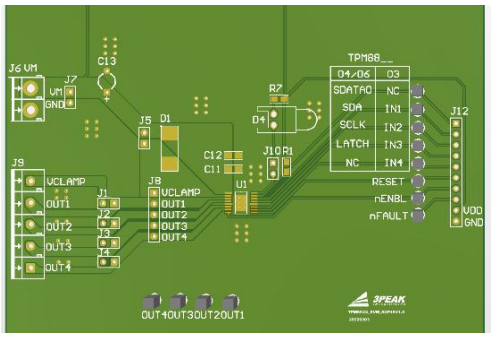
TPM8803 Driver EVM User's Guide



Key Features

- 4-Channel Smart Low-side Driver Array
  - 40-V Max Operating voltage, 48-V ABS Max Voltage
  - 250-mΩ Low-$R_{DS(ON)}$ with Maximum 3-A Driver Capability
  - Integrated Free-wheeling Diodes for Inductive Loads
  - Parallel Channel Driving Capability
  - Dual Supply VM and VCLAMP for Inductive Loads
- Diagnostics and Protection
  - Over-Current Protection
  - Short-Circuit Protection
  - Over-Temperature Protection

DESCRIPTIONS

The TPM8803 provides a 4-ch low-side driver with channel independent protection and diagnostics. It has low $R_{DS(ON)}$ MOSFET array with free-wheeling diodes to support all kinds of loads, resistive, inductive and capacitive. It supports dual high-voltage supplies, VM and VCLAMP.

It has a simple parallel interface with direct inputs. Overcurrent protection and short-circuit protection allow the controller to protect the system.

APPLICATIONS

- Relays, Solenoids, Unipolar Stepper Motors
- Electric Expansion Valves, Linear Valves
- LEDs and Heaters
- PLC Digital Outputs

Revision History

Revise Date	Version	Reason/Issue
2024-11-28	A0	First Issue

Contents Index

1. Performance Specification

A summary of the TPM8803 EVM performance specifications is provided in Table.1. Specifications are given for VM = 12V, VCLAMP = 12V, unless otherwise specified. The ambient temperature is 25℃ for all measurements, unless otherwise noted.

Table.1 TPM8803 EVM Performance Specification

PARAMETER	TEST CONDITIONS	MIN	Type	Max	UNITS
INPUT CHARACTERISTICS					
Power Supply Voltage, VM, VCLAMP		5		40	V
Logic Input Voltage		0		5	V
OUTPUT CHARACTERISTICS					
Output voltage, Voutx		0		40	V
Open Drain Output Voltage		0		5	V
Output current range, Ioutx				3	A

2. EVM Documentation

2.1 Schematic

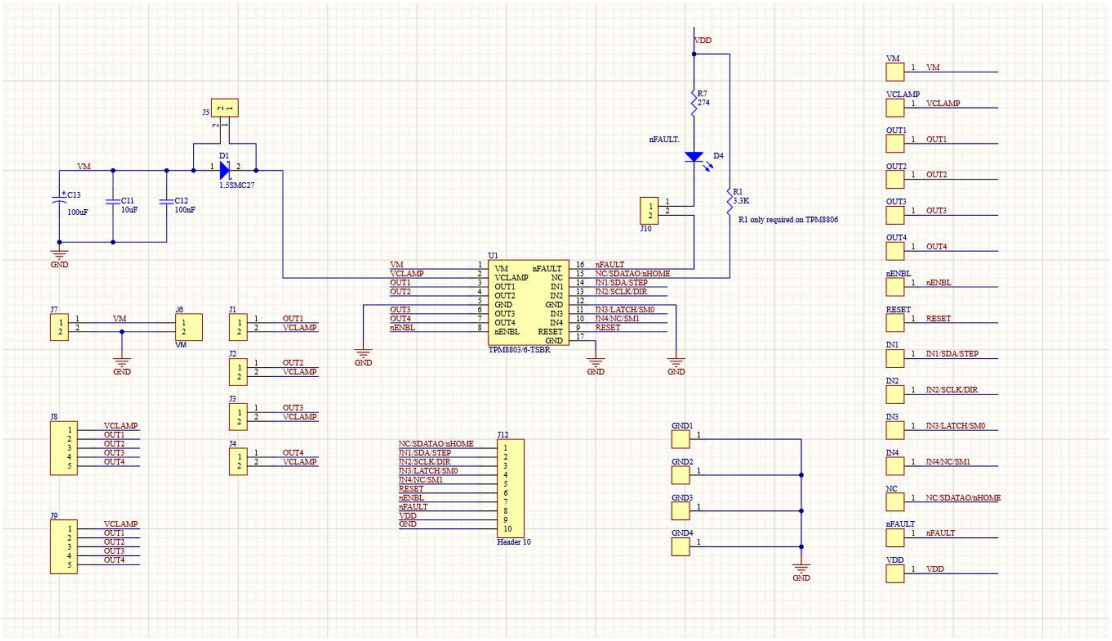


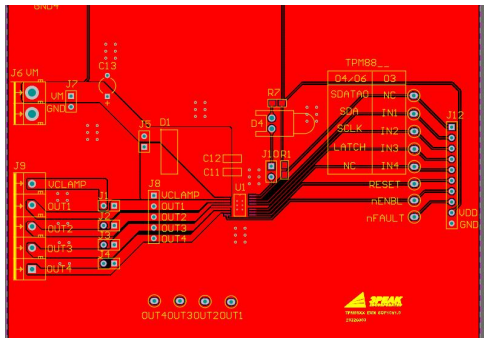
Fig. 1 TPM8803 EVM Schematic

2.2 Bill of Material

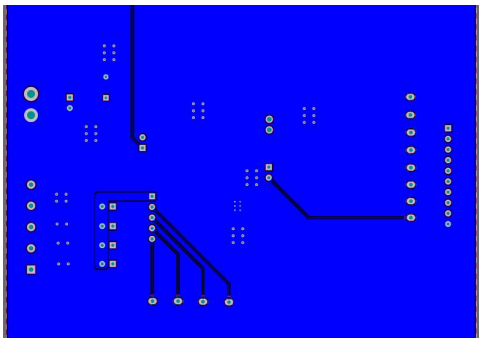
Table.2 TPM8803 EVM Bill of Materials

Designator	Qty	Value	Description	Package	MFR
C11	1	100nF	CAP, 100nF, 100V X7R	0805	Murata
C12	1	1uF	CAP, 1uF, 100V X7R	0805	Yageo
J1, J2, J3, J4, J5, J7, J10	7		Header, 100mil, 1*2	HDR1X2	
J6	1		Connector, 200mil, 1*2	Plugin	
J8	1		Header, 100mil, 1*5	HDR1X5	
J9	1		Connector, 200mil, 1*5	Plugin	
J12	1		Header, 100mil, 1*10	HDR1X10	
IN1, IN2, IN3, IN4, NC, nENBL, nFAULT, OUT1, OUT2, OUT3, OUT4, RESET, VCLAMP, VDD, VM, GND1, GND2, GND3, GND4	19		Test Point	SIP	
U1	1	TPM8803	4-CH Low-Side Driver	SOP16	3PEAK
R7	1	10kohm	10kohm, 125mW, ±1%	0805	Yageo
D4	1		Red LED, 100mil	Plugin	Everlight

2.3 PCB Layout



Top Layer



Bottom Layer

Fig. 2 TPM8803 EVM PCB Layout

3. Test Setup and Procedure

3.1 Test Setup

The TPM8803 EVM is provided with input/output connectors and test points as shown in Table.3.

Table.3 TPM8803 EVM Connections

Designator	Name	Description
J1	OUT1 Jumper	Connect OUT1 to VM
J2	OUT2 Jumper	Connect OUT2 to VM
J3	OUT3 Jumper	Connect OUT3 to VM
J4	OUT4 Jumper	Connect OUT4 to VM
J5	VCLAMP Jumper	Connect VCLAMP to VM
J6	VM Connector	Connector for the VM power supply
J7	VM Header	Connector for the VM power supply
J8	Test Header	provides logic input signals or captures waveforms
J9	OUTx Connector	Connector for the OUTx
J10	nFAULT Jumper	Connect the indicator LED of nFAULT to VDD
J12	Test Header	provides logic input signals or captures waveforms
Test Point		Used to captures waveforms

Referring to Table.3, the recommended connections to evaluate TPM8803-EVM is shown in Fig.3.

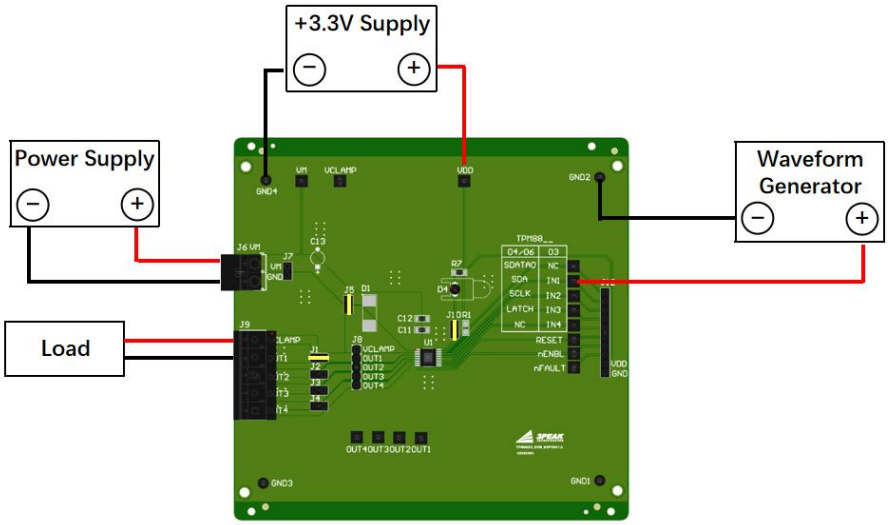


Fig. 3 EVM Test Setup

3.2 Test Equipment

Table.4 is the equipment used by 3PEAK, can also use other model of instruments which can support the voltage, current and power level of this EVM test. Multimeters are used as voltage or current meters which measure the voltage and current of input and output.

Table.4 Test Equipment Used by 3PEAK

Instruments	Model	Vender
DC Source	GPD3303S	GWINSTEK
DC Source	DP832	RIGOL
Oscilloscope	EXR058A	Keysight
Multimeter	34461A	Keysight
Waveform Generator	33600A	Keysight

3.3 Test Procedure

- Set up the EVM as described in Fig.3.
- Set the input power VM supply to 12V and adjust the current limit to 0.5A.
- Set the input power V3P3 supply to 3.3V and adjust the current limit to 0.1A.
- Short the corresponding pin header by Jumper Cap.
- Connect a load between VCLAMP and OUT on J9.
- Use a waveform Generator to provide input signals to the INx.
- Multimeters are used to measure voltage and current.
- Oscilloscope is used to capture waveform like input voltage and others.

4. Test Results and Performance Evaluation

4.1 Output Rising Edge

Below shows the rising edge of the OUT voltage. By pulling down the IN, the LS MOS is turned off, and the OUT voltage rises from 0 to VM. The VM is set at 24V and the Iout is set at 500mA.

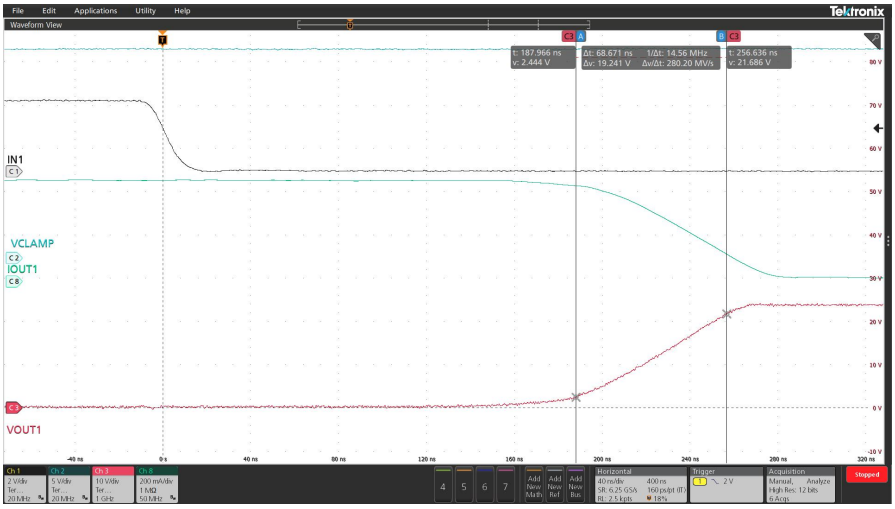


Fig. 4 Output Rising Edge (VM = 24V, Iout = 500mA)

4.2 Output Falling Edge

Below shows the Falling edge of the OUT voltage. By pulling up the IN, the LS MOS is turned on, and the OUT voltage falls from VM to 0. The VM is set at 24V and the Iout is set at 500mA.

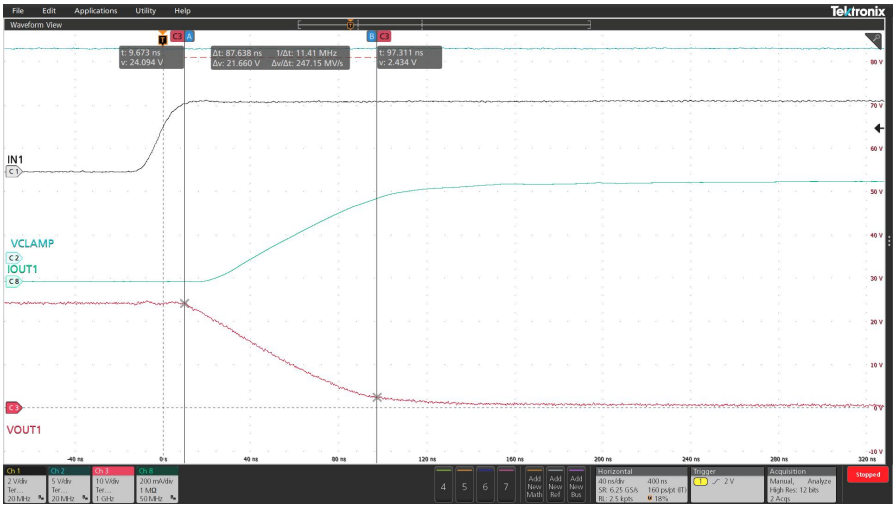


Fig. 5 Output Falling Edge (VM = 24V, Iout = 500mA)

4.3 Short Circuit Protection

Input Voltage is set to 24V and Output is short at the Output header and VM Connector by a short wire. Iout current is captured in waveform. After the OCP is triggered, the LS MOS is turned off and nFAULT is pulled down.

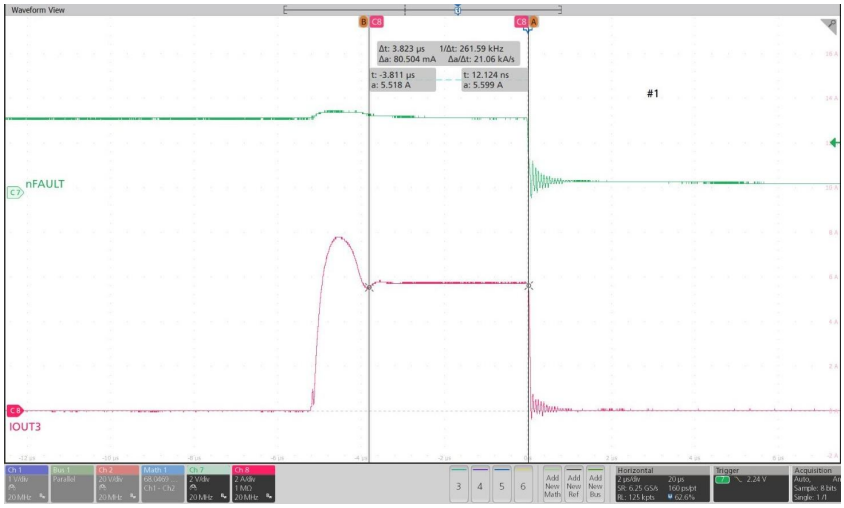


Fig. 6 Short Circuit Protection

4.4 Over Current Protection & Retry

Any channel that experiences an over current fault will automatically retry after a 1-ms delay. During the retry time, the nFAULT remains set. The retry timer is synchronized between channels, eliminating the need for separate timers for each channel.

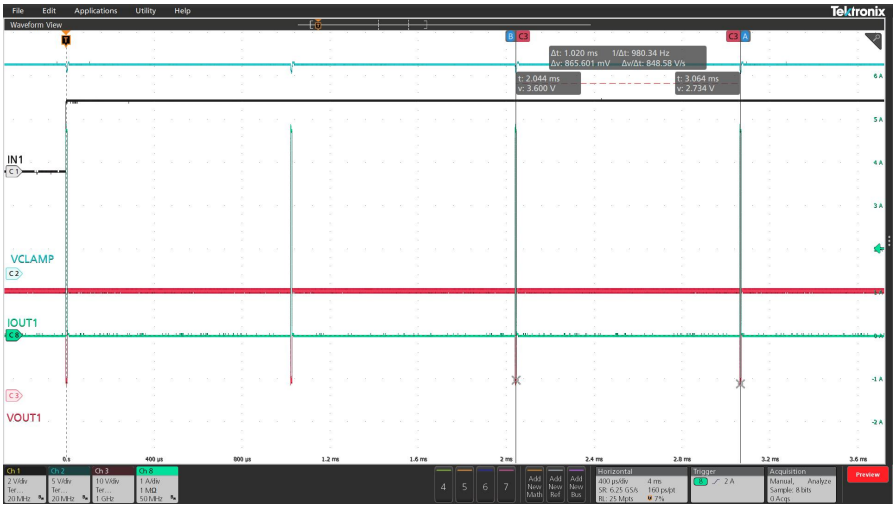


Fig. 7 Over Current Protection & Retry

IMPORTANT NOTICE AND DISCLAIMER

Trademarks. Any of the 思瑞浦 or 3PEAK trade names, trademarks, graphic marks, and domain names contained in this document /material are the property of 3PEAK. You may NOT reproduce, modify, publish, transmit or distribute any Trademark without the prior written consent of 3PEAK.

Performance Information. Performance tests or performance range contained in this document/material are either results of design simulation or actual tests conducted under designated testing environment. Any variation in testing environment or simulation environment, including but not limited to testing method, testing process or testing temperature, may affect actual performance of the product.

Disclaimer. 3PEAK provides technical and reliability data (including data sheets), design resources (including reference designs), application or other design recommendations, networking tools, security information and other resources "As Is". 3PEAK makes no warranty as to the absence of defects, and makes no warranties of any kind, express or implied, including without limitation, implied warranties as to merchantability, fitness for a particular purpose or non-infringement of any thirdparty's intellectual property rights. Unless otherwise specified in writing, products supplied by 3PEAK are not designed to be used in any life-threatening scenarios, including critical medical applications, automotive safety-critical systems, aviation, aerospace, or any situations where failure could result in bodily harm, loss of life, or significant property damage. 3PEAK disclaims all liability for any such unauthorized use.