

<b>PCN Number:</b>	20230928003.1	<b>PCN Date:</b>	September 29, 2023
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<b>Title:</b>	Qualification of FFAB using qualified Process Technology, Die Revision, Datasheet update and additional Assembly Site/BOM options for select devices		
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<b>Customer Contact:</b>	Change Management team	<b>Dept:</b>	Quality Services
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<b>Proposed 1<sup>st</sup> Ship Date:</b>	Dec 29, 2023	<b>Estimated Sample Availability:</b>	Oct 29, 2023*
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**\*Sample requests received after October 29, 2023 will not be supported.**

<b>Change Type:</b>					
<input checked="" type="checkbox"/>	Assembly Site	<input checked="" type="checkbox"/>	Design	<input type="checkbox"/>	Wafer Bump Material
<input type="checkbox"/>	Assembly Process	<input checked="" type="checkbox"/>	Data Sheet	<input type="checkbox"/>	Wafer Bump Process
<input checked="" type="checkbox"/>	Assembly Materials	<input type="checkbox"/>	Part number change	<input checked="" type="checkbox"/>	Wafer Fab Site
<input type="checkbox"/>	Mechanical Specification	<input type="checkbox"/>	Test Site	<input checked="" type="checkbox"/>	Wafer Fab Materials
<input checked="" type="checkbox"/>	Packing/Shipping/Labeling	<input type="checkbox"/>	Test Process	<input checked="" type="checkbox"/>	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.

OPA177

SBOS008A – SEPTEMBER 2000 – REVISED SEPTEMBER 2023



## 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 <i>Package Information</i> table, and <i>Typical Application, Device and Documentation Support</i> , and <i>Mechanical, Packaging, and Orderable Information</i> sections.....	1
• Added additional Features bullets and updated several specifications to align with <i>Electrical Characteristics</i> ..	1
• Changed application bullets to show linked applications.....	1
• Changed <i>Description</i> text for clarity.....	1
• Updated front-page diagram.....	1
• Added pin functions table.....	3
• Changed supply voltage from $\pm 22$ V (44 V) to 40 V in <i>Absolute Maximum Ratings</i> .....	4
• Moved operating temperature from <i>Absolute Maximum Ratings</i> to <i>Recommended Operating Conditions</i> .....	4
• Deleted lead temperature from <i>Absolute Maximum Ratings</i> .....	4
• Moved junction to ambient thermal information from <i>Absolute Maximum Ratings</i> to <i>Thermal Information</i> .....	4
• Added <i>ESD Ratings</i> and <i>Thermal Information</i> .....	4
• Changed several parameter names for consistency with modern data sheets in <i>Electrical Characteristics</i> .....	5
• Updated the format of <i>Electrical Characteristics</i> .....	5
• Added test conditions to the header of <i>Electrical Characteristics</i> .....	5
• Moved test conditions from condition column to the header of <i>Electrical Characteristics</i> .....	5
• Changed open-loop voltage gain unit from V/mV to dB in <i>Electrical Characteristics</i> .....	5
• Changed large signal voltage gain to open-loop voltage gain in <i>Electrical Characteristics</i> .....	5
• Changed Power Supply parameters no load test condition to $I_O = 0$ A in <i>Electrical Characteristics</i> .....	5
• Updated quiescent current maximum over temperature specification value from 25 mA (typo) to $\pm 2.5$ mA.....	5
• Changed supply current to quiescent current in <i>Electrical Characteristics</i> .....	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	<a href="https://www.ti.com/product/OPA177">https://www.ti.com/product/OPA177</a>

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
<input checked="" type="checkbox"/> 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
<b>FR-BIP-1</b>	<b>TID</b>	<b>DEU</b>	<b>Freising</b>

**Assembly Site Information:**

Assembly Site	Assembly Site Origin	Assembly Country Code	Assembly City
Carsem	CRS	MYS	Jelapang, Ipoh
<b>TI Chengdu</b>	<b>CDA</b>	<b>CHN</b>	<b>Chengdu</b>

**Die Rev:**

Current	New
Die Rev [2P] B, D, E	<b>Die Rev [2P]</b> <b>A</b>

Sample product shipping label (not actual product label)

TEXAS INSTRUMENTS  
 MADE IN: Malaysia  
 2DC: 20:  
 MSL '2 /260C/1 YEAR SEAL DT  
 MSL 1 /235C/UNLIM 03/29/04  
 OPT:  
 ITEM: 39  
 LBL: 5A (L)T0:1750

(1P) SN74LS07NSR  
 (Q) 2000 (D) 0336  
 (31T) LOT: 3959047MLA  
 (4W) TKY (1T) 7523483SI2  
 (P)  
 (2P) REV: (V) 0033317  
 (20L) C99: SHE (21L) CCO: USA  
 (22L) ASO: MLA (23L) ACO: MYS

**Product Affected:**

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

OPA2277U	OPA2277U/2K5	OPA277U	OPA277U/2K5
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**Group 2 Device list (FFAB/ Process migration plus BOM update):**

OPA177GS	OPA177GS/2K5	OPA177GS/2K5E4	OPA177GS/2K5G4
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**Group 3 Device list (FFAB/ Process migration plus BOM update):**

OPA2277P	OPA2277PA
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**Group 4 Device list (FFAB/ Process migration plus TI Chengdu Assembly site):**

OPA2277AIDRMT
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For alternate parts with similar or improved performance, please visit the product page on [TI.com](http://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 <sup>B</sup>	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 <sup>A</sup>	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:	QBS Process Reference:	QBS Process Reference:	QBS Process Reference:	QBS Process Reference:	QBS Package Reference:	QBS Package Reference:	QBS Package Reference:	QBS Package Reference:
					OPA2277AIDRMT	OPA2277U	MA828ID	INA821ID	OPA207D	MSP430F2132IRHBR	LM63625DQORRQ1	MSP430G2953IRHA40R	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:	QBS Process Reference:	QBS Process Reference:	QBS Package Reference:	QBS process Reference:							
					OPA2277P	OPA202ID	INA828ID	L293DNE	LTI013CP	NE5532P	TLC339IN	TS12A4514P	UCC37322P	SE555P	SN104571P	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: L283DNE	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.

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