

### Applications

- CATV Line Amplifiers
- CATV System Amplifiers
- Distribution Nodes
- Green Applications

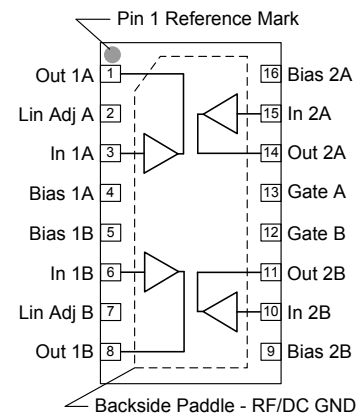


SOIC-16 Wide Package

### Product Features

- 75  $\Omega$ , 50-1000 MHz Bandwidth
- GaAs pHEMT & MESFET Technology
- User configurable gain: 27 – 34 dB
- Integrated linearization
- Choice of output device to optimize cost/performance
- Flexible bias voltage and current for optimum efficiency
- SOIC-16 Wide Package

### Functional Block Diagram



### General Description

The TAT8858A1H is a cost effective 75  $\Omega$  RFIC Amplifier designed for use in high gain 24 V or 12 V CATV applications up to 1000 MHz. It works with readily available SMT baluns and transformers to provide a highly flexible low cost replacement for traditional hybrids.

Gain of the TAT8858A1H may be easily adjusted by varying external components, allowing for a family of push-pull hybrid solutions to be developed from a single RFIC.

The TAT8858A1H provides integrated linearization to improve the 3rd order distortion performance.

The TAT8858A1H may be protected against ESD and transient surges with the TQP200002 and an output filter network. Consult TriQuint for discussion.

The TAT8858A1H supports traditional 24 V and 12 V supply voltages. Bias current may be adjusted to suit particular requirements with standard or active biasing approaches. Consult TriQuint for further discussion.

### Pin Configuration

Pin No.	Label	Pin No.	Label
1	OUT 1A	10	IN 2B
2	LIN ADJ A	11	OUT 2B
3	IN 1A	12	GATE B
4	BIAS 1A	13	GATE A
5	BIAS 1B	14	OUT 2A
6	IN 1B	15	IN 2A
7	LIN ADJ B	16	BIAS 2A
8	OUT 1B	Backside Paddle	RF/DC GND
9	BIAS 2B		

### Ordering Information

Part No.	Description
TAT8858A1H	RFIC
TAT8858A1H-PCB 24V	50-1000 MHz Eval Board
TAT8858A1H-PCB 12V	50-1000 MHz Eval Board

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

### Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-65 to 150°C

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

### Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Supply Voltage ( $V_{CC}$ )		24		V
$I_{CC}$		270		mA
$T_{CASE}$	-20		+120	°C
$T_J$ (for $>10^6$ hours MTTF)			+150	°C

Electrical performance is measured and guaranteed under conditions noted in the electrical specifications table.

Specifications are not guaranteed over all recommended operating conditions.

### Electrical Specifications

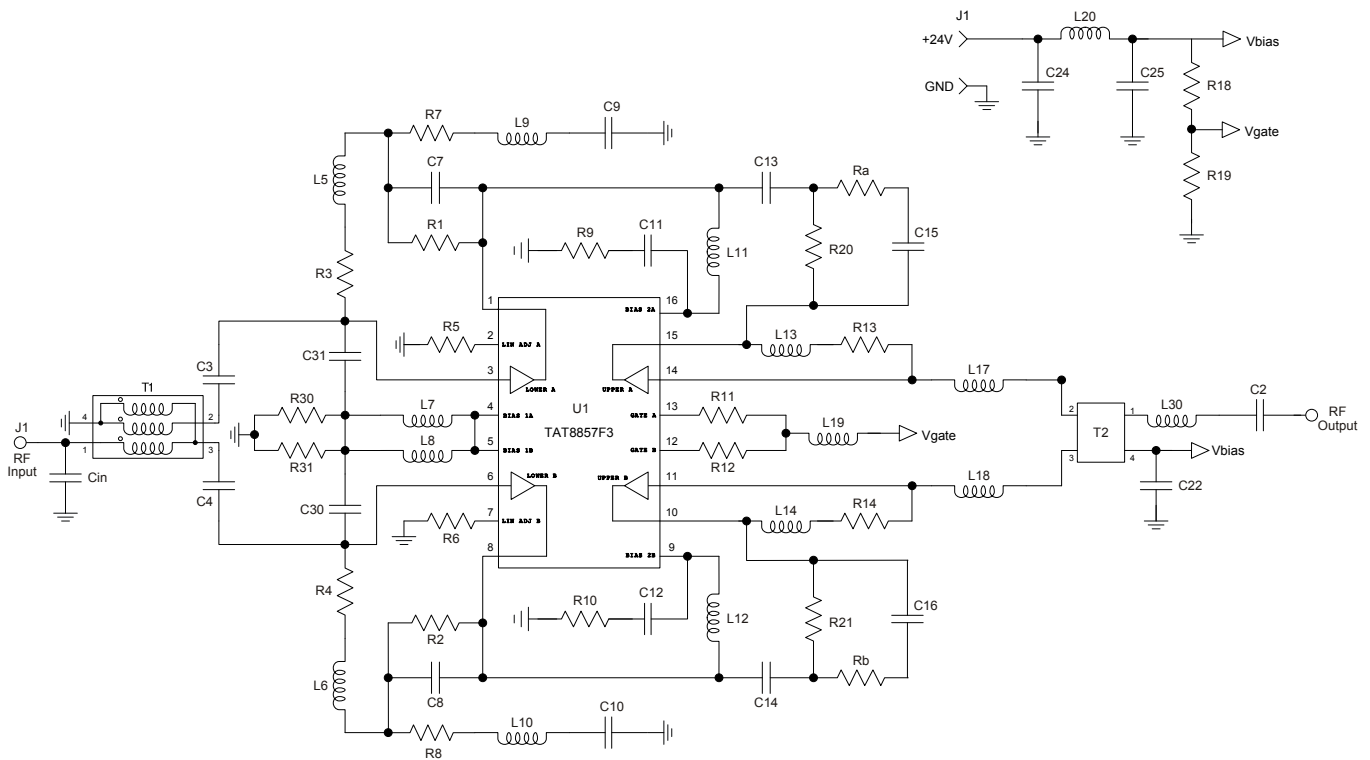
Test conditions unless otherwise noted:  $V_{CC} = +24V$ , Temp = +25°C, 75  $\Omega$  system.

Parameter	Conditions	Min	Typ	Max	Units
Operational Frequency Range		50		1000	MHz
Gain			32		dB
Input Return Loss	50-1000 MHz		18		dB
Output Return Loss			16		dB
Gain			31		dB
Input Return Loss	50-1200 MHz		14		dB
Output Return Loss			14		dB
Output P1dB	f=500 MHz		28		dBm
Output IP3	f1=225 MHz, f2=325 MHz, Pout= +11 dBm/tone		44		dBm
Composite Triple Beat <sup>(1)</sup>			-69		dBc
Composite Second Order <sup>(1)</sup>			-68		dBc
Composite Intermodulation Noise <sup>(1)</sup>			-70		dB
XMOD <sup>(1)</sup>			-61		dBc
Noise Figure	50-1000 MHz		3.0		dB
$V_{bias}$			24		V
$I_{DD}$ <sup>(2)</sup>			270		mA
Thermal Resistance, $\theta_{jc}$	Module (junction to case)		4.0		°C/W

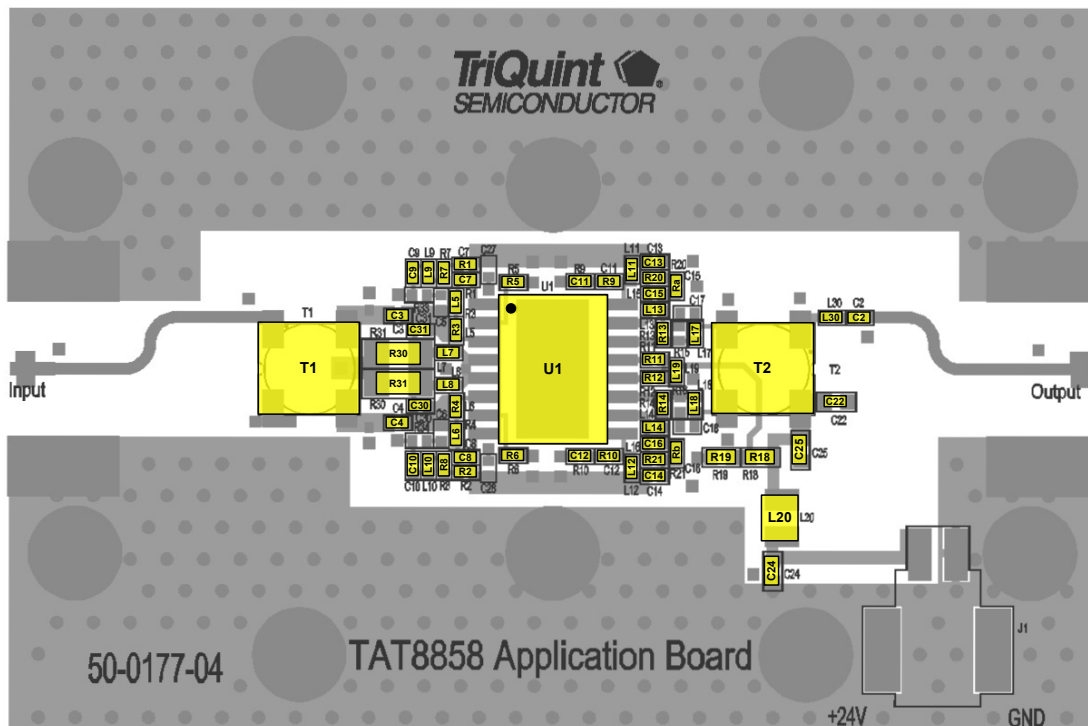
#### Notes:

- 79ch. NTSC + QAM (-6dB offset) to 1003.25 MHz flat input, 43dBmV/ch Vout at channel 2.
- Active biasing is easily implemented with traditional dual-pnp approaches. Biasing at 12 V is also possible.

**TAT8858A1H-PCB 24V Schematic**



**TAT8858A1H-PCB 24V Evaluation Board Layout**

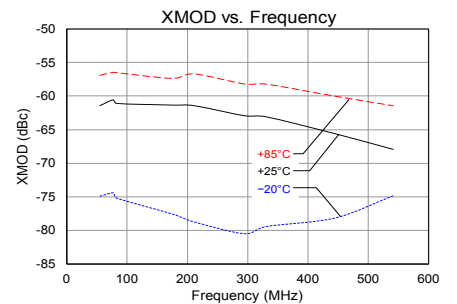
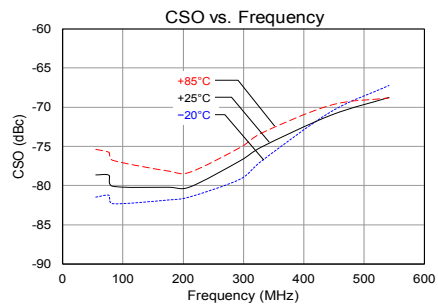
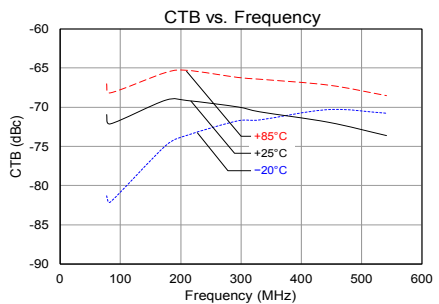
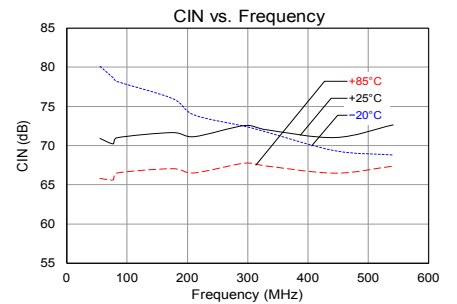
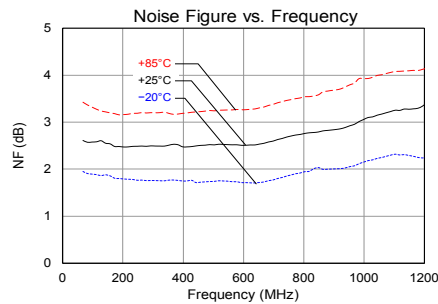
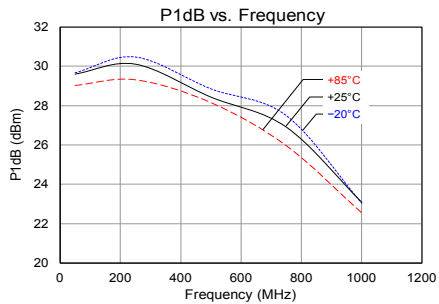
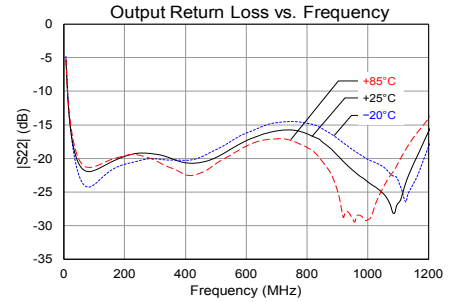
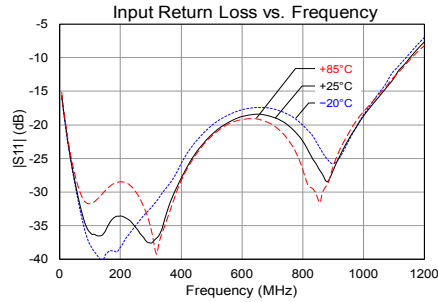
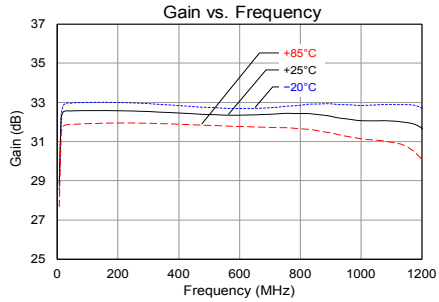


### Bill of Material – TAT8858A1H-PCB 24V

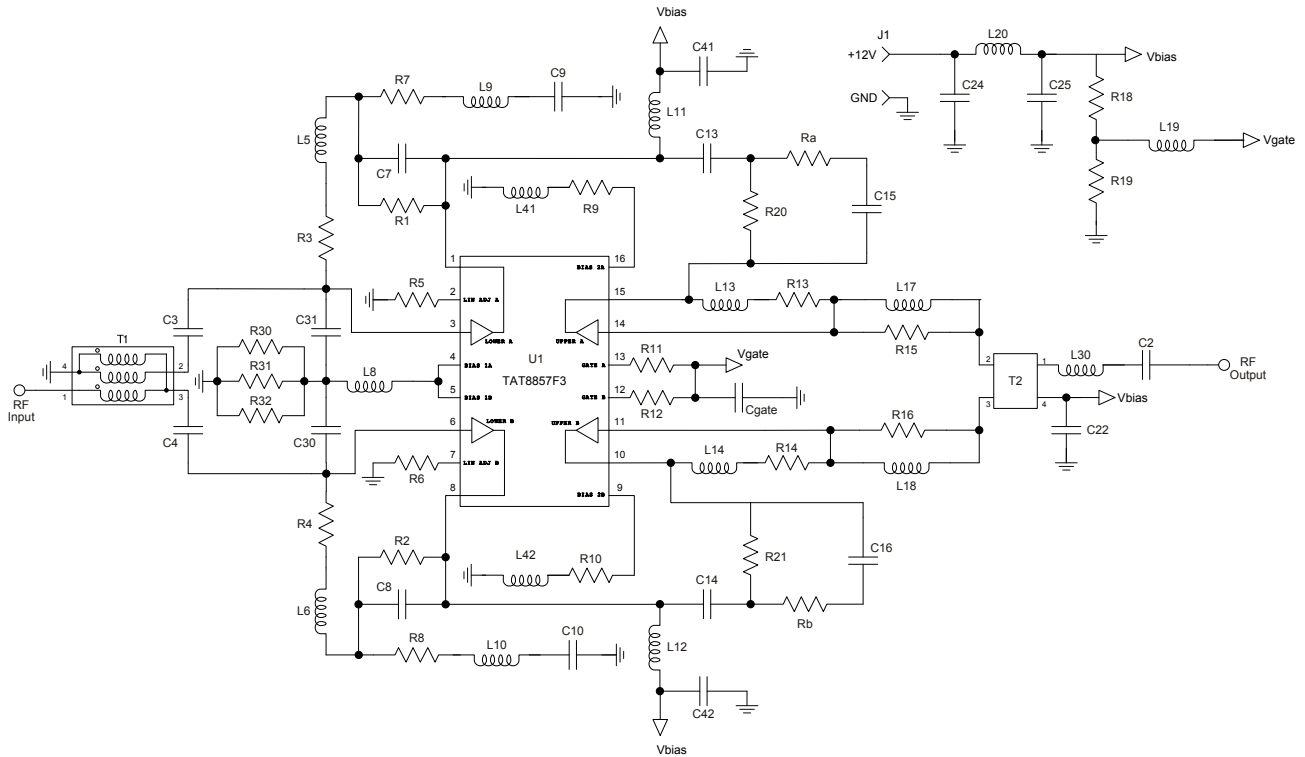
Reference Des.	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board	TriQuint	
U1	n/a	SOIC16W IC	TriQuint	TAT8858
T1	n/a	TX Line Transformer, 3rd winding, 1:1	Macom	MABA-008483-CT1760
T2	n/a	TX Line Transformer, Special, 2:1	Macom	MABA-007681-CT2010
			Mini-Circuits	TRS2-1T-1+
C30, C31	2.2 pF	CAP 0402, $\pm 0.1$ pF, 50V, NPO/COG	TDK	C1005C0G1H2R2B
C15, C16	4.7pF	CAP 0402, $\pm 0.1$ pF, 50V, NPO/COG	Murata	GRM1555C1H4R7BZ01D
C3, C4, C7, C8, C11, C12, C22	0.01 uF	CAP 0402, 10%, 50V, X7R	various	
C13, C14	330 pF	CAP 0402, 10%, 50V, X7R	Panasonic	ECJ-0EB1H331K
C9, C10, C2	470 pF	CAP 0402, 5%, 50V, NPO/COG	TDK	CGA2B2C0G1H471J
C24, C25	0.01 uF	CAP 0603, 10%, 50V, X7R	AVX	06035C103KAT2A
Cin	0.2 pF	CAP 0402, $\pm 0.05$ pF, 25V	AVX	04023J0R2ABWTR
L11, L12	470 nH	IND 0402, 5%	CoilCraft	0402AF-471XJLU
L9, L10	12 nH	IND 0402, 5%	CoilCraft	0402CS-12NXJLW
L5, L6	16 nH	IND 0402, 5%	CoilCraft	0402CS-18NXJLW
L30	1.0 nH	IND 0402, 5%	CoilCraft	0402CS-1N0XJLW
L17, L18	2.2 nH	IND 0402, 5%	CoilCraft	0402CS-2N2XJLW
L20	900 nH	IND 1008, 10%	CoilCraft	1008AF-901XKLC
L13, L14	43 nH	IND 0402, 5%	CoilCraft	0402CS-43NXJLW
L7, L8, L19	600 $\Omega$	RES 0402, 300mA bead	Murata	BLM15AG601SN1
R7, R8	36.0 $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R1, R2	20.0 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R3, R4	360 $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R18	2.70 k $\Omega$	RES 0603, 1%, 75V, 1/10W	various	
R19	2.00 k $\Omega$	RES 0603, 1%, 75V, 1/10W	various	
R5	8.06 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R6	18.2 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R9, R10	200 $\Omega$	RES 0402, 1%, 50V, 1/16W	various	
Ra, Rb	15.0 $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R13, R14	2.40 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R11, R12	33.0 $\Omega$	RES 0402, 1%, 50V, 1/16W	various	
R20, R21	24.0 $\Omega$	RES 0402, 1%, 50V, 1/16W	various	
R30, R31	12.0 $\Omega$	RES 1206, 1%, 200V, 1/4W	various	

### Performance Plots – TAT8858A1H-PCB 24V

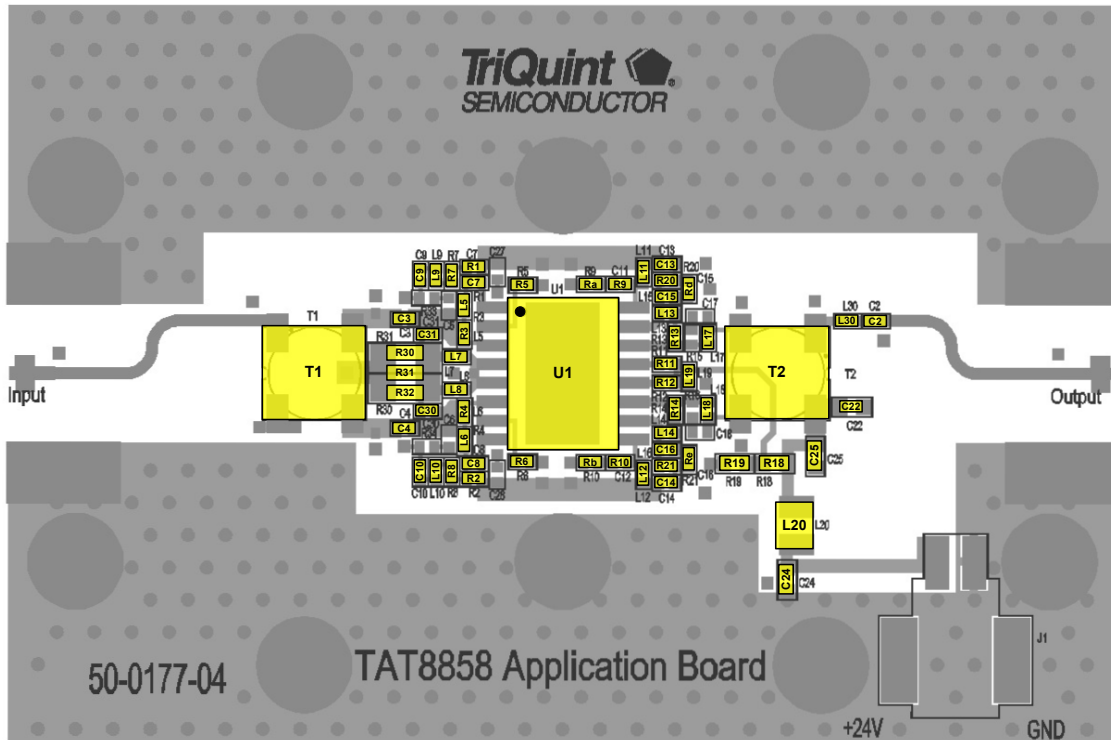
Test conditions unless otherwise noted:  $V_{CC} = +24\text{ V}$ ,  $I_{DD} = 270\text{ mA}$ ,  $T_{CASE} = +25^\circ\text{C}$ ,  $75\ \Omega$  system



**TAT8858A1H-PCB 12V Schematic**



**TAT8858A1H-PCB 12V Evaluation Board Layout**

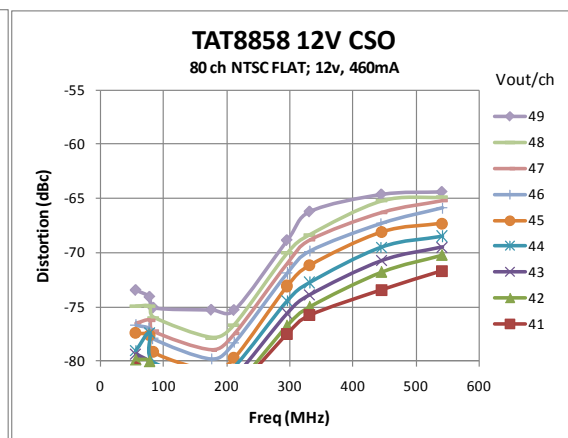
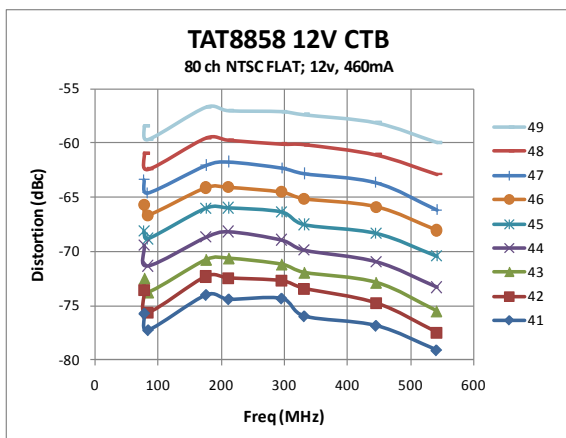
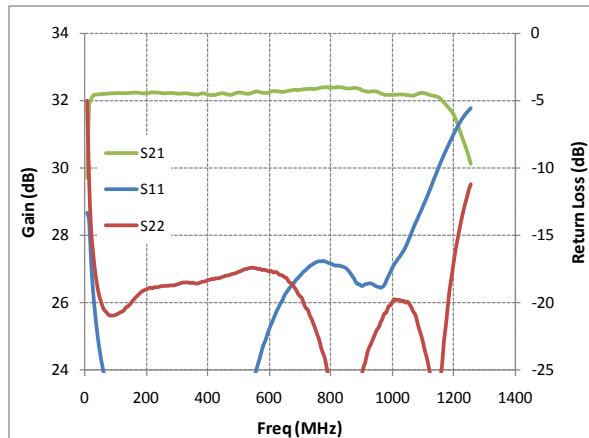


### Bill of Material – TAT8858A1H-PCB 12V

Reference Des.	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board	TriQuint	
U1	n/a	SOIC16W IC	TriQuint	TAT8858
T1	n/a	TX Line Transformer, 3rd winding, 1:1	Macom	MABA-008483-CT1760
T2	n/a	TX Line Transformer, Special, 2:1	Macom	MABA-007681-CT2010
			Mini-Circuits	TRS2-1T-1+
C30, C31	2.2 pF	CAP 0402, $\pm 0.1$ pF, 50V, NPO/COG	TDK	C1005C0G1H2R2B
C15, C16	4.7pF	CAP 0402, $\pm 0.1$ pF, 50V, NPO/COG	Murata	GRM1555C1H4R7BZ01D
C3, C4, C7, C8, C22, C41, C42	0.01 uF	CAP 0402, 10%, 50V, X7R	various	
C13, C14	330 pF	CAP 0402, 10%, 50V, X7R	Panasonic	ECJ-0EB1H331K
C9, C10, C2	470 pF	CAP 0402, 5%, 50V, NPO/COG	TDK	CGA2B2C0G1H471J
C24, C25	0.01 uF	CAP 0603, 10%, 50V, X7R	AVX	06035C103KAT2A
Cgate	100 pF	CAP 0402, 10%, 50V, X7R	various	
L11, L12	880 nH	IND 0805, $\pm 5\%$	GOWANDA	CC0805-880J-2
L9, L10	12 nH	IND 0402, 5%	CoilCraft	0402CS-12NXJLW
L5, L6	16 nH	IND 0402, 5%	CoilCraft	0402CS-16NXJLW
L30	1.0 nH	IND 0402, 5%	CoilCraft	0402CS-1N0XJLW
L17, L18	2.2 nH	IND 0402, 5%	CoilCraft	0402CS-2N2XJLW
L20	900 nH	IND 1008, 10%	CoilCraft	1008AF-901XKLC
L13, L14	43 nH	IND 0402, 5%	CoilCraft	0402CS-43NXJLW
L8, L19, L41, L42	600 $\Omega$	RES 0402, 300mA bead	Murata	BLM15AG601SN1
R7, R8	36.0 $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R1, R2	3.00 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R3, R4	360 $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R18	2.70 k $\Omega$	RES 0603, 1%, 75V, 1/10W	various	
R19	845 $\Omega$	RES 0603, 1%, 75V, 1/10W	various	
R5	5.10 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R6	9.10 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R9, R10	10.0 $\Omega$	RES 0402, 1%, 50V, 1/16W	various	
Ra, Rb	15.0 $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R15, R16	3.0 $\Omega$	RES 0402, 5%, 50V, 1/10W	various	
R13, R14	2.40 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R11, R12	33.0 $\Omega$	RES 0402, 1%, 50V, 1/16W	various	
R20, R21	24.0 $\Omega$	RES 0402, 1%, 50V, 1/16W	various	
R30, R31, R32	91.0 ohm	RES 1206, 1%, 200V, 1/4W	various	

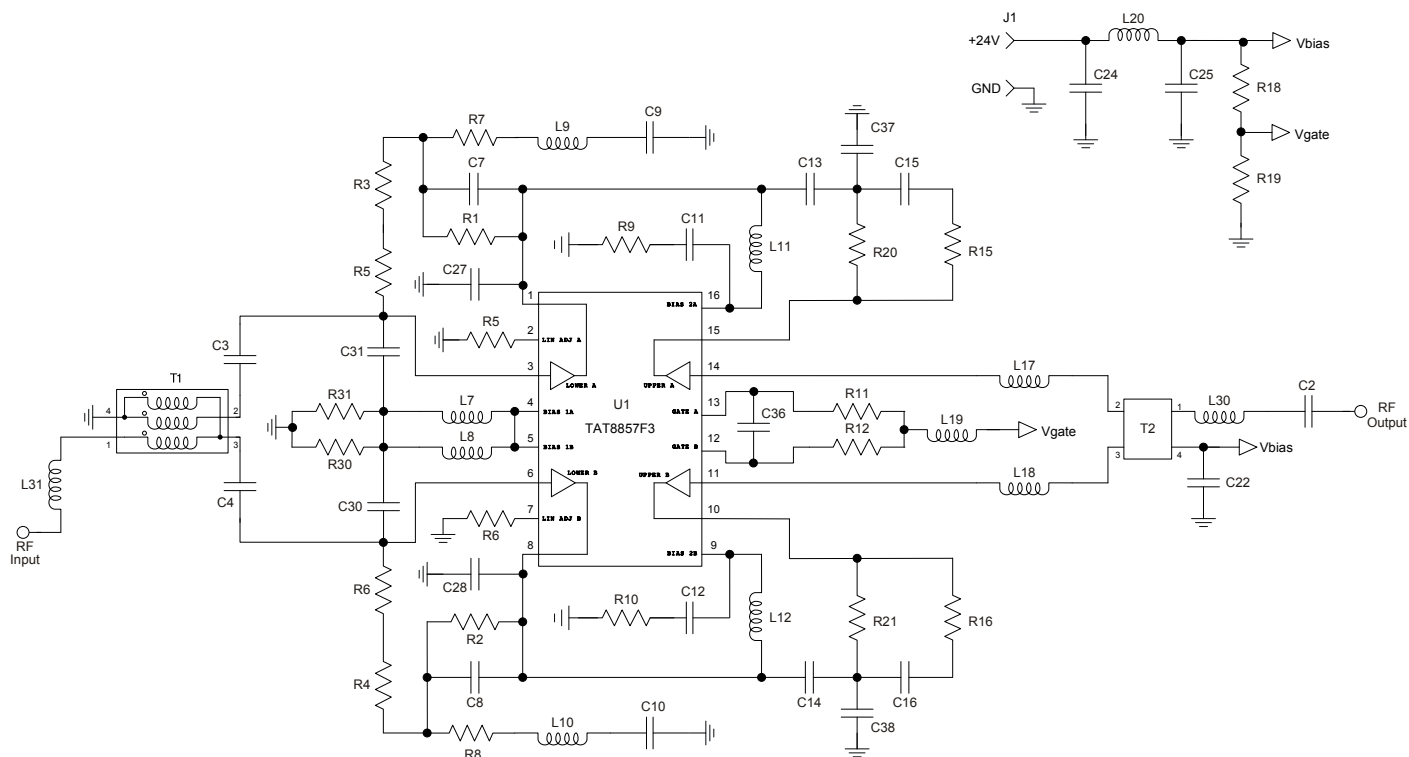
**Performance Plots – TAT8858A1H-PCB 12V**

Test conditions unless otherwise noted:  $V_{CC}=+12\text{ V}$ ,  $I_{DD} = 460\text{ mA}$ ,  $T_{CASE} = +25^{\circ}\text{C}$ ,  $75\ \Omega$  system

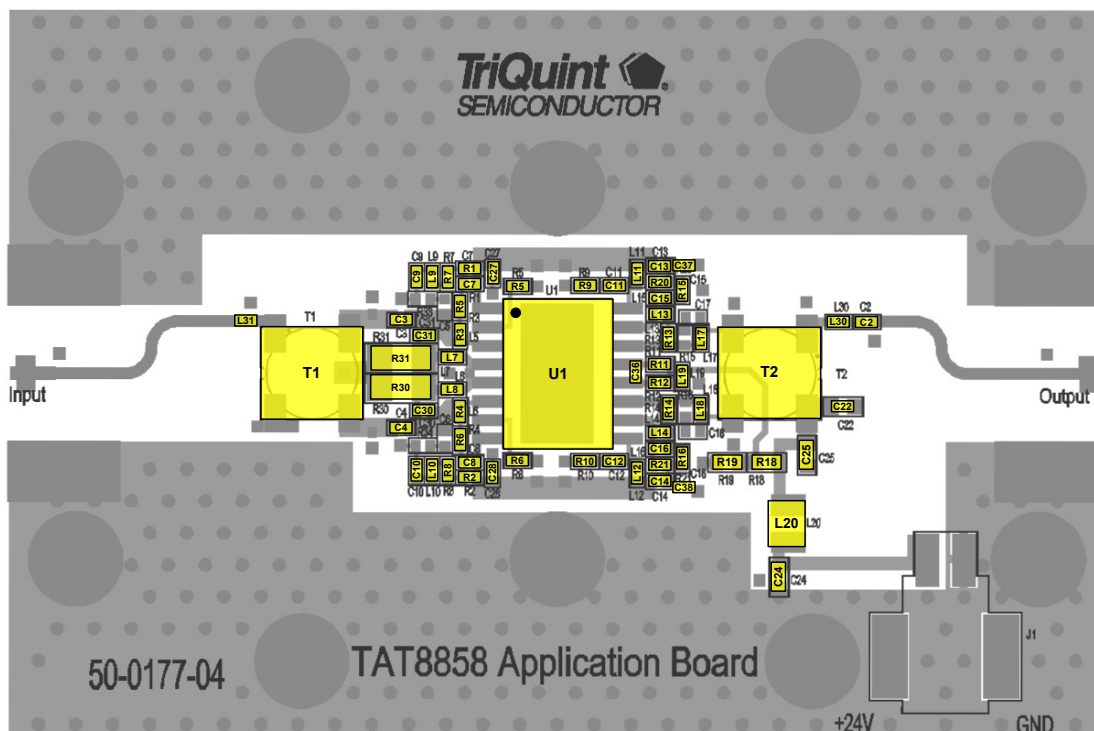




**TAT8858A1H 28 dB Gain Reference Design**



**TAT8858A1H 28 dB Gain Reference Design Layout**

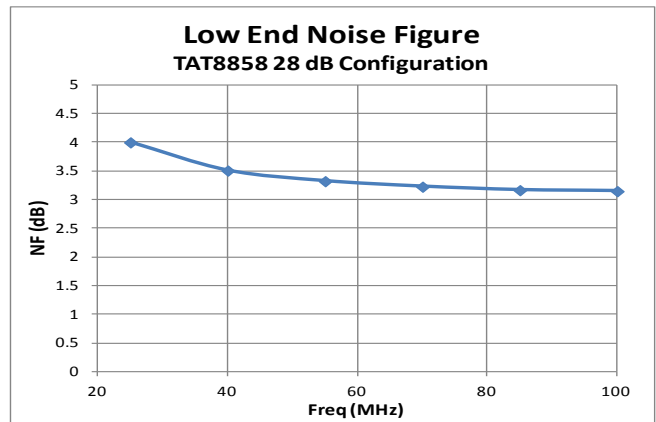
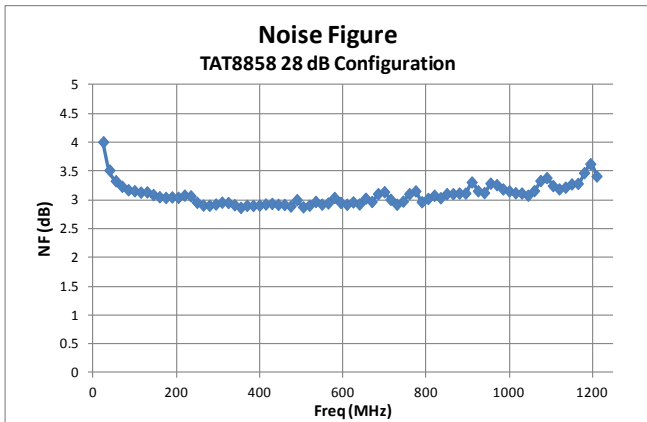
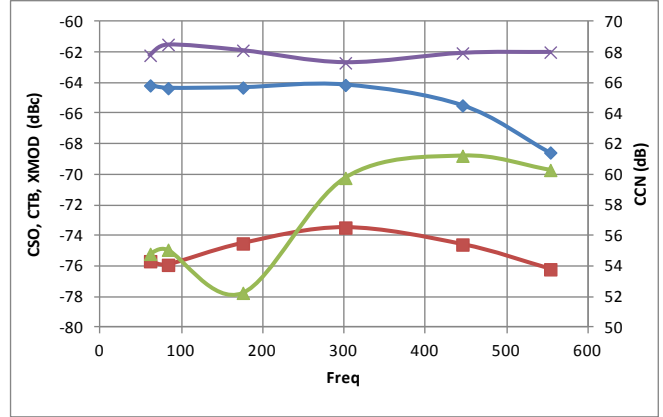
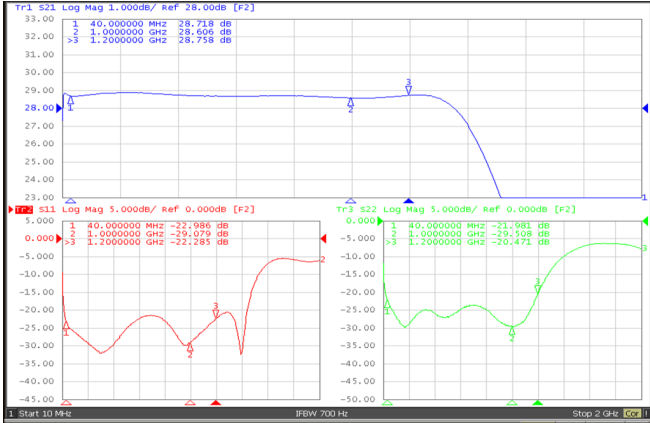


### Bill of Material – TAT8858A1H 28 dB Gain Reference Design

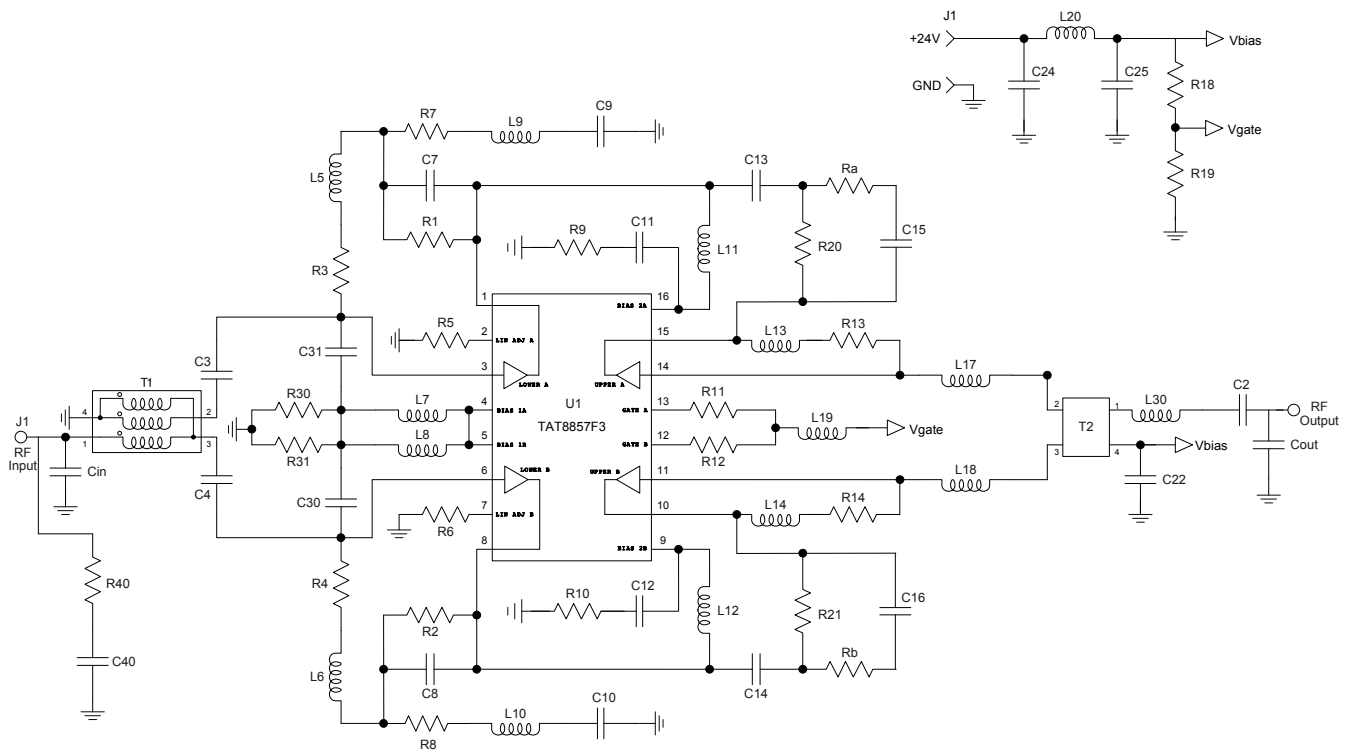
Reference Des.	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board	TriQuint	
U1	n/a	SOIC16W IC	TriQuint	TAT8858
T1	n/a	TX Line Transformer, 1:1	MA-COM	MABA-008483-CT1760
T2	n/a	TX Line Transformer, Special, 2:1	MA-COM	MABA-007681-CT2010
			Mini-Circuits	TRS2-1T-1+
C2	470 pF	CAP 0402, 5%, 50V, NPO/COG	TDK	CGA2B2C0G1H471J
C15, C16	5.6 pF	CAP 0402, ± 0.1pF, 50V, NPO/COG	Murata	GRM1555C1H5R6BZ01D
C3, C4, C7, C8, C11, C12, C22	0.01 uF	CAP 0402, 10%, 50V, X7R	various	
C13, C14	270 pF	CAP 0402, 10%, 50V, X7R	Panasonic	ECJ-0EB1H271K
C9, C10	560 pF	CAP 0402, 5%, 50V, NPO/COG	TDK	CGA2B2C0G1H561J
C24, C25	0.01 uF	CAP 0603, 10%, 50V, X7R	AVX	06035C103KAT2A
C27, C28, C36, C37, C38	0.5 pF	CAP 0402, ± 0.1pF, 25V, NPO/COG	AVX	04023J0R5BBSTR
C30, C31	1.5 pF	CAP 0402, ± 0.1pF, 50V, NPO/COG	TDK	C1005C0G1H1R5B
L11, L12	180 nH	IND 0402, 5%	CoilCraft	0402AF-181XJLU
L9, L10, L17, L18	3.9 nH	IND 0402, 5%	CoilCraft	0402CS-3N9XJLW
R5, R6	270 Ω	RES 0402, 1%, 1/16W	various	
L30, L31	1.0 nH	IND 0402, 5%	CoilCraft	0402CS-1N0XJLW
L20	900 nH	IND 1008, 10%	CoilCraft	1008AF-901XKLC
R15, R16	51.0 Ω	RES 0402, 1%, 1/10W	various	
L7, L8, L19	600 Ω	RES 0402, 300mA ferrite bead	Murata	BLM15AG601SN10
R7, R8	18.0 Ω	RES 0402, 1%, 1/10W	various	
R1, R2	20.0 kΩ	RES 0402, 1%, 1/10W	various	
R3, R4	0.0 Ω	RES 0402, 1/10W	various	
R18	2.70 kΩ	RES 0603, 1%, 1/10W	various	
R19	2.00 kΩ	RES 0603, 1%, 1/10W	various	
R5	10.0 kΩ	RES 0402, 1%, 1/10W	various	
R6	18.2 kΩ	RES 0402, 1%, 1/10W	various	
R9, R10	200 Ω	RES 0402, 1%, 1/16W	various	
R11, R12	33.0 Ω	RES 0402, 1%, 1/16W	various	
R20, R21	51.0 Ω	RES 0402, 1%, 1/16W	various	
R30, R31	12.0 ohm	RES 1206, 1%, 1/4W	various	

### Performance Plots – 28 dB Gain Reference Design

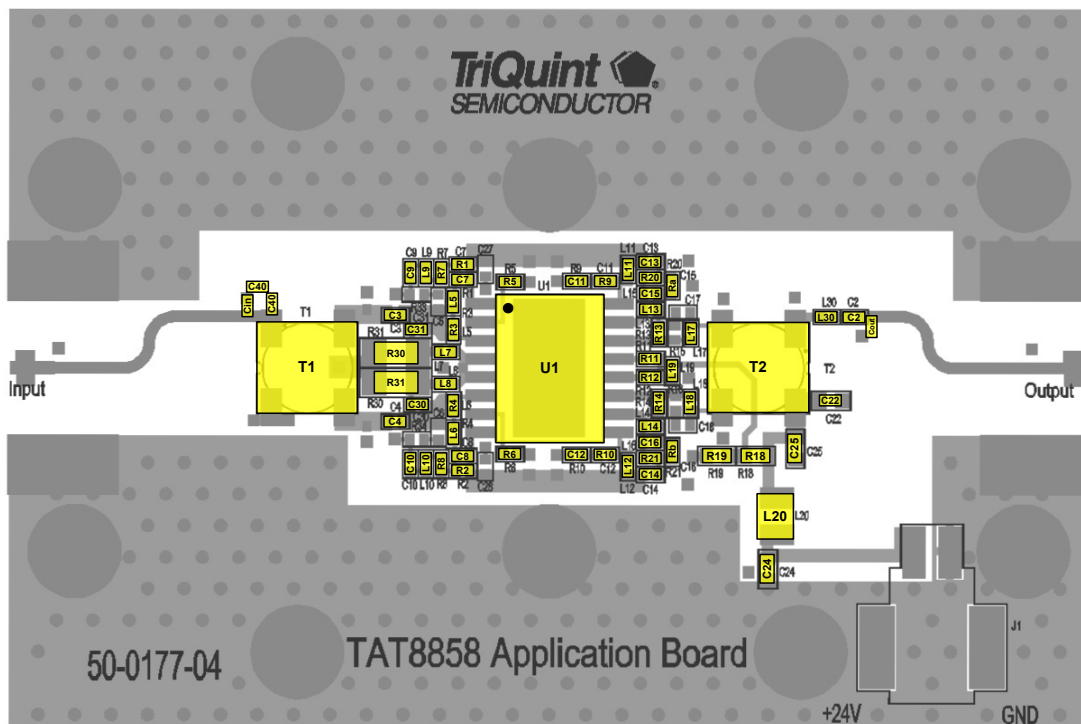
Test conditions unless otherwise noted:  $V_{CC}=+24\text{ V}$ ,  $I_{DD} = 270\text{ mA}$ ,  $T_{CASE} = +25^{\circ}\text{C}$ ,  $75\ \Omega$  system



**TAT8858A1H 1200 MHz Reference Design**



**TAT8858A1H 1200 MHz Reference Design Layout**

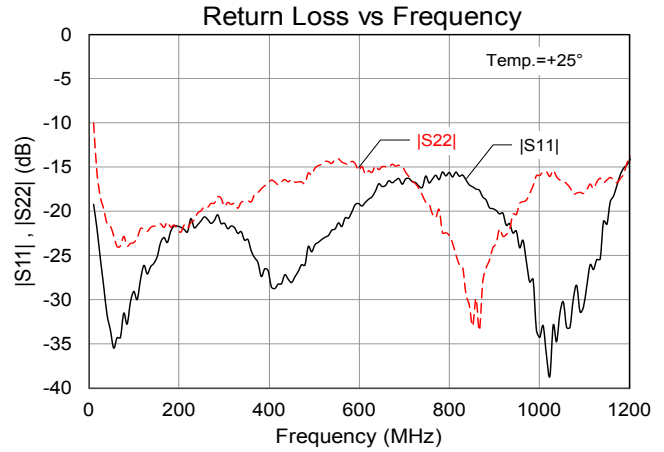
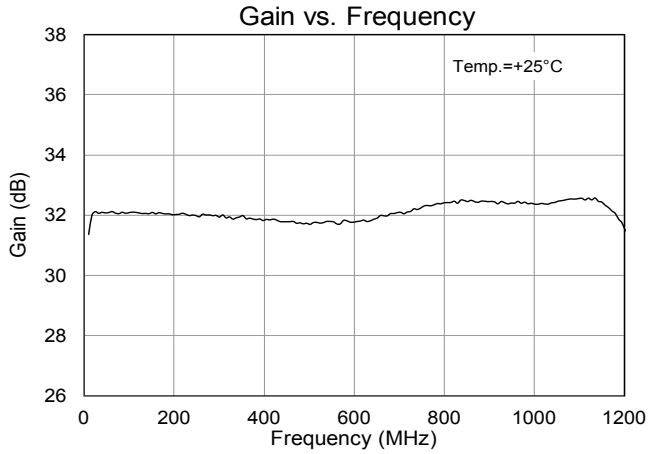


### Bill of Material – TAT8858A1H 1200 MHz Reference Design

Reference Des.	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board	TriQuint	
U1	n/a	SOIC16W IC	TriQuint	TAT8858
T1	n/a	TX Line Transformer, 3rd winding, 1:1	Macom	MABA-008483-CT1760
T2	n/a	TX Line Transformer, Special, 2:1	Macom	MABA-007681-CT2010
			Mini-Circuits	TRS2-1T-1+
C30, C31	2.2 pF	CAP 0402, $\pm 0.1$ pF, 50V, NPO/COG	TDK	C1005C0G1H2R2B
C15, C16	4.7pF	CAP 0402, $\pm 0.1$ pF, 50V, NPO/COG	Murata	GRM1555C1H4R7BZ01D
C3, C4, C7, C8, C11, C12, C22	0.01 uF	CAP 0402, 10%, 50V, X7R	various	
C13, C14	330 pF	CAP 0402, 10%, 50V, X7R	Panasonic	ECJ-0EB1H331K
C9, C10, C2	470 pF	CAP 0402, 5%, 50V, NPO/COG	TDK	CGA2B2C0G1H471J
C24, C25	0.01 uF	CAP 0603, 10%, 50V, X7R	AVX	06035C103KAT2A
C40	12 pF	CAP 0402, 5%, 50V, NPO/COG	Murata	GRM1555C1H120JA01D
Cin	0.3 pF	CAP 0402, $\pm 0.05$ pF, 25V	AVX	04023J0R3ABWTR
Cout	0.5 pF	CAP 0402, $\pm 0.1$ pF, 25V	AVX	04023J0R5BBSTR
L11, L12	470 nH	IND 0402, 5%	CoilCraft	0402AF-471XJLU
L9, L10	12 nH	IND 0402, 5%	CoilCraft	0402CS-12NXJLW
L5, L6	16 nH	IND 0402, 5%	CoilCraft	0402CS-18NXJLW
L30	4.7 nH	IND 0402, 5%	CoilCraft	0402CS-4N7XJLW
L17, L18	2.2 nH	IND 0402, 5%	CoilCraft	0402CS-2N2XJLW
L20	900 nH	IND 1008, 10%	CoilCraft	1008AF-901XKLC
L13, L14	43 nH	IND 0402, 5%	CoilCraft	0402CS-43NXJLW
L7, L8, L19	600 $\Omega$	RES 0402, 300mA bead	Murata	BLM15AG601SN1
R7, R8	36.0 $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R1, R2	20.0 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R3, R4	360 $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R18	2.70 k $\Omega$	RES 0603, 1%, 75V, 1/10W	various	
R19	2.00 k $\Omega$	RES 0603, 1%, 75V, 1/10W	various	
R5	8.06 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R6	18.2 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R9, R10	200 $\Omega$	RES 0402, 1%, 50V, 1/16W	various	
Ra, Rb	15.0 $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R13, R14	2.40 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	
R11, R12	33.0 $\Omega$	RES 0402, 1%, 50V, 1/16W	various	
R20, R21	24.0 $\Omega$	RES 0402, 1%, 50V, 1/16W	various	
R30, R31	12.0 $\Omega$	RES 1206, 1%, 200V, 1/4W	various	
R40	1.0 k $\Omega$	RES 0402, 1%, 50V, 1/10W	various	

**Performance Plots – TAT8858A1H 1200 MHz Reference Design**

Test conditions unless otherwise noted:  $V_{CC}=+24\text{ V}$ ,  $I_{DD} = 270\text{ mA}$ ,  $T_{CASE} = +25^{\circ}\text{C}$ ,  $75\ \Omega$  system

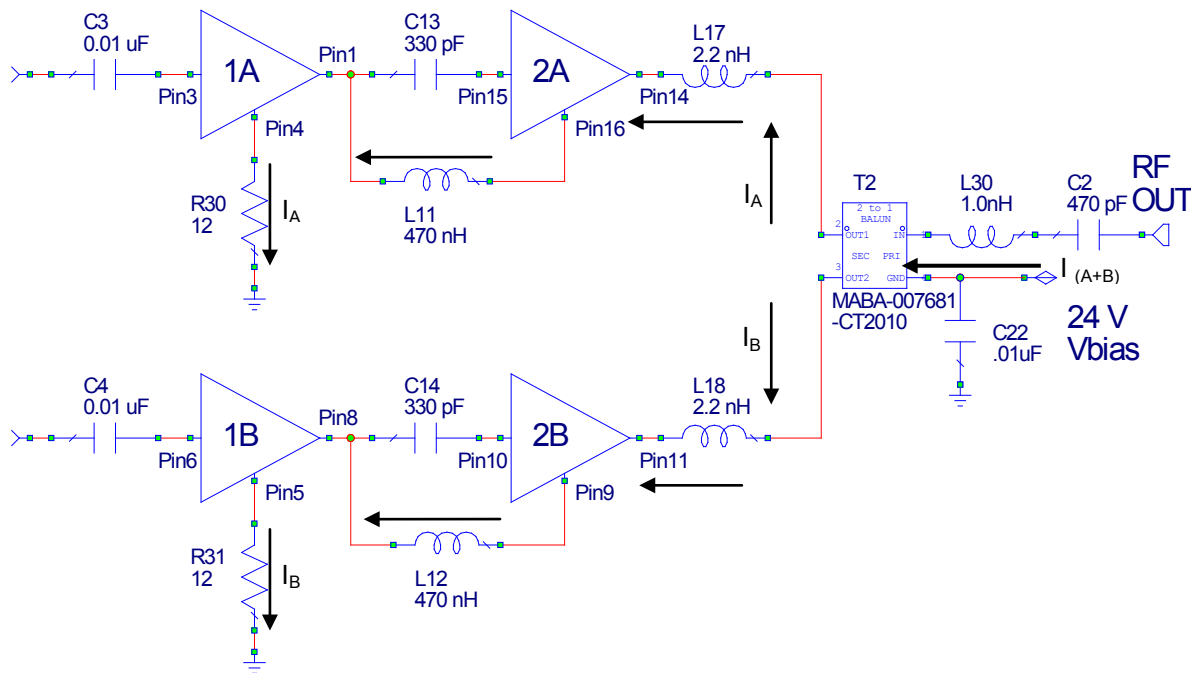


### Detailed Device Description

The TAT8858A1H is a 2-stage balanced amplifier using pHEMT & MESFET Technology. Each stage utilizes cascode topology to provide wide bandwidth and efficient linear amplification. The TAT8858 allows flexibility to set the gain and bias to meet the requirements of different applications without additional active devices. Bias options allow the designer to select either 12V bias for lower power dissipation green designs, or 24V for existing power supply systems. The TAT8858A1H push-pull amplifier can be configured to split a 24 V supply (and share the same current) or both amplifiers can be biased from a 12V supply and draw current independently.

### DC Operation

In 24V application output stage 2A is in series with input stage 1A, shown as in simplified DC diagram below. Output stage 2B is in series with input stage 1B. The DC current  $I_{(A+B)}$  flows from 24 V to ground through stage A & B in the direction shown below.



### Detailed Device Description

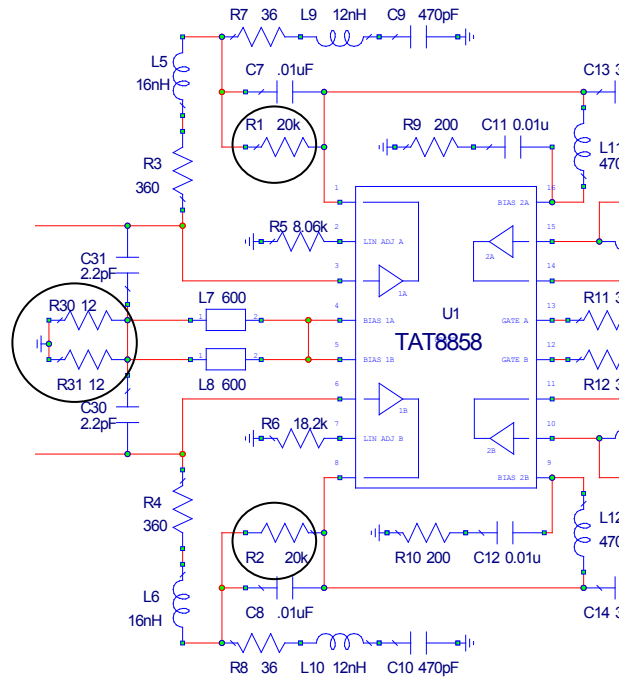
#### Bias Current Adjustment

Bias current is determined by 2 settings:

1. Size of DC feedback resistors - decreasing R1 & R2 will increase the bias current  $I_{DD}$ .
2. Tail resistors - decreasing R30, R31 will increase  $I_{DD}$ , but lead to wider variations.

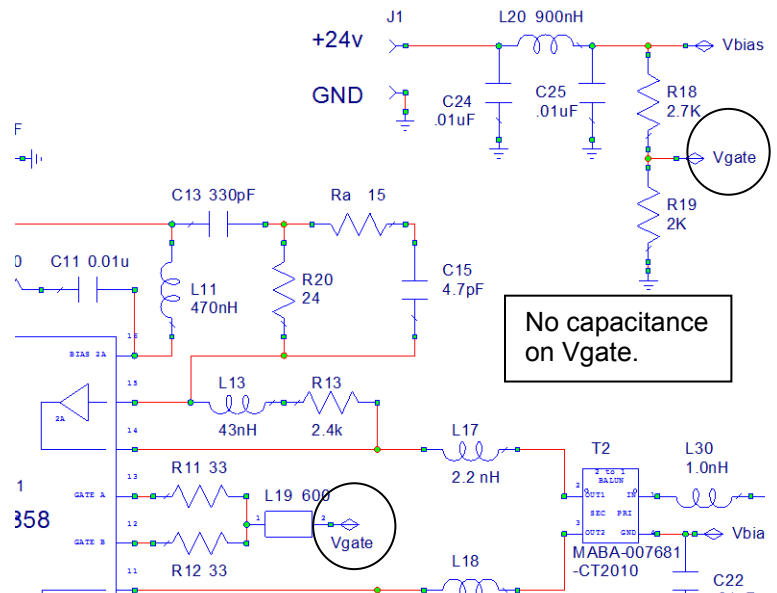
Active biasing schemes are possible but not necessary for most applications.

Best performance is with  $I_{DD} = 270\text{mA}$



#### Biasing of Output FET:

1. Voltage split ratio is left to the customer and is set by  $V_{gate}$ .
2. In 24V application no cap should be put on  $V_{gate}$ . This prevents a turn-on over-voltage condition from damaging the output FET.
3. Voltage divider should be done with same or lower resistor values to prevent gate leakage current in the output FET from affecting  $V_{gate}$ .





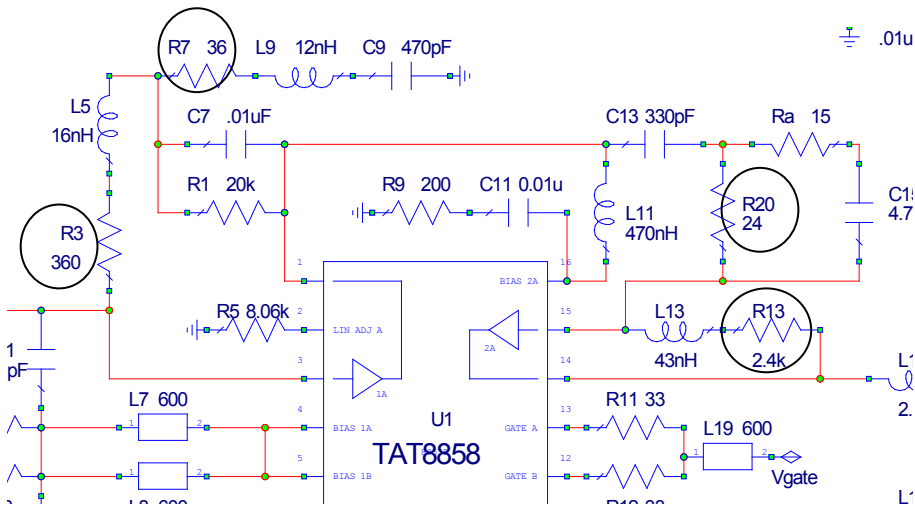
**Detailed Device Description**

**RF Operation**

**Gain Setting**

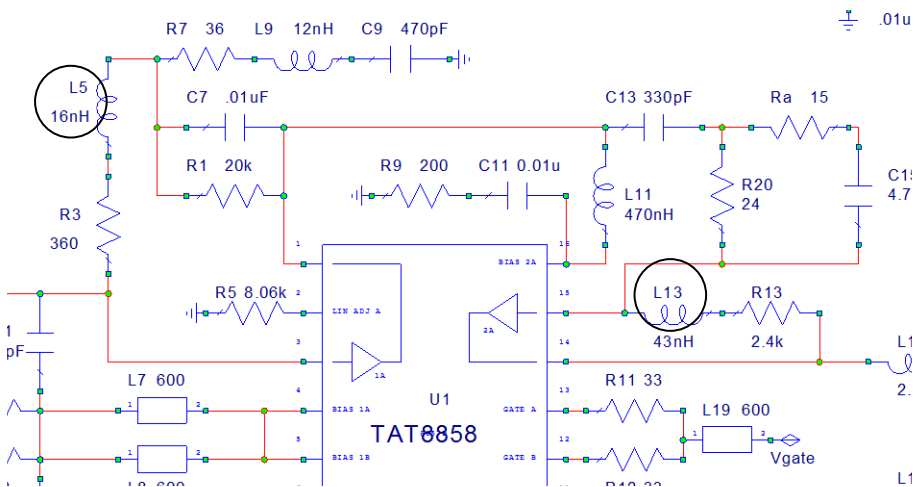
There are two primary ways to adjust the low frequency gain.

1. Adjust shunt feedback resistors around input and output stages.
2. Adjust resistors in inter – stage equalizer.



**Tilt Adjustment**

1. Adding inductors in series with the shunt feedback resistors will peak the gain.

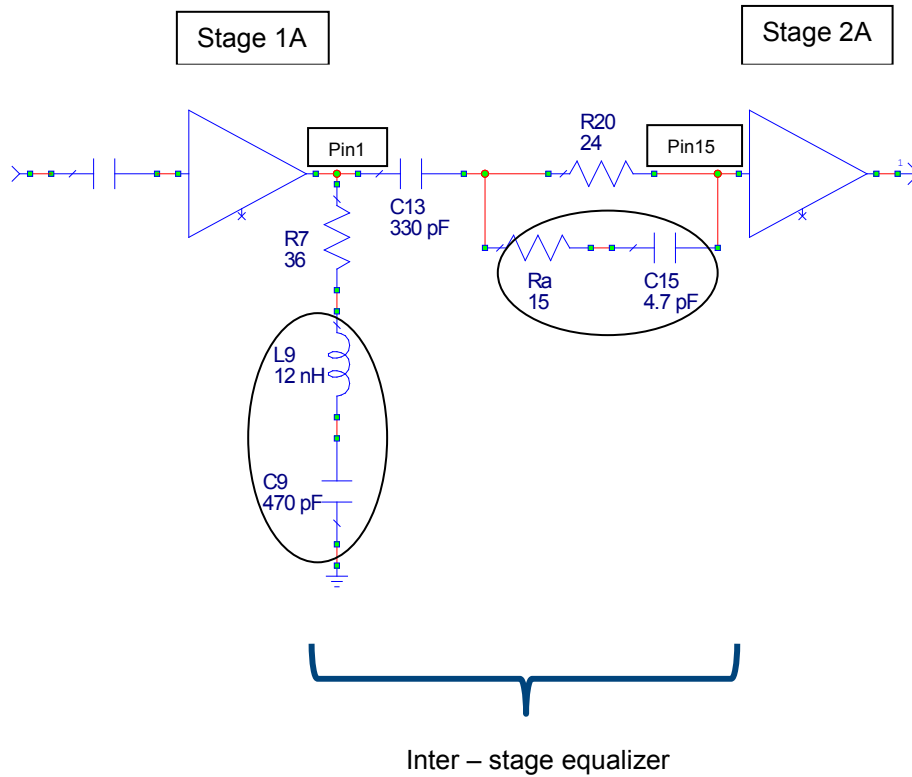


**Detailed Device Description**

**Inter – stage Equalizer**

Use inter – stage network for gain and tilt adjustment. Two inter – stage RLC networks shape the gain and return loss without affecting the noise figure and output performance.

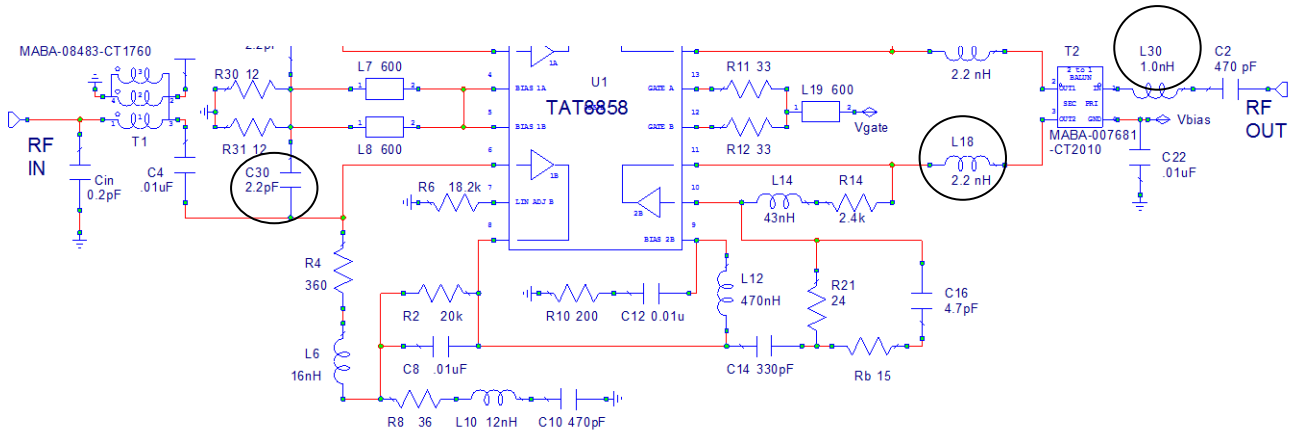
1. Increasing inductor L9 will provide up-tilt. C9 affects very low frequency response.
2. Ra and C15 will affect up-tilt shape.



### Detailed Device Description

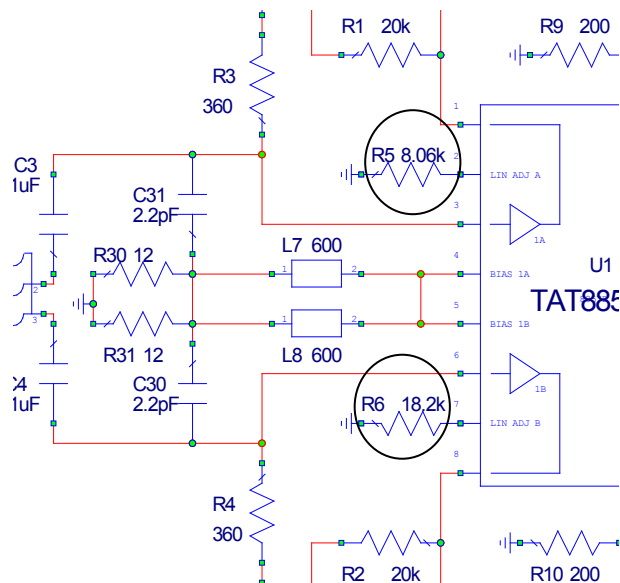
#### Return Loss Adjustment

1. Low frequency return loss should be considered at the same time with gain using the feedback and equalizer resistor values.
2. High frequency return loss can be adjusted with changes to the capacitor and inductor values near the input balun and output transformer.



#### CTB Linearization

1. R5, R6 determines linearizer bias current. Increasing R5, R6 decreases linearizer bias current. Decreasing R5, R6 increases linearizer bias current.
2. R5, R6 value in the reference design has been empirically optimized for the best CTB. R5, R6 settings have some impact on CSO.

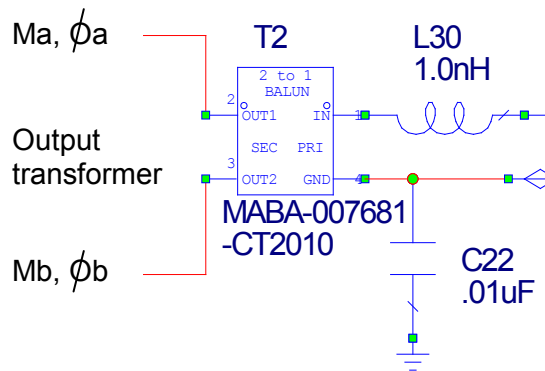
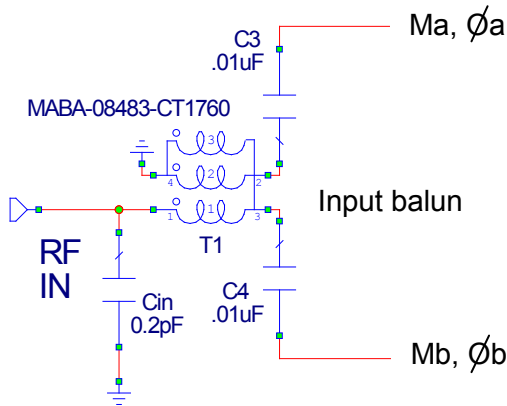


**Detailed Device Description**

**CSO Optimization**

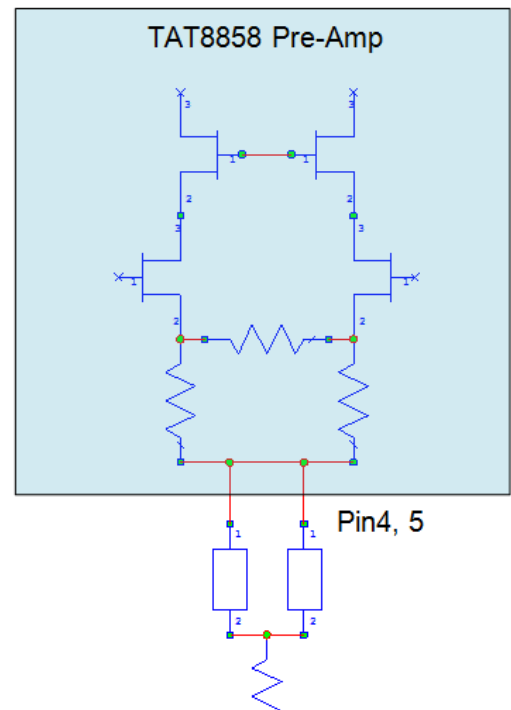
CSO is strongly dependent on circuit balance. Requires attention to:

1. Good input balun balance.
2. Good output transformer balance.
3. Maintaining symmetrical gain and phase response between circuit halves.



**Circuit Balance**

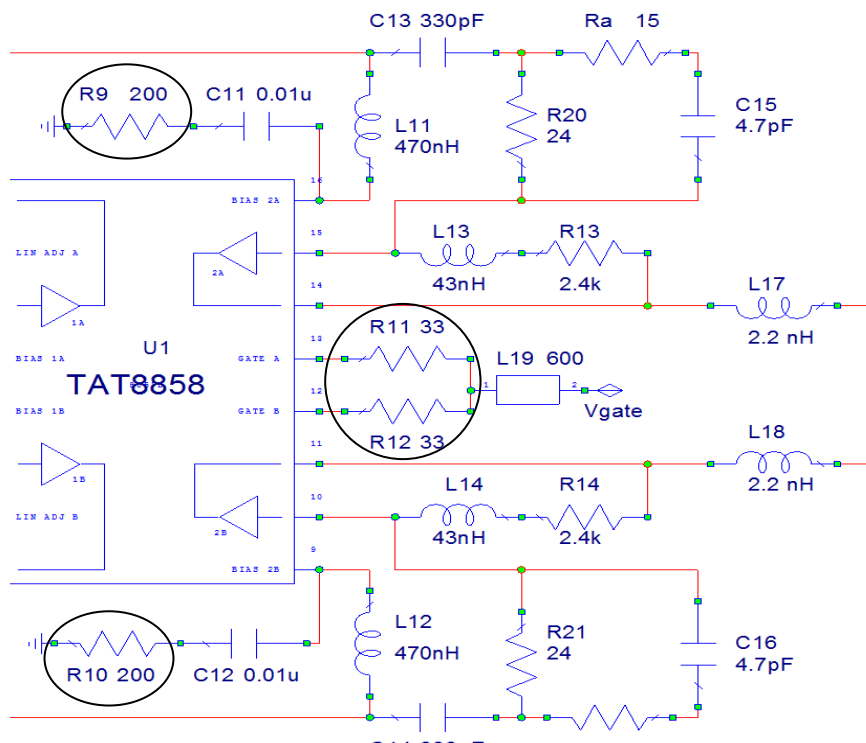
1. Pre-amp stage (stage 1A & stage 1B) is done with a differential pair topology.
2. A high impedance from Pin 4 & 5 to ground helps the pre-amp keep balance when the input balun is not perfect.
3. Ferrite beads can achieve high impedance at low cost. Two beads can be used to increase the current handling capability.



**Detailed Device Description**

**Stability**

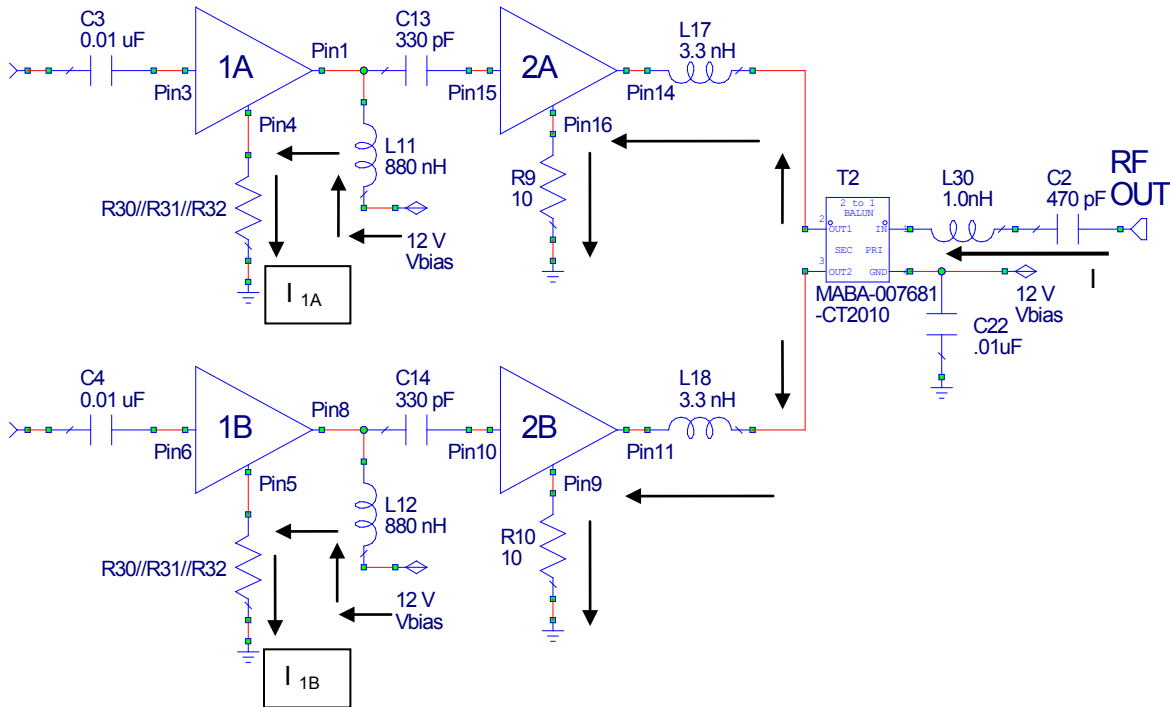
1. Significant stabilization circuits have been placed on the RFICs. However, external circuitry can affect stability.
2. These components are helpful to reduce out of band gain and improve stability.



### Detailed Device Description

#### DC Operation - 12V Supply Application

DC wise in 12V application output stage 2A is in parallel with input stage 1A, shown as in simplified DC diagram below. Similarly stage 2B is in parallel with input stage 1B. The DC current  $I_{(2A+2B)}$ ,  $I_{1A}$ ,  $I_{1B}$  flow from 12 V to ground through stage A & B in the direction shown below.

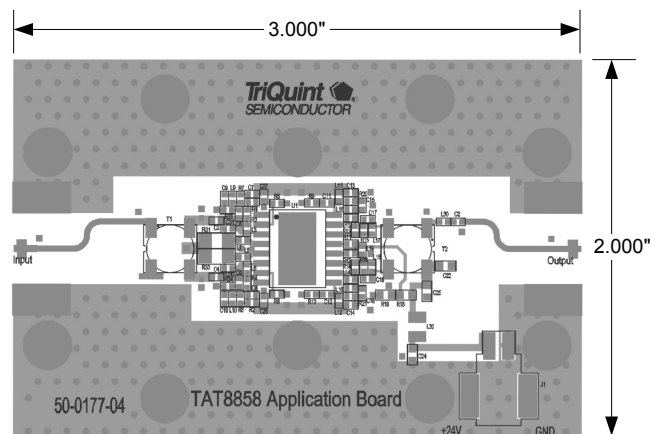
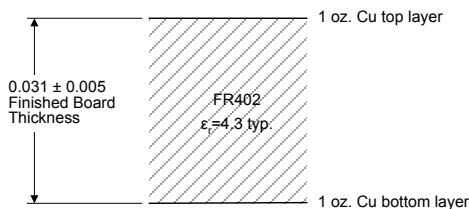


#### RF Operation

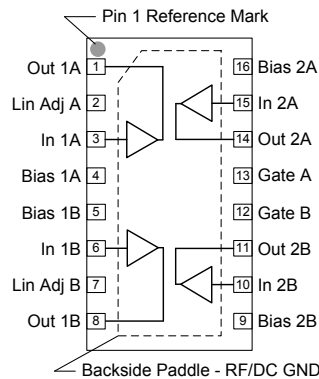
RF analysis for 12V supply application circuit is very similar to 24V. Please refer to the earlier part of Detailed Device Description for details.

### Evaluation Board PCB Information

TriQuint PCB 50-0177-04 Material and Stack-up



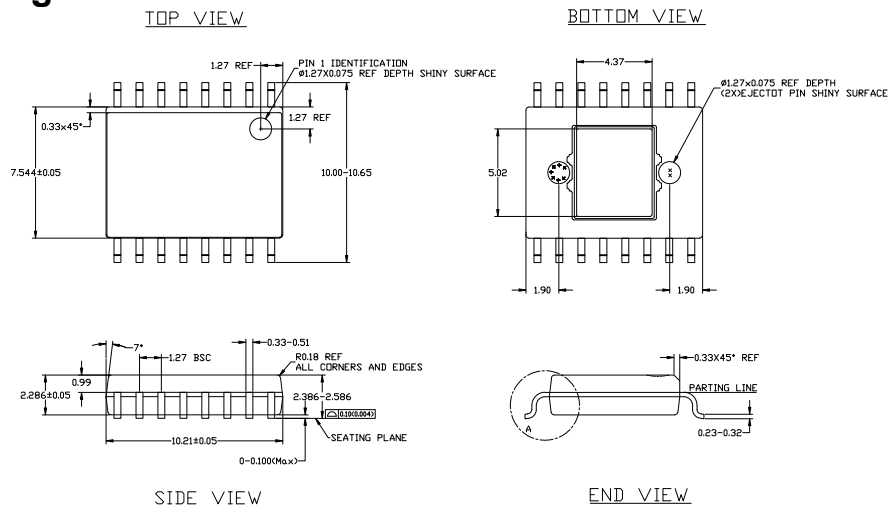
### Pin Configuration and Description



Pin No.	Symbol	Description
1	OUT 1A	Stage 1A cascode amplifier drain output. Connect to stage 2A cascode amplifier input Pin 16 using DC blocking cap C13, buffer and gain equalizer network (R20, Ra, C15), as shown in schematic page 3.
2	LIN ADJ A	Linearization adjustment A. Connect to ground using R5 to set linearizer bias.
3	IN 1A	Stage 1A cascode amplifier gate input. Connect to a balun output using blocking cap C3. Connect to stage 1A output Pin 1 using feedback network (R3, L5, R1, C7) to set gain and DC bias current. Connect to R30, R31 virtual ground using C5 to improve S11.
4	BIAS 1A	Stage 1A cascode amplifier source. Connect to ground using L7, R30. Pin 4 and Pin 5 are connected on chip.
5	BIAS 1B	Stage 1B cascode amplifier source. Connect to ground using L8, R31. Pin 4 and Pin 5 are connected on chip.
6	IN 1B	Stage 1B cascode amplifier gate input. Connect to a balun output using blocking cap C4. Connect to stage 1B output Pin 8 using feedback network (R4, L6, R2, C8) to set gain and DC bias current. Connect to R30, R31 virtual ground using C6 to improve S11.
7	LIN ADJ B	Linearization adjustment B. Connect to ground using R6 to set linearizer bias.
8	OUT 1B	Stage 1B cascode amplifier drain output. Connect to stage 2B cascode amplifier input Pin 10 using DC blocking cap C14, buffer and gain equalizer network (R21, Rb, C16).
9	BIAS 2B	Stage 2B cascode amplifier source. Connect to ground using serial RC network in 24V application. Connect to ground using serial resistor - bead network in 12V application. See more in detailed device description. BIAS 2B and BIAS 2A are connected on chip.
10	IN 2B	Stage 2B cascode amplifier input. Connect to stage 1B cascode amplifier drain output as explained in Pin 8 description.
11	OUT 2B	Stage 2B cascode amplifier drain output. Requires DC bias applied through the output balun, RL feedback network and series matching inductor.
12	GATE B	Stage 2B cascode amplifier output FET gate. Connect to gate bias using a resistor and a bead.
13	GATE A	Stage 2A cascode amplifier output FET gate. Connect to gate bias using a resistor and a bead.
14	OUT 2A	Stage 2A cascode amplifier drain output. Requires DC bias applied through the output balun, RL feedback network and series matching inductor.
15	IN 2A	Stage 2A cascode amplifier input. Connect to stage 1A cascode amplifier drain output as explained in Pin 1 description.
16	BIAS 2A	Stage 2A cascode amplifier source. Connect to ground using serial RC network in 24V application. Connect to ground using serial resistor - bead network in 12V application. See more in detailed device description. BIAS 2A and BIAS 2B are connected on chip.
Backside Paddle	RF/DC GND	RF/DC ground. Use recommended via pattern to minimize inductance and thermal resistance; see PCB Mounting Pattern for suggested footprint.

### Mechanical Information

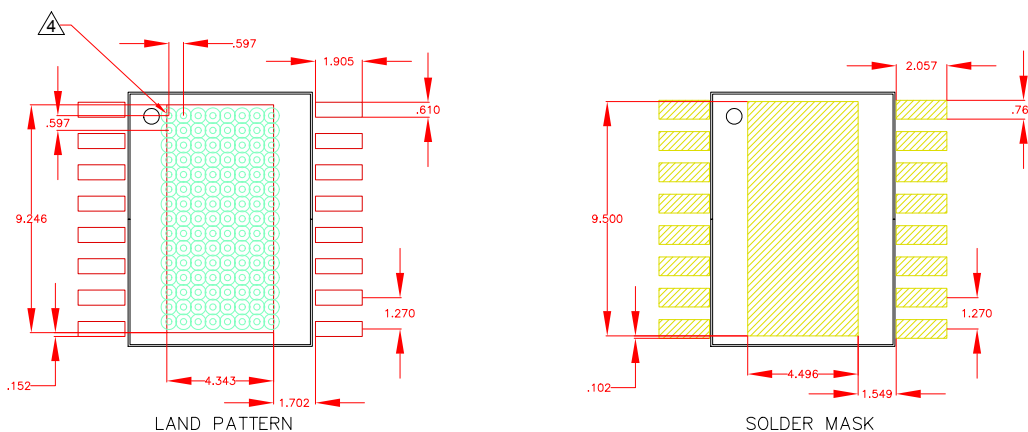
#### Package Marking and Dimensions



**Notes:**

1. All dimensions are in millimeters. Angles are in degrees.
2. Except where noted, this part outline conforms to JEDEC standard MO-220, Issue E (Variation VGGC) for thermally enhanced plastic very thin fine pitch quad flat no lead package (QFN).
3. Dimension and tolerance formats conform to ASME Y14.4M-1994.
4. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

### 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. A heatsink underneath the area of the PCB for the mounted device is strictly required for proper thermal operation. Damage to the device can occur without the use of one.
4. Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation.
5. Do not remove or minimize via hole structure in the PCB. Thermal and RF grounding is critical.
6. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25 mm (0.10").
7. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.



## Product Compliance Information

### ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: Class III  
Value: Passes  $\geq 500$  V  
Test: Human Body Model (HBM)  
Standard: JEDEC Standard JESD22-A114

### 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 max. reflow temperature) and tin/lead (245 °C max. reflow temperature) soldering processes.

Contact plating: Matte Tin

### 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:

- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) Free
- PFOS Free
- SVHC Free

## Contact Information

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Email: [sjcapplications.engineering@triquint.com](mailto:sjcapplications.engineering@triquint.com)

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- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
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## JONHON

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(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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