

# SEMICONDUCTOR GENERAL CATALOG

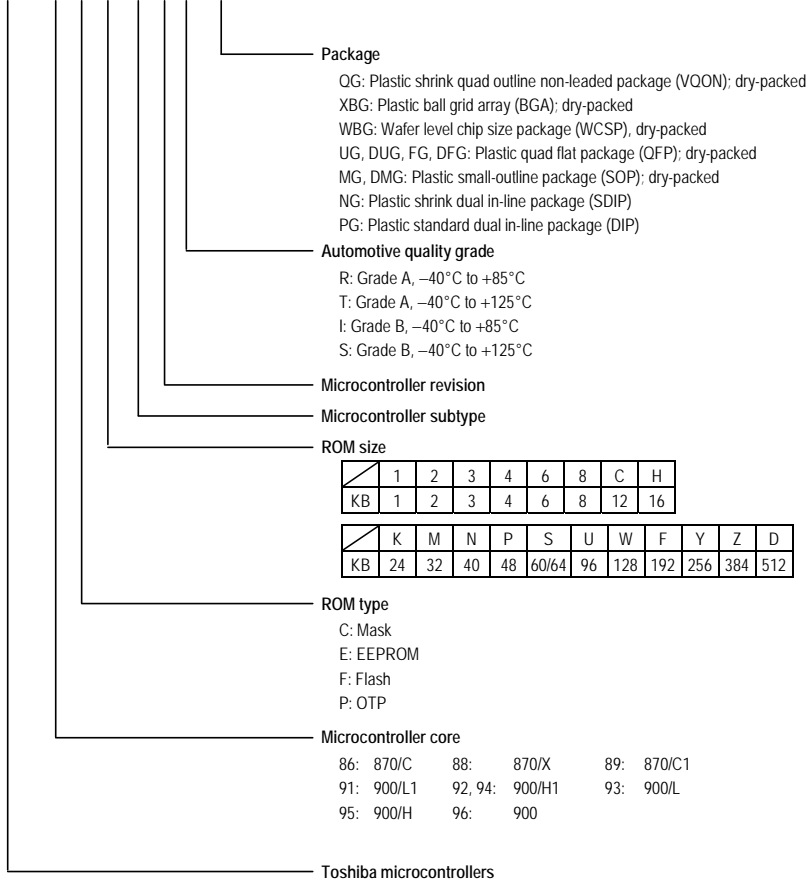
## Microcomputers

- 8-Bit Microcontrollers
- 16-Bit Microcontrollers
- 32-Bit Microcontrollers
- 8-Bit Microcontrollers for Automotive
- 16-Bit Microcontrollers for Automotive
- 32-Bit Microcontrollers for Automotive
- 32-Bit Microprocessors
- 64-Bit Microprocessors
- Development System Tools

# Part Numbering Nomenclature

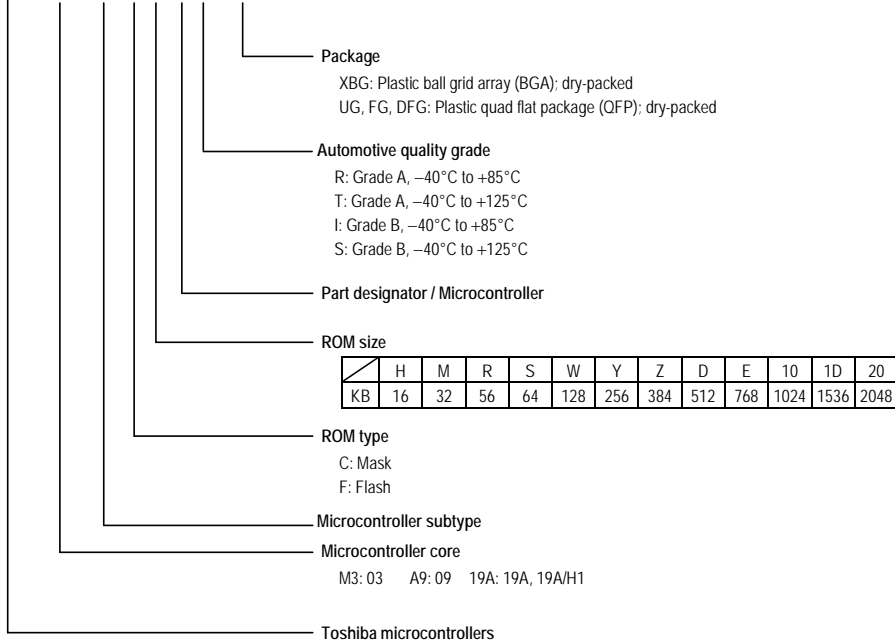
## Example 1

**TMP 89 F S 60 x x UG**



## Example 2

**TMP 19A 23 F Y x x XBG**



# 8-Bit Microcontrollers

## TLCS-870 Family: TLCS-870/C Series

□Flash Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 2)	LED Driver (Ch)	LCD Driver (Ch)	VFT Driver (Ch)	SEI (ch)	SIO (ch)	UART (ch)	UART/SIO (ch) (Note 1)	UART/I <sup>2</sup> C (ch) (Note 4)	I <sup>2</sup> C (ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	10-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Multiply-Accumulate (MAC)	Program Patch Logic	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 5))	Clock Gear	Power-On Reset	Voltage Detecting Circuit	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package					
TMP86F409NG	4K	512	(1) 0.25 (2) 0.5 (3) 0.5	8			1		1				6			1		2				Yes	Yes				26	(1) 4.5 to 5.5 (2) 3.0 to 5.5 (3) 2.7 to 5.5	(1) -40 to 85 (2) -40 to 85 (3) -20 to 85	-	SDIP32					
TMP86F807MG	8K	256	(1) 0.25 (2) 0.5	8			1		1				6			1		2				Yes	Yes				22	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86C407MG TMP86C807MG	SOP28					
TMP86F807NG				8			1		1					6			1		2				Yes	Yes						22	TMP86C407NG TMP86C807NG	SDIP28				
TMP86F808DMG				8			1		1					6			1		2					Yes	Yes						24	TMP86C408DMG TMP86C808DMG	SSOP30			
TMP86FH09AMG	16K	512	(1) 0.25 (2) 0.5 (3) 0.5	8			1		1				6			1		2				Yes	Yes				26	(1) 4.5 to 5.5 (2) 3.0 to 5.5 (3) 2.7 to 5.5	(1) -40 to 85 (2) -40 to 85 (3) -20 to 85	-	SOP32					
TMP86FH09ANG				8			1		1					6			1		2				Yes	Yes						26	TMP86C809NG TMP86CH09NG	SDIP32				
TMP86FH12AMG				8			1		1						8			1	1	2				Yes	Yes						24	TMP86CH12MG	SSOP30			
TMP86FH46BNG				19			1		1						8			1		2				Yes	Yes						33	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86CH46ANG	SDIP42	
TMP86FH47BUG					19			1		1					8			1		2				Yes	Yes						35	-		LOFP44 (10×10 mm)		
TMP86FH92DMG				(1) 0.25 (2) 0.5	8		8			1		1		1		6			1		2			Yes	Yes		Yes			Yes	24	(1) 4.0 to 5.5 (2) 2.7 to 5.5	-20 to 85	-	SSOP30	
TMP86FH93NG							8			1		1		1		1		6			1		2			Yes	Yes				Yes			Yes	26	SDIP32
TMP86FM29FG				32K	1536	(1) 0.5 (2) 1	4	32				1				8			1		4				Yes	Yes						39	(1) 2.7 to 3.6 (2) 1.8 to 3.6	-40 to 85	-	QFP64 (14×14 mm) LOFP64 (10×10 mm)
TMP86FM29LUG							4	32					1					8			1		4			Yes	Yes								39	LOFP64 (10×10 mm)
TMP86FM29UG	(1) 0.25 (2) 0.5	4	32								1				8			1		4			Yes	Yes				39	TMP86CM29UG	LOFP64 (10×10 mm)						
TMP86FM25FG	2048	4	(Note3) 60					1		1				8			1		4			Yes	Yes				42	TMP86CM25AFG	QFP100 (14×20 mm)							
TMP86FM48FG					11			1		1		1		16			2		2				Yes	Yes				54	-	QFP64 (14×14 mm)						
TMP86FM48UG					(1) 0.25 (2) 0.5	11			1		1		1		16			2		2				Yes	Yes				54	LOFP64 (10×10 mm)						
TMP86FP24FG	48K			12	24			1		1			8			2		2			Yes	Yes				54	LOFP80 (12×12 mm)									
TMP86FS27FG	60K	1024	(1) 0.25 (2) 0.5 (3) 0.5	8	40			1		1			8					1	2			Yes	Yes				55	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 70	TMP86CM27FG TMP86CP27AFG	QFP80 (14×20 mm)					
TMP86FS23AUG				2048	(1) 0.25 (2) 0.5 (3) 0.5	5	32			1		1			8			1		4	Yes		Yes	Yes				51		(1) 3.5 to 5.5 (2) 3.0 to 5.5 (3) 2.7 to 5.5	TMP86CM23AUG TMP86CP23AUG	LOFP64 (10×10 mm)				
TMP86FS28ADFG						40			1		1				8			2		4			Yes	Yes						62	(1) 4.0 to 5.5 (2) 3.0 to 5.5 (3) 2.7 to 5.5	TMP86CS28DFG	LOFP80 (12×12 mm)			
TMP86FS28AFG						40			1		1				8			2		4			Yes	Yes						62	TMP86CS28FG	QFP80 (14×20 mm)				
TMP86FS49BFG		(1) 0.25 (2) 0.5	13					2		2			1	16			2		4			Yes	Yes				56	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86CS49FG	QFP64 (14×14 mm)					
TMP86FS49BNG							2		2		1	16			2	16			2		4			Yes	Yes					56	-	SDIP64				
TMP86FS49BUG							2		2		1	16			2	16			2		4			Yes	Yes					56	TMP86CS49UG	LOFP64 (10×10 mm)				

Note 1) Configurable as UART or SIO.

Note 2) Minimum instruction execution times (1) to (3) correspond to (1) to (3) of both power supply voltage and operating temperature.

Note 3) Up to 960 LCD segments (60 seg. x 16 com.)

Note 4) Configurable as I<sup>2</sup>C or UART.

Note 5) The minimum instruction execution time in Low-Speed mode is 122 μs (at 32.768 kHz).

• Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

TLCS-870 Family: TLCS-870/X Series

□Flash Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs)	LED Driver (Ch)	VFT Driver (Ch)	SIO (Ch)	UART (Ch)	I <sup>2</sup> C (Ch)	PWM Generator (Ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	16-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Motor Controller (Ch)	Remote Control Preprocessor	Program Patch Logic	Watchdog Timer	Dual Clocks (Low-Speed Mode)	Internal Oscillator	Oscillation Frequency Detector	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package	
TMP88F846UG	8K	512	0.2	16	(Note 1) 1	(Note 1) 1					8	2	2	1			Yes		Yes		33	4.5 to 5.5	-40 to 85	-	LQFP44 (10×10 mm)	
TMP88FH41UG	16K			16	(Note 1) 1	(Note 1) 1						8	2	2	1			Yes						33	TMP88CH41UG	
TMP88FW45AFG	120K			4096	24	1	2		2			16	2	4	2			Yes			Yes			71		

Note 1) Cannot be used at the same time because their I/O pins are multiplexed.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

TLCS-870 Family: TLCS-870/C1 Series

□Flash Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (µs) (Note 3)	LED Driver (Ch)	LCD Driver (Ch)	SEI (Ch)	SIO (Ch)	UART (Ch)	UART/SIO (Ch) (Note 1)	PC/SIO (Ch) (Note 1)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	10-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Multiply-Accumulate (MAC)	Program Patch Logic	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 4))	Clock Gear	Power-On Reset	Voltage Detecting Circuit	On-Chip Debug Unit (Note 2)	Internal Oscillator	I/O Port (Pins) (Note 6)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package
TMP89FH40NG	16K	2048	(1) 0.1 (2) 0.238 (3) 0.5	6				1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	Yes	36	(1) 4.3 to 5.5 (2) 2.7 to 5.5 (3) 2.2 to 5.5		SDIP42	
TMP89FH42LUG			(1) 0.238 (2) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	40	(Note 5) (1) 2.7 to 3.6 (2) 2.2 to 3.6		LQFP44 (10×10 mm)	
TMP89FH42UG			(1) 0.1 (2) 0.238 (3) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	40	(1) 4.3 to 5.5 (2) 2.7 to 5.5		TMP89CH42UG (Note 7)	
TMP89FH46DUG			(1) 0.1 (2) 0.238 (3) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	42	(3) 2.2 to 5.5		TMP89CH46DUG	
TMP89FH46LDUG	32K	2048	(1) 0.238 (2) 0.5	8				1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	42	(Note 5) (1) 2.7 to 3.6 (2) 2.2 to 3.6		LQFP48 (7×7 mm)		
TMP89FM40NG			(1) 0.1 (2) 0.238 (3) 0.5	6					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	36	(1) 4.3 to 5.5 (2) 2.7 to 5.5 (3) 2.2 to 5.5		SDIP42	
TMP89FM42AUG			(1) 0.1 (2) 0.19 (3) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	Yes	40			
TMP89FM42KUG			(1) 0.19 (2) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	40	(1) 2.7 to 3.6 (2) 2.2 to 3.6		LQFP44 (10×10 mm)	
TMP89FM42LUG			(1) 0.238 (2) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	40				
TMP89FM42UG			(1) 0.1 (2) 0.238 (3) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	40	(1) 4.3 to 5.5 (2) 2.7 to 5.5 (3) 2.2 to 5.5	TMP89CM42UG (Note 7)		
TMP89FM43KQG			(1) 0.19 (2) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	Yes	38	(1) 2.7 to 3.6 (2) 2.2 to 3.6		VQON44 (5.3×5.3 mm)
TMP89FM43LQG			(1) 0.238 (2) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	38	(Note 5) (1) 2.7 to 3.6 (2) 2.2 to 3.6			
TMP89FM46ADUG			(1) 0.1 (2) 0.19 (3) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	Yes	42	(1) 4.3 to 5.5 (2) 2.7 to 5.5		
TMP89FM46DUG			(1) 0.1 (2) 0.238 (3) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	42	(3) 2.2 to 5.5	TMP89CM46DUG	LQFP48 (7×7 mm)	
TMP89FM46KDUG	(1) 0.19 (2) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	42	(Note 5) (1) 2.7 to 3.6 (2) 2.2 to 3.6					
TMP89FM82DUG			0.125	20				1			8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	39	4.5 to 5.5				
TMP89FS28LFG	60K	3072	(1) 0.167 (2) 0.25 (3) 0.5	80	2			1	1		8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	53	(1) 3.2 to 3.6 (2) 2.7 to 3.6 (3) 2.2 to 3.6		LQFP53 (20×20 mm)		
TMP89FS60FG			(1) 0.125 (2) 0.238	8					1	2	1	16			2		4				Yes	Yes	Yes	Yes	Yes	Yes	58	(1) 4.3 to 5.5 (2) 3.0 to 5.5	(1) -40 to 85 (2) -40 to 85		QFP64 (14×14 mm)
TMP89FS60UG			(3) 0.238	8					1	2	1	16			2		4				Yes	Yes	Yes	Yes	Yes	Yes	58	(3) 2.7 to 3.0	(3) -20 to 85		LQFP64 (10×10 mm)
TMP89FW20AUG	124K			7	32			1	3	1	8			2	1	4				Yes	Yes	Yes	Yes	Yes	Yes	52					
TMP89FW24ADFG			(1) 0.0625 (2) 0.125	11	40				1	3	1	8			2	1	4				Yes	Yes	Yes	Yes	Yes	Yes	68	(1) 2.7 to 5.5 (2) 1.8 to 5.5	-40 to 85		QFP80 (14×20 mm)
TMP89FW24AFG				11	40				1	3	1	8			2	1	4				Yes	Yes	Yes	Yes	Yes	Yes	68				LQFP80 (12×12 mm)

Note 1) Configurable as UART or SIO. Also, selectable from PC and SIO.

One SIO channel can be used simultaneously. As for the TMP89FS60, up to two SIO channels can be used simultaneously.

Note 2) The on-chip debug unit is available with the flash versions, but not with the mask ROM versions.

Note 3) Minimum instruction execution times (1) to (3) correspond to (1) to (3) of both power supply voltage and operating temperature.

Note 4) The minimum instruction execution time in Low-Speed mode is 122 µs (at 32.768 kHz).

Note 5) The erase/program power supply voltage is 3.0 to 3.6 V.

Note 6) Two ports are reserved for high-speed oscillator pins and cannot be used as I/O ports.

Note 7) The AD conversion accuracy differs between the flash and mask ROM versions. For details, see the datasheet.

• Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

TLCS-870 Family: TLCS-870/C Series

□Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 3)	LED Driver (Ch)	LCD Driver (Ch)	VFT Driver (Ch)	SEI (Ch)	SIO (Ch)	UART (Ch)	UART/SIO (Ch) (Note 1)	UART/I <sup>2</sup> C (Ch) (Note 4)	I <sup>2</sup> C (Ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	10-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Multiply-Accumulate (MAC)	Program Patch Logic	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 5))	Clock Gear	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP/Flash Version (See the datasheet for operating conditions.)	Package				
TMP86P203MG (Note 2)	2K	128	1.6	2									4					2			Yes			14	4.5 to 5.5			SOP20					
TMP86P203PG (Note 2)				2											4					2			Yes					14	DIP20				
TMP86C407MG	4K	256	(1) 0.25 (2) 0.5	8			1		1				6				1	2			Yes	Yes		22	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86P807MG	SOP28					
TMP86C407NG				8			1		1						6				1	2			Yes	Yes				22	TMP86P807NG	SDIP28			
TMP86C408DMG			8			1		1						6				1	2			Yes	Yes				24	TMP86P808DMG	SSOP30				
TMP86C420FG			(1) 0.25 (2) 0.5 (3) 0.95	4	32				1						8			1	2				Yes	Yes				39	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	TMP86P820FG	QFP64 (14×14 mm)		
TMP86C420UG				4	32			1					8			1	2				Yes	Yes		39			TMP86P820UG	LQFP64 (10×10 mm)					
TMP86C807MG	8K	256	(1) 0.25 (2) 0.5	8			1		1				6				1	2			Yes	Yes		22	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86P807MG	SOP28					
TMP86C807NG				8			1		1						6				1	2			Yes	Yes				22	TMP86P807NG	SDIP28			
TMP86C808DMG			8			1		1						6				1	2			Yes	Yes				24	TMP86P808DMG	SSOP30				
TMP86C820FG			(1) 0.25 (2) 0.5 (3) 0.95	4	32				1						8			1	2				Yes	Yes				39	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	TMP86P820FG	QFP64 (14×14 mm)		
TMP86C820UG				4	32			1					8			1	2				Yes	Yes		39			TMP86P820UG	LQFP64 (10×10 mm)					
TMP86C809NG	16K	512	(1) 0.25 (2) 0.5	8			1		1				6				1	2			Yes	Yes		26	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86FH09ANG	SDIP32					
TMP86C829BFG				4	32					1					8			1	4				Yes	Yes				39	TMP86PM29BFG	QFP64 (14×14 mm)			
TMP86C829BUG			(1) 0.25 (2) 0.5 (3) 0.95	4	32					1					8			1	4				Yes	Yes				39	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	TMP86PM29BUG	LQFP64 (10×10 mm)		
TMP86C847UG						19				1	1				8			1	2				Yes	Yes				35			TMP86PM47AUG TMP86PH47UG TMP86FH47BUG	LQFP44 (10×10 mm)	
TMP86CH06AUG	16K	512	(1) 0.25 (2) 0.5 (3) 0.95 (4) 0.95	8					1	1							1	2				Yes	Yes	Yes	35	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 2.0 to 5.5 (4) 1.8 to 5.5	-40 to 85	TMP86PH06UG	LQFP44 (10×10 mm)				
TMP86CH06NG				(1) 0.25 (2) 0.5 (3) 0.95	8					1	1								1	2				Yes	Yes			Yes	35	TMP86PH06NG	SDIP42		
TMP86CH09NG			(1) 0.25 (2) 0.5	8			1		1						6			1	2				Yes	Yes				26	(1) 4.5 to 5.5 (2) 2.7 to 5.5	TMP86FH09ANG	SDIP32		
TMP86CH12MG						8				1	1				8			1	1	2				Yes	Yes				24	(2) 2.7 to 5.5	TMP86FH12AMG**	SSOP30	
TMP86CH21AUG	16K	512	(1) 0.25 (2) 0.5 (3) 0.95 (4) 0.95	4	32					1				8			1	4				Yes	Yes		39	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 2.0 to 5.5 (4) 1.8 to 5.5	-40 to 85	TMP86PM29BUG	LQFP64 (10×10 mm)				
TMP86CH21FG				(1) 0.25 (2) 0.5 (3) 0.95	4	32					1				8			1	4					Yes	Yes				39	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	TMP86PM29BFG	QFP64 (14×14 mm)	
TMP86CH22UG						3	23				1	1			4			1	2					Yes	Yes				33			TMP86PH22UG	LQFP44 (10×10 mm)
TMP86CH46ANG			(1) 0.25 (2) 0.5 (3) 0.95 (4) 0.95	19						1	1				8			1	2					Yes	Yes				33	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 2.0 to 5.5 (4) 1.8 to 5.5	(1) -40 to 85 (2) -40 to 85 (3) -40 to 85 (4) -20 to 85	TMP86PH46NG TMP86PM46NG TMP86FH46BNG	SDIP42
TMP86CH47AUG				19					1	1			8			1	2					Yes	Yes		35			TMP86PM47AUG TMP86PH47UG TMP86FH47BUG	LQFP44 (10×10 mm)				

Note 1) Configurable as UART or SIO.

Note 2) Contains an OTP memory.

Note 3) Minimum instruction execution times (1) to (4) correspond to (1) to (4) of both power supply voltage and operating temperature.

Note 4) Configurable as I<sup>2</sup>C or UART.

Note 5) The minimum instruction execution time in Low-Speed mode is 122 μs (at 32.768 kHz).

• Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (µs) (Note 3)	LED Driver (Ch)	LCD Driver (Ch)	VFT Driver (Ch)	SEI (Ch)	SIO (Ch)	UART (Ch)	UART/SIO (Ch) (Note 1)	UART/I <sup>2</sup> C (Ch) (Note 4)	I <sup>2</sup> C (Ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	10-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Multiply-Accumulate (MAC)	Program Patch Logic	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 5))	Clock Gear	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP/Flash Version (See the datasheet for operating conditions.)	Package
TMP86CH72FG	16K	1024	(1) 0.25 (2) 0.5			32		1	1			1	6			1		2		Yes	Yes	Yes		54	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	TMP86PM72FG	QFP64 (14×14 mm)	
TMP86CH29BFG		1536	(1) 0.25 (2) 0.5	4	32					1			8			1		4			Yes	Yes		39	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86PM29BFG		LQFP64 (10×10 mm)
TMP86CH29BUG		1536	(3) 0.95	4	32					1			8			1		4			Yes	Yes		39	(3) 1.8 to 5.5		TMP86PM29BUG		
TMP86CK74AFG	24K	1024	(1) 0.25 (2) 0.5	2		37		1					8			2		2			Yes	Yes		70	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	TMP86PM74AFG	QFP80 (14×20 mm)	
TMP86CM27FG			(1) 0.25 (2) 0.5	8	40			1	1					8			1		2			Yes	Yes		55	(2) 2.7 to 5.5	TMP86PS27FG TMP86FS27FG		
TMP86CM47AUG			(1) 0.25 (2) 0.5 (3) 0.95	19					1	1					8			1		2			Yes	Yes		35	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	-40 to 85	TMP86PM47AUG
TMP86CM72FG	32K	1536	(1) 0.25 (2) 0.5			32		1	1			1	6			1		2		Yes	Yes	Yes		54	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	TMP86PM72FG	QFP64 (14×14 mm)	
TMP86CM23AUG			(1) 0.25 (2) 0.5 (3) 0.95 (4) 0.95	5	32			1	1					8			1		4		Yes		Yes	Yes	51	(1) 3.5 to 5.5 (2) 2.7 to 5.5 (3) 2.0 to 5.5 (4) 1.8 to 5.5	(1) -40 to 85 (2) -40 to 85 (3) -40 to 85 (4) -20 to 85	TMP86PM23UG TMP86FS23AUG	LQFP64 (10×10 mm)
TMP86CM29BFG			(1) 0.25 (2) 0.5 (3) 0.95	4	32					1					8		1		4			Yes	Yes		39	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	-40 to 85	TMP86PM29BFG	QFP64 (14×14 mm)
TMP86CM29BUG	(3) 0.95	4	32					1					8		1		4			Yes	Yes		39	(3) 1.8 to 5.5	TMP86PM29BUG	LQFP64 (10×10 mm)			
TMP86CM29LUG		4	32					1					8		1		4			Yes	Yes		39	(1) 2.7 to 3.6	TMP86FM29UG				
TMP86CM25AFG	2048	1024	(1) 0.25 (2) 0.5	4	(Note 2) 60			1	1				8			1		4			Yes	Yes		42	(2) 1.8 to 3.6	-30 to 70	TMP86FM25FG	QFP100 (14×20 mm)	
TMP86CM74AFG			(1) 0.25 (2) 0.5	2		37		1							8			2		2		Yes	Yes		70	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	TMP86PM74AFG	QFP80 (14×20 mm)
TMP86CP27AFG	48K	1024		8	40			1	1				8			1		2			Yes	Yes		55	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86PS27FG TMP86FS27FG		
TMP86CP23AUG		2048	(1) 0.25 (2) 0.5 (3) 0.95 (4) 0.95	5	32			1	1					8		1		4		Yes		Yes	Yes	51	(1) 3.5 to 5.5 (2) 2.7 to 5.5 (3) 2.0 to 5.5 (4) 1.8 to 5.5	(1) -40 to 85 (2) -40 to 85 (3) -40 to 85 (4) -20 to 85	TMP86PS23UG TMP86FS23AUG	LQFP64 (10×10 mm)	
TMP86CS44UG		1024	(1) 0.25 (2) 0.5	19				1	1					8	1		2		2			Yes	Yes		35	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86PS44UG	LQFP44 (10×10 mm)
TMP86CS25ADFG	60K	2048	(1) 0.25 (2) 0.5	4	(Note 2) 60			1	1				8			1		4			Yes	Yes		42	(1) 4.5 to 5.5 (2) 2.7 to 5.5	(1) -40 to 85 (2) -40 to 85		LQFP100 (14×14 mm)	
TMP86CS25AFG			(3) 0.95 (4) 0.95	4	(Note 2) 60			1	1					8			1		4			Yes	Yes		42	(3) 2.0 to 5.5 (4) 1.8 to 5.5	(3) -40 to 85 (4) -20 to 85	TMP86PS25FG	QFP100 (14×20 mm)
TMP86CS28DFG			(1) 0.25 (2) 0.5		40				1	1					8		2		4			Yes	Yes		62	(1) 4.0 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86FS28ADFG	LQFP80 (12×12 mm)
TMP86CS28FG				40				1	1				8			2		4			Yes	Yes		62	(2) 2.7 to 5.5		TMP86FS28AFG	QFP80 (14×20 mm)	
TMP86CS49FG	2048	1024	(1) 0.25 (2) 0.5	13				2	2			1	16			2		4			Yes	Yes		56	(1) 4.5 to 5.5 (2) 2.7 to 5.5	(1) -40 to 85 (2) -40 to 85	TMP86FS49BFG	QFP64 (14×14 mm)	
TMP86CS49UG			(3) 0.95 (4) 0.95	13				2	2			1	16				2		4			Yes	Yes		56	(3) 2.0 to 5.5 (4) 1.8 to 5.5	(3) -40 to 85 (4) -20 to 85	TMP86FS49BUG	LQFP64 (10×10 mm)
TMP86CS64AFG			(1) 0.25 (2) 0.5	16				2	1						16			2		4		Yes	Yes		91	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86PS64FG	QFP100 (14×20 mm)

Note 1) Configurable as UART or SIO.

Note 2) Up to 960 LCD segments (60 seg. x 16 com.)

Note 3) Minimum instruction execution times (1) to (4) correspond to (1) to (4) of both power supply voltage and operating temperature.

Note 4) Configurable as I<sup>2</sup>C or UART.

Note 5) The minimum instruction execution time in Low-Speed mode is 122 µs (at 32.768 kHz).

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

# TLCS-870 Family: TLCS-870/X Series

## □Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 3)	LED Driver (Ch)	VFT Driver (Ch)	SIO (Ch)	UART (Ch)	I <sup>2</sup> C (Ch) (Note 1)	PWM Generator (Ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	16-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Motor Controller (Ch)	Remote Control Preprocessor	Program Patch Logic	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 4))	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP/Flash Version (See the datasheet for operating conditions.)	Package	
TMP88CH40MG	16K	512	0.2	14		(Note2) 1	(Note2) 1				4	1	2	1			Yes		19	4.5 to 5.5	-40 to 85	TMP88PH40MG	SOP28	
TMP88CH40NG				14		(Note2) 1	(Note2) 1					4	1	2	1			Yes				19	TMP88PH40NG	SDIP28
TMP88CH41NG				16		(Note2) 1	(Note2) 1					8	2	2	1			Yes				33	TMP88PH41NG	SDIP42
TMP88CH41UG				16		(Note2) 1	(Note2) 1					8	2	2	1			Yes				33	TMP88PH41UG TMP88FH41UG	LOFP44 (10×10 mm)
TMP88CS43FG	64K	2048		24		1	1		2	16	2	4	2			Yes		71			TMP88PS43FG	QFP80 (14×20 mm)		
TMP88CS77FG				53	2		1	12	3	1					Yes	Yes	88	TMP88PU77FG			QFP100 (14×20 mm)			
TMP88CU74FG	96K	3072	(1) 0.32 (2) 122	37		1		1	12	2	2					Yes	Yes	71	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	TMP88PU74FG	QFP80 (14×20 mm)		
TMP88CU77FG				53	2		1	12	3	1					Yes	Yes	88	TMP88PU77FG			QFP100 (14×20 mm)			

Note 1) Either I<sup>2</sup>C bus or SIO module can be selected via software.

Note 2) Cannot be used at the same time because their I/O pins are multiplexed.

Note 3) Minimum instruction execution times (1) and (2) correspond to power supply voltages (1) and (2).

Note 4) The minimum instruction execution time in Low-Speed mode is 122 μs (at 32.768 kHz).

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.



TLCS-870 Family: TLCS-870/C1 Series

□Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 2)	LED Driver (Ch)	LCD Driver (Ch)	VFT Driver (Ch)	SEI (Ch)	SIO (Ch)	UART (Ch)	UART/SIO (Ch) (Note 1)	I <sup>2</sup> C/SIO (Ch) (Note 1)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	10-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Multiply-Accumulate (MAC)	Program Patch Logic	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 3))	Clock Gear	Power-On Reset	Voltage Detecting Circuit	I/O Port (Pins) (Note 4)	Power Supply Voltage (V)	Operating Temperature (°C)	Flash Version (See the datasheet for operating conditions.)	Package
TMP89CH42UG	16K	2048	(1) 0.1 (2) 0.238 (3) 0.5	8					1	1	1	8			2	4				Yes	Yes	Yes	Yes	Yes	40	(1) 4.3 to 5.5 (2) 2.7 to 5.5 (3) 2.2 to 5.5	-40 to 85	TMP89FH42UG	LQFP44 (10×10 mm)	
TMP89CH46DUG				8						1	1	1	8			2	4				Yes	Yes	Yes	Yes	Yes			42	TMP89FH46DUG	LQFP48 (7×7 mm)
TMP89CM42UG	32K	8							1	1	1	8			2	4				Yes	Yes	Yes	Yes	Yes	40			TMP89FM42UG	LQFP44 (10×10 mm)	
TMP89CM46DUG		8							1	1	1	8			2	4				Yes	Yes	Yes	Yes	Yes	42			TMP89FM46DUG	LQFP48 (7×7 mm)	

Note 1) Configurable as UART or SIO. Also, selectable from I<sup>2</sup>C and SIO.

One SIO channel can be used simultaneously.

Note 2) Minimum instruction execution times (1) to (3) correspond to power supply voltages (1) to (3).

Note 3) The minimum instruction execution time in Low-Speed mode is 122 μs (at 32.768 kHz).

Note 4) Two ports are reserved for high-speed oscillator pins and cannot be used as I/O ports.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

# 16-Bit Microcontrollers

## TLCS-900 Family: TLCS-900/L1 Series

□Flash Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 1)	LED Driver (Ch)	UART/SIO (Ch)	SIO (Ch)	I <sup>2</sup> C/SIO (Ch)	I <sup>2</sup> C (Ch)	DRAM Controller (Ch)	10-Bit AD Converter (Ch)	LCD Driver (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	Motor Controller (Ch)	32-kHz Timer (for SWW RTC)	RTC (Ch)	8-Bit PWM Generator (Ch)	CS/WAIT Controller (Ch)	Watchdog Timer	Dual Clocks	Clock Gear	Program Patch Logic(Bank)	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package
TMP91FU62DFG	96K	4096	0.2	8	3			1		16		4	4		Yes				Yes	Yes	Yes	6	69	4.5 to 5.5		QFP80 (14×20 mm)	
TMP91FU62FG				8	3			1		16		4	4		Yes					Yes	Yes	Yes				6	LQFP80 (12×12 mm)
TMP91FW40FG	128K	8192	(1) 0.148 (2) 0.25	4					4	(Note 2) 40		4	3			1			Yes	Yes		6	61	(1) 2.7 to 3.6 (2) 2.2 to 3.6	-40 to 85	TMP91CW40FG	LQFP100 (14×14 mm)
TMP91FW64DFG			(1) 0.16 (2) 0.25	3			2		16		6	5		Yes			4	Yes	Yes	Yes	Yes	6	83	(1) 4.5 to 5.5 (2) 2.7 to 5.5		-	QFP100 (14×20 mm)
TMP91FW64FG		(1) 0.148 (2) 0.25	3			2		16		6	5		Yes			4	Yes	Yes	Yes	Yes	6	53	(1) 2.7 to 3.6 (2) 2.2 to 3.6	-	LQFP100 (14×14 mm)		
TMP91FW27FG		12288	(1) 0.148 (2) 0.25	2		1			4		6	1		Yes			4	Yes	Yes	Yes	Yes		53	(1) 2.7 to 3.6 (2) 2.2 to 3.6	TMP91CU27FG	QFP64 (14×14 mm)	
TMP91FW27UG				2		1		4		6	1		Yes		4	Yes	Yes	Yes	Yes	Yes	Yes				TMP91CK27UG TMP91CP27UG TMP91CU27UG	LQFP64 (10×10 mm)	
TMP91FY42FG		256K	16384	0.148	2		1			8		8	2		Yes			4	Yes	Yes	Yes	Yes	81	2.7 to 3.6		TMP91CY22FG TMP91CW12AFG	LQFP100 (14×14 mm)

Note 1) Minimum instruction execution times (1) and (2) correspond to power supply voltages (1) and (2).

Note 2) For the 4-common and 40-segment LCD driver specification, see the technical datasheet.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

TLCS-900 Family: TLCS-900/L1 Series

□Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 2)	LED Driver (Ch)	UART/SIO (Ch)	UART (Ch)	SIO (Ch)	I <sup>2</sup> C/SIO (Ch)	I <sup>2</sup> C (Ch)	DRAM Controller (Ch)	Memory Bank Controller	10-Bit AD Converter (Ch)	LCD Controller	LCD Driver (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	32-kHz Timer (for SW RTC)	RTC (Ch)	8-Bit PMM Generator (Ch)	C/SWAIT Controller (Ch)	Watchdog Timer	Dual Clocks	Clock Gear	Program Patch Logic (Bank)	Touch Screen Interface	Melody/Alarm Generator (MLD)	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP/Flash Version (See the datasheet for operating conditions.)	Package	
TMP91C016FG	NA	NA	(1) 0.148 (2) 0.4	1	1					1	Yes	Yes		4			1		4	Yes	Yes	Yes			Yes	31	(1) 2.7 to 3.6 (2) 1.8 to 3.6	-10 to 70		LOFP100 (14×14 mm)		
TMP91C219FG		2048	0.111	1											6	1			4	Yes		Yes				45	(Note 1) (1) 4.75 to 5.25 (2) 3.0 to 3.6	-20 to 70				
TMP91C630FG		6144			2										6	1			4	Yes		Yes					53	2.7 to 3.6	-40 to 85			
TMP91C820AFG	8K	8192	(1) 0.111 (2) 0.148	3			1			1	Yes	Yes		4	1			1	4	Yes	Yes	Yes			Yes	77	(1) 3.0 to 3.6 (2) 2.7 to 3.6	-20 to 70		LOFP144 (16×16 mm)		
TMP91CK27UG	24K	1024	(1) 0.148	2			1							6	1	Yes			4	Yes	Yes	Yes				53	(1) 2.7 to 3.6	-40 to 85	TMP91FW27UG	LOFP64 (10×10 mm)		
TMP91CP27UG	48K	4096	(2) 0.4	2			1							6	1	Yes			4	Yes	Yes	Yes				53	(2) 1.8 to 3.6					
TMP91CU10FG	96K	3072	(1) 0.296 (2) 0.4	3										8	2				3	Yes	Yes	Yes				80	(1) 2.7 to 3.6 (2) 2.0 to 3.6			TMP91PW10FG	LOFP100 (14×14 mm)	
TMP91CU27FG		10240	(1) 0.148 (2) 0.4	2			1							4	1	Yes			4	Yes	Yes	Yes				53	(1) 2.7 to 3.6 (2) 1.8 to 3.6			TMP91FW27FG	QFP64 (14×14 mm)	
TMP91CU27UG					2			1							6	1	Yes			4	Yes	Yes	Yes				53		(2) 1.8 to 3.6		TMP91FW27UG	LOFP64 (10×10 mm)
TMP91CW11FG	128K	4096	(1) 0.16 (2) 0.32	6	2	1	2	1						8	2	Yes			2	3	Yes	Yes	Yes				79		(1) 4.5 to 5.5 (2) 2.7 to 5.5		TMP91PW11FG	LOFP100 (14×14 mm)
TMP91CW12AFG				(1) 0.148 (2) 0.4	2			1							8	2	Yes			4	Yes	Yes	Yes				81		(1) 2.7 to 3.6 (2) 1.8 to 3.6		TMP91FY42FG	
TMP91CW12FG				(1) 0.16 (2) 0.25	2			1							8	2	Yes			4	Yes	Yes	Yes				81		(1) 4.5 to 5.5 (2) 2.7 to 5.5		TMP91PW12FG	
TMP91CW40FG				(1) 0.148 (2) 0.25 (3) 0.4	4										4	(Note 3) 40	4	3	1		Yes	Yes	Yes	6	Yes		61		(1) 2.7 to 3.6 (2) 2.2 to 3.6 (3) 1.8 to 3.6		TMP91FW40FG	
TMP91CW60DFG		8192		0.2	3			2				16			6	5	Yes			4	Yes	Yes	Yes	6			83		4.5 to 5.5		TMP91FW64DFG	QFP100 (14×20 mm)
TMP91CW60FG						3			2					16			6	5	Yes			4	Yes	Yes	Yes	6			83		TMP91FW64FG	LOFP100
TMP91CY22FG		256K	16384	(1) 0.148 (2) 0.4	2			1							8	2	Yes			4	Yes	Yes	Yes				81	(1) 2.7 to 3.6 (2) 1.8 to 3.6		TMP91FY42FG	LOFP100 (14×14 mm)	

Note 1) 3.0 V to 3.6 V internally; 4.75 V to 5.25 V for input/output interface

Note 2) Minimum instruction execution times (1) to (3) correspond to power supply voltages (1) to (3).

Note 3) For the 4-common and 40-segment LCD driver specification, see the technical datasheet.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

TLCS-900 Family: TLCS-900/L Series

□Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 2)	UART/SIO (Ch)	I <sup>2</sup> C/SIO (Ch)	10-Bit AD Converter (Ch)	LCD Driver (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	32-kHz Timer (for SW RTC)	Motor Pattern Generator (Ch)	8-Bit PWM Generator (Ch)	CS/WAIT Controller (Ch)	Watchdog Timer	Dual Clocks	Clock Gear	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP Version (See the datasheet for operating conditions.)	Package		
TMP93CW41DFG	NA	4096	(1) 0.2 (2) 0.32	2		8		2	2		2	2	3	Yes	Yes	Yes	61	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	-	LQFP100 (14×14 mm)		
TMP93CS20FG	64K	2048		2	1	8	(Note3) 40	4	4	Yes				Yes	Yes	Yes	88				TMP93PW20AFG	LQFP144 (16×16 mm)	
TMP93CS36UG				2		4		4	2						Yes	Yes	Yes			33		-	LQFP44 (10×10 mm)
TMP93CW40DFG	128K	4096		2		8		2	2		2	2	3	Yes	Yes	Yes	79					TMP93PW40DFG	LQFP100 (14×14 mm)
TMP93CW44DFG (Note 1)				2	1	8		4	2						Yes	Yes	Yes			62			TMP93PW44ADFG (Note 1)

Note 1) Operating voltage of OTP-version TMP93PW44ADFG is 4.5 V to 5.5 V.

Note 2) Minimum instruction execution times (1) and (2) correspond to power supply voltages (1) and (2).

Note 3) For the 4-common and 40-segment LCD driver specification, see the technical datasheet.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## TLCS-900 Family: TLCS-900/H Series

### □Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 1)	UART/SIO (Ch)	DRAM Controller (Ch)	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	Motor Pattern Generator (Ch)	CS/WAIT Controller (Ch)	Watchdog Timer	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP Version (See the datasheet for operating conditions.)	Package
TMP95C001FG	NA	NA	(1) 0.16 (2) 0.32							4				(1) 4.5 to 5.5 (2) 2.7 to 5.5	-20 to 70		QFP64 (14×14 mm)
TMP95C061BDFG			0.16	2	1	4		4	2	2	4	Yes	56	4.5 to 5.5			LOFP100 (14×14 mm)
TMP95C063DFG			2	2	8	2	8	2	2	4	Yes	91	LOFP144 (20×20 mm)				
TMP95C265FG		2048	(1) 0.16	3		8	2	8	2		4	Yes	55	(1) 4.5 to 5.5 (2) 2.7 to 3.3			LOFP100 (14×14 mm)
TMP95CW65FG		4096	(2) 0.4	3		8	2	8	2		4	Yes	55				
TMP95CS64FG		64K	2048	0.16	3		8	2	8	2		4	Yes	81		4.5 to 5.5	
TMP95CS66FG				0.16	1				8	2	2		4	Yes			81

Note 1) Minimum instruction execution times (1) and (2) correspond to power supply voltages (1) and (2).

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## TLCS-900 Family: TLCS-900 Series

### □Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 1)	UART/SIO (Ch)	DRAM Controller (Ch)	6-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	Motor Pattern Generator (Ch)	8-Bit PWM Generator (Ch)	CS/WAIT Controller (Ch)	Watchdog Timer	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP Version (See the datasheet for operating conditions.)	Package
TMP96C041BFG	NA	NA	(1) 0.2	2			4	2	2	2	2	3	Yes	47	4.5 to 5.5	(1) -20 to 70 (2) -40 to 85		QFP80 (14×20 mm)
TMP96C141BFG		1024	(2) 0.25	2			4	2	2	2	2	3	Yes	47				

Note 1) Minimum instruction execution times (1) and (2) correspond to operating temperature (1) and (2).

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

# 32-Bit Microcontrollers

## TLCS-900 Family: TLCS-900/H1 Series

□Flash Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs)	USB Host (Full Speed) (Ch)	USB Device (Full Speed) (Ch)	SPI (SD Card)	High-Speed SIO (Ch)	UART/SIO (Ch)	I <sup>2</sup> C/SIO (Ch)	DMA Controller (Ch)	DRAM Controller (Ch)	NAND Flash Controller (Ch)	Memory Bank Controller	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	LCD Controller	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	32-kHz Timer (for S/W RTC)	RTC (Ch)	Motor Pattern Generator (Ch)	Multiply-Accumulate (MAC)	CS/WAIT Controller (Ch)	Watchdog Timer	Dual Clocks	Clock Gear	Program Patch Logic (Bank)	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package
TMP92FD23ADFG	512K	32768	0.05				1	3	2					12			6	2	Yes				4	Yes	Yes	Yes	8	84	3.0 to 3.6	-40 to 85	TMP92CY23DFG	QFP100 (14×20 mm)
TMP92FD23AFG									1	3	2					12			6	2	Yes			4	Yes	Yes	Yes	8			84	
TMP92FD28AFG				1	Yes	1	2	(Note1) 2											6	2		1			3	Yes	Yes	Yes			8	70

Note 1) Only one channel can be configured as SIO.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

TLCS-900 Family: TLCS-900/H1 Series

□Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 2)	USB Host (Full Speed) (Ch)	USB Device (Full Speed) (Ch)	SPI (SD Card)	High-Speed SIO (Ch)	UART/SIO (Ch)	UART (Ch)	I <sup>2</sup> C/SIO (Ch)	I <sup>2</sup> C (Ch)	DMA Controller (Ch)	DRAM Controller (Ch)	NAND Flash Controller (Ch)	Memory Bank Controller	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	LCD Controller	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	32-kHz Timer (for S/W RTC)	RTC (Ch)	Motor Pattern Generator (Ch)	Multiply-Accumulate (MAC)	CS/WAIT Controller (Ch)	Watchdog Timer	Dual Clocks	Clock Gear	Program Patch Logic (Bank)	Touch Screen Interface	Melody/Alarm Generator (MLD)	I <sup>2</sup> S (Inter-IC Sound) Interface (Ch)	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Flash Version (See the datasheet for operating conditions.)	Package	
TMP94C251ADFG ◇	NA	2048	0.05				2							2		8	2		4	4					6	Yes						64	4.5 to 5.5	-20 to 70	LQFP144 (20×20 mm)			
TMP92C820FG		8192						2	1	1				1	2	Yes	5		Yes	4	1	1				4	Yes	Yes	Yes		Yes		83			3.0 to 3.6		
TMP92CA25FG		10240	(1) 0.05		Yes		1		1				1	2	Yes	4		Yes	4	1	1					4	Yes	Yes	Yes	Yes	Yes	1	84	(1) 3.0 to 3.6	-20 to 70	LQFP144 (16×16 mm)		
TMP92CH21FG		16384	(2) 0.074	1			2						1	2	Yes	4		Yes	4	1	1					4	Yes	Yes	Yes	Yes	Yes	1	82	(2) 2.7 to 3.6				
TMP92CM22FG		32768	0.05				2		1							8				4	2						4	Yes		Yes				50	3.0 to 3.6	-40 to 85	LQFP100 (14×14 mm)	
TMP92CM27FG							2	4	2				1			12	2			8	6				2		6	Yes	Yes					83				
TMP92CF26AXBG		147456	(1) 0.0125 (2) 0.0167	1	Yes		1		1		6	1	2	Yes	6		Yes	8	2		1		Yes	4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2	136	(1) 0 to 50 (2) 0 to 70	-40 to 85	FBGA228 (15×15 mm)		
TMP92CF29AFG				1	Yes		2		1	6	1	2	Yes	6		Yes	8	2		1		Yes	4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1	98	(Note 1)					
TMP92CF30FG	1		Yes		2		1	6	1	2	Yes	6		Yes	8	2		1		Yes	4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1	98	(1) 3.0 to 3.6 (2) 1.4 to 1.6	0 to 70						
TMP92CZ26AXBG	294912		(1) 0.0125 (2) 0.0167	1	Yes		1		1	6	1	2	Yes	6		Yes	8	2		1		Yes	4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	2	136	(1) 0 to 50 (2) 0 to 70					
TMP92CY23DFG	256K	16384	0.05				3	2							12				6	2	Yes					4	Yes	Yes	Yes	8			84	3.0 to 3.6	-40 to 85	TMP92FD23ADFG	QFP100 (14×20 mm)	
TMP92CY23FG									3	2							12				6	2	Yes					4	Yes	Yes	Yes	8					84	TMP92FD23AFG
TMP92CD23ADFG	512K	32768					1	3	2							12				6	2	Yes					4	Yes	Yes	Yes	8					84	TMP92FD23ADFG	QFP100 (14×20 mm)
TMP92CD23AFG								1	3	2							12				6	2	Yes					4	Yes	Yes	Yes	8					84	TMP92FD23AFG
TMP92CD28AFG					1	Yes	1	2		(Note3) 2										6	2		1				3	Yes	Yes	Yes	8			70	TMP92FD28AFG	LQFP100 (14×14 mm)		

◇: Contains a 900/H2 core that is functionally fully compatible with 900/H1 core.

Note 1) Dual power supplies: 1.4 V to 1.6 V for internal circuitry, 3.0 V to 3.6 V for input/output interface.

Note 2) Minimum instruction execution times (1) and (2) correspond to (1) and (2) of both power supply voltage and operating temperature.

Note 3) Only one channel can be configured as SIO.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

TX03 Family: TX03 Series

□Flash Versions

Part Number	ROM (Bytes)	SRAM (Bytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	SSP(Ch)	UART/SIO (Ch)	Full UART(ch)	I <sup>2</sup> C (Ch)	I <sup>2</sup> C/SIO(Ch)	CAN (ch)	USB Host (Full Speed) (Ch)	USB Device (Full Speed) (Ch)	Ether MAC (ch)	10-Bit AD Converter (Ch)	12-Bit AD Converter (Ch)	10-Bit DA Converter (Ch)	16-Bit Timer/Counter (Ch)	CEC (Ch)	Remote Control Preprocessor (Ch)	Motor Controller (Ch)	Multi-Purpose Timer (MPT) (Ch)	Incremental Encoder Input (Ch)	Op. Amp (Ch)	Comparator (Ch)	External Interrupt Pins (Pins)	CS/WAIT Controller (Ch)	RTC (Ch)	Dual Clocks	Trace Function	Oscillation Frequency Detector	Power-On Reset	Voltage Detecting Circuit	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Package	
TMPM382FSFG **	64K	8K	40	2	1	3		1						10	8		1		(Note 1) 1	1	1			8	1	Yes	Yes	Yes	Yes	Yes	Yes	48	4.0 to 5.5	-40 to 85	QFP64 (14×14 mm)		
TMPM372FWUG **	128K	6K	(1) 80 (2) 32			4								11	8				1	1	1			10			Yes	Yes	Yes	Yes	Yes	53	4.5 to 5.5	(1) -40 to 85 (2) -40 to 105	LQFP64 (10×10 mm)		
TMPM373FWDUG **			(1) 80 (2) 32			3									7	8				1	1	1			8			Yes	Yes	Yes	Yes	37			LQFP48 (7×7 mm)		
TMPM374FWUG **			(1) 80 (2) 32			3									6	8				1	1	1			7			Yes	Yes	Yes	Yes	33			LQFP44 (10×10 mm)		
TMPM330FWFG		8K	40			3		3							12		10	1	2						8	1	Yes	Yes						78	2.7 to 3.6	-20 to 85	LQFP100 (14×14 mm)
TMPM332FWUG						2		2							8		10	1	1						5	1	Yes	Yes						44			LQFP64 (10×10 mm)
TMPM333FWFG						3		3								12		10								8	1	Yes	Yes								78
TMPM390FWFG **				20		1	3		1	1					12		10	1	2							8	1	Yes	Yes	Yes	Yes	Yes	Yes	74	1.7 to 3.6		
TMPM395FWAXBG				20		4	3		1	1					12		10	1	2							11	1	Yes	Yes	Yes	Yes	Yes	Yes	91			FBGA120 (6×6 mm)
TMPM380FWDFG			12K	40	2	2	5		2							18	8		1	(Note 1) 2		3	2			16	1	Yes	Yes	Yes	Yes	Yes	Yes	84	4.0 to 5.5	-40 to 85	QFP100 (14×20 mm)
TMPM380FWFG				40	2	2	5		2							18	8		1	(Note 1) 2		3	2			16	1	Yes	Yes	Yes	Yes	Yes	Yes	84			LQFP100 (14×14 mm)
TMPM382FWFG **				40	2	1	3			1						10	8		1	(Note 1) 1		1				8	1	Yes	Yes	Yes	Yes	Yes	Yes	48			QFP64 (14×14 mm)
TMPM366FWFG **			32K	48	4	3	2	1	2			1				12	10										10	2		Yes					74	(Note 2) 2.7 to 3.6	
TMPM366FWXBG **	48	4		3	2	1	2			1				12	10										10	2		Yes					74	FBGA109 (9×9 mm)			
TMPM367FWFG **	50K	80	31	3	4	2	3			1				8	2	8		1	(Note 1) 1		4	1			14	4	1	Yes	Yes	Yes	Yes	Yes	Yes	60			LQFP100 (14×14 mm)
TMPM367FWXBG **		80	31	3	4	2	3			1				8	2	8		1	(Note 1) 1		4	1			14	4	1	Yes	Yes	Yes	Yes	Yes	Yes	60			FBGA109 (9×9 mm)

Note 1) The motor controller channel is multiplexed with the multi-purpose timer (MPT).

Note 2) 3.0 to 3.6 V when USB is used.

Note 3) 48 MHz when USB is used.

- All products on this page incorporate a watchdog timer, a clock gear and an on-chip debug unit.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*\* : Under development



Part Number	ROM (Bytes)	SRAM (Bytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	SSP(Ch)	UART/SIO (Ch)	Full UART(ch)	I <sup>2</sup> C (Ch)	I <sup>2</sup> C/SIO(Ch)	CAN (ch)	USB Host (Full Speed) (Ch)	USB Device (Full Speed) (Ch)	Ether MAC (ch)	10-Bit AD Converter (Ch)	12-Bit AD Converter (Ch)	10-Bit DA Converter (Ch)	16-Bit Timer/Counter (Ch)	CEC (Ch)	Remote Control Preprocessor (Ch)	Motor Controller (Ch)	Multi-Purpose Timer (MPT) (Ch)	Incremental Encoder Input (Ch)	Op. Amp (Ch)	Comparator (Ch)	External Interrupt Pins (Pins)	CS/AWAIT Controller (Ch)	RTC (Ch)	Dual Clocks	Trace Function	Oscillation Frequency Detector	Power-On Reset	Voltage-Detecting Circuit	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Package					
TMPM370FYDFG	256K	10K	80		4									22	8				2	2	4	4	16				Yes	Yes	Yes	Yes	76	4.5 to 5.5	-40 to 85	QFP100 (14×20 mm)							
TMPM370FYFG			80		4										22	8				2	2	4	4	16				Yes	Yes	Yes	Yes				76						
TMPM330FYFG		16K	32K	40		3			3						12	10	1	2							8	1	Yes	Yes					78	2.7 to 3.6	-20 to 85	LQFP100 (14×14 mm)					
TMPM330FYWFG				40		3			3							12	10	1	2							8	1	Yes	Yes								78				
TMPM333FYFG				40		3				3						12	10										8	1	Yes	Yes								78			
TMPM377FYDFG **				80		3				1							11	8				2	2							Yes	Yes	Yes	Yes				63				
TMPM377FYFG **				80		3				1							11	8				2	2							Yes	Yes	Yes	Yes				63				
TMPM380FYDFG				40	2	2	5			2							18	8		1	(Note 1) 2	3	2				16	1	Yes	Yes	Yes	Yes	Yes				84	4.0 to 5.5	QFP100 (14×20 mm)		
TMPM380FYFG		40	2	2	5			2							18	8		1	(Note 1) 2	3	2				16	1	Yes	Yes	Yes	Yes	Yes	84									
TMPM341FYXBG **		512K	48K	54	4	1	5		2						15	2	12									12	2		Yes	Yes			86	1.65 to 3.6	-40 to 85	FBGA113 (6×6 mm)					
TMPM366FYFG **				48	4	3	2	1		2			1			12	10										10	2		Yes							74				
TMPM366FYXBG **			48	4	3	2	1		2			1			12	10										10	2		Yes				74								
TMPM367FYFG **			66K	32K	80	31	3	4	2	3		1			1	8	2	8		1	(Note 1) 1	4	1			14	4	1		Yes	Yes	Yes	Yes				60	(Note 2) 2.7 to 3.6	-40 to 85	LQFP100 (14×14 mm)	
TMPM367FYXBG **					80	31	3	4	2	3		1				1	8	2	8		1	(Note 1) 1	4	1			14	4	1		Yes	Yes	Yes				Yes				60
TMPM369FYFG **					80	31	3	4	2	3	1	1	1	1			16	2	8		1	(Note 1) 2	4	2			16	4	1		Yes	Yes	Yes				Yes				102
TMPM369FYXBG **					80	31	3	4	2	3	1	1	1	1			16	2	8		1	(Note 1) 2	4	2			16	4	1		Yes	Yes	Yes				Yes				102
TMPM330FDFG	512K		32K	40		3			3						12	10	1	2								8	1	Yes	Yes								78	-20 to 85	LQFP100 (14×14 mm)		
TMPM330FDWFG				40		3			3							12	10	1	2								8	1	Yes	Yes										78	
TMPM333FDFG				40		3				3						12	10										8	1	Yes	Yes										78	
TMPM341FDXBG		54		4	1	5			2							15	2	12								12	2		Yes	Yes			86								
TMPM376FDDFG **		80			4				1							22	8				2	2				16			Yes	Yes	Yes	Yes	82	4.5 to 5.5	QFP100 (14×20 mm)						
TMPM376FDFG **		80			4				1							22	8				2	2				16			Yes	Yes	Yes	Yes	82								
TMPM366FDFG **		128K	64K	48	4	3	2	1	2			1			12	10										10	2		Yes				74	(Note 2) 2.7 to 3.6	-40 to 85	LQFP100 (14×14 mm)					
TMPM366FDXBG **				48	4	3	2	1	2		2		1			12	10										10	2		Yes							74				
TMPM367FDFG **			128K	32K	80	31	3	4	2	3		1			1	8	2	8		1	(Note 1) 1	4	1			14	4	1		Yes	Yes	Yes	Yes				60				
TMPM367FDXBG **					80	31	3	4	2	3		3		1			8	2	8		1	(Note 1) 1	4	1			14	4	1		Yes	Yes	Yes				Yes	60			
TMPM369FDFG **					80	31	3	4	2	3	1	1	1	1			16	2	8		1	(Note 1) 2	4	2			16	4	1		Yes	Yes	Yes				Yes	102			
TMPM369FDXBG **					80	31	3	4	2	3	1	1	1	1			16	2	8		1	(Note 1) 2	4	2			16	4	1		Yes	Yes	Yes				Yes	102			

Note 1) The motor controller channel is multiplexed with the multi-purpose timer (MPT).

\*\* : Under development

Note 2) 3.0 to 3.6 V when USB is used.

Note 3) 48 MHz when USB is used.

- All products on this page incorporate a watchdog timer, a clock gear and an on-chip debug unit.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

TX03 Family: TX03 Series

□Flash Versions (Continued)

Part Number	ROM (Bytes)	SRAM (Bytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	SSP(Ch)	UART/SIO (Ch)	Full UART(ch)	I <sup>2</sup> C (Ch)	I <sup>2</sup> C/SIO(Ch)	CAN (ch)	USB Host (Full Speed) (Ch)	USB Dvive (Full Speed) (Ch)	Ether MAC (ch)	10-Bit AD Converter (Ch)	12-Bit AD Converter (Ch)	10-Bit DA Converter (Ch)	16-Bit Timer/Counter (Ch)	CEC (Ch)	Remote Control Preprocessor (Ch)	Motor Controller (Ch)	Multi-Purpose Timer (MPT) (Ch)	Incremental Encoder Input (Ch)	Op Amp (Ch)	Comparator (Ch)	External Interrupt Pins (Pins)	CS/WAIT Controller (Ch)	RTC (Ch)	Dual Clocks	Trace Function	Oscillation Frequency Detector	Power-On Reset	Voltage Detecting Circuit	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Package			
TMPM380DFG **	512K	32K	40	2	2	5		2						18		8		1	(Note 1) 2	3	2			16	1	Yes	Yes	Yes	Yes	Yes	Yes	84	4.0 to 5.5	-40 to 85	LOFP100 (14×14 mm)				
TMPM384DFG **			40	2	2	5		2							22		8		1	(Note 1) 2	4	2			16	1	Yes	Yes	Yes	Yes	Yes	Yes			84	LOFP144 (20×20 mm)			
TMPM321F10FG	1024K	64K	48	2	1	5		1	3	1				8		8		1							8	1	Yes	Yes					74	(Note 2) 2.7 to 3.6	-40 to 85	LOFP100 (14×14 mm)			
TMPM322F10FG			48	2	1	12			5	1					16		16		2							14	4	1	Yes	Yes						118	LOFP144 (20×20 mm)		
TMPM323F10FG			48	2	1	5		1	3	1	1				8		8		1							8	1	Yes	Yes							74	LOFP100 (14×14 mm)		
TMPM324F10FG			48	2	1	12			5	1	1				16		16		2								14	4	1	Yes	Yes						118	LOFP144 (20×20 mm)	
TMPM361F10FG					64	2	1	5		1	3				8		16	1	1								10	4	1	Yes	Yes				76	2.7 to 3.6	-20 to 85	LOFP100 (14×14 mm)	
TMPM362F10FG					64	2	1	12			5				16		16	1	2									16	4	1	Yes	Yes				120	LOFP144 (20×20 mm)		
TMPM363F10FG					(Note 3) 64	2	1	5		1	3	1	1		8		16	1	1									8	4	1	Yes	Yes				74	(Note 2) 2.7 to 3.6	-40 to 85	LOFP100 (14×14 mm)
TMPM364F10FG					(Note 3) 64	2	1	12			5	1	1		16		16	1	2									14	4	1	Yes	Yes				118	LOFP144 (20×20 mm)		

Note 1) The motor controller channel is multiplexed with the multi-purpose timer (MPT).

Note 2) 3.0 to 3.6 V when USB is used.

Note 3) 48 MHz when USB is used.

- All products on this page incorporate a watchdog timer, a clock gear and an on-chip debug unit.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*\* : Under development

## TX03 Family: TX03 Series

### □Mask ROM Versions

Part Number	ROM (Bytes)	SRAM (Bytes)	DRAM (Bytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	USB Host (High Speed) (Ch)	SD Host Controller (Ch)	SSP(SPI/MicroWire) (Ch)	UART (Ch)	I <sup>2</sup> C (Ch)	10-Bit AD Converter (Ch)	16-Bit Timer/Counter (Ch)	External Interrupt Pins (Pins)	Watchdog Timer	Static Memory Controller (Ch)	On-Chip Debug Unit	Trace Function	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Package
TMPM320C1DFG	NA	320K	1024K	144	8	1	1	4	4	2	4	8	4	Yes	2	Yes	Yes	55	(Note1)	-40 to 85	LQFP144 (20×20 mm)

Note 1) The following three power supplies are available:

- (1) For general port, AD converter: 3.0 V to 3.6 V
- (2) For USB: 3.15 V to 3.45 V
- (3) For internal circuitry: 1.1 V to 1.3 V

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

TX09 Family: TX09 Series

□Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Maximum Operating Frequency (MHz)	USB Device (High Speed) (Ch)	USB Host (Full Speed) (Ch)	SD Host Controller (Ch)	UART (Ch)	I <sup>2</sup> C (Ch)	SSP (Ch)	DMA Controller (Ch)	Static Memory Controller (Ch)	DRAM Controller (SDR SDRAM / LVC MOS DDR SDRAM) (Ch)	MANDEC (Ch)	10-Bit AD Converter (Ch)	LCD Controller	LCD Data Process Accelerator	16-Bit Timer/Counter (Ch)	32-kHz Timer (for SW RTC)	Watchdog Timer	I <sup>2</sup> S (Inter-IC Sound) Interface (Ch)	Touch Screen Interface	CMOS Image Sensor Interface (Ch)	JTAG (Debug)	JTAG (PC Trace)	JTAG (Boundary-Scan)	Clock Gear	Oscillation Frequency Detector	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Package
TMPA913CHXBG	NA	16K	(1) 200 (2) 150	1		2	2	2	2	8	4	1	2	6			6	Yes	Yes	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	98	(Note1)	(1) 0 to 70 (2) -20 to 85	FBGA361 (16×16 mm)
TMPA900CMXBG		32K		1	1	1	3	2	2	8	2	1	2	8	Yes	Yes	6	Yes	Yes	2	Yes	1	Yes	Yes	Yes	Yes	Yes	91			FBGA289 (15×15 mm)
TMPA901CMXBG				1	1	2	1	1	8	2	1	2	4	Yes	Yes	6	Yes	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	43	FBGA177 (13×13 mm)			
TMPA912CMXBG				1		2	2	2	8	4	1	2	6	Yes	Yes	6	Yes	Yes	2	Yes	1	Yes	Yes	Yes	Yes	Yes	98	FBGA361 (16×16 mm)			
TMPA910CRAXBG		56K	200	1	2	2	2	8	4	1	2	6	Yes	Yes	6	Yes	Yes	2	Yes	1	Yes	Yes	Yes	Yes	Yes	114	0 to 70				
TMPA910CRBxBG			150	1	2	2	2	8	4	1	2	6	Yes	Yes	6	Yes	Yes	2	Yes	1	Yes	Yes	Yes	Yes	Yes	114	-20 to 85				
TMPA911CRXBG			(1) 200 (2) 150	1		2	2	2	8	4	1	2	6	Yes	Yes	6	Yes	Yes	2	Yes	1	Yes	Yes	Yes	Yes	Yes	98	(1) 0 to 70 (2) -20 to 85			

Note 1) The following five power supplies are available:

- (1) For circuitry in general, AD converter, USB host (Full-Speed): 3.0 V to 3.6 V
- (2) For USB device (High-Speed): 3.15 V to 3.45 V
- (3) For memory: 1.7 V to 1.9 V/3.0 V to 3.6 V
- (4) For CMOS image sensor, I<sup>2</sup>S, LCD: 1.8 V to 3.6 V
- (5) For internal circuitry: 1.4 V to 1.6 V

Note 2) The external data bus width is as follows:

- TMPA910CRAXBG, TMPA910CRBxBG, TMPA911CRXBG, TMPA900CMXBG: Up to 32 bits
- TMPA912CMXBG, TMPA913CHXBG, TMPA901CMXBG: Up to 16 bits

Note 3) Maximum operating frequencies (1) and (2) correspond to operating temperatures (1) and (2).

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## TX19 Family: TX19A Series

### □Flash Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	UART/SIO (Ch)	UART/H/SIO (Ch)	UART (Ch)	I <sup>2</sup> C/SIO (Ch)	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	10-Bit DA Converter (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	32-Bit Timer Output Compare (Ch)	32-Bit Timer Input Capture (Ch)	Motor Controller (Ch)	External Interrupt Pins (Pins)	Dual Clocks	Debug Support Unit	I/O Ports (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package
TMP19A71FYFG	256K	10K	56	8	2	2		19				4			2	10	Yes	Yes	75	(Note 1) 2.3 to 2.7	-40 to 85	TMP19A71CYFG	QFP100 (14×20 mm)	
TMP19A71FYUG			56	8	2	2		19				4			2	10	Yes	Yes	75			TMP19A71CYUG	LQFP100 (14×14 mm)	
TMP19A23FYFG		24K	54	4	3	1	2	12				12					16	Yes	Yes	111	3.0 to 3.6		LQFP144 (20×20 mm)	
TMP19A23FYXBG			40	4	3	1	2	12				12					15	Yes	Yes	103				FBGA141 (9×9 mm)
TMP19A43FZXBG	384K	20K	40	8	3	3	1	16	2			16	8	4	48	Yes	Yes	Yes	143	(Note 1) 1.35 to 1.65	-20 to 85	TMP19A43CZXBG	FBGA193 (12×12 mm)	
TMP19A43FDXBG	512K	24K	40	8	3	3	1	16	2			16	8	4	48	Yes	Yes	Yes	143				TMP19A43CDXBG	
TMP19A61F10XBG	1024K	48K	54	8	9	2	2	32				36	4	4	16		Yes	Yes	212			TMP19A61C10XBG	FBGA289 (11×11 mm)	
TMP19A64F20BXBG	2048K	64K	54	8	7		1	24				11	10	4	20	Yes	Yes	Yes	209			TMP19A64C1DXBG	FBGA281 (13×13 mm)	

Note 1) A separate I/O power supply is required.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## TX19 Family: TX19A/H1 Series

### □Flash Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	UART/SIO (Ch)	UART/H/SIO (Ch)	UART (Ch)	I <sup>2</sup> C/SIO (Ch)	10-Bit AD Converter (Ch)	16-Bit Timer/Counter (Ch)	32-Bit Timer Output Compare (Ch)	32-Bit Timer Input Capture (Ch)	Motor Controller (Ch)	External Interrupt Pins (Pins)	RTC (Ch)	Dual Clocks	Debug Support Unit	I/O Ports (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package		
TMP19A44FDXBG	512K	32K	80	8	3	3		1	16	18	8	4		64	1	Yes	Yes	160	2.7 to 3.6	-20 to 85		FBGA241 (12×12 mm)		
TMP19A44FEXBG	768K	64K	80	8	3	3		1	16	18	8	4		64	1	Yes	Yes	160						
TMP19A44F10XBG	1024K		80	8	3	3		1	16	18	8	4		64	1	Yes	Yes	160						
TMP19A33F20NG	2048K	10K	64	8	5	3		3		2				11			Yes	49				SDIP64		
TMP19A33F20NG-OTP (Note 1)			64	8	5	3		3		2					11			Yes	49					

Note 1) The on-chip ROM can be programmed only once and can not be reprogrammed.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## TX19 Family: TX19A Series

### □Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	UART/SIO (Ch)	UART/HSIO (Ch)	UART (Ch)	I <sup>2</sup> C/SIO (Ch)	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	10-Bit DA Converter (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	32-Bit Timer Output Compare (Ch)	32-Bit Timer Input Capture (Ch)	Motor Controller (Ch)	External Interrupt Pins (Pins)	Dual Clocks	Debug Support Unit	I/O Ports (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Flash Version (See the datasheet for operating conditions.)	Package
TMP19A71CYFG	256K	10K	56	8	2		2		19				4			2	10	Yes	75	(Note 1) 1.35 to 1.65	-40 to 85	TMP19A71FYFG	QFP100 (14×20 mm)	
TMP19A71CYUG			56	8	2		2		19				4		2	10	Yes	75	TMP19A71FYUG			LQFP100 (14×14 mm)		
TMP19A43CZXBG	384K	20K	40	8	3	3		1	16	2			16	8	4		48	Yes	Yes			143	-20 to 85	TMP19A43FZXBG
TMP19A43CDXBG	512K	24K	40	8	3	3		1	16	2			16	8	4		48	Yes	Yes	143	TMP19A43FDXBG			
TMP19A61CDXBG		40K	54	8	9	2		2	32					36	4	4		16	Yes	212	TMP19A61F10XBG	FBGA289 (11×11 mm)		
TMP19A61C10XBG	1024K	48K	54	8	9	2		2	32				36	4	4		16	Yes	212	TMP19A64F20BXBG	FBGA281 (13×13 mm)			
TMP19A64C1DXBG	1536K	56K	54	8	7			1	24				11	10	4		20	Yes	Yes	209				

Note 1) A separate I/O power supply is required.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## TX19 Family: TX19A/H1 Series

### □Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	External Memory Interface	UART/SIO (Ch)	UART/HSIO (Ch)	I <sup>2</sup> C/SIO (Ch)	10-Bit AD Converter (Ch)	16-Bit Timer/Counter (Ch)	16-Bit PWM Generator (Ch)	CS/WAIT Controller (Ch)	Multiply-Accumulate (MAC)	External Interrupt Pins (Pins)	Watchdog Timer	Clock Gear	32-kHz Timer (for SW RTC)	RTC (ch)	Dual Clocks	Debug Support Unit	I/O Ports (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package
TMP19A31CYFG	NA	256K	80	8	Yes	5	5	2	12	16		6	Yes	16	Yes	Yes		1	Yes	Yes	96	2.7 to 3.6	-20 to 85	-	LQFP176 (24×24 mm)

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

# 8-Bit Microcontrollers for Automotive

## TLCS-870 Family: TLCS-870/C Series

### □Flash Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 1)	LED Driver (Ch)	CAN (Ch)	SEI (Ch)	SIO (Ch)	UART (Ch)	UART/I <sup>2</sup> C (Ch) (Note 3)	I <sup>2</sup> C (Ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 2))	Power-On Reset	Voltage Detecting Circuit	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package
TMP86FH92IDMG (Note 4)	16K	512	(1) 0.25 (2) 0.4	8		1		1	1			6		1	2	Yes	Yes	Yes	Yes	24	(1) 4.0 to 5.5 (2) 3.0 to 5.5	-40 to 85	TMP86CH92IDMG (Note 4) TMP86CH92SDMG ** (Note 4)	SSOP30

Note 1) Minimum instruction execution times (1) and (2) correspond to power supply voltages (1) and (2).

Note 2) The minimum instruction execution time in Low-Speed mode is 122 μs (at 32.768 kHz).

Note 3) Configurable as I<sup>2</sup>C or UART.

Note 4) Reliability testing includes AEC-Q100-Rev-F (July 18, 2003) in addition to Toshiba's standard tests (automotive grade).

- For further information about the I/R/S/T grade levels, please contact your nearest Toshiba sales representative.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*\* : Under development

## TLCS-870 Family: TLCS-870/C1 Series

### □Flash Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs)	LED Driver (Ch)	LCD Driver (Ch)	VFT Driver (Ch)	SEI (Ch)	SIO (Ch)	UART (Ch)	UART/SIO (Ch) (Note 1)	SEI/UART (Ch) (Note 3)	I <sup>2</sup> C/SIO (Ch) (Note 2)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	10-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Multiply-Accumulate (MAC)	Motor Controller (Ch) (Note 5)	Program Patch Logic	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 4))	Clock Gear	Power-On Reset	Voltage Detecting Circuit	On-Chip Debug Unit	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package	
TMP89FM82TDUG **	32K	2048	0.125	20						1	1		8			2			4	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	39	4.5 to 5.5	-40 to 125	-	LQFP48 (7×7 mm)

Note 1) Configurable as SIO or UART.

Note 2) Configurable as I<sup>2</sup>C or SIO. Up to two SIO channels can be used simultaneously.

Note 3) Configurable as SEI or UART.

Note 4) Only peripheral units remain active in Low-Speed mode.

Note 5) Enabled only in High-Speed mode.

- For further information about the I/R/S/T grade levels, please contact your nearest Toshiba sales representative.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*\* : Under development

## TLCS-870 Family: TLCS-870/C Series

### □Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 1)	LED Driver (Ch)	CAN (Ch) (Note 2)	SEI (Ch)	SIO (Ch)	UART (Ch)	UART/I <sup>2</sup> C (Ch) (Note 5)	I <sup>2</sup> C (Ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	16-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Watchdog Timer	Dual Clocks (Low-Speed Mode) (Note 4)	Power-On Reset	Voltage Detecting Circuit	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP/Flash Version (See the datasheet for operating conditions.)	Package
TMP86C408IDMG	4K	256	(1) 0.25 (2) 0.5	8	1			1			6	1	2	Yes	Yes			24	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85 -40 to 125 -40 to 85 -40 to 125	TMP86P808DMG	SSOP30	
TMP86C408SDMG				8	1	1			6	1	2	Yes	Yes			24							
TMP86C808IDMG				8	1	1			6	1	2	Yes	Yes			24							
TMP86C808SDMG				8	1	1			6	1	2	Yes	Yes			24							
TMP86C847IUG	8K	512	(1) 0.25 (2) 0.5	19		1	1				8	1	2	Yes	Yes			35	(1) 4.0 to 5.5 (2) 2.7 to 5.5	-40 to 85 -40 to 125 -40 to 125	TMP86PM47AUG TMP86PH47UG TMP86FH47AUG	LOFP44 (10×10 mm)	
TMP86C847SUG				19		1	1			8	1	2	Yes	Yes			35						
TMP86CH47IUG				19		1	1			8	1	2	Yes	Yes			35						
TMP86CH47SUG	16K	512	(1) 0.25 (2) 0.4	19		1	1				8	1	2	Yes	Yes			35	(1) 4.0 to 5.5 (2) 2.7 to 5.5	-40 to 85 -40 to 125	TMP86FH92IDMG (Note 6)	SSOP30	
TMP86CH92IDMG (Note 6)				8	1	1	1			6	1	2	Yes	Yes	Yes	Yes	24						
TMP86CH92SDMG (Note 6) **	8	1	1	1			6	1	2	Yes	Yes	Yes	Yes	24									
TMP86CH87RUG	32K	1024	0.25	8	(Note 3) 1	1	1				14	1	2	Yes	Yes			35	(1) 4.0 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86PM87RUG **	LOFP44 (10×10 mm)	
TMP86CM87RUG				8	(Note 3) 1	1	1			14	1	2	Yes	Yes			35						

Note 1) Minimum instruction execution times (1) and (2) correspond to power supply voltages (1) and (2).

\*\* : Under development

Note 2) There are four channels of mailboxes.

Note 3) Either the SEI or UART module should be selected via software.

Note 4) The minimum instruction execution time in Low-Speed mode is 122 μs (at 32.768 kHz).

Note 5) Configurable as I<sup>2</sup>C or UART.

Note 6) Reliability testing includes AEC-Q100-Rev-F (July 18, 2003) in addition to Toshiba's standard tests (automotive grade).

- For further information about the I/R/S/T grade levels, please contact your nearest Toshiba sales representative.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## TLCS-870 Family: TLCS-870/X Series

### □Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs)	LED Driver (Ch)	SIO (Ch)	UART (Ch)	10-Bit AD Converter (Ch)	16-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Motor Controller (Ch)	Watchdog Timer	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP Version (See the datasheet for operating conditions.)	Package
TMP88CH40IMG	16K	512	0.2	14	(Note 1) 1	(Note 1) 1	4	1	2	1	Yes	19	4.5 to 5.5	-40 to 85	TMP88PH40MG	SOP28

Note 1) Cannot be used at the same time because their I/O pins are multiplexed.

- For further information about the I/R/S/T grade levels, please contact your nearest Toshiba sales representative.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.



## 16-Bit Microcontrollers for Automotive

### TLCS-900 Family: TLCS-900/L1 Series

#### □Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 1)	CAN (16 Mailboxes) (Ch)	SEI (Ch)	UART/SIO (Ch)	I <sup>2</sup> C/SIO (Ch)	10-Bit AD Converter (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	32-kHz Timer (for SW RTC)	16-Bit PWM Generator (Ch)	CS/WAIT Controller (Ch)	PDC (Ch)	Watchdog Timer	Dual Clocks	Clock Gear	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Flash Version (See the datasheet for operating conditions.)	Package
TMP91CU27RUG **	96K	10K	0.148			2	1	4	6	1	Yes		3		Yes	Yes	Yes	53	2.7 to 3.6	-40 to 85	TMP91FW27UG	LQFP64 (10×10 mm)
TMP91CY22IFG	256K	16K	(1) 0.148 (2) 0.4			2	1	8	8	2	Yes		4		Yes	Yes	Yes	81	(1) 2.7 to 3.6 (2) 1.8 to 3.6		TMP91FY42FG	LQFP100 (14×14 mm)

Note 1) Minimum instruction execution times (1) and (2) correspond to power supply voltages (1) and (2).

\*\* : Under development

- For further information about the I/R/S/T grade levels, please contact your nearest Toshiba sales representative.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## 32-Bit Microcontrollers for Automotive

### TLCS-900 Family: TLCS-900/H1 Series

#### □Flash Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs)	CAN (16 Mailboxes) (Ch)	SEI (Ch)	UART/SIO (Ch)	I <sup>2</sup> C/SIO (Ch)	10-Bit AD Converter (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	RTC (Ch)	CS/WAIT Controller (Ch)	Watchdog Timer	Dual Clocks	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package
TMP92FD54AIFG (Note 1) **	512K	32K	0.05	1	1	2	3	12	8	2	1	1	Yes		68	4.5 to 5.25	-40 to 85	TMP92CD54IFG **	LQFP100 (14×14 mm)

Note 1) Contains voltage regulator.

\*\* : Under development

- For further information about the I/R/S/T grade levels, please contact your nearest Toshiba sales representative.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

### TLCS-900 Family: TLCS-900/H1 Series

#### □Mask ROM Versions

Part Number	ROM (Bytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs)	CAN (16 Mailboxes) (Ch)	SEI (Ch)	UART/SIO (Ch)	I <sup>2</sup> C/SIO (Ch)	10-Bit AD Converter (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	RTC (Ch)	CS/WAIT Controller (Ch)	Watchdog Timer	Dual Clocks	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Flash Version (See the datasheet for operating conditions.)	Package
TMP92CD54IFG (Note 1) **	512K	32K	0.05	1	1	2	3	12	8	2	1	1	Yes		68	4.5 to 5.25	-40 to 85	TMP92FD54AIFG **	LQFP100 (14×14 mm)

Note 1) Contains voltage regulator.

\*\* : Under development

- For further information about the I/R/S/T grade levels, please contact your nearest Toshiba sales representative.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

# TX03 Family: TX03 Series

## □Flash Versions

Part Number	ROM (Bytes)	SRAM (Bytes)	Maximum Operating Frequency (MHz)	CAN (ch)	DMA Controller (Ch)	SEI (ch)	UART/SIO (ch)	12-Bit AD Converter (Ch)	Timer/Compare (32 bit)(ch)	Timer/Capture (32 bit)(ch)	PWM (24 bit)	Motor Controller (Ch)	Resolver Digital Converter (RDC)	External Interrupt Pins (Pins)	Watchdog Timer	On-Chip Debug Unit	Trace Function	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Package
TMPM350FDTFG **	512K	48K	88	2	32	1	2	20	7	1	6	1		(Note 1) 1	Yes	Yes	Yes	43	4.5 to 5.5	-40 to 105	LQFP100 (14×14 mm)
TMPM354F10TFG **	1024K	64K	80	3	64	2	3	21	5	2	4	1	1	(Note 1) 1	Yes	Yes	Yes	56		-40 to 125	LQFP144 (20×20 mm)

Note 1) The seven capture inputs of the timer can be programmed as external maskable interrupts.

\*\* : Under development

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## 32-Bit Microprocessors

### TX39 Family

Part Number	Maximum Operating Frequency (MHz)	Internal Bus Width (Bits)	External Bus Width (Bits)	Instruction Cache (Kbytes)	Data Cache (Kbytes)	DMAC Channels (Ch)	I/O Ports (Pins)	Serial Interface (Ch)	Timer Channels (Ch)	External Interrupt Pins (Pins)	PCI Controller (MHz)	Debug Support Unit	Memory Controller	Others	Package
TMPR3912AUG-92 ☆	92	32	32	4	1		39	3	2	39			SDRAM, ROM, SRAM, Flash	LCD interface, PCMCIA, RTC	LQFP208
TMPR3912XB-92 ☆	92	32	32	4	1		39	3	2	39					FPGA217
TMPR3927CFE ☆	133	32	32	8	4	4	16	2	3	6	33	●	SDRAM, SRAM, ROM, Flash		QFP240

☆: Dry-packed

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## 64-Bit Microprocessors

### TX49 Family

Part Number	Maximum Operating Frequency (MHz)	Internal Bus Width (Bits)	External Bus Width (Bits)	Instruction Cache (Kbytes)	Data Cache (Kbytes)	DMAC Channels (Ch)	I/O Ports (Pins)	Serial Interface (Ch)	Timer Channels (Ch)	External Interrupt Pins (Pins)	PCI Controller (MHz)	Debug Support Unit	Memory Controller	Others	Package
TMPR4951BFG-200 ☆	200	64	32	16	8					1	4	●			LQFP100
TMPR4955BFG-200/300 ☆	200 /300	64	32	32	32					1	6	●	FPU		QFP160
TMPR4955CFG-400 ☆	400	64	32	32	32					1	6	●			QFP160
TMPR4956CXBG-400 ☆	400	64	64	32	32					1	6	●			PBGA217
TMPR4925XBG-200 ☆	200	64	32	16	16	4	32	2	3	8	33	●	NAND Flash, SDRAM, SRAM, ROM, NOR Flash	FPU, SPI, AC-Link, PCMCIA, RTC	PBGA256
TMPR4937XBG-300/333 ☆	300 /333	64	64	32	32	8	16	2	3	6	33/66	●	SDRAM, SRAM, ROM, NOR Flash	FPU, AC-Link	PBGA484
TMPR4938XBG-300/333 ☆	300 /333	64	64	32	32	8	16	2	3	6	33/66	●	NAND Flash, SDRAM, SRAM, ROM, NOR Flash	FPU, Ether MAC, SPI, AC-Link	PBGA484
TX4939XBG-400 ☆	400	64	32	32	32	8	101	4	6	7	33/66	●	NAND Flash, DDR-SDRAM, SRAM, ROM, NOR Flash	FPU, Ether MAC, ATA100, SPI, AC-Link/I <sup>2</sup> S, I <sup>2</sup> C, Video port, RTC, Crypt engine (AES, SHA1, etc.)	PBGA456
TX4961XBG-240 ☆	240	64	32	16	16	8	※	6	12	5		●	NAND Flash, DDR-SDRAM, SRAM, ROM, NOR Flash	Graphics controller, frame grabber, CAN controller, Media-LB interface, ADC, AC-Link controller	PBGA456
TX4964FG-120 ☆	120	64	16	8	8	4	※	4	6	7		●	SRAM, ROM, NOR Flash	Graphics controller, frame grabber, CAN controller, I <sup>2</sup> S controller	LQFP176
TX4966XBG-280 ☆	280	64	32	16	16	8	※	7	22	10		●	SDRAM, SRAM, ROM, NOR Flash	Graphics controller × 2, frame grabber × 2, APIX, RSDS, CAN controller, I <sup>2</sup> S controller	PBGA456

☆: Dry-packed

※: All I/O pins are configurable as general-purpose I/Os.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## 64-Bit Microprocessor Peripherals (PCI companion chip)

Part Number	Functions	Package
TC86C001FG (GOKU-S) ★	PCI interface (32 bit, 33 MHz) ATA/ATAPI host controller, Ultra DMA transfer (mode 4), maximum transfer rate = 66 MB/s USB1.1 host controller: 2 ports (OpenHCI 1.0a compatible) USB device controller: 1 port I <sup>2</sup> C/SIO Power supply voltage (I/O = 3.3 V, internal = 1.5 V)	LQFP144

★: Dry-packed

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

# Development System Tools

## TLCS-870/C Series (1/4)

### □ Software Products

Toshiba Integrated Development Environment	
C Compiler	Integrated Development Environment *1
SW89CN0-ZCC: 1 license SW89CN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses

- Choose either the RTE870/C model 15 In-Circuit Emulation system or the RTE870/C In-Circuit Emulation system.
- The TLCS-870/C Series software products run on the Japanese or English Microsoft® Windows® 2000, Microsoft® Windows® XP and Microsoft® Windows Vista®. Microsoft, Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- For the supported Programming tools, see the section "Programming Tools".
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

- \*1: The controller and In-Circuit Emulator comes with a single-seat download license for the Integrated Development Environment.
- \*2: The emulation chip is specifically designed for each target MCU. For availability status, contact your local Toshiba sales representative.
- \*3: One QFP adaptor and one pin protector are supplied with each QFP packaged product.  
When you purchase additional QFP adaptors or pin protectors, check their part numbers in the section "Spare Parts from Toshiba."
- \*4: These are ADLINKS's products.
- \*5: One IC socket is supplied with each target connection board. IC sockets are Yamaichi Electronics' products.

### □ Hardware Products

Target MCU		RTE870/C model 15 In-Circuit Emulation System						RTE870/C In-Circuit Emulation System																												
		Emulation Chip *2	model 15 In-Circuit Emulator			Accessory		Emulation Chip *2	In-Circuit Emulator	Accessory																										
Part Number	Package		Controller	Interface Module	Emulation Module	Target Connection Board *3	MCU Mount Adapter /IC Socket			Probe Set *4	Bump Socket *4 (MCU Mount Adapter)																									
TMP86P203PG	DIP20	TMP86C908XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D020NA0A	—	TMP86C908XBG	HW86EG000AG	AP20D3W-2	—																									
TMP86P203MG	SOP20					BMP86D020MC0A	IC253-020-0004-B *5			AP20S3T-2	BM-20S3T																									
TMP86CH06AUG	LOFP44 (10 x 10)	TMP86C906XB				BMP86D044DE0A	PN210020A	TMP86C906XBG		AP44QP	BM-44Q10P																									
TMP86PH06UG						BMP86D042NB0A	—			AP42D0U-2	—																									
TMP86CH06NG	SDIP42	TMP86C908XB				BMP86D028NB0A	—	TMP86C908XBG		AP28D4U	—																									
TMP86PH06NG						BMP86D028MC0A	IC253-028-0003-B *5			AP28S9T	BM-28S9T																									
TMP86C407NG	SDIP28	TMP86C908XB				BM1040R0B-G	BMP86A100010B	BMP86A200020A		BMP86D032NB0A	—	TMP86C909XBG	HW86EG000AG	AP32D4U	—																					
TMP86C807NG																BMP86D030MF1A	IC253-030-0002-B *5	AP30S3N-2	BM-30S3N																	
TMP86F807NG	SOP28	TMP86C908XB								BM1040R0B-G	BMP86A100010B	BMP86A200020A		BMP86D032NB0A	—	TMP86C909XBG	HW86EG000AG	AP32S9T	BM-32S9T																	
TMP86P807NG																				BMP86D030MF0A	IC253-030-0002-B *5	AP32D4U	—													
TMP86C407MG	SOP28	TMP86C908XB												BM1040R0B-G	BMP86A100010B	BMP86A200020A		BMP86D032NB0A	—	TMP86C909XBG	HW86EG000AG	AP32S9T	BM-32S9T													
TMP86C807MG																								BMP86D030MF0A	IC253-030-0002-B *5	AP30S3N	BM-30S3N									
TMP86F807MG	SSOP30	TMP86C908XB	BM1040R0B-G	BMP86A100010B	BMP86A200020A				BMP86D032NB0A									—	TMP86C909XBG	HW86EG000AG		AP32D4U	—													
TMP86P807MG																								BMP86D030MF0A	IC253-030-0002-B *5	AP30S3N	BM-30S3N									
TMP86C408DMG	SSOP30	TMP86C908XB							BM1040R0B-G									BMP86A100010B	BMP86A200020A			BMP86D032NB0A	—	TMP86C909XBG	HW86EG000AG	AP32D4U	—									
TMP86C408IDMG																												BMP86D030MF0A	IC253-030-0002-B *5	AP30S3N	BM-30S3N					
TMP86C808DMG	SSOP30	TMP86C908XB																				BM1040R0B-G	BMP86A100010B	BMP86A200020A		BMP86D032NB0A	—	TMP86C909XBG	HW86EG000AG	AP32S9T	BM-32S9T					
TMP86C808IDMG																																BMP86D030MF0A	IC253-030-0002-B *5	AP30S3N	BM-30S3N	
TMP86C808SDMG	SSOP30	TMP86C908XB				BM1040R0B-G	BMP86A100010B	BMP86A200020A					BMP86D032NB0A													—	TMP86C909XBG	HW86EG000AG		AP32D4U	—					
TMP86F808DMG																																BMP86D030MF0A	IC253-030-0002-B *5	AP30S3N	BM-30S3N	
TMP86P808DMG	SSOP30	TMP86C908XB								BM1040R0B-G	BMP86A100010B	BMP86A200020A	BMP86D032NB0A				—									TMP86C909XBG	HW86EG000AG			AP32S9T	BM-32S9T					
TMP86C809NG																																BMP86D030MF0A	IC253-030-0002-B *5	AP30S3N	BM-30S3N	
TMP86CH09NG	SDIP32	TMP86C909XB											BM1040R0B-G	BMP86A100010B	BMP86A200020A	BMP86D032NB0A	—				TMP86C909XBG					HW86EG000AG				AP32D4U	—					
TMP86FH09AMG	SOP32	—																														BM1040R0B-G	BMP86A100010B	BMP86A200020A	BMP86D032NB0A	—
TMP86FH09ANG	SDIP32	TMP86C909XB	BM1040R0B-G	BMP86A100010B	BMP86A200020A											BMP86D032NB0A	—			TMP86C909XBG	HW86EG000AG									AP32D4U	—					
TMP86F409NG		TMP86C912XB																																	BM1040R0B-G	BMP86A100010B
TMP86CH12MG	++	++							++							++	++	++	++	++																
TMP86FH12AMG **	SSOP30	++							++							++	++	++	++	++					++					++	++					

\*\* : Under development

++ : Under planning

## TLCS-870/C Series (2/4)

### Software Products

Toshiba Integrated Development Environment	
C Compiler	Integrated Development Environment *1
SW89CN0-ZCC: 1 license SW89CN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses

- Choose either the RTE870/C model 15 In-Circuit Emulation system or the RTE870/C In-Circuit Emulation system.
- The TLCS-870/C Series software products run on the Japanese or English Microsoft® Windows® 2000, Microsoft® Windows® XP and Microsoft® Windows Vista®. Microsoft, Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- For the supported Programming tools, see the section "Programming Tools".
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*1: The controller and In-Circuit Emulator comes with a single-seat download license for the Integrated Development Environment.

\*2: The emulation chip is specifically designed for each target MCU. For availability status, contact your local Toshiba sales representative.

\*3: One QFP adaptor and one pin protector are supplied with each QFP packaged product.

When you purchase additional QFP adaptors or pin protectors, check their part numbers in the section "Spare Parts from Toshiba."

\*4: These are ADLINKS's products.

### Hardware Products

Target MCU		RTE870/C model 15 In-Circuit Emulation System						RTE870/C In-Circuit Emulation System								
		Emulation Chip *2	model 15 In-Circuit Emulator			Accessory MCU Mount Adaptor /IC Socket	Emulation Chip *2	In-Circuit Emulator	Accessory							
Part Number	Package		Controller	Interface Module	Emulation Module				Target Connection Board *3	Probe Set *4	Bump Socket *4 (MCU Mount Adaptor)					
TMP86C420UG	LQFP64 (10 x 10)	TMP86C929AXB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D064DG0A	PN210033	TMP86C929AXBG	HW86EG000AG	AP64QM	BM-64Q10M					
TMP86C820UG						QFP64 (14 x 14)	BMP86D064DE0A			PN210026	AP64QP	BM-64Q14P				
TMP86P820UG							LQFP64 (10 x 10)			BMP86D064DG0A	PN210033	AP64QM	BM-64Q10M			
TMP86C420FG	QFP64 (14 x 14)									BMP86D064DE0A	PN210026	AP64QP	BM-64Q14P			
TMP86C820FG						LQFP44 (10 x 10)	TMP86C923XB					BMP86D044DE1A	PN210020A	TMP86C923XBG		AP44QP-2
TMP86P820FG	LQFP64 (10 x 10)											BMP86D064DG0A	PN210033			AP64QM
TMP86CH21AUG	LQFP64 (10 x 10)	++	++	++	++	++	++	++	++	++	++					
TMP86CH21FG												QFP64 (14 x 14)				
TMP86CH22UG	LQFP44 (10 x 10)	TMP86C923XB						TMP86C923XBG	HW86EG000AG	AP64QM	BM-64Q10M					
TMP86PH22UG																
TMP86CM23AUG	LQFP64 (10 x 10)	TMP86C923XB						TMP86C923XBG	HW86EG000AG	AP64QM	BM-64Q10M					
TMP86CP23AUG																
TMP86FS23AUG **	LQFP64 (10 x 10)	++	++	++	++	++	++	++	++	++	++					
TMP86PM23UG																
TMP86PS23UG	LQFP80 (12 x 12)	TMP86C923XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D064DG0A	PN210033	TMP86C923XBG	HW86EG000AG	AP64QM	BM-64Q10M					
TMP86FP24FG		TMP86C948XB			BMP86A200030A	BMP86D080DG1A	PN210008	—	—	—	—					
TMP86CS25ADFG	LQFP100 (14 x 14)	TMP86C925XB	BM1040R0B-G	BMP86A100010B	BMP86A200020A	BMP86D100DG0A	PN210023	TMP86C925XBG	HW86EG000AG	AP100QM-2	BM-100Q14M					
TMP86CM25AFG	QFP100 (14 x 20)					BMP86D100FF0A	PN210005A			AP100QN	BM-100Q142N					
TMP86CS25AFG		QFP100 (14 x 20)	TMP86C927XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D080FE0A	PN210002	TMP86C927XBG	HW86EG000AG	AP80QP	BM-80Q142P				
TMP86FM25FG																
TMP86PS25FG	QFP80 (14 x 20)	TMP86C927XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D080DG0A	PN210008	TMP86C989XBG	HW86EG000AG	AP80QM	BM-80Q12M					
TMP86CM27FG																
TMP86CP27AFG	QFP80 (14 x 20)	TMP86C989XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D080FE0A	PN210002	TMP86C989XBG	HW86EG000AG	AP80QP	BM-80Q142P					
TMP86FS27FG																
TMP86PS27FG	LQFP80 (12 x 12)	TMP86C989XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D080FE0A	PN210002	TMP86C989XBG	HW86EG000AG	AP80QP	BM-80Q142P					
TMP86CS28DFG		++				++	++	++	++	++	++	++	++	++		
TMP86FS28ADFG **	LQFP80 (12 x 12)	++	++	++	++	++	++	++	++	++	++					
TMP86CS28FG		++	++	++	++	++	++	++	++	++	++					
TMP86FS28AFG **	QFP80 (14 x 20)	++	++	++	++	++	++	++	++	++	++					

\*\* : Under development

++ : Under planning

## TLCS-870/C Series (3/4)

### □ Software Products

Toshiba Integrated Development Environment	
C Compiler	Integrated Development Environment *1
SW89CN0-ZCC: 1 license SW89CN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses

### □ Hardware Products

- Choose either the RTE870/C model 15 In-Circuit Emulation system or the RTE870/C In-Circuit Emulation system.
- The TLCS-870/C Series software products run on the Japanese or English Microsoft® Windows® 2000, Microsoft® Windows® XP and Microsoft® Windows Vista®. Microsoft, Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- For the supported Programming tools, see the section "Programming Tools".
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*1: The controller and In-Circuit Emulator comes with a single-seat download license for the Integrated Development Environment.

\*2: The emulation chip is specifically designed for each target MCU. For availability status, contact your local Toshiba sales representative.

\*3: One QFP adaptor and one pin protector are supplied with each QFP packaged product.

When you purchase additional QFP adaptors or pin protectors, check their part numbers in the section "Spare Parts from Toshiba."

\*4: These are ADLINKS's products.

\*5: These are top covers for IC packages. These are Tokyo Eletech's products.

Target MCU		RTE870/C model 15 In-Circuit Emulation System						RTE870/C In-Circuit Emulation System			
		Emulation Chip *2	model 15 In-Circuit Emulator			Accessory		Emulation Chip *2	In-Circuit Emulator	Accessory	
Part Number	Package		Controller	Interface Module	Emulation Module	Target Connection Board *3	MCU Mount Adapter /IC Socket			Probe Set *4	Bump Socket *4 (MCU Mount Adapter)
TMP86C829BUG	LQFP64 (10 x 10)	TMP86C929AXB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D064DGOA	PN210033	TMP86C929AXBG	HW86EG000AG	AP64QM	BM-64Q10M
TMP86CH29BUG											
TMP86CM29BUG											
TMP86CM29LUG											
TMP86FM29LUG											
TMP86PM29BUG											
TMP86C829BFG	QFP64 (14 x 14)	TMP86C944XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D064DE0A	PN210026	TMP86C944XBG	AP64QP	BM-64Q14P	
TMP86CH29BFG											
TMP86CM29BFG											
TMP86FM29BFG											
TMP86CS44UG	LQFP44 (10 x 10)	TMP86C944XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D044DE0A	PN210020A	TMP86C944XBG	AP44QP	BM-44Q10P	
TMP86PS44UG											
TMP86CH46ANG	SDIP42	TMP86C947XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D042NB1A	—	TMP86C947XBG	AP42D0U-3	—	
TMP86FH46BNG	SDIP42										
TMP86PH46NG											
TMP86PM46NG	LQFP44 (10 x 10)	TMP86C947XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D044DE0A	PN210020A	TMP86C947XBG	AP44QP	BM-44Q10P	
TMP86C847IUG											
TMP86C847SUG											
TMP86C847UG											
TMP86CH47AUG											
TMP86CH47IUG											
TMP86CH47SUG											
TMP86CM47AUG											
TMP86FH47BUG											
TMP86PH47UG											
TMP86PM47AUG											

## TLCS-870/C Series (4/4)

### Software Products

Toshiba Integrated Development Environment	
C Compiler	Integrated Development Environment *1
SW89CN0-ZCC: 1 license SW89CN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses

### Hardware Products

- Choose either the RTE870/C model 15 In-Circuit Emulation system or the RTE870/C In-Circuit Emulation system.
  - The TLCS-870/C Series software products run on the Japanese or English Microsoft® Windows® 2000, Microsoft® Windows® XP and Microsoft® Windows Vista®. Microsoft, Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
  - For the supported Programming tools, see the section "Programming Tools".
  - Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.
- \*1: The controller and In-Circuit Emulator comes with a single-seat download license for the Integrated Development Environment.  
 \*2: The emulation chip is specifically designed for each target MCU. For availability status, contact your local Toshiba sales representative.  
 \*3: One QFP adaptor and one pin protector are supplied with each QFP packaged product.  
 When you purchase additional QFP adaptors or pin protectors, check their part numbers in the section "Spare Parts from Toshiba."  
 \*4: These are ADLINKS's products.  
 \*5: One IC socket is supplied with each target connection board. IC sockets are Yamaichi Electronics' products.

Target MCU		RTE870/C model 15 In-Circuit Emulation System						RTE870/C In-Circuit Emulation System			
		Emulation Chip *2	model 15 In-Circuit Emulator			Accessory		Emulation Chip *2	In-Circuit Emulator	Accessory	
Part Number	Package		Controller	Interface Module	Emulation Module	Target Connection Board *3	MCU Mount Adaptor /IC Socket			Probe Set *4	Bump Socket *4 (MCU Mount Adapter)
TMP86FM48UG	LQFP64 (10 x 10)	TMP86C948XB	BM1040R0B-G	BMP86A100010B	BMP86A200030A	BMP86D064DG0A	PN210033	TMP86C948XBG	HW86EG000AG	AP64QM	BM-64Q10M
TMP86FM48FG	QFP64 (14 x 14)					BMP86D064DE0A	PN210026			AP64QP	BM-64Q14P
TMP86CS49UG	LQFP64 (10 x 10)	TMP86C949XB	—	—	BMP86A200010B	BMP86D064DG0A	PN210033	TMP86C949XBG	—	AP64QM	BM-64Q10M
TMP86FS49BUG										SDIP64	AP4D0U-2
TMP86PM49UG	LQFP64 (10 x 10)	TMP86C949XB	—	—	BMP86A200010B	BMP86D064DG0A	PN210033	TMP86C949XBG	—	AP64QM	BM-64Q10M
TMP86CS49FG	QFP64 (14 x 14)					BMP86D064DE0A	PN210026			AP64QP	BM-64Q14P
TMP86FS49BFG		QFP100 (14 x 20)	TMP86C964XB	—	—	BMP86A200020A	BMP86D100FF0A	PN210005A	TMP86C964XBG	—	AP100QN
TMP86PM49FG	AP64QP										BM-64Q14P
TMP86CS64AFG	QFP64 (14 x 14)	TMP86C972XB	—	—	BMP86A200010B	BMP86D064DE0A	PN210026	TMP86C972XBG	—	AP64QP	BM-64Q14P
TMP86PM72FG										AP80QP	BM-80Q142P
TMP86CK74AFG	QFP80 (14 x 20)	TMP86C974XB	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D080FE0A	PN210002	TMP86C974XBG	—	AP44QP	BM-44Q10P
TMP86CM74AFG										AP30S3N-4	BM-30S3N
TMP86PM74AFG	LQFP44 (10 x 10)	TMP86C987XB	—	—	BMP86A200020A	BMP86D044DE0A	PN210020A	TMP86C987XBG	—	AP32D4U-2	—
TMP86CH87RUG										AP32D4U-2	—
TMP86CM87RUG	SSOP30	TMP86C993XB	—	—	BMP86A200020A	BMP86D030MF3A	IC253-030-0002-B *5	TMP86C993XBG	—	AP30S3N-4	BM-30S3N
TMP86PM87RUG **										AP32D4U-2	—
TMP86CH92IDMG	SDIP32	—	—	—	BMP86D032NB1A	—	—	—	—	AP32D4U-2	—
TMP86CH92SDMG **										—	—
TMP86FH92IDMG	—	—	—	—	—	—	—	—	—	—	—
TMP86FH92DMG	—	—	—	—	—	—	—	—	—	—	—
TMP86FH93NG	—	—	—	—	—	—	—	—	—	—	—

\*\* : Under development



## TLCS-870/X Series

### □Software Products

Language Tool	Debugger
C Compiler & Assembler Set	
SW88YN0-ZCK: 1 license (Japanese edition) SW88YN0-ZCF: 1 license (English edition) SW88YN3-ZCK: 10 licenses (Japanese edition) SW88YN3-ZCF: 10 licenses (English edition)	SW88DN9-ZCK: 1 license (Japanese edition) SW88DN9-ZCF: 1 license (English edition) SW88DN3-ZCK: 10 licenses (Japanese edition) SW88DN3-ZCF: 10 licenses (English edition)

### □Hardware Products

Target MCU		RTE870/X model 15/25 In-Circuit Emulation System				
		In-Circuit Emulator		Accessory		
Part Number	Package	Controller *2	Emulation Pod	MCU Probe	Package Converter	MCU Mount Adapter /IC Socket /Top Cover for IC Package
TMP88CH40NG	SDIP28	BM1040R0B-G /BM1055R0C	BM88CS43F0A-GM	PN100003	PN200004	—
TMP88PH40NG						
TMP88CH40IMG	SOP28			PN200008	IC253-028-0003-B *4	
TMP88CH40MG						
TMP88PH40MG	LQFP44 (10 x 10)			TEC-044SA-PN1N0 *5	—	HOPACK044SA *5
TMP88CH41UG						
TMP88PH41UG						
TMP88FH41UG						
TMP88CH41NG	SDIP42			PN100002	PN200001	—
TMP88PH41NG						
TMP88PS42FG	QFP64 (14 x 20)			TEC-064RZ-T1/SET *5	—	HOPACK064RZ *5
TMP88PS42NG	SDIP64					
TMP88CS43FG	QFP80 (14 x 20)			TEC-080RA-T1/SET *1*5	—	HOPACK080RA178 *5
TMP88PS43FG						
TMP88FW45AFG	QFP80 (14 x 20)	BM88FW44F0A-GM	TEC-080RA-T1/SET *1*5	—	HOPACK080RA178 *5	
TMP88F846UG	LQFP44 (10 x 10)	BM88CS43F0A-GM	TEC-044SA-PN1N0 *5	—	HOPACK044SA *5	
TMP88CU74FG	QFP80 (14 x 20)	BM1055R0C	BM88CU74F0A	PN120004 *1	—	PN210002
TMP88PU74FG						
TMP88CS77FG	QFP100 (14 x 20)	BM88CP77F0A	PN120005 *1	—	PN210005A	
TMP88CU77FG						
TMP88PU77FG						

● The TLCS-870/X Series software products run on the Japanese or English Microsoft® Windows® 2000 and Microsoft® Windows® XP.

Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

● One QFP adapter and one pin protector are supplied with an MCU probe or a package converter whose name begins with "PN12".

When you purchase additional QFP adaptors or pin protectors, check their part numbers in the section "Spare Parts from Toshiba."

● For the supported Programming tools, see the section "Programming Tools".

● Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*1: These are spare parts. One spare part is supplied with each emulation pod.

\*2: "BM1040R0B-G/BM1055R0C" indicates that either one of them should be selected, the BM1040R0B-G when the model 15 controller is used and the BM1055R0C when the model 25 controller is used.

● For connection with the host system via RS-232C:

the BM1055R0C requires a 9-pin cross cable;

the BM1055R0B and BM1055R0A (old version) require a 25-pin straight cable;

the BM1040R0B-G requires a 25-pin straight cable.

● For connection with the emulation pod, the BM1055R0A, the old version of the controller, requires the PN300001.

\*3: One IC socket is supplied with each MCU probe. IC sockets are Yamaichi Electronics' product.

\*4: One IC socket is supplied with the package converter. The IC socket is Yamaichi Electronics' product.

\*5: These are Tokyo Eletech's products.

# TLCS-870/C1 Series

## □ Software Products

Toshiba Integrated Development Environment	
C Compiler	Integrated Development Environment *1
SW89CN0-ZCC: 1 license SW89CN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses

## □ Hardware Products

Target MCU		RTE870/C1 On-Chip Debug Emulation System		RTE870/C1 In-Circuit Emulation System				
		On-Chip Debug Emulator	Accessory	In-Circuit Emulator	Emulation Chip *3	Accessory *4		
Part Number	Package		Connector *2			Probe Set	Bump Socket (MCU Mount Adapter)	
TMP89FH00DUG	LQFP48 (7 x 7)	BMP89A400010A-G	FTSH-110-01-L-DV-K	—	—	—	—	
TMP89FH00WBG	WCSP39 (3.8 x 3.8)							
TMP89FW20AUG	LQFP64 (10 x 10)	**	**	—	—	—	—	
TMP89FW24ADFG	QFP80 (14 x 20)							
TMP89FW24AFG	LQFP80 (12 x 12)							
TMP89FS28LFG	QFP179 (20 x 20)	BMP89A400010A-G	FTSH-110-01-L-DV-K	BMP89A300010A-G	TMP89C900XBG	**	AP42D0U-4	—
TMP89FM40NG	SDIP42							
TMP89FH40NG								
TMP89FM42UG	LQFP44 (10 x 10)							
TMP89FM42LUG								
TMP89FM42AUG								
TMP89FM42KUG								
TMP89FH42UG								
TMP89FH42LUG								
TMP89CM42UG								
TMP89CH42UG	—	—						
TMP89FM43KQG	VOON44 (5.3 x 5.3)	BMP89A400010A-G	FTSH-110-01-L-DV-K	—	—	—	—	
TMP89FM43LQG								
TMP89FM46DUG	LQFP48 (7 x 7)	BMP89A400010A-G	FTSH-110-01-L-DV-K	BMP89A300010A-G	TMP89C900XBG	**	AP48QM-3	BM-48Q7M
TMP89FM46ADUG								
TMP89FM46KDUG								
TMP89FH46DUG								
TMP89FH46LDUG								
TMP89CM46DUG								
TMP89CH46DUG							—	—
TMP89FS60UG	LQFP64 (10 x 10)	BMP89A400010A-G	FTSH-110-01-L-DV-K	—	—	—	AP64QM-2	BM-64Q10M
TMP89FS60FG	QFP64 (14 x 14)						AP64QP-2	BM-64Q14P
TMP89FM82DUG	LQFP48 (7 x 7)						—	—
TMP89FM82TDUG		**						

- Choose either the On-Chip Debug Emulator or the In-Circuit Emulator. \*\*: Under development
  - The TLCS-870/C1 Series software products run on the Japanese or English Microsoft® Windows® 2000, Microsoft® Windows® XP and Microsoft® Windows Vista®. Microsoft, Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
  - For the supported Programming tools, see the section "Programming Tools".
  - Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.
- \*1: The emulator comes with a single-seat download license for the Integrated Development Environment.
- \*2: One spare part is supplied with each On-Chip Debug Emulator. These are Samtec's products. The part number shown here denotes surface mount type with keying shroud (recommended). Other mount types, such as through-hole, and other mating options are also available.  
For the specifications and purchase inquiries about this product, please contact the supplier Samtec, Inc. The recommended connector can also be purchased from it-sim corporation, Sophia Systems Co., Ltd. and UNIDUX INC.
- \*3: The emulation chip is specifically designed for each target MCU. For availability status, contact your local Toshiba sales representative.
- \*4: These are ADLINKS's products.

## TLCS-900 Family (1/4)

### □Software Products

Toshiba Integrated Development Environment		Real-Time OS (μTRON 3.0)
C Compiler	Integrated Development Environment *1	
SW96CN0-ZCC: 1 license SW96CN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses	SW96RN2-ZCC: Object code can be freely copied. SW96RNC-ZCC: Object code can be freely copied and comes with source code.

### □Hardware Products

Target MCU		RTE900 model 15/25 In-Circuit Emulation System					
		In-Circuit Emulator		Accessory			
Part Number	Package	Controller *2	Emulation Pod	MCU Probe/Probe Set	Package Converter	MCU Mount Adapter	
TMP91CU10FG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91CU10F0B-M15 *4	PN120013 *3	—	PN210023	
TMP91PW10FG			BM91CW11F0B-M15	PN120013 *3	—	PN210023	
TMP91CW11FG	LQFP100 (14 x 14)	BM1040R0B-G	BM91CW12AF0A-M15 *5	PN120013 *3	—	PN210023	
TMP91CW12AFG			BM91CW12F0A-M15	PN120013 *3	—	PN210023	
TMP91C016FG	LQFP100 (14 x 14)	BM1040R0B-G	BM91C016F0A-M15 *5	PN120013 *3	—	PN210023	
TMP91C219FG	LQFP100 (14 x 14)	BM1040R0B-G	BM91C219F0A-M15	PN120013 *3	—	PN210023	
TMP91C820AFG	LQFP144 (16 x 16)	/BM1055R0C	BM91CM20F0A-M15	PN120044 *3	—	PN210044 *3	
TMP91CY22FG	LQFP100 (14 x 14)	BM1040R0B-G	BM91CW12AF0A-M15 *5	PN120013 *3	—	PN210023	
TMP91CY22IFG							
TMP91CU27FG	QFP64 (14 x 14)	BM1040R0B-G	BM91CW12AF0A-M15 *5	TEC-064SA-T2/SET *6	—	HQPAC064SA *7	
TMP91FW27FG							
TMP91CK27UG	LQFP64 (10 x 10)	BM1040R0B-G	BM91CW12AF0A-M15 *5	PN120013 *3	PN120065-G	PN210033	
TMP91CP27UG							
TMP91CU27UG							
TMP91CU27RUG **							
TMP91FW27UG							
TMP91C630FG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91C630F0A-M15	PN120013 *3	—	PN210023	
TMP91CW40FG	LQFP100 (14 x 14)		BM91CW40F0A-M15	PN120013 *3	—	PN210023	
TMP91FW40FG		BM1040R0B-G	BM91CW12AF0A-M15	PN120013 *3	—	PN210023	
TMP91FY42FG	LQFP100 (14 x 14)	BM1040R0B-G	BM91CW12AF0A-M15	PN120013 *3	—	PN210023	
TMP91CW60FG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91CW60F0A-M15	PN120013 *3	—	PN210023	
TMP91CW60DFG	QFP100 (14 x 20)			TEC-100RB-T1/SET *6	—	HQPAC100RB179 *7	
TMP91FU62FG	LQFP80 (12 x 12)			TEC-080SD-T2/SET *6	—	HQPAC080SD *7	
TMP91FU62DFG	QFP80 (14 x 20)			TEC-080RA-T2/SET *6	—	HQPAC080RA178 *7	
TMP91FW64FG	LQFP100 (14 x 14)			TEC-100SD-T1/SET *6	—	HQPAC100SD *7	
TMP91FW64DFG	QFP100 (14 x 20)			BM91FW64F0A-GM	TEC-100RB-T1/SET *6	—	HQPAC100RB179 *7
					TEC-100RB-T1/SET *6	—	HQPAC100RB179 *7

● The TLCS-900 Family software products run on the Japanese or English Microsoft® Windows® 2000, Microsoft® Windows® XP, Microsoft® Windows Vista®. Microsoft, Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

\*\* : Under development

- The real-time OS requires a license agreement. For details, please contact your local Toshiba sales representative.
- One QFP adaptor and one pin protector are supplied with an MCU probe or a package converter whose name begins with "PN12." When you purchase additional QFP adaptors or pin protectors, check their part numbers in the section "Spare Parts from Toshiba."
- For the supported Programming tools, see the section "Programming Tools".
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*1: The controller comes with a single-seat download license for the Integrated Development Environment.

\*2: "BM1040R0B-G/BM1055R0C" indicates that either one of them should be selected, the BM1040R0B-G when the model 15 controller is used and the BM1055R0C when the model 25 controller is used.

- For connection with the host system via RS-232C:
  - the BM1055R0C requires a 9-pin cross cable;
  - the BM1055R0B and BM1055R0A (old version) require a 25-pin straight cable;
  - the BM1040R0B-G requires a 25-pin straight cable.
- The previous version of the controller requires a dedicated cable shown below. For details, contact your local Toshiba sales representative.
  - To perform a performance analysis and a coverage measurement using the BM1055R0B with an MCU whose name begins with "TMP92", the PN300007 is required.
  - BM1055R0A: The PN300001 is required. The BM1055R0A cannot be used for an MCU whose name begins with "TMP92".

\*3: These are spare parts. One spare part is supplied with each emulation pod.

\*4: To operate the TMP91CU10FG at 2 V on the target board, a 2-V conversion adaptor (PN410001) is required. For information about the 2-V conversion adaptor, contact your local Toshiba sales representative.

\*5: 2-V operation is not supported.

\*6: These are Tokyo Eletech's products.

\*7: These are top covers for IC packages. These are Tokyo Eletech's products.

## TLCS-900 Family (2/4)

### □ Software Products

Toshiba Integrated Development Environment		Real-Time OS (μTRON 3.0)
C Compiler	Integrated Development Environment *1	
SW96CN0-ZCC: 1 license SW96CN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses	SW96RN2-ZCC: Object code can be freely copied. SW96RNC-ZCC: Object code can be freely copied and comes with source code.

### □ Hardware Products

Target MCU		Emulation System				
Part Number	Package	Emulator		Accessory		
		Controller *2	Emulation Pod/Emulator	MCU Probe/Probe Set	MCU Mount Adapter / Top Cover for IC Package	Communication Cable: Connector
TMP92C820FG	LQFP144 (16 x 16)	BM1040R0B-G /BM1055ROC	BM92C820F0A-M15	PN120044 *3	PN210044 *3	—
TMP92CH21FG			BM92CH21F0A-M15	PN120044 *3	PN210044 *3	—
TMP92CM22FG	LQFP100 (14 x 14)		BM92CM22F0A-M15	PN120013 *3	PN210023	—
TMP92CY23FG	LQFP100 (14 x 14)		BM92CY23F0A-M15	PN120013 *3	PN210023	—
TMP92CY23DFG	QFP100 (14 x 20)			TEC-100RB-T1/SET *4	HQPACK100RB179 *4	—
TMP92CA25FG	LQFP144 (16 x 16)		BM92CA25F0A-M15	PN120044 *3	PN210044 *3	—
TMP92CZ26AXBG	FBGA228 (15 x15)	—	HW92DG000AG	—	—	FTSH-110-01-L-DV-K *5 *6
TMP92CF26AXBG		—	—	—	—	—
TMP92CM27FG	LQFP144 (16 x 16)	BM1040R0B-G /BM1055ROC	BM92CM27F0A-M15	PN120044 *3	PN210044 *3	—
TMP92CD28AFG	LQFP100 (14 x 14)		BM92CD28F0A-GM	PN120013 *3	PN210023	—
TMP92FD28AFG			—	—	—	—
TMP92CF29AFG	LQFP176 (20 x 20)	—	HW92DG000AG + BMC92CF29F0A-G *7	—	HOPACK176SE *4	—
TMP92CF30FG	LQFP176 (20 x 20)		—	—	—	—
TMP92CD54IFG **	LQFP100 (14 x 14)	BM1040R0B-G /BM1055ROC	BM92CY54F0A-M15	PN120013 *3	PN210023	—
TMP92FD54AIFG **						
TMP92CD23AFG	LQFP100 (14 x 14)	—	HW92ES230AG	TEC-100SD-T1/SET *4	HOPACK100SD *4	—
TMP92FD23AFG				TEC-100RB-T1/SET *4	HOPACK100RB179 *4	—
TMP92CD23ADFG						
TMP92FD23ADFG	QFP100 (14 x 20)	—	—	—	—	—

● The TLCS-900 Family software products run on the Japanese or English Microsoft® Windows® 2000, Microsoft® Windows® XP, Microsoft® Windows Vista®. \*\*: Under development  
Microsoft, Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

- The real-time OS requires a license agreement. For details, please contact your local Toshiba sales representative.
- One QFP adaptor and one pin protector are supplied with an MCU probe or a package converter whose name begins with "PN12."  
When you purchase additional QFP adaptors or pin protectors, check their part numbers in the section "Spare Parts from Toshiba."
- For the supported Programming tools, see the section "Programming Tools".
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*1: The controller comes with a single-seat download license for the Integrated Development Environment.

\*2: "BM1040R0B-G/BM1055ROC" indicates that either one of them should be selected, the BM1040R0B-G when the model 15 controller is used and the BM1055ROC when the model 25 controller is used.

- For connection with the host system via RS-232C:  
the BM1055ROC requires a 9-pin cross cable;  
the BM1055R0B and BM1055R0A (old version) require a 25-pin straight cable;  
the BM1040R0B-G requires a 25-pin straight cable.
- The previous version of the controller requires a dedicated cable shown below. For details, contact your local Toshiba sales representative.  
To perform a performance analysis and a coverage measurement using the BM1055R0B with an MCU whose name begins with "TMP92", the PN300007 is required.  
BM1055R0A: The PN300001 is required. The BM1055R0A cannot be used for an MCU whose name begins with "TMP92".

\*3: These are spare parts. One spare part is supplied with each emulation pod.

\*4: These are Tokyo Eletech's products.

\*5: These are Samtec's products. The part number shown here denotes surface mount type with keying shroud (recommended). Other mount types, such as through-hole, and other mating options are also available.  
For the specifications and purchase inquiries about this product, please contact the supplier Samtec, Inc. The recommended connector can also be purchased from it-sim corporation, Sophia Systems Co., Ltd. and UNIDUX INC.

\*6: One spare part is supplied with each emulator.

\*7: The BMC92CF29F0A-G is an in-circuit adaptor and should be purchased together with the emulator.

## TLCS-900 Family (3/4)

### □Software Products

Toshiba Integrated Development Environment		Real-Time OS (μITRON 3.0)
C Compiler	Integrated Development Environment *1	
SW96CN0-ZCC: 1 license SW96CN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses	SW96RN2-ZCC: Object code can be freely copied. SW96RNC-ZCC: Object code can be freely copied and comes with source code.

### □Hardware Products

Target MCU		RTE900 model 15/25 In-Circuit Emulation System				
		In-Circuit Emulator		Accessory		
Part Number	Package	Controller *2	Emulation Pod	MCU Probe	Package Converter	MCU Mount Adapter
TMP93CS20FG	LQFP144 (16 x 16)	BM1040R0B-G /BM1055R0C	BM93CS20F0B-M15	PN120044 *3	—	PN210044 *3
TMP93PW20AFG			BM93CS32F0B-M15	PN120039A *3	PN120063	PN210020A
TMP93CS36UG	LQFP100 (14 x 14)		BM93CM40F0C-M15	PN120013 *3	—	PN210023
TMP93CW40DFG						
TMP93PW40DFG	LQFP100 (14 x 14)		BM93CS44F0B-M15	PN120042 *3	—	PN210008
TMP93CW41DFG						
TMP93PS44FG	LQFP80 (12 x 12)		BM93CS44F0B-M15	PN120009	—	PN210002
TMP93CW44DFG	QFP80 (14 x 20)					
TMP93PW44ADFG						

● The TLCS-900 Family software products run on the Japanese or English Microsoft® Windows® 2000, Microsoft® Windows® XP, Microsoft® Windows Vista®.

Microsoft, Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

● The real-time OS requires a license agreement. For details, please contact your local Toshiba sales representative.

● One QFP adaptor and one pin protector are supplied with an MCU probe or a package converter whose name begins with "PN12."

When you purchase additional QFP adaptors or pin protectors, check their part numbers in the section "Spare Parts from Toshiba."

● For the supported Programming tools, see the section "Programming Tools".

● Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*1: The controller comes with a single-seat download license for the Integrated Development Environment.

\*2: "BM1040R0B-G/BM1055R0C" indicates that either one of them should be selected, the BM1040R0B-G when the model 15 controller is used and the BM1055R0C when the model 25 controller is used.

● For connection with the host system via RS-232C:

the BM1055R0C requires a 9-pin cross cable;

the BM1055R0B and BM1055R0A (old version) require a 25-pin straight cable;

the BM1040R0B-G requires a 25-pin straight cable.

● The previous version of the controller requires a dedicated cable shown below. For details, contact your local Toshiba sales representative.

To perform a performance analysis and a coverage measurement using the BM1055R0B with an MCU whose name begins with "TMP92", the PN300007 is required.

BM1055R0A: The PN300001 is required. The BM1055R0A cannot be used for an MCU whose name begins with "TMP92".

These are spare parts. One spare part is supplied with each emulation pod.

\*3: These are spare parts. One spare part is supplied with each emulation pod.

## TLCS-900 Family (4/4)

### □Software Products

Toshiba Integrated Development Environment		Real-Time OS (μITRON 3.0)
C Compiler	Integrated Development Environment *1	
SW96CN0-ZCC: 1 license SW96CN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses	SW96RN2-ZCC: Object code can be freely copied. SW96RNC-ZCC: Object code can be freely copied and comes with source code.

### □Hardware Products

Target MCU		RTE900 model 15/25 In-Circuit Emulation System								
		In-Circuit Emulator		Accessory						
Part Number	Package	Controller *2	Emulation Pod	MCU Probe	Package Converter	MCU Mount Adapter				
TMP94C251ADFG	LQFP144 (20 x 20)	BM1056R0B ##	BM94C251F0A	PN120050 *3	—	PN210036				
TMP95C001FG	QFP64 (14 x 14)	BM1040R0B-G /BM1055R0C	BM95C001F0B-M15	PN120039A *3	—	PN210026				
TMP95C061BDFG	LQFP100 (14 x 14)		BM95C061F0C-M15	PN120013 *3	—	PN210023				
TMP95C061BFG	QFP100 (14 x 14)	BM10R0B-G /BM1055R0C	BM95C061F0C-M15	PN120013 *3	—	PN210023				
TMP95C063DFG	LQFP144 (20 x 20)	BM1040R0B-G /BM1055R0C	BM95C063F0B-M15	PN120027 *3	—	PN210036				
TMP95CS64FG	LQFP100 (14 x 14)		BM95CS64F0B-M15	PN120013 *3	—	PN210023				
TMP95PW64FG										
TMP95C265FG	LQFP100 (14 x 14)									
TMP95CW65FG										
TMP95CS66FG	LQFP100 (14 x 14)									
TMP96C041BFG	QFP80 (14 x 20)						BM1040R0B-G /BM1055R0C	BM96C141F0D-M15	PN120009 *3	—
TMP96C141BFG										

● The TLCS-900 Family software products run on the Japanese or English Microsoft® Windows® 2000, Microsoft® Windows® XP, Microsoft® Windows Vista®.

Microsoft, Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

● The real-time OS requires a license agreement. For details, please contact your local Toshiba sales representative.

● One QFP adaptor and one pin protector are supplied with an MCU probe or a package converter whose name begins with "PN12."

When you purchase additional QFP adaptors or pin protectors, check their part numbers in the section "Spare Parts from Toshiba."

● For the supported Programming tools, see the section "Programming Tools".

● Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

##: Contact your local Toshiba sales representative before ordering products.

\*1: The controller comes with a single-seat download license for the Integrated Development Environment (excluding the BM1056R0B).

\*2: "BM1040R0B-G/BM1055R0C" indicates that either one of them should be selected, the BM1040R0B-G when the model 15 controller is used and the BM1055R0C when the model 25 controller is used.

● For connection with the host system via RS-232C:

the BM1055R0C requires a 9-pin cross cable;

the BM1055R0B and BM1055R0A (old version) require a 25-pin straight cable;

the BM1040R0B-G requires a 25-pin straight cable.

● The previous version of the controller requires a dedicated cable shown below. For details, contact your local Toshiba sales representative.

To perform a performance analysis and a coverage measurement using the BM1055R0B with an MCU whose name begins with "TMP92", the PN300007 is required.

BM1055R0A: The PN300001 is required. The BM1055R0A cannot be used for an MCU whose name begins with "TMP92".

\*3: These are spare parts. One spare part is supplied with each emulation pod.

\*4: To connect the BM96C031F0A to the controller (BM1055R0B), a dedicated adaptor is required. For details, please contact your local Toshiba sales representative.

# TX19A Series

## □Software Products

Toshiba Integrated Development Environment		Real-Time OS (μITRON 4.0)
C Compiler	Integrated Development Environment *1	
SW1ACN0-ZCC: 1 license SW1ACN3-ZCC: 10 license	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 license	SW1ARN5-ZCC: Object code can be freely copied. SW1ARNF-ZCC: Object code can be freely copied and comes with source code.

## □Hardware Products

Target MCU	RTE19A model 110 On-Chip Debug Emulation System		RTE19A model 120 On-Chip Debug Emulation System	
	On-Chip Debug Emulator	Accessory	On-Chip Debug Emulator	Accessory
		Communication Cable: Connector		Communication Cable: Connector
TMP19A23FYFG	BM1210R0A	FFSD-10-D-9.00-01-N: FTSH-110-01-F-D-K *2 FFSD-17-D-8.00-01-N: FTSH-117-01-F-D-K	BM1211R0A	FFSD-10-D-9.00-01-N: FTSH-110-01-F-D-K *2 FFSD-17-D-8.00-01-N: FTSH-117-01-F-D-K FFSD-10-D-8.00-01-N: FTSH-110-01-F-D-K
TMP19A23FYXBG				
TMP19A43CDXBG				
TMP19A43CZXBG				
TMP19A43FZXBG				
TMP19A43FDXBG				
TMP19A61C10XBG				
TMP19A61CDXBG				
TMP19A61F10XBG				
TMP19A64C1DXBG				
TMP19A64F20BXBG				
TMP19A71CYUG				
TMP19A71CYFG				
TMP19A71FYFG				
TMP19A71FYUG				

- Choose either the RTE19A model 110 On-Chip Debug Emulation system RTE19A model 120 On-Chip Debug Emulation system.
- The TX19A Series software products run on the Japanese or English Microsoft® Windows® 2000, Microsoft® Windows® XP and Microsoft® Windows Vista®. Microsoft, Windows and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- The real-time OS requires a license agreement. For details, please contact your local Toshiba sales representative.
- For the supported Programming tools, see the section "Programming Tools".
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*1: The emulator comes with a single-seat download license for the Integrated Development Environment.

\*2: These communication cables and connectors are provided by Samtec, Inc. Each emulator comes with a communication cable. If you need an additional communication cable, please contact Samtec directly. A connector must be purchased separately. The part numbers listed here denote connectors with through-hole leads. Other options, such as surface-mount leads and ejectors, are also available. For details, please visit Samtec's website.

FFSD-10-D-9.00-01-N: Communication cable for EJTAG (20 pin)	FTSH-110-01-F-D-K: EJTAG Connector (20 pin)
FFSD-17-D-8.00-01-N: Communication cable for TPC (34 pin)	FTSH-117-01-F-D-K: TPC Connector (34 pin)
FFSD-10-D-8.00-01-N: Communication cable for TPD (20 pin)	FTSH-110-01-F-D-K: TPD Connector (20 pin)

## TX19A/H1 Series

### □Software Products

Toshiba Integrated Development Environment		Real-Time OS (μITRON 4.0)
C Compiler	Integrated Development Environment *1	
SW1ACN0-ZCC: 1 license SW1ACN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses	SW1ARN5-ZCC: Object code can be freely copied. SW1ARNF-ZCC: Object code can be freely copied and comes with source code.

### □Hardware Products

Target MCU	RTE19A/H1 Light On-Chip Debug Emulation System		
	On-Chip Debug Emulator	Accessory	
		Communication Cable *2	Connector *2
TMP19A31CYFG	HW19DG100AG	FFSD-10-D-07.00-01-N	FTSH-110-01-L-DV-K *3
TMP19A33F20NG			
TMP19A33F20NG-OTP	HW19DG100AG *4		
TMP19A44FDXBG	HW19DG100AG		
TMP19A44FEXBG			
TMP19A44F10XBG			

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● The real-time OS requires a license agreement. For details, please contact your local Toshiba sales representative.

● Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*1: The emulator comes with a single-seat download license for the Integrated Development Environment.

\*2: These communication cables and connectors are provided by Samtec, Inc. One communication cable and one connector are supplied with each emulator.

\*3: One spare part is supplied with each emulator. The part number shown here denotes surface mount type with keying shroud (recommended). Other mount types, such as through-hole, and other mating options are also available.

For the specifications and purchase inquiries about this product, please contact the supplier Samtec, Inc. The recommended connector can also be purchased from it-sim corporation, Sophia Systems Co., Ltd. and UNIDUX INC.

\*4: The TMP19A33F20NG is required for debugging.



## TX49 Family

### □Hardware Products

Reference Board	Target MPU		Functions
	Part Number		
RBTX4951	TMPR4951BFG-200		These are reference boards for evaluating the TMPR4951 and TMPR 4955 respectively. Since both the TMPR4951 and TMPR 4955 have the SysAD Bus interface, the same board can be used for evaluation: the RBTX4951 and RBTX4955 simply come with different CPUs.
	RBHMA4601(CE)		
RBTX4955	TMPR4955CFG-400		These reference boards have a system controller (SysAD bridge), a NOR flash ROM, a DIMM DRAM, an SIO, an Ethernet controller, an I/O controller, and an EEPROM and an RTC connected to the SPI. Also, the reference boards provide an EJTAG connector, a ROM emulator connector and an expansion connector.
	RBHMA4605(CE)		
RBTX4925	TMPR4925XBG-200 RBHMA4300(CE)		This is a PCI-card-compliant reference board for evaluating the TMPR4925. This board has a CPU, a flash ROM, an SDRAM, a PCI controller, an Ethernet controller, an SIO interface, and PCMCIA and SmartMedia™ card slots. It also provides an expansion connector.
RBTX4937	TMPR4937XBG-300/333		This is a PCI-card-compliant reference board for evaluating the TMPR4937. This board has a CPU, a flash ROM, an SDRAM, an Ethernet controller and an SIO interface. It also provides a connector that can be connected to an external AC'97 board.
	RBHMA4400(CE)		
RBTX4938	TMPR4938XBG-300/333		This is a PCI-card-compliant reference board for evaluating the TMPR4938. This board has a CPU, a 128-MB SO-DIMM DRAM, a 16-MB NOR flash ROM, a detachable 32-MB NAND flash ROM and a PCI controller. On-chip features include an Ethernet controller, a debug Ethernet, an SIO, an ATA (IDE), an AC-Link interface, and an EEPROM and an RTC connected to the SPI. It also provides an expansion connector.
	RBHMA4500(CE)		
RBTX4939	TX4939XBG-400		This is an ATX-compliant reference board for evaluating the TX4939. It mainly consists of two modules: an independent CPU module having a DDR-SDRAM and an EJTAG interface, and a BASE board with a CPU module that allows the on-chip PCI, ATA, Ethernet MAC (RMII) and Video/Audio to be evaluated.
	RBHMS4700(CE)		
RBTC86C1	TC86C001FG(GOKU-S)		This is a reference board is compliant with the PCI card edge specification (3.3 V, 33-MHz, 32-bit) and is used to evaluate the TC86C001FG. It has a connector to which the ATA/ATAPI, two USB 1.1 host channels, a USB 1.1 device, I <sup>2</sup> C and SIO channels can be attached.
	RBHPE4300(CE)		
RBHBK4400	—		This is a backplane board that can be used for system evaluation in conjunction with a PCI-compliant referenced board. It consists of a PCI-card-type CPU board and four PCI bard slots. A commercially-available ATX-compliant power supply may be used.
	RBHBK4400(CE)		

● Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## Programming Tools (1/3)

Target MCU			OTP Programming	Flash Programming	
Family/Series	Part Number	Package	OTP Programming Adapter	Off-Board Programming *2	On-Board Programming *3
				FLASH Adapter *4	FLASH Writer: BM11401W0A-G *4 Connector: FTSH-110-01-L-DV-K *5
TLCS-870/C Series	TMP86P203MG	SOP20	BM11704		
	TMP86P203PG	DIP20	BM11203		
	TMP86PH06NG	SDIP42	BM11155	—	—
	TMP86PH06UG	LQFP44 (10 x 10)	BM11656		
	TMP86F807MG	SOP28	—	PN410117	⊙
	TMP86F807NG	SDIP28	—	PN410119	⊙
	TMP86P807MG	SOP28	BM11684	—	—
	TMP86P807NG	SDIP28	BM11197-G		
	TMP86F808DMG	SSOP30	—	PN410118	⊙
	TMP86F808NG	SDIP30	—	PN410119	⊙
	TMP86P808DMG	SSOP30	BM11683	—	—
	TMP86P808NG	SDIP30	BM11210		
	TMP86F409NG	SDIP32	—	PN410119	⊙
	TMP86FH09AMG	SOP32	—	—	⊙
	TMP86FH09ANG	SDIP32	—	PN410119	⊙
	TMP86FH12AMG	SSOP30	—	++	++
	TMP86P820FG	QFP64 (14 x 14)	BM11663		
	TMP86P820UG	LQFP64 (10 x 10)	BM11662-G	—	—
	TMP86PH22UG	LQFP44 (10 x 10)	BM11713		
	TMP86FS23AUG	LQFP64 (10 x 10)	—	++	++
	TMP86PM23UG	LQFP64 (10 x 10)	BM11698		
	TMP86PS23UG	LQFP64 (10 x 10)	BM11698		
	TMP86FP24FG	LQFP80 (12 x 12)	—	PN410107	⊙
	TMP86FM25FG	QFP100 (14 x 20)	—	PN410111	⊙
	TMP86PS25FG	QFP100 (14 x 20)	BM11672-G	—	—
	TMP86FS27FG	QFP80 (14 x 20)	—	PN410104	⊙
	TMP86PS27FG	QFP80 (14 x 20)	BM11701-G	—	—
	TMP86FS28ADFG	LQFP80 (12 x 12)	—	++	++
	TMP86FS28AFG	QFP80 (14 x 20)	—	++	++
	TMP86FM29FG	QFP64 (14 x 14)	—	PN410108	⊙
	TMP86FM29LUG	LQFP64 (10 x 10)	—	PN410105A	⊙
	TMP86FM29UG	LQFP64 (10 x 10)	—	PN410105A	⊙
	TMP86PM29BFG	QFP64 (14 x 14)	BM11663		
	TMP86PM29BUG	LQFP64 (10 x 10)	BM11662-G	—	—
	TMP86PS44UG	LQFP44 (10 x 10)	BM11687-G		
	TMP86FH46BNG	SDIP42	—	PN410110	⊙
	TMP86PH46NG	SDIP42	BM11188	—	—
	TMP86PM46NG	SDIP42	BM11188	—	—
	TMP86FH47BUG	LQFP44 (10 x 10)	—	PN410109	⊙
	TMP86PH47UG	LQFP44 (10 x 10)	BM11687-G		
	TMP86PM47AUG	LQFP44 (10 x 10)	BM11687-G	—	—
	TMP86FM48FG	QFP64 (14 x 14)	—	PN410108	⊙
	TMP86FM48UG	LQFP64 (10 x 10)	—	PN410105A	⊙
	TMP86FS49AIFG	QFP64 (14 x 14)	—	++	++
	TMP86FS49AIUG	LQFP64 (10 x 10)	—	++	++
	TMP86PM49FG	QFP64 (14 x 14)	BM11709	—	—
	TMP86PM49UG	LQFP64 (10 x 10)	BM11708		
	TMP86FS49BFG	QFP64 (14 x 14)	—	PN410108	⊙
	TMP86FS49BUG	LQFP64 (10 x 10)	—	PN410105A	⊙
	TMP86FS49BNG	SDIP64	—	PN410116	⊙
TMP86PS64FG	QFP100 (14 x 20)	BM11690			
TMP86PM72FG	QFP64 (14 x 14)	BM11707-G	—	—	
TMP86PM74AFG	QFP80 (14 x 20)	BM11689			
TMP86PM87RUG	LQFP44 (10 x 10)	BM11687-G			
TMP86FH92DMG	SSOP30	—	PN410118	⊙	
TMP86FH92IDMG	SSOP30	—	PN410118	⊙	
TMP86FH93NG	SDIP32	—	PN410119	⊙	

● Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

\*1: As a guideline, the adapter should be replaced after 2,000 writes.

\*2: Off-board Programming: Programs a Flash microcontroller before it is mounted on the target board.

\*3: On-board Programming: Programs a Flash microcontroller while it is mounted on the target board.

\*4: Comes with a download license for control software.

\*5: These are Samtec's products. The part number shown here denotes surface mount type with keying shroud (recommended). Other mount types, such as through-hole, and other mating options are also available. For the specifications and purchase inquiries about this product, please contact the supplier Samtec, Inc. The recommended connector can also be purchased from it-sim corporation, Sophia Systems Co., Ltd. and UNIDUX INC.

++: Under planning

⊙: Supported

## Programming Tools (2/3)

Target MCU			OTP Programming	Flash Programming	
Family/Series	Part Number	Package	OTP Programming Adapter	Off-Board Programming *2	On-Board Programming *3
				FLASH Adapter *4	FLASH Writer: BM1401W0A-G *4 Connector: FTSH-110-01-L-DV-K *5
TLCS-870/X Series	TMP88PH40MG	SOP28	BM11695-G	—	—
	TMP88PH40NG	SDIP28	BM11196	—	—
	TMP88FH41UG	LQFP44 (10 x 10)	—	PN410109	⊙
	TMP88PH41NG	SDIP42	BM11205	—	—
	TMP88PH41UG	LQFP44 (10 x 10)	BM11706	—	—
	TMP88PS42FG	QFP64 (14 x 20)	BM11200 *1	—	—
	TMP88PS42NG	SDIP64	BM11199-G	—	—
	TMP88PS43FG	QFP80 (14 x 20)	BM11680-G	—	—
	TMP88FW45AFG	QFP80 (14 x 20)	—	PN410104	⊙
	TMP88F846UG	LQFP44 (10 x 10)	—	PN410109	⊙
TMP88PU74FG	QFP80 (14 x 20)	BM11631	—	—	
TMP88PU77FG	QFP100 (14 x 20)	BM11650	—	—	
TLCS-870/C1 Series	TMP89FH00DUG	LQFP48 (7 x 7)	—	PN410115	⊙
	TMP89FH00WBG	WCSP39 (3.8 x 3.8)	—	—	⊙
	TMP89FW20AUG	LQFP64 (10 x 10)	—	++	++
	TMP89FW24ADFG	QFP80 (14 x 20)	—	++	++
	TMP89FW24AFG	LQFP80 (12 x 12)	—	++	++
	TMP89FS28LFG	QFP179 (20 x 20)	—	—	⊙
	TMP89FM40NG	SDIP42	—	PN410110	⊙
	TMP89FH40NG	SDIP42	—	PN410110	⊙
	TMP89FM42UG	LQFP44 (10 x 10)	—	PN410109	⊙
	TMP89FM42LUG	LQFP44 (10 x 10)	—	PN410109	⊙
	TMP89FM42AUG	LQFP44 (10 x 10)	—	PN410109	⊙
	TMP89FM42KUG	LQFP44 (10 x 10)	—	PN410109	⊙
	TMP89FH42UG	LQFP44 (10 x 10)	—	PN410109	⊙
	TMP89FH42LUG	LQFP44 (10 x 10)	—	PN410109	⊙
	TMP89FM43KQG	VQON44 (5.3 x 5.3)	—	PN410121-G	⊙
	TMP89FM43LQG	VQON44 (5.3 x 5.3)	—	PN410121-G	⊙
	TMP89FM46DUG	LQFP48 (7 x 7)	—	PN410115	⊙
	TMP89FM46ADUG	LQFP48 (7 x 7)	—	PN410115	⊙
	TMP89FM46KDUG	LQFP48 (7 x 7)	—	PN410115	⊙
	TMP89FH46DUG	LQFP48 (7 x 7)	—	PN410115	⊙
	TMP89FH46LDUG	LQFP48 (7 x 7)	—	PN410115	⊙
	TMP89FS60UG	LQFP64 (10 x 10)	—	PN410105A	⊙
	TMP89FS60FG	QFP64 (14 x 14)	—	PN410108	⊙
	TMP89FM82DUG	LQFP48 (7 x 7)	—	PN410115	⊙
	TMP89FM82TDUG	LQFP48 (7 x 7)	—	PN410115	⊙

● Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

++: Under planning

\*1: As a guideline, the adapter should be replaced after 2,000 writes.

⊙: Supported

\*2: Off-board Programming: Programs a Flash microcontroller before it is mounted on the target board.

\*3: On-board Programming: Programs a Flash microcontroller while it is mounted on the target board.

\*4: Comes with a download license for control software.

\*5: These are Samtec's products. The part number shown here denotes surface mount type with keying shroud (recommended). Other mount types, such as through-hole, and other mating options are also available. For the specifications and purchase inquiries about this product, please contact the supplier Samtec, Inc. The recommended connector can also be purchased from it-sim corporation, Sophia Systems Co., Ltd. and UNIDUX INC.

### Programming Tools (3/3)

Target MCU			OTP Programming	Flash Programming		
Family/Series	Part Number	Package	OTP Programming Adapter	Off-Board Programming *2	On-Board Programming *3	
				FLASH Adapter *4	FLASH Writer: BM1401W0A-G *4 Connector: FTSH-110-01-L-DV-K *5	
TLCS-900 Family	TMP91PW10FG	LQFP100 (14 x 14)	BM11629	—	—	
	TMP91PW11FG	LQFP100 (14 x 14)	BM11629			
	TMP91PW12FG	LQFP100 (14 x 14)	BM11649			
	TMP91PW18AFG	QFP80 (14 x 20)	BM11679			
	TMP91FW27FG	QFP64 (14 x 14)	—	PN410108	⊙	
	TMP91FW27UG	LQFP64 (10 x 10)		PN410105A	⊙	
	TMP91FW40FG	LQFP100 (14 x 14)		PN410106	⊙	
	TMP91FY42FG	LQFP100 (14 x 14)		PN410106	⊙	
	TMP91FU62DFG	QFP80 (14 x 20)		PN410104	⊙	
	TMP91FU62FG	LQFP80 (12 x 12)		PN410107	⊙	
	TMP91FW64DFG	LQFP100 (14 x 20)		PN410111	⊙	
	TMP91FW64FG	LQFP100 (14 x 14)		PN410106	⊙	
	TMP92FD23ADFG	QFP100 (14 x 20)		PN410111	⊙	
	TMP92FD23AFG	LQFP100 (14 x 14)		PN410106	⊙	
	TMP92FD28AFG	LQFP100 (14 x 14)		PN410106	⊙	
	TMP92FD54AIFG	LQFP100 (14 x 14)		—	—	
	TMP93PW20AFG	LQFP144 (16 x 16)		BM11641	—	—
	TMP93PW40DFG	LQFP100 (14 x 14)		BM11629		
	TMP93PS44FG	LQFP80 (12 x 12)	BM11628			
	TMP93PW44ADFG	QFP80 (14 x 20)	BM11652			
TMP95PW64FG	LQFP100 (14 x 14)	BM11629				
TX19 Family	TMP19A23FYFG	LQFP144 (20 x 20)	—	PN410120-G	⊙	

● Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

⊙: Supported

\*1: As a guideline, the adapter should be replaced after 2,000 writes.

\*2: Off-board Programming: Programs a Flash microcontroller before it is mounted on the target board.

\*3: On-board Programming: Programs a Flash microcontroller while it is mounted on the target board.

\*4: Comes with a download license for control software.

\*5: These are Samtec's products. The part number shown here denotes surface mount type with keying shroud (recommended). Other mount types, such as through-hole, and other mating options are also available.

For the specifications and purchase inquiries about this product, please contact the supplier Samtec, Inc. The recommended connector can also be purchased from it-sim corporation, Sophia Systems Co., Ltd. and UNIDUX INC.

## Accessory Tools

Expendable and optional hardware items for the development system are collectively referred to as accessory tools.

- MCU probe
  - Probe set
  - QFP adaptor
  - Pin protector
  - Package converter
  - MCU mount adaptors
  - Communication cable
  - Connector
- ◆ To provide versatility, the footprint pattern of the QFP adaptor leads is slightly different from that of an MCU. If there is a need to install both the QFP adaptor and the MCU with an identical footprint, the board must be designed to be compatible with both of them.
  - ◆ Before beginning a board design or purchasing these accessory tools, be sure to check the latest product specification, recommended footprints, etc. with each manufacturer.
  - ◆ Other than those listed below, accessory tools that can be used together with the Toshiba products are available from Tokyo Eletech Corporation. Please visit Tokyo Eletech Corporation's website for more details.

Adlinks Corp.	<a href="http://www.adlinks.co.jp">http://www.adlinks.co.jp</a>
Emulation Technology Inc.	<a href="http://www.emulation.com">http://www.emulation.com</a>
Samtec Inc.	<a href="http://www.samtec.com">http://www.samtec.com</a>
Tokyo Eletech Corp.	<a href="http://www.tetc.co.jp/e-index.htm">http://www.tetc.co.jp/e-index.htm</a>
Tyco Electronics Corp.	<a href="http://www.tycoelectronics.com">http://www.tycoelectronics.com</a>
Yamaichi Electronics Co., Ltd.	<a href="http://www.yamaichi.co.jp/index_e.shtml">http://www.yamaichi.co.jp/index_e.shtml</a>

## Spare Parts from Toshiba

The TLC-870/C model 15 target connection boards, MCU probes and package converters whose part numbers begin with "PN12" come with a QFP adaptor and a pin protector. When you purchase additional QFP adaptors or pin protectors, check their part numbers in the following Spare Parts table. For information about spare parts for third-party accessory tools, please contact the manufacturer or distributor of each product.

- ◆ Note that if you are using a package converter, use spare parts for package converters, not those for MCU probes.
- ◆ QFP adaptors and pin protectors are available from Tokyo Eletech and Toshiba.

## Target Connection Board Spare Parts

Part Number	Target MCU Package	Spare Part			
		QFP Adaptor *1		Pin Protector *2	
		Toshiba *3	Tokyo Eletech (QFP Socket)	Toshiba	Tokyo Eletech (Emulator Connector)
BMP86D044DE0A	LQFP44 (10 x 10)	PN210019	TQPACK044SA	PN210021	TQSOCKET044SAG
BMP86D044DE1A					
BMP86D064DE0A	QFP64 (14 x 14)	PN210025	TQPACK064SA	PN210027	TQSOCKET064SAG
BMP86D064DG0A	LQFP64 (10 x 10)	PN210031	TQPACK064SD	PN210032	TQSOCKET064SDG
BMP86D080DG0A	LQFP80 (12 x 12)	PN210007	TQPACK080SD	PN210009	TQSOCKET080SDG
BMP86D080DG1A					
BMP86D080FE0A	QFP80 (14 x 20)	PN210001	TQPACK080RA	PN210003	TQSOCKET080RAG
BMP86D100DG0A	LQFP100 (14 x 14)	PN210022	TQPACK100SD	PN210024	TQSOCKET100SDG
BMP86D100FF0A	QFP100 (14 x 20)	PN210004	TQPACK100RB	PN210006	TQSOCKET100RBG

\*1: QFP adaptors and QFP Sockets connectors are soldered onto the pc board of the target system. Once soldered, they should not be unsoldered from the pc board and resoldered.

\*2: Pin protectors are sockets used to protect the target connection boards for QFPs and the pins of QFP adaptors and QFP Sockets. Be sure to use a pin protector to protect the portion where the target connection board is connected. It is recommended to replace the pin protector or the emulator Connectors after 100 attachments and detachments.

\*3: For the recommended footprints pattern, please visit Tokyo Eletech Corporation's website.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## MCU Probe Spare Parts

Part Number	Target MCU Package	Spare Part			
		QFP Adaptor *1		Pin Protector *2	
		Toshiba *3	Tokyo Eletech (QFP Socket)	Toshiba	Tokyo Eletech (Emulator Connector)
PN120004	QFP80 (14 x 20)	PN210001	TQPACK080RA	PN210003	TOSOCKET080RAG
PN120005	QFP100 (14 x 20)	PN210004	TQPACK100RB	PN210006	TOSOCKET100RBG
PN120006A	LQFP80 (12 x 12)	PN210007	TQPACK080SD	PN210009	TOSOCKET080SDG
PN120009	QFP80 (14 x 20)	PN210001	TQPACK080RA	PN210003	TOSOCKET080RAG
PN120011	QFP44 (10 x 10)	PN210019	TQPACK044SA	PN210021	TOSOCKET044SAG
PN120013	LQFP100 (14 x 14)	PN210022	TQPACK100SD	PN210024	TOSOCKET100SDG
PN120014	QFP64 (14 x 20)	PN210010	TQPACK064RZ	PN210012	TOSOCKET064RZG
PN120022	LQFP64 (10 x 10)	PN210031	TQPACK064SD	PN210032	TOSOCKET064SDG
PN120023B	QFP100 (14 x 20)	PN210004	TQPACK100RB	PN210006	TOSOCKET100RBG
PN120027	LQFP144 (20 x 20)	PN210034	TQPACK144SD	PN210035	TOSOCKET144SDG
PN120039A	QFP64 (14 x 14)	PN210025	TQPACK064SA	PN210027	TOSOCKET064SAG
PN120040A	QFP160 (28 x 28)	PN210028	TQPACK160SB	PN210029	TOSOCKET160SBG
PN120042	LQFP80 (12 x 12)	PN210007	TQPACK080SD	PN210009	TOSOCKET080SDG
PN120044	LQFP144 (16 x 16)	PN210043	NQPACK144SE	PN210045	YQPACK144SE
PN120050	LQFP144 (20 x 20)	PN210034	TQPACK144SD	PN210035	TOSOCKET144SDG
PN120052	QFP64 (14 x 14)	PN210025	TQPACK064SA	PN210027	TOSOCKET064SAG
PN120057	TQFP128 (14 x 14)	PN210053	NQPACK128SE	PN210055	YQPACK128SE

\*1: QFP adaptors and QFP Sockets connectors are soldered onto the pc board of the target system. Once soldered, they should not be unsoldered from the pc board and resoldered.

\*2: Pin protectors are sockets used to protect the MCU probes for QFPs and the pins of QFP adaptors and QFP sockets. Be sure to use a pin protector to protect the portion where the MCU probe is connected. It is recommended to replace the pin protector or the emulator connectors after 100 attachments and detachments.

\*3: For the recommended footprints pattern, please visit Tokyo Eletech Corporation's website.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## Package Converter Spare Parts

Part Number	Target MCU Package	Spare Part			
		QFP Adaptor *1		Pin Protector *2	
		Toshiba *3	Tokyo Eletech (QFP Socket)	Toshiba	Tokyo Eletech (Emulator Connector)
PN120007	QFP64 (14 x 20)	PN210010	TQPACK064RZ	PN210012	TOSOCKET064RZG
PN120035	LQFP64 (10 x 10)	PN210031	TQPACK064SD	PN210032	TOSOCKET064SDG
PN120063	LQFP44 (10 x 10)	PN210019	TQPACK044SA	PN210021	TOSOCKET044SAG
PN120065-G	LQFP64 (10 x 10)	PN210031	TQPACK064SD	PN210032	TOSOCKET064SDG

\*1: QFP adaptors and QFP Sockets connectors are soldered onto the pc board of the target system. Once soldered, they should not be unsoldered from the pc board and resoldered.

\*2: Pin protectors are sockets used to protect the package converters for QFPs and the pins of QFP adaptors and QFP sockets. Be sure to use a pin protector to protect the portion where the package converter is connected. It is recommended to replace the pin protector or the emulator connectors after 100 attachments and detachments.

\*3: For the recommended footprints pattern, please visit Tokyo Eletech Corporation's website.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

## MCU Mount Adaptor Spare Parts

Part Number	Target MCU Package	Spare Part			
		QFP Adaptor *1		Pin Protector *2	
		Toshiba *3	Tokyo Eletech (QFP Socket)	Toshiba	Tokyo Eletech (Emulator Connector)
PN210002	QFP80 (14 x 20)	PN210001	TQPACK080RA	PN210003	TOSOCKET080RAG
PN210005A	QFP100 (14 x 20)	PN210004	TQPACK100RB	PN210006	TOSOCKET100RBG
PN210008	LQFP80 (12 x 12)	PN210007	TQPACK080SD	PN210009	TOSOCKET080SDG
PN210011A	QFP64 (14 x 20)	PN210010	TQPACK064RZ	PN210012	TOSOCKET064RZG
PN210020A	QFP44 (10 x 10)	PN210019	TQPACK044SA	PN210021	TOSOCKET044SAG
PN210023	LQFP100 (14 x 14)	PN210022	TQPACK100SD	PN210024	TOSOCKET100SDG
PN210026	QFP64 (14 x 14)	PN210025	TQPACK064SA	PN210027	TOSOCKET064SAG
PN210030	QFP160 (28 x 28)	PN210028	TQPACK160SB	PN210029	TOSOCKET160SBG
PN210033	LQFP64 (10 x 10)	PN210031	TQPACK064SD	PN210032	TOSOCKET064SDG
PN210036	LQFP144 (20 x 20)	PN210034	TQPACK144SD	PN210035	TOSOCKET144SDG
PN210044	LQFP144 (16 x 16)	PN210043	NQPACK144SE	—	—
PN210054	TQFP128 (14 x 14)	PN210053	NQPACK128SE	—	—

\*1: QFP adaptors and QFP Sockets connectors are soldered onto the pc board of the target system. Once soldered, they should not be unsoldered from the pc board and resoldered.

\*2: Pin protectors are sockets used to protect the MCU mount adaptors for QFPs and the pins of QFP adaptors and QFP sockets. Be sure to use a pin protector to protect the portion where the MCU mount adaptor is connected. It is recommended to replace the pin protector or the emulator connectors after 100 attachments and detachments.

\*3: For the recommended footprints pattern, please visit Tokyo Eletech Corporation's website.

• QFP adaptors and the pin protector are not attached to the MCU mount adaptor.

- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

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- Marlborough  
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