LINEAR INTEGRATED CIRCUITS

LS 141
LS 141A
LS 141C

PRELIMINARY DATA

FREQUENCY COMPENSATED OPERATIONAL AMPLIFIERS

- NO FREQUENCY COMPENSATION REQUIRED
- SHORT CIRCUIT PROTECTION
- OFFSET VOLTAGE NULL CAPABILITY
- LARGE COMMON MODE AND DIFFERENTIAL VOLTAGE RANGE
- NO LATCH-UP

The LS 141 series consists of general purpose operational amplifiers, intended for a wide range of analog applications. High common mode voltage range and absence of "latch-up" tendencies make the LS 141 series ideal for use as a voltage follower. The high gain and wide range of operating voltage provide superior performance in integrators, summing amplifiers, and general feedback applications. The LS 141 series is available with hermetic gold chip (8000 series). This is particularly suitable for professional and telecom applications, wherever very high MTTF are required.

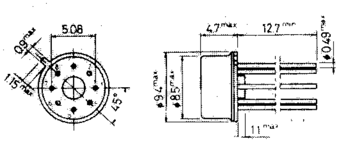
ABSOLUTE MAXIMUM RATINGS

		TO-99	Minidip	µpackage
V_s	Supply voltage for **LS 141/LS 141A**		± 22V	
	for **LS 141C**		± 18V	
V_i (1)	Input voltage		± 15V	
ΔV_i	Differential input voltage		± 30V	
T_{op}	Operating temperature for **LS 141/LS 141A**		-55 to 125°C	
	for **LS 141C**		0 to 70°C	
	Output short circuit duration(2)		indefinite	
P_{tot}	Power dissipation at $T_{amb} = 70°C$	520 mW	665 mW	400 mW
T_{stg}	Storage temperature	-65 to 150°C	-55 to 150°C	-55 to 150°C
	Lead soldering temperature	300°C (10s)	260°C (12s)	260°C (5s) 235°C (11s)

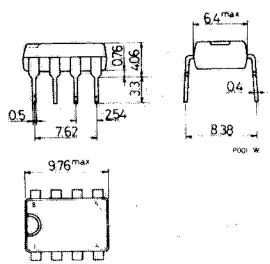
1) For supply voltage less than ± 15V, input voltage is equal to the supply voltage
2) The short circuit duration is limited by thermal dissipation

MECHANICAL DATA

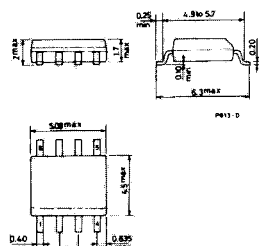
Dimensions in mm



TO-99

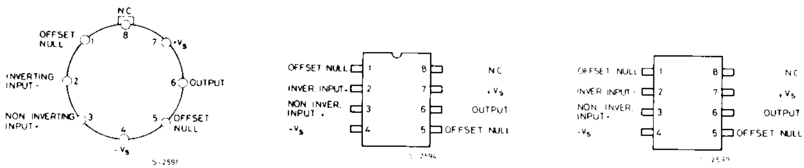


Minidip



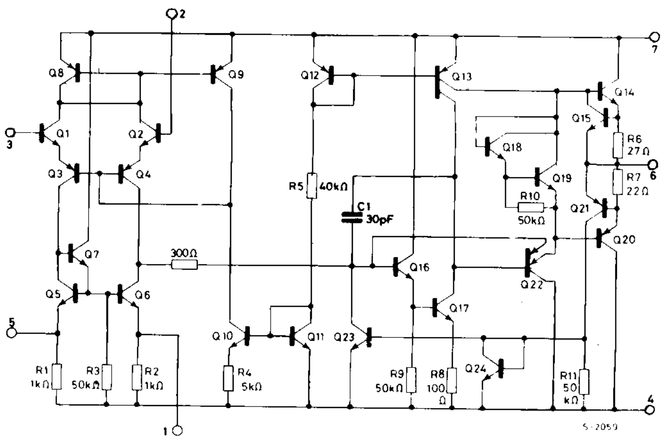
SO-8

CONNECTION DIAGRAMS AND ORDERING NUMBERS
(top views)



Type	TO-99	Minidip	SO-8
LS 141	LS 141T	–	–
LS 141A	LS 141 AT	–	–
LS 141C	LS 141 CT	LS 141 CB	LS 141 CM
LS 8141	–	–	LS 8141M
LS 8141A	–	–	LS 8141 AM
LS 8141C	–	–	LS 8141 CM

SCHEMATIC DIAGRAM



THERMAL DATA

			TO-99	Minidip	SO-8
$R_{th\ j\text{-}amb}$	Thermal resistance junction ambient	max	155 °C/W	120 °C/W	200* °C/W

* Measured with the device mounted on a ceramic substrate (25 x 16 x 0.6 mm)

ELECTRICAL CHARACTERISTICS (see note)

Parameter		Test conditions	LS 141			LS 141A			LS 141C			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
$\lvert V_2-V_3 \rvert$	Input offset voltage	T_{amb} = 25°C										
		$R_g \leq 10\ k\Omega$		1	5					2	6	mV
		$R_g \leq 50\ \Omega$					0.8	3				mV
		$T_{amb} = T_{min}$ to T_{max}										
		$R_g \leq 10\ k\Omega$			6						7.5	mV
		$R_g \leq 50\ \Omega$						4				mV
$\Delta\lvert V_2-V_3 \rvert$	Input offset voltage adjust. range	$V_s = \pm 20V$				±10						mV
		$V_s = \pm 15V$ T_{amb} = 25°C		±15						±15		mV
$\frac{\Delta\lvert V_2-V_3 \rvert}{\Delta T}$	Average input offset voltage drift							15				μV/°C
$\lvert I_2-I_3 \rvert$	Input offset current	T_{amb} = 25°C		20	200		3	30		20	200	nA
		$T_{amb} = T_{min}$ to T_{max}		85	500			70			300	nA
$\frac{\Delta\lvert I_2-I_3 \rvert}{\Delta T}$	Average input offset current drift							0.5				nA/°C
I_b	Input bias current	T_{amb} = 25°C		80	500		30	80		80	500	nA
		$T_{amb} = T_{min}$ to T_{max}			1.5			0.21			0.8	μA
R_i	Input resistance	T_{amb} = 25°C	0.3	2		1	6		0.3	2		MΩ
		$T_{amb} = T_{min}$ to T_{max}				0.5						MΩ
V_i	Input voltage range	T_{amb} = 25°C							±12	±13		V
		$T_{amb} = T_{min}$ to T_{max}	±12	±13								V
G_v	Large signal voltage gain	T_{amb} = 25°C $R_L \geq 2\ k\Omega$										
		$V_s = \pm 20V$ $V_o = \pm 15V$				50						V/mV
		$V_s = \pm 15V$ $V_o = \pm 10V$	50	200					20	200		V/mV
		$T_{amb} = T_{min}$ to T_{max} $R_L \geq 2\ k\Omega$										
		$V_s = \pm 20V$ $V_o = \pm 15V$				32						V/mV
		$V_s = \pm 15V$ $V_o = \pm 10V$	25						15			V/mV
		$V_s = \pm 5V$ $V_o = \pm 2V$				10						V/mV
V_o	Output voltage swing	$V_s = \pm 15V$										
		$R_L \geq 10\ k\Omega$	±12	±14					±12	±14		V
		$R_L \geq 2\ k\Omega$	±10	±13					±10	±13		V
		$V_s = \pm 20V$										
		$R_L \geq 10\ k\Omega$				±16						V
		$R_L \geq 2\ k\Omega$				±15						V
I_{sc}	Output short circuit current	T_{amb} = 25°C		25		10	25	35		25		mA
		$T_{amb} = T_{min}$ to T_{max}				10		40				mA
CMRR	Common mode rejection ratio	$R_g \leq 10\ k\Omega$ $V_{CM} = \pm 12V$	70	90					70	90		dB
		$R_g \leq 50\ \Omega$ $V_{CM} = \pm 15V$				80	95					dB

LS 141
LS 141A
LS 141C

ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions	LS 141			LS 141A			LS 141C			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
SVR	Supply voltage rejection ratio	$R_g \leq 50\Omega$ $V_s = \pm 5$ to $\pm 20V$				86	96					dB
		$R_g \leq 10k\Omega$ $V_s = \pm 5$ to $\pm 15V$	77	96					77	96		dB
	Transient respon. (unity gain)	$T_{amb} = 25°C$										
	Rise time			0.3			0.25	0.8		0.3		µs
	Overshoot			5			6	20		5		%
B	Bandwidth	$T_{amb} = 25°C$				0.437	1.5					MHz
SR	Slew rate	$T_{amb} = 25°C$		0.5		0.3	0.7			0.5		V/µs
I_s	Supply current	$T_{amb} = 25°C$		1.7	2.8					1.7	2.8	mA
P_{tot}	Power consumption	$T_{amb} = 25°C$ $V_s = \pm 20V$					80	150				mW
		$V_s = \pm 15V$		50	85					50	85	mW
		$V_s = \pm 20V$ $T_{amb} = T_{min}$						165				mW
		$T_{amb} = T_{max}$						135				mW
		$V_s = \pm 15V$ $T_{amb} = T_{min}$		60	100							mW
		$T_{amb} = T_{max}$		45	75							mW

Note: These specifications, unless otherwise specified, apply for $V_s = \pm 15V$ and $T_{amb} = -55$ to 125°C for LS 141 and LS 141A. For the LS 141C these specifications apply for $T_{amb} = 0$ to 70°C

Fig. 1 - Open loop voltage gain vs. supply voltage

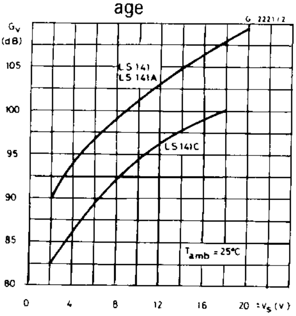


Fig. 2 - Output voltage swing vs. supply voltage

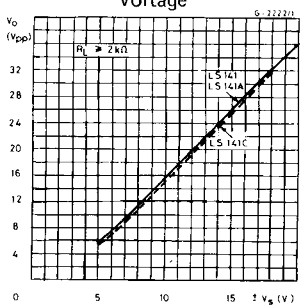


Fig. 3 - Power consumption vs. supply voltage

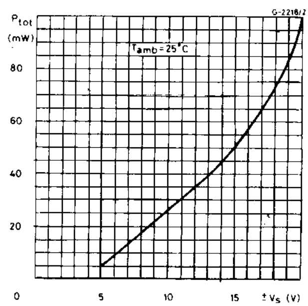


Fig. 4 - Open loop voltage gain vs. frequency

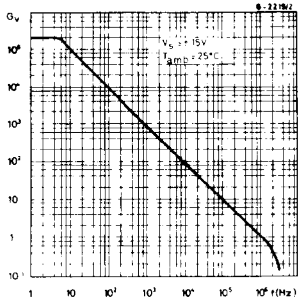


Fig. 5 - Open loop phase response vs. frequency

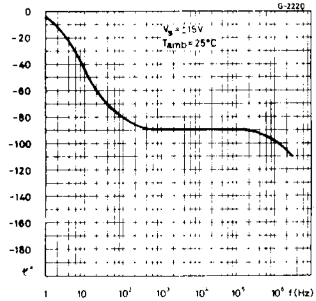


Fig. 6 - Input offset current vs. supply voltage (for LS 141 and LS 141C)

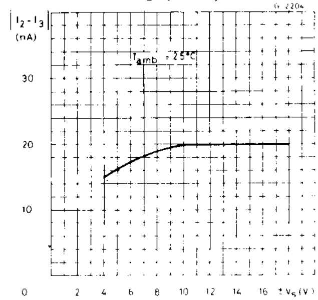


Fig. 7 - Input resistance and capacitance vs. frequency (for LS 141 and LS 141C)

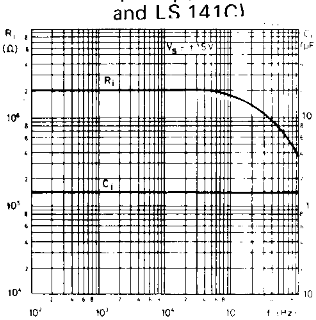


Fig. 8 - Output resistance vs. frequency

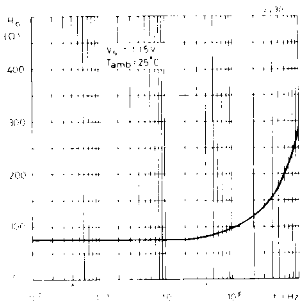


Fig. 9 - Output voltage swing vs. load resistance

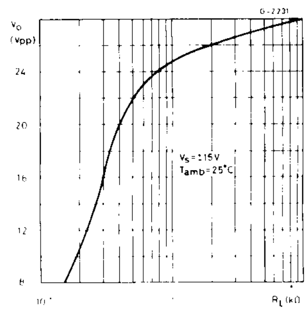


Fig. 10 - Output voltage swing vs. frequency

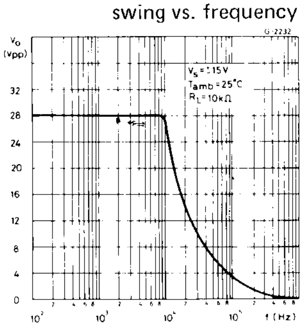


Fig. 11 - Input noise voltage vs. frequency

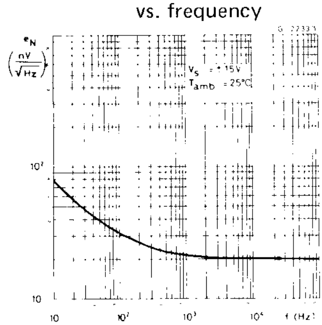


Fig. 12 - Input noise current vs. frequency

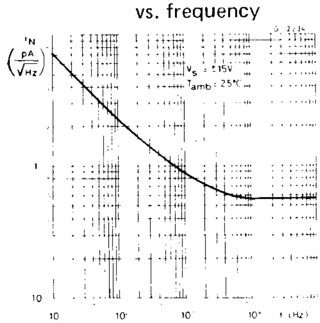


Fig. 13 - Transient response

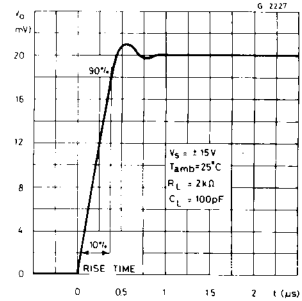


Fig. 14 - Common mode rejection ratio vs. frequency

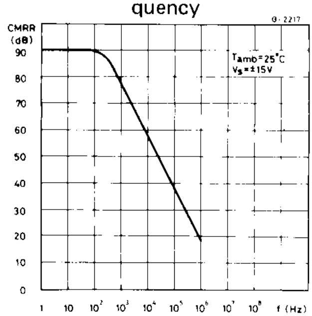
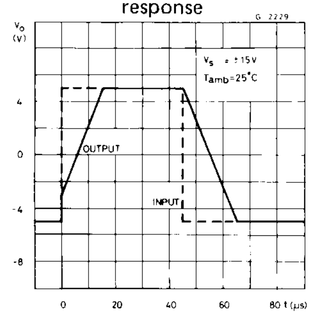


Fig. 15 - Voltage follower large signal pulse response



Typical performance curves for LS 141 and LS 141A

Fig. 16 - Input bias current vs. ambient temperature

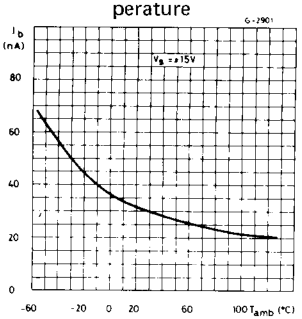


Fig. 17 - Input resistance vs. ambient temperature

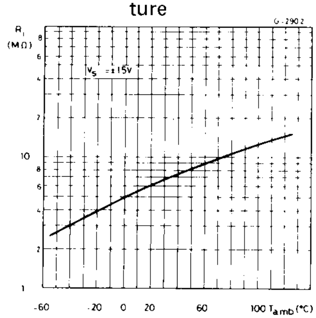


Fig. 18 - Input offset current vs. ambient temperature

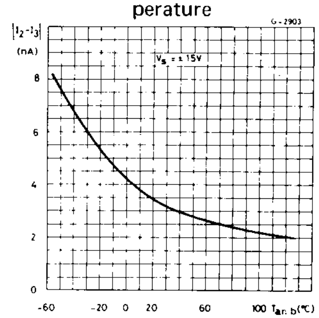


Fig. 19 - Output short-circuit current vs. ambient temperature

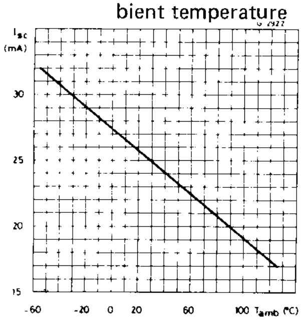


Fig. 20 - Power consumption vs. ambient temperature

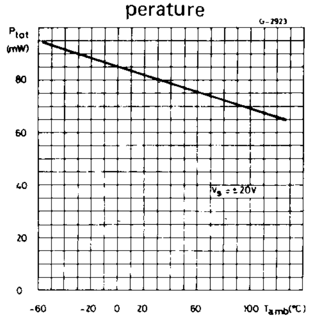
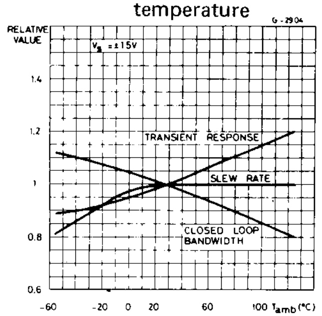


Fig. 21 - Frequency characteristics vs. ambient temperature



Typical performance curves for LS 141C

Fig. 22 - Input bias current vs. ambient temperature

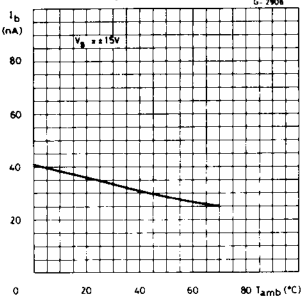


Fig. 23 - Input resistance vs. ambient temperature

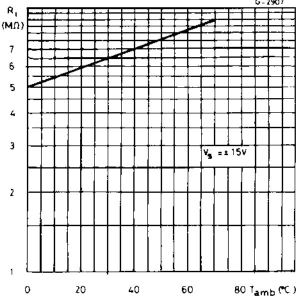


Fig. 24 - Input offset current vs. ambient temperature

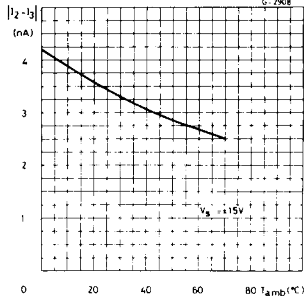


Fig. 25 - Output short circuit current vs. ambient temperature

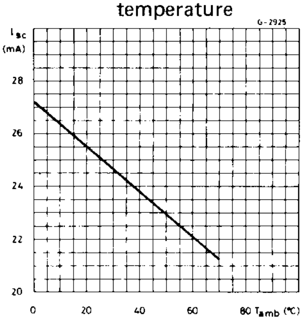


Fig. 26 - Power consumption vs. ambient temperature

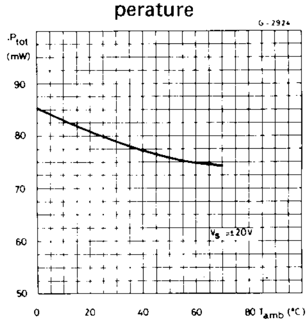
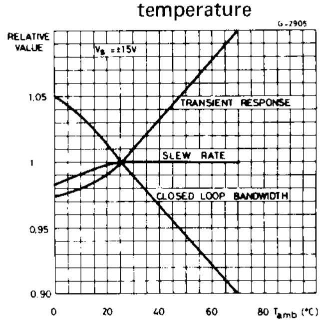


Fig. 27 - Frequency characteristics vs. ambient temperature



TYPICAL APPLICATIONS

Fig. 28 - Clipping amplifier

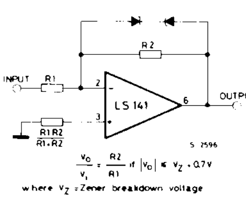


Fig. 29 - Simple integrator

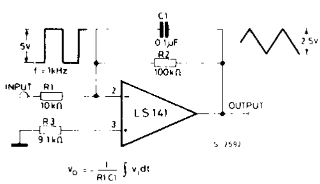
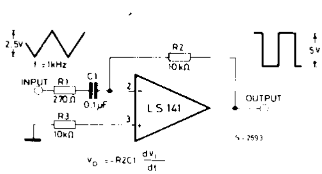


Fig. 30 - Simple differentiator



TYPICAL APPLICATIONS (continued)

Fig. 31 - High slew rate power amplifier

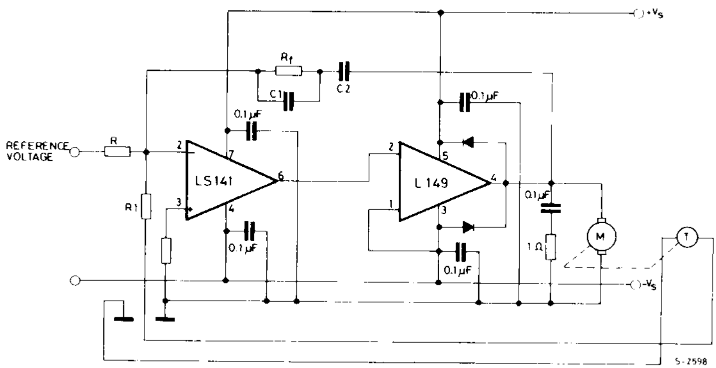


Fig. 32 - Notch filter using the LS 141 as a gyrator

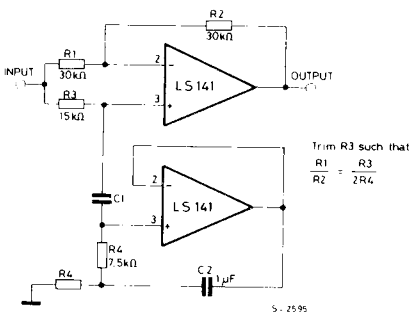


Fig. 33 - Notch frequency vs. C1