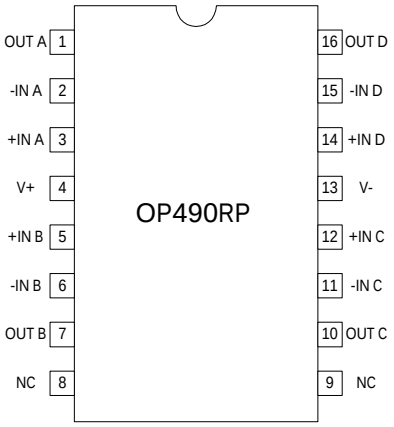
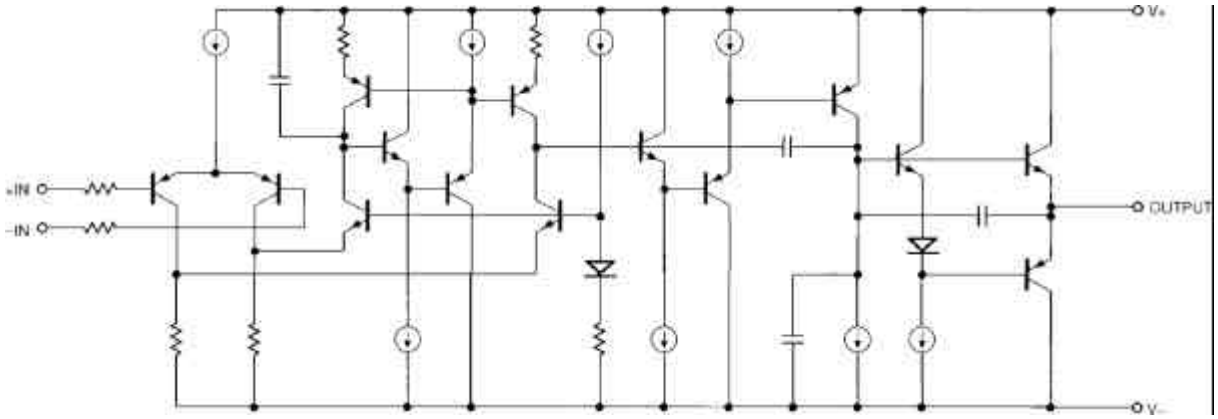
SPACE ELECTRONICS INC.
SPACE PRODUCTS

LOW VOLTAGE MICROPOWER QUAD OPERATIONAL AMPLIFIER

OP490RP





FEATURES:

- Rad-Pak® technology-hardened against natural space radiation
- Total dose hardness typical >100 krad (Si); dependent upon orbit and mission duration
- Package:
- - 16 pin Rad-Pak® flat package
- Low input offset voltage: 5 µV max
- · Low offset voltage drift
- - 5 µV/°C max (over -55°C to +125°C)
- Low supply current (per amplifier) 20 µA max
- High open-loop gain 700 V/mV min
- Outstanding PSRR: 5.6 µV/V min

DESCRIPTION:

Space Electronics' OP490RP (RP for Rad-Pak®) micropower quad operational amplifier microcircuit features a 100 kilorad (Si) typical total dose tolerance; dependent upon orbit. Using SEi's radiation-hardened Rad-Pak® packaging technology, the OP490RP has an extremely low input offset voltage no less than 0.5 mV with a drift of under 5 µV/°C, guaranteed over the full military temperature range. The OP490RP features low power consumption, drawing less than 20 µA per amplifier. Capable of surviving space environments, the OP490RP is ideal for satellite, spacecraft, and space probe missions. The patented radiation-hardened Rad-Pak® technology incorporates radiation shielding in the microcircuit package. It eliminates box shielding while providing required lifetime in orbit. This product is available with packaging and screening up to Class S.

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TABLE 1. OP490RP ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage	VCC		±18	V
Differential Input Voltage		(V-) - 20	(V+) + 20	V
Common-Mode Input Voltage		(V-) - 20	(V+) + 20	V
Output Short-Circuit Duration	Continuous			
Storage Temperature Range	TS	-65	+150	oC
Operating Temperature Range	TA	-55	+125	oC

TABLE 2. OP490RP ELECTRICAL CHARACTERISTICS

(VS = ±15V, TA = +25°C, UNLESS OTHERWISE SPECIFIED)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	VOS		---	0.2	0.5	mV
Input Offset Current	IOS	VCM = 0V	---	0.4	3	nA
Input Bias Current	IB	VCM = 0V	---	4.2	15	nA
Large Signal Voltage Gain	AVO	VS = ±15V, VO = 10V				V/mV
		RL = 100kΩ	700	1200	--	
		RL = 10kΩ	350	600	---	
		RL = 2kΩ	125	250	---	
		V+ = 5V , V- = 0V, 1V<VO<4V				
		RL = 100kΩ	200	400	--	
		RL = 10kΩ	100	180	--	
Input Voltage Range [1]	IVR	V+ = 5V, V- = 0V	0/4	--	--	V
		VS = ±15V	-15/13.5	--	--	
Output Voltage Swing	VO	VS = ±15V				V
		RL = 10kΩ	±13.5	±14.2	---	
		RL = 2kΩ	±10.5	±11.5	---	
	VOH	V+ = 12V, V- = 0V				
		RL = 2kΩ	12.0	4.2	--	
	VOL [2]	V+ = 5V, V- = 0V				
		RL = 10kΩ	--	100	500	
Common Mode Rejection	CMR	VCM = ±12V	90	110	---	dB
		V+ = 5V, V = 0V	--	110	--	
		VS = ±15V, -15V < VCM < 13.5	100	130	--	
Power Supply Rejection Ratio	PSRR		---	1.0	5.6	µV/V
Slew Rate	SR	VS = ±15V	5	12	---	V/ms
Supply Current (All Amplifiers)	ISY	VS = ±1.5V, No Load	--	40	60	µA
		VS = ±15V, No Load	---	60	80	
Capacitive Load Stability		AV = +1	---	650	---	pF
Input Noise Voltage	en p-p	fO = 0.1Hz to 10Hz	---	3	---	µVp-p

TABLE 2. OP490RP ELECTRICAL CHARACTERISTICS

(VS = ±15V, TA = +25°C, UNLESS OTHERWISE SPECIFIED)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Resistance Differential Mode	RIN	VS = ±15V	---	30	---	MΩ
Input Resistance Common Mode	RINCM	VS = ±15V	---	20	---	GΩ
Gain Bandwidth Product	GBWP	AV = +1	---	500	---	kHz
Channel Separation	CS	VO = 20Vp-p, fO = 10Hz, VS = ±15V [3]	120	150	---	dB

1. Guaranteed by CMR test.
2. Guaranteed by not tested.
3. Guaranteed but not 100% tested.

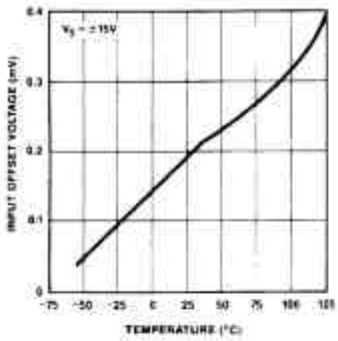
TABLE 3. OP490RP ELECTRICAL CHARACTERISTICS

(VS = ±15V, TA = -55 TO 125°C UNLESS OTHERWISE SPECIFIED.)

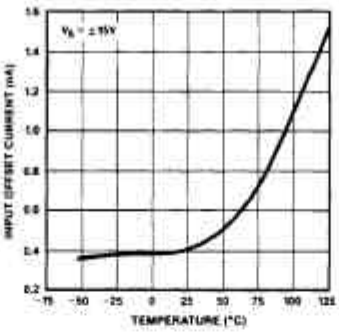
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	VOS		---	0.4	1.0	mV
Average Input Offset Voltage Drift	TCVOS	VS = ±15V	---	2	5	µV/°C
Input Offset Current	IOS	VCM = 0V	---	1.5	5	nA
Input Bias Current	IB	VCM = 0V	---	4.4	20	nA
Large Signal Voltage Gain	AVO	VS = ±15V, VO = 10V				V/mV
		RL = 100kΩ	225	400	--	
		RL = 10kΩ	125	240	---	
		RL = 2kΩ	50	110	---	
		V+ = ±5V , V- = 0V, 1V<VO<4V				
		RL = 100kΩ	100	200	--	
		RL = 10kΩ	50	110	--	
Input Voltage Range	IVR	V+ = 5V, V- = 0V	0/4	--	--	V
		VS = ±15V [1]	-15/13.5	--	--	
Output Voltage Swing	VO	VS = ±15V				V
		RL = 10kΩ	±13	±13.7	---	
		RL = 2kΩ	±10	±11	---	
	VOH	V+ = 5V, V- = 0V				V
		RL = 2kΩ	3.9	4.1	--	
	VOL [2]	V+ = 5V, V- = 0V				µV
		RL = 10kΩ	--	100	500	
Common Mode Rejection	CMR	V+ = 5V, V- = 0V, 0V < VCM < 3.5V	85	108	---	dB
		VS = ±15 V, -15V < VCM < 13.5 V	95	115	--	
Power Supply Rejection Ratio	PSRR		---	3.2	10	µV/V
Supply Current (All Amplifiers)	ISY	VS = ±1.5V, No Load	--	70	100	µA
		VS = ±15V, No Load	--	90	120	

1. Guaranteed by CMR test.
2. Guaranteed but not tesetd.

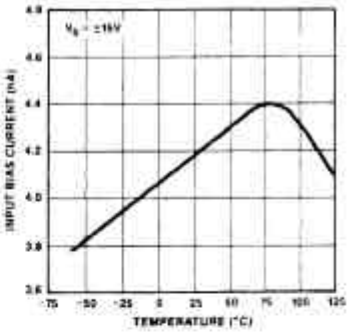
OP490RP TYPICAL OPERATING CHARACTERISTICS



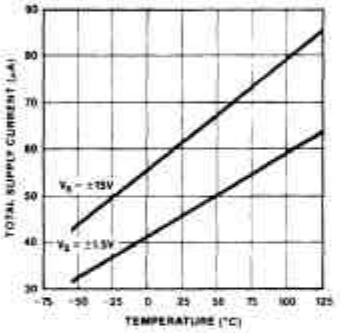
Input Offset Voltage vs. Temperature



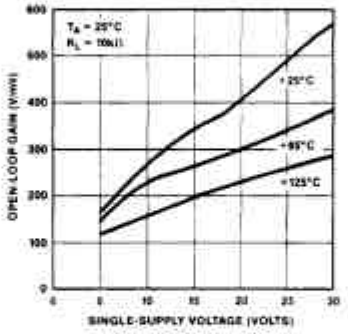
Input Offset Current vs. Temperature



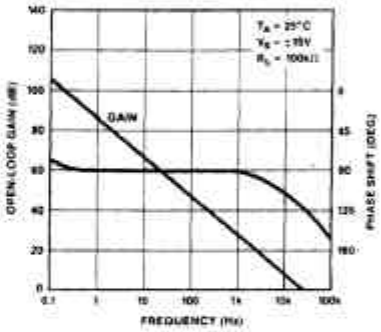
Input Bias Current vs. Temperature



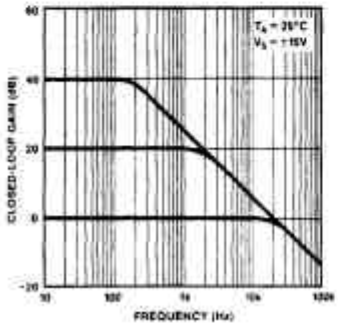
Total Supply Current vs. Temperature



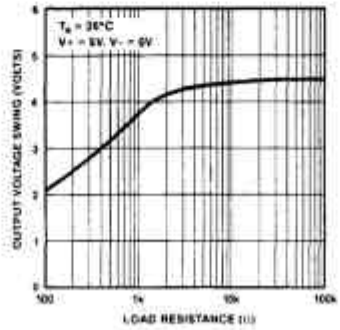
Open-Loop Gain vs. Single-Supply Voltage



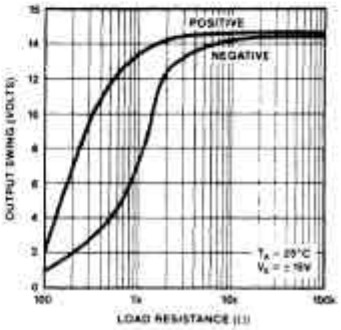
Open-Loop Gain and Phase Shift vs. Frequency



Closed-Loop Gain vs. Frequency

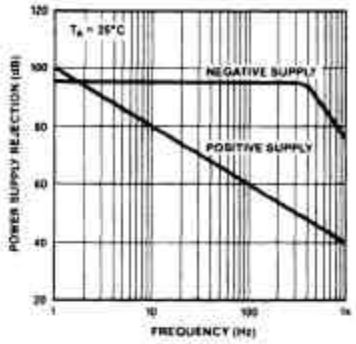


Output Voltage Swing vs. Load Resistance

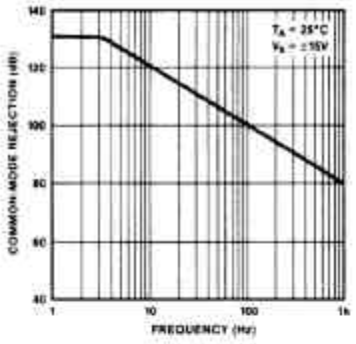


Output Voltage Swing vs. Load Resistance

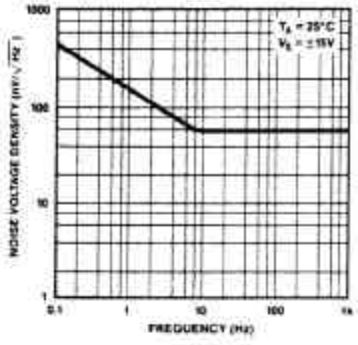
OP490RP TYPICAL OPERATING CHARACTERISTICS



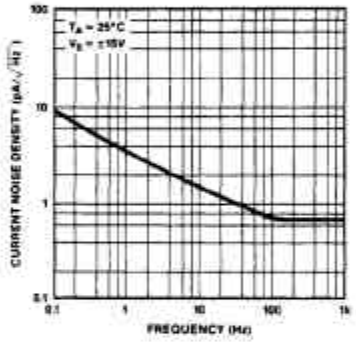
Power Supply Rejection vs. Frequency



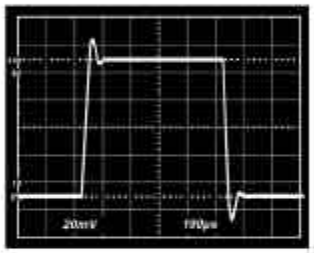
Common-Mode Rejection vs. Frequency



Noise Voltage Density vs. Frequency

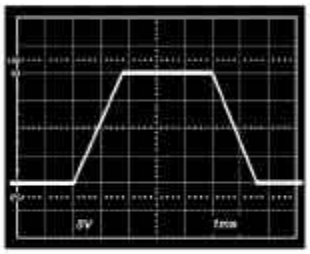


Current Noise Density vs. Frequency



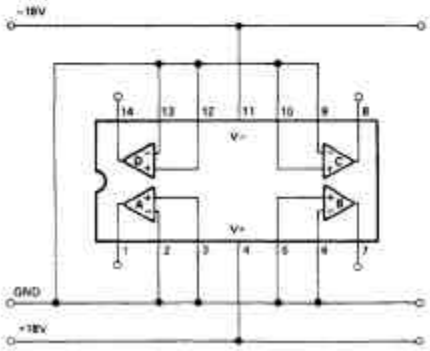
T_A = 25°C
V_S = ±15V
A_V = +1
R_L = 10kΩ
C_L = 500pF

Small-Signal Transient Response

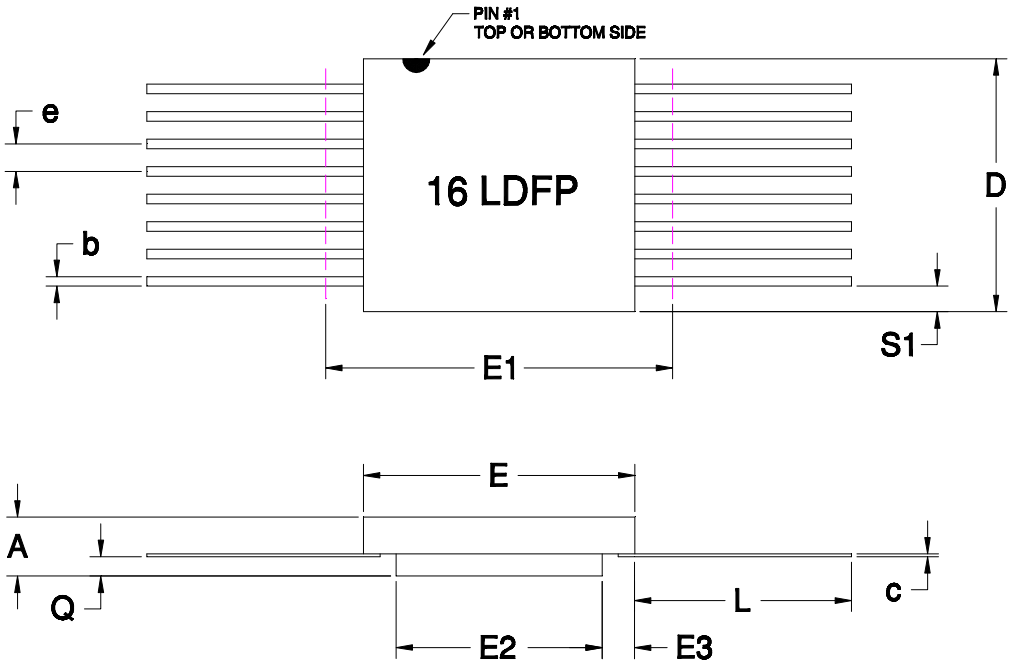


T_A = 25°C
V_S = ±15V
A_V = +1
R_L = 10kΩ
C_L = 500pF

Large-Signal Transient Response



Burn-In Circuit



16-PIN RAK-PAK® FLAT PACKAGE

SYMBOL	DIMENSION		
	MIN	NOM	MAX
A	0.117	0.130	0.143
b	0.015	0.017	0.022
c	0.004	0.005	0.009
D	--	0.415	0.440
E	0.245	0.280	0.285
E1	--	--	0.315
E2	0.130	0.156	--
E3	0.030	0.062	--
e	0.050 BSC		
L	0.325	0.335	0.345
Q	0.020	0.033	0.045
S1	0.005	0.024	--
N	16		

F16-01
Note: All dimensions in inches.

Important Notice:

These data sheets are created using the chip manufacturers published specifications. Space Electronics verifies functionality by testing key parameters either by 100% testing, sample testing or characterization.

The specifications presented within these data sheets represent the latest and most accurate information available to date. However, these specifications are subject to change without notice and Space Electronics assumes no responsibility for the use of this information.

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