

AN7399S

Spatializer sound processor IC

■ Overview

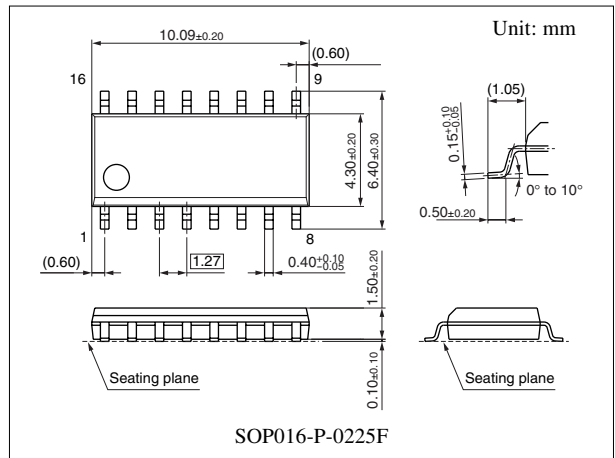
A spatializer audio processor is the Desper Inc.'s proprietary signal processing technology exclusively developed for the consumer electronics and multi-media market. It is based on the Desper's professional 3D audio production system "PRO-Spatializer". You can enjoy a sound enhancement and extension effect with the conventional two-speaker stereo system by using the innovative technology adopted in this equipment.

■ Features

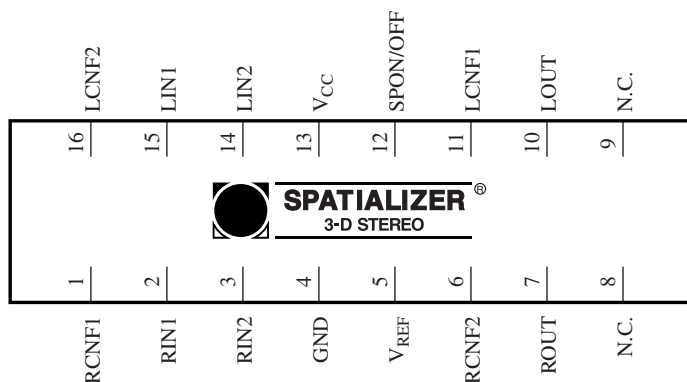
- Fewer external parts (minimum parts count: 4)
- Wide operating supply voltage: 4.5 V to 10 V
- A sound source in the center position is necessarily positioned in center regardless of the spatializer effect value.

■ Applications

- Radio cassette recorder, stereo-sound TV and VCR, personal computer, active speaker



■ Pin Assignment



Note) Spatializer® and the device trademark of circle-in-square are owned by Desper Products Inc..

This product can be used with the consent of the Desper Products Inc..

Under the terms of the agreement between Matsushita Electronics and Desper Products Inc., no technical information on the Spatializer, which is applied to this product, shall be provided.

■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	RCNF1	9	N.C.
2	RIN1	10	LOUT
3	RIN2	11	LCNF1
4	GND	12	SPON/OFF
5	V _{REF}	13	V _{CC}
6	RCNF2	14	LIN2
7	ROUT	15	LIN1
8	N.C.	16	LCNF2

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V _{CC}	10.5	V
Supply current	I _{CC}	3.0	mA
Power dissipation	P _D	31.5	mW
Operating ambient temperature *	T _{opr}	-25 to +75	°C
Storage temperature *	T _{stg}	-55 to +150	°C

Note) *: Except for the operating ambient temperature and storage temperature, all ratings are for T_a = 25°C.

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V _{CC}	4.5 to 10.0	V

■ Electrical Characteristics at V_{CC} = 9 V, freq. = 1 kHz, T_a = 25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off mode gain *1	VFFG	V _{IN} = 1 V[rms], f = 1 kHz	-1	0	1	dB
Off mode total harmonic distortion *1	THD _{FF}	V _{IN} = 1 V[rms], f = 1 kHz	—	0.01	0.05	%
On mode total harmonic distortion *1	THD _{ON}	V _{IN} = 0.4 V[rms], f = 1 kHz	—	0.02	0.1	%
Off mode output residual noise *2	N _{FF}	V _{IN} = 0 mV[rms], R _G = 4.7 kΩ	—	5	15	μV[rms]
On mode output residual noise *2	N _{ON}	V _{IN} = 0 mV[rms], R _G = 4.7 kΩ	—	7	20	μV[rms]
Crosstalk (off mode) *1	CT	V _{IN} = 1 V[rms], f = 1 kHz	—	-95	-75	dB
Maximum input level (off mode) *1	V _{MAX}	THD = 1%, f = 1 kHz	2.0	2.4	—	V[rms]
Total circuit current at no load	I _{TOTAL}	V _{IN} = 0 mV[rms]	0.8	1.4	2.0	mA
Off mode changeover voltage	V _{OFF}		0.0	—	0.5	V
On mode changeover voltage	V _{ON}		2.7	—	V _{CC}	V

Note) *1: Use DIN audio filter.

*2: Use A-characteristic curve filter.

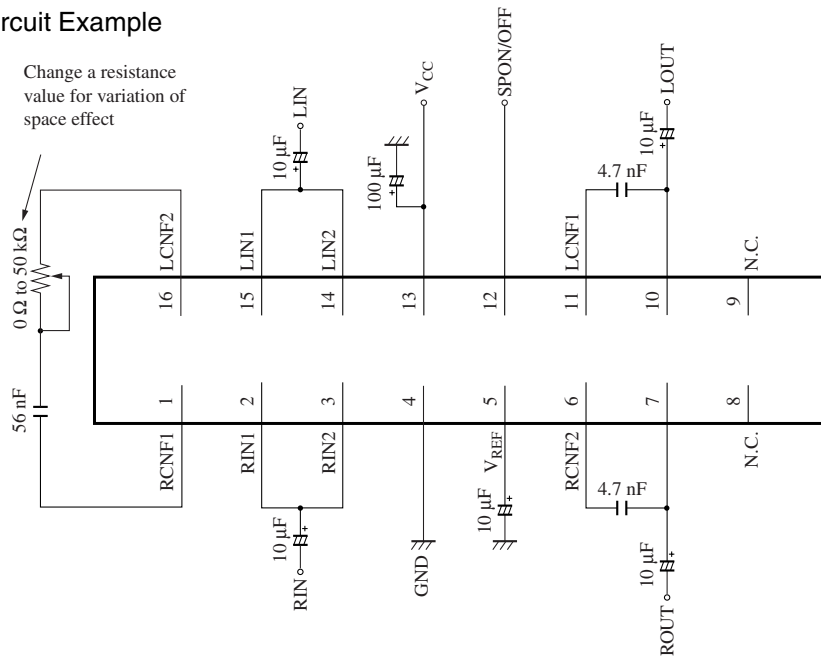
■ Terminal Equivalent Circuits

Pin No.	Symbol	Equivalent circuit	Description	Voltage
1	RCNF1	—	Capacitor pin 1	4.5 V
2	RIN1		R-ch. input pin 1	4.5 V
3	RIN2		R-ch. input pin 2	4.5 V
4	GND	—	GND pin	0 V
5	V _{REF}		Reference voltage stabilizing pin	4.5 V
6	RCNF2	—	Capacitor pin 2	4.5 V
7	ROUT		R-ch. output pin	4.5 V
8	N.C.	—	—	—
9	N.C.	—	—	—

■ Terminal Equivalent Circuits (continued)

Pin No.	Symbol	Equivalent circuit	Description	Voltage
10	LOUT		L-ch. output pin	4.5 V
11	LCNF1	—	Capacitor pin 3	4.5 V
12	SPON/OFF		Mode changeover pin	V_{CC} to 2.7 V / 0.5 V to 0 V
13	V_{CC}	—	Supply pin	V_{CC}
14	LIN1		L-ch. input pin 1	4.5 V
15	LIN2		L-ch. input pin 2	4.5 V
16	LCNF2	—	Capacitor pin 4	4.5 V

■ Application Circuit Example



■ Conceptual Description on Spatializer Operation

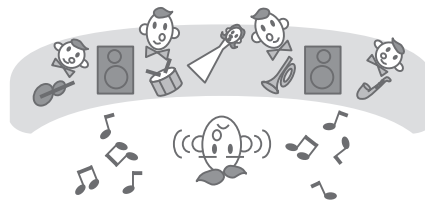
• Stereo normal mode

All sound are heard from between both left and right speakers.



• Conventional surround system

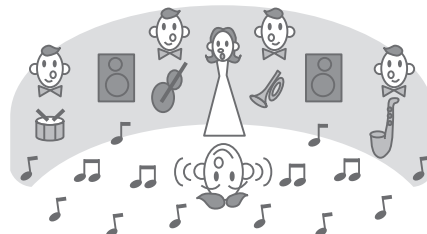
Sound expands outside the speakers but the sound position is not stable.



• Spatializer

The sound expands outside the two speakers and the sound position is stable.

The sound come to have its expansion and depth. And also, a sound source in the center position is necessarily positioned in center regardless of the spatializer effect value.



■ Usage Notes

1. Do not apply 0.3 V or more to pin 12 because it relates with pin 13 (V_{CC} pin)
2. If more than 0.3 V is applied to pin 12, the current flows to pin 13 (V_{CC} pin) via a surge protection diode connected to pin 12.

Request for your special attention and precautions in using the technical information and semiconductors described in this material

- (1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.
- (2) The technical information described in this material is limited to showing representative characteristics and applied circuit examples of the products. It does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.
- (3) The products described in this material are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
 - Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
 - Any applications other than the standard applications intended.
- (4) The products and product specifications described in this material are subject to change without notice for reasons of modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage and heat radiation characteristics. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, redundant design is recommended, so that such equipment may not violate relevant laws or regulations because of the function of our products.
- (6) When using products for which dry packing is required, observe the conditions (including shelf life and after-unpacking standby time) agreed upon when specification sheets are individually exchanged.
- (7) No part of this material may be reprinted or reproduced by any means without written permission from our company.

Please read the following notes before using the datasheets

- A. These materials are intended as a reference to assist customers with the selection of Panasonic semiconductor products best suited to their applications.
Due to modification or other reasons, any information contained in this material, such as available product types, technical data, and so on, is subject to change without notice.
Customers are advised to contact our semiconductor sales office and obtain the latest information before starting precise technical research and/or purchasing activities.
- B. Panasonic is endeavoring to continually improve the quality and reliability of these materials but there is always the possibility that further rectifications will be required in the future. Therefore, Panasonic will not assume any liability for any damages arising from any errors etc. that may appear in this material.
- C. These materials are solely intended for a customer's individual use.
Therefore, without the prior written approval of Panasonic, any other use such as reproducing, selling, or distributing this material to a third party, via the Internet or in any other way, is prohibited.