

<b>PCN Number:</b>	20170523001	<b>PCN Date:</b>	June 8, 2017
<b>Title:</b>	LMV932/LMV612 Performance improvement, Datasheet Update, and Elimination of Tungsten at Metal One		
<b>Customer Contact:</b>	<a href="#">PCN Manager</a>	<b>Dept:</b>	Quality Services
<b>Proposed 1<sup>st</sup> Ship Date:</b>	Sept 8, 2017	<b>Estimated Sample Availability:</b>	Date provided at sample request.
<b>Change Type:</b>			
<input type="checkbox"/>	Assembly Site	<input type="checkbox"/>	Assembly Process
<input checked="" type="checkbox"/>	Design	<input checked="" type="checkbox"/>	Electrical Specification
<input type="checkbox"/>	Test Site	<input type="checkbox"/>	Packing/Shipping/Labeling
<input type="checkbox"/>	Wafer Bump Site	<input type="checkbox"/>	Wafer Bump Material
<input type="checkbox"/>	Wafer Fab Site	<input type="checkbox"/>	Wafer Fab Materials
		<input type="checkbox"/>	Part number change
		<input type="checkbox"/>	Assembly Materials
		<input type="checkbox"/>	Mechanical Specification
		<input type="checkbox"/>	Test Process
		<input type="checkbox"/>	Wafer Bump Process
		<input checked="" type="checkbox"/>	Wafer Fab Process

### PCN Details

#### Description of Change:

#### Group 1 Devices: Design, Datasheet, and Metallization Changes

This notification is to announce a minor design change to improve the AC performance of the LMV932 and LMV612 product families. This change virtually eliminates the device's sensitivity to certain types of AC input signals. The change consists of 1) increasing a current mirror ratio by disconnecting one of two parallel diode connected N\_MOS transistors and 2) shortening the channel of another N-MOS transistor. The typical slew rate behavior has changed due to the design change. The datasheets will each have a new graph specific to the LMV932 and LMV612 for the slew rate vs. supply voltage in the "Typical Characteristics" section. The datasheets' literature number revisions will also be changing as shown below:

	Current	New
Product Family	Datasheet Number	<b>Datasheet Number</b>
LMV932	SNOS993O	<a href="#">SNOS993P</a>
LMV612	SNOSC69C	<a href="#">SNOSC69D</a>

The product datasheet(s) is also updated as seen in the change revision history below:

## LMV93x-N Single, Dual, Quad 1.8-V, RRIO Operational Amplifiers

### 4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

<b>Changes from Revision O (December 2014) to Revision P</b>	<b>Page</b>
• Deleted information specific to automotive grade - created separate automotive data sheet SNOSD49 .....	1
• Added links for WEBENCH .....	1
• Moved storage temperature to <i>Abs Max</i> table and changed <i>Handling Ratings</i> tables to <i>ESD Ratings</i> tables per new format.....	4
• Changed values in the <i>Thermal Information</i> table to align with JEDEC standards.....	4
• Changed Slew Rate vs Supply Voltage title to reflect LMV931 and LMV934 only .....	14
• Added Slew Rate vs Supply graph for LMV932 only .....	14
• Added <i>Receiving Notification of Documentation Updates</i> and <i>Community Resources</i> subsections .....	25
<b>Changes from Revision N (June 2014) to Revision O</b>	<b>Page</b>
• Added <i>Pin Configuration and Functions</i> section, <i>Handling Rating</i> table, <i>Feature Description</i> section, <i>Device Functional Modes, Application and Implementation, Power Supply Recommendations, Layout , Device and Documentation Support , and Mechanical, Packaging, and Orderable Information</i> sections .....	1
<b>Changes from Revision M (November 2013) to Revision N</b>	<b>Page</b>
• Complete rewrite for GDS standard. ....	1
• Added LMV934-N-Q1. The other Q grades were added in previous revision.....	1
<b>Changes from Revision L (March 2013) to Revision M</b>	<b>Page</b>
• Added Automotive Q Grade. ....	1

## LMV61x Single, Dual, and Quad, 1.4-MHz, Low-Power, General-Purpose 1.8-V Operational Amplifiers

### 4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

#### Changes from Revision C (July 2016) to Revision D Page

• Added links for WEBENCH .....	1
• Changed Slew Rate vs Supply title to reflect LMV611 and LMV614 only.....	13
• Added Slew Rate vs Supply Graph for LMV612 only .....	13

#### Changes from Revision B (March 2013) to Revision C Page

• Added <i>ESD Ratings</i> table, <i>Feature Description</i> section, <i>Device Functional Modes</i> , <i>Application and Implementation</i> section, <i>Power Supply Recommendations</i> section, <i>Layout</i> section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section .....	1
• Changed values in the <i>Thermal Information</i> table to align with JEDEC standards.....	5

#### Changes from Revision A (March 2012) to Revision B Page

• Changed layout of National Semiconductor data sheet to TI format.....	1
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These changes may be reviewed at the below datasheet links:

<http://www.ti.com/lit/ds/symlink/lmv932-n.pdf>

<http://www.ti.com/lit/ds/symlink/lmv612.pdf>

This change notification also includes the replacement of Tungsten at Metal one with standard aluminum metallization architecture on these devices in the CS80 Fab process at Maine Fab.

#### Current

Chip Site	Fab Process	Wafer Diameter	Metal One Composition
MAINEFAB	CS80	200mm	Tungsten contact fill and metal 1

#### New

Chip Site	Fab Process	Wafer Diameter	Metal One Composition
<b>MAINEFAB</b>	<b>CS80</b>	<b>200mm</b>	<b>Tungsten contact fill plus CMP and Al/Cu 0.5% metal 1</b>

#### Group 2 Devices: Datasheet Changes only

No design or Metallization changes.

Affected devices are listed in the product affected section of this document.

#### Reason for Change:

Improved performance for certain AC input signal conditions and continuity of supply.

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

None

#### Changes to product identification resulting from this PCN:

None

<b>Product Affected: Group 1 Devices</b>				
	LMV612MA/NOPB	LMV612MMX/NOPB	LMV932MAX	LMV932MM/NOPB
	LMV612MAX/NOPB	LMV932MA	LMV932MAX/NOPB	LMV932MMX/NOPB
	LMV612MM/NOPB	LMV932MA/NOPB	LMV932MM	
<b>Product Affected: Group 2 Devices</b>				
	LMV611MF/NOPB	LMV614MT/NOPB	LMV931MFX/NOPB	LMV934MA/NOPB
	LMV611MFX/NOPB	LMV614MTX/NOPB	LMV931MG	LMV934MAX/NOPB
	LMV611MG/NOPB	LMV931FF-MDC	LMV931MG/NOPB	LMV934MT/NOPB
	LMV611MGX/NOPB	LMV931MF	LMV931MGX/NOPB	LMV934MTX
	LMV614MA/NOPB	LMV931MF/NOPB	LMV931WP-MDC	LMV934MTX/NOPB
	LMV614MAX/NOPB	LMV931MFX	LMV934MA	

**Qualification Report  
LMV932 Design Change  
Approved 02-Mar-2017**

**Product Attributes**

<b>Attributes</b>	<b>Qual Device: LMV932Q1MA/NOPB (New Design)</b>	<b>Qual Device: LMV932Q1MA/NOPB (Old Design)</b>	<b>QBS Package Reference: LMP8601QMA</b>
Automotive Grade Level	Grade 1	Grade 1	Grade 1
Operating Temp Range	-40 to +125 C	-40 to +125 C	-40 to +125 C
Product Function	Signal Chain	Signal Chain	-
Wafer Fab Supplier	MFAB	MFAB	-
Die Revision	A	A	D
Assembly Site	TIEM-AT	TIEM-AT	TIEM-AT
Package Type	SOIC	SOIC	SOIC
Package Designator	D	D	D
Ball/Lead Count	8	8	8

- QBS: Qual By Similarity

- Qual Device LMV932Q1MA/NOPB is qualified at LEVEL1-260C

## 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: LMV932Q1MA/NOPB (New Design)	Qual Device: LMV932Q1MA/NOPB (Old Design)	QBS Package Reference: LMV932Q1MA/NOPB (Old Design)
<b>Test Group A – Accelerated Environment Stress Tests</b>									
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Automotive Preconditioning Level 1	MSL1 260C	1/160/0	1/231/0	3/693/0
THBT	A2	JEDEC J-STD-020 JESD22-A101	3	77	THBT 85°C, 85%,	1000 Hours	-	-	3/230/0
HAST	A3	JEDEC J-STD-020 JESD22-A110	3	77	Biased HAST, 130C/85%RH	96 Hours	-	1/77/0	-
AC	A4	JEDEC JESD22- A102	3	77	Autoclave 121C	96 Hours	1/77/0	1/77/0	3/231/0
TC	A5	JEDEC JESD22- A104 and Appendix 3	3	77	Temperature Cycle, - 65/150C	500 Cycles	1/77/0	1/77/0	3/231/0
PTC	A6	JEDEC JESD22- A105	1	45	Power Temperature Cycle	1000 Cycles	N/A	N/A	N/A
HTSL	A7	JEDEC JESD22- A103	1	45	High Temp Storage Bake 150C	1000 Hours	-	-	1/77/0
<b>Test Group B – Accelerated Lifetime Simulation Tests</b>									
HTOL	B1	JEDEC JESD22- A108	3	77	Life Test, 125C	1000 Hours	1/77/0	-	-
HTOL	B1	JEDEC JESD22- A108	3	77	Life Test, 150C	500 Hours	-	3/231/0	-
ELFR	B2	AEC Q100-008	3	800	Early Life Failure Rate, 150C	24 Hours	-	3/2400/0	-
EDR	B3	AEC Q100-005	3	77	NVM Endurance, Data Retention, and Operational Life	-	N/A	N/A	NA
<b>Test Group C – Package Assembly Integrity Tests</b>									
WBS	C1	AEC Q100-001	1	30	Wire Bond Shear (Cpk>1.67)	-	-	-	-
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull (Cpk>1.67)	-	-	-	-
SD	C3	JEDEC JESD22- B102	1	15	Surface Mount Solderability >95% Lead Coverage	-	-	-	-
PD	C4	JEDEC JESD22- B100 and B108	3	10	Physical Dimensions (Cpk>1.67)	-	-	-	-
<b>Test Group D – Die Fabrication Reliability Tests</b>									
EM	D1	JESD61	-	-	Electromigration	-	-	-	-
TDDB	D2	JESD35	-	-	Time Dependant Dielectric Breakdown	-	-	-	-
HCI	D3	JESD60 & 28	-	-	Hot Injection Carrier	-	-	-	-
NBTI	D4	-	-	-	Negative Bias Temperature Instability	-	-	-	-
<b>Test Group E – Electrical Verification Tests</b>									
SM	D5	-	-	-	Stress Migration	-	-	-	-
HBM	E2	AEC Q100-002	1	3	ESD - HBM	2500 V	1/3/0	1/3/0	-
CDM	E3	AEC Q100-011	1	3	ESD - CDM	1500 V	1/3/0	1/3/0	-
LU	E4	AEC Q100-004	1	6	Latch-up (125C, 25C)	(Per AEC- Q100-004)	1/6/0	1/6/0	-
ED	E5	AEC Q100-009	3	30	Electrical Distributions	Cpk>1.67 Room, hot, and cold test	3/90/0	-	-

**A1 (PC): Preconditioning:**

Performed for THB, Biased HAST, AC, uHAST & TC 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 &amp; LU

Room: AC/uHAST

**Green/Pb-free Status:**

Qualified Pb-Free (SMT) and Green

**Qualification Report**  
**CS080 AICu Back End Conversion**  
**Approve Date 20-Oct-2016**

**Product Attributes**

Attributes	Qual Device: LMV824Q1MT/NOPB
Assembly Site	TIEM-AT
Package Family	TSSOP
Wafer Fab Supplier	MFAB
Wafer Fab Process	CS080

- QBS: Qual By Similarity

- Qual Device LMV824Q1MT/NOPB is qualified at LEVEL1-260CG

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

Type	Test Name / Condition	Duration	Qual Device: LMV824Q1MT/NOPB
PC	Preconditioning Level 1	260C	3/720/0
AC	Autoclave 121C	96 Hours	3/231/0
HAST	Biased HAST, 130C/85%RH	96 Hours	3/231/0
TC	Temperature Cycle, -65/150C	500 Cycles	3/231/0
ELFR	Early Life Failure Rate, 125C	48 Hours	3/2400/1*
HTOL	Life Test, 125C	1000 Hours	3/231/0

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

\*One Continuity failure due to EOS

- 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/>**Green/Pb-free Status:**

Qualified Pb-Free (SMT) and Green

For questions regarding this notice, e-mails can be sent to the regional contacts shown below, or you can contact your local Field Sales Representative.

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