

Product /Process Change Notification

PCN Number: PCN-202109290001

Create Date: 29th Sep, 2021

Issue By PD: William Lin

1. Description of Change:

For more flexible and smooth production support and reduce shipment impact from current supplier, LITEON would add ChangeLight dice as 2nd source, keep the same performance, quality, and RA requirements. The action will implement at the end of November 2021.

2. Products Affected:

Please refer to list attached.

3. Before:

Products with Epistar dices for Green/ Hyer Red/ Red/ Super Red/ Yellow/ Yellow Orange colors

4. After:

Adding ChangeLight dices as 2nd source for Green/ Hyer Red/ Red/ Super Red/ Yellow/ Yellow Orange colors

5. Effected date :

The action will implement at the end of November 2021, if there is no feedback.

6. Available of sample:

6~8 weeks after receiving sample request.

Customer Approval Portion:

* Approved (____), Remark: _____

* Rejected (____), Reason (_____)

CUSTOMER REPRESENTATIVE NAME/TITLE:

SIGNATURE:

DATE:

E-MAIL:

PHONE:

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Products Affected:

Green

LTC-3620KG	LTC-5675KG	LTC-7500KG	LTD-4608JG-31	LTS-546AJG	LTS-547AJG
LTS-5603AJG	LTS-6780KG	LTD-4608JG	LTC-2723KG	LTC-4627JG	LTC-5836JG
LTD-4830CKG-P	LTP-4823JG-05	LTS-4302JG-04	LTS-4802JG		

Hyper Red

LSHD-A101	LSHD-F101	LTA-1101M	LTC-2623JD	LTC-2721JD	LTC-4624JD
LTC-5689KD	LTC-5689KD-01	LTC-571JD	LTC-5836JD	LTD-2701JD	LTD-4608KD-01
LTD-6740JD	LTP-3862JD	LTS-546AJD-25	LTS-4801KD-15	LTS-546AJD	LTS-547AJD
LSHD-A103	LTS-3367KD-HB	LTS-3861JD			

Red

LSHD-7501	LTS-2801AJE	LTS-8309KE	LTS-8809KE	LTS-4812ACKE-PM	LTD-4416CKE-PM
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Super Red

LTC-5685KR-S4	LTC-4624JR	LTC-4625JR	LTC-4724JR	LTC-4727JR	LTD-4608JR
LTD-4708JR	LTP-1557AKR	LTS-2301AJR-13	LTS-2801AJR	LTS-3361JR	LTS-367KR-02
LTS-3861JR	LTS-4301JR	LTS-4302KR-04	LTS-4801JR	LTS-4802BJR-H1	LTS-5003AJR
LTS-546AKR-16	LTS-5001AJR-04	LTC-2623JR	LTS-2806CKR-P	LTS-4812ACKR-P	LTS-4817CKR-PR
LTS-5003AJR-06	LTS-5325CKR-P	LTS-8809KR			

Yellow

LTC-2728JS	LTC-4727JS	LTS-3361JS	LTD-2601JS	LTC-36D4KS	
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Yellow Orange

LTC-3698KF	LTC-4627JF	LTC-4781AKF	LTS-10804KF	LTS-546AKF	LTC-46C6KF
LTD-2601KF					



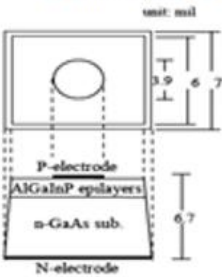
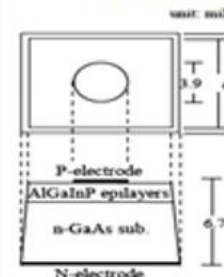
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Dice Comparison - Appearance

➤ Comparison Result

- EPI structure are the same
- Electrode polar and structure : P side up type , structure are different
- Pad material are the same
- Outline dimension of dice are the same

Vendor Name	Change Light	Epistar
EPI Structure	AlInGaP	AlInGaP
Electrode Polar and structure	P side up  <p>poly gon</p>	P side up  <p>circular</p>
Pad Material	Aluminum Pad	Aluminum Pad
Dice Figure		

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Summary for Reliability

- Test result summary of Change Light dice by different colors
- Approved by Liteon QA

Liteon PN Series RA Test Items	Green	Red	Hyper Red	Super Red	Yellow	Yellow
	02-KG-SSB (Change Light)	02-KE-SS7 (Change Light)	02-KD-SS3 (Change Light)	02-KR-SS4A (Change Light)	02-KR-SS3C (Change Light)	02-KS-SS4D (Change Light)
Life Test	pass	pass	pass	pass	pass	-
High Temperature High Humidity Storage Test	pass	pass	pass	pass	pass	-
Temperature Cycling Test	pass	pass	pass	pass	pass	pass
Thermal Shock Test	pass	pass	pass	pass	pass	pass
High temp. storage	pass	pass	-	-	-	-
Low temp. storage	pass	pass	-	-	-	-
reference	Appendix 1	Appendix 2	Appendix 3	Appendix 4	Appendix 5	Appendix 6

□ RA test condition :

Test Item	Test condition
Life test	Test temp. = room temp. (25~30°C) IF = 10mA * Test time = 1000 hrs
High temp./humidity	Test temp. = 85 ± 5 °C Humidity = 90 ~ 95 % Test time = 1000 hrs.
Thermal shock	Test temp. = 105 ± 5 °C Test time = 1000 hrs
Thermal cycle	Test temp. = -35 ± 5 °C Test time = 1000 hrs
High temp. storage	105°C ~ 25°C ~ -35°C ~ 25°C 30 mins 5 mins 30 mins 5 mins 30 cycles
Low temp. storage	105 ± 5 °C ~ -35 ± 5 °C 15 mins 15 mins 30 cycles

□ RA test criteria :

Item	Criteria for RA after and before
Forward Voltage (VF) decay ratio	0% < shift ratio < 20%
Luminous Intensity (IV) decay ratio	0% < decay ratio < 50%

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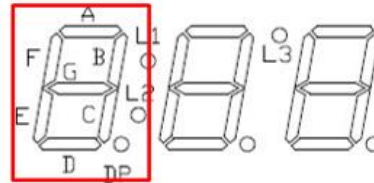
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Green Color Comparison

Appendix 1

- Liteon PN : 02-KG-SS series
- Test with ND Display device : LTC-4724JG
- Dice color : Green
- RA test meet QA spec.
 - Test result meet QA spec.
 - Dice performance are the same

Measured segment



IV & VF compared of life test

RA test result

Luminous Intensity measurement IF=20mA Unit: mcd				Forward Voltage measurement IF=20mA Unit: volt				Liteon PN Series		
checkpoint	Initial(0hr)	1000hrs	decay rate(%)	checkpoint	Initial(0hr)	1000hrs	shift rate(%)	02-KG SSB (change Light)	02-KG SSB (Epistar)	
Vendor				Vendor				RA Test items		
Change Light	11.4	11.0	4%	Change Light	2.08	2.08	0%	Life test	pass	pass
Epistar	11.6	11.0	5%	Epistar	2.03	2.04	0%	High temp./humidity	pass	pass
								Thermal shock	pass	pass
								Thermal cycle	pass	pass
								High temp. storage	pass	pass
								Low temp. storage	pass	pass

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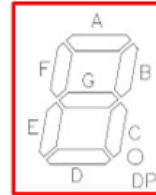
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Red Color Comparison

Appendix 2

- Liteon PN : 02-KE-SS series
- Test with ND Display device : LTS-4812CKE -PMDL
- Dice color : Red
- RA test meet QA spec.
 - Test result meet QA spec.
 - Dice performance are the same

Measured segment



IV & VF compared of life test

Luminous Intensity measurement IF=10mA Unit: mcd				Forward Voltage measurement IF=20mA Unit: volt			
checkpoint	Initial(0hr)	1000hrs	decay rate(%)	checkpoint	Initial(0hr)	1000hrs	shift rate(%)
Vendor				Vendor			
Change Light	19.2	18.7	3%	Change Light	2.04	2.04	0%
Epistar	20.1	19.1	5%	Epistar	2.04	2.04	0%

RA test result

RA Test Items	Liteon PN Series	
	02-KE-SS7 (change Light)	02-KE-SS7 (Epistar)
Life test	pass	pass
High temp./humidity	pass	pass
Thermal shock	pass	pass
Thermal cycle	pass	pass
High temp. storage	pass	pass
Low temp. storage	pass	pass

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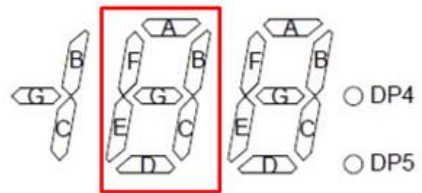
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Hyper Red Color Comparison

Appendix 3

- Liteon PN : 02-KD-SS series
- Test with ND Display device : LTC-5689KD -01
- Dice color : Hyper Red
- RA test meet QA spec.
 - Test result meet QA spec.
 - Dice performance are the same

Measured segment



IV & VF compared of life test

Luminous Intensity measurement IF=20mA Unit: mod			
check point	Initial(0hr)	1000hrs	decay rate(%)
Vendor			
Change Light	15.5	15.0	3%
Epistar	16.1	15.5	4%

Forward Voltage measurement IF=20mA Unit: volt			
check point	Initial(0hr)	1000hrs	shift rate(%)
Vendor			
Change Light	1.98	2.01	2%
Epistar	2.00	2.01	0%

RA test result

RA Test Items	Liteon PN Series	
	02-KD-SS3 (change Light)	02-KD-SS3 (Epistar)
Life test	pass	pass
High temp./humidity	pass	pass
Thermal shock	pass	pass
Thermal cycle	pass	pass

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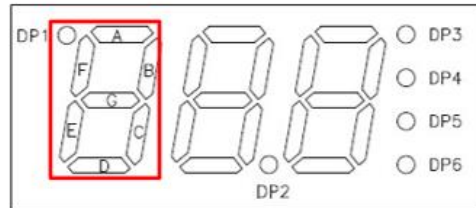
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Super Red Color Comparison

Appendix 4

- Liteon PN : 02-KR-SS series
- Test with ND Display device : LTC-5685KR -S4
- Dice color : Super Red
- RA test meet QA spec.
 - Test result meet QA spec.
 - Dice performance are the same

Measured segment



IV & VF compared of life test

Luminous Intensity measurement IF=10mA Unit: mcd				Forward Voltage measurement IF=10mA Unit: volt				RA Test Items		
check point	Initial(0hr)	1000hrs	decay rate(%)	check point	Initial(0hr)	1000hrs	shift rate(%)	LiteonPNSeries	02-KR-SS3 (change Light)	02-KR-SS3 (Epistar)
Vendor				Vendor				Life test	pass	pass
Change Light	18.2	17.5	4%	Change Light	1.99	2.01	1%	High temp./humidity	pass	pass
Epistar	14.8	14.0	5%	Epistar	2.02	2.04	1%	Thermal shock	pass	pass
								Thermal cycle	pass	pass

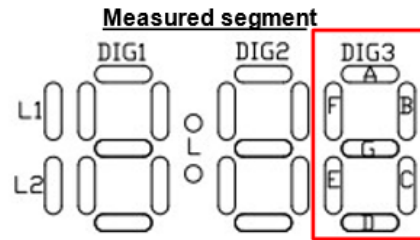
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Yellow Orange Color Comparison

Appendix 5

- Liteon PN : 02-KF-SS series
- Test with ND Display device : LTC-3698KF
- Dice color : Yellow Orange
- RA test meet QA spec.
 - Test result meet QA spec.
 - Dice performance are the same



IV & VF compared of life test

Luminous Intensity measurement F=20mA Unit:md				Forward Voltage measurement IF=20mA Unit:volt			
check point	initial(0hrs)	1000hrs	decay rate(%)	check point	initial(0hrs)	1000hrs	decay rate(%)
Vendor				Vendor			
Change Light	27	25.8	4%	Change Light	2.11	2.11	0%
Epistar	28.5	28.4	0%	Epistar	2.02	2.02	2%

RA test result

RA Test Items	LiteonPNSeries	
	02-KF-SS3C (change Light)	02-KF-SS3C (Epistar)
Life test	pass	pass
High temp./humidity	pass	pass
Thermal shock	pass	pass
Thermal cycle	pass	pass

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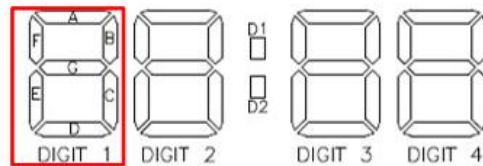
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Yellow Color Comparison

Appendix 6

- Liteon PN : 02-KS-SS3 series
- Test with ND Display device : LTC-36D4KS
- Dice color : Yellow
- RA test meet QA spec.
 - Test result meet QA spec.
 - Dice performance are the same

Measured segment



IV & VF compared of life test

Luminous Intensity measurement IF=1mA Unit:μcd				Forward Voltage measurement F=20mA Unit:volt			
checkpoint	Initial(0hr)	1000hrs	decayrate(%)	checkpoint	Initial(0hr)	1000hrs	shift rate(%)
Vendor				Vendor			
Change Light	683.2	681.0	0%	Change Light	2.10	2.11	0%
Epistar	683.6	681.6	0%	Epistar	2.10	2.13	1%

RA test result

RA Test Items	Liteon PN Series	
	02-KS-SS3A (change Light)	02-KS-SS3A (Epistar)
Life test	pass	pass
High temp./humidity	pass	pass
Thermal shock	pass	pass
Thermal cycle	pass	pass

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Summary for the EVA report

Conclusion :

- ① Electrode Polar structure of Change Light dice is different from Epistar, but this is not effective to the any processes or dice spec.
- ② ChangeLight dice RA test was approved by LITEON criteria.
- ③ ChangeLight and Epistar dice have the same optical performance according to the test result.