PCN

AO-PCN-2022-014-A

Introduction of 2nd source for classic InGaAlP chip for Mini TOPLED

Published by ams-OSRAM AG
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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 2nd source for classic InGaAlP chip for Mini TOPLED and additional location for released plater	
Affected products:	**Standard:** LS M676, LA M676, LO M676, LY M676 **Low current:** LS M67K, LO M67K, LY M67K, LG M67K	
Reason for change:	• Secure continuous supply • Introduction of additional supplier chips • Introduction of additional production location of released plater	
Description of change:	Current status Inhouse chips	New status 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-2022-014-A	
Time schedule for PCN material: (after implementation of change):	Final qualification report:	01.08.2022
	Samples available:	01.07.2022*) *) For details refer to file 2_cip_AO-PCN-2022-014-A
	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).
Assessment:	**No change in fit, form and reliability → no change in Datasheets**	
Documentation:	Customer information package 2_cip_AO-PCN-2022-014-A 3_cip_AO-PCN-2022-014-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-2022-014-A

Introduction of 2nd source for classic InGaAlP chip for Mini TOPLED

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

Please check the appropriate box below:

○ **Approval:** We agree with the proposed change and accept start of the shipment upon availability of PCN material	○ **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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Customer information package

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

Agenda

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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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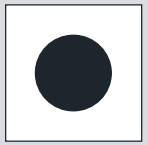
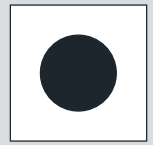
Description of change for standard chips

Item	Current status	2nd source chip A	2nd source chip B	2nd source chip C
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	0.05 - 0.50		
Bond pad size [µm]	100	100		

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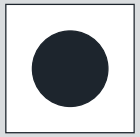
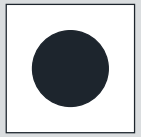
Description of change for low current chips

Item	Current status	2nd source chip D	2nd source chip E
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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List of affected products

Brand	Standard	Low current
Mini TOPLED	LS M676	LS M67K
	LA M676	LO M67K
	LO M676	LY M67K
	LY M676	LG M67K

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 Mini TOPLED

PCN Samples

Standard	Low current
LS M676	LS M67K
LA M676	LO M67K
LO M676	LY M67K
LY M676	LG M67K

Color code: available on request

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Time schedule

for PCN material (after implementation of change):		
Final qualification report	01.08.2022	
Samples available	01.07.2022	
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

Interim* Qualification Results overview 220116C1

Subject	Qualification for 2nd source introduction for classic InGaAlP Mini TOPLED devices
Date	23.06.2022
Tested device	Chip A: LY M676 Chip B: LS M676, LO M676, LY M676 Chip C: LS M676, LA M676, LO M676 Chip D: LS M67K, LY M67K, LG M67K Chip E: LS M67K, LO M67K, LG M67K
Brand (including sub brands)	Mini TOPLED
Applies to	LA M676; LO M676; LS M676; LY M676 LG M67K; LO M67K; LS M67K; LY M67K

* Tested sequences of this report fulfill standard AEC Q-102 Rev A. Final report will be submitted once missing sequences (FMG tests for three devices) are completed. Please refer to the test overview on the following pages.

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Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LY M676 (Chip A)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 110°C; I_F = 20mA Ton/off=30min	1000h	3x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	3x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 103°C; T_j = 105°C; I_F = 5mA ton/off = 5min	1000c	3x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	3x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 110°C; T_j = 120°C; I_F = 30mA	1000h	3x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =200mA; tp = 0,1ms; D = 3%	1000h	3x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	3x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	3x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	3x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	3x26	0	0	0
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	3x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	3x10	0	0	0

Constant Acceleration CA *MIL-STD-750-2* AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	3x10	for uncasted packages only	
Vibration Variable Frequency VVF *JESD22-B103* AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples		
Mechanical Shock MS *JESD22-B110* AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples		
Hermeticity HER *JESD22-A109* 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 *JESD22-A115* Test PCB: FR4	Machine Model	200V	3x10	0	0	0

LY M676:

Failure criteria:

Electrical failures:	V_f (I_f =20mA)	> 2,4V; ± 10% from initial value
Optical failures:	I_v (I_f =20mA)	absolute limit: ± 50% max.
	λ_{dom} (I_f = 20 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LS M676 (Chip B)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 110°C; I_F = 25mA Ton/off=30min	1000h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	1x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 102°C; T_j = 105°C; I_F =5mA ton/off = 5min	1000c	1x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	1x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 105°C; T_j = 120°C; I_F = 30mA	1000h	1x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =120mA; tp = 0,1ms; D = 3%	1000h	1x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	3x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	1x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	1x26	0	0	0
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	1x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	1x26	0	0	0

Constant Acceleration CA *MIL-STD-750-2* AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	for uncasted packages only	
Vibration Variable Frequency VVF *JESD22-B103* AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples		
Mechanical Shock MS *JESD22-B110* AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples		
Hermeticity HER *JESD22-A109* 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 *JESD22-A115* Test PCB: FR4	Machine Model	200V	1x10	0	0	0

LS M676:

Failure criteria:

Electrical failures:	V_f (I_f =20mA)	> 2,3V; ± 10% from initial value
Optical failures:	I_v (I_f =20mA)	absolute limit: ± 50% max.
	λ_{dom} (I_f = 20 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LO M676 (Chip B)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 110°C; I_F = 25mA Ton/off=30min	1000h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	1x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 103°C; T_j = 105°C; I_F = 5mA ton/off = 5min	1000c	1x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	1x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 105°C; T_j = 120°C; I_F = 30mA	1000h	1x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =120mA; tp = 0,1ms; D = 3%	1000h	1x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	1x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	1x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	1x26	0	0	0
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	1x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	1x10	0	0	0

Constant Acceleration CA *MIL-STD-750-2* AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	3x10	for uncasted packages only	
Vibration Variable Frequency VVF *JESD22-B103* AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples		
Mechanical Shock MS *JESD22-B110* AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples		
Hermeticity HER *JESD22-A109* 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 *JESD22-A115* Test PCB: FR4	Machine Model	200V	1x10	0	0	0

LO M676:

Failure criteria:

Electrical failures:	V_f (I_f =20mA)	> 2,4V; ± 10% from initial value
Optical failures:	I_v (I_f =20mA)	absolute limit: ± 50% max.
	λ_{dom} (I_f = 20 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LY M676 (Chip B)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 110°C; I_F = 20mA Ton/off=30min	1000h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	1x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 103°C; T_j = 105°C; I_F = 5mA ton/off = 5min	1000c	1x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	1x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 110°C; T_j = 120°C; I_F = 30mA	1000h	1x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =120mA; tp = 0,1ms; D = 3%	1000h	1x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	1x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	1x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	1x26	0	0	0
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	1x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	1x10	0	0	0

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

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures El.	Failures Opt.	Failures Vis
Electrostatic Discharge MM *JESD22-A115* Test PCB: FR4	Machine Model	200V	2x10	0	0	0

LY M676:

Failure criteria:

Electrical failures: V_f (I_f =20mA) > 2,4V; ± 10% from initial value

Optical failures: I_v (I_f =20mA) absolute limit: ± 50% max.
λ_{dom} (I_f = 20 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LS M676 (Chip C)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 110°C; I_F = 25mA Ton/off=30min	1000h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	1x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 102°C; T_j = 105°C; I_F =5mA ton/off = 5min	1000c	1x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	1x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 105°C; T_j = 120°C; I_F = 30mA	1000h	1x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =120mA; tp = 0,1ms; D = 3%	1000h	1x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	1x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	1x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	1x26	In Progress		
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	1x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	1x10	0	0	0

Constant Acceleration CA *MIL-STD-750-2* AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	for uncasted packages only	
Vibration Variable Frequency VVF *JESD22-B103* AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples		
Mechanical Shock MS *JESD22-B110* AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples		
Hermeticity HER *JESD22-A109* 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 *JESD22-A115* Test PCB: FR4	Machine Model	200V	2x10	0	0	0

LS M676:

Failure criteria:

Electrical failures:	V_f (I_f =20mA)	> 2,3V; ± 10% from initial value
Optical failures:	I_v (I_f =20mA)	absolute limit: ± 50% max.
	λ_{dom} (I_f = 20 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LA M676 (Chip C)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 110°C; I_F = 25mA Ton/off=30min	1000h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	1x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+85°C; T_s = 105°C; T_j = 115°C; I_F = 30mA ton/off = 5min	1000c	1x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	1x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 105°C; T_j = 115°C; I_F = 30mA	1000h	1x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =52mA; tp = 0,1ms; D = 3%	1000h	1x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	1x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	1x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	1x26	0	0	0
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	1x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	1x10	0	0	0

Constant Acceleration CA *MIL-STD-750-2* AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	for uncasted packages only
Vibration Variable Frequency VVF *JESD22-B103* AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples	
Mechanical Shock MS *JESD22-B110* AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples	
Hermeticity HER *JESD22-A109* 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 *JESD22-A115* Test PCB: FR4	Machine Model	200V	1x10	0	0	0

LA M676:

Failure criteria:

Electrical failures:	V_f (I_f =20mA)	> 2,3V; ± 10% from initial value
Optical failures:	I_v (I_f =20mA)	absolute limit: ± 50% max.
	λ_{dom} (I_f = 20 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LO M676 (Chip C)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 105°C; I_F = 20mA Ton/off=30min	1000h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	1x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 105°C; T_j = 115°C; I_F = 5mA ton/off = 5min	1000c	1x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	1x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 105°C; T_j = 115°C; I_F = 30mA	1000h	1x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =120mA; tp = 0,1ms; D = 3%	1000h	1x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	1x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	1x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	1x26	In Progress		
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	1x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	1x10	0	0	0

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

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures El.	Failures Opt.	Failures Vis
Electrostatic Discharge MM *JESD22-A115* Test PCB: FR4	Machine Model	200V	2x10	0	0	0

LO M676:

Failure criteria:

Electrical failures:	V_f (I_f =20mA)	> 2,4V; ± 10% from initial value
Optical failures:	I_v (I_f =20mA)	absolute limit: ± 50% max.
	λ_{dom} (I_f = 20 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LS M67K (Chip D)**

Test Performed		Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1	*JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 105°C; I_F = 20mA Ton/off=30min	1000h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2	*JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	1x26	0	0	0
Powered Temperature Cycle PTC	*JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 102°C; T_j = 105°C; I_F = 5mA ton/off = 5min	1000c	1x26	0	0	0
Temperature Cycling TC	*JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	1x26	0	0	0
High Temperature Operating Life HTOL	*JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 100°C; T_j = 105°C; I_F = 20mA	1000h	1x26	0	0	0
Pulsed Operating Life PLT	*JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =65mA; tp = 0,1ms; D = 3%	1000h	1x26	0	0	0
Dew DEW	*AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	1x26	0	0	0
Solderability SD	*IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S	*IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	1x26	0	0	0
Flowing Mixed Gas FMG	*IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	1x26	0	0	0
Board Flex Test BF	*AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	1x10	0	0	0
Electrostatic Discharge HBM	*ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	1x10	0	0	0

Constant Acceleration CA *MIL-STD-750-2* AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	3x10	for uncasted packages only	
Vibration Variable Frequency VVF *JESD22-B103* AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples		
Mechanical Shock MS *JESD22-B110* AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples		
Hermeticity HER *JESD22-A109* 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 *JESD22-A115* Test PCB: FR4	Machine Model	200V	1x10	0	0	0

LS M67K:

Failure criteria:

Electrical failures:	V_f (I_f =2mA)	> 2,2V; ± 10% from initial value
Optical failures:	I_v (I_f =2mA)	absolute limit: ± 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LY M67K (Chip D)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 105°C; I_F = 20mA Ton/off=30min	1000h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	1x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+85°C; T_s = 102°C; T_j = 105°C; I_F = 5mA ton/off = 5min	1000c	1x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	1x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 100°C; T_j = 105°C; I_F = 20mA	1000h	1x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =65mA; tp = 0,1ms; D = 3%	1000h	1x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	1x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	1x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	1x26	0	0	0
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	1x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	1x10	0	0	0

Constant Acceleration CA *MIL-STD-750-2* AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	for uncasted packages only
Vibration Variable Frequency VVF *JESD22-B103* AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples	
Mechanical Shock MS *JESD22-B110* AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples	
Hermeticity HER *JESD22-A109* 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 *JESD22-A115* Test PCB: FR4	Machine Model	200V	1x10	0	0	0

LY M67K:

Failure criteria:

Electrical failures:	V_f (I_f =2mA)	> 2,2V; ± 10% from initial value
Optical failures:	I_v (I_f =2mA)	absolute limit: ± 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 **LG M67K (Chip D)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 105°C; I_F = 20mA Ton/off=30min	1000h	2x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	2x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 103°C; T_j = 105°C; I_F = 5mA ton/off = 5min	1000c	2x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	2x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 100°C; T_j = 105°C; I_F = 20mA	1000h	2x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =65mA; tp = 0,1ms; D = 3%	1000h	2x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	2x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	2x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	2x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	2x26	0	0	0
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	2x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	2x10	0	0	0

Constant Acceleration CA *MIL-STD-750-2* AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	for uncasted packages only	
Vibration Variable Frequency VVF *JESD22-B103* AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples		
Mechanical Shock MS *JESD22-B110* AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples		
Hermeticity HER *JESD22-A109* 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 *JESD22-A115* Test PCB: FR4	Machine Model	200V	1x10	0	0	0

LG M67K:

Failure criteria:

Electrical failures:	V_f (I_f =2mA)	> 2,2V; ± 10% from initial value
Optical failures:	I_v (I_f =2mA)	absolute limit: ± 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LS M67K (Chip E)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 100°C; T_j = 105°C; I_F = 20mA Ton/off=30min	1000h	2x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	2x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 100°C; T_j = 105°C; I_F = 5mA ton/off = 5min	1000c	2x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	2x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 100°C; T_j = 105°C; I_F = 20mA	1000h	2x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =65mA; tp = 0,1ms; D = 3%	1000h	2x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	2x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	2x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	2x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	2x26	In Progress		
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	2x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	2x10	0	0	0

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

Additional Tests to AEC Q102

Test Performed	Condition	Duration	Sample Size	Failures El.	Failures Opt.	Failures Vis
Electrostatic Discharge MM *JESD22-A115* Test PCB: FR4	Machine Model	200V	2x10	0	0	0

LS M67K:

Failure criteria:

Electrical failures:	V_f (I_f =2mA)	> 2,2V; ± 10% from initial value
Optical failures:	I_v (I_f =2mA)	absolute limit: ± 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LO M67K (Chip E)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 105°C; T_j = 110°C; I_F = 20mA Ton/off=5min	1000h	1x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	1x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 105°C; T_j = 110°C; I_F = 20mA ton/off = 5min	1000c	1x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	1x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 105°C; T_j = 110°C; I_F = 20mA	1000h	1x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =65mA; tp = 0,1ms; D = 3%	1000h	1x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	1x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	1x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	1x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	1x26	0	0	0
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	1x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	1x10	0	0	0

Constant Acceleration CA *MIL-STD-750-2* AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	1x10	for uncasted packages only	
Vibration Variable Frequency VVF *JESD22-B103* AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples		
Mechanical Shock MS *JESD22-B110* AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples		
Hermeticity HER *JESD22-A109* 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 *JESD22-A115* Test PCB: FR4	Machine Model	200V	1x10	0	0	0

LO M67K:

Failure criteria:

Electrical failures:	V_f (I_f =2mA)	> 2,2V; ± 10% from initial value
Optical failures:	I_v (I_f =2mA)	absolute limit: ± 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 Rev-A.

Pre-conditioning according to Jedec Level II where applicable as per AEC-Q102 AEC-Q102 #A1 **LG M67K (Chip E)**

Test Performed	Condition	Duration	Sample Size	Failures El. AEC-Q102 #E1	Failures Opt. AEC-Q102 #E1	Failures Vis AEC-Q102 #E0
Wet High Temperature Operating Life WHTOL1 *JESD22-A101* AEC-Q102 #A2a Test PCB: IMS-Al	T_A = 85°C; r.H.= 85%; T_s = 105°C; T_j = 110°C; I_F = 20mA Ton/off=30min	1000h	2x26	0	0	0
Wet High Temperature Operating Life WHTOL2 *JESD22-A101* AEC-Q102 #A2b Test PCB: FR4	T_A = 85°C; r.H.= 85% I_F = 5mA	1000h	2x26	0	0	0
Powered Temperature Cycle PTC *JESD22-A105* AEC-Q102 #A3a Test PCB: IMS-Al	T_A = -40°C/+100°C; T_s = 105°C; T_j = 110°C; I_F = 5mA ton/off = 5min	1000c	2x26	0	0	0
Temperature Cycling TC *JESD22-A104* AEC-Q102 #A4a Test PCB: FR4	T_A = -40°C/+100°C 15min each extreme	1000c	2x26	0	0	0
High Temperature Operating Life HTOL *JESD22-A108* AEC-Q102 #B1a Test PCB: IMS-Al	T_A = 85°C; T_s = 105°C; T_j = 110°C; I_F = 20mA	1000h	2x26	0	0	0
Pulsed Operating Life PLT *JESD22-A108* AEC-Q102 #B3 Test PCB: FR4	T_A = 25°C I_F =65mA; tp = 0,1ms; D = 3%	1000h	1x26	0	0	0
Dew DEW *AEC-Q102-001* AEC-Q102#C7 Test PCB: FR4	$T_{A,min}$ = 10°C $T_{A,max}$ = 80°C r.H.= 53-100% I_F = 5mA	10c	2x26	0	0	0
Solderability SD *IEC 60068-2-58* AEC-Q102 #C10	T_A = 235°C method 2 (reflow simulation)	1x	2x10	-	-	0
Hydrogen Sulphide H2S *IEC 60068-2-43* AEC-Q102 #C12 Test PCB: FR4	15ppm H2S 40°C/90%r.H.	336h	2x26	0	0	0
Flowing Mixed Gas FMG *IEC 60068-2-60* AEC-Q102 #C13 Test PCB: FR4	T_A = 25°C, r.H.= 75% Test method 4	500h	2x26	0	0	0
Board Flex Test BF *AEC-Q102-002* AEC-Q102 #C14 Test PCB: FR4	2mm	1x	2x10	0	0	0
Electrostatic Discharge HBM *ANSI/ESDA/ JEDEC JS-001* AEC-Q102 #E3 Test PCB: FR4	Human Body Model	2000V	2x10	0	0	0

Constant Acceleration CA *MIL-STD-750-2* AEC-Q102 #G1	Method 2006 2000 gf; 1 min in x/y/z (+/- direction)	1x	2x10	for uncasted packages only	
Vibration Variable Frequency VVF *JESD22-B103* AEC-Q102 #G2	20g, 20-2000Hz; 4min / cy; 4cy/axis service condition 1	1x	sequential samples		
Mechanical Shock MS *JESD22-B110* AEC-Q102 #G3	1500g for 0.5ms, 5 blows, 3 orientations	1x	sequential samples		
Hermeticity HER *JESD22-A109* 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 *JESD22-A115* Test PCB: FR4	Machine Model	200V	1x10	0	0	0

LG M67K:

Failure criteria:

Electrical failures:	V_f (I_f =2mA)	> 2,2V; ± 10% from initial value
Optical failures:	I_v (I_f =2mA)	absolute limit: ± 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 Rev-A.

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