



# INTEL® ENPIRION® POWER SOLUTIONS

Powering Your Innovation





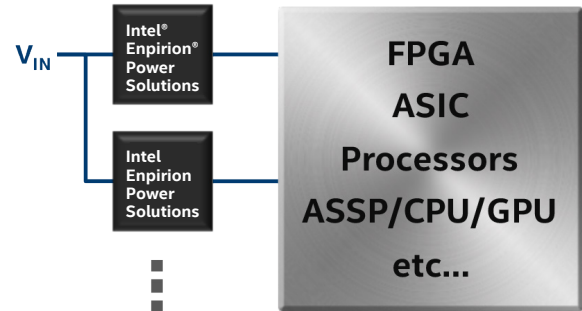
# INTEL® ENPIRION® POWER SOLUTIONS

## Intel Enpirion PowerSoCs enable:

- Low noise and fast transient response performance
- High power density and small footprint
- High efficiency and excellent thermal performance
- Low component count and high reliability
- Ease of design and fast time to market

## Expertise in Solving Your Toughest Power Challenges

Intel® Enpirion® Power Solutions are high-frequency DC-DC step-down power converters optimized for FPGAs, processors, ASICs, and other semiconductor devices.



PART NUMBER	MAX $I_{OUT}$ (A)	$V_{IN}$ RANGE (V)	$V_{OUT}$ RANGE (V)	SWITCHING FREQUENCY (MHZ)	PACKAGE (PINS)	PACKAGE SIZE (MM)			SOLUTION SIZE (MM <sup>2</sup> ) <sup>(1)</sup>	DIGITAL $V_{OUT}$ SET (VID OR PMBus*)	POWER GOOD / POK FLAG	PROGRAMMABLE SOFT-START	PRECISION ENABLE	INPUT SYNCHRONIZATION	OUTPUT SYNCHRONIZATION	PARALLEL CAPABILITY	PROGRAMMABLE FREQUENCY	LIGHT LOAD MODE	AUTOMOTIVE-GRADE AVAILABLE	
						L	W	H												
<b>POWERSOCS UP TO 6.6V INPUT</b>																				
EP5348UI	0.4	2.5 – 5.5	0.6 – $V_{IN}^{(2)}$	9.0	uQFN14	2.0	1.75	0.9	21											
EP5357/8HUI <sup>(3)</sup>	0.6	2.4 – 5.5	1.8 – 3.3	5.0	QFN16	2.5	2.25	1.1	14	•								•	•	
EP5357/8LUJ <sup>(3)</sup>	0.6	2.4 – 5.5	0.6 – $V_{IN}^{(2)}$	5.0	QFN16	2.5	2.25	1.1	14	•								•	•	
EP5368QI	0.6	2.4 – 5.5	0.6 – $V_{IN}^{(2)}$	4.0	QFN16	3.0	3.0	1.1	21	•										
EP5388QI	0.8	2.4 – 5.5	0.6 – $V_{IN}^{(2)}$	4.0	QFN16	3.0	3.0	1.1	28	•										
EP53A7/8HQI <sup>(3)</sup>	1.0	2.4 – 5.5	1.8 – 3.3	5.0	QFN16	3.0	3.0	1.1	21	•								•	•	
EP53A7/8LQI <sup>(3)</sup>	1.0	2.4 – 5.5	0.6 – $V_{IN}^{(2)}$	5.0	QFN16	3.0	3.0	1.1	21	•								•	•	
EN5311QI	1.0	2.4 – 6.6	0.6 – $V_{IN}^{(2)}$	4.0	QFN20	4.0	5.0	1.1	36	•										
EN6310QI	1.0	2.7 – 5.5	0.6 – 3.3	2.2	QFN30	4.0	5.0	1.85	65		•	•							•	
EP53F8QI	1.5	2.4 – 5.5	0.6 – $V_{IN}^{(2)}$	4.0	QFN16	3.0	3.0	1.1	40		•									
Footprint Compatible	EN5319QI	1.5	2.4 – 5.5	0.6 – $V_{IN}^{(2)}$	3.2	QFN24	4.0	6.0	1.1	50	•									
	EN5329QI	2.0																		55
	EN5339QI	3.0																		
EN5322QI	2.0	2.4 – 5.5	0.6 – $V_{IN}^{(2)}$	4.0	QFN24	4.0	6.0	1.1	58	•	•									
EN5335/6QI <sup>(4)</sup>	3.0	2.4 – 6.6	0.75 – $3.3/V_{IN}^{(2)}$	5.0	QFN44	7.5	10.0	1.85	157	•	•	•								
EN5337QI	3.0	2.4 – 5.5	0.75 – $V_{IN}^{(2)}$	5.0	QFN38	4.0	7.0	1.85	75		•	•	•							
EN6338QI	3.0	2.7 – 6.6	0.75 – $V_{IN}^{(2)}$	1.9	LGA19	3.75	3.75	1.9	45		•	•	•					•		
Footprint Compatible	EN6337QI	3.0	2.5 – 6.6	0.75 – $V_{IN}^{(2)}$	1.9	QFN38	4.0	7.0	1.85	75	•	•	•						•	•
	EN6347QI	4.0																		
Footprint Compatible	EN6340QI	4.0	2.7 – 6.6	0.6 – $V_{IN}^{(2)}$	2.0	QFN34	4.0	6.0	2.5	60	•	•	•							
	EN6363QI	6.0																		
EN5365/6QI <sup>(4)</sup>	6.0	2.4 – 5.5	0.75 – $3.3/V_{IN}^{(2)}$	5.0	QFN58	10.0	12.0	1.85	229	•	•	•								
EN5367QI	6.0	2.5 – 5.5	0.75 – $V_{IN}^{(2)}$	4.0	QFN54	5.5	10.0	3.0	160		•	•	•							
Footprint Compatible	EN6362QI	6.0	3.0 – 6.5	0.6 – $V_{IN}^{(2)}$	0.9 – 1.5	QFN56	8.0	8.0	3.0	160	•	•	•						•	
	EN6382QI	8.0																		
Footprint Compatible	EN5364QI	6.0	2.4 – 6.6	0.6 – $V_{IN}^{(2)}$	4.0	QFN68	8.0	11.0	1.85	160	•	•	•	•	•	•				
	EN5394QI	9.0																		
EN6360QI	8.0	2.5 – 6.6	0.6 – $V_{IN}^{(2)}$	0.9 – 1.5	QFN68	8.0	11.0	3.0	190		•	•	•	•	•	•	•	•	•	•
EN5395/6QI <sup>(4)</sup>	9.0	2.4 – 5.5	0.75 – $3.3/V_{IN}^{(2)}$	5.0	QFN58	10.0	12.0	1.85	277	•	•	•								
EN63A0QI	12.0	2.5 – 6.6	0.6 – $V_{IN}^{(2)}$	0.9 – 1.5	QFN76	10.0	11.0	3.0	225		•	•	•	•	•	•	•	•	•	•

PART NUMBER	MAX I <sub>OUT</sub> (A)	V <sub>IN</sub> RANGE (V)	V <sub>OUT</sub> RANGE (V)	SWITCHING FREQUENCY (MHZ)	PKG (PINS)	PKG SIZE (MM)			SOLUTION SIZE (MM <sup>2</sup> ) <sup>(1)</sup>	V <sub>OUT</sub> SET: VOLTAGE ID (VID)	POWER GOOD / POK FLAG	PROGRAMMABLE SOFT-START	PRECISION ENABLE	INPUT SYNCHRONIZATION	OUTPUT SYNCHRONIZATION	PARALLEL CAPABILITY	PROGRAMMABLE FREQUENCY	LIGHT LOAD MODE	AUTOMOTIVE-GRADE AVAILABLE						
						L	W	H																	
<b>POWERSOCS UP TO 12V INPUT</b>																									
EN2342QI	4.0	4.5 – 14.0	0.75 – 5.0	0.9 – 1.8	QFN68	8.0	11.0	3.0	200		•	•		•	•		•								
EN29A0QI	10.0	9.0 – 16.0	0.75 – 3.3	0.45 – 2.0	QFN84	12.0	14.0	4.0	450		•	•	•	•	•		•								
Footprint Compatible	EM2030xQI	4.5 – 16.0	0.5 – 1.3	0.8	QFN100	11.0	17.0	6.8	360		•	•													
	EM2040xQI									40.0															
Footprint Compatible	EM2120xQI	4.5 – 16.0	0.7 – 5.0	0.8 or 1.33	QFN100	11.0	17.0	6.8	360		•	•	•												
	EM2130xQI									30.0	0.7 – 3.6														
	EM2140xQI									40.0	0.5 – 1.325	0.8													
Footprint Compatible	EM2260xQI	4.5 – 16.0	0.5 – 1.3	0.8	QFN152	18.0	23.0	5.0	650		•	•	•	•	•										
	EM2280xQI									80.0	0.5	6.8													
<b>MULTI-OUTPUT POWERSOCS</b>																									
Footprint Compatible	EZ6301QI	1.5	2.7 – 6.6	0.6 – V <sub>IN</sub> <sup>(2)</sup>	2.5	QFN40	4.0	7.0	1.85	120		•	•	•											
		0.3	1.6 – 5.5	0.9 – V <sub>IN</sub> <sup>(2)</sup>																					
		0.3	1.6 – 5.5	0.9 – V <sub>IN</sub> <sup>(2)</sup>																					
	EZ6303QI	2.2	2.7 – 3.6	0.6 – V <sub>IN</sub> <sup>(2)</sup>	2.5	QFN40	4.0	7.0	1.85	120		•	•	•											
		0.3	1.6 – 5.5	0.9 – V <sub>IN</sub> <sup>(2)</sup>																					
		0.3	1.6 – 5.5	0.9 – V <sub>IN</sub> <sup>(2)</sup>																					
<b>LOW DROPOUT REGULATORS (LDOS)</b>																									
EY1602SI-ADJ	0.05	6.0 – 40.0	2.5 – 12.0		SOIC8	6.2	5.0	1.68	~45																
<b>DC-DC REGULATORS</b>																									
ER3105DI	0.5	3.0 – 36.0	0.6 – 34.0	0.3 – 2.0	DFN12	4.0	3.0	1.0	~160		•	•		•			•	•							
ER2120QI	2.0	5.0 – 14.0	0.6 – 5.0	0.5 – 1.2	QFN24	4.0	4.0	0.9	~165		•	•		•			•								
ER6230QI	3.0	2.7 – 6.6	0.75 – V <sub>IN</sub> <sup>(2)</sup>	1.9	QFN24	4.0	4.0	0.85	85		•	•		•			•	•							
<b>HIGH EFFICIENCY DDR MEMORY TERMINATION (VTT)</b>																									
EV1320QI	2.0	0.95 – 1.8	0.5 – 0.9	0.625	QFN16	3.3	3.3	0.9	40		•	•				•									
EV1340QI	5.0	1.0 – 1.8	0.6 – 0.9	1.5	QFN54	5.5	10.0	3.0	125		•	•													
EV1380QI	8.0	1.2 – 1.65	0.6 – 0.825	1.25 – 1.75	QFN68	8.0	11.0	3.0	200		•	•		•	•	•	•								

## FEATURED PRODUCTS

### EM2260/EM2280



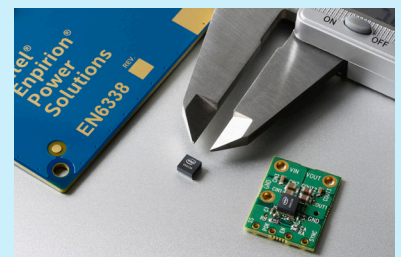
Footprint and Scalable Fully Digital PowerSoCs

### EN29A0



10 A Low-Noise PowerSoC

### EN6338



3 A High-Efficiency, Tiny PowerSoC

#### Notes:

1. Size estimate for example single-sided PCB including all suggested external components. Smaller size may be possible with double-sided PCB design.
2. Maximum V<sub>OUT</sub> = V<sub>IN</sub> - V<sub>DROPOUT</sub>, where V<sub>DROPOUT</sub> = R<sub>DROPOUT</sub> × Load Current. Reference device datasheet to calculate V<sub>DROPOUT</sub>.
3. Only "7" version features Light Load Mode. Only "8" version available in automotive grade.
4. Only "5" version features V<sub>OUT</sub> set by VID.

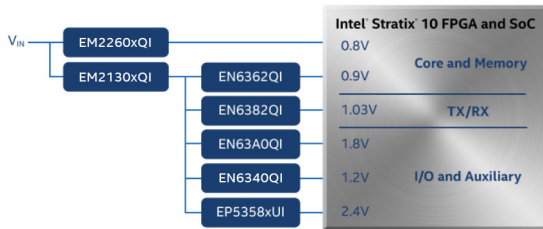
Also available:

ES1030QI: Tiny, Low-Profile, Four-Channel Power Rail Sequencer

For a complete list of Intel® Enpirion® power products, please visit [www.intel.com/enpirion](http://www.intel.com/enpirion)

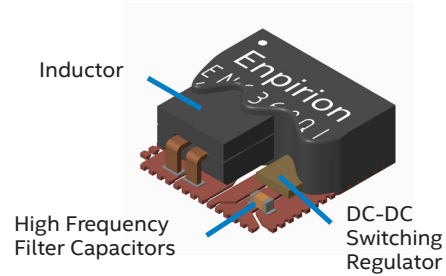
## Optimized for FPGA

With programmable logic and power expertise, Intel knows how to power FPGAs



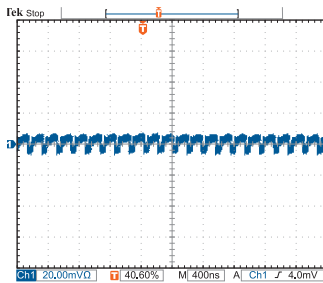
## Designed and Validated as a Complete Power Solution

Highly integrated and achieves >80,000 year mean time between failures (MTBF) reliability†



## Excellent AC+DC Noise Performance

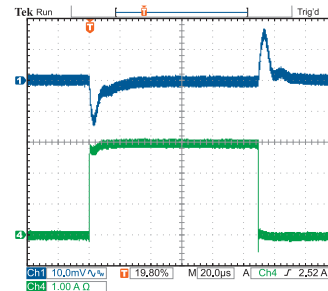
Achieve <10 mV<sub>pp</sub> ripple and ≤2% accuracy for most devices†



5 V input, 3.3 V output, 500 MHz bandwidth

## Fast Transient Response

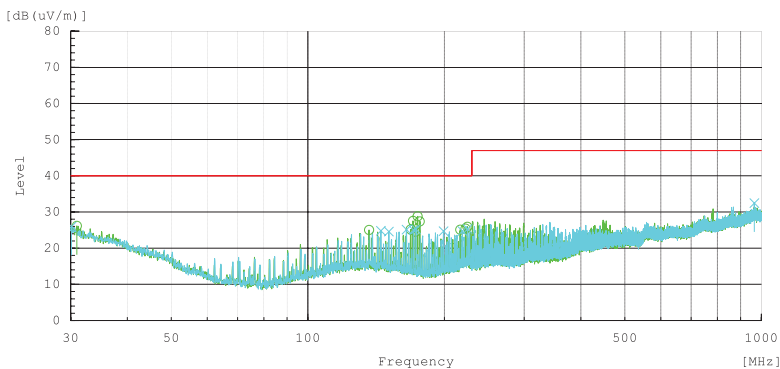
Reduce large, expensive bulk capacitance



5 V input, 3.3 V output, <16 mV deviation

## Low EMI Performance

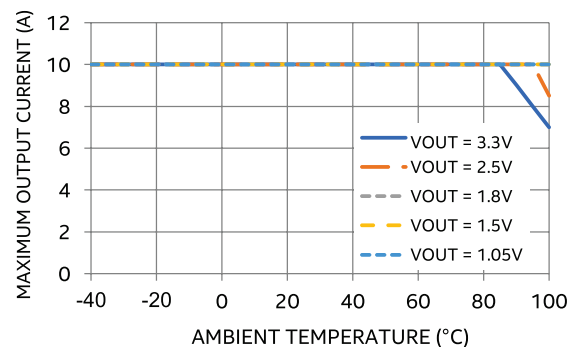
Exceeds CISPR 32 Class B Emissions



Conditions:  $V_{IN} = 12\text{ V}$ ,  $V_{OUT} = 1.2\text{ V}$

## No Thermal Derating

Minimal thermal derating up to 85°C



Conditions:  $V_{IN} = 12\text{ V}$ ,  $T_{JMAX} = 125^\circ\text{C}$ ,  $\Theta_{JA} = 10^\circ\text{C/W}$ , No Air Flow



[www.intel.com/enpirion](http://www.intel.com/enpirion)

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†Tests measure performance of components on a particular test, in specific systems. Differences in hardware, software, or configuration will affect actual performance. Consult other sources of information to evaluate performance as you consider your purchase. For more complete information about performance and benchmark results, visit [www.intel.com/benchmarks](http://www.intel.com/benchmarks).

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