

# RTS8505C Data Sheet

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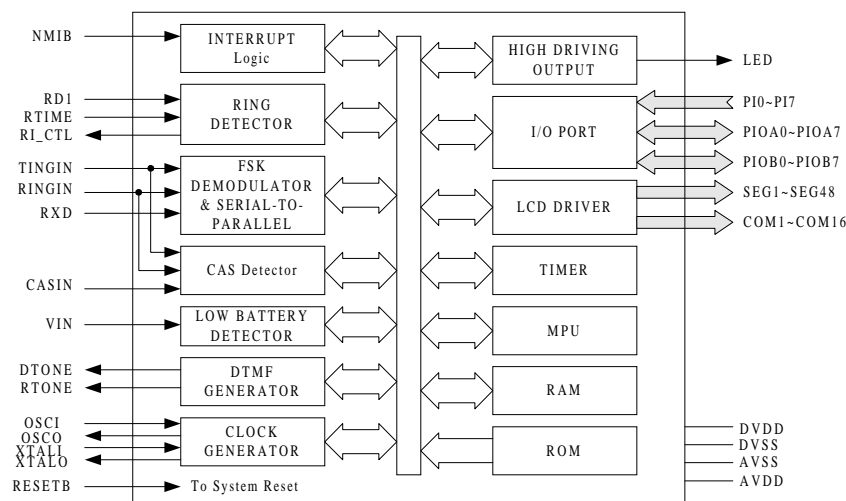
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## Features

- 8-bit micro-processor built in
- 32K bytes ROM
- 2.8K bytes general-purposed RAM
- Dual Oscillators
  - 3.58MHz for system clock
  - 32.768KHz for system clock and real time clock
- Ring and line reversal detector
- FSK demodulator & carrier detector
- CAS (CPE Alert Signal)/TAS detector
- DTMF (Dual Tone Multiple Frequency) generator
- Ringer tone generator
- Low voltage detector
- Priority-based Interrupts and NMI
- Two 8-bit general-purposed timers
- One watchdog timer
- Two serial-to-parallel ports
  - Input port: 8 pins with interrupt option.
  - I/O port A: 8 pins with maskable open-drain option.
- I/O port B: 8 pins.
- I/O port C optioned by programming: 8 pins (pin SEG41~SEG48)
- I/O port D optioned by programming: 8 pins (pin COM9~COM16)
- Output port E optioned by programming: 4 pins (COM5~COM8).
- Other I/O ports or pins
  - RI\_CTL pin, LED pin
- One LCD driver with adjustable contrast
  - Three programmable duty: 1/16, 1/8 or 1/4
  - Two programmable bias: 1/5 or 1/4
  - Maximum 48 segment output pins
  - Maximum 16 common output pins
- Power Management
  - Standby mode
  - Stop mode
- Operating voltage range: 2.8V~5.5V

## Block Diagram



## Applications

- Calling number delivery (CND) & Calling name delivery (CNAM) features
- Caller identification on call waiting (CIDCW) features
- Phone set adjunct boxes
- Feature phones
- Other communication systems

## Package

- 128 Pins QFP packaged.

## **General Description**

The RTS8505C is a caller ID integrated chip with call waiting function. An 8-bit microprocessor (6502) has been built in the chip and it provides a complete solution for the service of caller identification, especially for caller identification on call waiting. The RTS8505C provides all the features and functions offered by the former series product RTS8503C, including FSK demodulation, DTMF generation, Ring detection, Power Management and Low battery indication. In addition, a high performance CPE Alerting Tone (CAS) detection is also performed in this single chip. Basically, the chip's CAS performance is compliant to the SR-TSV-0002476 specification. With 32K ROM, it can help the designer easily and flexibly to achieve their desired features. Up to 3 sets of additional I/O ports are provided for the designer to connect more peripherals or other specified external circuits. Up to 16-degree contrast levels are supported to adjust the LCD contrast. Moreover, the operating voltage is enhanced to 2.8 Volt for the low power operation. For their applications, it provides a one-chip solution for the adjunct boxes, feature phones, and other communication systems.



## Pin Descriptions

Pin No.	Notation	I/O	Functional Description
4	AVDD	Power	Analog power supply Input
5	TIPIN	I	This input pin is connected to the tip side of the twisted pair line. FSK signal or CAS signal can be delivered into this pin. (*See note 1)
6	RINGIN	I	This input pin is connected to the ring side of the twisted pair line. (*See note 1)
7	RD1	I	This pin is normally coupled to the one of the twisted pair wires through an attenuating network. It detects energy and enables the 3.58MHz oscillator and precision ring detection.
8	RTIME	I	Ring time signal input. It is necessary to apply a proper RC circuit with a specified time constant for examine the validation of ring signal.
9	VIN	I	Low-voltage detector input. It provides a voltage comparator with the reference voltage of 2.45V±0.15V. (*see note 2)
10	CASIN	I	This is a single-ending input pin for CAS signal from the SPCS, alternatively used different from TIPIN/RINGIN.
11	AVSS	Power	Analog ground input.
12	VLCD0	I	Voltage supply input for LCD driver
13-35, 37-61	SEG1–SEG48	O	Segment output pin for LCD driver. The SEG1-40 pins are mainly used for the LCD driver. The SEG41-48 pins are multiple function pins either for the segment of LCD driver or the general I/O port
62-64, 69-81	COM1–COM16	O	Common output pin for LCD driver. The COM1-4 pins are mainly used for the LCD driver. The COM5-16 pins are multiple function pins either for the common of LCD driver or the general-purposed I/O port
84	XTALO	O	32.768KHz oscillator output.
85	XTALI	I	32.768KHz oscillator input.
86	RESETB	I	Reset signal input. (low active)
87	DVSS	Power	Digital ground input.
88-91, 103-106	PIOA0–PIOA7	I/O	General-purposed I/O pins with internal pull-up resistors and Open-drain structure
92	NMIB	I	Non-maskable Interrupt input with schmitt trigger built in. (low active)
93	EAB	I	This is a reserved pin with internal pull-up resistors. Don't connect this pin to any specified level.
94	RI_CTL	O	Ring control output or general-purposed output.
102	LED	O	General-purposed output with high driving capability. (Max. 10 - 15 mA)
107	DVDD	Power	Digital power supply input
108-115	PIO–PI7	I	General-purposed input pins with internal pull-up resistors It can be programmed as interrupt input (negative-edge trigger)
116-123	PIOB0–PIOB7	I/O	General-purposed I/O pins with internal pull-up resistors.
124	OSCO	O	3.58MHz oscillator output pin.
125	OSCI	I	3.58MHz oscillator input pin.
126	RXD	I	This pin is used to receive the output data of external FSK demodulator. One internal serial-to-parallel port is connected to this pin.
127	RTONE	O	Ringer tone signal output. This pin is used for output a specified ringer tone signal. (1000Hz or 1300Hz Sine/ square wave)
128	DTONE	O	DTMF signal output.

Note 1: 'TIPIN' and 'RINGIN' must be DC isolated from the phone line.

Note 2: The detected voltage level can be adjusted by using an external voltage divider circuit.

Note 3: It is suggested that the power pins AVDD and DVDD are blocked by coil for de-coupling the noise from analog circuit to digital circuit. (AVSS and DVSS, too)

Note 4: To avoid the problem of line unbalance, the ground of any test machine, such as oscilloscope or AI, must be isolated from the ground of this chip.

## Absolute Maximum Ratings

### Comments

DC Supply Voltage.....-0.5V to + 6.0V  
 Input Voltage.....-0.5V to VDD + 0.5V  
 Output Voltage.....-0.5V to VDD + 0.5V  
 Operating Temperature.....0°C to 70°C  
 Storage Temperature..... -40°C to 150°C

Never allow a stress to exceed the values listed under "Absolute Maximum Ratings", otherwise the device would suffer from a permanent damage. Nor is a stress at the listed value be allowed to persist over a period, since an extended exposure to the absolute maximum rating condition may also affect the reliability of the device, if not causing a damage thereof.

## AC & DC Electrical Characteristics

### DC Electrical Characteristics (Temperature=0°C to 70°C, V<sub>DD</sub>=4.5V, GND=0V)

Parameters	Conditions	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	MPU operating voltage	V <sub>DD</sub>	2.2	5.0	5.5	V
	FSK operating voltage	V <sub>DDF</sub>	2.8	5.0	5.5	V
	CAS operating voltage	V <sub>DDC</sub>	2.8	5.0	5.5	V
	RAM operating voltage	V <sub>RAM</sub>	2.2	5.0	5.5	V
Supply current	Current of FSK receiving data	I <sub>FSK</sub>	-	3.5	-	mA
	Current of CAS detection	I <sub>CAS</sub>	-	5.5	-	mA
	Current of DTMF dialing	I <sub>DTMF</sub>	-	2	-	mA
	Current of standby mode(MPU off, 3.58MHz off, 32.768KHz on, CAS off, FSK off, DTMF off, LCD on)	I <sub>STDY</sub>	-	50	-	μA
	Current of stop mode(MPU off, 3.58MHz off, 32.768KHz off, CAS off, FSK off, DTMF off, LCD off)	I <sub>STOP</sub>	-	2	-	μA
Output voltage	I <sub>OH</sub> =1 mA, PIOA and PIOB pins	V <sub>OH1</sub>	4.3	-	-	V
	I <sub>OL</sub> =2 mA, PIOA and PIOB pins	V <sub>OL1</sub>	0.2	-	-	V
	I <sub>OL</sub> =2.2 mA, PIOA open-drained	V <sub>OL2</sub>	0.2	-	-	V
Input voltage	PIOA and PIOB pins	V <sub>IH1</sub>	0.8 V <sub>DD</sub>	-	V <sub>DD</sub> +0.3	V
	PIOA and PIOB pins	V <sub>IL1</sub>	-0.3	-	0.2 V <sub>DD</sub>	V
	PI pins	V <sub>IH2</sub>	0.8 V <sub>DD</sub>	-	V <sub>DD</sub> +0.3	V
	PI pins	V <sub>IL2</sub>	-0.3	-	0.1V <sub>DD</sub>	V
Output current	V <sub>OH</sub> =4.0V, PIOA and PIOB pins V <sub>OH</sub> =3.6V	I <sub>OH1</sub>	-2.4 -4.0	-2.6 -4.4	-2.7 -4.6	mA
	V <sub>OH</sub> =0.9V, PIOA and PIOB pins V <sub>OH</sub> =0.5V	I <sub>OL1</sub>	6.3 3.9	7.0 4.4	7.4 4.6	mA
	V <sub>OH</sub> =0.9V, PIOA open-drained V <sub>OH</sub> =0.5V	I <sub>OL2</sub>	7.2 4.5	8.0 5.0	8.5 5.3	mA
	Pull-up resistor	PI, PIOA and PIOB	R <sub>PULL</sub>	-	100	-

**AC Electrical Characteristics – FSK Demodulation (Temperature=0°C to 70°C,  
V<sub>DD</sub>=4.5V, GND=0V)**

Parameters	Conditions	Min.	Typ.	Max.	Unit
Input sensitivity of Tip and Ring	S/N=25, Baud rate=1200 Bps Mark=1200Hz, Space=2200Hz	-	-45	-	dBm
SNR of input signal	Signal level = 0~-45dBm Baud rate=1200 Bps Mark=1200Hz, Space=2200Hz	-	13	-	dB
Baud Rate	Signal level = -45dBm, S/N=25 Mark=1200Hz, Space=2200Hz	1150	1200	1250	Bps
Positive twist (twist = mark power-space power)	Signal level=-45dBm, S/N=25, Baud rate=1200Bps	-	+10	-	dB
Negative twist			-6		
Bell 202 FSK Mark frequency	Signal level=-45dBm, S/N=25 Baud rate=1200Bps	1150	1200	1250	Hz
Space frequency		2150	2200	2250	

**AC Electrical Characteristics – CAS Detection (Temperature=0°C to 70°C,  
V<sub>DD</sub>=4.5V, GND=0V)**

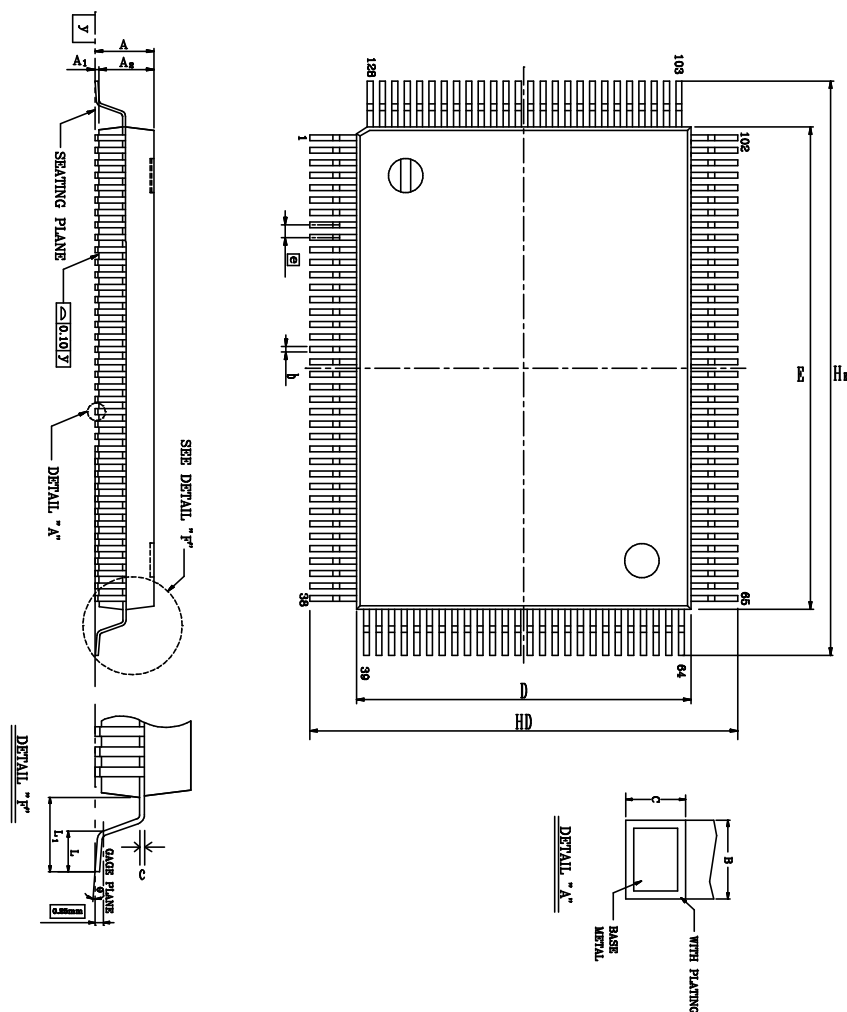
Parameters	Min.	Typ.	Max.	Unit
CAS (CPE Alert Signal) detection sensitivity	-	-40	-	dBm
Low tone frequency	2130-0.5%	2130	2130+0.5%	Hz
High tone frequency	2750-0.5%	2750	2750+0.5%	Hz
Signal reject level	-	-45	-	dBm





Pad No.	Name	X	Y	Pad No.	Name	X	Y
1	TIPIN	50.05	3765.50	57	COM16	3372.85	50.05
2	RINGIN	50.05	3609.60	58	COM15	3523.90	50.05
3	RD1	50.05	3483.30	59	COM14	3802.35	348.20
4	RTIME	50.05	3352.65	60	COM13	3802.35	491.25
5	VIN	50.05	3229.80	61	COM12	3802.35	643.20
6	CASIN	50.05	3114.80	62	COM11	3802.35	775.80
7	AVSS	50.05	2999.80	63	COM10	3802.35	913.40
8	VLCD0	50.05	2884.80	64	COM9	3802.35	1028.40
9	SEG48	50.05	2769.80	65	COM8	3802.35	1143.40
10	SEG47	50.05	2654.80	66	COM7	3802.35	1258.40
11	SEG46	50.05	2539.80	67	COM6	3802.35	1373.40
12	SEG45	50.05	2424.80	68	COM5	3802.35	1488.40
13	SEG44	50.05	2309.80	69	COM4	3802.35	1603.40
14	SEG43	50.05	2194.80	70	COM3	3802.35	1718.40
15	SEG42	50.05	2079.80	71	COM2	3802.35	1833.40
16	SEG41	50.05	1964.80	72	COM1	3802.35	1948.40
17	SEG40	50.05	1849.80	73	XTALO	3802.35	2065.05
18	SEG39	50.05	1734.80	74	XTALI	3802.35	2180.05
19	SEG38	50.05	1619.80	75	RESETB	3802.35	2295.05
20	SEG37	50.05	1499.80	76	DVSS	3802.35	2410.05
21	SEG36	50.05	1379.80	77	PIOA7	3802.35	2542.35
22	SEG35	50.05	1259.80	78	PIOA6	3802.35	2677.35
23	SEG34	50.05	1143.40	79	PIOA5	3802.35	2812.35
24	SEG33	50.05	1028.40	80	PIOA4	3802.35	2947.35
25	SEG32	50.05	913.40	81	NMIB	3802.35	3079.80
26	SEG31	50.05	798.40	82	EAB	3802.35	3224.80
27	SEG30	50.05	678.55	83	RL_CTL	3802.35	3369.80
28	SEG29	50.05	561.95	84	LED	3802.35	3514.80
29	SEG28	50.05	410.14	85	PIOA3	3540.20	3932.85
30	SEG27	50.05	266.75	86	PIOA2	3405.20	3932.85
31	SEG26	266.25	50.05	87	PIOA1	3270.20	3932.85
32	SEG25	396.25	50.05	88	PIOA0	3135.20	3932.85
33	SEG24	526.25	50.05	89	DVDD	3000.20	3932.85
34	SEG23	656.25	50.05	90	PI7	2869.55	3932.85
35	SEG22	797.80	50.05	91	PI6	2754.55	3932.85
36	SEG21	912.80	50.05	92	PI5	2639.55	3932.85
37	SEG20	1027.80	50.05	93	PI4	2524.55	3932.85
38	SEG19	1142.80	50.05	94	PI3	2409.55	3932.85
39	SEG18	1257.80	50.05	95	PI2	2294.55	3932.85
40	SEG17	1372.80	50.05	96	PI1	2179.55	3932.85
41	SEG16	1487.80	50.05	97	PI0	2064.55	3932.85
42	SEG15	1602.80	50.05	98	PIOB7	1949.55	3932.85
43	SEG14	1717.80	50.05	99	PIOB6	1834.55	3932.85
44	SEG13	1832.80	50.05	100	PIOB5	1719.55	3932.85
45	SEG12	1947.80	50.05	101	PIOB4	1604.55	3932.85
46	SEG11	2062.80	50.05	102	PIOB3	1489.55	3932.85
47	SEG10	2177.80	50.05	103	PIOB2	1374.55	3932.85
48	SEG9	2292.80	50.05	104	PIOB1	1259.55	3932.85
49	SEG8	2407.80	50.05	105	PIOB0	1144.55	3932.85
50	SEG7	2522.80	50.05	106	OSCO	1029.55	3932.85
51	SEG6	2637.80	50.05	107	OSCI	896.40	3932.85
52	SEG5	2752.80	50.05	108	RXD	746.40	3932.85
53	SEG4	2867.80	50.05	109	RTONE	596.40	3932.85
54	SEG3	2982.80	50.05	110	DTONE	446.40	3932.85
55	SEG2	3097.80	50.05	111	AVDD	174.55	3932.85
56	SEG1	3242.85	50.05				

### Package Diagram



Note :

1. Dimension D & E do not include interlead flash.
2. Dimension b does not include dambar protrusion/intrusion.
3. Controlling dimension : Millimeter
4. General appearance spec. should be based on final visual inspection spec.

Symbol	Dimension in inch			Dimension in mm		
	Min	Type	Max	Min	Type	Max
<b>A</b>	—		0.134	—	—	3.40
<b>A1</b>	0.004	0.010	0.036	0.10	<b>0.25</b>	0.91
<b>A2</b>	0.102	0.112	0.122	2.60	<b>2.85</b>	3.10
<b>b</b>	0.005	0.009	0.013	0.12	<b>0.22</b>	0.32
<b>c</b>	0.002	0.006	0.010	0.05	<b>0.15</b>	0.25
<b>D</b>	0.541	0.551	0.561	13.75	<b>14.00</b>	14.25
<b>E</b>	0.778	0.787	0.797	19.75	<b>20.00</b>	20.25
<b>e</b>	0.010	0.020	0.030	0.25	<b>0.5</b>	0.75
<b>HD</b>	0.665	0.677	0.689	16.90	<b>17.20</b>	17.50
<b>HE</b>	0.902	0.913	0.925	22.90	<b>23.20</b>	23.50
<b>L</b>	0.027	0.035	0.043	0.68	<b>0.88</b>	1.08
<b>L1</b>	0.053	0.063	0.073	1.35	<b>1.60</b>	1.85
<b>y</b>	—	—	0.004	—	—	0.10
<b>θ</b>	0°	—	12°	0°	—	12°

TITLE : <b>128 QFP</b> (14x20 mm ) PACKAGE OUTLINE -CU L/F, FOOTPRINT 3.2 mm			
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