

# SEMICONDUCTOR GENERAL CATALOG

## ASSPs

Audio & Video Equipment ICs  
Communications Equipment ICs  
Automotive ICs  
Peripheral Equipment LSIs  
Other Consumer Product ICs

## Audio & Video Equipment ICs

### TV Set ICs (Audio Output ICs)

Part Number	Package	Use	Functions and Features	Operating Supply Voltage (V)
TB2922HQ	P-HZIP12-1.78B	Audio output ICs	Sound output power: 20 W x 2, MOS output stage: Class AB, mute, standby, various protection circuits	9 to 26
TB2924AFG	P-HSOP36-450-0.65		Sound output power: 20 W x 2, PWM analog-input Class-D amp	11 to 20 (18)
TB2964FTG	P-QFN48-0707-0.50		Sound output power: 15 W x 2, I <sup>2</sup> S signal-input Class-D amp	9 to 18

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

### TV Tuning & Channel Decoder ICs (PIF, SIF ICs)

Part Number	Package	Use	Functions and Features	Operating Supply Voltage (V)
TB1338FNG/FTG ☆	P-SSOP24-300-0.65A QFN36-P-0606-0.50	Multi-standard PLL PIF/SIF	D/K, I, B/G, M, L, L', multi-standard PIF/SIF, FM radio receiver support, PIF VCO, audio trap, SIF filter, general-purpose SW port, split-carrier and intercarrier sound, I <sup>2</sup> C bus	4.75 to 5.25
TB1350FNG/FTG ☆	P-SSOP24-300-0.65A QFN36-P-0606-0.50	D/K, I, B/G, M, PLL PIF/SIF	D/K, I, B/G, M, FM radio receiver support, PIF VCO, audio trap, SIF filter, general-purpose SW port, split-carrier and intercarrier sound, I <sup>2</sup> C bus	4.75 to 5.25
TB1351FTG ☆	QFN36-P-0606-0.50	Multi-standard PLL PIF/SIF	D/K, I, B/G, M, L, L', multi-standard PIF/SIF, FM radio receiver support, PIF VCO, audio trap, SIF filter, general-purpose SW port, split-carrier and intercarrier sound, I <sup>2</sup> C bus	4.75 to 5.25
TB1354FTG ☆	QFN36-P-0606-0.50	Multi-standard PLL PIF/SIF	D/K, I, B/G, M, L, L', multi-standard PIF/SIF, FM radio receiver support, PIF VCO, audio trap, SIF filter, general-purpose SW port, split-carrier and intercarrier sound, I <sup>2</sup> C bus	4.75 to 5.25
TB1356FTG ☆	QFN36-P-0606-0.50	Multi-standard PLL PIF/SIF	D/K, I, B/G, M, L, L', multi-standard PIF/SIF, FM radio receiver support, PIF VCO, audio trap, SIF filter, general-purpose SW port, split-carrier and intercarrier sound, I <sup>2</sup> C bus, TOP adjustment pin, analog AFT output	4.75 to 5.25

☆: Dry-packed

\*\* : Under development

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

### (Channel Decoder ICs)

Part Number	Package	Use	Functions and Features	Operating Supply Voltage (V)
TC90532XBG ☆	P-FBGA177-1313-0.80C4	8PSK demodulator OFDM demodulator	Digital BS broadcasting, digital CS broadcasting (ISDB-S), 8PSK, QPSK demodulation, error correction, digital terrestrial broadcasting (ISDB-T), OFDM demodulation, error correction, A/D converter, memory	3.0 to 3.6 1.1 to 1.3
TC90522XBG ☆	P-FBGA177-1313-0.80C4	8PSK demodulator OFDM demodulator (Two channels each)	Digital BS broadcasting, digital CS broadcasting (ISDB-S), 8PSK, QPSK demodulation, error correction, digital terrestrial broadcasting (ISDB-T), OFDM demodulation, error correction, A/D converter, memory	3.0 to 3.6 1.1 to 1.3
TC90517WBG ☆	S-WFBGA76-040A01	OFDM demodulator	Digital terrestrial broadcasting (ISDB-T), OFDM demodulation, error correction,	3.0 to 3.6 2.3 to 2.7
TC90517FG ☆	P-LQFP64-1010-0.50E		A/D converter, memory	1.1 to 1.3

☆: Dry-packed

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

## Audio ICs (AM/FM Receiver ICs)

Part Number	Package	Description	Intended Use			Functions				Functions and Features	Operating Voltage (V)
			Car Audio	General Audio	Other	F/E	IF	Stereo Demodulation	Audio processor		
TB2132FNG ☆	P-SSOP30-300-0.65	Single-chip AM/FM stereo tuner with PLL		○		■	■	■		TV bands, VCO for MPX, compliant with new FCC standards	1.8 to 5.5
TB2178FG ☆	P-LQFP48-0707-0.50	Front End IC for Digital IF sampling tuner system	○			■				AM/FM front-end, IF amplifier, DAC outputs for RF synchronization	8.3
TC94A90FG ☆	P-LQFP216-2424-0.40A	IF sampling AM/FM digital processing tuner and Audio Digital Signal Processor	○					■	■	IF-sampling ADC x 2 ch Multipath noise cancellation with dual tuners Multi-bit DA converter x 6 ch Output ports for IBOC decoders On-chip audio processor	3.3/1.5
TC94B01FG ** ☆	P-LQFP64-1010-0.50	IF sampling AM/FM digital processing tuner	○					■	■	IF-sampling ADC x 1 ch Multipath noise cancellation Multi-bit DA converter x 2 ch Output ports for IBOC decoders	3.3/1.5

☆: Dry-packed

\*\* : Under development

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

## (Power Amp ICs)

Part Number	Package	Intended Use			Output Power (Pout)			Functions and Features	Operating Voltage (V)
		Car Stereos	Cassette Tape Recorders	TV/Home Stereos	Recommended Vcc	R <sub>L</sub> = 4 Ω	R <sub>L</sub> = 8 Ω		
TB2901HQ	P-HZIP25-1.00F	■			13.2 V	25 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, high-side switch, Maximum power: 47 W x 4 ch, R <sub>L</sub> = 2 Ω operation guaranteed	9 to 18
TB2902HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, mute, Command-controlled standby mode, Maximum power: 41 W x 4 ch, R <sub>L</sub> = 2 Ω operation guaranteed fC-bus-controlled self-diagnosis	9 to 18
TB2903HQ	P-HZIP25-1.00F	■			13.2 V	25 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, offset detection, Maximum power: 47 W x 4 ch	9 to 18
TB2904HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, offset detection, Maximum power: 43 W x 4 ch, speaker burnout prevention	9 to 18
TB2905HQ	P-HZIP25-1.00F	■			13.2 V	25 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, Class-KB efficiency, Maximum power: 47 W x 4 ch, self-diagnosis	9 to 18
TB2906HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, offset detection, Maximum power: 43 W x 4 ch, 34dB voltage gain, Speaker burnout prevention	9 to 18
TB2912HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, mute, Command-controlled standby mode, Maximum power: 41 W x 4 ch, R <sub>L</sub> = 2 Ω operation guaranteed fC-bus-controlled self-diagnosis	9 to 18
TB2913HQ	P-HZIP25-1.00F	■			13.2 V	25 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, clipping detector, Maximum power: 47 W x 4 ch	9 to 18
TB2915HQ	P-HZIP25-1.00F	■			13.2 V	24 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, Maximum power: 49 W x 4 ch, Class-KB efficiency, DC offset and short-circuit detection, Cross-wiring detection, R <sub>L</sub> = 2 Ω operation guaranteed	8 to 18
TB2921AHQ	P-HZIP25-1.00F	■			13.2 V	25 W x 4	—	MOS amplifier for 4 BTL channels, standby switch, mute, high-side switch, Maximum power: 51 W x 4 ch, R <sub>L</sub> = 2 Ω operation guaranteed	8 to 18
TB2922HQ	P-HZIP12-1.78B			■	18 V	37 W x 2	22 W x 2	MOS amplifier for 2 BTL channels, standby switch, mute	9 to 26
TB2923AHQ	P-HZIP25-1.00F	■			13.2 V	25 W x 4	—	MOS amplifier for 4 BTL channels, standby switch, mute, offset detection, Maximum power: 51 W x 4 ch, R <sub>L</sub> = 2 Ω operation guaranteed	8 to 18
TB2924AFG	HSOP36-P-450-0.65			■	15 V	19.5 W x 2	12 W x 2	Class D amplifier for 2 BTL channels, standby switch, mute, efficiency = 88%	11 to 18 (20)
TB2926HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4	—	MOS amplifier for 4 BTL channels, standby switch, mute, offset detection, Maximum power: 49 W x 4 ch	8 to 18
TB2929HQ	P-HZIP25-1.00F	■			13.2 V	21 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, offset detection, Maximum power: 45 W x 4 ch, AUX amp	8 to 18
TB2932AHQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, mute, Command-controlled standby mode, Hardware-standby mode, R <sub>L</sub> = 2 Ω operation guaranteed, fC-bus-controlled self-diagnosis, Selectable voltage gain (26/12 dB)	8 to 18
TB2932HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, mute, Command-controlled standby mode, R <sub>L</sub> = 2 Ω operation guaranteed fC-bus-controlled self-diagnosis, Selectable voltage gain (26/12 dB)	8 to 18

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

(Power Amp ICs) (Continued)

Part Number	Package	Intended Use			Output Power (Pout)			Functions and Features	Operating Voltage (V)
		Car Stereos	Cassette Tape Recorders	TV/Home Stereos	Recommended VCC	RL = 4 Ω	RL = 8 Ω		
TB2933HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, mute, Command-controlled standby mode, RL = 2 Ω operation guaranteed I <sup>2</sup> C-bus-controlled self-diagnosis, Selectable voltage gain (34/20 dB)	8 to 18
TB2934HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, mute, Command-controlled standby mode, Maximum power: 41 W x 4 ch, RL = 2 Ω operation guaranteed I <sup>2</sup> C-bus-controlled self-diagnosis, 34dB voltage gain	9 to 18
TB2936HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, offset detection, Maximum power: 49 W x 4 ch, 34dB voltage gain	8 to 18
TB2939HQ	P-HZIP25-1.00F	■			13.2 V	24 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, offset detection, Maximum power: 45 W x 4 ch, self-diagnosis	8 to 18
TB2946HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, offset detection, Maximum power: 49 W x 4 ch, RL = 2 Ω operation guaranteed	8 to 18
TB2956HQ	P-HZIP25-1.00F	■			13.2 V	23 W x 4		MOS amplifier for 4 BTL channels, standby switch, mute, clipping detector Maximum power: 45 W x 4 ch	8 to 18
TB2964FTG ☆	QFN48-P-0707-0.50			■	15 V	15 W x 2	10 W x 2	MOS amplifier for 2 BTL channels, Muting control (soft mute, forced mute), Oversampling digital filter with an asynchronous sampling rate converter, De-emphasis, Digital attenuator, Protection circuits	9 to 18

☆: Dry-packed

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

(Headphone Amp ICs)

Part Number	Package	Intended Use			Output Power	Functions and Features	Operating Voltage (V)
		Headphone Stereos	Digital Portable Stereos	Mobile Phones			
TB2173FTG ☆	P-VQON44-P-0606-0.4		■	■	9.5 mW (+B = 1.2 V, 16 Ω)	Support for 2 sources, electric volume, bass boost with AGC, OCL/output capacitor coupling, Gv = 8dB/24dB, beep, standby switch, mute, port expansion circuit	+B = 0.9 to 4.5 VDD = 1.8 to 4.5 VCC = 1.8 to 4.5

☆: Dry-packed

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

(Digital Tuning Systems (DTS) )

Part Number	Package	System No.	Remarks	Features					Operating Voltage (V)
				Crystal Oscillator	ROM Size	RAM Size	Display Format	I/O Ports	
TC9324FG ☆	P-QFP100-1420-0.65Q	DTS-20	Suitable for car stereos	4.5 MHz/ 75 kHz	16 bits x 16K	4 bits x 4096	LCD drive: 1/4, 1/3 & 1/2 duty, 1/2 & 1/3 bias	IN: 35 lines OUT: 13 lines I/O: 40 lines	4.5 to 5.5
TC9318AFAG ☆	P-LQFP64-1010-0.50E	DTS-21	Low-voltage operation Single chip Suitable for portables	75 kHz	16 bits x 4K	4 bits x 256	LCD drive: 1/3 duty, 1/2 bias	IN: 11 lines OUT: 33 lines I/O: 10 lines	1.8 to 3.6
TC9327BFG ☆	P-QFP80-1212-0.50F		Low-voltage operation Single chip Suitable for portables	75 kHz	16 bits x 7K	4 bits x 256	LCD drive: 1/4 duty, 1/2 bias	IN: 9 lines OUT: 33 lines I/O: 24 lines	1.8 to 3.6
TC9328AFG ☆	P-QFP80-1212-0.50F		Low-voltage operation Single chip Suitable for portables	75 kHz	16 bits x 8K	4 bits x 512	LCD drive: 1/4 duty, 1/2 bias	IN: 8 lines OUT: 21 lines I/O: 36 lines	0.9 to 1.8
TC9329AFAG ☆	P-LQFP64-1010-0.50A P-TFP64-1010-0.50C		Low-voltage operation Single chip Suitable for portables	75 kHz	16 bits x 4K	4 bits x 256	LCD drive: 1/4 duty, 1/2 bias	IN: 4 lines OUT: 16 lines I/O: 28 lines	0.9 to 1.8
TC9349AFG ☆	P-LQFP64-1010-0.50E		Low-voltage operation Single chip Suitable for portables	75 kHz	16 bits x 8K	4 bits x 512	LCD drive: 1/4 duty, 1/2 & 1/3 bias	IN: 4 lines OUT: 2 lines I/O: 45 lines	0.9 to 1.8

☆: Dry-packed

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

(Analog Switches)

Part Number	Package	Features	Operating Voltage (V)	
			VDD	VSS
TC9162CNG/CFG	P-SDIP28-400-1.78 P-SOP28-450-1.27B ☆	High breakdown voltage, analog function switch array	6.0 to 17.0	-17.0 to -6.0
TC9163CNG/CFG			6.0 to 17.0	-17.0 to -6.0
TC9164CNG/CFG			6.0 to 17.0	-17.0 to -6.0
TC9273CNG/CFG	P-SDIP28-400-1.78 P-SOP28-450-1.27B ☆	High breakdown voltage, analog function switch array semi-customization available	6.0 to 17.0	-17.0 to -6.0
TC9274CNG/CFG			6.0 to 17.0	-17.0 to -6.0
TC94A46CNG/CFG	P-SDIP42-600-1.78 P-QFP80-1420-0.80M ☆	High breakdown voltage, analog function switch array 14-circuit, 3-contact analog switch x 2	6.0 to 17.0	-17.0 to -6.0
TC94A88FG *	P-QFP80-1420-0.80M ☆	High breakdown voltage, analog function switch array 13-circuit, 4-contact analog switch x 2	6.0 to 17.0	-17.0 to -6.0

☆: Dry-packed

\*: New product

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

(Electronic Volume Control ICs)

Part Number	Package	Classification	Features	Operating Voltage (V)	
				VDD	VSS
TC9235APG/AFG	P-DIP16-300-2.54A	Volume control	Up/down-type electronic volume control	4.5 to 12.0	—
TC9260APG/AFG	P-SOP16-300-1.27 ☆		Serial-data-controlled electronic volume control	4.5 to 12.0	—
TC9459BNG/BFG	P-SDIP28-400-1.78 P-SOP28-450-1.27B ☆	High-breakdown-voltage volume control	High breakdown voltage, serial-data-controlled electronic volume control + loudness control	6.0 to 17.0	-17.0 to -6.0
TC9482BNG/BFG	P-SDIP28-400-1.78 P-SOP28-450-1.27B ☆		High breakdown voltage, 6-channel serial-data-controlled electronic volume control	6.0 to 17.0	-17.0 to -6.0
TC94A32BFG	P-SOP28-450-1.27B ☆		High breakdown voltage, serial-data-controlled electronic volume control with trim volume	6.0 to 17.0	-17.0 to -6.0
TC94A27BUG	P-LQFP44-1010-0.80A ☆		4-channel serial-data-controlled electronic volume control with trim volume	6.0 to 17.0	-17.0 to -6.0
TC94A81UG	P-LQFP44-1010-0.80A ☆		High breakdown voltage, 2-channel serial-data-controlled electronic volume control with trim volume, 4-input selector and zero crossing detection circuit	6.0 to 17.0	-17.0 to -6.0
TC9422ANG/AFG	P-SDIP28-400-1.78 P-SOP28-450-1.27B ☆		Single-chip volume control	Volume, 2-band tone control, 4-input selector	6.0 to 12.0
TC9498ANG/AFG *		6-channel serial-data-controlled electronic volume control with trim volume settings (single power supply)		4.5 to 14.0	—
TC9499ANG/AFG		6-channel serial-data-controlled electronic volume control with trim volume settings (dual power supplies)		4.5 to 7.0	-7.0 to -4.5

☆: Dry-packed

\*: New product

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

(PLLs, Prescalers)

Part Number	Package	Classification	Features	Operating Voltage (V)
TC9256APG	P-DIP16-300-2.54A	PLL	High-speed PLL incorporating a DTS prescaler	4.5 to 5.5
TC9256AFG	P-SOP16-300-1.27 ☆			4.5 to 5.5
TC9257APG	P-DIP20-300-2.54A			4.5 to 5.5
TC9257AFG	P-SOP20-300-1.27 ☆			4.5 to 5.5

☆: Dry-packed

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

(Compact Disc Player ICs)

Part Number	Package	Classification	Features	Operating Voltage (V)
TC94A15FG ☆	P-LQFP100-1414-0.50C	Single-chip processor	Sync separation, EFM demodulation, error detection/correction, error-corrected output, microcontroller interface, search control, digital equalizer, text data decoding, variable-speed playback, x8 oversampling digital filter, 1-bit DA converter, Integrated head amp	x4 play back mode for CD-DA/R CD-RX system 3.3/5

☆: Dry-packed

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

(CD/MP3 Player IC)

Part Number	Package	Classification	Features	Operating Voltage (V)
<i>TC94A92FG</i> ☆	P-LQFP80-1212-0.50F	Single-chip processor	CD-DA/R/RW: x2 playback, low power consumption, 1-Mbit SRAM (128 Kwords x 8 bits), standby mode Supports various compressed audio formats: MP3, WMA, AAC RF amp, CD digital servo, 8fs digital filter Multi-bit DA converter	3.3/1.5

☆: Dry-packed

- The products shown in italic are manufactured in offshore fabs.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

(Digital Signal Processor for Digital Amp System Applications)

Part Number	Package	Classification	Features	Operating Voltage (V)
TC94A34FG ☆	P-LQFP64-1010-0.50E	Audio digital signal processor	Low power consumption, 1-Mbit SRAM (128 Kwords x 8 bits) Supports various compressed audio formats: MP3, WMA, AAC Program ROM (20 K), program RAM (4 K), standby mode	3.3/1.5

☆: Dry-packed

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

# Communications Equipment ICs

## Mobile Radio IC Series (Bipolar/Bi-CMOS ICs)

Part Number	Package (Pin Pitch)	Functions	Applications	Features	Power Supply Voltage (V)	
TB31345WLG	WCSP96 (0.4 mm)	RF IC	Digital mobile and Wireless equipment	Freq. bands: Band I (2-GHz band), Band V/VI(800-MHz band), Band IX (1.7-GHz band) Reduced external parts: Direct conversion transmitter and receiver Low EVM: Tx = 3% (typ.); Rx = 10% (typ.) Fast lock & low noise: Fractional-N PLL + VCO + loop filter Reduced interference: LPF for GSM and CDMA2000 Ultra-small, thin package WCSP96 (4.13 mm x 4.16 mm x 0.6 mm)	Current consumption Transmitter: 66 mA (typ.) (@ +4-dBm output) Receiver: 36 mA (typ.)	2.8 to 3.1
<b>TB31224CFG</b>	QFP48 (0.8 mm)		Cordless phones	CTO-compatible PLL, IF detection and compander integrated into a single chip on-chip peripherals	Power-on reset	2.0 to 6.0
<b>TB31261AFG</b> ☆	QFP52 (0.65 mm)			900-MHz PLL, IF detection and compander integrated into a single chip, on-chip peripherals		2.7 to 5.5
<b>TB31262FG</b> ☆	QFP52 (0.65 mm)				VCO, varicap, LNA, MIX and PA integrated into a single chip	2.0 to 5.0
TB32302FG	☆ QFP52 (0.65 mm)		Low-power radio	400-MHz low-power radio, telemeter support, PLL, VCO, LNA, MIX, IF detection and PA integrated into a single chip		2.2 to 4.0
JTB32303-AS	Chip		Transceiver (FRS/GMRS/PMR)	Chip supply PLL, XOUT, LNA, MIX, IF amp, RSSI, Noise detector, Audio amp and TX-buffer into a single chip		2.5 to 4.5
JTB32304-AS	Chip			Chip supply PLL, XOUT, LNA, 2nd MIX, IF amp, RSSI, Noise detector, Audio amp and TX-buffer into a single chip		2.5 to 4.5
ETB32304-AS	Wafer			Wafer supply PLL, XOUT, LNA, 2nd MIX, IF amp, RSSI, Noise detector, Audio amp and TX-buffer into a single chip		2.5 to 4.5
TA32305FNG	☆ SSOP30 (0.65 mm)		Remote control (AM/FM)	240 kHz to 450 MHz RF amp, MIX, AM/FM demodulator, 2-level comparator, V <sub>CC</sub> = 2.2 V to 5.5 V, on-chip local x8 multiplier, receiver/transmitter		2.2 to 5.5
TC31298IXBG	☆ FBGA52 (0.5 mm)		Bluetooth (RF for chipset)	PLL, VCO, LNA, MIX, BPF, IF-amp, Digital detector, ADC, DAC, PA, antenna SW, PLL loopfilter integrated into a single chip	Current consumption Transmitter: 65 mA (typ.) Receiver: 65 mA (typ.)	3.0 to 3.6
TC31299IXBG	☆ FBGA52 (0.5 mm)		Bluetooth EDR (RF IC chip)	Bluetooth EDR-compliant single-chip RF IC with PLL, VCO, LNA, MIX, BPF, IF amp, digital detector, DAC, ADC, PA, antenna switch and PLL loop filter		
TA31273FNG	SSOP20 (0.65 mm)		Remote control (AM)	240 kHz to 450 MHz RF amp, MIX, AM demodulator, 2-level comparator, on-chip local x8 multiplier		3.0 to 5.5
TA31275FNG	☆ SSOP24 (0.65 mm)		Remote control (AM/FM)	240 kHz to 450 MHz RF amp, narrow band system, MIX, AM/FM demodulator, 2-level comparator, on-chip local x8 multiplier		2.4 to 5.5
TB31370FNG	☆ SSOP24 (0.65 mm)			RF operating frequency: 315 MHz on-chip VCO, IF filter, detector		4.0 to 5.5
TB31371FNG	☆ SSOP24 (0.65 mm)			RF operating frequency: 433.92 MHz on-chip VCO, IF filter, detector		3.6 to 5.5
TB31372FNG * ☆	SSOP24 (0.65 mm)		Remote control (AM/FM)	RF operating frequency: 315 MHz on-chip VCO, IF filter, detector, on-chip high-speed comparator		3.6 to 5.5
TB31373FNG * ☆	SSOP24 (0.65 mm)			RF operating frequency: 433.92 MHz on-chip VCO, IF filter, detector, on-chip high-speed comparator		

☆: Dry-packed

\*: New product

- The products shown in bold are also manufactured in offshore fabs.
- Contact the Toshiba sales representative for information about RoHS compliance before you purchase any components.

# Automotive ICs

## System Power Supplies

Part Number	Package	Functions	Characteristics				Remarks	Supply Voltage (V)
			Output Voltage Typ. (V)	Output Current Max (mA)	Input Voltage Max (V)	Power Dissipation Max (W)		
TB9000FG	SSOP16	CPU voltage regulator, watchdog timer	5	10 (Max) (Note)	45 (1 s)	0.6	Low current consumption: 120 $\mu$ A (typ.) Reset on watchdog timeout Reset detection: 4.7 V External transistor required	6 to 16
TB9000AFG	SSOP16	CPU voltage regulator, watchdog timer	5	10 (Max) (Note)	45 (1 s)	0.6	Low current consumption: 120 $\mu$ A (typ.) Reset on watchdog timeout Reset detection: 4.2 V External transistor required	6 to 16
TB9000CFNG	SSOP20 (0.65)	CPU voltage regulator, watchdog timer	5	10 (Max) (Note)	45 (1 s)	0.68	Low current consumption: 120 $\mu$ A (typ.) Reset on watchdog timeout Reset detection: 4.7 V External transistor required	6 to 16
TB9001FNG	SSOP20 (0.65)	CPU voltage regulator, watchdog timer	5	5 (Max) (Note)	45 (1 s)	0.68	Low current consumption: 95 $\mu$ A (typ.) Internal 32 kHz clock External transistor required	6 to 16
TB9004FNG	☆ SSOP24 (0.65)	CPU dual voltage regulator, watchdog timer	3.4/2.5/1.5 5.0	10 (Max) (Note)	45 (1 s)	0.85	3.4/2.5/1.5 V selectable 2 reset pins Low current consumption: 0 $\mu$ A ( $V_{CC1/2}$ : off) (typ.) External transistor required	6 to 16
TB9005FG	** SSOP20	CPU voltage regulator, watchdog timer	5	10 (Max) (Note)	45 (1 s)	0.68	Low current consumption: 90 $\mu$ A (typ.) Reset on watchdog timeout Reset detection: 4.7 V or 4.2 V (selectable) External transistor required	6 to 18

☆: Dry-packed

\*\* : Under development

Note: An external transistor is required. The gain varies with the transistor.

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

## Actuator Drivers (DC Motor Drivers)

Part Number	Package	Functions	Characteristics				Remarks	Supply Voltage (V)
			Output Voltage Typ. (V)	Output Current Max (mA)	Input Voltage Max (V)	Power Dissipation Max (W)		
TA8050AFG	HSOP20	H-bridge driver	—	1500	60 (1 s)	2.0	Standby function	8 to 16
TA8050FG	HSOP20	H-bridge driver	—	1500	60 (1 s)	2.0		6 to 16
TA8083PG	DIP16	H-bridge driver	—	500	60 (1 s)	1.4	Diagnosis function and standby function	8 to 16
TA8083FG	HSOP20	H-bridge driver	—	500	60 (1 s)	2.0	Diagnosis function and standby function	8 to 16
TA8083AFG	HSOP20	H-bridge driver	—	800	60 (1 s)	2.0	Diagnosis function and standby function	8 to 16
TB9056FNG	☆ SSOP24 (0.65)	LIN-compatible H-bridge driver	—	300	40 (1 s)	0.85	LIN Rev. 1.3 Motor driver: R <sub>DS(on)</sub> (H bridge: P-ch + N-ch) = 2.2 $\Omega$ (typ.) Potentiometer support	7 to 18

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



(Brushless Motor Drivers)

Part Number	Package	Functions	Features	Supply Voltage (V)
TB9061FNG ☆	SSOP24 (0.65)	3-phase sensorless motor 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 5-V regulated voltage, 5.12-MHz oscillator	5.5 to 18
TB9065FG ☆	QFP64 (0.65)	3 phase motor pre-driver	Charge-pump brushless pre-driver LIN transceiver 5 V power supply for a microcontroller (Requires external PNP transistors.) Watchdog timer, power-on-reset timer 3 ch analog comparator for Hall-effect devices Op-amp/comparator for motor overcurrent detection	7 to 18
TB9066FG ☆	QFP48 (0.5)	3-phase motor driver	Motor driver R <sub>DS(on)</sub> : 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
TB9067FNG ☆	SSOP24 (0.65)	3-phase motor pre-driver	120-degree commutation logic Pre-drivers for a high-side P-ch FET and a low-side N-h FET Internal PWM drive/external direct drive (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 ** ☆	QFP48 (0.5)	3-phase motor driver	Motor driver R <sub>DS(on)</sub> : 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

☆: Dry-packed

\*\* : Under development

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

# Peripheral Equipment LSIs

Part Number	Package	Device Type	Characteristics				Remarks	Power Supply Voltage (V)	
			Output Voltage Typ. (V)	Output Current Max (mA)	Input Voltage Max (V)	Power Dissipation Max (W)			
TB6066FNG	VSOP16	Shock sensor amp (low-noise charge amp)	—	—	—	0.025	1 channel, Window Comparator	2.7 to 5.5	
TB6073AFNG	VSOP16	Shock sensor amp (low-noise charge amp)	—	—	—	0.0225	2 channel	2.7 to 5.5	
TB6078AFUG	SM8	Shock sensor amp (low-noise charge amp)	—	—	—	0.0195	1 channel, small package, low-noise	2.7 to 5.5	
TB6079AFKG	*	US16	Shock sensor amp (Sensor signal processor)	—	—	—	0.022	Two I/O rail-to-rail op amps, reference amp, Window Comparator, small package	2.3 to 5.5
TB6082FNG	*	VSOP10	Shock sensor amp (low-noise charge amp)	—	—	—	0.03	1 channel, Circuitry used to build a notch filter, low-noise	2.3 to 5.5
TB6086FKG	*	US16	Shock sensor amp (Sensor signal processor)	—	—	—	0.022	1 channel, Circuitry used to build a notch filter, Window Comparator, small package	3.0 to 5.5
TC9384FUG	SSOP6	High-frequency modulator for optical disk drives	—	—	—	—	Designed for laser diodes	4.5 to 5.5	
TC9350BFNG	VSOP16	USB optical mouse controller	—	—	—	0.026	USB optical mouse controller	4.35 to 5.25	
TC93A02FUG/AFUG	SSOP6	High-frequency modulator for optical disk drives (2-ch)	—	—	—	—	Designed for dual-wavelength laser diodes	4.5 to 5.5	
TC9399FNG	VSOP16	Laser diode driver for CD-RW drives	—	400	—	—	Designed for optical disk drives	4.5 to 5.5	
TC93A04FNG/FTG	VSOP16 /TSSOP16	Laser diode driver for combo drives	—	400	—	—	Designed for dual-wavelength laser diodes	4.5 to 5.5	
TC93A05FNG	VSOP16	Laser diode driver for combo drives	—	400	—	—	Designed for dual-wavelength laser diodes	4.5 to 5.5	
TC93A14AFUG	SSOP6	High-frequency modulator for optical disk drives (2-ch)	—	—	—	—	Spectrum diffusion type	4.5 to 5.5	
TC93A16FTG	VQON24 ☆	Laser diode driver for Blu-ray Disc playback	—	100	—	—	3-terminal	4.5 to 12	
TC93A24FUG	*	SSOP6	High-frequency superimposition for Blu-ray Disc	—	—	—	Designed for blue-violet lasers	4.5 to 5.0	

☆: Dry-packed

\*: New product

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

## Other Consumer Product ICs

### Remote Controller ICs

Part Number	Package	Description/Use	Functions and Features	Operating Voltage (V)
TC9243APG TC9243AFG	P-DIP20-300-2.54A P-SOP20-300-1.27 ☆	Remote control transmitter suitable for TVs, VCRs and audio equipment	Used for transmission, 32 functions controllable through simultaneous multiple key presses	2.0 to 4.0

☆: Dry-packed

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

### 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.

### CLC (Common Line Communication) ICs

Part Number	Package	Applications	Features	Supply Voltage (V)
T6B70BFG ☆	SOP16-P-300-1.27	Interface IC for boilers	Carrier receiver, carrier identification, carrier pseudo-sine wave generator	4.5 to 5.5
T6B70BFNG	SSOP16-P-225-0.65B	Interface IC for boilers	Carrier receiver, carrier identification, carrier pseudo-sine wave generator Smaller package version of T6B70BFG	4.5 to 5.5

☆: Dry-packed

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

**Toshiba America****Electronic Components, Inc.**

- Irvine, Headquarters  
Tel: (949)623-2900 Fax: (949)474-1330
- Buffalo Grove (Chicago)  
Tel: (847)484-2400 Fax: (847)541-7287
- Duluth/Atlanta  
Tel: (770)931-3363 Fax: (770)931-7602
- El Paso  
Tel: (915)771-8156
- Houston  
Tel: (713)466-6277
- Marlborough  
Tel: (508)481-0034 Fax: (508)481-8828
- Parsippany  
Tel: (973)541-4715 Fax: (973)541-4716
- San Jose  
Tel: (408)526-2400 Fax: (408)526-2410
- Wixom (Detroit)  
Tel: (248)347-2607 Fax: (248)347-2602

**Toshiba Electronics do Brasil Ltda.**

Tel: (011)2539-6681 Fax: (011)2539-6675

**Toshiba India Private Ltd.**

Tel: (011)2331-8422 Fax: (011)2371-4603

**Toshiba Electronics Europe GmbH**

- Düsseldorf Head Office  
Tel: (0211)5296-0 Fax: (0211)5296-400
- France Branch  
Tel: (1)47282828 Fax: (1)42046491
- Italy Branch  
Tel: (039)68701 Fax: (039)6870205
- Spain Branch  
Tel: (91)660-6798 Fax: (91)660-6799
- U.K. Branch  
Tel: (1252)5300 Fax: (1252)53-0250
- Sweden Branch  
Tel: (8)704-0900 Fax: (8)80-8459

**Toshiba Electronics Asia (Singapore) Pte. Ltd.**

Tel: (6278)5252 Fax: (6271)5155

**Toshiba Electronics Service (Thailand) Co., Ltd.**

Tel: (02)501-1635 Fax: (02)501-1638

**Toshiba Electronics Trading (Malaysia) Sdn. Bhd.**

- Kuala Lumpur Head Office  
Tel: (03)5631-6311 Fax: (03)5631-6307
- Penang Office  
Tel: (04)226-8523 Fax: (04)226-8515

**Toshiba Electronics Asia, Ltd.**

- Hong Kong Head Office  
Tel: 2375-6111 Fax: 2375-0969
- Beijing Office  
Tel: (010)6590-8796 Fax: (010)6590-8791
- Chengdu Office  
Tel: (028)8675-1773 Fax: (028)8675-1065
- Qingdao Office  
Tel: (532)8579-3328 Fax: (532)8579-3329

**Toshiba Electronics Shenzhen Co., Ltd.**

Tel: (0755)2399-6897 Fax: (0755)2399-5573

**Toshiba Electronics (Shanghai) Co., Ltd.**

- Shanghai Head Office  
Tel: (021)6841-0666 Fax: (021)6841-5002
- Hangzhou Office  
Tel: (0571)8717-5004 Fax: (0571)8717-5013
- Nanjing Office  
Tel: (025)8689-0070 Fax: (025)8689-0125

**Toshiba Electronics (Dalian) Co., Ltd.**

Tel: (0411)8368-6882 Fax: (0411)8369-0822

**Tsurong Xiamen Xiangyu Trading Co., Ltd.**

Tel: (0592)226-1398 Fax: (0592)226-1399

**Toshiba Electronics Korea Corporation**

- Seoul Head Office  
Tel: (02)3484-4334 Fax: (02)3484-4302
- Daegu Office  
Tel: (053)428-7610 Fax: (053)428-7617

**Toshiba Electronics Taiwan Corporation**

- Taipei Head Office  
Tel: (02)2508-9988 Fax: (02)2508-9999

- ▶ Toshiba Corporation, and its subsidiaries and affiliates (collectively "TOSHIBA"), reserve the right to make changes to the information in this document, and related hardware, software and systems (collectively "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 intended for use in general electronics applications (e.g., computers, personal equipment, office equipment, measuring equipment, industrial robots and home electronics appliances) or for specific applications as expressly stated in this document. Product is neither intended nor warranted for use in equipment 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 or serious public impact ("Unintended Use"). Unintended Use includes, without limitation, equipment used in nuclear facilities, equipment used in the aerospace industry, 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, devices related to electric power, and equipment used in finance-related fields. Do not use Product for Unintended Use unless specifically permitted in this document.
  - ▶ 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 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.