

1.0 to 7.125 GHz Broad Band SPDT Switch

■ FEATURES

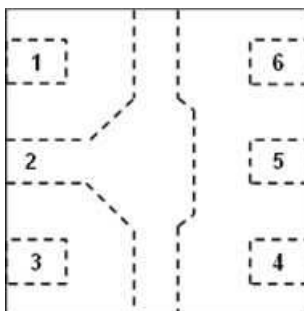
- Frequency range 1.0 to 7.125 GHz
- Operation voltage range 1.6 to 5.0 V (1.8V typ.)
- Low control voltage 1.8 V typ.
- Low insertion loss
 - 0.50 dB typ. @ f = 2.4 to 2.5 GHz, $V_{DD} = 1.8\text{ V}$
 - 0.50 dB typ. @ f = 4.9 to 5.9 GHz, $V_{DD} = 1.8\text{ V}$
 - 0.55 dB typ. @ f = 5.9 to 7.125 GHz, $V_{DD} = 1.8\text{ V}$
- High isolation
 - 25dB typ. @ f = 2.4 to 2.5 GHz, $V_{DD} = 1.8\text{ V}$
 - 25dB typ. @ f = 4.9 to 5.9 GHz, $V_{DD} = 1.8\text{ V}$
 - 25dB typ. @ f = 5.9 to 7.125 GHz, $V_{DD} = 1.8\text{ V}$
- High linearity
 - $P_{-1dB} = +31\text{ dBm}$ typ. @ f = 7.125GHz, $V_{DD} = 1.8\text{ V}$
- Ultra small & ultra-thin Package
 - DFN6-75 (1.0 mm x 1.0 mm x 0.375 mm typ.)
- RoHS compliant and Halogen Free, MSL1

■ APPLICATION

- 802.11a/b/g/n/ac/ax networks
- Wi-Fi Module, Access points, Smartphone and others mobile devices
- Transmit/receive switching, antenna switching and others switching applications

■ BLOCK DIAGRAM (DFN6-75)

(TOP VIEW)



■ GENERAL DESCRIPTION

The NJG1818K75 is 1.8V low operating and control voltage SPDT switch intended for WLAN systems.

The NJG1818K75 features low insertion loss and high isolation for high frequency up to 7.125GHz extended by Wi-Fi 6E. Furthermore, this switch is realized high handling power performance with 1.8 V low operation voltage. Integrated ESD protection devices on each port achieve excellent ESD robustness.

Integrated DC blocking capacitors at all RF ports and the ultra-small package of DFN6-75 offer very small mounting area.

■ TRUTH TABLE

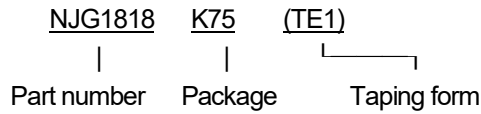
“H” = $V_{CTL} (H)$, “L” = $V_{CTL} (L)$

ON PATH	VCTL
PC-P1	H
PC-P2	L

■ PIN CONFIGURATION

PIN NO.	SYMBOL	DESCRIPTION
1	P1	RF terminal
2	GND	Ground terminal
3	P2	RF terminal
4	VCTL	Control signal input terminal.
5	PC	Common RF terminal
6	VDD	Voltage supply terminal

■ PRODUCT NAME INFORMATION



■ ORDERING INFORMATION

PART NUMBER	PACKAGE OUTLINE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	MOQ (pcs.)
NJG1818K75	DFN6 -75	Yes	Yes	Ni/Pd/Au	6	1.2	5,000

■ ABSOLUTE MAXIMUM RATINGS

(General conditions: $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50 \Omega$)

PARAMETER	SYMBOL	RATINGS	UNIT
RF input power	P_{IN}	+31 ⁽¹⁾	dBm
Supply voltage	V_{DD}	6.0	V
Control voltage	V_{CTL}	6.0	V
Power dissipation ⁽²⁾	P_D	380	mW
Operating temperature	T_{opr}	-40 to +105	°C
Storage temperature	T_{stg}	-55 to +150	°C

(1): $V_{DD} = 1.8 \text{ V}$, ON port

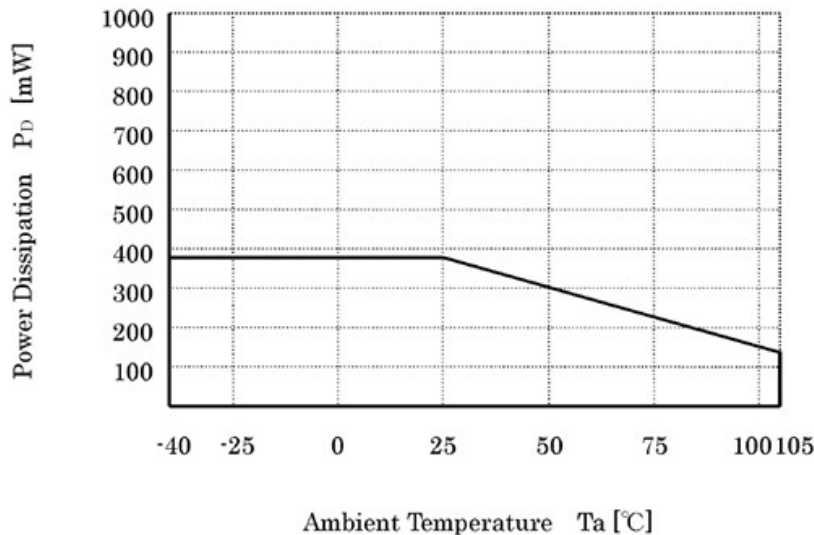
(2): Four-layer FR4 PCB (76.2 x 114.3 mm, with through-hole), $T_j = 150^\circ\text{C}$

■ POWER DISSIPATION VS.AMBIENT TEMPERATURE

Please, refer to the following Power Dissipation and Ambient Temperature.

(Please note the surface mount package has a small maximum rating of Power Dissipation [P_D], a special attention should be paid in designing of thermal radiation.)

Power Dissipation – Ambient Temperature Characteristic
Mounted on board



■ ELECTRICAL CHARACTERISTICS 1 (DC CHARACTERISTICS)

(General conditions: $T_a = +25^\circ\text{C}$, with application circuit)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply voltage	V_{DD}		1.6	1.8	5.0	V
Operating current	I_{DD}	No RF input, $V_{DD} = 1.8\text{ V}$	-	15	30	μA
Control voltage (LOW)	$V_{CTL}(\text{L})$		0	-	0.45	V
Control voltage (HIGH)	$V_{CTL}(\text{H})$		1.35	1.8	5.0	V
Control current	I_{CTL}	$V_{CTL}(\text{H}) = 1.8\text{ V}$	-	4	10	μA

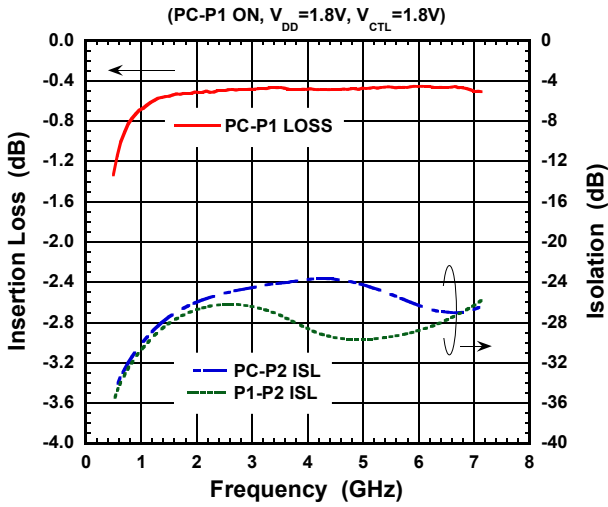
■ ELECTRICAL CHARACTERISTICS 2 (RF CHARACTERISTICS)

(General conditions: $T_a = +25^\circ\text{C}$, $Z_s = Z_l = 50\ \Omega$, $V_{DD} = 1.8\text{ V}$, $V_{CTL}(\text{H}) = 1.8\text{ V}$, $V_{CTL}(\text{L}) = 0\text{ V}$, with application circuit)

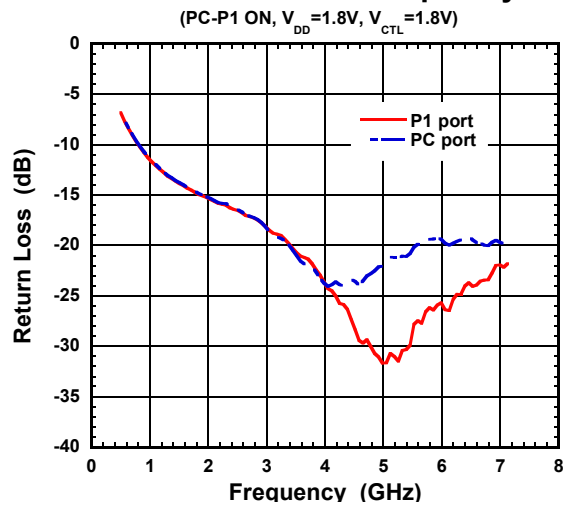
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Insertion loss	LOSS	$f = 2.4\text{ to }2.5\text{ GHz}$	-	0.50	0.70	dB
		$f = 4.9\text{ to }5.9\text{ GHz}$	-	0.50	0.70	
		$f = 5.9\text{ to }7.125\text{ GHz}$	-	0.55	0.75	
Isolation	ISL	$f = 2.4\text{ to }2.5\text{ GHz}$	23	25	-	dB
		$f = 4.9\text{ to }5.9\text{ GHz}$	22	25	-	
		$f = 5.9\text{ to }7.125\text{ GHz}$	22	25	-	
Return loss	RL	$f = 2.4\text{ to }2.5\text{ GHz}$	13	16	-	dB
		$f = 4.9\text{ to }5.9\text{ GHz}$	14	19	-	
		$f = 5.9\text{ to }7.125\text{ GHz}$	14	19	-	
Input power at 1dB compression point	$P_{-1\text{dB}}$	$f = 2.4\text{ to }7.125\text{ GHz}$	+28	+31	-	dBm
Switching time	T_{SW}	50% V_{CTL} to 10/90% RF	-	200	400	ns

ELECTRICAL CHARACTERISTICS

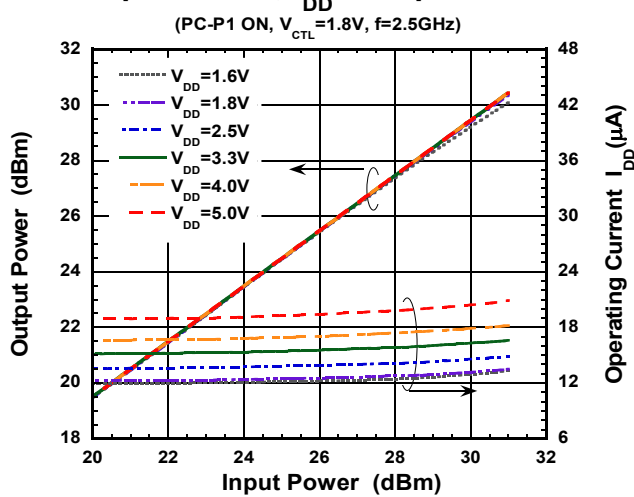
Loss, ISL vs Frequency



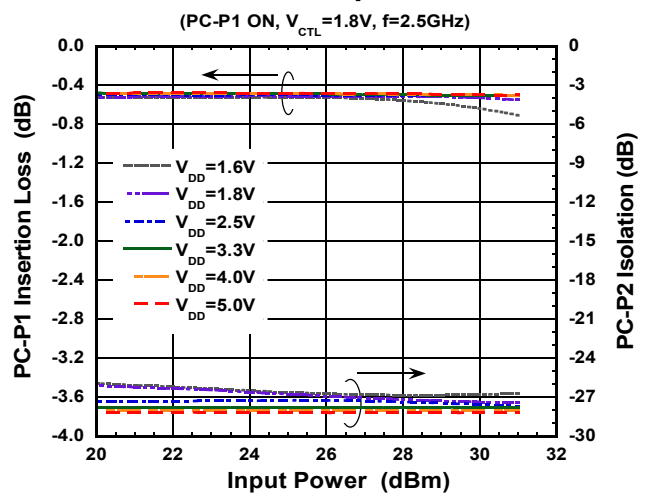
Return Loss vs Frequency



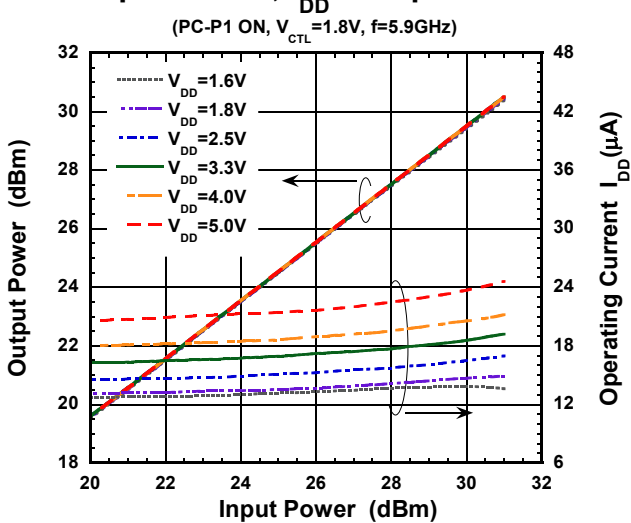
Output Power, I_{DD} vs Input Power



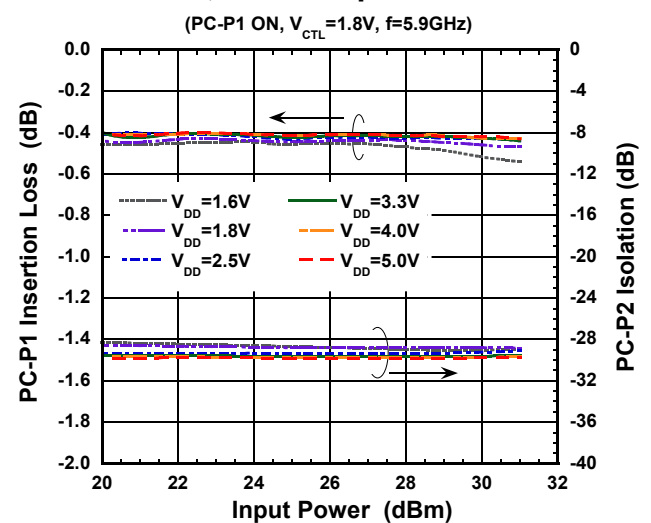
Loss, ISL vs Input Power



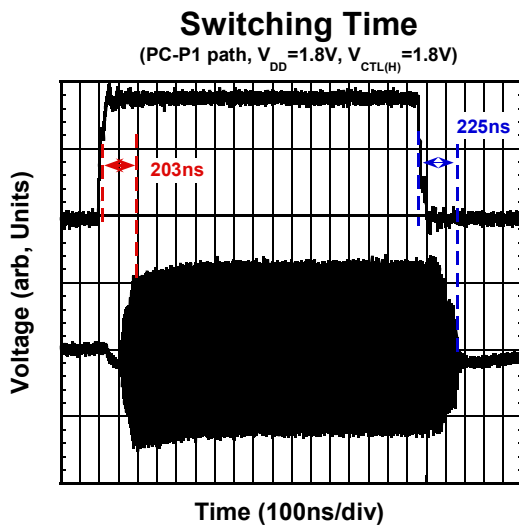
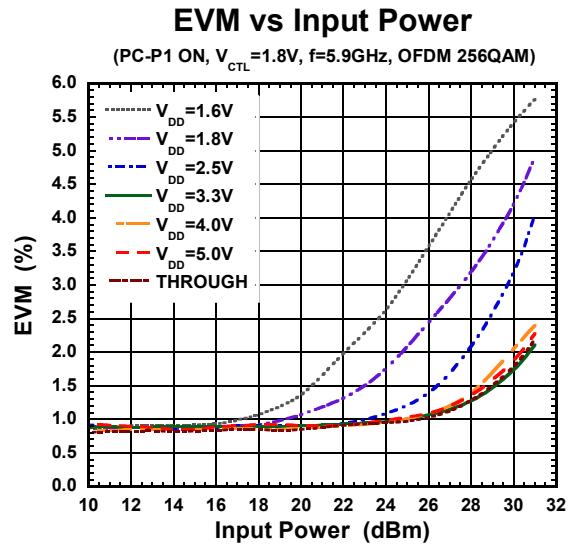
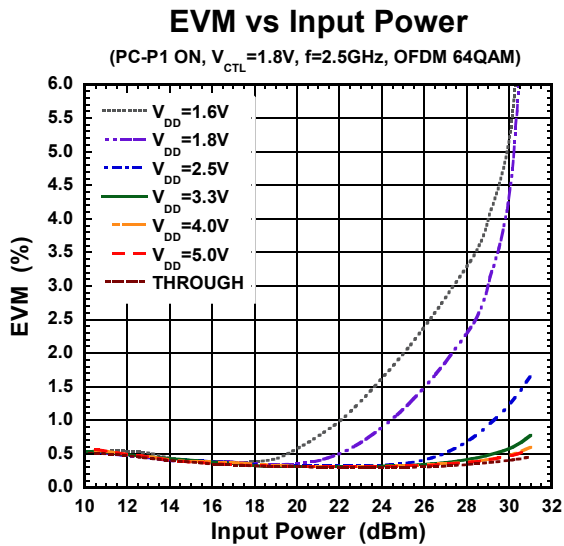
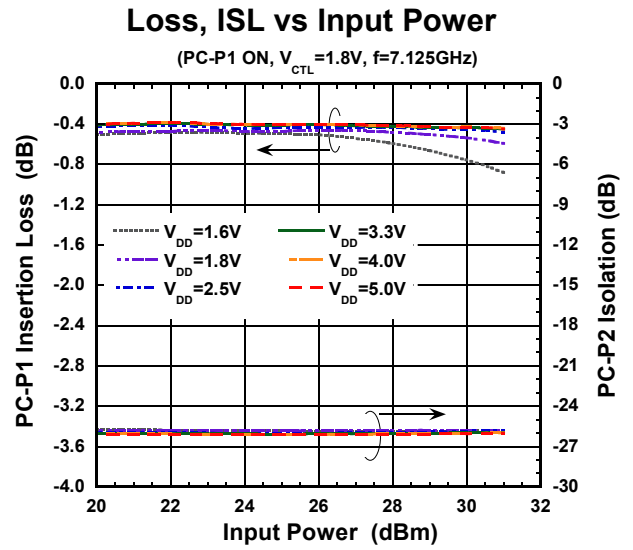
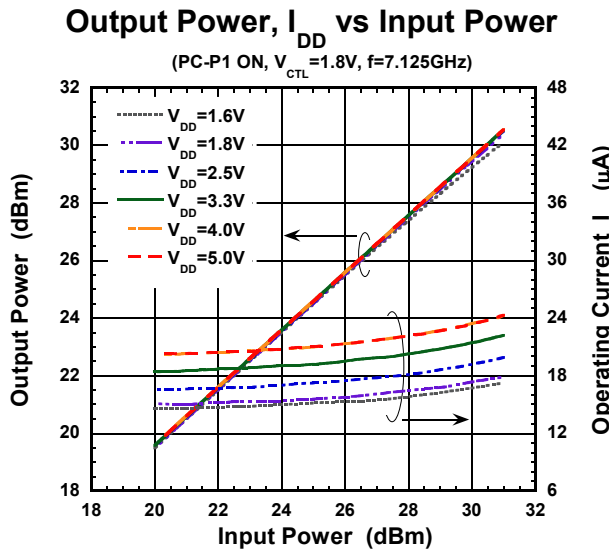
Output Power, I_{DD} vs Input Power



Loss, ISL vs Input Power

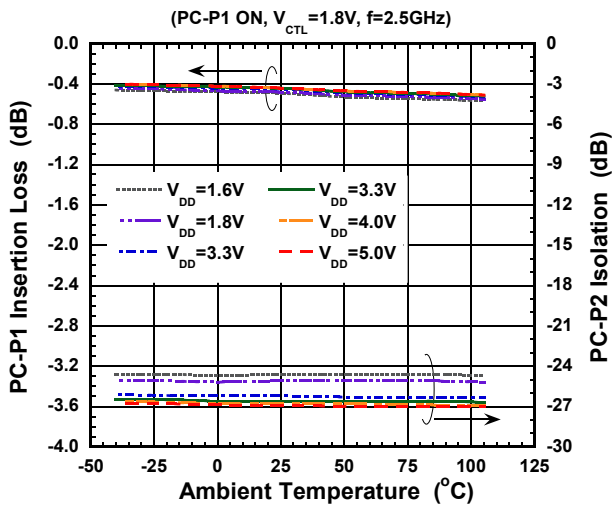


ELECTRICAL CHARACTERISTICS

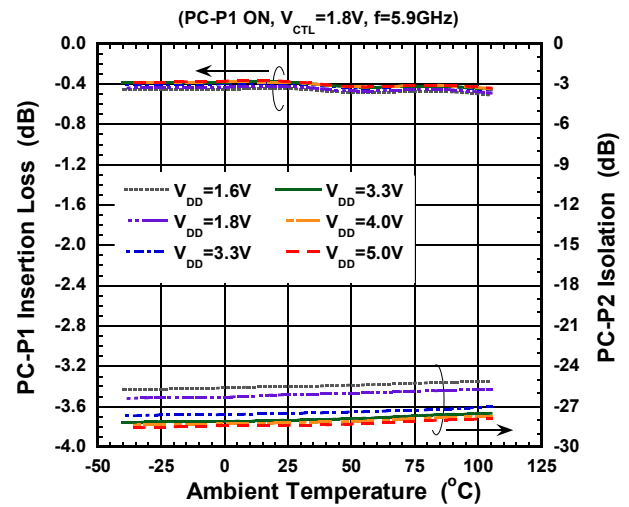


ELECTRICAL CHARACTERISTICS

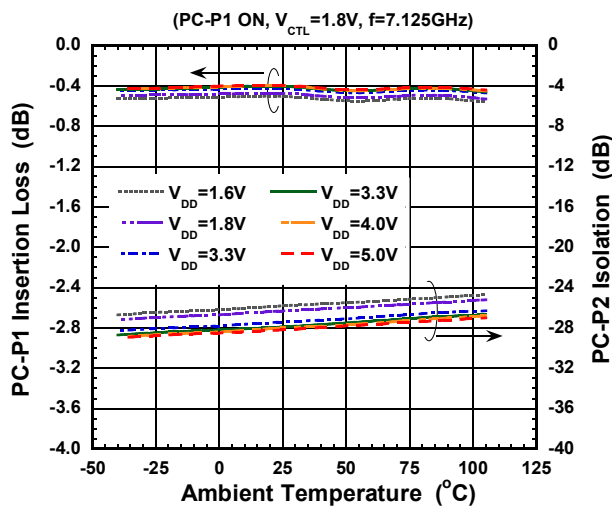
Loss, ISL vs Temperature



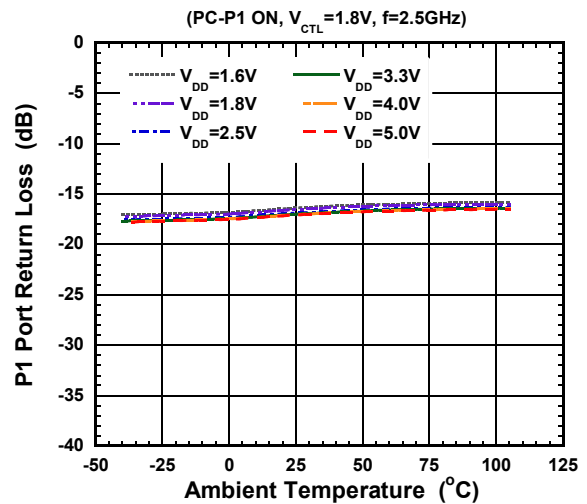
Loss, ISL vs Temperature



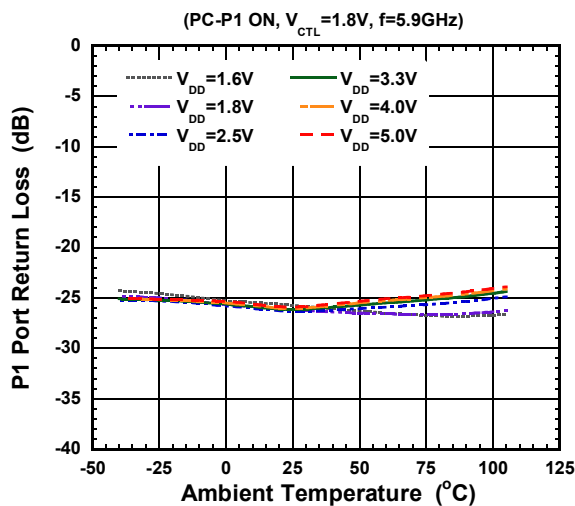
Loss, ISL vs Temperature



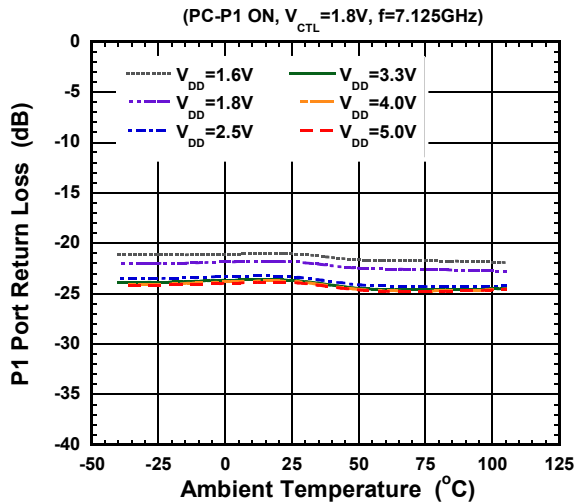
Return Loss vs Temperature



Return Loss vs Temperature



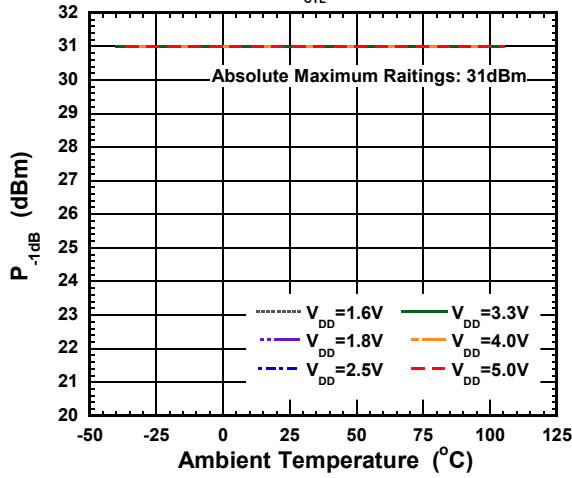
Return Loss vs Temperature



■ ELECTRICAL CHARACTERISTICS

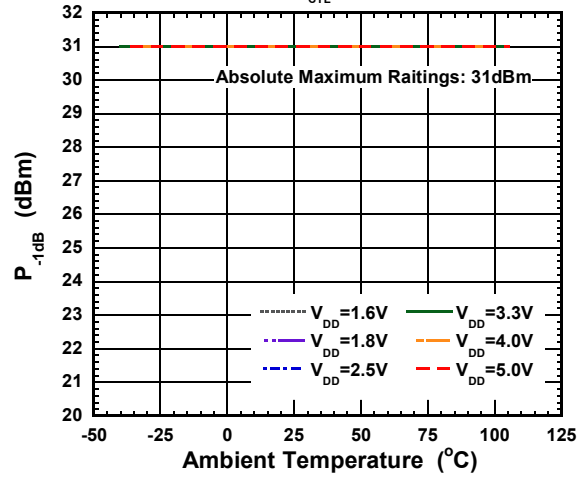
P_{-1dB} vs Temperature

-1dB
(PC-P1 ON, $V_{CTL}=1.8V$, $f=2.5GHz$)



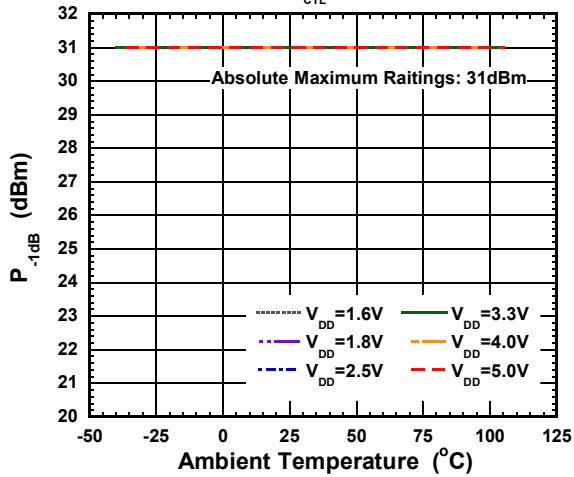
P_{-1dB} vs Temperature

-1dB
(PC-P1 ON, $V_{CTL}=1.8V$, $f=5.9GHz$)

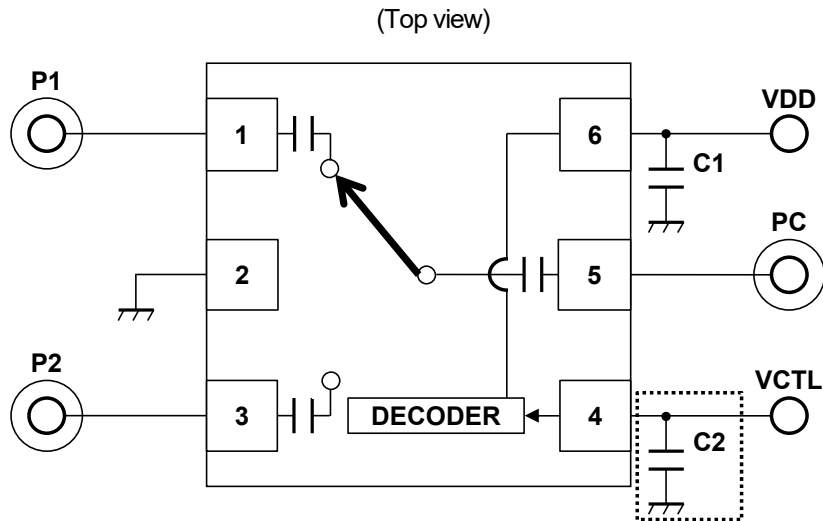


P_{-1dB} vs Temperature

-1dB
(PC-P1 ON, $V_{CTL}=1.8V$, $f=7.125GHz$)



APPLICATION CIRCUIT



NOTE:

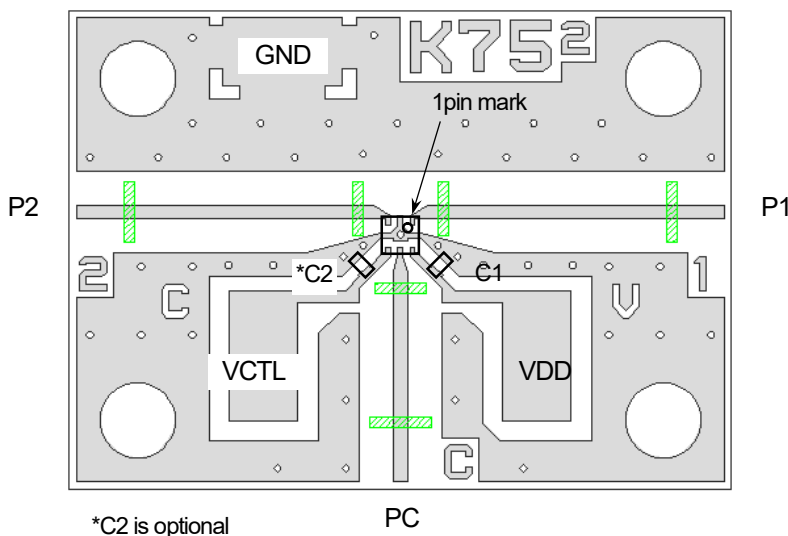
The bypass capacitor C2 is optional, and is recommended only when the control line is affected under noisy environment.

PARTS LIST

Part ID	Value	Notes
C1	1000 pF	MURATA MFG (GRM03 Series)
C2	10 pF	

EVALUATION BOARD

(TOP VIEW)

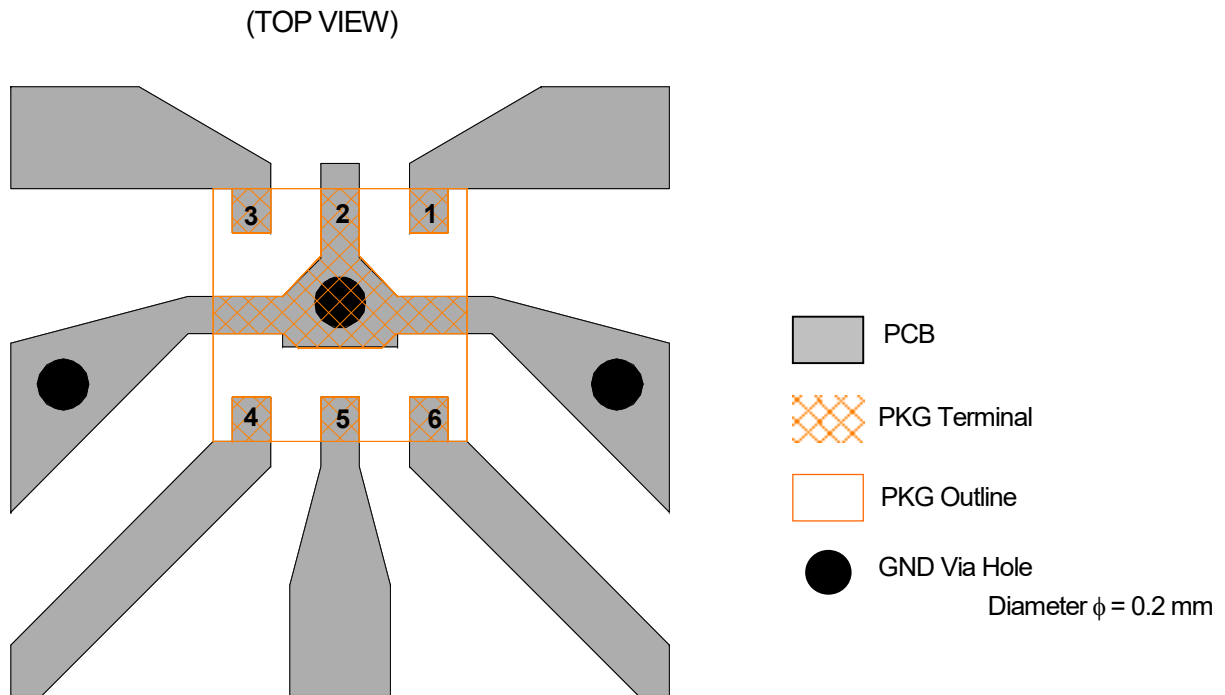


PCB: FR-4, t = 0.2 mm
 Capacitor size: 0603 (0.6 x 0.3 mm)
 Strip line width: 0.4 mm
 PCB size: 19.4 x 14.0 mm
 Through hole diameter: 0.2 mm

Loss of PCB and connectors

Frequency (GHz)	Loss (dB)
2.4	0.38
2.5	0.39
4.9	0.61
5.9	0.77
7.125	0.85

■ PCB LAYOUT GUIDELINE



PRECAUTIONS

For good RF performance, exposed pad should be connected to PCB ground plane as close as possible.


■ RECOMMENDED FOOTPRINT PATTERN (DFN6-75) <Reference>

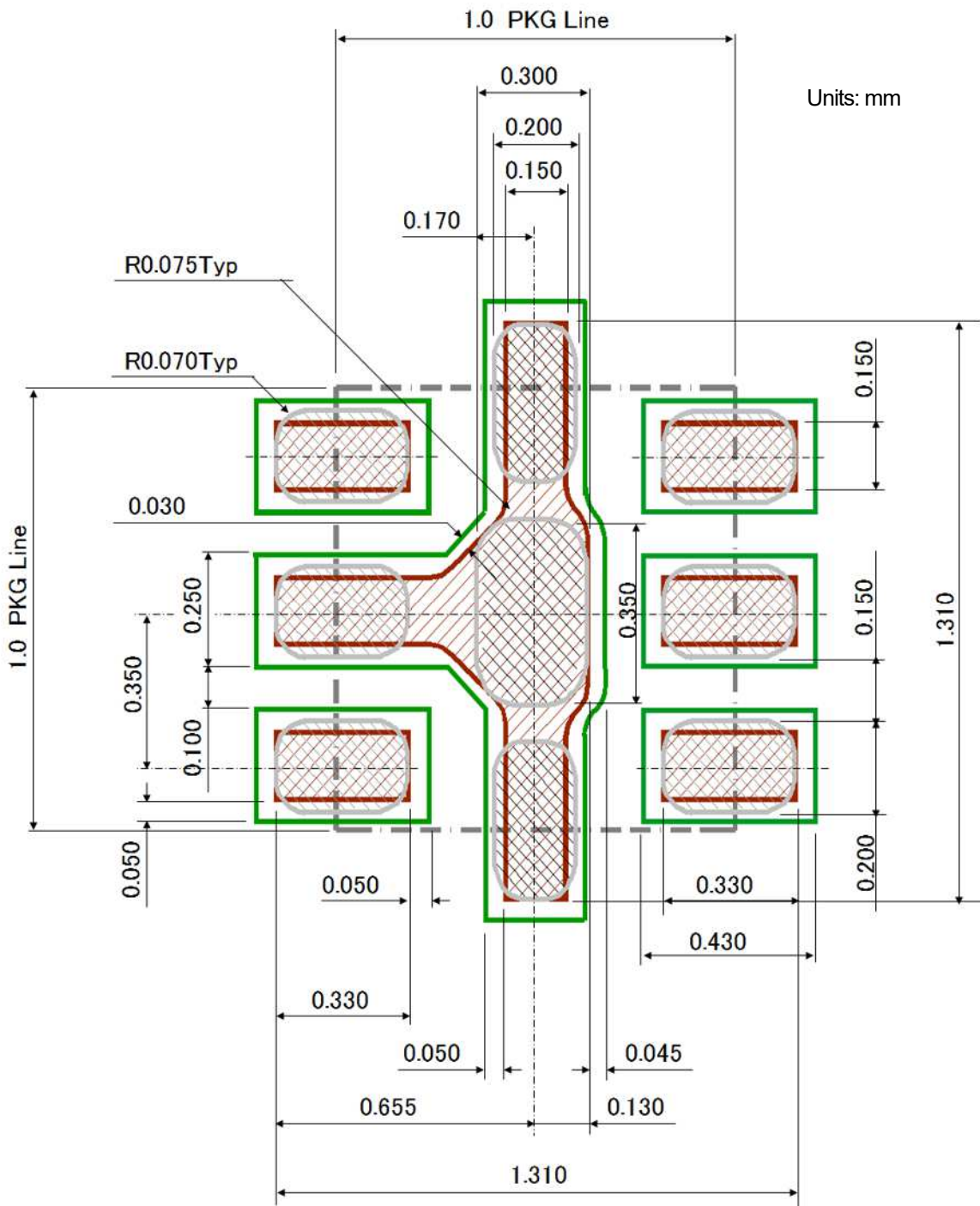
Package: 1.0 mm x 1.0 mm

Pin pitch: 0.35 mm

 : Land

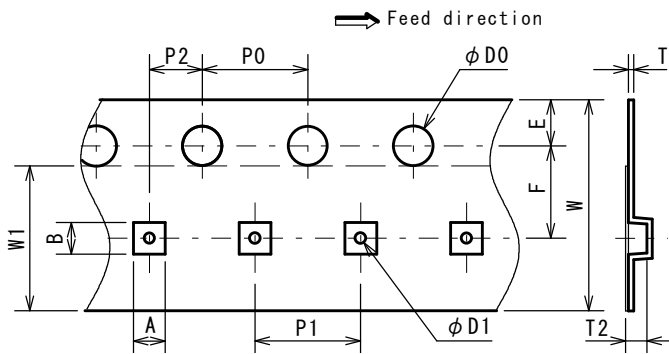
 : Mask (Open area) *Metal mask thickness: 100 μm

 : Resist (Open area)



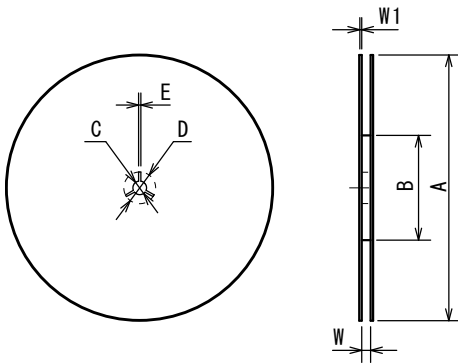
PACKING SPECIFICATION (DFN6-75)

TAPING DIMENSIONS



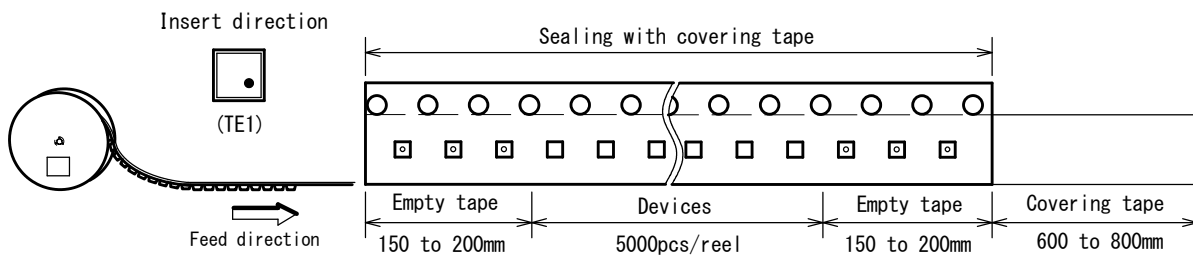
SYMBOL	DIMENSION	REMARKS
A	1.19 ^{+0.04} _{-0.01}	BOTTOM DIMENSION
B	1.19 ^{+0.04} _{-0.01}	BOTTOM DIMENSION
D0	1.5 ^{+0.1} ₀	
D1	0.5±0.05	
E	1.75±0.1	
F	3.5±0.05	
P0	4.0±0.1	
P1	4.0±0.1	
P2	2.0±0.05	
T	0.18±0.05	
T2	0.69±0.1	
W	8.0±0.1	
W1	5.5±0.1	THICKNESS 60 μ max

REEL DIMENSIONS

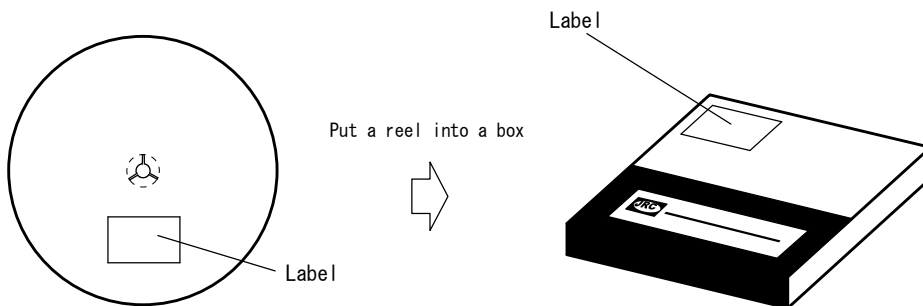


SYMBOL	DIMENSION
A	φ 180 ⁰ ₋₃
B	φ 60 ⁺¹ ₀
C	φ 13±0.2
D	φ 21±0.8
E	2±0.5
W	9±0.3
W1	1.2

TAPING STATE



PACKING STATE



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 - Traffic control system
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 - 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.
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10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
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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.



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