PCN Number:	20240221003.2	**PCN Date:**	February 21, 2024
Title:	Qualification of RFAB using qualified Process Technology, Die Revision, and MLA as additional Assembly & Test Site for select devices		
Customer Contact:	Change Management team	**Dept:**	Quality Services
Proposed 1st Ship Date:	August 19, 2024	**Sample requests accepted until:**	March 22, 2024*

***Sample requests received after March 22, 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 RFAB, die revision, and MLA as additional Assembly & Test Site option for select devices as listed below in the product affected section. Construction differences are noted below:

Current Fab Site			Additional Fab Site		
Current Fab Site	**Process**	**Wafer Diameter**	**Additional Fab Site**	**Process**	**Wafer Diameter**
GFAB6/8	P2CMOS	150/200 mm	RFAB	LBC9	300 mm
DFAB		200 mm			

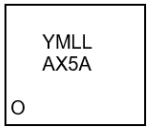
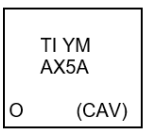
	Current	**New**
Probe Site (EWS)	TIEM-PR	None
Final Test site	TIEM	MLA

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

Additionally, there will be Assembly site & BOM options introduced for these devices as follows:

	TIEM	**MLA**
Die thickness	8.5 mils	7.5 mils
Wire diam/type	1.0 mil Au	0.80 mil Cu
Mount compound	8075531	4147858
Mold Compound	8096859	4211880
Lead finish	Matte Sn	NiPdAu
ECAT	G3	G4

Package marking change:

	Current	**Proposed**
Package Marking (Sample)	 YM = YEAR MONTH DATE CODE LL = ASSEMBLY LOT CODE O = PIN 1 INDICATOR	 TI = TI LETTER YM = YEAR MONTH DATE CODE O = PIN 1 INDICATOR CAV = CAVITY NUMBER

Test coverage, insertions, conditions will remain consistent with current testing.

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
GFAB6	GF6	GBR	Greenock
GFAB8	GF8	GBR	Greenock
DFAB	DLN	USA	Dallas
RFAB	**RFB**	**USA**	**Richardson**

Die Rev:

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

Assembly Site Information:

Assembly Site	Assembly Site Origin (22L)	Assembly Country Code (23L)	Assembly City
TIEMA	CU6	MYS	Melaka
MLA	**MLA**	**MYS**	**Kuala Lumpur**

Sample product shipping label (not actual product label)

Product Affected:

LMC6772QMM/NOPB	LMC6772QMMX/NOPB	LMC6772QMMX/S7002298

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)

Product Attributes

Attributes	Qual Device: LMC6772QMMX/NOPB	Qual Device: TLV1812QDGKRQ1	QBS Package, Process Reference: SN74LV244AQDGSRQ1, SN74LV273AQDGSRQ1 SN74LV541AQDGSRQ1	QBS Process Reference: BQ79616PAPRQ1	QBS Product Reference: TLV1812QDRQ1	QBS Package, Process Reference: OPA2991QDRQ1
Automotive Grade Level	Grade 1	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	-40 to 125
Product Function	Signal Chain	Signal Chain	Logic	Power Management	Signal Chain	Signal Chain
Wafer Fab Supplier	RFAB	RFAB	RFAB	RFAB	RFAB	RFAB
Assembly Site	MLA	MLA	MLA	PHI	MLA	MLA
Package Group	VSSOP	VSSOP	VSSOP	QFP	SOIC	SOIC
Package Designator	DGK	DGK	DGS	PAP	D	D
Pin Count	8	8	20	64	8	8

- QBS: Qual By Similarity
- Qual Device LMC6772QMMX/NOPB 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: LMC6772QMMX/NOPB	Qual Device: TLV1812QDGKRQ1	QBS Package, Process Reference: SN74LV244AQDGSRQ1, SN74LV273AQDGSRQ1 SN74LV541AQDGSRQ1	QBS Process Reference: BQ79616PAPRQ1	QBS Product Reference: TLV1812QDRQ1	QBS Package, Process Reference: OPA2991QDRQ1
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	3/924/0
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	96 Hours	-	1/77/0	3/231/0	-	1/77/0	3/231/0
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	3/231/0
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	3/231/0
TC-BP	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle Bond Pull	-	-	-	1/5/0	-	-	1/5/0	1/5/0
PTC	A5	JEDEC JESD22-A105	1	45	PTC	-40/125C	1000 Cycles	-	-	-	-	-	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	175C	500 Hours	-	1/77/0	-	-	1/77/0	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	150C	1000 Hours	-	-	3/135/0	-	-	3/135/0
Test Group B - Accelerated Lifetime Simulation Tests													
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	125C	1000 Hours	-	-	-	3/231/0	-	-
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	-	-	-	-	-	1/77/0
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: LMC6772QMMX/NOPB	Qual Device: TLV1812QDGKRQ1	QBS Package, Process Reference: SN74LV244AQDGSRQ1, SN74LV273AQDGSRQ1 SN74LV541AQDGSRQ1	QBS Process Reference: BQ79616PAPRQ1	QBS Product Reference: TLV1812QDRQ1	QBS Package, Process Reference: OPA2991QDRQ1
WBS	C1	AEC Q100-001	1	30	Wire Bond Shear	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	-	1/30/0	3/90/0	-	1/30/0	3/90/0
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	-	1/30/0	3/90/0	-	1/30/0	3/90/0
SD	C3	JEDEC J-STD-002	1	15	PB Solderability	>95% Lead Coverage	-	-	1/15/0	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	-	1/15/0	-
PD	C4	JEDEC JESD22-B100 and B108	3	10	Physical Dimensions	Cpk>1.67	-	-	1/10/0	3/30/0	-	1/10/0	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	1/3/0	-	-	1/3/0	-
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	500/ 750 Volts	1/3/0 (750V corner pins)	1/3/0 (750V corner pins)	-	-	-	-
LU	E4	AEC Q100-004	1	6	Latch-Up	Per AEC Q100-004	-	1/6/0	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	1/30/0	-	-	3/90/0	-

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LMC6772QMMX/NOPB	Qual Device: TLV1812QDGKRQ1	QBS Package, Process Reference: SN74LV244AQDGSRQ1, SN74LV273AQDGSRQ1 SN74LV541AQDGSRQ1	QBS Process Reference: BQ79616PAPRQ1	QBS Product Reference: TLV1812QDRQ1	QBS Package, Process Reference: OPA2991QDRQ1
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-2401-015

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

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: SN74LV244AQDGSRQ1	Qual Device: SN74LV273AQDGSRQ1	Qual Device: SN74LV541AQDGSRQ1	QBS Reference: SN74HCS74QPWRQ1
Test Group A - Accelerated Environment Stress Tests											
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL1 260C	1 Step	1/308/0	1/308/0	1/308/0	3/924/0
PC	A1.1	-	3	22	SAM Precon Pre	Review for delamination	1 Step	2/44/0	2/44/0	2/44/0	3/66/0
PC	A1.2	-	3	22	SAM Precon Post	Review for delamination	1 Step	2/44/0	2/44/0	2/44/0	3/66/0
HAST	A2.1	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	96 Hours	1/77/0	1/77/0	1/77/0	3/231/0
HAST	A2.1.2	-	3	1	Cross Section, post bHAST, 1X	Post stress cross section	Completed	1/1/0	1/1/0	1/1/0	3/3/0
HAST	A2.1.3	-	3	30	Wire Bond Shear, post bHAST, 1X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
HAST	A2.1.4	-	3	30	Bond Pull over Stitch, post bHAST, 1X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
HAST	A2.1.5	-	3	30	Bond Pull over Ball, post bHAST, 1X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
HAST	A2.2	JEDEC JESD22-A110	3	70	Biased HAST	130C/85%RH	192 Hours	1/70/0	1/70/0	1/77/0	3/210/0
HAST	A2.2.1	-	3	22	SAM Analysis, post bHAST 2X	Review for delamination	Completed	1/22/0	1/22/0	1/22/0	3/66/0
HAST	A2.2.2	-	3	1	Cross Section, post bHAST, 2X	Post stress cross section	Completed	1/1/0	1/1/0	1/1/0	3/3/0
HAST	A2.2.3	-	3	30	Wire Bond Shear, post bHAST, 2X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
HAST	A2.2.4	-	3	30	Bond Pull over Stitch, post bHAST, 2X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
HAST	A2.2.5	-	3	30	Bond Pull over Ball, post bHAST, 2X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
TC	A4.1	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	1/77/0	1/77/0	1/77/0	3/231/0
TC	A4.1.1	-	3	22	SAM Analysis, post TC 1X	Review for delamination	Completed	1/22/0	1/22/0	1/22/0	3/66/0
TC	A4.1.2	-	3	1	Cross Section, post TC, 1X	Post stress cross section	Completed	1/1/0	1/1/0	1/1/0	3/3/0
TC	A4.1.3	-	3	30	Wire Bond Shear, post TC, 1X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
TC	A4.1.4	-	3	30	Bond Pull over Stitch, post TC, 1X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
TC	A4.1.5	-	3	30	Bond Pull over Ball, post TC, 1X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0

TC	A4.2	JEDEC JESD22-A104 and Appendix 3	3	70	Temperature Cycle	-65C/150C	1000 Cycles	1/70/0	1/70/0	1/70/0	3/210/0
TC	A4.2.1	-	3	22	SAM Analysis, post TC, 2X	Review for delamination	Completed	1/22/0	1/22/0	1/22/0	3/66/0
TC	A4.2.2	-	3	1	Cross Section, post TC, 2X	Post stress cross section	Completed	1/1/0	1/1/0	1/1/0	3/3/0
TC	A4.2.3	-	3	30	Wire Bond Shear, post TC, 2X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
TC	A4.2.4	-	3	30	Bond Pull over Stitch, post TC, 2X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
TC	A4.2.5	-	3	30	Bond Pull over Ball, post TC, 2X	Post stress	Wires	1/30/0	1/30/0	1/30/0	3/90/0
HTSL	A6.1	JEDEC JESD22-A103	3	45	High Temperature Storage Life	150C	1000 Hours	1/45/0	1/45/0	1/45/0	3/135/0
HTSL	A6.1.1	-	3	1	Cross Section, post HTSL, 1X	Post stress cross section	Completed	1/1/0	1/1/0	1/1/0	3/3/0
HTSL	A6.2	JEDEC JESD22-A103	3	44	High Temperature Storage Life	150C	2000 Hours	1/44/0	1/44/0	1/44/0	3/132/0
HTSL	A6.2.1	-	3	1	Cross Section, post HTSL, 2X	Post stress cross section	Completed	1/1/0	1/1/0	1/1/0	3/3/0
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	1/30/0	1/30/0	1/30/0	3/90/0
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	1/30/0	1/30/0	1/30/0	3/90/0

- QBS: Qual By Similarity
- Qual Device SN74LV244AQDGSRQ1 is qualified at MSL1 260C
- Qual Device SN74LV273AQDGSRQ1 is qualified at MSL1 260C
- Qual Device SN74LV541AQDGSRQ1 is qualified at MSL1 260C
-
- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
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- Room/Hot/Cold : HTOL, ED
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Quality and Environmental data is available at TI's external Web site: http://www.ti.com/

TI Qualification ID: R-NPD-2211-055/R-NPD-2112-084

[1]-QEM-EVAL-2009-00336: Discounted. Assembly die attach process issue process optimized to avoid re-occurrence.

ZVEI ID: SEM-PW-13, SEM-PW-09, SEM-PW-02, SEM-PA-18, SEM-PA-07, SEM-PA-11, SEM-PA-05, SEM-PA-08, SEM-BD-01, SEM-PA-13, SEM-DE-01, SEM-DE-02, SEM-DE-03, 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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