



an Intel company

General Information

GD16511 is a wide bandwidth, limiting amplifier designed for:

- ◆ SDH STM-16
 - ◆ SONET OC-48
- optical communication systems.

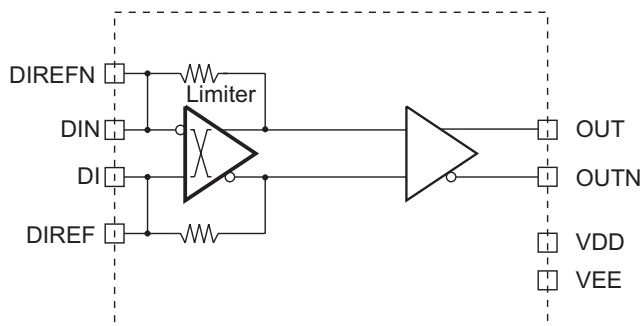
It features a linear gain of at least 28 dB and a 3 dB bandwidth larger than 3 GHz, measured in a 50 Ω system.

GD16511 has been measured together with a 2.5 Gbit/s *Clock and Data Recovery* (CDR) circuit, and error free operation has been measured down to below 3 mV_{PP} input signal (10^{-9} BER).

The amplifier allows for input signals from 1 mV_{PP} to above 1 V_{PP}.

GD16511 is manufactured in a Silicon Process and uses a single positive or negative 5 V supply with a typical power dissipation of 0.13 W.

GD16511 is delivered in a TQFP 32 Lead 5 × 5 mm plastic package with exposed heat slug for enhanced VEE connection.



2.5 Gbit/s Limiting Amplifier GD16511

Preliminary

Features

- 30 dB gain (typ.).
- Large dynamic range.
- 3 dB bandwidth above 3 GHz.
- Differential loop through inputs.
- Differential CML outputs.
- Operates up to 3.5 Gbit/s.
- Low power consumption: 0.13 W typ.
- Small 5 × 5 mm plastic package.

Applications

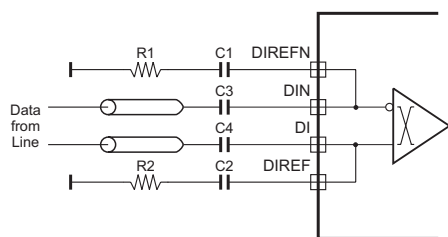
- Limiting amplifier for optical communication systems:
 - SDH STM-16
 - SONET OC-48
- Pulse shaper.
- Datacom up to 3.125 Gbit/s.

Application Information

Inputs

The inputs of GD16511 may be either AC or DC coupled. In either case input termination is made through the pins DIREF / DIREFN which must be terminated through the external resistors (R1 and R2) and de-coupled to ground with capacitors (C1 and C2), as shown in the Figure 1 below.

If the inputs are AC coupled GD16511 features an internal offset cancelling DC feedback. Because of the voltage division between the capacitors C3 and C1, (which must have the same value) on DI / DIREF and C4 and C2 (which also must have the same value) on DIN / DIREFN, the lower cut-off frequency is in the kHz range. Notice that the offset cancellation will only work if DIREF and DIREFN are not shorted together, and if the inputs are AC coupled, as shown in the Figure 1 below.



$$V_{diff} = |V_{DI} - V_{DIN}|$$

$$V_{CM} = \frac{V_{DI} + V_{DIN}}{2}$$

Figure 1. AC Coupled Input

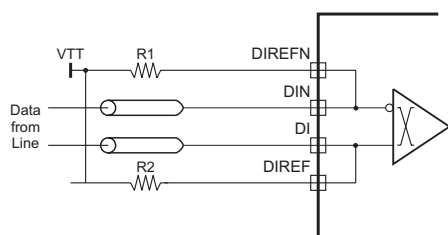
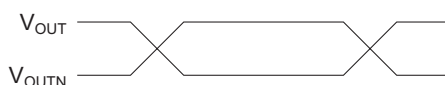
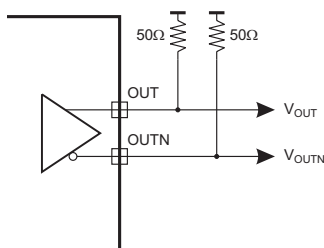


Figure 2. DC Coupling for Large Input Amplitude

Outputs

The outputs of GD16511 are open collectors (CML) and must be terminated to VDD via an external resistor matching the external transmission line impedance. Best performance is typically achieved using a 50 Ω termination resistor (please refer to Figure 3 below), however the voltage gain may be adjusted by using a different termination resistor (and characteristic transmission line impedance).



$$V_{diff} = |V_{OUT} - V_{OUTN}|$$

$$V_{CM} = \frac{V_{OUT} + V_{OUTN}}{2}$$

Figure 3. DC Coupled Output with 50 Ω Termination

AC coupling of the outputs are possible by using a resistor of 300 Ω to VDD for the DC return path and AC couple e.g. a transmission line terminated with its characteristic impedance, see Figure 4 below.

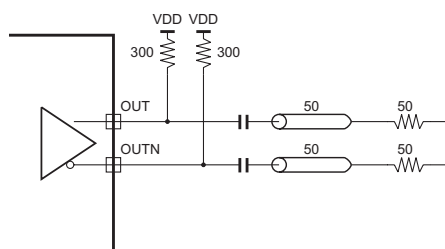


Figure 4. AC Coupled Output

Pin List

Mnemonic:	Pin No.:	Pin Type:	Description:
DI, DIN	6, 4	Anl. Input	Data inputs. If AC coupled the inputs are self biased.
DIREF, DIREFN	7, 3	Anl. Input	Loop through termination pins for data inputs.
OUT, OUTN	21, 20	CML	CML output pins. The outputs require an external path to VDD.
VDD	2, 5, 8, 9, 19, 22, 27, 30, 32	PWR	Ground pins.
VEE	1, 10, 11, 12, 13, 14, 15, 16, 17, 18, 23, 24, 25, 26, 28, 29, 31	PWR	Supply pins.
Heat sink	Package backside		Connected to VEE.

Package Pinout

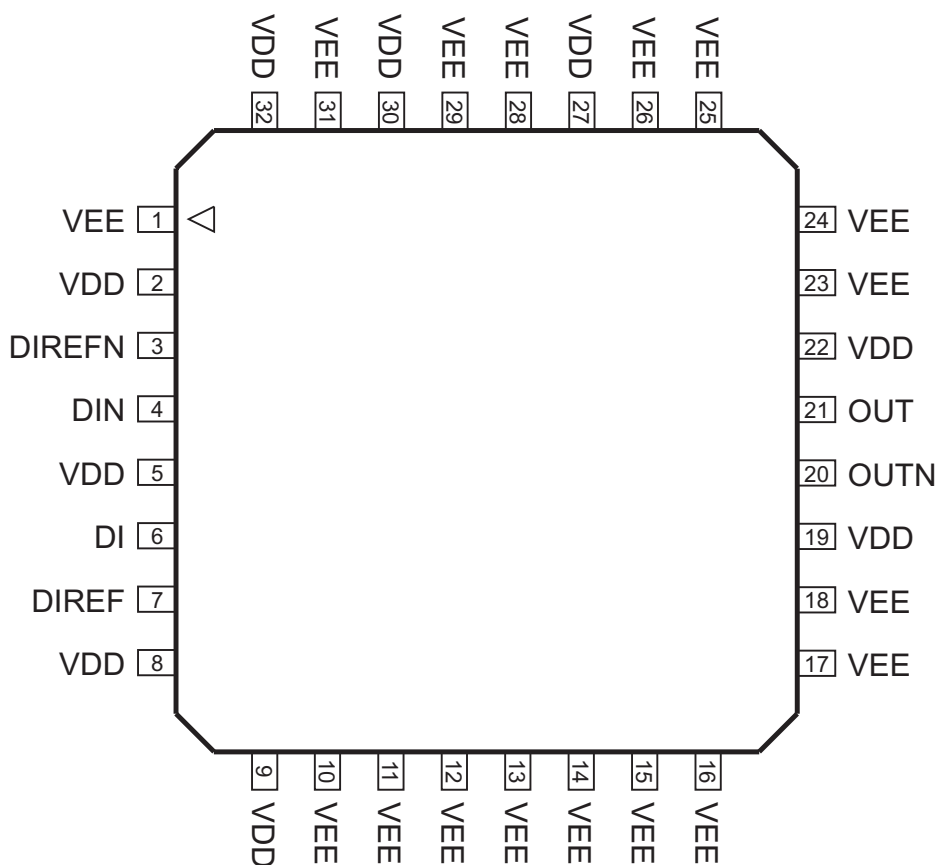


Figure 5. Package Pinout, 32 pin - Top View

Maximum Ratings

These are the limits beyond which the component may be damaged.

All voltages in table is referred to VDD.

All currents are defined positive out of the pin.

Symbol:	Characteristic:	Conditions:	MIN.:	TYP.:	MAX.:	UNIT:
V_{EE}	Negative Supply		-6		0	V
V_{CMLT}	CML Resistor Termination Voltage		V_{EE}		0	V
$V_{O\ CML}$	CML Output Voltage		V_{EE}		0	V
$I_{O\ CML}$	CML Output Current	Note 1	-10		+1	mA
T_J	Junction Temperature		-55		+125	°C
T_S	Storage Temperature		-65		+150	°C

Note 1: Nominal supply voltages.

Electrical Characteristics

$T_{CASE} = -40\ ^\circ\text{C}$ to $85\ ^\circ\text{C}$.

Specifications are tested at $85\ ^\circ\text{C}$. Performance at lower temperatures has been shown to be better in engineering samples.

All voltages in table are referred to VDD

All currents are defined positive out of pin.

Symbol:	Characteristic:	Condiions:	MIN.:	TYP.:	MAX.:	UNIT:
V_{EE}	Negative supply voltage		-5.5	-5.0	-4.5	V
I_{EE}	Supply current			25		mA
$V_{diff\ DI,DIN}$	Input voltage for DI, DIN	Note 4, 5			1.0	V
$V_{CM\ DI,DIN}$	Common mode range for DC coupled data input	DC coupled inputs Note 6	-2.0	-1.3	-0.2	V
$V_{DI,DIN}$	Input offset voltage				1	mV
$V_{OUT,OUTN}$	Output voltage swing	Note 1, 2, 5	0.3	0.4		V
$V_{LO\ OUT,OUTN}$	Minimum voltage on outputs		-1.2			V
t_r, t_f	Output rise and fall times (10 - 90%)	Note 1, 2			100	ps
$D_{OUT,OUTN}$	Output duty cycle variation		45	50	55	%
G	Small signal gain	Note 1, 3	28	32	35	dB
f_{3dB}	3 dB bandwidth	Note 1, 3	3.0	3.5		GHz

Note 1: Output externally terminated with $50\ \Omega$ to VDD.

Note 2: Limiting operation.

Note 3: Linear operation.

Note 4: Single ended or differential voltage. Defined as $|V_{DI} - V_{DIN}|$, see [Figure 1](#).

Note 5: Defined as $|V_{OUT} - V_{OUTN}|$, see [Figure 2](#).

Note 6: Defined as $\frac{V_{DI} + V_{DIN}}{2}$, see [Figure 1](#).

Package Outline

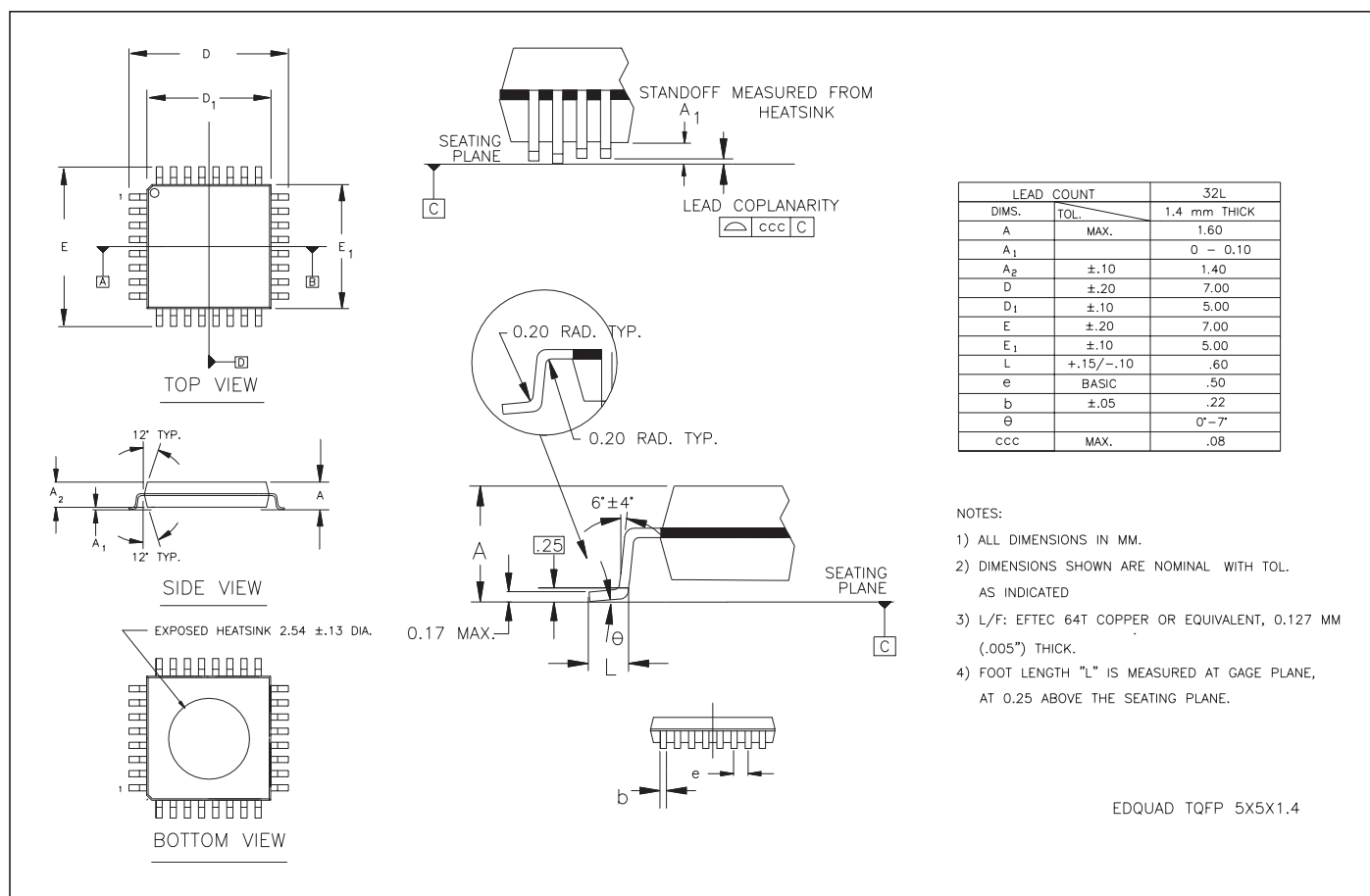


Figure 6. Package 32 pin

Ordering Information

Please order as specified below:

Product Name:	Intel Order Number:	Package Type:	Case Temperature Range:
GD16511-32BA	FAGD1651132BA MM#: 836058	32pin L TQFP	-40...85 °C

GIGA

an Intel company

Mileparken 22, DK-2740 Skovlunde
Denmark

Phone : +45 7010 1062

Fax : +45 7010 1063

E-mail : sales@giga.dk

Web site : <http://www.intel.com/ixa>

Please check our Internet web site
for latest version of this data sheet.

The information herein is assumed to be reliable. GIGA assumes no responsibility for the use of this information, and all such information shall be at the users own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. GIGA does not authorise or warrant any GIGA Product for use in life support devices and/or systems.

Distributor:

GD16511, Data Sheet Rev.: 5 - Date: 24 July 2001

Copyright © 2001 GIGA ApS
An Intel company
All rights reserved