M62384FP

8-Bit, 4-Channel, 3 to 5 V D-A Converter (Buffered)

REJ03F0077-0100Z
Rev.1.0
Sep.19.2003

Description

The M62384 is a CMOS-structure semiconductor integrated circuit incorporating four 8-bit D-A converter channels with output buffer op-amps.

Serial data transfer type input can easily be used through a combination of three lines: DI, CLK, and LD. Outputs incorporate buffer op-amps that have a drive capacity of 1 mA or above for both sink and source, and can operate over the entire voltage range from almost ground to VCC (0 to 5 V), making peripheral elements unnecessary and enabling configuration of a system with few component parts.

Support of power supply voltages of 3 V to 5 V enables the M62384 to be used in a wide range of applications.

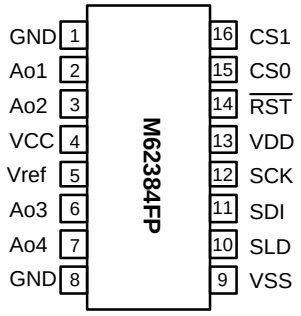
Features

- 12-bit serial data input (3-line type: SDI, SCK, SLD)
- Serial data transfer clock frequency: 10 MHz (max.)
- Output buffer op-amps
  Operable over entire voltage range from almost ground to VCC
- Power-on reset and external reset functions
- Chip select function
  Up to 4 chips connectable on the same bus
- Supported power supply voltage: 3 V to 5 V (2.7 V to 5.5 V)

Application

Signal gain setting and automatic adjustment in CTV and display monitors, conversion from digital data to analog data in consumer and industrial products

Pin Connection Diagram (Top View)

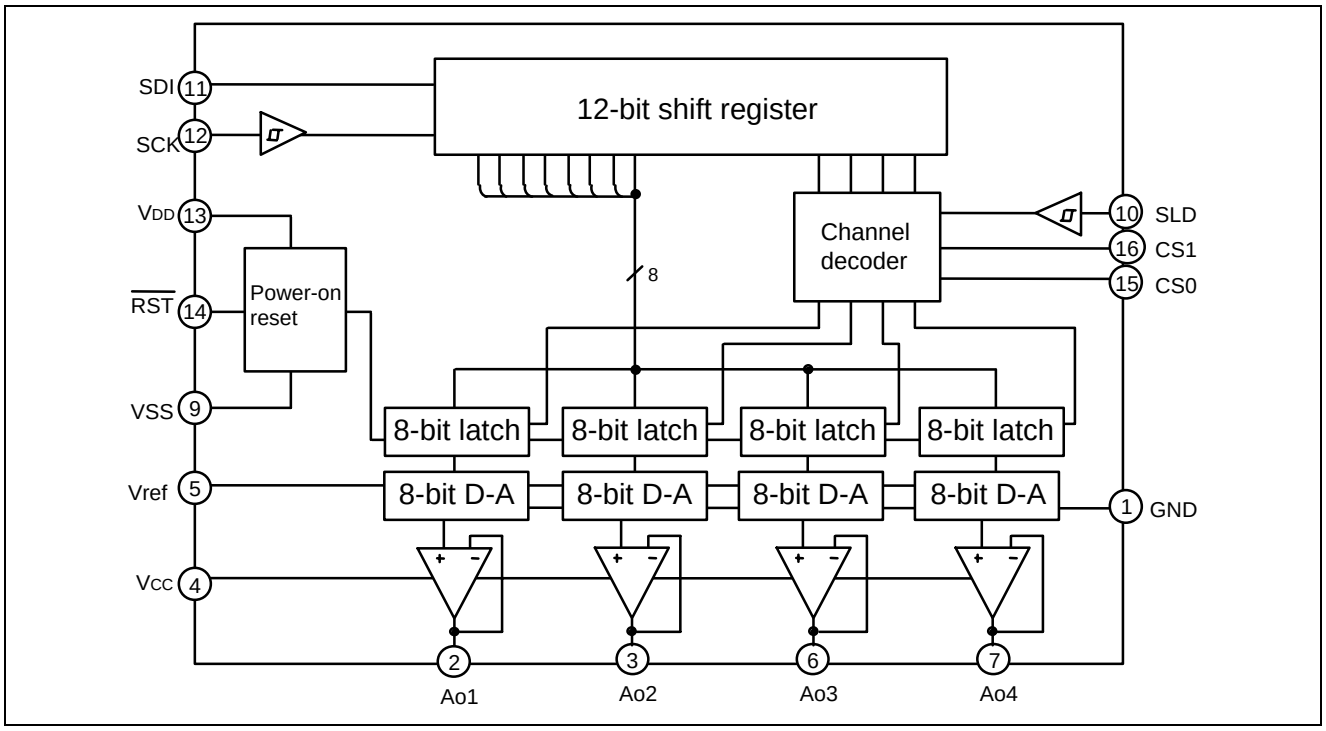


Package: 16P2N

This product is currently under development, and specifications and other details may be modified at a future date.

Downloaded from Elcodis.com electronic components distributor

Block Diagram



Downloaded from Elcodis.com electronic components distributor

Pin Functions

Pin No.	Symbol	Function
1, 8	GND	Analog GND: analog circuit GND (D-A converter lower reference voltage)
2	Ao1	D-A converter output pins (ch1 to ch4): full-swing buffer output Output voltage: Ao (00)h = 0V, Ao (FF)h = 255/256 × VREF
3	Ao2	
6	Ao3	
7	Ao4	
4	Vcc	Analog power supply (3 V to 5 V) Must rise simultaneously with VDD or after VDD rise.
5	Vref	D-A converter upper reference voltage input pin
9	Vss	Digital GND
10	SLD	Serial load signal input pin (Schmitt trigger input: with input hysteresis) When SLD is high, data is loaded from shift register into 8-bit latch corresponding to address.
11	SDI	Serial data input pin (TTL input in case of 5 V power supply) Inputs serial data with a 12-bit data length (MSB-first).
12	SCK	Serial clock signal input pin (Schmitt trigger input: with input hysteresis) At rising edge, data is read into shift register one bit at a time.
13	VDD	Digital power supply pin (3 V to 5 V) When power supply rises, D-A output is reset (0 V output: power-on reset).
14	$\overline{RST}$	Forced reset pin (TTL input in case of 5 V power supply) L: D-A output (AO1 to 4) = Fixed setting of 0 V H: Reset release (power-on reset operation)
15	CS0	Chip select pins (TTL input in case of 5 V power supply) Access possible only when chip select data (D11, D10) and pin (CS1, CS0) logic match.
16	CS1	

Absolute Maximum Ratings

(Unless specified otherwise, Ta = 25ºC)

Item	Symbol	Rated Value	Unit	Conditions
Power supply voltage	VCC,VDD	-0.3 to 7.0	V	
Digital input voltage	VDIN	-0.3 to Vcc+0.3 (≤ 7.0)	V	DC voltage (“H” level)
Reference voltage input voltage	Vref	-0.3 to Vcc+0.3 (≤ 7.0)	V	
D-A output voltage	VAO	-0.3 to Vcc+0.3 (≤ 7.0)	V	
Permissible loss	Pd	300	mW	
Operating ambient temperature	Topr	-20 to +75	°C	
Storage temperature	Tstg	-40 to +125	°C	

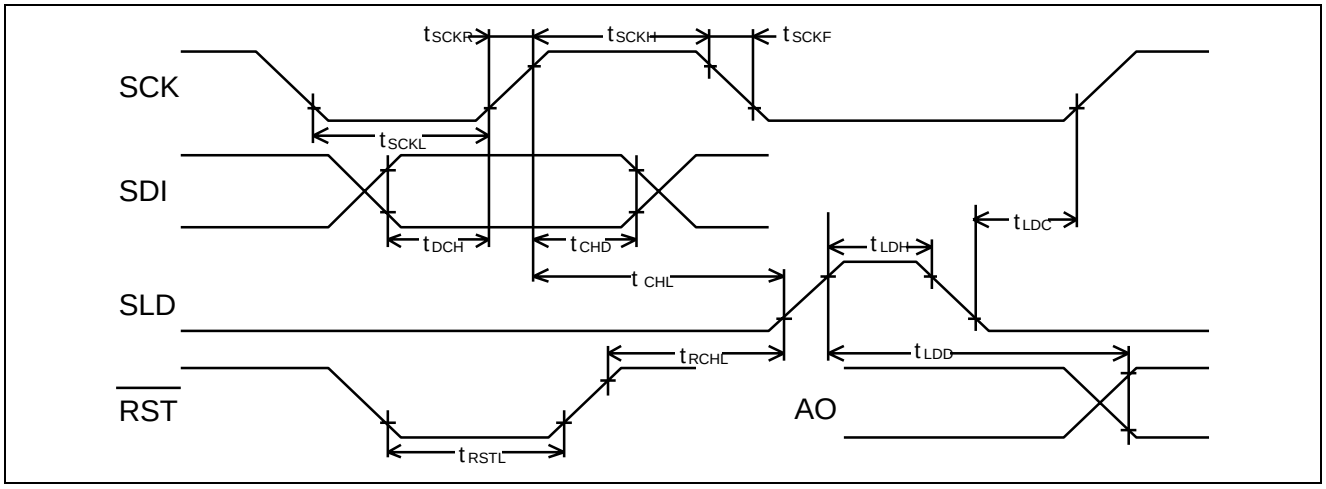
Downloaded from Elcodis.com electronic components distributor

Recommended Operating Conditions

(Unless specified otherwise, VCC = VDD = 5 V ±10%, Vref = 2 V to VCC, VSS = GND = 0 V, fsck = 5 MHz, VDINH = VDD, VDINL = VSS, Ta = 20ºC to 75ºC)

		Specification Values				
Item	**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit**	**Test Conditions**
Analog power supply voltage	VCC	2.7		5.5	V	VCC = VDD
Digital power supply voltage	VDD	2.7		5.5	V	VCC = VDD
Reference voltage	Vref	2.0		5.5	V	Vref ≤ VCC
Serial clock frequency	fsck			10	MHz	
“H” level digital input voltage	VDINH	0.5VDD		VDD	V	
“L” level digital input voltage	VDINL	VSS		0.2VDD	V	
Clock “H” pulse width	tsckH	30			ns	VCC = VDD ≥ 2.7V
Clock “L” pulse width	tsckL	30			ns	VCC = VDD ≥ 2.7V
Clock rise time	tsckR			200	ns	
Clock fall time	tsckF			200	ns	
Data setup time	tDCH	10			ns	
Data hold time	tCHD	20			ns	
Load setup time	tCHL	40			ns	
Load hold time	tLDC	20			ns	
Load “H” pulse width	tLDH	20			ns	
Reset “L” pulse width	tRSTL	50			ns	
Load setup time after reset release	tRCHL	50			ns	

Timing Chart



Downloaded from Elcodis.com electronic components distributor

Electrical Characteristics

(Unless specified otherwise, VCC = VDD = 5 V ±10%, Vref = 2 V to VCC, VSS = GND = 0 V, fsck = 5 MHz, VDINH = VDD, VDINL = VSS, Ta = 20ºC to 75ºC)

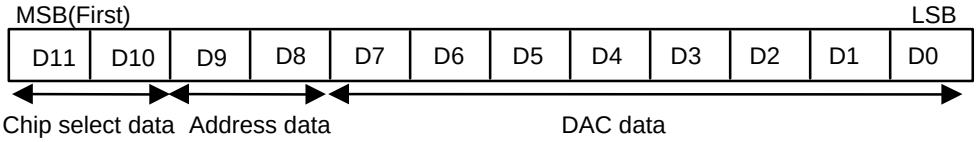
(1) Digital block

Item	Symbol	Specification Values			Unit	Test Conditions
		Min.	Typ.	Max.		
Digital block circuit current	IDD			1.0	mA	
Input leakage current	IDINLK	–10	0	10	µA	VDIN = VSS to VDD
Input threshold voltage	VDINT	0.2VDD		0.5VDD	V	
Input hysteresis voltage	ΔVDINT		100		mV	

(2) Analog block

Item	Symbol	Specification Values			Unit	Test Conditions
		Min.	Typ.	Max.		
Analog block circuit current	ICC		0.8	2.0	mA	No load
Reference voltage input current	Iref		0.5	1.0	mA	All channels: Maximum current conditions
Differential nonlinearity error	SDL	–1.0		1.0	LSB	VCC = VDD = 2.7V to 5.5V IA0: With no load
Nonlinearity error	SNL	–1.5		1.5	LSB	
Zero scale error	SZERO	–2.0		2.0	LSB	
Full-scale error	SFULL	–2.0		2.0	LSB	
Output current	IAO	±0.5			mA	VOA = 0.1V to VCC – 0.1V
Settling time	tLDD		5	10	µS	VOA = 0.5↔4.5V, IOA = 0.1mA, Co = 50pF output absorbed within ±0.5 LSB
Power-on reset voltage	VPR	0.8	1.5	2.5	V	VCC = 0 V → 5 V, V0A = 0 V setting voltage (reference values)

Digital Data Format



(1) Chip select data

D11	D10	CS1	CS0
0	0	L	L
0	1	L	H
1	0	H	L
1	1	H	H

Data is transferred only when logic of D11 and D10 matches CS pin setting (CS1, CS0).

Downloaded from Elcodis.com electronic components distributor

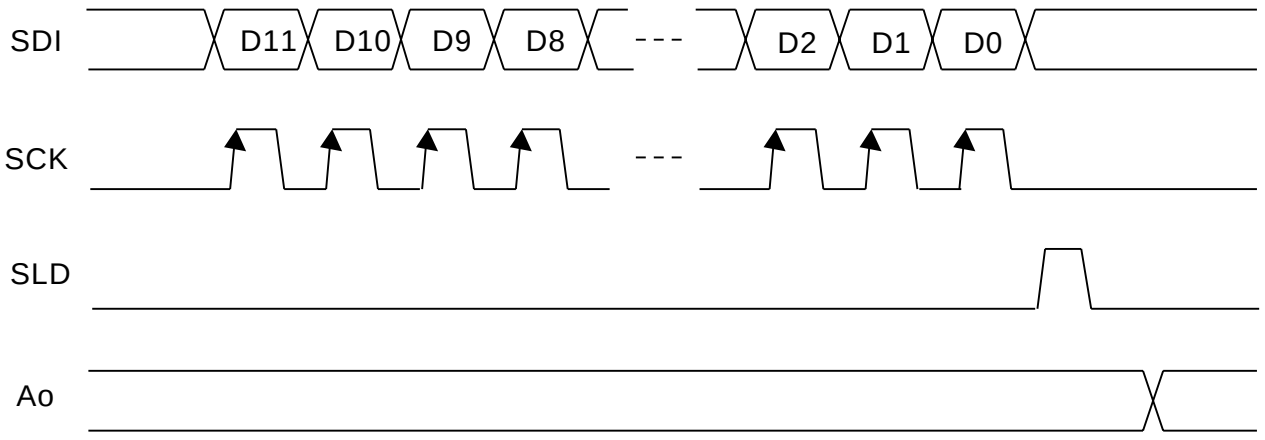
(2) Address data

D8	D9	Channel Selection
0	0	AO1 selected
0	1	AO2 selected
1	0	AO3 selected
1	1	AO4 selected

DAC Data

D7	D6	D5	D4	D3	D2	D1	D0	D-A output
0	0	0	0	0	0	0	0	(0/256)×Vref
0	0	0	0	0	0	0	1	(1/256)×Vref
0	0	0	0	0	0	1	0	(2/256)×Vref
0	0	0	0	0	0	1	1	(3/256)×Vref
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
1	1	1	1	1	1	1	0	(254/256)×Vref
1	1	1	1	1	1	1	1	(255/256)×Vref

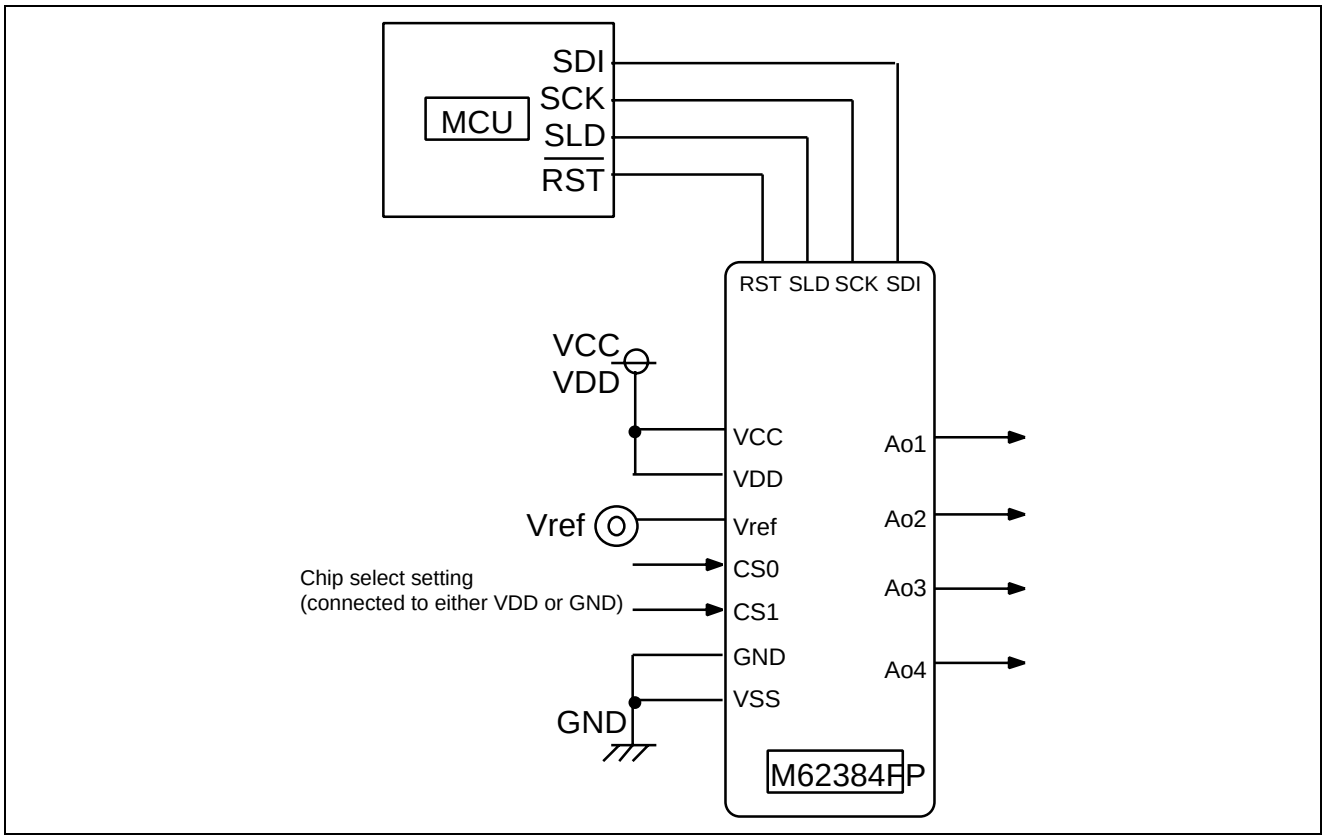
Data Timing Chart



When SLD is high, data captured in the shift register is loaded into the 8-bit latch corresponding to the address. Therefore, SCK should be held high or low when SLD is high.

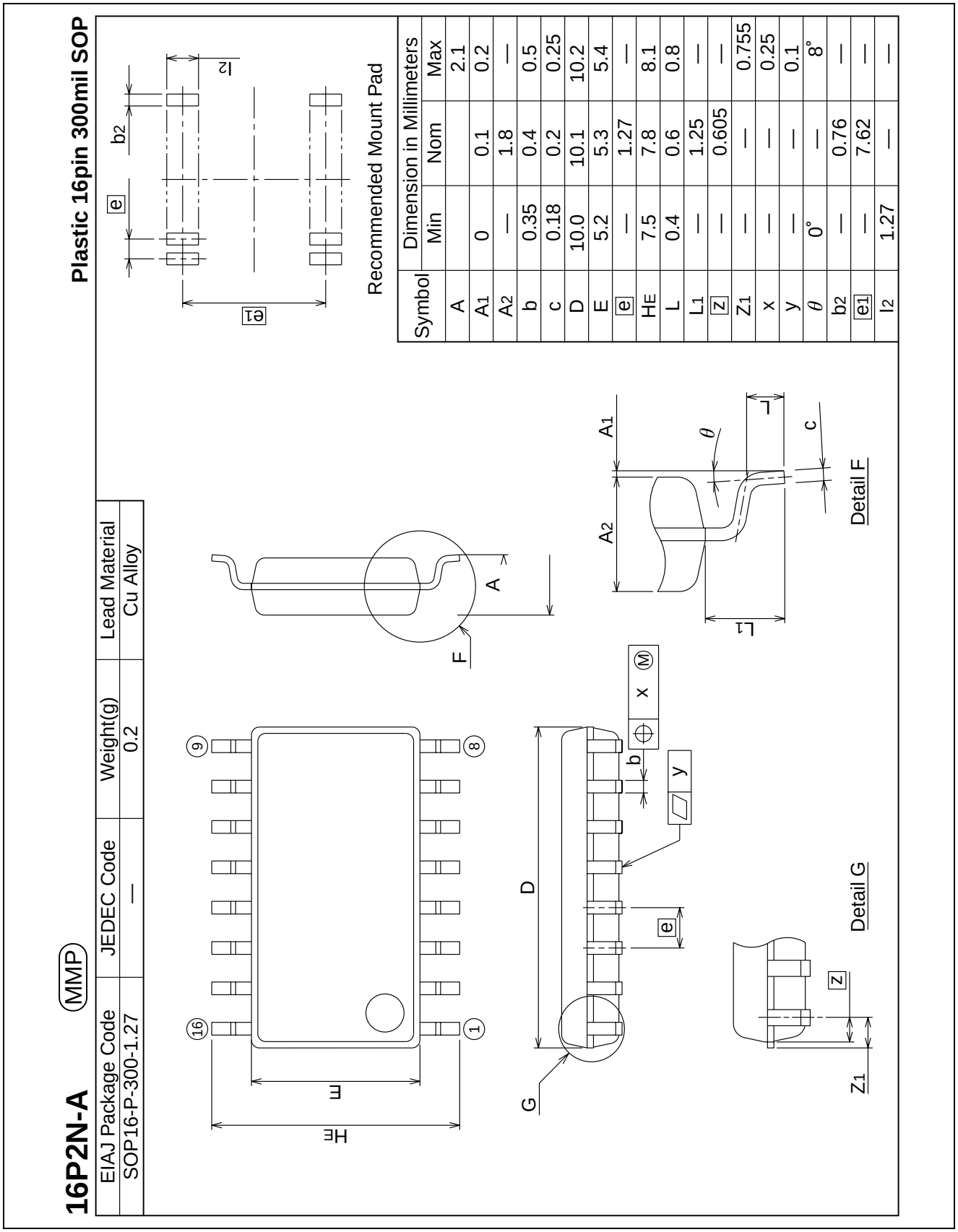
Downloaded from Elcodis.com electronic components distributor

Sample Application Circuit



Downloaded from Elcodis.com electronic components distributor

Package Dimensions



Symbol	Dimension in Millimeters		
	Min	Nom	Max
A			2.1
A_1	0	0.1	0.2
A_2	—	1.8	—
b	0.35	0.4	0.5
c	0.18	0.2	0.25
D	10.0	10.1	10.2
E	5.2	5.3	5.4
e	—	1.27	—
H_E	7.5	7.8	8.1
L	0.4	0.6	0.8
L_1	—	1.25	—
Z	—	0.605	—
Z_1	—	—	0.755
x	—	—	0.25
y	—	—	0.1
θ	0°	—	8°
b_2	—	0.76	—
e1	—	7.62	—
l_2	1.27	—	—

Downloaded from Elcodis.com electronic components distributor

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

Keep safety first in your circuit designs!
1. Renesas Technology Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.
Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials
1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corp. product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corp. or a third party.
2. Renesas Technology Corp. assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corp. without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor for the latest product information before purchasing a product listed herein.
The information described here may contain technical inaccuracies or typographical errors.
Renesas Technology Corp. assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.
Please also pay attention to information published by Renesas Technology Corp. by various means, including the Renesas Technology Corp. Semiconductor home page (http://www.renesas.com).
4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corp. assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology Corp. semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
6. The prior written approval of Renesas Technology Corp. is necessary to reprint or reproduce in whole or in part these materials.
7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
8. Please contact Renesas Technology Corp. for further details on these materials or the products contained therein.

RENESAS SALES OFFICES

http://www.renesas.com

Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500 Fax: <1> (408) 382-7501

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

© 2003. Renesas Technology Corp., All rights reserved. Printed in Japan.
Colophon 1.0

Downloaded from Elcodis.com electronic components distributor