45 W high efficiency adapter evaluation board

featuring 700 V CoolMOS™ P7 in SOT-223 package

DEMO_45W_19V_FLYB_P7

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GD10000490

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General description

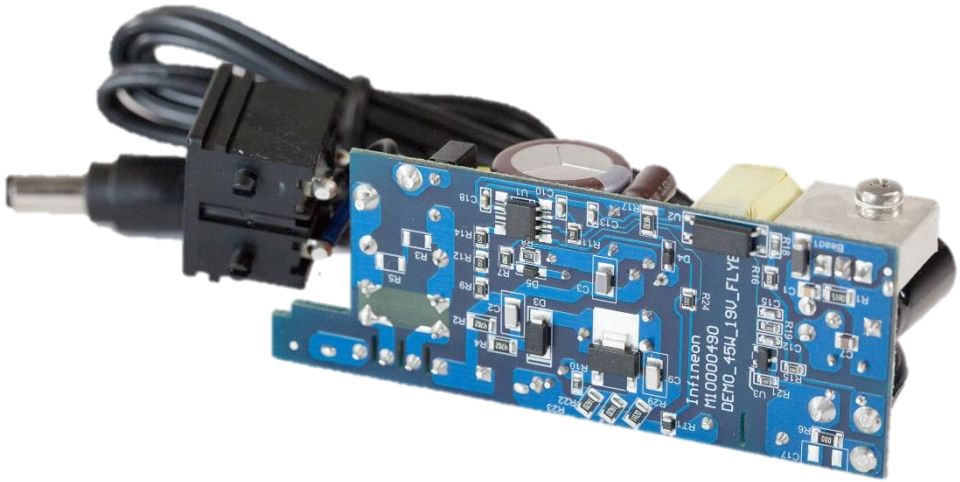
Introduction

This evaluation board (DEMO_45W_19V_FLYB_P7) was designed in a 45 W notebook adapter form factor using the 700 V CoolMOS™ P7 in a SOT-223 package (IPN70R600P7S) and a standard flyback PWM controller. The SOT-223 package is a cost effective one-to-one drop-in alternative to DPAK that also enables footprint reduction in some designs.

This evaluation board is not only designed to meet efficiency and thermal specifications, but has also passed the necessary conducted and radiated emissions requirements. It is an evaluation board design which meets the typical notebook adapter requirements and can be produced after verification tests.

Summary of features:

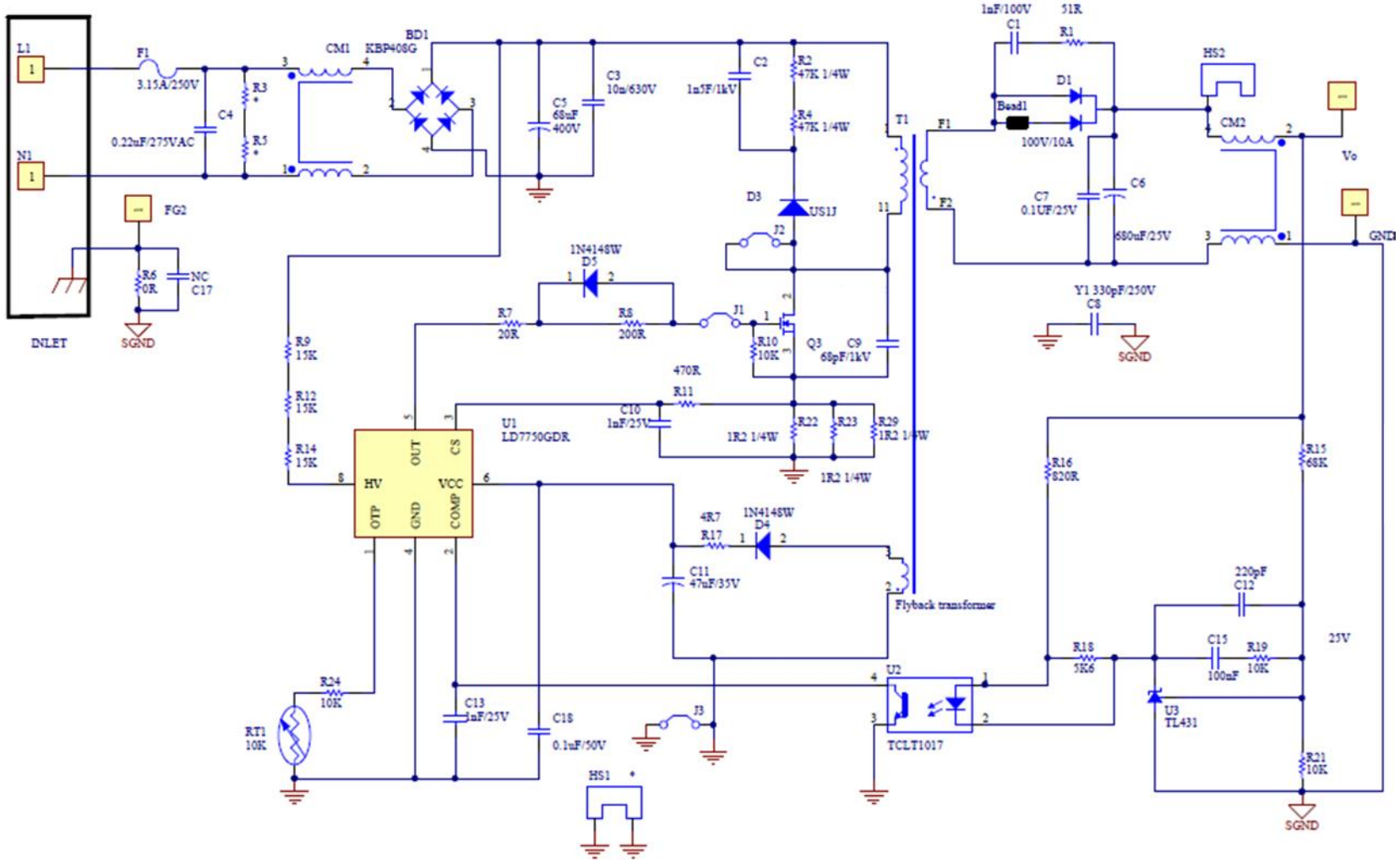
- Input voltage: 90 – 264 V_{AC}
- Output voltage: 19 V_{DC}
- Output current max.: 2.37 A
- Efficiency: ~87.9% (at 115 V_{AC}, 100% load)
- Efficiency: ~89.1% (at230 V_{AC}, 100% load)



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General description

Schematic



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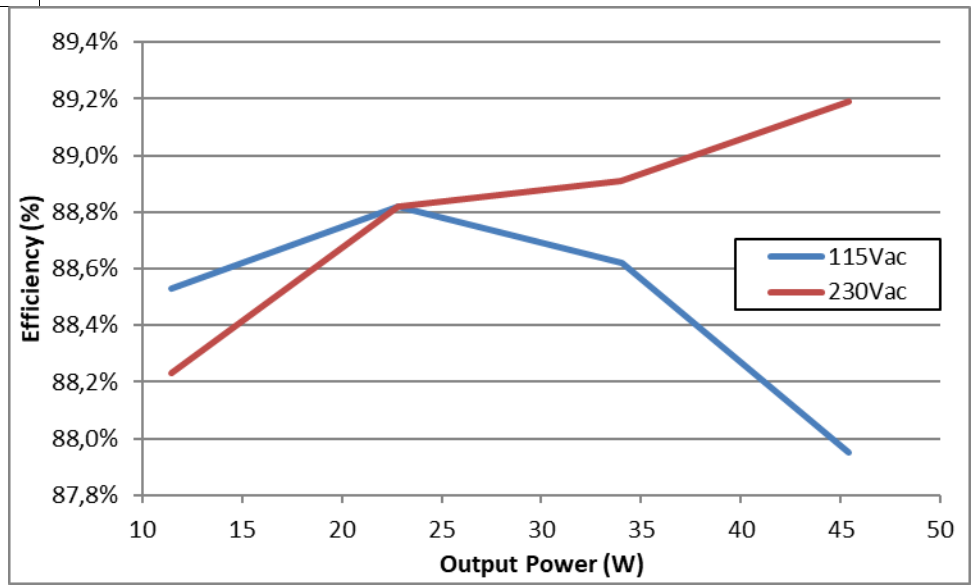
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Efficiency results

The table below shows the measured efficiency results of the final reference board meeting the EU CoC Version 6 requirements.

Input voltage	Rated power	P_{in}	V_{out}	I_{out}	P_{out}	Efficiency	Average η
115 V AC	25%	12.93	19.32	0.592	11.45	88.53%	88.53%
	50%	25.72	19.25	1.186	22.84	88.82%	
	75%	38.43	19.2	1.773	34.05	88.62%	
	100%	51.68	19.13	2.375	45.44	87.95%	
Input voltage	**Rated power**	**P_{in}**	**V_{out}**	**I_{out}**	**P_{out}**	**Efficiency**	**Average η**
230 V AC	25%	12.97	19.32	0.592	11.45	88.23%	88.79%
	50%	25.71	19.25	1.185	22.83	88.82%	
	75%	38.25	19.19	1.771	34.00	88.91%	
	100%	50.96	19.13	2.375	45.44	89.19%	





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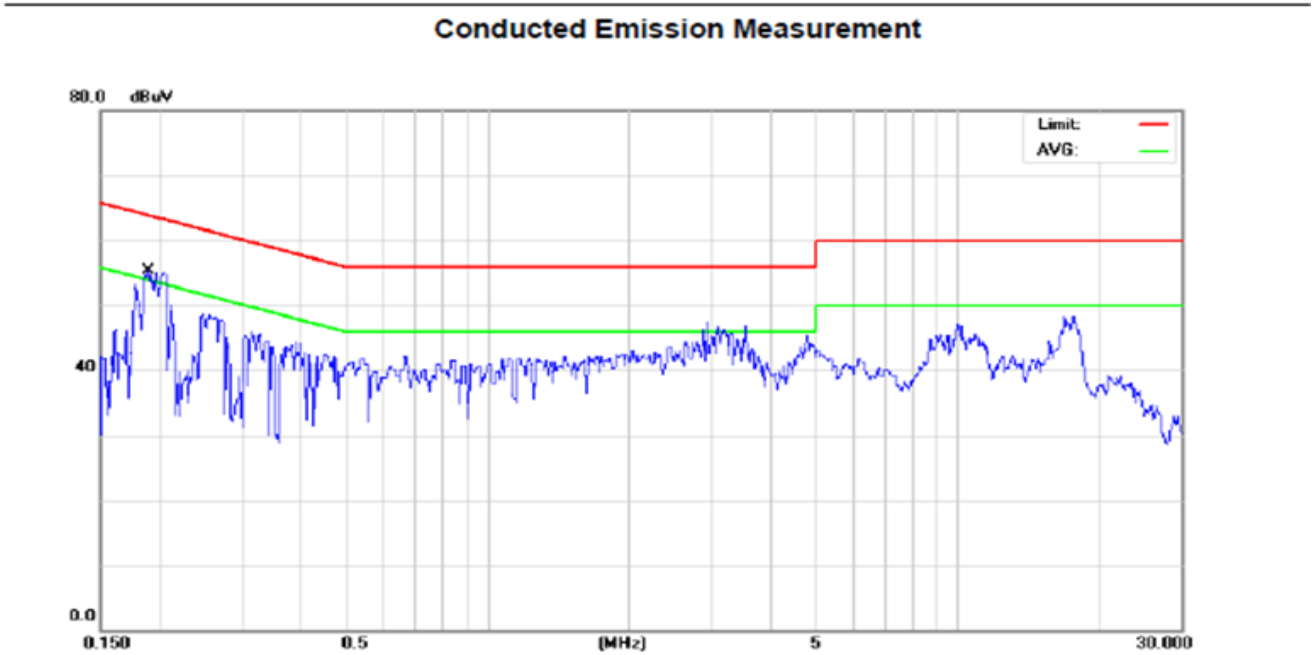
3 EMI results

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Conducted EMI results

Conducted emissions results from the reference board at 115 V_{AC} (line)

Below are the conducted emissions test results. The results are tested to the EN 55022 class B limit. With the changes mentioned in the previous sections, the reference design is capable of meeting the requirements with the QP measurement 9.94 dB below the QP limit line.

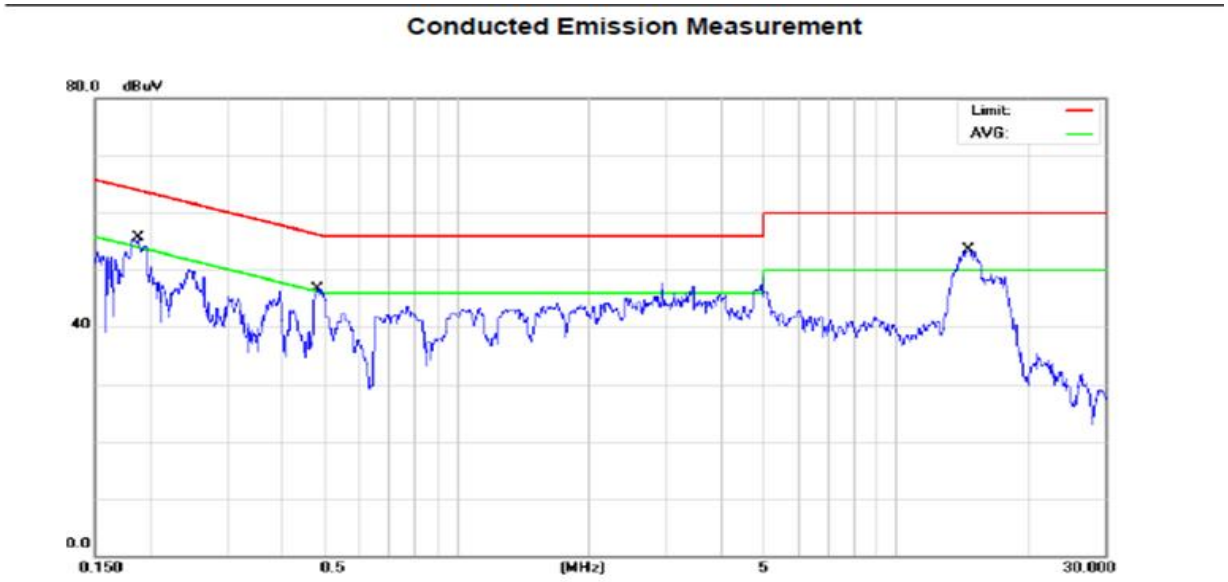


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1892	44.50	9.63	54.13	64.07	-9.94	QP	
2		0.1892	33.30	9.63	42.93	54.07	-11.14	AVG	

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Conducted EMI results

Conducted emissions results from the reference board at 230 V_{AC} (line)



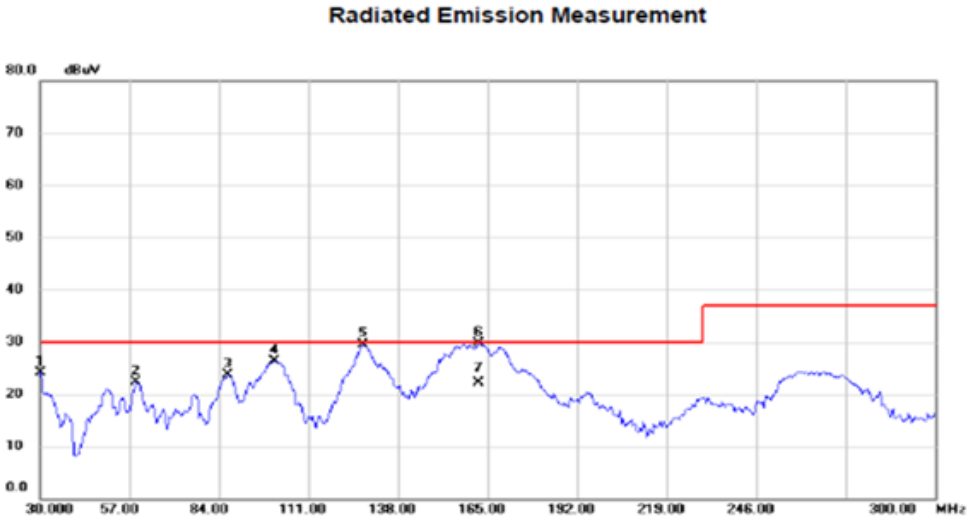
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1884	45.30	9.63	54.93	64.10	-9.17	QP	
2	*	0.1884	37.90	9.63	47.53	54.10	-6.57	AVG	
3		0.4832	35.00	9.70	44.70	56.28	-11.58	QP	
4		0.4832	23.80	9.70	33.50	46.28	-12.78	AVG	
5		14.6000	37.50	9.94	47.44	60.00	-12.56	QP	
6		14.6000	28.90	9.94	38.84	50.00	-11.16	AVG	

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Radiated EMI results

Radiated emissions results from the reference board at 115 V_{AC} (vertical)

Below are the radiated emissions test results done in at an external EMI chamber. The results are tested to the EN 55022 class B limit. With the changes mentioned in the previous sections, the reference design is capable of meeting the requirements with the QP measurement 7.32 dB below the QP limit line.

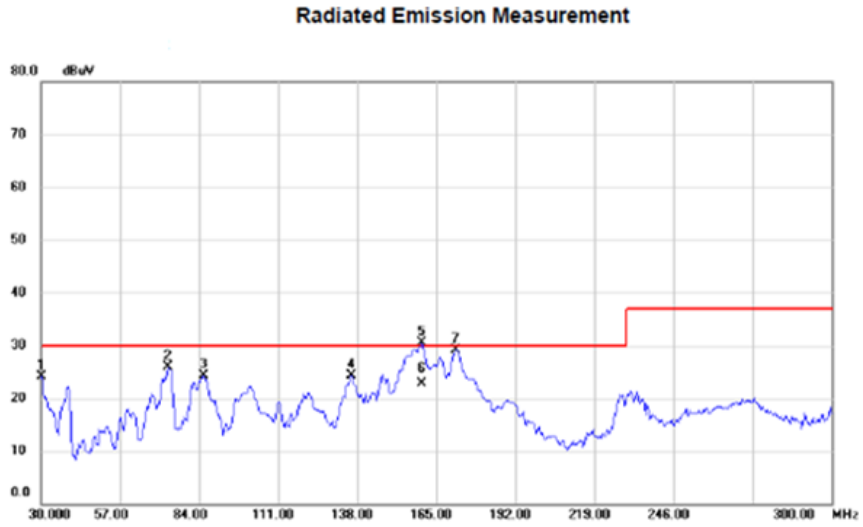


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		30.0000	56.02	-31.87	24.15	30.00	-5.85	peak	
2		59.1600	46.52	-24.15	22.37	30.00	-7.63	peak	
3		86.7000	51.31	-27.70	23.61	30.00	-6.39	peak	
4		100.7400	51.58	-25.25	26.33	30.00	-3.67	peak	
5		127.2000	49.32	-19.89	29.43	30.00	-0.57	peak	
6	*	162.3000	45.70	-15.95	29.75	30.00	-0.25	peak	
7		162.3000	38.04	-15.95	22.09	30.00	-7.91	QP	

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Radiated EMI results

Radiated emissions results from the reference board at 230 V_{AC} (vertical)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		30.0000	56.03	-31.87	24.16	30.00	-5.84	peak	
2		73.2000	51.35	-25.54	25.81	30.00	-4.19	peak	
3		85.6200	52.10	-27.87	24.23	30.00	-5.77	peak	
4		135.8400	40.91	-16.60	24.31	30.00	-5.69	peak	
5	*	160.1400	45.70	-15.19	30.51	30.00	0.51	peak	
6		160.1400	37.87	-15.19	22.68	30.00	-7.32	QP	
7		171.4800	48.45	-19.32	29.13	30.00	-0.87	peak	

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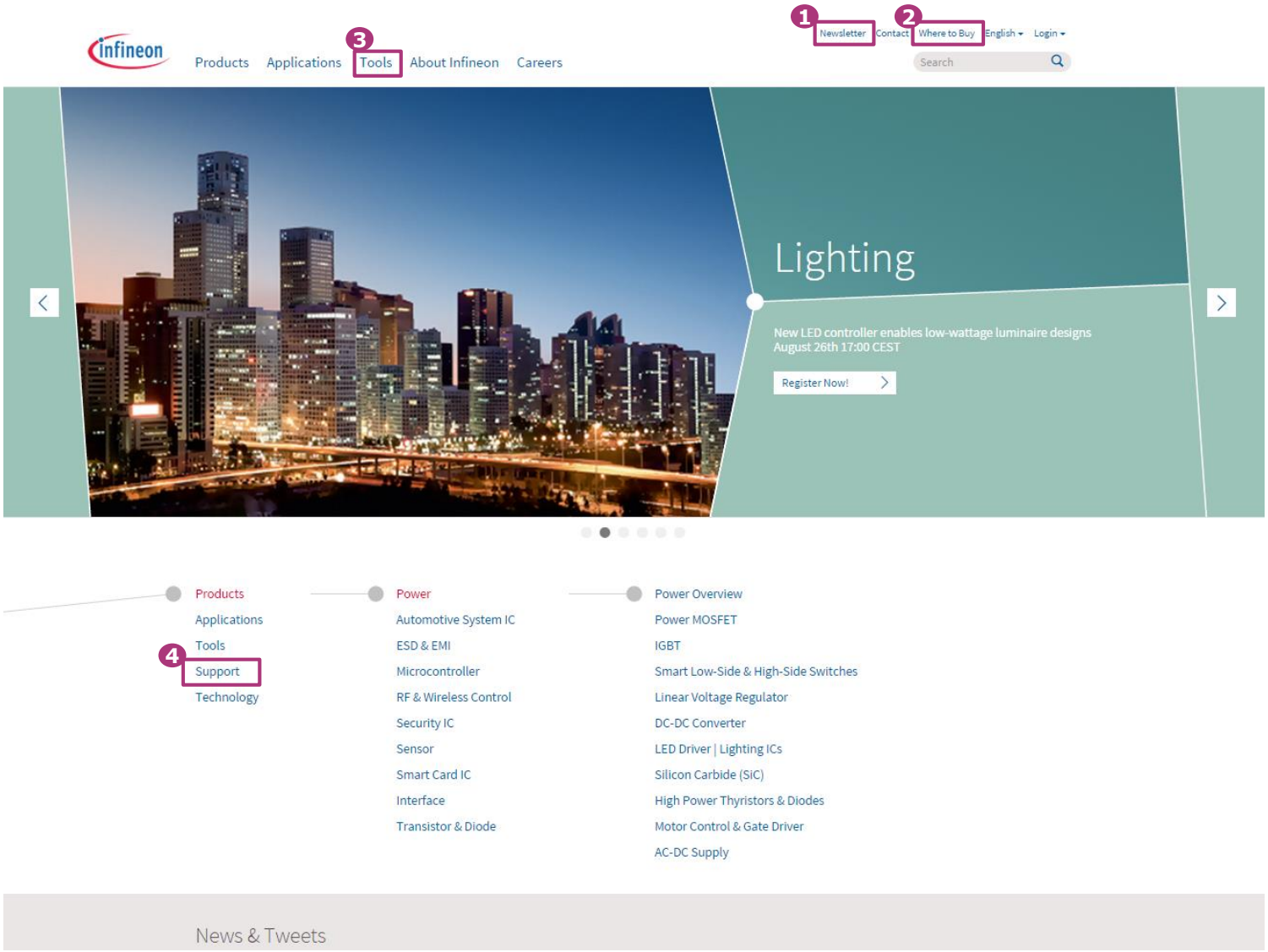
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