

MSM5052

Built-in Temperature Circuit and LCD Driver 4-Bit Microcontroller

GENERAL DESCRIPTION

The MSM5052 is a low-power microcontroller manufactured in complementary metal-oxide semiconductor technology. Integrated into a single chip are ROM, RAM, crystal oscillator, voltage doubler, timer, LCD driver, input port, output port, and thermistor-based temperature measuring circuit.

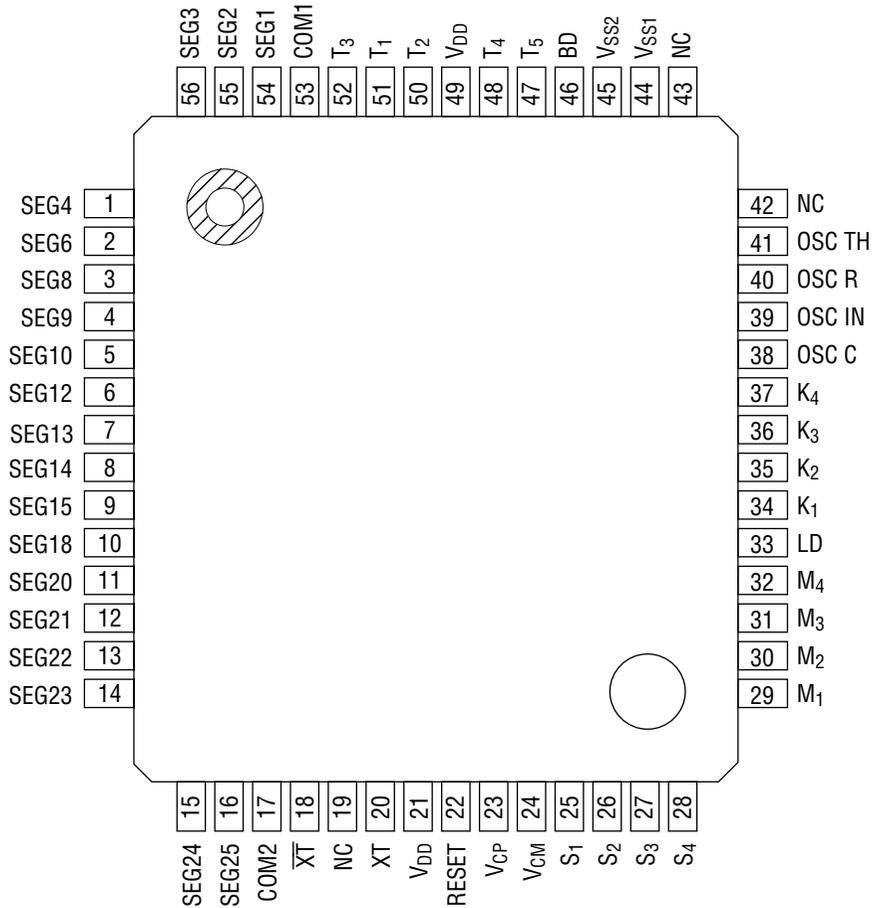
Using an on-chip ROM reduces power consumption.

The MSM5052 is widely used in electronic products requiring low-power operation, for example, thermometer and clinical thermometer.

FEATURES

- Low power consumption
 - Internal ROM : 1280 × 14 bits
 - Internal RAM : 62 × 4 bits
 - I/O port
 - Input port : 2 ports × 4 bits
 - Output port : 1 port × 4 bits
1 port × 1 bit
 - 4 × 4 key matrix input is available by using K₁ to K₄ and M₁ to M₄
 - 26 LCD drivers (1/2 duty, 1/2 bias, 52 segments)
 - 42 instructions
 - Minimum instruction execution time : 122.1 μs (Display instruction cycle: 244.2 μs)
 - 1.5 V operating voltage (Built-in LCD drive voltage doubler)
 - Buzzer function
 - Built-in thermistor-based temperature measuring circuit
 - Crystal oscillator : 32.768 kHz
 - Package options:
 - 56-pin plastic QFP (QFP56-P-910-0.65-K) : (Product name : MSM5052-xxxGS-K)
 - 56-pin plastic QFP (QFP56-P-910-0.65-2K) : (Product name : MSM5052-xxxGS-2K)
 - 80-pin plastic QFP (QFP80-P-1420-0.80-BK) : (Product name : MSM5052-xxxGS-BK)
 - Chip (Chip size 4.77 mm × 4.36 mm) : (Product name : MSM5052-xxx)
- xxx indicates a code number.

PIN CONFIGURATION (TOP VIEW)

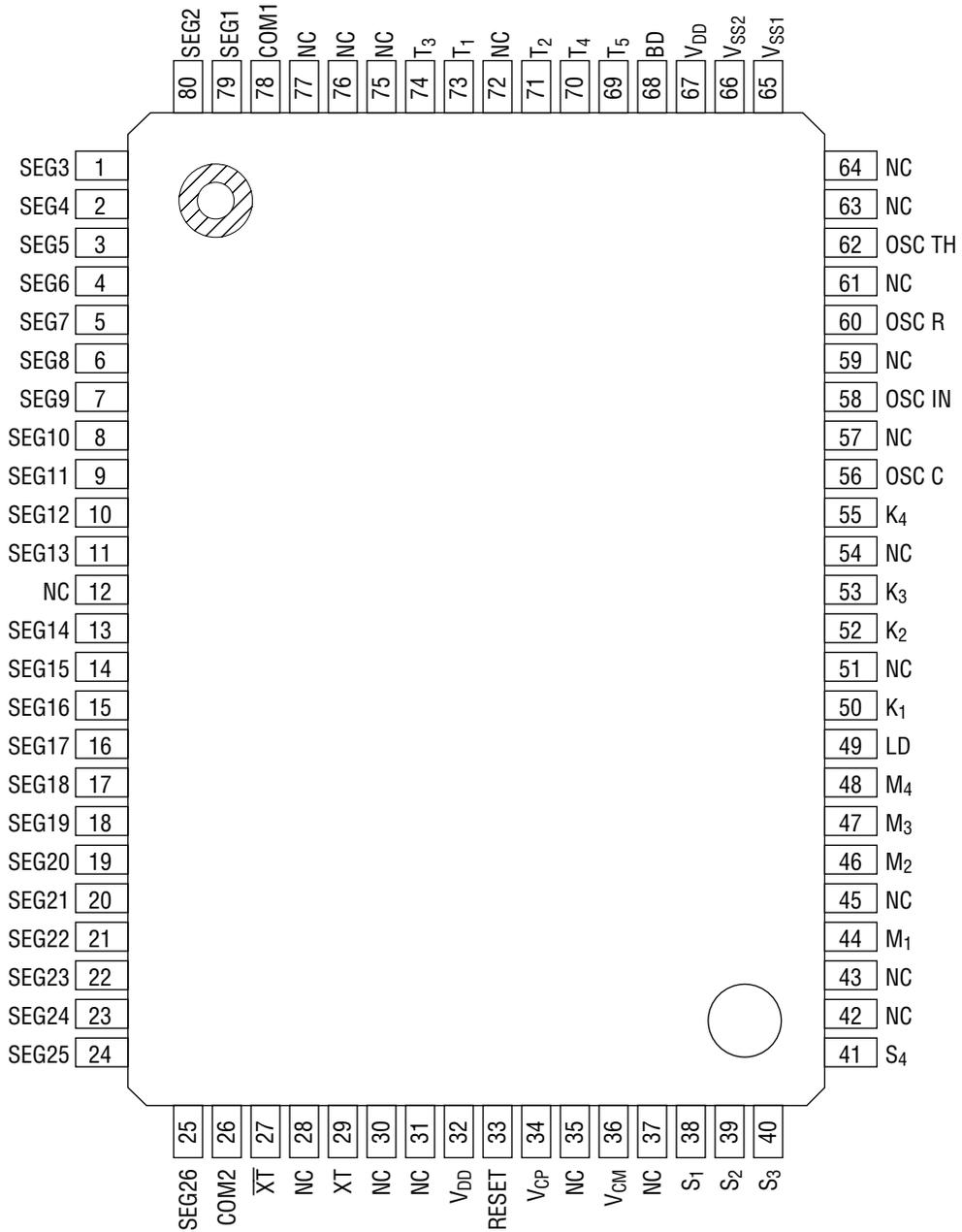


NC: No-connection pin

56-Pin Plastic QFP

Note: SEG5, SEG7, SEG11, SEG16, SEG17, SEG19, and SEG26 are not connected to package pins.

PIN CONFIGURATION (TOP VIEW) (continued)

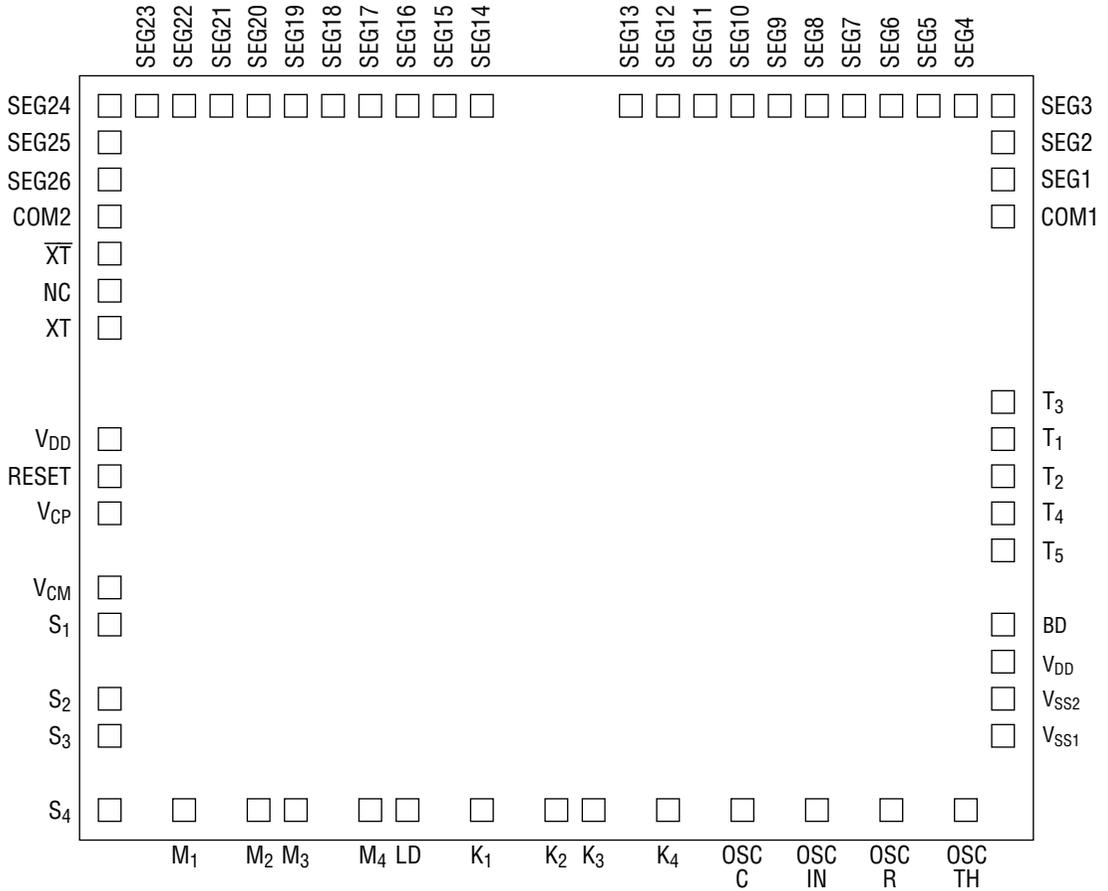


NC: No-connection pin

80-Pin Plastic QFP

PAD CONFIGURATION

Pad Layout



Chip size 4.77 × 4.36 (mm)

PIN DESCRIPTIONS

Symbol	Description
V _{DD}	Ground.
V _{SS1}	Power source (-1.5 V).
V _{SS2}	Power source for LCD driver (-3.0 V). This pin is connected to the V _{DD} pin through a 0.1 μ F capacitor.
V _{CP} , V _{CM}	Booster capacitor connection pins. V _{CP} pin is connected to the V _{CM} pin through a 0.1 μ F capacitor.
XT, $\overline{\text{XT}}$	Input and output pins of oscillator inverter. A 32.768 kHz crystal is connected to these pins.
T1 to T5	Pins to test internal logic. T1, T2, T4, and T5 are pulled down to V _{SS1} . T3 is the output. Test pins are normally open.
RESET	Pin to clear internal logic, pulled down to V _{SS1} . After power is turned on, the MSM5052 can be reset by this pin.
BD	Buzzer output.
OSC TH, OSC R, OSC C, OSC IN	Pins to RC oscillation circuit for temperature detection. These are the fundamental resistor, thermistor, and capacitor connection pins.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Rating	Unit
Power Supply Voltage	$V_{SS1}-V_{DD}$	$T_a = 25^\circ\text{C}$	-2.0 to +0.3	V
Input Voltage	V_{IN}	$T_a = 25^\circ\text{C}$	$V_{SS1} - 0.3$ to +0.3	V
Storage Temperature	T_{STG}	—	-55 to +125	$^\circ\text{C}$
Operating Temperature	T_{op}	—	-20 to +75	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS

DC Characteristics

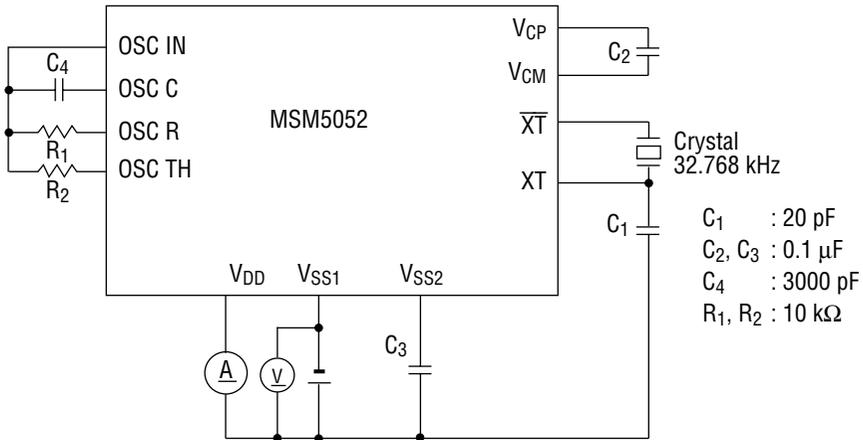
($V_{DD} = 0\text{ V}$, $V_{SS1} = -1.55\text{ V}$, $V_{SS2} = -3.0\text{ V}$, $C_1 = 30\text{ pF}$, $T_a = 25^\circ\text{C}$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
V_{SS1} Operating Voltage	V_{SS1}	V_{SS1} pin	-1.65	-1.55	-1.25	V
Power Supply Current 1	I_{DD1}	Temperature sampling off (Refer to measuring circuit)	—	3.0 *1	—	μA
Power Supply Current 2	I_{DD2}	Temperature sampling on (Refer to measuring circuit)	—	100 *2	—	μA
Oscillation Start Voltage	V_{OSC}	Within 10 seconds, V_{SS1} pin (Refer to measuring circuit)	—	—	-1.45	V
Output Current 1 COM	I_{OH1}	$V_{OH1} = -0.2\text{ V}$	—	—	-4	μA
	I_{OM1}	$V_{OM1} = V_{SS1} \pm 0.2\text{ V}$	-4	—	+4	
	I_{OL1}	$V_{OL1} = -2.8\text{ V}$	4	—	—	
Output Current 2 SEGMENT	I_{OH2}	$V_{OH2} = -0.2\text{ V}$	—	—	-0.4	μA
	I_{OL2}	$V_{OL2} = -2.8\text{ V}$	0.4	—	—	
Output Current 3 C, R, TH	I_{OH3}	$V_{OH3} = -0.4\text{ V}$	—	—	-400	μA
	I_{OL3}	$V_{OL3} = -1.15\text{ V}$	400	—	—	
Output Current 4 M_1-M_4 , LD	I_{OH4}	$V_{OH4} = -0.4\text{ V}$	—	—	-100	μA
	I_{OL4}	$V_{OL4} = -1.15\text{ V}$	10	—	—	
Output Current 5 BD	I_{OH5}	$V_{OH5} = -0.4\text{ V}$	-200	—	-50	μA
	I_{OL5}	$V_{OL5} = -1.15\text{ V}$	3	—	—	
Input Current S_1-S_4 , K_1-K_4	I_{IH}	$V_{IN} = 0\text{ V}$	3	—	30	μA
	I_{IL}	$V_{IN} = -1.55\text{ V}$	-0.2	—	—	
Built-in CD Capacitance	CD	—	—	25	—	pF

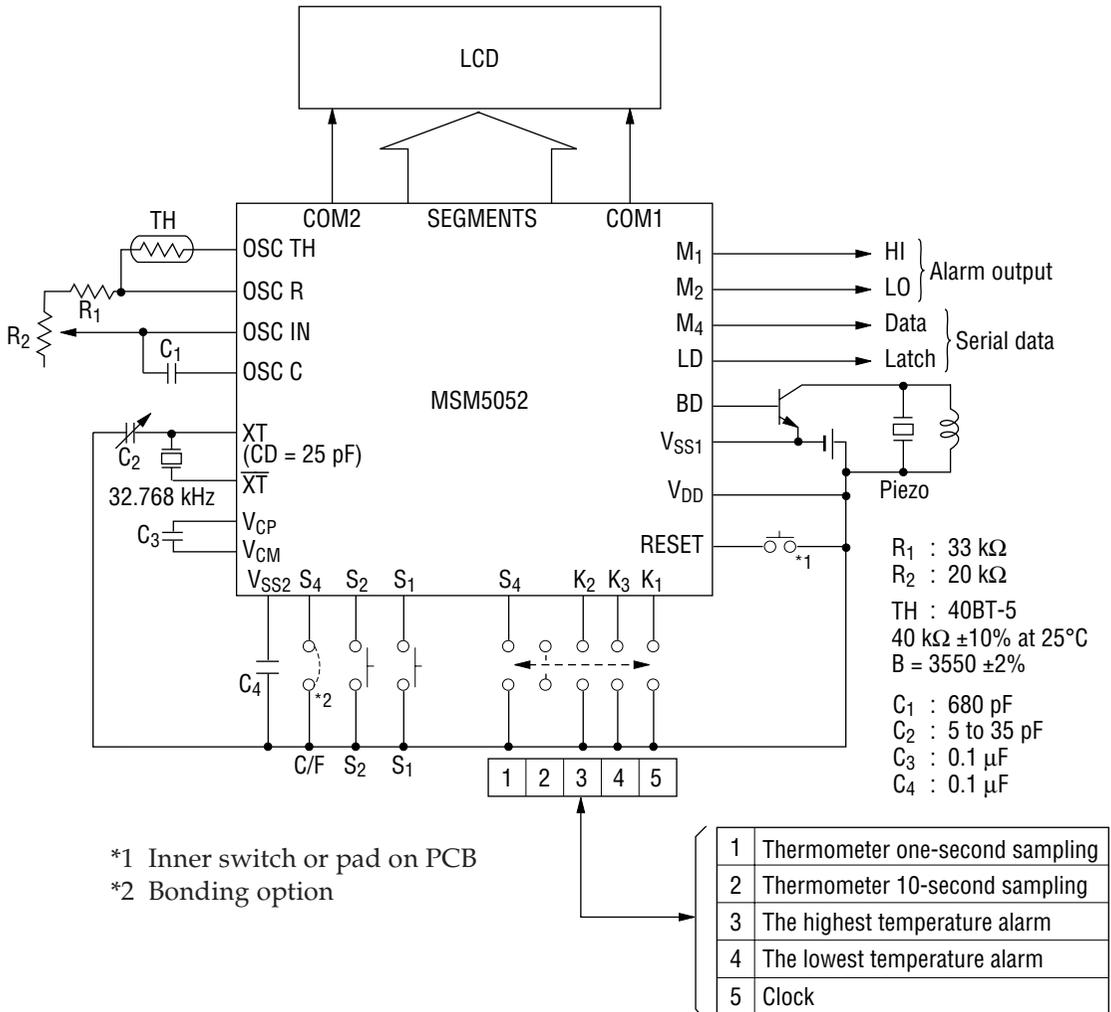
*1 The typ. value varies depending on the application program.

*2 The typ. value varies depending on the application program and RC thermistor to be used.

Measuring circuit

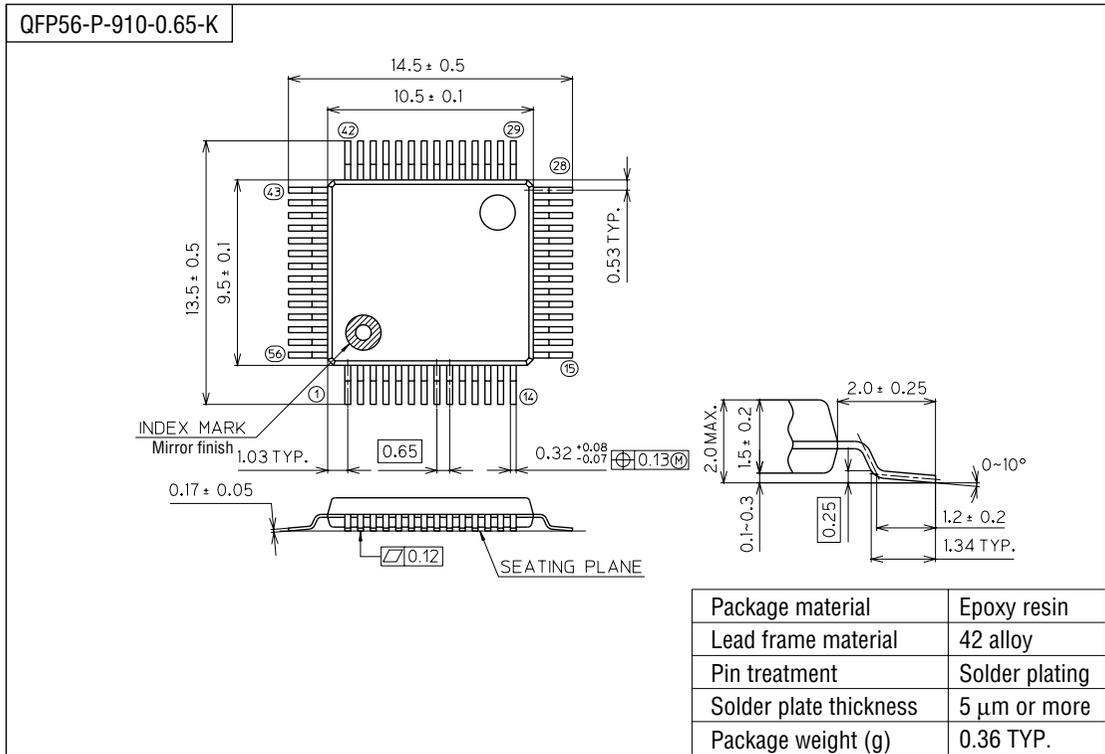


APPLICATION CIRCUIT



PACKAGE DIMENSIONS

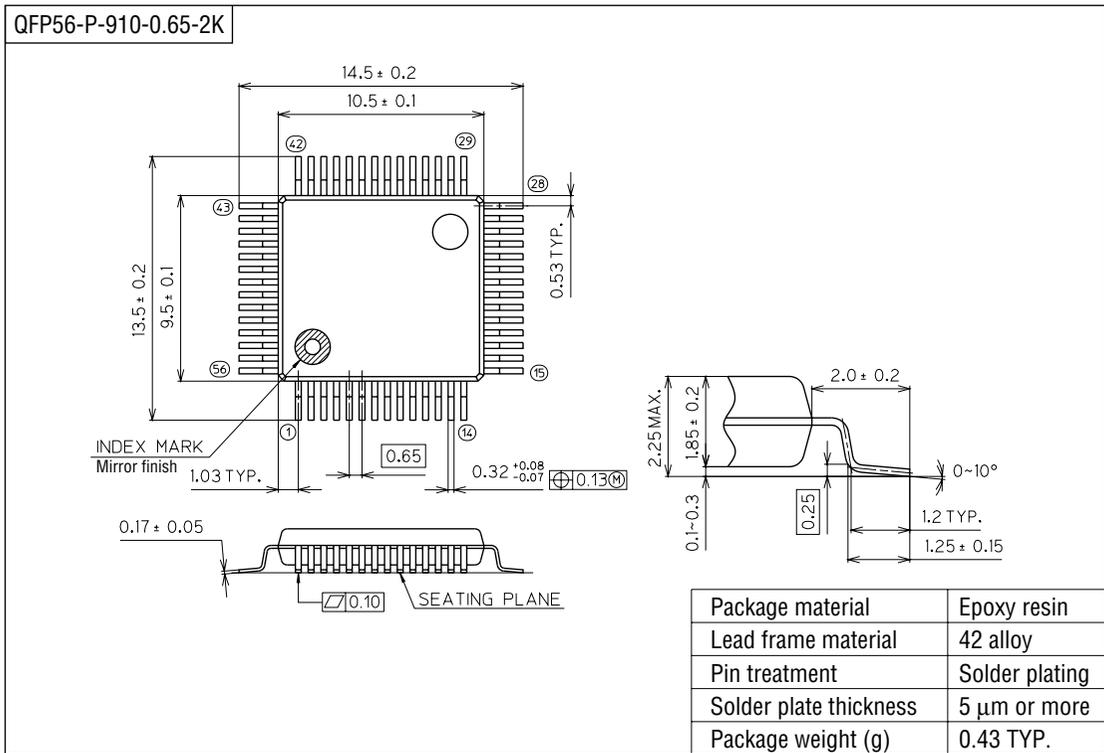
(Unit : mm)



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).

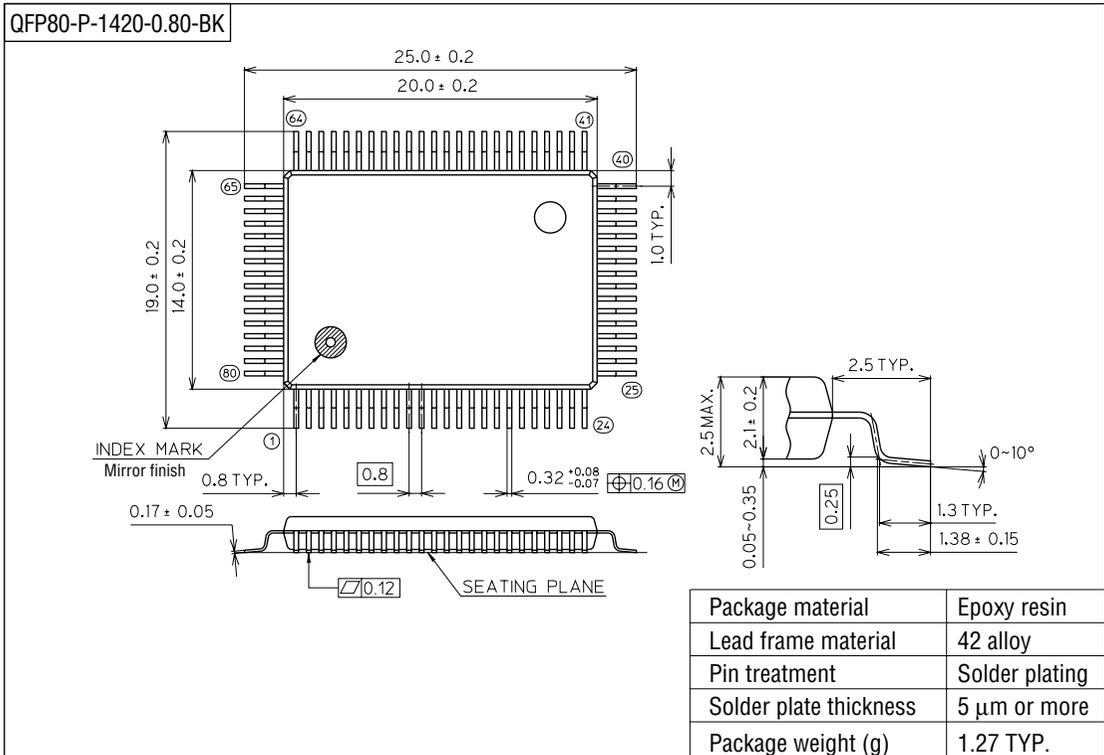
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