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# MOSFETS

Vishay Siliconix

## MOSFETs for Home Solar Electric and Energy Storage Systems



### 40 V to 800 V MOSFET Solutions

#### KEY BENEFITS:

- E Series Superjunction Standard MOSFETs
  - Best in class PFC or hard switching topology solutions
  - Lowest FOM
- EF Series Superjunction MOSFETs with Integrated Fast Body Diode
  - Fast body diode provides up to a 10x reduction in  $Q_{rr}$  over the standard E Series MOSFET for lifetime control
  - 2x reduction in charging and discharging time over competition
  - Designed and developed for soft switching topologies such as LLC resonant converters
- Gen VI and Gen V Medium Voltage MOSFETs
  - 40 V to 150 V device options
  - Optimized combination of  $R_{DS(ON)}$ ,  $Q_g$ , and  $C_{oss}$

#### RESOURCES

- For technical questions contact: [pmossupport@vishay.com](mailto:pmossupport@vishay.com)

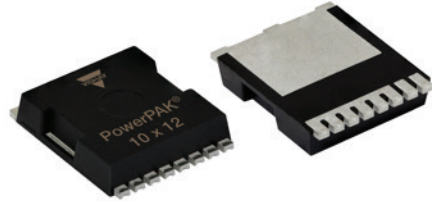


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### Available in Latest Surface-Mount Package Solutions

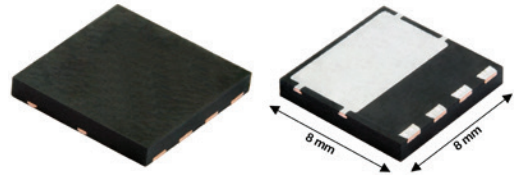
#### PowerPAK® 10 x 12

- Dimensions: 9.9 mm x 11.7 mm with low 2.3 mm profile
- TO leadless package
- Integrated Kelvin source connection



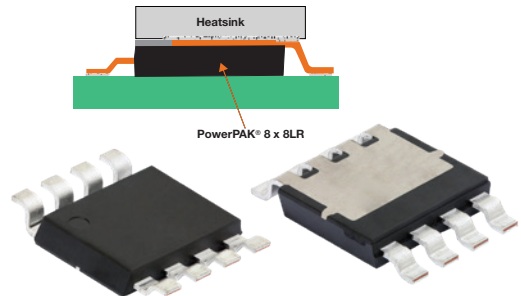
#### PowerPAK® 8 x 8

- Dimensions: 8 mm x 8 mm with low 1 mm profile
- Integrated Kelvin source connection
- Fully RoHS-compliant, halogen-free, and 100 % lead (Pb)-free



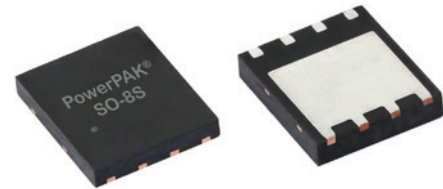
#### PowerPAK® 8 x 8LR

- Top-side cooling
- Dimensions: 10.42 mm x 8 mm with low 1.65 mm profile
- Extremely low junction to case thermal resistance of 0.25 °C/W
- Integrated Kelvin source connection



#### PowerPAK® SO-8S

- Ultra low  $R_{DS(ON)}$  for high density solution
- Lower thermal resistance to enhance power dissipation
- Dimension and land pattern compatible with PowerPAK® SO-8
- Robust SOA capability



#### PowerPAK® SO-8DC

- Double-sided cooling for high density solution
- Lower thermal resistance to enhance power dissipation
- Junction temperature upgrade to 175 °C
- Dimension and land pattern compatible with PowerPAK® SO-8
- Robust SOA capability

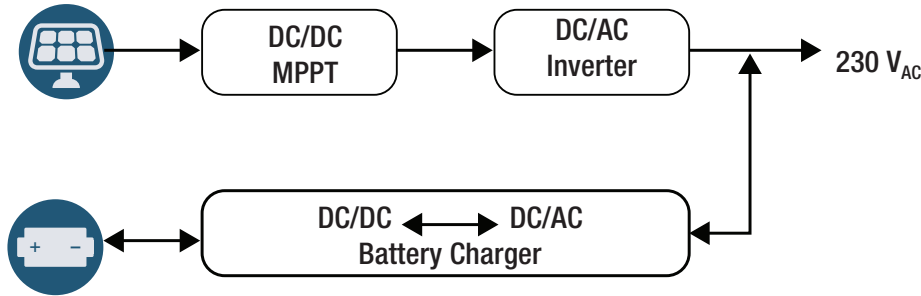


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## Applications:

### Home Energy Storage System

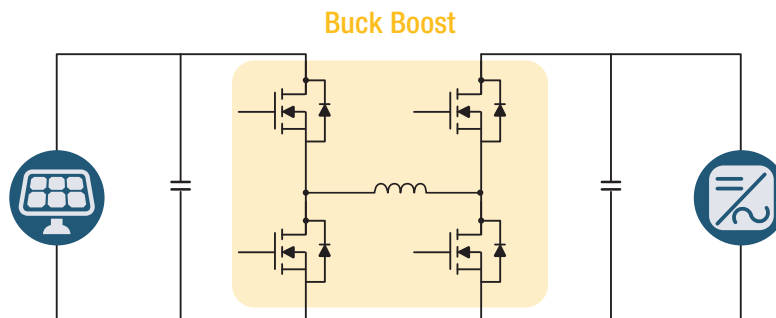
As shown in Figure 1, a simple home solar system includes a PV panel, MPPT, and inverter. However, it only provides self-sufficiency of 30 %. By incorporating a battery and battery charger, self-sufficiency can be increased to 70 %. Below, we'll explore Vishay high and low voltage MOSFETs for these functions.



### MPPT

#### MPPT Converter - Gen IV and Gen V Medium Voltage MOSFETs

- Ideal combination of  $R_{DS(ON)}$ ,  $Q_g$ , and  $C_{oss}$



#### 40 V to 150 V PowerPAK® SO-8S MOSFETs

- SiRS5700DP: 150 V / 5.6 mΩ
- SiRS5100DP: 100 V / 2.5 mΩ
- SiRS5800DP: 80 V / 1.8 mΩ
- SiRS4600DP: 60 V / 1.15 mΩ
- SiRS4400DP: 40 V / 0.69 mΩ

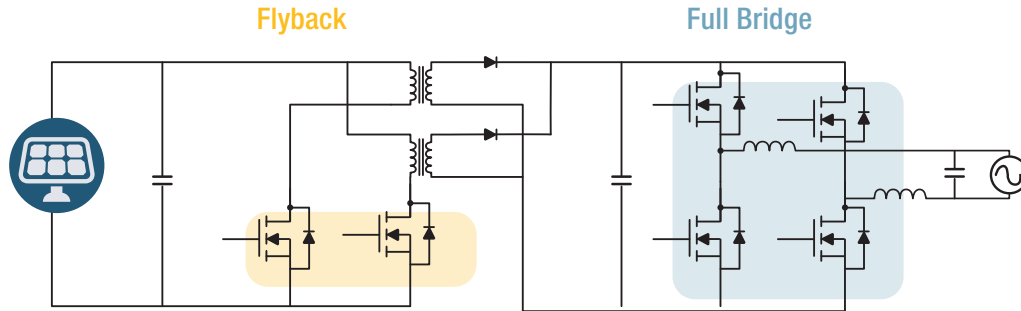
#### 40 V to 150 V PowerPAK® SO-8 MOSFETs

- SiR570DP: 150 V / 7.9 mΩ
- SiR510DP: 100 V / 4.2 mΩ
- SiR580DP: 80 V / 2.7 mΩ
- SiR626DP: 60 V / 1.7 mΩ
- SiR638DP: 40 V / 0.88 mΩ

#### 40 V to 150 V PowerPAK® SO-8DC MOSFETs

- SiDR570EP: 150 V / 7.9 mΩ
- SiDR510EP: 100 V / 4.2 mΩ
- SiDR5802EP: 80 V / 2.9 mΩ
- SiDR626EP: 60 V / 1.74 mΩ
- SiDR402EP: 40 V / 0.88 mΩ

## Inverter - Micro Inverter



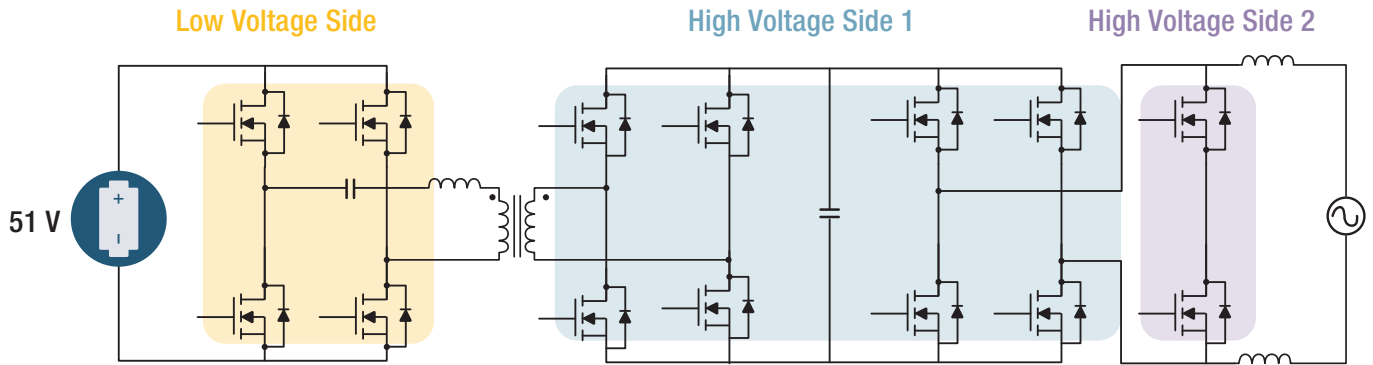
### Flyback Converter - Gen V Medium Voltage MOSFETs

- Ideal combination of  $R_{DS(ON)}$ ,  $Q_g$ , and  $C_{oss}$
- SiRS5700DP: 150 V / 5.6 m $\Omega$
- SiDR57XEP: 150 V / 7.9 m $\Omega$  - 8.8 m $\Omega$
- SiR57xDP: 150 V / 8 m $\Omega$  - 16 m $\Omega$

### Full-Bridge Inverter – 600 V to 800 V Superjunction E Series MOSFETs

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• DPAK <ul style="list-style-type: none"> <li>– SiHD180N60E: 600 V / 196 m<math>\Omega</math></li> </ul> </li> <li>• D<sup>2</sup>PAK <ul style="list-style-type: none"> <li>– SiHB080N60E: 600 V / 80 m<math>\Omega</math></li> <li>– SiHB100N60E: 600 V / 100 m<math>\Omega</math></li> <li>– SiHB120N60E: 600 V / 120 m<math>\Omega</math></li> <li>– SiHB150B60E: 600 V / 158 m<math>\Omega</math></li> <li>– SiHB180N60E: 600 V / 180 m<math>\Omega</math></li> <li>– SiHB17N80AE: 800 V / 290 m<math>\Omega</math></li> <li>– SiHB21N80AE: 800 V / 235 m<math>\Omega</math></li> <li>– SiHB24N80AE: 800 V / 184 m<math>\Omega</math></li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• PowerPAK® 8 x 8LR <ul style="list-style-type: none"> <li>– SiHR080N60E: 600 V / 84 m<math>\Omega</math></li> </ul> </li> <li>• PowerPAK® 10 x 12 <ul style="list-style-type: none"> <li>– SiHK075N60E: 600 V / 80 m<math>\Omega</math></li> <li>– SiHK105N60E: 600 V / 100 m<math>\Omega</math></li> <li>– SiHK125N60E: 600 V / 125 m<math>\Omega</math></li> <li>– SiHK155N60E: 600 V / 158 m<math>\Omega</math></li> </ul> </li> </ul> |
|--|---|

## Home Energy Storage - Battery Charger



### Low Voltage Side – Gen V 100 V to 150 V MOSFETs

- Ideal combination of  $R_{DS(ON)}$ ,  $Q_g$ , and  $C_{oss}$ 
  - SiRS5100DP: 100 V / 2.5 m $\Omega$
  - SiRS5700DP: 150 V / 5.6 m $\Omega$
  - SiDR51XEP: 100 V / 3.0 m $\Omega$  - 3.4 m $\Omega$
  - SiDR57XEP: 150 V / 7.9 m $\Omega$  - 8.8 m $\Omega$
  - SiR51xDP: 100 V / 3 m $\Omega$  - 8 m $\Omega$
  - SiR57xDP: 150 V / 8 m $\Omega$  - 16 m $\Omega$

### High Voltage Side 1 – 600 V Superjunction

#### EF Series MOSFETs

- PowerPAK® 8 x 8
  - SiHH070N60EF: 600 V / 71 m $\Omega$
  - SiHH085N60EF: 600 V / 85 m $\Omega$
  - SiHH105N60EF: 600 V / 105 m $\Omega$
- PowerPAK® 10 x 12
  - SiHK045N60EF: 600 V / 52 m $\Omega$
  - SiHK055N60EF: 600 V / 58 m $\Omega$
  - SiHK075N60EF: 600 V / 71 m $\Omega$
  - SiHK085N60EF: 600 V / 85 m $\Omega$
  - SiHK105N60EF: 600 V / 105 m $\Omega$
- D<sup>2</sup>PAK
  - SiHB055N60EF: 600 V / 55 m $\Omega$
  - SiHB068N60EF: 600 V / 68 m $\Omega$
  - SiHB085N60EF: 600 V / 85 m $\Omega$
  - SiHB105N60EF: 600 V / 105 m $\Omega$

### High Voltage Side 2 – 600 V Superjunction

#### E Series MOSFETs

- PowerPAK® 8 x 8LR
  - SiHR080N60E: 600 V / 84 m $\Omega$
- PowerPAK® 10 x 12
  - SiHK045N60E: 600 V / 49 m $\Omega$
  - SiHK055N60E: 600 V / 56 m $\Omega$
  - SiHK065N60E: 600 V / 67 m $\Omega$
  - SiHK075N60E: 600 V / 80 m $\Omega$
  - SiHK105N60E: 600 V / 100 m $\Omega$



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Part Number	Package	V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	R <sub>DS(on)</sub> (Ω) Max. V <sub>GS</sub> = 10 V	R <sub>DS(on)</sub> (Ω) Max. V <sub>GS</sub> = 7.5 V	Q <sub>g</sub> (nC) Typ. V <sub>GS</sub> = 10 V	Q <sub>gs</sub> Typ. (nC)	Q <sub>gd</sub> Typ. (nC)	I <sub>D</sub> (A) TC = 25 °C	R <sub>θ</sub> Typ. (Ω)
<b>LVM</b>										
<a href="#">SiRS5700DP</a>	PowerPAK® SO-8S	150	20	0.006	0.006	73	25	7.6	144	2.8
<a href="#">SiRS5702DP</a>	PowerPAK® SO-8S	150	20	0.007	0.008	58	22	5.1	119	1.2
<a href="#">SIDR570EP</a>	PowerPAK® SO-8DC	150	20	0.008	0.009	46.9	18.1	4.2	90.9	1.1
<a href="#">SiR570DP</a>	PowerPAK® SO-8	150	20	0.008	0.009	46.9	18.1	4.2	77.4	1.1
<a href="#">SiR578DP</a>	PowerPAK® SO-8	150	20	0.009	0.01	30	13.5	2	70.2	1.35
<a href="#">SiR572DP</a>	PowerPAK® SO-8	150	20	0.011	0.012	35.9	12.7	3.8	59.7	1.05
<a href="#">SiR574DP</a>	PowerPAK® SO-8	150	20	0.014	0.014	31.5	11.6	3.7	48.1	1
<a href="#">SiR576DP</a>	PowerPAK® SO-8	150	20	0.016	0.017	25.2	9.1	2.8	42.2	1
<a href="#">SiRS5100DP</a>	PowerPAK® SO-8S	100	20	0.003	0.003	68	24	5.1	225	1.4
<a href="#">SIDR510EP</a>	PowerPAK® SO-8DC	100	20	0.004	0.004	54	23.3	3	148	1.15
<a href="#">SiR510DP</a>	PowerPAK® SO-8	100	20	0.004	0.004	54	23.3	3	126	1.15
<a href="#">SiR5102DP</a>	PowerPAK® SO-8	100	20	0.004	0.006	33.7	15.7	1.7	110	1.15
<a href="#">SiR512DP</a>	PowerPAK® SO-8	100	20	0.005	0.005	41	17.9	2.3	100	1.05
<a href="#">SiR514DP</a>	PowerPAK® SO-8	100	20	0.006	0.007	31	12.4	1.7	84.8	1.05
<a href="#">SiR516DP</a>	PowerPAK® SO-8	100	20	0.008	0.009	23.6	10.1	1.6	63.7	0.95
<a href="#">SiRS5800DP</a>	PowerPAK® SO-8S	80	20	0.002	0.002	81	31	7.6	265	1.3
<a href="#">SiDR5802EP</a>	PowerPAK® SO-8DC	80	20	0.003	0.004	37.3	16.5	3.2	153	1.1
<a href="#">SiR580DP</a>	PowerPAK® SO-8	80	20	0.003	0.003	50.6	22	3.9	146	1.1
<a href="#">SiRS4600DP</a>	PowerPAK® SO-8S	60	20	0.001	0.001	108	33	14	334	1.2
<a href="#">SiDR626EP</a>	PowerPAK® SO-8DC	60	20	0.002	0.002	68	25	7.4	227	0.62
<a href="#">SiR626DP</a>	PowerPAK® SO-8	60	20	0.002	0.002	68	21	8.2	100	0.91
<a href="#">SiRS4400DP</a>	PowerPAK® SO-8S	40	20	0.001	0.001	195	45	18	440	0.95
<a href="#">SiDR402EP</a>	PowerPAK® SO-8DC	40	20	0.001	0.001	110	22.5	9.5	291	0.88
<a href="#">SiR638ADP</a>	PowerPAK® SO-8	40	20	0.001	0.001	110	22.5	9.5	100	0.88
<a href="#">SiRS4302DP</a>	PowerPAK® SO-8S	30	20	0.001	0.001	153	30	17	478	1.2
<a href="#">SiDR500EP</a>	PowerPAK® SO-8DC	30	16	0.000	0.001	120	25.6	8.7	421	0.9
<a href="#">SiR500DP</a>	PowerPAK® SO-8	30	16	0.000	0.001	120	25.6	8.7	350	0.9
<b>HVM</b>										
<b>E Series</b>										
<a href="#">SiHK045N60E</a>	PowerPAK® 10x12	600	± 30	0.049		65	28	14	48	0.8
<a href="#">SiHK055N60E</a>	PowerPAK® 10x12	600	± 30	0.056		54	26	11	42	0.8
<a href="#">SiHK065N60E</a>	PowerPAK® 10x12	600	± 30	0.067		48	19	11	34	0.8
<a href="#">SiHK075N60E</a>	PowerPAK® 10x12	600	± 30	0.08		41	17	9	29	0.8
<a href="#">SiHK105N60E</a>	PowerPAK® 10x12	600	± 30	0.1		35	14	8	24	0.8



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Part Number	Package	V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	R <sub>DS(on)</sub> (Ω) Max. V <sub>GS</sub> = 10 V	R <sub>DS(on)</sub> (Ω) Max. V <sub>GS</sub> = 7.5 V	Q <sub>g</sub> (nC) Typ. V <sub>GS</sub> = 10 V	Q <sub>gs</sub> Typ. (nC)	Q <sub>gd</sub> Typ. (nC)	I <sub>D</sub> (A) TC = 25 °C	R <sub>θ</sub> Typ. (Ω)
<a href="#">SiHK125N60E</a>	PowerPAK® 10x12	600	± 30	0.125		29	13	6	21	0.8
<a href="#">SiHK155N60E</a>	PowerPAK® 10x12	600	± 30	0.158		24	10	6	19	0.9
<a href="#">SiHR080N60E</a>	PowerPAK® 8x8LR	600	± 30	0.084		42	19	10	51	0.7
<a href="#">SiHB080N60E</a>	D <sup>2</sup> PAK	600	± 30	0.08		42	19	10	35	0.7
<a href="#">SiHB100N60E</a>	D <sup>2</sup> PAK	600	± 30	0.1		33	13	10	30	0.7
<a href="#">SiHB120N60E</a>	D <sup>2</sup> PAK	600	± 30	0.12		30	10	12	25	0.65
<a href="#">SiHB150N60E</a>	D <sup>2</sup> PAK	600	± 30	0.158		24	10	6	22	0.9
<a href="#">SiHB180N60E</a>	D <sup>2</sup> PAK	600	± 30	0.18		22	7	11	19	0.7
<a href="#">SiHD180N60E</a>	DPAK	600	± 30	0.195		21	7	11	19	0.6
<a href="#">SiHB17N80AE</a>	D <sup>2</sup> PAK	800	± 30	0.29		41	8	18	15	0.5
<a href="#">SiHB21N80AE</a>	D <sup>2</sup> PAK	800	± 30	0.235		48	9	22	17.4	0.55
<a href="#">SiHB24N80AE</a>	D <sup>2</sup> PAK	800	± 30	0.184		59	15	30	21	0.5
<b>EF Series</b>										
<a href="#">SiHK045N60EF</a>	PowerPAK® 10x12	600	± 30	0.052		70	29	15	47	1.2
<a href="#">SiHK055N60EF</a>	PowerPAK® 10x12	600	± 30	0.058		60	26	14	40	0.7
<a href="#">SiHK075N60EF</a>	PowerPAK® 10x12	600	± 30	0.071		48	20	21	33	0.7
<a href="#">SiHK085N60EF</a>	PowerPAK® 10x12	600	± 30	0.085		42	17	9	30	0.7
<a href="#">SiHK105N60EF</a>	PowerPAK® 10x12	600	± 30	0.105		34	16	8	24	0.8
<a href="#">SiHH070N60EF</a>	PowerPAK® 8x8	600	± 30	0.071		50	20	17	36	0.7
<a href="#">SiHH085N60EF</a>	PowerPAK® 8x8	600	± 30	0.085		42	17	9	30	0.7
<a href="#">SiHH105N60EF</a>	PowerPAK® 8x8	600	± 30	0.105		33	16	8	26	0.7
<a href="#">SiHB055N60EF</a>	D <sup>2</sup> PAK	600	± 30	0.055		63	29	15	46	0.8
<a href="#">SiHB068N60EF</a>	D <sup>2</sup> PAK	600	± 30	0.068		51	19	6	41	0.7
<a href="#">SiHB085N60EF</a>	D <sup>2</sup> PAK	600	± 30	0.084		42	17	9	34	0.7
<a href="#">SiHB105N60EF</a>	D <sup>2</sup> PAK	600	± 30	0.102		35	12	11	29	0.7