

## Product Description

The **PE25208** is an ultra-high efficiency charge pump IC that is configurable to divide down an input voltage by two or three and delivers up to 10A with peak efficiency up to 98.2%. The PE25208 can also be used in parallel to increase output power.

The PE25208 supports an input voltage range of 18V to 45V in divide-by-2 mode and 18V to 60V in divide-by-3 mode. The PE25208 is primarily used as a front-end converter to convert the USB PD EPR input to a lower voltage for downstream charger circuit with improved overall system efficiency.

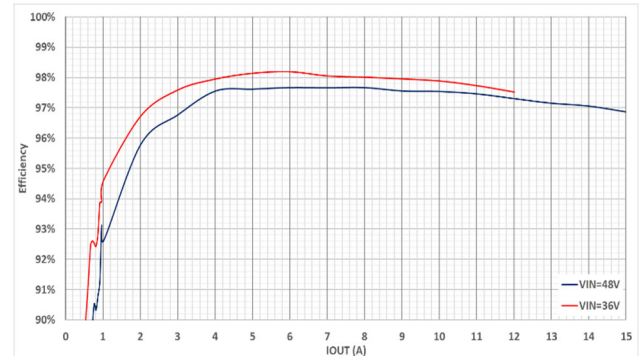
The PE25208 comes in an 8.095 mm × 4.095 mm 148-pin WLCSP package. The pinout is specially designed to be fully compatible with Type III PCB design.

## Features

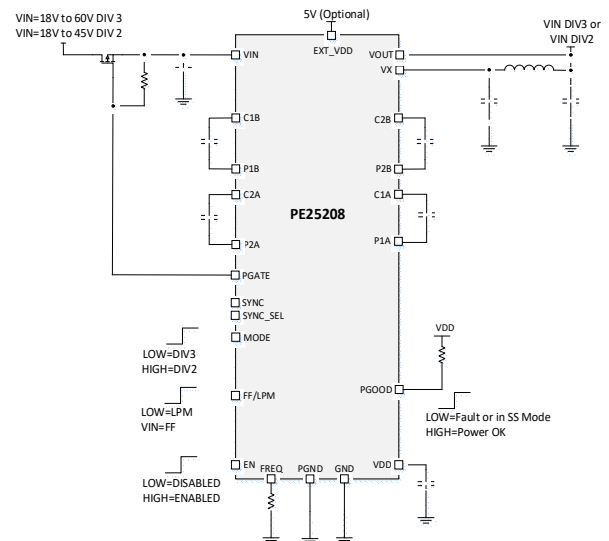
- Proprietary architecture enables industry-leading efficiency in an ultra-compact footprint and low-profile solution
- Parts can be operated in parallel for higher output power
- Input voltage range of 18V to 60V supports USB PD EPR input and custom AC-DC bricks
- Peak efficiency of 98.2%
- Selectable divide-by-3 or divide-by-2 mode
- Fully protected with input under-voltage, output short circuit detection and thermal shutdown fault detection
- Low EMI fixed-frequency operation under heavy load conditions

## Applications

- Ultrabooks/notebook computers
- Portable workstations
- Gaming laptops



**Figure 1. PE25208 Typical Efficiency vs. IOU at 48V Divide-by-3 and 36V Divide-by-2 Parallel Operations**



**Figure 2. PE25208 Typical Application Circuit**

## Typical Application Circuit

Figure 3 shows the application circuit for the PE25208 in single-IC operation.

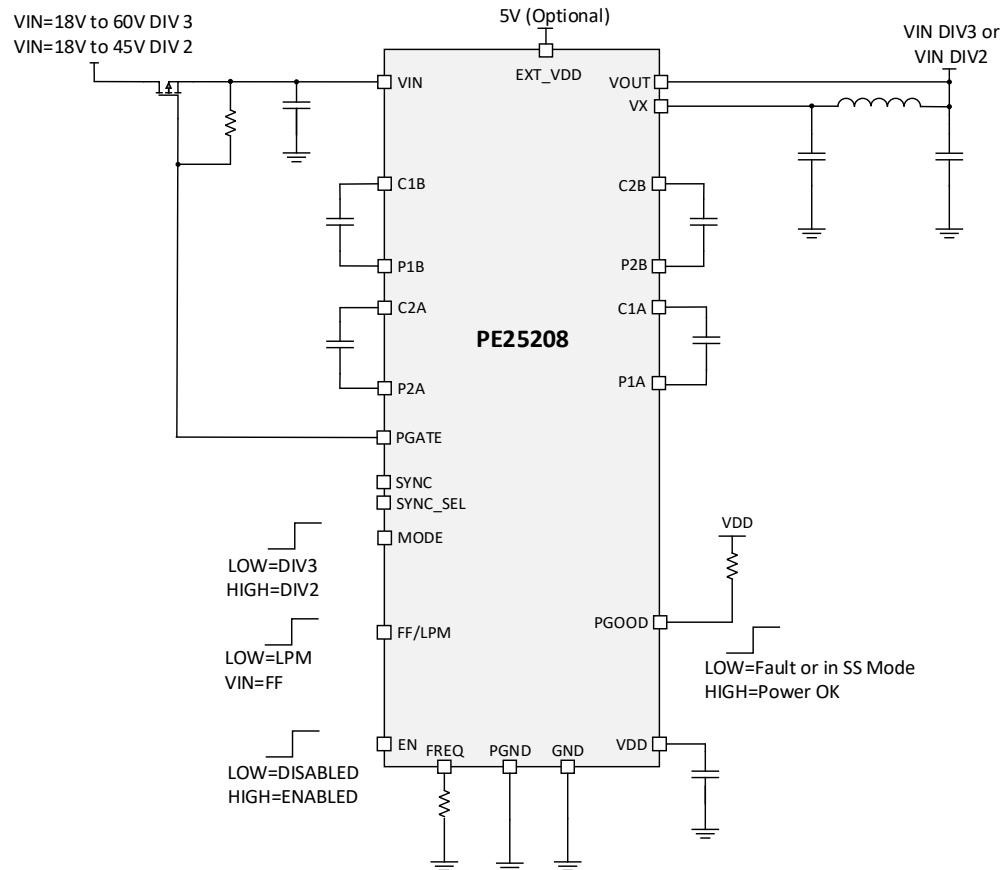


Figure 3. PE25208 Application Circuit in Single Operation

Figure 4 shows the application circuit for the PE25208 in parallel ICs operation.

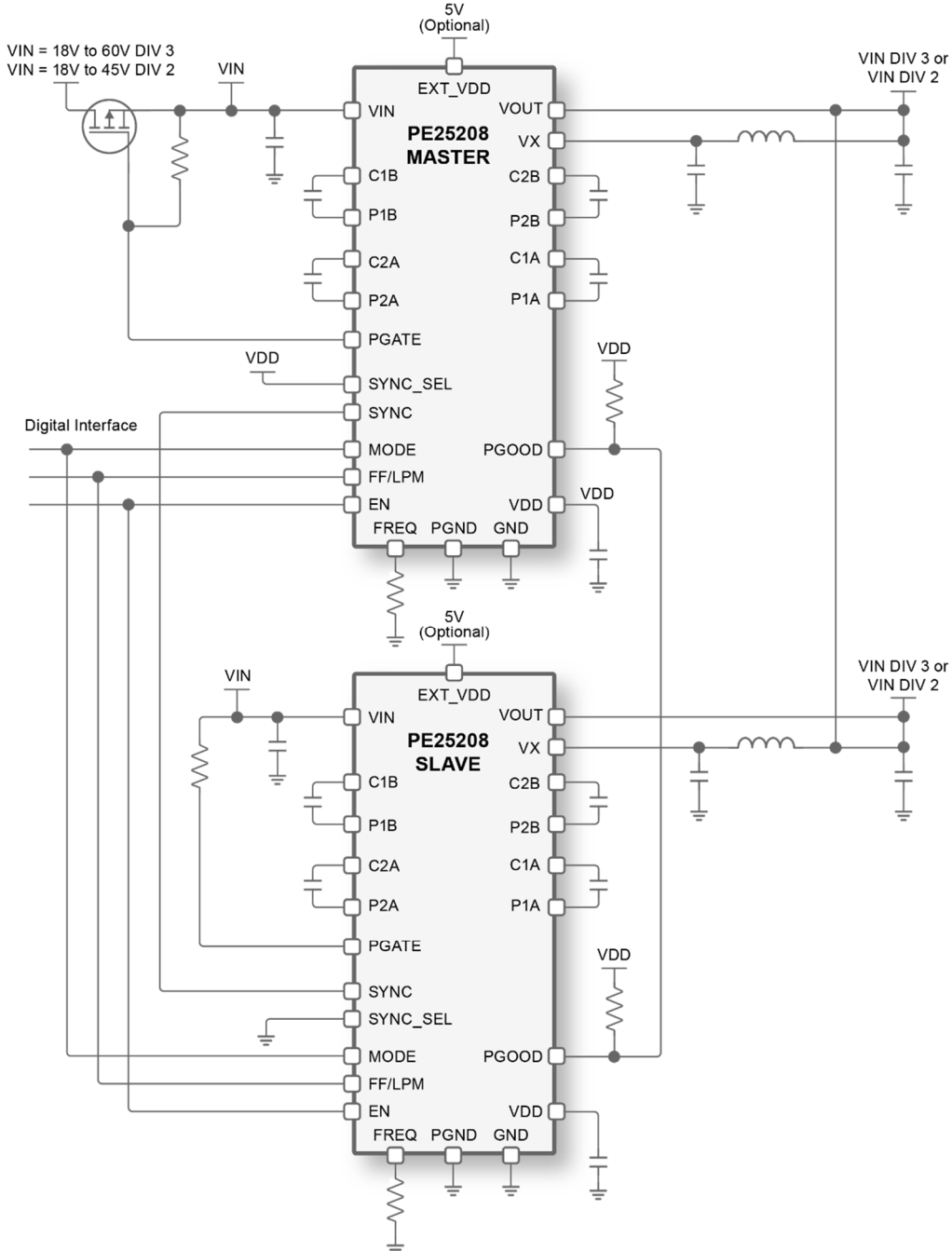


Figure 4. PE25208 Application Circuit in Parallel ICs Operation

## Applications Information

### Application Schematic

An example of the PE25208 single-IC application schematic is shown in Figure 5. An example of the PE25208 dual-IC application schematic is shown in Figure 6. Refer to the recommended components in Table 1 for single-IC application and Table 2 for dual-IC application.

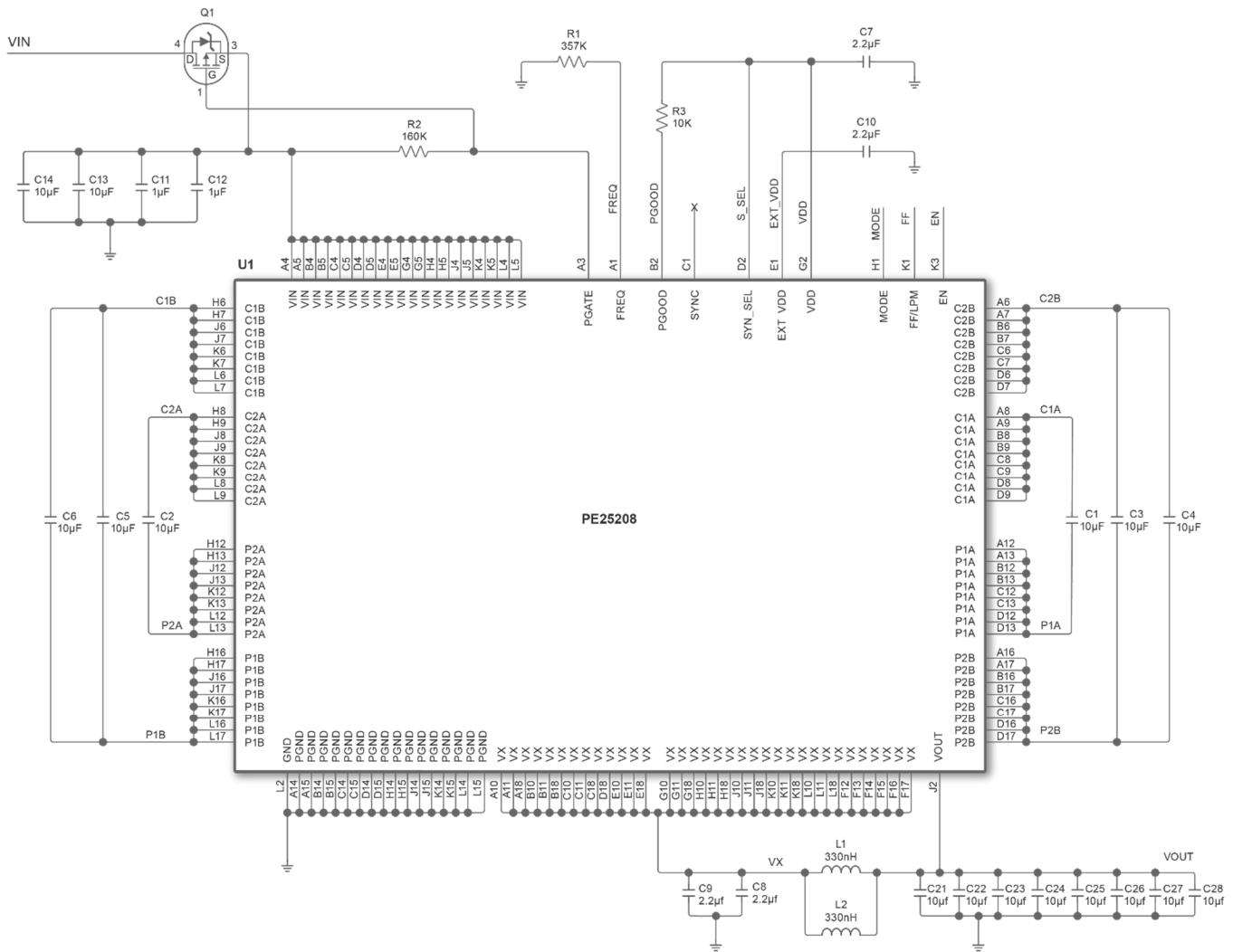


Figure 5. PE25208 Single-IC Application Schematic

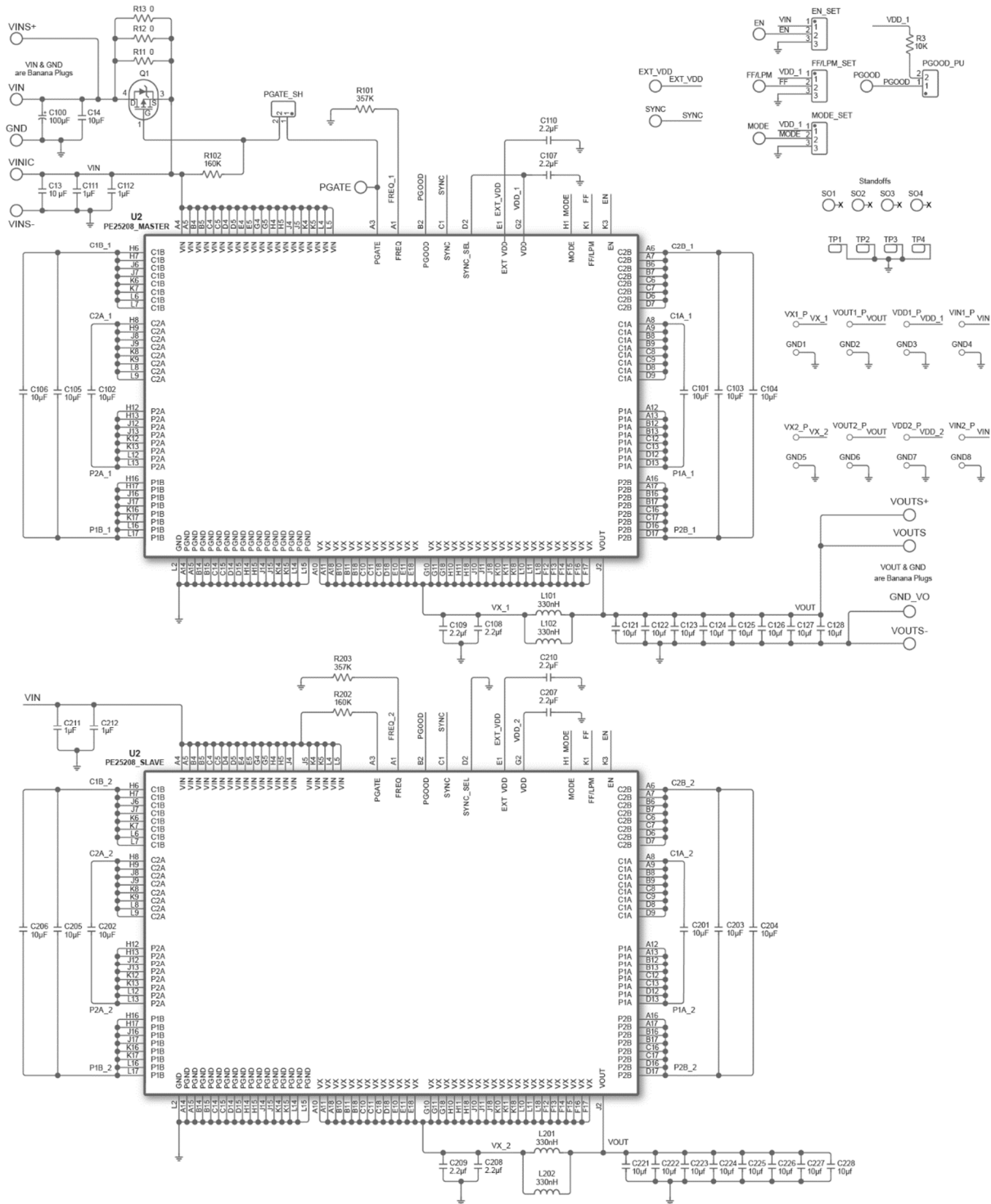


Figure 6. PE25208 Dual-IC Application Schematic

## Recommended Components

Examples of the standard components are shown in Table 1. PE25208 Single-IC Recommended Components

1 referencing to the application schematic in Figure 5 for PE25208 single IC application. Table 2 referencing to the application schematic in Figure 6 for PE25208 dual IC application. Components must be chosen by referring to system requirements such as voltage, temperature, etc. The information in this table is under evaluation and subject to change.

REFERENCE	VALUE	DESCRIPTION	MANUFACTURER	PART NUMBER
C1, C2, C3, C4, C5, C6	10 $\mu$ F	Charge Pump Fly Capacitor 10 $\mu$ F 100V X7S 1210	Murata	GRM32EC72A106KE05
C13, C14	10 $\mu$ F	Input Capacitor 10 $\mu$ F 100V X7S 1210	Murata	GRM32EC72A106KE05
C11, C12	1 $\mu$ F	Input Capacitor 1 $\mu$ F 100V X7S 0805	Murata	GRM21BC72A105KE01
C7, C10	2.2 $\mu$ F	VDD and EXT_VDD Capacitors 2.2 $\mu$ F 25V X5R 0402	Murata	GRM155R61E225ME15
C8, C9	2.2 $\mu$ F	VX Capacitor 2.2 $\mu$ F 50V X5R 0603	Murata	GRM188R61H225ME11
C21, C22, C23, C24, C25, C26, C27, C28 <sup>2</sup>	10 $\mu$ F	VOU Capacitor 10 $\mu$ F 50V X5R 0805	Murata	GRM21BR61H106KE43
L1, L2	330 nH	VX Inductor 100nH 8A 9 MOHM SMD	Cyntec	HTEL25201B-R33MXR-01
R1	357 k $\Omega$	FREQ Resistor 357k $\Omega$ 1% 1/10W 0603	Panasonic	ERJ-3EKF3573V
R2	160 k $\Omega$	PGATE to VIN Resistor 160k $\Omega$ 5% 1/10W 0603	Panasonic	ERJ-3GEYJ164V
R3	10 k $\Omega$	PGOOD Pull Up Resistor 10k $\Omega$ 1% 1/10W 0603	Panasonic	ERJ-3EKF1002V
Q1 <sup>1</sup>		P-Channel Power FET		
U1	PE25208	High Voltage Divide-by-2/3 Charge Pump	Murata	PE25208A-R

**Notes:**

1. Q1 external P-channel FET is optional.
2. Minimum required VOUT capacitance is 47  $\mu$ F. Maximum VOUT capacitance is up to 1 mF.

**Table 1. PE25208 Single-IC Recommended Components**

REFERENCE	VALUE	DESCRIPTION	MANUFACTURER	PART NUMBER
C101, C102, C103, C104, C105, C106, C201, C202, C203, C204, C205, C206	10 $\mu$ F	Charge Pump Fly Capacitor 10 $\mu$ F 100V X7S 1210	Murata	GRM32EC72A106KE05
C13, C14	10 $\mu$ F	Input Capacitor 10 $\mu$ F 100V X7S 1210	Murata	GRM32EC72A106KE05
C111, C112, C211, C212	1 $\mu$ F	Input Capacitor 1 $\mu$ F 100V X7S 0805	Murata	GRM21BC72A105KE01
C107, C110, C207, C210	2.2 $\mu$ F	VDD and EXT_VDD Capacitors 2.2 $\mu$ F 25V X5R 0402	Murata	GRM155R61E225ME15
C108, C109, C208, C209	2.2 $\mu$ F	VX Capacitor 2.2 $\mu$ F 50V X5R 0603	Murata	GRM188R61H225ME11
C121, C122, C123, C124, C221, C222, C223, C224 <sup>2</sup>	10 $\mu$ F	VOOUT Capacitor 10 $\mu$ F 50V X5R 0805	Murata	GRM21BR61H106KE43
L101, L102, L201, L202	330 nH	VX Inductor 100nH 8A 9 MOHM SMD	Cyntec	HTEL25201B-R33MXR-01
R101, R203	357 k $\Omega$	FREQ Resistor 357k $\Omega$ 1% 1/10W 0603	Panasonic	ERJ-3EKF3573V
R102, R202	160 k $\Omega$	PGATE to VIN Resistor 160k $\Omega$ 5% 1/10W 0603	Panasonic	ERJ-3GEYJ164V
R3	10 k $\Omega$	PGOOD Pull Up Resistor 10k $\Omega$ 1% 1/10W 0603	Panasonic	ERJ-3EKF1002V
Q1 <sup>1</sup>		P-Channel Power FET		
U1, U2	PE25208	High Voltage Divide-by-2/3 Charge Pump	Murata	PE25208A-R

**Notes:**

1. Q1 external P-channel FET is optional.
2. Minimum required VOOUT capacitance is 47  $\mu$ F. Maximum VOOUT capacitance is up to 1 mF.

**Table 2. PE25208 Dual IC Recommended Components**



## Evaluation Board

Figure 7 shows the PE25208 dual-IC evaluation board.

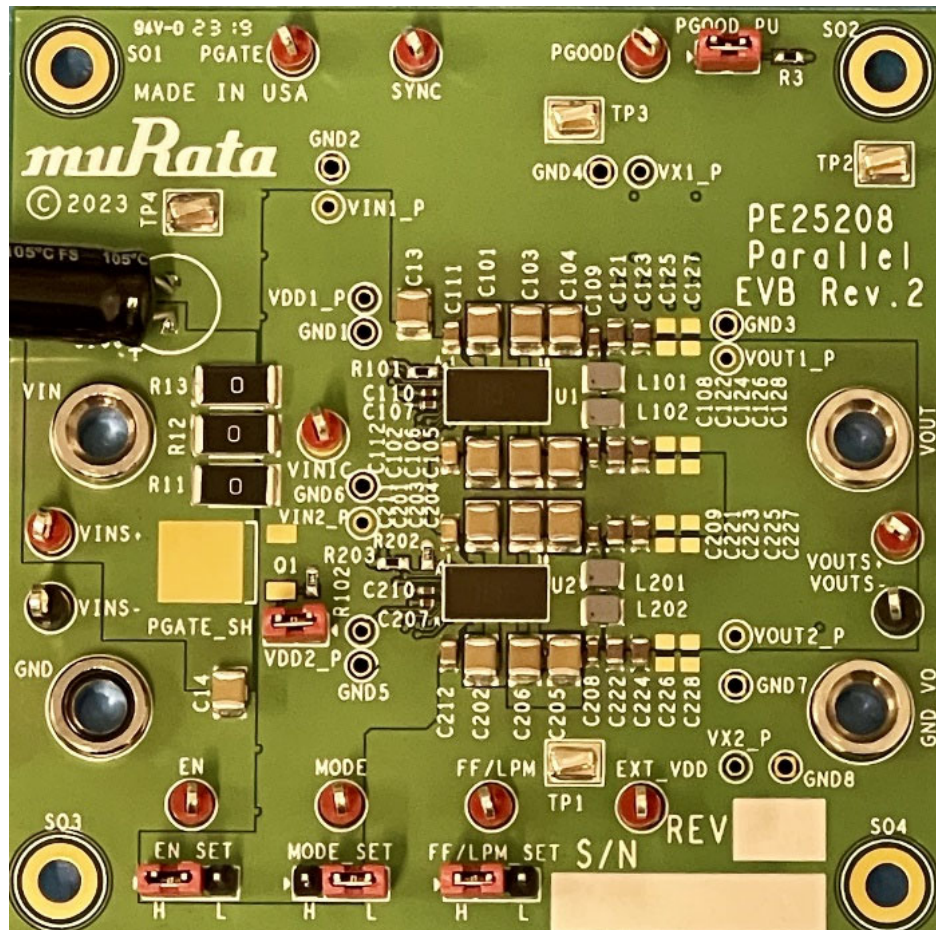


Figure 7. PE25208 Dual-IC Evaluation Board



## Order Codes

ORDER CODES	DESCRIPTION	PACKAGING	SHIPPING METHOD
PE25208A-R	PE25208 DC-DC converter	WLCSP	5000 unit/T&R
PE25208A-V (Not for production use)	PE25208 DC-DC converter	WLCSP	250 unit/T&R

**Table 3. Order Codes**

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#### **Limitation of Applications**

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- Aerospace equipment
- Undersea equipment
- Power plant control equipment
- Surgical implants
- Transportation equipment (vehicles, trains, ships, etc.)
- Traffic signal equipment
- Disaster prevention / crime prevention equipment
- Application of similar complexity and/or reliability requirements to the applications listed in the above

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