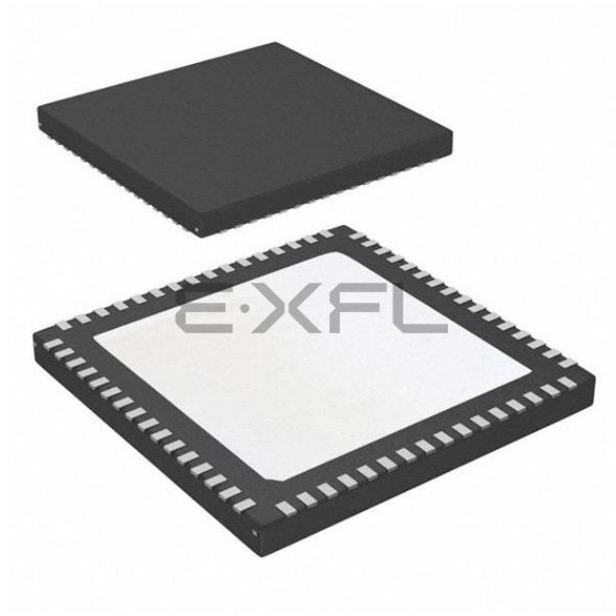

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Applications of "Embedded - Microcontrollers"

Details	
Product Status	Not For New Designs
Core Processor	ARM® Cortex®-M3
Core Size	32-Bit Single-Core
Speed	80MHz
Connectivity	EBI/EMI, I²C, IrDA, SmartCard, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, DMA, I²S, POR, PWM, WDT
Number of I/O	50
Program Memory Size	32KB (32K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	8K x 8
Voltage - Supply (Vcc/Vdd)	1.8V ~ 3.6V
Data Converters	A/D 28x12b; D/A 2x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	64-VFQFN Exposed Pad
Supplier Device Package	64-QFN (9x9)
Purchase URL	https://www.e-xfl.com/product-detail/silicon-labs/sim3c136-b-gm

3. Electrical Specifications

3.1. Electrical Characteristics

All electrical parameters in all tables are specified under the conditions listed in Table 3.1, unless stated otherwise.

Table 3.1. Recommended Operating Conditions

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Supply Voltage on VDD	V_{DD}		1.8	—	3.6	V
Operating Supply Voltage on VREGIN	V_{REGIN}	EXTVREG0 Not Used	4	—	5.5	V
		EXTVREG0 Used	3.0	—	3.6	V
Operating Supply Voltage on VIO	V_{IO}		1.8	—	V_{DD}	V
Operating Supply Voltage on VIOHD	V_{IOHD}	HV Mode (default)	2.7	—	6.0	V
		LV Mode	1.8	—	3.6	V
Voltage on I/O pins, Port Bank 0, 1 and 2 I/O	V_{IN}		V_{SS}	—	V_{IO}	V
Voltage on I/O pins, Port Bank 3 I/O and $\overline{\text{RESET}}$	V_{IN}	SiM3C1x7 PB3.0–PB3.7 and $\overline{\text{RESET}}$	V_{SS}	—	V_{IO}+2.0	V
		SiM3C1x7 PB3.8 - PB3.11	V_{SS}	—	Lowest of V_{IO}+2.0 or V_{REGIN}	V
		SiM3C1x6 PB3.0–PB3.5 and $\overline{\text{RESET}}$	V_{SS}	—	V_{IO}+2.0	V
		SiM3C1x6 PB3.6–PB3.9	V_{SS}	—	Lowest of V_{IO}+2.0 or V_{REGIN}	V
		SiM3C1x4 $\overline{\text{RESET}}$	V_{SS}	—	V_{IO}+2.0	V
		SiM3C1x4 PB3.0–PB3.3	V_{SS}	—	Lowest of V_{IO}+2.0 or V_{REGIN}	V
Voltage on I/O pins, Port Bank 4 I/O	V_{IN}		V_{SSHD}	—	V_{IOHD}	V
System Clock Frequency (AHB)	f_{AHB}		0	—	80	MHz
Peripheral Clock Frequency (APB)	f_{APB}		0	—	50	MHz
Operating Ambient Temperature	T_A		–40	—	85	°C
Operating Junction Temperature	T_J		–40	—	105	°C

Note: All voltages with respect to V_{SS}.

Table 3.6. External Regulator

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Input Voltage Range (at VREGIN)	V_{REGIN}		3.0	—	3.6	V
Output Voltage (at EXREGOUT)	$V_{EXREGOUT}$	Programmable in 100 mV steps	1.8	—	3.6	V
NPN Current Drive	I_{NPN}	400 mV Dropout	12	—	—	mA
PNP Current Drive	I_{PNP}	$V_{EXREGBD} > V_{REGIN}$- 1.5 V	–6	—	—	mA
EXREGBD Voltage (PNP Mode)	$V_{EXREGBD}$	V_{REGIN} >= 3.5 V	V_{REGIN} – 2.0	—	—	V
		V_{REGIN} < 3.5 V	1.5	—	—	V
Standalone Mode Output Current	$I_{EXTREGBD}$	400 mV Dropout	—	—	11.5	mA
External Capacitance with External BJT	C_{BJT}		4.7	—	—	µF
Standalone Mode Load Regulation	$LR_{STAND-ALONE}$		—	1	—	mV/mA
Standalone Mode External Capacitance	$C_{STAND-ALONE}$		47	—	—	nF
Current Limit Range	I_{LIMIT}	1 Ω Sense Resistor	10	—	720	mA
Current Limit Accuracy			—	—	10	%
Foldback Limit Accuracy			—	—	20	%
Current Sense Resistor	R_{SENSE}		—	—	1	Ω
Internal Pull-Down	R_{PD}		—	5	—	kΩ
Internal Pull-Up	R_{PU}		—	10	—	kΩ
Current Sensor						
Sensing Pin Voltage	$V_{EXTREGSP}$ $V_{EXTREGSN}$	Measured at EXTREGSP or EXTREGSN pin	2.2	—	V_{REGIN}	V
Differential Sensing Voltage	V_{DIFF}	($V_{EXTREGSP}$ – $V_{EXTREGSN}$)	10	—	1600	mV
Current at EXTREGSN Pin	$I_{EXTREGSN}$		—	8	—	µA
Current at EXTREGSP Pin	$I_{EXTREGSP}$		—	V_{DIFF} x 200 + 12	—	µA

Table 3.8. Internal Oscillators (Continued)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Low Power Oscillator (LPOSC0)						
Oscillator Frequency	f_{LPOSC}	Full Temperature and Supply Range	19	20	21	MHz
		T_A = 25 °C, V_{DD} = 3.3 V	19.5	20	20.5	MHz
Divided Oscillator Frequency	f_{LPOSCD}	Full Temperature and Supply Range	2.375	2.5	2.625	MHz
Power Supply Sensitivity	PSS_{LPOSC}	T_A = 25 °C	—	0.5	—	%/V
Temperature Sensitivity	TS_{LPOSC}	V_{DD} = 3.3 V	—	55	—	ppm/°C
Low Frequency Oscillator (LFOSC0)						
Oscillator Frequency	f_{LFOSC}	Full Temperature and Supply Range	13.4	16.4	19.7	kHz
		T_A = 25 °C, V_{DD} = 3.3 V	15.8	16.4	17.3	kHz
Power Supply Sensitivity	PSS_{LFOSC}	T_A = 25 °C	—	2.4	—	%/V
Temperature Sensitivity	TS_{LFOSC}	V_{DD} = 3.3 V	—	0.2	—	%/°C
RTC0 Oscillator (RTC0OSC)						
Missing Clock Detector Trigger Frequency	f_{RTCMCD}		—	8	15	kHz
RTC Robust Duty Cycle Range	DC_{RTC}		25	—	55	%
***Note:** PLL0OSC in free-running oscillator mode.						

Table 3.9. External Oscillator

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
External Input CMOS Clock Frequency*	f_{CMOS}		0	—	50	MHz
External Input CMOS Clock High Time	t_{CMOSH}		9	—	—	ns
External Input CMOS Clock Low Time	t_{CMOSL}		9	—	—	ns
External Crystal Clock Frequency	f_{XTAL}		0.01	—	30	MHz
***Note:** Minimum of 10 kHz during debug operations.						

Table 3.11. IDAC

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static Performance						
Resolution	N_{bits}			10		Bits
Integral Nonlinearity	INL		—	±0.5	±2	LSB
Differential Nonlinearity (Guaranteed Monotonic)	DNL		—	±0.5	±1	LSB
Output Compliance Range	V_{OCR}		—	—	V_{DD} – 1.0	V
Full Scale Output Current	I_{OUT}	2 mA Range	2.0	2.046	2.10	mA
		1 mA Range	0.99	1.023	1.05	mA
		0.5 mA Range	493	511.5	525	µA
Offset Error	E_{OFF}		—	250	—	nA
Full Scale Error Tempco	TC_{FS}	2 mA Range	—	100	—	ppm/°C
VDD Power Supply Rejection Ratio		2 mA Range	—	-220	—	ppm/V
Test Load Impedance (to V_{SS})	R_{TEST}		—	1	—	kΩ
Dynamic Performance						
Output Settling Time to 1/2 LSB		min output to max output	—	1.2	—	µs
Startup Time			—	3	—	µs

Table 3.19. Absolute Maximum Ratings (Continued)

Parameter	Symbol	Test Condition	Min	Max	Unit
Voltage on I/O pins, Port Bank 3 I/O	V_{IN}	SiM3C1x7, PB3.0–PB3.7, $V_{IO} \geq 3.3$ V	V_{SS}–0.3	5.8	V
		SiM3C1x7, PB3.0–PB3.7, $V_{IO} < 3.3$ V	V_{SS}–0.3	V_{IO}+2.5	V
		SiM3C1x7, PB3.8 - PB3.11	V_{SS}–0.3	Lowest of V_{IO}+2.5, V_{REGIN}+0.3, or 5.8	V
		SiM3C1x6, PB3.0–PB3.5, $V_{IO} \geq 3.3$ V	V_{SS}–0.3	5.8	V
		SiM3C1x6, PB3.0–PB3.5, $V_{IO} < 3.3$ V	V_{SS}–0.3	V_{IO}+2.5	V
		SiM3C1x6, PB3.6–PB3.9	V_{SS}–0.3	Lowest of V_{IO}+2.5, V_{REGIN}+0.3, or 5.8	V
		SiM3C1x4, PB3.0–PB3.3	V_{SS}–0.3	Lowest of V_{IO}+2.5, V_{REGIN}+0.3, or 5.8	V
Total Current Sunk into Supply Pins	I_{SUPP}	V_{DD}, V_{REGIN}, V_{IO}, V_{IOHD}	—	400	mA
Total Current Sourced out of Ground Pins	I_{VSS}	V_{SS}, V_{SSHD}	400	—	mA
Current Sourced or Sunk by Any I/O Pin	I_{PIO}	PB0, PB1, PB2, PB3, and $\overline{\text{RESET}}$	–100	100	mA
		PB4	–300	300	mA
Current Injected on Any I/O Pin	I_{INJ}	PB0, PB1, PB2, PB3, and $\overline{\text{RESET}}$	–100	100	mA
		PB4	–300	300	mA
Total Injected Current on I/O Pins	ΣI_{INJ}	Sum of all I/O and $\overline{\text{RESET}}$	–400	400	mA

***Note:** VSS and VSSHD provide separate return current paths for device supplies, but are not isolated. They must always be connected to the same potential on board.

4.1. Power

4.1.1. LDO and Voltage Regulator (VREG0)

The SiM3C1xx devices include two internal regulators: the core LDO Regulator and the Voltage Regulator (VREG0).

The LDO Regulator converts a 1.8–3.6 V supply to the core operating voltage of 1.8 V. This LDO consumes little power and provides flexibility in choosing a power supply for the system.

The Voltage Regulator regulates from 5.5 to 2.7 V and can serve as an input to the LDO. This allows the device to be powered from up to a 5.5 V supply without any external components other than bypass capacitors.

4.1.2. Voltage Supply Monitor (VMON0)

The SiM3C1xx devices include a voltage supply monitor which allows devices to function in known, safe operating condition without the need for external hardware. The supply monitor includes additional circuitry that can monitor the main supply voltage and the VREGIN input voltage divided by 4 (VREGIN / 4).

The supply monitor module includes the following features:

- Main supply “VDD Low” (VDD below the early warning threshold) notification.
- Holds the device in reset if the main VDD supply drops below the VDD Reset threshold.
- VREGIN divided by 4 (VREGIN / 4) supply “VREGIN Low” notification.

4.1.3. External Regulator (EXTVREG0)

The External Regulator provides all the circuitry needed for a high-power regulator except the power transistor (NPN or PNP) and current sensing resistor (if current limiting is enabled).

The External Regulator module has the following features:

- Interfaces with either an NPN or PNP external transistor that serves as the pass device for the high current regulator.
- Automatic current limiting.
- Automatic foldback limiting.
- Sources up to 1 A for use by external circuitry.
- Variable output voltage from 1.8–3.6 V in 100 mV steps.

4.1.4. Power Management Unit (PMU)

The Power Management Unit on the SiM3C1xx manages the power systems of the device. On power-up, the PMU ensures the core voltages are a proper value before core instruction execution begins. It also recognizes and manages the various wake sources for low-power modes of the device.

The PMU module includes the following features:

- Up to 16 pin wake inputs can wake the device from Power Mode 9.
- The Low Power Timer, RTC0 (alarms and oscillator fail), Comparator 0, and the $\overline{\text{RESET}}$ pin can also serve as wake sources for Power Mode 9.
- All PM9 wake sources (except for the $\overline{\text{RESET}}$ pin) can also reset the Low Power Timer or RTC0 modules.
- Disables the level shifters to pins and peripherals to further reduce power usage in PM9. These level shifters must be re-enabed by firmware after exiting PM9.
- Provides a PMU_Asleep signal to a pin as an indicator that the device is in PM9.

4.1.5. Device Power Modes

The SiM3C1xx devices feature four low power modes in addition to normal operating mode. Several peripherals provide wake up sources for these low power modes, including the Low-Power Timer (LPT0), RTC0 (alarms and oscillator failure notification), Comparator 0, and PMU Pin Wake.

In addition, all peripherals can have their clocks disabled to reduce power consumption whenever a peripheral is not being used using the clock control (CLKCTRL) registers.

4.1.5.1. Normal Mode (Power Mode 0)

Normal Mode is the default mode of the device. The core and peripherals are fully operational, and instructions are executed from flash memory.

4.1.5.2. Power Mode 1

In Power Mode 1 the core and peripherals are fully operational, with instructions executing from RAM. Compared with Normal Mode, the active power consumption of the device in PM1 is reduced. Additionally, at higher speeds in PM1, the core throughput can also be increased because RAM does not require additional wait states that reduce the instruction fetch speed.

4.1.5.3. Power Mode 2

In Power Mode 2 the core halts and any enabled peripherals continue to run at the selected clock speed. The power consumption in PM2 corresponds to the AHB and APB clocks left enabled, thus the power can be tuned to the optimal level for the needs of the application. To place the device in PM2, the core should execute a wait-for-interrupt (WFI) or wait-for-event (WFE) instruction. If the WFI instruction is called from an interrupt service routine, the interrupt that wakes the device from PM2 must be of a sufficient priority to be recognized by the core. It is recommended to perform both a DSB (Data Synchronization Barrier) and an ISB (Instruction Syncronization Barrier) operation prior to the WFI to ensure all bus accesses complete. When operating from the LFOSC0 with the DMACTRL0 AHB clock disabled, PM2 can achieve similar power consumption to PM3, but with the ability to wake on APB-clocked interrupts. For example, enabling only the APB clock to the Ports will allow the firmware to wake on a PMATCH0, PBEXT0 or PBEXT1 interrupt with minimal impact on the supply current.

4.1.5.4. Power Mode 3

In Power Mode 3, the AHB and APB clocks are halted. The device may only wake from enabled interrupt sources which do not require the APB clock (RTC0ALRM, RTC0FAIL, LPTIMER0, VDDLOW and VREGLOW). A special fast wake option allows the device to operate at a very low level from the RTC0TCLK or LFOSC0 oscillator while in PM3, but quickly switch to the faster LPOSC0 when the wake event occurs. Because the current consumption of these blocks is minimal, it is recommended to use the fast wake option.

The device will enter PM3 on a WFI or WFE instruction. Because all AHB master clocks are disabled, the LPOSC will automatically halt and go into a low-power suspended state. If the WFI instruction is called from an interrupt service routine, the interrupt that wakes the device from PM3 must be of a sufficient priority to be recognized by the core. It is recommended to perform both a DSB (Data Synchronization Barrier) and an ISB (Instruction Synchronization Barrier) operation prior to the WFI to ensure all bus access is complete.

4.1.5.5. Power Mode 9

In Power Mode 9, the core and all peripherals are halted, all clocks are stopped, and the pins and peripherals are set to a lower power mode. In addition, standard RAM contents are not preserved, though retention RAM contents are still available after exiting the power mode. This mode provides the lowest power consumption for the device, but requires an appropriate reset to exit. The available reset sources to wake from PM9 are controlled by the Power Management Unit (PMU).

Before entering PM9, the desired reset source(s) should be configured in the PMU. The SLEEPDEEP bit in the ARM System Control Register should be set, and the PMSEL bit in the RSTSRC0_CONFIG register must be set to indicate that PM9 is the desired power mode.

The device will enter PM9 on a WFI or WFE instruction, and remain in PM9 until a reset configured by the PMU occurs. It is recommended to perform both a DSB (Data Synchronization Barrier) and an ISB (Instruction Synchronization Barrier) operation prior to the WFI to ensure all bus access is complete.

4.3.1. PLL (PLL0)

The PLL module consists of a dedicated Digitally-Controlled Oscillator (DCO) that can be used in Free-Running mode without a reference frequency, Frequency-Locked to a reference frequency, or Phase-Locked to a reference frequency. The reference frequency for Frequency-Lock and Phase-Lock modes can use one of multiple sources (including the external oscillator) to provide maximum flexibility for different application needs. Because the PLL module generates its own clock, the DCO can be locked to a particular reference frequency and then moved to Free-Running mode to reduce system power and noise.

The PLL module includes the following features:

- Five output ranges with output frequencies ranging from 23 to 80 MHz.
- Multiple reference frequency inputs.
- Three output modes: free-running DCO, frequency-locked, and phase-locked.
- Ability to sense the rising edge or falling edge of the reference source.
- DCO frequency LSB dithering to provide finer average output frequencies.
- Spectrum spreading to reduce generated system noise.
- Low jitter and fast lock times.
- Ability to suspend all output frequency updates (including dithering and spectrum spreading) using the STALL bit during jitter-sensitive operations.

4.3.2. Low Power Oscillator (LPOSC0)

The Low Power Oscillator is the default AHB oscillator on SiM3C1xx devices and enables or disables automatically, as needed.

The Low Power Oscillator has the following features:

- 20 MHz and divided 2.5 MHz frequencies available for the AHB clock.
- Automatically starts and stops as needed.

4.3.3. Low Frequency Oscillator (LFOSC0)

The low frequency oscillator (LFOSC0) provides a low power internal clock source running at approximately 16.4 kHz for the RTC0 timer and other peripherals on the device. No external components are required to use the low frequency oscillator

4.3.4. External Oscillators (EXTOSC0)

The EXTOSC0 external oscillator circuit may drive an external crystal, ceramic resonator, capacitor, or RC network. A CMOS clock may also provide a clock input. The external oscillator output may be selected as the AHB clock or used to clock other modules independent of the AHB clock selection.

The External Oscillator control has the following features:

- Support for external crystal, RC, C, or CMOS oscillators.
- Support external CMOS frequencies from 10 kHz to 50 MHz and external crystal frequencies from 10 kHz to 30 MHz.
- Various drive strengths for flexible crystal oscillator support.
- Internal frequency divide-by-two option available.

4.6. Communications Peripherals

4.6.1. External Memory Interface (EMIF0)

The External Memory Interface (EMIF0) allows external parallel asynchronous devices, like SRAMs and LCD controllers, to appear as part of the system memory map. The EMIF0 module includes the following features:

- Provides a memory mapped view of multiple external devices.
- Support for byte, half-word and word accesses regardless of external device data-width.
- Error indicator for certain invalid transfers.
- Minimum external timing allows for 3 clocks per write or 4 clocks per read.
- Output bus can be shared between non-muxed and muxed devices.
- Available extended address output allows for up to 24-bit address with 8-bit parallel devices.
- Support for 8-bit and 16-bit (muxed-mode only) devices with up to two chip-select signals.
- Support for internally muxed devices with dynamic address shifting.
- Fully programmable control signal waveforms.

4.6.2. USART (USART0, USART1)

The USART uses two signals (TX and RX) and a predetermined fixed baud rate to communicate with a single device. In addition to these signals, the USART0 module can optionally use a clock (UCLK) or hardware handshaking (RTS and CTS).

The USART module provides the following features:

- Independent transmitter and receiver configurations with separate 16-bit baud rate generators.
- Synchronous or asynchronous transmissions and receptions.
- Clock master or slave operation with programmable polarity and edge controls.
- Up to 5 Mbaud (synchronous or asynchronous, TX or RX, and master or slave) or 1 Mbaud Smartcard (TX or RX).
- Individual enables for generated clocks during start, stop, and idle states.
- Internal transmit and receive FIFOs with flush capability and support for byte, half-word, and word reads and writes.
- Data bit lengths from 5 to 9 bits.
- Programmable inter-packet transmit delays.
- Auto-baud detection with support for the LIN SYNC byte.
- Automatic parity generation (with enable).
- Automatic start and stop generation (with separate enables).
- Transmit and receive hardware flow-control.
- Independent inversion correction for TX, RX, RTS, and CTS signals.
- IrDA modulation and demodulation with programmable pulse widths.
- Smartcard ACK/NACK support.
- Parity error, frame error, overrun, and underrun detection.
- Multi-master and half-duplex support.
- Multiple loop-back modes supported.
- Multi-processor communications support.

4.6.3. UART (UART0, UART1)

The USART uses two signals (TX and RX) and a predetermined fixed baud rate to communicate with a single device.

The UART module provides the following features:

- Independent transmitter and receiver configurations with separate 16-bit baud-rate generators.
- Asynchronous transmissions and receptions.
- Up to 5 Mbaud (TX or RX) or 1 Mbaud Smartcard (TX or RX).

Table 6.1. Pin Definitions and alternate functions for SiM3C1x7

Pin Name	Type	Pin Numbers TQFP-80	Pin Numbers LGA-92	Crossbar Capability (see Port Config Section)	Port Match	External Memory Interface (m = muxed mode)	Port-Mapped Level Shifter	Output Toggle Logic	External Trigger Inputs	Analog or Additional Functions
VSS	Ground	33 75	B15 B34							
VDD	Power (Core)	74	A44							
VIO	Power (I/O)	32 49 73	A19 A29 A43							
VREGIN	Power (Regulator)	76	A45							
VSSHD	Ground (High Drive)	4	B2							
VIOHD	Power (High Drive)	5	A3							
$\overline{\text{RESET}}$	Active-low Reset	80	A48							
SWCLK/TCK	Serial Wire/JTAG	45	B20							
SWDIO/TMS	Serial Wire/JTAG	44	A27							
PB0.0	Standard I/O	72	B33	XBR0	✓					ADC0.0
PB0.1	Standard I/O	71	B32	XBR0	✓					ADC0.1 CS0.0
PB0.2	Standard I/O	70	A42	XBR0	✓					ADC0.2 CS0.1
PB0.3	Standard I/O	69	B31	XBR0	✓					ADC0.3 CS0.2
PB0.4	Standard I/O	68	A41	XBR0	✓					ADC0.4 CS0.3
PB0.5	Standard I/O	67	B30	XBR0	✓					ADC0.5 CS0.4
PB0.6	Standard I/O	66	A40	XBR0	✓					CS0.5
PB0.7	Standard I/O	65	B29	XBR0	✓					ADC0.6 CS0.6 IVC0.0

Table 6.2. Pin Definitions and alternate functions for SiM3C1x6

Pin Name	Type	Pin Numbers	Crossbar Capability (see Port Config Section)	Port Match	External Memory Interface (m = muxed mode)	Port-Mapped Level Shifter	Output Toggle Logic	External Trigger Inputs	Analog or Additional Functions
VSS	Ground	25 59							
VDD	Power (Core)	58							
VIO	Power (I/O)	24 39							
VREGIN	Power (Regulator)	60							
VSSHD	Ground (High Drive)	2							
VIOHD	Power (High Drive)	3							
$\overline{\text{RESET}}$	Active-low Reset	64							
SWCLK/TCK	Serial Wire / JTAG	36							
SWDIO/TMS	Serial Wire / JTAG	35							
PB0.0	Standard I/O	57	XBR0	✓					ADC0.2 CS0.1
PB0.1	Standard I/O	56	XBR0	✓					ADC0.3 CS0.2
PB0.2	Standard I/O	55	XBR0	✓					ADC0.4 CS0.3
PB0.3	Standard I/O	54	XBR0	✓					ADC0.5 CS0.4
PB0.4	Standard I/O	53	XBR0	✓					ADC0.6 CS0.5 IVC0.0
PB0.5	Standard I/O	52	XBR0	✓					ADC0.7 CS0.6 IVC0.1
PB0.6	Standard I/O	51	XBR0	✓					ADC0.8 CS0.7 RTC1

Table 6.2. Pin Definitions and alternate functions for SiM3C1x6 (Continued)

Pin Name	Type	Pin Numbers	Crossbar Capability (see Port Config Section)	Port Match	External Memory Interface (m = muxed mode)	Port-Mapped Level Shifter	Output Toggle Logic	External Trigger Inputs	Analog or Additional Functions
PB1.8	Standard I/O	30	XBR0	✓	AD14m/ A6			WAKE.2	ADC1.3 CS0.12
PB1.9	Standard I/O	29	XBR0	✓	AD13m/ A5			WAKE.3	ADC1.2 CS0.13
PB1.10	Standard I/O	28	XBR0	✓	AD12m/ A4			DMA0T1 WAKE.4	ADC1.1 CS0.14
PB1.11	Standard I/O	27	XBR0	✓	AD11m/ A3			DMA0T0 WAKE.5	ADC1.0 CS0.15 PMU_Asleep
PB1.12	Standard I/O	26	XBR0	✓	AD10m/ A2			WAKE.6	
PB1.13	Standard I/O	23	XBR0	✓	AD9m/ A1				
PB1.14	Standard I/O	22	XBR0	✓	AD8m/ A0				
PB1.15	Standard I/O	21	XBR0	✓	AD7m/ D7				
PB2.0	Standard I/O	20	XBR1	✓	AD6m/ D6	LSI0	Yes	INT0.0 INT1.0	
PB2.1	Standard I/O	19	XBR1	✓	AD5m/ D5	LSI1	Yes	INT0.1 INT1.1	
PB2.2	Standard I/O	18	XBR1	✓	AD4m/ D4	LSI2	Yes	INT0.2 INT1.2	CMP0N.0 CMP1N.0 RTC0TCLK_OUT
PB2.3	Standard I/O	17	XBR1	✓	AD3m/ D3	LSI3	Yes	INT0.3 INT1.3	CMP0P.0 CMP1P.0
PB3.0	5 V Tolerant I/O	16	XBR1	✓	AD2m/ D2				CMP0P.1 CMP1P.1
PB3.1	5 V Tolerant I/O	15	XBR1	✓	AD1m/ D1				CMP0N.1 CMP1N.1

Table 6.2. Pin Definitions and alternate functions for SiM3C1x6 (Continued)

Pin Name	Type	Pin Numbers	Crossbar Capability (see Port Config Section)	Port Match	External Memory Interface (m = muxed mode)	Port-Mapped Level Shifter	Output Toggle Logic	External Trigger Inputs	Analog or Additional Functions
PB3.9	5 V Tolerant I/O	7	XBR1	✓	$\overline{BE0}$			DAC0T6 DAC1T6 LPT0T2 INT0.10 INT1.10 WAKE.15	CMP0N.5 CMP1N.5 EXREGBD
PB4.0	High Drive I/O	6				LSO0			
PB4.1	High Drive I/O	5				LSO1			
PB4.2	High Drive I/O	4				LSO2			
PB4.3	High Drive I/O	1				LSO3			

Table 6.3. Pin Definitions and Alternate Functions for SiM3C1x4

Pin Name	Type	Pin Numbers	Crossbar Capability (see Port Config Section)	Port Match	Output Toggle Logic	External Trigger Inputs	Analog or Additional Functions
VSS	Ground	14					
VDD	Power (Core)	35					
VIO	Power (I/O)	13					
VREGIN	Power (Regulator)	36					
VSSHD	Ground (High Drive)	2					
VIOHD	Power (High Drive)	3					
$\overline{\text{RESET}}$	Active-low Reset	40					
SWCLK	Serial Wire	24					
SWDIO	Serial Wire	23					
PB0.0	Standard I/O	34	XBR0	✓			ADC0.8 CS0.7 RTC1
PB0.1	Standard I/O	33	XBR0	✓			RTC2
PB0.2	Standard I/O	32	XBR0	✓			ADC0.9 CS0.0 VREFGND
PB0.3	Standard I/O	31	XBR0	✓			ADC0.10 CS0.1 VREF
PB0.4	Standard I/O	30	XBR0	✓			ADC1.6 CS0.2 IDAC0
PB0.5	Standard I/O	29					IDAC1
PB0.6	Standard I/O	28	XBR0	✓			ADC0.0 CS0.3 XTAL1
PB0.7	Standard I/O	27	XBR0	✓			ADC0.1 CS0.4 XTAL2

Table 6.3. Pin Definitions and Alternate Functions for SiM3C1x4 (Continued)

Pin Name	Type	Pin Numbers	Crossbar Capability (see Port Config Section)	Port Match	Output Toggle Logic	External Trigger Inputs	Analog or Additional Functions
PB0.8	Standard I/O	26	XBR0	✓			ADC0.14 ADC1.14
PB0.9	Standard I/O	25	XBR0	✓			ADC0.15 ADC1.15
PB0.10	Standard I/O	22	XBR0	✓		DMA0T1	ADC1.8
PB0.11	Standard I/O	21	XBR0	✓		DMA0T0	ADC1.7
PB0.12	Standard I/O	20	XBR0	✓		ADC0T15 WAKE.0	ADC1.5 CS0.10
PB0.13	Standard I/O	19	XBR0	✓		ADC1T15 WAKE.1	ADC1.4 CS0.11
PB0.14	Standard I/O	18	XBR0	✓		WAKE.2	ADC1.3 CS0.12
PB0.15	Standard I/O	17	XBR0	✓		WAKE.3	ADC1.2 CS0.13
PB1.0	Standard I/O	16	XBR0	✓		WAKE.4	ADC1.1 CS0.14
PB1.1	Standard I/O	15	XBR0	✓		WAKE.5	ADC1.0 CS0.15 PMU_Asleep
PB1.2	Standard I/O	12	XBR0	✓			CMP0N.0 CMP1N.0 RTC0TCLK_OUT
PB1.3	Standard I/O	11	XBR0	✓			CMP0P.0 CMP1P.0
PB3.0	5 V Tolerant I/O	10	XBR1	✓		DAC0T0 DAC1T0 LPT0T0 INT0.0 INT1.0 WAKE.12	CMP0P.1 CMP1P.1 EXREGSP

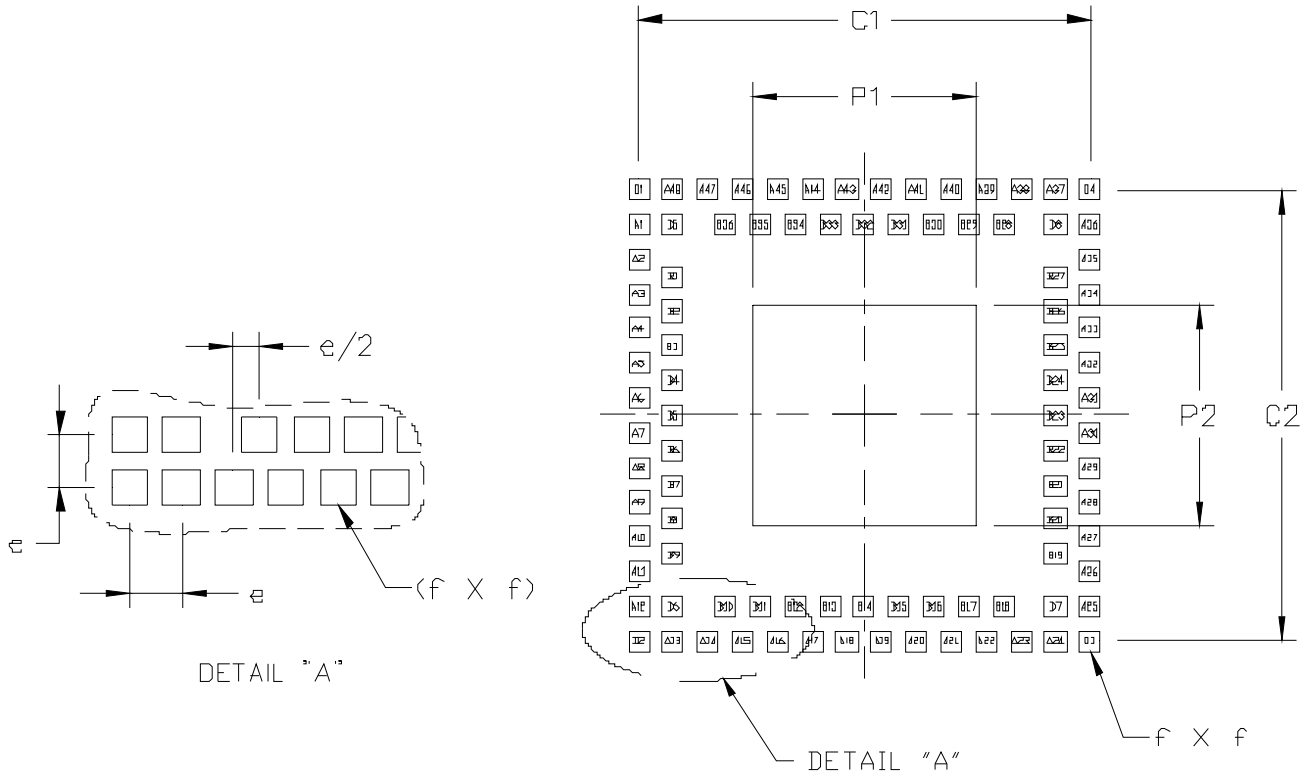

Figure 6.7. LGA-92 Landing Diagram

Table 6.5. LGA-92 Landing Diagram Dimensions

Dimension	Typical	Max
C1	6.50	—
C2	6.50	—
e	0.50	—
f	—	0.35
P1	—	3.20
P2	—	3.20

Notes:

1. All dimensions shown are in millimeters (mm) unless otherwise noted.
2. All feature sizes shown are at Maximum Material Condition (MMC) and a card fabrication tolerance of 0.05 mm is assumed.
3. Dimensioning and Tolerancing is per the ANSI Y14.5M-1994 specification.
4. This land pattern design is based on the IPC-7351 guidelines.

6.5. TQFP-80 Package Specifications

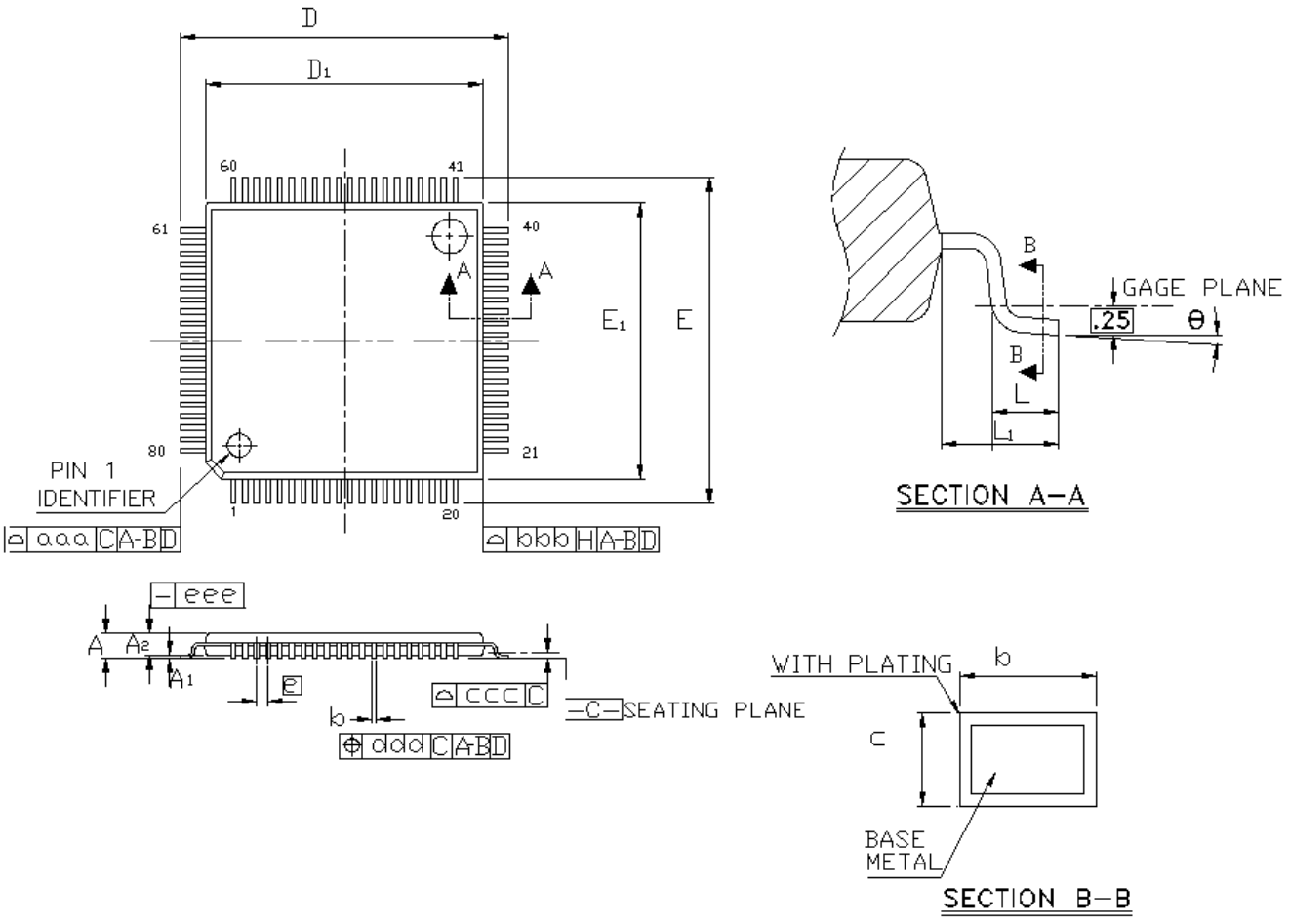

Figure 6.8. TQFP-80 Package Drawing

Table 6.6. TQFP-80 Package Dimensions

Dimension	Min	Nominal	Max
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b	0.17	0.20	0.27
c	0.09	—	0.20
D	14.00 BSC		
D1	12.00 BSC		
e	0.50 BSC		
E	14.00 BSC		
E1	12.00 BSC		

6.6.1. QFN-64 Solder Mask Design

All metal pads are to be non-solder mask defined (NSMD). Clearance between the solder mask and the metal pad is to be 60 µm minimum, all the way around the pad.

6.6.2. QFN-64 Stencil Design

1. A stainless steel, laser-cut and electro-polished stencil with trapezoidal walls should be used to assure good solder paste release.
2. The stencil thickness should be 0.125 mm (5 mils).
3. The ratio of stencil aperture to land pad size should be 1:1 for all pads.
4. A 3x3 array of 1.0 mm square openings on a 1.5 mm pitch should be used for the center ground pad.

6.6.3. QFN-64 Card Assembly

1. A No-Clean, Type-3 solder paste is recommended.
2. The recommended card reflow profile is per the JEDEC/IPC J-STD-020 specification for Small Body Components.

6.7. TQFP-64 Package Specifications

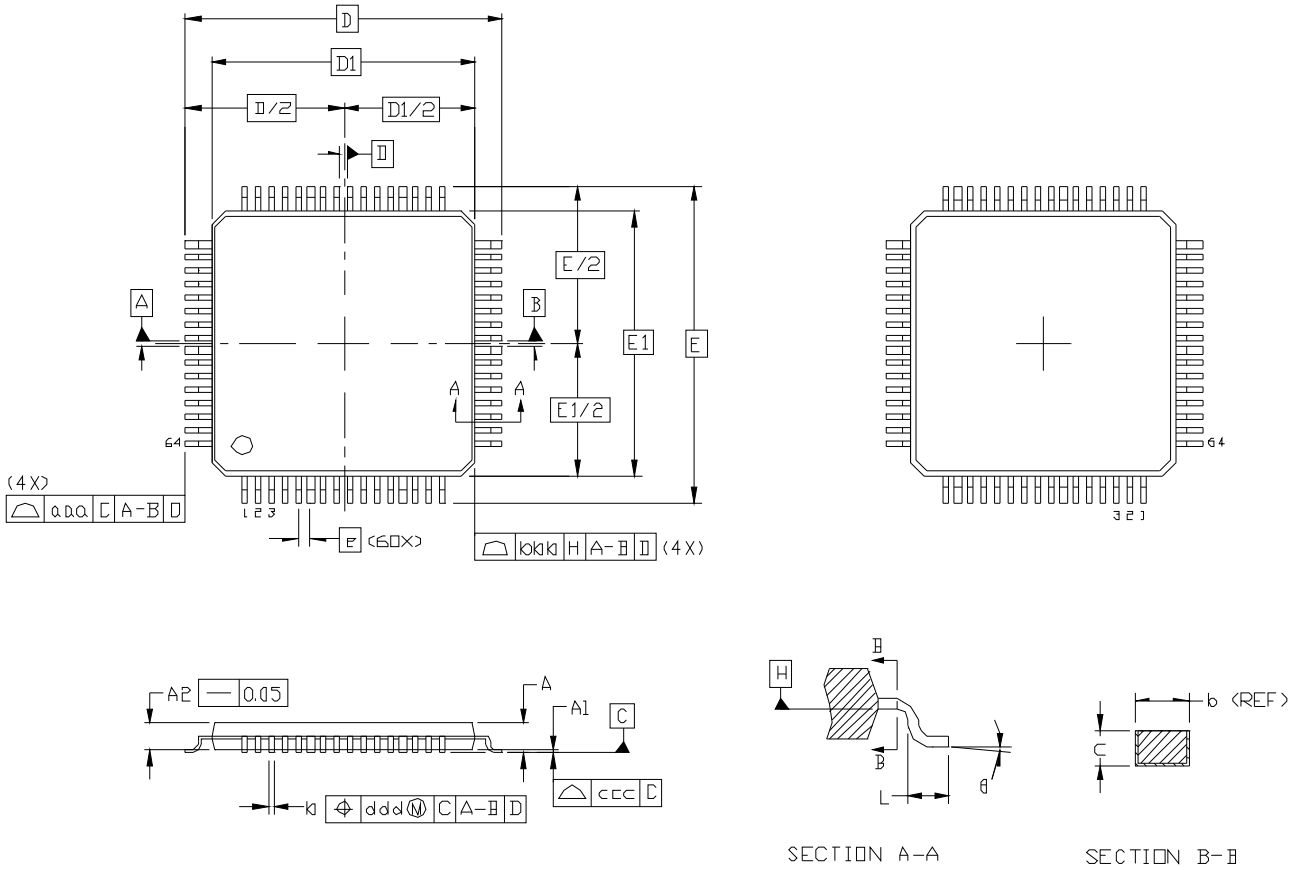

Figure 6.12. TQFP-64 Package Drawing

Table 6.10. TQFP-64 Package Dimensions

Dimension	Min	Nominal	Max
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b	0.17	0.22	0.27
c	0.09	—	0.20
D	12.00 BSC		
D1	10.00 BSC		
e	0.50 BSC		
E	12.00 BSC		
E1	10.00 BSC		
L	0.45	0.60	0.75
Θ	0°	3.5°	7°

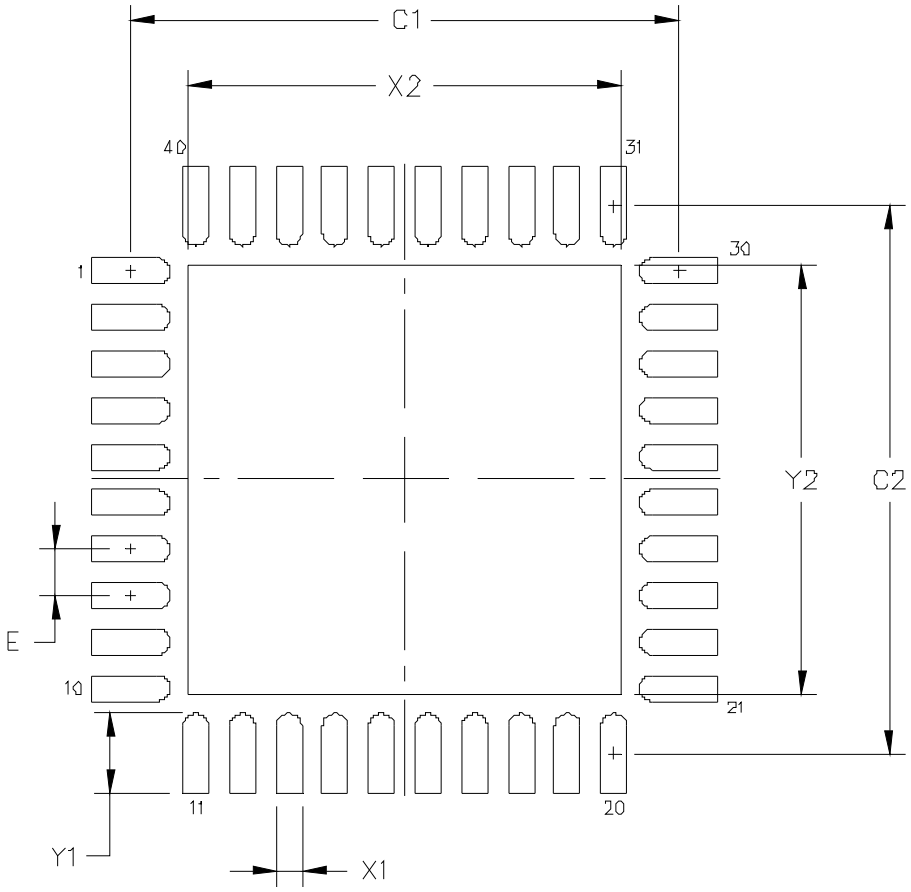

Figure 6.15. QFN-40 Landing Diagram

Table 6.13. QFN-40 Landing Diagram Dimensions

Dimension	mm
C1	5.90
C2	5.90
E	0.50
X1	0.30
Y1	0.85
X2	4.65
Y2	4.65

Notes:
1. All dimensions shown are in millimeters (mm).
2. This Land Pattern Design is based on the IPC-7351 guidelines.
3. All dimensions shown are at Maximum Material Condition (MMC). Least Material Condition (LMC) is calculated based on a Fabrication Allowance of 0.05 mm.