PCN Number:	20231031002.2	**PCN Date:**	October 31, 2023
Title:	Qualification of RFAB as an additional Fab site option and new Assembly/Test site Options for select devices		
Customer Contact:	Change Management Team	**Dept:**	Quality Services
Proposed 1st Ship Date:	Apr 28, 2024	**Sample requests accepted until:**	Dec 1, 2023*

***Sample requests received after Dec 1, 2023 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 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**
SH-BIP-1	JI1	150mm	RFAB	TIB	300mm

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

Constriction differences are as follows:

Group 1 BOM Table (RFAB/Process migration/Qualify MLA as and additional Assembly site to FMX):

	FMX	MLA
Bond wire composition, diameter diameter	Cu, 1.0 mil	Cu, 0.8 mil
Final Test Site	FMX	MLA

Group 2 BOM Table (RFAB/Process migration/Qualify MLA as and additional Assembly site to TAI):

	TAI	MLA
Bond wire composition, diameter diameter	Au, 0.96 mil	Cu, 0.8 mil
Mount Compound	4208458	4147858
Mold Compound	4209640	4211880
Final Test Site	TAI	MLA
MSL	3	1

In conjuction with this notice, the probe test step will be removed from the process flow.

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
RFAB	**RFB**	**USA**	**Richardson**

Die Rev:

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

Assembly Site Information:

Assembly Site	Assembly Site Origin (22L)	Assembly Country Code (23L)	Assembly City
TI Mexico	MEX	MEX	Aguascalientes
TI Taiwan	TAI	TWN	Chung Ho, New Taipei City
TI Malaysia	**MLA**	**MYS**	**Kuala Lumpur**

Sample product shipping label (not actual product label):

Product Affected:

Group 1 Device list (RFAB/Process migration/Qualify MLA as and additional Assembly site to FMX):

LM2901QDRDL	LM2901QDRQ1	LM2901VQDRQ1	SN104613DR

Group 2 Device list (RFAB/Process migration/Qualify MLA as and additional Assembly site to TAI):

MLA00197DR	MLA00197DRG4

TI Information
Selective Disclosure

Automotive New Product Qualification Summary
(As per AEC-Q100 and JEDEC Guidelines)

LM2901 Automotive SOIC Red Bull Refresh
Approve Date 04-OCTOBER -2023

Product Attributes

Attributes	Qual Device: LM2901QDRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Package, Process Reference: LM2903BQDRQ1	QBS Process Reference: LM2901BQPWRQ1
Automotive Grade Level	Grade 1	Grade 1	Grade 1	Grade 1
Operating Temp Range (C)	-40 to 125	-40 to 125	-40 to 125	-40 to 125
Product Function	Signal Chain	Signal Chain	Signal Chain	Signal Chain
Wafer Fab Supplier	RFAB	RFAB	CFAB	RFAB
Assembly Site	MLA	MLA	MLA	MLA
Package Group	SOIC	TSSOP	SOIC	TSSOP
Package Designator	D	PW	D	PW
Pin Count	14	14	8	14

- QBS: Qual By Similarity
- Qual Device LM2901QDRQ1 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: LM2901QDRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Package, Process Reference: LM2903BQDRQ1	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	-	3/924/0	1/308/0
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	96 Hours	1/77/0	-	3/231/0	1/77/0
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	-	3/231/0	1/77/0
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	1/77/0	-	3/231/0	1/77/0
TC-BP	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle Bond Pull	-	-	1/5/0	-	-	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	150C	1000 Hours	-	-	3/135/0	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	175C	500 Hours	1/77/0	-	-	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	-	3/231/0	1/77/0

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2901QDRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Package, Process Reference: LM2903BQDRQ1	QBS Process Reference: LM2901BQPWRQ1
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											
WBS	C1	AEC Q100-001	1	30	Wire Bond Shear	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	1/30	-	3/90/0	-
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	1/30	-	3/90/0	-
SD	C3	JEDEC J-STD-002	1	15	PB Solderability	>95% Lead Coverage	-	1/15	-	1/15/0	-
SD	C3	JEDEC J-STD-002	1	15	PB-Free Solderability	>95% Lead Coverage	-	1/15	-	1/15/0	-
PD	C4	JEDEC JESD22-B100 and B108	3	10	Physical Dimensions	Cpk>1.67	-	1/10	-	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	-	-	-

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2901QDRQ1	QBS Process Reference: LM2902BQPWRQ1	QBS Package, Process Reference: LM2903BQDRQ1	QBS Process Reference: LM2901BQPWRQ1
NBTI	D4	-	-	-	Negative 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	-	-	1/3/0
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	1500 Volts	-	-	-	-
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	500 Volts	1/3/0	-	-	1/3/0
LU	E4	AEC Q100-004	1	6	Latch-Up	Per AEC Q100-004	-	1/6/0	-	-	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

Orderable Part Numbers

The following table contains a list of all TI Orderable Part Numbers (OPNs) released by this qualification per Product Qualification Family definition (AEC Q100 Appendix 1). Group E results shown above cover all part numbers listed here.

LM2901QDRDL	LM2901QDRQ1
LM2901VQDRQ1	MLA00197DR
MLA00197DRG4	SN104613DR

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-2309-031

Automotive New Product Qualification Summary
(As per AEC-Q100, AEC-Q006, and JEDEC Guidelines)

Q006 Summary for 14 pin D package / 0.8 Mil PCC Wire LBC9 / TIB Al Bond Pad in MLA (Grade 1, -40/125C)
Approve Date 06-October -2021

Product Attributes

Attributes	Qual Device: SN74HCS74QDRQ1
Die Attributes	
Wafer Fab Supplier	RFAB
Wafer Process	LBC9
Die Size (L,W) (um)	460 x 510
Package Attributes	
Assembly Site	MLA
Package Group	SOIC
Package Designator	D
Package Size (mm)	8.65 x 3.9
Body Thickness (mm)	1.58
Pin Count	14
Lead Finish	NIPDAU
Lead Pitch(mm)	1.27
Bond Wire Composition	CU
Bond Wire Diameter(um)	20.32
Flammability Rating	-

- QBS: Qual By Similarity
- Qual Device SN74HCS74QDRQ1 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: SN74HCS74QDRQ1
Test Group A - Accelerated Environment Stress Tests								
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL1 260C	1 Step	3/0/0
PC	A1.1	-	3	22	SAM Precon Pre	Review for delamination	1 Step	3/66/0
PC	A1.2	-	3	22	SAM Precon Post	Review for delamination	1 Step	3/66/0
HAST	A2.1	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	96 Hours	3/231/0
HAST	A2.1.2	-	3	1	Cross Section, post bHAST, 1X	Post stress cross section	Completed	3/3/0
HAST	A2.1.3	-	3	30	Wire Bond Shear, post bHAST, 1X	Post stress	Wires	3/9/0
HAST	A2.1.4	-	3	30	Bond Pull over Stitch, post bHAST, 1X	Post stress	Wires	3/9/0

HAST	A2.1.5	-	3	30	Bond Pull over Ball, post bHAST, 1X	Post stress	Wires	3/9/0
HAST	A2.2	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	192 Hours	3/231/0
HAST	A2.2.1	-	3	22	SAM Analysis, post bHAST 2X	Review for delamination	Completed	3/66/0
HAST	A2.2.2	-	3	1	Cross Section, post bHAST, 2X	Post stress cross section	Completed	3/3/0
HAST	A2.2.3	-	3	30	Wire Bond Shear, post bHAST, 2X	Post stress	Wires	3/9/0
HAST	A2.2.4	-	3	30	Bond Pull over Stitch, post bHAST, 2X	Post stress	Wires	3/9/0
HAST	A2.2.5	-	3	30	Bond Pull over Ball, post bHAST, 2X	Post stress	Wires	3/9/0
TC	A4.1	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	3/231/0
TC	A4.1.1	-	3	22	SAM Analysis, post TC 1X	Review for delamination	Completed	3/66/0
TC	A4.1.2	-	3	1	Cross Section, post TC, 1X	Post stress cross section	Completed	3/3/0
TC	A4.1.3	-	3	30	Wire Bond Shear, post TC, 1X	Post stress	Wires	3/9/0
TC	A4.1.4	-	3	30	Bond Pull over Stitch, post TC, 1X	Post stress	Wires	3/9/0
TC	A4.1.5	-	3	30	Bond Pull over Ball, post TC, 1X	Post stress	Wires	3/9/0
TC	A4.2	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	1000 Cycles	3/231/0
TC	A4.2.1	-	3	22	SAM Analysis, post TC, 2X	Review for delamination	Completed	3/66/0
TC	A4.2.2	-	3	1	Cross Section, post TC, 2X	Post stress cross section	Completed	3/3/0
TC	A4.2.3	-	3	30	Wire Bond Shear, post TC, 2X	Post stress	Wires	3/9/0
TC	A4.2.4	-	3	30	Bond Pull over Stitch, post TC, 2X	Post stress	Wires	3/9/0
TC	A4.2.5	-	3	30	Bond Pull over Ball, post TC, 2X	Post stress	Wires	3/9/0
HTSL	A6.1	JEDEC JESD22-A103	3	45	High Temperature Storage Life	150C	1000 Hours	3/135/0
HTSL	A6.1.1	-	3	1	Cross Section, post HTSL, 1X	Post stress cross section	Completed	3/3/0
HTSL	A6.2	JEDEC JESD22-A103	3	45	High Temperature Storage Life	150C	2000 Hours	3/135/0
HTSL	A6.2.1	-	3	1	Cross Section, post HTSL, 2X	Post stress cross section	Completed	3/3/0
Test Group B - Accelerated Lifetime Simulation Tests								
HTOL	B1	JEDEC JESD22-A108	1	77	Life Test	125C	1000 Hours	3/231/0
ELFR	B2	AEC Q100-008	1	77	Early Life Failure Rate	125C	48 Hours	-
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 JESD22-B102	1	15	PB Solderability	>95% Lead Coverage	-	3/45/0
SD	C3	JEDEC JESD22-B102	1	15	PB-Free Solderability	>95% Lead Coverage	-	3/45/0
PD	C4	JEDEC JESD22-B100 and B108	1	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
NBTI	D4	-	-	-	Negative 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	-	500 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	-	3/90/0

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

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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-BKF-2110-024

ZVEI Ids: SEM-DE-01, SEM-DE-02, SEM-DE-03, SEM-PW-02, SEM-PW-09, SEM-PW-13, SEM-PA-07, SEM-PA-08, SEM-PA-11, SEM-PA-18, SEM-TF-01

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

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