10-Channel Gamma Buffer with V_{COM} Driver

ADD8710

FEATURES

Single-supply operation: 4.5 V to 18 V
Upper/lower buffers swing to V_S/GND
Gamma continuous output current: >10 mA
V_{COM} peak output current: 250 mA
Offset voltage: 12 mV
Slew rate: 8 V/µs
Unity gain stable with large capacitive loads
Supply current: 700 µA per amplifier
Compact 28-lead TSSOP
Pb-free package
Drop-in replacement for BUF11702

APPLICATIONS

TFT LCD monitor panels
TFT LCD notebook panels

PIN CONFIGURATION

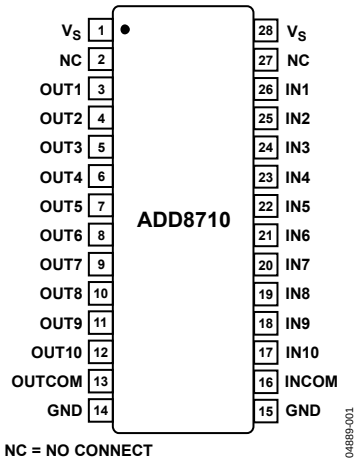

Figure 1. 28-Lead TSSOP (RU Suffix)

GENERAL DESCRIPTION

The ADD8710 is a low cost, 10-channel gamma buffer with a V_{COM} driver that operates from a single supply. The part is designed for high resolution TFT LCD panels and is built on an advanced, high voltage CBCMOS process.

The gamma buffers have a high slew rate, minimum 10 mA output current, and a high capacitive load drive capability. The V_{COM} buffer is capable of delivering 250 mA of peak current and can also drive large capacitive loads. The ADD8710 offers a wide supply range and offset voltages below 12 mV.

The ADD8710 is specified over the −40°C to +85°C temperature range and is available in a Pb-free, 28-lead TSSOP package.

FUNCTIONAL BLOCK DIAGRAM

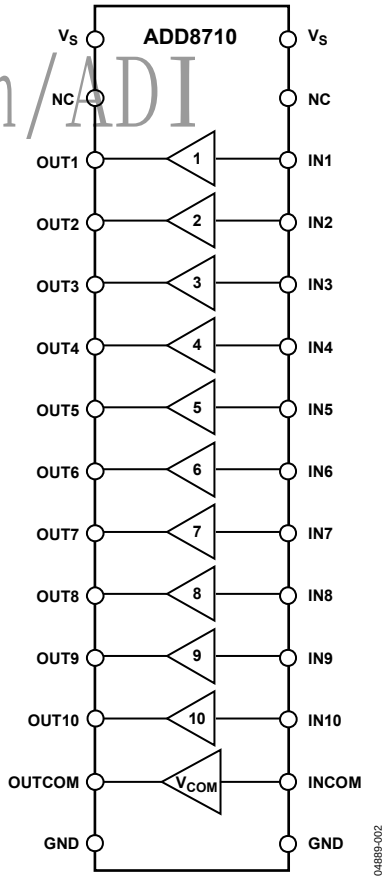

Figure 2.

Rev. B

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REVISION HISTORY

6/07—Rev. A to Rev. B

Changes to Figure 18 7

3/05—Rev. 0 to Rev. A

Change to Features 1
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Change to Absolute Maximum Ratings 4

6/04—Revision 0: Initial Version

SPECIFICATIONS

V_S = 16 V, V_{CM} = V_S/2, T_A @ 25°C, unless otherwise noted.

Table 1.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
INPUT CHARACTERISTICS		Applies to all channels				
Offset Voltage	V_{OS}			4	12	mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	−40°C ≤ T_A ≤ +85°C		5		µV/°C
Input Bias Current	I_B			0.5	1.1	µA
		−40°C ≤ T_A ≤ +85°C			1.5	µA
Input Impedance	Z_{IN}			400		kΩ
Input Capacitance	C_{IN}			1		pF
BUFFER CHARACTERISTICS						
Common-Mode Input Range	V_{CMM}					
Buffer 1 to Buffer 5			1.25		V_S	V
Buffer 6 to Buffer 10			0		V_S − 1.25	V
Output Voltage High (V1)	V_{OH}	V_S = 16 V, V_{IN} = 16 V, I_L = 10 mA	15.82	15.9		V
		V_S = 10 V, V_{IN} = 9.8 V, I_L = 10 mA	9.75	9.8		V
		−40°C ≤ T_A ≤ +85°C	9.7			V
Output Voltage High (V2 to V5)	V_{OH}	V_S = 10 V, V_{IN} = 8.5 V, I_L = 10 mA	8.45	8.5		V
		−40°C ≤ T_A ≤ +85°C	8.4			V
Output Voltage High (V6 to V10)	V_{OH}	V_S = 10 V, V_{IN} = 8 V, I_L = 10 mA	7.95	8		V
		−40°C ≤ T_A ≤ +85°C	7.9			V
Output Voltage Low (V1 to V5)	V_{OL}	V_S = 10 V, V_{IN} = 2 V, I_L = 10 mA		2	2.05	V
		−40°C ≤ T_A ≤ +85°C			2.10	V
Output Voltage Low (V6 to V9)	V_{OL}	V_S = 10 V, V_{IN} = 1.5 V, I_L = 10 mA		1.5	1.55	V
		−40°C ≤ T_A ≤ +85°C			1.60	V
Output Voltage Low (V10)	V_{OL}	V_S = 16 V, V_{IN} = 0 V, I_L = 10 mA		0.1	0.175	V
		V_S = 10 V, V_{IN} = 0.2 V, I_L = 10 mA		0.2	0.25	V
		−40°C ≤ T_A ≤ +85°C		0.3		V
Continuous Output Current	I_{OUT}			10		mA
Peak Output Current	I_{PK}	V_S = 16 V		100		mA
V_{COM} CHARACTERISTICS						
Common-Mode Input Range	V_{CMM}		0		V_S − 1.25	V
Output Voltage High	V_{OH}	V_S = 10 V, V_{IN} = 8 V, I_L = 30 mA	7.95	8		V
		−40°C ≤ T_A ≤ +85°C	7.9			V
Output Voltage Low	V_{OL}	V_S = 10 V, V_{IN} = 2 V, I_L = 30 mA		2	2.05	V
		−40°C ≤ T_A ≤ +85°C			2.10	V
Continuous Output Current	I_{OUT}			35		mA
Peak Output Current	I_{PK}	V_S = 16 V		250		mA
SUPPLY CHARACTERISTICS						
Supply Voltage	V_S		4.5		18	V
Power Supply Rejection Ratio	PSRR	V_S = 4.5 V to 16.5 V, −40°C ≤ T_A ≤ +85°C	70	90		dB
Total Supply Current	I_{SY}	V_O = V_S/2, no load		7.7	10	mA
		−40°C ≤ T_A ≤ +85°C			11.5	mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L = 2 kΩ, C_L = 200 pF	4	8		V/µs
Bandwidth	BW	−3 dB, R_L = 10 kΩ, C_L = 200 pF		5		MHz
Settling Time to 0.1% (Buffers)	t_S	1 V step, R_L = 10 kΩ, C_L = 200 pF		1.1		µs
Settling Time to 0.1% (V_{COM})	t_S	1 V step, R_L = 10 kΩ, C_L = 200 pF		0.7		µs
Phase Margin	Φ_O	R_L = 10 kΩ, C_L = 200 pF		45		Degrees
Channel Separation				75		dB

ABSOLUTE MAXIMUM RATINGS

Table 2.

Parameter	Rating
Supply Voltage (V_S)	18.5 V
Input Voltage	−0.5 V to V_S + 0.5 V
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	−40°C to +85°C
Junction Temperature Range	−65°C to +150°C
Lead Temperature	300°C
ESD Tolerance (HBM)	±2500 V
ESD Tolerance (MM)	±200 V

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

THERMAL RESISTANCE

θ_{JA} is specified for the worst-case conditions, that is, a device soldered in a circuit board for surface-mount packages.

Table 3. Thermal Resistance

Package Type	θ_{JA}	Unit
28-Lead TSSOP (RU)	67.7	°C/W

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

TYPICAL PERFORMANCE CHARACTERISTICS

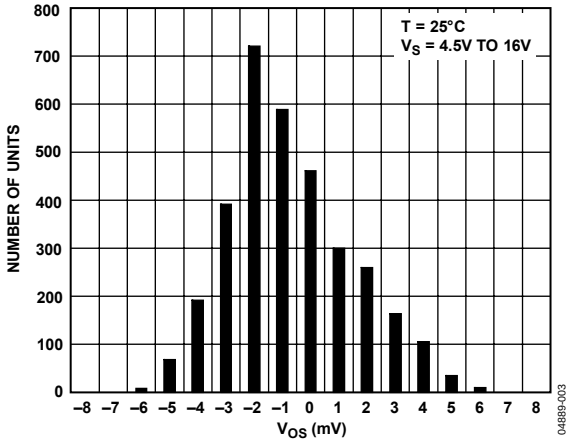


Figure 3. Input Offset Voltage Distribution

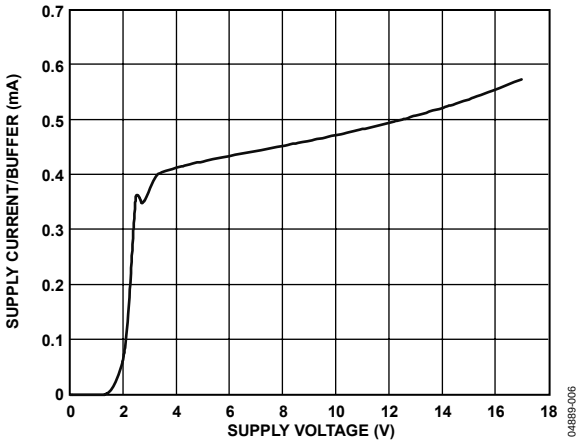


Figure 6. Supply Current/Buffer vs. Supply Voltage

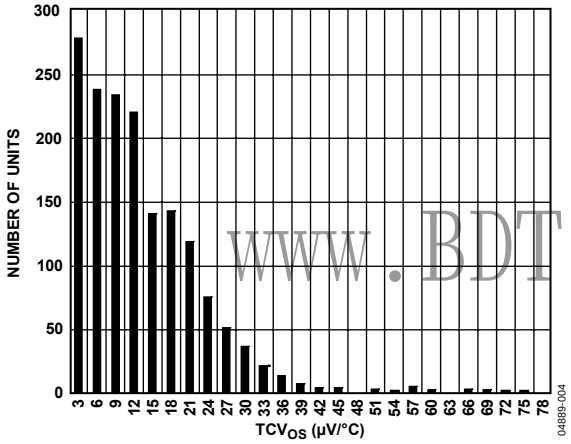


Figure 4. Input Offset Voltage Drift Distribution

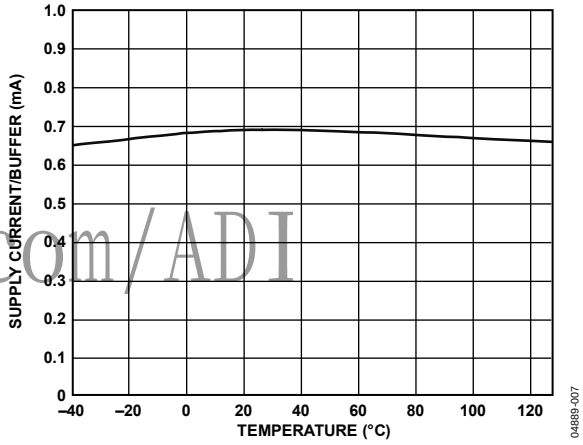


Figure 7. Supply Current/Buffer vs. Temperature

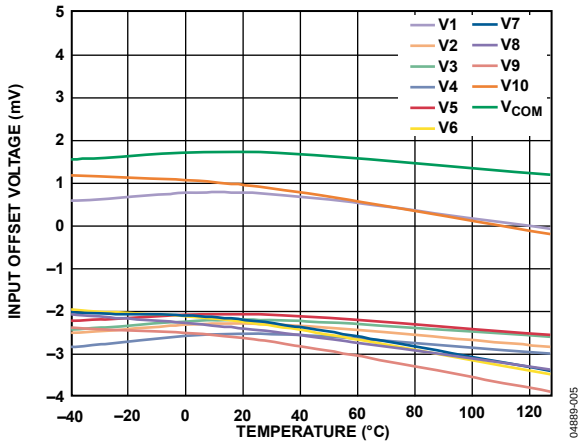


Figure 5. Input Offset Voltage vs. Temperature

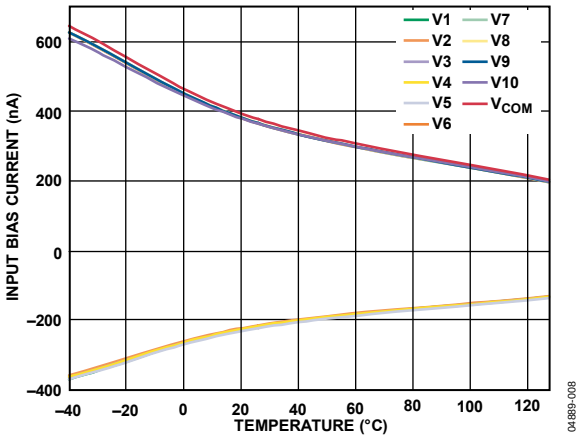


Figure 8. Input Bias Current vs. Temperature

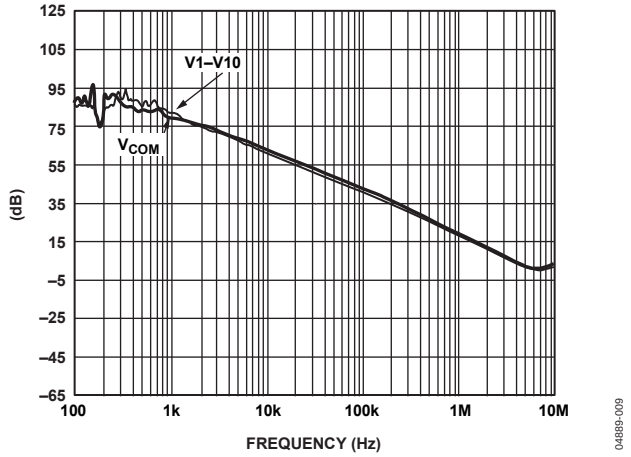


Figure 9. Power Supply Rejection Ratio vs. Frequency

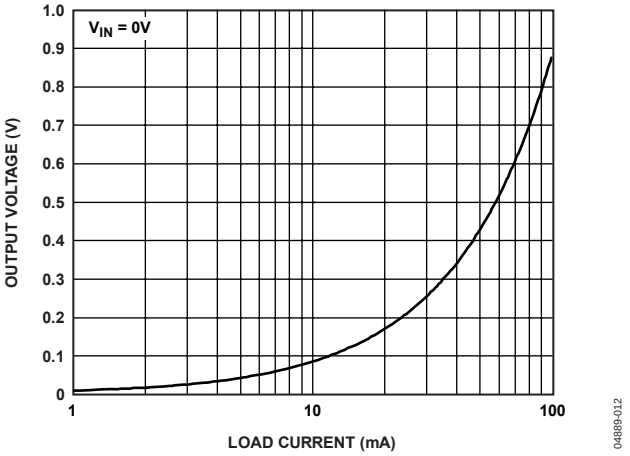


Figure 12. Channel V_{COM} Output Voltage Low vs. Load Current

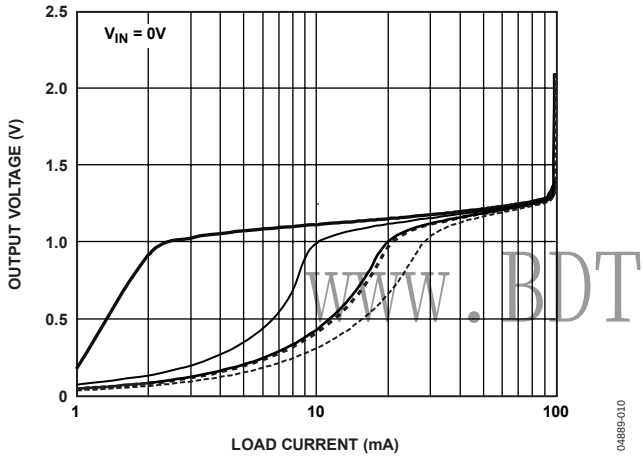


Figure 10. Channel 1 to Channel 5 Output Voltage Low vs. Load Current

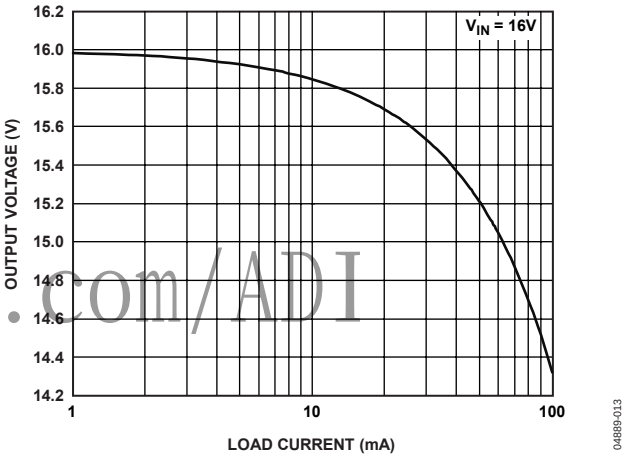


Figure 13. Channel 1 Output Voltage High vs. Load Current

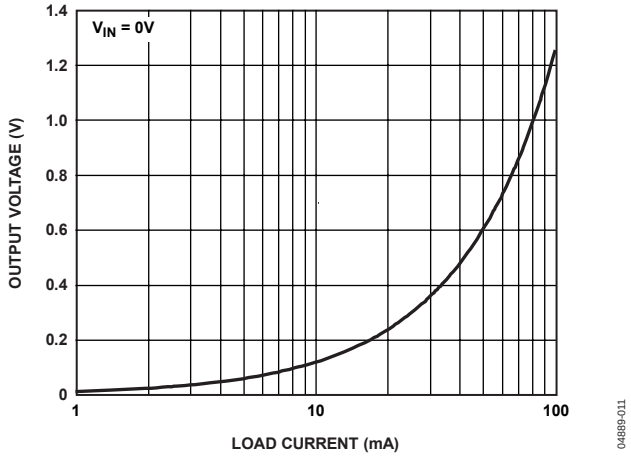


Figure 11. Channel 6 to Channel 10 Output Voltage Low vs. Load Current

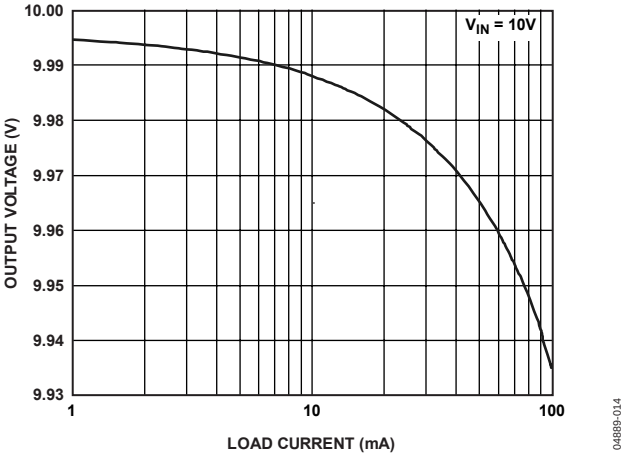


Figure 14. Channel 2 to Channel 5 Output Voltage High vs. Load Current

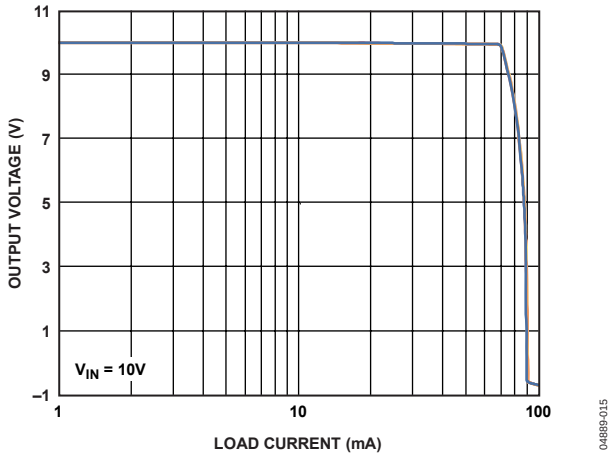


Figure 15. Channel 6 to Channel 10 Output Voltage High vs. Load Current

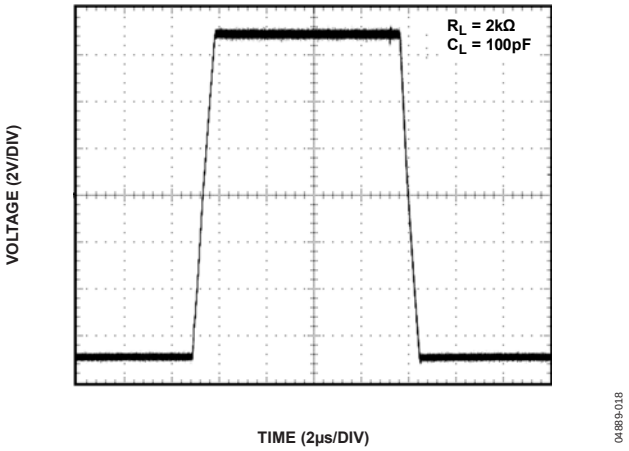


Figure 18. Large Signal Transient Response

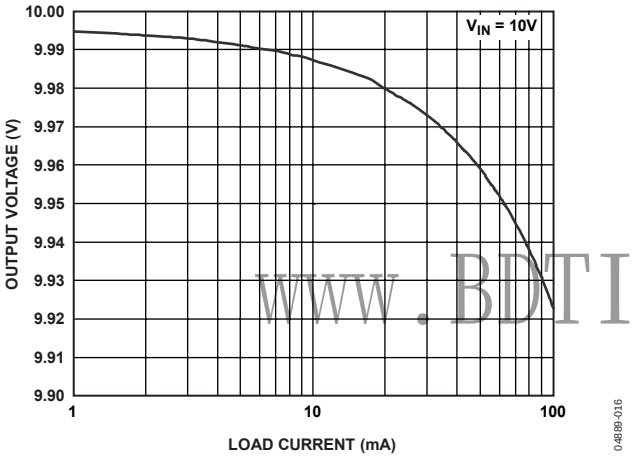


Figure 16. Channel V_{COM} Output Voltage High vs. Load Current

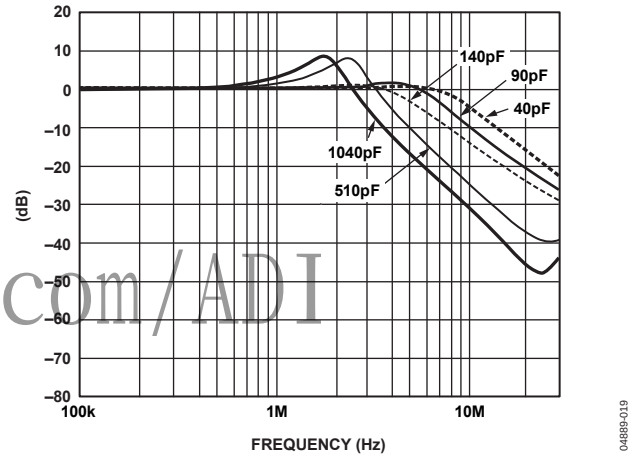


Figure 19. Channel 1 to Channel 5 Frequency Response vs. Capacitive Loading

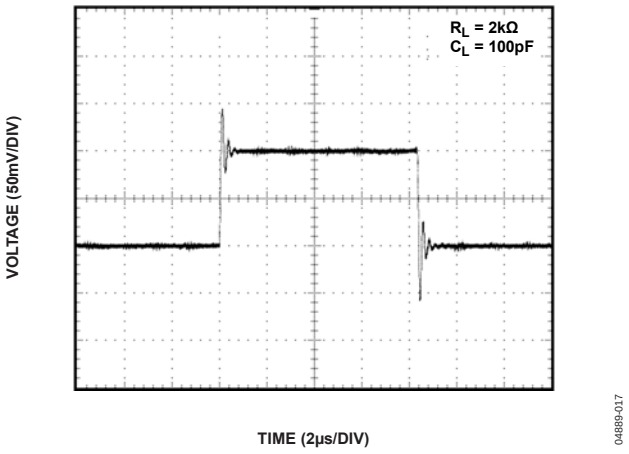


Figure 17. Small Signal Transient Response

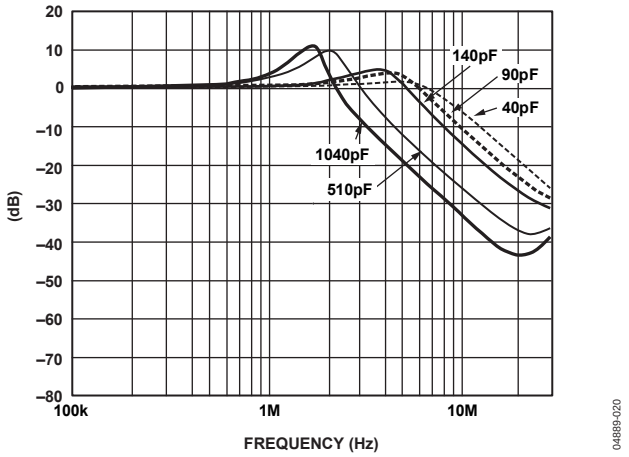


Figure 20. Channel 6 to Channel 10 Frequency Response vs. Capacitive Loading

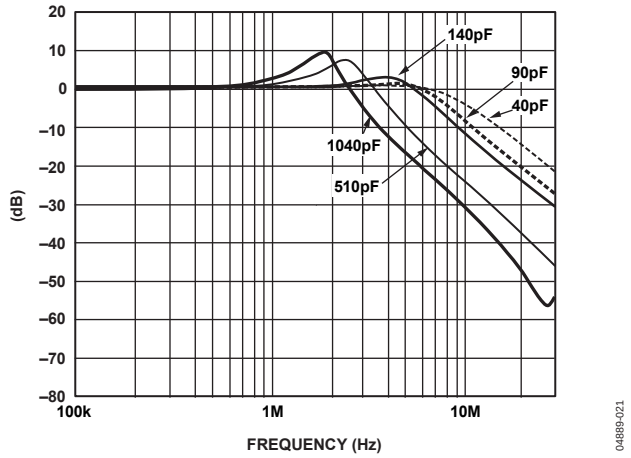


Figure 21. Channel V_{COM} Frequency Response vs. Capacitive Loading

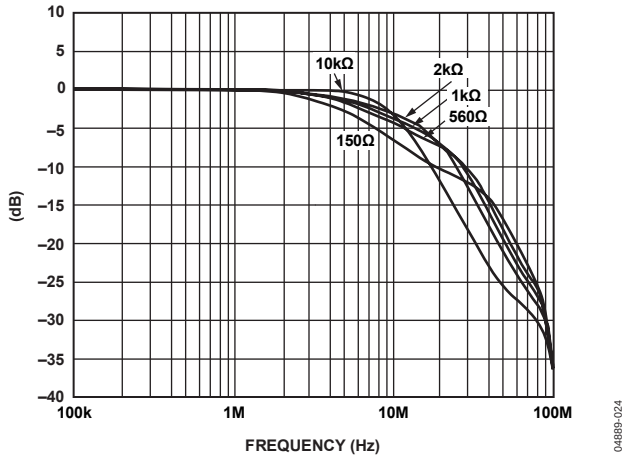


Figure 24. Channel V_{COM} Frequency Response vs. Resistive Loading

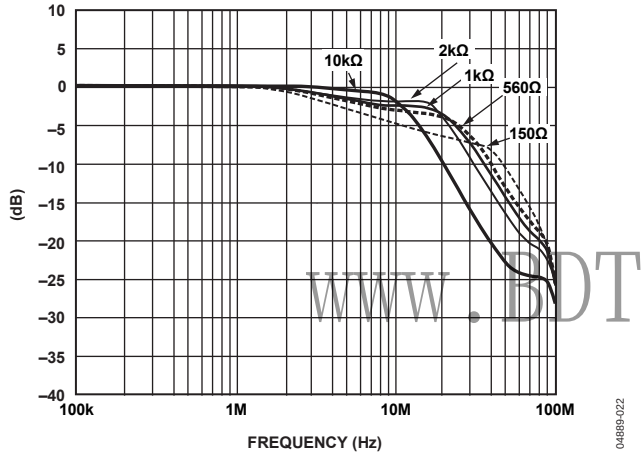


Figure 22. Channel 1 to Channel 5 Frequency Response vs. Resistive Loading

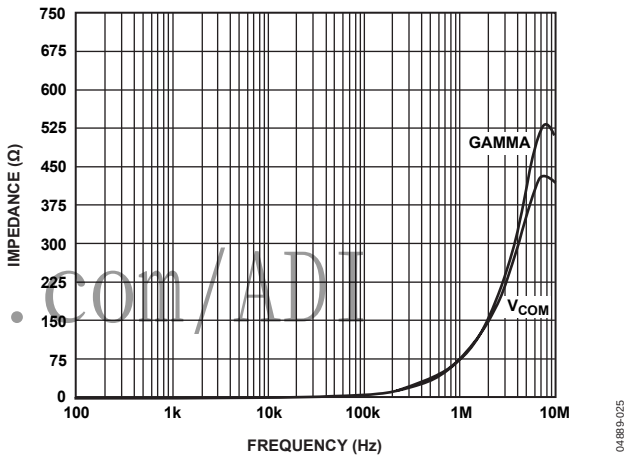


Figure 25. Closed-Loop Output Impedance vs. Frequency

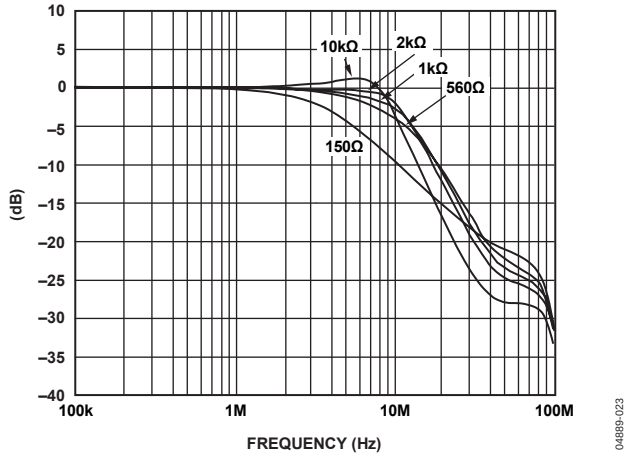


Figure 23. Channel 6 to Channel 10 Frequency Response vs. Resistive Loading

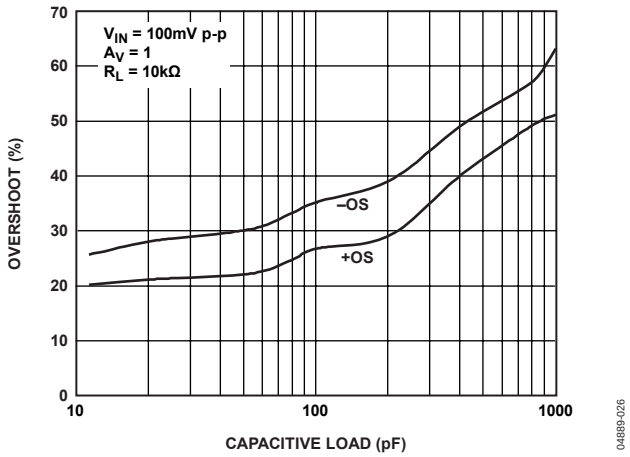


Figure 26. Channel 1 to Channel 5 Small Signal Overshoot vs. Load Capacitance

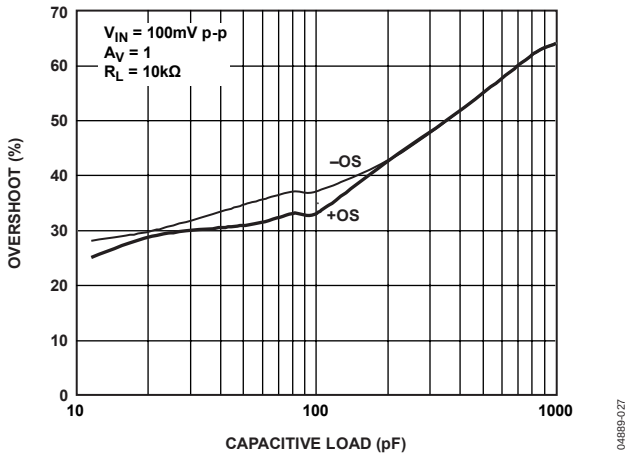


Figure 27. Channel 6 to Channel 10 Small Signal Overshoot vs. Load Capacitance

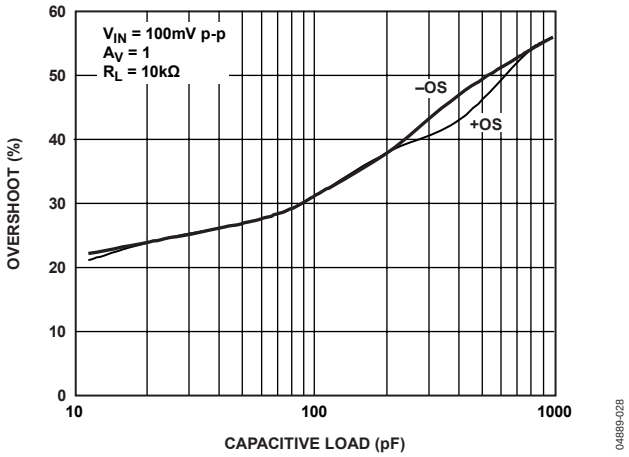
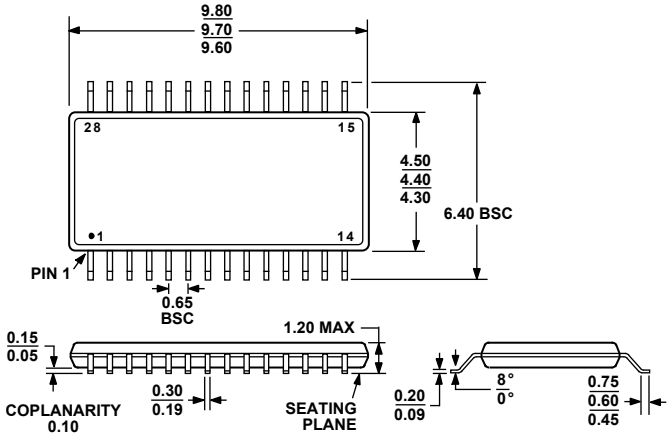


Figure 28. Channel V_{COM} Small Signal Overshoot vs. Load Capacitance

OUTLINE DIMENSIONS



COMPLIANT TO JEDEC STANDARDS MO-153-AE

Figure 29. 28-Lead Thin Shrink Small Outline Package [TSSOP]
(RU-28)
Dimensions shown in millimeters

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
ADD8710ARUZ[1]	–40°C to +85°C	28-Lead TSSOP	RU-28
ADD8710ARUZ-REEL[1]	–40°C to +85°C	28-Lead TSSOP	RU-28

[1] Z = RoHS Compliant Part.

NOTES

NOTES

D04889-0-6/07(B)