1.0 to 7.125 GHz Broad Band SPDT Switch

■ FEATURES

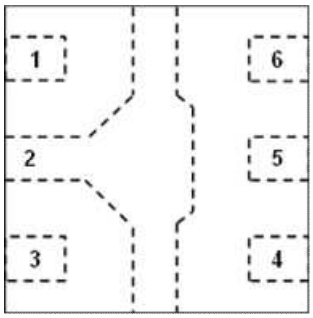
- Frequency range 1.0 to 7.125 GHz
- Operation voltage range 1.6 to 5.0 V (1.8V typ.)
- Low control voltage 1.8 V typ.
- Low insertion loss
  0.50 dB typ. @ f = 2.4 to 2.5 GHz, V_{DD} = 1.8 V
  0.50 dB typ. @ f = 4.9 to 5.9 GHz, V_{DD} = 1.8 V
  0.55 dB typ. @ f = 5.9 to 7.125 GHz, V_{DD} = 1.8 V
- High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

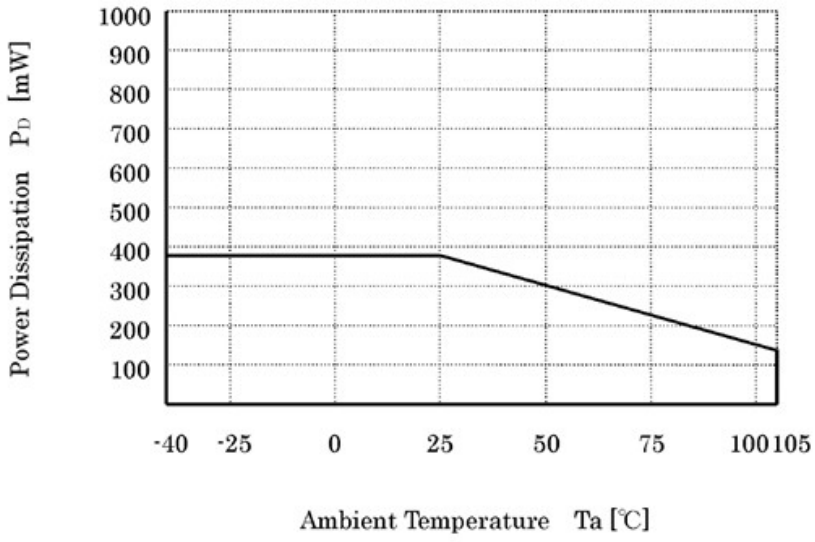
(1): V_{DD} = 1.8 V, ON port

(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)

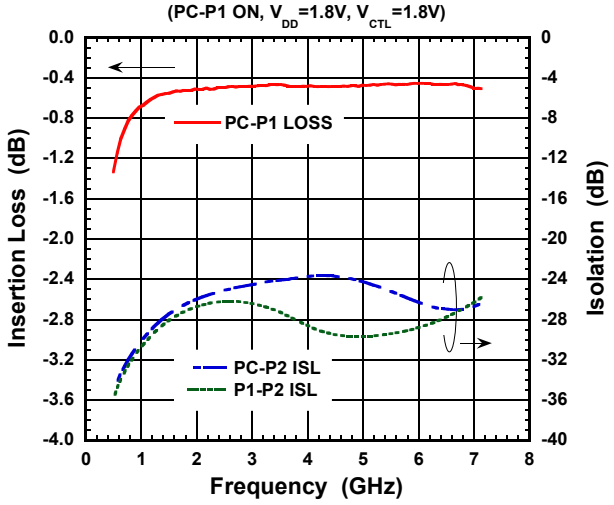
(General conditions: T_a = +25°C, Z_s = Z_l = 50 Ω, V_{DD} = 1.8 V, V_{CTL} (H) = 1.8V, V_{CTL} (L) = 0V, with application circuit)

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

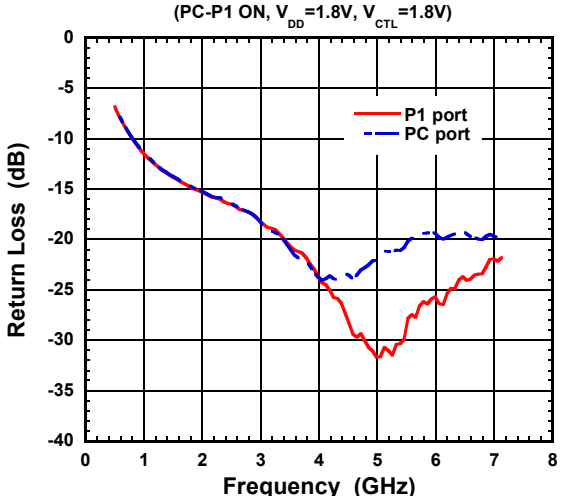
Loss, ISL vs Frequency

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



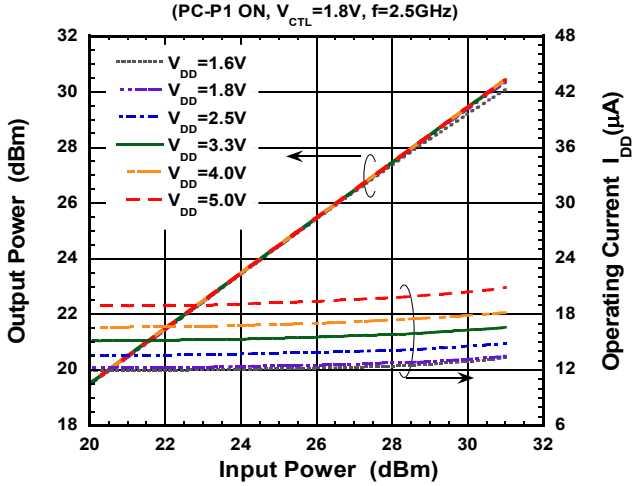
Return Loss vs Frequency

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



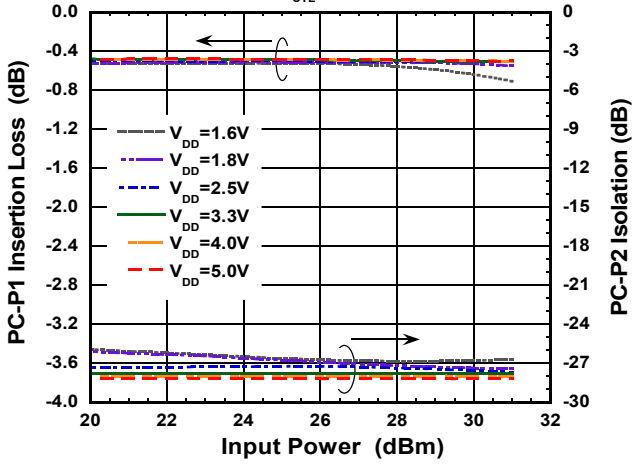
Output Power, I_{DD} vs Input Power

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



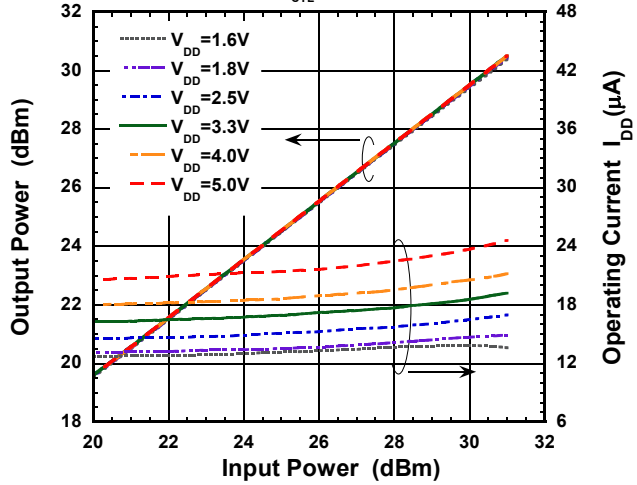
Loss, ISL vs Input Power

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



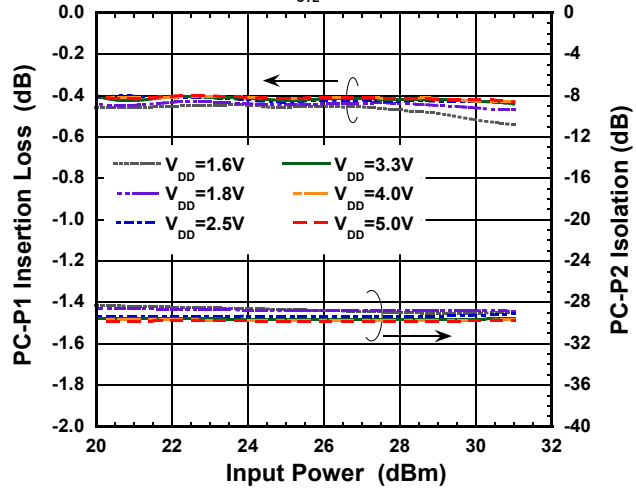
Output Power, I_{DD} vs Input Power

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



Loss, ISL vs Input Power

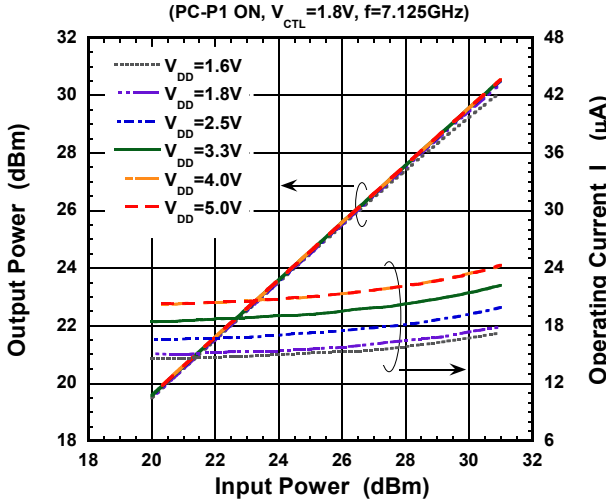
(PC-P1 ON, V_{CTL}=1.8V, f=5.9GHz)



■ ELECTRICAL CHARACTERISTICS

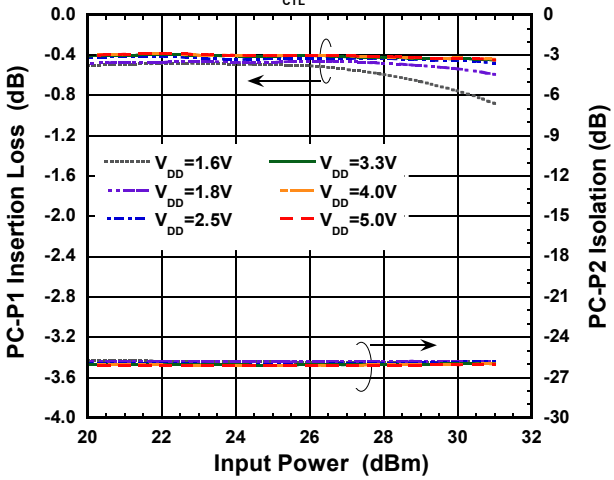
Output Power, I_{DD} vs Input Power

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



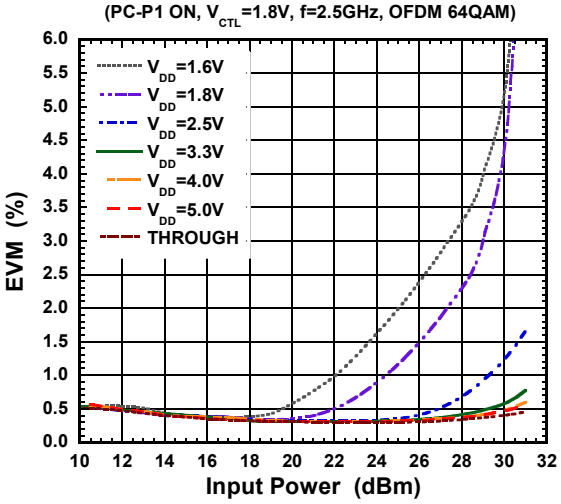
Loss, ISL vs Input Power

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



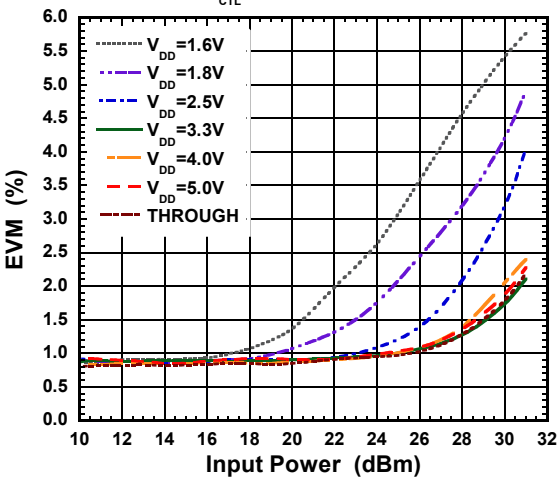
EVM vs Input Power

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



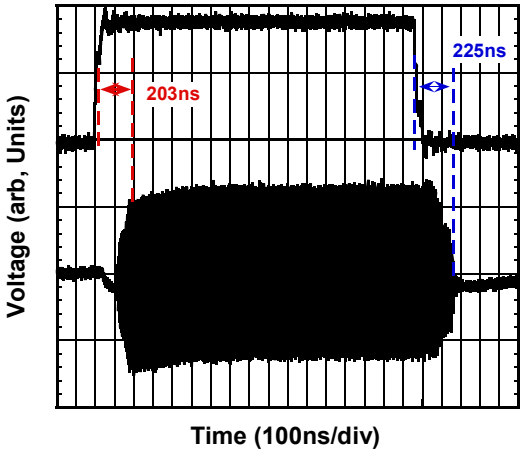
EVM vs Input Power

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



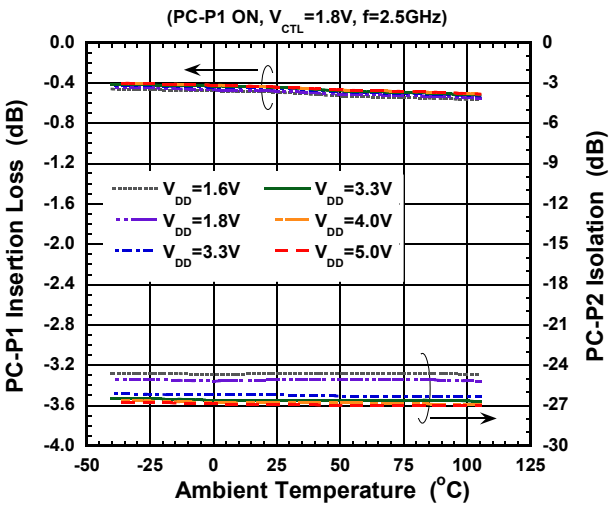
Switching Time

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

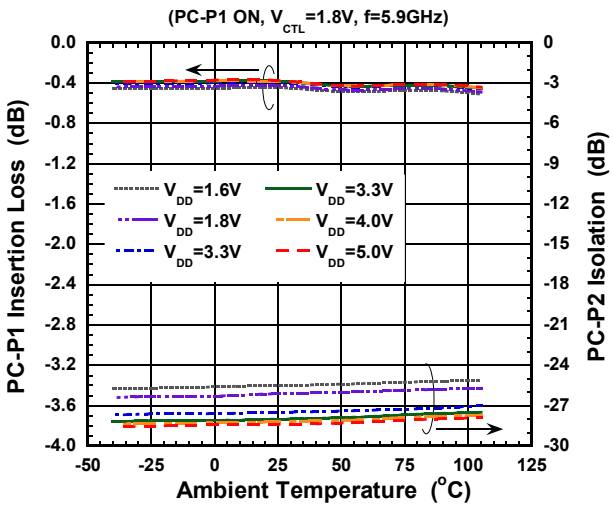


■ ELECTRICAL CHARACTERISTICS

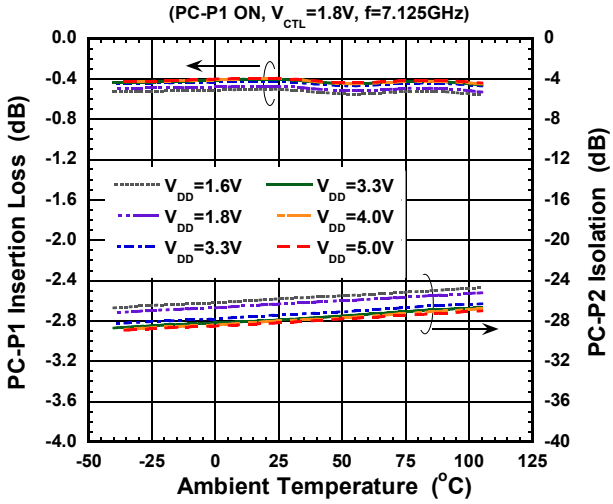
Loss, ISL vs Temperature



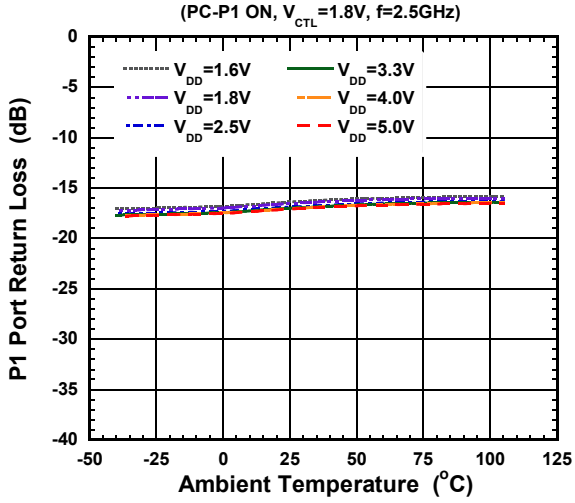
Loss, ISL vs Temperature



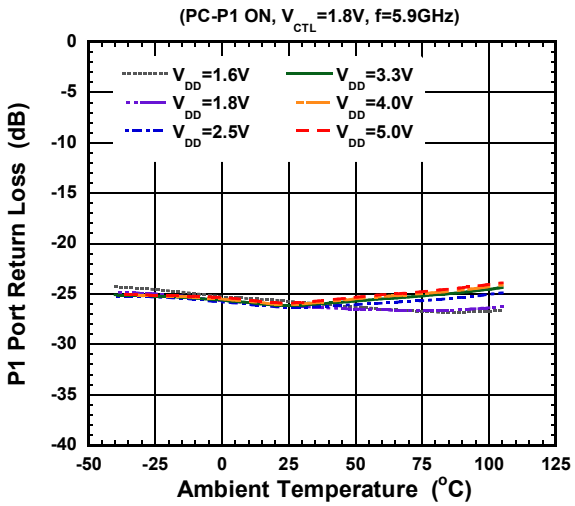
Loss, ISL vs Temperature



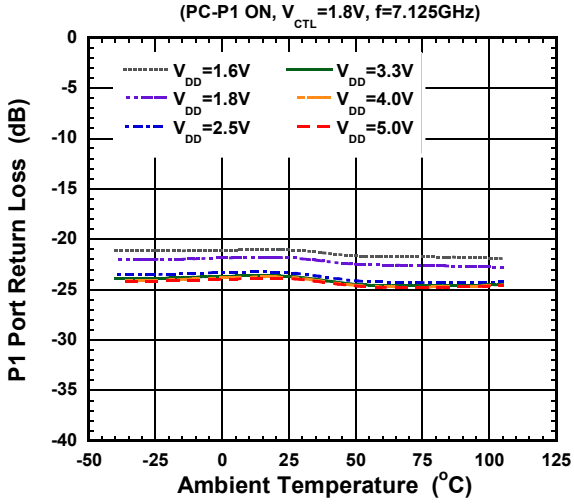
Return Loss vs Temperature



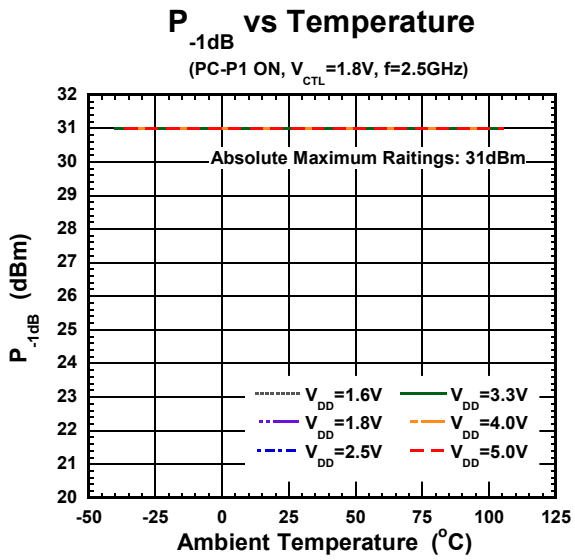
Return Loss vs Temperature

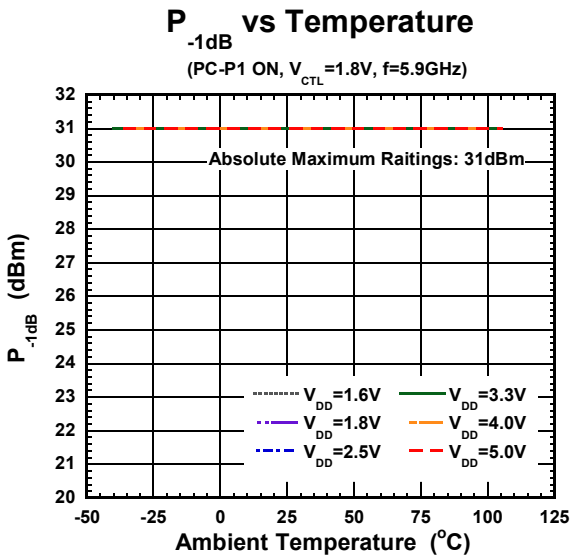


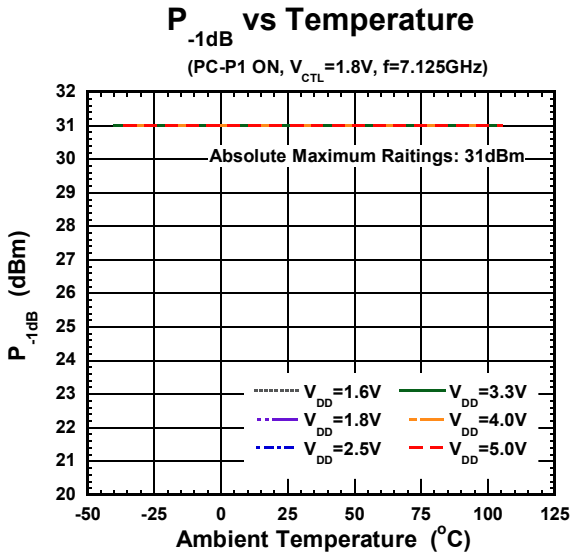
Return Loss vs Temperature



■ ELECTRICAL CHARACTERISTICS

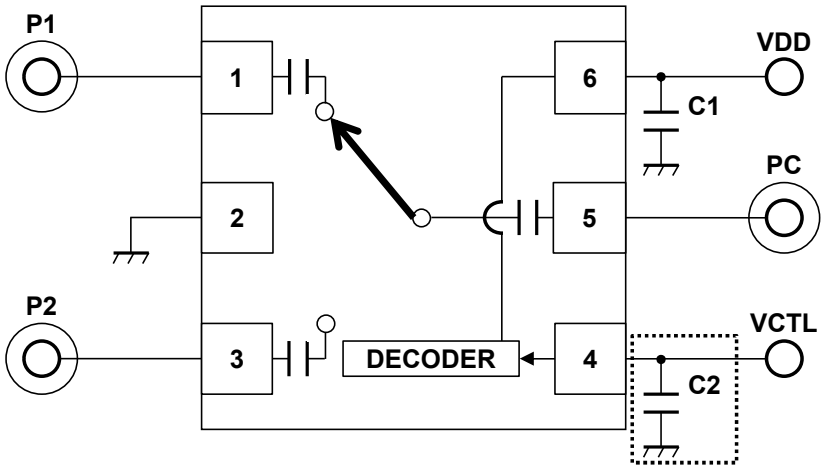






■ APPLICATION CIRCUIT

(Top view)



NOTE:

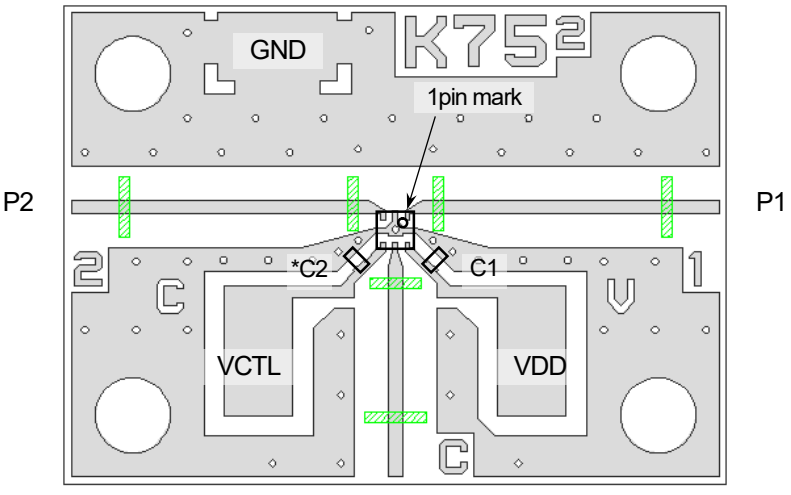
The bypass capacitor C2 is optional, and is recommended only when the control line is affected under noisy environment.

■ PARTS LIST

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

■ EVALUATION BOARD

(TOP VIEW)



*C2 is optional

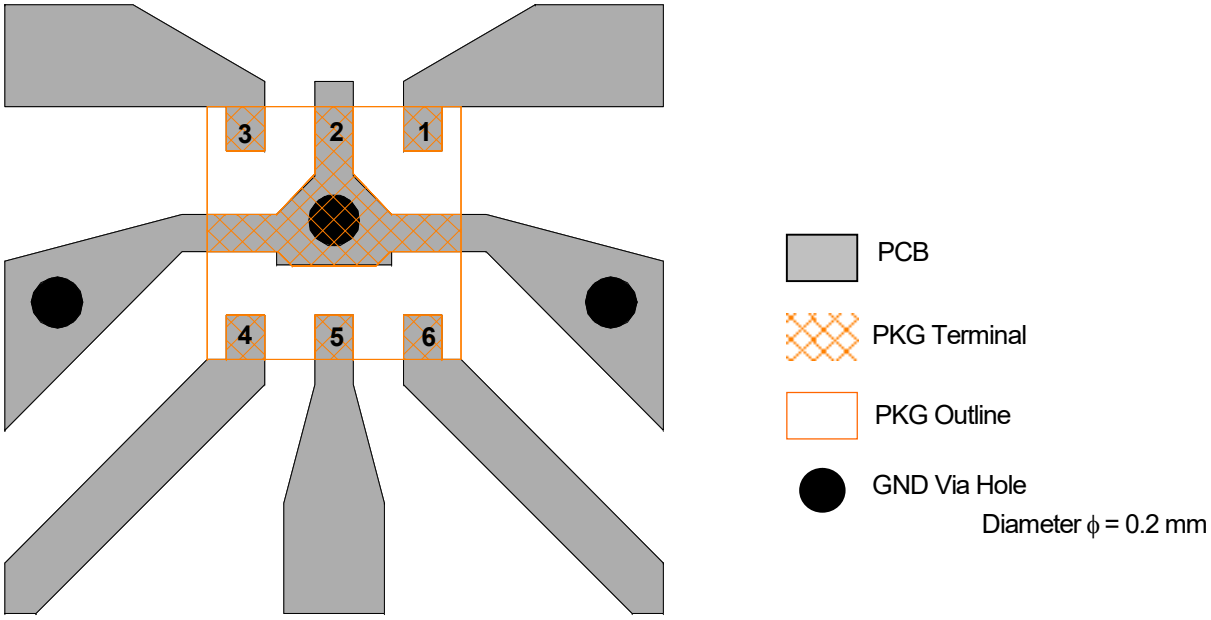
PCB: FR-4, t = 0.2 mm
Capacitor size: 0603 (0.6 x 0.3 mm)
Strip line width: 0.4 mm
PCB size: 19.4 x 14.0 mm
Through hole diameter: 0.2 mm

■ 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)



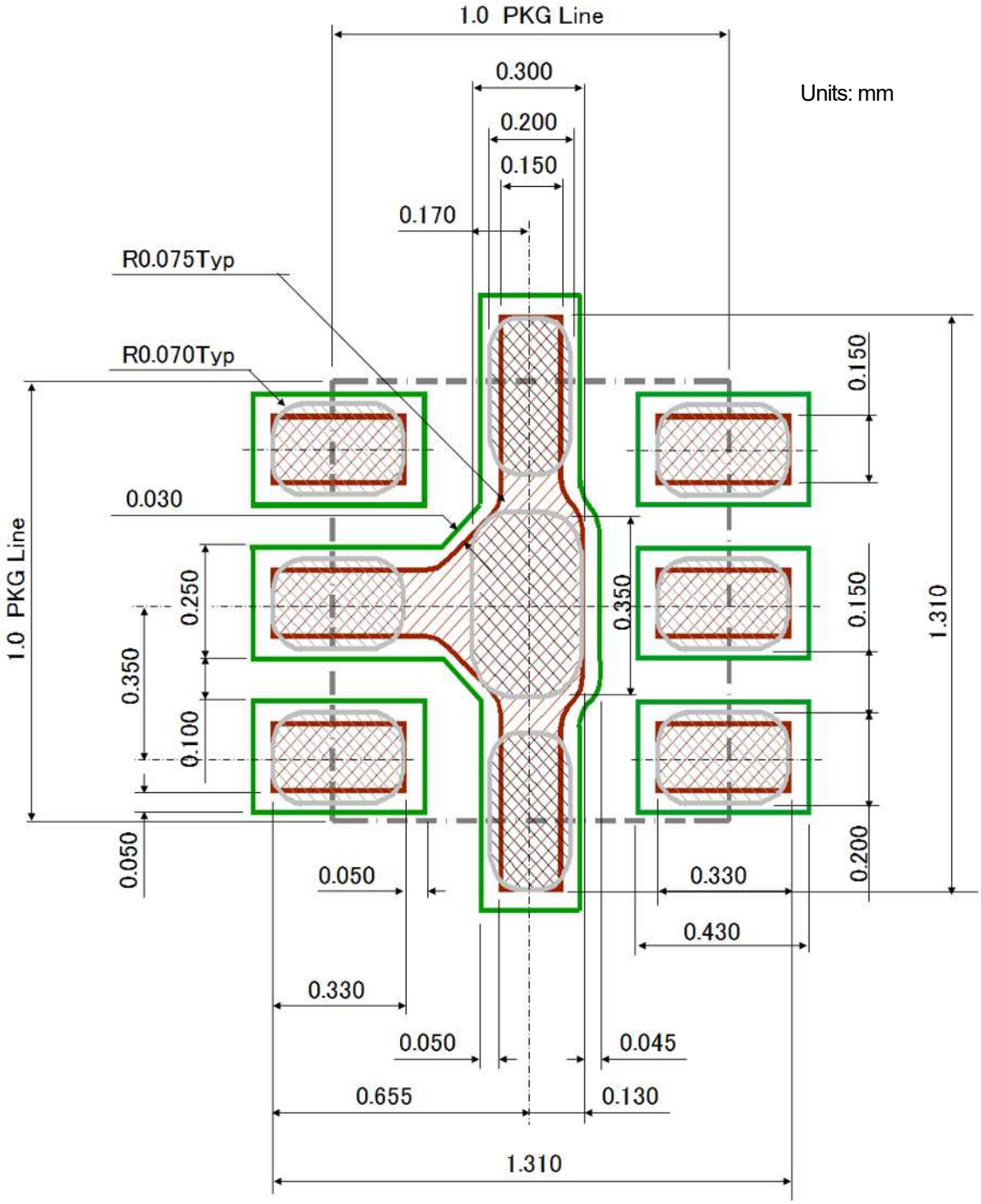
PRECAUTIONS

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

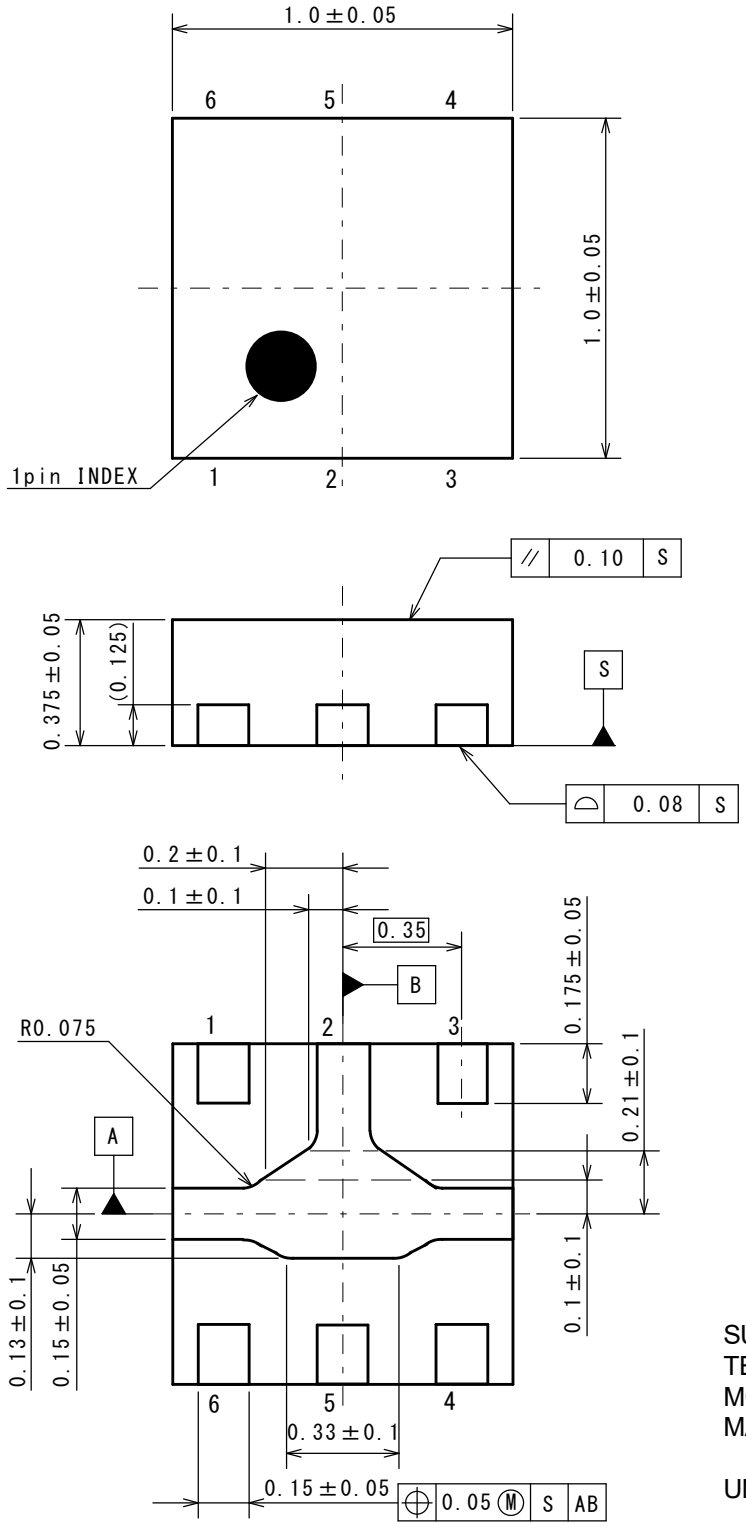
■ **RECOMMENDED FOOTPRINT PATTERN (DFN6-75)** <Reference>

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)



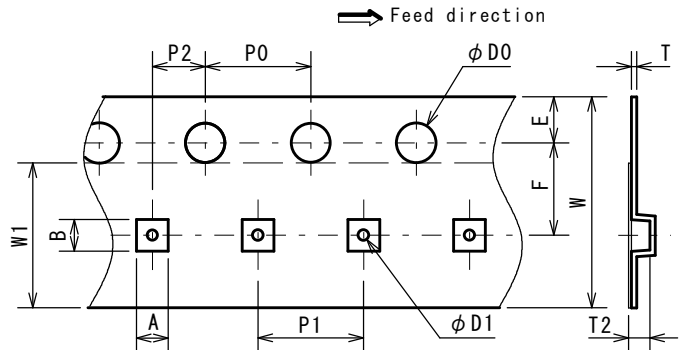
■PACKAGE OUTLINE (DFN6-75)



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

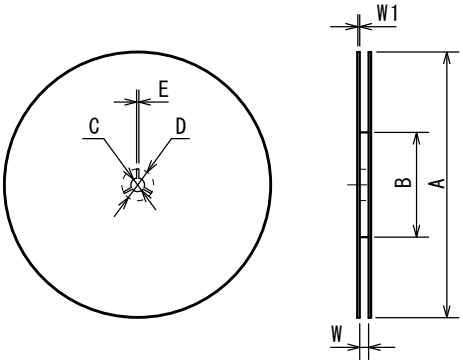
■ PACKING SPECIFICATION (DFN6-75)

TAPING DIMENSIONS



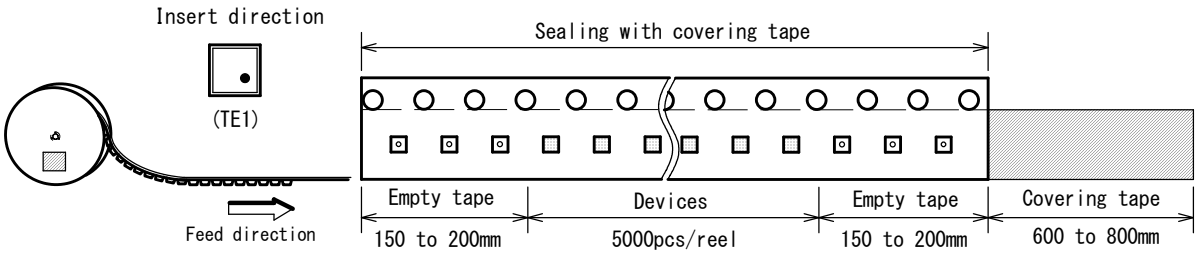
SYMBOL	DIMENSION	REMARKS
A	$1.19^{+0.04}_{-0.01}$	BOTTOM DIMENSION
B	$1.19^{+0.04}_{-0.01}$	BOTTOM DIMENSION
D0	$1.5^{+0.1}_{0}$	
D1	0.5±0.05	
E	1.75±0.1	
F	3.5±0.05	
P0	4.0±0.1	
P1	4.0±0.1	
P2	2.0±0.05	
T	0.18±0.05	
T2	0.69±0.1	
W	8.0±0.1	
W1	5.5±0.1	THICKNESS 60μmax

REEL DIMENSIONS

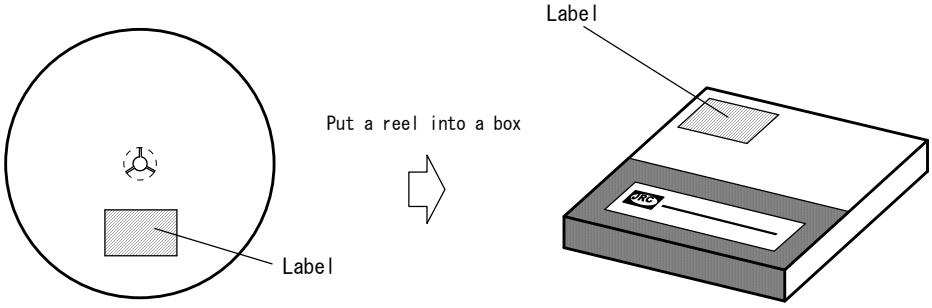


SYMBOL	DIMENSION
A	$\phi 180^{0}_{-3}$
B	$\phi 60^{+1}_{0}$
C	φ 13±0.2
D	φ 21±0.8
E	2±0.5
W	9±0.3
W1	1.2

TAPING STATE



PACKING STATE



[CAUTION]

1. NJR strives to produce reliable and high quality semiconductors. NJR's semiconductors are intended for specific applications and require proper maintenance and handling. To enhance the performance and service of NJR's semiconductors, the devices, machinery or equipment into which they are integrated should undergo preventative maintenance and inspection at regularly scheduled intervals. Failure to properly maintain equipment and machinery incorporating these products can result in catastrophic system failures

2. The specifications on this datasheet are only given for information without any guarantee as regards either mistakes or omissions. The application circuits in this datasheet are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial property rights.
All other trademarks mentioned herein are the property of their respective companies.

3. To ensure the highest levels of reliability, NJR products must always be properly handled.
The introduction of external contaminants (e.g. dust, oil or cosmetics) can result in failures of semiconductor products.

4. NJR offers a variety of semiconductor products intended for particular applications. It is important that you select the proper component for your intended application. You may contact NJR's Sale's Office if you are uncertain about the products listed in this datasheet.

5. Special care is required in designing devices, machinery or equipment which demand high levels of reliability. This is particularly important when designing critical components or systems whose failure can foreseeably result in situations that could adversely affect health or safety. In designing such critical devices, equipment or machinery, careful consideration should be given to amongst other things, their safety design, fail-safe design, back-up and redundancy systems, and diffusion design.

6. The products listed in this datasheet may not be appropriate for use in certain equipment where reliability is critical or where the products may be subjected to extreme conditions. You should consult our sales office before using the products in any of the following types of equipment.

   - 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 (Automobile, Airplane, railroad, ship, etc.)
   - Various Safety Devices

7. NJR's 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. NJR 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. The products are sold without warranty of any kind, either express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose.

8. 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.

9. The product specifications and descriptions listed in this datasheet are subject to change at any time, without notice.