

Product /Process Change Notification

PCN Number:

Create Date: 9th Sep, 2021

Issue By PD: William Lin

1. Description of Change:

Due to OTC / Tyntek dice shortage, dice lead time will be over 8 months. To avoid unpredictable delivering date, LITEON decide to add Epistar dice as 2nd source.

LITEON will keep the same performance, quality, and RA requirements; The action will implement at the end of November 2021.

2. Products Affected:

LSHD-5601	LTC-571HR	LTG-0412M-01	LTL-2785Y	LTP-305G
LSHD-7801	LTC-5723HR	LTG-0412M-03	LTL-2820G	LTP-305HR
LSHD-7803	LTC-5861G	LTG-0412M-05	LTL-2885G	LTP-3362G
LTA-1000E	LTC-5892HG	LTG-0605M-00	LTL-53173Y	LTP-3784E
LTA-1000G	LTD-2601G	LTG-0605M-01	LTL-54173G	LTP-3784G
LTA-1000HR	LTD-2601G-11	LTG-0605M-02	LTL-57173HR	LTP-3784G-01
LTA-1000Y	LTD-2701B	LTG-0605M-03	LTM-0537G-02	LTP-3786E
LTC-2623E	LTD-2701G	LTG-0605M-04	LTM-0538G-02	LTP-3786G
LTC-2721G	LTD-4708G	LTG-0605M-09	LTM-8522E	LTP-3862G
LTC-2723E	LTD-482EC	LTJ-811G	LTM-8522G	LTP-4323G
LTC-2723G	LTD-5250HR-03	LTJ-811HR	LTM-8522HR	LTS-6960HR
LTC-2723Y	LTD-5521AE	LTJ-811Y	LTM-8530G	LTS-6980HR
LTC-3710G	LTD-5621AG	LTL-2350HR	LTM-8647AG	LTS-7651HR
LTC-4627G	LTD-5623AG	LTL-2400Y	LTM-8647AHR	LTS-7673GN
LTC-4724G	LTD-6410G	LTL-2450Y	LTP-1057AG	LTP-587G
LTC-4727G	LTD-6440G	LTL-2550G	LTP-1057AHR	LTP-587HR
LTC-4727Y	LTD-6610E	LTL-2620HR	LTP-1257AA-01	LTP-587SE-01
LTC-561E	LTD-6910HR	LTL-2655HR	LTP-1457AG	LTP-587Y
LTC-561HR	LTD-6930HR	LTL-2685HR	LTP-1557AG	LTP-747G
LTC-5623G	LTD-6940HR	LTL-2755Y	LTP-2158AHR	LTP-757G
LTS-2801AE	LTS-3401LG	LTS-4301E	LTS-4801G	LTS-5503AE

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LTS-2801AG	LTS-3401LY	LTS-4301G	LTS-4910AHR	LTS-5601AG
LTS-312AE	LTS-3403LE	LTS-4510AG	LTS-4940AHR	LTS-5603AG
LTS-312AG	LTS-3403LG	LTS-4540AG	LTS-546AE	LTS-5701AY
LTS-312AHR	LTS-360G	LTS-4610AE	LTS-546AHR	LTS-5703AY
LTS-313AHR	LTS-360HR	LTS-4640AE	LTS-547AE	LTS-6460G
LTS-313AHR	LTS-367G	LTS-4801E	LTS-5501AE	LTS-6480G
LTS-315AHR	LTS-367HR			

Before:

Display's dice material with OTC / Tyntek dice.

3. After:

Adding Epistar dice as 2nd source. Please refer evaluate report as appendix.

4. Effected date :

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

Customer Approval Portion:

* **Approved (____), Remark:** _____

* **Rejected (____), Reason (_____)**

CUSTOMER REPRESENTATIVE NAME/TITLE:

SIGNATURE:

DATE:

E-MAIL:

PHONE:

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Appendix :

Specification for Finish Good- Orange dice

ABSOLUTE MAXIMUM RATING

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation Per Segment	75	mW
Peak Forward Current Per Segment (Frequency 1Khz, 10% duty cycle)	100*	mA
Continuous Forward Current Per Segment	25	mA
Forward Current Derating from 25°C	0.28	mA/°C
Reverse Voltage Per Segment	5	V
Operating Temperature Range	-35°C to +105°C	
Storage Temperature Range	-35°C to +105°C	
Soldering Conditions : 1/16 inch below seating plane for 3 seconds at 260°C		

* see figure 5 to establish pulsed condition

ELECTRICAL / OPTICAL CHARACTERISTICS AT Ta=25°C

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Average Luminous Intensity Per Segment	I _v	500	1560		μcd	I _r = 10mA
Peak Emission Wavelength	λ _p		610		nm	I _r = 20mA
Spectral Line Half-Width	Δλ		35		nm	I _r = 20mA
Dominant Wavelength	λ _d		602		nm	I _r = 20mA
Forward Voltage Per Segment	V _f		2.1	2.6	V	I _r = 20mA
Reverse Current Per Segment	I _r			100	μA	V _R = 5V
Luminous Intensity Matching Ratio	I _{v-m}			2 : 1		I _r = 10mA

Note: Luminous Intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

Luminous Intensity and Dominant Wavelength-Orange dice

Luminous Intensity,LTD-482AC-08J

UNIT: ucd
TEST CONDITION: IF = 10 mA
MEASURING EQUIPMENT: J17 TEKTRONIX
SPEC IV: Min 500 ucd, Typ 1560 ucd

Digit	Tyntek					Digit	Epistar				
	PRODUCT NO.						PRODUCT NO.				
	No.1	No.2	No.3	No.4	No.5	No.1	No.2	No.3	No.4	No.5	
Luminous Intensity	2489.1	2398.4	2471.9	2653.1	2439.2	Luminous Intensity	3149.6	3360.9	3335.9	3188.7	3262.4

Result : Luminous Intensity within DS spec

Dominant Wavelength,LTD-482AC-08J





UNIT: nm
TEST CONDITION: 20mA
MEASURING EQUIPMENT: CAS-140B
SPEC: Typ, 602 nm

Digit	Tyntek					Digit	Epistar				
	PRODUCT NO.						PRODUCT NO.				
	No.1	No.2	No.3	No.4	No.5	No.1	No.2	No.3	No.4	No.5	
Dominant Wavelength	602.5	602.5	602.5	602.0	602.4	Dominant Wavelength	601.6	600.8	601.0	601.8	601.3


Result : Dominant Wavelength within DS spec

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Light-up/Cross-talk- Orange dice

	Tyntek	Epistar
Light-up		
Cross-talk		

Reliability test- Orange dice

 Liteon Electronics (Thailand) Co.,Ltd.	RQN :	2105004434	N/D Products Reliability test plan Subject: Trial run 02-AAS1 (C07SOS-RS)							
	Product :	N/D								
	Device :	LTD-482AC-08J								
	Request date :	19-May-21								
	Requester :	Supomrat K. # 6003								
Numeric Display Products Stress test										
	Stress items	Test conditions	S/S (pc)	Read point	Plan		Actual		Result	Remark
					Start date	Finish date	Start date	Finish date		
	Pre-condition	Solder 260°C, 5 Sec	44	↓ 2x						
Environmental test	T/C Temperature Cycling	Temp. -35°C/ 25°C/ 105°C/ 25°C Dwell time 30/ 5/ 30/ 5 min	22	50 Cycles	20-May-21	22-May-21	19-May-21	19-May-21	PASS	
				100 Cycles	22-May-21	25-May-21	20-May-21	22-May-21	PASS	
	T/S Thermal shock	Temp. -35°C/ 105°C ± 5°C Dwell time 15min/ 15min	22	50 Cycles	20-May-21	22-May-21	20-May-21	22-May-21	PASS	
				100 Cycles	22-May-21	24-May-21	22-May-21	24-May-21	PASS	

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Conclusion- Orange dice

- **Luminous Intensity**
 - Display product within spec.
- **Dominant Wavelength**
 - Display product within spec.
- **Light-up/Cross-talk** : Passed
- **Reliability test** : Passed

Specification for Finish Good- Green dice

ABSOLUTE MAXIMUM RATING AT Ta=25°C

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation Per Segment	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	100	mA
Continuous Forward Current Per Segment	25	mA
Derating Linear From 25°C Per Segment	0.33	mA/°C
Reverse Voltage Per Segment	5	V
Operating Temperature Range	-35°C to +85°C	
Storage Temperature Range	-35°C to +85°C	

Solder Temperature: max 260°C for max 3sec at 1.6mm[1/16inch] below seating plane.

ELECTRICAL / OPTICAL CHARACTERISTICS AT Ta=25°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2200		μcd	I _f =10mA
Peak Emission Wavelength	λ _p		565		nm	I _f =20mA
Spectral Line Half-Width	Δλ		30		nm	I _f =20mA
Dominant Wavelength	λ _d		569		nm	I _f =20mA
Forward Voltage Per Segment	V _f	2.1	2.6		V	I _f =20mA
Reverse Current Per Segment	I _r			100	μA	V _r =5V
Luminous Intensity Matching Ratio	Iv-m			2:1		I _f =10mA

Note: Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

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Luminous Intensity and Dominant Wavelength- Green dice

Luminous Intensity,LTD-482G
 UNIT: ucd
 TEST CONDITION: IF = 10 mA
 MEASURING EQUIPMENT: J17 TEKTRONIX
 SPEC: Min = 800ucd , Typ = 2200 ucd

Digit	Tyntek					Digit	Epistar				
	PRODUCT NO.						PRODUCT NO.				
	No.1	No.2	No.3	No.4	No.5		No.1	No.2	No.3	No.4	No.5
Luminous Intensity	3014.6	3055.5	2885.4	3004.6	2930.6	Luminous Intensity	3452.8	3533.4	3681.7	3457.7	3700.6





Result : Luminous Intensity within DS spec

Dominant WavelengthLTD-482G
 UNIT: nm
 TEST CONDITION: 20mA
 MEASURING EQUIPMENT: CAS-140B
 SPEC: Typ, 569nm

Digit	Tyntek					Digit	Epistar				
	PRODUCT NO.						PRODUCT NO.				
	No.1	No.2	No.3	No.4	No.5		No.1	No.2	No.3	No.4	No.5
Dominant Wavelength	572.7	572.7	572.4	572.3	572.2	Dominant Wavelength	568.5	568.9	568.9	568.4	569.1


Result : Dominant Wavelength within DS spec

Light-up/Cross-talk- Green dice

	Tyntek	Epistar
Light-up		
Cross-talk		

Product /Process Change Notification

Reliability test- Green dice

 Liteon Electronics (Thailand) Co., Ltd.		RQN : 2102002426 Product : N/D Device : LTD-482G Request date : 17-May-21 Requester : Suponrat K. # 6003		N/D Products Reliability test plan Subject: Trial Run Dice C07SYG-RS						
Numeric Display Products Stress test										
Stess items	Test conditions	S/S (pc)	Read point	Plan		Actual		Result	Remark	
				Start date	Finish date	Start date	Finish date			
Pre-condition	Solder 260°C, 5 Sec	44	2x	18-May-21	19-May-21	18-May-21	19-May-21			
T/C Temperature Cycling	Temp. -35°C/ 25°C/ 105°C/ 25°C Dwell time 30/ 5/ 30/ 5 min	22	50 Cycles	19-May-21	22-May-21	19-May-21	22-May-21	PASS		
				23-May-21	26-May-21	23-May-21	26-May-21	PASS		
T/S Thermal shock	Temp. -35°C/ 105°C ± 5°C Dwell time 15min/ 15min	22	50 Cycles	19-May-21	21-May-21	19-May-21	21-May-21	PASS		
				22-May-21	24-May-21	22-May-21	24-May-21	PASS		
SR Solder resistance	T.Sol = 260°C Soak time =10 Sec. ± 1 Sec 3 mm. from base of epoxy bulb	5	10 Sec	18-May-21	19-May-21	18-May-21	19-May-21	PASS	5 pcs (ND Product) 5 pcs measurement data	
SA Solderability	T.Sol = 245°C Soak time = 5 ± 0.5 sec	5	5 Sec	18-May-21	19-May-21	18-May-21	19-May-21	PASS	5 pcs (ND Product) 5 pcs go/no-go	

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Conclusion- Green dice

- **Luminous Intensity**
 - Display product within spec.
- **Dominant Wavelength**
 - Display product within spec.
- **Light-up/Cross-talk** : Passed
- **Reliability test** : Passed

Product /Process Change Notification

Specification of Display-Red dice

ABSOLUTE MAXIMUM RATING AT T_A=25°C

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation Per Segment	75	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	100	mA
Continuous Forward Current Per Segment	25	mA
Derating Linear From 25°C Per Segment	0.33	mA/°C
Reverse Voltage Per Segment	5	V
Operating Temperature Range	-35°C to +85°C	
Storage Temperature Range	-35°C to +85°C	
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C		

ELECTRICAL / OPTICAL CHARACTERISTICS AT T_A=25°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I _v	800	2200		μcd	I _F =10mA
Peak Emission Wavelength	λ _p		635		nm	I _F =20mA
Spectral Line Half-Width	Δλ		40		nm	I _F =20mA
Dominant Wavelength	λ _d		623		nm	I _F =20mA
Forward Voltage, Per Segment	V _F		2.0	2.6	V	I _F =20mA
Reverse Current, Per Segment	I _R			100	μA	V _R =5V
Luminous Intensity Matching Ratio	I _v -m			2:1		I _F =10mA

Note: Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Eclairage) eye-response curve.

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Luminous Intensity and Dominant Wavelength-Red dice

Luminous Intensity,LTS-4802HR-07J

UNIT: ucd
 TEST CONDITION: I_F = 10 mA
 MEASURING EQUIPMENT: J17 TEKTRONIX
 SPEC: Min = 800ucd , Typ = 2200 ucd

Digit	Tyntek					Digit	Epistar				
	No.1	No.2	No.3	No.4	No.5		No.1	No.2	No.3	No.4	No.5
Luminous Intensity	3341.0	3340.7	3342.1	3342.9	3340.1	Luminous Intensity	3940.4	3819.4	4188.2	4042.2	3800.1

Result : Luminous Intensity within DS spec

Dominant Wavelength,LTS-4802HR-07J

UNIT: nm
 TEST CONDITION: 20mA
 MEASURING EQUIPMENT: CAS-140B
 SPEC: Typ = 623 nm







Digit	Tyntek					Digit	Epistar				
	No.1	No.2	No.3	No.4	No.5		No.1	No.2	No.3	No.4	No.5
Dominant Wavelength	618.8	619.0	619.1	619.0	618.8	Dominant Wavelength	611.2	611.2	611.3	611.3	611.3

Result : Dominant Wavelength within DS spec



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Product /Process Change Notification

Light-up/Cross-talk-Red dice

	OTC	Epistar
Light-up		
Cross-talk		
Appearance		

Reliability test-Red dice

 Liteon Electronics (Thailand) Co., Ltd.		RQN : 2105004593		N/D Products Reliability test plan Subject: Trial Run Dice C07SO-RS						
		Product : N/D								
		Device : LTS-4802HR-07J								
		Request date : 17-May-21								
		Requester : Supomrat K. # 6003								
Numeric Display Products Stress test										
Stress items	Test conditions	S/S (pc)	Read point	Plan		Actual		Result	Remark	
				Start date	Finish date	Start date	Finish date			
Pre-condition	Solder 260°C, 5 Sec	44		18-May-21	19-May-21	18-May-21	19-May-21			
Environmental test	T/C Temperature Cycling	Temp. -35°C/ 25°C/ 105°C/ 25°C Dwell time 30/ 5/ 30/ 5 min	22	50 Cycles	19-May-21	22-May-21	19-May-21	22-May-21	PASS	
				100 Cycles	23-May-21	26-May-21	23-May-21	26-May-21	PASS	
	T/S Thermal shock	Temp. -35°C/ 105°C ± 5°C Dwell time 15min/ 15min	22	50 Cycles	19-May-21	21-May-21	19-May-21	21-May-21	PASS	
				100 Cycles	22-May-21	24-May-21	22-May-21	24-May-21	PASS	
SR Solder resistance	T.Sol = 260°C Soak time =10 Sec. ± 1 Sec 3 mm. from base of epoxy bulb	5	10 Sec	18-May-21	19-May-21	18-May-21	19-May-21	PASS	5 pcs (ND Product) 5 pcs measurement data	
				SA Solderability	T.Sol = 245°C Soak time = 5 ± 0.5 sec	5	5 Sec	18-May-21	19-May-21	18-May-21

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Conclusion-Red dice

- **Luminous Intensity**
 - Display product within spec.
- **Dominant Wavelength**
 - Display product within spec.
- **Light-up/Cross-talk** : Passed
- **Reliability test** : Passed

Specification for Finish Good- Yellow dice

ABSOLUTE MAXIMUM RATING AT Ta=25°C

PARAMETER	MAXIMUM RATING	UNIT
Power Dissipation Per Segment	60	mW
Peak Forward Current Per Segment (1/10 Duty Cycle, 0.1ms Pulse Width)	80	mA
Continuous Forward Current Per Segment	20	mA
Derating Linear From 25°C Per Segment	0.27	mA/°C
Reverse Voltage Per Segment	5	V
Operating Temperature Range	-35°C to +85°C	
Storage Temperature Range	-35°C to +85°C	
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C		

ELECTRICAL / OPTICAL CHARACTERISTICS AT Ta=25°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		μcd	If=10mA
Peak Emission Wavelength	λp		585		nm	If=20mA
Spectral Line Half-Width	Δλ		35		nm	If=20mA
Dominant Wavelength	λd		588		nm	If=20 mA
Forward Voltage Per Segment	Vf		2.1	2.6	V	If=20 mA
Reverse Current Per Segment	Ir			100	μA	Vr=5V
Luminous Intensity Matching Ratio	Iv-m			2:1		If=10 mA

Note: Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission Internationale De L'Éclairage) eye-response curve.

Product /Process Change Notification

Luminous Intensity and Dominant Wavelength- Yellow dice

Luminous Intensity,LTS-5701AY
 UNIT: ucd
 TEST CONDITION: IF = 10 mA
 MEASURING EQUIPMENT: J17 TEKTRONIX
 SPEC: Min = 800ucd , Typ = 2400 ucd

Digit	Tyntek					Digit	Epistar				
	PRODUCT NO.						PRODUCT NO.				
	No.1	No.2	No.3	No.4	No.5		No.1	No.2	No.3	No.4	No.5
Luminous Intensity	3509.7	3527.1	3624.7	3360.7	3678.0	Luminous Intensity	3859.7	3709.7	4097.1	3837.4	3862.9





Result : Luminous Intensity within DS spec

Dominant Wavelength,LTS-5701AY
 UNIT: nm
 TEST CONDITION: 20mA
 MEASURING EQUIPMENT: CAS-140B
 SPEC: Typ = 588 nm

Digit	Tyntek					Digit	Epistar				
	PRODUCT NO.						PRODUCT NO.				
	No.1	No.2	No.3	No.4	No.5		No.1	No.2	No.3	No.4	No.5
Dominant Wavelength	587.0	587.4	587.2	586.9	587.1	Dominant Wavelength	587.9	587.9	587.9	587.8	587.8


Result : Dominant Wavelength within DS spec

Light-up/Cross-talk- Yellow dice

	OTC	Epistar
Light-up		
Cross-talk		

Product /Process Change Notification

Reliability test- Yellow dice

 Liteon Electronics (Thailand) Co., Ltd.		RQN : 2104003785 Product : N/D Device : LTS-5721AY Request date : 21-Apr-21 Requester : Suponrat K. # 6003		N/D Products Reliability test plan Subject: LTS-5701AY Trial run Dice C07SYM-RS					
Numeric Display Products Stress test									
Stess items	Test conditions	S/S (pc)	Read point	Plan		Actual		Result	Remark
				Start date	Finish date	Start date	Finish date		
Pre-condition	Solder 260°C, 5 Sec	44	2x						
T/C Temperature Cyding	Temp. -35°C/ 25°C/ 105°C/ 25°C Dwell time 30/ 5/ 30/ 5 min	22	50 Cycles	29-Apr-21	2-May-21	1-May-21	2-May-21	PASS	
				3-May-21	6-May-21	3-May-21	6-May-21	PASS	
T/S Thermal shock	Temp. -35°C/ 105°C ± 5°C Dwell time 15min/ 15min	22	50 Cycles	29-Apr-21	1-May-21	29-Apr-21	1-May-21	PASS	
				2-May-21	4-May-21	2-May-21	4-May-21	PASS	
SR Solder resistance	T.Sol = 260°C Soak time = 10 Sec. ± 1 Sec 3 mm. from base of epoxy bulb	5	10 Sec	3-May-21	4-May-21	3-May-21	4-May-21	PASS	5 pcs (ND Product) 5pcs measurement data
SA Solderability	T.Sol = 245°C Soak time = 5 ± 0.5 sec	5	5 Sec	3-May-21	4-May-21	3-May-21	4-May-21	PASS	5 pcs (ND Product) 5 pcs go/no-go

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Conclusion- Yellow dice

- **Luminous Intensity**
 - Display product within spec.
- **Dominant Wavelength**
 - Display product within spec.
- **Light-up/Cross-talk** : Passed
- **Reliability test** : Passed

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