

43Gbps TIA + Limiting Amplifier

Features

- - 3dB Bandwidth: 25 GHz
- Z_t: Single 2k ohm
- Differential Input

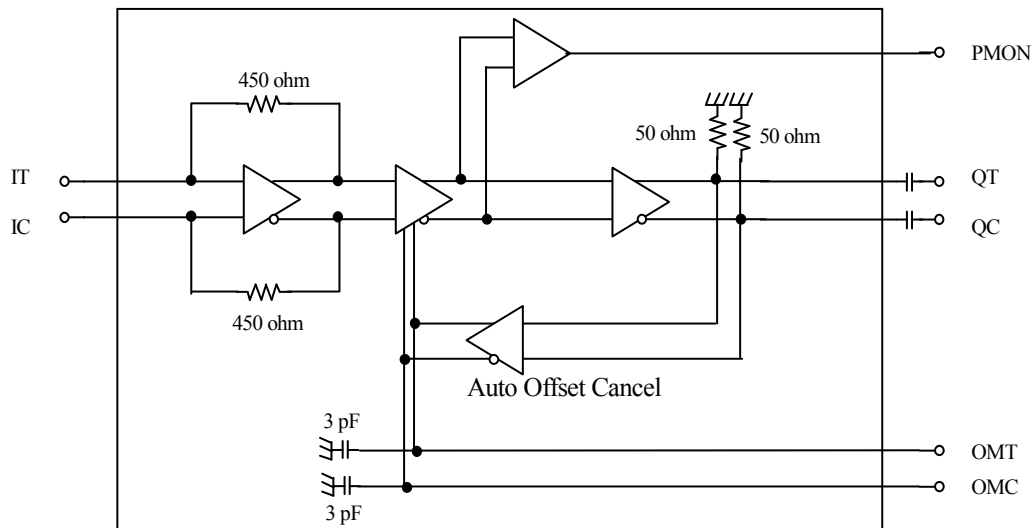
General Description

The NLR0613AXX is an ultra-fast InP HBT TIA + Limiting Amplifier frequency range extending from DC to 25 GHz. The IC is fabricated using an InP HBT process. The NLR0613AXX is provided in a bare die.

Applications

- O/E photo receiver of 43Gbps DQPSK optical communication system.

Functional Diagram



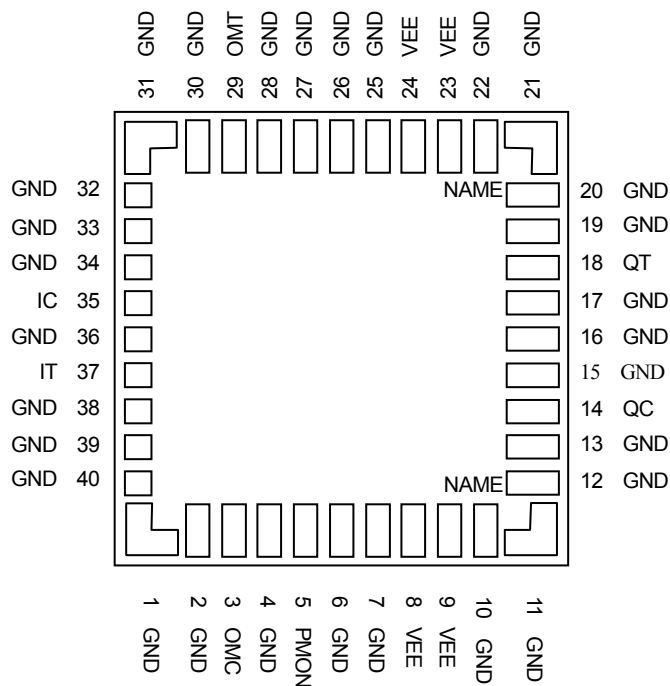
Connection Table

No.	NAME	FUNCTION	No.	NAME	FUNCTION
1	GND	Ground (0.0 V)	21	GND	Ground (0.0 V)
2	GND	Ground (0.0 V)	22	GND	Ground (0.0 V)
3	OMC	AOC ⁽²⁾ Monitor (Complementary)	23	VEE	Power Supply (-4.5 V)
4	GND	Ground (0.0 V)	24	VEE	Power Supply (-4.5 V)
5	PMON	Power Monitor	25	GND	Ground (0.0 V)
6	GND	Ground (0.0 V)	26	GND	Ground (0.0 V)
7	GND	Ground (0.0 V)	27	GND	Ground (0.0 V)
8	VEE	Power Supply (-4.5 V)	28	GND	Ground (0.0 V)
9	VEE	Power Supply (-4.5 V)	29	OMT	AOC ⁽²⁾ Monitor (True)
10	GND	Ground (0.0 V)	30	GND	Ground (0.0 V)
11	GND	Ground (0.0 V)	31	GND	Ground (0.0 V)
12	GND	Ground (0.0 V)	32	GND	Ground (0.0 V)
13	GND	Ground (0.0 V)	33	GND	Ground (0.0 V)
14	QC ⁽¹⁾	Data Output (Complementary)	34	GND	Ground (0.0 V)
15	GND	Ground (0.0 V)	35	IC	Data Input (Complementary)
16	GND	Ground (0.0 V)	36	GND	Ground (0.0 V)
17	GND	Ground (0.0 V)	37	IT	Data Input (True)
18	QT ⁽¹⁾	Data Output (True)	38	GND	Ground (0.0 V)
19	GND	Ground (0.0 V)	39	GND	Ground (0.0 V)
20	GND	Ground (0.0 V)	40	GND	Ground (0.0 V)

Notes

- (1) AC Coupling, Terminate unused output connectors to GND through 50-ohm resistors.
- (2) AOC: Auto Offset Cancel.

Connection Diagram (Top View)



Absolute Maximum Ratings

SYMBOL	PARAMETER	RATING	UNIT
VEE	Power Supply Voltage (VEE)	-6.0 to +0.2	V
I _{in}	Applied Current at Data Input (IT, IC)	3.5	mApp (1)
Topmcb	Operating Chip Bottom Temperature Range	-5 to 110	°C
Tstor	Storage Temperature	-40 to +125	°C

Note

(1) Short time.

Recommended Operating Conditions

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
VEE	Power Supply	-4.75	-4.50	-4.25	V
Topcb	Operating Chip Bottom Temperature	0	25	80	°C
I _{inmax}	Maximum Applied Current at Data Input (IT, IC)			2.0	mApp
IT, IC	Data Input Interface (IT, IC)	DC coupling (See DC Characteristics)			-
Voutom	AOC ⁽¹⁾ Monitor (OMT, OMC)	Terminate with 0.1u F to GND			-
Voutpm	Peak Current Monitor (PMON)	See Sample Implementation (See Sample PMON Characteristics)			-
QT, QC	Data Output Interface	AC coupling (See AC Characteristics), Terminate to GND through 50 ohm			-

Note

(1) AOC: Auto Offset Cancel.

DC Characteristics

(VEE = -4.25 V to -4.75 V, GND = 0.0 V, Tcb⁽¹⁾ = 0 to 80 °C)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
IEE	Power Supply Current (VEE)		88	115	mA
I _{inoff}	Input Bias Voltage at Input Current 0mA (IT, IC)		-1.44	-1.20	V
Pd	Power Dissipation		0.40	0.53	W

Note

(1) Tcb: Chip bottom temperature.

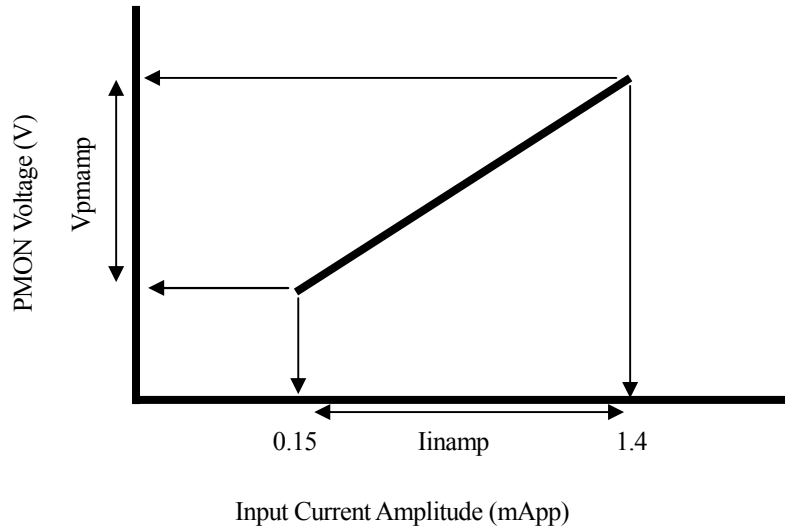
AC Characteristics

($V_{EE} = -4.25\text{ V to } -4.75\text{ V}$, $GND = 0.0\text{ V}$, $T_{cb}^{(1)} = 0\text{ to } 80\text{ }^{\circ}\text{C}$)

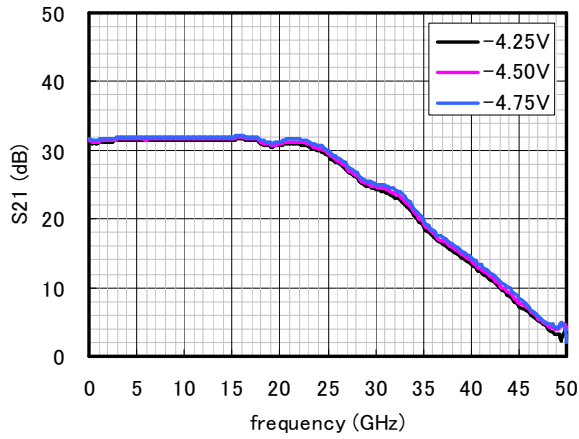
SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT	
f-3dB	-3dB Bandwidth	18	25		GHz	(2)
S21	Small Signal Gain@5GHz	26	32		dB	(2)
Gd	Group Delay Deviation @<21.5GHz		16	35	ps	(2)
S22	Output Return Ross @<21.5GHz		-11	-5	dB	(2)
Pmsl	Peak Current Monitor Slope (PMON)	0.14	0.24		V/mA	(3)
Vamp	Saturation Output Voltage Amplitude		0.4		V _{pp}	

Note

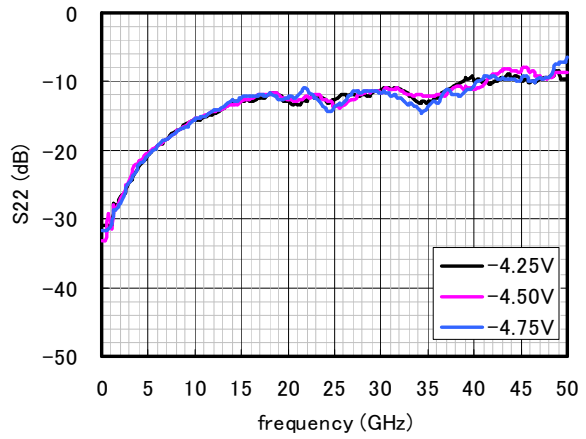
- (1) Tcb: Chip bottom temperature.
- (2) Measurement conditions
2-Port Network Analyzer
IT: AC Coupling, IC: AC Coupling with external capacitor. Terminate to GND through 50 ohm.
QT: AC coupling, QC: AC Coupling with external capacitor. Terminate to GND through 50 ohm.
- (3) Calculated as follows: $P_{msl} = V_{pmamp} / I_{inamp}$.



Sample S-parameter Characteristics



Small Signal Gain: S21



Output Return Loss S22

Measurement Conditions

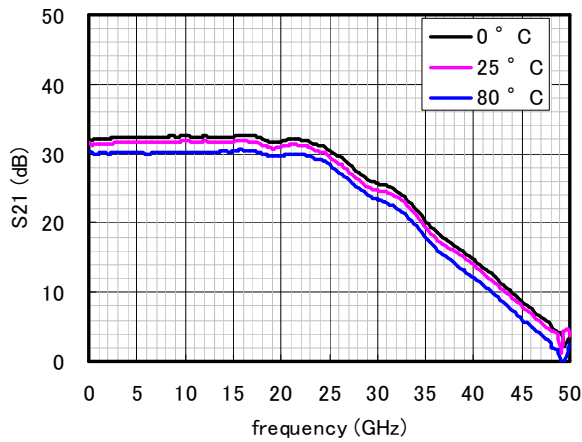
Tcb=25 °C

IT: AC Coupling

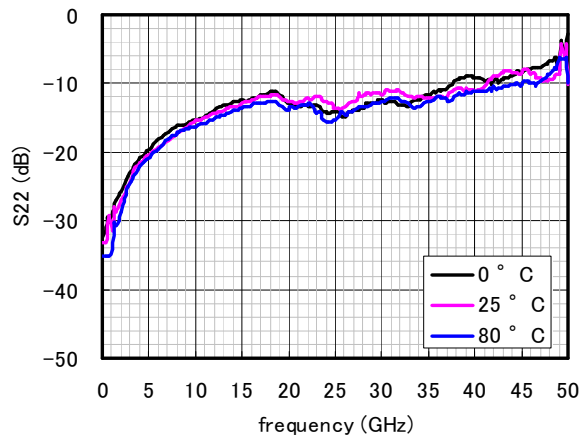
IC: AC Coupling with external capacitor. Terminate to GND through 50 ohm.

QT: AC coupling

QC: AC Coupling with external capacitor. Terminate to GND through 50 ohm.



Small Signal Gain: S21



Output Return Loss S22

Measurement Conditions

VEE=-4.5V

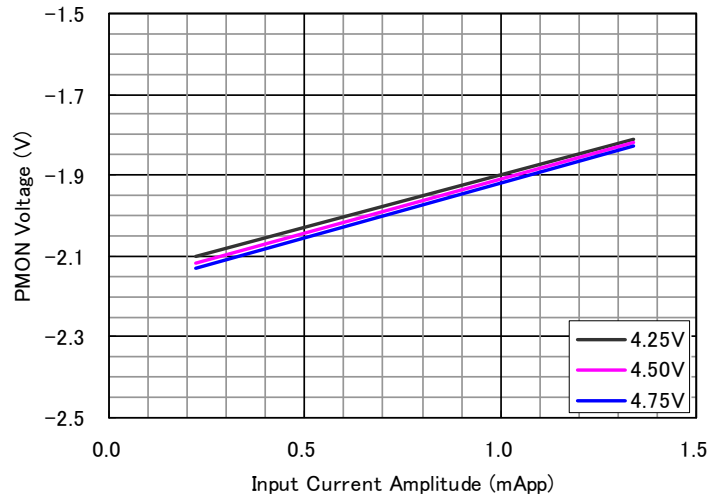
IT: AC Coupling

IC: AC Coupling with external capacitor. Terminate to GND through 50 ohm.

QT: AC coupling

QC: AC Coupling with external capacitor. Terminate to GND through 50 ohm.

Sample PMON Characteristics



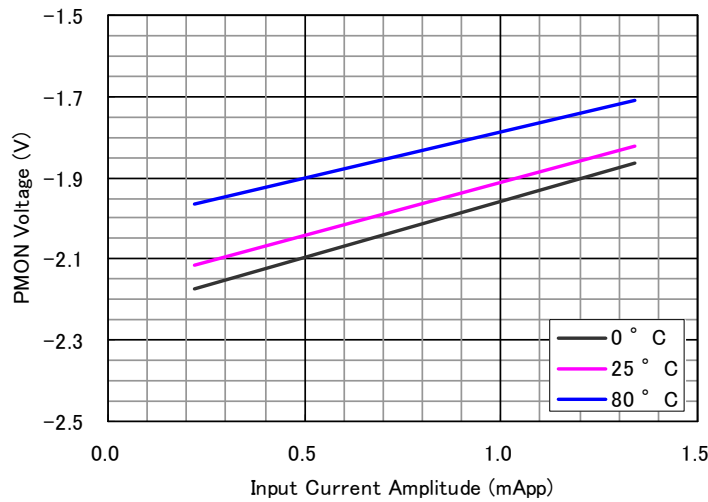
Measurement Conditions

T_{cb} = 25 °C

IT, TC: 21.5Gbps, NRZ, PN=31, MR=1/2

QT: AC Coupling with external capacitor. Terminate to GND through 50 ohm.

QC: AC Coupling with external capacitor. Terminate to GND through 50 ohm.



Measurement Conditions

V_{EE} = -4.5V

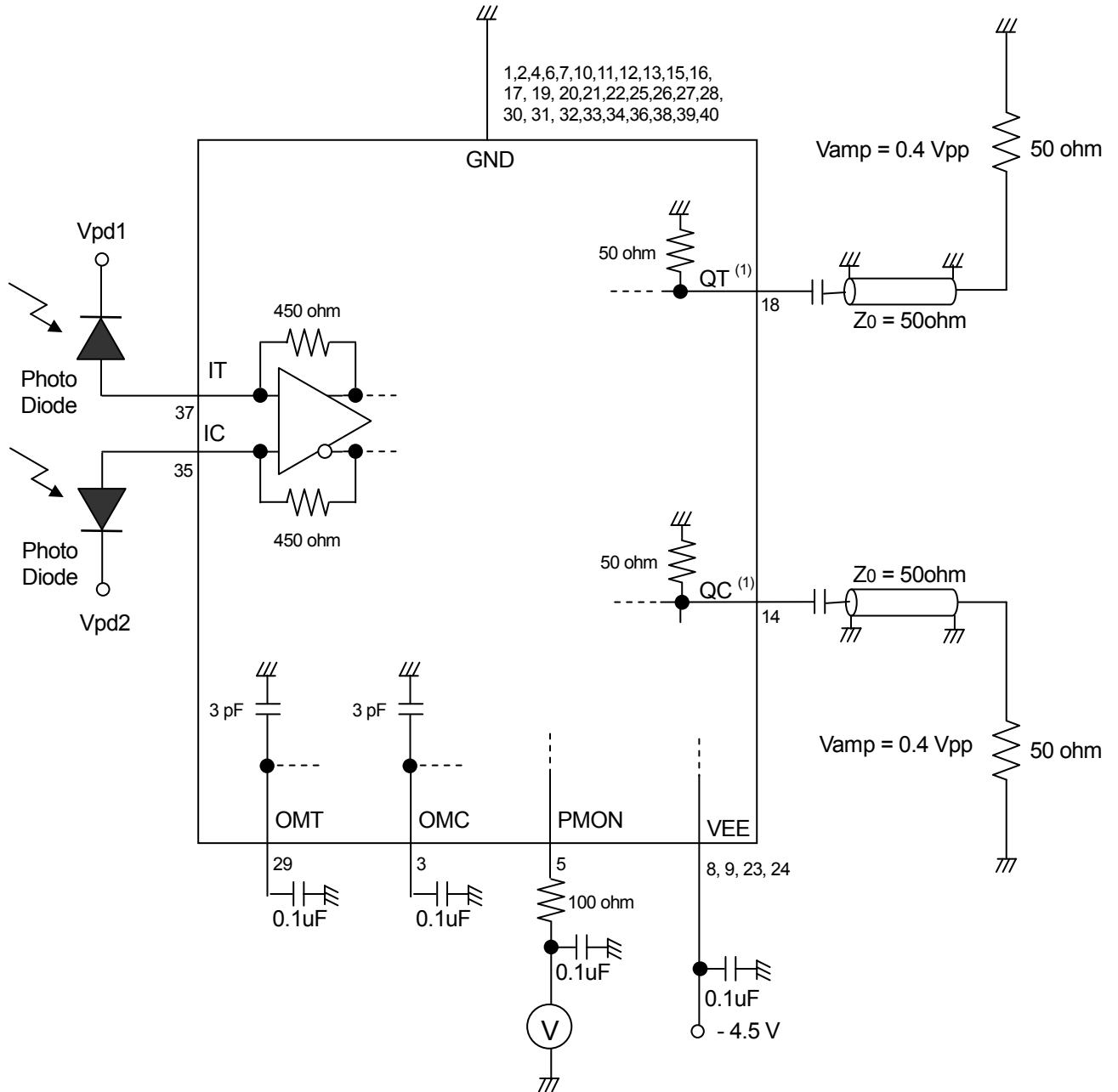
IT, TC: 21.5Gbps, NRZ, PN=31, MR=1/2

QT: AC Coupling with external capacitor. Terminate to GND through 50 ohm.

QC: AC Coupling with external capacitor. Terminate to GND through 50 ohm.

Sample Implementation

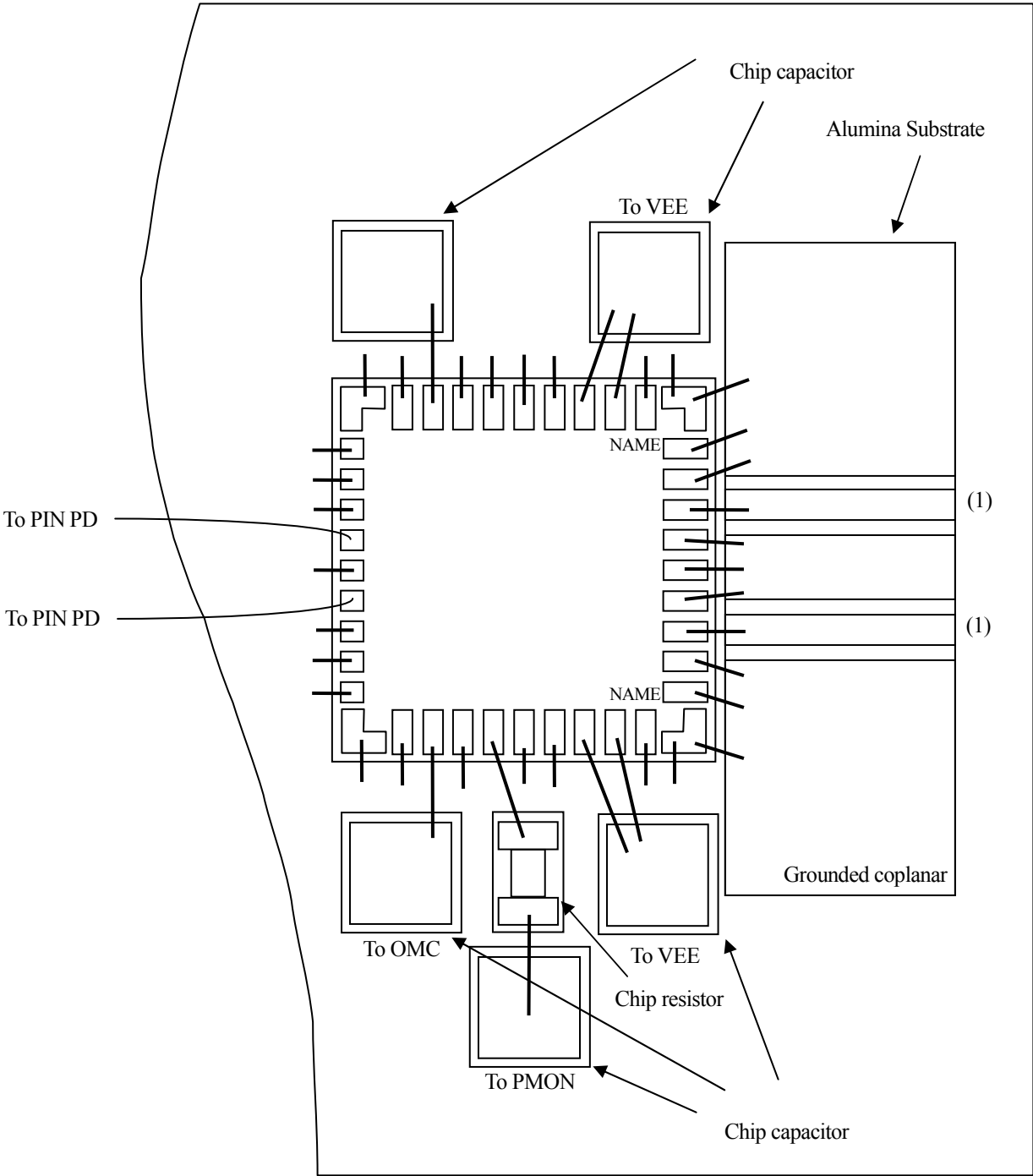
Note: Each number corresponds to a pad as shown in Connection Diagram.



Note

(1) AC coupling with external capacitor.

Mounting Example



Note
(1) AC coupling with external capacitor.

Handling Instructions

Since the IC is fabricated using an InP HBT process, users are recommended to follow the instructions below to prevent damage to the chip from electro-static discharge.

(1) Handling Precautions

- 1) Use a conductive working desk connected to the ground (or, a conductive table top connected to the ground).
- 2) Require all handling personnel to wear a conductive bracelet or wrist-strap connected to the ground through a 1 M-ohm resistor.
- 3) Ground all test equipment.
- 4) Ground all soldering iron tops.
- 5) Store IC's and other devices such as chip capacitors in their conductive carriers until they are soldered.
- 6) Use power supplies that do not generate over-voltages such as spikes. Many power supplies generate over-voltages when their outputs are turned on or turned off. To avoid these over-voltages, connect power supplies to VEE after the power supply outputs are turned on and set to 0 V. Disconnect power supplies from VEE after the power supply outputs are set to 0 V but before the outputs are turned off.

Caution

1. In order to improve products and technology, specifications are subject to change without notice.
2. When using the products, be sure the latest information and specifications are used.
3. Circuit drawings etc. shall be provided for the purpose of information only on application examples not for actual installation of equipment. NTT Electronics Corp. shall not assume any liability for damage that may result from the use of these circuit drawings etc. NTT Electronics Corp. shall not assent to or guarantee any rights of execution for patent rights of the third parties and other rights that may be raised for use of these circuit drawings.
4. To make a design, the products shall be used within the assured ranges with respect to maximum ratings, voltage, and radiation. NTT Electronics Corp. shall not take any responsibility for damage caused by neglecting the assured values or improper usage.
5. Though NTT Electronics Corp. makes every effort to improve quality and reliability, there is a risk that failure or malfunction may occur in semiconductors. It is therefore necessary that the purchasers should take responsibility for making a design that allows the products to operate safely on equipment and systems without any direct threat to the human body and/or property, should such failures or malfunction occur.
6. NTT Electronics Corp.'s semiconductor device products are designed to be used with multimedia networks communication equipment and related measuring equipment. They have not been developed for such equipment that may affect people's lives. Those who intend to use the products for special purposes that may affect human life as a result of failure or malfunction in the equipment using the products or that require extremely high reliability (e.g. life support, aircraft and space rockets, control in nuclear power facilities, submarine relays, control of operations, etc.) shall contact NTT Electronics Corp. before using the products. NTT Electronics Corp. shall not assume any liability for damage that may occur during operation of the products without prior consultation.
7. The product is controlled under the 'Foreign Exchange and Foreign Trade Law'. In the case of exporting this product, it is requested that you take necessary procedures to obtain prior approval from the Minister of Economy, Trade and Industry.
8. The product uses arsenic compound. Arsenic compound powder and vapor are dangerous for humans. Do not break, cut, crush or chemically destroy the products. To dispose of the products, follow the relevant regulations and laws; do not mix with general industrial waste and domestic garbage.
9. Any questions should be directed to the Sales Department of NTT Electronics Corp.

Copyright 2009
NTT Electronics Corp.