

## MAX38888 Evaluation Kit

Evaluates: MAX38888

### General Description

The MAX38888 evaluation kit (EV kit) evaluates the MAX38888 IC. The MAX38888 is a super cap backup regulator designed to transfer power between a super cap and a system supply rail. When the main battery is present and above the minimum system supply voltage, the regulator charges the super cap at up to a 500mA rate. Once the super cap is charged, the circuit draws only 2.5 $\mu$ A of current while it maintains the super cap in its ready state. When the main battery is removed, the regulator prevents the system from dropping below the minimum operating voltage, discharging the super cap at up to a 2.5A rate. The MAX38888 is externally programmable for minimum and maximum super cap voltage, minimum system voltage, and maximum charge and discharge currents. The internal DC/DC converter requires only a 1 $\mu$ H inductor.

### Features

- 2.99V to 3.36V System Output Voltage Range
- 1.42V to 2.71V Super Cap Voltage Range
- 2.5A Peak Discharge Current
- Resistor Adjustable Voltage and Current Thresholds
- Proven 2-Layer 2oz Copper PCB Layout
- Demonstrates Compact Solution Size
- Fully Assemble and Tested

### MAX38888 EV Kit Files

FILE	DESCRIPTION
MAX38888 EV BOM	EV Kit Bill of Material
MAX38888 EV PCB Layout	EV Kit Layout
MAX38888 EV Schematic	EV Kit Schematic

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

### Quick Start

#### Required Equipment

- MAX38888 EV kit
- 5V, 3A DC power supply
- One digital multimeter (DMM)

#### Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation. **Caution: Do not turn on power supply until all connections are completed.**

- 1) Verify that a shunt is installed onto pins 1 and 2 jumper JU1 (EV kit enabled).
- 2) Verify that jumper JU2 is opened (No load is connected across VSYS and PGND).
- 3) Set the power supply output to 3.4V and disable the power supply.
- 4) Connect the power supply between the VSYS and PGND terminal posts.
- 5) Connect the DMM between the VSC and PGND terminal posts.
- 6) Enable the power supply and verify that super cap voltage at VSC is ramping up and stops at about 2.7V.
- 7) Disable and disconnect the power supply from the VSYS and PGND terminal posts.
- 8) Verify that VSYS drops to about 3V, and VSC drops to about 2.5V.
- 9) Install jumper JU2 (This connects a 51 $\Omega$  load across VSYS and PGND).
- 10) Verify that VSYS remains at 3V while VSC is ramping down toward 1.5V.
- 11) Verify that VSYS is 0V when VSC drops below 1.5V.

## Detailed Description of Hardware

The MAX38888 EV kit provides a flexible circuit to evaluate the super cap backup regulator. External components allow a wide range of system and super cap voltages as well as charging and discharging currents.

### EN

The MAX38888 EV kit provides a jumper (JU1) to enable or disable the MAX38888. Refer to [Table 1](#) for JU1 jumper settings.

### VSYS Load

The MAX38888 EV kit provides a jumper (JU2) to connect a 51Ω resistive load across VSYS and PGND to simulate a discharging scenario during test. Refer to [Table 2](#) for JU2 jumper settings.

### Charge Mode

When the main battery is present and is above the minimum system supply voltage, the regulator charges the super cap at up to a 500mA rate. The MAX38888 EV Kit minimum system supply voltage is set to 3.36V, by resistors R5 and R6 with  $V_{FBS} = 0.56V$ .

**Table 1. EN (JU1)**

JU1 SHUNT POSITION	DESCRIPTION
1-2*	Enabled. EN = VSYS
2-3	Disabled. EN = PGND
Not Installed	Enabled. EN = VSYS (through resistor R9)

\*Default position.

**Table 2. VSYS Load (JU2)**

JU2 SHUNT POSITION	DESCRIPTION
Installed	Test Mode: A 51Ω resistive load is connected across VSYS and PGND
Not Installed*	Normal Operating Mode

\*Default position.

### Ready Mode

Once the super cap is charged to its maximum voltage, 2.7V, the circuit draws only 2.5μA of current while it maintains the super cap in its ready state. The MAX38888 EV Kit maximum super cap voltage is set to 2.7V, by resistors R1, R2, and R3 with  $V_{FBCH} = 0.5V$ ,

### Discharge Mode

When the main battery is removed, the regulator discharges the super cap at up to a 2.5A rate to prevent the system from dropping below the minimum operating voltage. The MAX38888 EV kit minimum operating voltage is set to 2.99V, by resistors R5 and R6 with  $V_{FBS} = 0.5V$ .

### Preserve Mode

As the super cap is discharged toward its minimum voltage, 1.42V, the MAX38888 disconnects all circuitry from the super cap and draws only 2.5μA of current to preserve the remaining capacity for keeping alive the real-time clock, memory, or other low-level function. The MAX38888 EV Kit minimum super cap voltage is set to 1.42V, by resistors R1, R2, and R3 with  $V_{FBCL} = 0.475V$ .

### Charge/Discharge Current Configuration

The MAX38888 EV Kit provides a resistor R4 to configure the charge/discharge current rate for the super cap.

The peak discharge current is set by resistor R4 connecting between the ISET and GND pins.

$$I_{DISCHARGE} = 2.5A \times (20k\Omega/R4)$$

The super cap charging current is internally set to 1/5 of the discharge current.

$$I_{CHARGE} = 0.5A \times (20k\Omega/R4)$$

Choose a value of R4 between 20kΩ to 100kΩ to ensure accurate current compliance.

MAX38888 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	BKUPB, RDY	—	2	5002	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.1IN; TOTAL LENGTH = 0.3IN; BOARD HOLE = 0.04IN; WHITE; PHOSPHOR BRONZE WIRE SILVER;
2	C1	—	1	GRM31CR71A226ME15	MURATA	22UF	CAPACITOR; SMT (1206); CERAMIC CHIP; 22UF; 10V; TOL = 20%; TG = -55°C TO +125°C; TC = X7R
3	C2	—	1	SCCS30B116SRBA1	AVX	11F	CAP; THROUGH HOLE-RADIAL LEAD; 11F; +30%/-10%; 2.7V; ALUMINUM-ELECTROLYTIC ;
4	C3	—	1	C0805C226M9PAC; GRM21BR60J226ME39; JMK212BJ226MG; CL21A226MQCLQN	KEMET;MURATA; TAIYO YUDEN; SAMSUNG ELECTRO-MECHANICS	22UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 22UF; 6.3V; TOL = 20%; TG = -55°C TO +125°C; TC = X5R
5	GND	—	1	5001	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.1IN; TOTAL LENGTH = 0.3IN; BOARD HOLE = 0.04IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
6	JU1	—	1	PEC03SAAN	SULLINS	PEC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS
7	JU2	—	1	PEC02SAAN	SULLINS	PEC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
8	L1	—	1	74437324010	WURTH ELECTRONICS INC	1UH	INDUCTOR; SMT; SHIELDED; 1UH; 20%; 5.00A
9	LX, VSC, VSYS	—	3	131-4353-00	TEKTRONICS	131-4353-00	CONNECTOR; WIREMOUNT; CIRCUIT BOARD TEST POINT MINIATURE PROBE; STRAIGHT; 4PINS
10	PGND, TP1-TP3	—	4	108-0740-001	EMERSON NETWORK POWER	108-0740-001	CONNECTOR; MALE; PANELMOUNT; BANANA JACK; STRAIGHT; 1PIN
11	R1, R5	—	2	CRCW0603499KFK	VISHAY DALE	499K	RESISTOR; 0603; 499KΩ; 1%; 100PPM; 0.1W; THICK FILM
12	R2	—	1	CRCW06034023FK	VISHAY DALE	402K	RESISTOR; 0603; 402K; 1%; 100PPM; 0.10W; THICK FILM
13	R3	—	1	CRCW06031M80FK	VISHAY DALE	1.8M	RESISTOR; 0603; 1.8MΩ; 1%; 100PPM; 0.10W; THICK FILM
14	R4	—	1	MCR03EZPFX2002; ERJ-3EKF2002; CR0603-FX-2002ELF	ROHM;PANASONIC;BOURNS	20K	RESISTOR; 0603; 20KΩ; 1%; 100PPM; 0.10W; THICK FILM
15	R6	—	1	RMCF0603FT2M49	STACKPOLE ELECTRONICS INC.	2.49M	RES; SMT (0603); 2.49M; 1%; ±200PPM/DEGC; 0.10W
16	R7, R8	—	2	CHPHT0603K1002FGT	VISHAY SFERNICE	10K	RESISTOR; 0603; 10KΩ; 1%; 100PPM; 0.0125W; THICK FILM
17	R9	—	1	CRCW06031M00FK; MCR03EZPFX1004	VISHAY DALE;ROHM	1M	RESISTOR; 0603; 1MΩ; 1%; 100PPM; 0.10W; THICK FILM
18	R10-R12	—	3	CRCW06030000Z0	VISHAY DALE	0	RESISTOR; 0603; 0Ω; 0%; JUMPER; 0.1W; THICK FILM
19	R13	—	1	ERJ-14NF49R9U	PANASONIC	49.9	RESISTOR; 1210; 49.9Ω; 1%; 100PPM; 0.5W; THICK FILM
20	SU1, SU2	—	2	S1100-B;SX1100-B	KYCON;KYCON	SX1100-B	TEST POINT; JUMPER; STR; TOTAL LENGTH = 0.24IN; BLACK; INSULATION = PBT;PHOSPHOR BRONZE CONTACT = GOLD PLATED
21	U1	—	1	MAX38888ATD+	MAXIM	MAX38888ATD+	EVKIT PART - IC; REG; SUPER CAP REGULATOR; PACKAGE OUTLINE: 21-0137; PACKAGE CODE: T1433+1; LAND PATTERN: 90-0062; TDFN14-EP
22	PCB	—	1	MAX38888	MAXIM	PCB	PCB.MAX38888
23	J2-J5	DNP	0	MAXIMPAD	N/A	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; NO WIRE TO BE SOLDERED ON THE MAXIMPAD
24	C4	DNP	0	N/A	N/A	OPEN	CAPACITOR; SMT (1210); OPEN; IPC MAXIMUM LAND PATTERN
TOTAL			33				

Component Suppliers

SUPPLIER	WEBSITE
AVX	www.avx.com
Kemet	www.kemet.com
Murata/TOKO	www.murata.com
Würth Electronics	www.we-online.com

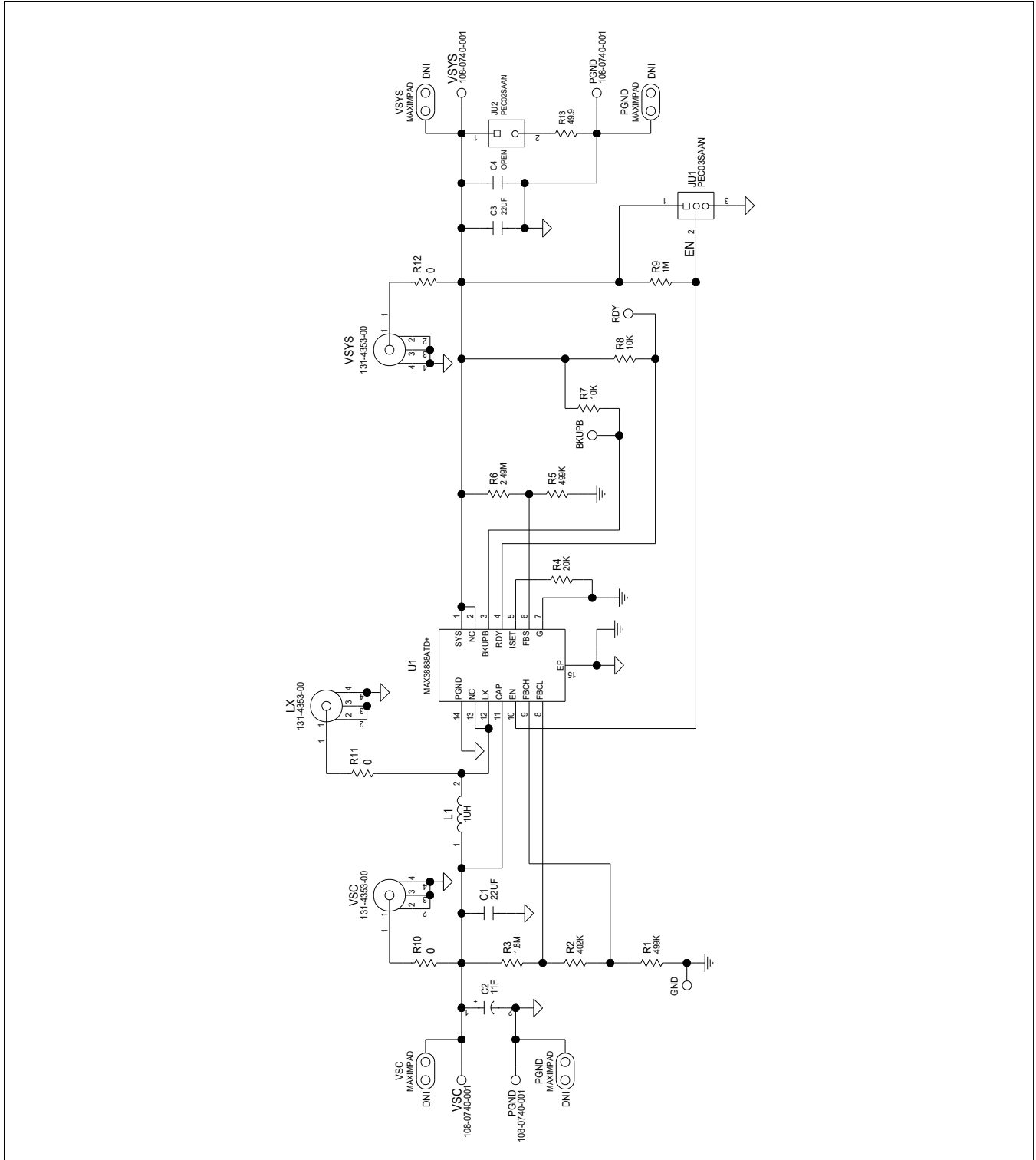
**Note:** Indicate that you are using the MAX38888 when contacting these component suppliers.

Ordering Information

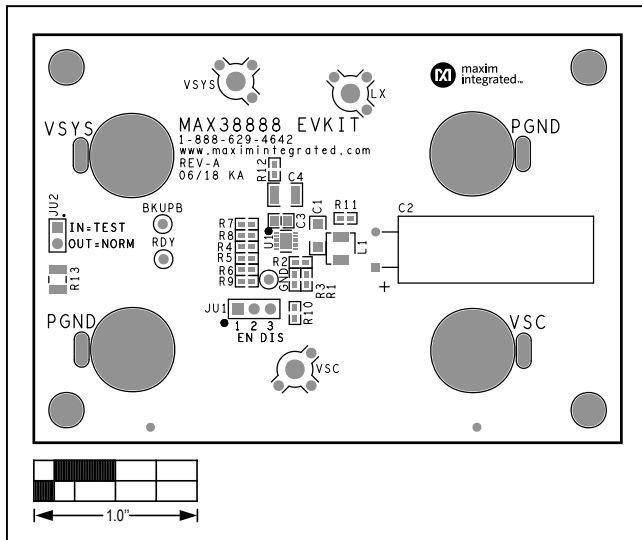
PART	TYPE
MAX38888EVKIT#	EVKIT

#Denotes RoHS

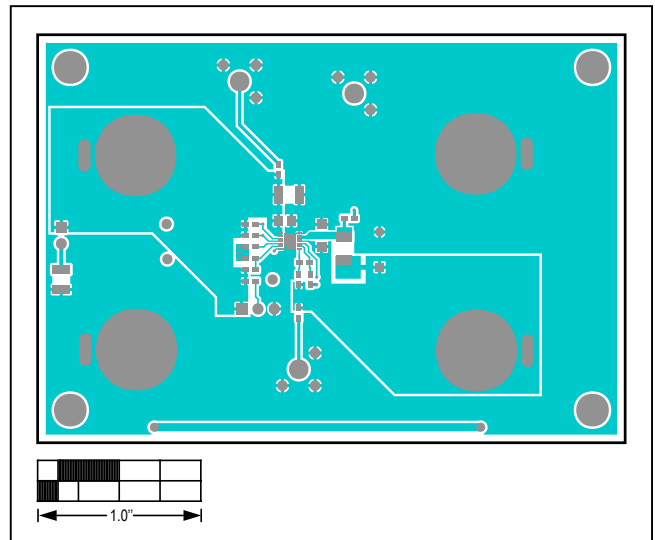
MAX38888 EV Kit Schematic



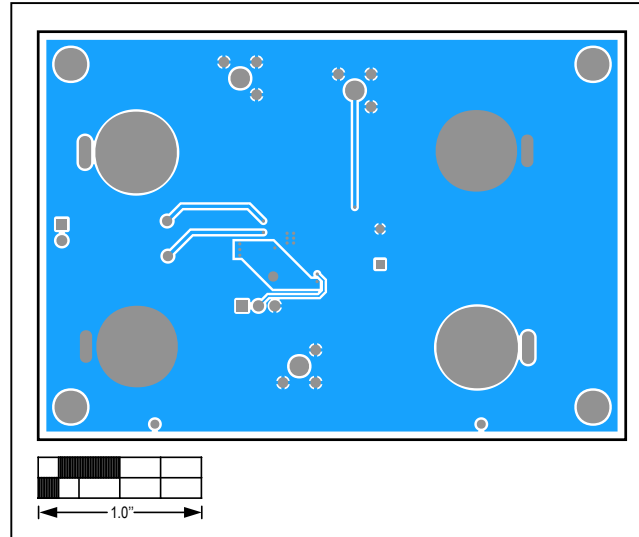
MAX38888 EV Kit PCB Layout Diagrams



MAX38888 EV Kit Component Placement Guide—  
Top Silkscreen



MAX38888 EV Kit PCB Layout—Top Layer



MAX38888 EV Kit PCB Layout—Bottom Layer

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/18	Initial release	—
1	7/19	Deleted placeholder text	1

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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