PCN Number: 202			2024	241119002.2		PCN Da	PCN Date:		November 20, 2024		
Title	Title: Qualification of RFAB using qualified Assembly/Test site (MLA) & alternate										
, , ,			Change Management Team		Dept:			Quality Services			
Proposed 1 st Ship Date:		e :	May	19, 2025 Sample requests accepted until:		December 20, 2024*					
*Sa	mple	requests red	eived	l aft	er	December	20, 2	024 will	not	be	supported.
Cha	nge T	ype:									
	Assen	nbly Site			\boxtimes	Design				Wa	fer Bump Material
Assembly Process				Data Sheet				Wa	fer Bump Process		
Assembly Materials				Part number change		ange	\boxtimes	Wa	fer Fab Site		
Mechanical Specification				\boxtimes	Test Site			\boxtimes	Wa	fer Fab Material	
	Packir	ng/Shipping/L	abelin	ng	\boxtimes	Test Process			\boxtimes	Wa	fer 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 for the devices listed below as well as new fab/test/probe and BOM options

C	Current Fab Sit	te	Additional Fab Site			
Fab Site	Process	Wafer Diameter	Fab Site	Process	Wafer Diameter	
SFAB	JI1	150 mm	RFAB	TIB	300 mm	

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

Group 1 BOM Table (FAB/Process migration, die change plus BOM update):

	Current	New
Bond Wire	Cu, 0.8 or	Cu, 0.8 mil
composition/diameter	1.0 mil	Cu, 0.8 IIII
Probe Site **	SFAB	No Probe

^{**} LM2902BAQPWRQ1 & LM2902BQPWRQ1 are Currently on no probe flow

Group 2 BOM Table (RFAB/Process migration, die change plus MLA as new Assembly site & BOM update (FMX Devices):

	FMX	MLA
Bond Wire composition/diameter	Cu, 1.0 mil	Cu, 0.8 mil
Final Test site	TI Mexico	TI Malaysia
Probe site	SFAB	No Probe

Group 3 BOM Table (RFAB/Process migration, die change plus MLA as new Assembly site & BOM update (TAI Devices):

	TAI	MLA
Bond Wire composition/diameter	Au, 0.96 mil	Cu, 0.8 mil
Mold Compound	4209640	4211880
Mount Compound	4208458	4147858
MSL	3	1
Final Test site	TI Taiwan	TI Malaysia
Probe site	SFAB	No Probe

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:

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

 Die Rev [2P]
 Die Rev [2P]

 A, B

Assembly Site Information:

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

Sample product shipping label (not actual product label):





(1P) \$N74L\$07N\$R (Q) 2000 (D) 0336 (31T)LOT: 3959047MLA (4W) TKY(1T) 7523483812

(2P) REV: (V) 0033317 (20L) CSO: SHE (21L) CCO:USA (22L) ASO: MLA (23L) ACO: MYS

Product Affected:

Group 1 Device Lis	: (FAB/Process mi	gration, die chang	e plus BOM update):
---------------------------	-------------------	--------------------	---------------------

<u> </u>	. , , , , , , , , , , , , , , , , , , ,	m, are emanige place by	orr apades).
LM2902BAQPWRQ1	LM2902KAVQPWRQ1	LM2902KVQPWRQ1	LM2902QPWRQ1
LM2902BQPWRQ1	LM2902KVQPWRCT	LM2902QPWRCT	

Group 2 Device List (RFAB/Process migration, die change plus MLA as new Assembly site & BOM update (FMX Devices)):

•				
LM124DRG4	LM2902KAV	QDRQ1	LM2902KVQDRQ1	LM2902QDRQ1
			, ,	
LM2902KAVQDRDL				

Group 3 Device List Group 3 BOM Table (RFAB/Process migration, die change plus MLA as new Assembly site & BOM update (TAI Devices)):

LM124DR	LM2902KVZQDRQ1	MLA00151DR

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

TI Information Selective Disclosure

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

LM2902BQDRQ1 Grade 1 Q100H, Q006 Approve Date 23-October-2024

Product Attributes

Attributes	Qual Device:	QBS Package, Process Reference:	QBS Package Reference:
Attributes	LM2902BQDRQ1	LM2901BQDRQ1	<u>OPA2991QDRQ1</u>
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	MLA	MLA	MLA
Package Group	SOIC	SOIC	SOIC
Package Designator	D	D	D
Pin Count	14	14	8

- QBS: Qual By Similarity, also known as Generic Data
- Qual Device LM2902BQDRQ1 is qualified at MSL1 260C

Qualification Results

Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2902BQDRQ1	QBS Package, Process Reference: LM2901BQDRQ1	QBS Package Reference: OPA2991QDRQ1
Test Group	A - Acce	elerated Environment	Stress 1	ests	'	'				'
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL1 260C	-	1/Pass	1/308/0	3/924/0
HAST	A2	JEDEC JESD22- A110	3	77	Biased HAST	130C/85%RH	96 Hours	1/77/0	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	1/77/0	3/231/0
тс	A4	JEDEC JESD22- A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	1/77/0	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
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	1/45/0	1/77/0	-
Test Group I	B - Acce	elerated Lifetime Simu	ılation Te	ests						
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	-	-	1/77/11
Test Group	C - Pack	age Assembly Integr	ity 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	3/90/0

Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2902BQDRQ1	QBS Package, Process Reference: LM2901BQDRQ1	QBS Packa Reference OPA2991QD
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	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	-	1/10/0	1/10/0	3/30/0
Test Group	D - Die F	abrication Reliability	Tests							
EM	D1	JESD61	-	-	Electromigration	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed P Process Technology Requirement
TDDB	D2	JESD35	-	-	Time Dependent Dielectric Breakdown	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed P Process Technology Requirement
HCI	D3	JESD60 & 28	-	-	Hot Carrier Injection	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed P Process Technology Requirement
ВТІ	D4	-	-	-	Bias Temperature Instability	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed P Process Technology Requirement
SM	D5	-	-	-	Stress Migration	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed P Process Technology Requirement
Test Group	E - Elect	trical Verification Test	s							
ESD	E2	AEC Q100-002	1	3	ESD HBM	-	2000 Volts	1/3/0	1/3/0	1/3/0

Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2902BQDRQ1	QBS Package, Process Reference: LM2901BQDRQ1	QBS Package Reference: OPA2991QDRQ1
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	500 Volts	1/3/0	1/3/0	1/3/0
LU	E4	AEC Q100-004	1	3	Latch-Up	Per AEC Q100- 004	-	1/3/0	1/6/0	1/6/0
ED	E5	AEC Q100-009	3	30	Electrical Distributions	Cpk>1.67 Room, hot, and cold	-	3/90/0	1/30/0	3/90/0
Additional T	ests									

- · 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-NPD-2212-024

[1]-HTOL failed due to rejects mixed back in with tested good units. See attached 4C.

TI Information Selective Disclosure

Automotive Qualification Summary (As per AEC and JEDEC Guidelines)

Q006 MLA at SOIC Approve Date 23-October-2024

Attributes	Qual Device:	QBS Package, Process Reference:	QBS Package Reference:
***********	LM2902BQDRQ1	<u>LM2901BQDRQ1</u>	<u>OPA2991QDRQ1</u>
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	MLA	MLA	MLA
Package Group	SOIC	SOIC	SOIC
Package Designator	D	D	D
Pin Count	14	14	8

Qualification Results

Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2902BQDRQ1	QBS Reference: LM2901BQDRQ1	QBS Reference: OPA2991QDRQ1
Test G	roup A - /	Accelerated Environi	ment Str	ess Test	s					
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL1 260C	-	-	-	3/924/0
PC	A1.1	-	3	22	SAM Precon Pre	Review for delamination	-	-	-	3/66/0
PC	A1.2	-	3	22	SAM Precon Post	Review for delamination	-	-	-	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	3	Wire Bond Shear, post bHAST, 1X	Post stress	-	-	-	3/9/0
HAST	A2.1.4	-	3	3	Bond Pull over Stitch, post bHAST, 1X	Post stress	-	-	-	3/9/0
HAST	A2.1.5	-	3	3	Bond Pull over Ball, post bHAST, 1X	Post stress	-	-	-	3/9/0
HAST	A2.2	JEDEC JESD22- A110	3	70	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	3	Wire Bond Shear, post bHAST, 2X	Post stress	-	-	-	3/9/0
HAST	A2.2.4	-	3	3	Bond Pull over Stitch, post bHAST, 2X	Post stress	-	-	-	3/9/0
HAST	A2.2.5	-	3	3	Bond Pull over Ball, post bHAST, 2X	Post stress	-	-	-	3/9/0

Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2902BQDRQ1	QBS Reference: LM2901BQDRQ1	QBS Reference: OPA2991QDRQ1
тс	A4.1	JEDEC JESD22- A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles		-	3/231/0
тс	A4.1.1	-	3	22	SAM Analysis, post TC 1X	Review for delamination	Completed	-	-	3/66/0
тс	A4.1.2	-	3	1	Cross Section, post TC, 1X	Post stress cross section	Completed	-	-	3/3/0
тс	A4.1.3	-	3	3	Wire Bond Shear, post TC, 1X	Post stress	-	-	-	3/9/0
тс	A4.1.4	-	3	3	Bond Pull over Stitch, post TC, 1X	Post stress	-	-	-	3/9/0
тс	A4.1.5	-	3	3	Bond Pull over Ball, post TC, 1X	Post stress	-	-	-	3/9/0
тс	A4.2	JEDEC JESD22- A104 and Appendix 3	3	70	Temperature Cycle	-65C/150C	1000 Cycles	-	-	3/231/0
тс	A4.2.1	-	3	22	SAM Analysis, post TC, 2X	Review for delamination	Completed	-	-	3/66/0
тс	A4.2.2	-	3	1	Cross Section, post TC, 2X	Post stress cross section	Completed	-	-	3/3/0
тс	A4.2.3	-	3	3	Wire Bond Shear, post TC, 2X	Post stress	-	-	-	3/9/0
тс	A4.2.4	-	3	3	Bond Pull over Stitch, post TC, 2X	Post stress	-	-	-	3/9/0
тс	A4.2.5	-	3	3	Bond Pull over Ball, post TC, 2X	Post stress	-	-	-	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	44	High Temperature Storage Life	150C	2000 Hours	-	-	3/135/0

Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2902BQDRQ1	QBS Reference: LM2901BQDRQ1	QBS Reference: OPA2991QDRQ1
HTSL	A6.2.1	-	3	1	Cross Section, post HTSL, 2X	Post stress cross section	Completed	-	-	3/3/0
Test G	roup C - F	Package Assembly Ir	ntegrity 1	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	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	3/90/0

- · QBS: Qual By Similarity, also known as Generic Data
- Qual Device LM2902BQDRQ1 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

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 Tl's external Web site: http://www.ti.com/

TI Oualification ID: R-NPD-2212-024

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

LM2902BQPWRQ1 Automotive RFAB 36V TIB Process In MLA (TSSOP 14 Pin) delta qual Approve Date 28-October-2024

Product Attributes

Attributes	Qual Device:	QBS Package Reference:	QBS Package, Process, Product Reference:	QBS Package Reference:	QBS Package Reference:
Attributes	LM2902BQPWRQ1	SN74HCS74QPWRQ1	LM2902BQPWRQ1	LM2903BQPWRQ1	TLV1812QPWRQ1
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	Logic	Signal Chain	Signal Chain	Signal Chain
Wafer Fab Supplier	RFAB	RFAB	RFAB	CFAB	RFAB
Assembly Site	MLA	MLA	MLA	MLA	MLA
Package Group	TSSOP	TSSOP	TSSOP	TSSOP	TSSOP
Package Designator	PW	PW	PW	PW	PW
Pin Count	14	14	14	8	8

- QBS: Qual By Similarity, also known as Generic Data
 Qual Device LM2902BQPWRQ1 is qualified at MSL1 260C

Qualification Results

Туре	#	Test Spec	Min Lot	SS /	Test Name	Condition	Duration		QBS Package Reference:	QBS Package, Process, Product Reference:	QBS Package Reference:	QBS Package Reference:
116%		0.0000000000000000000000000000000000000	Qty	Luc				LM2902BQPWRQ1	SN74HCS74QPWRQ1	LM2902BQPWRQ1	LM2903BQPWRQ1	TLV1812QPWRQ1

Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2902BQPWRQ1	QBS Package Reference: SN74HCS74QPWRQ1	QBS Package, Process, Product Reference: LM2902BQPWRQ1	QBS Package Reference: LM2903BQPWRQ1	QBS Package Reference: TLV1812QPWRQ1
Test Group	A - Acce	lerated Environ	ment St	ress Tes	sts							
PC	A1	JEDEC J- STD-020 JESD22- A113	3	77	Preconditioning	MSL1 260C	-	1/Pass	3/Pass	3/Pass	3/Pass	1/Pass
HAST	A2	JEDEC JESD22- A110	3	77	Biased HAST	130C/85%RH	96 Hours	1/77/0	3/231/0	3/231/0	3/231/0	1/77/0
AC/UHAST	A3	JEDEC JESD22- A102/JEDEC JESD22- A118	3	77	Autoclave	121C/15psig	96 Hours		3/231/0	-	-	-
AC/UHAST	A3	JEDEC JESD22- A102/JEDEC JESD22- A118	3	77	Unbiased HAST	110C/85%RH	264 Hours	_1	-	3/231/0	-	
AC/UHAST	A3	JEDEC JESD22- A102/JEDEC JESD22- A118	3	77	Unbiased HAST	130C/85%RH	96 Hours	1/77/0	i-	-	3/231/0	1/77/0
тс	A4	JEDEC JESD22- A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	1/77/0	3/231/0	3/231/0	3/231/0	1/77/0
TC-BP	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle Bond Pull	-	-	1/5/0	-	-	-	1/5/0
HTSL	A6	JEDEC JESD22- A103	1	45	High Temperature Storage Life	150C	1000 Hours	1/45/0	3/135/0	3/231/0	-	-
HTSL	A6	JEDEC JESD22- A103	1	45	High Temperature Storage Life	175C	500 Hours	-	-	-	3/135/0	1/77/0
Test Group	B - Acce	lerated Lifetime	Simula	tion Tes	ts							\$0
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	-	-	3/231/0	1/77/0
Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: <u>LM2902BQPWRQ1</u>	QBS Package Reference: <u>SN74HCS74QPWRQ1</u>	QBS Package, Process, Product Reference: LM2902BQPWRQ1	QBS Package Reference: <u>LM2903BQPWRQ1</u>	QBS Package Reference: <u>TLV1812QPWRQ1</u>
HTOL	B1	JEDEC JESD22- A108	3	77	Life Test	150C	408 Hours		-	3/231/0		-
HTOL	B1	JEDEC JESD22- A108	3		Life Test							
ELFR		AIU8		77	Life fest	150C	560 Hours	-	-	-	1/77/0	-
	B2	AEC Q100- 008	3	800	Early Life Failure Rate	150C		-	3/2400/0	3/2400/0	1/77/0	-
Test Group		AEC Q100-	3	800	Early Life	125C	Hours 48	-		3/2400/0		
Test Group		AEC Q100- 008	3	800	Early Life		Hours 48	1/30/0		3/2400/0		1/30/0
	C - Pack	AEC Q100- 008 age Assembly	3 Integrity	800 Tests	Early Life Failure Rate	125C Minimum of 5 devices, 30 wires	Hours 48 Hours	1/30/0	3/2400/0		-	1/30/0
WBS	C - Pack	AEC Q100- 008 age Assembly AEC Q100- 001	3 Integrity	800 Tests	Early Life Failure Rate Wire Bond Shear	Minimum of 5 devices, 30 wires Cpk>1.67 Minimum of 5 devices, 30 wires	48 Hours Wires		3/2400/0	3/90/0	3/90/0	
WBS WBP	C - Pack	AEC Q100- 008 AEC Q100- 001 MIL-STD883 Method 2011 JEDEC J- STD-002 JEDEC J- STD-002	3 Integrity	800 Tests 30	Early Life Failure Rate Wire Bond Shear	Minimum of 5 devices, 30 wires Cpl>-1.67 Minimum of 5 devices, 30 wires Cpl>-1.67 > 95% Lead	48 Hours Wires		3/2400/0 3/90/0 3/90/0	3/90/0	3/90/0	1/30/0
WBS WBP SD	C - Pack C1 C2 C3	AEC Q100- 008 age Assembly AEC Q100- 001 MIL-STD883 Method 2011 JEDEC J- STD-002 JEDEC J-	3 Integrity 1 1	800 Tests 30 30	Early Life Failure Rate Wire Bond Shear Wire Bond Pull PB Solderability PB-Free	Minimum of 5 devices, 30 wires Cpk>1.67 Minimum of 5 devices, 30 wires Cpk>1.67 SpSM Lead Coverage >95% Lead	48 Hours Wires		3/2400/0 3/90/0 3/90/0	3/90/0	3/90/0	1/30/0
WBP SD SD PD	C - Pack C1 C2 C3 C3 C4	AEC Q100- 008 age Assembly AEC Q100- 001 MIL-STD883 Method 2011 JEDEC J- STD-002 JEDEC J- STD-002 JEDEC J- SED22- BI00 and	1 1 1 1 1	800 Tests 30 30 15 15	Early Life Failure Rate Wire Bond Shear Wire Bond Pull PB Solderability PB-Free Solderability Physical	Minimum of 5 devices, 30 wires Cplx>1.67 Minimum of 5 devices, 30 wires Cplx>1.67 Septimum of 5 devices, 30 wires	Hours 48 Hours Wires	1/30/0	3/2400/0 3/90/0 3/90/0 1/15/0	3/90/0 3/90/0 - - 3/30/0	3/90/0 3/90/0 - -	1/30/0 1/15/0 1/15/0 1/10/0
WBP SD SD PD	C - Pack C1 C2 C3 C3 C4	AEC Q100- 008 AEC Q100- 001 AEC Q100- 001 MIL-STD883 Method 2011 JEDEC J- STD-002 JEDEC J- STD-002 JEDEC J- SED22- BI00 and B108	1 1 1 1 1	800 Tests 30 30 15 15	Early Life Failure Rate Wire Bond Shear Wire Bond Pull PB Solderability PB-Free Solderability Physical	Minimum of 5 devices, 30 wires Cplx>1.67 Minimum of 5 devices, 30 wires Cplx>1.67 Septimum of 5 devices, 30 wires	Hours 48 Hours Wires	1/30/0	3/2400/0 3/90/0 3/90/0 1/15/0	3/90/0	3/90/0 3/90/0	1/30/0 1/15/0 1/15/0
WBP SD SD PD Test Group	C - Pack C1 C2 C3 C3 C4 D - Die F	AEC Q100- 008 age Assembly AEC Q100- 001 MIL-STD883 Method 2011 JEDEC J- STD-002 JEDEC J- STD-002 JEDEC J- SED22- B100 and B108 abrication Relia	1 1 1 1 1	800 Tests 30 30 15 15	Early Life Failure Rate Wire Bond Shear Wire Bond Pull PB Solderability PB-Free Solderability Physical Dimensions	Minimum of 5 devices, 30 wires Cplx>1.67 Minimum of 5 devices, 30 wires Cplx>1.67 Septimum of 5 devices, 30 wires	Hours 48 Hours Wires	1/30/0 - 1/10/0 Completed Per Process Technology	3/2400/0 3/90/0 3/90/0 1/15/0 1/15/0 3/30/0 Completed Per Process Technology	3/90/0 3/90/0	- 3/90/0 3/90/0 3/30/0 Completed Per Process Technology	1/30/0 1/15/0 1/15/0 1/10/0 Completed Per Process Technology
WBS WBP SD SD PD Test Group EM	C - Pack C1 C2 C3 C3 C4 D - Die F	AEC Q100- 008 age Assembly AEC Q100- 001 MIL-STD883 Method 2011 JEDEC J- STD-002 JEDEC J- STD-003 JEDEC J- STD-004 JEDEC J- STD-004 JEDEC J- STD-005 JEDEC J- STD-005 JEDEC J- STD-005 JEDEC J- STD-006 JEDEC J- STD-006 JEDEC J- STD-006 JEDEC J- STD-006 JEDEC J- STD-007 JEDEC J- STD-007 JEDEC J- STD-008 JEDEC J- STD-008	1 1 1 1 1	800 Tests 30 30 15 15	Early Life Failure Rate Wire Bond Shear Wire Bond Pull PB Solderability PB-Free Solderability Physical Dimensions Electromigration Time Dependent Dielectric	Minimum of 5 devices, 30 wires Cplx>1.67 Minimum of 5 devices, 30 wires Cplx>1.67 Septimum of 5 devices, 30 wires	Hours 48 Hours Wires	1/30/0 Completed Per Process Technology Requirements Completed Per Process Technology Technology	3/2400/0 3/90/0 1/15/0 1/15/0 3/30/0 Completed Per Process Technology Requirements Completed Per Process Technology Requirements	3/90/0 3/90/0 Completed Per Process Technology Technology Technology Technology Technology Technology Technology Technology Technology	3/90/0 3/90/0 - 3/30/0 Completed Per Process Technology Requirements Completed Per Process Technology	1/30/0 1/15/0 1/15/0 1/10/0 Completed Per Process Technology Requirements Completed Per Process Technology Technology Requirements

	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device:	QBS Package Reference: SN74HCS74QPWRQ1	QBS Package, Process, Product Reference: LM2902BQPWRQ1	QBS Package Reference: LM2903BQPWRQ1	QBS Package Reference: TLV1812QPWRQ1
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
E - Elect	rical Verification	n Tests									
E2	AEC Q100- 002	1	3	ESD HBM	-	2000 Volts	1/3/0	1/3/0	3/9/0	1/3/0	1/3/0
E3	AEC Q100- 011	1	3	ESD CDM	-	1500 Volts	-	-	3/9/0	1/3/0	-
E3	AEC Q100- 011	1	3	ESD CDM	-	500 Volts	1/3/0	1/3/0	-	-	1/3/0
E4	AEC Q100- 004	1	3	Latch-Up	Per AEC Q100-004	-	1/3/0	1/6/0	3/18/0	-	1/6/0
E5	AEC Q100- 009	3	30	Electrical Distributions	Cpk>1.67 Room, hot, and cold	-	3/90/0	3/90/0	3/90/0	3/90/0	1/30/0
	D5 E - Elect E2 E3 E3 E4	D5 - E- Electrical Verification E2	# Test Spec Lot Qty D5	# Test Spec Lot Qty Lot D5 E-Electrical Verification Tests E2 AEC Q100- 002 1 3 E3 AEC Q100- 011 1 3 E4 AEC Q100- 004 1 3	# Test Spec	# Test Spec	# Test Spec Lot Qty SS / Lot Test Name Condition Duration	# Test Spec Lot Qty SS / Lot Test Name Condition Duration LM2902BQPWRQ1 D5 Stress Migration Completed Per Process Technology Requirements E2 AEC Q100- 002 1 3 ESD HBM - 2000 Volts 1/3/0 E3 AEC Q100- 1 3 ESD CDM - 1500 Volts	# Test Spec Not	Test Spec	Test Spec

- 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

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

TI Qualification ID: R-CHG-2308-024

[1]-2 units damaged by handler - discounted.

TI Information Selective Disclosure

Automotive Qualification Summary (As per AEC and JEDEC Guidelines)

Q006 TSSOP at MLA Approve Date 28-October-2024

Attributes	Qual Device:	QBS Package Reference:	QBS Package, Process, Product Reference:	QBS Package Reference:	QBS Package Reference:	
	LM2902BQPWRQ1	SN74HCS74QPWRQ1	LM2902BQPWRQ1	LM2903BQPWRQ1	TLV1812QPWRQ1	
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	Logic	Signal Chain	Signal Chain	Signal Chain	
Wafer Fab Supplier	RFAB	RFAB	RFAB	CFAB	RFAB	
Assembly Site	MLA	MLA	MLA	MLA	MLA	
Package Group	TSSOP	TSSOP	TSSOP	TSSOP	TSSOP	
Package Designator	PW	PW	PW	PW	PW	
Pin Count	14	14	14	8	8	

Qualification Results

Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2902BQPWRQ1	QBS Reference: SN74HCS74QPWRQ1	QBS Reference: LM2902BQPWRQ1	QBS Reference: LM2903BQPWRQ1	QBS Reference: TLV1812QPWRQ1
Test G	roup A - A	Accelerated	Environ	ment St	ress Tests							

Туре	#	Test Spec	Min Lot Qty	SS/ Lot	Test Name	Condition	Duration	Qual Device: LM2902BQPWRQ1	QBS Reference: SN74HCS74QPWRQ1	QBS Reference: LM2902BQPWRQ1	QBS Reference: LM2903BQPWRQ1	QBS Reference: TLV1812QPWRQ1
PC	A1	JEDEC J-STD- 020 JESD22- A113	3	77	Preconditioning	MSL1 260C			3/Pass	3/Pass	3/Pass	-
PC	A1.1		3	22	SAM Precon Pre	Review for delamination			3/66/0		3/66/0	
PC	A1.2		3	22	SAM Precon Post	Review for delamination	-		3/66/0		3/66/0	-
HAST	A2.1	JEDEC JESD22- A110	3	77	Biased HAST	130C/85%RH	96 Hours		3/231/0	-	3/231/0	-
HAST	A2.1.2	-8	3	1	Cross Section, post bHAST, 1X	Post stress cross section	Completed	-	3/3/0	ē.	-	-
HAST	A2.1.3		3	3	Wire Bond Shear, post bHAST, 1X	Post stress			3/9/0			-
HAST	A2.1.4		3	3	Bond Pull over Stitch, post bHAST, 1X	Post stress			3/9/0	•		-
HAST	A2.1.5	-	3	3	Bond Pull over Ball, post bHAST, 1X	Post stress	-	•	3/9/0			-
HAST	A2.2	JEDEC JESD22- A110	3	70	Biased HAST	130C/85%RH	192 Hours		3/231/0	L.	3/231/0	
HAST	A2.2.1	-	3	22	SAM Analysis, post bHAST 2X	Review for delamination	Completed		3/66/0	-	3/66/0	-
HAST	A2.2.2		3	1	Cross Section, post bHAST, 2X	Post stress cross section	Completed	-	3/3/0	-	3/3/01	-
HAST	A2.2.3	•	3	3	Wire Bond Shear, post bHAST, 2X	Post stress	-		3/9/0		3/9/0	
HAST	A2.2.4	• 5	3	3	Bond Pull over Stitch, post bHAST, 2X	Post stress	•		3/9/0	,	3/9/0	-
HAST	A2.2.5		3	3	Bond Pull over Ball, post bHAST, 2X	Post stress			3/9/0		3/9/0	-
Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2902BQPWRQ1	QBS Reference: SN74HCS74QPWRQ1	QBS Reference: LM2902BQPWRQ1	QBS Reference: LM2903BQPWRQ1	QBS Reference: TLV1812QPWRQ1
тс	A4.1	JEDEC JESD22- A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles		3/231/0	3/231/0	3/231/0	
TC	A4.1.1		3	22	SAM Analysis, post TC 1X	Review for delamination	Completed	-	3/66/0	3/66/0		
тс	A4.1.2		3	1	Cross Section, post TC, 1X	Post stress cross section	Completed		3/3/0	3/3/0		-
тс	A4.1.3		3	3	Wire Bond Shear, post TC, 1X	Post stress		-	3/9/0	3/9/0		
тс	A4.1.4		3	3	Bond Pull over Stitch, post TC, 1X	Post stress		-	3/9/0	3/9/0		
тс	A4.1.5		3	3	Bond Pull over Ball, post TC, 1X	Post stress			3/9/0	3/9/0		-
тс	A4.2	JEDEC JESD22- A104 and Appendix 3	3	70	Temperature Cycle	-65C/150C	1000 Cycles	•	3/231/0	3/231/0	3/231/0	
тс	A4.2.1	-	3	22	SAM Analysis, post TC, 2X	Review for delamination	Completed	-	3/66/0	3/66/0	3/66/0	-
тс	A4.2.2		3	1	Cross Section, post TC, 2X	Post stress cross section	Completed	-	3/3/0	3/3/0	3/3/0	
TC	A4.2.3	-	3	3	Wire Bond Shear, post TC, 2X	Post stress	-	-	3/9/0	3/9/0	3/9/0	-
тс	A4.2.4		3	3	Bond Pull over Stitch, post TC, 2X	Post stress	-		3/9/0	3/9/0	3/9/0	-
TC	A4.2.5		3	3	Bond Pull over Ball, post TC, 2X	Post stress			3/9/0	3/9/0	3/9/0	-
HTSL	A6.1	JEDEC JESD22- A103	3	45	High Temperature Storage Life	150C	1000 Hours		3/135/0			-

Туре	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: LM2902BQPWRQ1	QBS Reference: SN74HCS74QPWRQ1	QBS Reference: LM2902BQPWRQ1	QBS Reference: LM2903BQPWRQ1	QBS Reference: TLV1812QPWRQ1
HTSL	A6.1	JEDEC JESD22- A103	3	45	High Temperature Storage Life	175C	500 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	44	High Temperature Storage Life	150C	2000 Hours		3/135/0			-
HTSL	A6.2	JEDEC JESD22- A103	3	44	High Temperature Storage Life	175C	1000 Hours				3/135/0	-
HTSL	A6.2.1	-	3	1	Cross Section, post HTSL, 2X	Post stress cross section	Completed	-	3/3/0	-	3/3/0	-
Test G	roup C - I	Package As	sembly	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	3/90/0	3/90/0	3/90/0	1/30/0
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	3/90/0	3/90/0	1/30/0

- QBS: Qual By Similarity, also known as Generic Data
- Qual Device LM2902BQPWRQ1 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
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- 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 Tl's external Web site: http://www.ti.com/

TI Qualification ID: R-CHG-2308-024

[1]-1 unit damaged by handler - discounted

ZVEI ID's: 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-PS-02, SEM-PS-04, SEM-TF-01, SEM-QG-01

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