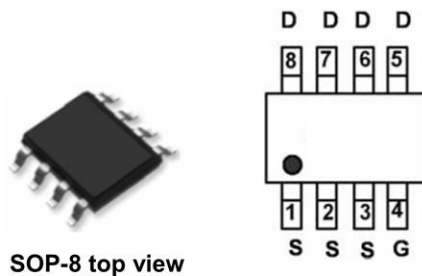


### GENERAL FEATURES

- $V_{DS} = -60V$   $I_D = -4A$
- $R_{DS(ON)} < -98m\Omega$  @  $V_{GS}=10V$
- $R_{DS(ON)} < -145m\Omega$  @  $V_{GS}=4.5V$

### Package and Pin Configuration



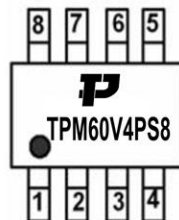
### Application

- Load/Power Switching
- Interfacing Switching
- Logic Level Shift

### Circuit diagram



### Marking:



### Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

| Parameter  | Symbol         | Value      | Unit       |
|--|----------------|------------|------------|
| Drain-Source Voltage                             | $V_{DSS}$      | -60        | V          |
| Continuous Drain Current                         | $I_D$          | -4         | A          |
| Pulsed Drain Current (note1)                     | $I_{DM}$       | -16        | A          |
| Gate-Source Voltage                              | $V_{GSS}$      | $\pm 20$   | V          |
| Single Pulse Avalanche Energy (note2)            | $E_{AS}$       | 36         | mJ         |
| Avalanche Current                                | $I_{AS}$       | 12         | A          |
| Power Dissipation ( $T_C = 25^\circ C$ ) (note3) | $P_D$          | 3.1        | W          |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$ | -55 To 150 | $^\circ C$ |

### Thermal Data

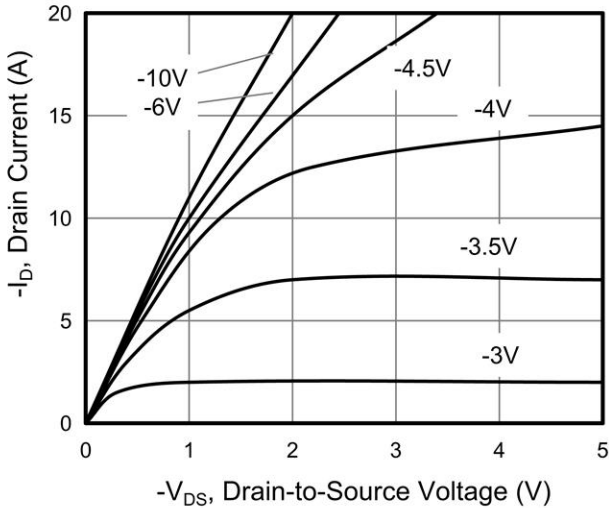
| Symbol | Parameter  | Value   | Unit         |
|--------|--|---------|--------------|
| Rthj-a | Thermal Resistance Junction-ambient <sup>3</sup> | Max. 40 | $^\circ C/W$ |

### Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

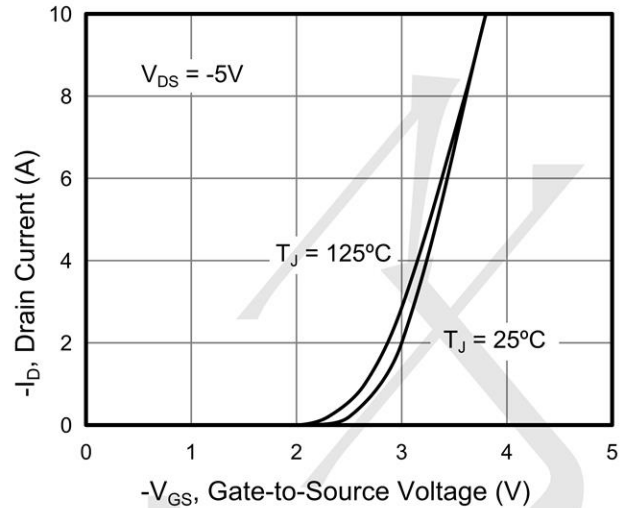
| Specifications T <sub>J</sub> = 25°C, unless otherwise noted |                      |   |       |      |      |      |
|--|----------------------|---|-------|------|------|------|
| Parameter  | Symbol               | Test Conditions   | Value |      |      | Unit |
|  |                      |   | Min.  | Typ. | Max. |      |
| <b>Static</b>  |                      |   |       |      |      |      |
| Drain-Source Breakdown Voltage                               | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                           | -60   | --   | --   | V    |
| Zero Gate Voltage Drain Current                              | I <sub>DSS</sub>     | V <sub>DS</sub> = -60V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C     | --    | --   | -1   | μA   |
|  |                      | V <sub>DS</sub> = -60V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 150°C    | --    | --   | -100 |      |
| Gate-Source Leakage  | I <sub>GSS</sub>     | V <sub>GS</sub> = ±20V  | --    | --   | ±100 | nA   |
| Gate-Source Threshold Voltage                                | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA             | -1.0  | -1.7 | -3.0 | V    |
| Drain-Source On-Resistance (Note3)                           | R <sub>DS(on)</sub>  | V <sub>GS</sub> = -10V, I <sub>D</sub> = -4A                            | --    | 90   | 98   | mΩ   |
|  |                      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3A                           | --    | 100  | 145  | mΩ   |
| <b>Dynamic</b>   |                      |   |       |      |      |      |
| Input Capacitance  | C <sub>iss</sub>     | V <sub>GS</sub> = 0V,<br>V <sub>DS</sub> = -30V,<br>f = 1.0MHz          | --    | 976  | --   | pF   |
| Output Capacitance   | C <sub>oss</sub>     |   | --    | 70   | --   |      |
| Reverse Transfer Capacitance                                 | C <sub>rss</sub>     |   | --    | 30   | --   |      |
| Total Gate Charge  | Q <sub>g</sub>       | V <sub>DD</sub> = -30V, I <sub>D</sub> = -4A,<br>V <sub>GS</sub> = -10V | --    | 24   | --   | nC   |
| Gate-Source Charge   | Q <sub>gs</sub>      |   | --    | 2.2  | --   |      |
| Gate-Drain Charge  | Q <sub>gd</sub>      |   | --    | 3.6  | --   |      |
| Turn-on Delay Time   | t <sub>d(on)</sub>   | V <sub>DD</sub> = -30V, I <sub>D</sub> = -4A,<br>R <sub>G</sub> = 2.5Ω  | --    | 10   | --   | ns   |
| Turn-on Rise Time  | t <sub>r</sub>       |   | --    | 5    | --   |      |
| Turn-off Delay Time  | t <sub>d(off)</sub>  |   | --    | 35   | --   |      |
| Turn-off Fall Time   | t <sub>f</sub>       |   | --    | 9    | --   |      |
| <b>Drain-Source Body Diode Characteristics</b>               |                      |   |       |      |      |      |
| Continuous Body Diode Current                                | I <sub>S</sub>       | T <sub>C</sub> = 25°C   | --    | --   | -4   | A    |
| Pulsed Diode Forward Current                                 | I <sub>SM</sub>      |   | --    | --   | -16  |      |
| Body Diode Voltage   | V <sub>SD</sub>      | T <sub>J</sub> = 25°C, I <sub>SD</sub> = -4A, V <sub>GS</sub> = 0V      | --    | --   | -1.2 | V    |
| Reverse Recovery Time  | t <sub>rr</sub>      | I <sub>F</sub> = -4A,<br>di <sub>F</sub> /dt = 100A/μs                  | --    | 36   | --   | ns   |
| Reverse Recovery Charge                                      | Q <sub>rr</sub>      |   | --    | 38   | --   | nC   |

**Typical Electrical and Thermal Characteristics**

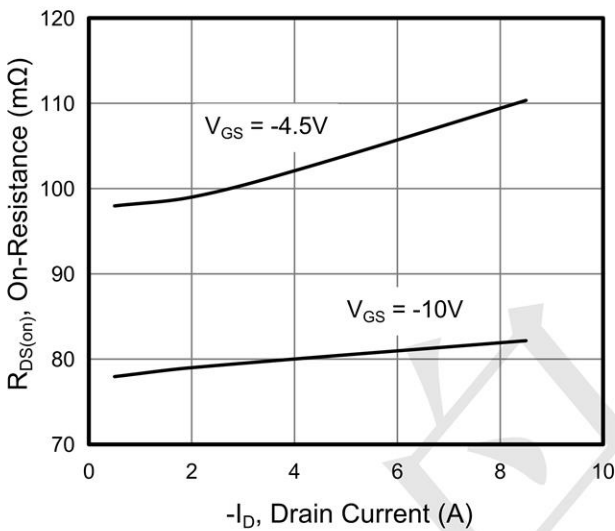
**Figure 1. Output Characteristics**



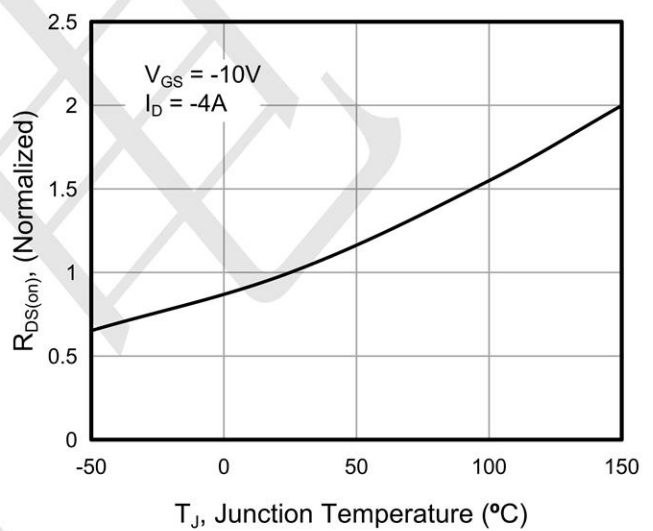
**Figure 2. Transfer Characteristics**



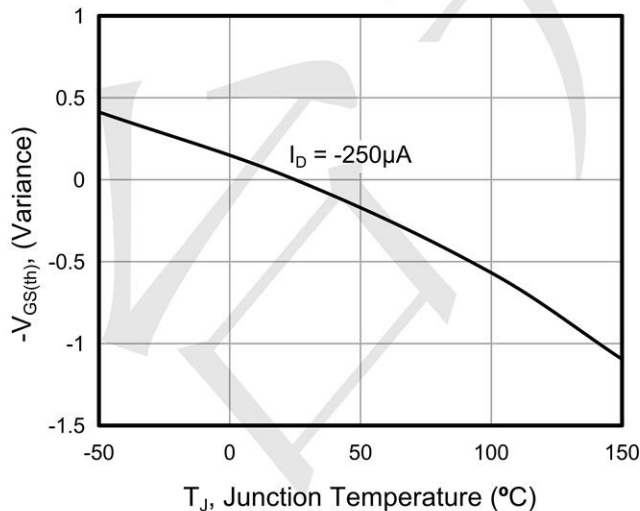
**Figure 3. On-Resistance vs. Drain Current**



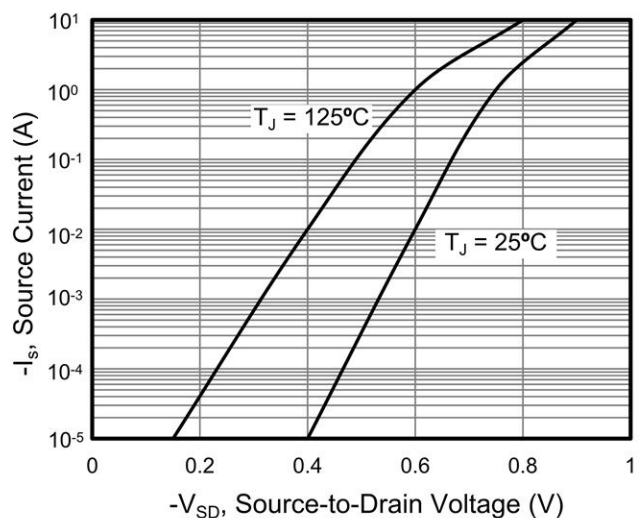
**Figure 4. On-Resistance vs. Junction Temperature**



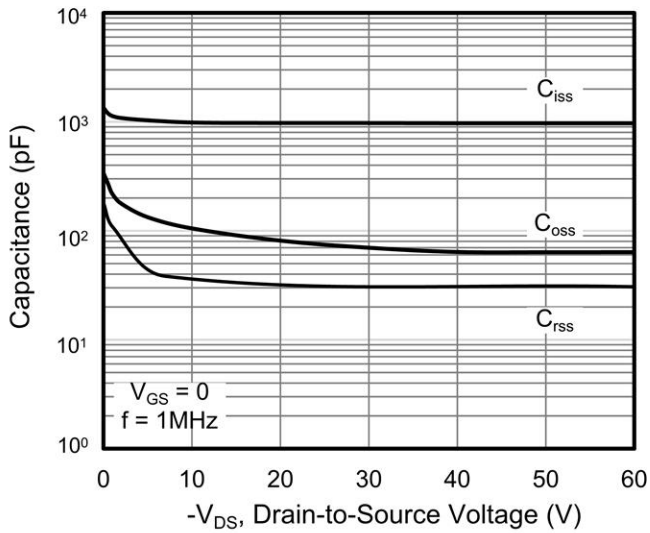
**Figure 5. Threshold Voltage vs. Junction Temperature**



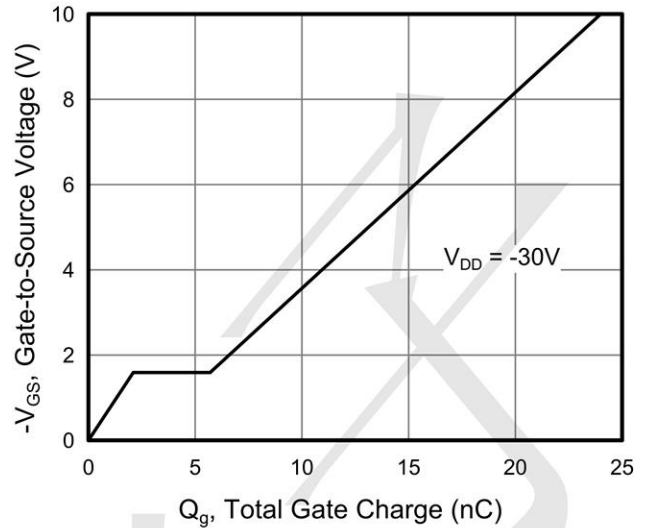
**Figure 6. Body Diode Forward Voltage**



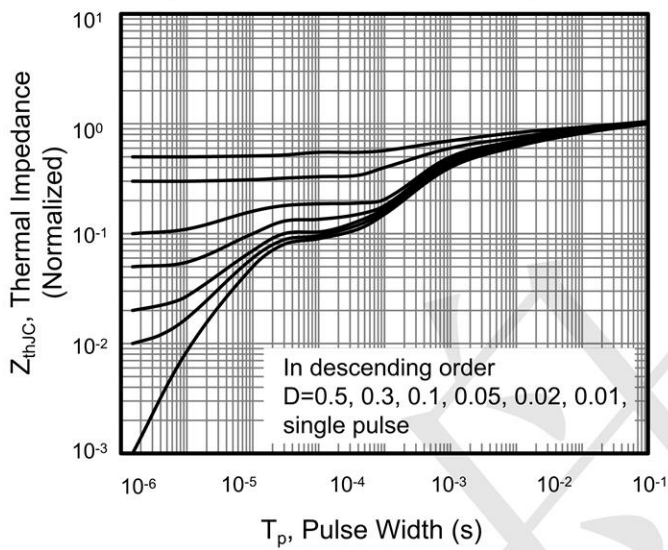
**Figure 7. Capacitance**



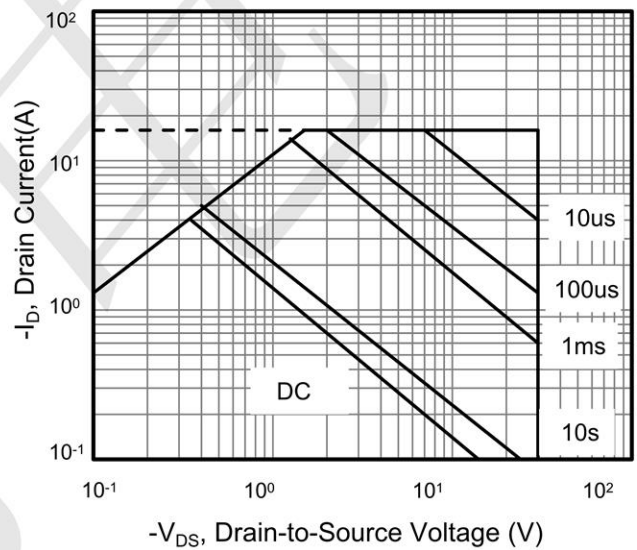
**Figure 8. Gate Charge**



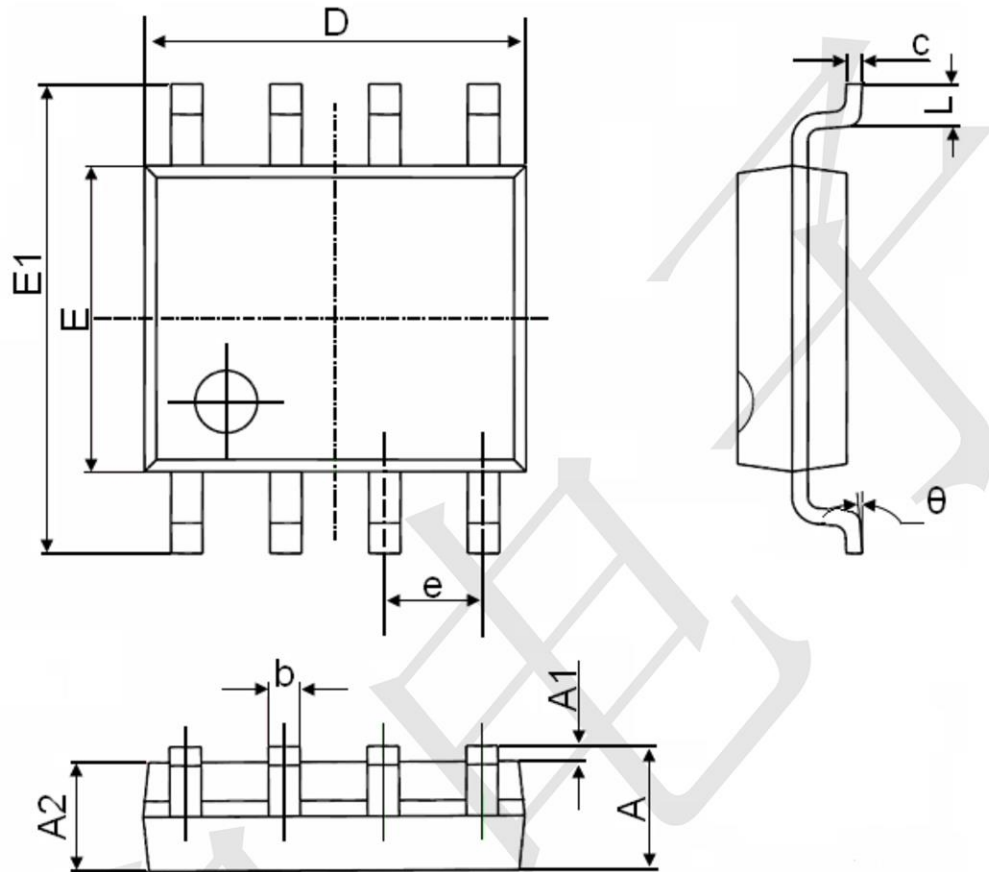
**Figure 9. Transient Thermal Impedance**



**Figure 10. Safe Operating Area**



**SOP-8 Package Information**



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1     | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2     | 1.350                     | 1.550 | 0.053                | 0.061 |
| b      | 0.330                     | 0.510 | 0.013                | 0.020 |
| c      | 0.170                     | 0.250 | 0.006                | 0.010 |
| D      | 4.700                     | 5.100 | 0.185                | 0.200 |
| E      | 3.800                     | 4.000 | 0.150                | 0.157 |
| E1     | 5.800                     | 6.200 | 0.228                | 0.244 |
| e      | 1.270(BSC)                |       | 0.050(BSC)           |       |
| L      | 0.400                     | 1.270 | 0.016                | 0.050 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

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