RTS8503C
A Caller ID Integrated System

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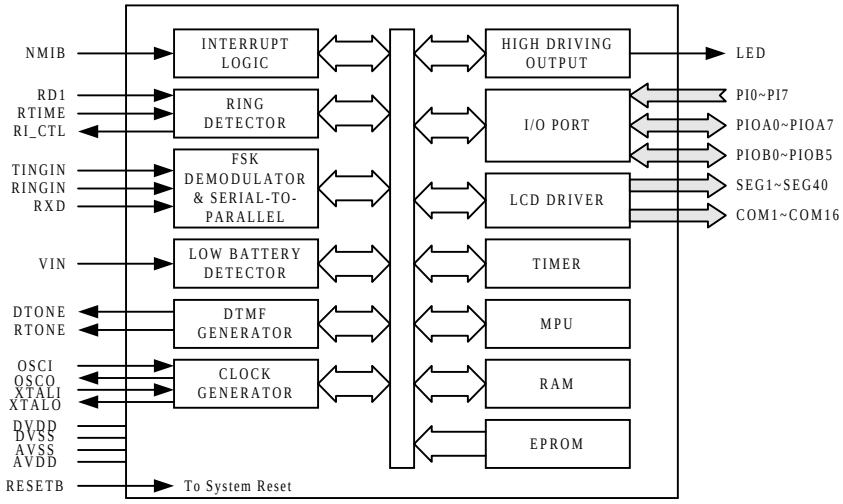
Features

- 8-bit micro-processor built in
- 32K bytes ROM
- 2K bytes genera-purposed RAM
- Dual oscillators
  - 3.58MHz for system clock
  - 32.768KHz for system clock and real time clock
- Ring detector with line reversal detected
- FSK demodulator & carrier detector
- DTMF generator
- Ringer tone generator
- Low voltage detector
- Interrupts with three priorities and NMI
- Two general-purposed 8-bit timers
- Watchdog Timer
- Two serial-to-parallel ports
- I/O ports with internal pull-up resistors built in
  - Input port : 8 pins
  - I/O port A: 8 pins with/without open-drain option
  - I/O port B: 6 pins
- Other output pins
  - RI_CTL pin, LED pin
- One LCD driver with three options by masking
  - 40 segments × 16 commons
  - 40 segments × 8 commons
  - 40 segments × 4 commons
- Two power saving mode
  - Standby mode
  - Stop mode
- Operating voltage range: 3.6V~5.5V

Block Diagram



Applications

- Calling number delivery (CND) and calling name delivery (CNAM) features
- Phone set adjunct boxes
- Feature phones
- Other communication systems

Package

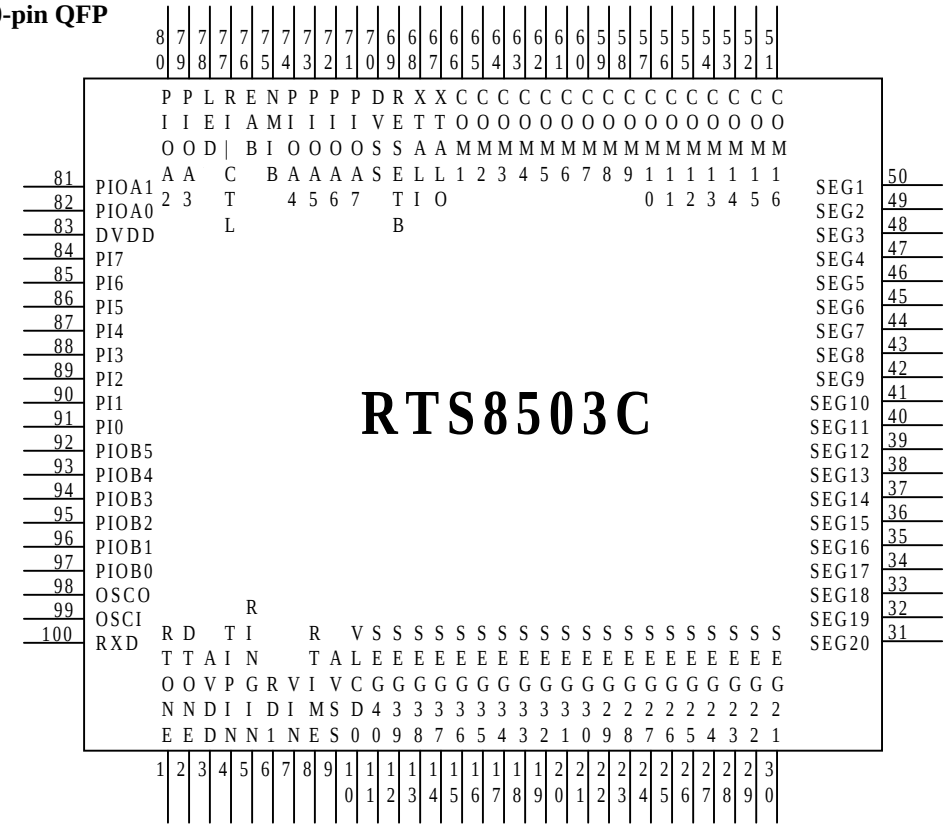
- 100-pin QFP or 128-pin QFP packaged

General Description

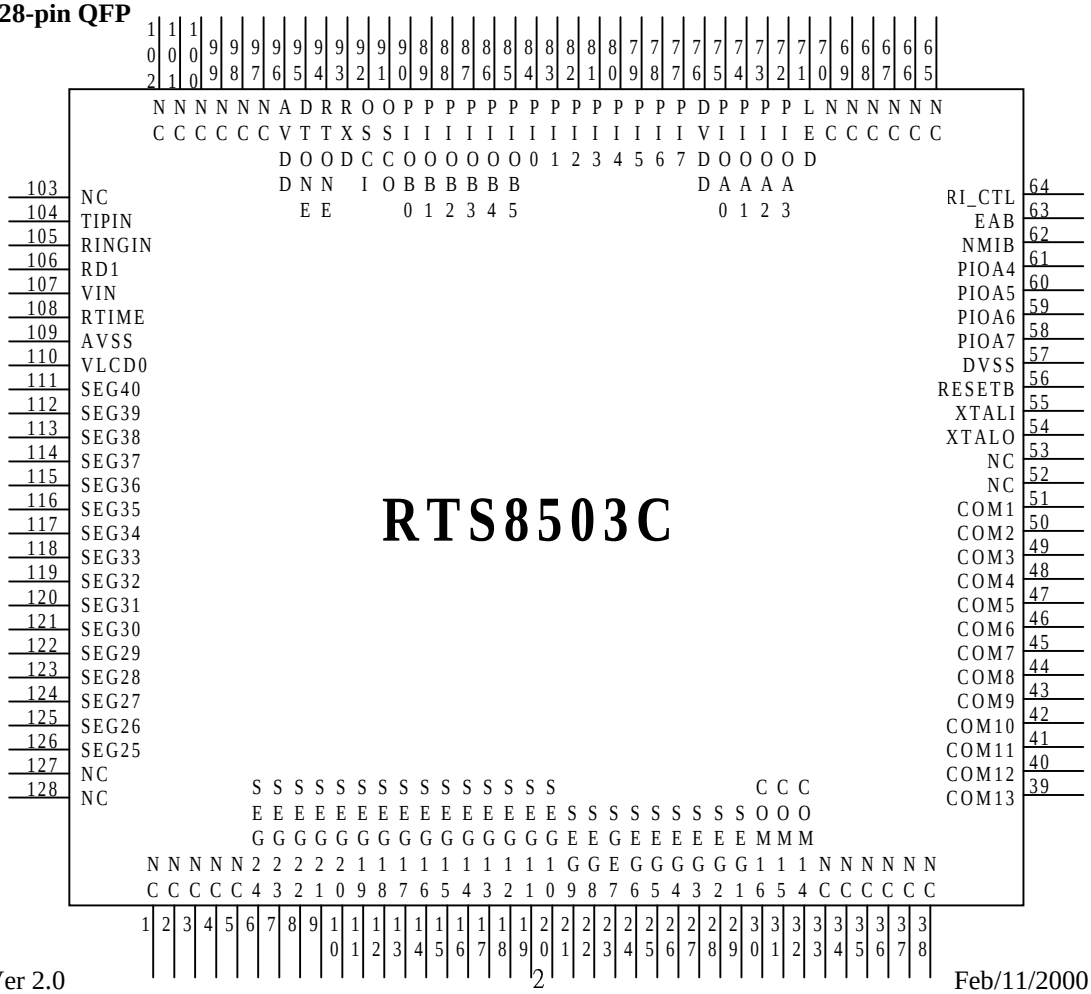
The RTS8503C is a micro-controller with an 8-bit micro-processor (6502) embedded and it provides a complete solution for the service of caller identification. The features and functions offered by the RTS8503C include FSK demodulation, DTMF generation, Ring detection, LCD driver, Power Management and Low battery indication. The FSK demodulator is designed for the Bell 202 and CCITT V.23 1200-baud asynchronous data and its performance is compliant to the Bellcore GR-30-CORE. With 32K Bytes ROM embedded, it can help the designers easily and flexibly to achieve the desired features. For these applications, it provides a one-chip solution for the adjunct boxes, feature phones, and other communication systems.

Pin Configuration

100-pin QFP



128-pin QFP



Pin Description

Pin No.	Notation	I/O	Description
1	RTONE	O	Ringer tone signal output.
2	DTONE	O	DTMF signal output.
3	AVDD	Power	Analog power supply Input.
4	TIPIN	I	Signal input of tip side of twisted pair line (*see note 1).
5	RINGIN	I	Signal input of ring side of twisted pair line (*see note 1).
6	RD1	I	Ring detection signal input (*see note 2).
7	VIN	I	Low-voltage detector input.
8	RTIME	I	Ring time signal input.
9	AVSS	Power	Analog ground input.
10	VLCD0	I	Voltage supply input for LCD driver.
11—50	SEG40 – SEG1	O	Segment output pins of LCD driver.
51—66	COM16 - COM1	O	Common output pins of LCD driver.
67	XTALO	O	32.768KHz oscillator output.
68	XTALI	I	32.768KHz oscillator input.
69	RESETB	I	Reset signal input (low active).
70	DVSS	Power	Digital ground input.
71-74	PIOA7 – PIOA4	I/O	General-purposed I/O pins with internal pull-up resistors Open-drain structure is optioned by masking.
75	NMIB	I	Non-maskable Interrupt input with schmitt trigger built in (low active).
76	EAB	I	This is a reserved pin with internal pull-up resistors. Don't connect this pin to any specified level.
77	RI_CTL	O	Ring control output or general-purposed output.
78	LED	O	General-purposed output with high driving capability. (Max. 10 - 15 mA)
79—82	PIOA3 – PIOA0	I/O	General-purposed I/O pins with internal pull-up resistors Open-drain structure is optioned by masking.
83	DVDD	Power	Digital power supply input.
84—91	PI7 –PI0	I	General-purposed input pins with internal pull-up resistors. It can be programmed as interrupt input (negative-edge trigger).
92—97	PIOB5 – PIOB0	I/O	General-purposed I/O pins with internal pull-up resistors.
98	OSCO	O	3.58MHz oscillator output.
99	OSCI	I	3.58MHz oscillator input.
100	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.

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

Note 2: 'RD1' input 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.

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

Absolute Maximum Ratings

DC Supply Voltage.....-0.5V to + 6.0V
Input Voltage.....-0.5V to V_{DD} + 0.5V
Output Voltage.....-0.5V to V_{DD} + 0.5V
Operating Temperature.....0℃ to 70℃
Storage Temperature..... -40℃ to 150℃

Comments
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℃to 70℃, V_{DD}=4.5V, GND=0V)

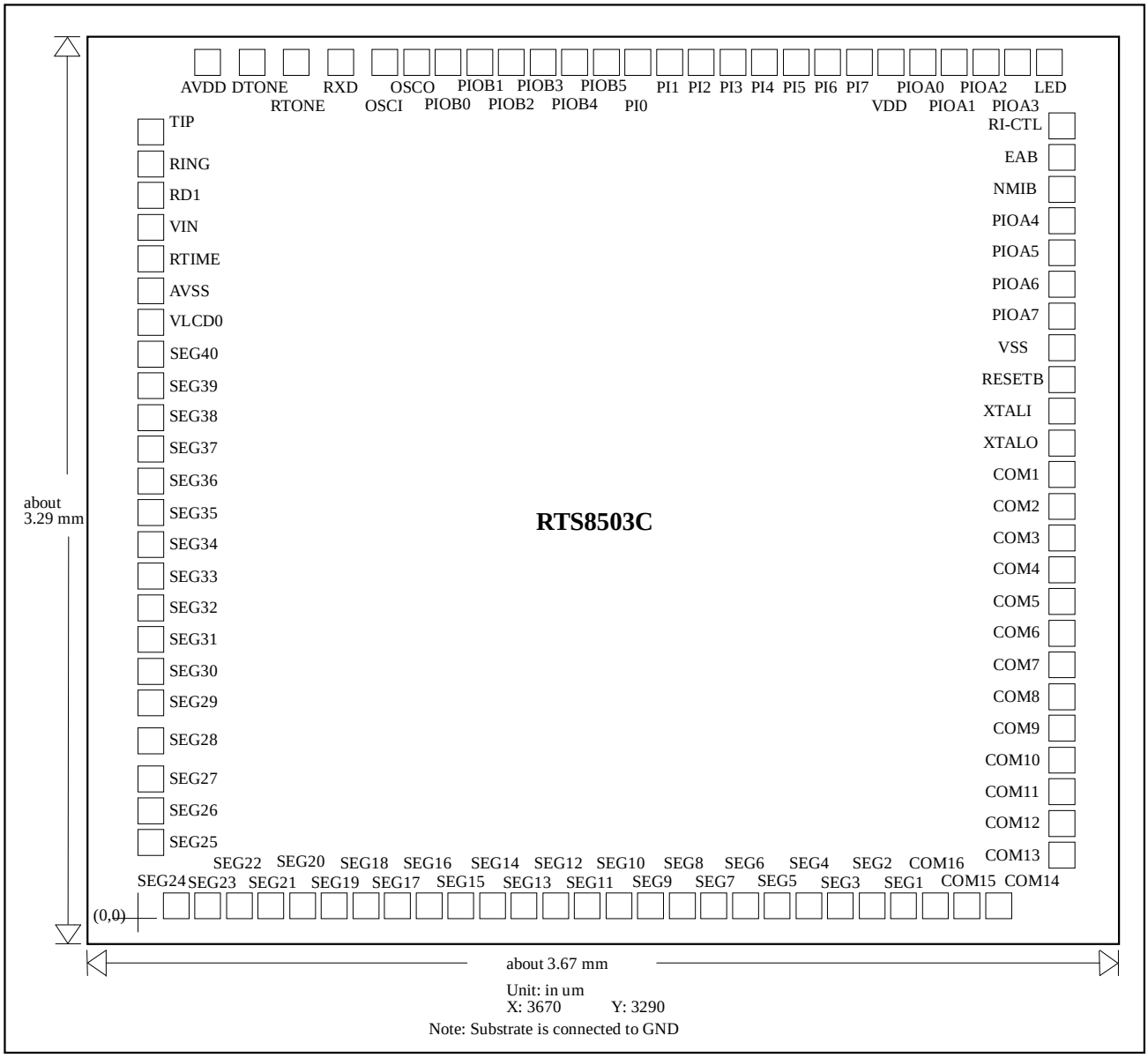
Parameters	Conditions	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	MPU operating voltage	V_{DD}	2.2	5.0	5.5	V
	FSK operating voltage	V_{DDF}	3.6	5.0	5.5	V
	RAM operating voltage	V_{RAM}	2.2	5.0	5.5	V
Supply current	current of FSK receiving data	I_{FSK}	-	4.0	-	mA
	current of DTMF dialing	I_{DTMF}	-	2.0	-	mA
	MPU on, 3.58MHz on, 32.768KHz on, FSK off, DTMF off, LCD on (voltage at pin 'VLCD0' is 3.95V)	I_{ACT}	-	1.0	-	mA
	MPU off, 3.58MHz off, 32.768KHz on, FSK off, DTMF off, LCD on (voltage at pin 'VLCD0' is 3.95V)	I_{STDBY}	-	50	-	μA
	MPU off, 3.58MHz off, 32.768KHz off, FSK off, DTMF off, LCD off	I_{STOP}	-	2	10	μA
Output voltage	I_{OH}=1 mA , PIOA and PIOB pins	V_{OH1}	4.3	-	-	V
	I_{OL}=2 mA, PIOA and PIOB pins	V_{OL1}	0.2	-	-	V
	I_{OL}=2.2 mA, PIOA open-drained	V_{OL2}	0.2	-	-	V
Input voltage	PIOA and PIOB pins	V_{IH1}	0.8 V_{DD}	-	V_{DD}+0.3	V
	PIOA and PIOB pins	V_{IL1}	-0.3	-	0.2 V_{DD}	V
	PI pins	V_{IH2}	0.8 V_{DD}	-	V_{DD}+0.3	V
	PI pins	V_{IL2}	-0.3	-	0.1V_{DD}	V
Output current	V_{OH}=4.0V, PIOA and PIOB pins V_{OH}=3.6V	I_{OH1}	-2.4 -4.0	-2.6 -4.4	-2.7 -4.6	mA
	V_{OH}=0.9V, PIOA and PIOB pins V_{OH}=0.5V	I_{OL1}	6.3 3.9	7.00 4.4	7.4 4.6	mA
	V_{OH}=0.9V, PIOA open-drained V_{OH}=0.5V	I_{OL2}	7.2 4.5	8.0 5.0	8.5 5.3	mA
Pull-up resistor	PI, PIOA and PIOB	R_{PULL}	-	100	-	KΩ
DTMF output distortion	R_{load}=10KΩ~40KΩ	DIS	-	-	0.7	%
Twist of DTMF power (high freq. power-low freq. power)	R_{load}=10KΩ~40KΩ	TW	1	2	3	dB
DTMF loading resistor	-	R_{load}	5	10	40	KΩ

AC Electrical Characteristics

(Temperature=0℃ to 70℃, V_{DD}=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	-	15	-	dB
Baud Rate	Signal level = -45dBm, S/N=25 Mark=1200Hz, Space=2200Hz	1160	1200	1220	Bps
Bell 202 FSK Mark frequency Space frequency	Signal level=-45dBm, S/N=25 Baud rate=1200Bps	1200-1.5% 2200-1.5%	1200 2200	1200+1.5% 2200+1.5%	Hz
CCITT V.23 Mark frequency Space frequency	Signal level=-45dBm, S/N=25 Baud rate=1200Bps	1300-1.5% 2100-1.5%	1300 2100	1300+1.5% 2100+1.5%	Hz
Bandpass frequency response	60Hz 100Hz 400Hz 500Hz 1200Hz 2200Hz 2700Hz 3500Hz 4000Hz	-	-48.0 -34.9 -1.6 0.4 1.3 0.8 -2.1 -31.6 -52.8	-	dB

Bonding Diagram

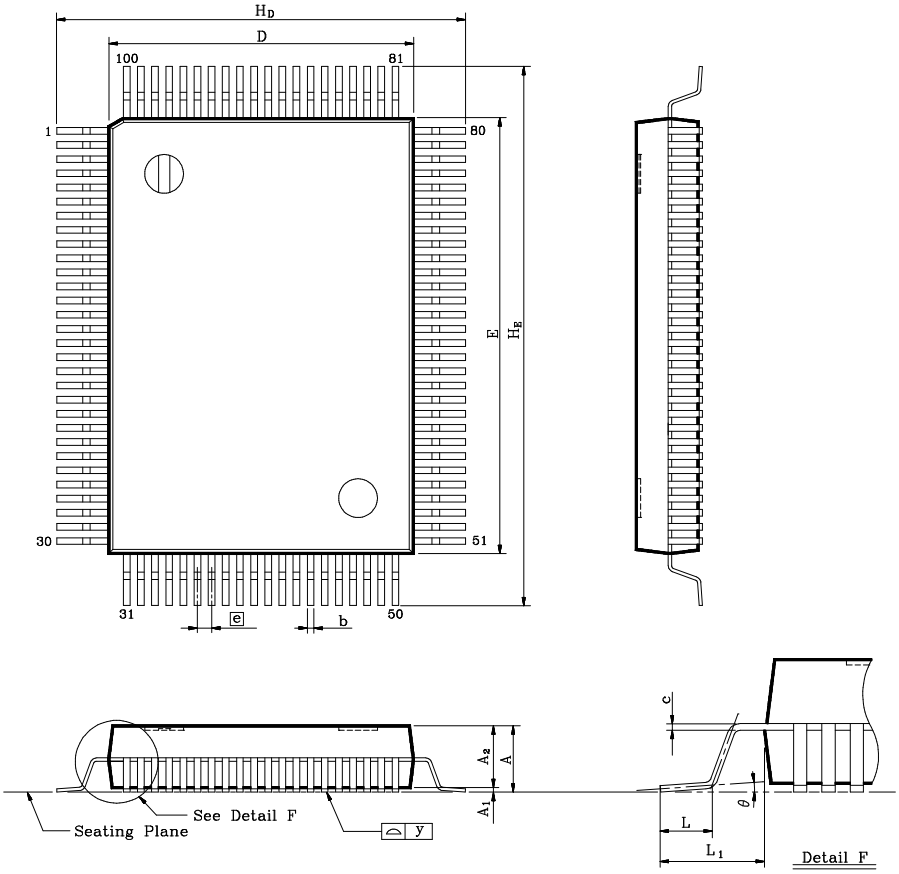


Unit: in um
X: 3670 Y: 3290

Note: Substrate is connected to GND

Pad No.	Name	X	Y	Pad No.	Name	X	Y
1	TIP	66.910	2923.85	51	COM13	3423.76	162.943
2	RING	67.876	2800.69	52	COM12	3423.69	289.075
3	RD1	68.773	2679.39	53	COM11	3423.28	417.139
4	VIN	70.567	2560.85	54	COM10	3420.66	532.30
5	RTIME	68.773	2440.44	55	COM9	3423.21	658.915
6	AVSS	68.733	2320.04	56	COM8	3421.14	774.559
7	VLCD0	63.253	2201.01	57	COM7	3424.79	895.102
8	SEG40	68.980	2076.74	58	COM6	3423.76	1019.09
9	SEG39	66.358	1959.72	59	COM5	3421.69	1135.77
10	SEG38	65.530	1843.31	60	COM4	3421.62	1258.73
11	SEG37	66.910	1716.77	61	COM3	3423.21	1376.52
12	SEG36	67.048	1597.95	62	COM2	3418.52	1497.33
13	SEG35	66.565	1140.52	63	COM1	3419.07	1617.67
14	SEG34	66.427	1360.59	64	XTALO	3422.31	1738.83
15	SEG33	65.185	1237.43	65	XTALI	3422.31	1860.0
16	SEG32	62.425	1117.09	66	RESETB	3418.31	1979.71
17	SEG31	60.976	1000.07	67	VSS	3421.69	2097.15
18	SEG30	61.735	875.935	68	PIOA7	3425.62	2220.73
19	SEG29	62.425	750.631	69	PIOA6	3421.97	2339.20
20	SEG28	61.183	632.434	70	PIOA5	3420.93	2461.33
21	SEG27	63.046	513.685	71	PIOA4	3420.52	2578.43
22	SEG26	61.045	372.925	72	NMIB	3423.42	2699.11
23	SEG25	60.838	231.061	73	EAB	3421.76	2824.07
24	SEG24	109.207	65.185	74	RI-CTL	3423.97	2951.92
25	SEG23	250.657	64.426	75	LED	3379.32	3082.47
26	SEG22	391.417	67.531	76	PIOA3	3250.78	3081.92
27	SEG21	511.270	66.703	77	PIOA2	3125.61	3082.82
28	SEG20	630.571	65.185	78	PIOA1	3005.34	3080.68
29	SEG19	748.423	66.289	79	PIOA0	2886.11	3080.68
30	SEG18	875.245	64.702	80	VDD	2761.91	3080.06
31	SEG17	990.20	63.115	81	PI7	2645.72	3080.47
32	SEG16	1113.64	66.220	82	PI6	2522.27	3080.81
33	SEG15	1237.36	65.185	83	PI5	2405.39	3081.50
34	SEG14	1355.35	64.702	84	PI4	2285.74	3080.81
35	SEG13	1478.31	65.185	85	PI3	2164.37	3081.16
36	SEG12	1598.92	64.702	86	PI2	2044.86	3081.09
37	SEG11	1723.67	65.737	87	PI1	1923.84	3082.61
38	SEG10	1846.01	65.737	88	PI0	1804.19	3079.71
39	SEG9	1967.17	65.737	89	PIOB5	1685.37	3081.92
40	SEG8	2080.74	66.220	90	PIOB4	1565.04	3081.50
41	SEG7	2203.22	67.324	91	PIOB3	1442.56	3080.06
42	SEG6	2327.70	66.289	92	PIOB2	1324.57	3081.50
43	SEG5	2442.79	66.772	93	PIOB1	1202.58	3083.50
44	SEG4	2565.19	66.220	94	PIOB0	1084.94	3080.06
45	SEG3	2687.81	67.807	95	OSCO	963.22	3080.75
46	SEG2	2804.49	65.185	96	OSCI	844.126	3081.23
47	SEG1	2927.03	66.772	97	RXD	706.54	3080.26
48	COM16	3045.50	63.874	98	RTONE	550.255	3081.85
49	COM15	3172.32	64.288	99	DTONE	387.208	3082.54
50	COM14	3297.15	63.046	100	AVDD	234.718	3083.64

Package Diagram



Symbol	Dimension(inch)			Dimension(mm)		
	Min	Typ	Max	Min	Typ	Max
A	0.106	0.118	0.130	2.70	**3.00**	3.30
A1	0.004	0.020	0.036	0.11	**0.51**	0.91
A2	0.102	0.112	0.122	2.60	**2.85**	3.10
b	0.007	0.012	0.017	0.18	**0.30**	0.42
c	0.002	0.006	0.010	0.04	**0.15**	0.26
D	0.541	0.551	0.561	13.75	**14.00**	14.25
E	0.778	0.787	0.797	19.75	**20.00**	20.25
e	0.020	0.026	0.031	0.50	**0.65**	0.80
HD	0.726	0.740	0.754	18.45	**18.80**	19.15
HE	0.963	0.976	0.990	24.45	**24.80**	25.15
L	0.039	0.047	0.055	1.00	**1.20**	1.40
L1	0.089	0.094	0.104	2.25	**2.40**	2.65
y	—	—	0.04	—	—	0.10
θ	0 °	—	12 °	0 °	—	12 °

NOTE:

1.Dimension D & E do not include interlead flash.

2.Dimension b does not include dambar protrusion /intrusion.

3.Controlling dimension: Millimeter on final visual inspection spec.

4.General appearance spec. should be based on final visual inspection spec.

TITLE :

100L QFP (14x20 mm2) FOOTPRINT 4.8 mm**

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