

## Introduction

Each MAX® II device has a user flash memory (UFM) block to store up to 8 Kbits of user data. You can use the UFM block to replace on-board flash and EEPROM memory devices which are used to store ASSP or processor configuration bits, or electronic ID information for a board during manufacturing. MAX II device logic capacity allows integration of system power-on reset (POR), interface bridging, and I/O expansion designs in addition to these serial flash capabilities.

This chapter provides a comprehensive listing of 2-Kbit, 4-Kbit, and 8-Kbit, non-volatile memory devices that could be potentially replaced by MAX II UFM devices. [Table 10-1](#) shows the capacity for the UFM block for all MAX II devices.

**Table 10-1.** MAX II UFM Array Size

Device	Total Bits	Sectors	Address Bits	Data Width
EPM240	8,192	2 (4096 bits per sector)	9	16
EPM570				
EPM1270				
EPM2210				

This chapter contains the following sections:

- [“Design Considerations” on page 10-1](#)
- [“List of Vendors and Devices” on page 10-2](#)

## Design Considerations

The MAX II UFM can be programmed, erased, and verified through the Joint Test Action Group (JTAG) port or through connections to/from the logic array in accordance with IEEE Std. 1532-2002. There are 13 interface signals to and from the UFM block and logic array which allow the logic array to read or write to the UFM during device user mode. A reference design or user logic can be used to interface the UFM to many standard interface protocols such as Serial Communication Interface (SCI), Serial Peripheral Interface (SPI), Inter-Integrated Circuit (I<sup>2</sup>C), Microwire, or other proprietary protocols. Altera's Quartus® II `altufm` megafunction provides interface logic for a subset of these interfaces (parallel and SPI). Any interfaces not provided by the megafunction or design examples, require you to create user logic to bridge the UFM block to your desired interface protocol.



For more information about programming and erasing the UFM block and/or the `altufm` megafunction, refer to the [Using User Flash Memory in MAX II Devices](#) chapter in the *MAX II Device Handbook*.

The differences between the UFM block and serial EEPROMs that you should consider in your integration of serial EEPROM applications are the sector-based erase and erase/reprogram cycles. Serial EEPROMs support byte wide erase, which is automatically implemented during a byte write sequence. The UFM block supports byte writes, but does not support byte erase requiring a sector-based erase sequence prior to any programming or writing. If the data content of a specific byte location needs to be overwritten in the UFM, the entire sector that byte resides in must be erased unless that byte location was already erased (all 1s). For programming endurance, the UFM erase/reprogram cycles do not meet the  $10^7$  and greater cycles seen in serial EEPROMs.

 Refer to the *DC and Switching Characteristics* chapter in the *MAX II Device Handbook* for the MAX II UFM block erase/programming endurance specification.

## List of Vendors and Devices

Table 10-2 through Table 10-10 list the vendors and their devices which can be replaced by the MAX II UFM block. The operating condition range for the UFM block and MAX II devices are within the range of the devices listed.

**Table 10-2.** Asahi Kasei Microsystems Co. Device Characteristics

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub> (MHz)	Operating Voltage (V) (1)
			SCI	1-Wire	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	AK93C75AV	8,192	—	—	—	—	—	✓	—	1.8 to 5.5
EEPROM	AK93C75BH	8,192	—	—	—	—	—	✓	—	1.8 to 5.5
EEPROM	AK6480AF/M	8,192	✓	—	—	—	—	—	1	1.8 to 5.5
EEPROM	AK6480BH/L	8,192	✓	—	—	—	—	—	1	1.8 to 5.5
EEPROM	AK93C65AF/V	4,096	—	—	—	—	—	✓	—	1.8 to 5.5
EEPROM	AK93C65BH	4,096	—	—	—	—	—	✓	—	1.8 to 5.5
EEPROM	AK93C61AV	4,096	—	—	—	—	—	✓	—	0.9 to 3.6
EEPROM	AK6440AF/M	4,096	✓	—	—	—	—	—	1	1.8 to 5.5
EEPROM	AK6440BH/L	4,096	✓	—	—	—	—	—	1	1.8 to 5.5
EEPROM	AK6004AF	4,096	—	—	—	—	✓	—	—	1.8 to 5.5
EEPROM	AK93C55AF/V	2,048	—	—	—	—	—	✓	—	1.8 to 5.5
EEPROM	AK93C55BH	2,048	—	—	—	—	—	✓	—	1.8 to 5.5
EEPROM	AK93C51AV	2,048	—	—	—	—	—	✓	—	0.9 to 3.6
EEPROM	AK6420AF/M	2,048	✓	—	—	—	—	—	1	1.8 to 5.5
EEPROM	AK6420BH	2,048	✓	—	—	—	—	—	1	1.8 to 5.5
EEPROM	AK6003AV	2,048	—	—	—	—	✓	—	—	1.8 to 5.5

**Note to Table 10-2:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

**Table 10-3.** Atmel Corporation Device Characteristics

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	AT25020	2,048	—	✓	—	—	—	—	3 MHz	2.7 (2.7 ~ 5.5)
EEPROM	AT25040	4,096	—	✓	—	—	—	—	3 MHz	2.7 (2.7 ~ 5.5)
EEPROM	AT25020A	2,048	—	✓	—	—	—	—	20 MHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT25040A	4,096	—	✓	—	—	—	—	20 MHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT25080	8,192	—	✓	—	—	—	—	3 MHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT25080A	8,192	—	✓	—	—	—	—	20 MHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT24C02	2,048	—	—	✓	—	—	—	400 kHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT24C04	4,096	—	—	✓	—	—	—	400 kHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT24C08	8,192	—	—	✓	—	—	—	400 kHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT24C02A	2,048	—	—	✓	—	—	—	400 kHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT24C04A	4,096	—	—	✓	—	—	—	400 kHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT24C08A	8,192	—	—	✓	—	—	—	400 kHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT34C02	2,048	—	—	✓	—	—	—	400 kHz	2.7 (2.7 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT93C56	2,048	—	—	—	✓	—	—	2 MHz	2.7 (2.7 ~ 5.5) 2.5 (2.5 ~ 5.5) 1.8 (1.8 ~ 5.5)
EEPROM	AT93C66	4,096	—	—	—	✓	—	—	2 MHz	2.7 (2.7 ~ 5.5) 2.5 (2.5 ~ 5.5) 1.8 (1.8 ~ 5.5)

**Note to Table 10-3:**

(1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

**Table 10-4.** Catalyst Semiconductor, Inc. Device Characteristics (Part 1 of 2)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	CAT93C56	2,048	—	—	—	—	—	✓	1 MHz	1.8 to 6.0
EEPROM	CAT93C57	2,048	—	—	—	—	—	✓	1 MHz	1.8 to 6.0
EEPROM	CAT93C66	4,096	—	—	—	—	—	✓	1 MHz	1.8 to 6.0
EEPROM	CAT34WC02	2,048	—	—	—	—	✓	—	400 kHz	1.8 to 6.0
EEPROM	CAT24WC03	2,048	—	—	—	—	✓	—	400 kHz	1.8 to 6.0

**Table 10-4.** Catalyst Semiconductor, Inc. Device Characteristics (Part 2 of 2)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	CAT24WC05	4,096	—	—	—	—	✓	—	400 kHz	1.8 to 6.0
EEPROM	CAT24WC02	2,048	—	—	—	—	✓	—	400 kHz	1.8 to 6.0
EEPROM	CAT24WC04	4,096	—	—	—	—	✓	—	400 kHz	1.8 to 6.0
EEPROM	CAT24WC08	8,192	—	—	—	—	✓	—	400 kHz	1.8 to 6.0
EEPROM	CAT64LC20	2,048	—	✓	—	—	—	—	1 MHz	2.5 to 6.0
EEPROM	CAT64LC40	4,096	—	✓	—	—	—	—	1 MHz	2.5 to 6.0
EEPROM	CAT25C02	2,048	—	✓	—	—	—	—	10 MHz	1.8 to 6.0
EEPROM	CAT25C03	2,048	—	✓	—	—	—	—	10 MHz	1.8 to 6.0
EEPROM	CAT25C04	4,096	—	✓	—	—	—	—	10 MHz	1.8 to 6.0
EEPROM	CAT25C05	4,096	—	✓	—	—	—	—	10 MHz	1.8 to 6.0
EEPROM	CAT25C08	8,192	—	✓	—	—	—	—	10 MHz	1.8 to 6.0
EEPROM	CAT25C09	8,192	—	✓	—	—	—	—	10 MHz	1.8 to 6.0
EEPROM	CAT25020	2,048	—	✓	—	—	—	—	10 MHz	1.8 to 6.0
EEPROM	CAT25040	4,096	—	✓	—	—	—	—	10 MHz	1.8 to 6.0

**Note to Table 10-4:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

**Table 10-5.** Dallas Semiconductor – Maxim Integrated Products, Inc. Device Characteristics

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub> (MHz)	Operating Voltage (V) (1)
			SCI	1-Wire	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	DS2433	4,096	—	✓	—	—	—	—	—	2.8 to 6.0

**Note to Table 10-5:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

**Table 10-6.** Fairchild Semiconductor Device Characteristics (Part 1 of 2)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	FM34W02UL	2,048	—	—	—	—	✓	—	400 kHz	2.7 to 5.5
EEPROM	FM93C56L	2,048	—	—	—	—	—	✓	1 MHz	2.7 to 5.5
EEPROM	FM93C66L	4,096	—	—	—	—	—	✓	1 MHz	2.7 to 5.5
EEPROM	FM93CS56L	2,048	—	—	—	—	—	✓	1 MHz	2.7 to 5.5
EEPROM	FM93CS66L	4,096	—	—	—	—	—	✓	1 MHz	2.7 to 5.5
EEPROM	FM24C08UL	8,192	—	—	✓	—	—	—	400 kHz	2.7 to 5.5
EEPROM	FM24C09UL	8,192	—	—	✓	—	—	—	400 kHz	2.7 to 5.5

**Table 10-6.** Fairchild Semiconductor Device Characteristics (Part 2 of 2)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	NM24C02L	2,048	—	—	✓	—	—	—	400 kHz	2.7 to 5.5
EEPROM	NM25C020L	2,048	—	✓	—	—	—	—	2.1 MHz	2.7 to 5.5
EEPROM	NM25C040L	4,096	—	✓	—	—	—	—	2.1 MHz	2.7 to 5.5

**Note to Table 10-6:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

**Table 10-7.** Holtek Semiconductor Inc. Device Characteristics

Type	Device	Size (Bits)	Interface						Clock Rate (MHz) (V <sub>CC</sub> = 5.0 V)	Operating Voltage (V) (1)
			SCI	1-Wire	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	HT24LC02	2,048	—	—	✓	—	—	—	0.4	2.2 to 5.5
EEPROM	HT24LC04	4,096	—	—	✓	—	—	—	0.4	2.4 to 5.5
EEPROM	HT24LC08	8,192	—	—	✓	—	—	—	0.4	2.4 to 5.5
EEPROM	HT93LC56	2,048	—	—	—	✓	—	—	1	Read: 2.0 ~ 5.5 Write: 2.4 ~ 5.5
EEPROM	HT93LC66	4,096	—	—	—	✓	—	—	1	Read: 2.0 ~ 5.5 Write: 2.4 ~ 5.5

**Note to Table 10-7:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

**Table 10-8.** Microchip Technology Inc. Device Characteristics (Part 1 of 2)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	24LCS62	2,048	—	—	—	—	✓	—	400 kHz	2.5 to 5.5
EEPROM	24LCS52	2,048	—	—	—	—	✓	—	400 kHz	2.5 to 5.5
EEPROM	24LC22A	2,048	—	—	—	—	✓	—	400 kHz	2.5 to 5.5
EEPROM	24LC02B	2,048	—	—	—	—	✓	—	400 kHz	2.5 to 5.5
EEPROM	24LC025	2,048	—	—	—	—	✓	—	400 kHz	2.5 to 5.5
EEPROM	24LC024	2,048	—	—	—	—	✓	—	400 kHz	2.5 to 5.5
EEPROM	24C02SC	2,048	—	—	—	—	✓	—	400 kHz	2.5 to 5.5
EEPROM	24LCS22A	2,048	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	24AA52	2,048	—	—	—	—	✓	—	100 kHz	1.8 to 5.5
EEPROM	24AA02	2,048	—	—	—	—	✓	—	100 kHz	1.8 to 5.5
EEPROM	24AA04	4,096	—	—	—	—	✓	—	400 kHz (2)	1.8 to 5.5
EEPROM	24AA08	8,192	—	—	—	—	✓	—	400 kHz (2)	1.8 to 5.5

**Table 10-8.** Microchip Technology Inc. Device Characteristics (Part 2 of 2)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	24LC04B	4,096	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	24LC08B	8,192	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	24LC09 (3)	8,192	—	—	Advanced Communication Riser (4)	—	—	—	400 kHz	2.5 to 5.5
EEPROM	93LC66A	4,096	—	—	—	—	—	✓	2 MHz	2.5 to 6.0
EEPROM	93AA66	4,096	—	—	—	—	—	✓	2 MHz	1.8 to 5.5
EEPROM	93LC66B	4,096	—	—	—	—	—	✓	2 MHz	2.5 to 6.0
EEPROM	93LC56A	2,048	—	—	—	—	—	✓	2 MHz	2.5 to 6.0
EEPROM	93AA56	2,048	—	—	—	—	—	✓	2 MHz	1.8 to 5.5
EEPROM	93LC56B	2,048	—	—	—	—	—	✓	2 MHz	2.5 to 6.0
EEPROM	25LC080	8,192	—	✓	—	—	—	—	2 MHz	2.5 to 5.5
EEPROM	25LC040	4,096	—	✓	—	—	—	—	2 MHz	2.5 to 5.5
EEPROM	25AA080	8,192	—	✓	—	—	—	—	1 MHz	1.8 to 5.5
EEPROM	25AA040	4,096	—	✓	—	—	—	—	1 MHz	1.8 to 5.5

**Notes to Table 10-8:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.
- (2) 100 kHz for V<sub>CC</sub> < 2.5 V.
- (3) This device is designed to meet the proprietary protocol.
- (4) Proprietary protocol by Microchip Technology Inc.

**Table 10-9.** Philips Semiconductors Device Characteristics

Type	Device	Size (bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	PCF8582C-2	2,048	—	—	—	—	✓	—	100 kHz	2.5 to 6.0
EEPROM	PCF8594C-2	4,096	—	—	—	—	✓	—	100 kHz	2.5 to 6.0
EEPROM	PCF8598C-2	8,192	—	—	—	—	✓	—	100 kHz	2.5 to 6.0
EEPROM	PCF85102C-2	2,048	—	—	—	—	✓	—	100 kHz	2.5 to 6.0
EEPROM	PCF85103C-2	2,048	—	—	—	—	✓	—	100 kHz	2.5 to 6.0

**Note to Table 10-9:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

**Table 10-10.** Rohm Co., Ltd. Device Characteristics (Part 1 of 2)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	BR24L02-W	2,048	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L04-W	4,096	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L08-W	8,192	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L02F-W	2,048	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L04F-W	4,096	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L08F-W	8,192	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L02FJ-W	2,048	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L04FJ-W	4,096	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L08FJ-W	8,192	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L02FV-W	2,048	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L04FV-W	4,096	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L08FV-W	8,192	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L02FVM-W	2,048	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L04FVM-W	4,096	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR24L08FVM-W	8,192	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	BR93L56-W	2,048	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L66-W	4,096	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L56F-W	2,048	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L66F-W	4,096	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L56RF-W	2,048	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L66RF-W	4,096	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L56FJ-W	2,048	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L66FJ-W	4,096	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L56RFJ-W	2,048	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L66RFJ-W	4,096	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L56FV-W	2,048	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L66FV-W	4,096	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L56RFV-W	2,048	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L66RFV-W	4,096	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L56RFVM-W	2,048	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR93L66RFVM-W	4,096	—	—	—	✓	—	—	2 MHz	1.8 to 5.5
EEPROM	BR9020-W	2,048	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9040-W	4,096	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9080AF-W	8,192	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9020F-W	2,048	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9040F-W	4,096	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9080ARFV-W	8,192	—	—	—	✓	—	—	2 MHz	2.7 to 5.5

**Table 10-10.** Rohm Co., Ltd. Device Characteristics (Part 2 of 2)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	BR9020FV-W	2,048	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9040FV-W	4,096	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9080ARFVM-W	8,192	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9020RFV-W	2,048	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9040RFV-W	4,096	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9020RFVM-W	2,048	—	—	—	✓	—	—	2 MHz	2.7 to 5.5
EEPROM	BR9040RFVM-W	4,096	—	—	—	✓	—	—	2 MHz	2.7 to 5.5

**Note to Table 10-10:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

**Table 10-11.** Seiko Instruments Inc. Device Characteristics (Part 1 of 3)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	1-Wire	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	S-93C66B	4,096	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 5.5 Write: 2.7 ~ 5.5
EEPROM	S-93C56B	2,048	—	—	—	✓	—	—	2.0 MHz	Read: 2.0 ~ 5.5 Write: 2.4 ~ 5.5
EEPROM	S-93C76A	8,192	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 5.5 Write: 2.7 ~ 5.5
EEPROM	S-93C66A	4,096	—	—	—	✓	—	—	2.0 MHz	1.8 to 5.5
EEPROM	S-93C56A	2,048	—	—	—	✓	—	—	2.0 MHz	1.8 to 5.5
EEPROM	S-29430A	8,192	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 5.5 Write: 2.5 ~ 5.5
EEPROM	S-29453A	8,192	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 5.5 Write: 2.5 ~ 5.5
EEPROM	S-29330A	4,096	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29230A	2,048	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29220A	2,048	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29331A	4,096	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29231A	2,048	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29221A	2,048	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29390A	4,096	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5



**Table 10-11.** Seiko Instruments Inc. Device Characteristics (Part 2 of 3)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	1-Wire	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	S-29290A	2,048	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29391A	4,096	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29291A	2,048	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29394A	4,096	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29294A	2,048	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.5 ~ 6.5
EEPROM	S-29355A	4,096	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 V ~ 6.5 V Write: 2.7 V ~ 6.5 V
EEPROM	S-29255A	2,048	—	—	—	✓	—	—	2.0 MHz	Read: 1.8 ~ 6.5 Write: 2.7 ~ 6.5
EEPROM	S-29L330A	4,096	—	—	—	✓	—	—	2.0 MHz	1.8 to 5.5
EEPROM	S-29L220A	2,048	—	—	—	✓	—	—	2.0 MHz	1.8 to 5.5
EEPROM	S-29L331A	4,096	—	—	—	✓	—	—	2.0 MHz	1.8 to 5.5
EEPROM	S-29L221A	2,048	—	—	—	✓	—	—	2.0 MHz	1.8 to 5.5
EEPROM	S-29L394A	4,096	—	—	—	✓	—	—	2.0 MHz	1.8 to 5.5
EEPROM	S-29L294A	2,048	—	—	—	✓	—	—	2.0 MHz	1.8 to 5.5
EEPROM	S-29U330A	4,096	—	—	—	✓	—	—	500 kHz	Read: 0.9 ~ 3.6 Write: 1.8 ~ 3.6
EEPROM	S-29U220A	2,048	—	—	—	✓	—	—	500 kHz	Read: 0.9 ~ 3.6 Write: 1.8 ~ 3.6
EEPROM	S-29U331A	4,096	—	—	—	✓	—	—	500 kHz	Read: 0.9 ~ 3.6 Write: 1.8 ~ 3.6
EEPROM	S-29U221A	2,048	—	—	—	✓	—	—	500 kHz	Read: 0.9 ~ 3.6 Write: 1.8 ~ 3.6
EEPROM	S-29U394A	4,096	—	—	—	✓	—	—	500 kHz	Read: 0.9 ~ 3.6 Write: 1.8 ~ 3.6
EEPROM	S-29U294A	2,048	—	—	—	✓	—	—	500 kHz	Read: 0.9 ~ 3.6 Write: 1.8 ~ 3.6
EEPROM	S-29Z330A	4,096	—	—	—	✓	—	—	500 kHz	0.9 to 3.6
EEPROM	S-29ZX30A	8,192	—	—	—	✓	—	—	500 kHz	0.9 to 3.6
EEPROM	S-24CS08A	8,192	—	—	✓	—	—	—	400 kHz	Read: 1.8 to 5.5 Write: 2.7 to 5.5
EEPROM	S-24CS04A	4,096	—	—	✓	—	—	—	400 kHz	Read: 1.8 ~ 5.5 Write: 2.7 ~ 5.5
EEPROM	S-24CS02A	2,048	—	—	✓	—	—	—	400 kHz	Read: 1.8 ~ 5.5 Write: 2.7 ~ 5.5
EEPROM	S-24C08A	8,192	—	—	✓	—	—	—	400 kHz	Read: 1.8 ~ 5.5 Write: 2.7 ~ 5.5

**Table 10-11.** Seiko Instruments Inc. Device Characteristics (Part 3 of 3)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	1-Wire	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	S-24C04A	4,096	—	—	✓	—	—	—	100 kHz	Read: 1.8 ~ 5.5 Write: 2.5 ~ 5.5
EEPROM	S-24C02A	2,048	—	—	✓	—	—	—	100 kHz	Read: 1.8 ~ 5.5 Write: 2.5 ~ 5.5
EEPROM	S-24C04B	4,096	—	—	✓	—	—	—	400 KHz	2.0 to 5.5
EEPROM	S-24C02B	2,048	—	—	✓	—	—	—	400 KHz	2.0 to 5.5

**Note to Table 10-11:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

**Table 10-12.** STMicroelectronics Device Characteristics (Part 1 of 2)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	M24C04-W	4,096	—	—	—	—	✓	—	400 kHz	2.5 to 5.5
EEPROM	M24C02-W	2,048	—	—	—	—	✓	—	400 kHz	2.5 to 5.5
EEPROM	M24C08-W	8,192	—	—	—	—	✓	—	400 kHz	2.5 to 5.5
EEPROM	M24C04-L	4,096	—	—	—	—	✓	—	400 kHz	2.2 to 5.5
EEPROM	M24C02-L	2,048	—	—	—	—	✓	—	400 kHz	2.2 to 5.5
EEPROM	M24C08-L	8,192	—	—	—	—	✓	—	400 kHz	2.2 to 5.5
EEPROM	M24C04-R	4,096	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	M24C02-R	2,048	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	M24C08-R	8,192	—	—	—	—	✓	—	400 kHz	1.8 to 5.5
EEPROM	ST24W04	4,096	—	—	—	—	✓	—	100 kHz	3.0 to 5.5
EEPROM	ST25W04	4,096	—	—	—	—	✓	—	100 kHz	2.5 to 5.5
EEPROM	ST24C04	4,096	—	—	—	—	✓	—	100 kHz	3.0 to 5.5
EEPROM	ST25C04	4,096	—	—	—	—	✓	—	100 kHz	2.5 to 5.5
EEPROM	M93C76-W	8192	—	—	—	—	—	✓	2 MHz	2.5 to 5.5
EEPROM	M93C66-W	4,096	—	—	—	—	—	✓	2 MHz	2.5 to 5.5
EEPROM	M93C56-W	2,048	—	—	—	—	—	✓	2 MHz	2.5 to 5.5
EEPROM	M93C76-R	8,192	—	—	—	—	—	✓	2 MHz	1.8 to 5.5
EEPROM	M93C66-R	4,096	—	—	—	—	—	✓	2 MHz	1.8 to 5.5
EEPROM	M93C56-R	2,048	—	—	—	—	—	✓	2 MHz	1.8 to 5.5
EEPROM	M93S66-W	4,096	—	—	—	—	—	✓	2 MHz	2.5 to 5.5
EEPROM	M93S56-W	2,048	—	—	—	—	—	✓	2 MHz	2.5 to 5.5
EEPROM	M93S66-R	4,096	—	—	—	—	—	✓	2 MHz	1.8 to 5.5
EEPROM	M93S56-R	2,048	—	—	—	—	—	✓	2 MHz	1.8 to 5.5
EEPROM	M95080-W	8,192	—	✓	—	—	—	—	10 MHz	2.5 to 5.5
EEPROM	M95040-W	4,096	—	✓	—	—	—	—	5 MHz	2.5 to 5.5
EEPROM	M95020-W	2,048	—	✓	—	—	—	—	5 MHz	2.5 to 5.5

**Table 10-12.** STMicroelectronics Device Characteristics (Part 2 of 2)

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	SPI	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	M95080-R	8,192	—	✓	—	—	—	—	10 MHz	1.8 to 5.5
EEPROM	M95040-S	4,096	—	✓	—	—	—	—	5 MHz	1.8 to 3.6
EEPROM	M95020-S	2,048	—	✓	—	—	—	—	5 MHz	1.8 to 3.6

**Note to Table 10-12:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

**Table 10-13.** Toshiba Corporation Device Characteristics

Type	Device	Size (Bits)	Interface						f <sub>MAX</sub>	Operating Voltage (V) (1)
			SCI	4-Wire	2-Wire	3-Wire	I <sup>2</sup> C	Microwire		
EEPROM	TC9WMA2FK	2,048	—	✓	—	✓	—	—	1 MHz	Read: 1.8 ~ 5.5 Write: 2.3 ~ 5.5
EEPROM	TC9WMB2FK	2,048	—	—	—	—	✓	—	400 kHz	Read: 1.8 ~ 5.5 Write: 2.3 ~ 5.5

**Note to Table 10-13:**

- (1) The MAX II device supports two different V<sub>CCINT</sub> of operating voltage ranges, which are 2.375 to 2.625 V, and 3.0 to 3.6 V; the MAX IIG device supports the 1.71 to 1.89 V operating voltage range.

## Conclusion

MAX II devices can be used to incorporate logic and memory devices on a design board, eliminating chip-to-chip delays, minimizing board space, and reducing total system cost. Since you can program the UFM block to suit your needs, MAX II devices offer more interface flexibility than an off-the-shelf EEPROM device.

## Referenced Documents

This chapter references the following documents:

- *DC and Switching Characteristics* chapter in the *MAX II Device Handbook*
- *Using User Flash Memory in MAX II Devices* chapter in the *MAX II Device Handbook*

## Document Revision History

Table 10-14 shows the revision history for this chapter.

**Table 10-14.** Document Revision History

<b>Date and Revision</b>	<b>Changes Made</b>	<b>Summary of Changes</b>
October 2008, version 1.5	■ Updated New Document Format.	—
December 2007, version 1.4	■ Added “Referenced Documents” section.	—
December 2006, version 1.3	■ Added document revision history.	—
January 2005, version 1.2	■ Previously published as Chapter 11. No changes to content.	—
December 2004, version 1.1	■ Updated text to Design Considerations section.	—