



# VISHAY SiS468DN Siliconix Discrete Semiconductor User Guide

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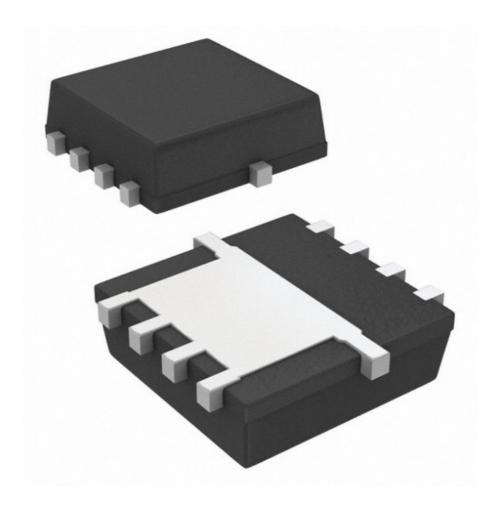


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**VISHAY SiS468DN Siliconix Discrete Semiconductor** 



### **Product Specifications**

• Brand: Vishay Siliconix

• Model: SiS468DN

• Type: N-Channel MOSFET

• Drain-Source Voltage (VDS): 80V

• RDS(on) max. at VGS = 10V: 0.0195 ohms

• RDS(on) max. at VGS = 7.5V: 0.0210 ohms

• RDS(on) max. at VGS = 4.5V: 0.0320 ohms

• Gate Charge (Qg): 8.7nC (typical)

• Continuous Drain Current (ID): 30A

• Configuration: Single

### **Product Features**

- N-Channel MOSFET
- Lead (Pb)-free and halogen-free package

### **Thermal Resistance Ratings**

• Maximum Junction-to-Ambient: 26°C/W

• Maximum Junction-to-Case: 1.9°C/W (steady state)

### **Product Usage Instructions**

#### Installation

- 1. Ensure the operating junction temperature range is between -55°C to +150°C.
- 2. Mount the MOSFET on a 1 x 1 FR4 board for optimal thermal performance.
- 3. Refer to the solder profile provided by Vishay for peak temperature recommendations.

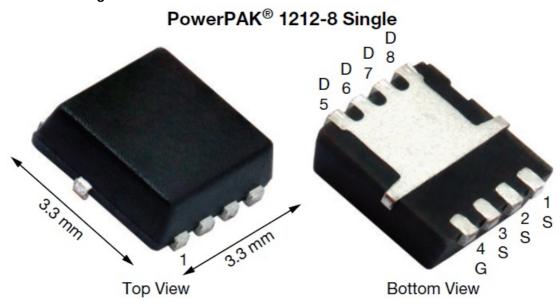
### Operation

- 1. Apply a gate-source voltage within the specified range for the desired drain-source current.
- 2. Monitor the drain-source voltage to stay within the 80V limit.
- 3. Avoid exceeding the continuous drain current rating of 30A.

### Frequently Asked Questions (FAQ)

- Q: What is the maximum drain-source breakdown voltage of the SiS468DN MOSFET?
  - A: The maximum drain-source breakdown voltage is 80V.
- Q: What is the typical gate charge for this MOSFET?
  - **A:** The typical gate charge is 8.7nC.
- Q: Can manual soldering with a soldering iron be used for leadless components?
  - **A:** Manual soldering with a soldering iron is not recommended for leadless components like the PowerPAK 1212-8.

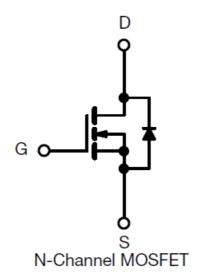
### PowerPAK® 1212-8 Single



### **FEATURES**

- TrenchFET® power MOSFET
- 100 % Rg and UIS tested
- Capable of operating with 5 V gate drive
- Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>

### **APPLICATIONS**



- Telecom bricks
- Primary side switch
- Synchronous rectification

### **PRODUCT SUMMARY**

| PRODUCT SUMMARY                                   |        |
|---|--------|
| V <sub>DS</sub> (V)                               | 80     |
| $R_{DS(on)}$ max. (W) at $V_{GS} = 10 \text{ V}$  | 0.0195 |
| $R_{DS(on)}$ max. (W) at $V_{GS} = 7.5$ V         | 0.0210 |
| $R_{DS(on)}$ max. (W) at $V_{GS} = 4.5 \text{ V}$ | 0.0320 |
| Q <sub>g</sub> typ. (nC)                          | 8.7    |
| I <sub>D</sub> (A) f, g                           | 30     |
| Configuration                                     | Single |

| ORDERING INFORMATION            |                  |
|---------------------------------|------------------|
| Package                         | PowerPAK® 1212-8 |
| Lead (Pb)-free and halogen-free | SiS468DN-T1-GE3  |

| ABSOLUTE MAXIMUM RATINGS (                         | T <sub>A</sub> = 25 °C, unle | ess otherwi      | se noted) |    |
|--|------------------------------|------------------|-----------|----|
| PARAMETER  | SYMBO<br>L                   | LIMIT            | UNIT      |    |
| Drain-source voltage                               | VDS                          | 80               | V         |    |
| Gate-source voltage                                |                              | VGS              | ± 20      | V  |
|  | T <sub>C</sub> = 25 °C       |                  | 30 g      |    |
| Continuous drain current (T <sub>J</sub> = 150 °C) | T <sub>C</sub> = 70 °C       |                  | 29.2      |    |
|  | T <sub>A</sub> = 25 °C       | I <sub>D</sub>   | 9.8 a, b  |    |
|  | T <sub>A</sub> = 70 °C       |                  | 7.8 a, b  |    |
| Pulsed drain current (t = 300 μs)                  | IDM                          | 60               |           |    |
| Continuous source-Drain diode curr                 | T <sub>C</sub> = 25 °C       | - I <sub>S</sub> | 30 g      | A  |
| ent  | T <sub>A</sub> = 25 °C       |                  | 3.1 a, b  |    |
| Single pulse avalanche current                     | L = 0.1 mH                   | IAS              | 10        |    |
| Single pulse avalanche energy                      | L = 0.1 11111                | EAS              | 5         | mJ |
|  | T <sub>C</sub> = 25 °C       |                  | 52        |    |
|  | T <sub>C</sub> = 70 °C       |                  | 33.3      |    |
| Maximum power dissipation                          | T <sub>A</sub> = 25 °C       | P <sub>D</sub>   | 3.7 a, b  | W  |
|  | T <sub>A</sub> = 70 °C       |                  | 2.4 a, b  |    |
| Operating junction and storage temp                | TJ, Tstg                     | -55 to +150      |           |    |
| Soldering recommendations (peak te                 |                              | 260              | °C        |    |

| THERMAL RESISTANCE RATINGS       |                  |            |         |         |      |  |  |  |
|----------------------------------|------------------|------------|---------|---------|------|--|--|--|
| PARAMETER                        |                  | SYMBO<br>L | TYPICAL | MAXIMUM | UNIT |  |  |  |
| Maximum junction-to-ambient a, e | t£10s            | RthJA      | 26      | 33      |      |  |  |  |
| Maximum junction-to-case (drain) | Steady-s<br>tate | RthJC      | 1.9     | 2.4     | °C/W |  |  |  |

### THERMAL RESISTANCE RATINGS

### **Notes**

- Surface mounted on 1" x 1" FR4 board
- t = 10 s
- See solder profile (<u>www.vishay.com/doc?73257</u>). The PowerPAK 1212-8 is a leadless package. The end of
  the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A
  solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom-side

### solder interconnection

- Rework conditions: Manual soldering with a soldering iron is not recommended for leadless components
- Maximum under steady-state conditions is 81 °C/W
- Based on TC = 25 °C
- Package limited

### **SPECIFICATIONS**

## (TJ = 25 °C, unless otherwise noted)

| PARAMETER SYMBO L  |                                  | TEST CONDITIONS  | MIN. | TYP.       | MAX.       | UNIT  |
|--|----------------------------------|--|------|------------|------------|-------|
| Static   | 1                                | 1  | 1    | 1          | 1          | 1     |
| Drain-source breakdown voltage                           | VDS                              | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                       | 80   | _          | _          | V     |
| V <sub>DS</sub> temperature coefficient                  | DV <sub>DS</sub> /T <sub>J</sub> |  | _    | 36         | _          | m\//0 |
| V <sub>GS(th)</sub> temperature coefficient DVGS(th) /TJ |                                  | I <sub>D</sub> = 250 μA  | _    | -5.5       | _          | mV/°  |
| Gate-source threshold voltage                            | VGS(th)                          | $V_{DS} = V_{GS}, I_D = 250 \mu A$                                   | 1.5  | _          | 3          | ٧     |
| Gate-source leakage                                      | IGSS                             | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V                      | _    | _          | ± 100      | nA    |
|  |                                  | V <sub>DS</sub> = 80 V, V <sub>GS</sub> = 0 V                        | _    | -          | 1          |       |
| Zero gate voltage drain current                          | IDSS                             | V <sub>DS</sub> = 80 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 ° | _    | _          | 10         | μΑ    |
| On-state drain current a                                 | ID(on)                           | V <sub>DS</sub> <sup>3</sup> 5 V, V <sub>GS</sub> = 10 V             | 20   | _          | _          | Α     |
|  | RDS(on)                          | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A                        | _    | 0.016<br>0 | 0.019<br>5 |       |
| Drain-source on-state resistance a                       |                                  | V <sub>GS</sub> = 7.5 V, I <sub>D</sub> = 7 A                        | _    | 0.017      | 0.021<br>0 | W     |
|  |                                  | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 5 A                        | _    | 0.023      | 0.032      | 32    |
| Forward transconductance a                               | gfs                              | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 10 A                        | _    | 25         | -          | S     |
| Dynamic b  |                                  |  |      |            |            |       |
| Input capacitance  | Ciss                             |  | _    | 780        | _          |       |
| Output capacitance                                       | Coss                             | V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V, f = 1 MH              | _    | 400        | _          | pF    |
| Reverse transfer capacitance                             | Crss                             | Z  | _    | 39         | _          | - P.  |
|  | Qg                               | $V_{DS} = 40 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 10$ A           | _    | 18.1       | 28         |       |
| Total gate charge  |                                  | $V_{DS} = 40 \text{ V}, V_{GS} = 7.5 \text{ V}, I_{D} = 10$          | _    | 13.8       | 21         |       |
|  |                                  |  | _    | 8.7        | 14         | 1     |

| Gate-source charge                     | Qgs            | $V_{DS} = 40 \text{ V}, V_{GS} = 4.5 \text{ V}, I_{D} = 10 \text{ A}$ | _   | 2.6  | _   | nC |
|--|----------------|---|-----|------|-----|----|
| Gate-drain charge                      | Qgd            |   | _   | 3.9  | _   |    |
| Output charge                          | Qoss           | V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V                         | _   | 23   | 35  |    |
| Gate resistance                        | R <sub>g</sub> | f = 1 MHz   | 0.2 | 1    | 2   | W  |
| Turn-on delay time                     | td(on)         |   | _   | 9    | 18  |    |
| Rise time                              | t <sub>r</sub> | V <sub>DD</sub> = 40 V, RL = 4 W,                                     | _   | 11   | 22  |    |
| Turn-off delay time                    | td(off)        | $I_D$ @ 10 A, $V_{GEN} = 7.5$ V, $R_g = 1$                            | _   | 15   | 30  |    |
| Fall time                              | t <sub>f</sub> | W   | _   | 9    | 18  |    |
| Turn-on delay time                     | td(on)         |   | _   | 8    | 16  |    |
| Rise time                              | t <sub>r</sub> | V <sub>DD</sub> = 40 V, RL = 4 W,                                     | _   | 10   | 20  | ns |
| Turn-off delay time                    | td(off)        | $I_D @ 10 A, V_{GEN} = 10 V, R_g = 1$                                 | _   | 15   | 30  |    |
| Fall time                              | t <sub>f</sub> | W   | _   | 9    | 18  |    |
| Drain-Source Body Diode Chara          | cteristics     |   |     |      |     |    |
| Continuous source-drain diode c urrent | I <sub>S</sub> | T <sub>C</sub> = 25 °C  | _   | _    | 30  | A  |
| Pulse diode forward current            | ISM            |   | _   | _    | 60  |    |
| Body diode voltage                     | VSD            | I <sub>S</sub> = 4 A, V <sub>GS</sub> = 0 V                           | _   | 0.78 | 1.2 | V  |
| Body diode reverse recovery tim e      | trr            |   | _   | 31   | 60  | ns |
| Body diode reverse recovery cha<br>rge | Qrr            | I <sub>F</sub> = 10 A, di/dt = 100 A/μs, T <sub>J</sub> = 25 °C       | _   | 25   | 50  | nC |
| Reverse recovery fall time             | ta             | 20 0  | _   | 15.5 | -   | nc |
| Reverse recovery rise time             | t <sub>b</sub> |   | _   | 15.5 | -   | ns |

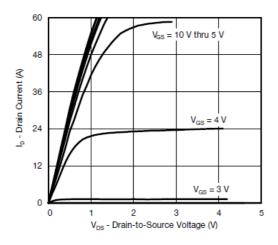
### Notes

- Pulse test; pulse width 300 μs, duty cycle 2 %
- Guaranteed by design, not subject to production testing

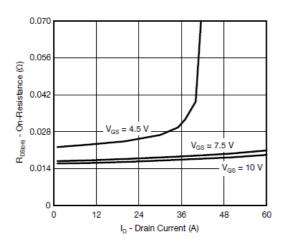
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and the functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### TYPICAL CHARACTERISTICS

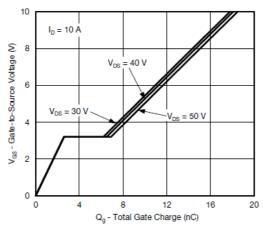
(25 °C, unless otherwise noted)



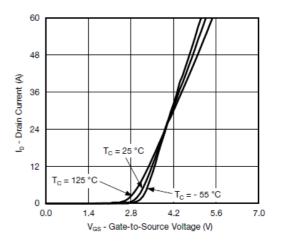
**Output Characteristics** 



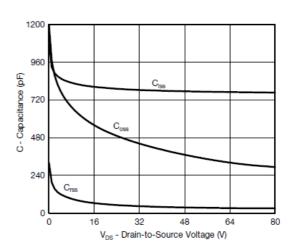
On-Resistance vs. Drain Current and Gate Voltage



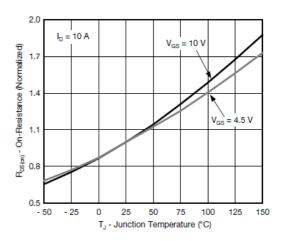
**Gate Charge** 



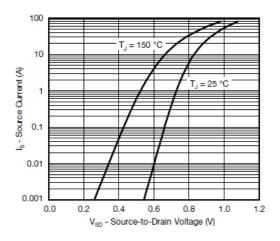
Transfer Characteristics



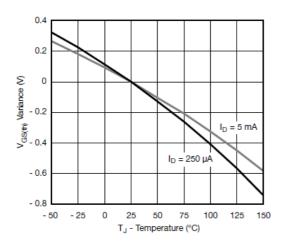
Capacitance



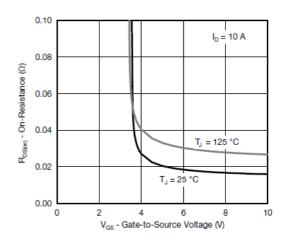
On-Resistance vs. Junction Temperature



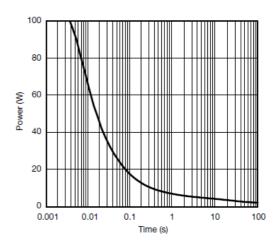
Source-Drain Diode Forward Voltage



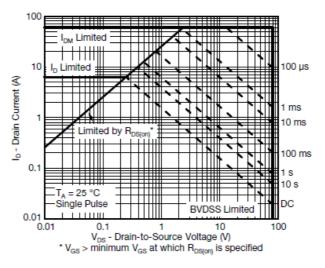
Threshold Voltage



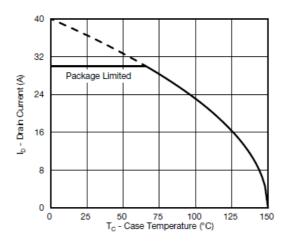
On-Resistance vs. Gate-to-Source Voltage



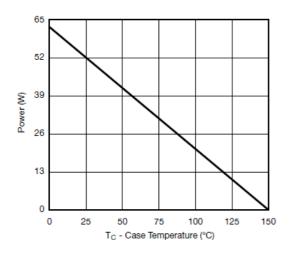
Single Pulse Power, Junction-to-Ambient



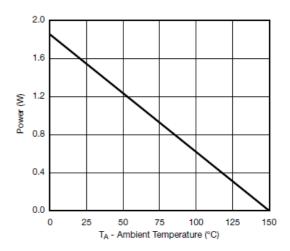
Safe Operating Area, Junction-to-Ambient



Current Derating <sup>a</sup>



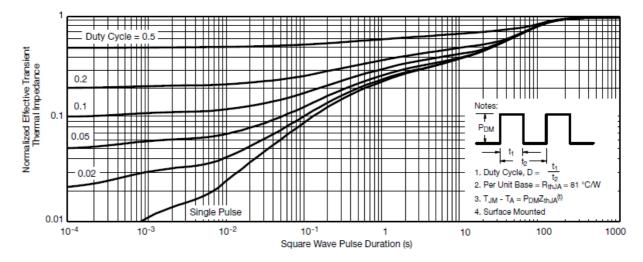




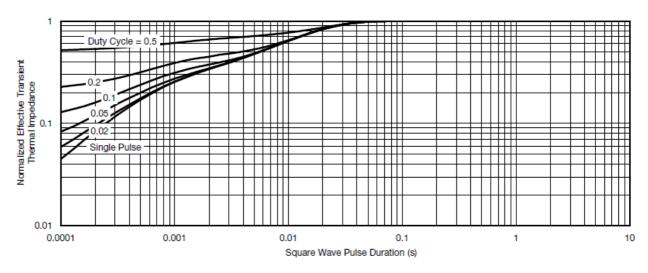
Power, Junction-to-Ambient

### Note

The power dissipation PD is based on TJ max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating when this rating falls below the package limit



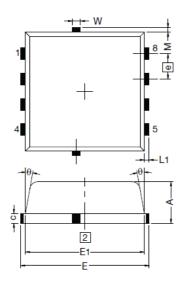
Normalized Thermal Transient Impedance, Junction-to-Ambient

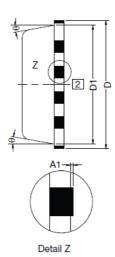


Normalized Thermal Transient Impedance, Junction-to-Case

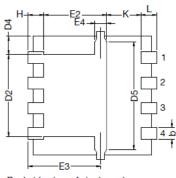
### **Package Information**

PowerPAK® 1212-8, (Single / Dual)

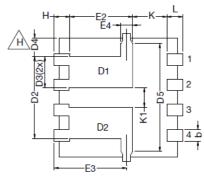




- Notes
  1. Inch will govern
  2 Dimensions exclusive of mold gate burrs
  3. Dimensions exclusive of mold flash and cutting burrs



Backside view of single pad



Backside view of dual pad

| DIM  | MILLIMET   | ERS  |      | INCHES     | INCHES     |       |  |  |  |
|------|------------|------|------|------------|------------|-------|--|--|--|
| DIM. | MIN.       | NOM. | MAX. | MIN.       | NOM.       | MAX.  |  |  |  |
| A    | 0.97       | 1.04 | 1.12 | 0.038      | 0.041      | 0.044 |  |  |  |
| A1   | 0.00       | _    | 0.05 | 0.000      | -          | 0.002 |  |  |  |
| b    | 0.23       | 0.30 | 0.41 | 0.009      | 0.012      | 0.016 |  |  |  |
| С    | 0.23       | 0.28 | 0.33 | 0.009      | 0.011      | 0.013 |  |  |  |
| D    | 3.20       | 3.30 | 3.40 | 0.126      | 0.130      | 0.134 |  |  |  |
| D1   | 2.95       | 3.05 | 3.15 | 0.116      | 0.120      | 0.124 |  |  |  |
| D2   | 1.98       | 2.11 | 2.24 | 0.078      | 0.083      | 0.088 |  |  |  |
| D3   | 0.48       | _    | 0.89 | 0.019      | _          | 0.035 |  |  |  |
| D4   | 0.47 typ.  | 1    |      | 0.0185 typ | 0.0185 typ |       |  |  |  |
| D5   | 2.3 typ.   |      |      | 0.090 typ  | 0.090 typ  |       |  |  |  |
| E    | 3.20       | 3.30 | 3.40 | 0.126      | 0.130      | 0.134 |  |  |  |
| E1   | 2.95       | 3.05 | 3.15 | 0.116      | 0.120      | 0.124 |  |  |  |
| E2   | 1.47       | 1.60 | 1.73 | 0.058      | 0.063      | 0.068 |  |  |  |
| E3   | 1.75       | 1.85 | 1.98 | 0.069      | 0.073      | 0.078 |  |  |  |
| E4   | 0.034 typ. |      | -    | 0.013 typ. |            | 1     |  |  |  |
| е    | 0.65 BSC   |      |      | 0.026 BSC  |            |       |  |  |  |
| K    | 0.86 typ.  |      |      | 0.034 typ. |            |       |  |  |  |
| K1   | 0.35       | _    | _    | 0.014      | _          | _     |  |  |  |
| Н    | 0.30       | 0.41 | 0.51 | 0.012      | 0.016      | 0.020 |  |  |  |
| L    | 0.30       | 0.43 | 0.56 | 0.012      | 0.017      | 0.022 |  |  |  |
| L1   | 0.06       | 0.13 | 0.20 | 0.002      | 0.005      | 0.008 |  |  |  |
| q    | 0°         | _    | 12°  | 0°         | _          | 12°   |  |  |  |
| W    | 0.15       | 0.25 | 0.36 | 0.006      | 0.010      | 0.014 |  |  |  |
| M    | 0.125 typ. | I    | I    | 0.005 typ. | 0.005 typ. |       |  |  |  |

### **Mounting and Thermal Considerations**

### Johnson Zhao

MOSFETs for switching applications are now available with die-on resistances around 1 m $\Omega$  and with the capability to handle 85 A. While these die capabilities represent a major advance over what was available just a few years ago, it is important for power MOSFET packaging technology to keep pace. It should be obvious that the degradation of a high-performance die by the package is undesirable. PowerPAK is a new package technology that addresses these issues. The PowerPAK 1212-8 provides ultra-low thermal impedance in a small package that is ideal for space-constrained applications. In this application note, the PowerPAK 1212-8's construction is

described. Following this, mounting information is presented. Finally, thermal and electrical performance is discussed.

#### THE PowerPAK PACKAGE

The PowerPAK 1212-8 package (Figure 1) is a derivative of PowerPAK SO-8. It utilizes the same packaging technology, maximizing the die area. The bottom of the die attach pad is exposed to provide a direct, low-resistance thermal path to the substrate the device is mounted on. The PowerPAK 1212-8 thus translates the benefits of the PowerPAK SO-8 into a smaller package, with the same level of thermal performance. (Please refer to application note "PowerPAK SO-8 Mounting and Thermal Considerations.")

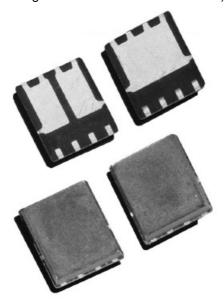


Figure 1. PowerPAK 1212 Devices

- The PowerPAK 1212-8 has a footprint area comparable to TSOP-6. It is over 40 % smaller than standard
- TSSOP-8. Its die capacity is more than twice the size of the standard TSOP-6's. It has thermal performance an order of magnitude better than the SO-8, and 20 times better than TSSOP-8. Its thermal performance is better than all current SMT packages in the market. It will take advantage of any PC board heat sink capability. Bringing the junction temperature down also increases the die efficiency by around 20 % compared with TSSOP-8. For applications where bigger packages are typically required solely for thermal consideration, the PowerPAK 1212-8 is a good option.
- Both the single and dual PowerPAK 1212-8 utilizes the same pin-outs as the single and dual PowerPAK SO-8.
- The low 1.05 mm PowerPAK height profile makes both versions an excellent choice for applications with space constraints.

#### **PowerPAK 1212 SINGLE MOUNTING**

- To take advantage of the single PowerPAK 1212-8's thermal performance see Application Note 826,
   Recommended Minimum Pad Patterns With Outline Drawing Access for Vishay Siliconix MOSFETs. Click on the PowerPAK 1212-8 single in the index of this document.
- In this figure, the drain land pattern is given to make full contact to the drain pad on the PowerPAK package. This land pattern can be extended to the left, right, and top of the drawn pattern. This extension will serve to increase the heat dissipation by decreasing the thermal resistance from the foot of the PowerPAK to the PC board and therefore to the ambient. Note that increasing the drain land area beyond a certain point will yield

little decrease in foot-to-board and foot-to ambient thermal resistance.

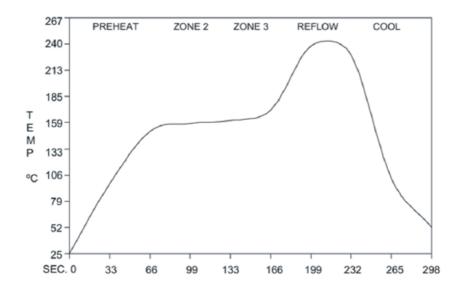
• Under specific conditions of board configuration, copper weight, and layer stack, experiments have found that adding copper beyond an area of about 0.3 to 0.5 in2 of will yield little improvement in thermal performance.

#### PowerPAK 1212 DUAL

- To take the advantage of the dual PowerPAK 1212-8's thermal performance, the minimum recommended land pattern can be found in Application Note 826,
- · Recommended Minimum Pad Patterns With Outline
- Drawing Access for Vishay Siliconix MOSFETs. Click on the PowerPAK 1212-8 dual in the index of this
  document.
- The gap between the two drain pads is 10 mils. This matches the spacing of the two drain pads on the PowerPAK 1212-8 dual package.
- This land pattern can be extended to the left, right, and top of the drawn pattern. This extension will serve to increase the heat dissipation by decreasing the thermal resistance from the foot of the PowerPAK to the PC board and therefore to the ambient.
  - Note that increasing the drain land area beyond a certain point will yield little decrease in foot-to-board and foot-to ambient thermal resistance. Under specific conditions of board configuration, copper weight, and layer stack, experiments have found that adding copper beyond an area of about 0.3 to 0.5 in 2 of will yield little improvement in thermal performance.

#### **REFLOW SOLDERING**

Vishay Siliconix surface-mount packages meet solder reflow reliability requirements. Devices are subjected to solder reflow as a preconditioning test and are then reliability-tested using temperature cycle, bias humidity, HAST, or pressure pot. The solder reflow temperature profile used, and the temperatures and time duration, are shown in Figures 2 and 3. For the lead (Pb)-free solder profile, see <a href="http://www.vishay.com/doc?73257">http://www.vishay.com/doc?73257</a>.



| Ramp-Up Rate                | + 6 °C /Second Maximum |
|-----------------------------|------------------------|
| Temperature at 155 ± 15 °C  | 120 Seconds Maximum    |
| Temperature Above 180 °C    | 70 - 180 Seconds       |
| Maximum Temperature         | 240 + 5/- 0 °C         |
| Time at Maximum Temperature | 20 - 40 Seconds        |
| Ramp-Down Rate              | + 6 °C/Second Maximum  |

Figure 2. Solder Reflow Temperature Profile

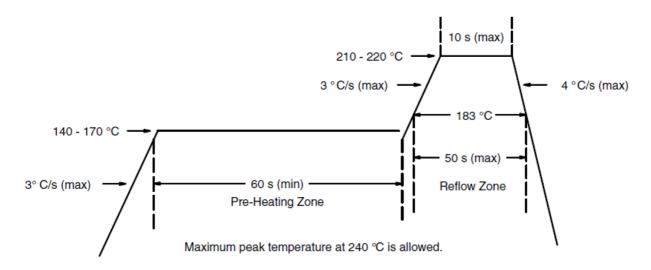


Figure 3. Solder Reflow Temperatures and Time Durations

| TABLE 1: EQIVALENT STEADY STATE PERFORMANCE |        |                                   |        |      |        |      |        |      |        |      |
|---|--------|-----------------------------------|--------|------|--------|------|--------|------|--------|------|
| Package                                     | sc     | SO-8 TSSOP-8 TSOP-8 PPAK 1212 PPA |        |      |        |      | PPAK   | SO-8 |        |      |
| Configuration                               | Single | Dual                              | Single | Dual | Single | Dual | Single | Dual | Single | Dual |
| Thermal Resiatance R <sub>thJC</sub> (C/W)  | 20     | 40                                | 52     | 83   | 40     | 90   | 2.4    | 5.5  | 1.8    | 5.5  |

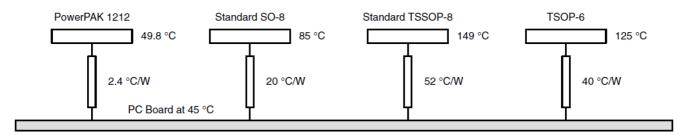


Figure 4. Temperature of Devices on a PC Board

### **EQUIVALENT STEADY STATE PERFORMANCE**

#### THERMAL PERFORMANCE

#### Introduction

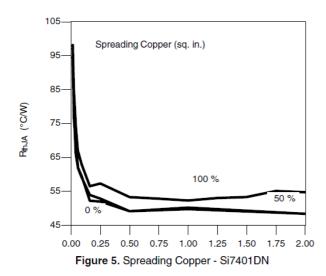
A basic measure of a device's thermal performance is the junction-to-case thermal resistance, Rθjc, or the junction to- foot thermal resistance, Rθjf. This parameter is measured for the device mounted to an infinite heat sink and is therefore a characterization of the device only, in other words, independent of the properties of the object to which the device is mounted. Table 1 shows a comparison of the PowerPAK 1212-8, PowerPAK SO-8, standard TSSOP-8 and SO-8 equivalent steady state performance.

By minimizing the junction-to-foot thermal resistance, the MOSFET die temperature is very close to the temperature of the PC board. Consider four devices mounted on a PC board with a board temperature of 45 °C (Figure 4). Suppose each device is dissipating 2 W. Using the junction- to-foot thermal resistance characteristics of the PowerPAK 1212-8 and the other SMT packages, die temperatures are determined to be 49.8 °C for the PowerPAK 1212-8, 85 °C for the standard SO-8, 149 °C for standard TSSOP-8, and 125 °C for TSOP-6. This is a 4.8 °C rise above the board temperature for the Power- PAK 1212-8, and over 40 °C for other SMT packages. A 4.8 °C rise has minimal effect on rDS(ON) whereas a rise of over 40 °C will cause an increase in rDS(ON) as high as 20 %.

### **Spreading Copper**

- Designers add additional copper, spreading copper, to the drain pad to aid in conducting heat from a device. It is helpful to have some information about the thermal performance for a given area of spreading copper.
   Figure 5 and Figure 6 show the thermal resistance of a PowerPAK 1212-8 single and dual devices mounted on a 2-in. x 2-in., four-layer FR-4 PC boards. The two internal layers and the backside layer are solid copper. The internal layers were chosen as solid copper to model the large power and ground planes common in many applications.
- The top layer was cut back to a smaller area and at each step junction-to-ambient thermal resistance
  measurements were taken. The results indicate that an area above 0.2 to 0.3 square inches of spreading
  copper gives no additional thermal performance improvement.
- A subsequent experiment was run where the copper on the back-side was reduced, first to 50 % in stripes to mimic circuit traces, and then totally removed. No significant effect was observed.

### **Vishay Siliconix**



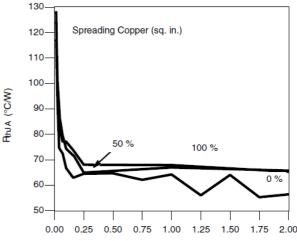


Figure 6. Spreading Copper - Junction-to-Ambient Performance

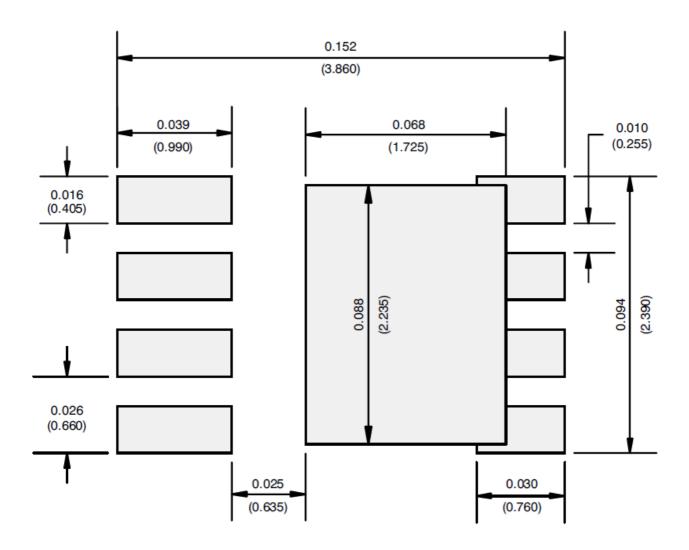
#### **CONCLUSIONS**

As a derivative of the PowerPAK SO-8, the PowerPAK 1212-8 uses the same packaging technology and has been shown to have the same level of thermal performance while having a footprint that is more than 40 % smaller than the standard TSSOP-8.

Recommended PowerPAK 1212-8 land patterns are provided to aid in PC board layout for designs using this new package.

The PowerPAK 1212-8 combines small size with attractive thermal characteristics. By minimizing the thermal rise above the board temperature, PowerPAK simplifies thermal design considerations, allows the device to run cooler, keeps rDS(ON) low, and permits the device to handle more current than a same- or larger-size MOSFET die in the standard TSSOP-8 or SO-8 packages.

**RECOMMENDED MINIMUM PADS FOR PowerPAK® 1212-8 Single** 



Recommended Minimum Pads Dimensions in Inches/(mm)

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### **Documents / Resources**



<u>VISHAY SiS468DN Siliconix Discrete Semiconductor</u> [pdf] User Guide SiS468DN Siliconix Discrete Semiconductor, SiS468DN, Siliconix Discrete Semiconductor, Discrete Semiconductor, Semiconductor

### References

- <u>O</u> applications.no
- vishay.com/doc?73257
- SiS468DN MOSFETs | Vishay
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