CEL

NEC's GaAs MMIC DPDT SWITCHES FOR 5 GHz BAND WIRELESS LAN

UPG2024TQ

FEATURES

- **OPERATING FREQUENCY:**
  f = 4.8 to 5.85 GHz
- **LOW INSERTION LOSS:**
  L_{INS} = 1.2 dB TYP. @ f = 4.8 to 5.85 GHz
- **HANDLING POWER:**
  $P_{in\ (0.1\ dB)}$ = +32 dBm TYP. @ f = 4.8 to 5.85 GHz
- **CONTROL VOLTAGE:**
  V_{cont} = +2.8 V/0 V TYP.
- **HIGH ISOLATION:**
  ISL (between TX and RX) = 30 dB TYP. @ f = 5.2 GHz
  ISL (between ANT1/ANT2 and RX/TX) = 25 dB TYP. @ f = 5.2 GHz
- **INPUT/OUTPUT RETURN LOSS:**
  RL_{in}/RL_{out} = 20 dB TYP. @ f= 4.8 to 5.85 GHz
- **SWITCHING SPEED:**
  t_{SW} = 20 ns TYP. @ t_{RISE}/t_{FALL} (10/90% RF)
- **HIGH-DENSITY SURFACE MOUNTING:**
  10-pin plastic TSON package (2.30 × 2.55 × 0.60 mm)
- **Pb FREE**

DESCRIPTION

NEC's UPG2024TQ is a GaAs MMIC DPDT switch for 5 GHz band wireless LAN. Low insertion loss and high handling power contribute to user's system design.

APPLICATIONS

- **5 GHz Band Wireless LAN (IEEE802.11a)**

ORDERING INFORMATION

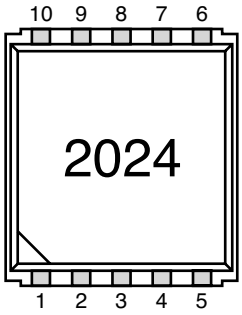
PART NUMBER	ORDER NUMBER	PACKAGE	MARKING	SUPPLYING FORM
UPG2024TQ-E1-A	UPG2024TQ-E1-A	10-pin plastic TSON (Pb-Free)	2024	• Embossed tape 8 mm wide • Pin 5, 6 face the perforation side of the tape • Qty 3 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: UPG2024TQ

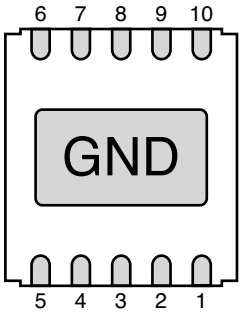
Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

PIN CONNECTIONS

(Top View)



(Bottom View)



PIN NO.	PIN NAME
1	TX
2	V_{cont1}
3	V_{cont2}
4	GND
5	RX
6	ANT1
7	V_{cont3}
8	V_{cont4}
9	GND
10	ANT2

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Control Voltage	V_{cont}	−6.0 to +6.0 **Note 1**	V
Input Power	P_{in}	+36	dBm
Total Power Dissipation	P_{tot}	0.15 **Note 2**	W
Operating Ambient Temperature	T_A	−45 to +85	°C
Storage Temperature	T_{stg}	−65 to +150	°C

Notes 1. Within the condition of $| V_{cont1} - V_{cont2} | \leq 6.0$ V

2. Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T_A = +85°C

RECOMMENDED OPERATING RANGE (T_A = +25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Control Voltage (High)	$V_{cont\ (H)}$	2.7	2.8	3.3	V
Control Voltage (Low)	$V_{cont\ (L)}$	−0.2	0	+0.2	V
Operating Frequency	f	4.8	−	5.85	GHz
Operating Ambient Temperature	T_A	−40	+25	+85	°C

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{cont} = 2.8 V/0 V, Z_O = 50 Ω, DC block capacitor = 2 pF, each port, on the below TRUTH TABLE, unless otherwise specified)

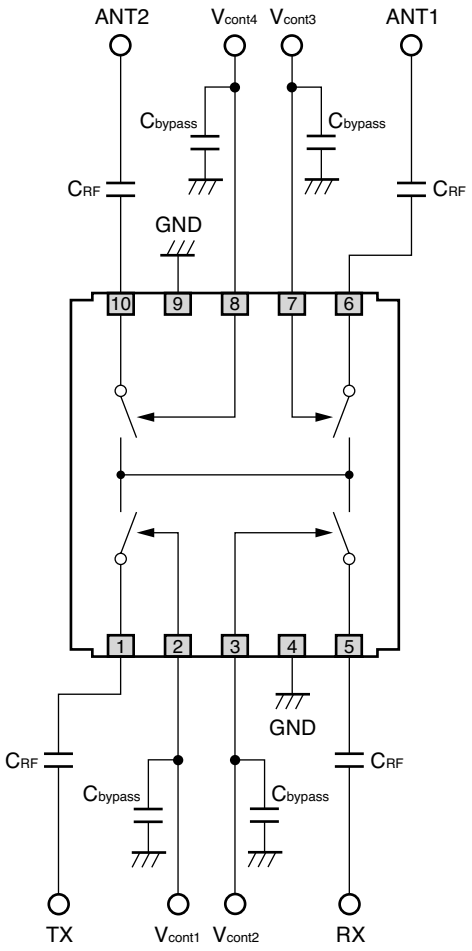
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Insertion Loss	L_{INS}	f = 4.9 GHz	–	1.2	1.5	dB
		f = 5.2 GHz	–	1.2	1.5	
		f = 5.8 GHz	–	1.5	1.7	
Isolation (Between TX and RX)	ISL	f = 4.9 GHz	20	25	–	dB
		f = 5.2 GHz	25	30	–	
		f = 5.8 GHz	20	25	–	
Input Return Loss	RL_{in}	f = 4.9 GHz	10	20	–	dB
		f = 5.2 GHz	10	20	–	
		f = 5.8 GHz	7	20	–	
Output Return Loss	RL_{out}	f = 4.9 GHz	10	20	–	dB
		f = 5.2 GHz	10	20	–	
		f = 5.8 GHz	7	20	–	
0.1 dB Gain Compression Input Power	$P_{in\ (0.1\ dB)}$	f = 4.9 GHz	30	33	–	dBm
		f = 5.2 GHz	30	32	–	
		f = 5.8 GHz	30	32	–	
Switching Speed	t_{SW}	t_{RISE}/t_{FALL} (10/90% RF)	–	20	–	ns
Control Current	I_{cont}		–	0.5	–	μA
Input 3rd Order Intercept Point	IIP_3		–	50	–	dBm

STANDARD CHARACTERISTICS FOR REFERENCE

(T_A = +25°C, V_{cont} = 2.8 V/0 V, Z_O = 50 Ω, DC block capacitor = 2 pF, each port, on the below TRUTH TABLE, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Isolation (Between ANT1/ANT2 and RX/TX)	ISL	f = 4.9 GHz	–	22	–	dB
		f = 5.2 GHz	–	25	–	
		f = 5.8 GHz	–	21	–	

TEST CIRCUIT



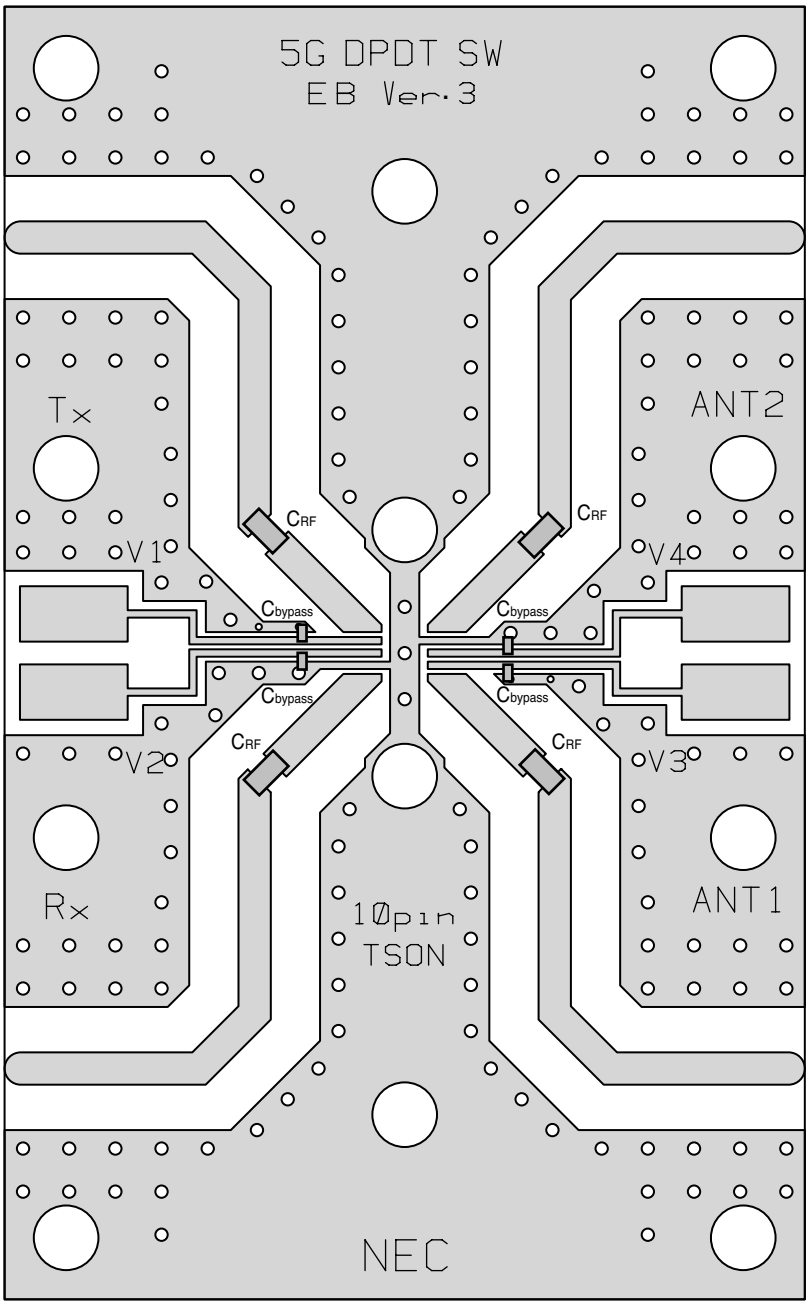
Remark C_{RF} : 2 pF
C_{bypass} : 1 000 pF

The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

TRUTH TABLE

V_{cont1}	V_{cont2}	V_{cont3}	V_{cont4}	PASS
Low	High	High	Low	ANT1-RX
High	Low	Low	High	ANT2-TX
High	Low	High	Low	ANT1-TX
Low	High	Low	High	ANT2-RX

ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



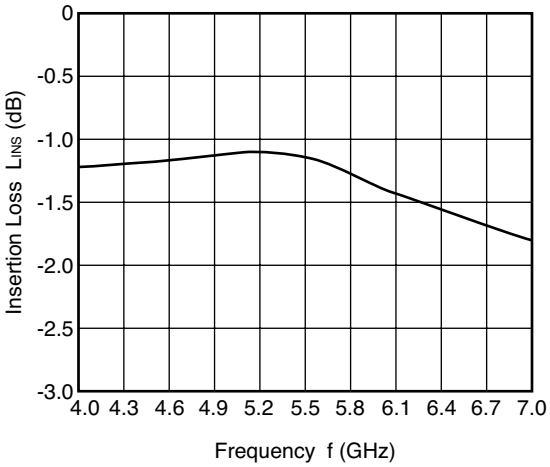
USING THE NEC EVALUATION BOARD

SYMBOL	FORM	RATING	PART NUMBER	MANUFACTURER
C_{RF}	Chip Capacitor	2 pF	GRM36CK020C50PB	muRata
C_{bypass}	Chip Capacitor	1 000 pF	GRP033B11C102KD01E	muRata
–	PC Terminal	–	A2-2PA-2.54DSA	Hirose
–	RF Connector	–	142-0721-821	Johnson
–	PWB	–	RO4003 (t = 0.51 mm)	Rogers

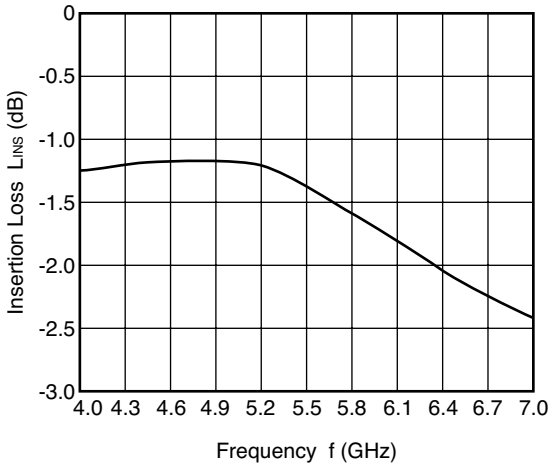
STANDARD CHARACTERISTICS FOR REFERENCE

(T_A = +25°C, V_{cont} = 2.8 V/0 V, Z_O = 50 Ω, DC block capacitor = 2 pF, using test fixture, unless otherwise specified)

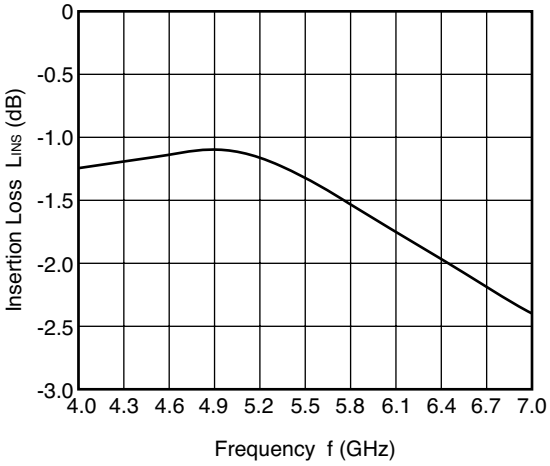
TX-ANT1 INSERTION LOSS vs. FREQUENCY
(When TX-ANT1 is ON)



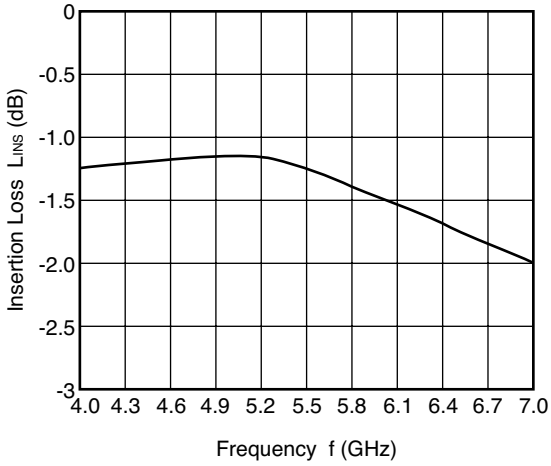
ANT1-RX INSERTION LOSS vs. FREQUENCY
(When ANT1-RX is ON)



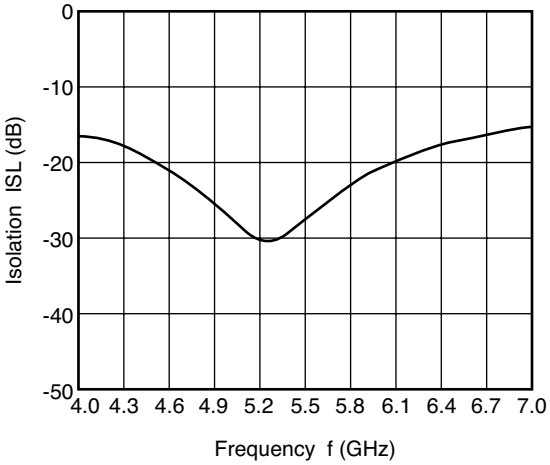
TX-ANT2 INSERTION LOSS vs. FREQUENCY
(When TX-ANT2 is ON)



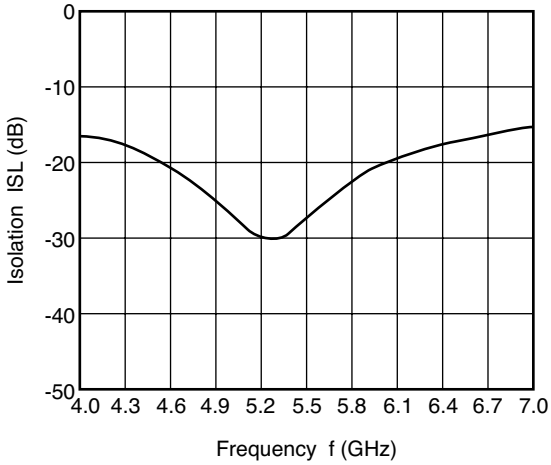
ANT2-RX INSERTION LOSS vs. FREQUENCY
(When ANT2-RX is ON)



RX-TX ISOLATION vs. FREQUENCY
(When ANT2-RX is ON)

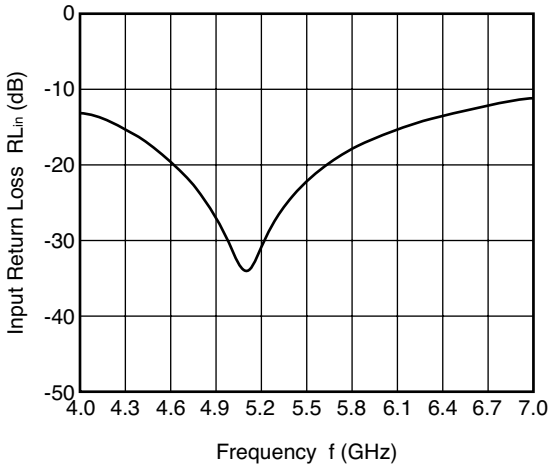


TX-RX ISOLATION vs. FREQUENCY
(When TX-ANT1 is ON)

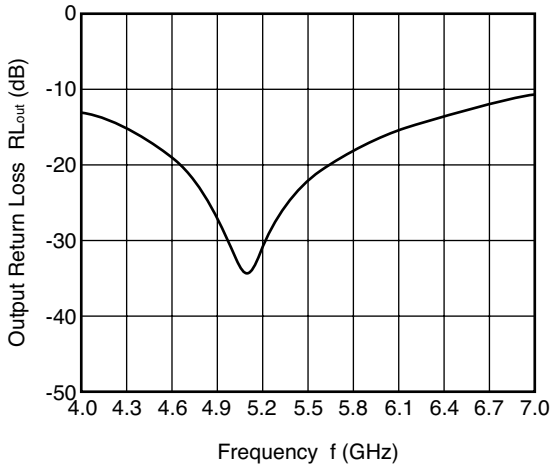


Remark The graphs indicate nominal characteristics.

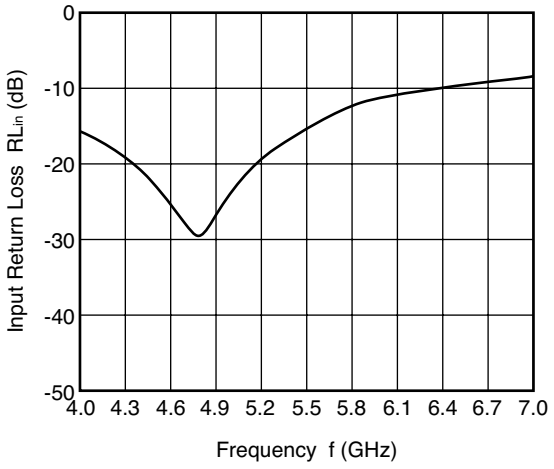
TX-ANT1 INPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT1 is ON)



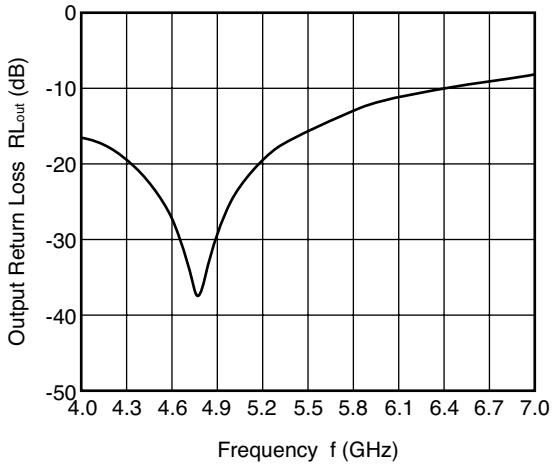
TX-ANT1 OUTPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT1 is ON)



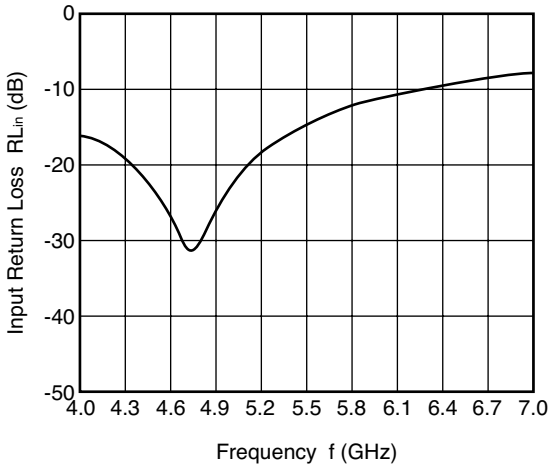
TX-ANT2 INPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT2 is ON)



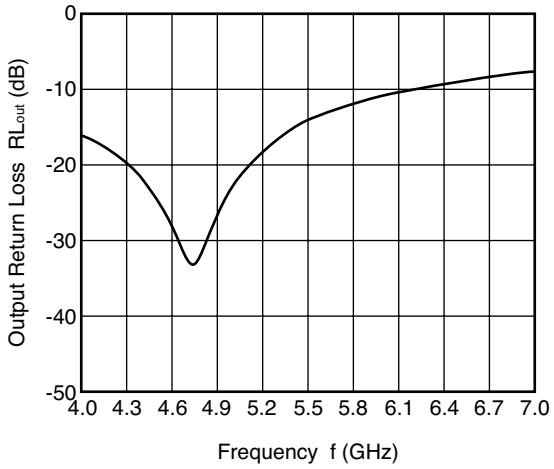
TX-ANT2 OUTPUT RETURN LOSS vs. FREQUENCY
(When TX-ANT2 is ON)



ANT1-RX INPUT RETURN LOSS vs. FREQUENCY
(When ANT1-RX is ON)

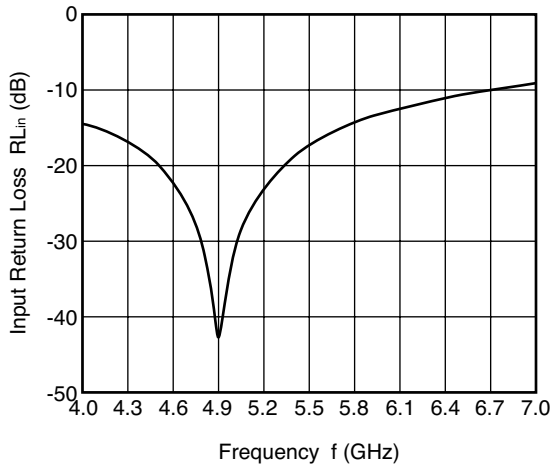


ANT1-RX OUTPUT RETURN LOSS vs. FREQUENCY
(When ANT1-RX is ON)

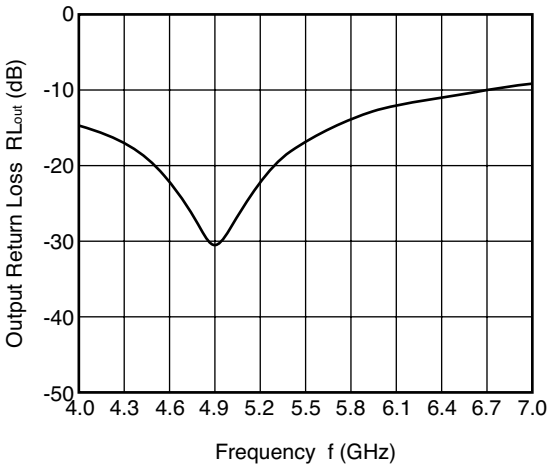


Remark The graphs indicate nominal characteristics.

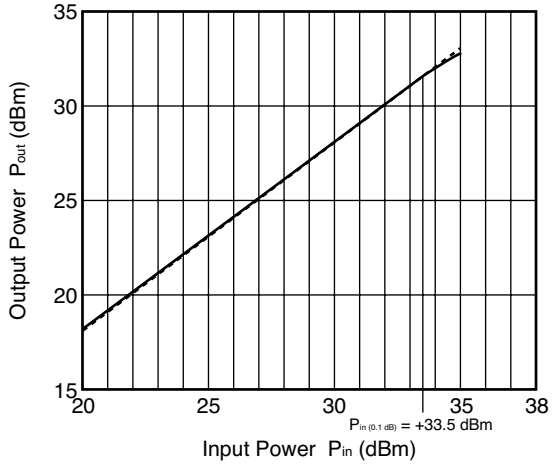
ANT2-RX INPUT RETURN LOSS vs. FREQUENCY
(When ANT2-RX is ON)



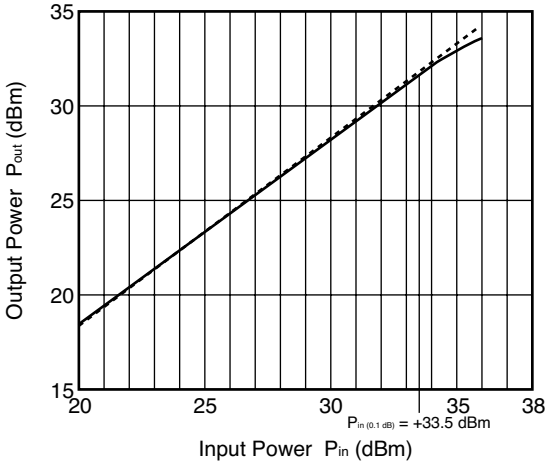
ANT2-RX OUTPUT RETURN LOSS vs. FREQUENCY
(When ANT2-RX is ON)



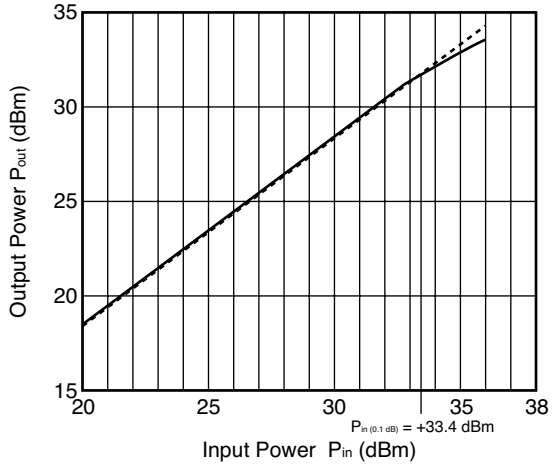
4.9 GHz OUTPUT POWER vs. INPUT POWER



5.2 GHz OUTPUT POWER vs. INPUT POWER



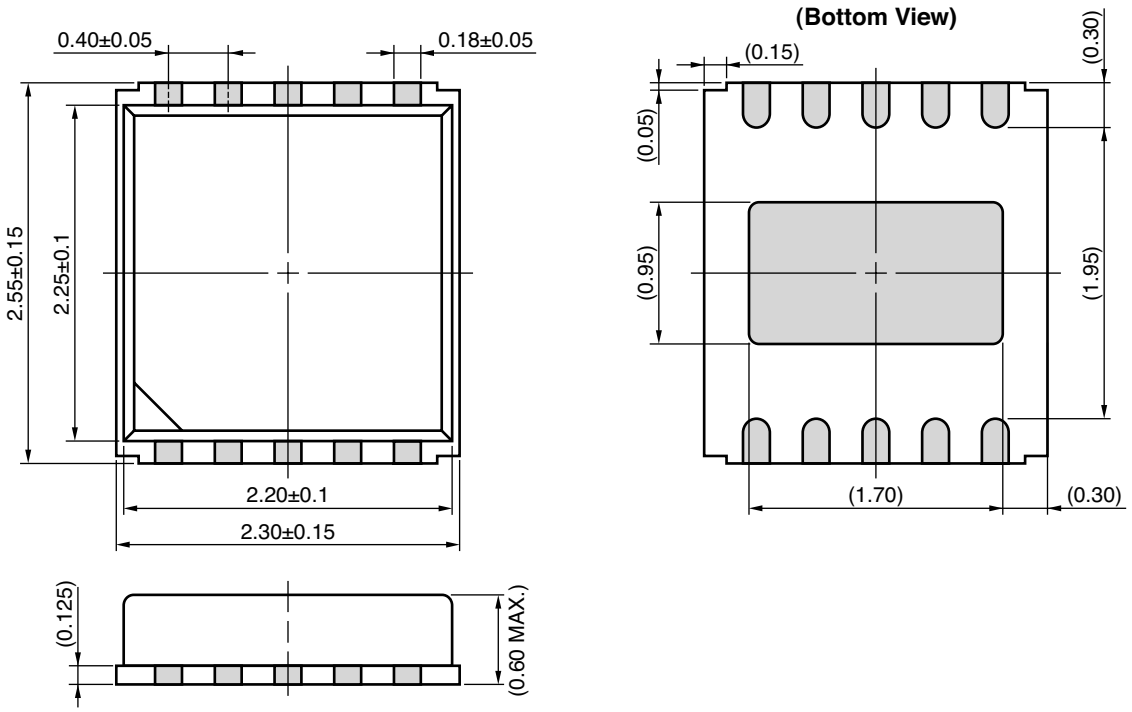
5.8 GHz OUTPUT POWER vs. INPUT POWER



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

10-PIN PLASTIC TSON (UNIT:mm)



Remark ( ) : Reference value

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

SOLDERING METHOD	SOLDERING CONDITIONS		CONDITION SYMBOL
Infrared Reflow	Peak temperature (package surface temperature)	: 260°C or below	IR260
	Time at peak temperature	: 10 seconds or less	
	Time at temperature of 220°C or higher	: 60 seconds or less	
	Preheating time at 120 to 180°C	: 120±30 seconds	
	Maximum number of reflow processes	: 3 times	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	
Wave Soldering	Peak temperature (molten solder temperature)	: 260°C or below	WS260
	Time at peak temperature	: 10 seconds or less	
	Preheating temperature (package surface temperature)	: 120°C or below	
	Maximum number of flow processes	: 1 time	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	
Partial Heating	Peak temperature (terminal temperature)	: 350°C or below	HS350
	Soldering time (per side of device)	: 3 seconds or less	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	

Caution Do not use different soldering methods together (except for partial heating).

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Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
Lead (Pb)	< 1000 PPM	-A	-AZ
		Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

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