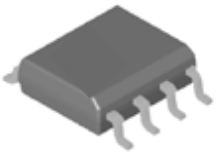
TAT7469

CATV 75 Ω pHEMT Dual RF Amplifier

Applications

- Edge QAM Gain Stage
- MDU Output
- RF Distribution Amplifiers
- Low Noise Optical TIA

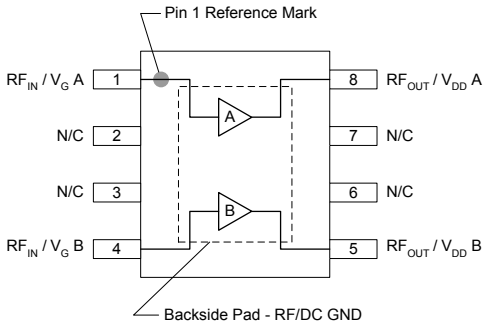


SOIC-8 Package

Product Features

- 75 Ω, 50 MHz to 1200 MHz Bandwidth
- RF Low Noise Figure: 3.2 dB to 1000 MHz
- Configurable as an Optical low noise TIA
  - EIN typ 3.5 pA/√Hz
  - Optical S21Typ 20dB Z/75 dB
- Adjustable Low Power Consumption
- pHEMT device technology
- SOIC-8 package

Functional Block Diagram



General Description

The TAT7469 is a 75 Ω RF Amplifier designed for CATV use, but capable of operation up to 1200 MHz. The TAT7469 contains two separate amplifiers for push pull applications. It is fabricated using 6-inch GaAs pHEMT technology to optimize performance and cost. Each amplifier contains on-chip active biasing. The bias current set point of each amplifier is adjustable with a single resistor from the input to ground.

Pin Configuration

Pin No.	Label
1	RF_{IN} / V_G A
2, 3, 6, 7	N/C
4	RF_{IN} / V_G B
5	RF_{OUT} / V_{DD} B
8	RF_{OUT} / V_{DD} A
Backside Pad	RF/DC GND

Ordering Information

Part No.	Description
TAT7469	75Ω Dual pHEMT Amplifier
TAT7469-SC8-EB	50-1200 MHz Evaluation Board

Standard T/R size = 1000 pieces on a 7” reel.

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Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	−55 to 150°C
Device Voltage (V_{DD})	+10 V
Device Current (I_{DD})	400 mA(†)

Operation of this device outside the parameter ranges given above may cause permanent damage.

† Total current of both amplifiers, individual side cannot exceed half this value as an independent amplifier

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Device Voltage (V_{DD})		5.0		V
Device Voltage (I_{DD})		250		mA
Case Temperature	−40		+85	°C
Tj for >10^6 hours MTTF			+145	°C

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

Test conditions unless otherwise noted:
TAT7469-SC8-EB Evaluation board, V_{DD}=+5 V, Heatsink Temp= +25°C, Zo = 75Ω , BIAS (J2) pin to GND

Parameter	Conditions	Min	Typ	Max	Units
Operational Frequency Range		50		1200	MHz
Gain	50 To 1200 MHz	17.0	17.5		dB
Gain Flatness(1)	50 To 1000 MHz		±0.75		dB
Input Return Loss	50 To 1000 MHz		18		dB
	>1000 To 1200 MHz		17		
Output Return Loss	50 To 1000 MHz		23		dB
	>1000 To 1200 MHz		17		
Output IP2(3)	Pout = +10 dBm/tone f1=225 MHz, f2=325 MHz 184 mA < I_{DD} < 315 mA	+70	+77		dBm
Output IP3		+37	+38		dBm
Noise Figure	Freq.=1000 MHz		3.2		dB
Device Current (I_{DD})(2)		184	250	315	mA
Thermal Resistance, θ_{jb}	Junction to base		13		°C/W

Notes:

1. Flatness determined by deviation from a straight-line curve fit.
2. R3 and R4 are used to set the bias current, 10 kΩ.
3. Low side intermod at 200 MHz.

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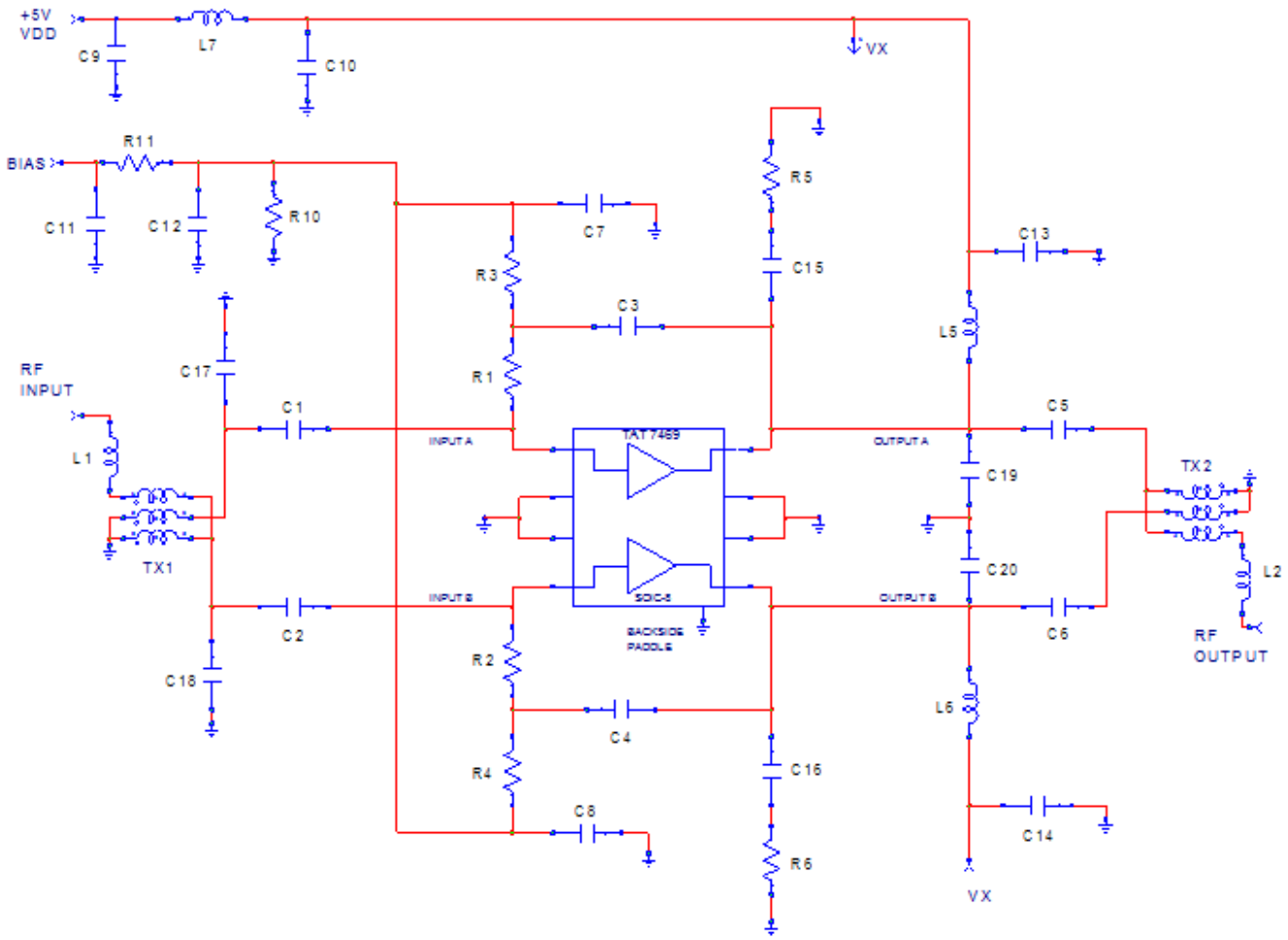
TAT7469-SC8-EB Evaluation Board Schematic



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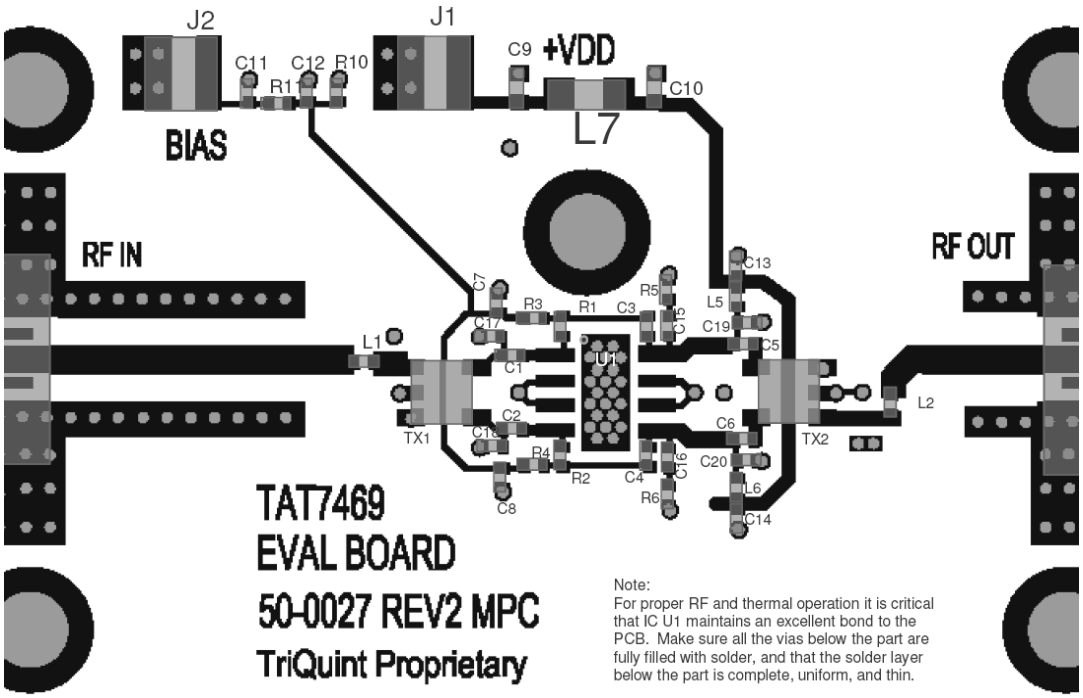
TAT7469-SC8-EB Evaluation Board



Bill of Material – TAT7469-SC8-EB

Reference Des.	Value	Description	Manuf.	Part Number
U1	n/a	75 Ω Dual pHEMT Amplifier	TriQuint	TAT7469
L1	3.6 nH	Chip Coil, 0402, 5%	CoilCraft	0402CS-3N6XJLW
L2	2.2 nH	Chip Coil, 0402, 5%	CoilCraft	0402CS-2N2XJLW
L5, L6	560 nH	Chip Coil, 0402, 5%	CoilCraft	0402AF-561XJLW
L7	0.9 uH	Chip Coil, 1008, 10%	various	
TX1, TX2(1)	1:1	1:1 Balun, 5 – 3000 MHz	MiniCircuits	TC1-33-75G2+
C1, C2, C3, C4, C7, C8, C11, C12, C13, C14	0.01 uF	Ceramic Cap, 0402, 16 V, NPO, 10%	various	
C5, C6	470 pF	Ceramic Cap, 0402, 50 V, NPO, 10%	various	
C15, C16	1.0 pF	Ceramic Cap, 0402, 50 V, ±0.10 pF	AVX	04025A010BAT9A
C17, C18	0.5 pF	Ceramic Cap, 0402, 50 V, ±0.10 pF	AVX	04025A005BAT9A
C9, C10	0.1 uF	Ceramic Cap, 0603, 16 V, NPO, 10%	various	
R1, R2	820 Ω	Thick Film Res, 0402, 1%	various	
R3, R4	10 kΩ	Thick Film Res, 0402, 1%	various	
R5, R6	30 Ω	Thick Film Res, 0402, 1%	various	
R10	100 Ω	Thick Film Res, 0402, 1%	various	
R11	0 Ω	Thick Film Res, 0402	various	
C19, C20	N/L	Do Not Load		
J3, J4	n/a	75 Ω Female connector	Amphenol	531-40039

Notes:
1. 1:1 balun may also be constructed using a binocular core (Fair Rite 2843002302; Type 43 material) with 1.5 turns of bifilar wire (MWS T2341222-10).

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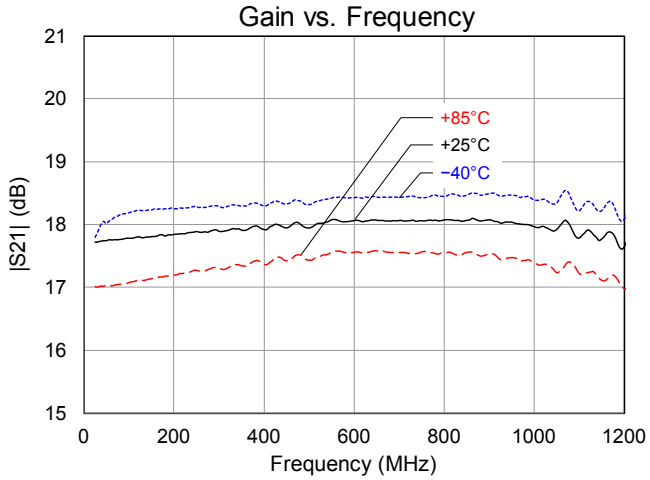
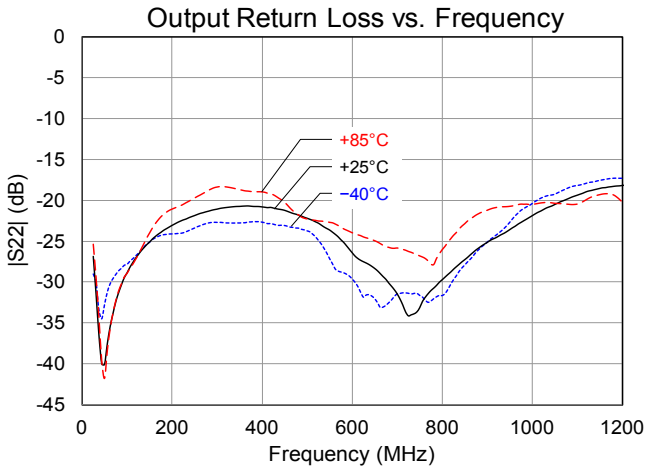
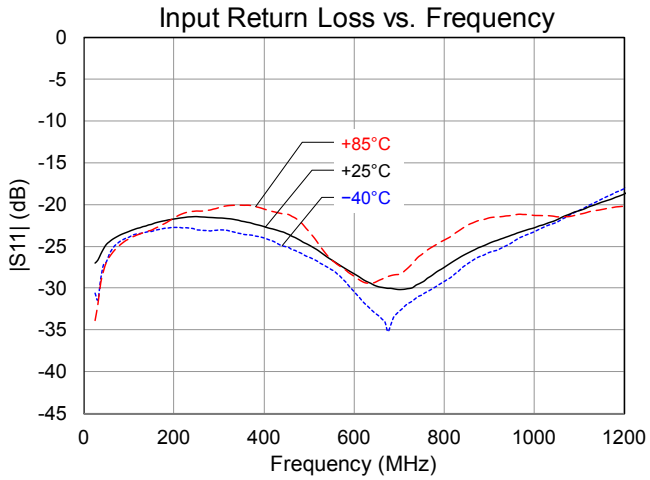
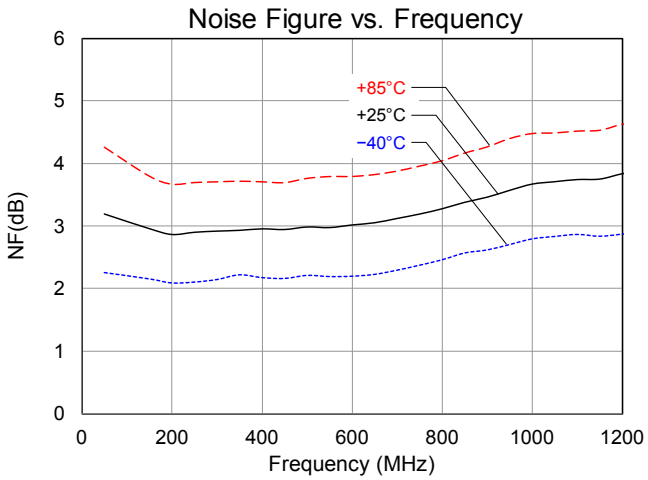
Performance Plots – TAT7469-SC8-EB

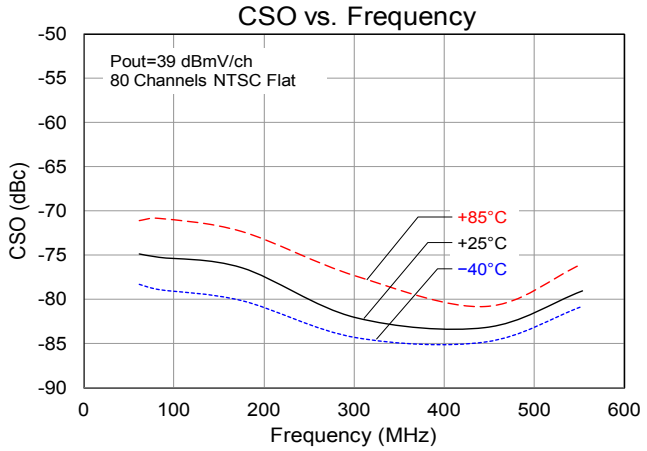
Test conditions unless otherwise noted: V_{DD}=+5 V, I_{DD}=250 mA (typ.), Temp=+25°C

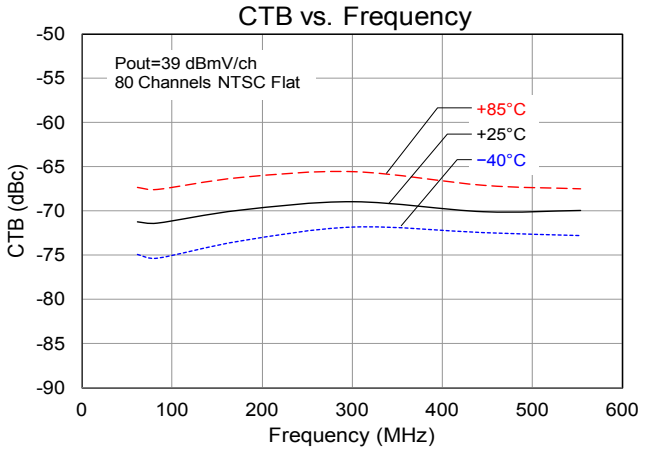












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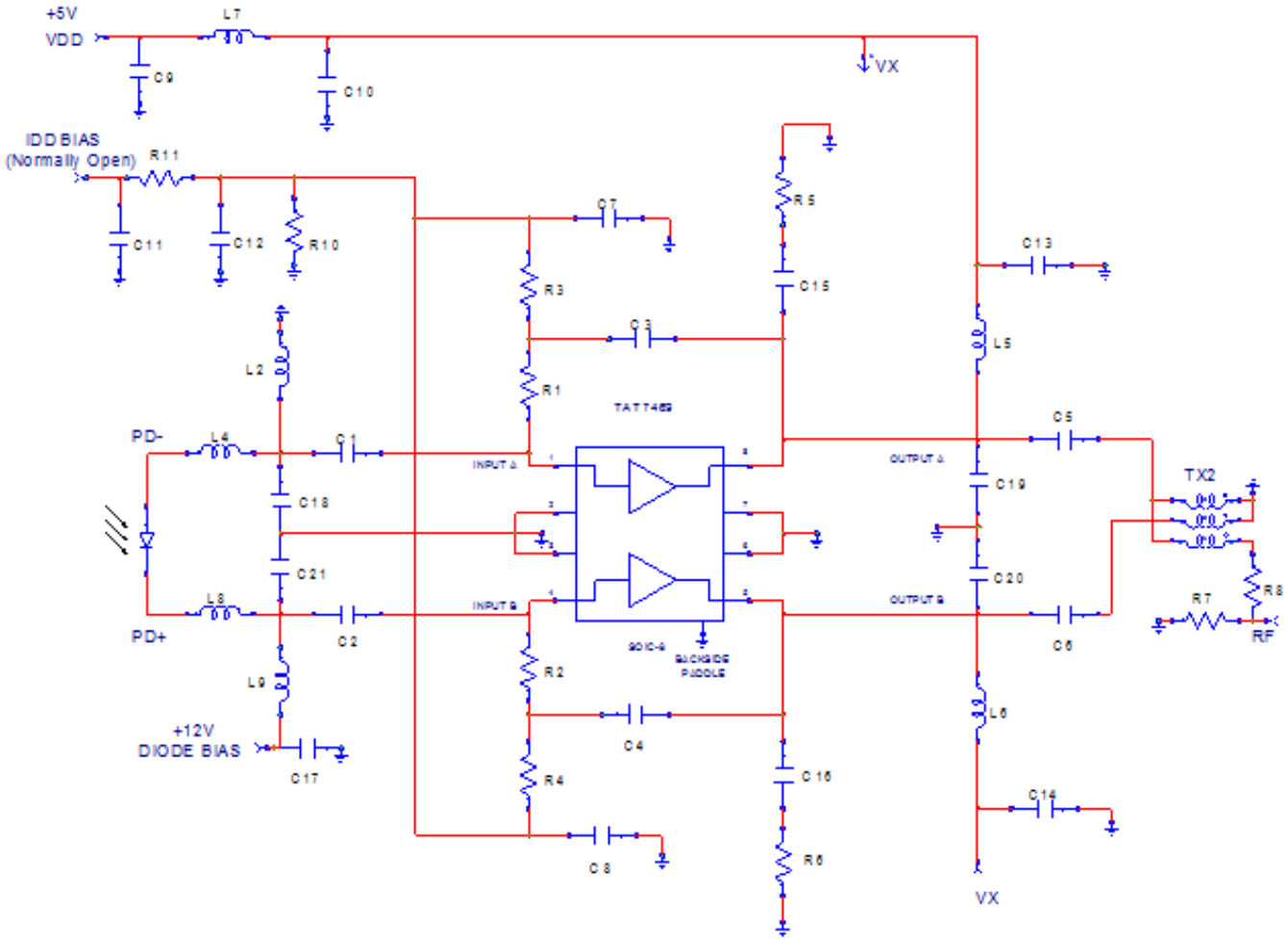
Optical Application Reference Design Schematic



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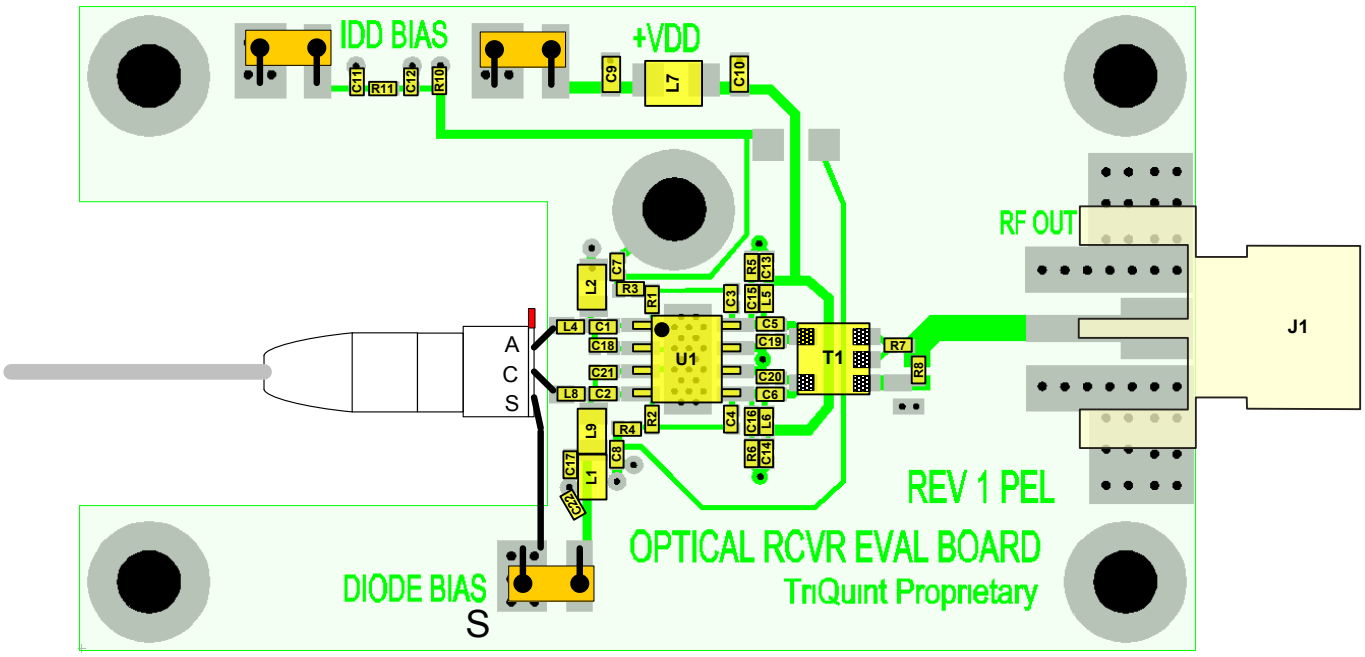
TAT7469-EVB Evaluation Board



Bill of Material – TAT7469-EVB

Reference Des.	Value	Description	Manuf.	Part Number
U1		TAT7469 Amplifier, SOIC-8	TriQuint	TAT7469
C1, C2	470 pF	CAP, 0402, 10%, 50V, X7R	TDK	ECJ-0EB1H471K
C3, C4, C5, C6, C7, C8, C11, C12, C13, C14, C17	0.01 uF	CAP, 0402, 10%, 16V, X7R	various	
C9, C10	0.1 uF	CAP, 0603, 10%, 16V, X7R	various	
C22	0.1 uF	CAP, 0603, 10%, 50V, X7R	various	
R1, R2	2k	RES, 0402, 5%. 1/16W. CHIP	various	
R3, R4	5.6 k Ω	RES, 0402, 5%. 1/16W. CHIP	various	
R8	22Ω	RES, 0402, 5%. 1/16W. CHIP	various	
R10	100 Ω	RES, 0402, 1%. 1/16W. CHIP	various	
R11	0 Ω	Thick Film Res, 0402	various	
L1	27uH	IND, 0805, 5%, 120mA, 11MHz	COILCRAFT	0805LS-273XJLB
L2, L9	880 nH	IND, 0805, ±5%, Gowanda	GOWANDA	CC0805-880J-2
L4, L8	12 nH	IND, 0402, 5%	COILCRAFT	0402CS-12NXJL
L5, L6	560 nH	IND, 0402, 5%	COILCRAFT	0402AF-561XJL
L7	900 nH	IND, 1008, 10% Ferrite Ind	COILCRAFT	1008AF-901XKL
J1	N/A	F-SIDE_GND Conn Precision edge launch	LIGHTHORSE	LTI-FSF55MGT-P-10-A-X7
C15, C16, C18, C19, C20, C21, R5, R6, R7	no load	0402, DNP		
T1	1:1 75Ω	SMT balun CD542	MINICIRCUITS	TC1-33-75G2+
PD	EPM705	Photo Diode	JDSU	X07051650-004R
PCB	Rev 1	TAT7469 Optical EVB	TRIQUINT	1098793
J2-3, J4-5, J6-7	n/a	Conn, 1x2, 0.1 inch RA	MOLEX	022-28-8021

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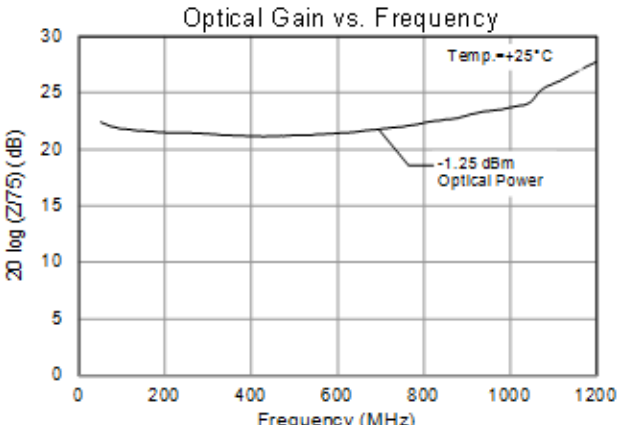
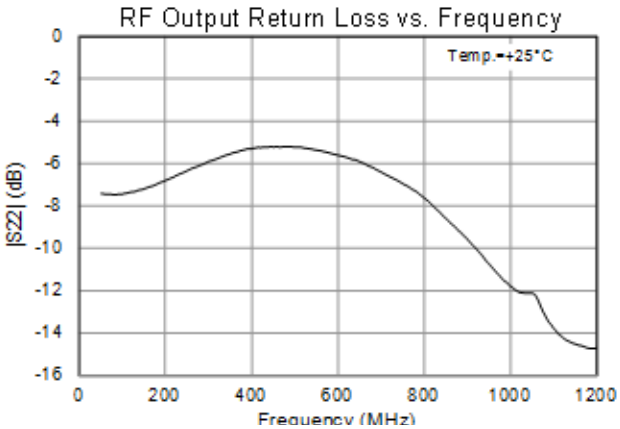
Typical Optical S21 & RF S22

Test conditions unless otherwise noted: V_{DD}=+5 V, I_{DD}=220 mA (typ.), V_{PD}=+12 V Temp=+25°C





Typical Optical Receiver Distortion

Test conditions unless otherwise noted: V_{DD}=+5 V, I_{DD}=220 mA (typ.), V_{PD}=+12 V Temp=+25°C
3.5% OMI, 79 channels NTSC, Flat Loading

Optical Power (dBm)	I_{PD} (mA)	Frequency (MHz)	Noise Floor (dBm)	Fund (dBmV/ch)	CSO (dBc)	CTB[1] (dBc)
+1	1.2	55.25	-96.9	29.4	-66.7	-65.6
		301.25	-95.3	28.8	-66.7	-64.7
		547.25	-97.7	28.3	-73.8	-66.8
-6	0.24	55.25	-101.1	14.2	-64.5	-64.3
		301.25	-100.8	14.8	-66.0	-63.8
		547.25	-101.5	14.2	-67.2	-63.0

Notes:
1. CTB was limited by the optical transmitter in the test set-up, actual receiver results are better than shown.

Typical EIN Performance

Test conditions unless otherwise noted:
V_{DD}=+5 V, I_{DD}=220 mA (typ.), V_{PD}=+12 V Temp=+25°C
3.5% OMI, 79 channels NTSC, Flat Loading

Freq (MHz)	EIN (pA/rtHz)
55	4.0
547	3.8
1000	3.5

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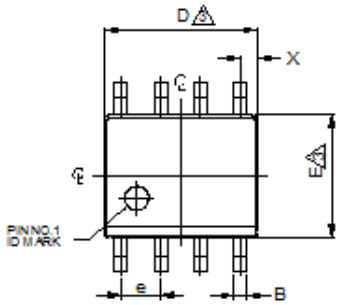
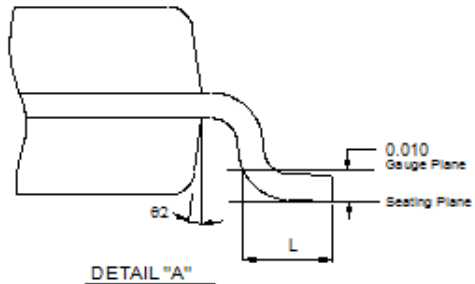
Package Marking and Dimensions

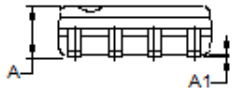
Marking: Part Number – TAT7469
Lot code – AaXXXX
Year/Week –YYWW

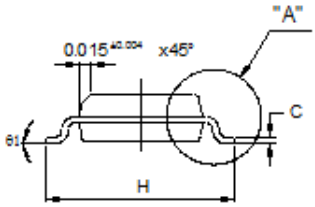


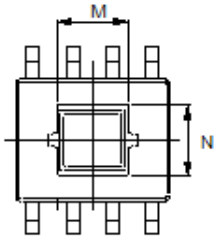
TOP VIEW



DETAIL "A"







BOTTOM VIEW

EXPOSED PADDLE

SYMBOL	8 SOIC	
	MIN	MAX
A	0.054	0.068
A1	0.001	0.004
B	0.014	0.019
D	0.189	0.196
E	0.150	0.157
H	0.229	0.244
M	0.087	0.097
N	0.082	0.092
e	0.050 BSC	
C	0.0075	0.0098
L	0.020	0.040
X	0.0215 REF	
θ1	0°	8°
θ2	7° BSC	

NOTE:
1. TOP PACKAGE SURFACE TO BE Ni, Pd, Au PLATING
2. BOTTOM PACKAGE SURFACE TO BE Ni. Pd. Au PLATING
3. DIMENSION ARE EXCLUSIVE MOLD FLASH AND GATE BURR.
4. FOOT LENGTH MEASURING IS BASED ON THE GAUGE PLANE METHOD.

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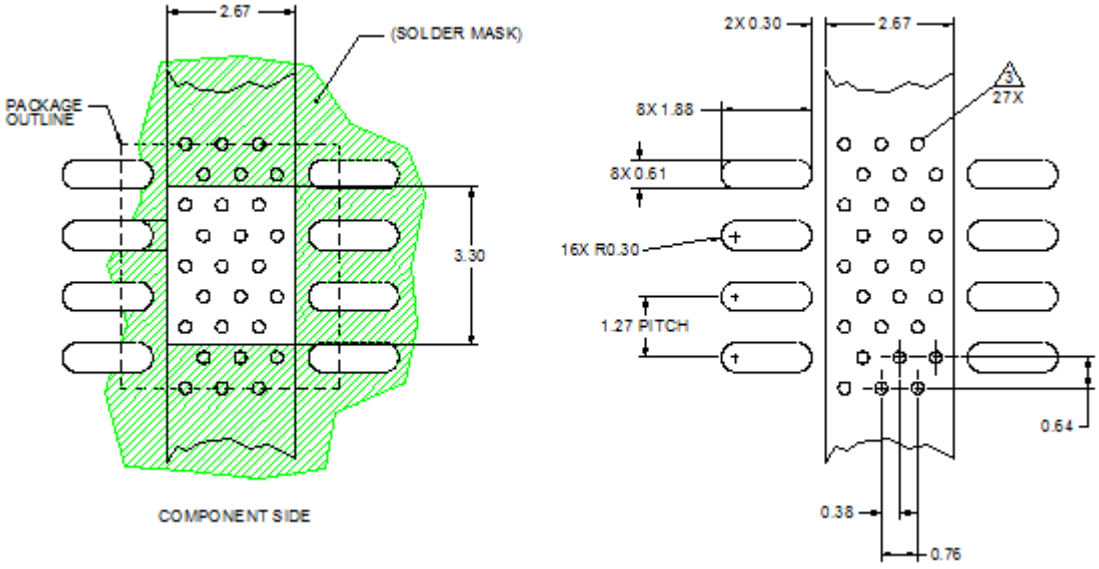
PCB Mounting Pattern



Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25mm (0.010”).
4. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

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Product Compliance Information

ESD Sensitivity Ratings

Caution! ESD-Sensitive Device

ESD Rating:	Class 1B
Value:	Passes ≥ 500 V to <1000 V
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114

ESD Rating:	Class IV
Value:	Passes ≥ 2000 V
Test:	Charged Device Model (CDM)
Standard:	JEDEC Standard JESD22-C101

MSL Rating

MSL Rating:	Level 3
Test:	260°C convection reflow
Standard:	JEDEC Standard IPC/JEDEC J-STD-020

Solderability

Compatible with both lead-free (260°C maximum reflow temperature) and tin/lead (245°C maximum reflow temperature) soldering processes.

Contact plating: Ni, Pd, & Au

RoHs Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

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Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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