

# How to implement DHCP in W7100A

Version 1.0



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# 1 Introduction

DHCP server uses DHCP to assign details like IP address or settings to the client that uses the DHCP. This application note will explain how to implement DHCP client by using W7100.

## 2 DHCP

DHCP uses UDP (User Datagram Protocol) through Transport Layer, and communicates with the DHCP server using UDP broadcast. Fig.1 describes the communication between the DHCP server and client.

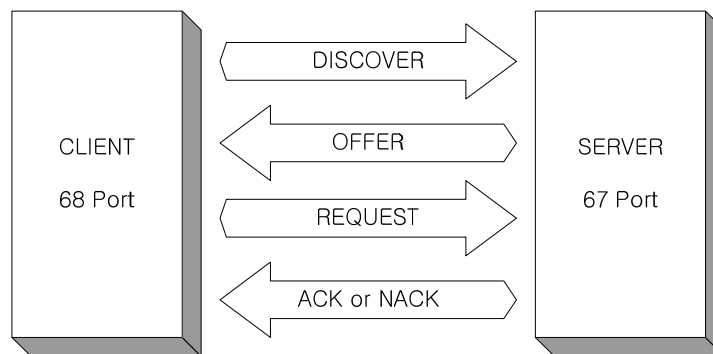


Fig. 1 DHCP Message

DHCP Client broadcasts the 'DISCOVERY message' on the connected network. If a DHCP Server exists on the computer network, the DHCP Server will receive the 'DISCOVERY message' and send the 'OFFER message' to the DHCP client. 'OFFER message' consists of an IP that can be used by DHCP client, Gateway(G/W), network information that is the same as the DNS server IP, and information like lease time. DHCP Client can acknowledge the DHCP Server by receiving the 'OFFER message,' and send the 'REQUEST message' to use the information suggested by the server. Then after the 'REQUEST message' is received, the DHCP Server decides whether the Lease duration (the period of time where the DHCP client IP address can be used) and Network configuration can be used or not. If the above information can be used, the DHCP Server will send an ACK message to the DHCP Client; or a NACK message if the information can't be used.

## 3 DHCP Client

### 3.1 Demonstration

Fig.2 shows the result of DHCP Client Test by connecting iMCU7100EVB and network gear. The DISCOVER/OFFER/REQUEST/ACK messages can be checked. The DHCP Client network configuration assigned by the DHCP Server can be checked also.

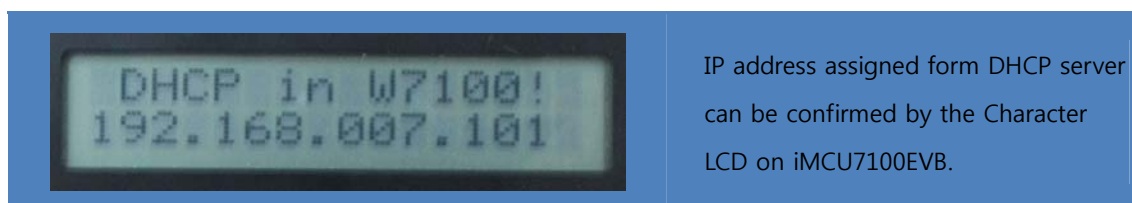
```
=====
W7100 DHCP Application !
=====

Wait for linking

Link !!

>DHCP mode
state_dhcp_request 2DHCP_Server 192.168.0.1
LOCAL IP ADDRESS : 192.168.0.31
SUBNET MASK : 255.255.255.0
G/W IP ADDRESS : 192.168.0.1
> DHCP Success.
```

Fig. 2 DHCP Client TEST



## 4 Software

### 4.1 Socket

#### 4.1.1 OPEN

Since the internet connection is not required between the DHCP Server and DHCP Client, DHCP needs to be opened by UDP. Use Sn\_MR\_UDP as shown below to OPEN the socket (line382).

```
dhcp_app.h
/* UDP port numbers for DHCP */
18 :      #define DHCP_SERVER_PORT 67      /* from server to client */
19 :      #define DHCP_CLIENT_PORT 68      /* from client to server */
156 :     #define SOCK_DHCP  0 // (0-7)

dhcp_app.c
382 :     socket(SOCK_DHCP, Sn_MR_UDP, DHCP_CLIENT_PORT, 0x0)
```

#### 4.1.2 SEND

The user must set the other user's IP address and port before sending the DHCP data. The DHCP\_SERVER\_PORT is fixed to 67. When DISCOVER or REQUEST is operated, The IP address uses the BROADCAST address (255.255.255.255) to send data. After receiving the DHCP Server IP from the DHCP message, use the parsed Server IP[] to send data (line204).

```
dhcp_app.c
/* DST IP : BroadCasting*/
202 :      S_port = DHCP_SERVER_PORT;
203 :      if(REREQ != 0)
204 :      for (i=0; i<4; i++) addr[i] = ServerIP[i];
205 :      else
206 :      for (i=0; i<4; i++) addr[i] = 0xFF;

// send MSG to Broadcasting
213 :      sendto(s, (uint8 *)&MSG.op, RIP_MSG_SIZE, addr, S_port);
```

#### 4.1.3 RECEIVE

This section is identical with the RECEIVE section of UDP. Please refer to 'How to implement UDP for W7100.'

```
dhcp_app.c
```

```
228 : len = recvfrom(s, (uint8*)&MSG.op, length, ServerAddrIn, &ServerPort);
```

#### 4.1.4 DHCP Message Format

The structure below is composed of codes that work with the DHCP message. (Please refer to the RFC1541 document for more details on DHCP Message Format and each Field). The fields below the ciaddr field are used to send network information; and the options field is used to send message type and information like client identifier.

```
dhcp_app.h
117 : #define OPT_SIZE          298      //DHCP total size : 576
118 : #define RIP_MSG_SIZE      (236 + OPT_SIZE)
119 : #define POS_OPTION         321

121 : typedef struct _RIP_MSG{
122 :     uint8  op; //Message op code / message type. 1 = BOOTREQUEST, 2 = BOOTREPLY
123 :     uint8  htype; //Hardware address type (e.g., '1' = 10Mb Ethernet)
124 :     uint8  hlen; //Hardware address length (e.g. '6' for 10Mb Ethernet)
125 :     uint8  hops; //Client sets to zero, optionally used by relay agents
126 :     uint32  xid; //Transaction ID.
127 :     uint16  secs; //Seconds passed since client began the request process
128 :     uint16  flags;
129 :     uint8  ciaddr[4]; //Client IP address
130 :     uint8  yiaddr[4]; //Your(Client) IP address
131 :     uint8  siaddr[4]; //Server IP address
132 :     uint8  giaddr[4]; //Relay agent IP address
133 :     uint8  chaddr[16]; // Client hardware address
134 :     uint8  sname[64]; //Optional server host name
135 :     uint8  file[128]; //Boot file name
136 :     uint8  OPT[OPT_SIZE]; //Optional parameters
137 : }RIP_MSG;
```

#### 4.2 DHCP Functions

The functions for implementing the DHCP client are listed under dhcp\_app.h below.

```
dhcp_app.h
145 : void send_DHCP_DISCOVER(SOCKET s); /* SEND DISCOVER MESSAGE to BROADCAST*/
146 : char parseDHCPMSG(SOCKET s,uint16 length); /* for parsing DHCP MESSAGE */
147 : char DHCP_SetIP(); /* for setting IP ADDRESS */
```

```

148 : void check_dhcp(void); /* for DHCP processing */
149 : void send_DHCP_REQUEST(SOCKET s, uint8 RREQ); /* SEND REQUEST MESSAGE */
150 : void set_network(void); /* setting network configuration */
    
```

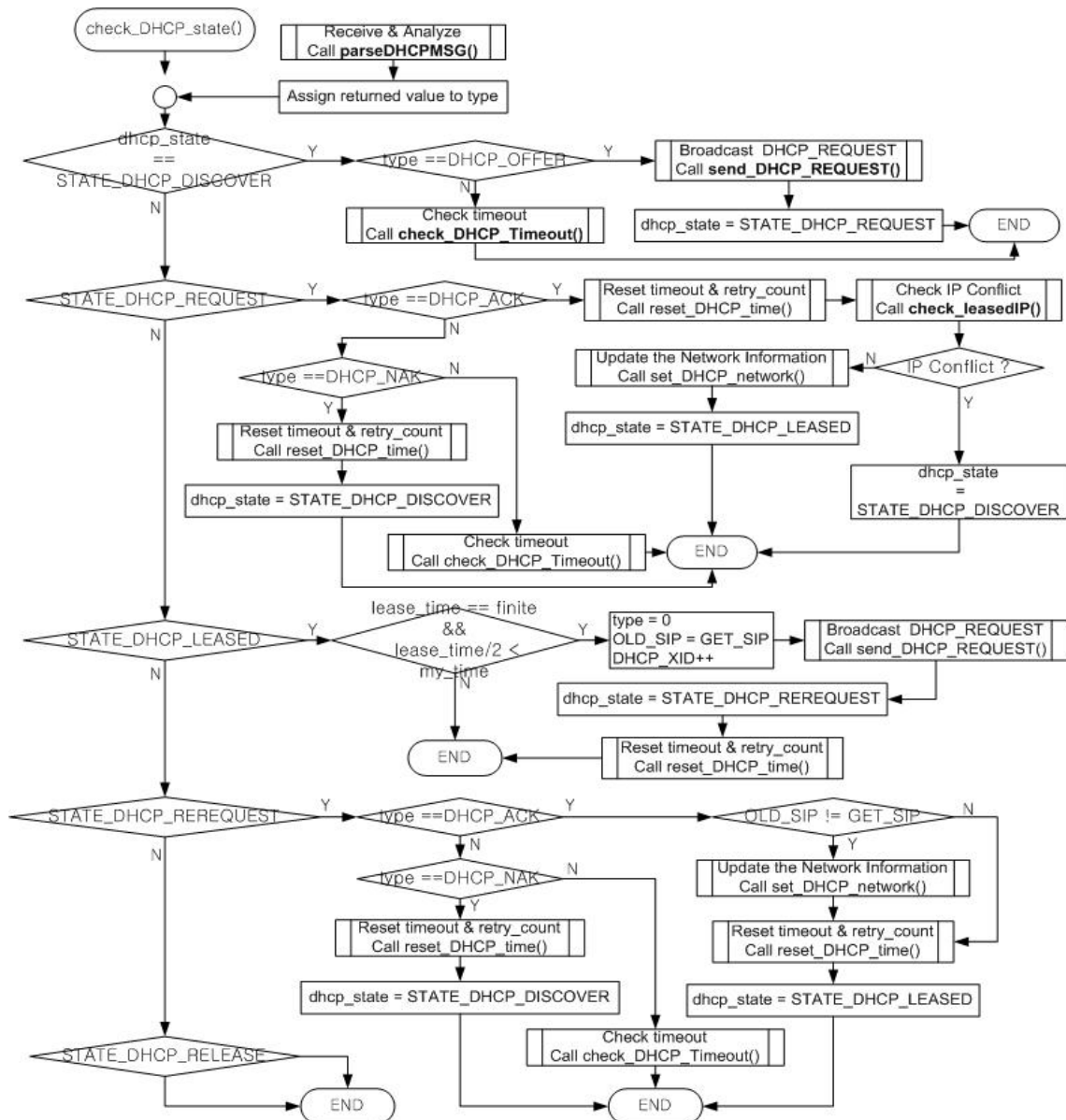


Fig. 3 check\_dhcp function

Fig.3 shows the flowchart of check\_dhcp(). DHCP\_OFFER, DHCP\_ACK, and DHCP\_REQUEST are operated depending on the change (transition) of dhcp\_state. Fig.4 shows the flowchart of parseDHCPMSG(). parseDHCPMSG() is used to phishing (parsing) DHCP messages. Fig.5 shows the flowchart of check\_LeaseIP() and send\_DHCP\_REQUEST().

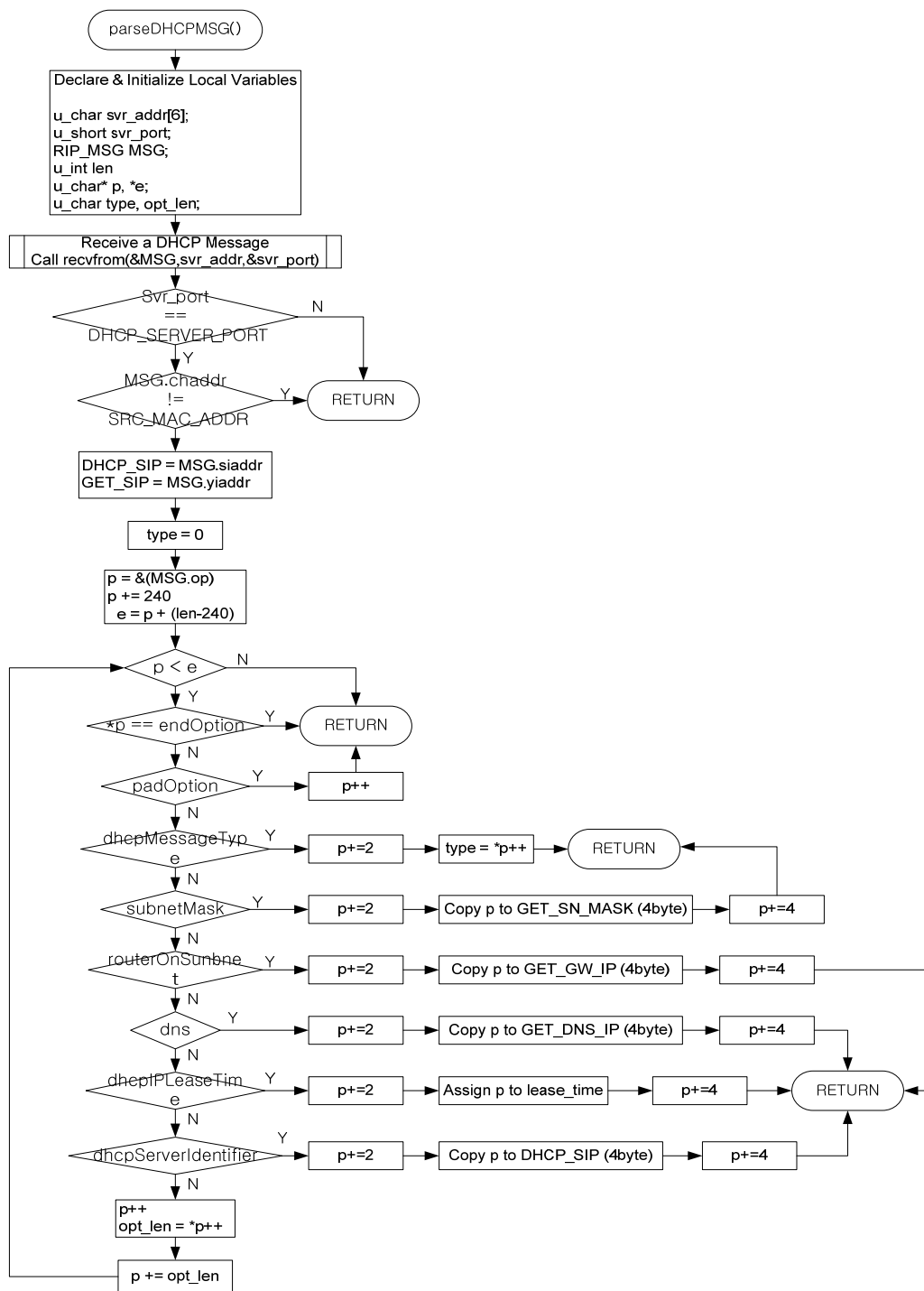


Fig. 4 parseDHCPMSG() function flowchart



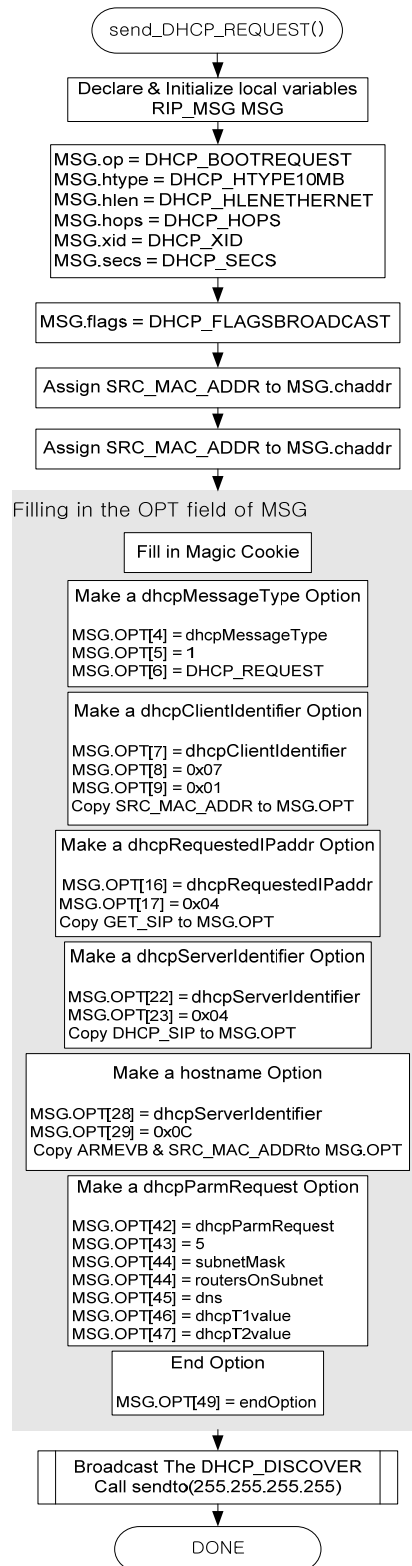


Fig. 5 send\_DHCP\_REQUEST() function flowchart

## Document History Information

Version	Date	Descriptions
Ver. 0.9Beta	Sep, 2009	Release with W7100 launching
Ver. 0.91	Feb, 2011	Modify the source code and fig. 2
Ver. 1.0	Mar, 2011	Modified for W7100A QFN 64pin package

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