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To our customers,

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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CMOS INTEGRATED CIRCUIT
 μ PD5716GR

CMOS MMIC 4 x 2 IF SWITCH MATRIX

FEATURES

- 4 independent IF channels, integral switching to channel input to either channel output
- Integrated 4 bit decoder
- Frequency range : $f = 250$ to $2\ 150$ MHz
- High isolation D/U ratio : ISL = 29 dB TYP.
- Insertion loss : $L_{INS} = 6.7$ dB TYP. @ $Z_0 = 50\ \Omega$
- Insertion loss flatness : $\Delta L_{INS} = 0.7$ dB TYP.
- Control voltage : $V_{CONT} = 0\ V/+5.0\ V$
- 16-pin plastic HTSSOP package

APPLICATIONS

- DBS IF switching
- Switch box
- 4×2 switching application for microwave signal

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μ PD5716GR-E1	μ PD5716GR-E1-A	16-pin plastic HTSSOP (Pb-Free)	D5716	<ul style="list-style-type: none"> • Embossed tape 12 mm wide • Pin 8, 9 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: μ PD5716GR

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

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

Parameter	Symbol	Ratings	Unit
Supply Voltage	V _{DD}	+6.0	V
Switch Control Voltage 1 to 4	V _{CONT1 to4}	+6.0	V
Total Power Dissipation	P _{tot}	2 ^{Note}	W
Input Power	P _{in}	+15	dBm
Operating Ambient Temperature	T _A	-40 to +85	°C
Storage Temperature	T _{stg}	-65 to +150	°C

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

RECOMMENDED OPERATING CONDITIONS (T_A = +25°C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V _{DD}	+4.0	+5.0	+5.5	V
Control Voltage (H) ^{Note}	V _{CONT (H)}	+4.0	+5.0	+5.5	V
Control Voltage (L)	V _{CONT (L)}	-0.2	0	+0.4	V

Note V_{DD}-0.4 V ≤ V_{CONT (H)} ≤ V_{DD}+0.2 V

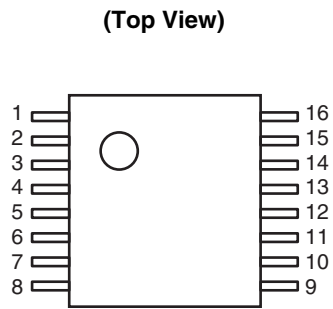
ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{DD} = +5.0 V, V_{CONT} = 0 V/+5.0 V, P_{in} = 0 dBm, Z_o = 50 Ω, each port, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss	L _{INS}	f = 0.25 to 2.15 GHz	-	6.7	9.0	dB
Insertion Loss Flatness	ΔL _{INS}	L _{INS} (0.95 GHz) - L _{INS} (2.15 GHz)	-	0.7	3.0	dB
Isolation D/U-ratio1 ^{Note 1}	ISL1	f = 0.25 to 0.95 GHz	28	35	-	dB
Isolation D/U-ratio2 ^{Note 1}	ISL2	f = 0.95 to 2.15 GHz	25	29	-	dB
Output Return Loss	RL _{out}	f = 0.25 to 2.15 GHz	10	13	-	dB
Control Current ^{Note 2}	I _{CONT}	V _{DD} = +5.0 V, V _{CONT} = +5.0 V/0 V, non-RF	-	50	100	μA
Supply Current	I _{DD}	V _{DD} = +5.0 V, V _{CONT} = +5.0 V/0 V, non-RF	-	50	100	μA

Notes 1. Isolation Desire Un-desire (D/U)-ratio = |(Signal leakage (off-state)) - (Insertion loss (on-state))|

2. Per 1 control pin

PIN CONNECTIONS



Pin No.	Pin Name	Pin No.	Pin Name
1	IN-C	16	IN-B
2	GND	15	GND
3	IN-D	14	IN-A
4	GND	13	GND
5	GND	12	V _{DD}
6	OUT2	11	OUT1
7	V _{CONT3}	10	V _{CONT1}
8	V _{CONT4}	9	V _{CONT2}

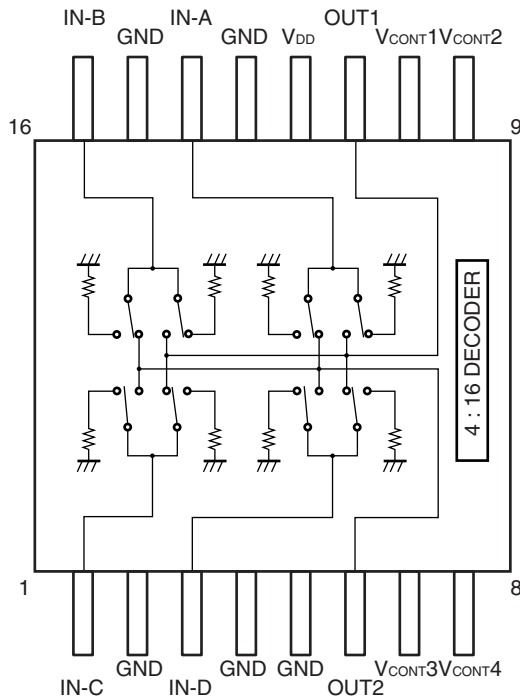
Remark Back side. : GND

TRUTH TABLE

State		Output Signal		Control Pins			
No.	Mode	OUT1	OUT2	V _{CONT1}	V _{CONT2}	V _{CONT3}	V _{CONT4}
1	AA	IN-A	IN-A	Low	Low	Low	Low
2	AB		IN-B	Low	Low	Low	High
3	AC		IN-C	Low	Low	High	Low
4	AD		IN-D	Low	Low	High	High
5	BA	IN-B	IN-A	Low	High	Low	Low
6	BB		IN-B	Low	High	Low	High
7	BC		IN-C	Low	High	High	Low
8	BD		IN-D	Low	High	High	High
9	CA	IN-C	IN-A	High	Low	Low	Low
10	CB		IN-B	High	Low	Low	High
11	CC		IN-C	High	Low	High	Low
12	CD		IN-D	High	Low	High	High
13	DA	IN-D	IN-A	High	High	Low	Low
14	DB		IN-B	High	High	Low	High
15	DC		IN-C	High	High	High	Low
16	DD		IN-D	High	High	High	High

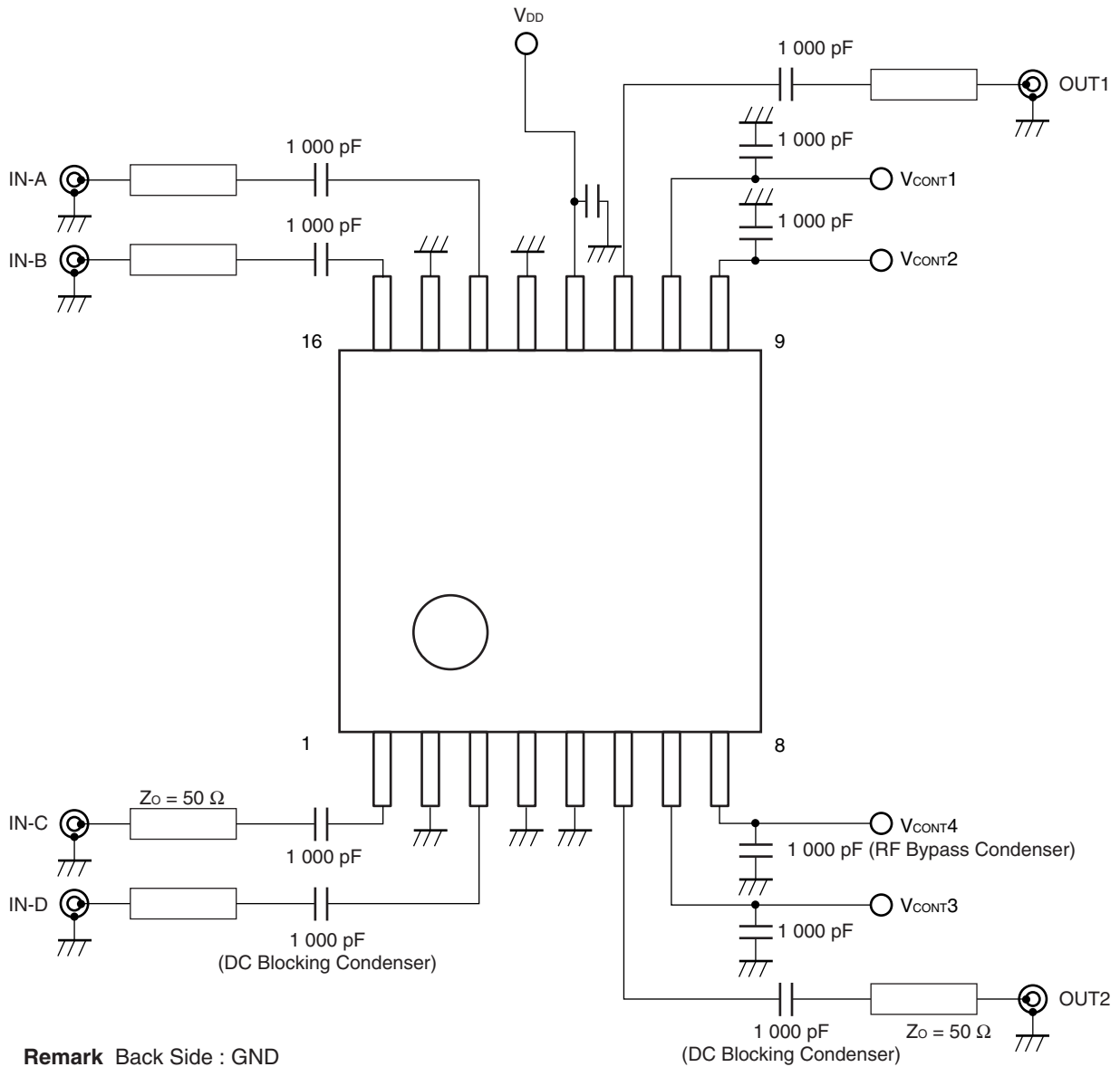
Remark High : +5.0 Vdc, Low : 0 Vdc

FUNCTIONAL DIAGRAM



Remark Back Side : GND

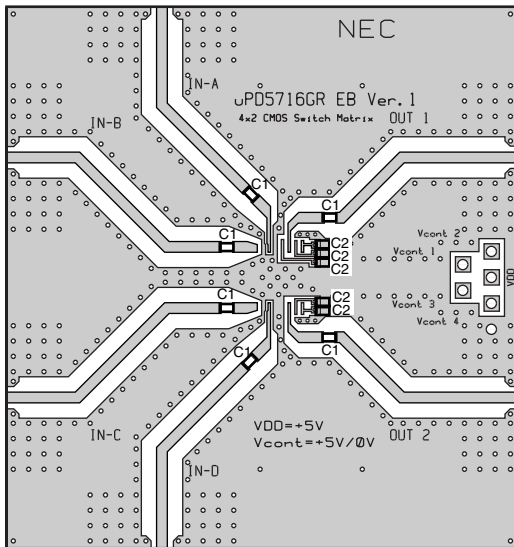
EVALUATION CIRCUIT ($V_{DD} = +5.0\text{ V}$, V_{CONT1} to $V_{CONT4} = 0\text{ V}/+5.0\text{ V}$, $P_{in} = 0\text{ dBm}$, $Z_o = 50\ \Omega$, DC Blocking Capacitor = $1\ 000\ \text{pF}$)



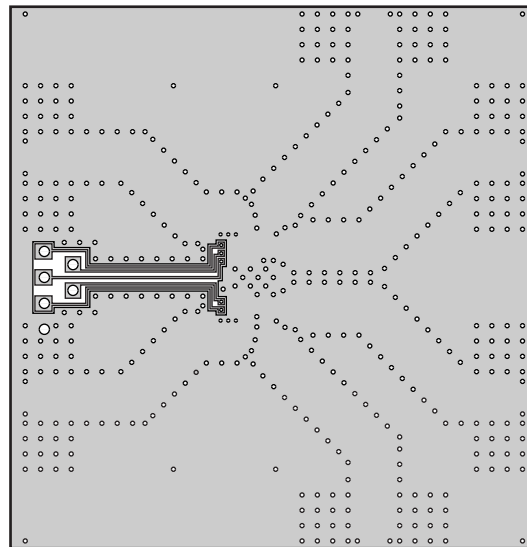
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

(Top View)



(Bottom View)



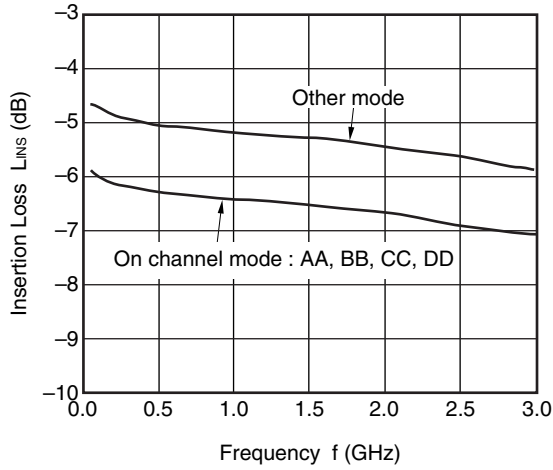
Notes

1. 50 × 53 × 0.51 mm double sided copper clad RO4003 (Rogers) board ($\epsilon_r = 3.38$).
2. Au plated on pattern
3. \circ : Through holes
4. C1, C2: 1 000 pF

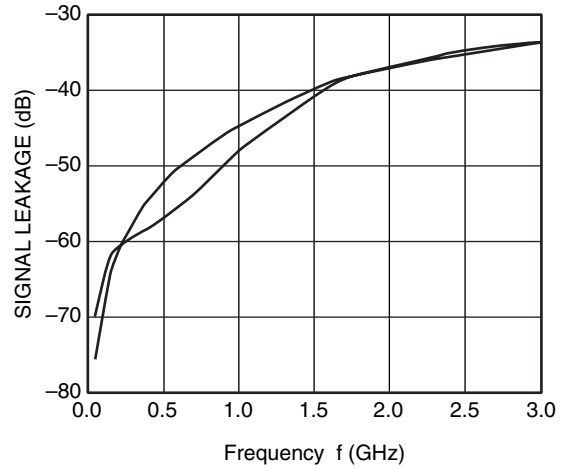
TYPICAL CHARACTERISTICS

($T_A = +25^\circ\text{C}$, $V_{DD} = +5.0\text{ V}$, $V_{CONT} = 0\text{ V}/+5.0\text{ V}$, $P_{in} = 0\text{ dBm}$, $Z_o = 50\ \Omega$, unless otherwise specified)

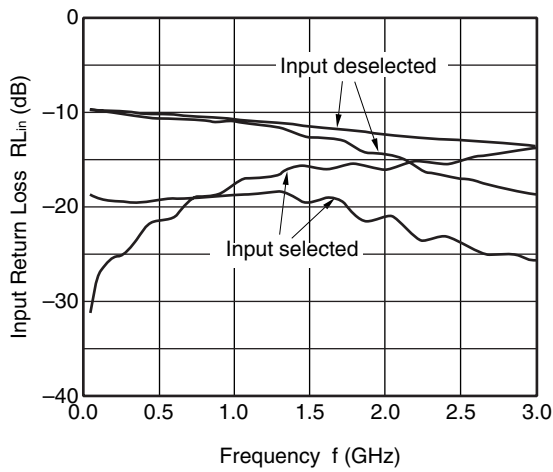
INSERTION LOSS vs. FREQUENCY
(INx-OUT, all states)



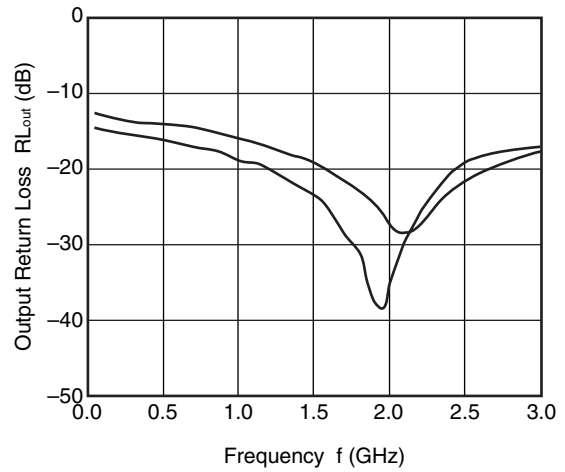
SIGNAL LEAKAGE vs. FREQUENCY
(INx-OUT, all states)



INPUT RETURN LOSS vs. FREQUENCY

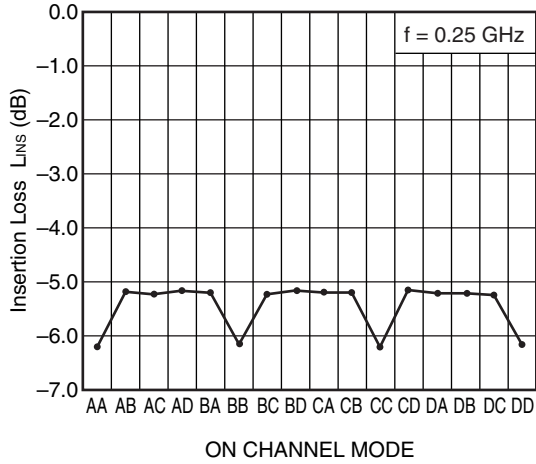


OUTPUT RETURN LOSS vs. FREQUENCY

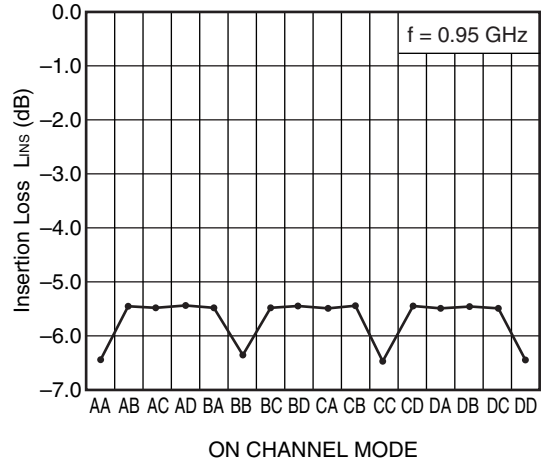


Remark The graphs indicate nominal characteristics.

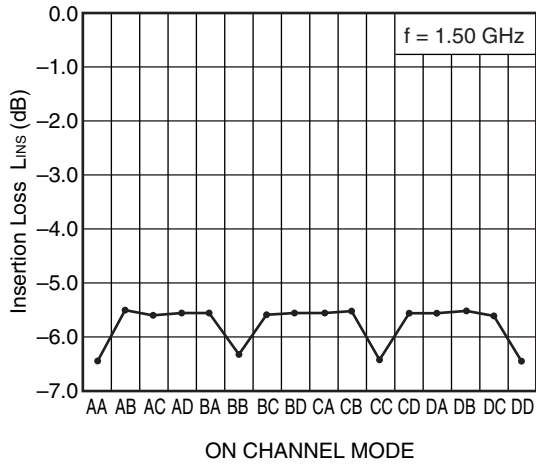
INSERTION LOSS vs.
ON CHANNEL MODE



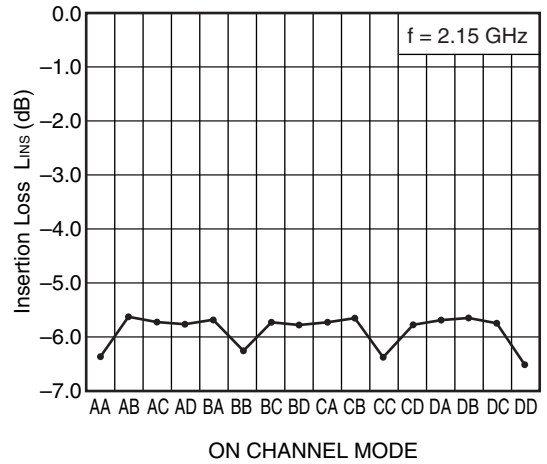
INSERTION LOSS vs.
ON CHANNEL MODE



INSERTION LOSS vs.
ON CHANNEL MODE

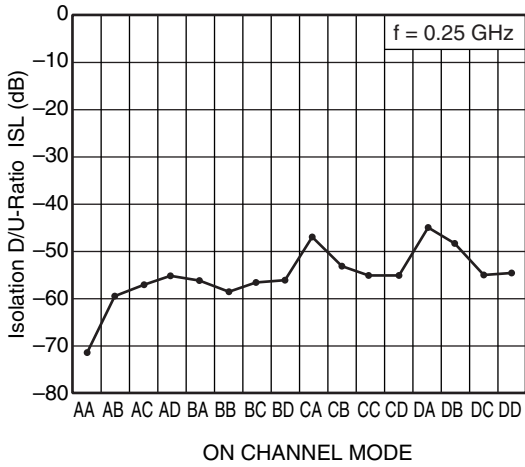


INSERTION LOSS vs.
ON CHANNEL MODE

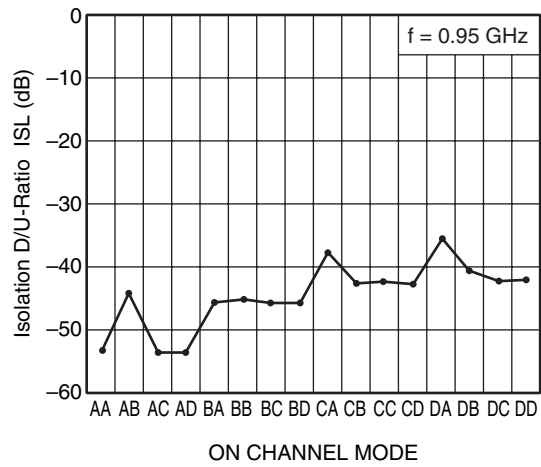


Remark The graphs indicate nominal characteristics.

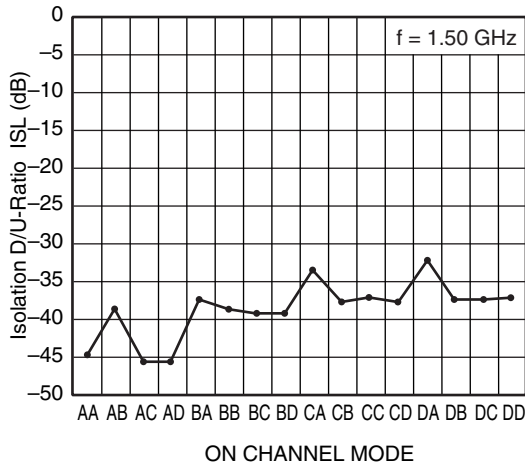
ISOLATION D/U-RATIO
vs. ON CHANNEL MODE



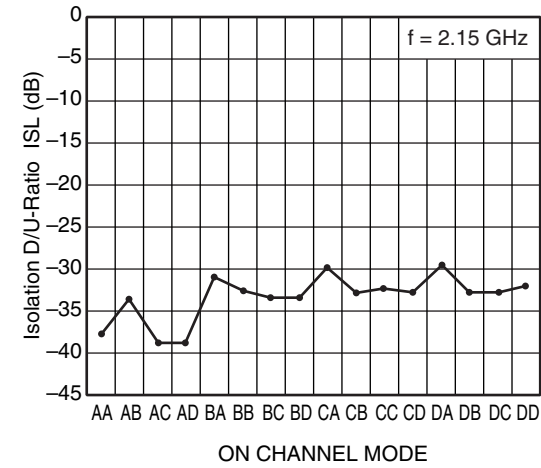
ISOLATION D/U-RATIO
vs. ON CHANNEL MODE



ISOLATION D/U-RATIO
vs. ON CHANNEL MODE

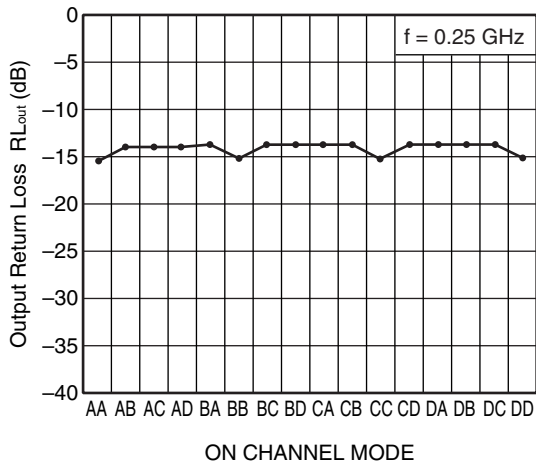


ISOLATION D/U-RATIO
vs. ON CHANNEL MODE

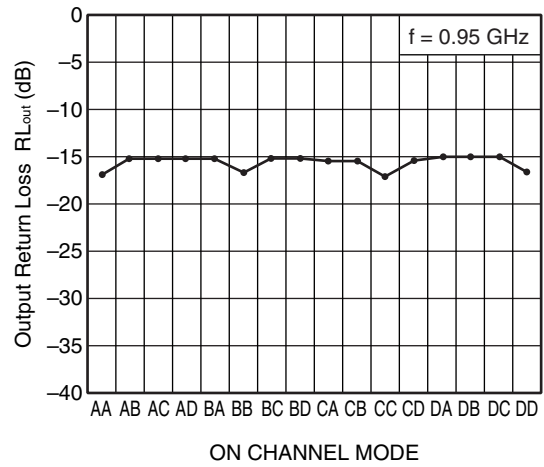


Remark The graphs indicate nominal characteristics.

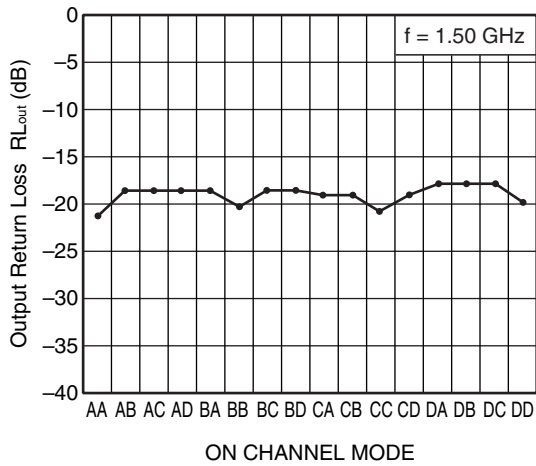
OUTPUT RETURN LOSS
vs. ON CHANNEL MODE



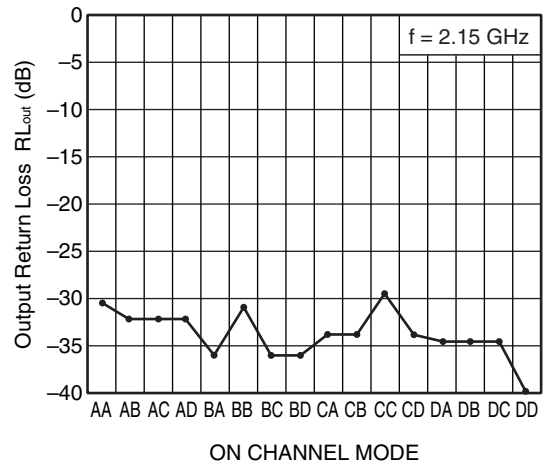
OUTPUT RETURN LOSS
vs. ON CHANNEL MODE



OUTPUT RETURN LOSS
vs. ON CHANNEL MODE



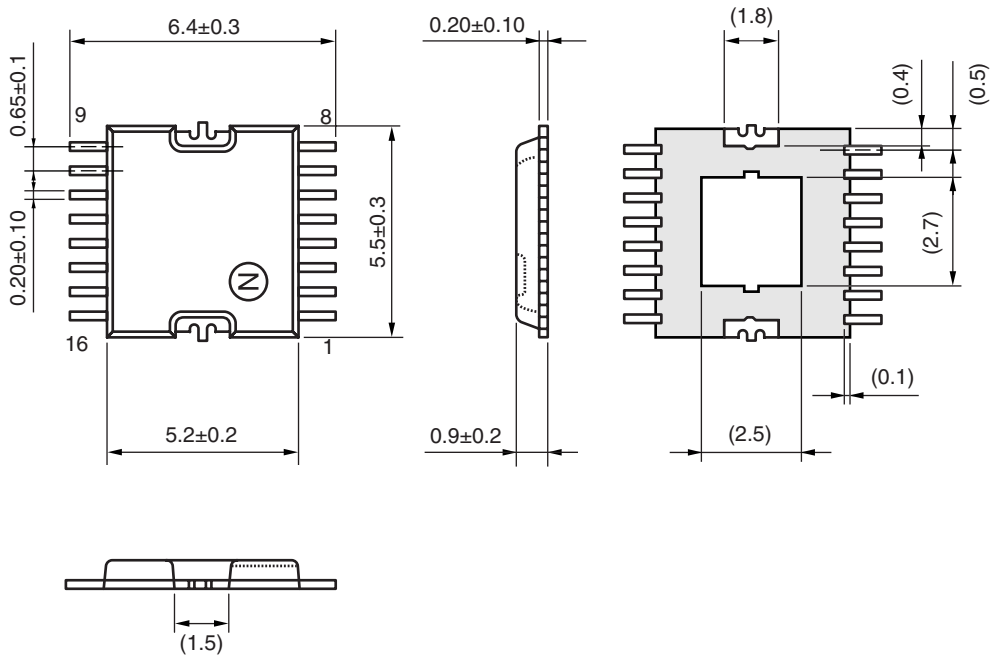
OUTPUT RETURN LOSS
vs. ON CHANNEL MODE



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

16-PIN PLASTIC HTSSOP (UNIT: mm)



Remark (): Reference value

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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	
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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