

M62383FP

5 V Composite Type D-A Converter

REJ03F0076-0100Z

Rev.1.0

Sep.19.2003

Description

The M62383FP is a 5 V composite D-A converter incorporating two modules, with two 8-bit buffer amp output D-A converters and an 8-bit D-A converter for reference voltage adjustment as one module.

The D-A outputs can be set simultaneously for each module without address setting. The data configurations comprise 16-bit serial data for the two main D-A circuits and 8-bit serial data for the reference voltage setting D-A. The D-A output buffer amps have full-swing output capability, from power supply voltage to GND.

Features

- Simultaneous dual-output data setting by means of 16-bit serial data (TTL level)
- Data transfer clock frequency: 10 MHz (max.)
- D-A converter output settling time: 5 μ s (typ.)
- Power-on reset and external reset (L reset) functions
(D-A output = 0 V, MON output = $V_{REF} \times 255/256$)

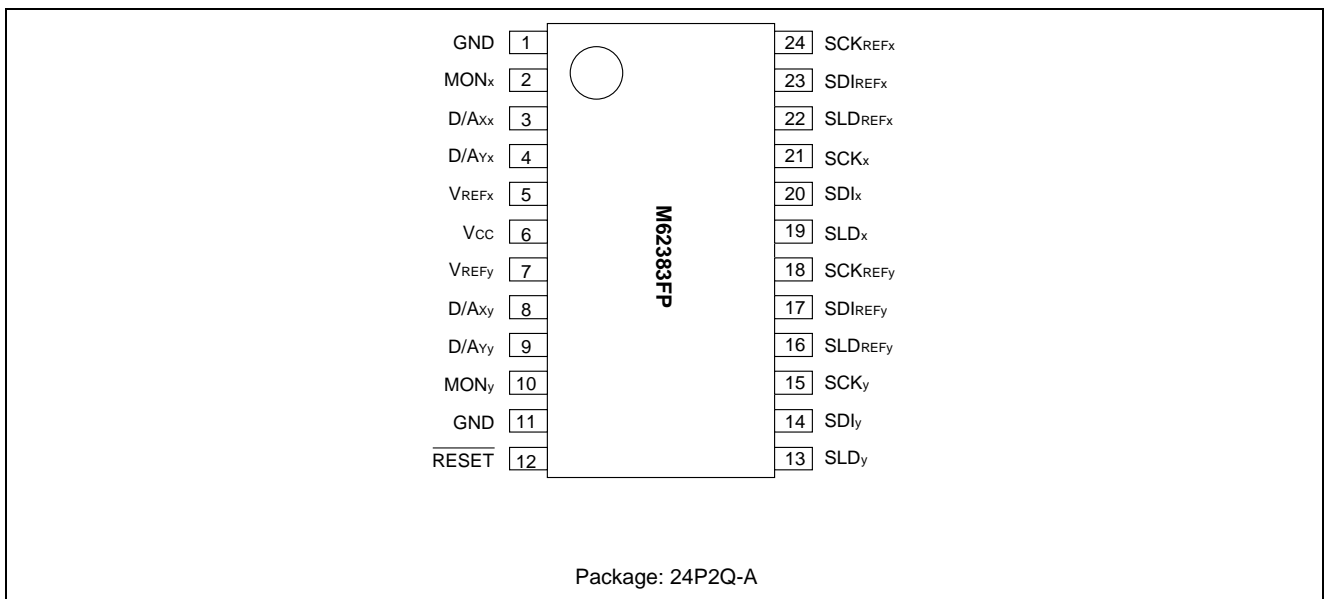
Application

Automatic adjustment of electronic devices

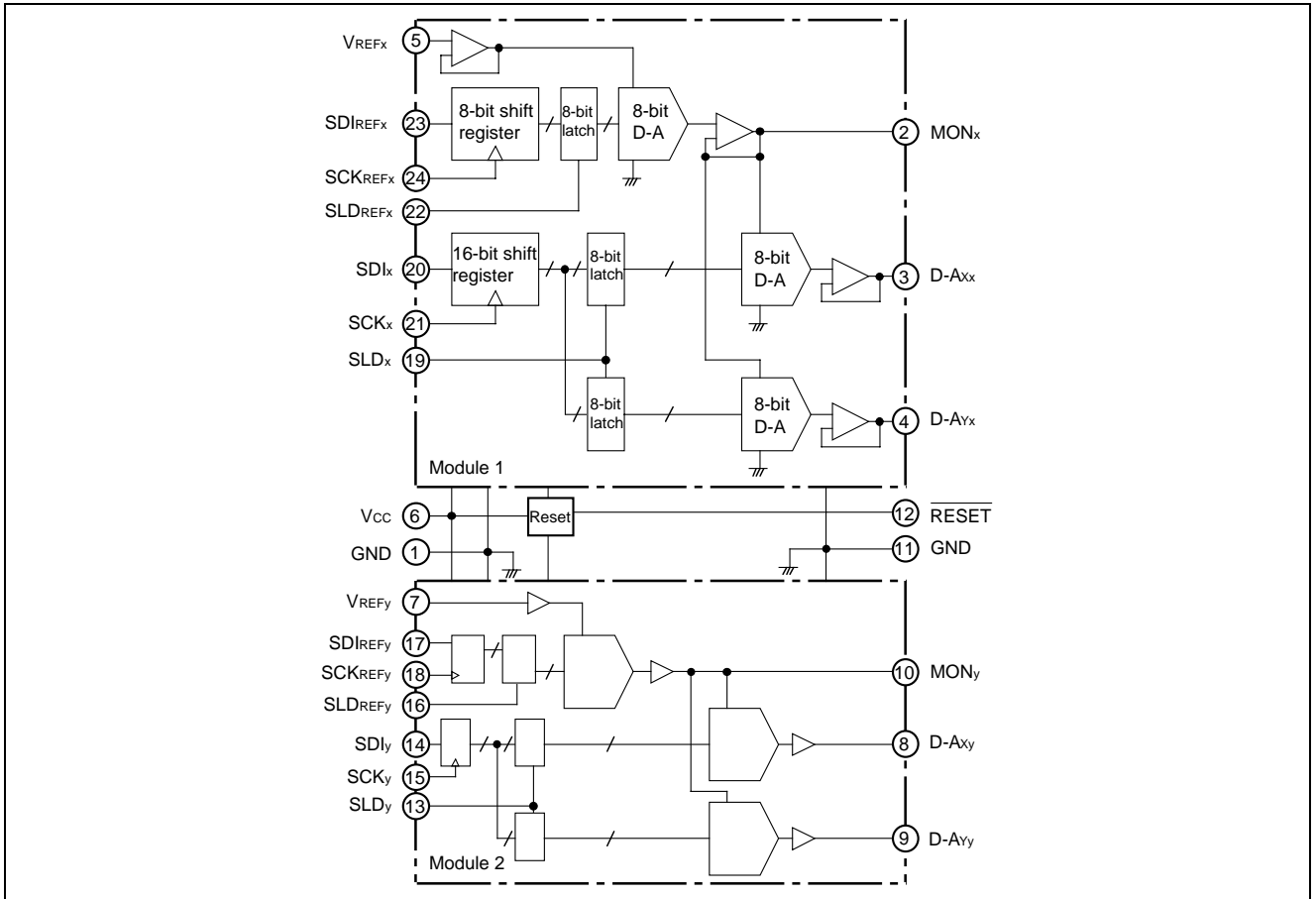
Recommended Operating Conditions

Power supply voltage: 5 V \pm 10%

Pin Connection Diagram (Top View)



Block Diagram



Pin Description

Pin No.	Symbol	Function	
1, 11	GND	Ground (GND) pin	
2	MONx	Module 1: Reference voltage D-A output pin	
10	MONy	Module 2: Reference voltage D-A output pin	
3	D/Axx	Module 1: 8-bit D-A output pin (x side)	
4	D/Axy	Module 1: 8-bit D-A output pin (y side)	
8	D/Ayx	Module 2: 8-bit D-A output pin (x side)	
9	D/Ayy	Module 2: 8-bit D-A output pin (y side)	
5	VREFx	Module 1: Reference voltage input pin	
7	VREFy	Module 2: Reference voltage input pin	
6	Vcc	Power supply (VCC) pin	
12	RESET	Reset pin	When input level is changed from "H" to "L", D-A output becomes 0 V (D-A data: 00h), and MON output becomes VREF × 255/256 (MON data: FFh). Even if input level is restored from "L" to "H", output is maintained until next data setting. TTL-based.
19	SLDx	Module 1: Load signal input pin	At rising edge of input signal from "L" to "H", data in 16-bit shift register is loaded into D/A data register. TTL-based.
13	SLDy	Module 2: Load signal input pin	
22	SLDREFx	Module 1: Reference voltage load signal input pin	At rising edge of input signal from "L" to "H", data in 8-bit shift register is loaded into D/A data register. TTL-based.
16	SLDREFy	Module 2: Reference voltage load signal input pin	
20	SDIx	Module 1: Serial data input pin	TTL-based 16-bit-length serial data
14	SDIy	Module 2: Serial data input pin	
23	SDIREF _x	Module 1: Reference voltage serial data input pin	TTL-based 8-bit-length serial data
17	SDIREF _y	Module 2: Reference voltage serial data input pin	
21	SCKx	Module 1: Shift clock signal input pin	TTL Schmitt trigger based serial clock input
15	SCKy	Module 2: Shift clock signal input pin	SDI serial data is sent to 16-bit shift register one bit at a time at each rise.
18	SCKREF _x	Module 1: Reference voltage shift clock signal input pin	TTL Schmitt trigger based serial clock input
24	SCKREF _y	Module 2: Reference voltage shift clock signal input pin	SDIREF serial data is sent to 8-bit shift register one bit at a time at each rise.

Absolute Maximum Ratings

(Unless specified otherwise, Ta = 25°C)

Item	Symbol	Rated Value	Unit	Conditions
Power supply voltage	VCC	-0.3 to 7.0	V	
Digital input voltage	VDIN	-0.3 to Vcc+0.3 (≤ 7.0)	V	DC voltage ("H" level voltage)
Reference voltage input voltage	VREF	-0.3 to Vcc+0.3 (≤ 7.0)	V	
Output voltage	VDAout	-0.3 to Vcc+0.3 (≤ 7.0)	V	
Internal permissible loss	Pd	500	mW	
Operating ambient temperature	Topr	-20 to +85	°C	
Storage temperature	Tstg	-55 to +150	°C	

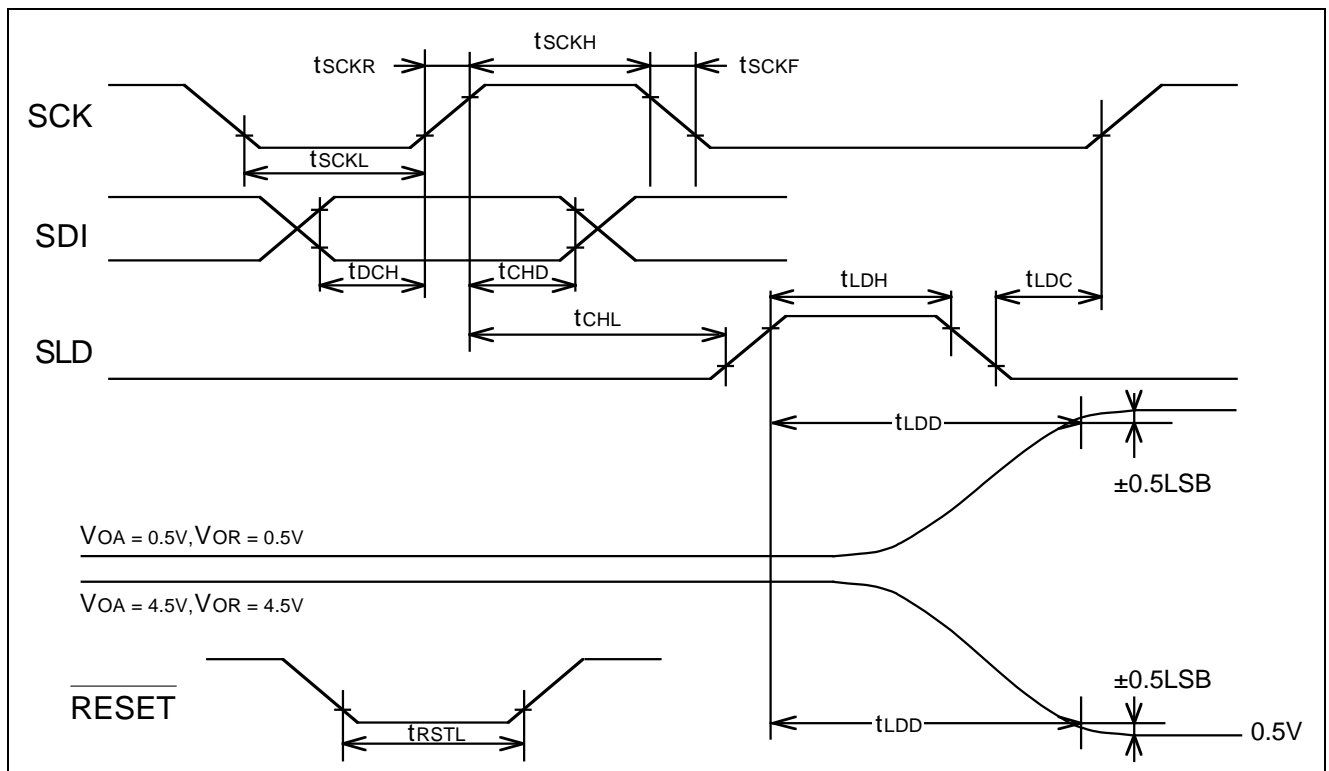
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Recommended Operating Conditions

(Unless specified otherwise, $V_{CC} = 5\text{ V} \pm 10\%$, $V_{REF} = V_{CC}$, $f_{SCK} = 5\text{ MHz}$, $V_{IH} = V_{CC}$, $V_{IL} = \text{GND}$, $T_a = 25^\circ\text{C}$)

Item	Symbol	Specification Values			Unit	Test Conditions
		Min.	Typ.	Max.		
Power supply voltage	V_{CC}	4.5	5.0	5.5	V	
Reference power supply voltage	V_{REF}	GND		V_{CC}	V	V_{CC} voltage or below
Clock frequency	f_{SCK}			10	MHz	
"H" level input voltage	V_{IH}	2		V_{CC}	V	TTL "H" input level
"L" level input voltage	V_{IL}	GND		0.8	V	TTL "L" input level
Clock input hysteresis voltage	V_{Δ}	0.4	0.6	1.0	V	TTL Schmitt trigger
Clock "L" pulse width	t_{SCKL}	30		450	ns	See timing chart
Clock "H" pulse width	t_{SCKH}	30		450	ns	See timing chart
Clock rise time	t_{SCKR}	10		100	ns	See timing chart
Clock fall time	t_{SCKF}	10		100	ns	See timing chart
Data setup time	t_{DCH}	10		100	ns	See timing chart
Data hold time	t_{CHD}	20		200	ns	See timing chart
Load setup time	t_{CHL}	40		800	ns	See timing chart
Load hold time	t_{LDC}	20		400	ns	See timing chart
Load "H" pulse time	t_{LDH}	20		400	ns	See timing chart
Reset "H" pulse time	t_{RSTL}	50			ns	See timing chart

Timing Chart



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Electrical Characteristics

(Unless specified otherwise, VCC = 5 V \pm 10%, VREF = VCC, fSCK = 5 MHz, VIH = VCC, VIL = GND, Ta = -20°C to 85°C)

(a) Common to analog and digital blocks

Item	Symbol	Specification Values			Unit	Test Conditions
		Min.	Typ.	Max.		
Circuit current	Icc		6.0	10	mA	

(b) Digital block

Item	Symbol	Specification Values			Unit	Test Conditions
		Min.	Typ.	Max.		
Input leakage current	IILK	-10		10	μ A	VIN = 0V to 5V

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(c) Analog block

Item	Symbol	Specification Values			Unit	Test Conditions
		Min.	Typ.	Max.		
Reference voltage input voltage	VREF	GND		V _{cc}	V	When SDIREF is set to (FF)h, VREF = MON
Reference voltage input current	IREF	-1		+1	μA	GND ≤ VREF ≤ V _{cc}
Upper reference voltage output voltage (*1)	VORU	4.88	4.98	V _{cc}	V	SDIREF = (FF)h, SDI = (FFFF)h, MON output value
Lower reference voltage output voltage (*1)	VORL	GND		0.10	V	SDIREF = (00)h, SDI = (FFFF)h, MON output value
Reference voltage output offset voltage (*1)	ΔVOR	-100		100	mV	VREF = 2 to 5V, SDI = (FFFF)h, 255/256VREF-VOR (MON output value)
Upper buffer amp D-A output voltage	VOAU	4.5			V	IOA = ±0.5mA, SDIREF = (FF)h, SDI = (FFFF)h
Lower buffer amp D-A output voltage	VOAL			0.05	V	IOA = ±0.5mA, SDIREF = (FF)h, SDI = (0000)h
Accuracy: Differential nonlinearity error	SDL	-1.0		+1.0	LSB	(Monotone increasing capability)
Accuracy: Nonlinearity error	SNL	-1.0		+1.0	LSB	
Accuracy: Zero scale error	SZERO	-2.0		+2.0	LSB	VREF = 2 to 5 V: Buffer output offset (*2)
Accuracy: Full-scale error	SFULL	-2.0		+2.0	LSB	VREF = 2 to 5 V: Buffer output offset (*2)
Reference voltage input pin capacitance	CREF			10	pF	
D-A converter output settling time	tLDDA		5	10	μS	VOA = 0.5↔4.5V, IOA = 0.1mA, Co = 50pF, SDIREF = (FF)h, Time for output to be absorbed within ±0.5 LSB
Reference voltage output settling time	tLDDR		10	20	μS	VOA = 0.5↔4.5V, no external load Time for output to be absorbed within ±0.5 LSB
Power-on reset voltage (*3)	$\overline{\text{VRESET}}$	0.8	1.5	3	V	V _{cc} = 0→5V, VOA = 0V, VOR = VREF×255/256 set

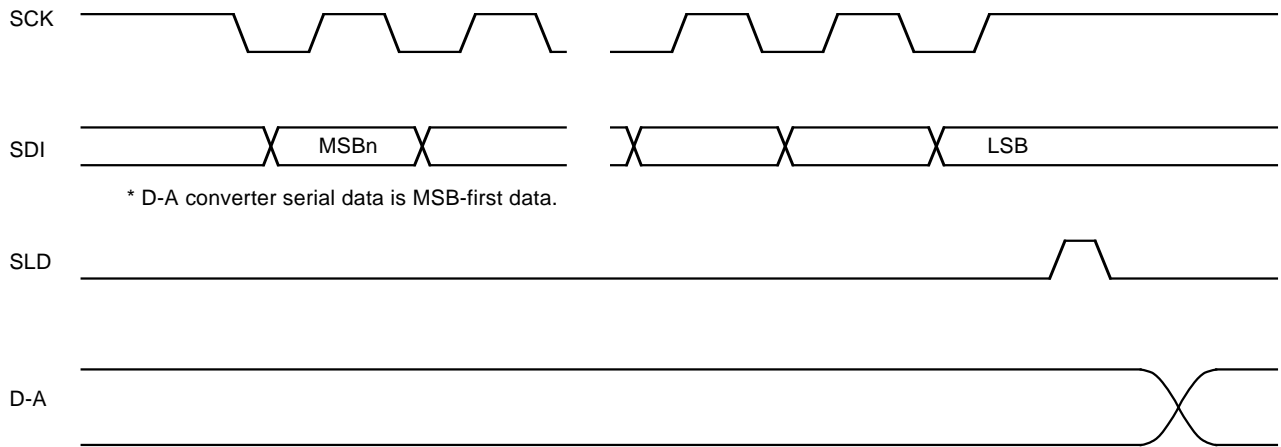
Notes: 1. MON output specification. Equivalent to ±5 LSB.

2. D-A output (D-Axx, D-Axy, D-Ayx, D-Ayy) specification. MON output is stipulated by 3 items in *1 above (VORU, VORL, ΔVOR).

3. Reference values

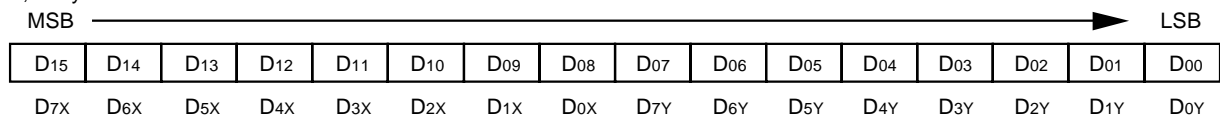
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Digital Data Format



* D-A converter serial data is MSB-first data.

SDIx, SDIy

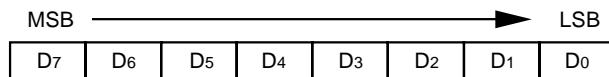


$$V_{OA} = V_{OR} \times \frac{2^7 \times D7^* + 2^6 \times D6^* + 2^5 \times D5^* + 2^4 \times D4^* + 2^3 \times D3^* + 2^2 \times D2^* + 2^1 \times D1^* + 2^0 \times D0^*}{256}$$

VOA: D-A output voltage
VOR: MON output voltage

Dn*: D-A data
n = 0 to 7, * = x, y

SDIREF_x, SDIREF



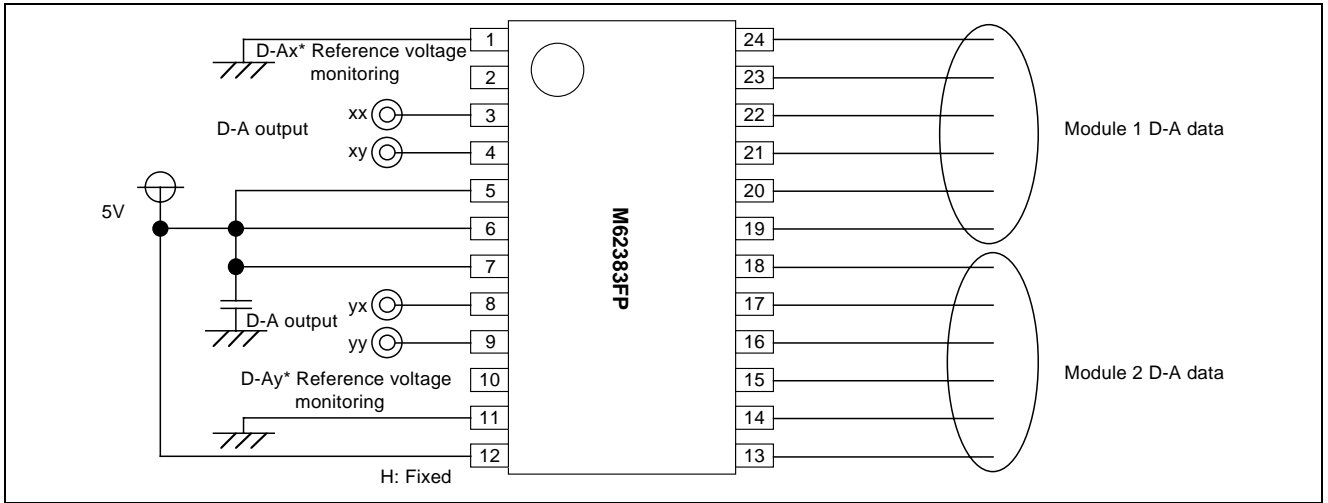
$$V_{OA} = V_{REF} \times \frac{2^7 \times D7 + 2^6 \times D6 + 2^5 \times D5 + 2^4 \times D4 + 2^3 \times D3 + 2^2 \times D2 + 2^1 \times D1 + 2^0 \times D0}{256}$$

VOR: MON output voltage
VREF: Reference voltage

Usage Notes

1. This IC has three pins to which a constant voltage is applied during use (constant-voltage input pins: VCC, VREF_x, VREF_y). If ripples or spikes are imposed on these pins, D-A conversion accuracy may fall. When using this IC, a capacitor (1 μF or higher recommended) must be inserted between the constant-voltage input pins and ground (GND) in order to ensure stable D-A conversion.
2. With regard to the reset function (power-on reset), when the power supply voltage passes the vicinity of 1.5 V at power-on, the D-A output voltage (VOA) becomes 0 V (D-A data: 00h), and the MON output voltage (VOR) becomes VREF × 255/256 (MON data: FFh), and output is maintained until the next data is set. In the event of repeated power supply on/off operations at short intervals, a reset may not be effected because of the simplicity of the circuit.

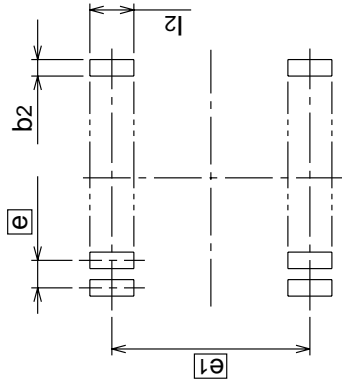
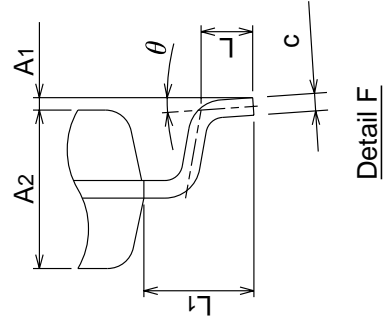
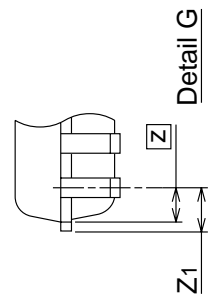
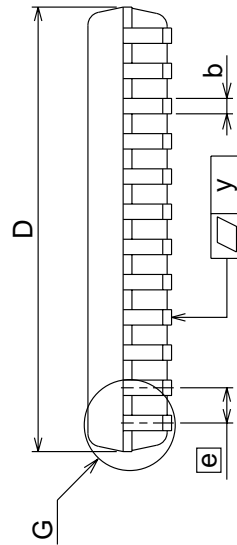
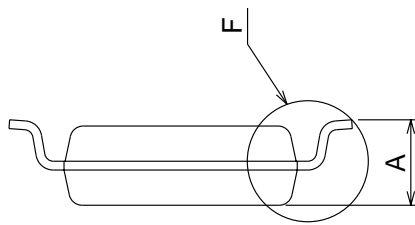
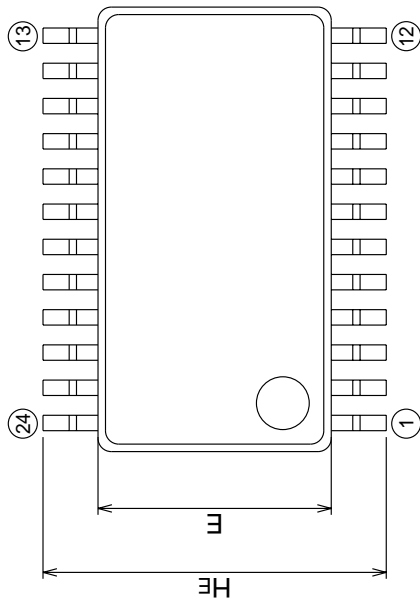
Sample Standard Application Circuit



Package Dimensions

24P2Q-A (MMP) Plastic 24pin 300mil SSOP

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
SSOP24-P-300-0.80	—	0.2	Cu Alloy



Recommended Mount Pad

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	2.1
A1	0	0.1	0.2
A2	—	1.8	—
b	0.3	0.35	0.45
c	0.18	0.2	0.25
D	10.0	10.1	10.2
E	5.2	5.3	5.4
e	—	0.8	—
HE	7.5	7.8	8.1
L	0.4	0.6	0.8
L1	—	1.25	—
Z	—	0.65	—
Z1	—	—	0.8
y	—	—	0.1
θ	0°	—	8°
b2	—	0.5	—
e1	—	7.62	—
l2	1.27	—	—

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