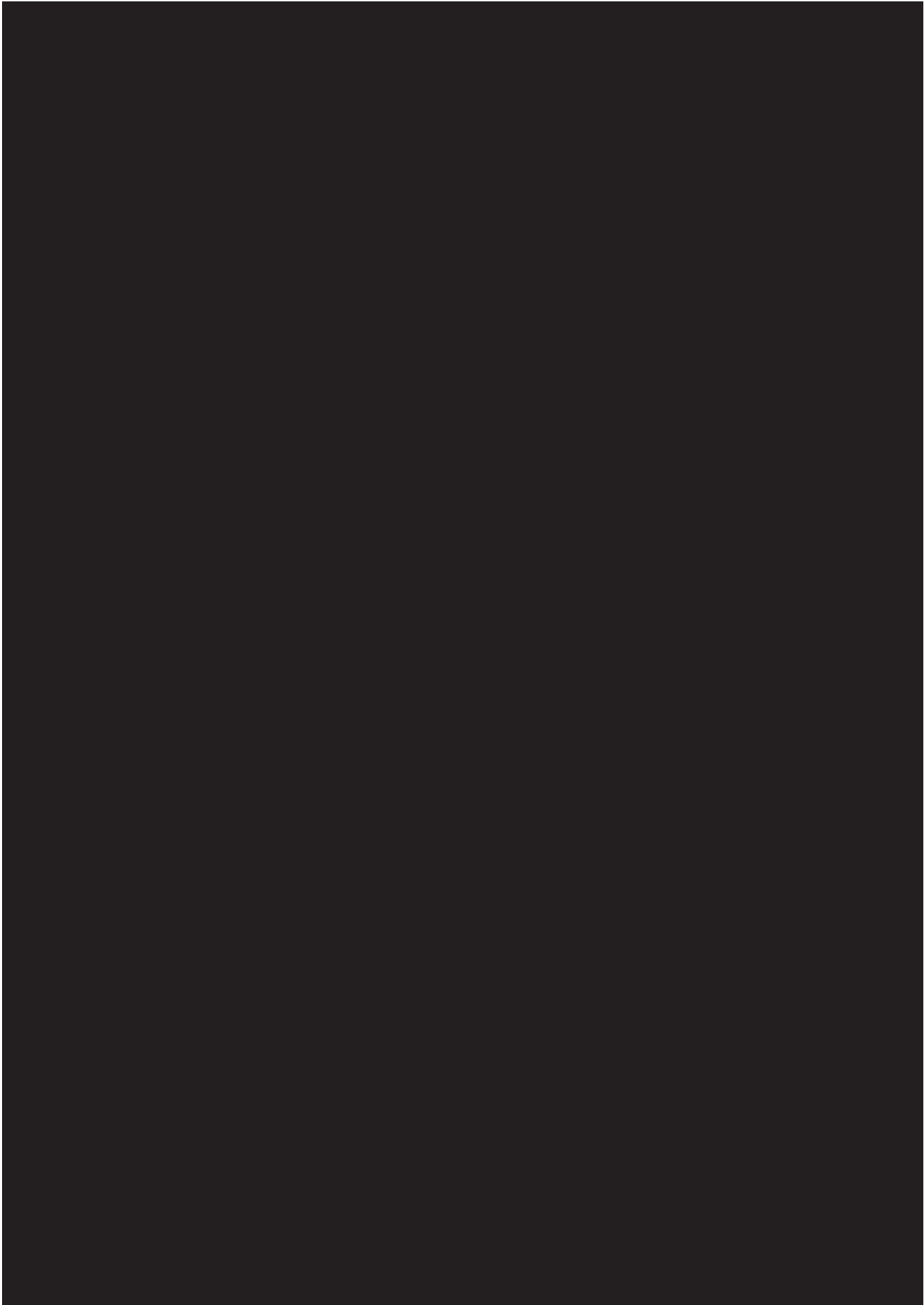










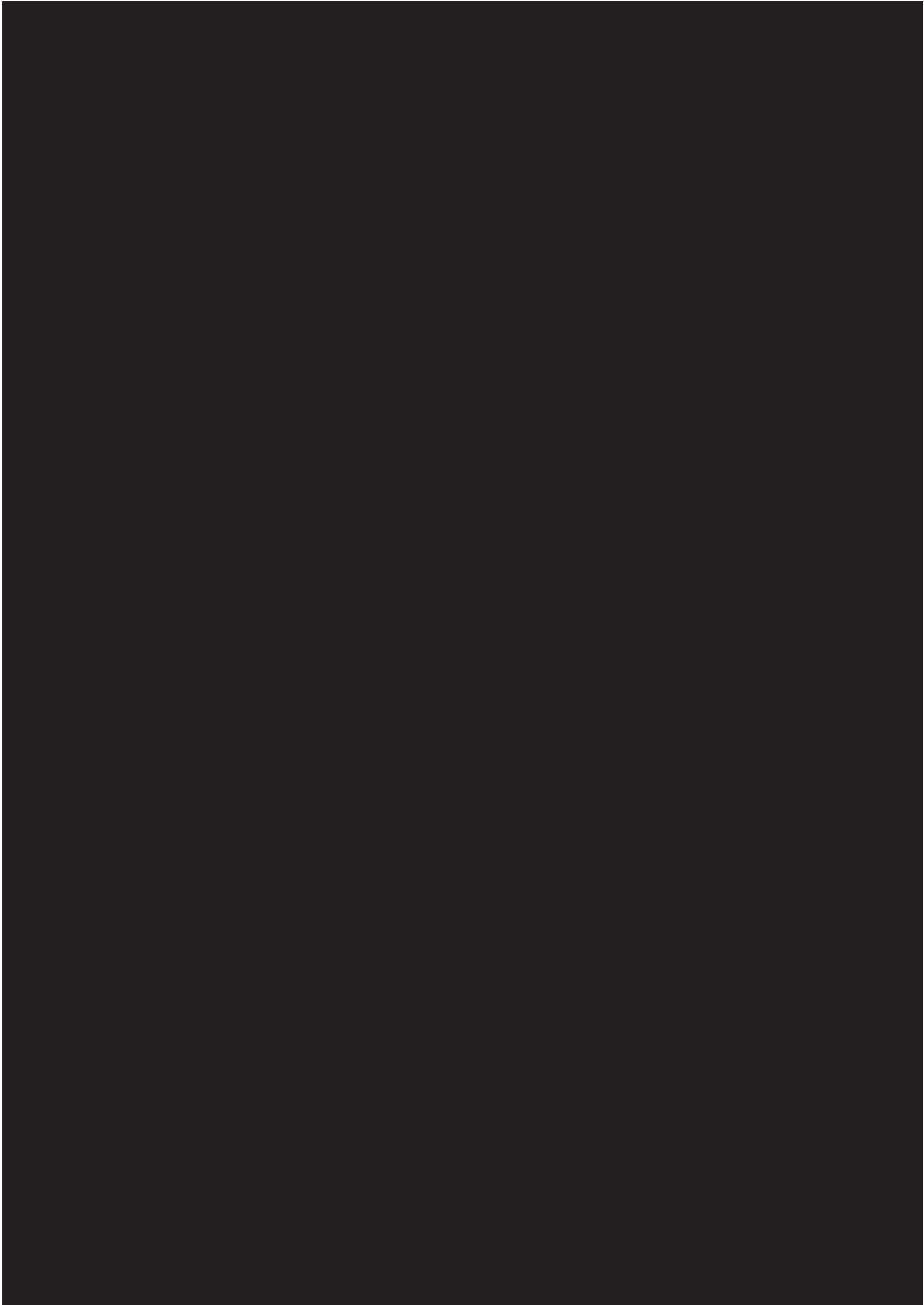






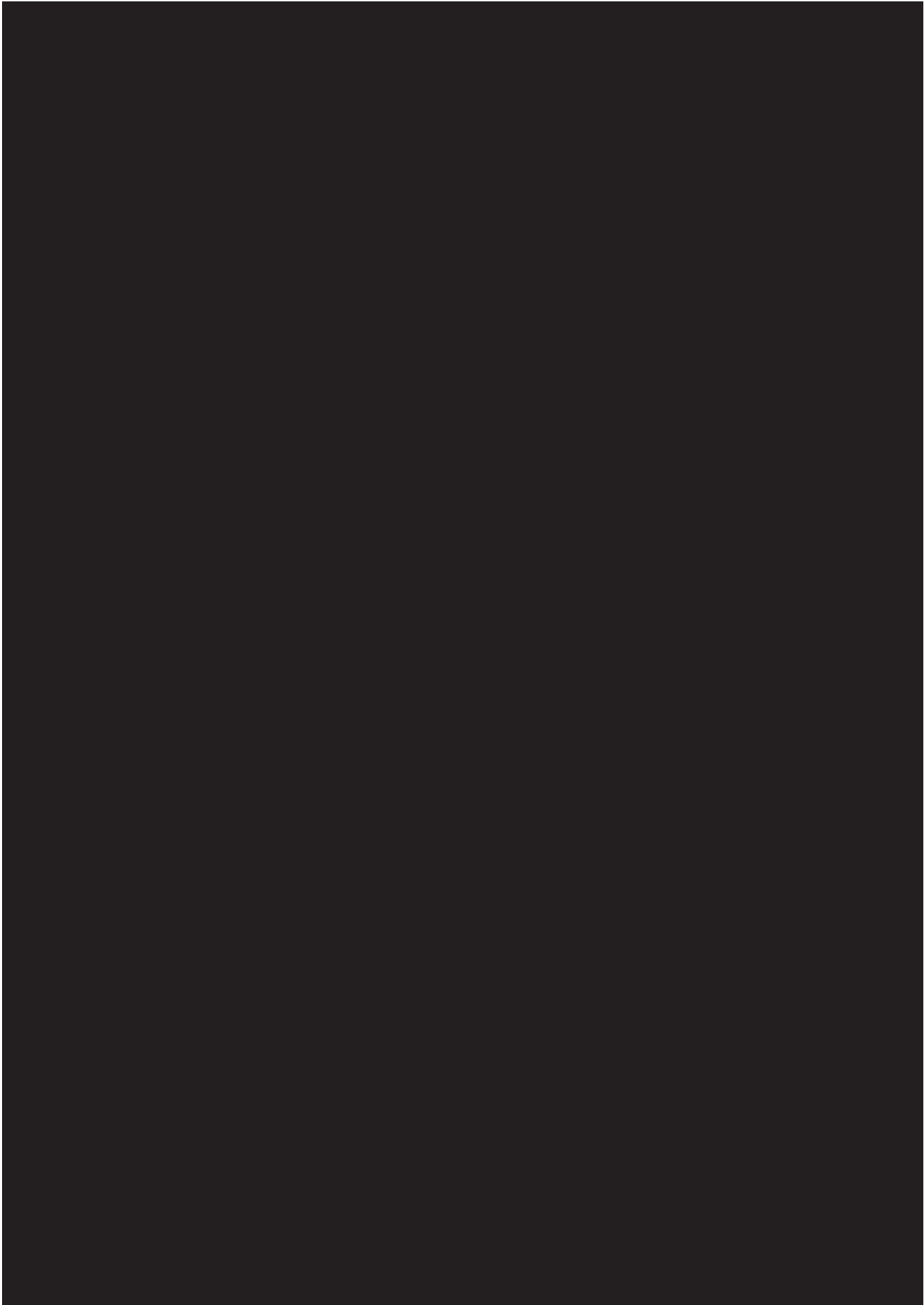












Project プロジェクト	Subject サブジェクト
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From Page No :

2008.1.29

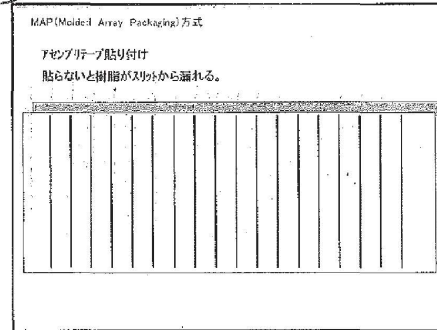
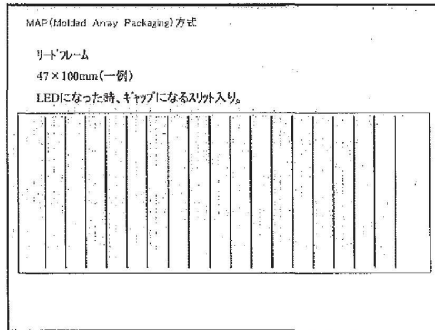
週報会
月報作成

2008.1.30

大さじ

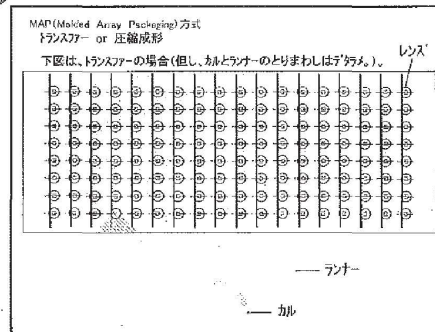
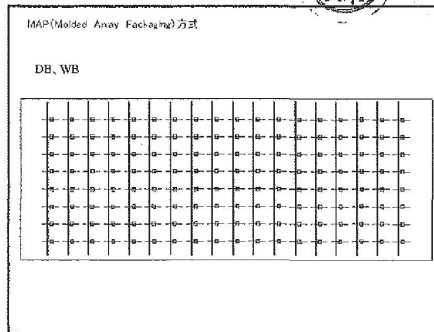
月報修正
MAP方式をSTPに説明する為の資料作成

技術
08.1.30
市川



技術
08.2.04
三木

技術
08.1.30
市川



技術
08.1.30
市川

(発明者)
Invented by 市川博史 2008年1月30日

(記入者)
Recorded by 三木 年 月 日

(証人)
Understood and Witnessed by 武市順司 08年2月15日

Signed _____ 年 月 日

Notebook No: 12001637

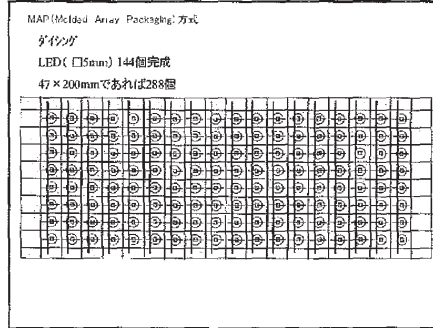
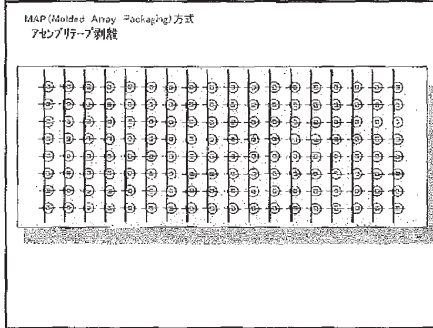
Date _____ 年 月 日 35

Project
プロジェクト

Subject
サブジェクト

From: Page No :

技術
08.1.30
市川



技術
08.1.30



技術
08.1.31
市川

発明者) Invented by 市川博史 2008年1月31日

Understood and Witnessed by
Signed 武部 順三 08' 2 月 日

記入者) Entered by 三木 _____ 年 月 日

Signed _____ 年 月 日

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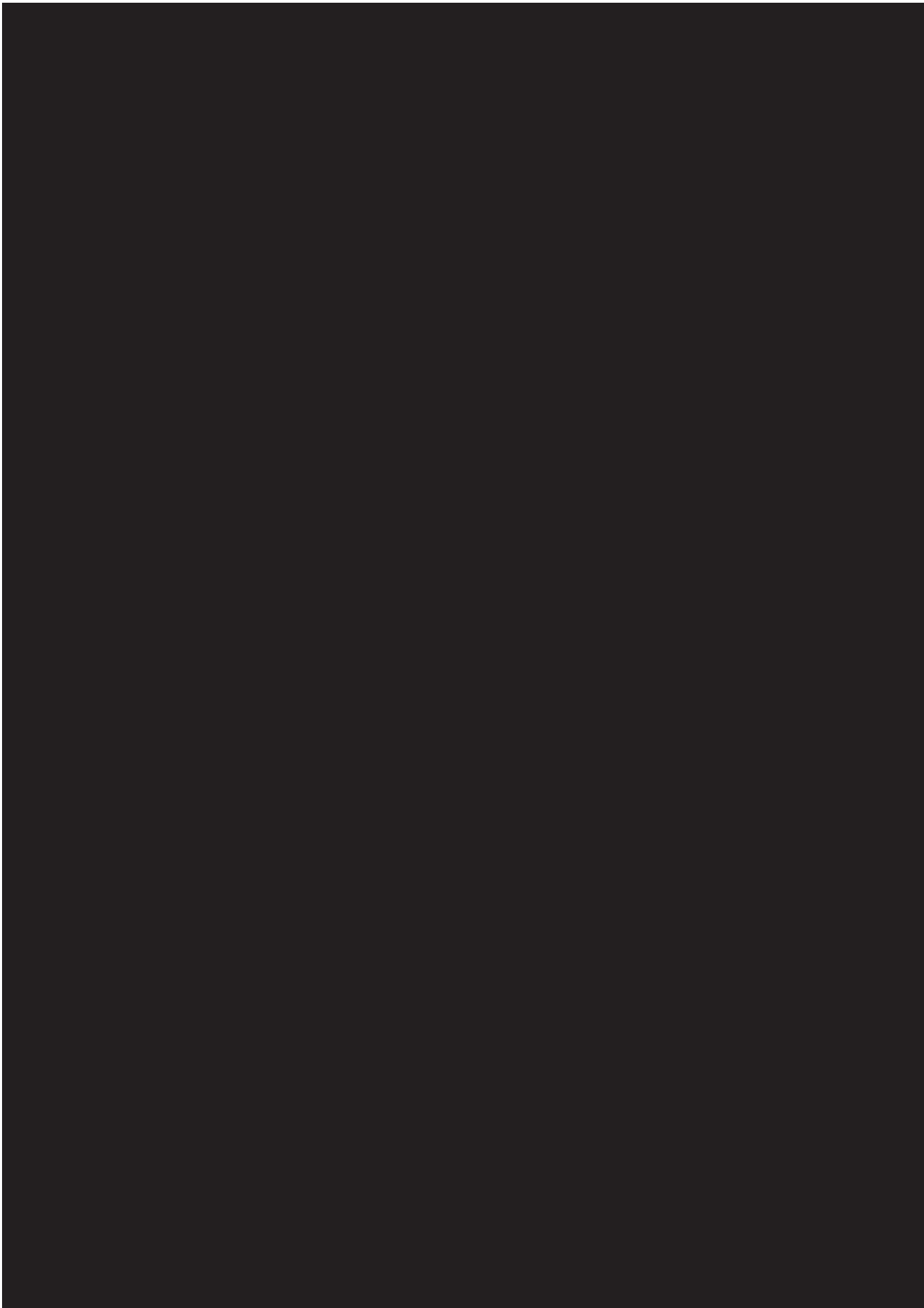
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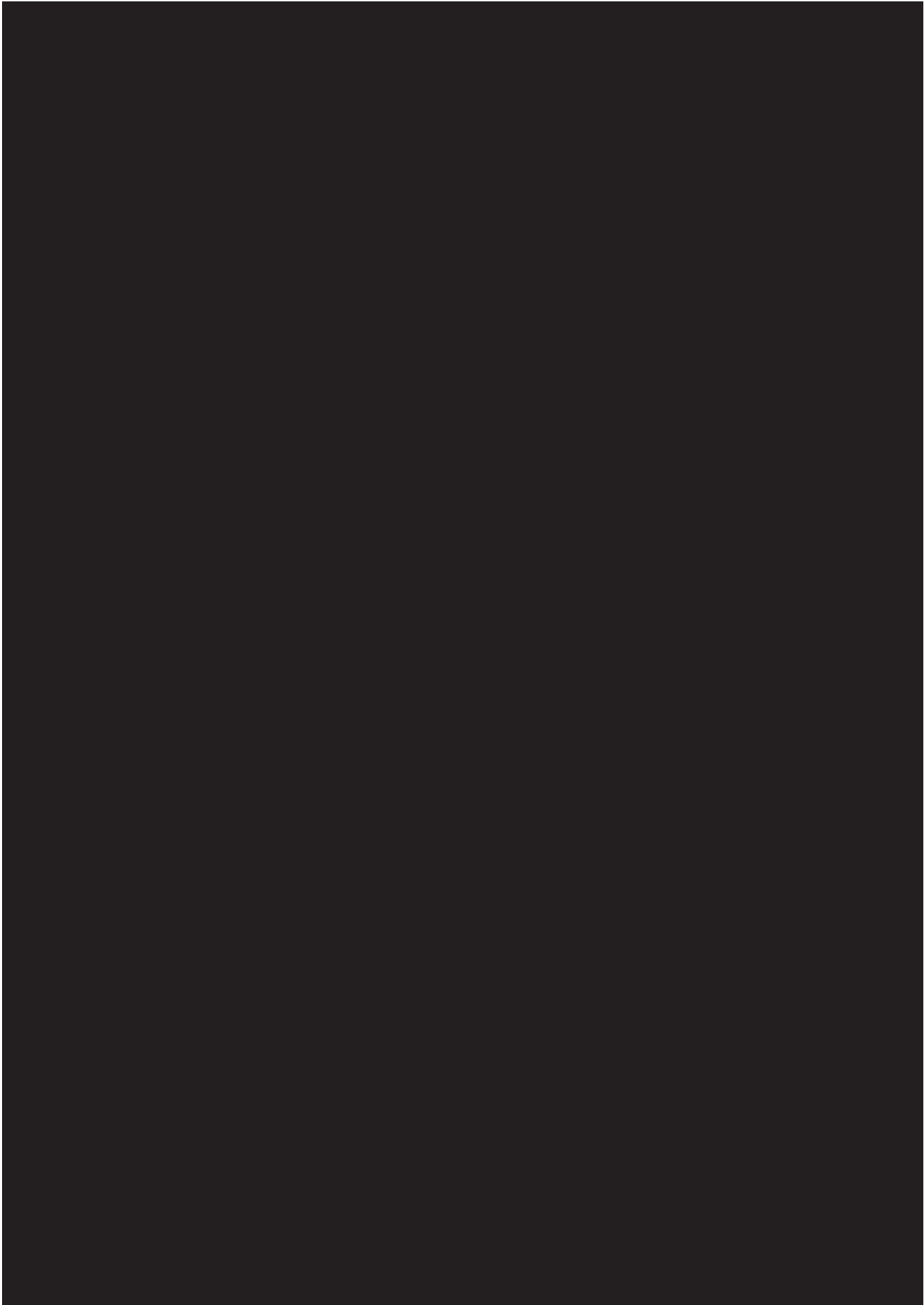
















Project プロジェクト	Subject サブジェクト
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From Page No :
2008.2.12

- ・週報会
- ・ダイレクトモールド 特許案の

2008.2.13

- ・ダイレクトモールド 特許案の
- ・ダイレクトモールド PKG 形状の組み合わせ (STPと)

キャビ有
キャビ無(小)
5x5
or
3x2

↑ このような 183 が集合した 基板を LFC と EMLC
~~モールド~~ で試作してみようということになった。
STPより 2/16 に設計のスケジュールを出してもさう。

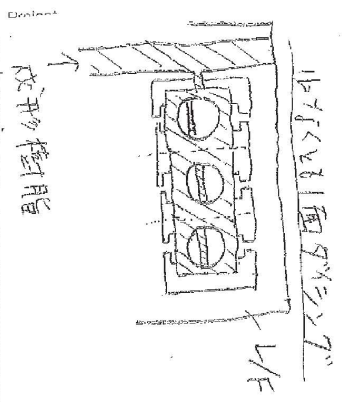
- ・ UL 試験片寸法 調整 と ULへの送付
SCR-1012

2008.2.14

- ① リードフレームを成形して 集合基板を作成。
アセンブリして、少なくとも 1個ダイバンプして作る LED とその製造方法
- ② キヤスタ構造がある リードフレームの LED
上記出願アイデアの 先行特許調査用資料作成

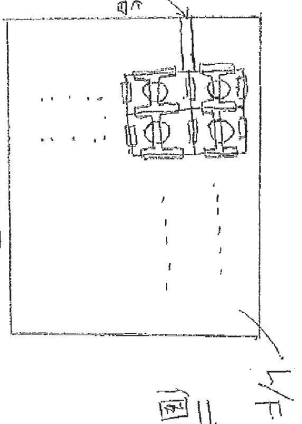
次頁

(発明者) Invented by	(日付) Date	(証人) Understood and Witnessed by	To Page No : (日付) Date
市川 博史	2008 年 2 月 14 日	長井 秀吉	2008 年 2 月 15 日
(記入者) Recorded by	年 月 日	Signed	年 月 日
三木			

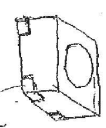


集電基板

⇒ このタイプは圧縮成形でピンも付くのでできる。

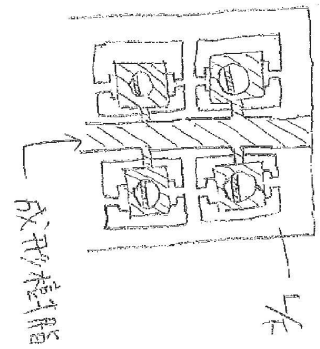


ピン化



。取り数多い

端子 (オマターが) ⇒ 半田がくっつかない
 銅のぬれが悪い
 酸にさらわす、
 粗のぬれが悪い
 信頼性が低い



① リードがL-4を成形して、集電基板を作成。Pbが引いて、少なくて表面が溶かして作るLEDとその製造方法
 。現状の183 取り数少ない

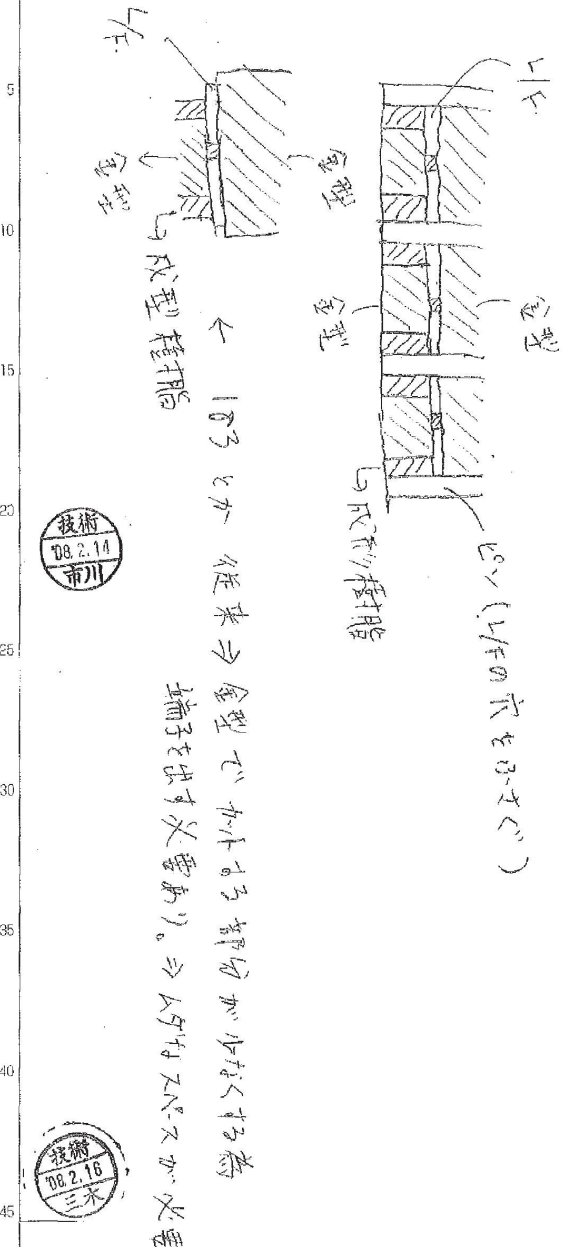
技術
08.2.14
市川

技術
08.2.16
三木

技術
08.2.15
長井

発明者 (Invented by) 市川博史 2008年2月14日
 記入者 (Recorded by) 三木 年月日

証人 (Witnessed by) Understood and Witnessed by
 Signed 長井秀幸 2008年2月15日
 Signed 年月日



技術
08.2.14
市川

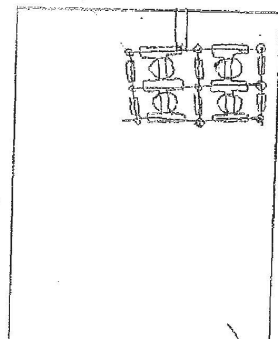
技術
08.2.16
三木

← 103とか 従来 → 金型で 加工する 部分 が 少なくなる 為
端子を出す 必要あり。 ⇒ 103が スペースが 必要

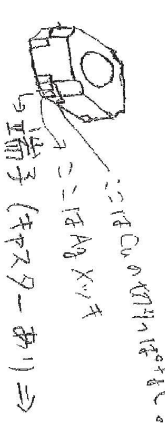
(発明者) 市川博史 2008年2月14日
Invented by

(記入者) 三木 2008年2月16日
Recorded by

ワイヤにワイヤスターになる 穴がある



⇒ 個片化



但し、このワイヤは、圧縮成形でワイヤを付けること ~~が~~ できない、
基板側

Signed _____ 年 月 日

Signed 長井 裕幸 2008年2月16日

② ワイヤスター構造があるリードフレーム

技術
08.2.14
市川

08.2.16

No:
date

Project プロジェクト	Subject サブジェクト
-------------------	-------------------

From Page No:

・来客

ローム インドーラス

日理アメリカ 経由で 過去紹介があった。

改めて、封止樹脂のプレゼンあり。

アクリルで有名。ポリマー、モノマーともあり。

2006年 83億、USDドル売り上げ

変わったところでは、塩だけで 1000億、円売り上げあり

高屈折率 1.60 と 1.57 のシリコン系の樹脂の紹介あり。

日理から、①シリコンの変性方法。

②シリコン 原材料はどの段階で入手

③ 特ちょう

④ タウの TCR との比較データ。水蒸気透過率
低分子ロキサン量等のデータ

~~等~~ 等 依頼した。

この材料の市場での実績なし。

NDA (案) と日本語訳を提出してもらう。

・日立化成の成形材料の耐光性試験用 ref. 作成
(執)

NS104-2. (Lot 5148ZE-0314)

100°C X 3hr + 150°C X 4hr

OE-6340 (Lot 0005016751)

083 の硬化条件で

To Page No:

48

(発明者) Invented by	市川博史	(日付) Date	2008年2月14日	(証人) Understood and Witnessed by	長村秀吉	(日付) Date	2008年2月15日
(記入者) Recorded by	08.2.16	年 月 日		Signed		年 月 日	

Notebook No.:

Project プロジェクト	Subject サブジェクト
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From Page No:
2008. 2. 15
・日産化成の成形材料耐熱耐光性試験ref.作成
9ZR
FSX X0510
・インストロン 高温引張試験の為の装置対応 (K社) 向け
・IPに 前日の特許アテアの先行技術の調査[✓]に行く。 依頼

(発明者) Invented by	市川博史 2008年2月15日	(証人) Understood and Witnessed by	長井 浩吉 2008年2月15日
(記入者) Recorded by	三木 08.2.16	Signed	年 月 日

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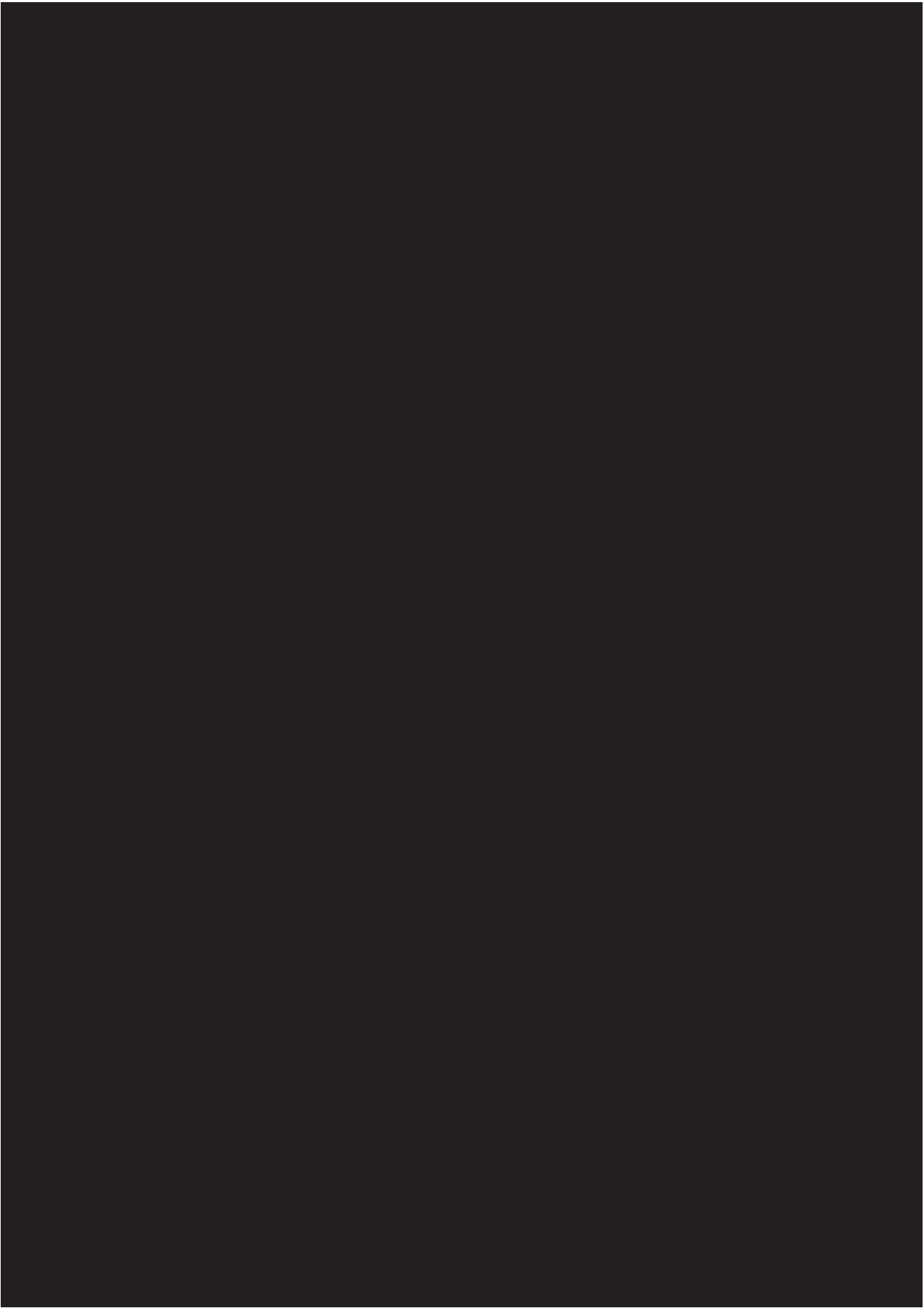
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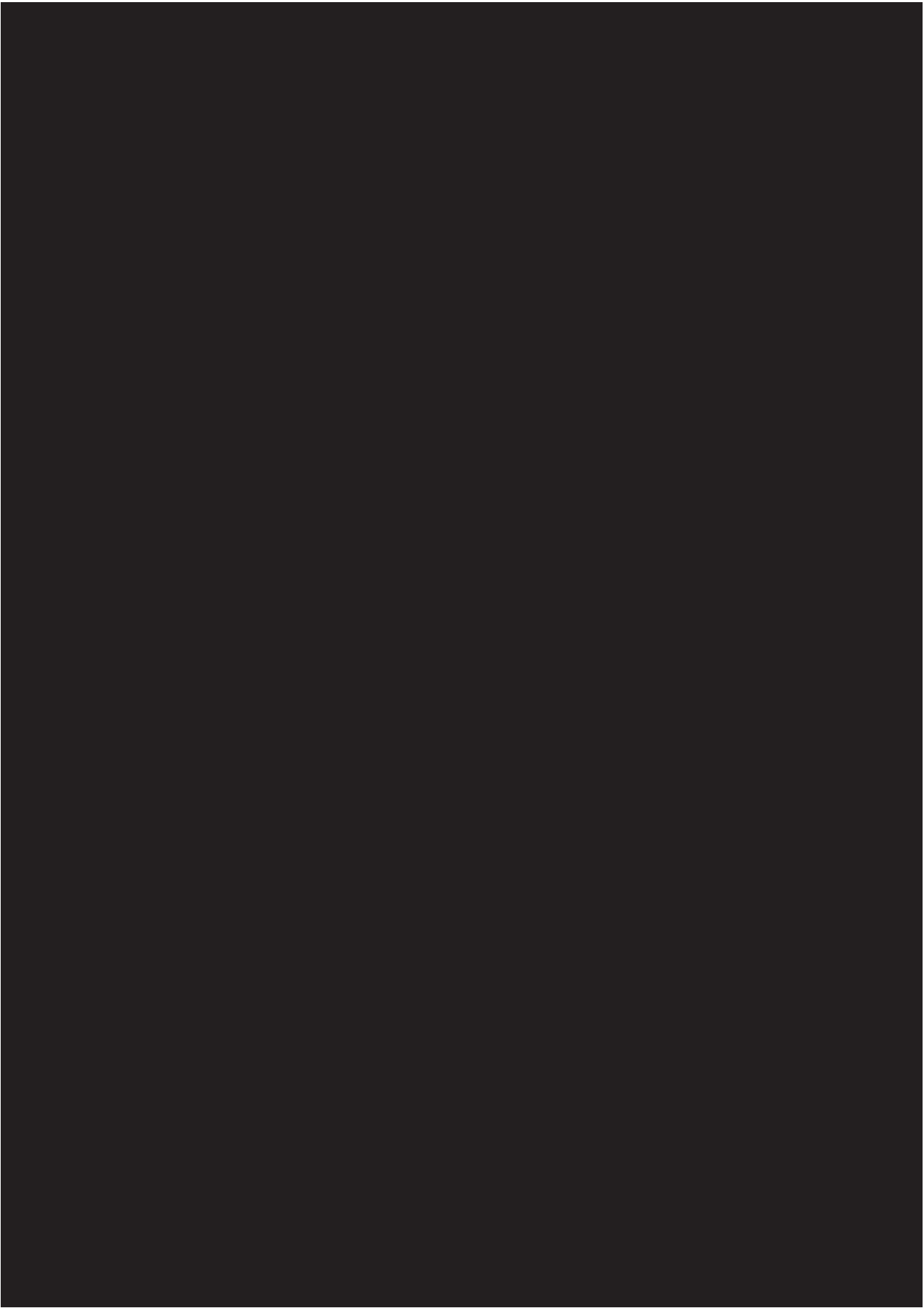




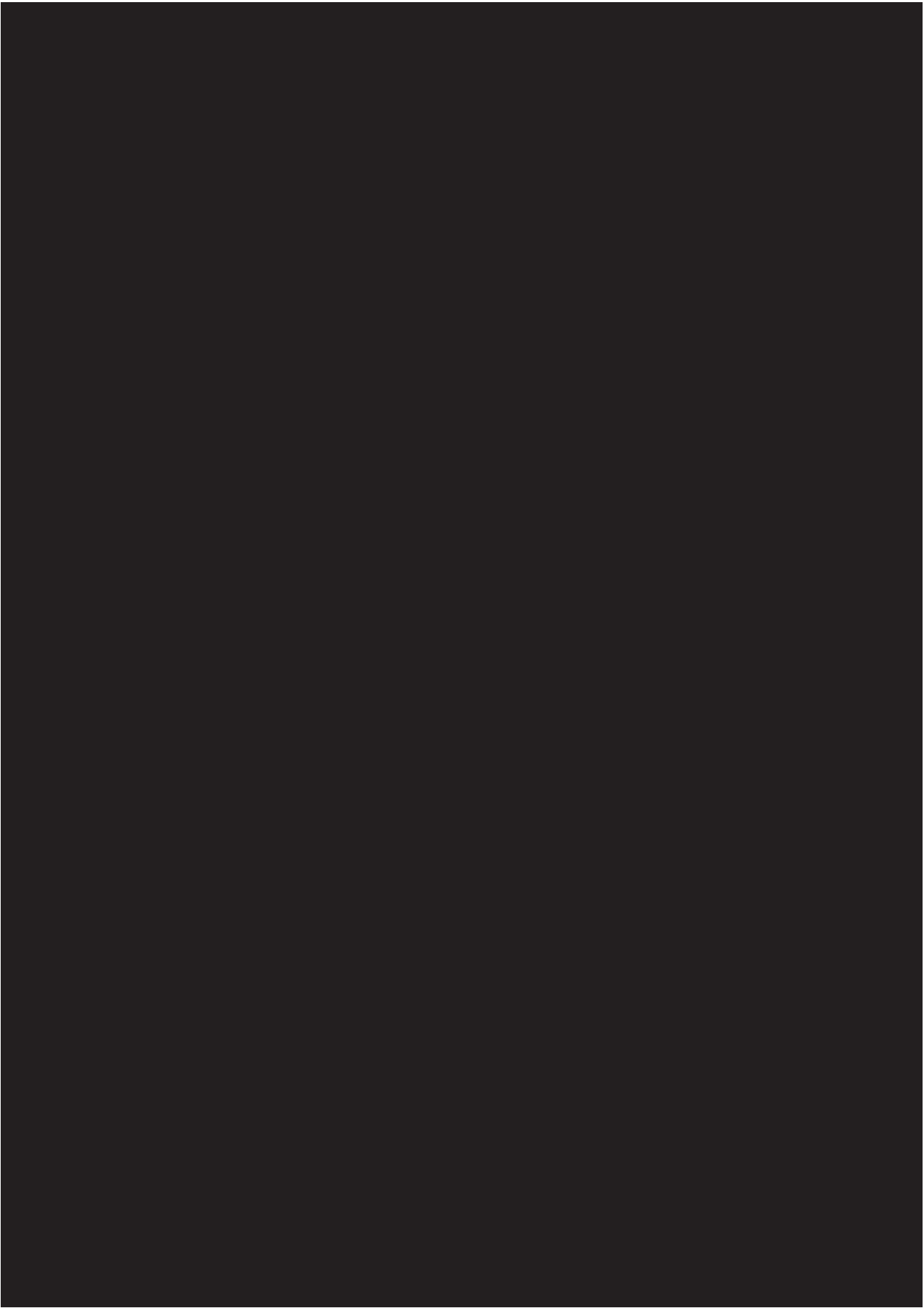


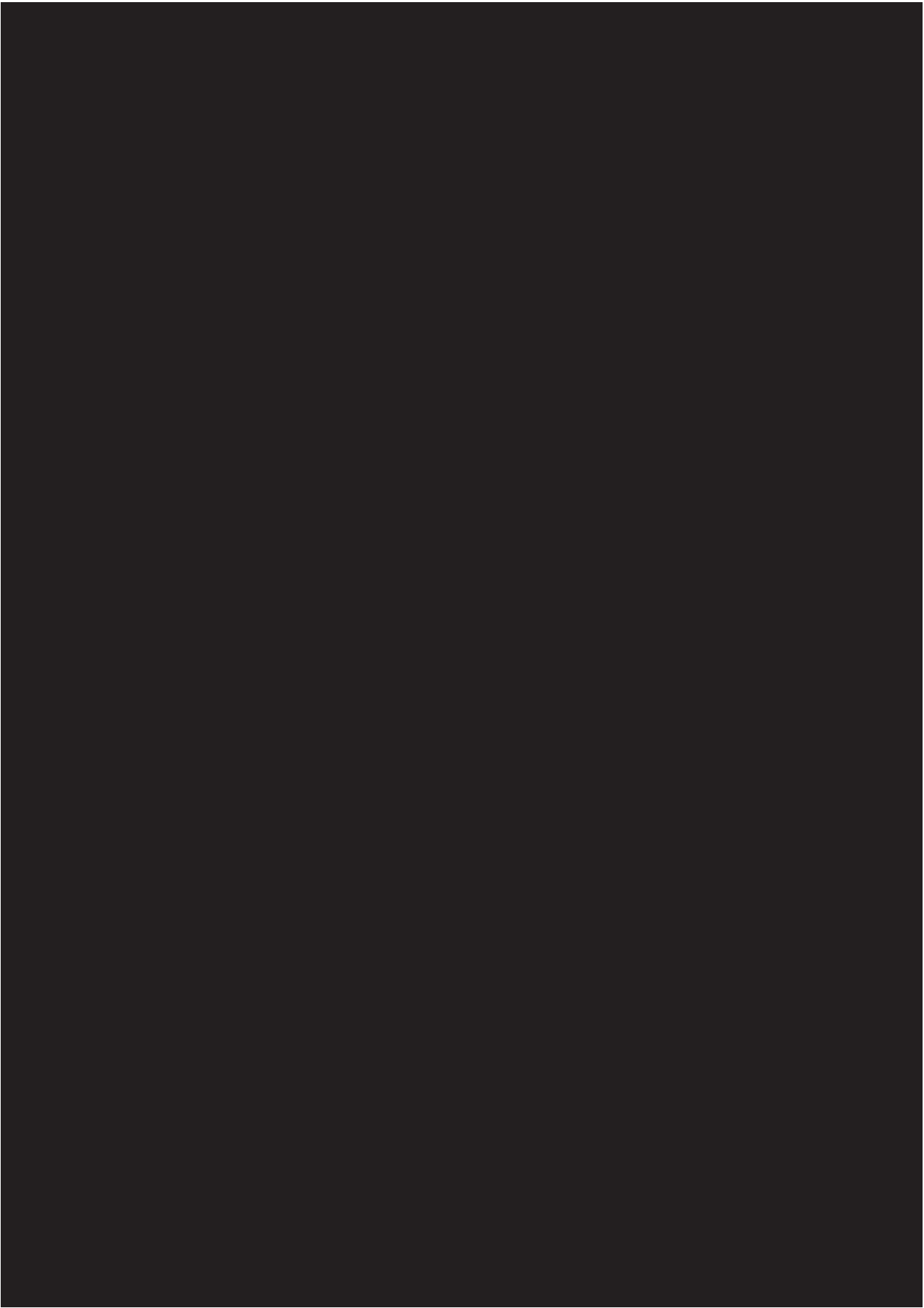










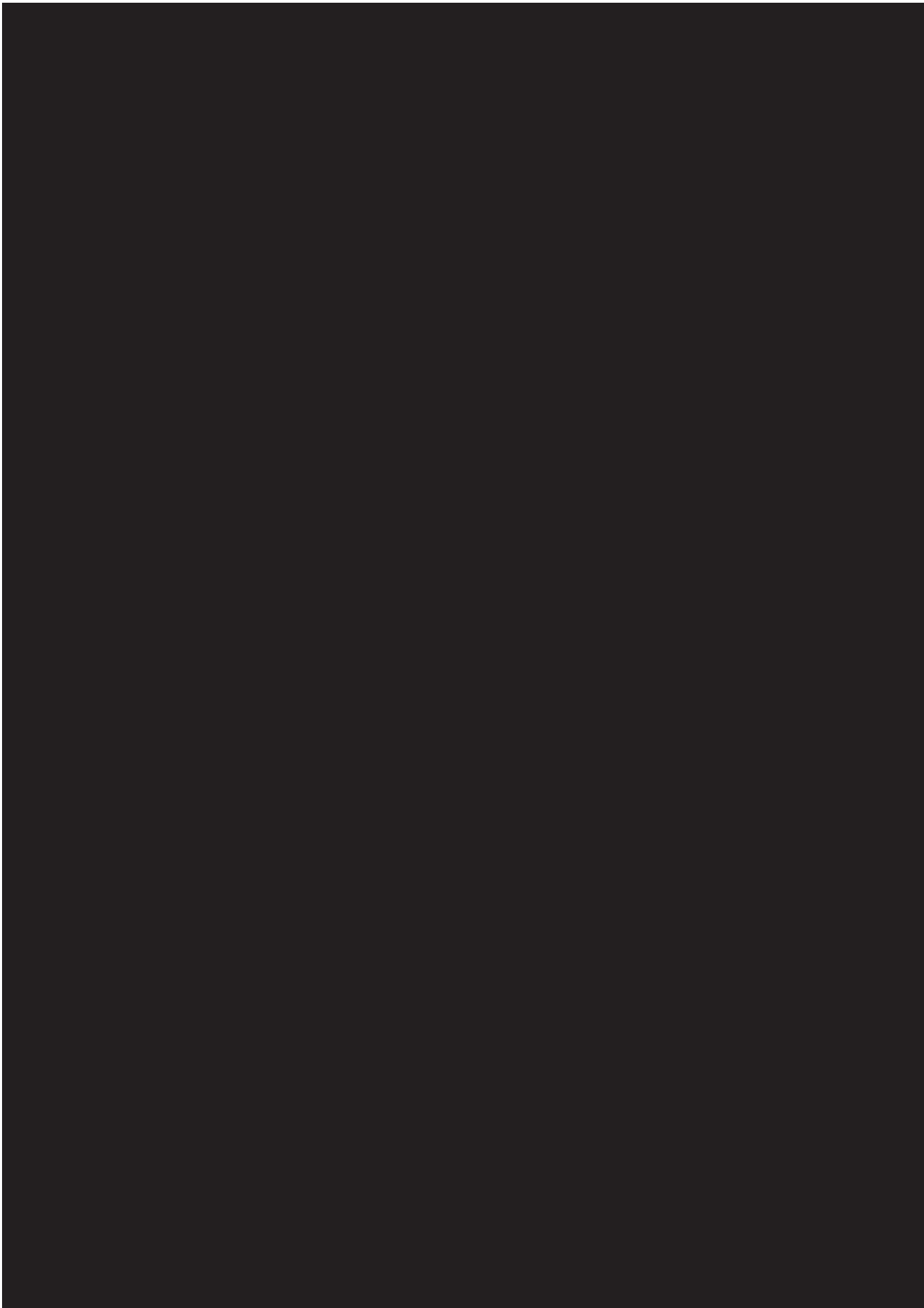




















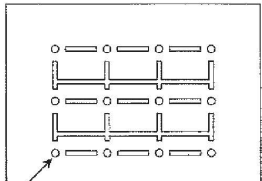
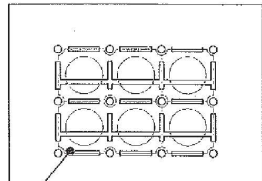
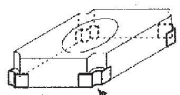
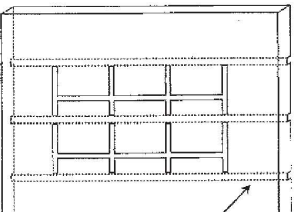

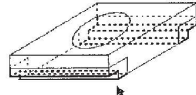
<p>Project プロジェクト</p>	<p>Subject サブジェクト</p>
<p>From Page No.: ETC 集合基板設計特徴まとめ</p>	
<p>特徴</p>	
<p>①. 取り個数を増やす為に、リードフレームに樹脂成形したハウジングの集合体に、ダイボンディング、ワイヤボンディング、樹脂封止し、少なくともハウジングの1面をダイシングにより個片化して作ることを特徴とするLEDとその製造方法</p>	
<p>②. ①の取り個数を更に増やす為、ハウジングを2次元に集合させた基板に、ダイボンディング、ワイヤボンディング、樹脂封止し、ダイシングにより個片化して作ることを特徴とするLEDとその製造方法。リードフレームには成形樹脂との密着性を向上させる為の切り欠きを設けている。</p>	
<p>(日付) Date</p>	<p>(証人) Understood and Witnessed by</p>
<p>(発明者) Invented by</p> <p style="text-align: right;">2008年3月9日</p>	<p>(日付) Date</p> <p>Signed _____ 年 月 日</p>
<p>(記入者) Recorded by</p>	<p>Signed _____ 年 月 日</p>

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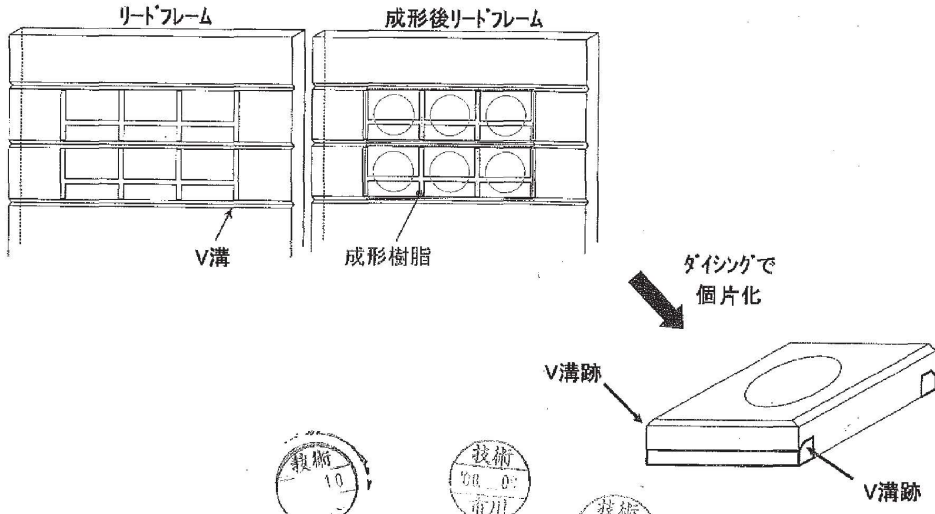
Project プロジェクト	Subject サブジェクト			
From Page No :				
<p style="text-align: center;">技術 08.3.09</p> <p>③. ②のLEDのリードの側面部は全てメッキ面ではなく、Cu等露出の切断面が露出するため、酸化され易い。従って、ハンダ濡れが悪く接合信頼性が低い。それを改良するため、個片化後キャストレーションになるメッキの施された穴のあるリードフレームを使用すると、キャストレーション部はメッキ面の為酸化されにくく、接合信頼性を向上させることができる。</p>				
<p>リードフレーム</p>  <p>キャスト用の穴</p> <p style="text-align: center;">技術 08.3.10 三木</p>	<p>成形後リードフレーム</p>  <p>成形樹脂</p> <p style="text-align: center;">技術 08.3.09 市川</p>	<p>ダイシングで 個片化</p> <p>➔</p>	 <p>キャストレーション</p>	
<p>個片化後、キャストレーションとなるメッキの施された、裏面に溝のあるリードフレームを使用すると、③と同様の効果が得られる。</p>				
<p>リードフレーム</p>  <p>裏面溝</p>	<p>成形後リードフレーム</p>  <p>成形樹脂</p> <p style="text-align: center;">技術 08.3.09 市川</p>	<p>ダイシングで 個片化</p> <p>➔</p>	 <p>キャストレーション</p>	
(発明者) 市川博史 Invented by		(日付) Date 2008年 3月 9日	(証人) Understood and Witnessed by	To Page No : (日付) Date
(記入者) 三木 Recorded by		年 月 日	Signed _____ 年 月 日	Signed _____ 年 月 日

Notebook No: 12001637

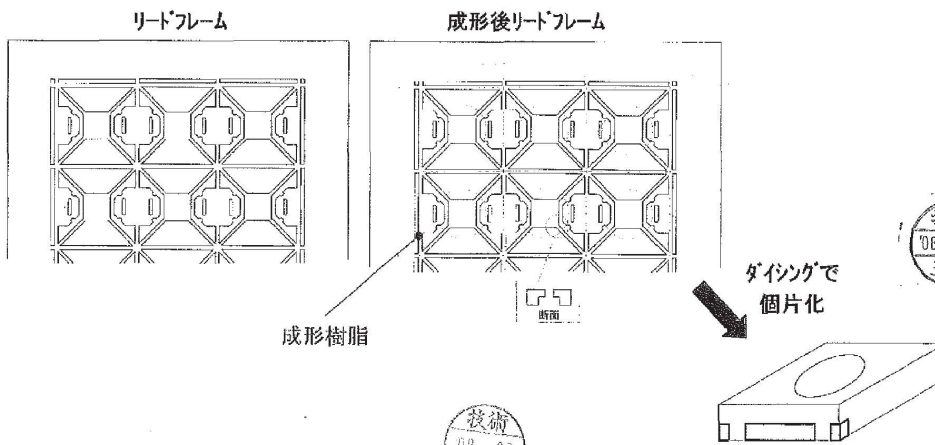
Date 年 月 日

Project プロジェクト	Subject: サブジェクト
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From ⑤. ①②③④は、ダイシングする厚みを薄くし加工を容易にするため、リードフレーム、成形樹脂に溝を設けてもよい（例えばV溝）。



⑥. ダイシング時のブレード振れを抑制するために、ダイシングラインにフレームを覆った構造をとる。かつ、成形樹脂との密着性向上のため、フレームには、段付き形状、ホール、切り欠きなどを設けている。ダイシングライン上のフレームは、ダイシング時に切り代となり、個片化するとなくなる。個片化後のLEDは、端子を2個以上有する。



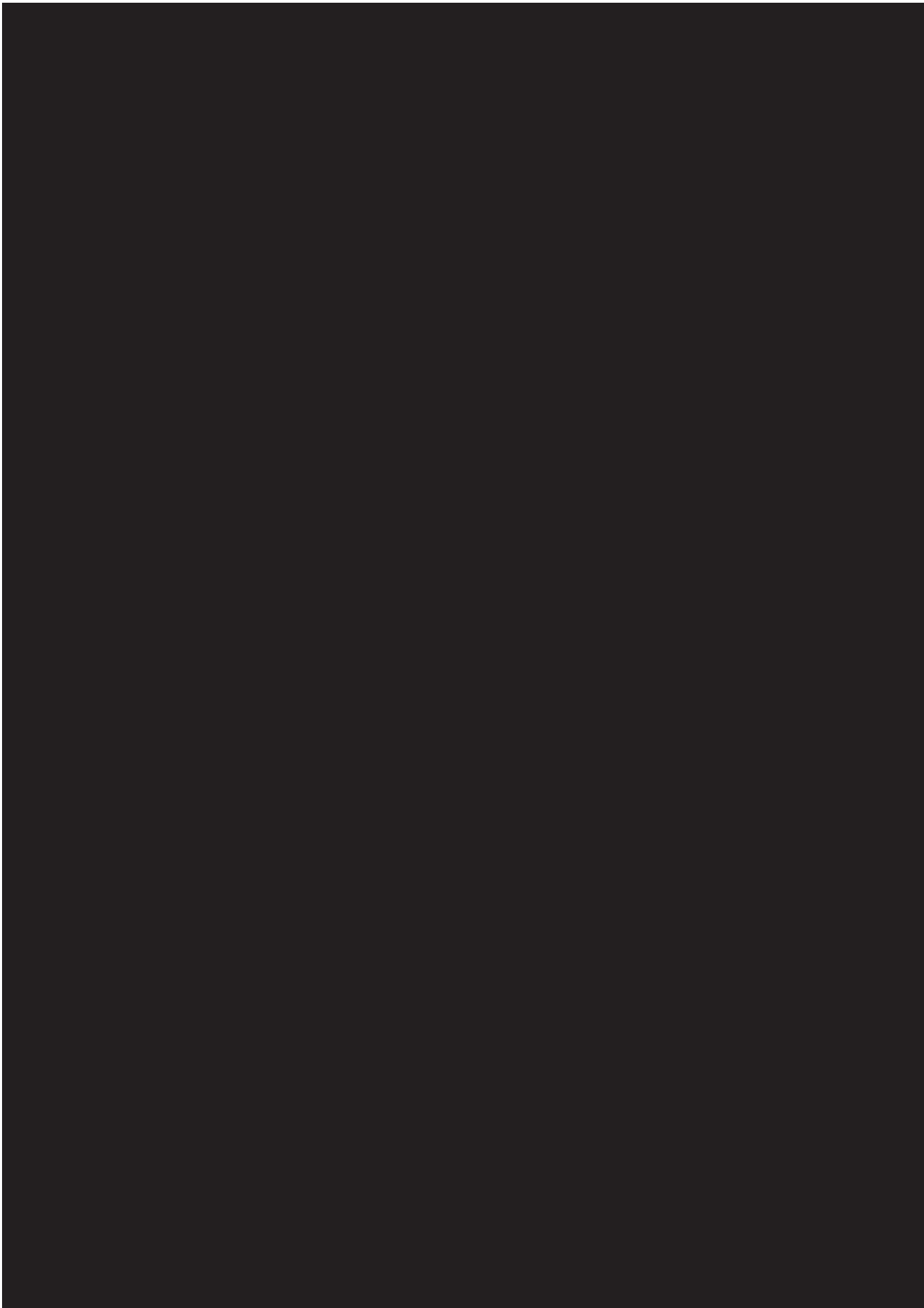
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(記入者) Recorded by 市川博史 2008.3.10	Signed	年月日
	Signed	年月日

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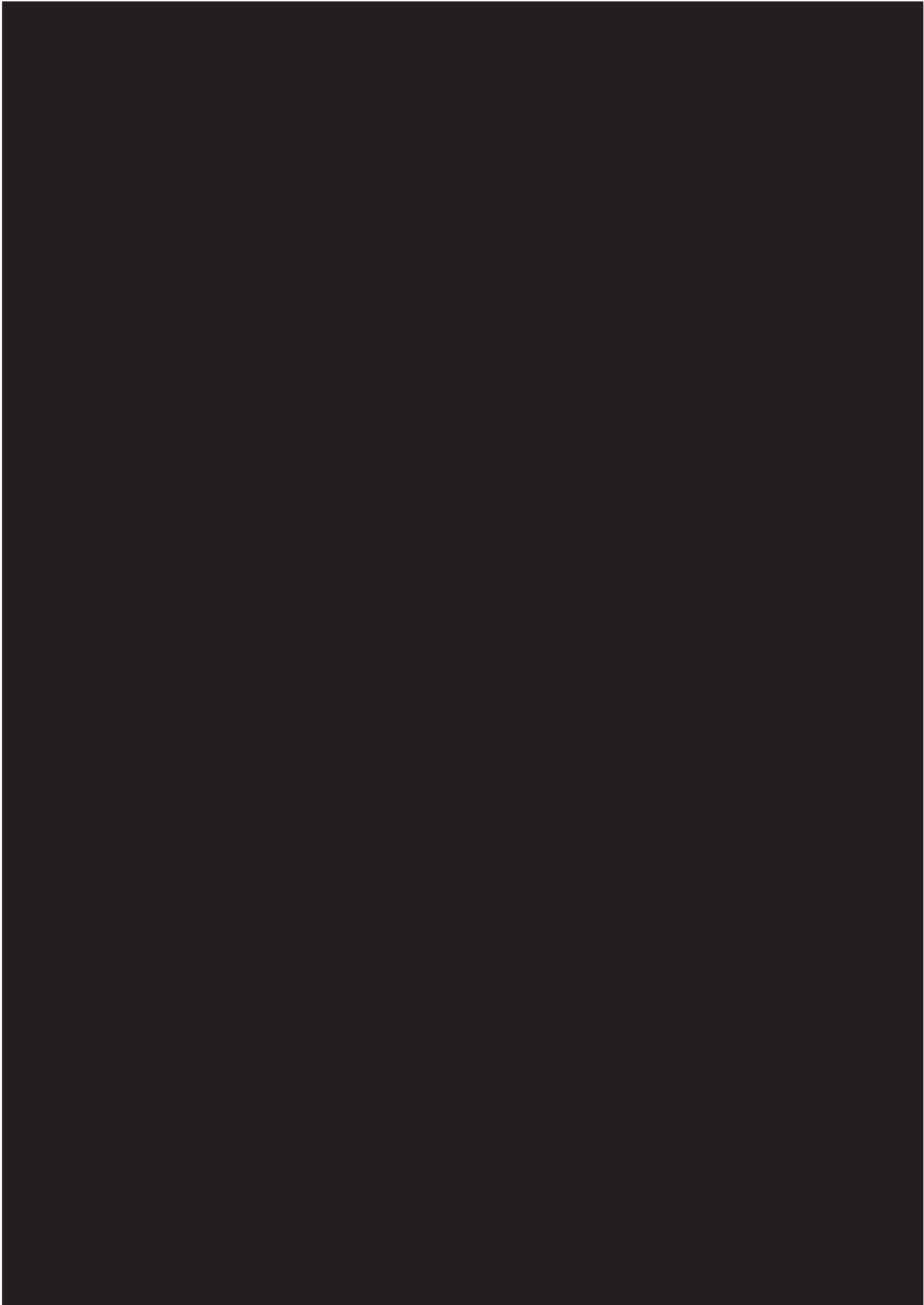


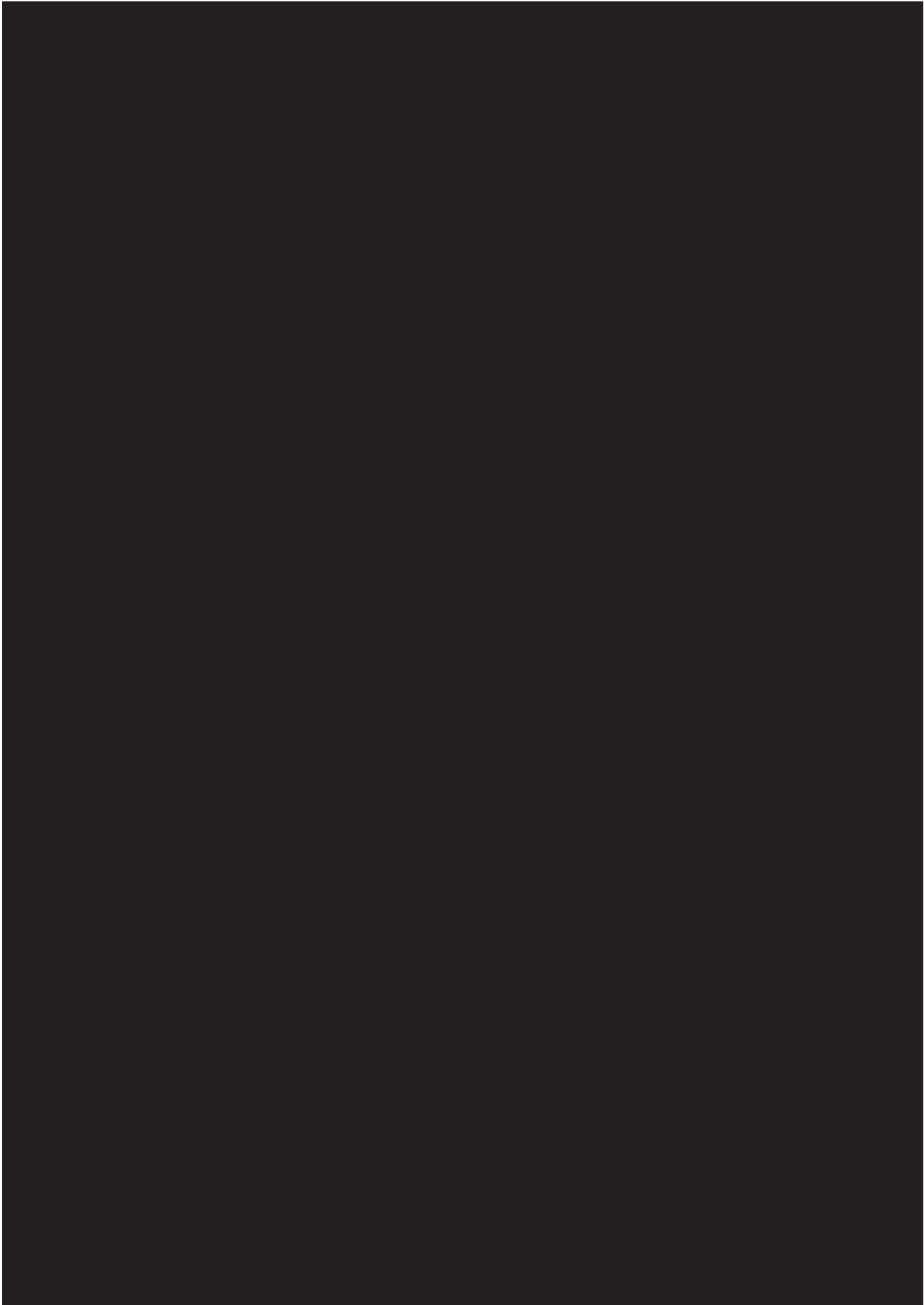












Project プロジェクト	Subject サブジェクト 推
<p>From Page No. 2008.3.14</p> <p>・EMC 集合基板 図面打ち合わせ</p> <p>・特許打ち合わせ (林KK、伊田村、笹岡)</p> <p>丸穴及び裏面のキャスター構造を採ったLEDとして出願する方向 その場合セラミックタイプとの違いを明らかにする必要があるので、 セラミックは 半田クラックの問題を抱えているので セラ 実装基板 (カウエポ、アルミ) との線膨張係数の近い金属L/Fを使用 したキャスターの付いた樹脂成形PKGとして出願する方向。 キャスターの必要性については、製産性を上げる為ダイシングで作る と金剛母材が剥き出しになる為、Ag₂S₂O₈で 接合信頼性を取 り得るというストーリー。 の誘電キャスター</p> <p>・日亜化成 透明封止樹脂耐熱、耐光性試験スタート。</p>	
<p>(発明者) Invented by 市川博東 2008年3月14日</p> <p>(記入者) Recorded by 三 年 月 日</p>	<p>To Page No. (日付) Date</p> <p>(証人) Understood and Witnessed by (日付) Date</p> <p>Signed _____ 年 月 日</p> <p>Signed _____ 年 月 日</p>

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Date 年 月 日

Notebook No: 121

Subject
サブジェクト

Project
プロジェクト

From Page No:

全型持造との整合性

2008.3.14

① 集合基板 図面打ち合わせ

打ち合わせ (林KK、IP田村、笹岡)

丸穴及び裏面のキャスター構造を採ったLEDとして出願する方向

その場合セラミックタイプとの違いを明かにする必要があるので、

セラミックは細クラックの問題を抱えているので、~~セラ~~ 実装基板

(カラエボ、アルミ)との線ばう張係数の近い金属L/Fを使用

したキャスターの付いた樹脂成形PKGとして出願する方向。

キャスターの必要性については、製産性を上げる為ダイシングで作る

と金属母材から引き出しになる為、Ag₂S₂O₈で接合信頼性を取

るというストーリー。
の特殊キャスター

・日立化成 透明封止樹脂の耐熱、耐光性試験スタート。

⑤

(日付) Date

(証人)
Understood and Witnessed by

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2008年3月14日

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年 月 日

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Project
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2008.3.21

Subject
サブジェクト



From Page No :

概要

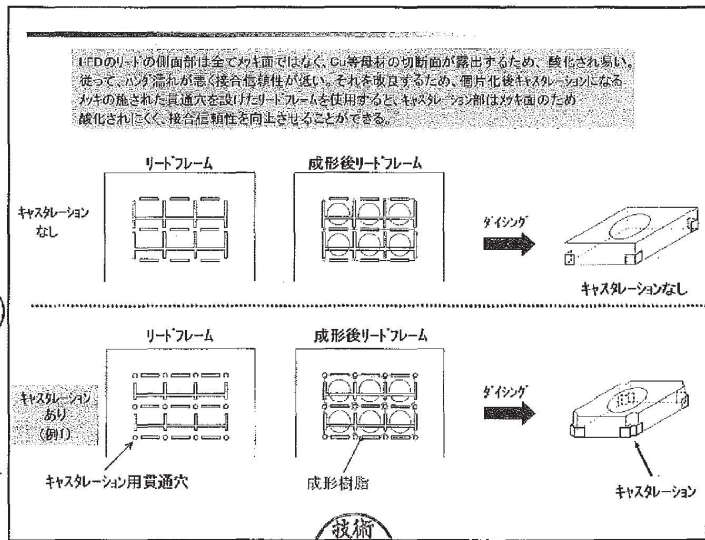
PKG

- ① 通常、セラミックPKGには、半導体を半田接合強度を向上させるため、PKG側面にキャストレーションと呼ばれるフィレット形成のための凹み部を設けている。
- ② しかし、PKGと実装基板(樹脂、金属等)の熱膨張係数差が大きいため、基板実装後に熱衝撃が加えられた際に半田部にクラックが発生し易く、①の対策のみでは不十分である。
※特に、セラミックPKGサイズが□3.5mm以上であると、上記の症状が顕著である。
- ③ ②を解決するため、実装基板との熱膨張係数差が小さい金属(例、銅、銅合金、42アロイ、鉄、アルミ)リードフレームを使用し、また、半田接合強度向上のためのキャストレーションを設けた樹脂成型PKGを提供する。
- ④ PKG樹脂材料は、熱可塑性樹脂、熱硬化性樹脂。より好ましくは、膨張率が金属に近い熱硬化性樹脂。
- ⑤ 封止材料としては、エポキシ、シリコンなどがあり、耐光耐熱の優れたシリコンが、より好ましい。

製法

- ① 上記PKGは、リードフレーム内製品の取り便数を向上(生産性向上・コスト低減)させるため、カットフォーミングではなく、個片化方法としてダイシングを採用している。
- ② 金属リードフレームをダイシングを行った際に、ダイシング面に母材が露出し、酸化され易い。そのため半田の濡れ性が悪く、基板実装後の半田接合信頼性が低い。
- ③ ②を解決するため、リードフレーム表面に、プレス、ハーフエッチ、ダイシング等で貫通穴・ザグリ・溝を設けて、その後メッキを施すことで、ダイシングを実施しても、リードフレーム母材を露出させずキャストレーションを設けることができる。(ページ2~6 例2~4)
- ④ また、ダイシングラインに成型樹脂/リードフレームがあるPKGにもキャストレーションを設置することができる。(ページ7 例5)

試作型は、例1、3を予定



(日付) Date

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(発明者)
Invented by

市川博史 2008年3月21日

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(記入者)
Recorded by



年 月 日

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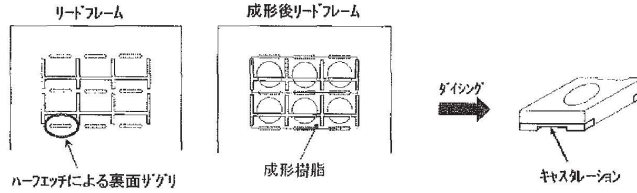
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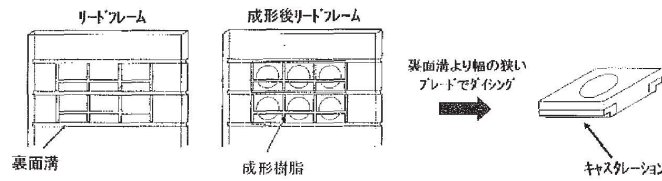
100021
市川

例2. 前ページのPKGで、貫通穴ではなく、裏面にクイの施された
ハーフエッチによるサグリを設けてもよい。



100021
市川

例3. 前ページのPKGで、サグリではなく、裏面にクイの施された
溝を設けてもよい。



100021
市川

100021
市川

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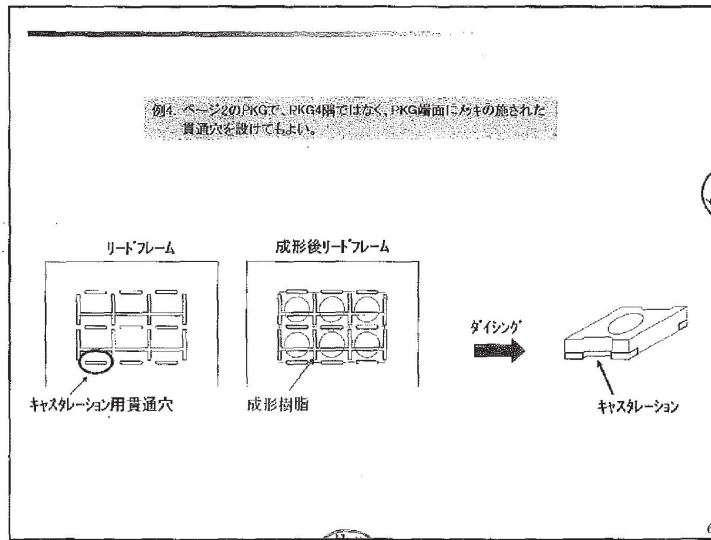
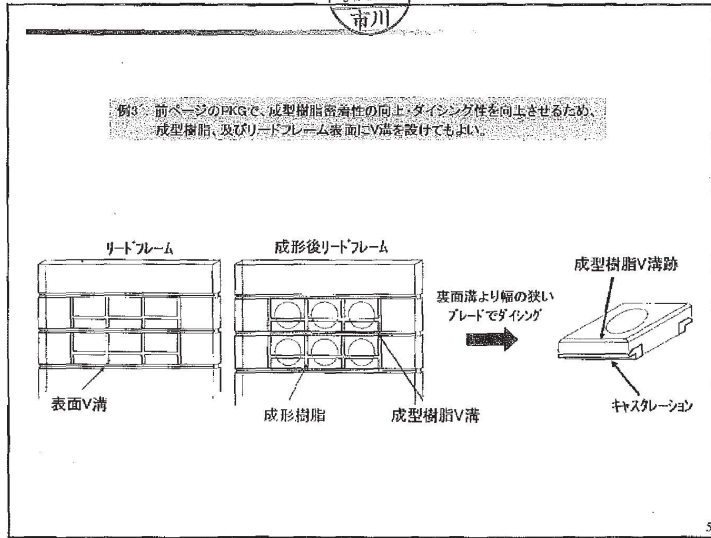
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Project
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Subject
サブジェクト



From Page No :



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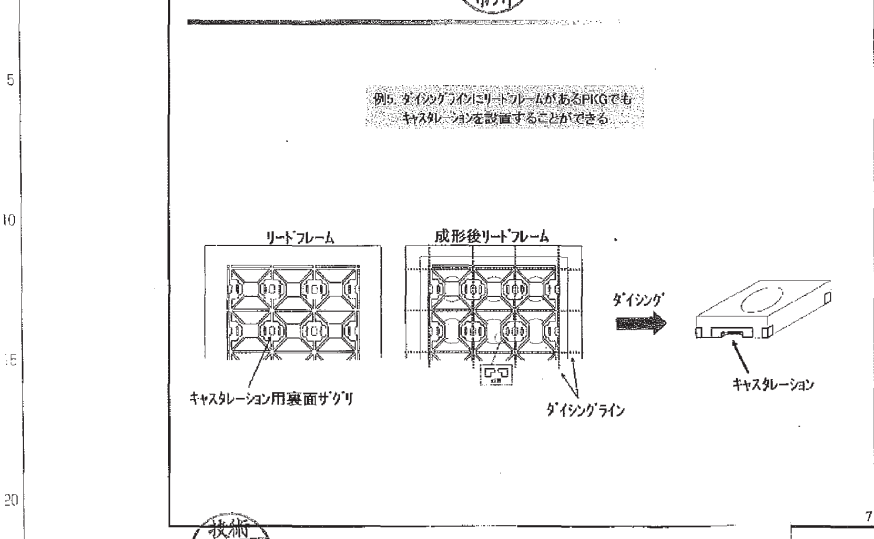


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Project プロジェクト	Subject リファジェクト
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From Page No : 08.3.21



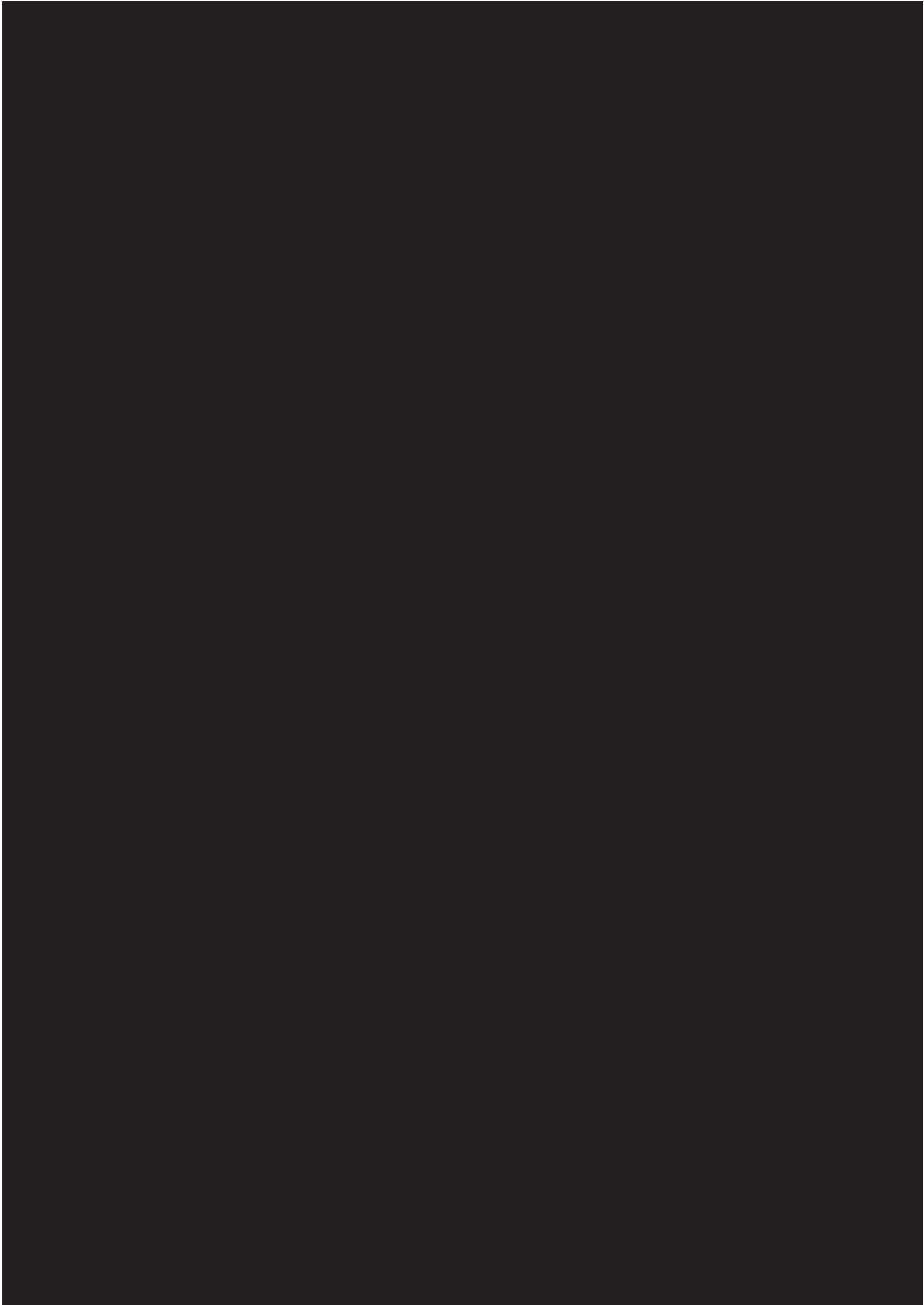
(発明者) Invented by	市川博史 2008年3月21日	(証人) Understood and Witnessed by	
(記入者) Recorded by	三浦	Signed	年 月 日

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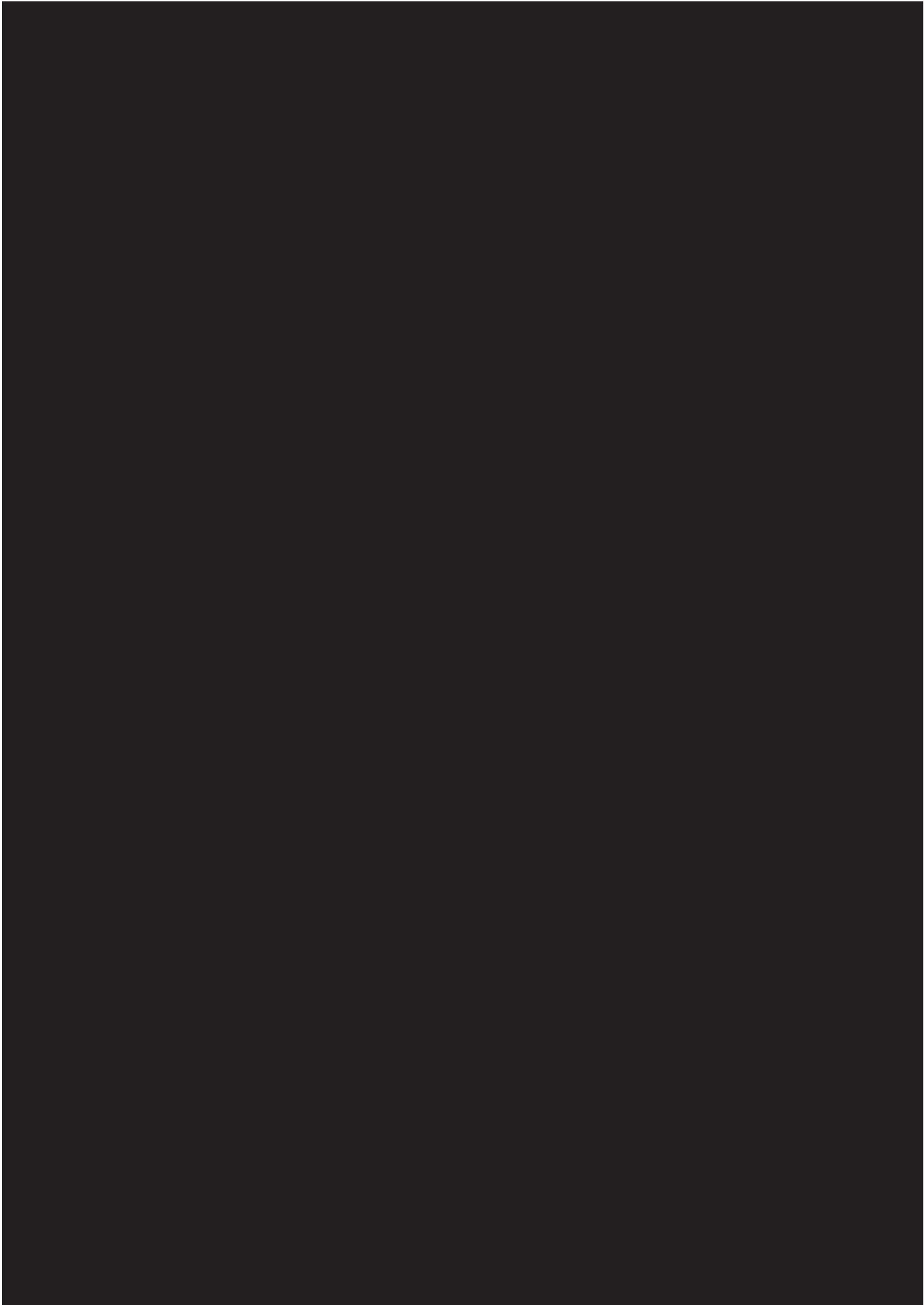




















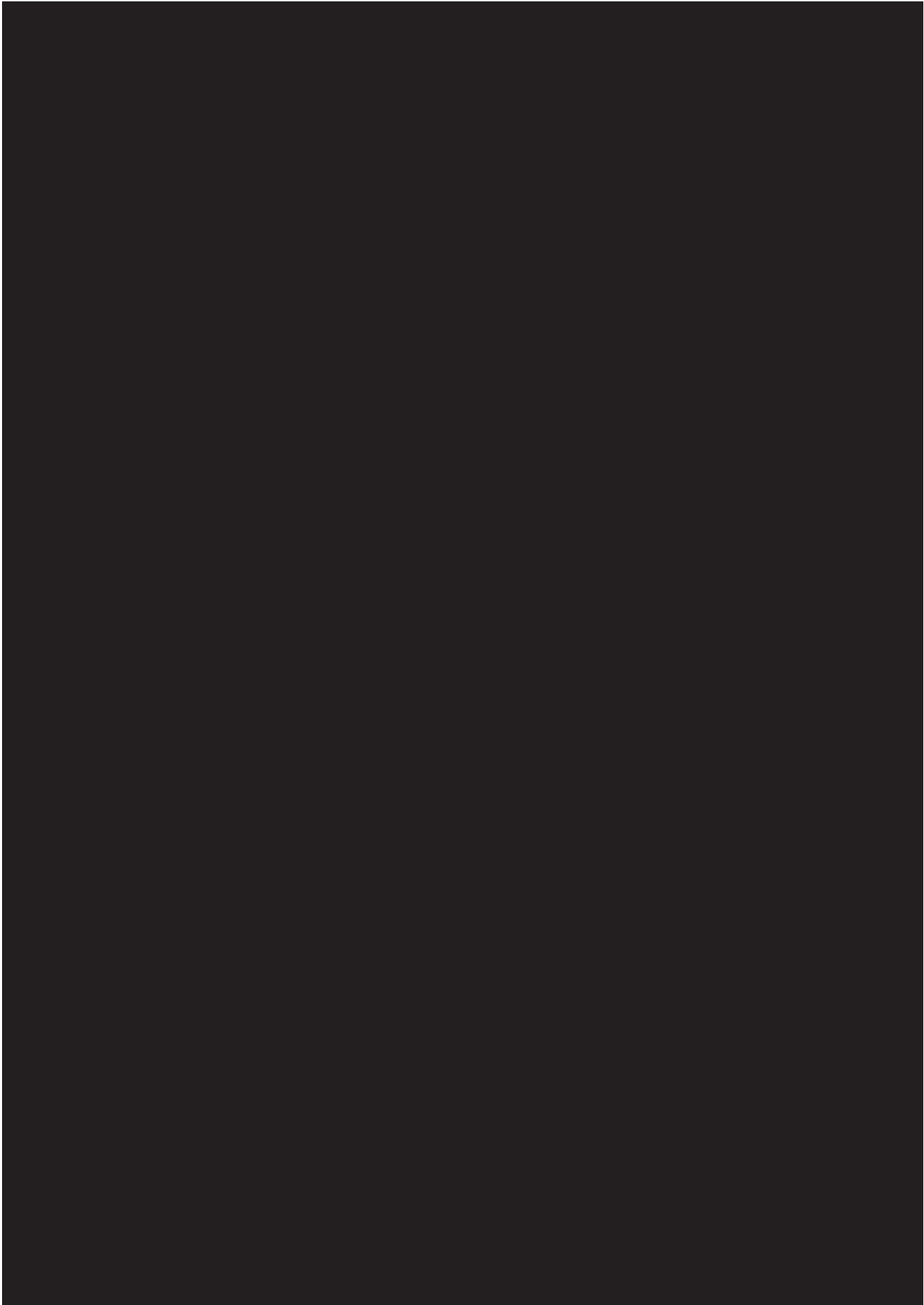














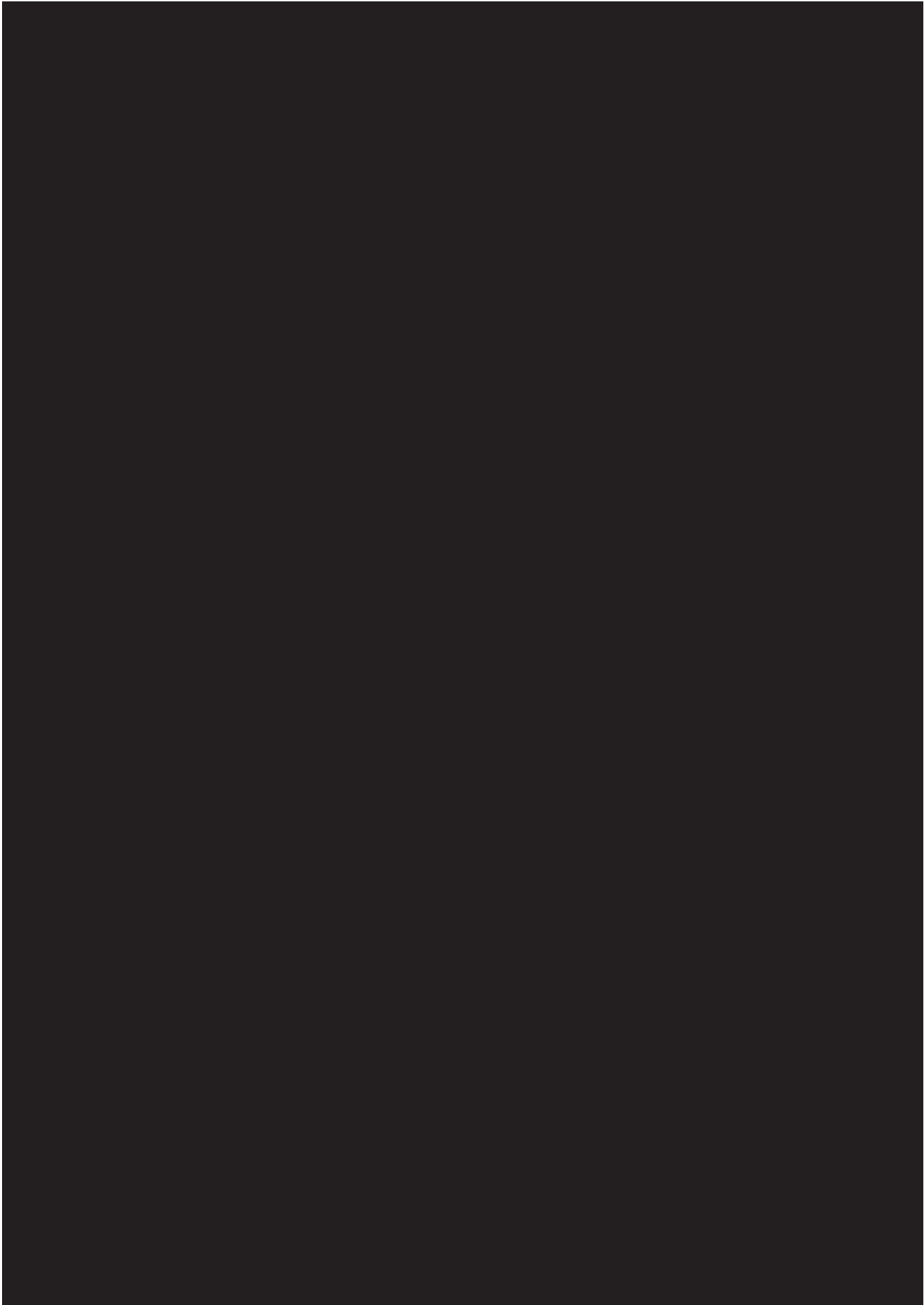




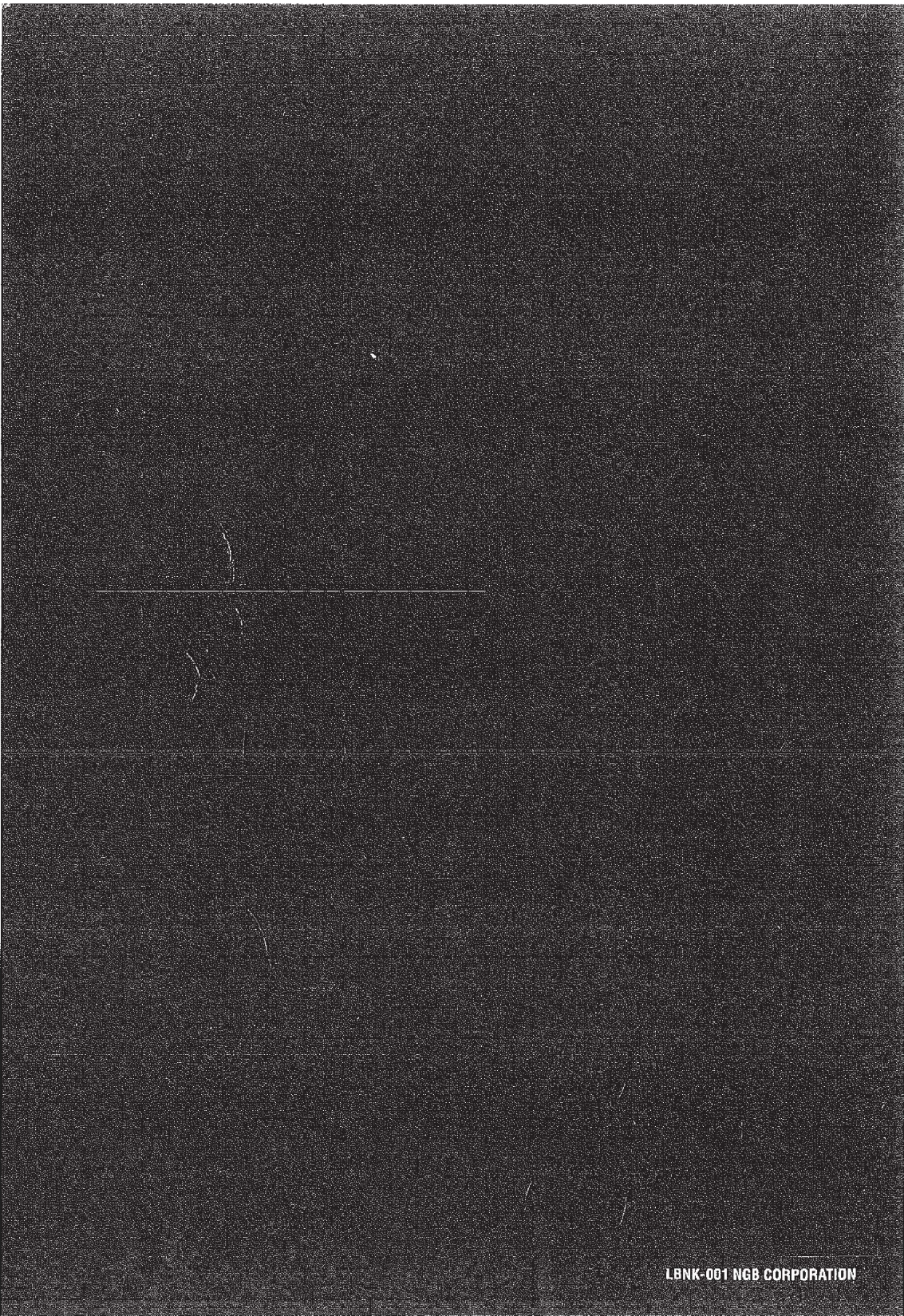












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