ISG-T5783 53Gbaud 8-Channel Linear TIA

General Description

ISG-T5783 is a high-performance eight channel TIA with each channel capable of operating up to 53Gbaud/s. The ISG-T5783 offers bias pad for Photodiode's Cathode node. There is also receive signal strength indicator pad available for each channel. The TIA channels have a pitch of 375um and the die size is 3.9x1.3mm. The TIA has an output swing up to 450mVpp under linear condition and very low input referred noise. The typical power dissipation per channel is 170mW.

The TIA offers SPI control for setting the gain and bias of the TIA. The TIA also offers automatic gain control as well as manual gain control.

Application

- Linear Optics
- 800G DR8

Ordering Information

Part Number	Ordering Part Number	Die	Shipping information
ISG-T5783	ISG-T5783	3.9x1.3x0.435mm	TBD

Features

- Supports Data rate up to 53Gbaud/s PAM4
- Flip-Chip assembly
- Channel pitch of 375um
- Up to 450mVpp differential output
- Automatic Gain Control to keep constant output with varying input current
- Very low Input referred noise of 14pA/√Hz
- Adjustable gain from 300ohm to 4kohm
- SPI digital interface
- RSSI functionality
- Case temperature range: -5C to +85C
- Die size - 3.9x1.3mm

Block Diagram

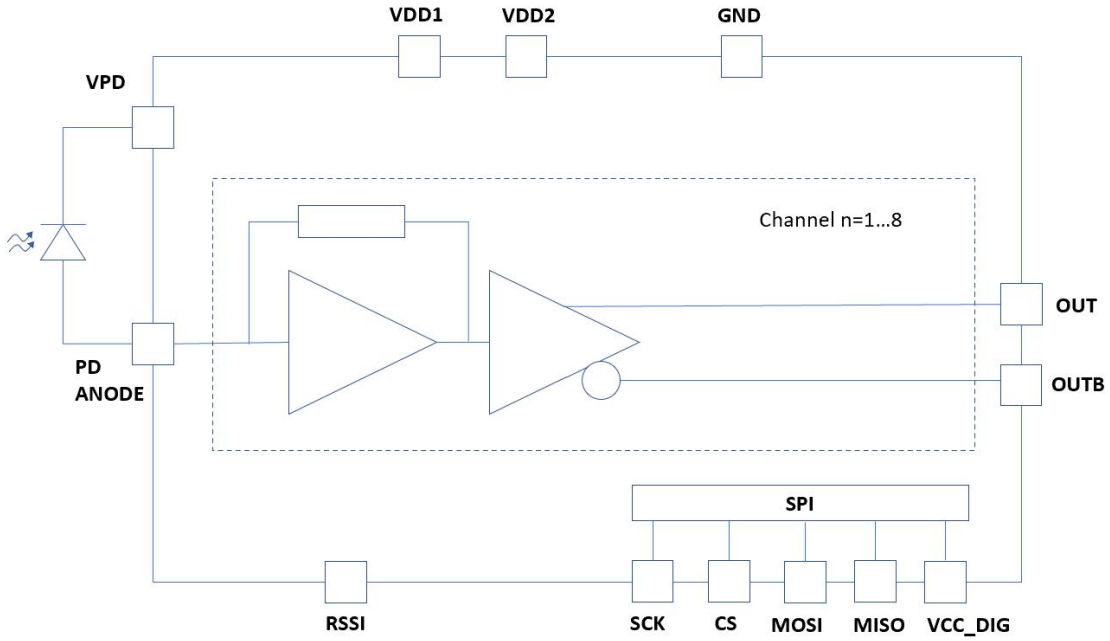


Figure 1 Single Channel Block Diagram

Absolute Maximum Rating

Stresses beyond those listed here may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the "Recommended Operating Conditions" and "Typical Specifications" of this data sheet is not recommended. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameter	Symbol	Min.	Typ.	Max.	Unit
Storage Temperature	Ts	-40	-	125	°C
TIA Input DC current	Iindc	-	-	3	mA
TIA Input RF current	Iinrf	-	-	3.5	mApp
TIA Bias voltage1	VDD1x	-0.5	-	3.6	V
TIA Bias voltage2	VDD2x	-0.5	-	3.6	V
PD Bias Voltage	PDx	-	-	3.6	V
ESD DC Pins (HBM)	ESDdc	-1000	-	1000	V
ESD RF Pins (HBM)	ESDrf	-250		250	V

Note: "x" stands for the channel number 1 to 8.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Case Temperature Range	Tcase	-5	-	85	°C
TIA Input DC current	Iindc	-	2	-	mA
TIA Bias voltage1	VDD1x	3.14	3.3	3.46	V
TIA Bias voltage2	VDD2x	3.14	3.3	3.46	V
Digital power supply	VDD_DIG	3.14	3.3	3.46	V
PD Bias Voltage	PDx	-	3.3	-	V
Receive Signal Strength indicator (1:5 ratio)	RSSI	0	-	1000	uA
TIA Bias Current 1	IDD1x	-	8	-	mA
TIA Bias current 2	IDD2x	-	43	-	mA

Typical Specifications (VDD1x=VDD2x=3.3V, Tp=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Maximum Data Rate	BRate	53.12	-	-	Gbaud/s
Input RF Current	Iinrf	-	2	-	mApp
Maximum Output (100ohm differential Load)	Vout	-	450	-	mVpp

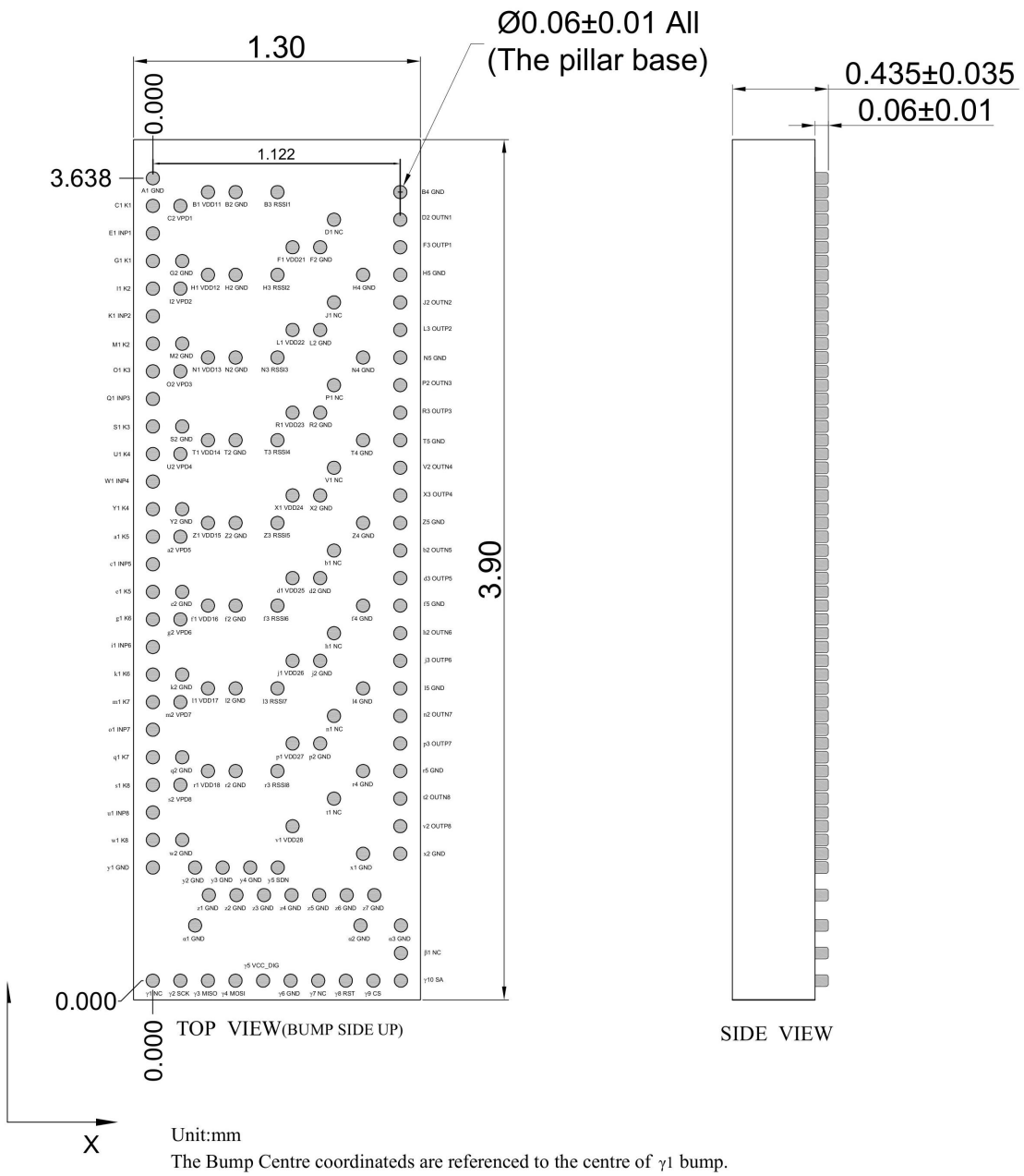
Differential Output Return Loss (<27GHz)	Sdd22	-	-11	-	dB
3dB Bandwidth[1]	BW3db	-	32	-	GHz
Max. Small Signal Transimpedance Gain	Gainmax	-	4	-	kohm
Min. Small Signal Transimpedance Gain	Gainmin	-	200	-	ohm
TIA Cathode bias Input DC Voltage	Vinput	-	1.3	-	V
Power Dissipation	Pdiss	-	170	-	mW

1. PD Capacitance of 50fF, Rpd of 10ohm.

Environmental Rating

Parameter	**Rating**
ESD Classification Rating	TBD
Thermal Resistance	TBD
Moisture Sensitivity Level Rating	MSL1

Die Outline & Pin Configuration



Unit:mm
The Bump Centre coordinateds are referenced to the centre of γ1 bump.
Bump center position coordinates(X,Y) is showed in table.
Unless otherwise specified tolerances are:
X.XX=±0.05mm
X.XXX=±0.010mm
Solder alloying: SnAg alloy(1.8% Ag by weight)

Bump center position coordinates

NO	PIN Name	Description	X	Y	NO	PIN Name	Description	X	Y
A1	GND	GND	0.000	3.638	T2	GND	GND	0.375	2.450
B1	VDD11	TIA bias voltage 1(channel 1)	0.250	3.575	T3	RSSI4	RSSI(channel 4)	0.565	2.450
B2	GND	GND	0.375	3.575	T4	GND	GND	0.953	2.450
B3	RSSI1	RSSI(channel 1)	0.565	3.575	T5	GND	GND	1.122	2.450
B4	GND	GND	1.122	3.575	U1	K4	PD Cathode Connection(channel 4)	0.000	2.388
C1	K1	PD Cathode Connection(channel 1)	0.000	3.513	U2	VPD4	PD Cathode bias Voltage(channel 4)	0.125	2.388
C2	VPD1	PD Cathode bias Voltage(channel 1)	0.125	3.513	V1	NC	NC	0.821	2.325
D1	NC	NC	0.821	3.450	V2	OUTN4	Output Negative(channel 4)	1.122	2.325
D2	OUTN1	Output Negative(channel 1)	1.122	3.450	W1	INP4	Input PD anode connection(channel 4)	0.000	2.263
E1	INP1	Input PD anode connection(channel 1)	0.000	3.388	X1	VDD24	TIA bias voltage 2(channel 4)	0.634	2.200
F1	VDD21	TIA bias voltage 2(channel 1)	0.634	3.325	X2	GND	GND	0.759	2.200
F2	GND	GND	0.759	3.325	X3	OUTP4	Output Positive(channel 4)	1.122	2.200
F3	OUTP1	Output Positive(channel 1)	1.122	3.325	Y1	K4	PD Cathode Connection(channel 4)	0.000	2.138
G1	K1	PD Cathode Connection(channel 1)	0.000	3.263	Y2	GND	GND	0.133	2.138
G2	GND	GND	0.133	3.263	Z1	VDD15	TIA bias voltage 1(channel 5)	0.250	2.075
H1	VDD12	TIA bias voltage 1(channel 2)	0.250	3.200	Z2	GND	GND	0.375	2.075
H2	GND	GND	0.375	3.200	Z3	RSSI5	RSSI(channel 5)	0.565	2.075
H3	RSSI2	RSSI(channel 2)	0.565	3.200	Z4	GND	GND	0.953	2.075
H4	GND	GND	0.953	3.200	Z5	GND	GND	1.122	2.075
H5	GND	GND	1.122	3.200	a1	K5	PD Cathode Connection(channel 5)	0.000	2.013
I1	K2	PD Cathode Connection(channel 2)	0.000	3.138	a2	VPD5	PD Cathode bias Voltage(channel 5)	0.125	2.013
I2	VPD2	PD Cathode bias Voltage(channel 2)	0.125	3.138	b1	NC	NC	0.821	1.950
J1	NC	NC	0.821	3.075	b2	OUTN5	Output Negative(channel 5)	1.122	1.950
J2	OUTN2	Output Negative(channel 2)	1.122	3.075	c1	INP5	Input PD anode connection(channel 5)	0.000	1.888
K1	INP2	Input PD anode connection(channel 2)	0.000	3.013	d1	VDD25	TIA bias voltage 2(channel 5)	0.634	1.825
L1	VDD22	TIA bias voltage 2(channel 2)	0.634	2.950	d2	GND	GND	0.759	1.825
L2	GND	GND	0.759	2.950	d3	OUTP5	Output Positive(channel 5)	1.122	1.825
L3	OUTP2	Output Positive(channel 2)	1.122	2.950	e1	K5	PD Cathode Connection(channel 5)	0.000	1.763
M1	K2	PD Cathode Connection(channel 2)	0.000	2.888	e2	GND	GND	0.133	1.763
M2	GND	GND	0.133	2.888	f1	VDD16	TIA bias voltage 1(channel 6)	0.250	1.700
N1	VDD13	TIA bias voltage 1(channel 3)	0.250	2.825	f2	GND	GND	0.375	1.700
N2	GND	GND	0.375	2.825	f3	RSSI6	RSSI(channel 6)	0.565	1.700
N3	RSSI3	RSSI(channel 3)	0.565	2.825	f4	GND	GND	0.953	1.700
N4	GND	GND	0.953	2.825	f5	GND	GND	1.122	1.700
N5	GND	GND	1.122	2.825	g1	K6	PD Cathode Connection(channel 6)	0.000	1.638
O1	K3	PD Cathode Connection(channel 3)	0.000	2.763	g2	VPD6	PD Cathode bias Voltage(channel 6)	0.125	1.638
O2	VPD3	PD Cathode bias Voltage(channel 3)	0.125	2.763	h1	NC	NC	0.821	1.575
P1	NC	NC	0.821	2.700	h2	OUTN6	Output Negative(channel 6)	1.122	1.575
P2	OUTN3	Output Negative(channel 3)	1.122	2.700	i1	INP6	Input PD anode connection(channel 6)	0.000	1.513
Q1	INP3	Input PD anode connection(channel 3)	0.000	2.638	j1	VDD26	TIA bias voltage 2(channel 6)	0.634	1.450
R1	VDD23	TIA bias voltage 2(channel 3)	0.634	2.575	j2	GND	GND	0.759	1.450
R2	GND	GND	0.759	2.575	j3	OUTP6	Output Positive(channel 6)	1.122	1.450
R3	OUTP3	Output Positive(channel 3)	1.122	2.575	k1	K6	PD Cathode Connection(channel 6)	0.000	1.388
S1	K3	PD Cathode Connection(channel 3)	0.000	2.513	k2	GND	GND	0.133	1.388
S2	GND	GND	0.133	2.513	l1	VDD17	TIA bias voltage 1(channel 7)	0.250	1.325
T1	VDD14	TIA bias voltage 1(channel 4)	0.250	2.450	l2	GND	GND	0.375	1.325

Bump center position coordinates

NO	PIN Name	Description	X	Y	NO	PIN Name		X	Y
l3	RSSI7	RSSI(channel 7)	0.565	1.325	γ2	SCK	Clock	0.125	0.000
l4	GND	GND	0.953	1.325	γ3	MISO	Master Input, Slave Output	0.250	0.000
l5	GND	GND	1.122	1.325	γ4	MOSI	Master Output, Slave Input	0.375	0.000
m1	K7	PD Cathode Connection(channel 7)	0.000	1.263	γ5	VCC_DIG	Digital Power supply	0.500	0.000
m2	VPD7	PD Cathode bias Voltage(channel 7)	0.125	1.263	γ6	GND	GND	0.625	0.000
n1	NC	NC	0.821	1.200	γ7	NC	NC	0.750	0.000
n2	OUTN7	Output Negative(channel 7)	1.122	1.200	γ8	RST	Digital Reset	0.875	0.000
o1	INP7	Input PD anode connection(channel 7)	0.000	1.138	γ9	CS	Chip Select	1.000	0.000
p1	VDD27	TIA bias voltage 2(channel 7)	0.634	1.075	γ10	SA	Slave Address	1.125	0.000
p2	GND	GND	0.759	1.075					
p3	OUTP7	Output Positive(channel 7)	1.122	1.075					
q1	K7	PD Cathode Connection(channel 7)	0.000	1.013					
q2	GND	GND	0.133	1.013					
r1	VDD18	TIA bias voltage 1(channel 8)	0.250	0.950					
r2	GND	GND	0.375	0.950					
r3	RSSI8	RSSI(channel 8)	0.565	0.950					
r4	GND	GND	0.953	0.950					
r5	GND	GND	1.122	0.950					
s1	K8	PD Cathode Connection(channel 8)	0.000	0.888					
s2	VPD8	PD Cathode bias Voltage(channel 8)	0.125	0.888					
t1	NC	NC	0.821	0.825					
t2	OUTN8	Output Negative(channel 8)	1.122	0.825					
u1	INP8	Input PD anode connection(channel 8)	0.000	0.763					
v1	VDD28	TIA bias voltage 2(channel 8)	0.634	0.700					
v2	OUTP8	Output Positive(channel 8)	1.122	0.700					
w1	K8	PD Cathode Connection(channel 8)	0.000	0.638					
w2	GND	GND	0.133	0.638					
x1	GND	GND	0.953	0.575					
x2	GND	GND	1.122	0.575					
y1	GND	GND	0.000	0.513					
y2	GND	GND	0.192	0.513					
y3	GND	GND	0.317	0.513					
y4	GND	GND	0.442	0.513					
y5	SDN	Shut Down	0.567	0.513					
z1	GND	GND	0.254	0.388					
z2	GND	GND	0.379	0.388					
z3	GND	GND	0.504	0.388					
z4	GND	GND	0.629	0.388					
z5	GND	GND	0.754	0.388					
z6	GND	GND	0.879	0.388					
z7	GND	GND	1.004	0.388					
α1	GND	GND	0.192	0.250					
α2	GND	GND	0.942	0.250					
α3	GND	GND	1.125	0.250					
β1	NC	NC	1.125	0.125					
γ1	NC	NC	0.000	0.000					

Revision History

Revision Information	Release Date	Description
V1	Aug 8, 2023	Advanced version release
V2	Mar 18, 2024	Updated Die Outline & Pin Configuration