OKI Semiconductor

MSM6641/6641E-xx

Built-in Remote Control Transmission Circuit 4-Bit Microcontroller

GENERAL DESCRIPTION

The MSM6641, powered by a single battery, is a 4-bit microcontroller fabricated in OKI's low-voltage CMOS technology. A remote-control output generator built into this device provides remote-control output.
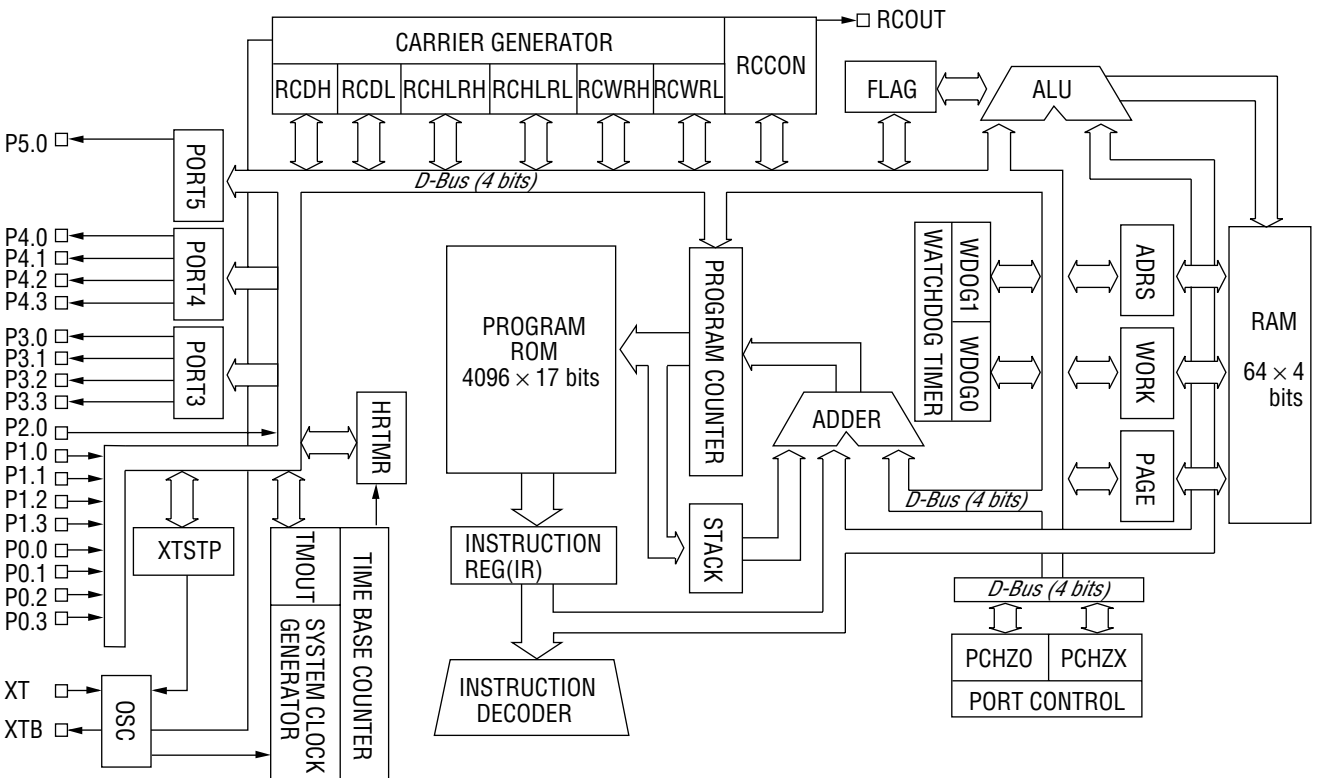
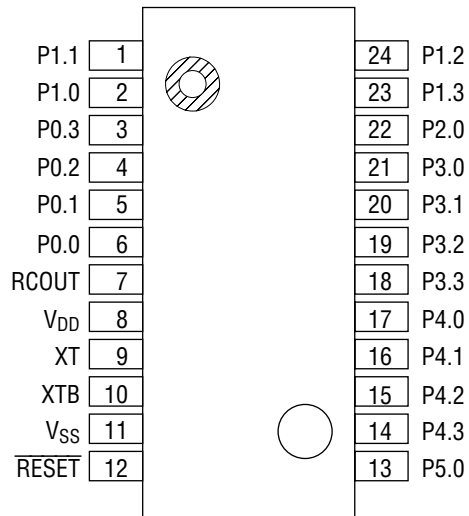The MSM6641 is best suited to remote-control applications.

FEATURES

- Operating range
  - Operating voltage   : 1.5 V (MSM6641)
    - 3.0 V (MSM6641E)
  - Operating frequency   : 1 MHz
  - Operating temperature   : −20 to +70°C
- Memory space
  - ROM   : 4096 words × 17 bits
  - RAM   : 64 words × 4 bits
- Minimum instruction execution time   : 16 μs
- I/O port
  - Input port   : 2 ports × 4 bits
    - 1 port × 1 bit
  - Output port   : 2 ports × 4 bits
    - 1 port × 1 bit
- Remote-control output port   : 1

  The remote-control output circuit consists of a carrier generator, a guide pulse and data pulse generator, and an output waveform controller.

  The remote control output can be provided by setting the control registers.
- Key-On Wake-Up function

  Oscillation can be stopped to turn off microcontroller operation.

  Application of predetermined input levels to the input ports turns on oscillation and microcontroller operation.
- Halt release timers   : 4

  Timer frequencies are selectable.
- Watchdog timers   : 2
- Clock   : 1 MHz ceralock resonator
- Power supply voltage   : 1.5 V/3.0 V (mask option)
- Package:

  24-pin plastic SOP (SOP24-P-430-1.27-K) (Product name : MSM6641-xxGS-K, MSM6641E-xxGS-K)

  Chip

  xx indicates the code number.

PIN CONFIGURATION (TOP VIEW)

P1.1	1	24 P1.2
P1.0	2	23 P1.3
P0.3	3	22 P2.0
P0.2	4	21 P3.0
P0.1	5	20 P3.1
P0.0	6	19 P3.2
RCOUT	7	18 P3.3
V_{DD}	8	17 P4.0
XT	9	16 P4.1
XTB	10	15 P4.2
V_{SS}	11	14 P4.3
$\overline{RESET}$	12	13 P5.0

24-Pin Plastic SOP

PIN DESCRIPTIONS

Pin	Symbol		Type	Description
8	V_{DD}		–	Power supply pin (1.5 V/3.0 V)
11	V_{SS}		–	Ground pin
9	XT		I	Oscillation input pin: a ceramic oscillator is connected.
10	XTB		O	Oscillation output pin: a ceramic oscillator is connected.
7	RCOUT		O	Remote control output pin: This pin outputs the remote control output set by the program. A "L" level is output at the time of reset.
12	$\overline{\text{RESET}}$		I	System reset input pin: when a "L" level is applied to this pin, the microcontroller's internal state is initialized and the program starts from ROM address 000H.
6 5 4 3	PORT 0	P0.0 P0.1 P0.2 P0.3	I	4-bit input port: normally used as the input of key matrix. A pull-down resistor or high impedance can be selected for each bit by the input pull-down control register (PCHZO) of PORT0.
2 1 24 23	PORT 1	P1.0 P1.1 P1.2 P1.3	I	4-bit input port: normally used as the input of key matrix. A pull-down resistor or high impedance for PORT1 can be selected by bit 0 of input pull-down control register (PCHZX) of $P_{ORTS}1$ and 2.
22	PORT 2	P2.0	I	1-bit input port: normally used as the input of key matrix. A pull-down resistor or high impedance for P2.0 can be selected by bit 1 of input pull-down control register (PCHZX) of $P_{ORTS}1$ and 2.
21 20 19 18	PORT 3	P3.0 P3.1 P3.2 P3.3	O	4-bit output port: normally used as the key return signal source of key matrix.
17 16 15 14	PORT 4	P4.0 P4.1 P4.2 P4.3	O	4-bit output port: normally used as the key return signal source of key matrix.
13	PORT 5	P5.0	O	1-bit output port: normally used as the key return signal source of key matrix.

ABSOLUTE MAXIMUM RATINGS (MSM6641)

V_{SS}=0 V

Parameter	Symbol	Condition	Rating	Unit
Power Supply Voltage	V_{DD}		−0.3 to +6.0	
Input Voltage	V_{IN}	Ta=25°C	−0.3 to V_{DD}+0.3	V
Output Voltage	V_O		−0.3 to V_{DD}+0.3	
Storage Temperature	T_{STG}	—	−55 to +125	°C

RECOMMENDED OPERATING CONDITIONS (MSM6641)

V_{SS}=0 V

Parameter	Symbol	Condition	Range	Unit
Power Supply Voltage	V_{DD}	—	+1.2 to +3.5	V
Operating Temperature	T_{op}	—	−20 to +70	°C
Oscillation Frequency	f_{OSC}	—	0.9 to 1.1	MHz

ELECTRICAL CHARACTERISTICS (MSM6641)

DC Characteristics

(V_{DD}=1.5 V, V_{SS}=0 V, f_{OSC}=1 MHz, Ta=25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Applied Pin
Operating Current Consumption	I_{DD}	At remote control output *1	—	300	600	μA	—
Static Current Consumption	I_{DDS}	During standby (XTSTP="1")	—	—	1	μA	—
Oscillation Start Voltage	V_{OSC}	—	—	—	1.2	V	—
Output Current 1	$-I_{OH1}$	V_O=1.0 V	150	—	—	μA	PORT3 to PORT5 *2
	I_{OL1}	V_O=0.5 V	150	—	—		
Output Current 2	$-I_{OH2}$	V_O=1.0 V	500	—	—	μA	RCOUT
	I_{OL2}	V_O=0.5 V	2	—	—	mA	
Input Current 1	I_{IH1}	V_I=1.5 V, input state, with pull-down resistor	3.75	7.5	15	μA	PORT0 to PORT2 *3
Input Leakage Current	$|I_{IL}|$	V_I=1.5 V/0 V, input state, without pull-down resistor	—	—	1	μA	PORT0 to PORT2 *3
Input Current 2	$-I_{IL2}$	V_I=0 V, with pull-up resistor	75	150	300	μA	$\overline{RESET}$
Input Voltage	V_{IH}	—	1.2	—	—	V	All input pins
	V_{IL}		—	—	0.3		

*1 The frequency is 333 kHz, in carrier-through state.
*2 PORT3=P3.0 to P3.3, PORT4=P4.0 to P4.3, PORT5=P5.0
*3 PORT0=P0.0 to P0.3, PORT1=P1.0 to P1.3, PORT2=P2.0

ABSOLUTE MAXIMUM RATINGS (MSM6641E)

V_{SS}=0 V

Parameter	Symbol	Condition	Rating	Unit
Power Supply Voltage	V_{DD}		−0.3 to +6.0	V
Input Voltage	V_{IN}	Ta=25°C	−0.3 to V_{DD}+0.3	
Output Voltage	V_O		−0.3 to V_{DD}+0.3	
Storage Temperature	T_{STG}	—	−55 to +125	°C

RECOMMENDED OPERATING CONDITIONS (MSM6641E)

V_{SS}=0 V

Parameter	Symbol	Condition	Range	Unit
Power Supply Voltage	V_{DD}	—	+2.0 to +3.5	V
Operating Temperature	T_{op}	—	−20 to +70	°C
Oscillation Frequency	f_{OSC}	—	0.9 to 1.1	MHz

ELECTRICAL CHARACTERISTICS (MSM6641E)

DC Characteristics

(V_{DD}=3.0 V, V_{SS}=0 V, f_{OSC}=1 MHz, Ta=25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Applied Pin
Operating Current Consumption	I_{DD}	At remote control output *1	—	1	2	mA	—
Static Current Consumption	I_{DDS}	During standby (XTSTP="1")	—	—	1	µA	—
Oscillation Start Voltage	V_{OSC}	—	—	—	2.0	V	—
Output Current 1	$-I_{OH1}$	V_O=2.5 V	500	—	—	µA	PORT3 to PORT5 *2
	I_{OL1}	V_O=0.5 V	500	—	—		
Output Current 2	$-I_{OH2}$	V_O=2.5 V	1.5	—	—	mA	RCOUT
	I_{OL2}	V_O=0.5 V	6	—	—		
Input Current 1	I_{IH1}	V_I=3.0 V, input state, with pull-down resistor	25	50	100	µA	PORT0 to PORT2 *3
Input Leakage Current	$| I_{IL} |$	V_I=3.0 V/0 V, input state, without pull-down resistor	—	—	1	µA	PORT0 to PORT2 *3
Input Current 2	$-I_{IL2}$	V_I=0 V, with pull-up resistor	150	300	600	µA	$\overline{RESET}$
Input Voltage	V_{IH}	—	2.5	—	—	V	All input pins
	V_{IL}		—	—	0.5		

*1 The frequency is 333 kHz, in carrier-through state.
*2 PORT3=P3.0 to P3.3, PORT4=P4.0 to P4.3, PORT5=P5.0
*3 PORT0=P0.0 to P0.3, PORT1=P1.0 to P1.3, PORT2=P2.0

(Unit : mm)

SOP24-P-430-1.27-K

Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating
Solder plate thickness	5 μm or more
Package weight (g)	0.58 TYP.
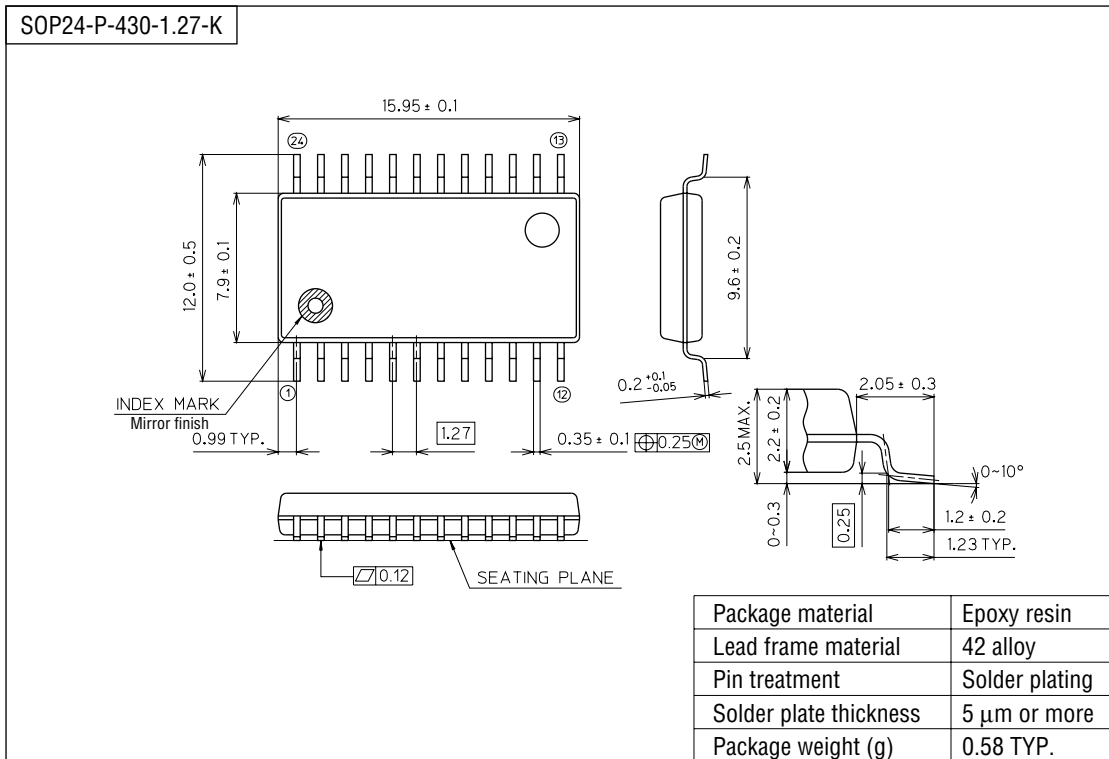
Notes for Mounting the Surface Mount Type Package

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).