

# DATA SHEET

# NEC

## GaAs HJ-FET INTEGRATED CIRCUIT

# μPG2253T6S

### RF FRONT-END IC FOR Bluetooth™ CLASS 1

#### DESCRIPTION

The μPG2253T6S is a RF front-end integrated circuit for Bluetooth Class 1 and includes TX/Bypass switch and a power amplifier with low-pass filter. And this device has no RF matching parts.

This device realizes high efficiency and low harmonics by 3.0 V operation. This device is housed in a 16-pin plastic QFN (Quad Flat Non-leaded) (T6S) package. And this package is able to high-density surface mounting by small external parts.

#### FEATURES

- Operating frequency :  $f_{opt} = 2\ 400$  to  $2\ 500$  MHz (2 450 MHz TYP.)
- Supply voltage :  $V_{DD1, 2, 3} = 3.0$  V TYP.
- Control voltage :  $V_{en} = 3.0$  V TYP.
- Circuit current :  $I_{DD} = 95$  mA TYP. @  $P_{in} = 0$  dBm
- Output power :  $P_{out} = 19$  dBm TYP. @  $P_{in} = 0$  dBm
- High efficiency : PAE = 28% TYP. @  $P_{in} = 0$  dBm
- High-density surface mounting : 16-pin plastic QFN package (T6S) ( $3.0 \times 3.0 \times 0.75$  mm)

#### APPLICATION

- Front-end IC for Bluetooth Class 1, ZigBee™ etc.

#### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2253T6S-E2	μPG2253T6S-E2-A	16-pin plastic QFN (T6S) (Pb-Free)	G5Y	<ul style="list-style-type: none"><li>• Embossed tape 8 mm wide</li><li>• Pin 10, 11, 12 face the perforation side of the tape</li><li>• Qty 3 kpcs/reel</li></ul>

**Remark** To order evaluation samples, please contact your nearby sales office.

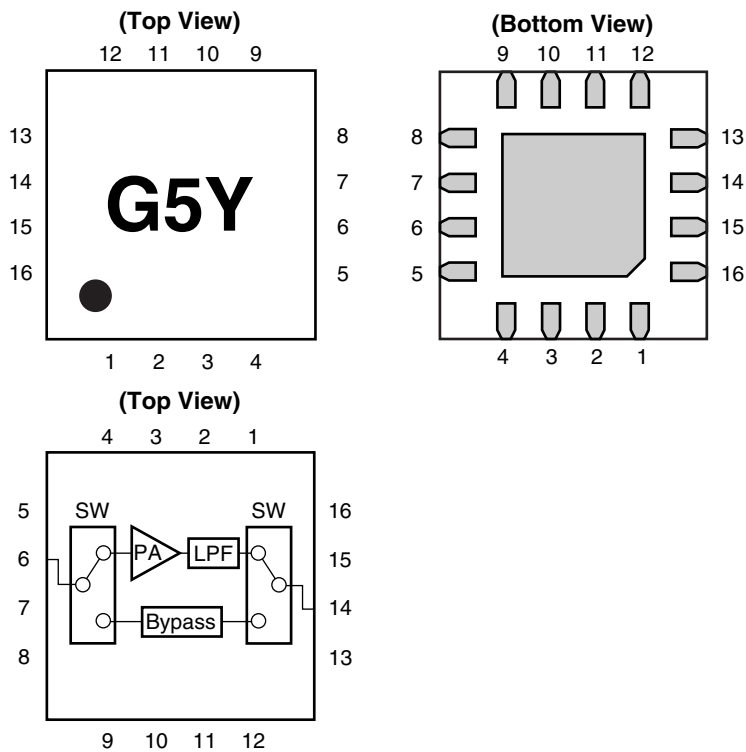
Part number for sample order: μPG2253T6S

**Caution** Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions must be employed at all times.

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PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



Pin No.	Pin Name
1	GND
2	N.C.
3	V <sub>en</sub>
4	N.C.
5	N.C.
6	RFin
7	N.C.
8	GND
9	V <sub>b1</sub>
10	V <sub>b2</sub>
11	V <sub>b3</sub> (1)
12	V <sub>b3</sub> (2)
13	GND
14	ANT
15	V <sub>sw1</sub>
16	V <sub>sw2</sub>

Remark Exposed pad : GND

TRUTH TABLE

V <sub>sw1</sub>	V <sub>sw2</sub>	Tx	Path
3.0 V	0 V	ON	OFF
0 V	3.0 V	OFF	ON

ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V <sub>DD1, 2, 3</sub>	5.0	V
Control Voltage	V <sub>en</sub>	4.0	V
Switching Voltage	V <sub>sw1, 2</sub>	5.0	V
Input Power	P <sub>in</sub>	+5	dBm
Power Dissipation	P <sub>D</sub>	400 <sup>Note</sup>	mW
Operating Ambient Temperature	T <sub>A</sub>	-45 to +85	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

Note Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T<sub>A</sub> = +85°C.

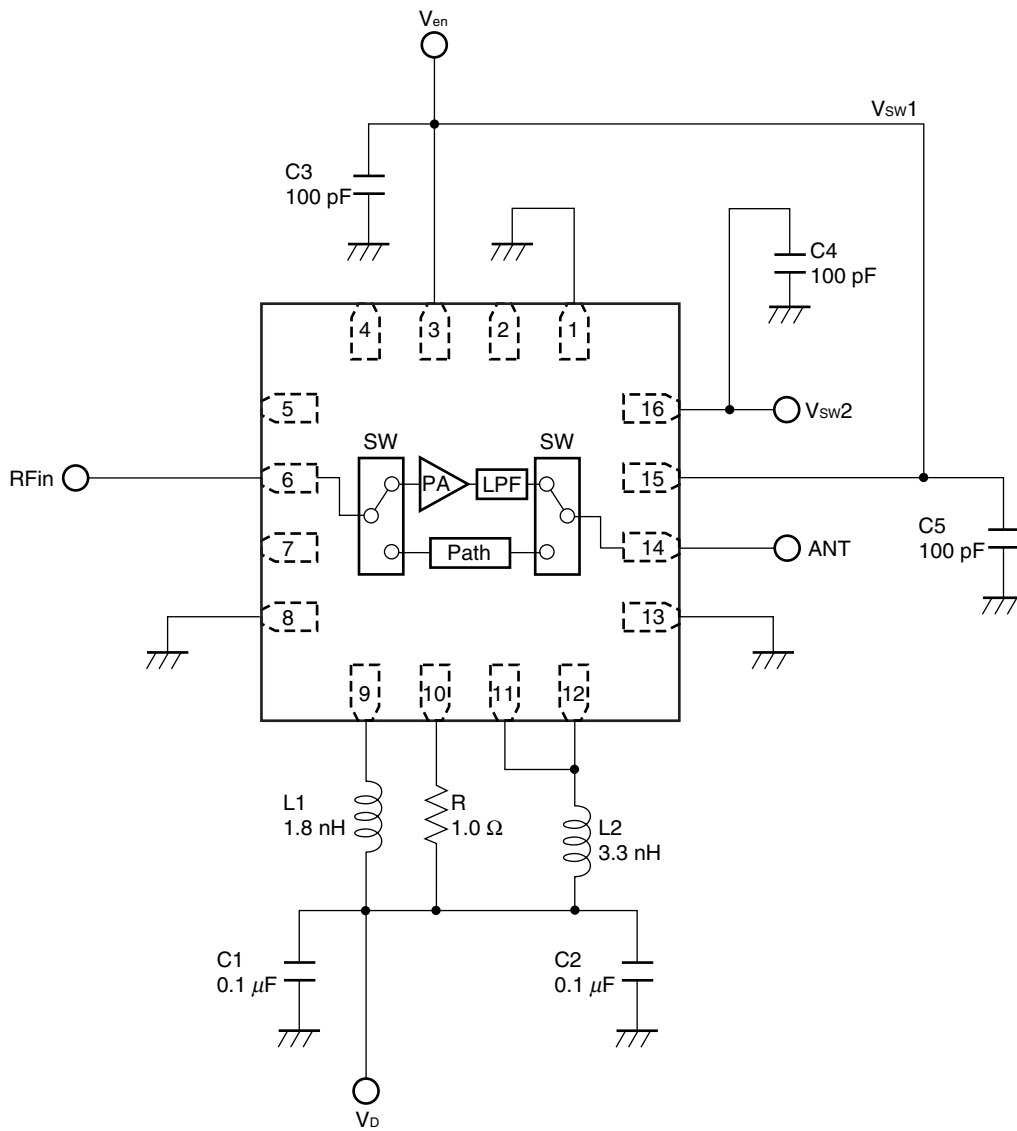
**RECOMMENDED OPERATING RANGE (T<sub>A</sub> = +25°C, unless otherwise specified)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f <sub>opt</sub>	2 400	2 450	2 500	MHz
Supply Voltage	V <sub>DD1, 2, 3</sub>	2.7	3.0	3.6	V
Switch Control Voltage (H)	V <sub>sw1, 2</sub>	1.8	3.0	3.6	V
Switch Control Voltage (L)	V <sub>sw1, 2</sub>	-0.2	0.0	0.2	V
Control Voltage (H)	V <sub>en</sub>	1.5	3.0	3.6	V
Control Voltage (L)	V <sub>en</sub>	-	0	0.2	V

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, V<sub>DD1, 2, 3</sub> = 3.0 V, f = 2 400 to 2 500 MHz, unless otherwise specified)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I <sub>DD</sub>	P <sub>in</sub> = 0 dBm, V <sub>en</sub> = 3.0 V, V <sub>sw1</sub> /V <sub>sw2</sub> = 3.0/0 V	-	95	120	mA
SW Current	I <sub>sw</sub>	RF off, V <sub>sw1</sub> /V <sub>sw2</sub> = 3.0/0 V	-	10	40	μA
Shut Down Current	I <sub>shut down</sub>	P <sub>in</sub> = -30 dBm, V <sub>en</sub> = 0 V, V <sub>sw1</sub> /V <sub>sw2</sub> = 3.0/0 V	-	4	15	μA
Output Power	P <sub>out</sub>	P <sub>in</sub> = 0 dBm, V <sub>en</sub> = 3.0 V, V <sub>sw1</sub> /V <sub>sw2</sub> = 3.0/0 V	17.5	19	-	dBm
Power Efficiency	PAE	P <sub>in</sub> = 0 dBm, V <sub>en</sub> = 3.0 V, V <sub>sw1</sub> /V <sub>sw2</sub> = 3.0/0 V	-	28	-	%
Input Return Loss	RL <sub>in</sub>	P <sub>in</sub> = -30 dBm, V <sub>en</sub> = 3.0 V, V <sub>sw1</sub> /V <sub>sw2</sub> = 3.0/0 V	-	-10	-	dB
Output Return Loss	RL <sub>out</sub>	P <sub>in</sub> = -30 dBm, V <sub>en</sub> = 3.0 V, V <sub>sw1</sub> /V <sub>sw2</sub> = 3.0/0 V	-	-8	-	dB
2nd Harmonics	2f <sub>0</sub>	P <sub>in</sub> = 0 dBm, V <sub>en</sub> = 3.0 V, V <sub>sw1</sub> /V <sub>sw2</sub> = 3.0/0 V	-	-25	-	dBm
3rd Harmonics	3f <sub>0</sub>	P <sub>in</sub> = 0 dBm, V <sub>en</sub> = 3.0 V, V <sub>sw1</sub> /V <sub>sw2</sub> = 3.0/0 V	-	-40	-	dBm
Insertion Loss	L <sub>ins</sub>	P <sub>in</sub> = -30 dBm, V <sub>en</sub> = 0 V, V <sub>sw1</sub> /V <sub>sw2</sub> = 0/3.0 V	-	1.5	2.0	dB

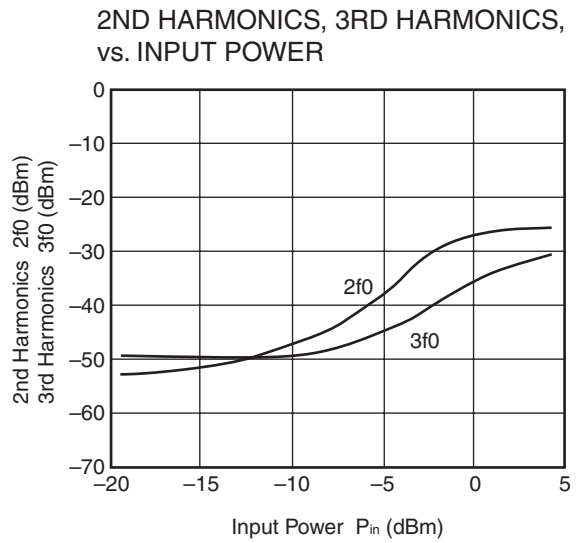
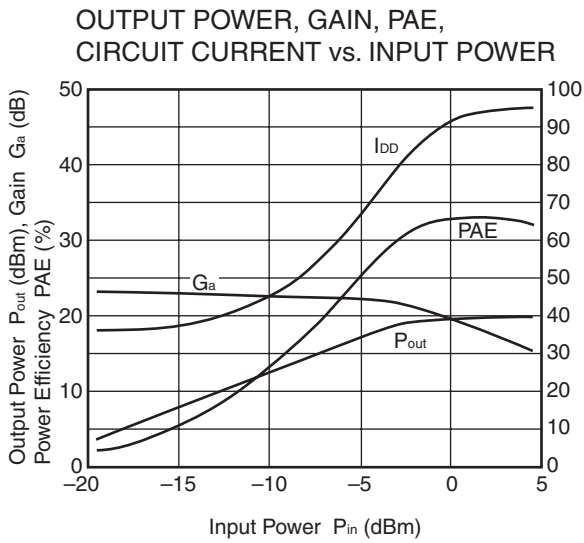
EVALUATION CIRCUIT



The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

**TYPICAL CHARACTERISTICS**

( $T_A = +25^\circ\text{C}$ ,  $V_{DD1, 2, 3} = 3.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$ ,  $V_{sw1}/V_{sw 2} = 3.0\text{ V}/0\text{ V}$ ,  $f = 2.45\text{ GHz}$ , unless otherwise specified)

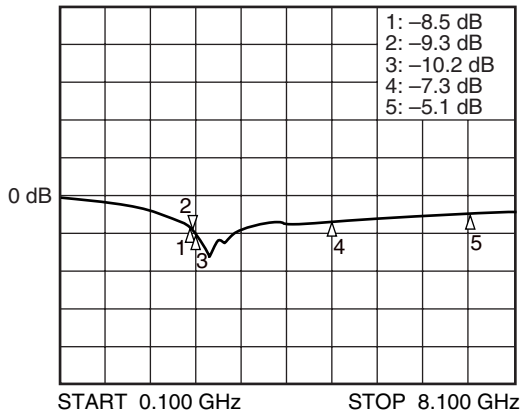


**Remark** The graphs indicate nominal characteristics.

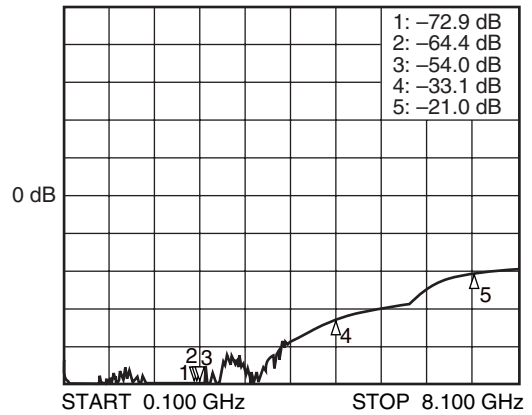
**Tx mode S-PARAMETERS**

Condition :  $T_A = +25^{\circ}\text{C}$ ,  $V_{DD1, 2, 3} = 3.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$ ,  $V_{sw1}/V_{sw2} = 3.0\text{ V}/0\text{ V}$ ,  $P_{in} = -30\text{ dBm}$

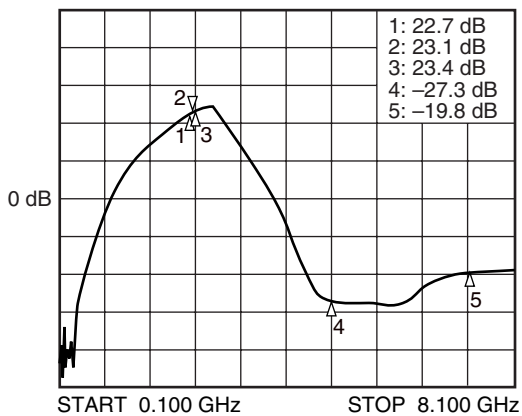
**S<sub>11</sub>-FREQUENCY**



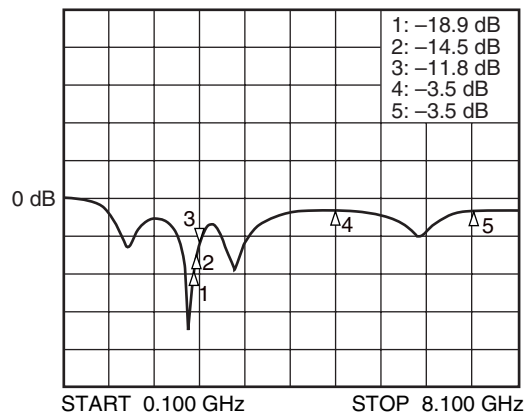
**S<sub>12</sub>-FREQUENCY**



**S<sub>21</sub>-FREQUENCY**



**S<sub>22</sub>-FREQUENCY**



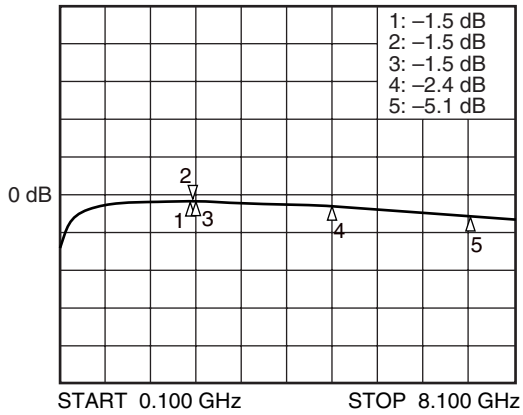
**Remarks 1.** The graphs indicate nominal characteristics.

- 2. Marker1 : 2.40 GHz
- Marker2 : 2.45 GHz
- Marker3 : 2.50 GHz
- Marker4 : 4.90 GHz
- Marker5 : 7.35 GHz

**Path mode S-PARAMETER**

Condition :  $T_A = +25^\circ\text{C}$ ,  $V_{DD1, 2, 3} = 3.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$ ,  $V_{sw1}/V_{sw2} = 0\text{ V}/3.0\text{ V}$ ,  $P_{in} = -30\text{ dBm}$

**S<sub>21</sub>-FREQUENCY**

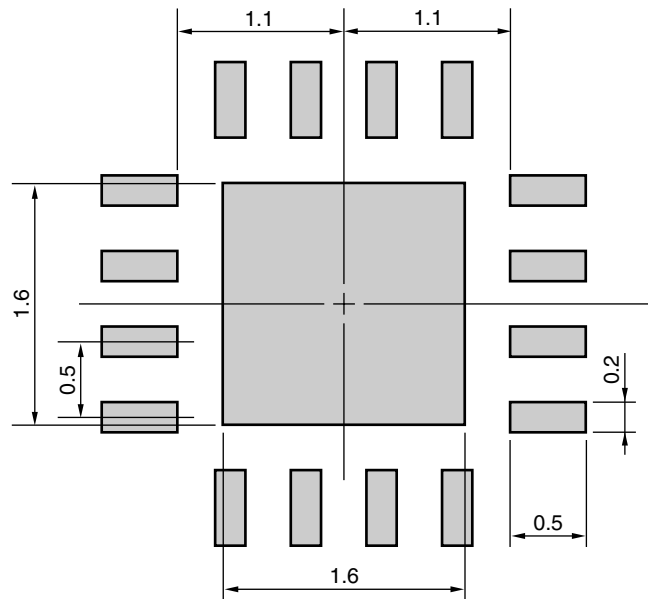


**Remarks 1.** The graph indicates nominal characteristics.

- 2. Marker1 : 2.40 GHz
- Marker2 : 2.45 GHz
- Marker3 : 2.50 GHz
- Marker4 : 4.90 GHz
- Marker5 : 7.35 GHz

MOUNTING PAD LAYOUT DIMENSIONS

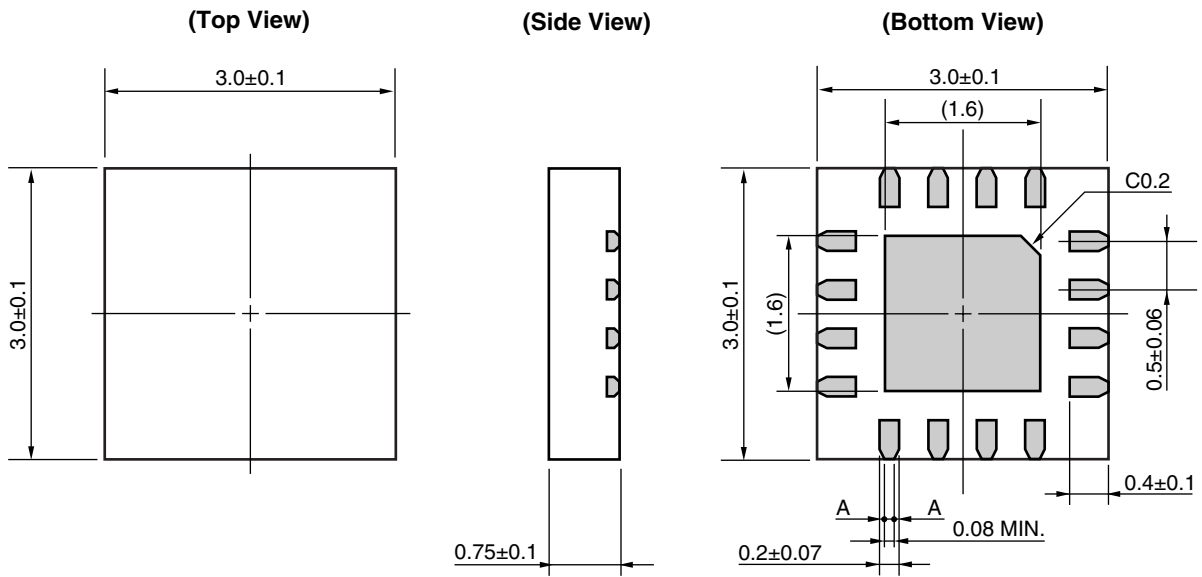
16-PIN PLASTIC QFN (UNIT: mm)



**Remark** The mounting pad 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

16-PIN PLASTIC QFN (T6S) (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)	: 260°C or below	IR260
	Time at peak temperature	: 10 seconds or less	
	Time at temperature of 220°C or higher	: 60 seconds or less	
	Preheating time at 120 to 180°C	: 120±30 seconds	
	Maximum number of reflow processes	: 3 times	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	
Partial Heating	Peak temperature (terminal temperature)	: 350°C or below	HS350
	Soldering time (per side of device)	: 3 seconds or less	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	

**Caution Do not use different soldering methods together (except for partial heating).**

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ZigBee is a trademark of Koninklijke Philips Electronics N.V.

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