DATA SHEET

NEC

CMOS INTEGRATED CIRCUIT

μPD5738T6N

WIDE BAND DPDT SWITCH

DESCRIPTION

The μPD5738T6N is a CMOS MMIC DPDT (Double Pole Double Throw) switch which is developed for mobile communications, wireless communications and another RF switching applications.

This device can operate within frequency from 0.01 to 2.5 GHz, having low insertion loss and high isolation performances. This device is housed in a 6-pin plastic TSON (Thin Small Out-line Non-leaded) (T6N) package, which allows high-density surface mounting.

FEATURES

- Supply voltage : V_{DD} = 1.5 to 3.6 V (2.8 V TYP.)
- Switch control voltage : $V_{cont (H)}$ = 1.5 to 3.6 V (2.8 V TYP.)
  : $V_{cont (L)}$ = −0.2 to +0.4 V (0 V TYP.)
- Low insertion loss[Note] : $L_{ins}1$ = 0.5 dB TYP. @ f = 0.01 to 0.05 GHz
  : $L_{ins}2$ = 0.8 dB TYP. @ f = 0.05 to 1.0 GHz
  : $L_{ins}3$ = 1.4 dB TYP. @ f = 1.0 to 2.0 GHz
  : $L_{ins}4$ = 1.6 dB TYP. @ f = 2.0 to 2.5 GHz
- High isolation[Note] : ISL1 = 45 dB TYP. @ f = 0.01 to 0.05 GHz
  : ISL2 = 22 dB TYP. @ f = 0.05 to 1.0 GHz
  : ISL3 = 16 dB TYP. @ f = 1.0 to 2.0 GHz
  : ISL4 = 15 dB TYP. @ f = 2.0 to 2.5 GHz
- Handling power[Note] : $P_{in (1 dB)}$ = +20 dBm TYP. @ f = 1.0 GHz
  : $P_{in (0.1 dB)}$ = +15 dBm TYP. @ f = 1.0 GHz
- High-density surface mounting : 6-pin plastic TSON (T6N) package (1.5 × 1.5 × 0.37 mm)
- High ESD voltage : machine-model 200 V (TYP.), human-body-model 3 kV (TYP.)

Note T_A = 25°C, V_{DD} = 2.8 V, $V_{cont (H)}$ = 2.8 V, $V_{cont (L)}$ = 0 V

APPLICATIONS

- Mobile communications
- Wireless communications
- Another RF switching applications

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPD5738T6N-E2	μPD5738T6N-E2-A	6-pin plastic TSON (T6N) (Pb-Free)	C3X	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 3 kpcs/reel

Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: μPD5738T6N

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

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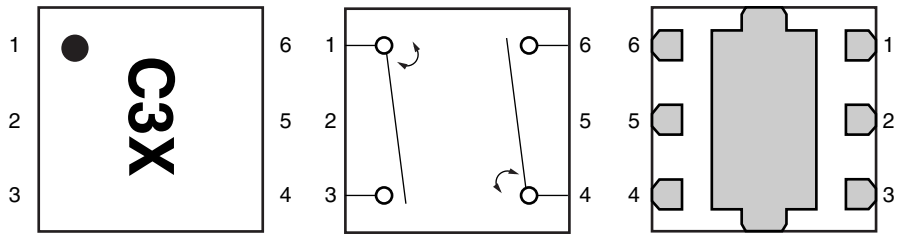
PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

(Top View) (Top View) (Bottom View)



Pin No.	Pin Name
1	INPUT1
2	V_{cont}
3	OUTPUT1
4	INPUT2
5	V_{DD}
6	OUTPUT2

Remark Exposed pad : GND

TRUTH TABLE

V_{cont}	INPUT1–OUTPUT1, INPUT2–OUTPUT2	INPUT1–OUTPUT2, INPUT2–OUTPUT1
Low	ON	OFF
High	OFF	ON

Remark High: +2.8 V, Low: 0 V

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{DD}	–0.5 to +4.6	V
Switch Control Voltage	V_{cont}	–0.5 to +4.6	V
Voltage Difference	$V_{cont (H)} - V_{DD}$	+0.5	V
Input Power	P_{in}	+23	dBm
Operating Ambient Temperature	T_A	–45 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

RECOMMENDED OPERATING RANGE (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{DD}	+1.5	+2.8	+3.6	V
Switch Control Voltage (H)	$V_{cont (H)}$	+1.5	+2.8	+3.6	V
Switch Control Voltage (L)	$V_{cont (L)}$	–0.2	0	+0.4	V

Remark $V_{DD} - 0.4\ V \leq V_{cont (H)} \leq V_{DD} + 0.2\ V$

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{DD} = 2.8 V, $V_{cont\,(H)}$ = 2.8 V, $V_{cont\,(L)}$ = 0 V, P_{in} = 0 dBm, Z_0 = 50 Ω, DC blocking capacitors = 10 000 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	f = 0.01 to 0.05 GHz	–	0.5	0.9	dB
Insertion Loss 2	$L_{ins}2$	f = 0.05 to 1.0 GHz	–	0.8	1.2	dB
Insertion Loss 3	$L_{ins}3$	f = 1.0 to 2.0 GHz	–	1.4	1.8	dB
Insertion Loss 4	$L_{ins}4$	f = 2.0 to 2.5 GHz	–	1.6	2.0	dB
Isolation 1	ISL1	f = 0.01 to 0.05 GHz	35	45	–	dB
Isolation 2	ISL2	f = 0.05 to 1.0 GHz	18	22	–	dB
Isolation 3	ISL3	f = 1.0 to 2.0 GHz	13	16	–	dB
Isolation 4	ISL4	f = 2.0 to 2.5 GHz	12	15	–	dB
Return Loss 1	RL1	f = 0.01 to 1.0 GHz	13	18	–	dB
Return Loss 2	RL2	f = 1.0 to 2.5 GHz	8	12	–	dB
0.1 dB Loss Compression Input Power [Note 1]	$P_{in\,(0.1\,dB)}$	f = 1.0 GHz	+10	+15	–	dBm
1 dB Loss Compression Input Power [Note 2]	$P_{in\,(1\,dB)}$	f = 1.0 GHz	–	+20	–	dBm
Supply Current	I_{DD}	V_{DD} = V_{cont} = 2.8 V, RF off	–	0.01	1	μA
Switch Control Current	I_{cont}	V_{DD} = V_{cont} = 2.8 V, RF off	–	0.01	1	μA
Switch Control Speed	t_{SW}	f = 1.0 GHz	–	0.4	1	μs

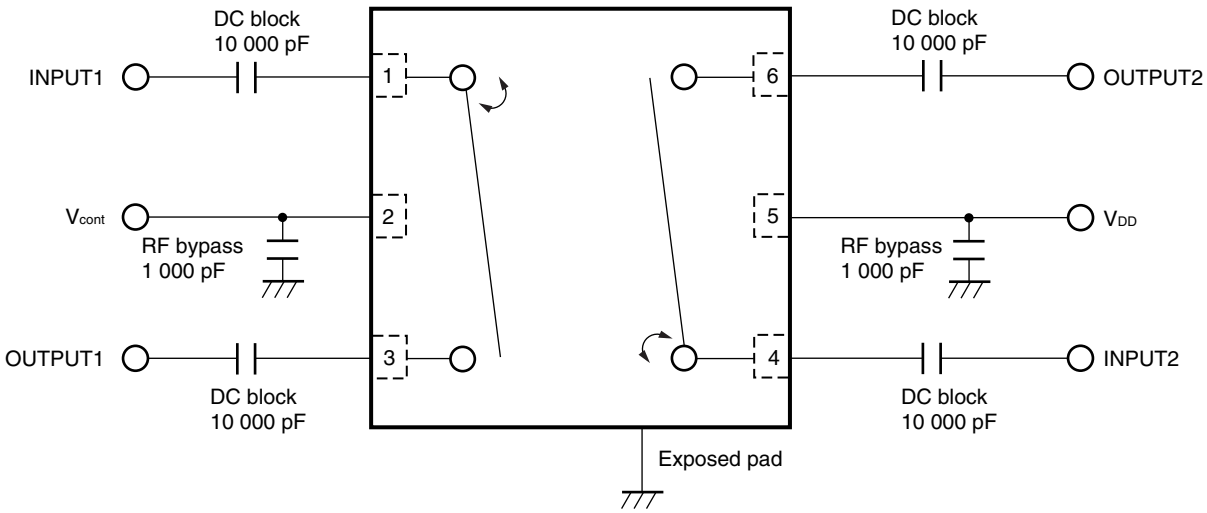
Notes 1. $P_{in\,(0.1\,dB)}$ is measured the input power level when the insertion loss increases more 0.1 dB than that of linear range.

2. $P_{in\,(1\,dB)}$ is measured the input power level when the insertion loss increases more 1 dB than that of linear range.

Caution DC blocking capacitors are necessary. Please do not supply any DC bias to the terminals (INPUT1, INPUT2, OUTPUT1, OUTPUT2).

The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system.

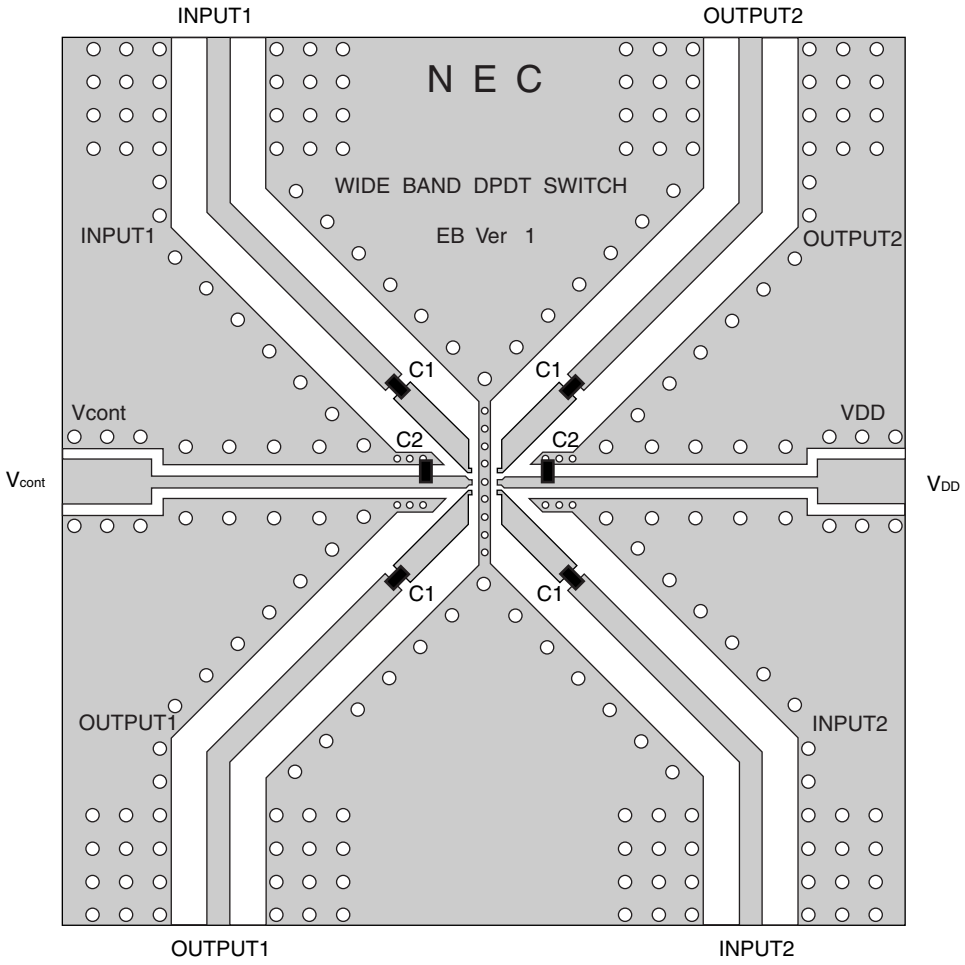
EVALUATION CIRCUIT



Caution This IC has pull down resistances inside between each RF line and GND line, which bias each RF pin internally to GND, then the IC cannot be used for DC switching.

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

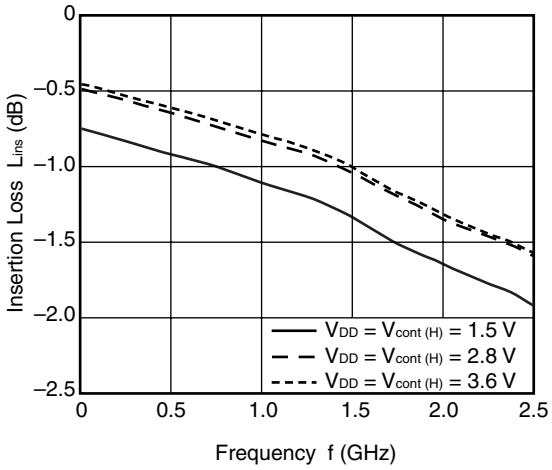


USING THE NEC EVALUATION BOARD

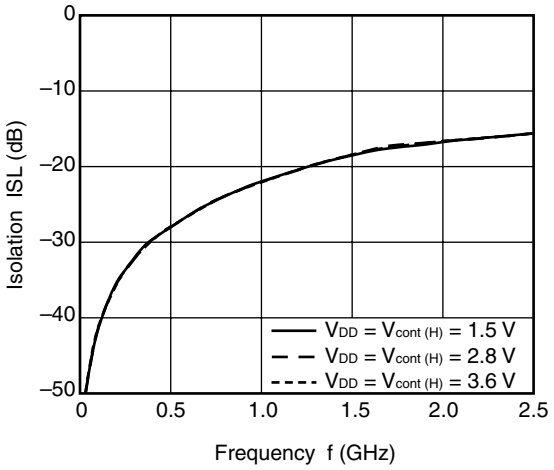
Symbol	Values
C1	1 0000 pF
C2	1 000 pF

TYPICAL CHARACTERISTICS (T_A = +25°C, V_{DD} = 2.8 V, $V_{cont\ (H)}$ = 2.8 V, $V_{cont\ (L)}$ = 0 V, P_{in} = 0 dBm, Z_0 = 50 Ω, DC blocking capacitors = 10 000 pF, unless otherwise specified)

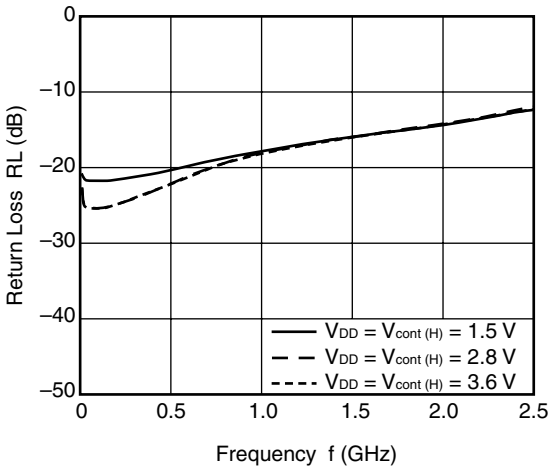
INPUT1, 2–OUTPUT1, 2
INSERTION LOSS vs. FREQUENCY



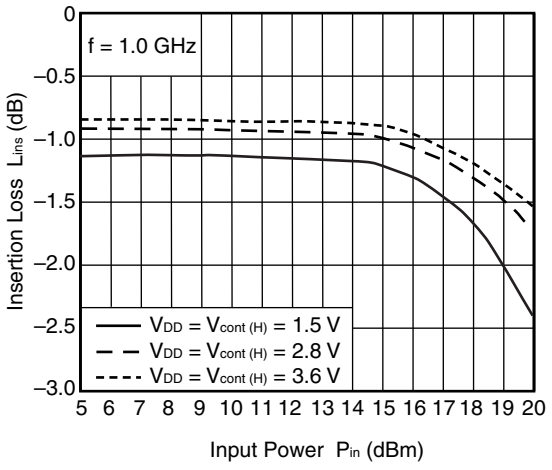
INPUT1, 2–OUTPUT1, 2
ISOLATION vs. FREQUENCY



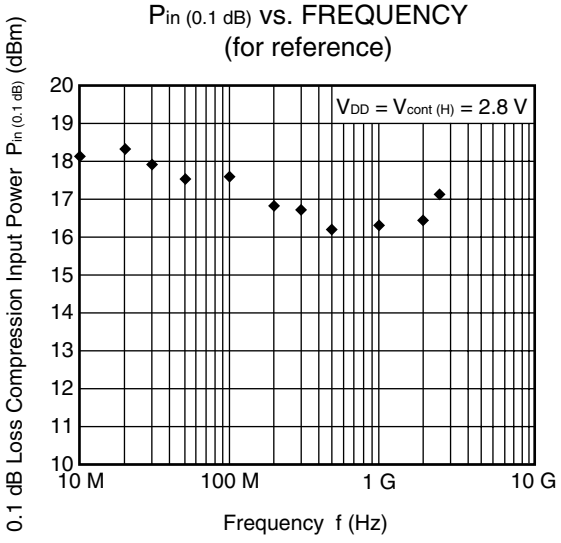
INPUT1, 2–OUTPUT1, 2
RETURN LOSS vs. FREQUENCY



INSERTION LOSS vs. INPUT POWER

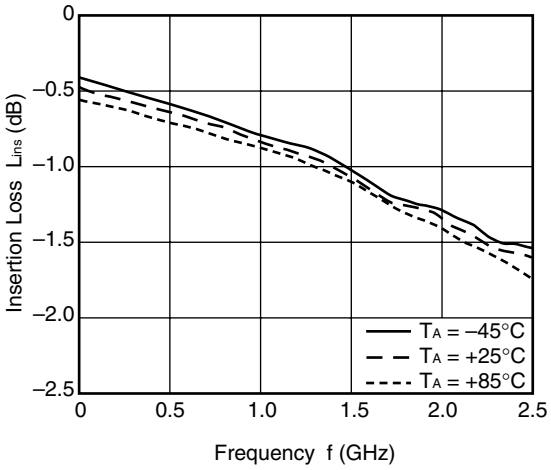


$P_{in\ (0.1\ dB)}$ vs. FREQUENCY
(for reference)

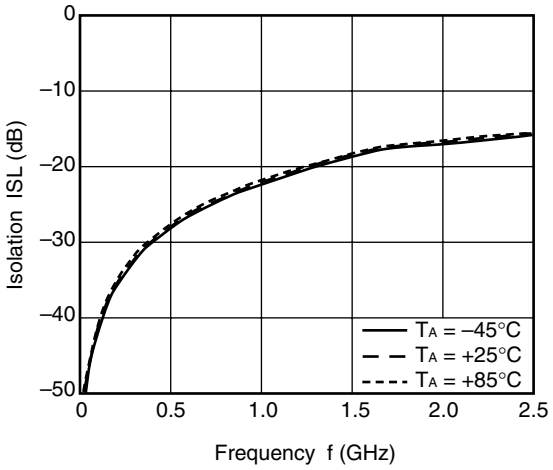


Remark The graphs indicate nominal characteristics.

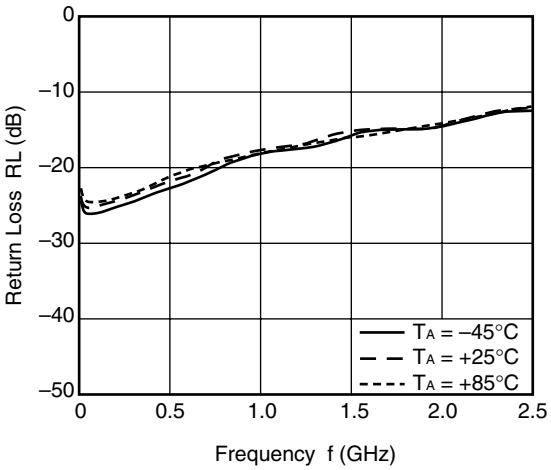
INPUT1, 2–OUTPUT1, 2
INSERTION LOSS vs. FREQUENCY



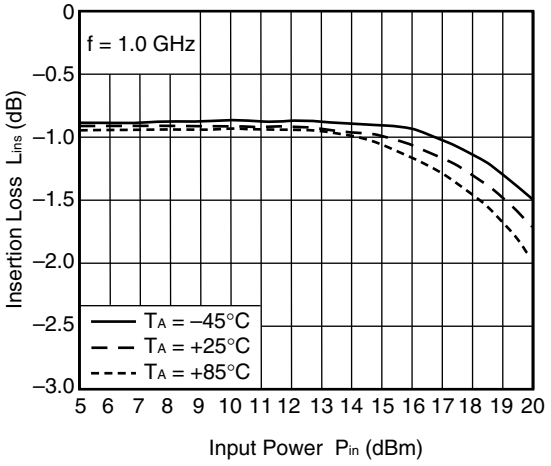
INPUT1, 2–OUTPUT1, 2
ISOLATION vs. FREQUENCY



INPUT1, 2–OUTPUT1, 2
RETURN LOSS vs. FREQUENCY



INSERTION LOSS vs. INPUT POWER

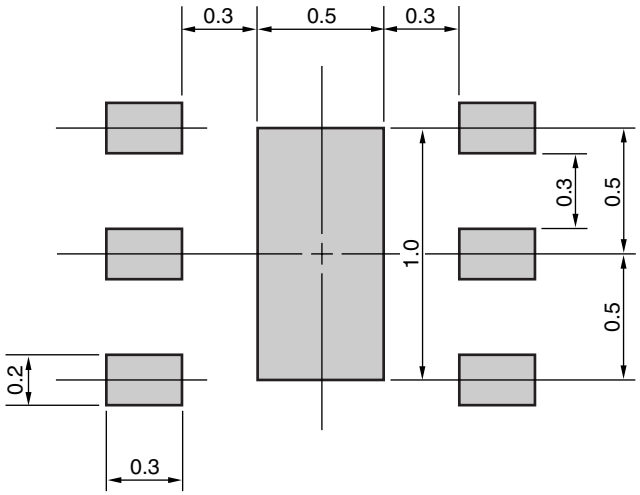


Remark The graphs indicate nominal characteristics.

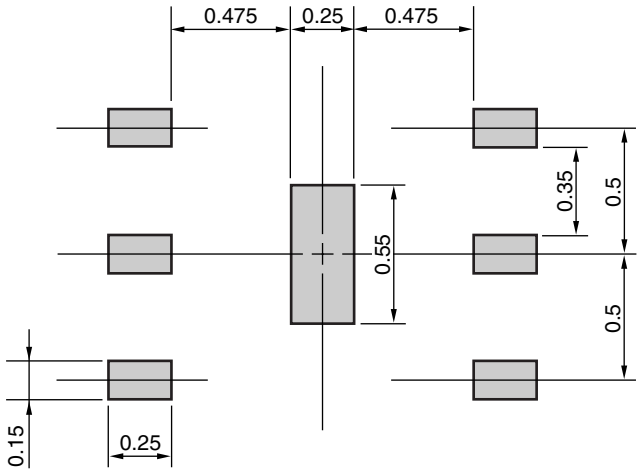
MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS

6-PIN PLASTIC TSON (UNIT: mm)

MOUNTING PAD



SOLDER MASK

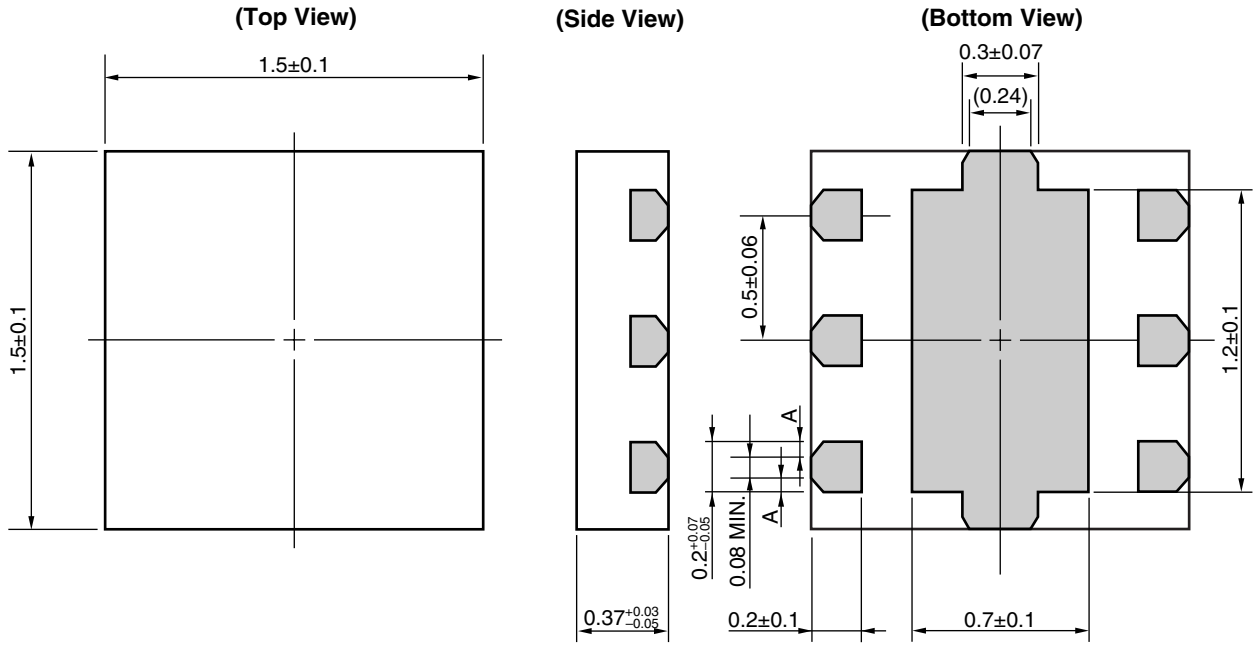


Solder thickness : 0.08 mm

Remark The mounting pad and solder mask layouts in this document are for reference only.
When designing PCB, please consider workability of mounting, solder joint reliability, prevention of solder bridge and so on, in order to optimize the design.

PACKAGE DIMENSIONS

6-PIN PLASTIC TSON (T6N) (UNIT: mm)



Remark A>0

( ) : Reference value

RECOMMENDED SOLDERING CONDITIONS

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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