

## MAX22191 Evaluation Kit

Evaluates: MAX22191

### General Description

The MAX22191 evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the functionality of the MAX22191 digital input in an optical isolator circuit. The EV kit features two circuits: one for a 24V digital input signal and one for a 48V input signal.

### Features

- 24V and 48V Circuits for Easy Evaluation
- Proven PCB Layout
- Fully Assembled and Tested

[Ordering Information](#) appears at end of data sheet.

### Quick Start

#### Required Equipment

- MAX22191 EV kit
- 24V Digital signal generator
- Oscilloscope

#### Startup Procedure

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

- 1) Ensure that the jumpers are in the default position ([Table 1](#)).
- 2) Connect the digital signal generator to the IN+ test point (TP3) and IN- test point (TP4).
- 3) Connect the oscilloscope to the IN+ test point (TP3), and the OUT (TP14) test point. Connect return terminals to the IN- test point (TP4)
- 4) Set the digital signal generator to generate a 0V–24V 2kHz pulse.
- 5) Turn on the digital signal generator.
- 6) Monitor the IN+ and OUT signals. Verify that the OUT signal toggles as expected.

## Detailed Description of Hardware

The MAX22191 EV kit is a fully assembled and tested circuit board for evaluating the MAX22191 digital input (DI) with either a 24V or 48V input.

### Powering the MAX22191 EV Kit

The MAX22191 can be powered parasitically, from the signal on IN, or from a local  $V_{CC}$  supply. To power the circuit parasitically, ensure that the  $V_{CC}$  jumper is set to LOW (J9 or J10 is 2-3) and apply a digital input signal to IN+.

To power the circuit from a local power supply, connect the  $V_{CC}$  jumper to 'TP' (J9 or J10 to 1-2) and apply a 3V to 5.5V supply to the  $V_{CC}$  test point.

### Selecting the Test Circuit (24V or 48V)

The MAX22191 EV kit supports 0-24V or 0-48V digital input (DI) signals. These circuits are clearly labeled on the silkscreen.

In the 48V circuit, R1 and R2 are used to shift the input voltage, such that the IEC 61131-2 thresholds are met for a 48V input signal. Additionally, R1 limits surge current, allowing for a higher voltage TVS clamp on the input.

Apply the digital input (DI) signal to the J1 terminal block when using signal voltages above 30V. Apply the DI signal to the J2 terminal block when using signal voltages below 30V.

### Testing the MAX22191 as a Current-Sinking Input

The MAX22191 EV kit can be used to evaluate the device in either a current sinking or current sourcing configuration.

To test the MAX22191 as a current sinking input, connect the proximity sensor/switch to the IN+ test point (TP1 or TP3) or terminal block (J1 or J2) on the EV kit. Connect the negative/return terminal of the sensor/switch to positive output of the 24V or 48V supply. Connect the return terminal of the supply to the IN- test point (TP2 or TP4) or terminal block (J1 or J2).

### Testing the MAX22191 as a Current Sourcing Input

The MAX22191 EV kit can be used to evaluate the device in either a current sinking or current sourcing configuration.

To test the MAX22191 as a current sourcing input, connect the proximity sensor/switch to the negative terminal of the 24V or 48V supply. Connect the positive terminal of the supply to the IN+ test point (TP1 or TP3) or terminal block (J1 or J2) on the EV kit. Connect the negative/return terminal of the sensor/switch to IN- test point (TP2 or TP4) or terminal block (J1 or J2).

### Evaluating the MAX22191 with an Optical Isolator ( $V_{CC} = 0V$ )

The MAX22191 includes an on-board high-speed optical isolator for easy evaluation. To use the optical isolator, set  $V_{CC} = 0V$  (J9 or J10 to 2-3) and connect an isolated supply between 2.7V and 5.5 to the  $V_{DD}$  test point (TP9 or TP11) on the isolated side of the board. Connect an oscilloscope to the VO test point (TP10 or TP12) to see the output of the isolator switch as the input signal (IN+) switches.

### Evaluating the MAX22191 with an Optical Isolator ( $3V \leq V_{CC} \leq 5.5V$ )

OUT is a push-pull buffered output when  $V_{CC}$  is present. Remove the R13 or R15 resistor and connect a resistive load to R9/R10 to test functionality in this mode.

**Table 1. Jumper Table (J3–J12)**

| JUMPER | SHUNT POSITION | DESCRIPTION                                                                                                                    |
|--------|----------------|--------------------------------------------------------------------------------------------------------------------------------|
| J3     | Open           | 58V TVS diode connected to IN+ on 48V circuit.                                                                                 |
|        | <b>Closed*</b> | 58V TVS diode not connected to IN+ on 48V circuit.                                                                             |
| J4     | Open           | 33V TVS diode connected to IN+ on 24V circuit.                                                                                 |
|        | <b>Closed*</b> | 33V TVS diode not connected to IN+ on 24V circuit.                                                                             |
| J5     | <b>Open*</b>   | 10Ω resistor connected between IN- and GND pin on IC on 48V circuit. This resistor can be used to monitor return current.      |
|        | Closed         | IN- is connected directly to GND pin on the IC on the 48V circuit.                                                             |
| J6     | <b>Open*</b>   | 10Ω resistor connected between IN- and GND pin on IC on 24V circuit. This resistor can be used to monitor return current.      |
|        | Closed         | IN- is connected directly to GND pin on the IC on the 24V circuit.                                                             |
| J7     | <b>Open*</b>   | 10nF capacitor connected to IN+ on 48V circuit.                                                                                |
|        | Closed         | 10nF capacitor not connected to IN+ on 48V circuit.                                                                            |
| J8     | <b>Open*</b>   | 10nF capacitor connected to IN+ on 24V circuit.                                                                                |
|        | Closed         | 10nF capacitor not connected to IN+ on 24V circuit.                                                                            |
| J9     | 1-2            | VCC is connected low on the 48V circuit.                                                                                       |
|        | <b>2-3*</b>    | VCC is connected to the test point (TP5) on the 48V circuit. Connect an external 3V to 5.5V supply to VCC to power the device. |
| J10    | 1-2            | VCC is connected low on the 24V circuit.                                                                                       |
|        | <b>2-3*</b>    | VCC is connected to the test point (TP6) on the 24V circuit. Connect an external 3V to 5.5V supply to VCC to power the device. |
| J11    | 1-2            | TEST is connected to GND on the 48V circuit.                                                                                   |
|        | <b>2-3*</b>    | TEST is connected to the TEST test point (TP7) on the 48V circuit.                                                             |
| J12    | 1-2            | TEST is connected to GND on the 24V circuit.                                                                                   |
|        | <b>2-3*</b>    | TEST is connected to the TEST test point (TP8) on the 24V circuit.                                                             |

## MAX22191 EV Kit Bill of Materials

| ITEM                                                        | REF-<br>DES              | DNI/D<br>NP | QTY | MFG PART #                       | MFG                          | VALUE          | DESCRIPTION                                                                                                                                                                |
|-------------------------------------------------------------|--------------------------|-------------|-----|----------------------------------|------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                                           | C1, C2, C5, C6           | -           | 4   | GRM188R72A103KA01                | MURATA                       | 0.01UF         | CAPACITOR; SMT (0603); CERAMIC CHIP; 0.01UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R                                                                               |
| 2                                                           | C3, C4                   | -           | 2   | GRM188R61A105KA61                | MURATA                       | 1UF            | CAPACITOR; SMT (0603); CERAMIC CHIP; 1UF; 10V; TOL=10%; MODEL=; TG=-55 DEGC TO +85 DEGC; TC=X5R;                                                                           |
| 3                                                           | D1                       | -           | 1   | C1608X5R1A105K                   | TDK                          | 58V            | DIODE; TVS; SMA; VRM=58V; IPP=4.3A                                                                                                                                         |
| 4                                                           | D2                       | -           | 1   | SMAJ58CA                         | DIODES INCORPORATED          | 33V            | DIODE; TVS; SMA (DO-214AC); VRM=33V; IPP=7.5A                                                                                                                              |
| 5                                                           | J1, J2                   | -           | 2   | SMAJ33CA                         | VISHAY GENERAL SEMICONDUCTOR | 1729018        | CONNECTOR; FEMALE; THROUGH HOLE; GREEN TERMINAL BLOCK; RIGHT ANGLE; 2PINS                                                                                                  |
| 6                                                           | J3-J8                    | -           | 6   | TSW-102-23-G-S                   | SAMTEC                       | TSW-102-23-G-S | CONNECTOR; THROUGH HOLE; SINGLE ROW; STRAIGHT; 2PINS; -55 DEGC TO +125 DEGC                                                                                                |
| 7                                                           | J9-J12                   | -           | 4   | TSW-103-23-G-S                   | SAMTEC                       | TSW-103-23-G-S | CONNECTOR; THROUGH HOLE; SINGLE ROW; STRAIGHT; 3PINS; -55 DEGC TO +125 DEGC                                                                                                |
| 8                                                           | J17, J18                 | -           | 2   | TSW-104-23-G-S                   | SAMTEC                       | TSW-104-23-G-S | CONNECTOR; THROUGH HOLE; SINGLE ROW; STRAIGHT; 4PINS                                                                                                                       |
| 9                                                           | R1                       | -           | 1   | CMB02070X150TG                   | VISHAY BEYSCHLAG             | 1.5K           | RESISTOR; SMT; 1.5K OHM; 2%; 1W; CARBON FILM                                                                                                                               |
| 10                                                          | R2                       | -           | 1   | CRCW06031K20FK                   | VISHAY DALE                  | 1.2K           | RESISTOR; 0603; 1.2K; 1%; 100PPM; 0.10W; THICK FILM                                                                                                                        |
| 11                                                          | R3, R4                   | -           | 2   | 6ENF10R0V                        | VISHAY DALE; PANASONIC       | 10             | RESISTOR; 0805; 10 OHM; 1%; 100PPM; 0.125W; THICK FILM                                                                                                                     |
| 12                                                          | R5, R6                   | -           | 2   | CRCW040240K2FK                   | VISHAY DALE                  | 40.2K          | RESISTOR; 0402; 40.2K OHM; 1%; 100PPM; 0.063W; THICK FILM                                                                                                                  |
| 13                                                          | R11, R12                 | -           | 2   | 3EKF1002                         | VISHAY DALE; PANASONIC       | 10K            | RESISTOR; 0603; 10K; 1%; 100PPM; 0.10W; THICK FILM                                                                                                                         |
| 14                                                          | R13, R15, R18, R19       | -           | 4   | RC0402JR-070RL; CR0402-16W-000RJ | YAGEO PHYCOMP; VENKEL LTD.   | 0              | RESISTOR; 0402; 0 OHM; 5%; JUMPER; 0.063W; THICK FILM                                                                                                                      |
| 15                                                          | TP1, TP3, TP9, TP11      | -           | 4   | 5010                             | KEYSTONE                     | N/A            | TESTPOINT WITH 1.80MM HOLE DIA. RED. MULTIPURPOSE; TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; |
| 16                                                          | TP2, TP4, TP15, TP16     | -           | 4   | 5011                             | KEYSTONE                     | N/A            | TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; YELLOW; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;                                                   |
| 17                                                          | TP5-TP8, TP10, TP12-TP14 | -           | 8   | 5014                             | KEYSTONE                     | N/A            | TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; YELLOW; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;                                                   |
| 18                                                          | U1, U2                   | -           | 2   | MAX22191AUT+                     | MAXIM                        | MAX22191AU T+  | EVKIT PART-IC; PARASITICALLY POWERED TYPE 3 DIGITAL INPUT; PACKAGE DWG NO.: 21-0058; PACKAGE LAND PATTERN: 90-0175; SOT23-6                                                |
| 19                                                          | U3, U4                   | -           | 2   | ACPL-061L-560E                   | BROADCOM LIMITED             | ACPL-061L-560E | IC; OPTO; ULTRA LOW POWER 10MBD DIGITAL CMOS                                                                                                                               |
| 20                                                          | PCB                      | -           | 1   | MAX22191                         | MAXIM                        | PCB            | OPTOCOUPLER; NSOIC8                                                                                                                                                        |
| 21                                                          | R9, R10                  | DNP         | 0   | CRCW06031K50FK                   | VISHAY DALE                  | 1.5K           | PCB: MAX22191<br>RESISTOR; 0603; 1.5K; 1%; 100PPM; 0.10W; THICK FILM                                                                                                       |
| 22                                                          | R16, R17                 | DNP         | 0   | RC0402JR-070RL; CR0402-16W-000RJ | YAGEO PHYCOMP; VENKEL LTD.   | 0              | RESISTOR; 0402; 0 OHM; 5%; JUMPER; 0.063W; THICK FILM                                                                                                                      |
| NOTE: DNI--> DO NOT INSTALL(PACKOUT); DNP--> DO NOT PROCURE |                          |             |     |                                  |                              |                |                                                                                                                                                                            |
| TOTAL                                                       |                          |             |     |                                  |                              |                | 55                                                                                                                                                                         |

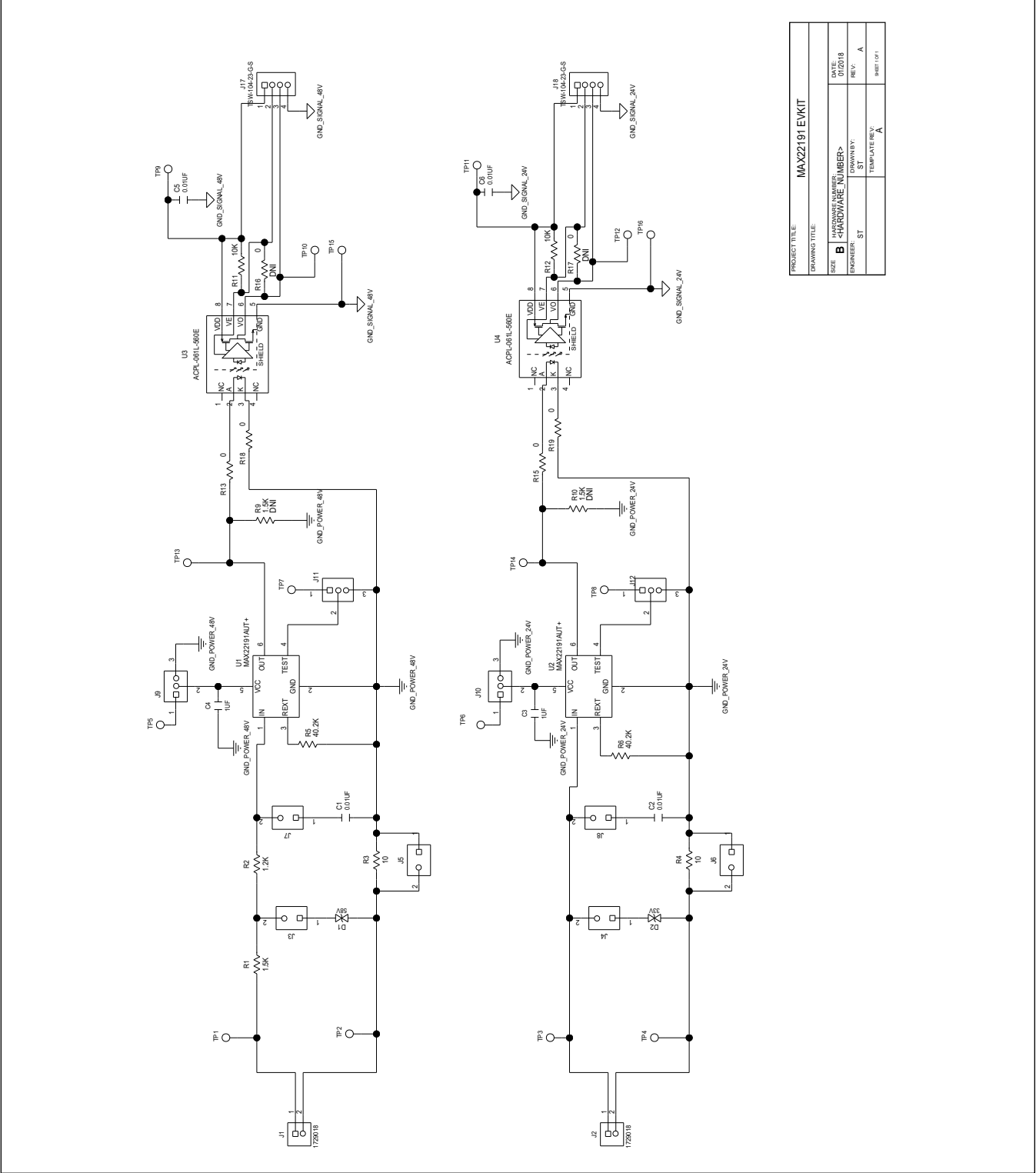
The image displays two PCB layout diagrams for the MAX22191 EVKIT, one for a 48V circuit and one for a 24V circuit. Both diagrams show the placement of components, including the MAX22191 IC, resistors, capacitors, and connectors. The 48V circuit includes components like J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, J11, J12, J13, J14, J15, J16, J17, J18, J19, J20, J21, J22, J23, J24, J25, J26, J27, J28, J29, J30, J31, J32, J33, J34, J35, J36, J37, J38, J39, J40, J41, J42, J43, J44, J45, J46, J47, J48, J49, J50, J51, J52, J53, J54, J55, J56, J57, J58, J59, J60, J61, J62, J63, J64, J65, J66, J67, J68, J69, J70, J71, J72, J73, J74, J75, J76, J77, J78, J79, J80, J81, J82, J83, J84, J85, J86, J87, J88, J89, J90, J91, J92, J93, J94, J95, J96, J97, J98, J99, J100, J101, J102, J103, J104, J105, J106, J107, J108, J109, J110, J111, J112, J113, J114, J115, J116, J117, J118, J119, J120, J121, J122, J123, J124, J125, J126, J127, J128, J129, J130, J131, J132, J133, J134, J135, J136, J137, J138, J139, J140, J141, J142, J143, J144, J145, J146, J147, J148, J149, J150, J151, J152, J153, J154, J155, J156, J157, J158, J159, J160, J161, J162, J163, J164, J165, J166, J167, J168, J169, J170, J171, J172, J173, J174, J175, J176, J177, J178, J179, J180, J181, J182, J183, J184, J185, J186, J187, J188, J189, J190, J191, J192, J193, J194, J195, J196, J197, J198, J199, J200, J201, J202, J203, J204, J205, J206, J207, J208, J209, J210, J211, J212, J213, J214, J215, J216, J217, J218, J219, J220, J221, J222, J223, J224, J225, J226, J227, J228, J229, J230, J231, J232, J233, J234, J235, J236, J237, J238, J239, J240, J241, J242, J243, J244, J245, J246, J247, J248, J249, J250, J251, J252, J253, J254, J255, J256, J257, J258, J259, J260, J261, J262, J263, J264, J265, J266, J267, J268, J269, J270, J271, J272, J273, J274, J275, J276, J277, J278, J279, J280, J281, J282, J283, J284, J285, J286, J287, J288, J289, J290, J291, J292, J293, J294, J295, J296, J297, J298, J299, J300, J301, J302, J303, J304, J305, J306, J307, J308, J309, J310, J311, J312, J313, J314, J315, J316, J317, J318, J319, J320, J321, J322, J323, J324, J325, J326, J327, J328, J329, J330, J331, J332, J333, J334, J335, J336, J337, J338, J339, J340, J341, J342, J343, J344, J345, J346, J347, J348, J349, J350, J351, J352, J353, J354, J355, J356, J357, J358, J359, J360, J361, J362, J363, J364, J365, J366, J367, J368, J369, J370, J371, J372, J373, J374, J375, J376, J377, J378, J379, J380, J381, J382, J383, J384, J385, J386, J387, J388, J389, J390, J391, J392, J393, J394, J395, J396, J397, J398, J399, J400, J401, J402, J403, J404, J405, J406, J407, J408, J409, J410, J411, J412, J413, J414, J415, J416, J417, J418, J419, J420, J421, J422, J423, J424, J425, J426, J427, J428, J429, J430, J431, J432, J433, J434, J435, J436, J437, J438, J439, J440, J441, J442, J443, J444, J445, J446, J447, J448, J449, J450, J451, J452, J453, J454, J455, J456, J457, J458, J459, J460, J461, J462, J463, J464, J465, J466, J467, J468, J469, J470, J471, J472, J473, J474, J475, J476, J477, J478, J479, J480, J481, J482, J483, J484, J485, J486, J487, J488, J489, J490, J491, J492, J493, J494, J495, J496, J497, J498, J499, J500, J501, J502, J503, J504, J505, J506, J507, J508, J509, J510, J511, J512, J513, J514, J515, J516, J517, J518, J519, J520, J521, J522, J523, J524, J525, J526, J527, J528, J529, J530, J531, J532, J533, J534, J535, J536, J537, J538, J539, J540, J541, J542, J543, J544, J545, J546, J547, J548, J549, J550, J551, J552, J553, J554, J555, J556, J557, J558, J559, J560, J561, J562, J563, J564, J565, J566, J567, J568, J569, J570, J571, J572, J573, J574, J575, J576, J577, J578, J579, J580, J581, J582, J583, J584, J585, J586, J587, J588, J589, J590, J591, J592, J593, J594, J595, J596, J597, J598, J599, J600, J601, J602, J603, J604, J605, J606, J607, J608, J609, J610, J611, J612, J613, J614, J615, J616, J617, J618, J619, J620, J621, J622, J623, J624, J625, J626, J627, J628, J629, J630, J631, J632, J633, J634, J635, J636, J637, J638, J639, J640, J641, J642, J643, J644, J645, J646, J647, J648, J649, J650, J651, J652, J653, J654, J655, J656, J657, J658, J659, J660, J661, J662, J663, J664, J665, J666, J667, J668, J669, J670, J671, J672, J673, J674, J675, J676, J677, J678, J679, J680, J681, J682, J683, J684, J685, J686, J687, J688, J689, J690, J691, J692, J693, J694, J695, J696, J697, J698, J699, J700, J701, J702, J703, J704, J705, J706, J707, J708, J709, J710, J711, J712, J713, J714, J715, J716, J717, J718, J719, J720, J721, J722, J723, J724, J725, J726, J727, J728, J729, J730, J731, J732, J733, J734, J735, J736, J737, J738, J739, J740, J741, J742, J743, J744, J745, J746, J747, J748, J749, J750, J751, J752, J753, J754, J755, J756, J757, J758, J759, J760, J761, J762, J763, J764, J765, J766, J767, J768, J769, J770, J771, J772, J773, J774, J775, J776, J777, J778, J779, J780, J781, J782, J783, J784, J785, J786, J787, J788, J789, J790, J791, J792, J793, J794, J795, J796, J797, J798, J799, J800, J801, J802, J803, J804, J805, J806, J807, J808, J809, J810, J811, J812, J813,

Figure 1 shows a sequence of six panels illustrating the assembly of a circuit board. The top row shows the initial assembly steps, and the bottom row shows the final assembly steps. The circuit board is green with white traces and components. A scale bar at the bottom indicates 1 inch.

Figure 1 shows a 2x3 grid of images illustrating the assembly of a circuit board. The top row shows the initial components: a copper pad, a via, and a square component. The bottom row shows the completed circuit with traces and a component. A scale bar at the bottom indicates 1 inch.

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MAX22191 EV Kit Schematic



## Ordering Information

| PART           | TYPE   |
|----------------|--------|
| MAX22191EVKIT# | EV Kit |

#Denotes RoHS compliant.

## Revision History

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION     | PAGES<br>CHANGED |
|--------------------|------------------|-----------------|------------------|
| 0                  | 3/18             | Initial release | —                |

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