PCN Number:	20230816003.2A	**PCN Date:**	April 04, 2024
Title:	Qualification of Additional Assembly & Test site options for select Devices		
Customer Contact:	Change Management team	**Dept:**	Quality Services
Proposed 1st Ship Date:	April 04, 2024	**Sample requests accepted until:**	Not applicable

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:

Revision A is to include a pin 1 ID Marking change that was not included on the original PCN notification for the devices under the Product Affected section.

Texas Instruments is pleased to announce the qualification of FMX and MLA as an additional Assembly & Test Site for Select Devices listed in the "Product Affected" Section.

Construction differences are as follows:

	ASESH	FMX	MLA
Mount Compound	EY1000063	4147858	4147858
Mold Compound	EN2000509	4211880	4211880
Lead finish	NiPdAuAg	NiPdAu	NiPdAu
Pin 1 ID marking	Stripe	Dot	Dot
Final Test site	ASESH	FMX	MLA

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

Reason for Change:

Continuity of supply.
Enable additional A/T capacity to support high volume ramps.

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.

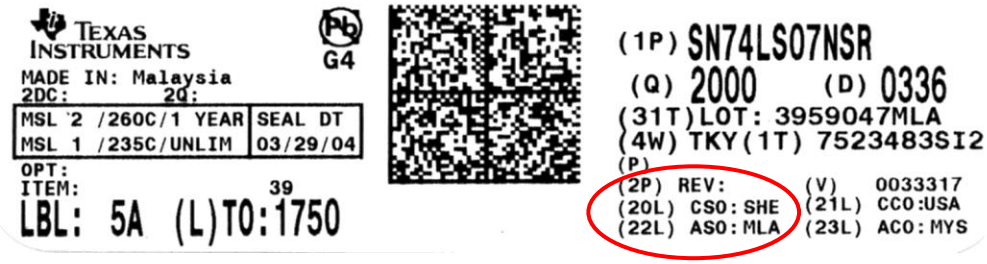
RoHS	REACH	Green Status	IEC 62474
☒ No Change	☒ No Change	☒ No Change	☒ No Change

Changes to product identification resulting from this PCN:

Assembly Site Information:

Assembly Site	Assembly Site Origin (22L)	Assembly Country Code (23L)	Assembly City
ASESH	ASH	CHN	Shanghai
TI Malaysia	MLA	MYS	Kuala Lumpur
TI Mexico	MEX	MEX	Aguascalientes

Sample product shipping label (not actual product label)



Product Affected:

TLIN1022ADRQ1	TLIN1029ADRQ1	TLIN2022ADRQ1	TLIN2029ADRQ1
TLIN1022DRQ1	TLIN1029DQ1	TLIN2022DRQ1	TLIN2029DQ1
TLIN1027DRQ1	TLIN1029DRQ1	TLIN2027DRQ1	TLIN2029DRQ1

Qualification Report

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

Approve Date: 30 January 2023

Product Attributes

Attributes	QBS Device: TCAN1044VDRQ1	QBS Device: TCAN1146DRQ1	Qual Device: TLV9064QDRQ1
Assembly Site	MLA	MLA	MLA
Package Type	SOIC	SOIC	SOIC
Package Designator	D	D	D
Wafer Fab Supplier	RFAB	RFAB	RFAB
Wafer Process ID	LBC9	LBC9	LBC9
Automotive Grade Level	Grade 1	Grade 1	Grade 1
MSL	LEVEL1-260C	LEVEL2-260C	LEVEL2-260C
Flammability Rating	UL 94 V-0	UL 94 V-0	UL 94 V-0

Qualification Results

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

Type	#	Test Spec	Lot Qty	SS/ Lot	Test Name / Condition	Duration	QBS Device: TCAN1044VDRQ1	QBS Device: TCAN1146DRQ1	Qual Device: TPL5010QDDCRQ1
TEST GROUP A – ACCELERATED ENVIRONMENT STRESS TESTS									
PC	A1	--	3	22	SAM Analysis, Pre-Stress	Devices	3/66/0	3/66/0	3/66/0
PC	A1	J-STD-020 JESD22-A113	3	-	Auto Preconditioning	Level 1 - 260C	No fails	--	--
PC	A1	J-STD-020 JESD22-A113	3	-	Auto Preconditioning	Level 2 - 260C	--	No fails	No fails
PC	A1	--	3	22	SAM Analysis, Post-Stress	Devices	3/66/0	3/66/0	3/66/0
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST, 130C	96 Hours	3/231/0	3/231/0	3/231/0
HAST	A2	--	3	1	Cross Section, Post BHAST, 96 Hours	Devices	1/1/0	3/3/0	3/3/0
HAST	A2	--	3	30	Wire Bond Shear, Post BHAST, 96 Hours	Wires	3/72/0	3/90/0	3/90/0
HAST	A2	--	3	30	Bond Pull over Stitch, Post BHAST, 96 Hours	Wires	3/72/0	3/90/0	3/90/0
HAST	A2	--	3	30	Bond Pull over Ball, Post BHAST, 96 Hours	Wires	3/72/0	3/90/0	3/90/0
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST, 130C	192 Hours	3/231/0	3/231/0	3/231/0
HAST	A2	--	3	1	Cross Section, Post BHAST, 192 Hours	Devices	3/3/0	3/3/0	3/3/0
HAST	A2	--	3	30	Wire Bond Shear, Post BHAST, 192 Hours	Wires	3/72/0	3/90/0	3/90/0
HAST	A2	--	3	30	Bond Pull over Stitch, Post BHAST, 192 Hours	Wires	3/72/0	3/90/0	3/90/0
HAST	A2	--	3	30	Bond Pull over Ball, Post BHAST, 192 Hours	Wires	3/72/0	3/90/0	3/90/0
AC	A3	JEDEC JESD22-A102	3	77	Autoclave, 121C	96 Hours	3/231/0	3/231/0	3/231/0
TC	A4	JEDEC JESD22-A104, Appendix 3	3	77	Temperature Cycle, -65/150C	500 Cycles	3/231/0	3/231/0	3/231/0
TC	A4	--	3	1	Cross Section, Post TC 500 Cycles	Devices	3/3/0	1/1/0	1/1/0
TC	A4	--	3	22	SAM Analysis, Post TC, 500 Cycles	Devices	3/66/0	3/66/0	3/66/0
TC	A4	--	3	30	Wire Bond Shear, Post TC 500 Cycles	Wires	3/72/0	3/90/0	3/90/0
TC	A4	--	3	30	Bond Pull over Stitch Post TC 500 Cycles	Wires	3/72/0	3/90/0	3/90/0
TC	A4	--	3	30	Bond Pull over Ball Post TC 500 Cycles	Wires	3/72/0	3/90/0	3/90/0
TC	A4	JEDEC JESD22-A104, Appendix 3	3	77	Temperature Cycle, -65/150C	1000 Cycles	3/231/0	3/231/0	3/231/0
TC	A4	--	3	1	Cross Section, Post TC 1000 Cycles	Devices	3/3/0	3/3/0	3/3/0
TC	A4	--	3	22	SAM Analysis, Post TC, 1000 Cycles	Devices	3/66/0	3/66/0	3/66/0
TC	A4	--	3	30	Wire Bond Shear, Post TC 1000 Cycles	Wires	3/72/0	3/90/0	3/90/0
TC	A4	--	3	30	Bond Pull over Stitch Post TC 1000 Cycles	Wires	3/72/0	3/90/0	3/90/0
TC	A4	--	3	30	Bond Pull over Ball Post TC 1000 Cycles	Wires	3/72/0	3/90/0	3/90/0
PTC	A5	JEDEC JESD22-A105	1	45	Power Temperature Cycle	1000 Cycles	N/A	N/A	N/A
PTC	A5	JEDEC JESD22-A105	1	45	Power Temperature Cycle	2000 Cycles	N/A	N/A	N/A
HTSL	A6	JEDEC JESD22-A103	3	45	High Temperature Storage Life, 170C	500 Hours	3/135/0	1/45/0	3/135/0
HTSL	A6	-	3	1	Cross Section, Post HTSL 500 Hours	Devices	1/1/0	1/1/0	3/3/0
HTSL	A6	JEDEC JESD22-A103	3	45	High Temperature Storage Life, 170C	1000 Hours	3/135/0	1/45/0	3/135/0
HTSL	A6	-	3	1	Cross Section, Post HTSL 500 Hours	Devices	3/3/0	1/1/0	3/3/0
HTSL	A6	JEDEC JESD22-A103	3	45	High Temperature Storage Life, 150C	1000 Hours	--	3/231/0	--

Type	#	Test Spec	Lot Qty	SS/ Lot	Test Name / Condition	Duration	QBS Device: TCAN1044VDRQ1	QBS Device: TCAN1146DRQ1	Qual Device: TPL5010QDDCRQ1
TEST GROUP B – ACCELERATED LIFETIME SIMULATION TESTS									
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test, Grade 1, 125C	1000 Hours	3/231/0	3/231/0	3/231/0
ELFR	B2	AEC Q100-008	3	77	Early Failure Rate, 125C	48 Hours	N/A	N/A	N/A
EDR	B3	AEC Q100-005	3	77	NVM Endurance, Data Retention, Operational Life	-	N/A	N/A	N/A
TEST GROUP C – PACKAGE ASSEMBLY INTEGRITY TESTS									
WBS	C1	AEC Q100-001	3	30	Wire Bond Shear (Cpk>1.67)	Bonds	3/90/0	3/90/0	3/90/0
WBP	C2	MIL-STD883 Method 2011	3	30	Wire Bond Pull (Cpk>1.67)	Wires	3/90/0	3/90/0	3/90/0
SD	C3	JEDEC JESD22-B102	1	15	Surface Mount Solderability (Pb)	>95% Lead Coverage, 155C Dry Bake	1/30/0	1/15/0	1/15/0
SD	C3	JEDEC JESD22-B102	1	15	Surface Mount Solderability (Pb-Free)	>95% Lead Coverage, 155C Dry Bake	1/30/0	1/15/0	1/15/0
PD	C4	JEDEC JESD22-B100 and B108	3	10	Auto Physical Dimensions	(Cpk>1.67)	3/30/0	3/30/0	3/30/0
SBS	C5	AEC Q100-010 AEC Q003	3	50	Solder Ball Shear	5 balls from a min. of 10 devices (Cpk>1.67)	N/A	N/A	N/A
LI	C6	JEDEC JESD22-B105	1	50	Lead Integrity	# of leads to destruction	1/24/0	--	--
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 Injection Carrier	--	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									
TEST	E1	Test program to supplier data sheet	All	All	Pre- and Post-Stress Function/Parameter	--	Completed	Completed	Completed
HBM	E2	AEC Q100-002	3	3	Electrostatic Discharge, Human Body Model	0 Fails 2KV HBM (Classification 2 or better)	3000V 1/3/0	4000V 1/3/0	4000V 1/3/0
CDM	E3	AEC Q100-011	3	3	Electrostatic Discharge, Charged Device Model	0 Fails 750V corner pins, 500V all other pins (Classification C4B or better)	1500V 1/3/0	1500V 1/3/0	1500V 1/3/0
LU	E4	AEC Q100-004	3	6	Latch-Up	0 Fails	1/6/0	1/6/0	1/6/0
ED	E5	AEC Q100-009 AEC Q003	3	30	Electrical Distributions	Cpk>1.67 at room, hot, cold test temperatures	3/90/0	3/90/0	3/90/0

A1 (PC): Preconditioning:
Performed for THB, Biased HAST, Autoclave, Unbiased HAST, Temperature Cycle & Power Temperature Cycle samples, as applicable.

Ambient Operating Temperature by Automotive Grade Level:
Grade 0 (or E): -40°C to +150°C
Grade 1 (or Q): -40°C to +125°C
Grade 2 (or T): -40°C to +105°C
Grade 3 (or I) : -40°C to +85°C

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/
Green/Pb-free Status: Qualified Pb-Free (SMT) and Green

Qualification Report

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

Approve Date 20-July-2023

Product Attributes

Attributes	Qual Device: TLIN1029DQ1	Qual Device: TLIN1029DRQ1	Qual Device: TLIN2029DQ1	Qual Device: TLIN2029DRQ1	Qual Device: TLIN1029ADRQ1	Qual Device: TLIN2029ADRQ1	QBS Reference (Process, Product): TLIN2029DQ1	QBS Reference (Package): CD4093BQM96Q1	QBS Reference (Package): TCAN1043ADRQ1
Automotive Grade Level	Grade 1	Grade 1	Grade 1	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	-40 to 125	-40 to 125	-40 to 125
Product Function	Interface	Interface	Interface	Interface	Interface	Interface	Interface	Interface	Interface
Wafer Fab Supplier	RFAB	RFAB	RFAB	RFAB	RFAB	RFAB	RFAB	SH-BIP-1	RFAB
Assembly Site	FMX	FMX	FMX	FMX	FMX	FMX	ASESHAT	FMX	FMX
Package Group	SOIC	SOIC	SOIC	SOIC	SOIC	SOIC	SOIC	SOIC	SOIC
Package Designator	D	D	D	D	D	D	D	D	D
Pin Count	8	8	8	8	8	8	8	14	14

QBS: Qual By Similarity
Qual Device TLIN1029DQ1 is qualified at MSL1 260C
Qual Device TLIN1029DRQ1 is qualified at MSL1 260C
Qual Device TLIN2029DQ1 is qualified at MSL1 260C
Qual Device TLIN2029DRQ1 is qualified at MSL1 260C
Qual Device TLIN1029ADRQ1 is qualified at MSL1 260C
Qual Device TLIN2029ADRQ1 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: TLIN1029DQ1	Qual Device: TLIN1029DRQ1	Qual Device: TLIN2029DQ1	Qual Device: TLIN2029DRQ1	Qual Device: TLIN1029ADRQ1	Qual Device: TLIN2029ADRQ1	QBS Reference (Process, Product): TLIN2029DQ1	QBS Reference (Package): CD4093BQM96Q1	QBS Reference (Package): TCAN1043ADRQ1
Test Group A - Accelerated Environment Stress Tests																
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL1 260C	-	QBS	QBS	QBS	QBS	QBS	QBS	-	-	3/0/0
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	96 Hours	QBS	QBS	QBS	QBS	QBS	QBS	-	-	3/231/0
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Unbiased HAST	130C/85%RH	96 Hours	QBS	QBS	QBS	QBS	QBS	QBS	-	-	3/231/0
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	1000 Cycles	QBS	QBS	QBS	QBS	QBS	QBS	-	-	3/231/0
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	150C	1000 Hours	QBS	QBS	QBS	QBS	QBS	QBS	-	-	3/135/0
Test Group B - Accelerated Lifetime Simulation Tests																
HTOL	B1	JEDEC JESD22-A108	1	77	Life Test	140C	480 Hours	QBS	QBS	QBS	QBS	QBS	QBS	3/231/0	-	-
ELFR	B2	AEC Q100-008	1	77	Early Life Failure Rate	125C	48 Hours	QBS	QBS	QBS	QBS	QBS	QBS	3/2400/1[2]	-	-
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	QBS	QBS	QBS	QBS	QBS	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	QBS	QBS	QBS	QBS	QBS	1/30/0	-	-	3/90/0
SD	C3	JEDEC J-STD-002	1	15	PB Solderability	>95% Lead Coverage	-	QBS	QBS	QBS	QBS	QBS	QBS	-	-	-
SD	C3	JEDEC J-STD-002	1	15	PB-Free Solderability	>95% Lead Coverage	-	QBS	QBS	QBS	QBS	QBS	QBS	-	3/66/0	-
PD	C4	JEDEC JESD22-B100 and B108	1	10	Physical Dimensions	Cpk>1.67	-	QBS	QBS	QBS	QBS	QBS	1/10/0	-	-	3/30/0
Test Group D - Die Fabrication Reliability Tests																
EM	D1	JESD61	-	-	Electromigration	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements
TDDB	D2	JESD35	-	-	Time Dependent Dielectric Breakdown	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements
HCI	D3	JESD60 & 28	-	-	Hot Carrier Injection	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements
NBTI	D4	-	-	-	Negative Bias Temperature Instability	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements

SM	D5	-	-	-	Stress Migration	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements
Test Group E - Electrical Verification Tests																
ESD	E2	AEC Q100-002	1	3	ESD HBM	-	4000 Volts	QBS	QBS	QBS	QBS	QBS	QBS	1/3/0	-	-
ESD	E2	AEC Q100-002	1	3	ESD HBM (Custom)	-	8000 Volts	QBS	QBS	QBS	QBS	QBS	QBS	1/3/0	-	-
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	1500 Volts	QBS	QBS	QBS	QBS	QBS	QBS	1/3/0	-	-
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	500 Volts	QBS	QBS	QBS	QBS	QBS	QBS	-	-	1/3/0
LU	E4	AEC Q100-004	1	6	Latch-Up	Per AEC Q100-004	-	QBS	QBS	QBS	QBS	QBS	QBS	1/6/0	-	-
ED	E5	AEC Q100-009	3	30	Electrical Distributions	Cpk>1.67 Room, hot, and cold	-	QBS	QBS	QBS	QBS	QBS	1/30/0	3/90/0	-	-

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/

ZVEI ID reference: SEM-PA-18, SEM-PA-07, SEM-PA-11, SEM-PA-05, SEM-TF-01

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