GENERAL DESCRIPTION

DV9658 is a CMOS LSI calculator chip with 8 digits arithmetic operations, single memory, percentage and extraction-of-square-root calculations, designed for triplex LCD application with solar cell power supply.

FUNCTIONS

- Four standard functions (+, -, x, ÷).
- Auto-constant calculations (constant : multiplicand, divisor, addend and subtrahend).
- Square and reciprocal calculations.
- Mark-up and mark-down calculations.
- Extraction of square root.
- Percentage calculations.
- Chain multiplication and division.
- Power calculations.
- Rough estimate calculations.

APPLICATION

This specification contains complete informations of functional operations, electrical characteristics, packaging, and crating requirements of C9318D.

FEATURES

- Accumulating memory : M+, M-, RM, CM, RM/CM.
- Rollover capability.
- Floating decimal.
- Overflow indication.
- 8-digit LCD triplex.
- Automatic power off function.

FUNCTIONAL DESCRIPTION

a. Floating point system

i) 8 digits floating decimal point system, with leading zero suppression, Zero shift.

ii) Symbols   : '-' negative number indicator.

: 'E' Error status indicator.

: 'M' Non-zero memory indicator.

b. Error Detections

i) System errors occur when :

- The integral part of any calculation result exceeds 8 digits.
- The integral part of any memory calculation result exceeds 8 digits.
- The integral part of any addend or subtrahend to memory exceed 8 digits.
- The integral part of a mark-up or mark-down calculation result exceeds 8 digits.
- The division by zero.
- The extraction of square root of a negative number.

ii) Rough estimate calculation error

- The integral part of the result of any standard functions, percentage, square, reciprocal or power calculations exceeds 8 digits and is equal to 16 digits or less.

c. Error Indication

i) System error

'0' is indicated in the 1-digit position and 'E' in the sign indicator position.

ii)Rough estimate calculation error

The high-order 8 digits of a calculation result is indicated together with 'E'. The decimal point is indicated in the position corresponding to a calculation result times 10^{-8}, and no zero shift is performed.

d. Error Release

i) System error can be released by the ON/C or ON/CE key.

ii)Rough estimate calculation error can be released by the ON/C, ON/CE, CE key.

e. Number Entry

Numerical can be entered up to 8 digits, entries that equal to 9 digits or more will be ignored.
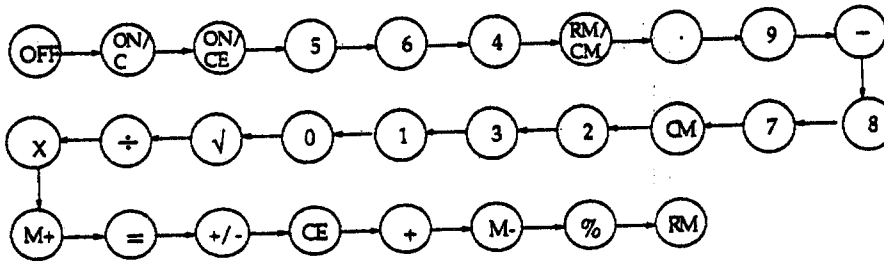
f. Memory Protection

The memory contents before any error detection are protected.

g. Memory Indication

If the memory contents is non-zero, 'M' is indicated in the memory indicator position.

h. Double Key Depression

The order of priority when two keys are being depressed simultaneously is as follows :

When the OFF and ON/C key are depressed simultaneously, the OFF key is given priority.

i. Key bounce protection

i) Front edge : down to 1 word and up to about 3 words.

ii)Trailing edge : 9 words. (1 word is 3.3ms when display frequency is Fd=100Hz.)

j. Auto Power Off

Power automatically turns off after 9 - 11 minutes pass from the last key press.

k. Clear Operation

All operations except memory content are cleared by ON/C key.

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Value	Unit	Note
Terminal voltage	VDD	- 0.3 ~ + 2.0	V	1
	VIN	- 0.3 ~ VDD + 0.3	V	1
Solar Supply Voltage	VSB	1.1 ~ 3.0	V	2
	VGG (LIM)	1.1 ~ 1.8	V	3
Operating temperature range	TOPR	0 ~ + 50	°C	--
Storage temperature range	TSTG	- 55 ~ + 125	°C	--

Note 1   : Maximum voltage on any pin is referenced to GND.

Note 2 :VSB is solar supply voltage.

Note 3 :VGG (lim) is limited voltage.

ELECTRICAL CHARACTERISTICS

(Ta = 25°C, V_{DD} = 1.5V unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Input Voltage	V_{IH}	VDD-0.4	--	--	V	—	4
	V_{IL}	--	--	0.4	V	--	
Input Current	I_{IH}	--	--	1	μA	V_{IN} = VDD	5
	I_{IL}	0.3	1	3	μA	V_{IN} = 0V	
Output Voltage 1	V_{OH}	VDD-0.15	--	--	V	No load	6
	V_{OL}	--	--	0.15	V	I_{OUT} = 15μA	
	V_{OA}	2.8	2.95	--	V	No load	
Output Voltage 2	V_{OB}	1.3	1.5	1.7	V	No load	7
	V_{OC}	--	0	0.2	V	No load	
Display Frequency	F_d	40	55	65	Hz	V_{DD} = 1.3V while display is ON.	7
	I_{OFF}	--	--	0.1	μA	Display is OFF	8
Dissipation Current	I_{DIS}	--	4.2	6	μA	V_{DD} = 1.3V while display is on.	9
	I_{OP}	--	6.8	--	μA	V_{DD} = 1.1V , while operation.	10

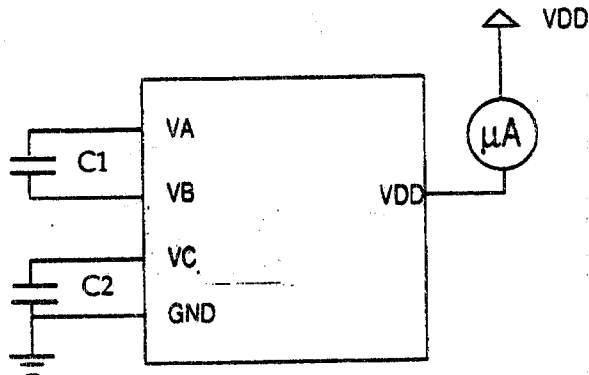Note 4 : Applies to Pins K2 ~ K6.
Note 5 : Applies to Pins K2 ~ K6.
Note 6 : Applies to P1,P2, A2X ~ A5X.
Note 7 : Applies to H1 ~ H3, A1 ~ A8, B1 ~ B8, C1 ~ C8.
Note 8 : Measured by the test circuit below after power supply automatically turns off.

Note 9 : Measured by the test circuit while "0" is being displayed after auto - clear operation and while key is not being depressed.
Note 10 : Measured by the test circuit while operation is being made by ON/C key and while key is not being depressed.

LCD BACKPLANE OUTPUT WAVEFORM

3
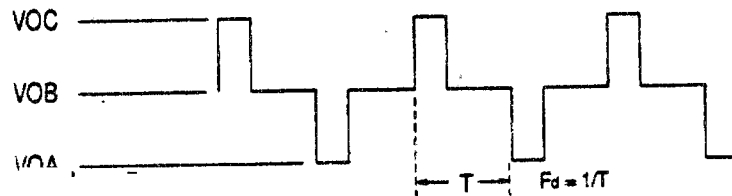
0123456789

b. Sign Font

M   **—**   **E**
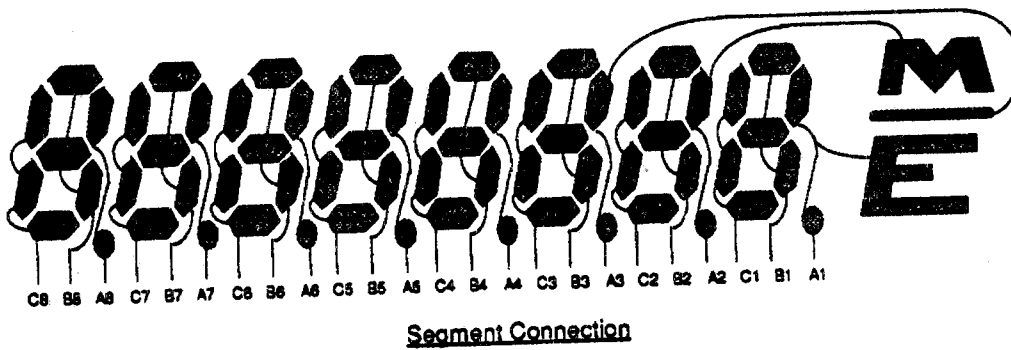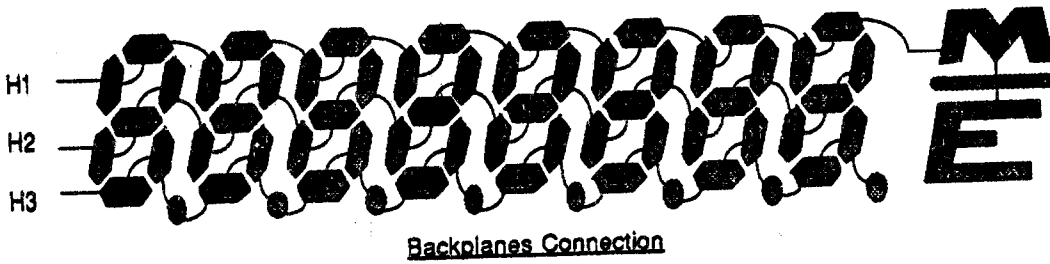
Memory indicator   Negative   Error indicator

LCD CONNECTOR

| H2 | H3 | C8 | B8 | A8 | C7 | B7 | A7 | C6 | B6 | A6 | C5 | B5 | A5 | C4 | B4 | A4 | C3 | B3 | A3 | C2 | B2 | A2 | C1 | B1 | A1 | H1 |

LCD Panel

H1

H2

H3

Backplanes Connection

| C8 | B8 | A8 | C7 | B7 | A7 | C6 | B6 | A6 | C5 | B5 | A5 | C4 | B4 | A4 | C3 | B3 | A3 | C2 | B2 | A2 | C1 | B1 | A1 |

Segment Connection

4

PIN DESCRIPTION
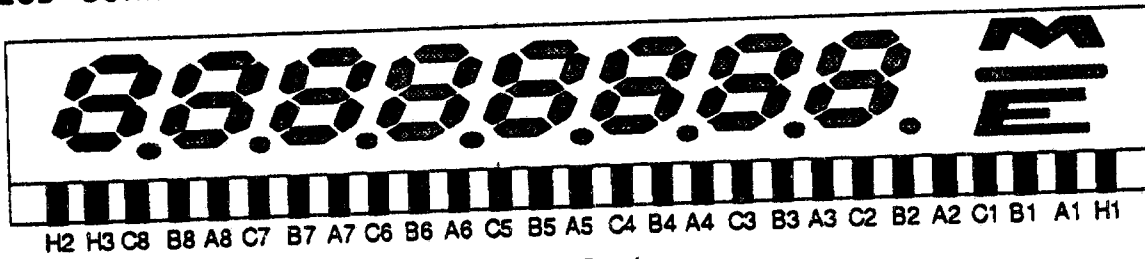
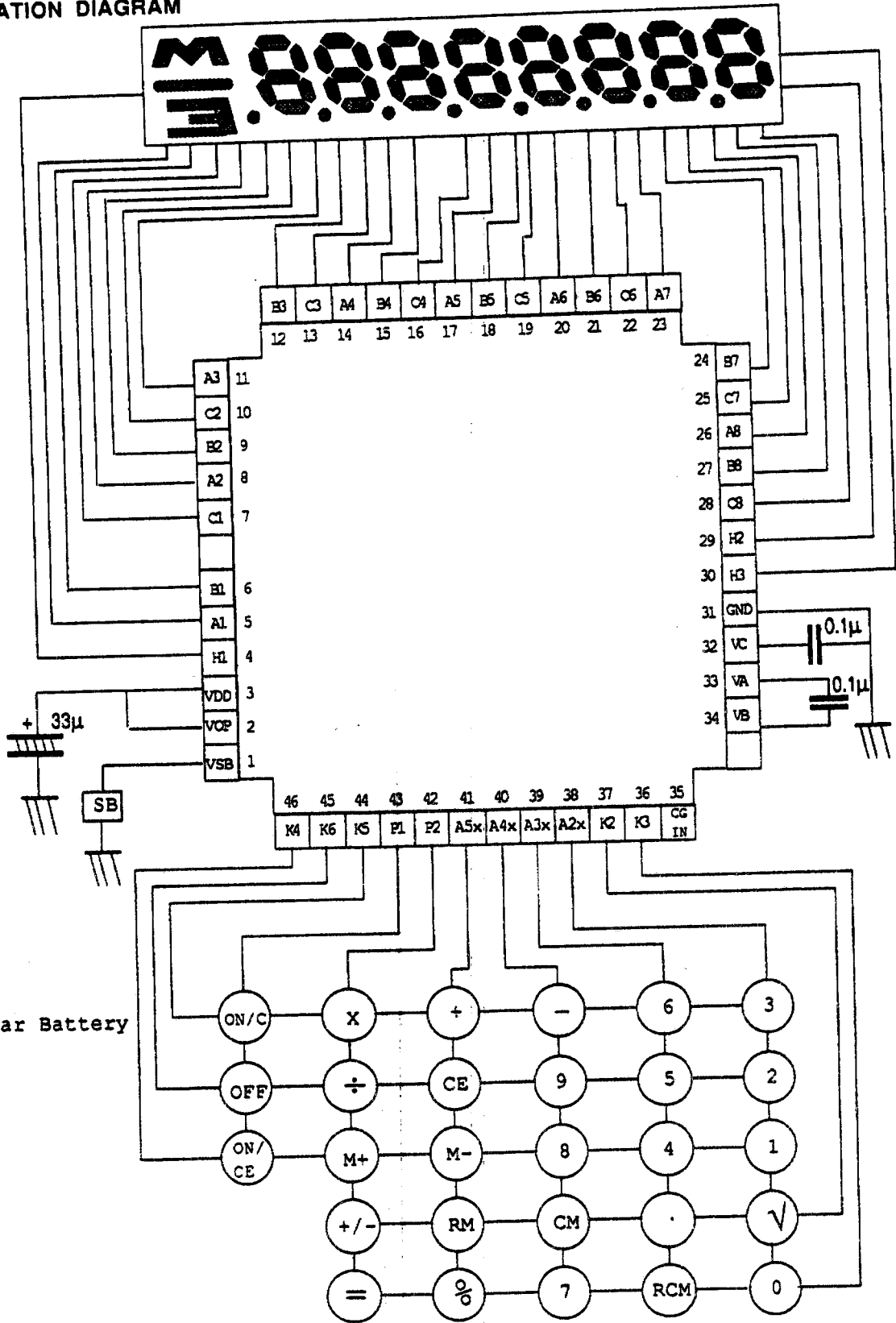| Pin No.	Signal	I/O	Description	Pin No.	Signal	I/O	Description
1	VSB	1	Solary Battery	24	B7	O	Display output.
2	Vop	1	Option Pin	25	C7	O	Display output.
3	VDD		Power supply.	26	A8	O	Display output.
4	H1	O	Display output.	27	B8	O	Display output.
5	A1	O	Display output.	28	C8	O	Display output.
6	B1	O	Display output.	29	H2	O	Display output.
7	C1	O	Display output.	30	H3	O	Display output.
8	A2	O	Display output.	31	GND		Ground.
9	B2	O	Display output.	32	VC	O	Cap terminal for voltage step-up.
10	C2	O	Display output.	33	VA	O	Cap terminal for voltage step-up.
11	A3	O	Display output.	34	VB	O	Cap terminal for voltage step-up.
12	B3	O	Display output.	35	CGin	I	Input terminal for CG.
13	C3	O	Display output.	36	K3	I	Key input.
14	A4	O	Display output.	37	K2	I	Key input.
15	B4	O	Display output.	38	A2X	O	Strobe output.
16	C4	O	Display output.	39	A3X	O	Strobe output.
17	A5	O	Display output.	40	A4X	O	Strobe output.
18	B5	O	Display output.	41	A5X	O	Strobe output.
19	C5	O	Display output.	42	P2	O	Strobe output.
20	A6	O	Display output.	43	P1	O	Strobe output.
21	B6	O	Display output.	44	K5	I	Key input.
22	C6	O	Display output.	45	K6	I	Key input.
23	A7	O	Display output.	46	K4	I	Key input.

SB: Solar Battery

Note : Chip substract must be flloating or connected to GND.

PAD DIAGRAM

Top row (left to right): CGIN, K3, K2, A2X, A3X, A4X, A5X, P2, P1, K5, K6, K4

Left column (top to bottom): VB, VA, VC, GND, H3, H2, C8, B8, A8, C7, B7

Right column (top to bottom): VSB, VOP, VDD, H1, A1, B1, C1, A2, B2, C2, A3

Bottom row (left to right): A7, C6, B6, A6, C5, B5, A5, C4, B4, A4, C3, B3

Die Size = 75 mil X 82 mil
Pad Size = 86 um X 86 um
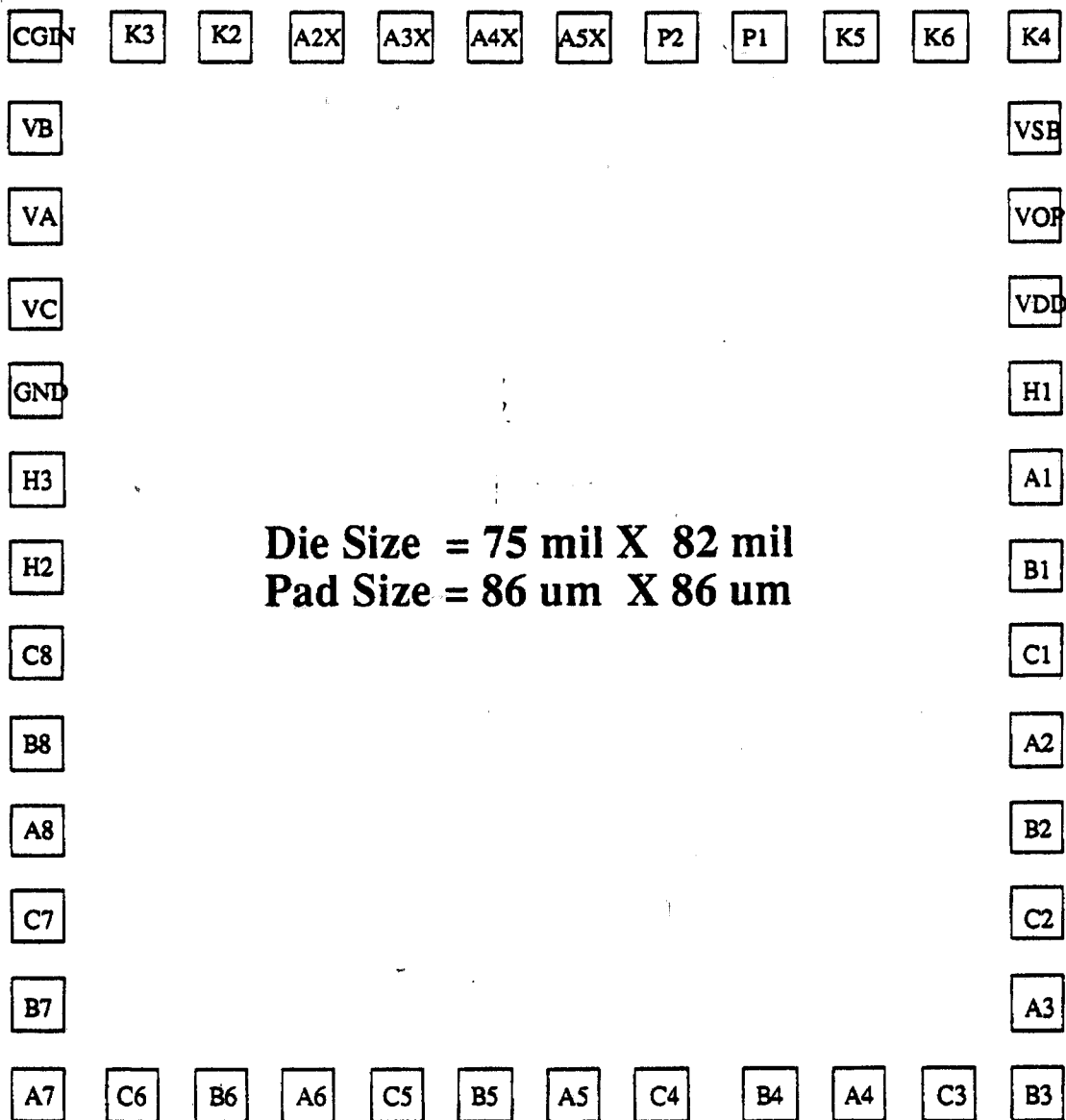
The Coordiante for Low Left Corner of Each Pad

A7(-869.0, -922.7)	A3 (782.9, -776.8)	K4 (782.9, 836.7)	VB (-869.0, 684.1)
C6(-713.1, -922.7)	C2 (782.9, -630.8)	K6 (628.6, 836.7)	VA (-869.0, 538.0)
B6(-567.0, -922.8)	B2 (782.9, -484.9)	K5 (481.1, 836.7)	VC (-869.0, 392.1)
A6(-420.9, -922.7)	A2 (782.9, -338.8)	P1 (331.8, 836.7)	GND(-869.0, 246.0)
C5(-274.6, -922.7)	C1 (782.9, -192.8)	P2 (184.8, 836.7)	H3 (-869.0, 100.1)
B5(-128.6, -922.7)	B1 (782.9, - 46.8)	A5X (37.8, 836.7)	H2 (-869.0, - 46.1)
A5(17.5, -922.7)	A1 (782.9, 99.2)	A4X (-109.2, 836.7)	C8 (-869.0, -192.2)
C4(163.4, -922.7)	H1 (782.9, 245.2)	A3X (-256.2, 836.7)	B8 (-869.0, -338.8)
B4(343.3, -922.7)	VDD(782.9, 391.1)	A2X (-403.2, 836.7)	A8 (-869.0, -484.7)
A4(489.5, -922.7)	VOP(782.9, 537.2)	K2 (-553.3, 836.7)	C7 (-869.0, -630.7)
C3(635.9, -922.8)	VSB(782.9, 683.2)	K3 (-700.3, 836.7)	B7 (-869.0, -776.7)
B3(782.9, -922.8)		CGIN(-870.0, 836.7)	

1602

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