

# Semiconductors for Wireless Communications

## Selection guide

### INTEGRATED FRONT-END SYSTEMS/MIXERS/AMPLIFIERS

TYPE	DESCRIPTION	V <sub>CC</sub> (V)	I <sub>CC</sub> (mA)	PINS	Pkg	INPUT FREQUENCY (GHz)
<b>Image Reject Front-End Systems</b>						
SA1920	dual-band 800/1900 MHz LNA + IRM + IFamp.	3.6 - 3.9	HB Rx: 41.1 HB Tx: 21.3 at 3.75 V	48	BE	0.869 - 0.96 or 1.93 - 1.99
SA1921	dual-band 800/1550 MHz LNA + IRM + IFamp.	3.6 - 3.9	HB Rx: 38.6 HB Tx: 18.8 at 3.75 V	48	BE	0.869 - 0.960 or 1.515 - 1.600
SA3600	low & high-band LNAs + mixers	2.7 - 4.0	LB:15 at 3 V HB: 20 at 3 V	24	DH	LB LNA: 0.8 - 1.0 HB LNA: 1.9 - 2.0 LB mixer: 0.8 - 1.0 HB mixer: 1.9 - 2.0
UAA2067G	LNA + IRM + mod. + VCO	3 - 3.5	Rx: 24 at 3.6 V Tx: 42 at 3.6 V	32	BE	1.8 - 1.9
UAA2068G	TX & synthe + integrated RFVCO for DECT	3 - 5.2	Rx: 35 at 3.6 V Tx: 55 at 3.6 V	32	BE	output: 1.88 - 1.92
UAA2077AM	LNA + IRM	3.15 - 5.3	27 at 4 V	20	DK	1.8 - 1.9
UAA2077BM	LNA + IRM + Tx down-convert mixer	3.6 - 5.3	Rx: 27 at 4 V Tx: 14 at 4 V	20	DK	1.8 - 2
UAA2077CM	LNA + IRM + Tx down-convert mixer	3.6 - 5.4	Rx: 36 at 3.75 V Tx: 14 at 3.75 V	20	DK	1.8 - 2
<b>Image-Reject Front-End Systems</b>						
UAA2073M	LNA + IRM + Tx down-convert mixer	3.6 - 5.3	Rx: 26 at 3.75 V Tx: 12 at 3.75 V	20	DK	0.925 - 0.960
UAA2073AM	LNA + IRM + Tx down-convert mixer	3.6 - 5.3	Rx: 26 at 3.75 V Tx: 12 at 3.75 V	20	DK	0.925 - 0.960
<b>Integrated Front-End Systems</b>						
SA611	LNA + mixer	2.7 - 5.5	8.3/5.2 <sup>(1)</sup> at 3 V	20	DK	LNA 1.2 mixer 1.2
SA621	LNA + mixer + VCO	2.7 - 5.5	13.3/10 <sup>(1)</sup> at 3 V	20	DK	LNA 1.2 mixer 1.2
SA631	LNA + mixer	2.7 - 5.5	8.3/5.2 <sup>(1)</sup> at 3 V	20	DK	LNA 1.2 mixer 1.2

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GAIN POWER (dB)	NOISE FIGURE (dB)	INPUT IP3 (dBm)	1 dB COMP. (dBm)	IMAGE REJECTION (dB)	INPUT IMPED. ( $\Omega$ )	OUTPUT IMPED. ( $\Omega$ )	FEATURES
<b><math>f_{RF} = 2 \text{ GHz}</math></b>							
22	LB: 2.6 HB: 4.1	LB: 9 HB: 12	24 - 25	35	50	50	dual-band 800 MHz & 1.9 GHz; triple-mode AMPS/DAMPS/PCS
22	LB: 2.6 HB: 3.9	LB:9 HB:13	24 - 25	35	50	50	dual-band 900 MHz & 1.5 GHz
30	5.8	-25	-33	34	190 0.8 pF diff.	50 asym.	RF to IF DECT transceiver (DSH)
20	4.3	-17	-22	32	60 1 pF diff.	1 k diff.	3.15 V, 4.3 dB DECT front-end (DSH)
20	4.3 DCS	-17	-23	32	60 1 pF diff.	1 k diff.	DCS1800 front-end
22	3.8 DCS 4.0 PCS	-17	-24	38	60 0.8 pF diff.	1 k diff.	PCS1900/DCS1800 front-end
<b><math>f_{RF} = 900 \text{ MHz}</math></b>							
23	3.25	-15	-23	37	150 1 pF diff.	1 k diff.	3.6 V phase 2 GSM receiver
22	3.6	-15	-23	45	150 1 pF diff.	1 k diff.	GSM high IF
<b><math>f_{RF} = 900 \text{ MHz}</math></b>							
15/-28 <sup>(1)</sup>	1.7	-7	-20		50	50	Low-voltage; excellent noise figure; LNA overload mode
8.7	9.5	+7	-14.5		50	high	
15/-28 <sup>(1)</sup>	1.7	-7	-20		50	50	Low-voltage; excellent noise figure; LNA overload mode; low phase-noise; interval VCO
8.7	9.5	+4.5	-10		50	high	
15/-28 <sup>(1)</sup>	1.7	-7	-20		50	50	Low voltage; excellent noise figure; LNA overload mode; excellent gain stability
9.6	9.5	+3.3	-14.5		50	high	
17/-15 <sup>(1)</sup> 16/-15 <sup>(1)</sup>	1.7 2.2	-7 -6	-17 -15		50	50	Low voltage; excellent noise figure; LNA overload mode; low current; excellent gain stability
10 9.5	10 8.5	+6 +4	-4 -6		50	high	

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TYPE NUMBER	DESCRIPTION	V <sub>CC</sub> (V)	I <sub>CC</sub> (mA)	PINS	Pkg <sup>(2)</sup>	INPUT FREQUENCY (GHz)
<b>Mixer Systems</b>						
SA9500	dual-band; CDMA/AMPS down-converters	2.7 - 3.3	PCS: 20; CDMA: 20; FM: 7.7	20	DH	HB: 1.99 LB: 0.894
SA9502	dual-band; CDMA/AMPS down-convertor	2.7 - 4.0	PCS: 15 CDMA: 18; FM: 6	20	DH	HB: 1.99 LB: 0.894
SA602A	mixer + oscillator	4.5 - 8.0	2.4 at 6 V	8	D	0.500
SA612A	mixer + oscillator	4.5 - 8.0	2.4 at 6 V	8	D	0.500
<b>RF Amplifiers</b>						
SA5200	dual gain stage	4.0 - 9.0	4.2/95 $\mu$ A <sup>(1)</sup> at 5 V (per amplif.)	8	D	DC - 1.2
SA5204A	wideband amp	5.0 - 8.0	25 at 6 V	8	D	DC - 0.350
SA5205A	wideband amp	5.0 - 8.0	25 at 6 V	8	D	DC - 0.550
SA5209	variable gain amp	4.5 - 7.0	43 at 5 V	16	D	DC - 0.850
SA5219	variable gain amp	4.5 - 7.0	43 at 5 V	16	D	DC - 0.700

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GAIN POWER (dB)	NOISE FIGURE (dB)	INPUT IP3 (dBm)	1dB COMP. (dBm)	INPUT IMPED. ( $\Omega$ )	OUTPUT IMPED. ( $\Omega$ )	FEATURES
<b>Mixer (<math>f_{RF} = 45</math> MHz)</b>						
11 7(FM)	9 9	LB: 6 HB: 1		should be matched to 50	open collector 1 k	Ideal mixer for dual-band triple-mode phones LO PCS freq.doubler
11 7(FM)	9 9	LB: 6 HB: 1		should be matched to 50	open collector 1 k	Ideal mixer for dual-band triple-mode phones Direct PCS LO in
17	5.0	-13	-25	1.5 k	1.5 k	Excellent noise figure; high gain
17	5.0	-13	-25	1.5 k	1.5 k	Excellent noise figure; high gain
<b>RF (<math>F_{RG} = 900</math> MHz for SA5200, 100 MHz for others)</b>						
7.5/13.5 <sup>(1)</sup> (per amplif.)	3.6	-1.8	+3.2	50	50	DC to 1.2 GHz; power-down mode
19	6.0 (50 $\Omega$ ) 4.8 (75 $\Omega$ )	-2	+4	50	50	DC to 350 MHz
19	6.0 (50 $\Omega$ ) 4.8 (75 $\Omega$ )	-2	+4	50	50	DC to 550 MHz
25 (voltage)	9.3	+13 (output)	-3	1.2	60	DC to 850 MHz; gain control pin
25 (voltage)	9.3	+13 (output)	-3	1.2	60	DC to 700 MHz; gain control pin

**Notes**

1. Amplifier: Enabled/Disabled.
2. Package Descriptions:  
D: = Small Outline (SO14/16/20)  
DK: = Shrink Small Outline Package (SSOP)  
BE: = Low Quad Flat Package (LQFP)  
DH: = Thin Shrink Small Outline Package (TSSOP).
3. Abbreviations:  
IRM: Image Reject Mixer  
LNA: Low Noise Amplifier  
DSH: Double Superheterodyne  
ZIF: zero IF  
diff: differential  
asym: asymmetrical.
4. Temperature range:  
SA types: -40 to +85 °C.

## DISCRETE FRONT-END SYSTEMS/MIXERS/AMPLIFIERS

SOCKET	SYSTEM FREQ. (MHz)	I <sub>C</sub> (mA)	V <sub>CE</sub> (V)	F <sub>T</sub> (GHz)	GAIN (dB) AT 900 MHz(dB)	NOISE AT 900 MHz (dB)	GAIN (dB) AT 1.9 GHz (dB)	NOISE AT 1.9 GHz (dB)	PACKAGE				
									SOT23	SOT323	SOT343 <sup>(1)</sup>	SOT353	SOT363
LNA	900	3	4,5	17	20	1	22	1.6			BFG403W		
	900 & 1900	2 - 5	3 - 12	9	17	1.2	10	1.9	BFR505	BFS505	BFG505W	BFC505	BFM505
	900 & 1900	3 - 30	3 - 12	9	17	1.2	10	1.9	BFR520	BFS520	BFG520W	BFC520	BFM520
	900 & 1900	1 - 10	2 - 4.5	22	21	1.2	29	0.9			BFG410W		
	900 & 1900	3 - 25	2 - 4.5	22	20	1.2	28	0.8			BFG425W		
	900; 1900 & 2400	250	4.5	21		1.2		1.8			BFG480W		
PA	900 & 1800	200	4.5	18			10				BFG21W		
Mixer	900	5 - 30	3 - 10	6	13	1.9			BFR93A	BFR93AW	BFG93AW		
	900 & 1900	2 - 5	3 - 12	9	17	1.2	10	1.9	BFR505	BFS505	BFG505W	BFE505	BFM505
	900 & 1900	3 - 30	3 - 12	9	17	1.2	10	1.9	BFR520	BFS520	BFG520W	BFE520	BFM520
	900 & 1900	1 - 10	2 - 4.5	22	21	1.2	29	0.9			BFG410W		
	900 & 1900	3 - 25	2 - 4.5	22	20	1.2	28	0.8			BFG425W		
Buffer & VCO	900	3 - 20	3 - 10	6	14	2.1			BFR92A	BFR92AW			
	900	5 - 30	3 - 10	6	13	1.9			BFR93A	BFR93AW			
	900 & 1900	2 - 5	3 - 12	9	17	1.2	10	1.9	BFR505	BFS505	BFG505W	BFC505	BFM505
	900 & 1900	3 - 30	3 - 12	8	17	1.2	10	1.9	BFR520	BFS520	BFG520W	BFC520	BFM520
	900 & 1900	1 - 10	2 - 4.5	22	21	0.9	29	1.2			BFG410W		
	900 & 1900	3 - 25	2 - 4.5	22	20	0.8	28	1.2			BFG425W		
IF	40 - 100	3 - 20	3 - 12	1.2	20 dB gain at 100 MHz				BF547	BF547W			
	100 - 250	3 - 20	3 - 8	2.8	25 dB gain at 250 MHz				BFS17A	BFS17W			
	>250	3 - 20	3 - 10	5	25 dB gain at 500 MHz				BFR92A	BFR92AW			

**Note**

1. Typically the gain is 2 - 3 dB higher in SOT343 packages.

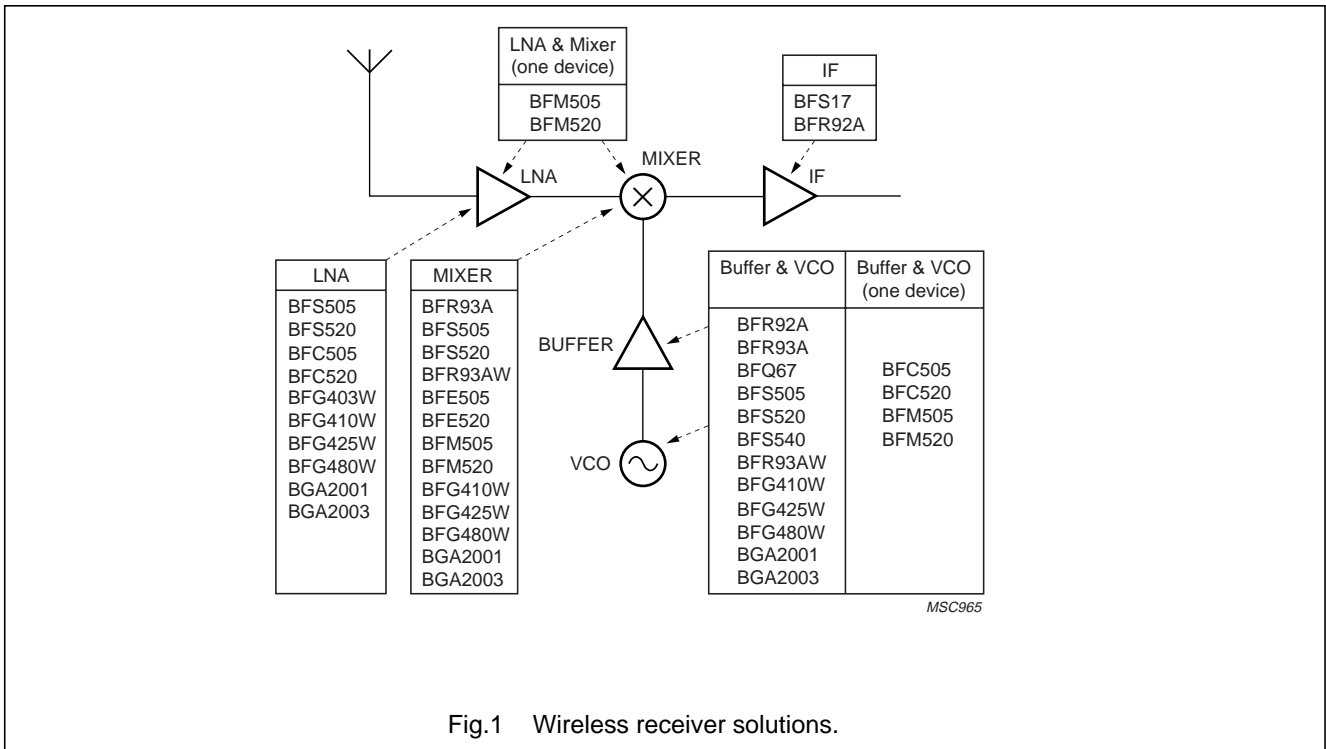


Fig.1 Wireless receiver solutions.

## PIN DIODES

TYPE	MAXIMUM RATINGS		CHARACTERISTICS						PACKAGE	CONFIG
	V <sub>r</sub> (V)	I <sub>f</sub> (mA)	R <sub>d</sub> I <sub>f</sub> = 0.5 mA f = 100 MHz (Ω)	R <sub>d</sub> I <sub>f</sub> = 10 mA f = 100 MHz (Ω)	C <sub>d</sub> V <sub>r</sub> = 0 V f = 1 MHz (pF)	C <sub>d</sub> V <sub>r</sub> = 5 V f = 1 MHz (pF)	C <sub>d</sub> V <sub>r</sub> = 20 V f = 1 MHz (pF)	I I <sub>f</sub> = 10 mA I <sub>r</sub> = 6 mA (μs)		
BAP50-03	50	50	25	3	0.45	0.3	0.25	1.04	SOD323	single
BAP50-04	50	50	25	3	0.45	0.3	0.25	1.04	SOT23	series
BAP50-05	50	50	25	3	0.45	0.3	0.25	1.04	SOT23	common cathode
BAP51-03	60	60	5.5	1.5	0.40	0.2	0.16	0.55	SOD323	single
BAP64-02	200	100	20	2	0.52	0.27	0.23	1.55	SOD523	single
BAP64-03	200	100	20	2	0.52	0.27	0.23	1.55	SOD323	single
BAP64-04	200	100	20	2	0.52	0.27	0.23	1.55	SOT23	series
BAP64-05	200	100	20	2	0.52	0.27	0.23	1.55	SOT23	common cathode

## FRONT-END MMICs

TYPE	REMARKS	V <sub>S</sub> (V)	I <sub>S</sub> (mA)	NF (dB)	GAIN (dB)	IP3 (dBm)	@ (GHz)	P <sub>1</sub> (dB)	ENABLE <sup>(1)</sup>	PACKAGE
BGA2001	amp	2.5	4	1.5	19 <sup>(2)</sup>		2	-		SOT 343R
BGA2003	amp	2.5	10	1.9	19 <sup>(2)</sup>	+5	2	-	x	SOT 343R
BGA2022 <sup>(3)</sup>	mixer (30 dB LO-RF isolation)	3	7	9	5 <sup>(4)</sup>	+5	0.8 to 1.9	-		SOT363
BGA2031	variable-gain (55 dB) amp	3	50	-	25 <sup>(5)</sup>	-48 <sup>(6)</sup>	1.9	12.5	x + control	SOT551

## Notes

1. On/off switch.
2. MSG.
3. Preliminary specification.
4. GC.
5. GP.
6. ACRP or DBc.

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## IF SYSTEMS

TYPE	V <sub>CC</sub> (V)	I <sub>CC</sub> (mA)	PINS	Pkg	INPUT FREQ. (GHz)	IF FREQ. (MHz)	f <sub>RF</sub> = 45 MHz		
							INPUT SENSITIVITY ( $\mu$ V)	MIXER GAIN (dB)	INPUT IP <sub>3</sub> (dBm)
<b>FM IF</b>									
SA604A	4.5 - 8	3.3 mA at 6 V	16	D	25	25	0.22 <sup>(1)</sup>	–	–
SA614A	4.5 - 8	3.3 mA at 6 V	16	D	25	25	0.22 <sup>(1)</sup>	–	–
SA624	4.5 - 8	3.4 mA at 6 V	16	D	25	25	0.22 <sup>(1)</sup>	–	–
<b>Mixer/FM IF</b>									
SA605	4.5 - 8	5.7 mA at 6 V	20	D,DK	500	25	0.22	13	–10
SA615	4.5 - 8	5.7 mA at 6 V	20	D,DK	500	25	0.22	13	–10
SA625	4.5 - 8	5.8 mA at 6 V	20	D,DK	500	25	0.22	13	–10
<b>Low-voltage mixer/FM IF</b>									
SA606	2.7 - 7	3.5 mA at 3 V	20	D,DK	150	2	0.31	17	–9
SA616	2.7 - 7	3.5 mA at 3 V	20	D,DK	150	2	0.31	17	–9
SA676	2.7 - 5.5	3.5 mA at 3 V	20	D,DK	100	2	0.45	17	–10
SA608	2.7 - 7	3.5 mA at 3 V	20	D,DK	150	2	0.31	17	–9
SA626	2.7 - 5.5	6.5 mA at 3 V	20	D,DK	500	25	0.54 <sup>(2)</sup>	11 <sup>(2)</sup>	–16 <sup>(2)</sup>
SA636	2.7 - 5.5	6.5 mA at 3 V	20	D,DK	500	25	0.54 <sup>(2)</sup>	11 <sup>(2)</sup>	–16 <sup>(2)</sup>
SA639	2.7 - 5.5	8.5 mA at 3 V	24	DH	500	25	2.24 <sup>(3)</sup>	12 <sup>(3)</sup>	–12.5 <sup>(4)</sup>
<b>Low Voltage mixer/Digital IF</b>									
SA647	2.7 - 5.5	5.9 at 3 V	20	DK	200	2	–112 dBm	–	–28
SA1630	2.7 - 5.5	Tx: 26.5; Rx: 33.5 at 3 V	48	BE	400	–	–	–	–
SA1638	2.7 - 5.5	Tx: 22; Rx: 18 at 3 V	48	BE	400	–	–	–	–



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RSSI RANGE (dB)	FAST RSSI	FREQ. CHECK PIN	IF FILTER MATCH (kHz)	OUTPUT OP AMPS	FEATURES
<b>FM IF</b>					
90	–	–	455	–	High Sensitivity
80	–	–	455	–	Wide IF BW
90	x	–	455	–	
<b>Mixer/FM IF</b>					
90	–	–	455	–	High Sensitivity
80	–	–	455	–	High Input Frequency
90	x	–	455	–	
<b>Low-voltage mixer/FM IF</b>					
90	–	–	455	Audio op amp RSSI op amp	High Sensitivity
80	–	–	455	Audio op amp RSSI op amp	Low Power
70	–	–	455	Audio op amp RSSI op amp	Audio op amp RSSI buffered
90	–	x	455	Audio Buffered RSSI op amp	Power-down mode (SA626/636/639)
90	x	–	10700	Audio Buffered RSSI op amp	
90	x	–	10700	RSSI op amp	
90	x	–	10700	Audio buffered RSSI op amp Post-detect amp Data switch	
<b>Low Voltage mixer/Digital IF</b>					
90	x	–	455	RSSI op amp	
90	x	–	455	RSSI op amp	
–	–	–	–	–	Wireless LAN using DSSS modulation; digital IF gain control of 70 dB in steps of 2 dB
–	–	–	–	–	GSM 900 MHz, DCS 1.8 GHz, quadrature up & down mixer stage

**Notes**

1. Measured with a Philips MESA602A mixer prior to the IF input.
2. Measured at  $f_{RF} = 240$  MHz.
3. Measured at  $f_{RF} = 110$  MHz.
4. Represents the  $-3$  dB input limiting point (dBm), Also shown in  $\mu$ V units into a  $50 \Omega$  matching network.

**Temperature range**SA types:  $-40$  to  $+85$  °C.**Package description**

D: small outline.  
 DK: shrink small outline package (SSOP).  
 BE: low quad flat package (LQFP).

**IF filter match**

455 kHz =  $1.5k \Omega$ .  
 10.7 MHz =  $330 \Omega$ .

## SYNTHESIZERS/PRESCALERS

TYPE	V <sub>CC</sub> (V)	I <sub>CC</sub> (mA)	PINS	PACKAGE	MAX RF/INPUT FREQ.	CHANNEL SPACING (GHz)	FRACTIONAL-N DIVIDER (kHz)	AUXILIARY SYNTHE- SIZER	APPLICATIONS
<b>Fractional-N frequency synthesizers</b>									
SA7016DH (new)	2.7 - 5.5	6.2 at 3 V	16	TSSOP16	1.3	–	x	–	IS-54/-136, IS-95, PDC, GSM digital cellular
SA7025DK	2.7 - 5.5	7.5 at 3 V	20	SSOP20	1.0 (main) 0.150 (aux)	–	x	x	IS-54/-136, IS-95, PDC, GSM digital cellular
SA7026DH (new)	2.7 - 5.5	7.5 at 3 V	20	TSSOP20	1.3 (main) 0.550 (aux)	–	x	x	IS-54/-136, IS-95, PDC, GSM digital cellular
SA8016DH (new)	2.7 - 5.5	8 at 3 V	16	TSSOP16	2.5	–	x	–	ISM-band, IS-54/-136, IS-95, PDC, GSM digital cellular
SA8025ADK	2.7 - 5.5	11 at 3 V	20	SSOP20	1.8 (main) 0.150 (aux)	–	x	x	PHS digital cordless, US PCS, PDC digital cellular
SA8026DH (new)	2.7 - 5.5	10 at 3 V	20	TSSOP20	2.5 (main) 0.550 (aux)	–	x	x	ISM-band, IS-54/-136, IS-95, PDC, GSM digital cellular
<b>Frequency synthesizers</b>									
UMA1015AM	2.7 - 5.5	at 3 V	20	SSOP20	1.1	5 - 1000	–	x (dual)	AMPS, CT1, CT2, TACS
UMA1021M	2.7 - 5.5	at 5.5 V	20	SSOP20	2.200	10 - 2000	–	–	GSM, DCS, PCS, DECT, PHS, WLL, WLAN
UMA1021AM	2.7 - 5.5	at 5.5 V	16	SSOP16	2.200	10 - 2000	–	–	GSM, DCS, PCS, DECT, PHS, WLL, WLAN
UMA1022M	2.7 - 5.5	at 5.5 V	20	SSOP20	2.100 (main) 0.550 (aux)	10 - 2000	–	x	GSM, DCS, DECT, PHS, WLL, WLAN
<b>Prescalers</b>									
	V <sub>CC</sub> (V)	I <sub>CC</sub> (mA)	Pins	Package	Max input frequency	Max. compare freq. (kHz)	Input sensitivity (dBm)	Divide ratio	
SA701D	2.7 - 6	4.5 at 3 V	8	SO8	1.1	65/270	–35	128/129, 64/65	
SA702D	2.7 - 6	4.5 at 3 V	8	SO8	1.1	1000	–35	64/66/72	

## TRANSMITTER ICs

TYPE	FREQUENCY RANGE: OUTPUT (MHz)	FREQUENCY RANGE: SYNTHESIZER (MHz)	SUPPLY VOLTAGE (V)	I <sub>CC</sub> AT FULL POWER (mA)	DIFFERENTIAL OUTPUT (dBm)	TRANSMIT OFFSET FREQ. (MHz)	PACKAGE	FEATURES
<b>Cellular</b>								
SA900	820 - 860 (AMPS) 820 - 920 (cellular)	N/A	4.5 - 5.1	42 (AMPS) 68 (dual)	2	90 - 140	LQFP48	I/Q transmit RF modulator with on-chip crystal osc. and VCO
SA9025	824 - 849 (cellular) 1840 - 1920 (PCS) with ext. up-conv.	500 - 2500	3.6 - 3.9	115 (analog) 125 (digital)	10	90 - 180	LQFP48	Highly integrated I/Q transmit RF-modulator with 2.5 GHz dual synth. for 800 & 1900 triple-mode TDMA

## MMICS AMPLIFIERS

TYPE NUMBER	FREQUENCY BAND (GHz)	SUPPLY VOLTAGE (V)	LOAD POWER (W)	OUTPUT POWER (dBm)	MIN. POWER GAIN (dB)	EFFICIENCY (%)	PACKAGE	FEATURES
<b>Cellular</b>								
CGY2021G	1.71 - 1.785 1.85 - 1.91	4.8	3.2	34	34	55	LQFP48	GaAs MMIC, 2W DCS/PCS power amplifier
CGY2013	0.880 - 0.915	3.6	3.5	34.5	34	50	LQFP48	GaAs MMIC, GSM 4W power amplifier
SA910	0.820 - 0.905	2.7 - 5.5	0.5	24	32	35	SSOP20	BiCMOS low-voltage, 900 MHz variable gain pre-amplifier
<b>Cordless</b>								
CGY2030M	1.88 - 1.90	3.6	0.5	27	27	40	SSOP16	GaAs MMIC 500 mW amplifier
CGY2032TS	1.88 - 1.90	3.6	0.5	27	27	50	SSOP16	GaAs MMIC 500 mW amplifier
<b>WLAN (ISM band)</b>								
SA2410	2.4 - 2.5	3.0 - 5.5		18.5	29	25	TQFP32	2.5 GHz power amplifier and T/R switch for WLAN (ISM-band)

## POWER AMPLIFIER MODULES

TYPE NUMBER	FREQUENCY BAND (MHz)	SUPPLY VOLTAGE (V)	MIN. LOAD POWER (W)	DRIVE POWER (mW)	MIN. POWER GAIN (dB)	EFFICIENCY MIN./TYP. (%)	PACKAGE	PACKAGE THICKNESS (mm)
<b>Digital cellular-GSM</b>								
BGY241	880 - 915	3.5	3	1	35	45 (min.)	SOT482B	2
<b>Digital cellular-DCS</b>								
BGY212A <sup>(1)</sup>	1710 - 1785	3.5	2.4 (typ.)	10	33	45 (min.)	SOT482B	1.6
BGY212B <sup>(2)</sup>	1850 - 1910	3.5	2.4 (typ.)	10	33	45 (min.)	SOT482B	1.6
<b>Dual band digital cellular (GSM900/DCS1800)</b>								
BGY280 <sup>(2)</sup>	880 - 915	3.5	4	10	35.5	50	SOT559	1.6
	1710 - 1785	3.5	3	10	33	45	SOT559	1.6

**Notes**

1. Preliminary specification.
2. Objective specification.

## POWER TRANSISTORS

TYPE NUMBER	FREQUENCY (GHz)	SUPPLY VOLTAGE (V)	LOAD POWER (W)	MIN. POWER GAIN (dB)	EFFICIENCY MIN./TYP. (%)	THERMAL RESISTANCE (K/W) <sup>(1)</sup>	PACKAGE
<b>Analog cellular</b>							
BLT80	900	7.5	0.8	6	60/67	22 <sup>(2)</sup>	SOT223
BLT81	900	7.5 6.0	1.2	6 6.5 (typ.)	60/70 70	32 <sup>(3)</sup>	SOT223
BLT70	900	4.8	0.6	6	60	55 <sup>(4)</sup>	SOT223
BLT71	900	4.8	1.2	6	60	24 <sup>(5)</sup>	SOT223
BLT71/8	900	4.8	1.2	11	55/63	40 <sup>(6)</sup>	SOT96
<b>Digital cellular/cordless</b>							
BFG21W	1900	3.6	0.4	11	50		SOT343
BFG540W	900	6	18 dBm	18			SOT343
BFG540W	1900	3.6	14 dBm	11			SOT343
BFG10W/x	900	6	28 dBm	10			SOT343
BFG10W/x	1900	3.6	20 dBm	6			SOT343
BFG11W/x	1900	3.6	26 dBm	6			SOT343

## Recommended line-ups

Application	Supply voltage (V)	Load power (W)	1st stage	2nd stage	3rd stage
Analog	6.0	1.2	BFG540W/x	BLT80	BLT81
	4.8	1.2	BFG540W/x	BLT70	BLT71
	4.8	1.2	BFG10W/x	BLT71/8	
DECT, PHS	3.6	0.4	BFG540/x BFG540W/x BFG425W	BFG10/x BFG10W/x BFG21W	BFG11/x BFG11W/x

## Notes

- Junction to soldering joint.
- $P_{tot} = 2W$ ,  $T_s = 131\text{ °C}$ .
- $P_{tot} = 2W$ ,  $T_s = 60\text{ °C}$ .
- $P_{tot} = 2.1W$ ,  $T_s = 60\text{ °C}$ .
- $P_{tot} = 3.5W$ ,  $T_s = 90\text{ °C}$ .
- $P_{tot} = 2.9W$ ,  $T_s = 60\text{ °C}$ .

## BASEBAND PROCESSORS

TYPE	PART TYPE	APPLICATION	V <sub>DD</sub> (V)	I <sub>DD</sub> (mA)	PACKAGE
PCF50731	baseband & audio interface	GSM/DCS/PCS	1.5 - 3.0	--	LQFP64
P90CL301	16-bit low voltage microcontroller	digital cellular	2.7 - 3.6	--	LQFP80
PCF5077	power amplifier controller	digital cellular	2.7 - 5.5	--	SSOP16
PCF5078	power amplifier controller	digital cellular	2.4 - 5.5	--	TSSOP8
SFZ2003	baseband processor with PMU	AMPS	2.7 - 3.3	10 typ. 0.7 (down mode)	LQFP128
SFZ2002	8-bit low-voltage microcontroller	AMPS	2.7 - 3.3	0.22mA/MHz active; 83 $\mu$ A/MHz idle	LQFP80
PCD509XY	baseband processor, ABC-pro	DECT, ISDN	1.8 - 3.6	--	LQFP80
PCD5096	universal codec	DECT, ISDN	2.7 - 3.6	--	QFP44
P8XCL883/4/6/7	TELX microcontroller	CT0/900 MHz	2.7 - 3.6	--	SO28
PCF5001	POCSAG decoder	Paging	1.5 - 6.0	60 $\mu$ A typ.	SO28L, LQFP32
PCD5002A	APOC1/POCSAG decoder	Paging	1.5 - 6.0	25 $\mu$ A typ. (OFF); 50 $\mu$ A typ. (ON)	LQFP32
PCD5003A	advanced POCSAG paging decoder	Paging	1.5 - 6.0	25 $\mu$ A typ. (OFF); 50 $\mu$ A typ. (ON)	LQFP32
PCA5007	pager baseband controller for all signal standards	Paging	0.9 - 1.6	50 $\mu$ A typ. (stby); 200 $\mu$ A typ. (operating)	LQFP48
PCD5008	FLEX decoder	Paging	1.8 - 3.3	6.8 $\mu$ A typ.	LQFP32
PCD5013	FLEX decoder with roaming capability	Paging	1.8 - 3.3	6.5 $\mu$ A typ.	LQFP32
PCA5010	pager baseband controller for all signal standards	Paging	0.9 - 1.6	50 $\mu$ A typ. (stby); 200 $\mu$ A typ. (operating)	LQFP48

## CALLER IDENTIFICATION

TYPE	DTMF-STANDARD	FSK-STANDARD	OPERATING VOLTAGE (V)	SPECIAL FEATURES	PACKAGE	MAX. SPEED (MHz)	CATEGORY
PCD3316	no	yes	2.5 - 3.6	Caller-ID decoder (level 2)	SO16L	3.58	CIDCW
PCD6002	see Table "DSP-based solutions for cordless"						

## DSP-BASED SOLUTIONS FOR CORDLESS

TYPE	DESCRIPTIONS	FEATURES/SPECIFICATIONS	PACKAGE	AM	TAM	MULTI-LINE TAM
<b>Digital telephone answering machine (DTAM) and Universal Codec</b>						
PCD6002	DTAM production IC	80CL51 microcontroller, DSP, dual codecs, 32 kb microcontroller memory, caller-ID, full duplex speakerphone, IOM-2 bus interface	QFP80	x	x	x
PCD5096	Universal Codec	Dual codecs, IOM-2 bus interface. Direct connection to PCD6002.	QFP44	-	-	x

TYPE	DESCRIPTIONS	TYP. $V_{LN}$ AT 15 mA (V)	PARALLEL OPERATION	TYP. $I_{CC}$ (mA)	PD <sup>(1)</sup>	$G_{V(TX)}$ (dB)	$G_{V(RX)}$ (dB)	LOUD-SPEAKER AMP.	TYP. $\Delta G_{V(AGC)}$ (dB)	PACKAGE	AM	TAM	MULTI-LINE TAM
<b>Programmable speech/transmission circuit</b>													
PCA1070	fully programmable line interface	4.83 (at 12 mA)	x	2.3	x	30 - 51	-25 - 11	-	via software	DIP24, SO24	x	x	x
<b>Line-interface ICs with improved EMC performance</b>													
TEA1097	see Table "Line-interface ICs for cordless base stations"										-	x	x
UBA1707											x	-	-

**Note**

1. PD = Power Down input; AM = Stand-alone Answering Machine; TAM = Telephone/Answering Machine.

## LINE-INTERFACE ICS FOR CORDLESS BASE STATIONS

TYPE	DETAILS	SUPPLY VOLTAGE (V)	LINE-POWERED	CURRENT CONSUMPTION (mA)	PD <sup>(1)</sup>	LOUD-SPEAKER AMPLIFIER	Rx <sub>OUT</sub> <sup>(2)</sup>	HANDS-FREE	CORDED HANDSET	PACKAGE
TEA1097	Speech and loudspeaker amplifier IC with auxiliary I/Os & switches	3.0 to 5.3 <sup>(3)</sup> ; 3.0 to 6.0 <sup>(4)</sup>	x	3.5 <sup>(5)</sup> ; 5.5 <sup>(6)</sup>	x	x	SEL	–	x	VSO40 QFP44
TEA1099	Speech and hands-free IC with auxiliary I/Os & switches	3.0 to 5.3 <sup>(3)</sup> ; 3.0 to 6.0 <sup>(4)</sup>	x	4.0 <sup>(5)</sup> ; 6.0 <sup>(6)</sup>	x	x	SEL	x	x	QFP44
UBA1706	Programmable line-interface IC with electronic hook switch	3.0 to 5.5	–	2.2	x	–		–	–	SSOP24
UBA1707	UBA1706 with loudspeaker and microphone amplifiers	3.0 to 5.5	–	2.2	x	x	SEL	–	–	SO28, SSOP28

**Notes**

1. Power Down input.
2. SEL = Single-Ended load.
3. Line-powered.
4. Mains-powered.
5. In speech mode.
6. In hands-free mode.



FUNCTION	PRODUCT OVERVIEW
LNAs	CGY2105/2106
Switches (synthesizers/gain)	SWT0102
Synthesizers/VCOs	UMA1021, SA8016
IF amplifiers	SA5209
AD/DA converters	TDA8768, TDA9901
Gain-controlled amplifiers	SA5209, TDA9901
Modulators/upconverters	MOD1327
PA drivers	Double Polysilicon MMIC, CGY series
PA controllers	PCF5075
PA transistors/modules	LDMOS BLF, BGY, BLV families
Circulators/isolators	Complete range for cellular and paging

**LDMOS POWER TRANSISTORS FOR BASE STATIONS**

TYPE	FREQUENCY (MHz)	V <sub>DS</sub> (V)	PL (PED) (W)	MIN. G <sub>P</sub> (dB)	MIN. EFFICIENCY (%)	IMD3 (dBc)
BLF1043	960	26	10	16	35	≤30
BLF1046	960	26	45	13	35	≤28
BLF1047	960	26	70	13	35	≤28
BLF1048	960	26	90	13	35	≤28
BLF2043	2000	26	10	13	30	≤30
BLF2045	2000	26	30	10	30	≤30
BLF2047	2000	26	70	10	30	≤30
BLF2048	2000	26	140	10	30	≤30

## RF POWER TRANSISTORS AND AMPLIFIERS FOR BASE STATIONS

TYPE	CLASS AB LOAD POWER $V_{CE} = 26\text{ V}$ (W)	CLASS AB POWER GAIN AT GIVEN $V_{CE}$ (dB)	INPUT POWER AT GIVEN $V_{CE}$ (W)	CLASS AB EFFICIENCY (CW) (%)	THERMAL RESISTANCE (j – mb) (K/W)	PACKAGE
<b>900 - 960 MHz bipolar RF power transistors</b>						
BLV904	5	12	0.3	>50	14.6 (j – h)	SOT409
BLV909	9	12	0.6	57	5.85	SOT409
BLV910	10	>11	0.8	>55	5.85	SOT171
BLV920	20	>10	2.0	>55	3.5	SOT171
BLV934	30	>9	3.8	>55	2.57	SOT171
BLV946	40	11	3.2	60	1.894	SOT273
BLV958	75	9.5	8.4	55	1.21	SOT391
BLV950	150	9	18.9	50	0.52	SOT262
<b>1800 - 2000 MHz bipolar RF power transistors</b>						
BLV2042	4	12	0.25	45	14.6 (j – h)	SOT409B
BLV2044	15	8	2.4	45	3.5	SOT437A
BLV2045N	35	9.5	3.9	43	1.4	SOT390A
BLV2046	50	≥7.5	8.9	≥40	0.9	SOT460A
BLV2047	60	≥8.5	8.5	≥40	0.73	SOT468A
BLV2048	120	>8	19.0	>40	0.35	SOT494A

TYPE	LOAD POWER $V_S = 26\text{ V}$ (W)	POWER GAIN AT GIVEN $V_S$ (dB)	INPUT POWER AT GIVEN $V_S$ (mW)	EFFICIENCY (CW) (%)	LOAD IMPEDANCE ( $\Omega$ )	PACKAGE
<b>920 - 960 MHz RF base-station amplifier modulus</b>						
BGY916	16	>28	25	>35	50	SOT365
BGY925	25	>28	50	>35	50	SOT365
<b>1805 - 1881 MHz RF base station amplifier modulus</b>						
BGY1816	16	>24	63	>35	50	SOT365A
BGY1816S	16	>29	20	>35	50	SOT501A
<b>1930 - 1990 MHz RF base-station amplifier modulus</b>						
BGY1916	16	≥24	63	>33	50	SOT365A

**I<sup>2</sup>C-BUS I/O EXPANDERS FOR BASE STATIONS**

TYPE	FUNCTION	SUPPLY VOLTAGE (V)	STANDBY CURRENT ( $\mu$ A)	I <sup>2</sup> C-BUS (kHz)	INTERRUPT	CONFIGURATION	ADDRESS	POWER-ON RESET	PACKAGE
PCF8574	Remote 8 bit I/O expansion via I <sup>2</sup> C-bus	2.5 - 6.0	10	100	yes	slave	8 devices addressable	internal	DIP16, SO16 or SSOP20
PCF8575	Remote 16 bit I/O expansion via I <sup>2</sup> C-bus	2.5 - 5.5		400	yes	slave	8 devices addressable	internal	SSOP24
PCF8584	Parallel bus to I <sup>2</sup> C-bus protocol converter and interface	4.5 - 5.5	2.5	100	yes	master/slave	7-bit address register written in during initialisation	external	DIP20, SO20

**GSM/DCS/PCS ICs**

TYPE	FUNCTION
UAA2075	single-chip GSM transceiver
UAA3520	single-chip 3 V GSM transceiver
UAA3521	single-chip GSM closed-loop transceiver
UAA3522 & UAA2077	GSM dual band with UAA2077 Tx modulation loop
UAA3525	single-chip DCS/PCS transceiver
TDA8002/03	SIM card interface
TDA8004/05 TDA8006	SIM card interface
UBA8070/71	power management unit (PMU)
UBA8073	PMU with SIM card interface DC/DC converter
UMA1021M	low-voltage frequency synthesizer
BGY240S	power amplifier module
CGY2013	MMIC power amplifier
CGY2021	MMIC power amplifier
UBA1710	modulator for GaAs power amplifier
PCF5078	power amplifier controller for GSM
P90CL301	low-voltage microcontroller
PCF50731	GSM baseband and audio interface
PCF50862	GSM baseband controller
TEA1095	hands-free IC
SA8026/16; SA7026/16	low-voltage 2.5 and 1.3 GHz fractional-N dual and single synthesizers

**TDMA RF ICs**

TYPE	FUNCTION
SA3600	dual-band RF front-end, low-voltage
SA1920	dual-band RF front-end
SA9025	dual-band RF transmitter/modulator with fractional-N dual synthesizer
SA647	IF digital receiver, low-voltage
SA611/631	low-voltage LNA and mixer - 1 GHz
SA621	low-voltage LNA mixer and VCO
SA8026/16; SA7026/16	low-voltage 2.5 and 1.3 GHz fractional-N dual and single synthesizers
SA900	I/Q transmit modulator
UBA8070/71	power management unit (PMU)

## Semiconductors for Wireless Communications

## Selection guide

### CDMA ICs

TYPE	FUNCTION
SA9500	low-voltage dual-band down converter for CDMA/AMPS
SA9502	low-voltage dual-band down converter for CDMA/AMPS
SA8026/16; SA7026/16	low-voltage 2.5 and 1.3 GHz fractional-N dual and single synthesizers

### AMPS/(E)TACS ICs

TYPE	FUNCTION
SA611	low-voltage LNA and mixer - 1 GHz
SA616	low-voltage high-performance mixer FM IF system
SA621	low-voltage LNA mixer and VCO
SA910	pre-driver
UMA1015AM	low-power dual frequency synthesizer
SZF2003	low-voltage baseband processor with PMU and DTMF detection
SZF2002	8-bit low-voltage microcontroller with embedded RAM
UMA1002	low-voltage data processor (DPROC)
TDA7050	audio amplifier

### DECT ICs

TYPE	FUNCTION
UAA2067G	low-voltage 2 GHz RF transceiver
UAA2068G	PLL/VCO/doubler/modulator
UAA3540TS	fully integrated DECT receiver
UAA2078	Zero-IF front-end
UAA2079	Zero-IF filter/demodulator
SA639	low-voltage mixer FM IF system with filter amplifier and data switch
UMA1022M	low-voltage frequency synthesizer
CGY2032	low-voltage MMIC power amplifiers
PCD5091/2/3/4	single-chip baseband processor
PCD50912 PCD50917	ABC-Pro handset baseband controller
PCD50922 PCD50927	ABC-Pro base unit baseband controller
PCD50937	ABC-Pro baseband controller for ISDN base units
PCD5096	universal CODEC
TEA1097/99	featurephone ICs (base unit)
UBA1706/07	programmable speech/transmission ICs

## TELX MICROCONTROLLERS (80CL51 CORE-BASED, OPTIMIZED FOR TELECOM)

TYPE	ROM (kB)	RAM (B)	EEPROM (B)	I/O	OPERATING VOLTAGE (V)	SPECIAL FEATURES	PACKAGE	MAX.	CATEGORY SPEED (MHz)
P83CL881	63	2048		32	2.7 - 3.6	UART, 400 kbits/s I <sup>2</sup> C-bus, low-voltage detection	LQFP44	10 <sup>(1)</sup>	TELX
P87CL881	63 (OTP)	2048		32	2.7 - 3.6	OTP version of P83CL881	LQFP44	10 <sup>(1)</sup>	TELX
P83CL883	8	256		18	2.7 - 3.6	UART, MSK modem, 400 kbits/s I <sup>2</sup> C-bus, DTMF, low-voltage det., In-System programming	SO28	3.58 <sup>(1)(2)</sup>	TELX
P87CL883	8 (OTP)	256		18	2.7 - 3.6	OTP version of P83CL883	SO28	3.58 <sup>(1)(2)</sup>	TELX
P83CL884	8	256	128	18	2.7 - 3.6	Same as P83CL883 but with additional 256 bytes EEPROM	SO28	3.58 <sup>(1)(2)</sup>	TELX
P87CL884	8 (OTP)	256	128	18	2.7 - 3.6	OTP version of P83CL884	SO28	3.58 <sup>(1)(2)</sup>	TELX
P83CL886	16	512		18	2.7 - 3.6	Same as P83CL883 but larger program memory size	SO28	3.58 <sup>(1)(2)</sup>	TELX
P87CL886	16 (OTP)	512		18	2.7 - 3.6	OTP version of P83CL886	SO28	3.58 <sup>(1)(2)</sup>	TELX
P83CL887	12	512		18	2.7 - 3.6	Same as P83CL883 but larger program memory size	SO28	3.58 <sup>(1)(2)</sup>	TELX
P87CL887	12 (OTP)	512		18	2.7 - 3.6	OTP version of P83CL887	SO28	3.58 <sup>(1)(2)</sup>	TELX
PCD6002	32 (OTP)	768		34	2.7 - 3.6	DTAM chip includes $\mu$ C, DTMF, DSP and MSK modem,	QFP80	3.58	DTAM
PCD3316					2.5 - 3.6	CIDCW receiver	SO16L	3.58 M/ 32 k <sup>(3)</sup>	CID

**Notes**

1. TELX core is twice as fast as standard 80C51, i.e. 10 MHz clock corresponds to 20 MHz clock on standard 80C51 with same performance.
2. For DTMF.
3. 2 crystals are required: one for RTC, the other to be shared with the microcontroller for DTMF generation.

**CT0 ICs**

TYPE	FUNCTION
UAA206x	transceiver
TELX microcontroller	See Chapter "TELX microcontrollers (80CL51 core-based, optimized for telecom)"
PCD3316	See Chapter "Caller identification"
PCD6002	See Chapter "DSP-based solutions for cordless"
TEA1118A	Speech/transmission IC (base unit)
TEA1097/99	Featurephone ICs (base unit)
UBA1706/07	Programmable speech/transmission ICs (base unit)
TDA7052A/AT	1 W low-voltage audio power amp with DC volume control

**PAGING ICs**

TYPE	FUNCTION
UAA2080	Advanced pager receiver
UAA2082	Advanced pager receiver
PCD5003A	Advanced POCSAG paging decoder
PCD5002A	APOC1/POCSAG decoder
PCF5001	POCSAG paging decoder
P87CL881	Low-voltage microcontroller
PCD5013	FLEX™ decoder
PCA5007	Baseband decoder for all pager standards
PCA5010	Baseband decoder for all pager standards
UAA3500HL <sup>(1)</sup>	Pager receiver for all bands (130 to 930 MHz)

**Note**

1. Compatible with high- (FLEX™, ERMES) and low-speed standards; available Q3, 1999.

**WLAN ICs**

<b>TYPE</b>	<b>FUNCTION</b>
SA2410	GaAs power amplifier with transmit/receive switch
SA2420	2.4 GHz transceiver RF front-end
<b>DSSS</b>	
SA8016	Low-voltage 2.5 GHz fractional-N synthesizer with phase-detector comparison 5 - 8 x channel spacing
UMA1021M	Low-voltage conventional synthesizer with prescalers, programmable dividers and phase comparators
SA1630	70 to 400 MHz IF I/Q transceiver
<b>FDSS</b>	
SA8026	Dual low-voltage 2.5 GHz fractional-N synthesizer with phase-detector comparison 5 - 8 x channel spacing
UMA1022M	Dual low-voltage conventional synthesizer with prescalers, programmable dividers and phase comparators
SA639	Low-voltage mixer FM IF system with filter amplifier

**GPS ICs**

<b>TYPE</b>	<b>FUNCTION</b>
UAA1570	Low-voltage, double-conversion, spread-spectrum radio receiver
SAA1575	Baseband processor with embedded controller and GPS correlator



## DC/DC CONVERTER ICs

TYPE NUMB ER	TEA1204T		TEA1205AT		TEA1206T		TEA1207T		TEA1210TS	
	V <sub>in</sub>	V <sub>out</sub>	V <sub>in</sub>	V <sub>out</sub>	V <sub>in</sub>	V <sub>out</sub>	V <sub>in</sub>	V <sub>out</sub>	V <sub>in</sub>	V <sub>out</sub>
Up conversion (V)	2.0 to 4.3 2.0 to 3.0	5.0 3.3	2.0 to 4.3 2.0 to 3.0	5.5 3.3	1.6 to 5	2.8 to 5.5	1.6 to 5	2.8 to 5.5	1.6 to 5	2.8 to 5.5
Down conversion (V)	3.6 to 5.0 3.3 to 5.0	3.6 3.3	not applicable		2.8 to 5.5	1.25 to 5.5	2.8 to 5.5	1.25 to 5.5	2.8 to 5.5	1.25 to 5.5
Synchronisation (MHz)	not applicable		13		9 to 20		4 to 20		9 to 20	
Max. output power (W): continuous/pulsed	3.25/8		3.25/8		3.25/12		2.75/7		5.75/14	
Switches' resistance (Ω)	0.15		0.15		0.15		0.22		0.055	
Switch frequency (kHz)	200		200		560		275		590	
Quiescent current (μA)	60		60		75		65		75	
Package	SO8		SO8		SO8		SO8		SSOP16	

## INTELLIGENT FAST-CHARGE ICs

TYPE NUMBER	TEA1104(T)	TEA1100(T)	TEA1101(T)	TEA1103(T)	TEA1102(T)
Cell type	NiCd, NiMH	NiCd	NiCd, NiMH	NiCd, NiMH	NiCd, NiMH, SLA, Li-Ion
Fast charge termination	-dV: <3 mV/cell	-dV: <3 mV/cell	-dV: <3 mV/cell	-dV: <3 mV/cell, dT/dt	-dV: <3 mV/cell, dT/dt
Currentless sensing	yes	yes	yes	yes	yes
Charge profile	fast charge, pulsating trickle	fast charge, pulsating trickle	fast charge, pulsating trickle	fast, top-off, pulsating trickle	NiCd, NiMH: fast, top-off pulsating trickle SLA, Li-Ion: fast, fill-up
Charge current control	digital drive	analog drive, PWM drive, digital drive	analog drive, PWM drive, digital drive	analog drive, PWM drive, voltage regulation	analog drive, PWM drive, voltage regulation
Poss. fast charge rates	0.2 CA to 5 CA	0.2 CA to 5 CA	0.2 CA to 5 CA	0.2 CA to 5 CA	0.2 CA to 5 CA
Possible trickle charge rates	fast charge/40	CA/10 to CA/100	CA/10 to CA/100	0.15 CA (top-off) 0.03 CA (trickle)	0.15 CA (top-off) 0.03 CA (trickle)
Charge with load	no	no	no	yes	yes
Refresh	external circuitry	external circuitry	external circuitry	integrated (manually activated) regulated discharge current	integrated (manually activated) regulated discharge current
User interface	LEDs	LEDs	LEDs	LEDs, buzzer, supports charge gauge function	LEDs, buzzer, supports charge gauge function
Protection	open/short circuit, time-out, max. temp., min. temp.	open/short circuit, time-out, max. temp., min. temp.	open/short circuit, time-out, max. temp., min. temp.	open/short circuit, time-out, max. temp., min. temp.	open/short circuit, time-out, max. temp., min. temp.
Package options	DIL/SO8	DIL/SO16	DIL/SO16	DIL/SO/SSOP20	DIL/SO/SSOP20

**LITHIUM-ION CELL PROTECTION IC**

SAA1502A operating range (battery voltage)	3.6 to 4.3 V
Max. charge voltage	17.5 V
Integrated MOS transistors	60 mΩ
Power-down current	0.1 μA
Operating temp. range	-25 to +80 °C
Package	SSOP16
Battery disconnection on: over discharge, over-charge, over-current (charge & discharge), high temperatures	

**KEY TRANSISTORS FOR POWER MANAGEMENT**

TYPE	R <sub>DS(ON)</sub> (Ω)	at V <sub>GS</sub> (V)	V <sub>DS</sub> (V)	V <sub>T</sub> (V)	ID (A)	PACKAGE
<b>N-channel PowerMOS - small SMD</b>						
BHS110	0.017	2.5	20	>1.0	tbf	TSSOP8
BHS109	0.04	2.5	20	>1.0	tbf	TSOP6/SC74 (SOT457)
BHS108	0.085	2.5	20	>1.0	tbf	SOT23
BHS107	0.09	2.5	20	>0.4	2.50	TSOP6/SC74 (SOT457)
BHS106	0.25	2.5	20	>0.4	1.43	SOT363/SC88
BHS105	0.25	2.5	20	>0.4	1.21	SOT23
BHS103	0.50	2.5	30	>0.4	0.86	SOT23
BHS102	0.40	10	30	>1.0	0.86	SOT23
BHS101	0.60	10	60	>1.0	0.70	SOT23
2N7002	4.0	10	60	>0.8	0.18	SOT23
<b>N-channel PowerMOS - small SMD, dual channel</b>						
BSH301	0.04	2.5	20	>0.4	5.0	TSSOP8
BSH302	0.2	2.5	20	>0.4	tbf	TSOP6/SC74 (SOT457)
BSH303	4	10	60	>1.0	tbf	TSOP6/SC74 (SOT457)
<b>P-channel PowerMOS - Small SMD</b>						
BSH209	0.04	2.5	12	>0.4	tbf	TSSOP8
BSH207	0.15	2.5	12	>0.4	1.98	TSOP6/SC74 (SOT457)
BSH208	0.175	2.5	12	>0.4	tbf	SOT23
BSH205	0.5	2.5	12	>0.4	0.86	SOT23
BSH206	0.5	2.5	12	>0.4	1.01	SOT363/SC88
BSH203	1.1	2.5	30	>0.4	0.57	SOT23
BSH202	0.9	10	30	>1.0	0.57	SOT23
BSH201	2.5	10	60	>1.0	0.34	SOT23
BSS84	10	10	50	>0.8	0.13	SOT23
<b>P-channel PowerMOS - Small SMD, dual channel</b>						
BSH402	0.5	2.5	12	>0.4	tbf	TSOP6/SC74 (SOT457)
BSH403	0.01	10	50	>0.8	tbf	TSOP6/SC74 (SOT457)

Semiconductors for Wireless  
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## Selection guide

TYPE	$R_{DS(ON)}$ ( $\Omega$ )	at $V_{GS}$ (V)	$V_{DS}$ (V)	$V_T$ (V)	ID (A)	PACKAGE
<b>N-channel PowerMOS - larger SMD</b>						
PHN1011	0.011	10	25	>1.0	11.0	SO8
PHN1013	0.0135	10	30	>1.0	10.0	SO8
PHN1015	0.014	10	25	>1.0	9.0	SO8
PHN1018	0.016	10	25	>1.0	8.7	SO8
PHN103	0.03	10	30	>1.0	8.5	SO8
<b>N-channel PowerMOS - larger SMD, dual channel</b>						
PHN203	0.03	10	25	>1.0	8.28	SO8
PHN205	0.05	10	30	>1.0	6.4	SO8
PHN210	0.1	10	30	>1.0	3.5	SO8
<b>P-channel PowerMos - larger SMD</b>						
PHP1025	0.025	2.5	12	>0.4	tbf	SO8
PHP1035	0.035	10	25	>1.0	8.0	SO8
PHP109	0.09	10	30	>1.0	5.0	SO8
<b>P-channel PowerMOS - larger SMD, dual channel</b>						
PHP222	0.22	2.5	30	>0.4	1.93	SO8
PHP206	0.06	10	25	>1.0	5.6	SO8
PHP212	0.12	10	30	>1.0	4.0	SO8
PHP225	0.25	10	30	>1.0	2.3	SO8
<b>N/P-channel PowerMOS - complementary pairs</b>						
PHC20306	0.03/0.06	10	25	>1.0	8.2	SO8
PHC20512	0.05/0.12	10	30	>1.0	6.4	SO8
PHC21025	0.1/0.25	10	30	>1.0	3.5	SO8
<b>N-channel PowerMOS with Schottky diode</b>						
PHN103S	0.03	10	25	>1.0	6.0	SO8

## OVERVIEW OF LCD GRAPHIC AND CHARACTER DRIVERS

TYPE	ROWS	COL	MATRIX SIZE (LINES × CHARS OR MATRIX SIZE)	LOGIC VOLTAGE RANGE (V)	LCD VOLTAGE V <sub>OP(MAX)</sub> (V)	ON-CHIP BIAS GEN.	ON-CHIP VOLTAGE MULTIPLIER	INTERFACE	TEMP. COMP.	PACKAGES	XTAL/ BUMPS
<b>Character drivers</b>											
PCF2116	16, 32	60	1 or 2 lines by 24 or 4 lines by 12	2.5 - 6.0	9	x	x	I <sup>2</sup> C-bus and parallel 4/8bit		LQFP128	x/x
PCF2104	16, 32	60	1 or 2 lines by 24 or 4 lines by 12	2.5 - 6.0	9	x		I <sup>2</sup> C-bus and parallel 4/8bit			x/x
PCF2105	16, 32	60	1 or 2 lines by 24 or 4 lines by 12	2.5 - 6.0	9	x		400 kbits/s I <sup>2</sup> C-bus and parallel 4/8bit			x/x
PCF2113	18	60	2 lines by 12 + icons or 1 line by 24 + icons	1.8 - 5.5	6.5	x	x	400 kbits/s I <sup>2</sup> C-bus and parallel 4/8bit	x	LQFP100	x/x
PCF2103	18	60	2 lines by 12 + icons or 1 line by 24 + icons	1.8 - 5.5	6.5	x		400 kbits/s I <sup>2</sup> C-bus and parallel 4/8bit			x/x
PCF2119 slim chip	9, 18	80	1 line by 32 or 2 lines by 16 + icons	1.5 - 4.0	6.5	x	x	400 kbits/s I <sup>2</sup> C-bus and parallel 4/8bit	x		-/x
<b>Graphic drivers</b>											
PCF8531 <sup>(1)</sup>	33	128	33 × 128	1.5 - 5.5	9	x	x		x	tray	/x
PCF8548 <sup>(1)</sup>	65	102	65 × 102	1.5 - 5.5	9	x	x		x	tray	/x
PCF8558 slim chip	40	101	40 × 101	2.5 - 6.0	9	x		400 kbits/s I <sup>2</sup> C-bus			/x
PCF8578	8, 16, 24, 32	32, 24, 16, 8	any	2.5 - 6.0	9			I <sup>2</sup> C-bus		VSO56, LQFP64	x/x
PCF8579		40	any	2.5 - 6.0	9			I <sup>2</sup> C-bus		VSO56, LQFP64	x/x
OM6202	65	102	65 × 102	2.5 - 3.3	16	x	x	parallel	x	TCP	/x
PCF8549	65	102	65 × 102	1.5 - 6.0	16	x	x	400 kbits/s; I <sup>2</sup> C-bus	x	tray	/x
OM6204	65	102	65 × 102	1.5 - 6.0	16	x	x	400 kbits/s; I <sup>2</sup> C-bus	x	TCP	/x

**Note**

1. New.

## OVERVIEW OF LCD SEGMENT DRIVERS

TYPE	SEGMENTS AT MULTIPLEX RATE						LOGIC VOLTAGE RANGE (V)	LCD VOLTAGE $V_{OP(MAX)}$ (V)	ON-CHIP BIAS VOLTAGE GENERATOR	INTERFACE	SPECIAL FEATURES	PACKAGES	XTAL/BUMPS
	1 : 1	1 : 2	1 : 3	1 : 4	1 : 8	1 : 16							
PCF8566 (OM4085 <sup>(1)</sup> )	24	48	72	96			2.5 - 6.0	6.0	x	I <sup>2</sup> C-bus	cascadable with PCF8566/76(C)	DIL40, VSO40	/x
PCF8576 PCF8576C	40	80	120	160			2.5 - 9.0 2.5 - 6.0	9.0 6.0	x	I <sup>2</sup> C-bus	cascadable with PCF8566/76(C)	VSO56, LQFP64	x/x
PCF8578					256	384	2.5 - 6.0	9.0		I <sup>2</sup> C-bus	easy blinking, scratch pad RAM	VSO56, LQFP64	x/x
OM4068	32	64	96				2.5 - 5.5	6.5		2 MHz serial	cascadable	QFP44, DIP40	x/
PCF8533 <sup>(2)</sup> slim chip	80	160	240	320			2.5 - 5.5	6.5	x	400 Kbits/s I <sup>2</sup> C-bus	cascadable up to 5120		/x

**Notes**

1.  $V_{DD} = 2.00$  V.
2. New.

## OVERVIEW OF REAL-TIME CLOCK ICs

TYPE	I <sup>2</sup> C	1/100 <sup>th</sup> SEC & SEC TIMING	M:h, D:m	YRS/ LEAP YRS	PROG. ALARM	PROG. TIMER	SUPPLY VOLTAGE I <sup>2</sup> C-BUS (V)	SUPPLY VOLTAGE CLOCK (V)	TYP. POWER CONSUMPTION (STANDBY)	PACKAGE
PCF8573	x		x		x		2.5 - 6.0	1.1 - 6.0	3 $\mu$ A at 1.5 V	DIL16, SO16
PCF8583	x	x	x	x	x	x	2.5 - 6.0	1.1 - 6.0	2 $\mu$ A at 1.0 V	DIL8, SO8L
PCF8593	x	x	x	x	x	x	2.5 - 6.0	1.1 - 6.0	1 $\mu$ A at 2.0 V	DIL8, SO8L
PCF8563 <sup>(1)</sup>	x		x	x	x	x	1.8 - 5.5	1.0 - 5.5	0.25 $\mu$ A at 1 V	DIL8, SO8, TSSOP8

**Note**

1. New - samples available.

TYPE	INTERRUPT OUTPUT	SCRATCHPAD RAM (1 V RET)	POWER FAIL DETECTOR	EVENT COUNTER MODE	POWER-ON RESET (V)	SUPPLY VOLTAGE I <sup>2</sup> C-BUS (V)	SUPPLY VOLTAGE CLOCK (V)	TYP. POWER CONSUMPTION (STANDBY)	PACKAGE
PCF8573			x		x	2.5 - 6.0	1.1 - 6.0	3 $\mu$ A at 1.5 V	DIL16, SO16
PCF8583	x	248 bytes		x	x	2.5 - 6.0	1.1 - 6.0	2 $\mu$ A at 1.0 V	DIL8, SO8L
PCF8593	x			x	ext.	2.5 - 6.0	1.1 - 6.0	1 $\mu$ A at 2.0 V	DIL8, SO8L
PCF8563 <sup>(1)</sup>	x		x		x	1.8 - 5.5	1.0 - 5.5	0.25 $\mu$ A at 1 V	DIL8, SO8, TSSOP8

**Note**

1. New - samples available.

## DIODES FOR WIRELESS TELEPHONY

SPECIFICATION	DESCRIP-TION	TYPE RANGE - SORTED BY PACKAGE TYPE									
		SOT23	SOD80	SC59/ SOT346	SC70/ SOT323	SC74/ SOT457	SC75/ SOT416	SC76/ SOD323	SC79/ SOD523	SC88/ SOT490	SC89/ SOT490
<b>Zener diodes</b>											
P <sub>ZSM</sub> max. 40 W P <sub>tot</sub> max. 250 - 400 mW	Zener diode	BZX84 PMBZ series	BZV55	PZM-N series				PDZ-B series			
V <sub>z</sub> max 5.6 V	ESD protection array					BZA456A					
V <sub>z</sub> max. 6.2 V	ESD protection array					BZA462A					

SPECIFICATION	DESCRIP- TION	TYPE RANGE - SORTED BY PACKAGE TYPE									
		SOT23	SOD80	SC59/ SOT346	SC70/ SOT323	SC74/ SOT457	SC75/ SOT416	SC76/ SOD323	SC79/ SOD523	SC88/ SOT490	SC89/ SOT490
V <sub>z</sub> max. 6 - 8 V	ESD protection array					BZA408B					
V <sub>z</sub> max. 20 V	ESD protection array					BZA420A					
<b>Schottky diodes</b>											
25 V, 1000 mA	medium power					1PS74SB23					
30 V, 200 mA	small signal	BAT54						1PS76SB10	1PS79SB10		1PS89SB14 1PS89SB15 1PS89SB16
40 V, 120 mA	small signal	BAS40					1PS75SB45	1PS76SB40		1PS88SB45	
40 V, 200 mA	small signal	BAT721		1PS59SB21				1PS76SB21			
40 V, 500 mA	small signal	BAT720		1PS59SB20							
40 V, 1000 mA	medium power		PRLL5819								
70 V, 70 mA	small signal	BAS70						1PS76SB70	1PS79SB70		
<b>Switching diodes</b>											
200 - 215 mA, 70 - 80 V	high speed switching	BAS16	BAS32L	1PS193	BAS16W		BAS16T	BAS316	BAS516		
	series connected	BAV99		1PS226	BAV99W BAV199 W1PS302						
	common cathode (BAV756S is CA/CC)	BAV70		1PS184	BAV70W 1PS301		BAV70T			BAV70S BAV756S	
	common anode	BAW56		1PS181	BAW56 1PS300		BAW56T			BAW56S	



## LOW-FREQUENCY SMALL-SIGNAL TRANSISTORS FOR WIRELESS TELEPHONY

MAX. $V_{CE0}$ & $I_C$	POL.	POLARITY TYPE RANGE - SORTED BY PACKAGE TYPE AND POWER ( $P_{TOT}$ ) RATING									
		SOT23 250 mW	SOT89/ SC-62 1.2 W	SOT143/ SC-61 250 mW	SOT223/ SC-73 1.3 W	SOT323/ SC-70 200 mW	SOT346/ SC-59 250 mW	SOT363/ SC-88 200 mW	SOT416/ SC-75 150 mW	SOT490/ SC-89 250 mW	OTHER FEATURES
<b>Breakthrough in small-signal transistors for extended battery life (very low <math>V_{CEsat}</math>)</b>											
10 V, 3 A	npn				BDL31						Very low $V_{CEsat} = 180$ mV ( $I_C = 1$ A; $I_B = 20$ mA)
10 V, 3 A	pnnp				BDL32						Very low $V_{CEsat} = 250$ mV ( $I_C = 1$ A; $I_B = 20$ mA)
40 V, 1 A	nnp	PMMT491A									Very low $V_{CEsat} < 300$ mV ( $I_C = 500$ mA; $I_B = 50$ mA)
40 V, 1 A	pnnp	PMMT591A									Very low $V_{CEsat} < 350$ mV ( $I_C = 500$ mA; $I_B = 50$ mA)
40 V, 5 A	nnp pnnp				PBSS4540Z PBSS5540Z						in development
50 V, 2 A	pnnp		PBSS5250X								in development
50 V, 3 A	nnp		PBSS4350X								in development
<b>High speed switching transistors</b>											
15 V, 100 mA	nnp	PMBT2369			PZT2369A	PMST2369					$t_{on}$ : 10 ns (at 10 mA/3 mA/ -1.5 mA)
40 V, 800 mA	nnp	PMBT2222A	PXT2222A		PZT2222A	PMST2222A					$t_{on}$ : 35 ns (at 150 mA/ 15 mA/-15 mA)
60 V, 600 mA	pnnp	PMBT2907A	PXT2907A		PZT2907A	PMST2907A					$t_{on}$ : 40 ns (at -150 mA/ -15 mA/15 mA)
<b>Resistor-equipped transistors</b>											
50 V, 100 mA	pnnp nnp	PDTA123ET PDTC123ET									R1/R2: 2.2 k $\Omega$ /2.2 k $\Omega$
50 V, 100 mA	pnnp nnp	PDTA143ET PDTC143ET				PDTA143EU PDTC143EU	PDTA143EK PDTC143EK		PDTA143EE PDTC143EE		R1/R2: 4.7 k $\Omega$ /4.7 k $\Omega$

MAX. $V_{CE0}$ & $I_c$	POL.	POLARITY TYPE RANGE - SORTED BY PACKAGE TYPE AND POWER ( $P_{TOT}$ ) RATING									
		SOT23 250 mW	SOT89/ SC-62 1.2 W	SOT143/ SC-61 250 mW	SOT223/ SC-73 1.3 W	SOT323/ SC-70 200 mW	SOT346/ SC-59 250 mW	SOT363/ SC-88 200 mW	SOT416/ SC-75 150 mW	SOT490/ SC-89 250 mW	OTHER FEATURES
50 V, 100 mA	pnp	PDTA114ET				PDTA114EU	PDTA114EK		PDTA114EE	PDTA114EEF <sup>(2)</sup>	R1/R2: 10 k $\Omega$ /10 k $\Omega$
	npnp						PUMD3				
	npn	PDTC114ET				PDTC114EU	PDTC114EK	PUMH11	PDTC114EE	PDTC114EEF <sup>(2)</sup>	
50 V, 100 mA	pnp	PDTA124ET				PDTA124EU	PDTA124EK		PDTA124EE		R1/R2: 22 k $\Omega$ /22 k $\Omega$
	npnp						PUMD2				
	npn	PDTC124ET				PDTC124EU	PDTC124EK	PUMH1	PDTC124EE		
50 V, 100 mA	pnp	PDTA144ET				PDTA144EU	PDTA144EK	PUMB2 <sup>(2)</sup>	PDTA144EE	PDTA144EEF <sup>(2)</sup>	R1/R2: 47 k $\Omega$ /47 k $\Omega$
	npnp						PUMD12				
	npn	PDTC144ET				PDTC144EU	PDTC144EK	PUMH6 <sup>(2)</sup>	PDTC144EE	PDTC144EEF <sup>(2)</sup>	
50 V, 100 mA	pnp	PDTA123JT							PDTA123JE	PDTA123JEF <sup>(2)</sup>	R1/R2: 2.2 k $\Omega$ /47 k $\Omega$
	npnp						PUMD10				
	npn	PDTC123JT							PDTC123JE	PDTC123JEF <sup>(2)</sup>	
50 V, 100 mA	pnp										R1/R2: 4.7 k $\Omega$ /open
	npnp						PUMD6				
	npn	PDTC143TT					PUMH7				
50 V, 100 mA	pnp	PDTA143XT							PDTA143XE		R1/R2: 4.7 k $\Omega$ /10 k $\Omega$
	npn	PDTC143XT							PDTC143XE		
50 V, 100 mA	pnp	PDTA143ZT					PDTA143ZK				R1/R2: 4.7 k $\Omega$ /47 k $\Omega$
	npn	PDTC143ZT					PDTC143ZK				
50 V, 100 mA	pnp	PDTA114TT				PDTA114TU	PDTA114TK	PUMB4			R1/R2: 10 k $\Omega$ /open
	npn	PDTC114TT				PDTC114TU	PDTA114TK	PUMH4	PDTC114TE		
50 V, 100 mA	pnp	PDTA114YT				PDTC114YU			PDTC114YE		R1/R2: 10 k $\Omega$ /47 k $\Omega$
	npnp						PUMD9				
	npn	PDTC114YT					PUMH9 <sup>(2)</sup>				
50 V, 100 mA	pnp								PDTA124XE	PDTA124XEF <sup>(2)</sup>	R1/R2: 22 k $\Omega$ /47 k $\Omega$
	npn								PDTC124XE	PDTC124XEF <sup>(2)</sup>	
50 V, 100 mA	pnp					PDTA144WU					R1/R2: 47 k $\Omega$ /22 k $\Omega$
	npn	PDTC114WT				PDTC144WU					

MAX. $V_{CE0}$ & $I_c$	POL.	POLARITY TYPE RANGE - SORTED BY PACKAGE TYPE AND POWER ( $P_{TOT}$ ) RATING									
		SOT23 250 mW	SOT89/ SC-62 1.2 W	SOT143/ SC-61 250 mW	SOT223/ SC-73 1.3 W	SOT323/ SC-70 200 mW	SOT346/ SC-59 250 mW	SOT363/ SC-88 200 mW	SOT416/ SC-75 150 mW	SOT490/ SC-89 250 mW	OTHER FEATURES
<b>Resistor-equipped transistor with two different resistor combinations</b>											
50 V, 100 mA	npnp							PUMD48			For npn R1/R2: 47 k $\Omega$ /47 k $\Omega$  For pnp R1/R2: 2.2 k $\Omega$ /47 k $\Omega$
<b>High current transistors</b>											
20 V, 1 A	npn		BC869		BCP69						
	npn		BC868		BCP68						
45 V, 1 A	npn				BCP51					BCX51	
	npn				BCP54					BCX54	
60 V 1 A	npn				BCP52					BCX52	
	npn				BCP55					BCX55	
80 V, 1 A	npn				BCP53					BCX53	
	npn				BCP56					BCX56	
<b>High-voltage transistors</b>											
150 V, 300 mA	npn	PMBT5401			PZT5401	PMST5401					low capacitance: $C_C < 6$ pF
160 V, 300 mA	npn	PMBT5550			PZT5551	PMST5550					low capacitance: $C_C < 6$ pF
300 V, 500 mA	npn	PMBTA92	PXTA92		PZTA92	PMSTA92					
300 V, 500 mA	npn	PMBTA42	PXTA42		PZTA42	PMSTA42					
350 V, 300 mA	npn				PZTA44						
<b>General purpose transistors</b>											
40 V, 100 mA	npn					2PC4081 <sup>(1)</sup>					
40 V, 500 mA	npn					2PA1576 <sup>(1)</sup>			2PA1774 <sup>(1)</sup>		high amplifications at high currents
45 V, 100 mA	npn	BC857				BC857W	2PB709A <sup>(1)</sup>		BC857T	BC857F	
45 V, 100 mA	npn									BC847F	

MAX. $V_{CE0}$ & $I_c$	POL.	POLARITY TYPE RANGE - SORTED BY PACKAGE TYPE AND POWER ( $P_{TOT}$ ) RATING									
		SOT23 250 mW	SOT89/ SC-62 1.2 W	SOT143/ SC-61 250 mW	SOT223/ SC-73 1.3 W	SOT323/ SC-70 200 mW	SOT346/ SC-59 250 mW	SOT363/ SC-88 200 mW	SOT416/ SC-75 150 mW	SOT490/ SC-89 250 mW	OTHER FEATURES
45 V, 500 mA	pnP	BC807				BC807W					high amplifications at high currents
45 V, 500 mA	npn	BC817				BC817W					high amplifications at high currents
50 V, 100 mA	npn						2PD601A <sup>(1)</sup>		2PC4617 <sup>(1)</sup>		
50 V, 500 mA	pnP						2PD602A				high amplifications at high currents
50 V, 500 mA	npn						2PB710A				high amplifications at high currents
65 V, 100 mA	pnP	BC856				BC856W			BC856T		
65 V, 100 mA	npn	BC846				BC846W			BC846T		
<b>General purpose transistor arrays</b>											
T1/T2: 30 V/6 V, 100 mA	pnP			BCV62 BCV64							current mirror Schmitt trigger
T1/T2: 30 V/6 V, 100 mA	npn			BCV61 BCV63							current mirror Schmidt trigger
T1/T2: 40 V, 100 mA	npn							PUMX1			
T1/T2: 40 V, 100 mA	pnP							PUMT1			
T1/T2: 40 V, 100 mA	pnPn							PUMZ1			
T1/T2: 45 V, 100 mA	pnP							BC857BS			tight $h_{FE}$ matching

MAX. $V_{CE0}$ & $I_c$	POL.	POLARITY TYPE RANGE - SORTED BY PACKAGE TYPE AND POWER ( $P_{TOT}$ ) RATING									
		SOT23 250 mW	SOT89/ SC-62 1.2 W	SOT143/ SC-61 250 mW	SOT223/ SC-73 1.3 W	SOT323/ SC-70 200 mW	SOT346/ SC-59 250 mW	SOT363/ SC-88 200 mW	SOT416/ SC-75 150 mW	SOT490/ SC-89 250 mW	OTHER FEATURES
T1/T2: 45 V, 100 mA	npn							BC847BS			tight $h_{FE}$ matching
T1/T2: 45 V, 100 mA	npnp							BC847BPN			tight $h_{FE}$ matching
T1/T2: 65 V, 100 mA	pnp							BC846S BC856S			in development

**Notes**

1. Only available in tight DC current gain groups.
2. Release planned for Q2/1999.

**POWER MOSFETs, 20 V to 300 V N- and P-channel complementary multi-chip**

V <sub>DS</sub> (V)	R <sub>DS(ON)</sub> (Ω)	@V <sub>GS</sub> (V)	I <sub>DS</sub> (A)	PACKAGE (SURFACE MOUNT)					TYPICAL APPLICATION (see notes)
				TSOP6 (SOT457)	TSSOP8 (SOT530)	SO8 (SOT96)	SO24 (SOT137)	SSOP24 (SOT340)	
20	2 x 0.04 (N) + ESD	2.5	5		BSH301 <sup>(6)</sup>				4
25	1 x 0.03/ 6 x 0.08 (N)	10	5					PHN70308	2
25	6 x 0.035 (MOS), 6 x 5A Schottky	10	8.3				PHN603S		5
30	2 x 0.03 (N)	10	5.2			PHN203			2, 3
30	0.05 (N)/ 0.12 (P)	10	6.4 (N) / 4 (P)			PHC20512			2, 4
30	0.1 (N)/ 0.25 (P)	10	3.5 (N) / 2.3 (P)			PHC21025			2, 4
30	2 x 0.05(N)	10	6.4			PHN205			2, 4
30	2 x 0.1 (N)	10	3.5			PHN210			2, 4
30	2 x 0.12(P)	10	4			PHP212			2, 4
30	2 x 0.25(P)	10	2.3			PHP225			2, 4
50	2 x 10 (P)	10	0.19	BSH403					4
60	2 x 4 (N)	10	0.29	BSH303					4
300	8 (N)/ 17 (P)	10	0.3 (N) / 0.2 (P)			PHC2300			1

**Notes**

1. Telecom line switching protection.
2. Telecom power conversion.
3. Telecom DC-DC conversion.
4. Telecom power (battery) management.
5. Universal Serial Bus (USB).
6. In development.

## POWER MOSFETs, 12 V to 300 V P-channel single chip

V <sub>DS</sub> (V)	R <sub>DS(ON)</sub> (Ω)	@V <sub>GS</sub> (V)	I <sub>DS</sub> (A)	PACKAGE						TYPICAL APPLICATION (see notes)
				SURFACE MOUNT					LEADED	
				SOT223	SO8 (SOT96)	SOT23	SOT363	TSOP6 (SOT457)	TO-92 (SOT54)	
12	0.15	2.5	1.98					BSH207		4
12	0.5	2.5	1.01				BSH206			4
12	0.5	2.5	0.86			BSH205				4
30	0.09	10	5.7	BSP090						2, 4
30	0.09	10	5		PHP109					2, 4
30	0.25	10	3	BSP250						2, 4
30	0.25	10	2.5		PHP125					2, 4
30	0.9	10	0.57			BSH202				4
30	1.1	2.5	0.57			BSH203				4
45	14	10	0.25							1, 2
50	10	10	0.13			BSS84				1, 2
60	2.5	10	0.34			BSH201				4
200	12	10	0.225	BSP220						1, 2
250	15	10	0.225	BSP225						1, 2
250	15	10	0.2					BSP254A		1, 2
300	17	10	0.21	BSP230						1, 2
300	17	10	0.17					BSP304A		1, 2

**Notes**

1. Telecom line switching protection.
2. Telecom power conversion.
3. Telecom DC-DC conversion.
4. Telecom power (battery) management.