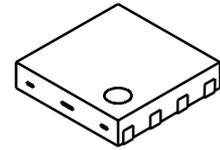


SP3T SWITCH GaAs MMIC

■ GENERAL DESCRIPTION

The NJG1804K64 is a GaAs SP3T switch controlled by three bits signals and suitable for Wi-Fi, Bluetooth and UWB applications. The NJG1804K64 features very low insertion loss and high isolation for Wi-Fi and Bluetooth, and it supports high frequency for UWB 8.5 GHz and 9.3 GHz. The small and thin DFN8-64 package is adopted.

■ PACKAGE OUTLINE



NJG1804K64

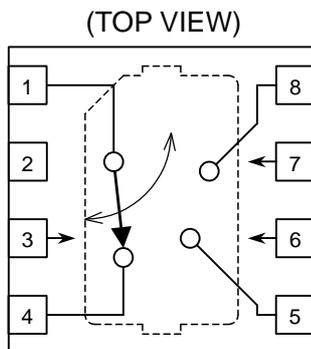
■ APPLICATION

- 802.11a/b/g/n/ac/ax/be WLAN applications, and Bluetooth
- UWB (Ultra-wide band)
- General purpose switching applications

■ FEATURES

- Control voltage 3.3 V typ. (1.9 V to 5.0 V)
- Low insertion Loss 0.50 / 0.60 / 0.85 dB typ. @ f = 2.5 / 5.9 / 7.125 GHz,
0.95 / 1.40 dB typ. @ f = 8.5 / 9.3 GHz
- High isolation 30 / 26 / 24 dB typ. @ f = 2.5 / 5.9 / 7.125 GHz,
21 / 20 dB typ. @ f = 8.5 / 9.3 GHz
- Input power at 1dB compression point +29 dBm typ. @ f = 2.5 / 5.9 / 7.125 GHz,
- Package DFN8-64 (Package size: 1.5 x 1.5 mm typ., t = 0.38 mm max.)
- RoHS compliant and Halogen free, MSL1

■ PIN CONFIGURATION



1. PC
2. NC
3. VCTL1
4. P1
5. P2
6. VCTL2
7. VCTL3
8. P3

Exposed pad: GND

■ TRUTH TABLE

“H”=V_{CTL(H)}, “L”=V_{CTL(L)}

VCTL1	VCTL2	VCTL3	PATH
H	L	L	PC-P1
L	H	L	PC-P2
L	L	H	PC-P3

NOTE: Please note that any data or drawing in this catalog is subject to change.

■ ABSOLUTE MAXIMUM RATINGS

Ta = +25 °C

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNITS
Input power	P _{IN}	V _{CTL(H)} = 3.3 V, V _{CTL(L)} = 0 V, ON state port	+30	dBm
Control voltage	V _{CTL}		5.0	V
Power dissipation	P _D	Four-layer FR4 PCB without through holes (76.2 x 114.3 mm), T _j = 150 °C	380	mW
Operating temperature	T _{opr}		-40 to +105	°C
Storage temperature	T _{stg}		-55 to +150	°C

■ ELECTRICAL CHARACTERISTICS 1 (DC Characteristics)

General conditions: Ta = +25 °C, V_{CTL(H)} = 3.3 V, V_{CTL(L)} = 0 V

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Control voltage (HIGH)	V _{CTL(H)}		1.9	3.3	5.0	V
Control voltage (LOW)	V _{CTL(L)}		-0.2	-	0.2	V
Control current	I _{CTL}		-	4	10	μA

■ ELECTRICAL CHARACTERISTICS 2 (RF Characteristics)

General conditions: Ta = +25 °C, V_{CTL(H)} = 3.3 V, V_{CTL(L)} = 0 V, Z_s = Z_l = 50 Ω

PARAMETERS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Insertion loss 1	LOSS1	f = 2.4 GHz to 2.5 GHz	-	0.50	0.70	dB
Insertion loss 2	LOSS2	f = 4.9 GHz to 5.9 GHz	-	0.60	0.80	dB
Insertion loss 3	LOSS3	f = 7.125 GHz	-	0.85	1.30	dB
Insertion loss 4	LOSS4	f = 8.5 GHz	-	0.95	1.40	dB
Insertion loss 5	LOSS5	f = 9.3 GHz	-	1.40	1.90	dB
Isolation 1	ISL1	f = 2.4 GHz to 2.5 GHz	27	30	-	dB
Isolation 2	ISL2	f = 4.9 GHz to 5.9 GHz	24	26	-	dB
Isolation 3	ISL3	f = 7.125 GHz	20	24	-	dB
Isolation 4	ISL4	f = 8.5 GHz	18	21	-	dB
Isolation 5	ISL5	f = 9.3 GHz	17	20	-	dB
Input power at 1dB compression point 1	P _{-1dB1}	f = 2.4 GHz to 2.5 GHz	+26	+29	-	dBm
Input power at 1dB compression point 2	P _{-1dB2}	f = 4.9 GHz to 5.9 GHz	+26	+29	-	dBm
Input power at 1dB compression point 3	P _{-1dB3}	f = 7.125 GHz	+26	+29	-	dBm
Input power at 1dB compression point 4	P _{-1dB4}	f = 8.5 GHz	+11	-	-	dBm
Input power at 1dB compression point 5	P _{-1dB5}	f = 9.3 GHz	+11	-	-	dBm
Return loss 1	RL1	f = 2.4 GHz to 2.5 GHz	15	25	-	dB
Return loss 2	RL2	f = 4.9 GHz to 5.9 GHz	15	20	-	dB
Return loss 3	RL3	f = 7.125 GHz	14	20	-	dB
Return loss 4	RL4	f = 8.5 GHz	13	19	-	dB
Return loss 5	RL5	f = 9.3 GHz	10	13	-	dB
Switching time	T _{sw}	50% CTL to 10% / 90% RF	-	80	300	ns

■ **TERMINAL INFORMATION**

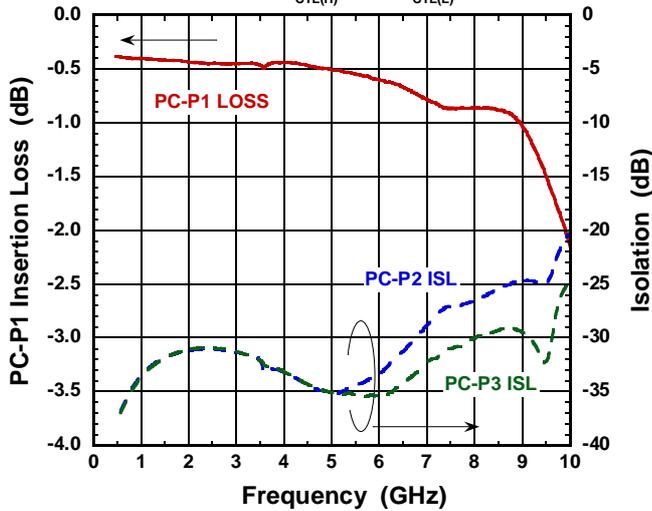
No.	SYMBOL	DESCRIPTION
1	PC	Common RF terminal. An external DC blocking capacitor is required.
2	NC	No connected terminal. This terminal is not connected with internal circuit. This terminal please connects to the PCB ground plane or floating.
3	VCTL1	Control voltage input terminal.
4	P1	RF terminal. An external DC blocking capacitor is required.
5	P2	RF terminal. An external DC blocking capacitor is required.
6	VCTL2	Control voltage input terminal.
7	VCTL3	Control voltage input terminal.
8	P3	RF terminal. An external DC blocking capacitor is required.
Exposed Pad	GND	Ground terminal. Connect exposed pad to ground plane as close as possible for excellent RF performance.

■ TYPICAL CHARACTERISTICS

(Typical Characteristics are intended to be used as reference data; they are not guaranteed.)

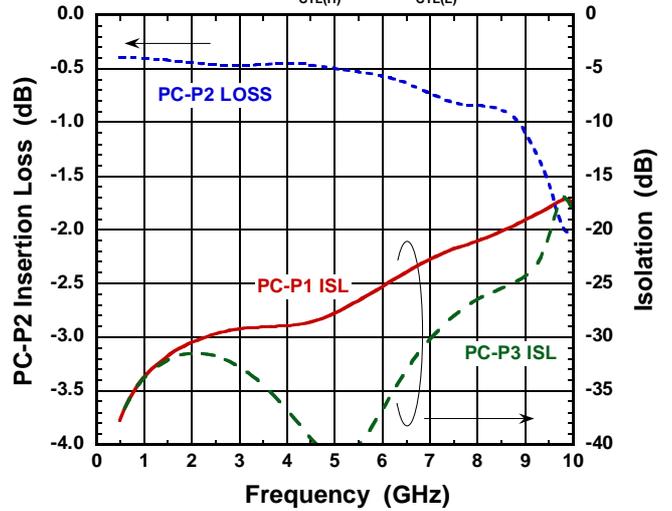
LOSS, ISL vs Frequency

(PC-P1 ON, $V_{CTL(H)}=3.3V$, $V_{CTL(L)}=0V$)



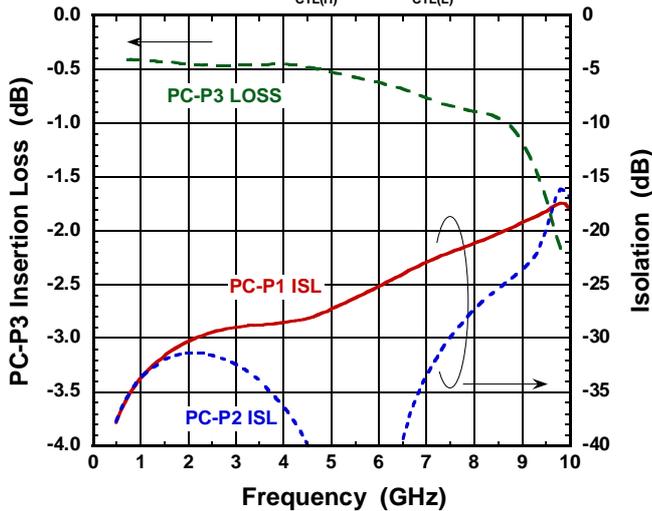
LOSS, ISL vs Frequency

(PC-P2 ON, $V_{CTL(H)}=3.3V$, $V_{CTL(L)}=0V$)



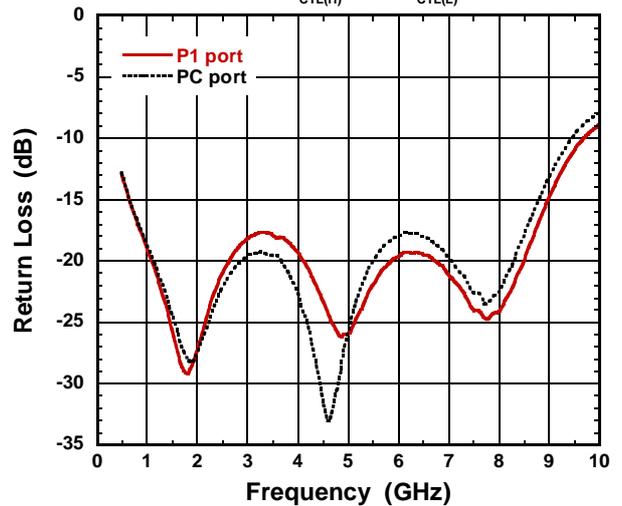
LOSS, ISL vs Frequency

(PC-P3 ON, $V_{CTL(H)}=3.3V$, $V_{CTL(L)}=0V$)



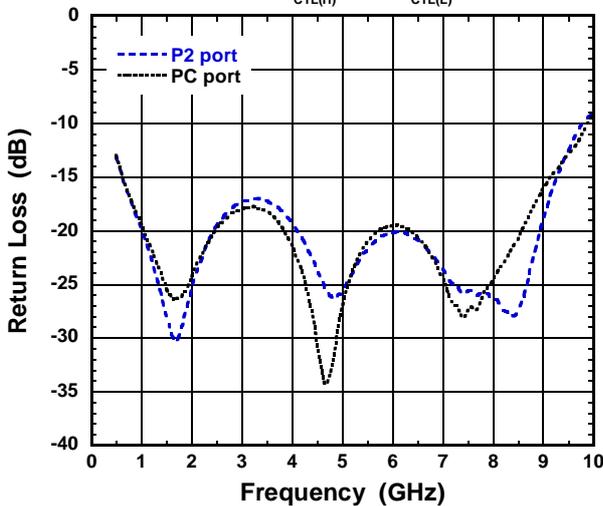
Return Loss vs Frequency

(PC-P1 ON, $V_{CTL(H)}=3.3V$, $V_{CTL(L)}=0V$)



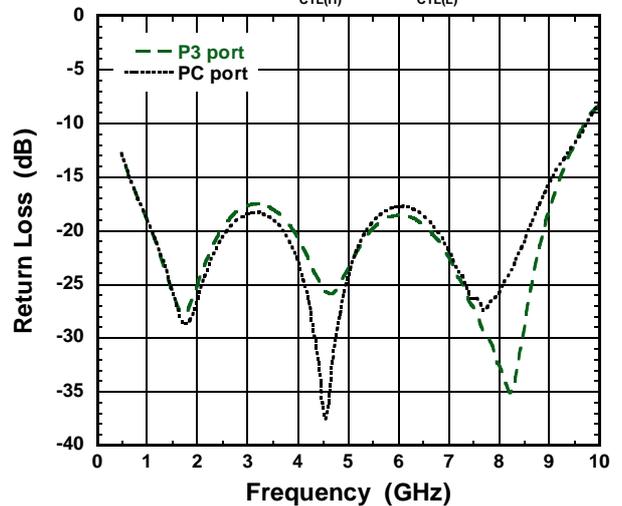
Return Loss vs Frequency

(PC-P2 ON, $V_{CTL(H)}=3.3V$, $V_{CTL(L)}=0V$)



Return Loss vs Frequency

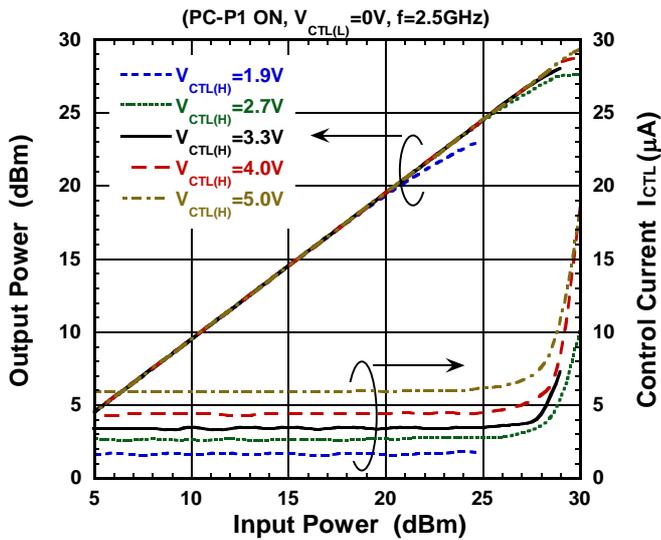
(PC-P3 ON, $V_{CTL(H)}=3.3V$, $V_{CTL(L)}=0V$)



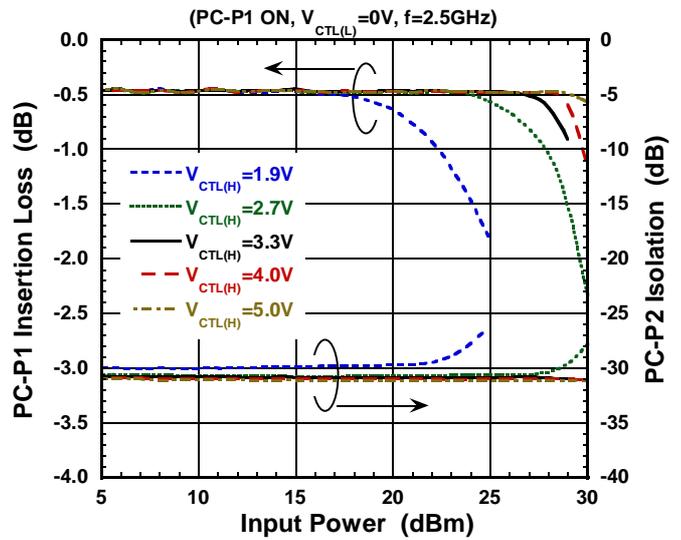
■ TYPICAL CHARACTERISTICS

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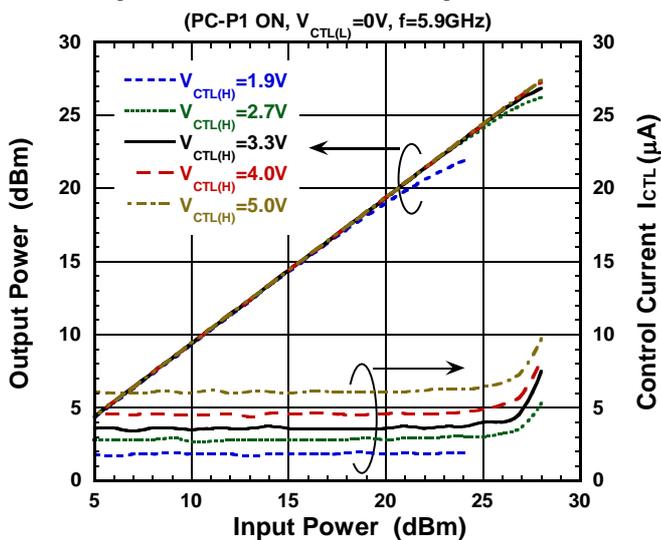
Output Power, I_{CTL} vs Input Power



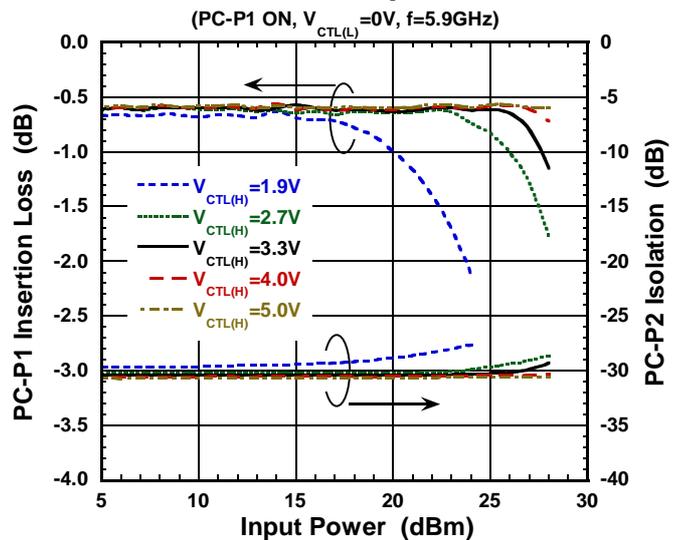
LOSS, ISL vs Input Power



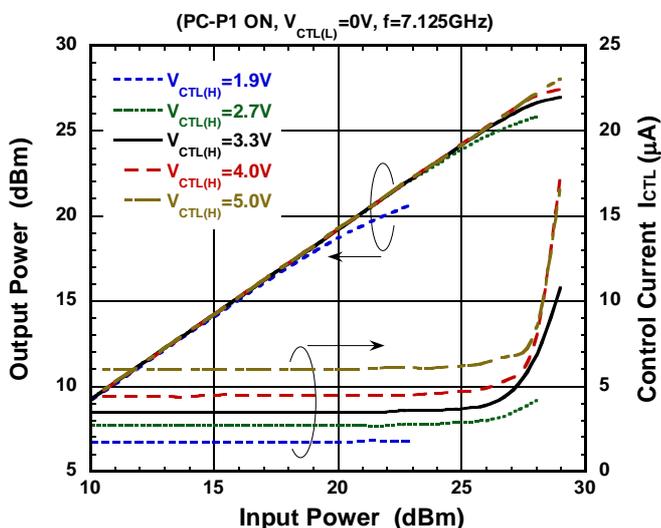
Output Power, I_{CTL} vs Input Power



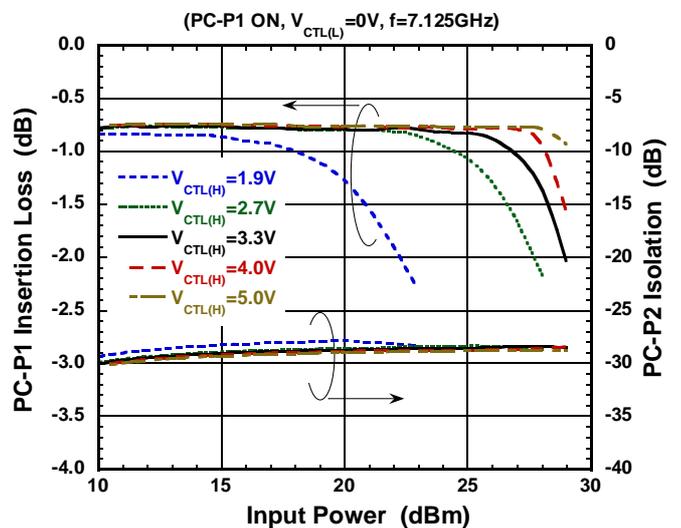
LOSS, ISL vs Input Power



Output Power, I_{CTL} vs Input Power



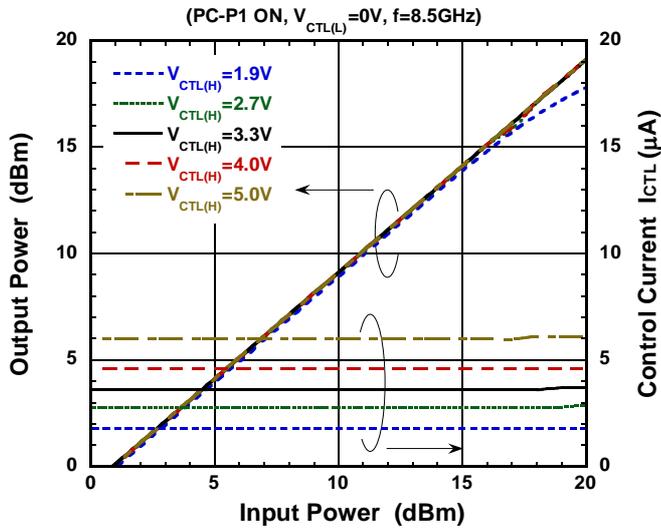
LOSS, ISL vs Input Power



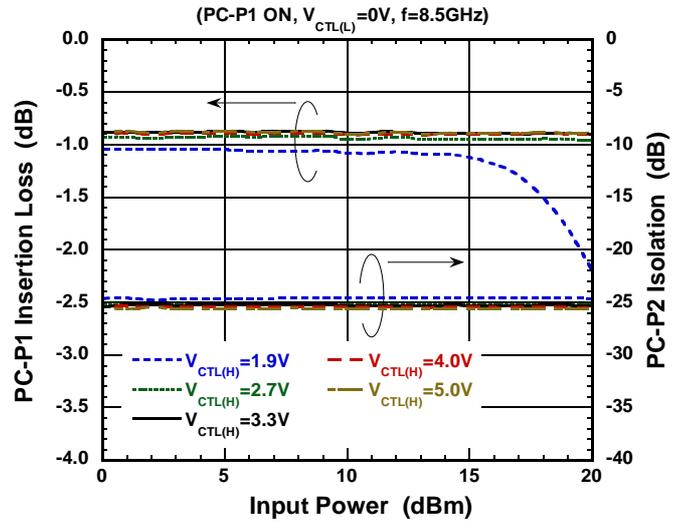
■ TYPICAL CHARACTERISTICS

(Typical Characteristics are intended to be used as reference data; they are not guaranteed.)

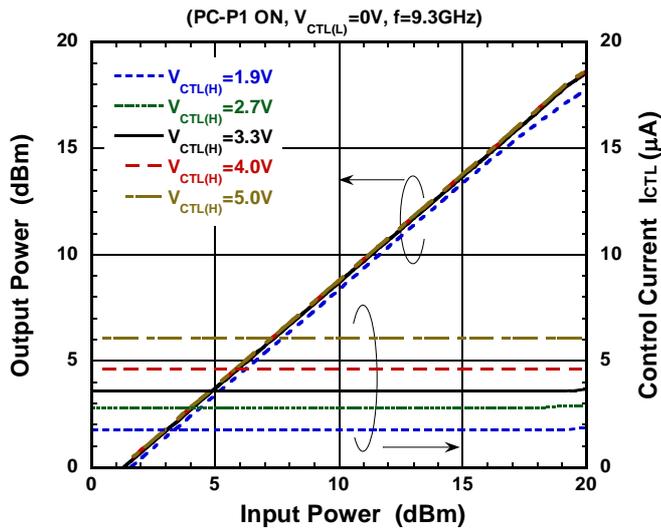
Output Power, I_{CTL} vs Input Power



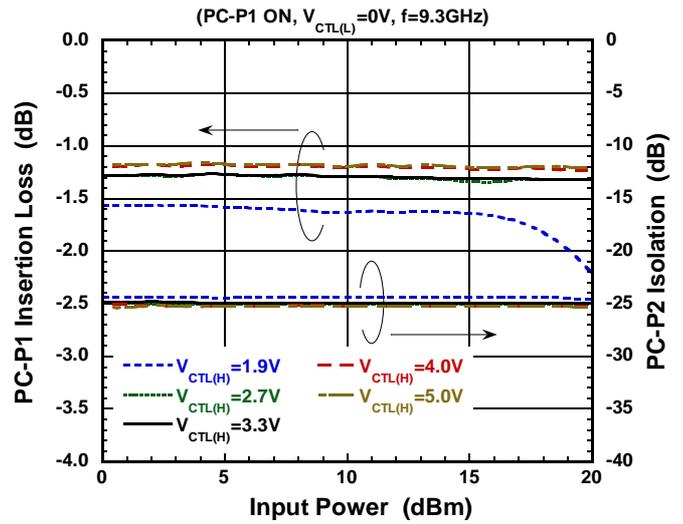
LOSS, ISL vs Input Power



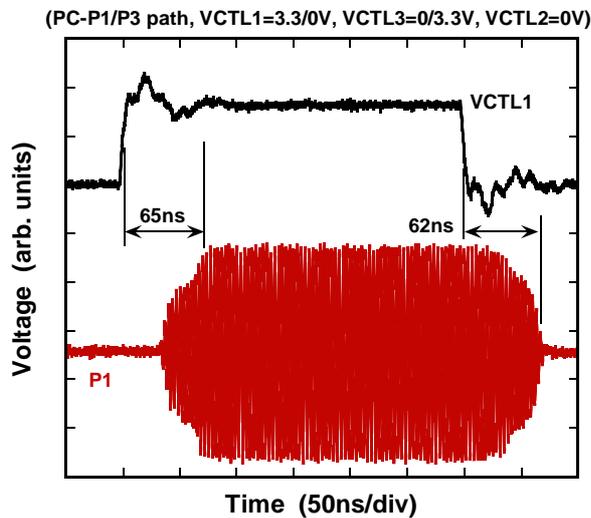
Output Power, I_{CTL} vs Input Power



LOSS, ISL vs Input Power



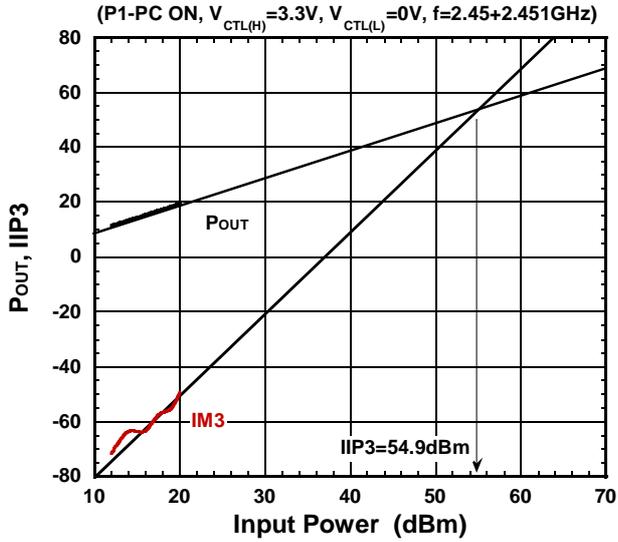
Switching Time



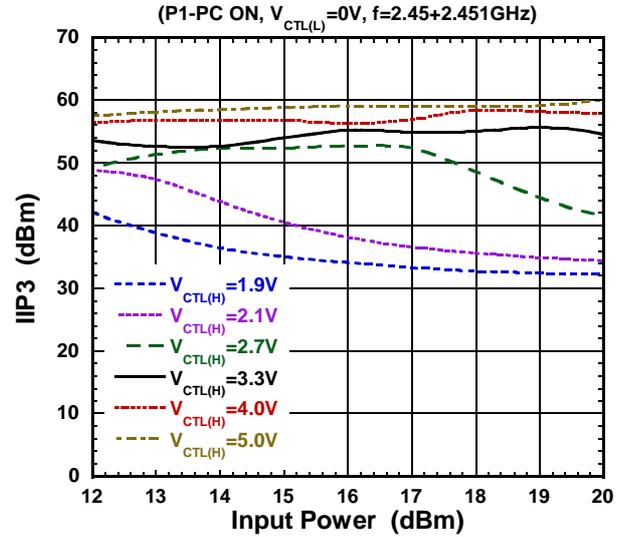
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(Typical Characteristics are intended to be used as reference data; they are not guaranteed.)

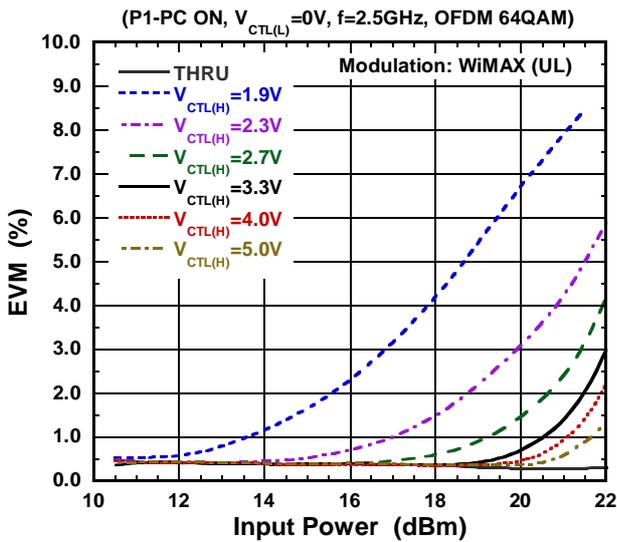
Output Power, IM3 vs Input Power



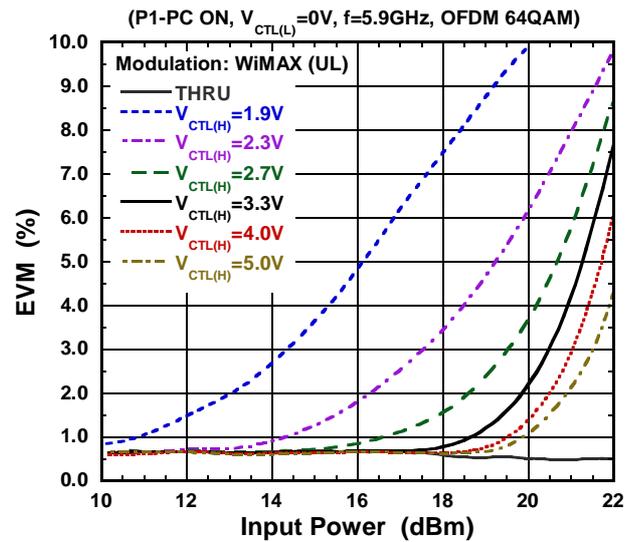
IIP3 vs Input Power



EVM vs Input Power($f=2.5GHz$)



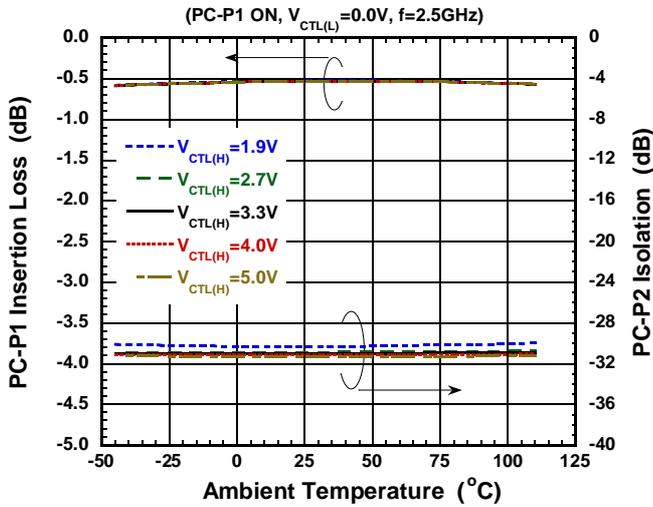
EVM vs Input Power($f=5.9GHz$)



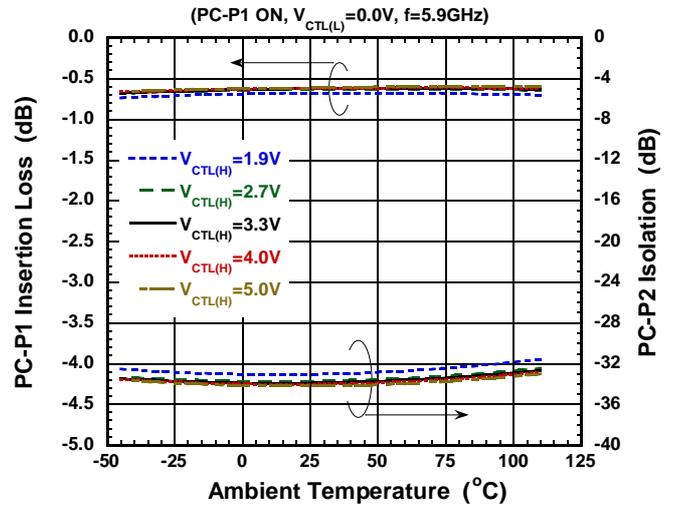
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(Typical Characteristics are intended to be used as reference data; they are not guaranteed.)

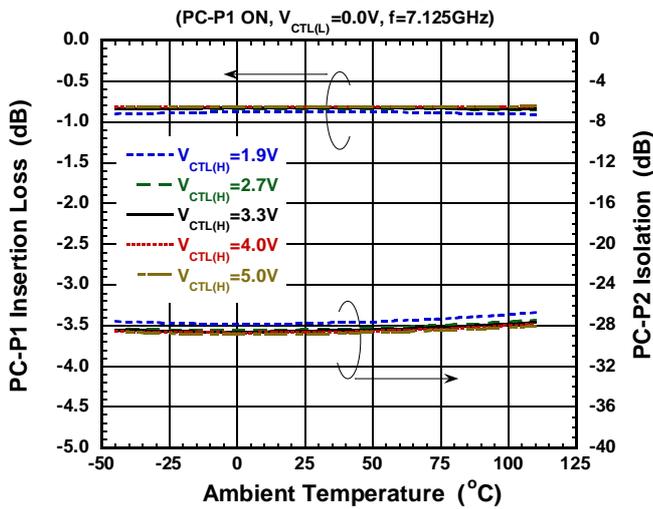
LOSS, ISL vs Temperature



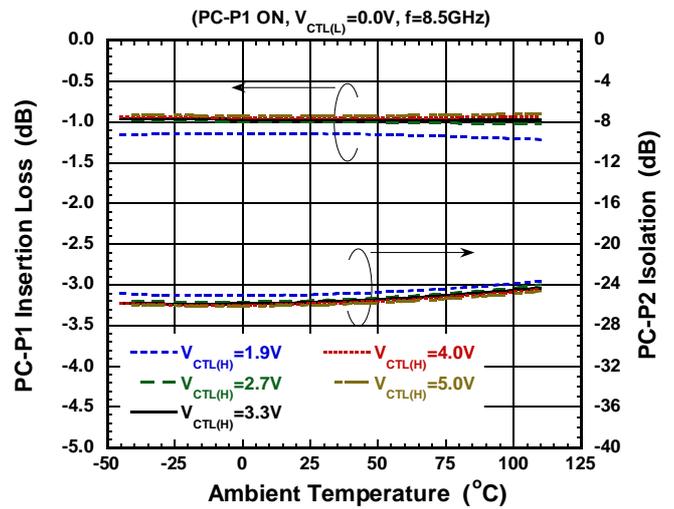
LOSS, ISL vs Temperature



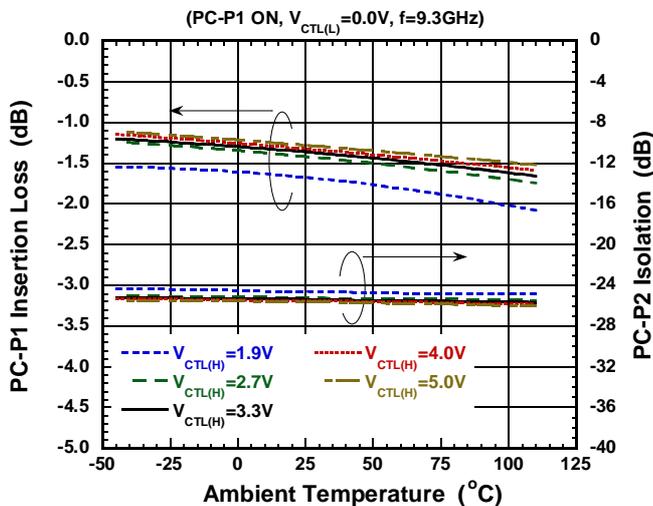
LOSS, ISL vs Temperature



LOSS, ISL vs Temperature



LOSS, ISL vs Temperature

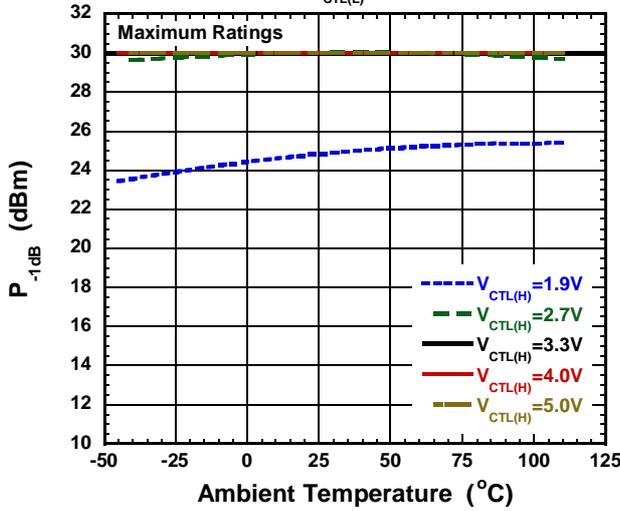


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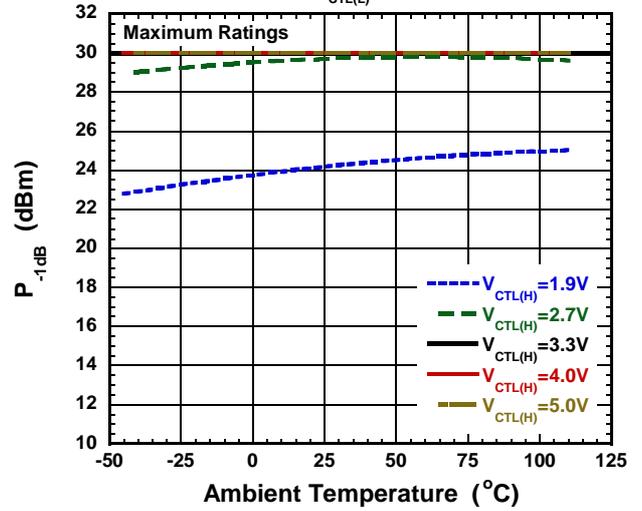
P-1dB vs Temperature

(PC-P1 ON, $V_{CTL(L)}=0V$, $f=2.5GHz$)



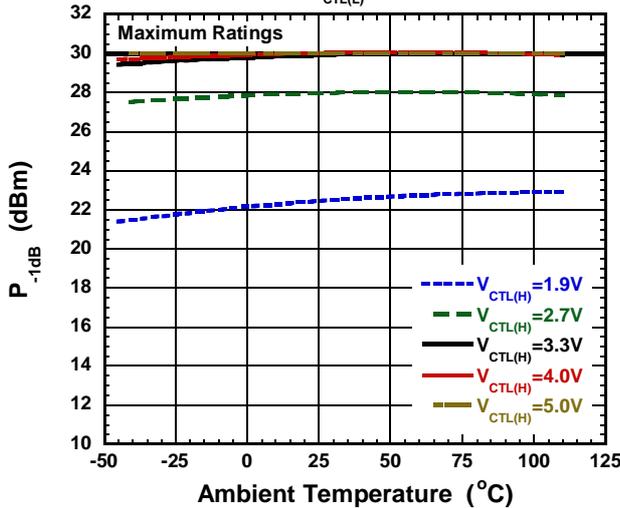
P-1dB vs Temperature

(PC-P1 ON, $V_{CTL(L)}=0V$, $f=5.9GHz$)



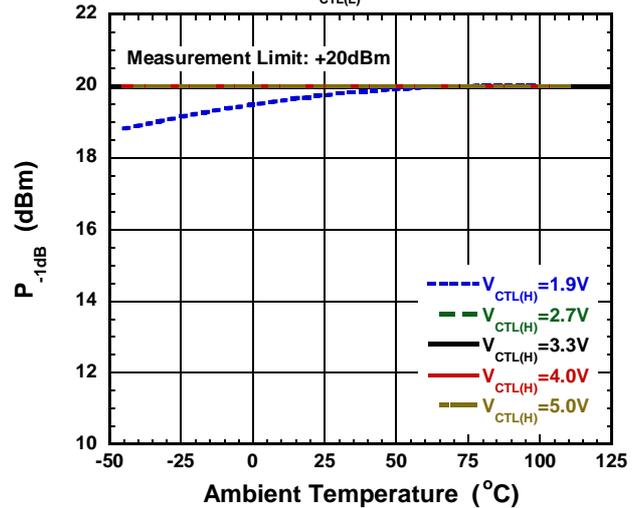
P-1dB vs Temperature

(PC-P1 ON, $V_{CTL(L)}=0V$, $f=7.125GHz$)



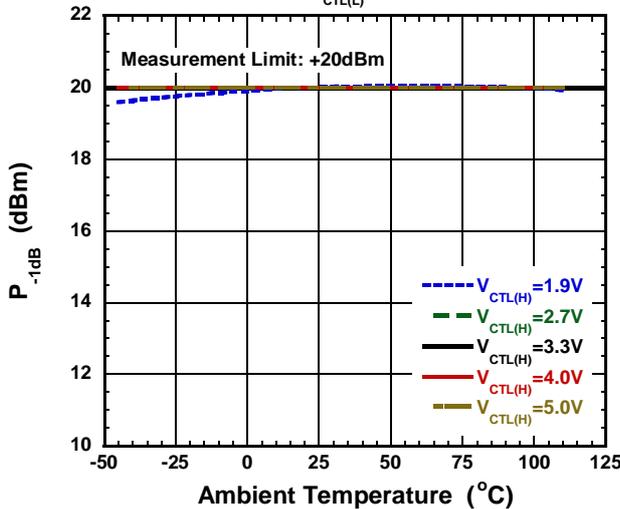
P-1dB vs Temperature

(PC-P1 ON, $V_{CTL(L)}=0V$, $f=8.5GHz$)



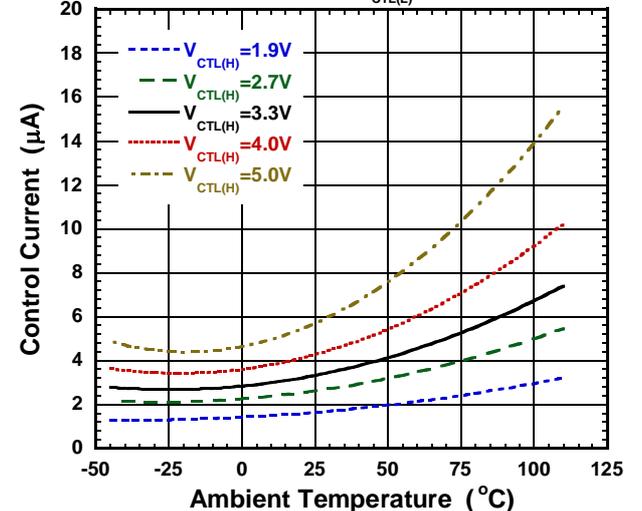
P-1dB vs Temperature

(PC-P1 ON, $V_{CTL(L)}=0V$, $f=9.3GHz$)



Control Current vs Temperature

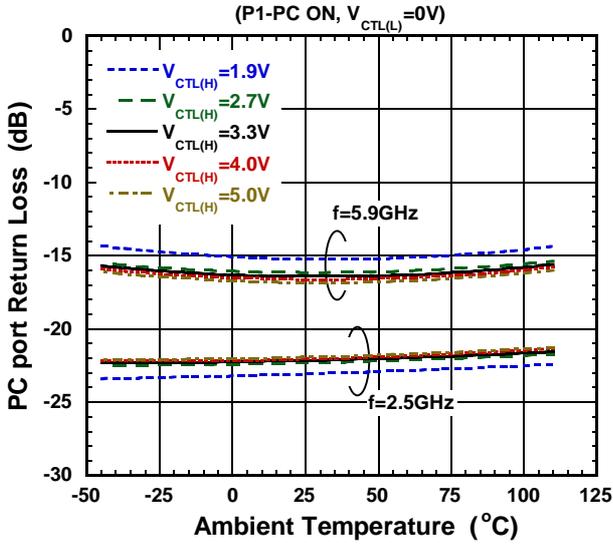
(P1-PC ON, $V_{CTL(L)}=0V$)



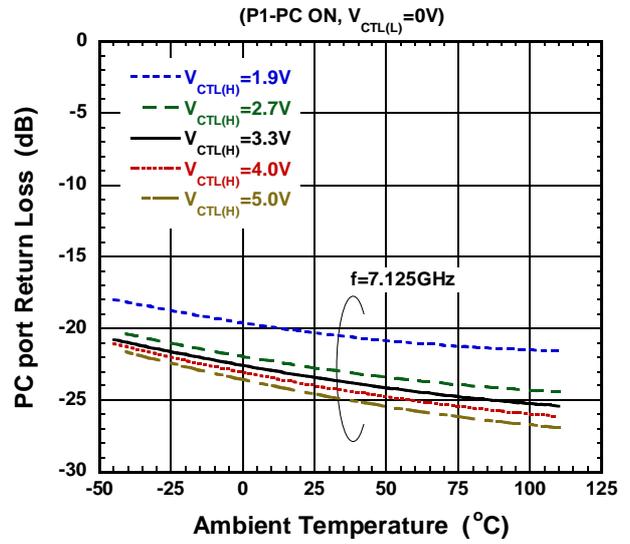
■ TYPICAL CHARACTERISTICS

(Typical Characteristics are intended to be used as reference data; they are not guaranteed.)

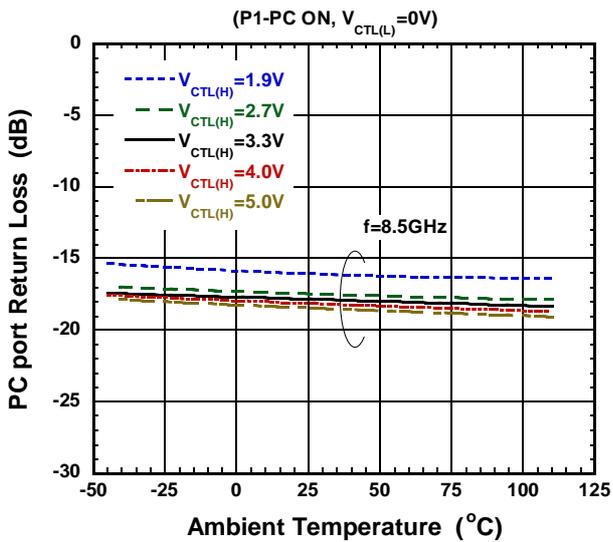
Return Loss vs Temperature



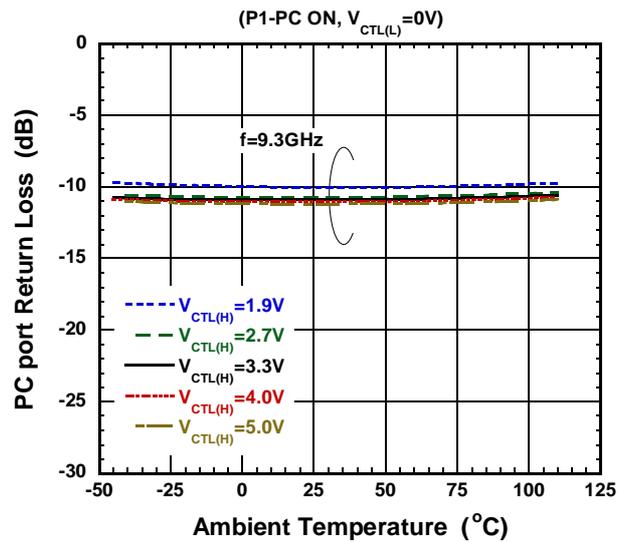
Return Loss vs Temperature



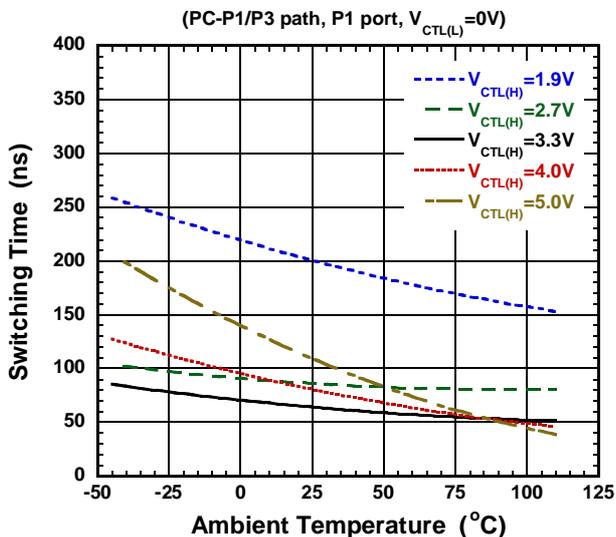
Return Loss vs Temperature



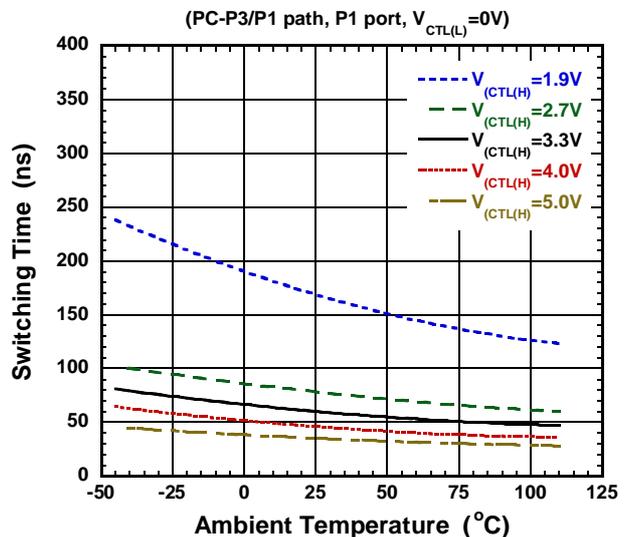
Return Loss vs Temperature



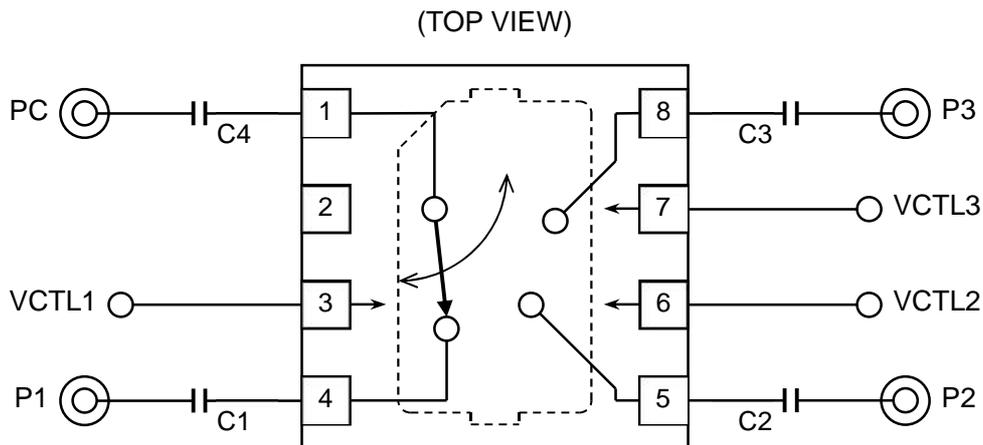
Switching Time(rise) vs Temperature



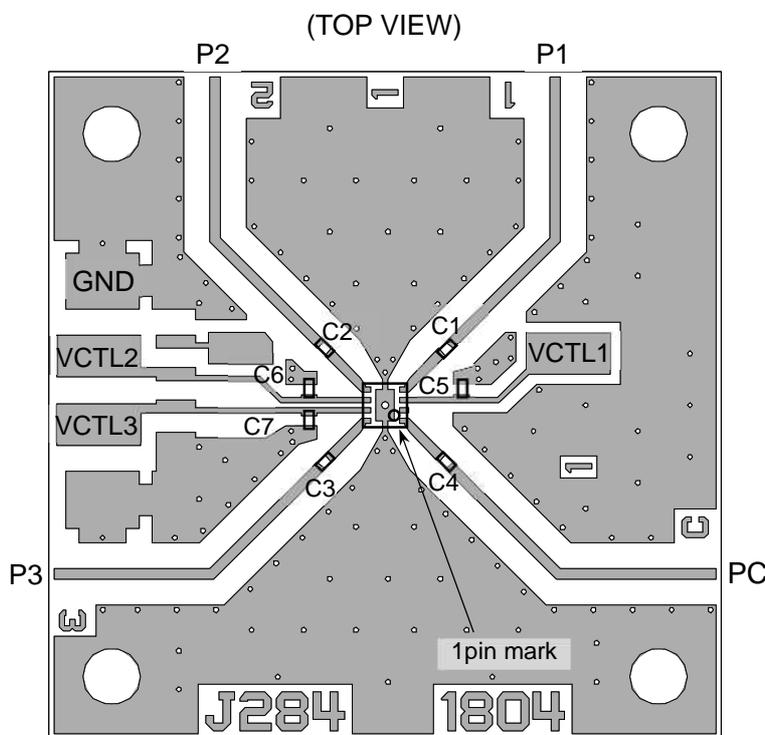
Switching Time(fall) vs Temperature



APPLICATION CIRCUIT



RECOMMENDED PCB DESIGN



PCB: FR-4, $t = 0.2$ mm
 Capacitor size: 0603 (0.6 x 0.3 mm)
 Strip line width: 0.38 mm
 PCB size: 25.8 x 25.8 mm
 Through hole diameter: 0.2 mm

Losses of PCB, capacitors and connectors

Frequency (GHz)	Loss (dB)
2.4	0.50
2.5	0.52
4.9	0.87
5.9	1.02
7.125	1.35
8.5	1.63
9.3	1.85

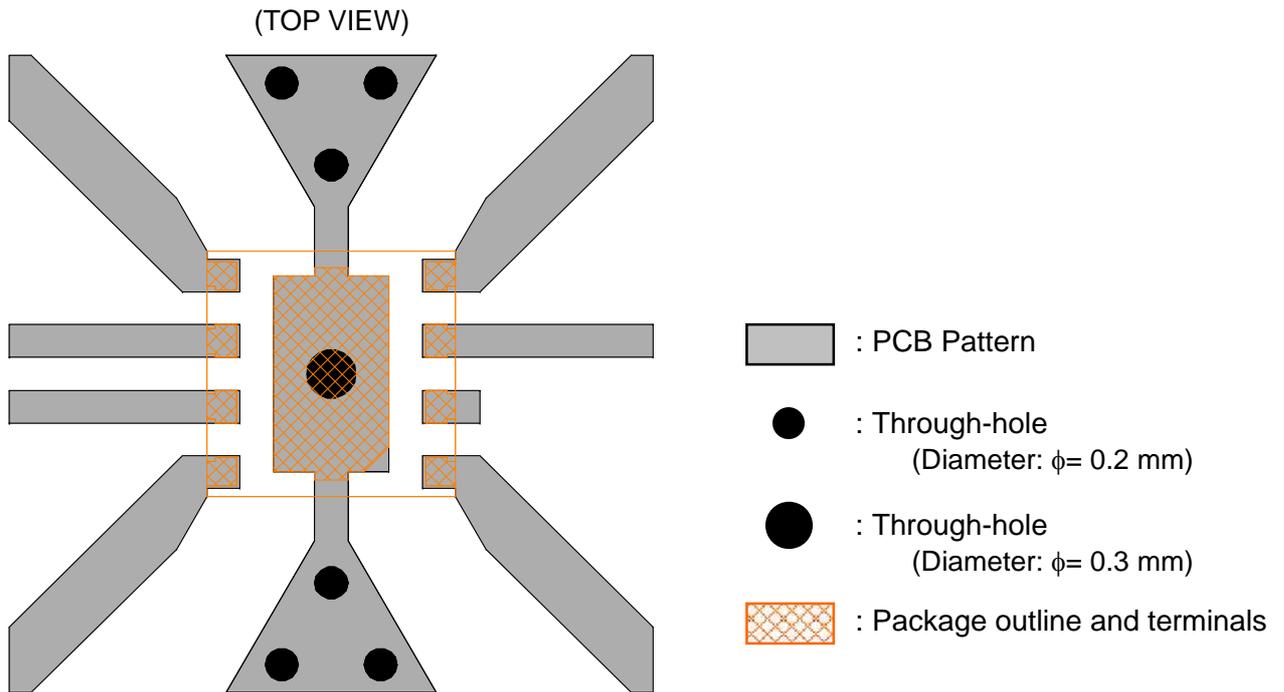
NOTE

The bypass capacitors, C5 to C7 are optional, and are recommended only when the control lines are affected under noisy environment.

PARTS LIST

No.	Value	Notes
C1 to C4	27pF	Murata MFG (GRM03 series)
C5 to C7	10pF	

■ PCB LAYOUT GUIDELINE



PRECAUTIONS

- [1] The DC blocking capacitors should be placed at RF terminals. Please choose appropriate capacitance value at the application frequency.
- [2] If the bypass capacitors (C5 to C7) are needed, they should be placed as close as possible to VCTL terminals.
- [3] For good RF performance, exposed pad should be connected to PCB ground plane as close as possible.

■ **RECOMMENDED FOOTPRINT PATTERN** (8pin DFN Package 1.5 x 1.5 mm) <Reference>

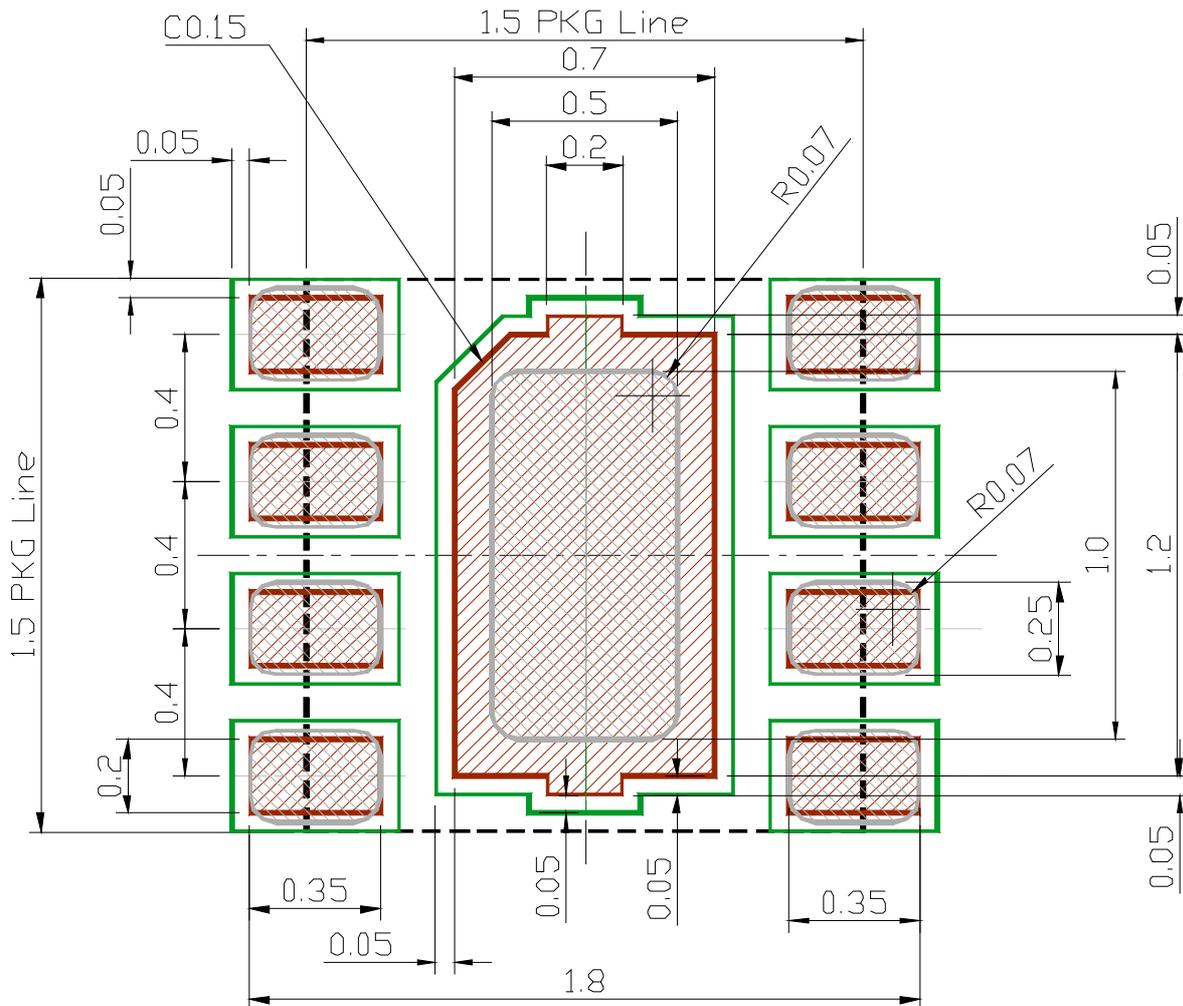
Package: 1.5 mm x 1.5 mm

Pin pitch: 0.4 mm

 : Land

 : Mask (Open area) *Metal mask thickness: 100 um

 : Resist (Open area)



1. The products and the product specifications described in this document are subject to change or discontinuation of production without notice for reasons such as improvement. Therefore, before deciding to use the products, please refer to our sales representatives for the latest information thereon.
2. The materials in this document may not be copied or otherwise reproduced in whole or in part without the prior written consent of us.
3. This product and any technical information relating thereto are subject to complementary export controls (so-called KNOW controls) under the Foreign Exchange and Foreign Trade Law, and related politics ministerial ordinance of the law. (Note that the complementary export controls are inapplicable to any application-specific products, except rockets and pilotless aircraft, that are insusceptible to design or program changes.) Accordingly, when exporting or carrying abroad this product, follow the Foreign Exchange and Foreign Trade Control Law and its related regulations with respect to the complementary export controls.
4. The technical information described in this document shows typical characteristics and example application circuits for the products. The release of such information is not to be construed as a warranty of or a grant of license under our or any third party's intellectual property rights or any other rights.
5. The products listed in this document are intended and designed for use as general electronic components in standard applications (office equipment, telecommunication equipment, measuring instruments, consumer electronic products, amusement equipment etc.). Those customers intending to use a product in an application requiring extreme quality and reliability, for example, in a highly specific application where the failure or misoperation of the product could result in human injury or death should first contact us.
 - Aerospace Equipment
 - Equipment Used in the Deep Sea
 - Power Generator Control Equipment (nuclear, steam, hydraulic, etc.)
 - Life Maintenance Medical Equipment
 - Fire Alarms / Intruder Detectors
 - Vehicle Control Equipment (automotive, airplane, railroad, ship, etc.)
 - Various Safety Devices
 - Traffic control system
 - Combustion equipment

In case your company desires to use this product for any applications other than general electronic equipment mentioned above, make sure to contact our company in advance. Note that the important requirements mentioned in this section are not applicable to cases where operation requirements such as application conditions are confirmed by our company in writing after consultation with your company.

6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, fire containment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
7. The products have been designed and tested to function within controlled environmental conditions. Do not use products under conditions that deviate from methods or applications specified in this datasheet. Failure to employ the products in the proper applications can lead to deterioration, destruction or failure of the products. We shall not be responsible for any bodily injury, fires or accident, property damage or any consequential damages resulting from misuse or misapplication of the products.
8. **Quality Warranty**
 - 8-1. **Quality Warranty Period**

In the case of a product purchased through an authorized distributor or directly from us, the warranty period for this product shall be one (1) year after delivery to your company. For defective products that occurred during this period, we will take the quality warranty measures described in section 8-2. However, if there is an agreement on the warranty period in the basic transaction agreement, quality assurance agreement, delivery specifications, etc., it shall be followed.
 - 8-2. **Quality Warranty Remedies**

When it has been proved defective due to manufacturing factors as a result of defect analysis by us, we will either deliver a substitute for the defective product or refund the purchase price of the defective product.

Note that such delivery or refund is sole and exclusive remedies to your company for the defective product.
 - 8-3. **Remedies after Quality Warranty Period**

With respect to any defect of this product found after the quality warranty period, the defect will be analyzed by us. On the basis of the defect analysis results, the scope and amounts of damage shall be determined by mutual agreement of both parties. Then we will deal with upper limit in Section 8-2. This provision is not intended to limit any legal rights of your company.
9. Anti-radiation design is not implemented in the products described in this document.
10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
11. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
12. Warning for handling Gallium and Arsenic (GaAs) products (Applying to GaAs MMIC, Photo Reflector). These products use Gallium (Ga) and Arsenic (As) which are specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or power. When the product is disposed of, please follow the related regulation and do not mix this with general industrial waste or household waste.
13. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.



Nisshinbo Micro Devices Inc.

Official website

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