



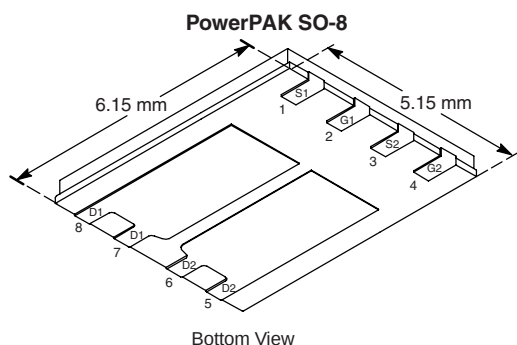
## Dual N-Channel 60-V (D-S) MOSFET

## PRODUCT SUMMARY

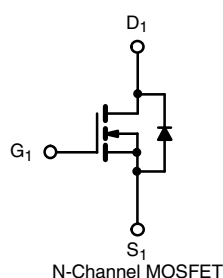
| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
|--------------|---------------------------|-----------|
| 60           | 0.075 at $V_{GS} = 10$ V  | 4.6       |
|              | 0.100 at $V_{GS} = 4.5$ V | 4.0       |

## FEATURES

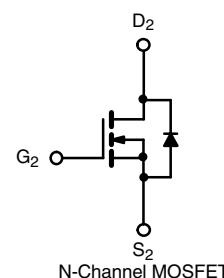
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET® Power MOSFET
- New Low Thermal Resistance PowerPAK® Package
- Dual MOSFET for Space Savings

RoHS  
COMPLIANT  
HALOGEN  
FREE  
Available

Ordering Information: Si7948DP-T1-E3 (Lead (Pb)-free)  
Si7948DP-T1-GE3 (Lead (Pb)-free and Halogen-free)



N-Channel MOSFET



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS  $T_A = 25$  °C, unless otherwise noted

| Parameter                                                       |                        | Symbol                            | 10 s        | Steady State | Unit |
|-----------------------------------------------------------------|------------------------|-----------------------------------|-------------|--------------|------|
| Drain-Source Voltage                                            |                        | V <sub>DS</sub>                   | 60          |              | V    |
| Gate-Source Voltage                                             |                        | V <sub>GS</sub>                   | ± 20        |              |      |
| Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup> | T <sub>A</sub> = 25 °C | I <sub>D</sub>                    | 4.6         | 3.0          | A    |
|                                                                 | T <sub>A</sub> = 70 °C |                                   | 3.6         | 2.4          |      |
| Pulsed Drain Current                                            |                        | I <sub>DM</sub>                   | 15          |              |      |
| Continuous Source Current (Diode Conduction) <sup>a</sup>       |                        | I <sub>S</sub>                    | 2.7         | 1.2          |      |
| Single Avalanche Current                                        | L = 1.0 mH             | I <sub>AS</sub>                   | 15          |              |      |
| Single Avalanche Energy                                         |                        | E <sub>AS</sub>                   | 11          |              | mJ   |
| Maximum Power Dissipation <sup>a</sup>                          | T <sub>A</sub> = 25 °C | P <sub>D</sub>                    | 3.3         | 1.4          | W    |
|                                                                 | T <sub>A</sub> = 70 °C |                                   | 2.1         | 0.9          |      |
| Operating Junction and Storage Temperature Range                |                        | T <sub>J</sub> , T <sub>stg</sub> | - 55 to 150 |              | °C   |
| Soldering Recommendations (Peak Temperature) <sup>b, c</sup>    |                        |                                   | 260         |              |      |

## THERMAL RESISTANCE RATINGS

| Parameter                                | Symbol     | Typical | Maximum | Unit |
|------------------------------------------|------------|---------|---------|------|
| Maximum Junction-to-Ambient <sup>a</sup> | $R_{thJA}$ | 29      | 38      | °C/W |
|                                          |            | 60      | 85      |      |
| Maximum Junction-to-Case (Drain)         | $R_{thJC}$ | 4.0     | 5.2     |      |

## Notes

- Surface Mounted on 1" x 1" FR4 board.
- See Solder Profile ([www.vishay.com/ppg273257](http://www.vishay.com/ppg273257)). The PowerPAK SO-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.

**SPECIFICATIONS**  $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted

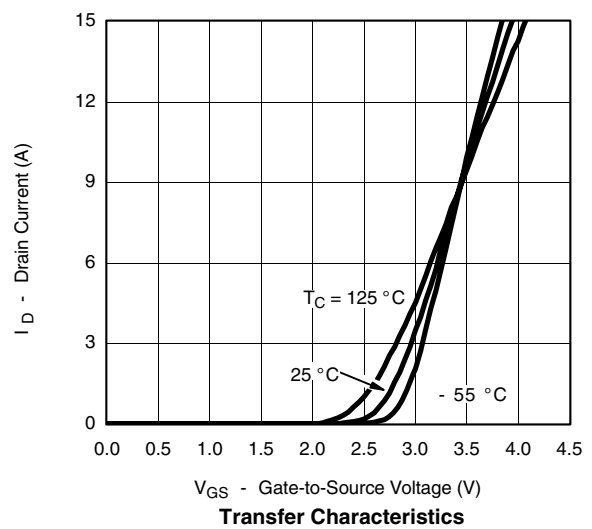
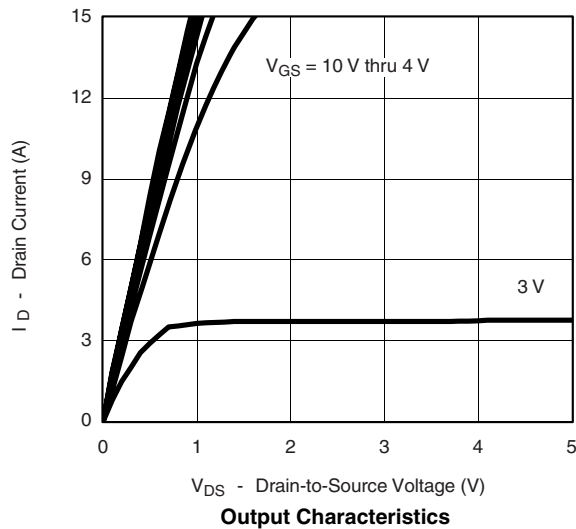
| Parameter                                     | Symbol       | Test Conditions                                                                                                                   | Min. | Typ.  | Max.      | Unit          |
|-----------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------|------|-------|-----------|---------------|
| <b>Static</b>                                 |              |                                                                                                                                   |      |       |           |               |
| Gate Threshold Voltage                        | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                                                                | 1    |       | 3         | V             |
| Gate-Body Leakage                             | $I_{GSS}$    | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$                                                                                |      |       | $\pm 100$ | nA            |
| Zero Gate Voltage Drain Current               | $I_{DSS}$    | $V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$                                                                                    |      |       | 1         | $\mu\text{A}$ |
|                                               |              | $V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 55\text{ }^{\circ}\text{C}$                                               |      |       | 5         |               |
| On-State Drain Current <sup>a</sup>           | $I_{D(on)}$  | $V_{DS} \geq 5\text{ V}$ , $V_{GS} = 10\text{ V}$                                                                                 | 15   |       |           | A             |
| Drain-Source On-State Resistance <sup>a</sup> | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ , $I_D = 4.6\text{ A}$                                                                                     |      | 0.060 | 0.075     | $\Omega$      |
|                                               |              | $V_{GS} = 4.5\text{ V}$ , $I_D = 4.0\text{ A}$                                                                                    |      | 0.080 | 0.100     |               |
| Forward Transconductance <sup>a</sup>         | $g_{fs}$     | $V_{DS} = 15\text{ V}$ , $I_D = 4.6\text{ A}$                                                                                     |      | 6     |           | S             |
| Diode Forward Voltage <sup>a</sup>            | $V_{SD}$     | $I_S = 2.7\text{ A}$ , $V_{GS} = 0\text{ V}$                                                                                      |      | 0.8   | 1.2       | V             |
| <b>Dynamic<sup>b</sup></b>                    |              |                                                                                                                                   |      |       |           |               |
| Total Gate Charge                             | $Q_g$        | $V_{DS} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 15\text{ A}$                                                             |      | 12    | 20        | nC            |
| Gate-Source Charge                            | $Q_{gs}$     |                                                                                                                                   |      | 2     |           |               |
| Gate-Drain Charge                             | $Q_{gd}$     |                                                                                                                                   |      | 3.5   |           |               |
| Gate Resistance                               | $R_g$        |                                                                                                                                   |      | 1.5   |           | $\Omega$      |
| Turn-On Delay Time                            | $t_{d(on)}$  | $V_{DD} = 30\text{ V}$ , $R_L = 2\text{ }\Omega$<br>$I_D \cong 15\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 2.5\text{ }\Omega$ |      | 7     | 20        | ns            |
| Rise Time                                     | $t_r$        |                                                                                                                                   |      | 8     | 25        |               |
| Turn-Off Delay Time                           | $t_{d(off)}$ |                                                                                                                                   |      | 15    | 40        |               |
| Fall Time                                     | $t_f$        |                                                                                                                                   |      | 7     | 20        |               |
| Source-Drain Reverse Recovery Time            | $t_{rr}$     | $I_F = 2.7\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$                                                                         |      | 30    | 60        |               |

Notes:

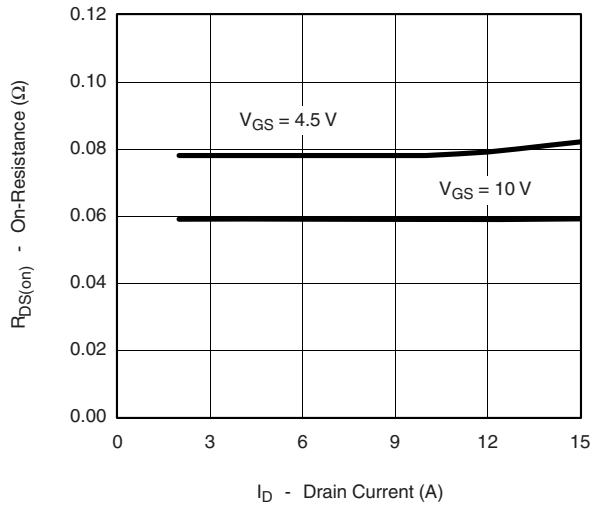
a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

b. Guaranteed by design, not subject to production testing.

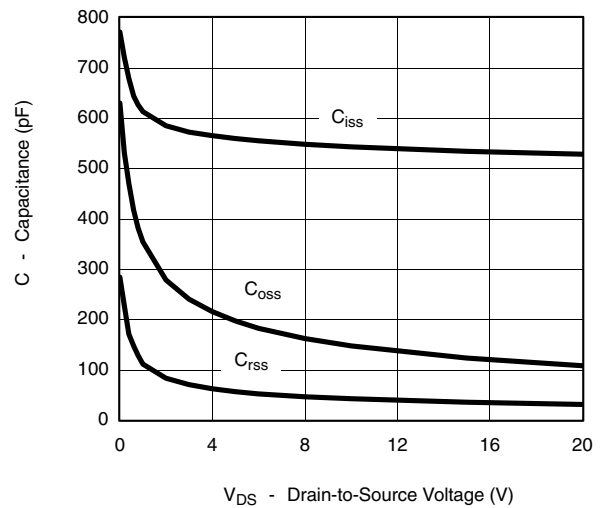
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**TYPICAL CHARACTERISTICS**  $25\text{ }^{\circ}\text{C}$ , unless otherwise noted

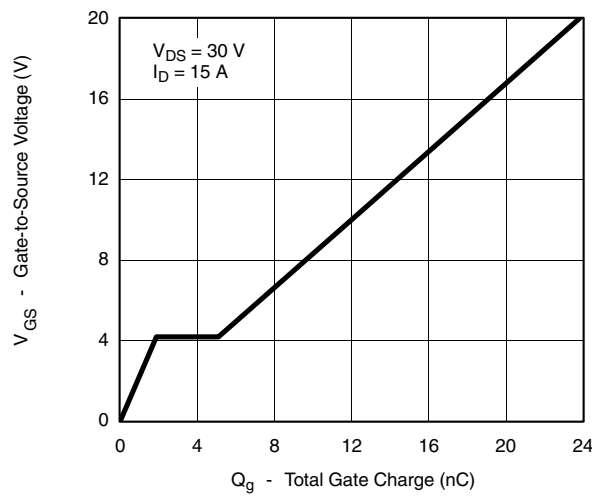
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



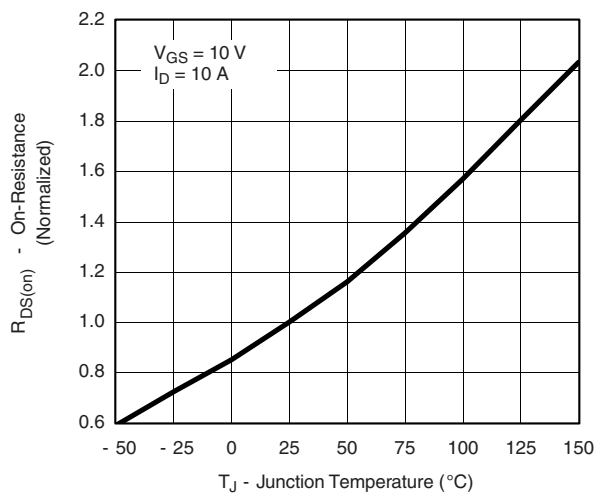
**On-Resistance vs. Drain Current**



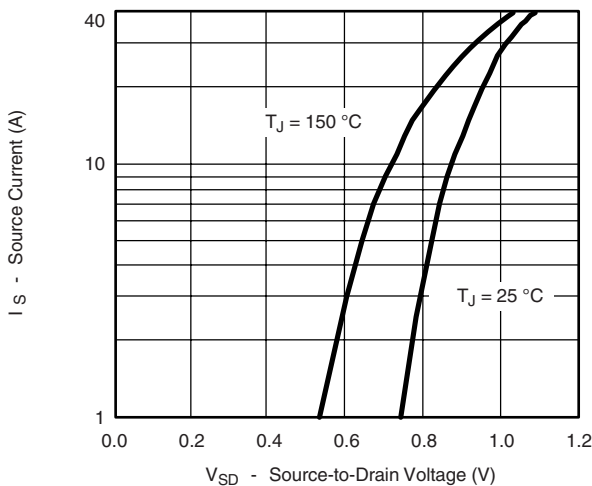
**Capacitance**



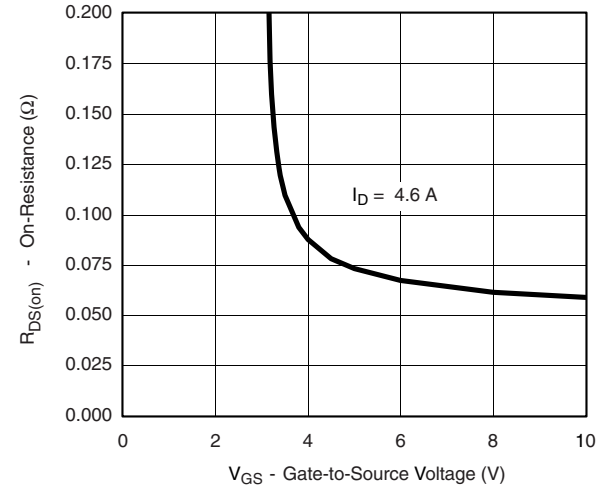
**Gate Charge**



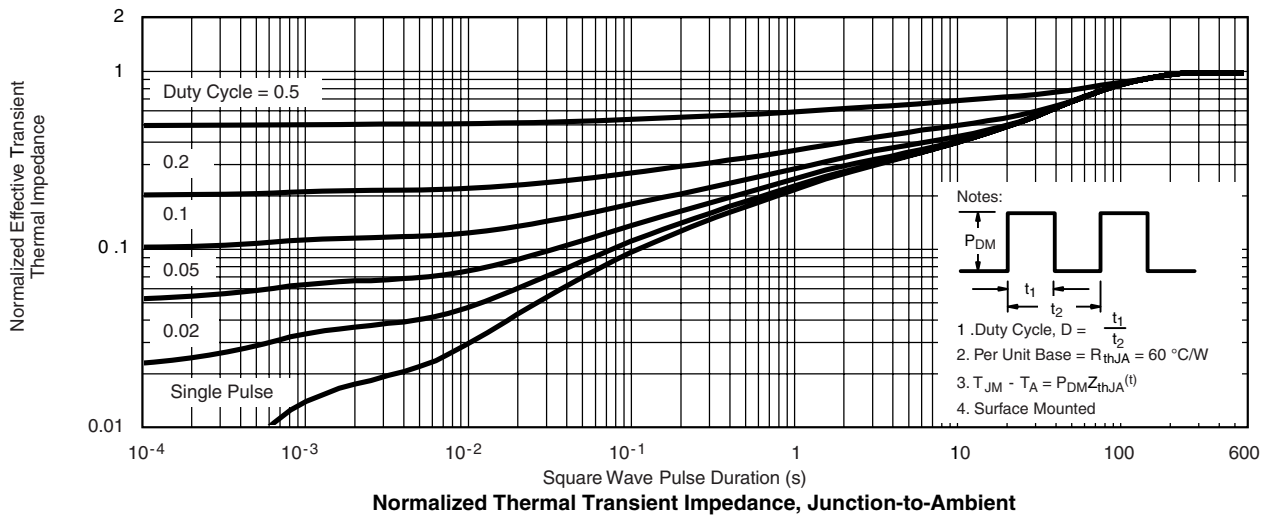
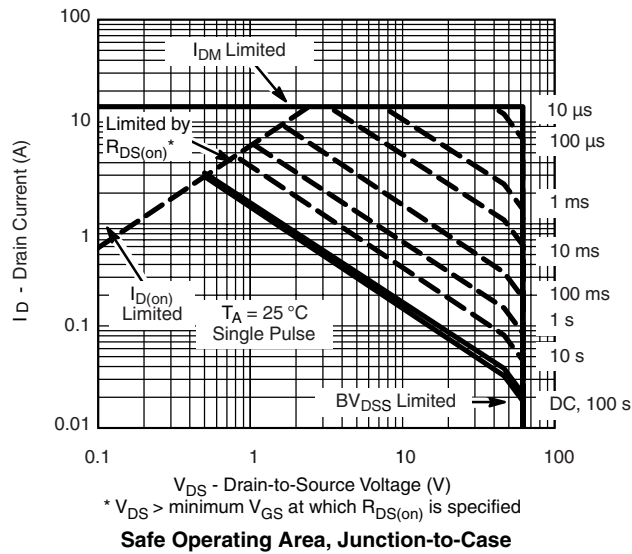
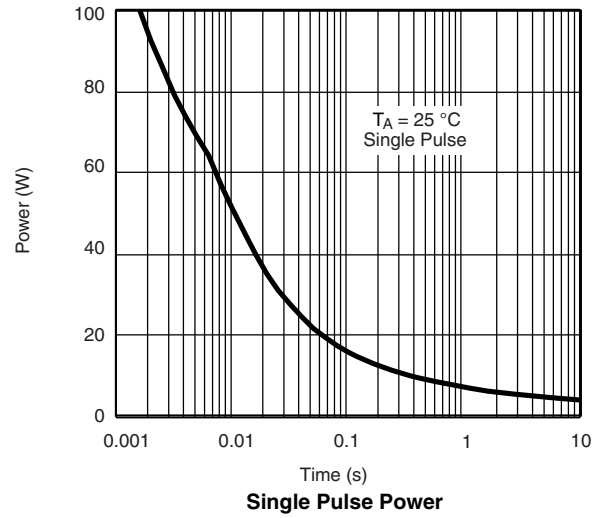
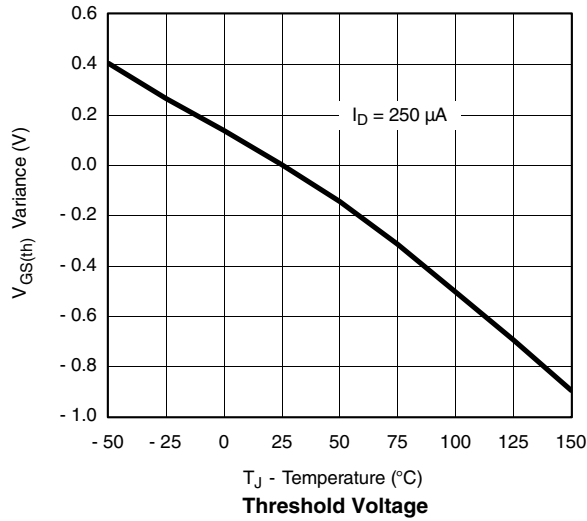
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

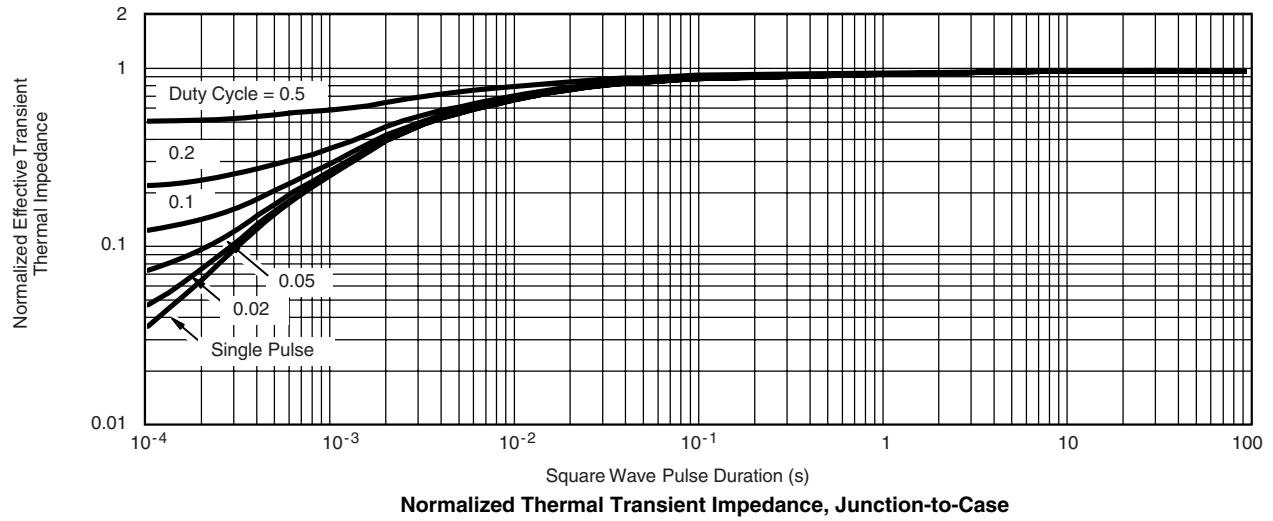


**On-Resistance vs. Gate-to-Source Voltage**

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

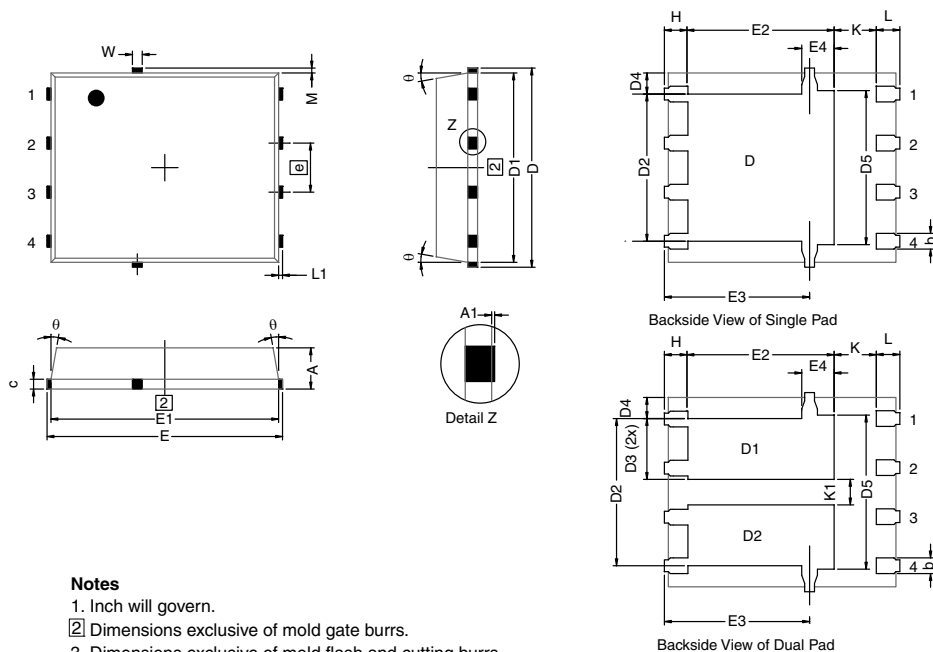


**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



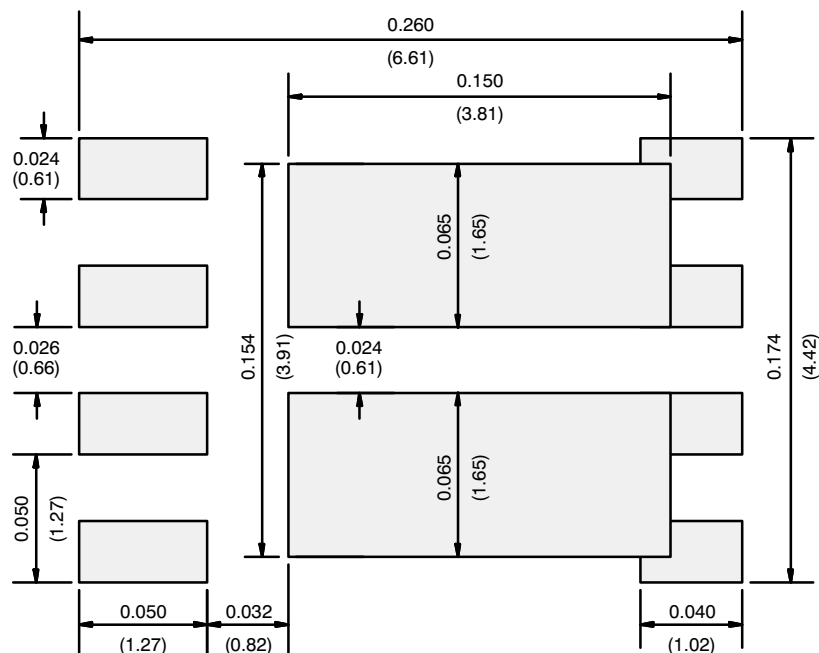
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## PowerPAK® SO-8, (Single/Dual)



| DIM.                            | MILLIMETERS |      |      | INCHES      |       |       |
|---------------------------------|-------------|------|------|-------------|-------|-------|
|                                 | MIN.        | NOM. | MAX. | MIN.        | NOM.  | MAX.  |
| A                               | 0.97        | 1.04 | 1.12 | 0.038       | 0.041 | 0.044 |
| A1                              |             | -    | 0.05 | 0           | -     | 0.002 |
| b                               | 0.33        | 0.41 | 0.51 | 0.013       | 0.016 | 0.020 |
| c                               | 0.23        | 0.28 | 0.33 | 0.009       | 0.011 | 0.013 |
| D                               | 5.05        | 5.15 | 5.26 | 0.199       | 0.203 | 0.207 |
| D1                              | 4.80        | 4.90 | 5.00 | 0.189       | 0.193 | 0.197 |
| D2                              | 3.56        | 3.76 | 3.91 | 0.140       | 0.148 | 0.154 |
| D3                              | 1.32        | 1.50 | 1.68 | 0.052       | 0.059 | 0.066 |
| D4                              | 0.57 typ.   |      |      | 0.0225 typ. |       |       |
| D5                              | 3.98 typ.   |      |      | 0.157 typ.  |       |       |
| E                               | 6.05        | 6.15 | 6.25 | 0.238       | 0.242 | 0.246 |
| E1                              | 5.79        | 5.89 | 5.99 | 0.228       | 0.232 | 0.236 |
| E2 (for AL product)             | 3.30        | 3.48 | 3.66 | 0.130       | 0.137 | 0.144 |
| E2 (for other product)          | 3.48        | 3.66 | 3.84 | 0.137       | 0.144 | 0.151 |
| E3                              | 3.68        | 3.78 | 3.91 | 0.145       | 0.149 | 0.154 |
| E4 (for AL product)             | 0.58 typ.   |      |      | 0.023 typ.  |       |       |
| E4 (for other product)          | 0.75 typ.   |      |      | 0.030 typ.  |       |       |
| e                               | 1.27 BSC    |      |      | 0.050 BSC   |       |       |
| K (for AL product)              | 1.45 typ.   |      |      | 0.057 typ.  |       |       |
| K (for other product)           | 1.27 typ.   |      |      | 0.050 typ.  |       |       |
| K1                              | 0.56        | -    | -    | 0.022       | -     | -     |
| H                               | 0.51        | 0.61 | 0.71 | 0.020       | 0.024 | 0.028 |
| L                               | 0.51        | 0.61 | 0.71 | 0.020       | 0.024 | 0.028 |
| L1                              | 0.06        | 0.13 | 0.20 | 0.002       | 0.005 | 0.008 |
| θ                               | 0°          | -    | 12°  | 0°          | -     | 12°   |
| W                               | 0.15        | 0.25 | 0.36 | 0.006       | 0.010 | 0.014 |
| M                               | 0.125 typ.  |      |      | 0.005 typ.  |       |       |
| ECN: C13-0702-Rev. K, 20-May-13 |             |      |      |             |       |       |
| DWG: 5881                       |             |      |      |             |       |       |

## RECOMMENDED MINIMUM PADS FOR PowerPAK® SO-8 Dual



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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