

M62436FP

SRS Sound Controller with SRS FOCUS, SRS Surround Sound On-Chip Sound Controller

REJ03F0061-0100Z

Rev.1.0

Sep.19.2003

Description

The M62436FP is a soundstaging control IC that was developed primarily for car audio systems. It provides increased flexibility in speaker placement and can also be used for home audio applications. (The M62436FP is particularly effective when combined with SRS.)

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Features

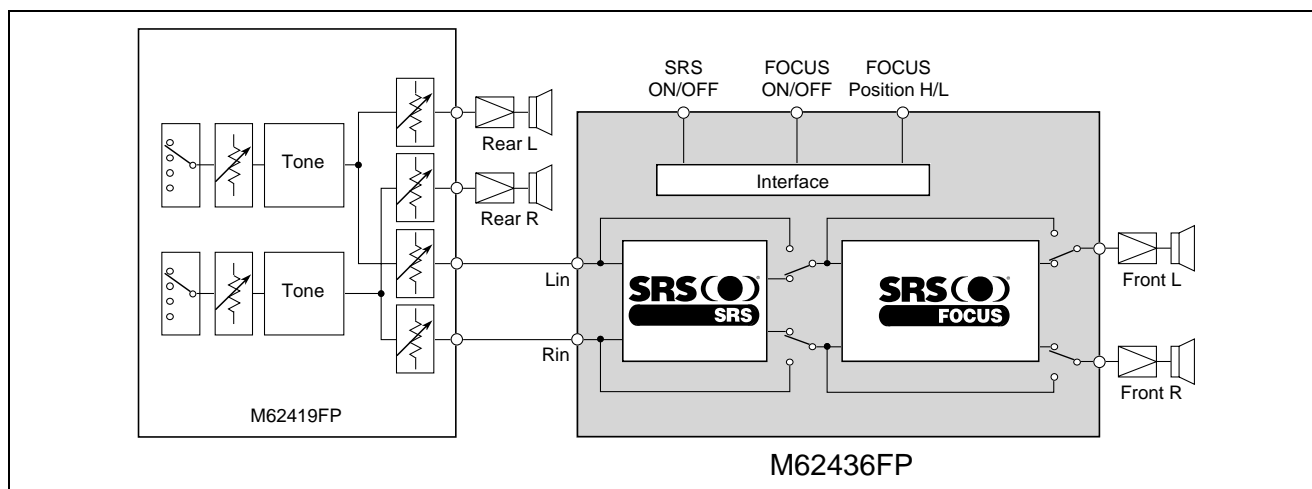
- On-chip SRS Focus
- On-chip SRS sound
- SRS on/off, Focus on/off, and bypass settings implemented using DC control

Recommended Operating Conditions

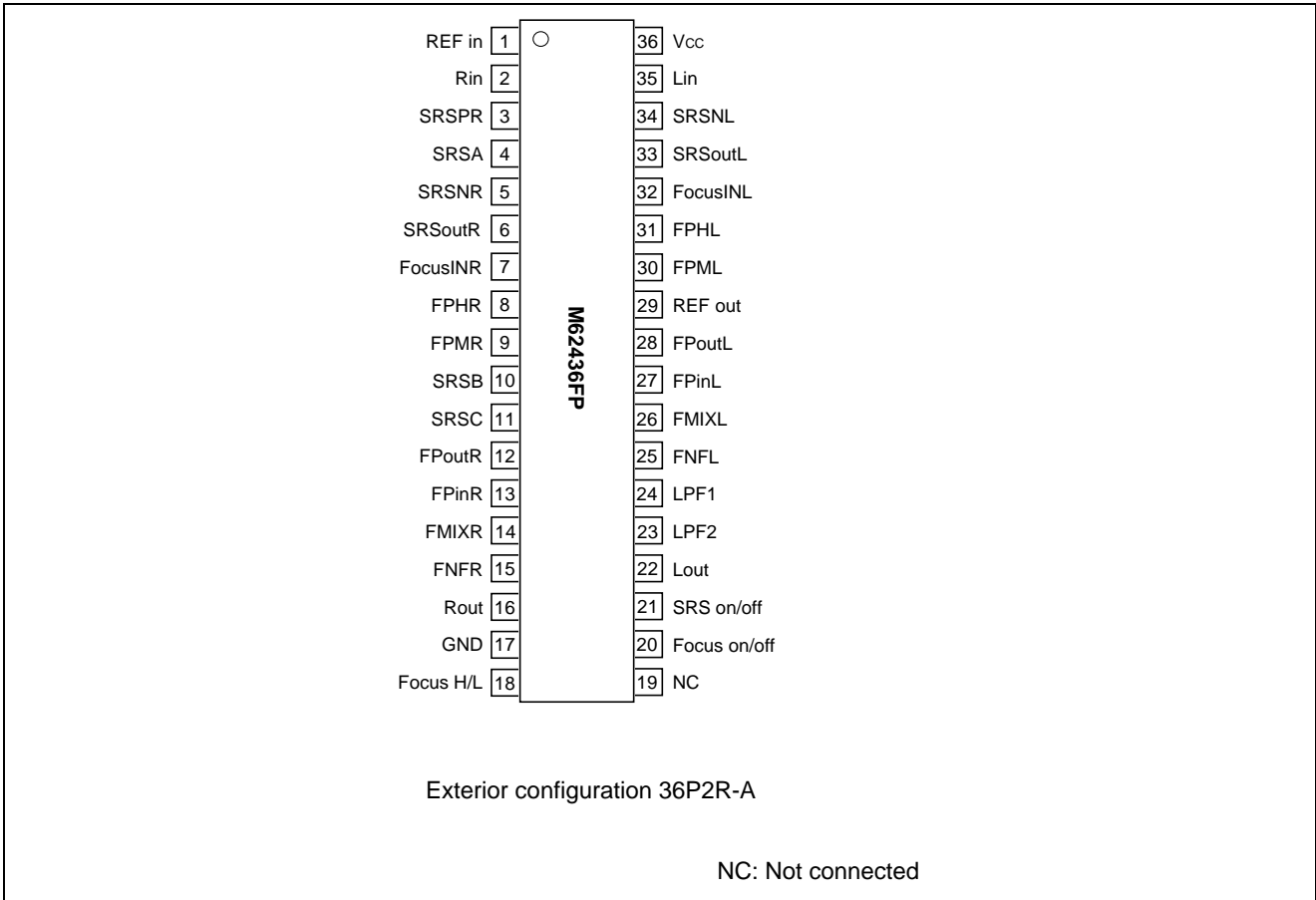
Power supply voltage range: $V_{cc} = 4.5-12\text{ V}$

Rated power supply voltage: $V_{cc} = 8\text{ V}$

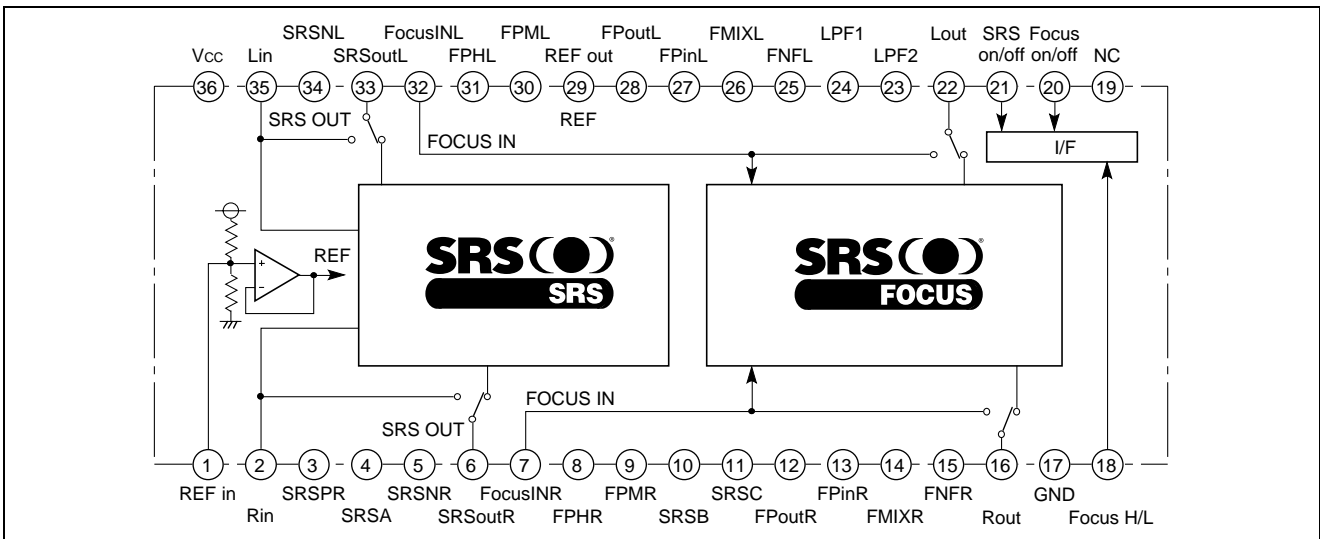
System Block Diagram



Pin Configuration Diagram (Top View)



Internal Block Diagram



Pin Description

Pin No.	Symbol	Function
1	REF in	REF input
2	Rin	Right channel input
3	SRSPR	Right channel SRS output OP positive input
4	SRSA	SRS filter capacitor connection A
5	SRSNR	Right channel SRS output OP negative input
6	SRSoutR	Right channel SRS output
7	FocusINR	Right channel Focus input
8	FPHR	Right channel LF high input
9	FPMR	Right channel LF mid input
10	SRSB	SRS filter capacitor connection B
11	SRSC	SRS filter capacitor connection C
12	FPoutR	Right channel LF output
13	FPinR	Right channel HF input
14	FMIXR	Right channel LF HF mix
15	FNFR	Right channel Focus output
16	Rout	Right channel output
17	GND	Ground
18	LF Position H/L	LF position H/L setting
19	NC	NC
20	Focus on/off	Focus on/off setting
21	SRS on/off	SRS on/off setting
22	Lout	Left channel output
23	LPF2	Bass filter capacitor connection 2
24	LPF1	Bass filter capacitor connection 1
25	FNFL	Left channel Focus output
26	FMIXL	Left channel LF HF mix
27	FPinL	Left channel HF output
28	FPoutL	Left channel LF output
29	REF out	REF output
30	FPML	Left channel LF mid input
31	FPHL	Left channel LF high input
32	FocusINL	Left channel Focus input
33	SRSoutL	Left channel SRS output
34	SRSNL	Left channel SRS output OP negative input
35	Lin	Left channel input
36	Vcc	Power supply

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Power supply voltage	VCC	12.0	V	
Internal power consumption	Pd	960	mW	Ta≤25°C
Heat reduction ratio	Kθ	9.6	mW/°C	Ta>25°C
Ambient operating temperature	Topr	-20 to +75	°C	
Storage temperature	Tstg	-55 to +125	°C	

Electrical Characteristics

(Ta = 25°C, V_{CC} = 8 V, and f = 1 kHz unless otherwise noted.)

Item	Symbol	Limits			Unit	Test Conditions
		Min.	Typ.	Max.		
Power supply characteristics						
Circuit current	I _{CC}	—	22	45	mA	Pin 36 current, no signal
I/O characteristics (R13 = R16 = 390, R14 = R17 = 200, R15 = R18 = 390, R40 = R42 = 10 kΩ unless otherwise noted.)						
Maximum output voltage	VOMt	1.6	1.9	—	V _{rms}	Pins 2 and 35 input, pins 16 and 22 output R _L = 10 kΩ, THD = 1%
Maximum input voltage	VIM1	0.32	0.65	—	V _{rms}	Pins 2 and 35 input, pins 16 and 22 output SRS: on, Focus: off, THD = 1% f = 150HMz
	VIM2	0.25	0.5	—	V _{rms}	Pins 2 and 35 input, pins 16 and 22 output f = 1kHMz
	VIM3	0.2	0.4	—	V _{rms}	Pins 2 and 35 input, pins 16 and 22 output SRS: on Focus: Position "H" on THD = 1% f = 20kHMz
Pass-through gain	Gvt	-2.0	0	2.0	dB	V _i = 100 mV _{rms} , SRS: off, Focus: off Gain between pins 2 and 35 and pins 16 and 22
	Gv1	7	10	13	dB	V _i = 100 mV _{rms} Pins 2 and 35 input, pins 16 and 22 output SRS: on, Focus: off f = 150HMz
	Gv2	10	13	16	dB	V _i = 100 mV _{rms} SRS: on f = 1kHMz
	Gv3	12	15	18	dB	SRS: on Focus: Position "H" on Gain between pins 2 and 35 and pins 16 and 22 f = 20kHMz
Output noise voltage	VNO1	—	5.0	15	μV _{rms}	R _g = 0 (pins 2 and 35), SRS: off, Focus: off DIN-audio filter
	VNO2	—	18	40	μV _{rms}	R _g = 0 (pins 2 and 35), SRS: on, Focus: off DIN-audio filter
	VNO3	—	50	90	μV _{rms}	R _g = 0 (pins 2 and 35) SRS: on, Focus: Position "H" on DIN-audio filter
Crosstalk between channels	CT	—	-90	-75	dB	Input side: f = 1 kHz, V _i = 0.5 V _{rms} Measurement side: R _g = 0, JIS-A filter Focus and SRS: off, R _L = 10 kΩ
Switch Block Characteristics						
High level input voltage	V _{IH}	2.1	~	V _{CC}	V	Pins 18, 20, 21
Low level input voltage	V _{IL}	0	~	0.8	V	Pins 18, 20, 21

Switch Settings

Pin 21 SRS Surround	SRS On/Off Switch
SRS ON	H
SRS OFF	L

Pin 19 Focus Position	Focus H/L Switch
Focus Position "H"	H
Focus Position "L"	L

Pin 20 Focus	Focus On/Off Switch
FOCUS ON	H
FOCUS OFF	L

Note: The bypass mode can be selected by setting the SRS on/off switch and Focus on/off switch to "L".

External Resistors

The midrange through high-range gain of the Focus circuit of the M62436FP can be specified using an externally connected resistor.

The midrange through high-range gain is set by the resistance division value between the 0.22 μF connected to pin 7 and REF. The M62436FP allows the user-specified gain to be set to high or low by switching the Focus position H/L setting of pin 18. The recommended resistance value settings are listed below.

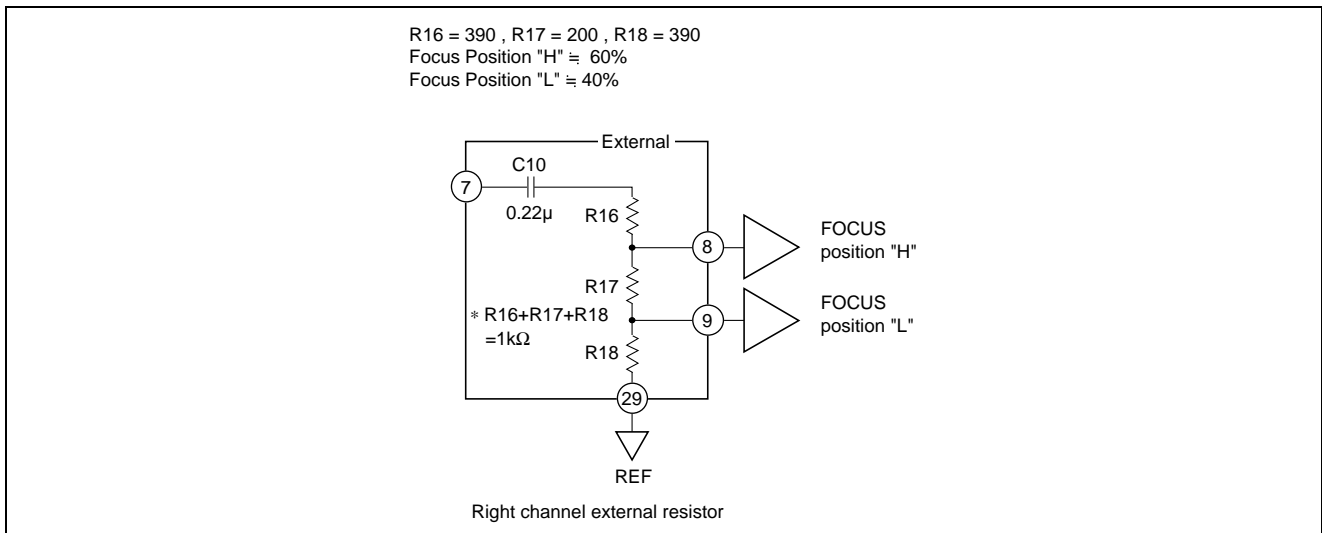
1. Focus Position "H" Setting

$$\frac{R17+R18}{R16+R17+R18} \text{ setting possible}$$

2. Focus Position "L" Setting

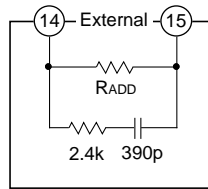
$$\frac{R18}{R16+R17+R18} \text{ setting possible}$$

Recommended Setting Values



- Notes 1. The left channel setting pins 7, 8, and 9 correspond to pins 32, 31, and 30.
- 2. Settings should be made so that R16 + R17 + R18 = 1 kΩ.

The effect (full-range gain) of the Focus circuit of the M62436FP can be reduced using an externally connected resistor.



Focus gain setting external resistor

The Focus gain can be reduced by connecting resistors between pins 14 and 15 and between pins 25 and 26. This has the effect of improving the maximum input voltage (and the output noise voltage) characteristics. However, there is a limitation on the maximum input voltage ($V_I = 0.6 V_{rms}$) due to the SRS sound block gain at $f = 150 \text{ Hz}$.

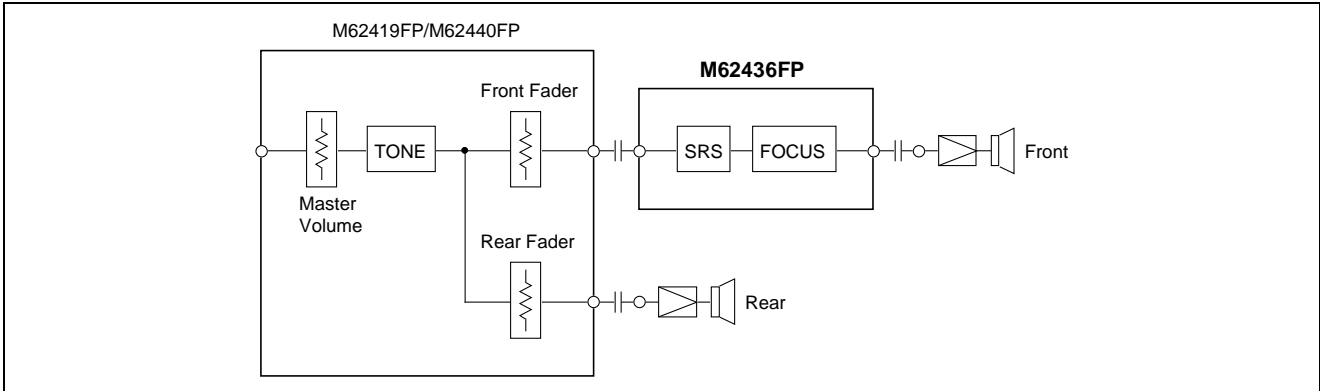
Reference

Note: $T_a = 25^\circ\text{C}$, $f = 1 \text{ kHz}$, $R_{13} = R_{16} = 390$, $R_{14} = R_{17} = 200$, $R_{15} = R_{18} = 390$, resistance between pins 14 and 15 and between pins 25 and 26 = $10 \text{ k}\Omega$ unless otherwise noted.)

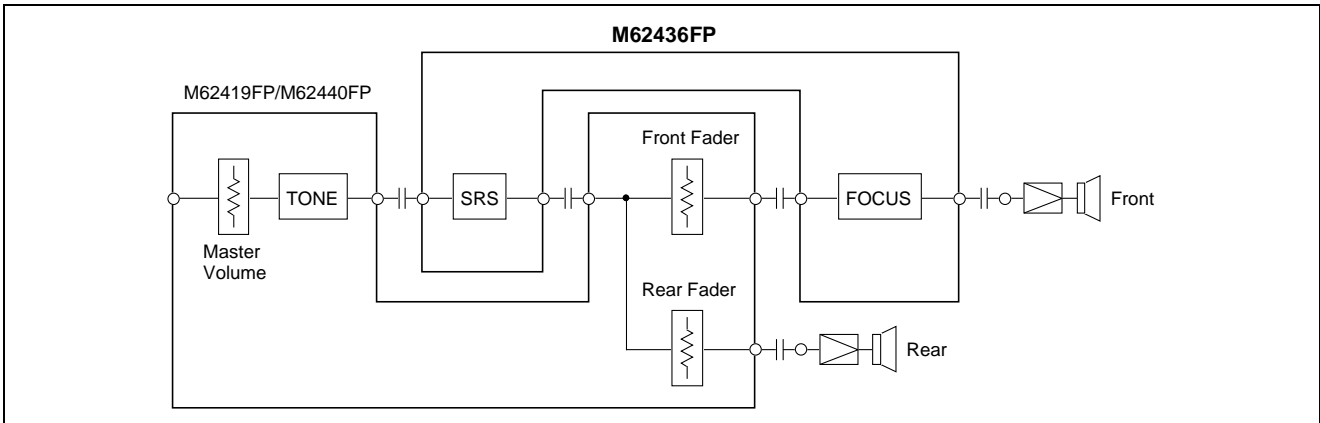
Item	Symbol	Typical Value	Unit	Test Conditions
Maximum output voltage	VOMt	1.9	Vrms	Pins 2 and 35 input, pins 16 and 22 output $R_L = 10 \text{ k}\Omega$, THD = 1%
Maximum input voltage	VIM1	0.65	Vrms	Pins 2 and 35 input, pins 16 and 22 output SRS: on, Focus: off, THD = 1%
	VIM2	0.85	Vrms	Pins 2 and 35 input, pins 16 and 22 output $f = 1 \text{ kHz}$
	VIM3	0.67	Vrms	Pins 2 and 35 input, pins 16 and 22 output $f = 20 \text{ kHz}$ SRS: on Focus: Position "H" on THD = 1%
Pass-through gain	Gvt	0	dB	$V_i = 100 \text{ mVrms}$, SRS: off, Focus: off Gain between pins 2 and 35 and pins 16 and 22
	Gv1	10	dB	$V_i = 100 \text{ mVrms}$ Pins 2 and 35 input, pins 16 and 22 output SRS: on, Focus: off $f = 150 \text{ Hz}$
	Gv2	7	dB	$V_i = 100 \text{ mVrms}$ SRS: on $f = 1 \text{ kHz}$
	Gv3	9	dB	SRS: on Focus: Position "H" on Gain between pins 2 and 35 and pins 16 and 22 $f = 20 \text{ kHz}$
Output noise voltage	VNO1	5	μVrms	$R_g = 0$ (pins 2 and 35), SRS: off, Focus: off DIN-audio filter
	VNO2	18	μVrms	$R_g = 0$ (pins 2 and 35), SRS: on, Focus: off DIN-audio filter
	VNO3	30	μVrms	$R_g = 0$ (pins 2 and 35) SRS: on, Focus: Position "H" on DIN-audio filter
Crosstalk between channels	CT	-90	dB	Input side: $f = 1 \text{ kHz}$, $V_i = 0.5 V_{rms}$ Measurement side: $R_g = 0$, JIS-A filter Focus and SRS: off, $R_L = 10 \text{ k}\Omega$

Sample System Circuit (Only One Channel Shown)

1. SRS Active for Front Speaker Only

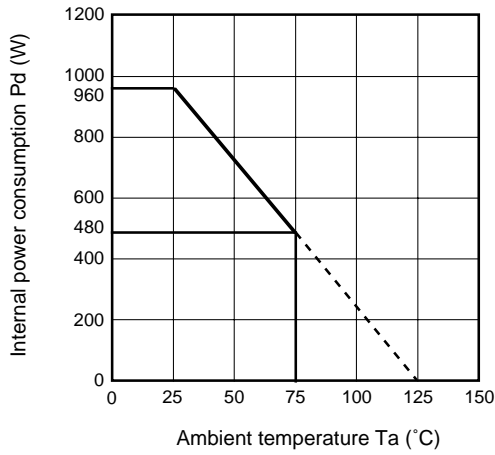


2. SRS Active for Front and Rear Speakers (Focus Active for Front Speaker Only)

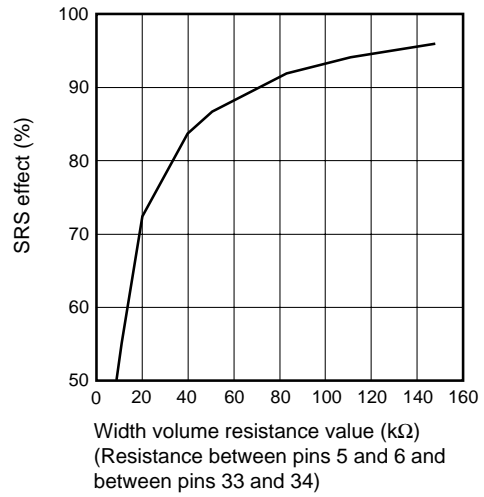


Characteristic Curves

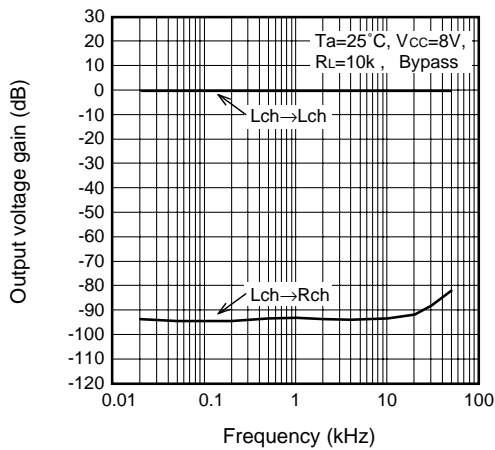
Heat Reduction Curve (Maximum Rating)



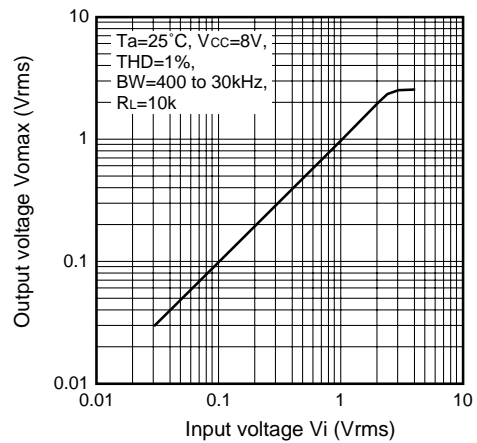
Width Volume Resistance Value-SRS Effect



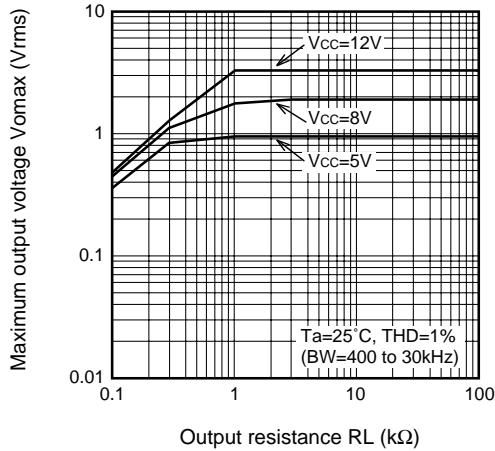
Frequency-Output Voltage Gain



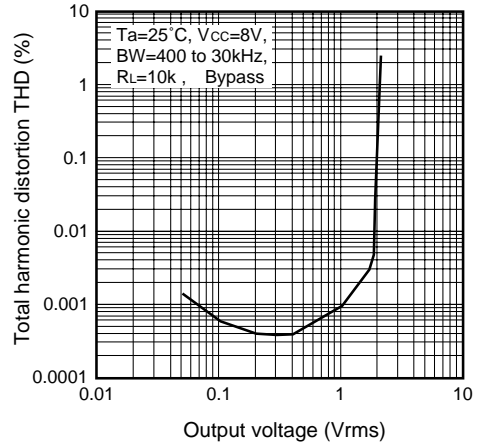
Input Voltage-Maximum Output Voltage

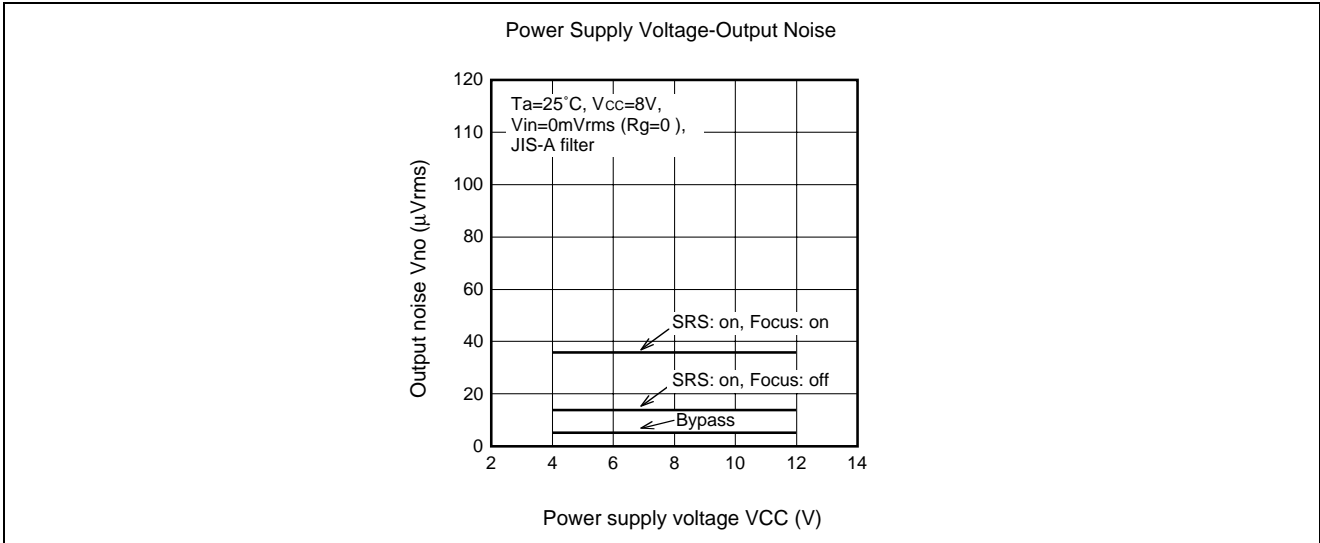


Maximum Output Voltage-Output Resistance

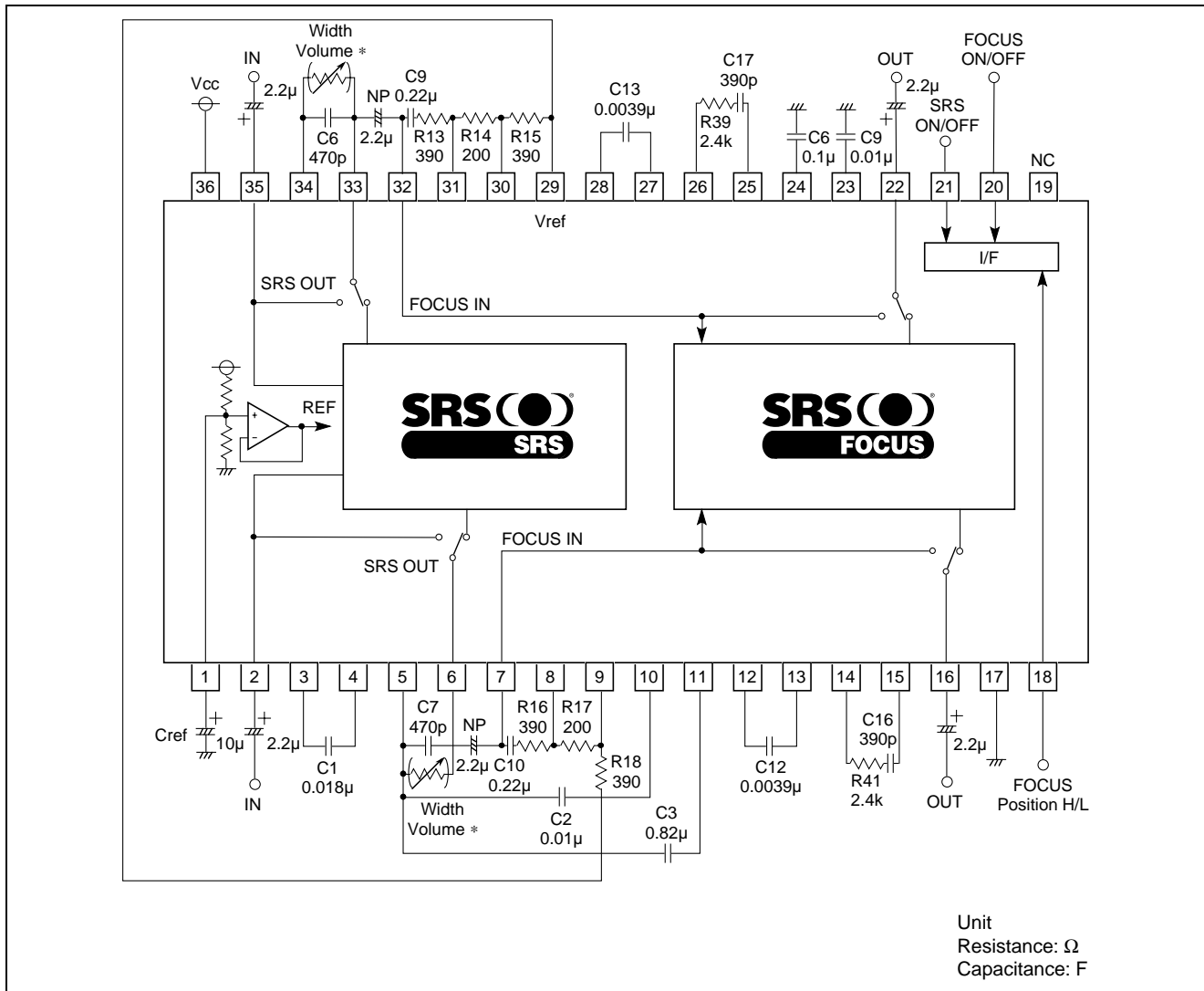


Output Voltage-Total Harmonic Distortion





Application Example



- * The SRS stereo effect can be reduced by connecting resistors (width volume) between pins 5 and 6 and between pins 33 and 34. However, the resistance value connected between pins 5 and 6 and between pins 33 and 34 should be the same.

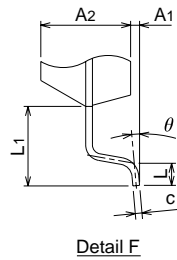
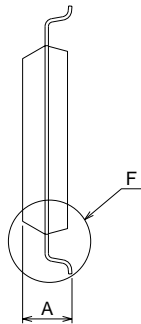
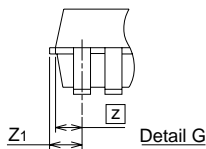
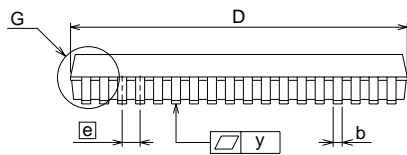
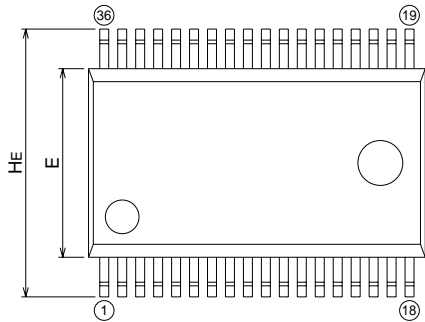
Usage Notes

No measures have been taken to prevent switching noise when the M62436FP's control switches (SRS on/off, Focus on/off, and Focus Position H/L) are operated. Therefore several tens of mV of switching noise may be generated. It is therefore recommended that external muting be applied to the output from the M62436FP when operating the switches. In addition, it is recommended that external muting be applied at power-on until all the necessary data has been written by the microprocessor.

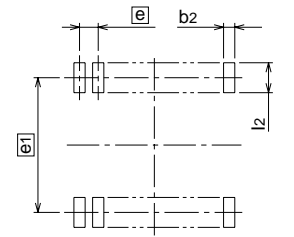
Package Dimensions

36P2R-A

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
SSOP36-P-450-0.80	⌀	0.53	Alloy 42



Plastic 36pin 450mil SSOP



Recommended Mount Pad

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	⌀	⌀	2.4
A1	0.05	⌀	⌀
A2	⌀	2.0	⌀
b	0.35	0.4	0.5
c	0.13	0.15	0.2
D	14.8	15.0	15.2
E	8.2	8.4	8.6
e	⌀	0.8	⌀
HE	11.63	11.93	12.23
L	0.3	0.5	0.7
L1	⌀	1.765	⌀
Z	⌀	0.7	⌀
Z1	⌀	⌀	0.85
y	⌀	⌀	0.15
θ	0Y	⌀	10Y
b2	⌀	0.5	⌀
e1	⌀	11.43	⌀
l2	1.27	⌀	⌀

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450 Holger Way, San Jose, CA 95134-1368, U.S.A
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Renesas Technology Europe Limited.
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, United Kingdom
Tel: <44> (1628) 585 100, Fax: <44> (1628) 585 900

Renesas Technology Europe GmbH
Dornacher Str. 3, D-85622 Feldkirchen, Germany
Tel: <49> (89) 380 70 0, Fax: <49> (89) 929 30 11

Renesas Technology Hong Kong Ltd.
7/F., North Tower, World Finance Centre, Harbour City, Canton Road, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2375-6836

Renesas Technology Taiwan Co., Ltd.
FL 10, #99, Fu-Hsing N. Rd., Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology (Shanghai) Co., Ltd.
26/F., Ruijin Building, No.205 Maoming Road (S), Shanghai 200020, China
Tel: <86> (21) 6472-1001, Fax: <86> (21) 6415-2952

Renesas Technology Singapore Pte. Ltd.
1, Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001