

**V<sub>COM</sub> with Dual Gamma Buffer**

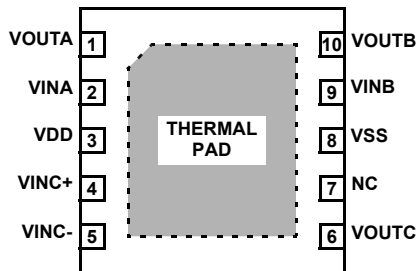


The EL5228 integrates a high power V<sub>COM</sub> amplifier with dual gamma reference voltage buffers. With 180mA peak and 65mA typical output current, the V<sub>COM</sub> amplifier is suitable for all sizes of LCD displays. The dual gamma buffers can output 30mA typical, 120mA peak and feature a bandwidth of 12MHz and a slew rate of 15V/μs. The V<sub>COM</sub> amplifier has a 44MHz bandwidth and 80V/μs slew rate.

The EL5228 operates from just 3.5mA typical supply current and is packaged in the high-power DFN-10 package. It is specified for operation over the -40°C to +85°C temperature range.

**Pinout**

**EL5228**  
**(10-PIN DFN)**  
TOP VIEW  
TOP VIEW



**Features**

- High power V<sub>COM</sub> amplifier
  - 180mA peak (65mA typ.) output current
  - 55MHz bandwidth
  - 75V/μs slew rate
- Dual gamma buffers
  - 120mA peak (30mA typ.) output current
  - 12MHz bandwidth
  - 10V/μs slew rate
- Just 3.5mA supply current
- Small DFN-10 package

**Applications**

- TFT-LCD displays
- Flat panel monitors
- Notebook displays
- LCD-TVs

**Ordering Information**

PART NUMBER	PACKAGE	TAPE & REEL	PKG. DWG. #
EL5228IL	10-Pin DFN	-	MDP0047
EL5228IL-T13	10-Pin DFN	13"	MDP0047
EL5228IL-T7	10-Pin DFN	7"	MDP0047

**Absolute Maximum Ratings** ( $T_A = 25^\circ\text{C}$ )

$V_{CC}$ Supply Voltage between VS and GND	..... TBD	Maximum Die Temperature	..... TBD
Supply Voltage between VSD and GND	..... TBD	Storage Temperature	..... TBD
Maximum Continuous Output Current	..... TBD	Power Dissipation	..... See Curves
Ambient Operating Temperature	..... TBD		

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

IMPORTANT NOTE: All parameters having Min/Max specifications are guaranteed. Typical values are for information purposes only. Unless otherwise noted, all tests are at the specified temperature and are pulsed tests, therefore:  $T_J = T_C = T_A$

**Electrical Specifications**  $V_{S+} = +15\text{V}$ ,  $V_{S-} = 0\text{V}$ ,  $R_L = 1\text{k}\Omega$  to  $7.5\text{V}$ ,  $T_A = 25^\circ\text{C}$  unless otherwise specified.

PARAMETER	DESCRIPTION	CONDITION	MIN	TYP	MAX	UNIT
<b>GAMMA BUFFER INPUT CHARACTERISTICS</b>						
$V_{OS}$	Input Offset Voltage	$V_{CM} = 7.5\text{V}$		2	14	mV
$TCV_{OS}$	Average Offset Voltage Drift	(Note 1)		5		$\mu\text{V}/^\circ\text{C}$
$I_B$	Input Bias Current	$V_{CM} = 7.5\text{V}$		2	50	nA
$R_{IN}$	Input Impedance			1		$\text{G}\Omega$
$C_{IN}$	Input Capacitance			2		pF
$A_V$	Voltage Gain	$0.5 \leq V_{OUT} \leq 14.5\text{V}$ , $R_L = 10\text{k}\Omega$	0.995		1.005	V/V
<b>GAMMA BUFFER OUTPUT CHARACTERISTICS</b>						
$V_{OL}$	Output Swing Low	$I_L = -5\text{mA}$		80	150	mV
$V_{OH}$	Output Swing High	$I_L = 5\text{mA}$	14.85	14.92		V
$I_{SC}$	Short Circuit Current	Short to GND (Note 2)	$\pm 80$	$\pm 120$		mA
<b>GAMMA BUFFER DYNAMIC PERFORMANCE</b>						
SR	Slew Rate (Note 3)	$1\text{V} \leq V_{OUT} \leq 14\text{V}$ , 20% to 80%, $R_L = 10\text{k}\Omega$	7	10		$\text{V}/\mu\text{s}$
$t_S$	Settling to +0.1%	$V_O = 2\text{V}$ Step		500		ns
BW	-3dB Bandwidth	$R_L = 10\text{k}\Omega$ , $C_L = 10\text{pF}$		12		MHz
CS	Channel Separation	$f = 5\text{MHz}$		75		dB
<b>V<sub>COM</sub> AMPLIFIER INPUT CHARACTERISTICS</b>						
$V_{OS}$	Input Offset Voltage	$V_{CM} = 7.5\text{V}$		3	15	mV
$TCV_{OS}$	Average Offset Voltage Drift (Note 4)			7		$\mu\text{V}/^\circ\text{C}$
$I_B$	Input Bias Current	$V_{CM} = 7.5\text{V}$		2	60	nA
$R_{IN}$	Input Impedance			1		$\text{G}\Omega$
$C_{IN}$	Input Capacitance			2		pF
CMIR	Common-Mode Input Range		-0.5		+15.5	V
CMRR	Common-Mode Rejection Ratio	for $V_{IN}$ from -0.5V to 15.5V	53	72		dB
$A_{VOL}$	Open-Loop Gain	$0.5\text{V} \leq V_{OUT} \leq 14.5\text{V}$	62	70		dB
<b>V<sub>COM</sub> AMPLIFIER OUTPUT CHARACTERISTICS</b>						
$V_{OL}$	Output Swing Low	$I_L = -5\text{mA}$		80	150	mV
$V_{OH}$	Output Swing High	$I_L = 5\text{mA}$	14.85	14.92		V
$I_{SC}$	Short-circuit Current			$\pm 180$		mA
$I_{OUT}$	Output Current			$\pm 65$		mA

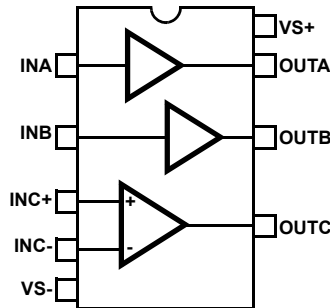
**Electrical Specifications**  $V_{S+} = +15V$ ,  $V_{S-} = 0V$ ,  $R_L = 1k\Omega$  to 7.5V,  $T_A = 25^\circ C$  unless otherwise specified.

PARAMETER	DESCRIPTION	CONDITION	MIN	TYP	MAX	UNIT
<b>V<sub>COM</sub> AMPLIFIER DYNAMIC PERFORMANCE</b>						
SR	Slew Rate (Note 5)	$1V \leq V_{OUT} \leq 14V$ , 20% to 80%		75		V/ $\mu$ s
t <sub>S</sub>	Settling to +0.1% ( $A_V = +1$ )	( $A_V = +1$ ), $V_O = 2V$ step		80		ns
BW	-3dB Bandwidth			60		MHz
GBWP	Gain-Bandwidth Product			32		MHz
PM	Phase Margin			50		°
d <sub>G</sub>	Differential Gain (Note 6)	$R_F = R_G = 1k\Omega$ and $V_{OUT} = 1.4V$		0.16		%
d <sub>p</sub>	Differential Phase (Note 6)	$R_F = R_G = 1k\Omega$ and $V_{OUT} = 1.4V$		0.22		°
<b>POWER SUPPLY PERFORMANCE</b>						
PSRR	Power Supply Rejection Ratio	$V_S$ is moved from 4.5V to 15.5V	60	80		dB
I <sub>S</sub>	Supply Current	No load		3.5	5	mA

NOTES:

1. Measured over the operating temperature range
2. Parameter is guaranteed (but not test) by design and characterization data
3. Slew rate is measured on rising and falling edges
4. Measured over operating temperature range
5. Slew rate is measured on rising and falling edges
6. NTSC signal generator used

**Typical Application Diagram**



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