Micropower, Dual, Single Supply Precision Op Amp

DESCRIPTION

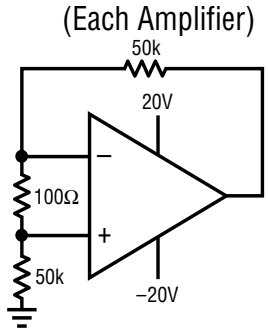
The RH1078M is a micropower dual op amp in the standard 8-pin configuration. This device is optimized for single supply operation at 5V. Specifications for ±15V are also provided.

The wafer lots are processed to LTC's in-house Class S flow to yield circuits usable in stringent military applications.

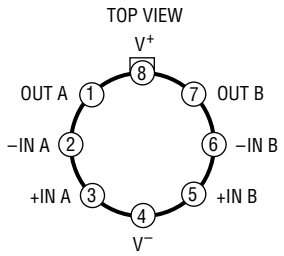
ABSOLUTE MAXIMUM RATINGS

Supply Voltage ..... ±22V
Differential Input Voltage ..... ±30V
Input Voltage ..... Equal to Positive Supply Voltage
..... 0.5V Below Negative Supply Voltage
Output Short-Circuit Duration ..... Indefinite
Operating Temperature Range ..... –55°C to 125°C
Storage Temperature Range ..... –55°C to 150°C
Lead Temperature (Soldering, 10 sec) ..... 300°C

BURN-IN CIRCUIT

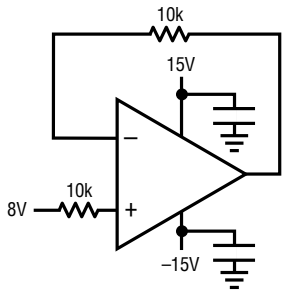


PACKAGE/ORDER INFORMATION



H PACKAGE
8-LEAD TO-5 METAL CAN

TOTAL DOSE BIAS CIRCUIT



Note: For ordering information contact LTC.

TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation)

V_S = 5V, V_{CM} = 0.1V, V_{OUT} = 1.4V unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	NOTES	T_A = 25°C MIN	TYP	MAX	SUB-GROUP	−55°C ≤ T_A ≤ 125°C MIN	TYP	MAX	SUB-GROUP	UNITS
V_{OS}	Input Offset Voltage					120	4			370	2, 3	µV
$\frac{\Delta V_{OS}}{\Delta Temp}$	Average Tempco of Offset Voltage								0.5			µV/°C
$\frac{\Delta V_{OS}}{\Delta Time}$	Long Term V_{OS} Stability				0.5							µV/Month
I_{OS}	Input Offset Current					0.8	1			1.5	2, 3	nA
I_B	Input Bias Current					15	1			18	2, 3	nA
e_n	Input Noise Voltage	0.1Hz to 10Hz	1		0.5							µVP-P
	Input Noise Voltage Density	f_O = 10Hz f_O = 1kHz	1 1		25 24							nV/√Hz nV/√Hz
i_n	Input Noise Current	0.1Hz to 10Hz	1		2.6							pAP-P
	Input Noise Current Density	f_O = 10Hz f_O = 1kHz	1 1		0.07 0.025							pA/√Hz pA/√Hz
R_{IN}	Input Resistance Differential		2		600							MΩ
	Common Mode		2		5							GΩ
	Input Voltage Range		2 2	3.5 0			1 1	3.20 0.05			2, 3 2, 3	V V
CMRR	Common-Mode Rejection Ratio	V_{CM} = 0V to 3.5V V_{CM} = 0.05V to 3.2V		94			1		88		2, 3	dB dB
PSRR	Power Supply Rejection Ratio	V_S = 2.3V to 12V V_S = 3.1V to 12V		100			1		94		2, 3	dB dB
A_{VOL}	Large-Signal Voltage Gain	V_O = 0.03V to 4V, No Load V_O = 0.03V to 3.5V, R_L = 50k V_O = 0.05V to 4V, No Load V_O = 0.05V to 3.5V, R_L = 50k		150 120			1 1	 80 60			 2, 3 2, 3	V/mV V/mV V/mV V/mV
V_{OUT}	Output Voltage Swing	Output Low, No Load Output Low, 2k to GND Output Low, I_{SINK} = 100µA Output High, No Load Output High, 2k to GND		 4.2 3.5		6 2 130	4 4 4 4 4	 3.9 3.0		8 170	5, 6 5, 6 5, 6 5, 6	mV mV mV V V
SR	Slew Rate	A_V = 1, V_S = ±2.5V		0.04			4					V/µs
GBW	Gain-Bandwidth Product	f_O ≤ 20kHz			200							kHz
I_S	Supply Current	per Amplifier				75	1			95	2, 3	µA
	Channel Separation	ΔV_{IN} = 3V, R_L = 10k			130							dB
	Minimum Supply Voltage		3			2.3						V

TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation)

V_S = ±15V unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	NOTES	T_A = 25°C MIN	TYP	MAX	SUB-GROUP	–55°C ≤ T_A ≤ 125°C MIN	TYP	MAX	SUB-GROUP	UNITS
V_{OS}	Input Offset Voltage					350	4			600	2, 3	µV
$\frac{\Delta V_{OS}}{\Delta Temp}$	Average Tempco of Offset Voltage								0.6			µV/°C
I_{OS}	Input Offset Current					0.8	1			1.5	2, 3	nA
I_B	Input Bias Current					15				18	2, 3	nA
	Input Voltage Range			13.5 –15.0			1 1					V V
CMRR	Common-Mode Rejection Ratio	V_{CM} = 13.5V, –15V V_{CM} = 13V, –14.9V		97			1		90		2, 3	dB dB
PSRR	Power Supply Rejection Ratio	V_S = 5V, 0V to ±18V		100			1	94			2, 3	dB
A_{VOL}	Large-Signal Voltage Gain	V_O = ±10V, R_L = 50k V_O = ±10V, R_L = 2k V_O = ±10V, R_L = 5k		1000 300			1 1		150		2, 3	V/mV V/mV V/mV
V_{OUT}	Output Voltage Swing	R_L = 50k R_L = 2k R_L = 5k		±13 ±11			4 4		±11		5, 6	V V V
SR	Slew Rate			0.06			4					V/µs
I_S	Supply Current	Per Amplifier				100	1			125	2, 3	µA

Note 1: All noise parameters are for V_S = ±2.5V, V_O = 0V.

Note 2: This parameter is guaranteed by design, characterization or correlation to other tested parameters.

Note 3: Power supply rejection ratio is measured at the minimum supply voltage. The op amps actually work at 1.8V supply but with a typical offset skew of –300µV.

TABLE 1A: ELECTRICAL CHARACTERISTICS (Postirradiation)

V_S = 5V, 0V, V_{CM} = 0.1V, V_O = 1.4V, T_A = 25°C unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	10KRAD(Si) MIN	10KRAD(Si) MAX	25KRAD(Si) MIN	25KRAD(Si) MAX	50KRAD(Si) MIN	50KRAD(Si) MAX	75KRAD(Si) MIN	75KRAD(Si) MAX	100KRAD(Si) MIN	100KRAD(Si) MAX	UNITS
V_{OS}	Input Offset Voltage			120		175		250		500			µV
I_{OS}	Input Offset Current			2		8		13		18			nA
I_B	Input Bias Current			20		40		80		100			nA
	Input Voltage Range		3.5		3.5		3.5		3.5				V
CMRR	Common-Mode Rejection Ratio	V_{CM} = 0V to 3.5V	91		89		87		85				dB
PSRR	Power Supply Rejection Ratio	V_S = 2.3V to 12V	100		100		98		88				dB
A_{VOL}	Large-Signal Voltage Gain	V_O = 0.03V to 4V, No Load V_O = 0.03V to 3.5V, R_L = 50k	150 120		150 50		100 20		50 10				V/mV V/mV
V_{OUT}	Output Voltage Swing	Output Low, No Load Output Low, 2k to GND Output Low, I_{SINK} = 100µA Output High, No Load Output High, 2k to GND	 4.2 3.5	6 2 130 	 4.2 3.5	9 2 140 	 4.2 3.5	13 2 150 	 4.2 3.5	20 2 160 			mV mV mV V V
S_R	Slew Rate	A_V = 1, V_S = ±2.5V	0.04		0.03		0.02		0.01				V/µs
I_S	Supply Current	per Amplifier		75		75		75		75			µA

TABLE 1A: ELECTRICAL CHARACTERISTICS (Postirradiation)

V_S = ±15V unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	10KRAD(Si) MIN	10KRAD(Si) MAX	25KRAD(Si) MIN	25KRAD(Si) MAX	50KRAD(Si) MIN	50KRAD(Si) MAX	75KRAD(Si) MIN	75KRAD(Si) MAX	100KRAD(Si) MIN	100KRAD(Si) MAX	UNITS
V_{OS}	Input Offset Voltage			350		500		650		800		1000	µV
I_{OS}	Input Offset Current			2		8		13		18		23	nA
I_B	Input Bias Current			20		40		80		100		120	nA
	Input Voltage Range		13.5 –15.0		13.5 –15.0		13.5 –15.0		13.5 –15.0		13.5 –15.0		V V
CMRR	Common-Mode Rejection Ratio	V_{CM} = 13.5V, –15V	94		92		90		88		86		dB
PSRR	Power Supply Rejection Ratio	V_S = 5V, 0V to ±18V	100		100		98		88		78		dB
A_{VOL}	Large-Signal Voltage Gain	V_O = 10V, R_L = 50k V_O = 10V, R_L = 2k	1000 300		700 200		400 120		150 45		50 15		V/mV V/mV
V_{OUT}	Output Voltage Swing	R_L = 50k R_L = 2k	±13 ±11		±13 ±11		±13 ±11		±13 ±11		±13 ±10		V V
SR	Slew Rate		0.05		0.04		0.03		0.02		0.01		V/µs
I_S	Supply Current	per Amplifier		100		100		100		100		100	µA

TABLE 2: ELECTRICAL TEST REQUIREMENTS

MIL-STD-883 TEST REQUIREMENTS	SUBGROUP
Final Electrical Test Requirements (Method 5004)	1*,2,3,4,5,6
Group A Test Requirements (Method 5005)	1,2,3,4,5,6
Group C and D End Point Electrical Parameters (Method 5005)	1,2,3

* PDA Applies to subgroup 1. See PDA Test Notes.

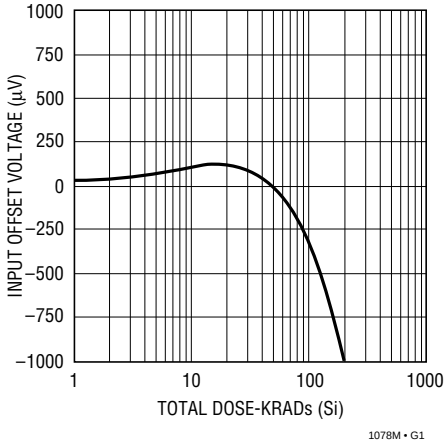
PDA Test Notes

The PDA is specified as 5% based on failures from group A, subgroup 1, tests after cooldown as the final electrical test in accordance with method 5004 of MIL-STD-883 Class B. The verified failures of group A, subgroup 1, after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent for the lot.

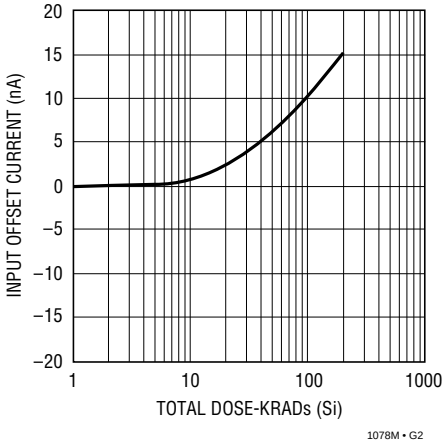
Linear Technology Corporation reserves the right to test to tighter limits than those given.

TYPICAL APPLICATIONS

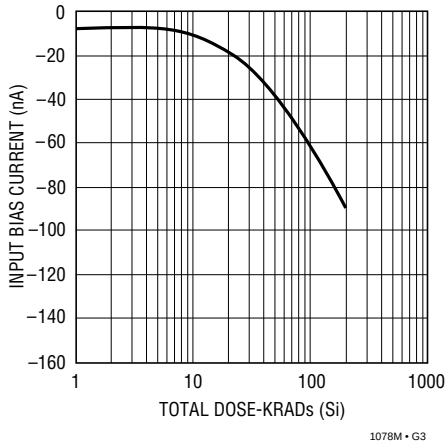
Input Offset Voltage



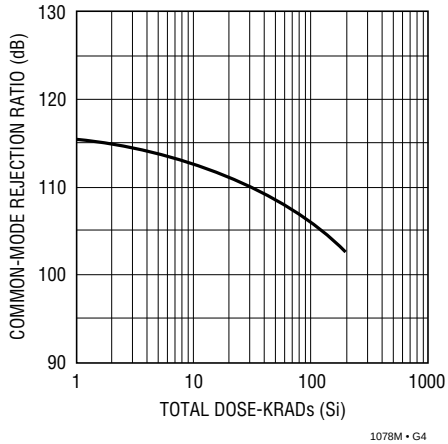
Input Offset Current



Input Bias Current

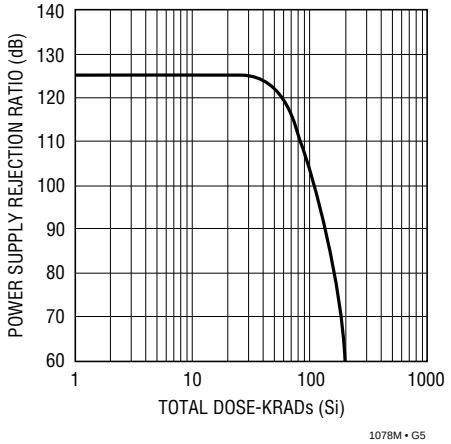


Common-Mode Rejection Ratio

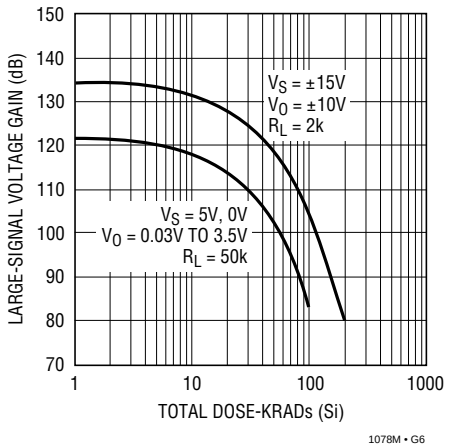


TYPICAL APPLICATIONS

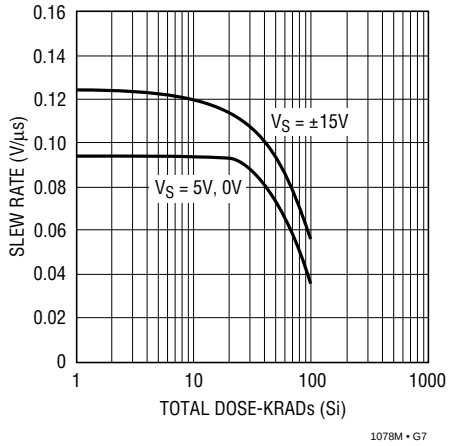
Power Supply Rejection Ratio



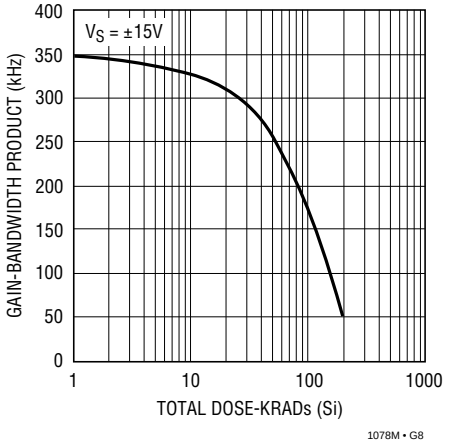
Large-Signal Voltage Gain



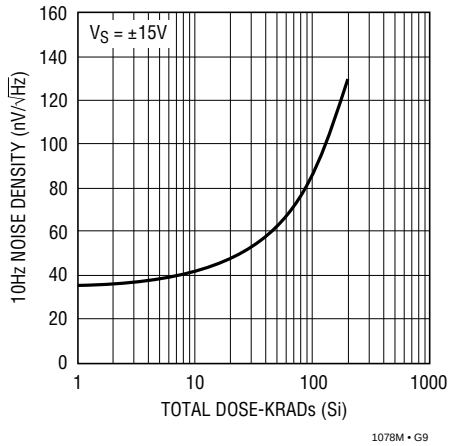
Slew Rate



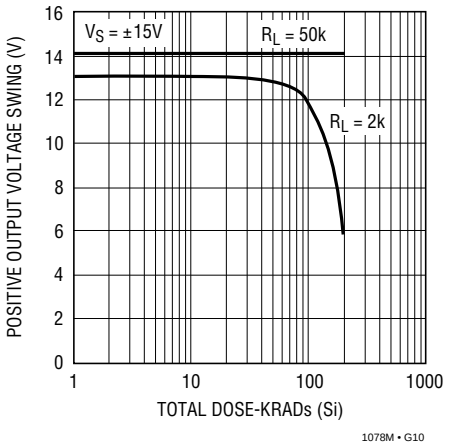
Gain-Bandwidth Product



10Hz Noise Density

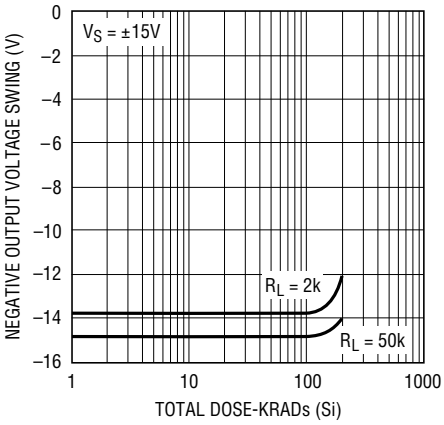


Positive Output Voltage Swing

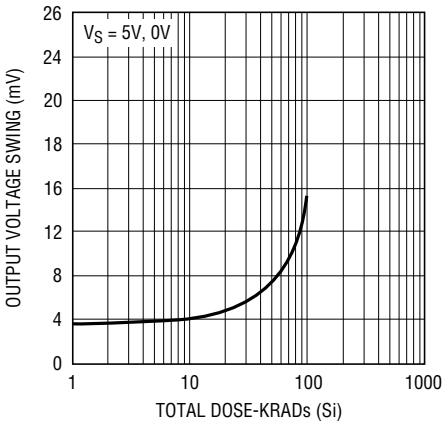


TYPICAL APPLICATIONS

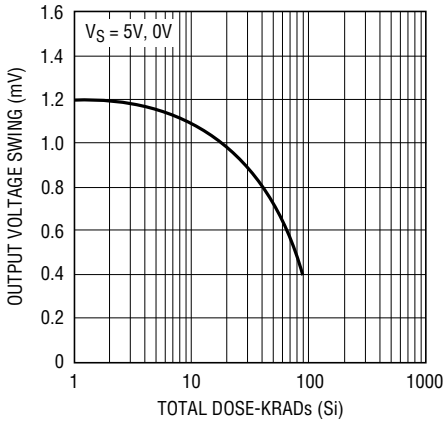
Negative Output Voltage Swing



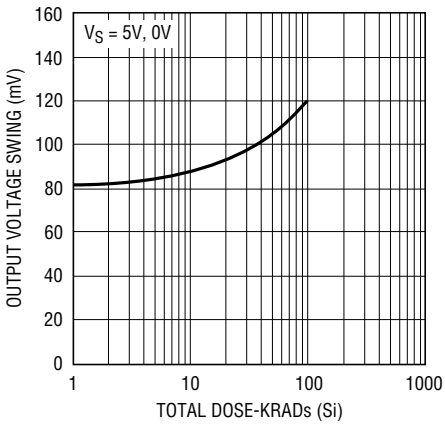
Output Voltage Swing Low, No Load



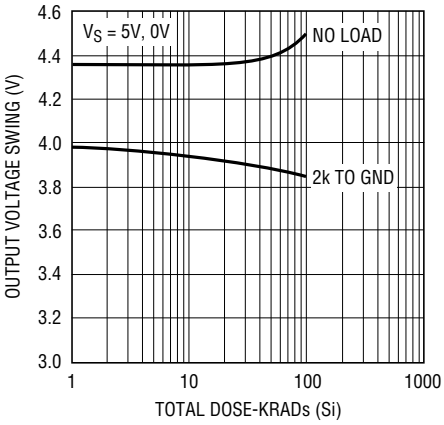
Output Voltage Swing Low, 2k to GND



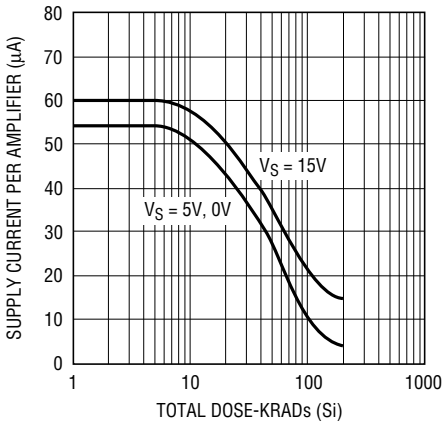
Output Voltage Swing Low, I_{SINK} = 100mA



Output Voltage Swing High



Supply Current



I.D. No. 66-10-0100 Rev. E 0798

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