PCN Number:	20241121000.2	**PCN Date:**	November 22, 2024
Title:	Qualification of LFAB as an additional Wafer Fab site for select devices		
Customer Contact:	Change Management team	**Dept:**	Quality Services
Proposed 1st Ship Date:	May 21, 2025	**Sample requests accepted until:**	December 22, 2024*

***Sample requests received after December 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 its LFAB fabrication facility as an additional Wafer Fab option for the devices listed below.

Current Fab Site			Additional Fab Site		
Current Fab Site	**Process**	**Wafer Diameter**	**Additional Fab Site**	**Process**	**Wafer Diameter**
UMC12i	F65	300mm	LFAB	F65	300mm

Qual details are provided in the Qual Data Section.

Reason for Change:

Continuity of Supply.

Anticipated impact on Form, Fit, Function, Quality or Reliability (positive / negative):

None

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
UMC12i	UMI	SGP	Singapore
LFAB	**LHI**	**USA**	**Lehi**

Sample product shipping label (not actual product label)

Product Affected:

M0G3105QDGS20RQ1	M0G3107QDGS32RQ1	M0G3506QRHBRQ1	M0L1305QDYYRQ1
M0G3105QDGS28RQ1	M0G3107QPMRQ1	M0G3507QDGS28RQ1	M0L1305QRGERQ1
M0G3105QDGS32RQ1	M0G3107QPTRQ1	M0G3507QDGS32RQ1	M0L1305QRHBRQ1
M0G3105QPMRQ1	M0G3107QRGZRQ1	M0G3507QPMRQ1	M0L1306QDGS20RQ1
M0G3105QPTRQ1	M0G3107QRHBRQ1	M0G3507QPTRQ1	M0L1306QDGS28RQ1
M0G3105QRGZRQ1	M0G3505QDGS28RQ1	M0G3507QRGZRQ1	M0L1306QDGS32RQ1
M0G3105QRHBRQ1	M0G3505QDGS32RQ1	M0G3507QRHBRQ1	M0L1306QDYYRQ1
M0G3106QDGS20RQ1	M0G3505QPMRQ1	M0L1304QDGS20RQ1	M0L1306QRGERQ1
M0G3106QDGS28RQ1	M0G3505QPTRQ1	M0L1304QDGS28RQ1	M0L1306QRHBRQ1
M0G3106QDGS32RQ1	M0G3505QRGZRQ1	M0L1304QDGS32RQ1	XM0L1304QDGS20RQ1
M0G3106QPMRQ1	M0G3505QRHBRQ1	M0L1304QDYYRQ1	XM0L1305QRHBRQ1
M0G3106QPTRQ1	M0G3506QDGS28RQ1	M0L1304QRGERQ1	XM0L1306QDGS20RQ1
M0G3106QRGZRQ1	M0G3506QDGS32RQ1	M0L1304QRHBRQ1	XM0L1306QDGS28RQ1
M0G3106QRHBRQ1	M0G3506QPMRQ1	M0L1305QDGS20RQ1	XM0L1306QRGERQ1
M0G3107QDGS20RQ1	M0G3506QPTRQ1	M0L1305QDGS28RQ1	XM0L1306QRHBRQ1
M0G3107QDGS28RQ1	M0G3506QRGZRQ1	M0L1305QDGS32RQ1	

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

MSP M0G* Qualification for addition of LFAB with QFP Packages
Approve Date 23-SEPTEMBER-2024

Product Attributes

Attributes	Qual Device: MSPM0G3507SPMR	Qual Device: MSPM0G3507SPTR	QBS Reference: TMS320F28379SPTPQ	QBS Reference: MSPM0G3507SPMR
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	Microcontroller	Microcontroller	Microcontroller	Microcontroller
Wafer Fab Supplier	LFAB	LFAB	LFAB, UMCI	UMCI
Assembly Site	PHI	PHI	PHI	PHI
Package Group	LQFP	LQFP	HLQFP	LQFP
Package Designator	PM	PT	PTP	PM
Pin Count	64	48	176	64

- QBS: Qual By Similarity, also known as Generic Data
- Qualification Devices MSPM0G3507SPMR and MSPM0G3507SPTR are listed in the table above and are qualified at MSL2 260C.
- Reference Device TMS320F28379SPTPQ is listed in the table above and is qualified at MSL3 260C.
- QBS uses generic data as in the table below. The mold compound is the same material for all devices, except the EME-G700S-LB ULA (Ultra Low Alpha) includes an extra step to remove alpha emitter radioisotopes. Temperature cycling tests at MSL2 confirm capability for the M0G3507Q* QFP packages.

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: MSPM0G3507SPMR	Qual Device: MSPM0G3507SPTR	QBS Reference: TMS320F28379SPTPQ	QBS Reference: MSPM0G3507SPMR
Test Group A - Accelerated Environment Stress Tests											
PC	A	JEDED J-STD-020, JESD22-A113	3	77	Preconditioning	MSL2 260C	-	QBS MSPM0G3507SPRMR & TMS320F28379SPTPQ	QBS MSPM0G3507SPRMR & TMS320F28379SPTPQ	-	3/462/0
PC	A1	JEDED J-STD-020, JESD22-A113	3	77	Preconditioning	MSL3 260C	-	QBS TMS320F28379SPTPQ	QBS TMS320F28379SPTPQ	6/1125/0	-
HAST	A2	Biased HAST	3	77	Biased HAST	110C/85%RH	264 Hours	QBS TMS320F28379SPTPQ	QBS TMS320F28379SPTPQ	6/462/0	-
UHAST	A3	Unbiased HAST	3	77	Unbiased HAST	130C/85%RH	96 Hours	QBS TMS320F28379SPTPQ	QBS TMS320F28379SPTPQ	4/308/0	-
TC	A4	Temperature Cycle	3	77	Temperature Cycle	-65C/150C	500 Cycles	QBS Reference Devices	QBS Reference Devices	6/462/0	3/231/0
TC- BP	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle bond Pull	-	-	QBS Reference Devices	QBS Reference Devices	2/10/0	1/5/0
HTSL	A6	High Temperature Storage Life[1]	3	77	High Temperature Storage Life[1]	150C	1000 Hours	1/77/0 + QBS Reference Devices	QBS Reference Devices	6/270/0	-
Test Group B - Accelerated Lifetime Simulation Tests											
HTOL	B1	Life Test	3	77	Life Test	125C	1000 Hours	1/77/0 + QBS Reference Devices	QBS Reference Devices	6/462/0	3/231/0
ELFR	B2	Early Life Failure Rate	3	800	Early Life Failure Rate	125C	48 Hours	1/800/0 + QBS TMS320F28379SPTPQ	← QBS	6/4800/0	2/1600/0
EDR	B3	AEC-Q100-105	3	77	Data Retention	150C	1000 Hours	1/77/0 + QBS Reference Devices	← QBS	6/462/0	3/231/0
EDR	B3	AEC-Q100-105	3	77	Endurance Cycling	-40, 25C, 125C	≥ 10K cycles	3/231/0 (1/77/0 for each temperature)	← QBS	6/432/0 (2/154/0 for each temperature)	3/231/0 (1/77/0 for each temperature)
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	2/60/0	3/90/0	3/90/0
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	3/90/0	2/60/0	3/90/0	3/90/0
PD	C4	JEDEC JESD22-B100 and B108	3	10	Physical Dimensions	Cpk>1.67	-	3/30/0	2/20/0	3/30/0	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
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
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
BTI	D4	-	-	-	Bias Temperature Instability	-	-	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
Test Group E - Electrical Verification Tests											
ESD	E2	AEC Q100-002	1	3	ESD HBM	-	2000 Volts	1/3/0	← QBS	1/3/0	1/3/0
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	500 Volts (750 corner pins)	1/3/0	← QBS	1/3/0	1/3/0
LU	E4	AEC Q100-004	1	6	Latch-Up	Per AEC Q100-004	-	1/3/0	← QBS	1/6/0	1/3/0
ED	E5	AEC Q100-009	3	30	Electrical Distributions	Cpk>1.67 Room, hot, and cold	-	1/30/0	← QBS	3/90/0	3/90/0

- Qualification Devices MSPM0G3507SPMR and MSPM0G3507SPTR are listed in the table above and are qualified at MSL2 260C.

- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- Test B1, HTOL Life Test and test B3, the Data Retention Test, were preceded by endurance cycling
- 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

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

TI Qualification ID: R-CHG-2409-029, R-CHG-2408-080, R-NPD-2306-083

TI Information
Selective Disclosure

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

Lego A3 Automotive QFN LFAB
Approve Date 23-SEPTEMBER-2024

Product Attributes

Attributes	Qual Device: M0GS507QRGZRQ1	Qual Device: M01306QRHBRQ1	QBS Reference: M0GS507QEMRQ1	QBS Reference: M0GS507QEMEQ1	Qual Device: M01306QRHRRQ1	QBS Reference: TMS320F2837X*PTPQ	Qual Device: M0GS507QRGZRQ1	QBS Reference: F2800157QRHRRQ1	QBS Reference: CC2642R1E1WRGZRQ1
Automotive Grade Level	Grade 1	Grade 1	Grade 1	Grade 1	Grade 1	Grade 1	Grade 1	Grade 1	Grade 2
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 105
Product Function	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller
Wafer Fab Supplier	LFAB	LFAB	LFAB	UMCI	LFAB	UMCI, LFAB	UMCI	UMCI	LFAB, UMCI
Assembly Site	CDAT	CDAT	PHI	PHI	CDAT	PHI	CDAT	CDAT	CDAT / CLARK-AT
Package Group	QFN	QFN	QFP	QFP	QFN	QFP	QFN	QFN	QFN
Package Designator	RGZ	RHB	PM	PM	RHB	PTP	RGZ	RHB	RGZ
Pin Count	48	32	64	64	32	176	48	32	48

- QBS: Qual By Similarity, also known as Generic Data
- Qual Devices M0G* and MOL* in RGZ and RHB packages are qualified at MSL2 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: M0GS507QRGZRQ1	Qual Device: M01306QRHBRQ1	Qual Device M0GS507QEMRQ1	Qual Device M0GS507QEMRQ1	Qual Device: M01306QRHBRQ1	QBS Reference: TMS320F2837X*PTPQ	Qual Device: M0GS507QRGZRQ1	QBS Reference: F2800157QRHBRQ1	QBS Reference: CC2642R1TWRGZRQ1
Test Group A - Accelerated Environment Stress Tests																
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL2 260C	-	1/77/0 + QBS F2800157QRHBRQ1	QBS M0G*RGZ + MOL*RHB F2800157QRHBRQ1	-	-	3/231/0	-	1/77/0 + QBS F2800157QRHBRQ1	3/900/0	-
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL3 260C	-	-	-	-	-	-	6/1125/0	-	-	6/1656/0
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST	110C/85%RH	264 Hours	QBS F2800157QRHBRQ1	QBS F2800157QRHBRQ1	-	-	QBS F2800157QRHBRQ1	6/462/0	QBS F2800157QRHBRQ1	3/231/0	6/462/0
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Autoclave	121C/15psig	96 Hours	QBS F2800157QRHBRQ1	QBS F2800157QRHBRQ1	-	-	QBS F2800157QRHBRQ1	-	QBS F2800157QRHBRQ1	2/154/0	-
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Temperature Humidity	85C/85%RH	1000 Hours	QBS F2800157QRHBRQ1	QBS F2800157QRHBRQ1	-	-	QBS F2800157QRHBRQ1	-	QBS F2800157QRHBRQ1	1/77/0	-
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Unbiased HAST	110C/85%RH	264 Hours	-	-	-	-	-	6/462/0[1]	-	-	6/462/0

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: M0GS507QBGZRQ1	Qual Device: M01306QRHBRQ1	Qual Device M0GS507QPMRQ1	Qual Device M0GS507QPMRQ1	Qual Device: M01306QRHBRQ1	QBS Reference: TMS320F2837X*PTPQ	Qual Device[1] M0GS507QRGZRQ1	QBS Reference: F2800157QRHBRQ1	QBS Reference: CC2642R1TWRGZRQ1
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-55C/125C	1000 Cycles	-	-	-	-	-	-	-	-	6/462/0
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	1/77/0 + QBS F2800157QRHBRQ1	QBS M0G*RGZ + MOL*RHB F2800157QRHBRQ1	-	-	3/231/0	6/462/0	1/77/0 + QBS F2800157QRHBRQ1	3/231/0	-
TC-BP	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle Bond Pull	-	-	1/5/0	QBS M0G*RGZ + MOL*RHB F2800157QRHBRQ1	-	-	1/5/0	2/10/0	1/5/0	1/5/0	2/10/0
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	150C	1000 Hours	QBS F2800157QRHBRQ1	QBS F2800157QRHBRQ1	-	-	QBS F2800157QRHBRQ1	6/270/0	QBS F2800157QRHBRQ1	3/135/0	6/270/0
Test Group B - Accelerated Lifetime Simulation Tests																
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	125C	1000 Hours	QBS M0G3507QPMRQ1 + Reference Devices	QBS M0G3507QPMRQ1 + Reference Devices	1/77/0 + QBS Reference Devices	3/231/0	3/231/0	6/462/0	QBS M0G3507QPMRQ1	-	6/462/0[2]
ELFR	B2	AEC Q100-008	3	800	Early Life Failure Rate	125C	48 Hours	QBS M0G3507QPMRQ1 + Reference Devices	QBS M0G3507QPMRQ1 + Reference Devices	1/800/0 + QBS TMS320F28379SPTPQ	2/1600/0	QBS TMS320F28379SPTPQ	6/4800/0	QBS M0G3507QPMRQ1	-	6/4800/0[3]
EDR	B3	AEC Q100-105	3	77	Data Retention	150C	1000 Hours	QBS M0G3507QPMRQ1 + Reference Devices	QBS M0G3507QPMRQ1 + Reference Devices	1/77/0 + QBS Reference Devices	3/231/0	3/231/0	6/462/0	QBS M0G3507QPMRQ1	-	6/462/0
EDR	B3	AEC Q100-105	3	77	Endurance Cycling	-40C, 25C, 125C	≥10K cycles	QBS M0G3507QPMRQ1 + Reference Devices	QBS M0G3507QPMRQ1 + Reference Devices	3/231/0 (1/77/0 for each temperature)	3/231/0 (1/77/0 for each temperature)	3/231/0 (1/77/0 for each temperature)	6/462/0 (2/154/0 for each temperature)	QBS M0G3507QPMRQ1	-	6/462/0[4]
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	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0
PD	C4	JEDEC JESD22-B100 and B108	3	10	Physical Dimensions	Cpk>1.67	-	3/30/0	3/30/0	3/30/0	3/30/0	3/30/0	3/30/0	3/30/0	3/30/0	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
BTI	D4	-	-	-	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	-	2000 Volts	QBS M0G3507QPMRQ1	1/3/0	1/3/0	1/3/0	1/3/0	2/6/0	QBS M0G3507QPMRQ1	1/3/0	2/6/0
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	500 Volts	1/3/0	1/3/0	1/3/0	1/3/0	1/3/0	2/6/0	1/3/0	1/3/0	2/6/0

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: M0GS507QBGZRQ1	Qual Device: M01306QRHBRQ1	Qual Device M0GS507QPMRQ1	Qual Device M0GS507QPMRQ1	Qual Device: M01306QRHBRQ1	QBS Reference: TMS320F2837X*PTPQ	Qual Device[1] M0GS507QRGZRQ1	QBS Reference: F2800157QRHBRQ1	QBS Reference: CC2642R1TWRGZRQ1
LU	E4	AEC Q100-004	1	6	Latch-Up	Per AEC Q100-004	-	QBS M0G3507QPMRQ1	1/3/0[5]	1/3/0	1/3/0	1/3/0[5]	2/6/0	QBS M0G3507QPMRQ1	1/6/0	2/6/0
ED	E5	AEC Q100-009	3	30	Electrical Distributions	Cpk>1.67 Room, hot, and cold	-	3/90/0	1/30/0	1/30/0	3/90/0	3/90/0	6/180/0	3/90/0	3/90/0	6/180/0

1. For this uHAST test, product MS320F2837X*PTPQ was stressed at an equivalent condition, 130C, 85% RH for 96 hrs.
2. While CC2642R1TWRGZRQ1 was stressed in the HTOL test at 125C for 1000 hrs in LFAB, this was ran at 105C for 1000 hrs in UMCI.
3. For CC2642R1TWRGZRQ1, this ELFR was ran at Grade 2 conditions, including at 105C for both 24 hrs and 48 hrs; and 125C for 24 hrs. These tests included here as a reference.
4. For CC2642R1TWRGZRQ1, the EDR test was conducted at only the high temperature condition.
5. See Errata MSPM0L110x, MSPM0L13xx Microcontrollers (literature # SLAZ741), which outlines best practices to avoid excessive current injection.

- Qualification Devices M0G* and MOL* in (QFN) RGZ and RHB packages are qualified at MSL2 260C.
- Qualification devices listed below include (QFN) RGE packages that are qualified to MSL1 260C.
- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- Test B1, HTOL Life Test and test B3, the Data Retention Test, were preceded by endurance cycling
- 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-2409-030, R-CHG-2409-029, R-CHG-2206-036, R-CHG-2403-093, R-CHG-2112-003, R-NPD-2306-083, R-NPD-2306-082, R-NPD-2304-106, R-BKF-2205-007, R-NPD-2205-009

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

Lego A3 Automotive VSSOP LFAB
Approve Date 23-SEPTEMBER-2024

Product Attributes

Attributes	Qual Device: M0G3507QDGS32RQ1	QBS Reference: M0G3507QPMRQ1	QBS Reference: M0G3507QPMRQ1	QBS Reference: M0L1306QRHBRQ1	QBS Reference: TMS320F2837X*PTPQ	QBS Reference: CC2642R1TWRGZRQ1	QBS Reference: M0L1306QDGS28RQ1
Automotive Grade Level	Grade 1	Grade 1	Grade 1	Grade 1	Grade 1	Grade 2	Grade 1
Operating Temp Range (C)	-40 to 125	-40 to 125	-40 to 125	-40 to 125	-40 to 125	-40 to 105	-40 to 125
Product Function	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller
Wafer Fab Supplier	LFAB	LFAB	UMCI	LFAB	UMCI, LFAB	LFAB	UMCI
Assembly Site	MLA	PHI	PHI	CDAT	PHI	CDAT / CLARK-AT	MLA
Package Group	VSSOP	QFP	QFP	QFN	QFP	QFN	VSSOP
Package Designator	DGS	PM	PM	RHB	PTP	RGZ	DGS
Pin Count	32	64	64	32	176	48	28

- QBS: Qual By Similarity, also known as Generic Data
- Qual Device M0G3507QDGS32RQ1 is qualified at MSL2 260C
- Qual Device M0G3507QDGS28RQ1 is qualified at MSL2 260C
- Qual Device M0G3107QDGS20RQ1 is qualified at MSL2 260C

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: M0G3507QDGS32RQ1	QBS Reference: M0G3507QPMRQ1	QBS Reference: M0G3507QPMRQ1	QBS Reference: M0L1306QRHBRQ1	QBS Reference: TMS320F2837X*PTPQ	QBS Reference: CC2642R1TWRGZRQ1	QBS[5] Reference: M0L1306QDGS28RQ1
Test Group A - Accelerated Environment Stress Tests														
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL2 260C	-	1/77/0 + QBS M0L1306QDGS28RQ1 + Reference Devices	QBS M0G3507QPMRQ1+ TMS320F2837x*PTPQ	3/462/0 + QBS TMS320F2837x*PTPQ	-	6/1125/0[1]	3/828/0	3/1710/0
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	96 Hours	QBS M0L1306QDGS28RQ1 + Reference Devices	QBS TMS320F2837x*PTPQ	QBS TMS320F2837x*PTPQ	-	6/462/0[1]	3/231/0	6/462/0
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Unbiased HAST	130C/85%RH	96 Hours	QBS M0L1306QDGS28RQ1 + Reference Devices	QBS TMS320F2837x*PTPQ	QBS TMS320F2837x*PTPQ	-	6/462/0	3/231/0	4/308/0
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	1/77/0 + QBS M0L1306QDGS28RQ1 + Reference Devices	QBS TMS320F2837x*PTPQ	3/231/0	-	6/462/0	-	6/462/0
TC-BP	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle Bond Pull	-	-	1/5/0	QBS TMS320F2837x*PTPQ	1/5/0	-	2/10/0	1/5/0	2/10/0

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: M0G3507QDGS32RQ1	QBS Reference: M0G3507QPMRQ1	QBS Reference: M0G3507QPMRQ1	QBS Reference: M0L1306QRHBRQ1	QBS Reference: TMS320F2837X*PTPQ	QBS Reference: CC2642R1TWRGZRQ1	QBS[5] Reference: M0L1306QDGS28RQ1
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	150C	1000 Hours	QBS M0L1306QDGS28RQ1 + References Devices	QBS TMS320F2837x*PTPQ	QBS TMS320F2837x*PTPQ	-	6/270/0	3/135/0	4/180/0
Test Group B - Accelerated Lifetime Simulation Tests														
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	125C	1000 Hours	QBS M0G3507QPMRQ1 + Reference Devices	1/77/0 + QBS Reference Devices	3/231/0	3/231/0	6/462/0	6/462/0[2]	QBS M0G3507QPMRQ1 + Reference Devices
ELFR	B2	AEC Q100-008	3	800	Early Life Failure Rate	125C	48 Hours	QBS M0G3507QPMRQ1 + Reference Devices	1/800/0 + QBS TMS320F28379SPTPQ	2/1600/0	QBS TMS320F28379SPTPQ	6/4800/0	6/4800/0[3]	QBS TMS320F28379SPTPQ
EDR	B3	AEC Q100-105	3	77	Data Retention	150C	1000 Hours	QBS M0G3507QPMRQ1 + Reference Devices	1/77/0 + QBS Reference Devices	3/231/0	3/231/0	6/462/0	6/462/0	QBS M0G3507QPMRQ1 + Reference Devices
EDR	B3	AEC Q100-105	3	77	Endurance Cycling	-40C, 25C, 125C	≥10K cycles	QBS M0G3507QPMRQ1 + Reference Devices	3/231/0 (1/77/0 for each temperature)	3/231/0 (1/77/0 for each temperature)	3/231/0 (1/77/0 for each temperature)	6/462/0 (2/154/0 for each temperature)	6/462/0[4]	QBS M0G3507QPMRQ1 + Reference Devices
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	3/90/0	3/90/0	3/90/0	3/90/0	1/30/0	3/180/0
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0	1/30/0	3/180/0
PD	C4	JEDEC JESD22-B100 and B108	3	10	Physical Dimensions	Cpk>1.67	-	3/30/0	3/30/0	3/30/0	3/30/0	3/30/0	1/10/0	3/60/0
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
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
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
BTI	D4	-	-	-	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
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
Test Group E - Electrical Verification Tests														
ESD	E2	AEC Q100-002	1	3	ESD HBM	-	2000 Volts	QBS M0G3507QPMRQ1	1/3/0	1/3/0	1/3/0	2/6/0	1/3/0	QBS M0L1306QRHBRQ1
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	500 Volts	1/3/0	1/3/0	1/3/0	1/3/0	2/6/0	1/3/0	1/3/0
LU	E4	AEC Q100-004	1	6	Latch-Up	Per AEC Q100-004	-	QBS M0G3507QPMRQ1	1/3/0	1/3/0	1/3/0[5]	2/6/0	1/6/0	QBS M0L1306QRHBRQ1[5]
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	3/90/0	6/180/0	3/90/0	3/90/0

1. TMS320F2837X*PTPQ supports MSL3 and was preconditioned to this MSL level for the Group A tests in this column. Additionally, for the Group A uHAST test, product TMS320F2837X*PTPQ was stressed at an equivalent condition, 130C, 85% RH for 96 hrs.
2. While CC2642R1TWRGZRQ1 was stressed in the HTOL test at 125C for 1000 hrs in LFAB, this was ran at 105C for 1000 hrs in UMCI.
3. For CC2642R1TWRGZRQ1, this ELFR was ran at Grade 2 conditions, including at 105C for both 24 hrs and 48 hrs; and 125C for 24 hrs. These tests included here as a reference.
4. For CC2642R1TWRGZRQ1, the EDR test was conducted at only the high temperature condition.
5. See Errata MSPM0L110x, MSPM0L13xx Microcontrollers (literature # SLAZ741), which outlines best practices to avoid excessive current injection.
6. Data in the Group A tests in this column includes data from both M0G3507QDGS28RQ1 and M0L1306QDGS28RQ1; these devices differ by die size and 2 die sizes were included in these Group A tests.

- Qualification Devices M0G* and MOL* in (VSSOP) DGS packages are qualified at MSL2 260C.
- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- Test B1, HTOL Life Test and test B3, the Data Retention Test, were preceded by endurance cycling
- 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-2409-031, R-CHG-2409-029, R-NPD-2306-083, R-NPD-2304-106, R-BKF-2205-007, R-CHG-2112-003, R-CHG-2206-036, R-NPD-2306-084, R-NPD-2304-108

TI Information
Selective Disclosure

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

Qualification Report for MOL* Products in SOT Packages in LFAB
Approve Date 23-SEPTEMBER-2024

Product Attributes

Attributes	Qual Device: M0L1306QDYYRQ1	QBS Reference: M0G3507QPMRQ1	QBS Reference: M0G3507QPMRQ1	QBS Reference: M01306QRHBRQ1	QBS Reference: TMS320F2837X*PTPQ	QBS Reference: CC2642R1TWRGZRQ1	QBS Reference:: M0L1306QDYYRQ1
Automotive Grade Level	Grade 1	Grade 1	Grade 1	Grade 1	Grade 1	Grade 2	Grade 1
Operating Temp Range (C)	-40 to 125	-40 to 125	-40 to 125	-40 to 125	-40 to 125	-40 to 105	-40 to 125
Product Function	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller	Microcontroller
Wafer Fab Supplier	LFAB	LFAB	UMCI	LFAB	UMCI, LFAB	LFAB	UMCI
Assembly Site	PHI	PHI	PHI	CDAT	PHI	CDAT / CLARK-AT	PHI
Package Group	SOT	QFP	QFP	QFN	QFP	QFN	SOT
Package Designator	DYY	PM	PM	RHB	PTP	RGZ	DYY
Pin Count	16	64	64	32	176	48	16

- QBS: Qual By Similarity, also known as Generic Data
- Qual Device XM0L1306QDYYRQ1 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: M0L1306QDYYRQ1	QBS PRODUCT Reference: M0G3507QPMRQ1	QBS PRODUCT Reference: M0G3507QPMRQ1	QBS PRODUCT Reference: M01306QRHBRQ1	QBS PRODUCT Reference: TMS320F2837X*PTPQ	QBS PRODUCT Reference: CC2642R1TWRGZRQ1	QBS PRODUCT Reference: M0L1306QDYYRQ1
Test Group A - Accelerated Environment Stress Tests														
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL2 260C	-	1/77/0 + QBS QBS MOL1306QDYYRQ1 + Reference Devices	QBS M0G3507QPMRQ1+ TMS320F2837x*PTPQ	3/462/0 + QBS TMS320F2837x*PTPQ	-	6/1125/0[1]		3/692/0[3]
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL1 260C	-	QBS MOL1306QDYYRQ1 + Reference Devices	-	-	-	-	3/828/0[2]	3/231/0
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	96 Hours	QBS MOL1306QDYYRQ1 + Reference Devices	QBS TMS320F2837x*PTPQ	QBS TMS320F2837x*PTPQ	-	6/462/0	3/231/0	3/231/0

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: M0L1306QDYYRQ1	QBS PRODUCT Reference: M0G3507QPMRQ1	QBS PRODUCT Reference: M0G3507QPMRQ1	QBS PRODUCT Reference: M01306QRHBRQ1	QBS PRODUCT Reference: TMS320F2837X*PTPQ	QBS PRODUCT Reference: CC2642R1TWRGZRQ1	QBS PRODUCT Reference: M0L1306QDYYRQ1
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Unbiased HAST	130C/85%RH	96 Hours	1/77/0 + QBS MOL1306QDYYRQ1 + Reference Devices	QBS TMS320F2837x*PTPQ	QBS TMS320F2837x*PTPQ	-	6/462/0	3/231/0	3/231/0
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	1/5/0	QBS TMS320F2837x*PTPQ	3/231/0	-	6/462/0	3/231/0[2]	3/231/0[4]
TC-BP	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle Bond Pull	-	-	QBS QBS MOL1306QDYYRQ1 + References Devices	QBS TMS320F2837x*PTPQ	1/5/0	-	2/10/0	1/5/0	1/5/0
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	150C	1000 Hours	1/77/0 + QBS QBS MOL1306QDYYRQ1 + Reference Devices	QBS TMS320F2837x*PTPQ	QBS TMS320F2837x*PTPQ	-	6/270/0	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	QBS M0G3507QPMRQ1 + Reference Devices	1/77/0 + QBS Reference Devices	3/231/0	3/231/0	6/462/0	6/462/0[5]	QBS M0G3507QPMRQ1 + Reference Devices
ELFR	B2	AEC Q100-008	3	800	Early Life Failure Rate	125C	48 Hours	QBS M0G3507QPMRQ1 + Reference Devices	1/800/0 + QBS TMS320F28379SPTPQ	2/1600/0	QBS TMS320F28379SPTPQ	6/4800/0	6/4800/0[6]	QBS TMS320F28379SPTPQ
EDR	B3	AEC Q100-105	3	77	Data Retention	150C	1000 Hours	QBS M0G3507QPMRQ1 + Reference Devices	1/77/0 + QBS Reference Devices	3/231/0	3/231/0	6/462/0	6/462/0	QBS M0G3507QPMRQ1 + Reference Devices
EDR	B3	AEC Q100-105	3	77	Endurance Cycling	-40C, 25C, 125C	≥10K cycles	QBS M0G3507QPMRQ1 + Reference Devices	3/231/0 (1/77/0 for each temperature)	3/231/0 (1/77/0 for each temperature)	3/231/0 (1/77/0 for each temperature)	6/462/0 (2/154/0 for each temperature)	6/462/0[7]	QBS M0G3507QPMRQ1 + Reference Devices
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	3/90/0	3/90/0	3/90/0	3/90/0	1/30/0	6/180/0
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	3/90/0	3/90/0	3/90/0	3/90/0	3/90/0	1/30/0	6/180/0
PD	C4	JEDEC JESD22-B100 and B108	3	10	Physical Dimensions	Cpk>1.67	-	3/30/0	3/30/0	3/30/0	3/30/0	3/30/0	1/10/0	6/60/0
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
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
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
BTI	D4	-	-	-	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

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: M0L1306QDYYRQ1	QBS PRODUCT Reference: M0G3507QPMRQ1	QBS PRODUCT Reference: M0G3507QPMRQ1	QBS PRODUCT Reference: M01306QRHBRQ1	QBS PRODUCT Reference: TMS320F2837X*PTPQ	QBS PRODUCT Reference: CC2642R1TWRGZRQ1	QBS PRODUCT Reference: M0L1306QDYYRQ1
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
Test Group E - Electrical Verification Tests														
ESD	E2	AEC Q100-002	1	3	ESD HBM	-	2000 Volts	QBS M0G3507QPMRQ1	1/3/0	1/3/0	1/3/0	2/6/0	1/3/0	QBS M0L1306QRHBRQ1
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	500 Volts	1/3/0	1/3/0	1/3/0	1/3/0	2/6/0	1/3/0	1/3/0
LU	E4	AEC Q100-004	1	6	Latch-Up	Per AEC Q100-004	-	QBS M0G3507QPMRQ1	1/3/0	1/3/0	1/3/0[8]	2/6/0	1/6/0	QBS M0L1306QRHBRQ1[8]
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	3/90/0	6/180/0	3/90/0	3/90/0

1. TMS320F2837X*PTPQ supports MSL3 and was preconditioned to this MSL level for the Group A tests in this column. Additionally, for the Group A uHAST test, product TMS320F2837X*PTPQ was stressed at an equivalent condition, 130C, 85% RH for 96 hrs.
2. CC2642R1TWRGZRQ1 supports MSL3 and was preconditioned to this MSL level for the Group A tests in this column. Additionally, for the Group A TC test, product CC2642R1TWRGZRQ1 was stressed at an equivalent condition, -55C/125C, for 1000 cycles.
3. One unit also showed electrical overstress, which reflects handling and testing in a laboratory environment. This unit was discounted from the qualification population, but is reported, consistent with AEC-Q100.
4. This test completed at both MSL1 and MSL2 conditions, including SAM review post 1000 cycles. All units passed, confirming support for MSL1, standard for SOT packages.
5. While CC2642R1TWRGZRQ1 was stressed in the HTOL test at 125C for 1000 hrs in LFAB, this was ran at 105C for 1000 hrs in UMCI.
6. For CC2642R1TWRGZRQ1, this ELFR was ran at Grade 2 conditions, including at 105C for both 24 hrs and 48 hrs; and 125C for 24 hrs. These tests included here as a reference.
7. For CC2642R1TWRGZRQ1, the EDR test was conducted at only the high temperature condition.
8. See Errata MSPM0L110x, MSPM0L13xx Microcontrollers (literature # SLAZ741), which outlines best practices to avoid excessive current injection.

- Qualification Devices MOL* in (SOT) DYY apackages are qualified at MSL1 260C.
- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- Test B1, HTOL Life Test and test B3, the Data Retention Test, were preceded by endurance cycling
- 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-2403-094, R-CHG-2409-031, R-CHG-2409-029, R-NPD-2306-083, R-NPD-2304-106, R-BKF-2205-007, R-CHG-2112-003, R-CHG-2206-036, R-NPD-2304-107

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

Lego A2 Auto SOT
Approve Date 18-Sept-2024

Product Attributes

Attributes	Qual Device: M0L1306QDYYRQ1	QBS Reference: TMS320F28377DPTPQ	QBS Reference: M0L1306QRHBRQ1
Automotive Grade Level	Grade 1	Grade 1	Grade 1
Operating Temp Range (C)	-40 to 125	-40 to 125	-40 to 125
Product Function	Microcontroller	Microcontroller	Microcontroller
Wafer Fab Supplier	UMCI	UMCI	UMCI
Assembly Site	PHI	PHI	CDAT
Package Group	SOT	QFP	QFN
Package Designator	DYY	PTP	RHB
Pin Count	16	176	32

- QBS: Qual By Similarity, based on generic data for the technology, product, and/or package. Additional supporting data are provided for as general reference data.
- Qual Device M0L1306QDYYRQ1 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: M0L1306QDYYRQ1	QBS Reference: TMS320F28377DPTPQ	QBS Reference: M0L1306QRHBRQ1
Test Group A - Accelerated Environment Stress Tests										
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL2 260C	-	3/692/0[1]	-	-
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL1 260C	-	3/231/0		
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	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[2]	-	-
TC	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle Bond Pull	-65C/150C	500 Cycles	1/5/0	-	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	150C	1000 Hours	3/135/0	-	-
Test Group B - Accelerated Lifetime Simulation Tests										
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	125C	1000 Hours	QBS M0L1306QRHBRQ1	6/462/0	3/231/0
ELFR	B2	AEC Q100-008	3	800	Early Life Failure Rate	125C	48 Hours	QBS TMS320F28377DPTPQ	3/2400/0	-

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: M0L1306QDYYRQ1	QBS Reference: TMS320F28377DPTPQ	QBS Reference: M0L1306QRHBRQ1
EDR	B3	AEC Q100-008	3	77	Data Retention	150C	1000 Hours	QBS M0L1306QRHBRQ1	-	3/231/0
EDR	B3	AEC Q100-005	3	77	Endurance Cycling	-40C, 25C, 125C	10K cycles, full bank; 100K cycles, single sector	QBS M0L1306QRHBRQ1	-	1/77/0 (at each temperature)
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	3/90/0	3/90/0
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	3/90/0	3/90/0	3/90/0
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	-	3/30/0	3/30/0	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
TDDB	D2	JESD35	-	-	Time Dependent Dielectric Breakdown	-	-	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
BTI	D4	-	-	-	Bias Temperature Instability	-	-	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
Test Group E - Electrical Verification Tests										
ESD	E2	AEC Q100-002	1	3	ESD HBM	-	2000 Volts	QBS M0L1306QRHBRQ1	-	1/3/0
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	-	QBS M0L1306QRHBRQ1	-	1/6/0[3]
ED	E5	AEC Q100-009	3	30	Electrical Distributions	Cpk>1.67 Room, hot, and cold	-	3/90/0	-	3/90/0
Additional Tests										

1. One unit also showed electrical overstress, which reflects handling and testing in a laboratory environment. This unit was discounted from the qualification population, but is reported, consistent with AEC-Q100.
2. This test completed at both MSL1 and MSL2 conditions, including SAM review post 1000 cycles. All units passed, confirming support for MSL1, standard for SOT packages.
3. See Errata MSPM0L110x, MSPM0L13xx Microcontrollers (literature # SLAZ741), which outlines best practices to avoid excessive current injection.

- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable
- Test B1, HTOL Life Test, was preceded by endurance cycling
- Test B3, Data Retention Test, was preceded by endurance cycling
- 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-2304-107

ZVEI ID's: SEM-PW-13

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