LINFINITY MICROELECTRONICS

THE INFINITE POWER OF INNOVATION

SG2273/SG3373

POWER OPERATIONAL AMPLIFIER

PRODUCTION DATA SHEET

DESCRIPTION

The SG2273/3273 is a monolithic power operational amplifier, which features a high-current, low-saturation voltage, flyback protected output stage optimized for driving heavily inductive loads. Capable of operation in a single supply mode from as low as 4.5V up to 13.2V, the SG2273/3273 is ideally suited for the computer peripheral environment, driving small motors, solenoids, and linear actuators in an H-bridge configuration.

As a general-purpose op amp, the SG2273/3273 exhibits low input offset voltage, high open loop gain, low quiescent current, a large differential input voltage range, and a common-mode input voltage range, which includes ground (V_{EE}).

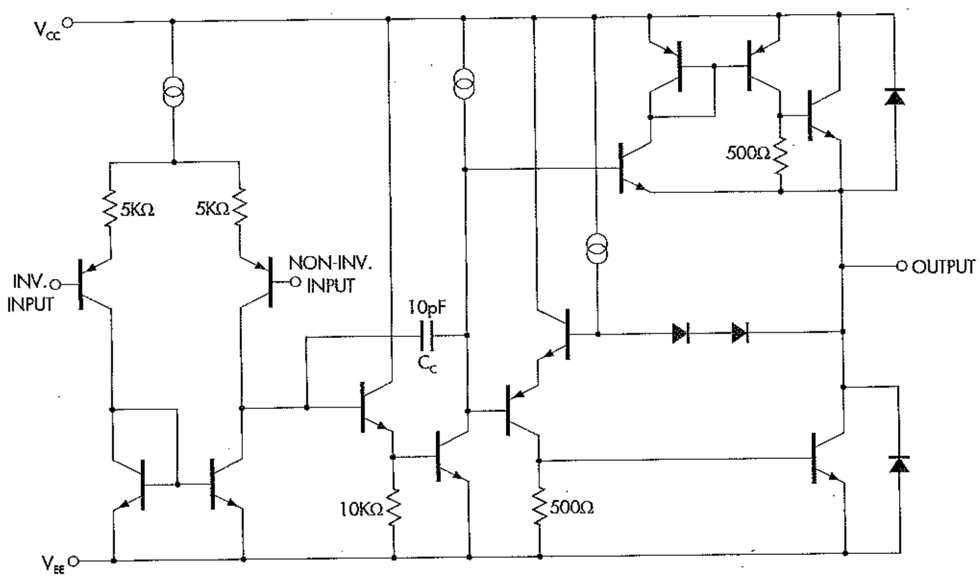
Available in a 5-pin TO-220 package, the SG2273/3273 provides system designers with a low-cost, convenient way to minimize power dissipation and reduce board area consumption in applications requiring high-current inductive load capability.

KEY FEATURES

- FULL OUTPUT SWING AT ±1A
- HIGH INDUCTIVE LOAD DRIVE CAPABILITY
- INTERNAL FLYBACK PROTECTION DIODES
- LOW POWER DISSIPATION
- SINGLE OR SPLIT SUPPLY OPERATION
- COMMON-MODE RANGE INCLUDES GROUND (V_{EE})
- HIGH OPEN LOOP GAIN
- LOW INPUT OFFSET VOLTAGE
- LARGE DIFFERENTIAL INPUT VOLTAGE RANGE
- THERMAL SHUTDOWN PROTECTION

PRODUCT HIGHLIGHT

SG2273 CIRCUIT SCHEMATIC DIAGRAM



PACKAGE ORDER INFO

T_A (°C)	P Plastic TO-220 5-pin
0 to 70	SG3273P
-45 to 85	SG2273P

FOR FURTHER INFORMATION CALL (714) 898-8121

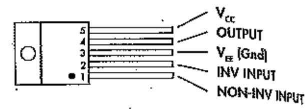
11861 WESTERN AVENUE, GARDEN GROVE, CA. 92841

ABSOLUTE MAXIMUM RATINGS (Note 1)

Supply Voltage (Single Supply) (V_{CC}) .... -0.3V to 14V
DC Output Current (I_{OUT}) .... ±1.4A
Peak Output Current (Non-Repetitive) (I_{OUT}) .... ±1.5A
Common-Mode Input Voltage (V_{ICM}) .... -0.3V to V_{CC}-2V
Differential-Mode Input Voltage (V_{IDM}) .... $\pm V_{CC}$
Operating Junction Temperature
Plastic (P - Package) .... 150°C
Storage Temperature Range .... -65°C to 150°C
Lead Temperature (Soldering, 10 seconds) .... 300°C

Note 1. Values beyond which damage may occur. All voltages are specified with respect to ground, and all currents are positive into the specified terminal.

PACKAGE PIN OUTS



P PACKAGE
(Top View)

THERMAL DATA

P PACKAGE:

THERMAL RESISTANCE-JUNCTION TO CASE, θ_{JC}	4.0°C/W
THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA}	55°C/W

Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
The θ_{JA} numbers are guidelines for the thermal performance of the device/pc-board system.
All of the above assume no ambient airflow.

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RECOMMENDED OPERATING CONDITIONS (Note 2)

Parameter	Symbol	Recommended Operating Conditions Min.	Typ.	Max.	Units
y Voltage (Single Supply)	V_{CC}	4.5		13.2	V
tput Current	I_{OUT}		±1.2		A
on-Mode Input Voltage	V_{ICM}	0		V_{CC}-2	V
ntial-Mode Input Voltage	V_{IDM}		$\pm V_{CC}$		V
ting Ambient Temperature Range:					
2273	T_A	-40		85	°C
3273	T_A	0		70	°C

Range over which the device is guaranteed functional.

ELECTRICAL CHARACTERISTICS

otherwise specified, these specifications apply over the operating ambient temperatures of -40°C ≤ T_A ≤ 85°C for the SG2373 and 0°C ≤ T_A ≤ 70°C for 273; V_{CC}=12V. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

Parameter	Symbol	Test Conditions	SG2273 Min.	SG2273 Typ.	SG2273 Max.	SG3273 Min.	SG3273 Typ.	SG3273 Max.	Units
c Characteristics									
Offset Voltage	V_{IO}	T_A = 25°C	-15	0	15	-15	0	15	mV
			-40		40	-30		30	mV
Bias Current	I_B	T_A = 25°C	-1.0	-0.2		-1.0	-0.2		µA
Offset Current	I_{OS}	T_A = 25°C	-50		50	-50		50	nA
			-200		200	-200		200	nA
ntial Input Resistance	R_{ID}		500			500			KΩ
Side Output Saturation Voltage	$+V_{SAT}$	I_{OUT} = 100mA		0.8	1.0		0.8		V
		I_{OUT} = 500mA		1.0	1.5		1.0	1.5	V
		I_{OUT} = 1A		1.4	2.0		1.4	2.0	V
de Output Saturation Voltage	$-V_{SAT}$	I_{OUT} = 100mA		0.3	0.7		0.3		V
		I_{OUT} = 500mA		0.6	1.0		0.6	1.0	V
		I_{OUT} = 1A		1.3	2.0		1.3	2.0	V
Loop Voltage Gain	A_{VOL}		70	90		70	90		dB
on-Mode Rejection Ratio	CMRR	T_A = 25°C	66	90		66	90		dB
Supply Rejection Ratio	PSRR		60	80		60	80		dB
ent Drain Current	I_{CC}	T_A = 25°C		7	17		7	15	mA
l Shutdown Temperature		T_A = 25°C		175			175		°C
mic Characteristics (T_A = 25°C)									
andwidth Product	GBWP	RL = ∞Ω		800			800		KHz
ate	dV_O/dt	AV = 1		1.6			1.6		V/µs
Bandwidth, -3dB	PBW			200			200		KHz
oise Voltage	E_N	22Hz to 22KHz		10			10		µV
oise Current	I_N	22Hz to 22KHz		200			200		pA
l Separation	CS	f = 1KHz, R_L = 10Ω, AV_{CL} = 30dB		60			60		dB

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Characteristic Curves

FIGURE #

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5. OPEN LOOP GAIN vs. FREQUENCY
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7. SUPPLY CURRENT vs. TEMPERATURE
8. SATURATION VOLTAGE vs. LOAD CURRENT

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13. 3.5-INCH WINCHESTER DISK DRIVE HEAD POSITION CONTROL AMPLIFIER

CHARACTERISTIC CURVES

[FIG]URE 1. — LARGE SIGNAL TRANSIENT RESPONSE

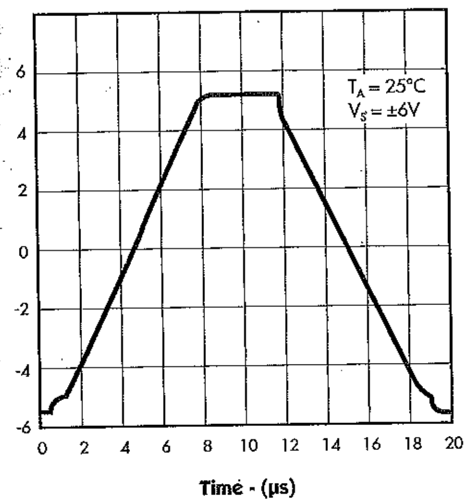
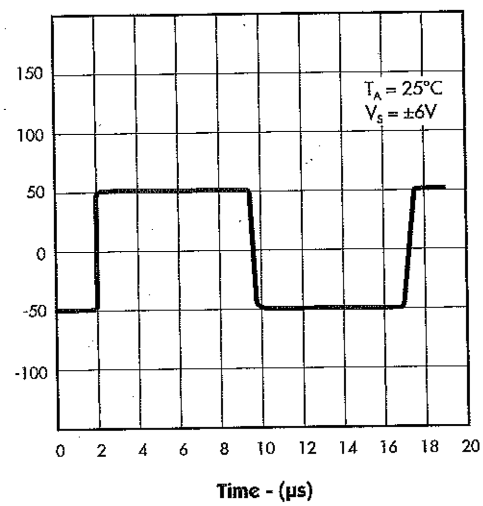


FIGURE 2. — SMALL SIGNAL TRANSIENT RESPONSE



[F]IGURE 3. — COMMON-MODE REJECTION RATIO vs. FREQUENCY

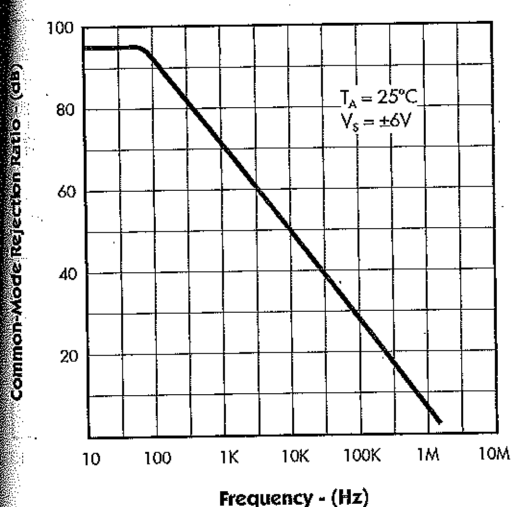
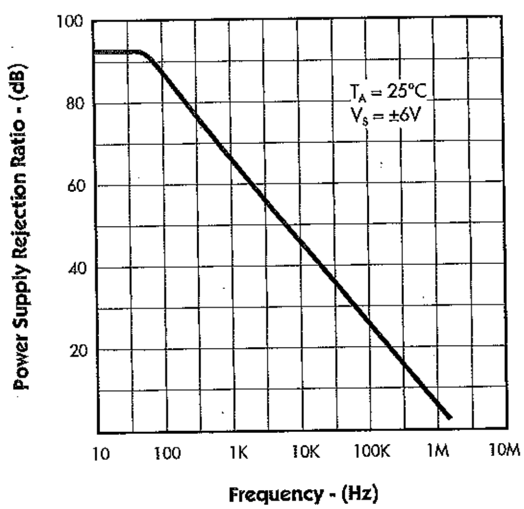


FIGURE 4. — POWER SUPPLY REJECTION vs. FREQUENCY



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CHARACTERISTIC CURVES

FIGURE 5. — OPEN LOOP GAIN vs. FREQUENCY

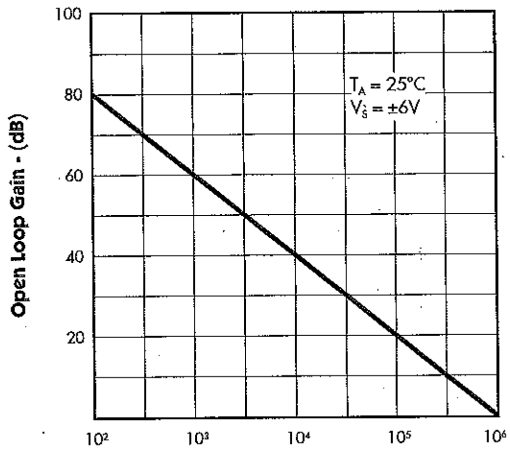


FIGURE 6. — SUPPLY CURRENT vs. SUPPLY VOLTAGE

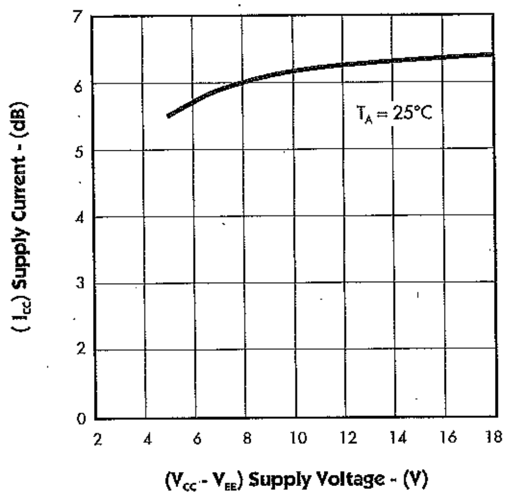


FIGURE 7. — SUPPLY CURRENT vs. TEMPERATURE

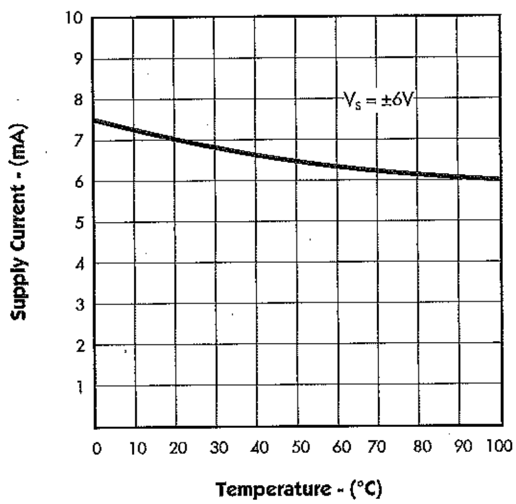
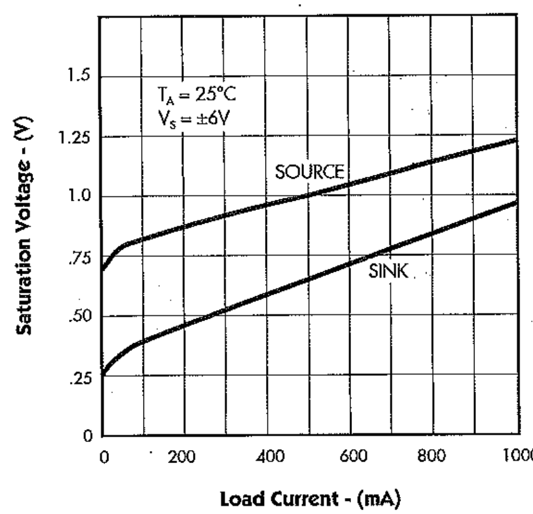


FIGURE 8. — SATURATION VOLTAGE vs. LOAD CURRENT



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TYPICAL APPLICATION CIRCUITS

FIGURE 9. — INVERTING POWER AMPLIFIER

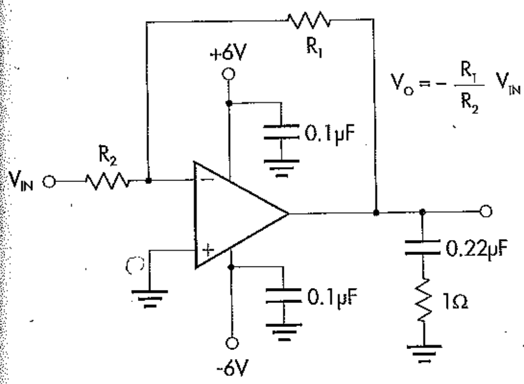


FIGURE 10. — NON-INVERTING POWER AMPLIFIER

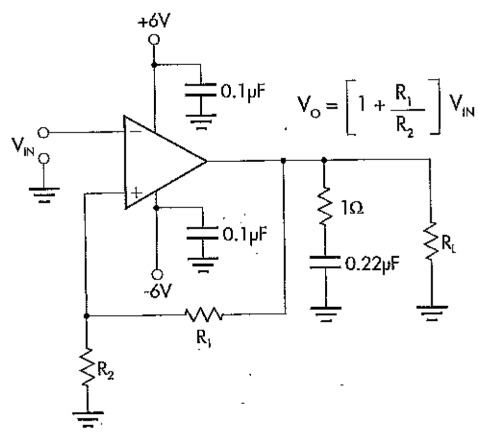
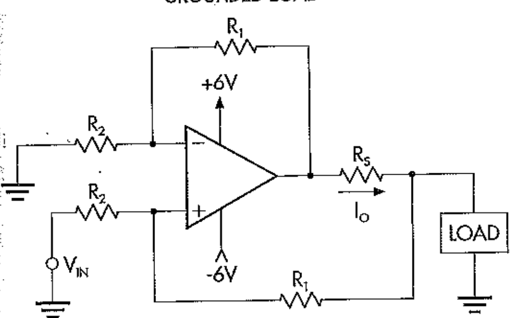
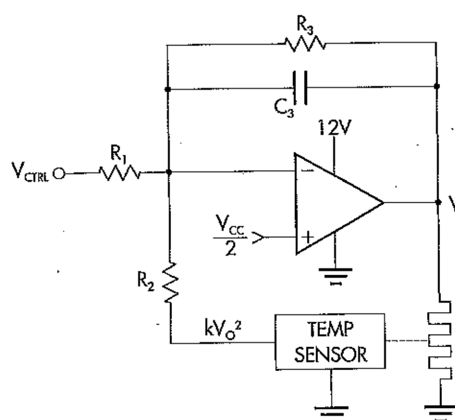


FIGURE 11. — REGULATED CURRENT SOURCE FOR A GROUNDED LOAD



$I_O = \frac{R_1}{R_2 * R_S} V_{IN}$ $R_S << R_1$ and R_2

FIGURE 12. — ADJUSTABLE TEMPERATURE CONTROL

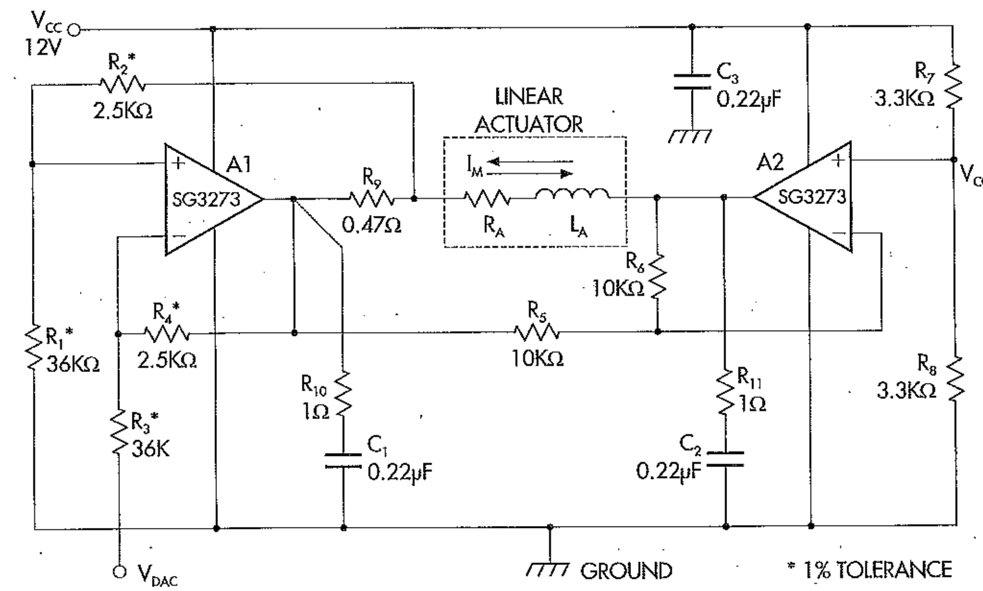


$R_3 >> R_1$ and R_2

$$V_O = \sqrt{\frac{1}{k}\left[\frac{V_{CC}}{2}\left(1 + \frac{R_1}{R_2}\right) - \frac{R_2}{R_1} V_{CTRL}\right]}$$

TYPICAL APPLICATION CIRCUITS

FIGURE 13. — 3.5-INCH WINCHESTER DISK DRIVE HEAD POSITION CONTROL AMPLIFIER



if $\frac{R_1}{R_2} = \frac{R_3}{R_4}$

then $|I_M| = \frac{R_4}{R_3 R_A} V_{DAC}$ — I_M: Sink to A_2 op-amp if $V_{DAC} < 0$; I_M: Sink to A_1 op-amp if $V_{DAC} > 0$

For the opposite example:

$I_M = \frac{2.5K}{(36K)(0.47)} V_{DAC} = 0.148\ V_{DAC}$ — $|I_M| \leq 740mA$ if $-5V \leq V_{DAC} \leq 5V$

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