

# OpAmps for Aerospace and Defense



## Qualification Ratings Offered:

- TI offers multiple qualification ratings for specific harsh environment needs, learn more in our app note, "Understanding quality levels for high reliability-rated components".

	Commercial	AEC-Q100	EP	QMLQ	Space EP	QMLV QMLV	QMLV-RHA
Packaging	Plastic	Plastic	Plastic	Ceramic	Plastic	Ceramic	Ceramic
Single Controlled Baseline	No	No	Yes	Yes	Yes	Yes	Yes
Bond Wire	Au / Cu	Au / Cu	Au	Al	Au	Al	Al

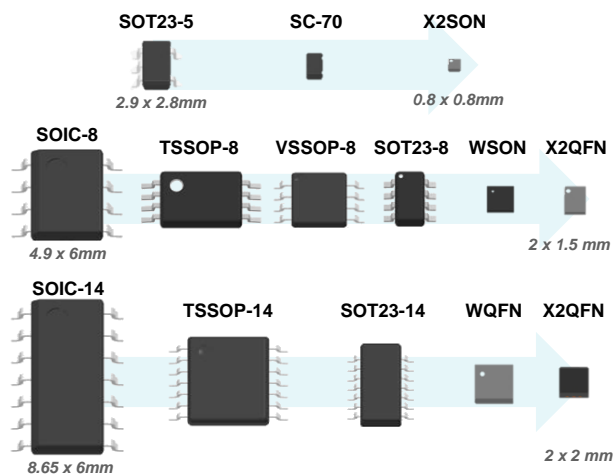
## Helpful Links:

- [Op amp search tool](#)
- [Circuit Cookbook](#)
- [Cross Reference tool](#)
- [TI Precision Labs – Op Amps](#)
- [Reliability Information](#)
- [Radiation Handbook](#)
- [Qualification ratings for TI parts](#)
- [TI Engineer's Calculator](#)
- [Pocket Reference Guide](#)

## Small Package Advancements:

- More small amps** than any competitor: >100 small-size amps
- Smallest Single, Dual, and Quad channel amps:** 0.8x0.8mm, 1.5x2mm, 2x2mm

Channels	Package	Size (mm)	Pitch(mm)
1	X2SON	0.8 x 0.8 x 0.4	0.48
1	SC70	2.0 x 1.25 x 1.1	0.65
2	X2QFN	2.0 x 1.5 x 0.4	0.5
2	WSON	2.0 x 2.0 x 0.8	0.5
2	SOT23-8	2.9 x 1.6 x 1.1	0.65
4	QFN	2.0 x 2.0 x 0.4	0.4
4	WQFN	3.0 x 3.0 x 0.8	0.5
4	SOT23-14	4.2 x 3.2 x 1.1	0.5
4	TSSOP	6.4 x 5.0 x 1.2	0.65



## Focus Applications

### Smart Munitions:

- Seeker Front End: (Radar Guidance, Laser Guidance)**
  - Improve sensor accuracy with **high slew rate, low noise, low power** op amps for gyroscope, accelerometer calibration

Device	GBW	SR	Supply	Noise (nV/√Hz)
<a href="#">OPA2991</a>	4.5MHz	21V/μs	2.7 - 40V	10
<a href="#">OPA2990</a>	1.1MHz	4.5V/μs	2.7 - 40V	30
<a href="#">LM7321</a>	20MHz	18V/μs	2.5 - 32V	15
<a href="#">TLV9042</a>	0.35MHz	0.25V/μs	1.2 - 5.5V	81.5

### Avionics:

- Large number of robust devices for harsh environments
  - Refreshed standard amplifiers** portfolio with improved temp range, **EMI filtering**
  - >70 **extended temp range** op amps (-55-125°C, -40-150°C)

Device	Supply	GBW	EMI Filter	Temp Range
<a href="#">LM2904B</a>	3 - 36V	1.2MHz	✓	-40-125C
<a href="#">OPA2990</a>	2.7 - 40V	1.1MHz	✓	-40-125C
<a href="#">TLV2371-EP</a>	2.7 - 16V	3MHz		-55-125C
<a href="#">TLC2274-HT</a>	4.4 - 16V	2.2MHz		-40-150C

### Radar / EW:

- Wide portfolio of **high slew rate**, low power op amps for use in radar or electronic warfare power supplies

Device	Vos (max)	GBW	SR	Noise (nV/√Hz)	Supply
<a href="#">TLV9301</a>	2.5mV	1MHz	3.5V/μs	33	4.5 - 40V
<a href="#">OPA2991</a>	0.7mV	4.5MHz	21V/μs	10	2.7 - 40V
<a href="#">LM8272</a>	5mV	13MHz	12V/μs	15	2.5 - 24V
<a href="#">LM6211</a>	2.5mV	17MHz	5.5V/μs	6	5 - 24V

### Software Defined Radio:

- Industry's **largest portfolio of small size op amps**, down to 0.8x0.8mm (1ch), 2x1.5mm (2ch), 2x2mm (4ch)
- Power-conscious with **low noise, high gain bandwidth**

Device	GBW	Iq (typ)	Noise (nV/√Hz)	Smallest dual ch pkg
<a href="#">TLV9062</a>	10MHz	0.54mA	16	2mm x 1.5mm
<a href="#">OPA2322</a>	20MHz	1.5mA	8.5	4.9mm x 3mm
<a href="#">TLV9152</a>	4.5MHz	0.56mA	10	2.9mm x 1.6mm
<a href="#">LM2904B</a>	1.2MHz	0.3mA	40	2.9mm x 1.6mm

Check out our latest op amps at: [www.ti.com/amplifier](http://www.ti.com/amplifier)  
Have a question? Ask on our E2E forum: [e2e.ti.com](http://e2e.ti.com)