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EM65XX

# EM65XX Datasheet

## MFP versions of EM66XX (Mask Rom)

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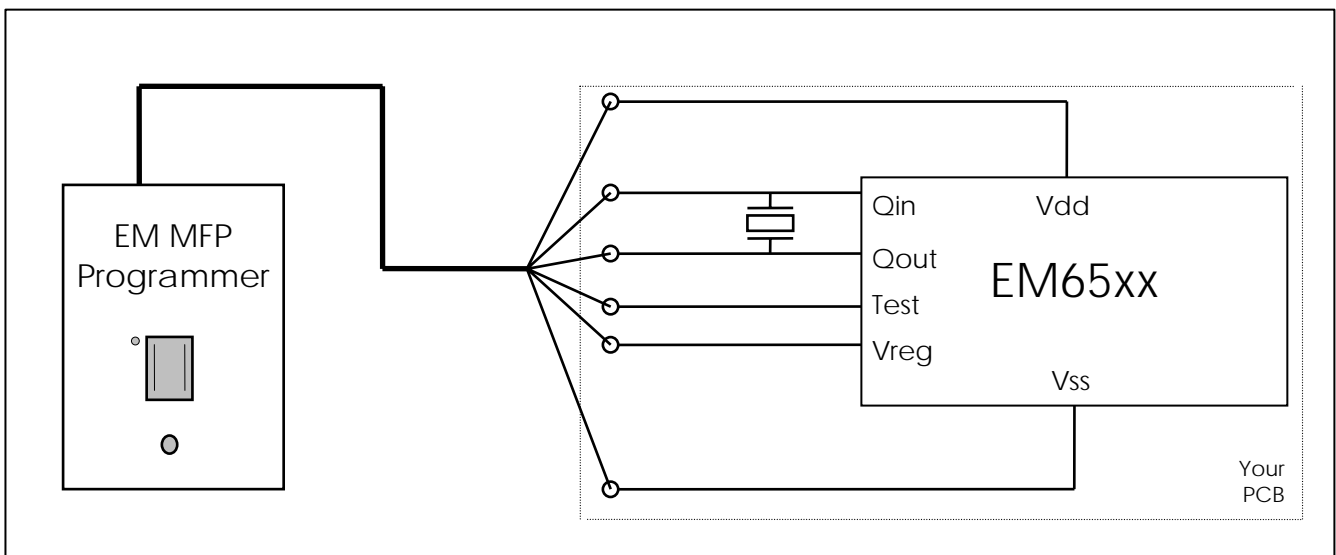
## 1. General

The EM65xx is the Multiple Field Programmable Version of the corresponding EM66xx 4 bit Microcontroller

The program ROM is replaced by non volatile memory, which can be programmed up to 100 times. Functionally, the two types are equal, except the metal options which are defined in the following pages.

Electrically, the MFP 's work above 2.0V and need more current, see the tables in the following description.

The programming is done with the EM MFP programmer, either by putting the device onto the programmer or connecting it with the connector at the back to your board.



### Handling Procedures

This devices have built-in protection against high static voltages or electric fields; however, anti-static precautions should be taken as for any other CMOS component. Unless otherwise specified, proper operation can only occur when all terminal voltages are kept within the supply voltage range.

### Absolute maximum ratings

|   | Min.      | Max.        | Units |
|---|-----------|-------------|-------|
| Power supply VDD-VSS                                | - 0.2     | + 5.5       | V     |
| Input voltage                                       | VSS - 0.2 | VDD+0.2     | V     |
| Storage temperature                                 | - 40      | + 125       | °C    |
| Electrostatic discharge to MIL-STD-883C method 3015 | -2000     | +2000       | V     |
| Maximum soldering conditions                        |           | 10s x 250°C |       |

Stresses above these listed maximum ratings may cause permanent damage to the device. Exposure beyond specified electrical characteristics may affect device reliability or cause malfunction.

### Ordering Information

The MFP's should be used for engineering purposes only. No volume production must be planned.



## 2. EM6503

### Input/Output ports

All ports if selected as outputs are Push-pull outputs (driving high / low).  
Inputs are not blocked when Output is selected and Outputs comes Hi-Z in Sleep mode.

### Input/Output Port Options

|    |            | Pull-Up<br>Yes / No | Pull-Down<br>Yes / No | Nch-open drain<br>Yes / No | Input blocked<br>when Output<br>Yes / No | Output Hi-Z in<br>SLEEP mode<br>Yes / No |
|----|------------|---------------------|-----------------------|----------------------------|--|--|
|    |            | 0                   | 1                     | 4                          | 5  | 6  |
| A0 | PA0 input  | NO                  | NO                    |                            |  |  |
| A1 | PA1 input  | NO                  | NO                    |                            |  |  |
| A2 | PA2 input  | NO                  | NO                    |                            |  |  |
| A3 | PA3 input  | NO                  | NO                    |                            |  |  |
| B0 | PB0 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| B1 | PB1 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| B2 | PB2 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| B3 | PB3 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| C0 | PC0 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| C1 | PC1 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| C2 | PC2 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| C3 | PC3 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| D0 | PD0 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| D1 | PD1 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| D2 | PD2 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |
| D3 | PD3 In/Out | NO                  | NO                    | NO                         | NO                                       | YES                                      |

### PortA reset

No PortA reset option is selected

|    |             | NO PortA reset<br>combination | PA0 & PA1 logic<br>AND input reset | PA0 & PA1 & PA2<br>logic AND input<br>reset | PA0 & PA1 & PA2 &<br>PA3 logic AND input<br>reset |
|----|-------------|-------------------------------|------------------------------------|---|---|
|    |             | 0                             | 1                                  | 2   | 3   |
| RA | PortA RESET | X                             |                                    |   |   |

### Supply Voltage Level Detector

T= -10°C to 60°C

| Symb.  | Parameter           | Min. | Typ. | Max. | Unit |
|--------|---------------------|------|------|------|------|
| VSVLD1 | SVLD voltage Level1 | 2.25 | 2.5  | 2.75 | V    |
| VSVLD2 | SVLD voltage Level2 | 3.15 | 3.5  | 3.85 | V    |
| VSVLD3 | SVLD voltage Level3 | 3.87 | 4.3  | 4.73 | V    |



## Electrical specifications

### Standard Operating Conditions

| Parameter       | Value           | Description                     |
|-----------------|-----------------|---------------------------------|
| Temperature     | 0°C...+60°C     |                                 |
| VDD             | +2.0 ...+5.0V   |                                 |
| VSS             | 0 V (reference) |                                 |
| CVreg           | min. 100nF      | Vreg logic supply capacitor     |
| f <sub>q</sub>  | 32768 Hz        | nominal frequency               |
| R <sub>qs</sub> | 35 kOhm         | typical quartz serial resistor  |
| CL              | 8.2pF           | typical quartz load capacitance |
| df/f            | +/- 30 ppm      | quartz frequency tolerance      |

### DC characteristics - Power Supply Pins

VDD=3.0V, T=25°C (note4) (unless otherwise specified), Vreg not shorted to VDD

| Parameter                                 | Conditions                     | Symb. | Min. | Typ.<br>(note1) | Max. | Unit |
|---|--------------------------------|-------|------|-----------------|------|------|
| ACTIVE Supply Current                     | +25°C (note2)                  | IVDDa |      | 9.0             | 15.0 | μA   |
| ACTIVE Supply Current<br>(in active mode) | (note2) (note3)<br>0°C...+60°C | IVDDa |      |                 | 20.0 | μA   |
| STANDBY Supply Current                    | +25°C                          | IVDDh |      | 1.7             | 4.0  | μA   |
| STANDBY Supply Current<br>(in Halt mode)  | (note3)<br>0°C...+60°C         | IVDDh |      |                 | 7.0  | μA   |
| SLEEP Supply Current                      | +25°C                          | IVDDs |      | 0.7             | 2.0  | μA   |
| SLEEP Supply Current<br>(SLEEP =1)        | (note3)<br>0°C...+60°C         | IVDDs |      |                 | 5.0  | μA   |
| Regulated Voltage                         | 0°C...+60°C                    | Vreg  | 1.6  |                 | 2.5  | V    |

VDD=5.0V, T=25°C (note4) (unless otherwise specified), Vreg not shorted to VDD

| Parameter                                 | Conditions                     | Symb. | Min. | Typ.<br>(note1) | Max. | Unit |
|---|--------------------------------|-------|------|-----------------|------|------|
| ACTIVE Supply Current                     | +25°C (note2)                  | IVDDa |      | 13.0            | 18.0 | μA   |
| ACTIVE Supply Current<br>(in active mode) | (note2) (note3)<br>0°C...+60°C | IVDDa |      |                 | 20.0 | μA   |
| STANDBY Supply Current                    | +25°C                          | IVDDh |      | 1.8             | 5.0  | μA   |
| STANDBY Supply Current<br>(in Halt mode)  | (note3)<br>0°C...+60°C         | IVDDh |      |                 | 10.0 | μA   |
| SLEEP Supply Current                      | +25°C                          | IVDDs |      | 0.7             | 2.0  | μA   |
| SLEEP Supply Current<br>(SLEEP =1)        | (note3)<br>0°C...+60°C         | IVDDs |      |                 | 5.0  | μA   |

**Note1:** For current measurement typical quartz described in Operating Conditions is used.

All I/O pins without internal Pull Up/Down are pulled to VDD externally.

**Note2:** Test loop with successive writing and reading of two different addresses with an inverted values (five instructions should be reserved for this measurement),

**Note3:** NOT tested at temperature if delivered in chip form.

**Note4:** Test conditions for ACTIVE and STANDBY Supply current mode are: Q<sub>in</sub> = external square wave, from rail to rail of Vreg (regulated voltage) with 100nF capacitor on Vreg. f<sub>Qin</sub> = 33kHz.

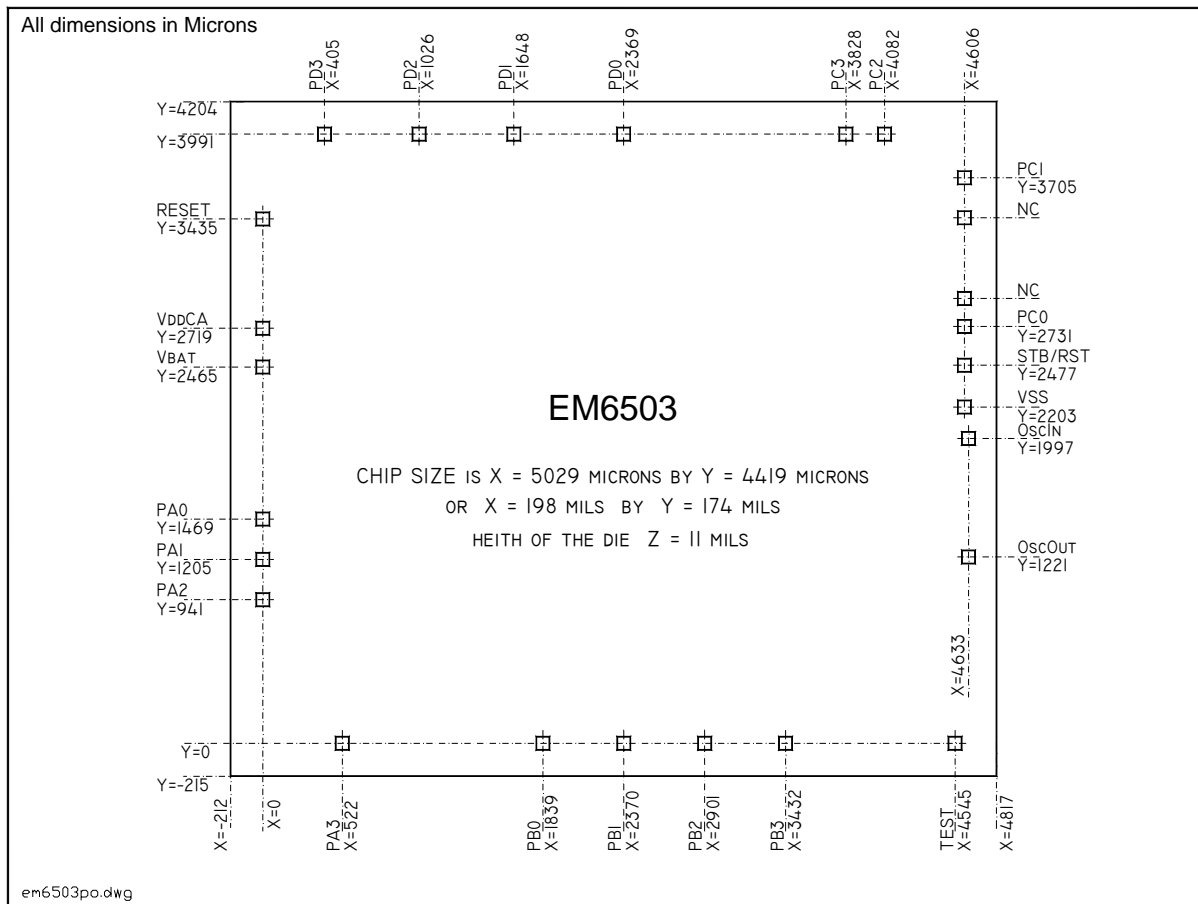


# EM65XX

## Today's Versions

|           | I/O's      | VLD levels | Remarks |
|-----------|------------|------------|---------|
| EM6503P02 | As defined | As defined | -       |

## Die, pad location and size



## Package

SO24 package. See dimensions in section 10.



## 3. EM6504

### Input / Output ports

The EM6504 - MFP version of EM6604 has no input pull-up or pull-down resistors. User has to put an external resistor if needed in the application. In metal ROM version (EM6604) user can select resistors described in Electrical parameters and Input/Output port mask option.

For PortC Input/Output selection there is an additional register in EM6504 (register **PcOE** at address 60hex) instead of metal mask in EM6604.

For PortA Rising/Falling Interrupt edge selection there is an additional register in EM6504 (register **PaIRQedge** at address 63hex) instead of metal mask in EM6604.

PortC Input/Output metal options are replaced by register **PcOE** in EM6504 MFP version. This register is described below.

### Input / Output ports option

|    |            | Output | Clocked Pull-Down R > 1M? | Clocked Pull-Up R > 1M? | Pull-Down R = 30k? | Pull-Down R = 150k? | Pull-Up R = 30k? | Pull-Up R = 150k? | No Input Pull-Up or Pull-Down |
|----|------------|--------|---------------------------|-------------------------|--------------------|---------------------|------------------|-------------------|-------------------------------|
|    |            | 0      | 1                         | 2                       | 3                  | 4                   | 5                | 6                 | 7                             |
| A0 | PA0 input  |        |                           |                         |                    |                     |                  |                   | x                             |
| A1 | PA1 input  |        |                           |                         |                    |                     |                  |                   | x                             |
| A2 | PA2 input  |        |                           |                         |                    |                     |                  |                   | x                             |
| A3 | PA3 input  |        |                           |                         |                    |                     |                  |                   | x                             |
| C0 | PC0 In/Out | PcOe0  |                           |                         |                    |                     |                  |                   | x                             |
| C1 | PC1 In/Out | PcOe1  |                           |                         |                    |                     |                  |                   | x                             |
| C2 | PC2 In/Out | PcOe2  |                           |                         |                    |                     |                  |                   | x                             |
| C3 | PC3 In/Out | PcOe3  |                           |                         |                    |                     |                  |                   | x                             |

the MFP EM6504 option selection is showed by « x » and « PCoex »

### PortA interrupt edge

This metal options are replaced by register **PaIRQedge** in EM6504 MFP version. The register is described below.

### PortA interrupt edge option

|    |           | Interrupt on Input's rising edge | Interrupt on Input's falling edge |
|----|-----------|----------------------------------|-----------------------------------|
|    |           | 8                                | 9                                 |
| I0 | PA0 – IRQ | PA0r = 1                         | PA0r = 0                          |
| I1 | PA1 – IRQ | PA1r = 1                         | PA1r = 0                          |
| I2 | PA2 – IRQ | PA2r = 1                         | PA2r = 0                          |
| I3 | PA3 – IRQ | PA3r = 1                         | PA3r = 0                          |

the MFP EM6504 PortA interrupt edge option is selected by values in register **PaIRQedge**



## Watchdog metal option

The Watch-Dog timer is always active.

## Watchdog metal option

|           |                 |                        |                          |
|-----------|-----------------|------------------------|--------------------------|
|           |                 | Watch-Dog timer ACTIVE | Watch-Dog timer INACTIVE |
| <b>W0</b> | <b>WD timer</b> | <b>x</b>               |                          |

## Supply Voltage Level Detector

T= -10°C to 60°C

| Symb.  | Parameter           | Min. | Typ. | Max. | Unit |
|--------|---------------------|------|------|------|------|
| VSVLD1 | SVLD voltage Level1 | 2.02 | 2.30 | 2.38 | V    |

## Additional registers

In EM6504 there are two additional registers replacing metal options in EM6604.

| Register name | add hex | add dec | reset value | write_bits                                   | read_bits | Remarks   |
|---------------|---------|---------|-------------|--|-----------|---|
|               |         |         | b'3210      | Read/Write_bits                              |           |   |
| PalRQedge     | 63      | 99      | 0000        | 0: PA0r<br>1: PA1r<br>2: PA2r<br>3: PA3r     |           | Port A IRQ edge<br>1 = rising<br>0 = falling    |
| PcOE          | 60      | 96      | 0000        | 0: PCoe0<br>1: PCoe1<br>2: PCoe2<br>3: PCoe3 |           | Port C Output Enable<br>1 = output<br>0 = input |

Because these two registers replace the metal option in EM6604 it is advised that they are written as first two instructions in the main program and that they are executed only once. They should not be changed later in the program because the metal options in EM6604 are fixed.

## Electrical specifications

### Standard Operating Conditions

| Parameter       | Value              | Description                          |
|-----------------|--------------------|--------------------------------------|
| Temperature     | 0°C...+60°C        |                                      |
| VDD             | +2.0 ...+5.0V      |                                      |
| VSS             | 0 V (reference)    |                                      |
| CVDDCA          | min. 100nF (note1) | Vreg switched logic supply capacitor |
| f <sub>q</sub>  | 32768 Hz           | nominal frequency                    |
| R <sub>qs</sub> | 35 kOhm            | typical quartz serial resistor       |
| CL              | 8.2pF              | typical quartz load capacitance      |
| df/f            | +/- 30 ppm         | quartz frequency tolerance           |

**Note1:** This capacitor maintains the Regulated Supply to the core when the core has been isolated by the internal Supply switch during driving the high current outputs. The user should be aware that the selection of this capacitor will dictate the time that the core can be isolated.





## DC characteristics - Power Supply Pins

VDD=3.0V, T=25°C (unless otherwise specified)

| Parameter                                 | Conditions                     | Symb. | Min. | Typ.(note5) | Max. | Unit |
|---|--------------------------------|-------|------|-------------|------|------|
| ACTIVE Supply Current                     | +25°C (note2)                  | IVDDa |      | 9.0         | 15   | μA   |
| ACTIVE Supply Current<br>(in active mode) | (note2 / 3 / 4)<br>0°C...+60°C | IVDDa |      |             | 20   | μA   |
| STANDBY Supply Current                    | +25°C                          | IVDDh |      | 2           | 4    | μA   |
| STANDBY Supply Current<br>(in Halt mode)  | (note3 / 4)<br>0°C...+60°C     | IVDDh |      |             | 7    | μA   |
| RAM data retention                        |                                | Vrd   | 1.3  |             |      | V    |
| VDDCA regulated voltage !!                |                                | VDDCA | 1.6  | 2.0         | 2.6  | V    |
| POR voltage                               | 0°C...+60°C                    | VPOR  |      | 0.9         | 1.40 | V    |
| SVLD voltage                              |                                | VSVDL | 2.25 | 2.5         | 2.8  | V    |

VDD=5.0V, T=25°C (unless otherwise specified)

| Parameter                                 | Conditions                     | Symb. | Min. | Typ.(note5) | Max. | Unit |
|---|--------------------------------|-------|------|-------------|------|------|
| ACTIVE Supply Current                     | +25°C (note2)                  | IVDDa |      | 13          | 18   | μA   |
| ACTIVE Supply Current<br>(in active mode) | (note2 / 3 / 4)<br>0°C...+60°C | IVDDa |      |             | 20   | μA   |
| STANDBY Supply Current                    | +25°C                          | IVDDh |      | 1.8         | 5    | μA   |
| STANDBY Supply Current<br>(in Halt mode)  | (note3 / 4)<br>0°C...+60°C     | IVDDh |      |             | 10   | μA   |

**Note2:** test loop with successive writing and reading of two different addresses with an inverted values (five instructions should be reserved for this measurement),

**Note3:** NOT tested at temperature if delivered in chip form.

**Note4:** Test conditions for ACTIVE and STANDBY Supply current mode are: Qin = external square wave, from rail to rail of Vreg (regulated voltage) with 100nF capacitor on Vreg. fQin = 33kHz.

**Note5:** For current measurement typical quartz described in Operating Conditions is used. All I/O pins without internal Pull Up/Down are pulled to VDD externally.

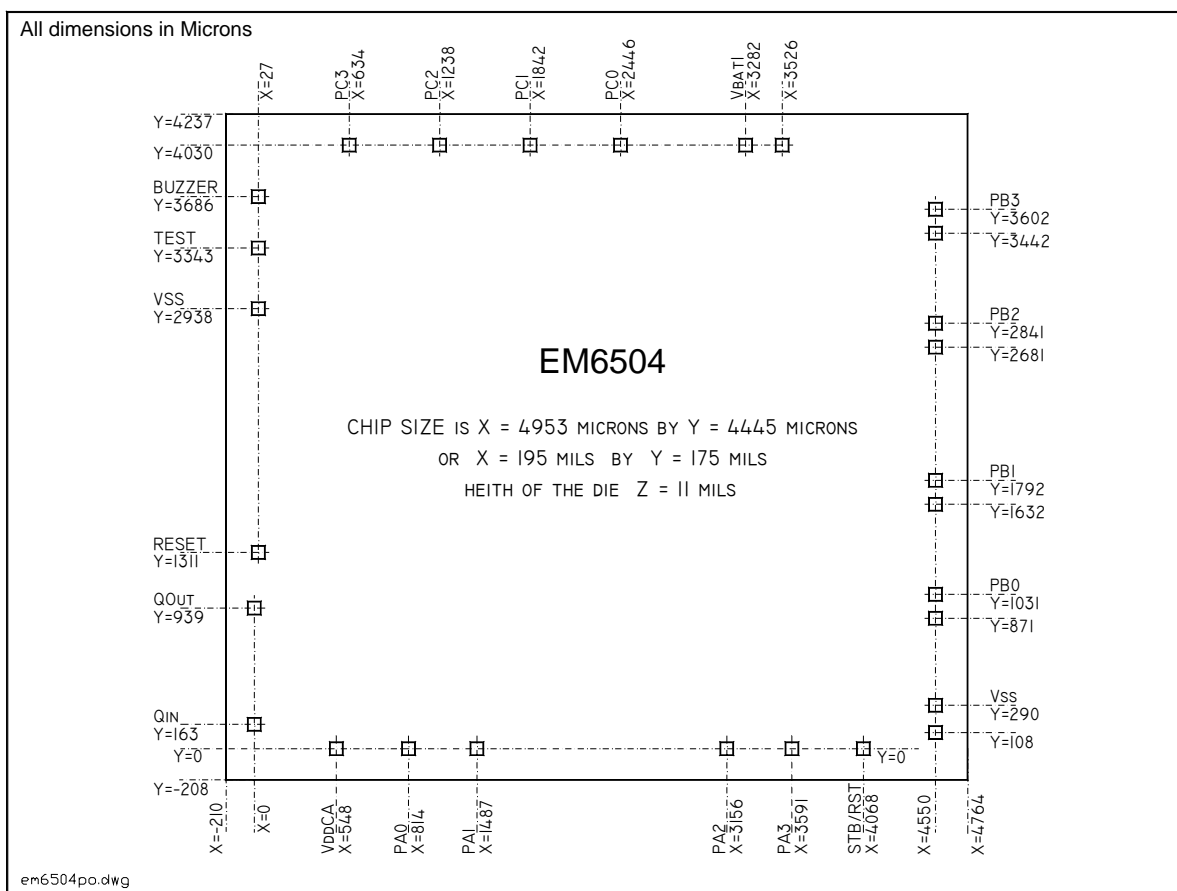


# EM65XX

## Today's Versions

|           | I/O's      | VLD levels | Remarks |
|-----------|------------|------------|---------|
| EM6504P02 | As defined | As defined | -       |

## Die, pad location and size



## Package

SO24 package. See dimensions in section 10.



## 4. EM6505

### Input/Output ports

All ports if selected as outputs are Push-pull outputs (driving high / low).  
Inputs are not blocked when Output is selected and Outputs stays active also in Sleep mode.

#### Input/Output Port Options

|    |            | Pull-Up<br>Yes / No | Pull-Down<br>Yes / No | Nch-open drain<br>Yes / No | Input blocked<br>when Output<br>Yes / No | Output Hi-Z in<br>SLEEP mode<br>Yes / No |
|----|------------|---------------------|-----------------------|----------------------------|--|--|
|    |            | 0                   | 1                     | 4                          | 5  | 6  |
| A0 | PA0 input  | NO                  | NO                    |                            |  |  |
| A1 | PA1 input  | NO                  | NO                    |                            |  |  |
| A2 | PA2 input  | NO                  | NO                    |                            |  |  |
| A3 | PA3 input  | NO                  | NO                    |                            |  |  |
| B0 | PB0 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| B1 | PB1 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| B2 | PB2 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| B3 | PB3 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| C0 | PC0 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| C1 | PC1 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| C2 | PC2 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| C3 | PC3 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| D0 | PD0 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| D1 | PD1 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| D2 | PD2 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |
| D3 | PD3 In/Out | NO                  | NO                    | NO                         | NO                                       | NO                                       |

### PortA reset

No PortA RESET is selected.

|    |             | NO PortA reset<br>combination | PA0 & PA1 logic<br>AND input reset | PA0 & PA1 & PA2<br>logic AND input<br>reset | PA0 & PA1 & PA2 &<br>PA3 logic AND input<br>reset |
|----|-------------|-------------------------------|------------------------------------|---|---|
|    |             | 0                             | 1                                  | 2   | 3   |
| RA | PortA RESET | X                             |                                    |   |   |

### Supply Voltage Level Detector

T= -10°C to 60°C

| Symb.  | Parameter           | Min. | Typ. | Max. | Unit |
|--------|---------------------|------|------|------|------|
| VSVLD1 | SVLD voltage Level1 | 2.02 | 2.30 | 2.38 | V    |
| VSVLD2 | SVLD voltage Level2 | 3.70 | 4.00 | 4.30 | V    |
| VSVLD3 | SVLD voltage Level3 | 4.15 | 4.50 | 4.86 | V    |



# EM65XX

## RC oscillator adjustment on the EM6505 (MFP version only)

| Register name | add hex | add dec | power up value | write_bits   | read_bits | Remarks                             |
|---------------|---------|---------|----------------|--|-----------|-------------------------------------|
|               |         |         | b'3210         | Read/Write_bits  |           |                                     |
| RC_Adj_Low    | 66      | 102     | 0001           | 0: OscAdj[0]<br>1: OscAdj[1]<br>2: OscAdj[2]<br>3: OscAdj[3] | ----      | Adjustment of RC oscillator (4 LSB) |
| RC_Adj_High   | 67      | 103     | 1000           | 0: OscAdj[4]<br>1: OscAdj[5]<br>2: OscAdj[6]<br>3: OscAdj[7] | ----      | Adjustment of RC oscillator (4 MSB) |

On the EM6605 (ROM version), the adjustment of the RC oscillator is done by metal option (refer to chapter 14 of the EM6605 datasheet).

On the EM6505 (MFP version), there is no metal option to adjust the frequency range. Adjusting the 8 bits contained in registers "RC\_Adj\_Low" and "RC\_adj\_High" sets the frequency. The bit "OscAdj[7]" selects the frequency range: low or high frequency range (refer to chapter 4 of the EM6605 datasheet).

The others bits as well as the external resistor on Pin 10, are used to adjust more precisely the frequency.

The frequency has to be in the range of 30kHz to 300kHz (refer to chapter 17.7 of the EM6605 datasheet).

## Electrical specifications

### Standard Operating Conditions

| Parameter   | Value           | Description                          |
|-------------|-----------------|--------------------------------------|
| Temperature | 0°C...+60°C     |                                      |
| VDD         | +2.0 ...+5.0V   |                                      |
| VSS         | 0 V (reference) |                                      |
| Cvreg       | min. 100nF      | regulated voltage capacitor tow. Vss |
| Rext        | 50kΩ - 400kΩ    | external R to set clock frequency    |

Cvreg : This capacitor maintains the Regulated Supply to the internal logic.

## DC characteristics - Power Supply Pins

For Frequency range of 30 - 300 kHz

VDD=5.0V, T=25°C, f=32kHz (note1) (unless otherwise specified) Rext ≈ 330kΩ

| Parameter                              | Conditions                     | Symb. | Min. | Typ. (note1) | Max. | Unit |
|--|--------------------------------|-------|------|--------------|------|------|
| ACTIVE Supply Current                  | +25°C (note2)                  | IVDDa |      | 30.0         | 40.0 | μA   |
| ACTIVE Supply Current (in active mode) | (note2) (note3)<br>0°C...+60°C | IVDDa |      |              | 50.0 | μA   |
| STANDBY Supply Current                 | +25°C                          | IVDDh |      | 17.0         | 20.0 | μA   |
| STANDBY Supply Current (in Halt mode)  | (note3)<br>0°C...+60°C         | IVDDh |      |              | 40.0 | μA   |
| SLEEP Supply Current                   | +25°C                          | IVDDs |      | 1.0          | 2.0  | μA   |
| SLEEP Supply Current (SLEEP =1)        | (note3)<br>0°C...+60°C         | IVDDs |      |              | 5.0  | μA   |
| Regulated Voltage                      | Vreg not at VDD                | Vreg  | 1.5  | 2.0          | 2.5  | V    |



# EM65XX

VDD=5.0V, T=25°C, f=200kHz (note1) (unless otherwise specified) Rext ≈ 62kΩ

| Parameter                                 | Conditions                     | Symb. | Min. | Typ.<br>(note1) | Max.  | Unit |
|---|--------------------------------|-------|------|-----------------|-------|------|
| ACTIVE Supply Current                     | +25°C (note2)                  | IVDDa |      | 80.0            | 100.0 | μA   |
| ACTIVE Supply Current<br>(in active mode) | (note2) (note3)<br>0°C...+60°C | IVDDa |      |                 | 120.0 | μA   |
| STANDBY Supply Current                    | +25°C                          | IVDDh |      | 30.0            | 40.0  | μA   |
| STANDBY Supply Current<br>(in Halt mode)  | (note3)<br>0°C...+60°C         | IVDDh |      |                 | 50.0  | μA   |
| SLEEP Supply Current                      | +25°C                          | IVDDs |      | 1.0             | 2.0   | μA   |
| SLEEP Supply Current<br>(SLEEP =1)        | (note3)<br>0°C...+60°C         | IVDDs |      |                 | 5.0   | μA   |

**Note1:** For current measurement the corresponding resistor for targeted frequency ±20% is selected; Rext : external resistor between the RCin and Vss pins.  
All I/O pins without internal Pull Up/Down are pulled to VDD externally.

**Note2:** Test loop with successive writing and reading of two different addresses with an inverted values (five instructions should be reserved for this measurement),

**Note3:** NOT tested at temperature if delivered in chip form.

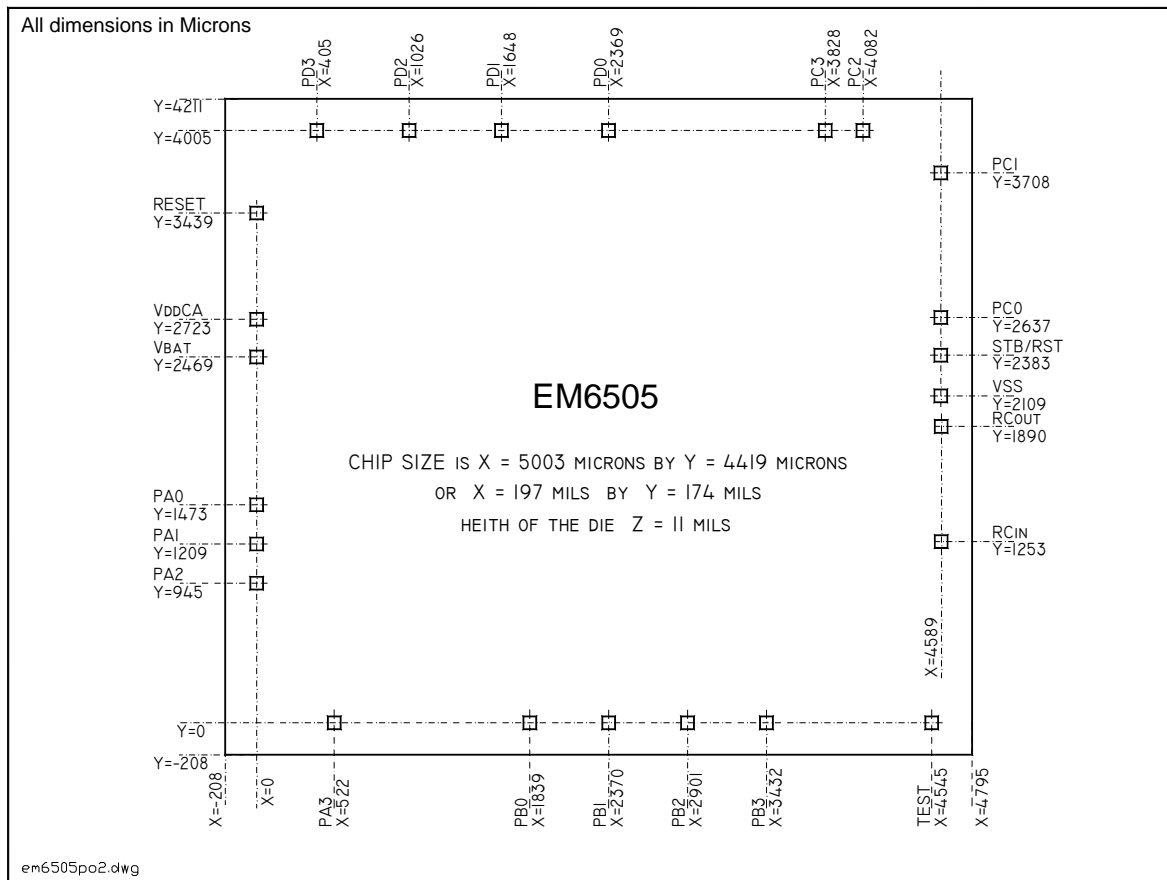


# EM65XX

## Today's Versions

|           | I/O's      | VLD levels | Remarks |
|-----------|------------|------------|---------|
| EM6505P02 | As defined | As defined | -       |

## Die, pad location and size



## Package

SO24 package. See dimensions in section 10.



## 5. EM6517

A new complete specification exists on the EM6517. Please refer to this document on our web site.  
(<http://www.emmarin.com/>)

For more information or questions please contact EM headquarters or your local EM office.



# EM65XX

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## 6. EM6520

A new complete specification exists on the EM6520. Please refer to this document on our web site.  
(<http://www.emmarin.com/>)

For more information or questions please contact EM headquarters or your local EM office.





## 7. EM6521

A new complete specification exists on the EM6521. Please refer to this document on our web site.  
(<http://www.emmarin.com/>)

For more information or questions please contact EM headquarters or your local EM office.



## 8. EM6522

A new complete specification exists on the EM6522. Please refer to this document on our web site.  
(<http://www.emmarin.com/>)

For more information or questions please contact EM headquarters or your local EM office.



## 9. EM6540

### Standard Operating Conditions

| Parameter      | MIN  | TYP | MAX | Unit | Description                 |
|----------------|------|-----|-----|------|-----------------------------|
| Temperature    | 0    | 25  | 60  | °C   |                             |
| VDD            | 2.2  | 3.6 | 5.5 | V    | fq max 620 kHz              |
|                | 2.5  | 3.6 | 5.5 | V    | fq max 680 kHz              |
| VSS            |      | 0   |     | V    | Reference terminal          |
| CVreg (note 1) | 0.22 | 1   |     | μF   | regulated voltage capacitor |
| fq             |      | 600 |     | kHz  | nominal frequency           |

### DC characteristics - Power Supply Pins

VDD=3V, T=25°C (unless otherwise specified)

| Parameter                              | Conditions                     | Symb. | Min. | Typ. (note1) | Max. | Unit |
|--|--------------------------------|-------|------|--------------|------|------|
| ACTIVE Supply Current                  | 25°C                           | IVDDa |      | 210          |      | μA   |
| ACTIVE Supply Current (in active mode) | (note2) (note3)<br>0°C...+60°C | IVDDa |      | 210          | 250  | μA   |
| STANDBY Supply Current (in Halt mode)  | (note3)<br>0°C...+60°C         | IVDDh |      | 10           | 15   | μA   |
| SLEEP Supply Current (SLEEP =1)        | (note3)<br>0°C...+60°C         | IVDDs |      | 0.4          | 1    | μA   |
| POR voltage                            |                                | VPOR  |      | 1.5          |      | V    |
| RAM data retention                     |                                | Vrd   | 1.5  |              |      | V    |
| Regulated Voltage                      |                                | Vreg  |      | 1.85         |      | V    |

**Note1:** Measured at typical freq. of 600kHz, no load.

**Note2:** Test loop with successive writing and reading of two different addresses with an inverted values (five instructions should be reserved for this measurement),

**Note3:** NOT tested at temperature if delivered in chip form.

### Metal Options

Functionally the EM6640 and the EM6540 are the same except the metal options of the EM6540 which are set in their default state.



## Input/Output Port Options

|    |            | <b>Pull-Up</b><br>controlled by software | <b>Pull-Down</b><br>controlled by software |
|----|------------|--|--|
|    |            | 0  | 1  |
| A0 | PA0 input  | none                                     | 100k $\Omega$                              |
| A1 | PA1 input  | none                                     | 100k $\Omega$                              |
| A2 | PA2 input  | none                                     | 100k $\Omega$                              |
| A3 | PA3 input  | none                                     | 100k $\Omega$                              |
| B0 | PB0 In/Out | 100k $\Omega$                            | 100k $\Omega$                              |
| B1 | PB1 In/Out | 100k $\Omega$                            | 100k $\Omega$                              |
| B2 | PB2 In/Out | 100k $\Omega$                            | 100k $\Omega$                              |
| B3 | PB3 In/Out | 100k $\Omega$                            | 100k $\Omega$                              |
| C0 | PC0 In/Out | 100k $\Omega$                            | 100k $\Omega$                              |
| C1 | PC1 In/Out | 100k $\Omega$                            | 100k $\Omega$                              |
| C2 | PC2 In/Out | 100k $\Omega$                            | 100k $\Omega$                              |
| C3 | PC3 In/Out | 100k $\Omega$                            | 100k $\Omega$                              |

## Digital Watchdog Option

|               |                  |            |
|---------------|------------------|------------|
| <b>MDigWD</b> | Digital WatchDog | <b>YES</b> |
|---------------|------------------|------------|

## SWBdataLevel Option

|                      |                   |            |
|----------------------|-------------------|------------|
| <b>MSWBdataLevel</b> | level of SWB data | <b>VDD</b> |
|----------------------|-------------------|------------|

## Supply Voltage Level Detector

T= -10°C to 60°C

| Symb.  | Parameter           | Min. | Typ. | Max. | Unit |
|--------|---------------------|------|------|------|------|
| VSVLD1 | SVLD voltage Level1 | 2.02 | 2.20 | 2.37 | V    |
| VSVLD2 | SVLD voltage Level2 | 2.30 | 2.50 | 2.70 | V    |

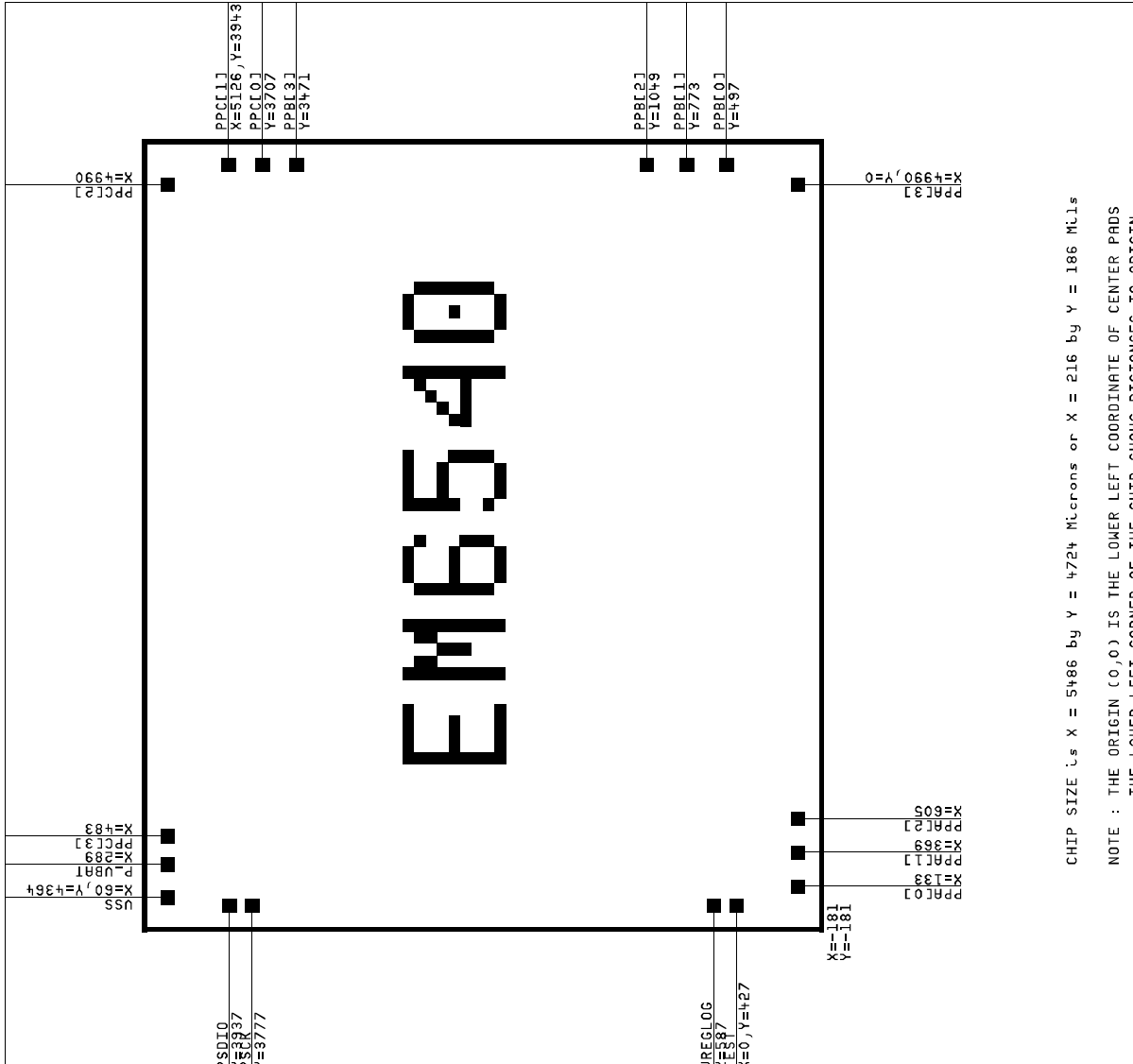
## Today's Versions

|           | I/O's      | VLD levels | Remarks |
|-----------|------------|------------|---------|
| EM6540P04 | As defined | As defined | -       |



# EM65XX

## Die, pad location and size



## Package

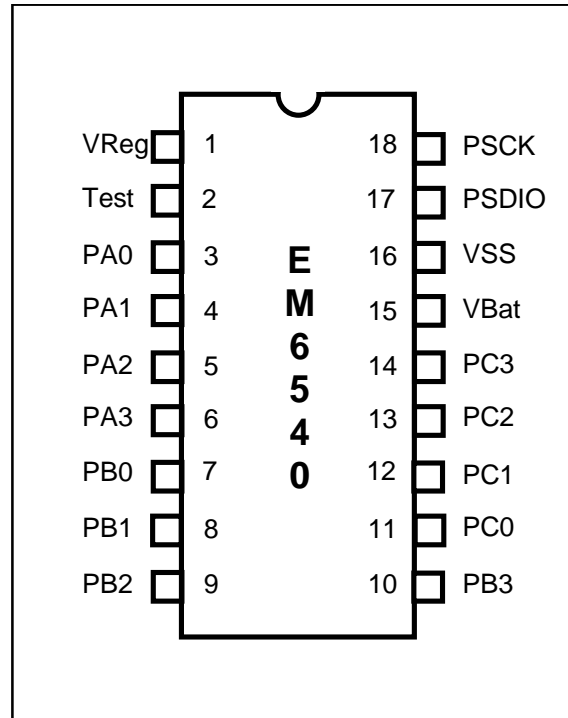
SO18 package. See dimensions in section 10.



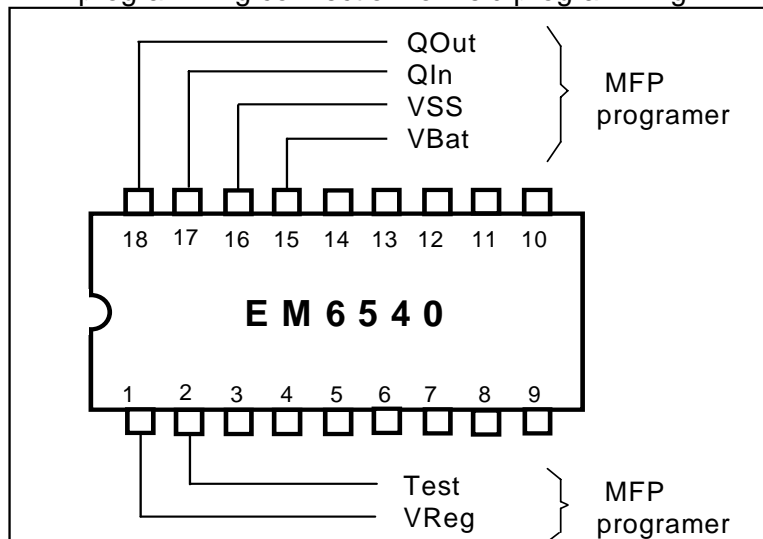
# EM65XX

## Pin out for the EM6540 (MFP of the EM6640)

Package: SO18



## MFP programming connection for field programming





## 10. Package Dimensions

All MFPs are available in chip form on special request.

Figure 1. SOP 18 Pin Package

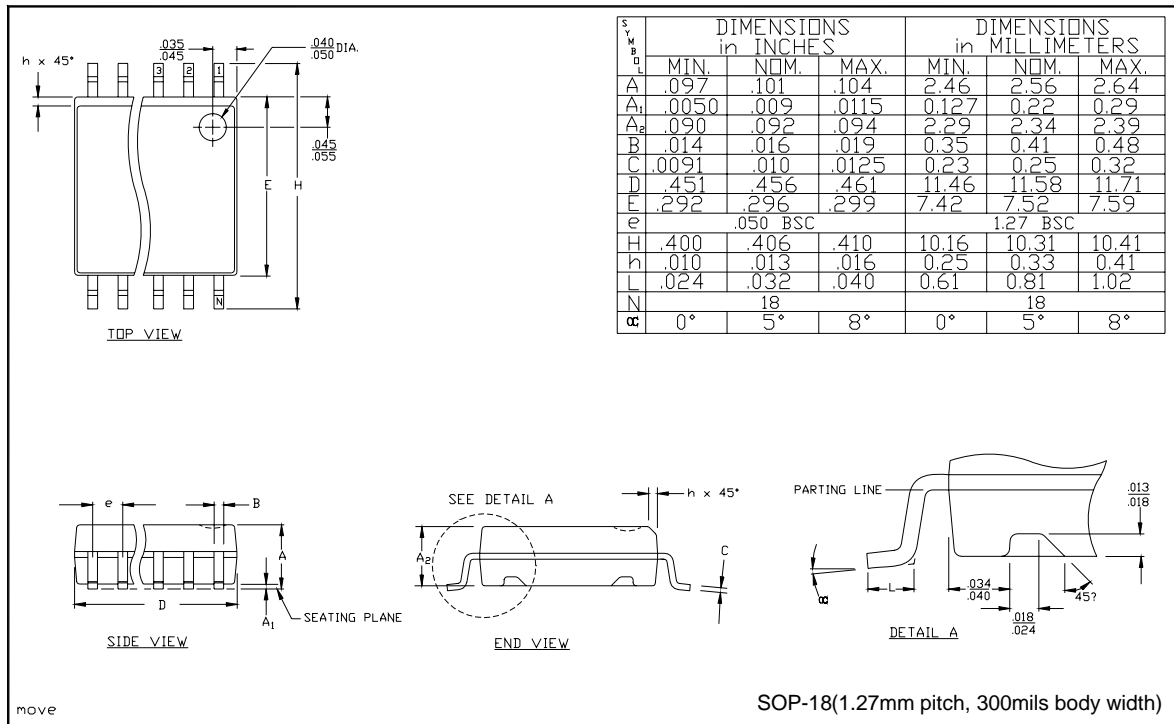
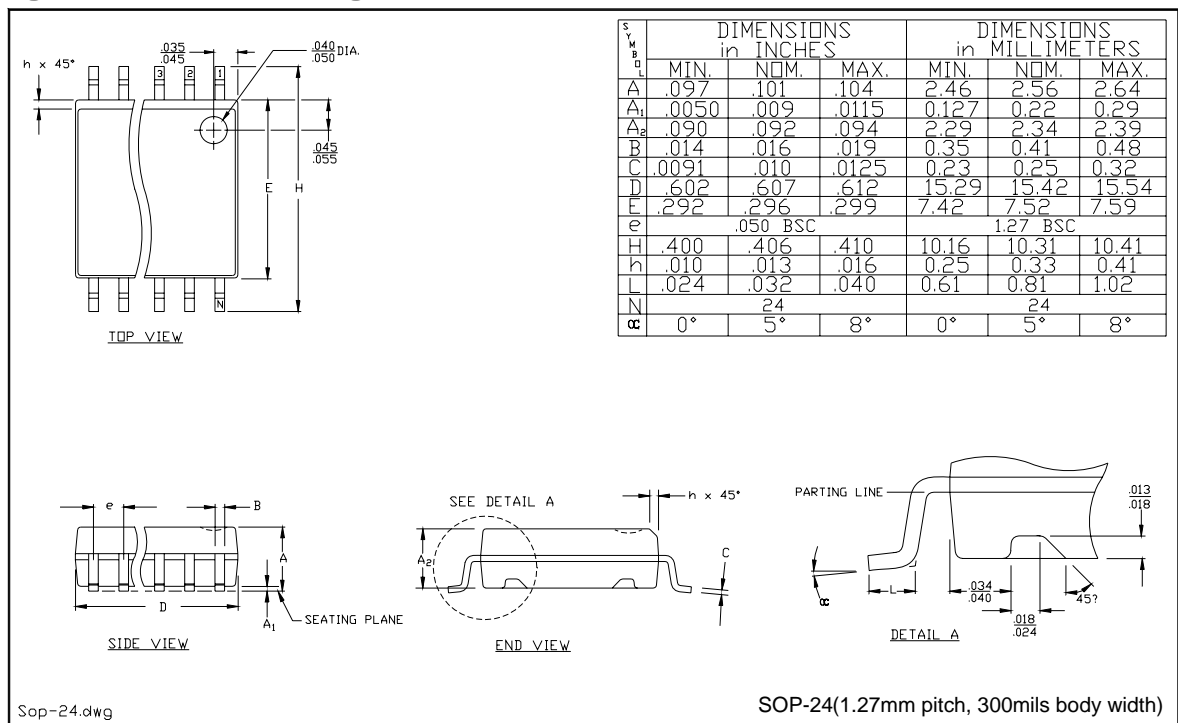


Figure 2. SOP 24 Pin Package





# EM65XX

Figure 3. SOP 28 Pin Package

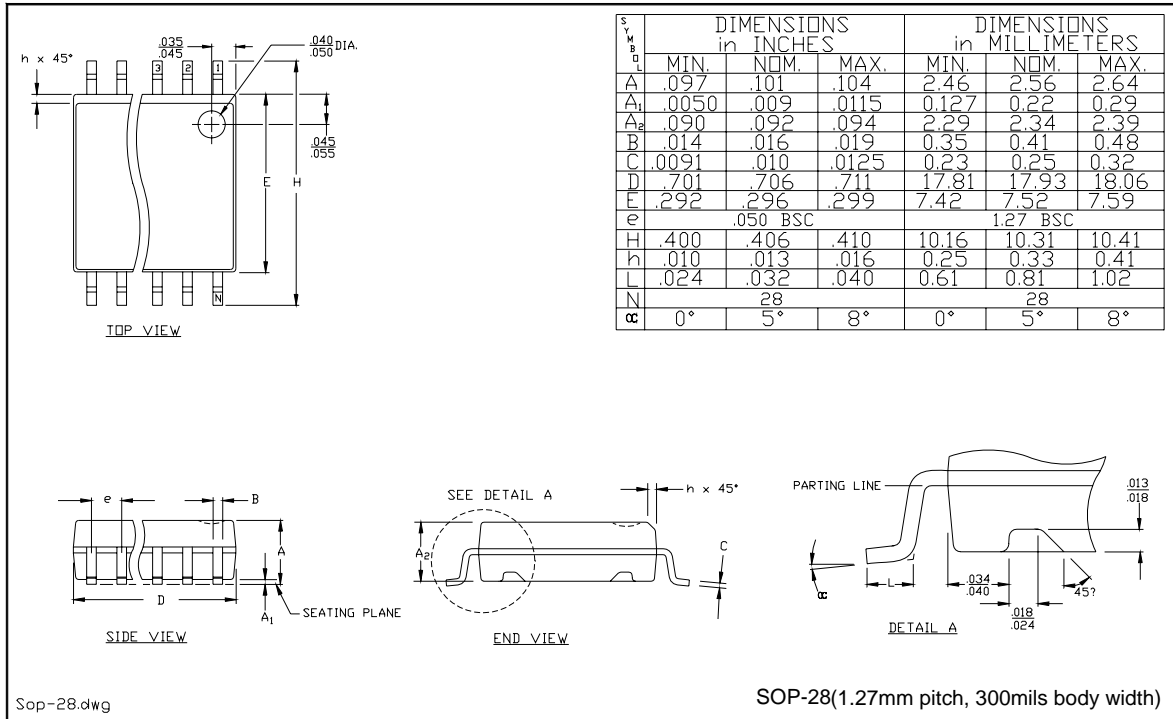
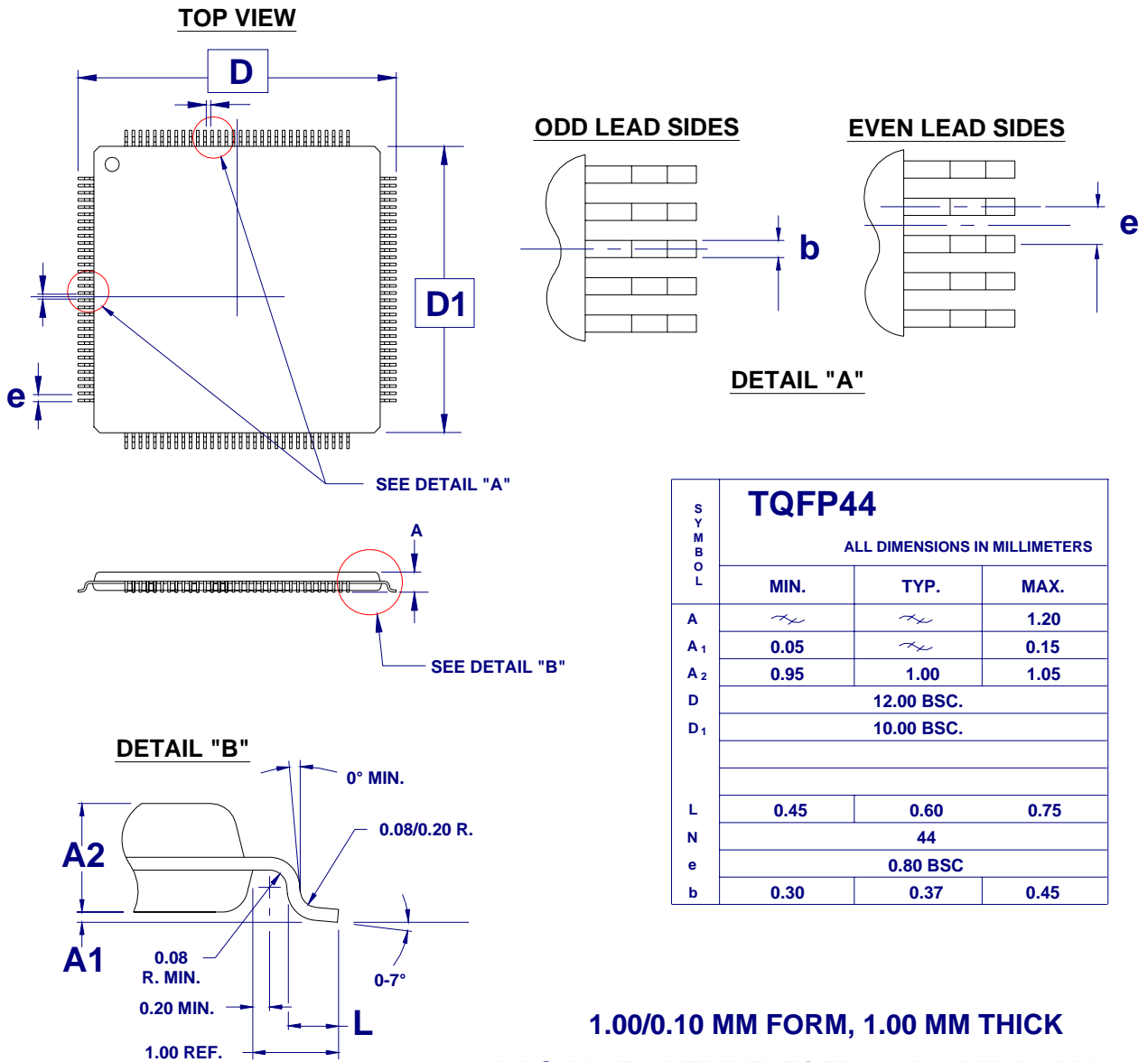


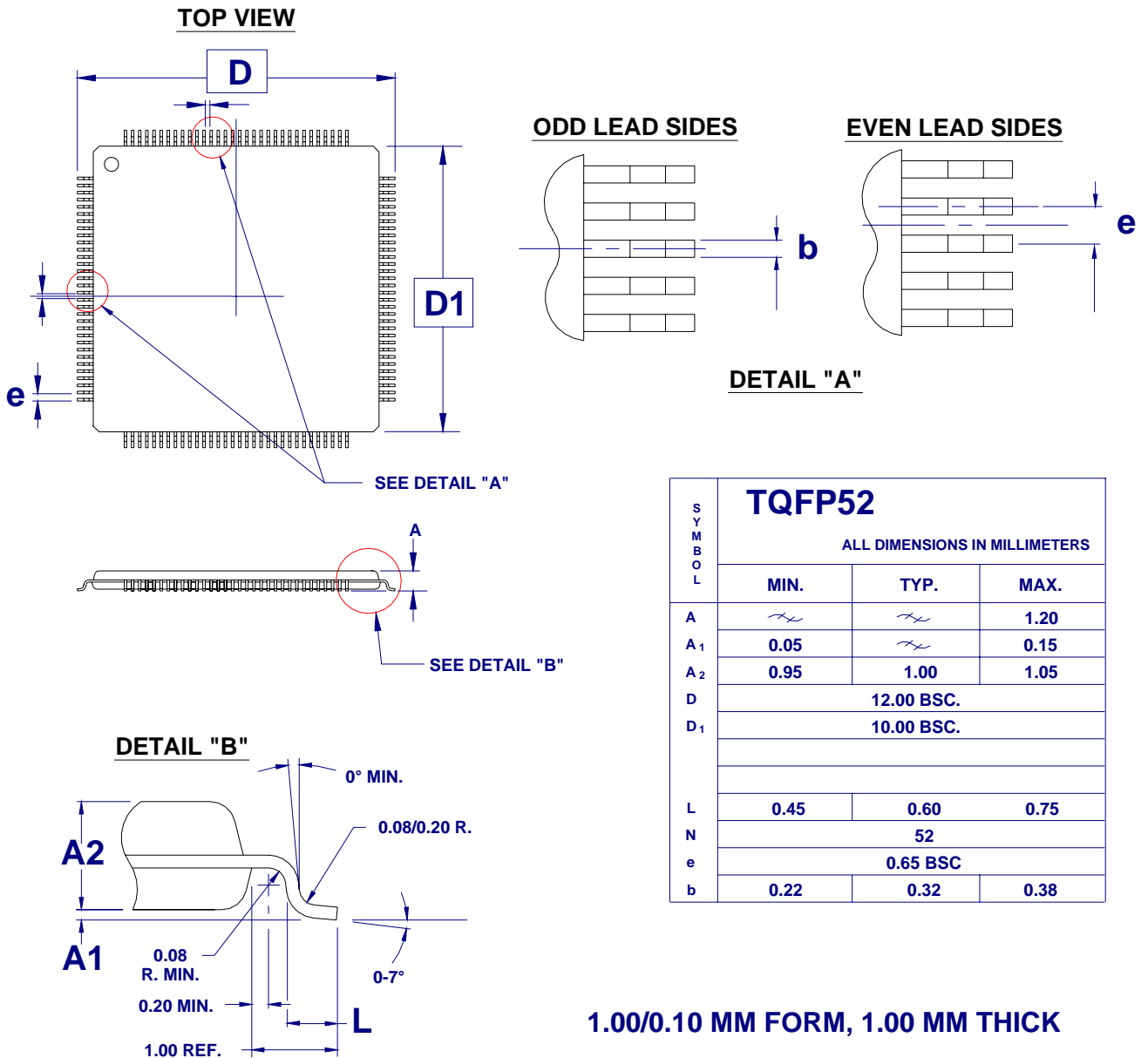


Figure 4. TQF 44 Pin Package



**1.00/0.10 MM FORM, 1.00 MM THICK  
PACKAGE OUTLINE, TQFP, 10X10 MM BODY,**

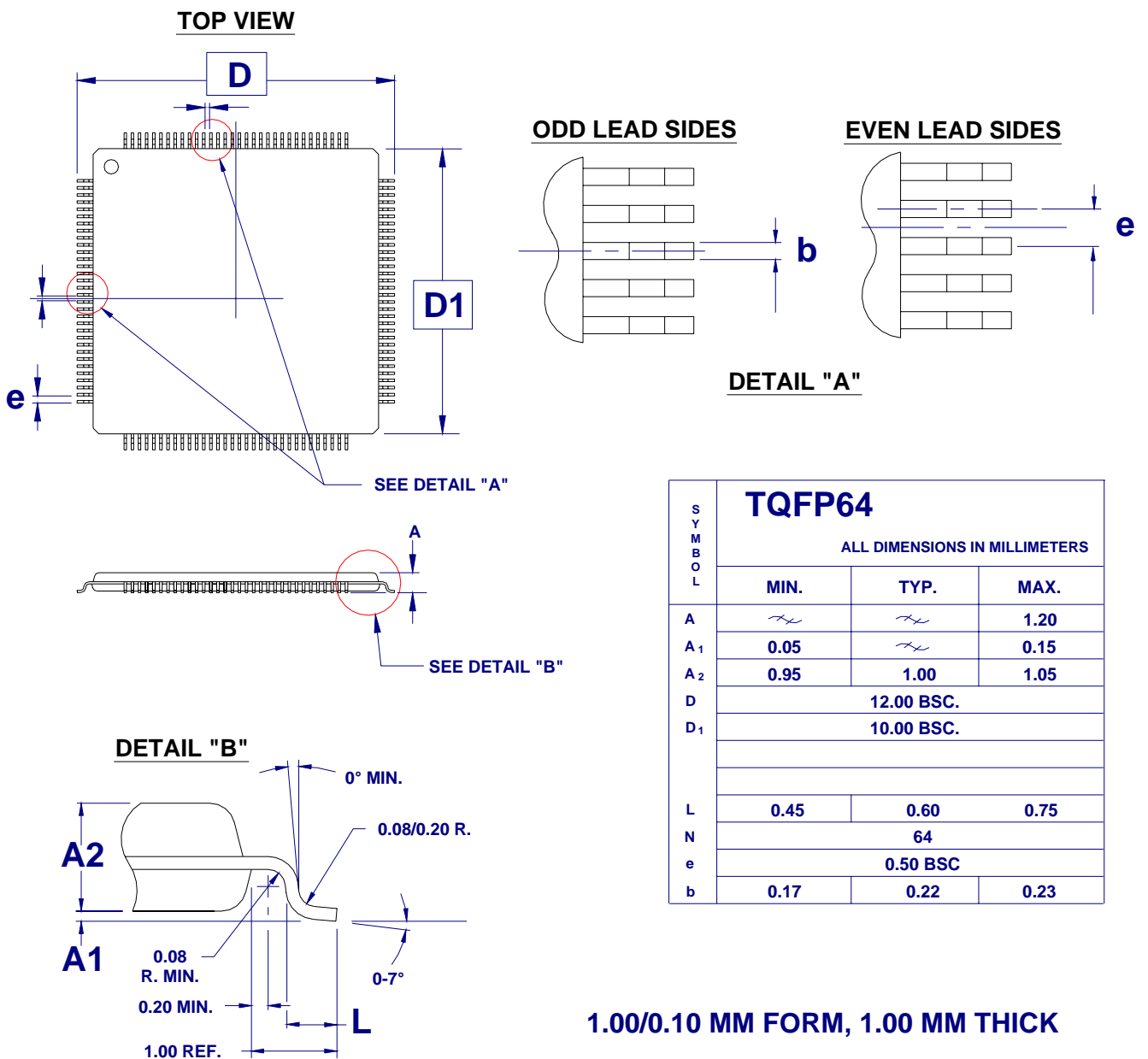
Figure 5. TQF 52 Pin Package





# EM65XX

Figure 6. TQF 64 Pin Package



For more information or questions please contact EM headquarters or your local EM office.



## 11. Ordering Information

### Ordering Part Number

| Part Number   | Package/Die Form   | Delivery Form/<br>Thickness |
|---------------|--------------------|-----------------------------|
| EM6503%%SO24A | 24 pin SOIC        | Stick                       |
| EM6503%%WP11  | Die in waffle pack | 11 mils                     |
| EM6504%%SO24A | 24 pin SOIC        | Stick                       |
| EM6504%%WP11  | Die in waffle pack | 11 mils                     |
| EM6505%%SO24A | 24 pin SOIC        | Stick                       |
| EM6505%%WP11  | Die in waffle pack | 11 mils                     |
| EM6517%%SO28A | 28 pin SOIC        | Stick                       |
| EM6517%%WP11  | Die in waffle pack | 11 mils                     |
| EM6520%%TQ44D | TQFP 44 pin        | Trays (Plate)               |
| EM6520%%WP11  | Die in waffle pack | 11 mils                     |
| EM6521%%TQ52D | TQFP 52 pin        | Trays (Plate)               |
| EM6521%%WP11  | Die in waffle pack | 11 mils                     |
| EM6522%%TQ64D | TQFP 64 pin        | Trays (Plate)               |
| EM6522%%WP11  | Die in waffle pack | 11 mils                     |
| EM6540%%SO18A | 18 pin SOIC        | Stick                       |
| EM6540%%WP11  | Die in waffle pack | 11 mils                     |

Please make sure to give the complete Part Number when ordering, including the 3-digit version. The version is made of 3 digits %%: the first one is a letter and the last two are numbers, e.g. P04 , P07, P12, etc.  
For other delivery forms, please contact EM Microelectronic-Marin S.A.

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