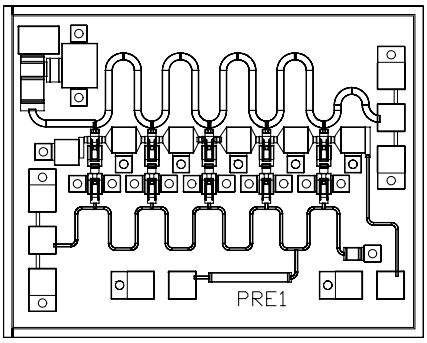
- **FEATURES**



  - DC – 23 GHz Frequency Bandwidth
  - 13 dB Small Signal Gain
  - 4 Vpp Output Voltage
  - -12 dB input/output return loss
  - Chip Size: 1.18 x 1.50 mm

- **DESCRIPTION AND APPLICATIONS**

The Filtronic Solid State FMA500 is a high-gain pre-driver pHEMT amplifier that operates from DC to 23 GHz. This five-stage travelling wave amplifier provides 13 dB nominal small signal gain and 4 V peak-to-peak NRZ output at bit rates to 12.5 Gb/sec. The FMA500 is designed as the pre-driver stage for OC-192 MZ modulator driver amplifiers for optical data communication applications, and can be cascaded with the FMA501 Driver MMIC to provide 30 dB of voltage gain. The FMA500 can also be used as an EA driver amplifier or as a transimpedance amplifier (TIA) for photoreceiver applications.

- **ELECTRICAL SPECIFICATIONS @ $T_{Ambient}$ = 25°C**

(V_{DD} = +4.0V, V_{GG} = -3.0V; V_{GC} = +1.5V; Z_{IN} = Z_{OUT} = 50Ω)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
3dB Operating Bandwidth	BW			23		GHz
Small Signal Gain	S_{21}			13		dB
Operating Current	I_{OP}			100		mA
Input Return Loss	S_{11}			-12		dB
Output Return Loss	S_{22}			-12		dB
Gain Control	GC	V_{GC} = 0V to 1.5V		6		dB
Group Delay Variation	$\Delta\tau_{grp}$	Over Bandwidth		±20		ps
Rise/Fall time, 20%-80%	$\tau_{R/F}$			20	30	ps
Output Voltage at Saturation	V_{OUT}	10Gb/sec, NRZ, V_{IN} = 2Vpp		4		V
Saturated Output Power	P_{SAT}	V_{IN} = 2Vpp		20		dBm

• ABSOLUTE MAXIMUM RATINGS

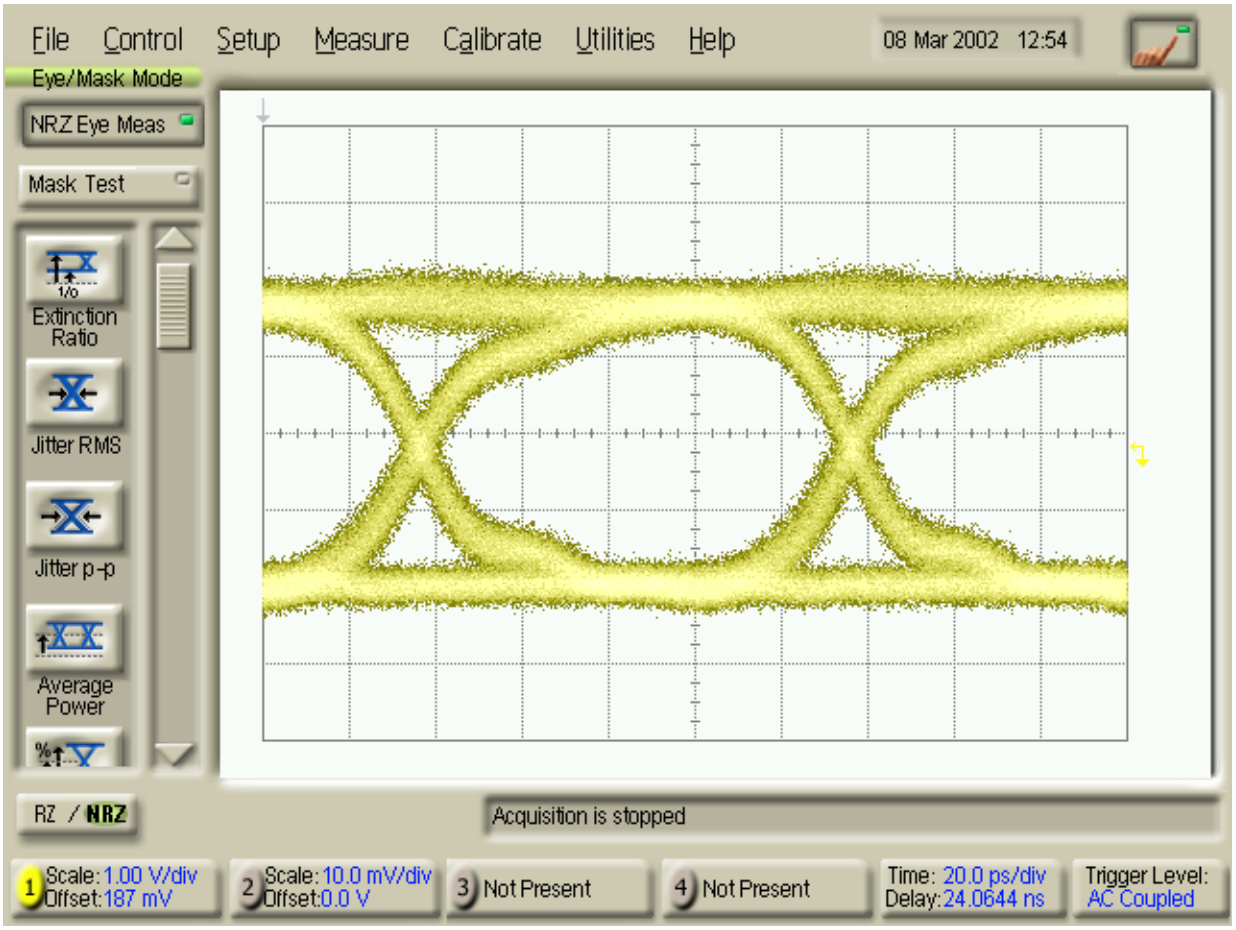
Parameter	Symbol	Test Conditions	Min	Max	Units
Drain Voltage	V_{DD}	$T_{Ambient}$ = 22 ± 3 °C		5.0	V
Operating Current	I_{OP}	$T_{Ambient}$ = 22 ± 3 °C		150	mA
RF Input Power	P_{IN}	$T_{Ambient}$ = 22 ± 3 °C		12	dBm
Channel Operating Temperature	T_{CH}	$T_{Ambient}$ = 22 ± 3 °C		150	ºC
Storage Temperature	T_{STG}	—	-65	165	ºC
Maximum Assembly Temperature (1 min. max.)	T_{MAX}	—		300	ºC

Notes:

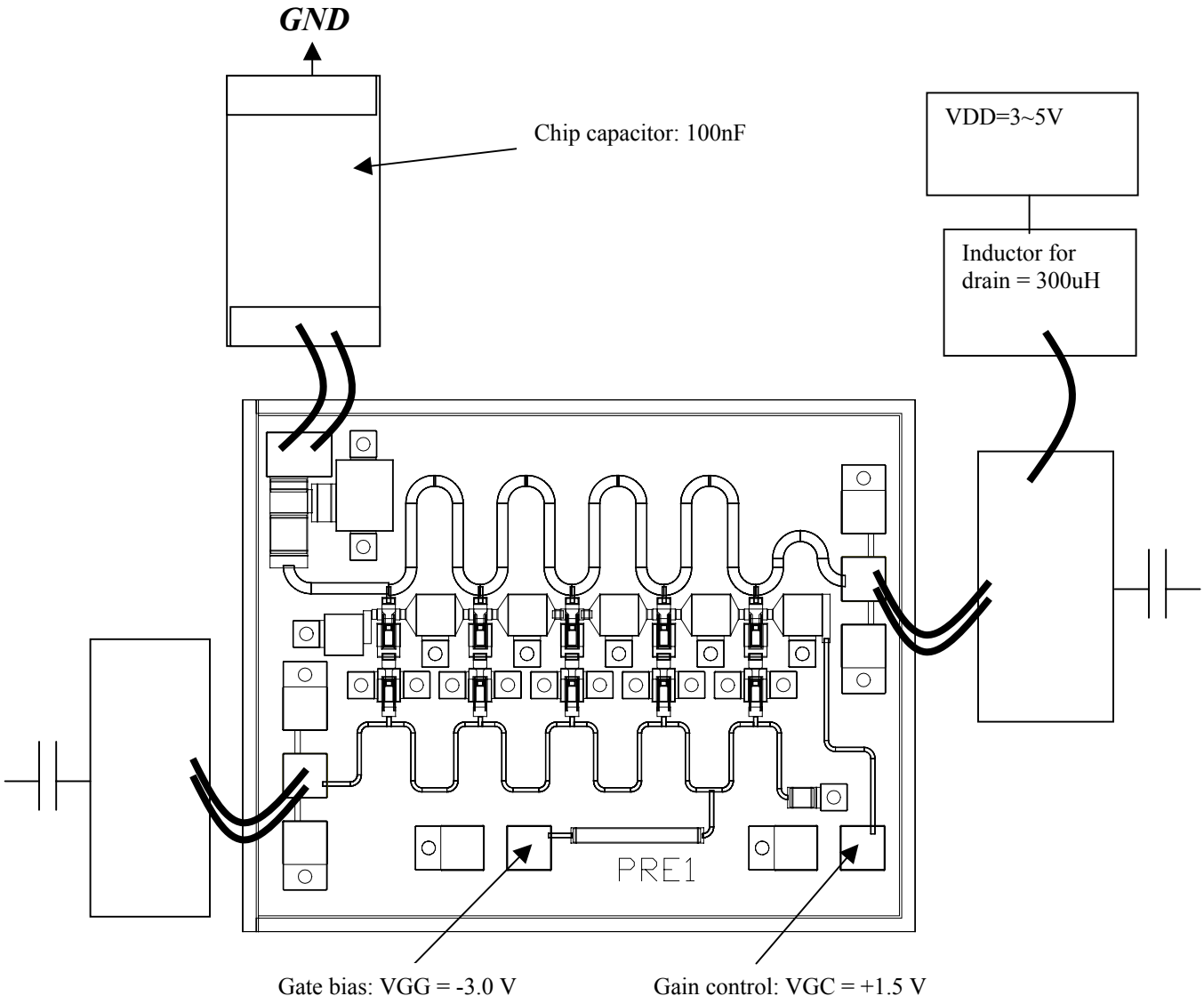
- Operating conditions that exceed the Absolute Maximum Ratings could result in permanent damage to the device.
- Recommended Continuous Operating Limits should be observed for reliable device operation.
- This PHEMT is susceptible to damage from Electrostatic Discharge. Proper precautions should be used when handling these devices.

• MEASURED PERFORMANCE: 10 Gb/s NRZ Eye Test

(V_{DD} = +4.0V, V_{GG} = -3.0V; V_{GC} = +1.5V; Z_{IN} = Z_{OUT} = 50Ω)



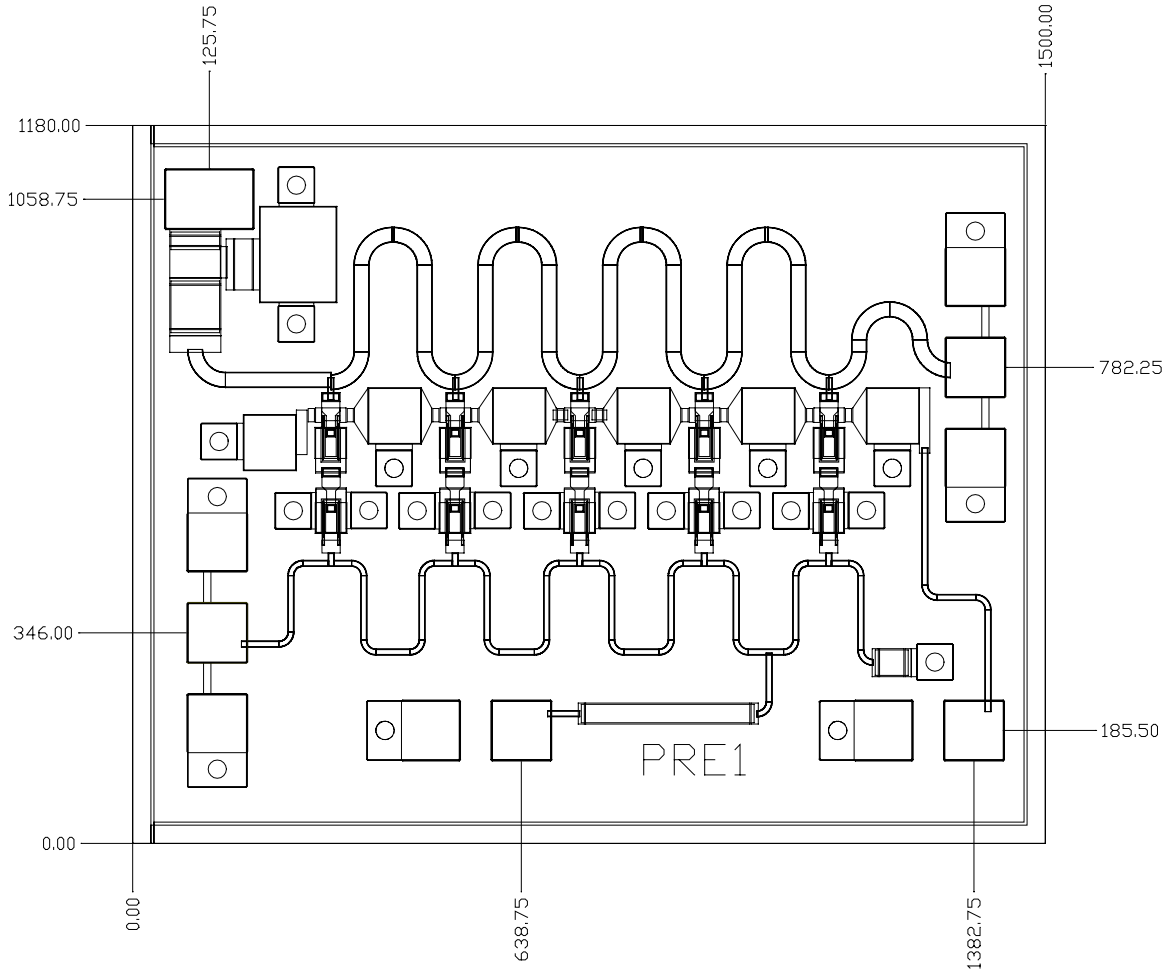
- **ASSEMBLY DIAGRAM**



Notes:

- Apply VGG first, then VGC and VDD.
- Disconnect VGC first, then VDD and VGG when turning off.
- Recommended lead bond technique is thermocompression wedge bonding with 0.001" (25µm) diameter wire. The bond tool force shall be 35-38 gram. Bonding stage temperature shall be 230-240°C, heated tool (150-160°C) is recommended. Ultrasonic bonding is not recommended.
- The recommended die attach is Ablebond silver epoxy, the stabilize bake temperature is set at 150°C for 45 minutes.
- Bond on bond or stitch bonds acceptable.
- Conductor over conductor acceptable. Conductors must not short.

- **MECHANICAL OUTLINE**



Notes:

- All units are in microns (µm).
- All pads are 100 X 100 μm^2.

- **HANDLING PRECAUTIONS**

To avoid damage to the devices care should be exercised during handling. Proper Electrostatic Discharge (ESD) precautions should be observed at all stages of storage, handling, assembly, and testing. These devices should be treated as Class 1A (0-500 V). Further information on ESD control measures can be found in MIL-STD-1686 and MIL-HDBK-263.

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