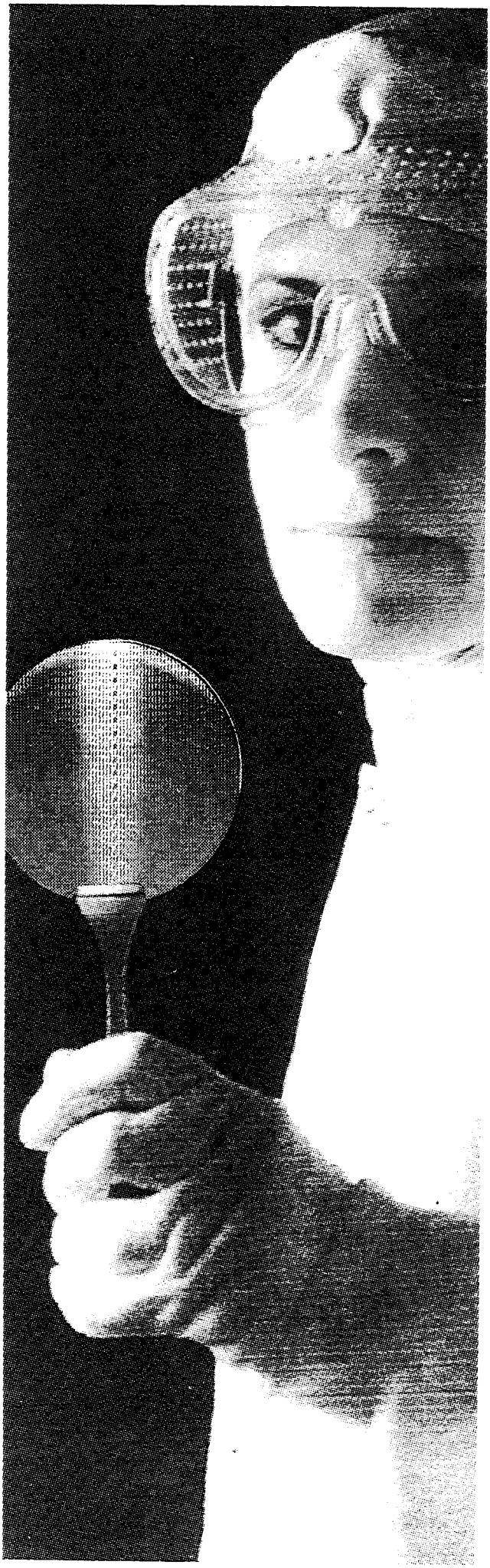
CMM-2
2.0 to 6.0 GHz GaAs MMIC Amplifier

- ❑ **High Gain: 12.5 dB**
- ❑ **Low Current: 35 mA @ 8V**
- ❑ **Small Size: 39 x 30 mils**
- ❑ **Directly Cascadable**
- ❑ **Self-Biased**
- ❑ **Single Power Supply**



Celeritek CMM-2 GaAs MMIC Amplifier

The CMM-2 is a 2 to 6 GHz GaAs MMIC amplifier. It is a two-stage feedback design which draws low current from a single power supply. Applications include oscillator buffers, RF and IF gain blocks and isolation amplifiers.

The CMM-2 is a very small chip which provides 12 dB of gain and 10 dBm of power from an 8 volt supply. The chip is directly cascadable with no additional components. The circuit's self-biasing feature provides excellent performance from a 5 to 8 volt supply. Care must be taken to isolate the input and output from external DC voltages. Good performance is available up to 12 GHz.

Celeritek MMIC's are fabricated on ion-implanted GaAs material with gold-based metalization. The FET gates are sub-half micron, tee cross-section construction. Air bridges are used for top level interconnection. Silicon nitride serves as capacitor dielectric and surface passivation. Mesa resistors are used for feedback and bias functions.

The CMM-2 is available in chip form. It can be screened to meet commercial, military Hi-Rel or space grade reliability requirements. Custom wafer qualification for special electrical and/or reliability requirements is also available.

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Specifications (T_A = 25°C, V_{DD} = 8V, 2-6 GHz)				
Parameters	**Units**	**Min**	**Typ**	**Max**
Small Signal Gain	dB	11.0	12.5	
Gain Flatness	±dB		0.5	1.0
Input VSWR	—		1.7:1	2.0:1
Output VSWR	—		2.0:1	2.5:1
Reverse Isolation	dB	25	30	
Gain Variation Over Temperature (-55 to +95°C)	±dB		0.75	1.00
Noise Figure	dB		5.5	7.0
1 dB Gain Compression Power Output	dBm	8	10	
Current	mA		35	50

Absolute Maximum Ratings

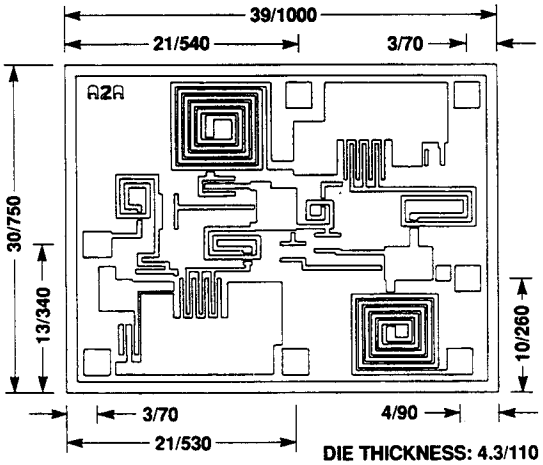
Parameter	Rating
Voltage	11V
Continuous Power Dissipation	1.25 W
Channel Temperature	+175°C
Storage Temperature	-65°C to +175°C
Mounting Temperature	+320°C
Input Power	+20 dBm
θ_{JC}	60°C/W

Die Attach and Bonding Procedures

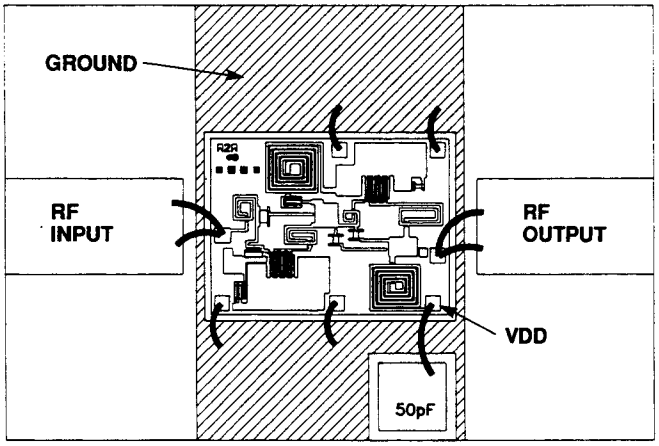
Die Attach: Conductive epoxy or preform die attach is recommended. For preform die attach: Preform: AuSn (80% Au, 20% Sn); Stage Temperature: 290°C, ±5°C; Handling Tool: Tweezers; Time: 1 min or less.

Wire Bonding: Wire Size: 0.7 to 1.0 mil in diameter (pre-stressed); Thermocompression bonding is preferred over thermosonic bonding. For thermocompression bonding: Stage Temperature: 250°C; Bond Tip Temperature: 150°C; Bonding Tip Pressure: 18 to 40 gms depending on size of wire.

Chip Diagram (Dimensions in Mils/µm)

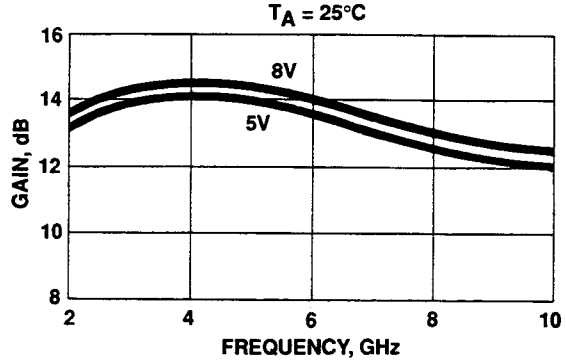


Bonding Diagram

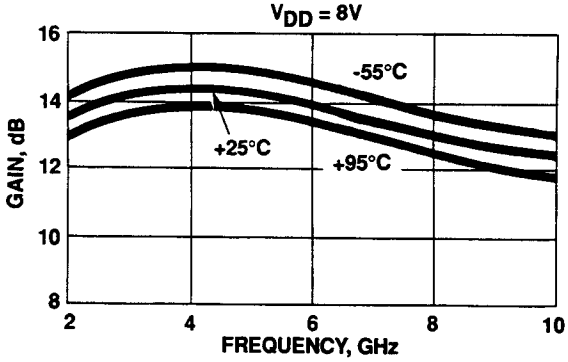


Typical Performance (T_A = 25°C)

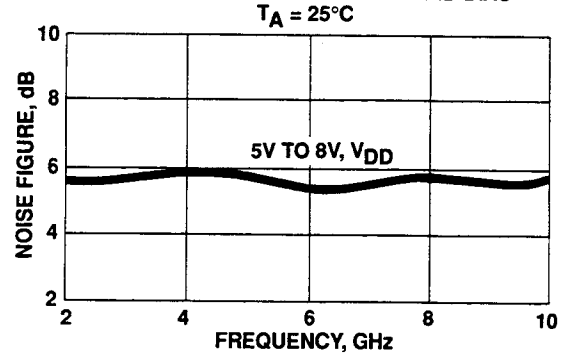
CMM-2
GAIN vs FREQUENCY AND BIAS
T_A = 25°C



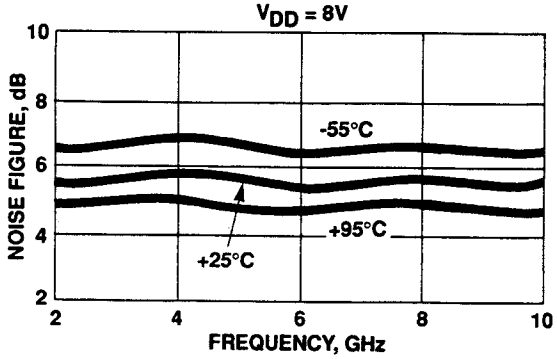
CMM-2
GAIN vs FREQUENCY AND TEMPERATURE
V_{DD} = 8V



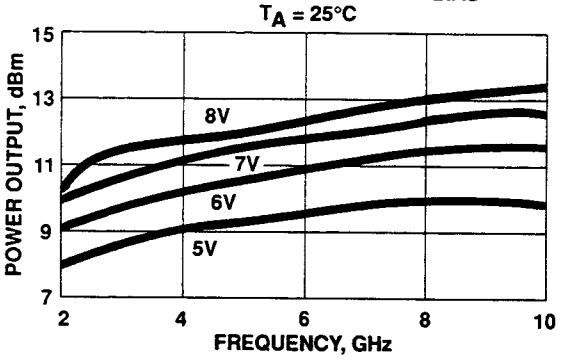
CMM-2
NOISE FIGURE vs FREQUENCY AND BIAS
T_A = 25°C



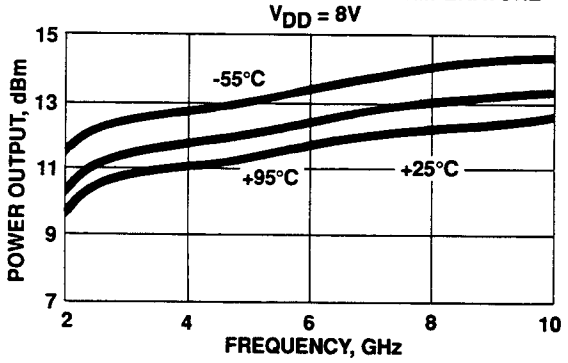
CMM-2
NOISE FIGURE vs FREQUENCY AND TEMPERATURE
V_{DD} = 8V



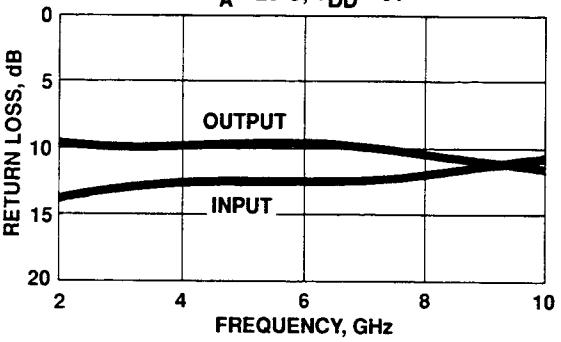
CMM-2
POWER vs FREQUENCY AND BIAS
T_A = 25°C



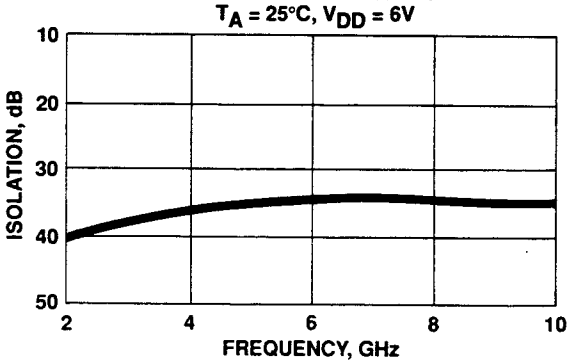
CMM-2
POWER vs FREQUENCY AND TEMPERATURE
V_{DD} = 8V



CMM-2
RETURN LOSS vs FREQUENCY
T_A = 25°C, V_{DD} = 6V



CMM-2
ISOLATION vs FREQUENCY
T_A = 25°C, V_{DD} = 6V



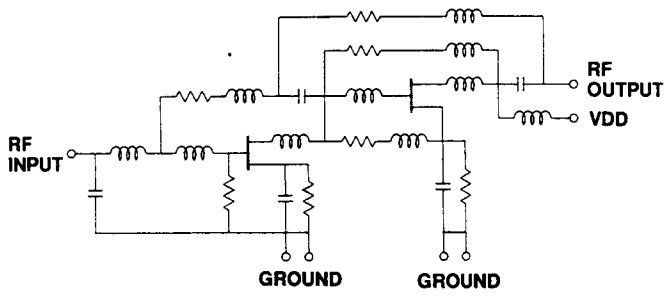
CMM-2 GaAs MMIC Amplifier

Typical Scattering Parameters, T_A = 25°C (S-Parameters Include Bonding Wire Parasitics)

CMM-2 V_{DD} = 8V

Frequency	S_{11}			S_{21}			S_{12}			S_{22}		
(GHz)	(dB)	(Mag)	(Ang)	(dB)	(Mag)	(Ang)	(dB)	(Mag)	(Ang)	(dB)	(Mag)	(Ang)
2.0	-14.2	0.194	-147.7	13.4	4.677	23.2	-40.6	0.009	26.6	-9.8	0.323	-166.0
3.0	-13.4	0.223	-163.4	14.1	5.070	-34.5	-37.7	0.013	24.1	-10.8	0.290	178.1
4.0	-12.6	0.234	-176.2	14.2	5.129	-78.4	-36.2	0.015	30.0	-10.1	0.312	160.5
5.0	-12.6	0.228	176.6	14.1	5.070	-116.1	-35.9	0.016	19.8	-10.0	0.317	143.7
6.0	-12.7	0.232	169.6	13.9	4.955	-150.9	-35.8	0.016	19.1	-9.8	0.322	129.2
7.0	-12.5	0.238	163.5	13.4	4.677	177.5	-35.6	0.017	21.2	-10.0	0.316	116.0
8.0	-12.1	0.248	157.0	13.0	4.467	148.1	-35.2	0.017	17.0	-10.5	0.298	104.5
9.0	-11.8	0.258	149.4	12.7	4.315	120.5	-35.0	0.018	14.7	-11.3	0.272	94.4
10.0	-11.6	0.264	137.8	12.4	4.169	94.3	-35.0	0.018	9.9	-12.1	0.247	84.4

Equivalent Circuit



Wafer Qualification Procedure

100% DC Test
100% Visual Insp.

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Sample Mechanical Evaluation

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Sample Circuit Performance Tests*

NF, Gain, P_{-1} dB, VSWR

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Reliability Assessment

*80% of tested samples must meet specifications for wafer acceptance.

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Specifications subject to change.

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