



# MAX8525 评估板

Evaluates: MAX8523/MAX8525

## 概述

MAX8525 评估板 (EV kit) 展示了高功率、动态可调的多相 VRM 10.0 应用电路。这款 DC-DC 转换器将高输入电压降低，产生一个精确的、低电压 CPU 核  $V_{CC}$  电源。MAX8525 评估板满足 Intel VRM 10 CPU 瞬态电压规范，包括与 CPU “电源好” 信号连接的接口逻辑。MAX8525 评估板由 MAX8525 电流模式、降压控制器和 MAX8523 高速、双相 MOSFET 栅极驱动器组成。MAX8525 评估板具有快速—主动的平均电流检测和电压定位功能，从而降低了功耗，减少了对大体积输出电容的需求。四相工作降低了对输入纹波电流的要求，减小了输出纹波电压。

MAX8525 评估板是完整组装并经过测试的电路板，采用 12V 输入电源能够提供数字可调的 0.8375V 到 1.5875V 输出电压 (6 位片上 DAC, 12.5mV 级差)。每相可给出高达 25A 的输出电流，总共 100A。评估板工作在 210kHz 的开关频率下，有卓越的线路和负载瞬态响应。两块评估板能够并联使用，实现真正的 8 相交错工作，并提供高达 200A 的电流。MAX8525 评估板经过简单的修改就能满足 Intel VRM 10.x 要求。详细内容请与厂商联系。

## 特性

- ◆ 四相电流模式评估板
- ◆ 并联工作可提供 200A 输出
- ◆ 兼容 VRM 10.0 (很容易调整到与 VRM 10.x 兼容)
- ◆ 快速—主动的平均电流检测
- ◆ 最快速的电压定位
- ◆ 高速、高精度、高效率
- ◆ 大体积输出电容的数量少
- ◆ 12V 输入电压
- ◆ 0.8375V 到 1.5875V 输出电压范围 (6 位 DAC)
- ◆ 100A 负载电流能力 (每相 25A)
- ◆ 210kHz 开关频率 (可调)
- ◆ 动态 VID 变化
- ◆ 差分电压遥测
- ◆ “电源好” 输出
- ◆ 28 引脚 QSOP 封装 (MAX8525)
- ◆ 16 引脚 QSOP 封装 (MAX8523)
- ◆ 完整组装并经过测试

## 订购信息

| PART         | TEMP RANGE   | IC PACKAGE                             |
|--------------|--------------|--|
| MAX8525EVKIT | 0°C to +70°C | 16 QSOP (MAX8523)<br>28 QSOP (MAX8525) |

## 元件列表

| DESIGNATION                       | QTY | DESCRIPTION   |
|-----------------------------------|-----|---|
| C1, C2, C5, C6, C9, C10, C13, C14 | 8   | 10 $\mu$ F, 25V X5R ceramic capacitors (1812)<br>Taiyo Yuden TMK432BJ106KM or<br>TDK C4532X5R1E106M |
| C3, C7, C11, C15                  | 0   | Not installed (1812)  |
| C4                                | 0   | Not installed (1206)  |
| C8, C12, C32                      | 3   | 470pF $\pm$ 10%, 50V X7R ceramic capacitors (0603)<br>Murata GRM188R71H471K or<br>equivalent        |

| DESIGNATION        | QTY | DESCRIPTION  |
|--------------------|-----|--|
| C16, C45           | 2   | 3300pF $\pm$ 10%, X7R ceramic capacitors (0402)<br>Murata GRP155R71H332K                                       |
| C17, C33–C41       | 10  | 680 $\mu$ F, 2.5V, 10m $\Omega$ low-ESR polymer capacitors (E-case)<br>Sanyo 2R5TPD680M                        |
| C18, C42, C43, C44 | 4   | 10 $\mu$ F $\pm$ 20%, 6.3V X5R ceramic capacitors (0805)<br>Taiyo Yuden AMK212BJ106MG or<br>TDK C2012X5R0J106M |



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元件列表 (续)

| DESIGNATION                      | QTY | DESCRIPTION  |
|----------------------------------|-----|--|
| C19, C20                         | 2   | 2.2 $\mu$ F $\pm$ 10%, 10V X5R ceramic capacitors (0612)<br>TDK C1632X5R1A225K                     |
| C21                              | 1   | 2.2 $\mu$ F $\pm$ 10%, 10V X7R ceramic capacitor (0805)<br>Taiyo Yuden LMK212BJ225KG               |
| C22                              | 1   | 2.2 $\mu$ F, 35V X7R ceramic capacitor (1206)<br>Taiyo Yuden EMK316BJ225MD                         |
| C23, C24, C25                    | 3   | 1 $\mu$ F, 6.3V X5R ceramic capacitors (0603)<br>Taiyo Yuden JMK107BJ105KA or TDK C1608X5R1A105K   |
| C26–C30                          | 5   | 0.22 $\mu$ F, 10V X7R ceramic capacitors (0603)<br>Taiyo Yuden LMK107BJ224MA or TDK C1608X7R1C224M |
| C31                              | 1   | 820pF $\pm$ 10%, 50V X7R ceramic capacitor (0402)<br>Murata GRP155R71H821                          |
| C46–C49                          | 4   | 0.033 $\mu$ F, 10V X7R ceramic capacitors (0402)<br>Murata GRP155R71A333K                          |
| C50                              | 0   | Not installed (0402)   |
| C51–C55                          | 0   | Not installed (D-case)   |
| D1, D2                           | 2   | 100mA, 30V dual Schottky diodes (SOT23)<br>Central Semiconductor CMPSH-3A                          |
| D3                               | 1   | 200mA dual silicon diode (SOT23)<br>Central Semiconductor CMPD3003S                                |
| D4                               | 1   | 3.3V Zener diode (SOD-323)<br>Central Semiconductor CMDZ5226B                                      |
| L1–L4                            | 4   | 0.6 $\mu$ H, 26A, 0.9m $\Omega$ power inductors (13mm x 13mm x 6mm)<br>Panasonic ETQP1H0R6BFA      |
| N1, N4, N7, N10, N13–N16         | 8   | N-channel MOSFETs (8-pin SO)<br>Fairchild FDS6694 or International Rectifier IRF7821               |
| N2, N3, N5, N6, N8, N9, N11, N12 | 8   | N-channel MOSFETs (8-pin SO)<br>Fairchild FDS6688 or International Rectifier IRF7832               |

| DESIGNATION            | QTY | DESCRIPTION  |
|------------------------|-----|--|
| R1–R4                  | 4   | 0.001 $\Omega$ $\pm$ 1%, 1W resistors (2512)<br>Panasonic ERJM1WTF1M0U                     |
| R5                     | 1   | 309 $\Omega$ $\pm$ 1% resistor (0603)  |
| R6                     | 1   | 1.3k $\Omega$ $\pm$ 1% resistor (0603)   |
| R7, R30, R34, R39, R40 | 5   | 0 $\Omega$ $\pm$ 1% resistors (0603)   |
| R8–R11                 | 4   | 3.3 $\Omega$ $\pm$ 5% resistors (0603)   |
| R12, R14               | 2   | 10 $\Omega$ $\pm$ 5% resistors (0603)  |
| R13                    | 1   | 10 $\Omega$ $\pm$ 5% resistor (0402)   |
| R15, R17               | 2   | 15k $\Omega$ $\pm$ 5% resistors (0603)   |
| R16                    | 1   | 100k $\Omega$ $\pm$ 5% resistor (0603)   |
| R18                    | 0   | Not installed (0603)   |
| R19, R20               | 2   | 50 $\Omega$ $\pm$ 5% resistors (0603)  |
| R21, R26               | 2   | 10k $\Omega$ $\pm$ 1% resistors (0402)   |
| R22                    | 1   | 2.67k $\Omega$ $\pm$ 1% resistor (0402)  |
| R23                    | 1   | 332k $\Omega$ $\pm$ 1% resistor (0603)   |
| R24, R25               | 2   | 100 $\Omega$ $\pm$ 5% resistors (0603)   |
| R27, R33               | 2   | 27.4k $\Omega$ $\pm$ 1% resistors (0402)   |
| R28, R29               | 2   | 1k $\Omega$ $\pm$ 5% resistors (0603)  |
| R31                    | 1   | 1.05k $\Omega$ $\pm$ 1% resistor (0402)  |
| R32                    | 1   | 1.91k $\Omega$ $\pm$ 1% resistor (0402)  |
| R35–R38                | 4   | 24 $\Omega$ $\pm$ 5% resistors (0402)  |
| R41–R47                | 7   | 1k $\Omega$ $\pm$ 5% resistors (0402)  |
| R48, R49               | 2   | 0 $\Omega$ $\pm$ 1% resistors (0402)   |
| U1                     | 1   | MAX8525EEI (28-pin QSOP)   |
| U2, U3                 | 2   | MAX8523EEE (16-pin QSOP)   |
| U4                     | 1   | Adjustable linear regulator (DPAK)<br>Fairchild KA317MR or National Semiconductor LM317MDT |
| None                   | 1   | Heatsink with mounting hardware<br>Thermshield TS-54960-CW                                 |
| None                   | 1   | Heatsink insulation<br>Bergquist GP-54960  |
| None                   | 2   | Heatsink mounting hardware<br>4–40 screws  |
| None                   | 1   | MAX8525 PC board   |

# MAX8525 评估板

元件供应商

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| SUPPLIER                | PHONE        | FAX          | WEBSITE                  |
|-------------------------|--------------|--------------|--------------------------|
| Bergquist               | 952-835-2322 | 952-835-4156 | www.bergquistcompany.com |
| Central Semiconductor   | 516-435-1110 | 516-435-1824 | www.centrasemi.com       |
| Fairchild               | 408-721-2181 | 408-721-1635 | www.fairchildsemi.com    |
| International Rectifier | 310-322-3331 | 310-322-3332 | www.irf.com              |
| Murata                  | 770-436-1300 | 770-436-3030 | www.murata.com           |
| Panasonic               | 714-373-7939 | 714-373-7183 | www.panasonic.com        |
| Sanyo                   | 619-661-6835 | 619-661-1055 | www.sanyovideo.com       |
| Taiyo Yuden             | 408-573-4150 | 408-573-4159 | www.t-yuden.com          |
| TDK                     | 847-390-4373 | 847-390-4428 | www.component.tdk.com    |
| Thermshield             | 603-524-3714 | 603-524-6602 | www.thermshield.com      |

**Note:** Please indicate that you are using the MAX8523 and MAX8525 when contacting these component suppliers.

## 详细说明

这款 100A、四相 buck 调节器被优化于 210KHz 频率和接近 1.20V 的输出电压下。通过 VID0-VID5 引脚可从 0.8375V 到 1.5875V 间以数字方式设定输出电压 (表 1)。V<sub>OUT</sub> = 1.20V 而且 V<sub>IN</sub> = 12V 时，电感纹波接近 35% (LIR = 0.35)。在 OSC 和地间外接一只电阻 R23 (332kΩ)，可设定开关频率。MAX8525 集成了一个 6 位 DAC，满足 Intel VRM 10.0 规范。评估板具备适用于动态 VID 调节的受控的 VID 电压转换，消除了欠压和过压冲击。在改变 VID 编码期间，消隐 PWRGD 信号，以避免系统在应 CPU 要求改变输出电压时出现任何错误故障信号。峰值电流模式控制实现了最快的瞬态响应。专有的均流方案将满载时各相间的电流不平衡度降低到 <5%。MAX8525 评估板还具有可编程的空载偏移和输出电压定位功能，可按照输出电流调节输出电压。

MAX8525 提供逐周期电流限制，以控制平均输出电流。评估板在短路和过载情况下提供电流折返式保护。该功能使得 VRM 在短路情况下能安全地工作，一旦短路情况消除，可自动恢复工作。如果输出电压降低到 PWRGD 下限以下，折返电流阈值就被设定在电流限制阈值的一半。当输出电压低于 PWRGD 阈值或输出电流大于电流限制阈值时，折返式保护就会启动。

表 1、VID 编程的输出电压 (VRM 10.0)

| VID5 | VID4 | VID3 | VID2 | VID1 | VID0 | VOUT   |
|------|------|------|------|------|------|--------|
| 0    | 0    | 1    | 0    | 1    | 0    | 0.8375 |
| 1    | 0    | 1    | 0    | 0    | 1    | 0.8500 |
| 0    | 0    | 1    | 0    | 0    | 1    | 0.8625 |
| 1    | 0    | 1    | 0    | 0    | 0    | 0.8750 |
| 0    | 0    | 1    | 0    | 0    | 0    | 0.8875 |
| 1    | 0    | 0    | 1    | 1    | 1    | 0.9000 |
| 0    | 0    | 0    | 1    | 1    | 1    | 0.9125 |
| 1    | 0    | 0    | 1    | 1    | 0    | 0.9250 |
| 0    | 0    | 0    | 1    | 1    | 0    | 0.9375 |
| 1    | 0    | 0    | 1    | 0    | 1    | 0.9500 |
| 0    | 0    | 0    | 1    | 0    | 1    | 0.9625 |
| 1    | 0    | 0    | 1    | 0    | 0    | 0.9750 |
| 0    | 0    | 0    | 1    | 0    | 0    | 0.9875 |
| 1    | 0    | 0    | 0    | 1    | 1    | 1.0000 |
| 0    | 0    | 0    | 0    | 1    | 1    | 1.0125 |
| 1    | 0    | 0    | 0    | 1    | 0    | 1.0250 |
| 0    | 0    | 0    | 0    | 1    | 0    | 1.0375 |
| 1    | 0    | 0    | 0    | 0    | 1    | 1.0500 |
| 0    | 0    | 0    | 0    | 0    | 1    | 1.0675 |
| 1    | 0    | 0    | 0    | 0    | 0    | 1.0750 |
| 0    | 0    | 0    | 0    | 0    | 0    | 1.0875 |
| 1    | 1    | 1    | 1    | 1    | 1    | OFF    |
| 0    | 1    | 1    | 1    | 1    | 1    | OFF    |
| 1    | 1    | 1    | 1    | 1    | 0    | 1.1000 |
| 0    | 1    | 1    | 1    | 1    | 0    | 1.1125 |

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表 1、VID 编程的输出电压 (VRM 10.0) (续)

| VID5 | VID4 | VID3 | VID2 | VID1 | VID0 | VOUT   |
|------|------|------|------|------|------|--------|
| 1    | 1    | 1    | 1    | 0    | 1    | 1.1250 |
| 0    | 1    | 1    | 1    | 0    | 1    | 1.1375 |
| 1    | 1    | 1    | 1    | 0    | 0    | 1.1500 |
| 0    | 1    | 1    | 1    | 0    | 0    | 1.1625 |
| 1    | 1    | 1    | 0    | 1    | 1    | 1.1750 |
| 0    | 1    | 1    | 0    | 1    | 1    | 1.1875 |
| 1    | 1    | 1    | 0    | 1    | 0    | 1.2000 |
| 0    | 1    | 1    | 0    | 1    | 0    | 1.2125 |
| 1    | 1    | 1    | 0    | 0    | 1    | 1.2250 |
| 0    | 1    | 1    | 0    | 0    | 1    | 1.2375 |
| 1    | 1    | 1    | 0    | 0    | 0    | 1.2500 |
| 0    | 1    | 1    | 0    | 0    | 0    | 1.2625 |
| 1    | 1    | 0    | 1    | 1    | 1    | 1.2750 |
| 0    | 1    | 0    | 1    | 1    | 1    | 1.2875 |
| 1    | 1    | 0    | 1    | 1    | 0    | 1.3000 |
| 0    | 1    | 0    | 1    | 1    | 0    | 1.3125 |
| 1    | 1    | 0    | 1    | 0    | 1    | 1.3250 |
| 0    | 1    | 0    | 1    | 0    | 1    | 1.3375 |
| 1    | 1    | 0    | 1    | 0    | 0    | 1.3500 |
| 0    | 1    | 0    | 1    | 0    | 0    | 1.3625 |

| VID5 | VID4 | VID3 | VID2 | VID1 | VID0 | VOUT   |
|------|------|------|------|------|------|--------|
| 1    | 1    | 0    | 0    | 1    | 1    | 1.3750 |
| 0    | 1    | 0    | 0    | 1    | 1    | 1.3875 |
| 1    | 1    | 0    | 0    | 1    | 0    | 1.4000 |
| 0    | 1    | 0    | 0    | 1    | 0    | 1.4125 |
| 1    | 1    | 0    | 0    | 0    | 1    | 1.4250 |
| 0    | 1    | 0    | 0    | 0    | 1    | 1.4375 |
| 1    | 1    | 0    | 0    | 0    | 0    | 1.4500 |
| 0    | 1    | 0    | 0    | 0    | 0    | 1.4625 |
| 1    | 0    | 1    | 1    | 1    | 1    | 1.4750 |
| 0    | 0    | 1    | 1    | 1    | 1    | 1.4875 |
| 1    | 0    | 1    | 1    | 1    | 0    | 1.5000 |
| 0    | 0    | 1    | 1    | 1    | 0    | 1.5125 |
| 1    | 0    | 1    | 1    | 0    | 1    | 1.5250 |
| 0    | 0    | 1    | 1    | 0    | 1    | 1.5375 |
| 1    | 0    | 1    | 1    | 0    | 0    | 1.5500 |
| 0    | 0    | 1    | 1    | 0    | 0    | 1.5625 |
| 1    | 0    | 1    | 0    | 1    | 1    | 1.5750 |
| 0    | 0    | 1    | 0    | 1    | 1    | 1.5875 |
| 1    | 0    | 1    | 0    | 1    | 0    | 1.5875 |



# MAX8525 评估板

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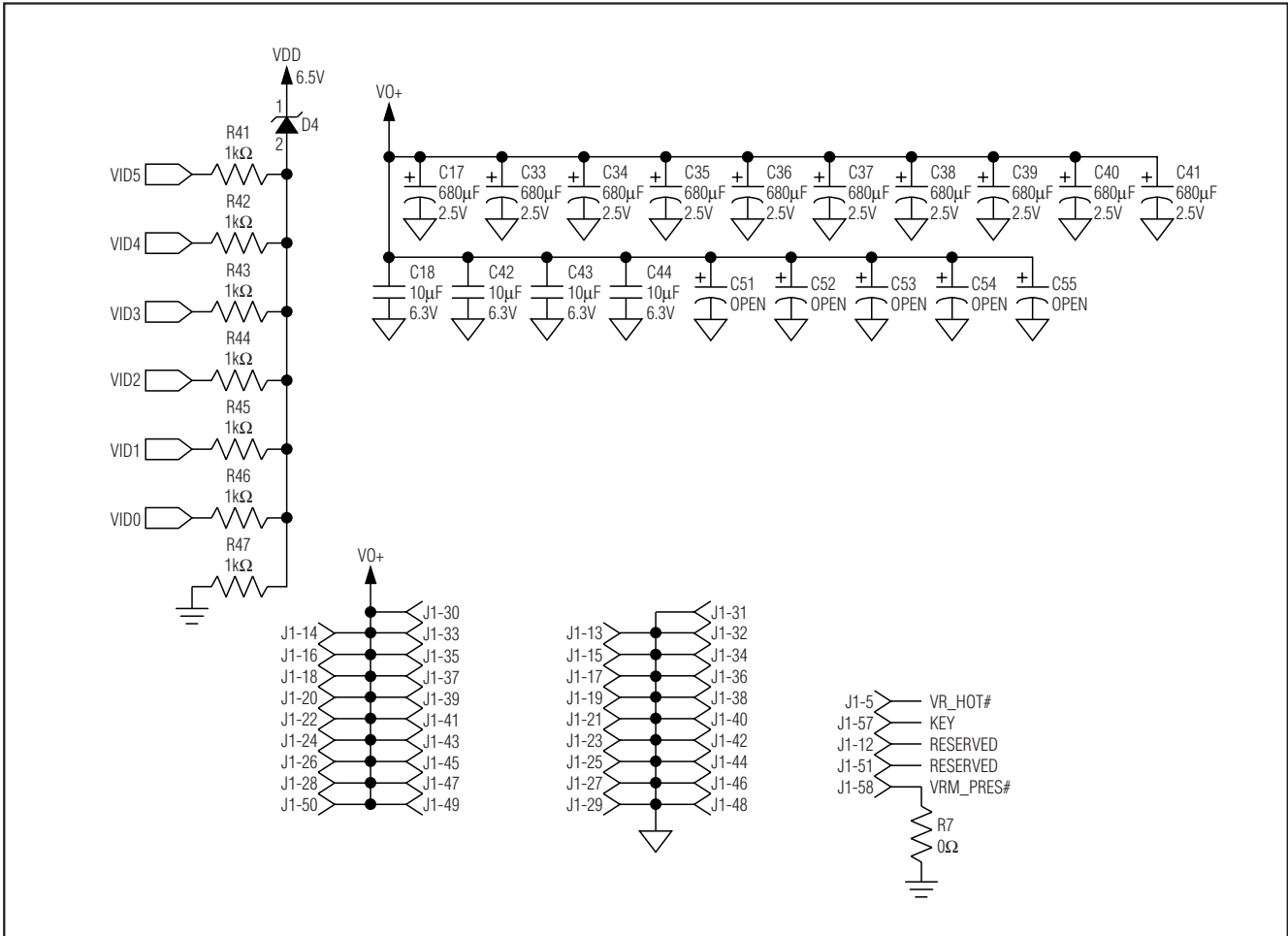


图 2. MAX8525 评估板原理图 (2-2)

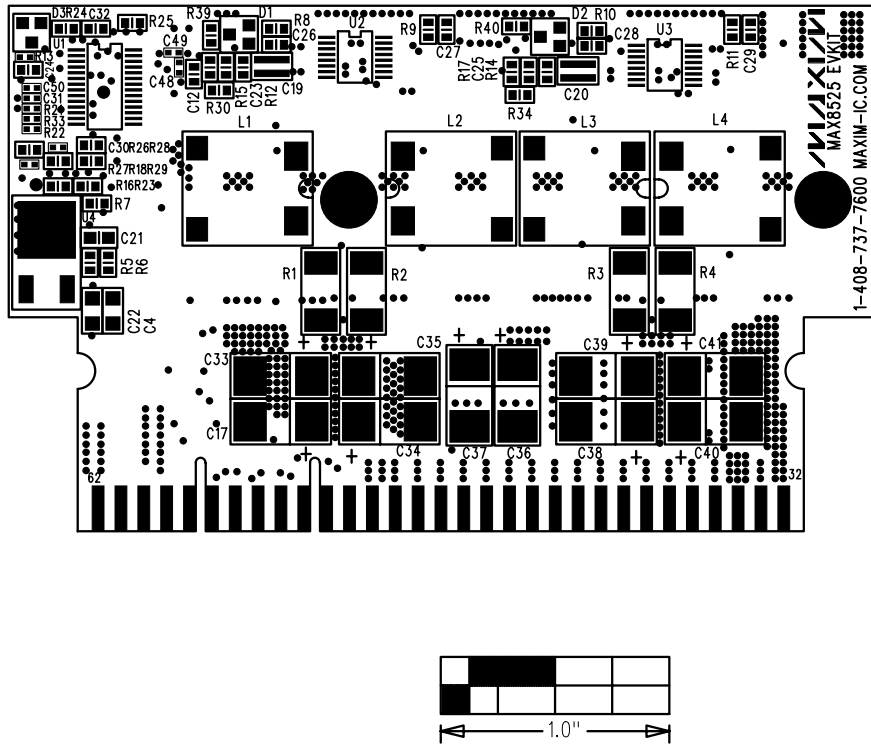


图 3. MAX8525 评估板元件布局图——元件面

# MAX8525 评估板

Evaluates: MAX8523/MAX8525

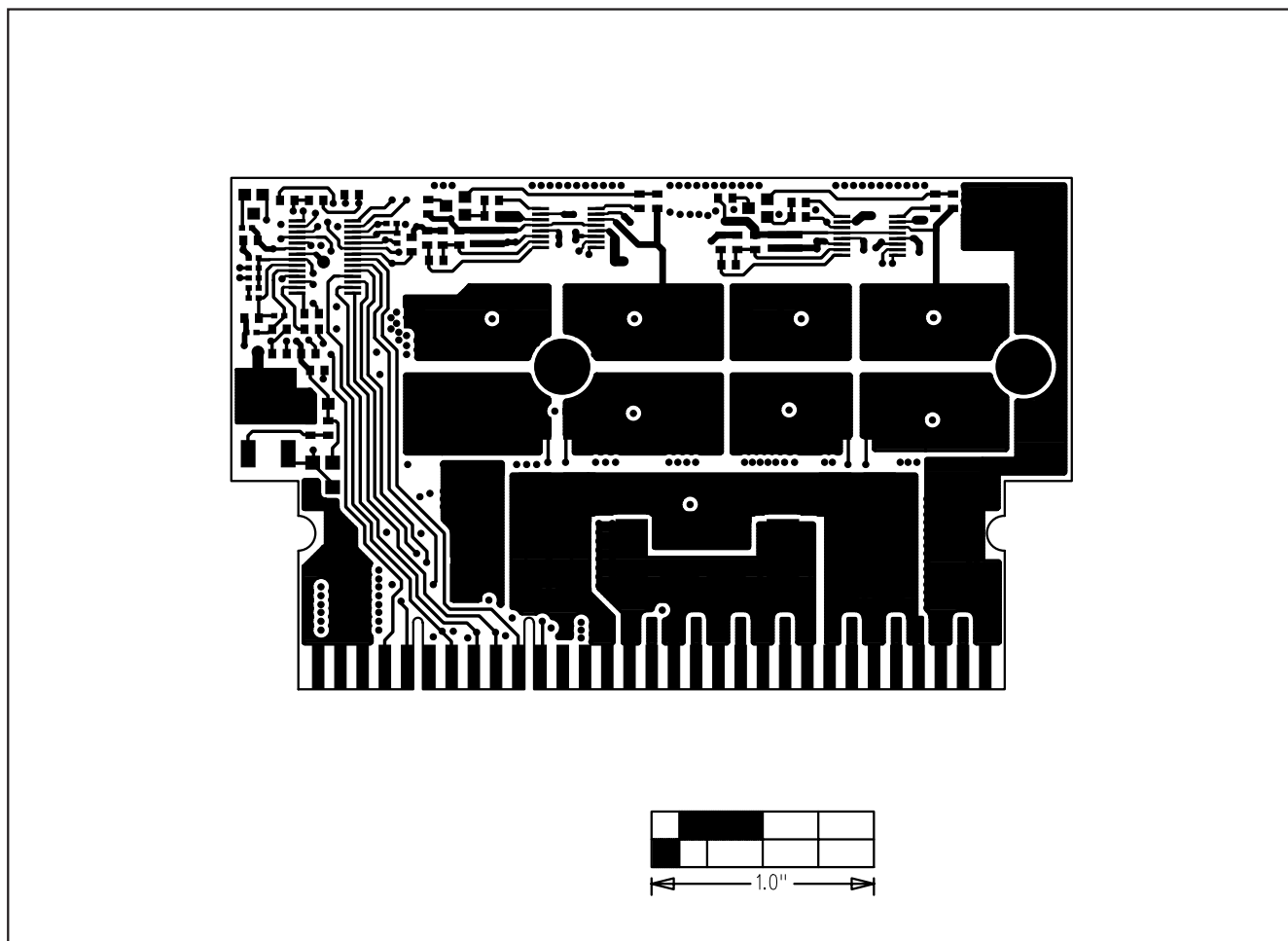


图 4. MAX8525 评估板 PC 板布线——元件面



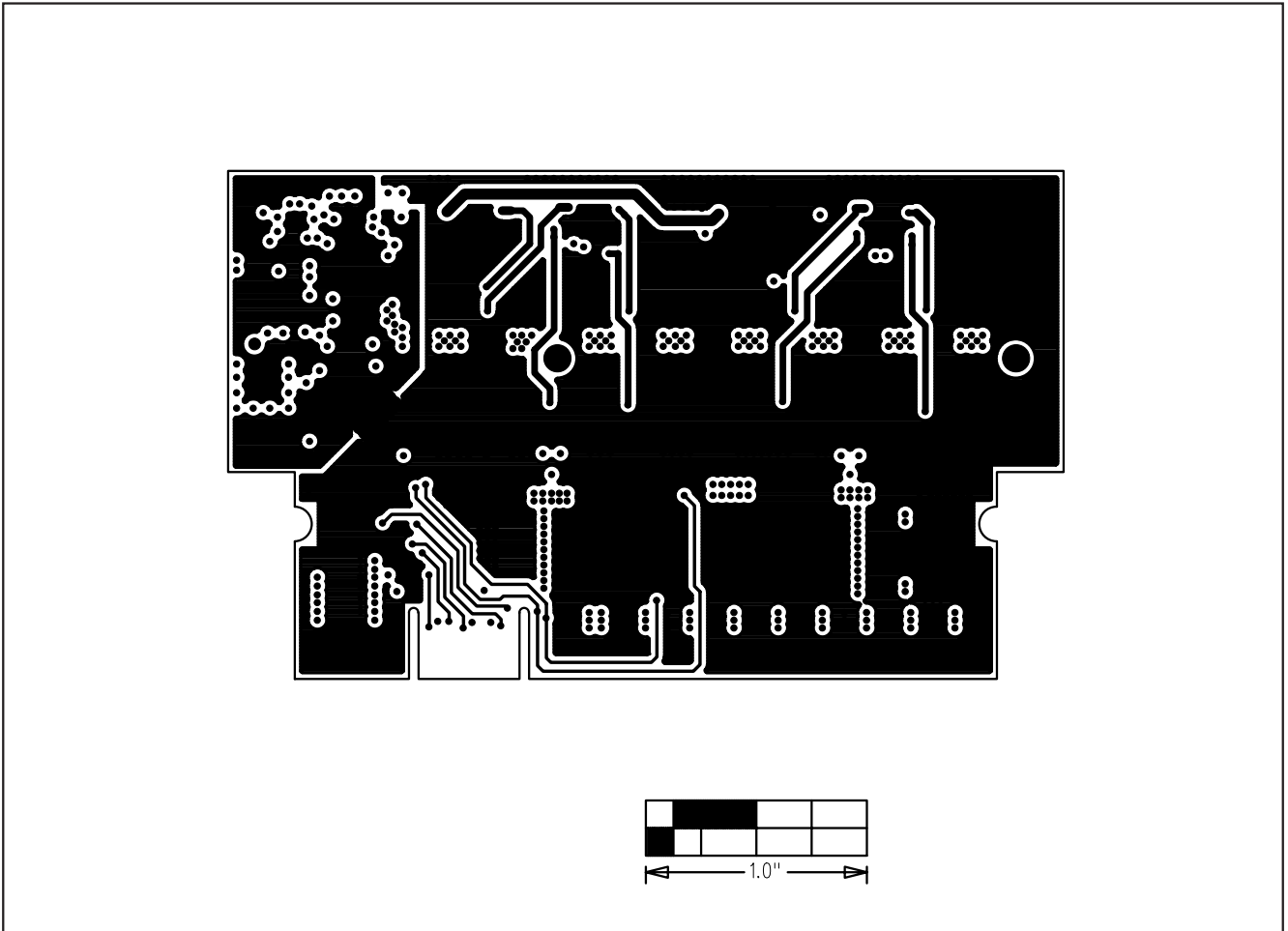


图 5. MAX8525 评估板 PC 板布线——第 2 层, GND

# MAX8525 评估板

Evaluates: MAX8523/MAX8525

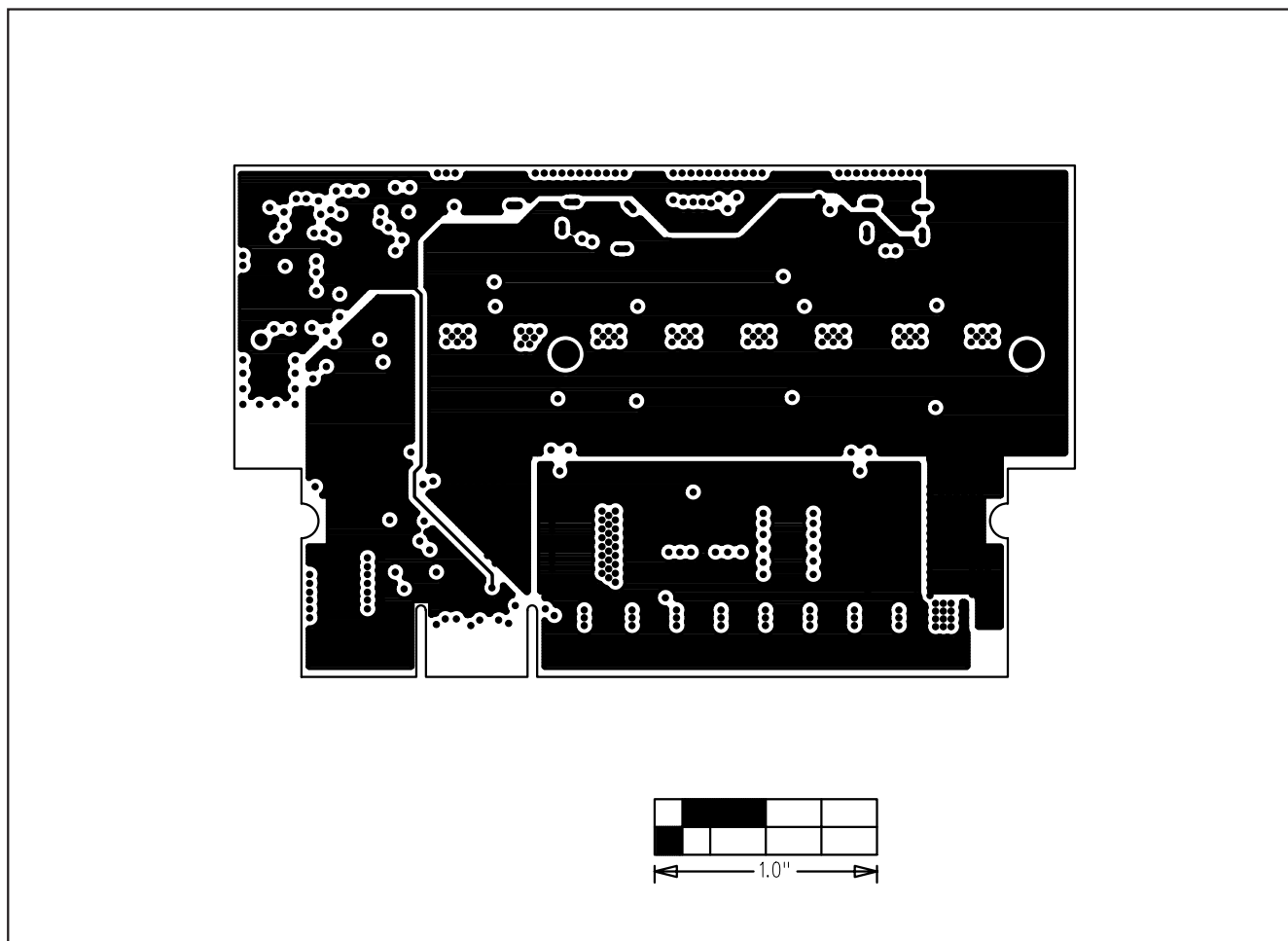


图 6. MAX8525 评估板 PC 板布线——第 3 层, GND

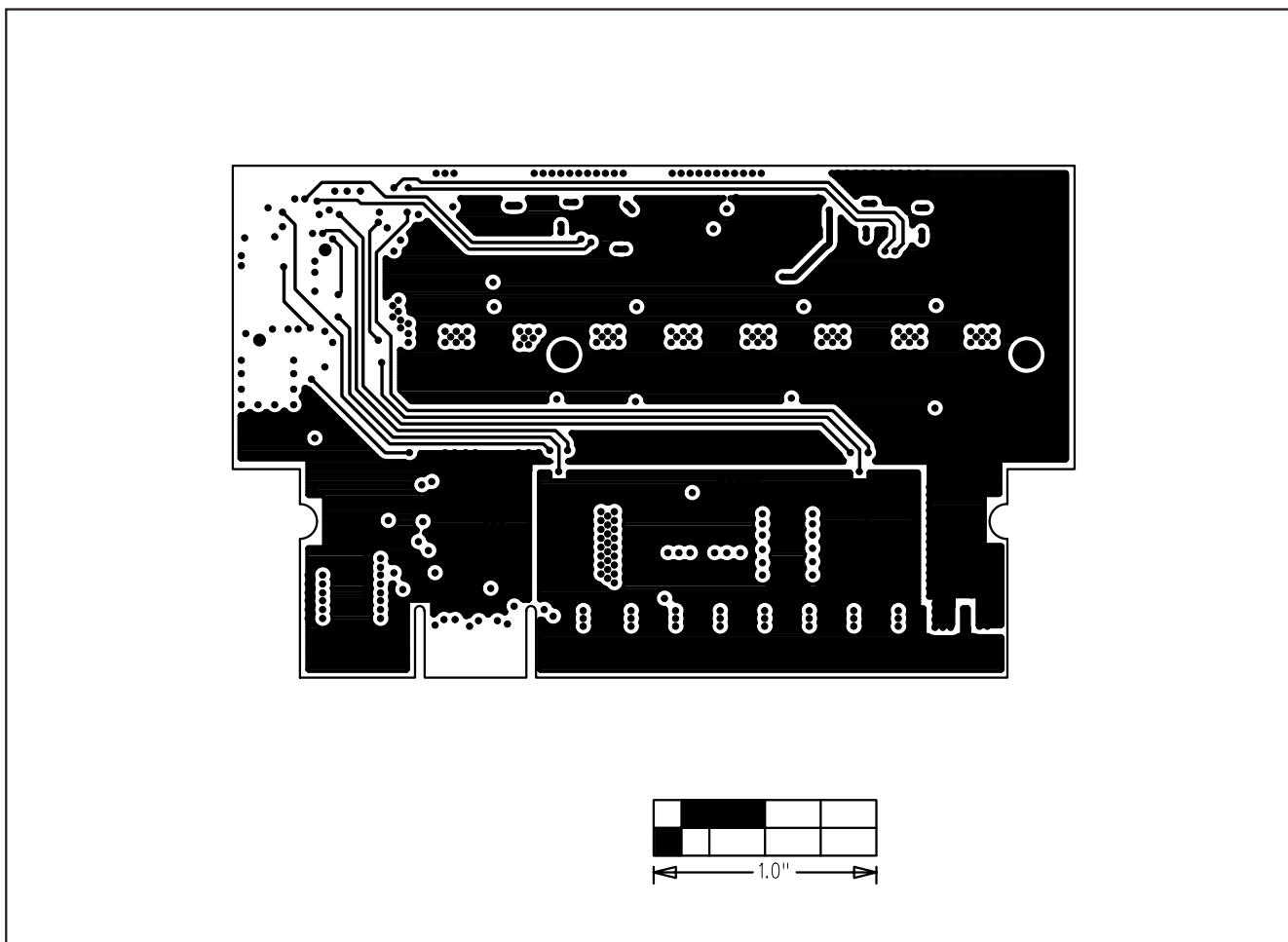


图 7. MAX8525 评估板 PC 板布线——第 4 层, 检测/GND

# MAX8525 评估板

Evaluates: MAX8523/MAX8525

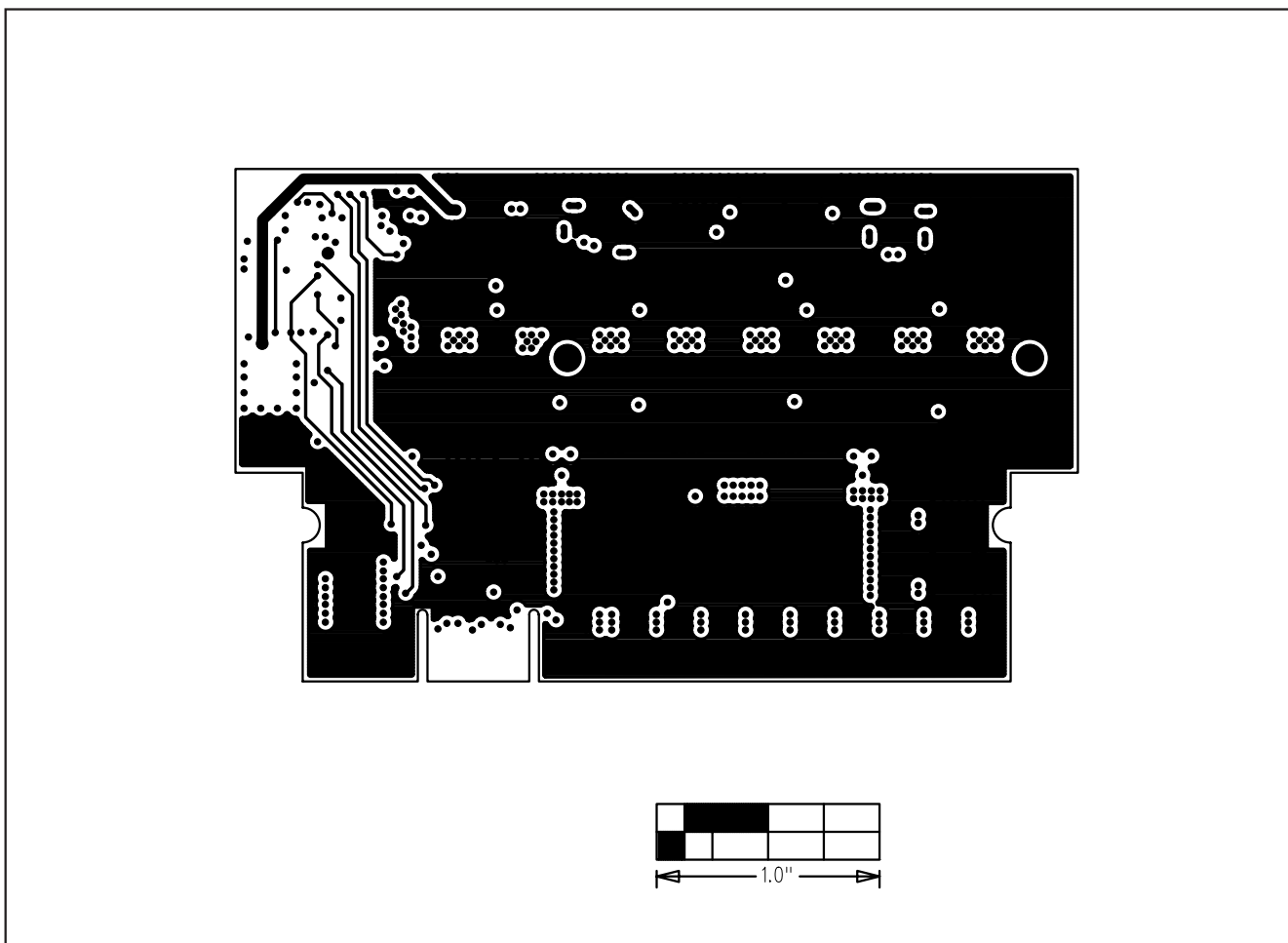


图 8. MAX8525 评估板 PC 板布线——第 5 层, GND

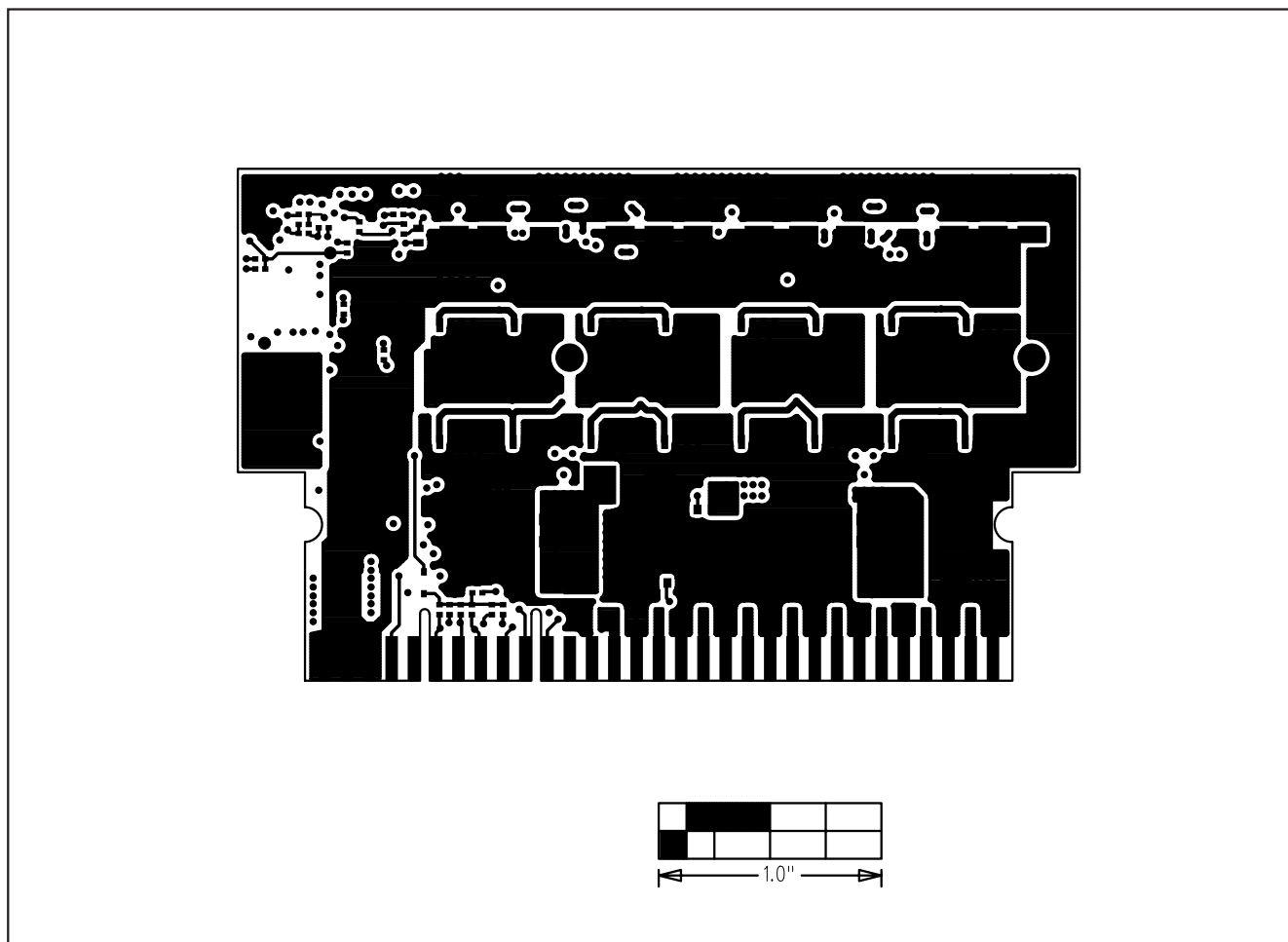


图 9. MAX8525 评估板 PC 板布线——焊接面

## MAX8525 评估板

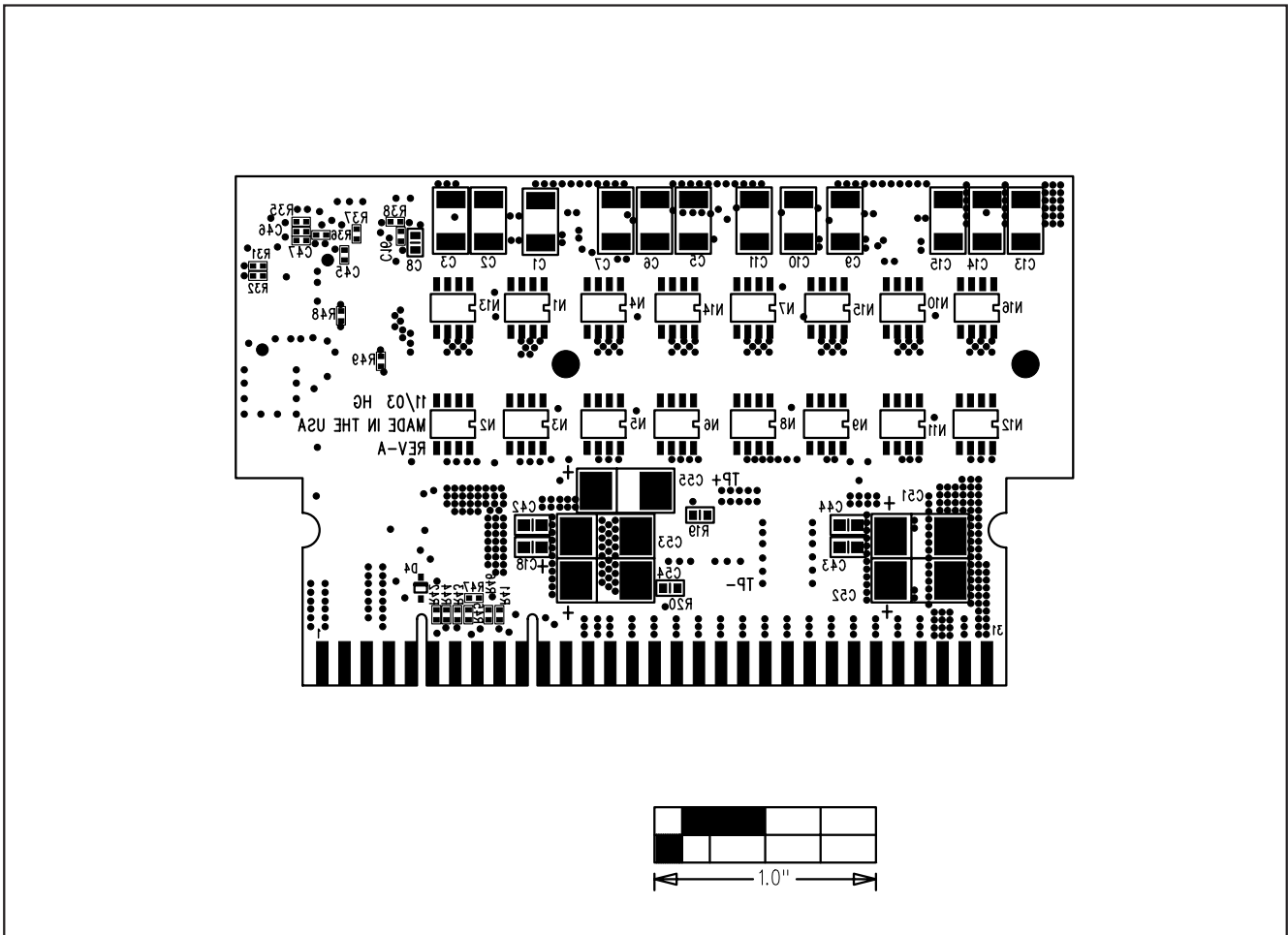


图 10. MAX8525 评估板元件布局图——焊接面

## MAXIM 北京办事处

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免费电话: 800 810 0310

电话: 010-6201 0598

传真: 010-6201 0298

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