



12500 TI Boulevard, MS 8640, Dallas, Texas 75243

PCN# 20231130004.1

**Qualification of RFAB using qualified Process Technology, Die Revision and additional Assembly site/BOM options for select devices
Change Notification / Sample Request**

Date: December 05, 2023

Dear Customer:

This is an announcement of a change to a device that is currently offered by Texas Instruments (TI). The details of this change are on the following pages, and are in alignment with our standard product change notification (PCN) [process](#).

TI requires acknowledgement of receipt of this notification within 30 days of the date of this notice. Lack of acknowledgement of this notice within 30 days constitutes acceptance and approval of this change. If samples or additional data are required, requests must be received within 30 days of this notification, given that samples are not built ahead of the change.

The Proposed First Ship date in this PCN letter is the earliest possible date that customers could receive the changed material. It is our commitment that the changed device will not ship before that date. If samples are requested within the 30 day sample request window, customers will still have 30-days to complete their evaluation regardless of the proposed 1st ship date.

This particular PCN is related to TI's multiyear transition plan for our two remaining factories with 150-millimeter production (DFAB in Dallas, Texas, and SFAB in Sherman, Texas). DFAB will remain open, but will focus on 200-mm production, with a smaller set of technologies. SFAB will close no earlier than 2024 and no later than 2025. As referenced in the "reason for change" below, these changes are part of our multiyear plan to transition these products to newer, more efficient manufacturing processes and technologies, underscoring our commitment to product longevity and supply continuity.

For questions regarding this notice or to provide acknowledgement of this PCN, you may contact your local Field Sales Representative or the Change Management team. For sample requests or sample related questions, contact your local Field Sales Representative. As always, we thank you for your continued business.

Change Management Team
SC Business Services

20231130004.1
Attachment: 1

Products Affected:

The devices listed on this page are a subset of the complete list of affected devices. According to our records, you have recently purchased these devices. The corresponding customer part number is also listed, if available.

DEVICE	CUSTOMER PART NUMBER
TLE2064IDR	null
OPA137NA/3K	null
OPA2137E/2K5	null
OPA2137EA/2K5	null
OPA4137U/2K5	null
OPA4137UA/2K5	null
TL022CP	null
TL343IDBVR	null
TLC27M2AIDR	null
TLC27M2BCDR	null
TLC27M2BIDR	null
TLC27M2IDR	null
TLC27M4ACDR	null
TLC27M4BIDR	null
TLC27M4CDR	null
TLC27M4IDR	null
TLC27M7CDR	null
TLC27M7IDR	null
TLC27M9IDR	null
TLE2061ACP	null
TLE2061CP	null
TLE2061IDR	null
TLE2061IP	null
TLE2062ACDR	null
TLE2062AIDR	null
TLE2062CDR	null
TLE2062CP	null
TLE2062IDR	null
TLE2064ACDR	null
TLE2064AIDR	null
TLV2221IDBVR	null
TLV2432CDR	null
TLV2432IDR	null
TLV2434AIDR	null
TLV2434IDR	null
TLV2434IPWR	null
TLV2721IDBVR	null
OPA2137U/2K5	null
OPA2137UA/2K5	null
TL022CDR	null
TLC27M2CDR	null
TLC27M4AIDR	null
TLC27M4BCDR	null
TLC27M4CPWR	null
TLC27M4IPWR	null
TLC27M9CDR	null
TLV2432AIDR	null
TLV2434AIPWR	null
TLV2434CPWR	null
TLV2721CDBVR	null
OPA137N/3K	null
OPA137UA/2K5	null
TLC27M2CPWR	null
TLC27M2IPWR	null
TLE2061AIP	null
TLE2061CDR	null
TLE2062IP	null
TLE2064CDR	null
TLV2432AIPWR	null

Technical details of this Product Change follow on the next page(s).

PCN Number:	20231130004.1		PCN Date:	December 05, 2023	
Title:	Qualification of RFAB using qualified Process Technology, Die Revision and additional Assembly site/BOM options for select devices				
Customer Contact:	Change Management team		Dept:	Quality Services	
Proposed 1st Ship Date:	Mar 4, 2024		Estimated Sample Availability:	Jan 4, 2024*	
*Sample requests received after January 4, 2024 will not be supported.					
Change Type:					
☒ Assembly Site	☒ Design	☐ Wafer Bump Material			
☒ Assembly Process	☐ Data Sheet	☐ Wafer Bump Process			
☒ Assembly Materials	☐ Part number change	☒ Wafer Fab Site			
☐ Mechanical Specification	☐ Test Site	☒ Wafer Fab Materials			
☒ Packing/Shipping/Labeling	☐ Test Process	☒ Wafer Fab Process			
PCN Details					
Description of Change:					
Texas Instruments is pleased to announce the qualification of a new fab & process technology (RFAB, LBC9) and additional Assembly site (MLA, CDAT and HFTFAT) for selected devices listed below in the product affected section.					
Current Fab Site			Additional Fab Site		
Current Fab Site	Process	Wafer Diameter	Additional Fab Site	Process	Wafer Diameter
DFAB	LINCMOS, EXCAL2, LBC2	150/200 mm	RFAB	LBC9	300 mm
SFAB	J11, BIPOLAR	150 mm			
The die was also changed as a result of the process change.					
Additionally, there will be BOM/Assembly options introduced for these devices:					
Group 1 BOM Table (RFAB/Process migration & additional BOM Qualification):					
	Current	Additional			
Mount Compound	4205846	4147858			
Mold Compound	4209640	4211880			
Bond wire composition, diameter	Cu, 0.96 or Au, 1.15, 1.31 mil	Cu, 0.8 mil			
Symbolization	BB Logo, Letters, Pin 1 stipe	TI Logo/TI Letters, Pin 1 dot			
MSL	1, 3, none	1, none			
Group 2 BOM Table (RFAB/Process migration & CDAT as additional Assembly site):					
	HNA	TFME	HFTF	LEN	CDAT
Mount Compound	SID#400180	SID# A-03	SID# A-03	SID#0003C10332	4207123
Mold Compound	SID#450413	SID#R-13	SID#R-27	SID#0011G60007	4222198
Bond wire composition, diameter	Cu, 1.0 mil	Au, 1.0 mil	Cu, 1.0 mil	Au, 1.0 mil	Cu, 0.8 mil
Lead finish	NiPdAu	NiPdAu	Matte Sn	NiPdAu	Matte Sn
Symbolization	Pin 1 stripe	Pin 1 stripe	Pin 1 stripe	Pin 1 stripe	Pin 1 dot
Group 3 BOM Table (RFAB/Process migration & MLA as additional Assembly site):					
	FMX	TAI	MLA		
Bond wire composition, diameter	Cu, 0.96 mil	Cu, 0.96 mil	Cu, 0.8 mil		

Group 4 BOM Table (RFAB/Process migration & HFTF as additional Assembly site):

	HNA	HFTF
Mount Compound	SID#400180	SID#A-18
Mold Compound	SID#450265	SID#R-30
Bond wire composition, diameter	Au, 1.0 mil	Cu, 0.8 mil
Lead finish	NiPdAu	Matte Sn
MSL	3	1

Upon expiry of this PCN TI will combine lead free solutions in a single standard part number, for the devices in this change notification. For example; OPA2137EA/2K5 – can ship with both Matte Sn and NiPdAu.

Example:

- Customer order for 7500 units of OPA2137EA/2K5 with 2500 units SPQ (Standard Pack Quantity per Reel).
- TI can satisfy the above order in one of the following ways.
 - I. 3 Reels of NiPdAu finish.
 - II. 3 Reels of Matte Sn finish
 - III. 2 Reels of Matte Sn and 1 reel of NiPdAu finish.
 - IV. 2 Reels of NiPdAu and 1 reel of Matte Sn finish.

Qual details are provided in the Qual Data Section.

Reason for Change:

These changes are part of our multiyear plan to transition products from our 150-millimeter factories to newer, more efficient manufacturing processes and technologies, underscoring our commitment to product longevity and supply continuity.

Anticipated impact on Form, Fit, Function, Quality or Reliability (positive / negative):

None

Impact on Environmental Ratings:

Checked boxes indicate the status of environmental ratings following implementation of this change. If below boxes are checked, there are no changes to the associated environmental ratings.

RoHS	REACH	Green Status	IEC 62474
☒ No Change	☒ No Change	☒ No Change	☒ No Change

Changes to product identification resulting from this PCN:**Fab Site Information:**

Chip Site	Chip Site Origin Code (20L)	Chip Site Country Code (21L)	Chip Site City
SH-BIP-1	SHE	USA	Sherman
DL-LIN	DLN	USA	Dallas
RFAB	RFB	USA	Richardson

Die Rev:**Current****New**

Die Rev [2P]	Die Rev [2P]
A, B, C, E, F	A, B

Assembly Site Information:

Assembly Site	Assembly Site Origin (22L)	Assembly Country Code (23L)	Assembly City
HNA	HNT	THA	Ayutthaya

TFME	NFM	CHN	Economic Development Zone
LEN	LIN	TWN	Taichung
FMX	MEX	MEX	Aguascalientes
TAI	TAI	TWN	Chung Ho, New Taipei City
HFTFAT	HFT	CHN	Hefei
CDAT	CDA	CHN	Chengdu
MLA	MLA	MYS	Kuala Lumpur

Sample product shipping label (not actual product label)



Product Affected:

Group 1 Device list (RFAB/Process migration & additional BOM Qualification):

OPA137UA/2K5	TL022CP	TLC27M7IP	TLE2062IP
OPA2137P	TLC27M2CPWR	TLE2061ACP	TLV2332IPWR
OPA2137PA	TLC27M2IPWR	TLE2061AIP	TLV2432AIPWR
OPA2137U/2K5	TLC27M4CPWR	TLE2061CP	TLV2434AIPWR
OPA2137UA/2K5	TLC27M4IPWR	TLE2061IP	TLV2434CPWR
OPA4137U/2K5	TLC27M7CP	TLE2062CP	TLV2434IPWR
OPA4137UA/2K5			

Group 2 Device list (RFAB/Process migration & CDAT as additional Assembly site):

OPA137N/3K	TL343IDBVR	TLV2721CDBVR	TLV2721IDBVR
OPA137NA/3K	TLV2221IDBVR		

Group 3 Device list (RFAB/Process migration & MLA as additional Assembly site):

TL022CDR	TLC27M4BCDR	TLE2061CDR	TLE2064CDR
TLC27M2ACDR	TLC27M4BIDR	TLE2061IDR	TLE2064IDR
TLC27M2AIDR	TLC27M4CDR	TLE2062ACDR	TLV2432AIDR
TLC27M2BCDR	TLC27M4IDR	TLE2062AIDR	TLV2432CDR
TLC27M2BIDR	TLC27M7CDR	TLE2062CDR	TLV2432IDR
TLC27M2CDR	TLC27M7IDR	TLE2062IDR	TLV2434AIDR
TLC27M2IDR	TLC27M9CDR	TLE2064ACDR	TLV2434CDR
TLC27M4ACDR	TLC27M9IDR	TLE2064AIDR	TLV2434IDR
TLC27M4AIDR			

Group 4 Device list (RFAB/Process migration & HFTF as additional Assembly site):

OPA2137E/2K5	OPA2137EA/2K5
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For alternate parts with similar or improved performance, please visit the product page on [TI.com](https://www.ti.com)

Qualification Results

Data Displayed as: Number of lots / Total sample size / Total failed

Type	#	Test Name	Condition	Duration	Qual Device: UA741CP	QBS Reference: OPA4990IDR	QBS Reference: NE5532P	QBS Reference: UCC37322P	QBS Reference: OPA990IDBVR
HAST	A2	Biased HAST	130C/85%RH	96 Hours	-	3/231/0	3/231/0	-	3/231/0
UHA	A3	Autoclave	121C, 2 atm	96 Hours	-	3/231/5 ¹	-	-	-
TC	A4	Temperature Cycle	-65/150C	500 Cycles	-	3/231/0	-	3/231/0	3/231/0
HTOL	B1	Life Test	150C	300 Hours	-	3/231/10 ^{2,3}	3/231/0	-	-
ELFR	B2	Early Life Failure Rate	125C	48 Hours	-	1/800/0	-	-	-
SD	C3	PB-Free Solderability	8 Hours Steam Age	-	-	-	3/66/0	3/66/0	-
ESD	E2	ESD CDM	-	250 Volts	1/3/0	-	-	-	-
ESD	E2	ESD HBM	-	3000 Volts	-	-	-	-	3/9/0
LU	E4	Latch-Up	Per JESD78	-	-	3/18/0	-	-	3/9/0
CHAR	E5	Electrical Characterization	Min, Typ, Max Temp	-	-	3/90/0	-	-	3/90/0
CHAR	E5	Electrical Characterization	Per Datasheet Parameters	-	-	3/90/0	-	-	3/90/0

- QBS: Qual By Similarity
- Qual Device UA741CP is qualified at NOT CLASSIFIED NOT CLASSIFIED

- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- The following are equivalent HTOL options based on an activation energy of 0.7eV : 125C/1k Hours, 140C/480 Hours, 150C/300 Hours, and 155C/240 Hours
- The following are equivalent HTSL options based on an activation energy of 0.7eV : 150C/1k Hours, and 170C/420 Hours
- The following are equivalent Temp Cycle options per JESD47 : -55C/125C/700 Cycles and -65C/150C/500 Cycles

Quality and Environmental data is available at TI's external Web site: <http://www.ti.com/>

Green/Pb-free Status:

Qualified Pb-Free(SMT) and Green

TI Qualification ID: R-CHG-2201-021

- [1]-Discounted
[2]-Discounted
[3]-Discounted

Qualification Results

Data Displayed as: Number of lots / Total sample size / Total failed

Type	Test Name / Condition	Duration	Qual Device: OPA2990IPWR	QBS Process Reference: DRV8873SPWPRQ1	QBS Process Reference: DRV8873SPWPRQ1-A0	QBS Process Reference: OPA2990IDR
AC	Autoclave 121C	96 Hours	-	2/202/0	1/77/0	-
ED	Electrical Distributions	Cpk>1.67	-	2/60/0	1/30/0	-
ED	Electrical Characterization	Per Datasheet Parameters	1/30/0	-	-	3/90/0
ELFR	Early Life Failure Rate, 125C	48 Hours	-	2/1600/0	2/802/0	-
HAST	Biased HAST, 130C/85%RH	96 Hours	3/231/0	2/150/0	1/106/0	3/231/0
HBM	ESD - HBM	2500 V	1/3/0	-	-	-
CDM	ESD - CDM	1500 V	1/3/0	-	-	3/9/0
HTOL	Life Test, 125C	1000 Hours	-	2/154/0	1/77/0	-
HTOL	Life Test, 150C	300 Hours	-	-	-	3/231/0
HTSL	High Temp. Storage Bake 150C	1000 Hours	-	-	1/60/0	-
HTSL	High Temp. Storage Bake 170C	420 Hours	3/231/0	-	-	3/231/0
HTSL	High Temp. Storage Bake 175C	500 Hours	-	2/100/0	-	-
LU	Latch-up	(per JESD78)	1/6/0	1/6/0	-	3/18/19
PD	Physical Dimensions	--	-	2/20/0	1/10/0	-
SD	Surface Mount Solderability	Pb Free	-	1/30/0	-	-
SD	Solderability - Dip and Look	Pb Free	-	-	1/30/0	-
SD	Solderability - Dip and Look	Pb	-	-	1/30/0	-
SD	Surface Mount Solderability	Pb	-	1/30/0	-	-
TC	Temperature Cycle, -65/150C	500 Cycles	3/231/0	2/154/0	1/77/0	3/231/0
UHA	Unbiased HAST, 130C/85%RH	96 Hours	3/231/0	-	-	3/231/0
BP	Bond Pull	Wires	-	2/10/0	1/5/0	-
WBS	Bond Shear	Wires	-	2/10/0	1/5/0	-

- QBS: Qual By Similarity

- Qual Device OPA2990IPWR is qualified at LEVEL2-260C

- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable

- The following are equivalent HTOL options based on an activation energy of 0.7eV : 125C/1k Hours, 140C/480 Hours, 150C/300 Hours, and 155C/240 Hours

- The following are equivalent HTSL options based on an activation energy of 0.7eV : 150C/1k Hours, and 170C/420 Hours

- The following are equivalent Temp Cycle options per JESD47 : -55C/125C/700 Cycles and -65C/150C/500 Cycles

Quality and Environmental data is available at TI's external Web site: <http://www.ti.com/>

Green/Pb-free Status:

Qualified Pb-Free(SMT) and Green

TI Qualification ID: 20181127-127682

Qualification Results
Data Displayed as: Number of lots / Total sample size / Total failed

Type	Test Name / Condition	Duration	Qual Device: OPA2990IDGKR	QBS Product Reference: OPA2990IDR	QBS Process Reference: OPA4990IDR	QBS Package Reference: LM5008MM
PC	Preconditioning, L2	Level 2-260C	-	3/990/0	3/1477/0	-
PC	Preconditioning, L1	Level 1 - 260C	-	-	-	3/693/0
ED	Electrical Characterization	Per Datasheet Parameters	-	3/90/0	3/90/0	-
HAST	Biased HAST, 130C/85%RH	96 Hours	-	3/231/0	3/231/0	3/231/0
AC	Autoclave 121C	96 Hours	-	-	3/231/5 (1)	-
TC	Temperature Cycle, -65/150C	500 Cycles	-	3/231/0	3/231/0	3/231/0
UHAST	Unbiased HAST 130C/85%RH	96 Hours	-	3/231/0	-	3/231/0
HTSL	High Temp Storage Bake 170C	420 Hours	-	3/231/0	-	3/231/0
HTSL	High Temp Storage Bake 175C	500 Hours	-	-	3/231/0	-
HTOL	Life Test, 150C	300 Hours	-	3/231/0	3/231/10 (2)	-
ELFR	Early Life Failure Rate, 125C	48 Hours	-	-	1/800/0	-
HBM	ESD - HBM	3000 V	-	3/9/0	3/9/0	-
HBM	ESD - HBM	1500 V	-	-	1/3/0	-
CDM	ESD - CDM	1500 V	-	3/9/0	2/6/0	-
LU	Latch-up	Per JESD78	-	6/36/0	3/18/0	-
MSL	Automotive Moist Sens. L2	Level 2-260C	-	-	3/36/0	-

Type	Test Name / Condition	Duration	Qual Device: OPA2990IDGKR	QBS Product Reference: OPA2990IDR	QBS Process Reference: OPA4990IDR	QBS Package Reference: LM5008MM
MSL	Moisture Sensitivity, L1	Level 1-260C	-	-	-	3/36/0
WBP	Bond Pull	Wires	-	3/228/0	3/228/0	3/228/0
WBP	Wire Bond Pull	Wires	-	3/228/0	3/228/0	3/228/0

- QBS: Qual By Similarity
- Qual Device OPA2991IDGKR is qualified at LEVEL1-260C
- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- The following are equivalent HTOL options based on an activation energy of 0.7eV : 125C/1k Hours, 140C/480 Hours, 150C/300 Hours, and 155C/240 Hours
- The following are equivalent HTSL options based on an activation energy of 0.7eV : 150C/1k Hours, and 170C/420 Hours
- The following are equivalent Temp Cycle options per JESD47 : -55C/125C/700 Cycles and -65C/150C/500 Cycles
Quality and Environmental data is available at TI's external Web site: <http://www.ti.com/>

Green/Pb-free Status:

Qualified Pb-Free(SMT) and Green

NOTE (1): Fails were due to mechanical damage from mishandling at test. Discounted.

NOTE (2): Fails due to faulty BI sockets. See 8D attached to the eQDB.

Change Number: C2106010

TI Qualification ID: 20210415-139633

Qualification Results
Data Displayed as: Number of lots / Total sample size / Total failed

Type	Test Name / Condition	Duration	Qual Device: TLV9061IDBVR	QBS Package Reference: TLV9061IDBVR (Matte Sn)	QBS Package Reference: TP576933DBVR (PHI)
ED	Electrical Characterization, side by side	Per Datasheet Parameters	Pass	-	-
FLAM	Flammability (UL 94V-0)	-	-	-	3/15/0
FLAM	Flammability (UL-1694)	-	3/15/0	-	-
HAST	Biased HAST, 130C/85%RH	96 Hours	-	3/231/0	-
HTOL	Life Test, 150C	300 Hours	-	3/231/0	-
HTSL	High Temp Storage Bake 170C	420 Hours	3/231/0	-	-
LI	Lead Fatigue	Leads	3/54/0	-	-
LI	Lead Pull	Leads	3/54/0	-	-
MISC	Salt Atmosphere	-	3/66/0	-	-
MQ	Manufacturability (Assembly)	(per mfg. Site specification)	Pass	-	-
PD	Physical Dimensions	(per mechanical drawing)	3/15/0	-	-
PKG	Lead Finish Adhesion	Leads	3/54/0	-	-
SD	Solderability	Pb Free	3/66/0	-	-
TC	Temperature Cycle, -65/150C	500 Cycles	3/231/0	-	-
UHA	Unbiased HAST 130C/85%RH	96 Hours	3/231/0	-	-
VM	Visual / Mechanical	(per mfg. Site specification)	3/984/0	-	-
WBP	Bond Pull	Wires	3/228/0	-	-
WBS	Ball Bond Shear	Wires	3/228/0	-	-

- QBS: Qual By Similarity

- Qual Device TLV9061IDBVR is qualified at LEVEL1-260C

- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable

- The following are equivalent HTOL options based on an activation energy of 0.7eV : 125C/1k Hours, 140C/480 Hours, 150C/300 Hours, and 155C/240 Hours

- The following are equivalent HTSL options based on an activation energy of 0.7eV : 150C/1k Hours, and 170C/420 Hours

- The following are equivalent Temp Cycle options per JESD47 : -55C/125C/700 Cycles and -65C/150C/500 Cycles

Quality and Environmental data is available at TI's external Web site: <http://www.ti.com/>

Green/Pb-free Status:

Qualified Pb-Free (SMT) and Green

TI Qualification ID: 20200211-132947

Qualification Results
Data Displayed as: Number of lots / Total sample size / Total failed

Type	#	Test Name	Condition	Duration	Qual Device: OPA2990IDR	QBS Reference: OPA2990IDR	QBS Reference: OPA2991IDR	QBS Reference: OPA2991IDR
HAST	A2	Biased HAST	130C/85%RH	96 Hours	-	3/231/0	-	-
UHA	A3	Autoclave	121C/15psig	96 Hours	-	-	-	1/77/0
UHA	A3	Unbiased HAST	130C/85%RH	96 Hours	-	3/231/0	-	-
TC	A4	Temperature Cycle	-65C/150C	500 Cycles	-	3/231/0	-	1/77/0
HTSL	A6	High Temperature Storage Life	150C	1000 Hours	-	3/231/0	-	-
SD	C3	PB-Free Solderability	Precondition w.155C Dry Bake (4 hrs +/- 15 minutes); PB-Free Solder;	-	-	1/22/0	-	-
ESD	E2	ESD CDM	-	250 Volts	-	1/3/0	-	-
ESD	E2	ESD HBM	-	1000 Volts	-	1/3/0	-	-
LU	E4	Latch-Up	Per JESD78	-	-	1/3/0	1/3/0	-
CHAR	E5	Electrical Characterization	Per Datasheet Parameters	-	-	1/30/0	1/30/0	-

• QBS: Qual By Similarity

• Qual Device OPA2990IDR is qualified at MSL1 260C

• Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable

• The following are equivalent HTOL options based on an activation energy of 0.7eV : 125C/1k Hours, 140C/480 Hours, 150C/300 Hours, and 155C/240 Hours

• The following are equivalent HTSL options based on an activation energy of 0.7eV : 150C/1k Hours, and 170C/420 Hours

• The following are equivalent Temp Cycle options per JESD47 : -55C/125C/700 Cycles and -65C/150C/500 Cycles

Quality and Environmental data is available at TI's external Web site: <http://www.ti.com/>

TI Qualification ID: R-CHG-2305-064

Qualification Results

Data Displayed as: Number of lots / Total sample size / Total failed

Type	#	Test Name	Condition	Duration	Qual Device: OPA4990IDR	QBS Reference: OPA4990IDR	QBS Reference: OPA4991IDR
HAST	A2	Biased HAST	130C	96 Hours	-	3/231/0	-
UHAST	A3	Autoclave	121C/15psig	96 Hours	-	3/231/0	1/77/0
TC	A4	Temperature Cycle	-65C/150C	500 Cycles	-	3/231/0	1/77/0
HTSL	A6	High Temperature Storage Life	170C	420 Hours	-	3/231/0	-
HTOL	B1	Life Test	150C	300 Hours	-	3/231/0	-
ELFR	B2	Early Life Failure Rate	125C	48 Hours	-	3/2400/0	-
LU	E4	Latch-Up	Per JESD78	-	-	3/18/0	-
CHAR	E5	Electrical Characterization	Per datasheet limits	-	-	3/90/0	-

- QBS: Qual By Similarity
- Qual Device OPA4990IDR is qualified at MSL1 260C
- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- The following are equivalent HTOL options based on an activation energy of 0.7eV : 125C/1k Hours, 140C/480 Hours, 150C/300 Hours, and 155C/240 Hours
- The following are equivalent HTSL options based on an activation energy of 0.7eV : 150C/1k Hours, and 170C/420 Hours
- The following are equivalent Temp Cycle options per JESD47 : -55C/125C/700 Cycles and -65C/150C/500 Cycles

Quality and Environmental data is available at TI's external Web site: <http://www.ti.com/>

TI Qualification ID: R-CHG-2305-066

Qualification Results

Data Displayed as: Number of lots / Total sample size / Total failed

Type	#	Test Name	Condition	Duration	Qual Device: TLC271CDR	QBS Reference: OPA4990IDR	QBS Reference: OPA990IDBVR	QBS Reference: SN74HCS08QDRQ1	QBS Reference: TCAN1044VDRQ1
HAST	A2	Biased HAST	130C	96 Hours	-	3/231/0	-	-	-
HAST	A2	Biased HAST	130C/85%RH	96 Hours	-	-	3/231/0	-	-
UHAST	A3	Autoclave	121C, 2 atm	96 Hours	-	3/231/5 ¹	-	-	-
UHAST	A3	Autoclave	121C/15psig	96 Hours	-	-	3/231/0	-	-
UHAST	A3	Autoclave	121C/15psig	96 Hours	-	-	-	3/231/0	3/231/0
TC	A4	Temperature Cycle	-65/150C	500 Cycles	-	3/231/0	-	-	-
TC	A4	Temperature Cycle	-65C/150C	500 Cycles	-	-	3/231/0	-	-
TC	A4	Temperature Cycle	-65C/150C	500 Cycles	-	-	-	3/231/0	3/231/0
HTSL	A6	High Temperature Storage Life	170C	420 Hours	-	3/231/0	3/231/0	-	-
HTOL	B1	Life Test	150C	300 Hours	-	3/231/10 ^{2,3}	-	-	-
ELFR	B2	Early Life Failure Rate	125C	48 Hours	-	1/800/0	-	-	-
WBS	C1	Ball Shear	76 balls, 3 units min	Wires	1/76/0	-	-	-	-
WBP	C2	Bond Pull	76 Wires, 3 units min	Wires	1/76/0	-	-	-	-
PD	C4	Physical Dimensions	Cpk>1.67	-	-	-	-	3/30/0	3/30/0

ESD	E2	ESD CDM	-	1500 Volts	-	-	3/9/0	-	-
ESD	E2	ESD CDM	-	250 Volts	1/3/0	-	-	-	-
ESD	E2	ESD HBM	-	3000 Volts	-	-	3/9/0	-	-
LU	E4	Latch-Up	Per JESD78	-	-	3/18/0	3/9/0	-	-
CHAR	E5	Electrical Characterization	Min, Typ, Max Temp	-	-	3/90/0	3/90/0	-	-
CHAR	E5	Electrical Characterization	Per Datasheet Parameters	-	-	3/90/0	3/90/0	-	-

- QBS: Qual By Similarity
- Qual Device TLC271CDR is qualified at MSL1 260C
- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- The following are equivalent HTOL options based on an activation energy of 0.7eV : 125C/1k Hours, 140C/480 Hours, 150C/300 Hours, and 155C/240 Hours
- The following are equivalent HTSL options based on an activation energy of 0.7eV : 150C/1k Hours, and 170C/420 Hours
- The following are equivalent Temp Cycle options per JESD47 : -55C/125C/700 Cycles and -65C/150C/500 Cycles

Quality and Environmental data is available at TI's external Web site: <http://www.ti.com/>

Green/Pb-free Status:

Qualified Pb-Free(SMT) and Green

TI Qualification ID: R-NPD-2209-036

[1]-Mechanical damage from mis-handling @ test.

[2]-Faulty BI sockets.

[3]-Faulty BI sockets.

Qualification Results

Data Displayed as: Number of lots / Total sample size / Total failed

Type	#	Test Name	Condition	Duration	Qual Device: OPA4990IPWR	QBS Process Reference: OPA2991QDGKRQ1	QBSProduct/Process/ Package Reference: OPA4991QPWRQ1
HAST	A2	Biased HAST	110C/85%RH	264 Hours	-	-	1/77/0
HAST	A2	Biased HAST	130C/85%RH	96 Hours	-	3/231/0	-
UHAIST	A3	Autoclave	121C/15psig	96 Hours	-	3/231/0	3/231/0
TC	A4	Temperature Cycle	-65C/150C	500 Cycles	-	3/231/0	1/77/0
HTSL	A6	High Temperature Storage Life	150C	1000 Hours	-	-	1/45/0
HTSL	A6	High Temperature Storage Life	175C	630 Hours	-	3/135/0	-
HTOL	B1	Life Test	150C	300 Hours	-	-	3/231/0
HTOL	B1	Life Test	150C	408 Hours	-	3/230/0	-
ELFR	B2	Early Life Failure Rate	125C	48 Hours	-	3/2397/0	-
SD	C3	PB Solderability	Precondition w.155C Dry Bake (4 hrs +/- 15 minutes)	-	-	1/15/0	-
SD	C3	PB-Free Solderability	Precondition w.155C Dry Bake (4 hrs +/- 15 minutes)	-	-	1/15/0	-
PD	C4	Physical Dimensions	Cpk>1.67	-	-	3/30/0	1/10/0

Type	#	Test Name	Condition	Duration	Qual Device: OPA4990IPWR	QBS Process Reference: OPA2991QDGKRQ1	QBSProduct/Process/ Package Reference: OPA4991QPWRQ1
ESD	E2	ESD CDM	-	1500 Volts	-	-	1/3/0
ESD	E2	ESD HBM	-	2000 Volts	-	1/3/0	-
ESD	E2	ESD HBM	-	4000 Volts	-	-	1/3/0
LU	E4	Latch-Up	Per JESD78	-	-	1/6/0	3/18/0
CHAR	E5	Electrical Distributions	Cpk>1.67 Room, hot, and cold	-	-	3/90/0	3/90/0

- QBS: Qual By Similarity
- Qual Device OPA4990IPWR is qualified at MSL1 260C

- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- The following are equivalent HTOL options based on an activation energy of 0.7eV : 125C/1k Hours, 140C/480 Hours, 150C/300 Hours, and 155C/240 Hours
- The following are equivalent HTSL options based on an activation energy of 0.7eV : 150C/1k Hours, and 170C/420 Hours
- The following are equivalent Temp Cycle options per JESD47 : -55C/125C/700 Cycles and -65C/150C/500 Cycles

Quality and Environmental data is available at TI's external Web site: <http://www.ti.com/>

TI Qualification ID: R-CHG-2305-067

Qualification Results

Data Displayed as: Number of lots / Total sample size / Total failed

Type	#	Test Name	Condition	Duration	Qual Device: TL062CP	QBS Reference: OPA4990IDR	QBS Reference: LM2904BQDRQ1	QBS Reference: NE5532P	QBS Reference: UCC37322P	QBS Reference: OPA2990IDR
HAST	A2	Biased HAST	130C	96 Hours	-	3/231/0	3/231/0	3/231/0	-	3/231/0
UHA	A3	Autoclave	121C, 2 atm	96 Hours	-	3/231/5 ¹	-	-	3/231/0	-
UHA	A3	Unbiased HAST	130C	192 Hours	-	-	3/231/0	-	-	-
UHA	A3	Unbiased HAST	130C/85%RH	96 Hours	-	-	-	-	-	3/231/0
TC	A4	Temperature Cycle	-65/150C	500 Cycles	-	3/231/0	3/231/0	-	3/231/0	3/231/0
HTSL	A6	High Temperature Storage Life	150C	1000 Hours	-	-	-	-	-	3/231/0
HTSL	A6	High Temperature Storage Life	170C	420 Hours	-	3/231/0	3/135/0	-	3/231/0	-
HTOL	B1	Life Test	150C	300 Hours	-	3/231/10 ^{2,3}	3/231/0	3/231/0	-	-
ELFR	B2	Early Life Failure Rate	125C	48 Hours	-	1/800/0	3/2400/4 ^{4,5}	-	-	-
SD	C3	PB Solderability	Precondition w.155C Dry Bake (4 hrs +/- 15 minutes)	-	-	-	1/15/0	-	-	-

SD	C3	Pb-Free Solderability	Precondition w.155C Dry Bake (4 hrs +/- 15 minutes)	-	-	-	1/15/0	-	-	-
ESD	E2	ESD CDM	-	250 Volts	-	-	-	-	-	1/3/0
ESD	E2	ESD HBM	-	1000 Volts	-	-	-	-	-	1/3/0
LU	E4	Latch-Up	Per JESD78	-	-	3/18/0	-	-	-	1/3/0
CHAR	E5	Electrical Characterization	Per Datasheet Parameters	-	1/30/0	3/90/0	-	-	-	1/30/0

- QBS: Qual By Similarity
- Qual Device TL062CP is qualified at NOT CLASSIFIED NOT CLASSIFIED
- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- The following are equivalent HTOL options based on an activation energy of 0.7eV : 125C/1k Hours, 140C/480 Hours, 150C/300 Hours, and 155C/240 Hours
- The following are equivalent HTSL options based on an activation energy of 0.7eV : 150C/1k Hours, and 170C/420 Hours
- The following are equivalent Temp Cycle options per JESD47 : -55C/125C/700 Cycles and -65C/150C/500 Cycles

Quality and Environmental data is available at TI's external Web site: <http://www.ti.com/>

Green/Pb-free Status:

Qualified Pb-Free(SMT) and Green

TI Qualification ID: R-CHG-2108-022

- [1]- Discounted - Handling
- [2]- Discounted - Handling
- [3]- Discounted - Handling
- [4]- Discounted - Test Coverage
- [5]- Discounted - Test Coverage

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