

2004. 9.

• •

..... 1

. 3

. 6

1. LED 6

2. LED 9

. LED 19

1. LED 19

2. LED 21

3. LED 29

4. LED 31

5. LED 33

. LED 34

. 38

..... 41

< -1> LED	.....	7
< -2> LED	.....	8
< -3> LED	.....	8
< -4> LED	가	9
< -5> LED	.....	12
< -6> LED	가	14
< -1> LED	.....	20
< -2> LED	.....	21
< -3> 電光	.....	23
< -4> LED	.....	24
< -5> LED	.....	25
< -6> LED	.....	26
< -7>	.....	28
< -8>	LED	29
< -9> LED	.....	30
< -10> LED	.....	31
< -1> LED	.....	34
< -2> LED	.....	35
< -3> LED	.....	35
< -4> LED	.....	36
< -1> LED	.....	19

LED(Light Emitting Diode,)

LED

. LED

, LED

LED

90%

10%

LED

1/10

10

가

LED

LED

LED

LED

24

가

LED

가

LED

가

가

가

LED

I.

,
 .
 LED(Light Emitting Diode,
) , LED
 . LED
 , LED
 .
 LED LED
 . LED
 (full color) , .
 , 3 , ,
 LED가 LED
 . , , LED ,
 LED .
 LED 가
 , 2 3 ,
 , LCD , ,

가 ,
LED 가

LED

가 ,

가 LED ,

1/3

LED

2

가 . 2010 , ,

LED , ,

가 , ,

가

LED
LED
LED 가

.
,
.

II

1. LED

1962 GE LED 가 , LED
LED , 1990 LED LED가,
1990 LED가 LED
LED 가 .
가 . . 3 LED .
3
, 가 가
LED
가 LED
LED
LED
LED LED
LED LED
LED LED
LED LED
LED LED

< -1> LED

	LED+TAG (日亞: 11-26114 / 住友: 2000-49374)	- -	- -	演色性
GaN	紫・近紫外LED+R,G,B (豊田合成+東芝)	- 性	(YAG , 演色 가)	-紫・近紫外LED (Cree 가 紫 LED(390nm))
	LED(InGaN)+ LED(InGaN)+ LED(AlGaAs)	- -	가 가	()
ZnSe	LED+ ZnSe (住友: 2000-82845)	- -	GaN (2.7V)	- - (8,000) -

: 産學 , 「固本照明革命を巻き起こすベンチャー-ビジネスと特許戦略」,
2001. 12.

LED

LED , , ,
, , , ,
, , LED
LED , 1993
1995 가 LED LED
가 LED 3 LED
, 가 LED
LED가

< -2> LED

LED	LED	, GaAs, GaN, ,
		pn , , , , , ,
LED	LED	, , , ,
		, , , , , ,
		LCD, , TV, ,
		, , , ,
		,
		, ,

: .

< -3> LED

TC1-62	LED 演色性
TC2-45	LED 光束測定 - CIE127
TC2-46	LED 光度測定 CIE/ISO
TC2-50	LED LED
TC2-58	LED 放射輝度
R4-22	LED
TC6-55	LED

: 日本 LED照明推進協議會.

, (CIE) LED

가

2. LED

(1) LED 가

LED

LED가

< -4> LED 가

LED	가	
指向性	局部照射器具(,)	, ,
	()	, ,
底	()	,
	(,)	,
	(가)	
	(,)	,
	()	,

: OITDA.

LED
LED
LED
, 가
LED
가 , , 가

(2) (LED)

LED
, 가
LED
LED 90%
10%
LED
1/10 , 10
365 24 가 LED
1/10
가 가 가
가

가

LED

LED 1990 가 2001

LED 「 가 LED LED (NEDO) 「 LED 1 4,600 LED 2 6,000 (CO₂) 가

4,333 kW, 가 1 8,000 가
 . 1

₩ (, 2003. 10. 29).
 2002 LED

(3) LED

(近紫外)

LED가

. LED ,

, ,

, 가

.

가

, 가 .

LED

가 가

,

< -5>

LED

	, , LED (), front pannel,
	, , , , , , 가 ,

(breakthrough)

(4) LED 가

LED , , 가
가

LED 가

가 가

LED 가 , LED

가,

가

LED

LED , LED

가)

(

(가)

가 LED

< -6> LED 가

- LED - LED
 - LED 가 , LED
 - 가 ,
 - LED 가
 - LED .
 - LED .
 - LED 가 .
 - 가, 가
 - () .
 - ,
 - LED () 가 .

: (KIET) .

LED .

(5) LED

1990 GaN LED가
 , LED
 . LED가 가
 (indicator)
 , R, G, B 3 ,
 , /

LED

1)

(, BMW)

LED

LED

LED

LED

LED 가

2)

LED가

()

가

LED가

. LED

LED 가

LED

LED

R, G, B

3

, , , , ,
LED .

3)

LED가
, LED가 가 , , , .

4)

LED 가 , , ,
()

LED가 . 380nm 가
가 .

(5) LED

LED가
. LED LED LED
LED .
가 가 , 450~
660nm

C
가

LED
LED
30%

LED
LED 70%

가

LED

LED

LED

(6)

LED(380nm)

가

()

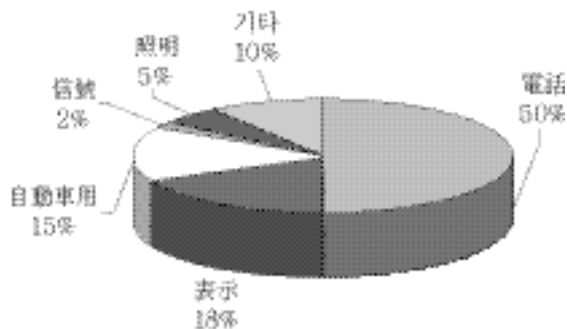
孔) 가 (380nm) (正
, 가 水
.
가 , ,
, , .

III LED

1. LED

LED
 2003 LED¹⁾ 27 2002
 47% 가
 , 50% ,
 , LED 가가 가 .

< -1> LED (2003 , 27)



: Strategies Unlimited, High-Brightness LED Market Review and Forecast 2003.

1) LED InGaAs, AlGaAs, InGaN

< -1> LED (2002)

	()	(%)
日亞化學	400	21.7
豐田合成	216	11.7
	153	8.3
	76	4.1
松下電器	57	3.1
東芝	41	2.2
	11	0.6
	3	0.2
三洋電機	3	0.2
	13	0.7
	974	52.9
Agilent	282	15.3
Lumileds	62	3.4
	20	1.1
	364	19.8
OSRAM Opto	208	11.3
	19	1.0
	227	12.3
	128	6.9
	112	6.1
	40	2.2
	280	15.2
	1,843	100.0

: Strategies Unlimited(2003).

， ，
， 18% .
，
가 .

< -2> LED (2002)

			-
	364	330	34
	974	598	376
	227	413	-186
	280	448	-168
	0	53	-53
	1,843	1,843	0

: Strategies Unlimited(2003).

LED ,
 ,
 LED 가 .
 LED ,
 53% 가 .
 , 3 40%
 . 6% .

2. LED

1998
 가 「電光
 (21 : 21世紀のあかり)」 .
 “21 ” LED
 . , LED 21

1997 12 3
 (COP3) 2010 (CO₂) 가
 1990 -6% .
 가 가 .
 1998
 (NEDO)가 20%

LED

NEDO (財)金屬系材料研究開發 (JRCM)
 田口常正
 , 13 7 가 . 5 (1998
 2002) 2 가 LED
 (GaN)
 , , . ,
 가) 가 (.
 , LED , LED
 , LED ,

< -3> 電光

	化成 / 鳥取大學 / 秋田大學 / 九州大學
	竝木精密寶石 / 住友化學工業 / 三重大學 / / 住友電氣工業
	三菱電機照明 / 千葉大學 / / 山田照明
	昭和電工 / 三菱電線工業 / 古河電氣工業 / 東京大學
發光機構解明	JRCM / 山口大學 / Agilent Technologies
	(財)日本電球工業會

: NEDO, 「 電光 (21) 」, 2003.

LED

LED 가 , 가

(WWW : World Wildlife

Fund)

LED

LED

LED LED

LED LED

가

< -4> LED

	2010	2010 CO ₂ (t C)	2020	2020 CO ₂ (t C)
LED	200 kW LED 2	137	600 kW	413
LED	17 LED 98	9	LED	9
LED	200 kW LED	120	400 kW LED	239
LED	200 kW LED	69	400 kW LED	138
LED	17 kW 70% LED 2	16	100%	23

: WWFジャパン(世界自然保護基金日本委員会)「WWF温暖化問題解決のためのシナリオ」2001.

LED

LED

“LED

100

LED

< -5> LED

日本電球工業會	- LED	1997. 7
日本照明器具工業會	LED照明器具	2003. 5
日本照明委員會 (JCIE)	LED	2003. 1
照明學會	LED	2002. 4 2004. 3

: LED

1999 “ LED
” LED
LED 全光束
「 JEL311
LED LED
, LED
6
, 200
LED OSRAM

. OSRAM

< -6>

LED

.		LED	(1996.8)
.	, Cree	LED	(1999.12)
.	Cree 가	LED	(2000.10)
.		LED ITC	(2000.12)
.	Cree ,	LED	(2000.12)
.	,	Cree	(2000.12)
.	,	(Cree)	(2001.5)
.	,	LED	(2001.7)
.		가 200	(2001.8)
.	,	LED	(2002.1)
.	,	LED	(2002.2)
.	,	Osram	(2002.6)
.			(2002.8)
.	,	Lumileds LED	(2002.10)
.	,	Cree ,	(2002.11)
.	,	LED	(2002.11)
.		가	(2002.12)
.	,	LED	(2003.7)
.	,	EPISTAR ,	(2003.10)
.		200	(2004.1)
.	,	LED	(2004.5)
.	,	LED	(2004.6)
.	,	Everlight LED	(2004.6)

: (KIET) .

LED

“ ”

LED

TV

가

가

LED

LED

가

가

가

,

LED

가

가

가

, 가

가

10

LED

가

1993 12 2004

LED 1996

2

가

LED

1986

(GaN)

LED

1991

1995 10

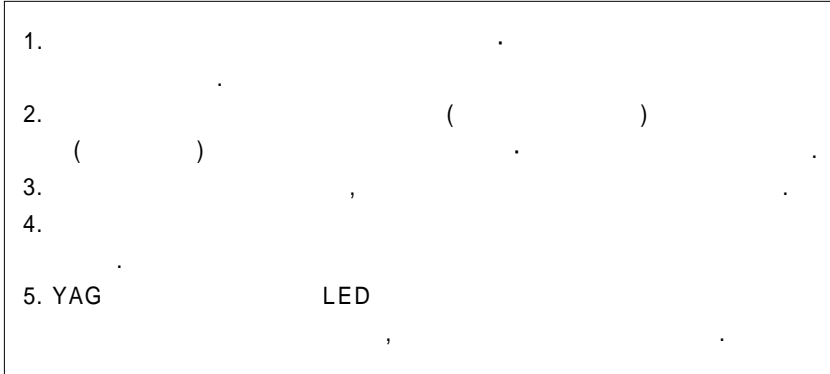
< -7 >

- (IP)
- ()
- 1 (0 5 ,) : ()
- 2 (5 ,) : ()
- 3 (10 ,) : (),
- 4 (10 ,) :

:

< -8>

LED



: (2002.9).

LED

1989

LED

1991

LED

1993 11

LED

YAG

LED

1996

LED

LED

3. LED

Sandia

(Opto electronic

Industry Development Association : OIDA)가

1999 가 (National Research Program on Semiconductor Lighting)

200 lm/W 5 ,

(DOE : Department of energy) DARPA() . Sandia

1999 가

2003 SEMATECH DOE

Solid State Lighting(SSL)

2001 7 Senate Bill S.1166 (The Next Generation Lighting Initiative) ,

20%

< -9> LED

	LED 2002	LED 2007	LED 2012	LED 2020		
(lm/W)	25	75	150	200	16	85
(khr)	20	>20	>100	>100	1	10
光束(lm/lamp)	25	200	1,000	1,500	1,200	3,400
(/klm)	200	20	<5	<2	0.4	1.5
(Color Render Index: CRI)	75	80	>80	>80	95	75
	Low-flux				-	-

: OIDA.

< -10>

LED

Hewlett-Packard Co. † Agilent Technologies
 Cree † Cree Lighting
 LumiLeds Lighting † Philips Lighting Agilent Technologies
 GELcore † GE Lighting EMCORE
 Advanced Illumination (Ai)
 Color Kinetics

10 4 8,000

2020

, 2007

, 2012

, 2020

2012

1/4 LED

, 2007

LED

200lm/W

가

2020

4. LED

ITRI(Industrial Technology and Research Ind.)

“ (Next generation lighting) ” 2002

R & D . 3 (2002 2005)

50 lm/W LED , R&D 100 lm/W가

LED LED

2003 12 가 「白光 LED
 研發聯盟次世代照明整合性計劃」
 LED

AlGaInP LED
 InGaN LED
 LED
 UEC, Epistar, Arima, Formosa Epitaxy
 10
 Steele 80 InGaN MOCVD 가
 2 5,000 /
 LED ,

LED 64% ,
 200 MOVPE (17)가
 MOVPE 2/3 LED ,
 HBT HEMT

5. LED

LED가

LED

2001 2007

LED

2003

6

「國家半導體照明工程協調」

LED

LED

가

「小康生活(

)」

LED

LED

LED

3

LED

80%가

LED

가

LED 50%

IV. LED

LED 가
 ,
 . 가
 LED .
 LED ,
 4 .
 , 66% 3 ,
 , , LED .
 LED ,
 가 .
 LED
 LCD LED

< -1> LED : , %

	2002	2003	가
	1,128	1,049	-7.0
	257	458	78.2
	1,379	1,488	7.9
	6	19	216.7

: KAIT, KOTIS.

:

< -2> LED

: , %

	2002	2003	가
	165	302	83.2
	41	78	89.7
	21	27	24.5
	12	25	102.5
	8	10	29.7

: KOTIS.

< -3> LED

-	- /
-	-
-	-
- ,	-
-	- , ,
-	-
-	-
-	-
가	가.

: (KIET)

LED

, LG

LED

LED

LED

< -4> LED

LG	<ul style="list-style-type: none"> • 2004 LED 1 , LED
	<ul style="list-style-type: none"> • 2004 LED , LED • LED , LCD • AlGaInP and InGaN LED • 2010 1
	<ul style="list-style-type: none"> • 2004 4 600 LED 1,000
	<ul style="list-style-type: none"> • 2004 4,000 LED BLU . . • LED
	<ul style="list-style-type: none"> • (GaAs) LED • 1
	<ul style="list-style-type: none"> • 50 · 100 · 150mm
	<ul style="list-style-type: none"> • LED (2004.4). LED 가 • (SSLDC) LED (2003.12)
	<ul style="list-style-type: none"> • (GaN) LED • (MOCVD)
	<ul style="list-style-type: none"> • LCD LED
	<ul style="list-style-type: none"> • Epi Wafer , Red LED InGaAIP
	<ul style="list-style-type: none"> • LED LED
	<ul style="list-style-type: none"> • LED ,
	<ul style="list-style-type: none"> • LED 700 /
	<ul style="list-style-type: none"> • 2004 4000 LED LCD BLU
	<ul style="list-style-type: none"> • 2004 100 LED , LCD BLU

: (KIET) .

LCD

LED

가

LED

LED

“ EL

LED

”(2001. 12 2004.

LG

12 : 26)

LED

(2001 2003 :

52.74)

V.

LED

LED

LED

LED

LED

24

LED

가

가

가

가

LED

가 LED
가
가
가 , LED
LED 가
가 , KS
가 LED
가 LED LED
가 LED
가 LED
가 LED
가 LED
LED
가 LED
가 LED
가 LED
LED

가

LED

< >

山口榮一, 「青色LED「200億円判決」の決定的な誤り」, 同志社大學,
2004. 2.

システム技術研究所, 「地域における地球温暖化対策」, 2003. 2.

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WWFジャパン(世界自然保護基金日本委員會) 「WWF温暖化問題解決のためのシナリオ」, 2001.

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An OIDA Technology Roadmap Update 20002 , September
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Strategies Unlimited, High-Brightness LED Market Review and Forecast 2003.

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