

# NXP power switching MOSFETs in compact QFN3333 package

Smaller. Faster. Cooler.



# 30 V Trench 6 MOSFETs in 3.3 x 3.3 mm QFN package

## A new range of 30 V Trench 6 MOSFETs in QFN3333 (SOT873) package

NXP now offers a range of high-performance, 30 V, logic-level MOSFETs in QFN3333 package. Measuring only 3.3 mm x 3.3 mm x 1 mm, the devices share the same great switching performance as our Trench-6 LFPAK types but with a 60% smaller footprint. They are ideal for space-constrained designs and high-efficiency power switching applications.

### Key benefits

- ▶ High efficiencies in power switching applications due to the optimized  $R_{DS(on)}$  and gate charge (Qg) characteristics of Trench-6 technology
- ▶ Fast switching - optimized for higher switching frequencies, typically up to 500 KHz
- ▶ 1 mm package height for low-profile applications
- ▶ Solder die-attach provides superior thermal performance -  $R_{th(j-mb)}$
- ▶ Reduced switching spikes
- ▶ Avalanche rated and 100% factory tested to ensure high reliability in your application

### Key features

- ▶ 30 V devices from 2.9 m $\Omega$ (typ) PSMN3R5-30LL to 15 m $\Omega$ (typ) PSMN017-30LL
- ▶ Rated for ID(MAX) up to 40 A
- ▶ Logic-level GATE threshold voltage
- ▶ Rugged +/-20 V GATE rating
- ▶ Devices rated to 150 °C
- ▶ ROHS compliant and halogen-free

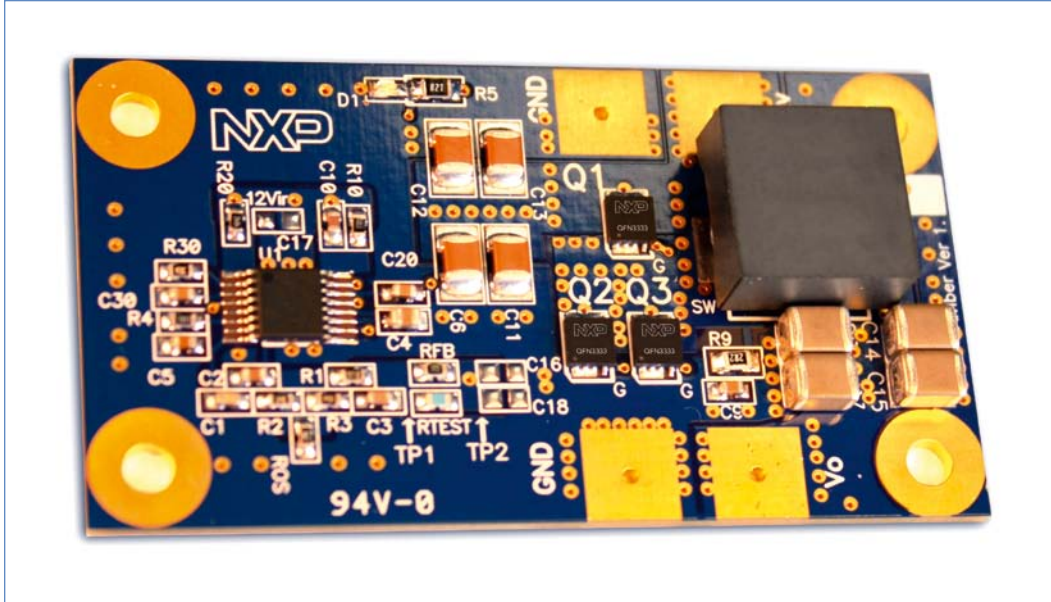
### Key applications

- ▶ DC:DC converters – Point-of-Load modules
- ▶ Battery protection – Li-Ion battery packs
- ▶ Load switching
- ▶ Power ORing
- ▶ Voltage regulator modules (VRMs)

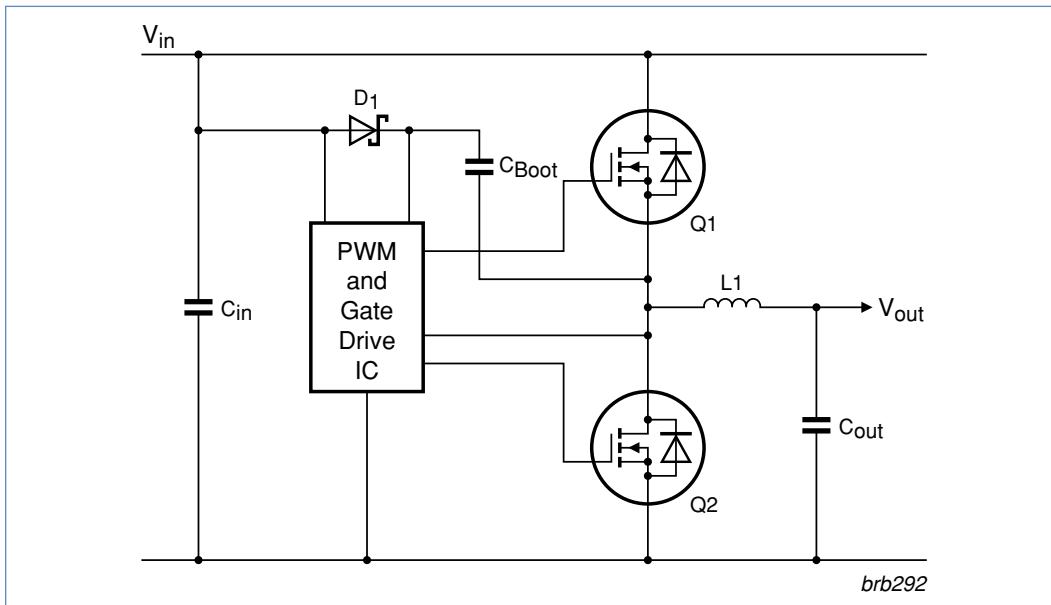


NXP already leads the way with its range of Trench 6 MOSFETs in LFPACK (Loss Free PAcKage). By combining the same great Trench 6 technology with the high performance QFN3333 package, our new 30 V devices are perfect for a wide range of space constrained power switching designs. The low  $R_{DSon}$  types use a solder die-attach and provide low thermal resistance and high reliability, ideal for the most demanding applications. Typical applications include synchronous buck converters, DC-DC applications, battery protection, load switching and power-ORing.

NXP QFN3333 Synchronous-buck evaluation PCB shows efficiency gains and reduced spiking when compared to equivalent LFPACK types.



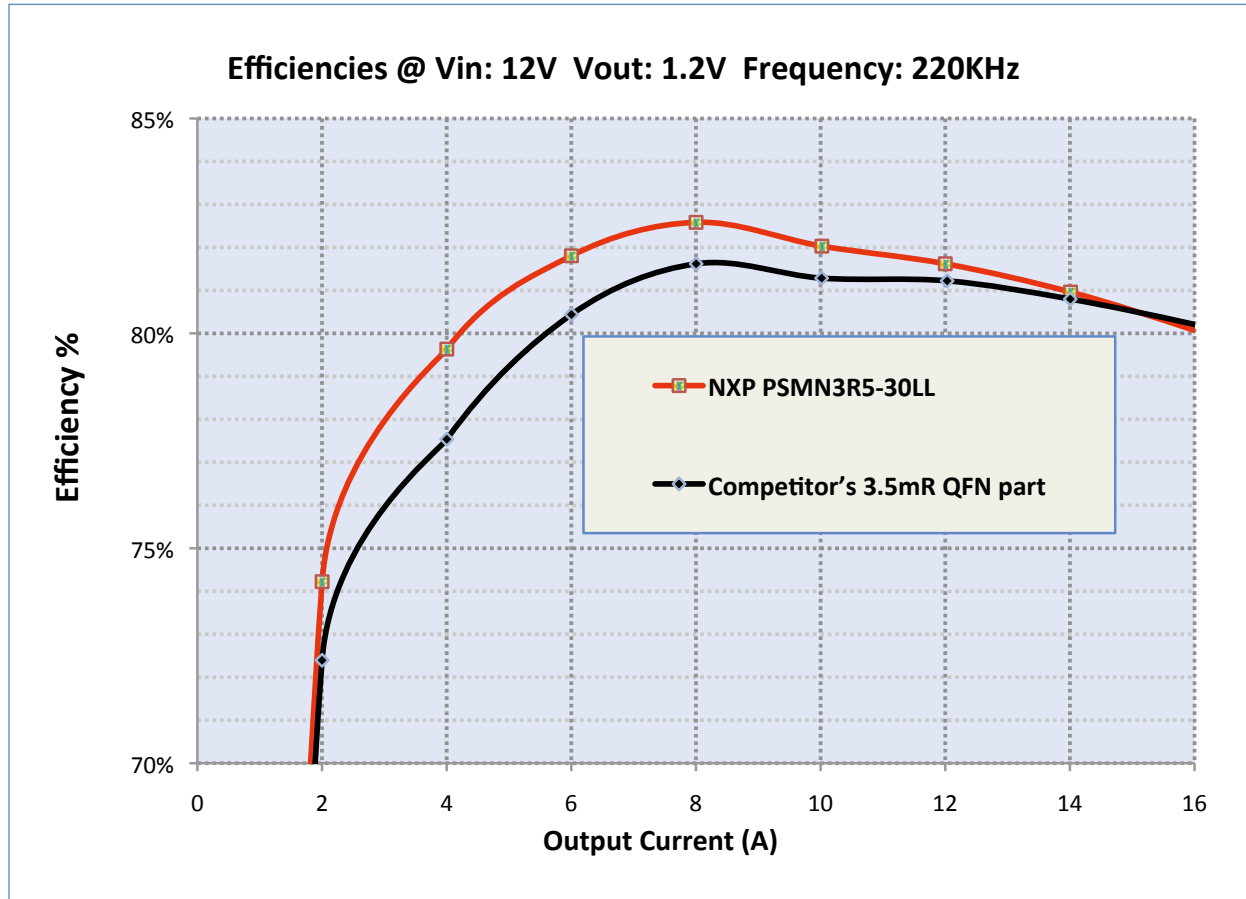
NXP QFN3333 Synchronous-buck evaluation PCB



Synchronous-buck regulator

The following graph and table compares the efficiency curve of the NXP 3.5 mΩ PSMN3R5-30LL and the leading competitor's 3.5 mΩ equivalent part. The Efficiency curves are measured on NXP's QFN3333 Synchronous-buck evaluation PCB and the MOSFETs are arranged in a 1-high & 1-low configuration.

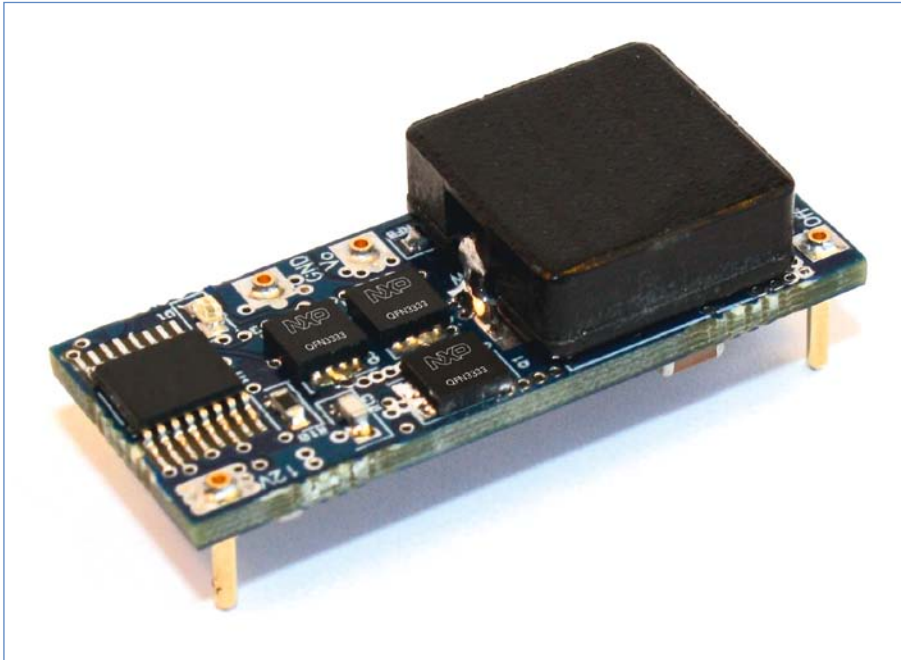
The results show that the NXP part achieves approx 1.1% better average efficiency and 1.2% better peak efficiency compared to the leading competitor's 3.5 mΩ part.



MOSFET type	Average efficiency %	Peak efficiency %	$R_{DS(on)}$ Max $V_g=10$ V	$R_{DS(on)}$ Typ $V_g=10$ V	$Q_g(Tot)$ Typ @10 V
PSMN3R5-30LL	80.5%	82.8%	3.55 mΩ	2.9 mΩ	37 nC
Competitor 3.5 mΩ	79.4%	81.6%	3.5 mΩ	2.9 mΩ	42 nC

NXP's space-optimized QFN3333 evaluation PCB demonstrates the usefulness of QFN3333 devices in achieving miniaturized designs. The DC-DC synchronous buck evaluation board, below, measures only 33 mm x 13 mm and delivers a powerful 14 amps output current with 86% peak efficiency ( $V_{in}=12\text{ V}$ ,  $V_{out}=1.2\text{ V}$ ,  $F_{req(sw)}=500\text{ KHz}$ ).

With a range of 30 V parts from 3.55 m $\Omega$  to 17 m $\Omega$ , NXP has the right combination of MOSFETs for your high performance and high efficiency power switching applications.



NXP QFN3333 synchronous-buck demonstrator board measuring only 13 mm x 33 mm

Type number	Package	V <sub>DS</sub>	R <sub>DS(on)</sub> Max mΩ V <sub>GS</sub> =10v	R <sub>DS(on)</sub> Typ mΩ V <sub>GS</sub> =10v	Qg(tot) Typ nC V <sub>GS</sub> =10v
<b>PSMN3R5-30LL</b>	<b>QFN3333</b>	<b>30</b>	<b>3.55</b>	<b>2.9</b>	<b>37</b>
<b>PSMN3R8-30LL</b>	<b>QFN3333</b>	<b>30</b>	<b>3.7</b>	<b>3</b>	<b>38</b>
<b>PSMN5R8-30LL</b>	<b>QFN3333</b>	<b>30</b>	<b>5.8</b>	<b>5</b>	<b>30</b>
<b>PSMN9R0-30LL</b>	<b>QFN3333</b>	<b>30</b>	<b>9</b>	<b>8</b>	<b>20.6</b>
<b>PSMN013-30LL</b>	<b>QFN3333</b>	<b>30</b>	<b>13</b>	<b>11</b>	<b>12.2</b>
<b>PSMN017-30LL</b>	<b>QFN3333</b>	<b>30</b>	<b>17</b>	<b>15</b>	<b>10</b>
<i>PSMN7R0-40LS</i>	<i>QFN3333</i>	<i>40</i>	<i>7</i>	-	-
<i>PSMN014-60LS</i>	<i>QFN3333</i>	<i>60</i>	<i>14</i>	-	-
<i>PSMN023-80LS</i>	<i>QFN3333</i>	<i>80</i>	<i>23</i>	-	-
<i>PSMN035-100LS</i>	<i>QFN3333</i>	<i>100</i>	<i>35</i>	-	-
PSMN1R2-25YL	LFPAK	25	1.2	0.9	105
PSMN1R5-25YL	LFPAK	25	1.5	1.13	76
PSMN1R3-30YL	LFPAK	30	1.3	1.04	100
PSMN1R5-30YL	LFPAK	30	1.5	1.29	77.9
PSMN1R6-30YL	LFPAK	30	1.6	1.29	77.9
PSMN1R7-30YL	LFPAK	30	1.7	1.29	77.9
PSMN2R0-30YL	LFPAK	30	2	1.55	64
PSMN2R5-30YL	LFPAK	30	2.4	1.79	57
PSMN3R0-30YL	LFPAK	30	3	2.19	45.8
PSMN3R5-30YL	LFPAK	30	3.5	2.43	41
PSMN4R0-30YL	LFPAK	30	4	2.72	36.6
PSMN5R0-30YL	LFPAK	30	5	3.63	29
PSMN6R0-30YL	LFPAK	30	6	4.26	24
PSMN7R0-30YL	LFPAK	30	7	4.92	22
PSMN9R0-30YL	LFPAK	30	8	6.16	17.8
PSMN2R6-40YS	LFPAK	40	2.8	2	63
<i>PSMN3R3-40YS</i>	<i>LFPAK</i>	<i>40</i>	<i>3.3</i>	<i>2.6</i>	<i>49</i>
PSMN4R0-40YS	LFPAK	40	4.2	3.2	38
<i>PSMN5R8-40YS</i>	<i>LFPAK</i>	<i>40</i>	<i>5.7</i>	<i>4.4</i>	<i>28.8</i>
PSMN8R3-40YS	LFPAK	40	8.6	6.6	20
<i>PSMN014-40YS</i>	<i>LFPAK</i>	<i>40</i>	<i>14</i>	<i>11</i>	<i>12</i>
PSMN5R5-60YS	LFPAK	60	5.2	3.6	56
PSMN7R0-60YS	LFPAK	60	6.4	4.95	45
PSMN8R5-60YS	LFPAK	60	8	5.6	39
PSMN012-60YS	LFPAK	60	11.1	8	28.4
PSMN017-60YS	LFPAK	60	15.7	12.3	20
<i>PSMN030-60YS</i>	<i>LFPAK</i>	<i>60</i>	<i>24.7</i>	<i>19.1</i>	<i>13</i>
PSMN8R2-80YS	LFPAK	80	8.5	5.8	56
<i>PSMN011-80YS</i>	<i>LFPAK</i>	<i>80</i>	<i>11</i>	<i>8</i>	<i>45</i>
PSMN013-80YS	LFPAK	80	12.9	9.7	37
<i>PSMN018-80YS</i>	<i>LFPAK</i>	<i>80</i>	<i>18</i>	-	-
PSMN026-80YS	LFPAK	80	27.5	20	20
<i>PSMN045-80YS</i>	<i>LFPAK</i>	<i>80</i>	<i>45</i>	<i>37</i>	<i>12.5</i>
PSMN012-100YS	LFPAK	100	12.8	10	64
PSMN016-100YS	LFPAK	100	16.3	12.7	54
PSMN020-100YS	LFPAK	100	20.5	15	41
PSMN028-100YS	LFPAK	100	27.5	21.4	33
PSMN039-100YS	LFPAK	100	39.5	30.8	23
<i>PSMN069-100YS</i>	<i>LFPAK</i>	<i>100</i>	<i>69</i>	-	-
PSMN1R6-30PL	TO-220	30	1.7	1.4	212
<i>PSMN1R8-30PL</i>	<i>TO-220</i>	<i>30</i>	<i>1.8</i>	<i>1.5</i>	<i>170</i>
PSMN2R0-30PL	TO-220	30	2.1	1.7	117
<i>PSMN2R7-30PL</i>	<i>TO-220</i>	<i>30</i>	<i>2.7</i>	<i>2.3</i>	<i>32</i>
<i>PSMN3R4-30PL</i>	<i>TO-220</i>	<i>30</i>	<i>3.4</i>	-	-
PSMN4R3-30PL	TO-220	30	4.3	3.5	41.5
<i>PSMN022-30PL</i>	<i>TO-220</i>	<i>30</i>	<i>22</i>	-	-

Types in **bold red** represent new products

Types in *red italic underline* are planned for release in Q2-2010

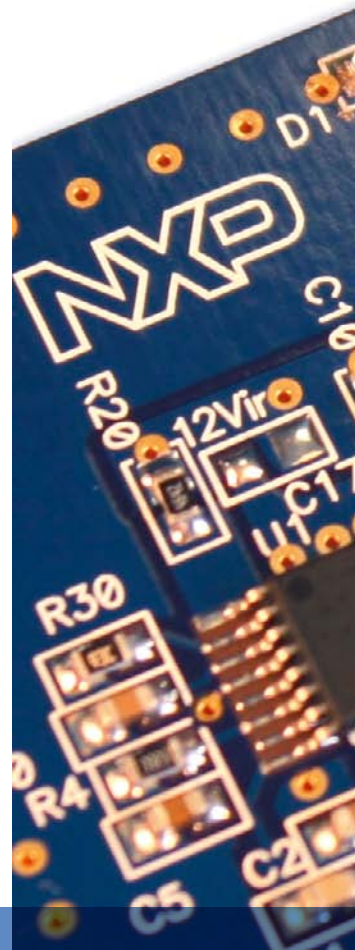
Type number	Package	V <sub>DS</sub>	R <sub>DS(on)</sub> Max mΩ V <sub>GS</sub> =10V	R <sub>DS(on)</sub> Typ mΩ V <sub>GS</sub> =10V	Qg(tot) Typ nC V <sub>GS</sub> =10V
PSMN2R2-40PS	TO-220	40	2.1	1.75	130
<i>PSMN2R8-40PS</i>	<i>TO-220</i>	<i>40</i>	<i>2.8</i>	-	-
PSMN4R5-40PS	TO-220	40	4.6	3.9	42.3
PSMN8R0-40PS	TO-220	40	7.6	6.2	21
PSMN3R0-60PS	TO-220	60	3	2.4	130
PSMN4R6-60PS	TO-220	60	4.6	3.5	70.8
PSMN7R6-60PS	TO-220	60	7.8	6.8	39
PSMN015-60PS	TO-220	60	14.8	12.6	20.9
PSMN4R4-80PS	TO-220	80	4.1	3.3	125
PSMN5R0-80PS	TO-220	80	4.7	3.7	101
<i>PSMN6R5-80PS</i>	<i>TO-220</i>	<i>80</i>	<i>6.5</i>	-	-
<i>PSMN8R7-80PS</i>	<i>TO-220</i>	<i>80</i>	<i>8.7</i>	-	-
PSMN012-80PS	TO-220	80	11	9	43
<i>PSMN017-80PS</i>	<i>TO-220</i>	<i>80</i>	<i>17</i>	-	-
PSMN050-80PS	TO-220	80	51	37	11
PSMN5R6-100PS	TO-220	100	5.6	4.3	141
PSMN7R0-100PS	TO-220	100	6.8	5.2	125
PSMN9R5-100PS	TO-220	100	9.6	8.16	82
PSMN013-100PS	TO-220	100	13.9	11	59
PSMN016-100PS	TO-220	100	16	13	49
PSMN027-100PS	TO-220	100	26.8	21	30
<i>PSMN034-100PS</i>	<i>TO-220</i>	<i>100</i>	<i>34.5</i>	<i>29.3</i>	<i>23.8</i>
PSMN7R0-100ES	I2PAK	100	6.8	5.4	125
PSMN013-100ES	I2PAK	100	13.9	11	59

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### Part numbering for NXP Trench 6 MOSFETs

<u>P</u>	<u>S</u>	<u>M</u>	<u>N</u>	<u>1</u>	<u>R</u>	<u>7</u>	-	<u>3</u>	<u>0</u>	<u>Y</u>	<u>S</u>
<b>MOSFET Brand name</b>	<b>MOSFET type</b> N -ch or P -ch		<b>MOSFET on - resistance</b> R <sub>DS(on)</sub>	<b>MOSFET voltage</b> BV <sub>DSS</sub>		<b>Package type</b>	<b>Gate threshold voltage</b>				
Power Silicon Max	N = N -ch		R95 = 0.95 mΩ	25 = 25 V		B = D2PAK SOT404	X = Extremely low				
	P = P -ch		1R7 = 1.7 mΩ	30 = 30 V		D = D2PAK SOT428	L = logic level				
	X = Dual N -ch		014 = 14 mΩ	40 = 40 V		E = I2PAK SOT226	S = standard level				
	X = Dual P -ch		125 = 125 mΩ	60 = 60 V		K = SO8 SOT96					
	Z = N -ch + P -ch			80 = 80 V		L = QFN3333 SOT873					
				100 = 100 V		P = TO220 SOT78					
				110 = 110 V		Y = LFPK SOT669 & SOT1023					



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