TDLNA002093SEP

Product Specification

Ultra-Low Noise Amplifier Tuning Range: 1.0 to 6.0 GHz

September 12, 2023

Features

Reference: 5 V / 55 mA / 2.33 GHz

- EVB Noise Figure (NF): 0.37 dB
- Gain: 21.0 dB
- OP1dB: 19.0 dBm
- OIP3: 30 dBm
- Flexible Bias Voltage and Current
- Process: GaAs pHEMT

Applications

- Satellite Communications
- Military and Space Applications
- Distributed Antenna Systems
- GPS Receivers

Description

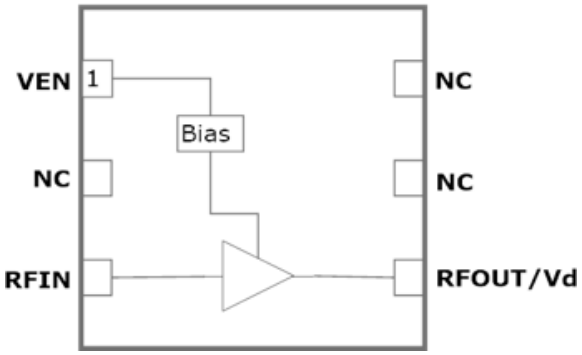
The TDLNA002093 ultra-low noise amplifier offers industry-leading noise figure (NF) and gain performance and can be tuned over a wide range of frequencies from roughly 1.0 to 6.0 GHz.

With application-specific biasing, TDLNA002093 is part of Teledyne e2v's new, high performance harsh environment MMIC solutions suitable for use as the first-stage LNA for advanced satellite or military communication receivers.

It can be biased over a range of Vdd from 2.7 to 5.0 volts and typical Iddq values from 30 mA to 100 mA.

The device uses a 1.5 mm x 1.5 mm DFN-6 package and pin out and the device can be screened for military and space applications per customer requirements. Radiation tolerance information available under NDA.

1.5 mm x 1.5 mm DFN-6
Functional Block Diagram
(Top View)



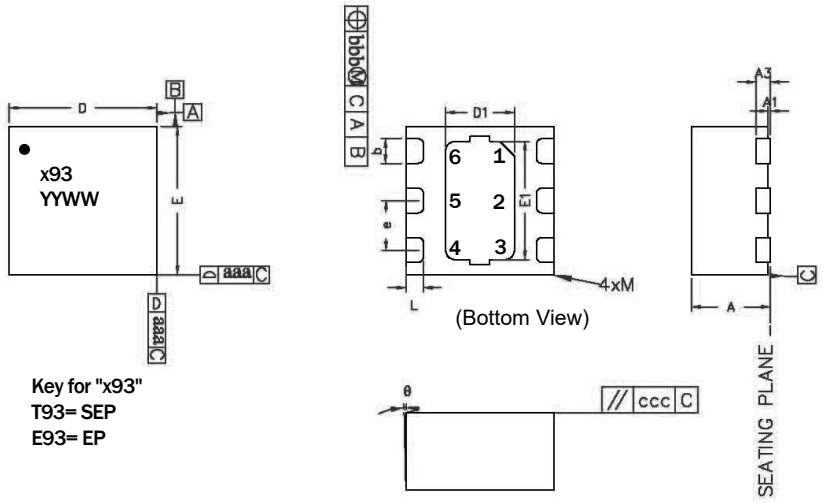
Absolute Ratings:

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{DD}	0	6.0	V
RF Input Power CW: (Load VSWR < 2:1; VD: 5.0 (volts)	$P_{IN\ MAX}$		23	dBm
Operating Temperature (Package Heat Sink)	T_{AMB}	-55	125	°C
Maximum Channel Temperature (MTTF > 10^6 Hours)	T_{MAX}		170	°C
Maximum Dissipated Power	$P_{DISS\ MAX}$		1000	mW
Electrostatic Discharge:				
Charged Device Model:	CDM	1000		V
Human Body Model:	HBM	500		V
Storage:				
Storage Temperature	T_{STG}	-65	150	°C
Moisture Sensitivity Level	MSL		3	--

Caution! ESD Sensitive Device

Exceeding Absolute Maximum Rating conditions may cause permanent damage to the device.

Mechanical Package Information: (1.5 x 1.5 mm DFN package type)



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.80	0.90
A1	0	0.02	0.05
A3	—	0.15REF.	—
b	0.20	0.25	0.30
D	1.40	1.50	1.60
D1	—	0.70BSC	—
E	1.40	1.50	1.60
E1	—	1.20BSC	—
e	—	0.50BSC	—
L	0.13	0.18	0.23
θ	0	—	12
aaa	—	0.25	—
bbb	—	0.10	—
ccc	—	0.10	—
M	—	—	0.05

Pin Assignments: (1.5 x 1.5 mm DFN package type)

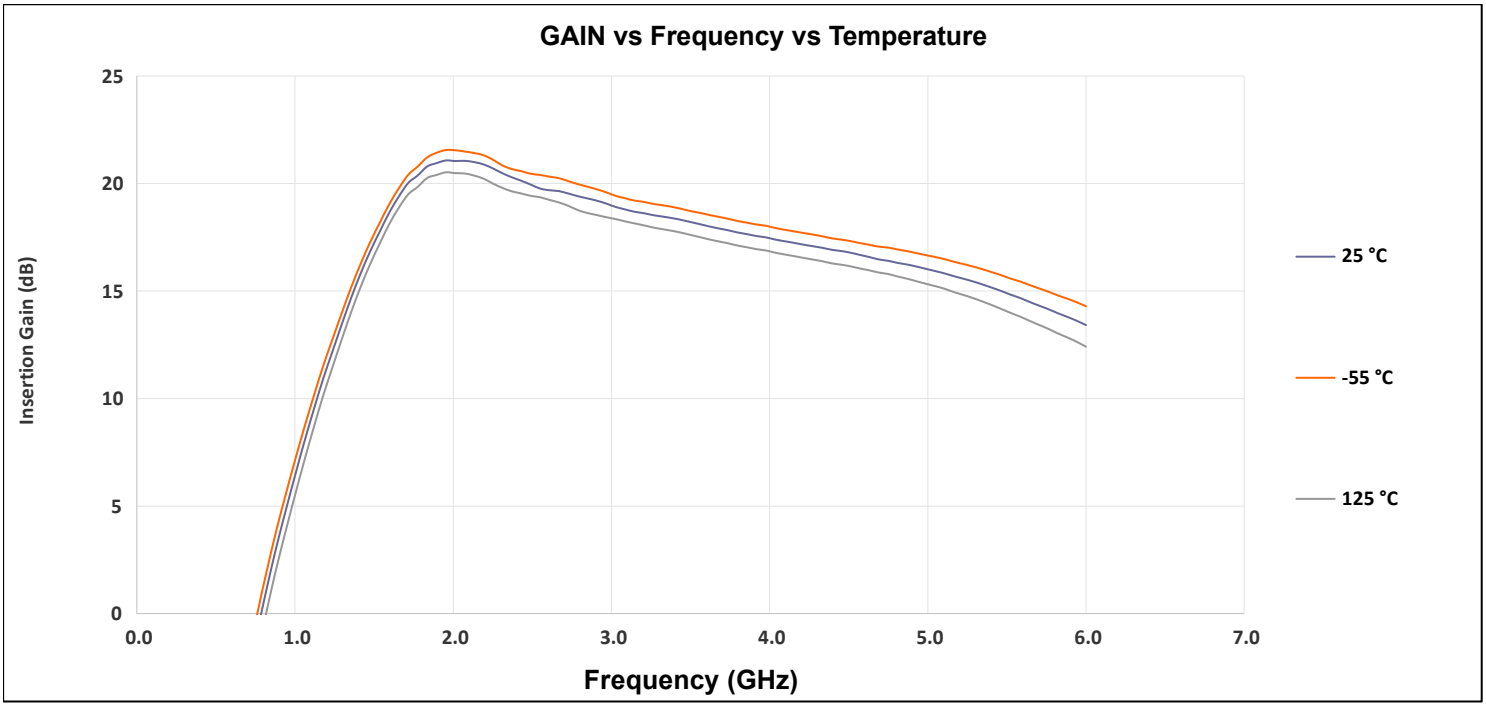
Pin	Name	Description	Note
1	V_{ENABLE}	Enable Voltage Input	V_{ENABLE} and series resistor set IDDQ. V_{ENABLE} < =0.2 volts disables device. On die pull-down resistor will turn the part off if this node is allowed to float.
2	NC	No Connect or Ground	No internal connection to the die
3	RF_In	LNA RF input	An external DC blocking cap must be used.
4	RF_Out	LNA RF output	V_{DD} must be applied through a choke to this pin.
5	NC	No Connect or Ground	No internal connection to die
6	NC	No Connect or Ground	No internal connection to die
PKG BASE	GND	Ground	Provides DC and RF ground for LNA, as well as thermal heat sink. TDY recommends multiple 8 mil vias beneath the package for optimal RF and thermal performance. Refer to evaluation board top layer graphic on schematic page.

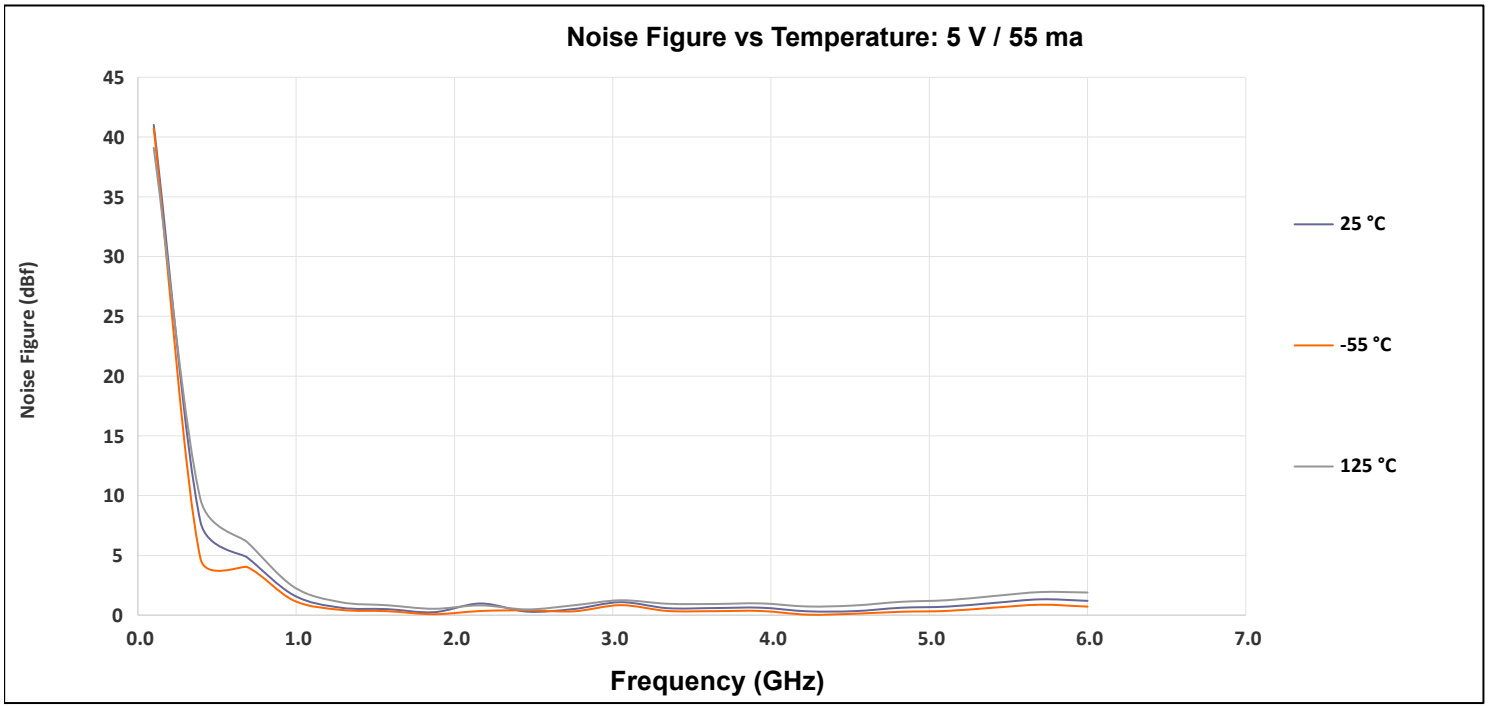
Electrical Specifications: Test conditions, unless otherwise noted: -55°C ≤ T_A ≤ 125°C, V_{DD} = 5V, f_{test} = 2GHz

Parameter	Symbol	Specification			Unit	Condition
		Min.	Typ.	Max.		
Frequency Range	*f*	1	2.33	6	GHz	V_{DD} = 5.0 V, T_A = 25°C
Gain	S21	17.4		25	dB	
Evaluation Board Noise Figure	NF		0.37		dB	Includes Board Losses at 1.8 GHz
Output 1dB Compression Power	OP1dB	16		20	dBm	
Output 3rd Order Intercept	OIP3 or OTOI		30		dBm	4.0 dBm P_{OUT} per tone at 2 MHz Spacing (2331.5 and 2333.5 MHz)
Switching Rise Time	T_{RISE}		400		ns	
Switching Fall Time	T_{FALL}		100		ns	
Supply Current	I_{DD}	30		80	mA	V_{DD}=V_{ENABLE}=5.0V; R_{BIAS}=3.3k Ohm
Enable Current	I_{ENABLE}			2	mA	
Leakage Current	$I_{LEAKAGE}$			500	uA	V_{DD}: 5.0V; V_{ENABLE}: 0.0V
Thermal Data						
Thermal Resistance: (Infra-Red Scan)	Θ_{jc}		43		°C/W	On standard Evaluation Board
Channel Temperature @ +85 C Reference (Package heat sink)	$T_{CHANNEL}$		100 (See note)		°C	V_{DD}: 5.0 V; I_{DDQ}: 70 mA; No RF; P_{DISS}: 350 mW

Note: MTTF >10^6 hours for $T_{CHANNEL}$ <= 170 degrees C.

TDLNA002093 Evaluation Board Data:





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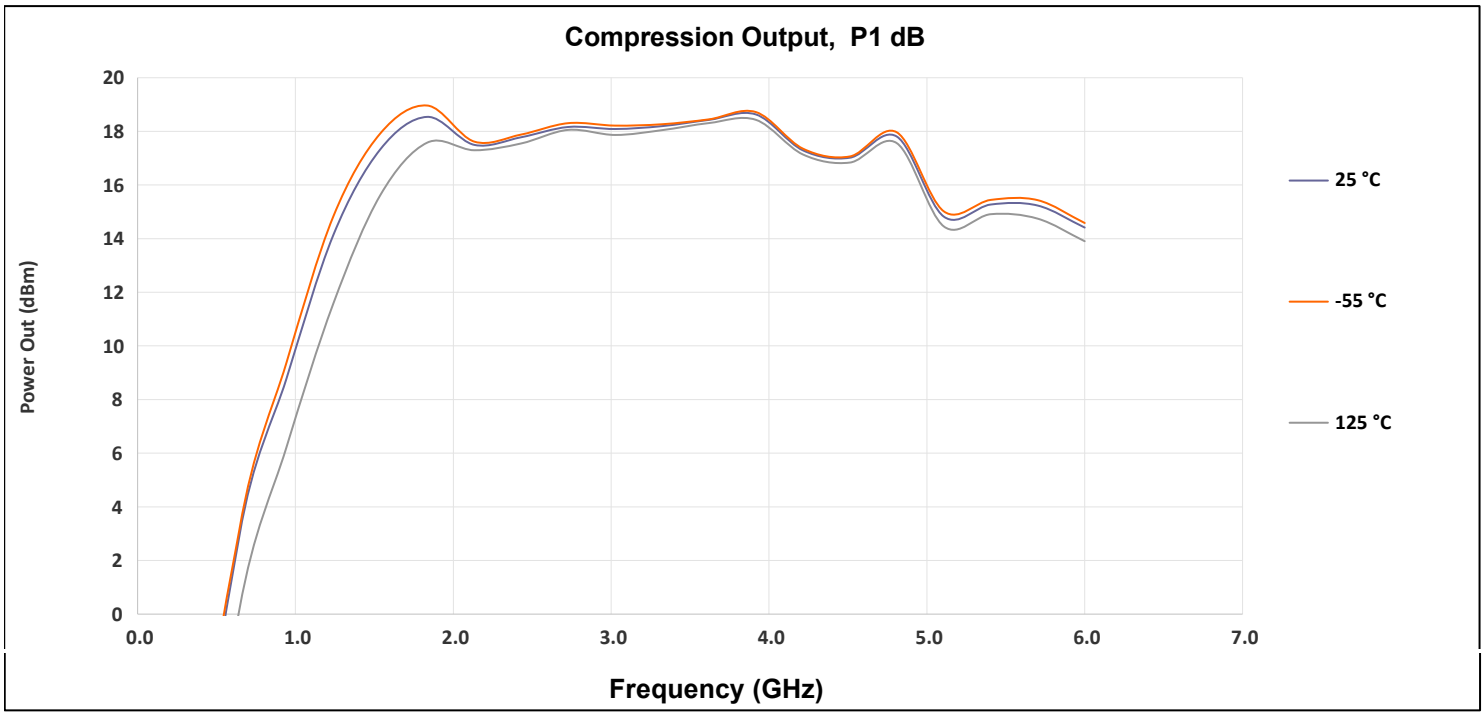

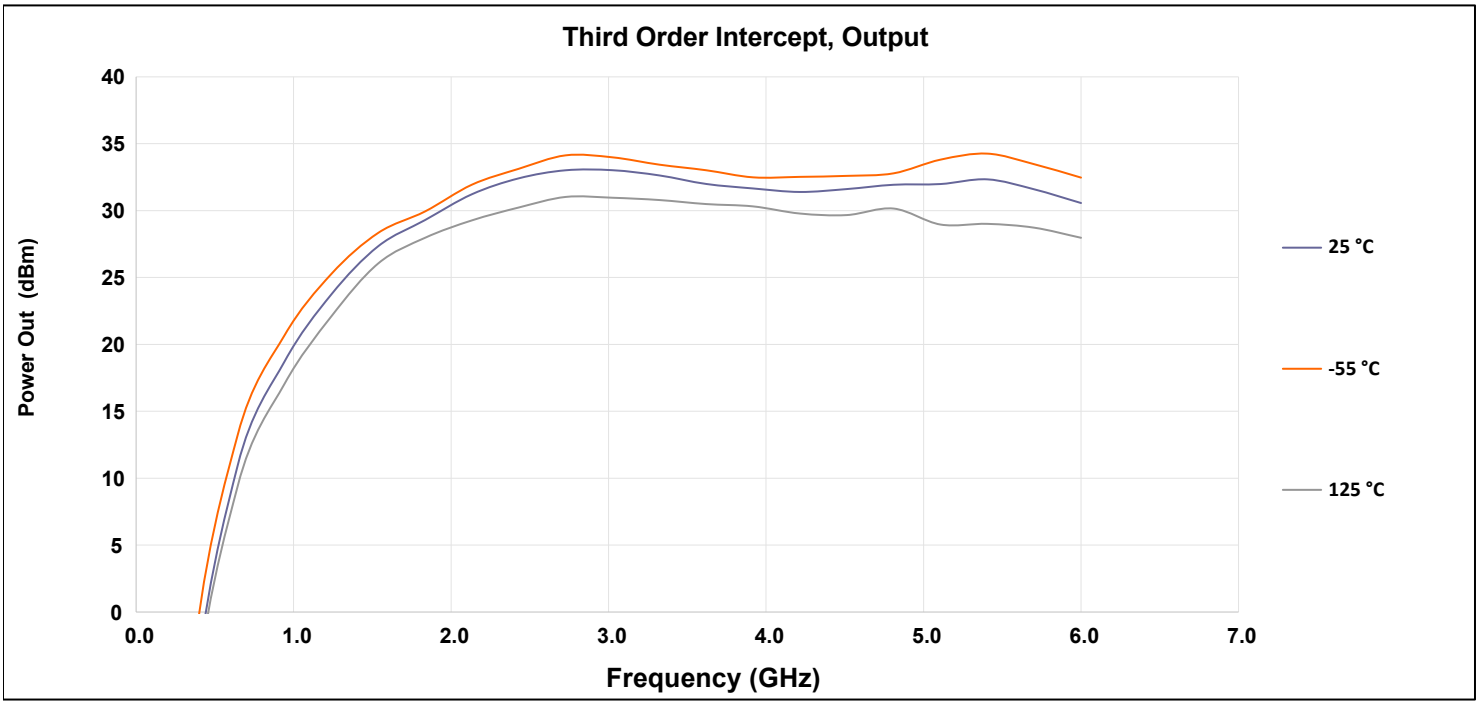

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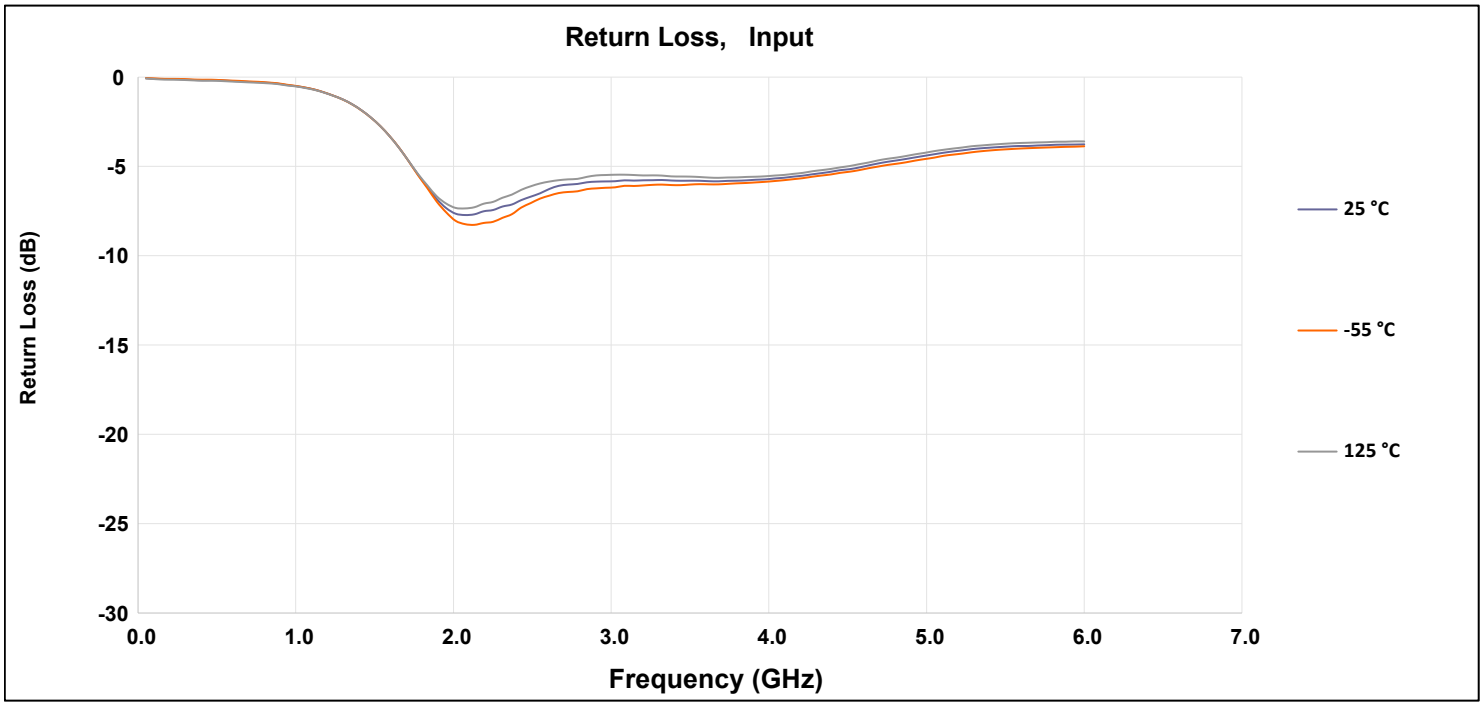

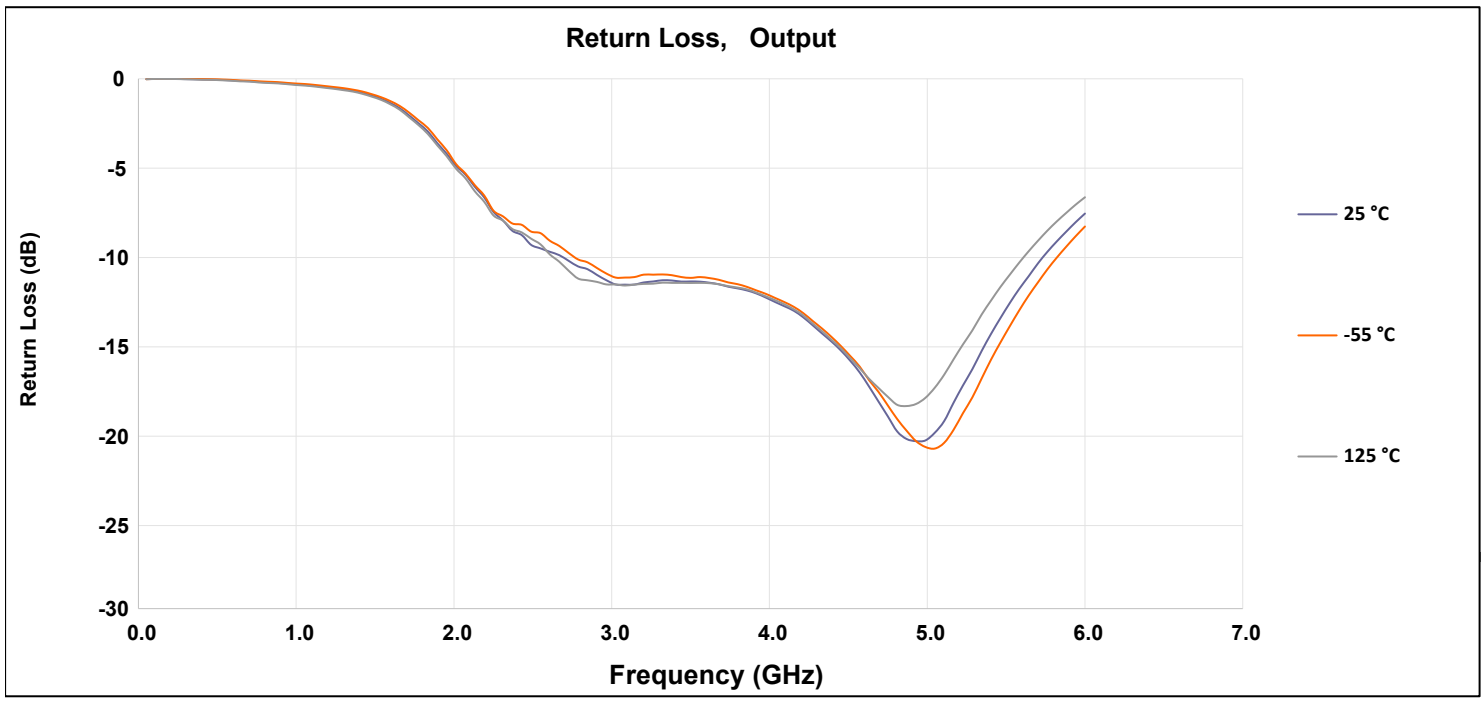

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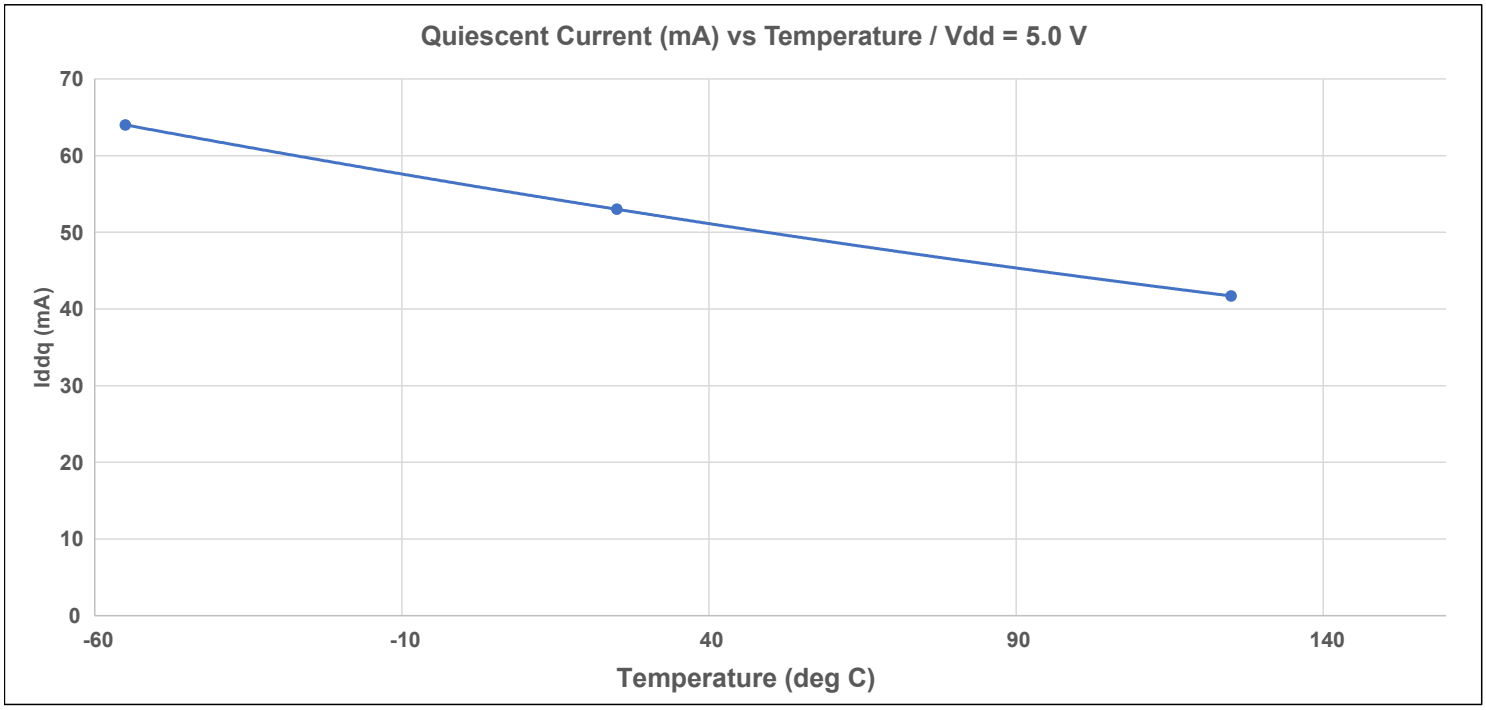
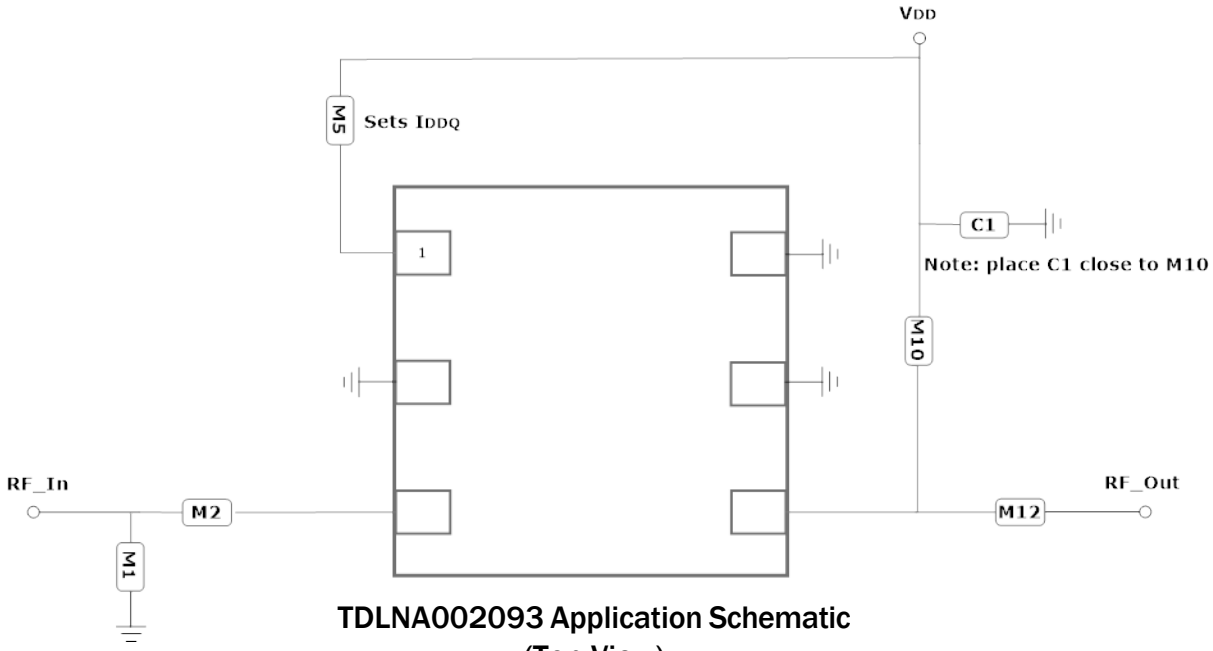


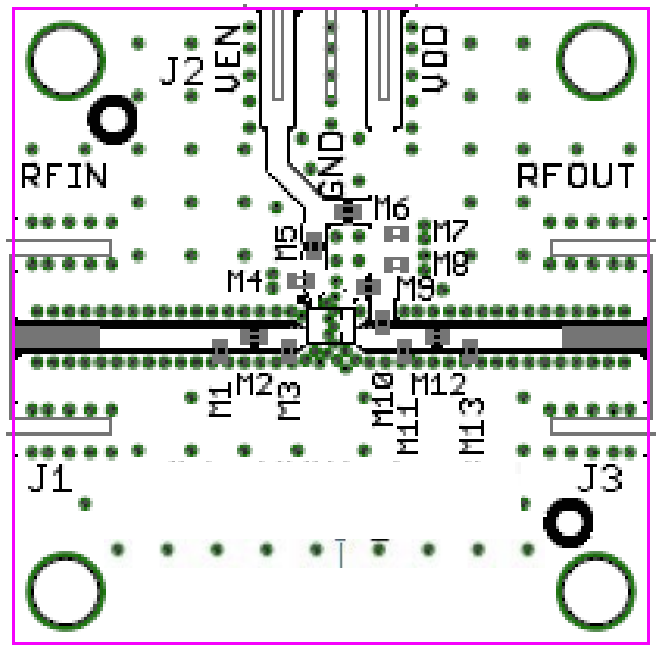
TDLNA002093 Standard Evaluation Board BOM: (2.3 to 2.7 GHz Tune)

Component	Type	Manufacturer	Family	Value	Package Size	Substitution
M1	Inductor	Coilcraft	HP	3.3 nH	0402	ok
M2	Capacitor	Murata	GJM	2.7 pF	0402	ok
M5 (See curves)	Resistor: 5%	Various	—	—	0402	ok
C1	Capacitor	Murata	GRM	0.1 uF	0402	ok
M10	Inductor	Murata	LQG	1.8 nH	0402	ok
M12	Capacitor	Murata	GJM	2.7 pF	0402	ok
Evaluation Board	GRF400X_RevC					

TDLNA002093 Application Schematic and Evaluation Board

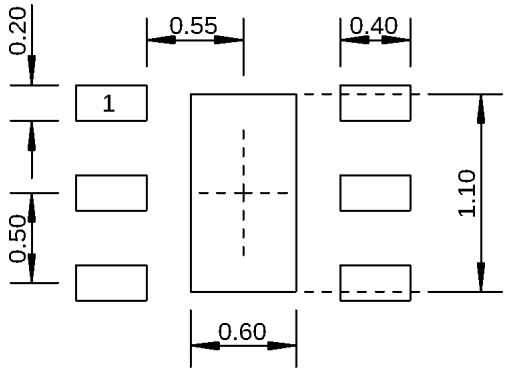


TDLNA002093 Application Schematic
(Top View)



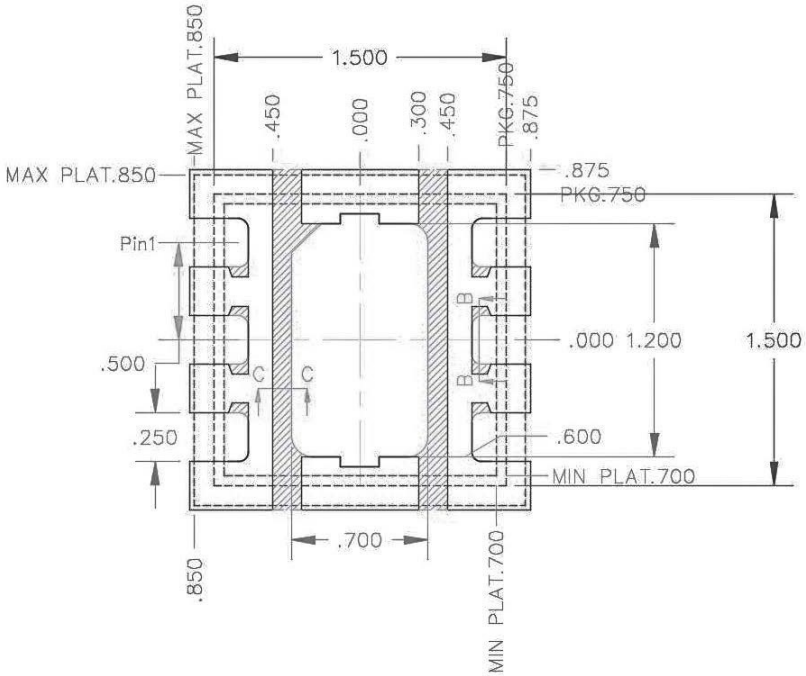
TDLNA002093 Evaluation Board
(Top View Component Side)

Mechanical Information



Dimensions in millimeters

1.5 mm DFN-6 Suggested PCB Footprint (Top View)



Dimensions in millimeters

1.5 mm DFN-6 Package Dimensions (Top View)

Ordering Information

Order Code	Description	Package	Shipping Method*
TDLNA002093EP	TDLNA002093 Production Units	1.5 mm DFN	Tape & Reel
TDLNA002093SEP	TDLNA002093 Production Units w/Burn-in	1.5 mm DFN	Tape & Reel
TDLNA002093SEP-00	TDLNA002093 Evaluation Kit	Evaluation Kit	Box

*Contact factory for information regarding Tape & Reel.

Document Revision History

Document Number	Description	Revision	Date of Revision
TDLNA002093_PROD_SPEC - 08/2023 Rev -	Initial Release	Rev: -	August 09, 2023
TDLNA002093SEP_PROD_SPEC - 09/2023 Rev 1	Clarification added to package diagrams and changed to TDLNA002093SEP_PROD_SPEC	Rev: 1	September 12, 2023

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