



Low Power-Loss Voltage Regulators

TO-220 Type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings				Electrical characteristics			Built-in functions						Package	
		Output current I _o (A)	Input voltage V _{in} (V)	Power dissipation (W)		Output voltage V _o ^{*3} (V) TYP.	Output voltage precision (%)	Dropout voltage V _{i-o} ^{*5} (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage	Lead forming available		
				Pd ^{*1}	Pd ^{*2}										Package shape type ^{*7}	
PQxxxRDA1SZH series	ASO protection function, low dissipation current at OFF state (I _{qs} : 5 μA (MAX.))	1	24	1.4	15	3.3, 5, 9, 12	±3	0.5	○	○	○	○			TO-220	A
PQxxxRDA2SZH series		2	20			3.3, 5, 9, 12	±2.5	1.0	○	○	○	○				A
PQ30RV11J00H	Variable output voltage	1	35	1.5	18	1.5 to 30	±2 ^{*4}	0.5	○	○	△ ^{*6}		○	○	TO-220	B
PQ30RV21J00H		2							○	○	△ ^{*6}		○	○		B
PQ30RV31J00H		3		2	20				○	○	△ ^{*6}		○	○		B

*1 At self-cooling

*2 With infinite heat sink attached

*3 The xxx in the model No. refer to the output voltage values of the model (e.g. 050 for 5 V, 120 for 12 V, 015 for 1.5 V).

*4 Reference voltage precision

*5 Current ratings are defined individually.

*6 △ : Available by adding circuit

*7 Refer to page 31

Surface Mount Type Low Power-Loss Voltage Regulators

SOT-89 Type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics			Built-in functions					Package	
		Output current I _o (A)	Input voltage V _{in} (V)	Power dissipation Pd ^{*1} (W)	Output voltage V _o ^{*2} (V) TYP.	Output voltage precision (%)	Dropout voltage V _{i-o} ^{*3} (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage		
PQ1LAXx5MSPQ▲	Compact, high radiation package, ceramic capacitor compatible	0.5	15	0.9	1.2, 1.5, 1.8, 2.5, 3.3, 5.0	±2.0	0.7	○	○	○	○			SOT-89
PQ1LAX95MSPQ▲	Ceramic capacitor compatible, variable output voltage				1.5 to 9.0	±2.0 ^{*4}		○	○	○	○	○		

*1 When mounted on a board

*2 The xx in the model No. refer to the output voltage values of the model (e.g. 25 for 2.5 V, 50 for 5.0 V).

*3 Current ratings are defined individually.

*4 Reference voltage precision

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.

Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.

*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.

Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



●SC-63 Type (1) Output Voltage Fixed Type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics				Built-in functions						Package Package shape type ⁴		
		Output current I _o (A)			Input voltage V _{in} (V)	Power dissipation Pd ^{*1} (W)	Output voltage V _o ^{*2} (V) TYP.	Output voltage precision (%)	Dropout voltage V _{i-o} ^{*3} (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage		Taped package	
		0.5	1	1.5													
PQxxxDNA1ZPH series	Ceramic capacitor compatible, ASO protection function, low dissipation current at OFF state (I _{qs} : 5 μA (MAX.)), solder dip compatible lead shape	○			24	8	3.3, 5, 9, 12	±2.5	0.5	○	○	○	○	-	○	F	
PQxxxENA1ZPH series▲	Minimum operating input voltage: 2.35 V, ceramic capacitor compatible, solder dip compatible lead shape	○			10	8	1.5, 1.8, 2.5, 3.3	±2.0	0.3	○	○	○	○	-	○	F	
PQxxxENB1ZPH series▲		○				5	1.2, 1.5, 1.8, 2.5, 3.3			○	○	○	○	-	○	F	
PQxxxENAHZPH series▲				○			1.5, 1.8, 2.5, 3.3			0.9	○	○	○	○	-	○	F
PQxxxGN01ZPH series		○				5.5	8			1.0, 1.2	±30 mV	-	○	○			-
PQxxxGN1HZPH series			○						○	○			-	○	F		

*1 With infinite heat sink attached

*2 The xxx in the model No. refer to the output voltage values of the model (e.g. 033 for 3.3 V, 050 for 5 V, 120 for 12 V).

*3 Current ratings are defined individually.

*4 Refer to page 31

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

●SC-63 Type (2) Output Voltage Variable Type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics				Built-in functions						Package Package shape type ⁴		
		Output current I _o (A)			Input voltage V _{in} (V)	Power dissipation Pd ^{*1} (W)	Output voltage V _o (V) TYP.	Output voltage precision (%)	Dropout voltage V _{i-o} ^{*3} (V)	Overheat protection	Overcurrent protection	ON/OFF control	Low dissipation current at OFF state	Variable output voltage		Taped package	
		0.5	1	1.5													
PQ070XNA1ZPH▲	Minimum operating input voltage: 2.35 V, ceramic capacitor compatible, solder dip compatible lead shape	○			10	8	1.5 to 7	±2.0 ^{*2}	0.5	○	○	○	○	○	○	F	
PQ070XNAHZPH▲				○						0.9	○	○	○	○	○	○	F
PQ070XNA2ZPH▲				○ (2A)						0.5	○	○	○	○	○	○	F
PQ070XNB1ZPH▲		○							5	1.2 to 7	0.3	○	○	○	○	○	F
PQ035ZN01ZPH	Reference voltage (V _{ref}): 0.6 V, minimum operating input voltage: 1.7 V (Dual power supply type), ceramic capacitor compatible, solder dip compatible lead shape	○			5.5	0.8 to 3.5	±30 mV	-	○	○			○	○	F		
PQ035ZN1HZPH				○					-	○	○			○	○	F	
PQ200WNA1ZPH	Minimum operating input voltage: 3.5 V, ASO protection function, low dissipation current at OFF state (I _{qs} : 5 μA (MAX.)), ceramic capacitor compatible, solder dip compatible lead shape	○			24	3.0 to 20	±2.5 ^{*2}	0.5	○	○	○	○	○	○	F		
PQ200WN3MZPH	Minimum operating input voltage: 5.5 V, low dissipation current at OFF state (I _{qs} : 5 μA (MAX.)), ceramic capacitor compatible, current limit: 800 mA	○ (0.3)							6.8	5.0 to 20	○	○	○	○	○	F	

*1 With infinite heat sink attached

*2 Reference voltage precision

*3 Current ratings are defined individually.

*4 Refer to page 31

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.

Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP. *RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.

Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



●SOP-8 Type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings			Electrical characteristics		Built-in functions		Taped package	Package
		Output current I _o (A)	Input voltage V _{in} (V)	Power dissipation Pd ^{*1} (W)	Output voltage V _o (V) TYP.	Output voltage precision ^{*2} (mV)	Overheat protection	Overcurrent protection		
PQ1DX095MZPQ▲	Built-in sink source function (For DDR II memory)	±0.8	6	0.6	V _{DD} x 1/2 (V _{DDQ} : 1.5 V (MIN.))	±25	○	○	○	SOP-8

*1 When mounted on a board

*2 Reference voltage precision

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

■Surface Mount Type Chopper Regulators (DC-DC Converters)

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electrical characteristics					Package	
		Switching current I _{sw} (A)	Power dissipation Pd ^{*1} (W)	Input voltage range V _{in} (V)	Output voltage V _o (V)	Output type	Oscillation frequency f _o (Hz) TYP.	Output saturation voltage V _{sat} (V) TYP.	Outline shape type ^{*4}	
PQ6CU12X2APQ▲	<ul style="list-style-type: none"> High switching voltage: 40 V (MAX.) For tuner power supply Variable oscillation frequency Ceramic capacitor compatible 	0.25	0.35	3.0 to 5.5	up to 36	Step-up	300 k to 800 k	R _{on} TYP. 1.7Ω	SOT-23-6W	
PQ1CN38M2ZPH	<ul style="list-style-type: none"> PWM chopper regulator (high oscillation frequency) Output ON/OFF control function Overcurrent/overheat protection circuits For light load 	0.8	8	4.5 to 40	V _{REF} ^{*3} to 35 (step-down type)/ -V _{REF} to -30 (inverting type)	Step-down	300 k	0.9	SC-63	F
PQ1CN41H2ZPH	<ul style="list-style-type: none"> PWM chopper regulator (high oscillation frequency) Overcurrent/overheat protection circuits 	1.5	8			Step-down	300 k	0.9		F
PQ1CX41H2ZPQ▲	<ul style="list-style-type: none"> Bootstrap system for high efficiency (Efficiency 90% (TYP.)) Low voltage output: 0.8 V (MIN.) Ceramic capacitor compatible 	1.5	0.8 When mounted on board	4.75 to 27	0.8 to 20	Step-down	400 k	R _{Dson} TYP. 0.45Ω	SOP-8	
PQ1CX53H2MPQ▲	<ul style="list-style-type: none"> Bootstrap system for high efficiency (Efficiency 89% (TYP.)) Low voltage output: 0.8 V (MIN.) Ceramic capacitor compatible 	3.5	2 When mounted on board	4.75 to 27	0.8 to 16	Step-down	400 k	R _{Dson} TYP. 0.15Ω	USB-8	
PQ1CX61H1ZPQ▲	<ul style="list-style-type: none"> Bootstrap system for high efficiency (Efficiency 88% (TYP.)) Low voltage output: 1.0 V (MIN.) Ceramic capacitor compatible 	1.5	0.8 When mounted on board	4.75 to 28	1.0 to 18.9	Step-down	900 k	R _{Dson} TYP. 0.55Ω	SOP-8	

*1 With infinite heat sink attached or when mounted on a board listed in the specification sheets.

*2 Output variable range (step-down/inversion).

*3 V_{REF} nearly equal to 1.26 V

*4 Refer to page 31

The model marked with ▲ may not be available in the near future. Contact with SHARP for details before use.

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.

Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.

*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.

Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



■ Chopper Regulators (DC-DC Converters)

● TO-220 Type

(Ta = 25°C)

Model No.	Features	Absolute maximum ratings		Electrical characteristics				Package		
		Switching current I _{sw} (A)	Power dissipation Pd*1 (W)	Input voltage range V _{in} (V)	Output voltage V _o *2 (V)	Output type	Oscillation frequency fo (kHz) TYP.	Output saturation voltage V _{sat} (V) TYP.	Outline shape type*5	
PQ1CG21H2FZH	<ul style="list-style-type: none"> • PWM chopper regulator • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function 	1.5*3	14	40	V _{REF} *4 to 35 (step-down type)/ -V _{REF} *4 to -30 (inverting type)	Step-down	100	1.0	TO-220	E
PQ1CG41H2FZH	<ul style="list-style-type: none"> • PWM chopper regulator (high oscillation frequency) • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function 						300	1.0		E
PQ1CG2032FZH	<ul style="list-style-type: none"> • PWM chopper regulator • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function 	3.5*3					70	1.4		E
PQ1CG3032FZH	<ul style="list-style-type: none"> • PWM chopper regulator (high oscillation frequency) • Built-in overcurrent/overheat protection circuits • Output ON/OFF control function 						150			E

*1 With infinite heat sink attached

*2 Output voltage variable range

*3 Peak current

*4 V_{REF} nearly equal to 1.26 V (TYP.)

*5 Refer to page 31

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.

Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.

*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.

Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



LED Drivers

Built-in Step-up Circuit

Model No.	Function	Features	No. of output circuits	Number of LEDs	Booster method	Constant current circuit	Switching transistor	Input voltage range (V)	Output ^{*1} current (mA) MAX.	Oscillation frequency (Hz) TYP.	Package
IR2E58U	White LED driver for backlight	<ul style="list-style-type: none"> Capable of driving a maximum of 96 LEDs with 12 LEDs (in series) per channel Built-in step-up DC-DC converter High oscillation frequency (1.5 MHz) makes use of a small coil possible Capable of controlling brightness using PWM control Step-up output control according to LED-Vf 	8	96	PWM	○	○	4.5 to 28	40/ch	500 k to 1.5 M	24HQFN
IR2E71Y	LED driver for backlight and call alert display (auto brightness adjustment)	<ul style="list-style-type: none"> 2 ch (11 LEDs x 2 ch) LED driver for backlight Auto brightness adjustment backlight LED 6 ch RGB LED driver for illumination Built-in switching regulator for LCD backlight Built-in LCD controller power supply (+5.8 V / -5.8 V MAX.) LDO 1 ch Interface for digital-output proximity sensor with ambient light sensor Built-in general purpose input/output port (7 ch MAX.) 	Backlight 2 RGB 6	Backlight 22 RGB 6	PWM	○	○	3.0 to 4.5	Backlight 25.5/ch RGB 12.7/ch	10 k to 1 M	35WL-CSP
IR2E67M	White LED driver for backlight	<ul style="list-style-type: none"> Built-in 10 ch. constant-current control amplifier (external output transistor) Enables driving LEDs up to external transistor voltage limit Built-in timing controller for lighting Wider range of PWM brightness control possible, from simultaneous total output control to local dimming Step-up output control according to LED-Vf 	10	*2	*3	*4	External	4.5 to 5.5	*5	-	80LQFP-1420
IR2E70N	White LED driver for backlight	<ul style="list-style-type: none"> Built-in step-up DC-DC controller for 2 ch individual control Capable of 2 ch individual PWM brightness control LED current value adjustable by external signal (voltage input / PWM signal) Brightness control possible at high contrast ratio 3000:1 Step-up output control according to LED-Vf 	2	*2	PWM	*6	External	4.5 to 5.5 8 to 28	*5	100 k to 500 k	24SSOP

*1 Constant current (MAX.)

*2 Determined by external transistor voltage limit.

*3 Built-in feedback voltage-generating circuit for external power supply.

*4 Built-in constant-current control amplifier (external output transistor)

*5 Determined by external resistor.

*6 Constant current can be controlled by LED anode voltage control.

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.

Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.

*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.

Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



■ AC-DC Conversion Type ICs for LED Lighting

Model No.	Features	Operating temperature range (°C)	Supply voltage range (V)	Dissipation current (mA) TYP.	Switching frequency (kHz) ^{*1} TYP.	Gate driver capacity		System	Package
						Low (Ω)	High (mA)		
IR3M92N4	Overvoltage/overheat/overcurrent circuits, high-speed activation, stand-by feature, PWM brightness control	-30 to +100	10 to 18	1	160	MAX. 15	MIN. 40	Flyback Step-down	SOP-8

*1 When operating a flyback converter

■ Power Amplifiers for Wireless LAN

Model No.	Application	Supply voltage Vcc (V) TYP.	Control voltage Vbb (V) TYP.	Linear output power ^{*1} (dBm)	Dissipation current (mA) TYP.	Gain (dB) TYP.	Detection circuit	Matching circuit	Package (mm)	
IRM068U7	For 2.4 GHz single-band wireless LAN (IEEE802.11b/g/n)	3.3	2.8	18	115	27	○	Built-in (IN)	HQFN6 pin (1.5 × 1.5 × 0.4 mm)	
QM2A1UA003				20	150	28	○	Built-in (IN)		
IRM053U7	For 5 GHz single-band wireless LAN (IEEE802.11a/n)			2.8	18	170	30	○	Built-in (IN/OUT)	HQFN10 pin (2 × 2 × 0.4 mm)
QM2A1UA004					20	225	31	○	Built-in (IN/OUT)	
IRM067U6	For 2.4/5 GHz dual-band wireless LAN (IEEE802.11a/b/g/n)		2.9	17	100	28	○	Built-in (IN/OUT)	HQFN16 pin (3 × 3 × 0.4 mm)	
				17	140	30				

*1 At time of OFDM 64QAM modulating wave input.

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
 Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
 *RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
 Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



■ Front-End Modules for Wireless LAN

Model No.	Application	Features	Supply voltage (V) TYP.	Control voltage (V) TYP.	Transmitter section			Receiver section		Package
					EVM (%) / Output power (dBm)	Dissipation current (mA) / Output power (dBm)	Gain (dB) TYP.	Noise figure (dB) TYP.	Gain: Normal/Bypass (dB) TYP.	
QM2A1UB028/032A	Front-end IC for 2.4 GHz wireless LAN (802.11b/g/n/ac) (SP3T SW + PA + LNA)	<ul style="list-style-type: none"> Built-in detection circuit, high efficiency / high linear-output power amplifier .11ac-compliant low EVM design Low-noise amplifier with bypass mode Built-in input/output matching circuit Compact and thin package 	3.6	3.3	2/19*1	200/19	27	2	13/-5.5	HQFN16 pin (2.5 × 2.5 × 0.4 mm)
QM2A1UB029/033A	Front-end IC for 5 GHz wireless LAN (802.11a/n/ac) (SPDT SW + PA + LNA)				2/18*2	180/18	28	2.5	13/-7	

*1 MCS7 HT20 at 64QAM input

*2 MCS7 HT40 at 64QAM input

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.

Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.

*RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.

Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



■ Package Lineup
● Surface-Mount Type

Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm	Package depth & width (D x W) x (seated height [MAX.]) mm		
FBGA (CSP)		P-LFBGA048-0606		0.8	6 x 6	6.0 x 6.0 x (1.4)		
		P-TFBGA048-0608	48		6 x 8	6.0 x 8.0 x (1.2)		
		P-TFBGA048-0808			8 x 8	8.0 x 8.0 x (1.2)		
		P-TFBGA056-0808	56					
		P-TFBGA060-0811	60 (48)*					
		P-TFBGA064-0811	64				8 x 11	8.0 x 11.0 x (1.2)
		P-TFBGA072-0811	72 (64)*					
		P-LFBGA072-0811						8.0 x 11.0 x (1.4) / (1.6)
		P-TFBGA081-0808	81				8 x 8	8.0 x 8.0 x (1.2)
		P-LFBGA085-0811	85					
		P-LFBGA087-0811	87				8 x 11	8.0 x 11.0 x (1.4) / (1.6)
		P-LFBGA088-0811						
		P-LFBGA088-0912	88				9 x 12	9.0 x 12.0 x (1.4) / (1.6)
		P-LFBGA090-0811	90				8 x 11	8.0 x 11.0 x (1.4) / (1.6)
		P-TFBGA096-1010	96				10 x 10	10.0 x 10.0 x (1.2)
		P-LFBGA107-0912	107				9 x 12	9.0 x 12.0 x (1.4) / (1.6)
		P-TFBGA111-1010	111					
		P-TFBGA112-1010	112				10 x 10	10.0 x 10.0 x (1.2)
		P-LFBGA115-0914	115				9 x 14	9.0 x 14.0 x (1.4) / (1.6)
		P-LFBGA116-1010	116				10 x 10	10.0 x 10.0 x (1.4) / (1.6)
		P-LFBGA130-1013	130				10 x 13	10.0 x 13.0 x (1.4) / (1.6)
		P-TFBGA144-1111	144				11 x 11	11.0 x 11.0 x (1.2)
		P-TFBGA160-1212	160					12.0 x 12.0 x (1.2)
		P-LFBGA168-1212	168				12 x 12	12.0 x 12.0 x (1.4) / (1.6)
		P-TFBGA180-1212	180					12.0 x 12.0 x (1.2)
		P-TFBGA184-1212	184					
		P-TFBGA240-1414	240				14 x 14	14.0 x 14.0 x (1.2)
		P-LFBGA280-1616	280					
		P-LFBGA352-1616	352				16 x 16	16.0 x 16.0 x (1.5)
		P-TFBGA064-0606	64			0.65	6 x 6	6.0 x 6.0 x (1.2)
		P-LFBGA140-0909	140				9 x 9	9.0 x 9.0 x (1.4)
		P-LFBGA160-1010	160				10 x 10	10.0 x 10.0 x (1.4) / (1.6)
		P-TFBGA180-1313	180				13 x 13	13.0 x 13.0 x (1.2)
P-LFBGA192-1010	192		10 x 10	10.0 x 10.0 x (1.4) / (1.6)				
P-LFBGA208-1212	208		12 x 12	12.0 x 12.0 x (1.4) / (1.6)				
P-LFBGA224-1313	224			13.0 x 13.0 x (1.4) / (1.6)				
P-TFBGA260-1313	260		13 x 13	13.0 x 13.0 x (1.2)				
(Plastic)								

* Figures in brackets indicate available terminal counts.

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
 Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
 *RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
 Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



●Surface-Mount Type (cont'd)

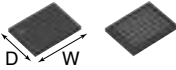
Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm	Package depth & width (D x W) x (seated height [MAX.]) mm			
FBGA (CSP)		P-VFBGA057-0505	57	0.5	5 x 5	5.0 x 5.0 x (0.9)			
		P-VFBGA075-0505	75			6 x 6	6.0 x 6.0 x (1.1)		
		P-TFBGA064-0606	64				6 x 6	6.0 x 6.0 x (0.9)	
		P-TFBGA068-0606	68		7 x 7			6.0 x 6.0 x (1.1)	
		P-VFBGA081-0606	81			7 x 7		6.0 x 6.0 x (0.9)	
		P-TFBGA084-0606	84				7 x 7	6.0 x 6.0 x (1.1)	
		P-VFBGA100-0606	100		7 x 7			6.0 x 6.0 x (0.9)	
		P-VFBGA100-0707				7 x 7		7.0 x 7.0 x (0.9)	
		P-TFBGA100-0707					7 x 7	7.0 x 7.0 x (1.1)	
		P-VFBGA108-0707	108		7 x 7			7.0 x 7.0 x (0.9)	
		P-TFBGA108-0707				7 x 7		7.0 x 7.0 x (1.1)	
		P-VFBGA120-0707					120	7 x 7	7.0 x 7.0 x (0.9)
		P-TFBGA120-0707	7 x 7		7.0 x 7.0 x (1.1)				
		P-TFBGA132-0707			132	8 x 8			7.0 x 7.0 x (1.1)
		P-TFBGA133-0808					133	8 x 8	8.0 x 8.0 x (1.1)
		P-VFBGA144-0808	144						8 x 8
		P-LFBGA144-0808			144	8 x 8			
		P-LFBGA144-0811					152	8 x 11	
		P-TFBGA152-0808	8 x 8						8 x 8
		P-VFBGA171-0811			171	8 x 11			
		P-LFBGA171-0811					176	8 x 11	
		P-VFBGA176-0909	176						9 x 9
		P-TFBGA176-0909			180	9 x 9			
		P-TFBGA180-0909					188	11 x 11	
		P-TFBGA188-0909	188						11 x 11
		P-VFBGA188-1111			208	10 x 10			
		P-VFBGA208-1010					208	10 x 10	
		P-TFBGA208-1010	245						14 x 14
		P-TFBGA245-1010			14 x 14	14 x 14			
		P-LFBGA245-1010					144	6 x 6	
		P-FBGA424-1414	424						14 x 14
		P-WFBGA144-0606			144	6 x 6			
		P-WFBGA121-0606					121	6 x 6	
P-WFBGA145-0606	145	7 x 7	7.0 x 7.0 x (1.0)						
P-TFBGA168-0707			168	7 x 7	8.0 x 8.0 x (1.0)				
P-TFBGA204-0808					204	8 x 8	8.0 x 8.0 x (1.0)		
P-WFBGA205-0808	205	8 x 8					8.0 x 8.0 x (0.8)		
P-WFBGA261-0808			261	8 x 8			8.0 x 8.0 x (0.8)		
(Plastic)									

Packages

Notice
 In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
 Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
 *RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
 Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



●Surface-Mount Type (cont'd)

Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm	Package depth & width (D x W) x (seated height [MAX.]) mm
FBGA (CSP)		P-TFBGAXXX-0606	to 36	0.8	6 x 6	6.0 x 6.0 x (1.2)
		P-TFBGAXXX-0707	to 49		7 x 7	7.0 x 7.0 x (1.2)
		P-TFBGAXXX-0808	to 81		8 x 8	8.0 x 8.0 x (1.2)
		P-TFBGAXXX-0909	to 100		9 x 9	9.0 x 9.0 x (1.2)
		P-TFBGAXXX-1010	to 121		10 x 10	10.0 x 10.0 x (1.2)
		P-TFBGAXXX-1111	to 144		11 x 11	11.0 x 11.0 x (1.2)
		P-TFBGAXXX-1212	to 196		12 x 12	12.0 x 12.0 x (1.2)
		P-TFBGAXXX-1313	to 216		13 x 13	13.0 x 13.0 x (1.2)
		P-TFBGAXXX-1414	to 240		14 x 14	14.0 x 14.0 x (1.2)
		P-TFBGAXXX-1515	to 352		15 x 15	15.0 x 15.0 x (1.2)
		P-TFBGAXXX-1616	to 352		16 x 16	16.0 x 16.0 x (1.2)
		P-TFBGAXXX-0606	to 49		0.65	6 x 6
		P-TFBGAXXX-0707	to 81	7 x 7		7.0 x 7.0 x (1.2)
		P-TFBGAXXX-0808	to 121	8 x 8		8.0 x 8.0 x (1.2)
		P-TFBGAXXX-0909	to 144	9 x 9		9.0 x 9.0 x (1.2)
		P-TFBGAXXX-1010	to 196	10 x 10		10.0 x 10.0 x (1.2)
		P-TFBGAXXX-1111	to 224	11 x 11		11.0 x 11.0 x (1.2)
		P-TFBGAXXX-1212	to 256	12 x 12		12.0 x 12.0 x (1.2)
		P-TFBGAXXX-1313	to 272	13 x 13		13.0 x 13.0 x (1.2)
		P-TFBGAXXX-1414	to 304	14 x 14		14.0 x 14.0 x (1.2)
		P-TFBGAXXX-1515	to 320	15 x 15		15.0 x 15.0 x (1.2)
		P-TFBGAXXX-1616	to 352	16 x 16		16.0 x 16.0 x (1.2)
		P-TFBGAXXX-0606	to 100	0.5		6 x 6
		P-TFBGAXXX-0707	to 132		7 x 7	7.0 x 7.0 x (1.1)
		P-TFBGAXXX-0808	to 164		8 x 8	8.0 x 8.0 x (1.1)
		P-TFBGAXXX-0909	to 192		9 x 9	9.0 x 9.0 x (1.1)
		P-TFBGAXXX-1010	to 216		10 x 10	10.0 x 10.0 x (1.1)
		P-TFBGAXXX-1111	to 244		11 x 11	11.0 x 11.0 x (1.1)
		P-TFBGAXXX-1212	to 268		12 x 12	12.0 x 12.0 x (1.1)
		P-TFBGAXXX-1313	to 296		13 x 13	13.0 x 13.0 x (1.1)
		P-TFBGAXXX-1414	to 320		14 x 14	14.0 x 14.0 x (1.1)
		P-TFBGAXXX-1515	to 348		15 x 15	15.0 x 15.0 x (1.1)
		P-TFBGAXXX-1616	to 372		16 x 16	16.0 x 16.0 x (1.1)
		P-TFBGAXXX-0505	to 100		0.4	5 x 5
		P-TFBGAXXX-0606	to 144	6 x 6		6.0 x 6.0 x (1.0)
		P-TFBGAXXX-0707	to 168	7 x 7		7.0 x 7.0 x (1.0)
P-TFBGAXXX-0808	to 204	8 x 8	8.0 x 8.0 x (1.0)			
P-TFBGAXXX-0909	to 228	9 x 9	9.0 x 9.0 x (1.0)			
P-TFBGAXXX-1010	to 264	10 x 10	10.0 x 10.0 x (1.0)			
P-BGA0356-2121	356	1.0	21 x 21	21.0 x 21.0 x (2.2)		
P-BGA0476-3535	476	1.27	35 x 35	35.0 x 35.0 x (2.63)		
P-BGA0528-3535	528					

XXX: Terminal counts


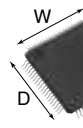
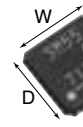

BGA is a trademark of Motorola Nippon Ltd.

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
 Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
 *RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
 Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



●Surface-Mount Type (cont'd)

Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm (mil)	Nominal dimensions mm (mil)	Package depth & width (D x W) x (seated height [MAX.]) mm	Lead frame material	
							Alloy42	Copper alloy
TSOP	 (Plastic)	P-TSOP048-1220	48	0.5	12 x 20	12.0 x 18.4 x (1.2)	○	○
		P-TSOP056-1420	56		14 x 20	14.0 x 18.4 x (1.2)	○	○
QFP	 (Plastic)	P-QFP048-0707	48	0.5	7 x 7	7.0 x 7.0 x (1.65)	○	○
LQFP		P-QFP072-1010	72		10 x 10	10.0 x 10.0 x (1.8)	○	—
		P-LQFP080-1212	80	12 x 12	12.0 x 12.0 x (1.7)	○	—	
TQFP		P-LQFP100-1414	100	14 x 14	14.0 x 14.0 x (1.7)	○	—	
		P-TQFP048-0707	48	7 x 7	7.0 x 7.0 x (1.2)	○	—	
		P-TQFP100-1414	100	14 x 14	14.0 x 14.0 x (1.2)	○	—	
P-TQFP128-1414	128	0.4	○		—			
VQFN	 (Plastic)	P-VQFN020-0404	20	0.5	4 x 4	4.2 x 4.2 x (1.0)	—	○
		P-VQFN024-0404	24				—	○
		P-VQFN028-0505	28				—	○
		P-VQFN032-0505	32	0.4	5 x 5	5.2 x 5.2 x (1.0)	—	○
		P-VQFN036-0606	36		6 x 6	6.2 x 6.2 x (1.0)	—	○
		P-VQFN048-0707	48		7 x 7	7.2 x 7.2 x (1.0)	—	○
		P-VQFN036-0505	36		5 x 5	5.2 x 5.2 x (1.0)	—	○
HQFN*	 (Plastic)	P-VQFN052-0707	52	7 x 7	7.2 x 7.2 x (1.0)	—	○	
		P-HQFN020-0404	20	0.5	4 x 4	4.0 x 4.0 x (1.0)	—	○
		P-HQFN024-0404	24			4.0 x 4.0 x (0.85)	—	○
P-HQFN028-0505	28	0.4	5 x 5	5.0 x 5.0 x (1.0)	—	○		
P-HQFN052-0707	52		7 x 7	7.2 x 7.2 x (1.0)	—	○		

* HQFN is a higher heat dissipation package of VQFN.

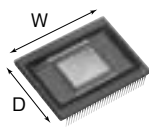
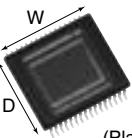
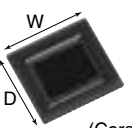
100 mil = 2.54 mm

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
 Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
 *RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
 Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

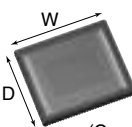


●For CCDs

Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm (mil)	Package depth & width (D x W) x (seated height [TYP.]) mm	
DIP	 (Plastic)	P-DIP014-0400A	14	1.27	10.16 (400)	10.0 x 10.0	
		P-DIP016-0450	16	1.27	11.43 (450)	11.4 x 12.2	
		P-DIP020-0500	20	1.27	12.2 (500)	12.0 x 13.8	
		P-DIP024-0400	24	0.80	10.16 (400)	10.0 x 10.0	
		P-DIP028-0566	28	1.11	14.4 (566)	14.2 x 16.0	
		P-DIP064-1000	64	P-DIP064-1000B	1.00	25.48 (1 000)	36.1 x 25.4
SOP	 (Plastic)	P-SOP014-0400A	14	1.27	12 (470)	10.0 x 10.0 x (4.1)	
		P-SOP028-0400	28	0.69	10.16 (400)	10.0 x 10.0 x (3.5)	
		P-SOP032-0525	32	0.78	13.3 (525)	12.0 x 13.8 x (3.92)	
LCC	 (Ceramic)	N-LCC040-R350 (B)	40	0.65	8.9 (350)	8.3 x 8.9 x (1.52)	
		N-LCC040-S433A		0.80	11.0 (433)	11.0 x 11.0 x (1.62)	

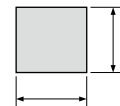
100 mil = 2.54 mm

●For CMOSs

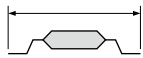
Package type	Appearance (Package material)	Package code	No. of terminals	Terminal pitch mm	Nominal dimensions mm (mil)	Package depth & width (D x W) x (seated height [TYP.]) mm
LCC	 (Ceramic)	N-LCC120-R898 ----- N-LCC120-R898A	120	0.65	22.8 (898)	20.0 x 22.8 x (2.67)

100 mil = 2.54 mm

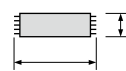
Nominal dimensions



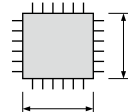
FBGA (CSP)
PBGA (BGA)



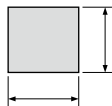
SOP
SSOP
MFP



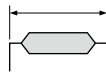
TSOP



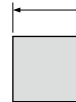
QFP
LQFP
TQFP



VQFN
HQFN



DIP



LCC

FBGA : fine-pitch ball grid array package

PBGA : plastic ball grid array package

SOP : small outline package

SSOP : shrink small outline package

MFP : mini flat package

TSOP : thin small outline package

QFP : quad flat package

LQFP : low profile quad flat package

TQFP : thin quad flat package

VQFN : very thin quad flat non-leaded package

HQFN : heat sink quad flat non-leaded package

DIP : dual inline package

LCC : leadless chip carrier

Ball Grid Array and BGA are trademarks of Motorola Nippon Ltd.

Notice



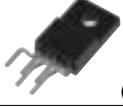
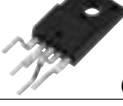
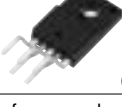
In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.

Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP. *RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.

Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.






●Lead-Inserting Type Packages [For regulators: PQ series]

Package type	Appearance (Package material)	No. of terminals	Terminal pitch mm	Outline dimensions (Width x Thickness x Height) mm	Lead frame material
TO-220	 (Plastic)	4	2.54	10.2 (MAX.) x 4.5 x 29.1* ²	Cu
TO-220 (Full mold)	 (Plastic)	4	2.54	10.2 (MAX.) x 4.5 x 29.1* ²	Cu
TO-220 (Full mold) [Lead forming type]	 (Plastic)	5	(1.7)* ¹	10.2 (MAX.) x 4.5 x 24.6* ²	Cu
TO-220 [Lead forming type]	 (Plastic)	5	(1.7)* ¹	10.2 (MAX.) x 4.5 x 24.6* ²	Cu
TO-220 [Lead forming type]	 (Plastic)	5	(1.7)* ¹	10.2 (MAX.) x 4.5 x 24.6* ²	Cu

*1 The figure in parentheses indicates reference value.

*2 Including lead length

●Surface-Mount Type Packages [For regulators/LED drivers: PQ series]

Package type	Appearance (Package material)	No. of terminals	Terminal pitch mm	Outline dimensions (Width x Height x Thickness) mm	Lead frame material
SC-63	 (Plastic)	5 (Heat sink included)	(1.27)* ¹	6.6 (MAX.) x 9.7 (MAX.)* ² x 2.1	Cu
SOP-8	 (Plastic)	8	1.27	5 x 6.2* ² x 1.55* ²	Cu
SOT-89	 (Plastic)	6	1.5	4.5 x 4.3* ² x 1.5	Cu

*1 The figure in parentheses indicates reference value.





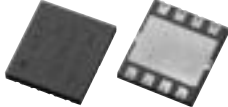
*2 Including lead length

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
 Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
 *RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
 Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.



●Surface-Mount Type Packages [For regulators/LED drivers: PQ series] (cont'd)

Package type	Appearance (Package material)	No. of terminals	Terminal pitch mm	Outline dimensions (Width x Height x Thickness) mm	Lead frame material
SOT-23-6	 (Plastic)	6	0.95	2.9 x 2.8*2 x 1.3	Cu
SOT-23-6W	 (Plastic)	6	0.95	2.9 x 2.8*2 x 1.3	Cu
SOT-23-L	 (Plastic)	6	(0.95)*1	(3.4)*1 x 3.3*2 x 1.4 (MAX.)	Cu
SOT-23-5	 (Plastic)	5	(0.95)*1	(2.9)*1 x 2.8*2 x 1.3 (MAX.)	Cu
USB-8		9 (Including radiating fin)	1.0	5.0 x 4.5 x 0.75 (MAX.)	Cu

*1 The figure in parentheses indicates reference value.

*2 Including lead length

Notice

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc.
 Except where specially indicated, models listed on this page comply with the RoHS Directive*. For details, please contact SHARP.
 *RoHS Directive: Prohibits use of lead, cadmium, hexavalent chromium, mercury and specific brominated flame retardants (PBBs and PBDEs), with certain exceptions.
 Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.