

Torex...Powerfully Small!

60V 6A Step-Down Charge Pump Module for High-Voltage Applications
XM981A Series Product Overview

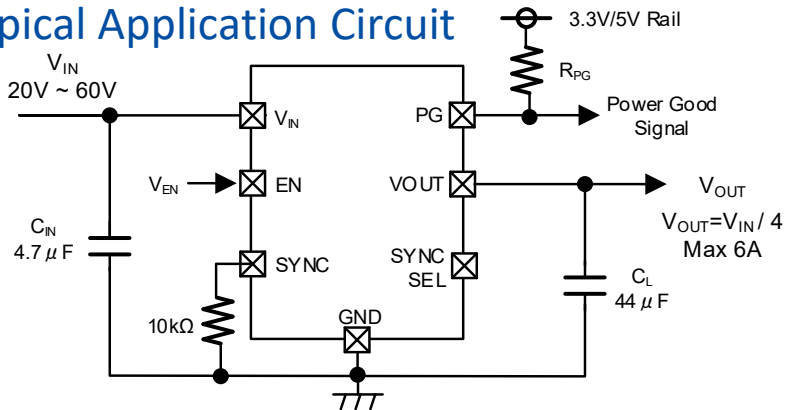
October. 2025
TOREX SEMICONDUCTOR LTD.
Rev. 1.2

Ideal for 48V-to-12V Intermediate Bus / High Efficiency, Compact and Low-Profile / Supports High Current with Parallel Connection

■ Features

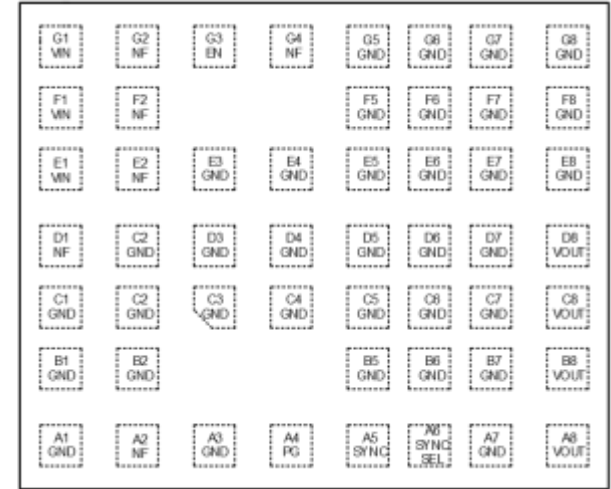
- Input Voltage Range : 20.0V ~ 60.0V (Absolute Max. : 61.0V)
- Output Voltage : $V_{IN} / 4$
- Output Current : 6A
* Up to 4 modules in parallel for 24A maximum
- Oscillation Frequency : 270kHz
- Efficiency : 96.5% ($V_{IN}=48V, V_{OUT}=12V, I_{OUT}=2.4A$)
95.0% ($V_{IN}=48V, V_{OUT}=12V, I_{OUT}=6A$)
- Function : Stackable up to 4 modules
Soft-start, UVLO
Power Good
- Protection : Current Limit
Thermal Shutdown
- Package : LGA52-C01 (11.5 x 9.5 x 2.1mm)
400pcs/Reel
- Operating Ambient Temp : -40°C ~ 105°C

■ Typical Application Circuit



■ Package

LGA52-C01
(11.5 x 9.5 x 2.1mm)

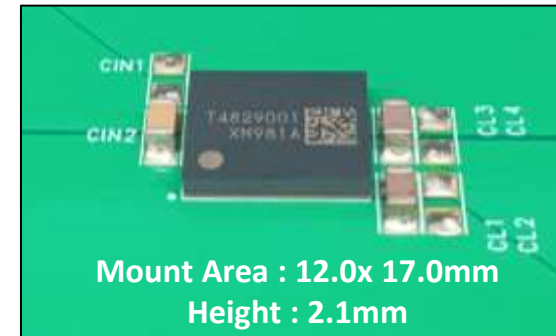


■ Compact / Low-Profile

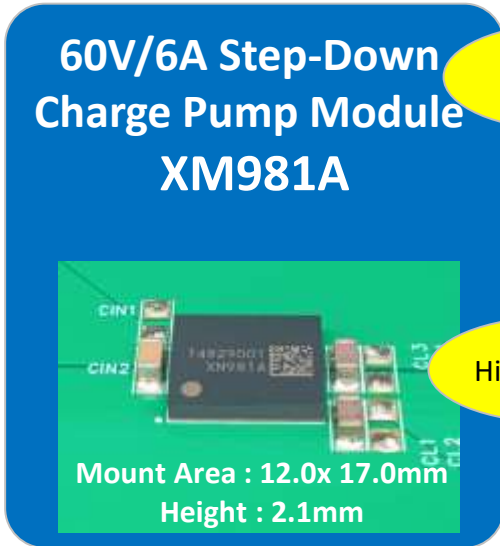
- No inductor required — Solution height just 2.1 mm

Key Components : C_{IN} 3.2 x 1.6mm x 1

C_L : 3.2 x 1.6mm x 2



- Enables compact, high-efficiency, and easy 12V power from a 48V source



① High-Efficiency Charge Pump

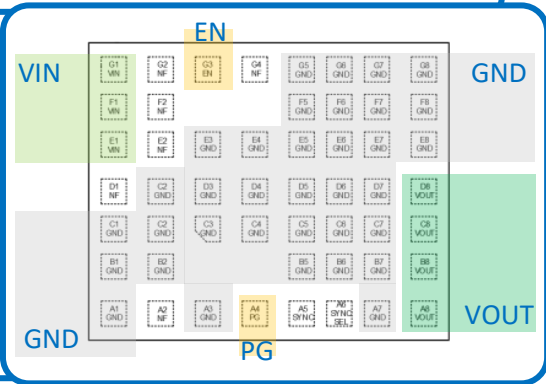
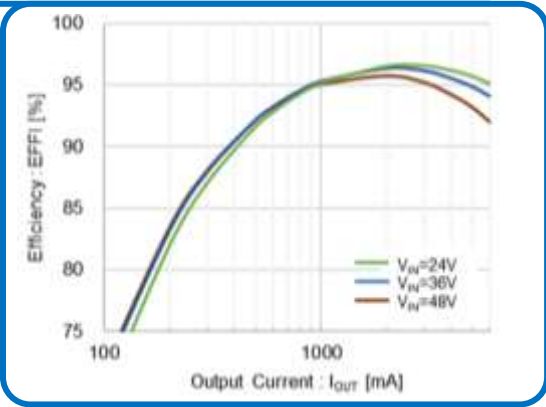
- ✓ Vin 48 V \Rightarrow Vout 12 V / 6 A with 95% efficiency
- ✓ Outputs 1/4 of the input voltage

② Parallel Connection for High Current

- ✓ Supports parallel connection
- ✓ Up to 4 modules in parallel for 24A maximum

③ Compact and Low-Profile

- ✓ Small 11.5 × 9.5 × 2.1 mm package
- ✓ Inductor-free charge pump design; only 3 key components required
- ✓ Pin layout optimized for easy PCB design

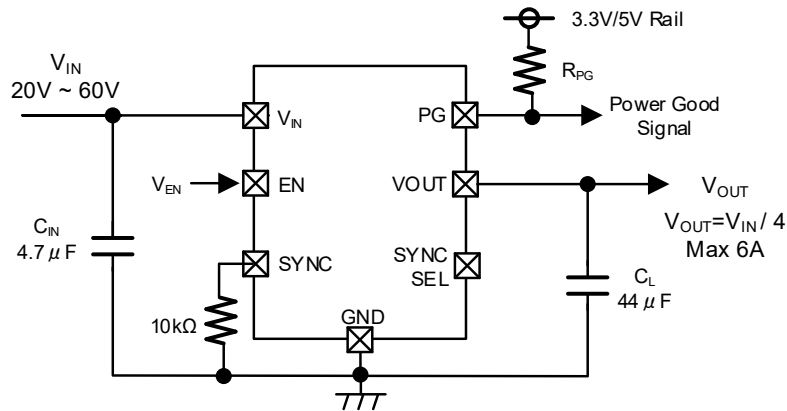


Seamless Migration to 48V Systems While Leveraging Existing 12V Assets

- Transition existing 12V-input systems to 48V input
- Applicable for industrial equipment (sensors and security in factories, buildings, facilities), home appliances, and medical/healthcare devices

■ Compact & Low-Profile Thanks to Charge Pump Design

Charge pump architecture eliminates the need for an inductor, reducing board area and module height
 Modular design requires only input and output capacitors as main components



Typical Application Circuit

Simple Design with Only C_{IN}/C_L
 Greatly Simplifies System Design

Main Components

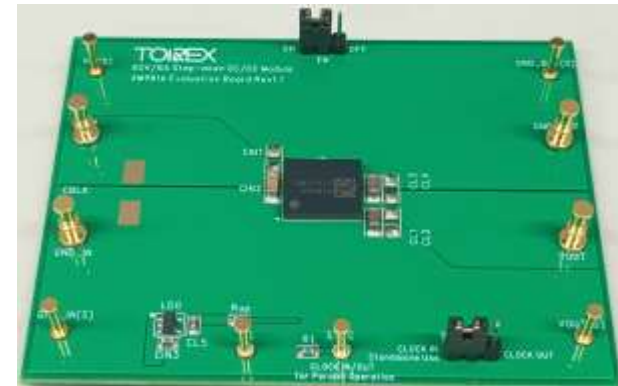
- C_{IN}** : 3.2 x 1.6mm x 1pcs
- C_L** : 3.2 x 1.6mm x 2pcs
- L** : No Inductor Required
- Resistor (R_{SYNC}/R_{PG})** : 2pcs

Option

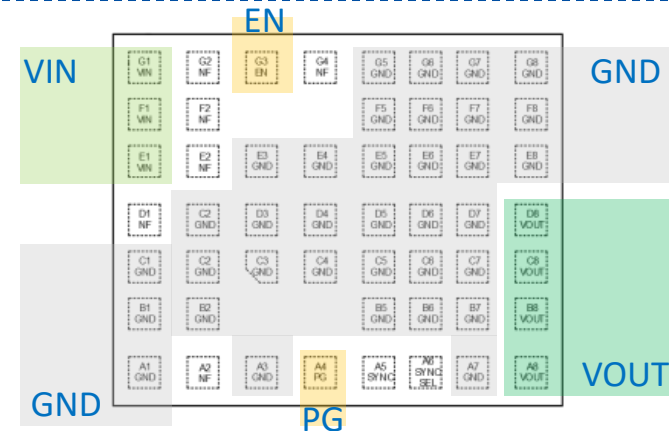
- LDO for Pull-up Rail** : 1pcs

External Components

Mount Area : 12.0x 17.0mm
 Height : 2.1mm



Compact & Low-Profile



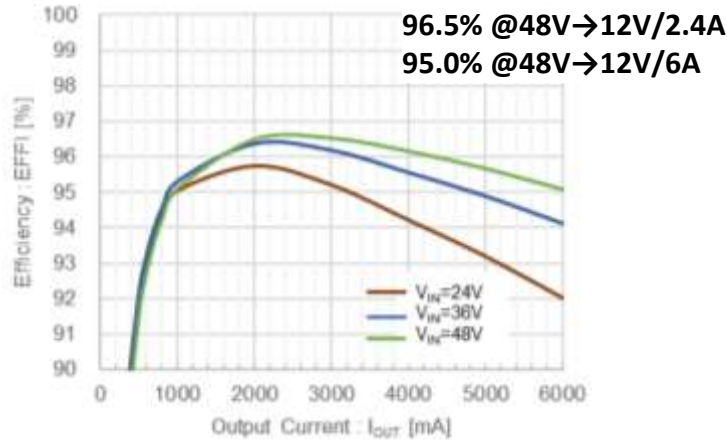
Pin Layout Optimized for Easy PCB Design / Reduces Design Effort

■ Low-Loss Charge Pump Design

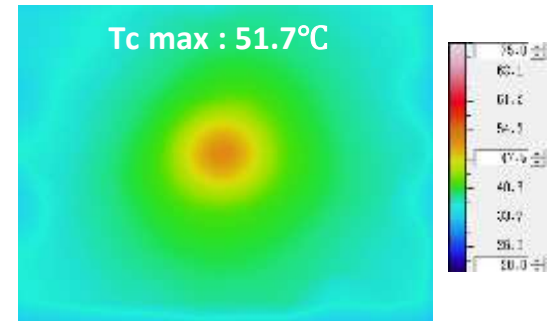
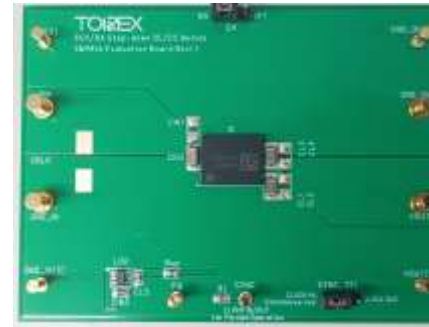
Charge pump architecture achieves low power loss

Generates less heat, enabling smaller package size

Outputs 1/4 of the input voltage with low ripple thanks to charge pump operation

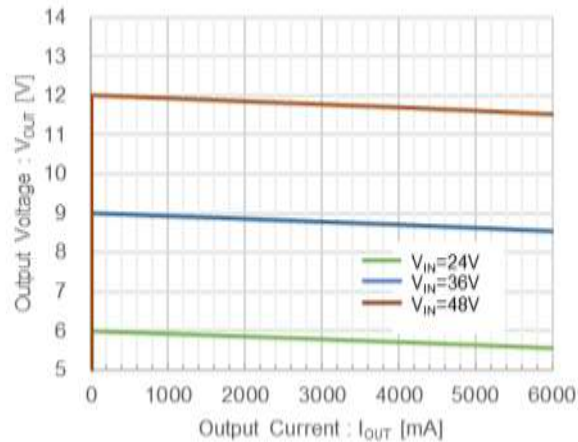


High Efficiency

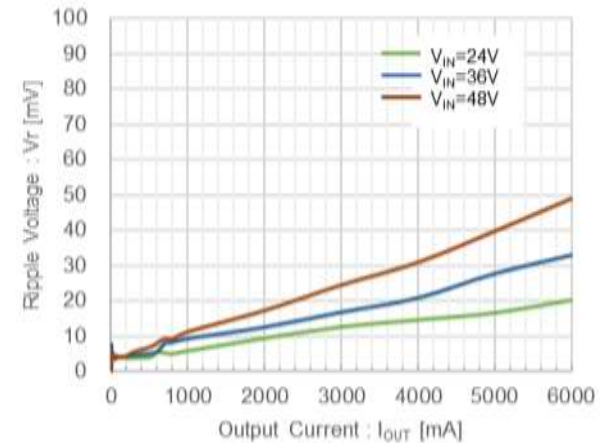


Condition
48V → 12V/4A @ Ta=25°C

Low Power Loss / Low Heat Generation



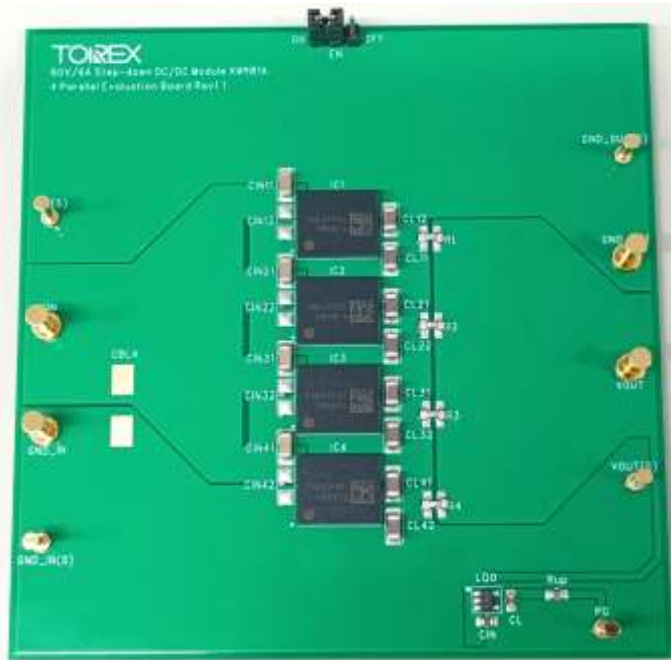
Load Regulation



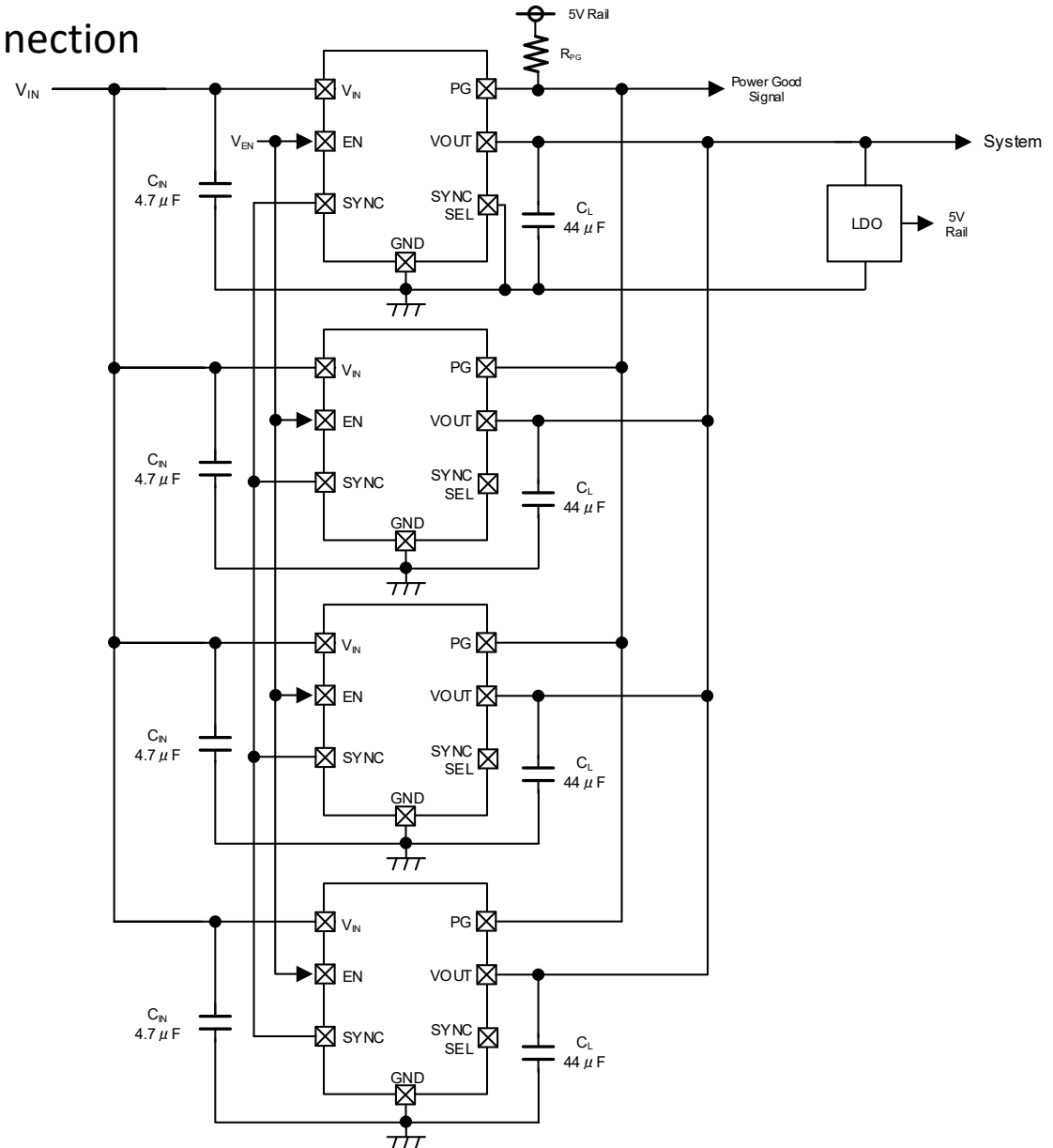
Ripple Voltage

■ Supports High Current with Parallel Connection

Synchronizable via SYNC Pin for Parallel Operation
 - Up to 4 Modules in Parallel, Supporting 24A Max



4-Module Parallel Evaluation Board



■ Seamless Migration of Existing 12V-Input Devices to 48V Systems

XM981A converts 48V to 12V

Connect the existing 12V system downstream of the XM981A for smooth transition to 48V input

For high-power downstream systems, up to 4 modules can be connected in parallel, supporting up to 24A

① Step-Down Charge Pump XM981A

: Outputs $\frac{1}{4}$ (12V) of 48V input

② Existing 12V-Input System

: Continues using existing system

