

## GENERAL DESCRIPTION

This user's guide explains how to quickly obtain the push-pull converter performance results with the MX6501T evaluation module (EVM). This EVM provides three push-pull converters for various input-to-output voltage conversions. All push-pull converters use low-power, center-tapped transformers from Maxin Micro whose designs have been optimized in form-factor, turns ratio, and saturation product to operate in combination with the MX6501T transformer driver. The following table lists the push-pull converter configurations with their associated transformers.

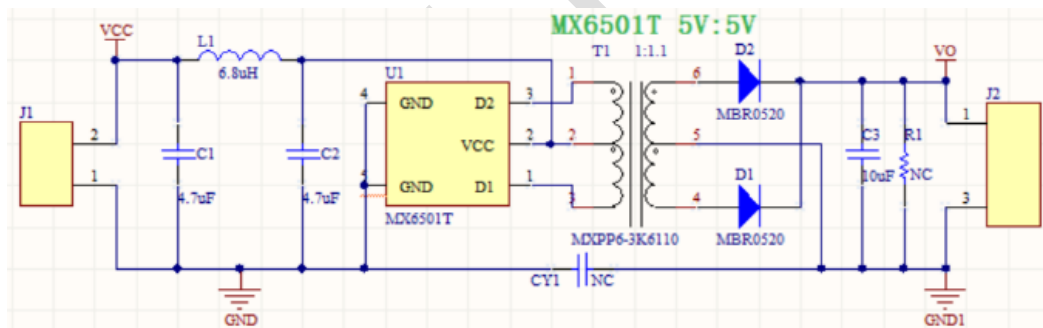
这为用户手册能够帮助迅速的了解无锡明芯微电子的推挽驱动 MX6501 和其对应的变压器实现的隔离效果和隔离效率 无锡明芯微的 MX6501 采用内置 36V LDMOS 的工艺 0.2 欧姆的内阻, 配合提供的不同变压器, 能够实现 12V 转 12V 输出, 5V 转 12V 输出和 5V 转 5V 以及 3.3V 转 3.3V 等不同的隔离输出, 该几款组合采用的是无 LDO 的方案, 由于是开路无反馈在输出端加了一个假负载 13kohm 能够实现 10% 以内的电压误差变动, 客户也可以加 LDO, 如果客户想实现小的低功耗可以选用 MX6505T 的产品, MX6505T 的产品有使能控制脚, 如果不用可以让该推挽输出停止工作达到节能目的

| PNs                 | VIN: VOUT            | Transformer   | Turns Ratio | V-T(Vus) | 隔离  |
|---------------------|----------------------|---------------|-------------|----------|-----|
| MX6501T 5V-5V EVM   | 5V 转 5V 最大 0.6A 输出   | MXPP6-3K6110  | 1:1.10      | 11       | 3kv |
| MX6501T 12V-12V EVM | 12V 转 12V 最大 0.6A 输出 | MXPP8-30-1103 | 1:1.03      | 30       | 3kv |
| NA                  | 5V:12V 最大 0.3A 输出    | MXPP8-30-1250 | 1:2.50      | 10       | 3kv |

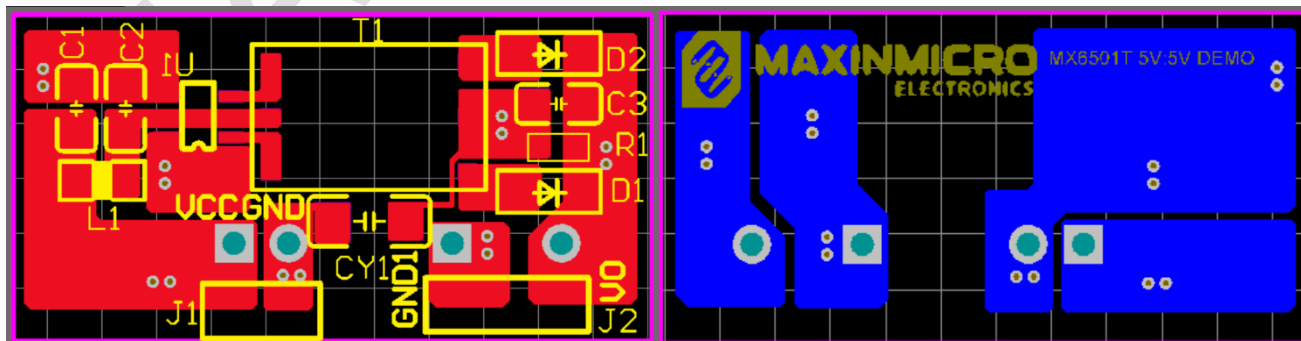
## Schematic and Board Layout

The following figure shows the Schematic of the EVM board.

下面是 5V 转 5V 的评估电路板线路图 采用的是 MX6501T+MXPP6-3K110 组合

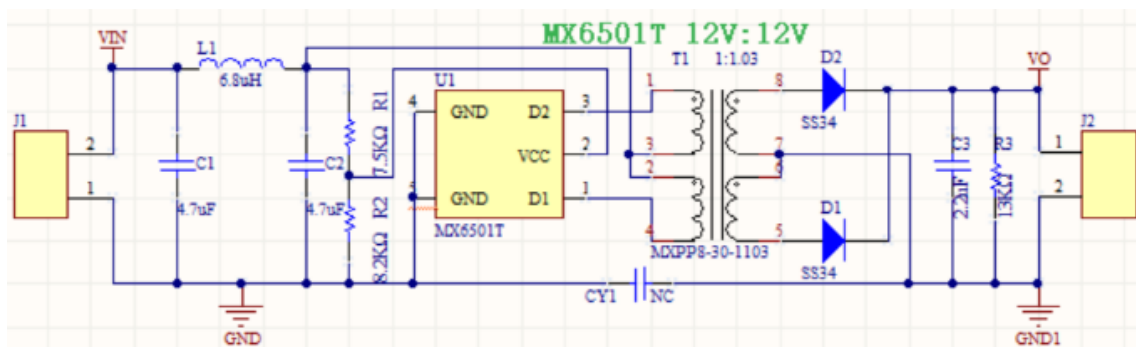


MX6501T 5V:5V EVM Schematic

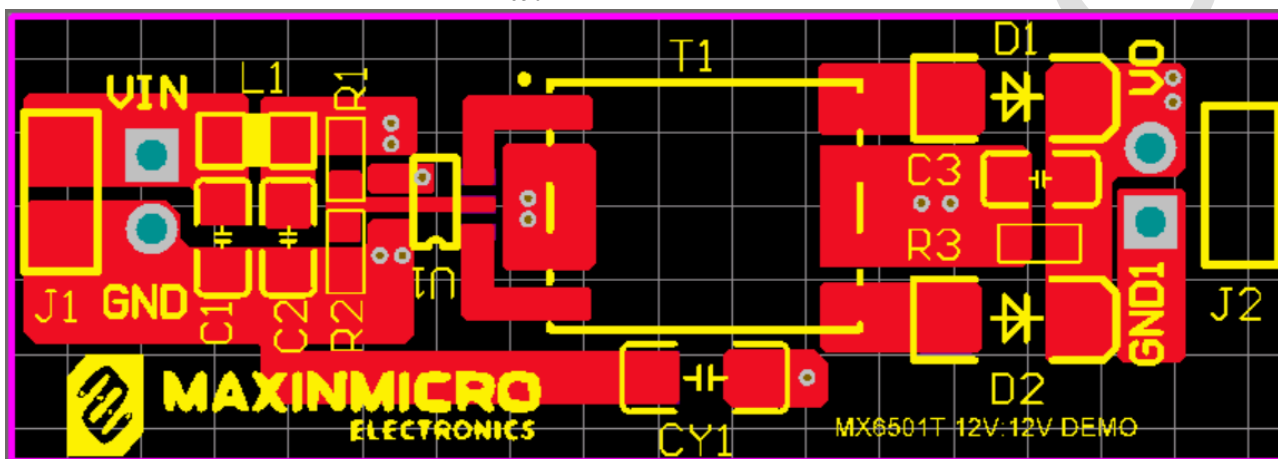


MX6501T 5V:5V EVM PCB Top Layer and Bottom Layer

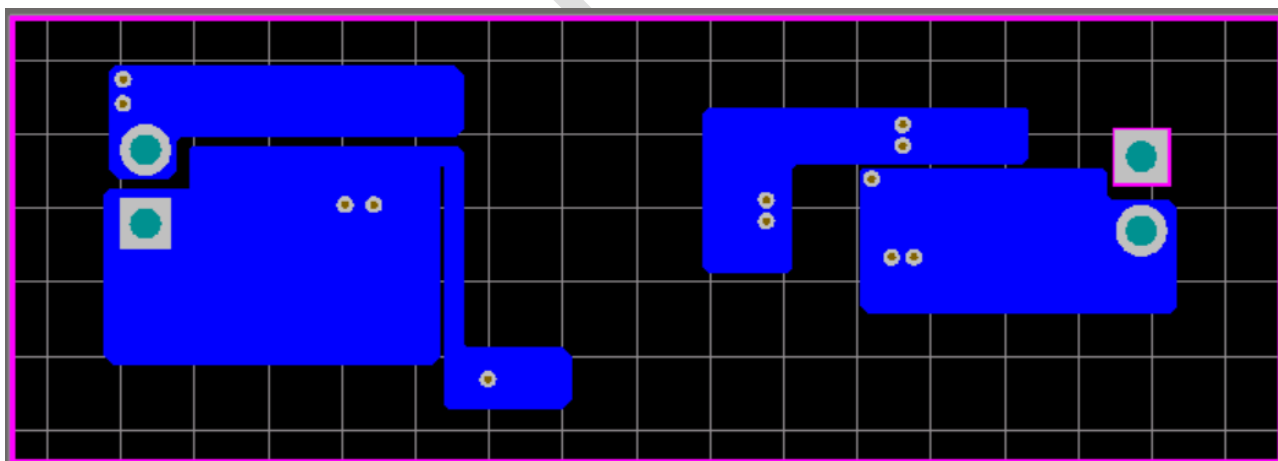
下面是 MX6501T+MXPP8-30-1103 组合实现的是最大 12V 转 12V0.5A 的输出功率，效率如下图



MX6501T 12V:12V EVM Schematic

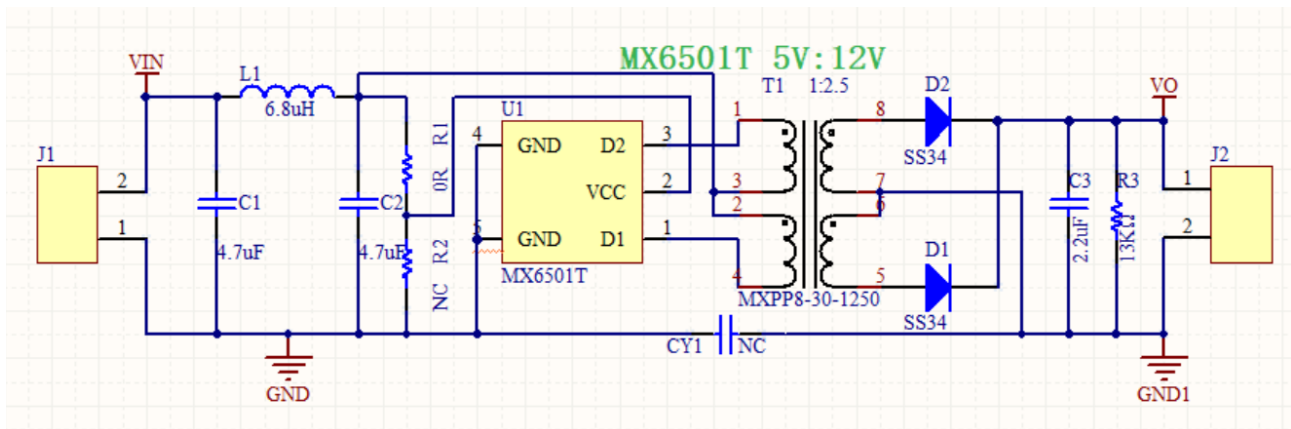


MX6501T 12V:12V EVM PCB Top Layer

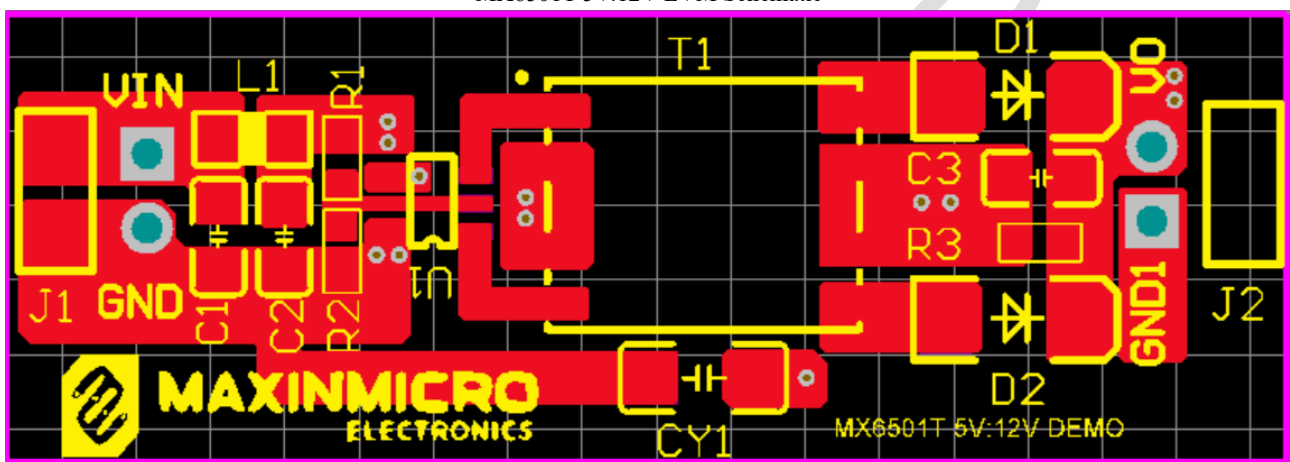


MX6501T 12V:12V EVM PCB Bottom Layer

如下是 MX6051T+MXPP8-30-1250 组合实现的是 5V 转 12V 最大 0.3A 的输出功率



MX6501T 5V:12V EVM Schematic



MX6501T 5V:12V EVM PCB Top Layer

## Bill of Materials

The following table lists the bill of materials for the MX6501T-5V:5V DEMO.

| serial number | Comment            | Designator | Footprint                 | Quantity | Manufacturer |
|---------------|--------------------|------------|---------------------------|----------|--------------|
| 1             | 4.7uF/25V          | C1, C2     | C-0805                    | 2        |              |
| 2             | 10uF/25V           | C3         | C-0805                    | 1        |              |
| 3             | NC                 | CY1        | C-1206                    | 1        |              |
| 4             | MBR0520            | D1, D2     | D-SOD-123                 | 2        |              |
| 5             | 2.54mm 2pin Header | J1         | HDR-TH_2P-P2.54-H-M-W10.4 | 1        |              |
| 6             | 2.54mm3pin Header  | J2         | HDR-TH_3P-P2.54-H-M-W10.4 | 1        |              |
| 7             | 6.8uH              | L1         | R-0805                    | 1        |              |
| 8             | NC                 | R1         | R-0603                    | 1        |              |
| 9             | MXPP6-3K6110       | T1         | 变压器 10.05*6.73mm          | 1        | MAXIN MICRO  |
| 10            | MX6501T            | U1         | SOT23-6                   | 1        | MAXIN MICRO  |

The following table lists the bill of materials for the MX6501T-12V:12V DEMO.

| serial number | Comment       | Designator | Footprint                 | Quantity | Manufacturer |
|---------------|---------------|------------|---------------------------|----------|--------------|
| 1             | 4.7uF/25V     | C1, C2     | C-0805                    | 2        |              |
| 2             | 2.2uF/50V     | C3         | C-0805                    | 1        |              |
| 3             | NC            | CY1        | C-1206                    | 1        |              |
| 4             | SS34          | D1, D2     | D-SMA                     | 2        |              |
| 5             | NC            | J1, J2     | HDR-TH_2P-P2.54-H-M-W10.4 | 2        |              |
| 6             | 6.8uH         | L1         | R-0805                    | 1        |              |
| 7             | 7.5KΩ         | R1         | R-0603                    | 1        |              |
| 8             | 8.2KΩ         | R2         | R-0603                    | 1        |              |
| 9             | 13KΩ          | R3         | R-0603                    | 1        |              |
| 10            | MXPP8-30-1103 | T1         | 变压器-SMD                   | 1        | MAXIN MICRO  |
| 11            | MX6501T       | U1         | SOT23-6                   | 1        | MAXIN MICRO  |

The following table lists the bill of materials for the MX6501T-5V:12V DEMO.

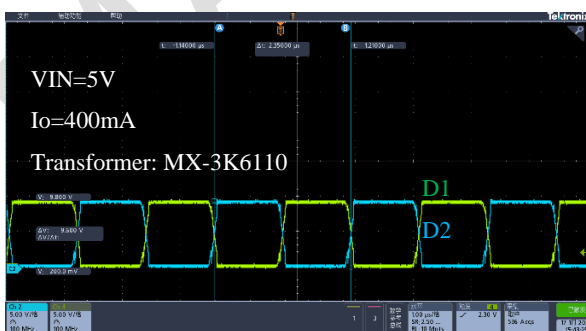
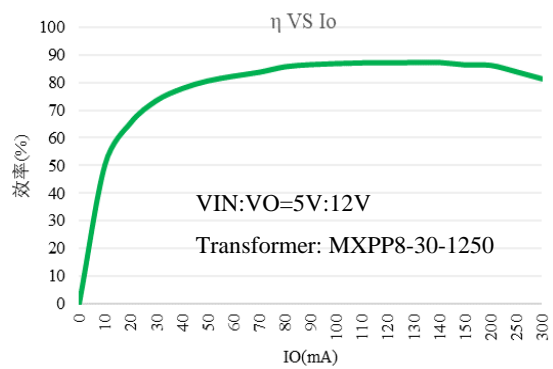
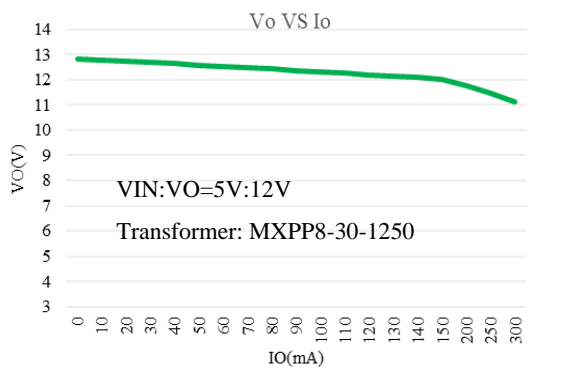
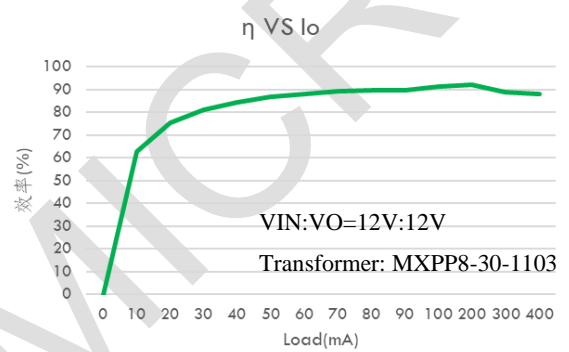
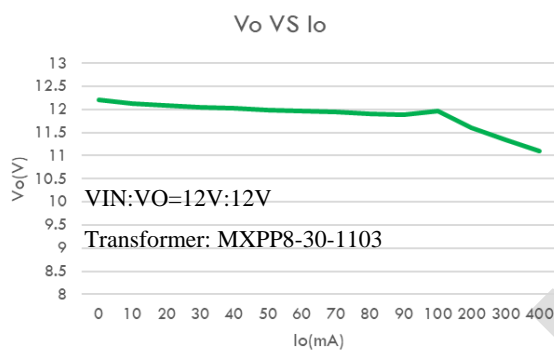
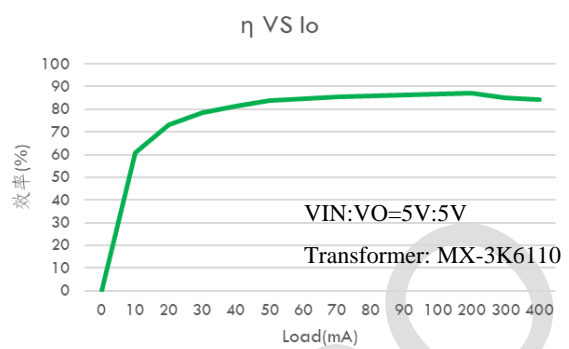
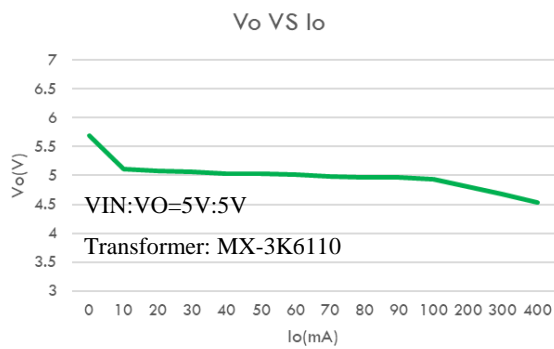
| serial number | Comment       | Designator | Footprint                 | Quantity | Manufacturer |
|---------------|---------------|------------|---------------------------|----------|--------------|
| 1             | 4.7uF/25V     | C1, C2     | C-0805                    | 2        |              |
| 2             | 2.2uF/50V     | C3         | C-0805                    | 1        |              |
| 3             | NC            | CY1        | C-1206                    | 1        |              |
| 4             | SS34          | D1, D2     | D-SMA                     | 2        |              |
| 5             | NC            | J1, J2     | HDR-TH_2P-P2.54-H-M-W10.4 | 2        |              |
| 6             | 6.8uH         | L1         | R-0805                    | 1        |              |
| 7             | 0Ω            | R1         | R-0603                    | 1        |              |
| 8             | NC            | R2         | R-0603                    | 1        |              |
| 9             | 13KΩ          | R3         | R-0603                    | 1        |              |
| 10            | MXPP8-30-1250 | T1         | 变压器-SMD                   | 1        | MAXIN MICRO  |
| 11            | MX6501T       | U1         | SOT23-6                   | 1        | MAXIN MICRO  |

## Efficiency test data/效率数据搞到 90%

| MX6501T 5V:5V efficiency   |   |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------------------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| IO(mA)                     | 0 | 10    | 20    | 30    | 40    | 50    | 60    | 70    | 80    | 90    | 100   | 200   | 300   | 400   |
| η(%)                       | 0 | 60.84 | 73.09 | 78.45 | 81.29 | 83.83 | 84.8  | 85.4  | 85.97 | 86.18 | 86.82 | 87.27 | 84.91 | 84.28 |
| MX6501T 12V:12V efficiency |   |       |       |       |       |       |       |       |       |       |       |       |       |       |
| IO(mA)                     | 0 | 10    | 20    | 30    | 40    | 50    | 60    | 70    | 80    | 90    | 100   | 200   | 300   | 400   |
| η(%)                       | 0 | 62.86 | 75.41 | 81.2  | 84.35 | 86.88 | 87.94 | 89.29 | 89.41 | 89.71 | 91.27 | 92.06 | 88.67 | 88.02 |

| MX6501T 5V:12V efficiency |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|---------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| IO(mA)                    | 0    | 10    | 20    | 30    | 40    | 50    | 60    | 70    | 80    | 90    | 100   | 110   | 120   | 130   | 140   | 150   | 200   | 250   | 300   |
| η(%)                      | 0.00 | 50.22 | 65.44 | 73.43 | 77.80 | 80.56 | 82.30 | 83.71 | 85.68 | 86.47 | 86.86 | 87.10 | 87.12 | 87.23 | 87.24 | 86.38 | 86.20 | 83.85 | 81.33 |

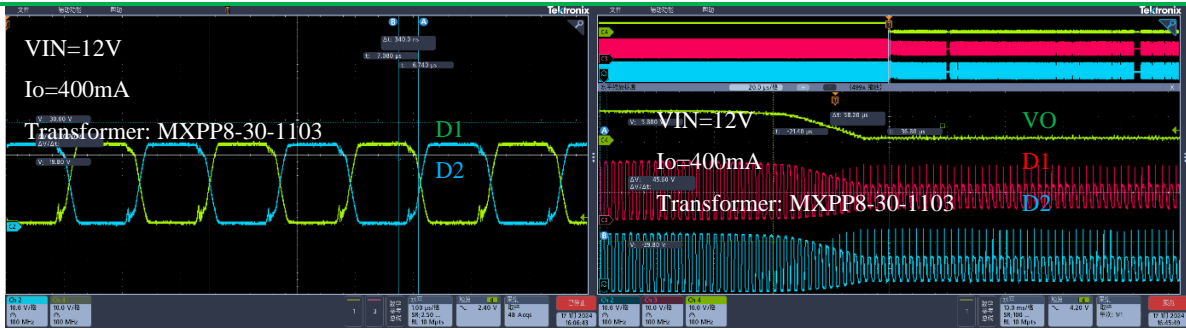
## Characteristic plots and waveforms



D1, D2 with Normal operation



Output short protection



D1, D2 with Normal operation

Output short protection

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## Restrictions on Product Use

- ◆ MAXIN micro is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing MAXIN products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such MAXIN products could cause loss of human life, bodily injury or damage to property.
- ◆ In developing your designs, please ensure that MAXIN products are used within specified operating ranges as set forth in the most recent MAXIN products specifications.
- ◆ The information contained herein is subject to change without notice.

Version update record:

V10 The original version (preliminary)