

PCN

AO-PCN-2022-015-A

Introduction of 2nd source for classic InGaAlP chip for PointLED

01.07.2022

Dear Customer,

please review this **PCN** and provide your feedback in the **Customer approval form** (at the end of this PCN document) to your ams OSRAM sales partner before **05.08.2022** *).

Please take note, that this PCN is published for the introduction of **additional source(s)**.

Your prompt reply will help ams OSRAM to assure a smooth and well executed transition. If ams OSRAM does not hear from your side by the due date, we will assume your (if you are a Distributor: and your customer's) full acceptance to this proposed change and its implementation.

ams OSRAM understands the time requirements your organization needs to approve this PCN. However, if you can provide ams OSRAM an estimated date your organization will have finalized this PCN review, ams OSRAM can use this date to plan continued production to secure your order needs during the expansion with additional source(s).

Your attention and response to this matter is highly appreciated.

Please direct your inquiries to your local Sales office.

*) ams OSRAM aligns with the widely recognized JEDEC/ECIA/IPC Joint Standard No. 46, which stipulates:

- Customers should acknowledge receipt of the PCN within 30 days of delivery of the PCN.
- Lack of acknowledgement of the PCN within 30 days constitutes acceptance of the change.
- After acknowledgement, lack of additional response within the 90 day period constitutes acceptance of the change. If the customer requires additional time to perform sample testing, beyond the 90 day review period, an extension must be negotiated with the supplier.

Subject of change:	Introduction of 2 nd source for classic InGaAlP chip for PointLED and additional location for released plater	
Affected products:	Standard: LO P476 Low current: LS P47K, LO P47K, LY P47K, LG P47K	
Reason for change:	<ul style="list-style-type: none"> • Secure continuous supply • Introduction of additional supplier chips • Introduction of additional production location of released plater 	
Description of change:	<u>Current status</u>	<u>New status</u>
	Inhouse chips	Inhouse chips + 2nd (and 3rd) source chips provided by supplier(s)
	Plater location: Wuxi/China	Plater location: Wuxi & Shanghai/China (same provider as currently)
	For details refer to file 2_cip_AO-PCN-2022-015-A	
Time schedule for PCN material: (after implementation of change):	Final qualification report:	01.08.2022
	Samples available:	01.08.2022 ^{*)} <small>*) For details refer to file 2_cip_AO-PCN-2022-015-A</small>
	Intended Start of delivery:	01.12.2022 ^{**)} <small>***) or earlier if released by customer and upon mutual agreement</small>
	Customer Review Finalization:	01.07.2023 ^{***)} <small>***) Expected final feedback of customer. Released order volume is related to deliveries of material from both previous and additional source(s).</small>
Assessment:	No change in fit, form and reliability → no change in Datasheets	
Documentation:	Customer information package 2_cip_AO-PCN-2022-015-A 3_cip_AO-PCN-2022-015-A_Qual	

Note:

Pre-PCN material: Products of current status, means before implementation of the changes as described in the PCN.

PCN material: Products with implementation of the changes as described in the PCN.

Customer approval form AO-PCN-2022-015-A

Introduction of 2nd source for classic InGaAlP chip for PointLED

Please list product(s) affected in your application(s):

Please check the appropriate box below:

- | | |
|--|---|
| <input type="radio"/> Approval:
We agree with the proposed change and accept start of the shipment upon availability of PCN material | <input type="radio"/> Not relevant:
Change is not relevant for products in use. |
|--|---|

Change cannot be accepted:

- We have objections:**
- We request following Information:**
- We request following Samples:**
- Expected approval date:**
- Volume requirements for Pre-PCN material:**

Remarks:

Sender:

Company:

Address / Location:

Signature:

Date:

Please return this approval form to your Sales partner.

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PCN

AO-PCN-2022-015-A – **correction pages 4 and 5** –

Introduction of 2nd source for classic InGaAlP chip for PointLED

Customer information package

S&MK EM FQE/OS Q CQM A ITR
2022-07-01

Agenda

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Introduction of 2nd source for classic InGaAlP chip for PointLED



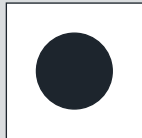
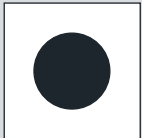
Reason for change

Item	Description
1.	Secure continuous supply
2.	Introduction of additional supplier chips
3.	Introduction of additional production location of released plater

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Introduction of 2nd source for classic InGaAlP chip for PointLED


Description of change for standard chips

Item	Current status	2 nd source chip A	2 nd source chip A	2 nd source chip B
Wafer size [mm]	100		100	
Wafer substrate	GaAs		GaAs	
Height [μm]	220		180	
Chip dicing process	Sawing		Sawing	
Picture (schematic)				
Chip size [μm]	200 x 200	200 x 200	180 x 180	180 x 180
Front metal type	Al		Au	
Front metal thickness [μm]	1.5		2.25 - 2.9	
Back metal type	Au		Au	
Back metal thickness [μm]	0.25		0.35 - 0.50	
Bond pad size [μm]	100		100	

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Description of change for low current chips

Item	Current status	2 nd source chip C	2 nd source chip D
Wafer size [mm]	100	100	
Wafer substrate	GaAs	GaAs	
Height [μm]	190	180	
Chip dicing process	Sawing	Sawing	
Picture (schematic)			
Chip size [μm]	170 x 170	160 x 160	170 x 170
Front metal type	Al	Au	
Front metal thickness [μm]	1.5	2.25-2.9	
Back metal type	Au	Au	
Back metal thickness [μm]	0.25	0.35-0.50	
Bond pad size [μm]	100	90	100

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Description of change for all devices

Current status	New status
Plater location: Wuxi/China	Plater location: Wuxi & Shanghai/China (same provider as currently)

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Changes in the datasheets

No change in fit, form and function of affected devices → no change in Datasheets

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Introduction of 2nd source for classic InGaAlP chip for PointLED

List of affected products

Brand	Standard	Low current
PointLED	LO P476	LS P47K
		LO P47K
		LY P47K
		LG P47K

Due to complexity not all device/chip source combinations will be available at start of series production.

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Introduction of 2nd source for classic InGaAlP chip for PointLED

PCN Samples

Standard	Low current
LO P476	LS P47K
	LO P47K
	LY P47K
	LG P47K

Color code: available from 01.08.2022 on request

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Introduction of 2nd source for classic InGaAlP chip for PointLED

Time schedule

for PCN material (<u>after</u> implementation of change):		
Final qualification report	01.08.2022	
Samples available	01.08.2022	
Intended Start of delivery	01.12.2022*)	*) or earlier if released by customer and upon mutual agreement
Customer Review Finalization:	01.07.2023 **)	**) Expected final feedback of customer. Released order volume is related to deliveries of material from both previous and additional source(s).

Note:

PCN material: Products with implementation of the changes as described in the PCN.

Sensing is life

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Qualification Results overview 220120C1

Subject	Qualification for 2nd source Chip introduction for classic InGaAlP PointLED devices
Date	01.07.2022
Tested device	Chip A: LO P476 Chip B: LO P476 Chip C: LS P47K, LY P47K, LG P47K Chip D: LS P47K, LO P47K, LG P47K
Brand (including sub brands)	PointLED
Applies to	LO P476, LG P47K, LO P47K, LS P47K, LY P47K

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LO P476 (Chip A)**

Test Performed	Condition	Duration	Sample Size	Failures		
				El.	Opt.	Vis
				<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E0</small>
Wet High Temperature Operating Life WHTOL1 <i>JESD22-A101</i> <small>AEC-Q102 #A2a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; r.H. = 85%; $T_s = 95^\circ\text{C}$; $T_j = 110^\circ\text{C}$ $I_F = 30\text{ mA}$ $T_{\text{on/off}} = 30\text{ min}$	1000 h	3x26	0	0	0
Wet High Temperature Operating Life WHTOL2 <i>JESD22-A101</i> <small>AEC-Q102 #A2b Test PCB: FR4</small>	$T_A = 85^\circ\text{C}$; r.H. = 85% $I_F = 5\text{ mA}$	1000 h	3x26	0	0	0
Powered Temperature Cycle PTC <i>JESD22-A105</i> <small>AEC-Q102 #A3a Test PCB: IMS-AI</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ $T_s = 100^\circ\text{C}$; $T_j = 105^\circ\text{C}$ $I_F = 5\text{ mA}$ $t_{\text{on/off}} = 5\text{ min}$	1000 c	3x26	0	0	0
Temperature Cycling TC <i>JESD22-A104</i> <small>AEC-Q102 #A4a Test PCB: FR4</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ 15 min each extreme	1000 c	3x26	0	0	0
High Temperature Operating Life HTOL1 <i>JESD22-A108</i> <small>AEC-Q102 #B1a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; $T_s = 95^\circ\text{C}$ $T_j = 110^\circ\text{C}$; $I_F = 30\text{ mA}$	1000 h	3x26	0	0	0
Pulsed Operating Life PLT <i>JESD22-A108</i> <small>AEC-Q102 #B3 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$ $I_F = 80\text{ mA}$; $t_p = 0,1\text{ms}$; $D = 3\%$	1000 h	3x26	0	0	0
Dew DEW <i>AEC-Q102-001</i> <small>AEC-Q102#C7 Test PCB: FR4</small>	$T_{A,\text{min}} = 10^\circ\text{C}$ $T_{A,\text{max}} = 80^\circ\text{C}$ r.H. = 53-100%	10 c	3x26	0	0	0
Solderability SD <i>IEC 60068-2-58</i> <small>AEC-Q102 #C10</small>	$T_A = 235^\circ\text{C}$ method 2 (reflow simulation)	1x	3x10	-	-	0
Hydrogen Sulphide H2S <i>IEC 60068-2-43</i> <small>AEC-Q102 #C12 Test PCB: FR4</small>	15 ppm H_2S $40^\circ\text{C}/90\%$ r.H.	336 h	3x26	0	0	0
Flowing Mixed Gas FMG <i>IEC 60068-2-60</i> <small>AEC-Q102 #C13 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$, r.H. = 75% Test method 4	500 h	3x26	0	0	0
Board Flex Test BF <i>AEC-Q102-002</i> <small>AEC-Q102 #C14 Test PCB: FR4</small>	2 mm	1x	3x10	0	0	0
Electrostatic Discharge HBM <i>ANSI/ESDA/ JEDEC JS-001</i> <small>AEC-Q102 #E3 Test PCB: FR4</small>	Human Body Model	2000 V	3x10	0	0	0

Constant Acceleration CA	<i>MIL-STD-750-2</i> AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	3x10	
Vibration Variable Frequency VVF	<i>JESD22-B103</i> AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples	for uncasted packages only
Mechanical Shock MS	<i>JESD22-B110</i> AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples	
Hermeticity HER	<i>JESD22-A109</i> AEC-Q102 #G4	Leak Test: Fine & Gross	1x	sequential samples	

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures		
				El.	Opt.	Vis
Electrostatic Discharge MM	<i>JESD22-A115</i> Machine Model Test PCB: FR4	200 V	3x10	0	0	0

Failure criteria:

Electrical failures:	V_f ($I_f = 20$ mA)	$> 2,35$ V; $\pm 10\%$ from initial value
Optical failures:	I_v ($I_f = 20$ mA) λ_{dom} ($I_f = 20$ mA)	absolute limit: $\pm 50\%$ max. ± 2 nm initial value
Visual failures:	acc JEDEC JESD22-B101	

Conclusion: The tested devices representing the product family as stated in the applies to section fulfill the reliability requirements of AEC-Q102 Initial/Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1

LO P476 (Chip B)

Test Performed	Condition	Duration	Sample Size	Failures		
				EI.	Opt.	Vis
				AEC-Q102 #E1	AEC-Q102 #E1	AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 <i>JESD22-A101</i> AEC-Q102 #A2a Test PCB: IMS-AI	$T_A = 85^\circ\text{C}$; r.H. = 85%; $T_s = 95^\circ\text{C}$; $T_j = 110^\circ\text{C}$ $I_F = 30\text{ mA}$ $T_{\text{on/off}} = 30\text{ min}$	1000 h	3x26	0	0	0
Wet High Temperature Operating Life WHTOL2 <i>JESD22-A101</i> AEC-Q102 #A2b Test PCB: FR4	$T_A = 85^\circ\text{C}$; r.H. = 85% $I_F = 5\text{ mA}$	1000 h	3x26	0	0	0
Powered Temperature Cycle PTC <i>JESD22-A105</i> AEC-Q102 #A3a Test PCB: IMS-AI	$T_A = -40^\circ\text{C}/+85^\circ\text{C}$ $T_s = 100^\circ\text{C}$; $T_j = 110^\circ\text{C}$ $I_F = 30\text{ mA}$ $t_{\text{on/off}} = 5\text{ min}$	1000 c	3x26	0	0	0
Temperature Cycling TC <i>JESD22-A104</i> AEC-Q102 #A4a Test PCB: FR4	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ 15 min each extreme	1000 c	3x26	0	0	0
High Temperature Operating Life HTOL1 <i>JESD22-A108</i> AEC-Q102 #B1a Test PCB: IMS-AI	$T_A = 85^\circ\text{C}$; $T_s = 100^\circ\text{C}$ $T_j = 115^\circ\text{C}$; $I_F = 30\text{ mA}$	1000 h	3x26	0	0	0
Pulsed Operating Life PLT <i>JESD22-A108</i> AEC-Q102 #B3 Test PCB: FR4	$T_A = 25^\circ\text{C}$ $I_F = 80\text{ mA}$; $t_p = 0,1\text{ms}$; $D = 3\%$	1000 h	3x26	0	0	0
Dew DEW <i>AEC-Q102-001</i> AEC-Q102#C7 Test PCB: FR4	$T_{A,\text{min}} = 10^\circ\text{C}$ $T_{A,\text{max}} = 80^\circ\text{C}$ r.H. = 53-100%	10 c	3x26	0	0	0
Solderability SD <i>IEC 60068-2-58</i> AEC-Q102 #C10	$T_A = 235^\circ\text{C}$ method 2 (reflow simulation)	1x	3x10	-	-	0
Hydrogen Sulphide H2S <i>IEC 60068-2-43</i> AEC-Q102 #C12 Test PCB: FR4	15 ppm H_2S $40^\circ\text{C}/90\%$ r.H.	336 h	3x26	0	0	0
Flowing Mixed Gas FMG <i>IEC 60068-2-60</i> AEC-Q102 #C13 Test PCB: FR4	$T_A = 25^\circ\text{C}$, r.H. = 75% Test method 4	500 h	3x26	0	0	0
Board Flex Test BF <i>AEC-Q102-002</i> AEC-Q102 #C14 Test PCB: FR4	2 mm	1x	3x10	0	0	0
Electrostatic Discharge HBM <i>ANSI/ESDA/ JEDEC JS-001</i> AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000 V	3x10	0	0	0

Constant Acceleration CA	<i>MIL-STD-750-2</i> AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	3x10	
Vibration Variable Frequency VVF	<i>JESD22-B103</i> AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples	for uncasted packages only
Mechanical Shock MS	<i>JESD22-B110</i> AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples	
Hermeticity HER	<i>JESD22-A109</i> AEC-Q102 #G4	Leak Test: Fine & Gross	1x	sequential samples	

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures		
				El.	Opt.	Vis
Electrostatic Discharge MM	<i>JESD22-A115</i> Machine Model Test PCB: FR4	200 V	3x10	0	0	0

Failure criteria:

Electrical failures:	V_f ($I_f = 20$ mA)	$> 2,35$ V; $\pm 10\%$ from initial value
Optical failures:	I_v ($I_f = 20$ mA) λ_{dom} ($I_f = 20$ mA)	absolute limit: $\pm 50\%$ max. ± 2 nm initial value
Visual failures:	acc JEDEC JESD22-B101	

Conclusion: The tested devices representing the product family as stated in the applies to section fulfill the reliability requirements of AEC-Q102 Initial/Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1

LS P47K (Chip C)

Test Performed	Condition	Duration	Sample Size	Failures		
				EI.	Opt.	Vis
				AEC-Q102 #E1	AEC-Q102 #E1	AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 <i>JESD22-A101</i> AEC-Q102 #A2a Test PCB: IMS-AI	$T_A = 85^\circ\text{C}$; r.H. = 85%; $T_s = 95^\circ\text{C}$; $T_j = 110^\circ\text{C}$ $I_F = 20\text{ mA}$ $T_{\text{on/off}} = 30\text{ min}$	1000 h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 <i>JESD22-A101</i> AEC-Q102 #A2b Test PCB: FR4	$T_A = 85^\circ\text{C}$; r.H. = 85% $I_F = 5\text{ mA}$	1000 h	1x26	0	0	0
Powered Temperature Cycle PTC <i>JESD22-A105</i> AEC-Q102 #A3a Test PCB: IMS-AI	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ $T_s = 100^\circ\text{C}$; $T_j = 105^\circ\text{C}$ $I_F = 5\text{ mA}$ $t_{\text{on/off}} = 5\text{ min}$	1000 c	1x26	0	0	0
Temperature Cycling TC <i>JESD22-A104</i> AEC-Q102 #A4a Test PCB: FR4	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ 15 min each extreme	1000 c	1x26	0	0	0
High Temperature Operating Life HTOL1 <i>JESD22-A108</i> AEC-Q102 #B1a Test PCB: IMS-AI	$T_A = 85^\circ\text{C}$; $T_s = 95^\circ\text{C}$ $T_j = 110^\circ\text{C}$; $I_F = 20\text{ mA}$	1000 h	1x26	0	0	0
Pulsed Operating Life PLT <i>JESD22-A108</i> AEC-Q102 #B3 Test PCB: FR4	$T_A = 25^\circ\text{C}$ $I_F = 50\text{ mA}$; $t_p = 0,1\text{ms}$; $D = 3\%$	1000 h	1x26	0	0	0
Dew DEW <i>AEC-Q102-001</i> AEC-Q102 #C7 Test PCB: FR4	$T_{A,\text{min}} = 10^\circ\text{C}$ $T_{A,\text{max}} = 80^\circ\text{C}$ r.H. = 53-100%	10 c	1x26	0	0	0
Solderability SD <i>IEC 60068-2-58</i> AEC-Q102 #C10	$T_A = 235^\circ\text{C}$ method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S <i>IEC 60068-2-43</i> AEC-Q102 #C12 Test PCB: FR4	15 ppm H_2S $40^\circ\text{C}/90\%$ r.H.	336 h	1x26	0	0	0
Flowing Mixed Gas FMG <i>IEC 60068-2-60</i> AEC-Q102 #C13 Test PCB: FR4	$T_A = 25^\circ\text{C}$, r.H. = 75% Test method 4	500 h	1x26	0	0	0
Board Flex Test BF <i>AEC-Q102-002</i> AEC-Q102 #C14 Test PCB: FR4	2 mm	1x	1x10	0	0	0
Electrostatic Discharge HBM <i>ANSI/ESDA/ JEDEC JS-001</i> AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000 V	1x10	0	0	0

Constant Acceleration CA	<i>MIL-STD-750-2</i> AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	
Vibration Variable Frequency VVF	<i>JESD22-B103</i> AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples	for uncasted packages only
Mechanical Shock MS	<i>JESD22-B110</i> AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples	
Hermeticity HER	<i>JESD22-A109</i> AEC-Q102 #G4	Leak Test: Fine & Gross	1x	sequential samples	

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures			
				El.	Opt.	Vis	
Electrostatic Discharge MM	<i>JESD22-A115</i> Test PCB: FR4	Machine Model	200 V	3x10	0	0	0

Failure criteria:

Electrical failures:	V_f ($I_f = 2$ mA)	$> 2,2$ V; $\pm 10\%$ from initial value
Optical failures:	I_v ($I_f = 2$ mA) λ_{dom} ($I_f = 2$ mA)	absolute limit: $\pm 50\%$ max. ± 2 nm initial value
Visual failures:	acc JEDEC JESD22-B101	

Conclusion: The tested devices representing the product family as stated in the applies to section fulfill the reliability requirements of AEC-Q102 Initial/Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 LY P47K (Chip C)

Test Performed	Condition	Duration	Sample Size	Failures		
				EI.	Opt.	Vis
				<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E0</small>
Wet High Temperature Operating Life WHTOL1 <i>JESD22-A101</i> <small>AEC-Q102 #A2a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; r.H. = 85%; $T_s = 90^\circ\text{C}$; $T_j = 110^\circ\text{C}$ $I_F = 20\text{ mA}$ $T_{\text{on/off}} = 30\text{ min}$	1000 h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 <i>JESD22-A101</i> <small>AEC-Q102 #A2b Test PCB: FR4</small>	$T_A = 85^\circ\text{C}$; r.H. = 85% $I_F = 5\text{ mA}$	1000 h	1x26	0	0	0
Powered Temperature Cycle PTC <i>JESD22-A105</i> <small>AEC-Q102 #A3a Test PCB: IMS-AI</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ $T_s = 100^\circ\text{C}$; $T_j = 105^\circ\text{C}$ $I_F = 5\text{ mA}$ $t_{\text{on/off}} = 5\text{ min}$	1000 c	1x26	0	0	0
Temperature Cycling TC <i>JESD22-A104</i> <small>AEC-Q102 #A4a Test PCB: FR4</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ 15 min each extreme	1000 c	1x26	0	0	0
High Temperature Operating Life HTOL1 <i>JESD22-A108</i> <small>AEC-Q102 #B1a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; $T_s = 90^\circ\text{C}$ $T_j = 110^\circ\text{C}$; $I_F = 20\text{ mA}$	1000 h	1x26	0	0	0
Pulsed Operating Life PLT <i>JESD22-A108</i> <small>AEC-Q102 #B3 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$ $I_F = 50\text{ mA}$; $t_p = 0,1\text{ms}$; $D = 3\%$	1000 h	1x26	0	0	0
Dew DEW <i>AEC-Q102-001</i> <small>AEC-Q102#C7 Test PCB: FR4</small>	$T_{A,\text{min}} = 10^\circ\text{C}$ $T_{A,\text{max}} = 80^\circ\text{C}$ r.H. = 53-100%	10 c	1x26	0	0	0
Solderability SD <i>IEC 60068-2-58</i> <small>AEC-Q102 #C10</small>	$T_A = 235^\circ\text{C}$ method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S <i>IEC 60068-2-43</i> <small>AEC-Q102 #C12 Test PCB: FR4</small>	15 ppm H_2S $40^\circ\text{C}/90\%$ r.H.	336 h	1x26	0	0	0
Flowing Mixed Gas FMG <i>IEC 60068-2-60</i> <small>AEC-Q102 #C13 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$, r.H. = 75% Test method 4	500 h	1x26	0	0	0
Board Flex Test BF <i>AEC-Q102-002</i> <small>AEC-Q102 #C14 Test PCB: FR4</small>	2 mm	1x	1x10	0	0	0
Electrostatic Discharge HBM <i>ANSI/ESDA/ JEDEC JS-001</i> <small>AEC-Q102 #E3 Test PCB: FR4</small>	Human Body Model	2000 V	1x10	0	0	0

Constant Acceleration CA	<i>MIL-STD-750-2</i> AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	
Vibration Variable Frequency VVF	<i>JESD22-B103</i> AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples	for uncasted packages only
Mechanical Shock MS	<i>JESD22-B110</i> AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples	
Hermeticity HER	<i>JESD22-A109</i> AEC-Q102 #G4	Leak Test: Fine & Gross	1x	sequential samples	

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures		
				El.	Opt.	Vis
Electrostatic Discharge MM	<i>JESD22-A115</i> Machine Model Test PCB: FR4	200 V	3x10	0	0	0

Failure criteria:

Electrical failures:	$V_f (I_f = 2 \text{ mA})$	$> 2,2 \text{ V}; \pm 10\%$ from initial value
Optical failures:	$I_v (I_f = 2 \text{ mA})$ $\lambda_{\text{dom}} (I_f = 2 \text{ mA})$	absolute limit: $\pm 50\%$ max. $\pm 2 \text{ nm}$ initial value
Visual failures:	acc JEDEC JESD22-B101	

Conclusion: The tested devices representing the product family as stated in the applies to section fulfill the reliability requirements of AEC-Q102 Initial/Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 LG P47K (Chip C)

Test Performed	Condition	Duration	Sample Size	Failures		
				El.	Opt.	Vis
				<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E0</small>
Wet High Temperature Operating Life WHTOL1 <i>JESD22-A101</i> <small>AEC-Q102 #A2a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; r.H. = 85%; $T_s = 90^\circ\text{C}$; $T_j = 115^\circ\text{C}$ $I_F = 20\text{ mA}$ $T_{\text{on/off}} = 30\text{ min}$	1000 h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 <i>JESD22-A101</i> <small>AEC-Q102 #A2b Test PCB: FR4</small>	$T_A = 85^\circ\text{C}$; r.H. = 85% $I_F = 5\text{ mA}$	1000 h	1x26	0	0	0
Powered Temperature Cycle PTC <i>JESD22-A105</i> <small>AEC-Q102 #A3a Test PCB: IMS-AI</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ $T_s = 100^\circ\text{C}$; $T_j = 105^\circ\text{C}$ $I_F = 5\text{ mA}$ $t_{\text{on/off}} = 5\text{ min}$	1000 c	1x26	0	0	0
Temperature Cycling TC <i>JESD22-A104</i> <small>AEC-Q102 #A4a Test PCB: FR4</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ 15 min each extreme	1000 c	1x26	0	0	0
High Temperature Operating Life HTOL1 <i>JESD22-A108</i> <small>AEC-Q102 #B1a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; $T_s = 90^\circ\text{C}$ $T_j = 115^\circ\text{C}$; $I_F = 20\text{ mA}$	1000 h	1x26	0	0	0
Pulsed Operating Life PLT <i>JESD22-A108</i> <small>AEC-Q102 #B3 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$ $I_F = 50\text{ mA}$; $t_p = 0,1\text{ms}$; $D = 3\%$	1000 h	1x26	0	0	0
Dew DEW <i>AEC-Q102-001</i> <small>AEC-Q102#C7 Test PCB: FR4</small>	$T_{A,\text{min}} = 10^\circ\text{C}$ $T_{A,\text{max}} = 80^\circ\text{C}$ r.H. = 53-100%	10 c	1x26	0	0	0
Solderability SD <i>IEC 60068-2-58</i> <small>AEC-Q102 #C10</small>	$T_A = 235^\circ\text{C}$ method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S <i>IEC 60068-2-43</i> <small>AEC-Q102 #C12 Test PCB: FR4</small>	15 ppm H_2S $40^\circ\text{C}/90\%$ r.H.	336 h	1x26	0	0	0
Flowing Mixed Gas FMG <i>IEC 60068-2-60</i> <small>AEC-Q102 #C13 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$, r.H. = 75% Test method 4	500 h	1x26	0	0	0
Board Flex Test BF <i>AEC-Q102-002</i> <small>AEC-Q102 #C14 Test PCB: FR4</small>	2 mm	1x	1x10	0	0	0
Electrostatic Discharge HBM <i>ANSI/ESDA/ JEDEC JS-001</i> <small>AEC-Q102 #E3 Test PCB: FR4</small>	Human Body Model	2000 V	1x10	0	0	0

Constant Acceleration CA	<i>MIL-STD-750-2</i> AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	
Vibration Variable Frequency VVF	<i>JESD22-B103</i> AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples	for uncasted packages only
Mechanical Shock MS	<i>JESD22-B110</i> AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples	
Hermeticity HER	<i>JESD22-A109</i> AEC-Q102 #G4	Leak Test: Fine & Gross	1x	sequential samples	

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures			
				El.	Opt.	Vis	
Electrostatic Discharge MM	<i>JESD22-A115</i> Test PCB: FR4	Machine Model	200 V	3x10	0	0	0

Failure criteria:

Electrical failures:	V_f ($I_f = 2$ mA)	> 2,2 V; $\pm 10\%$ from initial value
Optical failures:	I_v ($I_f = 2$ mA) λ_{dom} ($I_f = 2$ mA)	absolute limit: $\pm 50\%$ max. ± 2 nm initial value
Visual failures:	acc JEDEC JESD22-B101	

Conclusion: The tested devices representing the product family as stated in the applies to section fulfill the reliability requirements of AEC-Q102 Initial/Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LS P47K (Chip D)**

Test Performed	Condition	Duration	Sample Size	Failures		
				EI.	Opt.	Vis
				<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E0</small>
Wet High Temperature Operating Life WHTOL1 <i>JESD22-A101</i> <small>AEC-Q102 #A2a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; r.H. = 85%; $T_s = 90^\circ\text{C}$; $T_j = 105^\circ\text{C}$ $I_F = 20\text{ mA}$ $T_{\text{on/off}} = 30\text{ min}$	1000 h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 <i>JESD22-A101</i> <small>AEC-Q102 #A2b Test PCB: FR4</small>	$T_A = 85^\circ\text{C}$; r.H. = 85% $I_F = 5\text{ mA}$	1000 h	1x26	0	0	0
Powered Temperature Cycle PTC <i>JESD22-A105</i> <small>AEC-Q102 #A3a Test PCB: IMS-AI</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ $T_s = 100^\circ\text{C}$; $T_j = 105^\circ\text{C}$ $I_F = 5\text{ mA}$ $t_{\text{on/off}} = 5\text{ min}$	1000 c	1x26	0	0	0
Temperature Cycling TC <i>JESD22-A104</i> <small>AEC-Q102 #A4a Test PCB: FR4</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ 15 min each extreme	1000 c	1x26	0	0	0
High Temperature Operating Life HTOL1 <i>JESD22-A108</i> <small>AEC-Q102 #B1a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; $T_s = 90^\circ\text{C}$ $T_j = 105^\circ\text{C}$; $I_F = 20\text{ mA}$	1000 h	1x26	0	0	0
Pulsed Operating Life PLT <i>JESD22-A108</i> <small>AEC-Q102 #B3 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$ $I_F = 50\text{ mA}$; $t_p = 0,1\text{ms}$; $D = 3\%$	1000 h	1x26	0	0	0
Dew DEW <i>AEC-Q102-001</i> <small>AEC-Q102#C7 Test PCB: FR4</small>	$T_{A,\text{min}} = 10^\circ\text{C}$ $T_{A,\text{max}} = 80^\circ\text{C}$ r.H. = 53-100%	10 c	1x26	0	0	0
Solderability SD <i>IEC 60068-2-58</i> <small>AEC-Q102 #C10</small>	$T_A = 235^\circ\text{C}$ method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S <i>IEC 60068-2-43</i> <small>AEC-Q102 #C12 Test PCB: FR4</small>	15 ppm H_2S $40^\circ\text{C}/90\%$ r.H.	336 h	1x26	0	0	0
Flowing Mixed Gas FMG <i>IEC 60068-2-60</i> <small>AEC-Q102 #C13 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$, r.H. = 75% Test method 4	500 h	1x26	0	0	0
Board Flex Test BF <i>AEC-Q102-002</i> <small>AEC-Q102 #C14 Test PCB: FR4</small>	2 mm	1x	1x10	0	0	0
Electrostatic Discharge HBM <i>ANSI/ESDA/ JEDEC JS-001</i> <small>AEC-Q102 #E3 Test PCB: FR4</small>	Human Body Model	2000 V	1x10	0	0	0

Constant Acceleration CA	<i>MIL-STD-750-2</i> AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	
Vibration Variable Frequency VVF	<i>JESD22-B103</i> AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples	for uncasted packages only
Mechanical Shock MS	<i>JESD22-B110</i> AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples	
Hermeticity HER	<i>JESD22-A109</i> AEC-Q102 #G4	Leak Test: Fine & Gross	1x	sequential samples	

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures		
				El.	Opt.	Vis
Electrostatic Discharge MM	<i>JESD22-A115</i> Machine Model Test PCB: FR4	200 V	3x10	0	0	0

Failure criteria:

Electrical failures: V_f ($I_f = 2$ mA) > 2,2 V; $\pm 10\%$ from initial value

Optical failures: I_v ($I_f = 2$ mA) absolute limit: $\pm 50\%$ max.
 λ_{dom} ($I_f = 2$ mA) ± 2 nm initial value

Visual failures: acc JEDEC JESD22-B101

Conclusion: The tested devices representing the product family as stated in the applies to section fulfill the reliability requirements of AEC-Q102 Initial/Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LO P47K (Chip D)**

Test Performed	Condition	Duration	Sample Size	Failures		
				EI.	Opt.	Vis
				<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E0</small>
Wet High Temperature Operating Life WHTOL1 <i>JESD22-A101</i> <small>AEC-Q102 #A2a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; r.H. = 85%; $T_s = 90^\circ\text{C}$; $T_j = 105^\circ\text{C}$ $I_F = 20\text{ mA}$ $T_{\text{on/off}} = 30\text{ min}$	1000 h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 <i>JESD22-A101</i> <small>AEC-Q102 #A2b Test PCB: FR4</small>	$T_A = 85^\circ\text{C}$; r.H. = 85% $I_F = 5\text{ mA}$	1000 h	1x26	0	0	0
Powered Temperature Cycle PTC <i>JESD22-A105</i> <small>AEC-Q102 #A3a Test PCB: IMS-AI</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ $T_s = 100^\circ\text{C}$; $T_j = 105^\circ\text{C}$ $I_F = 5\text{ mA}$ $t_{\text{on/off}} = 5\text{ min}$	1000 c	1x26	0	0	0
Temperature Cycling TC <i>JESD22-A104</i> <small>AEC-Q102 #A4a Test PCB: FR4</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ 15 min each extreme	1000 c	1x26	0	0	0
High Temperature Operating Life HTOL1 <i>JESD22-A108</i> <small>AEC-Q102 #B1a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; $T_s = 90^\circ\text{C}$ $T_j = 105^\circ\text{C}$; $I_F = 20\text{ mA}$	1000 h	1x26	0	0	0
Pulsed Operating Life PLT <i>JESD22-A108</i> <small>AEC-Q102 #B3 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$ $I_F = 50\text{ mA}$; $t_p = 0,1\text{ms}$; $D = 3\%$	1000 h	1x26	0	0	0
Dew DEW <i>AEC-Q102-001</i> <small>AEC-Q102#C7 Test PCB: FR4</small>	$T_{A,\text{min}} = 10^\circ\text{C}$ $T_{A,\text{max}} = 80^\circ\text{C}$ r.H. = 53-100%	10 c	1x26	0	0	0
Solderability SD <i>IEC 60068-2-58</i> <small>AEC-Q102 #C10</small>	$T_A = 235^\circ\text{C}$ method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S <i>IEC 60068-2-43</i> <small>AEC-Q102 #C12 Test PCB: FR4</small>	15 ppm H_2S $40^\circ\text{C}/90\%$ r.H.	336 h	1x26	0	0	0
Flowing Mixed Gas FMG <i>IEC 60068-2-60</i> <small>AEC-Q102 #C13 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$, r.H. = 75% Test method 4	500 h	1x26	0	0	0
Board Flex Test BF <i>AEC-Q102-002</i> <small>AEC-Q102 #C14 Test PCB: FR4</small>	2 mm	1x	1x10	0	0	0
Electrostatic Discharge HBM <i>ANSI/ESDA/ JEDEC JS-001</i> <small>AEC-Q102 #E3 Test PCB: FR4</small>	Human Body Model	2000 V	1x10	0	0	0

Constant Acceleration CA	<i>MIL-STD-750-2</i> AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	
Vibration Variable Frequency VVF	<i>JESD22-B103</i> AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples	for uncasted packages only
Mechanical Shock MS	<i>JESD22-B110</i> AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples	
Hermeticity HER	<i>JESD22-A109</i> AEC-Q102 #G4	Leak Test: Fine & Gross	1x	sequential samples	

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures		
				El.	Opt.	Vis
Electrostatic Discharge MM	<i>JESD22-A115</i> Machine Model Test PCB: FR4	200 V	3x10	0	0	0

Failure criteria:

Electrical failures:	V_f ($I_f = 2$ mA)	$> 2,2$ V; $\pm 10\%$ from initial value
Optical failures:	I_v ($I_f = 2$ mA) λ_{dom} ($I_f = 2$ mA)	absolute limit: $\pm 50\%$ max. ± 2 nm initial value
Visual failures:	acc JEDEC JESD22-B101	

Conclusion: The tested devices representing the product family as stated in the applies to section fulfill the reliability requirements of AEC-Q102 Initial/Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LG P47K (Chip D)**

Test Performed	Condition	Duration	Sample Size	Failures		
				El.	Opt.	Vis
				<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E1</small>	<small>AEC-Q102 #E0</small>
Wet High Temperature Operating Life WHTOL1 <i>JESD22-A101</i> <small>AEC-Q102 #A2a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; r.H. = 85%; $T_s = 90^\circ\text{C}$; $T_j = 105^\circ\text{C}$ $I_F = 20\text{ mA}$ $T_{\text{on/off}} = 30\text{ min}$	1000 h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 <i>JESD22-A101</i> <small>AEC-Q102 #A2b Test PCB: FR4</small>	$T_A = 85^\circ\text{C}$; r.H. = 85% $I_F = 5\text{ mA}$	1000 h	1x26	0	0	0
Powered Temperature Cycle PTC <i>JESD22-A105</i> <small>AEC-Q102 #A3a Test PCB: IMS-AI</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ $T_s = 100^\circ\text{C}$; $T_j = 105^\circ\text{C}$ $I_F = 5\text{ mA}$ $t_{\text{on/off}} = 5\text{ min}$	1000 c	1x26	0	0	0
Temperature Cycling TC <i>JESD22-A104</i> <small>AEC-Q102 #A4a Test PCB: FR4</small>	$T_A = -40^\circ\text{C}/+100^\circ\text{C}$ 15 min each extreme	1000 c	1x26	0	0	0
High Temperature Operating Life HTOL1 <i>JESD22-A108</i> <small>AEC-Q102 #B1a Test PCB: IMS-AI</small>	$T_A = 85^\circ\text{C}$; $T_s = 90^\circ\text{C}$ $T_j = 105^\circ\text{C}$; $I_F = 20\text{ mA}$	1000 h	1x26	0	0	0
Pulsed Operating Life PLT <i>JESD22-A108</i> <small>AEC-Q102 #B3 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$ $I_F = 50\text{ mA}$; $t_p = 0,1\text{ms}$; $D = 3\%$	1000 h	1x26	0	0	0
Dew DEW <i>AEC-Q102-001</i> <small>AEC-Q102#C7 Test PCB: FR4</small>	$T_{A,\text{min}} = 10^\circ\text{C}$ $T_{A,\text{max}} = 80^\circ\text{C}$ r.H. = 53-100%	10 c	1x26	0	0	0
Solderability SD <i>IEC 60068-2-58</i> <small>AEC-Q102 #C10</small>	$T_A = 235^\circ\text{C}$ method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S <i>IEC 60068-2-43</i> <small>AEC-Q102 #C12 Test PCB: FR4</small>	15 ppm H_2S $40^\circ\text{C}/90\%$ r.H.	336 h	1x26	0	0	0
Flowing Mixed Gas FMG <i>IEC 60068-2-60</i> <small>AEC-Q102 #C13 Test PCB: FR4</small>	$T_A = 25^\circ\text{C}$, r.H. = 75% Test method 4	500 h	1x26	0	0	0
Board Flex Test BF <i>AEC-Q102-002</i> <small>AEC-Q102 #C14 Test PCB: FR4</small>	2 mm	1x	1x10	0	0	0
Electrostatic Discharge HBM <i>ANSI/ESDA/ JEDEC JS-001</i> <small>AEC-Q102 #E3 Test PCB: FR4</small>	Human Body Model	2000 V	1x10	0	0	0

Constant Acceleration CA	<i>MIL-STD-750-2</i> AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	
Vibration Variable Frequency VVF	<i>JESD22-B103</i> AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples	for uncasted packages only
Mechanical Shock MS	<i>JESD22-B110</i> AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples	
Hermeticity HER	<i>JESD22-A109</i> AEC-Q102 #G4	Leak Test: Fine & Gross	1x	sequential samples	

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures		
				El.	Opt.	Vis
Electrostatic Discharge MM	<i>JESD22-A115</i> Machine Model Test PCB: FR4	200 V	3x10	0	0	0

Failure criteria:

Electrical failures:	V_f ($I_f = 2$ mA)	$> 2,2$ V; $\pm 10\%$ from initial value
Optical failures:	I_v ($I_f = 2$ mA) λ_{dom} ($I_f = 2$ mA)	absolute limit: $\pm 50\%$ max. ± 2 nm initial value
Visual failures:	acc JEDEC JESD22-B101	

Conclusion: The tested devices representing the product family as stated in the applies to section fulfill the reliability requirements of AEC-Q102 Initial/Rev-A.

Disclaimer

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The Information contained in this Document does not constitute an independent warranty. The committed behavior is described in the Product data sheet and/or further, mutually agreed specifications.

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Further explanations:

Data: The Data used in this Document consider the reliability test results under the mentioned driving conditions only. For Product information on the maximum operating conditions and the OSRAM standard qualification profile please refer to the Product data sheet or contact your local sales partner.

Conditions: The conditions for the generation of the Data are as follows:

1. The Data and curves shown in this Document are based on experiments carried out under laboratory conditions on a random sample size of LED/IRED/Laser/Detector with readouts at discrete readout times (where applicable). Thus, the Data above represent a limited number of production lots only and may differ between different assembly lots over time (including chip or package changes). Thus, the behavior of the LED/IRED/Laser/Detector in the final application may differ from the Data. The behavior of the LED/IRED/Laser/Detector at conditions or readout times deviating from those stated above may not be deduced from the Data.

2. If applicable:

a) Extended driving conditions:

The tested driving conditions exceed the maximum limits stated in the Product data sheet. Therefore, a reduced lifetime or an accelerated degradation is expected. Failure limits noted in the Document refer to the testing condition according to the OSRAM standard Product qualification profile and not to the actual testing condition.

b) Extended testing duration:

The testing duration exceed the OSRAM standard qualification profile of the mentioned Product. Failure limits noted in the Document refer to the testing duration according to the OSRAM standard Product qualification profile and not to the actual testing duration.

c) Exceeding standard qualification conditions – (Product data sheet limits not affected):

The tested driving conditions exceed the OSRAM standard qualification profile of the mentioned Product. Therefore a reduced lifetime or an accelerated degradation is expected. Failure limits noted in the Document refer to the testing condition according to the OSRAM standard Product qualification profile and not to the actual testing condition.

3. For long term operation additional failure modes of the chip or package can occur which are not shown in this Document.

4. Possible differences in the thermal management of OSRAM and customer's setup may lead to a different aging behavior.

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