1.0 to 7.125 GHz Broad Band SPDT Switch

■ FEATURES

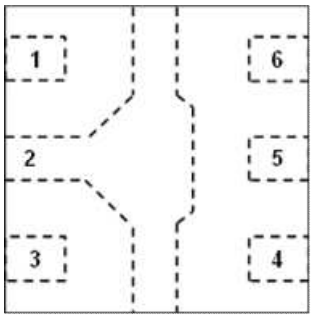
- Frequency range 1.0 to 7.125 GHz
- Operation voltage range 1.6 to 5.0 V (1.8V typ.)
- Low control voltage 1.8 V typ.
- Low insertion loss
  0.50 dB typ. @ f = 2.4 to 2.5 GHz, V_{DD} = 1.8 V
  0.50 dB typ. @ f = 4.9 to 5.9 GHz, V_{DD} = 1.8 V
  0.55 dB typ. @ f = 5.9 to 7.125 GHz, V_{DD} = 1.8 V
- High isolation
  25dB typ. @ f = 2.4 to 2.5 GHz, V_{DD} = 1.8 V
  25dB typ. @ f = 4.9 to 5.9 GHz, V_{DD} = 1.8 V
  25dB typ. @ f = 5.9 to 7.125 GHz, V_{DD} = 1.8 V
- High linearity
  P_{-1dB} = +31 dBm typ. @ f = 7.125GHz, V_{DD} = 1.8 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

NJG1818 K75 (TE1)

Part number | Package | Taping form

■ 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°C, Z_s = Z_l = 50 Ω)

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

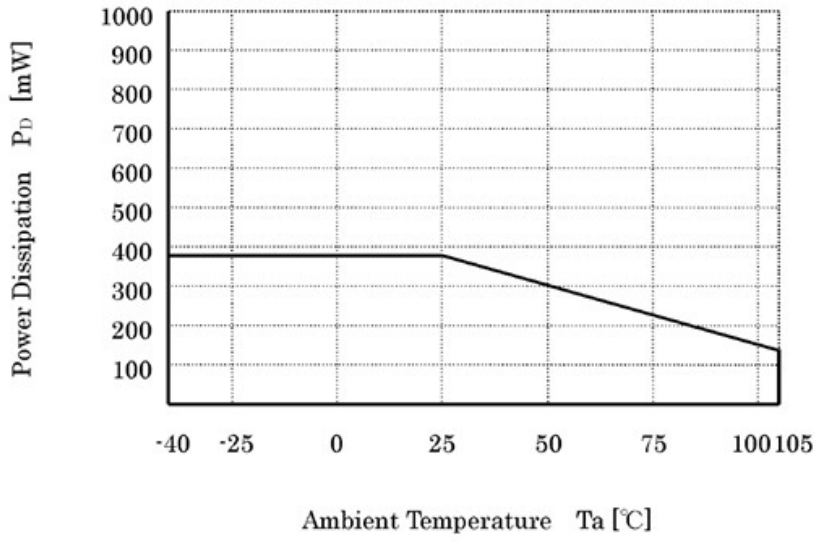
(1): V_{DD} = 1.8 V, ON port

(2): Four-layer FR4 PCB (76.2 x 114.3 mm, with through-hole), T_j = 150°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°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 V	-	15	30	μA
Control voltage (LOW)	V_{CTL} (L)		0	-	0.45	V
Control voltage (HIGH)	V_{CTL} (H)		1.35	1.8	5.0	V
Control current	I_{CTL}	V_{CTL} (H) = 1.8 V	-	4	10	μA

■ **ELECTRICAL CHARACTERISTICS 2 (RF CHARACTERISTICS)**

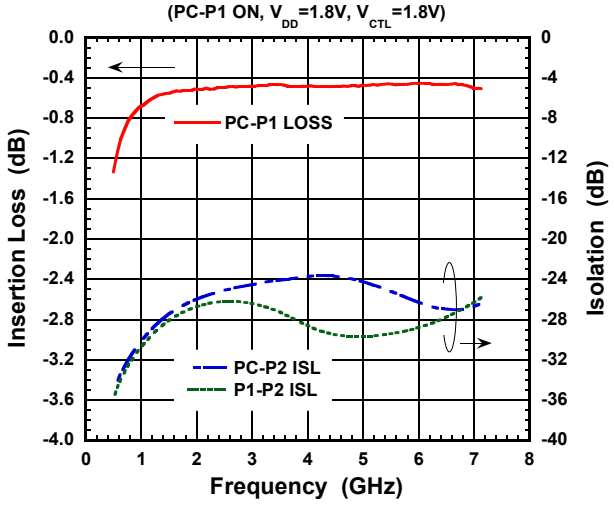
(General conditions: T_a = +25°C, Z_s = Z_l = 50 Ω, V_{DD} = 1.8 V, V_{CTL} (H) = 1.8V, V_{CTL} (L) = 0V, with application circuit)

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

■ ELECTRICAL CHARACTERISTICS

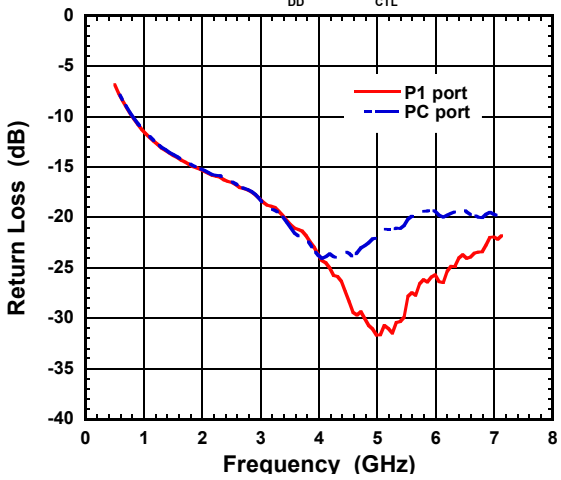
Loss, ISL vs Frequency

(PC-P1 ON, V_{DD}=1.8V, V_{CTL}=1.8V)



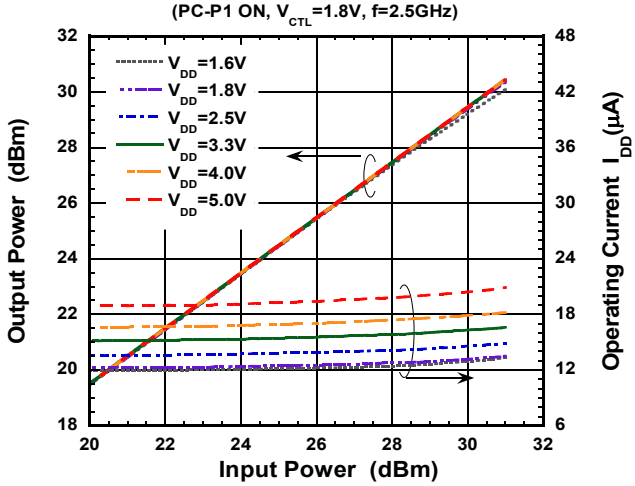
Return Loss vs Frequency

(PC-P1 ON, V_{DD}=1.8V, V_{CTL}=1.8V)



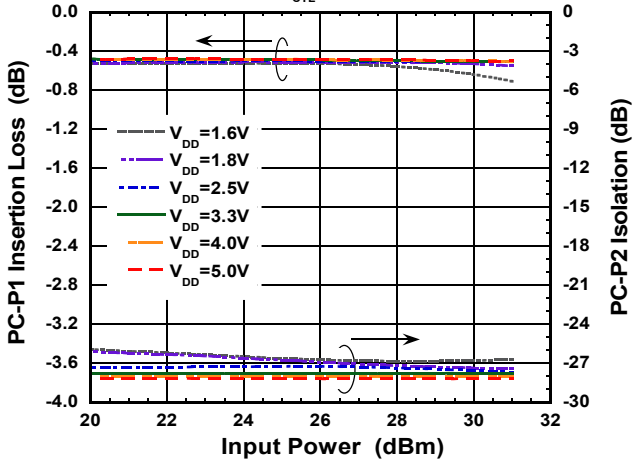
Output Power, I_{DD} vs Input Power

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



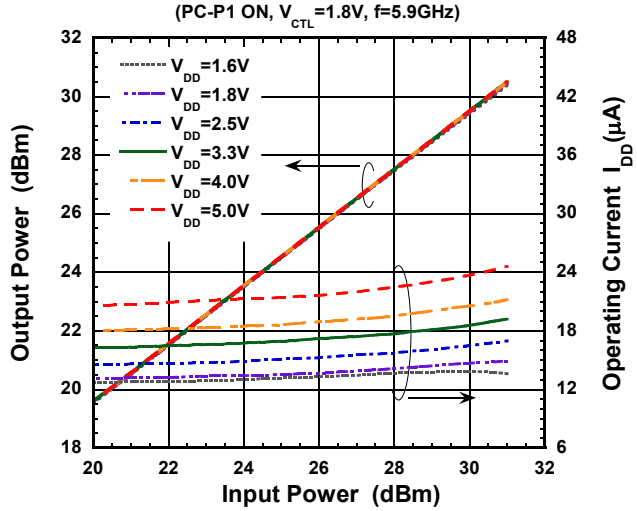
Loss, ISL vs Input Power

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



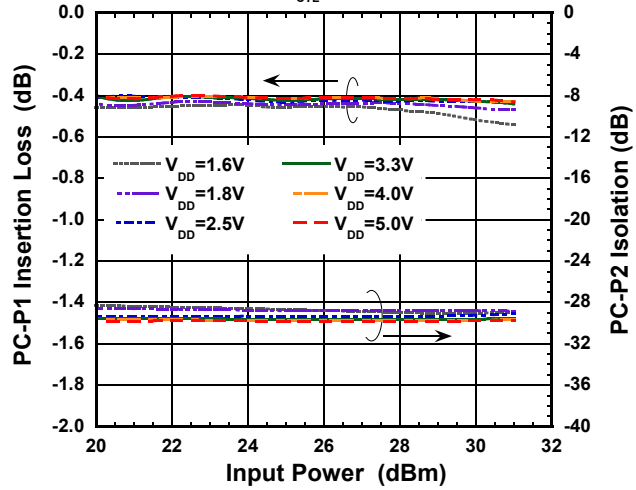
Output Power, I_{DD} vs Input Power

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



Loss, ISL vs Input Power

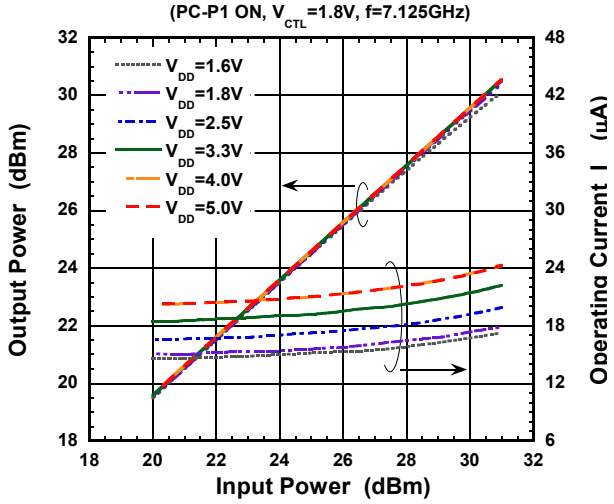
(PC-P1 ON, V_{CTL}=1.8V, f=5.9GHz)



■ ELECTRICAL CHARACTERISTICS

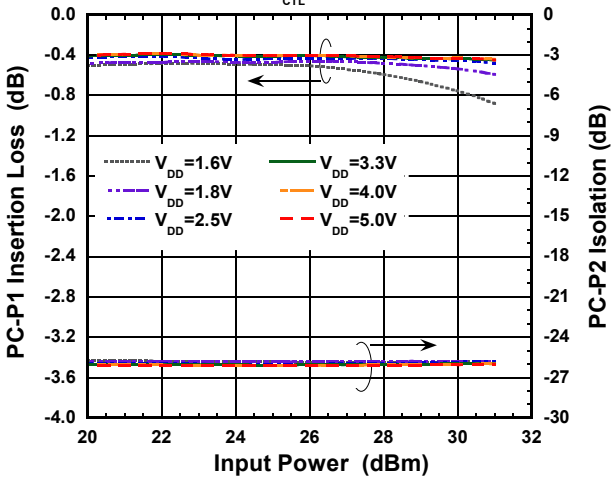
Output Power, I_{DD} vs Input Power

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



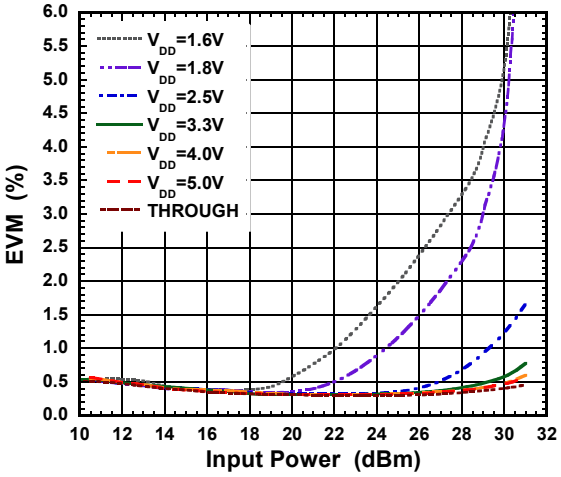
Loss, ISL vs Input Power

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



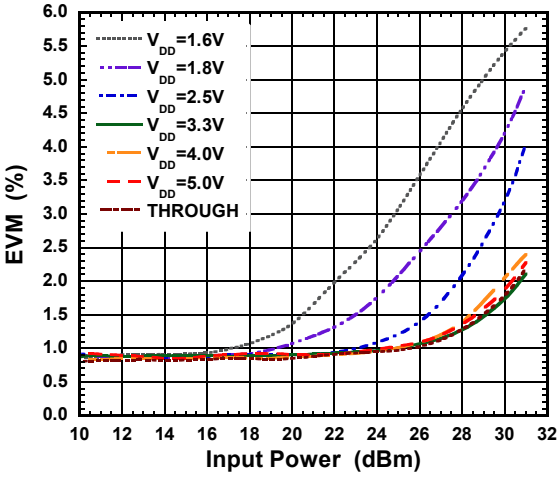
EVM vs Input Power

(PC-P1 ON, V_{CTL}=1.8V, f=2.5GHz, OFDM 64QAM)



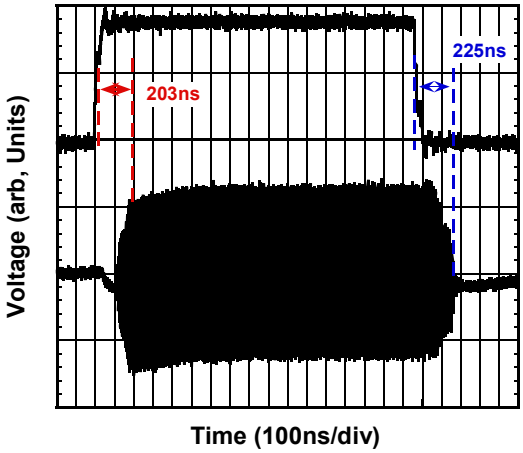
EVM vs Input Power

(PC-P1 ON, V_{CTL}=1.8V, f=5.9GHz, OFDM 256QAM)



Switching Time

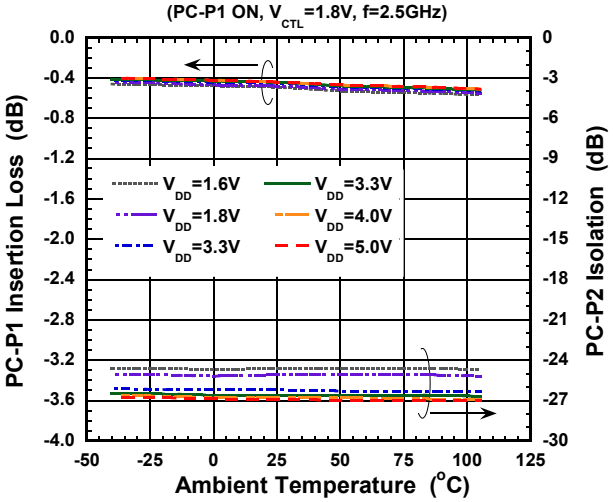
(PC-P1 path, V_{DD}=1.8V, $V_{CTL(H)}$=1.8V)



■ ELECTRICAL CHARACTERISTICS

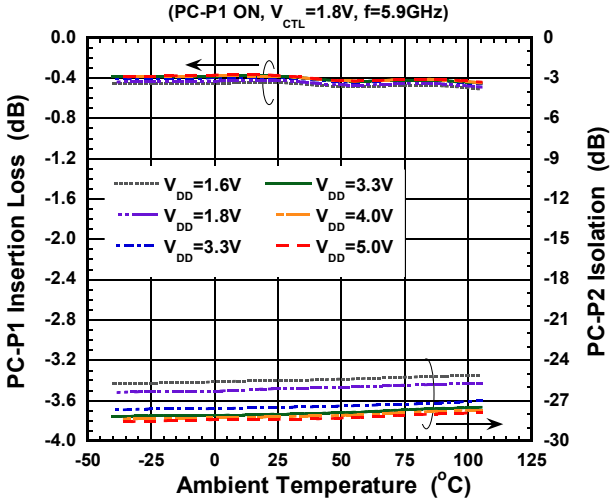
Loss, ISL vs Temperature

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



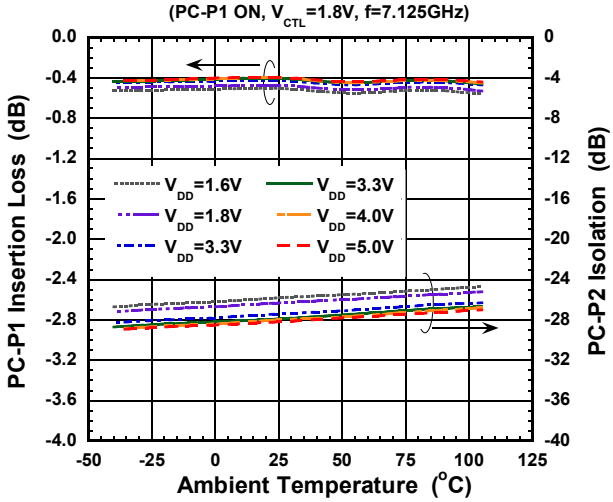
Loss, ISL vs Temperature

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



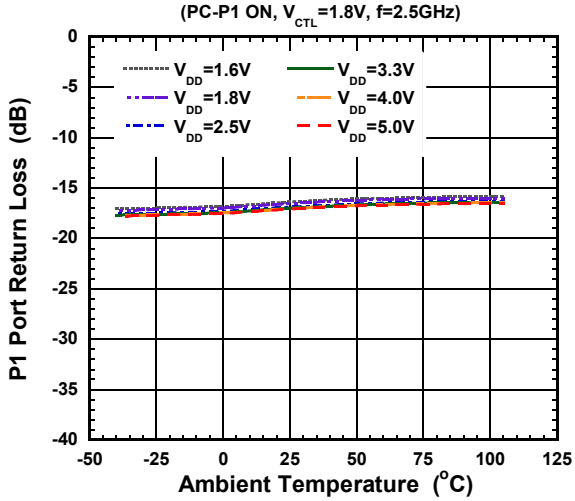
Loss, ISL vs Temperature

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



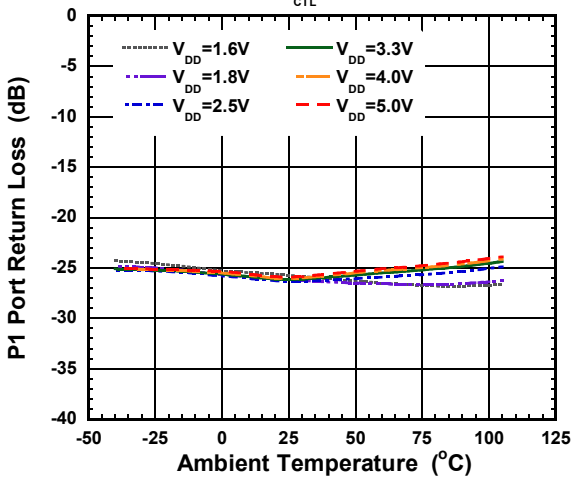
Return Loss vs Temperature

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



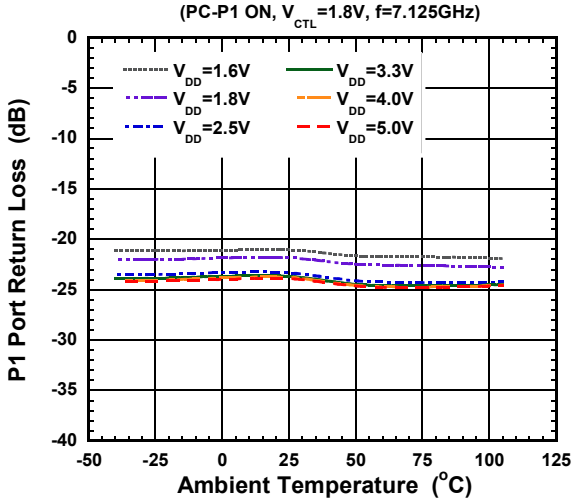
Return Loss vs Temperature

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

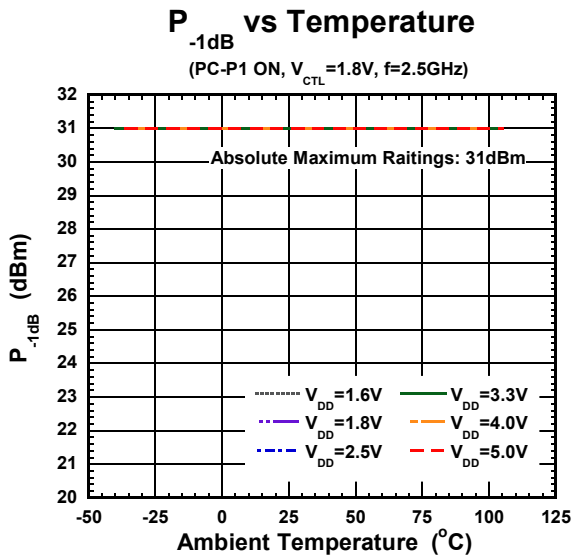


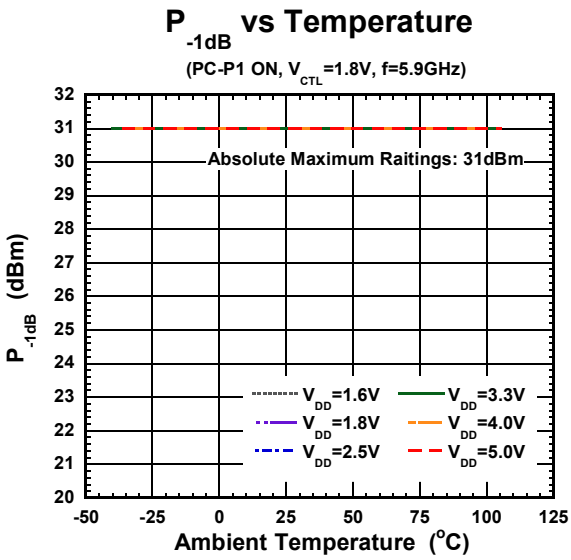
Return Loss vs Temperature

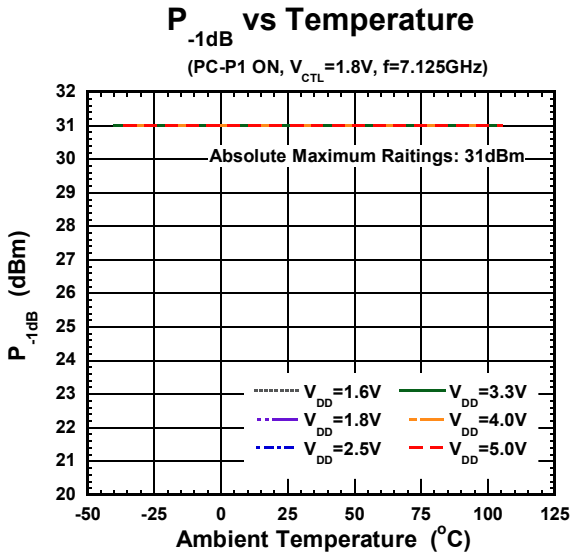
(PC-P1 ON, V_{CTL}=1.8V, f=7.125GHz)



■ ELECTRICAL CHARACTERISTICS

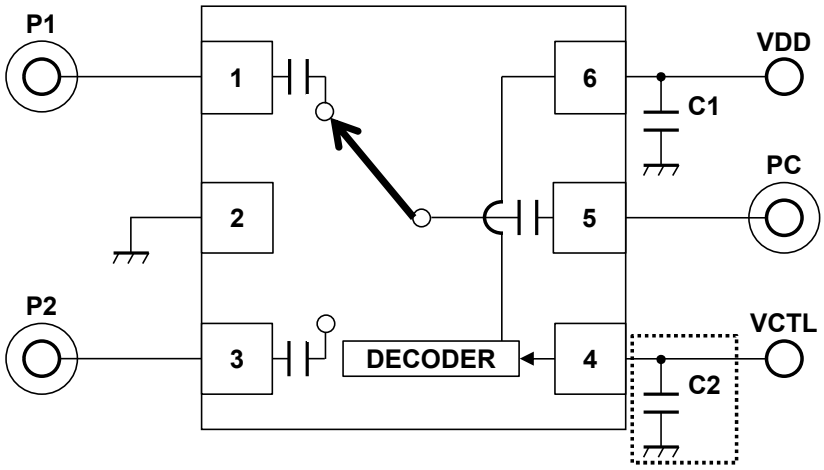






■ APPLICATION CIRCUIT

(Top view)



NOTE:

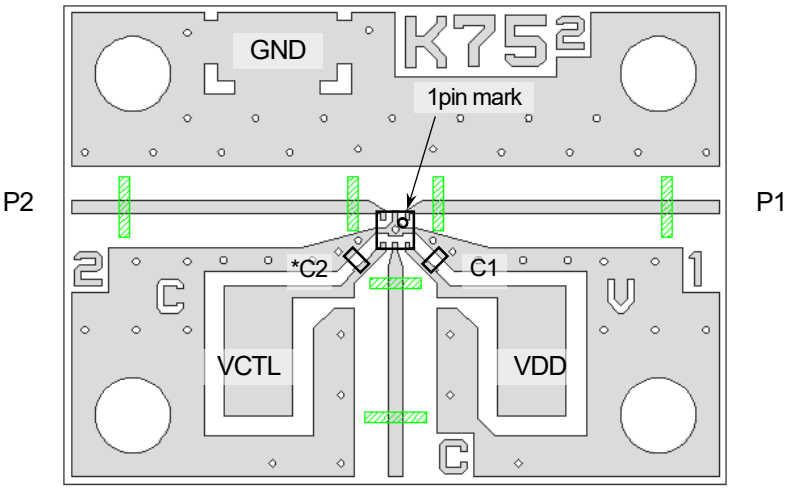
The bypass capacitor C2 is optional, and is recommended only when the control line is affected under noisy environment.

■ PARTS LIST

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

■ EVALUATION BOARD

(TOP VIEW)



*C2 is optional

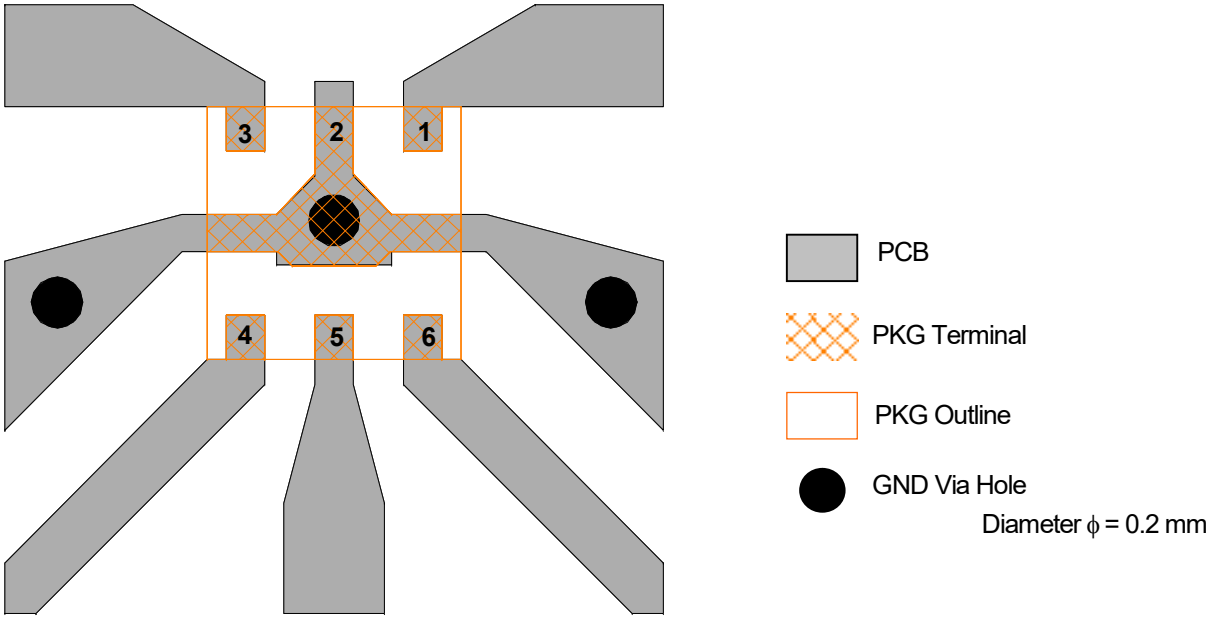
PCB: FR-4, t = 0.2 mm
Capacitor size: 0603 (0.6 x 0.3 mm)
Strip line width: 0.4 mm
PCB size: 19.4 x 14.0 mm
Through hole diameter: 0.2 mm

■ 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**

(TOP VIEW)



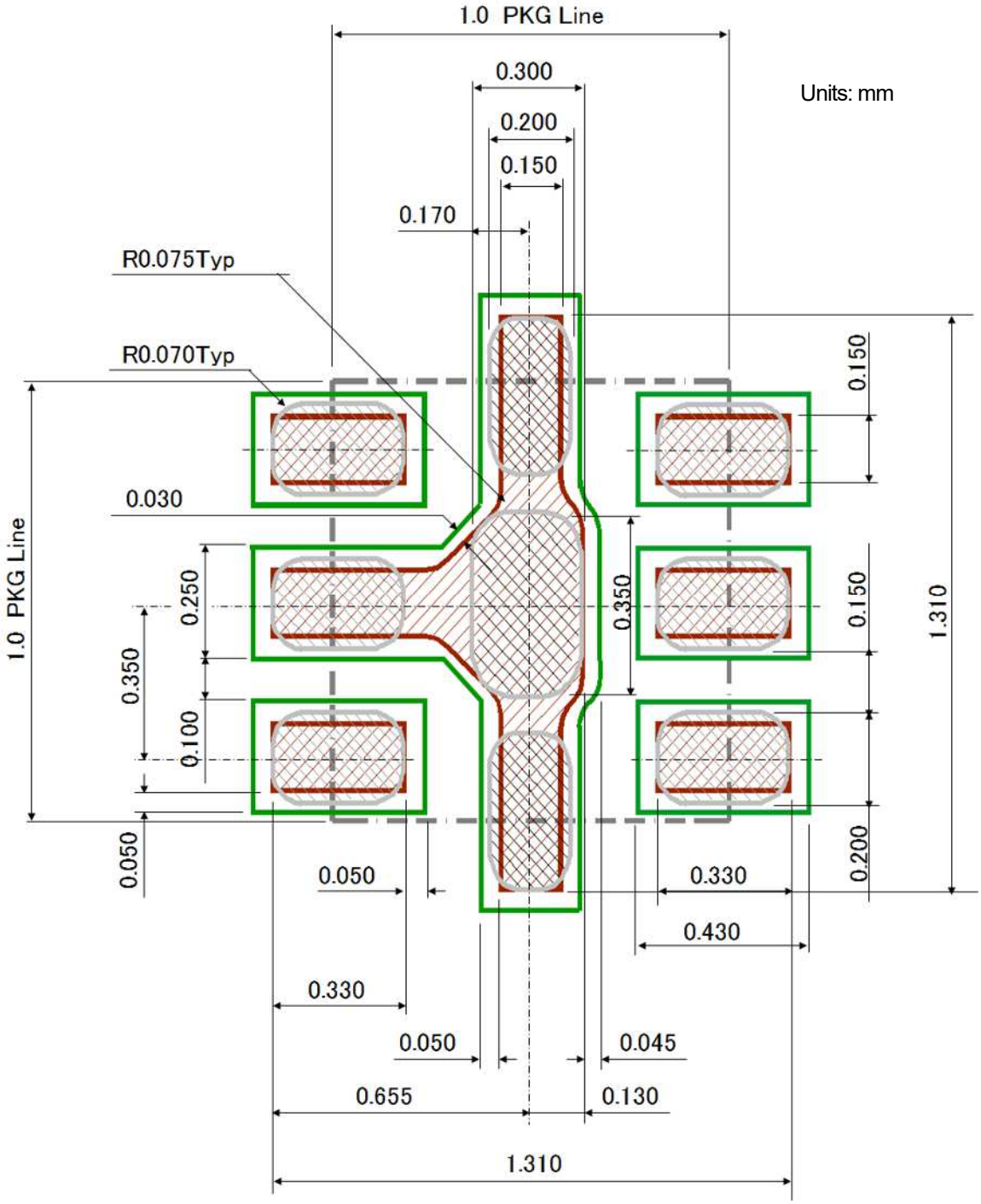
PRECAUTIONS

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

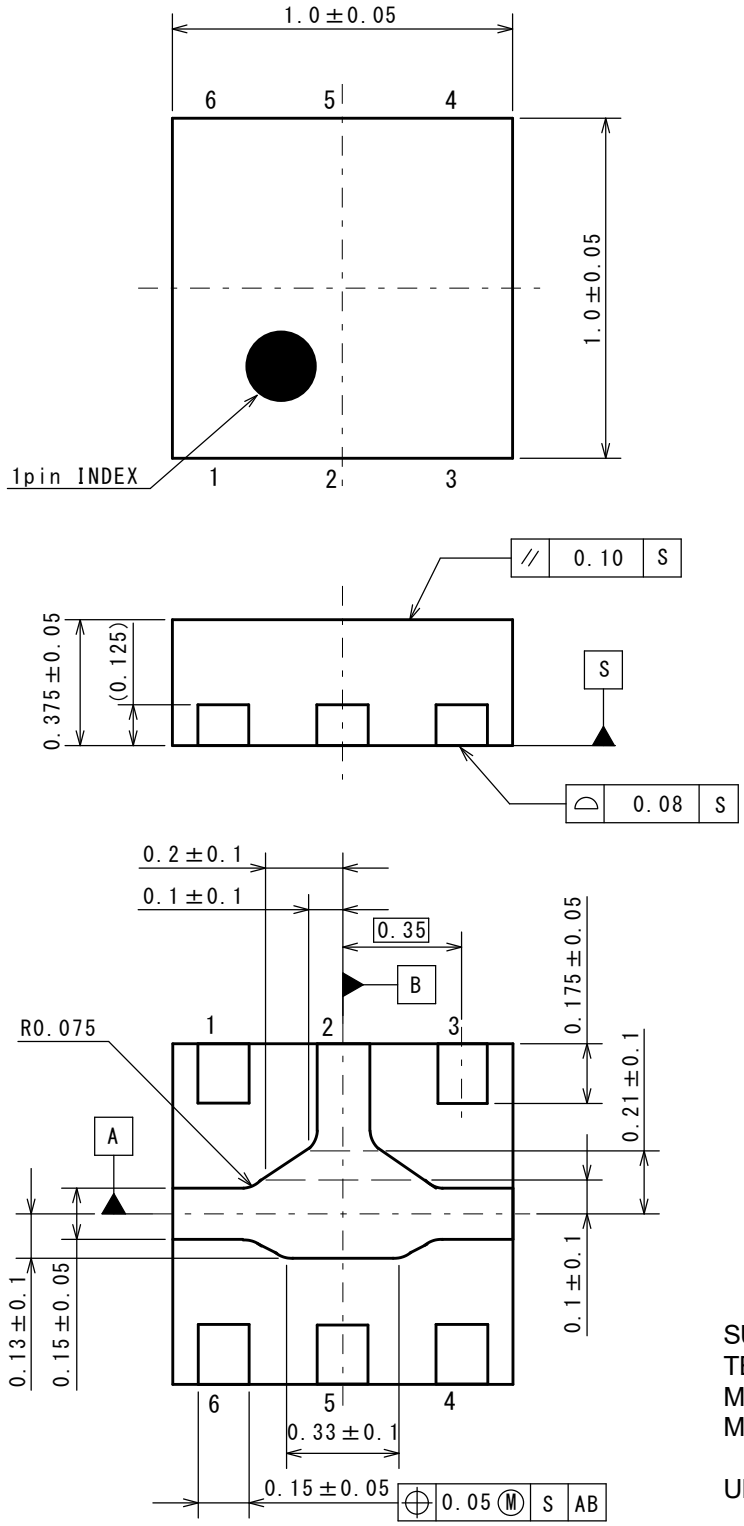
■ **RECOMMENDED FOOTPRINT PATTERN (DFN6-75)** <Reference>

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)



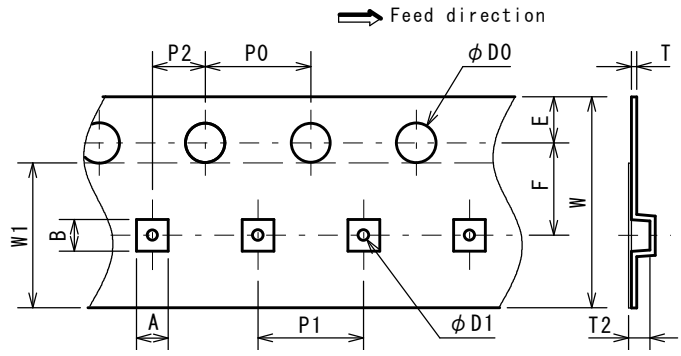
■PACKAGE OUTLINE (DFN6-75)



SUBSTRATE MATERIAL	: Copper
TERMINAL FINISH	: Ni/Pd/Au plating
MOLD MATERIAL	: Epoxy resin
MASS (TYP.)	: 1.2 (mg)
UNIT	: mm

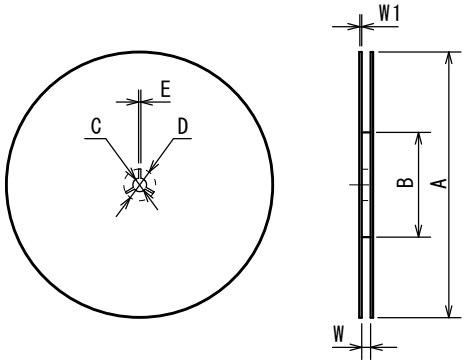
■ PACKING SPECIFICATION (DFN6-75)

TAPING DIMENSIONS



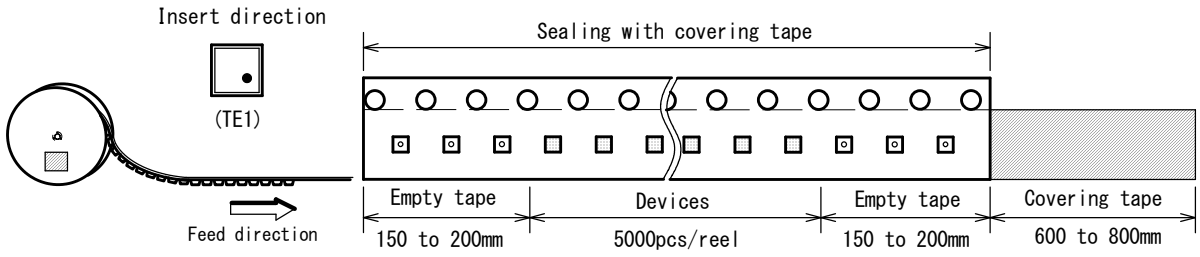
SYMBOL	DIMENSION	REMARKS
A	$1.19^{+0.04}_{-0.01}$	BOTTOM DIMENSION
B	$1.19^{+0.04}_{-0.01}$	BOTTOM DIMENSION
D0	$1.5^{+0.1}_{0}$	
D1	0.5±0.05	
E	1.75±0.1	
F	3.5±0.05	
P0	4.0±0.1	
P1	4.0±0.1	
P2	2.0±0.05	
T	0.18±0.05	
T2	0.69±0.1	
W	8.0±0.1	
W1	5.5±0.1	THICKNESS 60μmax

REEL DIMENSIONS

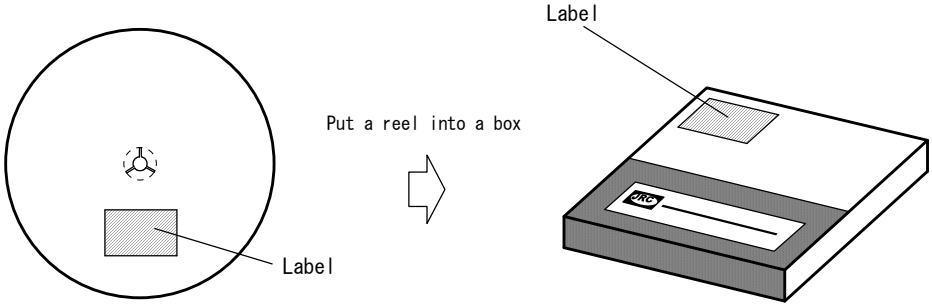


SYMBOL	DIMENSION
A	$\phi 180^{0}_{-3}$
B	$\phi\ 60^{+1}_{0}$
C	φ 13±0.2
D	φ 21±0.8
E	2±0.5
W	9±0.3
W1	1.2

TAPING STATE



PACKING STATE



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    - 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

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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.
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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.

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