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# MSM82C43

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## INPUT/OUTPUT PORT EXPANDER

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### GENERAL DESCRIPTION

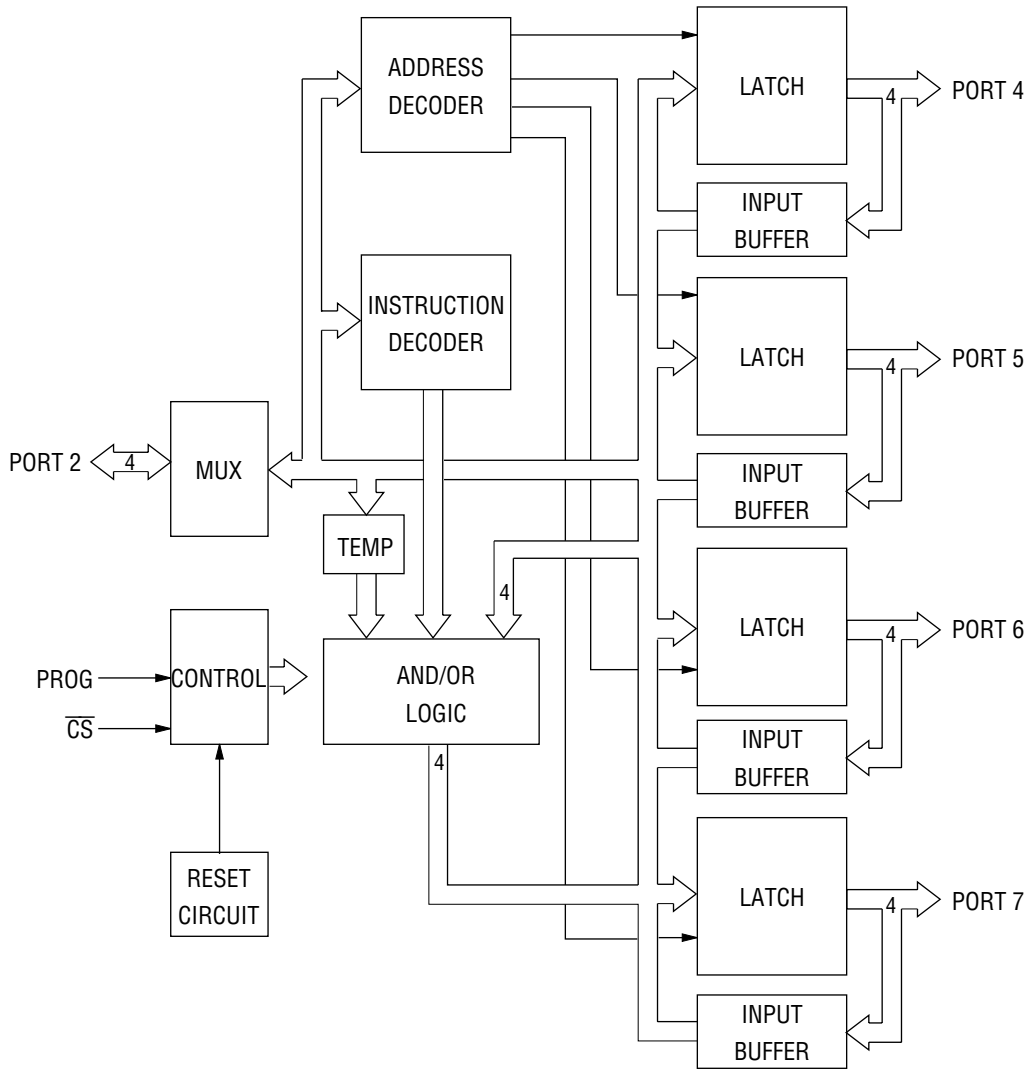
The MSM82C43 is an input/output port expander device based on CMOS technology and designed to operate at low power consumption levels.

In systems employing the MSM80C48/49 8-bit single chip microcomputers, 4-bit data can be expanded by dividing between four I/O lines by executing the MOVDA, P<sub>p</sub>, A and ORLDP<sub>p</sub>, A instructions.

### FEATURES

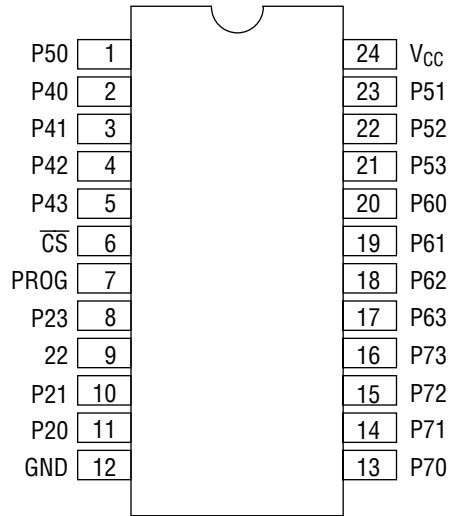
- CMOS technology for low power consumption
- 2.5 to 6 V single power supply (dependent on MSM80C48/49 operating frequency.)
- Fully static operation
- Bidirectional I/O ports
- TTL coimpatible (ports 4 thru 7)
- Functional compatiblity with Intel i8243
- Package options
  - 24 pin Plastic DIP (DIP24-P-600-2.54) : (Product name : MSM82C43RS)
  - 24 pin Plastic SOP (SOP24-P-430-1.27-K) : (Product name : MSM82C43GS-K)

FUNCTIONAL BLOCK DIAGRAM



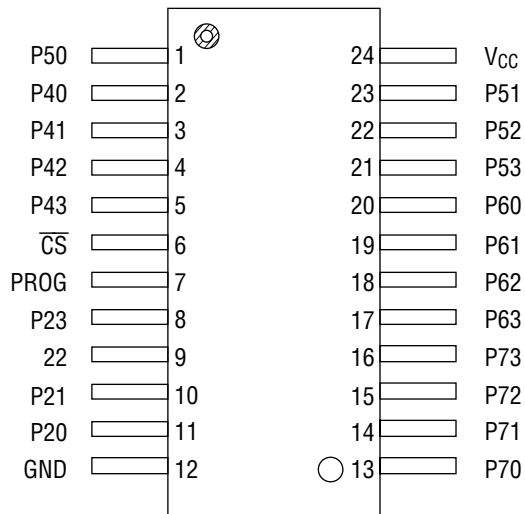
**PIN CONFIGURATION (TOP VIEW)**

**MSM82C43RS**



**24-pin Plastic DIP**

**MSM82C43GS**



**24 pin Plastic Small Outline Package**

**ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Conditions	Rating	Unit
Supply Voltage	$V_{CC}$	$T_a=25^{\circ}\text{C}$	-0.5 to 7	V
Input Voltage	$V_I$	$T_a=25^{\circ}\text{C}$	-0.3 to 7	V
Storage Temperature	$T_{STG}$	—	-65 to +150	$^{\circ}\text{C}$

**RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	Conditions	Range	Unit
Supply Voltage	$V_{CC}$	—	2.5 to 6*1	V
Ambient Temperature	$T_A$	—	-40 to +85	$^{\circ}\text{C}$
Fan-out	N	MOS load	10	—
		TTL load	3*2	—

**ELECTRIC CHARACTERISTICS**

**DC Characteristics**

(V<sub>CC</sub>=4.0V to 6.0V, Ta=-40°C to +85°C)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
"L" Input Voltage	V <sub>IL</sub>	—	-0.5	—	0.13V <sub>CC</sub>	V
"H" Input Voltage	V <sub>IH</sub>	—	0.4V <sub>CC</sub>	—	V <sub>CC</sub>	V
"L" Output Voltage Ports 4-7	V <sub>OL1</sub>	I <sub>OL</sub> =5mA	—	—	0.45	V
"L" Output Voltage Ports 7	V <sub>OL2</sub>	I <sub>OL</sub> =20mA	—	—	1	V
"L" Output Voltage Ports 2	V <sub>OL3</sub>	I <sub>OL</sub> =0.9mA	—	—	0.45	V
"L" Total Output Current from Ports 4-7*3	I <sub>OL</sub>	5mA/1PIN	—	—	80	mA
"H" Output Voltage Ports 4-7	V <sub>OH1</sub>	I <sub>OH</sub> =-240μA	0.75V <sub>CC</sub>	—	—	V
"H" Output Voltage Ports 2	V <sub>OH2</sub>	I <sub>OH</sub> =-100μA	0.75V <sub>CC</sub>	—	—	V
"H" Output Voltage Ports 4-7	V <sub>OH1</sub>	I <sub>OH</sub> =-40μA	0.93V <sub>CC</sub>	—	—	V
"H" Output Voltage Ports 2	V <sub>OH2</sub>	I <sub>OH</sub> =-20μA	0.93V <sub>CC</sub>	—	—	V
Input Leak Current*3	I <sub>IL1</sub>	0V <sub>IN</sub> V <sub>CC</sub>	-10	—	20	μA
Input Leak Current*6	I <sub>IL2</sub>	0 V <sub>IN</sub> V <sub>CC</sub>	-10	—	10	μA
Power Supply Current	I <sub>CC</sub>	"Standby stop No accessing	—	5	100	μA
		For continuous MSM80C49 access- ing at 11 MHz	—	1	2	mA

\*1 The supply voltage during operation is dependent on MSM80C49 operating frequency.

\*2 Except P20 thru P23.

\*3 P40 thru P43, P50 thru P53, P60 thru P63, P70 thru P73.

\*4 P70 thru P73.

\*5 P20 thru P23.

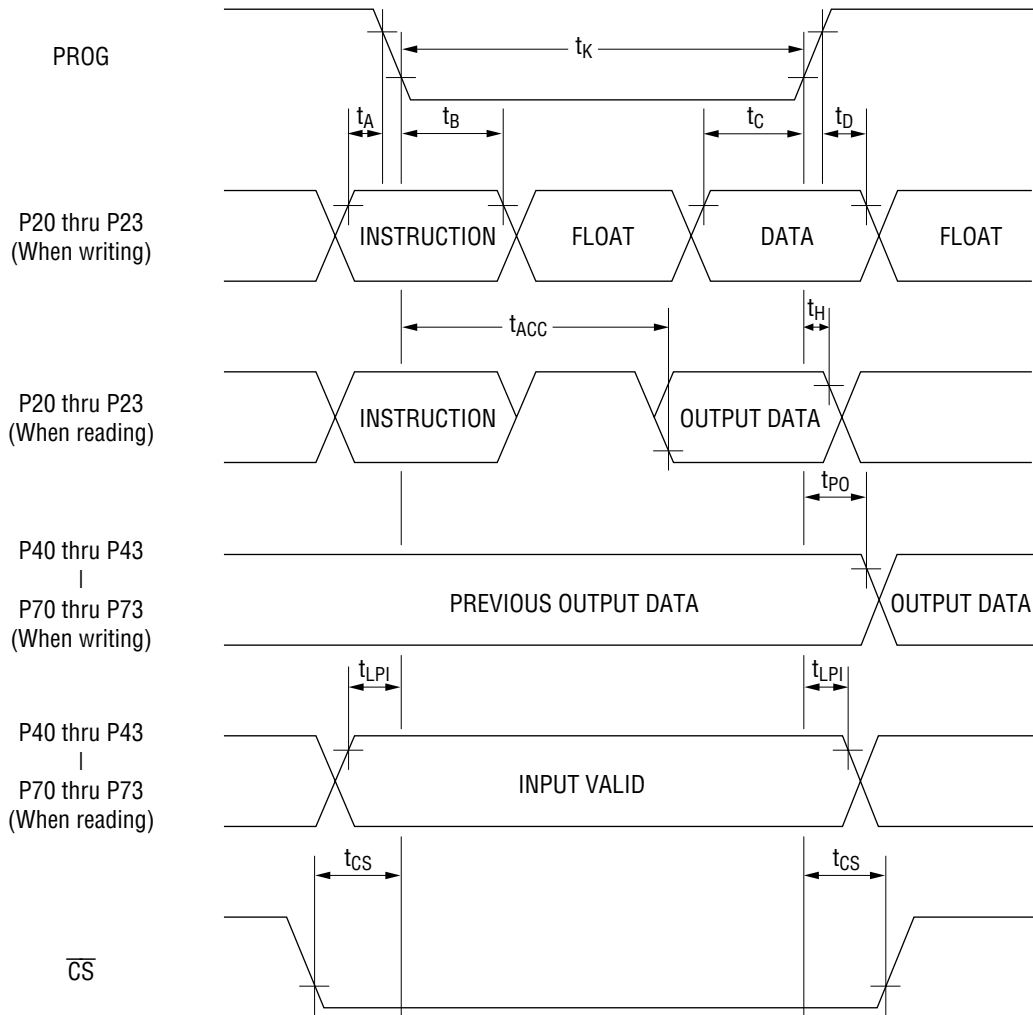
\*6 P20 thru P23, CS, PROG.

## AC CHARACTERISTICS

(V<sub>CC</sub>=4.0V to 6.0V, T<sub>a</sub>=-40°C to +85°C)

Parameter	Symbol	Conditions	Min.	Max.	Unit
Port Control Setting Time (up to PROG Falling Edge.)	t <sub>A</sub>	80pF LOAD	50	—	ns
Port Control Holding Time (up to PROG Falling Edge.)	t <sub>B</sub>	20pF LOAD	60	—	ns
Output Data Setting Time	t <sub>C</sub>	80pF LOAD	200	—	ns
Output Data Holding Time	t <sub>D</sub>	20pF LOAD	20	—	ns
Input Data Holding Time	t <sub>H</sub>	20pF LOAD	0	150	ns
PROG Pulse Width	t <sub>K</sub>	—	700	—	ns
$\overline{CS}$ Valid Time (before and after PROG)	t <sub>CS</sub>	—	50	—	ns
Output Data Valid Time (at Ports 4-7)	t <sub>PO</sub>	100pF LOAD	—	700	ns
Input Data Holding Time (at Ports 4-7)	t <sub>LP1</sub>	—	100	—	ns
Input Data Holding Time (from PROG Falling Edge)	t <sub>ACC</sub>	80pF LOAD	—	650	ns

**TIMING CHART**



## PIN FUNCTIONS

Pin	Function
PROG	Clock input from MSM80C49. When PROG is changed from "H" to "L", MSM82C43 STARTS operating in accordance with an order from MSM80C49.
$\overline{CS}$	Input for chip select. Outputs and internal status cannot be changed when $\overline{CS}$ is "H".
P20 – P23	4-bit bidirectional I/O ports. When connected to P20 thru P23 of MSM80C49, direct data transfer from port to accumulator and from accumulator to port is possible.
P40 – P43 P50 – P53 P60 – P63 P70 – P73	4-bit bidirectional I/O ports. Data is latched statistically when output to ports, but is only valid while PROG is at "L" level when input.
V <sub>CC</sub>	+5V power supply
GND	GROUND

## FUNCTIONS

### Power-on reset mode

Upon powered on, ports to 7 are 3-stated, and 2 is put into an input mode.

### Write mode

Execution of MOVD<sub>Pp</sub>, A, ORLD<sub>Pp</sub>, A, ANLD<sub>Pp</sub>, and A by MSM80C49 enables direct output of accumulator contents to ports 4 thru 7, and output to the ports after ORing or ANDing with port data. The port data is latched statistically at this time and remains unchanged until execution of the next instruction.

### Read mode

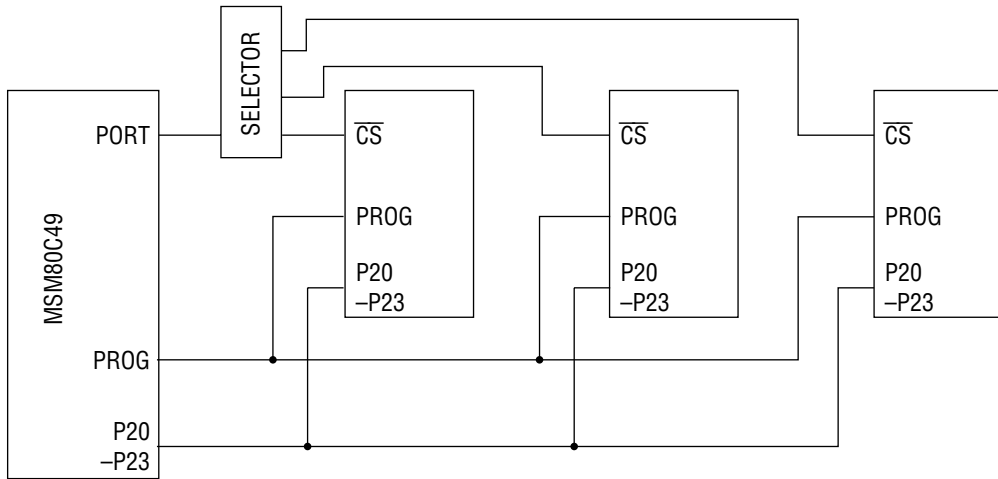
Execution of MOVDA and P<sub>p</sub> results in data of ports 4 thru 7 being accepted by the accumulator. Note that port data is valid only while PROG is at "L" level. When at "H" level, ports 4 thru 7 are switched to tristate and port 2 is switched to input mode.

### Address and instruction code

Instruction	P23	P22	Port	P21	P20
Read	0	0	Port 4	0	0
Write	0	1	Port 5	0	1
OR	1	0	Port 6	1	0
AND	1	1	Port 7	1	1



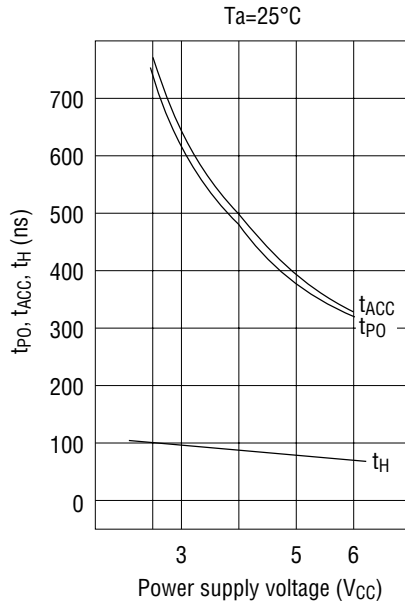
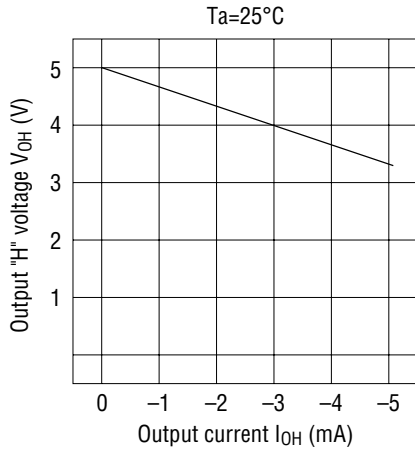
MSM82C43 Multiple connection example



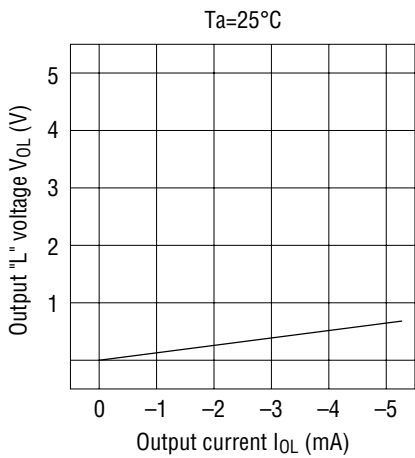
### OUTPUT CHARACTERISTICS

#### Standard dc characteristics

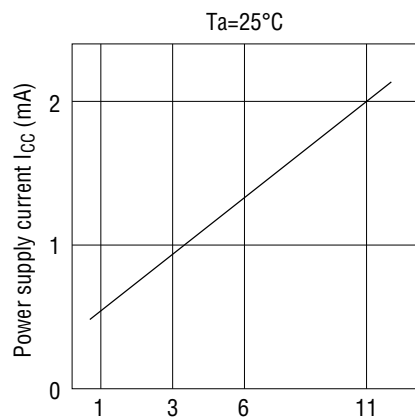
Output "H" voltage ( $V_{OH}$ ) vs. output current ( $I_{OH}$ )  $t_{PO}$ ,  $t_H$ , and  $t_{ACC}$  vs. power supply voltage ( $V_{CC}$ )



Output "L" voltage ( $V_{OL}$ ) vs. output current ( $I_{OL}$ )



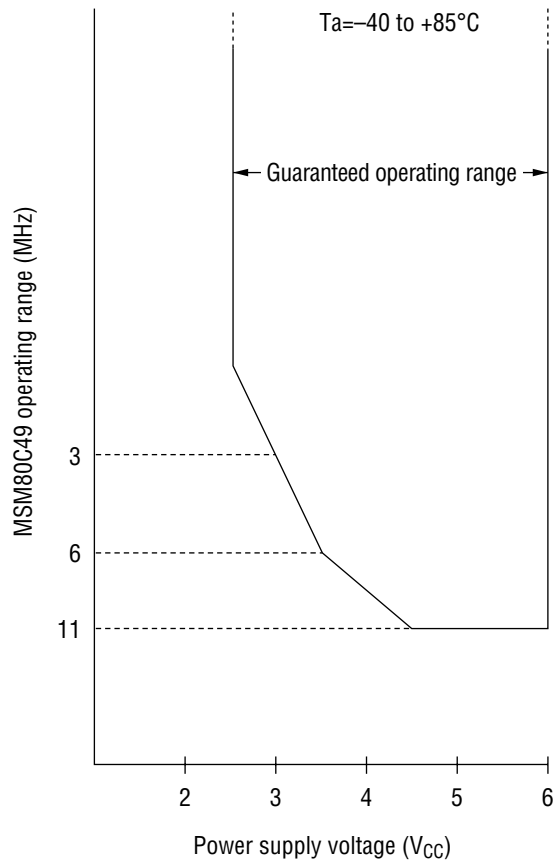
Operating frequency vs. power supply current ( $I_{CC}$ )



MSM80C49 operating frequency (MHz)

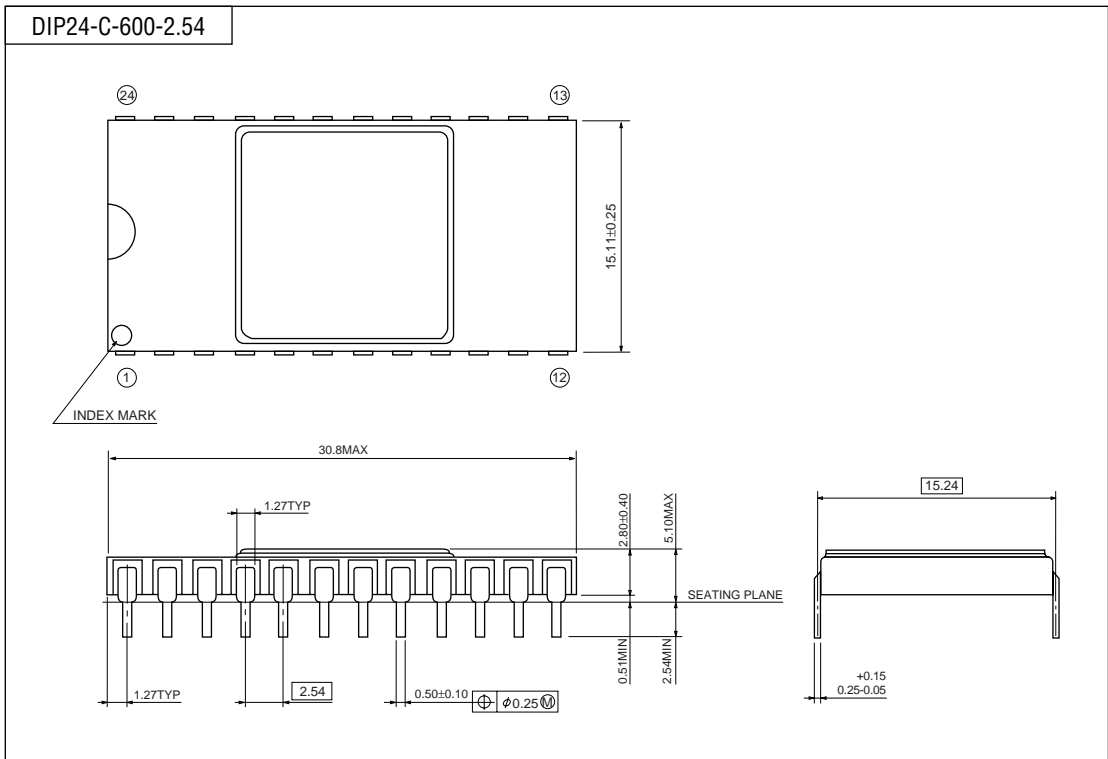
Note: The direction which the output current flows through the device is taken as the positive direction.

### GUARANTEED MSM82C43 OPERATING RANGE



**PACKAGE DIMENSIONS**

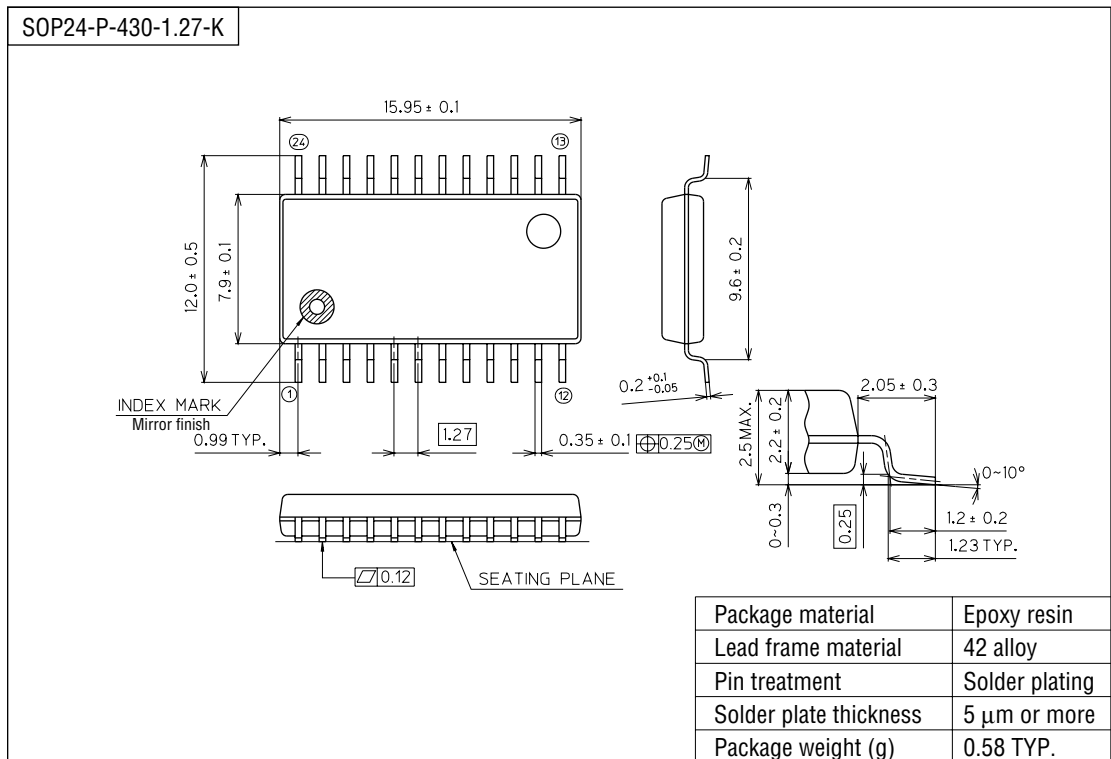
(Unit : mm)



**Notes for Mounting the Surface Mount Type Package**

The SOP, QFP, TSOP, SOJ, QFJ (PLCC), SHP and BGA are surface mount type packages, which are very susceptible to heat in reflow mounting and humidity absorbed in storage. Therefore, before you perform reflow mounting, contact Oki's responsible sales person for the product name, package name, pin number, package code and desired mounting conditions (reflow method, temperature and times).

(Unit : mm)



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