élantec
HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

EL2008C
55 MHz 1 Amp Buffer Amplifier

Features
- High slew rate – 2500V/μs
- Wide bandwidth –
  100 MHz @ R_L = 50Ω
  55 MHz @ R_L = 10Ω
- Output current – 1A Continuous
- Output Impedance – 1Ω
- Quiescent Current – 13mA
- Short circuit protected
- Over temperature protected
- Power package with isolated metal tab

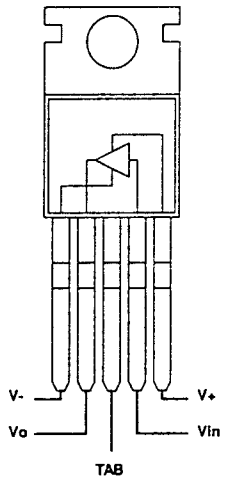
Applications
- Video distribution amplifier
- Fast op-amp booster
- Flash converter driver
- Motor driver
- Pulse transformer driver
- A.T.E. pin driver

Ordering Information

Part No.	Temp. Range	Pkg.	Outline #
EL2008CT	–25 to +85°C	TO-220	MDP0028

Connection Diagram

5 Pin TO-220
(Top View)



General Description

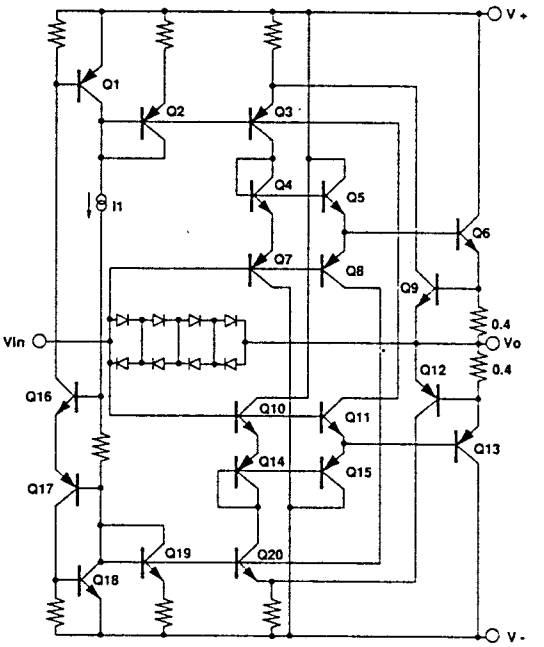
The EL2008 is a high speed bipolar monolithic buffer amplifier designed to provide currents over 1 amp at high frequencies, while drawing only 13 mA of quiescent supply current. The EL2008's 1500V/μs slew rate and 55MHz bandwidth driving a 10 ohm load is second only to the EL2009 and insures stability in fast op-amp feedback loops. Elantec has applied for patents on unique circuitry within the EL2008.

Used as an open loop buffer, the EL2008's low output impedance (1 ohm) gives a gain of 0.99 when driving a 100Ω load and 0.9 driving a 10Ω load. The EL2008 has output short circuit current limiting which will protect the device under both a DC fault condition and AC operation with reactive loads. In addition, the EL2008 has a temperature sensing circuit which disables the output stage in the event of a fault and limits the die temperature to a safe value.

The EL2008 is constructed using Elantec's proprietary Complementary Bipolar process that produces PNP and NPN transistors with essentially identical AC and DC characteristics. In the EL2008, the Complementary Bipolar process also insulates the package's metal heat sink tab from all supply voltages. Therefore the tab may be mounted to an external heat sink or the chassis without an insulator.

The EL2008CT is specified for operation over the –25 to +85°C temperature range and is provided in a 5 lead TO-220 plastic power package.

Simplified Schematic



Absolute Maximum Ratings (25°C)

V_S	Supply Voltage (V+ –V–)	±18V or 36V	T_A	Operating Temperature Range	–25°C to +85°
V_{IN}	Input Voltage (Note 1)	±15V or Vs	T_J	Operating Junction Temp.	+175°C
I_{IN}	Input Current (Note 1)	±50mA	T_{ST}	Storage Temp. Range	–65°to +150°
P_D	Power Dissipation (Note 2)	See Curves	T_{LD}	Lead Solder Temp. <10 Sec.	300°C
t_{SH}	Output Short Circuit Duration (Note 3)	Continuous			

Important Note:
All parameters having Min. / Max. specifications are guaranteed. The Test level column indicates the specific device testing actually performed during production and Quality inspection. Elantec performs most electrical tests using modern high-speed automatic test equipment, specifically the LTX77 Series system. Unless otherwise noted, all tests are pulsed tests, therefore $T_J = T_C = T_A$.

Test Level	Test Procedure
I	**100% production tested and QA sample tested per QA test plan QCX0002.**
II	**100% production tested at T_A = 25°C and QA sample tested at T_A = 25°C, T_{MAX} and T_{MIN} per QA test plan QCX0002.**
III	**QA sample tested per QA test plan QCX0002.**
IV	**Parameter is guaranteed (but not tested) by Design and Characterization Data.**
V	**Parameter is typical value at T_A = 25°C for information purposes only.**

Electrical Characteristics $V_s = \pm 15V$, $R_s = 50\Omega$, Unless otherwise specified.

		Test Conditions			Limits			Test	
Parameters	Description	V_{in}	Load	Temp	Min	Typ	Max	Level	Units
V_{OS}	Output Offset Voltage	0	∞	25°C	–40	10	+40	I	mV
				T_{MIN}, T_{MAX}	–50		+50	IV	mV
I_{IN}	Input Current	0	∞	25°C	–35	–5	+35	I	µA
				T_{MIN}, T_{MAX}	–50		+50	IV	µA
R_{IN}	Input Impedance	±12V	100Ω	25°C	0.5	2		I	MΩ
A_{V1}	Voltage Gain	±10V	∞	25°C	0.985	0.9995		I	V/V
A_{V2}	Voltage Gain	±10V	10Ω	25°C	0.88	0.91		I	V/V
A_{V3}	Voltage Gain, $V_S = \pm 5V$	± 3V	10Ω	25°C	0.87	0.89		I	V/V
V_{O1}	Output Voltage Swing	±14V	100Ω	25°C	±13			I	V
V_{O2}	Output Voltage Swing	±12V	10Ω	25°C	±10.5	±11		I	V

Electrical Characteristics – Continued $V_S = \pm 15V$, $R_S = 50\Omega$, Unless otherwise specified.

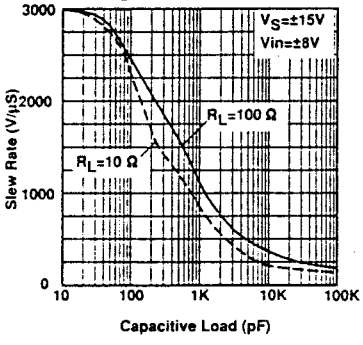
Parameters	Description	Test Conditions V_{in}	Load	Temp	Limits Min	Typ	Max	Test Level	Units
R_{O1}	Output Impedance	±10V	±10mA	25°C		1.8	2.5	I	Ω
R_{O2}	Output Impedance	±10V	±1A	25°C		0.8	1.0	I	Ω
I_O	Output Current	±12V	Note 4	25°C	1.4	1.8		I	A
				T_{MIN}, T_{MAX}	1			IV	A
I_S	Supply Current	0	∞	25°C	9	13	22	I	mA
PSRR	Supply Rejection (Note 5)	0	∞	25°C	60			I	dB
V_S+, V_S-	Supply Sensitivity (Note 6)		∞	25°C			2	I	mV/V
SR_1	Slew Rate (Note 7)	±10V	50Ω	25°C		2500		V	V/µs
		±10V	10Ω	25°C		1500		V	V/µs
SR_2	Slew Rate (Note 8)	±5V	10Ω	25°C		800		V	V/µs
t_r, t_f	Rise/Fall Time	100mV	10Ω	25°C		7		V	ns
BW	–3dB Bandwidth	100mV	10Ω	25°C		55		V	MHz
C_{IN}	Input Capacitance			25°C		25		V	pF
THD				25°C			1	I	%

Notes:

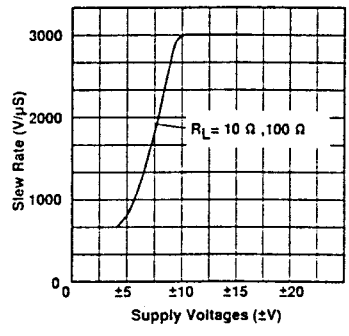
1. If the input exceeds the ratings shown (or the supplies) or if the input voltage exceeds ±7.5V then the input current must be limited to ±50mA. See the application hints for information.
2. The maximum power dissipation depends on package type, ambient temperature and heat sinking. See the characteristic curves for more details.
3. During Output Short Circuit test the junction temperature rises and can activate the Thermal Shut down circuit. A heat sink will lower the junction temperature below the trip point.
4. Force the input to +12V and the output to +10V and measure the output current. Repeat with –12V input and –10V on the output.
5. $V_s = \pm 4.5V$ then V_s is changed to ±18V.
6. $V_s+ = +15V$, $V_s- = -4.5V$ then V_s- is changed to –18V and $V_s- = -15V$, $V_s+ = +4.5V$ then V_s+ is changed to +18V.
7. Slew Rate is measured between $V_{out} = +5V$ and –5V.
8. Slew Rate is measured between $V_{out} = +2.5V$ and –2.5V.

Typical Performance Curves

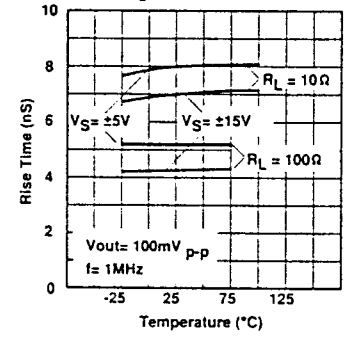
Slew Rate vs Capacitive Load



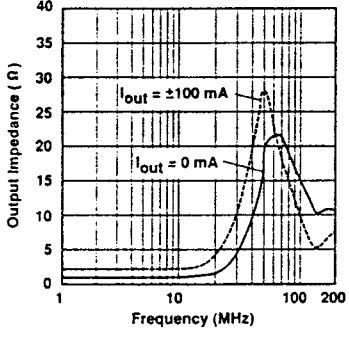
Slew Rate vs Supply Voltage



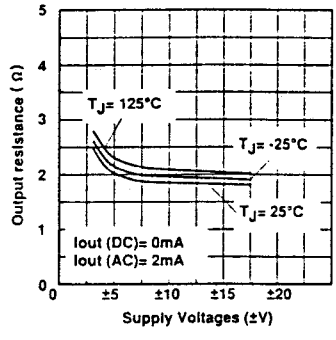
Rise Time vs Temperature



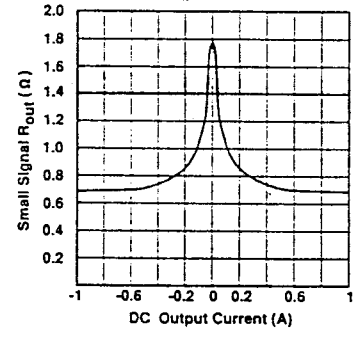
Output Impedance vs Frequency



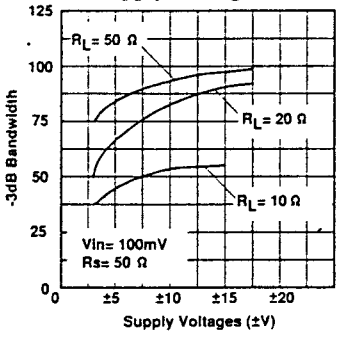
Output Resistance vs Supply Voltage



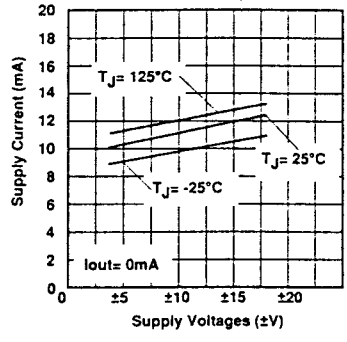
Small Signal Output Resistance vs DC Output Current



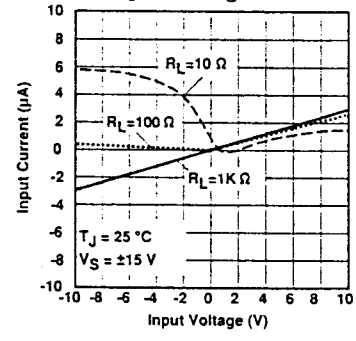
-3dB Bandwidth vs Supply Voltage



Quiescent Supply Current vs Supply Voltage

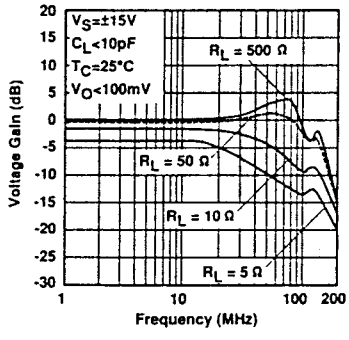


Input Current vs Input Voltage

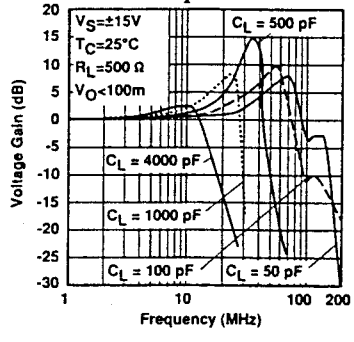


Typical Performance Curves - Continued

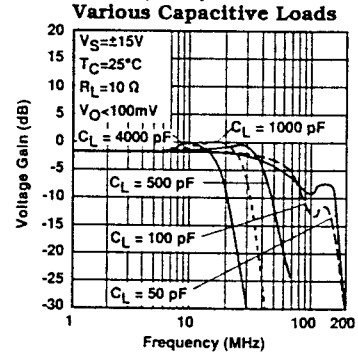
Voltage Gain vs Frequency at Various Resistive Loads



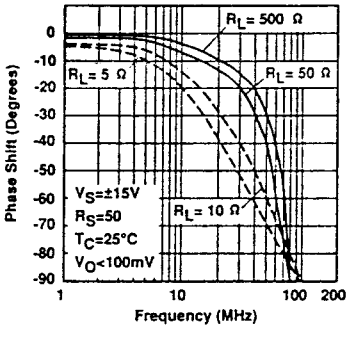
Voltage Gain vs Frequency at Various Capacitive Loads



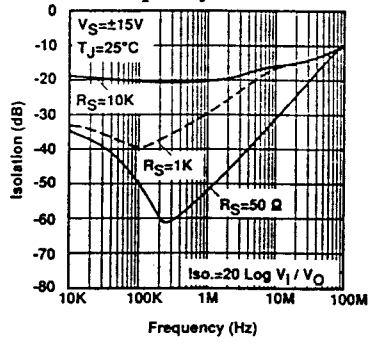
Voltage Gain vs Frequency at Various Capacitive Loads



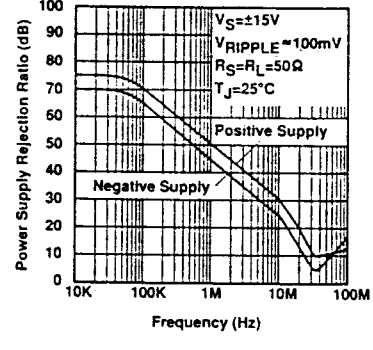
Phase Shift vs Frequency at Various Resistive Loads



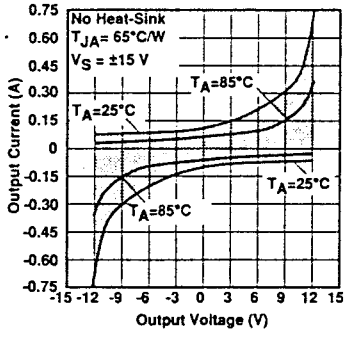
Reverse Isolation vs Frequency



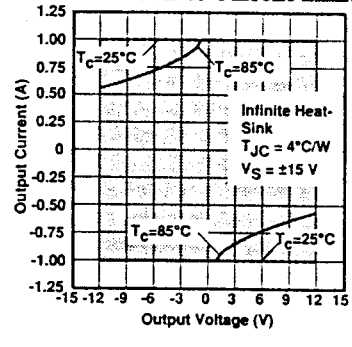
Power Supply Rejection Ratio vs Frequency



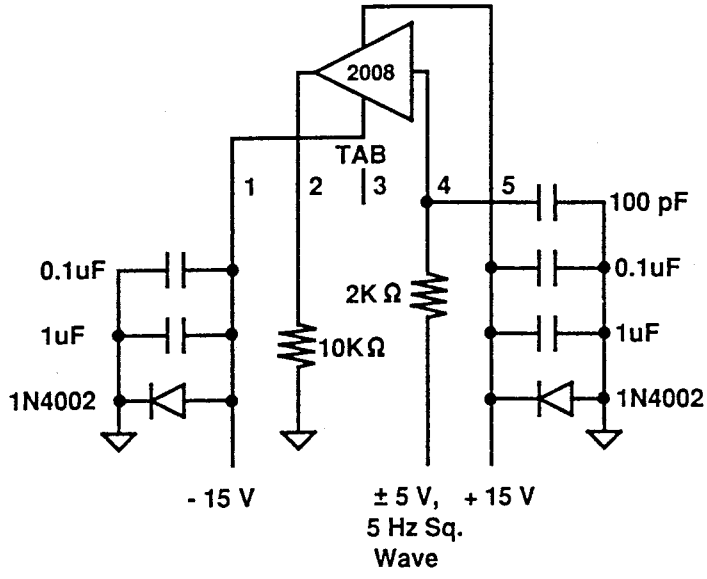
Active Operating Area. Operating Outside Area Will Invoke Thermal Shutdown or Current Limit



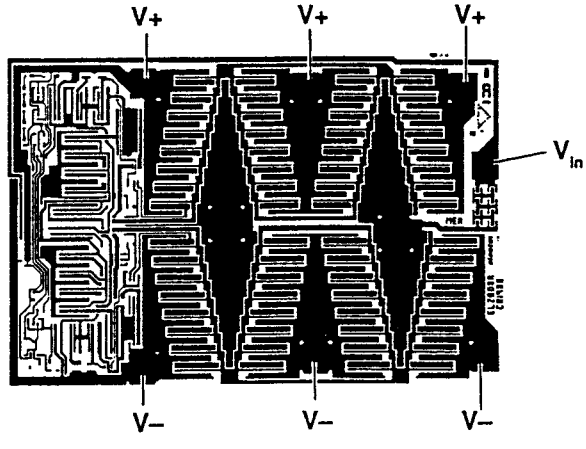
Active Operating Area. Operating Outside Area Will Invoke Thermal Shutdown or Current Limit



Burn-In Circuit



Die Layout EL2008



EL2009C

90 MHz 1 Amp Buffer Amplifier

Features

- High slew rate – 3000V/μs
- Wide bandwidth –
  125 MHz @ R_L = 50 ohm
  90 MHz @ R_L = 10 ohm
- Output current – 1A Continuous
- Output Impedance – 1 ohm
- Short circuit protected
- Over temperature protected
- Power package with isolated metal tab

Applications

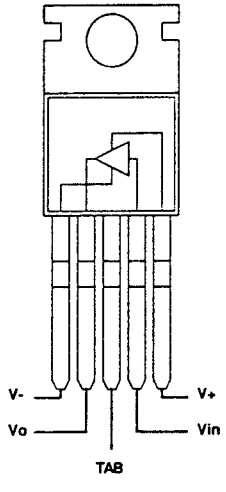
- Video distribution amplifier
- Fast op-amp booster
- Flash converter driver
- Motor driver
- Pulse transformer driver
- A.T.E. pin driver

Ordering Information

Part No.	Temp. Range	Pkg.	Outline #
EL2009CT	-25 to +85°C	TO-220	MDP0028

Connection Diagram

5 Pin TO-220
(Top View)



General Description

The EL2009 is a high speed bipolar monolithic buffer amplifier designed to provide currents over 1 amp at high frequencies, while drawing 40mA of quiescent supply current. The EL2009's 3000V/μs slew rate and 90 MHz bandwidth driving a 10 ohm load insures stability in fast op-amp feedback loops. Elantec has applied for patents on unique circuitry within the EL2009.

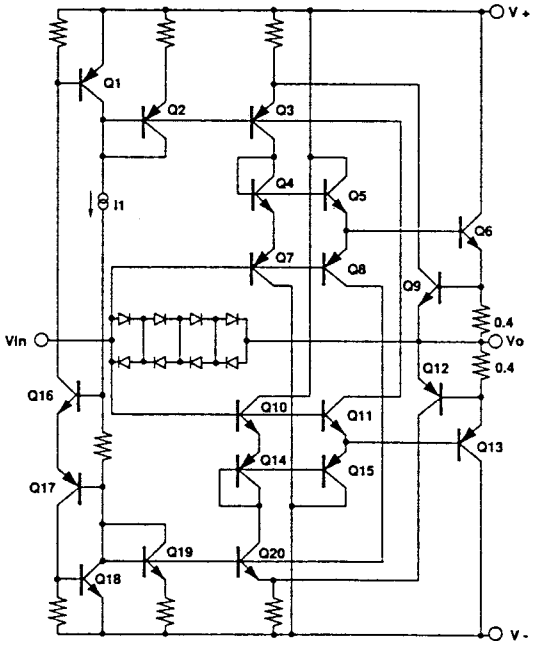
Used as an open loop buffer, the EL2009's low output impedance (1 ohm) gives a gain of 0.99 when driving a 100 ohm load and 0.9 driving a 10 ohm load.

The EL2009 has output short circuit current limit which will protect the device under both a DC fault condition and AC operation with reactive loads. In addition, the EL2009 has a temperature sensing circuit which disables the output stage in the event of a fault and limits the die temperature to a safe value.

The EL2009 is constructed using Elantec's proprietary Complementary Bipolar process that produces PNP and NPN transistors with essentially identical AC and DC characteristics. In the EL2009, the Complementary Bipolar process also insulates the package's metal heat sink tab from all supply voltages. Therefore the tab may be mounted to an external heat sink or the chassis without an insulator.

The EL2009CT is specified for operation over the –25 to +85°C temperature range and is provided in a 5 lead TO-220 plastic power package.

Simplified Schematic



September 1989 Rev. A

Absolute Maximum Ratings (25°C)

V_S	Supply Voltage (V+ –V–)	±18V or 36V	T_A	Operating Temperature Range	–25°C to +85°
V_{IN}	Input Voltage (Note 1)	±15V or Vs	T_J	Operating Junction Temp.	+175°C
I_{IN}	Input Current (Note 1)	±50mA	T_{ST}	Storage Temp. Range	–65°to +150°
P_D	Power Dissipation (Note 2)	See Curves	T_{LD}	Lead Solder Temp. <10 Sec.	300°C
t_{SH}	Output Short Circuit Duration (Note 3)	Continuous			

Important Note:
All parameters having Min. / Max. specifications are guaranteed. The Test level column indicates the specific device testing actually performed during production and Quality inspection. Elantec performs most electrical tests using modern high-speed automatic test equipment, specifically the LTX77 Series system. Unless otherwise noted, all tests are pulsed tests, therefore $T_J = T_C = T_A$.

Test Level	Test Procedure
I	100% production tested and QA sample tested per QA test plan QCX0002.
II	100% production tested at T_A = 25°C and QA sample tested at T_A = 25°C, T_{MAX} and T_{MIN} per QA test plan QCX0002.
III	QA sample tested per QA test plan QCX0002.
IV	Parameter is guaranteed (but not tested) by Design and Characterization Data.
V	Parameter is typical value at T_A = 25°C for information purposes only.

Electrical Characteristics V_S = ±15 V, R_S = 50Ω, Unless otherwise specified.

		Test Conditions			Limits			Test	
Parameters	Description	V_{in}	Load	Temp	Min	Typ	Max	Level	Units
V_{OS}	Output Offset Voltage	0	∞	25°C	–60		+60	I	mV
				T_{MIN}, T_{MAX}	–80		+80	IV	mV
I_{IN}	Input Current	0	∞	25°C	–125	–5	+125	I	µA
				T_{MIN}, T_{MAX}	–200		+200	IV	µA
R_{IN}	Input Impedance	±12V	100Ω	25°C	250	900		I	kΩ
A_{V1}	Voltage Gain	±10V	∞	25°C	0.985	0.999		I	V/V
A_{V2}	Voltage Gain	±10V	10Ω	25°C	0.88	0.90		I	V/V
A_{V3}	Voltage Gain, V_S = ±5V	±3V	10Ω	25°C	0.87	0.89		I	V/V
V_{O1}	Output Voltage Swing	±14V	100Ω	25°C	±13			I	V
V_{O2}	Output Voltage Swing	±12V	10Ω	25°C	±10.5	±11		I	V

Electrical Characteristics – Continued $V_S = \pm 15V$, $R_S = 50\Omega$, Unless otherwise specified.

		Test Conditions			Limits				
Parameters	**Description**	**V_{in}**	**Load**	**Temp**	**Min**	**Typ**	**Max**	**Level**	**Units**
R_{O1}	Output Impedance	±10V	±10mA	25°C			1.5	I	Ω
R_{O2}	Output Impedance	±10V	±1A	25°C		0.9	1.0	I	Ω
I_O	Output Current	±12V	Note 4	25°C	1.4	1.8		I	A
				T_{MIN}, T_{MAX}	1			IV	A
I_S	Supply Current	0	∞	25°C	30	45	65	I	mA
PSRR	Supply Rejection (Note 5)	0	∞	25°C	60			I	dB
V_S+, V_S-	Supply Sensitivity (Note 6)		∞	25°C			2	I	mV/V
SR_1	Slew Rate (Note 7)	±10V	50Ω	25°C		3000		V	V/µs
			10Ω			2500			
SR_2	Slew Rate (Note 8)	±5V	10Ω	25°C		1250		V	V/µs
t_r, t_f	Rise/Fall Time	100mV	10Ω	25°C		7		V	ns
BW	–3dB Bandwidth	100mV	10Ω	25°C		90		V	MHz
C_{IN}	Input Capacitance			25°C		25		V	pF
THD				25°C			1	I	%

Notes:

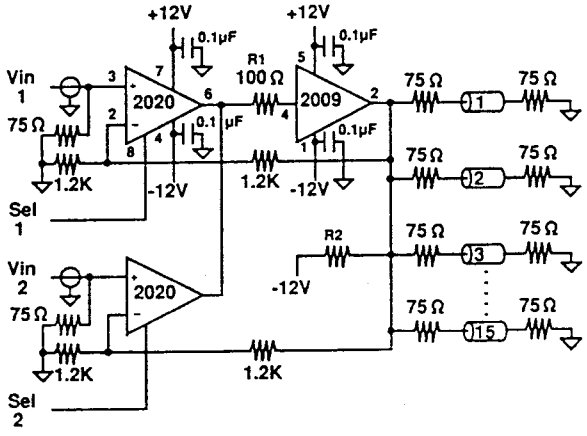
1. If the input exceeds the ratings shown (or the supplies) or if the input voltage exceeds ±7.5V then the input current must be limited to ±50mA. See the application hints for information.
2. The maximum power dissipation depends on package type, ambient temperature and heat sinking. See the characteristic curves for more details.
3. During Output Short Circuit test the junction temperature rises and can activate the Thermal Shut down circuit. A heat sink will lower the junction temperature below the trip point.
4. Force the input to +12V and the output to +10V and measure the output current. Repeat with –12V input and –10V on the output.
5. $V_s = \pm 4.5V$ then V_s is changed to ±18V.
6. $V_s+ = +15V$, $V_s- = -4.5V$ then V_s- is changed to –18V and $V_s- = -15V$, $V_s+ = +4.5V$ then V_s+ is changed to +18V.
7. Slew Rate is measured between $V_{out} = +5V$ and –5V.
8. Slew Rate is measured between $V_{out} = +2.5V$ and –2.5V.

Applications Information — Continued

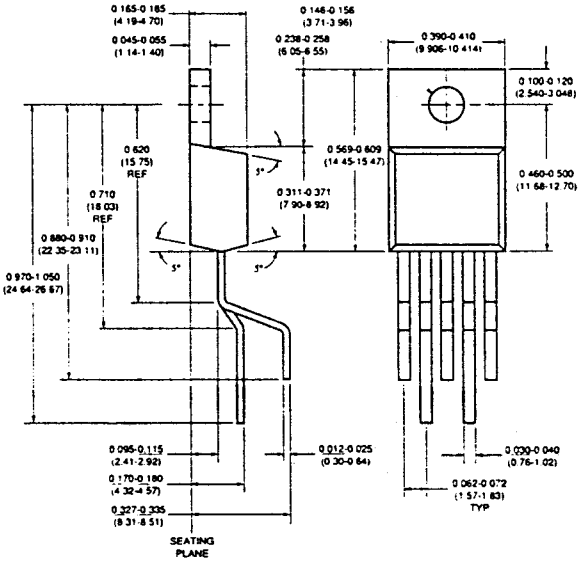
Video Distribution Amplifier

The EL2009 can drive 15 double matched 75 ohm cables. If the EL2009 is used within an op-amp feedback loop the output levels are independent of loading. The circuit below accepts 1 of 2 inputs and drives 15 cables. Pin 8 of the EL2020 (Disable) is used to multiplex between the inputs and can be easily expanded to accept more inputs. The circuit as shown when fully loaded has differential phase < 0.1° and differential gain < 0.1%. The 100 ohm resistor at the EL2009 input (R1) is necessary to stabilize the loop. The R2 resistor at the output of the EL2009, insures that the EL2009 sources current even when the output voltage is at 0V. This is necessary to achieve the excellent differential gain and phase values. More information about driving cables can be found in the EL2003 data sheet.

Video Mux & Distribution Amp.



Package Outline



MDP0028 Rev. A
5 Pin TO-220 Package

General Disclaimer

Specifications contained in this data sheet are in effect as of the publication date shown. Elantec, Inc. reserves the right to make changes in the circuitry or specifications contained herein at any time without notice. Elantec, Inc. assumes no responsibility for the use of any circuits described herein and makes no representations that they are free from patent infringement.

élantec
HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

Elantec, Inc.
1996 Tarob Court
Milpitas, CA 95035
Telephone: (408) 945-1323
TWX: 910-997-0649
Fax: (408) 945-9305
800#—outside CA only:
800-821-7429

WARNING—Life Support Policy

Elantec, Inc. products are not authorized for and should not be used within Life Support Systems without the specific written consent of Elantec, Inc. Life Support systems are equipment intended to support or sustain life and whose failure to perform when properly used in accordance with instructions provided can be reasonably expected to result in significant personal injury or death. Users contemplating application of Elantec, Inc. products in Life Support Systems are requested to contact Elantec, Inc. factory headquarters to establish suitable terms & conditions for these applications. Elantec, Inc.'s warranty is limited to replacement of defective components and does not cover injury to persons or property or other consequential damages.

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