

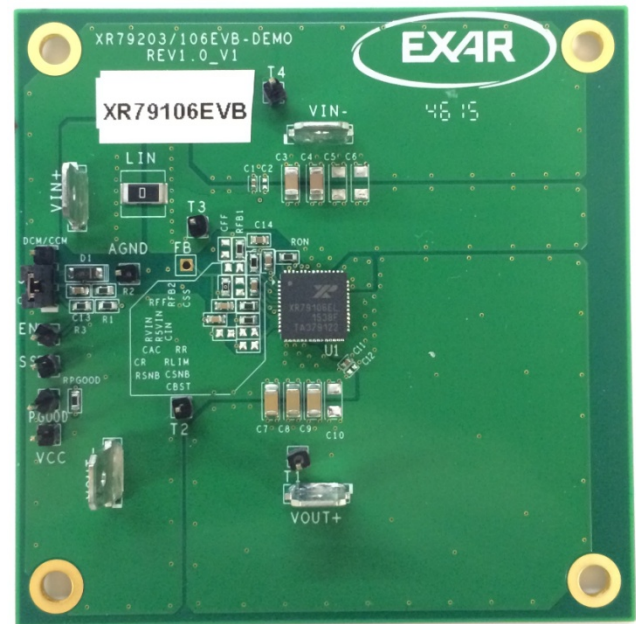
**22V, 6A Synchronous Step-Down COT Power Module**

April 2016

Rev. 1A

GENERAL DESCRIPTION

The XR79106 is part of a family of 22V synchronous step-down power modules combining the controller, drivers, inductor, passive components and MOSFETs in a single package for point-of-load supplies. This module requires very few external components leading to ease of design and fast time to market. The XR79106 has load current rating of 6A. A wide 4.5V to 22V input voltage range allows for single supply operation from industry standard 5V, 12V and 19.6V rails. With a proprietary emulated current mode Constant On-Time (COT) control scheme, the XR79106 provides extremely fast line and load transient response using ceramic output capacitors. It requires no loop compensation, simplifying circuit implementation and reducing overall component count. The control loop also provides 0.2% load and 0.2% line regulation and maintains constant operating frequency. A selectable power saving mode, allows the user to operate in Discontinuous Current Mode (DCM) at light current loads significantly increasing the converter efficiency. A host of protection features, including overcurrent, over temperature, short-circuit and UVLO, helps achieve safe operation under abnormal operating conditions. The XR79106 is available in a RoHS-compliant, green/halogen-free space-saving 8mm x 8mm x 4mm QFN package.

EVALUATION BOARD MANUAL**FEATURES**

- 6A step-down power module
 - 4.5V to 22V wide single input voltage
 - $\geq 0.6V$ adjustable output voltage
- Controller, drivers, inductor, passive components and MOSFETs integrated in one package
- Proprietary constant on-time control
 - No loop compensation required
 - Stable with ceramic output capacitors
 - Programmable 100ns to 1 μ s on-time
 - Constant 600kHz to 800kHz frequency
 - Selectable CCM or DCM/CCM operation
- Precision enable and power-good flag
- Programmable soft-start
- 8mm x 8mm x 4mm QFN package



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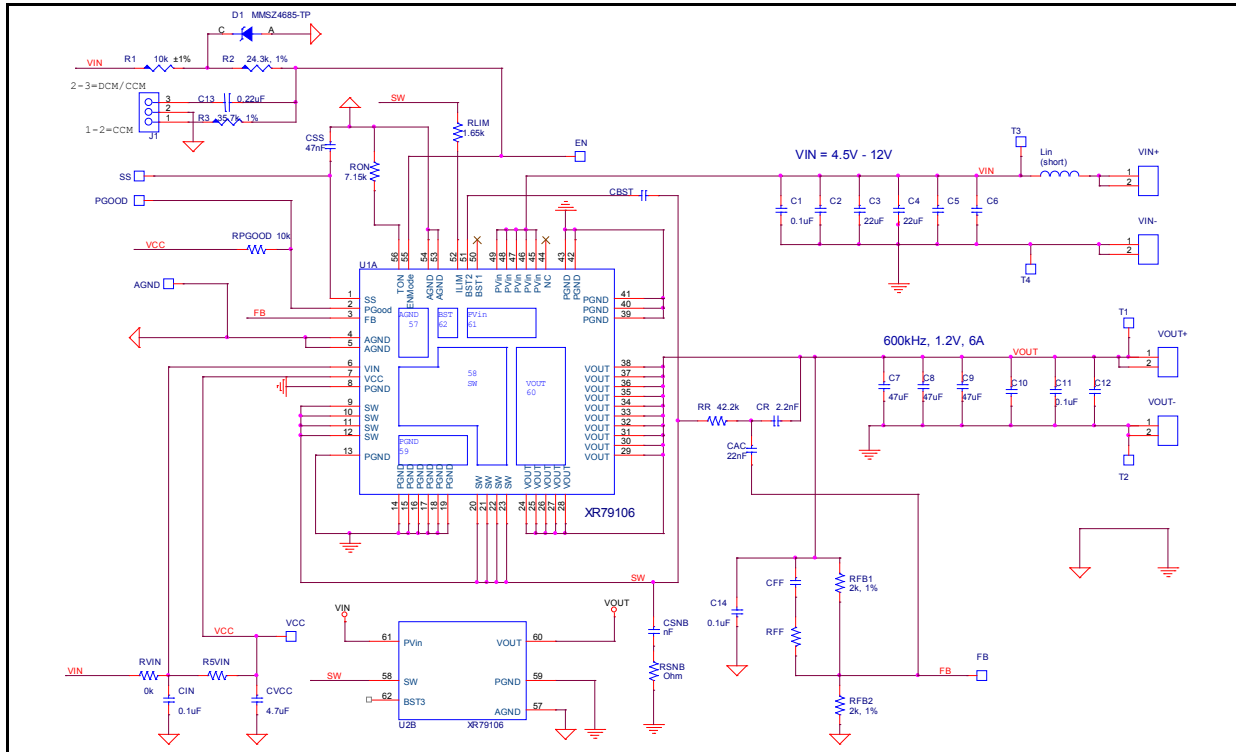


Fig. 1: XR79106 Evaluation Board Schematics

PIN CONFIGURATION

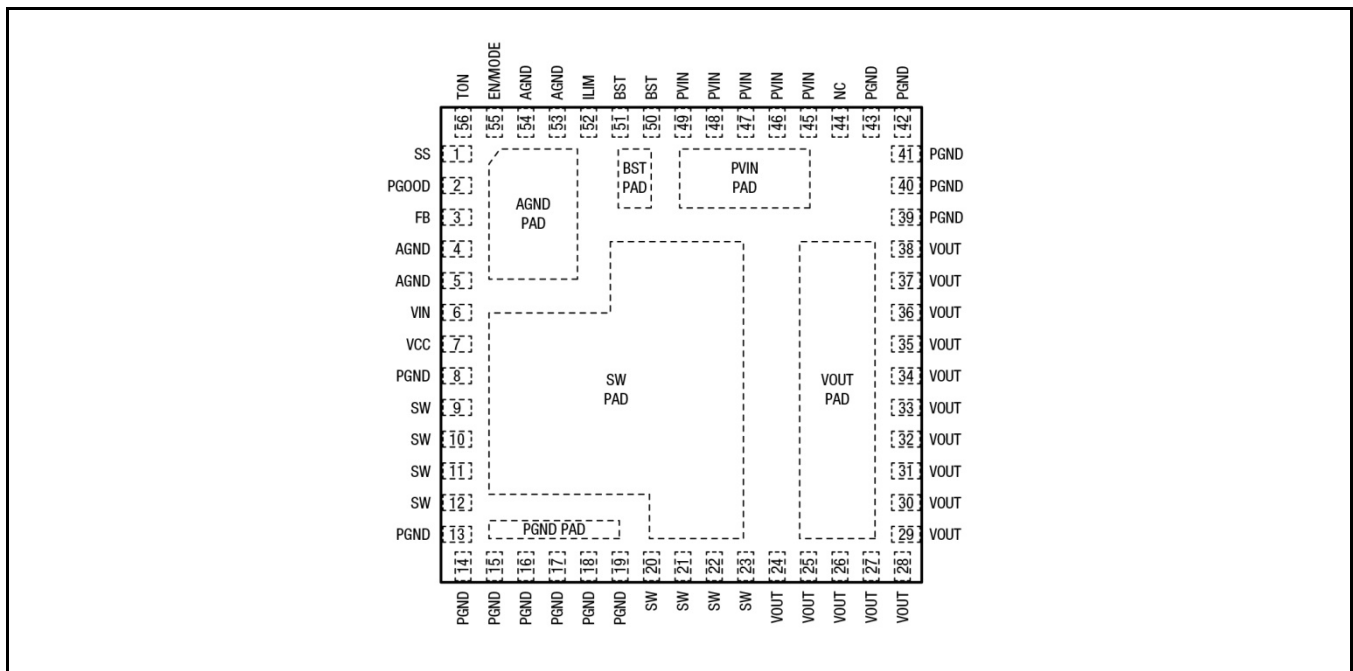


Fig. 2: XR79106 Pin Assignment

**22V, 6A Synchronous Step-Down COT Power Module****PIN FUNCTIONS**

| Pin Number | Pin Name | Type | Description |
|---------------------------|----------|-------|---|
| 1 | SS | A | Soft-start pin. Connect an external capacitor between SS and AGND to program the soft-start rate based on the 10 μ A internal source current. |
| 2 | PGOOD | OD, O | Power-good output. This open-drain output is pulled low when V _{OUT} is outside the regulation. |
| 3 | FB | A | Feedback input to feedback comparator. Connect with a set of resistors to V _{OUT} and AGND in order to program V _{OUT} . |
| 4, 5, 53, 54, AGND Pad | AGND | A | Analog ground. Control circuitry of the IC is referenced to this pin. Connect to PGND. |
| 6 | VIN | PWR | IC supply input. Provides power to internal LDO. Connect to PVIN pins. |
| 7 | VCC | PWR | The output of LDO. Bypass with a 4.7 μ F capacitor to AGND. |
| 8 | PGND | PWR | Controller low-side driver ground. Connect with a short trace to closest PGND pins or PGND pad. |
| 13-19, 39-43, PGND Pad | PGND | PWR | Ground of the power stage. Should be connected to the system's power ground plane. |
| 9-12, 20-23, SW Pad | SW | PWR | Switching node. It internally connects the source of the high-side FET, the drain of the low-side FET, the inductor and bootstrap capacitor. Use thermal vias and/or sufficient PCB land area in order to heatsink the low-side FET and the inductor. |
| 24-38, VOUT Pad | VOUT | PWR | Output of the power stage. Place the output filter capacitors as close as possible to these pins. |
| 45-49, PVIN Pad | PVIN | PWR | Power stage input voltage. Place the input filter capacitors as close as possible to these pins. |
| 50, 51, BST Pad | BST | A | Controller high-side driver supply pin. It is internally connected to SW via a 0.1 μ F bootstrap capacitor. Leave these pins floating. |
| 52 | ILIM | A | Overcurrent protection programming. Connect with a short trace to SW pins. |
| 55 | EN/MODE | I | Precision enable pin. Pulling this pin above 1.9V will turn the IC on and it will operate in forced CCM. If the voltage is raised above 3.0V, then the IC will operate in DCM or CCM depending on load. |
| 56 | TON | A | Constant on-time programming pin. Connect with a resistor to AGND. |

NOTE:

A = Analog, I = Input, O = Output, OD = Open Drain, PWR = Power.

ORDERING INFORMATIONRefer to XR79106 datasheet and/or www.exar.com for exact and up to date ordering information.

**22V, 6A Synchronous Step-Down COT Power Module**

USING THE EVALUATION BOARD**POWERING UP**

Connect the VIN+/VIN- with short leads to power supply. Use T3 and T4 pins to monitor VIN+ and VIN- respectively. Connect VOUT+/VOUT- with short leads to an electronic load. Use T1 and T2 pins to monitor VOUT+ and VOUT- respectively. Apply 12V using the power supply. The XR79106 EVB should power up and regulate the output at 1.2V. Input voltage range is from 4.5V to 22V. Maximum rated current for XR79106 is 6A.

JUMPER J1

If the jumper is set to CCM position, the Module will operate in “forced CCM”. If the Jumper is set to DCM/CCM position the Module will operate in DCM at light load.

OPERATION FROM A 5V RAIL ($V_{IN}=4.5V-5.5V$)

For operation from a 5V rail it is recommended to tie output of the LDO to VIN by populating R5VIN with a 0Ω resistor. This enhances the operation of the drivers at $V_{IN}<5V$. Please remember to remove R5VIN for operation at higher V_{IN} .

PROGRAMMING THE OUTPUT VOLTAGE

V_{OUT} can be programmed by changing RFB1 according to:

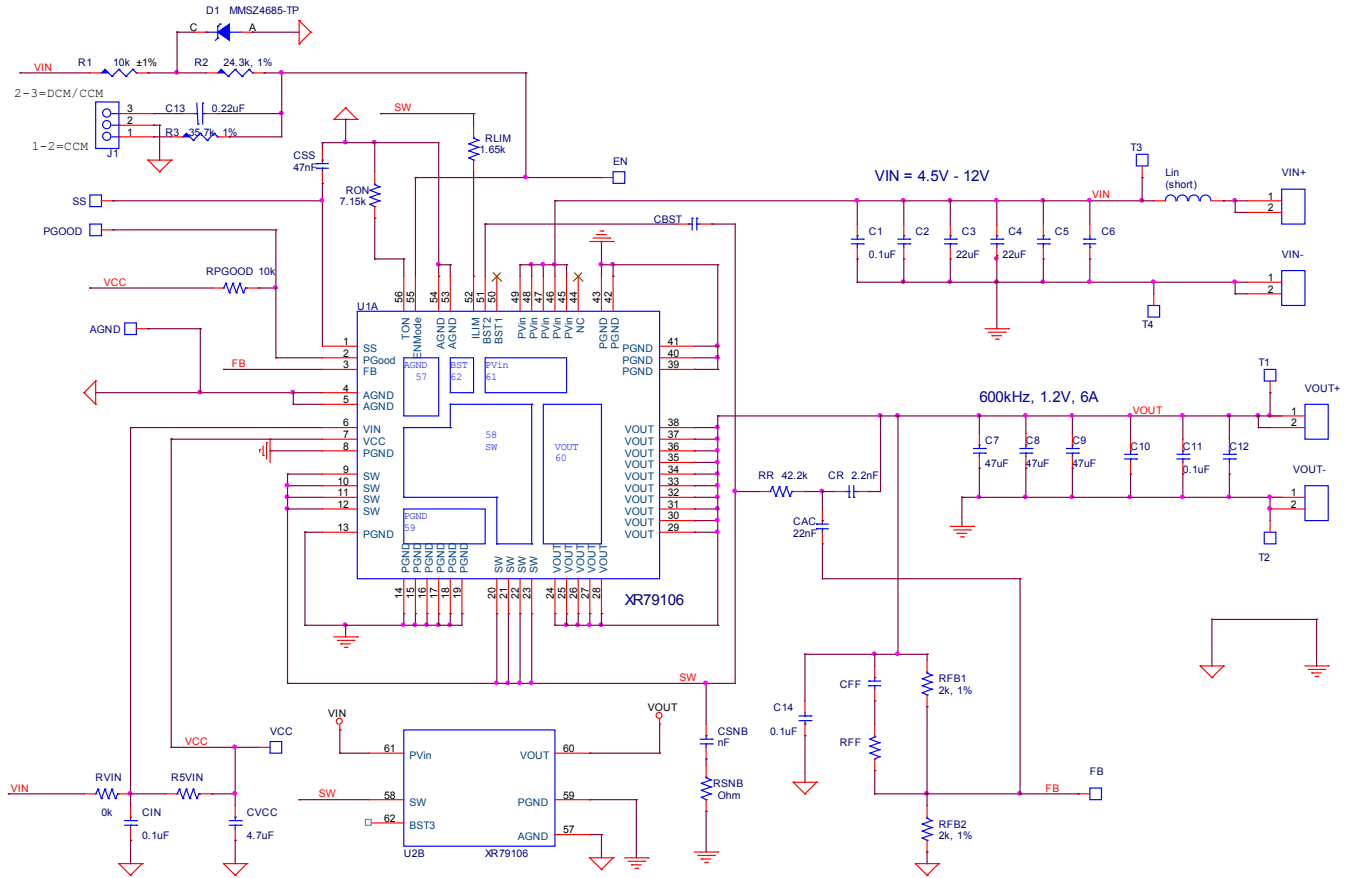
$$RFB1 = RFB2 \times \left(\frac{V_{OUT}}{0.6} - 1 \right)$$

Where RFB2 has a nominal value of 2kΩ.



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EVALUATION BOARD SCHEMATICS



XR79106 EVB Schematics



22V, 6A Synchronous Step-Down COT Power Module

XR79106EVB BILL OF MATERIAL

| | | | | | |
|----------------------------|---|------------------|--------------------|---------|---------------------------------------|
| PCB | 1 | Exar | 146-6724-01 | | XR79106 Evaluation Board |
| U1 | 1 | Exar | XR79106EL-F | 8mmX8mm | |
| D1 | 1 | ON SEMI | MMSZ4685T1G | SOD123 | DIODE ZENER 3.6V 500MW SOD123 |
| C3,C4 | 2 | MURATA | GRM31CR61E226KE15L | 1206 | CERAMIC CAP. 22uF, 25V, X5R, 10% |
| C7,C8,C9 | 3 | MURATA | GRM31CR61A476KE15L | 1206 | CERAMIC CAP. 47uF, 10V, X5R, 10% |
| C1,C11 | 2 | MURATA | GRM155R71H104KE14D | 0402 | CERAMIC CAP. 0.1uF, 50V, X7R, 10% |
| CIN, C14 | 2 | MURATA | GRM188R71H104KA93D | 0603 | CERAMIC CAP. 0.1uF, 50V, X7R, 10% |
| CVCC | 1 | MURATA | GRM188R61A475KE15D | 0603 | CERAMIC CER, 4.7uF, 10V, X5R, 10% |
| C13 | 1 | MURATA | GRM188R71C224KA01D | 0603 | CERAMIC CAP , 0.22uF, 16V, X7R, 10% |
| CSS | 1 | MURATA | GRM188R71H473KA61D | 0603 | CERAMIC CAP , 47nF, 50V, X7R, 10% |
| CR | 1 | MURATA | GRM188R71H222KA01D | 0603 | CERAMIC CAP., 2200PF, 50V, X7R, 10% |
| CAC | 1 | MURATA | GRM188R71H223KA01D | 0603 | CERAMIC CAP., 22nF, 50V, X7R, 10% |
| R1,RPGOOD | 2 | PANASONIC | ERJ-3EKF1002V | 0603 | Resistor 10.0K Ohm, 1/10W,1%,SMD |
| R2 | 1 | PANASONIC | ERJ-3EKF2432V | 0603 | Resistor 24.3K Ohm, 1/10W,1%,SMD |
| R3 | 1 | PANASONIC | ERJ-3EKF3572V | 0603 | Resistor 35.7K Ohm, 1/10W,1%,SMD |
| RFB1,RFB2 | 2 | PANASONIC | ERJ-3EKF2001V | 0603 | Resistor 2.0K Ohm, 1/10W,1%,SMD |
| RVIN | 1 | PANASONIC | ERJ-3GEY0R00V | 0603 | Resistor 0.00 Ohm, Jumper, 1/10W, SMD |
| RLIM | 1 | PANASONIC | ERJ-3EKF1651V | 0603 | Resistor 1.65K Ohm, 1/10W,1%,SMD |
| RR | 1 | PANASONIC | ERJ-3EKF4222V | 0603 | Resistor 42.2K Ohm, 1/10W,1%,SMD |
| RON | 1 | PANASONIC | ERJ-3EKF7151V | 0603 | Resistor 7.15K Ohm, 1/10W,1%,SMD |
| LIN | 1 | VISHAY/DALE | CRCW12100000Z0EAHP | 2010 | Resistor 0.00 Ohm, Jumper, 3/4W, SMD |
| T1-T4,VCC,PGOOD,SS,EN,AGND | 9 | Würth Elektronik | 61300111121 | 2.54mm | Header 1 pin |
| J1 | 1 | Würth Elektronik | 61300311121 | 2.54mm | Header 3 pin |
| VIN-, VIN+, VOUT-, VOUT+ | 4 | Würth Elektronik | 7471287 | | Mountin Tab WA-MTAB |



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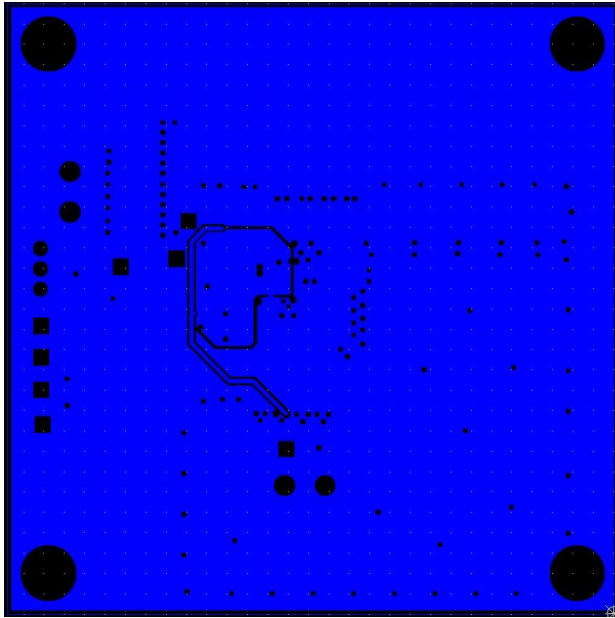


Fig. 7: Layer 2

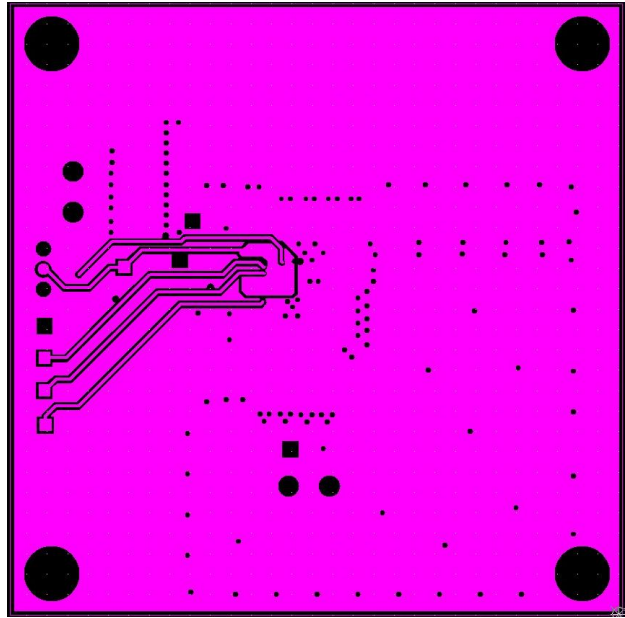


Fig. 8: Layer 3



22V, 6A Synchronous Step-Down COT Power Module

DOCUMENT REVISION HISTORY

| Revision | Date | Description |
|----------|---------|-----------------------------|
| 1A | 4/25/16 | Initial release of document |
| | | |
| | | |

BOARD REVISION HISTORY

| Board Revision | Date | Description |
|----------------|---------|-------------------------------------|
| REV 1.0 | 11/3/15 | Initial release of evaluation board |
| | | |
| | | |

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