DESCRIPTION

The XX1188 power-management IC (PMIC) is an complete, efficient, compact devices suitable for 3G cellular applications such as wireless data cards, handsets and PDAs,. It integrates a 2MHz synchronous buck regulator, nine low-dropout linear regulators (LDOs), a RESET generator, and an 32KHZ crystal driver and buffer.

XX1188 is housed in a thin QFN4x4-28pin package.

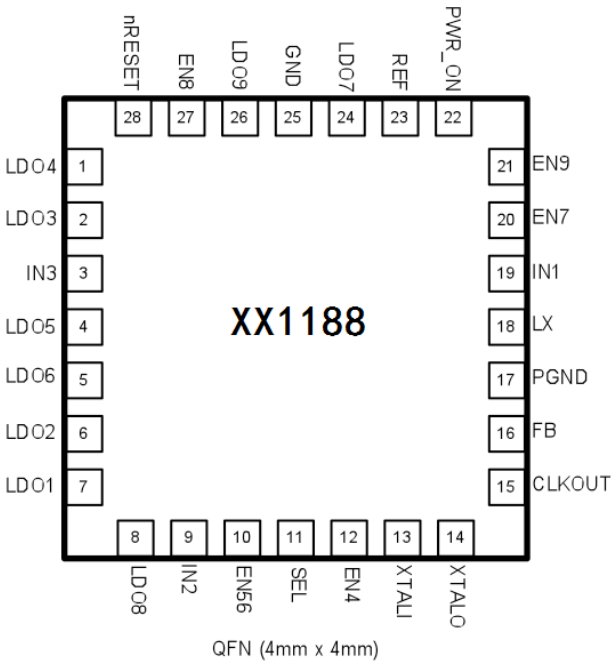
APPLICATIONS

- 3G wireless Cards
- 3G phones

FEATURES

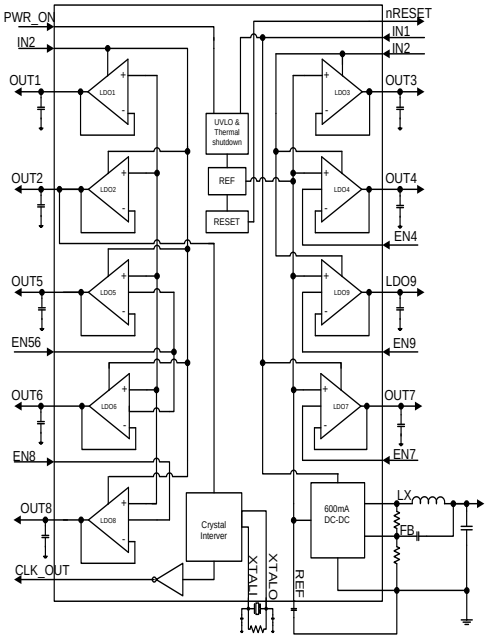
- **Buck converter for MSMC,1.2V/500mA**
- **LDO1 for MSME, 1.8V/300mA**
- **LDO2 for MSMP, 2.6V/300mA**
- **LDO3 for MEMA, 2.6V/300mA**
- **LDO4 for TCXO, 2.85V/50mA**
- **LDO5 for RFTX, 2.1V/300mA**
- **LDO6 for RFRX, 2.7V/150mA**
- **LDO7 for USB, 3.3V/50mA**
- **LDO8 for URIM, 3.0v/1.8v, 50mA**
- **LDO9 for MMC, 3.0V/150mA**
- **Independent ON/OFF control for LDO4,5,6,7,8,9**
- **RESET generator**
- **Inverter for 32Mhz crystal oscillator**
- **QFN4x4-28L package**

PIN CONFIGURATION



QFN (4mm x 4mm)

TYPICAL APPLICATION



ABSOLUTE MAXIMUM RATINGS

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

IN1,IN2, IN3 Voltage ..... –0.3V to 6V
EN_, REF, SEL Voltage ..... –0.3V to 6V
LX, LDO7 Voltage ..... –0.3V to IN1+0.3V
LDO1,2,5,6,8 Voltage ..... –0.3V to IN1+0.3V
LDO3,4,9 Voltage..... –0.3V to IN1+0.3V
XTALI, XTALO, CLKOUT Voltage ..... –0.3V to LDO2+0.3V
LX to ground current ..... Internally limited
Maximum Power Dissipation.....1.8W
Operating Temperature Range ..... –40°C to 85°C
Storage Temperature Range ..... –55°C to 150°C

ELECTRICAL CHACRACTERISTICS

SYSTEM CONTROL

(V_{IN} = 5V, unless otherwise specified. Typical values are at TA = 25oC.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range		3		5.5	V
Input UVLO	Rising, Hysteresis=100mV		2.9		V
Input Supply Current	V_{FB} =0.7V, All LDO ON		500		μA
Input Shutdown Current				1	μA
REFERENCE Voltage	V_{OUT} =2.5 to 5V	1.235	1.25	1.265	V
nRESET Delay			60		mS
Logic Input High Voltage (PWR_ON, EN_)		1.40			V
Logic Input Low Voltage (PWR_ON, EN_)				0.4	V
Thermal Shutdown			160		°C
Thermal Shutdown Hysteresis			15		°C

600mA DC-DC STEP-DOWN CONVERTER

(V_{IN} = 5V, unless otherwise specified. Typical values are at TA = 25oC.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range		2.6		5.5	V
Input UVLO	Rising, Hysteresis=100mV		2.5		V
Input Supply Current	V_{FB} =0.7V		40		μA
Input Shutdown Current				1	μA
FB Feedback Voltage	V_{OUT} =2.5 to 5V		0.6		V
FB Input Current			10		nA
Output Voltage Range		0.6		5	V
Load Regulation			0.001		%/mA
Line Regulation	V_{IN} =2.7 to 5.5V		0.04		%/V
Minimum ON/OFF time			100		ns
NMOS Switch On Resistance	I_{SW} =500mA		0.3		Ω
PMOS Switch On Resistance	I_{SW} =500mA		0.3		Ω

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
PMOS Switch Current Limit			1		A
NMOS Switch Current Limit			0.9		A
SW Leakage Current	V_{OUT}= 5.5V, V_{SW}= 0 or 5.5V, EN= V_{IN}			10	μA

LOW DROPOUT LINEAR REGULATORS

(V_{IN} = 5V, unless otherwise specified. Typical values are at TA = 25oC.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range		2.6		5.5	V
Input UVLO	Rising, Hysteresis=100mV		2.5		V
Input Supply Current			60		μA
Input Shutdown Current				1	μA
Maximum Output current	LDO4,7,8	50			mA
	LDO6,9	150			
	LDO1,2,3,5	300			
Dropout Voltage	LDO4,7,8, IOUT=50mA		100	150	mV
	LDO6,9, IOUT=75mA		100	150	
	LDO1,2,3,5, IOUT=100mA		100	150	
Load Regulation			0.02		%
Line Regulation	V_{IN} =2.7 to 5.5V		0.04		%/V

CRYSTAL OSCILLATOR DRIVER

(V_{IN} = 5V, unless otherwise specified. Typical values are at TA = 25oC.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Output High Voltage Level	I(CLK_OUT)=2mA	OUT2-0.4			V
Output Ligh Voltage Level				0.4	V
Duty cycle			50		%

PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
1	LDO4	LDO4 Output. Delivers up to 150mA.Connect a 2.2μF ceramic capacitor from OUT4 to GND.
2	LDO3	LDO3 Output. Delivers up to 150mA.Connect a 2.2μF ceramic capacitor from OUT3 to GND.
3	IN3	Power input for LDO3,4,9. Can be connected to IN3 or output of the BUCK.
4	LDO5	LDO 5 Output. Delivers up to 150mA.Connect a 2.2μF ceramic capacitor from OUT5 to GND.
5	LDO6	LDO 6 Output. Delivers up to 150mA.Connect a 2.2μF ceramic capacitor from OUT6 to GND.
6	LDO2	LDO 2 Output. Delivers up to 150mA.Connect a 2.2μF ceramic capacitor from OUT2 to GND.
7	LDO1	LDO1 Output. Delivers up to 150mA.Connect a 2.2μF ceramic capacitor from OUT1 to GND.
8	LDO8	LDO8 Output. Delivers up to 150mA.Connect a 2.2μF ceramic capacitor from OUT8 to GND.
9	IN2	Power input for LDO1,2,5,6,8. Can be connected to IN1 or output of the BUCK.
10	EN56	Enable Input for Linear Regulator 5 and 6. Drive high to enable.
11	SEL	Voltage select pin for LDO8.

PIN #	NAME	DESCRIPTION
12	EN4	Enable Input for Linear Regulator 4. Drive high to enable.
13	XTALI	Crystal input pin. Tiethe crystal between this pin and XTALO and a 22pF capacitor to GND.
14	XTALO	Crystal output pin. Tie the crystal between this pin and XTALI and a 22pF capacitor to GND.
15	CLKOUT	Clock output. Buffered output of the crystal oscillator.
16	FB	Feedback pin for BUCK. Connect to midpoint of the resistor ladder to set BUCK output voltage.
17	PGND	Power Ground. Connect to GND
18	LX	Inductor connection for BUCK. Connect an inductor between this pin to OUT of BUCK.
19	IN1	Power input for BUCK, LDO7 and system control circuit.
20	EN7	Enable Input for Linear Regulator 7. Drive high to enable.
21	EN9	Enable Input for Linear Regulator 9. Drive high to enable.
22	PWR_ON	Power on pin. Pull this pin high to turn on the IC.
23	REF	Low noise 1.25V reference. Bypass this pin with a 10nF cap to GND.
24	LDO7	LDO7 Output. Delivers up to 50mA. Connect a 2.2μF ceramic capacitor from OUT7 to GND.
25	GND	Ground
26	LDO9	LDO9 Output. Delivers up to 150mA.Connect a 2.2μF ceramic capacitor from OUT9 to GND.
27	EN8	Enable Input for Linear Regulator 8. Drive high to enable.
28	nRESET	Reset output, 65ms. Active low.. nRESET is low in shutdown.

FUNCTIONAL DESCRIPTION

The XX1188 power-management IC (PMIC) is an complete, efficient, compact devices suitable for 3G cellular applications such as wireless data cards, handsets and PDAs,. It integrates a 2MHz synchronous buck regulator, nine low-dropout linear regulators (LDOs), a RESET generator, and an 32KHZ crystal driver and buffer.

DC-DC Step-Down Converter

The XX1188 consists of a 2Mhz DC-DC step-down converter that is capable of delivering 600mA output current. It uses a hysteretic control scheme that provides fast switching, low output ripple, high efficiency, and fast transient response with simple setup of external components. The internal synchronous rectifier eliminates the use of external Schottky.

Linear Regulators

The XX1188 contains nine low-dropout, low quiescent current, low-operating voltage linear regulators. The maximum output currents for OUT1, OUT2, OUT3, and OUT5 are 300mA, for OUT6 and OUT6, they are 150mA, and for OUT4, OUT7and OUT8 they are 50mA. OUT1, OUT2, OUT3 are enabled after the DC-DC reaches regulation. The rest of the LDOs have enable control pins. Output of LDO8 can also be either 3.3V or 1.8V, depends on the voltage at SEL pin.

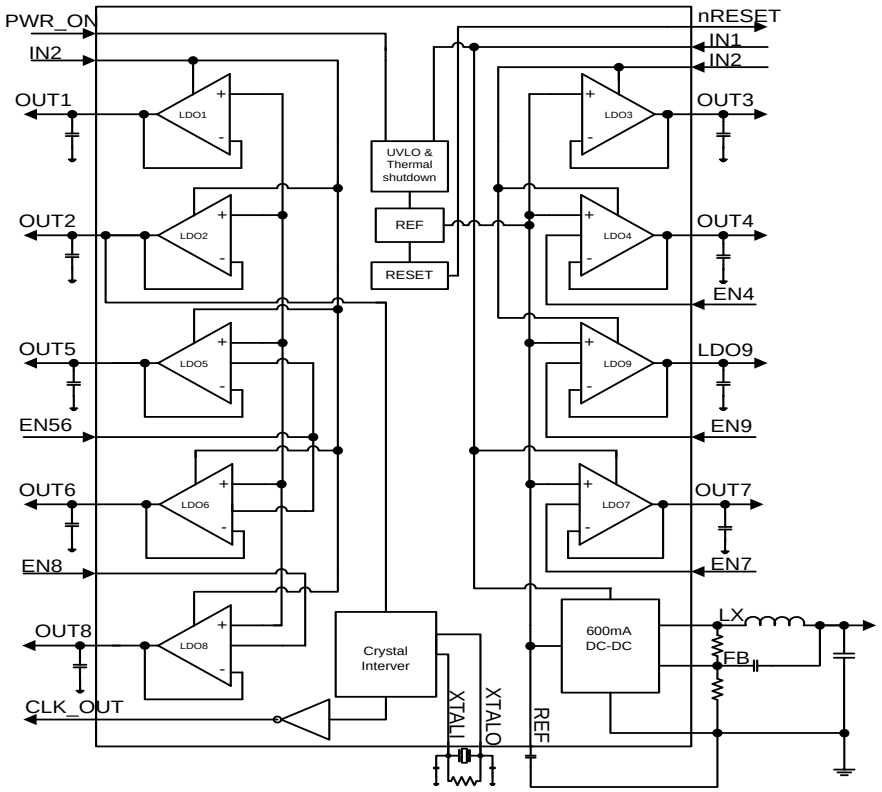
Crystal Driver

The XX1188 also provides a 32Khz crystal driver and a clock buffer that can be used for the system real time clock.

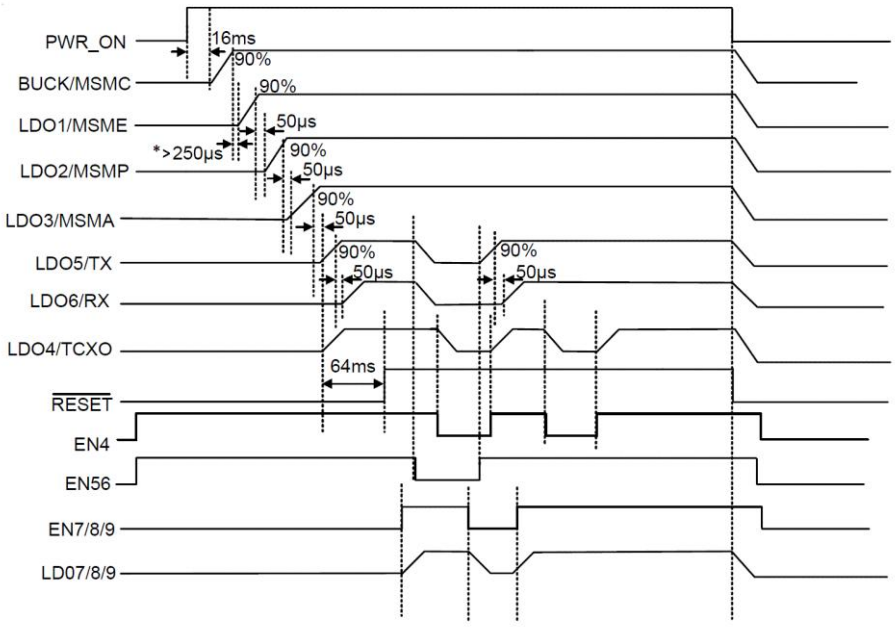
Reset

The XX1188 integrates a 60ms power-on reset generator, reducing system size and cost. nRESET is an open-drain output; connect a 10kΩ or greater pull-up resistor from nRESET to an appropriate voltage supply. nRESET asserts low upon startup and remains low until the 60ms reset timeout period expires, at which point nRESET goes high-Z.

BLOCK DIAGRAM

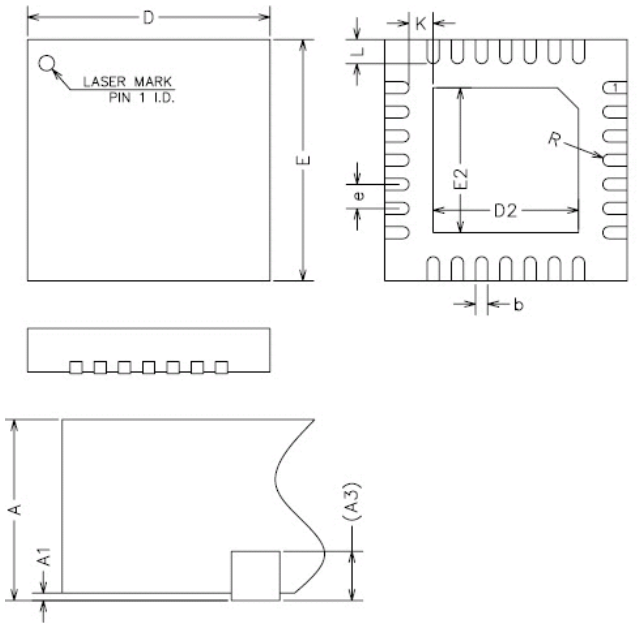


TIMING DIAGRAM



*The delay between LDO1 start up after Buck power up is to set min. delay time 250us, typical 350us, max. 500us at 25C. This is to guarantee enough delay time for full temperature range, as delay time is about 250us at 85C.

PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
A3		0.20REF	
b	0.15	0.20	0.25
D	3.90	4.00	4.10
E	3.90	4.00	4.10
D2	2.30	2.40	2.50
E2	2.30	2.40	2.50
e	0.30	0.40	0.50
K	0.20	–	–
L	0.35	0.40	0.45
R	0.09	–	–