X1-Device User Manual/Specification

HSDPA/WCDMA/EDGE/GPRS Data Module

Contents
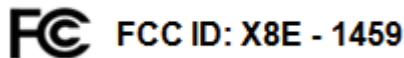
REVISION HISTORY

REV	ECO	CHANGE DESCRIPTION	APPROVED BY	DATE
1.0		Initial release		09/08/10

Notes (unless otherwise specified):
1. All parts and materials must be ROHS compliant.

FCC ID: X8E - 1459

⚠ **FCC Regulations:**

● This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

● This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiated radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
    -Reorient or relocate the receiving antenna.
    -Increase the separation between the equipment and receiver.
    -Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
    -Consult the dealer or an experienced radio/TV technician for help.
    Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

● The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
● Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
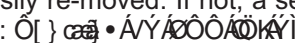
⚠ **RF Exposure Information:**

This device meets the government's requirements for exposure to radio waves.
This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. Government.

● This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

Maximum antenna gain allowed for use with this device is +2 dBi.

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: Ő[}æãd•ÁÝ/ÔÔÁ/ÖKÁÝ Ì ÒFl Í JÈ

1.1 GENERAL SPECIFICATIONS

PARAMETERS	DESCRIPTIONS			
External Access	WCDMA 850/1900/2100			
	GSM 850/900/1800/1900, GPRS/EDGE			
Protocols	3GPP TS 34.121 (WCDMA / HSDPA), 3GPP TS 51.010-1 (GSM/GPRS)			
Max Data Rate	HSDPA r5	3.6Mbps Down / 384 Kbps Up		
	WCDMA	384 Kbps		
	GPRS	Multi slot class 10 – 48Kbps (Down / Up)		
	EDGE	384 Kbps @ MSC9 (Down / Up)		
RX / TX Frequency Interval	WCDMA / HSDPA 850	45 MHz		
	WCDMA / HSDPA 1900	80 MHz		
	WCDMA / HSDPA 2100	190 MHz		
	GPRS / EDGE 850	45 MHz		
	GPRS / EDGE 900	45 MHz		
	GPRS / EDGE 1800	95 MHz		
	GPRS / EDGE 1900	80 MHz		
Max Output Power	WCDMA / HSDPA	23dBm (Power class: 3)		
	GPRS 850 / 900	33dBm (Power class: 4)		
	GPRS 1800 / 1900	30dBm (Power class: 1)		
	EDGE 850 / 900	27dBm (Power class: E2)		
	EDGE 1800 / 1900	26dBm (Power class: E2)		
Operating Voltage	VBATT 3.4V ~ 4.2V			
Current Consumption	Rock Bottom [Sleep]	0.75mA (Typical), 1.0mA (Max)		
	WCDMA standby	0.64s	1.28s	2.56s	5.12s
		3.37mA	2.27mA	1.71mA	1.36mA
	GPRS standby	0.471s		1.177s	
		2.98mA		1.69mA	
	Peak Current	1.8A			
Operating Temperature Range	-10°C ~ +60°C			
Storage Temperature Range	-30°C ~ +80°C			
Frequency Stability	WCDMA / HSDPA 800	±80Hz		
	WCDMA / HSDPA 2100	±170Hz		
	GSM / GPRS	±0.1ppm		
Physical Dimensions	45.00 x 32.00 x 2.63mm			
Weight	0.2656 oz			

2. RECEIVE SPECIFICATIONS

2.1 WCDMA/HSDPA

PARAMETERS		DESCRIPTIONS	
Frequency Range	WCDMA 2100	Down: 2110 ~ 2170 MHz	
	WCDMA 1900	Down: 1930 ~ 1990 MHz	
	WCDMA 850	Down: 869 ~ 894 MHz	
Reference Sensitivity Level	WCDMA 2100	-106.7dBm	
	WCDMA 1900	-104.7dBm	
	WCDMA 850	-104.7dBm	
Adjacent Channel Selectivity	WCDMA 2100	-92.7dBm	33dB @ ±5MHz
	WCDMA 1900	-90.7dBm	
	WCDMA 850	-90.7dBm	
Intermoduation	WCDMA 2100	-103.7dBm	-46dBm ±10MHz, ±20MHz
	WCDMA 1900	-101.7dBm	
	WCDMA 850	-101.7dBm	
Spurious Response	WCDMA 2100	-103.7dBm	-44dBm
	WCDMA 1900	-101.7dBm	
	WCDMA 850	-101.7dBm	
In-Band Blocking	WCDMA 2100	-103.7dBm	-56dBm @ ±10MHz, -44dBm @ ±10MHz
	WCDMA 1900	-101.7dBm	
	WCDMA 850	-101.7dBm	
Peak throughput	HSDPA	3.6Mbps	

2.2 GSM / GPRS

PARAMETERS		DESCRIPTIONS	
Frequency Range	GPRS / EDGE 850	Down: 869 ~ 894 MHz	
	GPRS / EDGE 900	Down: 925 ~ 960 MHz	
	GPRS / EDGE 1800	Down: 1805 ~ 1880 MHz	
	GPRS / EDGE 1900	Down: 1930 ~ 1990 MHz	
Minimum Input level for Reference Performance	GPRS 850/900/1800/1900	Type of Channel	Propagation Condition: BLER < 10%, Static
		PDTCH/CS-1	-102dBm
		PDTCH/CS-2	-102dBm
		PDTCH/CS-3	-102dBm
		PDTCH/CS-4	-102dBm
		PDTCH/CS-5	-99dBm
	EDGE 850/900/1800/1900	PDTCH/MCS-5	-98dBm
		PDTCH/MCS-6	-96dBm
		PDTCH/MCS-7	-93dBm
		PDTCH/MCS-8	-90.5dBm
		PDTCH/MCS-9	-86dBm

3. TRANSMIT SPECIFICATIONS

3.1 WCDMA/HSDPA

PARAMETERS	DESCRIPTIONS		
Frequency Range	WCDMA 2100	Up: 1920 ~ 1980 MHz	
	WCDMA 1900	Up: 1850 ~ 1910 MHz	
	WCDMA 850	Up: 824 ~ 849 MHz	
Max Output Power	20.3 ~ 25.7dBm (Power Class III)		
Min Output Power	Below -50dBm		
Spectrum Emission Mask	Below -35dBc	2.5 ~ 3.5 MHz	Offset 30KHz
	Below -35dBc	3.5 ~ 7.5 MHz	Offset 1MHz
	Below -39dBc	7.5 ~ 8.5 MHz	Offset 1MHz
	Below -49dBc	8.5 ~ 12.5 MHz	Offset 1MHz
Occupied Bandwidth	Below 5MHz		
ACLR	±5MHz 33dB, ±10MHz 43dB		

3.2 GPRS / EDGE

PARAMETERS	DESCRIPTIONS		
Frequency Range	GPRS / EDGE 850	Up: 824 ~ 849 MHz	
	GPRS / EDGE 900	Up: 880 ~ 915 MHz	
	GPRS / EDGE 1800	Up: 1710 ~ 1785 MHz	
	GPRS / EDGE 1900	Up: 1850 ~ 1910 MHz	
Frequency error	GPRS / EDGE	±0.1ppm	
Phase error	GPRS	Peak phase error	Below 20°
		RMS phase error	Below 5°
Modulation accuracy	EDGE	Peak EVM	Less than 5%
		RMS EVM	Less than 30%
Transmitter output power	GPRS / EDGE 850 / 900	Power Level	Output Power (dBm)	Tolerance (dBm)
		5	33	
		6	31	±3
		7	29	±3
		8	27	±3
		9	25	±3
		10	23	±3
		11	21	±3
		12	19	±3
		13	17	±3
		14	15	±3
		15	13	±3
		16	11	±5
	GPRS / EDGE 1800 / 1900	Power Level	Output Power (dBm)	Tolerance (dBm)
		0	30	±2
		1	28	±3
		2	26	±3
		3	24	±3
		4	22	±3
		5	20	±3
		6	18	±3

		7	16	±3	
		8	14	±3	
		9	12	±4	
		10	10	±4	
		11	8	±4	
		12	6	±4	
		13	4	±4	
		14	2	±5	
		15	0	±5	
ORFS @ Spectrum due to modulation	GSM / GPRS 850 / 900	Power (dBm)	Frequency offset (KHz)		
			±400	±600	±1200	±1800
		33	-19	-21	-21	-24
		31	-21	-23	-23	-26
		29	-23	-25	-25	-28
		27	-23	-26	-27	-30
		25	-23	-26	-29	-32
		23	-23	-26	-31	-34
		≤20	-23	-26	-32	-36
ORFS @ Spectrum due to switching transient	GSM / GPRS 1800 / 1900	Power (dBm)	Frequency offset (KHz)		
			±400	±600	±1200	±1800
		30	-22	-24	-24	-27
		28	-23	-25	-26	-29
		26	-23	-26	-28	-31
		24	-23	-26	-30	-33
		22	-23	-26	-31	-35
		≤21	-23	-26	-32	-36

4. BASEBAND

Processors

- RISC CPU @ 230 MHz
- DSP @ 115 MHz

Memory

- Multichip Package (MCP) contains both RAM & Flash
- 1GB NAND Flash
- 256MB (16MB x 16) DDR @ 92MHz

Connectivity

- Full Speed USB
- UART
- JTAG (Debug Port)

5. PIN DESCRIPTIONS

PIN	Name	Description	PIN	Name	Description
1	GND	Ground	2	VBAT	Battery
3	GND	Ground	4	VBAT	Battery
5	GND	Ground	6	VBAT	Battery
7	GND	Ground	8	VBAT	Battery
9	GND	Ground	10	VBAT	Battery
11	GND	Ground	12	VBAT	Battery
13	GND	Ground	14	VBAT	Battery
15	GND	Ground	16	VBAT	Battery
17	GND	Ground	18	VBAT	Battery
19	NC	No Connect	20	NC	No Connect
21	PS_HOLD	Power Supply Hold Up	22	UART_RXD	Serial Receive
23	SIM_DETECT	SIM card presence	24	UART_TXD	Serial Transmit
25	GPIO2	Spare GPIO	26	UART_RTS	Flow Control
27	GPIO3	Spare GPIO	28	UART_CTS	Flow Control
29	GND	Ground	30	JTAG_TDI	Test Data In
31	USB_DM	USB Data -	32	JTAG_TDO	Test Data Out
33	USB_DP	USB Data +	34	JTAG_TMS	Test Mode Select
35	GND	Ground	36	JTAG_TCK	Test Clock
37	USB_EN	USB Enable	38	JTAG_RTCK	Return Clock
39	HOST_WAKE	Host wake-up event	40	JTAG_TRST	Test Reset +
41	H_M_INT	Host to Modem Interrupt	42	JTAG_RESET_N	Test Reset -
43	M_H_INT	Modem to Host Interrupt	44	UIM_DATA	SIM DATA
45	VBATT_EN	Modem Power Enable	46	UIM_CLK	SIM Clock
47	VREG_MSME	1.8V (Linear)	48	UIM_RESET	SIM Reset
49	POWER_ON_OFF	Modem ON/OFF	50	VREG_USIM	SIM Voltage
51	GND	Ground	52	GND	Ground
53	GND	Ground	54	GND	Ground

6. PIN CHARACTERISTICS

6.1 Power Management

PIN	Name	Direction	Voltage	Description
21	PS_HOLD	Modem → Host	1.8V	Drive to 1.8V and hold for JTAG debug mode
49	POWER_ON_OFF	Host → Modem	1.8V	Pulling this pin LOW and holding for 500ms toggles power ON/OFF.
37	USB_EN	Host → Modem	1.8V	Enable/Disable USB PHY
45	VBATT_EN	Host → Modem	1.8V	Drive low to disconnect modem from the main battery

POWER_ON_OFF application note:

POWER_ON_OFF should be driven open collector on the host board.
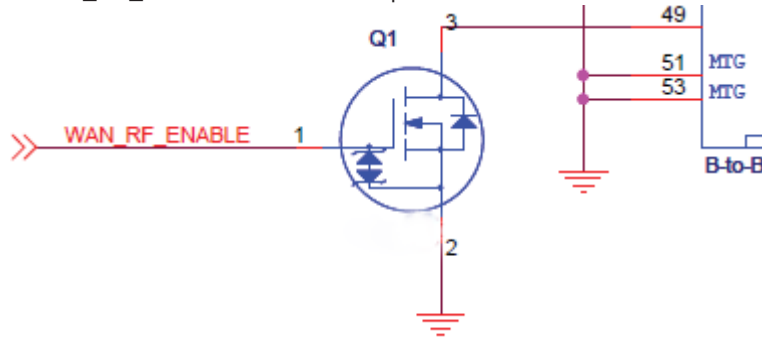
6.2 SIM Card Detection

PIN	Name	Direction	Voltage	Description
23	SIM_DETECT	Host → Modem	1.8V	Software drives this pin HIGH. Hardware should pull it LOW when a SIM Card is inserted.

6.3 UART

PIN	Name	Direction	Voltage	Description
22	UART_RXD	Host → Modem	1.8V	Receive Data
24	UART_TXD	Modem → Host	1.8V	Transmit Data
26	UART_RTS	Reserve		Reserve
28	UART_CTS	Reserve		Reserve

6.4 USB

| PIN	Name	Direction	Voltage	Description
31	USB_DM	Bidirectional	1.8V	USB Data -
33	USB_DP	Bidirectional	1.8V	USB Data +

DEVICE supports full-speed USB only. The UART operates at 115,200 Baud with no Flow Control.

6.5 Host Wake & Interrupts

PIN	Name	Direction	Voltage	Description
39	HOST_WAKE	Modem → Host	2.6V	Signals the host device to wake from sleep mode when a TPH event has occurred.
41	H_M_INT	Host → Modem	1.8V	Host to Modem Interrupt
43	M_H_INT	Modem → Host	1.8V	Modem to Host Interrupt

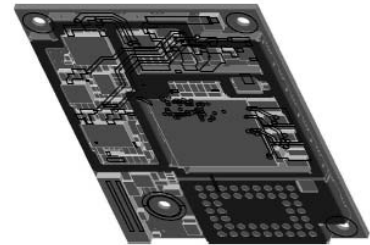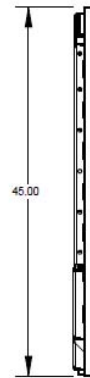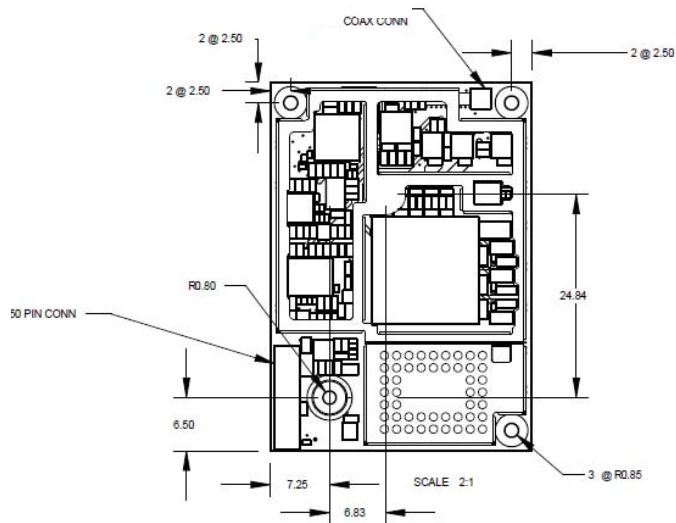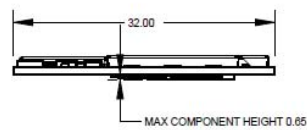## 7. MECHANICAL INTERFACE

7.1 SUPPLIER Part
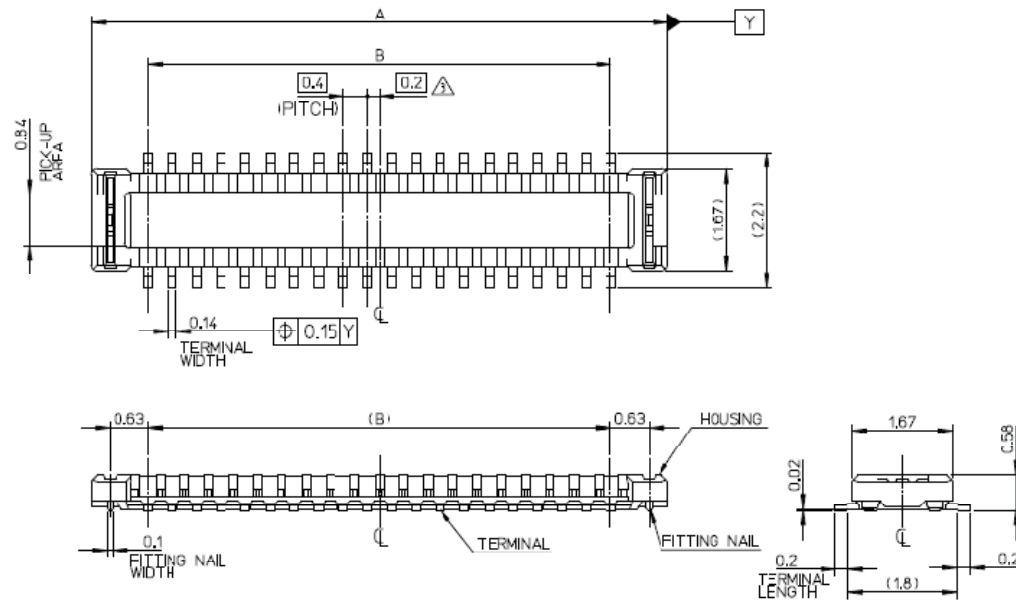
7.2 SUPPLIER Part – Complementary Part #1 (0.7mm stacking height)
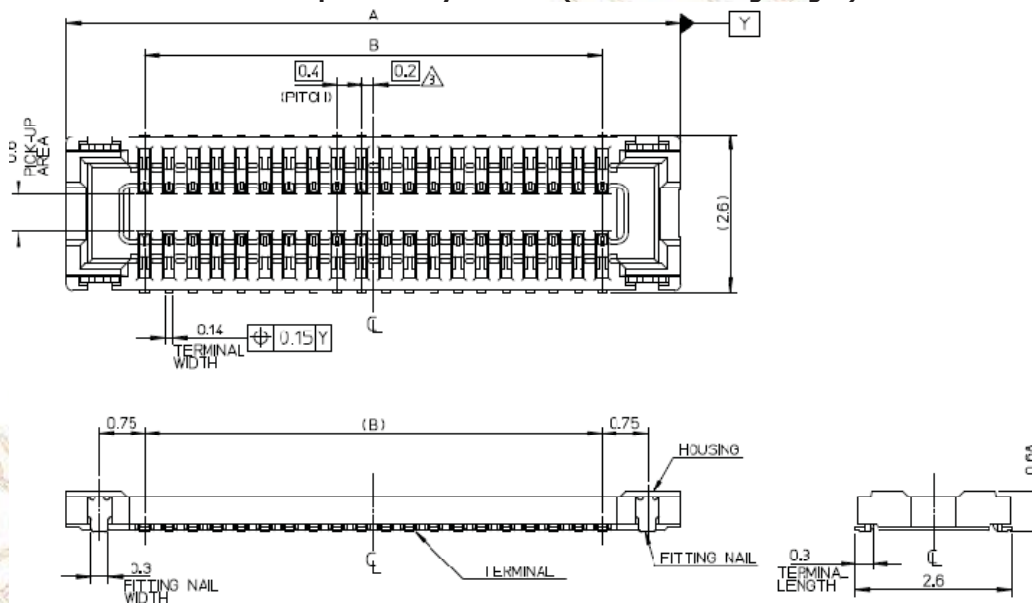
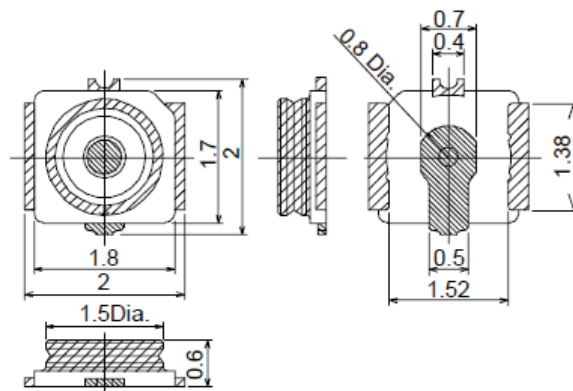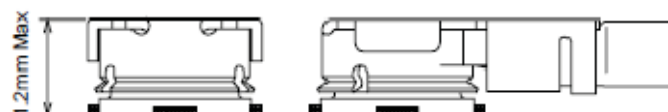### 7.3 MECHANICAL DRAWINGS

8. RF CONNECTOR Supplier Part

FIGURE1.   Construction

Scale: Free
Tolerances Unless
Otherwise Specified: +/-0.2
Unit: mm

OEM Installation Instruction

This 3G Module has been authorized for mobile operation in North America. End user installation is not allowed. This module must be installed at factory by the host integrator and should not provide any instruction to the user on how to remove or install the module.

This 3G module is approved to be used as a mobile device per FCC section 2.1091 and the antenna must be positioned in the host to provide at least 20 cm separation distance from user and nearby person.

The following conditions must be met:
1. Maintain at least a 20 cm separation between the antenna and the user's body.
2. To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain (including cable loss) must not exceed 4dBi for Cellular and PCS band.
3. This 3G module must not be co-located or jointly operated with any other transmitter or antenna within the host device.
4. A label with the following statements must be attached to the host end product if the FCC ID label is not visible at the time of purchasing:
Contains TX FCC ID: X8E-1459.
5. The host end product must include a user manual that clearly defines operating requirements and conditions that must be observed to ensure compliance with current FCC/IC RF exposure guidelines.
6. The host end product must also pass the FCC Part 15 unintentional emission testing requirement and be properly authorized per FCC Part 15.
For portable devices, a separate approval is required to satisfy the SAR requirements of FCC Part 2.1093.