PLESSEY
Semiconductors

T-74-11-01

SL521AC

WIDEBAND LOG AMPLIFIER
(CONFORMS TO MIL-STD-883C CLASS B)

The SL521AC is a bipolar monolithic integrated circuit amplifier, intended primarily for use in successive detection logarithmic IF strips, operating at centre frequencies between 10MHz and 100MHz. The device provides amplification, limiting and rectification, is suitable for direct coupling and incorporates supply line decoupling. The mid-band voltage gain of the SL521AC is typically 12dB (4 times).

FEATURES

- MIL-M-38510 Change Notification Observed
- Full Quality Conformance Inspection
- Well-Defined Gain
- 4dB Noise Figure
- High I/P Impedance
- Low O/P Impedance
- 165MHz Bandwidth
- On-Chip Supply Decoupling
- Low External Component Count
- Temperature Range: -55°C to +125°C

CHANGE NOTIFICATION

The change notification requirements of MIL-M-38510 will be implemented on this device type. Known customers will be notified of any changes since last buy when ordering further parts if significant changes have been made.

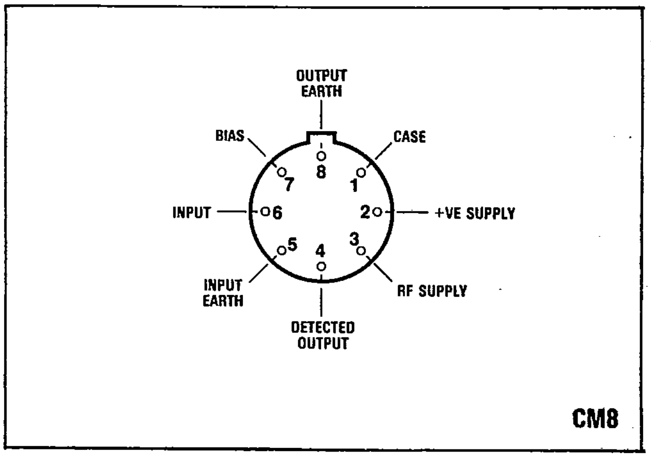


Fig.1 Pin connections - bottom view

ABSOLUTE MAXIMUM RATINGS
(Non-simultaneous)

Storage temperature range	-55°C to +175°C
Chip operating temperature	+175°C
Chip-to-ambient thermal resistance	250°C/W
Chip-to-case thermal resistance	80°C/W
Maximum instantaneous voltage at video output	+12V
Supply voltage	+9V

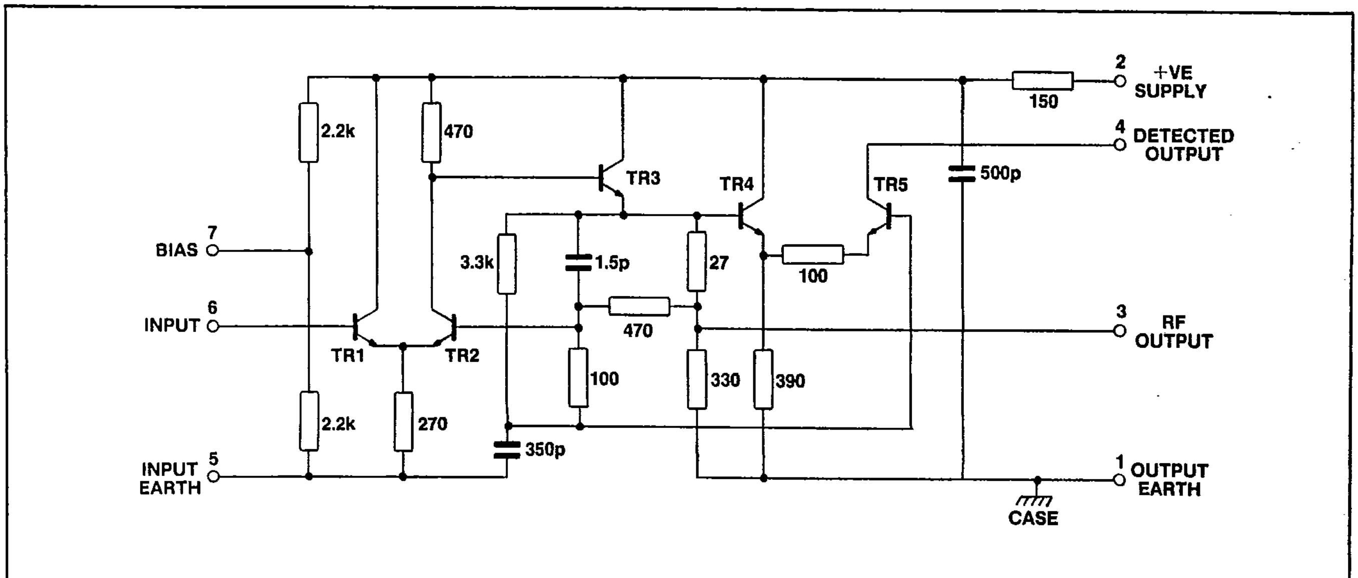


Fig.2 Circuit diagram SL521AC

Rev.	A	B	
Date	19 Jan 87	20 Feb 87	

SL521AC

T-74-11-01

ELECTRICAL CHARACTERISTICS

Test conditions (unless otherwise stated):

T_{amb} = -55°C to +125°C
Supply voltage = +6V
DC connection between input and bias pins
V_{IN} = 7mV rms
Source impedance = 10Ω
Load impedance = 8pF

Characteristic	Value		Units	Sub group	Conditions
	Min.	Max.			
Voltage gain, f =30MHz	11.3	12.7	dB	4, 7	T_{amb} = 25°C
Voltage gain, f =60MHz	11.0	13.0	dB	4, 7	T_{amb} = 25°C
Voltage gain, f =60MHz	10.0	14.0	dB	5, 6, 8	T_{amb} = -55°C to +125°C
Upper cut-off frequency	140	-	MHz	4	T_{amb} = 25°C
-3dB w.r.t. 60MHz	120	-	MHz	5, 6	T_{amb} = -55°C to +125°C
Lower cut-off frequency	-	7	MHz	4	T_{amb} = 25°C
-3dB w.r.t. 60MHz	-	10	MHz	5, 6	T_{amb} = -55°C to +125°C
Maximum rectified video output current (Figs. 4 and 5)	0.95	1.15	mA	4	T_{amb} = 25°C
	0.85	1.25	mA	5, 6	T_{amb} = -55°C to +125°C f = 60MHz, 0.5V rms input
Noise figure (Fig.6)	-	5.25	dB	4	T_{amb} = 25°C f = 60MHz, Rs = 450Ω
Supply current	12.5	18.0	mA	1, 2, 3	T_{amb} = -55°C to +125°C

NOTES
1. Overload occurs when the input signal reaches a level sufficient to forward bias the base collector junction to TR1 on peaks.
2. Sub groups 9, 10 and 11 are not required.
3. Functional performance (sub groups 7 and 8) is verified in the voltage gain tests (sub groups 4, 5 and 6).

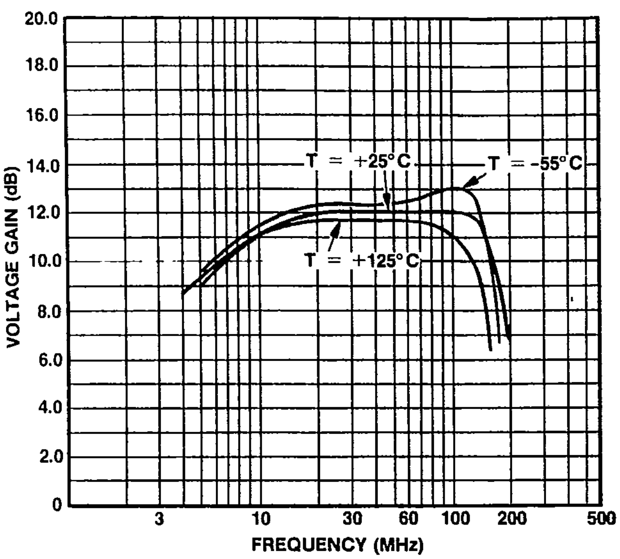


Fig.3 Voltage gain v. frequency (typical)

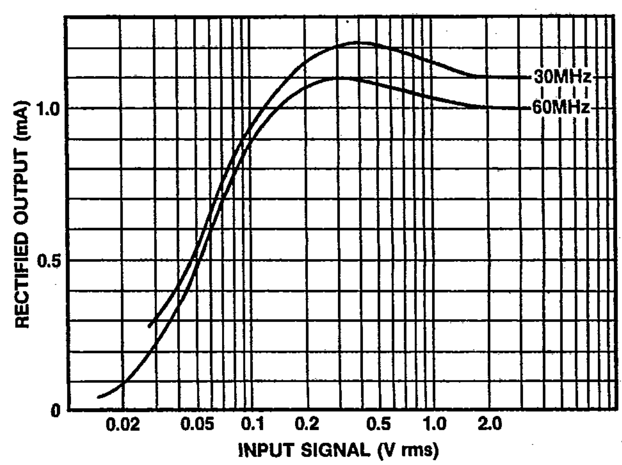


Fig.4 Rectified output current v. input signal (typical)

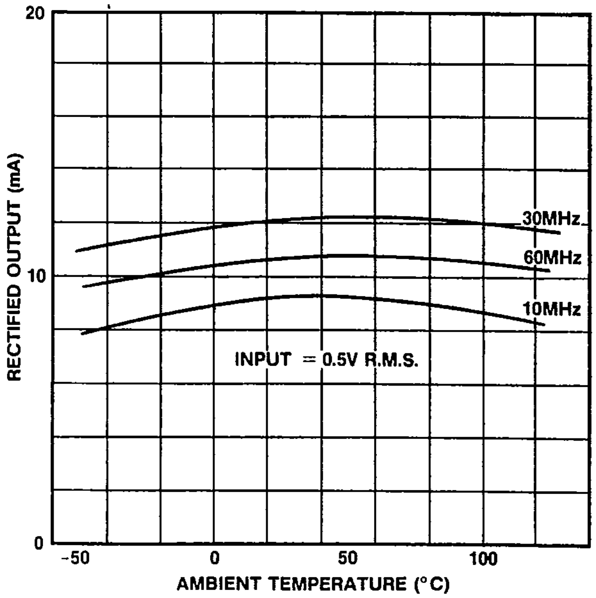


Fig.5 Maximum rectified output current v. temperature (typical)

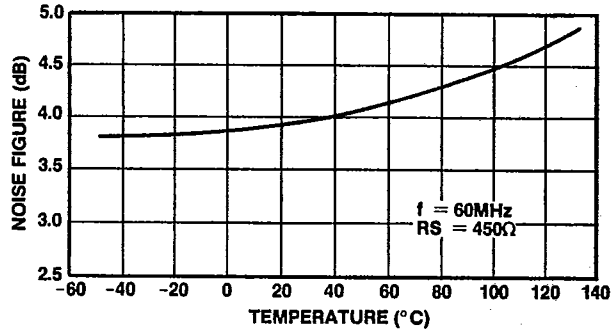


Fig.6 Noise figure v. temperature (typical)

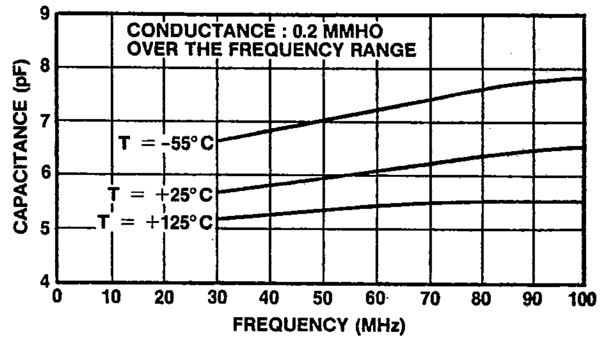


Fig.7 Input admittance with open-circuit output (typical)

OPERATING NOTES

The amplifiers are intended for use directly coupled, as shown in Fig.8.

The seventh stage in an untuned cascade will be giving virtually full output on noise.

Noise may be reduced by inserting a single tuned circuit in the chain. As there is a large mismatch between stages a simple shunt or series circuit cannot be used. The choice of network is also controlled by the need to avoid distorting the logarithmic law; the network must give unity voltage transfer at resonance. A suitable network is shown in Fig.9. The value of C1 must be chosen so that at resonance its admittance equals the total loss conductance across the tuned circuit. Resistor R1 may be introduced to improve the symmetry of filter response, providing other values are adjusted for unity gain at resonance.

A simple capacitor may not be suitable for decoupling the output line if many stages and fast rise times are required. Alternative arrangements may be derived, based on the parasitic parameters given.

Values of positive supply line decoupling capacitor required for untuned cascades are given below. Smaller values can be used in high frequency tuned cascades.

	Number of stages			
	6 or more	5	4	3
Minimum capacitance	30nF	10nF	3nF	1nF

The amplifiers have been provided with two earth leads to avoid the introduction of common ground lead inductance between input and output circuits. The equipment designer should take care to avoid the subsequent introduction of such inductance.

The 500pF supply decoupling capacitor has a resistance of, typically, 10Ω. It is a junction type having a low breakdown voltage and consequently the positive supply current will increase rapidly if the supply voltage exceeds 7.5V (see Absolute Maximum Ratings).

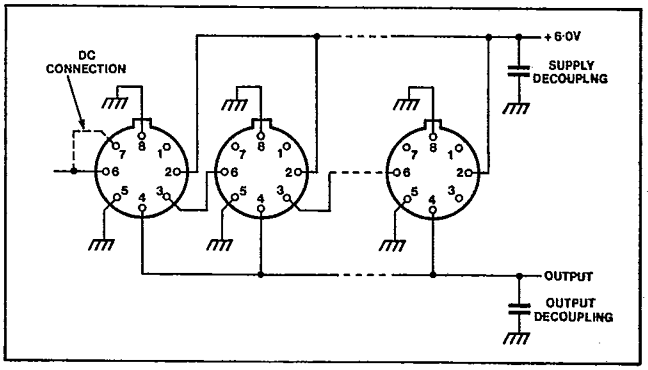


Fig.8 Direct coupled amplifiers

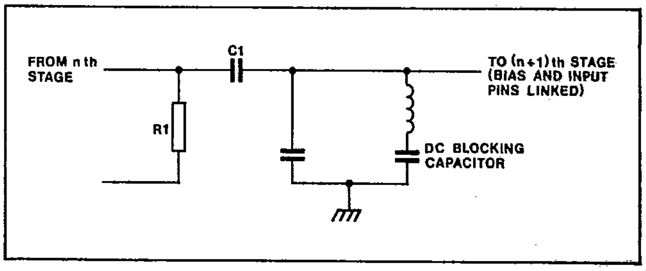


Fig.9 Suitable interstage tuned circuit

T-74-11-01

Parasitic Feedback Parameters (Approximate)

The quotation of these parameters does not indicate that elaborate decoupling arrangements are required; the amplifier has been designed specifically to avoid this requirement. The parameters have been given so that the necessity or otherwise of further decoupling, may become a matter of calculation rather than guesswork.

$$\frac{\tilde{I}_4}{V_6} = \frac{\text{RF current component from pin 4}}{\text{Voltage at pin 6}} = 20 \text{ mmhos}$$

(This figure allows for detector being forward biased by noise signals).

$$\frac{V_6}{V_4} = \frac{\text{Effective voltage induced at pin 6}}{\text{Voltage at pin 4}} = 0.003$$

$$\frac{I_2}{V_6} = \frac{\text{Current from pin 2}}{\text{Voltage at pin 6}} = 6 \text{ mmhos } (f = 10\text{MHz})$$

$$\left[\frac{V_6}{V_2}\right]_a = \frac{\text{Voltage induced at pin 6}}{\text{Voltage at pin 2}} = 0.03 \ (f = 10\text{MHz})$$

Voltage at pin 2
(pin 6 joined to pin 7 and
fed from 300Ω source)

$$\left[\frac{V_6}{V_2}\right]_b = \frac{\text{Voltage induced at pin 6}}{\text{Voltage at pin 2}} = 0.01 \ (f = 10\text{MHz})$$

Voltage at pin 2
(pin 7 decoupled)

$\frac{I_2}{V_6}$ $\left[\frac{V_6}{V_2}\right]_a$ $\left[\frac{V_6}{V_2}\right]_b$ decrease with frequency above 10MHz at 6dB/octave.

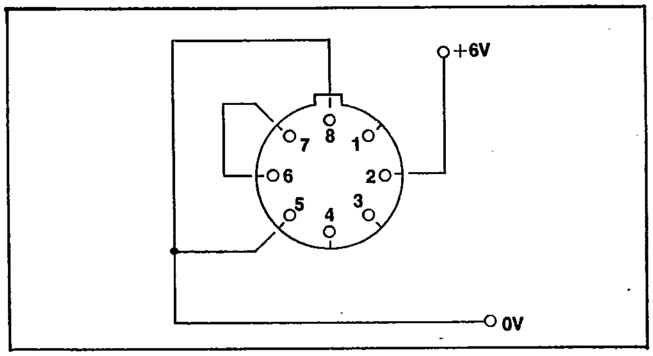
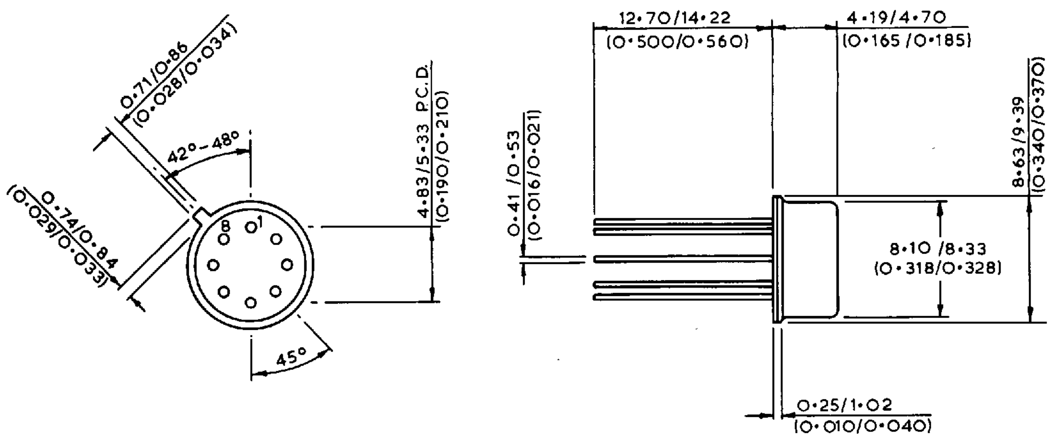
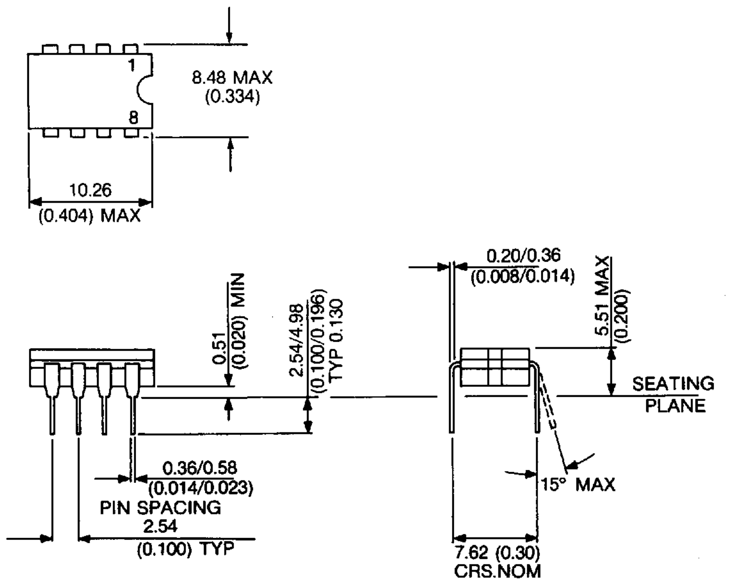


Fig.10 Burn-in/life test circuit
NOTE: PDA is 5% and based on sub groups 1 and 4.



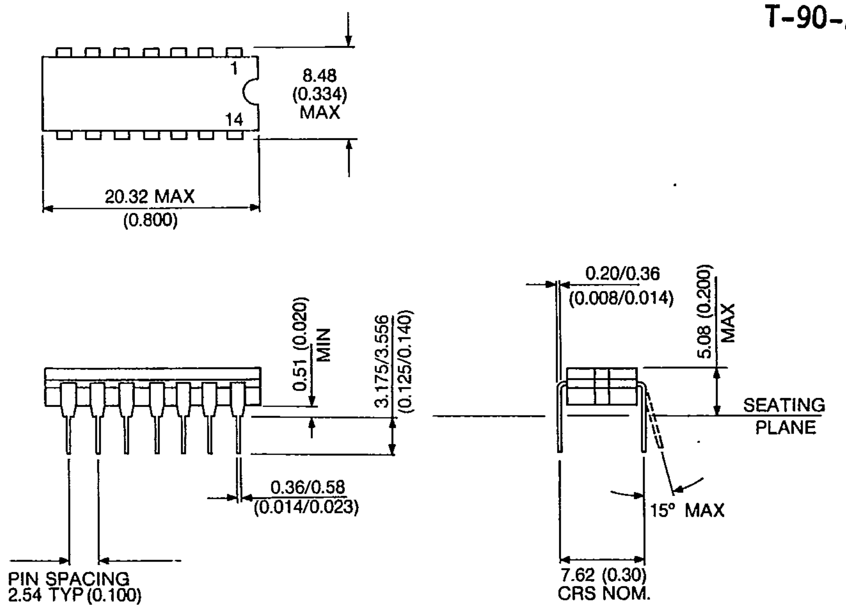
NOTE: This package does not have 'standoff' and therefore does not conform fully to MIL-M-38510F case outline A-1.

8-LEAD METAL CAN

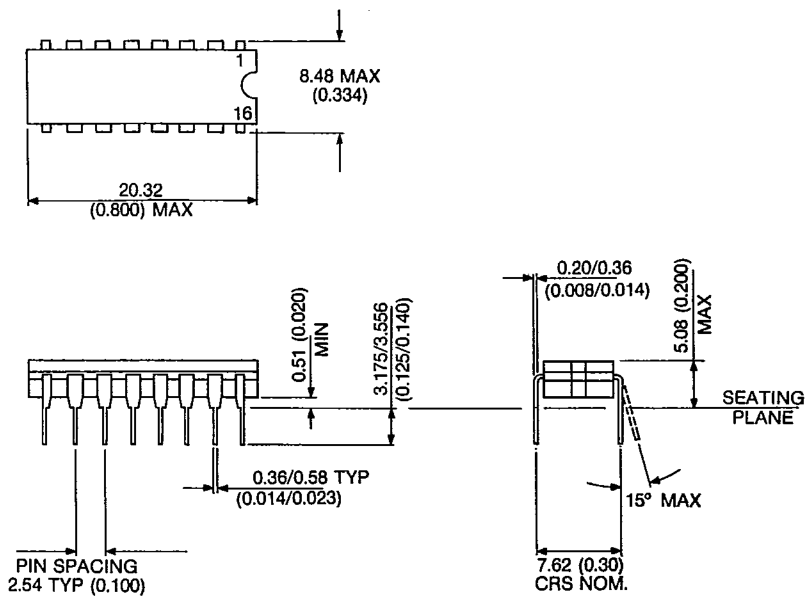


8 LEAD CERAMIC DIL CERDIP - DG8

T-90-20

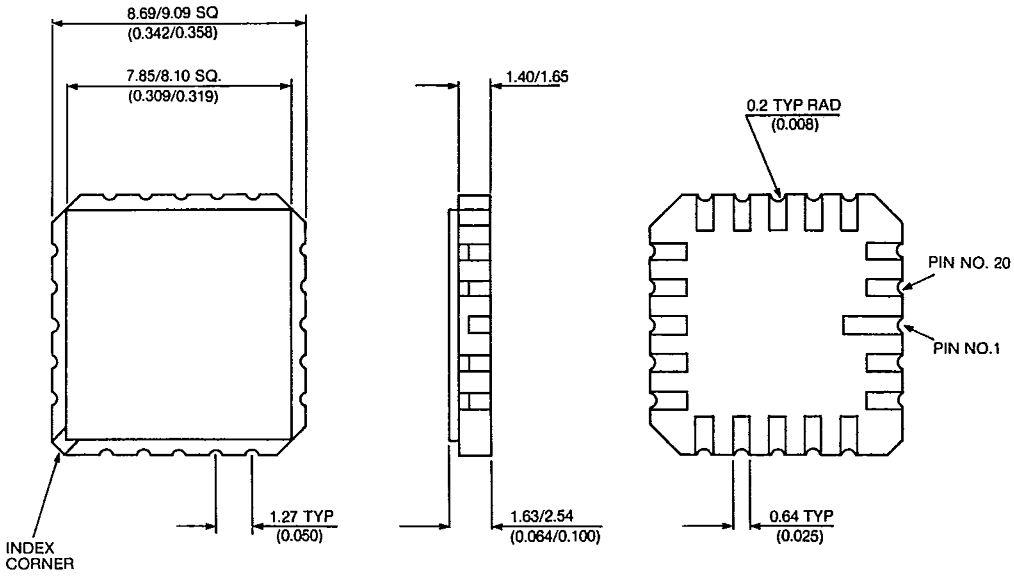


14 LEAD CERAMIC DIL CERDIP - DG14



16 LEAD CERAMIC DIL CERDIP - DG16

T-90-20



20-PIN LEADLESS CHIP CARRIER - LC20
(HERMETIC)