

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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Si ANALOG INTEGRATED CIRCUIT

Phase-out/Discontinued

μPC8218T5A

SILICON RF POWER AMPLIFIER IC FOR 1.9 GHz PHS

DESCRIPTION

The μPC8218T5A is a silicon monolithic integrated circuit designed for use as power amplifier 1.9 GHz PHS. This IC consists of three stage amplifiers as driver stage and final stage of power amplifier.

This device is packaged in surface mount 16-pin TSON (Thin Small Outline Non-leaded) plastic package.

FEATURES

- Output Power : $P_{out} = +20.5$ dBm MIN. @ $P_{in} = -19$ dBm, $f = 1.9$ GHz
- Operation Current : $I_{op} = 150$ mA TYP.
- Single Supply Voltage : $V_{DS} = 3.0$ V TYP.
- Suitable for High-density Surface Mounting : 16-pin Plastic TSON package ($3.3 \times 2.3 \times 0.6$ mm)

APPLICATION

- 1.9 GHz applications (Example : PHS etc.)

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPC8218T5A-E1	16-pin Plastic TSON	8218	<ul style="list-style-type: none"> • Embossed tape 12 mm wide • Pin 8, 9 face the perforation side of the tape • Qty 3 kpcs/reel

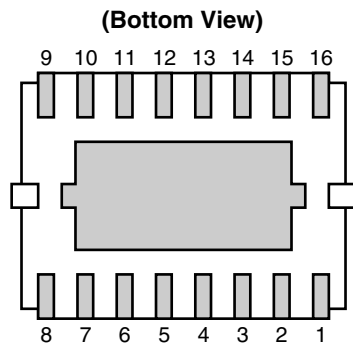
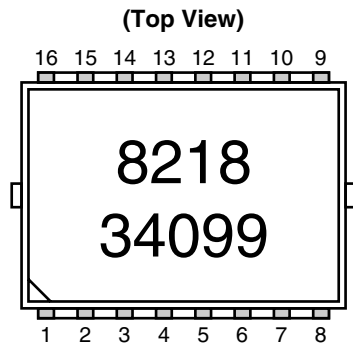
Remark To order evaluation samples, contact your nearby sales office.

Part number for sample order: μPC8218T5A

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

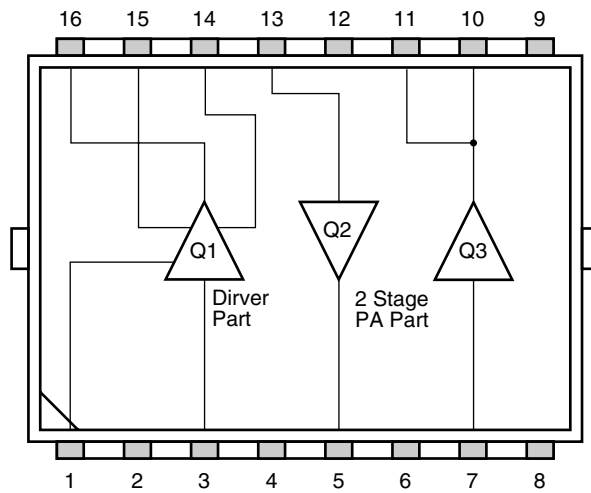
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 Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

PIN CONNECTIONS



Pin No.	Pin Name
1	V _{cc} 1
2	GND
3	INPUT1
4	GND
5	OUTPUT2
6	GND
7	INPUT3
8	NC
9	GND
10	OUTPUT3
11	OUTPUT3
12	GND
13	INPUT2
14	GND
15	GND
16	OUTPUT1

INTERNAL BLOCK DIAGRAM



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

Parameter	Symbol	Test Conditions	Ratings	Unit
Operating Ambient Temperature	T _A		-40 to +85	°C
Storage Temperature	T _{stg}		-55 to +150	°C
Channel Temperature	T _{ch}		150	°C
Power Dissipation of Package	P _D	T _A = +85°C	Note 4.33	W
Driver Part (Q1)				
Supply Voltage	V _{CC}		3.6	V
Circuit Current	I _{CC1}		60	mA
Maximum Input Power	P _{in1}		+10	dBm
2 Stage PA Part (Q2+Q3)				
Drain to Source Voltage	V _{DS}		8.0	V
Gate to Source Voltage	V _{GS}		8.0	V
Drain Current of Q2	I _{DS2}		45	mA
Drain Current of Q3	I _{DS3}		259	mA
Maximum Input Power to Q2	P _{in2}		+12	dBm
Maximum Input Power to Q3	P _{in3}		+16	dBm

Note Mounted on 33 × 21 × 0.4 mm epoxy glass PWB

RECOMMENDED OPERATING RANGE

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Operating Ambient Temperature	T _A		-40	+25	+85	°C
Driver Part (Q1)						
Supply Voltage	V _{CC}		2.7	3.0	3.3	V
2 Stage PA Part (Q2+Q3)						
Drain to Source Voltage	V _{DS}		2.7	3.0	3.5	V
Gate to Source Voltage	V _{GS}	T _A = +25°C	0	2.0	2.5	V
Maximum Input Power to Q2	P _{in2}	V _{DS} = 3 V, T _A = +25°C		2.0	5.0	dBm
Maximum Input Power to Q3	P _{in3}	V _{DS} = 3 V, T _A = +25°C		11.0	15.0	dBm

ELECTRICAL CHARACTERISTICS (f = 1.9 GHz, V_{CC} = V_{DS} = 3.0 V, T_A = +25°C, unless otherwise specified, using our standard test fixture)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
All Part (Driver Part + 2 Stage PA Part, Q1+Q2+Q3)						
Gate Voltage Adjusted Range	V _{GS}	P _{in} = -19 dBm, P _{out} = 20.5 dBm	1.2	1.8	2.3	V
Power Added Efficiency	η _{add}		-	25.0	-	%
Operation Current Consumption	I _{op}		-	150	175	mA
Input Return Loss	RL _{in}	P _{in} = -20 dBm	-	8	-	dB
Output Return Loss	RL _{out}		-	3	-	dB
Output Power	P _{out}	P _{in} = -19 dBm	20.5	-	-	dBm
Power Gain	G _P		39.5	-	-	dB
Liner Gain	G _L	P _{in} = -20 dBm	-	40.5	-	dB
Adjacent Channel Power 1	P _{adj (600)}	P _{in} = -19 dBm, Δ600 kHz	-	-62	-55	dBc
	P _{adj (900)}		P _{in} = -19 dBm, Δ900 kHz	-	-70	-60
Occupied Band Width	OBW	P _{in} = -19 dBm	-	250.0	270.0	kHz
2nd Harmonics Frequency Level	2f _o		-	-44	-	dBc
3rd Harmonics Frequency Level	3f _o		-	-60	-	dBc
Gain 1 dB Compression Output Power	P _{O (1 dB)}		-	21.0	-	dBm
Driver Part (Q1)						
Circuit Current	I _{CC}	No RF Signal	-	23	-	mA
Power Gain	G _P	P _{in} = -30 dBm	-	21.0	-	dB
Isolation	ISL		-	32.0	-	dB
Input Return Loss	RL _{in}		-	10.5	-	dB
Output Return Loss	RL _{out}		-	10.0	-	dB
Gain 1 dB Compression Output Power	P _{O (1 dB)}		-	8.5	-	dBm
Saturated Output Power	P _{O (sat)}	P _{in} = -5 dBm	-	10.0	-	dBm

ELECTRICAL CHARACTERISTICS (f = 1.9 GHz, V_{CC} = V_{DS} = 3.0 V, T_A = +25°C, unless otherwise specified, using our standard test fixture)

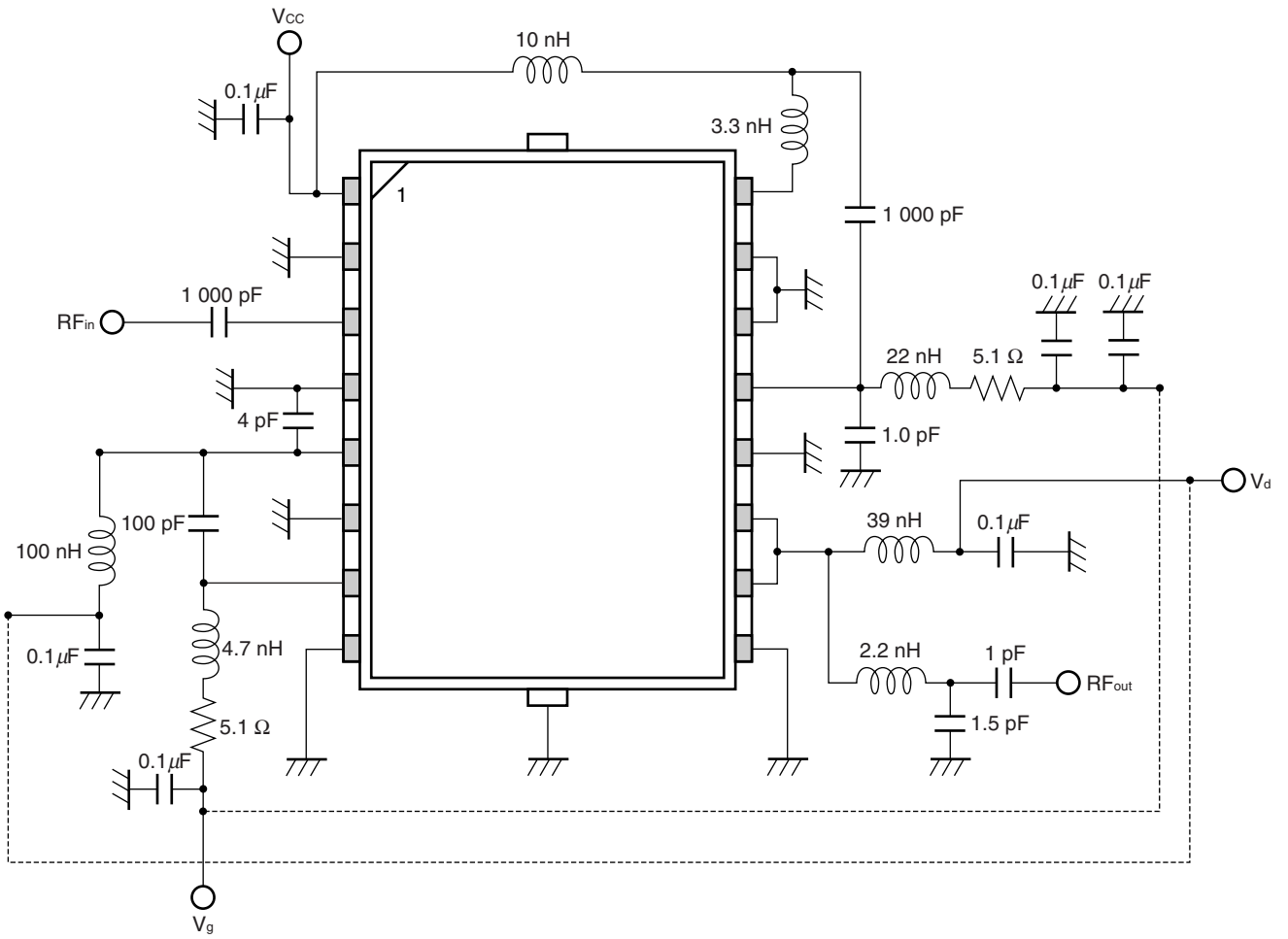
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
2 Stage PA Part (Q2+Q3)						
Gate Bias Voltage	V _{GS}	P _{in} = -5 dBm, P _{out} = -20.5 dBm	-	1.8	-	V
Power Added Efficiency	η _{add}		-	30.0	-	%
Drain Current	I _{DS} ^{Note}		-	121	-	mA
Input Return Loss	RL _{in}	P _{in} = -20 dBm	-	10.0	-	dB
Output Return Loss	RL _{out}		-	3	-	dB
Output Power	P _{out}	P _{in} = -5 dBm	-	21.0	-	dBm
Power Gain	G _P		-	26.0	-	dB
Linear Gain	G _L	P _{in} = -20 dBm	-	26.0	-	dB
Adjacent Channel Power 1	P _{adj} (600)	P _{in} = -5 dBm, Δ1600 kHz	-	-60	-	dBc
Adjacent Channel Power 1	P _{adj} (900)	P _{in} = -5 dBm, Δ1900 kHz	-	-70	-	dBc
Occupied Band Width	OBW	P _{in} = -5 dBm	-	250.0	-	kHz
2nd Harmonics Frequency Level	2f _o		-	-40	-	dBc
3rd Harmonics Frequency Level	3f _o		-	-45	-	dBc
Gain 1 dB Compression Output Power	P _O (1 dB)		-	21.0	-	dBm

Note I_{DS} is total drain currents of Q2 and Q3 part

DC CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Driver Part (Q1)						
Collector Current	I _{CC}	V _{CC} = 3.0 V	-	23	30	mA
2 Stage PA Part (Q2)						
On-state Resistance 2	R _{on2}	V _{DS} = 0.1 V, V _{GS} = 6 V	-	4.35	-	Ω
Drain to Source Breakdown Voltage 2	BV _{DSS2}	I _{DS} = 1.4 μA	10.0	12.0	16.0	V
Gate to Source Breakdown Voltage 2	BV _{GSS2}	I _{GS} = 1.4 μA	6.0	11.5	16.0	V
Gate Threshold Voltage 2	V _{th2}	V _{DS} = 3.5 V, I _{DS} = 1.4 mA	1.15	1.40	1.65	V
Transconductance 2	g _{m2}	V _{DS} = 3.5 V, I _{DS} = 25 mA	50	70	-	mS
2 Stage PA Part (Q3)						
On-state Resistance 3	R _{on3}	V _{DS} = 0.1 V, V _{GS} = 6 V	-	1.02	-	Ω
Drain to Source Breakdown Voltage 3	BV _{DSS3}	I _{DS} = 8.0 μA	10.0	12.0	16.0	V
Gate to Source Breakdown Voltage 3	BV _{GSS3}	I _{GS} = 8.0 μA	6.0	11.5	16.0	V
Gate Threshold Voltage 3	V _{th3}	V _{DS} = 3.5 V, I _{DS} = 8.0 mA	1.15	1.40	1.65	V
Transconductance 3	g _{m3}	V _{DS} = 3.5 V, I _{DS} = 150 mA	290	370	-	mS

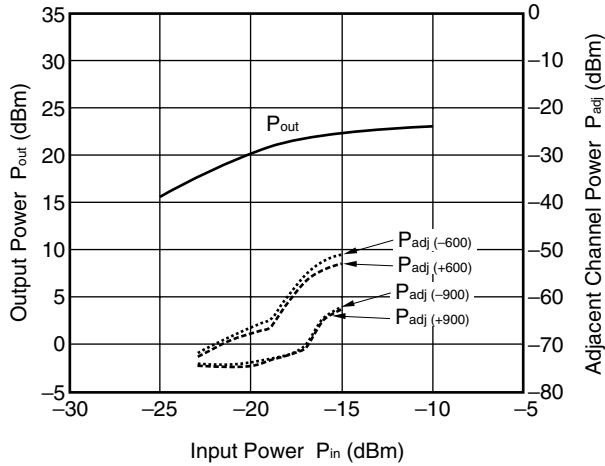
TEST CIRCUIT



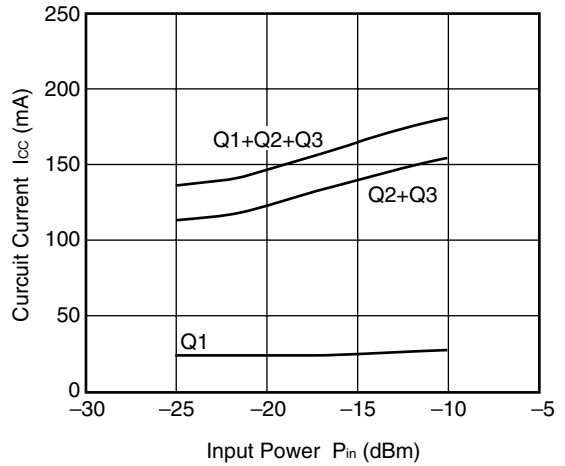
Remark Back Surface on GND

TYPICAL CHARACTERISTICS (f = 1.9 GHz, V_{DS} = V_{CC} = 3 V, T_A = +25°C, unless otherwise specified)

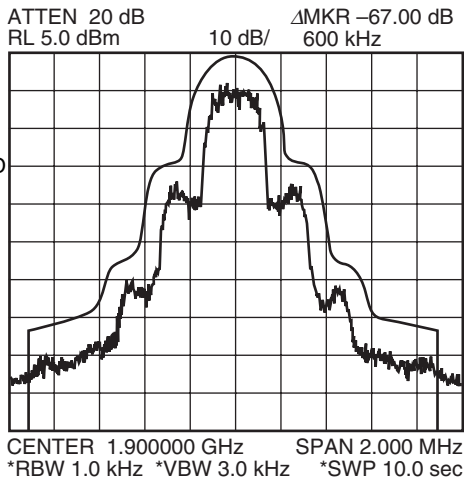
OUTPUT POWER, ADJACENT CHANNEL POWER vs. INPUT POWER



CIRCUIT CURRENT vs. INPUT POWER



ADJACENT CHANNEL POWER

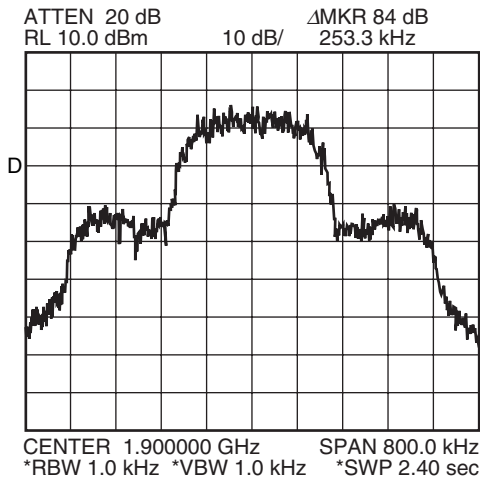


$P_{out} = 20.5 \text{ dBm}, P_{in} = -19 \text{ dBm}$
 $P_{adj} (+600 \text{ kHz}) = -67.0 \text{ dBc}$
 $P_{adj} (+900 \text{ kHz}) = -73.3 \text{ dBc}$

<Measurement Conditions>

Signal Generator	Spectrum Analyzer
Anritsu MG3670B	HP8561E
MOD : $\pi/4$ DQPSK	PBW : 1.0 kHz
bit rate : 384 kbps	VBW : 3.0 kHz
Source : internal	SPAN : 2 MHz
Filter : RNYQ	SWP : 10 sec
Roll Off : 0.5	ATT : > 10 dB
Phase Encode : Normal	Channel-SP : 600 kHz
Burst : Off	Channel-BW : 192 kHz
Pattern : PN9	

OCCUPIED BAND WIDTH

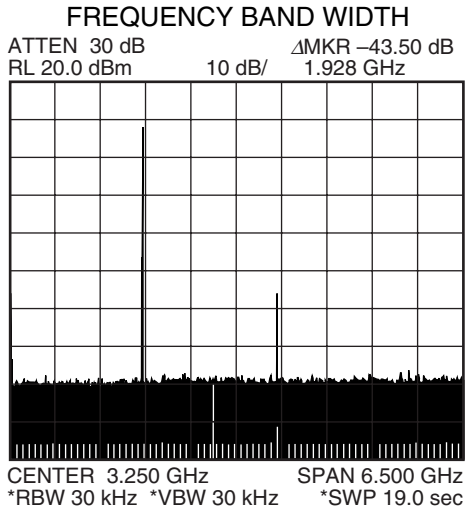


$P_{out} = 20.5 \text{ dBm}, P_{in} = -19 \text{ dBm}$

<Measurement Conditions>

Signal Generator	Spectrum Analyzer
Anritsu MG3670B	HP8561E
MOD : $\pi/4$ DQPSK	PBW : 1.0 kHz
bit rate : 384 kbps	VBW : 1.0 kHz
Source : internal	SPAN : 800 kHz
Filter : RNYQ	SWP : 2.4 sec
Roll Off : 0.5	Signal : < 5 dB form
Phase Encode : Normal	REF Level
Burst : Off	
Pattern : PN9	

Remark The graphs indicate nominal characteristics.

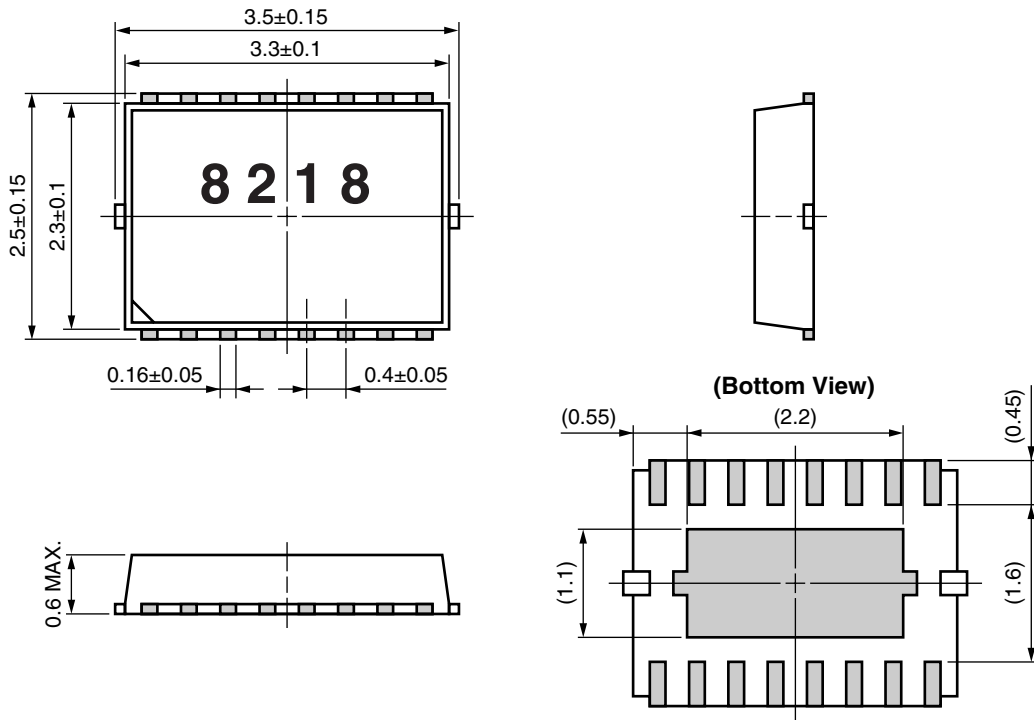


$P_{out} = 20.5 \text{ dBm}$, $P_{in} = -19 \text{ dBm}$
 $2f_0 = -43.5 \text{ dBc}$
 $3f_0 < -60 \text{ dBc}$

Remark The graph indicates nominal characteristics.

PACKAGE DIMENSIONS

16-PIN PLASTIC TSON (UNIT: mm)



Remark (): Reference value

NOTES ON CORRECT USE

- (1) Observe precautions for handling because of electro-static sensitive devices.
- (2) Form a ground pattern as widely as possible to minimize ground impedance (to prevent undesired oscillation).
All the ground pins must be connected together with wide ground pattern to decrease impedance difference.
- (3) The bypass capacitor should be attached to Vcc line.

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
Wave Soldering	Peak temperature (molten solder temperature) : 260°C or below Time at peak temperature : 10 seconds or less Preheating temperature (package surface temperature) : 120°C or below Maximum number of flow processes : 1 time Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (pin 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).

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M8E 00.4-0110

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