

MAX22195 Evaluation Kit

Evaluates: MAX22195

General Description

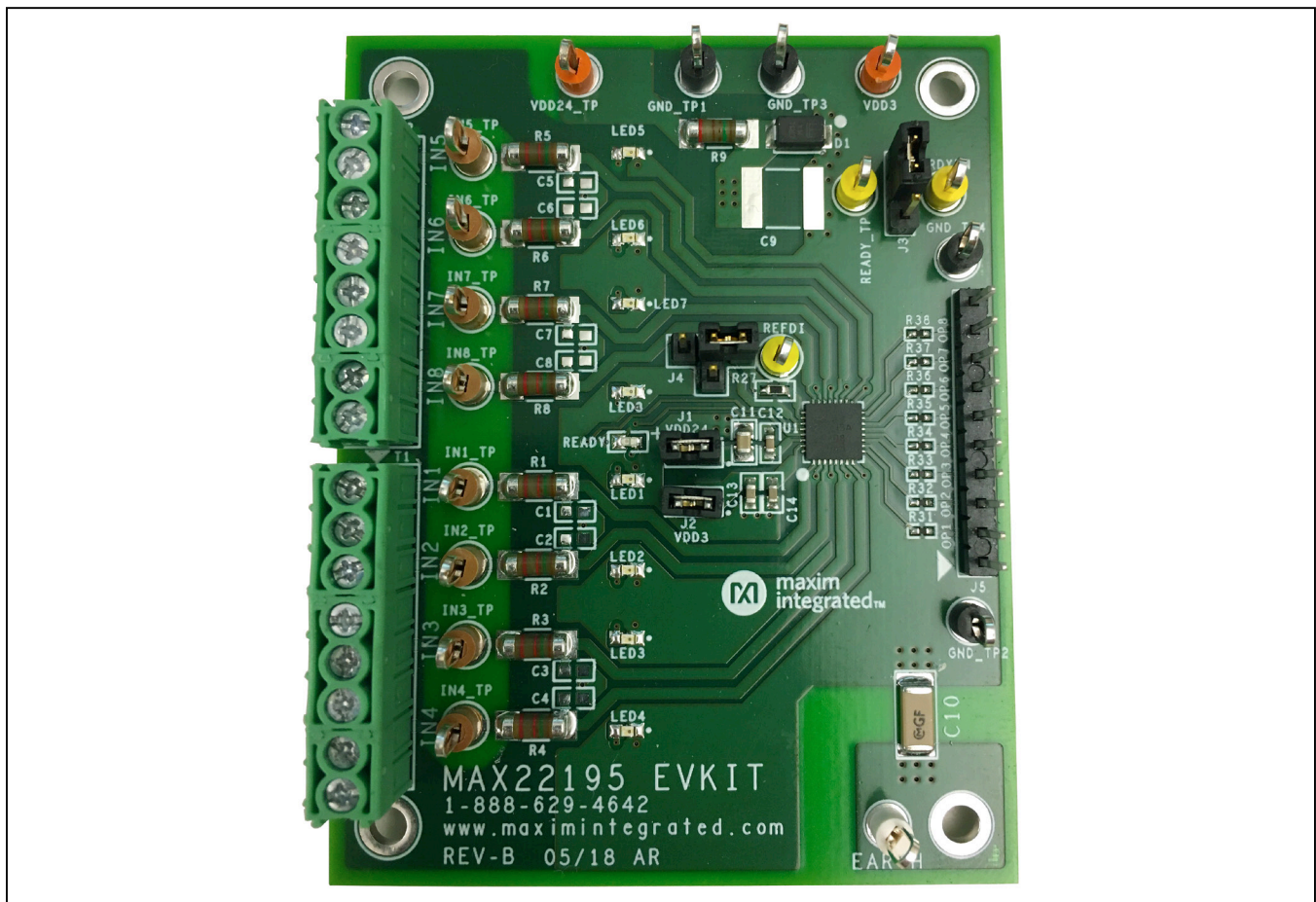
The MAX22195 evaluation kit (EV kit) provides the hardware necessary to evaluate the MAX22195 high-speed, octal, industrial digital input with parallel output device. The MAX22195 EV kit provides terminal blocks for all 8 inputs and a header for all 8 outputs for easy monitoring and evaluation. Eight field-side LEDs are provided to indicate the input status, and a READY LED to indicate the MAX22195 is operating normally.

Ordering Information appears at end of data sheet.

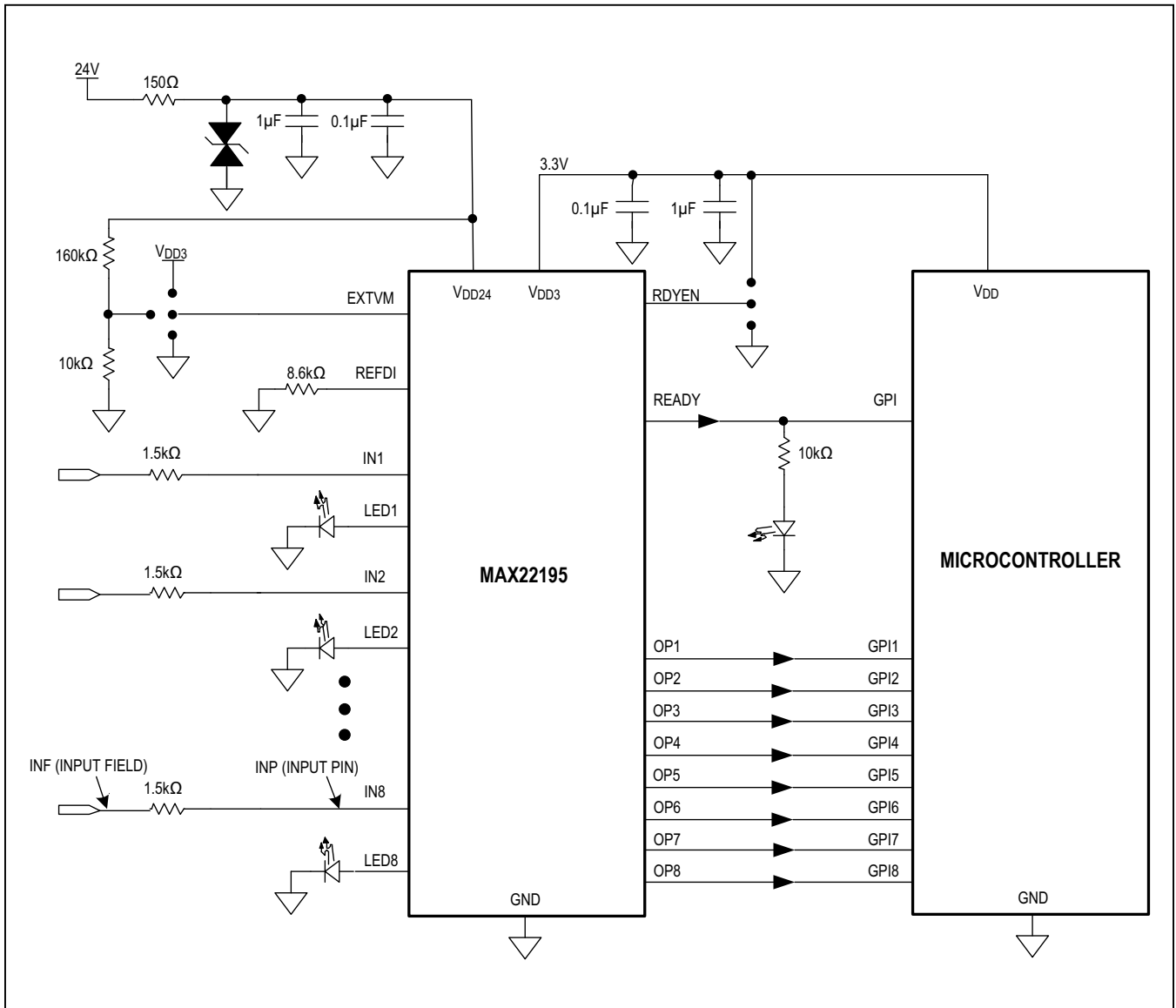
Features

- Easy Evaluation of the MAX22195
- Parallel Output for Simultaneous Signal Delivery
- Configurable External VDD24 Voltage Monitoring
- Configured for IEC 61131-2 Type 1, 3
- Robust Design $\pm 2kV$ Surge Tolerant Line-to-Line
- Withstand $\pm 8kV$ Contact ESD, ± 15 Air Gap ESD
- Fully Assembled and Tested
- Proven PCB Layout
- RoHS Compliant

MAX22195 EV Kit Photo



System Block Diagram



Quick Start

Required Equipment

- MAX22195 EV kit
- Two 24V DC voltage supplies
- Oscilloscope

Procedure

The EV kit is fully assembled and ready for evaluation. The MAX22195 is configured for eight Type 1 or Type 3 inputs (Terminal Blocks T1 and T2). Follow the steps below to verify the MAX22195 operation.

- 1) Verify all jumper settings are in default position from [Table 1](#).
- 2) For initial testing, the MAX22195 EV kit is powered by a 24V DC voltage supply at VDD24 and GND.
- 3) Connect the DC power supply between the EV kit's VDD24_TP and GND_TP1 test points. Set the DC power supply output to 24V, and then enable the output. Observe that, READY LED (yellow) on the EV kit is turned on, indicating the EV kit is powered up.
- 4) Connect the other 24V DC voltage supply between pin 1 and pin 2 of T1, or between IN1_TP and GND_TP2 test points. Connect the oscilloscope probe to header J5, OP1 (pin 2) and GND (pin 1 or 10).
- 5) Set the DC power supply to 24V, and then enable the output. Observe that LED1 (green) is on and OP1 logic output transitions to high (high level is about 3.3V) on the oscilloscope.

NOTE: On the MAX22195 EV kit, the sequence of the input test points from top to bottom is as follows: IN5, IN6, IN7, IN8, IN1, IN2, IN3, and IN4. IN1 is located at the middle of the left side. Refer to the [MAX22195 Schematics](#) and [Layout](#) for details.

Detailed Description of Hardware

The MAX22195 EV kit provides a proven layout for an 8-channel digital input solution with parallel output using MAX22195. The EV kit supports IEC 61131-2 Type 1, 3 operation and can be configured to support Type 2. This flexibility makes it easier to evaluate the system performance of the MAX22195.

Power Supply

The EV kit is powered by the 24V external DC supply, connected to VDD24_TP and GND_TP1 test points. The MAX22195 has an integrated regulator to provide 3.3V output at VDD3 which can be used to power the digital isolators and other field-side circuits. Alternatively, if an external 24V DC supply is not available, the device can be powered using an external 3.0V–5.5V DC supply through the VDD3 and GND_TP3 test points while leaving VDD24_TP test point unconnected (refer to [Table 1](#) for jumper settings).

RDYEN and READY Monitor

The READY is an open-drain PMOS output to indicate that the MAX22195 is working properly. A READY LED is provided on the EV kit as a visual indicator of the signal status. When READY is low, the READY LED is off and OP1-OP8 are in high-impedance regardless of the input status. The READY output can also be monitored on READY_TP test point.

The RDYEN is used to enable or disable the READY output. Jumper J3 is provided on the EV kit: set J3 to 1-2 to enable the READY signal, set J3 to 2-3 to disable the READY signal (refer to [Table 1](#) for jumper settings). A test point RDYEN is provided for monitoring purpose.

Table 1. MAX22195 EV Kit Jumper Settings

JUMPER	SHUNT POSITION	DESCRIPTION
J1	1 - 2*	Connect external power supply to VDD24
	Open	Use current meter to measure VDD24 supply current
J2	1 - 2*	Connect external power supply to VDD3 or connect the MAX22195 VDD3 output to the EV kit board
	Open	Use current meter to measure VDD3 supply current
J3	1 - 2*	Connect RDYEN to VDD3 to enable READY output
	2 -3	Connect RDYEN to GND to disable the READY output
J4	1 - 2*	Connect EXTVM to GND to use internal threshold (14V, typical) for VDD24 voltage monitoring
	1 - 3	Connect EXTVM to external resistor divider to set external threshold for VDD24 voltage monitoring
	1 - 4	Connect EXTVM to VDD3 to disable VDD24 voltage monitoring at READY pin if the device is powered by VDD3

*Default Position

External VDD24 Voltage Monitor

The EXTVM pin can be connected in 3 ways on the EV kit using jumper J4. Connect J4 to 1-2 to use internal threshold (14V, typical) for VDD24 voltage monitoring. Connect J4 to 1-4 to disable VDD24 voltage monitoring at READY pin if the EV kit is powered by VDD3 using an external DC supply. Connect J4 to 1-3 to use external resistive divider (R25 and R26) to set the external threshold for VDD24 voltage monitoring. The default R25 and R26 values set the VDD24 threshold to about 14V, typical. If other VDD24 threshold is desired, resistors R25 and R26 can be changed accordingly. Refer to the MAX22195 IC data sheet for details.

Type 1, 3 Inputs

The MAX22195 EV kit is configured to support the trip points (voltage and current) to satisfy the requirements of IEC 61131-2 Type 1 and Type 3 inputs. Resistor R27 sets the current limit value at 2.40mA and input resistors R1-R8 set the voltage threshold to ensure compliance. The input resistors R1-R8 are 1.5k Ω , 1W MELF resistors to support IEC 61000-4-5 Surge Tolerance up to \pm 1kV line-to-ground. A separate LED for each input port indicates the status of each input.

Type 2 Inputs

The MAX22195 EV kit can be configured to support Type 2 inputs. Type 2 inputs require a higher current limit (6mA, minimum). This can be achieved by connecting two MAX22195 inputs in parallel. The current limit for each channel is set to a nominal 3.97mA by changing resistor R27 to 5.2k Ω . To set the input voltage threshold correctly, input resistors R1-R8 need to be changed to 1k Ω , 1W MELF resistors. Install resistors R21-R24, 0 Ω , to create a pair of inputs. Refer to the MAX22195 IC data sheet for details.

IEC 61000-4 Immunity Compliance

The typical application for the MAX22195 requires it to pass basic transient immunity standards as defined by IEC 61000-4-x, covering -2 for Electrostatic Discharge (ESD), -4 for Electrical Fast Transient/Burst (EFT), and -5 for Surge Immunity. The MAX22195 EV kit includes circuitry to support testing to these standards to support \pm 2kV Line-to-Line Surge, \pm 8kV Contact ESD, and \pm 15kV Air Gap ESD. MELF Resistor R9 and TVS D1 (SMAJ33CA) provide protection from Surge and ESD voltage applied through VDD24. C10 is a 1000pF safety rated Y capacitor placed between Protective Earth (PE) and field ground (GND) to improve transient immunity (EFT). Refer to [Table 2](#) for MAX22195 EV kit transient immunity test results.

Table 2. MAX22195 EV Kit Transient Immunity Test Results

TEST		CONDITIONS	RESULT
Surge	Line-to-Line	IEC 61000-4-5, 1.2/50 μ s pulse, minimum 1k Ω resistor in series with IN1-IN8 with respect to GND	\pm 2kV
	Line-to-Ground	IEC 61000-4-5, 1.2/50 μ s pulse, minimum 1k Ω resistor in series with IN1-IN8 with respect to GND	\pm 1kV
	VDD24-to-Ground	IEC 61000-4-5, 1.2/50 μ s pulse, TVS SMAJ33CA or SM30T39AY between VDD24 and GND	\pm 1kV
EFT	Line-to-Earth	IEC 61000-4-4, 5kHz, 15ms burst time, 300ms burst period, 1000pF Y capacitor between GND and Earth	\pm 4kV
	VDD24-to-Earth	IEC 61000-4-4, 5kHz, 15ms burst time, 300ms burst period, TVS SMAJ33CA or SM30T39AY between VDD24 and GND, 1000pF Y capacitor between GND and Earth	\pm 4kV
ESD	Line-to-Ground, Contact Discharge	IEC 61000-4-2, minimum 1k Ω resistor in series with IN1-IN8 with respect to GND	\pm 8kV
	Line-to-Ground, Air-Gap Discharge	IEC 61000-4-2, minimum 1k Ω resistor in series with IN1-IN8 with respect to GND	\pm 15kV
	VDD24-to-Ground, Contact Discharge	IEC 61000-4-2, TVS SMAJ33CA or SM30T39AY between VDD24 and GND	\pm 8kV
	VDD24-to-Ground, Air-Gap Discharge	IEC 61000-4-2, TVS SMAJ33CA or SM30T39AY between VDD24 and GND	\pm 15kV

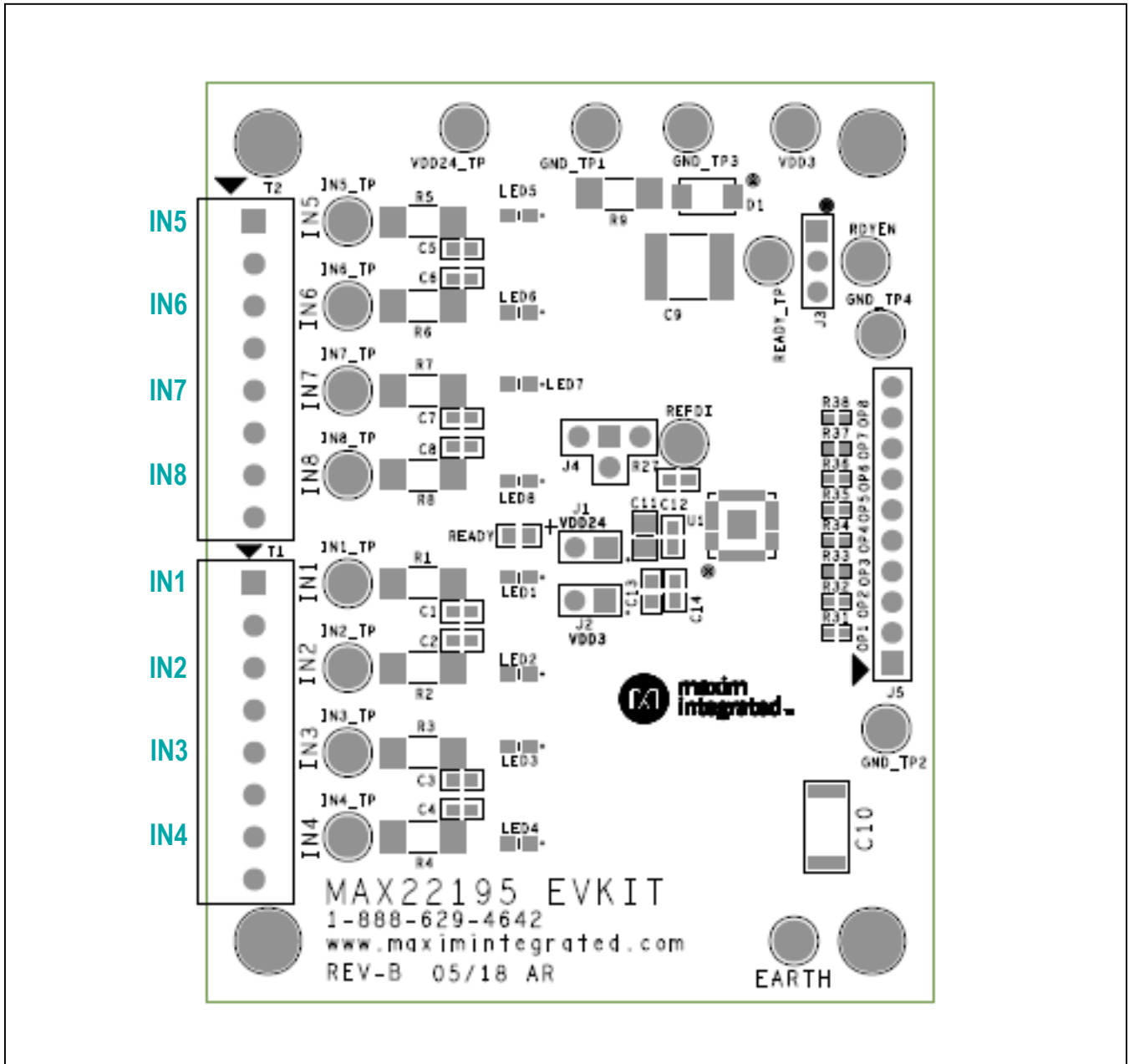


Figure 1. Terminal Block Connection and Input Test Points on the MAX22195 EV Kit

Ordering Information

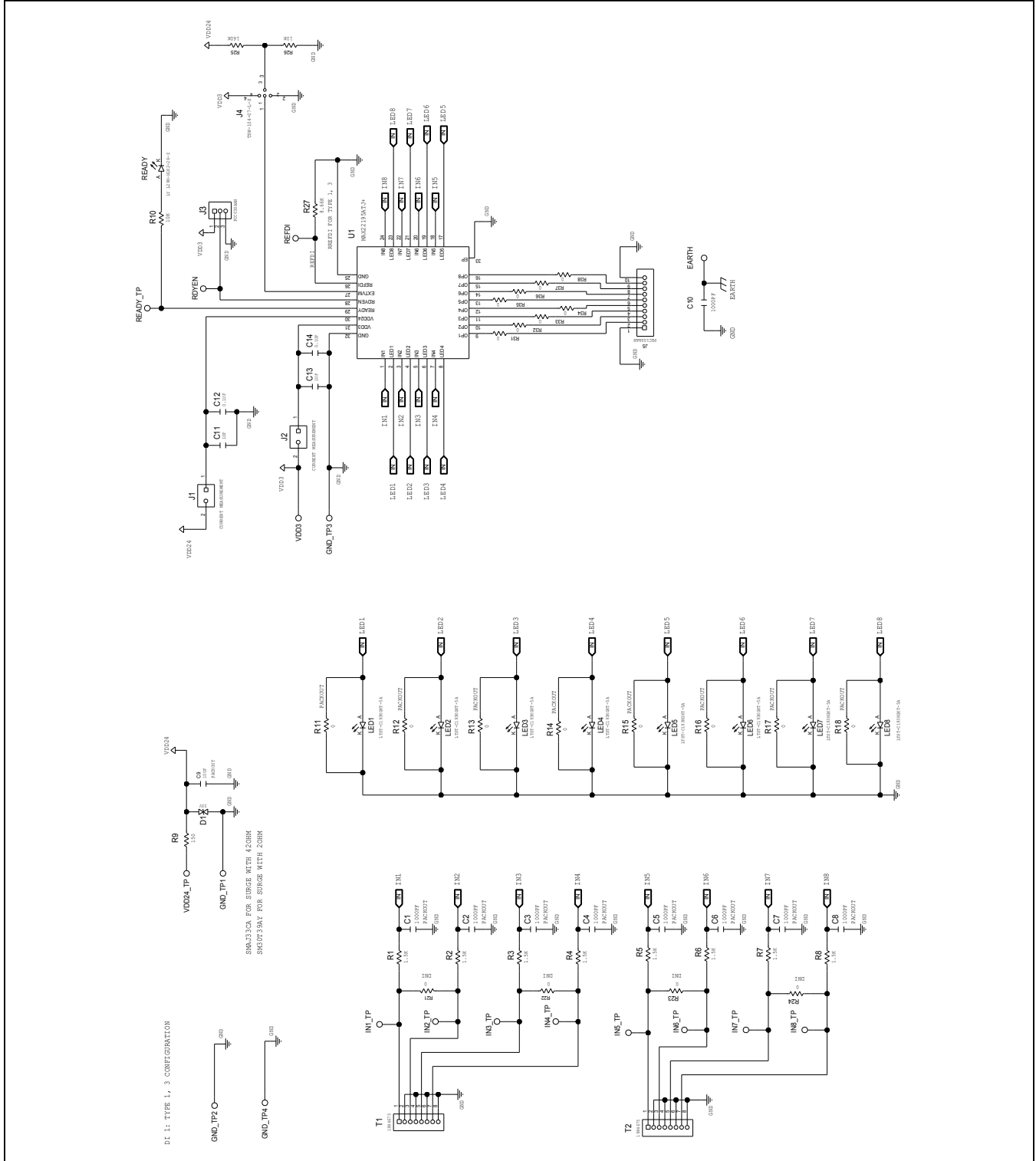
PART	TYPE
MAX22195EVKIT#	EV Kit with MAX22195ATJ+ installed

#Denotes RoHS compliant

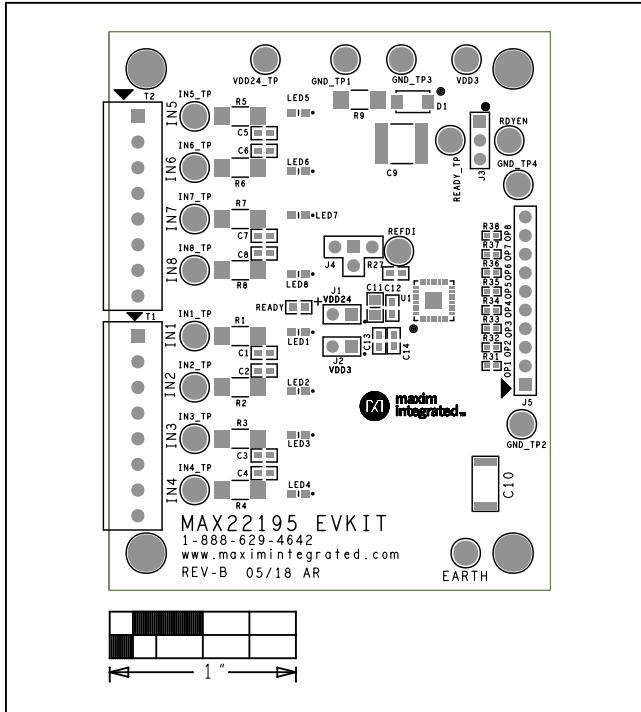
MAX22195 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	C10	-	1	GA352QR7GF102KW01	MURATA	1000PF	CAP; SMT (2211); 1000PF; 10%; 250V; X7R; CERAMIC CHIP	
2	C11	-	1	C2012X752A105K125; GRJ21BC72A105KE11	TDK;MURATA	1UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 1UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7S	
3	C12, C14	-	2	CC0603KRX7R0BB104	YAGEO	0.1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
4	C13	-	1	UMK107AB7105KA	TAIYO YUDEN	1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
5	D1	-	1	SMAJ33CA	VISHAY GENERAL	33V	DIODE; TVS; SMA (DO-214AC); VRM=33V; IPP=7.5A	
6	EARTH	-	1	5012	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
7	GND_TP1-GND_TP4	-	4	5011	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
8	IN1_TP-IN8_TP	-	8	5125	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BROWN; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
9	J1, J2	-	2	PEC02SAAN	SULLINS	PEC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS	
10	J3	-	1	PCC03SAAN	SULLINS	PCC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC	
11	J4	-	1	TSW-104-07-L-S	SAMTEC	TSW-104-07-L-S	EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 4PINS	
12	J5	-	1	PEC10SAAN	SULLINS ELECTRONICS CORP.	PEC10SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 10PINS	
13	LED1-LED8	-	8	LTST-C193KGKT-5A	LITE-ON ELECTRONICS INC.	LTST-C193KGKT-5A	DIODE; LED; STANDARD; YELLOW-GREEN; SMT (0603); PIV=1.9V; IF=0.005A; -55 DEGC TO +85 DEGC	
14	R1-R8	-	8	CMB02070X1501G	VISHAY BEYSCHLAG	1.5K	RESISTOR; SMT; 1.5K OHM; 2%; 1W; CARBON FILM	
15	R9	-	1	CMB02070X1500G	VISHAY BEYSCHLAG	150	RES; SMT; 150; 2%; 1W	
16	R10	-	1	CRG0603F10K	TE CONNECTIVITY	10K	RESISTOR; 0603; 10K OHM; 1%; 100PPM; 0.1W; THICK FILM	
17	R25	-	1	ERJ-3EKF1603	PANASONIC	160K	RES; SMT (0603); 160K; 1%; +/-100PPM/DEGC; 0.1W	
18	R26	-	1	CRCW060310K0FK; ERJ-3EKF1002	VISHAY DALE; PANASONIC	10K	RESISTOR; 0603; 10K; 1%; 100PPM; 0.10W; THICK FILM	
19	R27	-	1	ERJ-3EKF8661V	PANASONIC	8.66K	RESISTOR; 0603; 8.66K OHM; 1%; 100PPM; 0.10W; THICK FILM	
20	R31-R38	-	8	ERJ-2GE0R00X	PANASONIC	0	RESISTOR; 0402; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM	
21	RDYEN, READY_TP, REFDI	-	3	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;	
22	READY	-	1	LY L29K-H1K2-26-Z	OSRAM	LY L29K-H1K2-26-Z	DIODE; LED; LY L29K SERIES; SMARTLED; YELLOW; SMT (1608); VF=1.8V; IF=0.02A	
23	SU1-SU4	-	4	STC02SYAN	SULLINS ELECTRONICS CORP.	STC02SYAN	TEST POINT; JUMPER; STR; TOTAL LENGTH=0.256IN; BLACK; INSULATION=PBT CONTACT=PHOSPHOR BRONZE; COPPER PLATED TIN OVERALL	
24	T1, T2	-	2	1984675	PHOENIX CONTACT	1984675	CONNECTOR; FEMALE; THROUGH HOLE; PCB TERMINAL BLOCK; RIGHT ANGLE; 8PINS	
25	U1	-	1	MAX22195ATJ+	MAXIM	MAX22195ATJ+	EVKIT PART - IC; HIGH-SPEED; OCTAL; DI W PARALLEL OUTPUT; TQFN32-EP; PACKAGE CODE: T325Y-6; PACKAGE LAND PATTERN: 90-0603; PACKAGE OUTLINE: 21-0140	
26	VDD3, VDD24_TP	-	2	5013	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; ORANGE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
27	PCB	-	1	MAX22195	MAXIM	PCB	PCB:MAX22195	
28	MTH1-MTH4	DNI	4	1902B	GENERIC PART	N/A	STANDOFF; FEMALE-THREADED; HEX; 4-40IN; 3/8IN; NYLON	
29	MTH1-MTH4	DNI	4	P440.375	GENERIC PART	N/A	MACHINE SCREW; SLOTTED; PAN; 4-40IN; 3/8IN; NYLON	
30	C1-C8	DNI	8	C1608C0G2A102J080AA	TDK	1000PF	CAPACITOR; SMT (0603); CERAMIC CHIP; 1000PF; 100V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=C0G	
31	C9	DNI	1	CGA9N3X752A106K230KB	TDK	10UF	CAP; SMT (2220); 10UF; 10%; 100V; X7S; CERAMIC CHIP	
32	R11-R18	DNI	8	CRCW0603000020	VISHAY DALE	0	RESISTOR; 0603; 0 OHM; 0%; JUMPER; 0.1W; THICK FILM	
33	R21-R24	DNP	0	CRCW2512000020EGHP	VISHAY DRALORIC	0	RES; SMT (2512); 0; JUMPER; 1.5W	DNI
TOTAL			92					

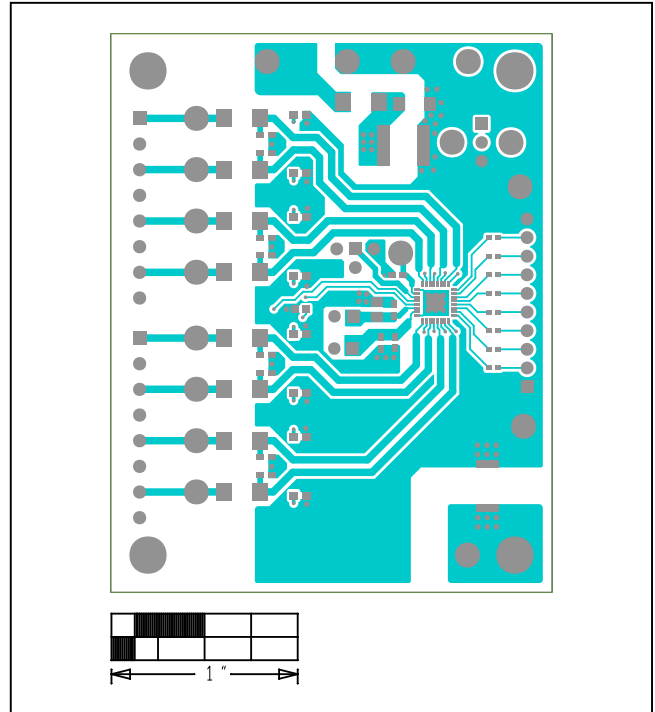
MAX22195 EV Kit Schematic



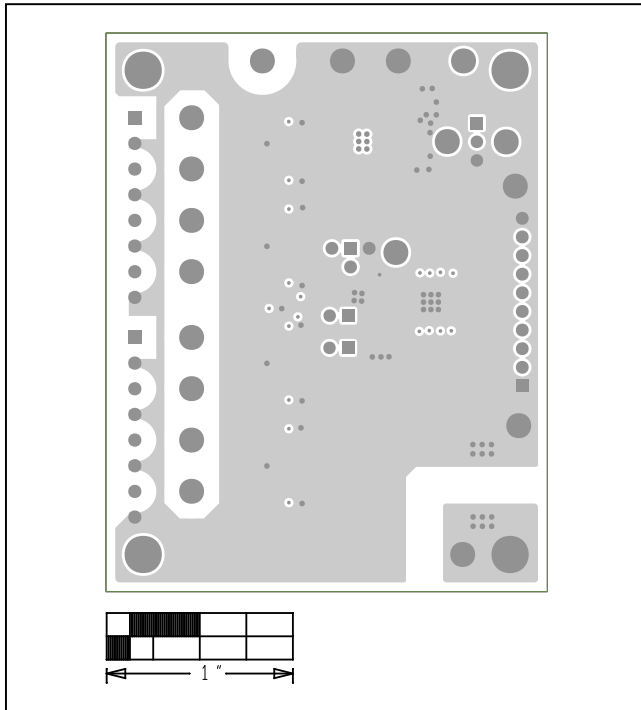
MAX22195 EV Kit PCB Layout Diagrams



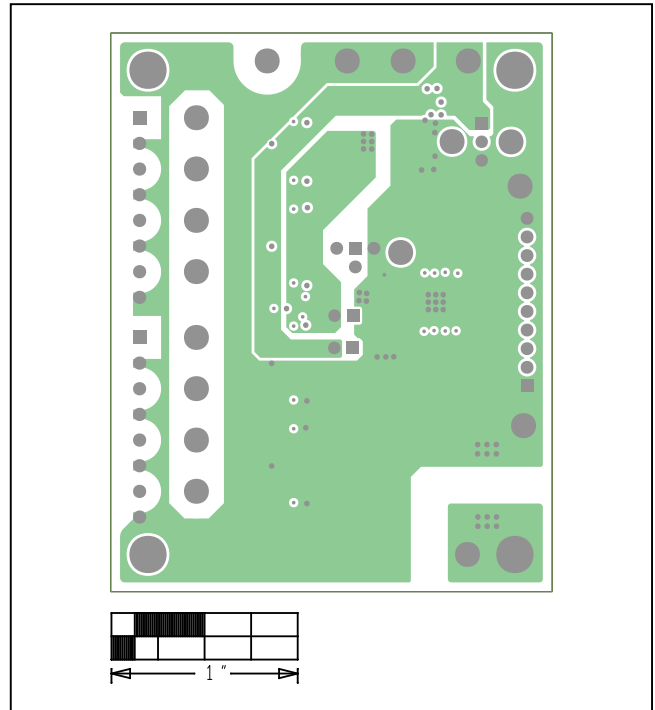
MAX22195 EV Kit—Top Silkscreen



MAX22195 EV Kit—Top

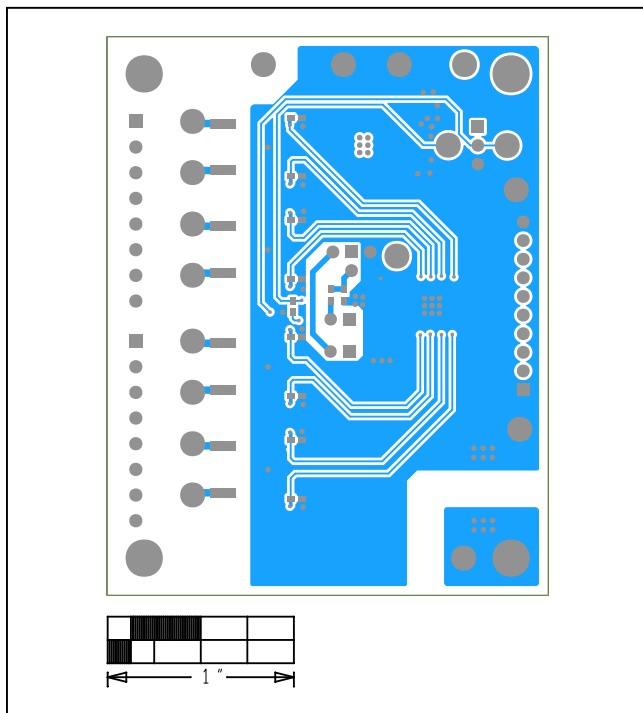


MAX22195 EV Kit—Internal 2

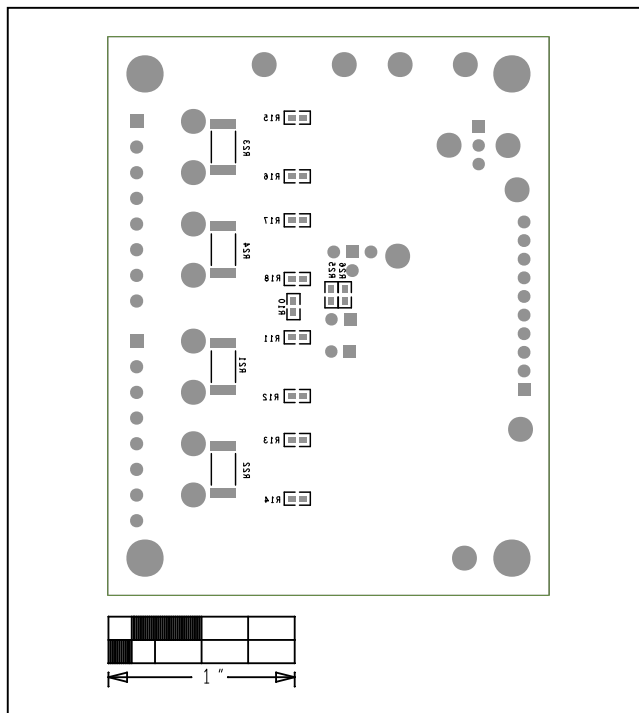


MAX22195 EV Kit—Internal 3

MAX22195 EV Kit PCB Layout Diagrams (continued)



MAX22195 EV Kit—Bottom



MAX22195 EV Kit—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/18	Initial release	—

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