PCN Number:	20240312000.2	**PCN Date:**	March 13, 2024
Title:	Qualification of RFAB as an additional Fab site option, Die Revision, and new Assembly/Test site Option for select devices		
Customer Contact:	Change Management Team	**Dept:**	Quality Services
Proposed 1st Ship Date:	September 09, 2024	**Sample requests accepted until:**	April 12, 2024*

***Sample requests received after April 12, 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 Material
☒	Packing/Shipping/Labeling	☐	Test Process	☒	Wafer Fab Process

PCN Details

Description of Change:

Texas Instruments is pleased to announce the qualification of its RFAB fabrication facility as an additional Wafer Fab option and Die revision in addition to Assembly/Test site options for the devices listed below.

Current Fab Site			Additional Fab site		
Current Fab Site	**Process**	**Wafer Diameter**	**Additional Fab site**	**Process**	**Wafer Diameter**
CFAB	JI3	200mm	RFAB	TIB	300mm

The die was also changed as a result of the process change.

Constriction differences are as follows:

BOM Table (RFAB/Process migration/Qualify CDAT as and additional Assembly site):

	TIPI	CDAT
Lead finish	NiPdAu	Matte Sn
Final Test site	TIPI	CDAT

Upon expiry of this PCN, there will be a transition period where TI will combine lead free solutions in a single ***standard part number*** For example; ***TL331IDBVRQ1*** – can ship with both Matte Sn and NiPdAu.
Example:

- Customer order for 7500 units of TL331IDBVRQ1 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.

Test coverage, insertions, conditions will remain consistent with current testing and verified with test MQ

Qual details are provided in the Qual Data Section.

Reason for Change:

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
CFAB	CU3	CHN	Chengdu
RFAB	**RFB**	**USA**	**Richardson**

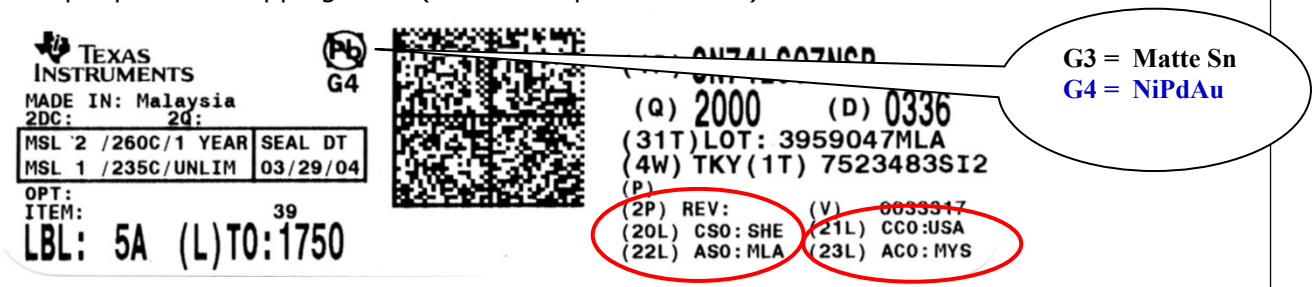
Die Rev:

Current	**New**
Die Rev [2P]	**Die Rev [2P]**
A	**A**

Assembly Site Information:

Assembly Site	Assembly Site Origin (22L)	Assembly Country Code (23L)	Assembly City
TI Phillippines	PHI	PHL	Baguio City
TI Chengdu	**CDA**	**CHN**	**Chengdu**

Sample product shipping label (not actual product label):



Product Affected:

SN331QDBVRQ1	TL331IDBVRQ1	TL331QDBVRQ1

For alternate parts with similar or improved performance, please visit the product page on TI.com

Automotive Qualification Summary
(As per AEC-Q100 Rev. H and JEDEC Guidelines)

TL331QDBVRQ1 (TIB, PHI, Automotive)
Approve Date 18-JANUARY -2024

Product Attributes

Attributes	Qual Device: TL331QDBVRQ1	QBS Package Reference: TL331BQDBVRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Package Reference: TL391BQDBVRQ1	QBS Process Reference: LM2901BQPWRQ1
Automotive Grade Level	Grade 1	Grade 1	Grade 1	Grade 1	Grade 1
Operating Temp Range (C)	-40 to 125	-40 to 125	-40 to 125	-40 to 125	-40 to 125
Product Function	Signal Chain	Signal Chain	Signal Chain	Signal Chain	Signal Chain
Wafer Fab Supplier	RFAB	CFAB	RFAB	CFAB	RFAB
Assembly Site	PHI	PHI	MLA	PHI	MLA
Package Group	SOT	SOT	TSSOP	SOT	TSSOP
Package Designator	DBV	DBV	PW	DBV	PW
Pin Count	5	5	14	5	14

- QBS: Qual By Similarity
- Qual Device TL331QDBVRQ1 is qualified at MSL1 260C

Qualification Results

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

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: TL331QDBVRQ1	QBS Package Reference: TL331BQDBVRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Package Reference: TL391BQDBVRQ1	QBS Process Reference: LM2901BQPWRQ1
Test Group A - Accelerated Environment Stress Tests												
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL1 260C	-	1/308/0	1/308/0	-	2/616/0	-
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	96 Hours	1/77/0	1/77/0	-	2/154/0	-
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Unbiased HAST	110C/85%RH	264 Hours	-	-	-	-	-
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Unbiased HAST	130C/85%RH	96 Hours	1/77/0	1/77/0	-	2/154/0	-
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	1/77/0	1/77/0	-	2/154/0	-
TC-BP	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle Bond Pull	-	-	1/6/0	-	-	-	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	150C	1000 Hours	-	1/45/0	-	2/90/0	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	175C	500 Hours	1/77/0	-	-	-	-
Test Group B - Accelerated Lifetime Simulation Tests												
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	150C	300 Hours	1/77/0	-	-	-	1/77/0
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	150C	408 Hours	-	-	3/231/0	-	-
ELFR	B2	AEC Q100-008	3	800	Early Life Failure Rate	125C	48 Hours	-	-	3/2400/0	-	-
Test Group C - Package Assembly Integrity Tests												

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: TL331QDBVRQ1	QBS Package Reference: TL331BQDBVRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Package Reference: TL391BQDBVRQ1	QBS Process Reference: LM2901BQPWRQ1
WBS	C1	AEC Q100-001	1	30	Wire Bond Shear	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	1/30/0	1/30/0	-	2/60/0	-
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	1/30/0	1/30/0	-	2/60/0	-
SD	C3	JEDEC J-STD-002	1	15	PB Solderability	>95% Lead Coverage	-	1/15/0	1/15/0	-	-	-
SD	C3	JEDEC J-STD-002	1	15	PB-Free Solderability	>95% Lead Coverage	-	1/15/0	1/15/0	-	-	-
PD	C4	JEDEC JESD22-B100 and B108	3	10	Physical Dimensions	Cpk>1.67	-	1/10/0	1/10/0	-	2/20/0	-
Test Group D - Die Fabrication Reliability Tests												
EM	D1	JESD61	-	-	Electromigration	-	-	Completed Per Process Technology Requirements	-	-	-	-
TDDB	D2	JESD35	-	-	Time Dependent Dielectric Breakdown	-	-	Completed Per Process Technology Requirements	-	-	-	-
HCI	D3	JESD60 & 28	-	-	Hot Carrier Injection	-	-	Completed Per Process Technology Requirements	-	-	-	-
BTI	D4	-	-	-	Bias Temperature Instability	-	-	Completed Per Process Technology Requirements	-	-	-	-
SM	D5	-	-	-	Stress Migration	-	-	Completed Per Process Technology Requirements	-	-	-	-
Test Group E - Electrical Verification Tests												
ESD	E2	AEC Q100-002	1	3	ESD HBM	-	2000 Volts	1/3/0	-	-	-	-
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	1000 Volts	1/3/0	-	-	-	-

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: TL331QDBVRQ1	QBS Package Reference: TL331BQDBVRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Package Reference: TL391BQDBVRQ1	QBS Process Reference: LM2901BQPWRQ1
LU	E4	AEC Q100-004	1	6	Latch-Up	Per AEC Q100-004	-	1/6/0	-	-	-	-
ED	E5	AEC Q100-009	3	30	Electrical Distributions	Cpk>1.67 Room, hot, and cold	-	1/30/0	-	-	-	3/90/0
Additional Tests												

- 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

Ambient Operating Temperature by Automotive Grade Level:

- Grade 0 (or E): -40C to +150C
- Grade 1 (or Q): -40C to +125C
- Grade 2 (or T): -40C to +105C
- Grade 3 (or I) : -40C to +85C

E1 (TEST): Electrical test temperatures of Qual samples (High temperature according to Grade level):

- Room/Hot/Cold : HTOL, ED
- Room/Hot : THB / HAST, TC / PTC, HTSL, ELFR, ESD & LU
- Room : AC/uHAST

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

TI Qualification ID: R-CHG-2301-058

Package cracked down the middle

Automotive Qualification Summary
(As per AEC-Q100 Rev. H and JEDEC Guidelines)

TL331QDBVRQ1 (TIB, CDAT, Automotive)
Approve Date 19-JANUARY -2024

Product Attributes

Attributes	Qual Device: TL331QDBVRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Product Reference: LM2901BQPWRQ1
Automotive Grade Level	Grade 1	Grade 1	Grade 1
Operating Temp Range (C)	-40 to 125	-40 to 125	-40 to 125
Product Function	Signal Chain	Signal Chain	Signal Chain
Wafer Fab Supplier	RFAB	RFAB	RFAB
Assembly Site	CDAT	MLA	MLA
Package Group	SOT	TSSOP	TSSOP
Package Designator	DBV	PW	PW
Pin Count	5	14	14

- QBS: Qual By Similarity
- Qual Device TL331QDBVRQ1 is qualified at MSL1 260C

Qualification Results

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

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: TL331QDBVRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Product Reference: LM2901BQPWRQ1
Test Group A - Accelerated Environment Stress Tests										
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL1 260C	-	3/924/0	-	-
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	96 Hours	3/231/0	-	-
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Unbiased HAST	110C/85%RH	264 Hours	-	-	-
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Unbiased HAST	130C/85%RH	96 Hours	3/231/0	-	-
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	3/231/0	-	-
TC-BP	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle Bond Pull	-	-	1/6/0	-	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	150C	1000 Hours	-	-	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	175C	500 Hours	1/45/0	-	-
Test Group B - Accelerated Lifetime Simulation Tests										
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	150C	300 Hours	1/77/0	-	1/77/0
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	150C	408 Hours	-	3/231/0	-

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: TL331QDBVRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Product Reference: LM2901BQPWRQ1
ELFR	B2	AEC Q100-008	3	800	Early Life Failure Rate	125C	48 Hours	-	3/2400/0	-
Test Group C - Package Assembly Integrity Tests										
WBS	C1	AEC Q100-001	1	30	Wire Bond Shear	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	3/90/0	-	-
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	3/90/0	-	-
SD	C3	JEDEC J-STD-002	1	15	PB Solderability	>95% Lead Coverage	-	1/15/0	-	-
SD	C3	JEDEC J-STD-002	1	15	PB-Free Solderability	>95% Lead Coverage	-	1/15/0	-	-
PD	C4	JEDEC JESD22-B100 and B108	3	10	Physical Dimensions	Cpk>1.67	-	3/30/0	-	-
Test Group D - Die Fabrication Reliability Tests										
EM	D1	JESD61	-	-	Electromigration	-	-	Completed Per Process Technology Requirements	-	-
TDDB	D2	JESD35	-	-	Time Dependent Dielectric Breakdown	-	-	Completed Per Process Technology Requirements	-	-
HCI	D3	JESD60 & 28	-	-	Hot Carrier Injection	-	-	Completed Per Process Technology Requirements	-	-
BTI	D4	-	-	-	Bias Temperature Instability	-	-	Completed Per Process Technology Requirements	-	-

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: TL331QDBVRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Product Reference: LM2901BQPWRQ1
SM	D5	-	-	-	Stress Migration	-	-	Completed Per Process Technology Requirements	-	-
Test Group E - Electrical Verification Tests										
ESD	E2	AEC Q100-002	1	3	ESD HBM	-	2000 Volts	1/3/0	-	-
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	1000 Volts	1/3/0	-	-
LU	E4	AEC Q100-004	1	6	Latch-Up	Per AEC Q100-004	-	1/6/0	-	-
ED	E5	AEC Q100-009	3	30	Electrical Distributions	Cpk>1.67 Room, hot, and cold	-	1/30/0	-	3/90/0
Additional Tests										

- 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
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E1 (TEST): Electrical test temperatures of Qual samples (High temperature according to Grade level):

- Room/Hot/Cold : HTOL, ED
- Room/Hot : THB / HAST, TC / PTC, HTSL, ELFR, ESD & LU
- Room : AC/uHAST

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

TI Qualification ID: R-CHG-2301-052

[1]-Units lost - QFLL closed
[2]-Unit lost - QFLL closed
[3]-Unit damaged prior to ATE
Package cracked down the middle

ZVEI IDs: SEM-DE-03, SEM-PW-02, SEM-PW-09, SEM-PW-13, SEM-PA-05, SEM-PA-18, SEM-PS-04, SEM-TF-01

For questions regarding this notice, e-mails can be sent to the Change Management team or your local Field Sales Representative.