12500 TI Boulevard, MS 8640, Dallas, Texas 75243

PCN# 20230928003.1
Qualification of FFAB using qualified Process Technology, Die Revision, Datasheet update and additional Assembly Site/BOM options for select devices
Change Notification / Sample Request

Date: September 29, 2023
To: PREMIER FARNELL PCN

Dear Customer:

This is an announcement of a change to a device that is currently offered by Texas Instruments (TI). The details of this change are on the following pages, and are in alignment with our standard product change notification (PCN) process.

TI requires acknowledgement of receipt of this notification within 30 days of the date of this notice. Lack of acknowledgement of this notice within 30 days constitutes acceptance and approval of this change. If samples or additional data are required, requests must be received within 30 days of this notification, given that samples are not built ahead of the change.

The Proposed First Ship date in this PCN letter is the earliest possible date that customers could receive the changed material. It is our commitment that the changed device will not ship before that date. If samples are requested within the 30 day sample request window, customers will still have 30-days to complete their evaluation regardless of the proposed 1st ship date.

This particular PCN is related to TI's multiyear transition plan for our two remaining factories with 150-millimeter production (DFAB in Dallas, Texas, and SFAB in Sherman, Texas). DFAB will remain open, but will focus on 200-mm production, with a smaller set of technologies. SFAB will close no earlier than 2024 and no later than 2025. As referenced in the "reason for change" below, these changes are part of our multiyear plan to transition these products to newer, more efficient manufacturing processes and technologies, underscoring our commitment to product longevity and supply continuity.

For questions regarding this notice or to provide acknowledgement of this PCN, you may contact your local Field Sales Representative or the Change Management team. For sample requests or sample related questions, contact your local Field Sales Representative. As always, we thank you for your continued business.

Change Management Team
SC Business Services

20230928003.1
Attachment: 1

Products Affected:

The devices listed on this page are a subset of the complete list of affected devices. According to our records, you have recently purchased these devices. The corresponding customer part number is also listed, if available.

DEVICE	CUSTOMER PART NUMBER
OPA177GS	null

Technical details of this Product Change follow on the next page(s).

PCN Number:	20230928003.1	PCN Date:	September 29, 2023
Title:	Qualification of FFAB using qualified Process Technology, Die Revision, Datasheet update and additional Assembly Site/BOM options for select devices		
Customer Contact:	Change Management team	Dept:	Quality Services
Proposed 1st Ship Date:	Dec 29, 2023	Estimated Sample Availability:	Oct 29, 2023*

***Sample requests received after October 29, 2023 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 a new fab & process technology (FFAB, BICOM3XHV) and assembly BOM options (MLA/FMX) and Qualifying TI Chengdu as additional assembly site for selected devices as listed below in the product affected section.

Current Fab Site			Additional Fab Site		
Current Fab Site	Process	Wafer Diameter	Additional Fab Site	Process	Wafer Diameter
SFAB	JIBB	150 mm	FFAB	BICOM3XHV	200 mm

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

Assembly BOM options and Assembly site differences are noted below:

Group 1 BOM Table (FFAB/Process migration plus BOM update):

	Current	Proposed
Wire type	1.2mil Au	1.0 mil Cu
Mold compound	4209640	4226323
Die attach	4205846	4147858

Group 2 BOM Table (FFAB/Process migration plus BOM update):

	Current	Proposed
Wire type	1.3mil Au	1.0 mil Cu
Mold compound	4209640	4226323
Die attach	4205846	4147858

Group 3 BOM Table (FFAB/Process migration plus BOM update):

	Current	Proposed
Wire type	1.3mil Au	0.8 mil Cu

Group 4 (FFAB/Process migration plus TI Chengdu as an additional Assembly site) BOM Table:

	Carsem	TI Chengdu
Wire type	1.2mil Au	1.0 mil Cu
Mold compound	435370	4224115
Die attach	435143	4207123

The datasheets will be changing as a result of the above mentioned changes. The datasheet change details can be reviewed in the datasheet revision history. The links to the revised datasheets are available in the table below.

4 Revision History

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

Changes from Revision * (September 2000) to Revision A (September 2023)	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document	1
• Changed data sheet title for clarity	1
• Added *Package Information* table, and *Typical Application*, *Device and Documentation Support*, and *Mechanical, Packaging, and Orderable Information* sections	1
• Added additional Features bullets and updated several specifications to align with *Electrical Characteristics*	1
• Changed application bullets to show linked applications	1
• Changed *Description* text for clarity	1
• Updated front-page diagram	1
• Added pin functions table	3
• Changed supply voltage from ±22 V (44 V) to 40 V in *Absolute Maximum Ratings*	4
• Moved operating temperature from *Absolute Maximum Ratings* to *Recommended Operating Conditions*	4
• Deleted lead temperature from *Absolute Maximum Ratings*	4
• Moved junction to ambient thermal information from *Absolute Maximum Ratings* to *Thermal Information*	4
• Added *ESD Ratings* and *Thermal Information*	4
• Changed several parameter names for consistency with modern data sheets in *Electrical Characteristics*	5
• Updated the format of *Electircal Characteristics*	5
• Added test conditions to the header of *Electrical Characteristics*	5
• Moved test conditions from condition column to the header of *Electrical Characteristics*	5
• Changed open-loop voltage gain unit from V/mV to dB in *Electrical Characteristics*	5
• Changed large signal voltage gain to open-loop voltage gain in *Electrical Characteristics*	5
• Changed Power Supply parameters no load test condition to I_O = 0 A in *Electrical Characteristics*	5
• Updated quiescent current maximum over temperature specification value from 25 mA (typo) to ±2.5 mA	5
• Changed supply current to quiescent current in *Electrical Characteristics*	5
• Added information about integrated overvoltage protection including OPAx206 to Input Protection	10
• Updated Noise Performance with new products such as the OPAx828, OPAx140, and OPAx210	10
• Changed operational amplifier recommendations to reflect new product developments	10

Product Folder	Current Datasheet Number	New Datasheet Number	Link to full datasheet
OPA177	**SBOS008**	**SBOS008A**	https://www.ti.com/product/OPA177

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
FR-BIP-1	**TID**	**DEU**	**Freising**

Assembly Site Information:

Assembly Site	Assembly Site Origin	Assembly Country Code	Assembly City
Carsem	CRS	MYS	Jelapang, Ipoh
TI Chengdu	**CDA**	**CHN**	**Chengdu**

Die Rev:

Current	New
Die Rev [2P]	**Die Rev [2P]**
B, D, E	**A**

Sample product shipping label (not actual product label)

Product Affected:

Group 1 Device list (FFAB/Process migration plus BOM update):

OPA2277U	OPA2277U/2K5	OPA277U	OPA277U/2K5

Group 2 Device list (FFAB/Process migration plus BOM update):

OPA177GS	OPA177GS/2K5	OPA177GS/2K5E4	OPA177GS/2K5G4

Group 3 Device list (FFAB/Process migration plus BOM update):

OPA2277P	OPA2277PA

Group 4 Device list (FFAB/Process migration plus TI Chengdu Assembly site):

OPA2277AIDRMT

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

Qualification Results

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

	Type	Test Name / Condition	Duration	Qual Device: OPA2277U	QBS Process Reference: OPA202ID	QBS Process Reference: INA828ID
	HTOL	Life Test, 100C [B]	300 Hours	-	-	-
	HTOL	Life Test, 150C	300 Hours	-	3/231/0	3/231/0
	HBM	ESD - HBM	2000V	1/3/0	3/9/0	1/3/0
	HBM	ESD - HBM	2500V	1/3/0	3/9/0	1/3/0
	HBM	ESD - HBM	3000V	1/3/0	3/9/0	1/3/0
	HBM	ESD - HBM	4000V	1/3/0	-	-
	CDM	ESD - CDM	1000V	1/3/0	3/9/0	1/3/0
	CDM	ESD - CDM	1500V	1/3/0	-	-
	LU	Latch-up	Per JESD78, Class 2	1/6/0	1/6/0	1/6/0
	LU	Latch-up	Per JESD78, Class 1	1/6/0	3/18/0	1/6/0
	ED	Electrical Characterization	Per Datasheet Parameters	1/30/0	3/90/0	3/90/0
	HAST	Biased HAST, 130C/85%RH	96 Hours	-	3/231/0	3/231/0
	HTSL	High Temp Storage Bake 170C	420 Hours	-	3/231/0	3/231/0
	TC	Temperature Cycle, -65/150C	500 Cycles	1/77/0	3/231/0	3/231/0
	THB	Biased Temperature and Humidity, 85C/85%RH	1000 Hours	-	-	-
	UHAST	Unbiased HAST 130C/85%RH	96 Hours	-	3/231/0	3/231/0

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

B -Tj of device at 150C

- 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

TI Qualification ID: 20210621-140618

Qualification Results

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

Type	#	Test Name	Condition	Duration	Qual Device: OPA277U	QBS Reference: INA849DR	QBS Reference: INA821ID
HAST	A2	Biased HAST	130C/85%RH	96 Hours	-	-	3/231/0
HAST	A2	Temperature Humidity Bias	85C/85%RH	1000 Hours	-	3/231/0	-
UHAST	A3	Unbiased HAST	130C/85%RH	96 Hours	-	3/231/0	3/231/0
TC	A4	Temperature Cycle	-65C/150C	500 Cycles	-	3/231/0	3/231/0
HTSL	A6	High Temperature Storage Life	170C	420 Hours	-	3/231/0	3/231/0
HTOL	B1	Life Test	100C [A]	300 Hours	-	1/77/0	-
HTOL	B1	Life Test	150C	300 Hours	-	-	3/231/0
ESD	E2	ESD CDM	-	5000 Volts	1/3/0	1/3/0	1/3/0
ESD	E2	ESD HBM	-	2000 Volts	1/3/0	1/3/0	1/3/0
LU	E4	Latch-Up	Per JESD78	-	1/3/0	1/6/0	1/6/0
CHAR	E5	Electrical Characterization	Per Datasheet Parameters	-	1/30/0	1/30/0	3/90/0

A Tj-150C

- QBS: Qual By Similarity
- Qual Device OPA277U is qualified at MSL2 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

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

TI Qualification ID: R-NPD-2110-076

Qualification Results

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

Type	#	Test Name	Condition	Duration	Qual Device: OPA2277AIDRMT	QBS Product Reference: OPA2277U	QBS Process Reference: INA828ID	QBS Process Reference: INA821ID	QBS Process Reference: OPA207ID	QBS Package Reference: MSP430F2132IRHBR	QBS Package Reference: LM63625DQDRRRQ1	QBS Package Reference: MSP430G2955IRHA40R	QBS Package Reference: OPA593DNTR
HAST	A2	Biased HAST	130C/85%RH	96 Hours	-	-	3/231/0	3/231/0	3/231/0	-	3/231/0	-	3/231/0
UHAST	A3	Autoclave	121C/15psig	96 Hours	-	-	-	-	-	3/231/0	-	3/231/0	-
UHAST	A3	Unbiased HAST	130C/85%RH	96 Hours	1/77/0	-	3/231/0	3/231/0	3/231/0	-	3/231/0	-	3/231/0
TC	A4	Temperature Cycle	-65C/150C	500 Cycles	1/77/0	1/77/0	3/231/0	3/231/0	3/231/0	3/231/0	3/231/0	3/231/0	3/231/0
HTSL	A6	High Temperature Storage Life	150C	1000 Hours	-	-	3/231/0	-	-	-	-	-	-
HTSL	A6	High Temperature Storage Life	170C	420 Hours	-	-	-	3/231/0	3/231/0	-	-	-	3/231/0
HTSL	A6	High Temperature Storage Life	175C	500 Hours	-	-	-	-	-	-	3/231/0	-	-
HTOL	B1	Life Test	125C	1000 Hours	-	-	3/231/0	-	-	-	-	-	-
HTOL	B1	Life Test	150C	300 Hours	-	-	-	3/231/0	3/231/0	-	-	-	3/231/0
HTOL	B1	Life Test	150C	408 Hours	-	-	-	-	-	-	1/77/0	-	-
ESD	E2	ESD CDM	-	250 Volts	1/3/0	1/3/0	1/3/0	1/3/0	1/3/0	-	-	-	3/9/0
ESD	E2	ESD CDM	-	500 Volts	1/3/0	1/3/0	-	-	-	-		-	-
ESD	E2	ESD HBM	-	1000 Volts	-	1/3/0	1/3/0	1/3/0	1/3/0	-	-	-	3/9/0
ESD	E2	ESD HBM	-	2000 Volts	-	1/3/0	-	-	-	-	-	-	-
LU	E4	Latch-Up	Per JESD78	-	1/3/0	1/3/0	1/6/0	1/6/0	1/3/0	-	1/6/0	-	12/36/0
CHAR	E5	Electrical Characterization	Per Datasheet Parameters	-	-	1/30/0	3/90/0	3/90/0	1/30/0	-	-	-	3/90/0

- QBS: Qual By Similarity
- Qual Device OPA2277AIDRMT 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

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

TI Qualification ID: R-NPD-2206-109

Qualification Results

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

Type	#	Test Name	Condition	Duration	Qual Device: OPA2277P	QBS Process Reference: OPA202ID	QBS Process Reference: INA828ID	QBS Package Reference: L293DNE	QBS Package Reference: LT1013CP	QBS Package Reference: NE5532P	QBS Package Reference: TLC339IN	QBS Package Reference: TS12A4514P	QBS Package Reference: UCC37322P	QBS Package Reference: SE555P	QBS Package Reference: SN104571P	QBS process Reference: OPA207ID
HAST	A2	Biased HAST	130C/85%RH	96 Hours	-	3/231/0	3/231/0	-	-	3/231/0	-	-	-	-	-	3/231/0
UHAST	A3	Autoclave	121C/15psig	96 Hours	-	-	-	3/231/0	-	-	3/231/0	1/77/0	3/231/0	3/231/0	3/231/0	-
UHAST	A3	Unbiased HAST	130C/85%RH	96 Hours	1/77/0	3/231/0	3/231/0	-	-	-	-	-	-	-	-	3/231/0
TC	A4	Temperature Cycle	-65C/150C	500 Cycles	1/77/0	3/231/0	3/231/0	3/225/0	3/231/0	-	3/231/0	1/77/0	3/231/0	3/231/0	3/231/0	3/231/0
HTSL	A6	High Temperature Storage Life	150C	1000 Hours	-	3/231/0	3/231/0	-	-	-	-	-	-	-	-	-
HTSL	A6	High Temperature Storage Life	170C	420 Hours	-	-	-	3/231/0	-	-	3/231/0	1/77/0	3/231/0	-	-	3/231/0
HTSL	A6	High Temperature Storage Life	175C	500 Hours	-	-	-	-	-	-	-	-	-	3/135/0	3/135/0	0/0/0
HTOL	B1	Life Test	125C	1000 Hours	-	3/231/0	3/231/0	-	-	-	-	-	-	-	-	-
HTOL	B1	Life Test	150C	300 Hours	-	3/231/0	-	-	-	3/231/0	-	-	-	-	-	3/231/0
SD	C3	PB-Free Solderability	8 Hours Steam Age	-	-	-	-	3/66/0	-	3/66/0	3/66/0	-	3/66/0	3/45/0	3/45/0	-
PD	C4	Physical Dimensions	Cpk>1.67	-	-	-	-	-	-	-	-	-	-	3/30/0	3/30/0	-
ESD	E2	ESD CDM	-	250 Volts	1/3/0	3/9/0	1/3/0	-	-	-	-	-	-	-	-	1/3/0
ESD	E2	ESD CDM	-	500 Volts	1/3/0	-	-	-	-	-	-	-	-	-	-	-

Type	#	Test Name	Condition	Duration	Qual Device: OPA2277P	QBS Process Reference: OPA202ID	QBS Process Reference: INA828ID	QBS Package Reference: L293DNE	QBS Package Reference: LT1013CP	QBS Package Reference: NE5532P	QBS Package Reference: TLC339IN	QBS Package Reference: TS12A4514P	QBS Package Reference: UCC37322P	QBS Package Reference: SE555P	QBS Package Reference: SN104571P	QBS process Reference: OPA207ID
ESD	E2	ESD HBM	-	1000 Volts	1/3/0	3/9/0	1/3/0	-	-	-	-	-	-	-	-	1/3/0
ESD	E2	ESD HBM	-	2000 Volts	1/3/0	-	-	-	-	-	-	-	-	-	-	-
LU	E4	Latch-Up	Per JESD78	-	1/3/0	4/12/0	1/6/0	-	-	-	-	-	-	-	-	1/3/0
CHAR	E5	Electrical Characterization	Per Datasheet Parameters	-	1/30/0	3/90/0	3/90/0	-	-	-	-	-	-	3/90/0	-	1/30/0

- QBS: Qual By Similarity
- Qual Device OPA2277P is qualified at NOT CLASSIFIED (N/A)

- 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

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

TI Qualification ID: R-NPD-2206-107

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