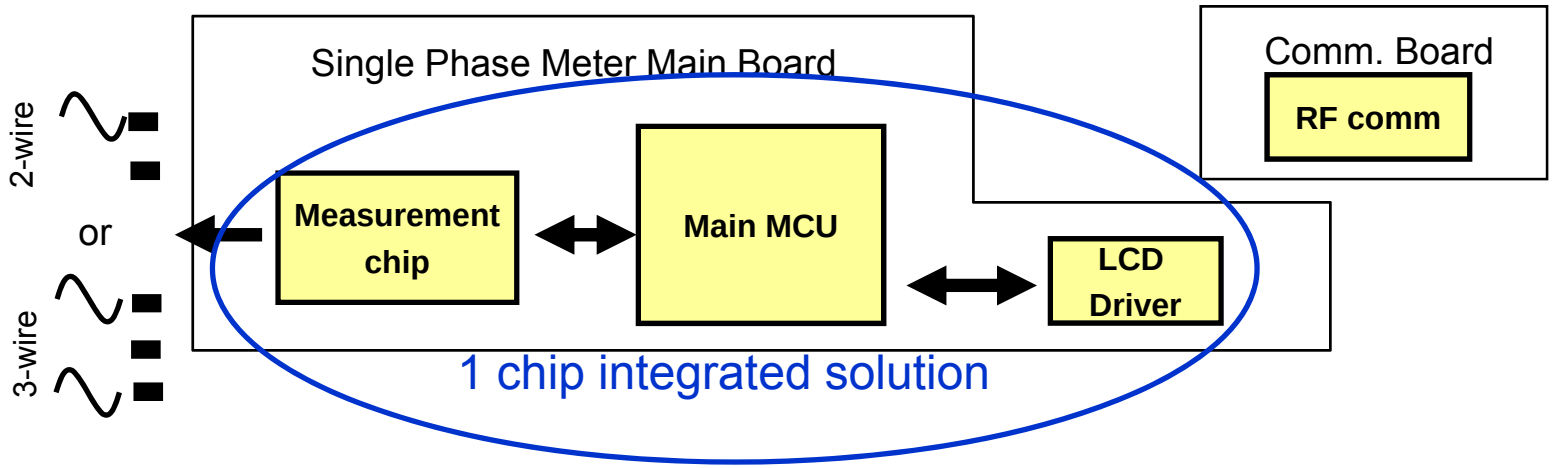
78K/Lx3-M
8-Bit MCU
For Single Phase Electricity Meter Applications

Target Markets

- Primary Application: Single Phase Electricity Meter Market
  - Support 2-wire and 3-wire single phase
  - Support for Rogowski coil
- Value Proposition: Low cost with high degree of integration
  - Sensing + Calculation + LCD in 1 chip



- 24-bit Delta Sigma ADC (up to 4 channels)
- Hardware block for Power Calculation
- Hardware block to assist Power Monitoring and Calculation
- Low Power Design

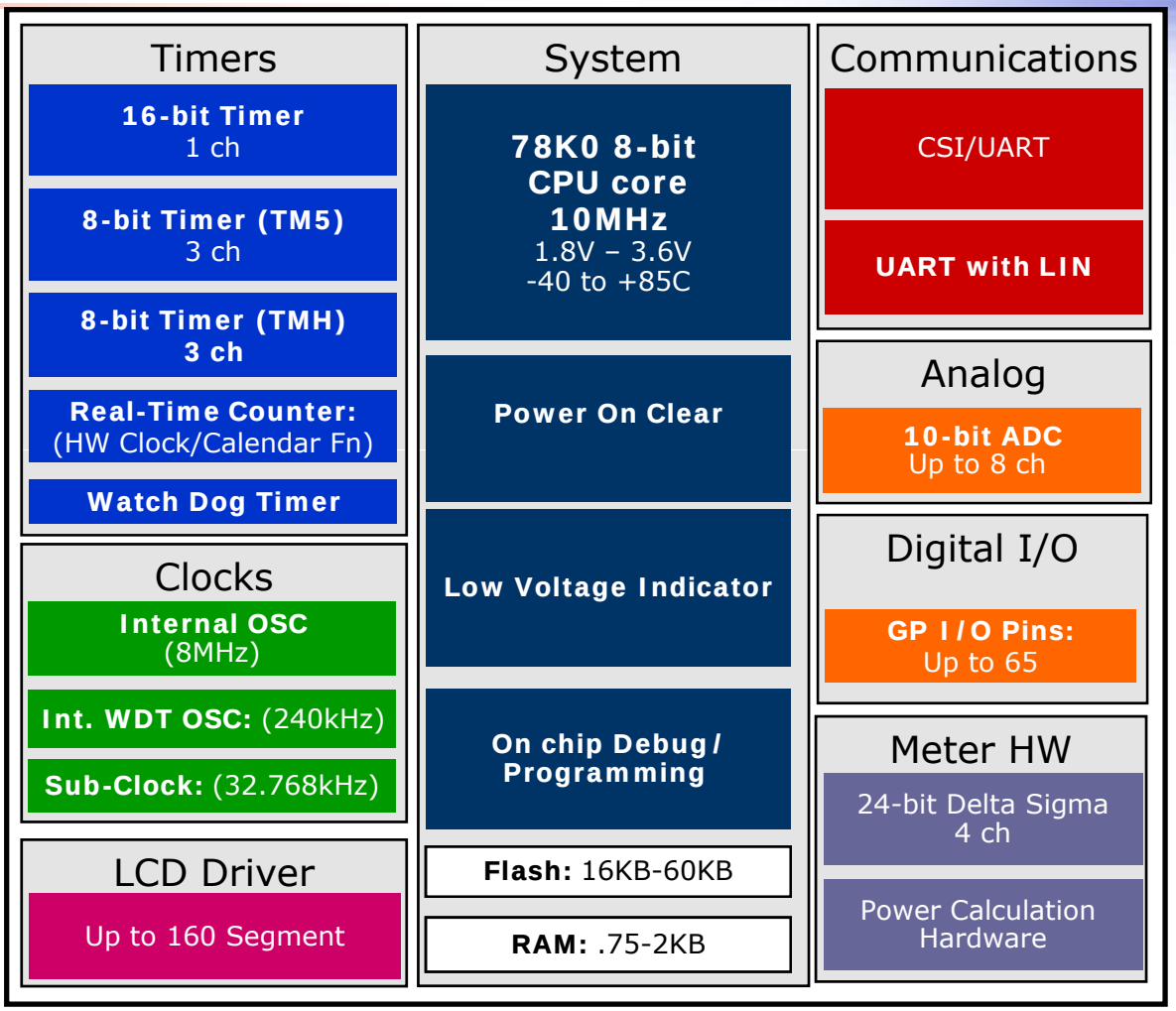
78K0/Lx3-M Block Diagram

Features

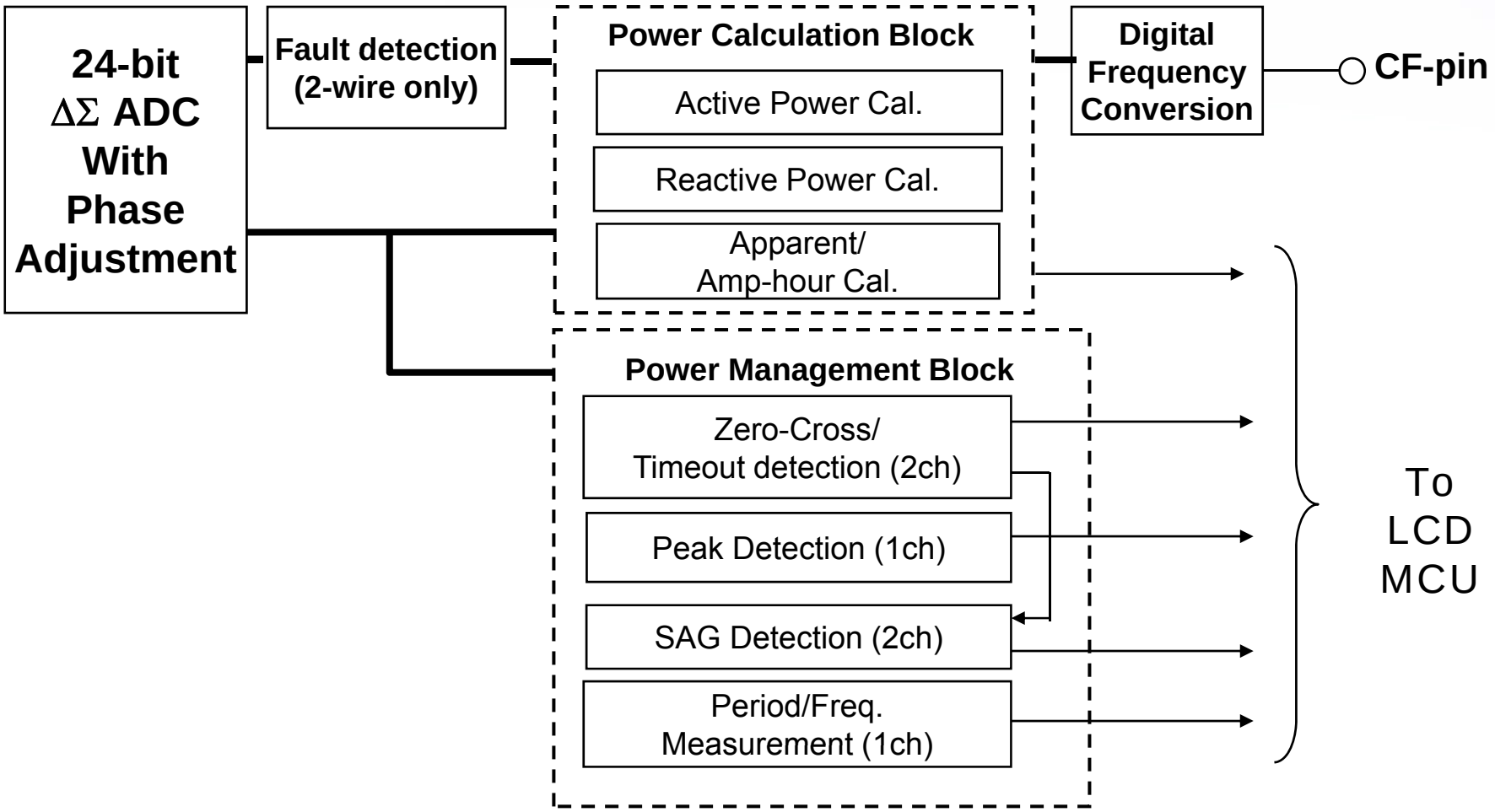
- 24-bit Delta Sigma ADC (4ch)
- Up to 160 LCD segments
- Electricity Power Calculation DSP
- Flash Memory
  - Error Correction Code (ECC)
  - Boot Loader (Boot Swap)
  - Self Programming
  - EEPROM emulation

Benefits

- High resolution and precise sensing
- Dedicated electricity power calculation hardware to simplify design
- Highly Reliable flash



78K0/Lx3-M Features And Benefits

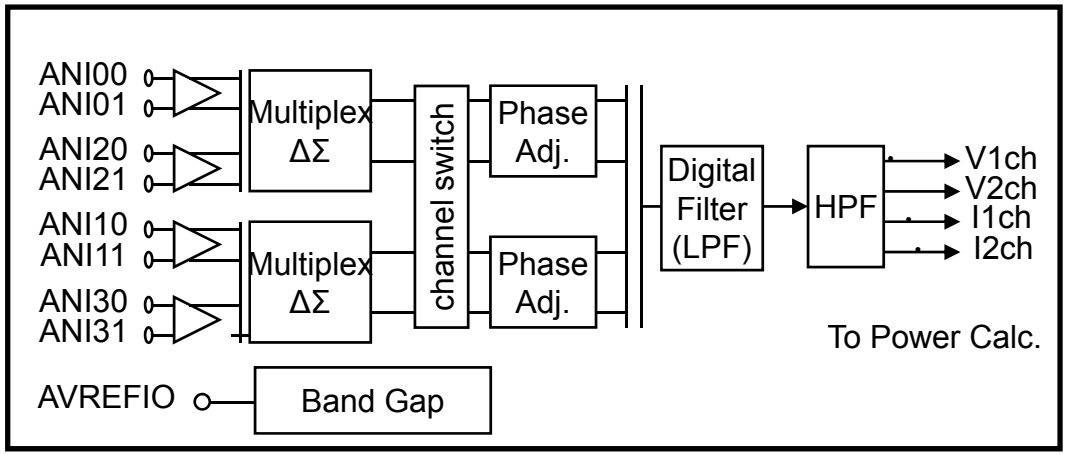


78K0/Lx3-M Features And Benefits

- 24-bit Delta Sigma ADC
  - 24-bit resolution
  - Selectable pre-amp to enhance SNR
    - X2, x16 on channel 1 and 3
  - *SNR ~ 76dB (typ)
  - *Reference Voltage generation 1.226V (typ)
  - Sampling Rate: 4.34kHz
  - Oversampling Rate: 128x

*Numbers are subjected to change as more evaluation is performed

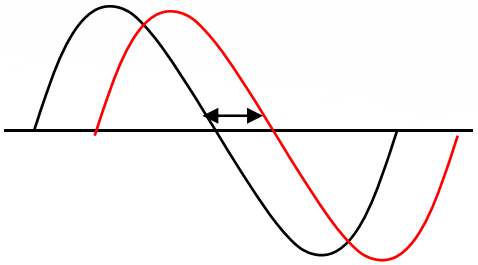
ANI pin	2-wire	3-wire	Pre-amp
ANI00,01	V1	V1	X1
ANI10,11	C2	C1	x2、x16
ANI20,21	V1	V2	X1
ANI30,31		C2	x2、x16



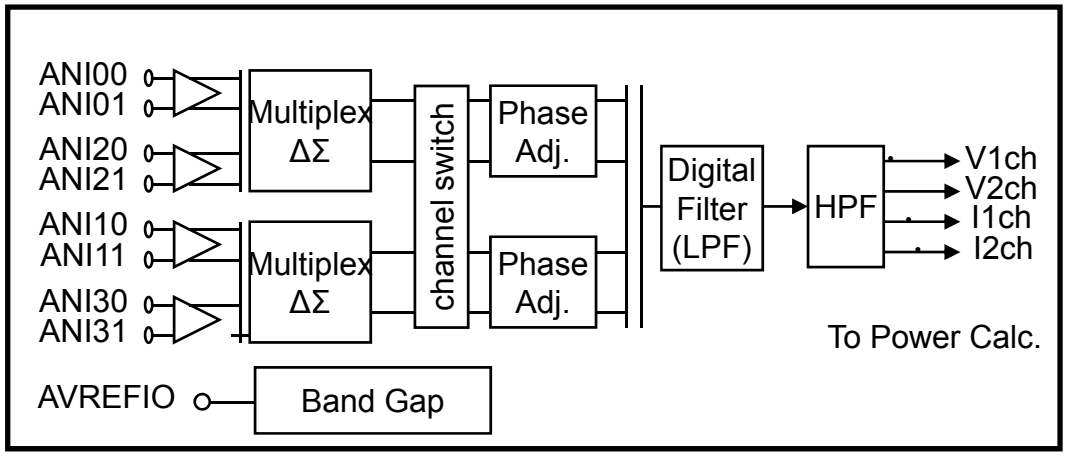
78K0/Lx3-M Features And Benefits

- Phase Adjustment to between Voltage and Current

- -255 to +255 adjustment
- Each step is 1.8uS
  - 50Hz: +/- 8.25 degree
  - 60Hz: +/- 9.9 degree



Phase gap between Current ch and Voltage ch



78K0/Lx3-M Features And Benefits

- Calculation: Reactive, Active and Apparent/Ampere-Hour
  - Signed, Absolute and Positive Modes
- Computation in 24-bit to preserve precision
- Additional Support
  - Zero-load detection

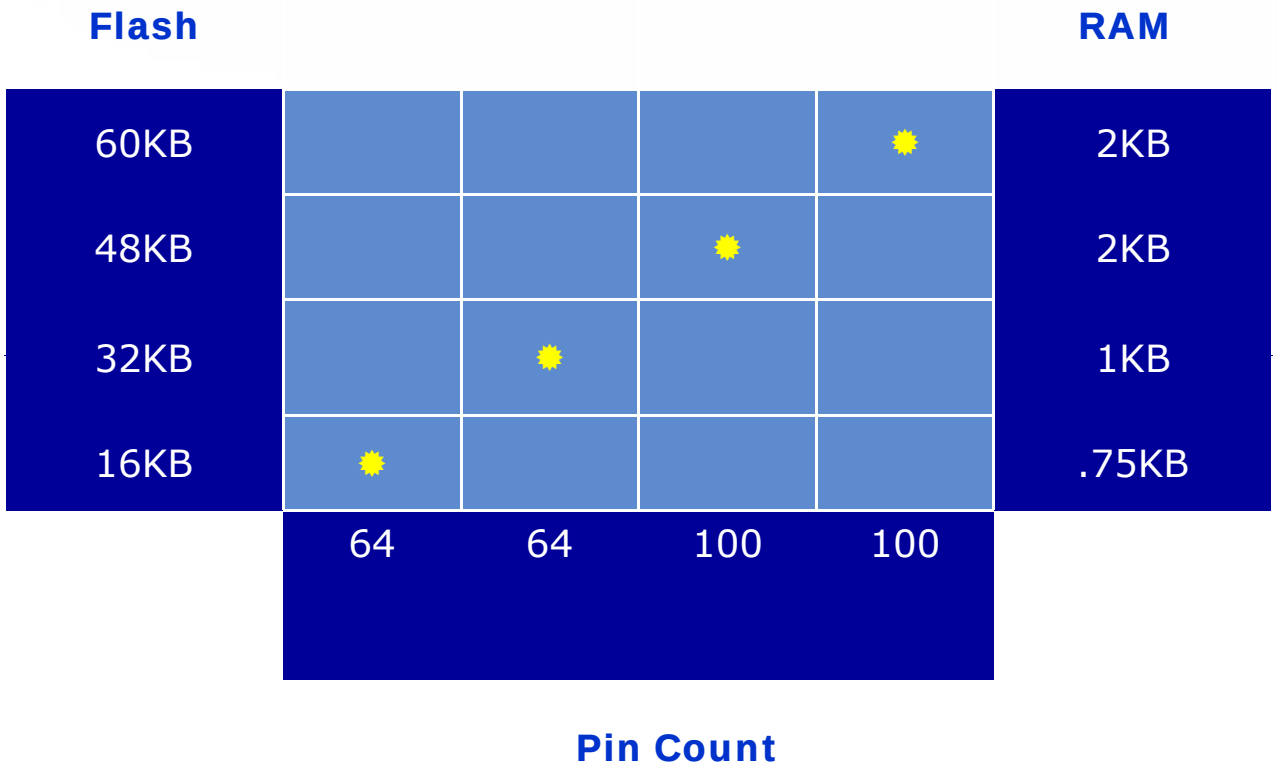
78K0/Lx3-M Features And Benefits

- Anti-tamper Function
  - Detect line-current and neutral current (difference could mean leaking)
  - 2-wire type only
- Zero-cross Detection Function
  - Detect zero-crossing of voltage line
- SAG Detection Function
  - Detect overloading condition
  - Causes an interrupt when voltage drops to a user-specified level for a user-specified time duration
- Peak Detection Function
  - Detect peak of voltage/current
  - Causes an interrupt when voltage/current exceeds a user-specified level
- Period/Frequency Measurement
  - Measure line period on voltage line
- Digital-Frequency conversion (DFC)
  - Convert power calculation result into wave form for calibration

78K0/Lx3-M Features And Benefits

- 10-bit ADC for Temperature Calibration
- IR Transceiver for scanner communication

Line up, Availability and Pricing



Choice of 4 Devices

78K0/Lx3-M Family Comparison

		uPD78F8052	uPD78F8053	uPD78F8054	uPD78F8055
		64pin	64pin	100pin	100pin
Flash		16K	32K	48K	60K
RAM		.75KB	1KB	2KB	
System Clock		Internal High-speed oscillator 8MHz +/-5% External oscillator 2MHz to 10MHz			
Sub Clock		32.768kHz			
WDT Clock		Internal Low-speed oscillator 240kHz			
LCD		24x4	24x4	40x4	40x4
Special Feature		Power Measurement Block/Power Management Block (more in later slides)			
Timer	16bit (TM0)	1ch			
	8bit (TM5)	1ch			
	8bit (TMH)	1ch			
	RTC	1ch			
	WDT	1ch			
Serial I/F		CSI/UART 1ch, UART w/ LIN 1ch			
10bit A/D		1ch		8ch	
24-bit Delta Sigma		3ch		4ch	
Ext. Interrupt		4		5	
POC, LVI		POC, LVI (10 selectable voltages)			
VDD/Ta conditions		VDD = 1.8 to 3.6V, Ta = -40 to +85 deg-C			