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Lucent Technologies
Bell Labs Innovations

LG1625AXF Laser Driver

Features

- High data-rate laser diode/LED driver
- Adjustable output current
- Operation up to 3 Gbits/s
- Single –5.2 V power supply
- 90 ps rise and fall times

Applications

- SONET/SDH transmission systems
- SONET/SDH test equipment
- Optical transmitters

Description

The LG1625AXF is a gallium-arsenide (GaAs) laser diode driver to be used with direct modulated laser diodes in high-speed nonreturn-to-zero (NRZ) transmission systems. The device is made in a high-performance 0.9 μm gate GaAs heterojunction FET technology that utilizes high-density MIM capacitors, airbridge interconnect, and NiCr film precision resistors.

The device contains three cascaded stages, operates with a single –5.2 V power supply and accepts ECL level inputs. Voltages control the modulated output current and laser prebias current. The LG1625AXF is available in a 24-lead hermetic, gull-wing package.

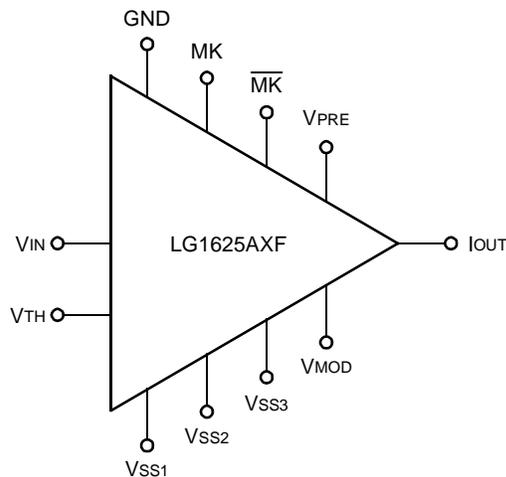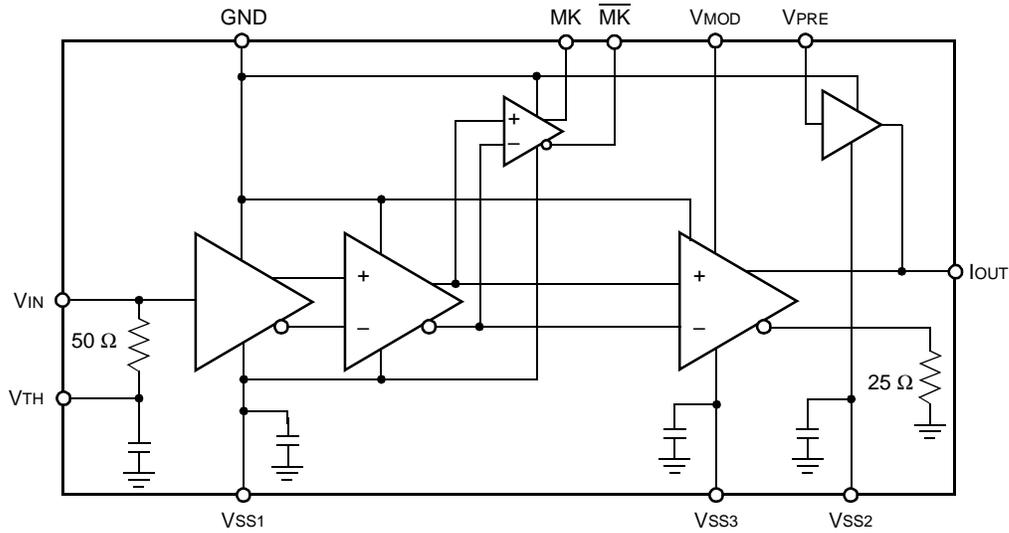A test fixture (TF1006A) with SMA connectors is available to allow quick evaluation of the LG1625AXF.
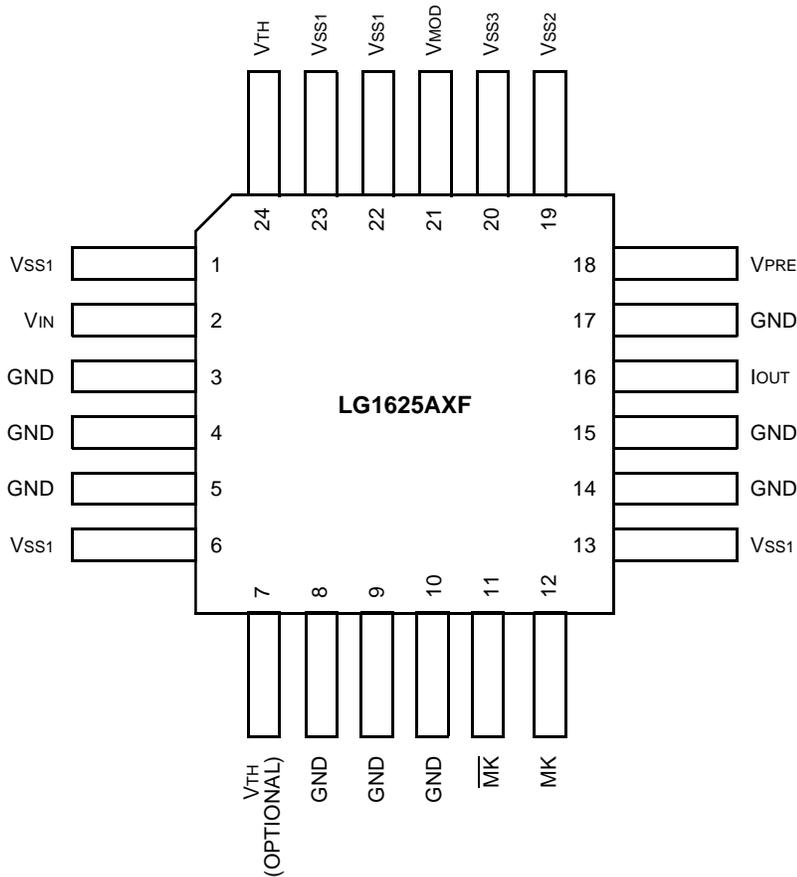

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Figure 1. Functional Diagram

Pin Information

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Figure 2. LG1625AXF Die Block Diagram

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Note: Figure 3 is not to scale.

Figure 3. LG1625AXF Package Pinout

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Pin Information (continued)

Table 1. LG1625AXF Pin Description

Pin	Symbol	Type[*]	Name/Definition
1, 6, 13, 22, 23	V_{SS1}	P	**V_{SS1} Supply.** –5.2 V power supply pin.
2	V_{IN}	I	**Data Input.**
3, 4, 5, 8, 9, 10, 14, 15, 17	GND	P	**Ground.**
7, 24	V_{TH}[†]	I	**Threshold Control.** Input (eye crossing).
11	$\overline{MK}$	O	**Complementary Mark Density Output.**
12	MK	O	**Mark Density Output.**
16	I_{OUT}	O	**Output.** dc couple to laser cathode.
18	V_{PRE}	I	**Prebias Control Input.**
19	V_{SS2}	P	**V_{SS2}.** –5.2 V supply for output prebias.
20	V_{SS3}	P	**V_{SS3}.** –5.2 V supply for output modulation.
21	V_{MOD}	I	**Modulation Current Control Input.**

* I = input, O = output, P = power.
† Connection to V_{TH} for threshold adjustment should be made through pin 24. Pin 7 is made available for additional bypassing of V_{TH} (See Figure 5 on page 6, Typical Test Circuit).

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent or latent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this device specification. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Table 2. Absolute Maximum Ratings (at T_A = 25 °C unless otherwise specified)

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{SS}	—	–5.95	V
Storage Temperature	T_{stg}	–40	125	°C
Operating Case Temperature Range	T_C	0	75	°C
Input Voltage	V_I	GND	V_{SS}	V
Power Dissipation	P_D	—	1	W

Handling Precautions

Although protection circuitry has been designed into this device, proper precautions should be taken to avoid exposure to electrostatic discharge (ESD) during handling and mounting. Lucent employs a human-body model (HBM) and charged-device model (CDM) for ESD-susceptibility testing and protection design evaluation. ESD voltage thresholds are dependent on the circuit parameters used in the defined model. No industry-wide standard has been adopted for the CDM. However, a standard HBM (resistance = 1500 Ω, capacitance = 100 pF) is widely used and, therefore, can be used for comparison purposes. The HBM ESD threshold presented here was obtained by using these circuit parameters.

Table 3. ESD Threshold Voltage

Human-Body Model ESD Threshold	
Device	Voltage
LG1625AXF	$\geq$200 V

Mounting and Connections

Certain precautions must be taken when using solder. For installation using a constant temperature solder, temperatures of under 300 °C may be employed for periods of time up to 5 seconds, maximum. For installation with a soldering iron (battery operated or nonswitching only), the soldering tip temperature should not be greater than 300 °C and the soldering time for each lead must not exceed 5 seconds.

Electrical Characteristics

$T_A = 25\ ^{\circ}C$, $V_{SS1} = V_{SS2} = V_{SS3} = -5.2$ V, $V_{TH} = -1.3$ V, $V_{MOD} = -3.4$ V, $R_L = 25\ \Omega$, data input = 600 mVp-p.

Minimum and Maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information purposes only and are not part of the testing requirements. Stresses in excess of the absolute maximum ratings can cause permanent damage to the device.

Table 4. Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Data Input Voltage	V_{IN}p-p	300	600	2000	mV
Voltage Control for Output Modulation Current	V_{MOD}	−5.5	—	−3.0	V
Output Modulation Current Minimum Maximum*	$I_{MOD\ LOW}$ $I_{MOD\ HIGH}$	— 55	0 65	2 —	mA mA
Voltage Control for Prebias Current	V_{PRE}	−5.5	—	−3.0	V
Output Prebias Current Minimum Maximum†	$I_{PRE\ LOW}$ $I_{PRE\ HIGH}$	— 30	0 40	0.5 —	mA mA
Output Rise & Fall Times (20%—80%) Rise Fall	T_{RISE} T_{FALL}	— —	90 90	— —	ps ps
Power Supply Voltage	V_{SS1}, V_{SS2}, V_{SS3}	−4.9	−5.2	−5.5	V
Power Supply Current‡	I_{SS1}	50	100	120	mA

* Maximum modulation at maximum V_{MOD}

† Maximum prebias at maximum V_{PRE}

‡ Excludes I_{PRE} and average I_{MOD}. Power supply current I_{SS2} (relating to prebias) is dependant on V_{PRE}. Power supply current I_{SS3} (relating to modulation) is dependant on V_{MOD}
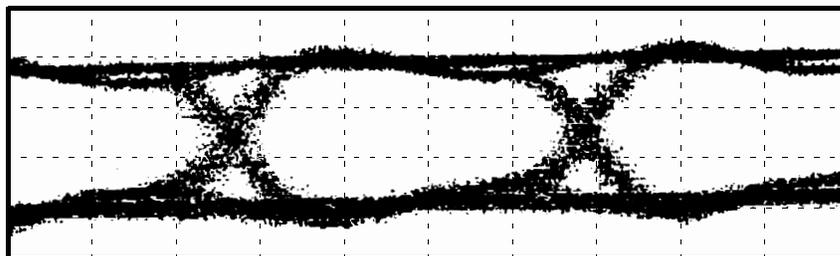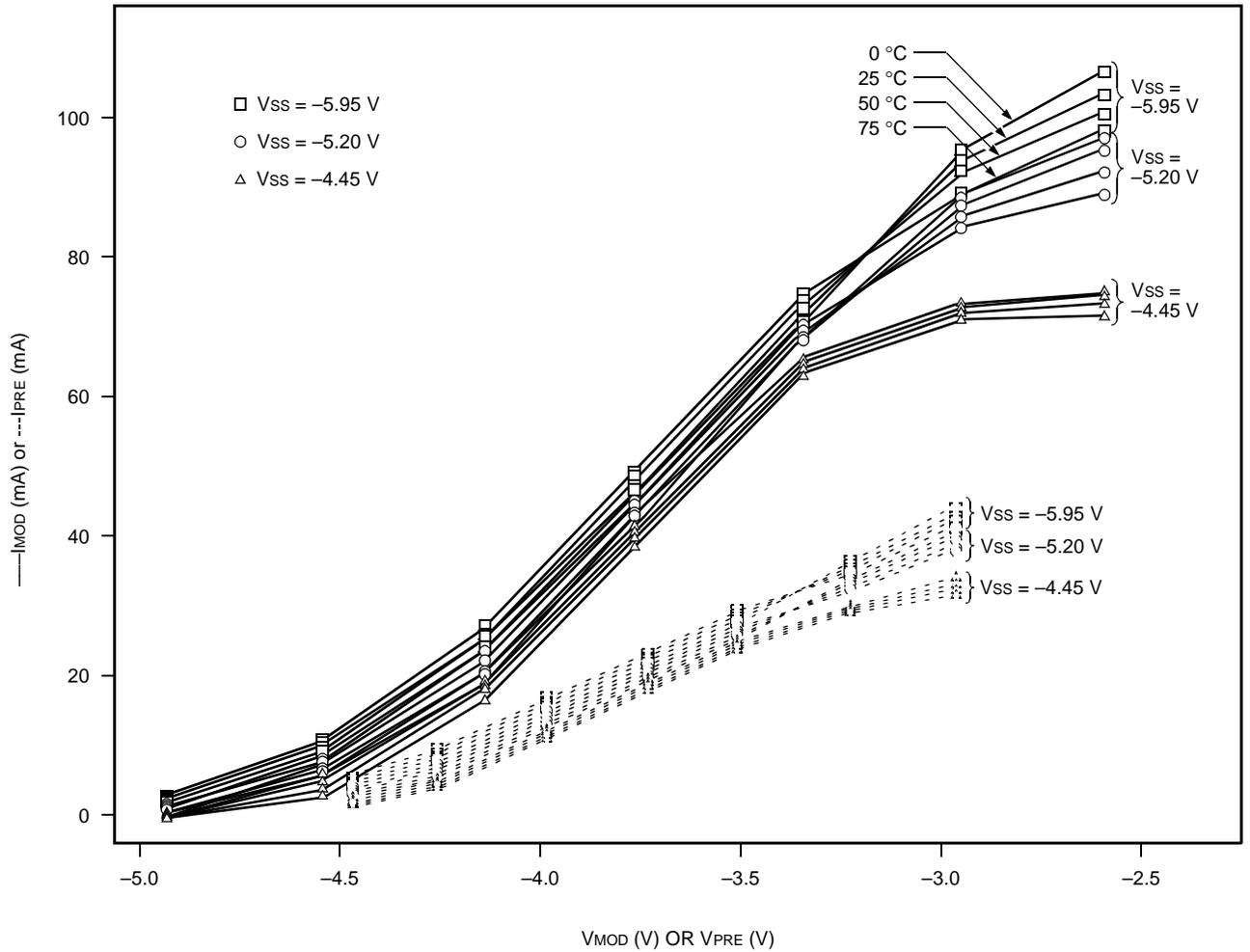

HORZ.: 100 pS/DIV., VERT.: 15 mA/DIV.

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**Figure 4. Typical Eye Diagram of I_{MOD}**

Test Circuit

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Notes:

GND pins 3, 4, 5, 8, 9, 10, 14, 15, 17.
VSS1 pins 1, 6, 13, 22, 23.

Figure 5. LG1625AXF Typical Test Circuit

LG1625AXF Application Notes

- VSS bypass capacitors should be mounted close to the package.

- 5000 Ω potentiometer is typically set for 2500 Ω. This establishes an approximate −1.3 V VTH which will track with VSS.

- Mark density (MK and $\overline{\text{MK}}$) outputs are terminated with 1 kΩ pull-up resistors.

- IMOD and IPRE can be measured and used to control VMOD and VPRE.

Typical Performance Characteristics

Figure 6. Output Modulation Current I$_{MOD}$ vs. the External Control Voltage V$_{MOD}$ or Output Prebias Current I$_{PRE}$ vs. the External Control Voltage V$_{PRE}$

Typical Performance Characteristics (continued)
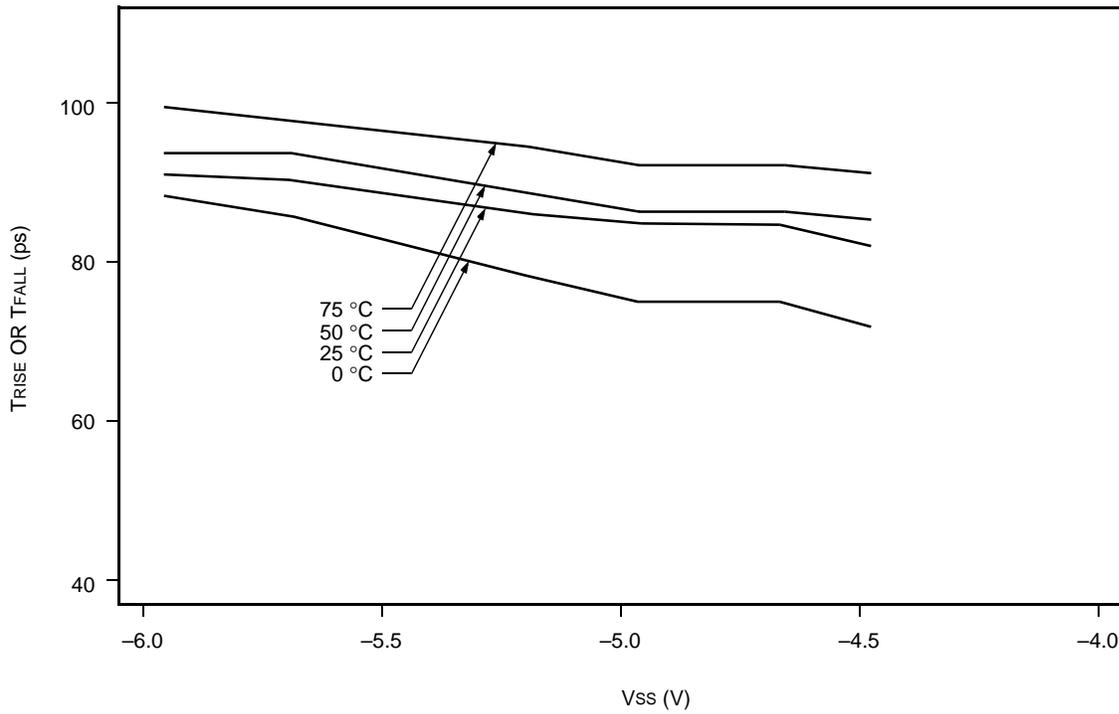
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Figure 7. Typical T$_{RISE}$ or T$_{FALL}$ vs. V$_{SS}$ for I$_{MOD}$ = 40 mA
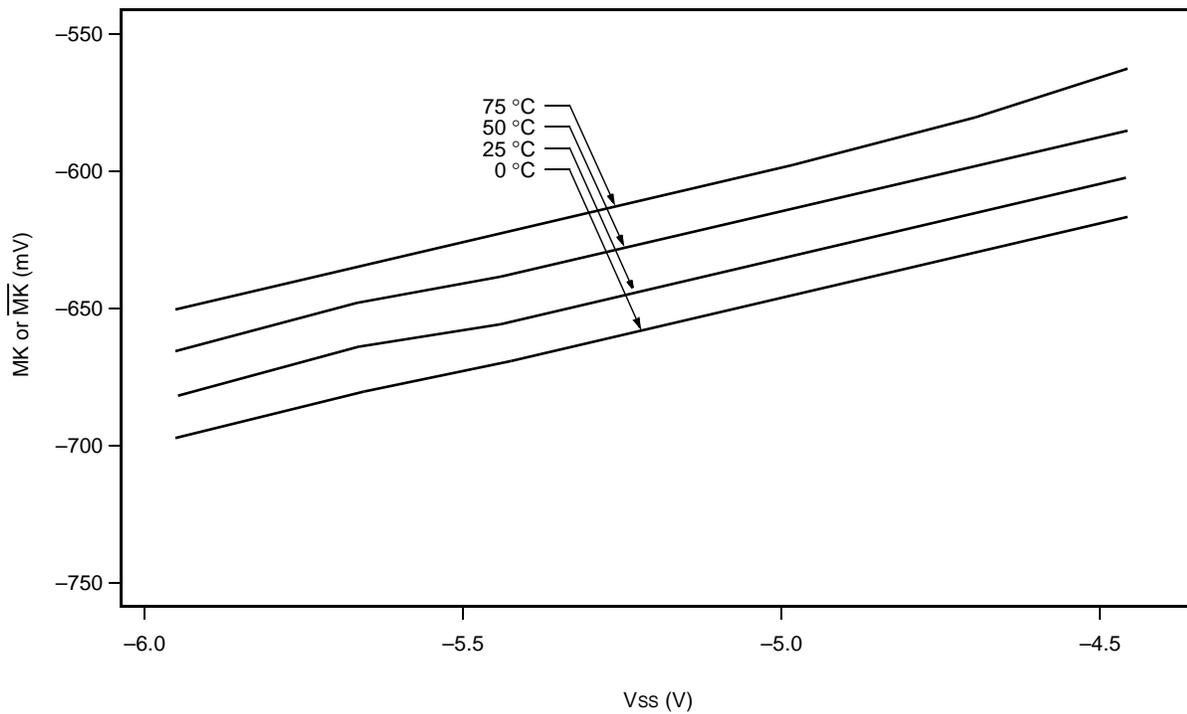
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Figure 8. Typical MK or $\overline{MK}$ vs. V$_{SS}$ for I$_{MOD}$ = 40 mA

Outline Diagram

24-Pin, Gull-Wing, Surface-Mount Package

Dimensions are in inches. Tolerance is ±0.005 inches unless otherwise noted.

LUCENT
1625AXF
XXXXXX

0.364 SQ.
0.260
0.050
0.012
0.010 BEFORE SOLDER DIP
0.604 ±0.015 TYP.
R0.010
0.065
0.008 BEFORE SOLDER DIP
0.074
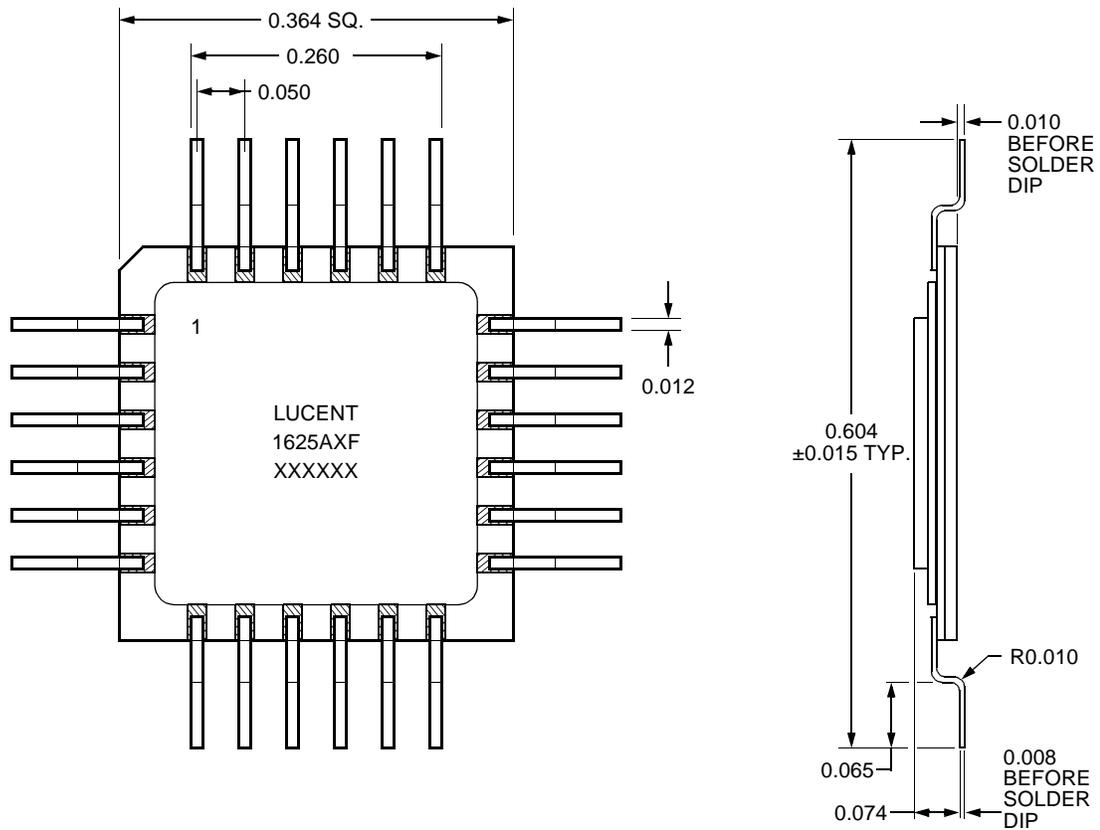
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Ordering Information

Device	Type	Comcode (Ordering Number)
LG1625AXF	24-Lead Gull Wing	107529067
TF1006A	Test Fixture	106733371

Appendix

The test fixture mentioned in the data sheet is sold separately and is described in detail below.
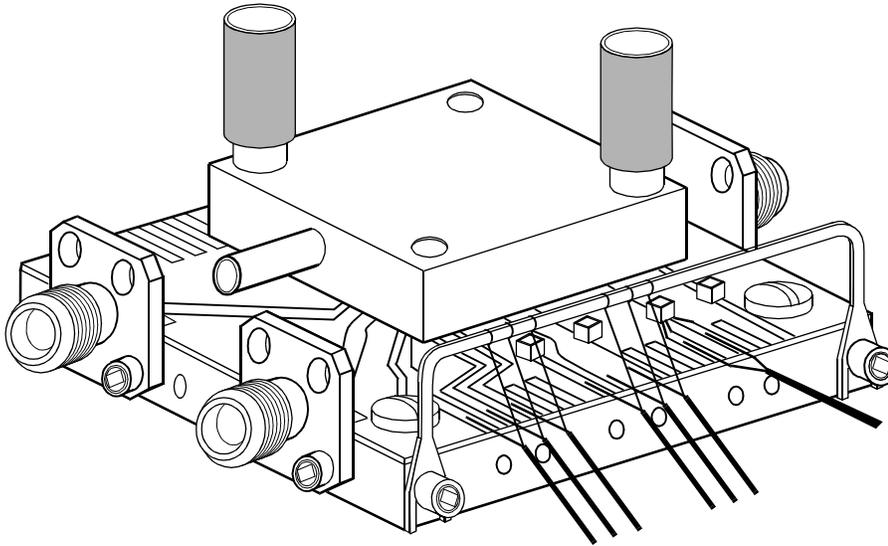
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Figure 9. TF1006A Test Fixture

TF1006A Test Fixture Features

- SMA connectors
- Easy package placement
- Good RF performance

Test Fixture Functional Description

The TF1006A test fixture is used to characterize 24-lead gullwing packages for high-speed fiber-optic communications. The fixture is a metallized substrate (PTFE filled material) fastened to a brass base. The package leads make contact to the microstrip lines on the fixture through use of a pressure ring and two thumb screws.

Three RF connectors are provided for connections to the input and outputs. BNC connectors are provided on soldered leads for dc bias lines.

The TF1006A is preassembled and fully tested prior to shipment.

Appendix (continued)

Test Fixture Functional Description (continued)
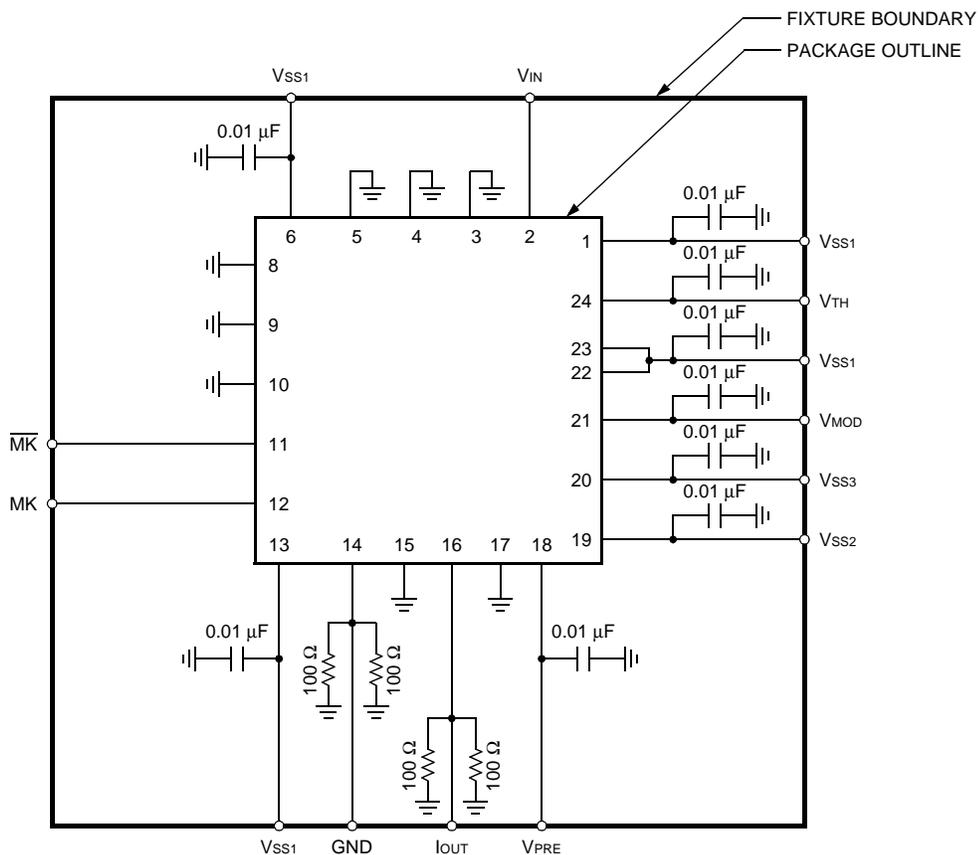
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Figure 10. TF1006A Electrical Diagram

Before Use of Test Fixture

- Due to possible stress during shipment, SMA connectors may be misaligned.
- Check each SMA for continuity.
- If necessary, realign and retighten with a 5/64 in. hex key wrench.

Instructions for Use of Test Fixture

A pair of flat-tip tweezers can be used to insert or remove a package from the test fixture. Always wear a grounding strap to prevent ESD.

1. To insert a package, remove the two thumb screws and gently lift the pressure ring off of the test fixture.

2. Place the pressure ring, cavity side up, on a flat ESD safe surface.

3. Connect the metal tube to a suitable vacuum source with flexible tubing.

4. Place the package, lid down, on a flat ESD safe surface. Locate pin 1 on the package.

Appendix (continued)

Instructions for Use of Test Fixture (continued)

5. Insert the package into the pressure ring (lid down) with pin 1 located next to the orientation mark and turn on the vacuum. The vacuum will retain the package in the pressure ring during the following steps.

6. Align the vertically conductive material on the circuit board.

7. Place the pressure ring down over the alignment pins and gently tighten the thumb screws.

8. Remove vacuum, if desired.
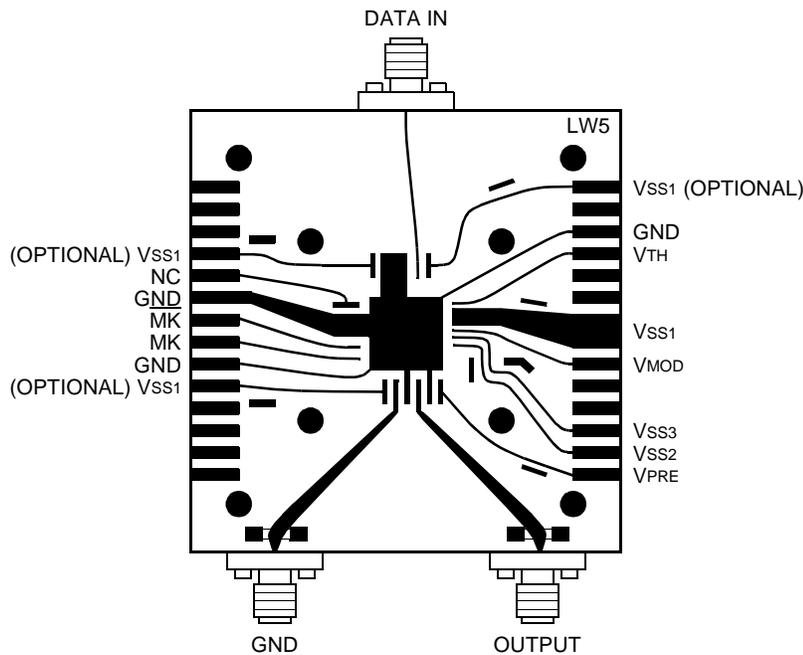
Note: Pressure ring not shown.

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Figure 11. TF1006A Connector Assignment

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