LT1210X DICE/DWF

High Temperature 200°C, 1.0A, 35MHz Current Feedback Amplifier

FEATURES

- **Extreme High Temperature Operation: –40°C to 200°C**
- **1.0A Minimum Output Drive Current**
- **35MHz Bandwidth, $A_V = 2$, $R_L = 10\Omega$**
- **900V/µs Slew Rate, $A_V = 2$, $R_L = 10\Omega$**
- High Input Impedance: 10MΩ
- Wide Supply Range: ±5V to ±15V
- Shutdown Mode: I_S < 200µA
- Adjustable Supply Current
- Stable with C_L = 10,000pF

APPLICATIONS

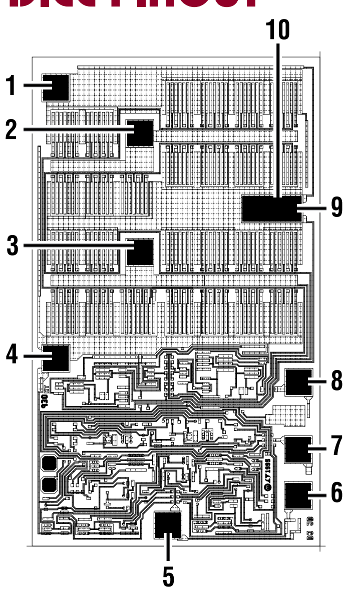
- Down-Hole Drilling and Instrumentation
- Heavy Industrial
- High Temperature Environments
- Cable Drivers
- Buffers
- Test Equipment Amplifiers
- Video Amplifiers

DESCRIPTION

The LT®1210X is a current feedback amplifier with high output current and excellent large-signal characteristics. The combination of high slew rate, 1.0A output drive and ±15V operation enables the device to deliver significant power at frequencies in the 1MHz to 2MHz range. Short-circuit protection ensures the device's ruggedness. The LT1210X is stable with large capacitive loads, and can easily supply the large currents required by the capacitive loading. A shutdown feature switches the device into a high impedance and low supply current mode, reducing dissipation when the device is not in use. For lower bandwidth applications, the supply current can be reduced with a single external resistor.

The LT1210X is a member of a growing series of high temperature qualified products offered by Linear Technology. For a complete selection of high temperature products, please consult our website www.linear.com

DICE PINOUT



80mils × 134mils,
12mils thick.
Backside metal: TiNiAg
Backside potential: V^+

DIE CROSS REFERENCE

LTC® Finished Part Number	Order Part Number
LT®1210X	**LT1210X DICE**
LT1210X	**LT1210X DWF***

Please refer to LT1210X standard product data sheet for other applicable product information.
***DWF = DICE in wafer form.**

PAD FUNCTION

1. **V^+:** Positive Supply Voltage. V^+ and $V^–$ must be chosen so that 10V ≤ (V^+ – $V^–$) < 36V. Both Pad 1 and Pad 4 must be connected to V^+.
2. **OUT:** Amplifier Output. The output can source/sink a minimum of 1A. Both Pad 2 and Pad 3 must be connected to OUT.
3. **OUT:** Amplifier Output. The output can source/sink a minimum of 1A. Both Pad 2 and Pad 3 must be connected to OUT.
4. **V^+:** Positive Supply Voltage. V^+ and $V^–$ must be chosen so that 10V ≤ (V^+ – $V^–$) < 36V. Both Pad 1 and Pad 4 must be connected to V+.
5. **–IN:** Inverting Input of Amplifier. Valid input range is ±12V on ±15V supplies.
6. **+IN:** Noninverting Input of Amplifier. Valid input range is ±12V on ±15V supplies.
7. **SHUTDOWN:** If the shutdown feature is not used, the SHUTDOWN pin must be connected to Ground or $V^–$. The SHUTDOWN pin can be used to either turn off the biasing for the amplifier, reducing the quiescent current to less than 200µA, or to control the quiescent current in normal operation.
8. **COMP:** Adding a 0.01µF capacitor between the output and the COMP pin greatly reduces peaking when driving capacitive loads. To disconnect the optional compensation, leave the COMP pin open.
9. **$V^–$:** Negative Supply Voltage. V^+ and $V^–$ must be chosen so that 10V ≤ (V^+ – $V^–$) < 36V. This is a double pad (shared with Pad 10).
10. **$V^–$:** Negative Supply Voltage. V^+ and $V^–$ must be chosen so that 10V ≤ (V^+ – $V^–$) < 36V. This is a double pad (shared with Pad 9).

ABSOLUTE MAXIMUM RATINGS

Supply Voltage .... ±18V
Input Current.. ±15mA
Output Short-Circuit Duration
(Note 2) ....Thermally Limited

Operating Temperature Range
LT1210X...–40°C to 200°C
Storage Temperature Range ....–65°C to 200°C

ELECTRICAL CHARACTERISTICS

T_A = 25°C. V_{CM} = 0V, ±5V ≤ V_S ≤ ±15V, pulse tested, V_{SD} = 0V, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{OS}	Input Offset Voltage			±3	±15	mV
	Input Offset Voltage Drift			10		µV/°C
I_{IN}^+	Noninverting Input Current			±2	±5	µA
I_{IN}^-	Inverting Input Current			±10	±60	µA
e_n	Input Noise Voltage Density	f = 10kHz, R_F = 1k, R_G = 10Ω, R_S = 0Ω		3.0		nV/√Hz
$+i_n$	Input Noise Current Density	f = 10kHz, R_F = 1k, R_G = 10Ω, R_S = 10k		2.0		pA/√Hz
$-i_n$	Input Noise Current Density	f = 10kHz, R_F = 1k, R_G = 10Ω, R_S = 10k		40		pA/√Hz
R_{IN}	Input Resistance	V_{IN} = ±12V, V_S = ±15V V_{IN} = ±2V, V_S = ±5V	1.50 0.25	10 5		MΩ MΩ
C_{IN}	Input Capacitance	V_S = ±15V		2		pF
	Input Voltage Range	V_S = ±15V V_S = ±5V	±12 ±2	±13.5 ±3.5		V V
CMRR	Common Mode Rejection Ratio	V_S = ±15V, V_{CM} = ±12V V_S = ±5V, V_{CM} = ±2V	55 50	62 60		dB dB
	Inverting Input Current Common Mode Rejection	V_S = ±15V, V_{CM} = ±12V V_S = ±5V, V_{CM} = ±2V		0.1 0.1	10 10	µA/V µA/V
PSRR	Power Supply Rejection Ratio	V_S = ±5V to ±15V	60	77		dB
	Noninverting Input Current Power Supply Rejection	V_S = ±5V to ±15V		30	500	nA/V
	Inverting Input Current Power Supply Rejection	V_S = ±5V to ±15V		0.7	5	µA/V
A_V	Large-Signal Voltage Gain	V_S = ±15V, V_{OUT} = ±10V, R_L = 10Ω	55	71		dB
		V_S = ±5V, V_{OUT} = ±2V, R_L = 10Ω	55	68		dB
R_{OL}	Transresistance, $\Delta V_{OUT}/\Delta I_{IN}^-$	V_S = ±15V, V_{OUT} = ±10V, R_L = 10Ω	100	260		kΩ
		V_S = ±5V, V_{OUT} = ±2V, R_L = 10Ω	75	200		kΩ
V_{OUT}	Maximum Output Voltage Swing	V_S = ±15V, R_L = 10Ω	±10.0	±11.5		V
		V_S = ±5V, R_L = 10Ω	±2.5	±3.0		V
I_{OUT}	Maximum Output Current	V_S = ±15V, R_L = 1Ω	1.0	2.0		A
I_S	Supply Current	V_S = ±15V, V_{SD} = 0V		35	50	mA
	Supply Current, R_{SD} = 51k (Note 3)	V_S = ±15V		15	30	mA
	Positive Supply Current, Shutdown	V_S = ±15V, V_{SD} = 15V			200	µA
	Output Leakage Current, Shutdown	V_S = ±15V, V_{SD} = 15V			10	µA

ELECTRICAL CHARACTERISTICS

T_A = 25°C. V_{CM} = 0V, ±5V ≤ V_S ≤ ±15V, pulse tested, V_{SD} = 0V, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
SR	Slew Rate (Note 4)	A_V = 2, R_L = 400Ω A_V = 2, R_L = 10Ω		900 900		V/μs V/μs
	Differential Gain (Note 5)	V_S = ±15V, R_F = 750Ω, R_G = 750Ω, R_L = 15Ω		0.3		%
	Differential Phase (Note 5)	V_S = ±15V, R_F = 750Ω, R_G = 750Ω, R_L = 15Ω		0.1		DEG
BW	Small-Signal Bandwidth	A_V = 2, V_S = ±15V, Peaking ≤ 1dB, R_F = R_G = 680Ω, R_L = 100Ω		55		MHz
		A_V = 2, V_S = ±15V, Peaking ≤ 1dB, R_F = R_G = 576Ω, R_L = 10Ω		35		MHz

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: Junction temperature must be kept below the Absolute Maximum rating. Applies to short circuits to ground only. A short circuit between the output and either supply may permanently damage the part when operated on supplies greater than ±10V.

Note 3: R_{SD} is connected between the Shutdown pad and ground.

Note 4: Slew rate is measured at ±5V on a ±10V output signal while operating on ±15V supplies with R_F = 1.5k, R_G = 1.5k and R_L = 400Ω.

Note 5: NTSC composite video with an output level of 2V.

SMALL-SIGNAL BANDWIDTH

R_{SD} = 0Ω, I_S = 30mA, V_S = ±5V, Peaking ≤ 1dB

A_V	R_L	R_F	R_G	−3dB BW (MHz)
−1	150 30 10	549 590 619	549 590 619	52.5 39.7 26.5
1	150 30 10	604 649 619	– – –	53.5 39.7 27.4
2	150 30 10	562 590 576	562 590 576	51.8 38.8 27.4
10	150 30 10	392 383 215	43.2 42.2 23.7	48.4 40.3 36.0

R_{SD} = 0Ω, I_S = 35mA, V_S = ±15V, Peaking ≤ 1dB

A_V	R_L	R_F	R_G	−3dB BW (MHz)
−1	150 30 10	604 649 665	604 649 665	66.2 48.4 46.5
1	150 30 10	750 866 845	– – –	56.8 35.4 24.7
2	150 30 10	665 715 576	665 715 576	52.5 38.9 35.0
10	150 30 10	453 432 221	49.9 47.5 24.3	61.5 43.1 45.5

R_{SD} = 7.5k, I_S = 15mA, V_S = ±5V, Peaking ≤ 1dB

A_V	R_L	R_F	R_G	−3dB BW (MHz)
−1	150 30 10	562 619 604	562 619 604	39.7 28.9 20.5
1	150 30 10	634 681 649	– – –	41.9 29.7 20.7
2	150 30 10	576 604 576	576 604 576	40.2 29.6 21.6
10	150 30 10	324 324 210	35.7 35.7 23.2	39.5 32.3 27.7

R_{SD} = 47.5k, I_S = 18mA, V_S = ±15V, Peaking ≤ 1dB

A_V	R_L	R_F	R_G	−3dB BW (MHz)
−1	150 30 10	619 698 698	619 698 698	47.8 32.3 22.2
1	150 30 10	732 806 768	– – –	51.4 33.9 22.5
2	150 30 10	634 698 681	634 698 681	48.4 33.0 22.5
10	150 30 10	348 357 205	38.3 39.2 22.6	46.8 36.7 31.3

SMALL-SIGNAL BANDWIDTH

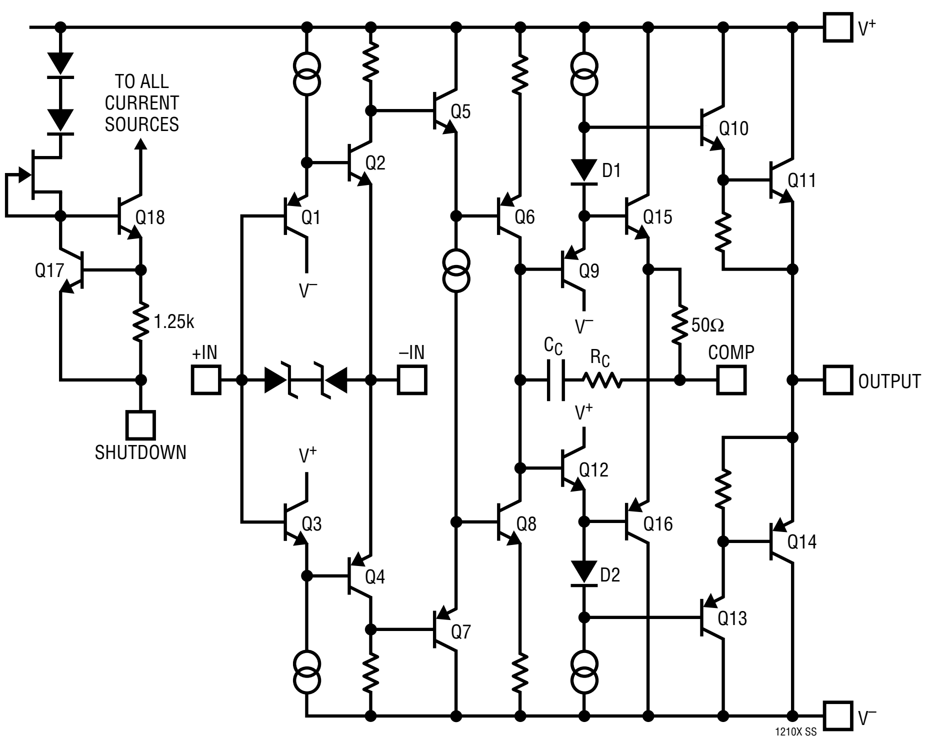
R_{SD} = 15k, I_S = 7.5mA, V_S = ±5V, Peaking ≤ 1dB

A_V	R_L	R_F	R_G	–3dB BW (MHz)
–1	150	536	536	28.2
	30	549	549	20.0
	10	464	464	15.0
1	150	619	–	28.6
	30	634	–	19.8
	10	511	–	14.9
2	150	536	536	28.3
	30	549	549	19.9
	10	412	412	15.7
10	150	150	16.5	31.5
	30	118	13.0	27.1
	10	100	11.0	19.4

R_{SD} = 82.5k, I_S = 9mA, V_S = ±15V, Peaking ≤ 1dB

A_V	R_L	R_F	R_G	–3dB BW (MHz)
–1	150	590	590	34.8
	30	649	649	22.5
	10	576	576	16.3
1	150	715	–	35.5
	30	768	–	22.5
	10	649	–	16.1
2	150	590	590	35.3
	30	665	665	22.5
	10	549	549	16.8
10	150	182	20.0	37.2
	30	182	20.0	28.9
	10	100	11.0	22.5

SIMPLIFIED SCHEMATIC



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