

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

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Interface Bridges / インタフェースブリッジ

Other Consumer Product ICs / その他機器用

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

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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 LVTTTL	LQFP64	—	—	—	—	—	○	—			

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(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	—	○	—	○	—		

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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 μ A (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 μ A (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

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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/ μ s (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: $R_{DS(on)}$ (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/ μ s (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: $R_{DS(on)}$ (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

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** : 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

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** : 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 _{DS(on)} : 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

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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, INT 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, INT 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, INT 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, INT 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, INT 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, INT 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-2 SM bridge chip - HDMI 1.4 - MIPI® CSI2 SM 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-2 SM from/to Parallel bridge chip - MIPI® CSI-2 SM Rx 1Gbps/lane x4 data lane, Parallel out (Max 100 MHz) - Parallel in (Max 166 MHz), MIPI CSI02 SM 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® DSI SM to LVDS bridge chip (Up to 1600 x 1200 24 bit per pixel) - MIPI® DSI SM 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® DSI SM to LVDS bridge chip (Up to 1920 x 1200 24 bit per pixel) - MIPI® DSI SM 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® DSI SM bridge chip (Up to 1920 x 1200 24 bit per pixel) - Parallel in (Max 166 MHz), MIPI® DSI SM Tx 1 Gbps/lane x4 data lane	1.2 for Core and MIPI® 1.8 or 3.3 for IO

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Communications ICs / 通信用

Wireless Communications ICs / 無線通信用IC

Part Number	Package (Pin Pitch)	Functions	Applications	Functions and Features			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 Δ5 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, Δ5 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

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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			

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

Host-IF	Other Interfaces	Other functions
UART	I ² C/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	

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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	-40 to +105	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			
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

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* : 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	$R_L = 2\ \Omega$ operation guaranteed	I ² C-bus controlled self-diagnosis	Maximum Power V _{CC} = 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 ($R_L = 4\ \Omega$)
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 ($R_L = 4\ \Omega$)
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 ($R_L = 4\ \Omega$) 6 to 16 ($R_L = 2\ \Omega$)
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 ($R_L = 4\ \Omega$) 6 to 16 ($R_L = 2\ \Omega$)
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 ($R_L = 4\ \Omega$) 6 to 16 ($R_L = 2\ \Omega$)
TCB701FNG ☆	PSOP36	TB	○	○	49 W	MOS amplifier for 4 BTL channels, Command-controlled standby, and mute mode, Hardware-standby mode, Class-TB efficiency, I ² C-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 ($R_L = 4\ \Omega$) 6 to 16 ($R_L = 2\ \Omega$)
TCB702FNG ☆	PSOP36	TB		○	45 W	MOS amplifier for 4 BTL channels, Command-controlled standby, and mute mode, Hardware-standby mode, Class-TB efficiency, I ² C-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 ($R_L = 4\ \Omega$)
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 ² C-bus controlled self-diagnosis, $R_L = 2\ \Omega$ 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 ² C-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 ($R_L = 4\ \Omega$) 6 to 18 ($R_L = 2\ \Omega$)
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 ($R_L = 4\ \Omega$) 6 to 16 ($R_L = 2\ \Omega$)
TB2909FNG ☆	HTSSOP16	AB				MOS amplifier for 1 SEPP channel, Standby function, Mute function, Maximum power: 5 W x 1 ch ($R_L = 8\ \Omega$, V _{CC} = 16 V), Output short detection, Thermal detection, Speaker open detection, Overvoltage detection	6 to 16

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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	I ² C	I ² S	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 32 + 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			600																												—

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

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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-TFPGA64 (6 mm x 6 mm) (0.65 mm)	HDMI™ 1.4	MIPI® CSI-2 SM v1.01	HDMI™ to MIPI® CSI-2 SM 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-VFPGA80 (7 mm x 7 mm) (0.65 mm)	HDMI™ 1.4b	MIPI® CSI-2 SM v1.01	HDMI™ to MIPI® CSI-2 SM 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-VFPGA80 (7mm x 7mm) (0.65 mm)	HDMI™ 1.4b	MIPI® DSI SM v1.1	HDMI™ to MIPI® DSI SM 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-VFPGA72 (4.5 mm x 4.5 mm) (0.40 mm)	(1) MIPI® CSI-2 SM v1.01 (2) Parallel	(1) Parallel (2) MIPI® CSI-2 SM v1.01	MIPI® CSI-2 SM to Parallel Camera Interface Bridge Parallel to MIPI® CSI-2 SM 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-VFPGA80 (7 mm x 7 mm) (0.65 mm)					
TC358762XBG ☆	P-VFPGA64 (5 mm x 5 mm) (0.50 mm)	(1) MIPI® DSI SM v1.01 (2) MIPI® DSI SM v1.01	(1) MIPI® DPI SM v2.0 (2) MIPI® DBI-2 SM v2.0	MIPI® DSI to MIPI® DPI SM /DBI SM 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-VFPGA81 (5 mm x 5 mm) (0.50 mm)	(1) MIPI® DSI SM v1.01 (2) MIPI® DPI SM v2.0	(1) VESA® DisplayPort™ 1.1a (2) VESA® DisplayPort™ 1.1a	MIPI® DSI SM to DisplayPort™ Display Interface Bridge MIPI® DPI SM 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-VFPGA80 (7 mm x 7 mm) (0.65 mm)	(3) MIPI® DSI SM v1.01 (4) MIPI® DPI SM v2.0	(3) DisplayPort™ 1.1a (4) DisplayPort™ 1.1a	MIPI® DSI SM to DisplayPort™ Display Interface Bridge MIPI® DPI SM 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-VFPGA72 (4.5 mm x 4.5 mm) (0.40 mm)	RGB	MIPI® DSI SM v1.02	RGB to MIPI® DSI SM 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-VFPGA80 (7 mm x 7 mm) (0.65 mm)					
TC358770AXBG ☆	P-VFPGA100 (5 mm x 5 mm) (0.40 mm)	MIPI® DSI SM v1.02	VESA® DisplayPort™ 1.1a	MIPI® DSI SM 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-VFPGA80 (7 mm x 7 mm) (0.65 mm)					

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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 SM v1.01	LVDS	MIPI® DSI SM 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 SM v1.01	LVDS	MIPI® DSI SM 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 SM v1.01	LVDS	MIPI® DSI SM 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 SM v1.01	LVDS	MIPI® DSI SM 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 SM v1.02	4K2K VESA®'s eDP to MIPI® DSI SM 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 SM , eDP-PHY) 1.8 (eDP-PHY) 1.8 or 3.3 (I/O, HPD)

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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

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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°C) 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, V _{ref} = 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, V _{ref} = 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, V _{ref} = 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°C) 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

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