

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	- Embossed tape 8 mm wide - Pin 10, 11, 12 face the perforation side of the tape - Qty 3 kpcs/reel

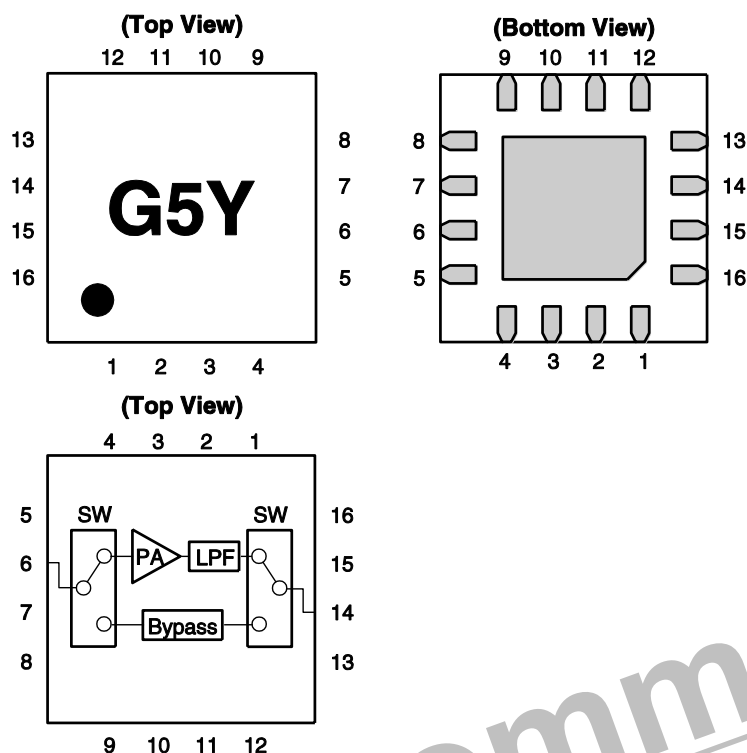
Remark To order evaluation samples, please contact your nearby sales office.

Part number for sample order: μPG2253T6S-A

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.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



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

Remark Exposed pad : GND

TRUTH TABLE

V _{sw1}	V _{sw2}	Tx	Path
3.0 V	0 V	ON	OFF
0 V	3.0 V	OFF	ON

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

Parameter	Symbol	Ratings	Unit
Supply Voltage	V _{DD1, 2, 3}	5.0	V
Control Voltage	V _{en}	4.0	V
Switching Voltage	V _{sw1, 2}	5.0	V
Input Power	P _{in}	+5	dBm
Power Dissipation	P _D	400 ^{Note}	mW
Operating Ambient Temperature	T _A	-45 to +85	°C
Storage Temperature	T _{stg}	-55 to +150	°C

Note Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T_A = +85°C.

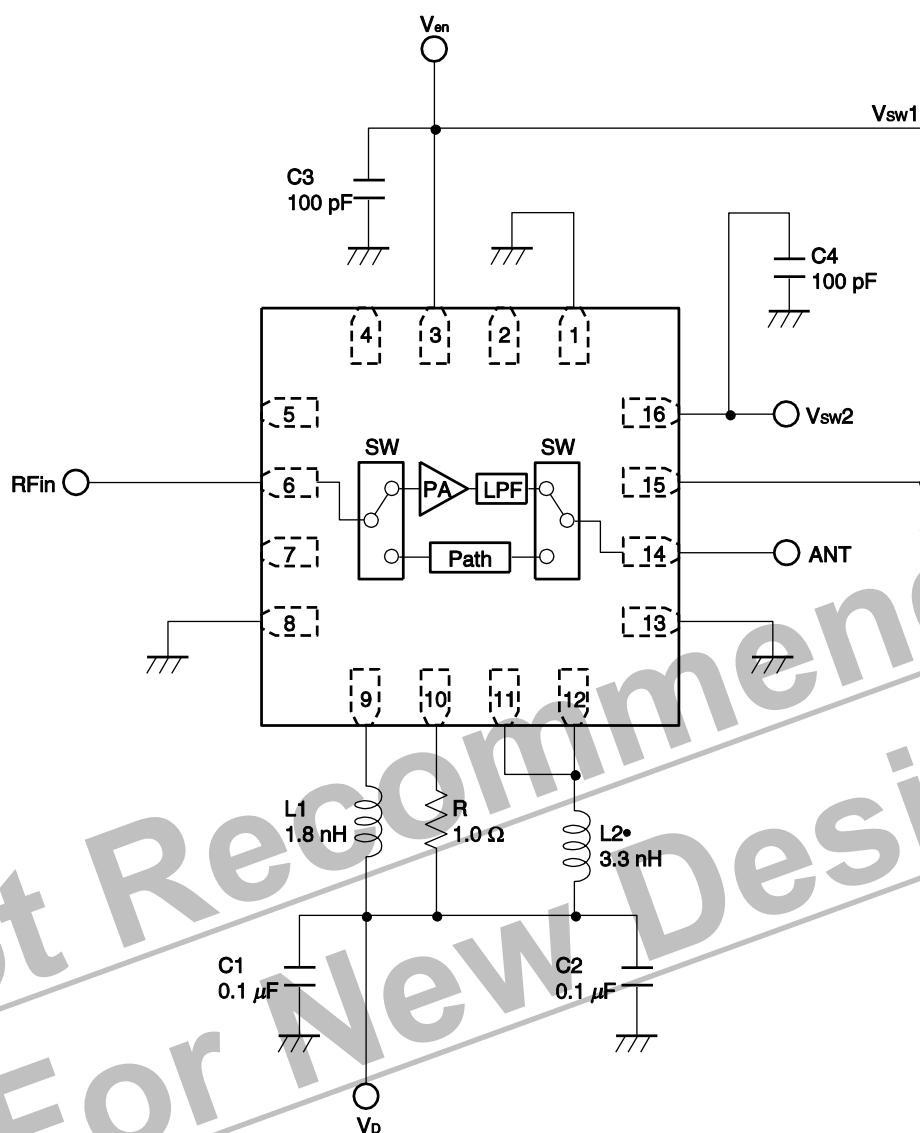
RECOMMENDED OPERATING RANGE ($T_A = +25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f_{opt}	2 400	2 450	2 500	MHz
Supply Voltage	$V_{\text{DD1, 2, 3}}$	2.7	3.0	3.6	V
Switch Control Voltage (H)	$V_{\text{sw1, 2}}$	1.8	3.0	3.6	V
Switch Control Voltage (L)	$V_{\text{sw1, 2}}$	-0.2	0.0	0.2	V
Control Voltage (H)	V_{en}	1.5	3.0	3.6	V
Control Voltage (L)	V_{en}	-	0	0.2	V

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, $V_{\text{DD1, 2, 3}} = 3.0\text{ V}$, $f = 2\,400$ to $2\,500\text{ MHz}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{DD}	$P_{\text{in}} = 0\text{ dBm}$, $V_{\text{en}} = 3.0\text{ V}$, $V_{\text{sw1}}/V_{\text{sw2}} = 3.0/0\text{ V}$	-	95	120	mA
SW Current	I_{sw}	RF off, $V_{\text{sw1}}/V_{\text{sw2}} = 3.0/0\text{ V}$	-	10	40	μA
Shut Down Current	$I_{\text{shut down}}$	$P_{\text{in}} = -30\text{ dBm}$, $V_{\text{en}} = 0\text{ V}$, $V_{\text{sw1}}/V_{\text{sw2}} = 3.0/0\text{ V}$	-	4	15	μA
Output Power	P_{out}	$P_{\text{in}} = 0\text{ dBm}$, $V_{\text{en}} = 3.0\text{ V}$, $V_{\text{sw1}}/V_{\text{sw2}} = 3.0/0\text{ V}$	17.5	19	-	dBm
Power Efficiency	PAE	$P_{\text{in}} = 0\text{ dBm}$, $V_{\text{en}} = 3.0\text{ V}$, $V_{\text{sw1}}/V_{\text{sw2}} = 3.0/0\text{ V}$	-	28	-	%
Input Return Loss	RL_{in}	$P_{\text{in}} = -30\text{ dBm}$, $V_{\text{en}} = 3.0\text{ V}$, $V_{\text{sw1}}/V_{\text{sw2}} = 3.0/0\text{ V}$	-	-10	-	dB
Output Return Loss	RL_{out}	$P_{\text{in}} = -30\text{ dBm}$, $V_{\text{en}} = 3.0\text{ V}$, $V_{\text{sw1}}/V_{\text{sw2}} = 3.0/0\text{ V}$	-	-8	-	dB
2nd Harmonics	$2f_0$	$P_{\text{in}} = 0\text{ dBm}$, $V_{\text{en}} = 3.0\text{ V}$, $V_{\text{sw1}}/V_{\text{sw2}} = 3.0/0\text{ V}$	-	-25	-	dBm
3rd Harmonics	$3f_0$	$P_{\text{in}} = 0\text{ dBm}$, $V_{\text{en}} = 3.0\text{ V}$, $V_{\text{sw1}}/V_{\text{sw2}} = 3.0/0\text{ V}$	-	-40	-	dBm
Insertion Loss	L_{ins}	$P_{\text{in}} = -30\text{ dBm}$, $V_{\text{en}} = 0\text{ V}$, $V_{\text{sw1}}/V_{\text{sw2}} = 0/3.0\text{ V}$	-	1.5	2.0	dB

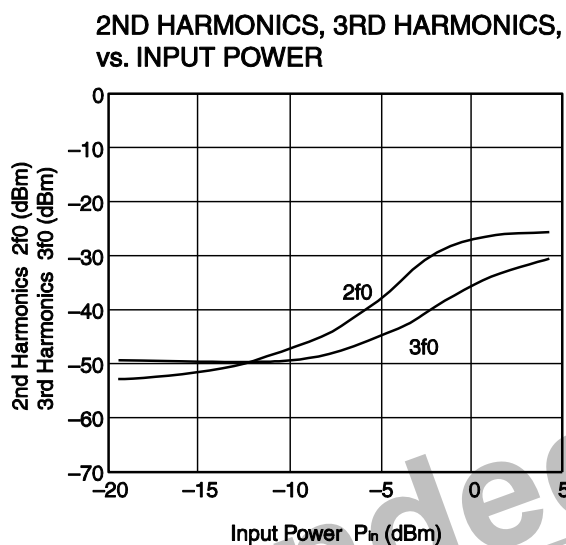
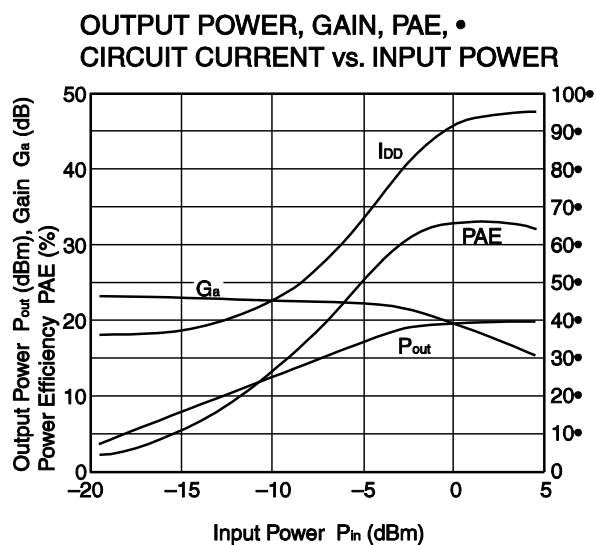
EVALUATION CIRCUIT



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)



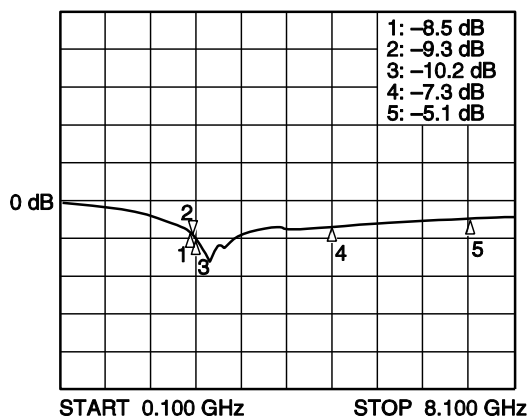
Remark The graphs indicate nominal characteristics.

Not Recommended
For New Design

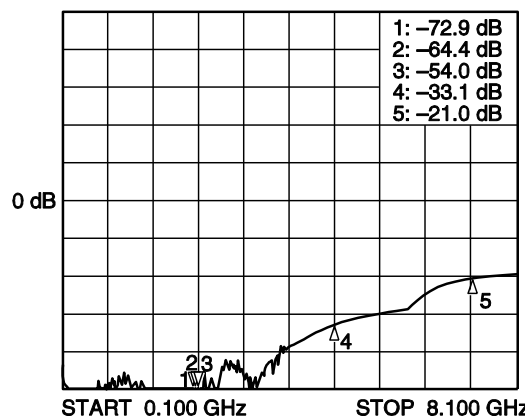
Tx mode S-PARAMETERS

Condition : $T_A = +25^\circ\text{C}$, $V_{DD1, 2, 3} = 3.0\text{ V}$, $V_{en} = 3.0\text{ V}$, $V_{SW1}/V_{SW2} = 3.0\text{ V}/0\text{ V}$, $P_{in} = -30\text{ dBm}$

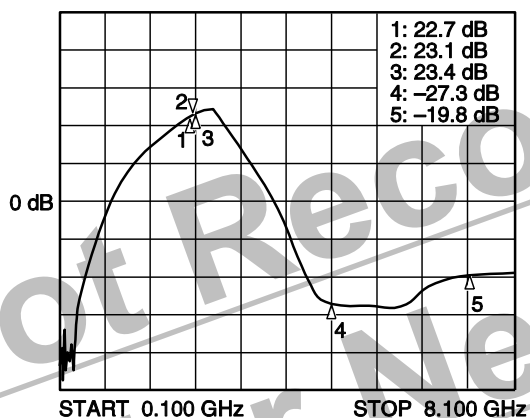
S₁₁-FREQUENCY



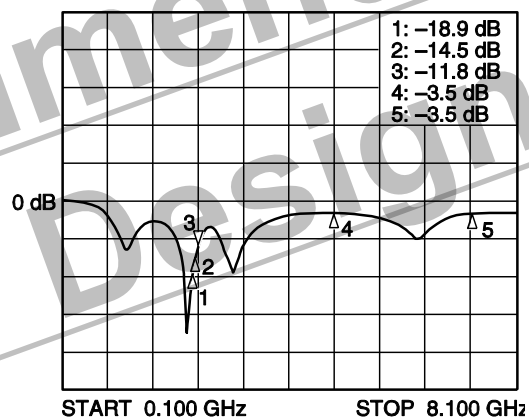
S₁₂-FREQUENCY



S₂₁-FREQUENCY



S₂₂-FREQUENCY



Remarks 1. The graphs indicate nominal characteristics.

2. Marker1 : 2.40 GHz

Marker2 : 2.45 GHz

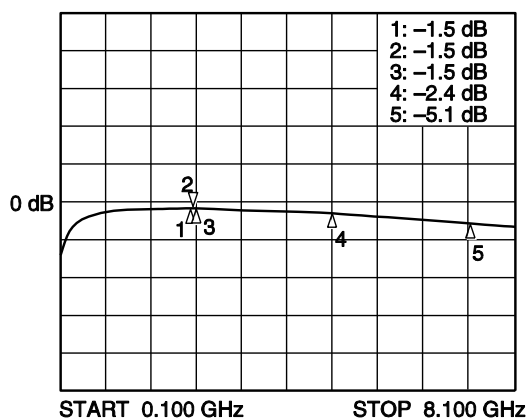
Marker3 : 2.50 GHz

Marker4 : 4.90 GHz

Marker5 : 7.35 GHz

Path mode S-PARAMETER

Condition : $T_A = +25^\circ\text{C}$, $V_{DD1, 2, 3} = 3.0\text{ V}$, $V_{en} = 3.0\text{ V}$, $V_{SW1}/V_{SW2} = 0\text{ V}/3.0\text{ V}$, $P_{in} = -30\text{ dBm}$

S₂₁-FREQUENCY

Remarks 1. The graph indicates nominal characteristics.

2. Marker1 : 2.40 GHz

Marker2 : 2.45 GHz

Marker3 : 2.50 GHz

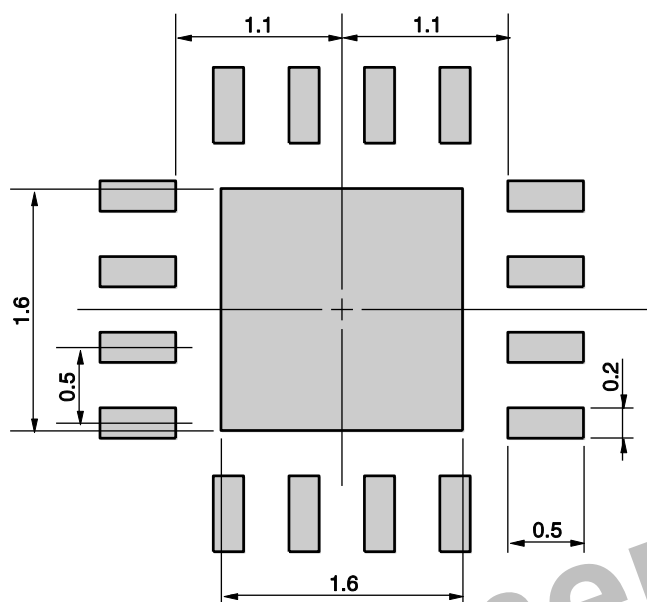
Marker4 : 4.90 GHz

Marker5 : 7.35 GHz

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MOUNTING PAD LAYOUT DIMENSIONS

16-PIN PLASTIC QFN (UNIT: mm)

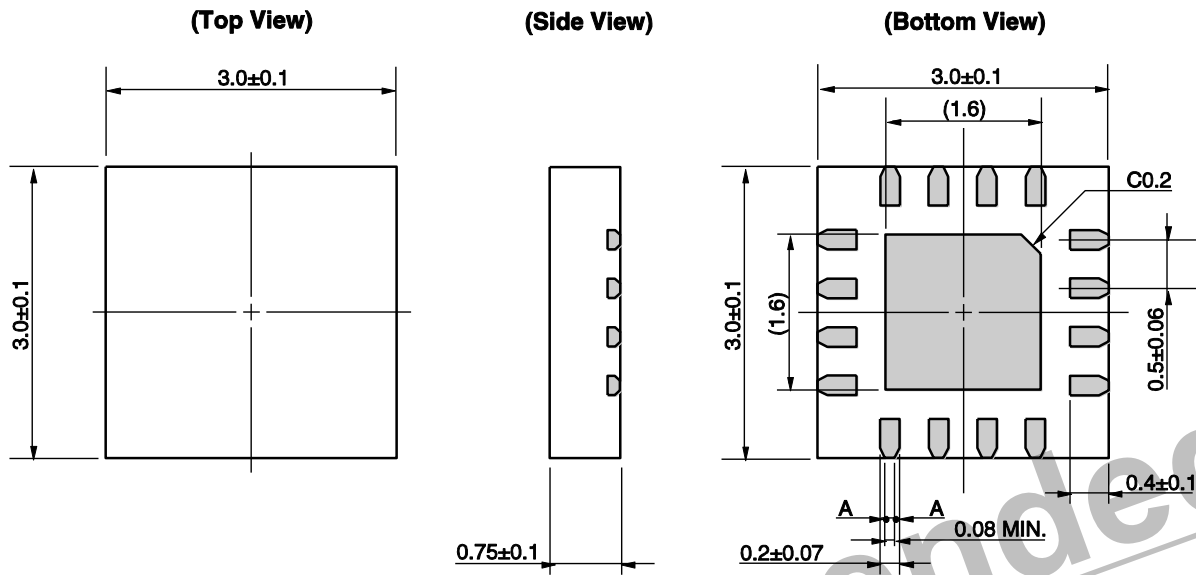


Remark The mounting pad layouts in this document are for reference only.

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)



Not Recommended
For New Design

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 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	IR260
Partial Heating	Peak temperature (terminal temperature) : 350°C or below Soldering time (per side of device) : 3 seconds or less Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	HS350

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

**Not Recommended
For New Design**

Caution	GaAs Products	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.
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**Not Recommended
For New Design**