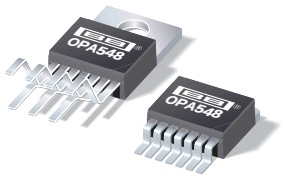
BURR - BROWN®



OPA548

**PRELIMINARY INFORMATION
SUBJECT TO CHANGE
WITHOUT NOTICE**

High-Voltage, High-Current OPERATIONAL AMPLIFIER

FEATURES

- **WIDE SUPPLY RANGE**
  Single Supply: +8V to +60V
  Dual Supply: ±4V to ±30V
- **HIGH OUTPUT CURRENT:**
  3A Continuous
- **WIDE OUTPUT VOLTAGE SWING**
- **FULLY PROTECTED:**
  Thermal Shutdown
  Adjustable Current Limit
- **OUTPUT DISABLE CONTROL**
- **THERMAL SHUTDOWN INDICATOR**
- **HIGH SLEW RATE: 10V/µs**
- **LOW QUIESCENT CURRENT**
- **PACKAGES:**
  7-Lead TO-220
  7-Lead DDPAK Surface-Mount

APPLICATIONS

- **VALVE, ACTUATOR DRIVER**
- **SYNCHRO, SERVO DRIVER**
- **POWER SUPPLIES**
- **TEST EQUIPMENT**
- **TRANSDUCER EXCITATION**
- **AUDIO AMPLIFIER**

DESCRIPTION

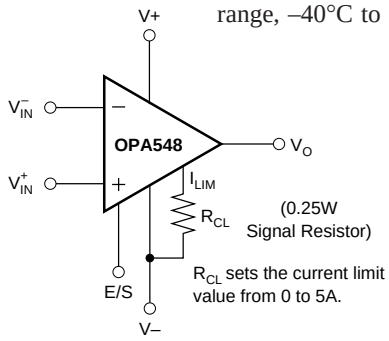
The OPA548 is a low cost, high-voltage/high-current operational amplifier ideal for driving a wide variety of loads. A laser-trimmed monolithic integrated circuit provides excellent low-level signal accuracy and high output voltage and current.

The OPA548 operates from either single or dual supplies for design flexibility. In single supply operation, the input common-mode range extends below ground.

The OPA548 is internally protected against overtemperature conditions and current overloads. In addition, the OPA548 was designed to provide an accurate, user-selected current limit. Unlike other designs which use a "power" resistor in series with the output current path, the OPA548 senses the load indirectly. This allows the current limit to be adjusted from 0 to 5A with a 0 to 330µA control signal. This is easily done with a resistor/potentiometer or controlled digitally with a voltage-out or current-out DAC.

The Enable/Status (E/S) pin provides two functions. An input on the pin not only disables the output stage to effectively disconnect the load but also reduces the quiescent to conserve power. The E/S pin output can be monitored to determine if the OPA548 is in thermal shutdown.

The OPA548 is available in an industry-standard 7-lead staggered TO-220 package and a 7-lead DDPAK surface-mount plastic power package. The copper tab allows easy mounting to a heat sink or circuit board for excellent thermal performance. It is specified for operation over the extended industrial temperature range, –40°C to +85°C.



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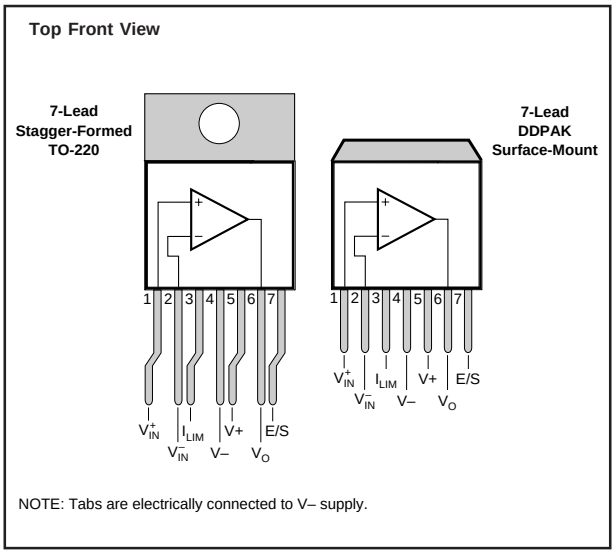
SPECIFICATIONS

At T_{CASE} = +25°C, V_S = ±30V and E/S pin open, unless otherwise noted.

PARAMETER	CONDITION	OPA548T, F MIN	OPA548T, F TYP	OPA548T, F MAX	UNITS
OFFSET VOLTAGE					
Input Offset Voltage	V_{CM} = 0, I_O = 0		±1	±5	mV
vs Temperature	T_A = –40°C to +85°C		±25		µV/°C
vs Power Supply	V_S = ±4V to ±30V		10	100	µV/V
INPUT BIAS CURRENT(1)					
Input Bias Current(2)	V_{CM} = 0V		–100	–500	nA
vs Temperature			±0.5		nA/°C
Input Offset Current	V_{CM} = 0V		±5	±50	nA
NOISE					
Input Voltage Noise Density, f = 1kHz			90		nV/√Hz
Current Noise Density, f = 1kHz			1		pA/√Hz
INPUT VOLTAGE RANGE					
Common-Mode Voltage Range: Positive	Linear Operation	(V+) –3	(V+) –2.3		V
Negative	Linear Operation	(V–) –0.1	(V–) –0.2		V
Common-Mode Rejection	V_{CM} = (V–) –0.1V to (V+) –3V	80	95		dB
INPUT IMPEDANCE					
Differential			10^7 || 6		Ω || pF
Common-Mode			10^9 || 4		Ω || pF
OPEN-LOOP GAIN					
Open-Loop Voltage Gain, f = 10Hz	V_O = ±25V, R_L = 1kΩ	90	100		dB
	V_O = ±25V, R_L = 10Ω		90		dB
FREQUENCY RESPONSE					
Gain-Bandwidth Product	R_L = 10Ω		1		MHz
Slew Rate	G = 1, 50Vp-p, R_L = 10Ω		10		V/µs
Full Power Bandwidth			54		kHz
Settling Time: ±0.1%	G = –10, 50V Step		18		µs
Total Harmonic Distortion + Noise, f = 1kHz	R_L = 10Ω		0.05		%
OUTPUT					
Voltage Output, Positive	I_O = 3A	(V+) –3.7	(V+) –3.3		V
Negative	I_O = –3A	(V–) +3.5	(V–) +3		V
Positive	I_O = 0.6A	(V+) –2.5	(V+) –2		V
Negative	I_O = –0.6A	(V–) +2	(V–) +1.5		V
Maximum Continuous Current Output: dc		±3			A
ac		3			Arms
Leakage Current, Output Disabled, dc	V_O = V– to (V+) –1V		5	10	mA
Output Current Limit					
Current Limit Range			0 to ±5		A
Current Limit Equation			$I_{LIM} = (15000)(4.75)/(13750Ω + R_{CL})$		A
Current Limit Tolerance(1)	R_{CL} = 14.8kΩ (I_{LIM} = ±2.5A),		±100	±200	mA
	R_L = 7.5Ω				
Capacitive Load Drive			1000		pF
OUTPUT ENABLE /STATUS (E/S) PIN					
Shutdown Input Mode					
$V_{E/S}$ High (output enabled)	E/S Pin Open or Forced High	(V–) +2.4			V
$V_{E/S}$ Low (output disabled)	E/S Pin Forced Low			(V–) +0.8	V
$I_{E/S}$ High (output enabled)	E/S Pin High		–60		µA
$I_{E/S}$ Low (output disabled)	E/S Pin Low		–65		µA
Output Disable Time			1		µs
Output Enable Time			3		ms
Thermal Shutdown Status Output					
Normal Operation	Sourcing 20µA	(V–) +2.4	(V–) +3.5		V
Thermally Shutdown	Sinking 5µA, T_J > 160°C		(V–) +0.35	(V–) +0.8	V
Junction Temperature, Shutdown			+160		°C
Reset from Shutdown			+140		°C
POWER SUPPLY					
Specified Voltage			±30		V
Operating Voltage Range		±4		±30	V
Quiescent Current	I_{LIM} Connected to V–, I_O = 0		±15	±20	mA
Quiescent Current, Shutdown Mode	I_{LIM} Connected to V–		±6		mA
TEMPERATURE RANGE					
Specified Range		–40		+85	°C
Operating Range		–40		+125	°C
Storage Range		–55		+125	°C
Thermal Resistance, θ_{JC}					
7-Lead DDPAK, 7-Lead TO-220	f > 50Hz		2		°C/W
7-Lead DDPAK, 7-Lead TO-220	dc		3		°C/W
Thermal Resistance, θ_{JA}					
7-Lead DDPAK, 7-Lead TO-220	No Heat Sink		65		°C/W

NOTES: (1) High-speed test at T_J = +25°C. (2) Positive conventional current flows into the input terminals.

CONNECTION DIAGRAMS



NOTE: Tabs are electrically connected to V– supply.

ABSOLUTE MAXIMUM RATINGS

Output Current	See SOA Curve
Supply Voltage, V+ to V–	60V
Input Voltage	(V–)–0.5V to (V+)+0.5V
Input Shutdown Voltage	V+
Operating Temperature	–40°C to +125°C
Storage Temperature	–55°C to +125°C
Junction Temperature	150°C
Lead Temperature (soldering 10s)(2)	300°C

NOTE: (1) Stresses above these ratings may cause permanent damage. (2) Vapor-phase or IR reflow techniques are recommended for soldering the OPA548F surface mount package. Wave soldering is not recommended due to excessive thermal shock and "shadowing" of nearby devices.

ELECTROSTATIC DISCHARGE SENSITIVITY

This integrated circuit can be damaged by ESD. Burr-Brown recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.