

Microcontroller Shipments--Second Quarter 1987

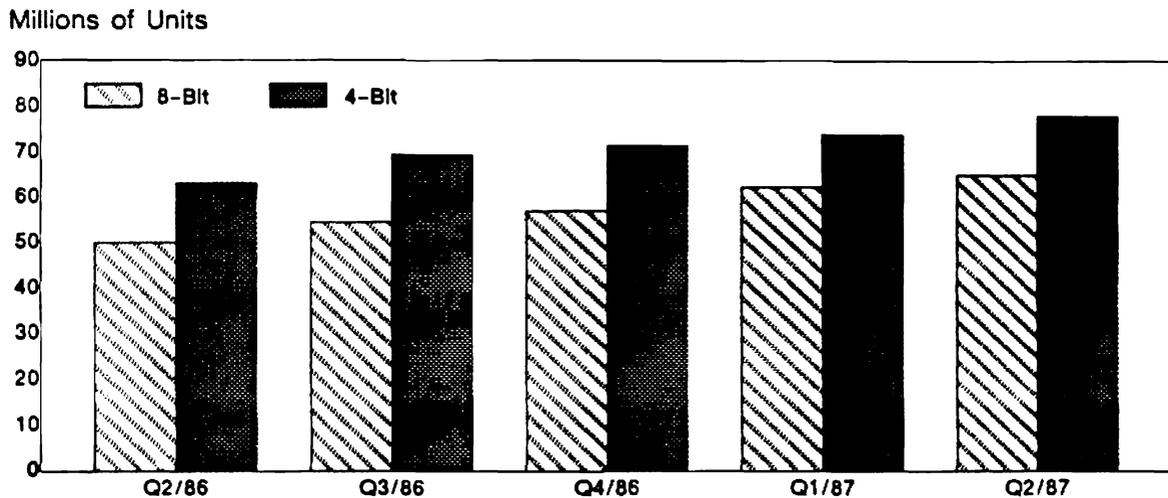
SECOND QUARTER 1987 WORLDWIDE UNIT SHIPMENTS

During the second quarter of 1987, microcontroller unit shipments increased approximately 7.0 million units or just over 5.0 percent from first quarter 1987 shipments. Estimated worldwide shipments of all microcontrollers totaled approximately 143.1 million units.

Figure 1 illustrates the growth in 4- and 8-bit microcontroller shipments from the second quarter of 1986 through the second quarter of 1987.

Figure 1

**4- and 8-Bit Microcontroller Unit Shipments
Second Quarter 1986 through Second Quarter 1987
(Millions of Units)**



Source: Dataquest
January 1988

Microcontroller Shipments--Second Quarter 1987

Table 1 shows the change in total microcontroller unit shipments from the first quarter of 1987 through the second quarter of 1987. Figure 2 illustrates the percent change in 8-bit microcontrollers from the second quarter of 1986 through the second quarter of 1987. Table 2 shows the change in leading 8-bit MCU shipments from the first quarter of 1987 through the second quarter of 1987. The most growth was displayed by the 8051 and 8048 devices in this quarter.

During second quarter 1987, approximately 79 percent of all 8-bit CMOS MCU shipments were Japanese manufactured and shipped. Table 3, which provides market share information by technology for 8-bit MCUs, shows a steady increase in the CMOS share of the market for the period.

Table 4 shows the market share changes in shipments (not consumption) by geographical region for 4- and 8-bit MCUs, from the second quarter of 1986 through the second quarter of 1987.

Table 1

**Total Microcontroller Unit Shipments
First Quarter 1987 through Second Quarter 1987
(Thousands of Units)**

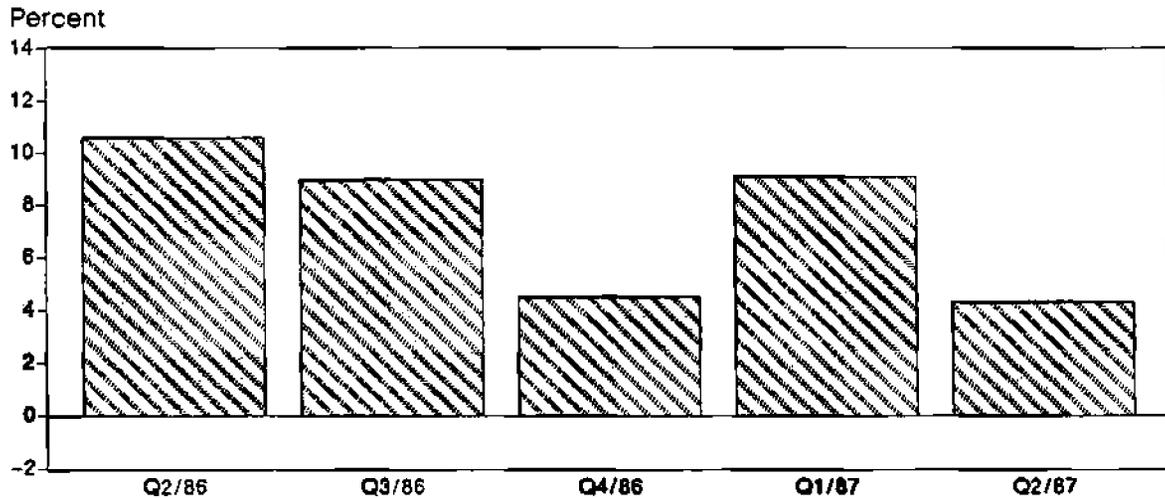
<u>MCU</u>	<u>Q1/1987</u>		<u>Q2/1987</u>		<u>Percent Growth Q1 to Q2</u>
	<u>Units</u>	<u>Percent of Shipments</u>	<u>Units</u>	<u>Percent of Shipments</u>	
4-Bit	73,760	54.2%	78,056	54.5%	5.8%
8-Bit	62,291	45.7	64,966	45.4	4.3%
16-Bit	118	0.1	117	0.1	(0.9%)
Total	136,169	100.0%	143,139	100.0%	5.1%

Source: Dataquest
January 1988

Microcontroller Shipments--Second Quarter 1987

Figure 2

**Quarterly Percent Change in 8-Bit Microcontroller Unit Shipments
Second Quarter 1986 through Second Quarter 1987
(Percent)**



Source: Dataquest
January 1988

Table 2

**Leading 8-Bit Microcontroller Unit Shipments
First Quarter 1987 through Second Quarter 1987
(Thousands of Units)**

Device	Q1/1987		Q2/1987		Percent Growth Q1 to Q2
	Units	Percent of Shipments	Units	Percent of Shipments	
6805	9,450	15.2%	9,593	14.8%	1.5%
8049	8,629	13.9	8,438	13.0	(2.2%)
8051	6,752	10.8	7,037	10.8	4.2%
8048	3,515	5.6	3,643	5.6	3.6%
Others	33,945	54.5	36,255	55.8	6.8%
Total	62,291	100.0%	64,966	100.0%	4.3%

Source: Dataquest
January 1988

Microcontroller Shipments--Second Quarter 1987

Table 3

**Market Share by Technology for 8-bit Microcontrollers
Second Quarter 1986 through Second Quarter 1987**

<u>Device</u>	<u>Tech.</u>	<u>Q2/86</u>	<u>Q3/86</u>	<u>Q4/86</u>	<u>Q1/87</u>	<u>Q2/87</u>
8-Bit MCU	CMOS	27.7%	28.1%	30.0%	31.3%	32.8%
	NMOS	<u>72.3</u>	<u>71.9</u>	<u>70.0</u>	<u>68.7</u>	<u>67.2</u>
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Source: Dataquest
January 1988

Table 4

**Market Share by Region for 4- and 8-Bit Microcontrollers
Second Quarter 1986 through Second Quarter 1987**

<u>Device Type</u>	<u>Region</u>	<u>Q2/86</u>	<u>Q3/86</u>	<u>Q4/86</u>	<u>Q1/87</u>	<u>Q2/87</u>
4-Bit	United States	18.0%	18.0%	19.9%	17.7%	16.8%
	Japan	79.7	79.6	77.6	79.8	80.8
	Europe	<u>2.3</u>	<u>2.4</u>	<u>2.5</u>	<u>2.5</u>	<u>2.4</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
8-Bit	United States	36.4%	37.4%	39.9%	40.3%	39.5%
	Japan	46.8	46.2	43.6	44.4	44.9
	Europe	<u>16.7</u>	<u>16.4</u>	<u>16.6</u>	<u>15.3</u>	<u>15.6</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Columns may not add to totals shown due to rounding.

Source: Dataquest
January 1988

Microcontroller Shipments--First Quarter 1987

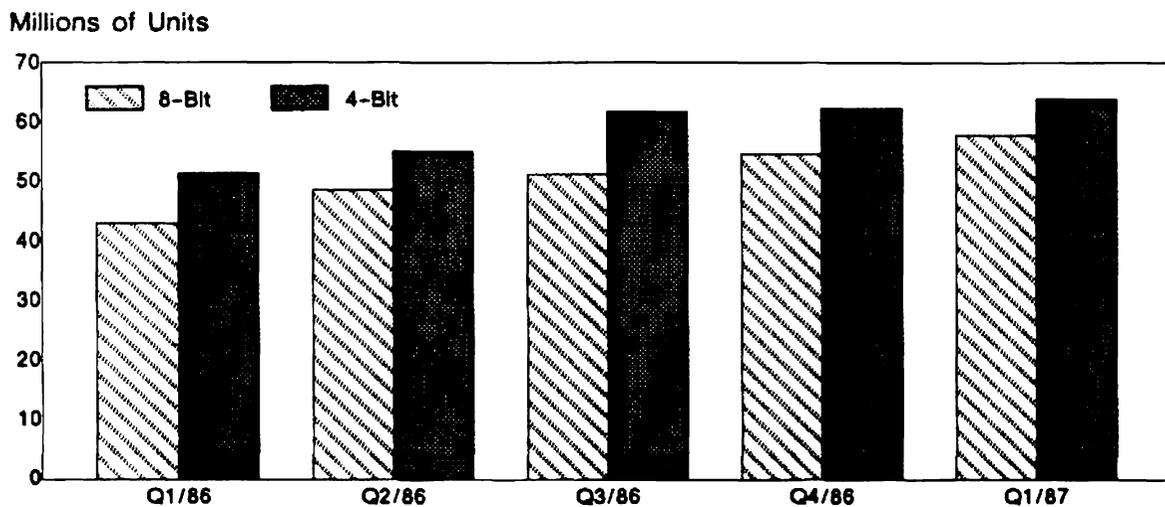
FIRST QUARTER 1987 WORLDWIDE UNIT SHIPMENTS

During the first quarter of 1987, microcontroller unit shipments increased approximately 4.8 million units or 4 percent from fourth quarter 1986 shipments. Estimated worldwide shipments of all microcontrollers totaled approximately 122.2 million units. Shipments of all types of microcontrollers increased. Shipments of 8-bit MCU devices accounted for approximately 48 percent of total microcontrollers shipped in first quarter 1987.

Figure 1 illustrates the growth in 4- and 8-bit microcontroller shipments from the first quarter of 1986 through the first quarter of 1987.

Figure 1

4- and 8-Bit Microcontroller Unit Shipments
First Quarter 1986 through First Quarter 1987
(Millions of Units)



Source: Dataquest
January 1988

Microcontroller Shipments--First Quarter 1987

Table 1 shows the change in total microcontroller unit shipments from the fourth quarter of 1986 through the first quarter of 1987. Figure 2 illustrates the percent change in 8-bit microcontrollers from the first quarter of 1986 through the first quarter of 1987.

The 8049 made the largest gain in the first quarter, growing a little more than 15 percent. The three other leading 8-bit microcontrollers experienced moderate growth, gaining 3 to 5 percent over the fourth quarter. Table 2 compares first quarter 1987 shipments with fourth quarter 1986 shipments for the top 8-bit microcontrollers.

Table 1

**Total Microcontroller Unit Shipments
Fourth Quarter 1986 through First Quarter 1987
(Thousands of Units)**

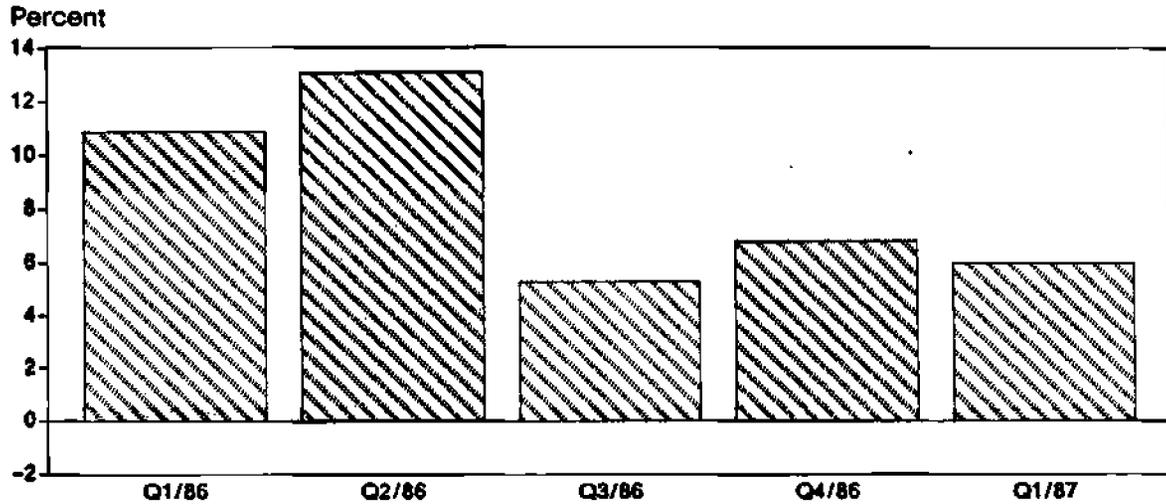
<u>Device</u>	<u>Q4/86</u>		<u>Q1/87</u>		<u>Percent Growth Q4 to Q1</u>
	<u>Units</u>	<u>Percentage of Shipments</u>	<u>Units</u>	<u>Percentage of Shipments</u>	
4-Bit	62,512	53.3%	64,060	52.4%	2.48%
8-Bit	54,721	46.6	57,989	47.5	5.97%
16-Bit	107	0.1	118	0.1	10.28%
Total	117,340	100.0%	122,167	100.0%	4.11%

Source: Dataquest
January 1988

Microcontroller Shipments--First Quarter 1987

Figure 2

**Quarterly Percent Change in 8-Bit Microcontroller Unit Shipments
First Quarter 1986 through First Quarter 1987
(Percent)**



Source: Dataquest
January 1988

Table 2

**Leading 8-Bit Microcontroller Unit Shipments
Fourth Quarter 1986 through First Quarter 1987
(Thousands of Units)**

Device	Q4/86		Q1/87		Percent Growth Q4 to Q1
	Units	Percentage of Shipments	Units	Percentage of Shipments	
6805	8,865	16.2%	9,270	16.0%	4.57%
8049	7,423	13.6	8,549	14.7	15.17%
8051	6,446	11.8	6,617	11.4	2.65%
8048	3,297	6.0	3,424	5.9	3.85%
Others	<u>28,690</u>	<u>52.4</u>	<u>30,129</u>	<u>52.0</u>	5.02%
Total	54,721	100.0%	57,989	100.0%	5.97%

Source: Dataquest
January 1988

Microcontroller Shipments--First Quarter 1987

Japanese suppliers have long controlled the 4-bit MCU market, shipping more than 75 percent of the total market demand. The 8-bit MCU market, as highlighted in Table 3, is much more evenly balanced. U.S. and Japanese suppliers each ship approximately 42 percent of the market demand. Europe is also strong in 8-bit microcontrollers, supplying more than 16 percent of shipments.

Table 4 shows the ratio between NMOS and CMOS shipments of 8-bit MCUs. During first quarter 1987 approximately 79 percent of all 8-bit CMOS MCU shipments were supplied by Japanese manufacturers.

Table 3

**Market Share by Region for 4- and 8-bit Microcontrollers
First Quarter 1986 through First Quarter 1987**

<u>Device</u>	<u>Region</u>	<u>Q1/86</u>	<u>Q2/86</u>	<u>Q3/86</u>	<u>Q4/86</u>	<u>Q1/87</u>
4-Bit	United States	20.1%	20.7%	20.2%	22.7%	20.5%
	Japan	77.2	76.7	77.1	74.4	76.7
	Europe	<u>2.7</u>	<u>2.6</u>	<u>2.7</u>	<u>2.9</u>	<u>2.8</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
8-Bit	United States	39.2%	37.8%	38.0%	41.6%	42.1%
	Japan	44.1	44.7	45.4	41.2	41.6
	Europe	<u>16.7</u>	<u>17.5</u>	<u>16.6</u>	<u>17.2</u>	<u>16.3</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4

Market Share by Technology for 8-Bit MCU Shipments

<u>Device</u>	<u>Region</u>	<u>Q1/86</u>	<u>Q2/86</u>	<u>Q3/86</u>	<u>Q4/86</u>	<u>Q1/87</u>
8-Bit MCU	CMOS	23.4%	25.2%	27.3%	27.5%	26.5%
	NMOS	<u>76.6</u>	<u>74.8</u>	<u>72.7</u>	<u>72.5</u>	<u>73.5</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Dataquest
January 1988

Microcontroller Shipments--Fourth Quarter 1986

FOURTH QUARTER 1986 WORLDWIDE UNIT SHIPMENTS

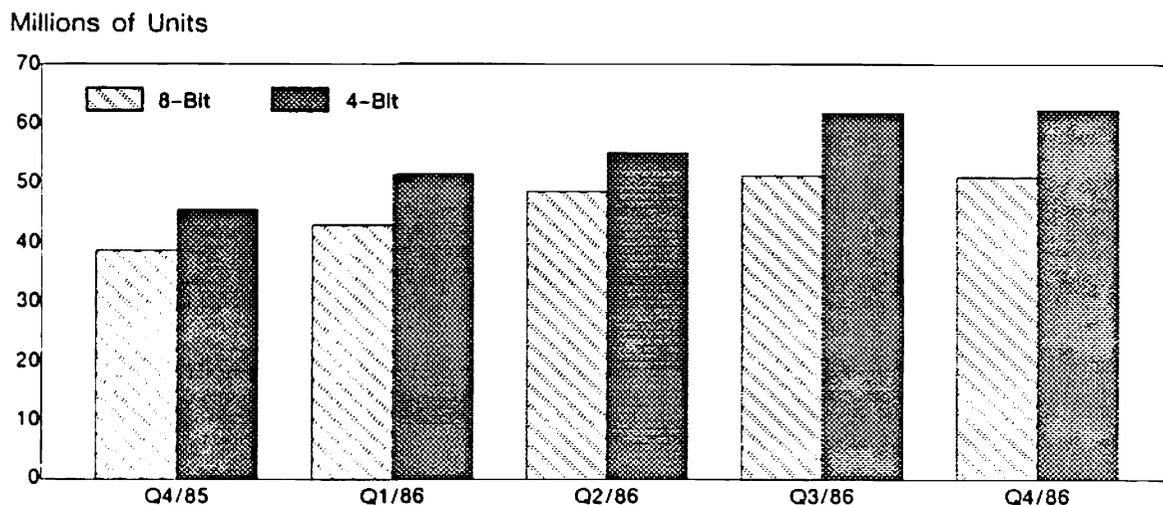
During the fourth quarter of 1986, microcontroller unit shipments increased slightly (0.4 percent) from third quarter 1986 shipments. Estimated worldwide shipments of all microcontrollers totaled approximately 113.7 million units. Shipments of 8-bit MCU devices, which accounted for approximately 45 percent of total microcontrollers shipped in fourth quarter 1986, decreased slightly.

Figure 1 illustrates the growth in 4- and 8-bit microcontroller shipments from the fourth quarter of 1985 through the fourth quarter of 1986.

Table 1 shows the change in total microcontroller unit shipments from the third quarter of 1986 through the fourth quarter of 1986. Figure 2 illustrates the percent change in 8-bit microcontrollers from the fourth quarter of 1985 through the fourth quarter of 1986.

Figure 1

4- and 8-Bit Microcontroller Unit Shipments
Fourth Quarter 1985 through Fourth Quarter 1986



Source: Dataquest
December 1987

Microcontroller Shipments--Fourth Quarter 1986

Table 1

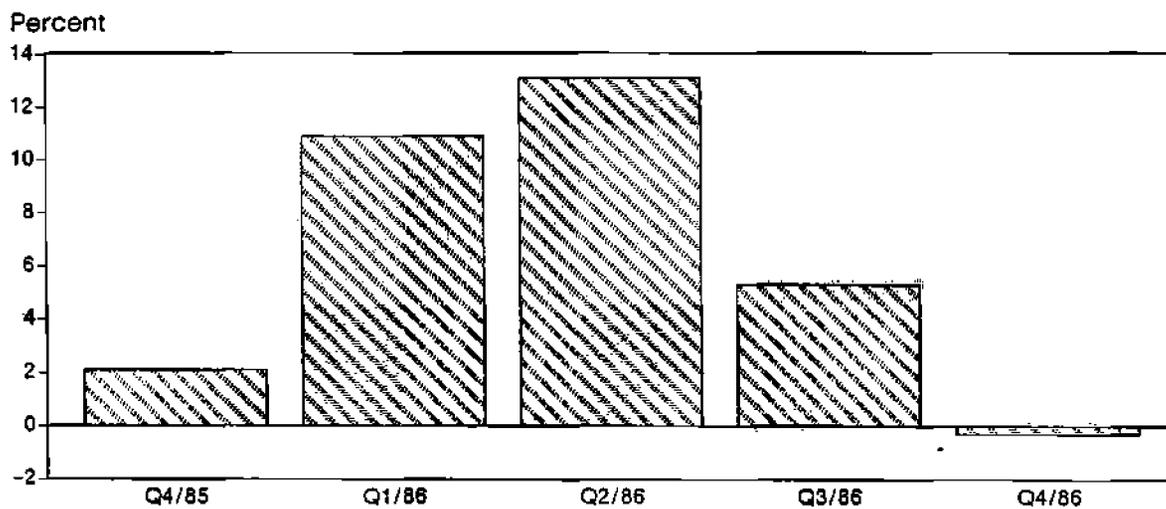
**Total Microcontroller Unit Shipments
Third Quarter 1986 through Fourth Quarter 1986
(Thousands of Units)**

MCU	Q3/1986		Q4/1986		Percent Growth Q3 to Q4
	Units	Percent of Shipments	Units	Percent of Shipments	
4-Bit	61,947	54.7%	62,512	55.0%	0.9%
8-Bit	51,255	45.2	51,104	44.9	(0.3%)
16-Bit	117	0.1	127	0.1	8.5%
Total	113,319	100.0%	113,743	100.0%	0.4%

Source: Dataquest
December 1987

Figure 2

**Quarterly Percent Change in 8-Bit Microcontroller Unit Shipments
Fourth Quarter 1985 through Fourth Quarter 1986**



Source: Dataquest
December 1987

Microcontroller Shipments--Fourth Quarter 1986

Table 2 shows the changes in estimated shipments of leading 8-bit microcontrollers from the third quarter of 1986 through the fourth quarter of 1986. During this period, only the 8051 registered strong growth.

Table 2
8-Bit Microcontroller Shipments
Third Quarter 1986 through Fourth Quarter 1986
(Thousands of Units)

<u>Device</u>	<u>Q3/1986</u>		<u>Q4/1986</u>		<u>Percent Growth Q3 to Q4</u>
	<u>Units</u>	<u>Percent of Shipments</u>	<u>Units</u>	<u>Percent of Shipments</u>	
8049	7,622	14.9%	7,699	15.1%	1.0%
6805	7,557	14.7	7,413	14.5	(1.9%)
8051	4,855	9.5	5,381	10.5	10.8%
8048	3,583	7.0	3,226	6.3	(10.0%)
Others	<u>27,638</u>	<u>53.9</u>	<u>27,385</u>	<u>53.6</u>	(0.9%)
Total	51,255	100.0%	51,104	100.0%	(0.3%)

Source: Dataquest
December 1987

Table 3 shows the market share changes in shipments (not consumption) by geographical region for 4- and 8-bit MCUs, from fourth quarter 1985 through fourth quarter 1986. Table 4 shows market share by technology for 8-bit microcontrollers for the same period. During fourth quarter 1986, approximately 80.3 percent of all 8-bit CMOS MCU shipments were Japanese-manufactured and shipped.

Microcontroller Shipments--Fourth Quarter 1986

Table 3

**Market Share by Region for 4- and 8-Bit Microcontrollers
Fourth Quarter 1985 through Fourth Quarter 1986**

	<u>Region</u>	<u>Q4/85</u>	<u>Q1/86</u>	<u>Q2/86</u>	<u>Q3/86</u>	<u>Q4/86</u>
4-Bit	United States	14.3%	19.6%	20.7%	20.2%	22.7%
	Japan	82.8	77.8	76.7	77.1	74.4
	Europe	<u>2.9</u>	<u>2.7</u>	<u>2.6</u>	<u>2.7</u>	<u>2.9</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
8-Bit	United States	44.1%	40.0%	38.3%	37.1%	38.6%
	Japan	42.4	44.4	45.4	46.8	44.1
	Europe	<u>13.5</u>	<u>15.6</u>	<u>16.3</u>	<u>16.1</u>	<u>17.3</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Dataquest
December 1987

Table 4

**Market Share by Technology for Microcontrollers
Fourth Quarter 1985 through Fourth Quarter 1986**

<u>Device</u>	<u>Technology</u>	<u>Q4/85</u>	<u>Q1/86</u>	<u>Q2/86</u>	<u>Q3/86</u>	<u>Q4/86</u>
8-Bit MCU	CMOS	21.6%	23.3%	25.2%	26.6%	26.3%
8-Bit MCU	NMOS	<u>78.4</u>	<u>76.7</u>	<u>74.8</u>	<u>73.4</u>	<u>73.7</u>
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Source: Dataquest
December 1987

Microcontroller Shipments--Third Quarter 1986

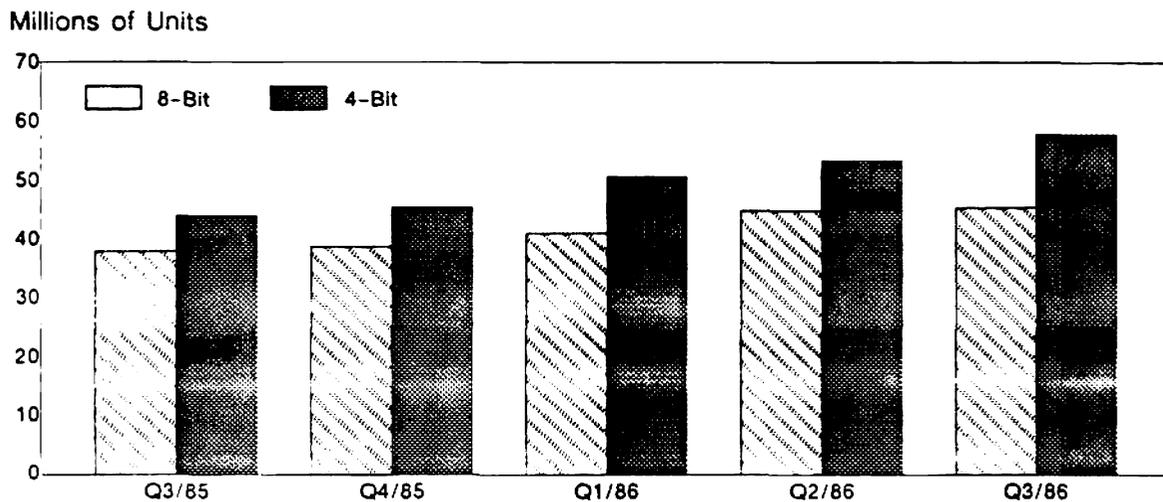
THIRD QUARTER 1986 WORLDWIDE UNIT SHIPMENTS

During the third quarter of 1986, microcontroller unit shipments increased approximately 4.9 million units or 5.0 percent from second quarter 1986 shipments. Estimated worldwide shipments of all microcontrollers totaled approximately 103.7 million units. Shipments of all types of microcontrollers increased.

Figure 1 illustrates the growth in 4- and 8-bit microcontroller shipments from the third quarter of 1985 through the third quarter of 1986.

Figure 1

4- and 8-Bit Microcontroller Unit Shipments
Third Quarter 1985 through Third Quarter 1986
(Millions of Units)



Source: Dataquest
December 1987

Microcontroller Shipments--Third Quarter 1986

Table 1 shows the change in total microcontroller unit shipments from the second quarter of 1986 through the third quarter of 1986. Most growth was displayed by the 8051 and 8049 in this quarter. Figure 2 illustrates the percent change in 8-bit microcontrollers from the third quarter of 1985 through the third quarter of 1986. Table 2 shows the change in leading 8-bit MCU shipments from the second quarter of 1986 through the third quarter of 1986.

The leading 8-bit microcontrollers in third quarter 1986--the 8049, 6805, 8051, and 8048--accounted for approximately 49.4 percent of the total 8-bit MCU market.

During third quarter 1986, approximately 75.7 percent of all 8-bit CMOS MCU shipments were Japanese manufactured and shipped. Table 3 shows market share by technology for 8-bit MCUs.

Table 4 shows the market share changes in shipments (not consumption) by geographical region for 4- and 8-bit MCUs, from the third quarter of 1985 through the third quarter of 1986.

Table 1

**Total Microcontroller Unit Shipments
Second Quarter 1986 through Third Quarter 1986
(Thousands of Units)**

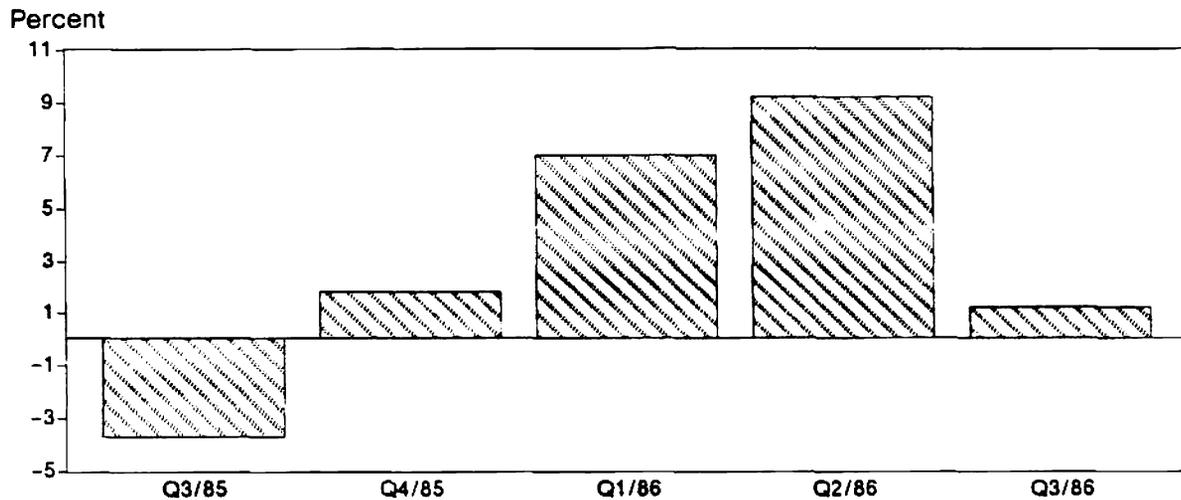
MCU	Q2/1986		Q3/1986		Percent Growth Q2 to Q3
	Units	Percent of Shipments	Units	Percent of Shipments	
4-Bit	53,688	54.3%	58,057	56.0%	8.1%
8-Bit	45,038	45.6	45,521	43.9	1.1%
16-Bit	98	0.1	117	0.1	19.4%
Total	98,824	100.0%	103,695	100.0%	4.9%

Source: Dataquest
December 1987

Microcontroller Shipments--Third Quarter 1986

Figure 2

**Quarterly Percent Change in 8-Bit Microcontroller Unit Shipments
Third Quarter 1985 through Third Quarter 1986
(Percent)**



Source: Dataquest
December 1987

Table 2

**Leading 8-Bit Microcontroller Unit Shipments
Second Quarter 1986 through Third Quarter 1986
(Thousands of Units)**

Device	Q2/1986		Q3/1986		Percent Growth Q2 to Q3
	Units	Percent of Shipments	Units	Percent of Shipments	
8049	6,970	15.5%	7,333	16.1%	5.21%
6805	7,108	15.8	7,010	15.4	(1.38%)
8051	4,119	9.1	4,455	9.8	8.16%
8048	3,698	8.2	3,703	8.1	0.14%
Others	<u>23,143</u>	<u>51.4</u>	<u>23,020</u>	<u>50.6</u>	(0.53%)
Total	45,038	100.0%	45,521	100.0%	1.07%

Source: Dataquest
December 1987

Microcontroller Shipments--Third Quarter 1986

Table 3

**Market Share by Technology for 8-bit Microcontrollers
Third Quarter 1985 through Third Quarter 1986**

<u>Device</u>	<u>Tech.</u>	<u>Q3/85</u>	<u>Q4/85</u>	<u>Q1/86</u>	<u>Q2/86</u>	<u>Q3/86</u>
8-Bit MCU	CMOS	20.4%	21.6%	21.5%	22.1%	21.6%
8-Bit MCU	NMOS	<u>79.6</u>	<u>78.4</u>	<u>78.5</u>	<u>77.9</u>	<u>78.4</u>
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Source: Dataquest
December 1987

Table 4

**Market Share by Region for 4- and 8-Bit Microcontrollers
Third Quarter 1985 through Third Quarter 1986**

<u>Device Type</u>	<u>Region</u>	<u>Q3/85</u>	<u>Q4/85</u>	<u>Q1/86</u>	<u>Q2/86</u>	<u>Q3/86</u>
4-Bit	United States	16.1%	14.3%	20.3%	21.2%	21.5%
	Japan	81.0	82.9	76.9	76.1	75.6
	Europe	<u>2.9</u>	<u>2.8</u>	<u>2.8</u>	<u>2.7</u>	<u>2.9</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
8-Bit	United States	44.7%	44.1%	41.5%	40.8%	41.2%
	Japan	41.5	42.4	43.6	43.9	44.4
	Europe	<u>13.8</u>	<u>13.5</u>	<u>14.9</u>	<u>15.3</u>	<u>14.4</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Dataquest
December 1987

Microcontroller Shipments--Second Quarter 1986

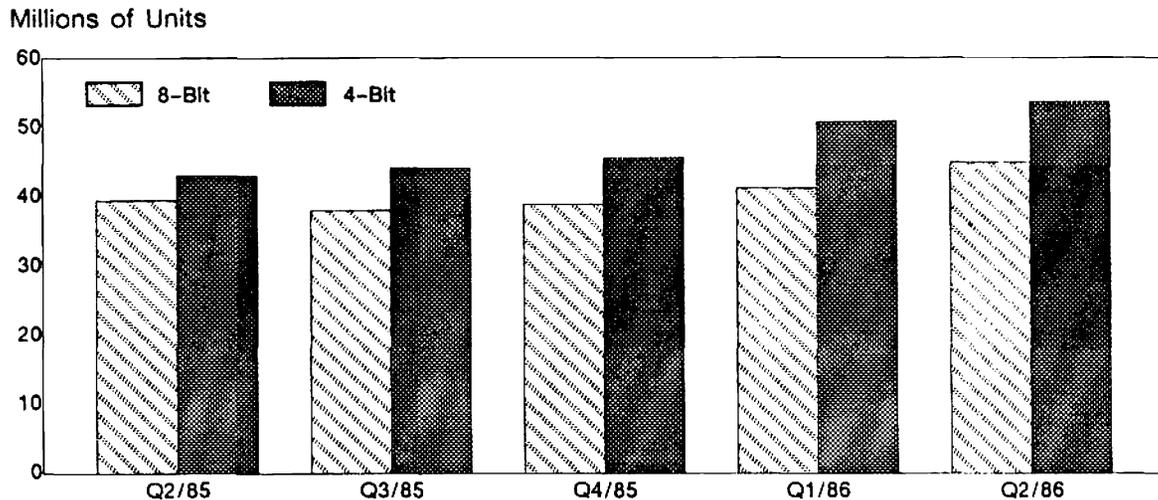
SECOND QUARTER 1986 WORLDWIDE UNIT SHIPMENTS

During the second quarter of 1986, microcontroller unit shipments increased approximately 6.6 million units or 7.2 percent from first quarter 1986 shipments. Estimated worldwide shipments of all microcontrollers totaled approximately 98.8 million units. Shipments of all types of microcontrollers increased. Shipments of 8-bit MCU devices accounted for approximately 45 percent of total microcontrollers shipped in second quarter 1986.

Figure 1 illustrates the growth in 4- and 8-bit microcontroller shipments from the second quarter of 1985 through the second quarter of 1986.

Figure 1

**4- AND 8-BIT MICROCONTROLLER UNIT SHIPMENTS
SECOND QUARTER 1985 THROUGH SECOND QUARTER 1986
(Millions of Units)**



Source: Dataquest
April 1987

Microcontroller Shipments--Second Quarter 1986

Table 1 shows the change in total microcontroller unit shipments from the first quarter of 1986 through the second quarter of 1986. Most growth was displayed by the 6805 and 8051 in this quarter. Figure 2 illustrates the percent change in 8-bit microcontrollers from the second quarter of 1985 through the second quarter of 1986. Table 2 shows the change in leading 8-bit MCU shipments from the first quarter of 1986 through the second quarter of 1986.

Table 1

**TOTAL MICROCONTROLLER UNIT SHIPMENTS
FIRST QUARTER 1986 THROUGH SECOND QUARTER 1986
(Thousands of Units)**

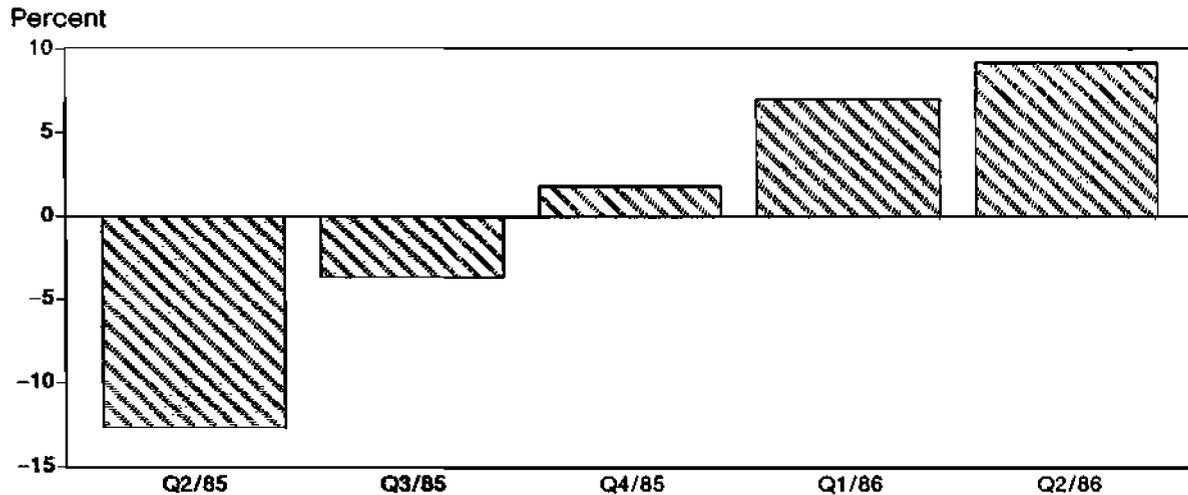
<u>MCU</u>	<u>Q1/1986</u>		<u>Q2/1986</u>		<u>Percent Growth Q1 to Q2</u>
	<u>Units</u>	<u>Percent of Shipments</u>	<u>Units</u>	<u>Percent of Shipments</u>	
4-Bit	50,900	55.2%	53,688	54.3%	5.5%
8-Bit	41,241	44.7	45,038	45.6	9.2%
16-Bit	81	0.1	98	0.1	21.0%
Total	92,222	100.0%	98,824	100.0%	7.2%

Source: Dataquest
April 1987

Microcontroller Shipments--Second Quarter 1986

Figure 2

QUARTERLY PERCENT CHANGE IN 8-BIT MICROCONTROLLER UNIT SHIPMENTS
SECOND QUARTER 1985 THROUGH SECOND QUARTER 1986
(Percent)



Source: Dataquest
April 1987

Table 2

LEADING 8-BIT MICROCONTROLLER UNIT SHIPMENTS
FIRST QUARTER 1986 THROUGH SECOND QUARTER 1986
(Thousands of Units)

Ranking	Device	Q1/1986		Q2/1986		Percent Growth Q1 to Q2
		Units	Percent of Shipments	Units	Percent of Shipments	
1	6805	6,393	15.5%	7,108	15.8%	11.2%
2	8049	6,493	15.7	6,970	15.5	7.4%
3	8051	3,720	9.0	4,119	9.1	10.7%
4	8048	3,413	8.3	3,698	8.2	8.4%
5	Others	21,221	51.5	23,143	51.4	9.1%
	Total	41,241	100.0%	45,038	100.0%	9.2%

Source: Dataquest
April 1987

Microcontroller Shipments--Second Quarter 1986

The leading 8-bit microcontrollers in second quarter 1986--the 6805, 8049, 8051, and 8048--represented approximately 48.6 percent of the total 8-bit MCU market. During this period, Japanese manufacturers shipped more than 70 percent of 8048 and 8049 devices worldwide, while U.S. manufacturers shipped approximately 75 percent of 8051 and 6805 devices worldwide.

Table 3 shows the market share changes in shipments (not consumption) by geographical region for 4- and 8-bit MCUs, from the second quarter of 1985 through the second quarter of 1986.

Table 3

MARKET SHARE BY REGION FOR 4- AND 8-BIT MICROCONTROLLERS SECOND QUARTER 1985 THROUGH SECOND QUARTER 1986

<u>Device Type</u>	<u>Region</u>	<u>Q2/85</u>	<u>Q3/85</u>	<u>Q4/85</u>	<u>Q1/86</u>	<u>Q2/86</u>
4-Bit	United States	16.5%	16.3%	14.3%	20.3%	21.2%
	Japan	80.5	80.7	82.8	76.9	76.1
	Europe	<u>3.0</u>	<u>3.0</u>	<u>2.9</u>	<u>2.8</u>	<u>2.7</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
8-Bit	United States	42.5%	44.4%	44.1%	41.5%	40.8%
	Japan	43.9	41.8	42.4	43.6	43.9
	Europe	<u>13.6</u>	<u>13.8</u>	<u>13.5</u>	<u>14.9</u>	<u>15.3</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Dataquest
April 1987

Microcontroller Shipments--First Quarter 1986

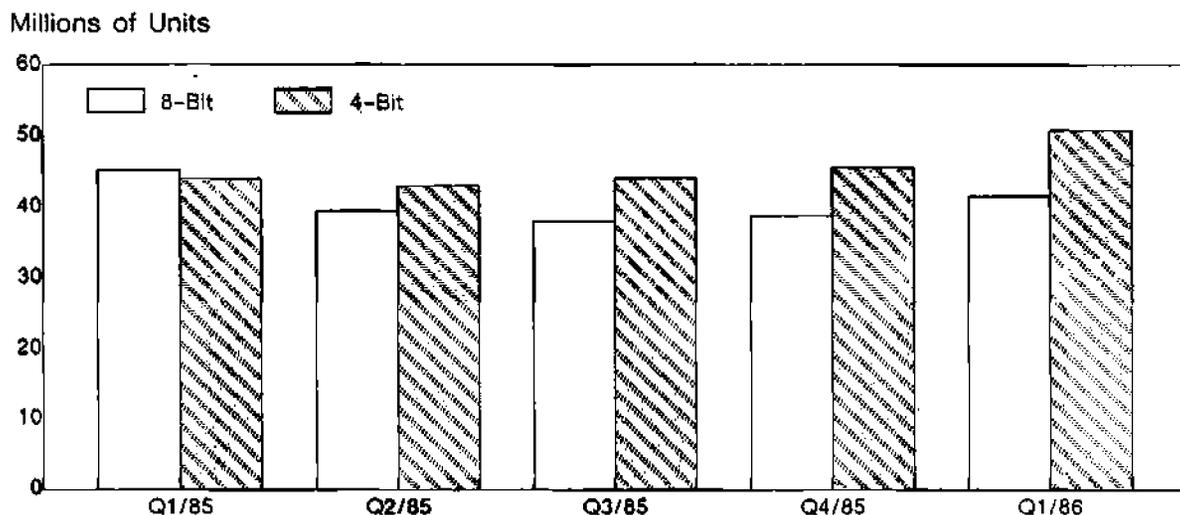
FIRST QUARTER 1986 WORLDWIDE UNIT SHIPMENTS

During the first quarter of 1986, microcontroller unit shipments increased approximately 8 million units or 9.5 percent from fourth quarter 1985 shipments. Estimated worldwide shipments of all microcontrollers totaled approximately 92.5 million units. Shipments of all types of microcontrollers increased. Shipments of 8-bit MCU devices accounted for approximately 45 percent of total microcontrollers shipped in first quarter 1986.

Figure 1 illustrates the growth in 4- and 8-bit microcontroller shipments from the first quarter of 1985 through the first quarter of 1986.

Figure 1

4- AND 8-BIT MICROCONTROLLER UNIT SHIPMENTS
FIRST QUARTER 1985 THROUGH FIRST QUARTER 1986
(Millions of Units)



Source: Dataquest
February 1987

Microcontroller Shipments--First Quarter 1986

Table 1 shows the change in total microcontroller unit shipments from the fourth quarter of 1985 through the first quarter of 1986. Both the 8048 and 8049 displayed growth in this quarter. Figure 2 illustrates the percent change in 8-bit microcontrollers from the first quarter of 1985 through the first quarter of 1986. Table 2 shows the change in leading 8-bit MCU shipments from the fourth quarter of 1985 through the first quarter of 1986.

Table 1

**TOTAL MICROCONTROLLER UNIT SHIPMENTS
FOURTH QUARTER 1985 THROUGH FIRST QUARTER 1986
(Thousands of Units)**

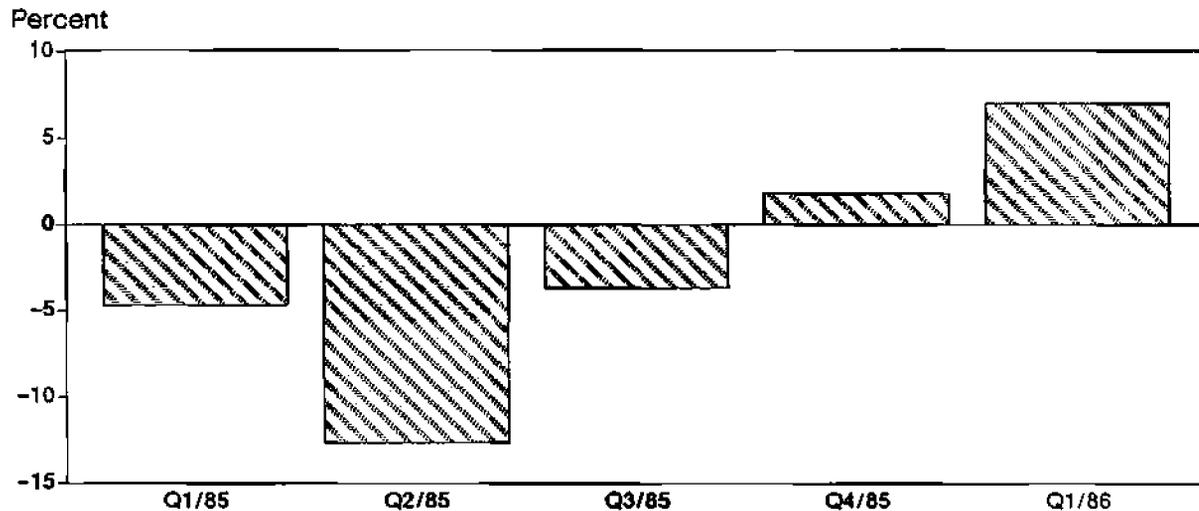
MCU	<u>Q4/1985</u>		<u>Q1/1986</u>		Percent Growth Q4 to Q1
	<u>Units</u>	<u>Percent of Shipments</u>	<u>Units</u>	<u>Percent of Shipments</u>	
4-Bit	45,635	54.0%	50,900	55.0%	11.5%
8-Bit	38,848	45.9	41,567	44.9	7.0%
16-Bit	<u>71</u>	<u>0.1</u>	<u>81</u>	<u>0.1</u>	14.1%
Total	84,554	100.0%	92,548	100.0%	9.5%

Source: Dataquest
February 1987

Microcontroller Shipments--First Quarter 1986

Figure 2

**QUARTERLY PERCENT CHANGE IN 8-BIT MICROCONTROLLER UNIT SHIPMENTS
FIRST QUARTER 1985 THROUGH FIRST QUARTER 1986
(Percent)**



Source: Dataquest
February 1987

Table 2

**LEADING 8-BIT MICROCONTROLLER UNIT SHIPMENTS
FOURTH QUARTER 1985 THROUGH FIRST QUARTER 1986
(Thousands of Units)**

Ranking	Device	Q4/1985		Q1/1986		Percent Growth Q4 to Q1
		Units	Percent of Shipments	Units	Percent of Shipments	
1	8049	5,999	15.4%	6,491	15.6%	8.2%
2	6805	6,776	17.5	6,393	15.4	(5.7%)
3	8051	3,855	9.9	3,692	8.9	(4.2%)
4	8048	3,110	8.0	3,415	8.2	9.8%
5	Others	<u>19,108</u>	<u>49.2</u>	<u>21,576</u>	<u>51.9</u>	12.9%
	Total	38,848	100.0%	41,567	100.0%	7.0%

Source: Dataquest
February 1987

Microcontroller Shipments--First Quarter 1986

The key 8-bit microcontrollers in first quarter 1986--the 8049, 6805, 8051, and 8048--represented approximately 48 percent of the total 8-bit MCU market. During this period, Japanese manufacturers shipped more than 66 percent of 8048 and 8049 devices worldwide, while U.S. manufacturers shipped approximately 78 percent of 8051 and 6805 devices worldwide.

Table 3 shows the market share changes in shipments (not consumption) by geographical region for 4- and 8-bit MCUs, from the first quarter of 1985 through the first quarter of 1986.

Table 3

MARKET SHARE BY REGION FOR 4- AND 8-BIT MICROCONTROLLERS FIRST QUARTER 1985 THROUGH FIRST QUARTER 1986

<u>Device Type</u>	<u>Region</u>	<u>Q1/85</u>	<u>Q2/85</u>	<u>Q3/85</u>	<u>Q4/85</u>	<u>Q4/86</u>
4-Bit	United States	17.5%	16.5%	16.3%	14.3%	20.3%
	Japan	79.5	80.5	80.7	82.8	76.9
	Europe	<u>3.0</u>	<u>3.0</u>	<u>3.0</u>	<u>2.9</u>	<u>2.8</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
8-Bit	United States	44.8%	42.2%	44.7%	43.8%	42.1%
	Japan	42.3	44.0	41.5	42.6	43.2
	Europe	<u>12.9</u>	<u>13.8</u>	<u>13.8</u>	<u>13.6</u>	<u>14.7</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Dataquest
February 1987

Over the past year, the rate of change of market share experienced in the 8-bit MCU market has slowed down, but there is increased variability in the 1986 4-bit MCU market over the previous quarter.

Microcontroller Shipments—Third Quarter 1985

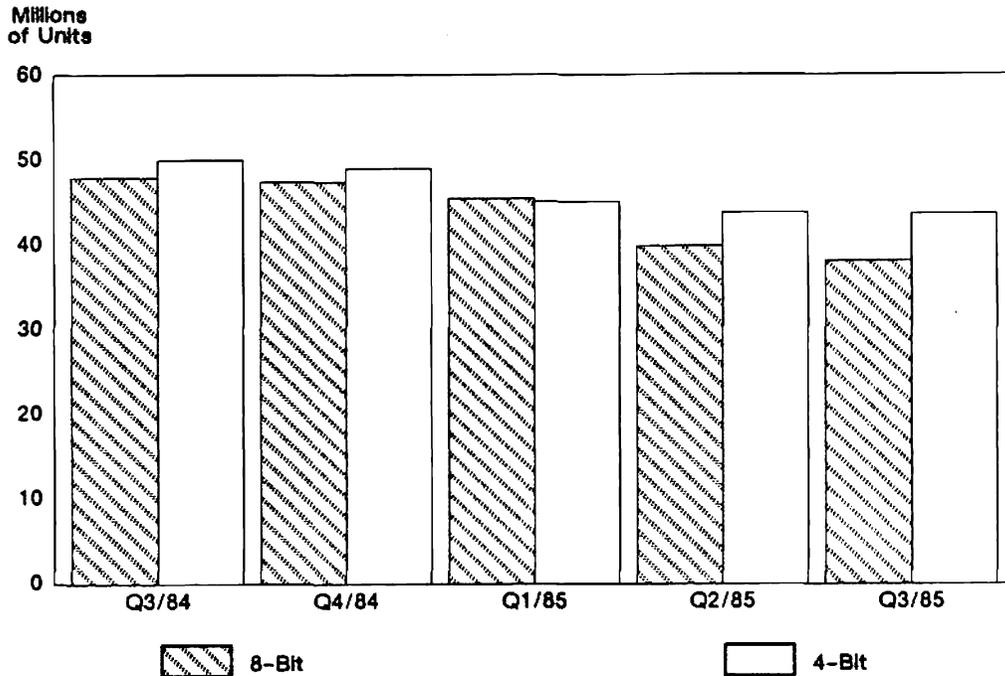
THIRD QUARTER 1985 WORLDWIDE UNIT SHIPMENTS

During the third quarter of 1985, microcontroller unit shipments decreased approximately 1.9 million units or 2.3 percent from second quarter 1985 shipments. Estimated worldwide shipments of all microcontrollers totaled approximately 82 million units. Shipments of 4-bit microcontrollers decreased slightly, and shipments of 8-bit microcontrollers decreased 4.3 percent. Shipments of 8-bit MCU devices accounted for approximately 46.5 percent of total microcontrollers shipped in third quarter 1985.

Figure 1 illustrates the growth in 4- and 8-bit microcontroller shipments from the third quarter of 1984 through the third quarter of 1985.

Figure 1

4- AND 8-BIT MICROCONTROLLER UNIT SHIPMENTS
THIRD QUARTER 1984 THROUGH THIRD QUARTER 1985
(Millions of Units)



Source: DATAQUEST
April 1986

Microcontroller Shipments—Third Quarter 1985

Table 1 shows the change in total microcontroller unit shipments from the second quarter of 1985 through the third quarter of 1985. The 8048 lost the greatest market share during this quarter while the 6805 displayed significant growth. Figure 2 illustrates the percent change in 8-bit microcontrollers from the third quarter of 1984 through the third quarter of 1985. Table 2 shows the change in leading 8-bit MCU shipments from the second quarter of 1985 through the third quarter of 1985.

Table 1

**TOTAL MICROCONTROLLER UNIT SHIPMENTS
SECOND QUARTER 1985 THROUGH THIRD QUARTER 1985
(Thousands of Units)**

<u>MCU</u>	<u>Q2/1985</u>		<u>Q3/1985</u>		<u>Percent Growth Q2 to Q3</u>
	<u>Units</u>	<u>Percent of Shipments</u>	<u>Units</u>	<u>Percent of Shipments</u>	
4-Bit	43,859	52.3%	43,699	53.4%	(0.4%)
8-Bit	39,854	47.6	38,123	46.5	(4.3%)
16-Bit	<u>55</u>	<u>0.1</u>	<u>56</u>	<u>0.1</u>	1.8%
Total	83,768	100.0%	81,878	100.0%	(2.3%)

Source: DATAQUEST
April 1986

Microcontroller Shipments—Third Quarter 1985

Figure 2

QUARTERLY PERCENT CHANGE IN 8-BIT MICROCONTROLLER UNIT SHIPMENTS
THIRD QUARTER 1984 THROUGH THIRD QUARTER 1985
(Percent)

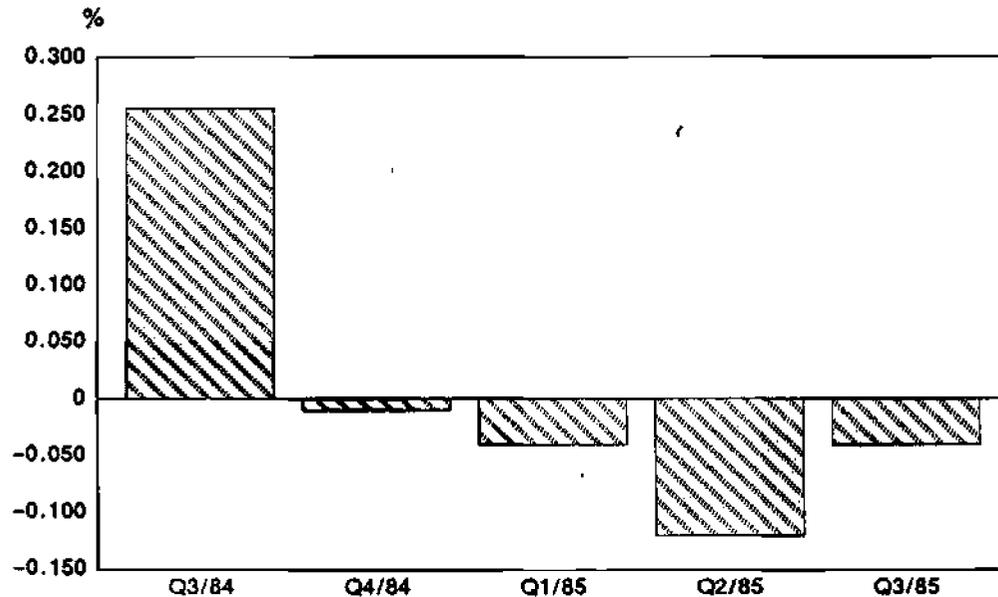


Table 2

LEADING 8-BIT MICROCONTROLLER UNIT SHIPMENTS
SECOND QUARTER 1985 THROUGH THIRD QUARTER 1985
(Thousands of Units)

Ranking	Device	Q2/1985		Q3/1985		Percent Growth Q2 to Q3
		Units	Percent of Shipments	Units	Percent of Shipments	
1	8049	6,178	15.5%	5,555	14.6%	(10.1%)
2	6805	4,755	11.9	5,505	14.4	15.8%
3	8051	3,830	9.6	3,774	9.9	(1.5%)
4	8048	4,470	11.2	3,575	9.4	(20.0%)
5	Others	20,621	51.8	19,714	51.7	(4.4%)
	Total	39,854	100.0%	38,123	100.0%	(4.3%)

Source: DATAQUEST
April 1986

Microcontroller Shipments—Third Quarter 1985

The key 8-bit microcontrollers in third quarter 1985--the 8049, 6805, 8051, and 8048--had approximately 48.3 percent of the total 8-bit MCU market. During this period, Japanese manufacturers shipped more than 66 percent of 8048 and 8049 devices worldwide, while U.S. manufacturers shipped approximately 77 percent of 8051 and 6805 devices worldwide.

Table 3 shows the market share changes in shipments (not consumption) by geographical region for 4- and 8-bit MCUs, from the third quarter of 1984 through the third quarter of 1985.

Table 3

MARKET SHARE BY REGION FOR 4- AND 8-BIT MICROCONTROLLERS THIRD QUARTER 1984 THROUGH THIRD QUARTER 1985

<u>Device Type</u>	<u>Region</u>	<u>Q3/84</u>	<u>Q4/84</u>	<u>Q1/85</u>	<u>Q2/85</u>	<u>Q3/85</u>
4-Bit	United States	21.2%	18.8%	17.5%	16.5%	16.3%
	Japan	77.3	78.7	79.5	80.5	80.7
	Europe	<u>1.5</u>	<u>2.5</u>	<u>3.0</u>	<u>3.0</u>	<u>3.0</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%
8-Bit	United States	49.1%	46.7%	44.8%	42.2%	44.7%
	Japan	40.2	41.5	42.3	44.0	41.3
	Europe	<u>10.7</u>	<u>11.8</u>	<u>12.9</u>	<u>13.8</u>	<u>14.0</u>
	Total	100.0%	100.0%	100.0%	100.0%	100.0%

Source: DATAQUEST
April 1986

We saw the U.S. manufacturers continue to lose market share of the 8-bit microcontroller market in the third quarter of 1985 from the same quarter a year earlier, but at a slower pace from that experienced from the second quarter of 1984 to the second quarter of 1985.