

## MAX25600 Evaluation Kit

Evaluates: MAX25600

### General Description

The MAX25600 evaluation kit (EV kit) provides a reliable platform for validating designs that use the MAX25600 automotive high-voltage, high-brightness LED (HB LED) buck boost controller. The EV kit operates from 8V to 48V DC supply voltage. The EV kit is configured to deliver up to 1.5A to one string of one to fifteen LEDs. The total voltage of the string can vary from 3V to 60V.

### Benefits and Features

- 8V to 48V Input Voltage Range
- Demonstrates Analog Dimming Control, Digital Dimming Control
- Demonstrates Input Current Limit
- Demonstrates LED Current Monitoring function
- Demonstrates LED Short and Open Protection
- Proven PCB Layout
- Fully Assembled and Tested

**Ordering Information** appears at end of data sheet.

### Quick Start

#### Required Equipment

- MAX25600 EV kit
- 12V, 5A DC power supply
- A series-connected LED string rated at least 1.5A
- Oscilloscope with a current probe

#### Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation:

**Caution: Do not turn on the power supply until all connections are made.**

- 1) Verify that all jumpers are in their default positions, as shown in [Table 1](#).
- 2) Connect the positive terminal of the 12V supply to the VINP1 board PCB pad and the negative terminal to the GND1\_board PCB pad.
- 3) Connect the LED string across the LED+ and LED- PCB pads on the EV kit. The Anode of the LED string should go to the LED+ PCB pad and Cathode of the LED string to LED- PCB pad.
- 4) Clip the current probe on the wire connected to the LED string.
- 5) Turn on the DC power supply.
- 6) Verify that the LEDs turn on.
- 7) Verify that the oscilloscope displays approximately 1.5A.

### Detailed Description

The MAX25600 evaluation kit (EV kit) provides a reliable platform for validating designs that use the MAX25600 automotive high-voltage, high-brightness LED (HB LED) buck boost controller. The EV kit operates from 8V to 48V DC supply voltage. The EV kit is configured to deliver up to 1.5A to one string of LEDs. The total voltage of the string can vary from 3V to 60V.

#### Analog Dimming Control (ICTRL)

When J2 is closed, the LED current is set by the resistive divider from VCC. The equation to set the LED current is

$$I_{LED} = \frac{V_{ICTRL} - 200mV}{5 \times R9}$$

In the case of the EV kit, ILED is set to 1.5A. Use a screw driver on the potentiometer R21 to adjust the LED current.

### PWM Dimming

The EV kit demonstrates the PWM dimming feature of the MAX25600 using either an external PWM signal, or a DC voltage at the PWMDIM pin.

#### External PWM dimming:

Keep J4 open and remove the 0.1uF C55 capacitor (installed by default). Connect an external PWM signal to the PWMDIM test point. Vary the duty cycle to increase or decrease the intensity of the HB LED string. The PWMDIM input of the device has a 2V (max) rising threshold and a 0.4V (min) falling threshold and is compatible with 3.3V and 5V logic-level signals.

#### Analog-to-PWM dimming:

Keep J4 open and keep the 0.1uF C55 (installed by default). The PWM dimming duty cycle is set by the voltage at PWMDIM between 0.2V (0% duty) and 3.2V (100% duty). Drive the PWMDIM test point with an external DC source. PWMDIM voltages above 3.2V set the dimming duty cycle to 100%.

**Table 1. MAX25600 EV Kit Jumper Descriptions**

| JUMPER | SHUNT POSITION | DESCRIPTION  |
|--------|----------------|--|
| J1     | Closed         | Short the PMOS PWM dimming switch.   |
|        | Open*          | PWM dimming done with the PMOS switch  |
| J2     | Closed         | Uses the resistive divider from VCC and the potentiometer R21 to set the LED current.  |
|        | Open           | Apply an external DC voltage between 0.2V to 1.2V for setting LED current.   |
| J3     | Open           | Connect an external power supply for the IN pin of the IC, using the IN_IC PAD.  |
|        | 1-2*           | Connect the IN input of the IC to the VIN power supply connected on VINP1 PAD.   |
|        | 2-3            | The IN and VCC inputs of the IC are shorted and should be driven with an external 5V supply.                                   |
| J4     | Open           | Apply an external PWM clock source for PWM dimming or apply an external DC source between 0.2V to 3.2V for analog PWM dimming. |
|        | 1-2*           | PWMDIM pin pulled to VCC for 100% duty.  |
|        | 2-3            | PWMDIM pin pulled to GND to turn OFF.  |

### Current Monitor Output

The EV kit also demonstrates the current-monitor output feature of the buck boost controller. The MAX25600 includes a current monitor on the IOUTV pin. The IOUTV voltage is an analog voltage indication of the LED current when DIM is high. The voltage on the IOUTV pin is given by the following equation:

$$V_{IOUTV} = I_{LED} \times R_{CS\_LED} \times 5 + 0.2V$$

### Input-Current Limit

The MAX25600 features circuitry that limits the input current during line dropouts. Refer to the IC datasheet for details on setting the input current limit.

### External VCC input

The EV kit demonstrates operation of the buck boost controller with an external VCC input. In this case, the internal LDO is not used. Move the shunt to pins 2-3 on J3 (the IN and VCC pins of the buck controller are shorted together). Apply an external power supply between 4.6V and 5.5V on the IN\_IC PCB pad to allow switching of the device.

### Faults

#### Open and Short LEDs:

The IC detects the open and short fault conditions of the LEDs and the fault pin is pulled low. The fault pin also goes low when there is an overtemperature condition. The fault pin is an open-drain output and is active low.

## Ordering Information

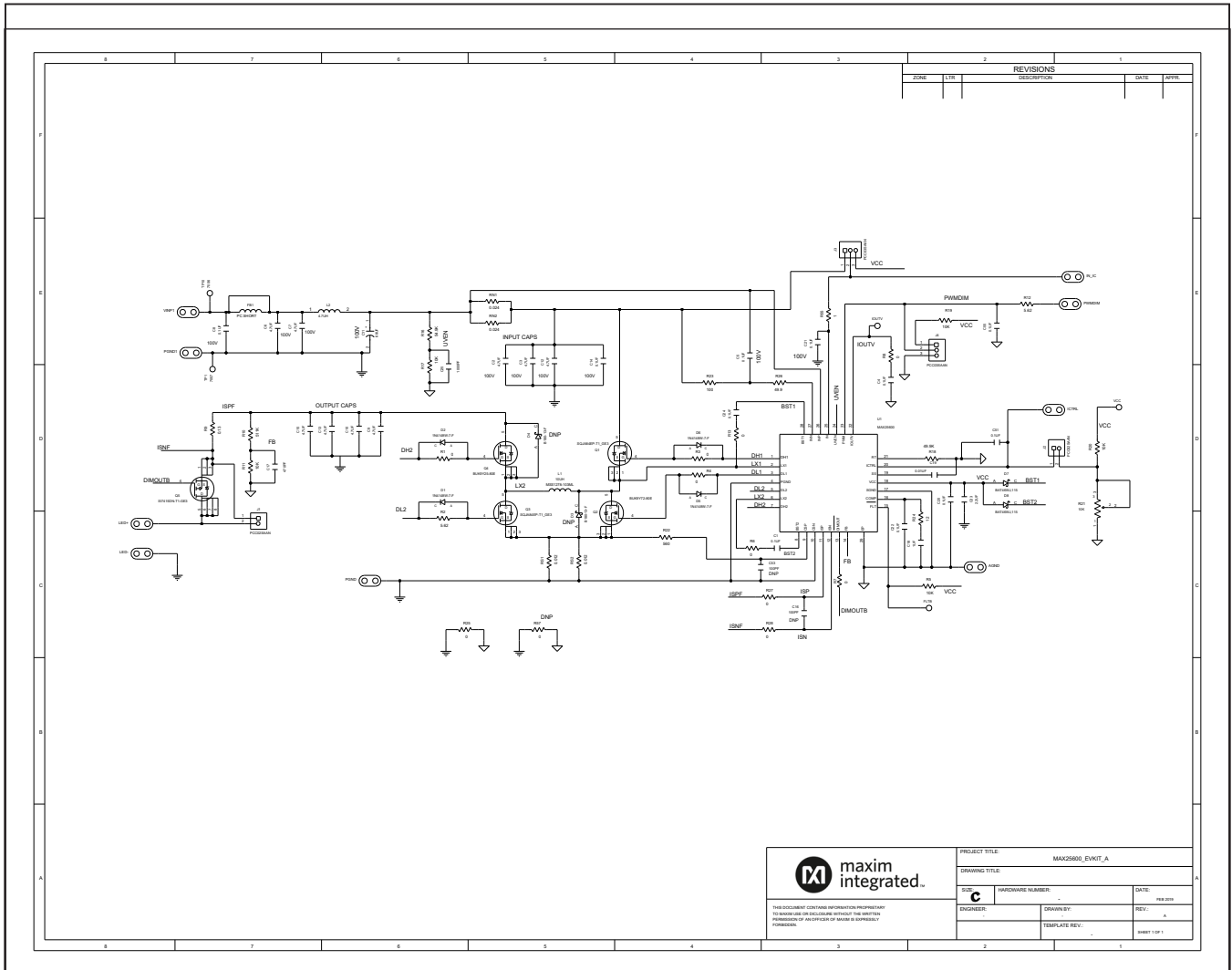
| PART           | TYPE   |
|----------------|--------|
| MAX25600EVKIT# | EV Kit |

#Denotes RoHS compliant.

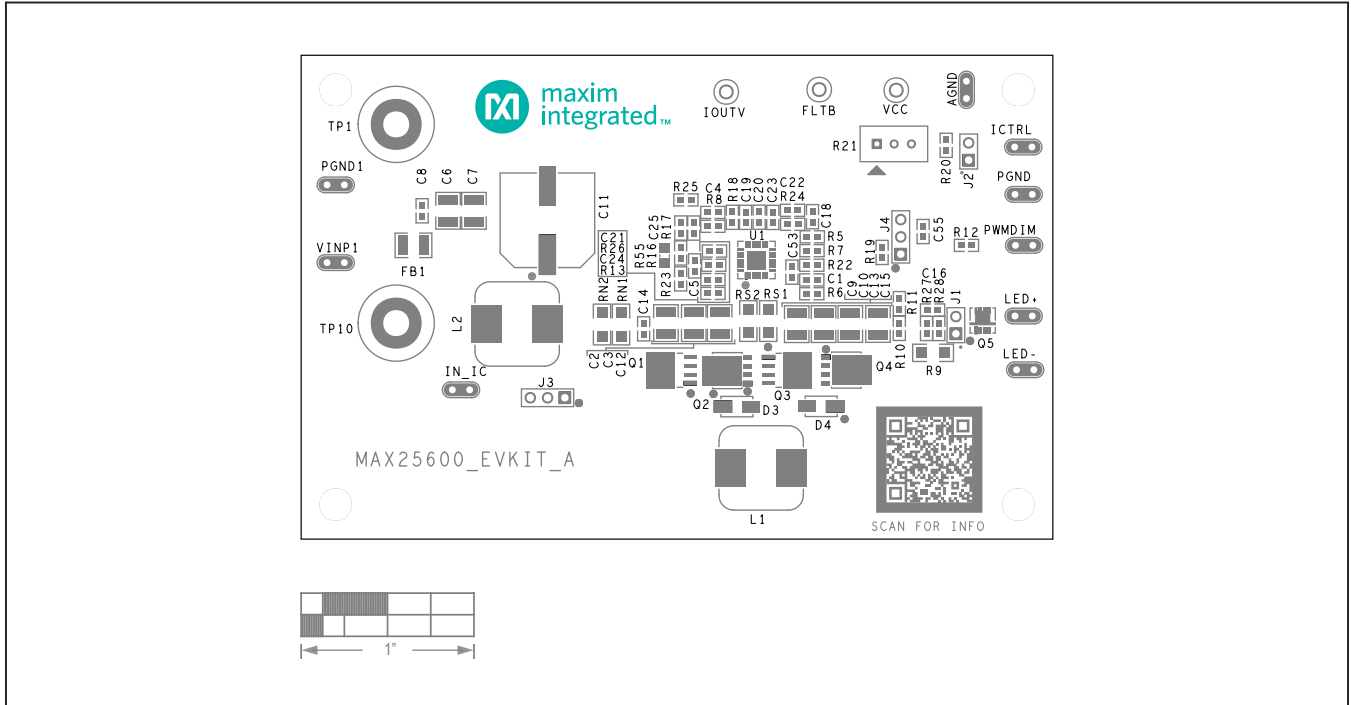
MAX25600 EV Kit Bill of Materials

| ITEM  | QTY | REF DES   | MFG PART #  | MANUFACTURER  | VALUE           | DESCRIPTION  |
|-------|-----|---|---|---|-----------------|--|
| 1     | 9   | AGND, ICTRL, IN_IC, LED+, LED-, PGND, PGND1, PVMMDIM, VINP1 | 9020 BUSS   | WEICO WIRE  | MAXIMPAD        | EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG   |
| 2     | 6   | C1, C4, C20, C22, C24, C55                                  | 885012206071;CGJ3E2X7R1E104K080AA; C1608X7R1E104K080AA;C0603C104K3RAC; GRM188R71E104KA01;C1608X7R1E104K | WURTH ELECTRONICS INC;TDK; TDK;KEMET                              | 0.1UF           | CAPACITOR; SMT; 0603; CERAMIC; 0.1uF; 25V; 10%; X7R; -55degC to +125degC; +/-15% from -55degC to +125degC  |
| 3     | 9   | C2, C3, C6, C7, C9, C10, C12, C13, C15                      | CGA6M3X7S2A475K200AE; CGA6M3X7S2A475K200AB  | TDK;TDK   | 4.7UF           | CAPACITOR; SMT (1210); CERAMIC CHIP; 4.7UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7S; AUTO  |
| 4     | 1   | C5  | CGA3E3X7S2A104K080AB  | TDK   | 0.1UF           | CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7S  |
| 5     | 3   | C8, C14, C21  | CC0603KRX7R0BB104;GRM188R72A104KA35; GCJ188R72A104KA01;HMK107B7104KA; 06031C104KAT2A                    | YAGEO;MURATA;MURATA; TAIYO YUDEN;AVX                              | 0.1UF           | CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R  |
| 6     | 1   | C11   | EEV-FK2A680Q  | PANASONIC   | 68UF            | CAPACITOR; SMT (CASE, H13); ALUMINUM-ELECTROLYTIC; 68UF; 100V; TOL=20%; MODEL=EEV SERIES   |
| 7     | 1   | C17   | C0603C471K1RAC; 06031C471KAT2A  | KEMET;AVX   | 470PF           | CAPACITOR; SMT; 0603; CERAMIC; 470pF; 100V; 10%; X7R; -55degC to +125degC; +/-15% from -55degC to +125degC   |
| 8     | 1   | C18   | C0603X5R160-105KNP;EMK107BJ105KA; C1608X5R1C105K080AA;GRM188R61C105K; 0603YD105KAT2A;CL10A105K08NNN     | VENKEL LTD.;TAIYO YUDEN; TDK;MURATA;AVX;SAMSUNG ELECTRO-MECHANICS | 1UF             | CAPACITOR; SMT; 0603; CERAMIC; 1uF; 16V; 10%; X5R; -55degC to +85degC; 0 +/-15% degC MAX USE 20-0001u-63 FOR NEW DESIGN                              |
| 9     | 1   | C19   | C1608C0G1E103J080AA   | TDK   | 0.01UF          | CAPACITOR; SMT (0603); CERAMIC CHIP; 0.01UF; 25V; TOL=5%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=C0G   |
| 10    | 1   | C23   | C1608X5R1E225K;TMK107ABJ225KA; TMK107BJ225KA;GRM188R61E225KA12  | TDK;TAIYO YUDEN; TAIYO YUDEN;MURATA                               | 2.2UF           | CAPACITOR; SMT (0603); CERAMIC CHIP; 2.2UF; 25V; TOL=10%; MODEL=; TG=-55 DEGC TO +85 DEGC; TC=X5R  |
| 11    | 1   | C25   | C0603H102J1GAC  | KEMET   | 1000PF          | CAPACITOR; SMT (0603); CERAMIC CHIP; 1000PF; 100V; TOL=5%; MODEL=HT SERIES; TG=-55 DEGC TO +200 DEGC; TC=C0G   |
| 12    | 1   | C51   | CGA3E2X8R1E104K080AE  | TDK   | 0.1UF           | CAP; SMT (0603); 0.1UF; 10%; 25V; X8R; CERAMIC CHIP  |
| 13    | 4   | D1, D2, D5, D6  | 1N4148W-7-F   | DIODES INCORPORATED   | 1N4148W-7-F     | DIODE; SWT; SMT (SOD-123); PIV=100V; IF=0.3A; -65 DEGC TO +150 DEGC  |
| 14    | 2   | D7, D8  | BAT46WJ   | NXP   | BAT46WJ.115     | DIODE; SCH; SMT (SOD-323F); PIV=100V; IF=0.25A   |
| 15    | 1   | FB1   | HF70ACB322513   | TDK   | 52              | INDUCTOR; SMT (1210); FERRITE-BEAD; 52; TOL=+-25%; 0.4A; -40 DEGC TO +125 DEGC   |
| 16    | 3   | FLTB, IOUTV, VCC  | 5007  | KEYSTONE  | N/A             | TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.35IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;                               |
| 17    | 2   | J1, J2  | PCC02SAAN   | SULLINS   | PCC02SAAN       | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 2PINS; -65 DEGC TO +125 DEGC   |
| 18    | 2   | J3, J4  | PCC03SAAN   | SULLINS   | PCC03SAAN       | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC   |
| 19    | 1   | L1  | MSS1278-103ML   | COILCRAFT   | 10UH            | INDUCTOR; SMT; FERRITE CORE; 10UH; TOL=+-20%; 5.7A   |
| 20    | 1   | L2  | MSS1278T-472ML  | COILCRAFT   | 4.7UH           | INDUCTOR; SMT; FERRITE BOBBIN CORE; 4.7UH; TOL=+-0.2%; 6.2A; -40 DEGC TO +125 DEGC   |
| 21    | 2   | Q1, Q3  | SQJA84EP-T1_GE3   | VISHAY SILICONIX  | SQJA84EP-T1_GE3 | TRAN; AUTOMOTIVE; N-CHANNEL MOSFET; NCH; SO-8L; PD-(55W); I-(46A); V-(80V)   |
| 22    | 1   | Q2  | BUK9Y72-80E   | NEXPERIA  | BUK9Y72-80E     | TRAN; N-CH LOGIC LEVEL MOSFET; NCH; LFPAK; PD-(45W); I-(15A); V-(80V)  |
| 23    | 1   | Q4  | BUK9Y25-80E   | NEXPERIA  | BUK9Y25-80E     | TRAN; N-CH LOGIC LEVEL MOSFET; NCH; LFPAK; PD-(95W); I-(37A); V-(80V)  |
| 24    | 1   | Q5  | SI7415DN-T1-GE3   | VISHAY SILICONIX  | SI7415DN-T1-GE3 | TRAN; P-CHANNEL 60-V (D-S) MOSFET; PCH; POWERPAK1212-8; PD-(3.8W); I-(5.7A); V-(60V)   |
| 25    | 10  | R1, R3, R4, R6-R8, R13, R25, R27, R28                       | CRCW06030000Z0  | VISHAY DALE   | 0               | RESISTOR; 0603; 0 OHM; 0%; JUMPER; 0.1W; THICK FILM  |
| 26    | 2   | R2, R12   | CRCW06035R62FK  | VISHAY DALE   | 5.62            | RESISTOR; 0603; 5.62 OHM; 1%; 100PPM; 0.10W; THICK FILM  |
| 27    | 5   | R5, R11, R17, R19, R20                                      | 301-10K-RC  | XICON   | 10K             | RESISTOR; 0603; 10K OHM; 5%; 200PPM; 1/16W; THICK FILM   |
| 28    | 1   | R9  | CSR1206FTR130   | STACKPOLE ELECTRONICS INC   | 0.13            | RESISTOR; 1206; 0.13 OHM; 1%; 100PPM; 0.5W; THICK FILM   |
| 29    | 1   | R10   | ERJ-3EKF5113  | PANASONIC   | 511K            | RESISTOR; 0603; 511K OHM; 1%; 100PPM; 0.1W; THICK FILM   |
| 30    | 1   | R16   | CRCW060354K9FK  | VISHAY DALE   | 54.9K           | RES; SMT (0603); 54.9K; 1%; +/-100PPM/DEGC; 0.1W   |
| 31    | 1   | R18   | 288-0603-49.9K-RC   | XICON   | 49.9K           | RESISTOR; 0603; 49.9K OHM; 0.1%; 10PPM; 1/16W; THIN FILM   |
| 32    | 1   | R21   | 3296W-1-103LF   | BOURNS  | 10K             | RESISTOR; THROUGH-HOLE-RADIAL LEAD; 3296 SERIES; 10K OHM; 10%; 100PPM; 0.5W; SQUARE TRIMMING POTENTIOMETER; 25 TURNS; MOLDED CERAMIC OVER METAL FILM |
| 33    | 1   | R22   | CRCW0603560RFK  | VISHAY DALE   | 560             | RESISTOR; 0603; 560 OHM; 1%; 100PPM; 0.10W; THICK FILM   |
| 34    | 1   | R23   | RG1608P-101-B.ERA-3YEB101V  | SUSUMU CO LTD.;PANASONIC  | 100             | RESISTOR; 0603; 100 OHM; 0.1%; 25PPM; 0.1W; THICK FILM   |
| 35    | 1   | R24   | RCS060312R0FK   | VISHAY DALE   | 12              | RESISTOR; 0603; 12 OHM; 1%; 100PPM; 0.25W; THICK FILM  |
| 36    | 1   | R26   | CRCW060349R9FK  | VISHAY DALE   | 49.9            | RESISTOR; 0603; 49.9 OHM; 1%; 100PPM; 0.10W; THICK FILM  |
| 37    | 1   | R55   | CRCW08051R00FK  | VISHAY DALE   | 1               | RESISTOR; 0805; 1 OHM; 1%; 100PPM; 0.125W; THICK FILM  |
| 38    | 2   | RN1, RN2  | ERJ-8BWF024   | PANASONIC   | 0.024           | RES; SMT (1206); 0.024; 1%; +/-150PPM/DEGC; 1W   |
| 39    | 2   | RS1, RS2  | TLM2BER012F   | TE CONNECTIVITY   | 0.012           | RES; SMT (1206); 0.012; 1%; +/-100PPM/DEGC; 0.5W;NOTE:PURCHASE DIRECT FROM THE MANUFACTURER  |
| 40    | 1   | TP1   | 7007  | KEYSTONE  | 7007            | CONNECTOR; PANELMOUNT; BINDING POST; STRAIGHT THROUGH; 1PIN; BLACK   |
| 41    | 1   | TP10  | 7006  | KEYSTONE  | 7006            | CONNECTOR; PANELMOUNT; BINDING POST; STRAIGHT THROUGH; 1PIN; RED   |
| 42    | 1   | U1  | MAX25600  | MAXIM   | MAX25600        | EVKIT PART-IC; MAX25600; QFN28-EP; PACKAGE OUTLINE DRAWING: 21-100130; PACKAGE CODE: T2855+5C  |
| 43    | 1   | PCB   | MAX25600  | MAXIM   | PCB             | PCB:MAX25600   |
| TOTAL | 91  |   |   |   |                 |  |

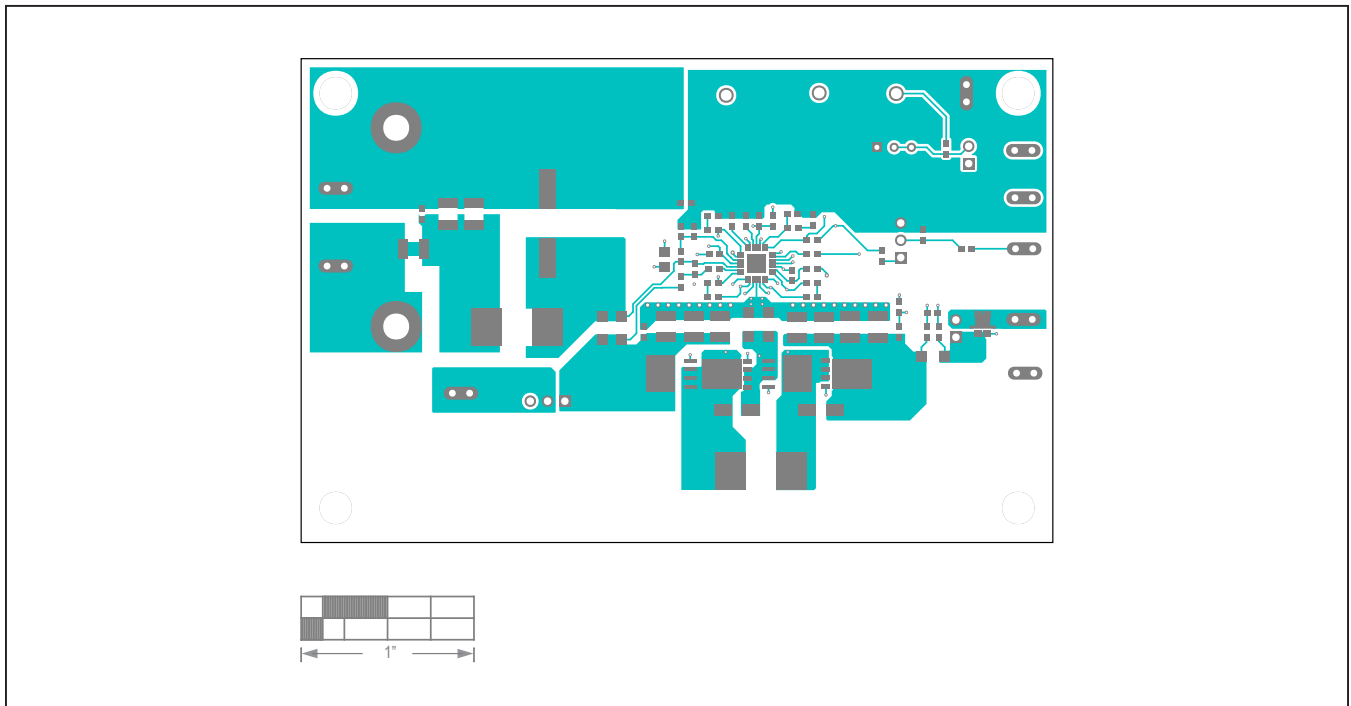
MAX25600 EV Kit Schematics



### MAX25600 EV Kit PCB Layout Diagrams

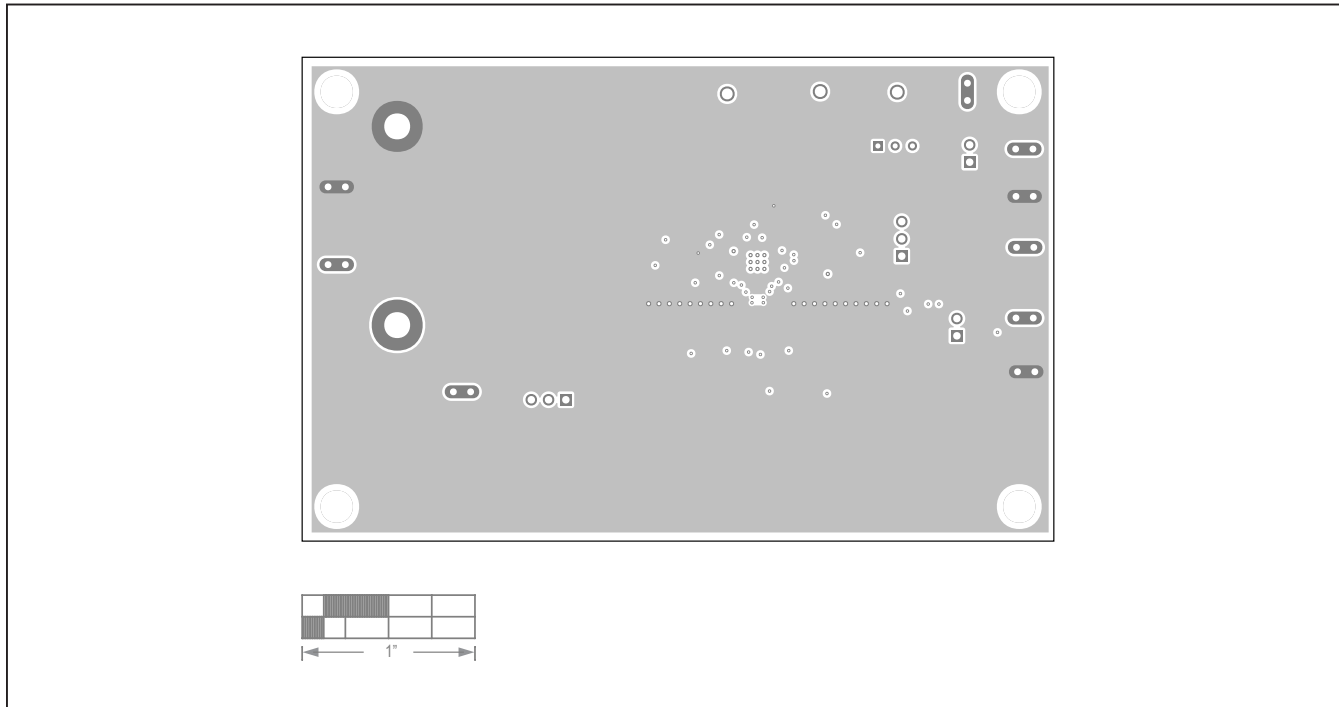


MAX25600 EV Kit Component Placement Guide—Top Silkscreen

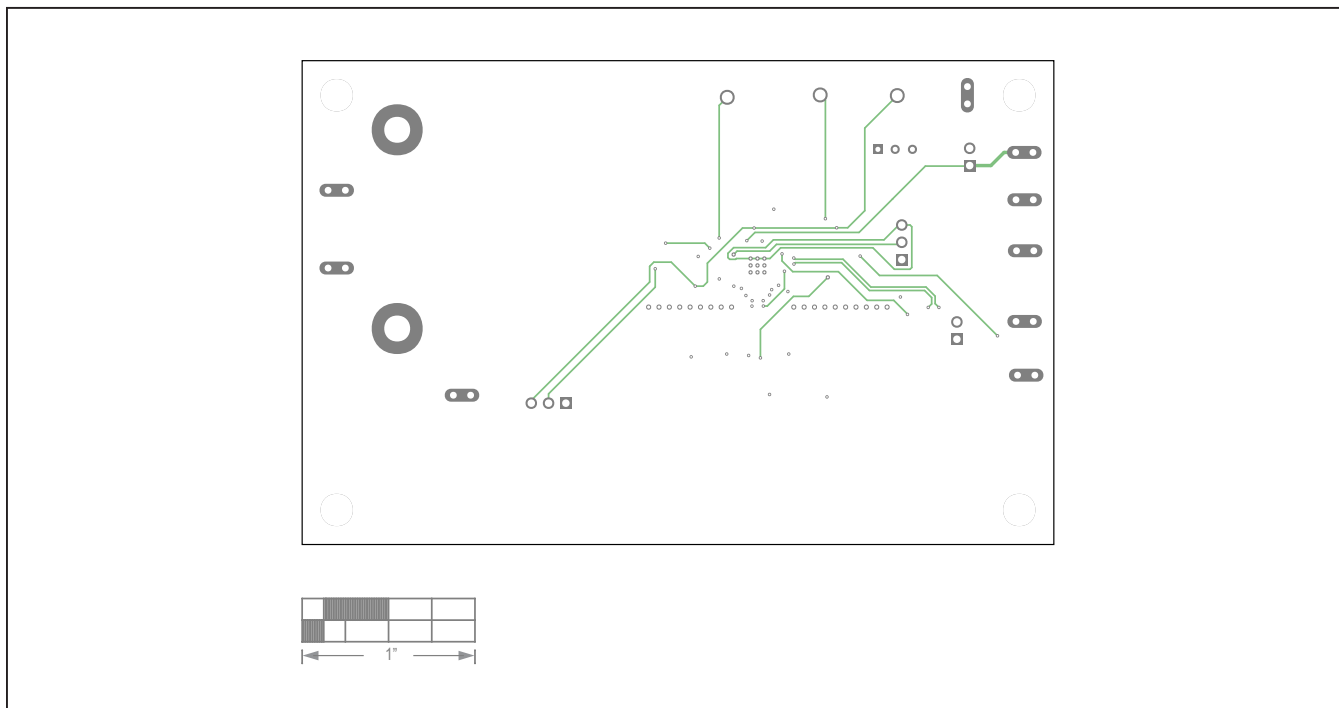


MAX25600 EV Kit PCB Layout—Top View

MAX25600 EV Kit PCB Layout Diagrams (continued)

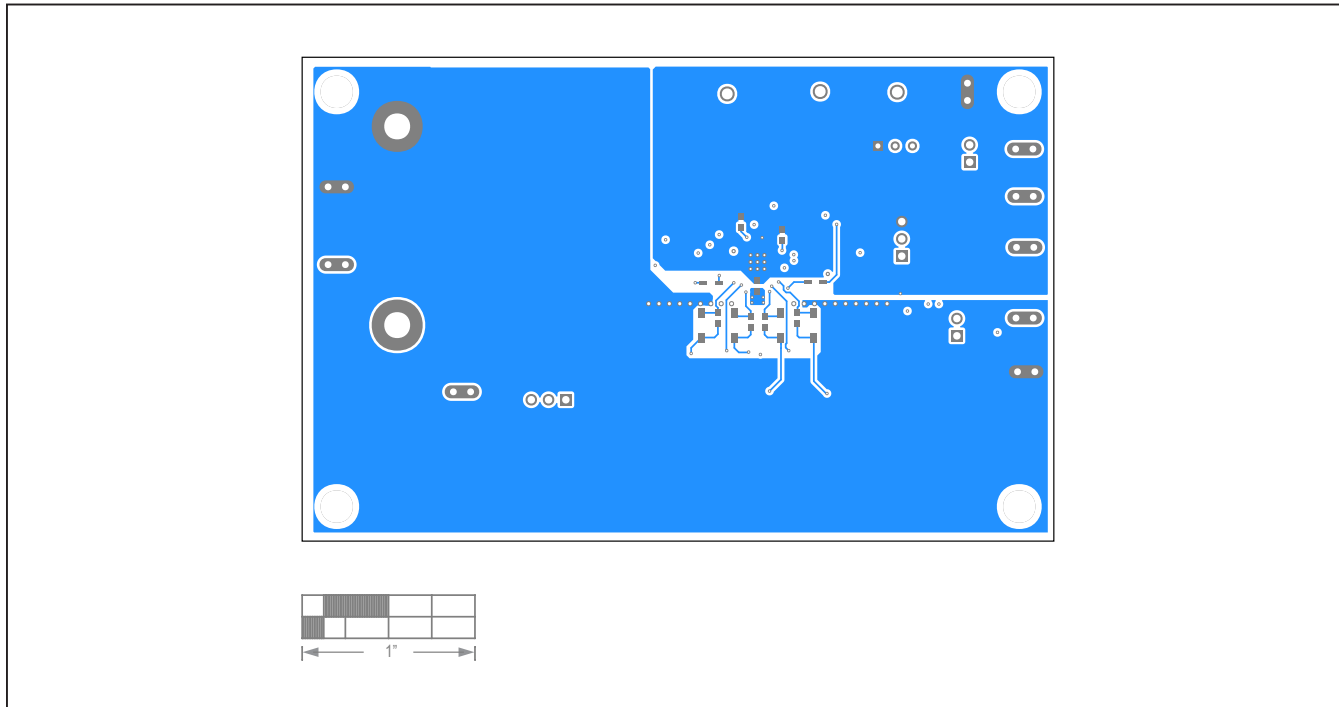


MAX25600 EV Kit PCB Layout—Internal2

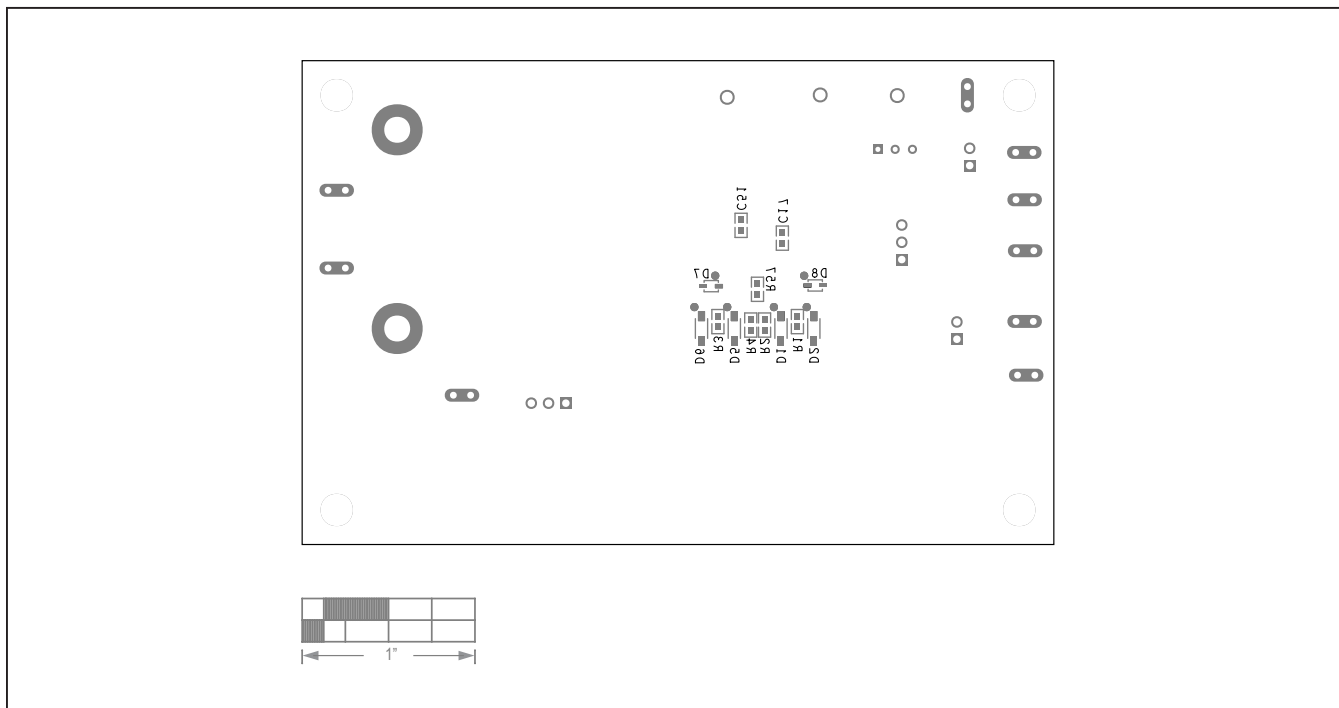


MAX25600 EV Kit PCB Layout—Internal3

### MAX25600 EV Kit PCB Layout Diagrams (continued)



MAX25600 EV Kit PCB Layout—Bottom View



MAX25600 EV Kit Component Placement Guide—Bottom Silkscreen



## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION     | PAGES CHANGED |
|-----------------|---------------|-----------------|---------------|
| 0               | 5/19          | Initial release | —             |

For pricing, delivery, and ordering information, please visit Maxim Integrated's online storefront at <https://www.maximintegrated.com/en/storefront/storefront.html>.

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Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
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- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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