6.10 Boot ROM and Peripheral Booting

The device boot ROM (on both the CPUs) contains bootloading software. The CPU1 boot ROM does the system initialization before bringing CPU2 out of reset. The device boot ROM is executed each time the device comes out of reset. Users can configure the device to boot to flash (using GET mode) or choose to boot the device through one of the bootable peripherals by configuring the boot mode GPIO pins.

The CPU1 boot ROM, being master, owns the boot mode GPIO and boot configurations. The CPU2 boot ROM either boots to flash (if configured to do so through user configurable DCSM OTP) or enters a WAIT BOOT mode if no OTP is programmed. In WAIT BOOT mode, the CPU1 application instructs the CPU2 boot ROM on how to boot further using boot mode IPC commands supported by CPU2 boot ROM.

Table 6-14 shows the possible boot modes supported on the device. The default boot mode pins are GPIO72 (boot mode pin 1) and GPIO 84 (boot mode pin 0). Users may choose to have weak pullups for boot mode pins if they use a peripheral on these pins as well, so the pullups can be overdriven. On this device, customers can change the factory default boot mode pins by programming user configurable DCSM OTP locations. This is recommended only for cases in which the factory default boot mode pins do not fit into the customer design. More details on the locations to be programmed is available in the *TMS320F2837xD Dual-Core Delfino Microcontrollers Technical Reference Manual*.

Table 6-14. Device Boot Mode

MODE NO.	CPU1 BOOT MODE	CPU2 BOOT MODE	$\overline{\text{TRST}}$	GPIO72 (BOOT MODE PIN 1)	GPIO84 (BOOT MODE PIN 0)
0	Parallel I/O	Boot from Master	0	0	0
1	SCI Mode	Boot from Master	0	0	1
2	Wait Boot Mode	Boot from master	0	1	0
3	Get Mode	Boot from Master	0	1	1
4-7	EMU Boot Mode (Emulator Connected)	Boot from Master	1	X	X

NOTE

The default behavior of Get mode is boot-to-flash. On unprogrammed devices, using Get mode will result in repeated watchdog resets, which may prevent proper JTAG connection and device initialization. Use Wait mode or another boot mode for unprogrammed devices.

CAUTION

Some reset sources are internally driven by the device. The user must ensure the pins used for boot mode are not actively driven by other devices in the system for these cases. The boot configuration has a provision for changing the boot pins in OTP. For more details, see the *TMS320F2837xD Dual-Core Delfino Microcontrollers Technical Reference Manual*.

6.10.1 EMU Boot or Emulation Boot

The CPU enters this boot when it detects that $\overline{\text{TRST}}$ is HIGH (in other words, when an emulator/debugger is connected). In this mode, the user can program the EMUBOOTCTRL register (at location 0xD00) to instruct the device on how to boot. If the contents of the EMUBOOTCTRL locations are invalid, then the device would default into WAIT Boot mode. The emulation boot allows users to verify the device boot before programming the boot mode into OTP.

6.10.2 WAIT Boot Mode

The device in this boot mode loops in the boot ROM. This mode is useful if users want to connect a debugger on a secure device or if users do not want the device to execute an application in flash yet.

6.10.3 Get Mode

The default behavior of Get mode is boot-to-flash. This behavior can be changed by programming the Zx-OTPBOOTCTRL locations in user configurable DCSM OTP. The user configurable DCSM OTP on this device is divided in to two secure zones: Z1 and Z2. The Get mode function in boot ROM first checks if a valid OTPBOOTCTRL value is programmed in Z1. If the answer is yes, then the device boots as per the Z1-OTPBOOTCTRL location. The Z2-OTPBOOTCTRL location is read and decodes only if Z1-OTPBOOTCTRL is invalid or not programmed. If either Zx-OTPBOOTCTRL location is not programmed, then the device defaults to factory default operation, which is to use factory default boot mode pins to boot to flash if the boot mode pins are set to GET MODE. Users can choose the device through which to boot—SPI, I2C, CAN, and USB—by programming proper values into the user configurable DCSM OTP. More details on this can be found in the *TMS320F2837xD Dual-Core Delfino Microcontrollers Technical Reference Manual*.

6.10.4 Peripheral Pins Used by Bootloaders

Table 6-15 shows the GPIO pins used by each peripheral bootloader. This device supports two sets of GPIOs for each mode, as shown in Table 6-15.

Table 6-15. GPIO Pins Used by Each Peripheral Bootloader

BOOTLOADER	GPIO PINS	NOTES
SCI-Boot0	SCITXDA: GPIO84 SCIRXDA: GPIO85	SCIA Boot I/O option 1 (default SCI option when chosen through Boot Mode GPIOs)
SCI-Boot1	SCITXDA: GPIO28 SCIRXDA: GPIO29	SCIA Boot option 2 – with alternate I/Os.
Parallel Boot	D0 – GPIO65 D1 – GPIO64 D2 – GPIO58 D3 – GPIO59 D4 – GPIO60 D5 – GPIO61 D6 – GPIO62 D7 – GPIO63 HOST_CTRL – GPIO70 DSP_CTRL – GPIO69	
CAN-Boot0	CANRXA: GPIO70 CANTXA: GPIO71	CAN-A Boot – I/O option 1
CAN-Boot1	CANRXA: GPIO62 CANTXA: GPIO63	CAN-A Boot – I/O option 2
I2C-Boot0	SDAA: GPIO91 SCLA: GPIO92	I2CA Boot – I/O option 1
I2C-Boot1	SDAA: GPIO32 SCLA: GPIO33	I2CA Boot – I/O option 2
SPI-Boot0	SPISIMOA - GPIO58 SPISOMIA - GPIO59 SPICLKA - GPIO60 SPISTEA - GPIO61	SPIA Boot – I/O option 1
SPI-Boot1	SPISIMOA – GPIO16 SPISOMIA – GPIO17 SPICLKA – GPIO18 SPISTEA – GPIO19	SPIA Boot – I/O option 2
USB Boot	USB0DM - GPIO42 USB0DP - GPIO43	The USB Bootloader will switch the clock source to the external crystal oscillator (X1 and X2 pins). A 20-MHz crystal should be present on the board if this boot mode is selected.