

60 Series Radio Wake on WLAN support

60-SIPT/60-2230C
v1.5

1 Introduction

Laird supports Wake on WLAN (WoW) for both Wi-Fi and Bluetooth with the 60 series products (60-SIPT and 60-2230C). This application note provides information on the Wi-Fi and Bluetooth pin definitions, instructions on how to probe these pins in the 60-SIPT and 60-2230C development kits, and software requirements and configuration.

2 Hardware

2.1 WoW PIN Definitions in the SiP

- **WoW for Wi-Fi** - Pin 23 on the SiP
- **WoW for Bluetooth** - Pin 67 on the SiP

You must wire each of these pins to a GPIO in the host processor and set it as input.

Pin	Name	Type	Voltage	Description
23	GPIO0	I/O	VIO	General purpose I/O pin. Reserved for Wake on WLAN feature.
67	LED_OUT_BT	O,PU	VIO	LED indicator for Bluetooth with a 10-mA drive capability. N/C - Reserved for Bluetooth wake up host feature.

2.2 Wow Radio Development Kit PIN Locations

2.2.1 60-SIPT Development Kit

Wi-Fi Wow - The GPIO0 (SiP pin 23) can be probed without any modification of the development kit.
Bluetooth WoW - You must remove R35 and mount a 0-ohm resistor on R39. You can then attach the GPIO 3-pin in the development kit to the pin in the SiP.

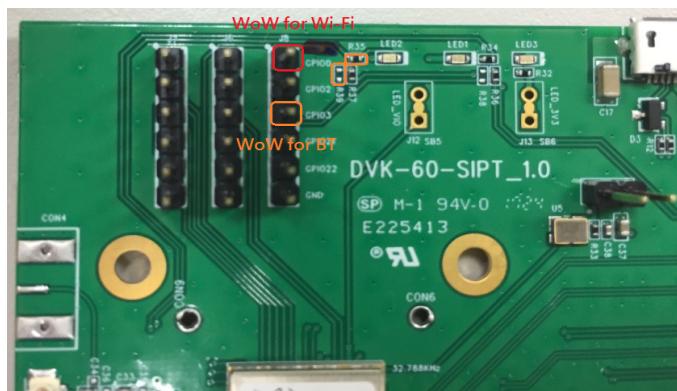
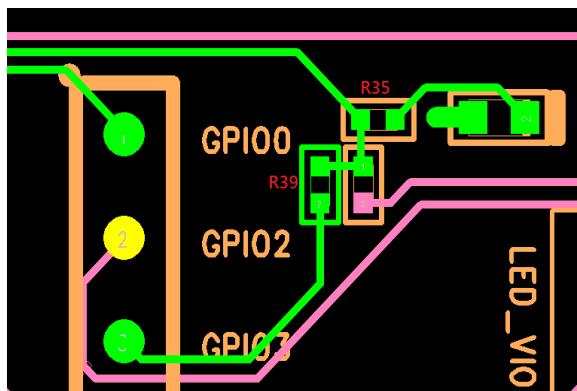


Figure 1: Wow location for Wi-Fi and BT on the 60-SIPT DVK

2.2.2 60-2230C Development Kit v1.0

Wi-Fi WoW – This pin can be probed at TP4 without any modification of the development kit.

Bluetooth WoW – There is currently no pinout for this pin. It will be added in the next generation of the development kit (v1.1).

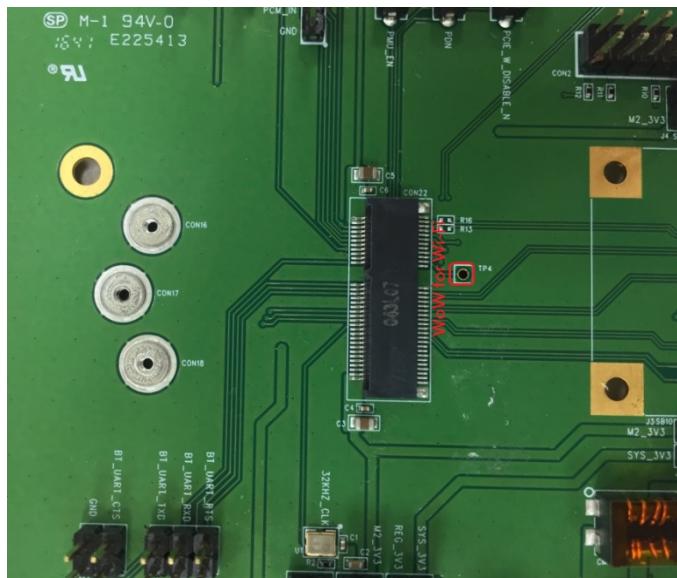
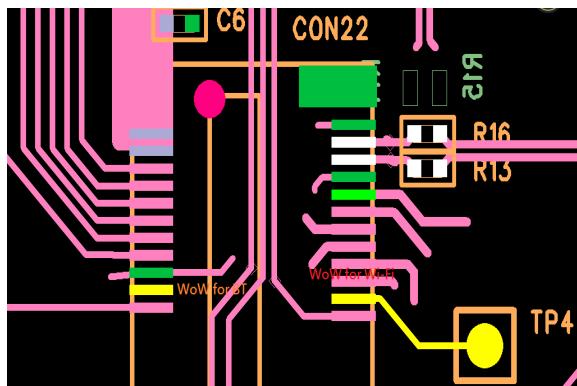


Figure 2: Wow location for Wi-Fi and BT on the 60-2230C DVK

3 Software

This section describes all software related requirements for Wake on Wireless to work with the 60 Series radios. All WoW signals emanating from the SIP are active low, and for Wi-Fi the pin assertion will last for approximately 1 second before reverting to its normal state.

The 60 Series host software supports the following bus interfaces:

Interface	Wi-Fi	Bluetooth	Note
SDIO	x	x	
PCIE	x		The PCIE Wi-Fi support is currently in beta
USB		x	
UART		x	

3.1 Host Requirements

In order for WoW to function properly, the host system must be able to maintain power to radio when the host processor is suspended.

The 60 series Wi-Fi driver will check that the SDIO host controller has the MMC_PM_KEEP_POWER capability set. If not set the radio driver will not report support for WoW, and will fail all suspend requests or attempts to set a WoW trigger.

3.2 Configuration

3.2.1 802.11 Netlink

The following netlink 802.11 WoW triggers are supported. These triggers may be configured at any time, however the 60 series Wi-Fi radio driver will only enable the trigger when it is notified that the host is actually suspended. Consequently one can't simply configure a WoW trigger and expect the radio to assert the GPIO line when the trigger condition is met (e.g. disconnect) because the trigger may not be enabled.

- NL80211_WOWLAN_TRIG_DISCONNECT - Loss of beacons
- NL80211_WOWLAN_TRIG_ANY - Loss of beacons or RX of any unicast 802.11 packet
- NL80211_WOWLAN_TRIG_NET_DETECT - Network detection

Note: NL80211_WOWLAN_TRIG_NET_DETECT supports the full channel set, but only a single SSID, and no 'Match' support.

3.2.2 iw

The iw cli configuration utility may be used to display and change parameters of network interfaces that are specific to wireless operation. One may use iw to check for WoW support and to configure WoW parameters for the 802.11 radio.

To check Wi-Fi radio WoW support, use the following command.

```
1 'iw phy0 info'
2
3 ...
4     WLAN support:
5         * wake up on anything (device continues operating normally)
6         * wake up on disconnect
7         * wake up on network detection, up to 0 match sets
8 ...
```

If radio is associated before host is suspended, the following iw command may be used to wake the host if the connection is lost.

```
1 'iw phy0 wowlan enable disconnect'
```

If radio is associated before host is suspended, the following iw command may be used to wake the host if the connection is lost or an 802.11 unicast packet is received.

```
1 'iw phy0 wowlan enable any'
```

If radio is not associated before host is suspended, the following iw command may be used to wake the host when the network becomes available.

```
1 'iw phy0 wowlan enable net-detect interval 5000 freqs 2412 5180 active ssid foobar'
```

Note: The interval is required to complete the NL80211_WOWLAN_TRIG_NET_DETECT request, but is not used as the scan interval by the radio.

3.3 Events

The following events are sent by the 60 series Wi-Fi radio driver in response to a WoW trigger occurrence.

- NL80211_WOWLAN_TRIG_WAKEUP_PKT_80211 - RX of a unicast packet
- NL80211_WOWLAN_TRIG_NET_DETECT_RESULT - Network detected
- NL80211_WOWLAN_TRIG_DISCONNECT - Loss of beacons

Revision History

Version	Date	Notes	Approver
1.0	01 Nov 2017	Initial Release	Jay White
1.1	02 Nov 2017	Converted to LaTeX	Steve Braneky
1.2	03 Nov 2017	Added software section	Steve Braneky
1.3	08 Nov 2017	Clarified when WoW triggers are enabled	Steve Braneky
1.4	10 Nov 2017	Clarified signal states	Steve Braneky
1.5	10 Nov 2017	Clarified loss of association to mean beacons	Steve Braneky