

RDS DATA DEMODULATOR IC

The μ PC2539 is data demodulator IC for FM receiver applying to Radio Data System in European countries and Radio Broadcasting Data System in USA.

This IC carries out to extract 57kHz RDS signal from FM multiplex signal, demodulate data-stream, recover bit-rate-clock, and discriminate SK signal in ARI system.

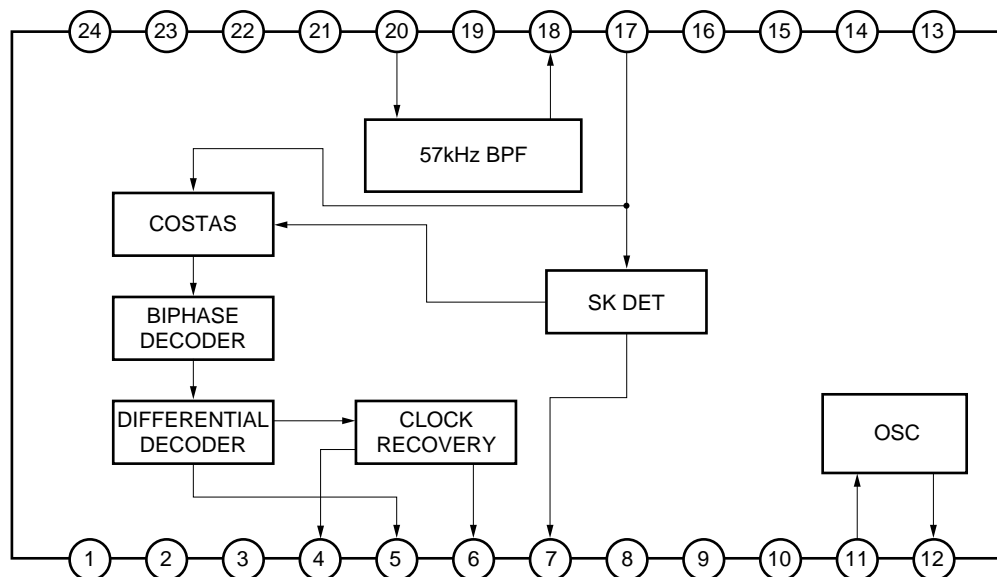
FEATURES

- Adjustment-free
- Built-in 57kHz band-pass-filter consist of switched capacitors.
- High sensitivity.
- Employing digital PLL.
- Small outline plastic package

ORDERING INFORMATION

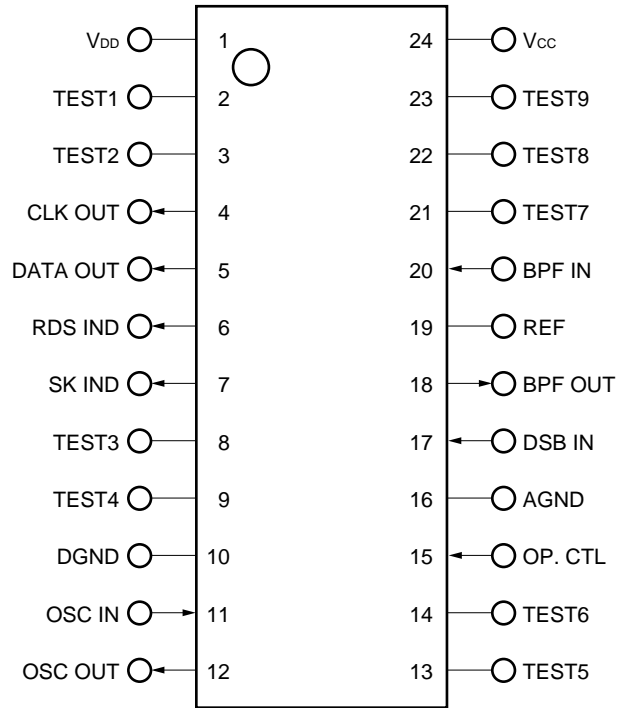
Part Number	Package
μ PC2539GS	24-pin plastic SOP (300 mil)

BLOCK DIAGRAM



The information in this document is subject to change without notice.

PIN CONFIGURATION (Top View)



PIN FUNCTIONS

Pin no.	Pin name	Function
1	V _{DD}	Power Supply for Digital Circuit
2	TEST1	Pin for Test : Normally connect to GND.
3	TEST2	Pin for Test : Normally be open.
4	CLK OUT	Bit-Rate-Clock Output Pin
5	DATA OUT	RDS Data Output Pin
6	RDS IND	RDS Identification Indicator : When RDS signal is detected, the output voltage becomes to Low level.
7	SK IND	SK Identification Indicator : When SK signal is detected, the output voltage becomes to Low level.
8	TEST3	Pin for Test : Normally connect to GND.
9	TEST4	Pin for Test : Normally connect to GND.
10	DGND	GND for Digital Circuit
11	OSC IN	Oscillator Input Pin
12	OSC OUT	Oscillator Output Pin
13	TEST5	Pin for Test : Normally be open.
14	TEST6	Pin for Test : Normally connect to GND.
15	OP.CTL	Operation/Stop control Pin : High:Operation mode, Low:Stop mode
16	AGND	GND for Analog Circuit
17	DSB IN	DSB Demodulator Input Pin
18	BPF OUT	Band-Pass-Filter Output Pin
19	REF	Reference Voltage for BPF
20	BPF IN	Band-Pass-Filter Input Pin
21	TEST7	Pin for Test : Normally connect to GND.
22	TEST8	Pin for Test : Normally connect to GND.
23	TEST9	Pin for Test : Normally connect to GND.
24	V _{CC}	Power Supply for Analog Circuit

ELECTRICAL SPECIFICATIONS (PRELIMINARY)**ABSOLUTE MAXIMUM RATINGS (Unless otherwise specified, $T_A=25^\circ\text{C}$)**

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}	V_{CC} pin, V_{DD} pin	7.0	V
Power dissipation	P_d	$T_A=85^\circ\text{C}$	280	mW
Operating ambient temperature	T_{opt}		-30 to +85	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

Caution Exposure to Absolute Maximum Rating for extended periods may affect device reliability; exceeding the ratings could cause permanent damage. The parameters apply independently.

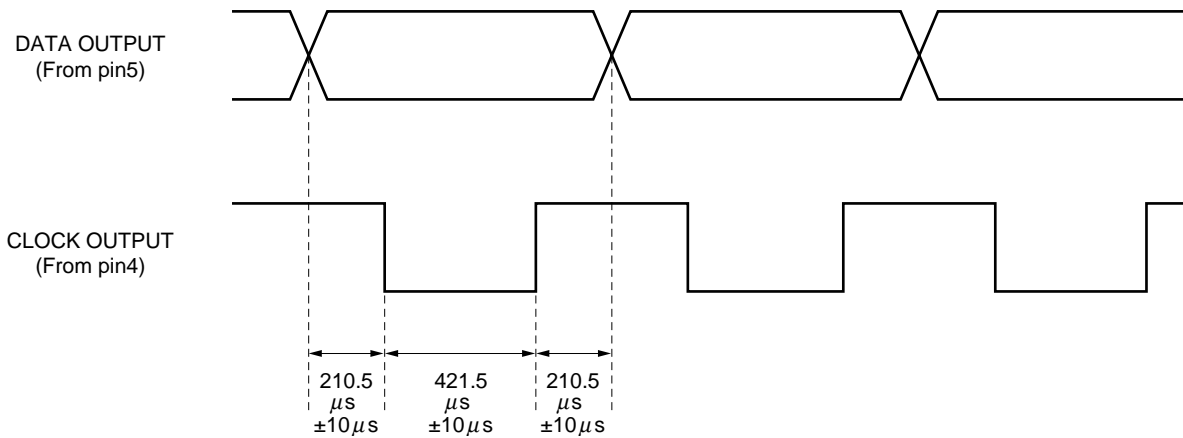
RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Supply voltage	V_{CC}	V_{CC} pin, V_{DD} pin	4.5	5.0	5.5	V
FM Demodulation Signal Input Voltage	V_{in}	MONO, $\Delta f=75\text{kHz}$		280		mVrms

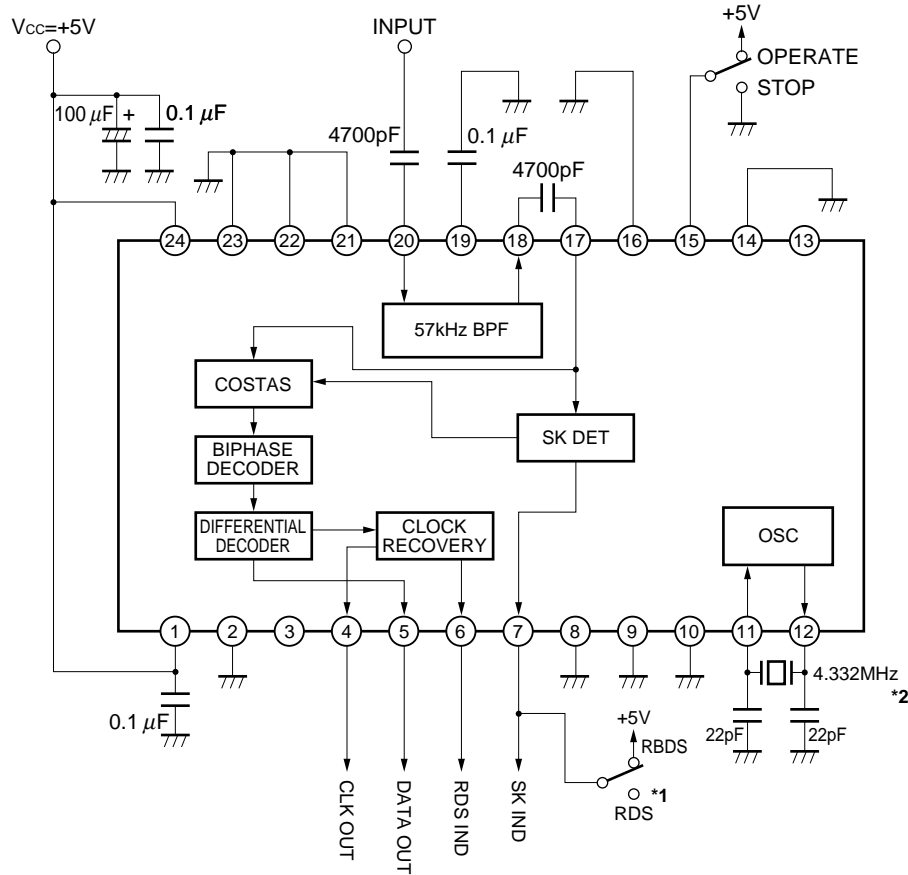
ELECTRICAL CHARACTERISTICS (Unless otherwise specified, $T_A=25^\circ\text{C}$, $V_{CC}=V_{DD}=5.0\text{V}$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Circuit current	I_{CC}	No Signal	10	15	20	mA
SK Detection Sensitivity(ON)	S_{sk1}	SK ONLY	2.5	3.5	4.5	mVrms
SK Detection Sensitivity(OFF)	S_{sk2}	SK ONLY	1.0	2.0	3.0	mVrms
RDS Detection Sensitivity	S_{rds}	RDS ONLY, DATA(101010..)	0.1	0.2	0.6	mVrms
SK Lock Up Time	T_{sk}	SK ONLY, $V_{sk}=10\text{mVrms}$	12	16	20	bit
RDS Lock Up Time 1	T_{rds1}	RDS ONLY	10	40	80	bit
RDS Lock Up Time 2	T_{rds2}	RDS+SK, $V_{sk}=10\text{mVrms}$	20	50	100	bit
Output Voltage(H Level)	VOH	$I_o=\pm 100\mu\text{A}$, Pin 4, 5, 6	4.90	4.95	-	V
		$I_o=\pm 5\mu\text{A}$, Pin 7	4.90	4.95	-	V
Output Voltage(L Level)	VOL	$I_o=\pm 100\mu\text{A}$, Pin 4, 5, 6	-	0.05	0.10	V
		$I_o=\pm 5\mu\text{A}$, Pin 7	-	0.05	0.10	V
Band-Pass-Filter Characteristics						
Peak Gain	A_v	$f_{in}=57\text{kHz}$, $V_{in}=10\text{mVrms}$	22	25	28	dB
Pass Band Width	BW	$A_v-3\text{dB}$	2.8	3.3	3.8	kHz
Attenuation 1	ATT1	$f_{in}=53\text{kHz}$, $V_{in}=10\text{mVrms}$	23	27	31	dB
Attenuation 2	ATT2	$f_{in}=38\text{kHz}$, $V_{in}=10\text{mVrms}$	75	85	-	dB
Maximum Input Level	V_{inmax}	$f_{in}=57\text{kHz}$	120	150	-	mVp-p
Signal to Noise Ratio	S/N	$f_{in}=57\text{kHz}$, $V_{in}=3\text{mVrms}$	25	30	-	dB
Input Impedance	Z_{in}		26	35	44	$k\Omega$
Output Impedance	Z_{out}		-	300	660	Ω

TIMING CHART OF DATA OUTPUT AND CLOCK OUTPUT

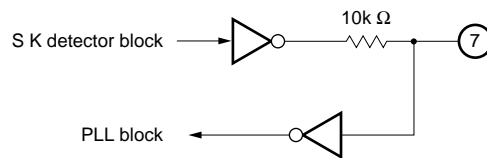


APPLICATION CIRCUIT ESAMPLE



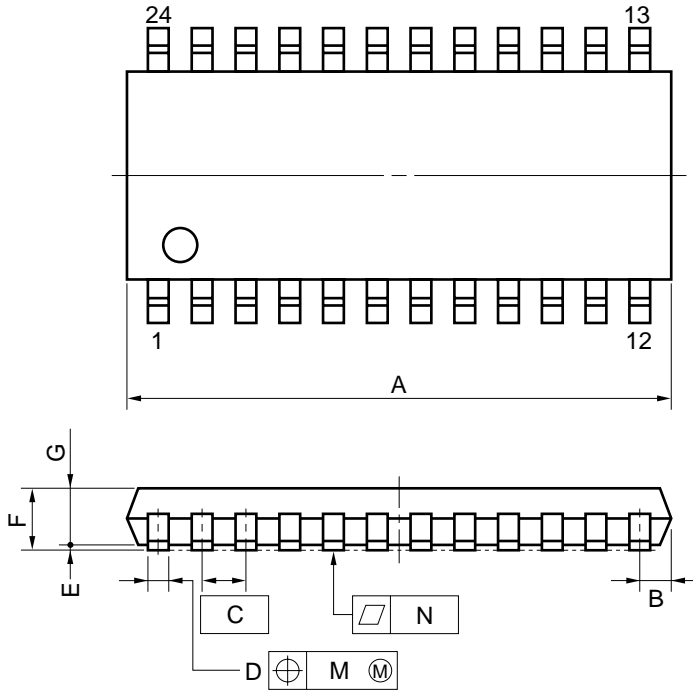
- Notes**
1. Pin 7 does not have ability enough to drive LED directly because of internal serial resistor (10kΩ) shown in following figure. In application for system with no ARI signal such as RBDS in USA, pin 7 is recommended to be connected with V_{DD}.
 2. Crystal oscillation frequency tolerance : ±100ppm

The equivalent circuit in pin 7

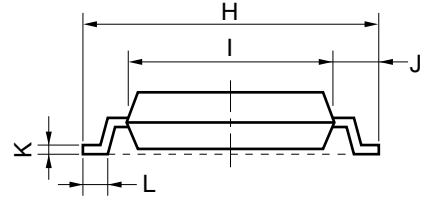
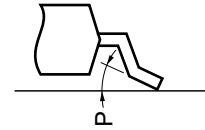


PACKAGE DRAWING

24 PIN PLASTIC SOP (300 mil)



detail of lead end



NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	15.54 MAX.	0.612 MAX.
B	0.78 MAX.	0.031 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	0.40 ^{+0.10} _{-0.05}	0.016 ^{+0.004} _{-0.003}
E	0.1±0.1	0.004±0.004
F	1.8 MAX.	0.071 MAX.
G	1.55	0.061
H	7.7±0.3	0.303±0.012
I	5.6	0.220
J	1.1	0.043
K	0.20 ^{+0.10} _{-0.05}	0.008 ^{+0.004} _{-0.002}
L	0.6±0.2	0.024 ^{+0.008} _{-0.009}
M	0.12	0.005
N	0.10	0.004
P	3° ^{+7°} _{-3°}	3° ^{+7°} _{-3°}

P24GM-50-300B-4

The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.

NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or others.

While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customer must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.

NEC devices are classified into the following three quality grades:

“Standard”, “Special”, and “Specific”. The Specific quality grade applies only to devices developed based on a customer designated “quality assurance program” for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices in “Standard” unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact NEC Sales Representative in advance.

Anti-radioactive design is not implemented in this product.