μPG2417T6M

Data Sheet

GaAs Integrated Circuit
SP6T Switch for NFC Application

R09DS0010EJ0100
Rev.1.00
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DESCRIPTION

The μPG2417T6M is a GaAs MMIC for SP6T (Single Pole Six Throw) switch for NFC (Near Field Communication) application.

This device is housed in a 12-pin plastic TSQFN (Thin Small Quad Flat Non-leaded) (T6M) package and is suitable for high-density surface mounting.

FEATURES

- 1, 2, 4, 8 pF capacitors on RF path are built in PKG.
- Switch control voltage : $V_{cont\ (H)}$ = 2.85 V TYP.
  : $V_{cont\ (L)}$ = 0 V TYP.
- Low insertion loss : L_{ins} = 0.5 dB TYP. @ f = 13.56 MHz
- High isolation : ISL = 50 dB TYP. @ f = 13.56 MHz
- Handling power : $P_{in\ (0.1\ dB)}$ = +32.0 dBm TYP. @ f = 13.56 MHz
- High-density surface mounting : 12-pin plastic TSQFN (T6M) package (2.0 × 2.0 × 0.37 mm)

APPLICATIONS

- NFC Application (FeliCa™ etc.)

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2417T6M-E2	μPG2417T6M-E2-A	12-pin plastic TSQFN (T6M) (Pb-Free)	2417	• Embossed tape 8 mm wide • Pin 10, 11, 12 face the perforation side of the tape • Qty 3 kpcs/reel

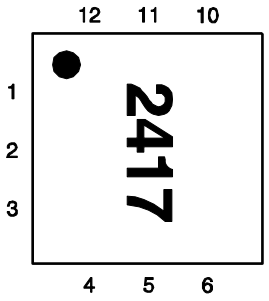
Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: μPG2417T6M-A

CAUTION

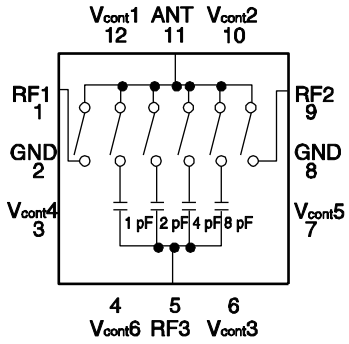
Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection.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

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

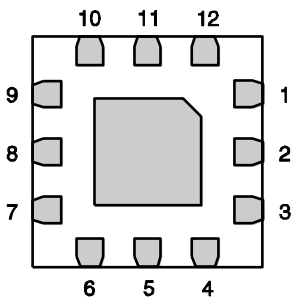
(Top View)



(Top View)



(Bottom View)



Pin No.	Pin Name
1	RF1
2	GND
3	$V_{cont}4$
4	$V_{cont}6$
5	RF3
6	$V_{cont}3$
7	$V_{cont}5$
8	GND
9	RF2
10	$V_{cont}2$
11	ANT
12	$V_{cont}1$

SW TRUTH TABLE

RF Path								
ANT-RF3 (Capacitor)	ANT-RF1	ANT-RF2	$V_{cont}1$	$V_{cont}2$	$V_{cont}3$	$V_{cont}4$	$V_{cont}5$	$V_{cont}6$
OFF	OFF	ON	L	H	L	L	L	L
	ON	OFF	H	L	L	L	L	L
	ON	ON	H	H	L	L	L	L
1 pF	OFF	OFF	L	L	H	L	L	L
	OFF	ON	L	H	H	L	L	L
	ON	OFF	H	L	H	L	L	L
	ON	ON	H	H	H	L	L	L
2 pF	OFF	OFF	L	L	L	H	L	L
	OFF	ON	L	H	L	H	L	L
	ON	OFF	H	L	L	H	L	L
	ON	ON	H	H	L	H	L	L
3 pF	OFF	OFF	L	L	H	H	L	L
	OFF	ON	L	H	H	H	L	L
	ON	OFF	H	L	H	H	L	L
	ON	ON	H	H	H	H	L	L
4 pF	OFF	OFF	L	L	L	L	H	L
	OFF	ON	L	H	L	L	H	L
	ON	OFF	H	L	L	L	H	L
	ON	ON	H	H	L	L	H	L
5 pF	OFF	OFF	L	L	H	L	H	L
	OFF	ON	L	H	H	L	H	L
	ON	OFF	H	L	H	L	H	L
	ON	ON	H	H	H	L	H	L
6 pF	OFF	OFF	L	L	L	H	H	L
	OFF	ON	L	H	L	H	H	L
	ON	OFF	H	L	L	H	H	L
	ON	ON	H	H	L	H	H	L
7 pF	OFF	OFF	L	L	H	H	H	L
	OFF	ON	L	H	H	H	H	L
	ON	OFF	H	L	H	H	H	L
	ON	ON	H	H	H	H	H	L
8 pF	OFF	OFF	L	L	L	L	L	H
	OFF	ON	L	H	L	L	L	H
	ON	OFF	H	L	L	L	L	H
	ON	ON	H	H	L	L	L	H
9 pF	OFF	OFF	L	L	H	L	L	H
	OFF	ON	L	H	H	L	L	H
	ON	OFF	H	L	H	L	L	H
	ON	ON	H	H	H	L	L	H
10 pF	OFF	OFF	L	L	L	H	L	H
	OFF	ON	L	H	L	H	L	H
	ON	OFF	H	L	L	H	L	H
	ON	ON	H	H	L	H	L	H
11 pF	OFF	OFF	L	L	H	H	L	H
	OFF	ON	L	H	H	H	L	H
	ON	OFF	H	L	H	H	L	H
	ON	ON	H	H	H	H	L	H
12 pF	OFF	OFF	L	L	L	L	H	H
	OFF	ON	L	H	L	L	H	H
	ON	OFF	H	L	L	L	H	H
	ON	ON	H	H	L	L	H	H
13 pF	OFF	OFF	L	L	H	L	H	H
	OFF	ON	L	H	H	L	H	H
	ON	OFF	H	L	H	L	H	H
	ON	ON	H	H	H	L	H	H
14 pF	OFF	OFF	L	L	L	H	H	H
	OFF	ON	L	H	L	H	H	H
	ON	OFF	H	L	L	H	H	H
	ON	ON	H	H	L	H	H	H
15 pF	OFF	OFF	L	L	H	H	H	H
	OFF	ON	L	H	H	H	H	H
	ON	OFF	H	L	H	H	H	H
	ON	ON	H	H	H	H	H	H

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

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	V_{cont}	−6.0 to +6.0 Note	V
Input Power (ON Port)	P_{in}	+35.0	dBm
Operating Ambient Temperature	T_A	−45 to +85	°C
Storage Temperature	T_{stg}	−55 to +150	°C

Note: $|V_{cont\ (H)} - V_{cont\ (L)}| \leq 6.0$ V

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

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Switch Control Voltage (H)	$V_{cont\ (H)}$	+2.4	+2.85	+3.4	V
Switch Control Voltage (L)	$V_{cont\ (L)}$	−0.2	0	+0.2	V
Control Voltage Difference	$\Delta V_{cont\ (H)}$, $\Delta V_{cont\ (L)}$ Note	−0.1	0	+0.1	V

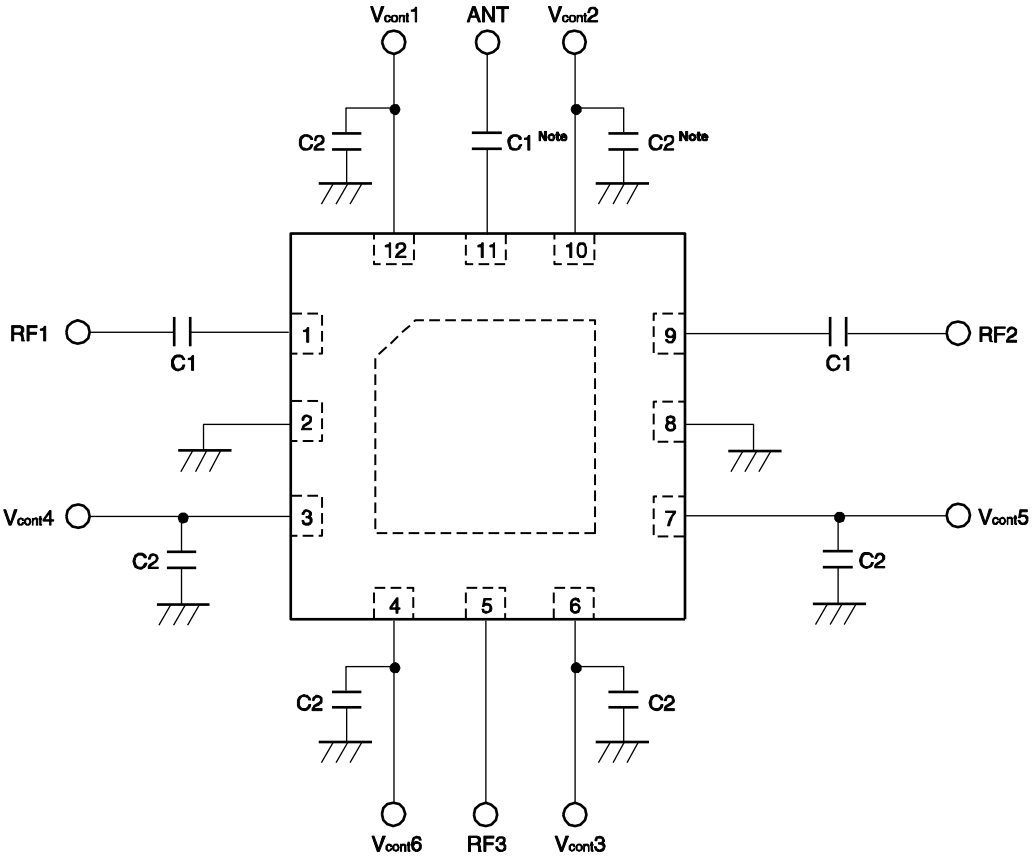
Note: $\Delta V_{CONT(H)}$ is a difference between the maximum and the minimum control voltage among $V_{CONT}1_{(H)}$, $V_{CONT}2_{(H)}$, $V_{CONT}3_{(H)}$, $V_{CONT}4_{(H)}$, $V_{CONT}5_{(H)}$ and $V_{CONT}6_{(H)}$.
$\Delta V_{CONT(L)}$ is a difference between the maximum and the minimum control voltage among $V_{CONT}1_{(L)}$, $V_{CONT}2_{(L)}$, $V_{CONT}3_{(L)}$, $V_{CONT}4_{(L)}$, $V_{CONT}5_{(L)}$ and $V_{CONT}6_{(L)}$.

ELECTRICAL CHARACTERISTICS
(T_A = –45 to +85°C, f = 13.56 MHz, $V_{cont\ (H)}$ = +2.4 to +3.4V, $V_{cont\ (L)}$ = –0.2 to +0.2 V, Z_O = 50 Ω, DC blocking capacitors = 10 000 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss	$L_{ins}1$	ANT-RF1, $V_{cont}1$ = H, P_{in} = +20 dBm	–	0.5	0.9	dB
	$L_{ins}2$	ANT-RF2, $V_{cont}2$ = H, P_{in} = +20 dBm	–	0.5	0.9	dB
	$L_{ins}3$	ANT-RF3, $V_{cont}3$ = H, P_{in} = +20 dBm	36.0	38.0	40.0	dB
	$L_{ins}4$	ANT-RF3, $V_{cont}4$ = H, P_{in} = +20 dBm	31.5	33.5	35.5	dB
	$L_{ins}5$	ANT-RF3, $V_{cont}5$ = H, P_{in} = +20 dBm	26.0	28.0	30.0	dB
	$L_{ins}6$	ANT-RF3, $V_{cont}6$ = H, P_{in} = +20 dBm	20.5	22.5	24.5	dB
Isolation	ISL1	ANT-RF1, $V_{cont}2$ = H, P_{in} = +20 dBm	32.0	50.0	–	dB
	ISL2	ANT-RF2, $V_{cont}1$ = H, P_{in} = +20 dBm	32.0	50.0	–	dB
Capacitance Value	Cap 1	ANT-RF3, $V_{cont}3$ = H	–	1.0	–	pF
	Cap 2	ANT-RF3, $V_{cont}4$ = H	–	2.0	–	pF
	Cap 3	ANT-RF3, $V_{cont}5$ = H	–	4.0	–	pF
	Cap 4	ANT-RF3, $V_{cont}6$ = H	–	8.0	–	pF
0.1 dB Loss Compression Input Power **Note**	$P_{in\ (0.1\ dB)}$	ANT-RF1/RF2	28.0	32.0	–	dBm
Switch Control Current	I_{cont}	No RF input	–	2	30	μA
Switch Control Speed	t_{SW}	50% CTL to 90/10% RF	–	1	5	μs

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

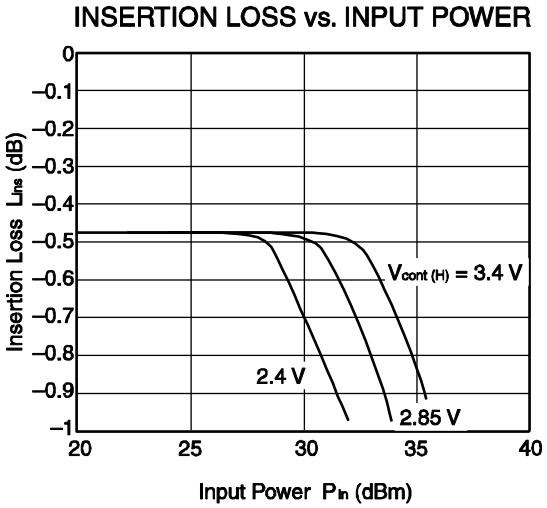
EVALUATION CIRCUIT



Note: C1: 10 000 pF
C2: 10 000 pF

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°C, f = 13.56 MHz, $V_{cont\ (H)}$ = +2.4 to +3.4 V, $V_{cont\ (L)}$ = 0 V, Z_O = 50 Ω, DC blocking capacitors = 10 000 pF)

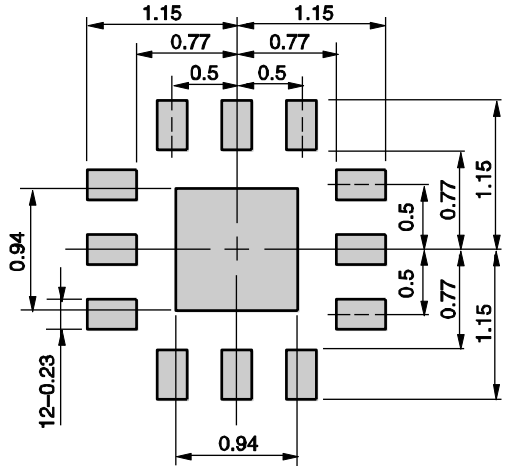


Remark The graph indicates nominal characteristics.

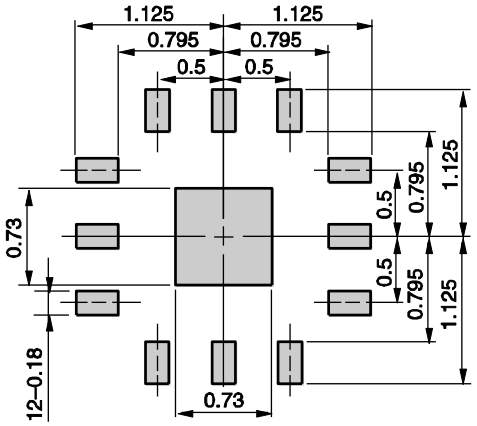
MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS

12-PIN PLASTIC TSQFN (T6M) (UNIT: mm)

MOUNTING PAD



SOLDER MASK

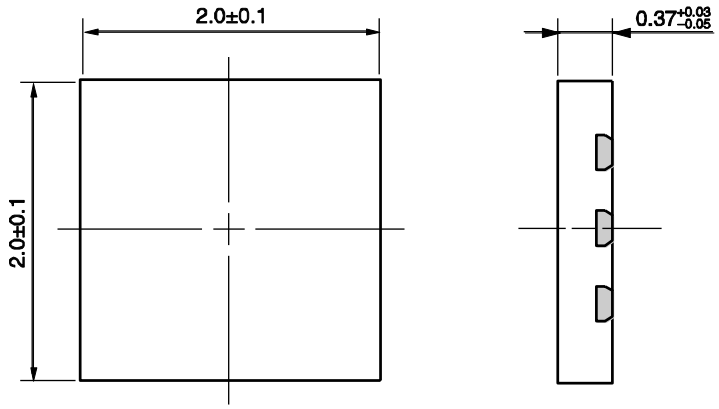


Solder thickness : 0.1 mm

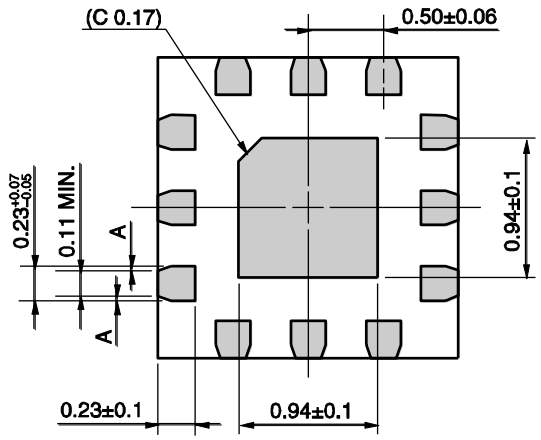
Remark The mounting pad and solder mask layouts in this document are for reference only.

PACKAGE DIMENSIONS

12-PIN PLASTIC TSQFN (T6M) (UNIT: mm)



(Bottom View)



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).

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.

Rev.	Date	Description	
		Page	Summary
1.00	Dec 24, 2010	—	First edition issued

FeliCa is the contactless IC card technology developed by Sony Corporation.

FeliCa is a trademark of Sony Corporation.