To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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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RENESAS

DATA SHEET

CMOS INTEGRATED CIRCUIT

μPD5716GR

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_O = 50 Ω
- Insertion loss flatness : ΔL_{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
μPD5716GR-E1	μPD5716GR-E1-A	16-pin plastic HTSSOP (Pb-Free)	D5716	• 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: μPD5716GR

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

Document No. PU10620EJ01V0DS (1st edition)
Date Published June 2006 NS CP(K)
Printed in Japan

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_{CONT}1 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)

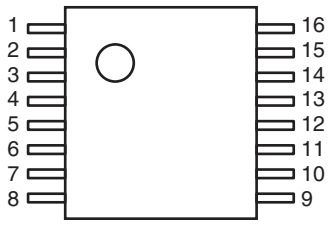
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss	L_{INS}	f = 0.25 to 2.15 GHz	–	6.7	9.0	dB
Insertion Loss Flatness	ΔL_{INS}	$\lvert L_{INS (0.95 GHz)} - L_{INS (2.15 GHz)} \rvert$	–	0.7	3.0	dB
Isolation D/U-ratio1 Note 1	ISL1	f = 0.25 to 0.95 GHz	28	35	–	dB
Isolation D/U-ratio2 Note 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

(Top View)



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	$V_{CONT}3$	10	$V_{CONT}1$
8	$V_{CONT}4$	9	$V_{CONT}2$

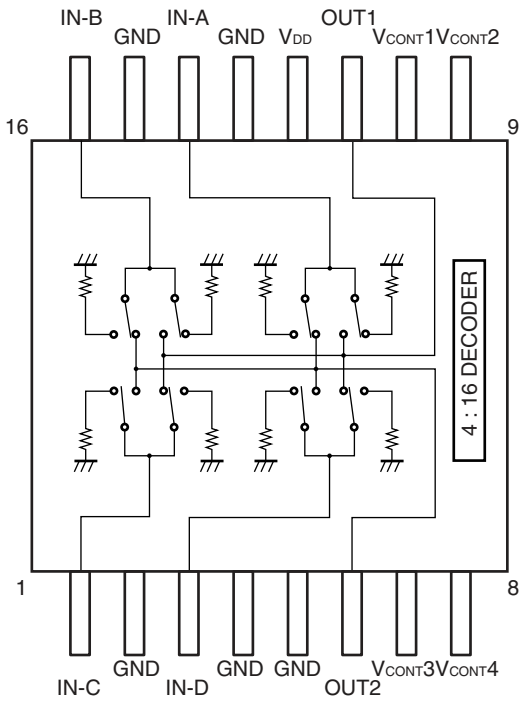
Remark Back side. : GND

TRUTH TABLE

State		Output Signal		Control Pins			
No.	Mode	OUT1	OUT2	$V_{CONT}1$	$V_{CONT}2$	$V_{CONT}3$	$V_{CONT}4$
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

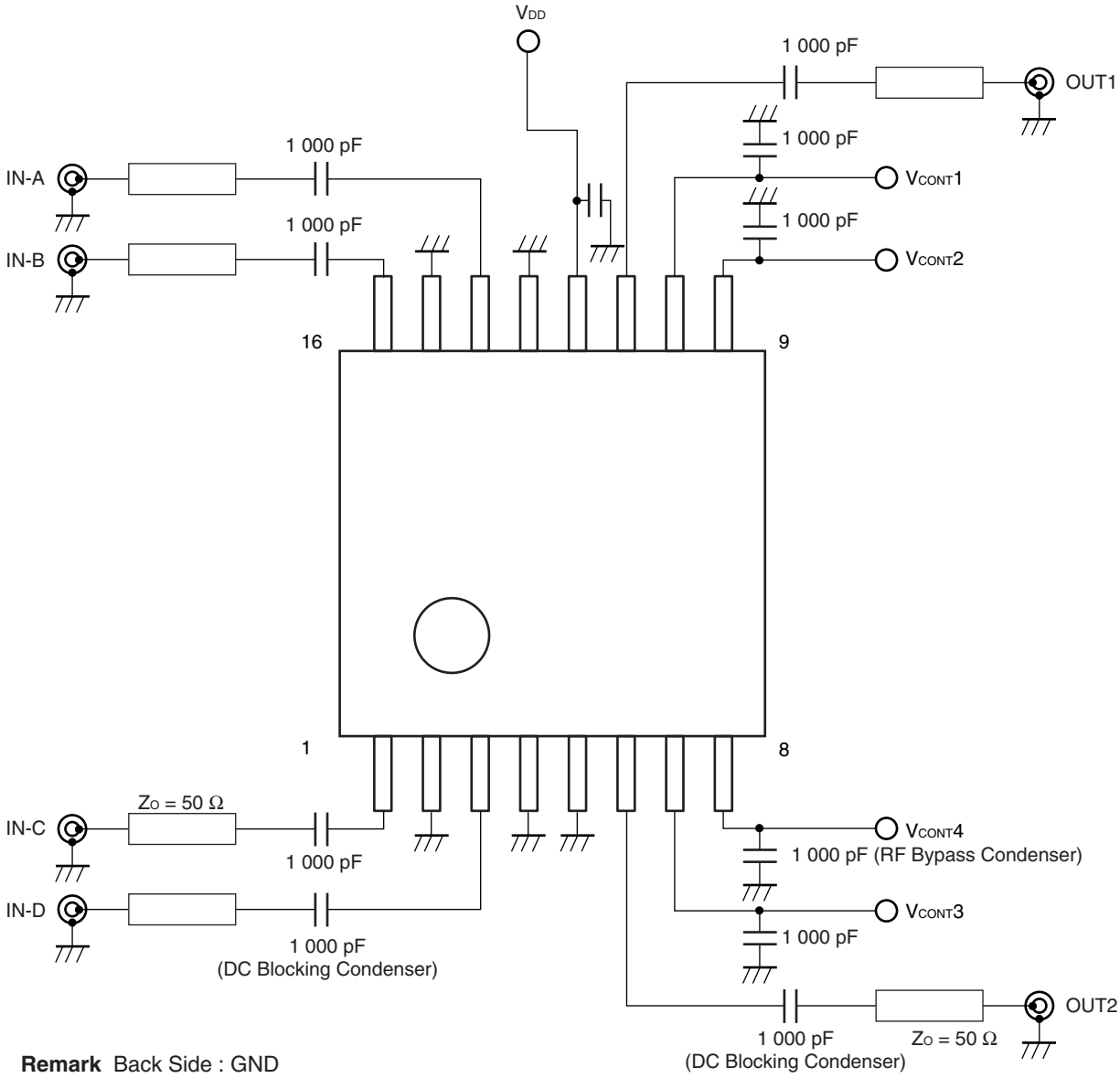
Remark High : +5.0 Vdc, Low : 0 Vdc

FUNCTIONAL DIAGRAM



Remark Back Side : GND

EVALUATION CIRCUIT (V_{DD} = +5.0 V, $V_{CONT}1$ to $V_{CONT}4$ = 0 V/+5.0 V, P_{in} = 0 dBm, Z_O = 50 Ω, DC Blocking Capacitor = 1 000 pF)

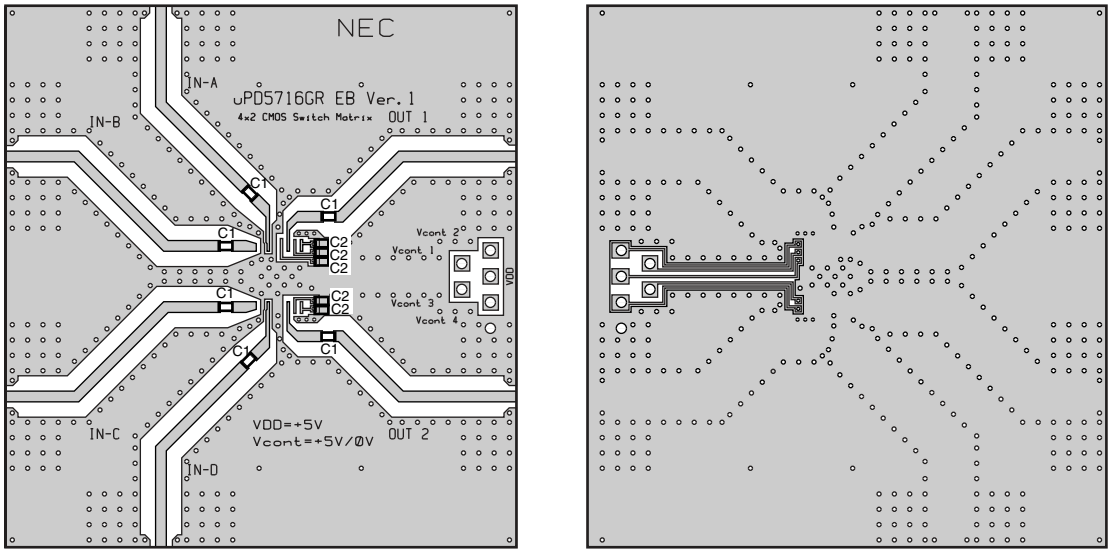


Remark Back Side : GND

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)**



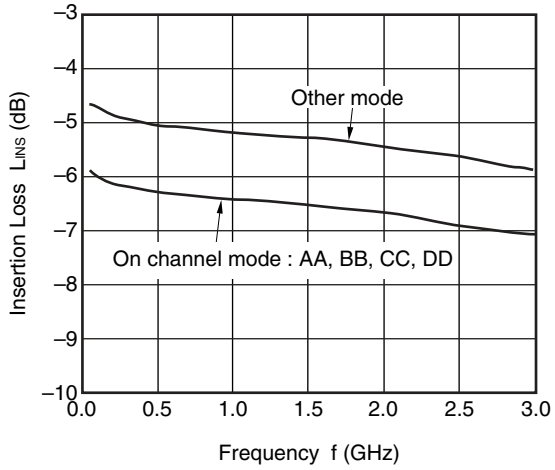
Notes

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

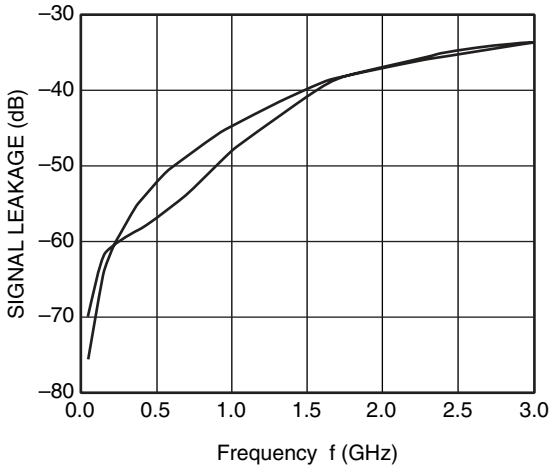
TYPICAL CHARACTERISTICS

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

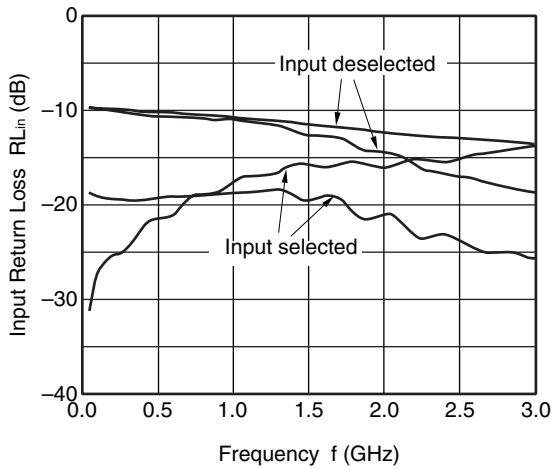
INSERTION LOSS vs. FREQUENCY
(INx-OUT, all states)



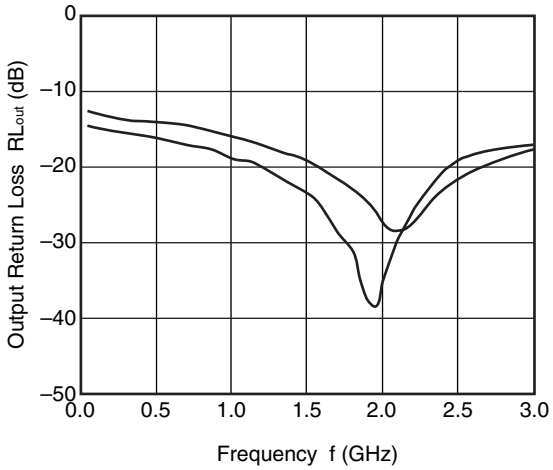
SIGNAL LEAKAGE vs. FREQUENCY
(INx-OUT, all states)



INPUT RETURN LOSS vs. FREQUENCY

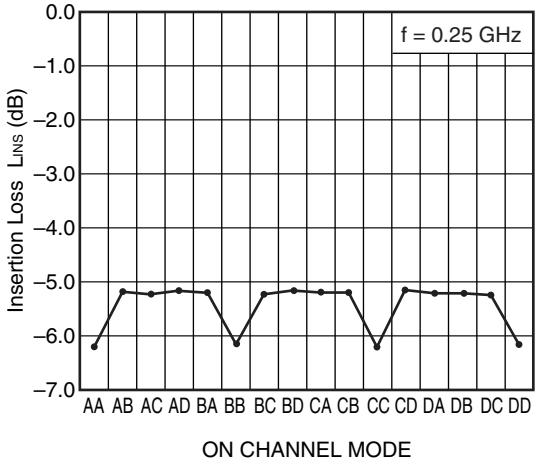


OUTPUT RETURN LOSS vs. FREQUENCY

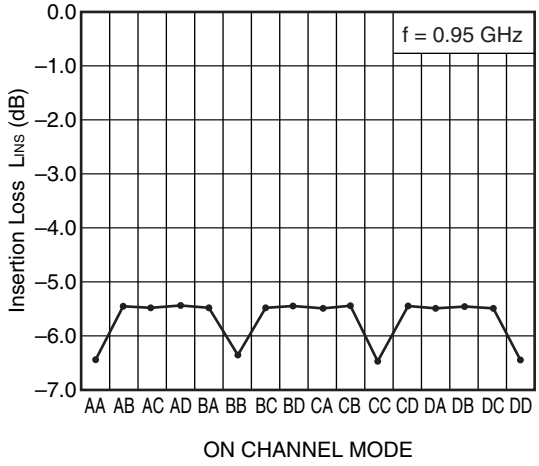


Remark The graphs indicate nominal characteristics.

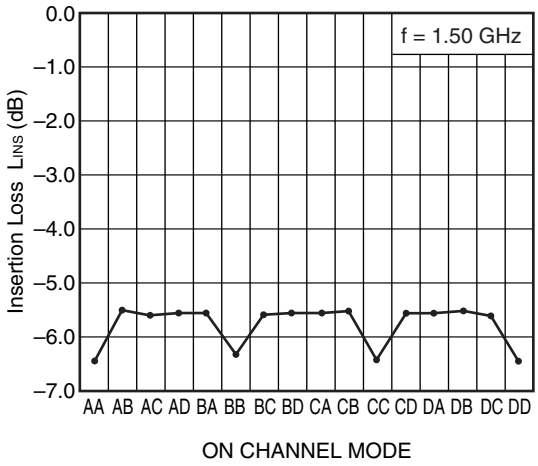
INSERTION LOSS vs.
ON CHANNEL MODE



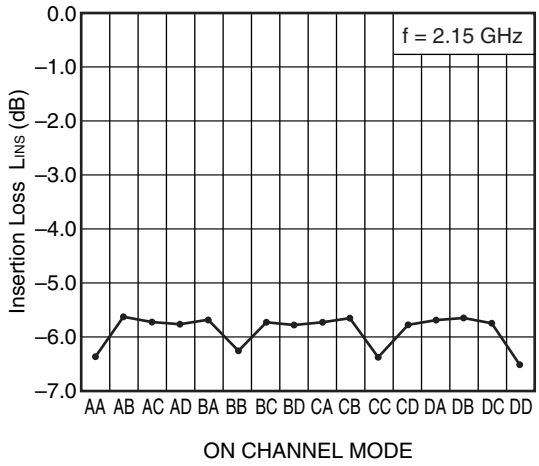
INSERTION LOSS vs.
ON CHANNEL MODE



INSERTION LOSS vs.
ON CHANNEL MODE

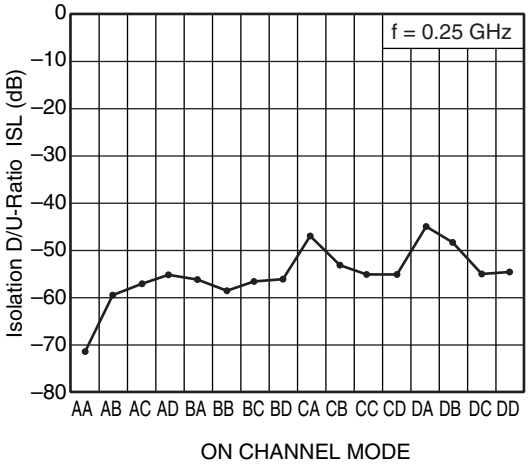


INSERTION LOSS vs.
ON CHANNEL MODE

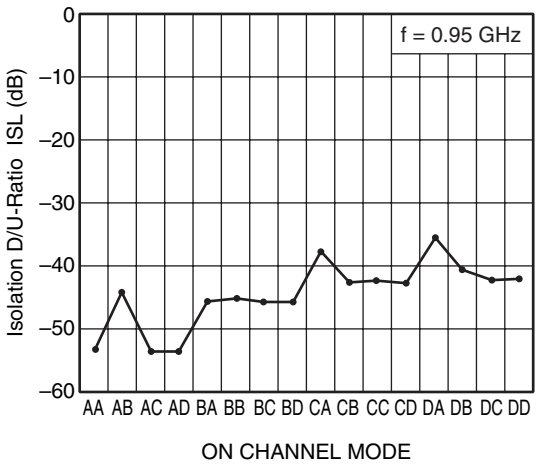


Remark The graphs indicate nominal characteristics.

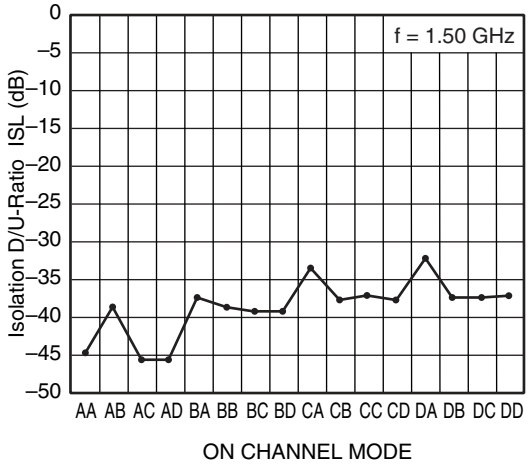
ISOLATION D/U-RATIO
vs. ON CHANNEL MODE



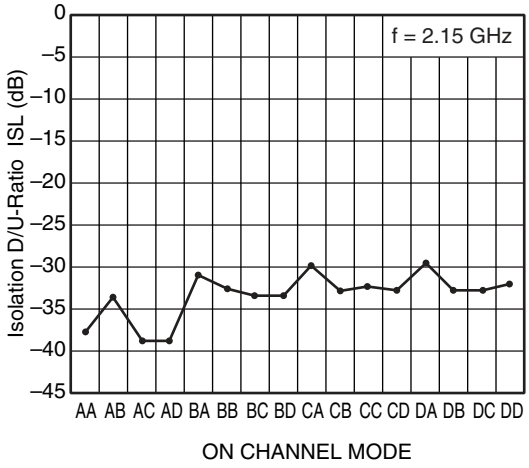
ISOLATION D/U-RATIO
vs. ON CHANNEL MODE



ISOLATION D/U-RATIO
vs. ON CHANNEL MODE

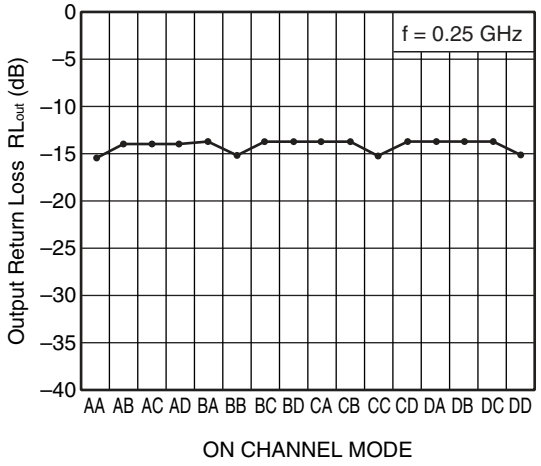


ISOLATION D/U-RATIO
vs. ON CHANNEL MODE

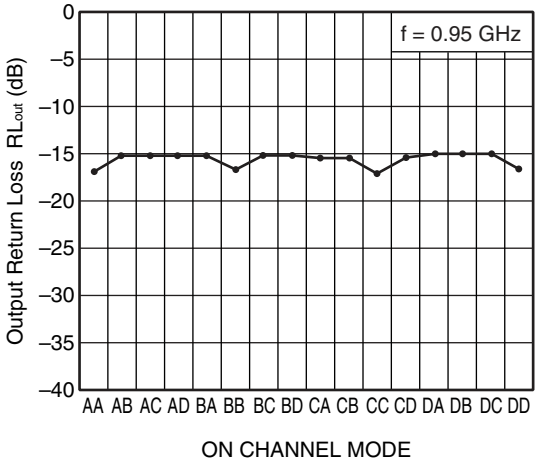


Remark The graphs indicate nominal characteristics.

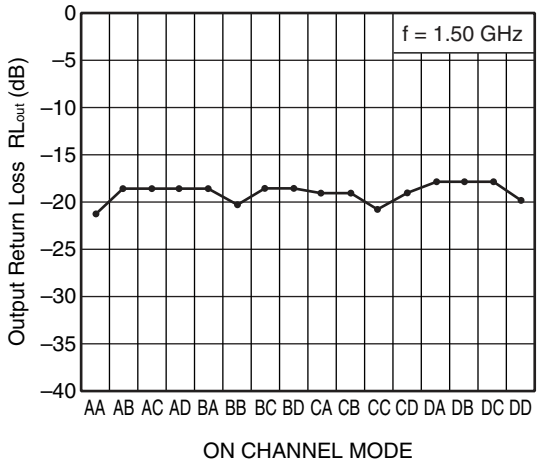
OUTPUT RETURN LOSS
vs. ON CHANNEL MODE



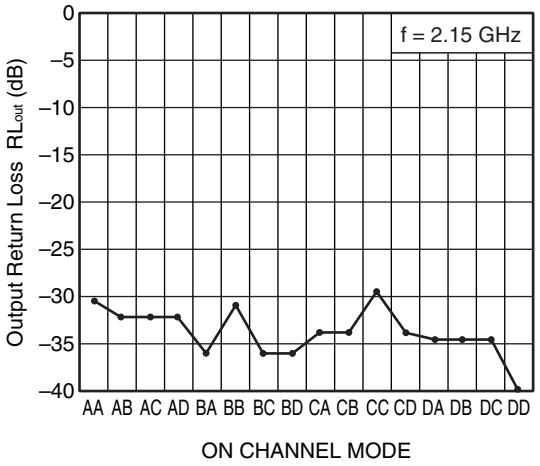
OUTPUT RETURN LOSS
vs. ON CHANNEL MODE



OUTPUT RETURN LOSS
vs. ON CHANNEL MODE



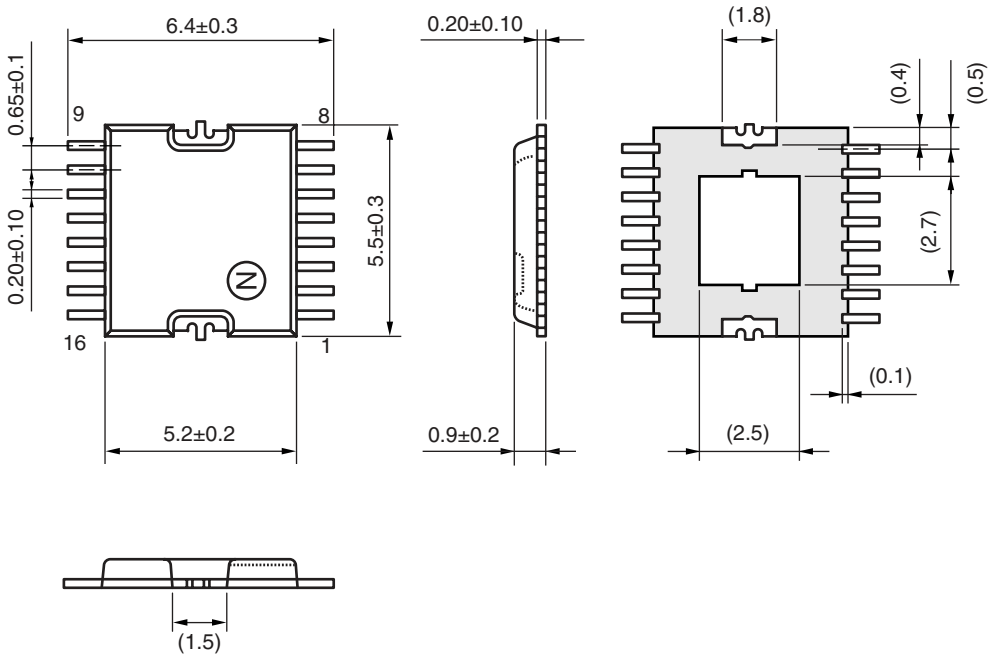
OUTPUT RETURN LOSS
vs. ON CHANNEL MODE



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) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
Partial Heating	Peak temperature (terminal temperature) Soldering time (per side of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350

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

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