TCT−102BB

Product Preview
Antenna Tuner

INTRODUCTION

ON Semiconductor's TCT−102BB antenna tuner combines a Passive Tunable Integrated Circuit (PTIC) and an SPST switch in a single package to create a product which can be used in advanced antenna tuning designs. The high Q and wide tuning range of the PTIC give premium performance, and the SPST gives flexibility to design a variety of optimized tuner networks.

Features

- PTIC:
  - High Quality Factor (Q) for Low Loss
  - Wide Tuning Range from 2.7 pF to 0.53 pF
  - High Power Handling Capability
  - Compatible with PTIC Control ICs from ON Semiconductor
- SPST:
  - Very Low R_{ON} = 1.3 Ω
  - Very Low C_{OFF} = 130 fF
  - High RF Handling Peak Voltage: 60 V

Typical Applications

- Tunable Antenna Matching Networks
- Antenna Tuning for GSM, EDGE, WDCMA, LTE and 5 G Smartphones
- Main and Diversity Antenna Tuning
- Aperture and Impedance Tuning

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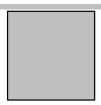
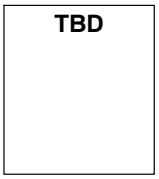
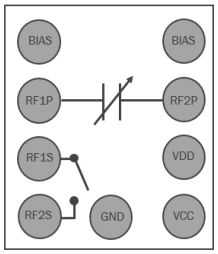


ECP9
CASE TBD

MARKING DIAGRAM



FUNCTIONAL BLOCK DIAGRAM



ORDERING INFORMATION

Device	Package	Shipping
TCT−102BB−FT	ECP9	

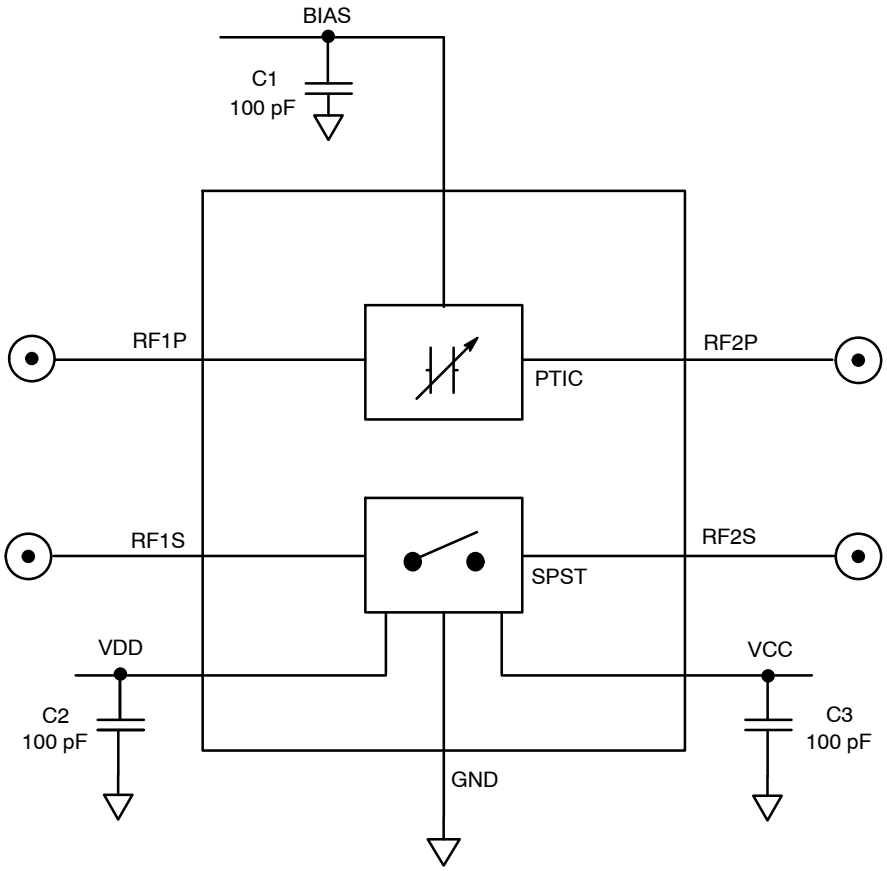


Figure 1. Application Schematic

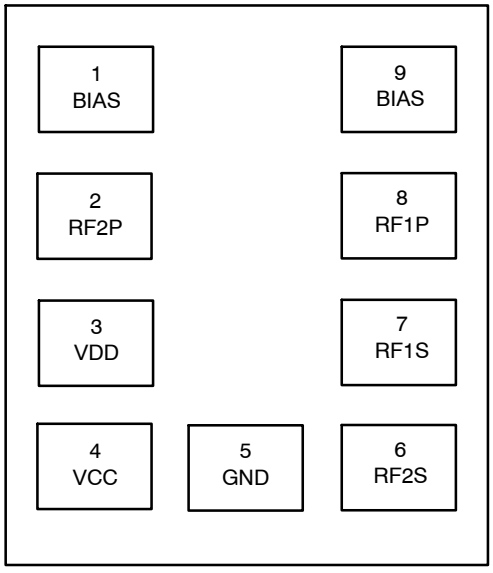


Figure 2. Pin Connections

Table 1. PIN FUNCTION DESCRIPTION

Pin No.	Symbol	Description
1	BIAS	PTIC DC Bias Voltage
2	RF2P	PTIC RF Output
3	VDD	SPST DC Supply Voltage
4	VCC	SPST Logic Control Voltage
5	GND	SPST Ground
6	RF2S	SPST RF Port 2
7	RF1S	SPST RF Port 1
8	RF1P	PTIC RF Input
9	BIAS	PTIC DC Bias Voltage

Table 2. VCC TRUTH TABLE FOR RF CHANNEL OPERATING MODE

VCC	Mode
Low	RF1S to RF2S Isolated
High	RF1S to RF2S On

Table 3. MAXIMUM RATINGS

Rating	Symbol	Value	Unit
RF Input Power (all RF Ports) (F_0=950MHz, 20% DC, VSWR=1:1, T_A=25C)	Pin	+38.5	dBm
DC Supply Voltage	V_{DD}	−0.3 to 3.6	V
Control Pin Voltage	V_{CC}	−0.3 to 3.3	V
Operating Temperature Range	T_{OP}	−30 to +85	°C
Storage Temperature Range	TSTG	−55 to 125	°C
ESD Capability, HBM	ESDHBM	500	V
ESD Capability, CDM	ESDCDM	500	V

1. Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Table 4. RECOMMENDED OPERATING RANGES

Rating	Symbol	Min	Typ	Max	Unit
Operating Frequency		0.6		3.8	GHz
DC Supply Voltage	V_{DD}	1.7	2.8	3.3	V
Control Voltage High	V_{CCH}	1.5	1.8	3.0	V
Control Voltage Low	V_{CCL}	0	0	0.3	V
PTIC Operating Bias Voltage	V_{BIAS}	1.0		24	V

Table 5. ELECTRICAL CHARACTERISTICS − LINEAR PARAMETERS
(V_{DD} = 2.8 V, V_{CCL} = 0 V, V_{CCH} = 1.8 V, T_A = 25 °C, Z_0 = 50 Ω)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SPST						
Insertion Loss (RF1S to RF2S)	F_0 = 0.6−1.0 GHz	IL		0.13	0.15	dBM
	F_0 = 1.0−2.2 GHz	IL		0.15	0.20	dBM
	F_0 = 2.2−3.0 GHz	IL		0.18	0.26	dBM
	F_0 = 3.0−3.8 GHz	IL		0.23	0.36	dBM
Isolation (RF1S to RF2S)	F_0 = 0.6−1.0 GHz	ISO	21	23		dBM
	F_0 = 1.0−2.2 GHz	ISO	15	17		dBM
	F_0 = 2.2−3.0 GHz	ISO	11	13		dBM
	F_0 = 3.0−3.8 GHz	ISO	9	11		dBM
On Resistance (RF1S to RF2S)	F_0 = DC	R_{ON}		1. 3	1.4	Ω
Off Capacitance (RF1S to RF2S)	F_0 = 500 MHz	C_{OFF}		130	140	fF
P 0.1 dB	F_0 = 950 MHz, 20%DC	P_0.1 dB		+45		dBm
RF Peak Voltage (RF1S to RF2S, RF2S to RF1S)	F_0 = 950 MHz. RF1S to RF2S isolated	V		60		V
PTIC						
Capacitance	VBIAS = 2 V		2.46	2.7	2.94	pF
	VBIAS = 24 V		0.42	0.53	0.64	pF
Q (Note 2)	F_0 = 0.6 GHz, VBIAS = 2 V			70		
	F_0 = 0.6 GHz, VBIAS = 24 V			35		
	F_0 = 2.7 GHz, VBIAS = 2 V			40		
	F_0 = 2.7 GHz, VBIAS = 24 V			20		
	F_0 = 3.8 GHz, VBIAS = 2 V			10		
	F_0 = 3.8 GHz, VBIAS = 24 V			10		
Transition Time (Note 3)	C_{MIN} to C_{MAX}			66	72	μS
	C_{MAX} to C_{MIN}			48	52	μS

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
2. Sample testing only. RF1P and R2P must be connected to DC ground
3. Sample testing only. PTIC Control IC Turbo Mode must be used

Table 6. ELECTRICAL CHARACTERISTICS − NON−LINEAR PARAMETERS
(V_{DD} = 2.8 V, V_{CCL} = 0 V, V_{CCH} = 1.8 V, T_A = 25 °C, Z_0 = 50 Ω)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SPST						
Second Harmonic	LTE TX F_0 = 0.6−3.8 Ghz, P_{IN} = 26 dBm	2 F_0		−90	−80	dBM
	GSM LB F_0 = 824−915 Mhz, P_{IN} = 35 dBm	2 F_0		−65	−55	dBM
	GSM HB F_0 = 1710−1910 Mhz, P_{IN} = 33 dBm	2 F_0		−70	−60	dBM
Third Harmonic	LTE TX F_0 = 0.6−3.8 GHz, P_{IN} = 26 dBm	3 F_0		−90	−80	dBM
	GSM LB F_0 = 824−915 MHz, P_{IN} = 35 dBm	3 F_0		−65	−55	dBM
	GSM HB F_0 = 1710−1910 MHz, P_{IN} = 33 dBm	3 F_0		−75	−65	dBM
2nd Order Intermodulation	Refer to Table 7	IMD2		−115	−105	dBM
3rd Order Intermodulation	Refer to Table 8	IMD3		−115	−105	dBM
PTIC						
Second Harmonic (Note 4)	F_0 = 0.9 GHz, V_{BIAS} = 2 V, P_{IN} = +23 dBm	2 F_0		−75	−70	dBM
	F_0 = 0.9 GHz, V_{BIAS} = 24 V, P_{IN} = +23 dBm	2 F_0		−85	−80	dBM
Third Harmonic (Note 4)	F_0 = 0.9 GHz, V_{BIAS} = 2 V, P_{IN} = +23 dBm	3 F_0		−63	−58	dBM
	F_0 = 0.9 GHz, V_{BIAS} = 24 V, P_{IN} = +23 dBm	3 F_0		−98	−90	dBM
Third Order Intercept Point	F_1 = 850 MHz, F_2 = 860 MHz, P_{IN} = 25 dBm/Tone, V_{BIAS} = 2 V	IIP3		73		dB
	F_1 = 850 MHz, F_2 = 860 MHz, P_{IN} = 25 dBm/Tone, V_{BIAS} = 24 V	IIP3		83		dB

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
4. PTIC Harmonics are measured in the reflect configuration

Table 7. IMD2 TEST CONDITIONS

Band	IN−Band Frequency MHz	CW Carrier MHz	dBm	CW Interferer MHz	dBm
1 Low	2140	1950	+20	190	−15
1 High	2140	1950	+20	1090	−15
5 High	881.5	836.5	+20	45	−15
5 High	881.5	836.5	+20	1718	−15

Table 8. IMD2 TEST CONDITIONS

Band	IN−Band Frequency MHz	CW Carrier MHz	dBm	CW Interferer MHz	dBm
1 Low	2140	1950	+20	190	−15
5 High	881.5	836.5	+20	791.5	−15

TYPICAL PERFORMANCE CURVES

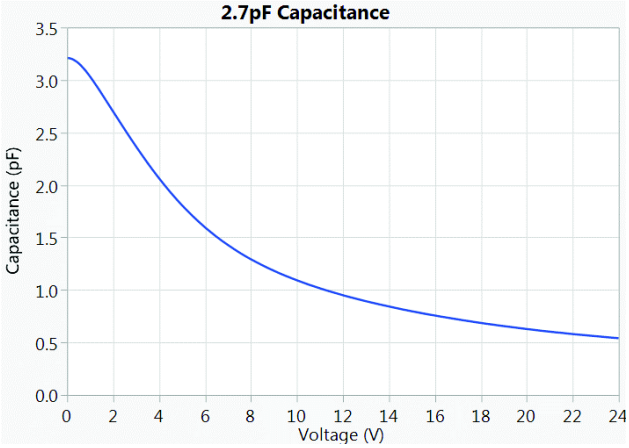


Figure 3.

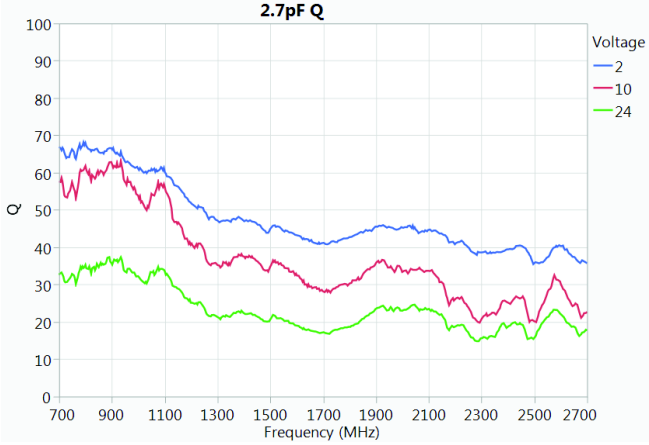


Figure 4.

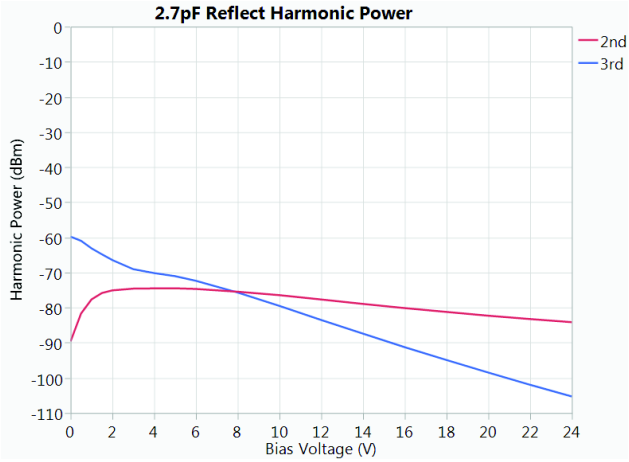


Figure 5.

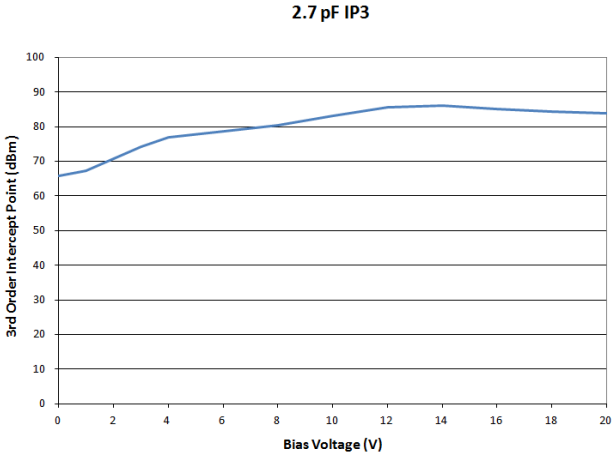


Figure 6.

TCT−102BB

PACKAGE DIMENSIONS
ECP9
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PUBLICATION ORDERING INFORMATION

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