# Microcontrollers in Solar Applications

Texas Instruments

Power voltage (PV) systems utilize solar panels to convert sunlight to electricity. This electricity is then used in power generation for on-grid or off-grid applications:

- On-grid applications: Solar panels drive an inverter that matches a common grid to share energy with multiple homes.
- Off-grid applications: Solar panels drive a converter but do not have a common utility grid connection. They can be individual homes or end applications, such as solar-powered streetlights, water pumps or telecom base stations.

In each of these applications, you must have two key elements:

1. Solar panel(s) to collect energy (all solar panels output DC)
2. Inverter (DC/AC) or converter (DC/DC) to maximize the power production from the solar panels, as well as convert the low voltages from the panels into usable higher voltages.

Inverter systems are used to create AC voltages for driving AC applications on the grid, while converter systems create higher DC voltages for driving a directly attached load and also handle functions such as battery charging. Both of these can be handled by C2000™ microcontrollers (MCUs).

## *Why partner with TI in solar applications?*

- Complete development packages
- Flexible solutions for changing market requirements
- Easy programming and tools selection
- Robust ecosystem of tools and software from third parties for development and support

## *Microcontrollers for your solar applications*

| MIPS | Device | Processor | Features |
|---|---|---|---|
| 150 | **F28M35x**<br>**F28M36x** | ARM® M3 + C28x<br>Dual subsystem | • M3 (up to 125 MHz), C28x (up to 150 MHz)<br>• Connectivity and real-time control peripherals<br>• 3-phase solar inverter, communications-enabled string inverters |
| 80 | **C2834x**<br>**F2833x** | Floating point<br>High performance | • Up to 300 MHz/300 MIPS, fast 12-MSPS 12-bit ADC<br>• Dual CAN, 176 QFP, 179 µBGA, 256 BGA<br>• 3-phase inverters, high-performance string inverters |
| 60 | **F2806x** | Floating point<br>with co-processor + VCU options | • Up to 90 MHz/180 MIPS*, 12-bit 3.0-MSPS ADC<br>• Floating point, Control Law Accelerator, VCU, USB 2.0<br>• 1-phase solar inverter + PLC, micro inverters and optimizers |
| | **F2803x** | Fixed point<br>with co-processor options | • Up to 60 MHz/120 MIPS,12-bit 4.6-MSPS ADC<br>• Control Law Accelerator, CAN, up to 256KB Flash<br>• DC arc detection, 1-phase inverters, micro inverters and optimizers |
| 40 | **F2802x** | Fixed point<br>Low cost | • Up to 60 MHz/60 MIPS, 12-bit 4.6-MSPS ADC<br>• Up to 128KB Flash, LIN<br>• Off-grid solar, low-cost solar applications (MPPT front end) |

## *Getting Started*

### Solution highlights

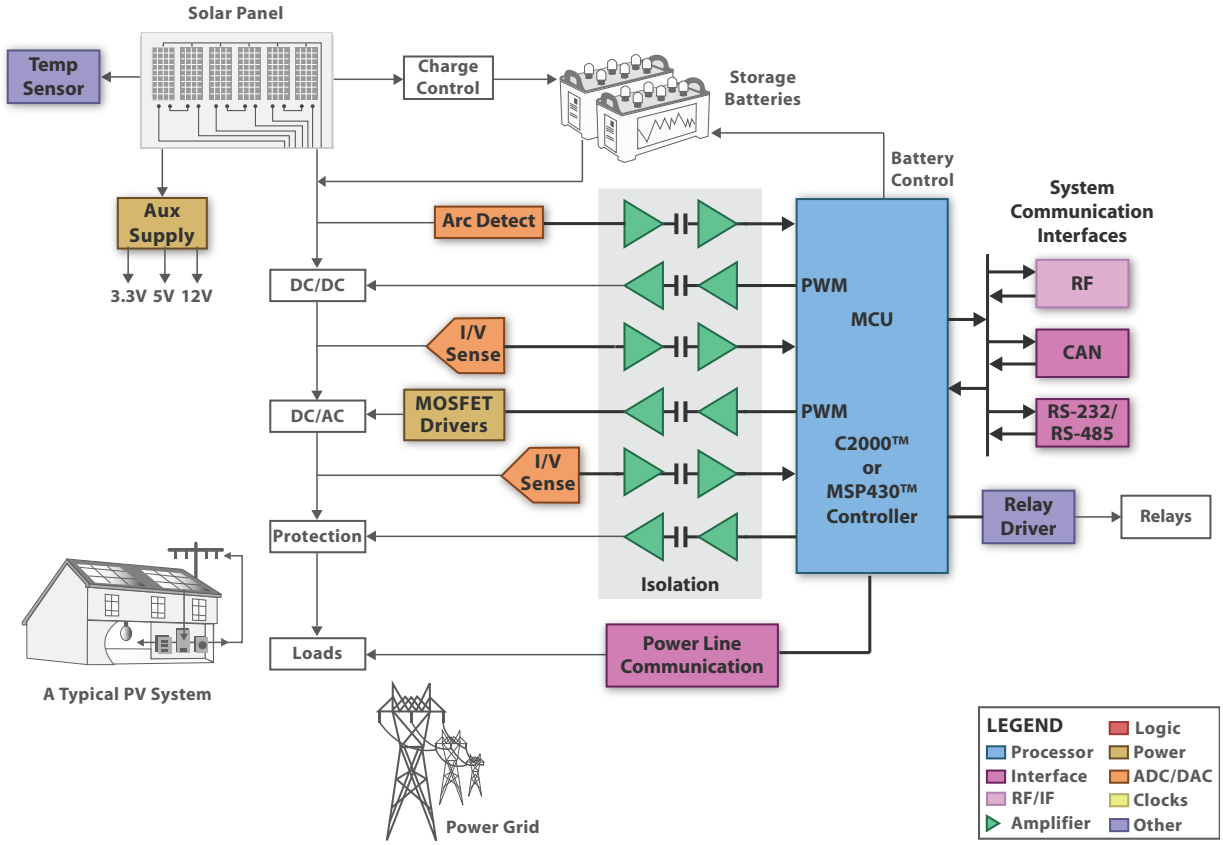
- Solar overview: **www.ti.com/solar**
- Solar application tools: **www.ti.com/c2000tools**
- Third-party support: **www.vissim.com/**

### Software

- controlSUITE™ software: **www.ti.com/controlsuite**

### Application kits

- Piccolo™ Solar Explorer Development Kit: **www.ti.com/tool/tmdssolarpexpkit**
- High-Voltage Isolated Solar MPPT Developers Kit: **www.ti.com/tool/tmdshvmpptkit**
- High-Voltage Single-Phase Inverter Development Kit: **www.ti.com/tool/tmdshv1phinvkit**

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