

**EP-78230**  
**EMULATION PROBE**

**EP-78230GC-R**  
**EP-78230GJ-R**  
**EP-78230LQ-R**

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## PREFACE

**Target:** This manual is intended for the user who uses in-circuit emulator and EP-78230GC-R to debug microcomputer.

Refer to the documents of the individual devices and the selection guide of the development tools for the combination of the emulation probes and target devices.

**Purpose:** The purpose of the manual is for the user to understand the connection method of EP-78230GC-R to in-circuit emulator.

**Organization:** This manual consists of following main parts:

- General description
- Connection method

**Guidance:** Before reading this manual, read the in-circuit emulator relevant manuals to understand the debug system configuration and function.

- To understand the **EP-78230GC-R** function and connection method in a general way  
→Read the manual according to the table of contents.
- To understand the operation environment and configuration.  
→Read **Chapter 1 GENERAL DESCRIPTION**.
- To understand the specific connection method  
→Read **Chapter 2 CONNECTION**.

In this manual, the EP-78230GC-R is taken as representative of all the products of the family unless otherwise stated. If this manual is used as a manual for the EP-78230GJ-R or EP-7830LQ-R, the EP-78230GC-R must be regarded as the EP-78230GJ-R or EP-78230LQ-R.

<b>Legend:</b>	<b>Note:</b>	Explanation of indicated part of the text
	<b>Caution:</b>	Information requiring the user's special attention
	<b>Remarks:</b>	Supplementary information

Check: Check the names and quantity of the EP-78230GC-R accessories against the following:  
(If the accessories are not complete, call the NEC sales person or agency.)

- Emulation probe One
- Connector board One
- User's manual (this manual) One
- Mounting screws Two pieces
  - Use the mounting screws to connect the emulation probe and in-circuit emulator.
- Conversion socket
  - Use the conversion socket to connect the emulation probe and target system.  
Note that it is attached only to the EP-78230GC-R and EP-78230GJ-R. See the table below.

**< Connector Board and Conversion Socket Correspondence Table >**

Emulation Probe	Connector Board	Conversion Socket
EP-78230GC-R	80GC CONNECTOR	EV-9200GC-80
EP-78230GJ-R	94GJ CONNECTOR	EV-9200G-94
EP-78230LQ-R	84LQ CONNECTOR	Not Attached

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# CHAPTER 1 GENERAL DESCRIPTION

This chapter outlines the EP-78230GC-R.

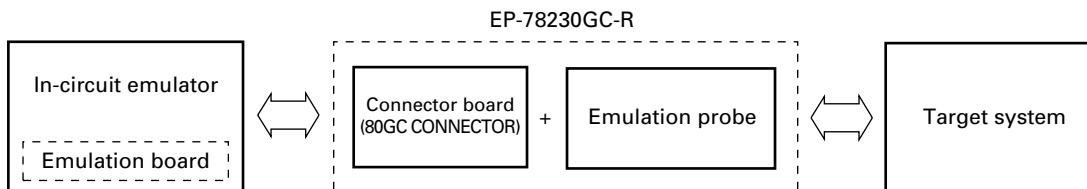
## 1.1 Operation Environment

The EP-78230GC-R is a probe set to connect in-circuit emulator and a target system. When they are connected by the EP-78230GC-R, a microcomputer environment is provided and the target system hardware and software can be debugged totally. See **Chapter 2** for the specific connection method.

**Figure 1-1. Operation Environment**

- Connection of in-circuit emulator and target system

< Example of EP-78230GC-R >



## 1.2 Configuration

The EP-78230GC-R is a set of a emulation probe and connector board.

### (1) Emulation probe

The emulation probe consists of the following:

☐ Probe

Connects in-circuit emulator and target system.

- EP-78230GC-R: 80 pin GC probe
- EP-78230GJ-R: 94 pin GJ probe
- EP-78230LQ-R: 84 pin LQ probe

☐ Ground clip

Is connected to target system GND. In-circuit emulator and target system GND potentials become the same and resistance to static electricity and noise is provided.

☐ External sense clips

These eight sense clips are used to see the pin levels of ICs mounted on the target system.

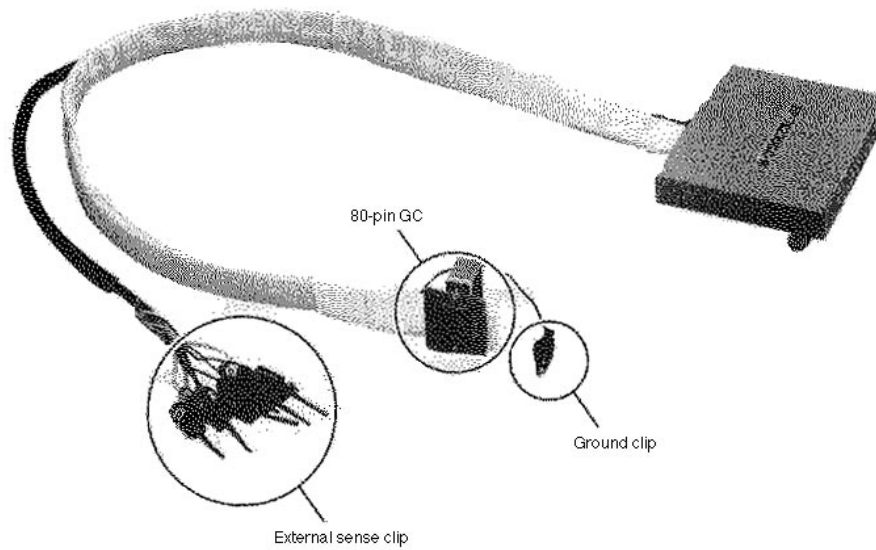
### (2) Connector board

The connector board is a board used to connect the output pins to the emulation probe on the emulation board. The connector board is attached to the emulation board connector <sup>Note</sup>.

**Note** What the connector board is mounted to depends on the board to be connected. See Table 2-1 of this manual and refer to the users' manual of the in-circuit emulator or emulation board.

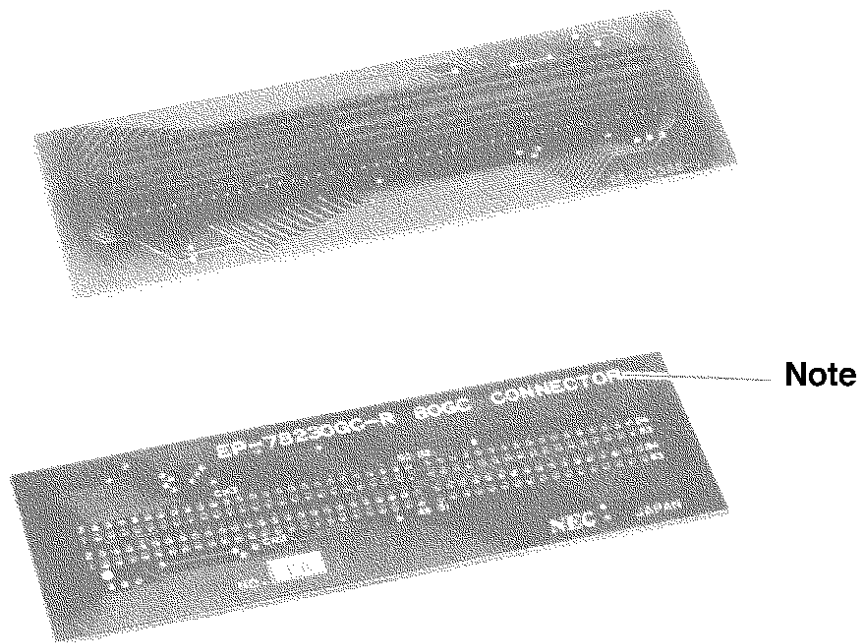
**Figure 1-2. Emulation Probe and Connector Board (EP-78230GC)**

Emulation probe



**Note** The shapes and nomenclatures are different for the individual emulation probes.

**Connector Board (80GC CONNECTOR)**



**Note** There is silk printing of the names corresponding to the probes. Confirm it is in pair with the probe.

[MEMO]

## CHAPTER 2 CONNECTION

This chapter explains the EP-78230GC-R connection method, power on and off sequence, and emulation probe removal method from the target system.

### 2.1 Connection of In-circuit Emulator and Target System

The connection procedure is outlined below:

(1) Connection of emulation board and connector board

The type of the board to be connected depends on the in-circuit emulator to be used.

(2) Connection of in-circuit emulator and emulation probe

(3) Connection of emulation probe and target system

(4) External sense clip connection (when external sense clips are used)

(5) Power on

Next, these connection procedures are explained in detail.

## (1) Connection of connector board

Which board the connector board is connected to depends on the target device.  
See Table 2-1 for the type of board to be connected and the CN numbers of each board.  
The  $\mu$ PD78234 subseries is taken as an example of the target device to be connected.

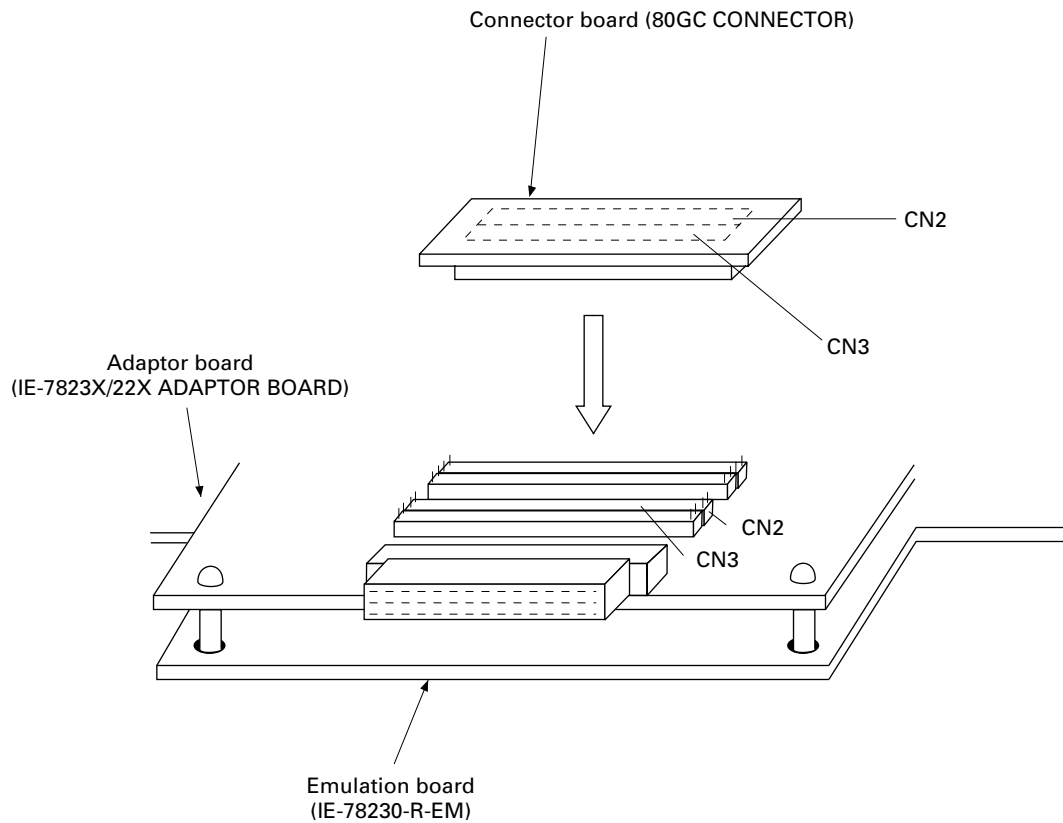
**Caution** If the connector board is inserted with a wrong connector, the in-circuit emulator may be broken.

- Connection example of connector board

The connector board is connected to the IE-7823X/22X ADAPTER BOARD which is fixed to emulation board IE-78230-R-EM.

Insert CN2 and CN3 of the connector board to those of the adapter board in such a way that the pin numbers coincide. See **Figure 2-1**.

**Figure 2-1. Connector Board Connection**



**Remark** The shape of the emulation board depends on the type of the pertinent product. The connection steps to the connector board, however, are the same as shown in Figure 2-1. Refer to the user's manual of the individual in-circuit emulators for the details of board mounting to the in-circuit emulator.

**Table 2-1. Board to be Connected**

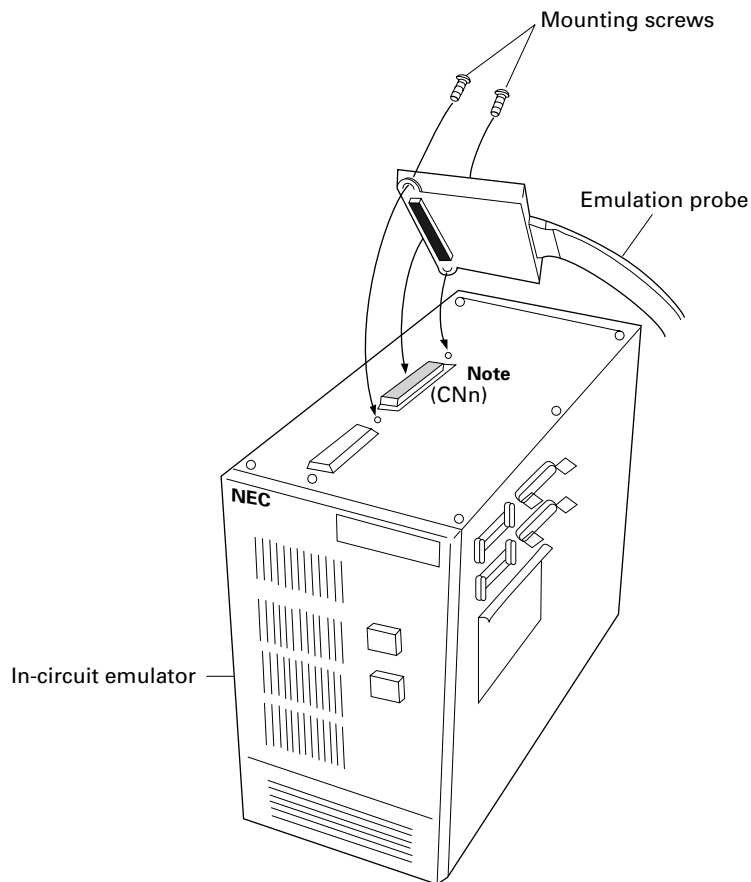
Emulation probe (connector board name)	Series name	Corresponding package	Adapter board	Emulation board	In-circuit emulator	Connector No. to be connected	
						Boards	Connector boards
EP-78230GC-R (80GC CONNECTOR)	$\mu$ PD78054 subseries	80-pin QFP (14 x 14mm)	None	IE-78064-R-EM	IE-78000-R	CN6 ↔ CN2 CN5 ↔ CN3	
	$\mu$ PD78098 subseries		None	IE-78098-R-EM		CN6 ↔ CN2 CN5 ↔ CN3	
	$\mu$ PD78234 subseries		IE-7823X/22X (fixed to emulation board)	IE-78230-R-EM	IE-78230-R	CN2 ↔ CN2 CN3 ↔ CN3	
	$\mu$ PD784026 subseries		None	IE-784000-R-EM + IE-784026-R-EM1 (I/O emulation board)	IE-784000-R	CN2 ↔ CN2 CN3 ↔ CN3	
EP-78230-GJ-R (94GJ CONNECTOR)	$\mu$ PD78224 subseries	94-pin QFP (20 x 20mm)	IE-7823X/22X (fixed to emulation board)	IE-78230-R-EM	IE-78230-R	CN4 ↔ CN2 CN5 ↔ CN3	
	$\mu$ PD78234 subseries					CN2 ↔ CN2 CN3 ↔ CN3	
EP-78230LQ-R (84LQ CONNECTOR)	$\mu$ PD78224 subseries	84-pin QFJ	IE-7823X/22X (fixed to emulation board)	IE-78230-R-EM	IE-78230-R	CN4 ↔ CN2 CN5 ↔ CN3	
	$\mu$ PD78234 subseries					CN2 ↔ CN2 CN3 ↔ CN3	

## (2) Connection of in-circuit emulator and emulation probe

The connection procedure is outlined below:

- 1) Connect the emulation probe to the emulation probe connection DIN connector on the in-circuit emulator top.
- 2) After connection, be sure to fix the emulation probe and in-circuit emulator with mounting screws.

**Figure 2-2. Connection of In-circuit Emulator Main Unit and Emulation Probe Example**



**Note** The Connecting parts may be different, according to the emulation board used. Refer to the in-circuit emulator or emulation board User's Manual.

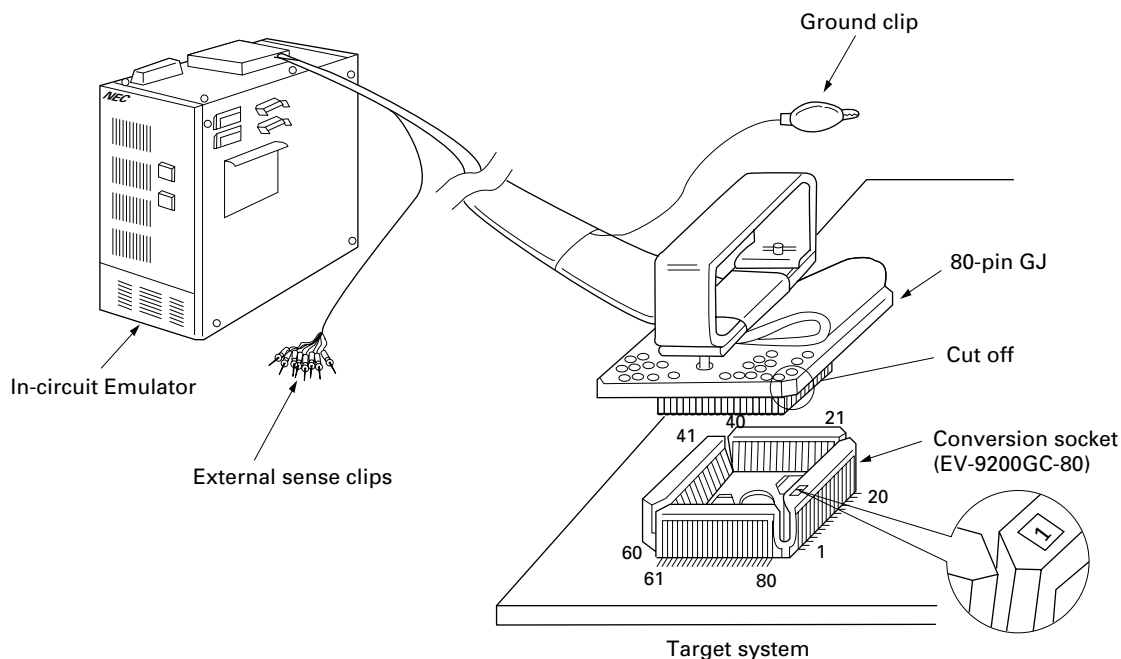
## (3) Connection of emulation probe and target system

Connect the emulation probe and target system in the following sequence:

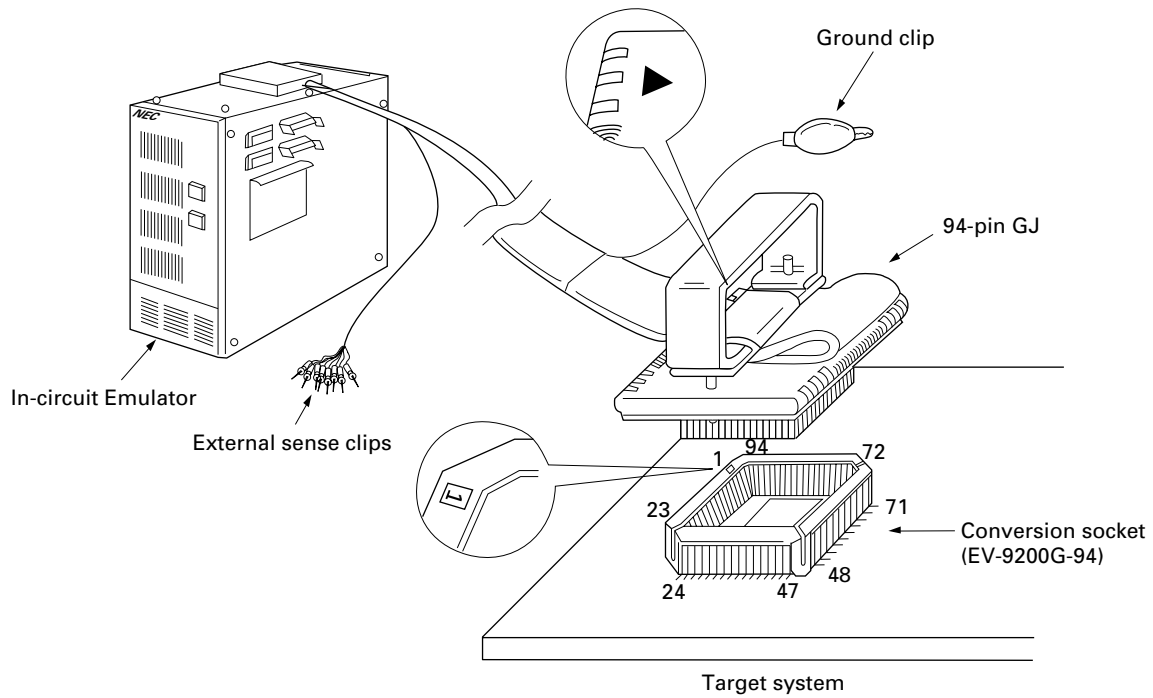
- Cautions**
1. Before connecting the probe to the target system, be sure to connect the ground clip first. If the ground clip is not connected, in-circuit emulator may be destroyed due to static electricity, etc.
  2. In connection, be careful so as not to insert the pins oppositely. If erroneous connection is made, in-circuit emulator may be destroyed.

- 1) Turn of the target system power.
- 2) Solder the conversion socket (accessory: EV-9200GC-80, EV-9200-94) to the target system. Use a commercial QFJ socket for the LQ probe.
- 3) Connect the emulation probe ground clip to the target system ground (GND).
- 4) Insert the emulation probe so that the tip of the emulation probe main unit couples with pin 1 of the conversion socket or the socket QFJ soldered on the target system in 2).

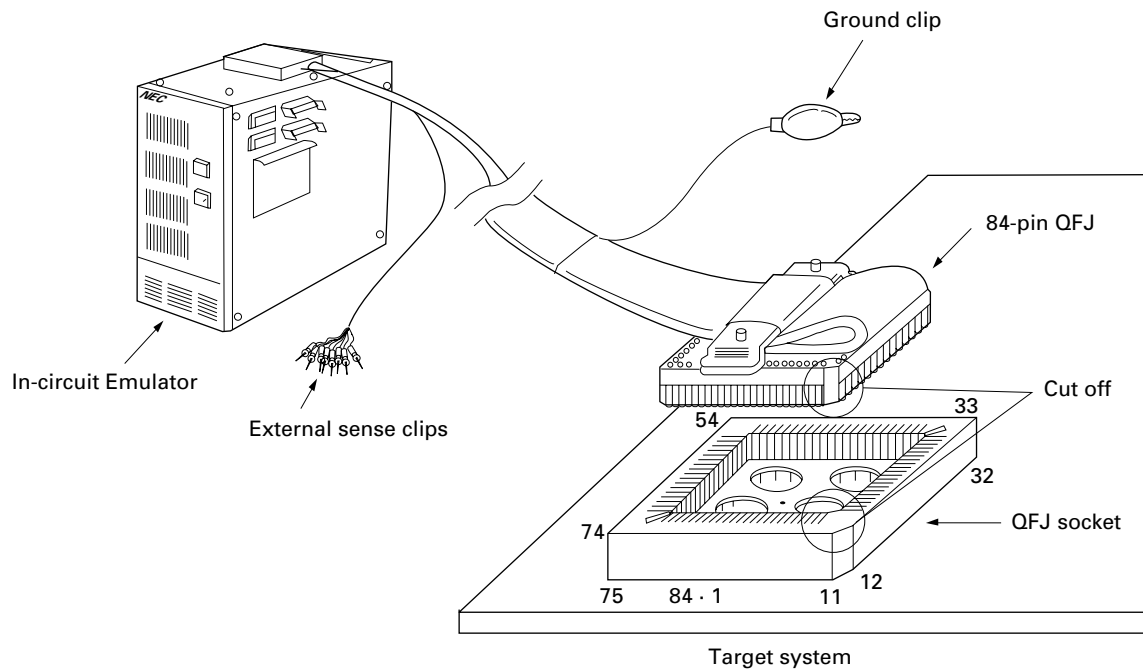
**Figure 2-3. Connection of EP-78230GC-R and Target System**



**Figure 2-4. Connection of EP-78230GJ-R and Target System**



**Figure 2-5. Connection of EP-78230LQ-R and Target System**



#### (4) External sense clip connection

The emulation probe has eight external sense clips that can trace the signals on the target system in realtime.

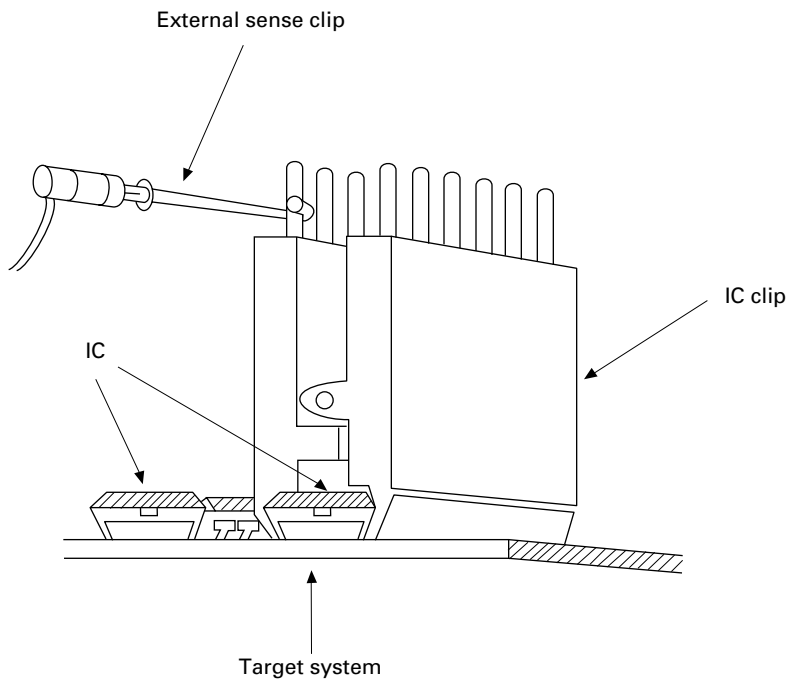
The external sense clips are directly connected to the input buffer HCT244 installed in the in-circuit emulator proper, therefore their input levels are TTL levels. The eight external sense clips are usually input signal lines, but the signal line of the No.1 external sense clip can be used as the trigger output signal line to the external circuit at the time an event is generated by setting an in-circuit emulator OUT command. Refer to the in-circuit emulator user's manual.

- |                 |  |
|-----------------|--|
| <b>Cautions</b> | <ol style="list-style-type: none"><li><b>1. Connect the external sense clips only to TTL level signal lines. If the external sense clip is connected to any other signal line than the TTL level, accurate high or low level cannot be detected. The in-circuit emulator sensor may be destroyed depending on the voltage level.</b></li><li><b>2. When the No.1 external sense clip is used as an external trigger output, be sure it be not connected to the signal output line. Negligence in this may result in trouble.</b></li></ol> |
|-----------------|--|

To use the external sense clips, connect in the following sequence:

- 1) Turn off the target system power and the in-circuit emulator power in order.
- 2) Attach a commercially available IC clip to any IC to be traced on the target system.
- 3) Connect the external sense clip to the attached IC clip.
- 4) Turn on the in-circuit emulator power and the target system power in order.

**Figure 2-6. External Sense Clip Connection**



**Remark** To connect the external sense clips, preferably use IC clips. Touch mistake can be prevented to improve operability.

## 2.2 Power On and Off Sequence

Upon completion of connection of the emulation probe and target system, next turn on the power. The power on and off sequence is as follows:

**Caution** Be sure to turn on and off the power in the sequence described below. If you turn on and off the power in erroneous sequence, in-circuit emulator may be destroyed.

### (1) Power on sequence

- 1) Turn on the in-circuit emulator power.
- 2) Turn on the target system power.

### (2) Turn off sequence

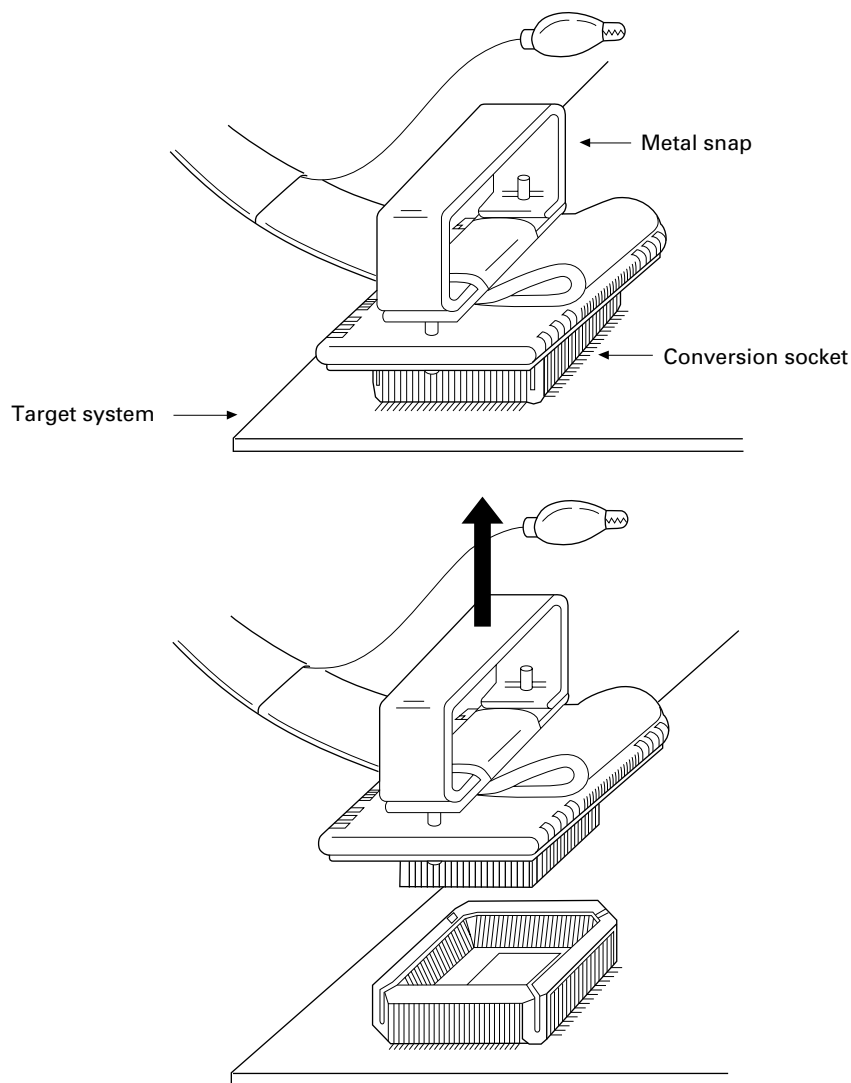
- 1) Turn off the target system power.
- 2) Turn off the in-circuit emulator power.

### 2.3 Removal of Emulation Probe from Target System

Remove the emulation probe from the target system in the following sequence:

- (a) EP-78230GC-R and EP-78230GJ-R
- 1) Turn off the target system power.
  - 2) Turn off the in-circuit emulator power.
  - 3) Pull the metal snap at the emulation probe tip just above and draw out the emulation probe from the conversion socket.

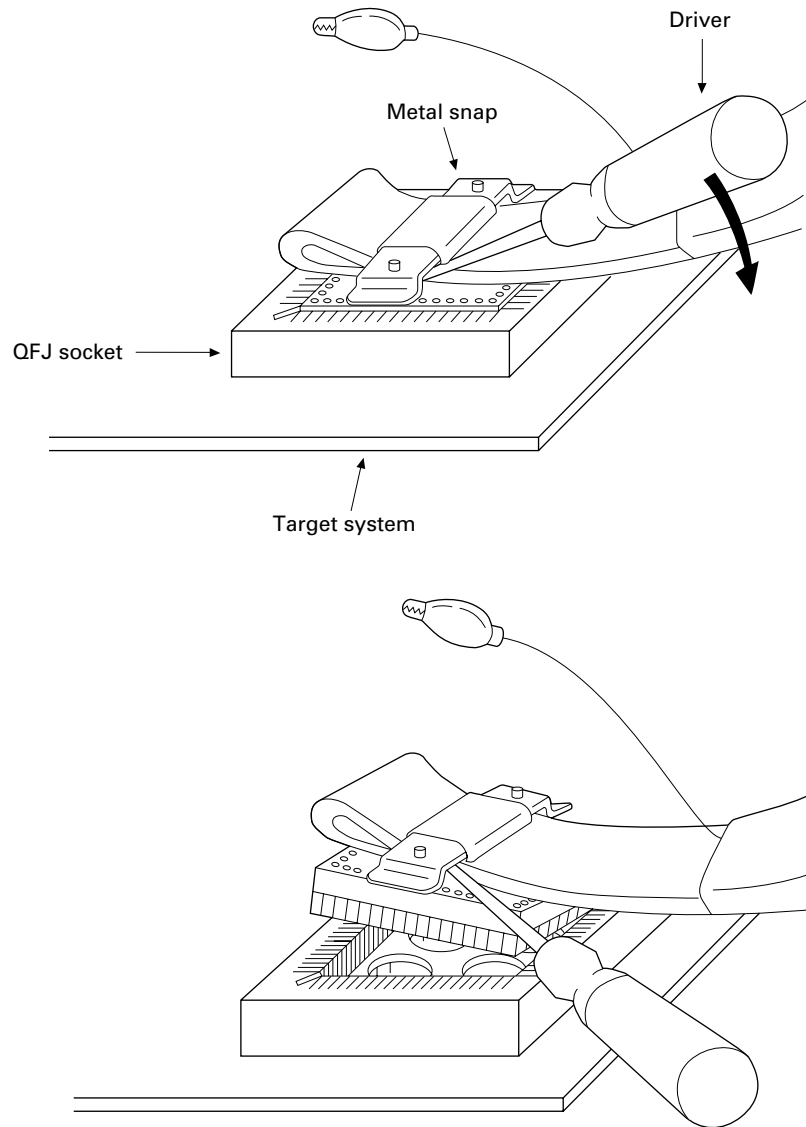
**Figure 2-7. Removal of EP-78230GJ-R**



**Remark** Remove the EP-78230GC-R in the same way as shown in Figure 2-7.

## (b) EP-78230LQ-R

- 1) Turn off the target system power.
- 2) Turn off the in-circuit emulator power.
- 3) Insert a screw driver etc. between the QJF socket and the metal snap provided at the tip of the emulation probe. Pull it down to remove the emulation probe from the QJF socket.

**Figure 2-8. Removal of EP-78230LQ-R**

[MEMO]

## APPENDIX A EMULATION PROBE PIN CORRESPONDENCE TABLE

### A.1 80-pin GC Emulation probe

CNn Pin No.	Emulation probe	CNn Pin No.	Emulation probe	CNn Pin No.	Emulation probe	CNn Pin No.	Emulation probe
1	GND	25	15	49	34	73	61
2		26	16	50	33	74	NC
3	EXT0	27	17	51	32	75	
4	EXT1	28	18	52	31	76	70
5	EXT2	29	19	53	41	77	69
6	EXT3	30	20	54	42	78	68
7	EXT4	31	21	55	43	79	67
8	EXT5	32	NC	56	44	80	66
9	EXT6	33	NC	57	45	81	65
10	EXT7	34	30	58	46	82	64
11	1	35	29	59	47	83	63
12	2	36	28	60	48	84	62
13	3	37	27	61	49	85	80
14	4	38	26	62	50	86	79
15	5	39	25	63	51	87	78
16	6	40	24	64	52	88	77
17	7	41	23	65	53	89	76
18	8	42	22	66	54	90	75
19	9	43	40	67	55	91	74
20	10	44	39	68	56	92	73
21	11	45	38	69	57	93	72
22	12	46	37	70	58	94	71
23	13	47	36	71	59	95	GND
24	14	48	35	72	60	96	

**Remarks** 1. CNn pin No.

CNn: Connector connecting the emulation probe.

The n value may be different, according to the emulation board connected. Refer to the emulation board or in-circuit emulator User's Manual.

2. The meanings of the symbols and number under emulation probe have the following meanings.

GND : Ground clip (GND)  
EXT0-EXT7 : External sense clip 1-8  
1-80 : Pin numbers of 80-pin GC at emulation probe tip  
NC : No connection

## A.2 94-pin GJ Emulation probe

CN1 Pin No.	Emulation probe	CN1 Pin No.	Emulation probe	CN1 Pin No.	Emulation probe	CN1 Pin No.	Emulation probe
1	GND	25	88	49	19	73	47
2		26	89	50	20	74	48
3	EXT0	27	90	51	21	75	49
4	EXT1	28	91	52	23	76	50
5	EXT2	29	92	53	24	77	51
6	EXT3	30	93	54	25	78	52
7	EXT4	31	94	55	26	79	54
8	EXT5	32	1	56	27	80	56
9	EXT6	33	2	57	28	81	57
10	EXT7	34	3	58	29	82	58
11	72	35	4	59	30	83	59
12	73	36	5	60	32	84	61
13	74	37	6	61	33	85	62
14	75	38	7	62	34	86	63
15	76	39	8	63	36	87	64
16	77	40	9	64	37	88	65
17	79	41	10	65	38	89	66
18	80	42	11	66	39	90	22
19	81	43	12	67	40	91	67
20	82	44	14	68	42	92	68
21	83	45	15	69	43	93	69
22	85	46	16	70	44	94	71
23	86	47	17	71	45	95	GND
24	87	48	18	72	46	96	

**Remarks** 1. CN1: Connector connecting the emulation probe.

2. The meanings of the symbols and number under emulation probe have the following meanings.

GND : Ground clip (GND)  
 EXT0-EXT7 : External sense clip 1-8  
 1-94 : Pin numbers of 94-pin GJ at emulation probe tip  
 NC : No Connection

**A.3 84-pin LQ Emulation probe**

<b>CN1 Pin No.</b>	<b>Emulation probe</b>	<b>CN1 Pin No.</b>	<b>Emulation probe</b>	<b>CN1 Pin No.</b>	<b>Emulation probe</b>	<b>CN1 Pin No.</b>	<b>Emulation probe</b>
<b>1</b>	<b>GND</b>	<b>25</b>	<b>26</b>	<b>49</b>	<b>50</b>	<b>73</b>	<b>74</b>
<b>2</b>		<b>26</b>	<b>27</b>	<b>50</b>	<b>51</b>	<b>74</b>	<b>75</b>
<b>3</b>	<b>EXT0</b>	<b>27</b>	<b>28</b>	<b>51</b>	<b>52</b>	<b>75</b>	<b>76</b>
<b>4</b>	<b>EXT1</b>	<b>28</b>	<b>29</b>	<b>52</b>	<b>53</b>	<b>76</b>	<b>77</b>
<b>5</b>	<b>EXT2</b>	<b>29</b>	<b>30</b>	<b>53</b>	<b>54</b>	<b>77</b>	<b>78</b>
<b>6</b>	<b>EXT3</b>	<b>30</b>	<b>31</b>	<b>54</b>	<b>55</b>	<b>78</b>	<b>79</b>
<b>7</b>	<b>EXT4</b>	<b>31</b>	<b>32</b>	<b>55</b>	<b>56</b>	<b>79</b>	<b>80</b>
<b>8</b>	<b>EXT5</b>	<b>32</b>	<b>33</b>	<b>56</b>	<b>57</b>	<b>80</b>	<b>81</b>
<b>9</b>	<b>EXT6</b>	<b>33</b>	<b>34</b>	<b>57</b>	<b>58</b>	<b>81</b>	<b>82</b>
<b>10</b>	<b>EXT7</b>	<b>34</b>	<b>35</b>	<b>58</b>	<b>59</b>	<b>82</b>	<b>83</b>
<b>11</b>	<b>12</b>	<b>35</b>	<b>36</b>	<b>59</b>	<b>60</b>	<b>83</b>	<b>84</b>
<b>12</b>	<b>13</b>	<b>36</b>	<b>37</b>	<b>60</b>	<b>61</b>	<b>84</b>	<b>1</b>
<b>13</b>	<b>14</b>	<b>37</b>	<b>38</b>	<b>61</b>	<b>62</b>	<b>85</b>	<b>2</b>
<b>14</b>	<b>15</b>	<b>38</b>	<b>39</b>	<b>62</b>	<b>63</b>	<b>86</b>	<b>3</b>
<b>15</b>	<b>16</b>	<b>39</b>	<b>40</b>	<b>63</b>	<b>64</b>	<b>87</b>	<b>4</b>
<b>16</b>	<b>17</b>	<b>40</b>	<b>41</b>	<b>64</b>	<b>65</b>	<b>88</b>	<b>5</b>
<b>17</b>	<b>18</b>	<b>41</b>	<b>42</b>	<b>65</b>	<b>66</b>	<b>89</b>	<b>6</b>
<b>18</b>	<b>19</b>	<b>42</b>	<b>43</b>	<b>66</b>	<b>67</b>	<b>90</b>	<b>7</b>
<b>19</b>	<b>20</b>	<b>43</b>	<b>44</b>	<b>67</b>	<b>68</b>	<b>91</b>	<b>8</b>
<b>20</b>	<b>21</b>	<b>44</b>	<b>45</b>	<b>68</b>	<b>69</b>	<b>92</b>	<b>9</b>
<b>21</b>	<b>22</b>	<b>45</b>	<b>46</b>	<b>69</b>	<b>70</b>	<b>93</b>	<b>10</b>
<b>22</b>	<b>23</b>	<b>46</b>	<b>47</b>	<b>70</b>	<b>71</b>	<b>94</b>	<b>11</b>
<b>23</b>	<b>24</b>	<b>47</b>	<b>48</b>	<b>71</b>	<b>72</b>	<b>95</b>	<b>GND</b>
<b>24</b>	<b>25</b>	<b>48</b>	<b>49</b>	<b>72</b>	<b>73</b>	<b>96</b>	

**Remarks** 1. CN1: Connector connecting the emulation probe.

2. The meanings of the symbols and number under emulation probe have the following meanings.

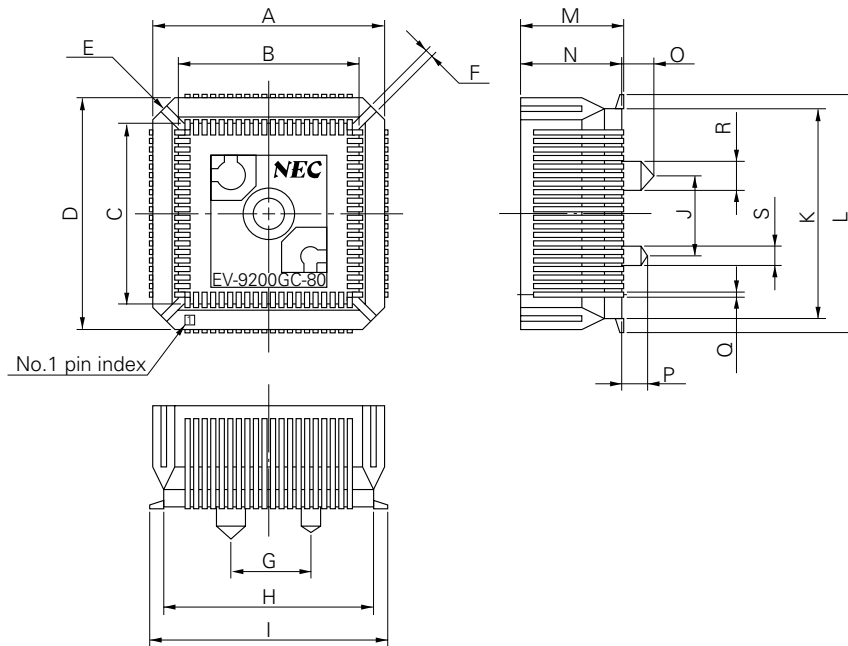
GND : Ground clip (GND)  
 EXT0-EXT7 : External sense clip 1-8  
 1-84 : Pin numbers of 84-pin LQ at emulation probe tip  
 NC : No Connection

[MEMO]

## APPENDIX B SOCKET DRAWINGS OF CONVERSION SOCKETS AND FOOT PRINTS

### B.1 EV-9200GC-80

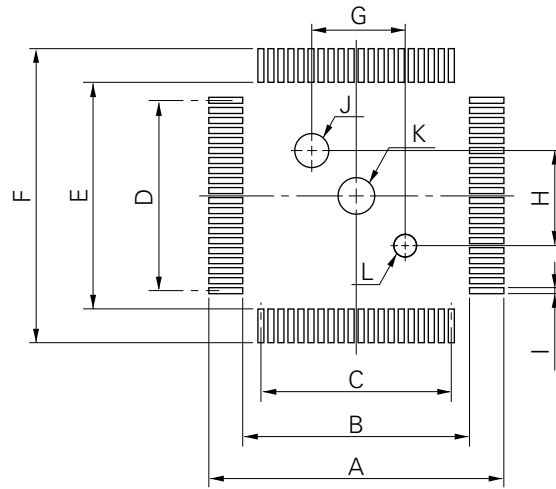
Figure B-1. Socket Drawing of EV-9200GC-80 (Reference) (Unit: mm)



EV-9200GC-80-G0

ITEM	MILLIMETERS	INCHES
A	18.0	0.709
B	14.4	0.567
C	14.4	0.567
D	18.0	0.709
E	4-C 2.0	4-C 0.079
F	0.8	0.031
G	6.0	0.236
H	16.0	0.63
I	18.7	0.736
J	6.0	0.236
K	16.0	0.63
L	18.7	0.736
M	8.2	0.323
O	8.0	0.315
N	2.5	0.098
P	2.0	0.079
Q	0.35	0.014
R	φ2.3	φ0.091
S	φ1.5	φ0.059

Figure B-2. Footprint of EV-9200GC-80 (Reference) (Unit: mm)

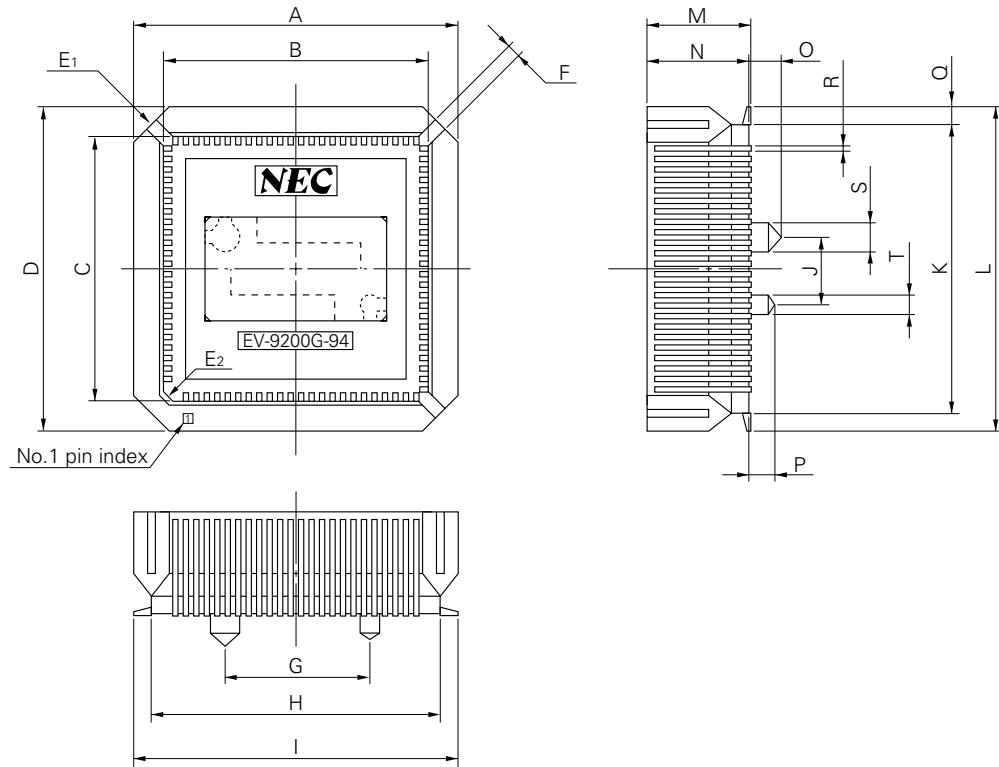


EV-9200GC-80-P0

**Caution** The mount pad dimensions for EV-9200 may differ from those of the target products (for QFP) in part. For the recommended mount pad dimensions for QFP, refer to "Semiconductor Device Mounting Technology Manual" (IEI-1207).

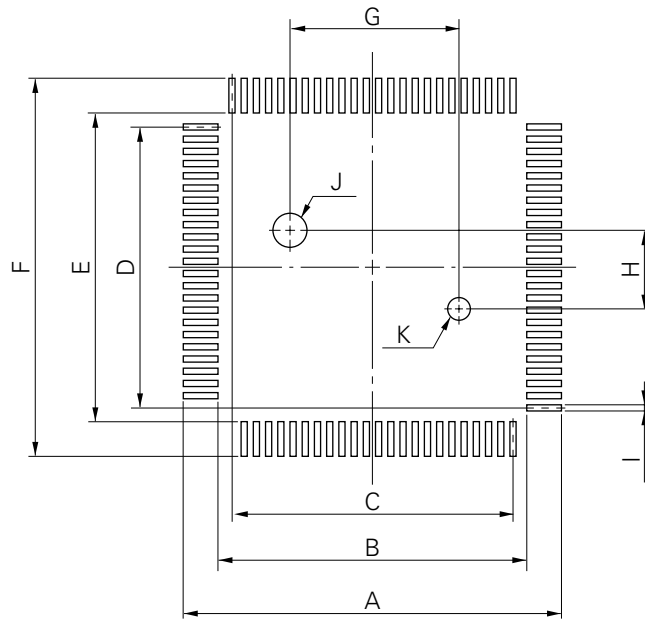
## B.2 EV-9200G-94

Figure B-3. Socket Drawing of EV-9200G-94 (Reference) (Unit: mm)



EV-9200G-94-G0

ITEM	MILLIMETERS	INCHES
A	25.0	0.984
B	20.35	0.801
C	20.35	0.801
D	25.0	0.984
E <sub>1</sub>	4-C 2.8	4-C 0.11
E <sub>2</sub>	C 1.5	C 0.059
F	0.8	0.031
G	11.0	0.433
H	22.0	0.866
I	24.7	0.972
J	5.0	0.197
K	22.0	0.866
L	24.7	0.972
M	8.0	0.315
N	7.8	0.307
O	2.5	0.098
P	2.0	0.079
Q	1.35	0.053
R	0.35±0.1	0.014 <sup>+0.004</sup> <sub>-0.005</sub>
S	∅2.3	∅0.091
T	∅1.5	∅0.059

**Figure B-4. Footprint of EV-9200G-94 (Reference) (Unit: mm)**

EV-9200G-94-P0

**Caution** The mount pad dimensions for EV-9200 may differ from those of the target products (for QFP) in part. For the recommended mount pad dimensions for QFP, refer to "Semiconductor Device Mounting Technology Manual" (IEI-1207).