Discontinued Product

This version: Jan. 1998
Previous version: Mar. 1996

# OKI Semiconductor

# MSM6353/6353L-xx

**Built-in 8 or 5 bit Serial Port 4-Bit Microcontroller**

## GENERAL DESCRIPTION

The MSM6353/6353L is a low-power 4-bit microcontroller manufactured in CMOS process technology. It is best suited for the control of battery-driven equipment. The built-in 8-bit or 5-bit serial port provides a data communication capability with external apparatus.

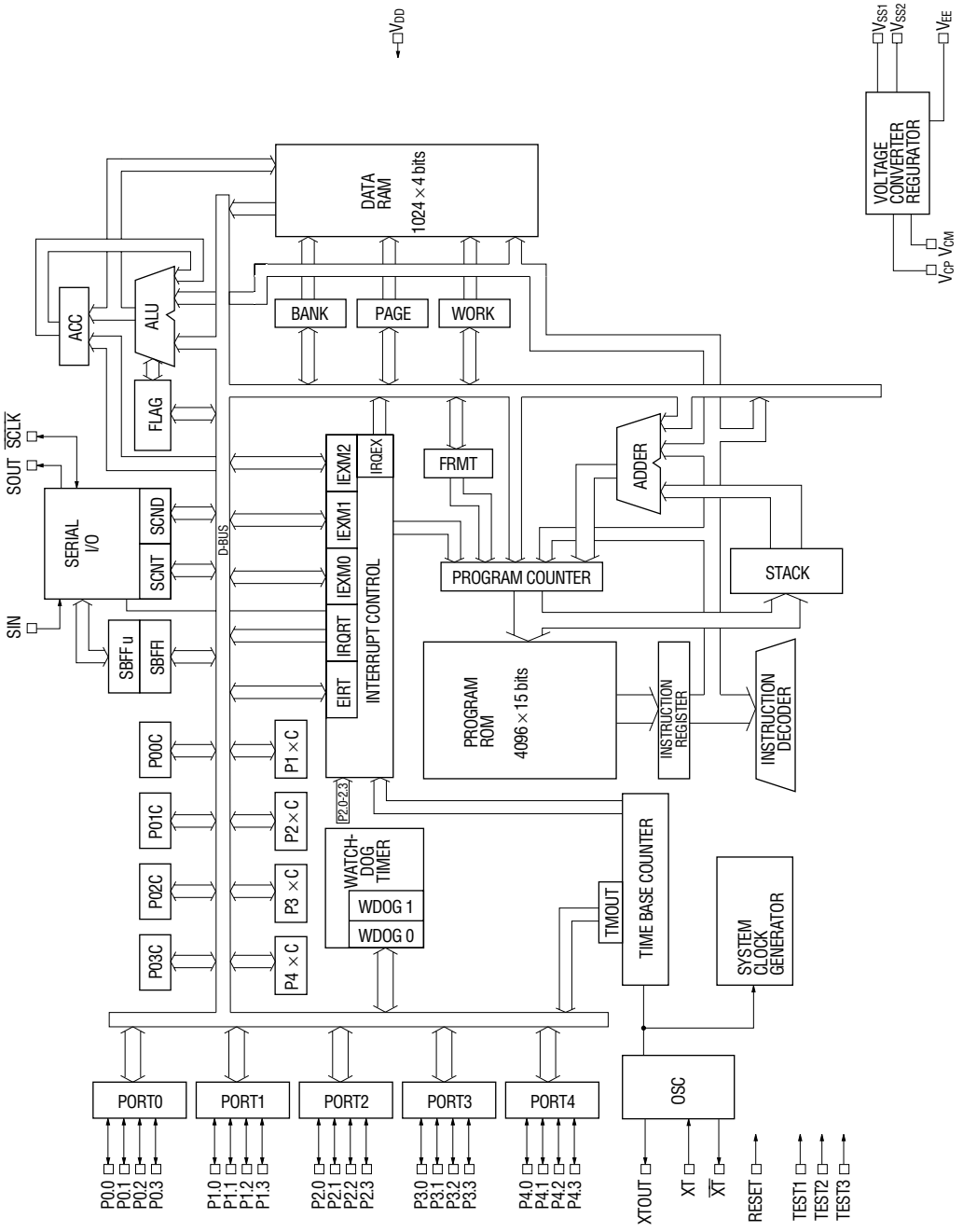
## FEATURES

- Low power consumption
- Large capacity memory
- ROM : 4096 words × 15 bits
- RAM : 1024 words × 4 bits
- I/O port
  Input-output port : 5 ports × 4 bits (input or output can be specified for each port)
- 1.5 V single-power-supply operation (MSM6353)
  Can be changed to 3.0 V specification by mask option (MSM6353L).
- Built-in watchdog timer
- Built-in serial port of 8 bits or 5 bits (asynchronous)
- 32.768 kHz built-in crystal oscillator circuit
- Package options:

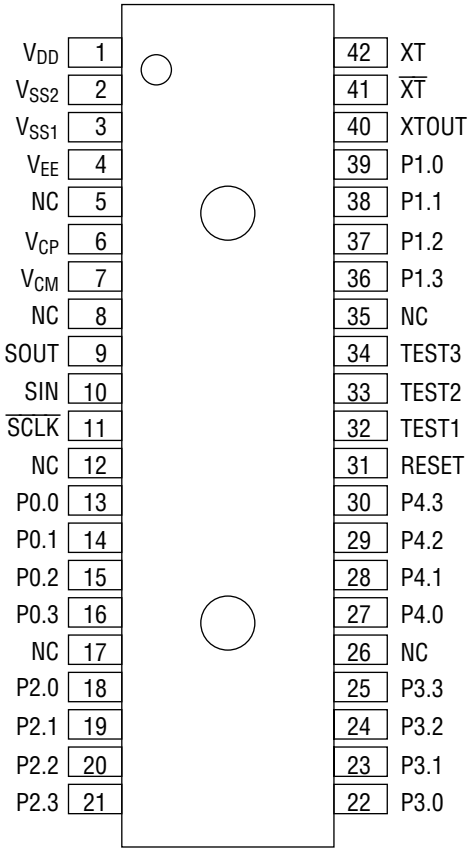
| | | |
|---|---|---|
| 42-pin shrink DIP | (SDIP42-P-600-1.78) | (Product name: MSM6353-xxSS, MSM6353L-xxSS) |
| 44-pin plastic QFP | (QFP44-P-910-0.80-K) | (Product name:MSM6353-xxGS-K, MSM6353L-xxGS-K) |
| | (QFP44-P-910-0.80-2K) | (Product name: MSM6353-xxGS-2K,MSM6353L-xxGS-2K) |

xx indicates the code number.

## BLOCK DIAGRAM



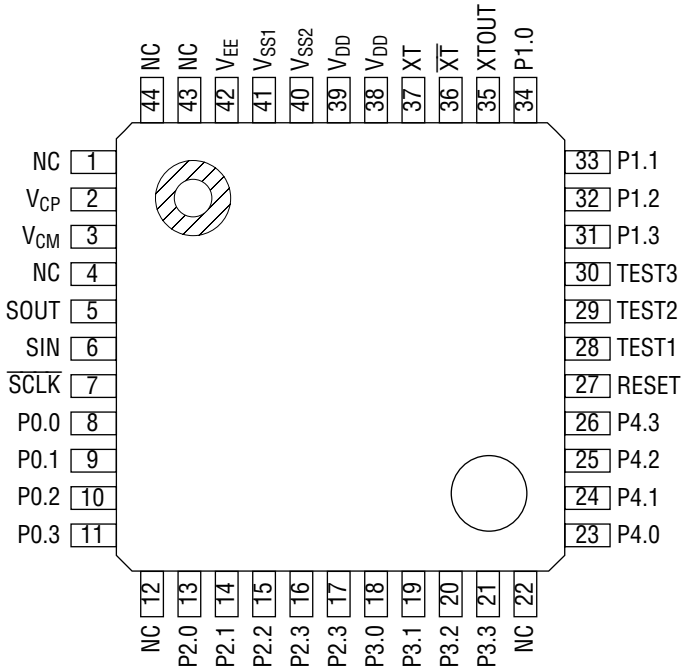
## PIN CONFIGURATION (TOP VIEW)




NC : No-connection pin

**42-Pin Shrink DIP**

## PIN CONFIGURATION (TOP VIEW) (Continued)




NC : No-connection pin

**44-Pin Plastic QFP**

## ABSOLUTE MAXIMUM RATINGS (MSM6353, 1.5 V)

$V_{DD}$=0 V ($V_{SS1}$=$V_{SS2}$=battery voltage)

| Parameter | Symbol | Condition | Rating | Unit |
|---|---|---|---|---|
| Power Supply Voltage | $V_{SS1}$ | Ta=25°C | –6.0 to +0.3 | V |
| Input Voltage | $V_{IN}$ | | $V_{SS}$–0.3 to $V_{SS}$+0.3 | |
| Output Voltage | $V_{OUT}$ | | $V_{SS}$–0.3 to $V_{SS}$+0.3 | |
| Storage Temperature | $T_{STG}$ | — | –55 to +125 | °C |

## RECOMMENDED OPERATING CONDITIONS (MSM6353, 1.5 V)

$V_{DD}$=0 V ($V_{SS1}$=$V_{SS2}$=battery voltage)

| Parameter | Symbol | Condition | Range | Unit |
|---|---|---|---|---|
| Operating Voltage | $V_{op}$ | BUF=Fixed to "0" | –1.25 to –1.75 | V |
| Operating Temperature | $T_{op}$ | — | –20 to +70 | °C |
| Operating Frequency | $f_{OSC}$ | — | 32.768 | kHz |

## ELECTRICAL CHARACTERISTICS (MSM6353, 1.5 V)

### DC Characteristics

($V_{DD}$=0 V, $V_{SS1}$=$V_{SS2}$=–1.5 V (battery voltage), $f_{OSC}$=32,768 Hz, $C_X$=35 pF, Ta=25°C)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit | Applied Pin |
|---|---|---|---|---|---|---|---|
| Current Consumption | $I_{DD}$ | *1 *2 | — | 3.0 | — | µA | — |
| Oscillation Start Voltage | $-V_{OSC}$ | Within 2 sec. | — | — | 1.4 | V | — |
| Output Current 1 | $-I_{OH1}$ | $V_O$=–0.5 V | 150 | — | — | µA | PORT0 to PORT4*3 |
| | $I_{OL1}$ | $V_O$=–1.0 V | 150 | — | — | | SOUT, $\overline{SCLK}$, XTOUT |
| Output Current 2 | $-I_{OH2}$ | $V_O$=–0.5 V | 7 | — | — | µA | BD |
| | $I_{OL2}$ | $V_O$=–1.0 V | 20 | — | — | | |
| Input Current 1 | $-I_{IH1}$ | $V_I$=0 V, input state, with pull-down resistor | 75 | 150 | 300 | µA | PORT0 to PORT4 |
| Input Leakage Current | $\lvert I_{IL2} \rvert$ | $V_I$=0V, –1.5 V, input state, without pull-down resistor | — | — | 1 | µA | PORT0 to PORT4 $\overline{SCLK}$, SIN, SOUT |
| Input Current 3 | $-I_{IL3}$ | $V_I$=0 V, with pull-down resistor | — | 4 | — | µA | RESET |
| Input Voltage | $-V_{IH}$ | — | — | — | 0.3 | V | All input pins |
| | $-V_{IL}$ | — | 1.2 | — | — | | |

*1 This value depends on program.
*2 Backup flag (BUF)=fixed to "0".
*3 PORT0=P0.0-P0.3, PORT1=P1.0-P1.3, PORT2=P2.0-P2.3, PORT3=P3.0-P3.3, PORT4=P4.0-P4.3.

## ABSOLUTE MAXIMUM RATINGS (MSM6353L, 3.0 V)

$V_{DD}$=0 V ($V_{SS1}$=$V_{SS2}$=battery voltage)

| Parameter | Symbol | Condition | Rating | Unit |
|---|---|---|---|---|
| Power Supply Voltage | $V_{SS1}$ | Ta=25°C | –6.0 to +0.3 | V |
| Input Voltage | $V_{IN}$ | | $V_{SS}$–0.3 to $V_{SS}$+0.3 | |
| Output Voltage | $V_{OUT}$ | | $V_{SS}$–0.3 to $V_{SS}$+0.3 | |
| Storage Temperature | $T_{STG}$ | — | –55 to +125 | °C |

## RECOMMENDED OPERATING CONDITIONS (MSM6353L, 3.0 V)

$V_{DD}$=0 V ($V_{SS1}$=$V_{SS2}$=battery voltage)

| Parameter | Symbol | Condition | Range | Unit |
|---|---|---|---|---|
| Operating Voltage | $V_{op}$ | BUF=Fixed to "1" | –2.2 to –3.5 | V |
| Operating Temperature | $T_{op}$ | — | –20 to +70 | °C |
| Operating Frequency | $f_{OSC}$ | — | 32.768 | kHz |

## ELECTRICAL CHARACTERISTICS (MSM6353L, 3.0 V)

### DC Characteristics

($V_{DD}$=0 V, $V_{SS1}$=$V_{SS2}$=–3.0 V (battery voltage), $f_{OSC}$=32,768 Hz, $C_X$=35 pF, Ta=25°C)

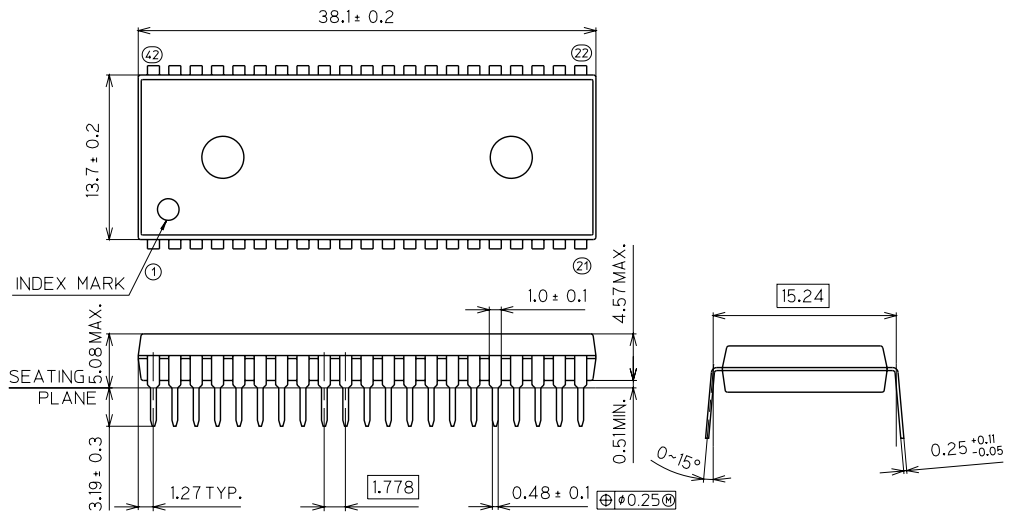
| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit | Applied Pin |
|---|---|---|---|---|---|---|---|
| Current Consumption | $I_{DD}$ | *1 *2 | — | 3.0 | — | µA | — |
| Oscillation Start Voltage | $-V_{OSC}$ | Within 2 sec. | — | — | 2.4 | V | — |
| Output Current 1 | $-I_{OH1}$ | $V_O$=–0.5 V | 500 | — | — | µA | PORT0 to PORT4*3 |
| | $I_{OL1}$ | $V_O$=–2.5 V | 500 | — | — | | SOUT, $\overline{SCLK}$, XTOUT |
| Output Current 2 | $-I_{OH2}$ | $V_O$=–0.5 V | 7 | — | — | µA | BD |
| | $I_{OL2}$ | $V_O$=–2.5 V | 20 | — | — | | |
| Input Current 1 | $-I_{IH1}$ | $V_I$=0 V, input state, with pull-down resistor | 150 | 300 | 600 | µA | PORT0 to PORT4 |
| Input Leakage Current | $\lvert I_{IL2} \rvert$ | $V_I$=0 V, –3 V, input state, without pull-down resistor | — | — | 1 | µA | PORT0 to PORT4 $\overline{SCLK}$, SIN, SOUT |
| Input Current 3 | $-I_{IL3}$ | $V_I$=0 V, with pull-down resistor | — | 25 | — | µA | RESET |
| Input Voltage | $-V_{IH}$ | — | — | — | 0.5 | V | All input pins |
| | $-V_{IL}$ | — | 2.5 | — | — | | |

*1 This value depends on program.
*2 Backup flag (BUF)=fixed to "1".
*3 PORT0=P0.0-P0.3, PORT1=P1.0-P1.3, PORT2=P2.0-P2.3, PORT3=P3.0-P3.3, PORT4=P4.0-P4.3.

## PACKAGE DIMENSIONS

(Unit : mm)

SDIP42-P-600-1.78



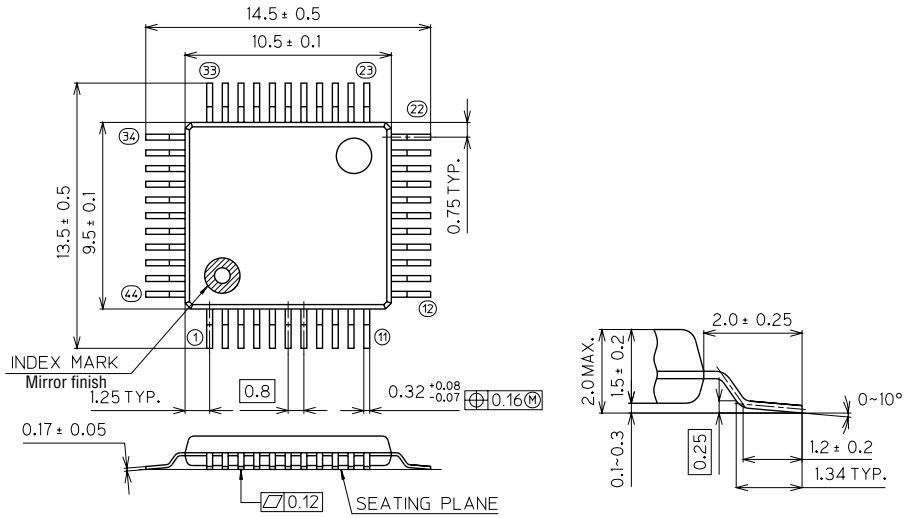

| | |
|---|---|
| Package material | Epoxy resin |
| Lead frame material | 42 alloy |
| Pin treatment | Solder plating |
| Solder plate thickness | 5 μm or more |
| Package weight (g) | 4.52 TYP. |

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).

(Unit : mm)

QFP44-P-910-0.80-K



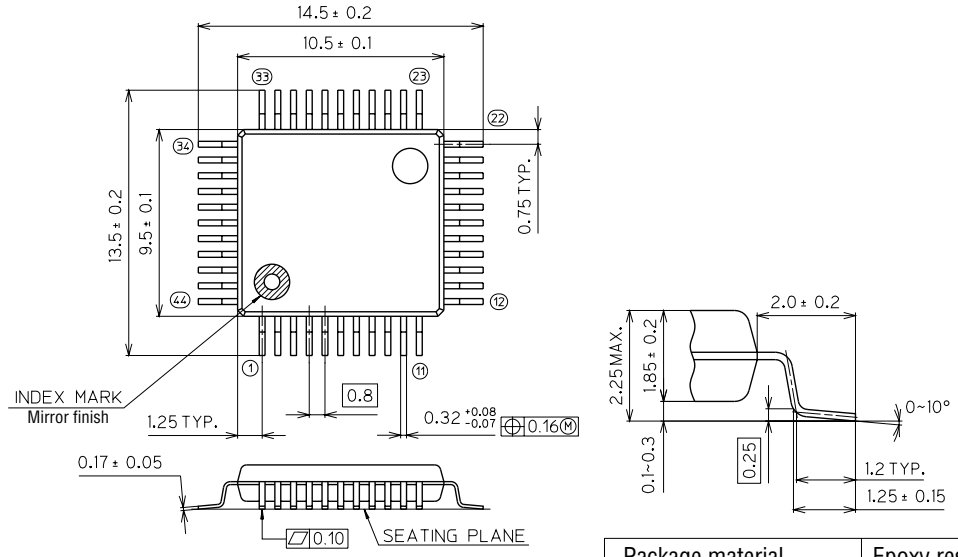

| | |
|---|---|
| Package material | Epoxy resin |
| Lead frame material | 42 alloy |
| Pin treatment | Solder plating |
| Solder plate thickness | 5 μm or more |
| Package weight (g) | 0.35 TYP. |

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).

(Unit : mm)

QFP44-P-910-0.80-2K




| | |
|---|---|
| Package material | Epoxy resin |
| Lead frame material | 42 alloy |
| Pin treatment | Solder plating |
| Solder plate thickness | 5 μm or more |
| Package weight (g) | 0.41 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).