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# Microcomputers / Microcomputer Development Systems

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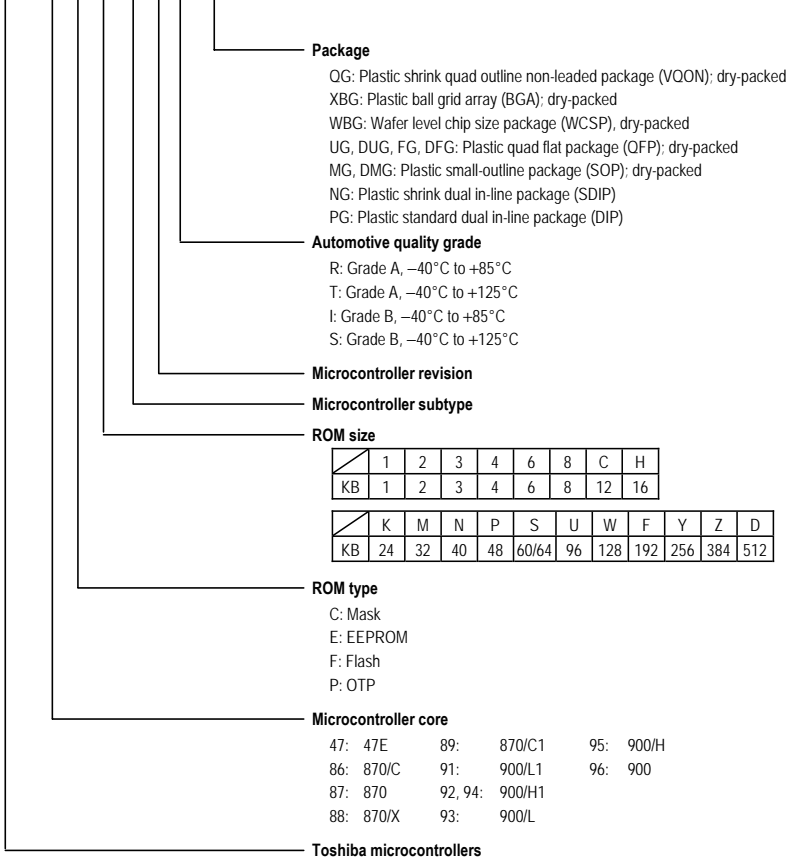
Microcomputer Selection Guide

Microcomputer Development System Selection Guide

# Part Numbering Nomenclature

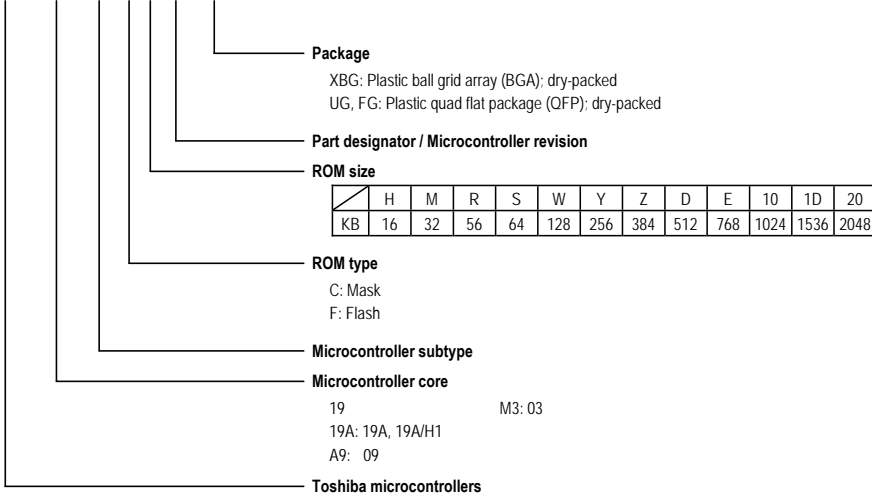
## Example 1

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



## Example 2

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



# Microcomputer Selection Guide

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# Microcontrollers

## 4-Bit Microcontrollers

### TLCS-47 Family: TLCS-47E Series

□Mask ROM Versions

Part Number	ROM (Kbytes)	RAM (Nibbles)	Minimum Instruction Execution Time (μs) (Note 2)	LED Driver (Ch)	LCD Driver (Ch)	SIO (Ch)	AD Converter (Ch)	Pulse Generator (Ch)	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 4))	Standby Mode	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP Version	Package					
TMP47C101MG	1	64	(1) 1.3 (2) 1.9	4						Yes	Yes	11	(Note1) (1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	—	SOP16					
TMP47C101PG				4							Yes	Yes			11	TMP47P201VPG	DIP16				
TMP47C102MG				4					Yes	Yes	15	Yes			15	TMP47P202VMG	SOP20				
TMP47C102PG				4					Yes	Yes	15	Yes			15	TMP47P202VPG	DIP20				
TMP47C103MG				8	1	Yes	Yes	23				Yes			23	TMP47P403VMG	SOP28				
TMP47C103NG				8	1	Yes	Yes	23				Yes			23	TMP47P403VNG	SDIP28				
TMP47C201MG				4								Yes			11	—	SOP16				
TMP47C201PG				4								Yes			11	TMP47P201VPG	DIP16				
TMP47C202MG				4					Yes	Yes	15	Yes			15	TMP47P202VMG	SOP20				
TMP47C202PG				4					Yes	Yes	15	Yes			15	TMP47P202VPG	DIP20				
TMP47C203MG				8	1	Yes	Yes	23				Yes			23	TMP47P403VMG	SOP28				
TMP47C203NG				8	1	Yes	Yes	23				Yes			23	TMP47P403VNG	SDIP28				
TMP47C206MG				2	128	(1) 1 (2) 1.9	5			1	Yes	Yes			15	Yes	15	(1) 4.0 to 5.7 (2) 4.0 to 5.7	-40 to 85	TMP47P206VMG	SOP20
TMP47C206PG							5			1	Yes	Yes			15	Yes	15			TMP47P206VPG	DIP20
TMP47C241MG	5	1	4				Yes	Yes	21	(1) 4.5 to 6.0 (2) 2.7 to 6.0	TMP47P241VMG	SOP28									
TMP47C241NG	5	1	4				Yes	Yes	21	(1) 4.5 to 6.0 (2) 2.7 to 6.0	TMP47P241VNG	SDIP28									
TMP47C243DMG (Note3)	8	1	8				1	Yes	Yes	23	TMP47P443VDMG	SSOP30									
TMP47C243MG (Note3)	8	1	8				1	Yes	Yes	23	TMP47P443VMG	SOP28									
TMP47C243NG (Note3)	8	1	8				1	Yes	Yes	23	TMP47P443VNG	SDIP28									
TMP47C222FG (Note3)		20	1				4	1	Yes	Yes	Yes	22	TMP47P422VFG	QFP44 (14×14 mm)							
TMP47C222NG (Note3)		20	1				4	1	Yes	Yes	Yes	20	TMP47P422VNG	SDIP42							
TMP47C222UG (Note3)		20	1				4	1	Yes	Yes	Yes	22	TMP47P422VUG	LQFP44 (10×10 mm)							
TMP47C422FG (Note3)		20	1				4	1	Yes	Yes	Yes	22	TMP47P422VFG	QFP44 (14×14 mm)							
TMP47C422NG (Note3)		20	1				4	1	Yes	Yes	Yes	20	TMP47P422VNG	SDIP42							
TMP47C422UG (Note3)		20	1				4	1	Yes	Yes	Yes	22	TMP47P422VUG	LQFP44 (10×10 mm)							
TMP47C443DMG (Note3)	8	1	8				1	Yes	Yes	23	TMP47P443VDMG	SSOP30									
TMP47C443MG (Note3)	8	1	8	1	Yes	Yes	23	TMP47P443VMG	SOP28												
TMP47C443NG (Note3)	8	1	8	1	Yes	Yes	23	TMP47P443VNG	SDIP28												

Note 1) When CR oscillation is used (2.2 V to 5.5 V at 2.5 MHz)

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

Note 3) Contains the CPU core for the 470 Series.

Note 4) The minimum instruction execution time in Low-Speed mode is 244 μs (at 32.768 kHz).

- Not recommended for automotive applications.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

# 8-Bit Microcontrollers

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

### □Flash Versions

Part Number	ROM (Kbytes)	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	Dial Clocks (Low-Speed Mode) (Note 5)	Clock Gear	Power-On Reset	Undervoltage Detection	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package						
TMP86F409NG	4	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	8	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						
TMP86F808NG				8		1		1							5			1	2				Yes	Yes					24	TMP86C808NG	SDIP30						
TMP86F809NG				8		1		1							6			1	2				Yes	Yes					26	TMP86C809NG	SDIP32						
TMP86FH09ANG	16	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	TMP86C809NG TMP86CH09NG	SDIP32							
TMP86FH12MG				8		1		1						8			1	1	2				Yes	Yes					24	TMP86CH12MG	SSOP30						
TMP86FH46ANG				19		1		1						8			1	2					Yes	Yes					33	TMP86C846NG TMP86CH46ANG	SDIP42						
TMP86FH47ADUG				19		1		1						8			1	2					Yes	Yes					35	—	LOFP48 (7×7 mm)						
TMP86FH47AUG				19		1		1						8			1	2					Yes	Yes					35	TMP86C845UG TMP86C847UG TMP86CH47AUG	LOFP44 (10×10 mm)						
TMP86FH92DMG				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			6			1	2						Yes	Yes	Yes	Yes			26				SDIP32				
TMP86FM29FG				32	1536	(1) 0.25 (2) 0.5	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)		
TMP86FM29UG							4	32				1				8			1	4						Yes			Yes						39	TMP86CM29LUG	LOFP64 (10×10 mm)
TMP86FM25FG							4	(Note 3) 60		1		1				8			1	4									Yes	Yes						42	TMP86CM25AFG
TMP86FM48FG	11						1		1		1		16			2	2							Yes	Yes			54	QFP64 (14×14 mm) LOFP64 (10×10 mm) LOFP80 (12×12 mm)								
TMP86FM48UG	11						1		1		1		16			2	2							Yes	Yes			54									
TMP86FP24FG	48		12				24		1		1		8			2	2		2				Yes	Yes	Yes			54									
TMP86FS27FG	60	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)	
TMP86FS23UG				5	32		1	1				8			1	4	Yes						Yes	Yes			51	TMP86CM23AUG TMP86CP23AUG	LOFP64 (10×10 mm)								
TMP86FS28DFG				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	(1) -40 to 85 (2) -40 to 85 (3) -20 to 85			TMP86CS28DFG	LOFP80 (12×12 mm)				
TMP86FS28FG				40		1	1				8			2	4								Yes	Yes			62						TMP86CS28FG	QFP80 (14×20 mm)			
TMP86FS49BFG				60	2048	(1) 0.25 (2) 0.5	13			2	2		1		16			2	4		4				Yes	Yes			56			(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP86CH49FG TMP86CM49FG TMP86CS49FG		QFP64 (14×14 mm)	
TMP86FS49BUG							13		2	2		1		16		2	4								Yes	Yes			56							TMP86CM49UG	LOFP64 (10×10 mm)

Note 1) Configurable as UART or SIO.

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

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 (Kbytes)	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	8	512	0.2	16	(Note1) 1	(Note1) 1					8	2	2	1			Yes		Yes		33	4.5 to 5.5	-40 to 85	—	LQFP44 (10×10 mm)
TMP88FH41UG	16			16	(Note1) 1	(Note1) 1					8	2	2	1			Yes				33			TMP88CH41UG	
TMP88FW45AFG	120			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 (Kbytes)	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)	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 4))	Clock Gear	Power-On Reset	Undervoltage Detection	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	16		(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	(Note5) (1) 2.7 to 3.6 (2) 2.2 to 3.6		LQFP44 (10x10 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 (3) 2.2 to 5.5		TMP89CH42UG (Note 7)		
TMP89FH46DUG			(1) 0.238 (2) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	42	(Note5) (1) 2.7 to 3.6 (2) 2.2 to 3.6		TMP89CH46DUG	LQFP48 (7x7 mm)	
TMP89FH46LDUG	2048		(1) 0.1 (2) 0.238 (3) 0.5	8				1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	42	(1) 2.7 to 3.6 (2) 2.2 to 3.6	-40 to 85	-			
TMP89FM40NG			(1) 0.1 (2) 0.19 (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) 0.19 (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 (10x10 mm)	
TMP89FM42KUG			(1) 0.238 (2) 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)	
TMP89FM42LUG	32		(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	-	-			
TMP89FM42UG			(1) 0.19 (2) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	38			(Note5) (1) 2.7 to 3.6 (2) 2.2 to 3.6	VQON44 (5.3x5.3 mm)	
TMP89FM43LOG			(1) 0.1 (2) 0.19 (3) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	42			(1) 4.3 to 5.5 (2) 2.7 to 5.5 (3) 2.2 to 5.5		
TMP89FM46ADUG			(1) 0.1 (2) 0.238 (3) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	42			(Note5) (1) 2.7 to 3.6 (2) 2.2 to 3.6	TMP89CM46DUG	LQFP48 (7x7 mm)
TMP89FM46DUG	3072		(1) 0.1 (2) 0.238 (3) 0.5	8				1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	42	(1) 4.3 to 5.5 (2) 2.7 to 5.5 (3) 2.2 to 5.5	-40 to 85	-			
TMP89FM46KDUG			(1) 0.19 (2) 0.5	8					1	1	1	8			2		4				Yes	Yes	Yes	Yes	Yes	Yes	42			(Note5) (1) 2.7 to 3.6 (2) 2.2 to 3.6		
TMP89FM82DUG			0.125	16					1			8			2		4			Yes	Yes	Yes	Yes	Yes	Yes	Yes	39			4.5 to 5.5		
TMP89FS60FG			60	(1) 0.125 (2) 0.238 (3) 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 (3) 2.7 to 3.0	(1) -40 to 85 (2) -40 to 85 (3) -20 to 85
TMP89FS60UG	124	3072	(1) 0.0625 (2) 0.125	8	32	1	3	1	8		2	1	4							Yes	Yes	Yes	Yes	Yes	Yes	52	(1) 2.7 to 5.5 (2) 1.8 to 5.5	-40 to 85	-	QFP64 (14x14 mm)		
TMP89FW20UG				8																		Yes	Yes	Yes	Yes	Yes				Yes	58	LQFP64 (10x10 mm)
TMP89FW24DFG				12	40	1	3	1	8		2	1	4									Yes	Yes	Yes	Yes	Yes				Yes	68	QFP80 (14x20 mm)
TMP89FW24FG				12	40	1	3	1	8		2	1	4									Yes	Yes	Yes	Yes	Yes				Yes	68	LQFP80 (12x12 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. 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) and (3) correspond to power supply voltages (1) and (3).

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 (Kbytes)	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/PC (Ch) (Note 4)	I <sup>2</sup> C (Ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	8-Bit DA Converter (Ch)	16-Bit Timer/Counter (Ch)	18-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		
TMP86P202MG (Note2)	2	128	0.5	2									4					2			Yes			14	3.3 to 5.5		—	SOP20			
TMP86P202PG (Note2)				2											4					2			Yes						14	DIP20	
TMP86P203MG (Note2)			1.6	2										4								Yes			14			4.5 to 5.5	SOP20		
TMP86P203PG (Note2)				2											4							Yes			14				DIP20		
TMP86C407MG	4	(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	TMP86P807MG TMP86F807MG	SOP28				
TMP86C407NG						1		1							6			1		2			Yes	Yes				22	SDIP28		
TMP86C408DMG						1		1							6			1		2			Yes	Yes				24	SSOP30		
TMP86C408NG						1		1							6			1		2			Yes	Yes				24	SDIP30		
TMP86C420FG				(1) 0.25 (2) 0.5	4	32			1							8			1		2			Yes			Yes		39	(1) 4.5 to 5.5 (2) 2.7 to 5.5	QFP64 (14×14 mm)
TMP86C420UG				(3) 0.95	4	32			1							8			1		2			Yes			Yes		39	(3) 1.8 to 5.5	LQFP64 (10×10 mm)
TMP86C807MG	8	(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	TMP86P807MG TMP86F807MG	SOP28				
TMP86C807NG						1		1							6			1		2			Yes	Yes				22	SDIP28		
TMP86C808DMG						1		1							6			1		2			Yes	Yes				24	SSOP30		
TMP86C808NG						1		1							6			1		2			Yes	Yes				24	SDIP30		
TMP86C820FG				(1) 0.25 (2) 0.5	4	32			1							8			1		2			Yes			Yes		39	(1) 4.5 to 5.5 (2) 2.7 to 5.5	QFP64 (14×14 mm)
TMP86C820UG				(3) 0.95	4	32			1							8			1		2			Yes			Yes		39	(3) 1.8 to 5.5	LQFP64 (10×10 mm)
TMP86C845UG		0.5	19					1					8					2			Yes	Yes		35	2.7 to 5.5	TMP86PM47AUG TMP86PH47UG TMP86FH47AUG	LQFP44 (10×10 mm)				
TMP86C809NG	8	(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	TMP86F809NG TMP86FH09ANG	SDIP32				
TMP86C822UG				(1) 0.25 (2) 0.5 (3) 0.95 (4) 0.95	3	23			1	1					4			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	LQFP44 (10×10 mm)	
TMP86C829BFG					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	QFP64 (14×14 mm)	
TMP86C829BUG				(1) 0.25 (2) 0.5 (3) 0.95	4	32					1					8			1		4			Yes	Yes			39	LQFP64 (10×10 mm)		
TMP86C846NG					19				1	1						8			1		2			Yes	Yes			33	TMP86PH46NG TMP86FH46ANG	SDIP42	
TMP86C847UG					19				1	1						8			1		2			Yes	Yes			35	TMP86PM47AUG TMP86PH47UG TMP86FH47AUG	LQFP44 (10×10 mm)	
TMP86CH06AUG	16	(1) 0.25 (2) 0.5 (3) 0.95 (4) 0.95	8						1	1							1		2			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	(1) -40 to 85 (2) -40 to 85 (3) -40 to 85 (4) -20 to 85	TMP86PH06UG			
TMP86CH06NG				(1) 0.25 (2) 0.5 (3) 0.95	8						1	1							1		2			Yes	Yes	Yes	35	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	-40 to 85	TMP86PH06NG	SDIP42
TMP86CH09NG				(1) 0.25	8			1	1							6			1		2			Yes	Yes		26	(1) 4.5 to 5.5	TMP86FH09ANG	SDIP32	
TMP86CH12MG				(2) 0.5	8			1	1							8			1	1	2			Yes	Yes		24	(2) 2.7 to 5.5	TMP86FH12MG	SSOP30	

Note 1) Configurable as UART or SIO.

Note 2) Contains an OTP memory.

Note 3) Minimum instruction execution times (1) to (4) correspond to power supply voltages (1) to (4).

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 (Kbytes)		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
	(1)	(2)	(1)	(2)																											
TMP86CH21AUG	16	512	(1) 0.25	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	(1) -40 to 85 (2) -40 to 85 (3) -40 to 85 (4) -20 to 85	TMP86PM29BUG	LQFP64 (10×10 mm)	
TMP86CH21FG			(2) 0.5	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)
TMP86CH22UG			(3) 0.95	3	23					1	1					4			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	TMP86PH22UG	LQFP44 (10×10 mm)
TMP86CH46ANG			(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 TMP86FH46ANG	SDIP42
TMP86CH47AUG				19						1	1					8			1			2			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	(1) -40 to 85 (2) -40 to 85 (3) -40 to 85 (4) -20 to 85	TMP86PM47AUG TMP86PH47UG TMP86FH47AUG	LQFP44 (10×10 mm)
TMP86CH49FG				(1) 0.25 (2) 0.5 (3) 0.95	13				2	2			1		16			2			4			Yes	Yes	56	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	-40 to 85	TMP86PM49FG TMP86FS49BFG	QFP64 (14×14 mm)	
TMP86CH72FG			1024	(1) 0.25 (2) 0.5			16		1	1			1		6				1		2			Yes	Yes	Yes	54	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	-30 to 70	TMP86PM72FG	QFP64 (14×14 mm)
TMP86CH29BFG			1536	(1) 0.25	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	LQFP64 (10×10 mm)	
TMP86CH29BUG		(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	TMP86PM29BUG	LQFP64 (10×10 mm)	
TMP86CK74AFG		24	1024	(1) 0.25	2		16		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	(2) 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 85	TMP86PS27FG TMP86FS27FG	QFP80 (14×20 mm)		
TMP86CM46ANG		19							1	1					8			1		2			Yes	Yes	33	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	-40 to 85	TMP86PM46NG	SDIP42		
TMP86CM47AUG	(1) 0.25	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	LQFP44 (10×10 mm)		
TMP86CM49FG	(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 (3) 1.8 to 5.5	-40 to 85	TMP86PM49FG TMP86FS49BFG	QFP64 (14×14 mm)		
TMP86CM49UG	(3) 0.95	13							2	2			1		16			2		4			Yes	Yes	56	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	-40 to 85	TMP86PM49UG TMP86FS49BUG	LQFP64 (10×10 mm)		
TMP86CM72FG	(1) 0.25 (2) 0.5					16			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	32	1536		(1) 0.25	5	32							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 TMP86FS23UG	LQFP64 (10×10 mm)	
TMP86CM29BFG				(2) 0.5	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	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	-40 to 85	TMP86PM29BUG	LQFP64 (10×10 mm)
TMP86CM29LUG			(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) 1.8 to 5.5	-40 to 85	TMP86FM29UG	LQFP64 (10×10 mm)	
TMP86CM25AFG		(1) 0.25	4	(Note2) 60					1	1					8				1		4			Yes	Yes	42	(1) 2.7 to 3.6 (2) 1.8 to 3.6	-40 to 85	TMP86FM25FG	QFP100 (14×20 mm)	
TMP86CM25FG		(2) 0.5	4	(Note2) 60					1	1					8				1		4			Yes	Yes	42	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	-40 to 85	TMP86PS25FG	QFP100 (14×20 mm)	
TMP86CM25FG		(3) 0.95	4	(Note2) 60					1	1					8				1		4			Yes	Yes	42	(1) 4.5 to 5.5 (2) 2.7 to 5.5 (3) 1.8 to 5.5	-40 to 85	TMP86PS25FG	QFP100 (14×20 mm)	
TMP86CM74AFG		(2) 0.5		(1) 0.25 (2) 0.5	2		16		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)	

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 power supply voltages (1) to (4).

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/C Series

□Mask ROM Versions (Continued)

Part Number	ROM (Kbytes)	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)	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	
TMP86CP27AFG	48	1024	(1) 0.25 (2) 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 85	TMP86PS27FG TMP86FS27FG	QFP80 (14×20 mm)	
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 TMP86FS23UG	LQFP64 (10×10 mm)
TMP86CS44UG	60	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		2048	(1) 0.25 (2) 0.5	4	(Note2) 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	—	QFP100 (14×14 mm)
TMP86CS25AFG			(3) 0.95 (4) 0.95	4	(Note2) 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
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	TMP86FS28DFG	LQFP80 (12×12 mm)
TMP86CS28FG				40		1	1					8			2				4			Yes	Yes		62			TMP86FS28FG	QFP80 (14×20 mm)
TMP86CS49FG		(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 power supply voltages (1) to (4).

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 Series

□Mask ROM Versions

Part Number	ROM (Kbytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 3)	LED Driver (Ch)	LCD Driver (Ch)	VFT Driver (Ch)	SIO (Ch)	UART (Ch)	I <sup>2</sup> C (Ch) (Note 1)	High-Speed Serial Output (Ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	6-Bit Comparator (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Watchdog Timer	Dual Clocks	Low-Speed Mode (Note 4)	Clock Gear	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP Version (See the datasheet for operating conditions.)	Package		
TMP87C405AMG	4	256	(1) 0.5	6										2		Yes	Yes	22		22	(1) 4.5 to 5.5	-30 to 70	TMP87P808MG	SOP28			
TMP87C408DMG (Note2)			(2) 0.95	6		1				6					2		Yes	Yes	22		22		(2) 2.7 to 5.5	—	SSOP30		
TMP87C408LMG			0.95	6		1				6					2		Yes	Yes	22		22		1.8 to 4.0	TMP87P808LMG	SOP28		
TMP87C408LNG			6		1					6					2		Yes	Yes	22		22			TMP87P808LNG	SDIP28		
TMP87C408MG			6		1					6					2		Yes	Yes	22		22		(1) 4.5 to 5.5	TMP87P808MG	SOP28		
TMP87C408NG			6		1					6					2		Yes	Yes	22		22		(2) 2.7 to 5.5	TMP87P808NG	SDIP28		
TMP87C409BMG			(1) 0.5	6					1		8				1	2	Yes			22			22	(1) 4.5 to 5.5	TMP87P809BMG	SOP28	
TMP87C409BNG			(2) 0.95	6					1		8				1	2	Yes			22			22	(2) 2.2 to 5.5	TMP87P809BNG	SDIP28	
TMP87C446NG		512	256	(1) 0.5 (2) 0.95	8		1			1	8				2	2	Yes	Yes	35		35		(1) 4.5 to 5.5	TMP87PH46NG	SDIP42		
TMP87C447UG					8		1			1	8					2	2	Yes	Yes	37			37	(2) 2.7 to 5.5	TMP87PH47UG	LQFP44 (10×10 mm)	
TMP87C807UG					8		1				1		8				2	2	Yes	Yes	37			37			
TMP87C808LMG					0.95	6		1				6					2		Yes	Yes	22			22	1.8 to 4.0	TMP87P808LMG	SOP28
TMP87C808LNG						6		1				6					2		Yes	Yes	22			22		TMP87P808LNG	SDIP28
TMP87C808MG						6		1				6					2		Yes	Yes	22			22	(1) 4.5 to 5.5	TMP87P808MG	SOP28
TMP87C808NG						6		1				6					2		Yes	Yes	22			22	(2) 2.7 to 5.5	TMP87P808NG	SDIP28
TMP87C809BMG						6					1		8				1	2	Yes				22		22	(1) 4.5 to 5.5	TMP87P809BMG
TMP87C809BNG	6						1		8				1	2	Yes			22		22	(2) 2.2 to 5.5	TMP87P809BNG	SDIP28				
TMP87C840FG	(1) 0.5 (2) 0.95	8		2					8					2	2	Yes	Yes	56		56	(1) 4.5 to 6.0	TMP87PH40AFG	QFP64 (14×20 mm)				
TMP87C840NG		8		2					8					2	2	Yes	Yes	56		56	(2) 2.7 to 6.0	TMP87PH40ANG	SDIP64				
TMP87C841FG		8		2					16				2	2	Yes	Yes	56		56	(1) 4.5 to 5.5	TMP87PM41FG	QFP64 (14×20 mm)					
TMP87C841NG		8		2					16				2	2	Yes	Yes	56		56	(2) 2.7 to 5.5	TMP87PM41NG	SDIP64					
TMP87C841UG		8		2					16				2	2	Yes	Yes	56		56		TMP87PM41UG	LQFP64 (10×10 mm)					
TMP87C814FG		0.5	256	(1) 0.5 (2) 0.95		16	1			8					2	2	Yes	Yes	55		55	4.5 to 5.5	TMP87PM14FG	QFP64 (14×20 mm)			
TMP87C814NG						16	1			8						2	2	Yes	Yes	55		55		TMP87PM14NG	SDIP64		
TMP87C846NG					8		1			1	8					2	2	Yes	Yes	35		35	(1) 4.5 to 5.5 (2) 2.7 to 5.5	TMP87PH46NG	SDIP42		
TMP87C847LUG	0.95				8		1			1	8					2	2	Yes	Yes	37		37	1.8 to 4.0	TMP87PH47LUG	LQFP44 (10×10 mm)		
TMP87C847UG	8					1			1	8					2	2	Yes	Yes	37		37	(1) 4.5 to 5.5 (2) 2.7 to 5.5	TMP87PH47UG				
TMP87CC40FG	12				512	(1) 0.5 (2) 0.95	8		2			8				2	2	Yes	Yes	56		56	(1) 4.5 to 6.0 (2) 2.7 to 6.0	TMP87PH40AFG	QFP64 (14×20 mm)		
TMP87CC40NG							8		2				8				2	2	Yes	Yes	56		56		TMP87PH40ANG	SDIP64	
TMP87CC41FG							8		2				16					2	2	Yes	Yes	56		56	(1) 4.5 to 5.5 (2) 2.7 to 5.5	TMP87PM41FG	QFP64 (14×20 mm)
TMP87CC41NG		8		2						16					2	2	Yes	Yes	56		56		TMP87PM41NG	SDIP64			
TMP87CC41UG	8		2				16					2	2	Yes	Yes	56		56		TMP87PM41UG	LQFP64 (10×10 mm)						
TMP87CH14FG	16	0.5	(1) 0.5 (2) 0.95		16	1			8					2	2	Yes	Yes	55		55	4.5 to 5.5	TMP87PM14FG	QFP64 (14×20 mm)				
TMP87CH14NG					16	1			8					2	2	Yes	Yes	55		55		TMP87PM14NG	SDIP64				
TMP87CH40FG				8		2				8					2	2	Yes	Yes	56		56	(1) 4.5 to 6.0	TMP87PH40AFG	QFP64 (14×20 mm)			
TMP87CH40NG				8		2				8					2	2	Yes	Yes	56		56	(2) 2.7 to 6.0	TMP87PH40ANG	SDIP64			

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

Note 2) A 125°C version is available for the TMP87C408DMG. For further information, please contact your nearest Toshiba sales representative.

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 Series

□Mask ROM Versions (Continued)

Part Number	ROM (Kbytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 2)	LED Driver (Ch)	LCD Driver (Ch)	VFT Driver (Ch)	SIO (Ch)	UART (Ch)	I <sup>2</sup> C (Ch) (Note 1)	High-Speed Serial Output (Ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	6-Bit Comparator (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 3))	Clock Gear	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP Version (See the datasheet for operating conditions.)	Package		
TMP87CH41FG	16	512	(1) 0.5 (2) 0.95	8			2				16			2	2	Yes	Yes		56	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP87PM41FG	QFP64 (14×20 mm)			
TMP87CH41NG				8			2					16			2	2	Yes	Yes				56	TMP87PM41NG	SDIP64		
TMP87CH41UG				8			2					16			2	2	Yes	Yes				56	TMP87PM41UG	LQFP64 (10×10 mm)		
TMP87CH46NG				8			1				1	8			2	2	Yes	Yes				35	TMP87PH46NG	SDIP42		
TMP87CH47LUG					0.95	8			1		1	8			2	2	Yes	Yes		37	1.8 to 4.0	-30 to 70	TMP87PH47LUG	LQFP44 (10×10 mm)		
TMP87CH47UG					0.95	8			1		1	8			2	2	Yes	Yes		37			TMP87PH47UG	LQFP44 (10×10 mm)		
TMP87CH48DFG					(1) 0.5 (2) 0.95	8				1	1				16		2	2	Yes	Yes		56	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP87PH48DFG	QFP64 (14×14 mm)
TMP87CH48UG					(1) 0.5 (2) 0.95	8				1	1				16		2	2	Yes	Yes		56			TMP87PH48UG	LQFP64 (10×10 mm)
TMP87CH74AFG					0.5	16		16	1		1		12			2	2	Yes	Yes		71	4.5 to 5.5		TMP87PM74FG	QFP80 (14×20 mm)	
TMP87CH75FG						16		16	1		1		16			2	2	Yes	Yes		89			TMP87PM75FG	QFP100 (14×20 mm)	
TMP87CH21CDFG			24	1024	(1) 0.5 (2) 0.95	1	32		2				8			2	2	Yes	Yes		52	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	TMP87PP21DFG	LQFP80 (12×12 mm)	
TMP87CH21CFG						1	32		2					8			2	2	Yes	Yes				52	TMP87PP21FG	QFP80 (14×20 mm)
TMP87CH29NG						3	24			1				5			1	4	Yes	Yes				43	TMP87PM29NG	SDIP64
TMP87CH29UG						3	24			1				5			1	4	Yes	Yes				43	TMP87PM29UG	LQFP64 (10×10 mm)
TMP87CK14FG					0.5		16	1				8			2	2	Yes	Yes		55	4.5 to 5.5		TMP87PM14FG	QFP64 (14×20 mm)		
TMP87CK14NG							16	1				8			2	2	Yes	Yes		55			TMP87PM14NG	SDIP64		
TMP87CK29NG					(1) 0.5 (2) 0.95	3	24		1			5			1	4	Yes	Yes		43	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP87PM29NG	LQFP64 (10×10 mm)		
TMP87CK29UG	3	24						1			5			1	4	Yes	Yes		43	TMP87PM29UG			LQFP64 (10×10 mm)			
TMP87CK40AFG						8		2				8			2	2	Yes	Yes		56			TMP87PM40AFG	QFP64 (14×20 mm)		
TMP87CK40ANG						8		2				8			2	2	Yes	Yes		56			TMP87PM40ANG	SDIP64		
TMP87CK41FG					(1) 0.5 (2) 0.95	8			2			16			2	2	Yes	Yes		56	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP87PM41FG	QFP64 (14×20 mm)		
TMP87CK41NG						8			2			16			2	2	Yes	Yes		56			TMP87PM41NG	SDIP64		
TMP87CK41UG						8			2			16			2	2	Yes	Yes		56			TMP87PM41UG	LQFP64 (10×10 mm)		
TMP87CM70BFG	512						16	1			1			6	2	2	Yes	Yes		73				TMP87PM70FG	QFP80 (14×20 mm)	
TMP87CM14FG	32	1024	0.5		16	1				8			2	2	Yes	Yes		55	4.5 to 5.5		TMP87PM14FG	QFP64 (14×20 mm)				
TMP87CM14NG					16	1				8			2	2	Yes	Yes		55			TMP87PM14NG	SDIP64				
TMP87CM21CDFG					(1) 0.5 (2) 0.95	1	32		2			8			2	2	Yes	Yes		52	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	TMP87PP21DFG	LQFP80 (12×12 mm)		
TMP87CM21CFG						1	32		2			8			2	2	Yes	Yes		52			TMP87PP21FG	QFP80 (14×20 mm)		
TMP87CM23AFG						1	40		2			8			2	2	Yes	Yes		70			TMP87PP23FG	QFP100 (14×20 mm)		
TMP87CM29NG						3	24			1		5			1	4	Yes	Yes		43			TMP87PM29NG	SDIP64		
TMP87CM29UG					3	24			1		5			1	4	Yes	Yes		43				TMP87PM29UG	LQFP64 (10×10 mm)		

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

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

Note 3) 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 (Kbytes)	RAM (Bytes)	Minimum Instruction Execution Time (μs) (Note 2)	LED Driver (Ch)	LCD Driver (Ch)	VFT Driver (Ch)	SIO (Ch)	UART (Ch)	I <sup>2</sup> C (Ch) (Note 1)	High-Speed Serial Output (Ch)	8-Bit AD Converter (Ch)	10-Bit AD Converter (Ch)	6-Bit Comparator (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Watchdog Timer	Dual Clocks (Low-Speed Mode (Note 3))	Clock Gear	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP Version (See the datasheet for operating conditions.)	Package			
TMP87CM40AFG	32	1024	(1) 0.5 (2) 0.95	8		2				8				2	2	Yes	Yes			56	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	TMP87PM40AFG	QFP64 (14×20 mm)			
TMP87CM40ANG				8		2					8					2	2	Yes	Yes					56	TMP87PM40ANG	SDIP64	
TMP87CM41FG				8		2						16				2	2	Yes	Yes				56	-40 to 85	TMP87PM41FG	QFP64 (14×20 mm)	
TMP87CM41NG				8		2					16					2	2	Yes	Yes				56		TMP87PM41NG	SDIP64	
TMP87CM41UG				8		2					16					2	2	Yes	Yes				56		TMP87PM41UG	LQFP64 (10×10 mm)	
TMP87CM48DFG				8		1	1				16					2	2	Yes	Yes				56		TMP87PM48DFG	QFP64 (14×14 mm)	
TMP87CM48UG				8		1	1				16					2	2	Yes	Yes				56		TMP87PM48UG	LQFP64 (10×10 mm)	
TMP87CM53FG				7		1	1				8					2	2	Yes	Yes	Yes			72		(1) 4.5 to 5.5 (2) 2.2 to 5.5	-30 to 60	TMP87PM53FG
TMP87CM74AFG				16	16	1	1			12						2	2	Yes	Yes				71	4.5 to 5.5			-30 to 70
TMP87CM75FG				16	16	1	1			16						2	2	Yes	Yes				89		TMP87PM75FG	QFP100 (14×20 mm)	
TMP87CP21CDFG	48	2048	(1) 0.5 (2) 0.95	1	32	2				8				2	2	Yes	Yes			52	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	TMP87PP21DFG	LQFP80 (12×12 mm)			
TMP87CP21CFG				1	32	2				8					2	2	Yes	Yes					52	TMP87PP21FG	QFP80 (14×20 mm)		
TMP87CP23FG				1	40	2				8						2	2	Yes	Yes					70	TMP87PP23FG	QFP100 (14×20 mm)	
TMP87CS68DFG	60			7		1	1			8				2	2	Yes	Yes	Yes		72			TMP87PS68DFG	LQFP80 (12×12 mm)			
TMP87CS71BFG					16	1			1			6				2	2	Yes	Yes			73			TMP87PS71AFG	QFP80 (14×20 mm)	

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

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

Note 3) 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 (Kbytes)	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	16	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	LQFP44 (10x10 mm)	
TMP88CS42FG	64	2048	(1) 0.32 (2) 122	24	1	1		2	16	2	4	2			Yes		Yes	55	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-30 to 70	TMP88PS42FG	QFP64 (14x20 mm)	
TMP88CS42NG				24	1	1		2	16	2	4	2			Yes		Yes	55			TMP88PS42NG	SDIP64	
TMP88CS43FG				24	1	1		2	16	2	4	2			Yes		Yes	71			TMP88PS43FG	QFP80 (14x20 mm)	
TMP88CS77FG				18	2		1	12	3	1					Yes	Yes	88	TMP88PU77FG			QFP100 (14x20 mm)		
TMP88CU74FG	96	3072	(1) 0.32 (2) 122	16	1		1	12	2	2				Yes	Yes	71						TMP88PU74FG	QFP80 (14x20 mm)
TMP88CU77FG				18	2		1	12	3	1					Yes	Yes	88						TMP88PU77FG

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 (Kbytes)	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	Undervoltage Detection	I/O Port (Pins) (Note 4)	Power Supply Voltage (V)	Operating Temperature (°C)	Flash Version (See the datasheet for operating conditions.)	Package
TMP89CH42UG	16	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
TMP89CM42UG	32	2048	(1) 0.1 (2) 0.238 (3) 0.5	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

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) and (3) correspond to power supply voltages (1) and (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 (Kbytes)	RAM (Bytes)	Minimum Instruction Execution Time ( $\mu$ s) (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)	Memory Bank Controller	10-Bit AD Converter (Ch)	LCD Controller	LCD Driver (Ch)	8-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	Motor Controller (Ch)	32-kHz Timer (for SW 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	96	4096	0.2	8	3			1			16			4	4	Yes				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	Yes	6			69	LQFP80 (12×12 mm)		
TMP91FW40FG	128	8192	(1) 0.148 (2) 0.25	4						4		(Note2) 40		4	3			1		Yes	Yes	Yes	Yes	6	61	(1) 2.7 to 3.6 (2) 2.2 to 3.6	—	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) 0.16 (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	—	LQFP100 (14×14 mm)
TMP91FW27FG		12288		(1) 0.148 (2) 0.25	2		1				4			6	1	Yes				3	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				3	Yes	Yes	Yes	Yes				53	TMP91CK27UG TMP91CP27UG TMP91CU27UG	LQFP64 (10×10 mm)
TMP91FY42FG		256	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 (Kbytes)	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 S/W RTC)	RTC (Ch)	8-Bit PWM Generator (Ch)	CS/WAIT Controller (Ch)	Watchdog Timer	Dual Clocks	Clock Gear	Program Patch Logic (Bank)	Touch Screen Interface	Melody/Alarm Generator (MILD)	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	4	Yes	Yes	Yes				31	(1) 2.7 to 3.6 (2) 1.8 to 3.6	-10 to 70	—	LOFP100 (14×14 mm)	
TMP91C025FG			(1) 0.111 (2) 0.148 (3) 0.25	2							Yes	4	Yes		4			1	4	4	Yes	Yes	Yes	Yes	Yes	Yes	38	(1) 3.0 to 3.6 (2) 2.7 to 3.6 (3) 2.4 to 3.6			-40 to 85
TMP91C219FG		2048	0.111	1											6	1			4	4	Yes		Yes				45	(Note1) (1) 4.75 to 5.25 (2) 3.0 to 3.6			-20 to 70
TMP91C630FG		6144		2									8		6	1			4	4	Yes		Yes				53	2.7 to 3.6			-40 to 85
TMP91C815FG		8192	(1) 0.148 (2) 0.4	2		1					Yes	8	Yes		4			1	4	4	Yes	Yes	Yes			Yes	61	(1) 2.7 to 3.6 (2) 1.8 to 3.6			-40 to 85
TMP91C824FG			(1) 0.122 (2) 0.4	2		1					Yes	8			4			1	4	4	Yes	Yes	Yes		Yes	35	(Note1) (1) 4.75 to 5.25 (2) 3.0 to 3.6	-20 to 70			
TMP91C829FG			0.111	2											6	1			4	4	Yes		Yes				45	(1) 4.75 to 5.25 (2) 3.0 to 3.6			
TMP91C820AFG	8	(1) 0.111 (2) 0.148	2	1	1			1	Yes	8	Yes			4	1		1	4	4	Yes	Yes	Yes		Yes	77	(1) 3.0 to 3.6 (2) 2.7 to 3.6	-40 to 85	LOFP144 (16×16 mm)			
TMP91CK27UG	24	1024	(1) 0.148 (2) 0.4	2		1						4		6	1	Yes		3	3	Yes	Yes	Yes				53	(1) 2.7 to 3.6 (2) 1.8 to 3.6	-40 to 85	TMP91FW27UG	LOFP64 (10×10 mm)	
TMP91CP27UG	48	4096	(1) 0.296 (2) 0.4	3		1						4		6	1	Yes		3	3	Yes	Yes	Yes				53	(1) 2.7 to 3.6 (2) 2.0 to 3.6	-40 to 85	TMP91PW10FG	LOFP100 (14×14 mm)	
TMP91CU10FG	96	3072	(1) 0.296 (2) 0.4	3								8		8	2			3	3	Yes	Yes	Yes				80	(1) 2.7 to 3.6 (2) 2.0 to 3.6	-40 to 85	TMP91FW27FG	QFP64 (14×14 mm)	
TMP91CU27FG		10240	(1) 0.148 (2) 0.4	2		1						4		6	1	Yes		3	3	Yes	Yes	Yes				53	(1) 2.7 to 3.6 (2) 1.8 to 3.6	-40 to 85	TMP91FW27UG	LOFP64 (10×10 mm)	
TMP91CU27UG			(1) 0.148 (2) 0.4	2		1							4		6	1	Yes		3	3	Yes	Yes	Yes				53	(1) 2.7 to 3.6 (2) 1.8 to 3.6			
TMP91CW11FG	128	4096	(1) 0.16 (2) 0.32	6	2	1	2	1				8		2	2	Yes		2	3	Yes	Yes	Yes				79	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	TMP91PW11FG	LOFP100 (14×14 mm)	
TMP91CW12AFG			(1) 0.148 (2) 0.4	2		1							8		8	2	Yes		4	4	Yes	Yes	Yes				81	(1) 2.7 to 3.6 (2) 1.8 to 3.6			
TMP91CW12FG			(1) 0.16 (2) 0.25	2		1							8		8	2	Yes		4	4	Yes	Yes	Yes				81	(1) 4.5 to 5.5 (2) 2.7 to 5.5			
TMP91CW40FG			(1) 0.148 (2) 0.25 (3) 0.4	4								4		(Note3) 40	4	3		1		Yes	Yes		6				61	(1) 2.7 to 3.6 (2) 2.2 to 3.6 (3) 1.8 to 3.6			
TMP91CW60DFG		8192	0.2		3			2			16				6	5	Yes		4	4	Yes	Yes	Yes	6			83	4.5 to 5.5	-40 to 85	TMP91FW64DFG	QFP100 (14×20 mm)
TMP91CW60FG					3			2				16				6	5	Yes		4	4	Yes	Yes	Yes	6			83			
TMP91CY22FG		256	16384	(1) 0.148 (2) 0.4	2		1						8		8	2	Yes		4	4	Yes	Yes	Yes				81	(1) 2.7 to 3.6 (2) 1.8 to 3.6	-40 to 85	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) and (3) correspond to power supply voltages (1) and (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 (Kbytes)	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			
				2	1	8	2	2	2	2	3	Yes	Yes	Yes	61									
TMP93CS41DFG	NA	2048	(1) 0.2 (2) 0.32	2	1	8		4	2					Yes	Yes	Yes	44	(1) 4.5 to 5.5 (2) 2.7 to 5.5	-40 to 85	—	LQFP100 (14×14 mm)			
TMP93CS45FG		2		1	8		4	2							Yes	Yes	Yes				44	LQFP80 (12×12 mm)		
TMP93CW41DFG		4096		2		8		2	2		2	2	3		Yes	Yes	Yes				61	LQFP100 (14×14 mm)		
TMP93CS20FG	64	2048		2	1	8	(Note3) 40	4	4	Yes					Yes	Yes	Yes			88			TMP93PW20AFG	LQFP144 (16×16 mm)
TMP93CS32FG				2		6		4	2						Yes		Yes			49			TMP93PW32FG	QFP64 (14×14 mm)
TMP93CS36UG				2		4		4	2						Yes		Yes			33			—	LQFP44 (10×10 mm)
TMP93CS40DFG				2		8		2	2		2	2	3	Yes	Yes	Yes	Yes			79			TMP93PS40DFG	LQFP100 (14×14 mm)
TMP93CS44FG				2	1	8		4	2						Yes	Yes	Yes			62			TMP93PS44FG	LQFP80 (12×12 mm)
TMP93CU44DFG (Note1)				96	3072	2	1	8		4	2					Yes	Yes			Yes			62	TMP93PW44ADFG (Note1)
TMP93CW40DFG	128	4096		2		8		2	2		2	2	3	Yes	Yes	Yes	79			TMP93PW40DFG	LQFP100 (14×14 mm)			
TMP93CW44DFG (Note1)				2	1	8		4	2					Yes	Yes	Yes	62			TMP93PW44ADFG (Note1)	QFP80 (14×20 mm)			
TMP93CW46AFG				5		8		2	2			2	3	Yes	Yes	Yes	79			TMP93PW46AFG	LQFP100 (14×14 mm)			

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 (Kbytes)	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			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			3		8	2	8	2		4	Yes	55		(1) 4.5 to 5.5 (2) 2.7 to 5.5			LOFP100 (14×14 mm)
TMP95CW65FG			3		8	2	8	2		4	Yes	55					
TMP95CS64FG			3		8	2	8	2		4	Yes	81	4.5 to 5.5				
TMP95CS66FG			1				8	2		4	Yes	81		(1) 4.5 to 5.5 (2) 2.7 to 5.5			
TMP95CW64FG	128	4096	(1) 0.16 (2) 0.4	3		8	2	8	2		4	Yes	81		-20 to 70	TMP95PW64FG	LOFP100 (14×14 mm)

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 (Kbytes)	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	
TMP96C031ZFG	NA	NA	0.2	2	1	4		4	1	2		4	Yes	37	4.5 to 5.5	-20 to 70	—	QFP64 (14×20 mm)	
TMP96C041BFG			2			4	2	2	2	2	3	Yes	47	(1) -20 to 70 (2) -40 to 85				TMP96PM40FG	QFP80 (14×20 mm)
TMP96C141BFG			2			4	2	2	2	2	3	Yes	47						
TMP96CM40FG			2			4	2	2	2	2	3	Yes	65						

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.

## 32-Bit Microcontrollers

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

#### □Flash Versions

Part Number	ROM (Kbytes)	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)	UART/SIO/HSIO (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 SW 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	512	32768	0.05				2	1	2						12			6	2	Yes			4	Yes	Yes	Yes	8	84	3.0 to 3.6	-40 to 85	TMP92CY23DFG	QFP100 (14x20 mm)			
TMP92FD23AFG									2	1	2						12			6	2	Yes			4	Yes	Yes	Yes			8	84	TMP92CY23FG	LOFP100 (14x14 mm)	
TMP92FD28AFG				1	Yes	1	2	(Note:1)	2											6	2		1			3	Yes	Yes			Yes	8	70	TMP92CD23AFG	LOFP100 (14x14 mm)

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 (Kbytes)	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)	UART/SIO/HSIO (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		
TMP94C241CFG◇	2048	2048	0.05					2						2			8	2	4	4					6	Yes							64	4.5 to 5.5	-20 to 70	QFP160 (28x28 mm)				
TMP94C251ADFG◇								2								2			8	2	4	4					6	Yes								64	LOFP144 (20x20 mm)			
TMP92C820FG				8192					2	1		1			1	Yes	5	Yes	4	1	1					4	Yes	Yes	Yes		Yes	Yes	83			3.0 to 3.6	LOFP144 (16x16 mm)			
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													
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	NA	32768	0.05				2		1							8			4	2					4	Yes	Yes						58	3.0 to 3.6	-40 to 85	LOFP100 (14x14 mm)				
TMP92CM27FG							2	4		2		1			12	2		8	6			2			2	6	Yes	Yes								83	LOFP144 (16x16 mm)			
TMP92CF26AXBG	147456	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	Yes	Yes	2	136	(Note1)	(1) 0 to 50 (2) 0 to 70	FBGA228 (15x15 mm)					
TMP92CF29AFG			0.0125	1	Yes	2			1	6	1	2	Yes	6	Yes	8	2	1		Yes	4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1	98	3.0 to 3.6	0 to 70	LOFP176 (20x20 mm)						
TMP92CF30FG			0.0125	1	Yes	2			1	6	1	2	Yes	6	Yes	8	2	1		Yes	4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1	98	1.4 to 1.6	(1) 0 to 50 (2) 0 to 70	FBGA228 (15x15 mm)							
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									
TMP92CY23DFG	256	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 (14x20 mm)		
TMP92CY23FG								3		2								12			6	2	Yes				4	Yes	Yes	Yes	8							84	TMP92FD23AFG	LOFP100 (14x14 mm)
TMP92CD23ADFG	512	32768					2		1	2							12			6	2	Yes				4	Yes	Yes	Yes	8							84	TMP92FD23ADFG	QFP100 (14x20 mm)	
TMP92CD23AFG								2		1	2								12			6	2	Yes			4	Yes	Yes	Yes	8							84	TMP92FD23AFG	LOFP100 (14x14 mm)
TMP92CD28AFG						1	Yes	1	2			(Note3)	2								6	2	1				3	Yes	Yes	Yes	8							70	TMP92FD28AFG	LOFP100 (14x14 mm)

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

Note 1) 1.4 V to 1.6 V internally; 3.0 V to 3.6 V for input/output interface.

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

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.

# Automotive Microcontrollers

## 8-Bit Microcontrollers for Automotive

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

#### □Flash Versions

Part Number	ROM (Kbytes)	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	Undervoltage Detection	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Mask ROM Version (See the datasheet for operating conditions.)	Package
TMP86FH92IDMG (Note4)	16	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 (Note4) TMP86CH92SDMG (Note4)	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.

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

#### □Flash Versions

Part Number	ROM (Kbytes)	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	Undervoltage Detection	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 **	32	2048	0.125	16						1	1		8				2		4		1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	39	4.5 to 5.5	-40 to 125	—	LOFP48 (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) The minimum instruction execution time in Low-Speed mode is 122 μs (at 32.768 kHz).

Note 5) The motor controller can only be used when an 8-MHz oscillator is used with the clock gear set to 1x.

- 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 (Kbytes)	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	Undervoltage Delection	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	OTP/Flash Version (See the datasheet for operating conditions.)	Package	
TMP86C408IDMG	4	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	8	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 85 -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				19		1	1					8	1	2	Yes	Yes								35
TMP86CH92IDMG (Note6)	16	1024	(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) 2.7 to 5.5	-40 to 85 -40 to 125	TMP86FH92IDMG (Note6)	SSOP30		
TMP86CH92SDMG (Note6)				8	1	1	1					6	1	2	Yes	Yes	Yes	Yes					24	
TMP86CH87RUG	32	1024	0.25	8	(Note3) 1	1	1				14	1	2	Yes	Yes				35	4.5 to 5.5	-40 to 85	TMP86PM87RUG	LOFP44 (10×10 mm)	
TMP86CM87RUG				8	(Note3) 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).

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 (Kbytes)	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	16	512	0.2	14	(Note1) 1	(Note1) 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 (Kbytes)	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 **	96	10240	0.148			2	1	4	6	1	Yes		3		Yes	Yes	Yes	53	2.7 to 3.6	-40 to 85	TMP91FW27UG	LOFP64 (10×10 mm)
TMP91CY22IFG	256	16384	(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	-40 to 85	TMP91FY42FG	LOFP100 (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 (Kbytes)	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)	HW 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 (Note1) **	512	32768	0.05	1	1	2	3	12	8	2	1	1	Yes		68	4.5 to 5.25	-40 to 85	TMP92CD54IFG **	LOFP100 (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 (Kbytes)	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)	HW 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 (Note1)**	512	32768	0.05	1	1	2	3	12	8	2	1	1	Yes		68	4.5 to 5.25	-40 to 85	TMP92FD54AIFG **	LOFP100 (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.

# ARM Core-Based Microcontrollers

## 32-Bit Microcontrollers

### TX03 Family: TX03 Series

□Flash Versions

Part Number	ROM (Kbytes)	SRAM (Kbytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	SSP (Ch)	UART/SIO (Ch)	UART/HSEO (Ch)	PC (Ch)	PC/SIO (Ch)	10-Bit AD Converter (Ch)	12-Bit AD Converter (Ch)	10-Bit DA Converter (Ch)	16-Bit Timer/Counter (Ch)	USB Host (Full Speed) (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)	CSWAIT Controller (Ch)	Watchdog Timer	Clock Gear	RTC (Ch)	Dual Clocks	On-Chip Debug Unit	Trace Function	Oscillation Frequency Detector	Power-On Reset	Undervoltage Detection	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Package		
TMPM382FSFG **	64	8	40	2	1	3			1		10		8		1		<sup>(Note3)</sup> 1	1			8	Yes	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	48	4.0 to 5.5	-40 to 85	QFP64 (14x14 mm)		
TMPM330FWFG			40			3			3		12		10		1	2						8	Yes	Yes	1	Yes	Yes	Yes					78	2.7 to 3.6	-20 to 85	LQFP100 (14x14 mm)		
TMPM332FWUG			40		2				2		8		10		1	1						5	Yes	Yes	1	Yes	Yes	Yes					44	2.7 to 3.6	-20 to 85	LQFP64 (10x10 mm)		
TMPM333FWFG			40			3			3		12		10									8	Yes	Yes	1	Yes	Yes	Yes					78	2.7 to 3.6	-20 to 85	LQFP100 (14x14 mm)		
TMPM390FWFG **			20		1	3			1	1	12		10		1	1						7	Yes	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	76	1.7 to 3.6	-20 to 85	LQFP100 (14x14 mm)	
TMPM395FWXBG	128		20		4	3		1	1	12		10		1	1						11	Yes	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	91	1.7 to 3.6	-20 to 85	FBGA120 (6x6 mm)		
TMPM380FWDFG **		12	40	2	2	5			2		18		8		1		<sup>(Note3)</sup> 2	3	2		16	Yes	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	84	4.0 to 5.5	-40 to 85	QFP100 (14x20 mm)	
TMPM380FWFG **			40	2	2	5			2		18		8		1		<sup>(Note3)</sup> 2	3	2		16	Yes	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	84	4.0 to 5.5	-40 to 85	LQFP100 (14x14 mm)	
TMPM382FWFG **			40	2	1	3			1		10		8		1		<sup>(Note3)</sup> 1	1			8	Yes	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	48	4.0 to 5.5	-40 to 85	QFP64 (14x14 mm)	
TMPM370FYDFG		10	80			4					22		8				2		2	4	4	16	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes	76	4.5 to 5.5	-20 to 85	QFP100 (14x20 mm)		
TMPM370FYFG			80			4					22		8				2		2	4	4	16	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes	76	4.5 to 5.5	-20 to 85	QFP100 (14x20 mm)		
TMPM330FYFG		256	40			3			3		12		10		1	2					8	Yes	Yes	1	Yes	Yes	Yes							78	2.7 to 3.6	-20 to 85	LQFP100 (14x14 mm)	
TMPM330FYWFG**			40			3			3		12		10		1	2						8	Yes	Yes	1	Yes	Yes	Yes						78	2.7 to 3.6	-40 to 85	LQFP100 (14x14 mm)	
TMPM333FYFG			40			3			3		12		10									8	Yes	Yes	1	Yes	Yes	Yes						78	2.7 to 3.6	-20 to 85	LQFP100 (14x14 mm)	
TMPM380FYDFG **			40	2	2	5			2		18		8		1		<sup>(Note3)</sup> 2	3	2		16	Yes	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	84	4.0 to 5.5	-40 to 85	QFP100 (14x20 mm)
TMPM380FYFG **			40	2	2	5			2		18		8		1		<sup>(Note3)</sup> 2	3	2		16	Yes	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	84	4.0 to 5.5	-40 to 85	QFP100 (14x20 mm)
TMPM330FDFG		512	40			3			3		12		10		1	2					8	Yes	Yes	1	Yes	Yes	Yes							78	2.7 to 3.6	-20 to 85	LQFP100 (14x14 mm)	
TMPM330FDWFG			40			3			3		12		10		1	2						8	Yes	Yes	1	Yes	Yes	Yes						78	2.7 to 3.6	-40 to 85	LQFP100 (14x14 mm)	
TMPM333FDFG			40			3			3		12		10									8	Yes	Yes	1	Yes	Yes	Yes						78	2.7 to 3.6	-20 to 85	LQFP100 (14x14 mm)	
TMPM341FDXBG **			54	4	1	5			2		16	2	12									12	2	Yes	Yes			Yes	Yes	Yes				87	2.7 to 3.6	-40 to 85	FBGA113 (6x6 mm)	
TMPM361F10FG		1024	64	2	1	5		1	3	8		16		1	1						10	4	Yes	Yes	1	Yes	Yes	Yes					76	2.7 to 3.6	-20 to 85	LQFP100 (14x14 mm)		
TMPM362F10FG			64	2	1	12			5	16		16		1	2						16	4	Yes	Yes	1	Yes	Yes	Yes					120	2.7 to 3.6	-20 to 85	LQFP144 (20x20 mm)		
TMPM363F10FG			<sup>(Note1)</sup> 64	2	1	5		1	3	8		16		1	1	1					8	4	Yes	Yes	1	Yes	Yes	Yes					74	2.7 to 3.6	-20 to 85	LQFP100 (14x14 mm)		
TMPM364F10FG **			<sup>(Note1)</sup> 64	2	1	12			5	16		16		1	1	2					14	4	Yes	Yes	1	Yes	Yes	Yes					118	2.7 to 3.6	-20 to 85	LQFP144 (20x20 mm)		
TMPM360F20FG **	2048		128	64		1	12			5	16		16		1	2						17	4	Yes	Yes	1	Yes	Yes	Yes					120	2.7 to 3.6	-20 to 85	LQFP144 (20x20 mm)	

Note 1) 48 MHz when USB is used.

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

Note 3) The motor controller channel is multiplexed with the multi-purpose timer (MPT).

• 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 (Kbytes)	SRAM (Kbytes)	eDRAM (Kbytes)	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	320	1024	144	8	1	1	4	4	2	4	8	4	Yes	2	Yes	Yes	55	(Note1) 1.1 to 1.3	-40 to 85	LOFP144 (20x20 mm)

Note 1) The following three power supplies are available:

- (1) For external circuitry in general, USB, external AD converter, internal eDRAM: 3.0 V to 3.6 V
- (2) For external USB device : 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 (Kbytes)	RAM (Kbytes)	Minimum Instruction Execution Time (μs)	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)	NANDFC (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
				1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
TMPA913CHXBG	NA	16	(1) 0.005 (2) 0.0067	1		2	2	2	2	8	4	1	2	6			6	Yes	Yes	2	Yes		Yes	Yes	Yes	Yes	Yes	98	(Note1) 1.4 to 1.6	(1) 0 to 70 (2) -20 to 85	FBGA361 (16x16 mm)
TMPA900CMXBG				1	1	3	2	2	8	2	1	2	8	Yes	Yes	6	Yes	Yes	2	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	91			FBGA289 (15x15 mm)
TMPA901CMXBG				1	1	2	1	1	8	2	1	2	4	Yes	Yes	6	Yes	Yes	1	Yes		Yes	Yes	Yes	Yes	Yes	43	FBGA177 (13x13 mm)			
TMPA912CMXBG				1		2	2	2	8	4	1	2	6	Yes	Yes	6	Yes	Yes	2	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	98		FBGA361 (16x16 mm)	
TMPA910CRAXBG		56	0.005	1	2	2	2	8	4	1	2	6	Yes	Yes	6	Yes	Yes	2	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	114	0 to 70			
TMPA910CRBXBG			0.0067	1	2	2	2	8	4	1	2	6	Yes	Yes	6	Yes	Yes	2	Yes	1	Yes	Yes	Yes	Yes	Yes	Yes	114	-20 to 85			
TMPA911CRXBG			(1) 0.005 (2) 0.0067	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 external circuitry in general, external AD converter, external USB host (Full-Speed): 3.0 V to 3.6 V
- (2) For external USB device (High-Speed): 3.15 V to 3.45 V
- (3) For external memory: 1.7 V to 1.9 V/3.0 V to 3.6 V
- (4) For external CMOS image sensor, external I<sup>2</sup>S, external 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
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

# TX System RISC Microcontrollers / Microprocessors

## 32-Bit Microcontrollers

### TX19 Family: TX19 Series

□Flash Versions

Part Number	ROM (Kbytes)	RAM (Kbytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	UART/SIO (Ch)	UART/HSEO (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
TMP1940FDBFG	512	16	32	4	2	2	1	8				4	4				11	Yes	Yes	77	2.7 to 3.6	-40 to 85	TMP1940CYAFG	LOFP100 (14×14 mm)
TMP1942FDU		20	32	4	5		1	16		3	12	14					29	Yes	Yes	108			TMP1942CYUE	LOFP144 (16×16 mm)
TMP1942FDXBG **		32	4	5			1	16		3	12	14						29	Yes	Yes			108	TMP1942CZXBG
TMP1962F10AXBG	1024	40	40.5	8	7		1	24				12	4	8	8		25		Yes	202	(Note1) 2.2 to 2.7	-20 to 85	TMP1962C10XBG	FBGA281 (13×13 mm)

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

\*\* : Under development

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

### TX19 Family: TX19A Series

□Flash Versions

Part Number	ROM (Kbytes)	RAM (Kbytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	UART/SIO (Ch)	UART/HSEO (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	256	10	56	8	2	2		19					4			2	10		Yes	75	(Note1) 2.25 to 2.75	-40 to 85	TMP19A71CYFG	QFP100 (14×20 mm)
TMP19A71FYUG			56	8	2	2		19					4			2	10		Yes	75			TMP19A71CYUG	LOFP100 (14×14 mm)
TMP19A23FYFG	384	20	54	4	3	1	2	12					12				16		Yes	111	3.0 to 3.6		—	LOFP144 (20×20 mm)
TMP19A23FYXBG			40	4	3	1	2	12				12				15		Yes	103	FBGA141 (9×9 mm)				
TMP19A43FZXBG	512	24	40	8	3	3	1	16	2			16	8	4		48	Yes	Yes	143	(Note1) 1.35 to 1.65	-20 to 85		TMP19A43CZXBG	FBGA193 (12×12 mm)
TMP19A43FDXBG	512	24	40	8	3	3	1	16	2			16	8	4		48	Yes	Yes	143				TMP19A43CDXBG	FBGA193 (12×12 mm)
TMP19A61F10XBG	1024	48	54	8	9	2		2	32			36	4	4		16		Yes	212				TMP19A61C10BG	FBGA289 (11×11 mm)
TMP19A64F20XBG	2048	64	54	8	7		1	24				11	10	4		20	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 (Kbytes)	RAM (Kbytes)	Maximum Operating Frequency (MHz)	DMA Controller (Ch)	UART/SIO (Ch)	UART/HSEO (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
TMP19A44FDAXBG	512	32	80	8	3	3	1	16	18	8	4	64	1	Yes	Yes	Yes	160	2.7 to 3.6	-20 to 85	—	FBGA241 (12x12 mm)	
TMP19A44FEXBG	768	64	80	8	3	3	1	16	18	8	4	64	1	Yes	Yes	Yes	160					
TMP19A44F10XBG	1024		80	8	3	3	1	16	18	8	4	64	1	Yes	Yes	Yes	160					
TMP19A33F20NG	2048	10	64	8	5	3	3	2				11				Yes	49	2.7 to 3.6	-20 to 85	—	SDIP64	
TMP19A33F20NG-OTP(Note1)			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.

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## TX19 Family: TX19 Series

### □Mask ROM Versions

Part Number	ROM (Kbytes)	RAM (Kbytes)	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
TMP1941AFG	NA	10	40	4	2	2	1	8				4	4				11	Yes	Yes	46	2.7 to 3.6	-40 to 85	—	LQFP100 (14×14 mm)
TMP1940CYAFG			32	4	2	2	1	8				4	4				11	Yes	Yes	77			TMP1940FDBFG	
TMP1942CYUE	256	16	32	4	5		1	16		3	12	14					29	Yes	Yes	108	2.7 to 3.6	-40 to 85	TMP1942FDU	LQFP144 (16×16 mm)
TMP1942CZUE				32	4	5		1	16		3	12	14					29	Yes	Yes			108	TMP1942FDXBG **
TMP1942CZXBG	384		32	4	5		1	16		3	12	14					29	Yes	Yes	108				FBGA177 (13×13 mm)
TMP1962C10BXBG	1024	40	40.5	8	7		1	24				12	4	8	8		25	Yes	202	(Note1) 1.35 to 1.65	-20 to 85	TMP1962F10AXBG	FBGA281 (13×13 mm)	

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

\*\* Under development

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## TX19 Family: TX19A Series

### □Mask ROM Versions

Part Number	ROM (Kbytes)	RAM (Kbytes)	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	256	10	56	8	2	2		19					4		2	10	Yes	Yes	75	2.7 to 3.6	-40 to 85	TMP19A71FYFG	QFP100 (14×20 mm)	
TMP19A71CYUG				56	8	2	2		19				4		2	10	Yes	Yes	75			TMP19A71FYUG	LQFP100 (14×14 mm)	
TMP19A43CZXBG	384	20	40	8	3	3	1	16	2			16	8	4		48	Yes	Yes	143	(Note1) 1.35 to 1.65	-20 to 85	TMP19A43FZXBG	FBGA193 (12×12 mm)	
TMP19A43CDXBG	512	24	40	8	3	3	1	16	2			16	8	4		48	Yes	Yes	143			TMP19A43FDXBG		
TMP19A61CDXBG	1024	40	54	8	9	2	2	32				36	4	4		16	Yes	212				TMP19A61F10XBG	FBGA289 (11×11 mm)	
TMP19A61C10XBG		48	54	8	9	2	2	32				36	4	4		16	Yes	212						
TMP19A64C1DXBG	1536	56	54	8	7		1	24				11	10	4		20	Yes	Yes	209			TMP19A64F20BXBG	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

□Mask ROM Versions

Part Number	ROM (Kbytes)	RAM (Kbytes)	Maximum Operating Frequency (MHz)	External SRAM Interface	DMA Controller (Ch)	Remote 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	On-chip Debug Function	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	256	80	Yes	8	Yes	5	5	2	12	16	16	6	Yes	16	Yes	Yes		1	Yes	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.



## 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					FBGA217
TMPR3927CFE	133	32	32	8	4	4	16	2	3	6	33	●	SDRAM, SRAM, ROM, Flash		QFP240

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## 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

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

\*\* : Under development

● 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

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# ASSPs

## Mixed-Signal Controllers

Part Number	ROM (Kbytes)	RAM (Bytes)	Minimum Instruction Execution Times (μs)	SIO (Ch)	I <sup>2</sup> C (Ch)	10-Bit AD Converter (Ch)	18-Bit Timer/Counter (Ch)	16-Bit Timer/Counter (Ch)	10-Bit Timer/Counter (Ch)	8-Bit Timer/Counter (Ch)	Watchdog Timer	Clock Gear	Power-On Reset	Sensor Sampling Circuit	Offset Voltage Adjustment Circuit	On-chip Debug Function	Internal Oscillator (High-Speed)	Internal Oscillator (Low-Speed)	I/O Port (Pins)	Power Supply Voltage (V)	Operating Temperature (°C)	Package
TMP89FH00DUG	16	1024	0.2	1	1	4		1			Yes	Yes	Yes	(Note1) Yes	Yes	Yes	Yes	Yes	15	2.2 to 3.6	-40 to 85	LQFP48 (7×7 mm)
TMP89FH00WBG	16	1024	0.2	1	1	4		1			Yes	Yes	Yes	(Note1) Yes	Yes	Yes	Yes	Yes	15	2.2 to 3.6	-40 to 85	WCSP39 (3.8×3.8 mm)

Note1) Supports 1- to 4-axes resistive-bridge-type acceleration sensors.

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

# Microcomputer Development System Selection Guide

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# TLCS-47 Family Development System

## □ Software Products

Language Tool		Debugger
Assembler	C-Like Compiler	
SW471E0-ZZJ: Japanese edition SW471E0-ZZE: English edition	SW476E0-ZZJ: Japanese edition SW476E0-ZZE: English edition	SW477E0-ZZJ ## : Controller: BM1020A (for the RTE emulation system), Japanese edition SW477E0-ZZE ## : Controller: BM1020A (for the RTE emulation system), English edition SW477E1-ZZJ: Controller: BM1022R0B (for the model 10 emulation system), Japanese edition SW477E1-ZZE: Controller: BM1022R0B (for the model 10 emulation system), English edition

## □ Hardware Products

Target MCU		In-Circuit Emulation System				
Part Number	Package	Emulator		Accessory		
		Controller *5	Emulation Pod	MCU Probe	Package Converter	MCU Mount Adapter /IC Socket
TMP47C101PG	DIP16	BM1020A ##	BM4721A ##	PN100002 + PN200001 *4	BM1160 ##	—
TMP47C201PG						
TMP47P201VPG						
TMP47C101MG	SOP16	BM1020A ##	BM47C203N0A ##	PN100004 *4	AS-DIP.3-016-SO03-1 ## *3	—
TMP47C201MG						
TMP47C102PG	DIP20	BM1020A ##	BM47C203N0A ##	PN100003 *4	AS-DIP.3-020-SO03-1 *3	—
TMP47C202PG						
TMP47P202VPG						
TMP47C102MG	SOP20	BM1020A ##	BM47C203N0A ##	PN100004 *4	AS-DIP.6-028-SO08-1 *3	—
TMP47C202MG						
TMP47P202VMG	SDIP28	BM1020A ##	BM47C203N0A ##	PN100003 *4	AS-DIP.6-028-SO08-1 *3	—
TMP47C103NG						
TMP47C203NG						
TMP47P403VNG	SOP28	BM1020A ##	BM47C203N0A ##	PN100003 *4	AS-DIP.6-028-SO08-1 *3	—
TMP47C103MG						
TMP47C203MG						
TMP47P403VMG	DIP20	BM1022R0B ##	BM47C206M0A ##	PN100004 *4	AS-DIP.3-020-SO03-1 *3, *4	—
TMP47C206PG						
TMP47P206VPG						
TMP47C206MG	SOP20	BM1022R0B ##	BM47C206M0A ##	PN100004 *4	AS-DIP.3-020-SO03-1 *3, *4	—
TMP47P206VMG						
TMP47C222UG	LQFP44 (10 x 10)	BM1022R0B ##	BM47C422N0B ##	PN120030	—	IC149-044-052-B5 *1
TMP47C422UG						
TMP47P422VUG						
TMP47C222FG	QFP44 (14 x 14)	BM1022R0B ##	BM47C422N0B ##	PN120019	—	IC149-044-039-B5 *1
TMP47C422FG						
TMP47P422VFG						
TMP47C222NG	SDIP42	BM1022R0B ##	BM47C422N0B ##	PN100002 *4	PN200001 *4	—
TMP47C422NG						
TMP47P422VNG						
TMP47C241NG	SDIP28	BM1020A ##	BM47214A ##	PN110003 ##	BM1152 ##	—
TMP47P241VNG						
TMP47C241MG	SOP28	BM1020A ##	BM47214A ##	PN110003 ##	BM1152 + AS-SDP.4-028-SO05-2 ## *3	—
TMP47P241VMG						
TMP47C243NG	SDIP28	BM1022R0B ##	BM47C443N0B ##	PN100003 *4	AS-DIP.6-028-SO08-1 *3	—
TMP47C443NG						
TMP47P443VNG						
TMP47C243MG	SOP28	BM1022R0B ##	BM47C443N0B ##	PN100003 *4	AS-DIP.6-028-SO08-1 *3	—
TMP47C443MG						
TMP47P443VMG	SSOP30	BM1022R0B ##	BM47C443N0B ##	PN100003 *4	AS-DIP.6-028-SO08-1 *3	—
TMP47C243DMG						
TMP47C443DMG						
TMP47P443VDMG	SSOP30	BM1022R0B ##	BM47C443N0B ##	PN100003 *4	AS-DIP.6-028-SO08-1 *3	—
TMP47C243DMG						
TMP47C443DMG	SSOP30	BM1022R0B ##	BM47C443N0B ##	PN100003 *4	AS-DIP.6-028-SO08-1 *3	—
TMP47P443VDMG						

● The TLCS-47 Family software products run on the Japanese or English Microsoft® Windows® 95, Microsoft® Windows NT®4.0, DOS-compatible box and Microsoft® MS-DOS®. Microsoft, Windows, Windows NT and MS-DOS 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.

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

\*1: One IC socket is supplied with each MCU probe. IC sockets are Yamaichi Electronics' products.

\*2: One IC socket is supplied with each package converter. IC sockets are Yamaichi Electronics' products.

\*3: The package converters whose part numbers begin with AS are Emulation Technology's products.

AS-DIP.3-016-SO03-1: DIP16 → SOP16

AS-DIP.6-028-SO08-1: DIP28 → SOP28

AS-DIP.3-020-SO03-1: DIP20 → SOP20

AS-SDP.4-028-SO05-2: SDIP28 → SOP28

\*4: These are spare parts. One spare part is supplied with each emulator or emulation pod.

\*5: BM1020A: RTE controller, BM1022R0B: model 10 controller

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

### Software Products

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

### Hardware Products

Target MCU		Emulation Chip *2	Controller	RTE870/C model 15 In-Circuit Emulation System			RTE870/C Light In-Circuit Emulation System		
Part Number	Part Number			Interface Module	Emulation Module	Target Connection Board *3	Accessory MCU Mount Adapter /IC Socket	Light In-Circuit Emulator	Probe Set *4
TMP86P202PG	DIP20	TMP86C908XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D020NA0A	—	AP20D3W-2	—
TMP86P202MG	SOP20					BMP86D020MC0A	IC253-020-0004-B *5	AP20S3T-2	BM-20S3T
TMP86P203PG	DIP20					BMP86D020NA0A	—	AP20D3W-2	—
TMP86P203MG	SOP20					BMP86D020MC0A	IC253-020-0004-B *5	AP20S3T-2	BM-20S3T
TMP86CH06AUG	LOFP44 (10 x 10)	TMP86C906XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D044DE0A	PN210020A	AP44QP	BM-44Q10P
TMP86CH06JUG						—	—	—	AP42D0U-2
TMP86PH06NG	SDIP42	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D028NB0A	—	AP28D4U	—
TMP86C407NG	SDIP28					BMP86D028NB0A	—	AP28D4U	—
TMP86C807NG	SOP28					BMP86D028MC0A	IC253-028-0003-B *5	AP28S9T	BM-28S9T
TMP86F807NG						—	—	—	—
TMP86C407MG	SOP28	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D030MF1A	IC253-030-0002-B *5	AP30S3N-2	BM-30S3N
TMP86C807MG						SSOP30	BMP86D030MF1A	—	AP30D4U-2
TMP86F807MG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D030NB0A	—	AP30D4U-2	—
TMP86P807MG						—	BMP86D030NB0A	—	AP30D4U
TMP86C408DMG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D032NB0A	—	AP32D4U	—
TMP86C408DMG						—	BMP86D032NB0A	—	AP32D4U
TMP86C808DMG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D030MF0A	IC253-030-0002-B *5	AP30S3N	BM-30S3N
TMP86C408S5DMG						—	BMP86D030MF0A	—	AP30S3N
TMP86C808DMG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D030MF1A	IC253-030-0002-B *5	AP30S3N-2	BM-30S3N
TMP86C808S5DMG						—	BMP86D030MF1A	—	AP30S3N-2
TMP86F808DMG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D030NB0A	—	AP30D4U-2	—
TMP86P808DMG						—	BMP86D030NB0A	—	AP30D4U
TMP86C408NG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D030NB0A	—	AP30D4U-2	—
TMP86C808NG						—	BMP86D030NB0A	—	AP30D4U
TMP86F808NG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D032NB0A	—	AP32D4U	—
TMP86P808NG						—	BMP86D032NB0A	—	AP32D4U
TMP86C809NG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D030MF0A	IC253-030-0002-B *5	AP30S3N	BM-30S3N
TMP86CH09NG						—	BMP86D030MF0A	—	AP30S3N
TMP86FH09ANG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D030MF1A	IC253-030-0002-B *5	AP30S3N-2	BM-30S3N
TMP86F409NG						—	BMP86D030MF1A	—	AP30S3N-2
TMP86F809NG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D030NB0A	—	AP30D4U-2	—
TMP86CH12MG						—	BMP86D030NB0A	—	AP30D4U
TMP86FH12MG	SSOP30	TMP86C909XBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D030MF0A	IC253-030-0002-B *5	AP30S3N	BM-30S3N
TMP86FH12MG						—	BMP86D030MF0A	—	AP30S3N

- Choose either the RTE870/C model 15 In-Circuit Emulation system or the RTE870/C Light 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 Light 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 OFP adaptor and one pin protector are supplied with each OFP packaged product.
- \*4: These are ADLINK's products.
- \*5: One IC socket is supplied with each target connection board. IC sockets are Yamaichi Electronics' products.

TLCS-870/C Series (2/4)

□ Software Products

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

□ Hardware Products

Target MCU			RTE870/C model 15 In-Circuit Emulation System				RTE870/C Light In-Circuit Emulation System														
Part Number	Package	Emulation Chip #2	Controller	Interface Module	Emulation Module	Target Connection Board #3	Accessory MCU Mount Adapter /IC Socket	Light In-Circuit Emulator	Probe Set #4	Bump Socket #4 (MCU Mount Adapter)											
											TMP86C420JG	LOFP64 (10 x 10)	TMP86C929AXBG	BM1040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D0064DG0A	PNZ10033	BMP86A300010A	AP64QM	BM-64Q10M
TMP86C820JG	LOFP64 (10 x 10)	BMP86D0064DE0A	PNZ10026	AP64QP	BM-64Q14P																
TMP86P820JG	OFFP64 (14 x 14)	BMP86D0064DG0A	PNZ10033	AP64QM	BM-64Q10M																
TMP86C420FG	OFFP64 (14 x 14)	BMP86D0064DE0A	PNZ10026	AP64QP	BM-64Q14P																
TMP86C820FG	LOFP64 (10 x 10)	TMP86C923XBG	BMP86A100010B	BMP86D0064DE1A	PNZ10020A	AP44QP-2	BM-44Q10P														
TMP86P820FG	OFFP64 (14 x 14)				PNZ10033	AP64QM	BM-64Q10M														
TMP86CH21AUG	LOFP64 (10 x 10)				TMP86C948XBG	BMP86A200030A	BMP86D0080DG1A	PNZ10008	—	—											
TMP86CH21IFG	OFFP64 (14 x 14)							PNZ10023	AP100QM-2	BM-100Q14M											
TMP86C822JG	LOFP44 (10 x 10)							BMP86A200020A	BMP86D1000G0A	BMP86D100FF0A	PNZ10005A	AP100QN					BM-100Q142N				
TMP86PH22JG	LOFP64 (10 x 10)										PNZ10002	AP80QP					BM-80Q142P				
TMP86CM23AUG	LOFP64 (10 x 10)							TMP86C927XBG	BMP86A200010B	BMP86D0080FE0A	PNZ10008	AP80QM					BM-80Q12M				
TMP86CP23AUG	LOFP64 (10 x 10)										PNZ10002	AP80QP					BM-80Q142P				
TMP86F S23JG	LOFP64 (10 x 10)										TMP86C925XBG	BMP86A200020A					BMP86D0080FE0A	PNZ10008		AP80QM	BM-80Q12M
TMP86PM23JG	LOFP64 (10 x 10)																	PNZ10002		AP80QP	BM-80Q142P
TMP86P S23JG	OFFP80 (12 x 12)	TMP86C928XBG	BMP86D0080FE0A	BMP86D0080FE0A	PNZ10002	AP80QP	BM-80Q142P														
TMP86F P24FG	LOFP100 (14 x 14)				PNZ10008	AP80QM	BM-80Q12M														
TMP86C S25ADFG	LOFP100 (14 x 14)	TMP86C925XBG	BMP86A200020A	BMP86D100FF0A	PNZ10005A	AP100QN	BM-100Q142N														
TMP86CM25AFG	OFFP100 (14 x 20)				PNZ10002	AP80QP	BM-80Q142P														
TMP86CM25FG	OFFP100 (14 x 20)	TMP86C927XBG	BMP86A200010B	BMP86D0080FE0A	PNZ10002	AP80QP	BM-80Q142P														
TMP86C P27AFG	OFFP80 (14 x 20)				PNZ10008	AP80QM	BM-80Q12M														
TMP86F S27FG	OFFP80 (14 x 20)	TMP86C928XBG	BMP86A200010B	BMP86D0080FE0A	PNZ10002	AP80QP	BM-80Q142P														
TMP86C S28DFG	LOFP80 (12 x 12)				PNZ10008	AP80QM	BM-80Q12M														
TMP86F S28DFG	LOFP80 (12 x 12)				PNZ10002	AP80QP	BM-80Q142P														
TMP86C S28FG	OFFP80 (14 x 20)				PNZ10008	AP80QM	BM-80Q12M														

- Choose either the RTE870/C model 15 In-Circuit Emulation system of the RTE870/C Light 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 Light 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.
- \*4: These are ADLINKS s products.

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

### □ Software Products

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

### □ Hardware Products

Target MCU		Emulation Chip *2	RTE870/C model 15 In-Circuit Emulation System				RTE870/C Light In-Circuit Emulation System		
Part Number	Package		Controller	Interface Module	Emulation Module	Target Connection Board *3	Accessory MCU Mount Adapter /IC Socket	Light In-Circuit Emulator	Probe Set *4
TMP86C829BUG	LOFP64 (10 x 10)	TMP86C929AXBG	BMT040R0B-G	BMP86A100010B	BMP86A200010B	BMP86D064DG0A	PN210033	AP64QM	BM-64Q10M
TMP86CH29BUG									
TMP86CM29BUG									
TMP86CM29LUG									
TMP86FM29UG									
TMP86PM29BUG									
TMP86C829BFG									
TMP86CH29BFG									
TMP86CM29BFG									
TMP86FM29FNG									
TMP86PM29BFG	SDIP42	TMP86C944XBG		BMP86A100010B	BMP86A200010B	BMP86D044DE0A	PN210026	AP64QP	BM-64Q14P
TMP86C845UG									
TMP86C846NG									
TMP86CH46ANG									
TMP86CM46ANG									
TMP86FH46ANG									
TMP86PH46NG									
TMP86PM46NG									
TMP86C847UG									
TMP86C847SUG									
TMP86C847UG	LOFP44 (10 x 10)	TMP86C947XBG		BMP86A100010B	BMP86A200030A	BMP86D044DE0A	PN210020A	AP44QP	BM-44Q10P
TMP86CH47UG									
TMP86CM47AUG									
TMP86CH47IUG									
TMP86CH47SUG									
TMP86CM47AUG									
TMP86FH47AUG									
TMP86PH47UG									
TMP86PM47AUG									
TMP86FH47ADUG									
TMP86FM48UG	LOFP44 (10 x 10)	TMP86C948XBG		BMP86A200030A	BMP86D064DG0A	HOPACK048SD *5	PN210033	AP48QM-2	BM-48Q7M
TMP86FM48UG									
TMP86FM48FG	LOFP44 (14 x 14)							AP64QP	BM-64Q10M
								AP64QP	BM-64Q14P

- Choose either the RTE870/C model 15 In-Circuit Emulation System or the RTE870/C Light 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 Light 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.



## 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	SW00MND-ZCC: 1 license SW00MN3-ZCC: 10 licenses

 Hardware Products

Target MCU				RTE870/C model 15 In-Circuit Emulation System				RTE870/C Light In-Circuit Emulation System							
Emulation Chip *2		Interface Module		Emulation Module		Target Connection Board *3		Accessory		Light In-Circuit Emulator		Probe Set *4		Accessory	
Part Number	Package	Controller	Emulation Chip	Interface Module	Emulation Module	Target Connection Board *3	IC Socket	Light In-Circuit Emulator	Probe Set *4	Bump Socket *4 (MCU Mount Adapter)					
TMP86CM49UG						BMP86D064DG0A	PN210033		AP64QM	BM-64Q10M					
TMP86CS49UG	LOFP64 (10 x 10)					BMP86D064DE0A	PN210026	BMP86A300010A	AP64QP	BM-64Q14P					
TMP86FS49BUG															
TMP86PM49UG															
TMP86CH49FG			TMP86C949XBG		BMP86A200010B										
TMP86CM49FG															
TMP86CS49FG	QFP64 (14 x 14)														
TMP86FS49BFG															
TMP86PM49FG															
TMP86CS64AFG	QFP100 (14 x 20)		TMP86C964XBG		BMP86A200020A	BMP86D100FF0A	PN210005A	BMP86A300020A	AP100QN	BM-100Q142N					
TMP86PS64FG															
TMP86CH72FG															
TMP86CM72FG	QFP64 (14 x 14)	BM1040R0B-G	TMP86C972XBG	BMP86A100010B					AP64QP	BM-64Q14P					
TMP86CK74AFG															
TMP86PM72FG															
TMP86CM74AFG	QFP80 (14 x 20)		TMP86C974XBG		BMP86A200010B	BMP86D064DE0A	PN210026	BMP86A300010A	AP80QP	BM-80Q142P					
TMP86PM74AFG															
TMP86CH87RUG															
TMP86CM87RUG	LOFP44 (10 x 10)		TMP86C987XBG			BMP86D044DE0A	PN210020A		AP44QP	BM-44Q10P					
TMP86PM87RUG															
TMP86CH92DMG															
TMP86CM92SDMG	SSOP30		TMP86C993XBG		BMP86A200020A	BMP86D030MF3A	IC253-030-0002-B *5	BMP86A300020A	AP-30S3N-4	BM-30S3N					
TMP86FH92IDMG															
TMP86FH92DMG															
TMP86FH93NG	SDIP32					BMP86D032NB1A			AP32DAU-2						

● Choose either the RTE870/C model 15 In-Circuit Emulation system or the RTE870/C Light 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 Light 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.

\*4: These are ADLINKS's products.

\*5: One IC socket is supplied with each target connection board. IC sockets are Yamaichi Electronics' products.

# TLCS-870 Series (1/3)

## ☐ Software Products

Language Tool	Debugger
C/C-Like Compiler & Assembler Set	
SW87YN0-ZCJ: 1 license (Japanese edition) SW87YN0-ZCE: 1 license (English edition) SW87YN3-ZCJ: 10 licenses (Japanese edition) SW87YN3-ZCE: 10 licenses (English edition)	SW87DN9-ZCK: 1 license (Japanese edition) SW87DN9-ZCF: 1 license (English edition) SW87DN3-ZCK: 10 licenses (Japanese edition) SW87DN3-ZCF: 10 licenses (English edition)

## ☐ Hardware Products

Target MCU		RTE870 model 10 In-Circuit Emulation System							
		In-Circuit Emulator		Accessory					
Part Number	Package	Controller	Emulation Pod	MCU Probe	Package Converter	MCU Mount Adapter /IC Socket			
TMP87C405AMG	SOP28	BM1022R0B ##	BM87C408MOA ##	PN100003 *1	AS-DIP.6-028-SO08-1 *1,*2	—			
TMP87C807UG	QFP44 (10 x 10)		BM87CH47U0B ##	PN120011 *1	—	PN210020A			
TMP87C408LNG	SDIP28		BM87C408MOA ##	PN100003 *1	AS-DIP.6-028-SO08-1 *1,*2	—			
TMP87C408NG									
TMP87C808LNG									
TMP87C808NG									
TMP87P808LNG									
TMP87P808NG									
TMP87C408LMG	SOP28		BM87C408MOA ##	PN100003 *1	AS-DIP.6-028-SO08-1 *1,*2	—			
TMP87C408MG									
TMP87C808LMG									
TMP87C808MG									
TMP87P808LMG									
TMP87P808MG									
TMP87C408DMG	SSOP30		BM1022R0B ##	BM87C809N0A ##	PN100003 *1	PN200007	IC253-030-0002-B *3		
TMP87C409BNG	SDIP28					PN200004 *1	AS-DIP.6-028-SO08-1 *2	—	
TMP87C809BNG									
TMP87P809NG									
TMP87C409BMG	SOP28					AS-DIP.6-028-SO08-1 *2	—	—	
TMP87C809BMG									
TMP87P809MG									
TMP87C814FG	QFP64 (14 x 20)					BM87CM14N0A ##	PN110008 *1	PN120007	PN210011A
TMP87CH14FG									
TMP87CK14FG									
TMP87CM14FG									
TMP87PM14FG									
TMP87C814NG	SDIP64					—	—	—	—
TMP87CH14NG									
TMP87CK14NG									
TMP87CM14NG									
TMP87PM14NG									
TMP87CH21CDFG	LQFP80 (12 x 12)	—				PN120006A	—	PN210008	
TMP87CM21CDFG									
TMP87CP21CDFG									
TMP87PP21DFG									
TMP87CH21CFG	QFP80 (14 x 20)	BM87CP23F0B ##				PN120004	—	PN210002	
TMP87CM21CFG									
TMP87CP21CFG									
TMP87PP21CFG									
TMP87CM23AFG	QFP100 (14 x 20)	—				PN120005 *1	—	PN210005A	
TMP87CP23FG									
TMP87PP23FG									
TMP87CH29UG	LQFP64 (10 x 10)	BM87CM29U0B ##	PN120022 *1	—	PN210033				
TMP87CK29UG									
TMP87CM29UG									

- The TLCS-870 Series software products run in the following environments:  
C/C-Like Compiler & Assembler Set: Japanese or English Microsoft® Windows® 98 and Microsoft® Windows NT®4.0.  
Debugger: Japanese or English Microsoft® Windows® 2000 and Microsoft® Windows® XP.  
Microsoft, Windows and Windows NT 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.  
##: Contact your local Toshiba sales representative before ordering products.
- \*1: These are spare parts. One spare part is supplied with each emulation pod.
- \*2: The package converters (DIP28 → SOP28) whose part numbers begin with AS are Emulation Technology's products.
- \*3: One IC socket is supplied with the package converter. The IC socket is Yamaichi Electronics' product.

## TLCS-870 Series (2/3)

### □ Software Products

Language Tool	Debugger
C/C-Like Compiler & Assembler Set	
SW87YN0-ZCJ: 1 license (Japanese edition) SW87YN0-ZCE: 1 license (English edition) SW87YN3-ZCJ: 10 licenses (Japanese edition) SW87YN3-ZCE: 10 licenses (English edition)	SW87DN9-ZCK: 1 license (Japanese edition) SW87DN9-ZCF: 1 license (English edition) SW87DN3-ZCK: 10 licenses (Japanese edition) SW87DN3-ZCF: 10 licenses (English edition)

### □ Hardware Products

Target MCU		RTE870 model 10 In-Circuit Emulation System							
		In-Circuit Emulator		Accessory					
Part Number	Package	Controller	Emulation Pod	MCU Probe	Package Converter	MCU Mount Adapter			
TMP87PM29UG	LQFP64 (10 x 10)	BM87CM29U0B ##	BM87CM29U0B ##	PN120022 *1	—	PN210033			
TMP87CH29NG	SDIP64			PN110005		—	—		
TMP87CK29NG			QFP64 (14 x 20)	PN120014	—	PN210011A			
TMP87CM29NG									
TMP87PM29NG									
TMP87C840FG									
TMP87CC40FG	SDIP64		BM87CK40N0B ##	PN110005 *1	—	—			
TMP87CH40FG									
TMP87CK40AFG									
TMP87CM40AFG									
TMP87PH40AFG	LQFP64 (10 x 10)		BM1022R0B ##	BM87CK40N0B ##	PN110005 *1	—	—		
TMP87PM40AFG									
TMP87C840NG									
TMP87CC40NG									
TMP87CH40NG	QFP64 (14 x 20)			BM87CM41N0A ##	PN120014	—	PN210011A		
TMP87CK40ANG									
TMP87CM40ANG									
TMP87PH40ANG									
TMP87PM40ANG	SDIP64	BM87CH47U0B ##		BM87CM41N0A ##	PN110005 *1	—	—		
TMP87C841UG									
TMP87CC41UG									
TMP87CH41UG								LQFP64 (10 x 10)	BM87CM41N0A ##
TMP87CK41UG									
TMP87CM41UG									
TMP87PM41UG									
TMP87C841FG	QFP64 (14 x 20)			BM87CH47U0B ##	BM87CM41N0A ##	PN120014	—	PN210011A	
TMP87CC41FG									
TMP87CH41FG									
TMP87CK41FG									
TMP87CM41FG	SDIP64		BM87CH47U0B ##		BM87CM41N0A ##	PN110005 *1	—	—	
TMP87PM41FG									
TMP87C841NG									
TMP87CC41NG									
TMP87CH41NG	SDIP42				BM87CH47U0B ##	BM87CM41N0A ##	PN100002 *1	PN200001 *1	—
TMP87CK41NG									
TMP87CM41NG									
TMP87PM41NG									
TMP87C446NG	LQFP44 (10 x 10)	BM87CH47U0B ##				BM87CH47U0B ##	PN120011 *1	—	PN210020A
TMP87C846NG									
TMP87CH46NG									
TMP87PH46NG									
TMP87C447UG	LQFP44 (10 x 10)			BM87CH47U0B ##		BM87CH47U0B ##	PN120011 *1	—	PN210020A
TMP87C847LUG									
TMP87C847UG									
TMP87CH47LUG									

- The TLCS-870 Series software products run in the following environments:

C/C-Like Compiler & Assembler Set: Japanese or English Microsoft® Windows® 98 and Microsoft® Windows NT®4.0.

Debugger: Japanese or English Microsoft® Windows® 2000 and Microsoft® Windows® XP.

Microsoft, Windows and Windows NT 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.

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

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

## TLCS-870 Series (3/3)

### □ Software Products

Language Tool	Debugger
C/C-Like Compiler & Assembler Set	
SW87YN0-ZCJ: 1 license (Japanese edition) SW87YN0-ZCE: 1 license (English edition) SW87YN3-ZCJ: 10 licenses (Japanese edition) SW87YN3-ZCE: 10 licenses (English edition)	SW87DN9-ZCK: 1 license (Japanese edition) SW87DN9-ZCF: 1 license (English edition) SW87DN3-ZCK: 10 licenses (Japanese edition) SW87DN3-ZCF: 10 licenses (English edition)

### □ Hardware Products

Target MCU		RTE870 model 10 In-Circuit Emulation System				
		In-Circuit Emulator		Accessory		
Part Number	Package	Controller	Emulation Pod	MCU Probe	Package Converter	MCU Mount Adapter
TMP87CH47UG	LQFP44 (10 x 10)	BM1022R0B ##	BM87CH47U0B ##	PN120011 *1	—	PN210020A
TMP87PH47LUG						
TMP87PH47UG						
TMP87CH48UG	LQFP64 (10 x 10)		BM87CH48U0A ##	PN120022 *1		PN210033
TMP87CM48UG						
TMP87PH48UG						
TMP87PM48UG	QFP64 (14 x 14)		PN120052	PN210026		
TMP87CH48DFG						
TMP87CM48DFG						
TMP87PM48DFG	QFP80 (14 x 20)		BM87CM53F0A ##	PN120004 *1		PN210002
TMP87CM53FG						
TMP87PM53FG						
TMP87CS68DFG	LQFP80 (12 x 12)		BM87CS68DF0A ##	PN120006A *1		PN210008
TMP87PS68DFG						
TMP87CM70BFG						
TMP87PM70FG	QFP80 (14 x 20)	BM87CK70F0B ##	PN120004	PN210002		
TMP87CS71BFG						
TMP87PS71AFG						
TMP87CH74AFG	QFP80 (14 x 20)	PN120004	PN210002			
TMP87CM74AFG						
TMP87PM74FG						
TMP87CH75FG	QFP100 (14 x 20)	BM87CM75F0A ##	PN120005 *1	PN210005A		
TMP87CM75FG						
TMP87PM75FG						

- The TLCS-870 Series software products run in the following environments:

C/C-Like Compiler & Assembler Set: Japanese or English Microsoft® Windows® 98 and Microsoft® Windows NT®4.0.

Debugger: Japanese or English Microsoft® Windows® 2000 and Microsoft® Windows® XP.

Microsoft, Windows and Windows NT 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.
- ##: Contact your local Toshiba sales representative before ordering products.  
\*1: These are spare parts. One spare part is supplied with each emulation pod.

## 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 10 In-Circuit Emulation System																		
		In-Circuit Emulator		Accessory																
Part Number	Package	Controller *2	Emulation Pod	MCU Probe	Package Converter	MCU Mount Adapter /IC Socket														
TMP88CH40NG	SDIP28	BM1040R0B-G /BM1055R0C	BM88CS43F0A-M15	PN100003	PN200004	—														
TMP88PH40NG					PN200008	IC253-028-0003-B *4														
TMP88CH40IMG	SOP28			BM1040R0B-G /BM1055R0C	BM88CS43F0A-M15	PN120011	—	PN210020A												
TMP88CH40MG							—	PN210020A												
TMP88PH40MG	LOFP44 (10 x 10)					BM1040R0B-G /BM1055R0C	BM88CS43F0A-M15	PN120011	—	PN210020A										
TMP88PH41UG									—	PN210020A										
TMP88CH41UG	SDIP42							BM1040R0B-G /BM1055R0C	BM88CS43F0A-M15	PN100002	PN200001	—								
TMP88PH41UG											—	—								
TMP88CH41NG	QFP64 (14 x 20)									BM1040R0B-G /BM1055R0C	BM88CS43F0A-M15	PN120014	—	PN210011A						
TMP88PS42FG													—	—						
TMP88CS42NG	SDIP64											BM1040R0B-G /BM1055R0C	BM88CS43F0A-M15	PN110005	—	—				
TMP88PS42NG															—	—				
TMP88CS43FG	QFP80 (14 x 20)													BM1040R0B-G /BM1055R0C	BM88CS43F0A-M15	PN120004 *1	—	PN210002		
TMP88PS43FG																	—	—		
TMP88FW45AFG	QFP80 (14 x 20)															BM1040R0B-G /BM1055R0C	BM88CS43F0A-M15	PN120004 *1	—	PN210002
TMP88F846UG	LOFP44 (10 x 10)																	PN120011	—	PN210020A
TMP88CU74FG	QFP80 (14 x 20)	BM1055R0C	BM88CU74F0A															PN120004 *1	—	PN210002
TMP88PU74FG																			—	—
TMP88CS77FG	QFP100 (14 x 20)			BM1055R0C	BM88CP77F0A													PN120005 *1	—	PN210005A
TMP88CU77FG																			—	—
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: model 15 controller, BM1055R0C: model 25 controller
- 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.

# 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)												
TMP89FW20UG	LQFP64 (10 x 10)												
TMP89FW24DFG	QFP80 (14 x 20)												
TMP89FW24FG	LQFP80 (12 x 12)												
TMP89FM40NG	SDIP42	BMP89A400010A-G	FTSH-110-01-L-DV-K	BMP89A300010A-G	TMP89C900XBG **	AP42D0U-4	—						
TMP89FH40NG													
TMP89FM42UG	LQFP44 (10 x 10)					—	—	—	AP44QP-3	BM-44Q10P			
TMP89FM42LUG													
TMP89FM42AUG													
TMP89FM42KUG													
TMP89FH42UG													
TMP89FH42LUG													
TMP89CM42UG													
TMP89CH42UG													
TMP89FM43LQG	VOON44 (5.3 x 5.3)					BMP89A400010A-G	FTSH-110-01-L-DV-K	BMP89A300010A-G	TMP89C900XBG **	AP48QM-3	BM-48Q7M		
TMP89FM46DUG	LQFP48 (7 x 7)	—	—	—	AP48QM-3							BM-48Q7M	
TMP89FM46ADUG													
TMP89FM46KDUG													
TMP89FH46DUG													
TMP89FH46LDUG													
TMP89CM46DUG													
TMP89CH46DUG													
TMP89FS60UG													LQFP64 (10 x 10)
TMP89FS60FG	QFP64 (14 x 14)	AP64QP-2	BM-64Q14P										
TMP89FM82DUG	LQFP48 (7 x 7)	—	—	—	—	—							
TMP89FM82TDUG **	LQFP48 (7 x 7)												

- 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		BM1040R0B-G	BM91CW12AF0A-M15 *5	PN120013 *3		PN210023											
TMP91PW11FG			BM91CW12F0A-M15	PN120013 *3		PN210023											
TMP91CW12AFG		TQFP128 (14 x 14)	BM1040R0B-G	BM91C815F0A-M15 *5		PN120057 *3	PN210054										
TMP91CW12FG		LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91C016F0A-M15 *5		PN120013 *3	PN210023										
TMP91PW12FG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91C219F0A-M15	PN120013 *3	PN210023												
TMP91C815FG	LQFP144 (16 x 16)		BM91CM20F0A-M15	PN120044 *3	PN210044 *3												
TMP91C016FG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91CW12AF0A-M15 *5	PN120013 *3	PN210023												
TMP91C219FG	LQFP100 (14 x 14)		BM91C824F0A-M15 *5	PN120013 *3	PN210023												
TMP91C820AFG	LQFP144 (16 x 16)	BM91C025F0A-M15	PN120013 *3	PN210013 *3	PN210023												
TMP91CY22FG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91CW12AF0A-M15 *5	TEC-064SA-T2/SET *6	HOPACK064SA *7												
TMP91CY22IFG																	
TMP91C824FG																	
TMP91C025FG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91CW12AF0A-M15 *5	PN120013 *3	PN120065-G	PN210033											
TMP91CU27FG	QFP64 (14 x 14)					BM91C829F0A-M15	PN120013 *3	PN210023									
TMP91FW27FG									BM91C630F0A-M15	PN120013 *3	PN210023						
TMP91CK27UG												BM91CW40F0A-M15	PN120013 *3	PN210023			
TMP91CP27UG															BM1040R0B-G	PN120013 *3	PN210023
TMP91CU27UG																	
TMP91CU27RUG **	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91CW60F0A-M15	PN120013 *3	—	PN210023											
TMP91FW27UG							QFP100 (14 x 20)	BM1040R0B-G /BM1055R0C	BM91CW60F0A-M15	TEC-100RB-T1/SET *6	HOPACK100RB179 *7						
TMP91C829FG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91CW60F0A-M15	TEC-080SD-T2/SET *6	HOPACK080SD *7												
TMP91C630FG						QFP100 (14 x 20)	BM1040R0B-G /BM1055R0C	BM91CW60F0A-M15	TEC-080RA-T2/SET *6	HOPACK080RA178 *7							
TMP91CW40FG	LQFP80 (12 x 12)	BM1040R0B-G /BM1055R0C	BM91CW60F0A-M15	TEC-100SD-T1/SET *6	HOPACK100SD *7												
TMP91FW40FG						QFP80 (14 x 20)	BM1040R0B-G /BM1055R0C	BM91CW60F0A-M15	TEC-100RB-T1/SET *6	HOPACK100RB179 *7							
TMP91FY42FG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91FW64F0A-GM	TEC-100SD-T1/SET *6	HOPACK100SD *7												
TMP91CW60FG						QFP100 (14 x 20)	BM1040R0B-G /BM1055R0C	BM91FW64F0A-GM	TEC-100RB-T1/SET *6	HOPACK100RB179 *7							
TMP91CW60DFG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91FW64F0A-GM	TEC-100SD-T1/SET *6	HOPACK100SD *7												
TMP91FU62FG						QFP100 (14 x 20)	BM1040R0B-G /BM1055R0C	BM91FW64F0A-GM	TEC-100RB-T1/SET *6	HOPACK100RB179 *7							
TMP91FU62DFG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM91FW64F0A-GM	TEC-100SD-T1/SET *6	HOPACK100SD *7												
TMP91FW64FG						QFP100 (14 x 20)	BM1040R0B-G /BM1055R0C	BM91FW64F0A-GM	TEC-100RB-T1/SET *6	HOPACK100RB179 *7							
TMP91FW64DFG																	

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

\*2: BM1040R0B-G: model 15 controller, BM1055R0C: model 25 controller

- 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 (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		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	LOFP144 (16 x 16)	BM1040R0B-G /BM1055R0C	BM92C820F0A-M15	PN120044 *3	PN210044 *3	—	
TMP92CH21FG			BM92CH21F0A-M15	PN120044 *3	PN210044 *3		
TMP92CM22FG	LOFP100 (14 x 14)		BM92CM22F0A-M15	PN120013 *3	PN210023		
TMP92CY23FG	LOFP100 (14 x 14)		BM92CY23F0A-M15	PN120013 *3	PN210023		
TMP92CY23DFG	QFP100 (14 x 20)			TEC-100RB-T1/SET *4	HOPACK100RB179 *4		
TMP92CA25FG	LOFP144 (16 x 16)		BM92CA25F0A-M15	PN120044 *3	PN210044 *3		
TMP92CZ26AXBG	FBGA228 (15 x 15)	—	HW92DG000AG	—	—	FTSH-110-01-L-DV-K *5 *6	
TMP92CF26AXBG		—	—	—	—		
TMP92CM27FG	LOFP144 (16 x 16)	BM1040R0B-G /BM1055R0C	BM92CM27F0A-M15	PN120044 *3	PN210044 *3	—	
TMP92CD28AFG	LOFP100 (14 x 14)		BM92CD28F0A-GM	PN120013 *3	PN210023		
TMP92FD28AFG			—	HW92DG000AG + BMC92CF29F0A-G *7	—		HOPACK176SE *4
TMP92CF29AFG	LOFP176 (20 x 20)	—	—	—	HOPACK176SE *4	—	
TMP92CF30FG	LOFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM92CY54F0A-M15	PN120013 *3	PN210023	—	
TMP92CD54IFG **							—
TMP92FD54AIFG **							—

- Choose either the RTE900 model 15 / model 25 In-Circuit Emulation system or the RTE900 In-Circuit Emulation system. Both system can use the same accessories.

Target MCU		Emulation System			Accessory	
		RTE900 model 15 / model 25 In-Circuit Emulation System		RTE900 In-Circuit Emulation System	MCU Probe/Probe Set	MCU Mount Adapter / Top Cover for IC Package
		Controller	Emulation Pod	In-Circuit Emulator		
TMP92CD23AFG	LOFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM92FD23AF0A-M15	HW92ES230AG	PN120013 / TEC-100SD-T1/SET *8	PN210023 / HOPACK100SD *8
TMP92FD23AFG					TEC-100RB-T1/SET *4	HOPACK100RB179 *4
TMP92CD23ADFG	QFP100 (14 x 20)					
TMP92FD23ADFG					—	—

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  - The real-time OS requires a license agreement. For details, please contact your local Toshiba sales representative.
  - 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: The controller comes with a single-seat download license for the Integrated Development Environment.
- \*2: BM1040R0B-G: model 15 controller, BM1055R0C: model 25 controller
- 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: 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.
- \*8: Appropriate accessories vary with the emulation system to be used.
- RTE900 model 15 / model 25 system:  
Use the MCU probe (PN120013) that comes with the BM92FD23AF0A-M15 and MCU mount adapter (PN210023).
- RTE900 system:  
Use the probe set (TEC-100SD-T1/SET) and top cover for IC package (HOPACK100SD) from Tokyo Eletech.



## 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			BM93CS20F0B-M15	PN120039A *3		PN210026	
TMP93CS32FG	QFP64 (14 x 14)		BM93CS32F0B-M15	PN120039A *3	PN120063	PN210020A	
TMP93PW32FG			BM93CS32F0B-M15	PN120039A *3	PN210023		
TMP93CS36UG	LQFP44 (10 x 10)		BM93CM40F0C-M15	PN120013 *3	—	PN210023	
TMP93CS40DFG	LQFP100 (14 x 14)		BM93CM40F0C-M15	PN120013 *3			
TMP93CW40DFG			BM93CS44F0B-M15	PN120042 *3			PN210008
TMP93PS40DFG							
TMP93PW40DFG							
TMP93CS41DFG							
TMP93CW41DFG							
TMP93CS44FG	LQFP80 (12 x 12)		BM93CS44F0B-M15	PN120009	PN210002		
TMP93PS44FG			PN120042 *3	PN210008			
TMP93CU44DFG	QFP80 (14 x 20)		BM93CS44F0B-M15	PN120009	PN210002		
TMP93CW44DFG			PN120042 *3	PN210008			
TMP93PW44ADFG	LQFP80 (12 x 12)	BM93CW46F0B-M15	PN120013 *3	PN210023			
TMP93CS45FG	LQFP80 (12 x 12)	BM93CW46F0B-M15	PN120013 *3	PN210023			
TMP93CW46AFG	LQFP100 (14 x 14)	BM93CW46F0B-M15	PN120013 *3	PN210023			
TMP93PW46AFG		BM93CW46F0B-M15	PN120013 *3	PN210023			

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

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

\*2: BM1040R0B-G: model 15 controller, BM1055R0C: model 25 controller

● 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
TMP94C241CFG	QFP160 (28 x 28)	BM1056R0B ##	BM94C241FOA	PN120040A *3	—	PN210030
TMP94C251ADFG	LQFP144 (20 x 20)		BM94C251FOA	PN120050 *3		PN210036
TMP95C001FG	QFP64 (14 x 14)		BM95C001F0B-M15	PN120039A *3		PN210026
TMP95C061BDFG	LQFP100 (14 x 14)		BM95C061F0C-M15	PN120013 *3		PN210023
TMP95C063DFG	LQFP144 (20 x 20)		BM95C063F0B-M15	PN120027 *3		PN210036
TMP95CS64FG	LQFP100 (14 x 14)	BM1040R0B-G /BM1055R0C	BM95CS64F0B-M15	PN120013 *3	—	PN210023
TMP95CW64FG						
TMP95PW64FG						
TMP95C265FG						
TMP95CW65FG						
TMP95CS66FG						
TMP96C031ZFG	QFP64 (14 x 20)	BM1055R0B ##	BM96C031FOA *4	PN110007 *3	PN120007 *3	PN210011A
TMP96CM40FG	QFP80 (14 x 20)	BM1040R0B-G /BM1055R0C	BM96C141F0D-M15	PN120009 *3	—	PN210002
TMP96PM40FG						
TMP96C041BFG						
TMP96C141BFG						

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

● 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.

##: 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: model 15 controller, BM1055R0C: model 25 controller, BM1056R0B: model 25/2 controller

● 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 BM96C031FOA to the controller (BM1055R0B), a dedicated adaptor is required. For details, please contact your local Toshiba sales representative.

## TX19 Series

### □ Software Products

Toshiba Integrated Development Environment		Real-Time OS (μITRON 3.0)
C Compiler	Integrated Development Environment *1	
SW19CN0-ZCC: 1 license SW19CN3-ZCC: 10 licenses	SW00MN0-ZCC: 1 license SW00MN3-ZCC: 10 licenses	SW19RN2-ZCC: Object code can be freely copied. SW19RN3-ZCC: The Green Hills Software (GHS) compiler is supported. Object code can be freely copied. SW19RNC-ZCC: Object code can be freely copied and comes with source code. SW19RND-ZCC: The Green Hills Software (GHS) compiler is supported. Object code can be freely copied and comes with source code.

### □ Hardware Products

Target MCU	RTE19 for N-WIRE On-Chip Debug Emulation System	
	On-Chip Debug Emulator	Accessory
	DSU PROBE for N-WIRE	Connector
TMP1940CYAFG	BM1200R0A	104068-1 *2 / FTSH-110-01-F-D-K *3
TMP1940FDBFG		
TMP1941AFG	BM1200R0A ##	
TMP1942CYUE	BM1200R0A	
TMP1942CZUE		
TMP1942CZXBG		
TMP1942FDU		
TMP1942FDXBG **		
TMP1962C10BXBG		
TMP1962F10AXBG		

- The TX19 series software products run in the following environments: \*\*: Under development

Toshiba Integrated Development Environment: Japanese or English Microsoft® Windows® 2000 and Microsoft® Windows® XP.

TX19 Series Real-Time OS (μITRON 3.0): Japanese or English Microsoft® Windows® 98, Microsoft® Windows NT® 4.0 and Microsoft® Windows® 2000.

Microsoft, Windows and Windows NT 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.
- 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 emulator comes with a single-seat download license for the Integrated Development Environment.

\*2: These are Available from Tyco Electronics's products.

\*3: These are Samtec's products.

These connectors have through-hole leads. Other options, such as surface mount leads and ejectors are also available. Please visit Samtec, Inc.'s website for more details.

# 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 FFSD-17-D-8.00-01-N: FTSH-117-01-F-D-K *2	BM1211R0A	FFSD-10-D-9.00-01-N: FTSH-110-01-F-D-K FFSD-17-D-8.00-01-N: FTSH-117-01-F-D-K *2 FFSD-10-D-8.00-01-N: FTSH-110-01-F-D-K
TMP19A23FYXBG				
TMP19A43CDXBG				
TMP19A43CZXBG				
TMP19A43FZXBG				
TMP19A43FDXBG				
TMP19A61C10XBG				
TMP19A61CDXBG				
TMP19A61F10XBG				
TMP19A64C1DXBG				
TMP19A64F20BDBG				
TMP19A71CYUG				
TMP19A71CYFG				
TMP19A71FYFG				
TMP19A71FYUG				

- Choose either the RTE19A model 110 On-Chip Debug Emulation system or 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			
TMP19A44FDXBG			
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.

# 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. 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.
	RBHMA4601(CE)	
RBTX4955	TMPR4955CFG-400	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.
	RBHMA4605(CE)	
RBTX4925	TMPR4925XBG-200	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.
	RBHMA4300(CE)	
RBTX4937	TMPR4937XBG-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.
	RBHMA4400(CE)	
RBTX4938	TMPR4938XBG-300/333	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.
	RBHMA4500(CE)	
RBTX4939	TX4939XBG-400	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.
	RBHMS4700(CE)	
RBTC86C1	TC86C001FG(GOKU-S)	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.
	RBHPE4300(CE)	
RBHBK4400	—	
	RBHBK4400(CE)	

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

## Programming Tools (1/4)

Family/Series	Target MCU		OTP Programming	Flash Programming	
	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-47 Family	TMP47P201VPG	DIP16	BM1187	—	—
	TMP47P202VMG	SOP20	BM11613		
	TMP47P202VPG	DIP20	BM1187		
	TMP47P403VMG	SOP28	BM11541		
	TMP47P403VNG	SDIP28	BM1140		
	TMP47P206VMG	SOP20	BM11626		
	TMP47P206VPG	DIP20	BM11125 ##		
	TMP47P422VFG	QFP44 (14 x 14)	BM11603		
	TMP47P422VNG	SDIP42	BM11102		
	TMP47P422VUG	LQFP44 (10 x 10)	BM11670		
	TMP47P241VMG	SOP28	BM11557		
	TMP47P241VNG	SDIP28	BM1156		
	TMP47P443VDMG	SSOP30	BM11115 *1		
TMP47P443VMG	SOP28	BM11601			
TMP47P443VNG	SDIP28	BM11100			
TLCS-870/C Series	TMP86P202MG	SOP20	BM11704	—	—
	TMP86P202PG	DIP20	BM11203		
	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	⊙
	TMP86F809NG	SDIP32		PN410119	⊙
	TMP86FH09ANG	SDIP32		PN410119	⊙
	TMP86FH12MG	SSOP30		PN410118	⊙
	TMP86P820FG	QFP64 (14 x 14)	BM11663	—	—
	TMP86P820UG	LQFP64 (10 x 10)	BM11662-G		
	TMP86PH22UG	LQFP44 (10 x 10)	BM11713		
	TMP86FS23UG	LQFP64 (10 x 10)	—	PN410105A	⊙
	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	—	—
	TMP86FS28DFG	LQFP80 (12 x 12)	—	PN410107	⊙
	TMP86FS28FG	QFP80 (14 x 20)		PN410104	⊙
	TMP86FM29FG	QFP64 (14 x 14)		PN410108	⊙
	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			
TMP86FH46ANG	SDIP42	—	PN410110	⊙	
TMP86PH46NG	SDIP42	BM11188	—	—	
TMP86PM46NG	SDIP42	BM11188			
TMP86FH47ADUG	LQFP48 (7 x 7)	—			PN410115

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

⊙: Supported

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

\*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.

## Programming Tools (2/4)

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/C Series	TMP86FH47AUG	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	⊙
	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		⊙	
TLCS-870 Series	TMP87PM14FG	QFP64 (14 x 20)	BM11199 *1	—	—
	TMP87PM14NG	SDIP64	BM11198		
	TMP87PP21DFG	LQFP80 (12 x 12)	BM11605		
	TMP87PP21FG	QFP80 (14 x 20)	BM11604		
	TMP87PP23FG	QFP100 (14 x 20)	BM11585		
	TMP87PM29NG	SDIP64	BM11143		
	TMP87PM29UG	LQFP64 (10 x 10)	BM11617		
	TMP87PH40AFG	QFP64 (14 x 20)	BM1137-G *1		
	TMP87PH40ANG	SDIP64	BM1136-G		
	TMP87PM40AFG	QFP64 (14 x 20)	BM1137-G *1		
	TMP87PM40ANG	SDIP64	BM11714		
	TMP87PM41FG	QFP64 (14 x 20)	BM1137-G *1		
	TMP87PM41NG	SDIP64	BM1136-G		
	TMP87PM41UG	LQFP64 (10 x 10)	BM11621		
	TMP87PH46NG	SDIP42	BM11193-G		
	TMP87PH47LUG	LQFP44 (10 x 10)	BM11594-G		
	TMP87PH47UG	LQFP44 (10 x 10)	BM11594-G		
	TMP87PH48DFG	QFP64 (14 x 14)	BM11647		
	TMP87PH48UG	LQFP64 (10 x 10)	BM11617		
	TMP87PM48DFG	QFP64 (14 x 14)	BM11647		
	TMP87PM48UG	LQFP64 (10 x 10)	BM11617		
	TMP87PM53FG	QFP80 (14 x 20)	BM11604		
	TMP87PS68DFG	LQFP80 (12 x 12)	BM11605		
	TMP87PM70FG	QFP80 (14 x 20)	BM11550		
	TMP87PS71AFG	QFP80 (14 x 20)	BM11607		
	TMP87PM74FG	QFP80 (14 x 20)	BM11620		
	TMP87PM75FG	QFP100 (14 x 20)	BM11624		
	TMP87P808LMG	SOP28	BM11616		
	TMP87P808LNG	SDIP28	BM11122-G		
	TMP87P808MG	SOP28	BM11616		
	TMP87P808NG	SDIP28	BM11122-G		
	TMP87P809MG	SOP28	BM11616		
	TMP87P809NG	SDIP28	BM11122-G		

● 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.

++: Being planned

⊙: Supported



## Programming Tools (3/4)

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: BM1401WOA-G *4 Connector: FTSH-110-01-L-DV-K *5
TLCS-870/X Series	TMP88PH40MG	SOP28	BM11695	—	—
	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	—	—
	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)	—	—	⊙
	TMP89FW20UG	LQFP64 (10 x 10)	—	PN410105A	⊙
	TMP89FW24DFG	QFP80 (14 x 20)	—	PN410104	⊙
	TMP89FW24FG	LQFP80 (12 x 12)	—	PN410107	⊙
	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	⊙
	TMP89FM43LOG	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.

⊙: 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.

## Programming Tools (4/4)

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	
TLC5-900 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	—	—
	TMP93PW32FG	QFP64 (14 x 14)		BM11632		
	TMP93PS40DFG	LQFP100 (14 x 14)	BM11629			
	TMP93PW40DFG	LQFP100 (14 x 14)	BM11629			
	TMP93PS44FG	LQFP80 (12 x 12)	BM11628			
	TMP93PW44ADFG	QFP80 (14 x 20)	BM11652			
	TMP93PW46AFG	LQFP100 (14 x 14)	BM11629			
TMP95PW64FG	LQFP100 (14 x 14)	BM11629				
TMP96PM40FG	QFP80 (14 x 20)	BM11539				
TMP96PM40FG	QFP80 (14 x 20)	BM11539				
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	TQSOCKET080RAG
PN120005	QFP100 (14 x 20)	PN210004	TQPACK100RB	PN210006	TQSOCKET100RBG
PN120006A	LQFP80 (12 x 12)	PN210007	TQPACK080SD	PN210009	TQSOCKET080SDG
PN120009	QFP80 (14 x 20)	PN210001	TQPACK080RA	PN210003	TQSOCKET080RAG
PN120011	QFP44 (10 x 10)	PN210019	TQPACK044SA	PN210021	TQSOCKET044SAG
PN120013	LQFP100 (14 x 14)	PN210022	TQPACK100SD	PN210024	TQSOCKET100SDG
PN120014	QFP64 (14 x 20)	PN210010	TQPACK064RZ	PN210012	TQSOCKET064RZG
PN120022	LQFP64 (10 x 10)	PN210031	TQPACK064SD	PN210032	TQSOCKET064SDG
PN120023B	QFP100 (14 x 20)	PN210004	TQPACK100RB	PN210006	TQSOCKET100RBG
PN120027	LQFP144 (20 x 20)	PN210034	TQPACK144SD	PN210035	TQSOCKET144SDG
PN120039A	QFP64 (14 x 14)	PN210025	TQPACK064SA	PN210027	TQSOCKET064SAG
PN120040A	QFP160 (28 x 28)	PN210028	TQPACK160SB	PN210029	TQSOCKET160SBG
PN120042	LQFP80 (12 x 12)	PN210007	TQPACK080SD	PN210009	TQSOCKET080SDG
PN120044	LQFP144 (16 x 16)	PN210043	NOPACK144SE	PN210045	YOPACK144SE
PN120050	LQFP144 (20 x 20)	PN210034	TQPACK144SD	PN210035	TQSOCKET144SDG
PN120052	QFP64 (14 x 14)	PN210025	TQPACK064SA	PN210027	TQSOCKET064SAG
PN120057	TQFP128 (14 x 14)	PN210053	NOPACK128SE	PN210055	YOPACK128SE

\*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	TQSOCKET064RZG
PN120035	LQFP64 (10 x 10)	PN210031	TQPACK064SD	PN210032	TQSOCKET064SDG
PN120063	LQFP44 (10 x 10)	PN210019	TQPACK044SA	PN210021	TQSOCKET044SAG
PN120065-G	LQFP64 (10 x 10)	PN210031	TQPACK064SD	PN210032	TQSOCKET064SDG

\*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	TQSOCKET080RAG
PN210005A	QFP100 (14 x 20)	PN210004	TQPACK100RB	PN210006	TQSOCKET100RBG
PN210008	LQFP80 (12 x 12)	PN210007	TQPACK080SD	PN210009	TQSOCKET080SDG
PN210011A	QFP64 (14 x 20)	PN210010	TQPACK064RZ	PN210012	TQSOCKET064RZG
PN210020A	QFP44 (10 x 10)	PN210019	TQPACK044SA	PN210021	TQSOCKET044SAG
PN210023	LQFP100 (14 x 14)	PN210022	TQPACK100SD	PN210024	TQSOCKET100SDG
PN210026	QFP64 (14 x 14)	PN210025	TQPACK064SA	PN210027	TQSOCKET064SAG
PN210030	QFP160 (28 x 28)	PN210028	TQPACK160SB	PN210029	TQSOCKET160SBG
PN210033	LQFP64 (10 x 10)	PN210031	TQPACK064SD	PN210032	TQSOCKET064SDG
PN210036	LQFP144 (20 x 20)	PN210034	TQPACK144SD	PN210035	TQSOCKET144SDG
PN210044	LQFP144 (16 x 16)	PN210043	NOPACK144SE	—	—
PN210054	TQFP128 (14 x 14)	PN210053	NOPACK128SE	—	—

\*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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