TOSHIBA

SEMICONDUCTOR GENERAL CATALOG
半導体製品総覧表2019年1月版

ASSPs
専用IC

Automotive ICs / 車載用
Communications ICs / 通信用
Audio ICs / オーディオ用
Application Processors / アプリケーションプロセッサ
Interface Bridges / インタフェースブリッジ
Other Consumer Product ICs / その他機器用

SCA0004O

Automotive ICs / 車載用

Image Recognition Processors / 画像認識プロセッサ

Part Number	Maximum Operating Frequency (MHz) MeP, MPE	Maximum Operating Frequency (MHz) Arm® Cortex®-A9 MPCore	Media Processing Engine [MPE]	Image Processing Accelerator								Video Input Interface (ch)	Video Output Interface (ch)	PCI Express® (lane)	UART (ch)	SPI (ch)	I2C (ch)	CAN (ch)	PCM (ch)	Memory Controller	CPU Core		Package
				Affine Transformation	Pyramid	Filter	Histogram	Histogram of Oriented Gradients [HOG]	Enhanced CoHOG	Matching	SfM										Toshiba's Proprietary 32-bit RISC CPU MeP	Arm 32-bit RISC Arm® Cortex®-A9 MPCore	
TMPV7502XBG ☆	266.7	—	○	○	—	○	○	○	—	○	—	1	1	—	5	1	4	2	2	DDR2-SDRAM, SRAM, ROM, NOR Flash	○	—	PLFBGA324
TMPV7504XBG ☆	266.7	—	○	○	—	○	○	—	—	○	—	2	1	—	5	4	4	3	2	DDR2-SDRAM, SRAM, ROM, NOR Flash	○	—	PBGA516
TMPV7506XBG ☆	266.7	—	○	○	—	○	○	○	—	○	—	4	1	1	5	4	4	3	2	DDR2-SDRAM, SRAM, ROM, NOR Flash	○	—	PBGA516
TMPV7528XBG ☆	266.7	300	○	○	—	○	○	○	—	○	—	4	1	1	5	4	4	3	2	DDR2-SDRAM, SRAM, ROM, NOR Flash	○	○	PBGA516
TMPV7608XBG ☆	266.7	—	○	○	○	○	○	○	○	○	○	8	1	—	5	4	8	3	2	LPDDR2-SDRAM SRAM, ROM, NOR Flash	○	—	PFBGA796

☆: Dry-packed / 防湿梱包品

・ The video input interface of the TMPV7608XBG has a 4-of-8 video switch.

・ Arm and Cortex are registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

・ PCI Express and PCIe are registered trademarks of PCI-SIG.

・ TMPV7608XBGのビデオ入力インタフェースは、8入力4選択のビデオスイッチ付きです。

・ ArmおよびCortexは、Arm Limited（またはその子会社）のUSまたはその他の国における登録商標です。

・ PCI ExpressまたはPCIeは、PCI-SIG社の商標または登録商標です。

Automotive Video Processors / 車載ディスプレイ用映像処理IC
(Dual/Single-Picture Video Processors) /（2画面/単画面映像処理IC）

Part Number	Function	Package	ADC	Color Decoder	Overlay	Muteless Input Switch	New Picture Adjustment	LVDS Input I/F	Two Digital Video Output	Panel	Operating Temperature (˚C)	Supply Voltage (V)
TC90195AXBG ☆	Dual pictures processing	LFBGA293	1	1	○	○	○	○	○	WXGA+	−40 to +85	1.1 to 1.3 3.0 to 3.6
TC90175XBG ☆	Picture processing	LFBGA293	1	1	—	○	○	○	○	Full-HD		
TC90197XBG ☆	Dual pictures processing	LBGA 256	4	2	○	—	○	—	—	WVGA		1.4 to 1.6 2.3 to 2.7 3.0 to 3.6
TC90193SBG ☆	Quick display function for Rear view monitor	FBGA228	1	1	—	—	○	—	—			
TC90193ASBG ☆			1	1	—	○	○	—	—			
TC90202XBG ☆	LCD Timing control & Picture quality adjustment	FBGA121	—	—	—	—	○	—	—			1.4 to 1.6 3.0 to 3.6
TC90205FG ☆		LQFP80	—	—	—	—	○	—	—			
TC90207FG ☆	LVDS to LVTTL	LQFP64	—	—	—	—	—	○	—			

☆: Dry-packed / 防湿梱包品

(Video Decoder ICs) /（ビデオデコーダIC）

Part Number	Function	Package	ADC	Color Decoder	Component Input (D2)	New Picture Adjustment	ITU-R BT.601 Output	ITU-R BT.656 Output	8 bit Serial Output (D2)	Operating Temperature (˚C)	Supply Voltage (V)
TC90104AFG ☆	Video Decoder	LQFP64	3	1	○	—	○	○	○	−40 to +85	1.4 to 1.6 2.3 to 2.7 3.0 to 3.6
TC90106FG ☆			3	1	○	—	—	○	○ Embedded SAV/EAV		
TC90105FG ☆	Video Decoder with 2.5 V regulator	LQFP80	2	2	—	○	○	○	—		
TC90107FG ☆		LQFP64	1	1	—	○	—	○	—		

☆: Dry-packed / 防湿梱包品

System Power Supplies / システム電源

Part Number	Package	Functions	Characteristics			Remarks	Supply Voltage (V)
			Output Voltage Typ. (V)	Input Voltage Max (V)	Power Dissipation Max (W)		
TB9005FNG ☆	SSOP20 (0.65)	CPU voltage regulator Watchdog timer	5	45 (60 s)	0.6	Low current consumption: 90 μA (typ.) Watchdog timer enable/disable Reset detection: 4.75 V or 4.25 V (selectable) External transistor required	6 to 18
TB9021FNG ☆	HTSSOP16	CPU voltage regulator Watchdog timer	5	50	2.8	Low current consumption: 30 μA (typ.) Output transistors included Window watchdog timer Reset detection: 4.7 V or 4.2 V (selectable)	6 to 18
TB9042FTG ** ☆	HQFN52	CPU voltage regulator Switching regulators Series regulators Watchdog timer SPI communications	1.5/1.2 5 5 5/3.3	40 (1 s)	5.5	2 switching regulators 1.2 V/1.5 V selectable 3 series regulators 2 watchdog timers SPI communications Diagnosis functions	7 to 20.1
TB9044AFNG ** ☆	HTSSOP48	Switching regulator Series regulators Trackers Watchdog timer SPI communications	5 5 5 5	40 (1 s)	3.84	Buck/Boost Switching regulator 1 series regulator 3 trackers 1 watchdog timer SPI communications Diagnosis functions	2.7 to 28
TB9045FNG ** ☆	HTSSOP48	Switching regulator CPU voltage regulator Series regulators Trackers Watchdog timer SPI communications	1.1/1.2/ 1.25/1.5 5 5 5 5	40 (1 s)	3.84	Buck/Boost Switching regulator 1 switching regulator 1 series regulator 3 trackers 1 watchdog timer SPI communications Diagnosis functions	2.7 to 28

☆: Dry-packed / 防湿梱包品

**: Under development / 開発中

Brushed DC Motor Driver ICs / ブラシ付きモータドライバ

Part Number	Package	Functions	Remarks	Output Current Max (A)	Supply Voltage (V)
TB9051FTG ☆	PQFN28 (0.65)	1-ch H-bridge driver	PWM control, Small package, Built-in overcurrent detection, etc.	5	4.5 to 28
TB9052FNG ☆	HTSSOP48 (0.5)	H-bridge pre-driver	High speed pre-driver = 250 ns (typ.) High speed current monitor = 3 V/μs (min) Sequence control logic Diagnostic function	1	6 to 18
TB9056FNG ☆	SSOP24 (0.65)	LIN-compatible H-bridge driver	LIN Rev. 1.3 Motor driver: R_{DSON} (H bridge: P-ch + N-ch) = 2.2 Ω (typ.) Potentiometer support	0.3	7 to 18
TB9057FG ☆	LQFP48 (0.5)	H-bridge pre-driver	High speed pre-driver = 250 ns (typ.) High speed current monitor = 3 V/μs (min) Motor rotation detection Diagnostic function	1	5 to 21
TB9058FNG ** ☆	SSOP24 (0.65)	LIN-compatible H-bridge driver	LIN Rev. 1.3 (Enhanced Checksum) Motor driver: R_{DSON} (H bridge: P-ch + N-ch) = 2.2 Ω (typ.) Potentiometer support	0.3	7 to 18
TB9101FNG ☆	SSOP24 (0.65)	2-ch H-bridge driver	Diagnostic function, standby function, P-ch + N-ch = 1.2 Ω (typ.)	1	7 to 18
TB9102FNG ☆	SSOP24 (0.65)	6-ch Half-bridge driver / 3-ch H-bridge driver	SPI communications, Diagnosis function P-ch + N-ch = 1.0 Ω (typ.)	1	7 to 18
TB9110FNG ☆	SSOP24 (0.65)	1-ch High-side pre-driver	Motor rotational speed control by PWM input Built-in charge pump, diagnosis function, standby function	0.02	7 to 18
TB9111FNG ** ☆	HSSOP32 (0.65)	1-ch Half-bridge driver	2 pieces assumed for brushed motor usage 3 chip configuration (controller, PchFET, NchFET) Slew rate control for switching noise reduction Current limit control (Enable/disable setting), Over current and temperature detection (H/L side)	54	5 to 28

☆: Dry-packed / 防湿梱包品　　**: Under development / 開発中

Stepping Motor Driver IC / ステッピングモータドライバ

Part Number	Package	Functions	Remarks	Output Current Max (A)	Supply Voltage (V)
TB9120FTG ** ☆	VQFN28	2-phase bipolar stepping motor driver with a clock input interface	Constant-current PWM control Micro step drive, supporting up to 1/32 steps Stall detection Mixed decay mode Wettable pins with excellent solderability	1.0	7.0 to 18

☆: Dry-packed / 防湿梱包品　　**: Under development / 開発中

Brushless Motor Driver ICs / ブラシレスモータドライバ

Part Number	Package	Functions	Characteristics	Supply Voltage (V)
TB9061AFNG ☆	SSOP24 (0.65)	Sensorless control with 120 degree commutation, Pre-driver	3-phase, full-wave sensorless drive PWM pulse input control/DC level input control (selectable) Comparator for induced voltage detection Thermal shutdown, overcurrent detection, overvoltage detection Output PWM Dynamic range expansion	5.5 to 18
TB9062FNG ** ☆	SSOP24 (0.65)	Sensorless control with 120 degree commutation, Pre-driver	3-phase, full-wave sensorless drive Pre-drivers for high-side Pch FETs and low-side Nch FETs PWM pulse input control Comparator for induced voltage detection Thermal shutdown, overcurrent detection, overvoltage detection, undervoltage detection,input PWM signal abnormality detection Output PWM Dynamic range expansion Improvement for start-up performance	6.5 to 166
TB9067FNG ☆	SSOP24 (0.65)	Hall IC, Pre-driver for 120 degree commutation	120-degree commutation logic Pre-drivers for a high-side P-ch FET and a low-side N-ch FET PWM pulse input control/DC level input control (selectable) Two options for setting the output duty cycle (pulse input, analog input) Overcurrent detection, thermal shutdown, supply voltage increase, supply voltage decrease Soft start	6 to 18
TB9068FG ☆	LQFP48 (0.5)	Motor driver with a LIN transceiver	Motor driver R_{DSON}: P-ch = 1 Ω (typ.), N-ch = 1 Ω (typ.) 120-degree commutation logic LIN 1.3-based transceiver 5 V supply for a microcontroller (external PNP transistor required) Watchdog timer, power-on reset timer Three analog comparators for Hall devices	7 to 18
TB9080FG ☆	LQFP64 (0.5)	Hall elements, Pre-driver for sine-wave control	Supports both PWM and DC inputs for sine-wave driver logic. Motor RPM feedback, auto lead angle correction Abnormal condition detection such as overcurrent, overvoltage, overtemperature and motor lock Sleep mode	7 to 18
TB9081FG ☆	LQFP64 (0.5)	3-Phase Brushless Motor Pre-driver	5-channel safety relay Selectable operation on fault detection Initial diagnosis of detection circuits	4.5 to 28
TB9111FNG ** ☆	HSSOP32 (0.65)	1-ch Half-bridge driver	3 pieces assumed for brushless motor usage 3 chip configuration (controller, PchFET, NchFET) Slew rate control for switching noise reduction Over current and temperature detection (H/L side)	5 to 28

☆: Dry-packed / 防湿梱包品

**: Under development / 開発中

Interface Bridges / インタフェースブリッジ

Part Number	Package	Applications	Functions and Features	Supply Voltage (V)
TC9560XBG ☆	P-LFBGA170 (0.65)	Ethernet AVB Bridge Solution For Automotive Applications	Host (External application) I/F: PCIe I/F [Gen2.0 (5 GT/s), Endpoint, Single lane], Automotive I/F: Ethernet AVB [IEEE802.1AS, IEEE802.1Qav], MAC Audio I/F: I2S/TDM Peripheral I/F: I2C/SPI, Quad-SPI, UART, GPIO, INTC CPU Core: Arm® Cortex®-M3	1.8/3.3 for IO 1.8/2.5/3.3 for RGMII/RMII 1.8 for PCIe 1.1 for Core
TC9560AXBG ** ☆	P-LFBGA170 (0.65)	Ethernet AVB Bridge Solution For Automotive Applications	Host (External application) I/F: PCIe I/F [Gen2.0 (5 GT/s), Endpoint, Single lane], Automotive I/F: Ethernet AVB [IEEE802.1AS, IEEE802.1Qav], MAC, 2ch CAN-FD Audio I/F: I2S/TDM Peripheral I/F: I2C/SPI, Quad-SPI, UART, GPIO, INTC CPU Core: Arm® Cortex®-M3	1.8/3.3 for IO 1.8/2.5/3.3 for RGMII/RMII 1.8 for PCIe 1.1 for Core
TC9560BXBG ** ☆	P-LFBGA170 (0.65)	Ethernet AVB Bridge Solution For Automotive Applications	Host (External application) I/F: HSIC I/F (480 Mbps) Automotive I/F: Ethernet AVB [IEEE802.1AS, IEEE802.1Qav], MAC Audio I/F: I2S/TDM Peripheral I/F: I2C/SPI, Quad-SPI, UART, GPIO, INTC CPU Core: Arm® Cortex®-M3	1.8/3.3 for IO 1.2 for HSIC 1.8/2.5/3.3 for RGMII/RMII 1.1 for Core
TC9562XBG ** ☆	P-LFBGA120 (0.65)	Ethernet AVB Bridge Solution For Automotive Applications	Host (External application) I/F: PCIe I/F [Gen2.0 (5 GT/s), Endpoint, Single lane], Automotive I/F: Ethernet AVB [IEEE802.1AS, IEEE802.1Qav], MAC Audio I/F: I2S/TDM Peripheral I/F: I2C/SPI, Quad-SPI, UART, GPIO, INTC CPU Core: Arm® Cortex®-M3	1.8/3.3 for IO 1.8/2.5/3.3 for RGMII/RMII/MII 1.8 for PCIe 1.1 for Core
TC9562AXBG ** ☆	P-LFBGA120 (0.65)	Ethernet AVB Bridge Solution For Automotive Applications	Host (External application) I/F: PCIe I/F [Gen2.0 (5 GT/s), Endpoint, Single lane], Automotive I/F: Ethernet AVB [IEEE802.1AS, IEEE802.1Qav], MAC Audio I/F: I2S/TDM Peripheral I/F: I2C/SPI, Quad-SPI, UART, GPIO, INTC CPU Core: Arm® Cortex®-M3	1.8/3.3 for IO 1.8/2.5/3.3 for RGMII/RMII/MII 1.8 for SGMII 1.8 for PCIe 1.1 for Core
TC9562BXBG ** ☆	P-LFBGA120 (0.65)	Ethernet AVB/TSN Bridge Solution For Automotive and Industrial Applications	Host (External application) I/F: PCIe I/F [Gen2.0 (5 GT/s), Endpoint, Single lane], Automotive I/F: Ethernet AVB [IEEE802.1AS, IEEE802.1Qav], Ethernet TSN [IEEE802.1 Qbv, IEEE802.1 Qbu, IEEE802.3 br] MAC Audio I/F: I2S/TDM Peripheral I/F: I2C/SPI, Quad-SPI, UART, GPIO, INTC CPU Core: Arm® Cortex®-M3	1.8/3.3 for IO 1.8/2.5/3.3 for RGMII/RMII/MII 1.8 for SGMII 1.8 for PCIe 1.1 for Core
TC9590XBG ☆	P-LFBGA64 (0.8)	IVI (In-Vehicle Infotainment) system	HDMI to MIPI® CSI-2SM bridge chip - HDMI 1.4 - MIPI® CSI2SM 1 Gbps/Lnae x 4 data lane	1.2 for Core and MIPI® 1.8 or 3.3 for IO 1.2/2.5/3.3 for HDMI
TC9591XBG ☆	P-VFBGA80 (0.65)	IVI (In-Vehicle Infotainment) system	MIPI® CSI-2SM from/to Parallel bridge chip - MIPI® CSI-2SM Rx 1Gbps/lane x4 data lane, Parallel out (Max 100 MHz) - Parallel in (Max 166 MHz), MIPI CSI02SM Tx 1 Gbps/lane x4 data lane	1.2 for Core and MIPI® 1.8 or 3.3 for IO
TC9592XBG ☆	P-VFBGA49 (0.65)	IVI (In-Vehicle Infotainment) system	MIPI® DSISM to LVDS bridge chip (Up to 1600 x 1200 24 bit per pixel) - MIPI® DSISM Rx 1 Gbps/lane x 4 data lane, Single LVDS	1.2 for Core and MIPI® 1.8 or 3.3 for IO
TC9593XBG ☆	P-VFBGA64 (0.65)	IVI (In-Vehicle Infotainment) system	MIPI® DSISM to LVDS bridge chip (Up to 1920 x 1200 24 bit per pixel) - MIPI® DSISM Rx 1 Gbps/lane x 4 data lane, Dual LVDS	1.2 for Core and MIPI® 1.8 or 3.3 for IO
TC9594XBG ** ☆	P-VFBGA80 (0.65)	IVI (In-Vehicle Infotainment) system	Parallel to MIPI® DSISM bridge chip (Up to 1920 x 1200 24 bit per pixel) - Parallel in (Max 166 MHz), MIPI® DSISM Tx 1 Gbps/lane x4 data lane	1.2 for Core and MIPI® 1.8 or 3.3 for IO

☆: Dry-packed / 防湿梱包品

**: Under development / 開発中

・HDMI and the HDMI logo are trademarks or registered trademarks of HDMI licensing in U.S and other countries.

・MIPI® mark and logo is registered trademark of MIPI® Alliance, Inc. and CSI-2SM and DSISM service marks of MIPI Alliance, Inc.

Communications ICs / 通信用

Wireless Communications ICs / 無線通信用IC

Part Number	Package (Pin Pitch)	Functions	Applications	Functions and Features	Current consumption		Supply Voltage (V)
TC32306FTG ☆	QFN36 (0.5 mm)	RF- IC	Remote keyless entry (remote door lock/unlock), TPMS (tire pressure monitoring system), Remote control (AM/FM), etc.	Single-chip RF transceiver; Supported modulation: ASK/FSK. Use for four RF Band: 315, 434, 868/915-MHz, Fractional-N ΔΣ PLL Receiver sensitivity: under −116 dBm (At IF BW = 320 kHz, data rate = 600 Hz, frequency deviation = +/−40 kHz) Transmitter power: +10 dBm (typ. by maximum coarse step control) Two IF Filter bandwidths: wide 320 kHz (typ.) at IF = 230 kHz/ middle 270 kHz (typ.) at IF = 280 kHz Signal Detection: RSSI detection, noise detection (only for FSK), preamble detection Serial control (4 wire SPI) /EEPROM control (This IC also can be used as a specialized for receiving.)	Current consumption	TX: 12 mA (typ. /@Output level: +10 dBm) RX: 9.7 mA (typ.) Battery Saving: 0 μA (typ.)	3V Use: 2.0 to 3.3 5V Use: 2.4 to 5.5
TC32163FG ☆	LQFP48 (0.5 mm)		DSRC (Dedicated Short Range Communication), ETC (Electronic Toll Collection System)	5.8-GHz transceiver; ASK/QPSK, transmit power = −15 dBm to −2 dBm Transmitter EVM = 6.5% (typ.) ACPR ⊿5 MHz = −42 dBc (typ.), receiver EVM = 8% (typ.)		RX (ASK/QPSK): 62 mA/66 mA (typ.) TX (ASK/QPSK): 75 mA/75 mA (typ.)	2.7 to 3.6
TC32166FNG ☆	SSOP10 (0.65 mm)		DSRC (Dedicated Short Range Communication), ETC (Electronic Toll Collection System)	5.8-GHz power amp; Power gain = 20 dB (typ.), ACPR (ASK/QPSK, ⊿5 MHz) = −44 dBc (@Output level: +14 dBm)		TX: 75 mA (typ. /@Output level: +14 dBm)	3.0 to 3.6
TC32168FTG ☆	QFN32（0.5 mm）		ETC (Electronic Toll Collection System) for China	Single-Chip 5.8 G Hz transceiver including Wakeup function and FM0 Modem Supported modulation: ASK/OOK Receiving sensitivity: −60 dBm (typ.) Wakeup sensitivity: −45 dBm (typ.) Transmit power: +3 dBm		Sleep: 5 μA RX: 30 mA (typ.) TX: 35 mA (typ.)	1.8 to 3.6
TC32169FTG ** ☆	QFN32（0.5 mm）		ETC (Electronic Toll Collection System) for China	Single-Chip 5.8 G Hz transceiver including Wakeup function and FM0 Modem Supported modulation: ASK/OOK Receiving sensitivity: −60 dBm (typ.) Wakeup sensitivity: −45 dBm (typ.) Transmit power: +3 dBm AEC-Q100 Available		Sleep: 5 μA RX: 30 mA (typ.) TX: 35 mA (typ.)	1.8 to 3.6

☆: Dry-packed / 防湿梱包品

**: Under development / 開発中

Bluetooth® ICs / Bluetooth® IC

(Bluetooth® Classic / Bluetooth® Classic_low energy dual ICs for Consumer) /
（民生用Bluetooth® Classic / Bluetooth® Classic low energy dual IC）

CPU	Host-IF	Other Interfaces
ARM7TDMI-S™	UART	I²C/SPI /GPIO

Part Number	Bluetooth Core Spec.	Profiles	Features	Operating temperature (˚C)	Supply Voltage (V)	Package
TC35661SBG-203 ☆	Ver.4.2 Classic	SPP	・Receiver sensitivity −90 dBm ・Transmit power 2 dBm ・Current consumption in TX/RX (peak) 63 mA ・Current consumption in deep sleep mode 30 μA	−40 to +85	1.7 to 1.9 or 2.7 to 3.6	BGA64 (0.5 mm Pitch) 5.0 mm x 5.0 mm
TC35661SBG-009 ☆	Ver.4.2 Classic/low energy dual	HCI	・Receiver sensitivity −91 dBm ・Transmit power 2 dBm ・Current consumption in TX/RX (peak) 63 mA ・Current consumption in deep sleep mode 30 μA ・Wide band Speech			
TC35661SBG-503 ☆	Ver.4.2 Classic/low energy dual	SPP, GATT, SMP	・Receiver sensitivity −91 dBm ・Transmit power 2 dBm ・Current consumption in TX/RX (peak) 63 mA ・Current consumption in deep sleep mode 30 μA			
TC35661SBG-551 ☆			・Receiver sensitivity −91 dBm ・Transmit power 1 dBm ・Current consumption in TX/RX (peak) 63 mA ・Current consumption in deep sleep mode 30 μA ・LE Secure Connections			

☆: Dry-packed / 防湿梱包品

(Bluetooth® low energy ICs for Consumer) /（民生用Bluetooth® low energy IC）

Host-IF	Other Interfaces	Other functions
UART	I²C/SPI/GPIO	ADC/PWM/DC-DC

Part Number	Bluetooth Core Spec.	Profiles	NFC Tag	CPU	Features	Operating temperature (˚C)	Supply Voltage (V)	Package
TC35667FTG-006 ☆	Ver.4.1 low energy	HCI, GATT, SMP		Arm® Arm7TDMI-S™	・Receiver sensitivity –92 dBm ・Transmit power 0 dBm ・Current consumption in TX/RX (peak) 5.9 mA (3.3 V, –4 dBm TX power)/ 5.7 mA ・Current consumption in deep sleep mode 0.05 μA ・Scatternet	–40 to +85	1.8 to 3.6	QFN40 (0.5 mm Pitch) 6.0 mm x 6.0 mm
TC35670FTG-006 ☆			✓			–30 to +85		
TC35676FSG-001 ☆						–40 to +85		QFN40 (0.4 mm Pitch) 5.0 mm x 5.0 mm
TC35678FXG-002 ☆	Ver.4.2 low energy			Cortex®-M0	・Receiver sensitivity –93.5 dBm ・Transmit power 0 dBm ・Current consumption in TX/RX (peak) 3.3 mA (3.0 V, 0 dBm TX power)/ 3.3 mA ・Current consumption in deep sleep mode 0.05 μA ・Scatternet ・LE Data Length Extension ・LE Secure Connections	–40 to +85		QFN60 (0.4 mm Pitch) 7.0 mm x 7.0 mm
TC35678FSG-002 ☆								QFN40 (0.4 mm Pitch) 5.0 mm x 5.0 mm
TC35679FSG-002 ☆								
TC3567CFSG-002 ☆ *								
TC3567DFSG-002 ☆ *								
TC35680FSG-002 ☆ *	Ver.5.0 low energy	HCI, GATT, SMP		Cortex®-M0	・Receiver sensitivity -95 dBm(1 Mbps) / -105dBm(125 kbps) ・Transmit power +8 dBm max. ・Current consumption in Tx/Rx (peak) 11.5 mA at Tx +8 dBm 2 Mbps / 6.0 mA at Tx +0 dBm 1 Mbps 5.5 mA at Rx 2 Mbps / 5.1 mA at Rx 1 Mbps ・Current consumption in deep sleep mode 0.05 μA ・LE Data Length Extension ・LE Secure Connections ・2 Mbps ・Long Range ・Advertising Extensions	–40 to +85	1.9 to 3.6	QFN40 (0.4 mm Pitch) 5.0 mm x 5.0 mm
TC35681FSG-002 ☆ *						–40 to +120	1.8 to 3.6	

☆: Dry-packed / 防湿梱包品

* : New product / 新製品

・FeliCa is a registered trademark of Sony Corporation.

・The Tag section of this product uses the FeliCa Lite-S technology licensed from Sony Corporation.

・Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.
Arm7 is a trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

・FeliCa はソニー株式会社の登録商標です。

・本製品の Tag 部は、ソニー株式会社の FeliCa Lite-S 技術ライセンスに基づいて製品化されています。

・Arm は、Arm Limited（またはその子会社）の US またはその他の国における登録商標です。
Arm7 は、Arm Limited（またはその子会社）の US またはその他の国における商標です。

Bluetooth® ICs / Bluetooth® IC

(Bluetooth® Classic / Bluetooth® Classic_low energy dual / Bluetooth® low energy ICs for Automotive) /
(車載用Bluetooth® Classic / Bluetooth® Classic_low energy dual / Bluetooth® low energy IC)

Part Number	Bluetooth Core Spec.	Profiles	Features	Operating temperature (˚C)	Supply Voltage (V)	Package
TC35661IDBG-203 ☆	Ver.4.2 Classic	SPP	・Receiver sensitivity −90 dBm ・Transmit power 2 dBm ・Current consumption in TX/RX (peak) 63 mA ・Current consumption in deep sleep mode 30 μA	−40 to +85	2.7 to 3.6	BGA64 (0.8 mm Pitch) 7.0 mm x 7.0 mm
TC35661IDBG-009 ☆	Ver.4.2 Classic/low energy dual	HCI	・Receiver sensitivity −91 dBm ・Transmit power 2 dBm ・Current consumption in TX/RX (peak) 63 mA ・Current consumption in deep sleep mode 30 μA ・Wide band Speech			
TC35661IDBG-503 ☆		SPP, GATT, SMP	・Receiver sensitivity −91 dBm ・Transmit power 2 dBm ・Current consumption in TX/RX (peak) 63 mA ・Current consumption in deep sleep mode 30 μA			
TC35668IXBG ☆	Ver.4.2 Classic	HFP, A2DP, AVRCP, PBAP, SPP	・Receiver sensitivity −93 dBm ・Transmit power 1 dBm ・Current consumption in TX/RX (peak) 174 mA ・On-chip DSP ・Wide band Speech		3.0 to 3.6	BGA97 (0.5 mm Pitch) 6.0 mm x 6.0 mm
TC35667IFTG-005 ☆	Ver.4.0 low energy	HCI, GATT, SMP	・Receiver sensitivity −92 dBm ・Transmit power 0 dBm ・Current consumption in TX/RX (peak) 5.9 mA (3.3 V, −4 dBm TX power)/ 5.7 mA ・Current consumption in deep sleep mode 0.05 μA		1.8 to 3.6	QFN40 (0.5 mm Pitch) 6.0 mm x 6.0 mm
TC35679IFTG-002 ☆ *	Ver.4.2 low energy		・Receiver sensitivity −93.5 dBm ・Transmit power 0 dBm ・Current consumption in TX/RX (peak) 3.3 mA (3.0 V, 0 dBm TX power)/ 3.3 mA ・Current consumption in deep sleep mode 0.05 μA ・Scatternet ・LE Data Length Extension ・LE Secure Connections	−40 to +105		
TC35681IFTG-002 ☆ **	Ver.5.0 low energy	HCI, GATT, SMP	・Receiver sensitivity -95 dBm(1 Mbps) / -105 dBm(125 kbps) ・Transmit power +8 dBm max. ・Current consumption in Tx/Rx (peak) 11.5 mA at Tx +8 dBm 2 Mbps / 6.0 mA at Tx +0 dBm 1 Mbps 5.5 mA at Rx 2 Mbps / 5.1 mA at Rx 1 Mbps ・Current consumption in deep sleep mode 0.05 μA ・LE Data Length Extension ・LE Secure Connections ・2 Mbps ・Long Range ・Advertising Extensions	−40 to +125	1.8 to 3.6	QFN40 (0.5 mm Pitch) 6.0 mm x 6.0 mm

☆: Dry-packed / 防湿梱包品

* : New product / 新製品

**: Under development / 開発中

Audio ICs / オーディオ用

Audio ICs / オーディオ用IC

(Power Amp ICs) /（パワーアンプIC）

Part Number	Package	Class	R_L = 2 Ω operation guaranteed	I^2C-bus controlled self-diagnosis	Maximum Power Vcc = 15.2 V	Features	Supply Voltage (V)
TCB001HQ	HZIP25	AB			45 W	MOS amplifier for 4 BTL channels, Standby function, Mute function, Output DC offset detection, Output short detection, +B overvoltage detection, 6 V operations (Engine idling reduction capability), Proof against from GSM	6 to 18 (R_L = 4 Ω)
TCB001FNG ☆	PSOP36	AB			45 W	MOS amplifier for 4 BTL channels, Standby function, Mute function, Output DC offset detection, Output short detection, +B overvoltage detection, 6 V operations (Engine idling reduction capability), Proof against from GSM	6 to 18 (R_L = 4 Ω)
TCB501HQ	HZIP25	AB	○		49 W	MOS amplifier for 4 BTL channels, Standby function, Mute function, High-side-switch (include of back flowpreventing circuit), Fulltime Output DC offset detection, 6 V operations (Engine idling reduction capability), Proof against from GSM	6 to 18 (R_L = 4 Ω) 6 to 16 (R_L = 2 Ω)
TCB502HQ	HZIP25	AB	○		49 W	MOS amplifier for 4 BTL channels, Standby function, Mute function, Full time Output DC offset detection, 6 V operations (Engine idling reduction capability), Proof against from GSM	6 to 18 (R_L = 4 Ω) 6 to 16 (R_L = 2 Ω)
TCB503HQ	HZIP25	AB	○		49 W	MOS amplifier for 4 BTL channels, Standby function, Mute function, Output DC offset detection, Output Clip detection, 6 V operations (Engine idling reduction capability), Proof against from GSM	6 to 18 (R_L = 4 Ω) 6 to 16 (R_L = 2 Ω)
TCB701FNG ☆	PSOP36	TB	○	○	49 W	MOS amplifier for 4 BTL channels, Command-controlled standby, and mute mode, Hardware-standby mode, Class-TB efficiency, I^2C-bus controlled self-diagnosis, Cross-wiring detection, +B Voltage Detection, Selectable voltage gain (26/16 dB), 6 V operations (Engine idling reduction capability), Proof against from GSM	6 to 18 (R_L = 4 Ω) 6 to 16 (R_L = 2 Ω)
TCB702FNG ☆	PSOP36	TB		○	45 W	MOS amplifier for 4 BTL channels, Command-controlled standby, and mute mode, Hardware-standby mode, Class-TB efficiency, I^2C-bus controlled self-diagnosis, Cross-wiring detection, Selectable voltage gain (26/16 dB), 6 V operations (Engine idling reductioncapability), Proof against from GSM	6 to 18 (R_L = 4 Ω)
TB2952AHQ	HZIP25	AB	○	○	49 W	MOS amplifier for 4 BTL channels, Command-controlled standby and mute mode, Hardware-standby mode, Maximum power: 49 W x 4 ch, I^2C-bus controlled self-diagnosis, R_L = 2 Ω operation guaranteed, Selectable voltage gain (26/12 dB), 6 V operations (Engine idling reduction capability), Proof against from GSM	
TB2975HQ	HZIP25	KB	○	○	49 W	MOS amplifier for 4 BTL channels, Command-controlled standby, and mute mode, Hardware-standby mode, Class-KB efficiency, I^2C-bus controlled self-diagnosis, Cross-wiring detection, Selectable voltage gain (26/16 dB), 6 V operations (Engine idling reduction capability), Proof against from GSM	6 to 18 (R_L = 4 Ω) 6 to 18 (R_L = 2 Ω)
TB2925HQ	HZIP25	KB	○		49 W	MOS amplifier for 4 BTL channels, Standby function, Mute function, Maximum power: 49 W x 4 ch, Class-KB efficiency, Output DC offset detection, Output short detection, +B overvoltage detection, Cross-wiring detection, 6 V operations (Engine idling reduction capability), Proof against from GSM	6 to 18 (R_L = 4 Ω) 6 to 16 (R_L = 2 Ω)
TB2909FNG ☆	HTSSOP16	AB				MOS amplifier for 1 SEPP channel, Standby function, Mute function, Maximum power: 5 W x 1 ch (R_L = 8 Ω, Vcc = 16 V), Output short detection, Thermal detection, Speaker open detection, Overvoltage detection	6 to 16

☆: Dry-packed / 防湿梱包品

Application Processors / アプリケーションプロセッサ

HMI Solution / HMIソリューション

Part Number	Package (package size) (ball pitch)	CPU	CPU Frequency	SRAM (MByte)	L1 I Cache (Kbyte)	L1 D Cache (Kbyte)	L2 Cache (Kbyte)	DRAM Controller	External Extended Bus Interface	2D Graphic Engine	LCD Controller	USB	Ether-MAC	UART	I²C	I²S	SPIB	SPIM	PWM	12bit ADC	SDIO/e-MMC	GPIO	DMA controller	Timer/Counter	RTC	Encrypt Data Function	FPU	Camera I/F	Operating Temperature (°C)
TZ2100XBG	PLFBGA310 (16 mm x 16 mm) (0.8 mm pitch)	Arm® Cortex®-A9 MPCore	300	1 MB + 32 KB	32	32	128	DDR3/DDR3L x 16 bit	Address: 27 bit, Data: 32 bit	Toshiba original graphics accelerator	WVGA (800 x 480 pixel) 60 fps, 24 bit Parallel I/F	USB2.0 host /device	10/100 Mbps x 1	4	4	2	2	7	6	4	3	128	●	16	1	—			Ta = –20 to 80 Ta = –40 to 85 (1)
TZ2101XBG			600																							●	●	●	
TZ2102XBG																										—			

Note(1): Extended temperature range / 温度拡張品

・ Arm and Cortex are registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

・ All other company names, product names, and service names may be trademarks of their respective companies.

・ Arm、Cortexは、米国および／あるいはその他の国におけるArm Limited（またはその子会社）の登録商標です。

・ その他の社名・商品名・サービス名などは、それぞれ各社が商標として使用している場合があります。

Interface Bridges / インタフェースブリッジ

MPD: Mobile Peripheral Devices

Part Number	Package (Package Size) (Ball Pitch)	Functions		Feature/Supported Resolution	Applications	Supply Voltage (V)
		Rx (input)	Tx (output)			
TC358743XBG ☆	P-TFBGA64 (6 mm x 6 mm) (0.65 mm)	HDMI™ 1.4	MIPI® CSI-2SM v1.01	HDMI™ to MIPI® CSI-2SM Camera Serial Interface Bridge HDMI™ Video format: Up to FHD (1920 x 1080, 60 fps, 24 bpp (bits per pixel)	Smart TV, smart monitor, smart set-top box, Digital Media Adapter (DMA)	1.2 (MIPI®/Core) 3.3 (HDMI™) 1.8 to 3.3 (I/O) 2.5 (APLL)
TC358840XBG ☆	P-VFBGA80 (7 mm x 7 mm) (0.65 mm)	HDMI™ 1.4b	MIPI® CSI-2SM v1.01	HDMI™ to MIPI® CSI-2SM Camera Serial Interface Bridge HDMI™ Video format: Up to 4K Ultra HD (3840 x 2160, 30 fps, 24 bpp)	Smart set top box, smart TV, smart monitor, DMA	1.2 MIPI® 1.1 CORE/PLL 3.3 (HDMI™) 1.8 to 3.3 (I/O)
TC358870XBG ☆	P-VFBGA80 (7mm x 7mm) (0.65 mm)	HDMI™ 1.4b	MIPI® DSISM v1.1	HDMI™ to MIPI® DSISM Display Serial Interface Bridge HDMI™ Video format: Up to 4K Ultra HD (3840 x 2160, 30 fps, 24 bpp)	HMD, mobile devices, gaming accessories, wearable computers display	1.2 MIPI® 1.1 CORE/PLL 3.3 (HDMI™) 1.8 to 3.3 (I/O)
TC358746AXBG ☆	P-VFBGA72 (4.5 mm x 4.5 mm) (0.40 mm)	(1) MIPI® CSI-2SM v1.01 (2) Parallel	(1) Parallel (2) MIPI® CSI-2SM v1.01	MIPI® CSI-2SM to Parallel Camera Interface Bridge Parallel to MIPI® CSI-2SM Camera Interface Bridge Up to 100 MHz PCLK frequency for Output mode, and 166 MHz for Input mode.	Smartphone, tablet, VOIP phone, industrial device	1.2 (MIPI®/Core) 1.8 to 3.3 (I/O)
TC358748XBG ☆	P-VFBGA80 (7 mm x 7 mm) (0.65 mm)					
TC358762XBG ☆	P-VFBGA64 (5 mm x 5 mm) (0.50 mm)	(1) MIPI® DSISM v1.01 (2) MIPI® DSISM v1.01	(1) MIPI® DPISM v2.0 (2) MIPI® DBI-2SM v2.0	MIPI® DSI to MIPI® DPISM/DBISM Display Interface Bridge Up to WXGA (1366 x 768, 60 fps, 24 bpp)	Tablet, smartphone, smartwatch, HMD, portable navigation device (PND)	1.2 (MIPI®/Core) 1.8 to 3.3 (I/O)
TC358767AXBG ☆	P-VFBGA81 (5 mm x 5 mm) (0.50 mm)	(1) MIPI® DSISM v1.01 (2) MIPI® DPISM v2.0	(1) VESA® DisplayPort™ 1.1a (2) VESA® DisplayPort™ 1.1a	MIPI® DSISM to DisplayPort™ Display Interface Bridge MIPI® DPISM to DisplayPort™ Display Interface Bridge Up to WUXGA (1920 x 1200, 60 fps, 24 bpp)	Tablet	1.2 (MIPI®/Core) 1.2 & 1.8 (DisplayPort™) 1.8 (I/O)
TC358867XBG ☆	P-VFBGA80 (7 mm x 7 mm) (0.65 mm)	(3) MIPI® DSISM v1.01 (4) MIPI® DPISM v2.0	(3) DisplayPort™ 1.1a (4) DisplayPort™ 1.1a	MIPI® DSISM to DisplayPort™ Display Interface Bridge MIPI® DPISM to DisplayPort™ Display Interface Bridge Up to WUXGA (1920 x 1200, 60 fps, 24 bpp)	Information terminal, Tablet	1.2 (MIPI®/Core) 1.2 & 1.8 (DisplayPort™) 1.8 (I/O)
TC358768AXBG ☆	P-VFBGA72 (4.5 mm x 4.5 mm) (0.40 mm)	RGB	MIPI® DSISM v1.02	RGB to MIPI® DSISM Display Interface Bridge Up to WUXGA (1920 x 1200, 60 fps, 24 bpp)	Smartphone, tablet	1.2 (MIPI®/Core) 1.8 to 3.3 (I/O)
TC358778XBG ☆	P-VFBGA80 (7 mm x 7 mm) (0.65 mm)					
TC358770AXBG ☆	P-VFBGA100 (5 mm x 5 mm) (0.40 mm)	MIPI® DSISM v1.02	VESA® DisplayPort™ 1.1a	MIPI® DSISM to DisplayPort™ Display Interface Bridge Up to (QSXGA 2560 x 2048, 60 fps, 24 bpp)	Tablet	1.2 (MIPI®/Core) 1.2 & 1.8 (DisplayPort™) 1.8 (I/O)
TC358777XBG ☆	P-VFBGA80 (7 mm x 7 mm) (0.65 mm)					

☆: Dry-packed / 防湿梱包品

MPD: Mobile Peripheral Devices

Part Number	Package (Package Size) (Ball Pitch)	Functions		Feature/Supported Resolution	Applications	Supply Voltage (V)
		Rx (input)	Tx (output)			
TC358771XBG ☆	P-VFBGA49 (5 mm x 5 mm) (0.65 mm)	MIPI® DSI℠ v1.01	LVDS	MIPI® DSI℠ to LVDS Display Interface Bridge with Back Light Control (single link) Up to UXGA (1600 x 1200, 60 fps, 24 bpp)	Tablet	1.2 (MIPI®/Core) 1.8 (LVDS) 1.8 to 3.3 (I/O)
TC358772XBG ☆	P-VFBGA 64 (6 mm x 6 mm) (0.65 mm)	MIPI® DSI℠ v1.01	LVDS	MIPI® DSI℠ to LVDS Display Interface Bridge with Back Light Control (dual link) Up to WUXGA (1920 x 1200, 60 fps, 24 bpp)	Tablet	1.2 (MIPI®/Core) 1.8 (LVDS) 1.8 to 3.3 (I/O)
TC358774XBG ☆	P-VFBGA49 (5 mm x 5 mm) (0.65 mm)	MIPI® DSI℠ v1.01	LVDS	MIPI® DSI℠ to LVDS Display Interface Bridge (single link) Up to UXGA (1600 x 1200, 60 fps, 24 bpp)	Tablet	1.2 (MIPI®/Core) 1.8 (LVDS) 1.8 to 3.3 (I/O)
TC358775XBG ☆	P-VFBGA64 (6 mm x 6 mm) (0.65 mm)	MIPI® DSI℠ v1.01	LVDS	MIPI® DSI℠ to LVDS Display Interface Bridge (dual link) Up to WUXGA (1920 x 1200, 60 fps, 24 bpp)	Tablet	1.2 (MIPI®/Core) 1.8 (LVDS) 1.8 to 3.3 (I/O)
TC358860XBG ☆	P-VFBGA65 (5 mm x 5 mm) (0.5 mm)	VESA® Embedded DisplayPort™ (eDP) ver1.4	MIPI® DSI℠ v1.02	4K2K VESA®'s eDP to MIPI® DSI℠ Display Serial Interface Bridge Up to 4K Ultra HD (4096 x 2048, 60 fps, 3840 x 2160, 24 bpp)	Phablet, tablet, portable game and PC, HMD	1.2 (MIPI®) 1.1 (Core, MIPI® D-PHY℠, eDP-PHY) 1.8 (eDP-PHY) 1.8 or 3.3 (I/O, HPD)

☆: Dry-packed / 防湿梱包品

I/O Expander

Part Number	Package (Pin Pitch)	Functions	Applications	Functions and Features	Supply Voltage (V)
TC35894XBG ☆	P-TFBGA36 (0.5 mm)	I/O expander	I/O port expansion	Up to 24 GPIO ports. GPIO ports can be used for key matrix (up to 96 keys) or PWM/timer (up to 3 channels). Chattering reduction, internal clock oscillator, internal pull-up/pull-down resistors Up to 26-port direct key functionality (when GPIOs are not used).	1.62 to 3.60
TC35894FG ☆	P-LQFP44 (0.8 mm)			Up to 24 GPIO ports. GPIO ports can be used for key matrix (up to 96 keys) or PWM/timer (up to 3 channels). Chattering reduction, internal clock oscillator, internal pull-up/pull-down resistors Up to 26-port direct key functionality (when GPIOs are not used)	1.62 to 3.60

☆: Dry-packed / 防湿梱包品

Other Product ICs / その他機器用

Shock Sensor ICs / ショックセンサIC

Part Number	Package	Device Type	Output Source Current Min (μA)	Output Sink Current Min (μA)	Window-Comparator Detection Voltage Levels Typ. (V)	Supply Current (Ta = 25℃) Max (mA)	Supply Voltage (V)	Remarks
TB6082FNG	VSOP10	Shock sensor amp (low-noise charge amp)	80 (OP-AMP2) (@ V_{CC} - 0.3 V)	500 (OP-AMP2) (@ 0.3 V)	—	5.0 (V_{CC} = 2.5 V, Vref = 1.0 V)	2.3 to 5.5	1 channel, Built-in amplifier for notch filter, low-noise
TB6082FTG	QFN16	Shock sensor amp (low-noise charge amp)	80 (OP-AMP2) (@ V_{CC} - 0.3 V)	500 (OP-AMP2) (@ 0.3 V)	—	5.0 (V_{CC} = 2.5 V, Vref = 1.0 V)	2.3 to 5.5	1 channel, Built-in amplifier for notch filter, low-noise
TB6086FTG	QFN16	Shock sensor amp (Sensor signal Amplifier)	100 (OP-AMP) (@ V_{CC} - 0.3 V)	100 (OP-AMP) (@ 0.3 V)	2.05 (High) 1.25 (Low)	4.0 (V_{CC} = 3.3 V, Vref = 1.65 V)	3.0 to 5.5	1 channel, Built-in amplifier for notch filter, Window Comparator
TC93A33FTG	QFN16	Shock sensor amp (low-noise charge amp)	80 (OP-AMP2) (@ V_{CC} - 0.3 V)	80 (OP-AMP2) (@ 0.3 V)	—	4.5 (V_{CC} = 1.8 V, EN = H)	1.6 to 2.3	1 channel, Built-in amplifier for notch filter, low-noise

High-Frequency Modulator ICs / 高周波重畳IC

Part Number	Package	Device Type	Frequency (MHz)	Amplitude (mApp)	Operating Current Consumption (V_{DD} = 5.0 V, Ta = 25℃) Max (mA)	Supply Voltage (V)	Remarks
TC93A14AFUG	SSOP6	High-frequency modulator for optical disk (2-ch)	250 to 450	25 to 80	21.5	4.5 to 5.5	Spread spectrum type

Interface ICs for Hot Water Dispensers / 給湯器用インタフェースIC

Part Number	Package	Features	Applications	Supply Voltage (V)
T6B70BFG	SOP16	Carrier receiver, carrier identification, carrier pseudo-sine wave generator	Communication for hot water dispensers	4.5 to 5.5
T6B70BFNG	SSOP16	Carrier receiver, carrier identification, carrier pseudo-sine wave generator Smaller package version of T6B70BFG	Communication for hot water dispensers	4.5 to 5.5

RESTRICTIONS ON PRODUCT USE

Toshiba Corporation and its subsidiaries and affiliates are collectively referred to as “TOSHIBA”.
Hardware, software and systems described in this document are collectively referred to as “Product”.

- TOSHIBA reserves the right to make changes to the information in this document and related Product without notice.
- This document and any information herein may not be reproduced without prior written permission from TOSHIBA. Even with TOSHIBA's written permission, reproduction is permissible only if reproduction is without alteration/omission.
- Though TOSHIBA works continually to improve Product's quality and reliability, Product can malfunction or fail. Customers are responsible for complying with safety standards and for providing adequate designs and safeguards for their hardware, software and systems which minimize risk and avoid situations in which a malfunction or failure of Product could cause loss of human life, bodily injury or damage to property, including data loss or corruption. Before customers use the Product, create designs including the Product, or incorporate the Product into their own applications, customers must also refer to and comply with (a) the latest versions of all relevant TOSHIBA information, including without limitation, this document, the specifications, the data sheets and application notes for Product and the precautions and conditions set forth in the "TOSHIBA Semiconductor Reliability Handbook" and (b) the instructions for the application with which the Product will be used with or for. Customers are solely responsible for all aspects of their own product design or applications, including but not limited to (a) determining the appropriateness of the use of this Product in such design or applications; (b) evaluating and determining the applicability of any information contained in this document, or in charts, diagrams, programs, algorithms, sample application circuits, or any other referenced documents; and (c) validating all operating parameters for such designs and applications. **TOSHIBA ASSUMES NO LIABILITY FOR CUSTOMERS' PRODUCT DESIGN OR APPLICATIONS.**
- **PRODUCT IS NEITHER INTENDED NOR WARRANTED FOR USE IN EQUIPMENTS OR SYSTEMS THAT REQUIRE EXTRAORDINARILY HIGH LEVELS OF QUALITY AND/OR RELIABILITY, AND/OR A MALFUNCTION OR FAILURE OF WHICH MAY CAUSE LOSS OF HUMAN LIFE, BODILY INJURY, SERIOUS PROPERTY DAMAGE AND/OR SERIOUS PUBLIC IMPACT ("UNINTENDED USE").** Except for specific applications as expressly stated in this document, Unintended Use includes, without limitation, equipment used in nuclear facilities, equipment used in the aerospace industry, lifesaving and/or life supporting medical equipment, equipment used for automobiles, trains, ships and other transportation, traffic signaling equipment, equipment used to control combustions or explosions, safety devices, elevators and escalators, and devices related to power plant. **IF YOU USE PRODUCT FOR UNINTENDED USE, TOSHIBA ASSUMES NO LIABILITY FOR PRODUCT.** For details, please contact your TOSHIBA sales representative or contact us via our website.
- Do not disassemble, analyze, reverse-engineer, alter, modify, translate or copy Product, whether in whole or in part.
- Product shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable laws or regulations.
- The information contained herein is presented only as guidance for Product use. No responsibility is assumed by TOSHIBA for any infringement of patents or any other intellectual property rights of third parties that may result from the use of Product. No license to any intellectual property right is granted by this document, whether express or implied, by estoppel or otherwise.
- **ABSENT A WRITTEN SIGNED AGREEMENT, EXCEPT AS PROVIDED IN THE RELEVANT TERMS AND CONDITIONS OF SALE FOR PRODUCT, AND TO THE MAXIMUM EXTENT ALLOWABLE BY LAW, TOSHIBA (1) ASSUMES NO LIABILITY WHATSOEVER, INCLUDING WITHOUT LIMITATION, INDIRECT, CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OR LOSS, INCLUDING WITHOUT LIMITATION, LOSS OF PROFITS, LOSS OF OPPORTUNITIES, BUSINESS INTERRUPTION AND LOSS OF DATA, AND (2) DISCLAIMS ANY AND ALL EXPRESS OR IMPLIED WARRANTIES AND CONDITIONS RELATED TO SALE, USE OF PRODUCT, OR INFORMATION, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY OF INFORMATION, OR NONINFRINGEMENT.**
- Product may include products using GaAs (Gallium Arsenide). GaAs is harmful to humans if consumed or absorbed, whether in the form of dust or vapor. Handle with care and do not break, cut, crush, grind, dissolve chemically or otherwise expose GaAs in Product.
- Do not use or otherwise make available Product or related software or technology for any military purposes, including without limitation, for the design, development, use, stockpiling or manufacturing of nuclear, chemical, or biological weapons or missile technology products (mass destruction weapons). Product and related software and technology may be controlled under the applicable export laws and regulations including, without limitation, the Japanese Foreign Exchange and Foreign Trade Law and the U.S. Export Administration Regulations. Export and re-export of Product or related software or technology are strictly prohibited except in compliance with all applicable export laws and regulations.
- Product may include products subject to foreign exchange and foreign trade control laws.
- Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. Please use Product in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. **TOSHIBA ASSUMES NO LIABILITY FOR DAMAGES OR LOSSES OCCURRING AS A RESULT OF NONCOMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.**

In addition to the above, the following are applicable only to development tools.

- Though TOSHIBA works continually to improve Product's quality and reliability, Product can malfunction or fail. Use the Product in a way which minimizes risk and avoid situations in which a malfunction or failure of Product could cause loss of human life, bodily injury or damage to property, including data loss or corruption. For using the Product, customers must also refer to and comply with the latest versions of all relevant TOSHIBA information, including without limitation, this document, the instruction manual, the specifications, the data sheets for Product.
- Product is provided solely for the purpose of performing the functional evaluation of a semiconductor product. Please do not use Product for any other purpose, including without limitation, evaluation in high or low temperature or humidity, and verification of reliability.
- Do not incorporate Product into your products or system. Products are for your own use and not for sale, lease or other transfer.

SEMICONDUCTOR GENERAL CATALOG
半導体製品総覧表

Jan. 2019
SCA0004O

製品取り扱い上のお願い

株式会社東芝およびその子会社ならびに関係会社を以下「当社」といいます。
本資料に掲載されているハードウエア、ソフトウエアおよびシステムを以下「本製品」といいます。

- 本製品に関する情報等、本資料の掲載内容は、技術の進歩などにより予告なしに変更されることがあります。
- 文書による当社の事前の承諾なしに本資料の転載複製を禁じます。また、文書による当社の事前の承諾を得て本資料を転載複製する場合でも、記載内容に一切変更を加えたり、削除したりしないでください。
- 当社は品質、信頼性の向上に努めていますが、半導体・ストレージ製品は一般に誤作動または故障する場合があります。本製品をご使用頂く場合は、本製品の誤作動や故障により生命・身体・財産が侵害されることのないように、お客様の責任において、お客様のハードウエア・ソフトウエア・システムに必要な安全設計を行うことをお願いします。なお、設計および使用に際しては、本製品に関する最新の情報（本資料、仕様書、データシート、アプリケーションノート、半導体信頼性ハンドブックなど）および本製品が使用される機器の取扱説明書、操作説明書などをご確認の上、これに従ってください。また、上記資料などに記載の製品データ、図、表などに示す技術的な内容、プログラム、アルゴリズムその他応用回路例などの情報を使用する場合は、お客様の製品単独およびシステム全体で十分に評価し、お客様の責任において適用可否を判断してください。
- 本製品は、特別に高い品質・信頼性が要求され、またはその故障や誤作動が生命・身体に危害を及ぼす恐れ、膨大な財産損害を引き起こす恐れ、もしくは社会に深刻な影響を及ぼす恐れのある機器（以下“特定用途”という）に使用されることは意図されていませんし、保証もされていません。特定用途には原子力関連機器、航空・宇宙機器、医療機器（ヘルスケア除く）、車載・輸送機器、列車・船舶機器、交通信号機器、燃焼・爆発制御機器、各種安全関連機器、昇降機器、発電関連機器などが含まれますが、本資料に個別に記載する用途は除きます。特定用途に使用された場合には、当社は一切の責任を負いません。なお、詳細は当社営業窓口まで、または当社Webサイトのお問い合わせフォームからお問い合わせください。
- 本製品を分解、解析、リバースエンジニアリング、改造、改変、翻案、複製等しないでください。
- 本製品を、国内外の法令、規則及び命令により、製造、使用、販売を禁止されている製品に使用することはできません。
- 本資料に掲載してある技術情報は、製品の代表的動作・応用を説明するためのもので、その使用に際して当社及び第三者の知的財産権その他の権利に対する保証または実施権の許諾を行うものではありません。
- 別途、書面による契約またはお客様と当社が合意した仕様書がない限り、当社は、本製品および技術情報に関して、明示的にも黙示的にも一切の保証（機能動作の保証、商品性の保証、特定目的への合致の保証、情報の正確性の保証、第三者の権利の非侵害保証を含むがこれに限らない。）をしておりません。
- 本製品にはGaAs（ガリウムヒ素）が使われているものがあります。その粉末や蒸気等は人体に対し有害ですので、破壊、切断、粉砕や化学的な分解はしないでください。
- 本製品、または本資料に掲載されている技術情報を、大量破壊兵器の開発等の目的、軍事利用の目的、あるいはその他軍事用途の目的で使用しないでください。また、輸出に際しては、「外国為替及び外国貿易法」、「米国輸出管理規則」等、適用ある輸出関連法令を遵守し、それらの定めるところにより必要な手続を行ってください。
- 本製品には、外国為替及び外国貿易法により、輸出または海外への提供が規制されているものがあります。
- 本製品のRoHS適合性など、詳細につきましては製品個別に必ず当社営業窓口までお問い合わせください。本製品のご使用に際しては、特定の物質の含有・使用を規制するRoHS指令等、適用ある環境関連法令を十分調査の上、かかる法令に適合するようご使用ください。お客様がかかる法令を遵守しないことにより生じた損害に関して、当社は一切の責任を負いかねます。

上記に加えて、以下は開発ツールのみに適用されます。

- 当社は品質、信頼性の向上に努めていますが、本製品は誤作動または故障する場合があります。本製品をご使用頂く場合は、本製品の誤作動や故障により生命・身体・財産が侵害されることのないようにご使用ください。本製品をご使用頂く場合は、本製品に関する最新の情報（本資料、取扱説明書、仕様書、データシートなど）をご確認の上、これに従ってください。
- 本製品は、半導体製品の機能評価に使用されることを意図しています。機能評価以外の目的（温度・湿度特性評価、信頼性評価など）には使用しないでください。
- 本製品をお客様の製品に組み込まないでください。また、本製品を販売、譲渡、貸与等しないでください。

TOSHIBA

東芝デバイス&ストレージ株式会社

最新のデータシートやカタログを下記ホームページでも公開しています。
https://toshiba.semicon-storage.com/

【お問い合わせ先】

Previous edition: SCA0004N
2019-1