EV5455-L-00A

Peak Power Assist for Smart/AI-Enabled Speakers, Evaluation Board

The Future of Analog IC Technology

DESCRIPTION

EV5455-L-00A Evaluation Board is designed to demonstrate the capabilities of MP5455. The MP5455 is designed as a peak power assist for low power applications, releasing energy as needed during peak loading events. The internal input-current-limit block with dv/dt control prevents inrush current during system start-up; the bus voltage start-up slew rate is programmable. MPS's patented power back-up control circuit minimizes the storage capacitor requirement. It pumps the input voltage to a higher storage voltage and releases the energy over a hold-up time to the system in the case of an input outage. The storage voltage and the release voltage are both programmable for different system requirements.

The MP5455 is available in a space QFN20 (3mmX4mm) package.

FEATURES

- Wide 2.7 to 7V Operating Input Range for MP5455
- 60mΩ Back to Back Switch for Input Current Limit Circuit and Reverse Current Blocking
- Reverse Current Protection
- 6V Bus Clamping Voltage
- Power on Reset
- Adjustable dv/dt Slew Rate for Bus Voltage Start-up
- Thermal Protection
- Available in an QFN20(3mmx4mm) Package

APPLICATIONS

- Peak Power Smoother for Smart Speakers
- Artificial Intelligence (AI)-Enabled Speakers
- Power Back-Up
- Battery Hold-Up Supplies

ELECTRICAL SPECIFICATION

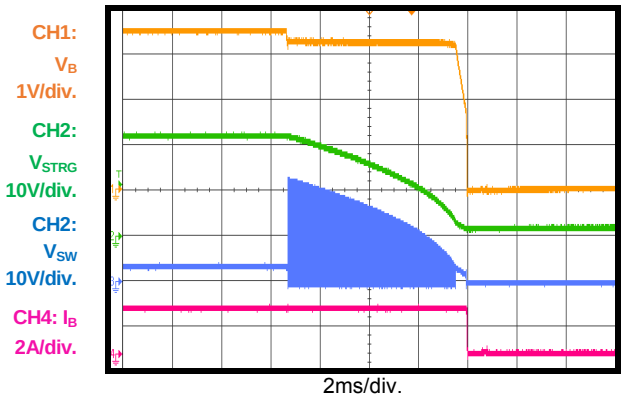
Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	3.5-5	V
Charge Voltage	V_{STRG}	23.5	V
Bus Release Voltage	$V_{RELEASE}$	3.2	V
Boost Inductor Peak Current	I_{CHARGE}	0.4	A
Buck Max Output Current	$I_{RELEASE}$	2	A

EV5455-L-00A EVALUATION BOARD

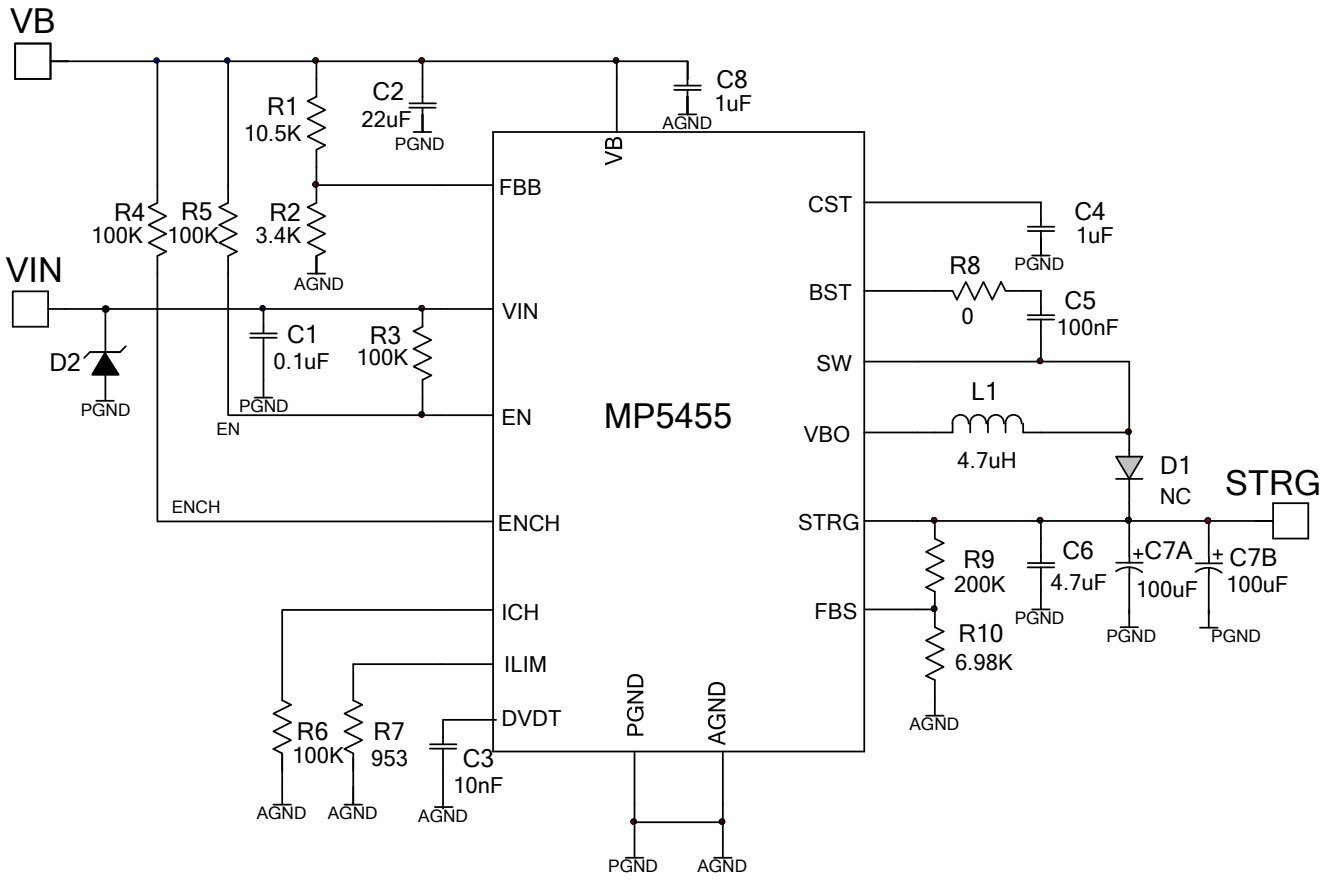
(L x W) 6.35cm x 6.35cm	
Board Number	**MPS IC Number**
EV5455-L-00A	MP5455GL

Release

I_B=2A, C_{STRG}=2 x 100µF



EVALUATION BOARD SCHEMATIC



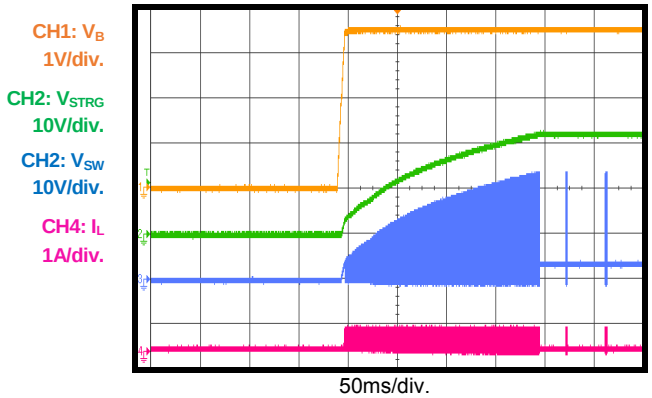
EV5455-L-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer P/N
1	L1	4.7μH	4.7μH, DCR 19.5mΩ, 7A	SMD	Wurth	744311470
1	R1	10.5k	Film Res., 1%	0603	Yageo	RC0603FR-0710K5L
1	R2	3.4k	Film Res., 1%	0603	Yageo	RC0603FR-073K4L
4	R3, R4, R5, R6	100k	Film Res., 1%	0603	Yageo	RC0603FR-07100KL
1	R7	953	Film Res., 1%	0603	Yageo	RC0603FR-07953RL
1	R8	0	Film Res., 1%	0603	Yageo	RC0603FR-07200KL
1	R9	200k	Film Res., 1%	0603	Royal	RL0603FR-07200KL
1	R10	6.98k	Film Res., 1%	0603	Yageo	RC0603FR-076K98L
2	C1, C5	100nF	Ceramic Cap., 25V, X7R	0603	Murata	GRM188R71E104KA01D
1	C2	22μF	Ceramic Cap., 10V, X5R	1206	Murata	GRM31CR61A226ME19L
1	C3	10nF	Ceramic Cap., 16V, X7R	0603	Murata	GRM188R71C103KA01D
2	C4, C8	1μF	Ceramic Cap,50V,X5R	0603	Yageo	CC0603KRX5R9BB106
1	C6	4.7μF	Ceramic Cap,50V,X7R	1206	Murata	GRM31CR71H475KA12L
2	C7A, C7B	100uF	50V/100μF	CD284	JH	ECR1HXY101M080011
0	D1	NC				
1	D2	SMA6J5.0A	TVS DIODE	SMA	VISHAT	SMA6J5.0A
1	U1	MP5455	MP5455GL	QFN20-3mmx4mm	MPS	MP5455GL

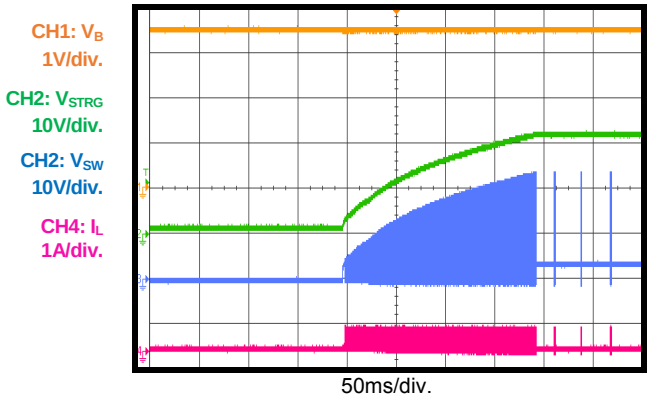
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.
V_{IN} = 3.5V, $V_{STORAGE}$ =23.5V, $V_{RELEASE}$=3.2V, For DCDC Converter: V_{OUT}=3.2V, L=4.7µH, T_A = +25ºC, unless otherwise noted.

V_{IN} Power On

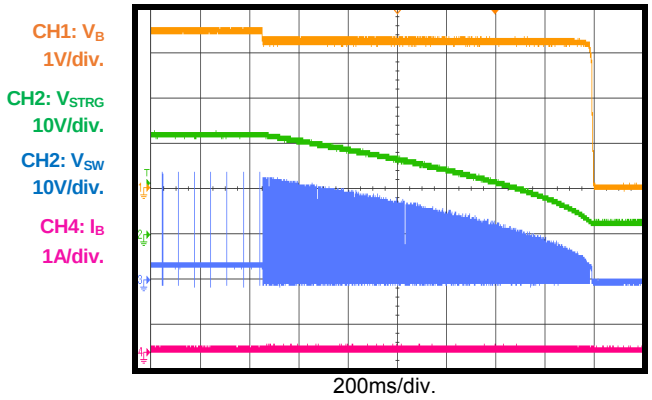


ENCH Power On



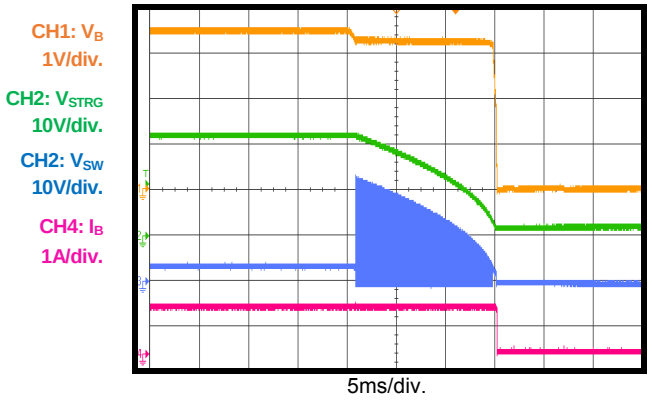
Release

I_B=10mA, C_{STRG}=2 x 100µF



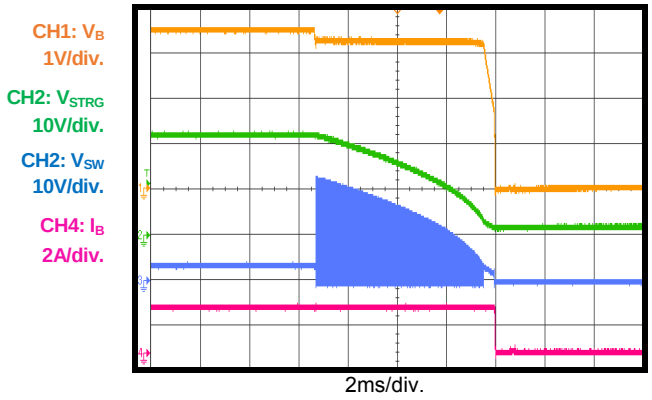
Release

I_B=1A, C_{STRG}=2 x 100µF



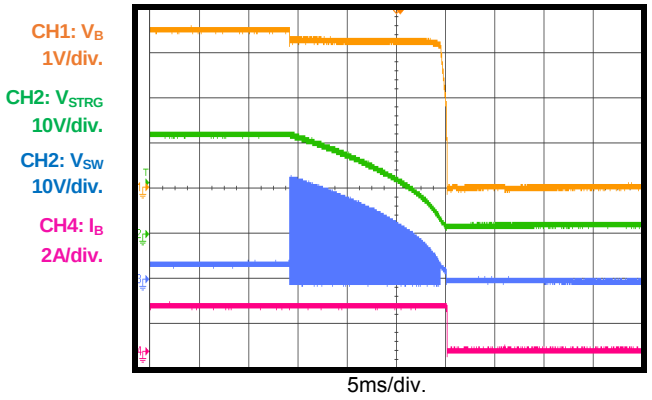
Release

I_B=2A, C_{STRG}=2 x 100µF



Release

I_B=2A, C_{STRG}=2 x 220µF

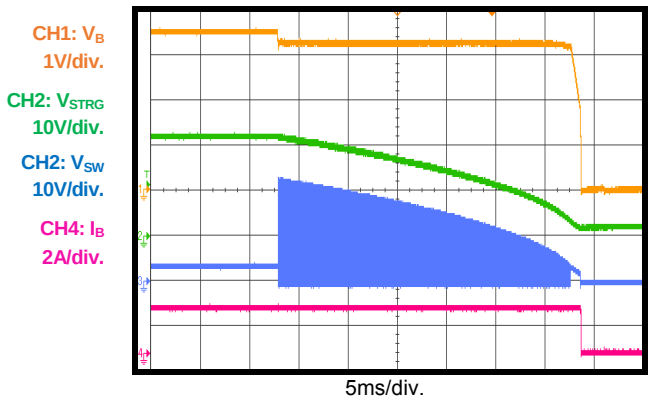


EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.
V_{IN} = 3.5V, $V_{STORAGE}$ =23.5V, $V_{RELEASE}$=3.2V, For DCDC Converter: V_{OUT}=3.2V, L=4.7µH, T_A = +25ºC, unless otherwise noted.

Release

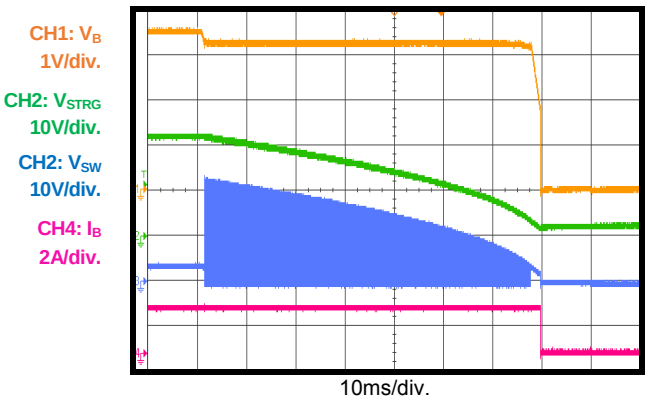
I_B=2A, C_{STRG}=1000µF



5ms/div.

Release

I_B=2A, C_{STRG}=2200µF



10ms/div.

PRINTED CIRCUIT BOARD LAYOUT

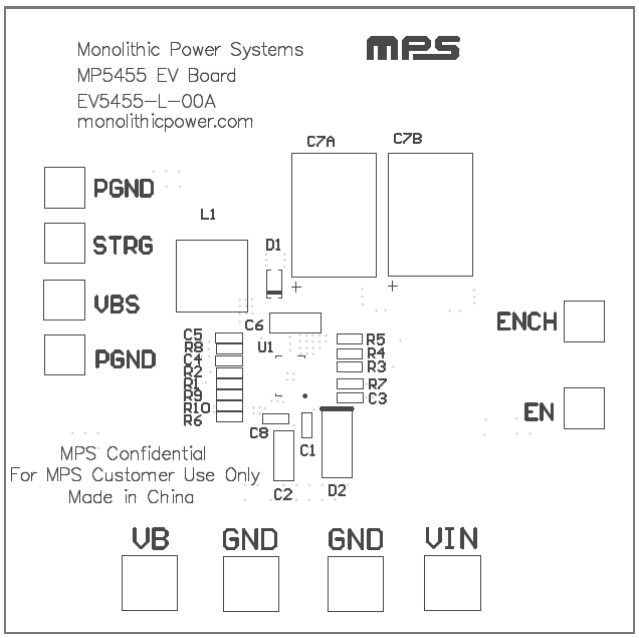


Figure 1—Top Silk Layer

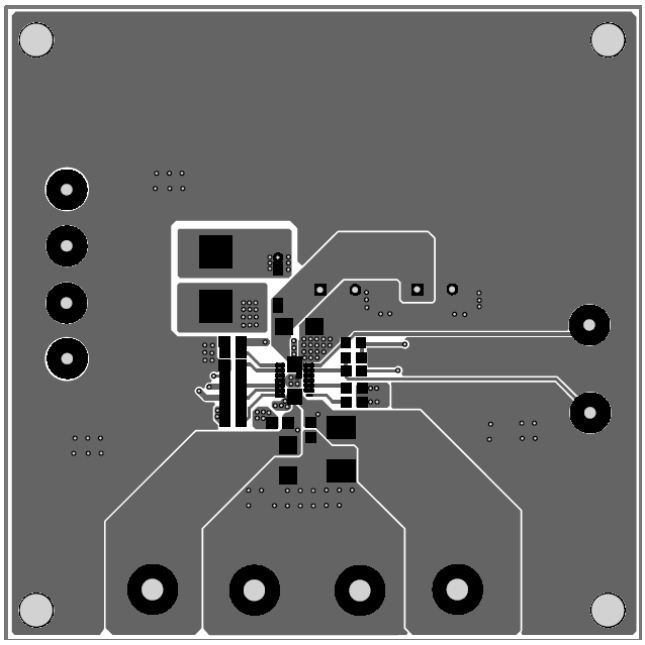


Figure 2—Top Layer

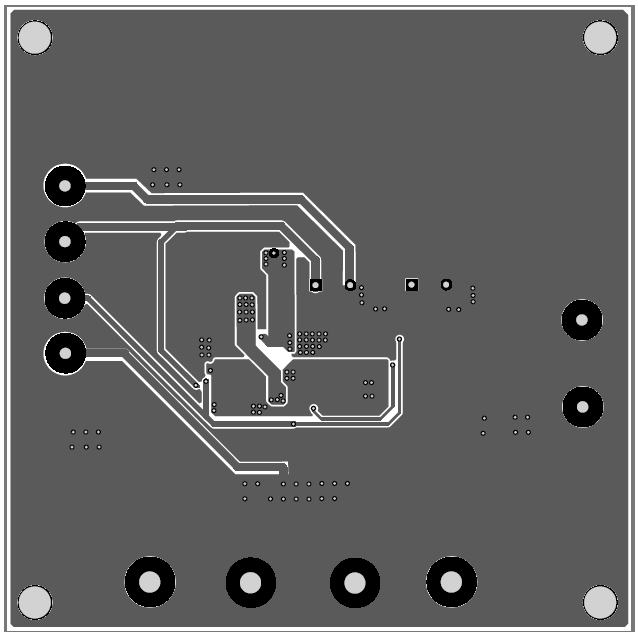


Figure 3—Bottom Layer

QUICK START GUIDE

The board layout accommodates most commonly used components.

1. Connect the positive and negative terminals of the load to VB and GND pins, respectively.
2. Preset Power Supply to 3.5V. Turn off Power Supply.
3. Connect Power Supply terminals to:

   Positive (+): VIN

   Negative (–): GND
4. Turn on Power Supply after making connections, MP5455 will charge the storage capacitor to 23.5V after DCDC converter completes start-up.
5. In order to observe the power release performance, following two methods can be applied:

   Turn off the power supply.

   Short VIN to GND directly. Note: make sure bench power supply have output current limiting when doing this test.
6. Use R1 and R2 to set release voltage:

$$V_{RELEASE} = 0.79V \times \frac{R1 + R2}{R2}$$

   Similarly, R9 and R10 can be chosen for storage voltage setting:

$$V_{STRG} = 0.79V \times \frac{R9 + R10}{R10}$$