

T-74-13-01



GigaBit Logic

16G074

Transimpedance Amplifier

22 dB Gain / 1.9 GHz Bandwidth

FEATURES

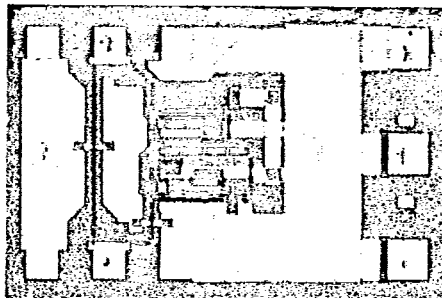
- High gain > 22 dB
- Broad Bandwidth: DC to 1.9 GHz typ.
- -28.0 dBm input sensitivity @ 1.1 Gbit/s & 10^{-9} BER
- Available in die form or die on substrate
- Low output impedance
- Stable operation
- Three choices of integrated feedback resistance: 1.0, 2.0, and 4.0 K Ω

APPLICATIONS

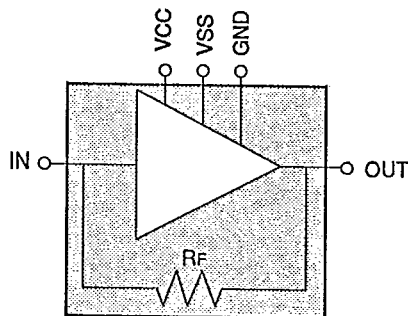
- Fiber optic systems
- Instrumentation and measurement systems

FUNCTIONAL DESCRIPTION

The 16G074 is a stable GaAs IC transimpedance amplifier capable of 22 dB gain ($R_s = R_L = 50\Omega$) at a 1.9 GHz -3 dB cutoff frequency (typ.) making it ideally suited for high speed fiber optic, instrumentation, and measurement applications. It operates from +5V and -3V power supplies. The integrated feedback loop design provides high gain and stable operation. Three choices of integrated feedback resistance are available to match various photodiode load requirements: 1.0, 2.0, and 4.0 K Ω .



CIRCUIT DIAGRAM



ELECTRICAL CHARACTERISTICS

0°C to 70°C

Feedback Resistance R_F	1.0 K Ω (Typ.)
	2.0 K Ω (Typ.)
	4.0 K Ω (Typ.)
Gain	20.0 dB ($R_F = 1.0K\Omega$)
	21.5 dB ($R_F = 2.0K\Omega$)
	22.0 dB ($R_F = 4.0K\Omega$)
High Frequency Cutoff (-3dB)	1.9 GHz (Typ.)

ORDERING INFORMATION

Nominal Feedback Resistance	Die	Die on Ceramic Substrate
1.0 K Ω	16G074-10X	16G074-10X1
2.0 K Ω	16G074-20X	16G074-20X1
4.0 K Ω	16G074-40X	16G074-40X1

Supply Voltages	VCC = +5V
	VSS = -3V
Supply Currents	ICC = 35 mA (Typ.)
	ISS = -25 mA (Typ.)

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ABSOLUTE MAXIMUM RATINGS							
SYMBOL	PARAMETER	ABSOLUTE MAXIMUM RATINGS					
I IN	Current into any input; continuous	1 mA					
I OUT	Current from any output; continuous	15 mA					
V IN	Voltage applied to any input; continuous VCC = +5V, VSS = -3V	-2 to +0.6V					
VOUT	Output Voltage	-2 to +0.6V					
VCC	Supply Voltage	0V to +8V					
VSS	Supply Voltage	0V to -5V					
PD	Power Dissipation	1W					
TSTOR	Storage Temperature	-55 to +150°C					
TA	Ambient Operating Temperature	-55 to +125°C					
RECOMMENDED OPERATING CONDITIONS							
PARAMETER	SYMBOL	Min	Nom	Max	UNITS		
Supply Voltage	VCC	+4.25	+5	+6	V		
	VSS	-4	-3	-2.5	V		
Output Termination Load Resistance	Rload		50		Ω		
Ambient Operating Temperature	TA	0		70	°C		
ELECTRICAL CHARACTERISTICS							
VCC = +4.25V to +6V, VSS = -4V to -2.5V, TA = 0°C to 70°C							
PARAMETER	SYMBOL	TEST CONDITIONS	PART #	VALUE			UNITS
				Min	Typ	Max	
Supply Current	ICC	I IN = 0	All parts		35	50	mA
	ISS	I IN = 0	All parts		-25	-35	mA
Feedback Resistance	RF	DC	16G074-10	0.9	1.0	1.1	KΩ
			16G074-20	1.8	2.0	2.2	KΩ
			16G074-40	3.6	4.0	4.4	KΩ
Gain (f = 10 MHz)	A	RS = RL = 50Ω	16G074-10	20.0			dB
			16G074-20	21.5			dB
			16G074-40	22.0			dB
High Frequency Cut-off (-3dB)	fc			1.7	1.9		GHz
Overload Point @ 10 ⁻⁹		PIN photodiode	16G074-10		-5.2		dBm
			16G074-20		-6.5		dBm
Sensitivity @ 10 ⁻⁹		PIN photodiode 2.5 Gbit/s	16G074-10		-24		dBm

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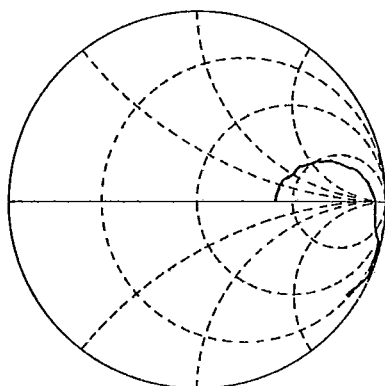
16G074

EXAMPLES OF AC CHARACTERISTICS

1) S-Parameters

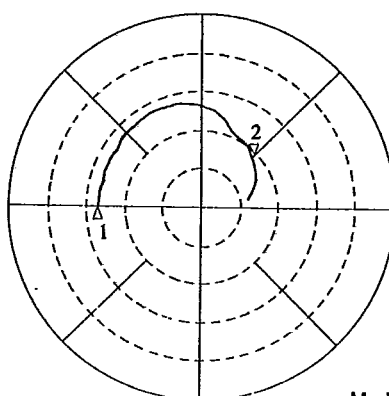
S11

1 Unit Full Scale



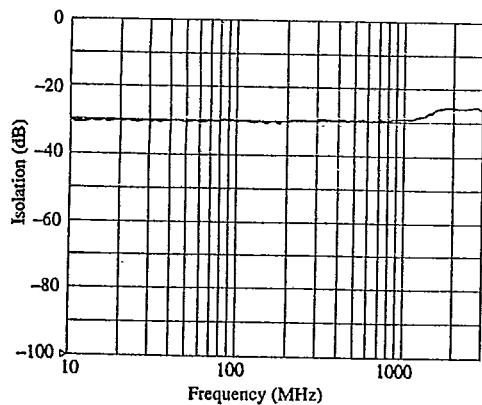
S21

20 Units Full Scale

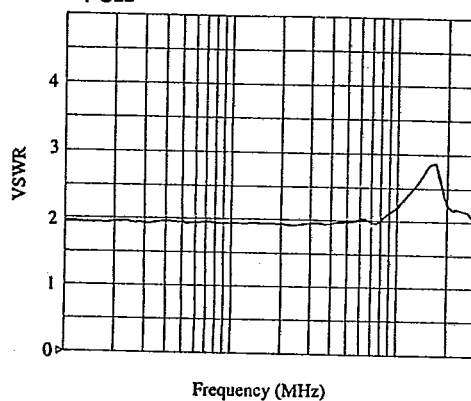


Markers:
1. 10 MHz
2. 2,350 MHz

S12



$\frac{1+S_{22}}{1-S_{22}}$



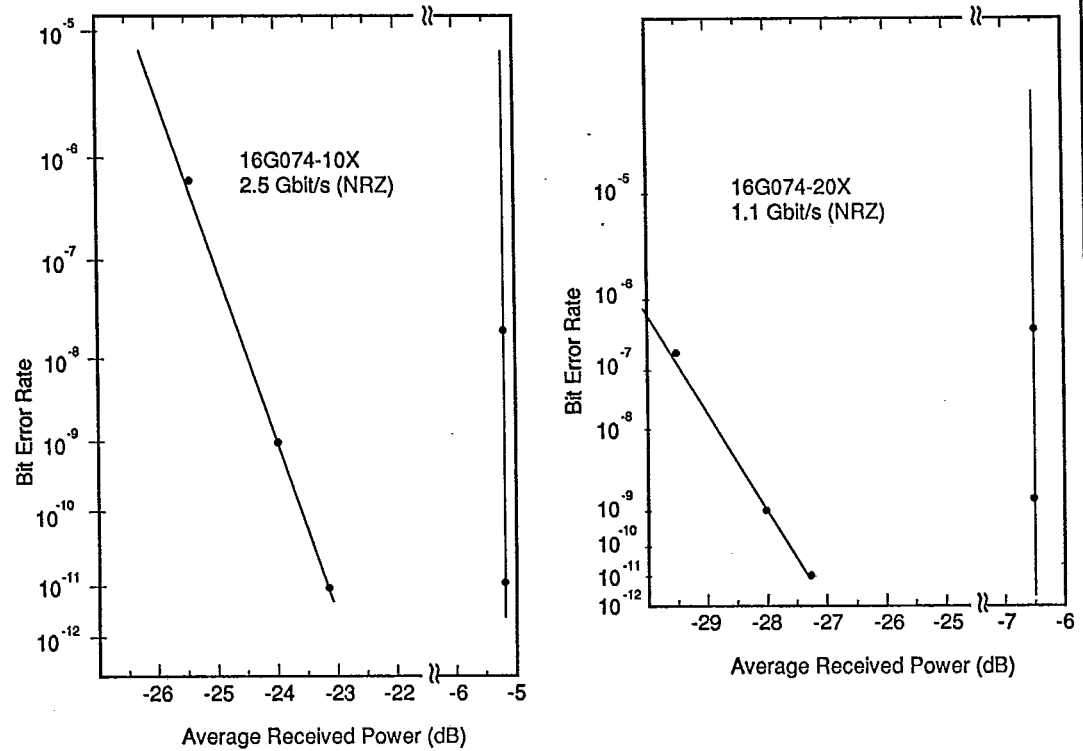
Conditions: VCC = +5V, VSS = -3V, RF = 1.0 KΩ



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SENSITIVITY CHARACTERISTICS



SENSITIVITY

SPEED	BER	AVERAGE RECEIVED POWER (dBm)	
		16G074-10X	16G074-20X
1.1 Gbit/s	10 ⁻⁹	-26.2	-28.0
	10 ⁻¹¹	-25.4	-27.3
1.6 Gbit/s	10 ⁻⁹		-25.5
	10 ⁻¹¹		-24.4
2.5 Gbit/s	10 ⁻⁹	-24.0	
	10 ⁻¹¹	-23.2	

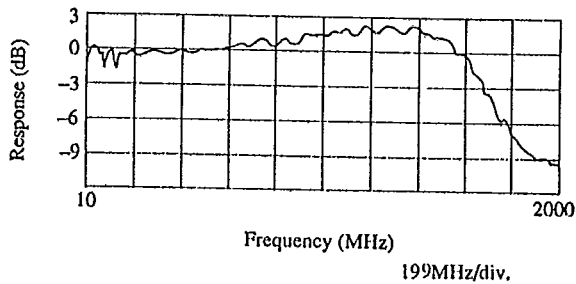


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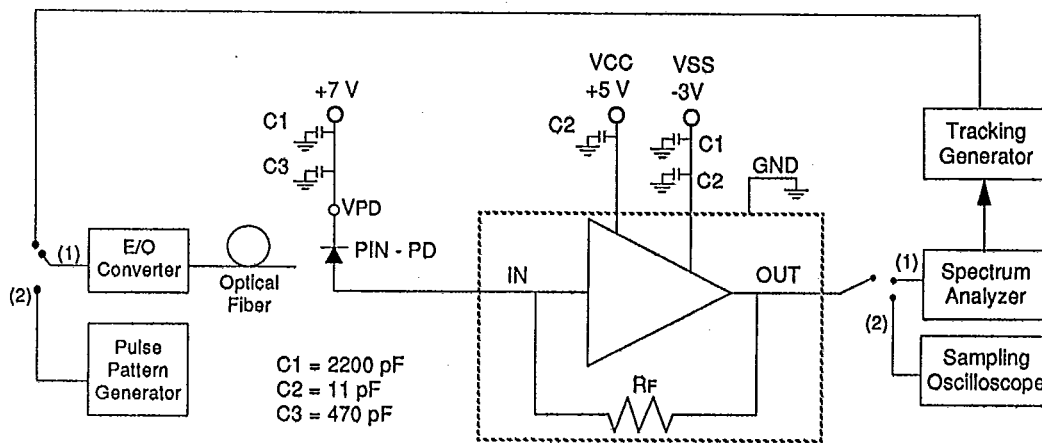
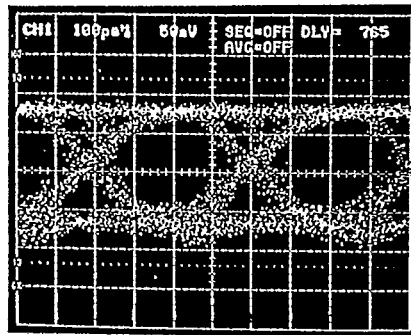
EXAMPLE OF PIN-AMP SYSTEM MEASUREMENT

1. Frequency Response



Conditions:
VCC = +5V
VSS = -3V
VPD = +7V
RF = 1.0 K Ω
FL = 50 Ω

2. Eye Diagram (2.4 Gbit/s)



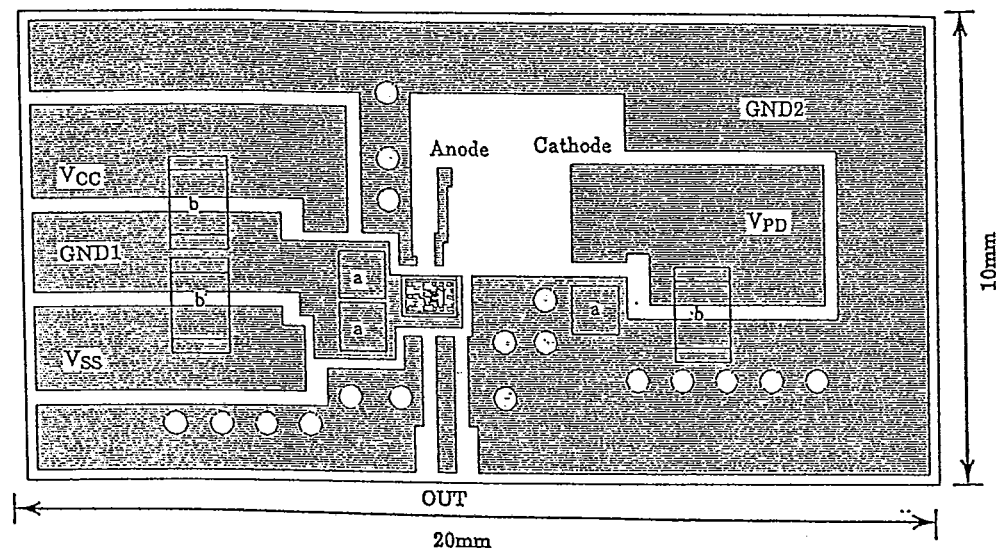
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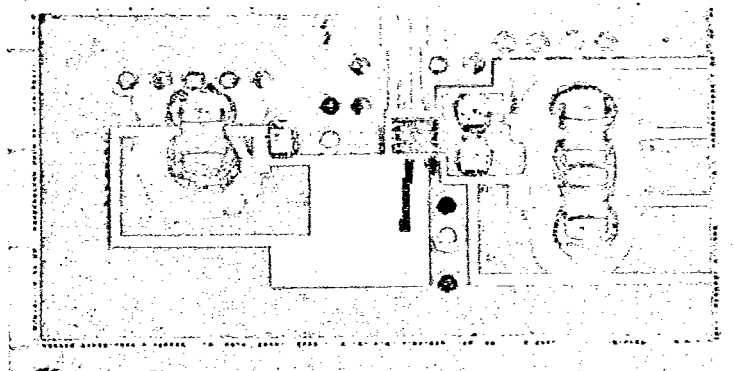
DIE ON SUBSTRATE LAYOUT (16G074-X1)



a = 470 pF
b = 2200 pF

GND1, GND2 = Ground
VCC = +5V Supply Voltage
VSS = -3V Supply Voltage
VPD = Detector Bias Voltage
OUT = Output
Thickness = 635 μ m

DIE ON SUBSTRATE PHOTOGRAPH



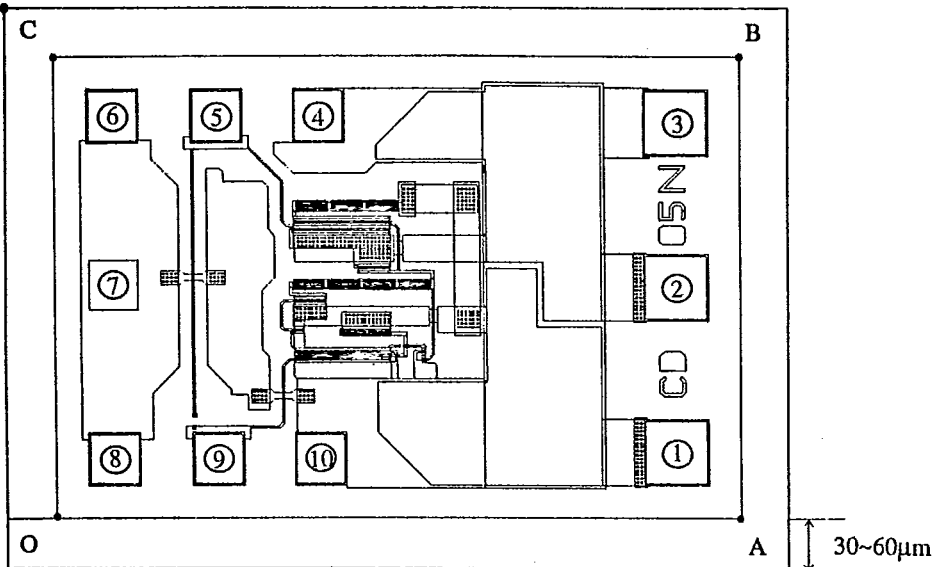


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DIE PAD ASSIGNMENTS



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PAD	PAD SIZE	CENTER POSITION (µm)	PAD	PAD SIZE	CENTER POSITION (µm)
1 ... VCC	95 µm sq.	960, 100	8 ... GND	75 µm sq.	90, 90
2 ... VSS	95 µm sq.	960, 350	9 ... IN	75 µm sq.	250, 90
3 ... GND	95 µm sq.	960, 600	10 ... GND	75 µm sq.	410, 90
4 ... GND	75 µm sq.	410, 610	A		1060, 0
5 ... OUT	75 µm sq.	250, 610	B		1060, 700
6 ... GND	75 µm sq.	90, 610	C		0, 700
7 ... GND	75 µm sq.	90, 354	O		0, 0

PRECAUTIONS

Because of their small dimensions, the GaAs FETs from which the 16G074 is designed can be damaged or destroyed when subjected to large transient voltages. Such transients can be generated by power supplies when switched on if not properly decoupled. It is also possible to induce spikes from static electricity charged operators or ungrounded equipment. To prevent damage to devices from transient breakdown.

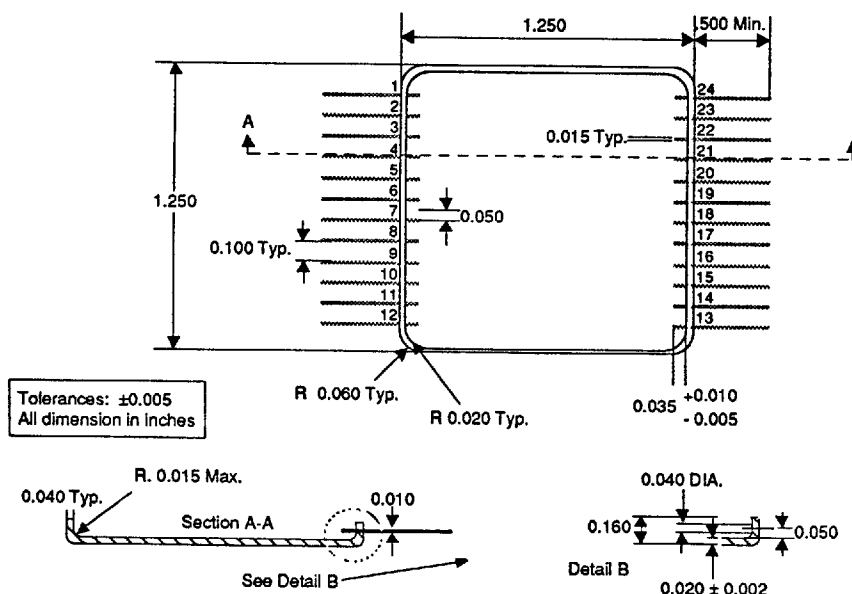
- DC ground all equipment and operators
- Avoid any voltages surges when turning on power supplies

T-90-20

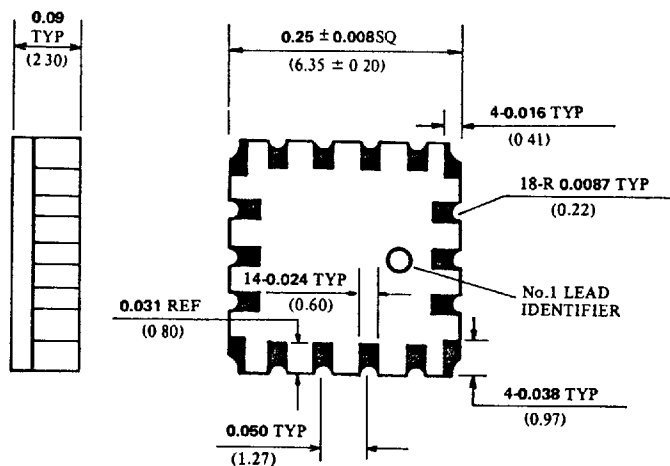


24 PIN METAL FLATPACK 18 PIN PACKAGE

24 PIN METAL FLATPACK Type H



18 PIN LEADLESS CHIP CARRIER TYPE L1



All dimensions shown in inches and (millimeters)

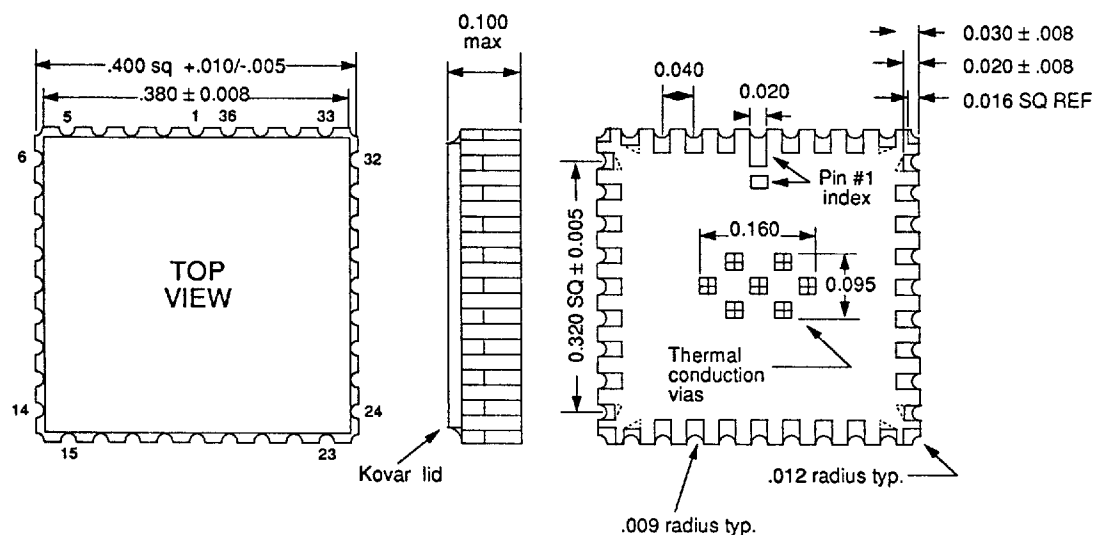
T-90-20



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36 PIN PACKAGES

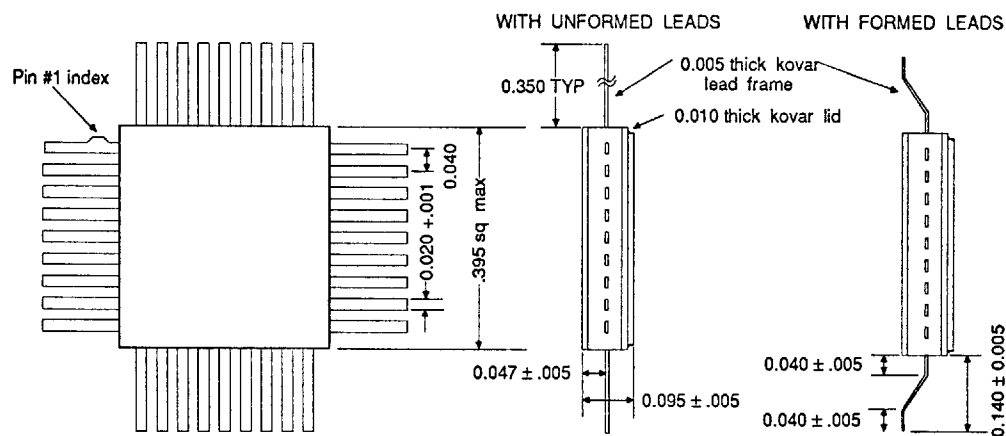
36 PIN LEADLESS CHIP CARRIER TYPE L36



NOTES:

- 1) The package bottom thermal vias, top lid surface and 4 metallized corner castellations (when present) are all at Vss potential.
- 2) All dimensions in inches.
- 3) Pin #1 identifier may be an elongated pad or small, square gray marker.

36 I/O LEAD FLATPACK TYPE F

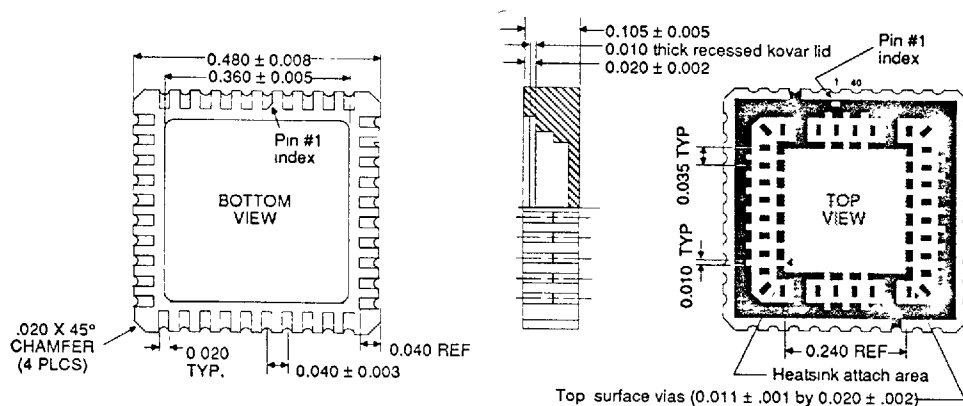




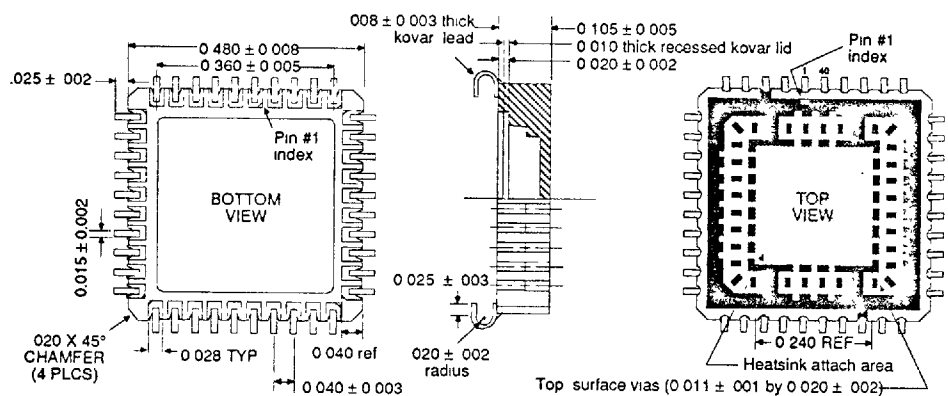
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T-90-20
40 PIN PACKAGES

40 PIN LEADLESS CHIP CARRIER TYPE L



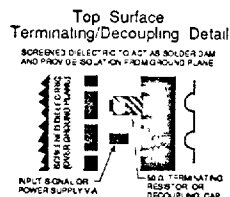
40 PIN LEADED CHIP CARRIER TYPE C



NOTES

- (1) Footprint is JEDEC standard outline
- (2) Top surface vias (for terminating resistors and decoupling capacitors) are not available on pins 3, 4, 17, 18, 23, 24, 37, and 38
- (3) Top surface metal (not including vias) and pins 3 and 23 are fixed at VTT potential
- (4) Recommended top surface chip resistors are 0.040 long by 0.020 wide by 0.010 thick typ. 100 mw min. nominal power rating (Mini-Systems MSR 21 or equivalent)
- (5) Recommended top surface chip capacitors are 0.040 long by 0.030 wide by 0.020 thick typ. $25V$ VCCW 1000 of min. (Johnson R09 case or equivalent)
- (6) Recommended heat/sinks are GBL P/Ns 90GHS 40 A and 90GHS 40 B
- (7) Thermally conductive, electrically non-conductive epoxy is recommended for heatsink attachment (Ablestick 789 4 or 561K, or Thermalloy Thermalbond™ or equivalent)
- (8) L40 and C40 packages are dimensionally identical except for contact finger width

TOP SURFACE LEGEND	
Metalized Ceramic	
Screened Dielectric	
Bare Ceramic	

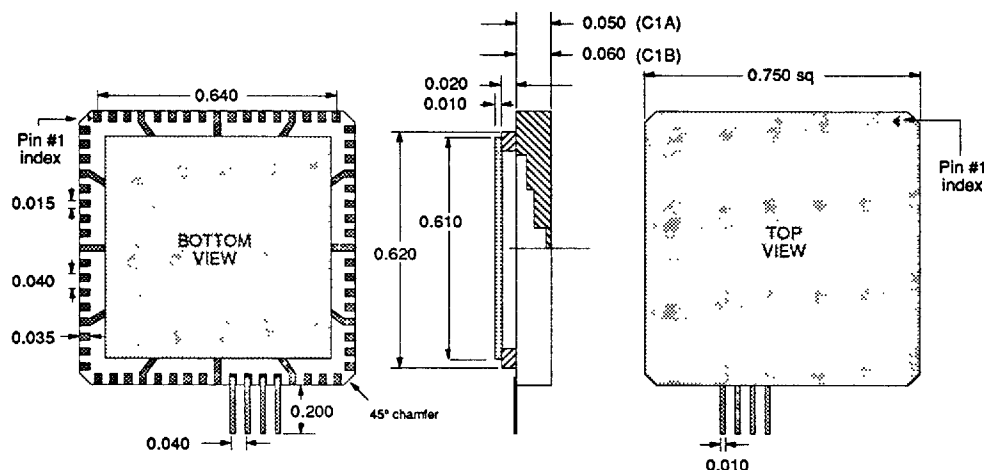




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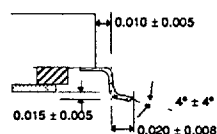
T-90-20
68 & 132 PIN
PACKAGES

68 PIN LEADED CHIP CARRIER TYPE C1



1. All dimensions in inches.
2. C1A PACKAGE: Package lid, top, and pins 4, 9, 14, 21, 26, 31, 38, 43, 48, 55, 60, 65 are at common potential (system ground).
3. C1B PACKAGE: Package lid and pins 4, 9, 14, 21, 26, 31, 38, 43, 48, 55, 60, 65 are at common potential (system ground).
4. Tolerance on all dimensions is $\pm 1\%$ but not larger than ± 0.005 . Tolerance on 0.640 end pad to end pad dimension is ± 0.003 .

GULLWING LEADS



132 PIN LEADED CHIP CARRIER TYPE C3

