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STPMIC1 configuration

Johnson Zhang

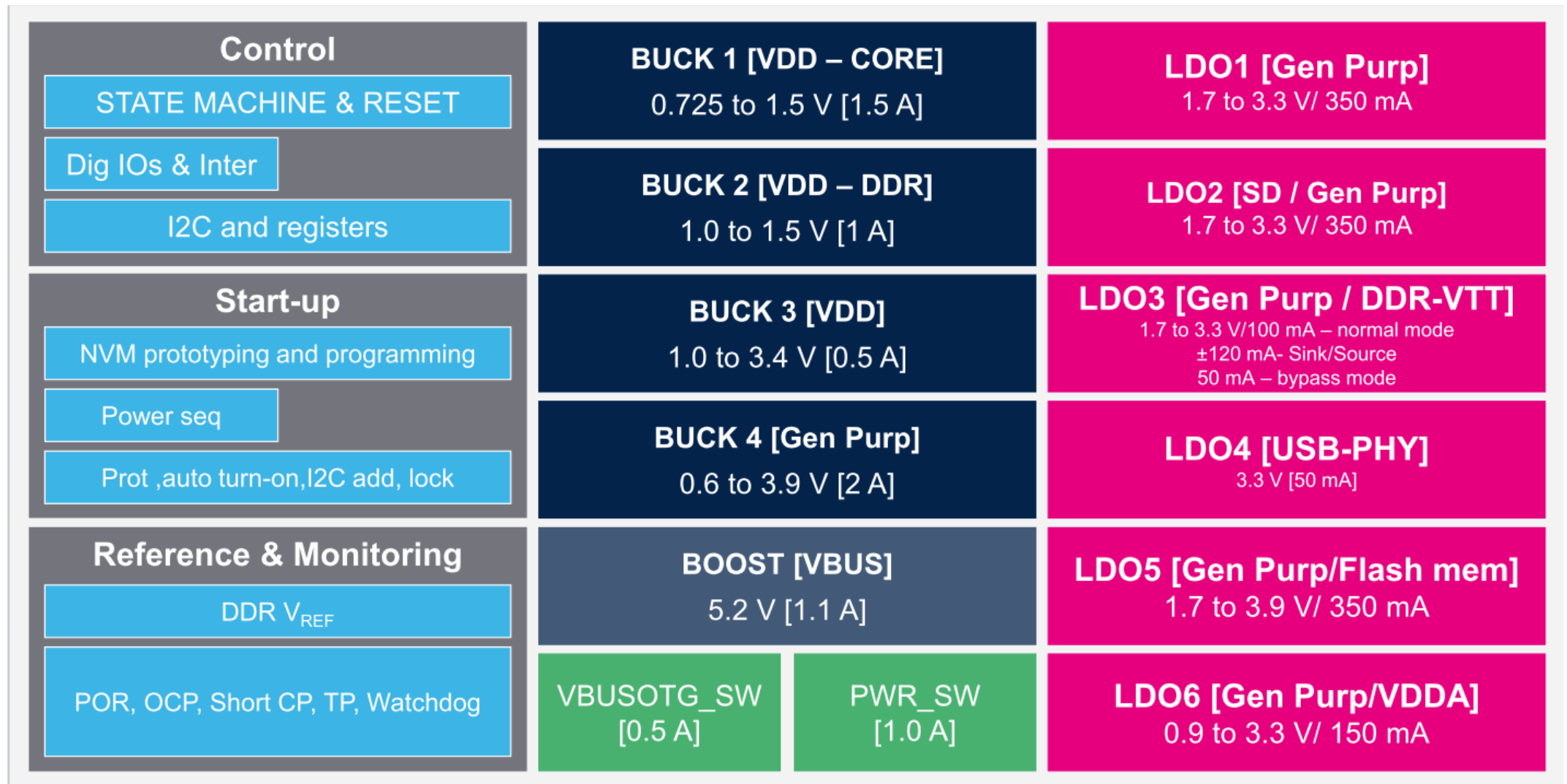
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STPMIC1 overview



STPMIC1 block diagram

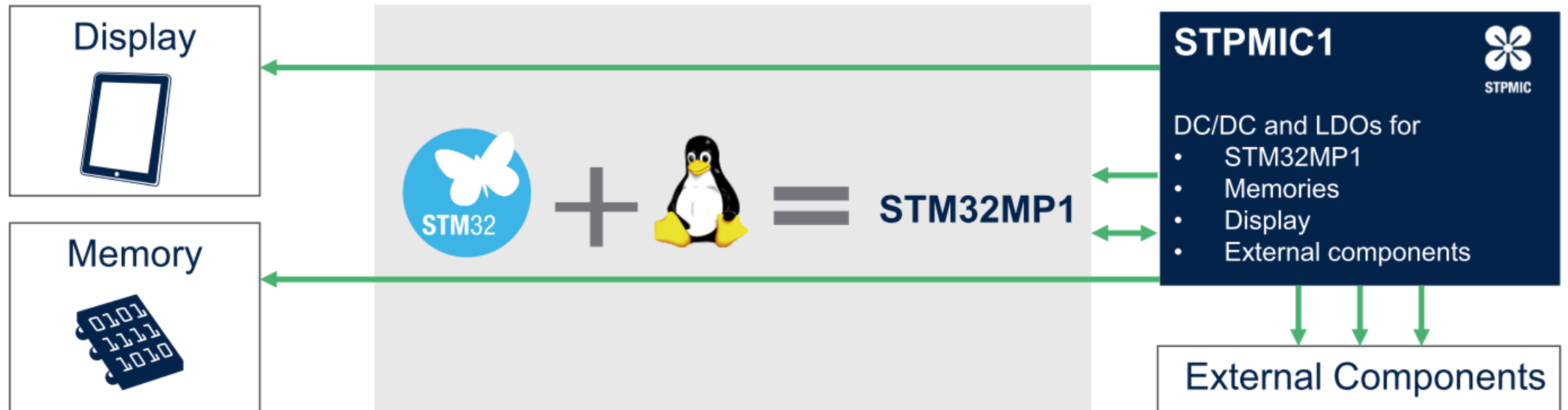


STPMIC1 IC vs. Discrete solutions

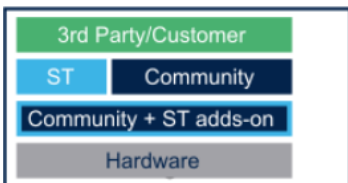
	STPMIC1	Discrete solution
Monitor all power rails and provide OCP, OVP, OTP features	✓	✗
Power-up / Power-down sequence	✓	✗
Voltage accuracy / settling time needed by STM32MP1 series	✓	Need an accurate component selection
Overall solution footprint (*)	✓	✗
BOM	✓	✗

STPMIC1 and STM32MP1

The All-In-One power management solution for STM32MP1 microprocessors:



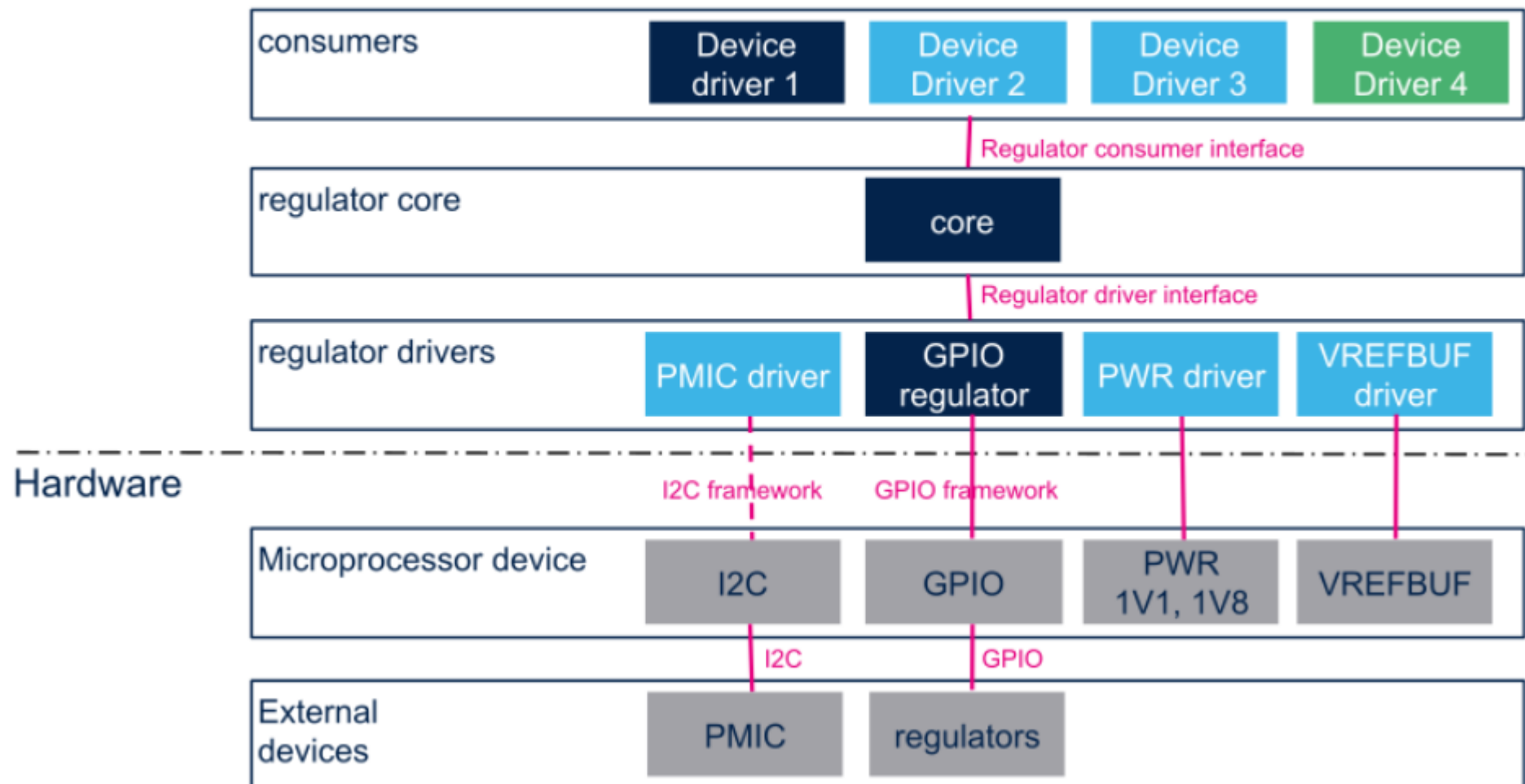




Linux PMIC Framework Overview

User space

Kernel space



STPMIC1 Configuration



Kernel Configuration

Module	Source code	Configurations in menuconfig
Core part	include/linux/mfd/stpmic1.h drivers/mfd/stpmic1.c	MFD_STPMIC1
Regulator	drivers/regulator/stpmic1_regulator.c	REGULATOR_STPMIC1
Watchdog	drivers/watchdog/stpmic1_wdt.c	STPMIC1_WATCHDOG
Input	drivers/input/misc/stpmic1_onkey.c	INPUT_STPMIC1_ONKEY

U-boot Configuration

STPMIC1 is used by U-Boot to :

- Control regulators used by other drivers (mmc-supply for SDCard for example, usb vbus)
- Trace pmic startup reason

Configurations:

- CONFIG_DM_PMIC
- CONFIG_PMIC_STPMIC1
- CONFIG_DM_REGULATOR
- CONFIG_DM_REGULATOR_STPMIC1
- CONFIG_SYSRESET

TF-A Configuration

STPMIC1 is used by TF-A firmware to:

- Configure DDR power supplies.
- Configure the regulators for system suspend and system shutdown.

TF-A SPTMIC1 driver supports configuration via device-tree.

DTS Configuration

Put the chosen I2C node to the TF-A device tree file stm32mp151.dtsi, you can generate it by CubeMX or copy it from kernel device tree, here is an example using I2C4 for PMIC:

```
i2c4: i2c@5c002000 {  
    compatible = "st,stm32mp15-i2c";  
    reg = <0x5c002000 0x400>;  
    interrupt-names = "event", "error";  
    interrupts-extended = <&exti 24 IRQ_TYPE_LEVEL_HIGH>,  
                        <&intc GIC_SPI 96 IRQ_TYPE_LEVEL_HIGH>;  
    clocks = <&rcc I2C4_K>;  
    resets = <&rcc I2C4_R>;  
    #address-cells = <1>;  
    #size-cells = <0>;  
    st,syscfg-fmp = <&syscfg 0x4 0x8>;  
    wakeup-source;  
    status = "disabled";  
    secure-status = "disabled";  
};
```

DTS Configuration

Assign PINs for the chosen I2C in stm32mp15-pinctrl.dtsi:

```
&pinctrl_z {  
    i2c4_pins_a: i2c4-0 {  
        pins {  
            pinmux = <STM32_PINMUX('Z', 4, AF6)>, /* I2C4_SCL */  
                    <STM32_PINMUX('Z', 5, AF6)>; /* I2C4_SDA */  
            bias-disable;  
            drive-open-drain;  
            slew-rate = <0>;  
        };  
    };  
};
```

DTS Configuration

Enable the chosen I2C in your board DTS file:

```
&i2c4 {  
    pinctrl-names = "default";  
    pinctrl-0 = <&i2c4_pins_a>;  
    i2c-scl-rising-time-ns = <185>;  
    i2c-scl-falling-time-ns = <20>;  
    clock-frequency = <400000>;  
    status = "okay";  
    secure-status = "okay";  
}
```

DTS Configuration

Enable the chosen I2C and change pmic node parent to this newly added I²C in your board DTS file:

```
&i2c4 {  
    pinctrl-names = "default";  
    pinctrl-0 = <&i2c4_pins_a>;  
    i2c-scl-rising-time-ns = <185>;  
    i2c-scl-falling-time-ns = <20>;  
    clock-frequency = <400000>;  
    status = "okay";  
    secure-status = "okay";  
  
    pmic: stpmic@33 { _____
```

DTS Configuration

Configure vin for regulators in your board DTS file:

```
vin: vin {  
    compatible = "regulator-fixed";  
    regulator-name = "vin";  
    regulator-min-microvolt = <5000000>;  
    regulator-max-microvolt = <5000000>;  
    regulator-always-on;  
};
```

```
regulators {  
    compatible = "st,stm32-regulators";  
    buck1-supply = <&vin>;  
    buck2-supply = <&vin>;  
    buck3-supply = <&vin>;  
    buck4-supply = <&vin>;  
    ldo1-supply = <&v3v3>;  
    ldo2-supply = <&vin>;  
    ldo3-supply = <&vdd_ddr>;  
    ldo4-supply = <&vin>;  
    ldo5-supply = <&vin>;  
    ldo6-supply = <&v3v3>;  
    vref_ddr-supply = <&vin>;  
    boost-supply = <&vin>;  
    pwr_sw1-supply = <&bst_out>;  
    pwr_sw2-supply = <&bst_out>;
```

DTS Configuration

Configure regulators and use it for peripherals in your board DTS file:

```
v3v3: buck4 {
    regulator-name = "v3v3";
    regulator-min-microvolt = <3300000>;
    regulator-max-microvolt = <3300000>;
    regulator-always-on;
    regulator-over-current-protection;
    regulator-initial-mode = <0>;
    lp-stop {
        regulator-suspend-microvolt = <3300000>;
        regulator-on-in-suspend;
    };
    standby-ddr-sr {
        regulator-off-in-suspend;
    };
    standby-ddr-off {
        regulator-off-in-suspend;
    };
};
```

```
&sdmmc1 {
    pinctrl-names = "default";
    pinctrl-0 = <&sdmmc1_b4_pins_a>;
    disable-wp;
    st,neg-edge;
    bus-width = <4>;
    vmmc-supply = <&v3v3>;
    status = "okay";
};
```

STPMIC1 NVM Configuration



STPMIC1 NVM Configuration

The STPMIC1 NVM is used to customize the default output voltage, POWER_UP/POWER_DOWN sequence, protection behavior, auto turn-on functionality, I2C slave address etc.

Default NVM configuration vs part number:

	Default configuration table					
	STPMIC1A		STPMIC1B		STPMIC1C	
	Default output voltage	Rank	Default output voltage	Rank	Default output voltage	Rank
LDO1	1.8 V	0	1.8 V	0	1.8 V	0
LDO2	1.8 V	0	2.9 V	2	1.8 V	0
LDO3	1.8 V	0	1.8 V	0	1.8 V	0
LDO4	3.3 V	3	3.3 V	3	3.3 V	0
LDO5	2.9 V	2	2.9 V	2	1.8 V	0
LDO6	1.0 V	0	1.0 V	0	1.0 V	0
REFDDR	0.55 V	0	0.55 V	0	0.55 V	0
BOOST	5.2 V	N/A	5.2 V	N/A	5.2 V	N/A
BUCK1	1.2 V	2	1.2 V	2	1.1 V	0
BUCK2	1.1 V	0	1.1 V	0	1.1 V	0
BUCK3	3.3 V	1	1.8 V	1	1.2 V	0
BUCK4	3.3 V	2	3.3 V	2	1.15 V	0
	Default value					
VINOK_Rise	3.5 V		3.3 V		3.5 V	

STPMIC1 NVM Configuration

CubeProgrammer can be used to read and update the PMIC NVM partition which is identified by the reserved Id 0xF4.

Uboot can read and update the PMIC NVM partition with command “fuse”, the bank is 1.

STPMIC1 Reg	STPMIC1 Address	NVM offset
NVM_ON_OFF_CTRL_SHR	0xF8	0
NVM_BUCK_RANK_SHR	0xF9	1
NVM_LDO14_RANK_SHR	0xFA	2
NVM_LDO56_VREF_RANK_SHR	0xFB	3
NVM_BUCKS_VOUT_SHR	0xFC	4
NVM_LDO13_VOUT_SHR	0xFD	5
NVM_LDO56_VOUT_SHR	0xFE	6
NVM_DEV_ADDR_SHR	0xFF	7

Thank you